MANUAL TRANSMISSION

MODEL F5MC1

CONTENTS

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1. SPECIFICATIONS

TRANSMISSION MODEL TABLE – MODEL 1994

Transmission model	Gear ratio	Speedometer gear ratio	Final gear ratio	Vehicle model	Engine model
F5MC1-1-QQAF	A	29/36	3.55	E99A	420B

GEAR RATIO TABLE

	A
1st	3.54
2nd	2.31
3rd	1.36
4th	1.03
5th	0.81
Reverse	3.94

SERVICE SPECIFICATIONS

Items	Specifications
Differential ring gear bolts	0.025–0.33 mm
Differential case preload	0.18 mm

SEALANTS

Items	Specified sealant
End cover and bolts	LOCTITE 5699
Clutch housing to transaxle case	LOCTITE 518
Clutch housing to transaxle case bolts	LOCTITE 518

TORQUE SPECIFICATIONS

Items	Specifications
Differential ring gear bolts	81 Nm
End cover bolts	26 Nm
Reverse idler gear bolt	20 Nm
Reverse fork bracket bolt	11 Nm
Transmission case – clutch housing bolt	26 Nm

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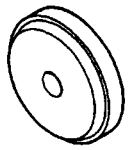
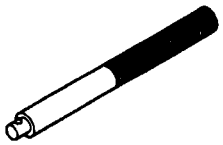
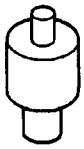
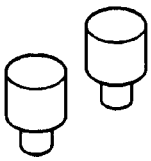
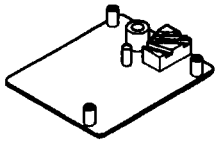
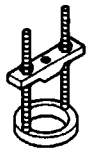
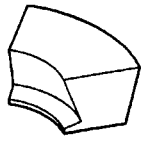
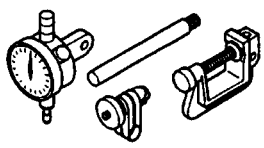
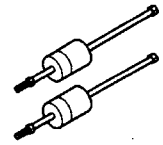
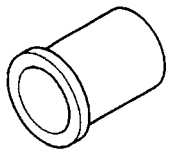
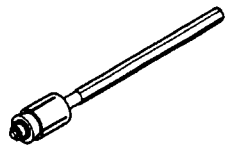
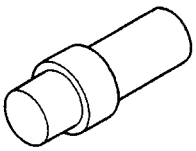
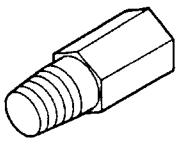
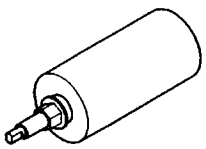
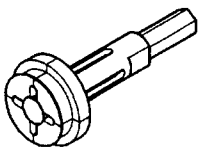
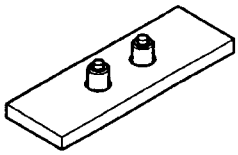
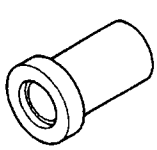
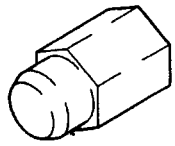
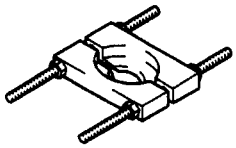
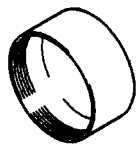
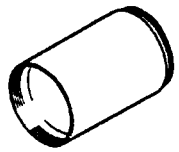
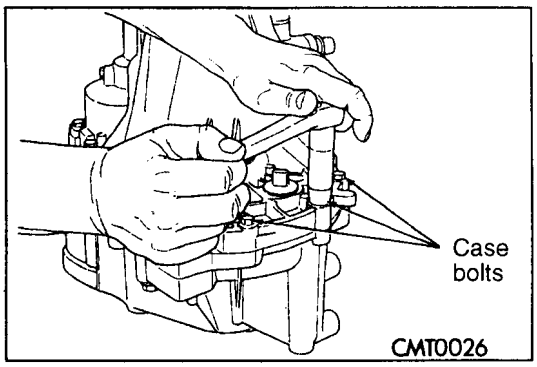
2. SPECIAL TOOLS

Tool	Number	Name	Use
	MB990927	Installer adapter	Removal of input shaft bearing and sleeve.
	MB990933	Installer adapter	Installation of output bearing race and differential bearing race.
	MB990938	Installer bar	Use with MB990926, MB990933.
	MB995023	Bearing remover & installer	Installation and removal of input shaft bearing, output shaft bearing.
	MB995024	Bearing remover & installer	
	MB995025	Bearing remover & installer	
	MB995028	Puller press	Removal of differential bearing.
	MB995029	Puller blocks adapter	Removal of differential bearing.
	MB995030	Dial indicator set	Adjustment of differential side gear.

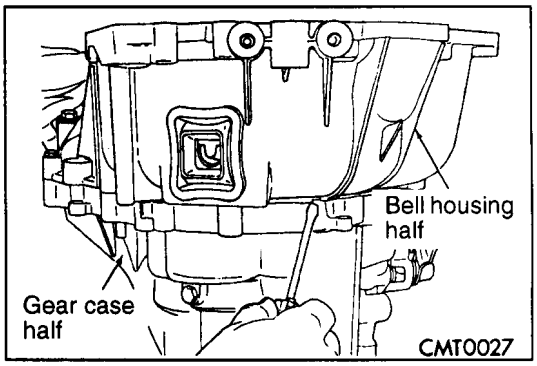
Tool	Number	Name	Use
	MB995031	Puller set	Removal of shifter rail bushing, shifter crossover bushing, shifter selector shaft.
	MB995033	Seal installer	Installation of input shaft bearing and sleeve.
	MB995038	Differential bearing torque tool	Checking of differential bearing end play, differential bearing turning torque.
	MB995039	Adapter	Removal of differential bearing. Adjustment of differential side gear end play.
	MB995040	Bushing remover	Removal of shifter rail bushing, shifter selector shaft.
	MB995048	Cup remover	Removal of differential bearing race.
	MB995052	Bearing race remover	Removal of output bearing race.
	MB995056	Bearing remover & installer	Removal of input shaft bearing, output shaft bearing.
	MB995058	Bearing installer	Installation of input shaft bearing, output shaft bearing.

Tool	Number	Name	Use
	MD998343	Adapter	Installation of shifter rail bushing, shifter selector shaft.
	MD998801	Bearing remover	Installation and removal of each bearing, synchronizer.
	MD998812	Installer cap	Use with MD998813, MD998821, MD998826.
	MD998813	Installer – 100	Use with MD998812, MD998821.
	MD998821	Installer adapter (44)	Installation of 3–4 speed synchronizer, 5 speed synchronizer and differential bearing cone.
	MD998826	Installer adapter (54)	Installation of axle shaft oil seal.

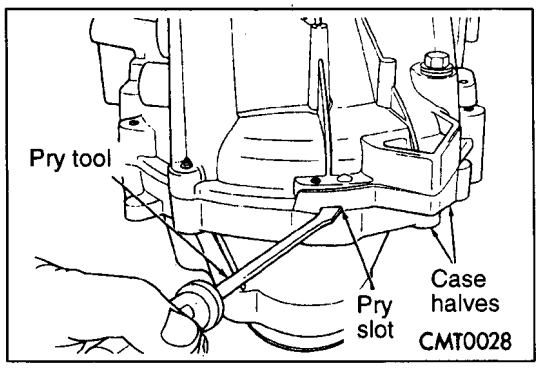


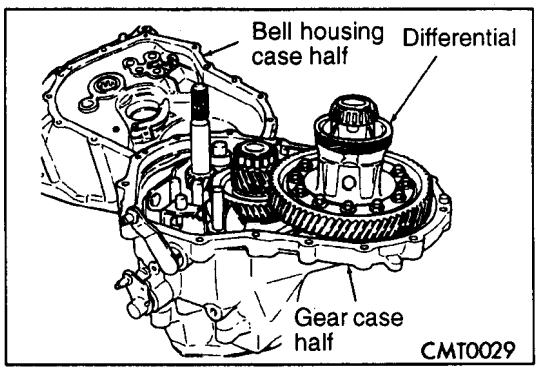
3. CASE DISASSEMBLY

(1) Place transmission on bench.
(2) Remove transmission case half bolts.

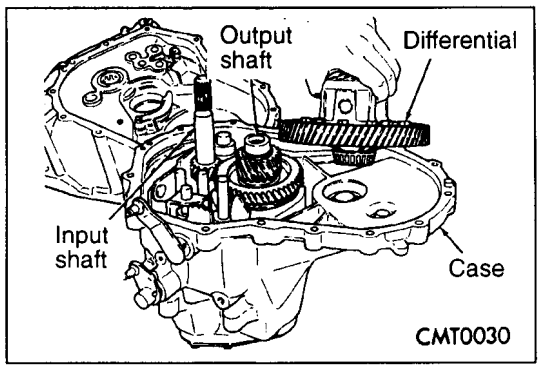


(3) Place two screwdrivers in the slots of case halves near the dowels. Separate the case halves.





(4) Remove bell housing case half.



(5) Remove output shaft roller bearing from output shaft.
(6) Remove differential assembly.

