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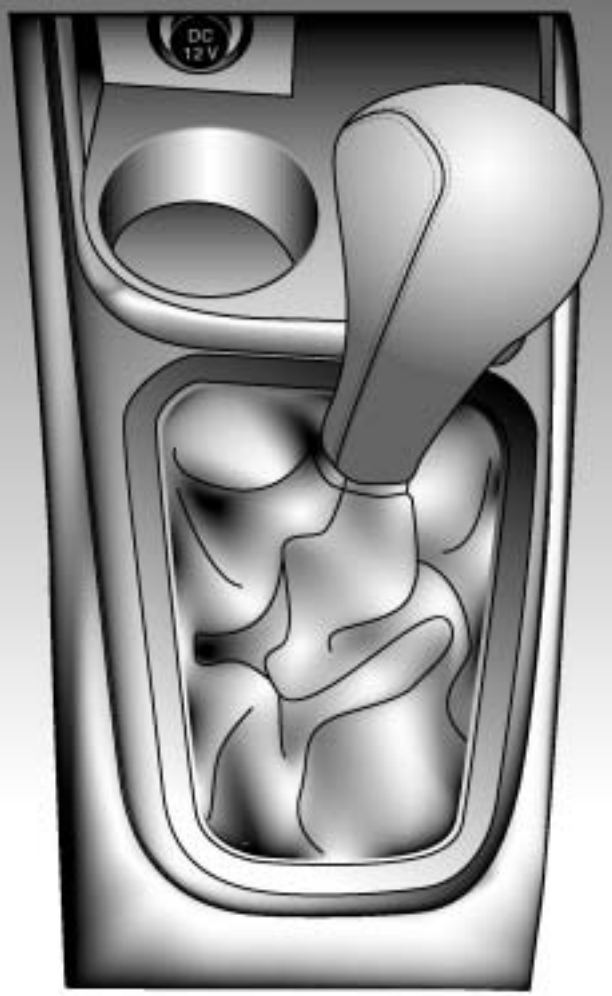
MANUAL TRANSMISSION SERVICE



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MANUAL TRANSMISSION SERVICE
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MANUAL TRANSMISSION SERVICE OBJECTIVES

Upon completion of this traning program, you will be able to:

Given a vehicle with a manual transmission and hydraulic clutch

- Inspect clutch pedal clevis pin movement and pedal travel.
- Inspect and adjust ASCD switch and/or clutch pedal stop.
- Properly bleed any air from the clutch hydraulic system.

Given a FS5R30A 5-speed manual transmission (Required for Nissan Technicians and Optional for Infiniti Technicians)

- Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections, documenting which components require replacement.
- Using puller kit J39856, disassemble shift components and gear assemblies, noting any components which require replacement.
- Reassemble the mainshafts and countershafts into the adapter plate.
- Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.
- Bench shift the transmission, verifying shift into all gears.

Given a FS6R31A 6-speed manual transmission (Required for all technicians)

- Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections, documenting which components require replacement.
- Disassemble shift components and gear assemblies, noting any components which require replacement.
- Reassemble the mainshafts and countershafts into the adapter plate.
- Measure and adjust gear endplays if necessary.
- Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.
- Bench shift the transmission verifying shift into all gears.

Given a RS5F51A 5-speed manual transmission (Required for Nissan Technicians and Optional for Infiniti Technicians)

- Disassemble the transmission case halves, perform necessary gear inspections, documenting which components require replacement.
- Disassemble gear assemblies, noting any components which require replacement.
- Perform endplay and preload measurements, selecting correct shims.
- Reassemble gear assemblies and case halves.

Given a RS5F70A 5-speed manual transmission (Optional for Nissan Technicians, required for Infiniti Technicians)

- Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections, documenting which components require replacement.
- Remove shift components and gear assemblies from clutch housing.
- Inspect the final drive pinion and side gears.
- Identify shim size and placement.
- Measure final drive side bearing preload and determine shim size. Determine correct final drive turning torque.
- Reassemble gear assemblies, shift components and case halves.
- Bench shift the transmission verifying shift into all gears.

Given a RS6F51A/H 6-speed manual transmission (Required for Nissan Technicians and Optional for Infiniti Technicians)

- Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections, documenting which components require replacement.
- Disassemble shift components and gear assemblies, noting any components which require replacement.
- Reassemble the mainshafts and countershafts into the adapter plate.
- Measure and adjust gear endplays if necessary.
- Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.
- Bench shift the transmission verifying shift into all gears.

TEXT

MANUAL TRANSMISSION SERVICE

Introduction

Internal combustion engines develop very little torque or power at low rpm. This is especially obvious when you try to start out in direct drive, 4th gear in a 4-speed or 5th gear in a 6-speed manual transmission -- the engine stalls because it is not producing enough torque to move the load.

Manual transmissions have long been used as a method for varying the relationship between the speed of the engine and the speed of the wheels. Varying gear ratios inside the transmission allow the correct amount of engine power to reach the drive wheels at different engine speeds. This enables engines to operate within their power band.

A transmission has a gearbox containing a set of gears, which act as torque multipliers to increase the twisting force on the driveshaft, creating a "mechanical advantage", which gets the vehicle moving.

From the basic 4 and 5-speed manual transmission used in early Nissan and Infiniti vehicles, to the state-of-the-art, high-tech six speed transmission used today, the principles of a manual gearbox are the same. The driver manually shifts from gear to gear, changing the mechanical advantage to meet the vehicles needs.

Nissan and Infiniti vehicles use the constant-mesh type manual transmission. This means the mainshaft gears are in constant mesh with the counter gears. This is possible because the gears on the mainshaft are not splined/locked to the shaft. They are free to rotate on the shaft. With a constant-mesh gearbox, the main drive gear, counter gear and all mainshaft gears are always turning, even when the transmission is in neutral.

Transmission Designation

Each transmission has its own unique designation. A front wheel drive designation always begins with **RS** and a rear wheel drive designation always begins with **FS**. Each designation goes as follows:

Front Wheel Drive
RS6F51A or H

RS = Remote Shift

6 = 6 Forward gears

F = Front drive

51 = Model designation

A = Standard final drive

H = Helical type limited slip final drive

Rear Wheel Drive
FS6R31A

FS = Fixed Shift

6 = 6 Forward gears

R = Rear drive

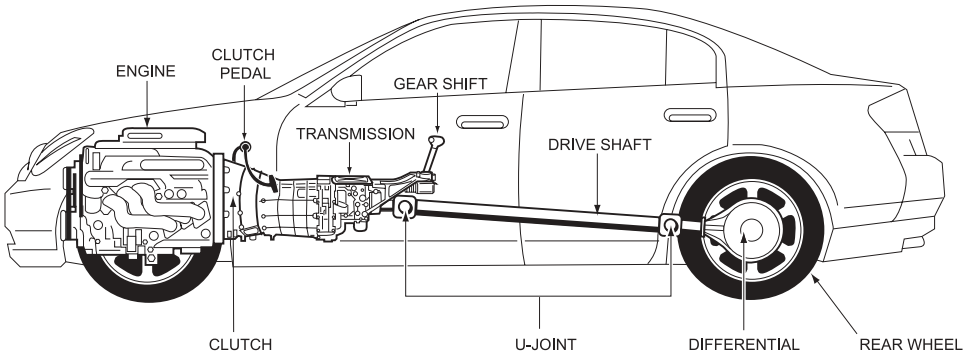
31 = Model designation

A = Version

Note: The letter V on some front drive transmissions indicates a viscous coupling, limited slip final drive.

Unit Operation

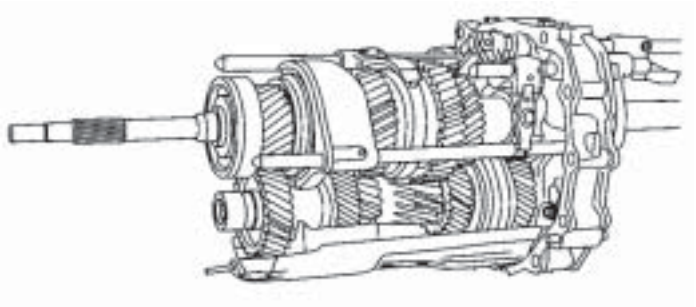
Engines have a maximum rpm value. The transmission allows the gear ratio between the engine and the drive wheels to change as the car speeds up and slows down. The driver shifts gears so the engine stays below the rpm band of its best performance.



Input Shaft, Counter Shaft and Output Shaft

The input shaft is in constant mesh with the clutch disc. In other words, the clutch disc drives the input shaft. When the clutch is engaged, the input shaft continually turns whether the car is moving or not. The input shaft in turn drives the counter shaft. Whenever the input shaft turns, the counter shaft rotates as well. When a gear is selected, the counter shaft then turns the output shaft, which is connected to the drive shaft or drive axle.

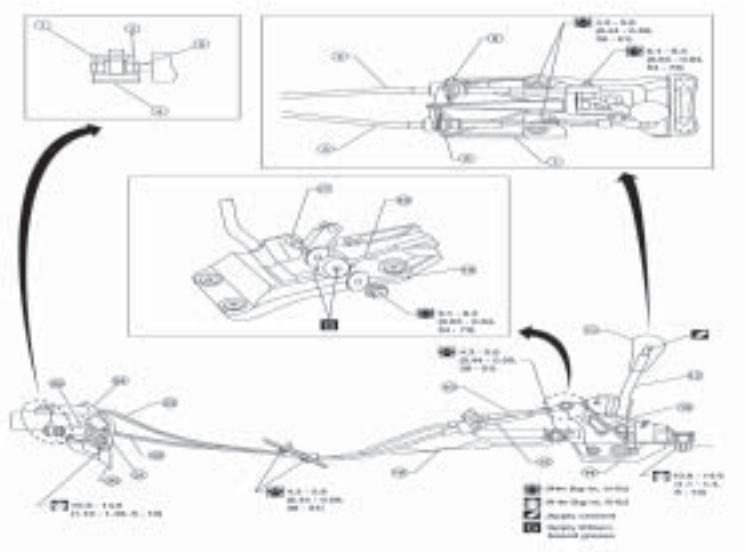
The output shaft only turns when the vehicle is moving.



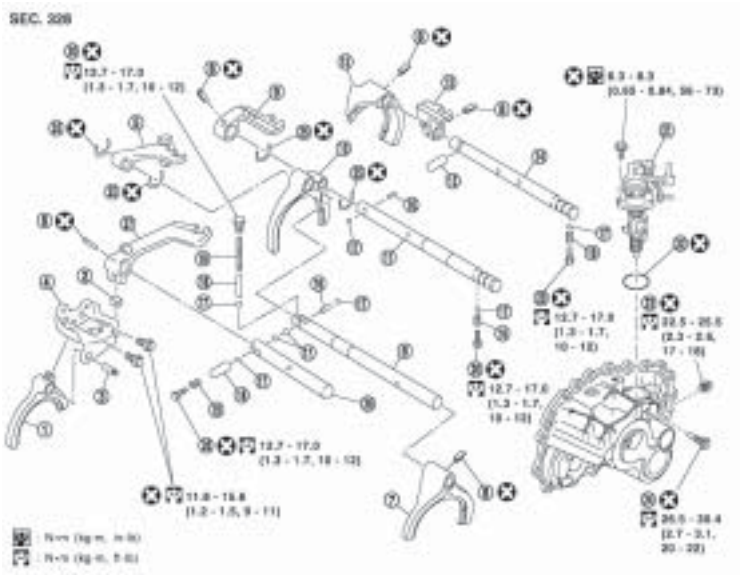
Shift Lever

Using the gearshift, the driver selects the desired gear for the driving condition.

The gearshift or shift lever connects the transmission using either a shift rod or shift cables. The shift rod or cables move the internal shift rods.



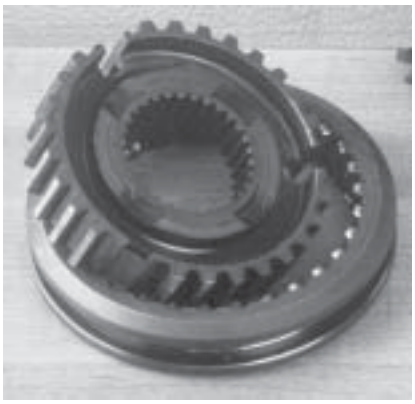
This slides the shift fork, which is attached to the coupling sleeve.



The shift fork could be compared to an oarlock on a rowboat. Moving the shift fork engages the selected gear.

Before a shift takes place it's necessary to synchronize the rotating speeds of the transmission elements.

Having the hub splined to the shaft and the coupling sleeve splined to the hub does this.



Forward Gears

The transmission changes the ratio of the engine speed and the wheels by connecting gears in various combinations.

For strength and quiet operation, all forward gears are helical cut. The helical cut distributes the force more evenly across the gear face.

Gear Ratio

Anytime rotational motion takes place, gears are used to maintain a rotational speed.

Gears are used to:

- Increase or decrease the speed of rotation
- Reverse the direction of rotation
- Keep the rotation of two axes synchronized
- Amplify torque

In the above figure, two gears rotate in opposite directions with the smaller gear rotating at two to three times the speed of the larger gear. The fact that one gear spins twice as fast as the other is due to the gear ratio.

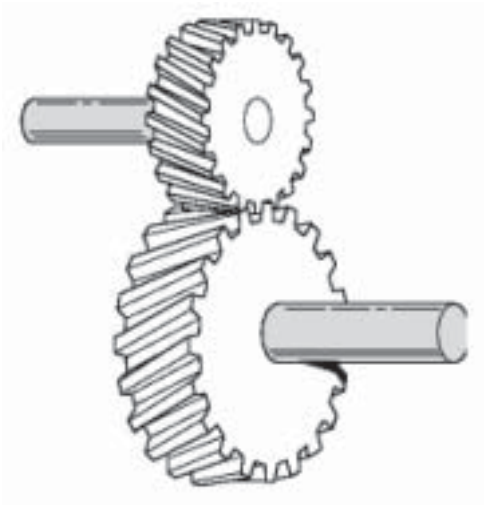
The diameter of the gear on the left is approximately three times that of the gear on the right. The gear ratio is therefore 3:1.

If both gears have the same diameter, they would rotate at the same speed (1 to 1) in opposite directions.

Transmission gears have teeth rather than smooth edges. The teeth have three advantages:

1. They prevent slippage between the gears.

2. They make it possible to determine exact gear ratios.



Counting the teeth in the gears and then dividing the number of teeth in the larger gear by the number of teeth in the smaller gear determines the gear ratio. One example of this would be 60 teeth on one gear and 20 on the other. The gear ratio when these two gears are connected together is 3:1.

3. The teeth make it so that slight imperfections in the actual diameter and circumference of two gears don't matter. The number of teeth control the gear ratios even if the diameters are a bit off.

Transmission gear ratios for each gear are determined by the need of the vehicle. Lower gears have higher gear ratios (6 to 1), which improve the performance off the line. Higher gears have lower ratios (2 to 1) for improved fuel economy at higher speeds.

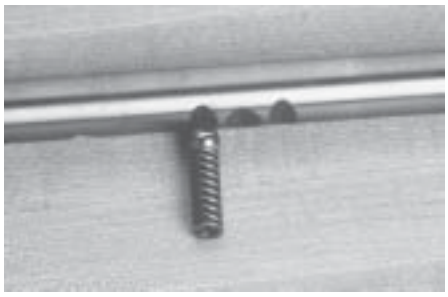
Note: Gear ratios take into consideration the final drive when determining the total gear ratio.

Internal Components

Check Balls and Springs

The check balls and springs serve several purposes. First, they prevent the transmission from engaging two gears at one time. The detent or cutout in the shift rod blocks out any other rod once the shift rod begins moving. The check ball fits into the cutout or detent in the shift rod.

Second, they assist in keeping the transmission gear engaged once it's been selected.



Third, a straight, un-scored and properly aligned shift rod assists with smooth engagement of each gear.

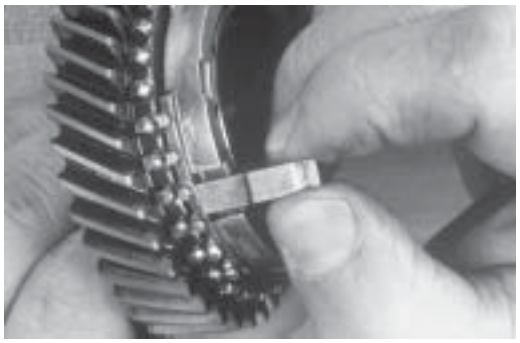
The check ball and detent in the shift rod hold the shift rod in neutral or in gear because of spring pressure applied to the ball by the check spring.

Synchronizer Hub, Coupling Sleeve, Shift Inserts, and Baulk Rings

Before a shift takes place, it is necessary to synchronize the rotating speeds of the transmission elements being joined. Where each gear on the mainshaft spins freely;

- The synchronizer hub is splined directly to the shaft and the coupling sleeve is splined to the synchronizer hub.

- The external splines on the hub provide a sliding surface for the coupling sleeve splines as well as lock the sleeve to the hub.
- When a shift is complete, the coupling sleeve is engaged to the gear beveled teeth. This locks the gear to the shaft through the synchronizer hub.

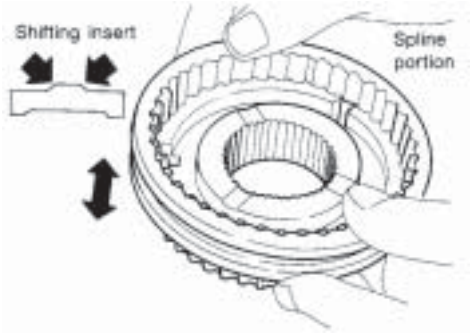


- Most synchronizer hubs, coupling sleeves and shift inserts serve a dual purpose. The coupling sleeve pushes against the shift insert, which pushes against the baulk ring. The baulk ring slows down or speeds up the spinning gear, which enables the coupling sleeve to lock the gear to the shaft. When shifting to the next gear, the driver moves the shift lever, which in turn moves the shift fork and coupling sleeve, unlocking one gear, then passing through a neutral position and locking another gear on the opposite side of the hub and coupling sleeve.

The baulk ring is made of a softer material such as brass or iron. It's designed to slow down or brake the selected gear during up-shifts and speed up the selected gear during down-shifts.

Each coupling sleeve has three shift inserts which are held in place with either a coil spring or a spread spring. During the shift;

- The insert presses the baulk ring up against the selected gear's braking surface.

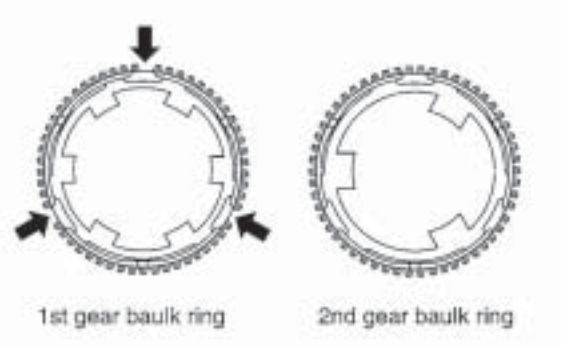


- This slows the gear down sufficiently so a smooth shift takes place. When down shifting, the insert presses the baulk ring against the selected gear, matching gear speed to output shaft speed.

Note: Coupling sleeves and hubs can be directional. Use the service manual and verify proper direction on reassembly.

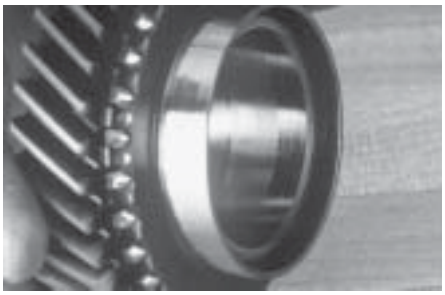
Double and Triple Cone Baulk Rings

A double cone or triple cone synchronizer is utilized in cases where there are high demands for performance and/or reduction of gear shifting force. These are normally installed on 1st and 2nd gears. The double and triple cone synchronizers use two and three times the 'braking' surface of a normal baulk ring.



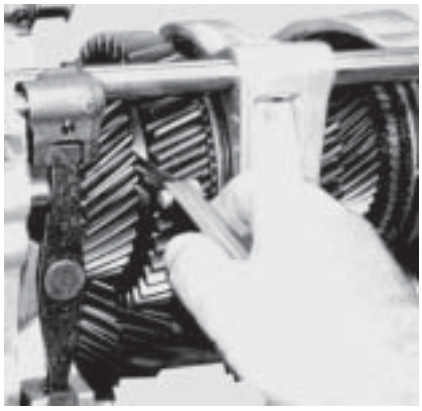
Main Gears

As mentioned earlier, transmission forward gears are a helical cut design. Not only are they helical cut, they have beveled teeth machined into the face of the gear. This enables the coupling sleeve a surface, which it can engage and readily lock onto.



Gear Endplay

Designed into each gear is a specified endplay. Endplay is defined as the clearance between the gear and the collar on the shaft or two gears. Endplay or clearance between the gears allows for lubrication of the two components.



Too much endplay could create unusual noises, difficulty in shifting, jumping out of gear, or difficulty in taking the transmission out of a particular gear.

Insufficient endplay could result in noise, wear or even binding. This could also create the effect of being in two gears at one time.

The gear endplay should be measured prior to disassembly and reassembly of a transmission.

Reverse Gears

The output shaft and counter shaft each contain a reverse gear. When a vehicle moves forward, the counter shaft and mainshaft spin in opposite directions. The shaft rotation speed depends on the engine rpm and selected gear.

When the vehicle is standing still and reverse is selected, the reverse gear on the output shaft engages the idler gear. This causes the output shaft to spin in the reverse direction, allowing the vehicle to back up.

Bearings

Bearings reduce friction by providing smooth metal balls or rollers, and a smooth inner and outer metal surface for the balls to roll against. These balls or rollers "bear" the load, allowing the device to spin smoothly.

The bearings used in the transmission support the input, countershaft and output shafts. On front wheel drive vehicles bearings also support the final drive.

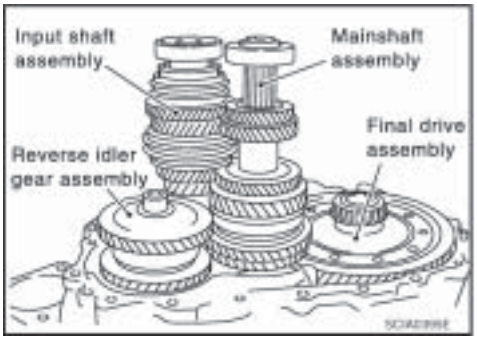
Whether the transmission is front wheel drive or rear wheel drives determines which types of bearings are used. Rear wheel drive transmissions use primarily a caged ball bearing.

Front wheel drive manual transmissions use a combination of both the caged ball bearing and a tapered bearing. The tapered bearing is used so a preload can be added to the shaft during assembly and overhaul.

Tapered bearings have a calculated amount of tension or preload applied to them. Too much preload causes the bearing to overheat. Too little preload causes the bearing to wobble inside the bearing outer race. Both conditions cause premature bearing failure.

Front Wheel Drive Final Drive

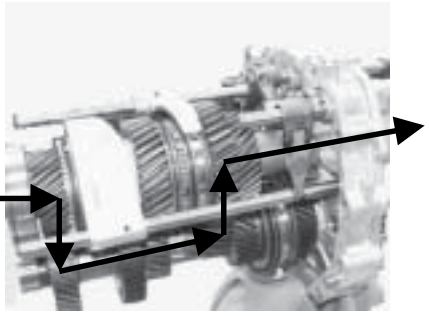
Front wheel drive vehicles are completely self-contained. Within the transmission case is the differential or final drive. The transmission mainshaft is in constant mesh with the final drive ring gear. The output gear turns the ring gear and final drive assembly, thereby turning the drive axle shaft, which is attached to the wheels.



The final drive is a conventional arrangement of gears that divide the torque between the drive axle shafts. The final drive consists of a set of four gears. Two are called final drive side gears, and two are final drive pinion gears. Each side gear is splined to a drive axle shaft, which must turn when its side gear rotates.

Power Flow

The function of any transmission is to transfer power from the engine to the drive wheels. Lower gear ratios in the transmission serve as torque multipliers and assist the engine develop enough power to accelerate from a standstill. The input shaft drives the counter shaft. When the shift-coupling sleeve locks one gear to the mainshaft, then the output shaft spins at a rate equivalent to the ratio of the gearing.

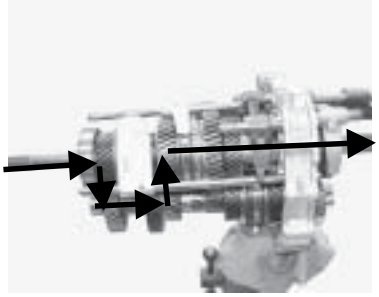


The torque multiplication comes into play when looking at the twisting force on the driveshaft to get the vehicle moving. For example, a first gear ratio of 3.794:1 and an engine which produces 274 lb.-ft of torque will put around 1039 lb.-ft. of twisting force onto the driveshaft (274 lb.-ft. x 3.794 = 1039.5 lb.-ft.). In first gear, the engine's torque is multiplied or increased 3.794 times.

The higher the ratio (6 to 1), the more torque; but the slower the drive wheels turn.

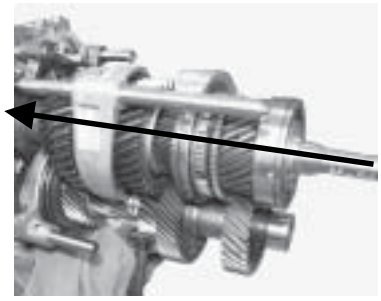
First gear connects the engine power to the drive wheels via a pair of reduction gear sets, which gives increased power and reduced wheel speed when the car begins moving.

In 1st gear the engine turns at a much higher rpm than the transmission output shaft.



Conversely, the same thing occurs in each of the other gears. 2nd gear in a 6-speed rear wheel drive transmission multiplies the torque 2.324 times. Fifth gear has a gear ratio of 1.00:1. This means there is no torque multiplication. The output shaft turns at the exact same rpm as the input shaft.

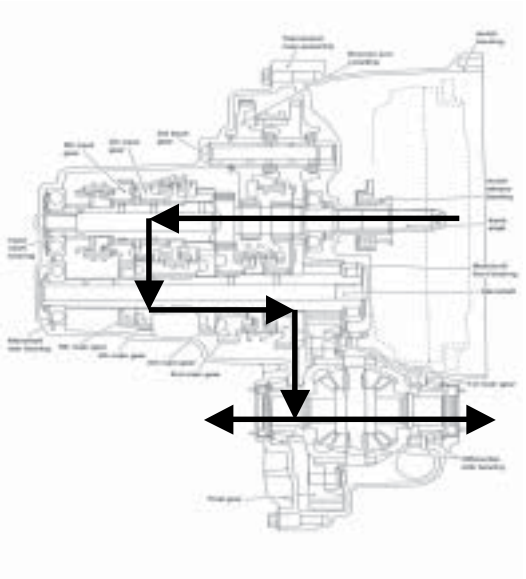
When sixth gear is selected the ratio is less than 1.00:1. In actuality, the output shaft turns at a higher rate of speed than the input shaft.



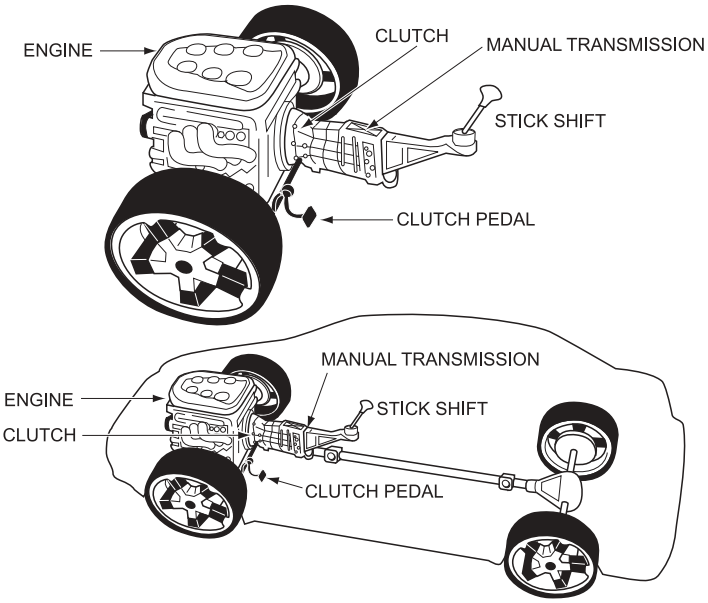
Note: When cruising at high speeds, torque multiplication isn't necessary. On a five-speed manual transmission, 4th gear is 1.00:1. Some FWD transmissions such as the 6-speed Sentra and Maxima don't use a 1.00:1 ratio in 4th or 5th gear.

Power Flow Front Wheel Drive

Power flow through a front wheel drive is almost the same as a rear wheel drive transmission. The exceptions are the layout of the main and countershafts along with the final drive housed with the transmission components. On front wheel drive transmissions, the mainshaft becomes the input shaft and the countershaft becomes the mainshaft. The illustration below shows the power flow through 4th gear on the RS5F51A transmission.



Clutch Operation and Assembly

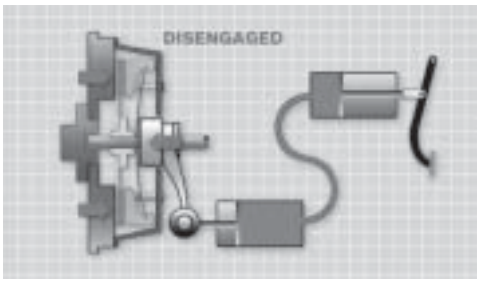


For ease of driving in all conditions and speeds, all manual transmissions require the use of some type of clutch. The clutch is used for disengaging the engine from the transmission.

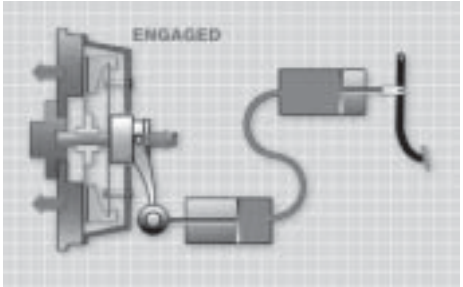
Clutches are used in devices with two rotating shafts. In these devices, a motor or pulley typically drives one shaft, and the other shaft drives another device. In the case of the motor vehicle it is either a driveshaft, rear drive, or drive axle, front drive. The clutch connects the two shafts so that they can either be locked together and spin at the same speed, or be disconnected and spin at different speeds.

