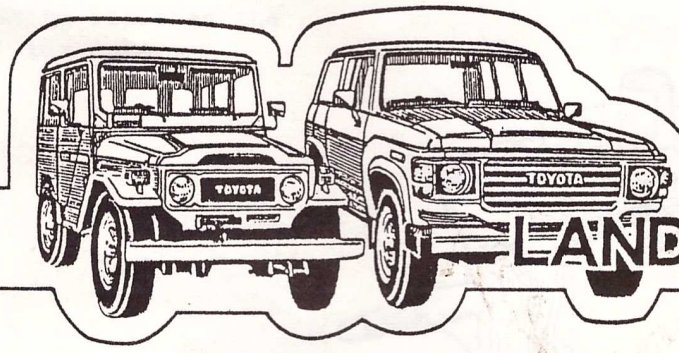
TOYOTA 6810



LAND CRUISER

OVERDRIVE

by

Fairey

FITTING INSTRUCTIONS

Issue 3/84

To fit Land Cruiser 4 or 5 speed with H41 or H42 Transfer Box from August 1980 onward

PLEASE PASS THESE INSTRUCTIONS TO VEHICLE USER

FW ENGINEERING LIMITED
(Formerly Fairey Winches)

ABBEY RISE, WHITCHURCH ROAD, TAVISTOCK, DEVON. PL19 9DR Tel. Tavistock (0822) 4101/7 Telex: 45324

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WHERE THE OVERDRIVE FITS

The overdrive casting replaces the existing transfer box cover.

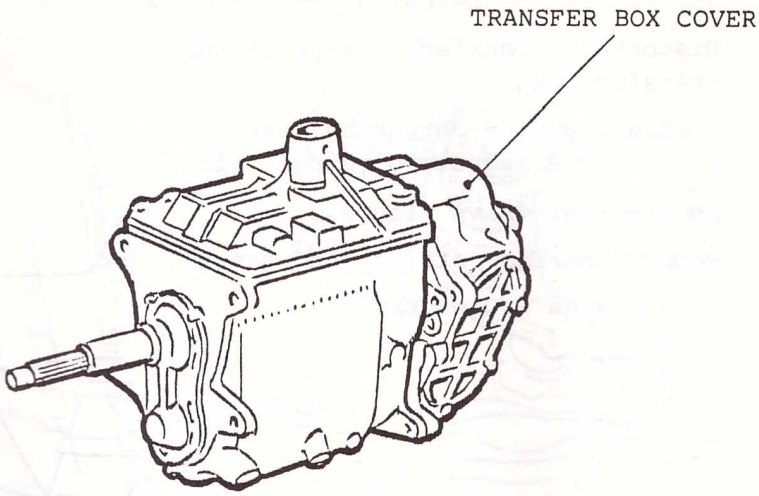


FIG.1

TOOLS REQUIRED

½ inch square drive socket set
Hand or electric drill.
3 mm (1/8") diameter twist drill
50 mm (2") diameter hole saw.
Vehicle jack.
'Loctite' thread sealant, preferably 270 grade but 241 or 290 will do.
Gasket cement.
Selection of basic mechanics tools,
Torque wrench 0 - 125 ft.lbs.

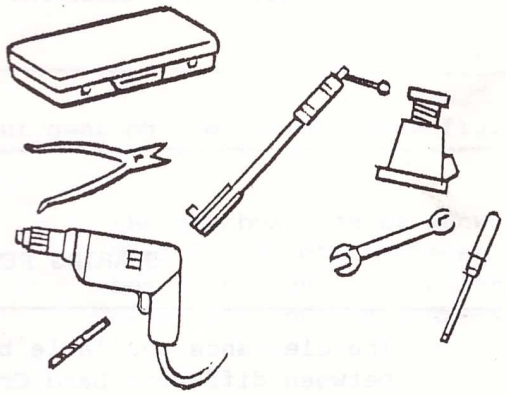


FIG.2

PREPARE THE VEHICLE

The majority of the work will be carried out underneath the vehicle.

Disconnect the battery.

Remove the skidplate.

Drain the oil from the transfer box.

Disconnect the speedometer cable at the transfer box.

Disconnect the rear propellor shaft at the transfer box (tie to convenient chassis member)

Move the shift lever to first gear.

Move the transfer lever to 4L.

Remove the transfer case end cover and loosen the revealed Mainshaft Nut.

Disconnect transfer linkage at the transfer box.

Remove transfer detent ball and spring.(use magnet to remove ball)

Remove rear drive flange.

Remove bearing retainer and gasket.

Remove side PTO cover.

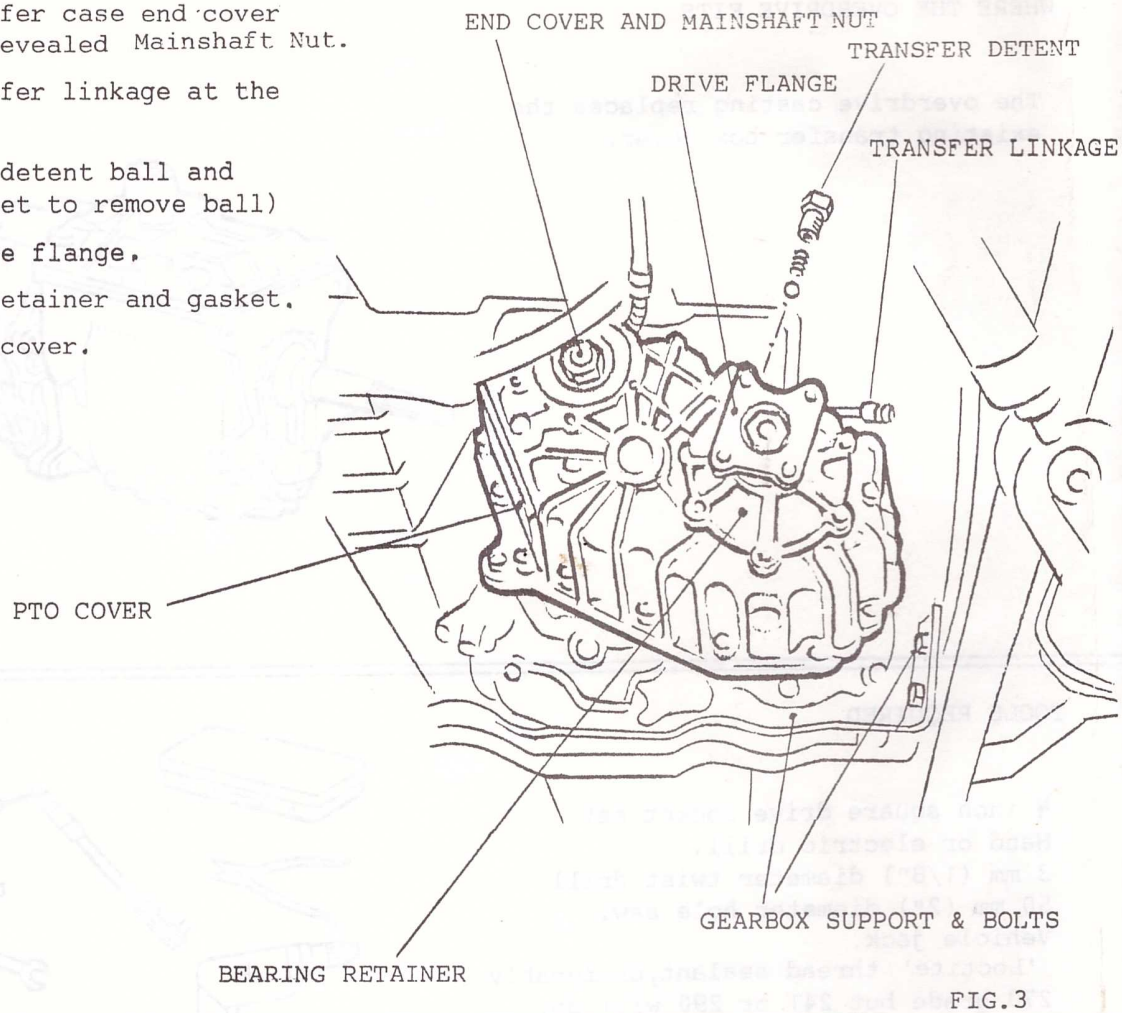


FIG.3

NOTE

The clearance available behind the transfer box varies between different Land Cruiser models. On some models the cross member and fuel tank can make some of the fitting stages difficult. If this happens, the following additional stages will help.

Unclip the handbrake cable from the cross member.

Disconnect the exhaust pipe at the exhaust manifold and disconnect any items which will be damaged by slightly lowering the rear of the gearbox. See fig. 4

Position a jack, with 75 mm (3") of downtravel available, under the gearbox support cross member.

Remove the 8 bolts (4 each side) holding the gearbox support to the chassis.

Lower the gearbox to give the required clearance around the transfer box, probably about 40 mm (1½") at the cross member.

Before lowering, check engine compartment to ensure sufficient clearance available around engine radiator and ancillaries.

Remove the rear casting of the transfer box.

Remove the output shaft cluster and selector fork.

Remove the idler gear cluster, ensuring that the shaft remains in the intermediate plate. Be careful not to loose the bronze thrust washers.

Remove the nut, bearing, PTO gear, spacer and output gear from the gearbox output shaft. If bearing and output gear are tight fits on shaft, use suitable levers and gear pullers. Lever against flat steel plates or the transfer back plate bolts to prevent local damage to the aluminium.