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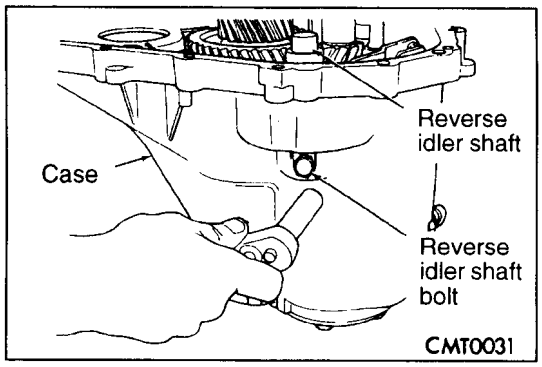
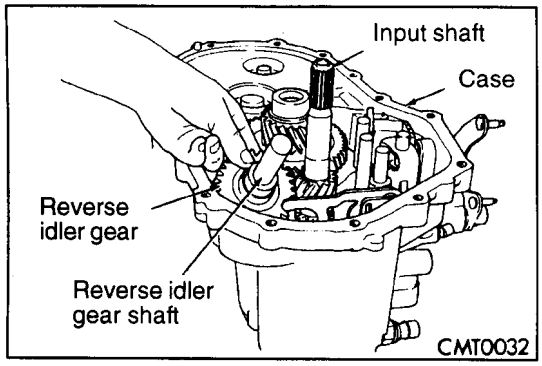
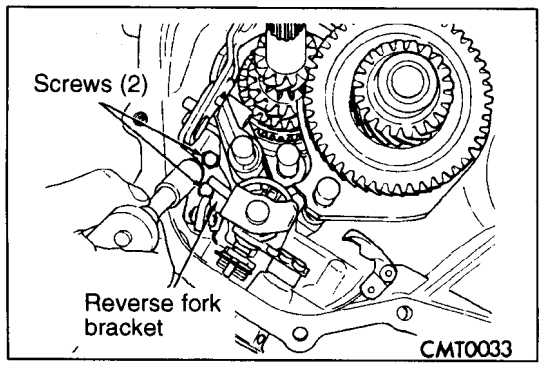
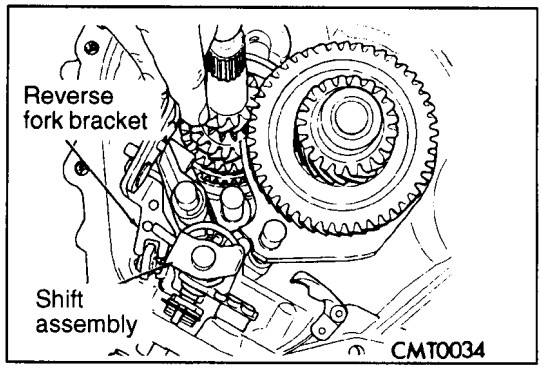


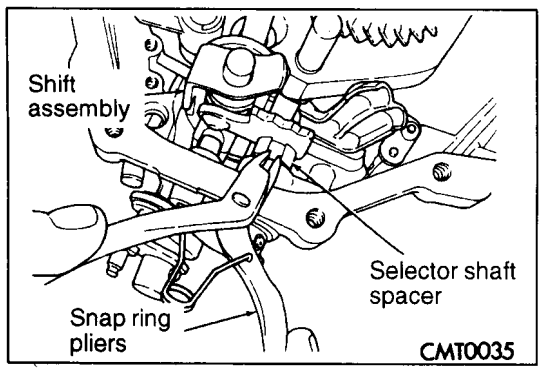
(7) Remove reverse idler shaft bolt. Remove reverse idler gear.





(8) Remove two screws retaining reverse fork bracket. Remove reverse fork bracket and reverse cam blockout assembly.





(9) Use snap ring pliers to remove selector shaft spacer.

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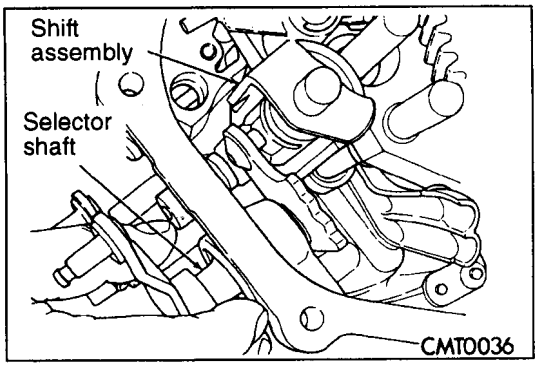
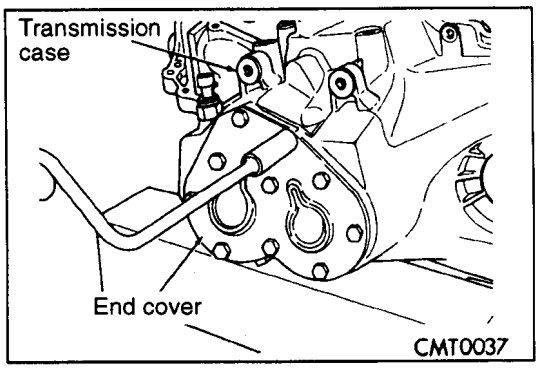
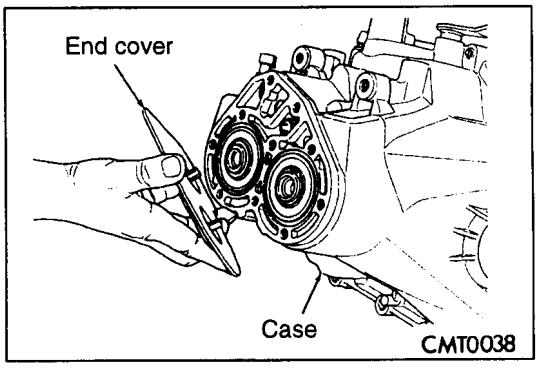
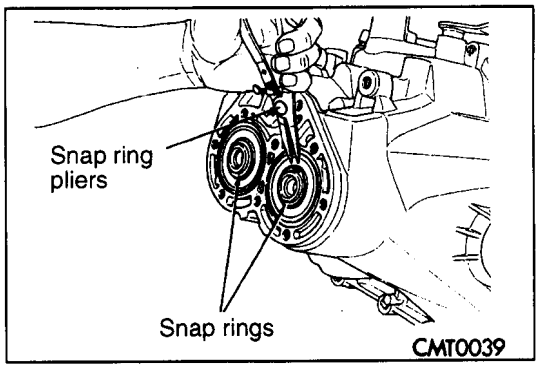


(10) Push the selector shaft shift pin out of the slot in the blocker assembly and turn selector shaft up and out of the way.

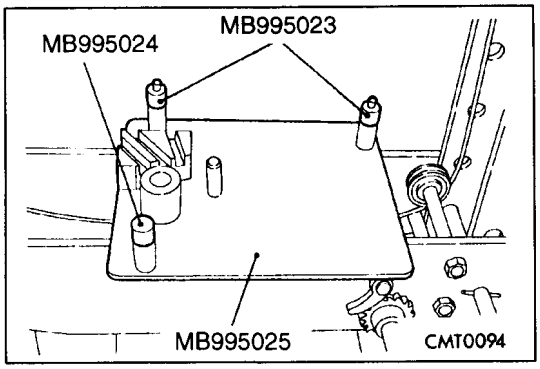


(11) Remove transmission end cover.





(12) Remove two snap rings retaining the output shaft and the input shaft to the bearing.



(13) Using pallet fixture and shims provided (MB995023, MB995024, MB995025), turn transmission over and install transmission onto pallet fixture. Verify shim spacers are in position on pallet fixture. Install transmission into shop press.

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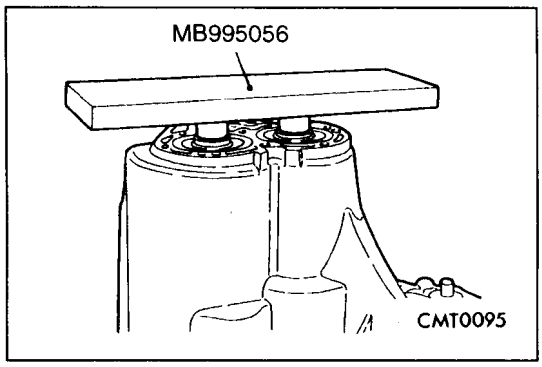
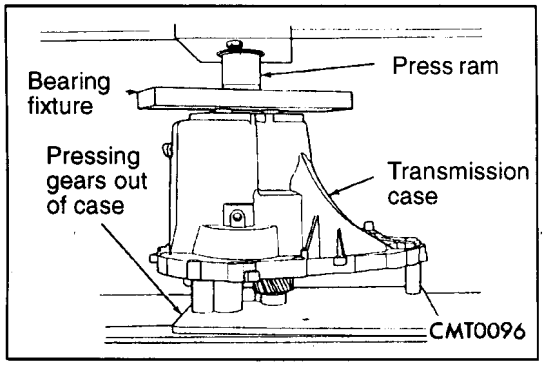


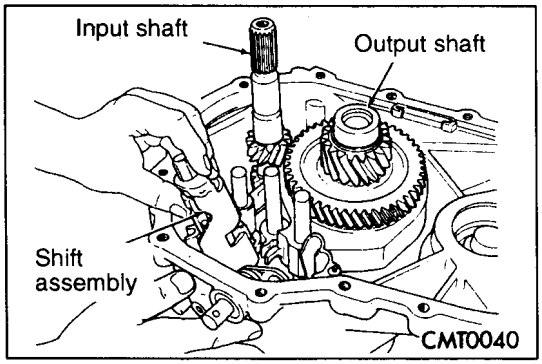
(14)Install base plate holding fixture (MB995056) onto transmission end bearings.

Caution

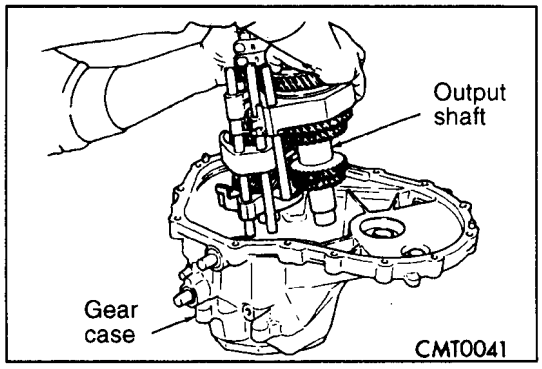
- **The oil feed trough in the input shaft can be damaged while pressing on the shaft.**



(15)Install transmission gear case into shop press. Press output and input shaft assemblies out of case.
(16)Remove transmission from press.



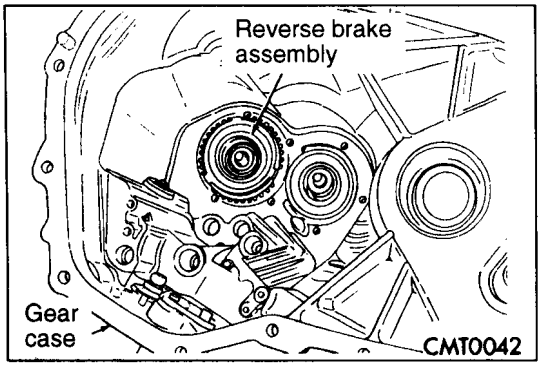
(17)Remove blocker assembly from gear case.



(18)Remove input and output shaft assemblies from gear case. The fork and rail assemblies will come out of case with the geartrain.

Caution

- **The output shaft assembly is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1/2 synchronizer or gear fails, it is necessary to replace the complete output shaft assembly.**



(19)Remove reverse brake assembly from gear case.