When the engine is running, the flywheel and clutch are constantly spinning, but the drive wheels aren't. In order for a car to come to a complete stop without stalling the engine, the wheels need to be disconnected from the engine. The clutch connects and disconnects the engine from the transmission during start up and shifting. The clutch allows a smooth engagement between a spinning engine and a non-spinning transmission.

The flywheel and clutch cover or pressure plate are both connected directly to the engine, while the clutch disc is connected to the transmission through the input shaft.



When the clutch pedal is pressed, a cable or hydraulic piston pushes on the release fork, which presses the throw-out bearing against the middle of the diaphragm spring. As the middle of the diaphragm spring is pushed in, a series of pins near the outside of the spring causes the spring to pull the pressure plate away from the clutch disc. This releases the clutch from the spinning engine.



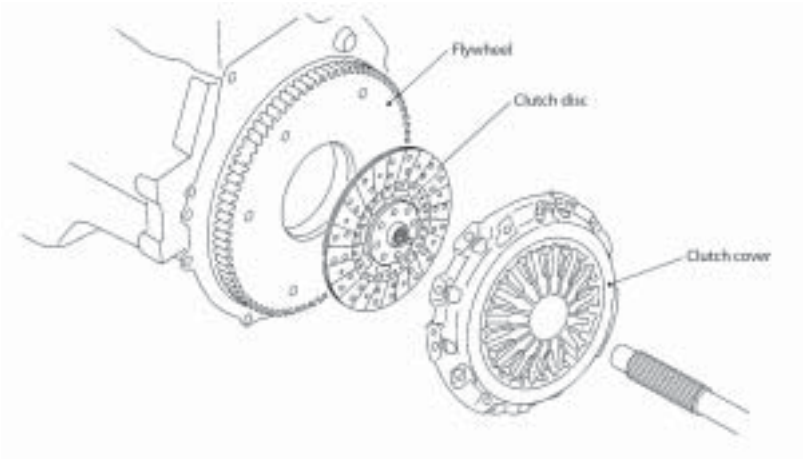
The clutch applies and removes engine torque from the input shaft.

When the clutch pedal is released, the springs push the pressure plate against the clutch disc, which in turn presses against the flywheel. This locks the engine to the transmission-input shaft, causing the engine and transmission input shaft to spin at the same speed.

Note the springs in the clutch disc; these springs help to isolate the transmission from the shock of the clutch engaging. The lines cut in the disc assist in breaking any vacuum that could cause the disc to stick to the flywheel or pressure plate.

Flywheel

The flywheel is a fairly large wheel that is attached to the crankshaft. It provides the momentum to keep the crankshaft turning between cylinder firings.



The flywheel is the base for the entire clutch attachment. The side of the flywheel where the clutch attaches is a smooth surface, which is used for friction between the flywheel and pressure plate. The clutch disc is sandwiched in between the pressure plate and flywheel. A bushing called the "pilot bushing" is installed in a hole in the center of the crankshaft. The bronze bushing is used to support the end of the input shaft on rear-wheel drive manual transmissions.

Around the flywheel is the ring gear, which the starter motor engages. The ring gear then mechanically turns the engine when the ignition key is turned to the start position.

Dual Mass Flywheel and Clutch

Starting in 2002, the QR25 and VQ35DE engines began using a newly designed "Dual Mass Flywheel." Design of the dual mass flywheel reduces drivetrain noise and vibrations.

This flywheel design removes the dampening springs from the clutch disc and incorporates an arc spring directly into the flywheel.

When removing the dual mass flywheel from the QR25 motor, it's necessary to use the Torque Plus - T50 tool.

Note: Refer to the appropriate service manual and ASIST for the correct procedures associated with testing the flywheel rotation movement anytime the clutch is replaced or the flywheel is removed from the engine.

When reinstalling the flywheel on the VQ35 engine, pay close attention to the flywheel alignment dowel pin location. Incorrect flywheel installation will result in a no-start condition or a rough running engine. The crank position sensor identifies TDC from the flywheel and crank position sensor. (May/June 2002 Tech Talk pg. 13 and S.I.R. volume 102 contain additional information on flywheel indexing.)

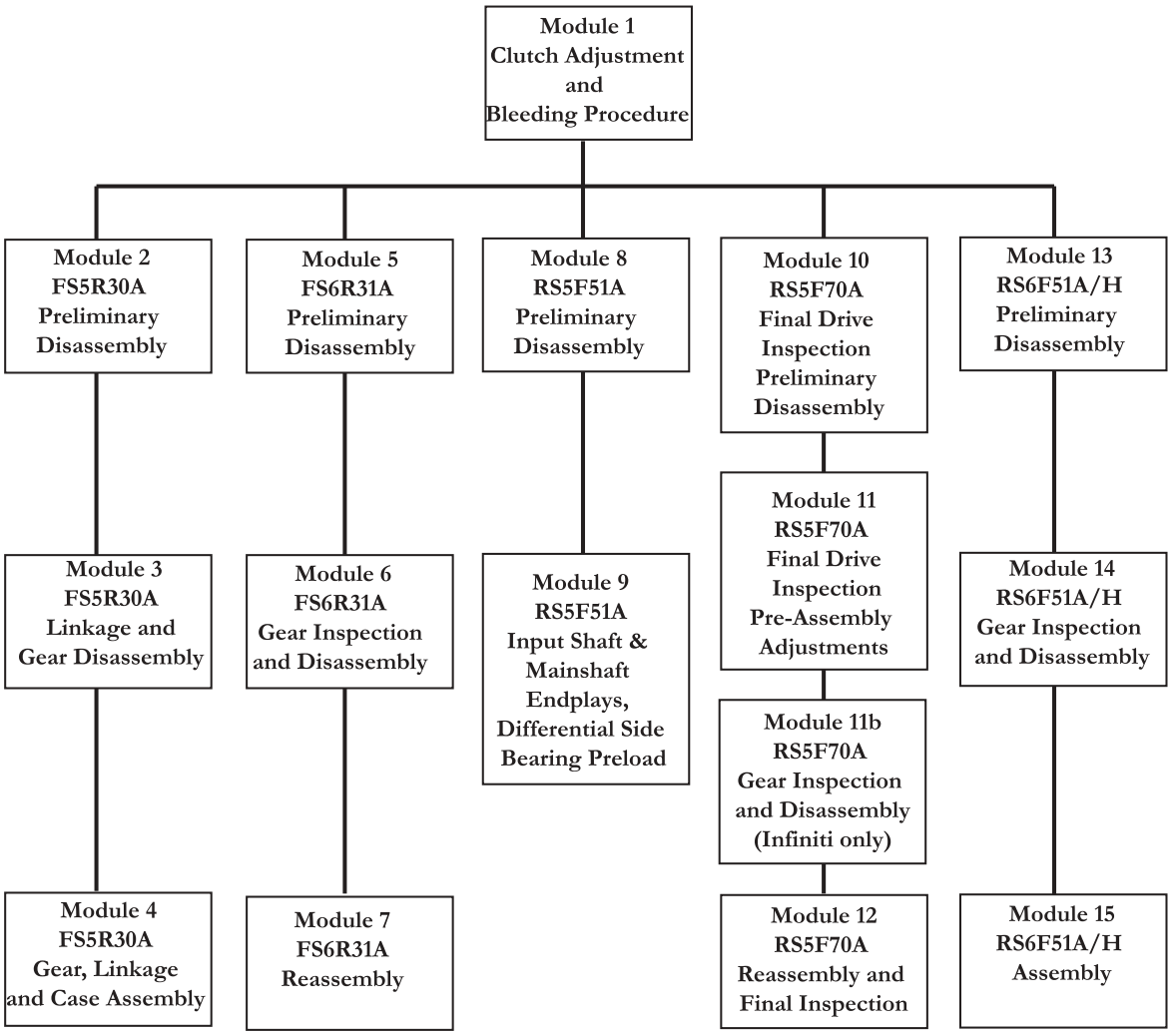
MODULES

Date of Class _____

MANUAL TRANSMISSION SERVICE SIGN-OFF SHEET

WORKSHEET	TITLE	INSTRUCTOR
Module 1	Clutch Adjustment and Bleeding Procedure	
Module 2	FS5R30A Preliminary Disassembly	
Module 3	FS5R30A Linkage and Gear Disassembly	
Module 4	FS5R30A Gear, Linkage and Case Assembly	
Module 5	FS6R31A Preliminary Disassembly	
Module 6	FS6R31A Gear Inspection and Disassembly	
Module 7	FS6R31A Reassembly	
Module 8	RS5F51A Preliminary Disassembly	
Module 9	RS5F51A Input Shaft, Mainshaft and Reverse Gear Endplay	
Module 10	RS5F70A Final Drive Inspection Preliminary Disassembly	
Module 11	RS5F70A Final Drive Inspection Pre-Assembly Adjustments	
Module 11b	RS5F70A Gear Inspection and Disassembly	
Module 12	RS5F70A Reassembly and Final Inspection	
Module 13	RS6F51A Preliminary Disassembly	
Module 14	RS6F51A or RS6F51H Gear Inspection and Disassembly	
Module 15	RS6F51A or RS6F51H Assembly	

MANUAL TRANSMISSION SERVICE COURSE MAP



CLUTCH ADJUSTMENT AND BLEEDING PROCEDURE

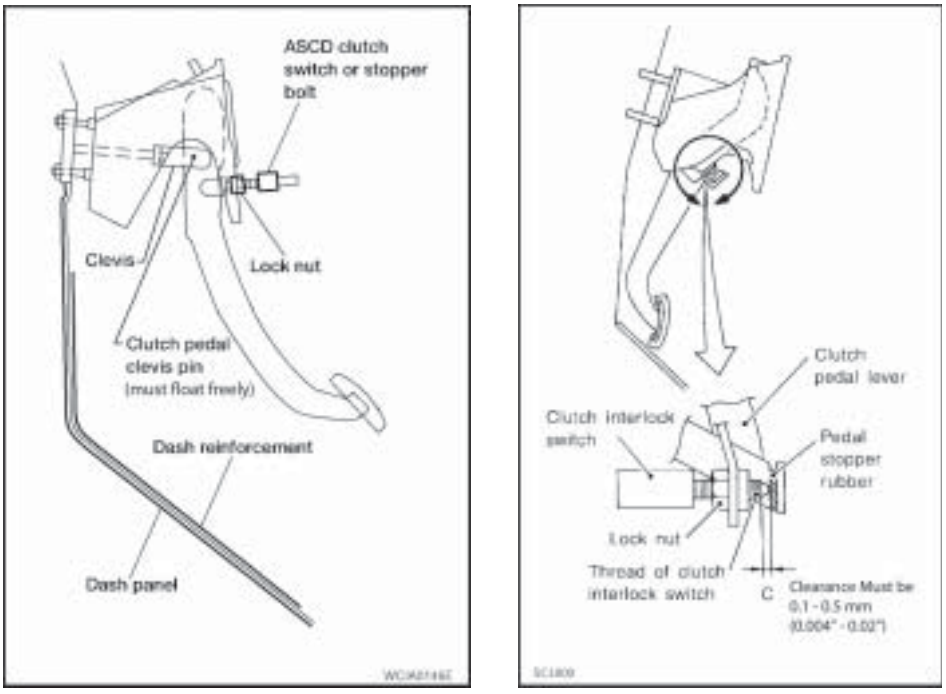
Objective: Given a vehicle with a manual transmission, inspect clutch pedal clevis pin movement and clutch pedal travel. If necessary, adjust Automatic Speed Control Device (ASCD) switch or clutch pedal stop, correctly bringing all clearances into specification. Properly bleed any air from the clutch hydraulic system.

Relevance: Understanding which components to adjust saves time when it comes to clutch adjustment and when performing service work and transmission repair.

Resources:

- 2002 or later manual transmission vehicle
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- TSB NTB02-025 2002 Altima: Clutch Adjustment
- Technician gloves

Skill Check: Properly adjust the ASCD switch or clutch pedal stop. If necessary, bleed the clutch hydraulic system of any air.



Clutch Interlock Adjustment

1. Vehicle model year _____
   Vehicle model _____

2. Locate and print the page in the ESM that contains information for Clutch Pedal Inspection and Adjustment.

3. Are any service bulletins stored in ASIST that relate to the clutch system for the vehicle you are inspecting?

   YES / NO *(Circle one)*

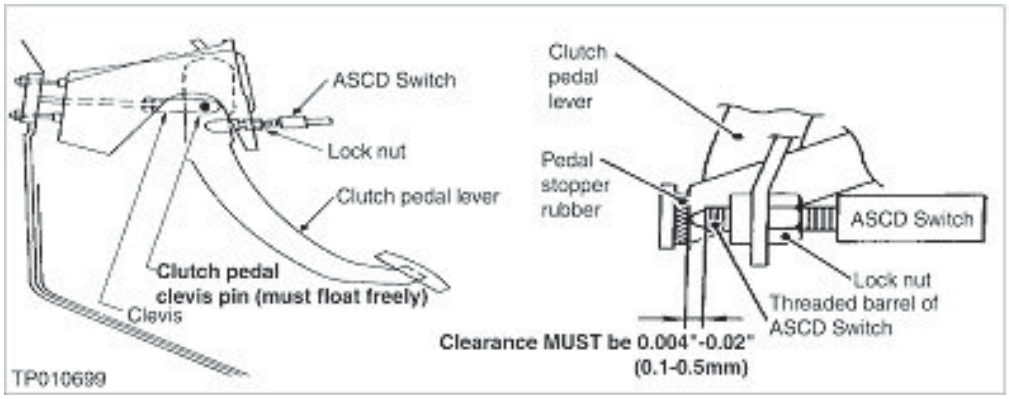
4. If yes, print those bulletins which contain information on this procedure.

5. Inspect the clutch pedal clevis pin as described in the TSB and service manual. Inspect the clevis pin and indicate if it floats freely in the bore of the clutch pedal.

   Floats freely / Binding *(Circle one)*

6. Which component should be adjusted first to remove any binding in the clutch pedal clevis pin?

_____



ASCD Switch or Clutch Stopper Adjustment

7. If necessary, adjust the ASCD switch or pedal stopper so the clutch pedal clevis pin floats freely in the bore.

8. Reinspect the clutch pedal clevis pin as described in the TSB and service manual and indicate if it now floats freely in the bore of the clutch pedal.

Floats freely / Binding *(Circle one)*

9. According to the TSB and service manual, what would be the next step if the clutch pedal clevis pin continues to show signs of binding?

_____

_____

_____

_____

_____

10. Measure the clearance between the clutch interlock switch and the pedal rubber stopper. Is the clearance within specification?

    YES / NO *(Circle one)*

11. If no, adjust the clearance.

12. After adjusting clearance "C", verify the engine restarts with the clutch pedal depressed.

Training Tip:

- The clutch pedal clevis pin must float freely in the clevis and clutch pedal bore. This helps ensure the clutch master cylinder is fully retracted.
- Full retraction ensures that the pressure side of the plunger is opened to the oil reservoir in the master cylinder and can maintain a full oil charge for the next clutch pedal stroke.
- A full oil charge guarantees complete disengagement (release) of the pressure plate.
- Complete disengagement ensures the pressure plate produces enough return force to overcome the clutch pedal assist spring force and any pedal friction. This ensures the master cylinder fully retracts.

Note: Some clutch systems require adjusting the clutch cable. Always refer to the appropriate service manual for the latest clutch adjustment information.

Clutch Hydraulic System Bleeding Procedure

13. Where do you find information for bleeding air from the clutch hydraulic system?

    _____

14. Is there more than one area on this vehicle requiring bleeding?

    YES / NO *(Circle one)*

15. Which items require bleeding? *(Check one)*

    ☐ Clutch master cylinder

    ☐ Clutch operating cylinder

    ☐ Air bleeder valve

16. List the order that should be followed to bleed the clutch system.

    _____ Clutch master cylinder

    _____ Clutch operating cylinder

    _____ Air bleeder valve

17. Inspect the clutch hydraulic system for the following items before bleeding:

    - Able to fully disengage clutch?

      YES / NO *(Circle one)*

    - Pedal stays to floor?

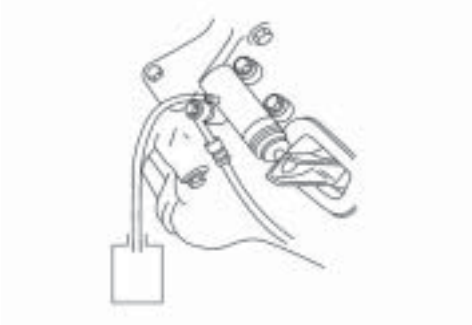
      YES / NO *(Circle one)*

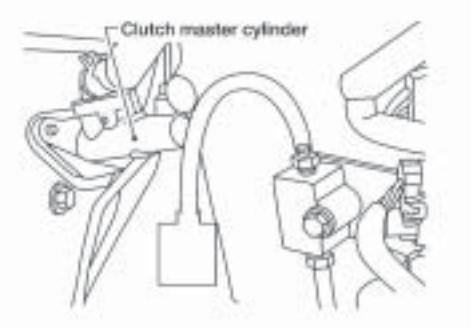
    - Clutch pedal feels mushy?

      YES / NO *(Circle one)*

    - Clutch pedal has excessive freeplay?

      YES / NO *(Circle one)*





18. Locate the procedure for bleeding air from the clutch hydraulic system.

19. As per your training instructor, perform the Air Bleeding Procedure as outlined in the service manual.

20. After performing the air bleeding procedure, inspect the clutch hydraulic system for the following items:

    - Able to fully disengage clutch?

      YES / NO *(Circle one)*

    - Pedal stays to floor?

      YES / NO *(Circle one)*

    - Clutch pedal feels mushy?

      YES / NO *(Circle one)*

    - Clutch pedal has excessive freeplay?

      YES / NO *(Circle one)*

You have now completed this worksheet. You should be able to inspect the clutch pedal clevis pin movement and pedal travel. You should be able to properly adjust the ASCD switch or clutch pedal stop. If necessary, you should also be able to bleed the clutch hydraulic system.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**
- **Drain fluid from clutch operating system!**

V6 Frontier and Xterra

FS5R30A

FS5R30A PRELIMINARY DISASSEMBLY

Module 02

Objective: Given a FS5R30A 5-speed manual transmission from a V-6 Frontier Truck or Xterra, inspect shift quality on the bench, disassemble the transmission, and perform the necessary inspections, noting any components requiring replacement.

Relevance: Learning how to bench shift a transmission, then following correct procedures for disassembly saves time when it comes to service work.

Resources:

- FS5R30A 5-speed rear wheel drive manual transmission
- Shifter
- TSB NTB95-036 Essential Tool Release
- J39856 Gear and Bearing Removal Kit
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves
- Two 2X4s 16" long

Skill Check: Bench shift the transmission, then follow worksheet and ESM procedures for disassembling the FS5R30A transmission.

Follow Service Manual procedures unless otherwise noted.

1. Are any service bulletins available in ASIST that relate to the transmission you are inspecting?

   YES / NO *(Circle one)*

2. Using ASIST, review any service bulletins relating to this transmission. List them by title and TSB number in the following spaces.

   _____

   _____

   _____

3. Inspect transmission case for signs of visible damage. Record your findings below:

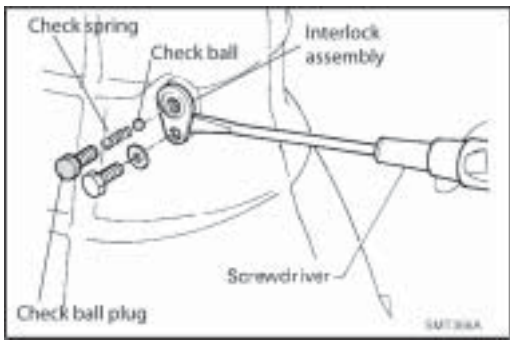
   _____

4. Bench shift the transmission prior to disassembly. Does the transmission shift into all-forward gears and reverse?

   YES / NO *(Circle one)*

5. If the transmission does not shift into one or more ranges, note it here:

   _____



6. Remove the check ball plug, check spring, and check ball.

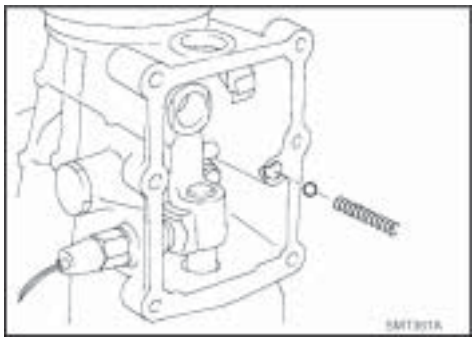
CAUTION:

Do not remove the interlock assembly before removing check ball plug, check spring and check ball. Doing so could result in the check ball falling into the transmission case.

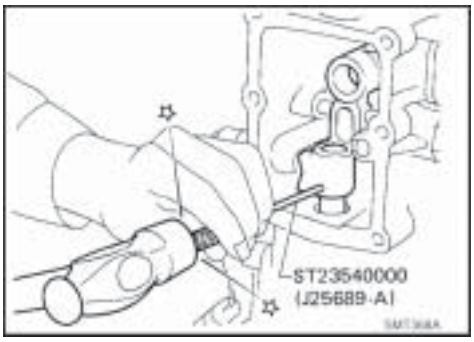
Note: Later transmissions use a one-piece check ball, which is removed as an assembly.

7. Remove the interlock assembly.

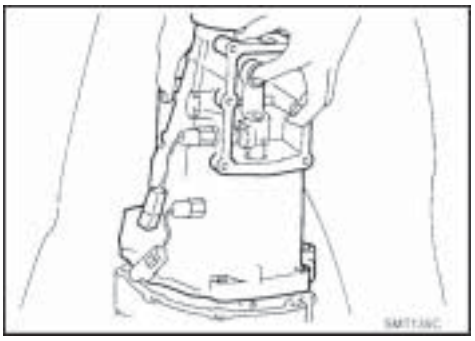
8. Remove control housing, return spring and check ball.

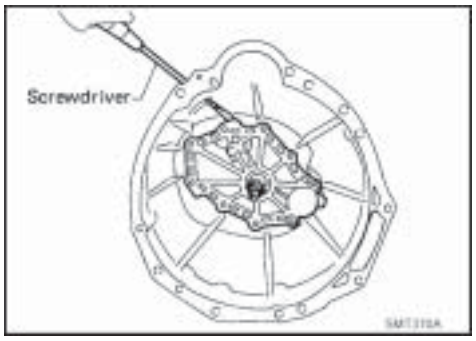


9. Drive out retaining pin from striking arm.

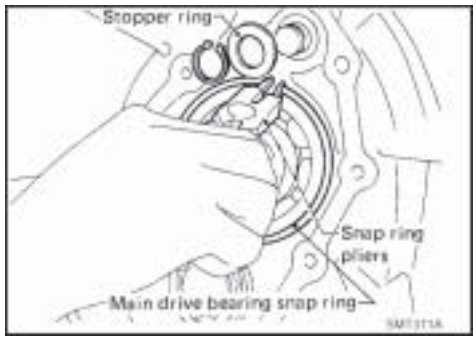


10. Remove the rear extension case. While doing so, lift up on the striking arm.

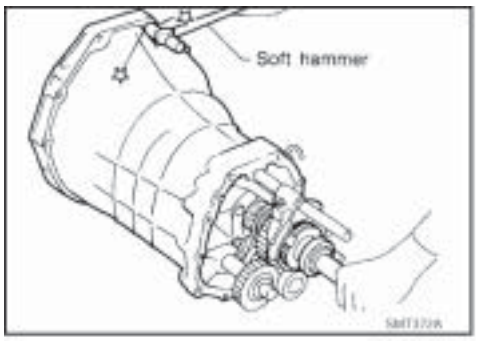




11. Remove the front cover and gasket from the transmission case.



12. Remove the stopper ring and main drive bearing snap ring.



13. Separate the front case half from the center adapter plate.

14. Inspect the front and rear transmission cases and center adapter plate mating surfaces for damage. Note any damage found.

    _____

15. What would be the customer complaint for a damaged transmission case, center adapter plate, or rear extension housing mating surface?

    _____

16. Inspect the gear sets and shift components for any noticeable problems. Note any damage found:

    _____

You have now completed this worksheet. You should be able to inspect the transmission shift quality, disassemble the case halves and remove the internal shift linkage.

Instructor's Initials: _____

NOTES

FS5R30A LINKAGE AND GEAR DISASSEMBLY

Objective: Given a FS5R30A manual transmission, disassemble the transmission shift components and gear assemblies, and perform the necessary inspections, recommending which parts should be replaced.

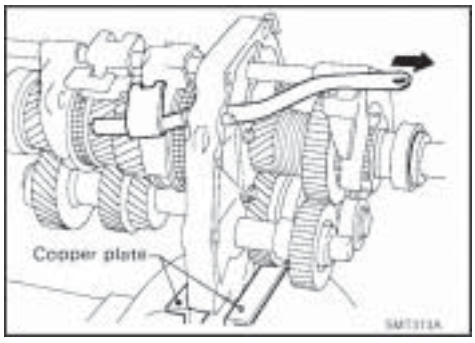
Relevance: Following correct procedures for disassembly saves time when it comes to service work and transmission repair.

Resources:

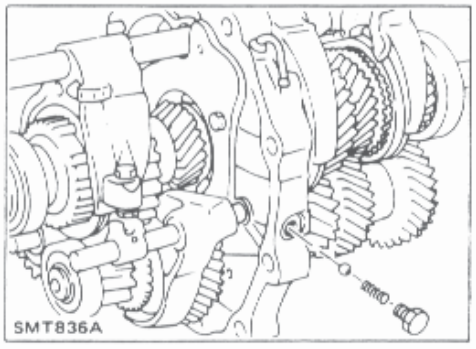
- FS5R30A 5-speed rear wheel drive manual transmission
- TSB NTB95-036 Essential Tool Release
- J39856 Gear and Bearing Removal Kit
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly disassemble the gear assemblies, identifying which components, if any, require replacement.

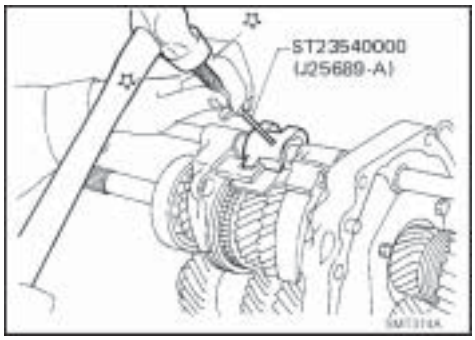
Follow Service Manual procedures unless otherwise noted.



1. Remove Over Drive (OD) and reverse fork rod.



2. Some transmissions require removing the check ball plug, check ball and return spring.

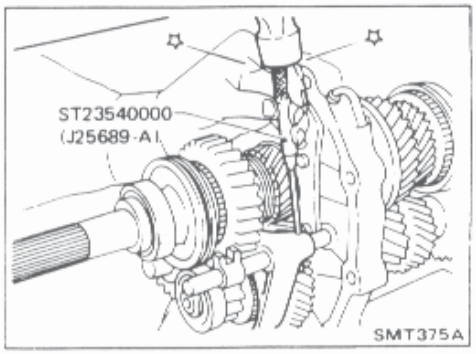


3. Drive out retaining pin from striking lever using suitable pin punch or Tool (J25689-A).

4. While pulling out striking rod, remove striking lever and striking interlock. Then remove 1st and 2nd, 3rd and 4th, and reverse shift forks.

5. Drive out retaining pin from OD shift fork.

6. Pull out OD fork rod and then remove OD shift fork.



7. Inspect removed components and note any damaged items:

_____

8. List the endplay specification for the following components:

1st Main Gear Endplay _____

_____

2nd Main Gear Endplay _____

_____

3rd Main Gear Endplay _____

_____

OD Counter Gear Endplay _____

_____

Reverse Main Gear Endplay_____

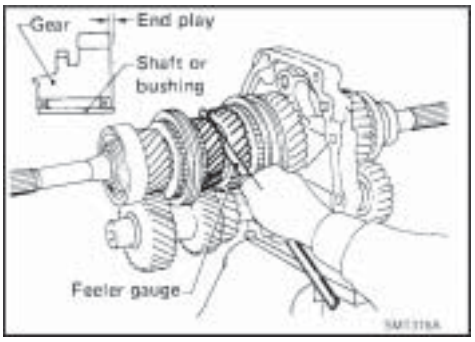
_____

Counter Gear Endplay _____

_____

Reverse Idler Gear Endplay _____

_____



9. Measure the endplay for each of these components.

   1st Main Gear Endplay _____

   _____

   2nd Main Gear Endplay _____

   _____

   3rd Main Gear Endplay _____

   _____

10. What does the ESM instruct you to check if the gear endplay is out of specification for any of the above components?

    _____

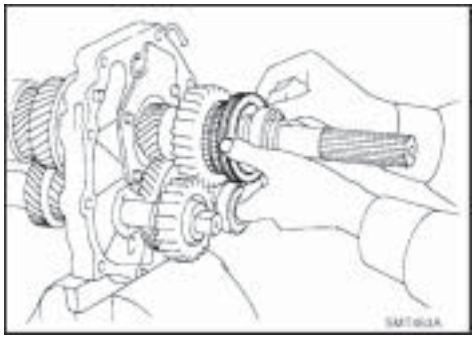
    _____

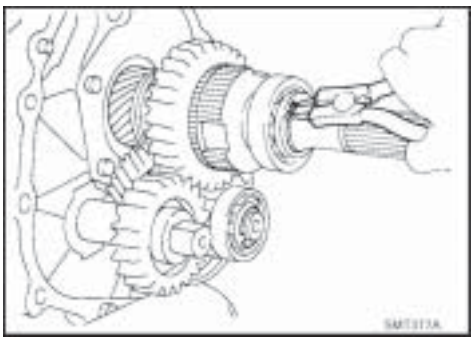
    _____

Gear Component Disassembly

11. Remove rear side components on mainshaft and counter gear.

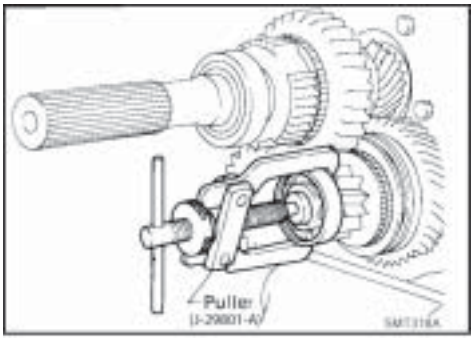
12. Remove the reverse coupling sleeve.





