

BERENS MODEL 400



SHOP MANUAL

**HONE MANUFACTURING CO.
11748 E. Washington Blvd.
Santa Fe Springs, Ca. 90670**

FOREWORD

This Shop Manual provides the Service Technician with complete information for the proper installation and servicing of the Model 400 Hone Overdrive in Toyota Land Cruisers.

The information is grouped according to the procedures being performed. Specifications, recommended special tools and materials are included.

All of the information contained herein was in

effect at the time this manual was approved for printing. The Hone Manufacturing Company reserves the right to change specifications or design without notice and without incurring obligation.

NOTE: Similarity of certain materials herein to that found in Toyota Repair Manuals does not imply concurrence nor approval on the part of the Toyota Motor Sales Company, Ltd. with the contents of this publication.

INTRODUCTION

This Manual provides step-by-step procedures for the installation, maintenance and operation of the Berens Hone Overdrive, in all Toyota Land Cruisers which are equipped with the two speed transfer case. This manually controlled overdrive provides quiet and economical cruising capability in 2-wheel drive.

Installation of the overdrive entails: Removal and partial disassembly of the transfer case to allow replacement of the transfer driveshaft and attachment of the overdrive; removal and shortening of the rear propeller shaft 8¼" (210 mm); re-

routing of the parking brake flexible wire assembly; and assembly and installation.

Much of the material in this Manual covers information that is essentially in accordance with that found in a Toyota Land Cruiser Repair Manual. It is recommended that the parties concerned with installation and maintenance of a Model 400 Hone Overdrive avail themselves of an official Toyota Repair Manual. Thorough familiarity with the basic workings of the transfer case and related components will assist a person performing the procedures found in this manual.

HONE MANUFACTURING COMPANY
Santa Fe Springs, California U.S.A.
January 1, 1973

GENERAL OPERATION

Hone Overdrive Transmissions consist of a planetary gear set combined with a syncromesh. (Fig. A) The syncromesh enables the operator to shift the unit into overdrive and back into direct at will, in any gear, (Fig. B). Lubrication is self contained requiring only periodical maintenance along with the vehicle's engine, transmission and differential. The patented gear clutch arrangement insures full time gear engagement. It does not allow "free wheeling" as did earlier original equipment overdrives.



FIG. A - PLANETARY GEAR SET

LUBRICATION is the "life blood" of your overdrive transmission. Models 210, 300, and 500 are designed to be lubricated by Type B Automatic Transmission Fluid. (Prior to November, 1972, the model 210 was lubricated by 90 W gear lub.) The model 400 is designed to be lubricated by the same lubricant specified for the Toyota four wheel drive transfer case. With the proper maintenance of lubrication, your overdrive will give you many thousands of trouble free driving miles.

SHIFTING of the "manual" overdrive is accomplished in the same manner as shifting any manual transmission; simply disengage the vehicle's clutch and move the overdrive shift lever to the position and gear desired. In the case of an automatic transmission, put the automatic transmission into neutral and select the overdrive gear desired. Then return the automatic transmission to its drive gear.

NOTE: Shifting the overdrive when stopped should be done only with the automatic transmission in the "park" position.



FIG. B - SYNCROMESH

SPECIFICATIONS: Models 210, 300 and 400 will transmit nearly one thousand pound feet of continuous torque and will provide continuous service with a gross vehicle weight up to 8,500 pounds without the aid of an auxiliary cooling system. With the cooling system, these models will handle up to 10,000 pounds GVW.

ADVANTAGES of an overdrive include increased gasoline mileage, increased engine life, additional forward gears, decreased noise level and more driving pleasure.

WARRANTY

Hone Manufacturing Company guarantees the Berens Hone Overdrive to be free from defects in material and workmanship for 1 year from date of purchase. This warranty is expressly limited to the replacement at our factory of the parts, which, in our opinion, after examination, appear to be

defective. Ship the complete overdrive, less mounting brackets and shift mechanism, prepaid to our factory. The overdrive will be returned to you COD for the freight and any other charges not covered by the warranty.

INSTALLATION INSTRUCTIONS

DISASSEMBLY

1. Elevate the vehicle and secure in a safe manner.
2. Remove the transmission undercover. Note, removal of the exhaust pipes and muffler provides more working space, but is not mandatory.
3. Drain the lubricant from the transmission and the transfer case.
4. Disconnect the rear propeller shaft by removing the four hex-head cap bolts, lock washers and nuts at the rear and the four nuts and lock washers securing the front yoke flange. Remove the propeller shaft from the vehicle.
5. Disconnect the front propeller shaft by removing the four hex-head cap bolts, lock washers and nuts securing the rear yoke flange. Leave the propeller shaft connected at the forward yoke.
6. Remove the cotter pin and the clevis pin, and disconnect the transfer case gear shift control rod from the gear shift lever which is located on top of the transfer case.
7. Remove the four hex-head bolts and wave washers that secure the diaphragm chamber assembly to the front drive extension housing, (Fig. 1). Then, remove the chamber assembly and packing from the housing.
8. Disconnect the speedometer cable at the driven end and remove the hex-head cap bolt and lock washer securing the speed detector (if used) to the spline shaft cap. Also, disconnect the electrical wires from the speed detector.
9. Remove the cotter pin, the hex nut and the flat washer that secures the emergency brake drum to the transfer driveshaft. Then, remove the brake drum from the shaft.
10. Remove the four hex-head bolts and lock washers that secure the brake back plate to the speedometer gear housing, (Fig. 2). Then remove the brake back plate complete.
11. Remove the six hex-head cap bolts and lock washers that secure the spline shaft cap to the transfer case, (Fig. 3). Then, remove the spline shaft cap and packing.
12. Remove the six hex-head cap bolts and wave washers that secure the power take-off cover to the transfer case, (Fig. 4). Then, remove the power take-off cover and packing.

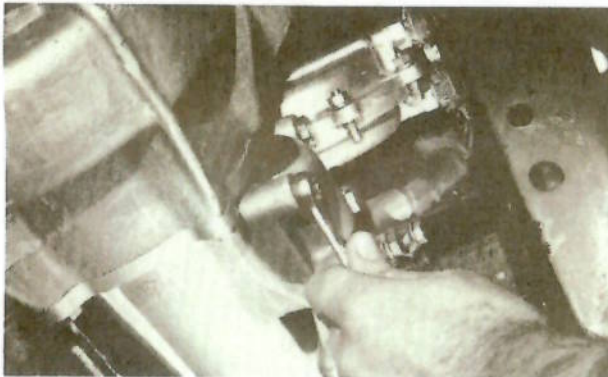


FIG. 1 — REMOVING THE DIAPHRAGM CHAMBER FROM THE TRANSFER FRONT DRIVE EXTENSION HOUSING.

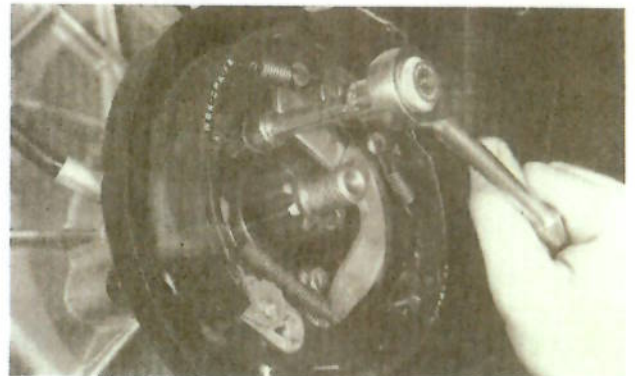


FIG. 2—REMOVING THE CENTER BRAKE BACK PLATE FROM THE SPEEDOMETER GEAR HOUSING.