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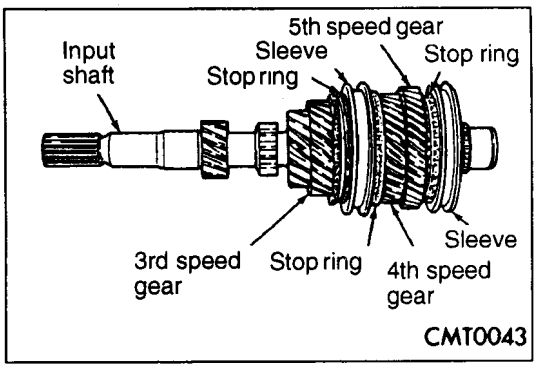
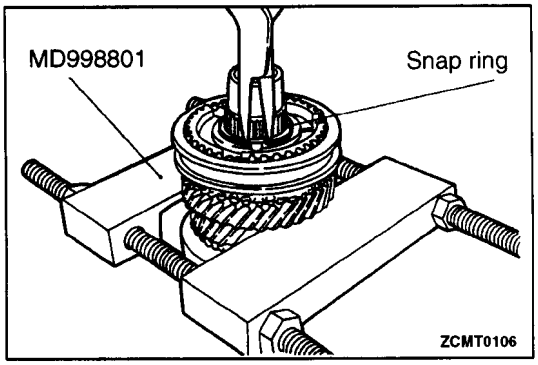
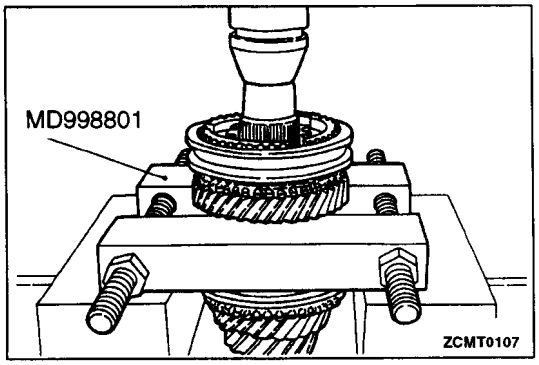


4. INPUT SHAFT DISASSEMBLY

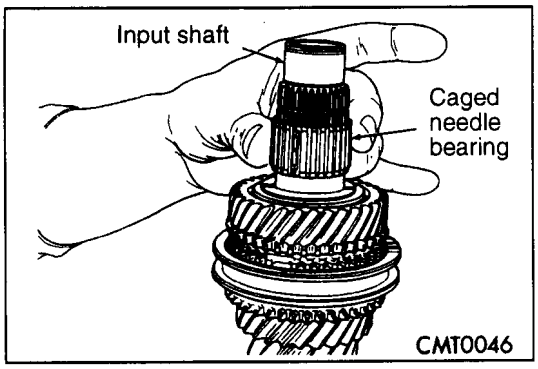
The input shaft incorporates the 3rd, 4th, and 5th speed gears and synchronizers on the assembly.



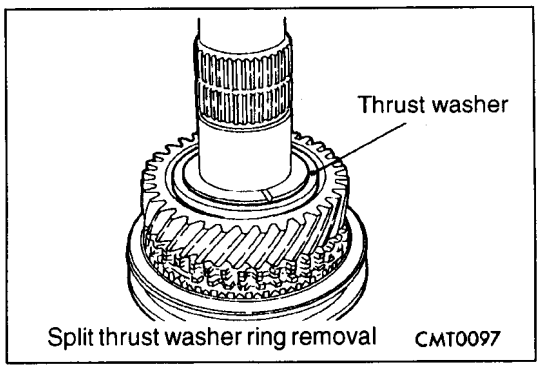
(1) Install MD998801 behind 5th speed gear. Remove snap ring at 5th synchronizer hub on input shaft.



(2) Remove synchronizer and gear using shop press.



(3) Remove caged needle bearing.



(4) Remove 4-5 gears split thrust washer ring.

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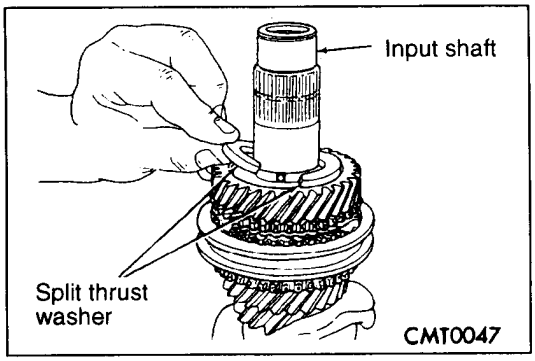
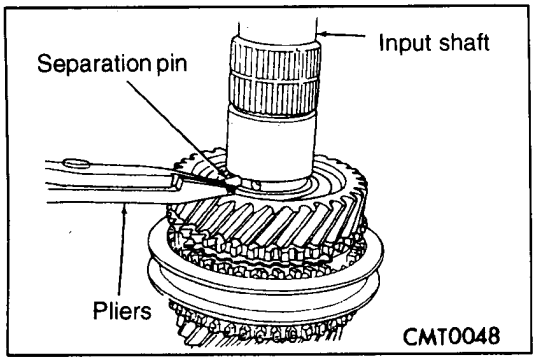
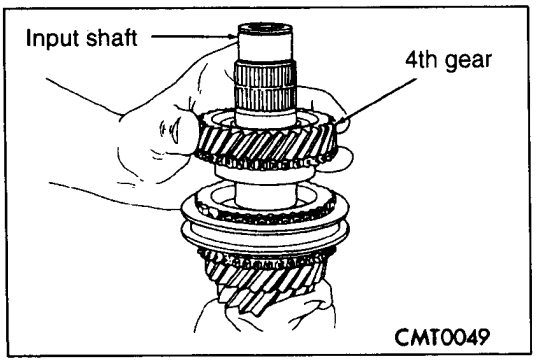


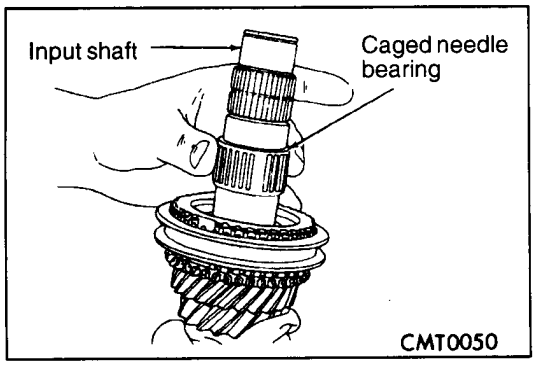
(5) Remove split thrust washer.



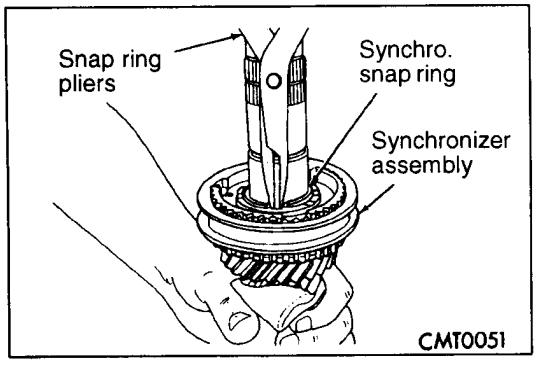
(6) Remove split thrust washer separation pin.



(7) Remove 4th gear.



(8) Remove 4th gear caged needle bearing. Check the caged needle bearing for a broken retention spring.



(9) Remove blocking ring. Remove 3/4 synchronizer hub retaining snap ring.

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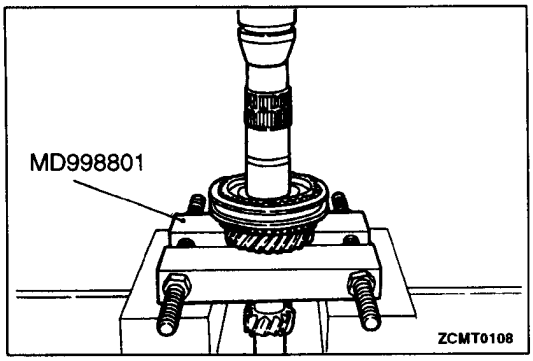
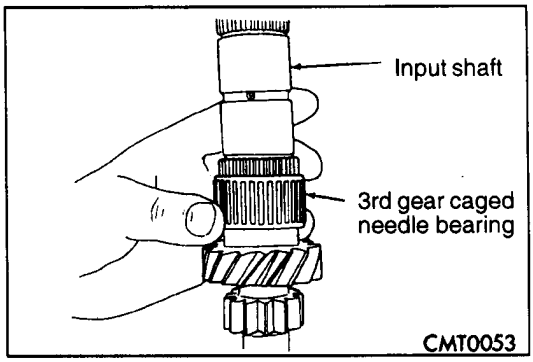
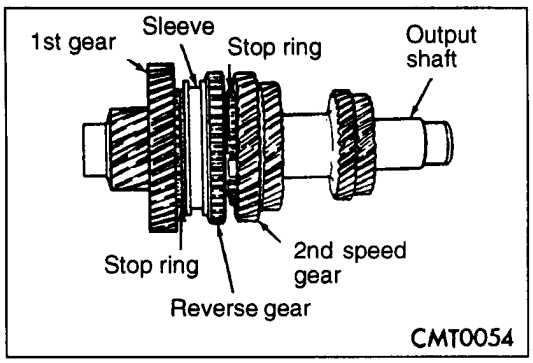


(10) Install input shaft in shop press. Use MD998801 to remove 3/4 synchronizer and 3rd gear.



(11) Remove 3rd gear caged needle bearing. Check the caged needle bearing for a broken retention spring.
(12) Inspect the input shaft for worn or damaged bearing races or chipped gear teeth. Replace as necessary.



5. OUTPUT GEAR DISASSEMBLY

The output shaft incorporates the 1st and 2nd gears and synchronizers on the assembly.

Caution

- **The output shaft assembly is serviced as an assembly. Do not try to repair any component on the output shaft. If the 1/2 synchronizer or gear fails, it is necessary to replace the complete output shaft assembly.**

6. TRANSMISSION CLEANING AND INSPECTION

Clean the gears, bearings, shafts, synchronizers, thrust washers, oil feeder, shifter mechanism, gear case, and bellhousing with solvent. Dry all parts except the bearings with compressed air. Either allow the bearings to dry in air or wipe them dry with clean shop towels.
Inspect the gears, bearings, shafts and thrust washers. Replace the bearings and cups if the rollers are worn, chipped, cracked, flat spotted, or brinnelled, or if the bearing cage is damaged or distorted. Replace the thrust washers if cracked, chipped, or worn. Replace the gears if the teeth are chipped, cracked, or wore thin. Inspect the synchronizers. Replace the sleeve if worn or damaged in any way. Replace the stop rings if the friction material is burned, flaking off, or worn. Check the condition of the synchronizer keys and springs. Replace these parts if worn, cracked, or distorted.