13. Remove mainshaft rear snap ring and counter gear rear snap ring.

14. Remove C-ring holder and mainshaft C-rings from mainshaft.



15. Remove counter gear rear end snap ring and bearing.

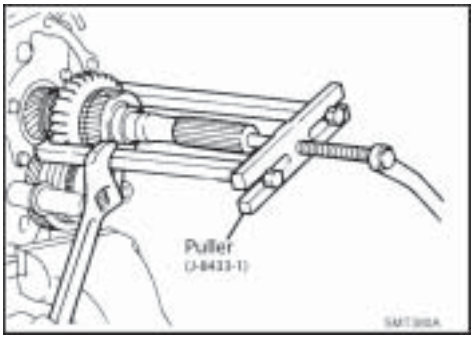
16. Remove reverse idler thrust washer and reverse idler gear (VG33 model) or snap ring, sub-gear bracket, steel ball, sub gear spring, sub-gear and reverse idler (VG33ER model) and reverse idler needle bearings.

17. Remove mainshaft rear bearing (2WD model) using specific pullers:

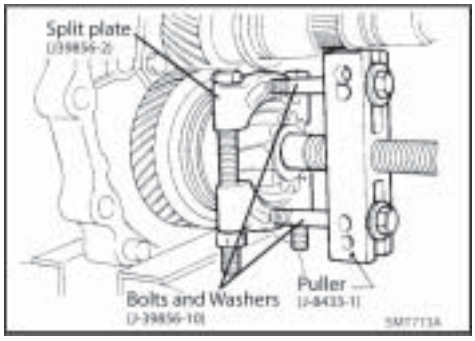
    Tool Number: J-26349-A, J25726-B

18. Remove mainshaft spacer.

Note: Use the puller number associated with the illustration. Not all illustrations match the exact puller.

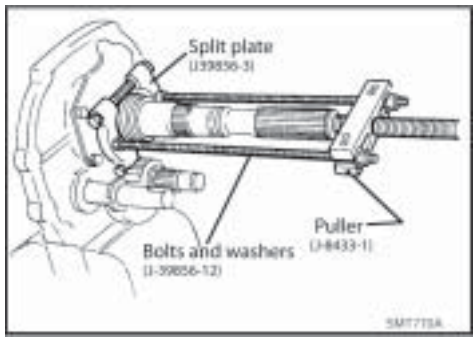


19. Remove reverse main gear together with the mainshaft spacer and reverse synchronizer hub using a puller. Then remove reverse gear needle bearings.



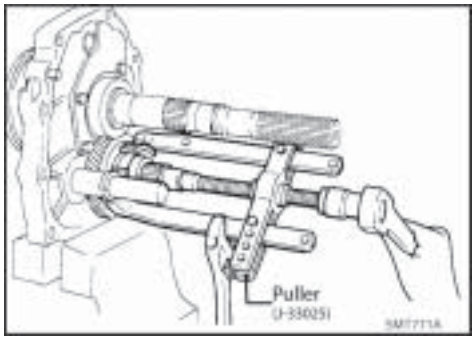
20. Remove reverse counter gear using a puller.

21. Remove OD coupling sleeve together with OD baulk ring, reverse baulk ring and spring inserts.



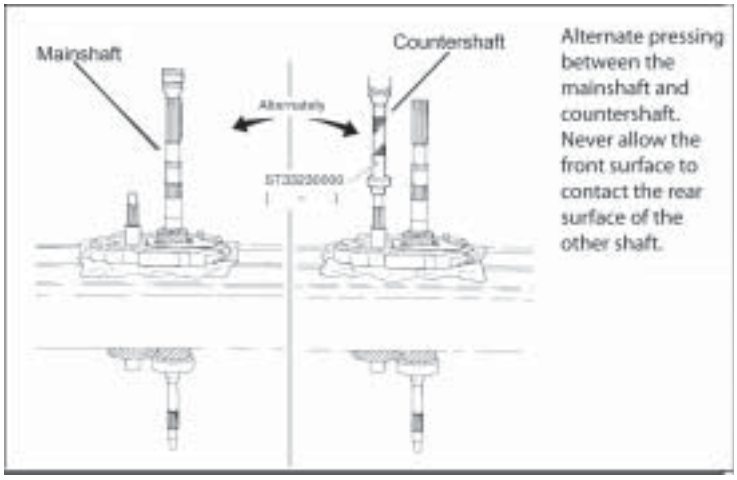
22. Remove reverse gear bushing using a puller.

23. Remove speedometer drive gear (2WD model).



24. Remove OD gear bushing, OD gear needle bearing, OD counter gear and reverse cone using the puller.

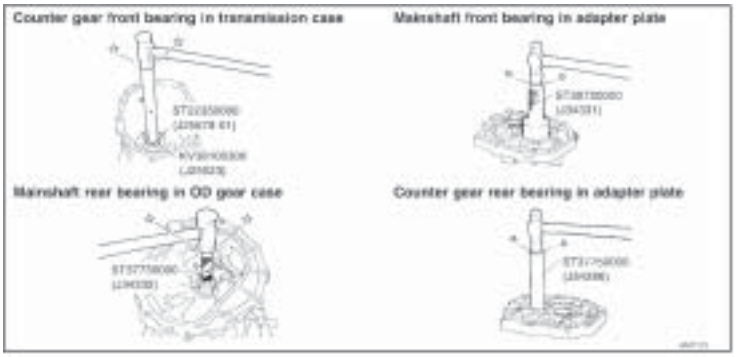
25. Press the mainshaft and counter gear assemblies out from the adapter plate.

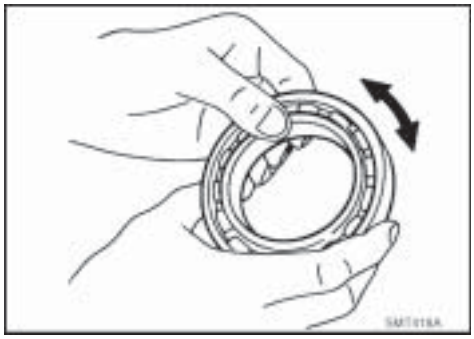


CAUTION:

Do not disassemble mainshaft and countershaft unless instructed to by instructor.

26. Remove all bearings from the transmission case and adapter plate. ***Do not remove shift shaft bearing.***



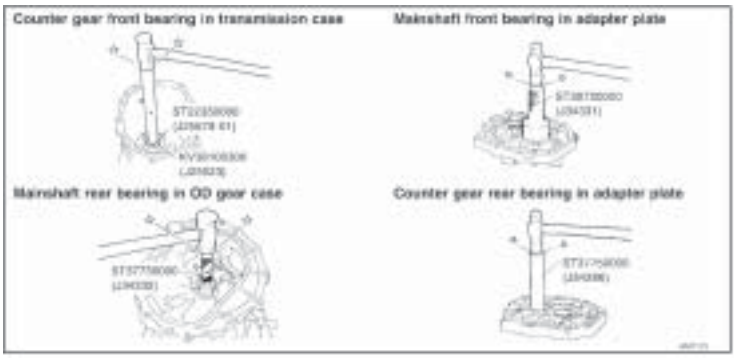


27. Inspect each bearing and verify it rolls freely and does not exhibit any unusual noise. Verify there are no visible cracks pitting or wear.

28. Note any damaged items:

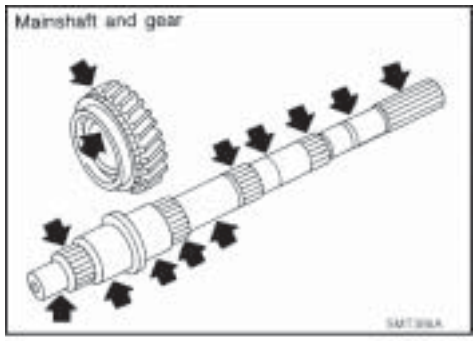
_____

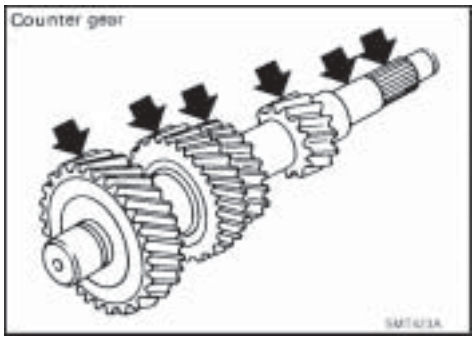
29. Install previously removed bearings into transmission case and adapter plate.



30. After removing the mainshaft and countershaft, inspect the contact surface on each gear, mainshaft, main drive gear, or counter gear for damage which may include any of the following:

	OK	NG
▪ Unusual wear	___	___
▪ Peeling/flaking	___	___
▪ Abrasion	___	___
▪ Dent	___	___
▪ Bent shaft	___	___
▪ Any other damage	___	___





31. List any components that show any signs of wear or damage:

_____

You have now completed this worksheet. You should be able to remove the shift components, mainshaft and countershaft from the adapter plate along with removing the bearings from the transmission case and adapter plate as well as perform each inspection as indicated by the service manual, then recommend which components require replacement. You should be able to reinstall the bearings back into the adapter plate and transmission case.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

FS5R30A GEAR, LINKAGE AND CASE ASSEMBLY

Objective: Given a FS5R30A manual transmission, reassemble the mainshaft and countershafts into the adapter plate. Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.

Relevance: Following correct procedures (including heating the gear assemblies) for reassembly saves time when it comes to service work and transmission repair.

Resources:

- FS5R30A 5-speed rear wheel drive manual transmission
- TSB NTB95-036 Essential Tool Release
- J39856 Gear and Bearing Removal Kit
- Heating device such as a toaster oven or hot plate
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves
- Heat resistant gloves
- Barbecue tongs

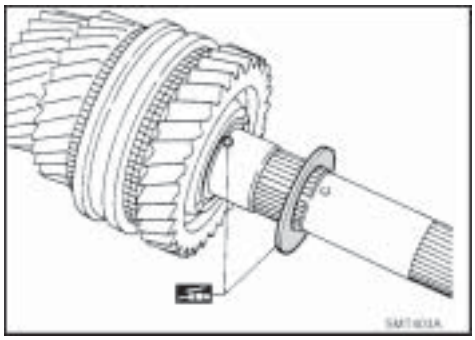
Skill Check: Properly reassemble the FS5R30A manual transmission and shift into all forward and reverse gears.

Mainshaft and Countershaft Assembly

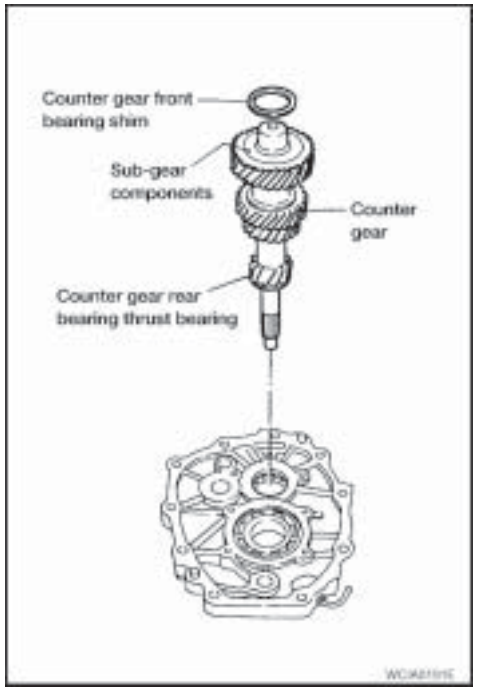
Follow Service Manual procedures unless otherwise noted.

1. Begin reassembling the mainshaft and countershaft into the adapter plate.

2. Use the following precautions during reassembly.



3. Apply multi-purpose grease to the steel ball and 1st gear washer to hold them in place before installing the mainshaft into the adapter plate. Once the ball and washer are in place, avoid moving the mainshaft, to prevent dislodging the ball.



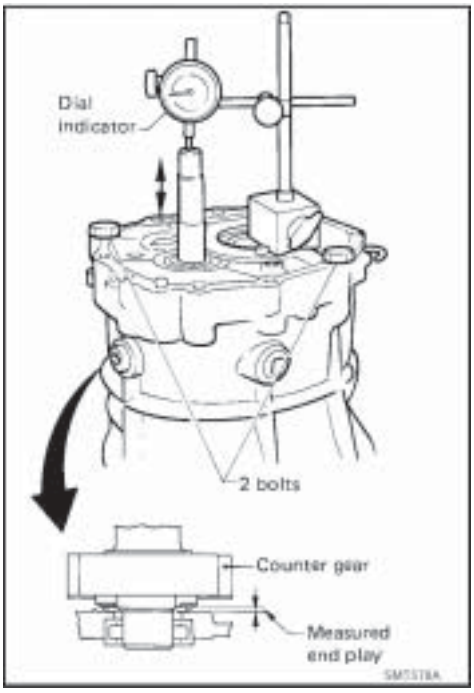
4. Set the completed mainshaft aside until the worksheet instructs you to install it in the adapter plate.

5. When replacing the counter gear, transmission case, counter gear rear thrust bearing or sub-gear components, select counter gear shim before assembling mainshaft and countershaft to adapter plate.

6. How much endplay should the counter gear have when it's installed in the adapter plate?

   _____

7. Install counter gear with sub-gear components, counter gear front thrust washer and counter gear rear thrust washer on adapter plate.



8. Remove counter gear front bearing shim from transmission case.

9. Place adapter plate and counter gear assembly in transmission case (case inverted).

10. Tighten adapter plate to transmission case using 2 bolts.

11. Place dial indicator on rear end of counter gear.

12. Move counter gear up and down and measure dial indicator deflection. List results:

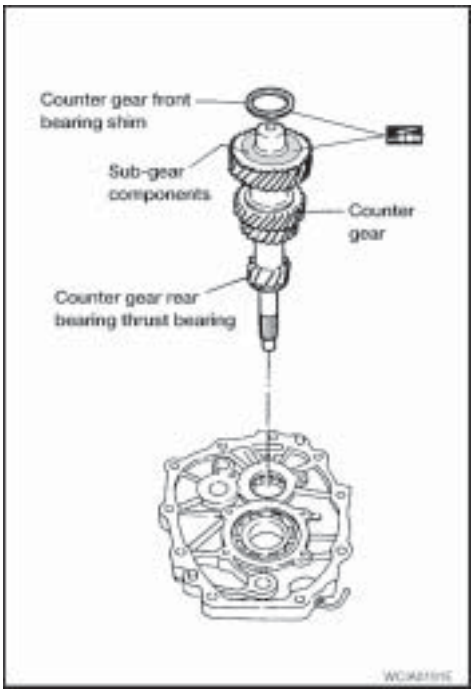
_____

13. Select the proper thrust washer using the ESM table as a guide.

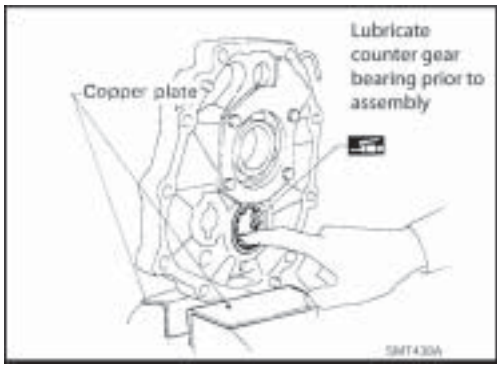
14. Separate the adapter plate and transmission case.

15. Remove counter gear assembly.

16. Apply multi-purpose grease to the counter gear front bearing shim before installing the mainshaft and countershaft into the front transmission case.

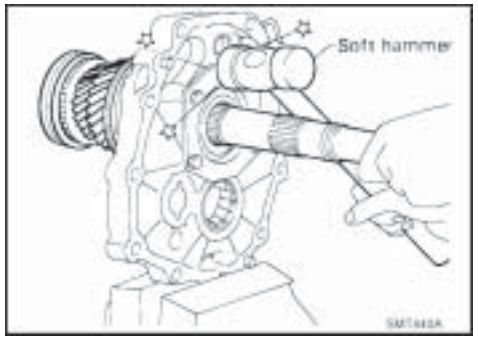


Component Assembly

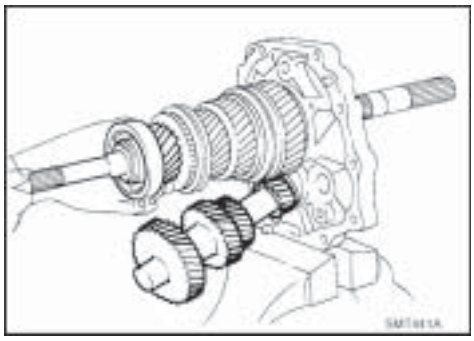


17. Lubricate the counter gear rear bearing with multi-purpose grease prior to assembly.

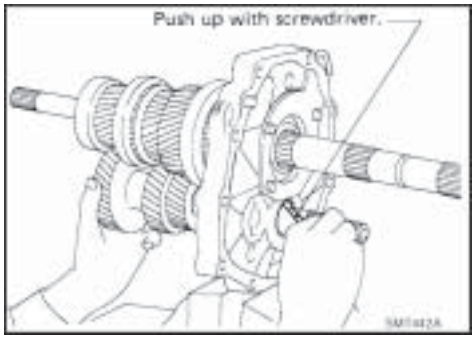
18. Assemble components as per worksheet, service manual and training instructor instructions.



19. Partially install mainshaft on mainshaft front bearing. **Do not install mainshaft completely in adapter plate.**

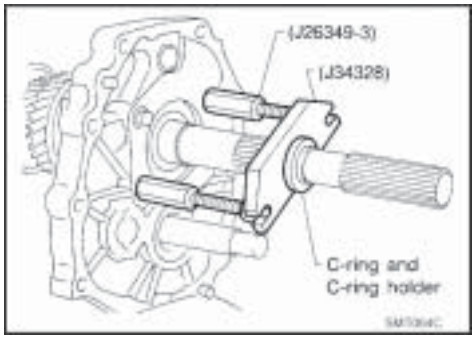


20. Install counter gear in counter gear rear bearing and install main drive gear, pilot bearing and spacer on mainshaft.



21. When installing counter gear into counter gear rear bearing, push up on upper roller of counter gear rear bearing with screwdriver.

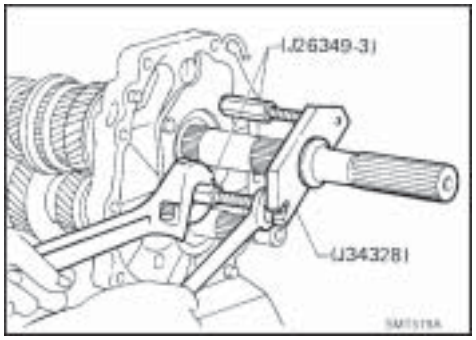
22. Install tools J26349-3 onto adapter plate and C-Ring and C-ring holder on mainshaft.



23. Install tool J34328 on mainshaft.

24. Have your instructor inspect puller setup before assembling mainshaft and countershaft into adapter plate.

Instructor Initials _____



25. Install mainshaft and counter gear completely by extending length of tool J26349-3.

26. Measure the endplay for each of these components after assembling mainshaft and countershaft into adapter plate.

    1st Main Gear Endplay _____

    _____

    2nd Main Gear Endplay _____

    _____

    3rd Main Gear Endplay _____

    _____

27. Does the endplay now match the measurements taken in module 3?

    YES / NO *(Circle one)*

28. If the endplay is not correct, what should you check?

    _____

    _____

29. Have your instructor check your work after installing mainshaft and countershaft.

Instructor Initials _____

Note: Begin the gear heating process by placing the removed gear sets and components on the hot plate, in the oven, or in the frying pan. Heat the hot plate, frying pan or toaster oven to 400° - 425° F.

CAUTION:

Heated components are extremely hot. Always wear safety glasses and heat insulated gloves before handling hot gears. Have all installation tools available. Pay attention to the installation order prior to assembly.

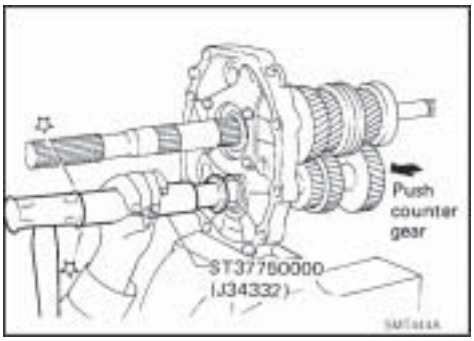
Note: While the ESM shows a hammer being used to install parts, we recommend heating the components using a 'hot plate method' and sliding them into place. This prevents unnecessary damage to the transmission parts. ***Pay very close attention to component direction prior to installation.***

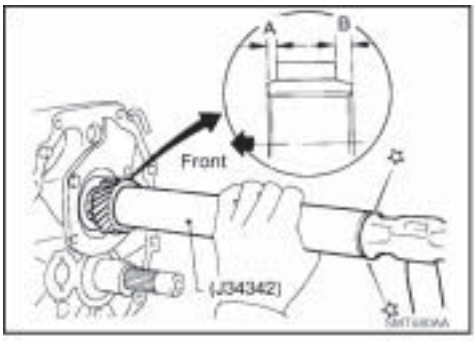
Rear Side Component Assembly

30. Install the rear side components as per worksheet, service manual and training instructor instructions.

31. Install heated rear side components on mainshaft and counter gear.

32. Install OD gear bushing using tool J34332 on the front of counter gear.

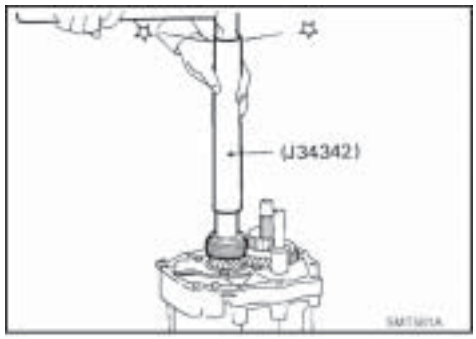




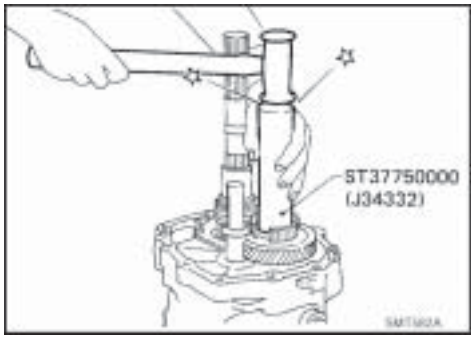
33. Install OD main gear using tool J34342. Pay attention to gear direction; area B is wider than area A. The narrow area "A" points to the front of the transmission.

34. The service manual has you install the adapter plate with mainshaft and counter gear into the transmission case. When heating the gears this is not necessary.

35. Install OD gear needle bearing and then install OD counter gear and reverse idler shaft.



36. Install reverse gear bushing with speedometer drive gear (2WD model) using tool J34342.

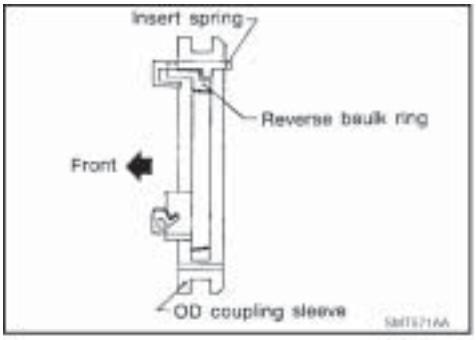


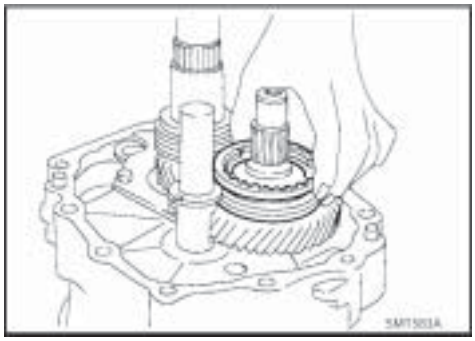
37. Install reverse gear cone using tool J34332.

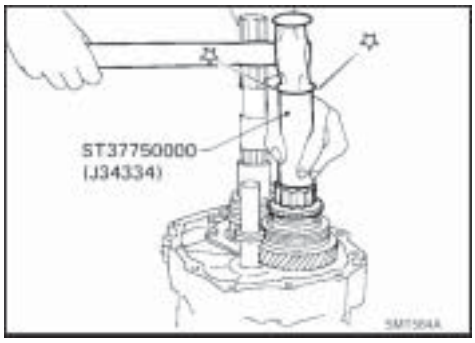
38. Install insert springs and reverse baulk ring on OD counter gear. Then install assembled items on OD baulk ring on OD counter gear.

CAUTION:

Pay very close attention to direction prior to installation. If these components are installed in the wrong order they could be damaged when trying to remove them.



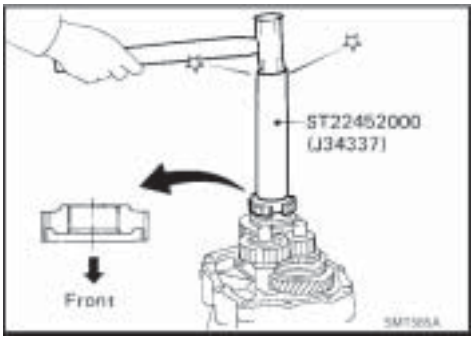




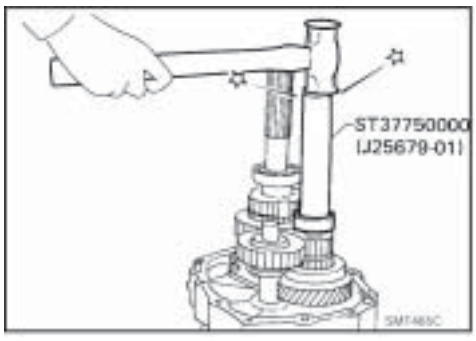
39. Install reverse counter gear using tool J34334.

40. Install reverse gear needle bearing and then install reverse main gear, reverse idler gear and reverse idler rear thrust washer.

41. Install reverse synchronizer hub using tool J34337. Gear is directional, pay attention to direction prior to installation.

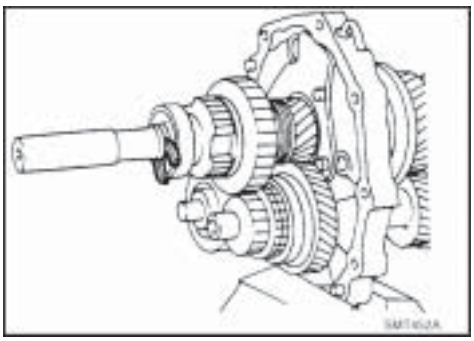


42. Install mainshaft spacer and mainshaft rear bearing (2WD model) using tool J26349-A and J25276-B.

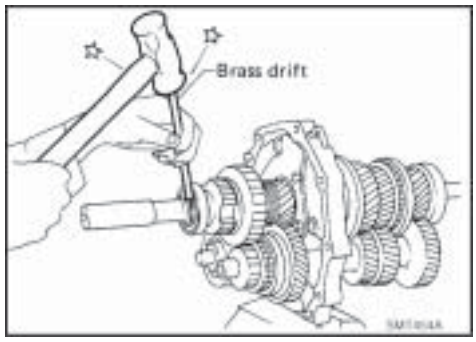


43. Install counter gear rear end bearing using tool J25679-01.

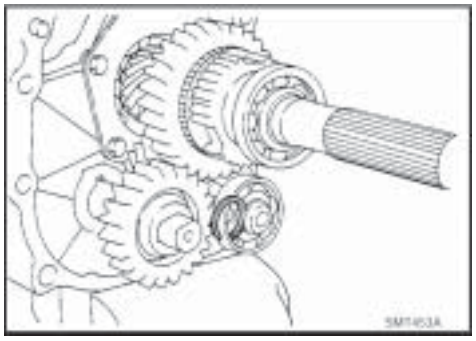
44. If adapter plate was installed to transmission case, remove it at this time and remount to vice.



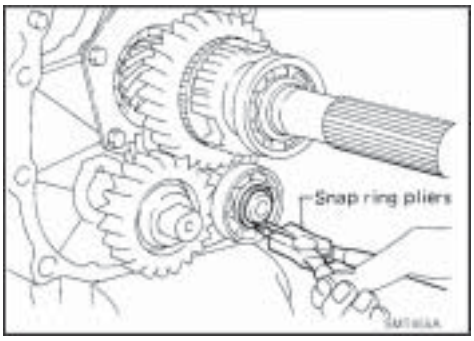
45. Select the proper mainshaft C-ring minimizing the groove clearance.



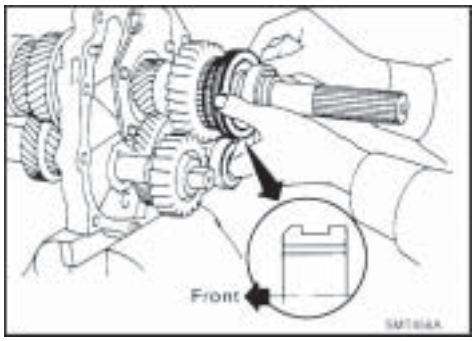
46. Install selected mainshaft C-ring, C-ring holder and mainshaft rear snap ring.



47. Select proper counter gear rear snap ring minimizing groove clearance.



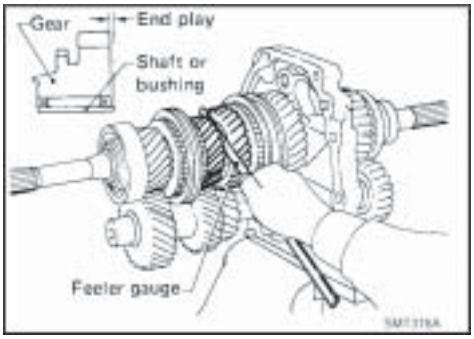
48. Install the selected counter gear rear snap ring.