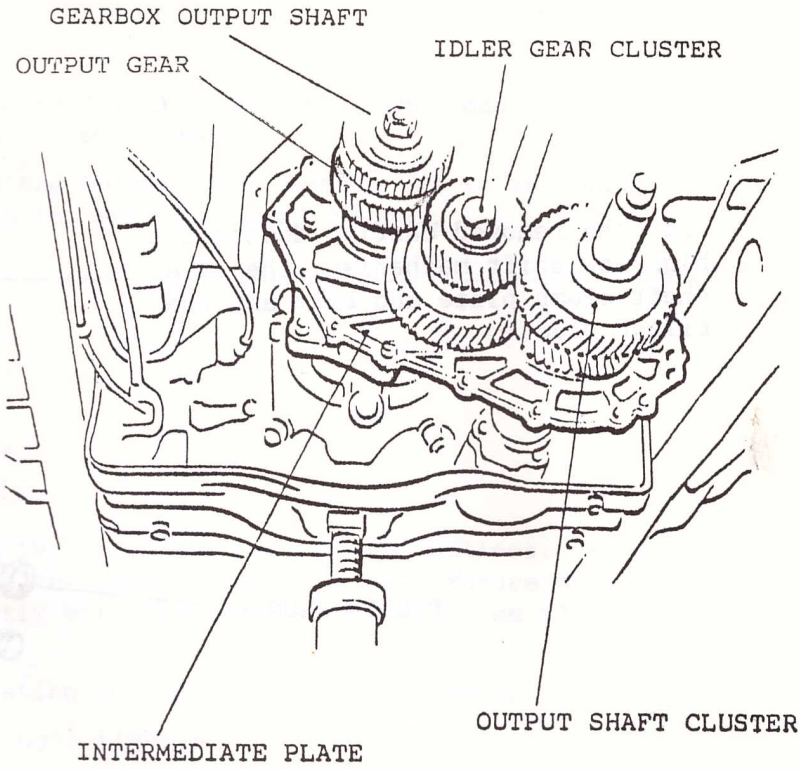
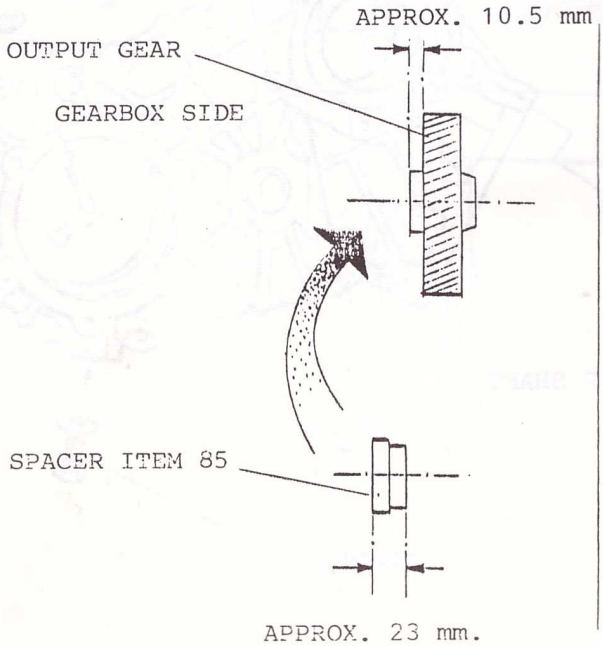
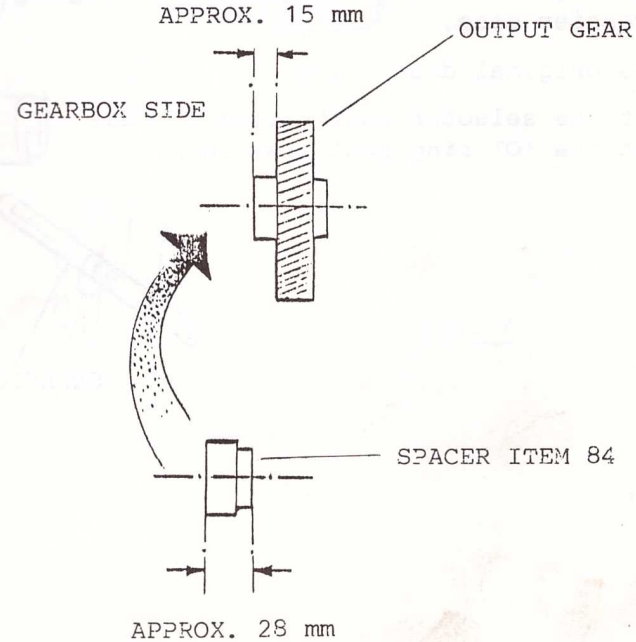


FIG.4

It is important to identify the type of output gear on the vehicle (see fig. 4).

In order to ensure selection of the correct spacer, item 84 or 85, identify the output gear by measuring the depth of the boss on the gearbox side as shown below. Then fit matching spacer to gearbox output shaft with largest diameter end towards gearbox.





From the removed casting detach the high/low shift machanism, the idler shaft clamp plate and bolt and the filler plug

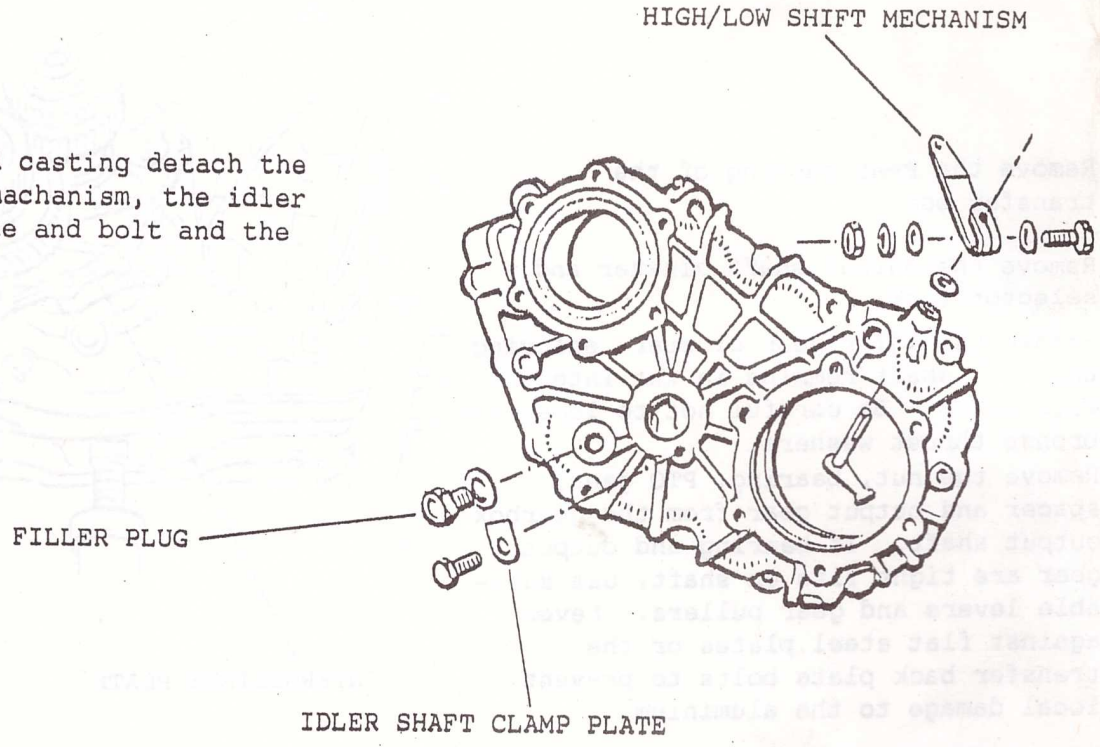


FIG.5

Into the overdrive casting fit:-

The high/low shift mechanism from the transfer case.

The original drain plug.

Fit the selector shaft, item 35 (but not the 'O' ring seal item 26).

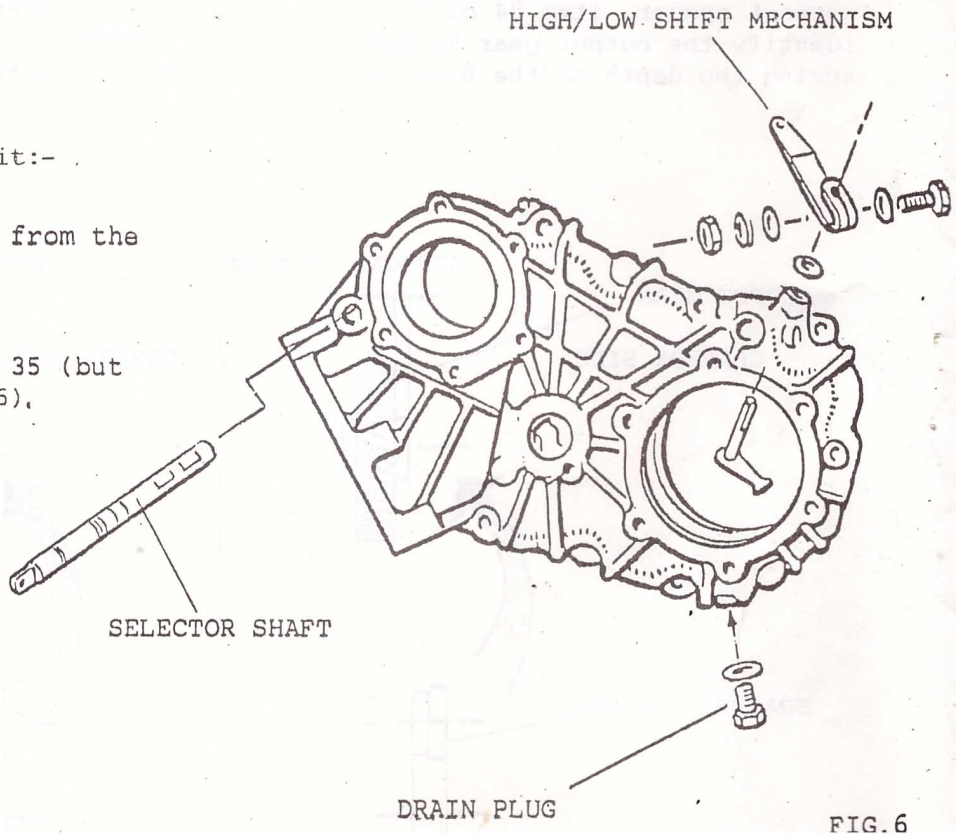


FIG.6

MAINTENANCE NOTE

It is suggested that before commencing to fit the overdrive, the condition of the existing parts should be examined for worn items.