FIG. 3 — REMOVING THE SPLINE SHAFT CAP FROM THE TRANSFER CASE.

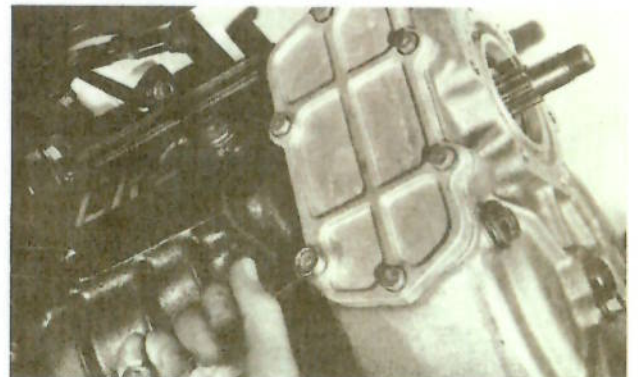


FIG. 4 — REMOVING THE POWER TAKE-OFF COVER FROM THE TRANSFER CASE.

13. Place transmission in low gear. Then, bend back the locking tab of the lock washer at the end of the spline shaft and remove the lock nut, lock washer and spacer that secure the two driving gears on the shaft between the front and rear bearings, (Fig. 5).
14. Support the transfer case on a transmission jack in such a manner that the case may be move toward rear of vehicle in subsequent steps.
15. Remove the five hex-head cap bolts and lock washers that secure the transfer case to the transmission case. Two of the five bolts are located inside the case and can be reached through the power take-off cover hole, (Fig. 6).

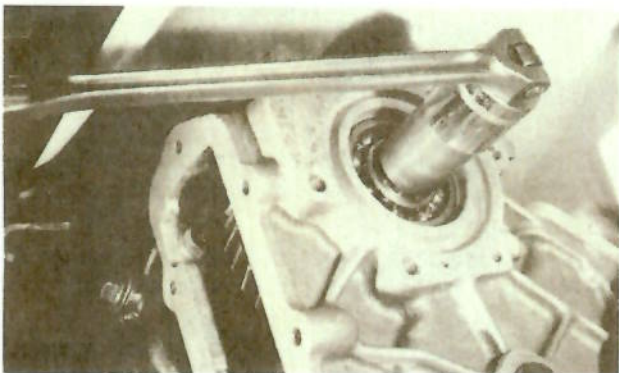


FIG. 5 — REMOVING THE NUT FROM THE SPLINE SHAFT.

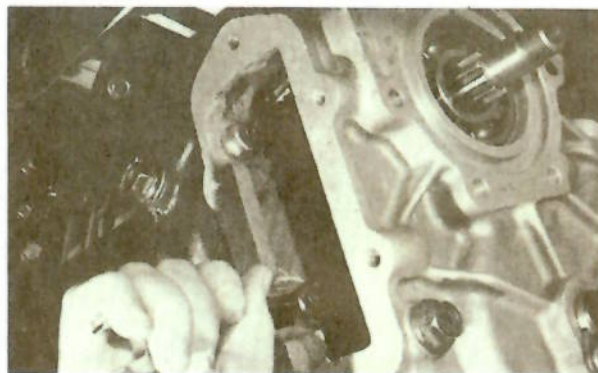


FIG. 6 — REMOVING AN INSIDE BOLT FROM THE POWER TAKE-OFF COVER HOLE.

16. Using a universal puller, pull the transfer case away from the transmission, (Fig. 7). Prior to removal, note the orientation of the power take-off driving gear and spacers (if used). These parts will come free, but remain in the transfer case as it is removed from the vehicle.
NOTE: Use of a universal puller for this operation is strongly recommended. Because if a puller is not used, the spline shaft may be pulled from the transmission. This occurrence would then require disassembly of the transmission to allow re-installation of the needle roller bearings and gears on the spline shaft.
17. Move the transfer case assembly to a work bench for the following procedures. Be careful not to drop the power take-off drive gear, the transfer drive gear or the spacers (if used) out of the transfer case. Remove these parts at the bench.
18. Remove the eight hex-head cap bolts and wave washers that secure the transfer case cover to the case. Remove the cover and packing. NOTE: The shift lever assembly is not removed from the case cover during these procedures.
19. Remove the five hex-head cap bolts and wave washers that secure the front drive extension housing to the transfer case, (Fig. 8). Remove the packing and the housing with the internal parts from the case. NOTE: It may be necessary to tap the housing with a soft hammer to break it free. Remove the front drive clutch hub from the driveshaft. Note the orientation of the hub. (Fig. 9).
20. Remove the cotter pin and gear shift fork plug, (Fig. 10). Remove the gear shift fork lock ball and spring from the fork and the fork shaft lock.

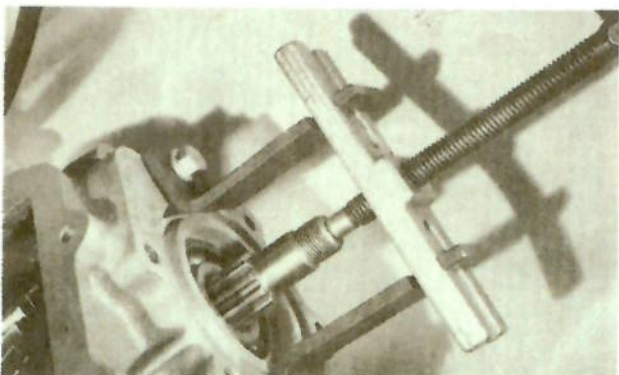


FIG. 7 — REMOVING THE TRANSFER CASE FROM THE TRANSMISSION CASE WITH UNIVERSAL PULLER.



FIG. 8 — REMOVING THE FRONT DRIVE EXTENSION HOUSING FROM THE TRANSFER CASE.

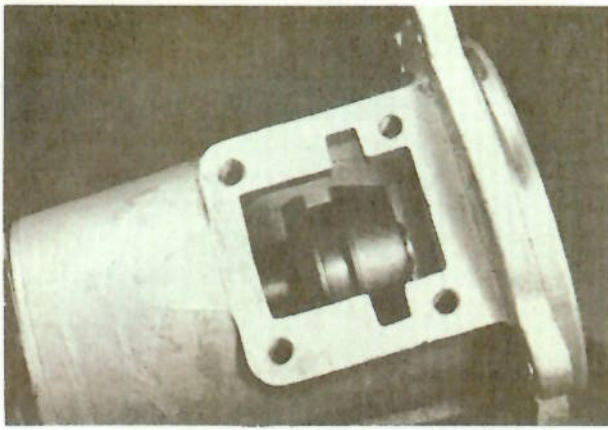


FIG. 9 - DIRECTION OF THE FRONT DRIVE CLUTCH HUB.