49. Install reverse coupling sleeve. Coupling sleeve is directional, pay attention to direction prior to installation.

50. Have your instructor inspect the installed rear side components.

Instructor Initials _____



51. Measure each gear endplay as a final inspection before assembling shift components.

    1st Main Gear Endplay _____

    _____

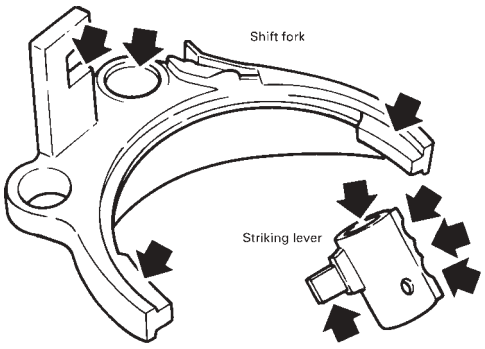
    2nd Main Gear Endplay _____

    _____

    3rd Main Gear Endplay _____

    _____

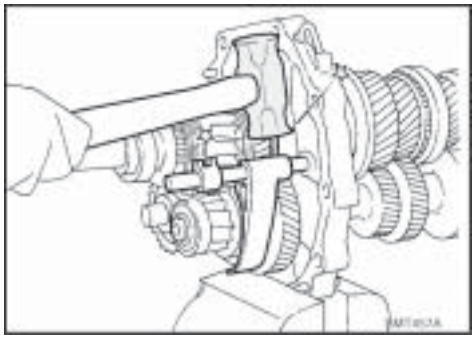
Shift Control Components Assembly



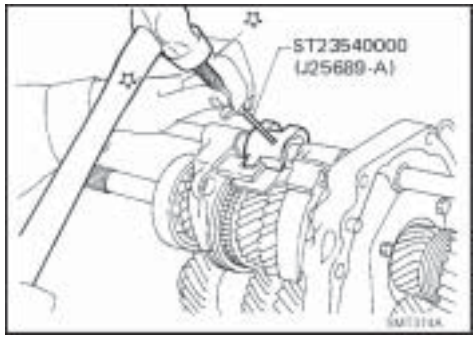
52. Check contact surface and sliding surface for the internal shift linkage prior to assembly. Note any problems found:

    _____

53. Install shift components as per worksheet and service manual instructions.



54. Install OD fork rod and OD shift fork. Then install retaining pin into OD shift fork.



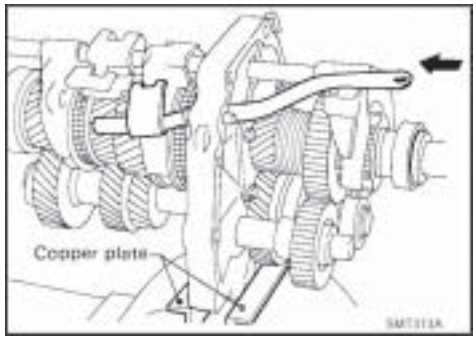
55. Install striking rod into hole of shift forks, striking lever and interlock and then install retaining pin into striking lever using tool J25689-A. The striking rod roll pin must be flush with the inner sleeve.

56. What would happen if the striking rod roll pin were not installed properly?

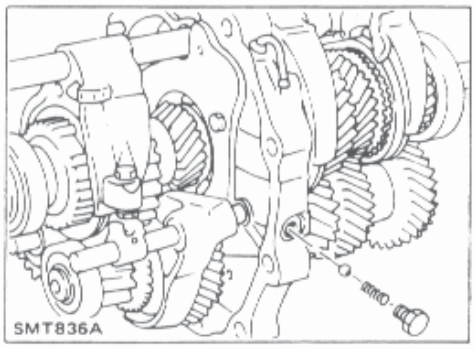
_____

_____

_____



57. Install OD and reverse fork rod.



58. Install check ball, return spring and check ball plug if equipped.

59. After installing all shift components, verify you are able to shift into all forward and reverse gears.

60. Have your instructor inspect the shift linkage installation and operation before continuing.

Instructor Initials _____

Case Assembly

61. Assemble gear assembly to front and rear transmission case halves as per service manual instruction.

62. Bench shift the transmission after assembly. Does the transmission shift into all-forward gears and reverse?

    YES / NO *(Circle one)*

63. If the transmission does not shift into one or more ranges, note it here:

    _____

You have now completed this worksheet. You should be able to assemble the mainshaft and countershafts to the adapter plate. You should also be able to assemble the gear assembly into the front and rear case halves. After assembly you should be able to shift the transmission into all forward and reverse gears.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

350Z and G35

FS6R31A

FS6R31A PRELIMINARY DISASSEMBLY

Objective: Given a FS6R31A 6-speed manual transmission, inspect shift quality on the bench, disassemble the transmission, and perform the necessary inspections, noting any components requiring replacement.

Relevance: Learning how to bench shift a transmission, then following correct procedures for disassembly saves time when it comes to service work.

Resources:

- FS6R31A 6-speed rear wheel drive manual transmission
- Hand tools
- 1 - CJ85-1 Snap On Puller with CJ84-16 screw
- Heating device such as a toaster oven or hot plate
- 2 - J33025 Puller jaws
- 2 - 6" bolts, 3/8 diameter, course thread
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Bench shift the transmission, then follow worksheet and ESM procedures for disassembling the FS6R31A transmission.

Follow Service Manual procedures unless otherwise noted.

1. Are any service bulletins available in ASIST that relate to the transmission you are inspecting?

   YES / NO *(Circle one)*

2. Using ASIST, review any service bulletins relating to this transmission. List them by title and TSB number in the following spaces.

   _____

   _____

   _____

3. Inspect transmission case for signs of visible damage. Record your findings below:

   _____

4. Bench shift the transmission prior to disassembly. Does the transmission shift into all-forward gears and reverse?

   YES / NO *(Circle one)*

5. If the transmission does not shift into one or more ranges, note it here:

   _____

6. Remove and inspect check select spring and check ball from the rear extension case. Note any problems found.

   _____

7. Remove the right and left return spring plug, spring and plunger. Identify right and left springs.

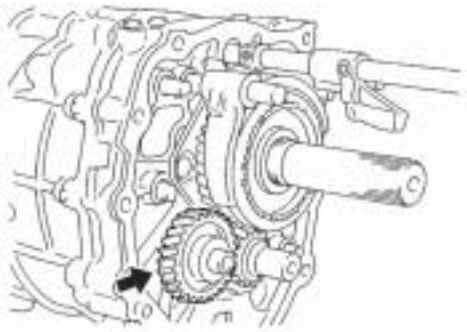
   Right side spring color _____

   Left side spring color _____

8. Identify right and left-hand plungers.

   Right hand notched? **YES / NO** *(Circle one)*

   Left hand notched? **YES / NO** *(Circle one)*



9. Remove the rear extension case and front transmission cover as per service manual instructions. Follow service manual instructions for removing the reverse idler gear prior to removing the front case half.

Note: The service manual instructs you to remove the reverse idler gear. This is not necessary to remove the front case.

10. Separate the front case half from the center adapter plate.

11. Inspect the case and center adapter plate mating surfaces for damage. Note any damage found.

    _____

12. What would be the customer complaint for a damaged transmission case, center adapter plate, or rear extension housing mating surface?

    _____

13. Inspect the gear sets and shift components for any noticeable problems. Note any damage found:

    _____

You have now completed this worksheet. You should be able to inspect the transmission shift quality and disassemble the case halves.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

FS6R31A GEAR INSPECTION AND DISASSEMBLY

Objective: Given a FS6R31A manual transmission, disassemble the transmission shift components and gear assemblies, and perform the necessary inspections, recommending which parts should be replaced.

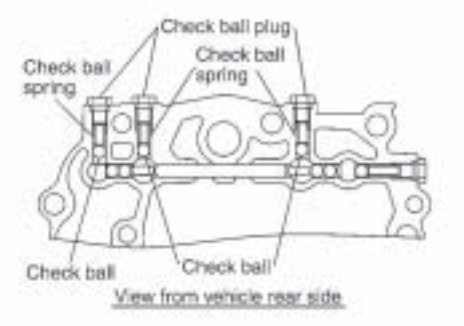
Relevance: Following correct procedures for disassembly saves time when it comes to service work and transmission repair.

Resources:

- FS6R31A 6-speed rear wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

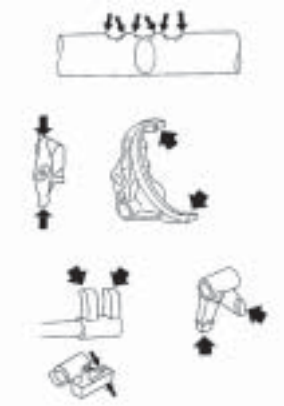
Skill Check: Properly disassemble the gear assemblies, identifying which components, if any, require replacement.

Follow Service Manual procedures unless otherwise noted.



1. Remove and inspect all check plugs, springs and balls from center adapter plate. Note any damaged components:

   _____



2. Remove shift rods, forks and brackets as per service manual instructions. Inspect components and note any damaged components:

   _____

3. List the endplay **specification** for the following components:

   Main drive gear Endplay _____

   _____

   Mainshaft front Endplay (Measure after removing shafts from adapter plate) _____

   _____

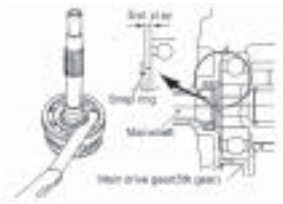
   Mainshaft rear Endplay _____

   _____

   Counter gear Endplay _____

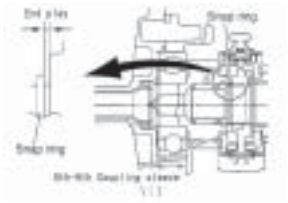
   _____

4. Measure and record the endplay for each of these components:



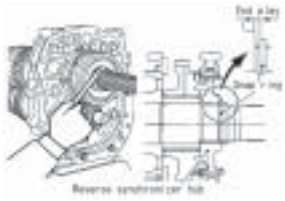
Main drive gear Endplay _____

_____



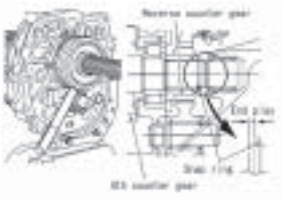
Mainshaft front Endplay _____

_____



Mainshaft rear Endplay _____

_____



Counter gear Endplay _____

_____

Note: Follow all procedures as outlined in the service manual.

5. Continue disassembling the transmission mainshaft and countershafts from the adapter plate as per service manual instructions.

6. Disassemble mainshaft. ***Do not disassemble countershaft!***

Note: When removing the mainshaft rear bearing snap ring, turn the snap ring to the 6 O' Clock position, then remove snap ring. Spreading the snap ring and tapping the shaft forward also assists with snap ring removal.

CAUTION:

Be aware that when using the press, if the mainshaft gear positioner catches on the V-block, etc., the mainshaft could be damaged.

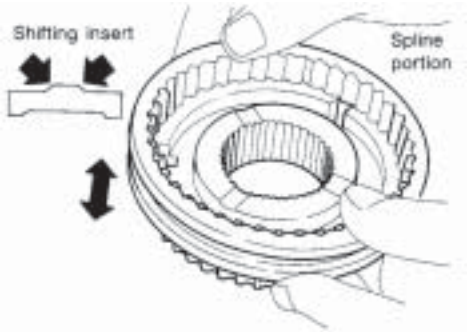
7. Inspect the contact surface on each gear, mainshaft, main drive gear, or counter gear for damage which may include any of the following:

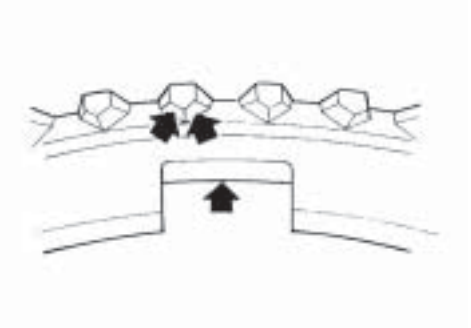
	OK	NG
▪ Unusual wear	___	___
▪ Peeling/flaking	___	___
▪ Abrasion	___	___
▪ Dent	___	___
▪ Bent shaft	___	___
▪ Any other damage	___	___

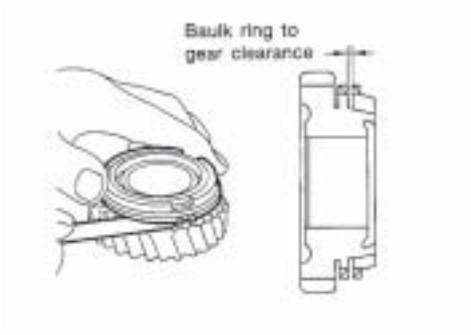
8. List any components that show any signs of wear or damage:

_____

9. Inspect the contact surfaces for each coupling sleeve, synchronizer hub, baulk ring, and shift insert for damage or abrasion.







10. Inspect the single cone synchronizer clearance for 5th and 6th baulk rings.

Clearance specification

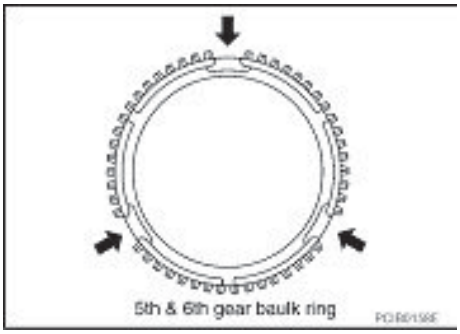
Standard: _____

Limit value: _____

Measurement

5th gear baulk ring _____

6th gear baulk ring _____



11. List any identifiable marks for the 5th and 6th gear baulk rings.

_____

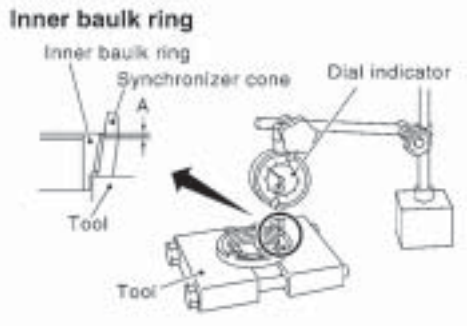
_____

_____

_____

_____

_____



12. Inspect the double cone synchronizer clearance for 1st and 2nd gear inner and outer baulk rings.

Clearance "A" specification

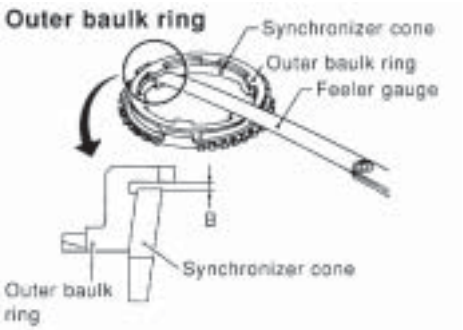
Standard: _____

Limit value: _____

Clearance "B" specification

Standard: _____

Limit value: _____



Note: The service manual instructs you to measure the double cone synchronizer clearance using a dial indicator. This is more readily done using a depth gauge such as a vernier caliper or straight edge and feeler gauge.

Measurement

1st gear inner baulk ring clearance A

_____

1st gear outer baulk ring clearance B

_____

2nd gear inner baulk ring clearance A

_____

2nd gear outer baulk ring clearance B

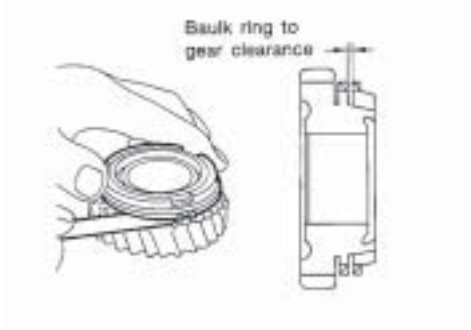
_____

13. List the identifiable marks for 1st and 2nd double cone baulk rings.

_____

_____

_____



14. Measure the single cone synchronizer clearance for the reverse gear baulk ring.

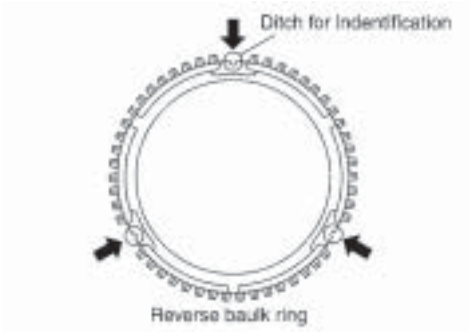
Clearance specification

Standard: _____

Limit value: _____

Measurement

Reverse gear baulk ring _____



15. As per the ESM, list the identifying marks for the reverse gear baulk ring.

_____

_____

_____

_____

16. Inspect each ball bearing to verify it rotates smoothly. Note any damage below:

_____

17. List the components the ESM recommends replacing any time the mainshaft and counter shafts are disassembled.

_____

_____

_____

_____

18. Review these procedures with your instructor.

You have now completed this worksheet. You should be able to remove the mainshaft and countershaft from the adapter plate along with disassembling both shafts, perform each inspection as indicated by the service manual, then recommending which components require replacement.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

NOTES

FS6R31A REASSEMBLY

Objective: Given a FS6R31A manual transmission, reassemble the transmission mainshaft and counter shaft assemblies, measure gear endplays and make any necessary adjustments.

Relevance: Following correct procedures (including heating the gear assemblies) for reassembly saves time when it comes to service work and transmission repair.

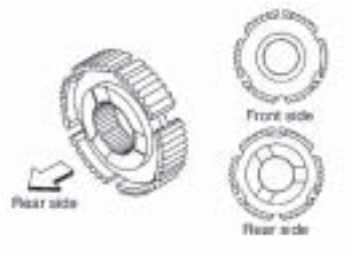
Resources:

- FS6R31A 6-speed rear wheel drive manual transmission
- Heating device such as a toaster oven or hot plate
- Barbecue tongs
- Welder's gloves
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly reassemble the FS6R31A manual transmission and shift into all forward and reverse gears.

Follow Service Manual procedures unless otherwise noted.

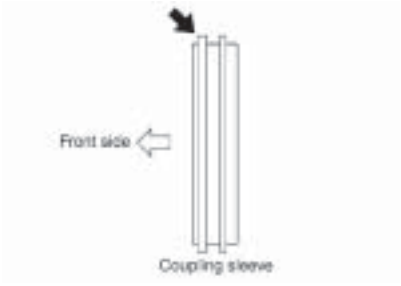
Note: The service manual instructs you to assemble the mainshaft bearing retainer plate using a medium strength locking sealant on the bolt threads. Under normal circumstances this is a critical procedure. For training purposes, do not install any sealant on the threads.



1. Reassemble the mainshaft assembly following service manual instructions.

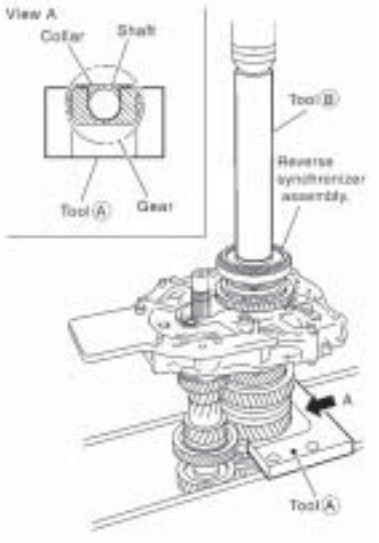
Note: Many items are directional. Pay close attention to the directions shown in the service manual.

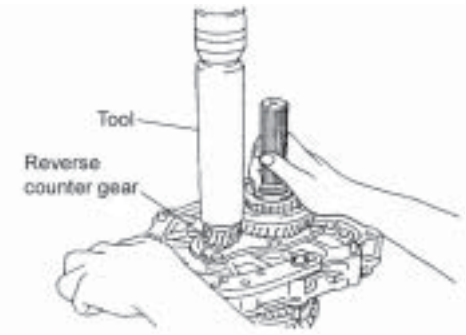
2. Reassemble the mainshaft and counter shaft into the adapter plate.



Note: Heat the transmission components prior to assembly as per instructor's direction.

3. Continue assembling the reverse gear components.





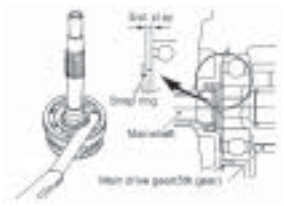
4. When should the reverse counter gear be replaced? *(Check one)*

   ☐ Only when it shows signs of wear.

   ☐ Each time the transmission is disassembled.

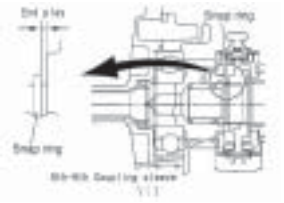
   ☐ The counter gear never requires replacement.

5. Measure the endplay for each of these components:



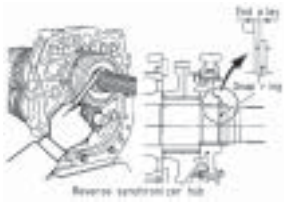
Main drive gear Endplay _____

_____



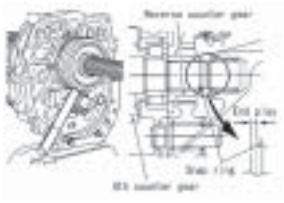
Mainshaft front Endplay (Measure before installing shafts into adapter plate)

_____



Mainshaft rear Endplay _____

_____

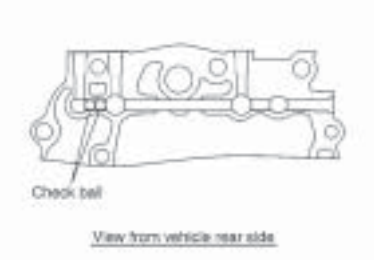


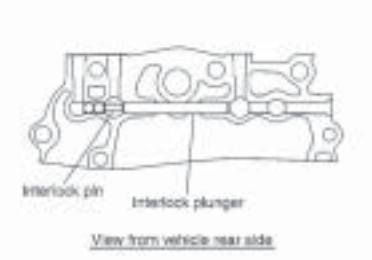
Counter gear Endplay _____

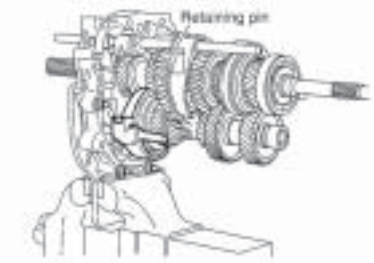
_____

6. Notify your instructor if any endplay is not within specification.

7. Install shift control components including all check balls, interlock pins and interlock plungers.







8. Install windage tray to center adapter plate.

9. Prior to assembling the transmission gear assembly into the case, inspect and verify the following:

   Able to shift into all forward gears?

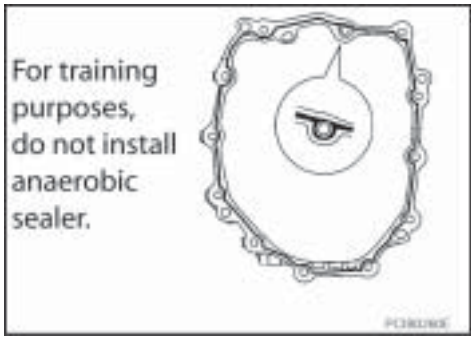
   YES / NO *(Circle one)*

   Able to shift into reverse gear?

   YES / NO *(Circle one)*

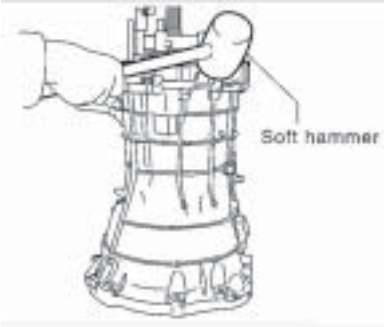
   Transmission gears rotate without binding?

   YES / NO *(Circle one)*

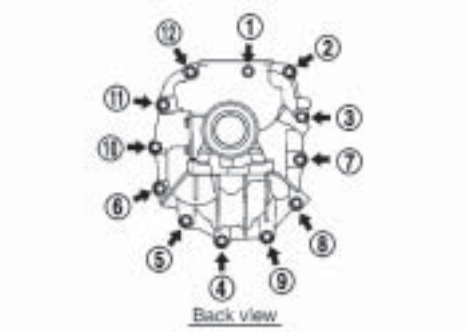


Note: The service manual instructs you to assemble the front case and rear extension housing using an anaerobic sealer between the case halves. Under normal circumstance this is a critical procedure. For training purposes, do not install any sealer to the case halves.

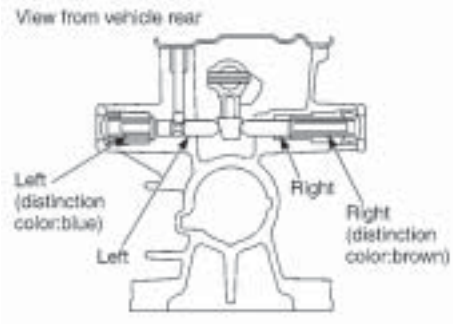
Note: One method for assembling the transmission gear assembly and the front case is to place the gear assembly on a set of blocks, then place the front case half on top of the gear set.



10. Assemble the mainshaft/counter shaft assembly to the front case and rear extension housing. Follow the correct tightening sequence as shown in the illustration and in the service manual.



11. Install the left and right return spring plugs and plungers into the proper position.



12. Bench shift the transmission into all forward and reverse gears. Note any gears you found difficulty engaging while bench shifting the transmission.

_____

You have now completed this worksheet. You should be able to reassemble the transmission mainshaft and counter shaft assemblies, measure gear endplays, make any necessary adjustments, complete the final assembly of the gear components and case assemblies. You should be able to shift the transmission into all forward and reverse gears.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

Sentra, Altima, Maxima

RS5F51A

RS5F51A PRELIMINARY DISASSEMBLY

Objective: Given a RS5F51A 5-speed manual transmission, inspect shift quality on the bench, disassemble the transmission, and perform the necessary inspections, noting any noticeable components requiring replacement.

Relevance: Following correct procedures for disassembly saves time when it comes to service work and transmission repair.

Resources:

- RS5F51A 5-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly disassemble the case and gear assemblies.

Follow Service Manual procedures unless otherwise noted.

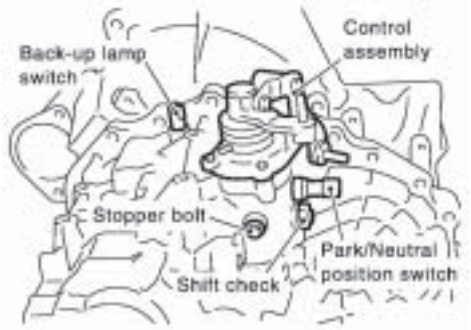
1. Are any service bulletins stored in ASIST that relate to the transmission you are inspecting?

   YES / NO *(Circle one)*

2. Using ASIST, review any service bulletins relating to this transmission. List them by title and TSB number in the following spaces.

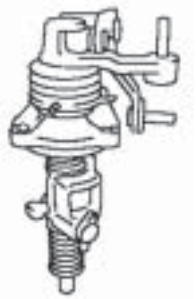
   _____

Note: The internal shift linkage was removed previously from this transmission, making shifter operation inspection impossible.

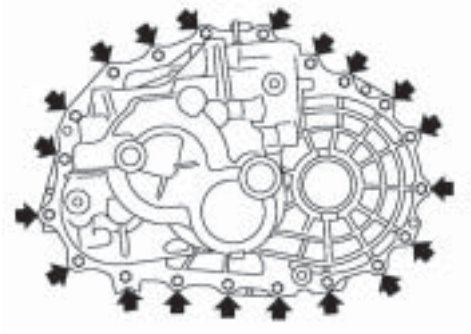


3. Remove the drain plug, filler plug, park/neutral position switch, back-up lamp switch, shift check and stopper bolts. Note any problems or difficulties encountered while removing these components.

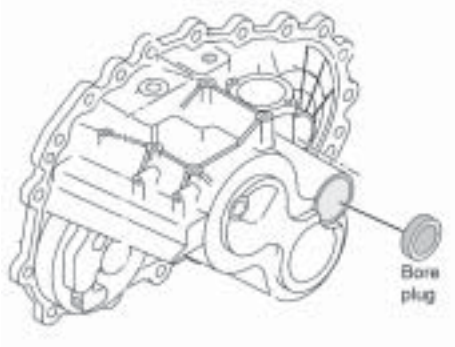
   _____



4. Remove the shift control assembly.



5. Remove the transaxle case fixing bolts.



6. Remove the bore plug at the rear of the transaxle case.

CAUTION:

Avoid damaging the transaxle case while removing the bore plug.

7. Spread the mainshaft rear bearing snap ring through the bore plug hole, then separate the clutch housing from the transaxle case.

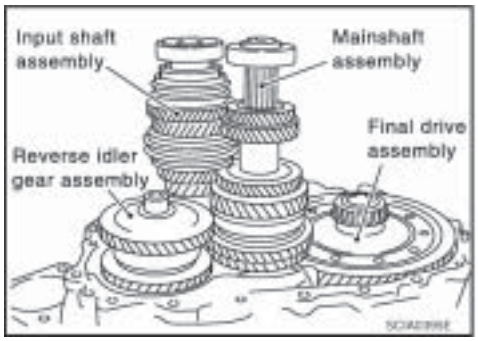
8. Remove the oil gutter and baffle plate and set aside.

9. Inspect the clutch housing and transaxle case attaching surfaces for damage. Note any problems found.

_____

10. What would be the customer complaint if the mating surface is damaged?

_____



11. Inspect the gear sets for any noticeable problems. Record your findings below:

_____

You have now completed this worksheet. You should be able to inspect the transmission shift quality and disassemble the case halves, then remove internal shift linkage.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS5F51A INPUT SHAFT, MAINSHAFT AND REVERSE GEAR ENDPLAY

Objective: Given a RS5F51A manual transmission, disassemble the transmission shift components and gear assemblies, perform the necessary endplay and preload measurements, then select the correct shims.

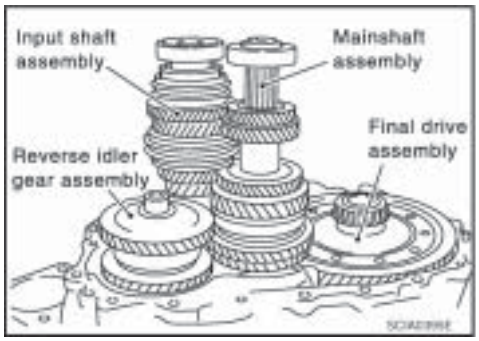
Relevance: Following correct procedures for reassembly saves time when it comes to service work and transmission repair.

Resources:

- RS5F51A 5-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves
- Optional: J34921B Shim Setting Gauge
- Optional: J34921-25 Adapter

Skill Check: Properly measure the input shaft, mainshaft and reverse idler gear endplays. Reassemble the transmission as per worksheet and ESM instructions.

Follow Service Manual procedures unless otherwise noted.



1. Remove the gear components from the clutch housing. The input shaft, mainshaft and reverse idler gear assemblies require lifting out as a complete unit. If necessary use a soft faced hammer to tap on the input shaft for easier removal.

CAUTION:

Do not remove the differential oil seals or input shaft oil seal.

2. Remove the final drive assembly.

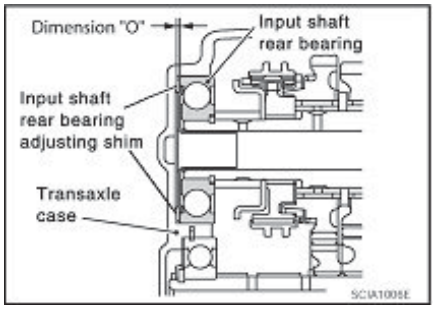
3. Remove the snap ring for the mainshaft rear bearing located at the bore plug hole.

