Instructions Created by an:

Automotive Service Excellence
MASTER AUTO TECHNICIAN

86-95 Suzuki Samurai Samurai Complete Transmission Rebuild Kit with Synchronizers (SKU# STM-RP)

Installation Instructions

Part I

Part II Begins on Page 44 of this document.

Notice: If there are any parts you need that are not included in this kit you can most likely find them on our website. If you don't see a part you need on our website please call us. We can help you find it.

CAUTION: Safety glasses should be worn at all times when working with vehicles and related tools and equipment.

FOR ADDITIONAL COPIES OF THESE AND OTHER INSTRUCTIONS GO TO: www.lowrangeoffroad and click on the "INSTRUCTIONS" tab.

Suggested Tools

Basic Tools

- (2) 10" Standard Screwdrivers
- Standard Screwdriver
- Socket: 12, 24 & 32mm
- Deep Socket: 14mm
- Ratchet
- Extension
- Ball Peen Hammer
- 3/16 Pin Punch
- Large Drift Punch
- Brass Hammer
- 2X4X12" Board
- Work Bench
- Rags

Specialty Tools (See Next Page)

- 3 Jaw Gear Puller
- Gear Puller
- Hydraulic Press
- Snap Ring Pliers
- Pipe – Bearing Driver

Specialty Tools

3 Jaw Gear Puller

Gear Puller

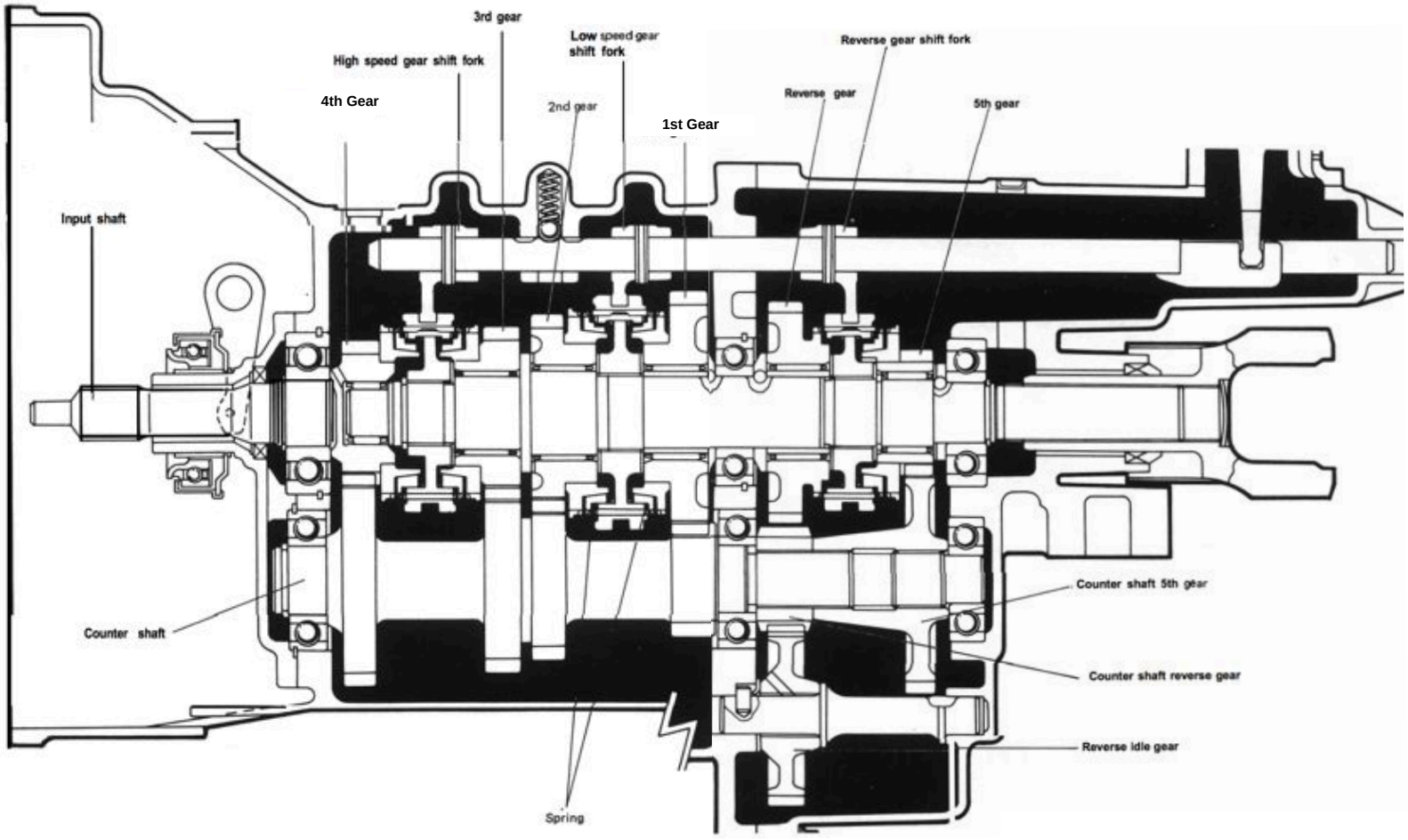
Snap Ring Pliers

Hydraulic Press

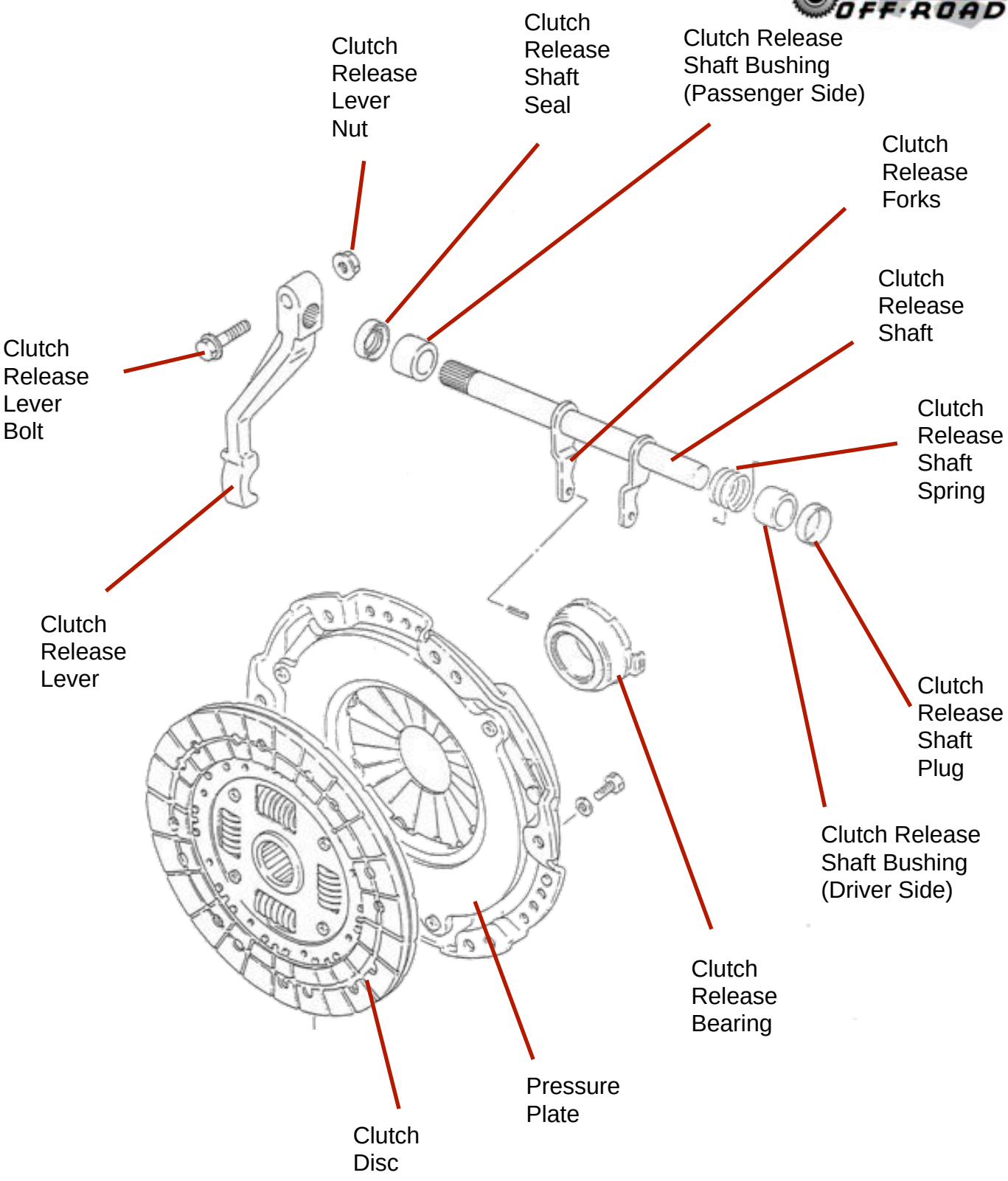
1.750” DOM Pipe

1.75” Outside Diameter
1.25” Inside Diameter
.250 Wall
8” long

Transmission Parts Identification



Clutch Release Assembly Parts



Nearly every bolt and nut associated with the transmission requires 12 mm socket or end wrench. It is understood that the tool to use is a 12mm unless stated otherwise.

Step 1

Place the transmission on a clean workbench.

Note: It is recommended that you pressure wash the transmission prior to disassembly.

Step 2

Loosen the clutch release lever bolt.

Step 3

Remove the clutch release lever by tapping it with a hammer.

Step 4

Pull out on the release forks and remove the release bearing.

Rebuilding the Release Shaft Assembly

If you are not rebuilding the release shaft assembly skip to Step 14

Step 5

Push the clutch release shaft to the side as shown.

Step 6

Remove the release shaft spring by bending it and sliding it off the shaft.

Note: This step will destroy the spring but that is okay, this spring will be replaced.

Step 7

Drive the first bushing and plug out of the case by placing the release shaft against it as shown . . . .

Step 8

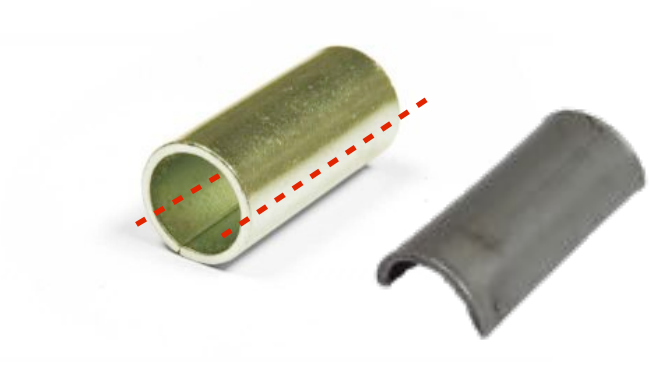
. . . . and hitting the shaft with a hammer.

Step 9

The shaft will push the bushing and plug out of the case.

Step 10

Drive out the second bushing by positioning a custom made tool as shown here. (The next tech tip shows how to make this tool if you don't have one)



Tech Tip 10

Obtain a shock absorber bushing sleeve that measures 1.5" long and .5" ID. Cut the sleeve in half so that it looks like the one on the right.

Step 11

Strike the end of the release shaft using a punch and a hammer.

Step 12

This shows the seal and the bushing removed.

Step 13

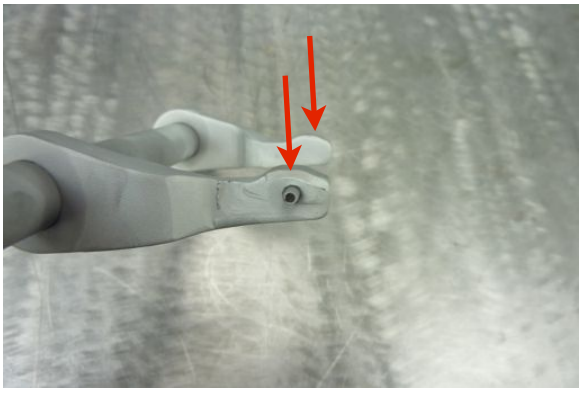
Remove the clutch release shaft as shown.

Tech Tip 13A

Inspect the release shaft on both ends where it contacted the bushings. Check the forks where they contact the release bearing as well. Replace if needed.

Tech Tip 13B

This shows the other end of the release shaft being checked for wear.



Tech Tip 13C

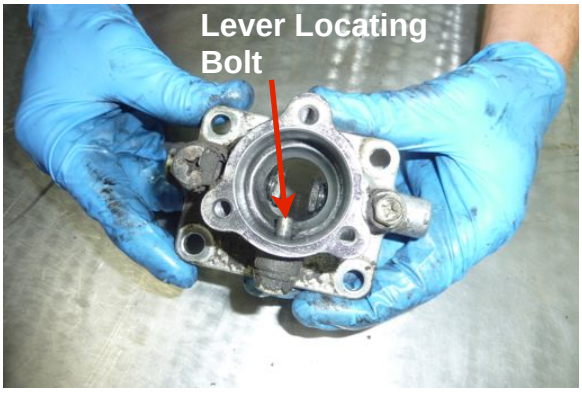
The area indicated by the arrows should be rounded. If it is not the release shaft should be replaced.

Step 14

Remove the (4) bolts securing the shifter tower.

Step 15

Tap upward on the shifter tower to brake it loose and remove the shifter tower.



Step 16

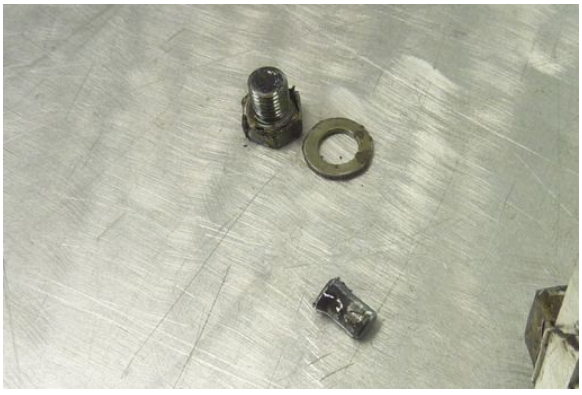
Inspect the shifter tower for wear. The lever locating bolt is usually broken. Replace it if it is. If it is not broken or worn skip to Step 19.

Step 17

Remove the shifter locating bolt.

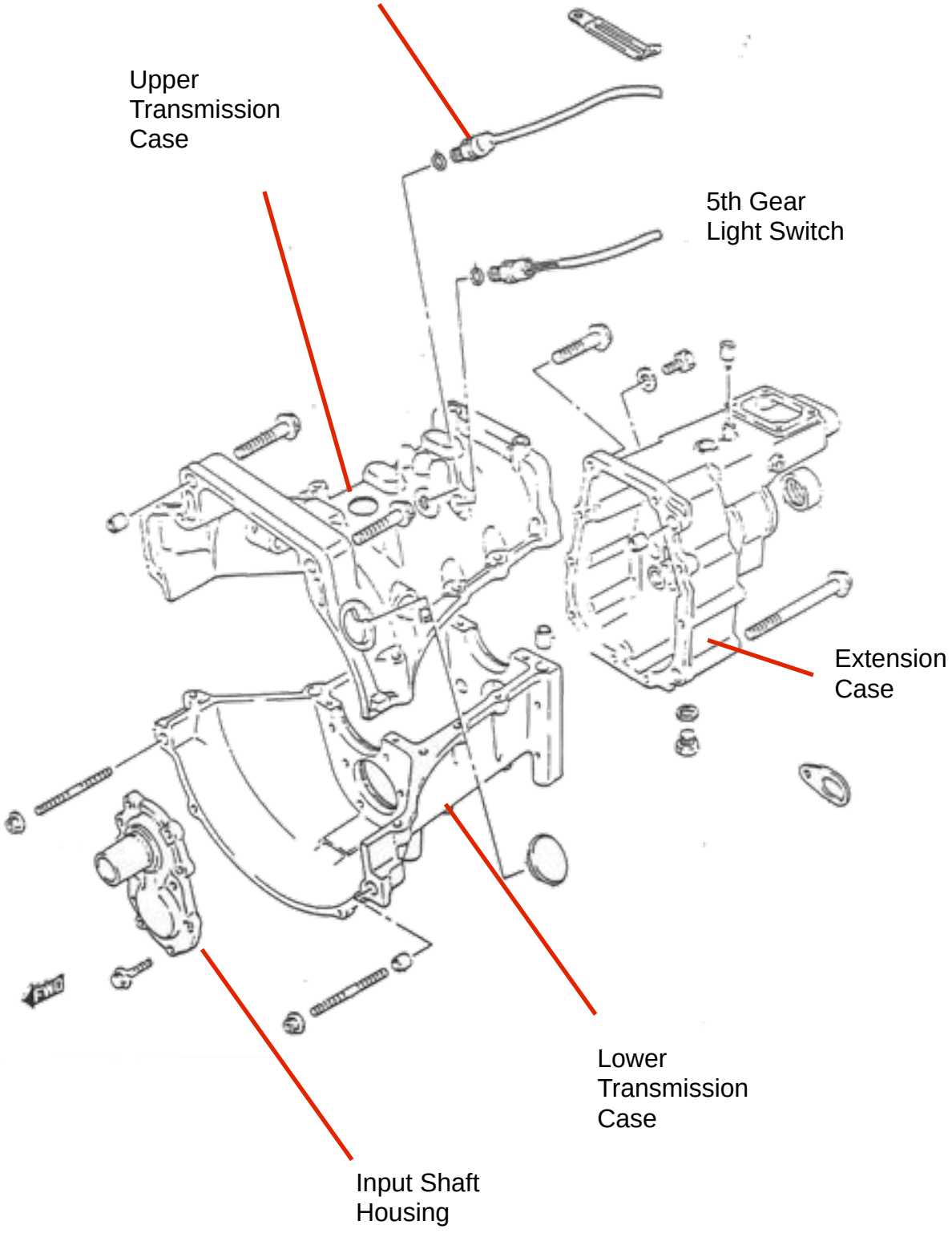
Step 18

Drive out the broken part of the bolt using a punch and a hammer.



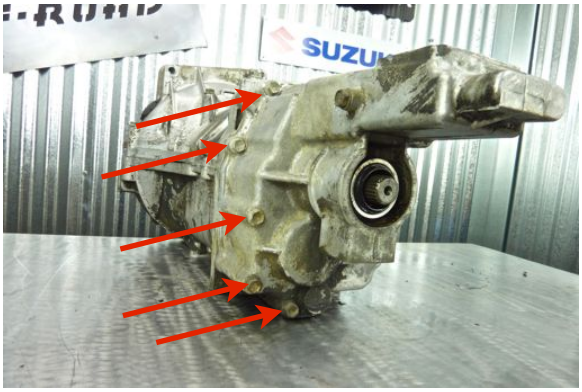
Tech Tip 18

Broken shifter locating bolt.


Backup Light Switch
Upper Transmission Case
5th Gear Light Switch
Extension Case
Lower Transmission Case
Input Shaft Housing

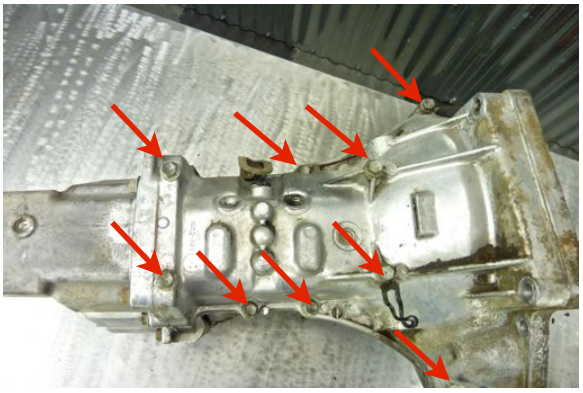
Step 19

Remove the extension case bolts.



