QUALITY DRIVEN® SERVICE

SUBARU

CERTIFIED SUBARU TECHNICIAN

Technician Reference Booklet

6 Speed Manual Transmission

Module 203

AUTOMOTIVE Youth Educational Systems YES®

June 2008

MSA5P0473C

Technical Training

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6 Speed Manual Transmission (203)

6 Speed Manual Transmission

Outline

The AWD 6 Speed manual transmission is equipped with the following features:

- 1st, 3rd, and reverse gears are equipped with a three piece synchronizer.
- 2nd gear is equipped with a single synchronizer.
- Reverse gear is a constant-mesh type that ensures smooth shift lever operation, and a scissors gear is used in the reverse idler gear to reduce gear noise.
- A parallel-link type select return system is used to shorten the shift lever stroke.
- A slider ring is equipped below the shift knob to prevent accidental shifting into reverse gear.
- The lubricating system is equipped with an oil pump.
- A LSD front differential Cam Type (2004)
- A LSD front differential Helical Type (2005 to present)
- The center differential is Driver Controlled Center Differential (DCCD)

SHIFTER

NOTE: ADDITIONAL ENHANCEMENTS TO THE SYNCHRONIZER ASSEMBLIES AND LUBRICATION SYSTEM IN 2008 MODEL YEAR. (COVERED LATER IN THIS TRB)

6 Speed Manual Transmission (203)

Specification

Specification table

Type			6-forward speeds and 1 reverse
Transmission gear ratio		1st	3.636
		2nd	2.375
		3rd	1.761
		4th	1.346
		5th	1.062
		6th	0.842
		Reverse	3.545
Front reduction gear	Final	Type of gear	Hypoid
		Gear ratio	3.900
Rear reduction gear	Transfer	Type of gear	Helical
		Gear ratio	1.000
	Final	Type of gear	Hypoid
		Gear ratio	3.900
Front differential			Cam Type (2004) Helical Type (2005 to present)
Center differential			DCCD
Transmission gear oil			GL-5
Transmission gear oil capacity			4.1ℓ

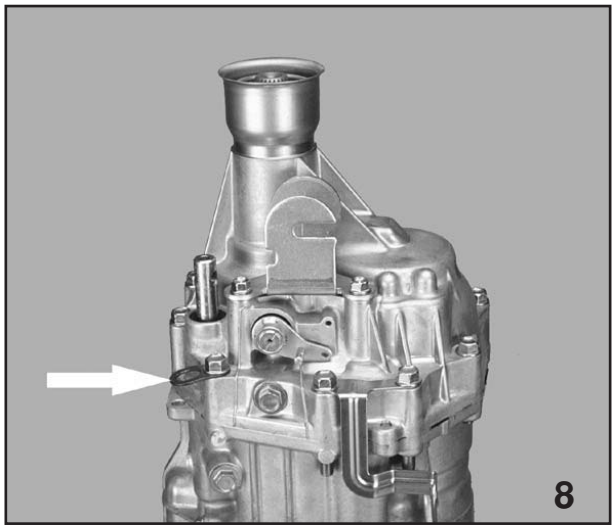
6

SPECIFICATION TABLE

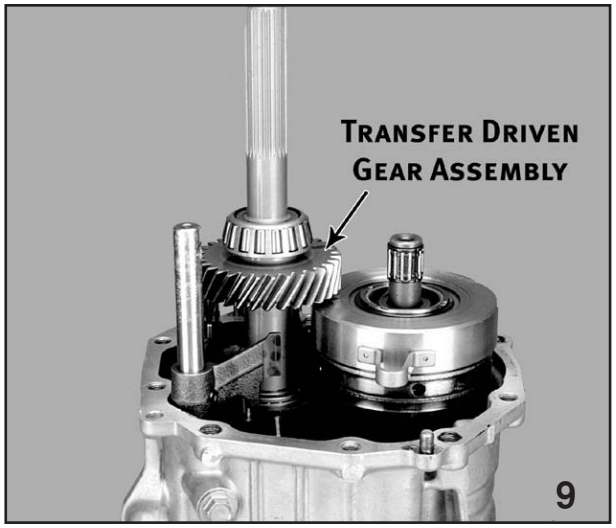
NOTE: ALWAYS CONSULT THE APPROPRIATE SUBARU SERVICE MANUAL ON STIS FOR GEAR RATIOS OF ANY GIVEN MODEL YEAR.

Transmission Overview Construction

REFER TO THE SERVICE MANUAL ON STIS WEB SITE FOR PROPER SEALING DURING REASSEMBLE.



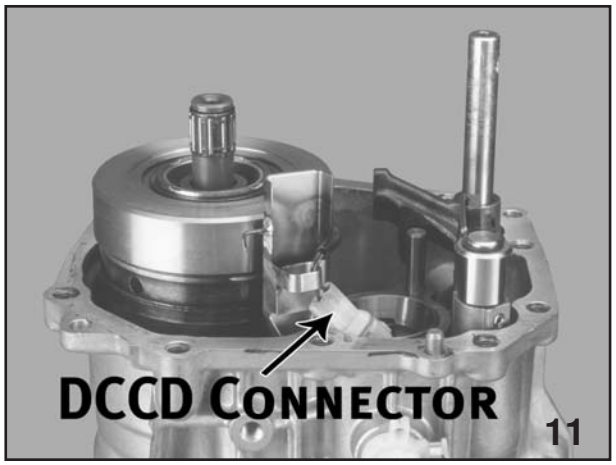
Extension Case



Transfer Driven Gear

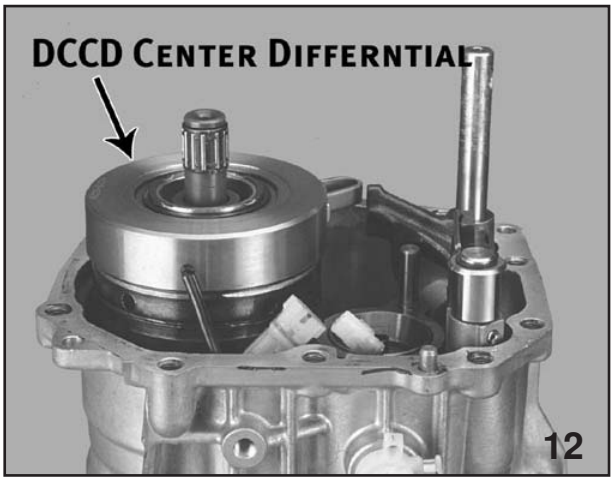
1. Remove the bolts securing the extension case to the transmission main case. Separate the extension case with care from the transmission main case.
2. Note the location of the exposed components.

Oil Guide

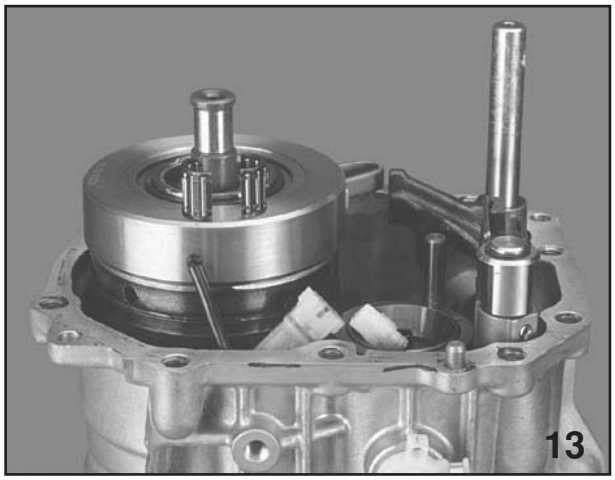


DCCD Connector

3. Remove the transfer driven gear assembly by lifting the assembly by hand.
4. Pull upward on the oil guide and position the connector so that it can be disconnected. Remove the oil guide and disconnect the connector of the Drive controlled center differential. (Do not remove the DCCD harness unless the harness is being replaced).
   - Remove harness, pipes and hoses.
   - Tape or secure harness to main case.

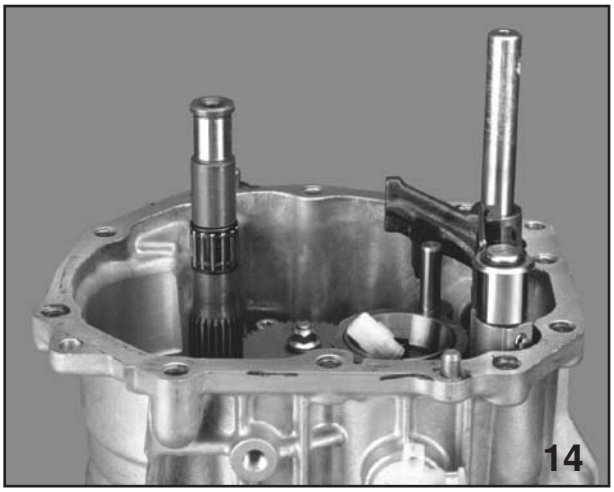


DCCD Center Differential

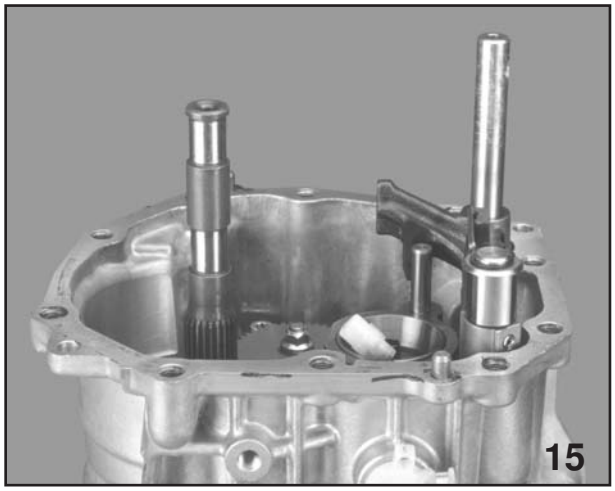


Upper Bearing Split

5. Separate the upper split bearing and maintain the orientation of the bearing so that it can be returned to its original position during reassembly.
6. Lift the driver controlled center differential from the pinion shaft.

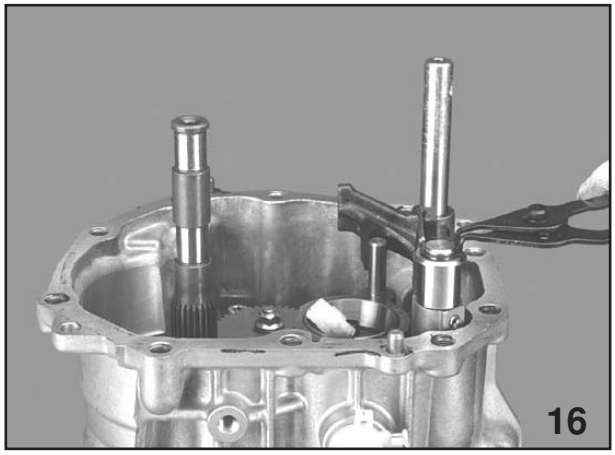


Lower Bearing Needle

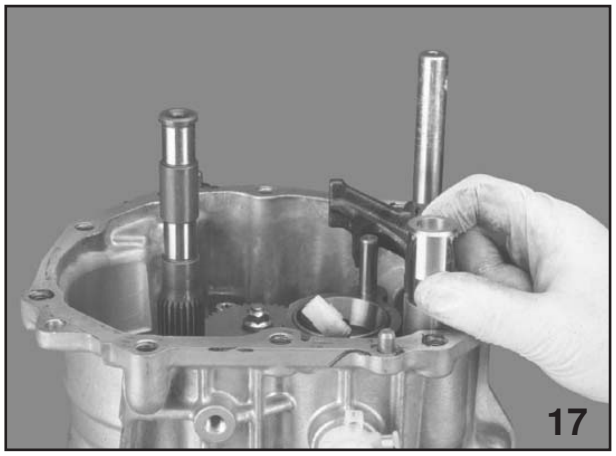


Lower Bearing Split

7. Separate the lower split bearing and maintain the orientation of the bearing so that it can be returned to its original position during reassembly.

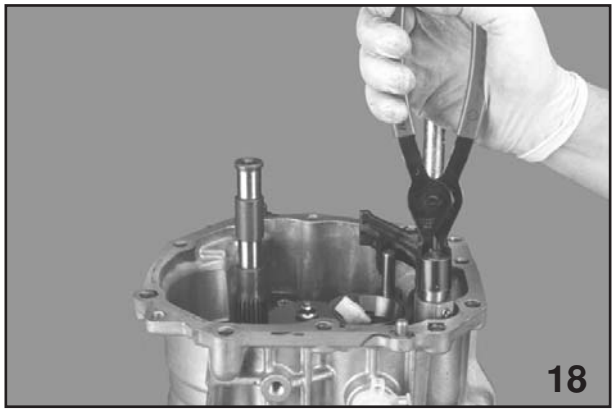


Striker Rod Snap Ring

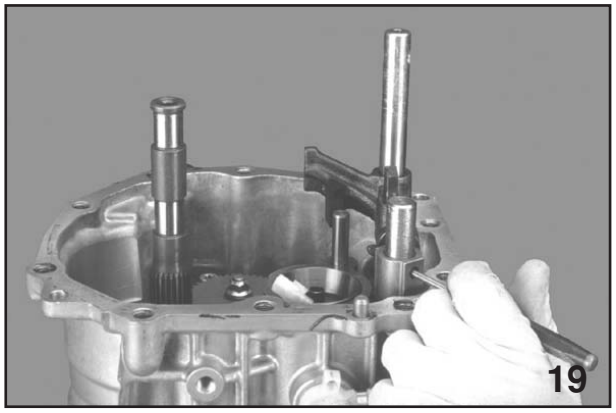


Striker Rod Support

8. Remove the snap ring from the striker rod.
9. Remove the striker rod support. Note: The shape and fit. 2005MY design differs from 2004MY.