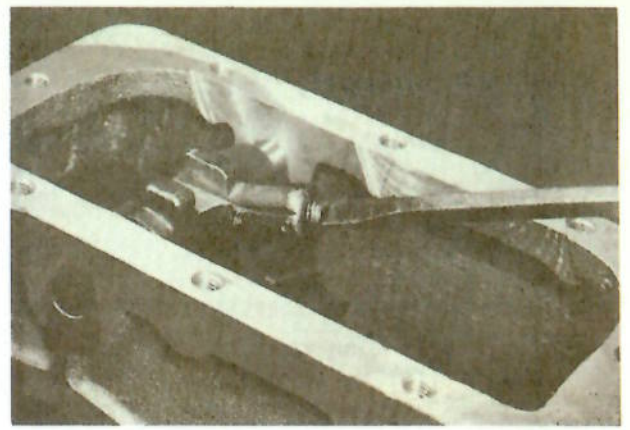


FIG. 10 - REMOVING THE GEAR SHIFT FORK PLUG FROM THE HIGH AND LOW FORK.

21. Use a brass rod, approximate 12 mm (7/16") diameter, and by carefully tapping with a hammer, drift the high/low fork shaft out of the rear of the case, (Fig. 11). Then remove the high/low fork from the case.
22. Remove the hex-head cap bolt and washer, securing the speedometer shaft sleeve and the lock plate. Remove the speedometer shaft sleeve set together with the speedometer driven gear, (Fig. 12).
23. Remove the five hex-head cap bolts and spring washers that secure the speedometer gear housing to the transfer case, (Fig. 13). Remove the housing.
24. Remove the packing and the driveshaft adjust shims from the case. Remove the speedometer drive gear and the spacer from the driveshaft, (Fig. 14).

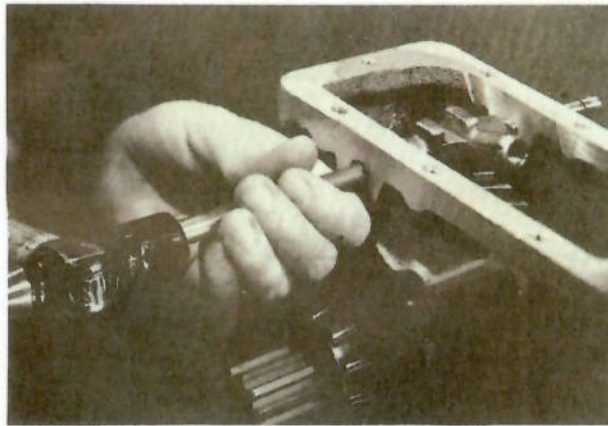


FIG. 11 - REMOVING THE HIGH AND LOW FORK SHAFT FROM THE TRANSMISSION CASE.

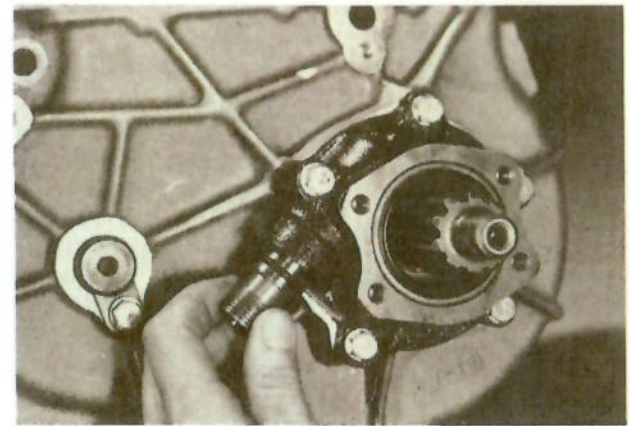


FIG. 12 - REMOVING THE SPEEDOMETER DRIVEN GEAR FROM THE SPEEDOMETER GEAR HOUSING.

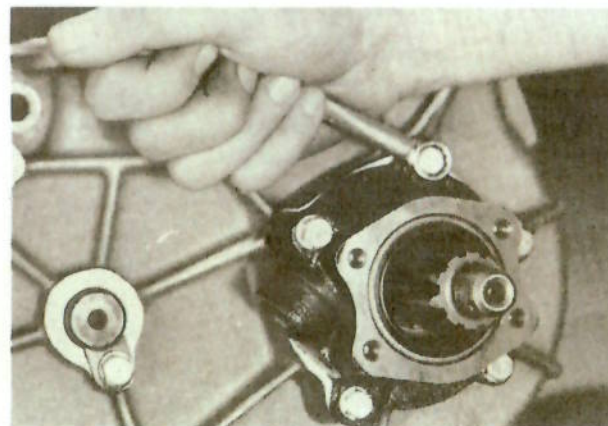


FIG. 13 - REMOVING THE SPEEDOMETER GEAR HOUSING FROM THE TRANSFER CASE.

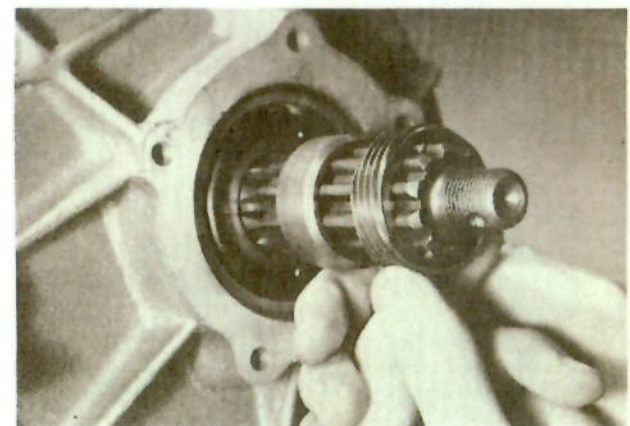


FIG. 14 - REMOVING THE SPEEDOMETER DRIVE GEAR AND THE SPACER FROM THE TRANSFER DRIVE SHAFT

25. Position the transfer case on the bench with the forward face down. Support the case on two blocks of wood to provide at least 80 mm (3'') of clearance between the forward end of the driveshaft and the bench top.

Place a block of hard wood or soft metal of appropriate thickness underneath the low speed gear. Remove the driveshaft by installing a piece of tubing over the threaded end of the shaft and carefully tapping with a hammer, (Fig. 15).

26. Remove the cone of the rear tapered roller bearing and the thrust plate from the case. Carefully drift the rear roller bearing cup out of the case using a brass rod and a hammer.
27. Remove the high/low clutch hub from the driveshaft, taking note of its orientation. Press the cone of the front tapered roller bearing, the thrust plate, the high speed transfer gear and the high speed gear bushing from the driveshaft, (Fig. 16). NOTE: This shaft will not be used in making the over-drive installation.

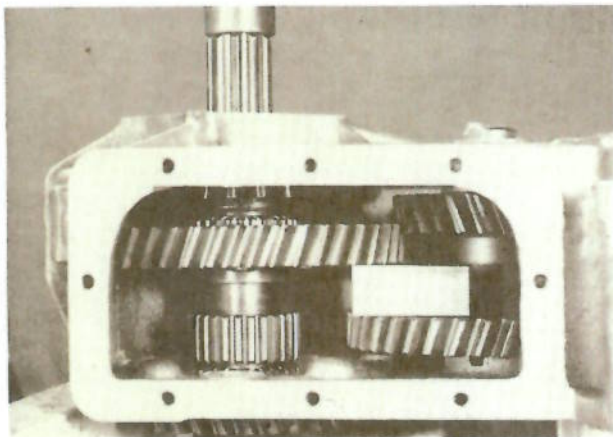


FIG. 15 — REMOVING THE DRIVE SHAFT FROM THE TRANSFER CASE.

