

Thank you for purchasing our GT-LT95 Overdrive Kit.

This all-range overdrive has been designed to fit onto the PTO flange area of the Land Rover LT95 gearbox. This means that you can enjoy the 28% overdrive in any gear, including reverse, and in high or low range.

In conjunction with Global Roamer Corporation of Canada, we have developed a robust overdrive gearbox that will allow you to enjoy quieter, more fuel-efficient cruising on motorways, along with the ability to split every gear while towing heavy loads. It also allows you to overdrive all gears while in low range, reducing engine noise and wear on those long sandy tracks and beaches.



The GT-LT95 overdrive gearbox takes advantage of Global Roamer's legendary epicyclic gear train technology which is used in their ROAMERDRIVE overdrive gearboxes. Also known as *planetary gear sets*, they are well known for their strength and durability. Global Roamer Corporation has a world-wide population of many thousands of overdrives using this very same *bullet-proof* technology.

Many of the older style 'layshaft' overdrive units suffered badly from a lack of lubrication. The GT-LT95 is designed to be open to the transfer case and utilises an innovative lubrication system which directs transfer case oil through the overdrive gearbox and back to the transfer case via a large deep groove ball bearing. To handle the extra heat generated by the overdrive gearbox, a finned transfer case cover is supplied which doubles the heat rejection compared to the standard cover. If even more cooling is required for high speed, high load in hot climates, the cover has ports for an oil cooler and manual temperature sensor.



As with all gearboxes, lubrication failure due to excessive heat, lack of supply, or both, is to be avoided at all costs. To assist this, we have teamed up with another Australian company, Gauge Innovations, to supply you with an accurate digital temperature gauge. This very clever gauge uses simple lug style sensors that can monitor both engine and gearbox temperature. Unlike traditional sensors, they operate independent of oil level. It even has an optional exhaust gas temperature thermocouple available; perfect for turbocharged applications. Not only does the gauge have simple to understand icons that change colour if safe limits are exceeded, it also has a series of audible alarms so you never miss that vital warning.

APPLICATION

Although initially designed for use on the 4-speed Range Rover Classics, with modifications to the selector lever assembly, the GT-LT95 overdrive gearbox can be installed on most vehicles fitted with Land Rover's LT95 gearbox.

The following is a list of the most common vehicles that were fitted with the LT95 gearbox:

- Range Rover 1970-1983
- Stage 1 V8 109's 1979-1985
- 90's and 110's V8 1983-1984
- Ex-Military Forward Control 101 1972-1978
- NZ Army Stage 1 V8 109's 1982-1986
- Australian Army Perentie 3.9L Isuzu 4 cylinder 1984-92
- Australian Army Bushranger 3.9L Isuzu 4 cylinder 1992-98

IN THE BOX (Range Rover Classic Kit)

- GT-LT95 Overdrive Gearbox
- Coupling assembly
- Finned transfer case cover
- Transfer case cover gasket
- Digital temperature gauge kit including 2 sensors
- 8 off M8 studs, nuts and spring washers
- Selector assembly and mounting hardware
- Selector gaiter and mounting ring
- 'GT Overdrive' Vehicle Badge

Installation (Range Rover Classic)

Introduction: The purpose of this installation manual is to assist a skilled automotive technician in the installation of the GT-LT95 overdrive kit onto the LT95 4-speed gearbox as installed in the 1970-1983 Range Rover Classic. **It is assumed that the LT95 gearbox is in good serviceable condition.**

It is possible to install the overdrive gearbox from above by removing the centre floor panel, or from below by lowering the rear of the gearbox so that the PTO flange is clear of the centre floor panel. Refer to the *Range Rover Repair Operations Manual 1970-1985* for procedures to remove the centre floor section, or how to lower the rear of the gearbox.

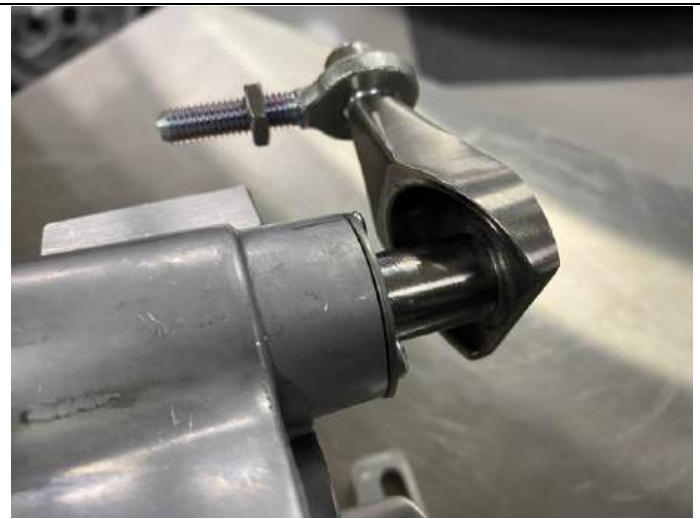
Safety: The installation of the gearbox should only be undertaken by a suitably qualified technician or person experienced in the repair and maintenance of off-road motor vehicles. It may involve lifting the vehicle which can be dangerous if proper equipment and procedures are not followed. This manual details the procedure for installing the GT-LT95 overdrive gearbox, however, **procedures outlined in the *Range Rover Repair Operations Manual 1970-1985* must be adhered to, especially as detailed in the section on *General Fitting Instructions* which contains *Safety Precautions*.** It is the responsibility of the person installing this product to ensure that they are properly informed in relation to recognised workshop safety procedures. If you are unsure how to proceed, stop, and contact the support staff at Garage Therapy.