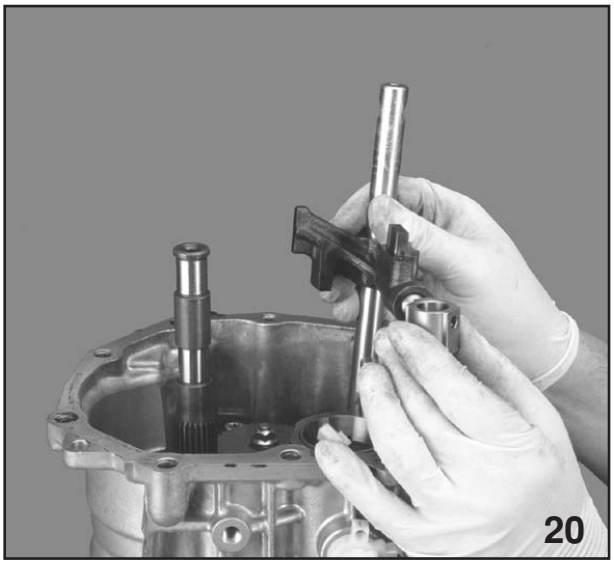


Neutral Set Spring

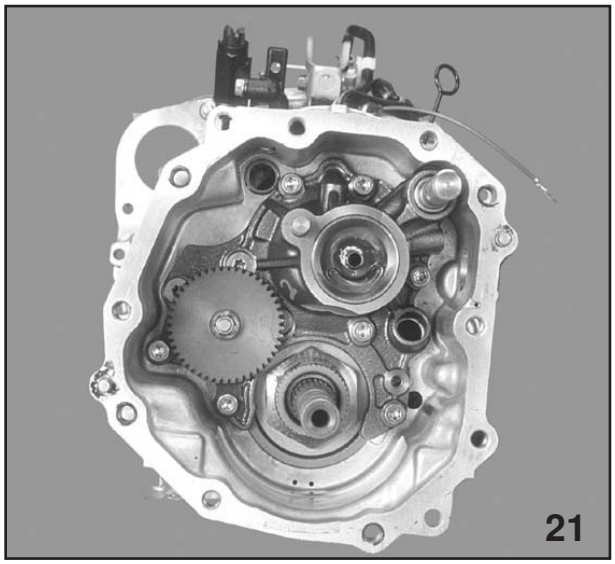


Selector Arm 2 Drift Pin

10. Spread the neutral set spring and remove from the striker rod.
11. Remove the drift pin from the selector arm number 2.

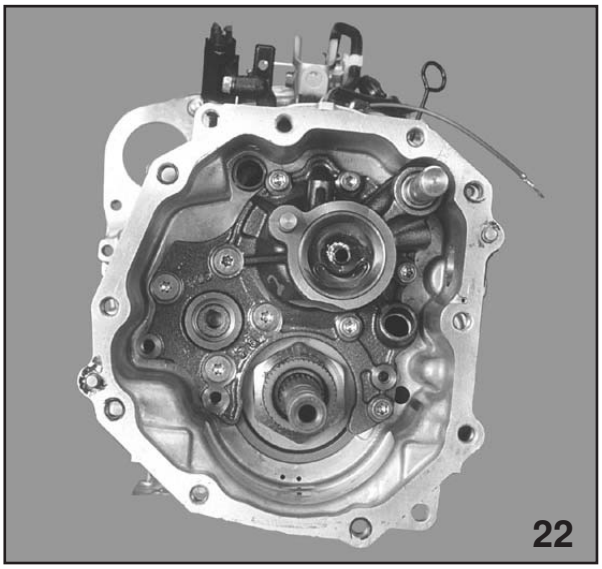


Removing Selector Arm 1 and 2

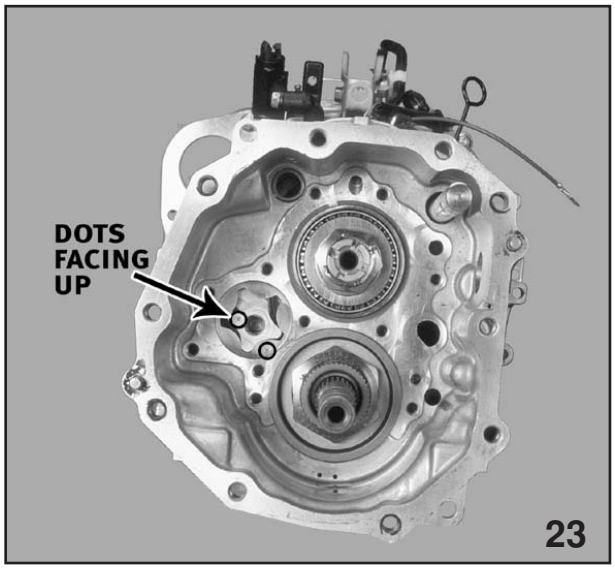


Oil Pump Driven Gear

12. Hold selector arm number one and selector arm number two together and remove in one motion.
13. Remove the oil pump driven gear and holder plate.



Oil Pump Cover



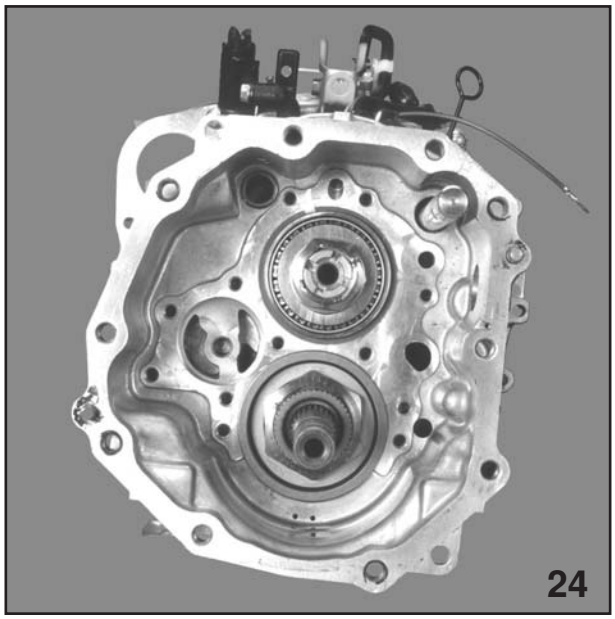
Oil Pump Rotors

14. Remove the bolts securing the oil pump cover, holder plate and drive gear.

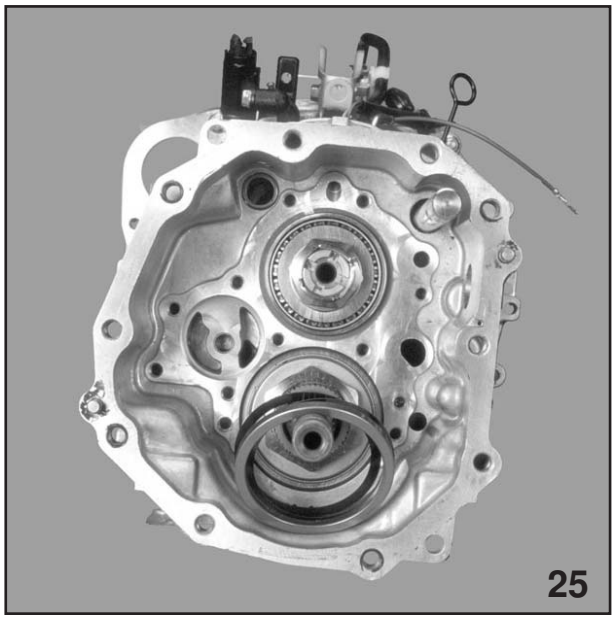
NOTE: PLUG OIL GUIDE AND SELECTOR ARM #1 PASSAGES TO PREVENT FOREIGN ITEMS FROM LODGING IN HOLES.

15. Remove the oil pump cover.

NOTE: THE MAIN SHAFT SHIM USUALLY COMES OFF WITH THE OIL PUMP COVER



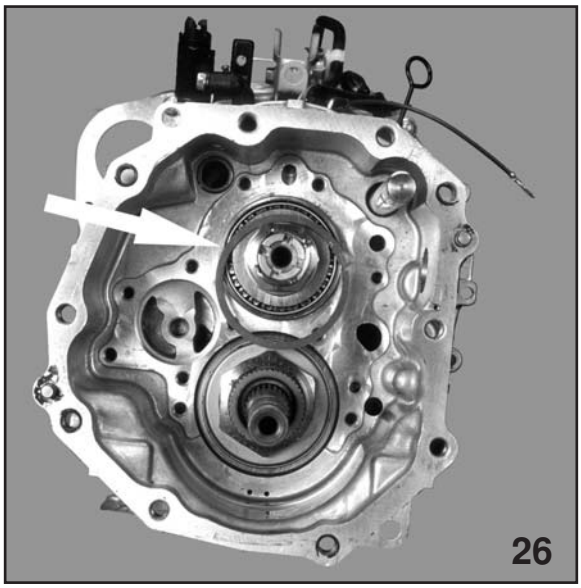
Oil Pump Rotors Removed



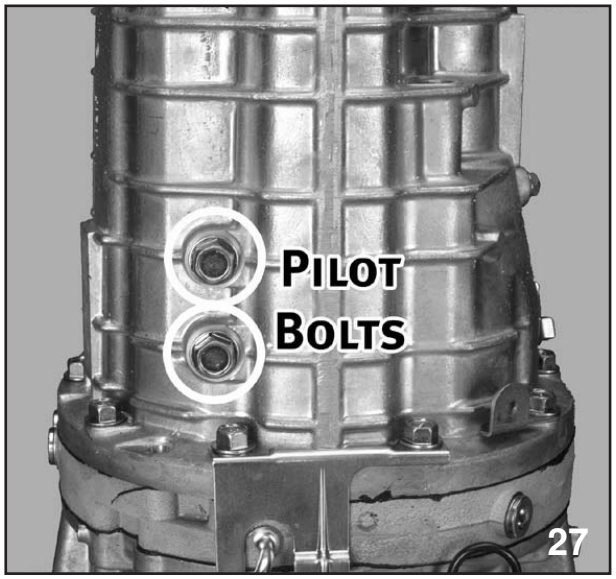
Shims and Collar

16. Remove the oil pump inner and outer rotor.
17. Remove the shim and collar from the top of the driven shaft and main shaft.

NOTE: SHIMS ON BOTH BEARINGS

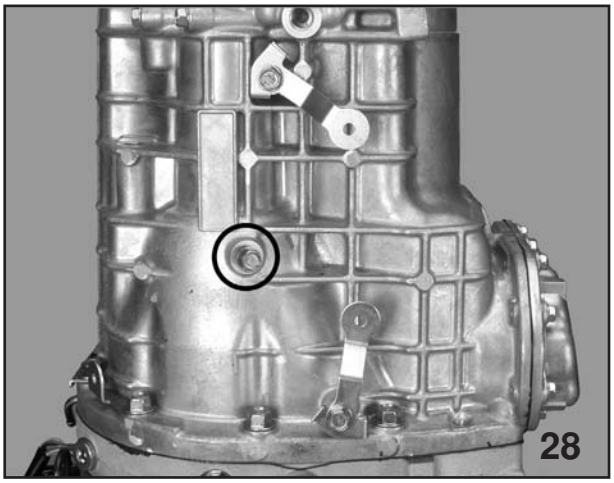


Main Shaft Snap Ring

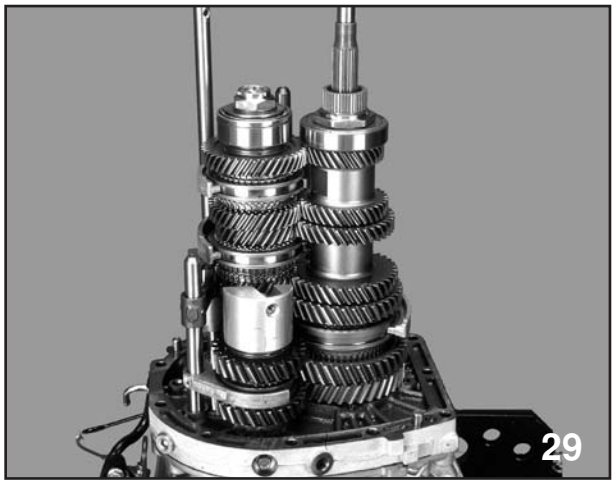


Pilot Bolts

18. Push up on the main shaft while removing the Snap Ring.
19. Remove the two pilot bolts.
20. Remove the two bolts securing the vent hose bracket and remove the bracket.