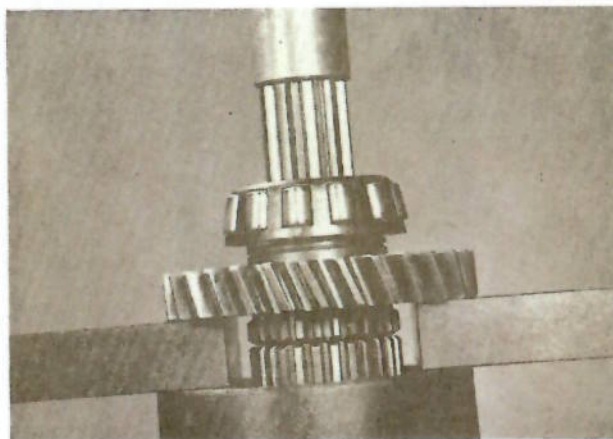


FIG. 16 — REMOVING THE CONE OF FRONT TAPERED ROLLER BEARING FROM THE TRANSFER DRIVE SHAFT.

28. Remove the cotter pin and clevis pin securing the forward end of the parking brake flexible wire and also the clamp screws securing the forward end of the flexible wire housing. Unsecure the clamps holding the housing to the frame and remove the back plate and housing from the vehicle. Note, the parking brake flexible wire assembly will be re-routed during the installation procedure. NOTE: Relocation and/or the modification of the frame crossmember immediately to the rear of the parking brake may be necessary. On some 1973 models this cross member was rotated a few degrees at the factory. In these cases, the cross member must be cut at both sides near the main frame members and rotated for adequate clearance. It is recommended that a collar be used at each cut when rewelding the cross member.

29. Thoroughly clean all parts with suitable cleaning agent and dry. Examine each part to make certain all foreign matter has been removed. Replace any parts which appear excessively worn.

ASSEMBLY

30. During assembly lightly oil all parts that would normally receive lubrication during operation. NOTE: Never transmit press forces through the balls or rollers. Never use direct hammer blows to install a bearing. Always keep the bearings free of debris.
31. Install the bushing, the high-speed transfer gear, and the thrust plate on the forward end of the over-drive input shaft (P/N 4003). Then place the front tapered roller bearing on the shaft. Seat the cone of the bearing solidly against the thrust plate, by carefully tapping a piece of appropriate size metal tubing against the cone with a hammer, (Fig. 17).
32. Insert the output end of the overdrive input shaft into the transfer case through the front opening. Install the high/low clutch hub and the low speed gear on the output end of the shaft and slide the shaft through the case. Lay the transfer case face down, supported on two blocks of wood so that the input end of the shaft is resting squarely against the bench top. Install the thrust plate and the rear tapered roller bearing on the shaft. Solidly seat the cone of the bearing and the thrust plate on the shaft, using an appropriate size piece of tubing and a hammer, (Fig. 18).

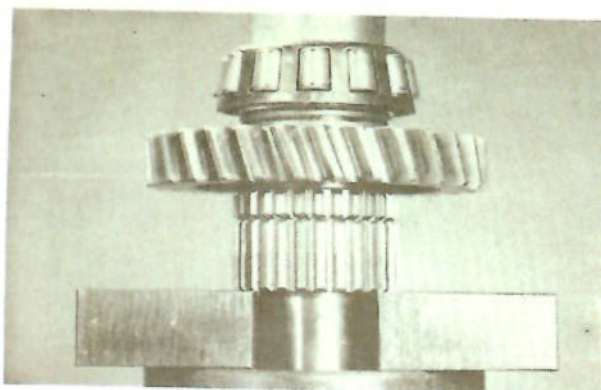


FIG. 17 - INSTALLING THE CONE OF FRONT TAPERED ROLLER BEARING ON THE OVERDRIVE INPUT SHAFT.

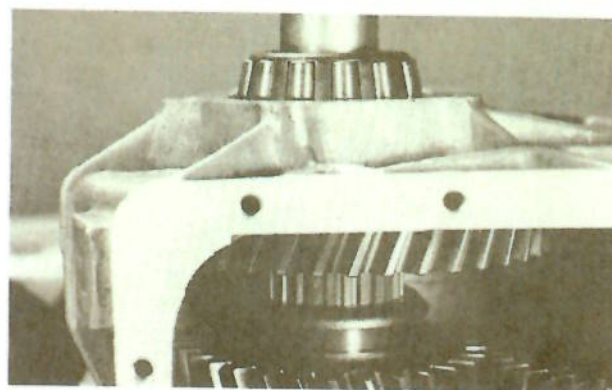


FIG. 18 - INSTALLING THE CONE OF REAR TAPERED ROLLER BEARING ON THE OVERDRIVE INPUT SHAFT.

33. Using a hammer and appropriate size piece of tubing, carefully seat the cup of the rear tapered roller bearing in the case, (Fig. 19).
34. Install the front drive clutch hub on the forward end of the overdrive input shaft. (Refer to Disassembly Fig.) Then, place the front drive extension housing, in which the front drive shaft group of parts are assembled, and a packing in position against the transfer case. (Refer to Disassembly Fig.) Install and tighten the five hex-head cap bolts and wave washers to 1.5 m-kg (11 ft-lbs.) torque.
35. Install the gear shift shaft and the fork assembly following the Disassembly Procedure in reverse order.
36. Position a new packing on top of the transfer case. Then, place the transfer case cover in position, making certain the gear shift cam engages the shift fork. Install and tighten the eight hex-head cap bolts and wave washers to 1.5 m-kg (11 ft-lbs.) torque.
37. Place the original adjust shims(s), a special packing (P/N 4126), and the overdrive forward housing with assembled parts in place against the transfer case. Install and sequentially tighten the five hex-head special cap bolts (P/N 4143) and the lock washers (P/N 1035-19 to 2.25 m-kg (18 ft-lbs.) torque.
38. Place the high/low clutch hub in neutral position, engage the front drive and temporarily install a cap bolt with nut in one of the four holes of the transfer joint retainer. Then, measure the bearing preload by hooking a spring scale to the cap bolt installed in the transfer joint retainer. (Fig. 20). The preload should be 4.7 - 5.9 kg (10.3 - 13.0 lbs.). If preload is incorrect, add or remove shims to get proper setting. Toyota adjust shims are listed in the Tools and Materials section.
39. Install a snap ring (P/N 1027) in the second groove from the output end of the overdrive input shaft. NOTE: Check the clearance between the end of the sun gear and the snap ring using a feeler gauge (Fig. 22). The acceptable tolerance is .020 inches to .060 inches. If the clearance is less than .020 inches, the pinion gear cage cannot be installed. The appropriate thickness of bearing pre-load shims must be removed from the rear bearing cup and placed ahead of the forward bearing cup. If the clearance is greater than .060 inches, the pinion gear cage will interfere with the output shaft flange causing major damage to the gear set. To correct this condition, remove the housing from the transfer

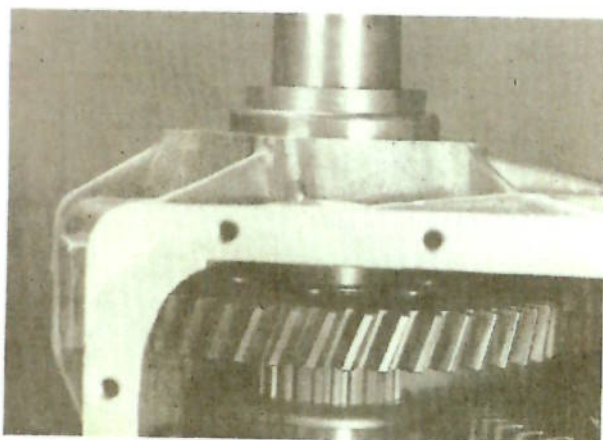


FIG. 19 - INSTALLING THE CUP OF REAR TAPERED ROLLER BEARING IN THE TRANSFER CASE.