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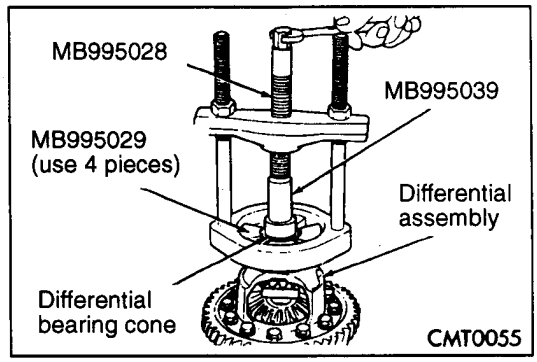
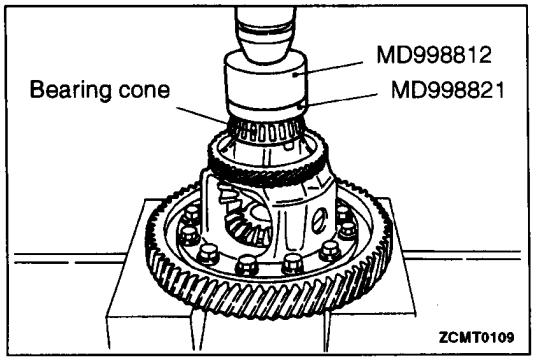
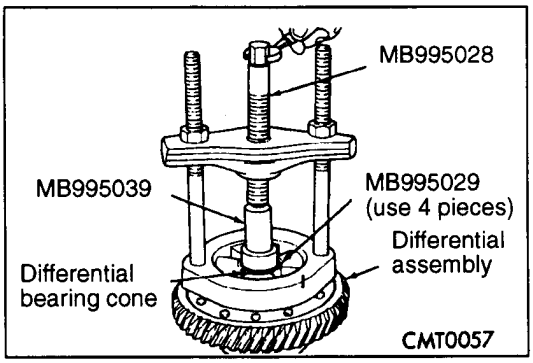
7. DIFFERENTIAL OVERHAUL

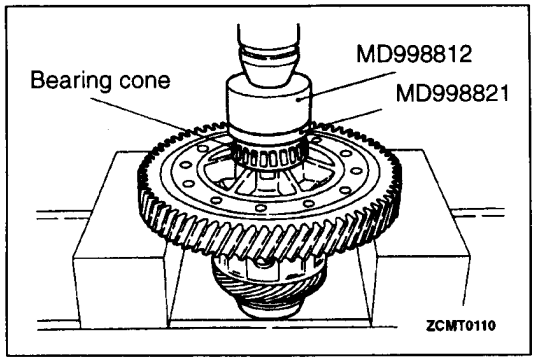
Shim thickness need only be determined if any of the following parts are replaced:
Transmission gear case
Clutch bellhousing case
Differential case
Differential bearing



Refer to Bearing Adjustment Procedure at the end of this section to determine proper shim thickness. This will provide correct bearing preload and proper bearing turning torque.







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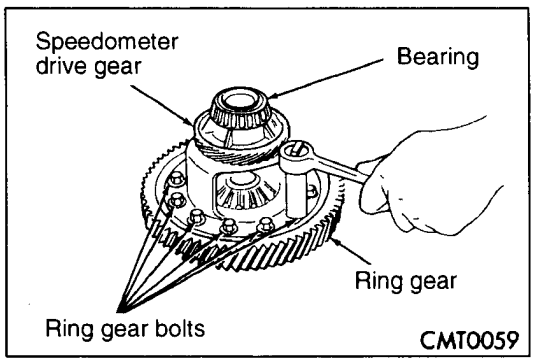

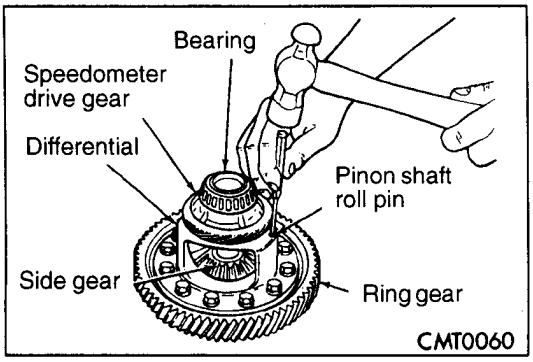

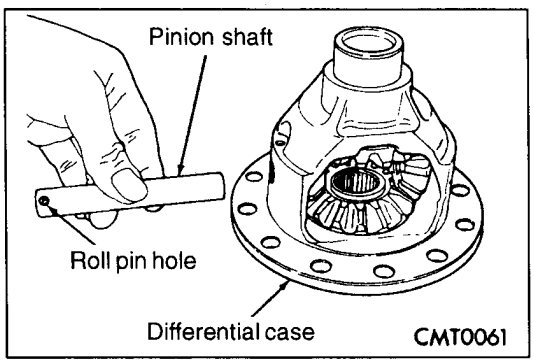

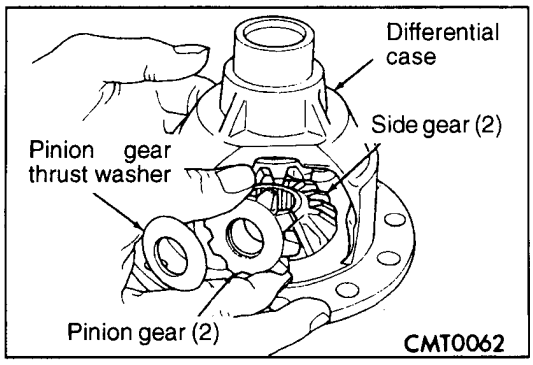

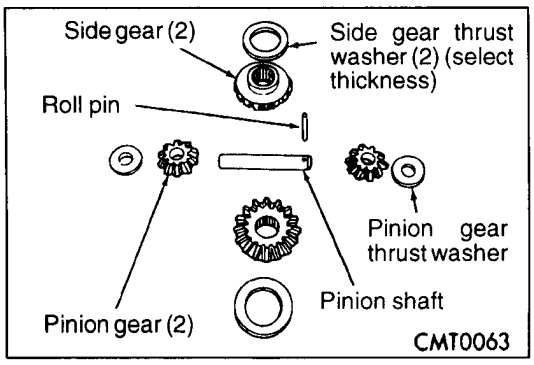

Caution

- **Always install new ring gear bolts. Tighten ring gear bolts to 81 Nm torque.**

Assemble the differential side gears, pinion gears and pinion gears with the pinion gear washers. Rotate the assembly two full revolutions both clockwise and counterclockwise.

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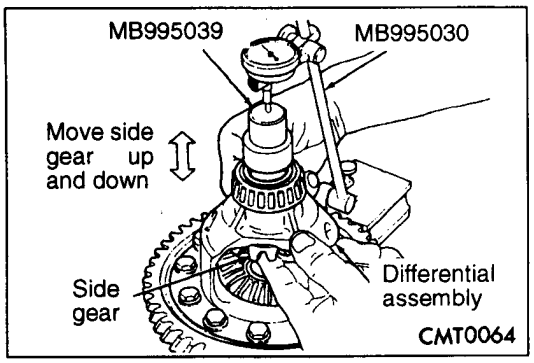
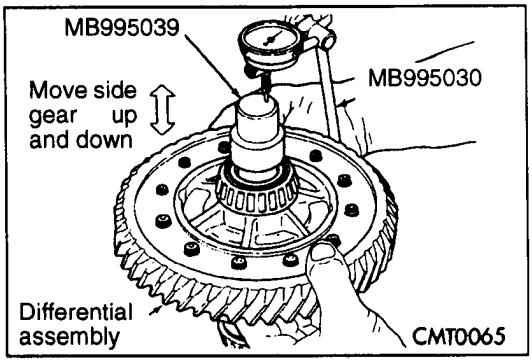


Set up dial indicator as shown and record end play. Rotate side gear 90 degrees and record another end play. Again, rotate side gear 90 degrees and record a final end play. Using the smallest end play recorded, shim that side gear to within 0.025 mm to 0.33 mm. The other side gear should be checked using the same procedure.



Caution

- **Side gear end play must be within 0.025 mm to 0.33 mm. Four select thrust washers are available: 0.81 mm, 0.93 mm, 1.07 mm and 1.19 mm**

8. SYNCHRONIZER OVERHAUL

DISASSEMBLY

Place synchronizer in a clean shop towel and wrap. Press on inner hub. Carefully open up shop towel and remove springs, balls, keys, hub, and sleeve.

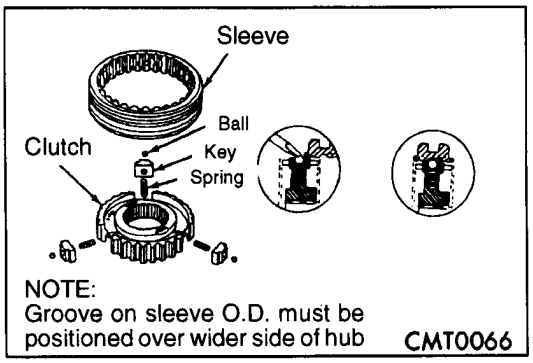
CLEAN

Do not attempt to clean the blocking rings with solvent. The friction material will become contaminated. Place synchronizer components in a suitable holder and clean with solvent. Air dry.

INSPECT

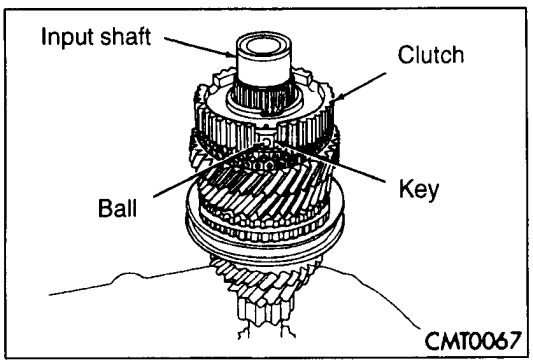
Proper inspections of components involve:
Teeth, for wear, scuffed, nicked, burred or broken teeth
keys, for wear or distortion
Balls and springs, for distortion, cracks or wear

If any of these conditions exists in these components, replace as necessary.