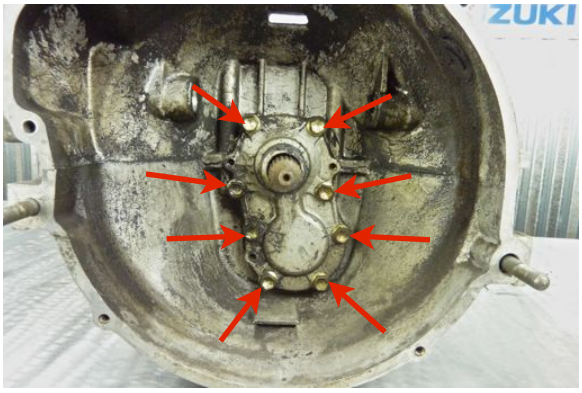
Step 20

Continue removing the extension case bolts.



Step 21

Remove the (9) transmission upper case bolts.



Step 22

Remove the (8) input shaft housing bolts.

Step 23

Remove the 5th/reverse rod locating bolt as well.

Step 24

Prop up the rear of the transmission using a 2X4X12” board.

Step 25

Jar the extension case loose by tapping it with a hammer as shown.

Caution: Do not strike hard. Cast aluminum is easily broken.

Step 26

Pull the extension case back about **an inch**. Do not attempt to remove it all the way at this point.

Step 27

Reach inside the extension case and pull the reverse idler gear toward the rear of the transmission so it stays with the extension case.

Step 28

Continue removing the extension case. The reverse idler gear will soon drop out the bottom. Be sure to catch it. Set the extension case and the reverse idler gear aside for now.

Step 29

Remove the 2X4 board.

Step 30

Begin the removal of the top transmission case by prying gently with a large standard screwdriver in the location shown here.

Step 31

Continue the removal of the transmission upper case by prying as shown here.

Caution: Do not gouge the case halves with the screwdrivers.

Step 32

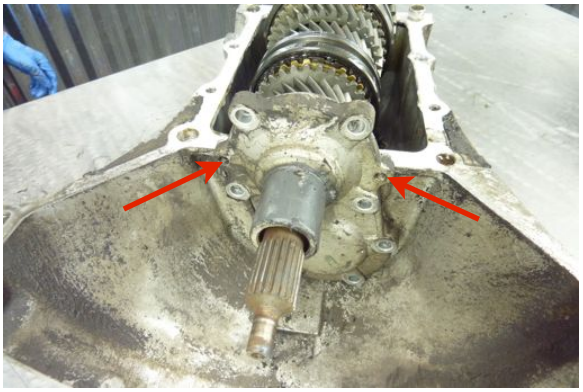
Continue working the upper and lower cases apart with the screwdriver. You may need to hit the shifter rods with the heel of your hand as well to help separate the cases.

Step 33

Continue working the upper case until it is separated from the lower case.

Step 34

Remove the input shaft housing by tapping it with a hammer. If it does not come loose easily you will need to go to the next Tech Tip.



Tech Tip 34

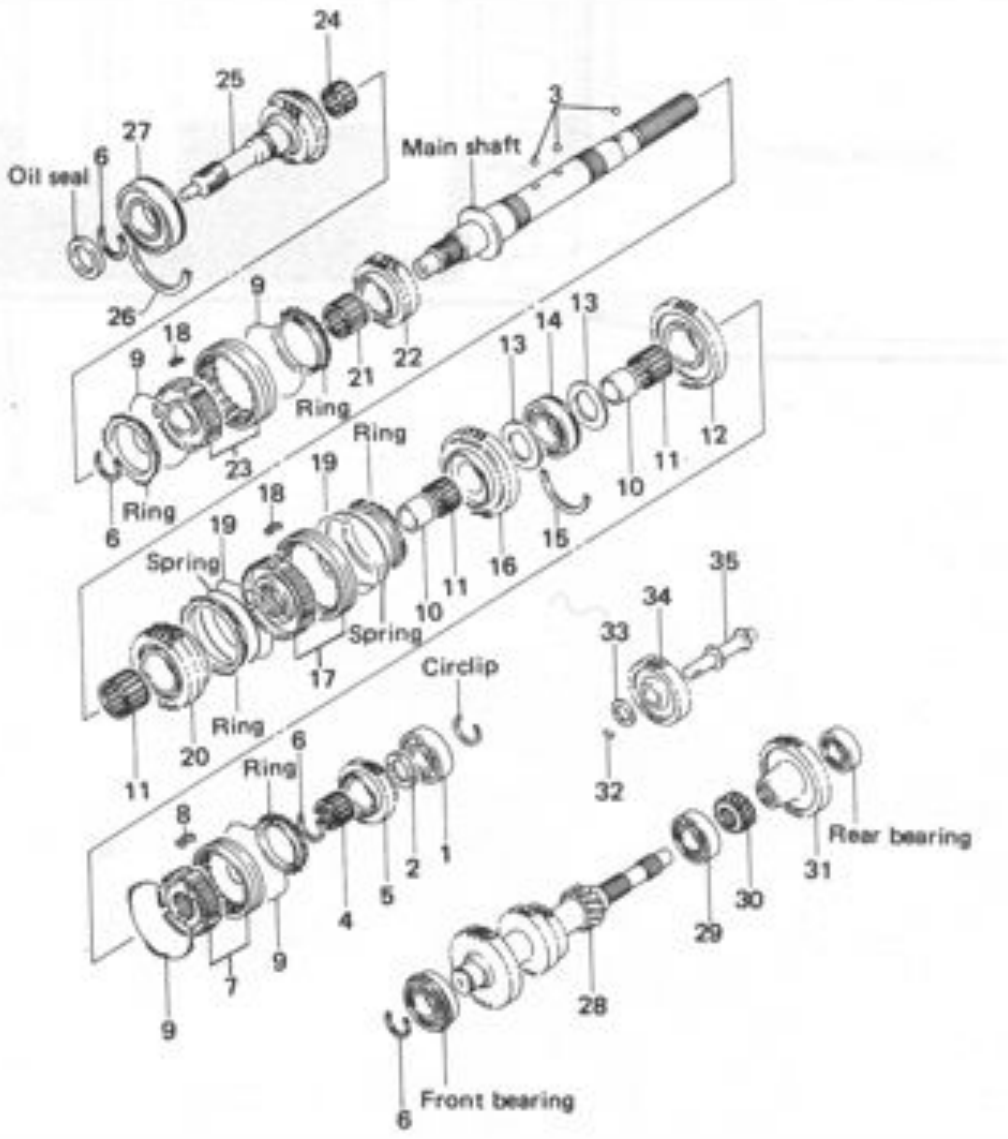
Thread two 6X1.0X25mm bolts in the locations shown here. Tighten them in an increasingly tighter back-and-forth pattern until the housing breaks loose.

Step 35

Remove the input shaft housing.

Step 36

Inspect the housing for wear and damage. Pay particular attention to the area that supports the throwout bearing. (See Arrow) If wear is noted, replace the housing.



1. Main shaft rear bearing
2. 5th gear washer
3. Main shaft washer bell
4. 5th gear needle bearing
5. 5th gear
6. Circlip
7. Synchronizer reverse hub set
8. Synchronizer key
9. Synchronizer spring
10. Gear bush
11. Needle bearing
12. Reverse gear
13. Main shaft bearing washer
14. Main shaft center bearing
15. C ring
16. Low gear
17. Synchronizer low speed hub set
18. Synchronizer key
19. Synchronizer spring
20. 2nd gear
21. 3rd gear needle bearing
22. 3rd gear
23. High speed synchronizer hub set
24. Input shaft bearing
25. Input shaft
26. C ring
27. Front bearing
28. Counter shaft
29. Center bearing
30. Reverse gear
31. Counter shaft 5th gear
32. Pin
33. Washer
34. Reverse idle gear
35. Reverse gear shaft

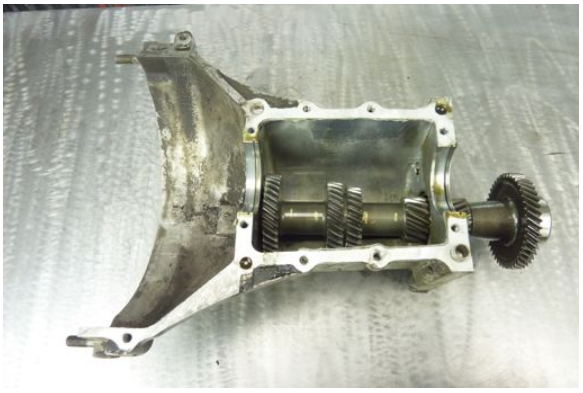
Step 37

Lift out the main shaft assembly . . . .

Step 38

. . . and set it aside. Be sure to protect the gears by placing a cloth under it.

Removing the Counter Shaft



Step 39

Leave the lower transmission case on the bench.

Step 40

Strike the counter shaft from the rear using a ball peen hammer. Strike the shaft squarely so as not the mushroom the end of the shaft.

Step 41

Continue striking the counter shaft until you can remove the snap ring at the other end of the shaft.

Step 42

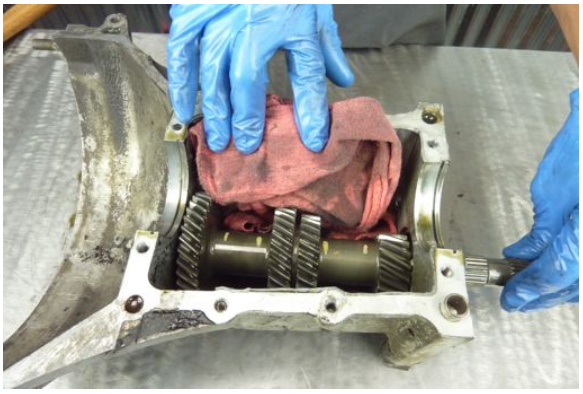
Remove the snap ring using a pair of snap ring pliers.

Step 43

Remove the countershaft rear bearing and the countershaft 5th gear together, using a three jaw puller as shown here.

Step 44

Remove the countershaft reverse gear.



Step 45

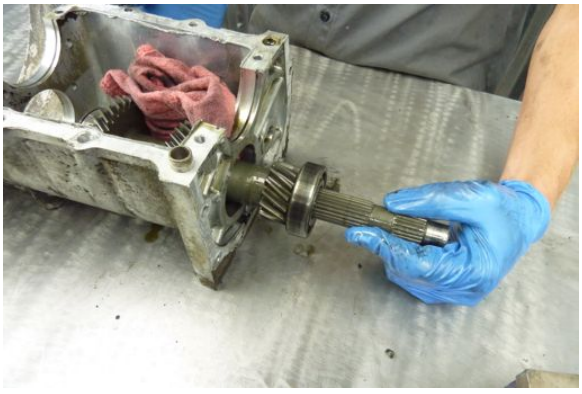
Place a cloth under the countershaft prior to the next step to keep the countershaft from becoming damaged during removal.

Step 46

Strike the countershaft sharply using a brass hammer rearward until the front and rear bearings are free from the case.

Tech Tip 46

This shows the countershaft nearly free from the case.



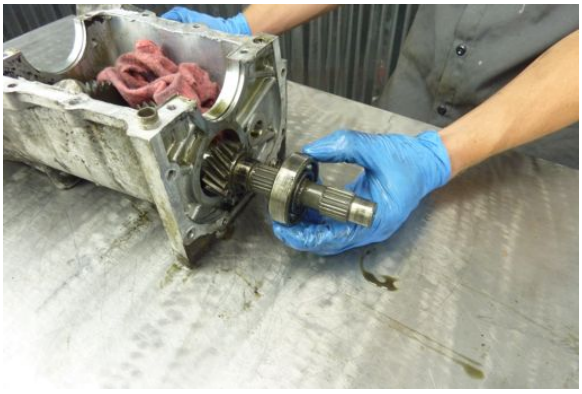
Step 47

Once the countershaft bearings are free from the case, slide the countershaft rearward as shown here.

Step 48

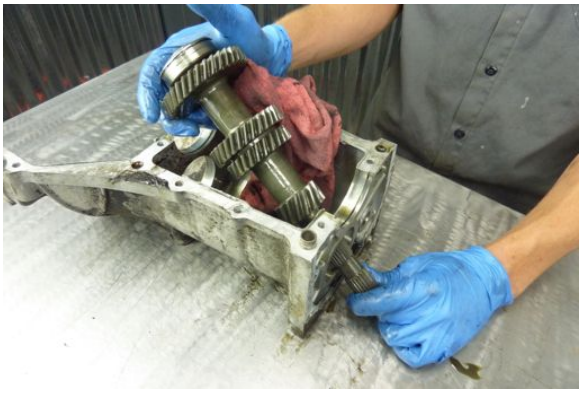
Install the gear puller as shown here and force the rear countershaft bearing rearward.

Note: Normally you would not remove a bearing by pulling against the outer bearing race because this can damage the bearing. But it is okay here we are replacing this bearing.



Step 45

Remove the rear countershaft bearing.



Step 50

Remove the countershaft.

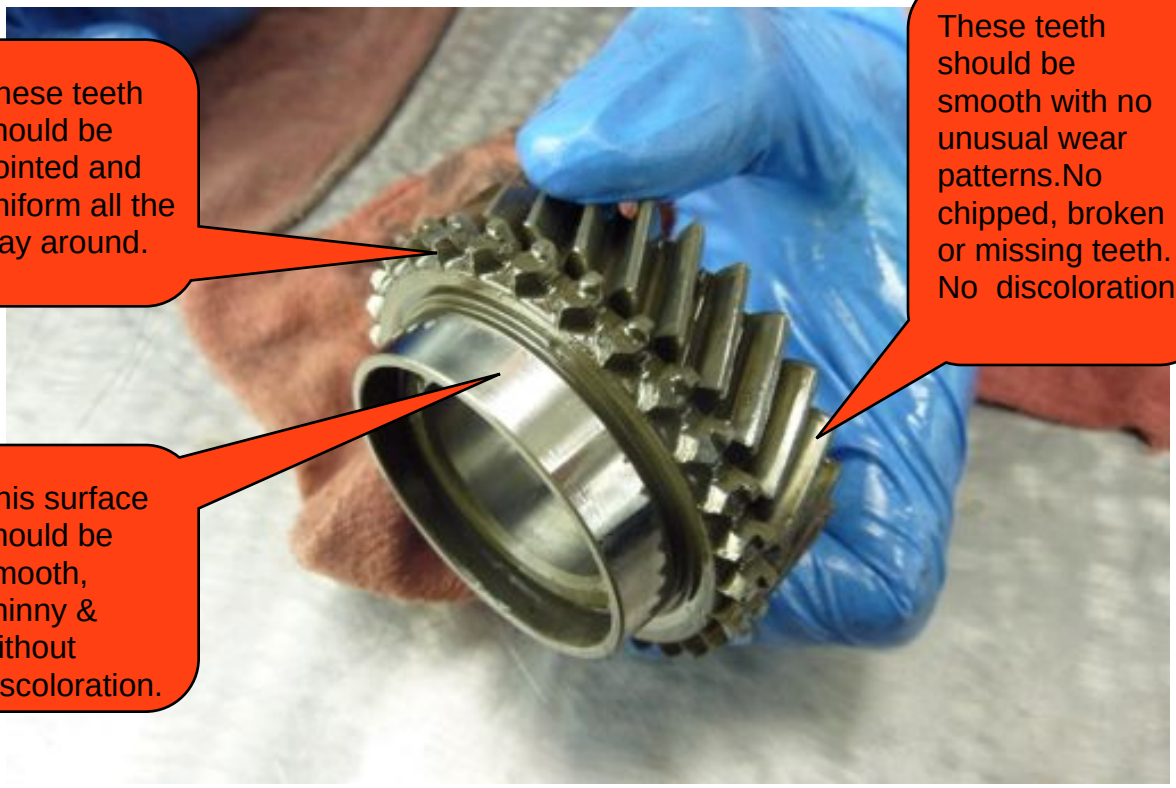
Step 51

Carefully inspect the counter shaft for unusual gear wear patterns, cracked, damaged or missing teeth. Replace if necessary.

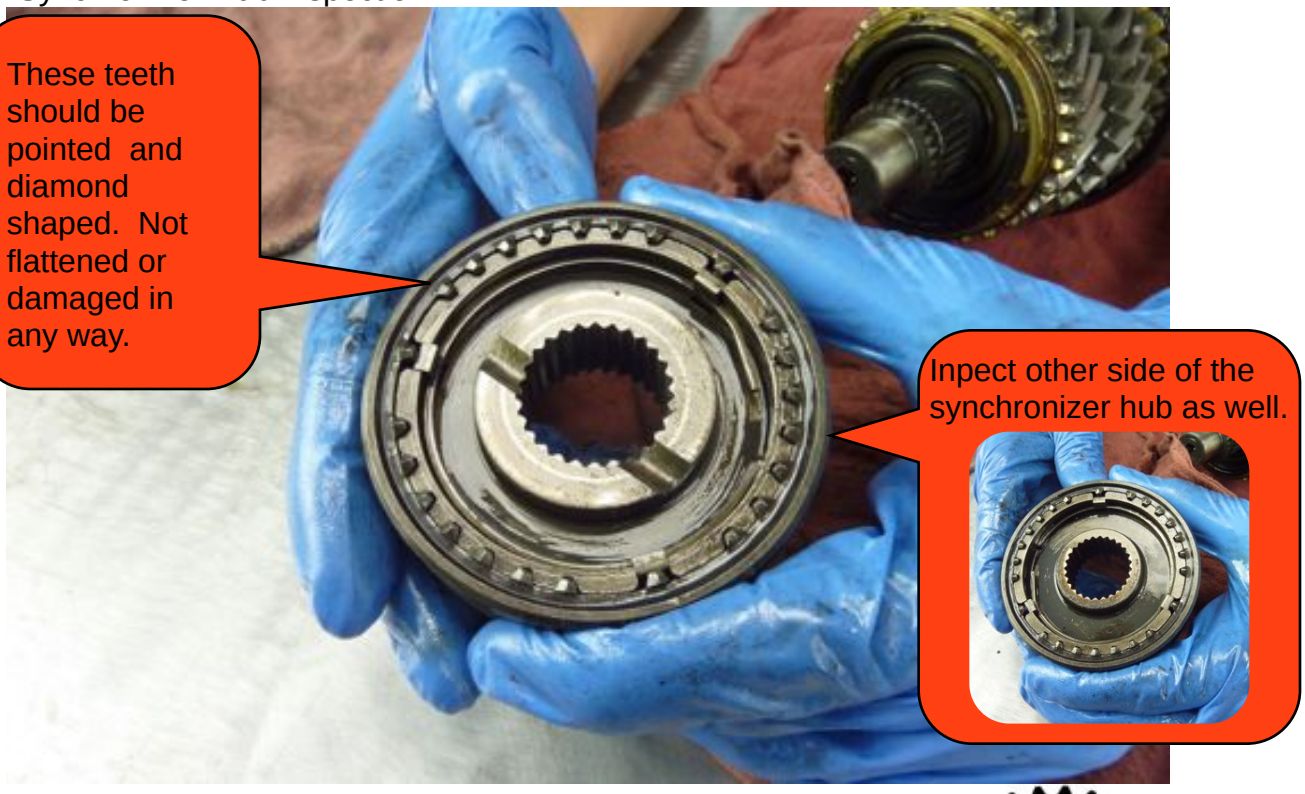
How to Inspect Gears & Synchronizer Hubs.

Note: Synchronizers do not need inspection. They are supplied in the kit.