4. Remove the mainshaft rear bearing adjusting shim and input shaft rear bearing adjusting shim from the transaxle case.

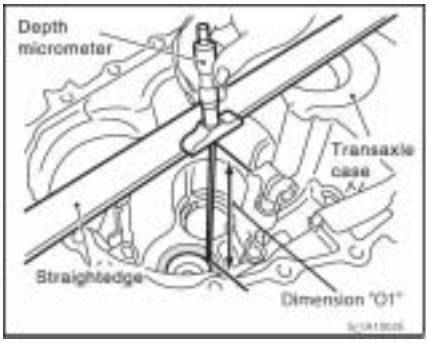
Note: This worksheet has you make three different measurements. This includes measuring the endplay for the input shaft, mainshaft and reverse idler gear. Endplay is a specific gap between two given components. Preload is an actual tension placed on a set of bearings. Under normal overhaul procedures a fourth measurement is for the preload on the differential side gears. This takes place on the RS5F70A transmission worksheet. In general, roller or ball bearings require an endplay setting and taper bearings like those used in differentials require a preload.

Input Shaft Endplay

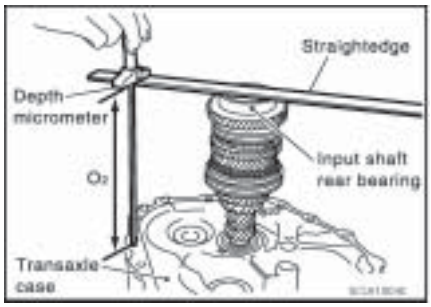
Rather than use a pre-load on the input shaft rear bearing, the transmission uses a specified gap or endplay clearance between the input shaft rear bearing and the transaxle case. The specification calls for an endplay value or clearance between 0 - 0.0024 in (0 - 0.6 mm). In many instances, this clearance is less than the thickness of a human hair. The input shaft endplay requires using three dimensions or measurements when determining the amount of endplay between the transmission case and input shaft rear bearing.



- Dimension "O" is the thickness of the adjusting shim.



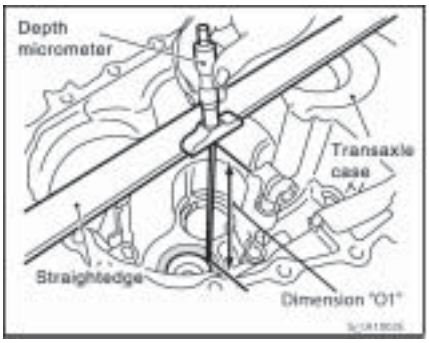
- Dimension "O1" is the distance between the transaxle case and the mounting face of the adjusting shim.



- Dimension "O2" is the distance between the clutch housing case end face and the end face of the input shaft rear bearing.

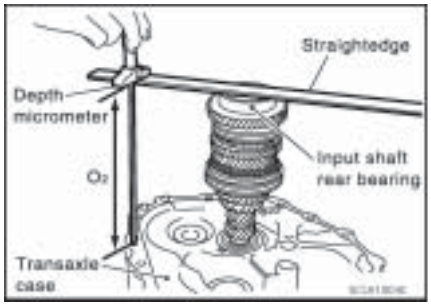
The formula for calculating the thickness of the shim is as follows:

Dimension "O" = (O1 - O2) - Endplay



5. Using a depth micrometer and straight edge as shown in the illustration, measure dimension "O1" between transaxle case end face and mounting face of adjusting shim. Record results.

   _____ Dimension "O1"



6. Using the depth micrometer and straight edge as shown in illustration, measure dimension "O2" between clutch housing case end face and end face of input shaft rear bearing. Record results.

   _____ Dimension "O2"

7. Calculate shim thickness using the following formula:

   _____ Dimension O1

   - _____ Dimension O2

   =_____ Clearance
   (Refer to shim chart in the ESM and view available shims before proceeding.)

   - _____ Endplay 0 - 0.0024 in (0 - 0.06 mm)

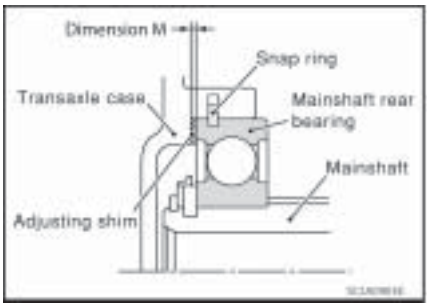
   =_____ Dimension O (Shim thickness)

Example:

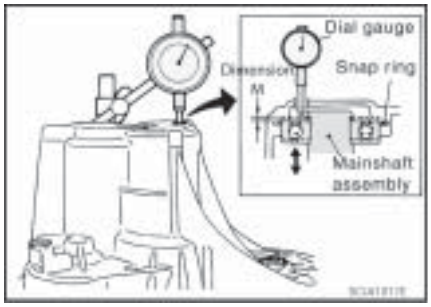
If the clearance measures 1.34 mm and the input shaft clearance can be between 0 - 0.0024 in (0 - 0.06 mm), a review of the shim chart in the ESM shows an available shim of 1.32 mm, this provides a clearance or endplay of 0.02 mm. This is well within the accepted endplay range. The key is not to put a preload on the input shaft bearings or too much clearance. Always refer to the ESM for shim selection.

Mainshaft Endplay

The mainshaft uses an endplay similar to the Input Shaft. The ESM specification calls for an endplay value between 0 - 0.0024 in (0 - 0.6 mm). The mainshaft endplay requires using two dimensions or measurements when determining the amount of endplay between the transmission case and mainshaft rear bearing. The procedure also requires the use of a dial indicator when measuring the clearance between the bearing and the transmission case.



- Dimension "P" equals the thickness of the adjusting shim



- Dimension "M" equals the distance between the mainshaft rear bearing and transaxle case.

The formula for calculating the thickness of the mainshaft endplay shim is as follows:

Dimension "P" = "M" - Endplay

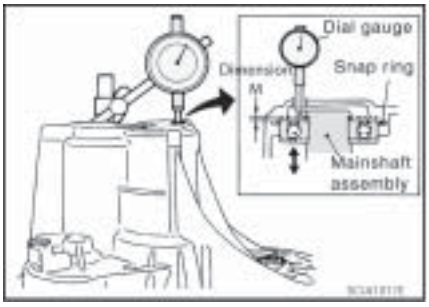
8. Install the mainshaft into the clutch housing.

9. Install snap ring to transaxle case.

10. Install the transaxle case to the clutch housing.

11. Install the snap ring to the mainshaft rear bearing.

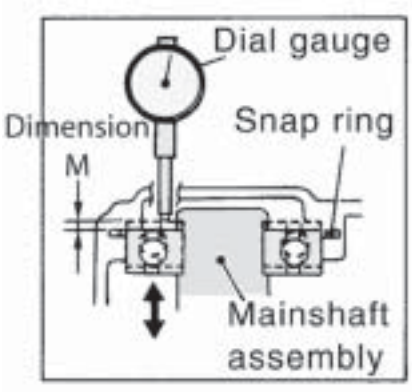
12. Temporarily tighten the fixing bolts around the transaxle case.



13. Install and attach the dial indicator deflector to the mainshaft through the bore plug access hole.

14. Zero the dial indicator.

15. ***Do not spread the snap ring when moving the mainshaft up and down while measuring the endplay.***



16. Reach in through the control assembly mounting hole with a screwdriver and lift up on the mainshaft, pressing the mainshaft against the transmission case.

17. Record the distance of travel or movement indicated on the dial indicator.

    _____

18. The distance the mainshaft assembly moves in the transaxle case becomes "Dimension M".

19. Calculate the shim thickness using the following formula:

    _____ Dimension M

    - _____ Endplay 0 - 0.0024 in (0 - 0.06 mm) (Refer to shim chart in the ESM and view available shims before proceeding.)

    =_____ Dimension P (Shim thickness)

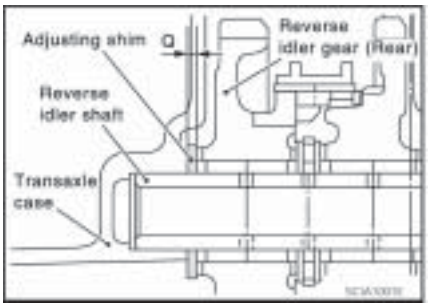
Example:

If the clearance measures 1.00 mm and the mainshaft clearance can be between 0 - 0.0024 in (0 - 0.06 mm), a review of the shim chart in the ESM shows an available shim of 0.96 mm, this provides a clearance or endplay of 0.04 mm. This is well within the accepted endplay range. The key is not to put a preload on the mainshaft bearings or too much clearance. Always refer to the ESM for shim selection.

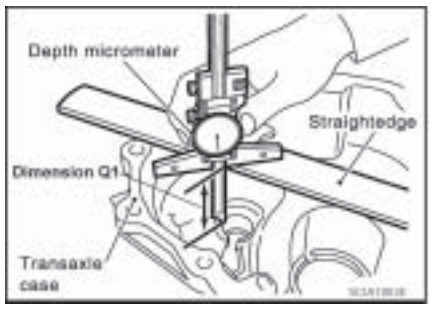
20. Remove the transaxle case and mainshaft from the clutch housing.

Reverse Idler Gear Endplay

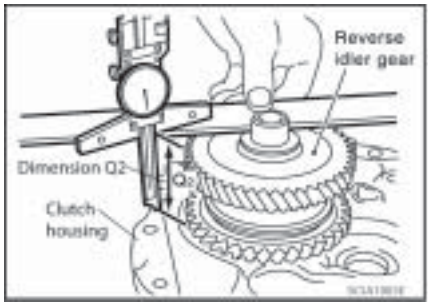
The reverse idler gear requires using an endplay or gap between the gear face and the transmission case. The specification calls for an endplay value or clearance between 0.0016 - 0.0055 in (0.04 - 0.14 mm). The reverse idler gear requires using three dimensions or measurements when determining the amount of endplay between the transmission case and reverse idler gear.



- Dimension "Q" is the thickness of the adjusting shim.



- Dimension "Q1" is the distance between the transaxle case end face and mounting face of adjusting shim.

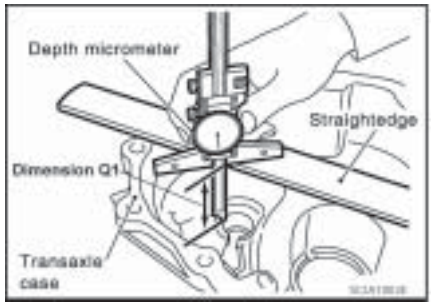


- Dimension "Q2" is the distance between the clutch housing case end face and end face of the reverse idler gear set.

The formula for calculating the formula is as follows:

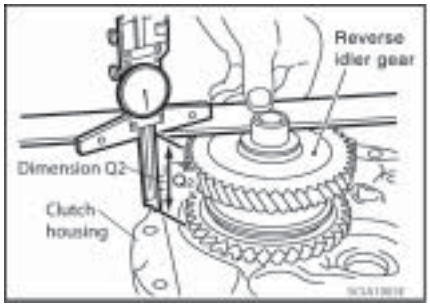
Dimension "Q" = (Q1 - Q2) - Endplay

Note: The service manual shows using a straight edge and depth gauge; this can also be done using the bridge tool set J34921B Shim Setting Gauge and J34921-25 Adapter.



21. Using a depth micrometer and straight edge as shown in the illustration, measure dimension "Q1" between the transaxle case end face and mounting face of adjusting shim. Record results.

    _____ Dimension "Q1"



22. Using the depth micrometer and straight edge as shown in the illustration, measure dimension "Q2" between clutch housing case end face and end face of reverse idler gear. Record results:

    _____ Dimension "Q2"

23. Calculate shim thickness using the following formula:

    ____ Dimension Q1

    - ____ Dimension Q2

    =____ Clearance
    (Refer to shim chart in the ESM and view available shims before proceeding.)

    - ____ Endplay 0.0016 - 0.0055 in (0.04 - 0.14 mm)

    =____ Dimension Q (shim thickness)

Example:

If dimension "Q1" measures 66.05 mm and dimension "Q2" measures 63.28 mm, you first subtract Q2 from Q1. This provides a difference of 2.77 mm. The specification provides for a clearance between 0.0016 - 0.0055 in (0.04 - 0.14 mm). A review of the shim chart in the ESM shows an available shim of 2.64 mm, this provides a clearance or endplay of 0.13 mm. This is well within the accepted endplay range. Again, the key is not to put a preload on the reverse idler gear or too much clearance. Always refer to the ESM for shim selection.

24. Install the selected reverse idler gear adjusting shim onto reverse idler gear.

25. Have your instructor inspect your work before proceeding.

    Instructor Initials _____

26. Locate special tool J34921 B Shim Setting Gauge and J34921-25 Adapter.

27. Place tool on case as per illustration and lock components into position.

28. Remove the reverse gear endplay shim from top of reverse gear.

29. Place tool on clutch housing with reverse gear installed. Allow the adapter to drop to the top of the reverse gear as shown in illustration.

30. Using a feeler gauge, measure the reverse gear endplay/clearance.

31. Did your results vary from your first measurement?

    YES / NO *(Circle one)*

32. Install the gear components in the clutch housing as per ESM instructions.

Note: The reverse gear shaft has a specific location in the transmission case. The rear case half will not fit properly if the reverse gear shaft is not in the correct location.

33. Install the magnet onto clutch housing.

34. Install the selected input shaft adjusting shim onto the input shaft.

35. Install the baffle plate and oil gutter into the transaxle case.

36. Do transmission gears rotate without binding?

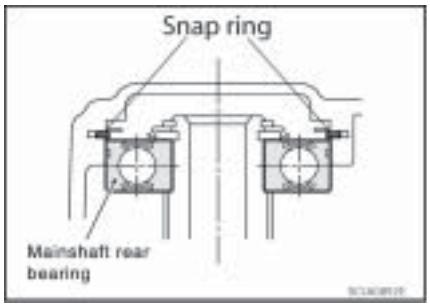
    YES / NO *(Circle one)*

37. Is the reverse idler gear shaft properly installed?

    YES / NO *(Circle one)*

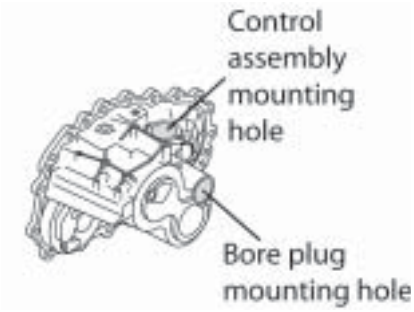
38. Install the selected mainshaft rear bearing adjusting shim into transaxle case.

39. Install the mainshaft rear bearing snap ring into the transaxle case.



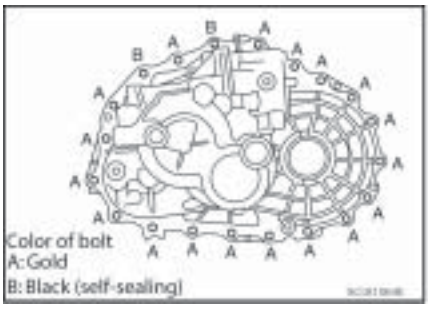
40. Install the transaxle case onto the input shaft and mainshaft.

41. Through the bore plug mounting hole, spread the snap ring.



42. Through the control assembly-mounting hole, lift up the mainshaft assembly.

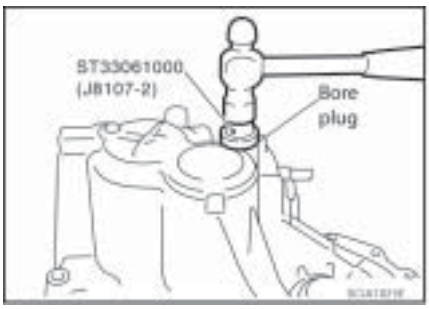
43. Securely install the snap ring onto the mainshaft rear bearing as shown in the service manual.



44. The service manual calls out "A" and "B" bolts for securing the two case halves. These bolts must be installed in specific locations and should be replaced after each disassembly. Why do the "B" bolts require replacement?

    _____

45. Install the "A" and "B" bolts and torque to specification.



46. Your instructor may have you install a new bore plug or reuse the original part for training purposes. Install the bore plug as per the service manual.

47. Continue following the service manual for the remainder of the transaxle assembly.

You have now completed this worksheet. You should be able to disassemble the transaxle case, remove the internal shift linkage, and remove the input shaft, mainshaft and final drive from the clutch housing. Correctly measure and determine endplay for the input shaft, mainshaft and reverse idler gear assembly. You should also be able to measure and select the correct shims for preload on the differential assembly. You should also be able to reassemble the transaxle after selecting the proper shims.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

Sentra

RS5F70A

RS5F70A FINAL DRIVE INSPECTION PRELIMINARY DISASSEMBLY

Objective: Given a RS5F70A 5-speed manual transmission, inspect shift quality on the bench, disassemble the transmission, and perform the necessary inspections, noting any noticeable components requiring replacement.

Relevance: Learning how to bench shift a transmission, then following correct procedures for disassembly saves time when it comes to service work.

Resources:
- RS5F70A 5-speed front wheel drive manual transmission
- Hand tools
- J34921B Shim Setting Gauge
- J34291-25 Adapter
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Bench shift the transmission, then follow worksheet and ESM procedures for disassembling the RS5F70A transmission.

Follow Service Manual procedures unless otherwise noted.

1. Are any service bulletins stored in ASIST that relate to the transmission you are inspecting?

   YES / NO *(Circle one)*

2. Using ASIST, review any service bulletins relating to this transmission. List them by title and TSB number in the following spaces.

   _____

   _____

   _____

3. Inspect transmission case for signs of visible damage. Record your findings below:

   _____

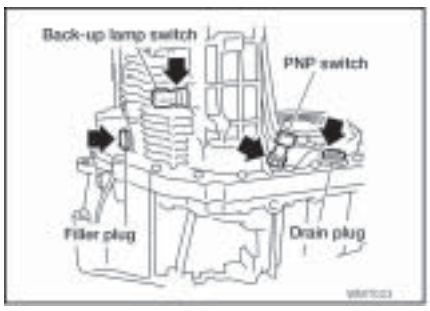
4. Bench shift the transmission prior to disassembly. Does the transmission shift into all forward and reverse gears?

   YES / NO *(Circle one)*

5. If the transmission does not shift into one or more ranges, note it here:

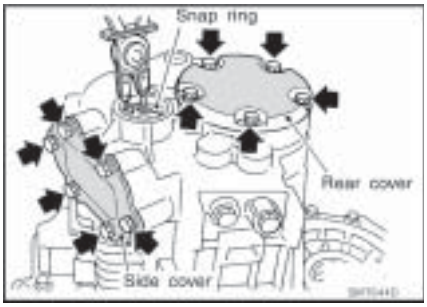
   _____

Disassembly



6. Remove the back-up lamp, PNP switch, drain plug, and filler plug from transaxle case. Note any problems or difficulties encountered while removing these components.

   _____

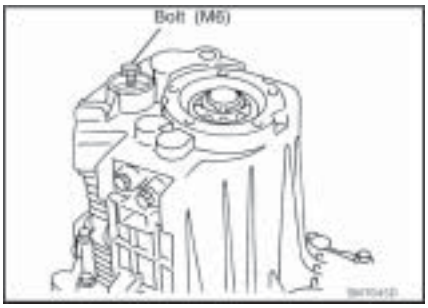


7. Remove the snap ring from the reverse idler shaft as shown.

8. Remove the side cover and rear cover from the case.

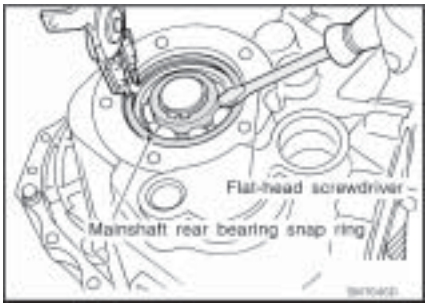
9. Remove O-ring and mainshaft bearing adjusting shim.

10. Remove reverse idler gear shaft by attaching a 6 mm bolt to threaded portion of shaft.



11. Using a suitable tool such as pliers, remove the reverse idler shaft from the case by pulling on bolt head.

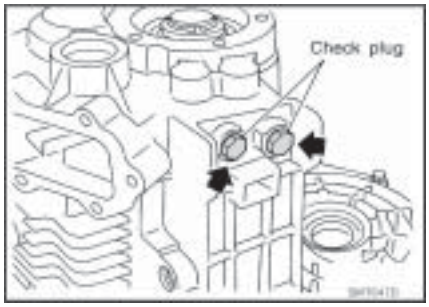
12. Remove the reverse idler gear, thrust washer (front and rear), and bearing from case.



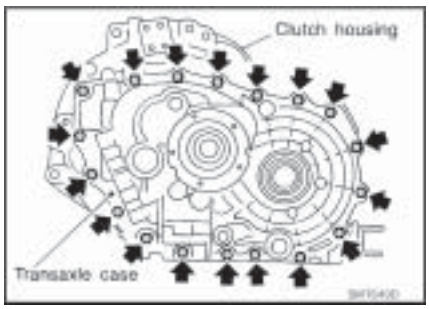
13. Remove the mainshaft rear bearing snap ring from the case.

14. What problem would you have if this snap ring were not removed?

_____



15. Remove the check plugs, springs, and check balls from case.



16. Remove transaxle case mounting bolts.

17. Remove transaxle case from clutch housing.

18. Inspect the clutch housing and transaxle case attaching surfaces for damage. Note any problems found.

_____

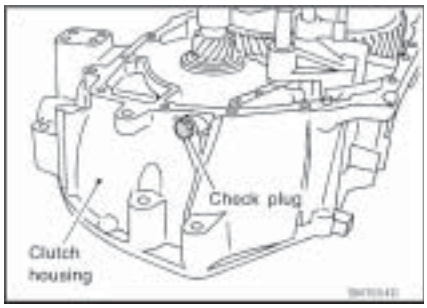
19. What would be the customer complaint if the mating surface is damaged?

_____

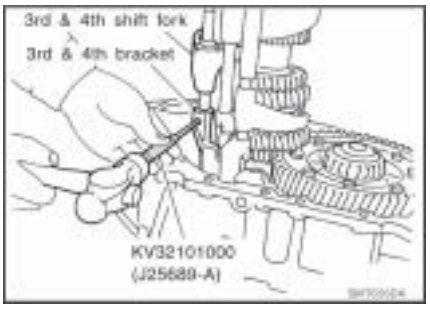
Clutch Housing

20. Inspect the gear sets and shift components for any noticeable problems. Record your findings below:

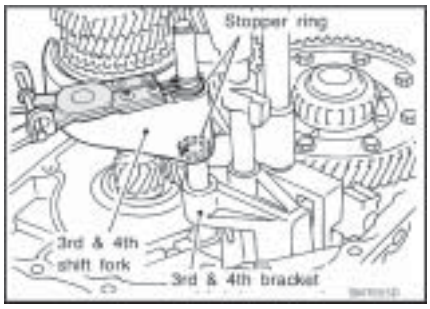
_____



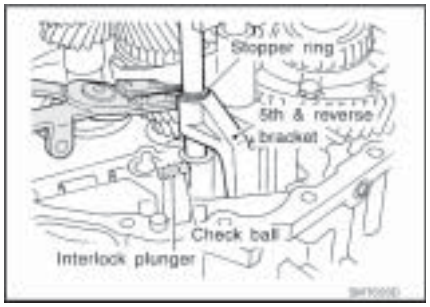
21. Remove check plugs, check springs, check pins and check balls from housing.



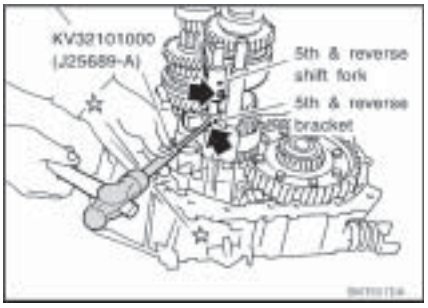
22. Remove the 3rd and 4th bracket retaining pin using tool J25689-A.



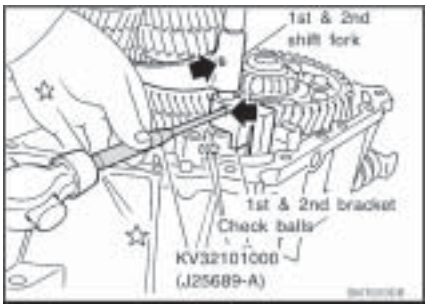
23. Remove the 3rd and 4th shift fork stopper ring.
24. Remove the 3rd and 4th fork rod.
25. Remove the 3rd and 4th shift fork and bracket.



26. Remove the interlock plunger and bracket.
27. Remove the 5th and reverse bracket stopper ring.



28. Remove the retaining pins from 5th and reverse shift fork and 5th and reverse bracket using tool J25689-A.
29. Remove the 5th and reverse fork rod.
30. Remove the interlock pin from 5th and reverse fork rod using tool J25689-A.
31. Remove the reverse switch bracket and 5th & reverse bracket.

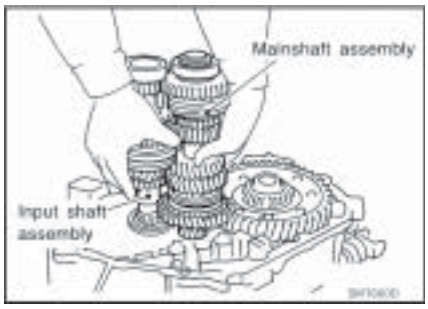


32. Remove the check ball from housing.

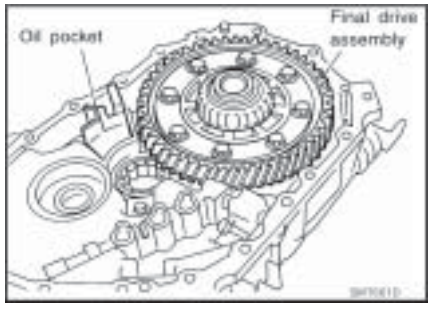
33. Remove retaining pin for 1st and 2nd shift fork and 1st and 2nd bracket.

34. Remove 1st and 2nd fork rod.

35. Remove 5th and reverse and 1st and 2nd shift forks, and 1st and 2nd bracket.



36. Remove both input shaft and mainshaft assemblies from housing.



37. Remove final drive assembly from clutch housing.

You have now completed this worksheet. You should be able to inspect the transmission shift quality and disassemble the case halves, then remove internal shift linkage, gear assemblies and final drive assembly.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS5F70A FINAL DRIVE INSPECTION PRE-ASSEMBLY ADJUSTMENTS

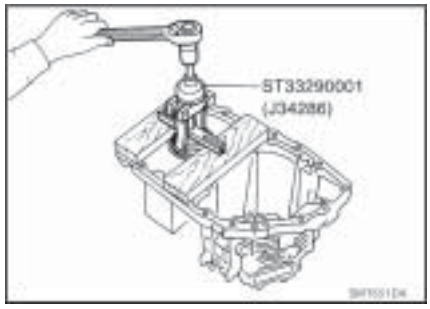
Objective: Given a RS5F70A 5-speed manual transmission, inspect the final drive assembly, determine shim size and placement, note any problems on the worksheet and reassemble the transmission.

Relevance: Learning how to inspect the final drive side gears and shims as well as determine differential side bearing preload saves time when it comes to service work.

Resources:
- RS5F70A 5-speed front wheel drive manual transmission
- Hand tools
- J34921B Shim Setting Gauge
- J34291-25 Adapter
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly inspect the final drive assembly, determine shim size and placement, note any problems on the worksheet.

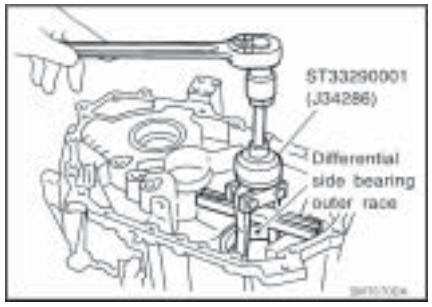
Follow Service Manual procedures unless otherwise noted.



1. Visually inspect the final drive assembly paying attention to the final drive gear and side gears. Note any problems below:

   _____

2. Remove the left and right side bearing outer race from the clutch housing and transaxle case. Remove all shims from case halves.



Note: Inspect for improper shim placement.

3. Which side should the differential side bearing shim be placed? *(Check one)*

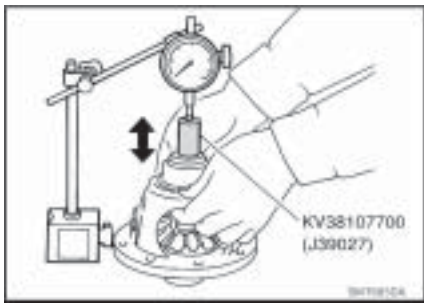
   ☐ Clutch housing

   ☐ Transaxle case

Differential Side Gear and Case Measurement

4. List from the ESM the specification for clearance between side gear and differential case.

   _____



5. Place the final drive upright using the bearing inside the bearing race for support on the workbench.

6. Place the final drive adapter and dial gauge onto side gear. Move side gear up and down, measuring the side gear clearance. List measured results:

   _____

7. Place the final drive onto the opposite side and measure the side gear clearance on the other gear. List measured results:

   _____

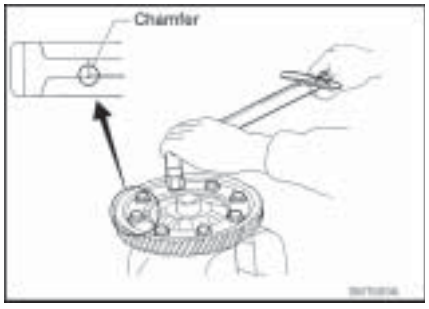
8. Was either side gear clearance out of specification?

   YES / NO *(Circle one)*

9. If either side were out of specification, what would be necessary to bring it back into specification?

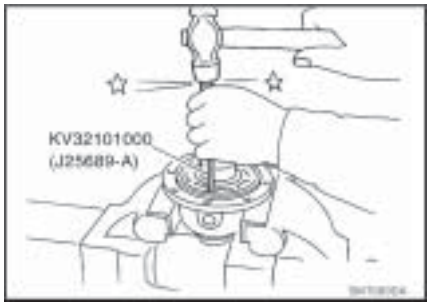
   _____

Disassembly



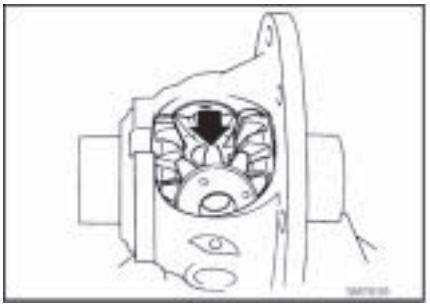
10. The service manual instructs you to remove the final drive gear. For training purposes this is not necessary.