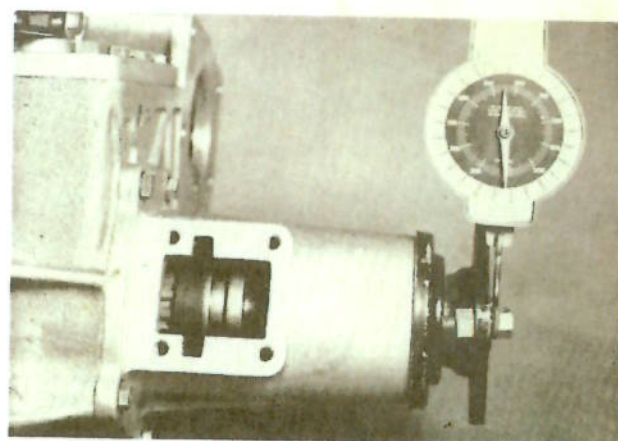


FIG. 20 - MEASURING THE TAPERED ROLLER BEARING PRELOAD.

case and add an extra packing. It will be necessary to add the same thickness of bearing preload shims at the same time. Reinstall the housing and check the bearing preload. The standard packing is approximately .020 inches thick. Also available is an extra thick packing which is approximately .060 inches thick. (P/N 4126-1).

40. Engage a brass synchronizer blocking ring (P/N 1020-1) with the overdrive synchronizer assembly. (Fig. 21). Rotate the blocking ring to insure timing of the three notches to the three synchro plates.

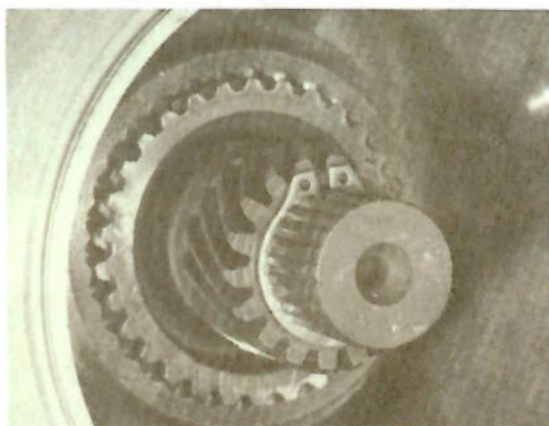


FIG. 21 - BRASS SYNCHRONIZER BLOCKING RING ENGAGED WITH THE SYNCHRONIZER ASSEMBLY.

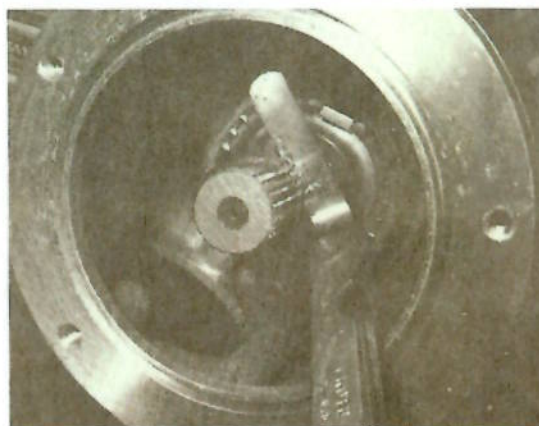


FIG. 22 - CHECKING CLEARANCE WITH A FEELER GAUGE.

41. Install the pinion gear cage (P/N 103) with assembled parts on the input shaft. Slide the assembly forward to expose the snap ring groove near the end of the shaft. Install a snap ring (P/N 1027) in the groove. (Fig. 23)

42. Position the "O" ring (P/N 1031) in the groove located in the mating face of the overdrive rear housing. Use grease to hold the "O" ring in the groove.

Then, carefully mate the overdrive rear housing, with pre-installed parts, to the overdrive forward housing. Make certain the bushing (P/N 1019) is installed in the overdrive output shaft or on the pinion gear cage.

Install and tighten the five hex-head special cap bolts (P/N 4143) and lock washers (P/N 1035-19) to 1.5 m-kp (11 ft-lbs.) torque, (Fig. 24).

43. Install the speedometer spacer and the speedometer drive gear on the overdrive output shaft. (Refer to Disassembly Fig. 14) Then, place a special packing (P/N 4126) and the speedometer gear housing in place against the overdrive rear housing.

Install and tighten the five hex-head cap bolts and lock washers to 1.5 m-kp (11 ft-lbs.) torque.

44. Install the filler plug (P/N 4051) and the drain plug (P/N 4051) in the overdrive forward housing. Tighten the drain plug and leave the filler plug loose.

45. Drill a 27 mm (1-1/16") hole in the side of the transmission floor cover to accept the tunnel plate shifter bushing (P/N 1035-2). The center of the hole should be located 39 mm (1-1/2") above the floor and 39 mm (1-1/2") rearward of the outward bend in the transmission cover.

Securely mount the plate and bushing assembly (P/N 1035-1) and hex nut (P/N 1035-20 and 1035-4). Note, the shifter rod and assembled parts are shown in Fig. 25 to illustrate the position of the shifter rod with the overdrive in "direct drive" for future reference.

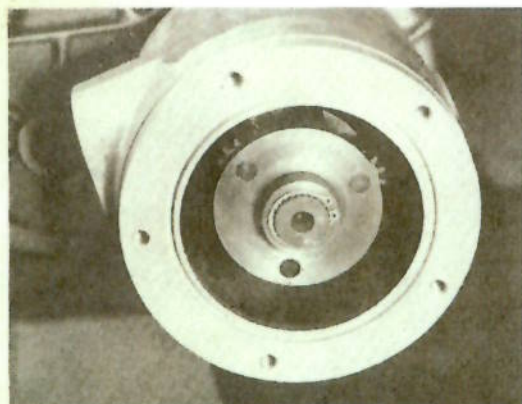


FIG. 23 - PINION GEAR CAGE ASSEMBLY SECURED ON INPUT SHAFT BY SNAP RING.

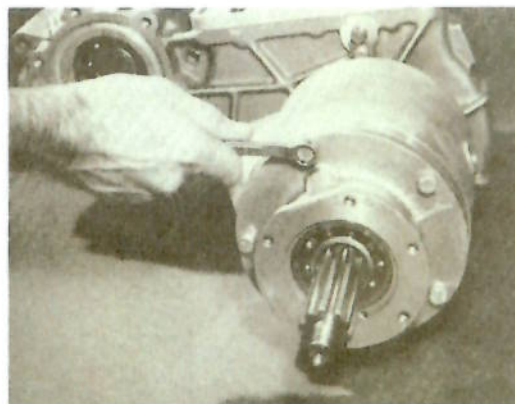


FIG. 24 - FASTENING THE OVERDRIVE REAR HOUSING TO THE FORWARD HOUSING WITH THE FLAT LOCATED AS SHOWN.

VEHICLE INSTALLATION

46. Cement a new packing onto the rear face of the transmission, using a non-hardening adhesive. Then, install the transfer drive gear, the two spacers (if used) and the power take-off driving gear in the transfer case.

Insert a transfer guide shaft tool (Toyota P/N 09323-60010) or equivalent through the gears and the spacers (if used) to hold in alignment. (Fig. 26)



FIG. 25 - LOCATION OF THE INSTALLED TUNNEL PLATE SHIFTER AND BUSHING ASSEMBLY AND ALSO POSITION OF SHIFTER ROD WITH OVERDRIVE IN "DIRECT DRIVE".