ASSEMBLY

(1) Position synchronizer hub onto a suitable holding fixture (input shaft).
(2) Install springs into hub slot.
(3) Insert key into hub and spring.



(4) Apply petroleum jelly to the hole in the key. Insert balls into each key.

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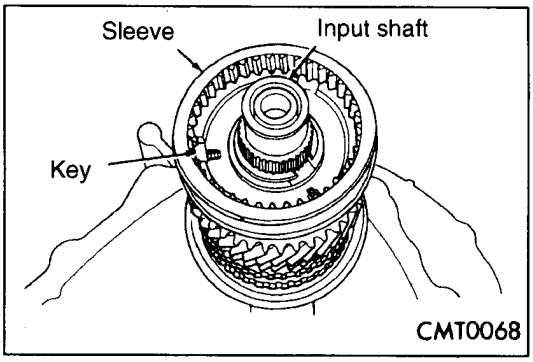
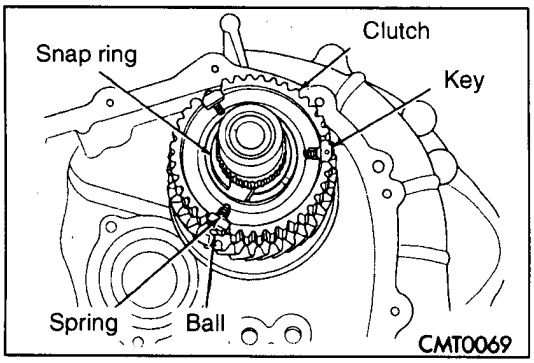


(5) Slide sleeve over the hub and depress balls as you carefully slip the sleeve into position.



(6) Line up stop ring tang over the keys in the hub. Install stop rings. Center the keys and balls by pushing on both stop rings.

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9. SHIFTER RAILS OVERHAUL

(1) Remove shifter rails from the geartrain.
(2) To service the 5/R shift rail, remove the C-clip retaining the reverse shift lever arm. Remove the 5th shift fork roll pin and remove the 5th shift fork.
Remove the shift lug roll pin and remove the shift lug. Replace parts as necessary.
(3) To service the 3/4 shift rail, remove the roll pin retaining the 3/4 shift fork. Remove the shift fork. Remove the shift lug roll pin and remove shift lug. Replace parts as necessary.
(4) To service the 1/2 shift rail, remove the roll pin retaining the 1/2 shift fork. Remove the shift fork and replace parts as necessary.

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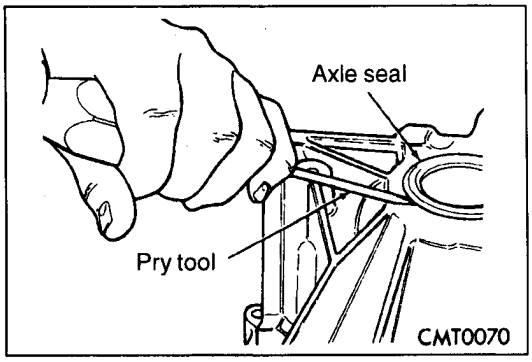
10. GEAR CASE OVERHAUL

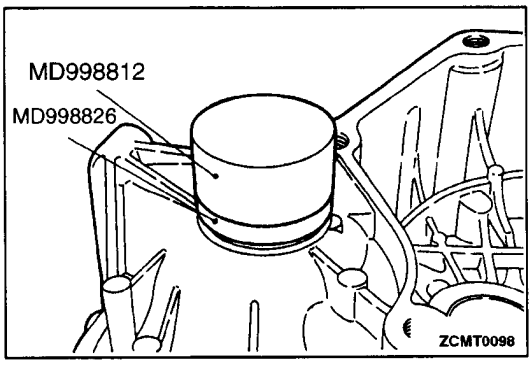
The components that are left in the gear cases when the gear train is pulled out are the:
Axle shaft seals
Output bearing race and retainer
Input bearing and sleeve
Differential bearing cones
Shifter rail bushings
Shifter shafts
Shifter shaft seals
Shifter shaft bushings
Rear bearing oil feed trough



AXLE SHAFT SEALS

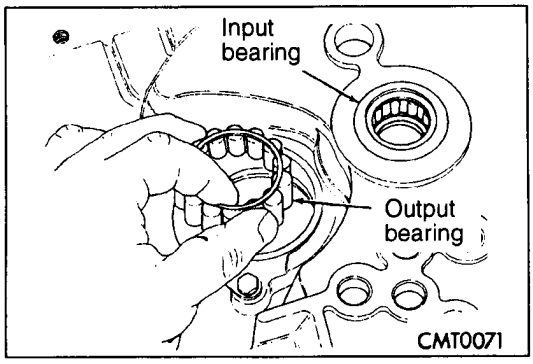
REMOVAL

(1) Insert a flat blade pry tool at outer edge of axle shaft seal.
(2) Tap on the pry tool with a small hammer and remove axle shaft seal.



INSTALLATION

(1) Clean axle shaft seal bore of any excess sealant.
(2) Align axle shaft seal with axle shaft seal bore.
(3) Install axle seal on tool MD998812, MD998826 and insert into axle shaft seal bore.
(4) Tap seal into position.



OUTPUT BEARING

REMOVAL

(1) Remove caged roller bearing from output bearing race.

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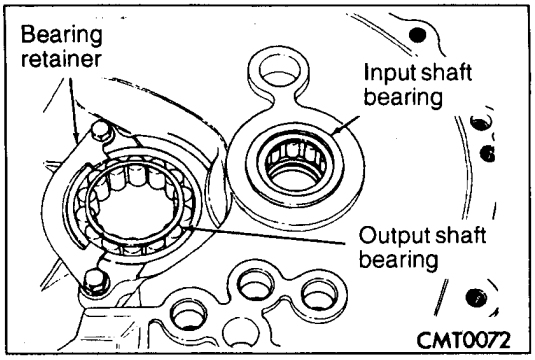
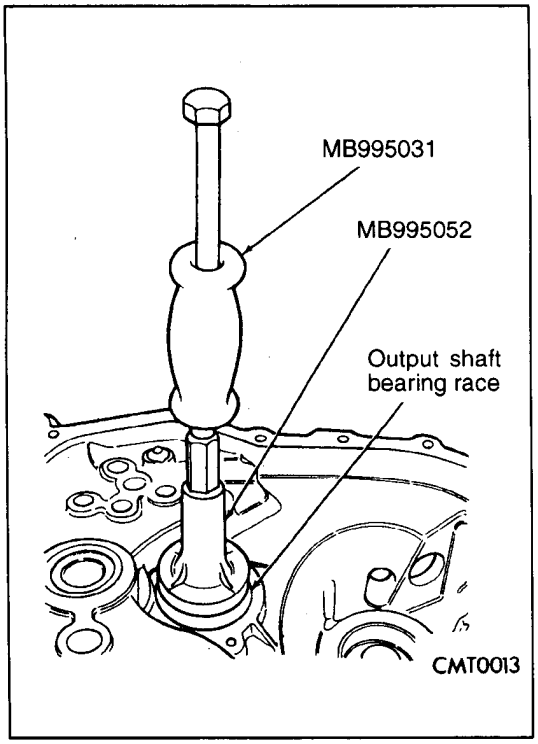
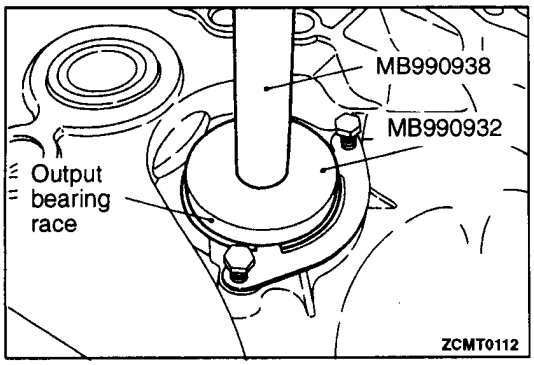


(2) Remove screws at output bearing retainer strap.



(3) Install tool MB995031, MB995052. Tighten tool to output bearing race.

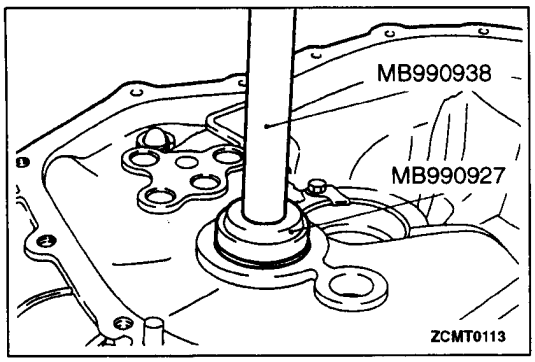


INSTALLATION

(1) Line up output bearing race to race bore.
(2) Insert tool MB990933, MB990938 into output bearing race. Tap race into bore.

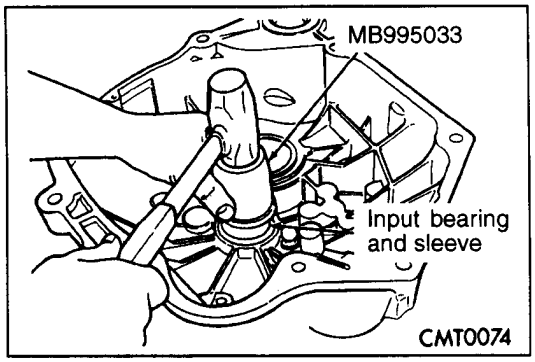
INPUT BEARING AND SLEEVE

The input bearing is a bearing and sleeve one-piece unit. The sleeve is the slide point for the clutch release bearing and lever.



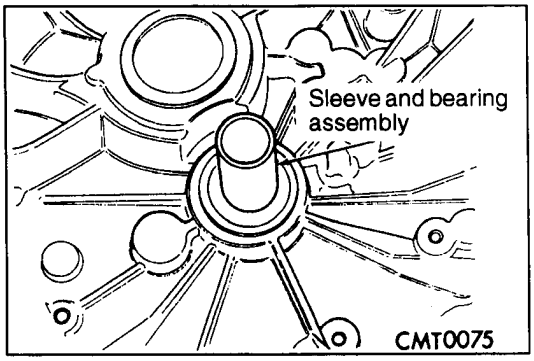
REMOVAL

(1) Install tool MB990927, MB990938 over input bearing on the gear case side of the transmission clutch housing.
(2) Tap the input bearing out of the housing.