1. Unpack all items and check off against the list below:
 - GT-LT95 Overdrive Gearbox
 - Coupling assembly
 - Finned transfer case cover
 - Transfer case cover gasket
 - Digital temperature gauge kit including 2 sensors
 - 8 off M8 studs, nuts and spring washers
 - Selector assembly and mounting hardware
 - Selector gaiter and mounting ring
 - 'GT Overdrive' Vehicle Badge

2. Using a small prybar or screw driver, move the overdrive selector shaft rearward so that the overdrive is in the engaged position. Ensure the overdrive output gear turns freely. If the output shaft doesn't turn freely, it indicates that the direct drive synchro ring has 'locked' onto its cone during storage and shipping. Filling the overdrive with some oil and then shifting it in and out of engagement will usually free up the direct drive synchro ring.



Important: Due to shipping restrictions, the overdrive is shipped dry. Over time this can result in the synchro rings '*locking*' onto their cones during storage and shipping. It is important to ensure the output shaft turns freely while in the engaged position prior to installing the overdrive. Do not install the overdrive and try and use the engine to free up the synchro ring as this can result in severe damage to the overdrive. Contact our support staff if you are unable to get the overdrive to turn freely while in the engaged position.





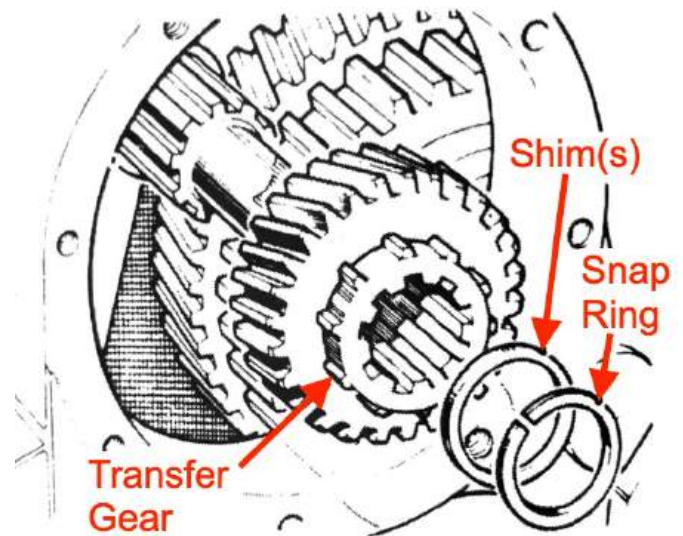
3. Remove centre floor panel or lower the rear of the gearbox as noted in the Introduction above.
4. Check for and repair any oil leaks from the transfer case, excluding the bottom and PTO flange covers.
5. Drain the oil from the transfer case and remove the following:
 - a. PTO cover
 - b. Mainshaft rear needle roller bearing
 - c. Transfer case cover



6. Remove the retaining snap ring and shim(s) and the transfer gear from the mainshaft.



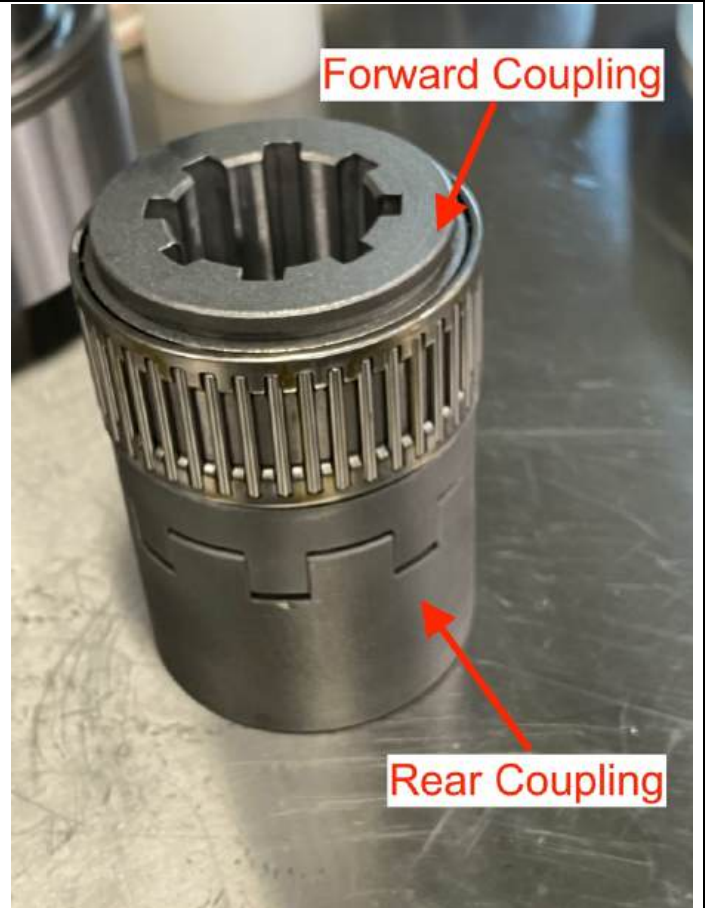
Important: Care needs to be taken to ensure that the mainshaft doesn't move forward during these steps as the roller thrust bearing assembly inside the main gearbox can be dislodged requiring the main gearbox to be disassembled to reposition it.