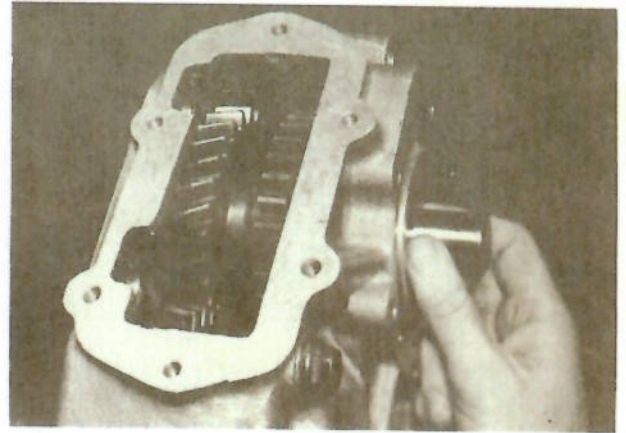


FIG. 26 - INSTALLING GUIDE SHAFT TOOL TO HOLD GEARS IN ALIGNMENT.

47. Place the transfer case and the overdrive assembly on a transmission jack and move under the vehicle.
48. Align and engage the transfer guide shaft tool with the transmission spline shaft. Then, carefully move the transfer case forward engaging the transfer drive gear, the power take-off driving gear and the spacers (if used) on the spline shaft.
- NOTE: When interference is encountered between the transfer case rear bearing and the spline shaft bearing land, swing the right side of the transfer case up into final installation attitude.
49. Remove the special alignment tool from the end of the spline shaft. Place the transmission in low gear. Then, install the spacer, the lock washer and the lock nut on the end of the spline shaft. Tighten the spline shaft nut to engage the transfer case rear bearing and the spline shaft bearing land. When approximately 10 mm (3/8") separation exists between faces of transfer case and transmission, temporarily stop tightening the spline nut.
50. Secure the transfer case to the transmission case with the five hex-head cap bolts and spring washers. Note, two of the bolts are short and are secured at the inside of the case, access is through the power take-off cover hole. (Refer to Disassembly Fig. 6) Carefully tighten the five bolts sequentially to 3.5 - 4.1 m-kG (25 - 30 ft-lbs.) torque.
51. Remove the transmission jack from under the vehicle.
52. Tighten the spline shaft nut to 14 m-kG (100 ft-lbs.) torque. Then bend the nut lock tab over the nut.
53. Install the power take-off cover, the spline shaft cap and two new packings. Tighten the hex-head cap bolts and wave washers to 1.5 m-kG (11 ft-lbs) torque. (Refer to Disassembly procedures).
54. Install the shift fork (P/N 4142) on the sleeve of the synchronizer assembly (P/N 1020), (Fig. 27).
55. Position the "O" ring (P/N 4138) in the groove located in the mating face of the overdrive shift cover plate (P/N 4118). Use grease to hold the "O" ring in the groove.
- Then, place the shift cover assembly with assembled parts in position on the overdrive forward housing making certain that the shaft on the shifter fork engages the hole in the shift yoke guide (P/N 4119). Install and tighten the four hex-head special cap bolts (P/N 4143) and lock washers (P/N 1035-19) to 1.5 m-kG (11 ft-lbs.) torque, (Fig. 28).

NOTE: Occasionally the detent spring supplied is too short and will not be detected by the factory inspection. When this occurs the overdrive will not stay in gear. To correct this situation, remove the shift cover assembly. Remove the snap ring on the shift shaft which retains the shift cover, detent ball and the detent spring. Remove the ball and spring from the shift cover and insert a 1/16 inch thick spacer in the bottom of the drilled hole. Reassemble and reinstall the assembly (Fig. 29).

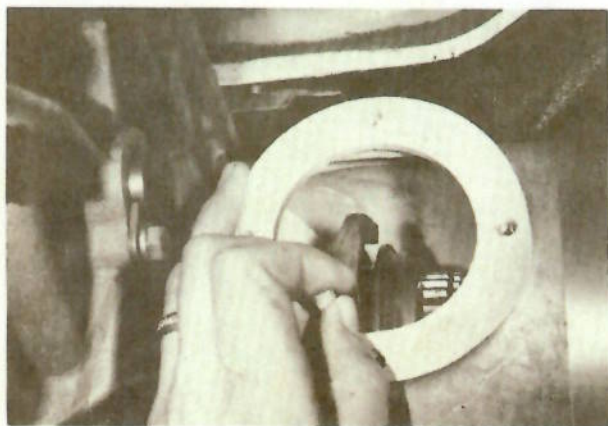


FIG. 27 — INSTALLING SHIFT FORK ON SLEEVE OF SYNCHRONIZER ASSEMBLY.

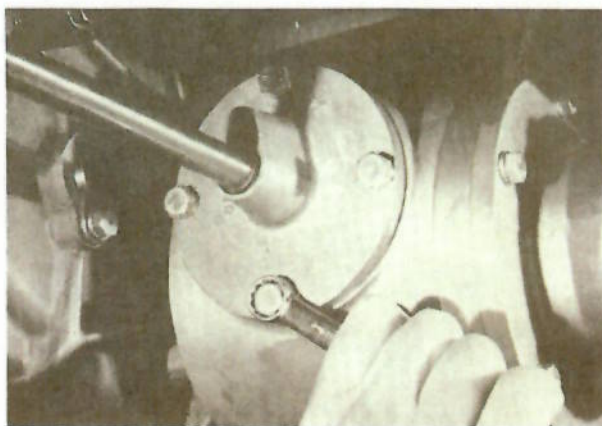


FIG. 28 — FASTENING THE SHIFT COVER PLATE TO THE OVERDRIVE FORWARD HOUSING.

56. Position the diaphragm chamber assembly and a new packing in place against the transfer case. Then, install and tighten the four hex-head cap bolts and wave washers to 1.5 m-kg (11 ft-lbs.) torque. (Refer to Disassembly Fig. 1).
57. Re-install the clevis pin in the transfer case gear shift control rod and secure with a cotter pin.
58. Install the parking brake back plate on the speedometer gear housing with four hex-head cap bolts and lock washers. Then, tighten the four bolts to 1.5 m-kg (11 ft-lbs.) torque.
59. Route the parking brake flexible wire and housing assembly over the top of the transfer case and the top of the transmission shift linkage. Connect the forward end of the flexible wire to the parking brake lever with a clevis pin and cotter pin. Then, secure the flexible wire housing, attach plate to the firewall with two screws.
60. Install the rear-most flexible wire housing clamp on the spline shaft cap as illustrated, (Fig. 30). Tighten the hex-head cap bolt to 1.5 m-kg (11 ft-lbs.) torque.

NOTE: The FJ-55 emergency brake cable is not long enough for use with the overdrive. Purchase and install Toyota No. 46410-60021 brake cable.

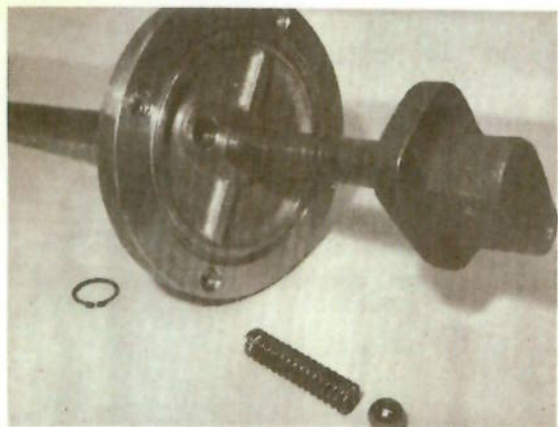


FIG. 29 — SHIFT COVER ASSEMBLY DIS-ASSEMBLED.