Check both the idler gear cluster and the output gear cluster and if in doubt, renew any suspect parts as detailed in the vehicle repair manual.

FITTING THE OVERDRIVE

Fit the transfer gear cluster, item 14.

Fit the bronze cone, item 15.

Fit the driving sleeve assembly, item 19, turning to engage the splines. Note that the driving sleeve locates inside the inner ring, item 81. Ensure also that cone, item 15, is engaged correctly with the shifter blocks, item 63. (See also fig. 20).

Fit the tab washer, item 20, tabs locating in slots in driving sleeve.

Fit the mainshaft nut, item 21, and finger tighten.

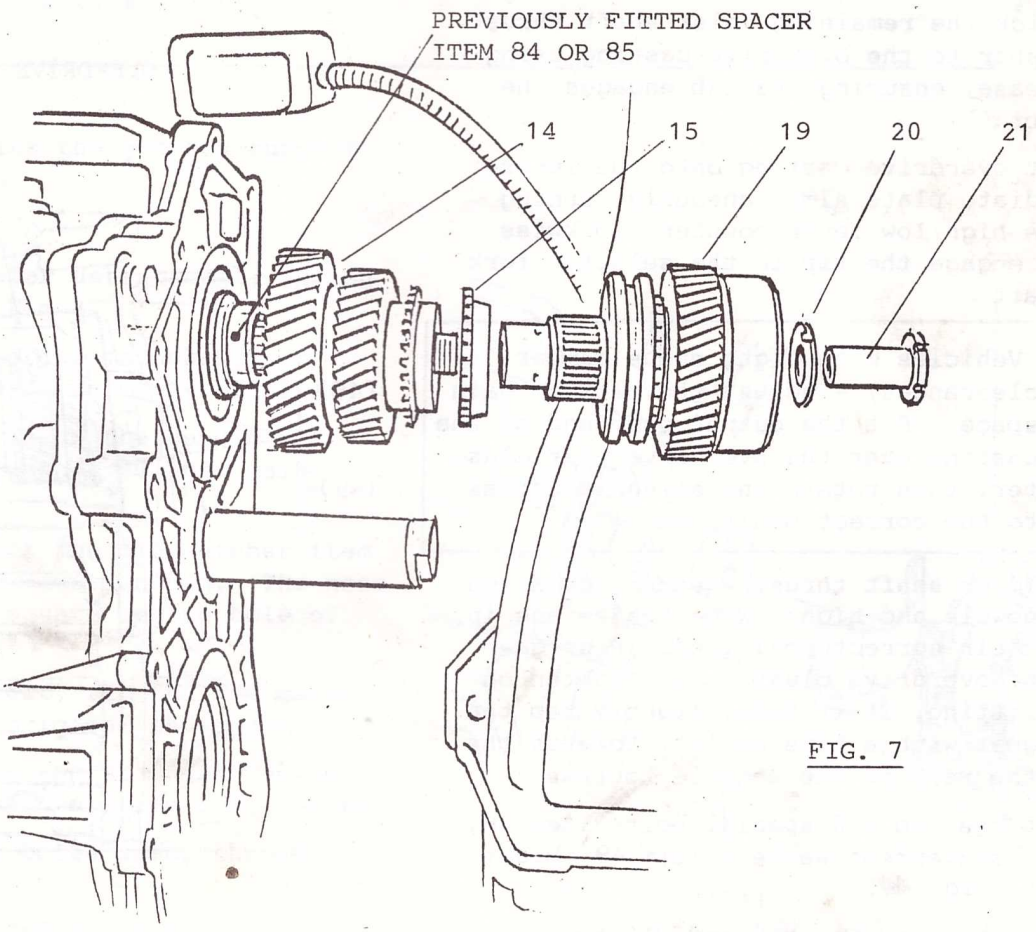


FIG. 7

Stick the idler shaft thrust washer to the intermediate plate using grease, ensure the tab engages the slot.

Fit the gasket item 45.

Fit the idler gear cluster.

Re-fit the output gear cluster together with the high/low selector fork. See also Fig. 19.

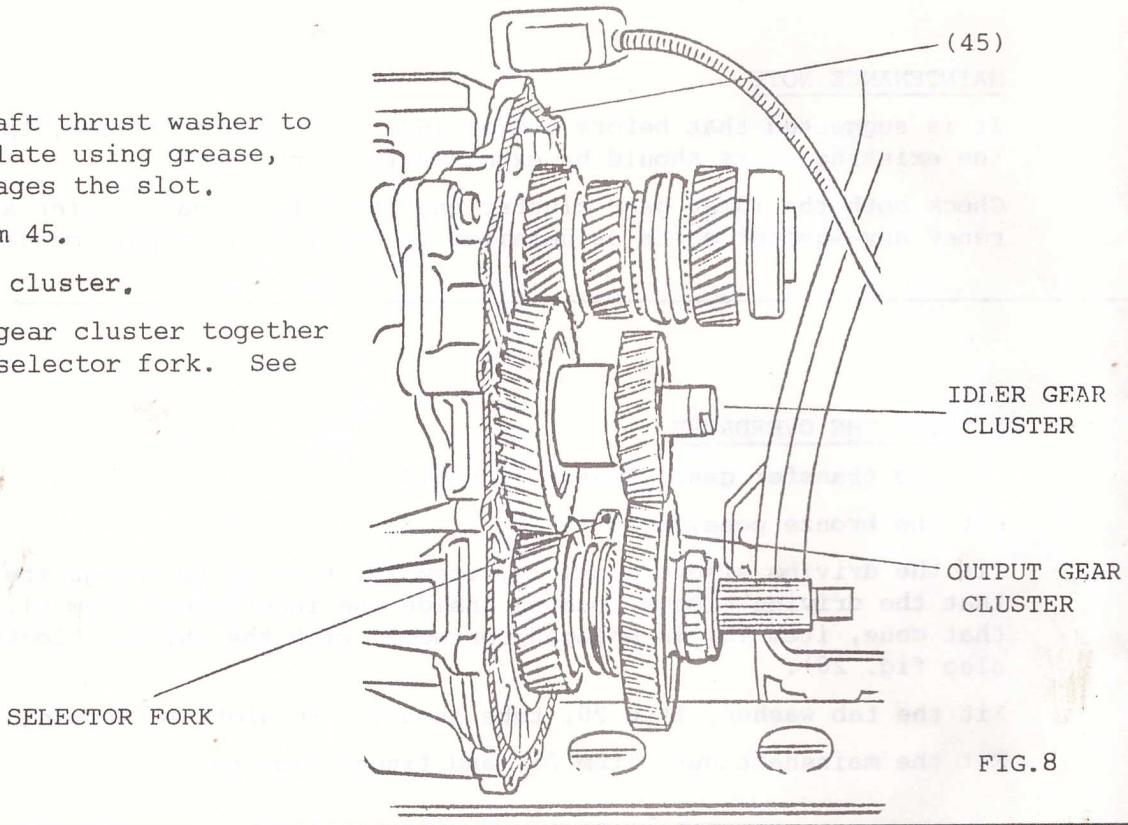


FIG.8

Stick the remaining idler shaft thrust washer to the overdrive casting using grease, ensuring the tab engages the slot.

Fit overdrive casting onto the intermediate plate simultaneously turning the high/low lever counter clockwise to engage the tip in the selector fork shaft.

NOTE Vehicles with tight cross member clearances; - adjust the jack to gain space. Fit the output gear end of the casting over the overdrive gear cluster, then rotate and slide it across to the correct position.

CHECK Idler shaft thrust washers, location dowels and high/low mechanism are in their correct positions. Rear gear of overdrive cluster may tighten on fitting, if it does, lightly tap the gear with a hide mallet, towards the the rear of the vehicle to free.

Fit the two M10 special bolts item 46, and shakeproof washers item 49 (black) ref. fig. 19.

Fit the original M10 and M12 transfer case bolts except the two M12 bolts at the very top.

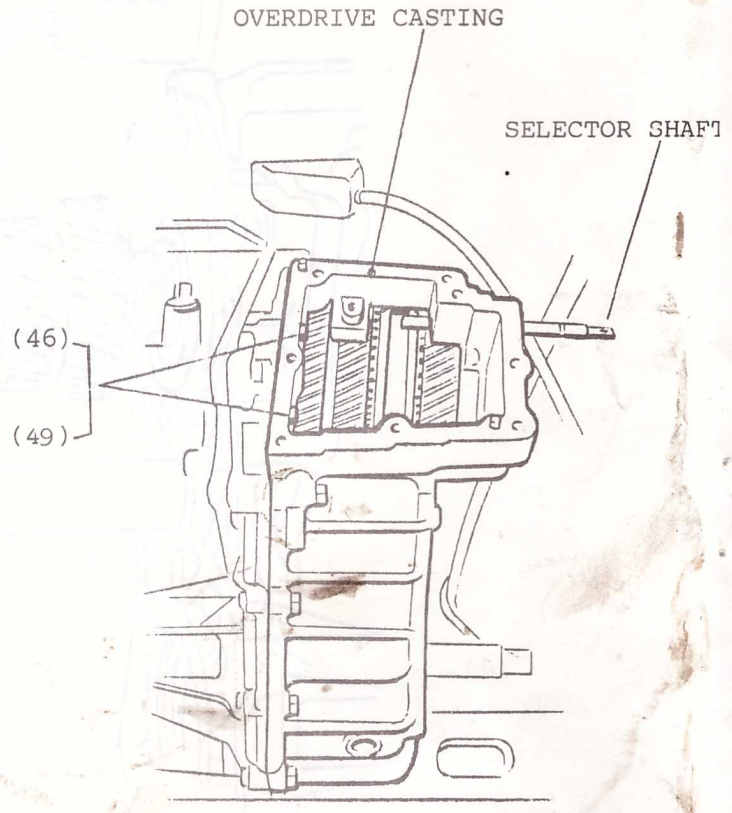


FIG.9

Tightening torque:- M10 bolts 3.5 - 4.5 kg m (26 - 32 ft lb)
M12 bolts 5.0 - 8.0 kg m (37 - 57 ft lb)

Oil the selector shaft, item 35, and carefully fit 'O' ring seal, item 26, in groove. Push shaft into the overdrive casting, taking care to keep shallow groove on shaft still visible.