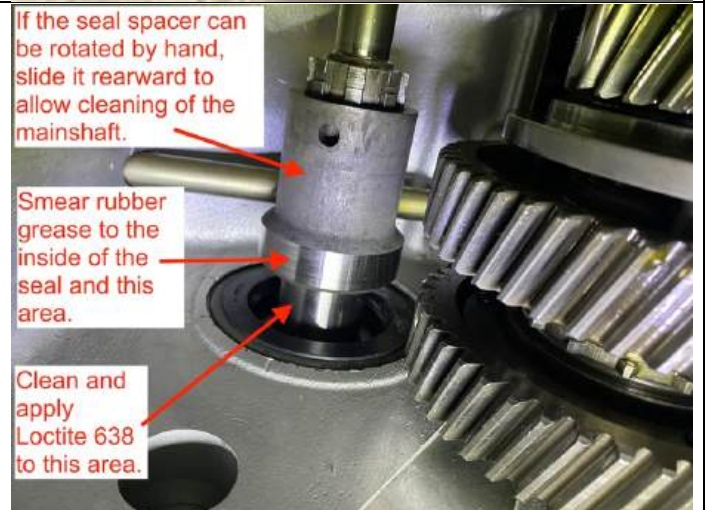
7. Carefully remove the coupling and needle roller bearing assembly from its packaging.
8. Split apart the forward and rear coupling halves.



Important: The two coupling halves have been matched to provide a snug fit between the two. This is important to reduce the total gear train backlash. To separate the two halves it may be necessary to tap the rear coupling from side to side with a soft mallet. Take care not to damage the mating faces.



9. Check to make sure the seal spacer is locked onto the mainshaft by attempting to rotate or move it by hand. If the seal spacer can be rotated or moved on the mainshaft, perform the following steps.
 - a) Carefully move the seal spacer rearward along the mainshaft as far as the transfer gear lever cross shaft.
 - b) Repeatedly clean the mainshaft using a Scotch-Brite pad and solvent (brake clean spray works well) to remove any old locking compound and oil residue. Move the seal spacer back and forth while flushing with solvent. Repeat this to remove as much oil as possible from the mainshaft and seal spacer.
 - c) Smear the inside of the seal and outside of the seal space with a small amount of rubber grease.
 - d) Apply Loctite 638 (an oil tolerant, high strength retaining compound) to the mainshaft and slide the seal spacer **fully home**.
 - e) Reinstall the forward coupling.
 - f) Immediately proceed with the steps below before the Loctite cures.





Important: It is possible for the main gearbox oil to migrate to the transfer case of the LT95 if the rear mainshaft seal is excessively worn or damaged. A history of oil consumption in the main gearbox in the absence of any external leaks would warrant further inspection and possibly the replacement of the rear mainshaft seal. The seal can be inspected and replaced during the installation of the GT-LT95 overdrive.



Important: Care needs to be taken to ensure that the mainshaft doesn't move forward during these steps as the roller thrust bearing assembly inside the main gearbox can be dislodged requiring the main gearbox to be disassembled to reposition it.

10. Carefully slide the forward coupling half onto the mainshaft and temporarily fit the retaining snap ring.

Note: Do not install the shim(s) at this stage.



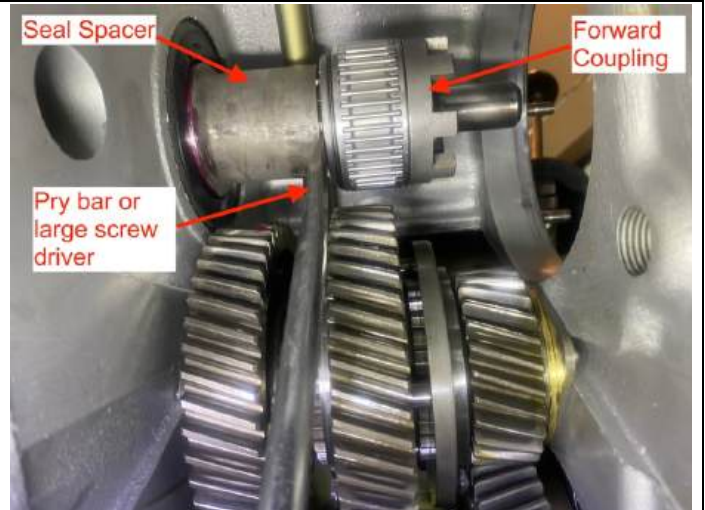
Important: Ensure that the front coupling slides into place. Do not force or drive the coupling onto the mainshaft spline as you risk moving the mainshaft forward resulting in the need to disassemble the main gearbox to relocate the roller thrust assembly. It may be necessary to grind away any high spots or burrs on the mainshaft to allow the forward coupling to slide on.



11. Pry the seal spacer and the forward coupling apart using a pry bar or large flat screwdriver.



Important: Ensure that the forward coupling is pressed hard against the retaining snap ring.