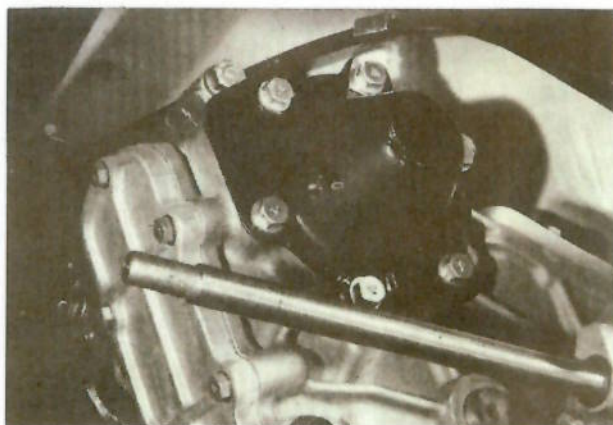


FIG. 30 — POSITION OF PARKING BRAKE FLEXIBLE WIRE HOUSING CLAMP ON SPLINE SHAFT CAP.

61. Remove the hex-head cap bolt and washer securing the clamp on the speedometer cable housing located on the frame. Then, re-install the hex-head cap bolt and washer.

Re-connect the speedometer cable to the speedometer shaft sleeve set. Then, install the speed detector support bracket (P/N 4125) on the spline shaft cap. Secure the speed detector mounting clamp to the support bracket with a 1/4" hex-head bolt (P/N 1046), a flat washer (P/N 1047), a lock washer (P/N 1045-12), and a 1/4" hex-head nut (P/N 1045-13), as illustrated, (Fig. 31). Tighten the spline shaft cap bolt to 1.5 m-kg (11 ft-lbs.) torque. Reconnect the electrical cables.

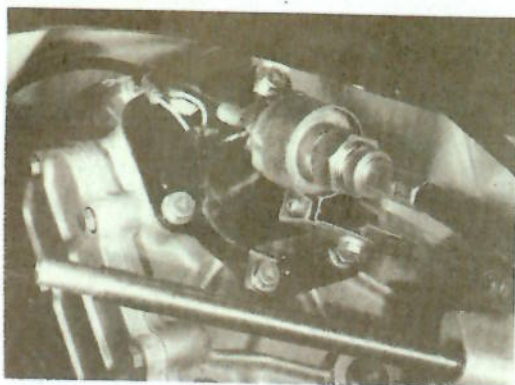


FIG. 31 - POSITION OF SPEED DETECTOR BRACKET ON SPLINE SHAFT CAP.



FIG. 32 - POSITION OF SHIFT YOKE SHAFT SUPPORTS.

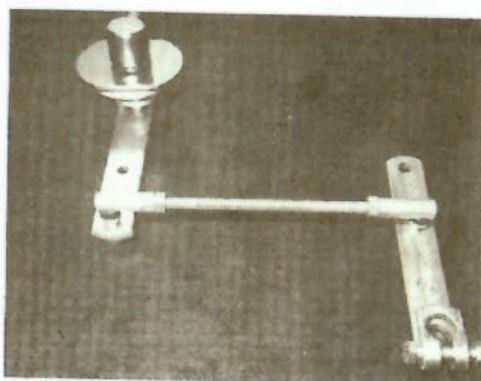


FIG. 33 - SHIFT LINKAGE GEOMETRY. LONG CONNECTION TO SHIFTER. SHORT CONNECTION TO UNIT.

62. Install the center brake drum on the overdrive output shaft, taking care not to damage the oil seal. Secure the brake drum on the shaft with the original flat washer and the hexagon nut (P/N 1038). Tighten the nut to 17 m-kg (120 ft-lbs.) torque.
NOTE: If the rear oil seal is damaged the lubrication level will drain below the safe level. Both the overdrive and the transfer gears may be damaged. The most common cause of oil seal damage is neglecting to release the emergency brake while driving.
63. Install a modified rear propeller shaft which is 8¼" (210 mm) shorter than the original shaft. Secure the rear joint yoke with four hex-head cap bolts, lock washers and hex-nuts, and the flange yoke with four hex-nuts and lock washers. Tighten the nuts and bolts to 1.4 - 2.0 m-kg (10 - 15 f-lbs.) torque.
64. Install, as illustrated (Fig. 32), the shift bracket support (P/N 4124), the shift shaft support (P/N 4123), the hex-bolt (P/N 1035-18), a lock washer (P/N 1035-19), and a flat washer (P/N 1035-22) using the original hex-head cap bolt and wave washer in the transfer cover. Position the parts so as not to place a bind in the shift yoke shaft and tighten the hex-bolts to 1.5 m-kg (11 ft-lbs.) torque.
65. Insert the shifter shaft (P/N 1035-5) into the shifter bushing (P/N 1035-2). Fix the shifter rod in the position shown previously in Fig. 25. Install the knob (P/N 1035-8).
66. Shift the overdrive into "Direct drive" by rotating the shift shaft (P/N 4122) counter-clockwise.
67. Assemble the shift linkage cranks (P/N 1035-3), the shift linkage swivels (P/N 4127), and the shift linkage rod (P/N 4130). Then, install the shift linkage cranks on the shift shafts, (Fig. 33).
68. Re-connect the front propeller shaft. Install and tighten the four hex-head cap bolts and lock washers to 1.4 - 2.0 m-kg (10 - 15 ft-lbs.) torque.
69. Place the vehicle in a level attitude and fill the transmission, the transfer case, the overdrive unit and the speedometer drive gear housing with the lubricant recommended by Toyota for the transmission and transfer case. After filling each cavity to the over flow level, install and tighten the fill plugs and install the speedometer shaft sleeve set and secure it with the lock plate, hex head bolt and lock washer. Note: The FJ-55 emergency brake cable is not long enough for use with the overdrive. Purchase and install Toyota part number 46410-60021 brake cable.
70. Attach the vent hose (P/N 3055-1) located on the forward top of the overdrive. Attach the nylon vent to the opposite end of the vent hose. Spring clamps (P/N 4145) are provided for this purpose. Attach the vent end of the hose to the cross member or any other suitable member using any good water proof tape. The vent should be located at least 6 inches above the unit.
71. Replace the transmission undercover and the exhaust system (if removed). Test drive.

TOOLS AND MATERIALS

SERVICE TOOLS

Certain common and special service tools are required and/or recommended for carrying out the procedures described in this Manual.