Gear Inspection



Synchronizer Hub Inspection



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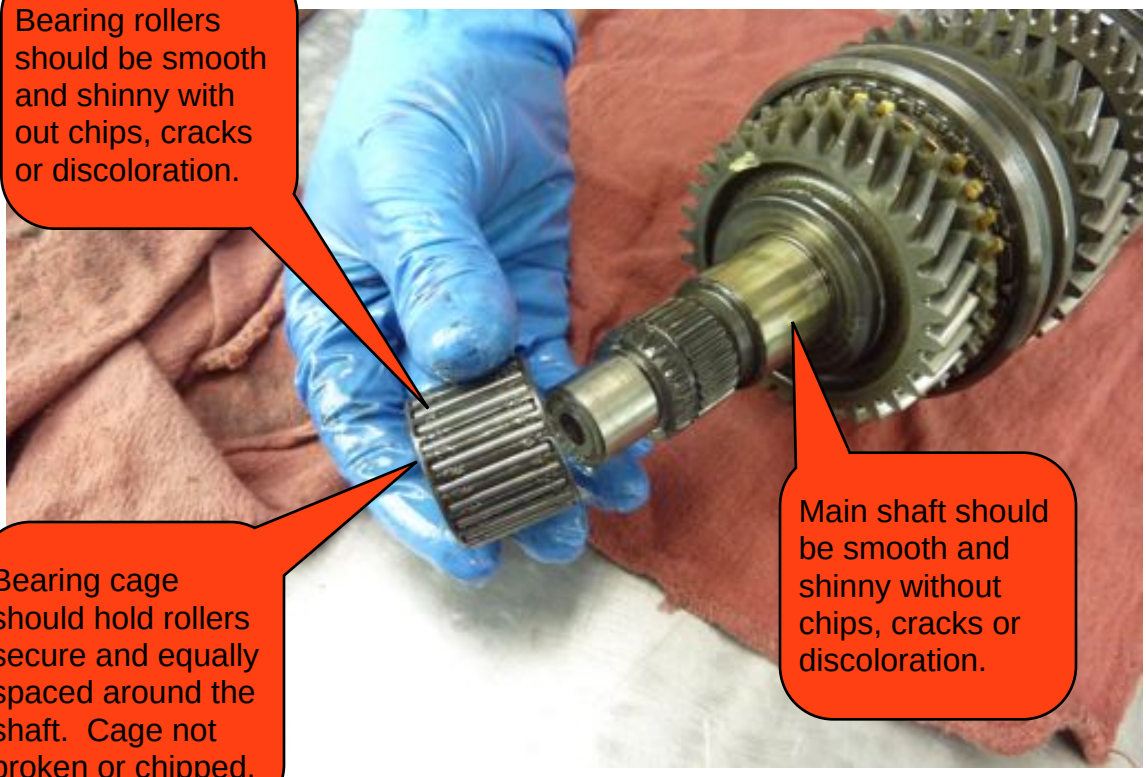
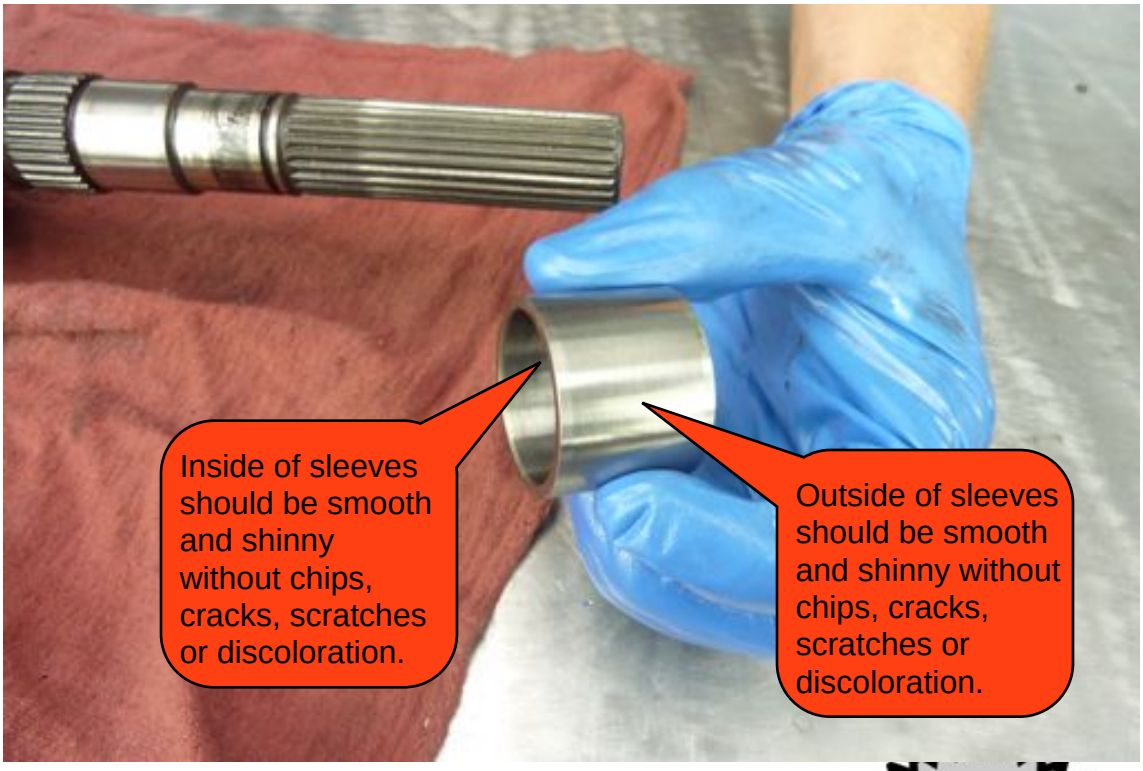
Orem, UT 84058 USA

How to Inspect Bearings & Sleeves





Disassembling the Main Shaft

Step 52

Lay out a couple of cleaning cloths to protect the main shaft assembly and a third cloth to place the parts on as they are removed.

Tech Tip 52

It is wise to set all the parts that are removed from the main shaft in the order of removal so they can be reinstalled in reverse order.

Step 53

Lay the main shaft as shown.

Step 54

Remove the input shaft assembly. Inspect the input shaft gear and synchronizer teeth. Also, inspect the tip of the shaft that is supported by the pilot bearing. See Arrow.

Step 55

Remove and inspect the input shaft bearing.

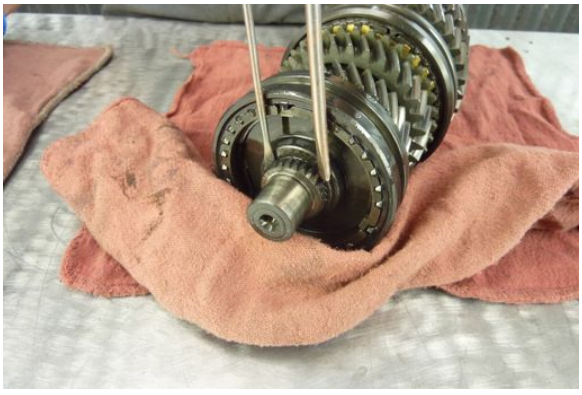
Step 56

Remove the first high speed synchronizer ring.

Note: This part is supplied in the kit.

Step 57

Remove the high speed hub circlip using two standard screwdrivers of equal length. Simply hit both screwdrivers simultaneously with the heel of your hand.



Tech Tip 57

This shows the positioning of the two screwdrivers on the circlip.

Step 58

Remove and inspect the high speed synchronizer hub set.

Step 59

Remove the second high speed synchronizer ring.

Note: This part is supplied in the kit.

Step 60

Remove and inspect 3rd gear.

Step 61

Remove and inspect the third gear bearing.

Step 62

Turn the main shaft assembly around.

Step 63

Remove the rear bearing circlip with the two screwdrivers as before.

Step 64

Remove the main shaft rear bearing using a 3 jaw puller as shown.

Note: Normally you would not remove a bearing by pulling against the outer bearing race because this can damage the bearing. But it is okay here, we are replacing this bearing.

Step 65

Remove the 5th gear washer.

Step 66

Remove the 5th gear washer ball.

Tech Tip 66

To remove this type of ball, wipe it clean with a cloth. Once it is clean, rotate the shaft and the ball will fall out on the cloth.

Step 67

Remove and inspect 5th gear.

Step 68

Remove 5th gear synchronizer ring.

Note: This part is supplied in the kit.

Step 69

Remove and inspect the 5th gear bearing.

Step 70

Remove the next circlip with the two screwdrivers as before.

Step 71

Remove and inspect the reverse synchronizer hub set.

Step 72

Remove and inspect the reverse gear.

Step 73

Remove and inspect the reverse gear bearing.

Step 74

Remove and inspect the reverse gear sleeve.

Step 75

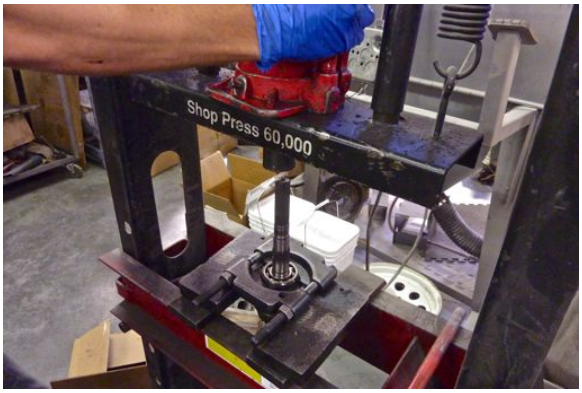
Remove the main shaft bearing washer.

Step 76

Remove the main shaft bearing washer ball.

Step 77

Install a bearing puller as shown here.



Step 78

Set up the main shaft in a press as shown here.

Step 79

Force the main shaft down using the press. Be sure to catch the main shaft as it becomes free from the bearing.

Step 80

Remove the main shaft bearing washer.

Step 81
Remove the washer ball.

Step 82
Remove and inspect 1st gear.

Step 83
Remove the 1st gear synchronizer ring and spring.

Step 84
Remove the 1st gear bearing.

Step 85

Remove and inspect the 1st gear sleeve.

Step 86

Remove and inspect the high speed synchronizer hub set.

Step 87

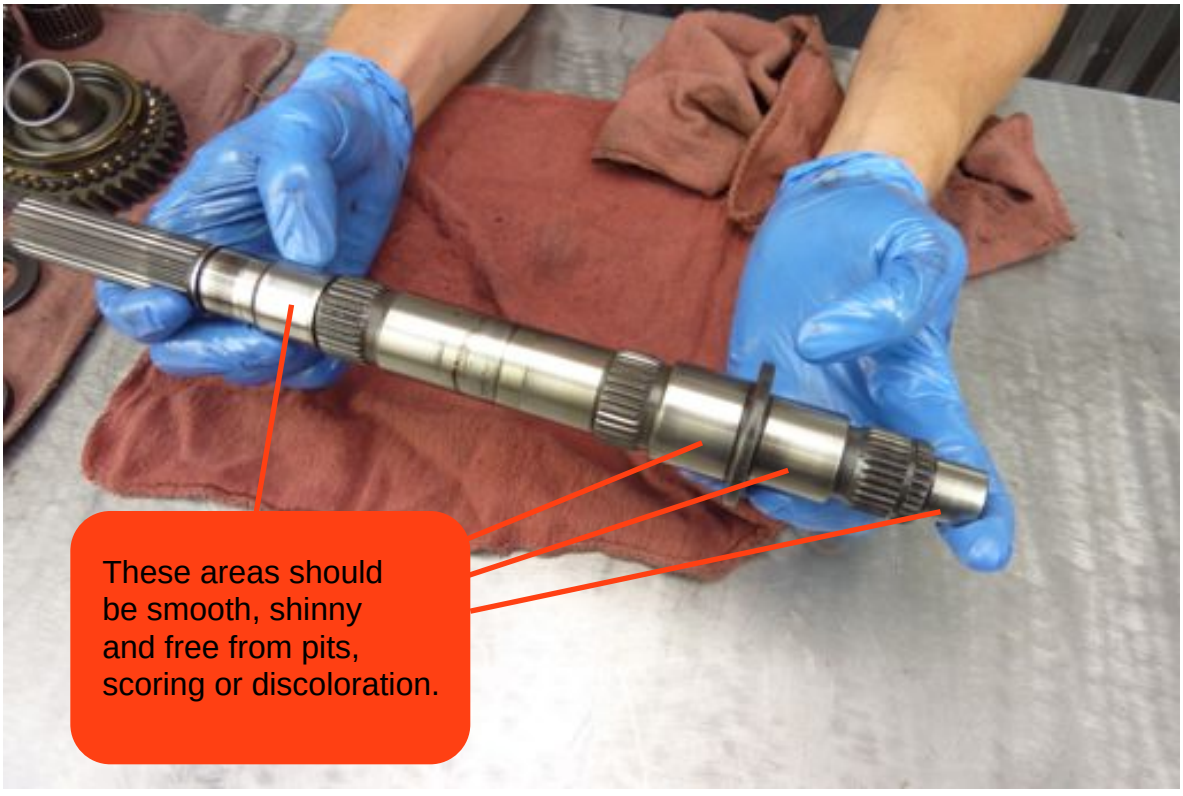
Remove the high speed synchronizer spring and ring.

Step 88

Remove and inspect 2nd gear.

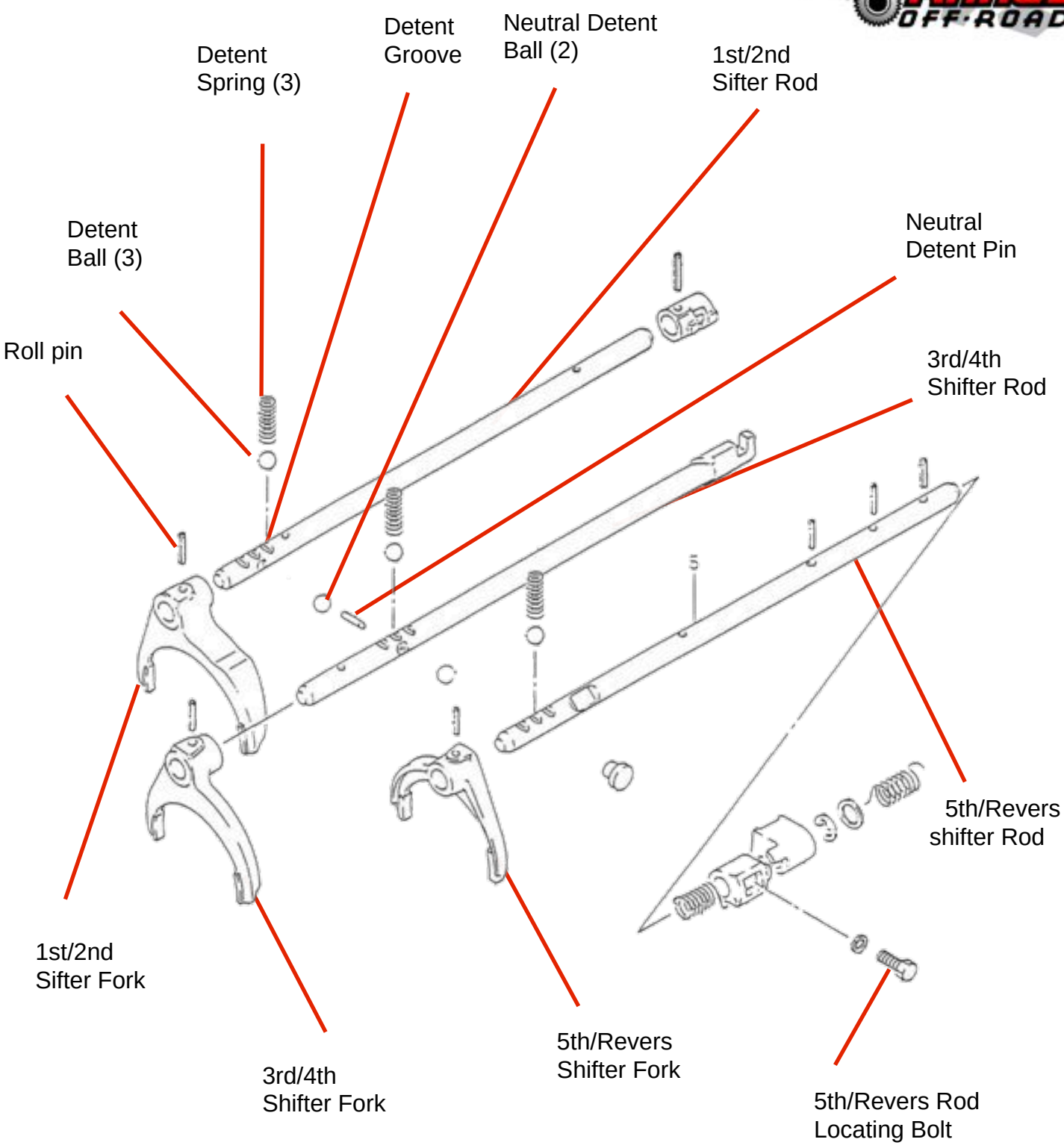
Step 89

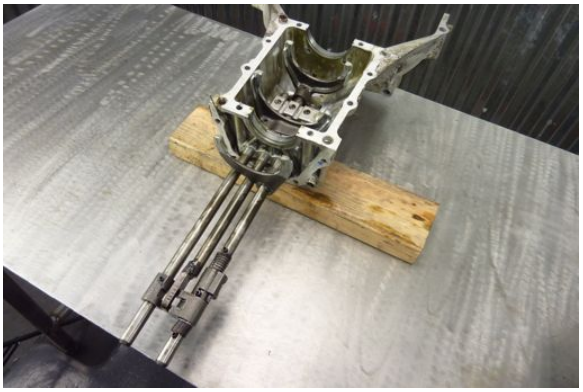
Remove and inspect the 2nd gear bearing.



Step 90

Inspect the main shaft.


Detent Spring (3)
Detent Groove
Neutral Detent Ball (2)
1st/2nd Sifter Rod
Detent Ball (3)
Neutral Detent Pin
Roll pin
3rd/4th Shifter Rod
5th/Revers shifter Rod
1st/2nd Sifter Fork
3rd/4th Shifter Fork
5th/Revers Shifter Fork
5th/Revers Rod Locating Bolt



Step 91

Place the transmission upper case on a 2X4 as shown.

Step 92

Position the (3) sifter rods in neutral position if they are not there already.

Step 93

Drive the 3rd/4th shifter fork roll pin downward using a 3/16” pin punch. Continue until the shaft is free to slide inside the fork.

Note: This should free the shifter fork from the shaft so the shaft can be removed.

Step 94

Drive the 1st/2nd shifter fork roll pin down until the shaft is free to slide in the fork.

Step 95

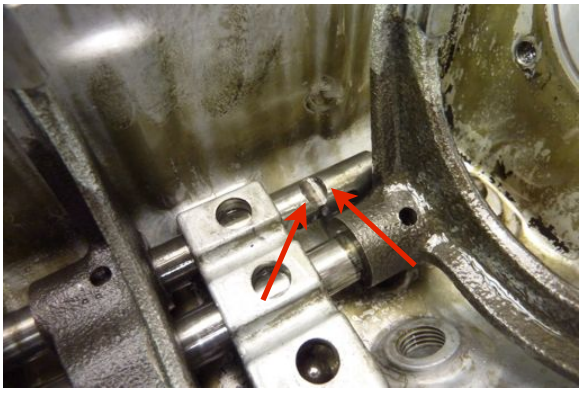
Place your finger over the 5th/reverse detent ball hole to prevent the ball and spring from flying out and slide the 5th/reverse shifter rod out of the upper case.

Step 96

Place your finger over the 1st/2nd detent ball hole to prevent the ball and spring from flying out and slide the 1st/2nd shifter rod out of the upper case.

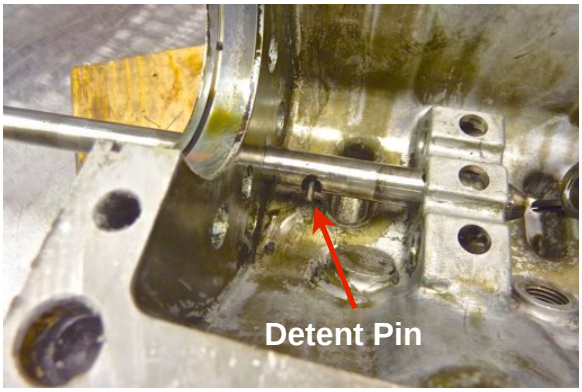
Tech Tip 96A

Sometimes the shifter rod will get a few burrs near the detent grooves preventing the rod from coming out of the case. If this happens, do not force the rod out of the case. Push the rod back into the case so that the detent ball grooves are visible and remove the burrs using emery cloth.



Tech Tip 96B

Lightly sand in the areas indicated by the arrows. Once the burrs are removed remove the 1st/2nd shifter Rod. Once the rod is removed, remove the 1st/2nd shifter fork from the transmission upper case.