12. Using a set of feeler gauges, measure and record the gap between the seal spacer and the forward coupling half.

13. Select shim(s) so that the maximum clearance when installed is 0.05mm (0.002").



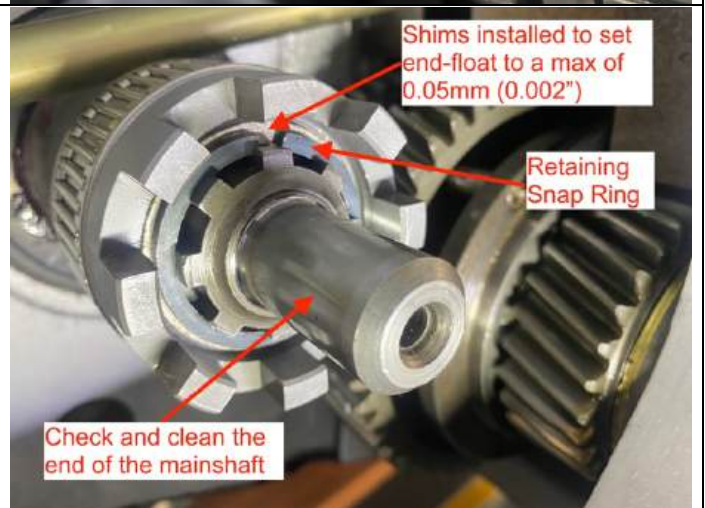
Important: Ensure that the maximum clearance is not exceeded as this sets the gearbox mainshaft end-float. Excessive end-float will increase gear train backlash.



14. Install the shim(s) and the retaining snap ring.
15. Check and clean the end of the mainshaft.

Note: Ensure the retaining snap ring is properly fitted and replace it if it has lost tension.

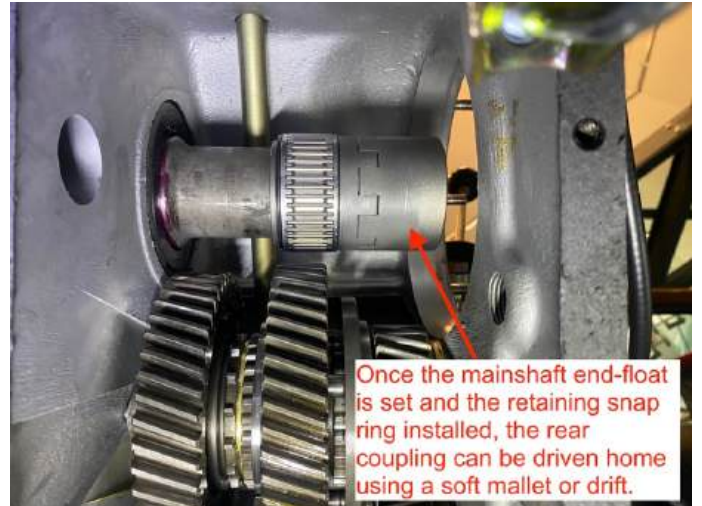
Note: The rear of the mainshaft engages with a bronze bush inside the input shaft of the overdrive gearbox. This area rotates with the overdrive gearbox's input shaft. Minor wear or pitting of this area caused by the original needle roller bearing can be tolerated.



16. Once the retaining snap ring has been fitted, the mainshaft cannot move forward and it is now safe to drive the rear coupling half onto the forward half using a soft mallet or drift.



Important: Care needs to be taken to avoid damaging the internal spline area of the rear coupling half. The two coupling halves have been matched to provide a snug fit between the two. This is important to reduce the total gear train backlash.



17. Fit the Selector Bracket using the supplied fasteners to the top transfer cover. Do not fully tension fasteners.

Note: Sound deadening is sometimes bonded onto the top surface of the transfer case top cover. A small amount of this may need to be cut/scraped away to allow the Selector Bracket to sit on the top cover. It is also acceptable to use some spacing washers under the Selector Bracket so that it clears the sound deadening.

Note: The supplied fasteners can be either socket head cap screws or hex bolts.

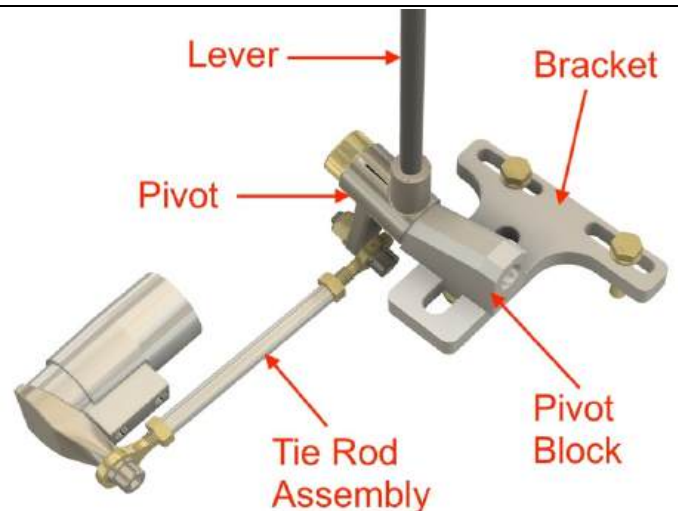


18. Fit the selector Pivot, Pivot Block and Tie Rod Assembly. Do not fully tension fasteners. Do not fit the Selector Lever.

Note: The Pivot Block has been designed for use in both RHD and LHD vehicles. For RHD vehicles, install the Pivot Block as shown with the selector Pivot fitted to the angled face of the Pivot Block. For LHD vehicles, rotate the Pivot Block 180° and fit the selector Pivot to the vertical face.

Note: The Selector Bracket allows for the adjustment of the Selector Lever in relation to the floor cut-out detailed below. Do not fully tension these fasteners.

Note: The Tie Rod Assembly can be installed on either side of the Pivot to achieve the best alignment.