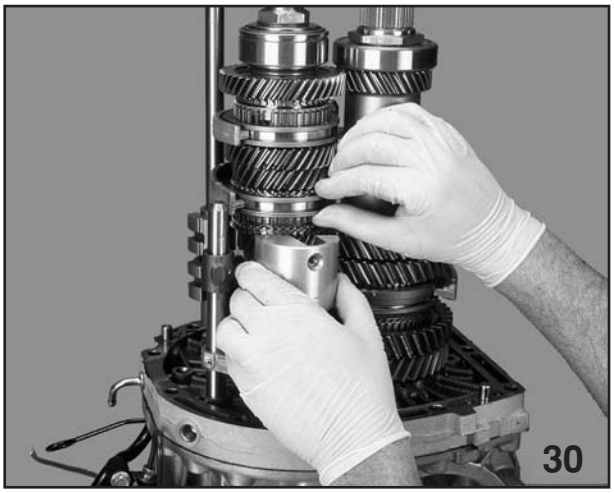


Reverse Idler Bolt

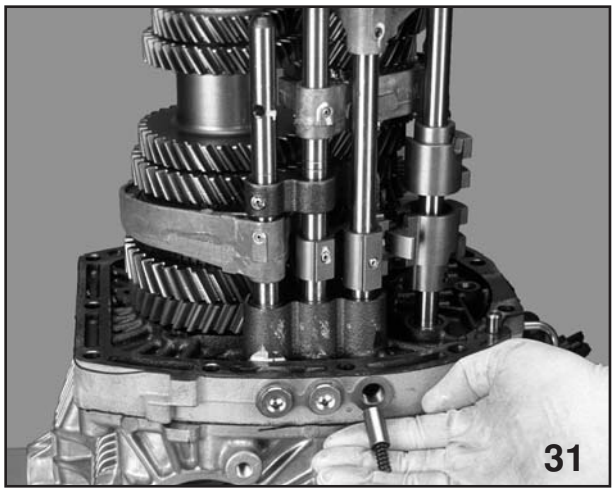


Main Case Removed

21. Remove the reverse idler holder mounting bolt and gasket.
22. Remove the bolts securing the transmission main case to the differential adapter plate. Remove the 3 lower nuts and then remove the main case.

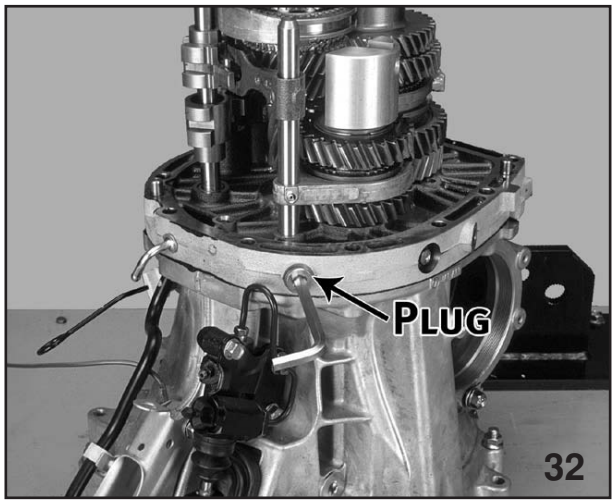


Reverse Idler Holder

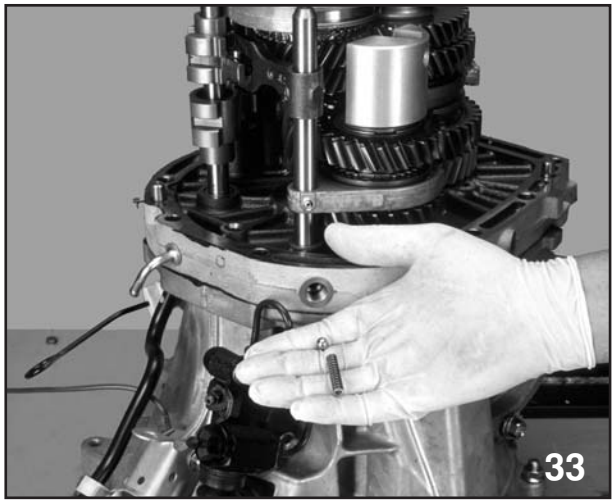


Detent and Spring

23. Set the transmission into 4th gear and slide the reverse idler holder from the reverse idler shaft.
24. Remove the shift arm plugs (3), gaskets (3), springs (3) and detent plungers (3).

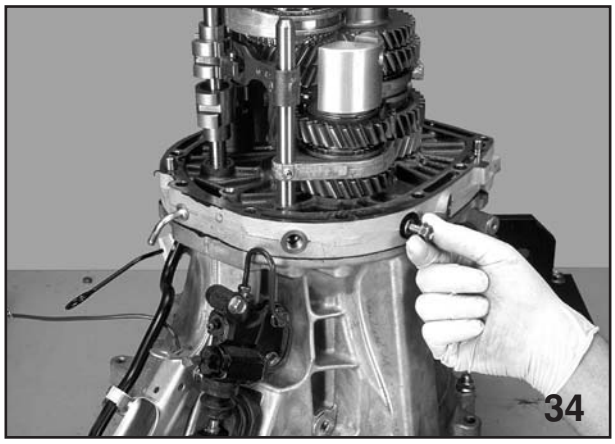


PLUG

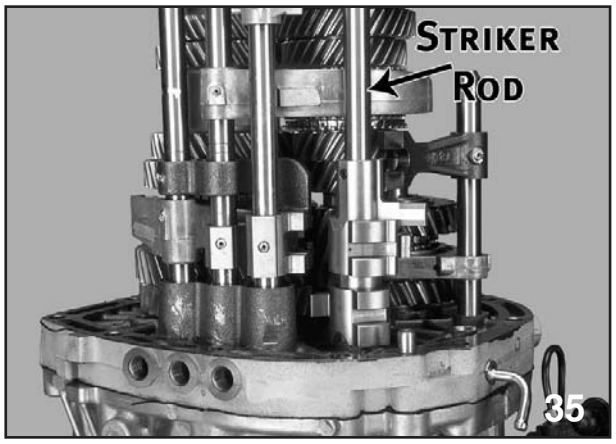


BALL AND SPRING

25. Remove the reverse shift arm plug, gasket, spring, and ball.



REVERSE IDLER BOLT



STRIKER ROD

26. Remove the reverse idler shaft mounting bolt.

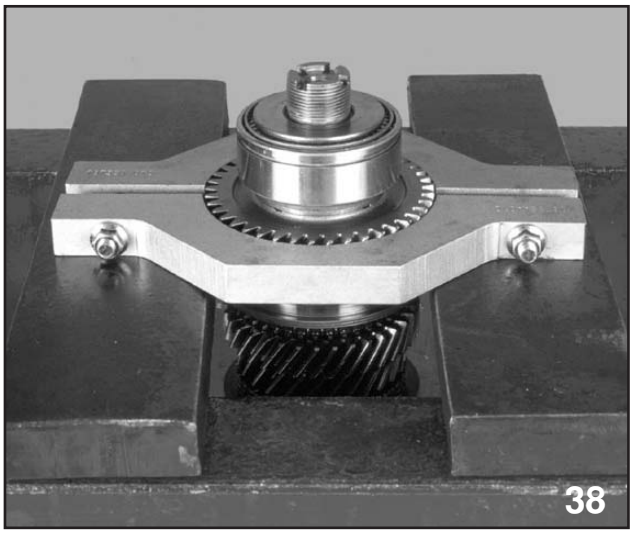
27. Rotate the striker rod counter clockwise so that the interlock blocks clear the shifting gates of the shift forks. Remove the striker rod and interlocks together.

NOTE: ORIENTATION OF INTERLOCKS. BE CAREFUL NOT TO DROP INTERLOCKS DURING REMOVAL PROCESS.

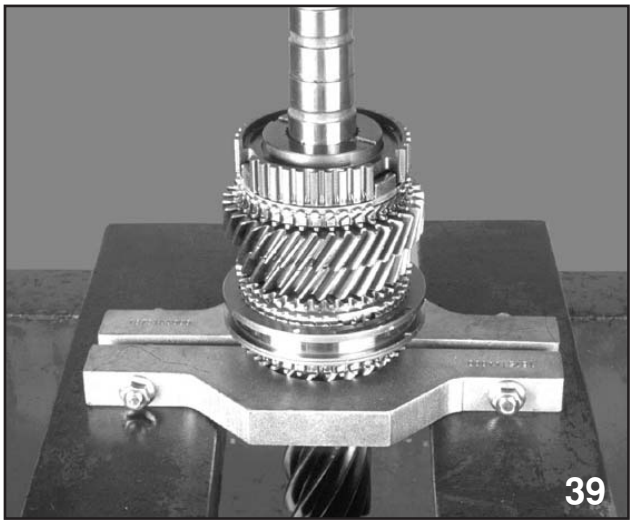
Removing Components

28. Hold the main shaft, driven shaft and shift rails together. Have a helper hold the reverse idler gear and shaft. All parts must be lifted at the same time.

Main Shaft Disassemble



Main shaft in Remover 18722AA000



Remover 18720AA000

1. Insert the splines of the main shaft into the Base holder (18664AA000) while supporting the main shaft bearing and 6th gear with Holder (18665AA000).
2. Unstake the lock nut and remove the locknut using a 38 mm socket.
3. Support the main shaft in a press with Remover (18722AA000) positioned under the 6th gear.
4. Apply force to the main shaft using Remover (899864100) or similar tool.
5. Press off the 5th/6th hub with Remover (18720AA000) under the 3rd gear.

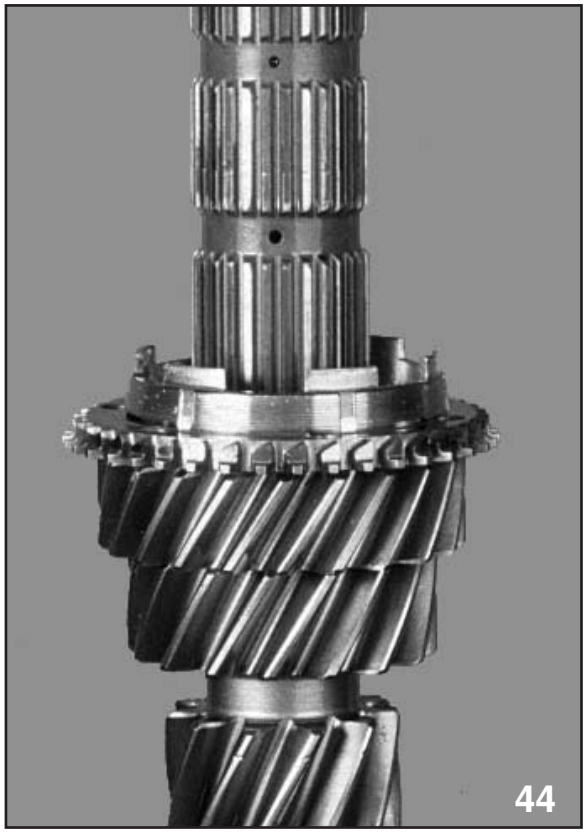
Main Shaft Assembly

Main Shaft

3rd Gear Bearing

1. Install the 3rd gear needle bearing.

3RD GEAR



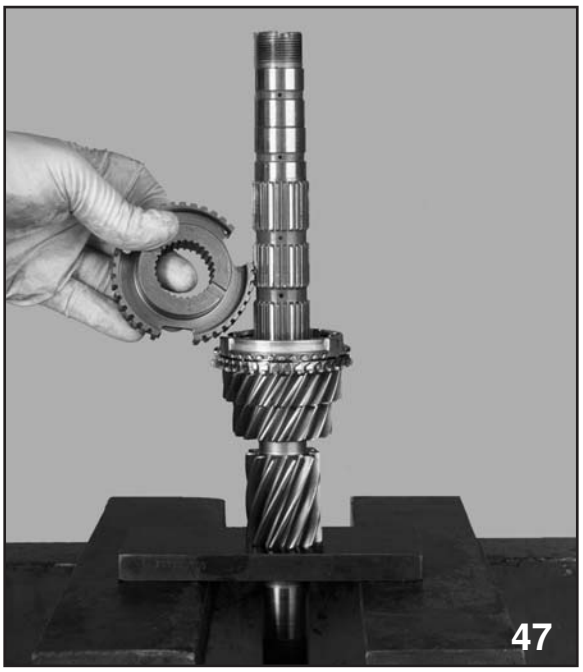
3RD GEAR INNER BAULK RING

2. Install 3rd gear.
3. Install 3rd gear inner baulk ring.

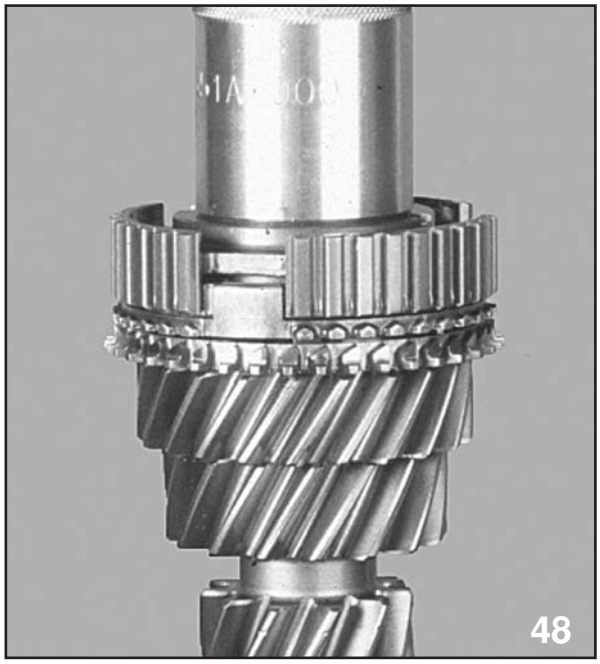
3rd Gear Synchronizer Cone

3rd Gear Outer Baulk Ring

4. Install the 3rd gear synchronizer cone.
5. Install the 3rd gear outer baulk ring.

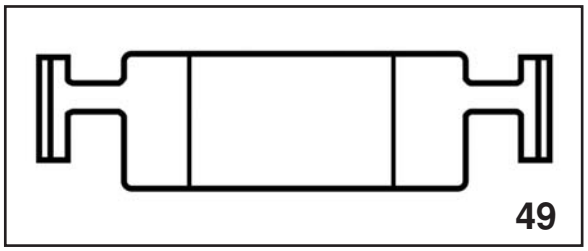


Main Shaft



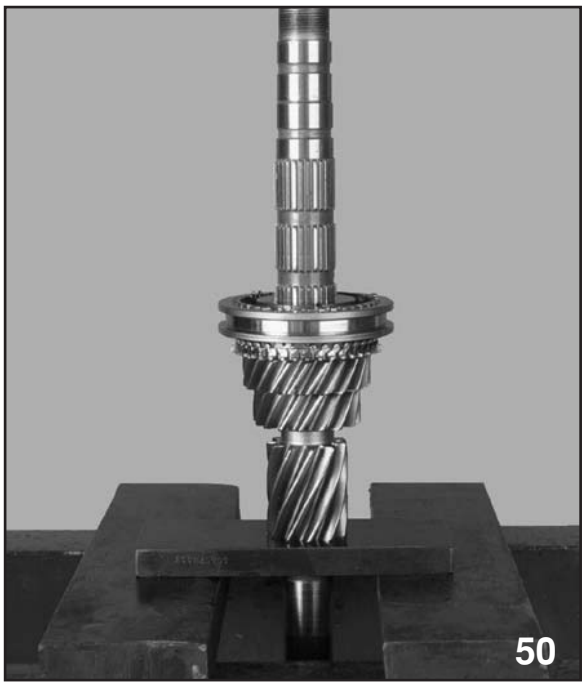
Installing 3rd/4th Hub

6. Support the main shaft in a press with holder (398177700) or similar tool under 1st gear.
7. Press the 3rd/4th hub (directional) on the main shaft using Installer (18651AA000).