Step 97

Repeat previous steps on the 3rd/4th shift rod and fork with only one exception. See the next Tech Tip.

Tech Tip 97A Caution!!!

As you slide the 3rd/4th shift rod out. Be sure to retrieve the detent pin. You will need it when reassembling the transmission. If this is lost or not installed properly, the transmission will not shift correctly.

Step 98

Once all the shifter rods are out remove the detent balls and springs. This is done by placing a cloth on the table and turning the transmission upper case over. 5 balls and three springs should fall out. It may be necessary to lightly tap the case on the bench.

Step 99

Remove the front bearing circlip using two standard screwdrivers.

Step 100

Install the bearing puller on the front bearing as shown here.

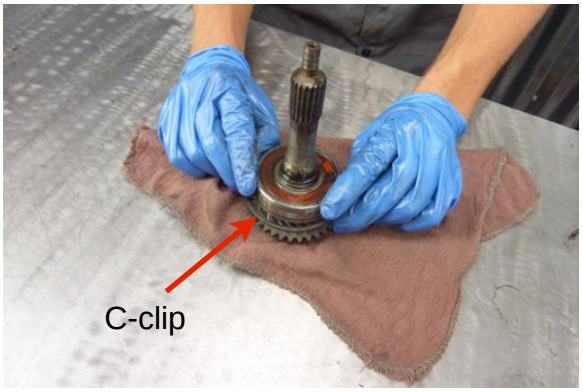
Step 101

Place the counter shaft in a press as shown here and force the shaft down. Be sure to catch the shaft as it comes free from the bearing.

Tech Tip 101

Bearing removed from the countershaft.

Removing the Input Shaft Bearing



Step 102

Remove the input bearing C-Clip.

Important: Be sure to save this clip as it will be needed with the new bearing.

Step 103

Remove the circlip using two standard screwdrivers.

Step 104

Position the bearing puller as shown here.

Step 105

Place the input shaft in a press as shown and force the input shaft downward. Be sure to catch the input shaft as it comes free from the bearing.

Tech Tip 105

Bearing removed from the input shaft.

Removing the Input Shaft Seal

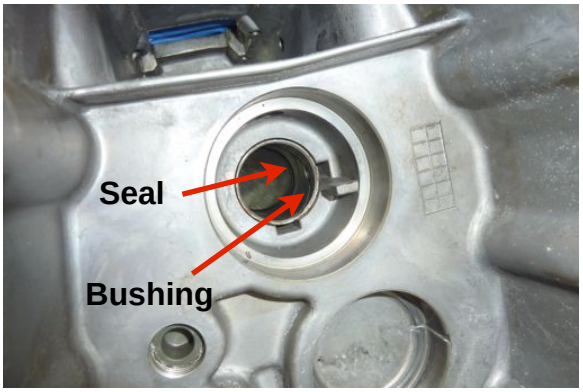
Step 106

Place a seal hook under the seal and pry it out.

Tech Tip 106

This shows the seal removed.

Removing the Output Shaft Seal & Bushing from the Extension Case

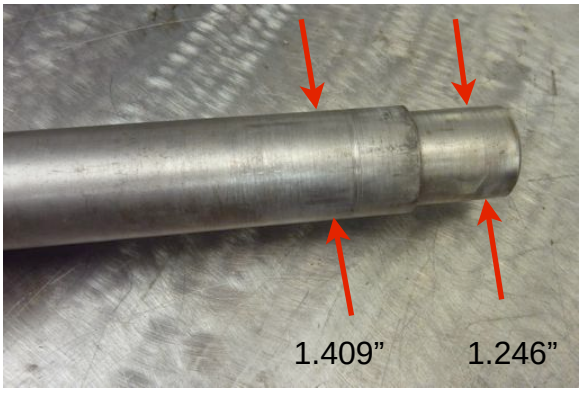


Step 107

We have found it best to push the bushing and seal out of the extension case, both parts at the same time. You will need to find a tool that is large enough to contact the bushing, but small enough to fit through the hole in the extension case. (See next Tech Tips)

Tech Tip 107A

This is a custom built slide hammer tool we designed and built for driving out the bushing and seal.

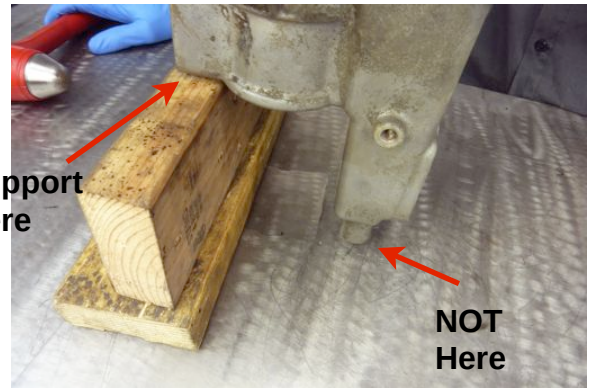


Step 107B

These are the diminutions of the tool we made. You may be able to find a socket that will fit the 1.409” dimension or at least come close enough to do the job. It is kind of hard on the socket but it can be done.

Step 108

Place the extension case on a block of wood and drive the bushing and seal out. (See next 3 Tech Tips before driving out the bushing and seal)

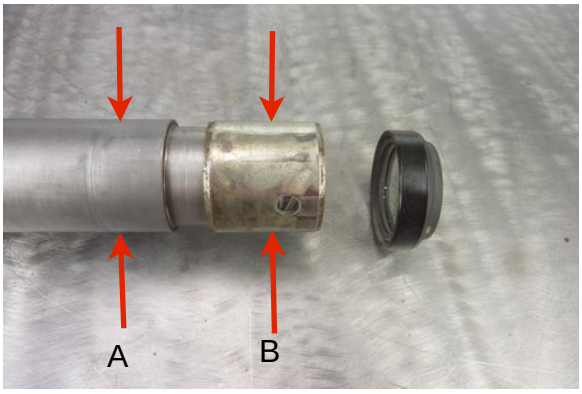


Tech Tip 108A

Be sure to support the extension case on a block of wood as shown.

Tech Tip 108B

Seal and bushing driven out.



Tech Tip 108C

This shows how the tool fits the bushing once the bushing has been removed from the case. Be sure that the tool at point A is smaller than the outside diameter of the bushing at point B.

Tech Tip 108C

This concludes the disassembly process. Of course you will want to clean all the parts your will need for reassembly. Continue to the next page when you are ready for reassembly.

Instructions Created by an:

Automotive Service Excellence
MASTER AUTO TECHNICIAN

86-95 Suzuki Samurai Samurai Complete Transmission Rebuild Kit with Synchronizers (SKU# STM-RP)

Installation Instructions

Part II – Disassembly

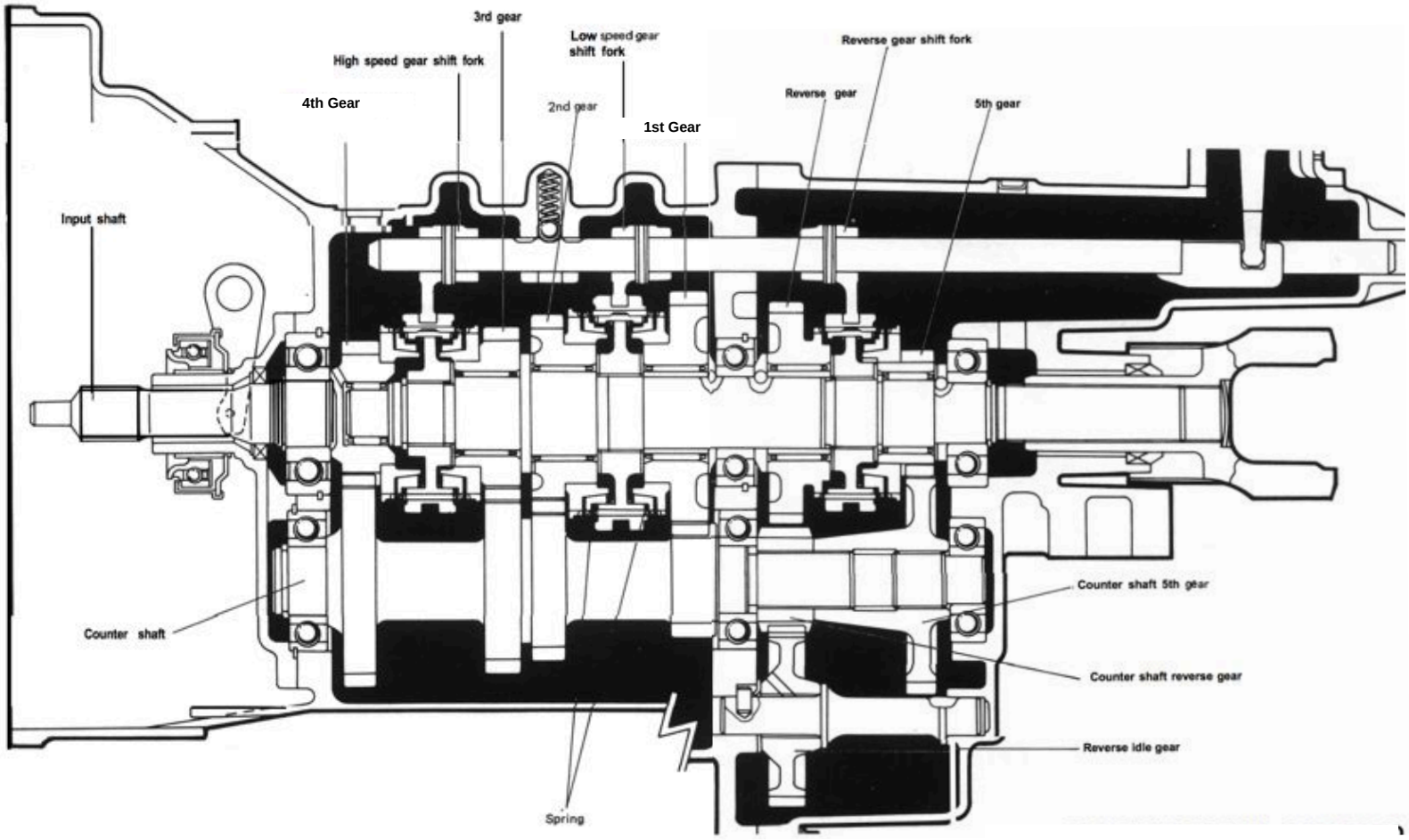
Notice: We will be basing these instructions on a complete transmission rebuild just like we do for our customers. You may not be replacing all the parts that we do. If we show replacing a part you are not replacing, simply skip those steps and move on the procedures you need.

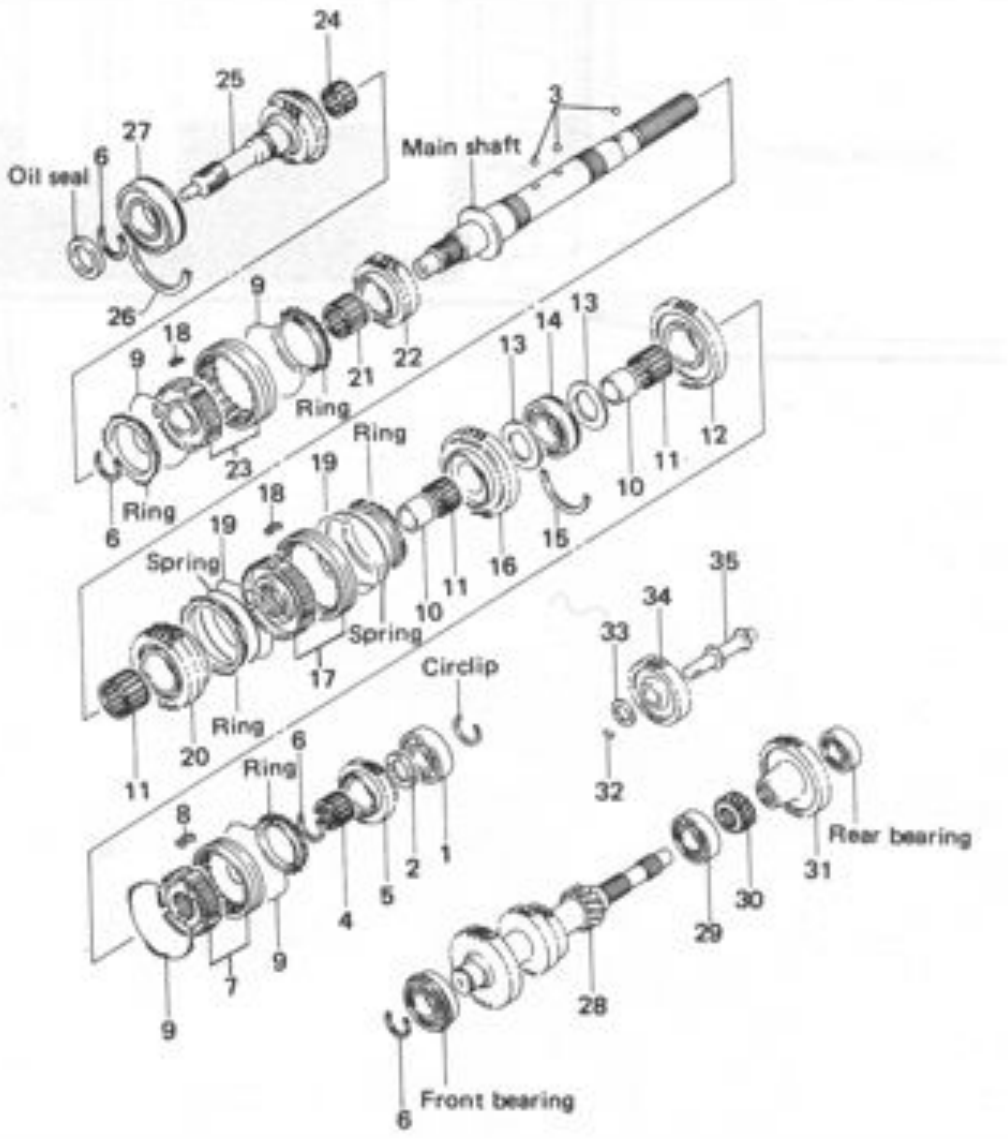
If you find there are parts that you need but are not included in the kit, there is a good chance they can be found on our website. If you cannot find the part you need on our website, feel free to give us a call, there is a good chance we can help you find it.

Additionally, we are not showing the cleanup of all the parts. We will assume you know how to do that. Simply put, just make sure all the parts (transmission cases, extension case, shifter tower, release lever, input shaft housing, shifter rods, shifter forks, etc) are all cleaned and free of grease, dirt, old gaskets, etc.

You should also reassemble this transmission on a clean work surface in a dust free environment.

Samurai Transmission Parts Identification

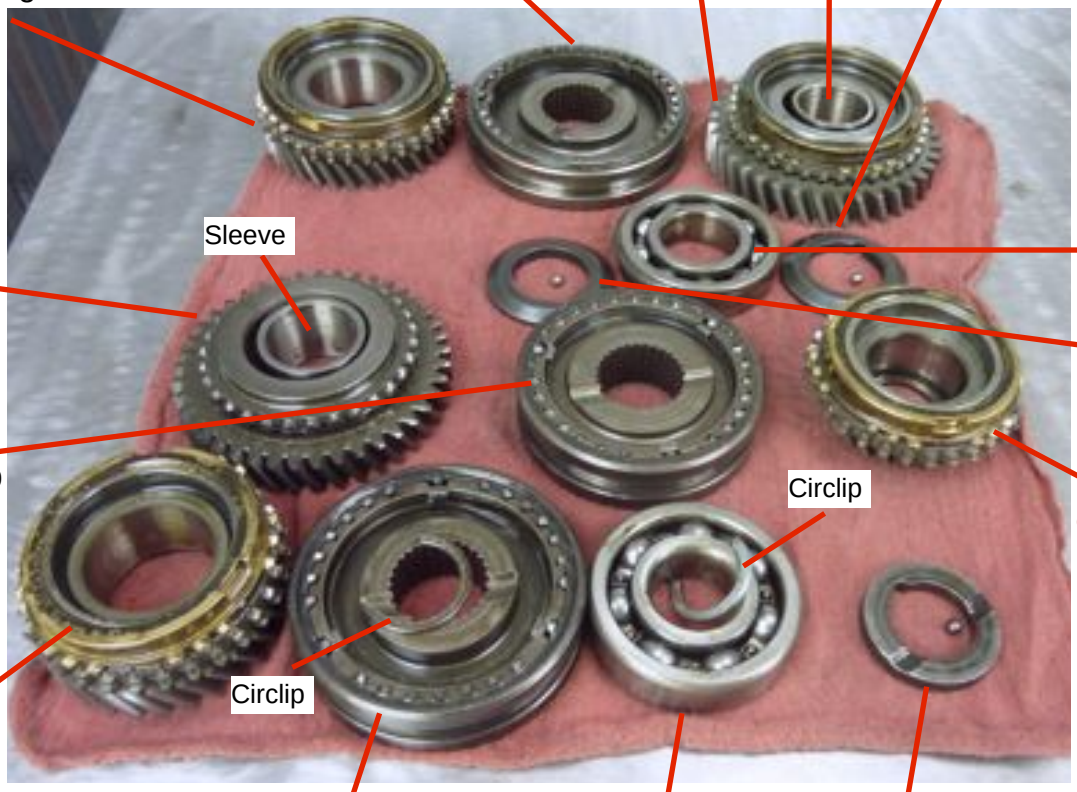




1. Main shaft rear bearing
2. 5th gear washer
3. Main shaft washer bell
4. 5th gear needle bearing
5. 5th gear
6. Circlip
7. Synchronizer reverse hub set
8. Synchronizer key
9. Synchronizer spring
10. Gear bush
11. Needle bearing
12. Reverse gear
13. Main shaft bearing washer
14. Main shaft center bearing
15. C ring
16. Low gear
17. Synchronizer low speed hub set
18. Synchronizer key
19. Synchronizer spring
20. 2nd gear
21. 3rd gear needle bearing
22. 3rd gear
23. High speed synchronizer hub set
24. Input shaft bearing
25. Input shaft
26. C ring
27. Front bearing
28. Counter shaft
29. Center bearing
30. Reverse gear
31. Counter shaft 5th gear
32. Pin
33. Washer
34. Reverse idle gear
35. Reverse gear shaft

Step 1

Set out all the main shaft parts as shown here.



1 - 2nd Gear, Synchro Ring and Spring

2 - 1st/2nd Synchronizer Hub

3 - 1st Gear, Synchro Ring,Spring, and Sleeve

4 - Bearing Washer & Ball

5 - Main Shaft Front

6 - Bearing Washer & Ball

7 - Reverse Gear & Sleeve

8 - 5th/Reverse Synchronizer Hub

9 - 5th Gear & Synchro Ring

10 - Bearing Washer & Ball

11 - Main Shaft Rear Bearing & Circlip

12 - 3rd Gear & Synchro Ring

13 - 3rd/4th Synchronizer & Circlip

Red numbers indicate the order in which these parts are to be installed on the main shaft.

Step 2

Set out the main shaft and a tub of good quality high temperature wheel bearing grease.

Test Fitting and Replacing the Synchronizer Rings

Step 3

Remove the old 2nd gear synchronizer ring and spring.

Step 4

Install the new 2nd gear synchronizer ring and spring.

Note: Be sure the new synchronizer matches the shape and size of the gear as did the old one. On rare occasion we have been shipped the wrong synchronizer rings from our supplier.

Step 5

Repeat Steps 3 and 4 on 1st Gear.

Step 6

Repeat Steps 3 and 4 on 5th gear.

Note: This synchronizer does not have a spring with it as did 1st and 2nd gear synchronizer rings.

Step 7

Repeat Steps 3 and 4 on 3rd gear. There is no synchronizer spring here either.

Matching up and Laying Out the Main Shaft Bearings

Step 8

Swap out the old main shaft front bearing with the new one. Compare the bearing numbers to insure you have the correct bearing.

Step 8 Continued

Remove the C-Clip from the old bearing . . . .