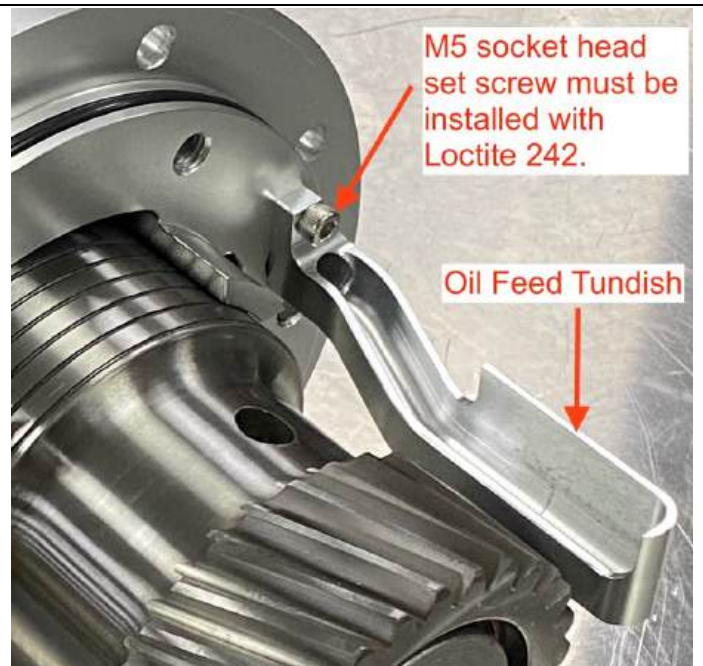
19. Inspect and clean the inside diameter and the mating face of the PTO flange register. Patch any defects using a suitable *liquid metal*.
20. Remove any sharp edges that might damage the sealing 'O' ring when fitting the GT-LT95 overdrive gearbox.
21. Apply Loctite 242 (thread seal lock) and screw the 8 off M8 hex socket studs fully into the PTO mounting flange of the transfer case. There should be approximately 20mm of the stud protruding from the PTO flange mounting face.
22. Apply a film of rubber grease to the inside register of the PTO.

Note: The sealing of the overdrive gearbox to the transfer case is by way of an 'O' ring fitted to the overdrive mounting flange. To assist cooling of the overdrive gearbox, we do not recommend installing a gasket to the PTO flange. Where the inside diameter of the PTO flange area is damaged, or has significant casting defects that cannot be repaired, a gasket may be required. Depending on operating conditions, an external oil cooler and pump may then be required. See notes at on our website in relation to routing of the oil cooler circuit.

23. Locate the Oil Feed Tundish and M5 socket head set screw. Apply Loctite 242 (thread seal lock) to the M5 set screw and secure the Oil Feed Tundish to the overdrive mounting flange.



Important: Loctite 242 locking compound must be used on the M5 set screw to secure the Oil Feed Tundish. Failure to do so may result in the Oil Feed Tundish separating from the mounting flange resulting in severe damage to the transfer case and gear set.



24. Check to ensure the nylon coupling spacer is still in place inside the output shaft.



Important: The nylon coupling spacer is designed to ensure correct engagement of the rear coupling. Should the nylon spacer not be fitted, it is possible that the rear coupling could disengage from the front coupling resulting in loss of drive regardless of overdrive engagement.



25. Apply some oil to the forward coupling needle roller bearing and some grease to the end of the mainshaft.

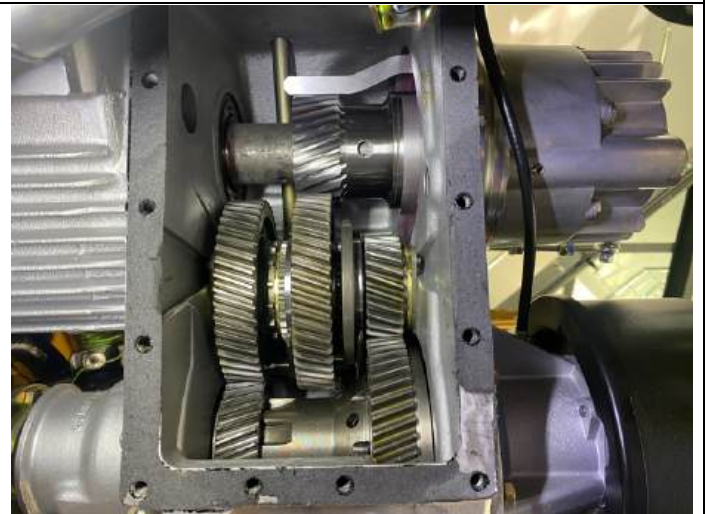
26. Apply a long lasting rubber 'O' ring lubricant such as Molykote 111 to the mounting flange 'O' ring.

27. Lift the overdrive gearbox into position while rotating it until the transfer gear and coupling assembly mesh. Ensure the mounting flange cut-out aligns with the transfer intermediate shaft and slide the overdrive gearbox onto the mounting studs. Push the overdrive gearbox into the transfer case PTO register until the 'O' ring seal touches the PTO flange face.

Note: It may be necessary to rotate the rear driveshaft (with centre diff locked) to allow the transfer gears, and the overdrive input shaft and rear coupling to mesh. The centre diff lock can be engaged by applying a short low pressure burst of compressed air to the front of the vacuum unit which will then emit an audible click. Remember to disengage the centre diff lock.



Caution: The overdrive gearbox weighs approximately 25kgs. If necessary, use suitable lifting equipment or a second person to assist.





28. Once the overdrive gearbox is engaged to a point where the 'O' ring seal on the mounting flange is in contact with the transfer case PTO flange face, fit the spring washers and hex M8 nuts finger tight.
29. Push home the overdrive gearbox until its mounting flange is in contact with the transfer case PTO flange face.
30. Tighten the hex nuts in a diagonal fashion.