Fit selector fork item 30 and align bolt scallop.

Fit bolt item 31 but leave loose for later adjustment.

Fit stop screw item 43 with a little Loctite under the head only, ensure shaft is free to slide.

Fit detent ball and spring, items 38 and 39.

Fit screw item 40, with Loctite so that head lies 3 mm (1/8") below the surface.

Engage selector shaft, item 35, in centre detent position.

Adjust fork 30 in selector shaft 35 to ensure mid position of item 65 between adjacent gear faces, and tighten bolt to 2.2 kg m (15 ft lb)

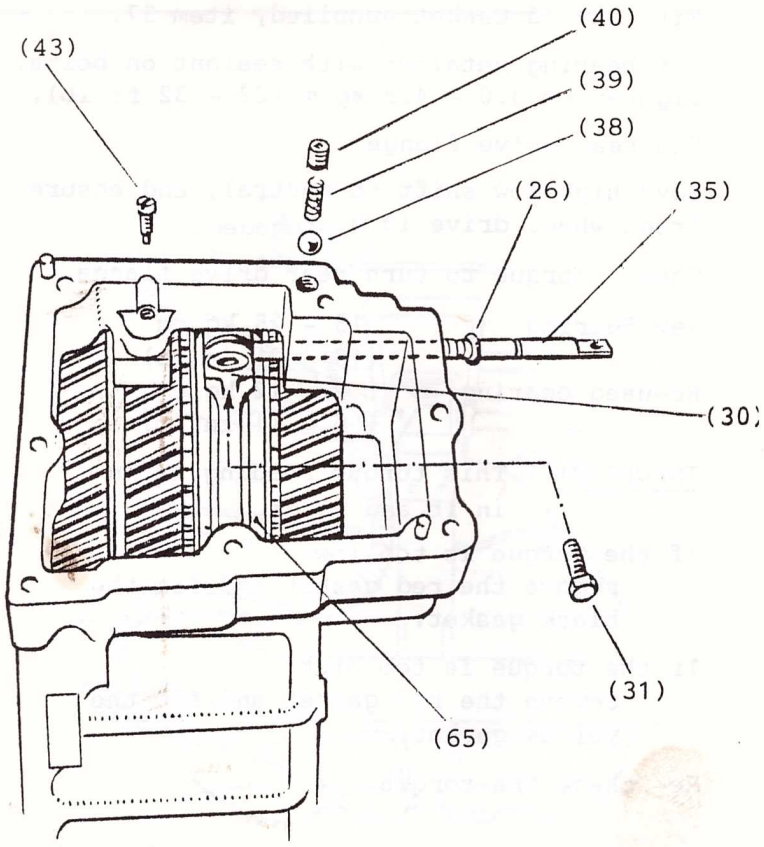


FIG.10

If necessary raise the gearbox support back into place.

Re-fit the transfer detent ball, spring and plug. Ref. Fig 3.

Tighten the overdrive mainshaft nut to approximately 14 kg m (100 ft lb),

then tighten to allow the bending of the next tab on washer 20 into main-shaft nut slot.

Using grease stick the oil catcher item 22 to engage its location tag. The nose fits inside the square centre hole of the mainshaft nut.

Using gasket cement, fit the new gasket item 23 and the original end cover.

IMPORTANT Never use the standard Toyota gasket with an overdrive unit fitted.

Fit the original bolts using thread sealant.

Fit the original idler shaft clamp plate. Ref. Fig. 5.

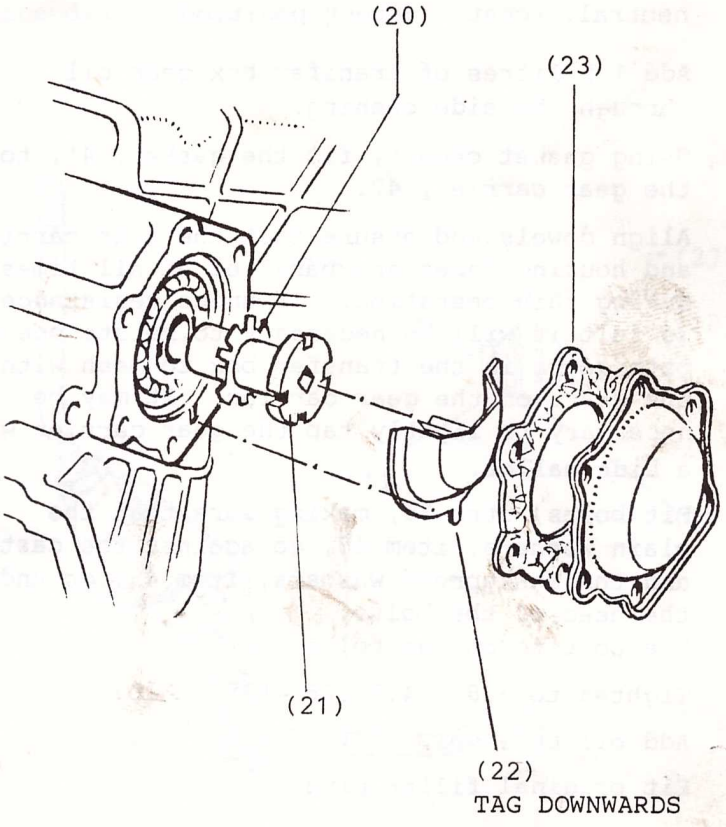


FIG.11

Fit the Red Gasket supplied, item 37.

Fit bearing retainer with sealant on bolts. Tighten to 3.0 - 4.5 kg m (22 - 32 ft lb).

Fit rear drive flange.

Move high/low shift to neutral, and ensure front wheel drive is disengaged.

Check torque to turn rear drive flange.

New Bearing	15 - 25 kg cm
	(13 - 21 in lb)
Re-used bearing	7 - 12 kg cm
	(6 - 11 in lb)

IMPORTANT - This torque reading is in in lb and kg cm.

If the torque is too low:
remove the red gasket and fit the black gasket.

If the torque is too high:
remove the red gasket and fit the yellow gasket.

Re- check the torque.

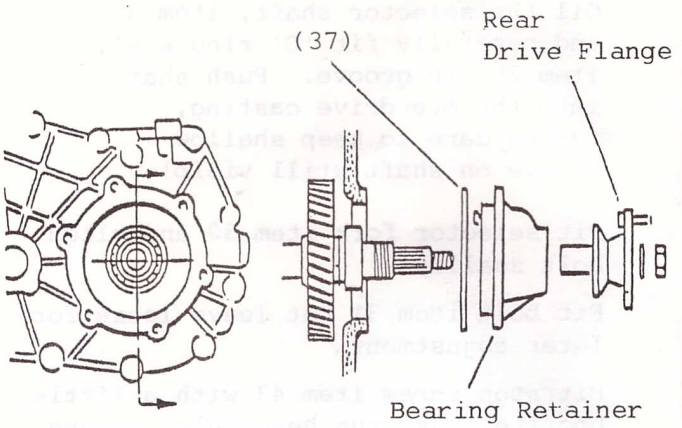


FIG. 12

If the torque is still appreciably outside that recommended, shim the bearing retainer as instructed in the vehicle workshop manual.

Tighten the rear flange retaining nut to 14 - 17 kg m (101 - 123 ft lb).

Re-connect Transfer Linkage rod end.

FITTING THE GEAR CARRIER

Before fitting the Gear Carrier make sure the Selector Shaft is in neutral. (centre detent position).

Add 1.5 litres of transfer box gear oil through the side opening.

Using gasket cement, fit the gasket, 41, to the gear carrier, 42.

Align dowels and ensure that the gear carrier and housing faces are parallel at all times during this operation. If undue resistance is felt it will be necessary to rotate one or both gears in the transfer box to mesh with the gears on the gear carrier. It may be necessary to lightly tap the gear carrier with a hide mallet.

Fit bolts, item 50, making sure that the plain washers, item 48, go against the casting, and the shakeproof washers, item 49, go under the head of the bolts.
Use Loctite on the bolts.

Tighten to 3.8 - 4.7 (28 - 35 ft lb)

Add oil to level.

Fit original filler plug.

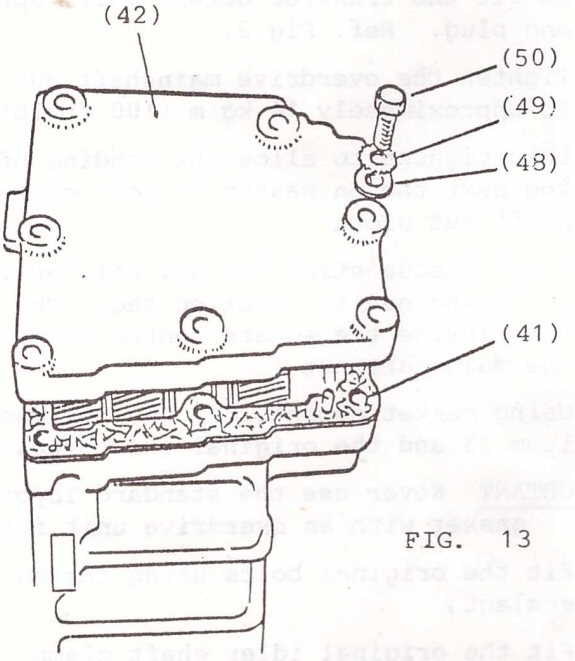


FIG. 13

On models where the handbrake cable passes close behind the transfer box, fit the cable clip, item 52, as shown.