Step 8 Continued

. . . . . and install it on the new bearing

Step 9

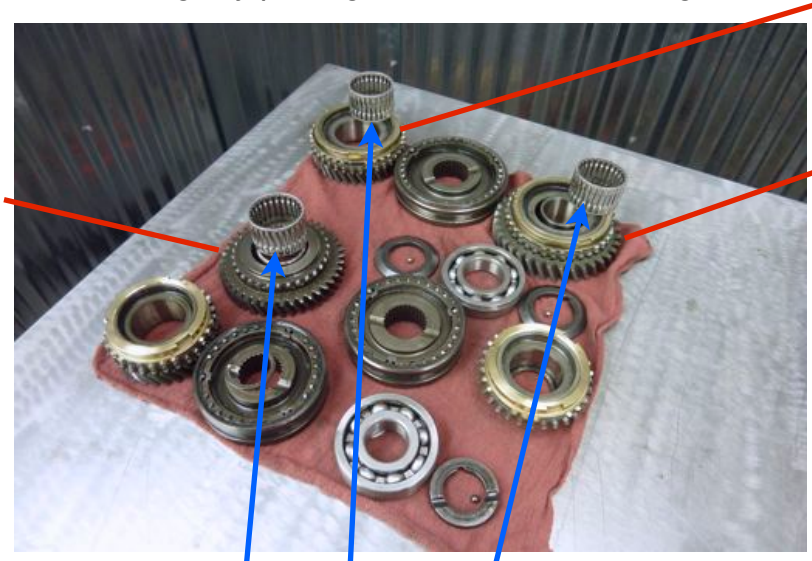
Swap out the old main shaft rear bearing with the new one. Compare the bearing numbers to insure you have the correct bearing.

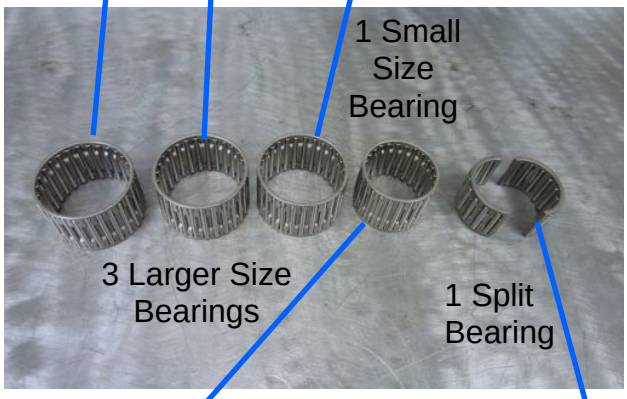
Tech Tip 9

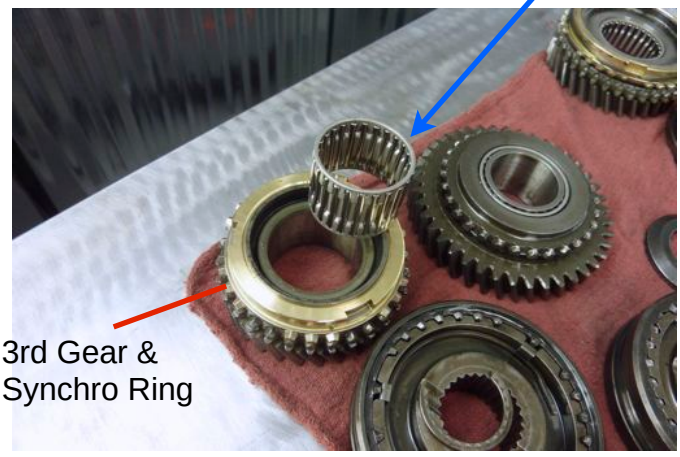
Unlike the old main shaft rear bearing, the new bearing may have a snap ring groove with a snap ring in it. As long as the numbers match, this bearing will work. However, you will need to remove the snap ring from the new bearing. It will not be needed in this application.

Step 10

Ready the new needle bearings by placing them with the correct gears.





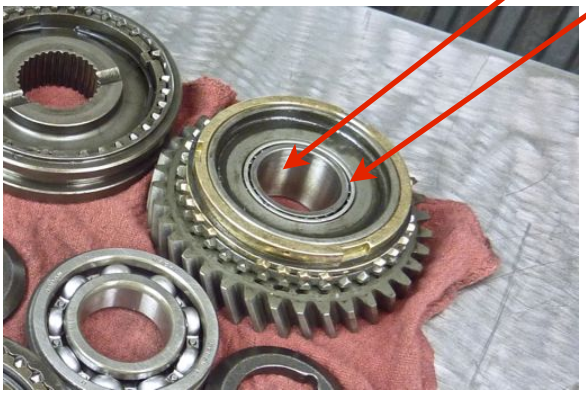


Step 11

Once all (5) needle bearings are placed where they are to be installed. . . .

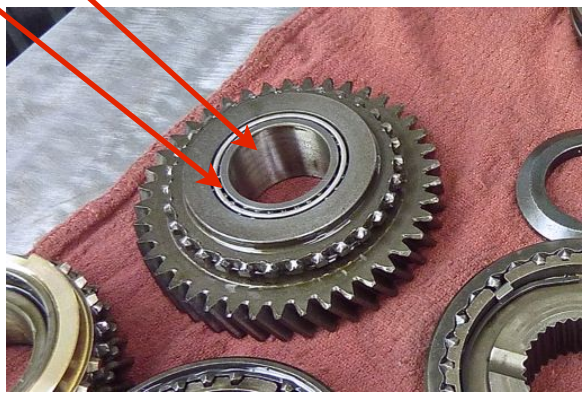
Step 11 Continued

. . . test fit each one to insure it fits correctly.



Tech Tip 11A

The bearing will fit between the sleeve and gear on the 1st . . . . . .



Tech Tip 11B

. . . . and reverse gears.

Assembling the Main Shaft

High Temperature wheel bearing grease will be applied to may parts during assembly. This is to provide temporary protection for these parts until gear oil can find its way to them. Failure to use grease during reassembly could damage these part and greatly reduce the life of the transmission.

Step 12

Stand the main shaft on the work bench with the output splines up.

Step 13

Apply bearing grease to the inside of the 2nd gear needle bearings.

Note: Work the grease into the bearing cage and around all the needle bearings.

Step 14

Install the 2nd gear bearing on the main shaft.

Step 15

Apply bearing grease to the bottom thrust face of 2nd gear.

Step 16

Apply grease to the synchronizer surface of 2nd gear.

Step 17

Install the 2nd gear synchronizer and spring.

Step 18

Install grease to the outside of the second gear synchronizer ring.

Step 19

Install the 2nd gear assembly (synchronizer up) on the main shaft.

Step 20

Install the 1st/2nd synchronizer hub on the main shaft as shown.

Tech Tip 20

Rotate the synchronizer until it sits down in place as shown.

Step 21

Install the 1st gear sleeve on the main shaft.

Tech Tip 21

The 1st gear sleeve must fit below the ball hole as shown. If it does not, you will need to check previously installed items for proper fit.

Step 22

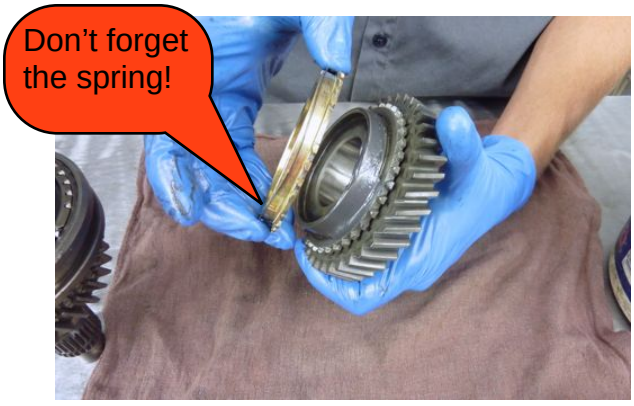
Apply bearing grease to the inside of the 1st gear bearing.

Step 23

Install the 1st gear bearing over the sleeve.

Step 24

Apply grease to the synchronizer surface of 1st gear.



Step 25

Install the 1st gear synchronizer ring and spring.

Step 36

Apply grease to the back side of the synchronizer ring.

Step 27

Install 1st gear on the main shaft and over the bearing.

Note: Be sure the synchronizer ring is facing down.

Step 28

Install the washer locating ball.

Step 29

Install the bearing washer with the bevel up.

Note: Be sure to align the notch in the washer with the ball.

Tech Tip 29

This shows the bearing washer properly installed.

Step 30

Install the main shaft center bearing.

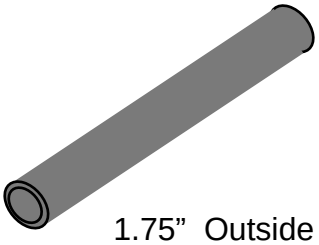
Note: C-clip toward the top of the main shaft.

Step 31

Force the main shaft center bearing in place by using a hydraulic press or a pipe and hammer as shown here. (See next Tech Tip for Pipe dimensions)

Note: Continue pounding until the bearing is firmly seated against the washer.

1.750” DOM (.250 Wall) Pipe



1.75” Outside Diameter
1.25” Inside Diameter
8” Long

Tech Tip 31

This is the dimensions on the pipe we used.

Step 32

Install the washer locating ball as shown.

Step 33

Install the second bearing washer bevel side down.

Note: Be sure the notch in the washer aligns with the ball and the flat side of the washer is oriented upward.

Step 34

Install the reverse gear sleeve.

Step 35

Apply bearing grease to the inside of the reverse gear needle bearing.

Step 36

Install the reverse gear needle bearing over the reverse gear sleeve.

Step 37

Apply bearing grease to the inside of the reverse gear.

Step 38

Apply grease to the thrust face of the reverse gear.

Step 39

Install the reverse gear over the bearing with the synchronizer teeth upward.

Step 40

Install the 5th/reverse synchronizer hub.

Note: The wider face of the synchronizer hub goes down.

Step 41

Lay the main shaft on its side and install the circlip.

Note: Place a cloth under the assembly for protection.

Tech Tip 41A

Snap the circlip in place by prying downward using a large standard screwdriver.

Tech Tip 41B

Insure the circlip is seated by tapping it downward using a punch (or a large standard screwdriver) and a hammer.

Step 42

Apply bearing grease to one half of the 5th gear needle bearing.

Step 43

Place the first half of the needle bearing on the main shaft.

Step 44

Apply bearing grease to the second half of the 5th gear needle bearing.

Step 45

Place this needle bearing on the main shaft opposite the first one.

Step 46

Apply bearing grease to the synchronizer side of of the 5th gear.

Step 47

Install the 5th gear synchronizer ring on 5th gear.

Step 48

Apply bearing grease to the outside of the 5th gear synchronizer ring.

Step 49

Install 5th gear over the 5th gear bearing with the synchronizer facing down.

Step 50

Install the washer ball.

Step 51

Apply grease on the top side of 5th gear.

Step 52

Install the 5th gear bearing washer as shown.

Note: Install this washer with the grooved side down.

Tech Tip 52

Be sure to align the notch of the washer with the ball.

Step 53

Install the main shaft rear bearing.

Step 54

Force the main shaft rear bearing on the main shaft using a hydraulic press or a pipe and hammer as shown here.

Step 55

Continue pressing the bearing until there is sufficient room for the circlip to be installed.

Step 56

Install the circlip by snapping it into place using a punch (or large standard screwdriver) and a hammer.

Tech Tip 56

Be sure the circlip is sitting all the way down in the groove of the main shaft.

Step 57

Turn the main shaft around.

Step 58

Apply wheel bearing grease to the inside of the 3rd gear needle bearing.

Step 59

Install the 3rd gear needle bearing on the main shaft as shown here.

Step 60

Apply grease to the back side of 3rd gear as shown.

Step 61

Apply grease to the synchronizer side of 3rd gear.

Step 62

Install the 3rd gear synchronizer ring on 3rd gear.

Step 63

Apply grease to the outside of the synchronizer ring.

Step 64

Install third gear over the bearing.

Step 65

Install the 3rd/4th synchronizer hub on the main shaft with the grooved side toward 3rd gear.

Tech Tip 65

There should be enough room to install a circlip in the groove of the main shaft. If not, check all parts associated with the 3rd gear for proper fit and correct as needed.

Step 66

Position the circlip as shown.

Step 67

Snap the circlip into place using a large standard screwdriver.

Note: Be sure it is seated all the way down in the groove.

Step 68

Set the main shaft aside for now.

Assembling the Input Shaft

Step 69

Remove the snap ring from the front (or input shaft) bearing using snap ring pliers.

Note: This snap ring can be discarded. It will not be used in this application.

Step 70

Place the input shaft on the workbench as shown and place the front bearing on the shaft.

Step 71

Force the bearing on the input shaft using a press or hammer and pipe as shown here.

Step 72

support the pilot bushing end of the input shaft on a block of wood and 4th gear on a cloth. Then position the circlip in the groove.

Note: This circlip was removed from the input shaft during disassembly.

Step 73

Snap the circlip into place using a large standard screwdriver and hammer.

Step 74

Reinstall the C-Clip on the front bearing in the groove.

Note: This C-Clip was removed from the old front bearing during disassembly.

Step 75

Apply grease to the synchronizer surface of 4th gear.

Step 76

Install the 4th gear synchronizer ring.

Step 77

Apply a liberal amount of bearing grease inside of the input shaft bearing cavity.

Step 78

Install the input shaft needle bearing.

Step 79

Apply more bearing grease to the inside of the bearing.

Step 80

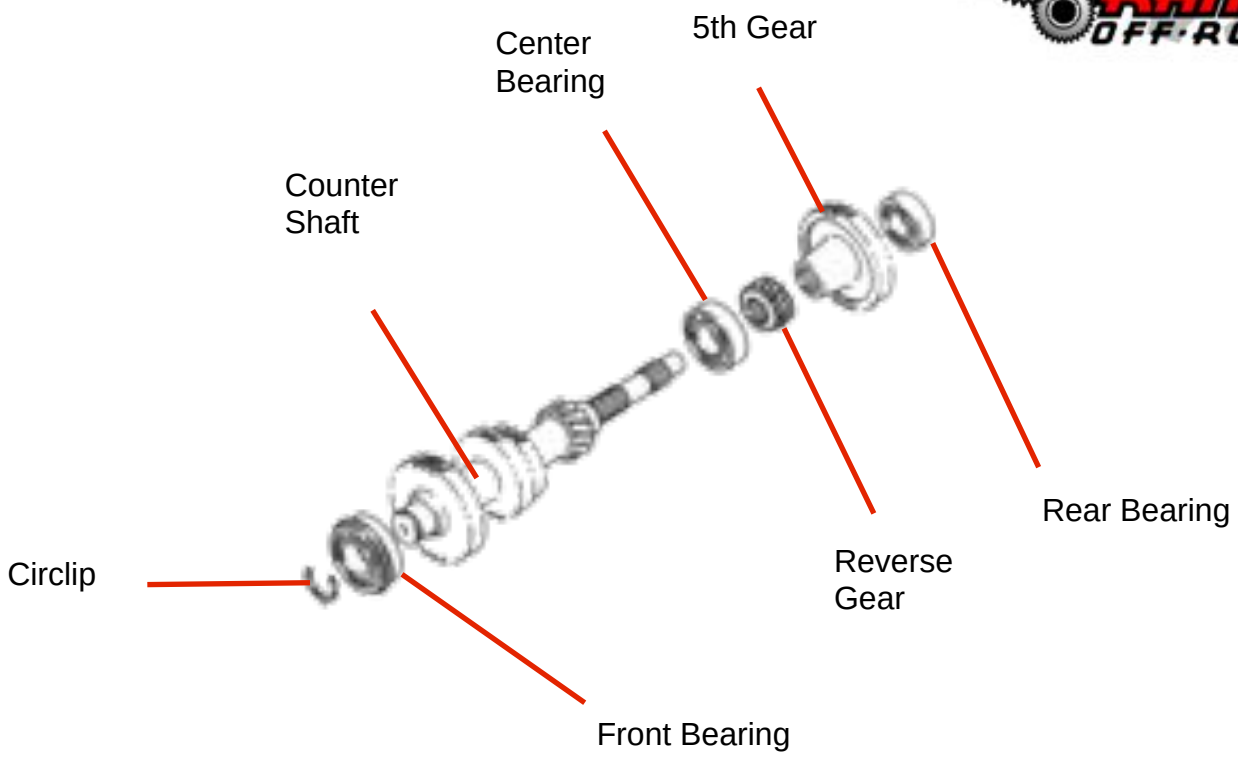
Apply bearing grease to the outside of the synchronizer ring.

Step 81

Install the input shaft assembly onto the front of the main shaft assembly.

Step 82

The main shaft is now ready for installation in the transmission case. Simply set it aside for now.



Assembling the Counter Shaft

Step 83

Lay the counter shaft on the work bench.

Note: Lay a cloth under the shaft for protection.

Step 84

Select the new counter shaft front bearing by comparing the numbers on the side of the bearing. The new front counter shaft bearing should have a snap ring in place.

Step 85

Place the front counter shaft bearing on the counter shaft as shown.

Note: Snap ring up.

Step 86

Force the bearing on the counter shaft by striking it sharply with a ball peen hammer. Be sure to strike the bearing on the inner race only. Continue driving the bearing until it is flush with the shaft.

Step 87

Once the bearing is flush with the shaft, continue driving the bearing on using the pipe and hammer. Continue driving the bearing until it seats against the gear and the circlip groove is fully exposed.

Step 88

Position the circlip in the counter shaft groove.

Note: Reuse the circlip from the counter shaft.

Step 89

Snap the circlip into place using a large screwdriver and hammer.

Step 90

Remove the snap ring from the front countershaft bearing using snap ring pliers.

Note: Keep this snap ring it will be used later.

Assembling the Counter Shaft in the Transmission Lower Case

Step 91

Install the counter shaft in the transmission lower case by inserting the rear end (smaller gear end) in first.

Step 92

After the rear of the counter shaft is positioned in the case, slide it forward positioning the front counter shaft bearing in the case.

Step 93

Place the transmission lower case on the work bench as shown and drive the front bearing about half way into position in the case. **DO NOT** drive the bearing all the way into position at this time.

Step 94

Install the counter shaft center bearing on to the counter shaft.

Step 95

Using the pipe and hammer drive the center bearing into the counter shaft.

Step 96

Continue driving the counter shaft rear bearing on to the shaft and into the case. Continue driving the bearing into the case until it is about a 1/4” above the case as shown here.

Step 97

Install the counter shaft reverse gear.

Step 98

Install the counter shaft 5th gear.

Step 99

Position the counter shaft rear gear bearing.

Step 100

Drive this bearing into place using a ball peen hammer.

Caution: Be sure to strike the bearing squarely by hitting the center race. DO NOT strike the outer race of the bearing.

Tech Tip 100

The bearing should be flush with the counter shaft at this point.

Step 101

Continue driving the counter shaft downward until the snap ring can be reinstalled on the counter shaft front bearing. See Next Tech Tip.

Tech Tip 101

The front bearing groove should be fully visible.

Step 102

Once the front bearing groove is fully visible, install the snap ring in the counter shaft front bearing groove.

Step 103

Now drive the counter shaft and front bearing rearward until the snap ring is secure against the transmission case.

Note: Be sure to strike the shaft squarely so as not to mushroom the shaft.

Step 104

Check for any lateral (in-out) movement of the 5th gear.

Step 105

If movement is found to be present, position the pipe on the front of the counter shaft and strike the inner race of the fifth gear bearing as shown.

Step 106

Check for lateral movement again. If movement is felt repeat the previous step until there is no movement.

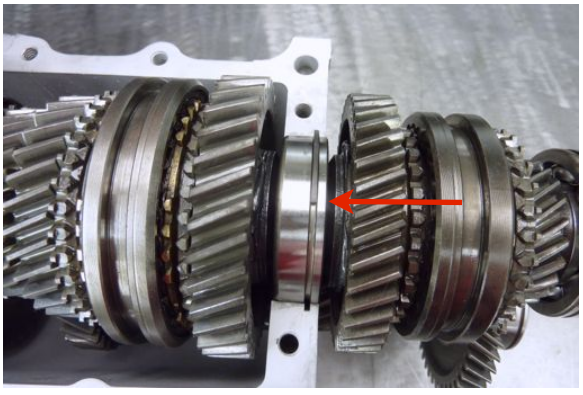
Installing the Main Shaft in the Transmission Lower Case

Step 107

Place the transmission lower case on the work bench.