Note: Due to the space limitations, it is best to install the spring washers and hex nuts before the overdrive gearbox is pushed fully into place. A soft mallet can be used to overcome the initial compression of the 'O' ring seal. Always ensure there is some compression of the 'O' ring seal and replace the 'O' ring if necessary. Watch carefully to ensure the 'O' ring isn't damaged during installation. If the overdrive gearbox doesn't slide home easily, stop and investigate the cause. Forcing the overdrive gearbox into place may cause damage to internal components.



31. Clean the transfer case cover gasket area. Apply grease to both sides of the gasket and fit the new finned transfer case cover. Fit the oil drain plug and washer and tension.

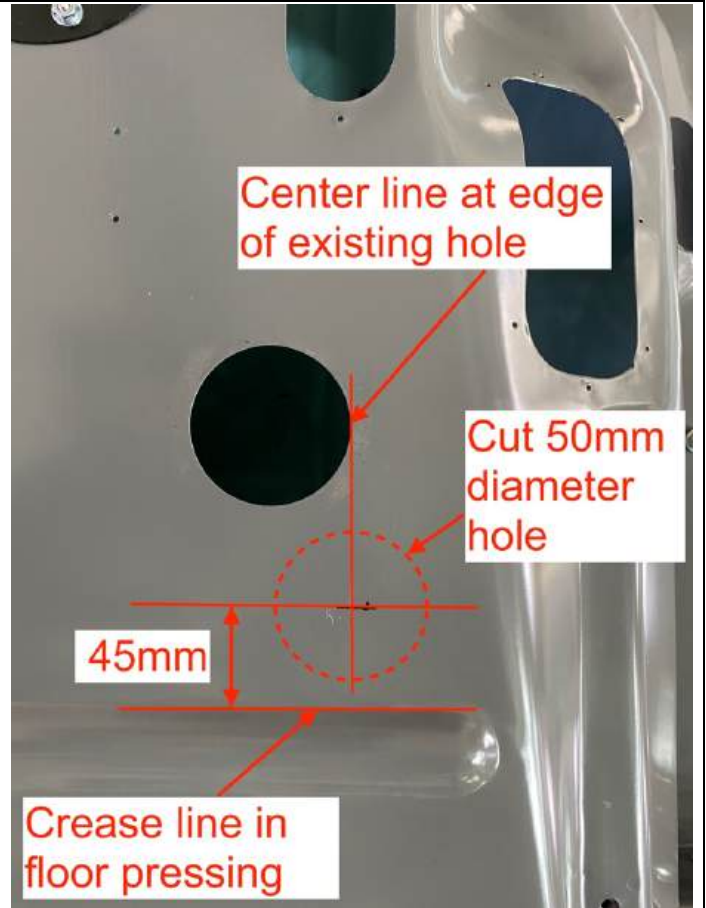
Note: If required, the finned transfer case cover has two 3/8" NPT ports to accept an oil suction line and a manual temperature sender for pump control. If an external oil cooling circuit is installed, it is important that only the suction line be installed into one of the oil ports. Cooled oil should be returned via the 3/8" NPT oil port in the overdrive gearbox. See notes on our website in relation to routing of the oil cooler circuit and maximum oil flow rate.



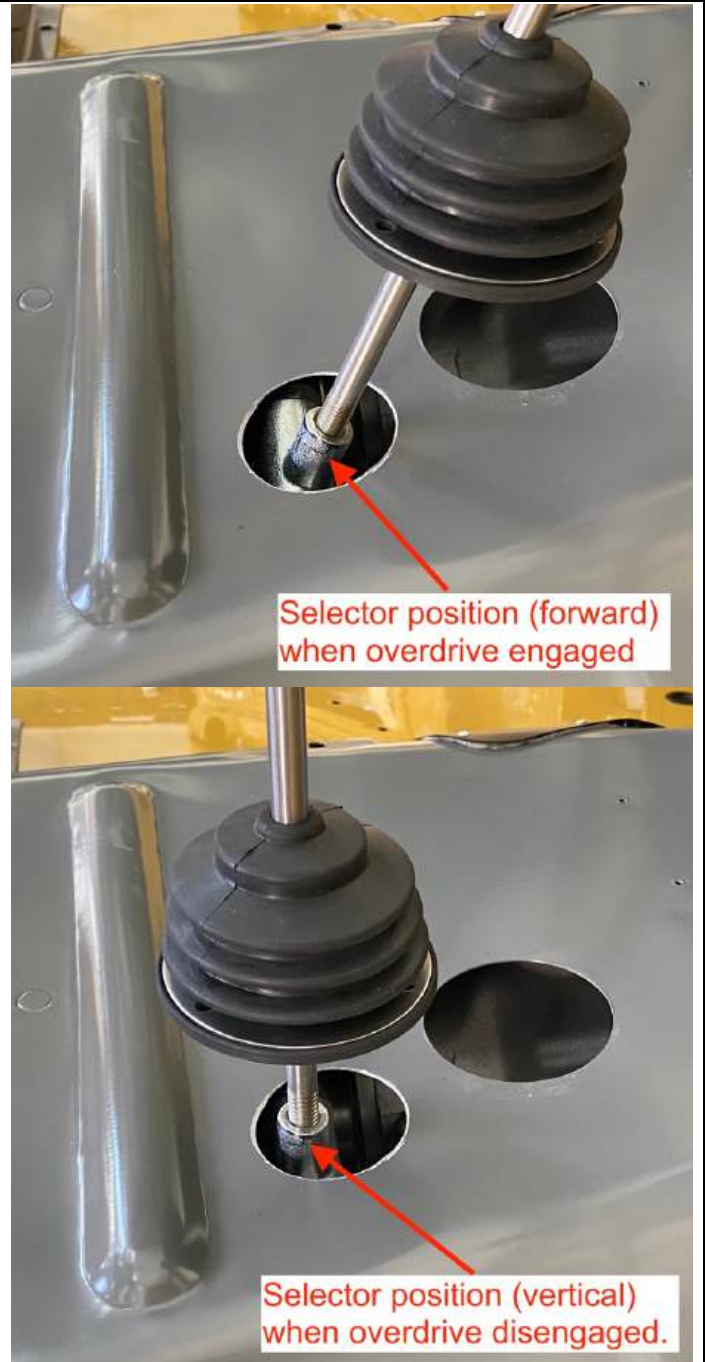
32. If fitting the overdrive gearbox from below, remove any floor coverings from the centre floor panel.
33. Mark out the location of the cut-out to be made in the centre floor panel as shown and use a 50mm metal hole-saw to make the cut-out.