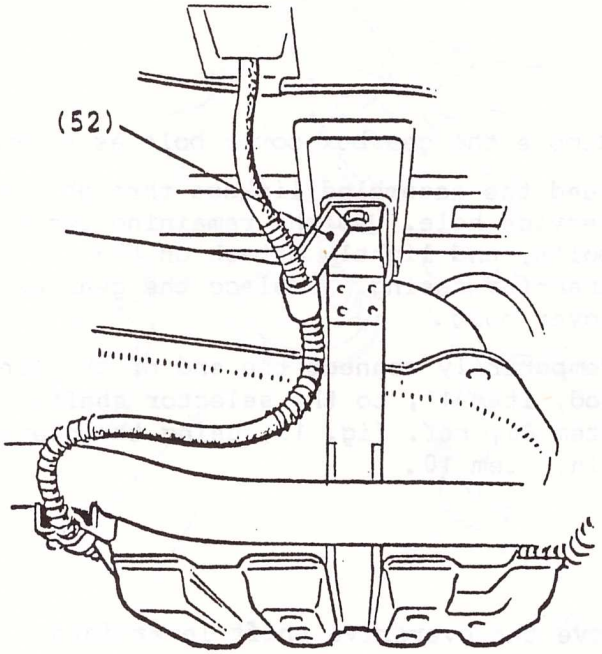
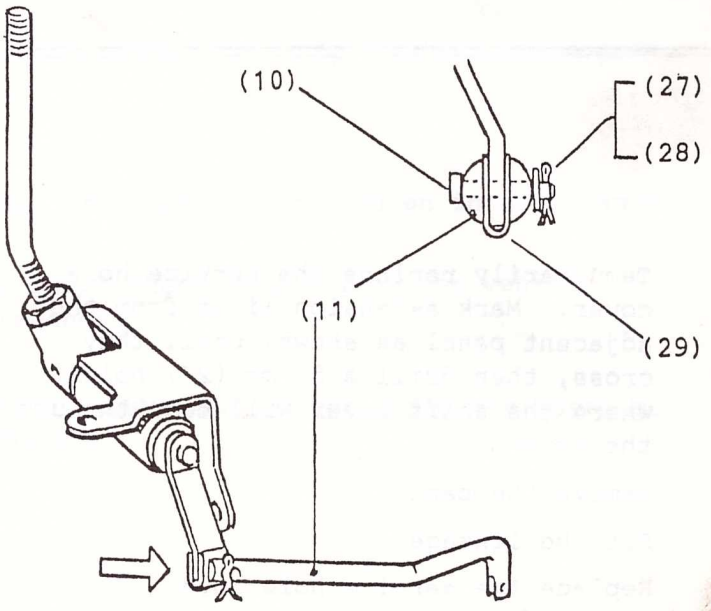


FIG.14

NOTE - FOR LAND CRUISER MODEL HJ60 - See Appendix A, Page 16.
FOR 5 SPEED GEARBOX MODEL - See Appendix B, Page 18.

Assemble the linkage as shown.
See also Figs. 19 and 20.



Remove the gearbox cover bolt as shown.

Feed the assembled linkage through the service hole. Use the remaining two M12 bolts, and lightly attach on the transfer casing. Replace the gearbox cover bolt.

Temporarily connect the end of the link rod, item 11, to the selector shaft, item 35, ref. fig. 19, using the clevis pin, item 10.

Move the overdrive shift lever into neutral.

*Mark on the adjacent floor panel, two lines at right angles as shown, from the position where the shift lever protrudes above the floor.

Remove the linkage.

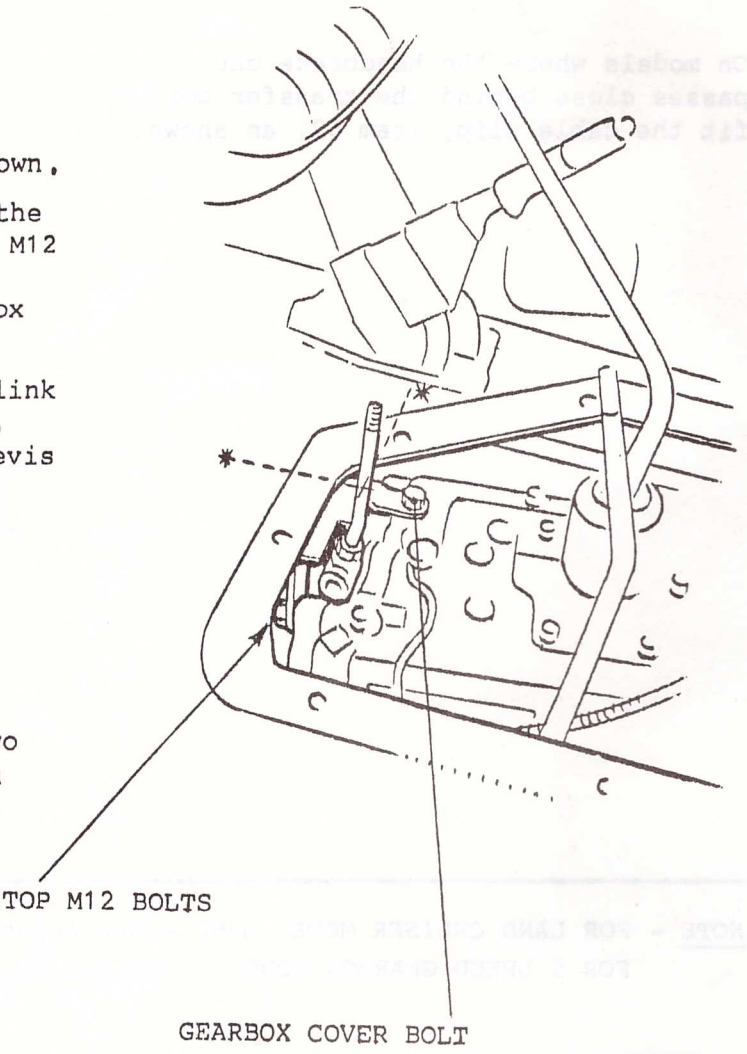


FIG.16

Temporarily replace the service hole cover. Mark extension lines from the adjacent panel as shown, until they cross, then drill a 50 mm (2") hole where the shift lever will come through the cover.

Remove the panel.

Fit the linkage.

Replace the service hole cover.

Remove all burrs with half round file.

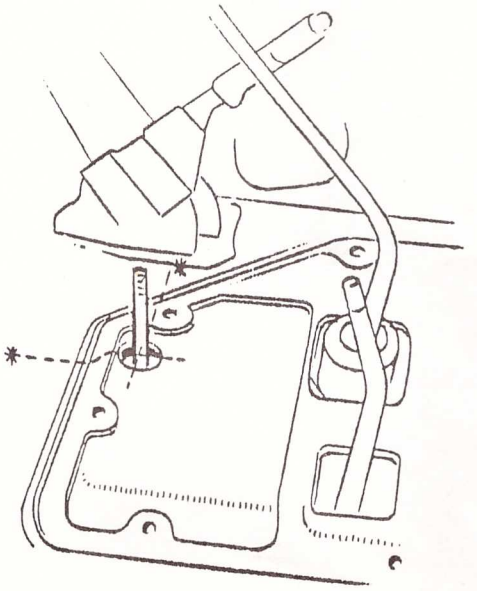


FIG.17

Re-fit floor covering cutting slot to allow shift lever full movement.

Slide the grommet and retaining plate, item 5, onto the shift lever, item 3. Lightly press the grommet onto the service hole cover. Move the shift lever backwards and forwards while simultaneously adjusting the grommet position. When the position is found where the grommet will not pull on the shift lever, fit the four self tapping screws, item 6, using a 3.2 mm (1/8") diameter twist drill. Ref. fig. 19.

Fit the knob and locknut, items 1 and 2.

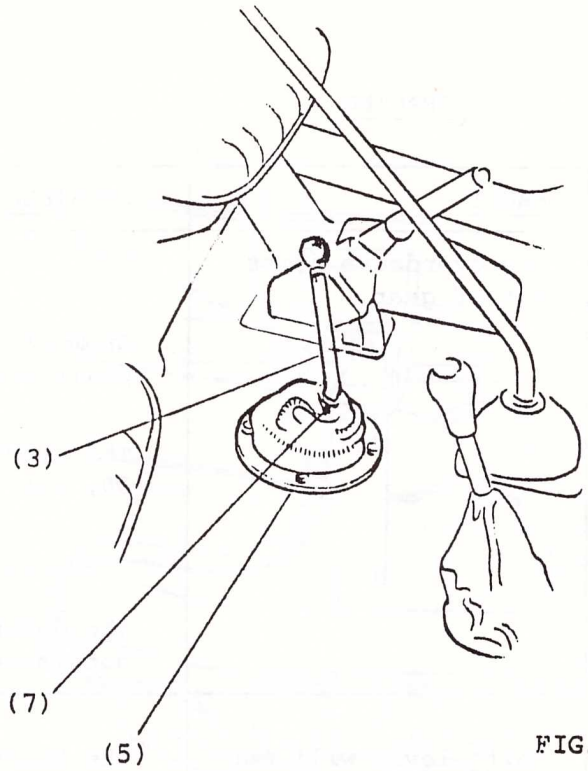


FIG.18

Check oil levels in gearbox and transfer box.

Re-fit propellor shaft.

Re-connect speedometer cable..

Re-fit skid plate.

Re-fit exhaust (if removed).

Re-connect battery.

Fit the label, item 51, to the rear of the vehicle.

Fitting is now complete.

MAINTENANCE

After 500 kms. check that all bolts are tight, if necessary re-tighten in accordance with fitting instructions.

After 1000 kms drain and refill the transfer box. Thereafter follow the vehicle owner's manual concerning transfer box maintenance.

NOTE:- The unit serial number is visible on the underside of the overdrive casting. Please quote this number with any enquiry.