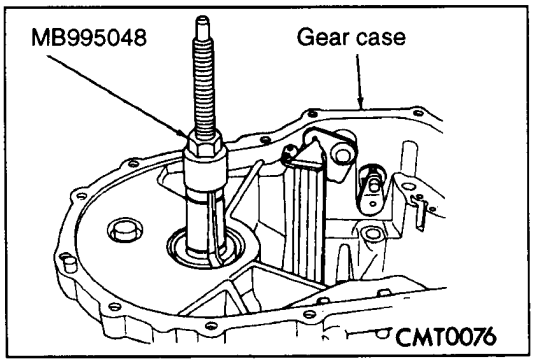


INSTALLATION

(1) Position sleeve and bearing assembly at input bearing bore.
(2) Install tool MB995033 over input bearing.



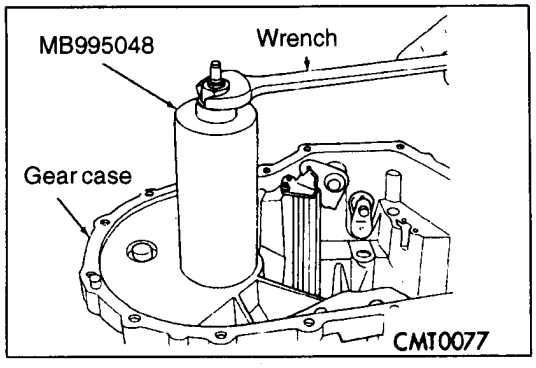
(3) Tap input bearing into bore until it is fully seated.



DIFFERENTIAL BEARING CUPS

REMOVAL

(1) Install MB995048 into the differential bearing cup.



(2) Install the tool cup over the tool.
(3) Tighten the tool until the race is removed from the case.

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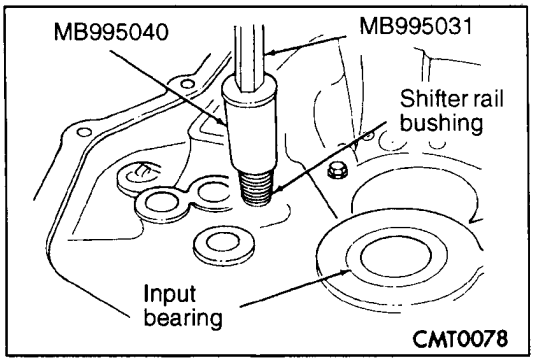
INSTALLATION

(1) Position the bearing cup into the case.
(2) Install the bearing cup onto MB990933.
(3) Using MB990933, MB990938 driver, install differential bearing cup into the transmission case.



SHIFTER RAIL BUSHINGS

REMOVAL

(1) Thread tool MB995040 into shifter rail bushing.
(2) Install MB995031 onto tool.
(3) Remove bushing using slide hammer and tool assembly.

INSTALLATION

(1) Line up replacement bushing in bore.
(2) Using tool MD998343, tap bushing into bore until flush with the chamfer in the case.

SHIFTER SHAFT SEALS

It is not necessary to remove the shifter shafts from the transmission to service the shifter shaft seals.

REMOVAL

(1) Using a pick tool, pry up on the shifter shaft seal and remove seal from bore.

INSTALLATION

(1) Position new shifter shaft seal in bore.
(2) Install shifter shaft seal into bore using an appropriate size deep well socket.

SHIFTER SELECTOR SHAFT

REMOVAL

(1) With the transmission disassembled, remove the selector shaft by pushing on the shaft from the outside and pulling shaft out from the inside.

Reverse removal procedure to install selector shaft.

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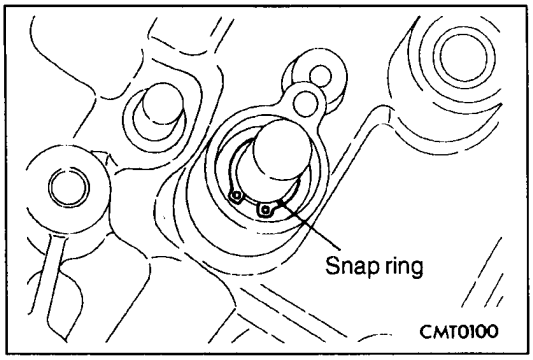
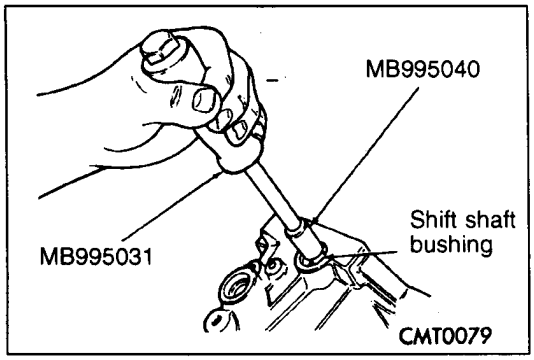


SHIFTER CROSSOVER SHAFT

REMOVAL

(1) With the transmission disassembled, remove the crossover shaft seal.
(2) Use snap ring plier to remove the snap ring at the crossover shaft bore.
(3) Push the crossover shaft in the case and remove the crossover assembly.

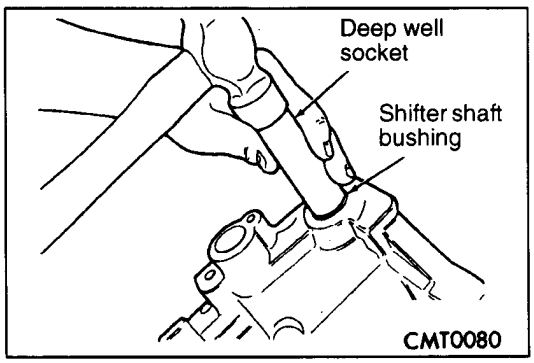
Reverse removal procedure to install crossover shaft.



SHIFTER SELECTOR SHAFT BUSHING

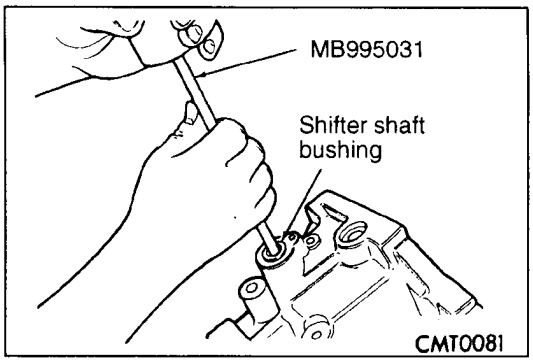
REMOVAL

(1) Threadl MB995040 into bushing.
(2) Install MB995031 onto tool and remove bushing using slide hammer.



INSTALLATION

(1) Position replacement bushing over selector shaft bore.
(2) Using an appropriate size deep well socket, install bushing in selector shaft bore.



SHIFTER CROSSOVER SHAFT BUSHING

REMOVAL

(1) Install MB995031 through the crossover bushing.
(2) Thread nut and washer onto MB995031.
(3) Using the MB995031, remove the crossover shaft bushing.

INSTALLATION

(1) Position the replacement crossover shaft bushing over the crossover shaft bushing bore.
(2) Using an appropriate size deep well socket, install the crossover shaft bushing into the bushing bore.

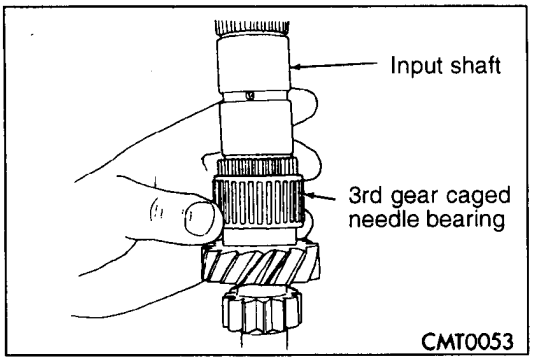
REAR BEARING OIL FEED TROUGH

REMOVAL

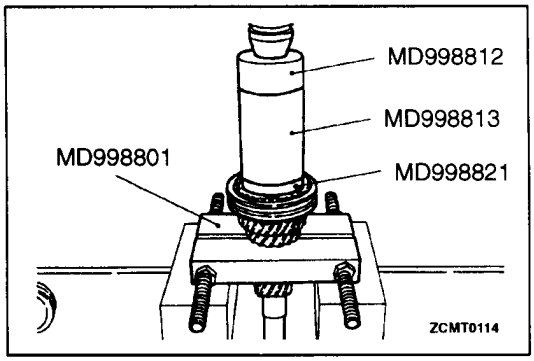
The bearing oil feed trough is retained in the case by a pin that is molded into the case and clips that are part of the trough.
(1) Using light plier pressure, squeeze the clips together at the rear of the trough.
(2) Slide the trough over the retaining pin that locates the trough in the case.

Reverse removal procedure to install oil feed trough.

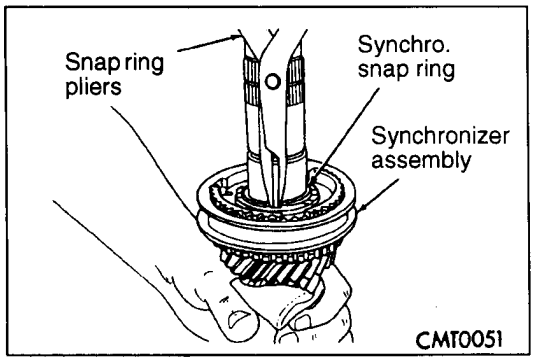
11. INPUT GEAR REASSEMBLY



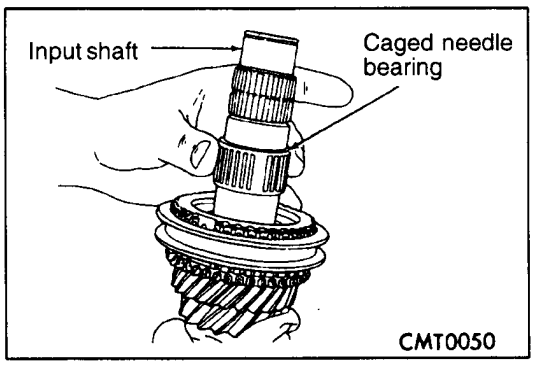
(1) Place input gear into shop press.
(2) Install 3rd gear caged needle bearing on input shaft.