Note: For LHD vehicles, the cut-out can be moved further towards the centre of the floor panel. It may be best to adjust the location of the selector bracket and pivot block as per below prior to making the cut-out.

Note: Most early Range Rover Classic were not fitted with a centre console. If one has been fitted, it may also be necessary to modify or remove the centre console or shift the location of the selector shaft closer to the right hand seat.



34. If fitting from above, fit the floor panel into place but don't secure it, or
35. If fitting from below, raise the rear of the gearbox.
36. Adjust the location of the selector Bracket and Pivot Block so that the location of the Selector Lever is towards the rear of the cut-out to allow clearance when lever is pushed forward to engage the overdrive.
37. Adjust the length of the Tie Rod so that the Selector Lever is vertical when moved reward (overdrive disengaged).
38. If fitting from above, remove floor panel, apply body sealing compound and reinstall and fasten into place, or
39. If fitting from below, reverse steps taken to lower the rear of the gearbox.
40. Centre the selector gaiter retaining ring over the cut out and mark out and drill three holes to match the supplied retaining screws.





41. Install floor covering and make a cut-out to expose the selector pivot.
42. Fit selector lever shaft, gaiter, retaining ring and selector knob. Use the locking nut to align the knob so that the *engagement arrow* is pointing forward.
43. Secure the gaiter and retaining ring using the screws supplied. If the gaiter and ring are installed over carpet and underlay, longer screws may be required.





44. Fill the overdrive with 1 litre of GL4 75W90 oil via the socket head plug on the overdrive. **(Do not use GL5 or GL4/5).**
45. Fill the Transfer Case with approximately 3.1 litres of GL4 75W90 oil. **(Do not use GL5 or GL4/5).**
46. Set the overdrive selector lever in 'neutral' (half way between engaged and disengaged) and run the vehicle on a hoist in third gear at approx 1,500rpm for around 15mins to pre-charge the overdrive gearbox with oil and to ensure proper lubrication of internal components.
47. While still on the hoist, engage the overdrive by depressing the clutch and moving the selector lever forward, release the clutch and again run the vehicle in third gear at approx 1,500rpm for around 15mins.



Important: Due to shipping restrictions, the overdrive is shipped dry. Over time this can result in the synchro rings 'locking' onto their cones during storage and shipping. It is important to ensure the output shaft turns freely while in the engaged position prior to installing the overdrive. Do not install the overdrive and try and use the engine to free up the synchro ring as this can result in severe damage to the overdrive. Contact our support staff if you are unable to get the overdrive to turn freely while in the engaged position.

48. Stop the vehicle and top up oil to the transfer case until the oil level is at the bottom of the oil level port located at the rear of the transfer case.
49. Check the oil level again after initial road testing.

Note: During the initial running of the overdrive gearbox, oil will be transferred from the transfer case to the overdrive gearbox. It is important to complete the filling of oil after this pre-charging procedure and again after initial road testing.

When changing oil, fill until oil is at the bottom of the oil level port at the rear of the transfer case; approximately 3.1 litres.

If an oil cooler circuit has been fitted, in addition to the filling instruction above, fill to the bottom of the oil level port, run the oil cooler circulation pump until the oil cooling circuit is purged of air. Top up oil to the bottom of the oil level port.



Important: Only use API GL4 75W90 oil in the transfer. We recommend fully synthetic oil for high temperature climates or where high loads and extended high speeds are anticipated. Do not use GL5 or GL4/5 oils as these are designed for hypoid gear sets and often contain additives which are corrosive to the internal bronze components used in the GT-LT95 overdrive gearbox. A reputable brand of high-quality synthetic oil is often the cheapest option in the long run.

50. Use isopropanol or other alcohol cleaning solution to clean the area on the rear right hand side of the lower tailgate.
51. Position the 'GT Overdrive' vehicle badge about 35mm from the side and bottom edge of the lower tailgate panel.
52. Using a soft cloth, firmly press the badge onto the surface and clean away any marks.



Running-in

There is no special run-in procedure required for the GT-LT95 Overdrive Gearbox. However, like with all new gear sets, it will take some time for all of the mating surfaces to evenly adapt to each other. The time this takes depends on a few factors including the wear on the existing intermediate gear in the transfer case and driving conditions, however, we believe that this happens within the first 4,000kms. At this point, the oil should be changed to remove any fine metal particles resulting from the bedding-in of components.