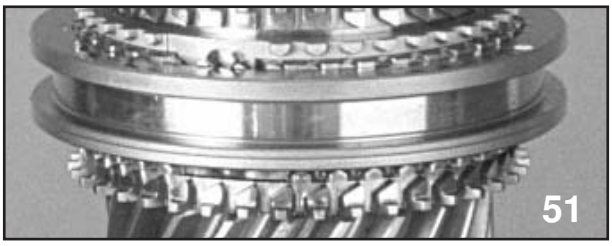


Hub Artwork

CAUTION: POSITION THE OUTER BAULK RING PROTRUSIONS TO ENGAGE WITH THE CUT-OUTS IN THE HUB. THIS ALIGNMENT MUST BE EXACT AS THE HUB IS PRESSED ONTO THE MAIN SHAFT.



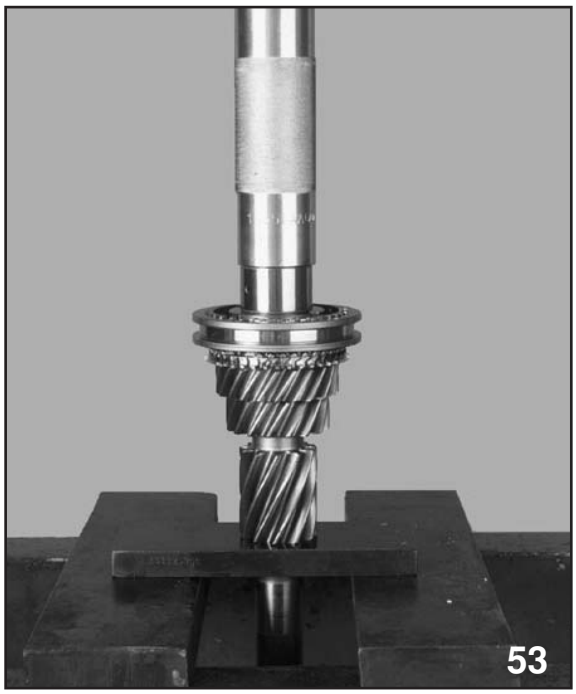
Installed Slider



Slider Close Up

8. Install the 3rd/4th slider on the 3rd/4th hub (Directional). Position the keys in the slider over the protrusions of the outer baulk ring.

Installing Bushing

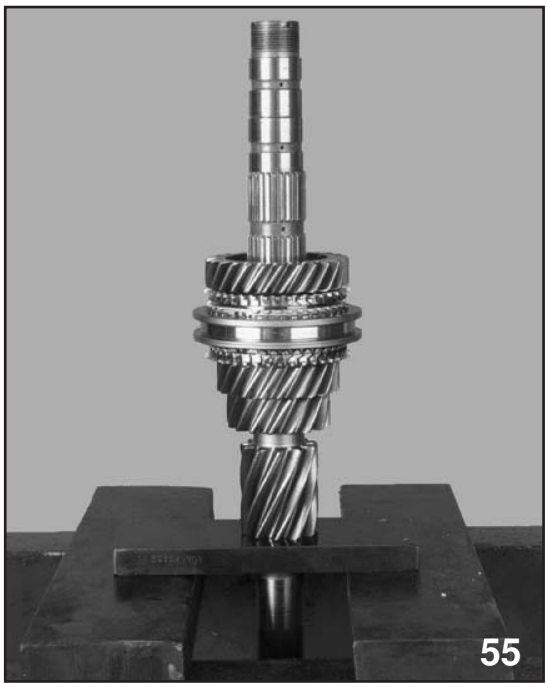


Bushing Installed

9. Press the 4th gear bushing on the main shaft. Position the oil hole in the bushing away from the oil hole in the main shaft.

SEE PAGE 26 FOR BUSHING ALIGNMENT.

Bearing Installed



Gear Installed

10. Install the 4th gear needle bearing.

Bushing Installed

Bearing Installed

11. Install the 4th gear.
12. Press the 5th gear bushing on the main shaft. Position the oil hole in the bushing away from the oil hole in the main shaft.
13. Install the 5th gear bearing.

SEE PAGE 26 FOR BUSHING ALIGNMENT.

Gear Installed

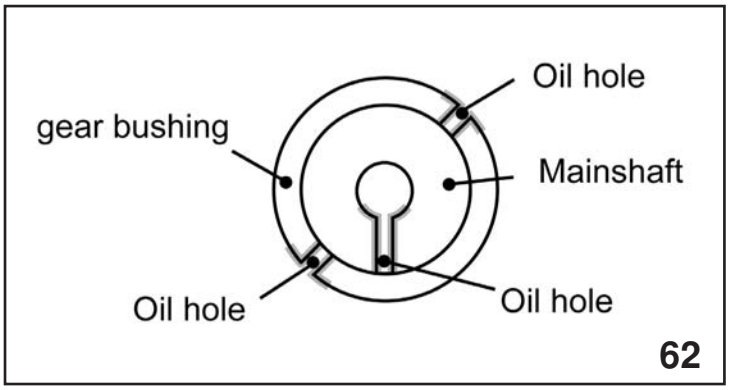
Baulk Ring Installed

14. Install the 5th gear
15. Install the 5th gear baulk ring.

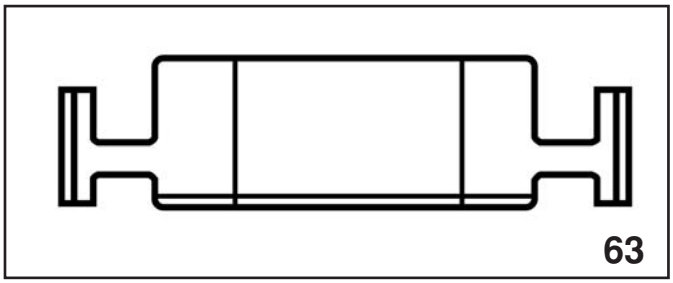
Installing 5th/6th Hub

Hub Installed

16. Install the 5th and 6th gear synchronizer hub. The hub (Directional) must be installed as shown while aligning the slots in the hub with the baulk ring of 5th gear.



Bushing Artwork



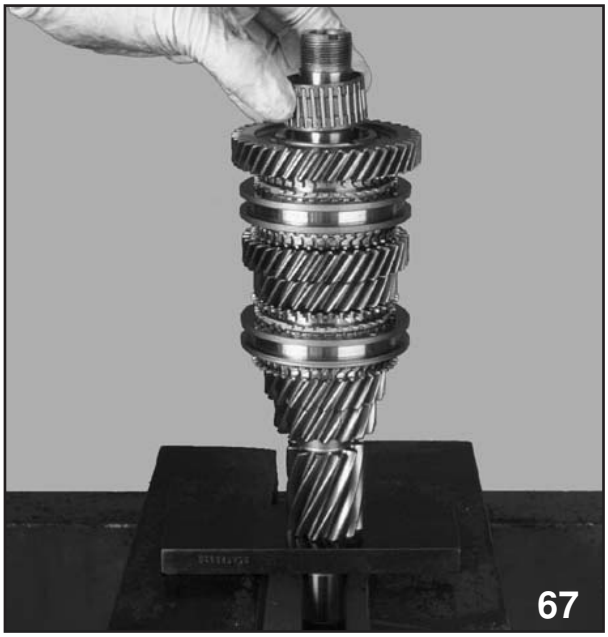
Hub Artwork

Slider Installed

Baulk Ring

17. Install the 5th and 6th gears slider (Directional) with the inserts aligned with the protrusions of the 5th gear baulk ring.
18. Install the 6th gear baulk ring while aligning the protrusions of the 6th gear baulk ring with the inserts of the 5th and 6th gear slider.

Gear Installed



Bearing Installed

19. Install the 6th gear and 6th gear bearing.

Installing Bushing

Bushing Installed

20. Press the 6th gear bushing onto the main shaft, taking care not to overlap the main shaft oil hole and the bushing oil hole.

SEE PAGE 26 FOR BUSHING ALIGNMENT.

Installing Bearing

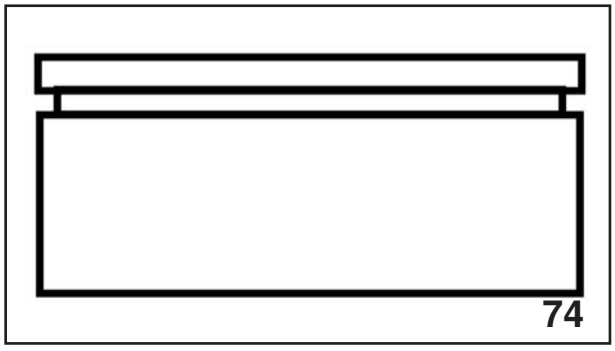
21. Press the lower tapered roller bearing onto the main shaft.

Installing Retainer

Installing Upper Bearing

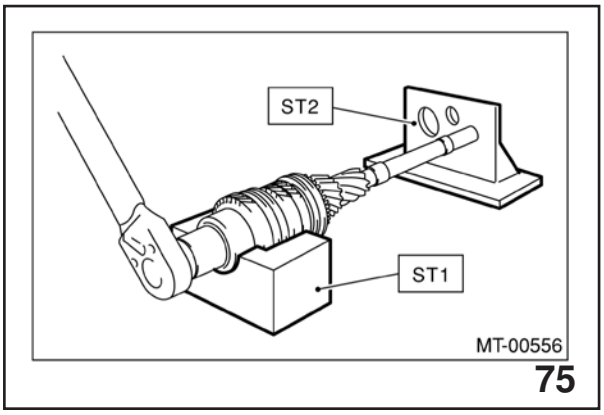
22. Install the bearing retainer into place with the snap ring groove facing the top side.

Bearing Installed



Retainer Artwork

23. Press the upper tapered roller bearing onto the main shaft.



TORQUING MAIN SHAFT

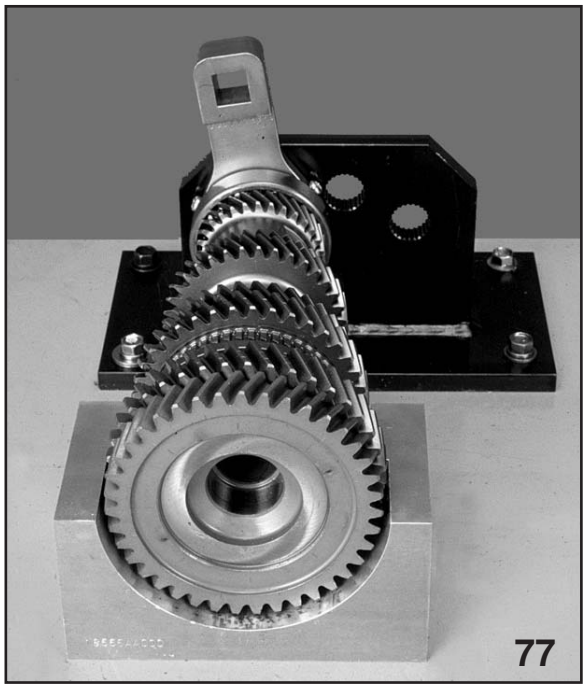
24. Install a new washer and new lock nut. Torque to 289 ft. lbs. (392 N~m)