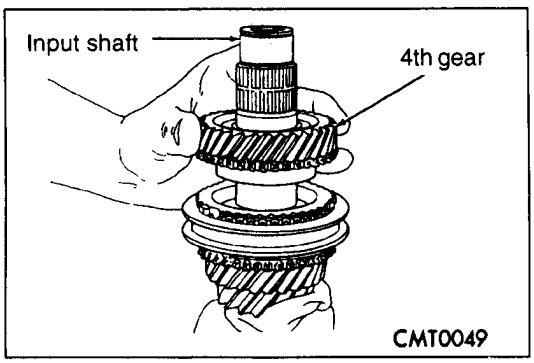
(3) Install 3rd gear and 3/4 synchronizer onto input shaft. Install MD998812, MD998813, MD998821 over input shaft and press on synchronizer hub and 3rd gear. The synchronizer hub has the letter "U" stamped on the top face of the hub.
This designates that the hub must be installed with the "U" facing upward.



(4) Install 3/4 synchronizer snap ring into slot on input shaft.



(5) Install blocking ring into 3/4 synchronizer. Install 4th gear caged needle bearing.



(6) Install 4th gear onto input shaft.

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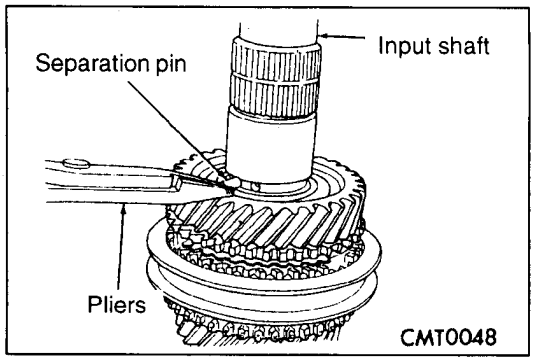
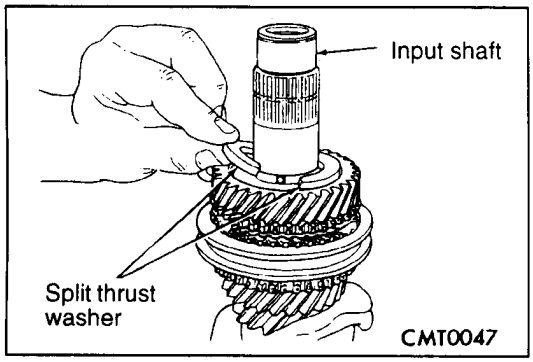
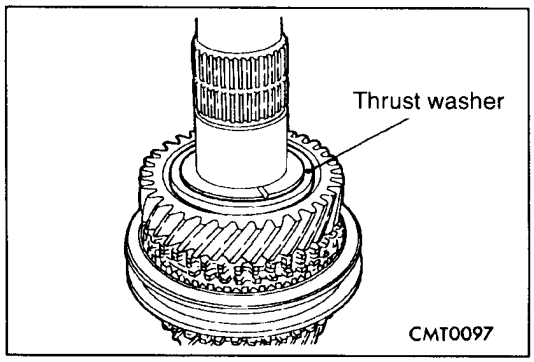


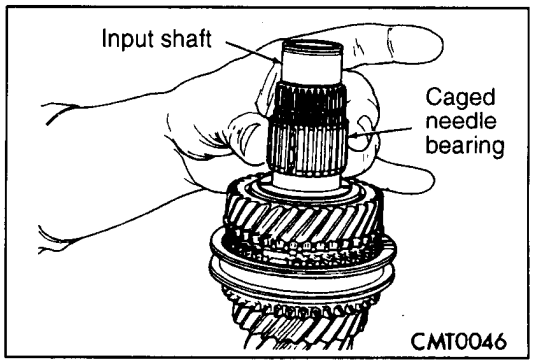
(7) Install 4/5 split thrust washer separation pin.



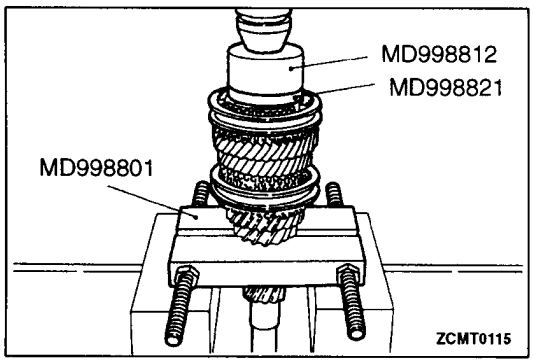
(8) Install split thrust washer onto input shaft.



(9) Install split thrust washer retaining ring.



(10) Install 5th gear caged needle bearing.



(11) Using MD998812, MD998821, install 5th speed gear and synchronizer. The 5th gear synchronizer hub has the letter "R" stamped on the top face of the hub. This designates that hub must be installed with the "R" facing upward.

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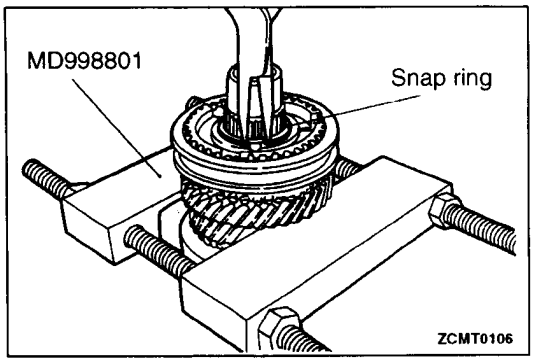
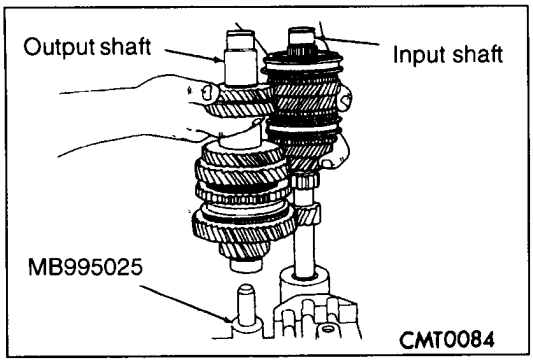
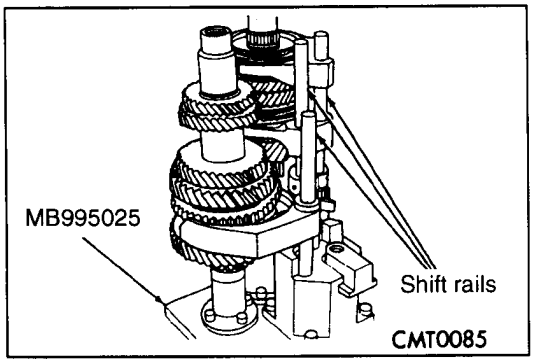


(12)Install 5th gear synchronizer snap ring.

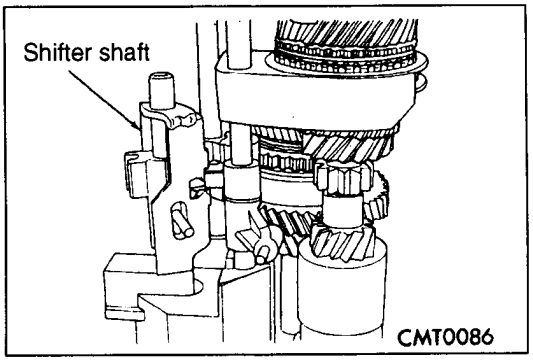
12. CASE REASSEMBLY



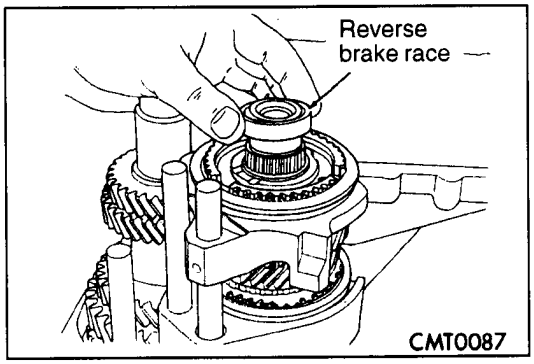
(1) Verify pallet shims are removed from pallet. Install output and input gear into pallet fixture (MB995025).



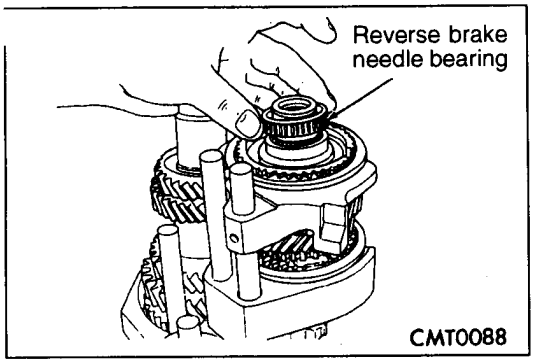
(2) Install shift rails and forks into pallet fixture.



(3) Install shifter shaft, shift finger and blocker assembly into pallet fixture.



(4) Install reverse brake race onto input gear.



(5) Install reverse brake needle bearing.

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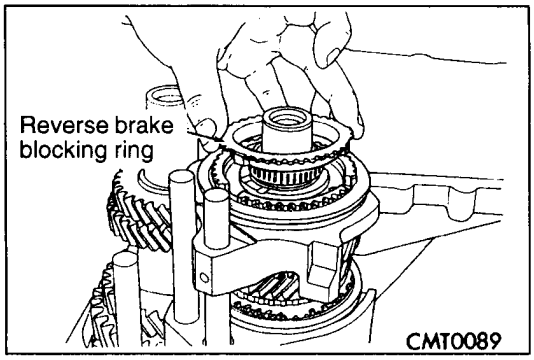
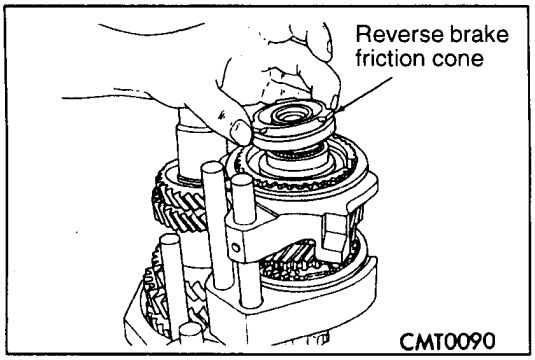
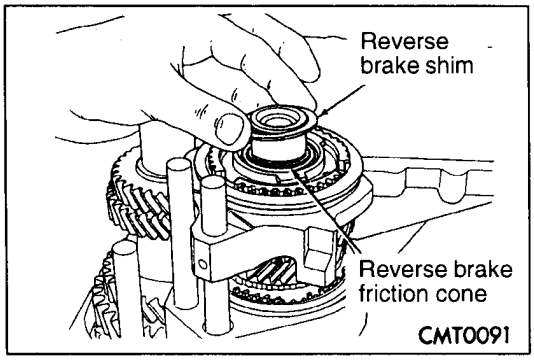


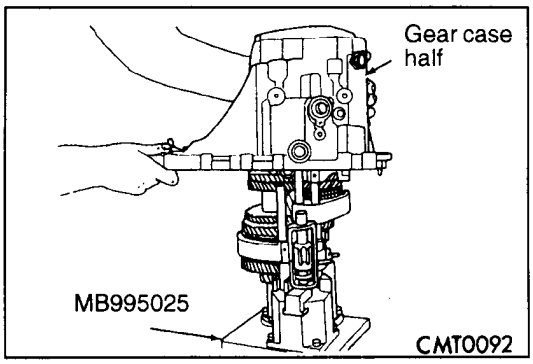
(6) Install reverse brake blocking ring.