FAULT TRACING

FAULT	POSSIBLE CAUSE	REMEDY
The overdrive jumps out of gear.	Grommet not correctly positioned	Re-position the grommet in the appropriate direction.
	The synchromesh fork, item 30, not correctly set.	Re-set the fork for the neutral position with the selector shaft, item 35, in the neutral detent position.
	The detent spring, item 39, not loaded enough.	Tighten the detent screw, item 40, by one turn.
Shift lever will not engage standard drive or overdrive.	The handbrake cable is interfering with the overdrive linkage.	Ensure that the handbrake cable clip, item 52, is correctly fitted. Ref. fig. 14.
	The overdrive linkage is interfering with the vehicle body.	Identify the point of interference, and rectify.
	Failed thrust bearing.	Remove the gear carrier, item 42. Identify end play in the output gear cluster, and replace the appropriate bearing.
Transfer box noisy	The overdrive linkage is touching the body.	Identify the interference and rectify.
	Low oil level.	Check, rectify and determine cause. Check gaskets, oil seals and the tightness of bolts.
	Bearing failing.	Look for metal particles in the oil. Identify the bearing and rectify.

OPERATING INSTRUCTIONS

The overdrive unit is fitted with a synchromesh gearchange unit and should be treated as an extra gearbox. Since the overdrive gearchange is mechanical, the clutch must be used when changing into or out of overdrive just the same as when changing gear in the gearbox. There are three lever positions,overdrive in, neutral and overdrive out.

TO ENGAGE

Simultaneously press the clutch and release the accelerator pedal. Move the overdrive operating lever forward. Simultaneously release the clutch and press the accelerator.

TO DISENGAGE

Simultaneously press the clutch and release the accelerator pedal. Move the overdrive operating lever backward. Simultaneously release the clutch and press the accelerator.

OVERDRIVE RATIO - 0.78 : 1

When overdrive is engaged, engine revolutions will be reduced by 22% at the same road speed in any gear.

Conversely, the road speed will increase by 27% at the same engine revolutions as standard drive, provided sufficient power is available.

Item Ref.	Description	FWL Part No.	Quantity
1	Overdrive Knob	746	1
2	Locknut	4-49-1223	2
3	Shift Lever	6124	1
4	Shift Lever Pivot	6683	1
5	Grommet	5194	1
6	Self Tapping Screw	5204	4
8	Overdrive Casting	6685	1
10	Clevis Pin	785	2
11	Link Rod	6504	1
14	Transfer Gear Cluster	6805	
15	Bronze synchromesh Cone	5695	2 (1 is in item 19)
16	Bearing 45 Bore x 50 x 27 long	4-12-45502723	1
17	Spacer	6802	1
18	Snap Ring	4-26-4523153	1
19	Driving Sleeve Assembly	6806	1
20	Tab Washer	6415	2 (1 spare)
21	Mainshaft Nut	6421	1
22	Oil Catcher	6343	1
23	End Cover Gasket	6423	1
26	'O' Ring Seal	4-21-0123	2 (1 spare)
27	Split Pin	4-63-151223	2
28	Washer	156	2
29	Nylon Strip	5058	2
30	Selector Fork	6682	1
31	Bolt M8 x 25	4-32-0802512	1
35	Selector Shaft	6416	1
37	Gasket - red	6425	1
	Gasket - black	6426	1
	Gasket - yellow	6427	1
38	Steel Ball	753	1
39	Spring	725	1
40	Socket Head Screw M10	4-39-101003	1
41	Gasket	6424	1
42	Gear Carrier Assembly	6686	1
43	Stop Screw	6437	1
45	Gasket	6422	1
46	Special Bolt M10 - 1.25-6gx25	5402	2
47	Shakeproof Washer	4-53-1033	7
48	Plain Washer 10 bore x 24 x 2	6431	7
49	Shakeproof Washer (black)	4-52-1013	2
50	Bolt M10 - 1.25-6gx40	6430	7
51	Label	5201/R	1
52	Handbrake Clip	6667	1

ITEMS 1-52 SHOWN ON FIG.19

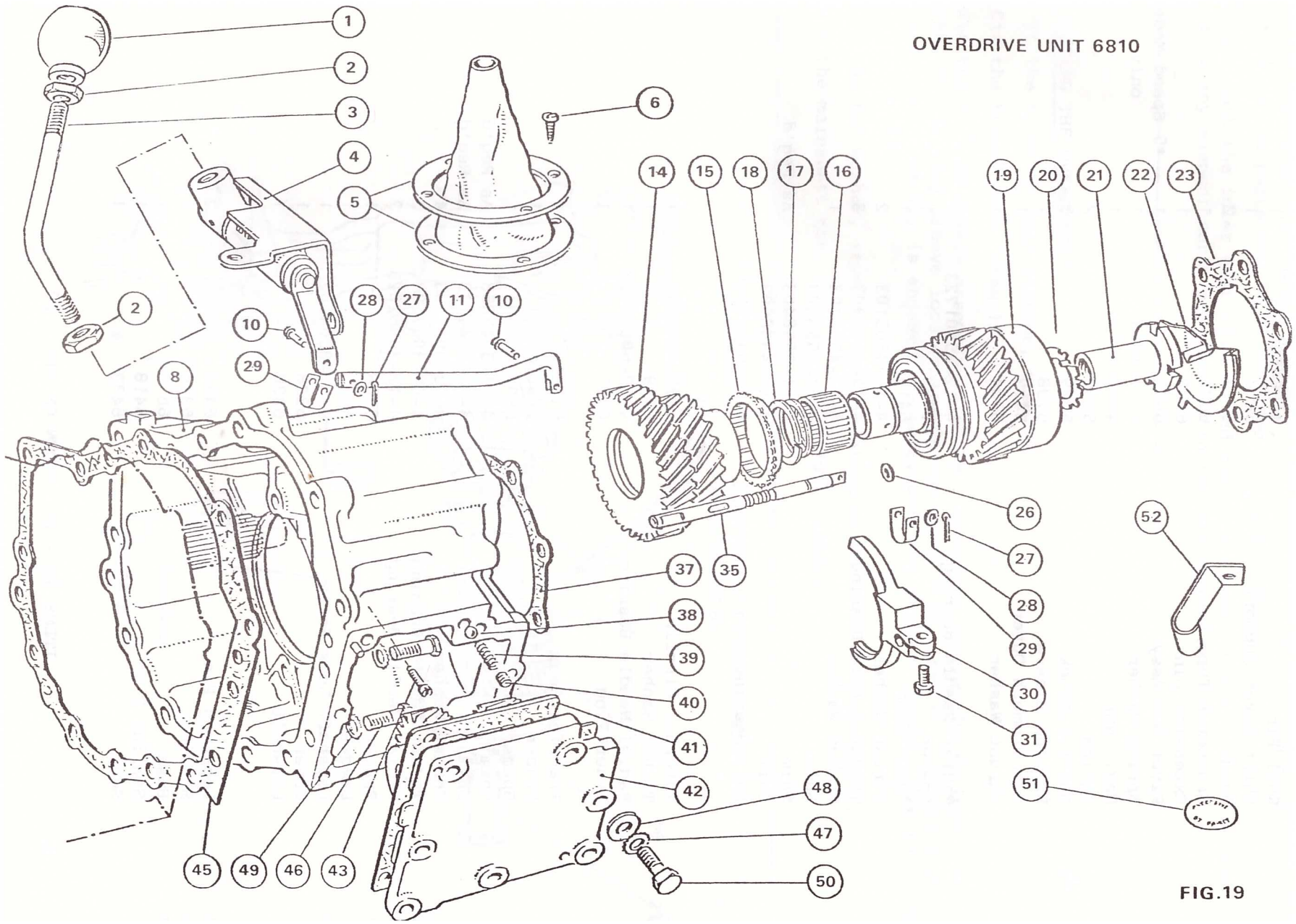

OVERDRIVE UNIT 6810
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FIG.19

Item Ref.	Description	FWE Part No.	Quantity	
54	Roll Pin	4-56-502423	1	
55	Shift Lever Support	5413	1	
56	Bush	5723	2	
57	Bracket & Tube Assy	6674	1	
*58	Extension Link	6938	1	
59	Pivot Bar Assy	6678	1	*5 Speed Model
*60	Spring Washer	4-51-1013	1	only
*61	Hex. Nut	4-47-1013	1	
62	Spring	5700	2	
63	Shifter Block	5699	3	
64	Driving Sleeve	6798	1	
65	Synchromesh Outer	5423	1	
66	Thrust Washer	5384	1	
68	Radial Needle Bearing	4-12-45501723	2	
69	Spacer	6420	1	
70	Input Gear	6414	1	
71	Thrust Washer	4-03-4565103	2	
72	Thrust Needle Bearing	4-07-4565303	3	
73	Thrust Washer	4-03-4565403	1	
74	Shim	4-01-4558303		
	Shim	4-01-4558403	As Req'd	
	Shim	4-01-4558503		
75	Ball Bearing	4-13-045100253	1	
78	Internal Circlip	4-25-6548253	1	
79	Thrust Washer	6479	1	
80	Radial Needle Bearing	4-12-60652023	1	
81	Inner Ring	6797	1	
83	Transfer Gear	6799	1	
84	Spacer	6800	1	
85	Spacer	6801	1	
86	Shim	4-01-3047053	As Req'd	
	Shim	4-01-3047133	As Req'd	
87	Thrust Washer	4-03-3047103	4	
88	Thrust Needle Bearing	4-07-3047203	2	
89	Radial Needle Bearing	4-12-30362623	2	
90	Spacer	5388	1	
91	Laygear	6413	1	
92	Layshaft Lock Screw	4-36-0604002	1	
93	Cover	6338	1	
94	Layshaft	6428	1	
97	Location Pin	6434	2	
98	Housing	6336	1	
99	Bush	6673	1	
100	Sealing Disc	6418	1	
101	Seal	6433	1	