25. Stake the lock nut in four (4) places. Do not crack the staking area.

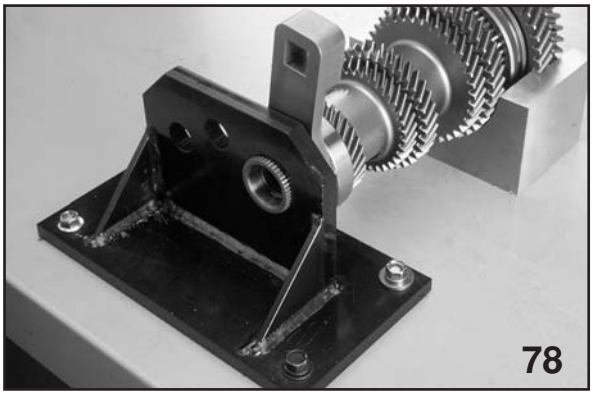
ST1 18665AA000

ST2 18664AA000

Driven Shaft Disassembly

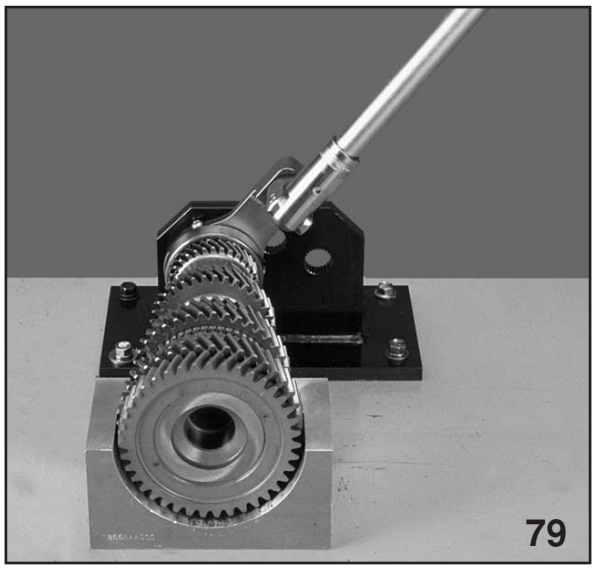


Driven Shaft Gear View

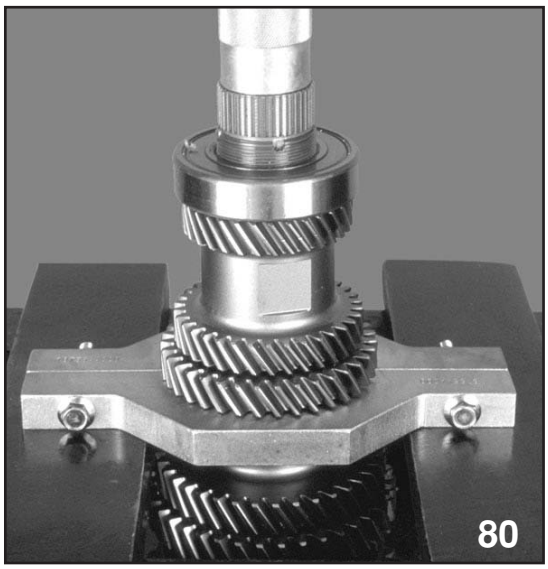


Driven Shaft Base Tool View

1. Secure the Base holding tool (18664AA000) to a rigid work bench. Unstake the locknut. Fit the Adapter Wrench (18620AA000) on the lock nut of driven shaft. Tighten the three screws to remove any looseness. Align the splines of the driven shaft with the Base holding tool while supporting the reverse and 1st gear with holder (18666AA000).



Breaker Bar

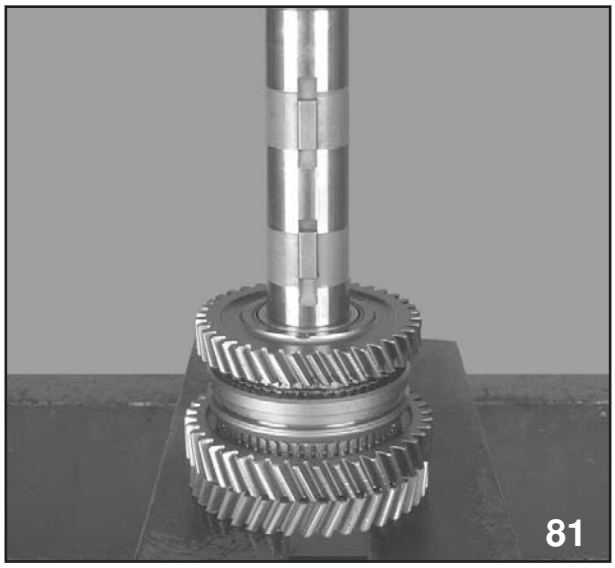


Driven Shaft on Press

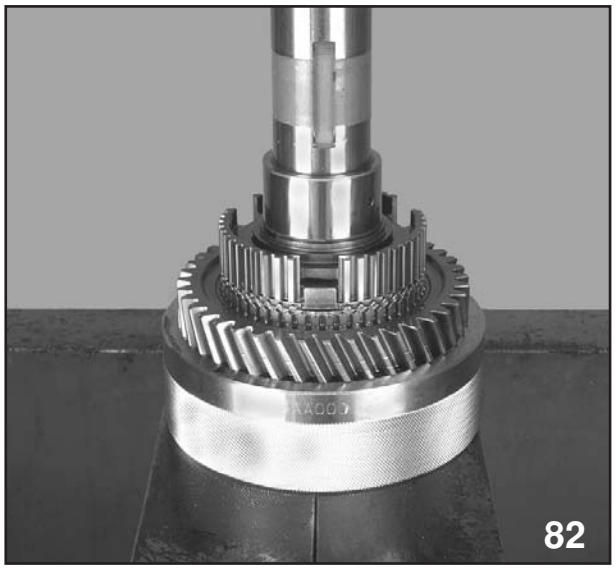
2. Loosen the locknut.

CAUTION: THE LOCK NUT IS TORQUED TO 391 FOOT LBS. USE CARE TO AVOID PERSONAL INJURY.

3. Place the driven shaft on a press supported with Remover (18723AA000) under 3rd gear. Apply pressure to the top of the driven shaft with Remover (499877000) or similar tool.

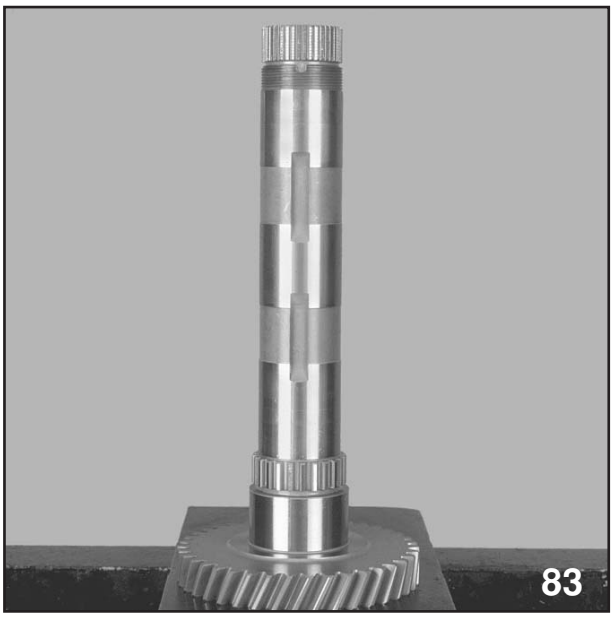


Woodruff Keys



Remover 18754AA000

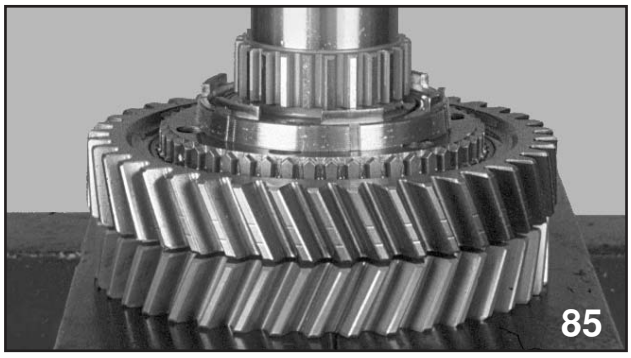
4. Remove the two woodruff keys from the driven shaft.
5. Support the driven shaft on a press with Remover (18754AA000) under 1st gear. Apply pressure to the top of the driven shaft with Remover (499877000) or similar tool.



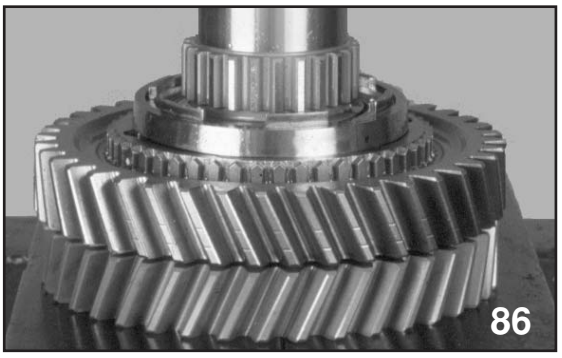
Driven Shaft

6. Inspect the driven shaft and reverse gear

Driven Shaft Reassembly

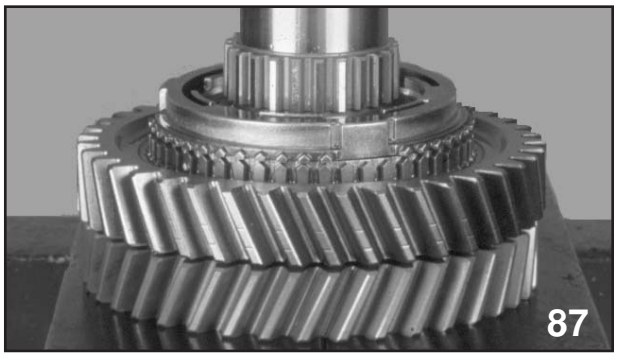


1st Gear

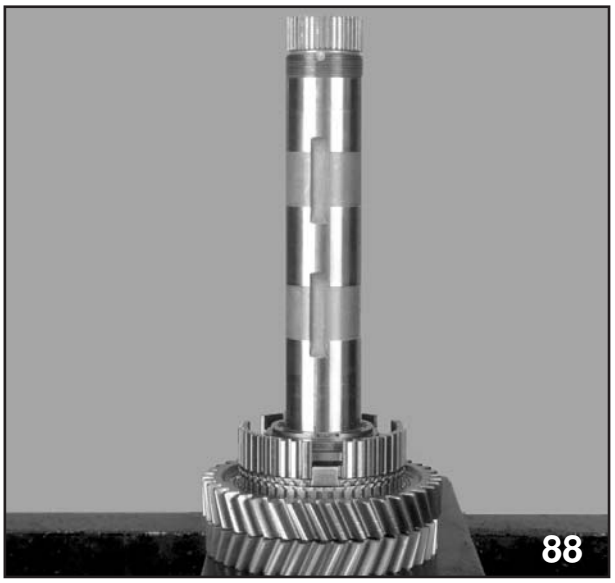


1st Gear Inner Baulk Ring

1. Install the 1st gear on the driven shaft.
2. Install the 1st gear inner baulk ring.
3. Install the 1st synchronizer cone.



Outer Baulk Ring Installed



Hub Installed

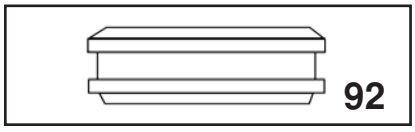
4. Install the 1st gear outer baulk ring.
5. Install the 1st/2nd gear hub (Directional) on the driven shaft.

Hub Artwork

Installing Bushing

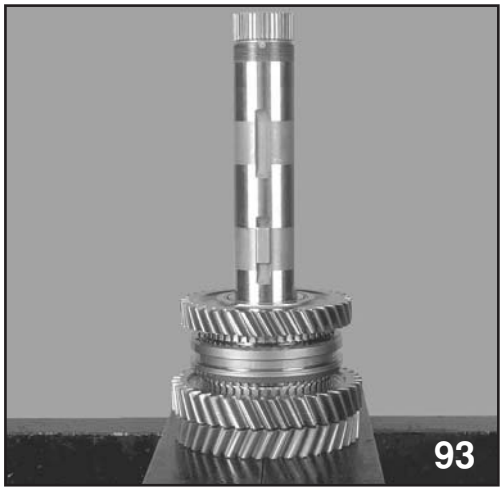
Slider and Bearing Installed

6. Press the 2nd gear bushing on the driven shaft using installer (18654AA000). The oil hole on the bushing must be positioned away from the oil hole located on the driven shaft.



Slider Artwork

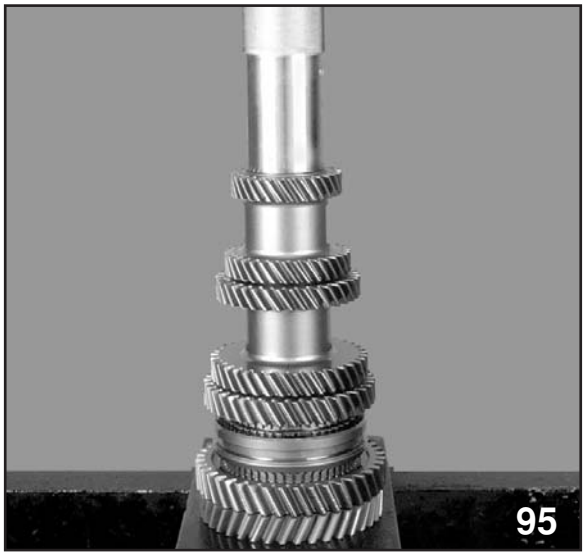
7. Install the 1st/2nd gear slider (Directional). Confirm that the slider key is positioned over the protruded portion of the outer baulk ring.
8. Install the 2nd gear needle bearing.



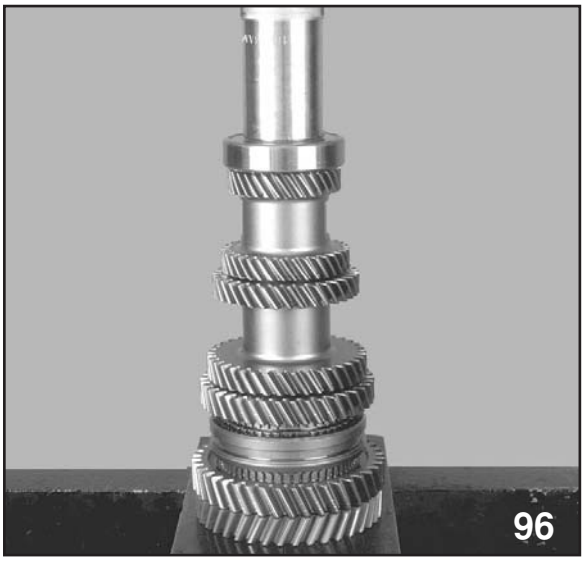
2nd Gear Installed and Lower Woodruff Key

3rd/4th Gear Installed and Upper Woodruff Key

9. Install the 2nd gear outer baulk ring and the 2nd gear.
10. Install the lower woodruff key on the driven shaft.
11. Press the 3rd/4th gear set on the driven shaft using Installer (18654AA000).