Note: We will not be removing the side bearings and speedometer drive gear for this exercise.



11. Remove the lock pins for the pinion mate using tool J25689-A.

12. Remove the pinion shaft.



13. Rotate pinion mate gear, and remove pinion mate gear, pinion mate thrust washer, side gear, and side gear thrust washer from differential case.

14. Inspect mating surfaces of differential case, side gears and pinion mate gears and check washers for wear.

15. List any problems identified with differential case, side gears, pinion mate gears and washers.

    _____

16. What caused the side gear endplay to be excessive?

    _____

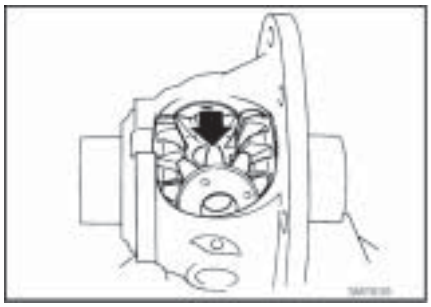
17. Do not repair side gear clearance at this time.

Assembly

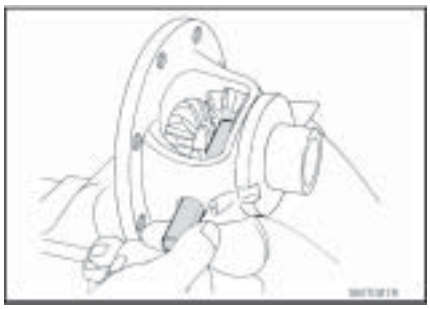
Note: Do not force shims and shaft during assembly. If the pinion shaft encounters difficulty during assembly, inspect gear alignment.

18. Apply gear oil to sliding area of differential case, each gear, and thrust washer.

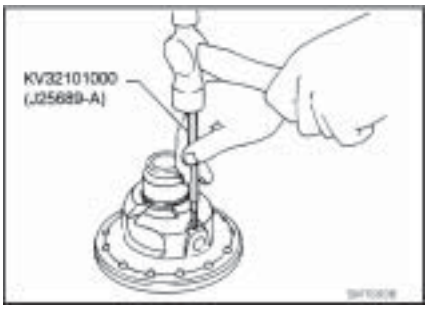
19. Install side gear thrust washer and side gear into differential case.



20. Position pinion mate gear and pinion mate thrust washer diagonally, and install them into differential case while rotating into position.

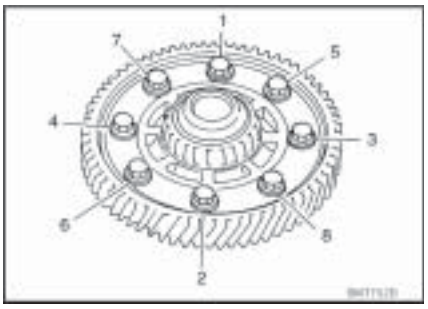


21. Insert pinion mate shaft into differential case. Do not force the shaft into position. If unable to fully install, inspect pinion gear position.



22. Install retaining pin using tool J25689-A.

23. If removed, install differential gear onto differential case. Tighten mounting bolts in order as shown in illustration.



24. What is the torque specification for these bolts?

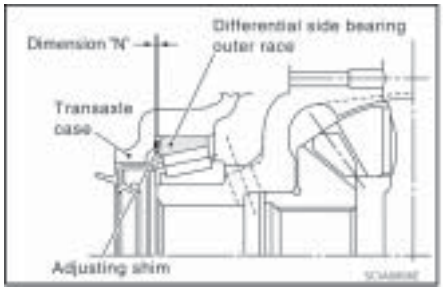
_____

Note: The service manual instructs you to apply sealer to the mounting bolts. For training purposes, you will not be using locktite or any sealers with similar properties during assembly.

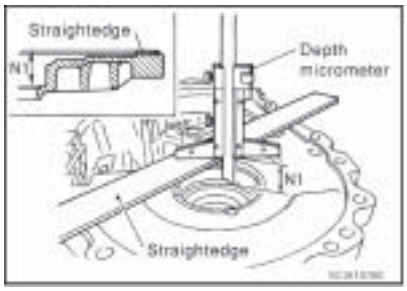
Differential Side Bearing Preload

The differential side bearing preload varies from the endplay measured in the RS5F51A worksheet. Preload is a determined amount of load or tension added to the bearing. Preload keeps a specified amount of load on the bearing without overloading the bearing and causing premature failure. The specification calls for a preload of 0.0059 - 0.0083 in (0.15 - 0.21 mm).

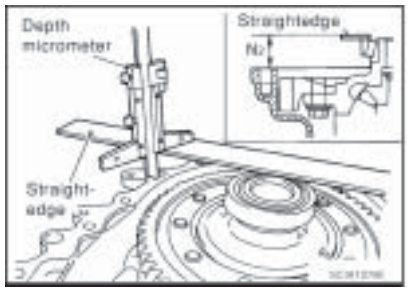
The differential side bearing preload requires using three dimensions or measurements when determining the amount of preload on the differential side bearings.



- Dimension "N" is the thickness of the adjusting shim.



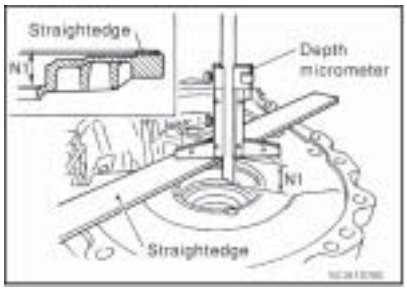
- Dimension "N1" is the distance between transmission case end face and mounting face of adjusting shim.



- Dimension "N2" is the distance between the differential side bearing and clutch housing.

The formula for calculating the thickness of the shim is as follows:

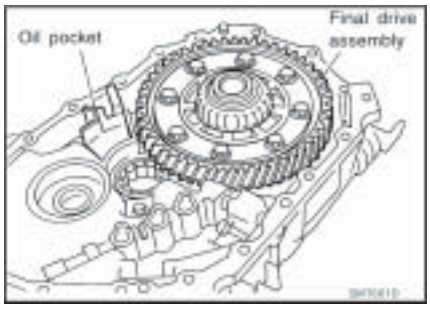
Dimension "N" = (N1 - N2) + Preload

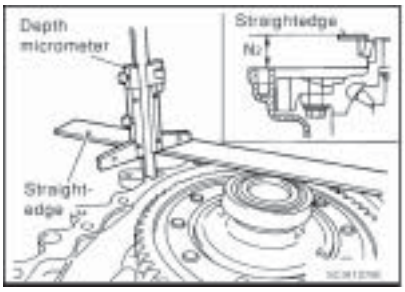


25. Using the depth micrometer and straight edge, measure dimension "N1" between transmission case end face and mounting face of adjusting shim as shown. Record results:

    _____ Dimension "N1"

26. Install differential side bearing race into clutch housing.





27. Set differential into clutch housing and place the outer bearing race onto the differential bearing (final drive gear side).

28. Seat the bearings by rotating the final drive gear five or more times by hand. While the gear is rotating, apply light pressure to the upper side-bearing race.

29. Using depth micrometer and straightedge, measure dimension "N2" between differential side bearing outer race and clutch housing end face as shown in illustration. Record results:

    _____ Dimension "N2"

30. Calculate differential side bearing preload shim thickness using the following formula:

    ____ Dimension N1

    - ____ Dimension N2

    = ____ Clearance
    (Refer to shim chart in the ESM and view available shims before proceeding.)

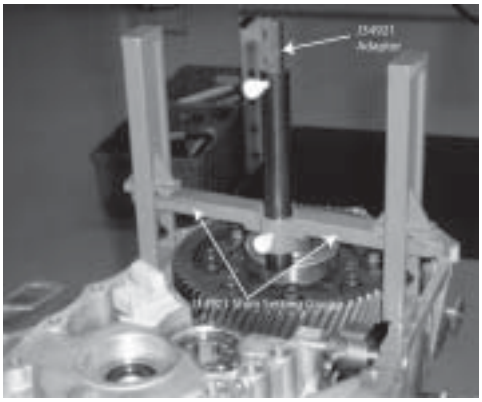
    + ____ Preload 0.0059 - 0.0083 in (0.15 - 0.21 mm) (clearance and pressure applied to bearing)

    = ____ Dimension N (thickness of adjusting shim(s))

Example:

If the clearance measures 0.60 mm and the preload can be between 0.0059 - 0.0083 in (0.15 - 0.21 mm), this requires adding the necessary preload to the clearance. A review of the shim chart in the ESM shows an available shim of 0.76 mm, this provides a preload of 0.16 mm. This is well within the accepted preload. The key is not to put too much pressure or preload on the bearings. Always refer to the ESM for shim selection.

31. Locate bridge tool J34921B Shim Setting Gauge and J34291-25 Adapter.



32. Place tool on clutch housing and rest the adapter on the final drive side gear as per illustration.

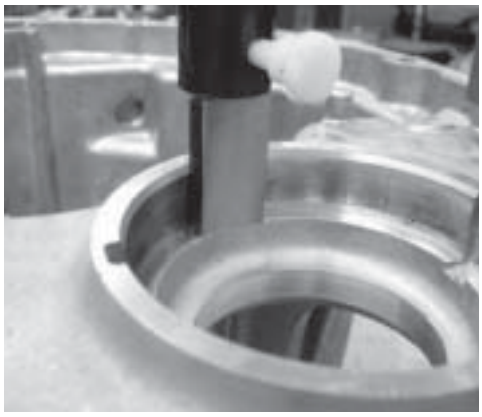
33. Place bridge tool on transmission case as per illustrations. Allow the small adapter to drop to the case.

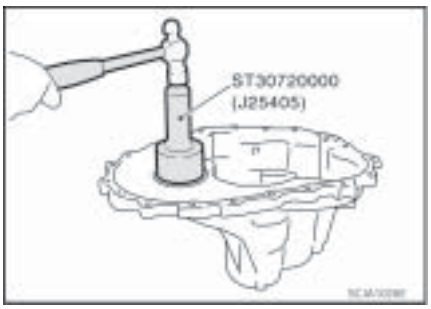
34. Using a feeler gauge, measure the final drive bearing clearance.

35. Calculate the preload for the final drive.

36. Does bridge tool value match results obtained in step 30?

YES / NO *(Circle one)*





37. Install the selected adjusting shim(s) and then install the differential side bearing outer race.

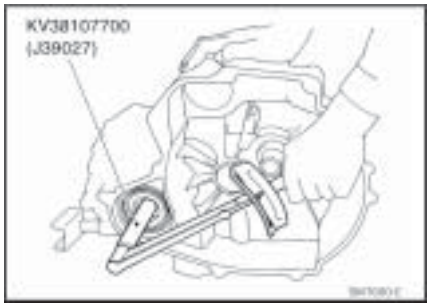
38. Install final drive into the clutch housing.

39. Assemble case halves, tightening bolts to specification.

40. List the specification for the final drive turning torque.

_____

_____



41. Measure the turning torque of the final drive assembly using tool J39027 and an inch-pound pointer type torque wrench.

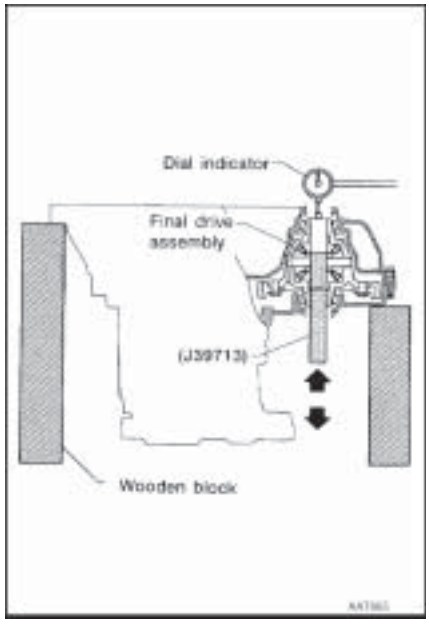
42. List the obtained results for the final drive turning torque.

_____

43. If the final drive turning torque is out of specification, what should be done to bring it back into specification?

_____

_____



44. Disassemble transaxle case halves. Do not remove final drive assembly from clutch housing.

You have now completed this worksheet. You should be able to inspect the final drive assembly and complete all measurements relating to the final drive.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS5F70A GEAR INSPECTION AND DISASSEMBLY

Objective: Given a RS5F70A manual transmission, disassemble the input shaft as instructed by the worksheet and perform the necessary inspections, recommending which parts should be replaced.

Relevance: Following correct procedures for disassembly saves time when it comes to service work and transmission repair.

Resources:
- RS5F70A 5-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- ESM
- Technician gloves

Skill Check: Properly disassemble and reassemble the input shaft gear assembly.

Module 11b

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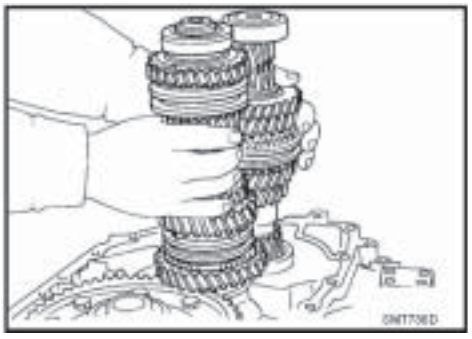
Follow Service Manual procedures unless otherwise noted.



1. Remove the gear components from the clutch housing. The input shaft, mainshaft and reverse idler gear assemblies require lifting out as a complete unit. If necessary, use a soft faced hammer tapping on the input shaft for easier removal.

Input Shaft and Gears Inspection, Disassembly and Assembly

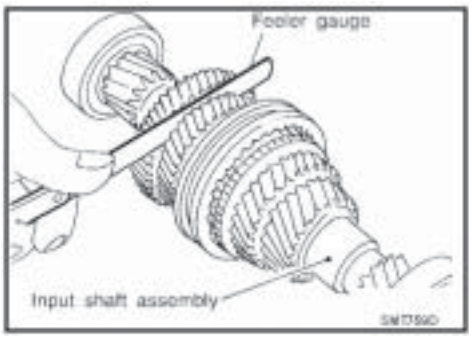
2. List the end play **specification** for the following components:

   3rd gear End play _____

   _____

   4th gear End play _____

   _____



3. **Measure** the gear endplay and list your findings.

   3rd gear End play _____

   _____

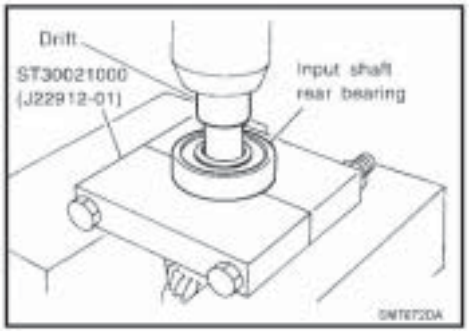
   4th gear End play _____

   _____

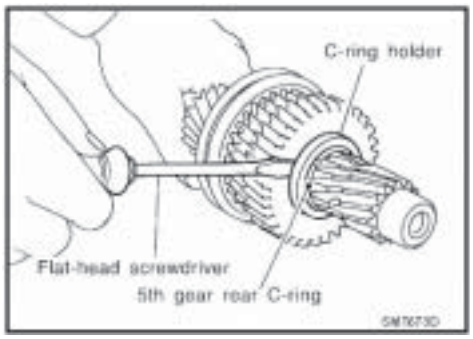
4. If the endplay is greater or less than the standard specification, which items should be inspected?

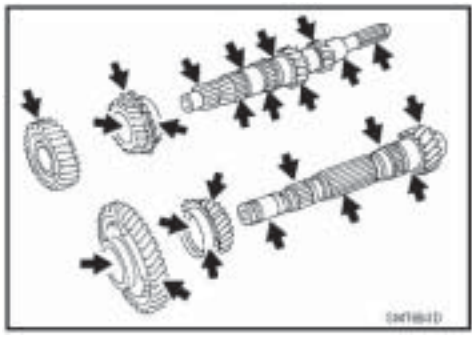
   _____

   _____



5. Continue disassembling the input shaft as per service manual instruction.





6. Inspect the contact surface on each gear, input shaft and main drive gear for damage which may include any of the following:

	OK	NG
▪ Unusual wear	___	___
▪ Excessive wear	___	___
▪ Peeling	___	___
▪ Abrasion	___	___
▪ Dent	___	___
▪ Bent shaft	___	___
▪ Any other damage	___	___

Module 11b

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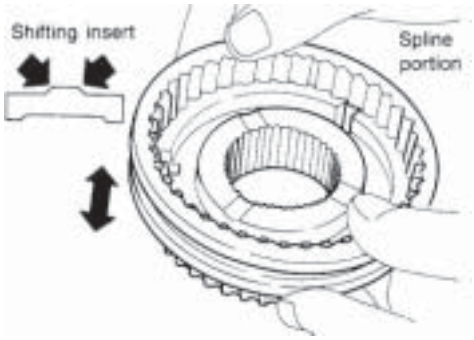
7. List any items that show any signs of unusual wear or damage:

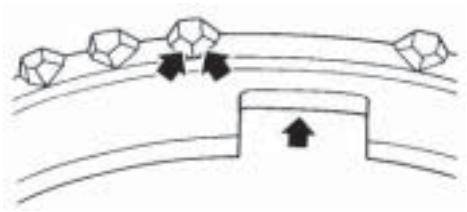
_____

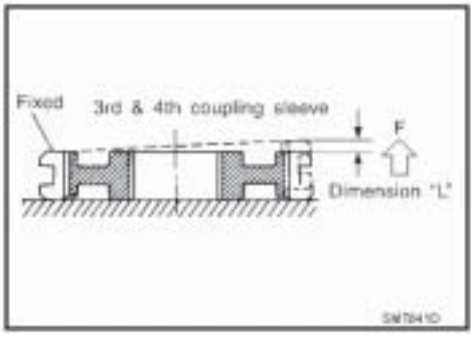


8. Inspect the contact surface of the coupling sleeve, synchronizer hub, shifting insert and baulk rings.

9. List any items that show any signs of unusual wear or damage:

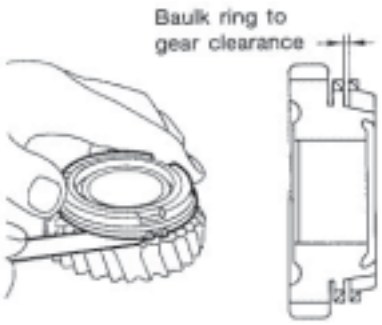
_____





10. Inspect the free play movement for the 3rd-4th coupling sleeve with one end of the coupling sleeve and hub held steady, and the other end lifted as shown in the illustration. If the movement exceeds expectation, what would be the necessary repair?

_____



11. Inspect the single cone synchronizer clearance for 3rd and 4th baulk rings.

    Clearance specification

    Standard 3rd & 4th: _____

    _____

    Limit value: _____

    Measurement

    3rd gear baulk ring _____

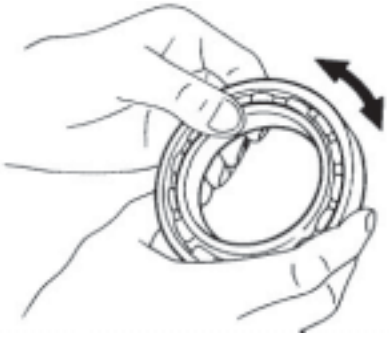
    _____

    4th gear baulk ring _____

    _____

12. If the baulk ring clearance is out of specification, which item(s) require replacing?

    _____



13. Inspect input shaft bearings for damage and rough rotation.

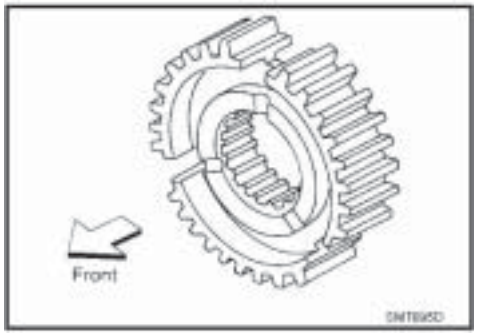
14. List any items that show any signs of unusual wear or damage:

    _____

Module 11b

Assembly

15. Begin reassembling the input shaft as per worksheet and ESM instructions.



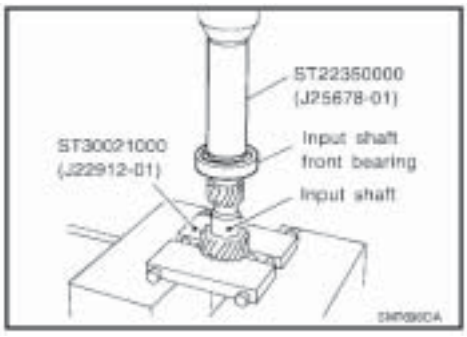
Note: Many items are directional. Pay close attention to the direction shown in the service manual during transmission assembly.

16. Are any items listed in the ESM which should be replaced anytime the input shift is disassembled? If so, which items?

    _____

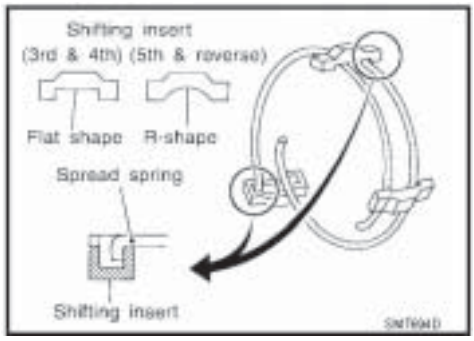
    _____

    _____



17. Install front bearing on input shaft using the press and a suitable bearing support tool.

18. Install 3rd gear needle, 3rd input gear and 3rd gear baulk ring bearing to input shaft.

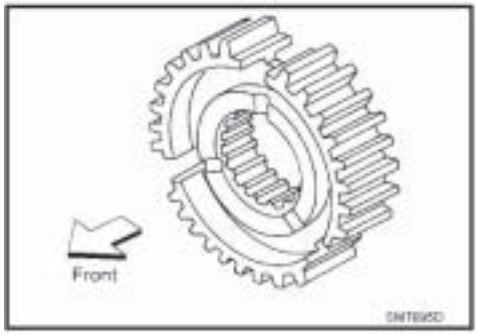


19. Install spread spring, shifting insert, and 3rd and 4th synchronizer hub onto 3rd and 4th coupling sleeve.

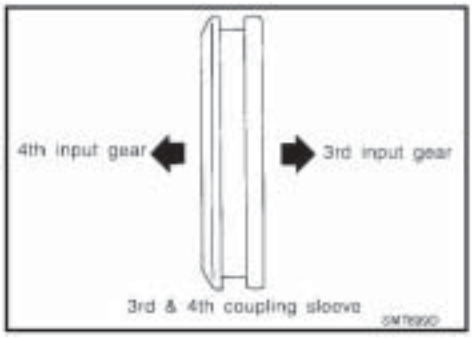
Note: Pay attention to the shape of spread spring and shifting insert for correct assembly. Do not install spread spring hook onto the same shifting insert.

CAUTION:

During overhaul procedures, the ESM recommends replacing the 3rd & 4th synchronizer hub. For training purposes, reuse hub.



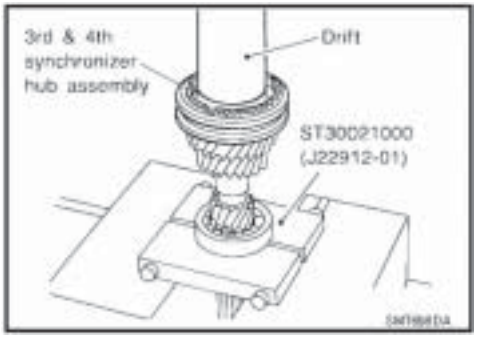
20. Install synchronizer hub with its three grooves facing the front of the input shaft (3rd input gear side).



21. Install the 3rd and 4th coupling sleeve with the chamfered surface facing the 4th input gear side onto the hub assembly.

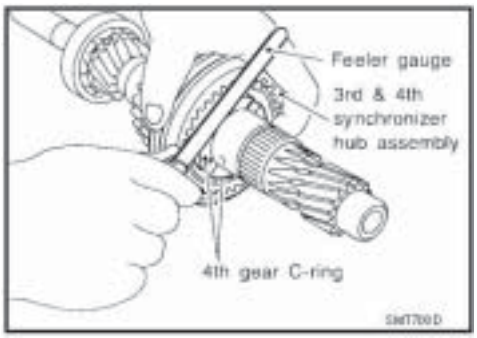
22. Install shift inserts and spread springs onto the hub and coupling sleeve assembly.

23. Position bearing splitter under the front input bearing so the bearing is supported equally by the inner and outer races.



24. Align the grooves for the 3rd & 4th hub and coupling sleeve assembly onto the input shaft, then press the hub onto the input shaft.

25. Install the 4th gear C-ring onto the input shaft.



26. Measure the end play for the 3rd and 4th synchronizer hub and list your results.

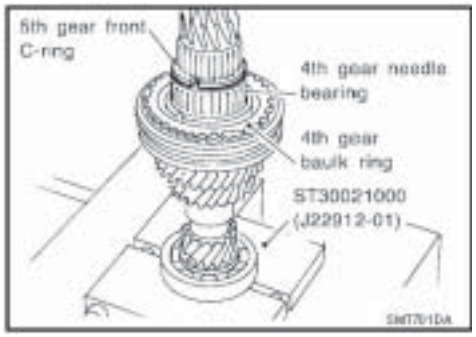
_____

27. Is the 3rd & 4th gear synchronizer hub end play measurement within specification?

    YES / NO *(Circle one)*

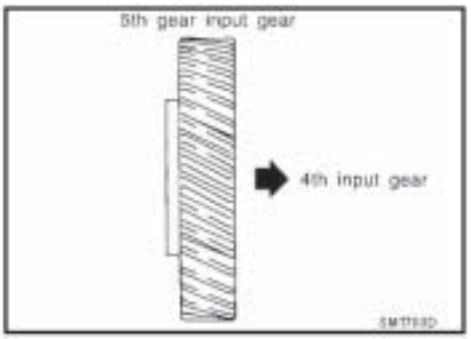
28. If the end play is not within specification, what does the ESM recommend doing to bring the measurement back into specification?

    _____



29. Continue with assembly by installing the 4th gear needle bearing, 4th gear baulk ring, and 5th gear front C-ring.

30. Install 4th gear input.



31. Install 5th input gear as per illustration.

32. According to the ESM, is the 5th input gear reusable?

    YES / NO *(Circle one)*

33. Install the 5th gear rear C-Ring onto input shaft.

34. Measure the 5th input gear end play and list your findings.

    _____

35. If the end play is not within specification, what does the ESM recommend doing to bring the measurement back into specification?

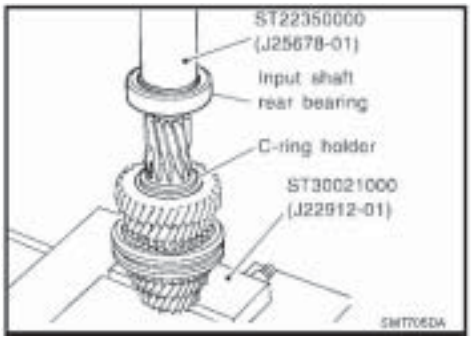
    _____

    _____

36. According to the ESM, is the C-ring holder reusable?

YES / NO *(Circle one)*

37. For training purposes install the original C-ring holder.

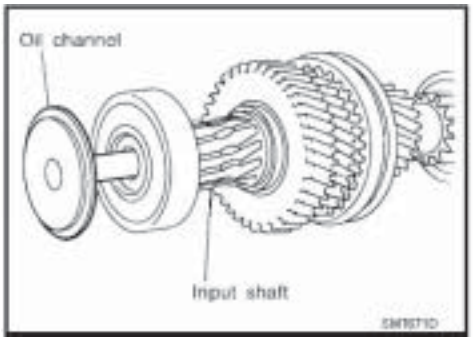


38. Install input shaft rear bearing using the proper press procedures.

39. Which direction should the input shaft rear bearing face when installed?

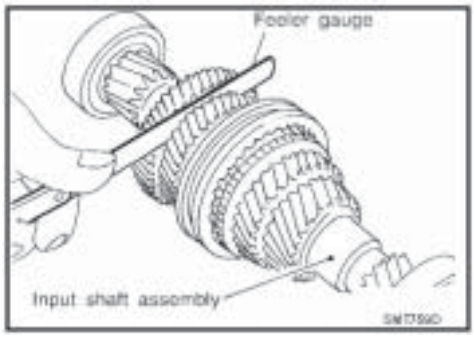
_____

_____



40. Install oil channel onto the input shaft.

Module 11b



41. **Measure** the gear endplay and list your findings.

3rd gear End play _____

_____

4th gear End play _____

_____

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42. If the endplay is greater or less than the standard specification, which items should be inspected?

_____

_____

You have now completed this worksheet. You should be able to disassemble the input shaft, perform each inspection as indicated by the service manual, recommend which components require replacement, and reassemble the input shaft prior to transmission assembly.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS5F70A REASSEMBLY AND FINAL INSPECTION

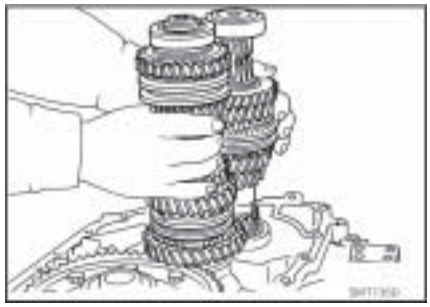
Objective: Given a RS5F70A 5-speed manual transmission, reassemble the transmission case halves and determine the mainshaft endplay using service manual procedures. Verify the transmission shifts into all forward and reverse gears after unit assembly.

Relevance: Following correct procedures for reassembly saves time when it comes to service work and transmission repair.

Resources:
- RS5F70A 5-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly reassemble the transmission components, then determine reverse idler gear endplay.

Follow Service Manual procedures unless otherwise noted.



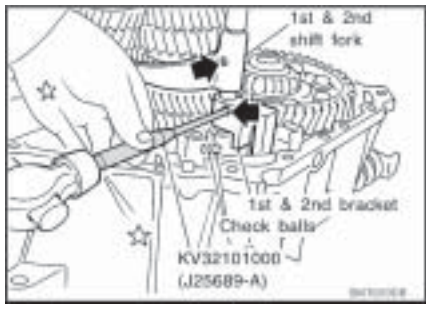
1. Install input shaft assembly and mainshaft assembly into clutch housing.