ITEMS 54 - 101 SHOWN ON FIG. 20

OVERDRIVE UNIT 6810

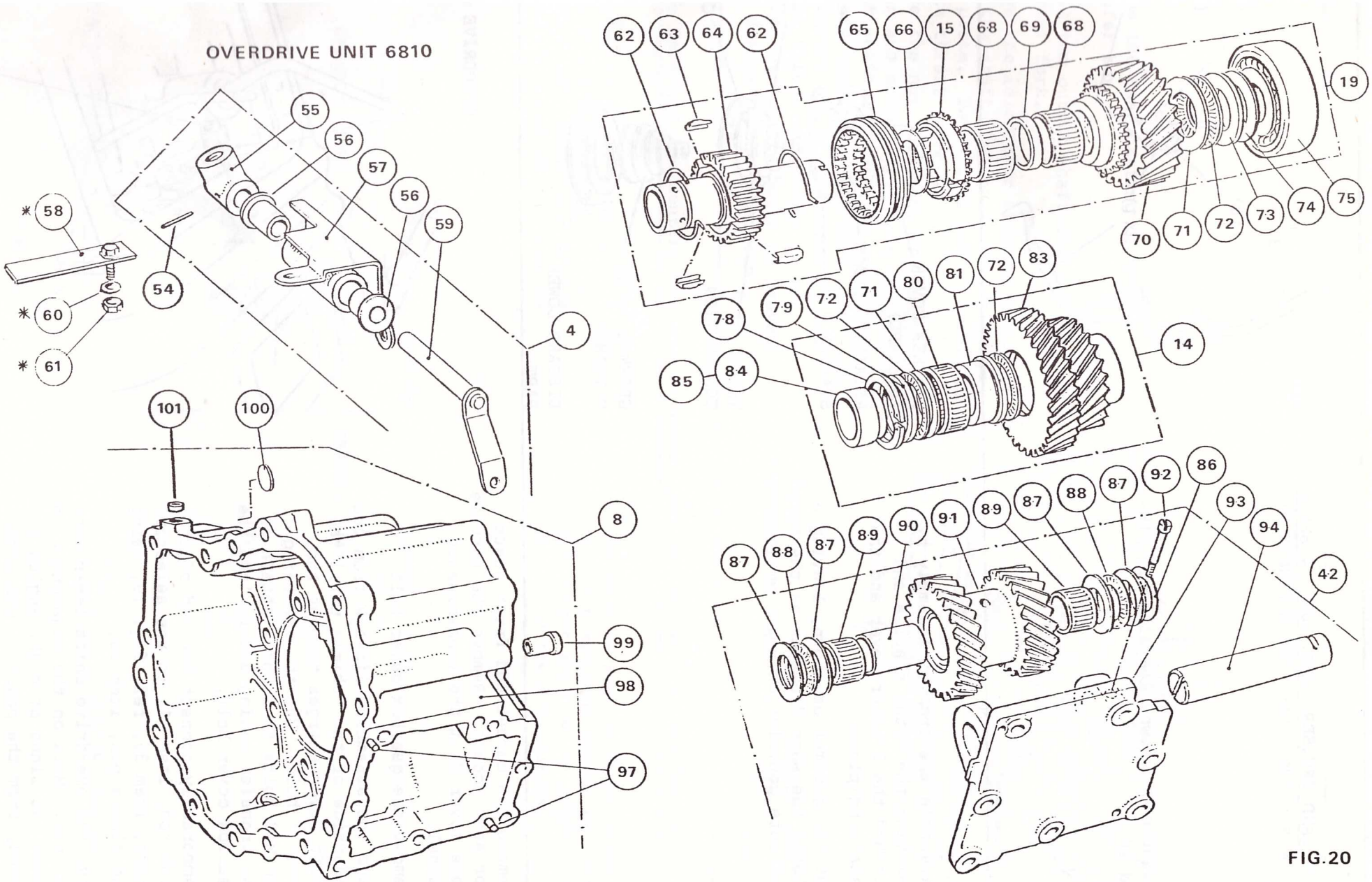


FIG.20

FOR LAND CRUISER MODEL HJ60 4 SPEED
(FOR 5 SPEED MODELS SEE APPENDIX B)

Assemble as shown, see also fig. 19 and 20.

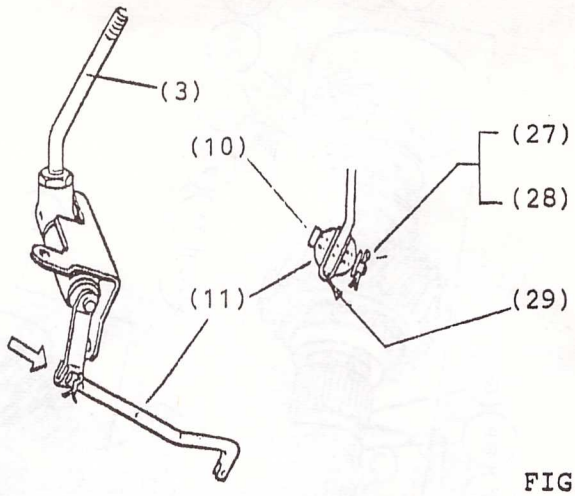


FIG.21

Dismantle the grommet assembly by removing the metal staples and discard the leather cover and the retaining plate.

Cut the grommet as shown, leaving a flange the same diameter as the third complete convolution.

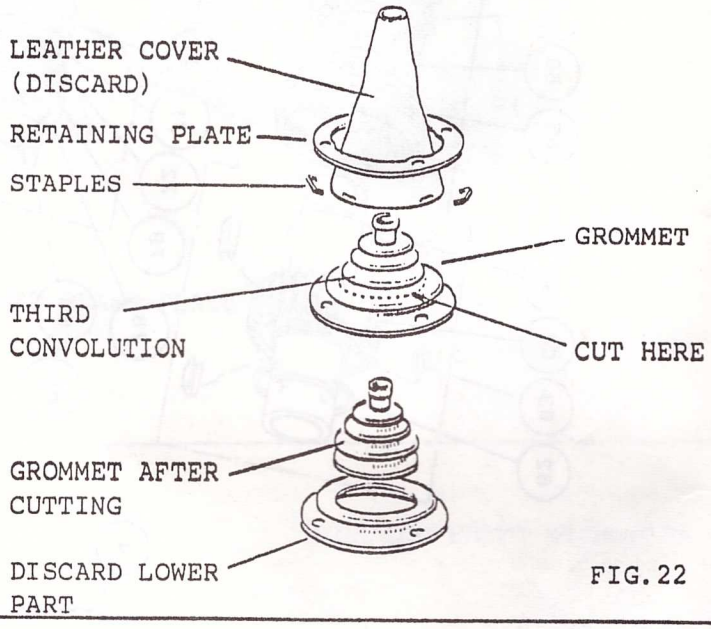


FIG.22

Remove the carpet and front seats for easy access. Remove the service hole cover from the transmission tunnel.

Remove the gearbox cover bolt.

Feed the assembled linkage from the underside of the vehicle until the shift lever emerges through the service hole. Use the remaining two M12 bolts to lightly attach on the transfer casing and replace the gearbox cover bolt.

Temporarily connect the end of the link rod, item 11, to the selector shaft, item 35, ref. fig. 19, using the clevis pin, item 10.

Move the overdrive shift lever into neutral. Mark on the adjacent floor panel two lines at right angles as shown, from the position where the shift lever protrudes above the floor. Then remove the linkage.

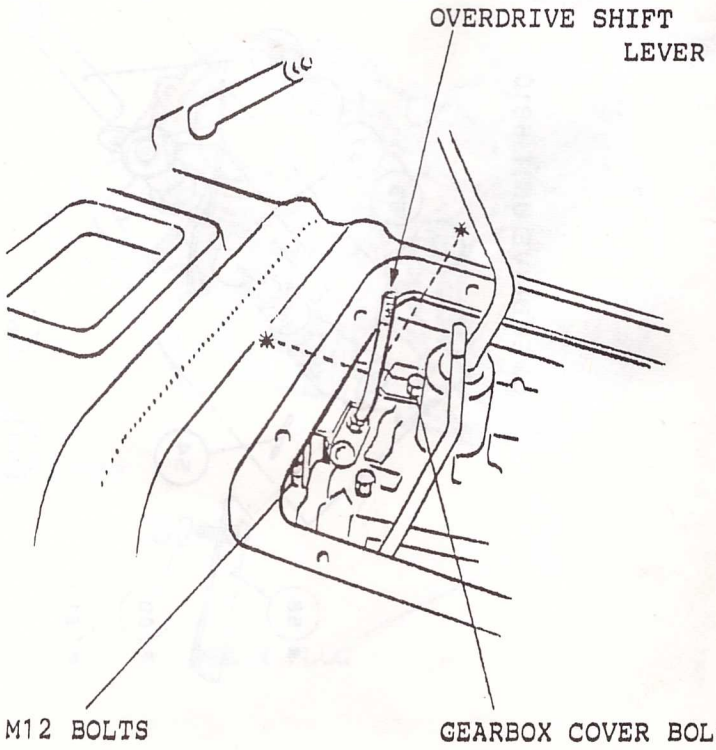


FIG.23

Temporarily replace the service hole cover. Mark extension lines from the adjacent panel as shown, until they cross, then drill a 50 mm (2") hole. Remove the panel. To prevent damage to the rubber grommet, remove all burrs with a half round file. Fit the linkage, tighten all bolts and the locknut on the shift lever.

Replace the service hole cover.