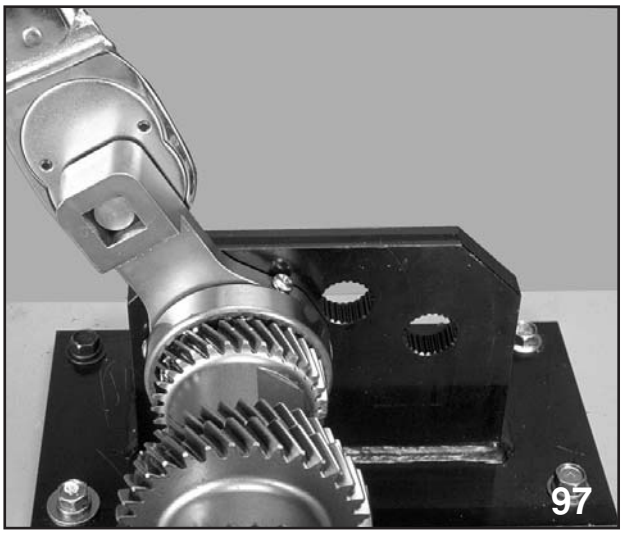


5TH/6TH GEAR INSTALLED



BEARING INSTALLED

12. Install the upper woodruff key and press the 5th/6th gear set on the driven shaft using Installer (18654AA000).
13. Press the ball bearing on the driven shaft (Directional) using Installer (18654AA000).



TORQUING DRIVEN SHAFT NUT

14. Install a new locknut on the driven shaft and fit the Adapter Wrench (18620AA000) on the lock nut of driven shaft. Tighten the three screws to remove any looseness. Align the splines of the driven shaft with the Base holding tool while supporting the reverse and 1st gear with holder (18666AA000).
15. Torque the locknut to 391 ft. lbs. (530 N~m)

NOTE: THE TORQUE WRENCH SUPPLIED AS A SPECIAL TOOL IS DIFFERENT THAN TORQUE WRENCH USED TO WRITE THE SERVICE MANUAL. THIS MAKES IT NECESSARY TO RECALCULATE THE TORQUE SPECIFICATION WHEN USING THE ADAPTER WRENCHES. USE THE FOLLOWING FORMULA TO DETERMINE THE NEW TORQUE SPECIFICATION.

T = L1 / (A + L1) x T1

T = New Torque Specification

L1 = Length of the torque wrench from the center of the handle to the center of the socket mount.

A = Length of the adapter from the middle of the socket mount to the middle of the wrench.

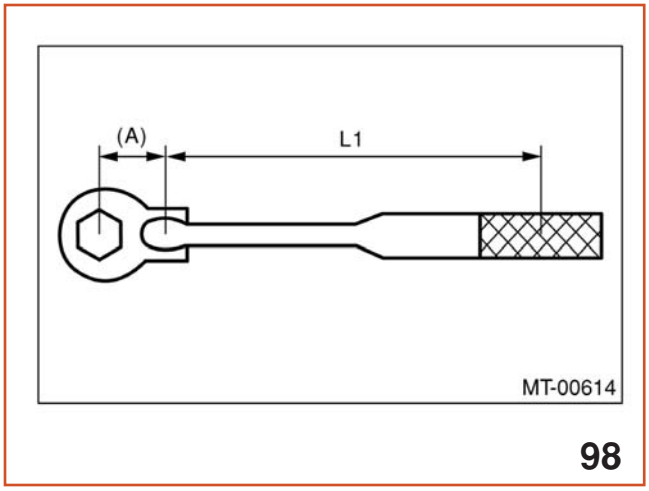
T1 = Original torque specification

Example: T = 37.5 / (4 + 37.5) x 420

T = 37.5/ 41.5 x 420

T = .90 x 420

T = 378

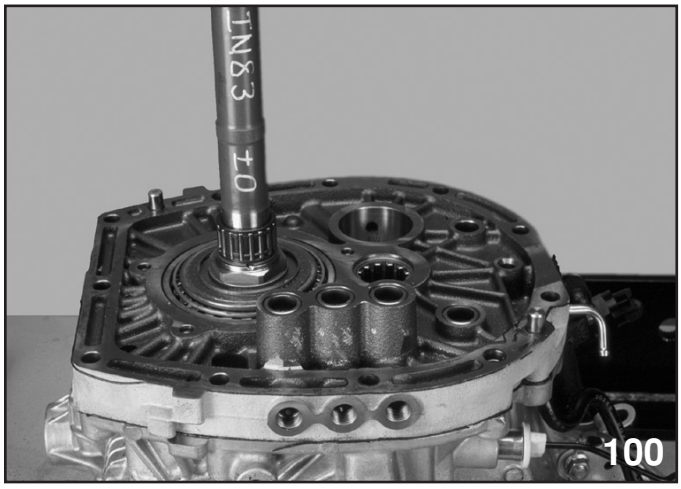


Torque Wrench Artwork

16. Stake the new locknut in 4 places.

Drive Pinion Shaft Assembly

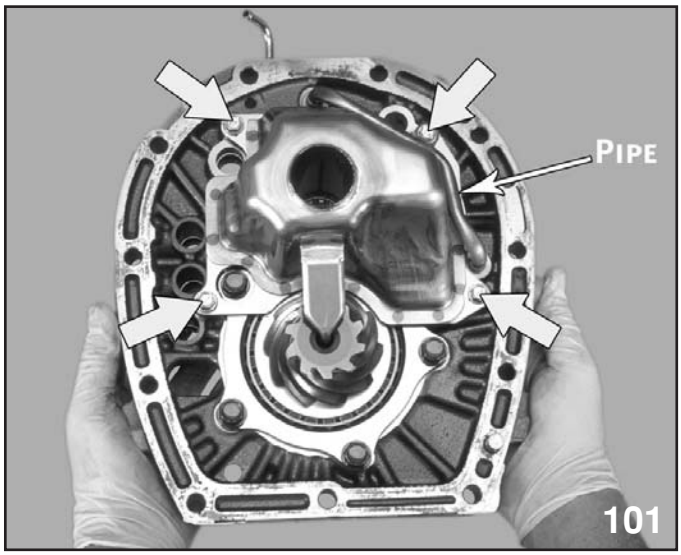
Removal



Back Side of Adapter Plate

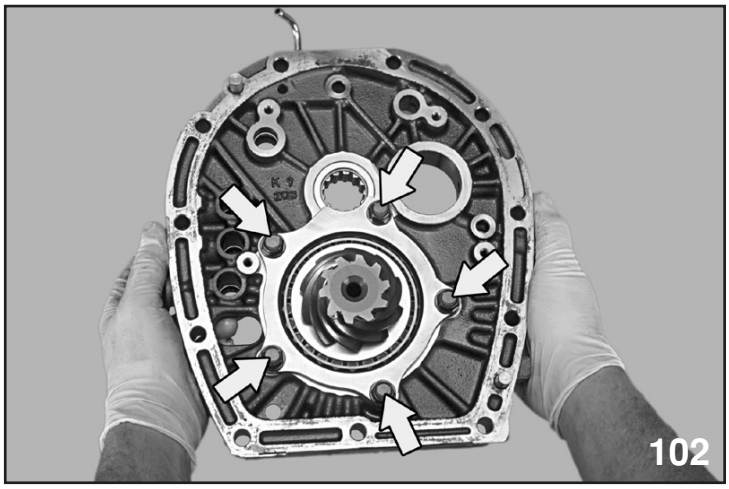
Disassembly

Replace the drive pinion shaft as a set with hypoid driven gear.



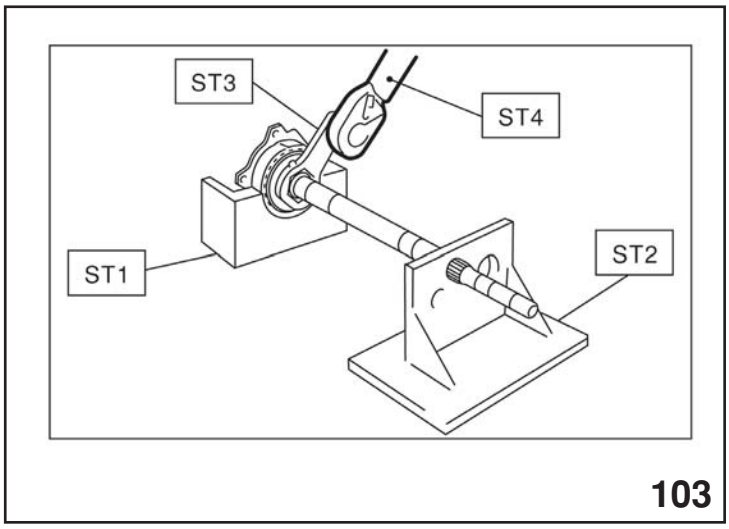
4 Oil Chamber Bolts

1. Remove the pipe and oil chamber (4 bolts).



Pinion Shaft Artwork

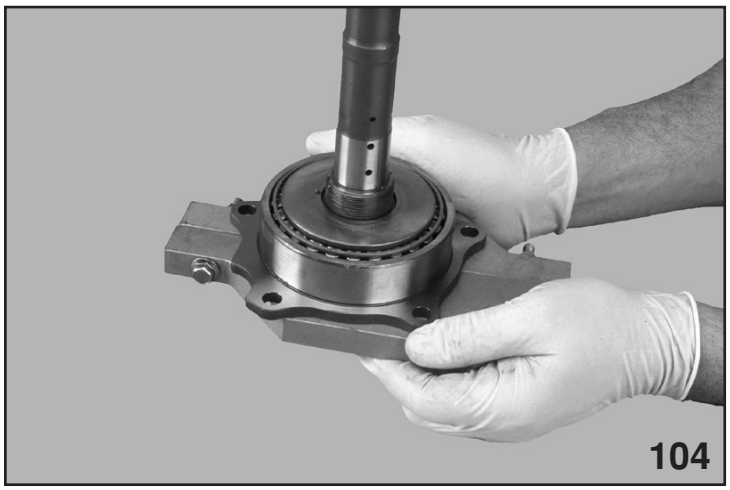
2. Remove the drive pinion shaft and shim from adapter plate.



Pinion Shaft Artwork

3. Secure the ST on workbench
   ST 18664AA000 BASE
4. Unstake the lock nut.
5. Install the ST3 to lock nut, then install drive pinion shaft in ST. Remove the lock nut and washer.

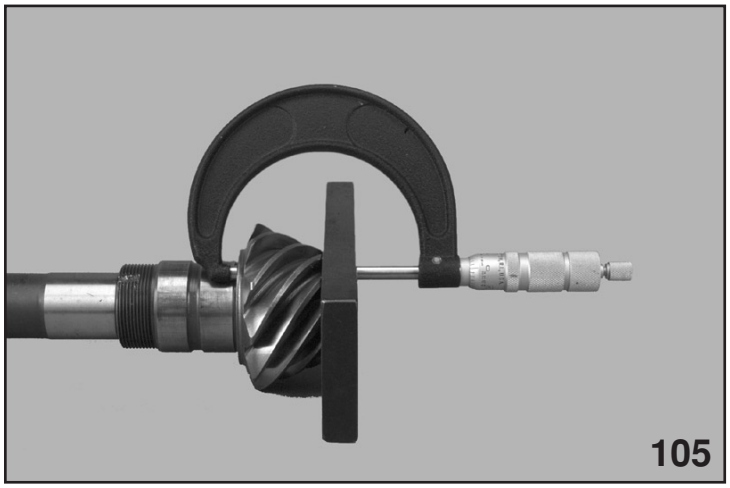
   ST1 18667AA000 Holder
   ST2 18664AA000 Base
   ST3 18621AA000 Adapter wrench
   ST4 Breaker Bar



Press Plates

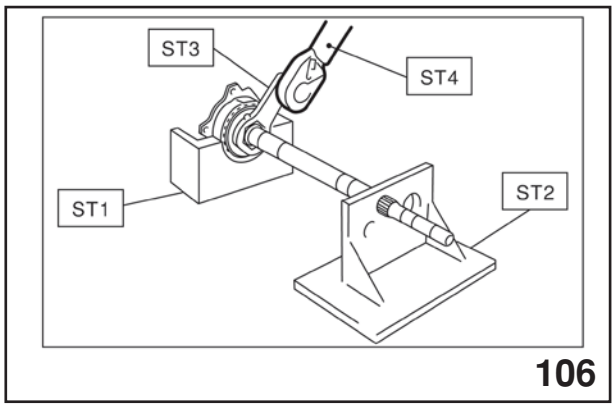
6. Using the ST, remove the taper roller bearing assembly.
   ST 18723AA000 Remover

Assembly



A

1. Using the ST, measure dimension A of drive pinion.
   ST 398643600 Gauge



PINION SHAFT ARTWORK

Install a new washer and a new lock nut.

Install the ST to the drive pinion and insert into special tool (ST2) and support with (ST1). Then tighten the lock nut using special tool (ST3) and (ST4).

ST1 18667AA000 Holder

ST2 18664AA000 Base

ST3 18621AA000 Adapter Wrench

ST4 18852AA00 Torque Wrench

NOTE: TIGHTEN WITH THE (ST) AND TORQUE WRENCH (ST4) STRAIGHT-LINED.