During this run-in period, you may notice that the gear shift is a little more mechanical as the synchromesh rings and cones bed-in.

Slightly higher oil temperatures may also be experienced during the first 1,000kms.

Operating

The GT-LT95 Overdrive Gearbox is a fully synchromesh gear change. With the Selector Lever in the vertical position the overdrive is disengaged. Depress the clutch and move the Selector Lever forward to engage overdrive, resulting in a 28% reduction in engine revs. Depress the clutch and move the Selector Lever rearward to disengage overdrive. It is also possible to double de-clutch while shifting, resulting in smoother disengagement (down-shifting) of the overdrive.

The overdrive can be engaged in any gear, including reverse. It can also be operated in both high and low range.

Quieter and more fuel-efficient motorway driving is the main benefit of the overdrive. However, being able to split gears while towing or negotiating long inclines can also be very useful. The use of overdrive in low range can also assist navigating deserts or sandy tracks where a higher momentum can be helpful.

Oil Temperature

When oils get too hot, their viscosity reduces and they are not able to provide the high pressure lubrication that is required in gearboxes. When this happens, friction between the sliding metal surfaces increases, often resulting in a run-away temperature condition. You may have seen components that have been subjected to a lack of lubrication where they are burnt and sometimes even welded together by the extreme heat generated. It is easy to tell if this has happened in a gearcase as the oil will have a distinctive burnt smell.

If you are operating at high speeds, high loads, in high ambient temperatures or with a modified engine, you may need to fit an oil cooler to the transfer case. We have designed a finned aluminium transfer case cover which doubles the heat rejection from the cover. It also has 2 oil ports; one that is used as the such port for an oil cooler, and the other to fit an optional oil temperature sender. The return oil is directed back into a port at the top of the GT-LT95 Overdrive gearbox.

It is important to monitor the gearbox temperature. We've teamed up with an Australian instrument company, Gauge Innovations, to supply a 2" digital oil temp gauge. It can be configured

to display up to 2 temperature readings (engine and transfer case) plus an optional exhaust gas temperature.

If the temperature exceeds Safe Limits, the gearbox icon on the digital temperature gauge will change colour to AMBER and an audible alarm consisting of 3 beeps every minute will be heard. If this happens, you will need to disengage the overdrive and reduce speed and load until the oil temperature reduces to within safe limits.

If the oil temperature continues to rise and exceeds Maximum Operating Limits, the gearbox icon on the digital temperature gauge will turn RED and a continuous audible alarm will be heard. If this happens, you will need to stop the vehicle as soon as it is safe to do so and check the transfer case oil level.

If operating in hotter climates, extended high speed or high load conditions, it may be necessary to install our optional transmission cooler kit. The oil cooler typically lowers the operating temperature of the transfer case and overdrive gearbox by around 20°C, along with increasing lubrication to the overdrive gearbox.

The oil temperature in the transfer case of the LT95 gearbox varies depending on several factors including:

- Ambient Temperature
- Load
 - Speed
 - Towing
 - Terrane
 - Engine modifications
- Engine running temperature and the resultant heat soak to the LT95 gearbox

The Digital Oil Temperature gauge comes pre-set with the following limits:

- Safe Limit (AMBER) Alarm 95°C
- Maximum Operating Limit (RED) Alarm 110°C

Due to varying operating conditions noted above, we have found that it is sometimes required to increase the Safe Limit to 100°C. Follow the instructions provided with the Digital Temperature Gauge. Based on advice from our oil supplier, if synthetic **API GL4 75W90** is used, the Maximum Operating Limit should remain at 110°C.



Important: Do not attempt to move the Selector Lever without depressing the clutch.

If you need to stop on a motorway, move the vehicle as far away as possible from the motorway. Do not attempt any maintenance on the vehicle while it is on or near a motorway.

If towing is required, it is advisable to use a tilt/lift style recovery vehicle.

Maintenance

- Change the transfer case oil after the first 4,000 Kms and thereafter every 40,000 or after wading.



- Regularly check and rectify any oil leaks. Refer to *Service Bulletin – Selector Shaft Seal* should the 'O' ring seal require replacing.
- The GT-LT95 Overdrive Gearbox uses Land Rover synchromesh cones and standard series ball bearings which are readily available.



Important: Insufficient oil in the transfer case will result in severe overheating and failure of the overdrive gearbox.

Only use API GL4 75W90 oil in the transfer. We recommend fully synthetic oil for high temperature climates or where high loads and extended high speeds are anticipated. Do not use GL5 or GL4/5 oils as these are designed for hypoid gear sets and often contain additives which may be corrosive to the internal bronze components used in the GT-LT95 overdrive gearbox.

Warranty

The GT-LT95 Overdrive Gearbox is guaranteed to be free from defect for a period of 12 months from the date of purchase. We will repair or replace (at our discretion) any overdrive gearbox that malfunctions during the warranty period. The warranty doesn't cover the cost of transport or any other costs incurred in relation to the installation. Please submitted any claim in writing along with the overdrive serial number and proof of purchase to Garage Therapy to obtain a claim number. We cannot accept overdrive units shipped without prior authorization or claim number.



Important: Damage caused by a lack of lubrication, or overheating is obvious and is not covered by warranty. Corrosion of bronze components due to the use incorrect oil is also not covered by warranty. The warranty is also limited to use with standard engines only.