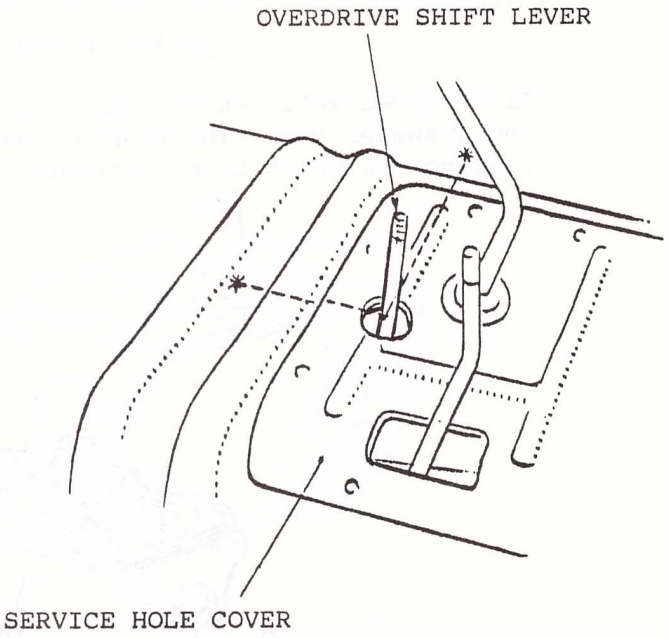
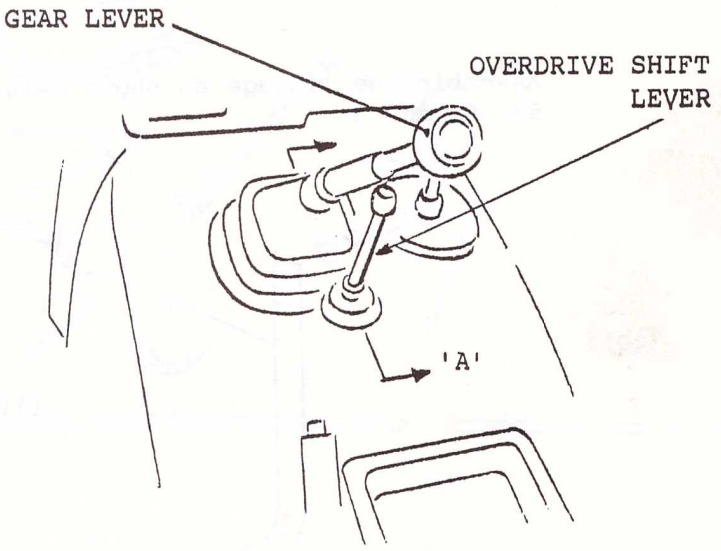


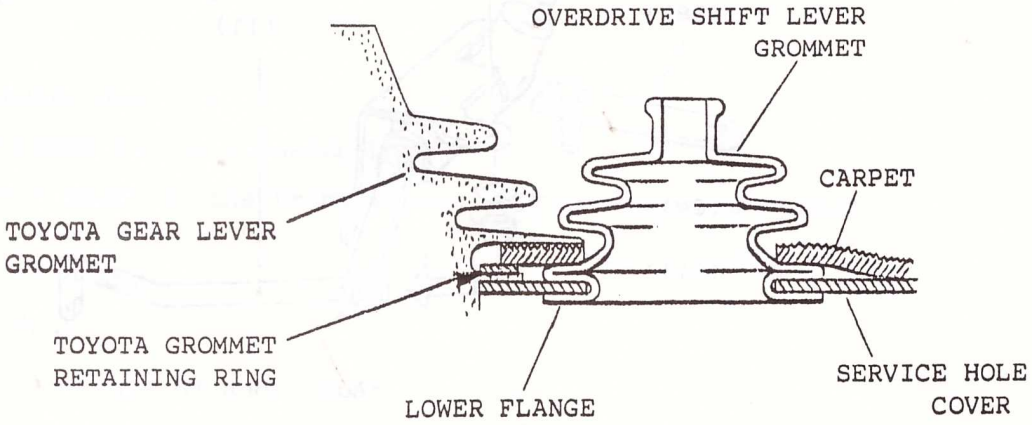
FIG.24

Re-fit the carpet, cutting a 50 mm (2") diameter hole to accomodate the grommet under service cover, then press carpet over the second convolution of the grommet. Where gear lever rubber gaiter protrudes into the grommet fitting area, lift lower flange of gaiter and fit over carpet. Grommet should now be secured by both the service cover and the carpet fit.

Fit knob and locknut.

Now refer to remainder of fitting instructions from fig. 18 onwards (page 11).



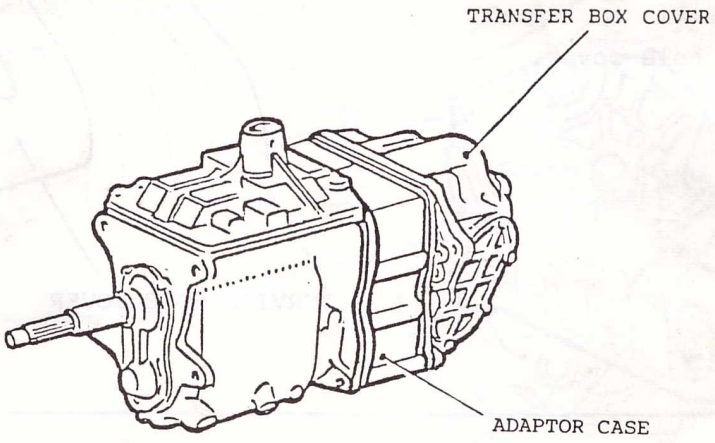


SECTION VIEW ON ARROW 'A'

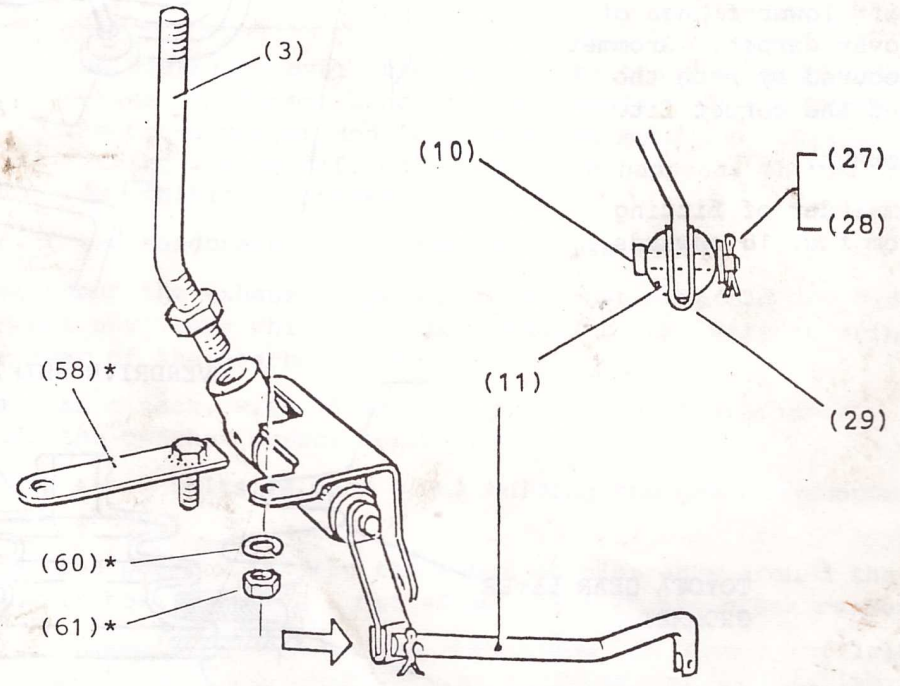
FIG.25

LINKAGE ASSEMBLY FOR 5 SPEED MODELS

All 5 speed vehicles have an adaptor case fitted between the Gearbox and Transfer Box. The Adaptor Link bridges the adaptor case when fitting the Shift Lever Linkage.



Assemble the linkage as shown using the Adaptor Link Kit, items 58, 60 and 61.



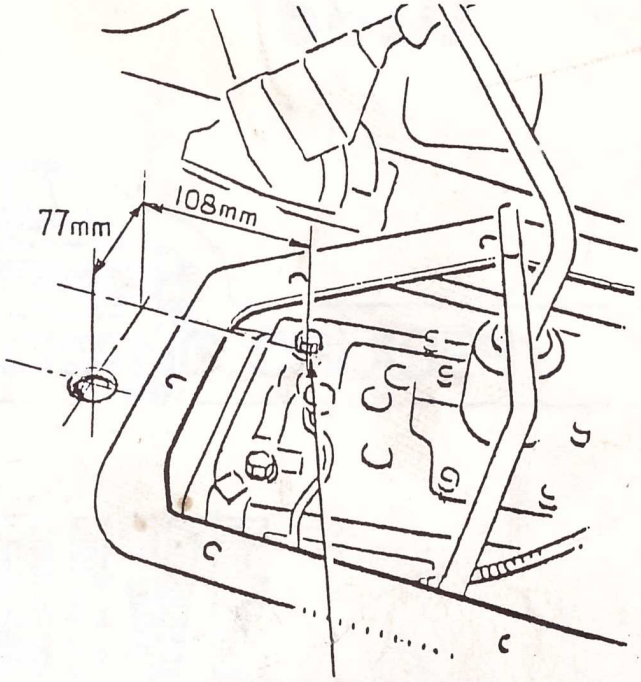
*Additions to Fig. 15

Remove carpet from transmission tunnel if necessary.
Remove the service hole cover from the transmission tunnel inside the vehicle.

Mark on the Floor Panel, two lines at right angles as shown, where the Shift Lever will protrude above the floor.

Drill a 50mm (2") hole, centred on the crossed lines, through Floor Panel.

Remove all burrs with half round file.



Working from below - pass the assembled Linkage over the Transfer Box and, using the remaining two M12 Bolts and Gearbox Cover Bolt, position and tighten.

Connect Link Rod, item 11 to the Selector Shaft, item 35, using Clevis Pin, item 10, Split Pin, item 27, Washer, item 28 and Nylon Strip, item 29.

Replace the Service Hole Cover.

Proceed as instructions on page 11, but note that the Grommet will locate onto the Floor Panel.

Complete installation as Fitting Instructions.

Addition to Parts List, page 15.

ITEM REF	DESCRIPTION	F W L PART No.	QUANTITY
58	Adaptor Link	6938	1
60	Spring Washer	4-51-1013	1
61	Hex Nut	4-47-1013	1