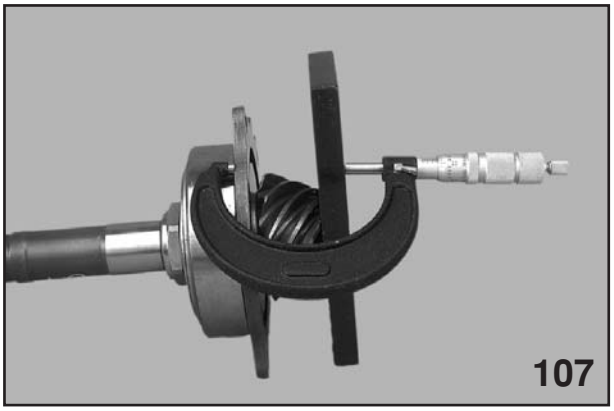
T = L1 / (A + L1) x T1

T = New Torque Specification

L1 = Length of the torque wrench from the center of the handle to the center of the socket mount.

A = Length of the adapter from the middle of the socket mount to the middle of the wrench.

T1 = Original torque specification



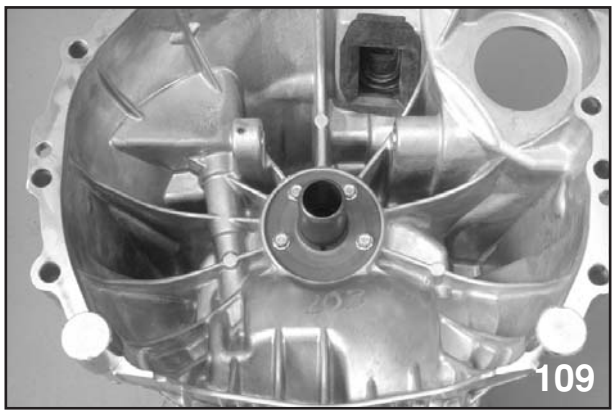
B

Using the ST, measure dimension B of the drive pinion.

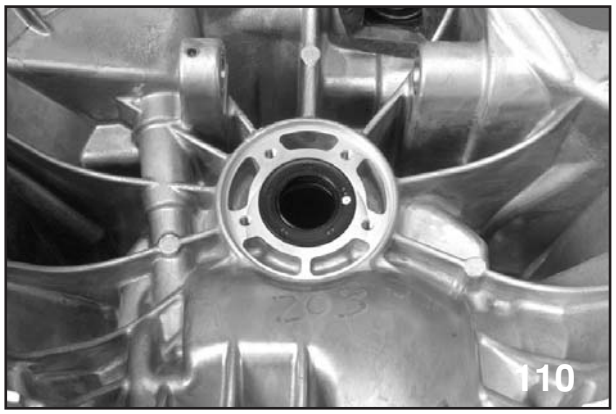
ST398643600 Gauge

T= 6.5 ± 0.0624 mm - (B - A)

Main Shaft Seal Replacement



Release Bearing Guide



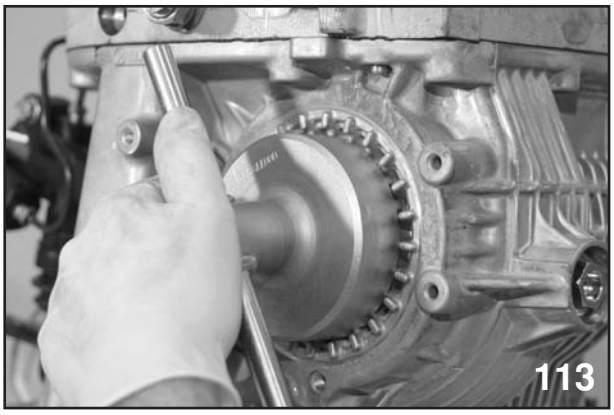
Main Shaft Seal Front View

Remove the clutch release bearing guide and inspect for wear or damage. Remove the seal using a general seal removal tool, be careful to avoid scratching the main shaft sealing surface and the transmission case.

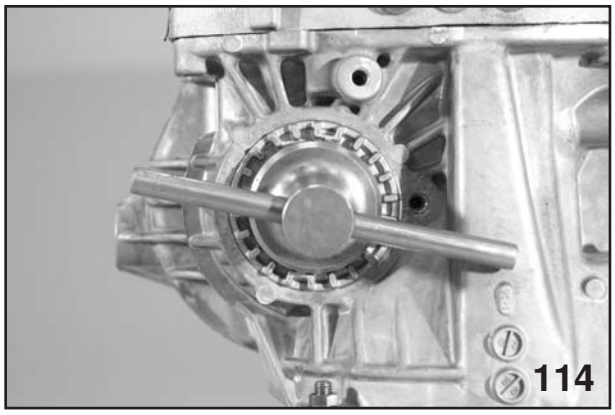
The seal can also be removed by a general tool from the back side, driving it towards the front. Install the new seal using general seal installation tool.

Main Shaft Seal Rear View

Hypoid Gear Backlash



Bearing Retainer Wrench in use Right Side



Bearing Retainer Wrench in use Left Side

1. Install the right and left side retainer. ST1 499787000 WRENCH ASSY (RIGHT SIDE) ST2 18658AA000 WRENCH ASSY (LEFT SIDE)

NOTE: SCREW IN THE RIGHT SIDE RETAINER A BIT FURTHER THAN LEFT SIDE.

2. Install the drive pinion shaft assembly, and then secure it with four bolts.

NOTE: USE THE OLD GASKET AND WASHER TO PREVENT DAMAGING, THE MATING SURFACE OF THE CASE .

TIGHTENING TORQUE: 50 N·M (5.0 KGF-M, 36.9 FT-LB)

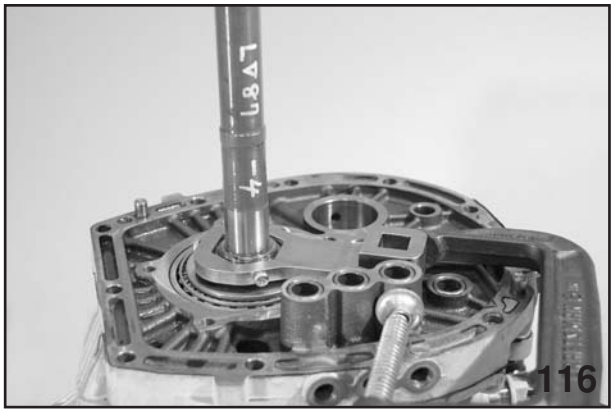
3. Using the ST, screw in the left side retainer until the drive pinion and hypoid driven gear contacts lightly. Then loosen the right side retainer.

   ST1 499787000 WRENCH ASSY (RIGHT SIDE)

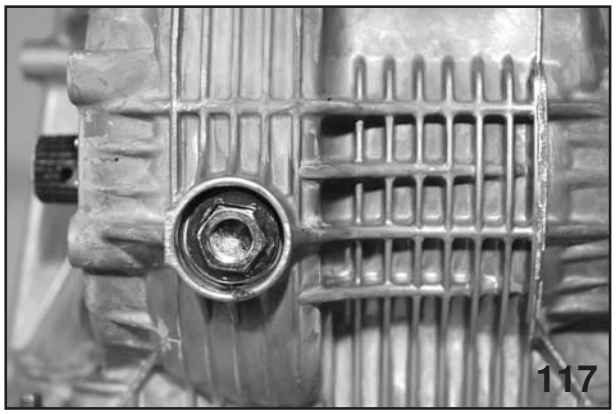
   ST2 18658AA000 WRENCH ASSY (LEFT SIDE)

ST HANDLE

4. Using the ST, rotate the drive pinion shaft several times. ST 18631AA000 HANDLE
5. Repeat step 3 and 4 until the left side retainer can not be rotated. For the right side retainer, screw it in until the inner race and outer race contacts lightly. This condition is “0” backlash.
6. Mark an engagement point on the right and left side retainer and clutch housing.
7. Return the left side retainer for three teeth, and screw in the right side retainer for three teeth.



PINION SHAFT HELD



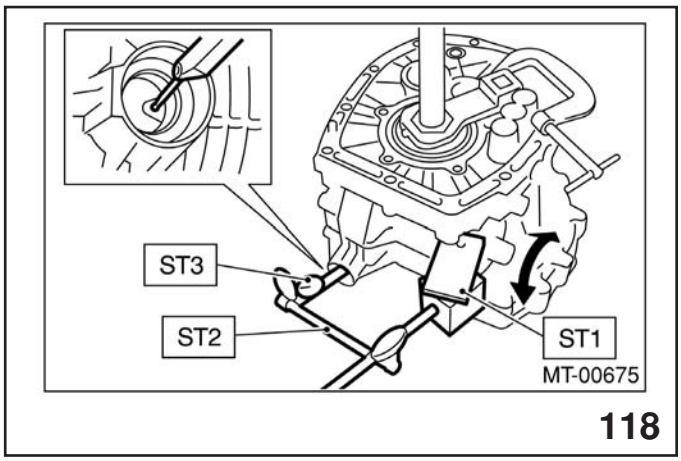
DRAIN PLUG

8. After rotating the drive pinion shaft several times, measure the hypoid gear backlash using the ST.
9. Use the ST with "C" clamp to, secure the drive pinion shaft. ST 18660AA000 ADAPTER WRENCH

   ST1 498255400 PLATE

   ST2 498247001 MAGNET BASE

   ST3 498247100 DIAL GAUGE



Backlash Artwork

HYPOID GEAR BACKLASH:

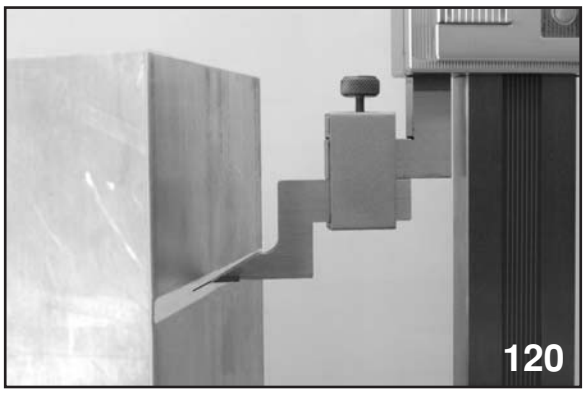
0.13 — 0.18 MM (0.0051 — 0.0071 IN)

10. If the backlash is out of specification, adjust it by turning the right and left side retainers equal amounts to maintain pre-load.
11. Screw in the right side retainer an additional 1.75 teeth.

Scribe Differential

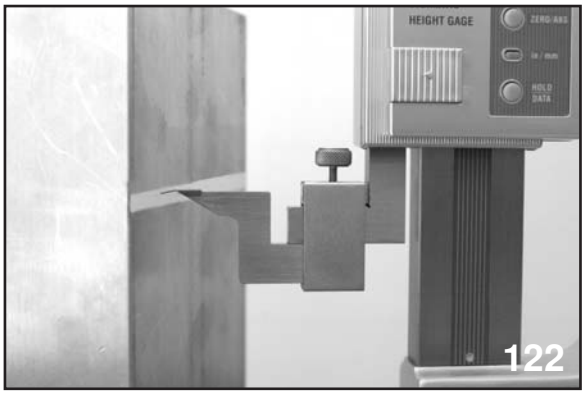
Determine Scribe Differential (SD) by performing the following:

1. Place a large aluminum block and height gauge on a flat machined surface.
2. Adjust the height gauge to about half of its maximum distance.
3. Carefully etch a mark into the aluminum block with the end of the scribe.
4. Turn on and zero the height gauge
5. Carefully move the height gauge away from the aluminum block while keeping the base of the height gauge on the machined surface. (Gauge 398643600)
6. Invert the scribe ensuring the center part of the scribe is positioned on the same side of the gauge extension arm used in step 3.
7. Move the height gauge back to the aluminum block and adjust the height so that the end of scribe is equal to the mark placed on the block in step 3.
8. The reading on the gauge is the scribe differential (SD).



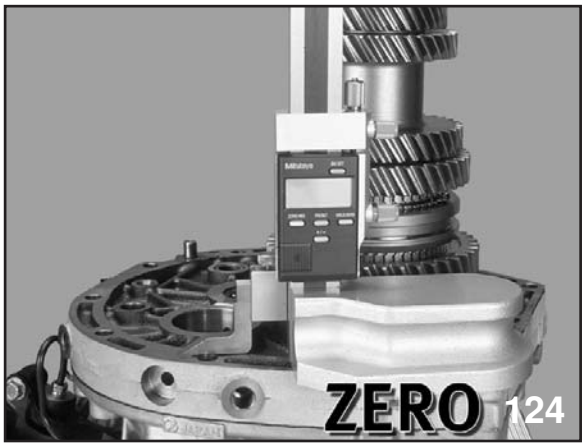
Step 3

Step 4

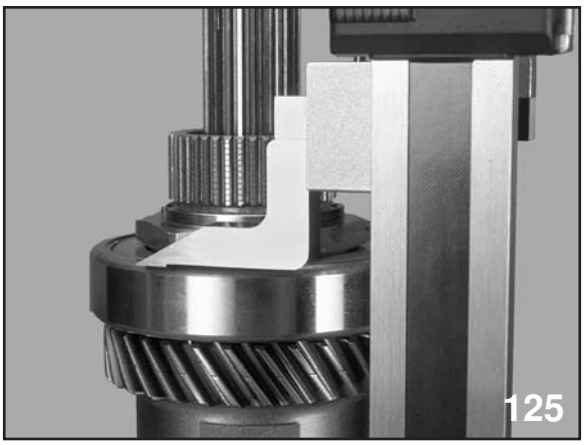


Step 7

Main Shaft Alignment and Main Shaft End Play



Zero



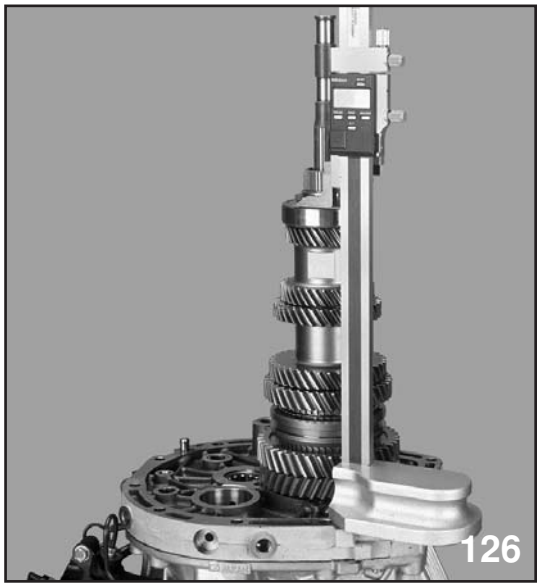
Top of Bearing

Main shaft snap ring and washer

1. Install the driven shaft assembly onto the drive pinion shaft and place the height gauge (18853AA000) onto the adapter plate matching surface.
2. Move the jaw of the height gauge downward until it touches the adapter plate matching surface and zero the gauge indicator.
3. Measure distance (A) between the ball bearing top surface and the adapter plate, using the height gauge.