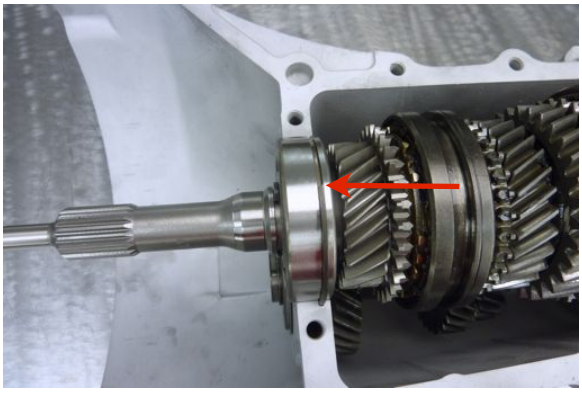
Step 108

Position the main shaft assembly as shown here and carefully lower it into place.



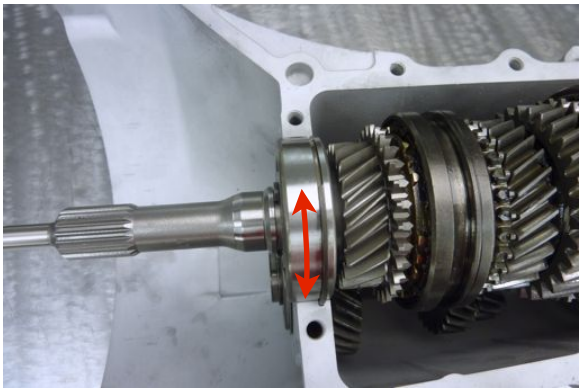
Tech Tip 108A

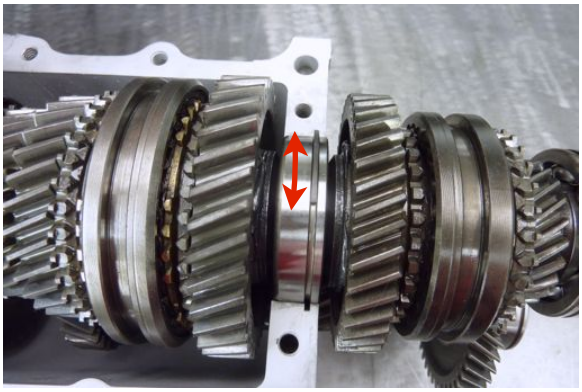
Insure that the rear bearing C-clip is positioned in the case groove and that the end of the C-clip ring is in the 12 o'clock position.



Tech Tip 108B

Insure that the front bearing C-clip is positioned in the case groove and that the end of the C-clip ring is at the 12 o'clock position. Additionally, these C-clips should be opposite each other, one C-clip toward the right side of the case and the other toward the left. See Tech Tip C.

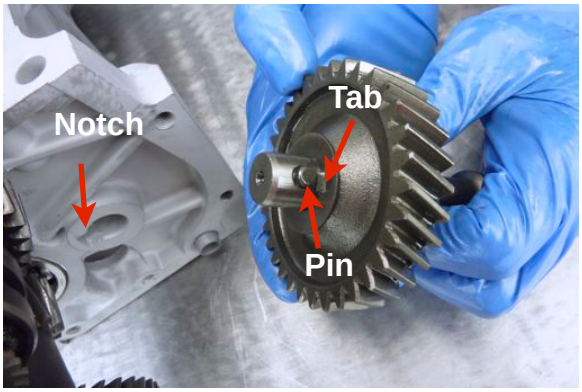




Tech Tip 108C

C-clips should be opposite each other. One toward the left side of the case the other toward the right.

Installing Reverse Idler Gear



Tech Tip 109

When installing the reverse idler gear insure that the pin and tab on the shaft are oriented toward the notch in the lower case.

Step 109

Install the reverse idler gear in the lower housing.

Testing the Transmission for Correct Operation in All Gears

Step 110

Check to see that the main shaft and the counter shaft turn with out binding.

Step 111

Shift the transmission into 1st gear and check for correct operation.

Step 112

Shift the transmission into 2nd gear and check for correct operation. Then move the 1st/2nd synchronizer hub back into neutral position.

Step 113

Shift the transmission into 3rd gear and check for correct operation.

Step 114

Shift the transmission into 4th gear and check it for correct operation. Then move the 3rd/4th synchronizer hub back into neutral position.

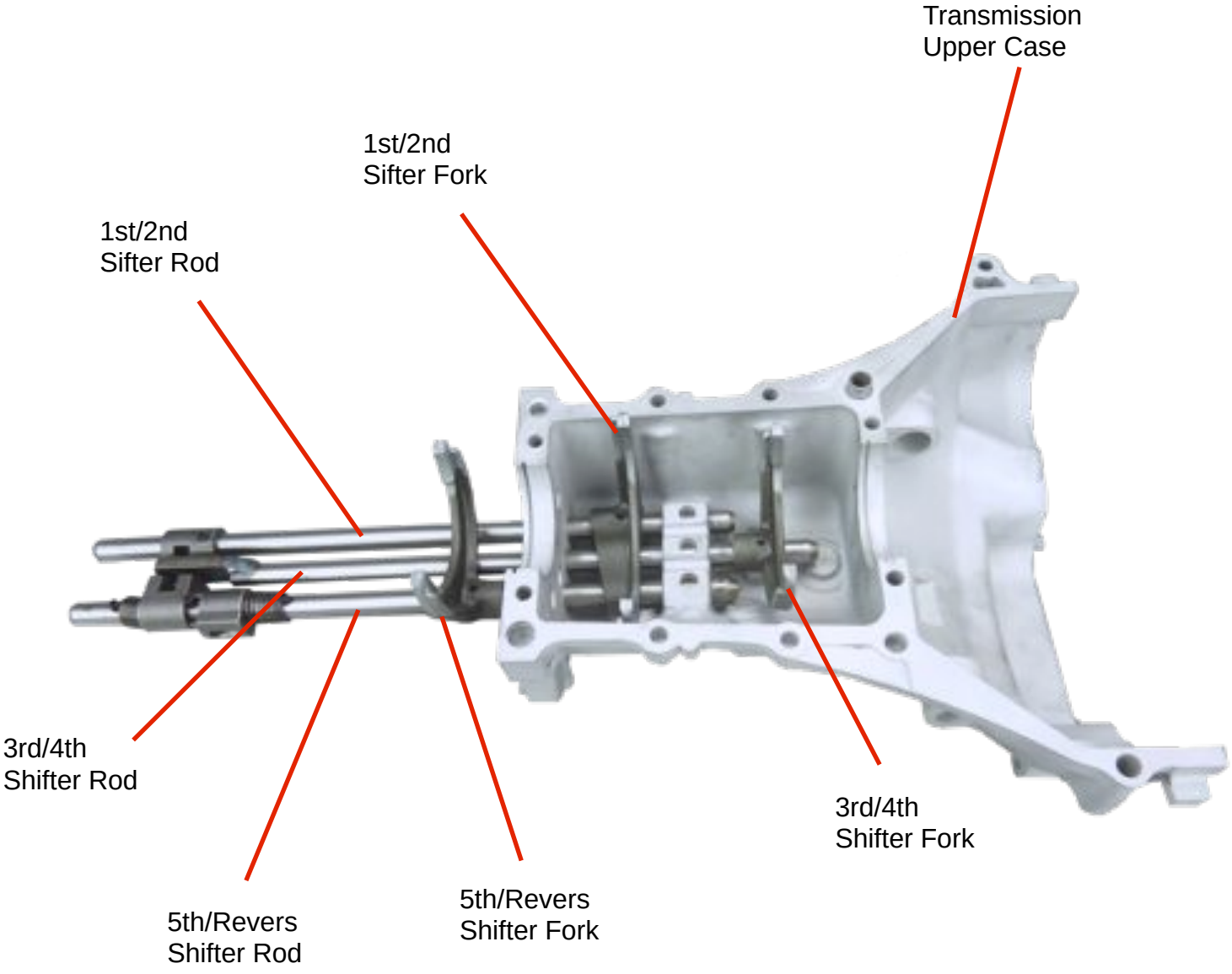
Step 115

Shift the transmission into 5th gear and check for correct operation.

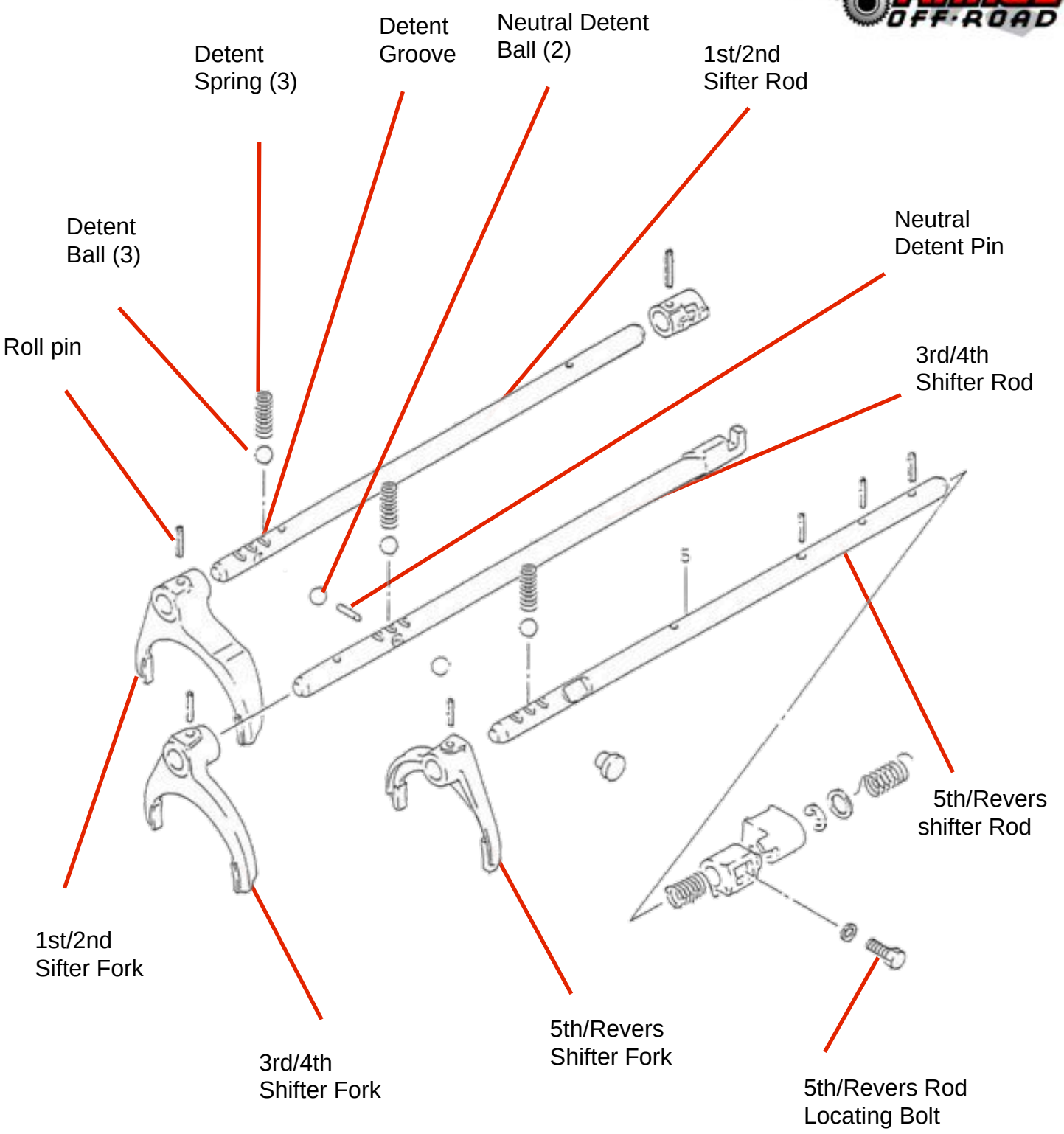
Step 116

Shift the transmission into reverse gear and check for correct operation. Then move the 5th/Reverse synchronizer hub back into neutral.

Transmission Upper Case Assembly



Shifter Fork Assembly



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1195 S 1680 W
Orem, UT 84058 USA

Assembling the Transmission Upper Case—Shifter Rods and Forks

Step 117

Place the transmission upper case on the work bench.

Step 118

Install one detent spring in each of the 3 holes.

Step 119

Position the 3rd/4th shifter fork on the work bench and drive the roll pin back into its original position.

Step 120

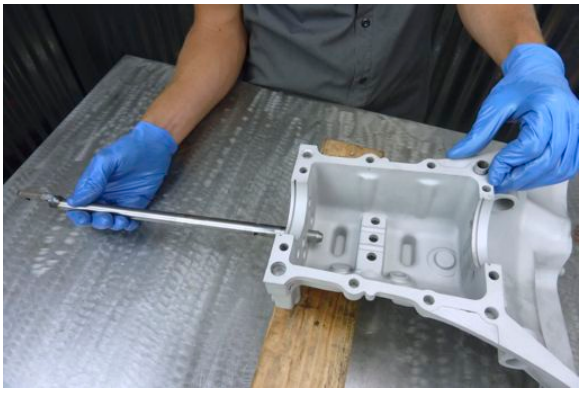
Continue driving the roll pin through the shifter fork until it can be reinstalled on the shifter rod with out obstruction.

Tech Tip 120

This shows the roll pin properly positioned, ready for installation on the shifter rod.

Step 121

Repeat **Steps 119 and 120** on the 1st/ 2nd shifter fork.



Step 122

Place a 2x4 under the rear of the upper case. Insert the 3rd/4th shifter rod into the middle position in the transmission upper case.

Step 123

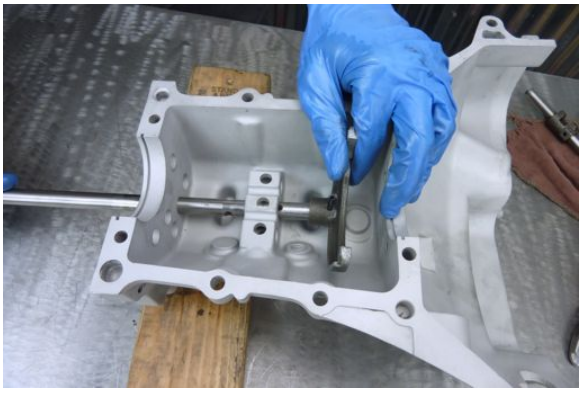
Stop when the rod is positioned as shown here.

Step 124

Drop a detent ball in the center hole.

Step 125

Using a small screwdriver, push the ball down against spring tension and continue pushing the shift rod into place.



Step 126

Install the 3rd/4th shifter fork on the end of the shift rod.

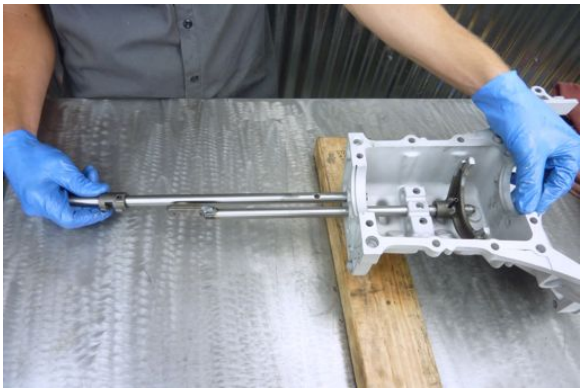
Note: DO NOT drive in the roll pin yet.

Step 127

Install the neutral detent pin in the 3rd/4th shifter rod. Then rotate the shifter rod so that the detent pin in perfectly horizontal and the detent grooves in the rod are facing down.

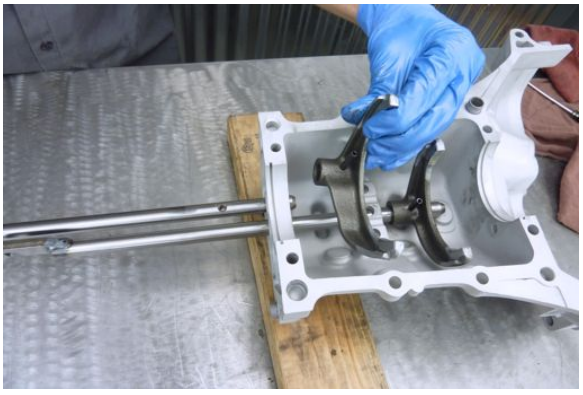
Step 128

While holding the 3rd/4th shifter fork in place continue pushing the shifter rod in to place. Continue inserting the rod until it reaches the NEUTRAL (second click) position. DO NOT drive the shifter fork roll pin into place yet. DO NOT tilt the case at this point. The the neutral detent pin will fall out of place.



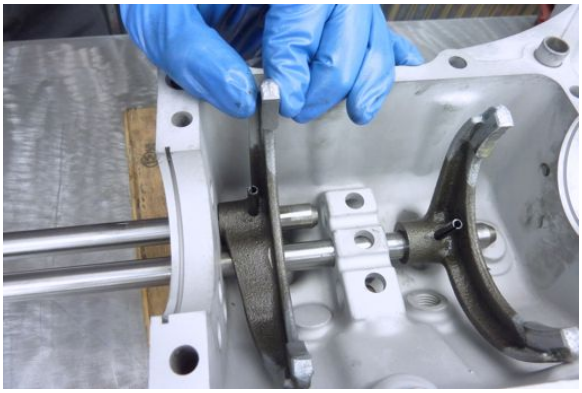
Step 129

Insert the 1st/2nd shifter rod into the rear of the transmission upper case as shown.



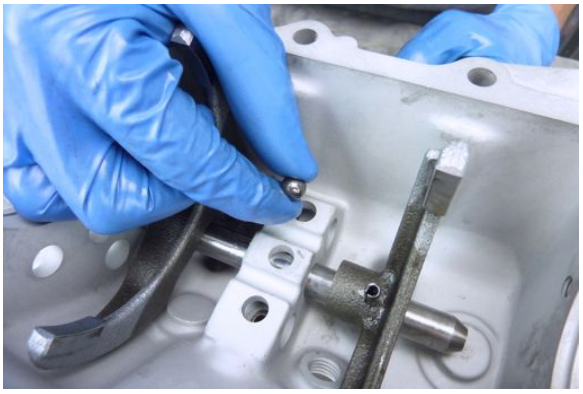
Step 130

Position the 1st/2nd shifter fork on the end of the shifter rod.



Step 131

While holding the shifter fork stationary, continue inserting the shifter rod, but stop just before the rod enters the detent ball hole.



Step 132

Install 1 of the 2 neutral detent balls in the hole as shown.

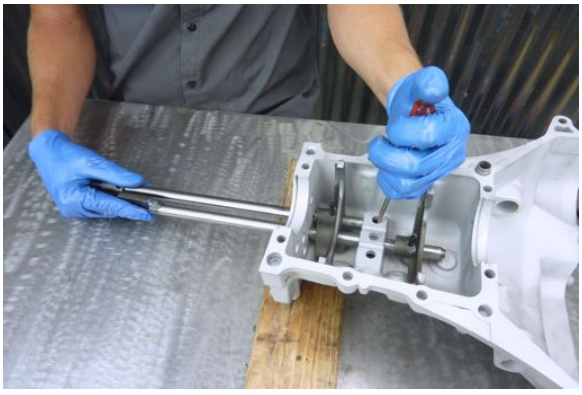
Note: It really doesn't matter which ball you use. All 5 detent balls are the same size.

Step 133

Push the neutral detent ball sideways against the neutral detent pin that was installed earlier.

Step 134

Drop another detent ball in the same hole. It should rest on top the detent spring.