CAUTION:

Be careful not to damage input shaft oil seal during installation of input shaft assembly.

2. Install 5th and reverse shift fork.

3. Install 1st and 2nd shift fork, bracket, and fork rod.



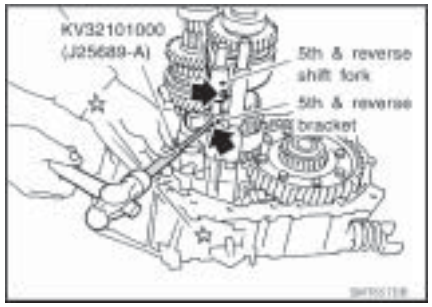
4. Install retaining pin for 1st and 2nd bracket using tool J25689-A.

Note: As a general rule when rebuilding manual transmissions, do not reuse the retaining pins. Check the appropriate service manual for information.

5. Install the two check balls.

6. Install interlock pin into the 5th and reverse fork rod using tool J25689-A.

7. Install reverse switch bracket, 5th & reverse bracket, and fork rod.



8. Install new retaining pin for 5th and reverse shift fork and reverse switch bracket using tool J25689-A.

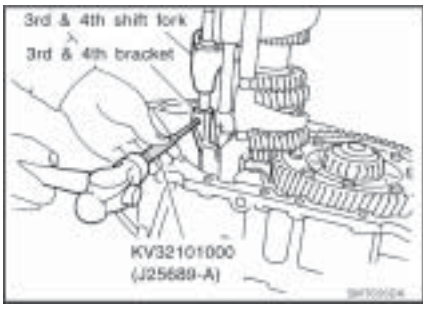
9. Install 5th and reverse bracket stopper ring.

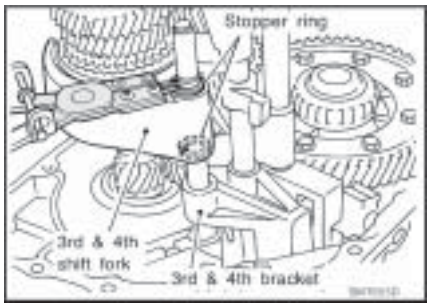
Note: As a general rule when rebuilding manual transmissions, do not reuse the stopper rings. Check the appropriate service manual for information.

10. Install check ball and interlock plunger.

11. Install 3rd & 4th shift fork, bracket, and fork rod.

12. Install 3rd and 4th bracket retaining pin using tool J25689-A.

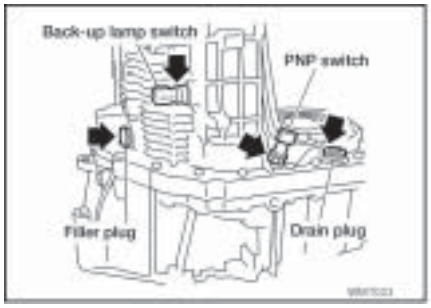




13. Install 3rd & 4th stopper ring.

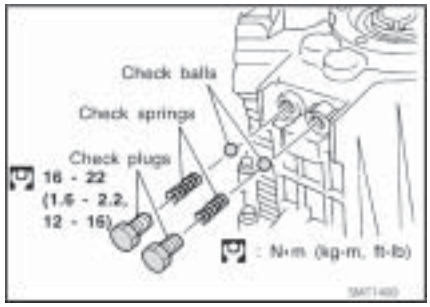
14. Install check ball, check pin, and check spring, and check plug. Tighten the check plug to specification.

15. Install transaxle case onto clutch housing, tightening mounting bolts to specification.

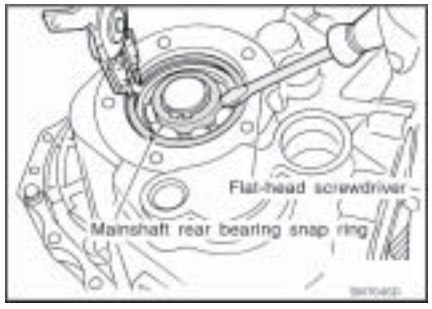


16. Install back-up lamp switch, PNP switch, and drain plug.

17. Install speedometer pinion assembly.



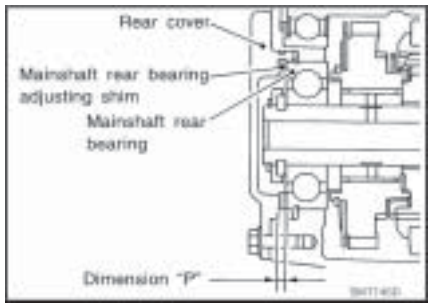
18. Install check springs and check balls.



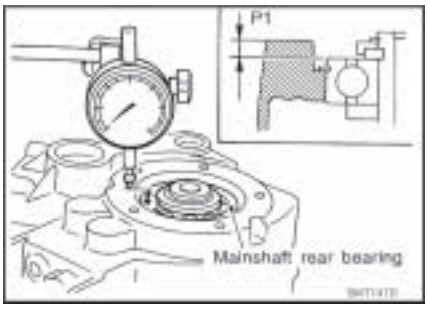
19. Using snap ring pliers and flat-head screwdriver, install snap ring.

Mainshaft Endplay

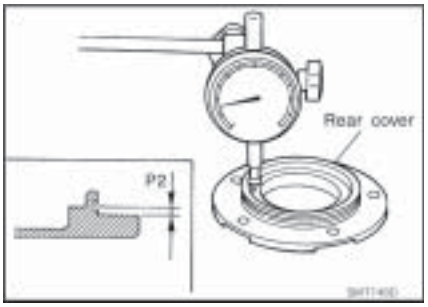
Rather than use a preload on the input shaft rear bearing, the transmission uses a specified gap or endplay clearance between the mainshaft rear bearing and the rear cover. The endplay value or clearance between the rear mainshaft bearing and rear cover calls for a clearance of between 0 - 0.0024 in (0 - 0.06 mm). The mainshaft endplay requires using three dimensions or measurements when determining the amount of endplay between the bearing and the rear cover.



- Dimension "P" is the thickness of the adjusting shim.



- Dimension "P1" is the distance between the transaxle case end face and mainshaft rear bearing.



- Dimension "P2" is the distance between adjusting shim end face of rear cover and transaxle mounting face.

The formula for calculating the shim thickness is as follows:

Dimension "P" = (P1 - P2) - Endplay

20. Calculate mainshaft adjusting shim thickness using the following formula:

    _____ Dimension P1

    - _____ Dimension P2

    =_____ Clearance
    (Refer to shim chart in the ESM and view available shims before proceeding.)

    - _____ Endplay 0 - 0.0024 in (0 - 0.06 mm)

    =_____ Dimension P (Shim thickness)

Example:

If the clearance measures 3.19 mm and the input shaft clearance can be between 0 - 0.0024 in (0 - 0.06 mm), a review of the shim chart in the ESM shows an available shim of 3.15 mm, this provides a clearance or endplay of 0.04 mm. This is well within the accepted endplay range. The key is not to put a preload on the input shaft bearings or too much clearance. Always refer to the ESM for shim selection.

Note: This procedure can be completed using the bridge tool, depth gauge or vernier caliper.

21. Install mainshaft-adjusting shim.

22. Install reverse idler gear, O-ring, thrust washers (front and rear), and bearing onto reverse idler shaft. (Lubricate O-ring with gear oil prior to installation.)

23. Install snap ring into transaxle case using snap ring pliers.

24. List the reverse idler gear shaft endplay specification from the ESM.

    _____

25. Using the procedure found in the ESM, measure the reverse idler gear shaft endplay and list your results.

    _____

26. What would be the proper procedure for bringing the endplay into specification if your measurement showed it was incorrect?

    _____

27. Apply gear oil to the rear cover O-ring, install rear cover, side cover gasket and side cover.

28. Tighten mounting bolts to the specified torque.

29. Bench shift the transmission. Does the transmission shift into all forward and reverse gears?

    YES / NO *(Circle one)*

30. If the transmission does not shift into one or more ranges, note it here:

    _____

You have now completed this worksheet. You should be able to assemble the case halves, complete all measurements relating to the mainshaft endplay and reverse idler gear endplay, then complete the transmission reassembly. After assembly, the transmission should be able to shift into all gear ranges.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

NOTES

Sentra, Maxima

RS6F51A/H

RS6F51A PRELIMINARY DISASSEMBLY

Objective: Given a RS6F51A or RS6F51H 6-speed manual transmission, inspect shift quality on the bench, disassemble the transmission, and perform the necessary inspections, noting any components requiring replacement.

Relevance: Learning how to bench shift a transmission, then following correct procedures for disassembly saves time when it comes to service work.

Resources:

- RS6F51A or RS6F51H 6-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Bench shift the transmission, then follow worksheet and ESM procedures for disassembling the RS6F51A OR RS6F51H transmission.

Follow Service Manual procedures unless otherwise noted.

1. Are any service bulletins stored in ASIST that relate to the transmission you are inspecting?

   YES / NO *(Circle one)*

2. Using ASIST, review any service bulletins relating to this transmission. List them by title and TSB number in the following spaces.

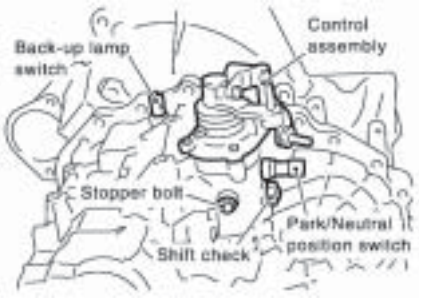
   _____

3. Inspect transmission case for signs of visible damage. Record your findings below:

   _____

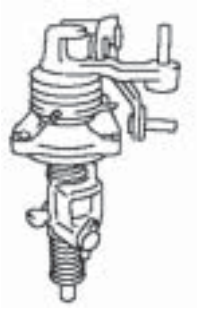
4. Bench shift the transmission prior to disassembly. Does the transmission shift into all-forward gears and reverse?

   YES / NO *(Circle one)*



5. Remove the drain plug, filler plug, park/neutral position switch, back-up lamp switch, shift check and stopper bolts. Note any problems or difficulties encountered while removing these components.

   _____

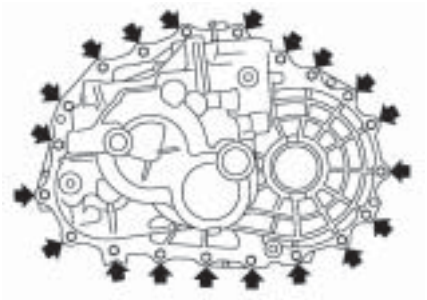


6. Remove the shift control assembly.

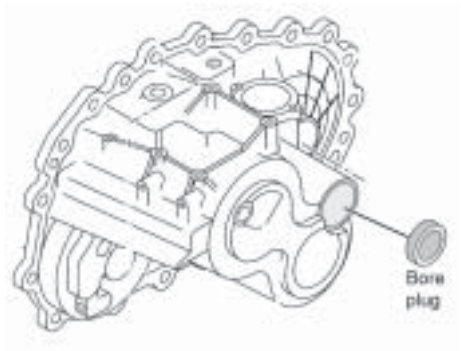
7. Remove the two check ball plugs, two check springs and two check balls.

8. Are the check ball plugs reusable?

   YES / NO *(Circle one)*



9. Remove the transaxle case fixing bolts.



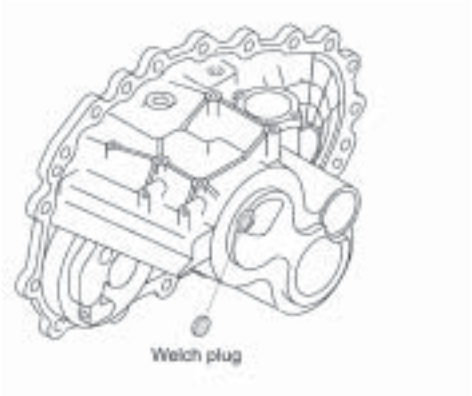
10. Remove the bore plug at the rear of the transaxle case.

CAUTION:

Avoid damaging the transaxle case while removing the bore plug.

11. Spread the mainshaft rear bearing snap ring through the bore plug hole, then separate the clutch housing from the transaxle case.

12. Remove the oil gutter and baffle plate and set aside.



13. Do not remove the welch plug from the transaxle case as instructed by the ESM.

14. Inspect the clutch housing and transaxle case mating surfaces for damage. Note any problems found.

    _____

15. What could be the effect of a damaged transmission case-mating surface?

    _____

16. Inspect the gear sets and shift components for any noticeable problems. Record your findings below:

    _____

You have now completed this worksheet. You should be able to inspect the transmission shift quality and disassemble the case halves.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS6F51A OR RS6F51H GEAR INSPECTION AND DISASSEMBLY

Objective: Given a RS6F51A or RS6F51H manual transmission, disassemble the transmission shift components and gear assemblies as instructed by worksheet, perform the necessary inspections, recommending which parts should be replaced.

Relevance: Following correct procedures for disassembly saves time when it comes to service work and transmission repair.

Resources:
- RS6F51A or RS6F51H 6-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

Skill Check: Properly disassemble and reassemble the input shaft gear assembly.

Follow Service Manual procedures unless otherwise noted.

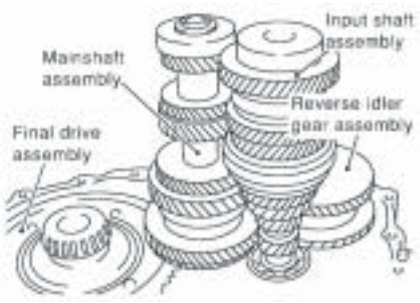
1. Remove and inspect the reverse check ball plug, reverse check spring, reverse shift check sleeve and check ball.

2. Is the check ball plug reusable?

   YES / NO *(Circle one)*

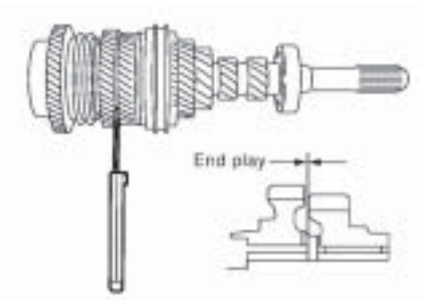
3. Remove brackets, stopper rings, shift rods, forks, check balls and interlock pins as per service manual instructions. Inspect components and note any problems found.

   _____



4. Remove the gear components from the clutch housing. The input shaft, mainshaft and reverse idler gear assemblies require lifting out as a complete unit. If necessary use a soft faced hammer to tap on the input shaft for easier removal. ***Do not remove the differential oil seals or side bearing races and input shaft oil seal.***

Input Shaft and Gears Inspection, Disassembly and Assembly



5. List the endplay **specification** for the following components:

   3rd gear Endplay _____

   _____

   4th gear Endplay _____

   _____

   5th gear Endplay _____

   _____

   6th gear Endplay _____

   _____

6. **Measure** the gear endplay and list your findings.

   3rd gear Endplay _____

   4th gear Endplay _____

   5th gear Endplay _____

   6th gear Endplay _____

Note: Measurement of 4th, 5th and 6th gear endplay must be done using a dial indicator! This procedure is not found in the ESM. See your instructor for assistance.

7. If the endplay is greater or less than the standard specification, which items should be inspected?

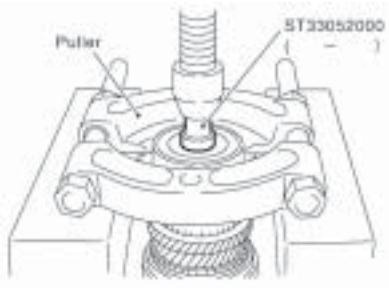
   _____

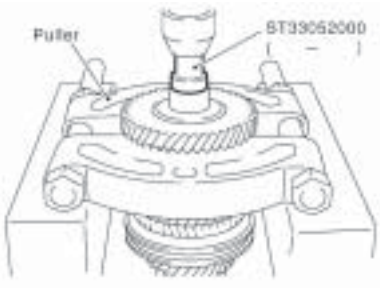
   _____

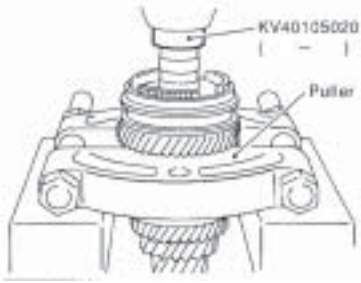
   _____

   _____

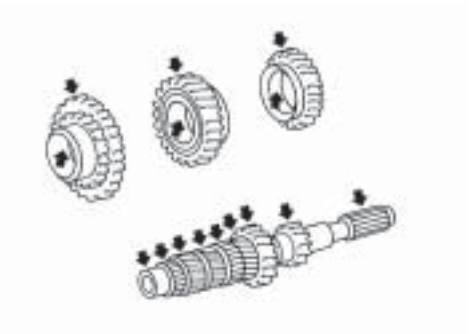
8. Continue disassembling the input shaft as per service manual instruction.







Note: The rear input shaft bearing must be removed in order to access the 6th gear retaining snap ring. Failure to remove bearing and snap ring prior to pressing off 6th gear will damage the input shaft.



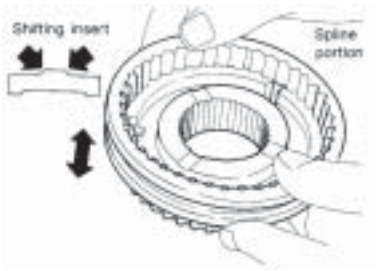
9. Inspect the contact surface on each gear, input shaft and main drive gear for damage which may include any of the following:

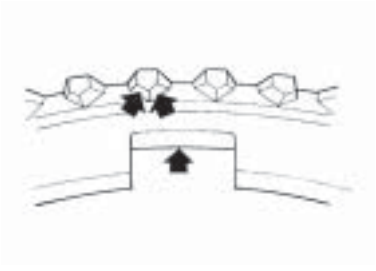
	OK	NG
▪ Unusual wear	___	___
▪ Excessive wear	___	___
▪ Peeling	___	___
▪ Abrasion	___	___
▪ Dent	___	___
▪ Bent shaft	___	___
▪ Any other damage	___	___

10. List any items that show any signs of unusual wear or damage:

_____

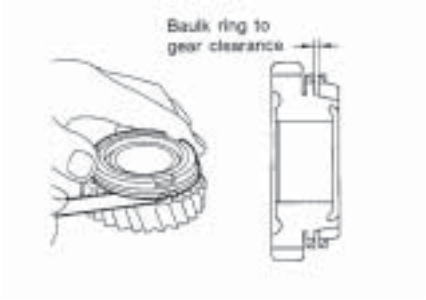
11. Inspect the contact surface of the coupling sleeve, synchronizer hub, shifting insert and baulk rings.





12. List any items that show any signs of unusual wear or damage:

_____



13. Inspect the single cone synchronizer clearance for 3rd, 4th, 5th and 6th baulk rings.

Clearance specification

Standard 3rd & 4th: _____

_____

Standard 5th & 6th: _____

Limit value: _____

Measurement

3rd gear baulk ring _____

4th gear baulk ring _____

5th gear baulk ring _____

6th gear baulk ring _____

14. If the baulk ring clearance is out of specification, which item(s) require replacing?

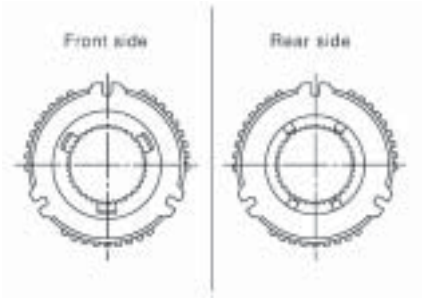
_____

15. Inspect input shaft bearings for damage and rough rotation.

16. List any items that show any signs of unusual wear or damage:

_____

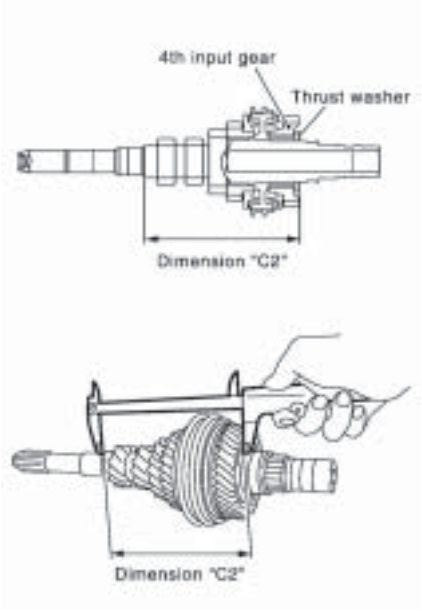
17. Begin reassembling the input shaft as per service manual instructions.



Note: Heat the 3rd gear bushing prior to assembly.

Module 14

Note: Many items are directional. Pay close attention to the direction shown in the service manual during transmission assembly.



Thrust Washer Selection	
Thickness	**Part Number**
0.1512 in (3.84 mm)	32347-8H500
0.1535 in (3.90 mm)	32347-8H501
0.1559 in (3.96 mm)	32347-8H502
0.1583 in (4.02 mm)	32347-8H503
0.1606 in (4.08 mm)	32347-8H504
0.1630 in (4.14 mm)	32347-8H505

18. List which components the ESM recommends replacing any time the input shaft is disassembled.

    _____

19. List the standard dimension for the "C2" measurement:

    _____

20. Measure and record shim thickness prior to installation on input shaft:

    _____

21. Perform measurement "C2" as instructed by the service manual and write your findings:

    _____

Note: Another method for obtaining Dimension C2 value can be done using the following steps:

a. Measure bearing input shaft bearing thickness
b. Install bearing on front of input shaft
c. Perform Dimension C2 measurement using bearing.
d. Subtract input shaft bearing thickness

22. Which thrust washer should be used to bring the input shaft "C2" dimension into specification?

    Thickness _____ Part Number _____

Note: Heat the thrust washer and 5th gear bushing prior to assembly.

23. Continue assembling the input shaft as per service manual instructions.

24. Measure the 6th gear snap ring to groove endplay specification value:

_____

25. List the thickness of the snap ring used during the previous transmission assembly.

_____

26. List the 6th gear snap ring part number.

_____

Snap Ring Selection

Thickness	Part number	Thickness	Part number
1.76 mm (0.0693 in)	32204 8H511	2.01 mm (0.0791 in)	32204 8H516
1.81 mm (0.0713 in)	32204 8H512	2.06 mm (0.0811 in)	32204 8H517
1.86 mm (0.0732 in)	32204 8H513	2.11 mm (0.0831 in)	32204 8H518
1.91 mm (0.0752 in)	32204 8H514	2.16 mm (0.0850 in)	32204 8H519
1.96 mm (0.0772 in)	32204 8H515	2.21 mm (0.0871 in)	32204 8H520

27. After installing the 6th gear snap ring, measure the endplay and list your findings:

_____

28. Is the endplay correct?

YES / NO *(Circle one)*

29. Install front and rear input shaft bearings as per service manual instructions.

30. Measure the gear endplay and list your findings.

3rd gear Endplay _____

4th gear Endplay _____

5th gear Endplay _____

6th gear Endplay _____

Note: Measurement of 4th, 5th and 6th gear endplay must be done using a dial indicator!

31. If the endplay is greater or less than the standard specification, which items should be inspected?

_____

_____

_____

_____

You have now completed this worksheet. You should be able to remove the shift rods, forks, check balls, interlock pins, input shaft and mainshaft from the clutch housing and disassemble the input shaft, perform each inspection as indicated by the service manual, then recommend which components require replacement.

Instructor's Initials: _____

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

RS6F51A OR RS6F51H ASSEMBLY

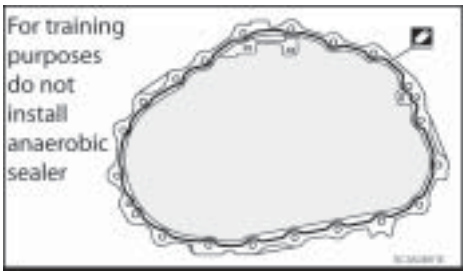
Objective: Given a RS6F51A or RS6F51H manual transmission, install the assembled transmission gear assemblies into the transmission case. Assemble the transmission case halves and miscellaneous components. Verify the transmission shifts into all 6 forward gears and reverse.

Relevance: Following correct procedures for reassembly saves time when it comes to service work and transmission repair.

Resources:
- RS6F51A or RS6F51H 6-speed front wheel drive manual transmission
- Hand tools
- Safety glasses
- Electronic Service Manual (ESM)
- Technician gloves

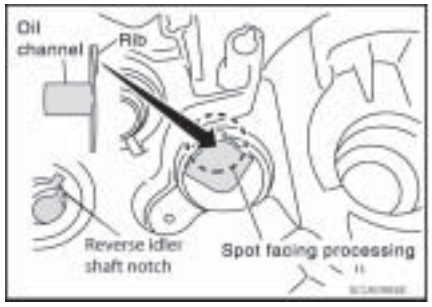
Skill Check: Properly reassemble the RS6F51A OR RS6F51H manual transmission and shift into all forward and reverse gears.

Follow Service Manual procedures unless otherwise noted.



Note: The service manual instructs you to assemble the clutch housing and transaxle case using an anaerobic sealer between the case halves. Under normal circumstance this is a critical procedure. For training purposes, do not install any sealer to the case halves.

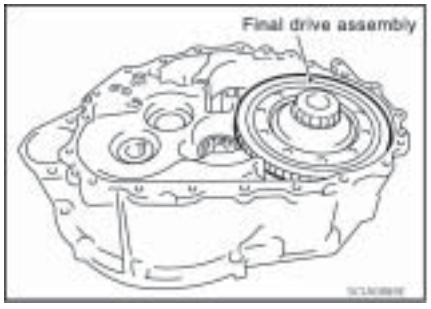
1. If the input shaft oil seal or differential oil seals were removed, install new seals prior to gear assembly.



2. Inspect the mainshaft oil channel in the clutch housing for damage that may have occurred during disassembly. If necessary, remove the mainshaft front bearing and replace the oil channel.

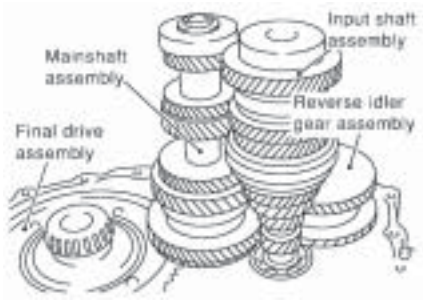
3. Prior to installing the gear assemblies, inspect all bearing races and bearings. Note any problems found.

_____



4. Install the final drive assembly into the clutch housing as per service manual instructions.

Note: The reverse gear shaft has a specific location in the transmission case. The rear case half will not fit properly if the reverse gear shaft is not in the correct location.



5. Continue with the service manual instructions by installing the input shaft assembly, mainshaft assembly and reverse assembly into the clutch housing.

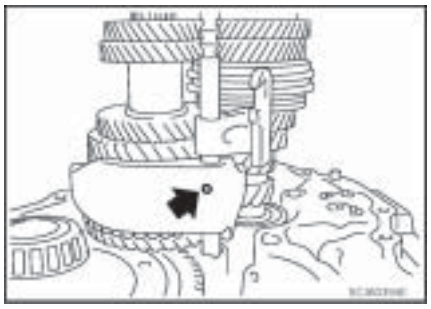
CAUTION:

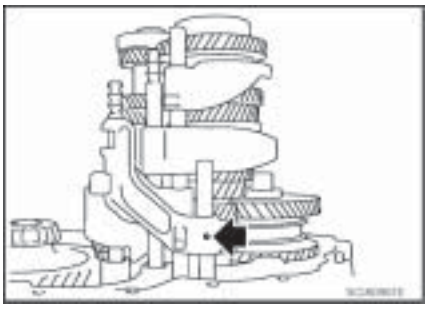
Do not damage the input shaft oil seal during assembly.

6. The service manual indicates several components should be replaced during assembly of the shift rods and shift forks. Place a check mark by those parts that should ***always*** be replaced.

- ☐ Retaining pins
- ☐ Shift rods
- ☐ Shift forks
- ☐ Stopper rings
- ☐ Shift check sleeve
- ☐ Shift check ball
- ☐ Mainshaft rear bearing snap ring

7. Continue assembling shift forks, rods, retaining pins and brackets as per the service manual instructions.





8. Once the shift forks, rods, retaining pins and brackets are assembled, install the magnet onto the clutch housing.

9. The service manual instructs you to install adjusting shims. Selecting adjusting shims is addressed in module 9 (RS5F51A).

10. Install the baffle plate and oil gutter.

11. Install pre-selected mainshaft bearing adjusting shim into the transaxle case.

12. Install the snap ring for the mainshaft rear bearing into the transaxle case.

CAUTION:

The service manual instructs using a new snap ring. For training purposes, reuse the original snap ring.

13. Prior to assembling the transmission case halves verify the following:

    Able to shift into all forward gears?

    YES / NO *(Circle one)*

    Able to shift into reverse gear?

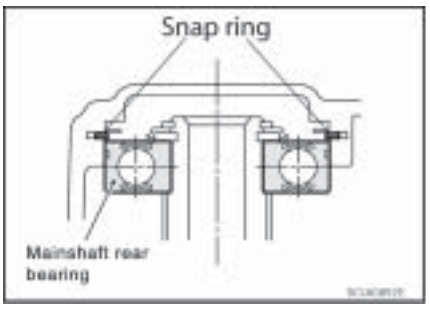
    YES / NO *(Circle one)*

    Transmission gears rotate without binding?

    YES / NO *(Circle one)*

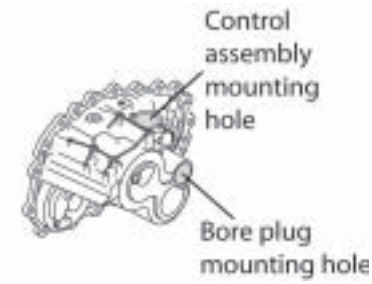
    Reverse idler shaft installed with pin in notch? (the pin should not be resting on the clutch housing)

    YES / NO *(Circle one)*



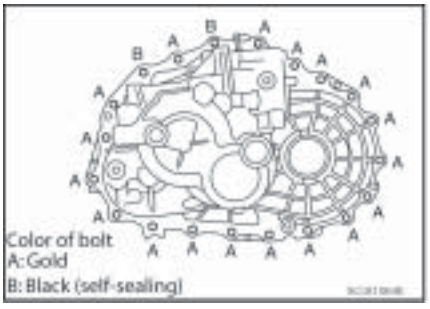
14. Install the transaxle case onto the input shaft and mainshaft.