It is urged that the person(s) undertaking installation of the Model 400 Berens Overdrive acquire the tools listed below, or a reasonable facsimile thereof. Toyota parts which may be required for installation are the following:

<u>TOOL NO.</u>	<u>DESCRIPTION</u>
09316-60010	Replacer, transmission & transfer bearing
09318-60010	Tool, transfer low speed holding
09322-60010	Remover, transfer drive shaft
09323-60010	Shaft, transfer guide
09910-00013	Clamp, puller
09950-20010	Puller, universal

OTHER SERVICE TOOLS

Spring scale
Snap ring pliers
Torque wrench(s)

TOYOTA PARTS

<u>PART NO.</u>	<u>DESCRIPTION</u>
36141-60020	Gasket, transfer case cover, No. 1
36142-60020	Gasket, transfer case cover, No. 2
36143-60010	Gasket, transfer case, front
36144-60010	Gasket, transfer power take-off cover
36145-60010	Gasket, transfer extension housing cover
36164-60020	Gasket, transfer shift shaft guide
36253-60010	Lock, input shaft nut
90311-42014	Seal, type T oil
90311-45018	Seal, type T oil
90564-64017	Shim - 0.10 mm (0.0039'')
90564-64023	Shim - 0.15 mm (0.0059'')
90564-64024	Shim - 0.20 mm (0.0079'')
90564-64025	Shim - 0.25 mm (0.0098'')
95381-01215	Pin, cotter
95381-02015	Pin, cotter
95381-02025	Pin, cotter



HONE MFG. CO.
BERENS
HONE OVERDRIVE
MODEL 400

MODEL 400 PARTS LIST

QTY.	QTY.	NO.	DESCRIPTION	QTY.	QTY.	NO.	DESCRIPTION
1	1	402	Forward Housing Assembly	1	408	Bag Misc. Parts	
	1	1002	Stationary Gear	2	1027	Snap Ring	
	*1	103	Planet Cage Assembly	2	1035-3	Crank-shifter (short)	
	1	1004	Sun Gear	2	1035-13	Cap screw 5/16" - 24 x 1 1/2"	
	1	1007	Spacer-short	2	1035-14	Lock nut 5/16" - 24	
	1	1008	Spacer-long	1	1035-18	Cap screw 5/16 - 18 x 5/8	
	1	1020	Synchro assembly	17	1035-19	Lock washer - 5/16"	
	*2	1020-1	Synchro blocking ring	1	1035-22	Flat washer - 5/16"	
	1	1024	Snap ring	1	1038	Lock nut - 3/4" - 16	
	1	1025	Snap ring	1	1045-12	Lock washer - 1/4"	
	1	1029	Bearing	1	1045-13	Nut 1/4" - 20	
	1	3055-1	Vent	1	1046	Cap screw 1/4 - 20 x 1/2	
	1	4000	Forward housing	1	1047	Flat washer 1/4"	
1	1	403	Output Housing Assembly	2	4051	Oil plug 1/2" NPT	
	1	1019	Bushing, planet gear	1	4123	Support-shift shaft	
	1	1029-1	Bearing	1	4124	Bracket-shift support	
	1	1030	Bearing	1	4125	Bracket-speed detector	
	1	1032	Ring gear	2	4127	Swivel-shift linkage	
	1	1033	Snap ring	1	4130	Rod-shift linkage	
	1	3014	Retainer washer	1	4142	Shifter fork	
	1	3052	Snap ring	11	4143	Hex cap 8-1.25p x 7.8	
	1	3053	Roll pin	3	4160	Hex nut 5/16 - 24	
	1	4001	Output housing	2	4145	Spring Clamp	
	1	4006	Output shaft	1	4146	Vent Hose	
	*3	4143	Hex bolt 8-1.25p x 7/8"	1	3055	Vent	
1	1	404	Input Shaft Assembly	1	410	Tunnel Plate Assembly	
	1	4003	Input shaft	1	1035-1	Tunnel plate	
	1	4144	Bearing, roller	1	1035-2	Tunnel plate bushing	
1	1	407	Shift Cover Assembly	1	1035-4	Hex nut 7/8" - 14	
	1	1021	Ball, detent	1	1035-20	Flat washer 7/8"	
	1	1022	Spring	1	411	Shifter Rod Assembly	
	1	4118	Shift cover casting	1	1035-5	Shifter shaft	
	1	4119	Shift index casting	1	1035-8	Knob	
	1	4122	Shift yoke shaft	1	4120	Shifter Lever	
	1	4140	Snap ring	1	412	Envelope	
	1	4141	O-ring	1	1031	"O" ring	
				2	4126	Packing	
				1	4138	"O" ring	
				1	4199	Owners information	

NOTE: *Indicates loosely assembled parts requiring disassembly for installation.

OPERATION – MAINTENANCE – SPECIFICATIONS

OPERATION

The overdrive is equipped with full synchromesh. Shift pattern: Forward for overdrive and rearward for direct drive. Shifting is accomplished in the same manner as shifting the gears of any standard transmission.

It is recommended that only direct drive be used when operating the vehicle off pavement.

MAINTENANCE

Check oil level: Top-up if necessary at 600 miles (1000 km) and then every 4000 miles (6000 km).

Change oil every 24,000 miles (36,000 km).

Lubricate linkage every 2000 miles (3000 km).

Re-tighten accessible fittings at 600 miles (1000 km) and then every 12,000 miles (18,000 km).

SPECIFICATIONS

OVERDRIVE

Gear ratios: direct - 1:1; overdrive - 0.7:1

Oil: type - same as used in transmission and transfer case.

Capacity: 0.8 liters (0.9 U.S. qts.)

Weight (dry): net increase - 11.6 kg (25-1/2 lbs.)

Length: net - 210 mm (8.25")

Diameter: nominal - 172 mm (6.75")

TRANSFER CASE

Oil: type - as recommended by Toyota

Capacity: 1.70 liters (1.8 U.S. qts.)

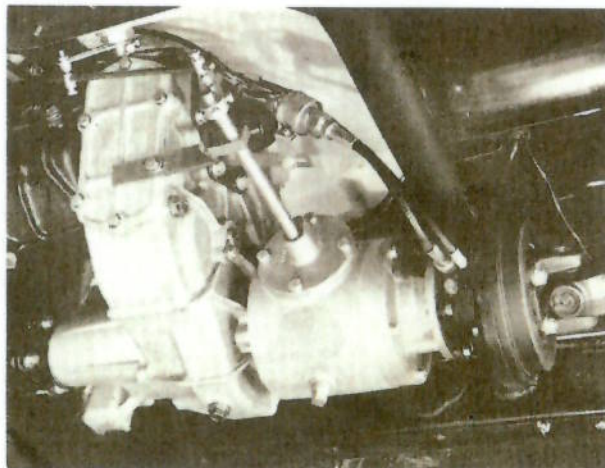
TRANSMISSION

Oil: type - as recommended by Toyota

Capacity: 3.12 liters (3.3 U.S. qts.)

WARNING:

Do not engage the overdrive while in 4-wheel drive. Damage will occur which is not covered by warranty. A warning decal is supplied for use on the instrument panel.



BERENS HONE OVERDRIVE INSTALLED IN TOYOTA LAND CRUISER

Please record your Serial Number here

and keep this record in a safe place. It will be the only permanent record of your unit unless you register the number with the factory using the cut out card below.

Four good reasons to register your overdrive unit are:

- (1) In the unlikely event that a manufacturing defect occurred in your particular unit, Hone Manufacturing Company will be able to contact you for correction or replacement.
- (2) In the case of theft, Hone Manufacturing Company may be able to help locate your property through future parts purchases or information requests.
- (3) As new products or accessories are added to the Hone line, registered owners will receive information about or special offers for the new items.
- (4) In the event that you decide to install the overdrive unit yourself, the Warranty will begin on the registration date rather than on the sale date to the dealer.



UNIT SERIAL NUMBER _____

MODEL NUMBER _____ VEHICLE INSTALLED ON _____

NAME OF DEALER WHERE PURCHASED _____

DATE OF INSTALLATION OR FIRST USE _____

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE NUMBER _____