Step 135

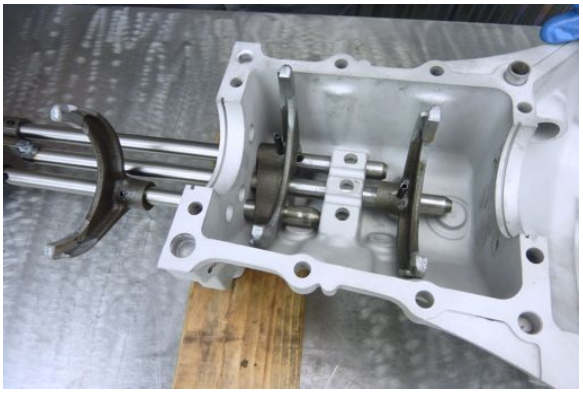
Using a screwdriver, push down on the ball and continue inserting the shifter rod.

Step 136

Turn the shifter rod until the detent grooves are facing downward. Position the shifter rod in the neutral (second click) position. DO NOT drive the shifter fork roll pin into place at this time.

Step 137

Insert the 5th/reverse shifter rod and fork into the rear of the upper case as shown.

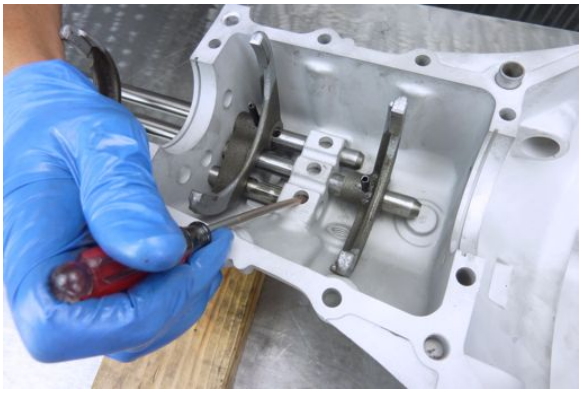


Step 138

Stop just short of the detent ball holes.

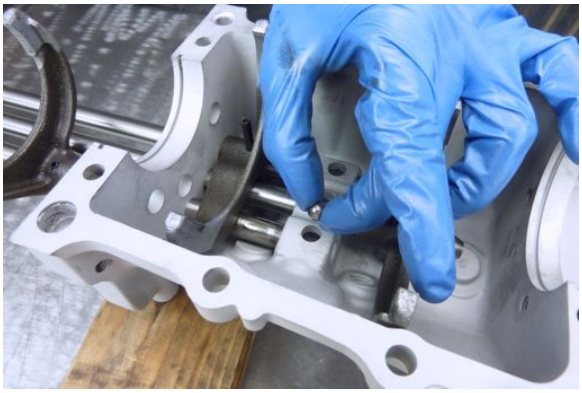
Step 139

Drop the 2nd neutral detent ball into the hole as shown.



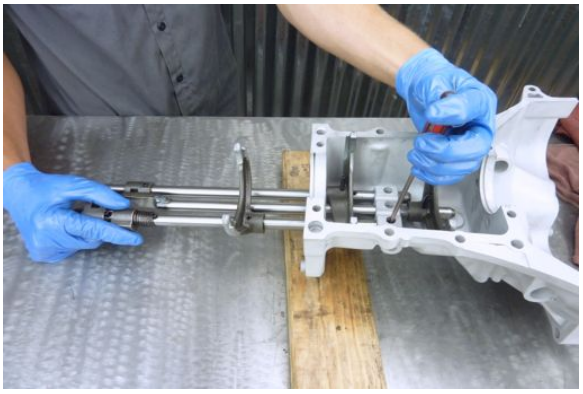
Step 140

Using a screwdriver, push the neutral detent ball sideways against the neutral detent pin.



Step 141

Drop the last detent ball in the same hole as shown.

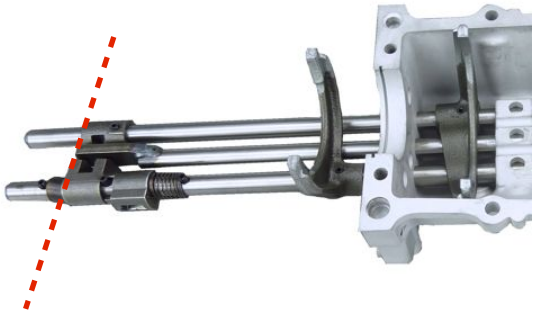


Step 142

While holding the detent ball down with a screwdriver, continue inserting the 5th/ reverse shifter rod. Once the rod is keeping the ball in place, rotate the shifter rod so that the detent grooves are facing downward.

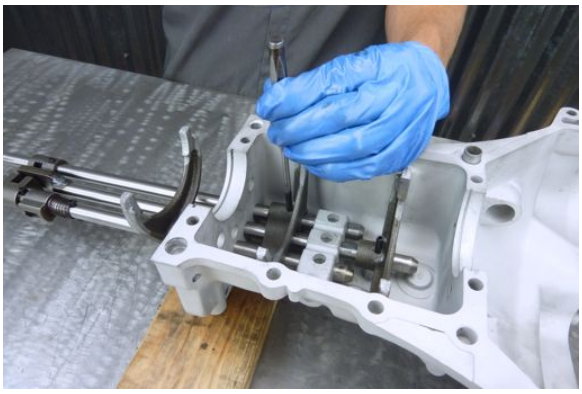
Step 143

Continue inserting the 5th/reverse shifter rod until it reaches neutral (2nd click) position.



Tech Tip 143

Double check that all 3 shift rods are in neutral position by looking at the shifter lever assembly. All should be aligned as shown here.

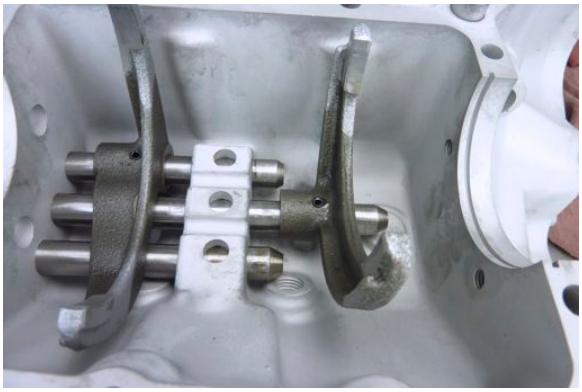


Step 144

Align the 1st/2nd shifter fork roll pin with the hole in the shifter rod and drive in the roll pin using a punch and hammer.

Step 145

Align the 3rd/4th shifter fork roll pin with the hole in the shifter rod and drive in the roll pin using a punch and hammer.



Tech Tip 145

Both roll pins should be flush with the surface of the shift fork.

Installing the Input Shaft Seal

Step 146

Position the input shaft seal in the input shaft housing. The garter spring of the seal should oriented UP.

Step 147

Drive the seal into place using a 32mm socket and hammer.

Step 148

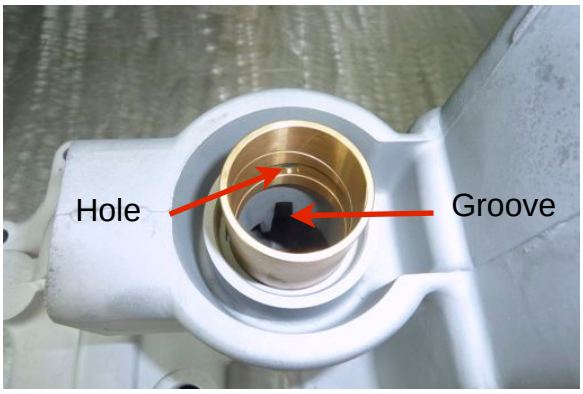
Continue driving the seal until it is flush with the surface of the input shaft housing.

Installing the Output Shaft Bushing & Seal

Step 149

Place the extension case on the work bench as shown.

Note: The case should sit flat against the workbench. If there are locating dowels in the extension case preventing the case from sitting flat, place the case on a 2x4.



Step 150

Position the output shaft bushing in the extension case as shown.

Caution: Be sure to align the hole in the bushing with the groove in the case before driving the bushing in. Failure to align the hole and groove WILL result in poor lubrication of the output yoke leading to premature failure of the yoke and bushing.

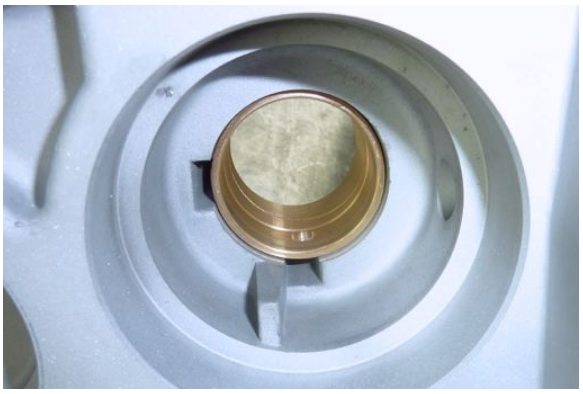
Step 151

Using the same tool used to remove the old bushing, drive in the new bushing.

Note: See disassembly instructions (Pg 42, Step 107B) for the dimensions of this tool.

Tech Tip 151A

Continue driving in the bushing until it is flush with the extension case.



Tech Tip 151B

Inspect the bushing from the inside of the extension case to see that the hole and groove align properly.

Step 152

Test the fit of the bushing with an output yoke to see that there is little side to side movement.

Step 153

Position the output shaft seal as shown.

Note: Position the garter spring downward.

Step 154

Drive the output shaft seal into place using a 32mm socket and hammer.

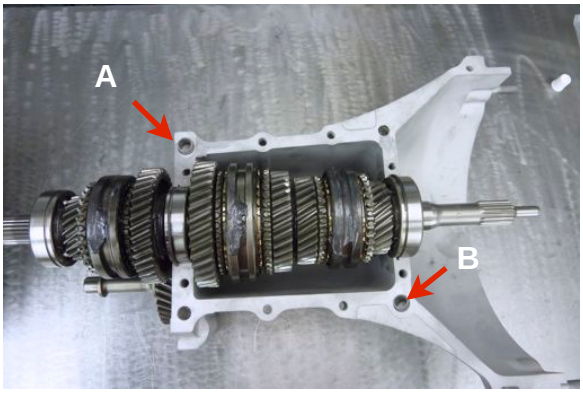
Tech Tip 154

The edge of the seal should be flush with the case.

Installing the Transmission Upper Case on the Lower Case

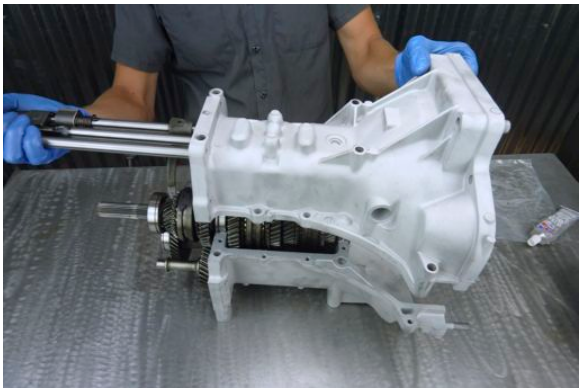
Step 155

Apply bearing grease to the upper portion of all three synchronizer hubs.



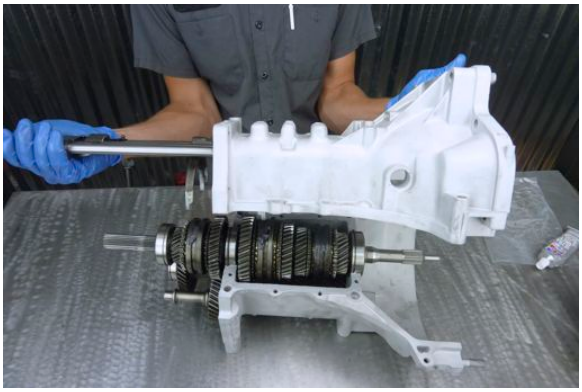
Step 156

Insure that the locator dowels are positioned properly. Dowel A should be located in either the lower case or upper case. Dowel B should be in either the upper case or lower case.



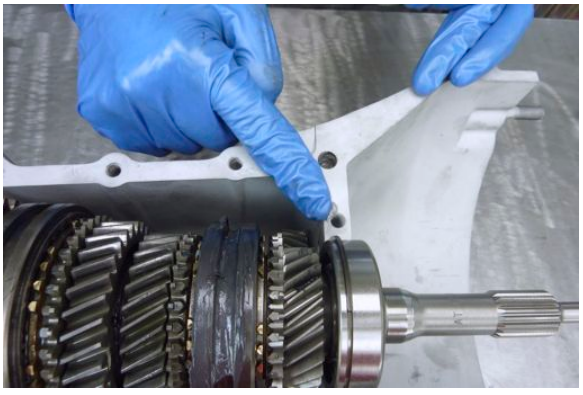
Step 157

Dry fit (assemble without gasket maker) the transmission upper case onto the lower case. Make sure the shifter forks align with the synchronizer hubs and the dowel pins align with the holes.



Step 158

Once you are confident the cases will come together properly, remove the upper case.

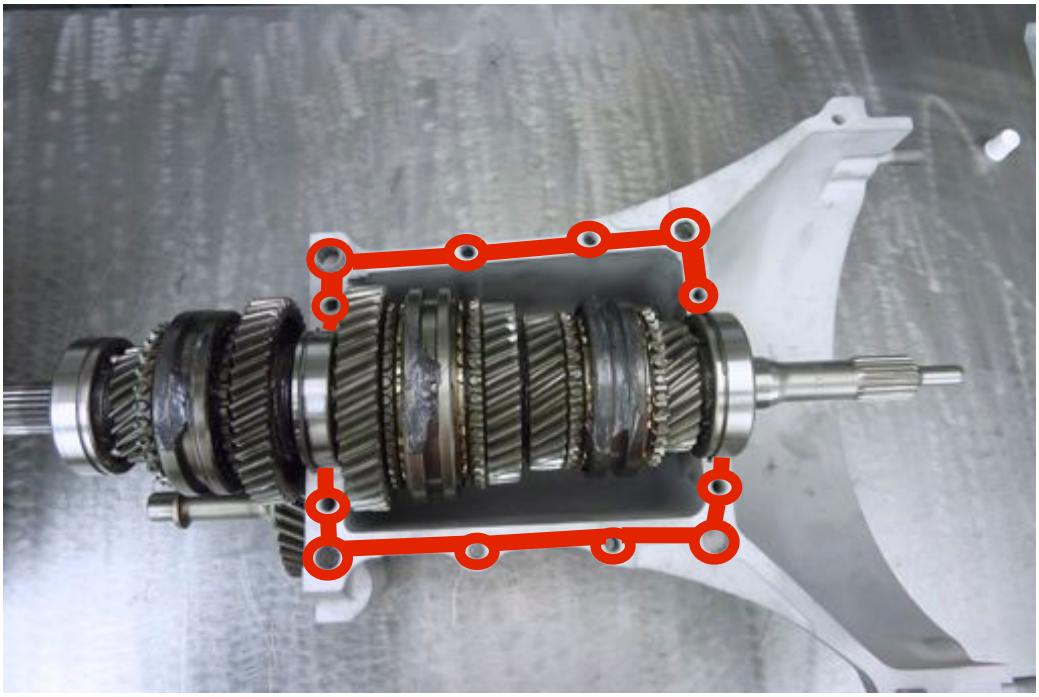


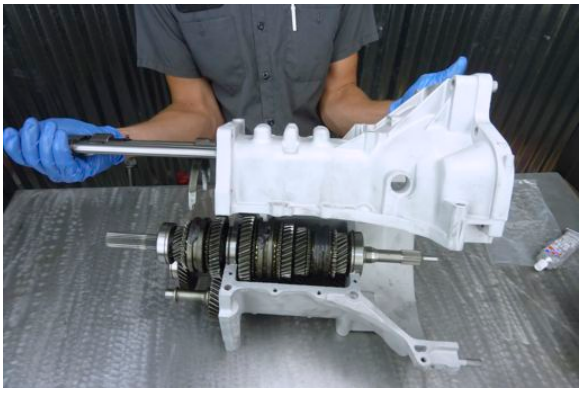
Step 159

Apply a thin layer of Permatex Ultra Gray Silicone Gasket Maker to the lower case as shown in the next Tech Tip

Tech Tip 159

This shows where to apply the gasket maker.





Step 160

Place the upper case back on the lower case as before.

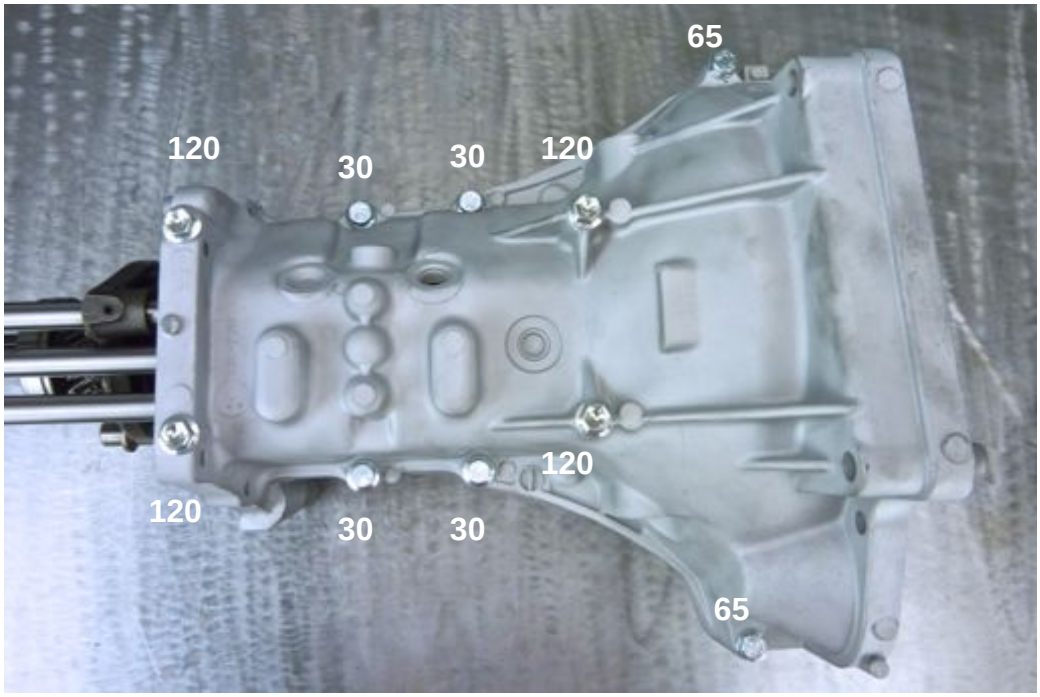
Step 161

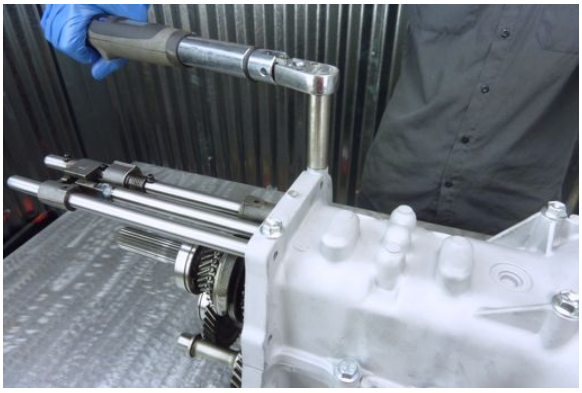
Install the case bolts. See next Tech Tip for bolt size and location.

Tech Tip 161

This shows the bolt size and location

120 = M8X1.25X120mm
65 = M8X1.25X65mm
30 = M8X1.25X30mm



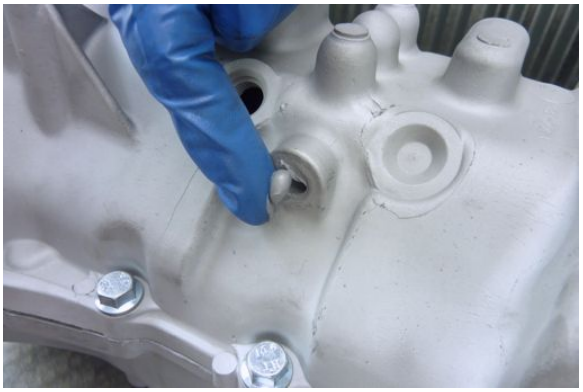


Step 162

Snug all the bolts using a 12mm socket and ratchet.