15. Through the bore plug mounting hole, spread the snap ring.



16. Through the control assembly mounting hole, lift up the mainshaft assembly.

17. Securely install the snap ring onto the mainshaft rear bearing as shown in the service manual.

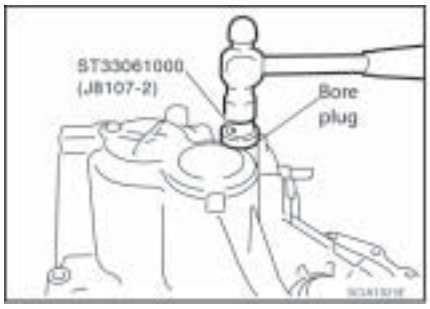


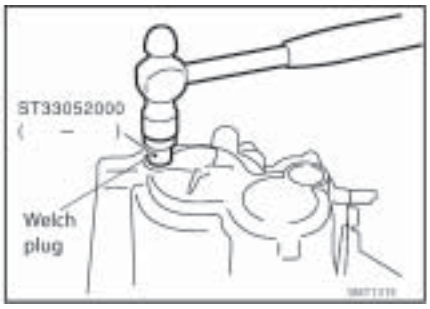
18. The service manual calls out "A" and "B" bolts for securing the two case halves. These bolts must be installed in specific locations and should be replaced after each disassembly. Why do the "B" bolts require replacement?

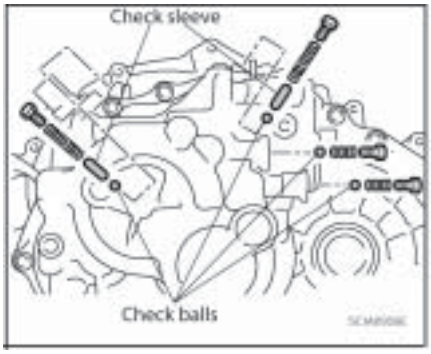
_____

19. Install the "A" and "B" bolts and torque to specification.

20. Your instructor may have you install a new bore plug and welch plug (if previously removed) or reuse the old ones for training purposes. Install the bore plug and welch plug (if previously removed) as per the service manual.







21. Install the 2 shift check sleeves, 4 check balls, and 4 check springs. The service manual indicates installing new check ball plugs. For training purposes reuse the original check ball plugs.

22. Continue following the service manual for the remainder of the transaxle assembly.

23. Upon completing transaxle assembly, bench shift the transaxle into all forward and reverse gears. Note any gears that were difficult to engage while bench shifting the transmission.

_____

You have now completed this worksheet. You should be able to follow the service manual and install the final drive assembly, mainshaft and input shaft into the transmission case/clutch housing. You should also be able to install the shift linkage and verify the transmission can be shifted into each of the gears prior to case assembly. Finally, you should be able to assemble the case halves and control assembly, then verify the transmission shifts into all forward and reverse gears.

Instructor's Initials: _____

- **Please return this workstation to the condition in which you found it!**
- **Clean all tools and return them to their proper location!**

Note: Always use genuine Nissan manual transmission gear oil with a viscosity of 75W-85 with a rating of GL-4. Refer to NTB03-015 for additional information.

NOTES

NOTES

Manual Transmission Service

Welcome

Manual Transmission Service

Agenda

Agenda

- Day One
  - 9:00 - 9:30 Introductions, Administrative Issues and Objectives
  - 9:30 - 10:15 Manual Transmission Discussion
  - 10:15 - 10:30 Break
  - 10:30 - 11:00 Manual Transmission Discussion
  - 11:00 - 12:00 Shop Activities
  - 12:00 - 1:00 Lunch
  - 1:00 - 4:30 Shop Activities

Agenda

- Day Two
  - 9:00 - 10:00 Manual Transmission Discussion
  - 10:00 - 10:30 SIR Video 102 “Clutch Adjustment Procedures”
  - 10:30 - 10:45 Break
  - 10:45 - 12:00 Shop Activities
  - 12:00 - 1:00 Lunch
  - 1:00 - 4:30 Shop Activities

Agenda

- Day Three
  - 9:00 - 10:30 Diagnostic Tips
  - 10:30 - 10:45 Break
  - 10:45 - 12:00 Shop Activities
  - 12:00 - 1:00 Lunch
  - 1:00 - 4:00 Shop Activities
  - 4:00 - 4:30 Q & A (Surveys and Wrap-up)

Manual Transmission Service

Course Objectives

Manual Transmission Service Course Objectives

- **Given a vehicle with a manual transmission and hydraulic clutch**
  - Inspect clutch pedal clevis pin movement and pedal travel.
  - Inspect and adjust ASCD switch and/or clutch pedal stop.
  - Properly bleed any air from the clutch hydraulic system.

Manual Transmission Service Course Objectives

- **Given a FS5R30A 5-speed manual transmission**
  - Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections documenting which components require replacement.
  - Using puller kit J39856, disassemble shift components and gear assemblies, noting any components which require replacement.
  - Reassemble the main shafts and countershafts into the adapter plate.
  - Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.
  - Bench shift the transmission verifying shift into all gears.

Manual Transmission Service Course Objectives

- **Given a FS6R31A 6-speed manual transmission**
  - Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections documenting which components require replacement.
  - Disassemble shift components and gear assemblies noting any components which require replacement.
  - Reassemble the main shafts and countershafts into the adapter plate.
  - Measure and adjust gear endplays if necessary.
  - Attach the shift linkage to the gear assembly and reassemble the transmission case halves to the adapter plate.
  - Bench shift the transmission verifying shift into all gears.

Manual Transmission Service Course Objectives

- **Given a RS5F51A 5-speed manual transmission**
  - Disassemble the transmission case halves, perform necessary gear inspections documenting which components require replacement.
  - Disassemble gear assemblies noting any components which require replacement.
  - Perform endplay and preload measurements, selecting correct shims.
  - Reassemble gear assemblies, shift components and case halves.

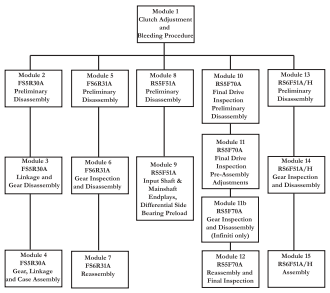
Manual Transmission Service Course Objectives

- **Given a RS5F70A 5-speed manual transmission**
  - Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections documenting which components require replacement.
  - Remove shift components and gear assemblies from clutch housing.
  - Inspect the final drive pinion and side gears.
  - Identify shim size and placement.
  - Measure final drive side bearing preload and determine shim size. Determine correct final drive turning torque.
  - Reassemble gear assemblies, shift components and case halves.
  - Bench shift the transmission verifying shift into all gears.

Manual Transmission Service Course Objectives

- **Given a RS6F51A/H 6-speed manual transmission**
  - Inspect shift quality on the bench, disassemble the transmission case halves, perform necessary gear and shift linkage inspections documenting which components require replacement.
  - Disassemble shift components and gear assemblies noting any components which require replacement.
  - Reassemble the main shafts and countershafts into the clutch housing.
  - Measure and adjust gear endplays if necessary.
  - Attach the shift linkage to the gear assemblies and reassemble the transmission case halves.
  - Bench shift the transmission verifying shift into all gears.

MANUAL TRANSMISSION SERVICE
COURSE MAP



Manual Transmission Service

Designation

Transmission Designation

- Each transmission has its own unique designation
- Front Wheel Drive
  - **RS6F51A or H**
    - **RS = Remote Shift**
    - **6 = 6 Forward gears**
    - **F = Front drive**
    - **51 = Model designation (51 & 71 current U.S. models)**
    - **A = Standard final drive**
    - **H = Helical type limited slip final drive**

Note: The letter V on some front drive transmissions indicate a viscous coupling limited slip final drive.

Transmission Designation

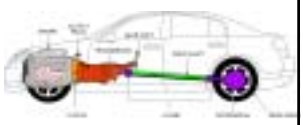
- Rear Wheel Drive
  - **FS6R31A**
    - **FS = Fixed Shift**
    - **6 = 6 Forward gears**
    - **R = Rear drive**
    - **31 = Model designation (30, 31 & 71 current U.S. models)**
    - **A = Version**

Manual Transmission Service

Unit Operation

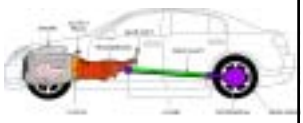
The Goal of a Transmission

- Engines have a maximum rpm value.
- The transmission allows the gear ratio between the engine and the drive wheels to change as the car speeds up and slows down.
- The driver shifts gears so the engine stays below the redline and near the rpm band of its best performance.



How Manual Transmissions Work

- The transmission is connected to the engine through the clutch.
- The input shaft of the transmission turns at the same rpm as the engine.
- The output shaft speed depends upon gear selection and gear ratio.



Input Shaft, Counter Shaft, and Output Shaft

- The input shaft is in constant mesh with the clutch disc.
- The clutch disc drives the input shaft.
- When the clutch is engaged, the input shaft continually rotates.
- The counter shaft rotates anytime the input shaft rotates.

Input Shaft, Counter Shaft, and Output Shaft

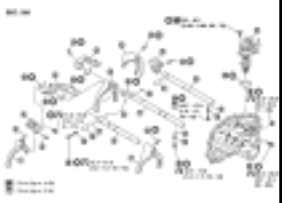
- When selecting a gear on the mainshaft, the counter shaft then drives the output shaft.
- The output shaft is connected to the drive shaft or drive axle.
- The output shaft only turns when the vehicle is moving.

Shift Lever

- Using the gearshift, the driver selects the desired gear for the driving condition.

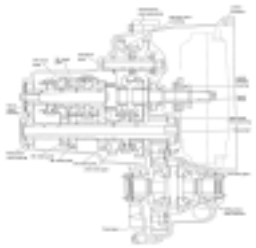
Shift Rods and Shift Forks

- The gear shift or shift lever connects to the transmission using either a shift rod or shift cables.
- The shift rod or cables move the internal shift rods.



Shift Rods and Shift Forks

- This slides the shift fork, which is attached to the coupling sleeve.
- The shift fork could be compared to an oarlock on a rowboat. Moving the shift fork engages the selected gear.



Synchronizer Hub and Coupling Sleeve

- Before a shift takes place, its necessary to synchronize the rotating speeds of the transmission elements.
- The hub is splined to the shaft and the coupling sleeve is splined to the hub.

Forward Gears

- The transmission changes the ratio of the engine speed and the wheels by connecting gears in various combinations.
- For strength and quiet operation, all forward gears are helical cut.
- The helical cut distributes the force more evenly across the gear face.

Transmission Case and Adapter Plate

- The transmission case provides a chamber with adequate capacity to hold lubricating fluid.
- Included in the chamber are plastic lubricating trays.
- The case and adapter plate support the input shaft, mainshaft and countershaft.
- It also supports and aligns the shift rods.
- The case is made of aluminum alloy, providing strength and durability.

Manual Transmission Fluid

- Most newer model manual transmissions use manual transmission fluid with an API GL-4 rating
- Recommended weight of 75W-85 or 75W-90
- Consult the appropriate section of the ESM for correct refill information and fluid recommendations
- All warranty M/T repairs require using genuine Nissan MT fluid Part no. 999MP-MTF00P

See TSB NTB03-015 for additional information

Manual Transmission Service

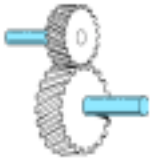
Gear Ratio

Gear Ratio

- Where rotational motion takes place, gears are used.
- Gears are used to:
  - Increase or decrease the speed of rotation
  - Reverse the direction of rotation
  - Keep the rotation of two axis synchronized
  - Amplify torque

Gear Ratio (continued)

- Transmission gears have teeth rather than smooth edges
- The teeth have three advantages
  - They prevent slippage between gears
  - They make it possible to determine exact gear ratio's
  - Slight imperfections in the actual diameter and circumference of two gears don't matter. The number of teeth control the gear ratio's even if the diameter's are off



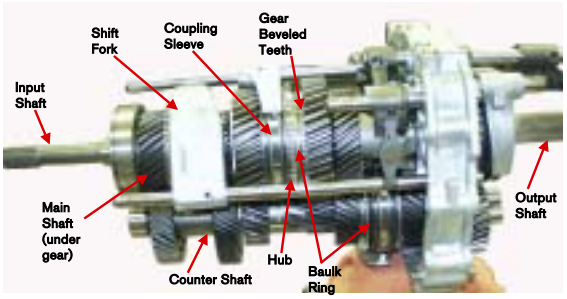
Manual Transmission Service

Internal Components

Transmission Assembly

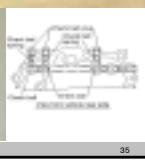
- Internal combustion engines develop very little torque or power at low rpm.
- Manual transmissions vary the relationship between the speed of the engine and the speed of the wheels.
- Varying gear ratios allow the correct amount of engine power to reach the drive wheels at different speeds.

Transmission Assembly



Check Balls, Springs, and Interlocks

- Prevent the transmission from engaging two gears at one time.
- Assist in keeping the transmission gear engaged once its selected.
- Straight, unscored and properly aligned shift rod assists with smooth engagement.
- The check ball and detent in the shift rod hold the shift rod in neutral or in gear because of spring pressure applied to the ball by the check spring.

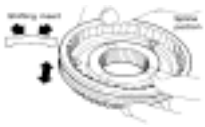


Synchronizer Hub and Coupling Sleeve

- Synchronizer hub is splined directly to the shaft.
- Coupling sleeve is splined to the synchronizer hub
- The coupling sleeve is engaged to the gear beveled teeth when the shift is complete.

Synchronizer Hub and Coupling Sleeve

- Synchronizer hub and coupling sleeve serve a dual purpose.
- Coupling sleeve pushes against the shift insert which pushes against the baulk ring.
- The baulk ring slows down or speeds up the spinning gear, enabling the coupling sleeve to lock the gear to the shaft.



Tech Note:

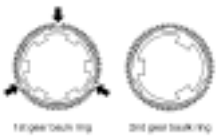
Coupling sleeves and hubs can be directional. Use the ESM and verify proper direction on reassembly.

Baulk Ring (Synchronizer Ring)

- Baulk ring is made of softer material such as brass or iron.
- Slows down or speeds up the selected gear during up shifts or down shifts.
- The insert presses up against the selected gear's baulk ring, which then presses the baulk ring against the gear's braking surface.
- This slows the gear down sufficiently so a smooth shift takes place.
- Down shifting the insert presses against the selected gear matching gear speed to output shaft speed.

Double and Triple Cone Baulk Rings

- Double and Triple Cone Synchronizer Baulk Rings utilized in cases where there are high demands for performance and/or reduction of gear shifting force.
- Normally installed on 1st and 2nd gears.
- Double and triple cone synchronizers use two and three times the braking surface of a normal baulk ring.

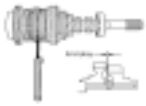


Main Gears

- Main gears use a helical cut design.
- Beveled teeth machined into the face of the gear.
- Beveled teeth enable the coupling sleeve a surface which it can engage and readily lock onto.

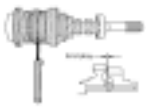
Gear Endplay

- Each gear has a specified endplay.
- Endplay is defined as the clearance between the gear and the collar on the shaft or two gears.
- Endplay allows for lubrication between two gears or components.



Gear Endplay

- Too much endplay could result in unusual noise.
- Difficulty in shifting.
- Jumping out of gear.
- Difficulty in taking the transmission out of gear.



Gear Endplay

- Insufficient endplay could result in noise, wear or even binding.
- Could create the effect of being in two gears at one time.
- Endplay should be measured prior to disassembly and reassembly of a transmission.

Question: Why should the gear endplay be measured before and after disassembly?

Reverse Gears

- The output shaft and counter shafts each contain a reverse gear.
- When a vehicle moves forward, the counter shaft and mainshaft spin in opposite directions.
- When reverse is selected, the reverse gear on the output shaft engages the idler gear.
- This causes the output shaft to spin in the reverse direction.

Bearings

- Reduce friction by providing smooth metal balls or rollers, and a smooth inner and outer metal surface for the balls to roll against.
- Balls or rollers "bear: the load, allowing the device to spin smoothly.

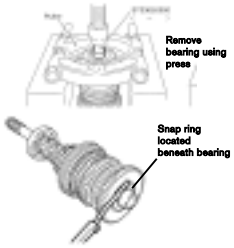
Question: Why do FWD transmissions use taper bearings and RWD transmissions use ball bearings?

Tapered roller bearings can support larger radial and larger thrust loads than a ball bearing.

Front Wheel Drive Final Drive

- Front wheel drive transmissions are completely self-contained.
- The final drive resides in the transmission case.
- The final drive is a conventional arrangement of gears that divide the torque between the drive axle shafts.
- Final drive consists of a set of four gears.
- Two are called side gears
- Two are called pinion gears
- Each side gear is splined to a drive axle shaft which must turn when its side gear rotates.

Precautionary Information

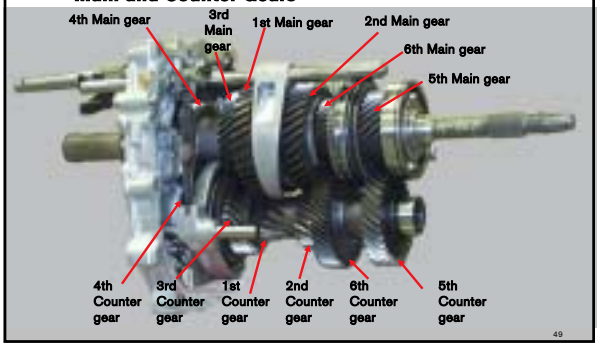


- Prior to beginning shop activities
  - Follow the worksheets as outlined.
  - The worksheets utilize the ESM as well as information and procedures in the worksheet.
  - Following all procedures prevents damaging transmission components.
  - Some components are hidden below another part such as a bearing.

Manual Transmission Service

Power Flow

Main and Counter Gears



Power Flow

- The function of any transmission is transferring power from the engine to the drive wheels.
- Lower gear ratios serve as torque multipliers and assist the engine develop enough power to accelerate from a standstill.
- The input shaft drives the counter shaft.
- When the shift coupling sleeve locks one gear to the mainshaft, the output shaft spins at a rate equivalent to the ratio of the gearing.

350Z/G35 6-speed power flow through 1st gear

Power Flow

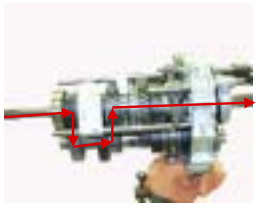
- Torque multiplication comes into play when looking at the twisting force on the driveshaft to get the vehicle moving.
- A 1st gear ratio of 3.794:1 and an engine which produces 274 lb.-ft of torque places approximately 1039 lb.-ft. of twisting force onto the driveshaft(274 lb.-ft. x 3.794=1039.5 lb.-ft.)
- The higher the ratio the more torque; but the slower the drive wheels turn.

Power Flow

- 1st gear connects the engine power to the drive wheels via a pair of reduction gear sets.
- This gives increased power and reduced wheel speed when the car begins moving.
- In 1st gear the engine turns at a much higher rpm than the transmission output shaft.

Power Flow

- The same thing occurs in each of the other gears.
- 2nd gear in a 6-speed rear wheel drive transmission multiplies the torque 2.34 times.



350Z/G35 6-speed power flow through 2nd gear

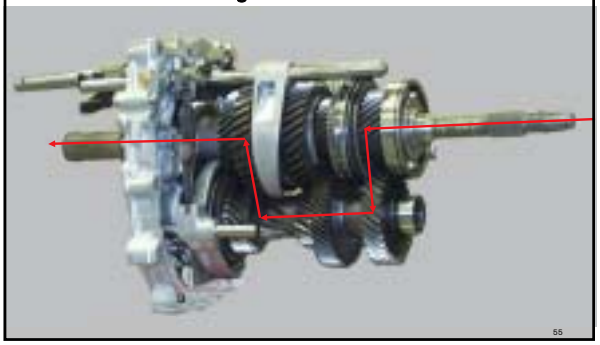
Power Flow

- 5th gear has a gear ratio of 1.00:1. This mean there is no torque multiplication.
- In 6th gear the ratio is less than 1.00:1. (0.794:1)
- The output shaft turns at a higher rate of speed than the input shaft.

Note: Gear ratio's are located in the manual transmission SDS section of the ESM.

350Z/G35 6-speed power flow through 5th gear

Power Flow through 1st Gear



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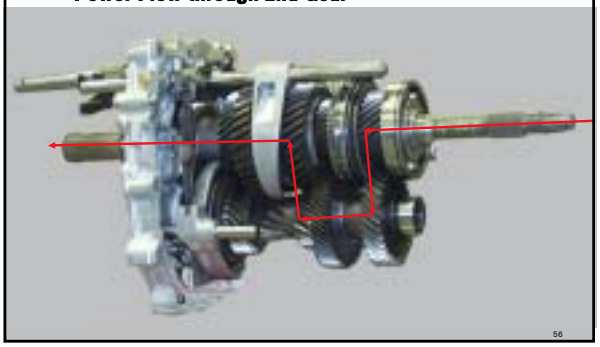
Power Flow through 2nd Gear



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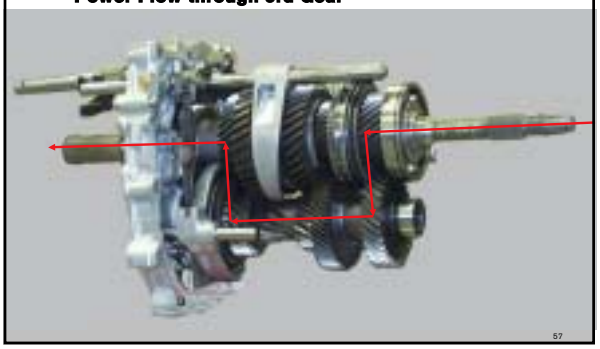
Power Flow through 3rd Gear



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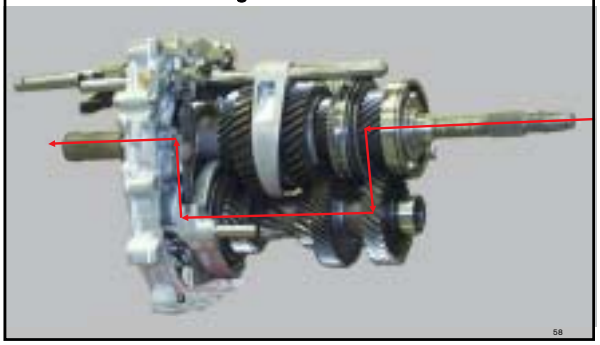
Power Flow through 4th Gear



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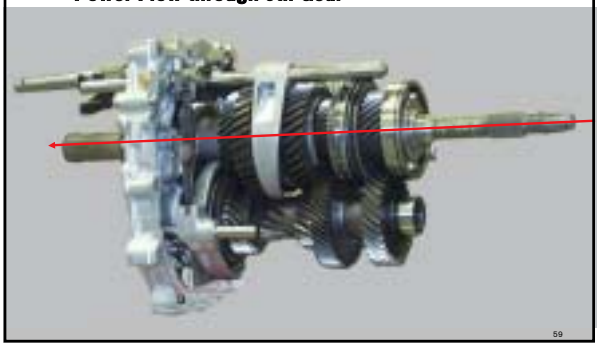
Power Flow through 5th Gear



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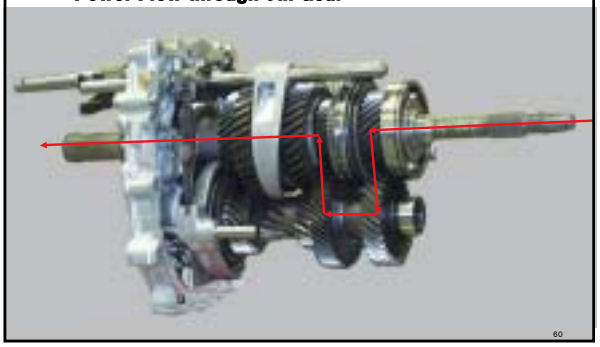
Power Flow through 6th Gear



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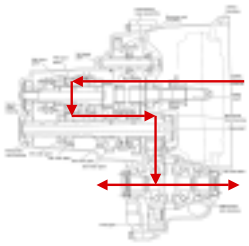
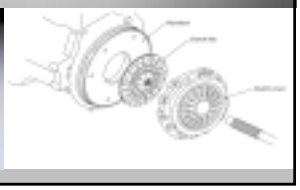
Power Flow FWD

- Power flow through a FWD is almost the same as a RWD.
- The exceptions are the layout of the main and countershafts along with the final drive housed with the transmission components.
- On FWD transmissions, the main shaft becomes the input shaft.
- The countershaft becomes the mainshaft.



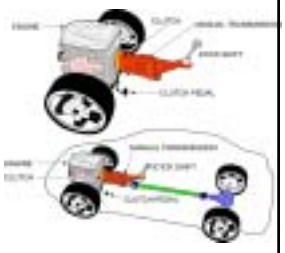
Manual Transmission Service

Clutch System and Flywheels



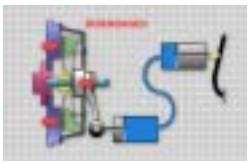
Clutch Operation and Assembly

- All manual transmissions require the use of some type of clutch.
- The clutch connects two components so they spin together at the same speed.
- The clutch is used for disengaging the engine from the transmission.
- When the engine is running, the flywheel and clutch spin constantly.
- The clutch disconnects the drive wheels from the engine, preventing stalling when coming to a stop.



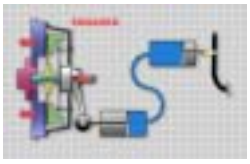
Clutch Assembly

- The clutch disc connects to the engine through the input shaft.
- When the clutch pedal is pressed, the cable or piston presses the clutch release fork which in turn presses the diaphragm on the pressure plate.
- As the middle of the diaphragm spring is pushed in, a series of pins near the outside of the spring causes the spring to pull the pressure plate away from the disc.
- This releases the clutch disc from the spinning engine.



Clutch Operation

- The clutch applies and removes torque from the input shaft.
- When the clutch pedal is released, the springs push the pressure plate against the clutch disc.
- The clutch disc is held in place against the flywheel by spring pressure from the pressure plate.
- Locking the disc to the flywheel causes the input shaft to spin at the same speed as the engine.



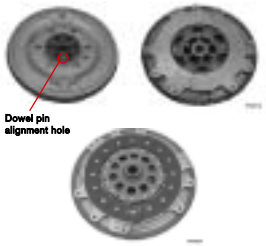
Play animation

Flywheel

- The flywheel is a large wheel attached to the crankshaft.
- Provides the momentum to keep the crankshaft turning between cylinder firings.
- Provides base for clutch attachment.
- Smooth surface used for friction between flywheel and pressure plate.
- Clutch disc sandwiched between flywheel and pressure plate.
- The starter motor engages the ring gear and mechanically turns the engine.

Dual Mass Flywheel and Clutch

- The dual mass flywheel reduces drivetrain noise and vibration.
- The clutch disc for a dual mass flywheel does not use dampening springs.
- The flywheel incorporates the use of an arc spring directly into the flywheel.



Manual Transmission Service

Diagnostic Tips

Grinds when upshifting or downshifting

- Clutch adjustment
- Shift linkage loose or worn
- Shift linkage adjustment
- Worn baulk ring
- Excessive gear end play
- Worn clutch
- Worn shift fork
- Worn shift insert

Jumps Out of Gear

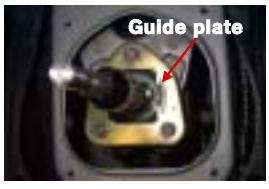
- Possible causes:
  - Inspect shift boot
  - Inspect external shift linkage
  - Inspect for missing engine dowel pins
  - Inspect the shift forks
  - Inspect gear endplay
  - Inspect coupling sleeves
  - Inspect baulk rings

Jumps Out of Gear

- Possible causes:
  - Inspect baulk rings
  - Inspect the individual gear
  - Inspect for worn shift inserts
  - Inspect shift detents and check balls.
  - Motor mounts
  - Shift lever adjustment (350Z/G35)

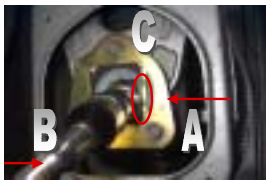
350Z/G35 Jumps Out of Gear

- Inspect shift control lever assembly guide plate adjustment



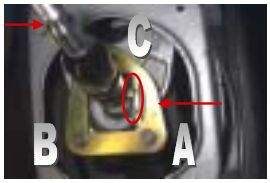
350Z/G35 Jumps Out of Gear

- Loosen guide plate bolts A, B and C
- Shift control lever to 6th gear
- Press shift control lever towards right side (reverse)
- Bring the guide plate against the reverse lockout tab.
- Finger tighten bolt A



350Z/G35 Jumps Out of Gear

- Shift control lever to 5th gear
- Press shift control lever towards right side
- Slide guide plate closer until the guide plate reverse lockout contacts control lever tab
- Tighten guide plate bolt C
- Tighten guide plate bolts A and B to the specified torque
- Inspect shift control lever operation



Difficult To Get Into Gear

- Inspect transmission fluid viscosity
- Clutch master cylinder fluid level
- Inspect clutch adjustment
- Inspect clutch cable
- Worn external shift linkage
- Inspect internal shift rod bushings
- Inspect coupling sleeve
- Worn shift insert
- Inspect baulk rings
- Inspect gear for wear

Note: Refer to the ESM for the correct clutch adjustment procedure.

Transmission Noise

- Is the noise present at all times?
- Does the noise occur only when depressing the clutch pedal?
- Is the noise a low rumbling noise?
- Is the noise high pitched?
- Does the noise change pitch when accelerating or decelerating?
- Is the noise present in only one specific gear?
- Does the noise occur when first depressing the clutch?

Mainshaft or Countershaft Bearing Noise

- These bearings differ from the input shaft bearing.
- Noises associated with these bearing occur only when cruising.
- Typically this is a low rumbling noise.
- Isolation can be done using the Chassis Ears or stethoscope while driving or operating the car on a lift.
- This noise changes with different gear selections.

Pressure Plate Finger Height

- Inspect clutch finger height prior to removal and after installation
- Finger height should all be equal or even

Note: If finger height is uneven, a vibration or noise could occur.

Contaminated Clutch Disc

- Inspect clutch disc for contamination.
- Oil saturated disc can cause any of the following:
  - Slipping
  - Judder
  - Gear raking or grinding (disc sticks to pressure plate or flywheel)
- Possible causes for contamination are leaking front transmission oil seal, rear main engine oil seal or oil pan gasket.

Damaged Flywheel

- Overheated flywheel develops cracks and hotspots.
- Turning or grinding the flywheel may not remove the cracks and/or hotspots.
- Replacement will then be necessary.

Note: Dual Mass Flywheels cannot be resurfaced.