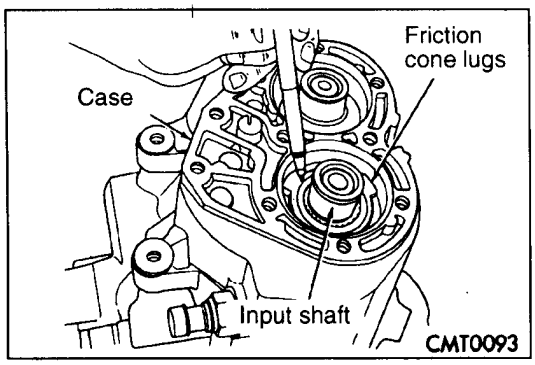
(7) Install reverse brake friction cone.



(8) Install reverse brake shim. Apply petroleum jelly to shim to hold in place.



(9) Install gear case half over pallet fixture. Line up shift finger over 3/4 lug.



(10) Line up reverse brake friction cone lug to the slots in the gear case. Verify reverse brake shim is in position.

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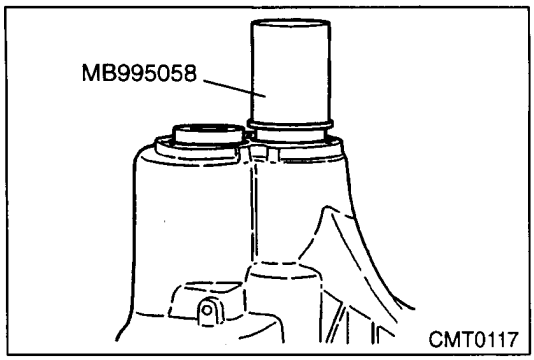
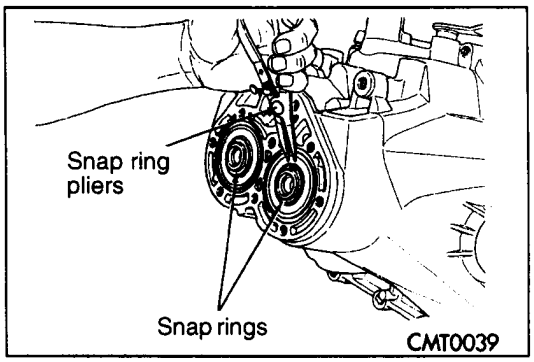
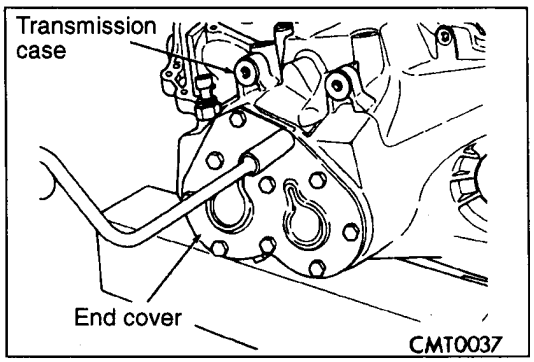


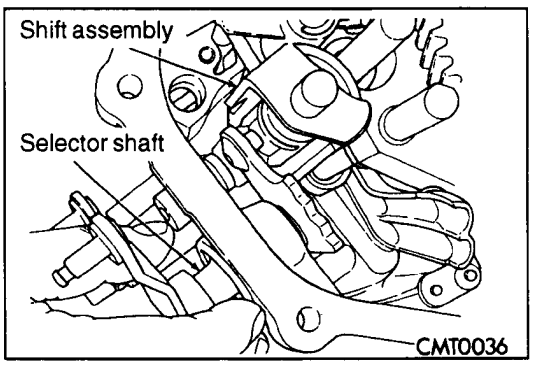
(11) Using MB995058, press on input and output shaft bearings until they bottom into the case and against the shafts.



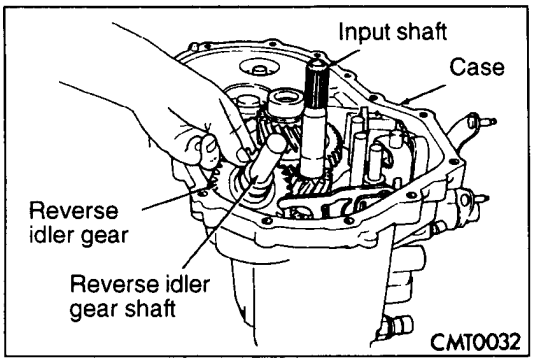
(12) Install shaft snap rings at input and output bearings.



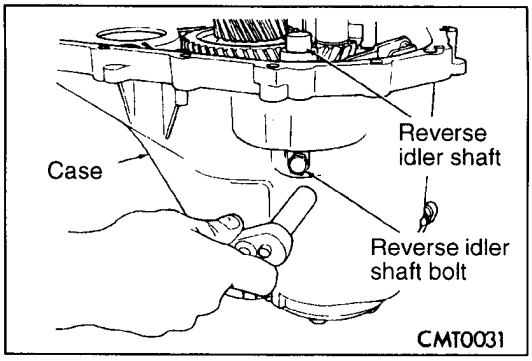
(13) Apply Loctite 5699 or equivalent to end cover outer edge and around bolt holes. Install end cover onto gear case. Tighten end cover bolts to 26 Nm (19 ft.lbs.) torque.
(14) Remove gear case from pallet fixture.
(15) Install gear case in a holding fixture with end cover facing down.

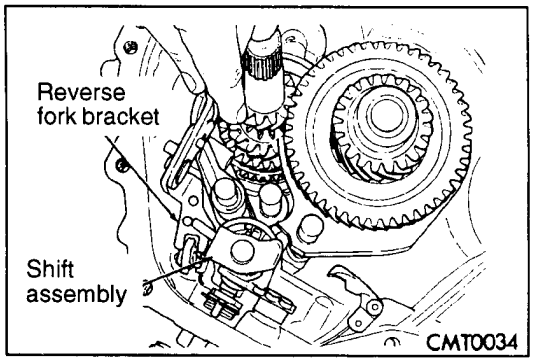


(16) Turn selector shaft into slot on blocker assembly.

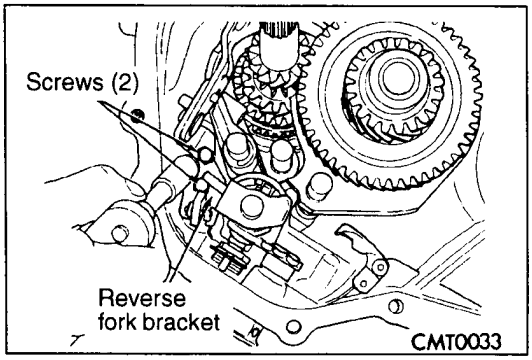


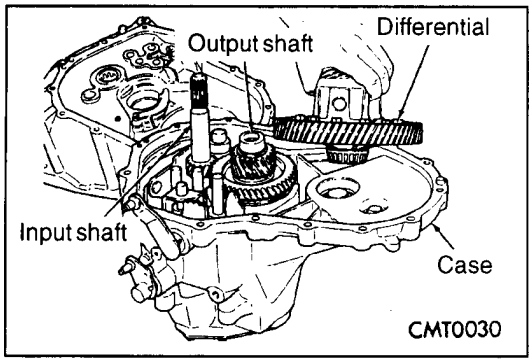
(17) Push selector shaft spacer clip onto selector shaft.
(18) Install reverse idler gear and shaft. Install bolt into shaft. Tighten bolt on shaft to 20 Nm torque.





(19) Install reverse fork bracket and reverse lockout. Tighten screws to 11 Nm torque.





(20) Install differential into gear case.

13. DIFFERENTIAL BEARING PRELOAD ADJUSTMENT

(1) Remove bearing cup and existing shim from clutch bell-housing case.
(2) Press in new bearing cup into bell housing case (or use a cup that has been ground down on the outer edge for ease of measurement).
(3) Press in new bearing cup into gear case side.
(4) Oil differential bearings with SAE 5W-30 engine oil and install differential assembly in transmission gear case. Install clutch bell housing over gear case. Install and torque case bolts to 26 Nm. Record end play.
(5) Position transmission with bell housing facing down on workbench with C-clamps. Position dial indicator.
(6) Apply a medium load to differential with MB995038 and a T-Handle, in the downward direction. Roll differential assembly back and forth many times. This will settle the bearings. Zero dial indicator. To obtain end play readings, apply a medium load in the upward direction while rolling differential assembly back and forth. Record end play.
(7) The shim required for proper bearing preload is total of end play and (constant) preload of 0.18 mm. Combine shim, if necessary, to obtain the required shim.
(8) Remove case bolts. Remove clutch bell housing differential bearing cup. Install shim(s) selected in step (7). Then press the bearing cup into clutch bell housing.
(9) Apply a 1/16 inch bead of Loctite 518, or equivalent to outer edge of case and around the bolt holes. Install clutch bell housing. Install and torque case bolts to 26 Nm.
(10) Using MB995038 and an inch-pound torque wrench, check turning torque of the differential assembly in clockwise and counterclockwise directions. The turning torque should be 0.68–1.36 Nm. If the turning torque is too high, install a 0.05 mm thinner shim. If the turning torque is too low, install a 0.05 mm thicker shim.
(11) Recheck turning torque. Repeat Step (10) until the proper turning torque is obtained.

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