Step 163

Torque all the bolts using a progressively tighter criss-cross pattern until 15 ft. lbs is reached.



Step 164

Plug this hole with Ultra Gray Silicone Gasket Maker.

Installing the Transmission Extension Case

Step 165

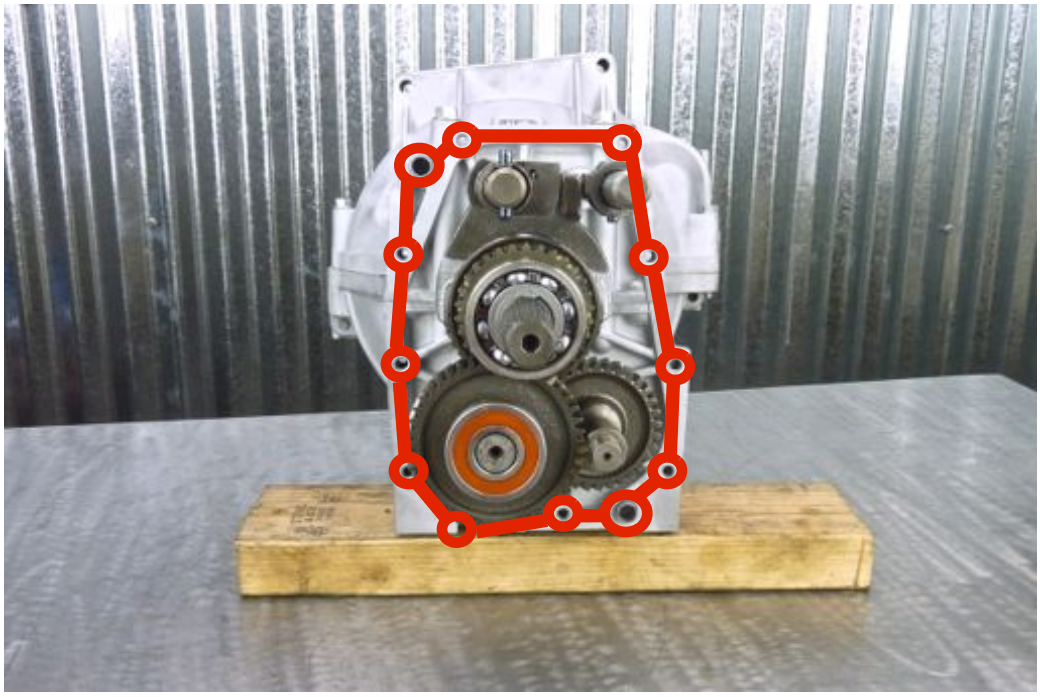
Prop-up the rear of the transmission with a 2X4 as shown.

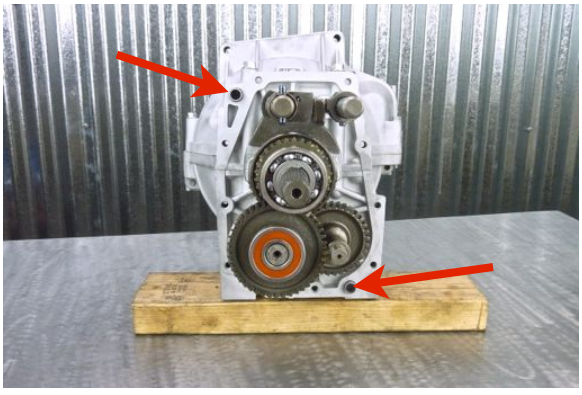
Step 166

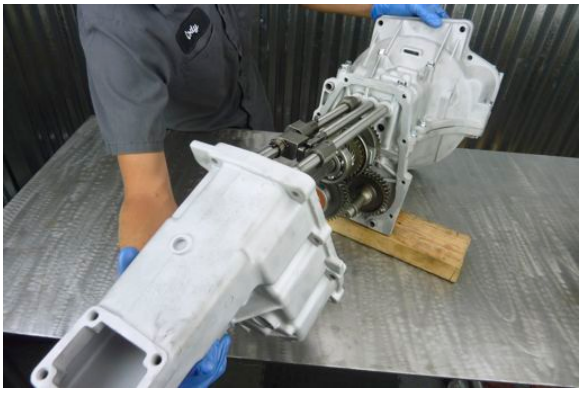
Apply a thin coat of Ultra Gray Silicone Gasket Maker to the transmission case where the extension case will contact. See the next Tech Tip to see where to apply sealer.

Step 167

This shows where to apply the gasket maker.





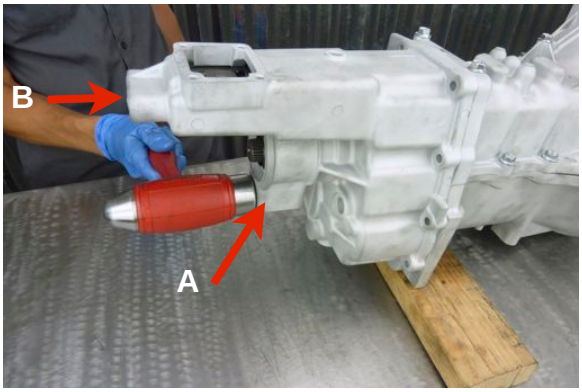


Step 168

Be sure the (2) locating dowels are in place.

Step 169

Begin installing the extension case. Be sure the reverse idler shaft, shifter rods, output shaft, counter shaft bearing and output shaft bearing are all positioned properly.



Step 170

Continue working the extension case into place. You should be able to get the extension case within about 3/4 of an inch by hand.

Step 171

Once you are sure that all the internal parts are positioned properly, tap the extension case at point A. The case should continue moving closer with each tap of the hammer. You may have to tap at point B as well.

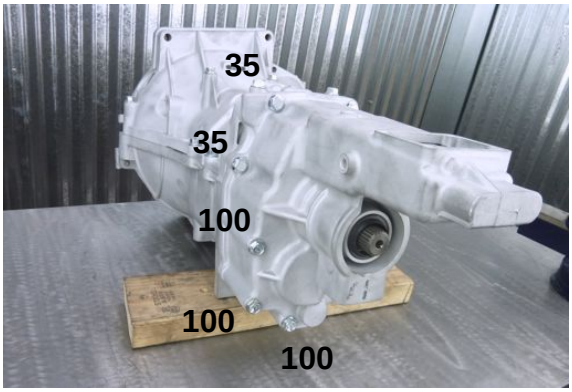
Step 172

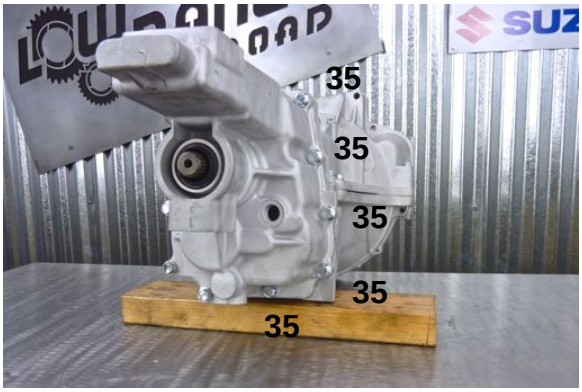
Once the extension case is snug against the transmission case, install the bolts as shown in the next Tech Tip.

Caution: DO NOT draw the extension case in place using the bolts.

Tech Tip 172

This shows the location and size of the bolts.





35 = M8X1.25X35
100 = M8X1.25X100

Step 173

Snug the (10) bolts using a 12mm socket and ratchet.

Step 174

Tighten the (10) bolts using an increasingly tighter criss-cross pattern until 15 ft. lbs. is reached.

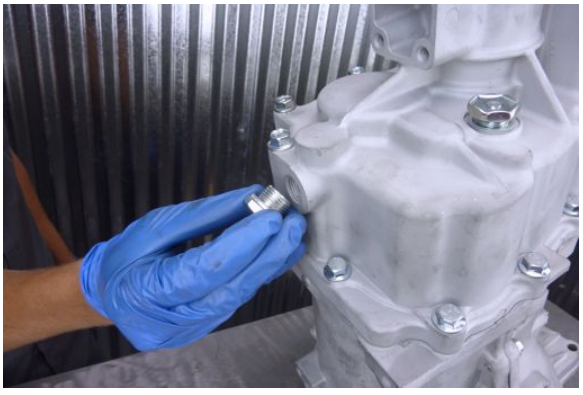
Step 175

Install and torque the reverse gear shift rim bolt to 15 ft. lbs.

Step 176

Install the oil filler plug.

Note: Just hand tight for now.



Step 177

Install the drain plug.

Step 178

Tighten the drain plug using a 24mm socket.

Step 179

Tighten the oil filler plug using a 24mm socket.

Step 180

Apply a small amount of bearing grease to the surface of the input shaft.

Step 181

Apply a thin layer of Ultra Gray Silicone Gasket Maker to the input shaft housing.

Tech Tip 181

This shows where to apply the gasket maker.

Step 182

Install the input shaft housing.

Step 183

Install the input shaft housing bolts.

Note: All 8 bolts are M8X1.25X25.

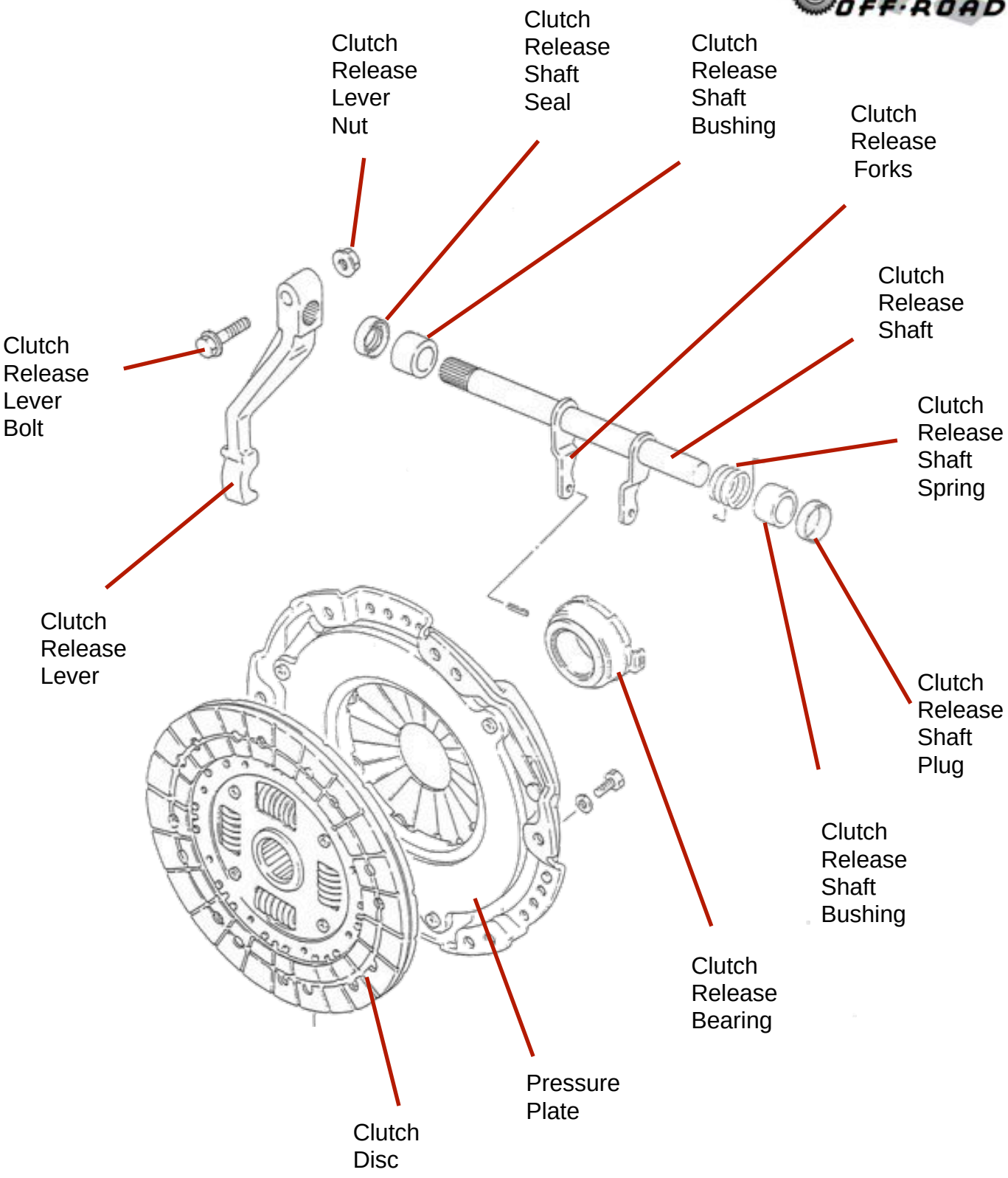
Step 184

Snug the input shaft housing bolts using a 12 mm socket and ratchet.

Step 185

Torque the input shaft bolts in an increasingly tighter criss-cross pattern until you reach 15 ft. lbs.

Clutch Release Parts



Step 186

Install the release lever spring as shown.

Note: Be sure to place the hook over the fork.

Step 187

Install the clutch release shaft, the non spring end first . . . .

Step 188

. . . . and then the other.

Step 189

Position the spring as shown.

Step 190

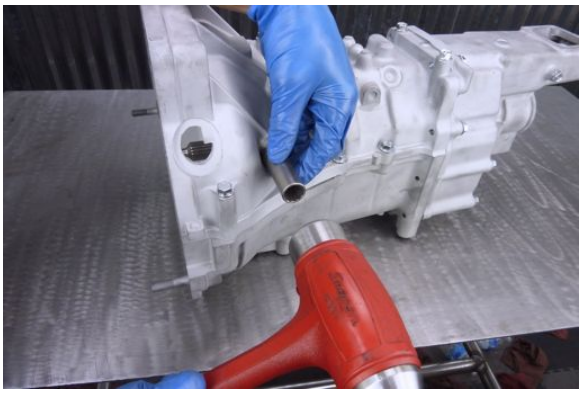
Install the driver side clutch release shaft bushing using a hammer.

Step 190 Continued

Continue driving in the bushing until it is flush with the housing.

Step 191

Insure the release shaft is properly positioned inside the driver side bushing.



Step 192

Continue driving in the bushing until it is about 1/4” inside the case as well.

Step 193

Install the passenger side release shaft bushing.

Step 194

Drive the bushing into place using a 14mm deep socket.

Tech Tip 194

Continue driving the bushing into the case until it is about 1/4” inside the case.

Step 195

Install the release shaft seal.

Step 196

Tap the seal into place using a 14mm deep socket and hammer.

Tech Tip 196

The seal should be flush with the case.

Step 197

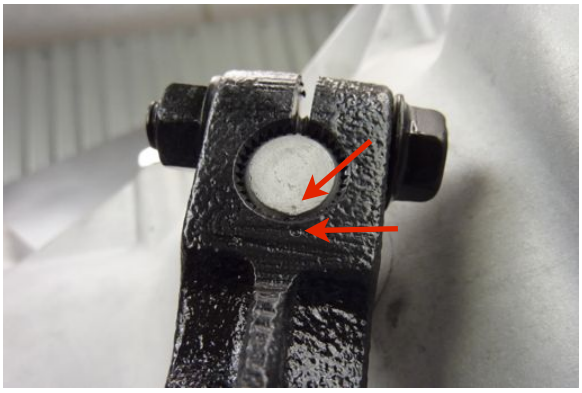
Position the release shaft plug on the driver side as shown.

Step 198

Drive the release shaft plug into place using a 14mm deep socket and hammer.

Tech Tip 198

The plug should be slightly deeper than flush with the case.



Step 199

Install the clutch release lever onto the release shaft.

Note: Be sure the two dots are aligned.

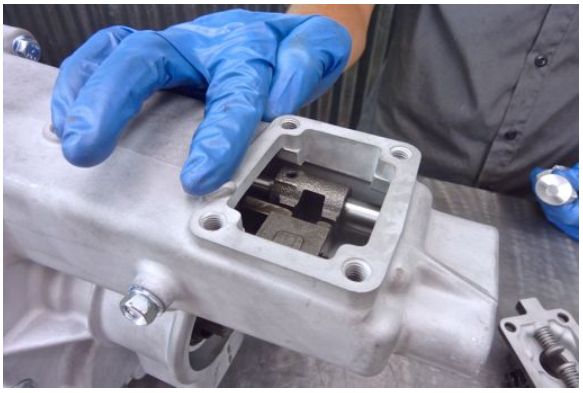
Step 200

Tighten the clutch release lever pinch bolt using a 12 mm socket.

Step 201

Install the Ignition Timing plug.

Installing the Shifter Tower

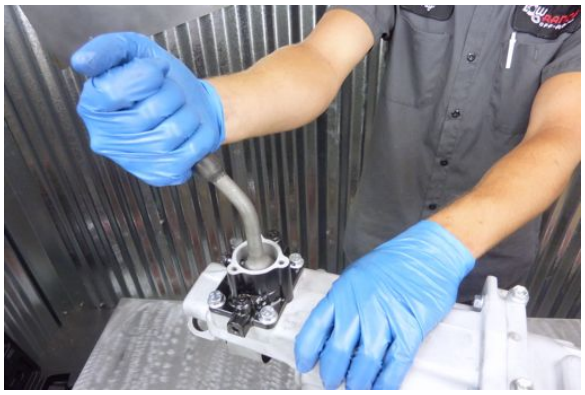


Step 202
Apply a thin coat of Ultra Gray Silicone Gasket Maker where the shifter tower is to be installed.

Step 203
Install the shifter tower.

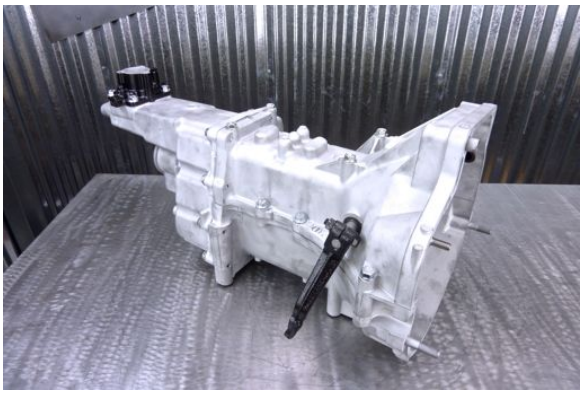
Step 204
Install the (4) shifter tower bolts.

Step 205
Snug these bolts then torque them to 15 ft. lbs.



Step 206

Temporarily install the shift lever and shift the transmission in to all gears.



Conclusion!

This concludes our instructions for rebuilding a Samurai transmission. We hope they have been helpful. If you need help with installing a clutch, transmission, or anything else on your Samurai we invite you to our website . Simply click on the “Instructions” tab and select Samurai.

As always, If you experience any difficulty during the installation of this product please contact Low Range Off-Road Technical Support at 801-805-6644 M-F 7:30am-5:30pm MST. Thank you for purchasing from Low Range Off-Road.

These instructions are designed as a general installation guide. Installation of many Low Range Off-Road products require specialized skills such as metal fabrication, welding and mechanical trouble shooting. If you have any questions or are unsure about how to proceed, please contact our shop at 801-805-6644 or seek help from a competent fabricator. Using fabrication tools such as welders, torches and grinders can cause serious bodily harm and death. Please operate equipment carefully and observe proper safety procedures.

Rock crawling and off-road driving are inherently dangerous activities. Some modifications will adversely affect the on-road handling characteristics of your vehicle. All products sold by Low Range Off-Road are sold for off road use only. Any other use or application is the responsibility of the purchaser and/or user. Some modifications and installation of certain aftermarket parts may under certain circumstances void your original dealer warranty. Modification of your vehicle may create dangerous conditions, which could cause roll-overs resulting in serious bodily injury or death. Buyers and users of these products hereby expressly assume all risks associated with any such modifications and use.