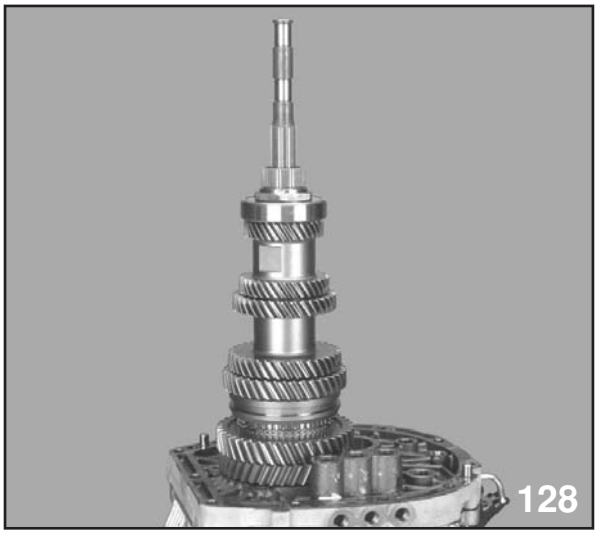
   A=
4. Select the correct snap ring and washer according to the value of (A) from the appropriate table in the Service Manual on STIS Web site.

The snap ring controls the main shaft alignment in the case. The washer controls the main shaft end play.

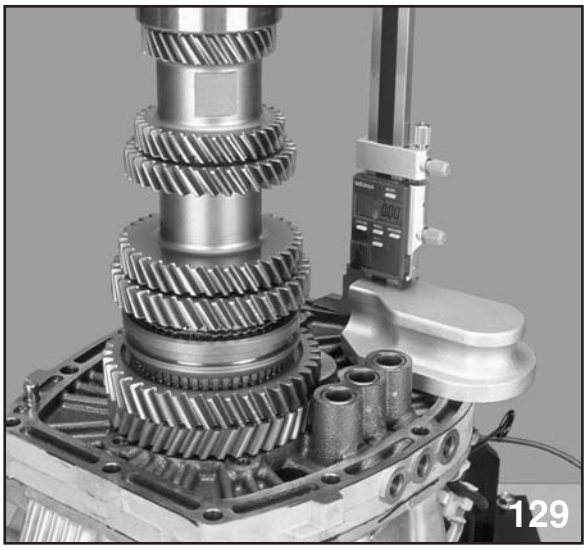


A

1st-2nd Fork Rod Measurement

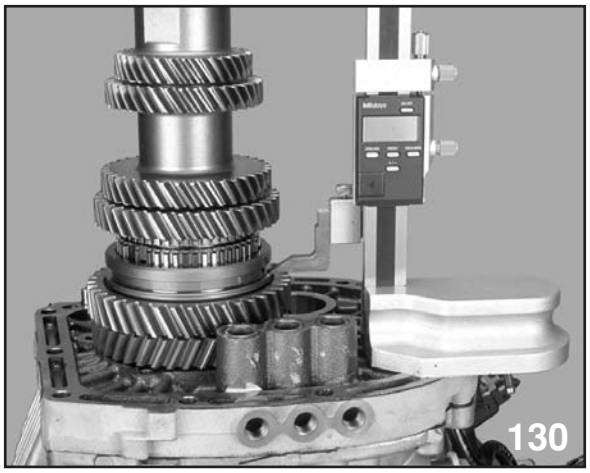


Driven Shaft on Pinion Shaft

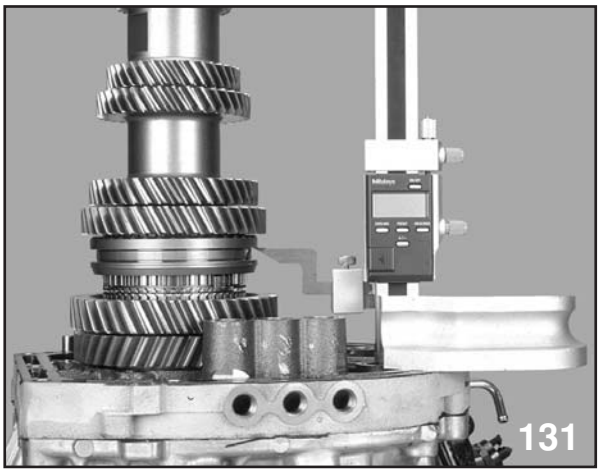


Zero

1. Install the driven shaft assembly onto the drive pinion shaft and place the height gauge on the adapter plate matching surface.
2. Move the jaw of the height gauge downward until it touches the adapter plate matching surface and zero the gauge indicator.



B1



B2

3. Shift the 1st-2nd sleeve into 1st gear position fully, and then measure distance (B1) between the sleeve lower edge and the adapter plate, using the height gauge.
4. Remove the jaw from the height gauge and reinstall it upside down.
5. Shift the 1st-2nd sleeve into 2nd gear position fully, and then measure distance (B2) between the sleeve upper edge and the adapter plate, using the height gauge.
6. Add Scribe Differential (SD) to the measured value of B2.

   B3 = B2 + Scribe Differential (SD) =

See page 46 to determine Scribe Differential (SD)

NOTE: WHEN THE JAW IS INSTALLED UPSIDE DOWN COMPARED WITH ORDINARY POSITION, ADD SCRIBE DIFFERENTIAL (SD) (FIXING VALUE) TO THE MEASURED VALUE, FOR GETTING ACTUAL MEASUREMENT VALUE.

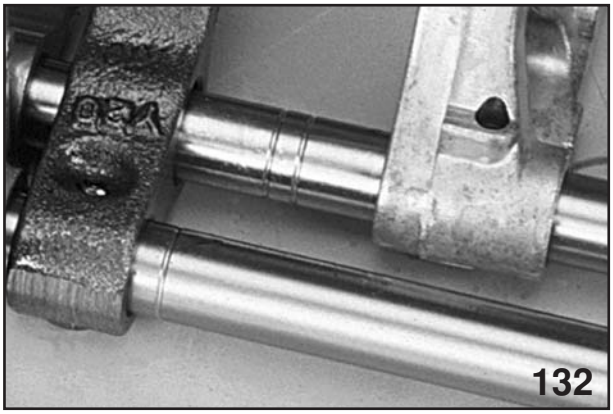
7. According to both measurement values (B1, B3), calculate the “Neutral position” of the 1st-2nd sleeve.

NOTE: MEASURE EACH SLEEVE AT 5 LOCATIONS (APPROXIMATELY 72° APART) UTILIZE A HELPER TO HOLD THE SLEEVE. ENSURE THAT HELPER HOLDS SLEEVE IN STRAIGHT UP POSITION. AVERAGE THE FIVE MEASUREMENTS.

D = (B1 + B3)/2 =

D: Distance between the “Neutral position” of the 1st-2nd sleeve and the adapter plate matching surface

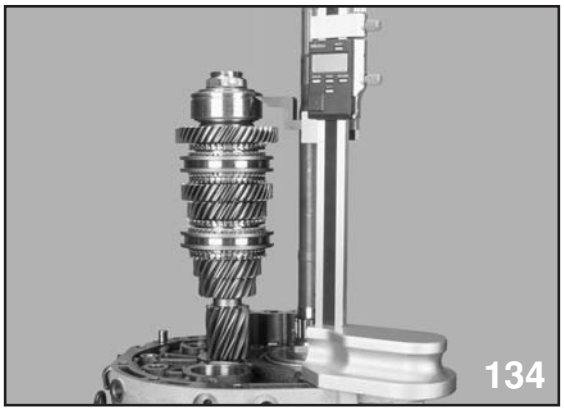
8. Select a suitable 1st-2nd shift fork rod from the table in the Subaru Service Manual on STIS Web site.



LINES ON SHIFT ROD

The rods will have different numbers of lines machined around the circumference of the rod to identify it.

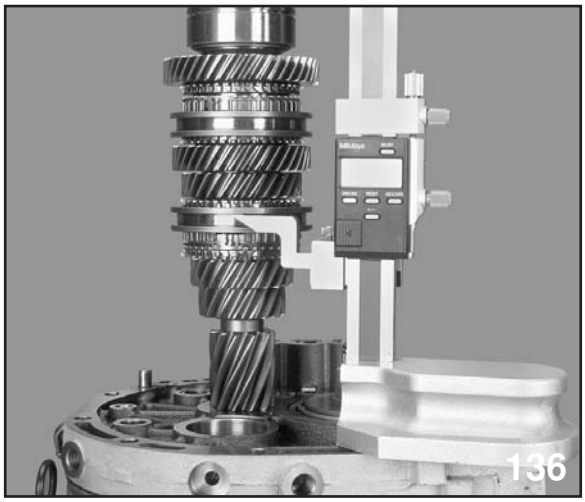
3rd -4th Fork Rod Measurement



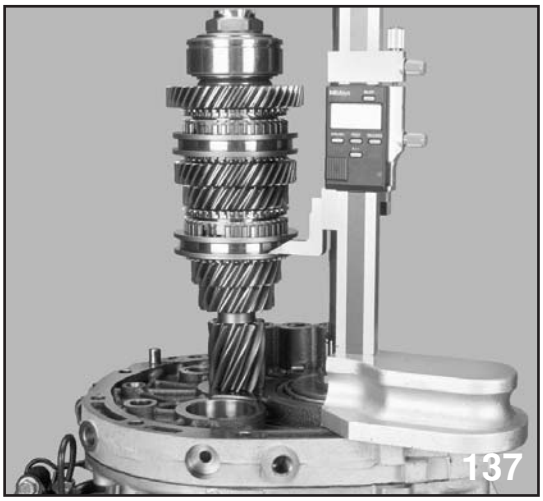
Height Gauge on Adapter Plate

Zero

1. Install the main shaft assembly onto the adapter plate and place the height gauge onto the adapter plate matching surface.
2. Move the jaw of the height gauge upward until it touches the top position of the snap ring groove on the taper roller bearing retainer, and then zero the gauge indicator.



Slider in 4th Gear



Slider in 3rd Gear

3. Shift the 3rd-4th sleeve into 4th gear position fully, and then measure distance (C1) between the sleeve upper edge and the groove top surface, using the height gauge.
4. Remove the jaw from the height gauge and reinstall it upside down. (The Jaw is flat on only one side)
5. Shift the 3rd-4th sleeve into 3rd gear position fully, and then measure distance (C2) between the sleeve lower edge and the groove top surface, using the height gauge.

6. Add Scribe Differential (SD) to measured value of C2.

C3 = C2 + Scribe Differential (SD)

See page 46 to determine Scribe Differential (SD)

NOTE: WHEN THE JAW IS INSTALLED UPSIDE DOWN COMPARED WITH ORDINARY POSITION, SCRIBE DIFFERENTIAL (SD) (FIXING VALUE) TO THE MEASURED VALUE, FOR GETTING ACTUAL MEASUREMENT VALUE.

7. According to both measurement values (C1, C3), calculate the “Neutral position” of the 1^{st}-2^{nd} sleeve.

NOTE: MEASURE EACH SLEEVE AT 5 LOCATIONS (APPROXIMATELY 72° APART) UTILIZE A HELPER TO HOLD THE SLEEVE. ENSURE THAT HELPER HOLDS SLEEVE IN STRAIGHT UP POSITION. AVERAGE THE FIVE MEASUREMENTS.

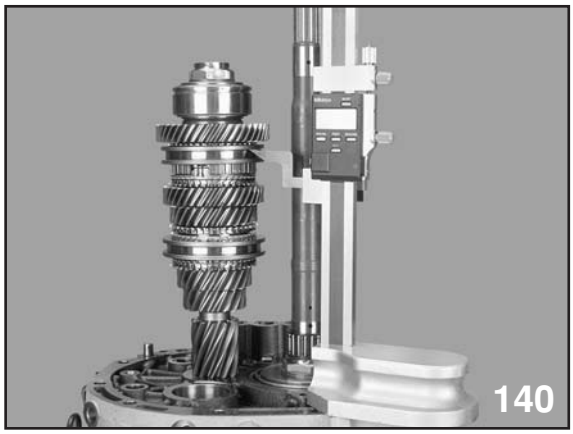
D = (C1 + C3)/2 =

D: Distance between the “Neutral position” of the 3^{rd}-4^{th} sleeve and the groove top Surface

8. Select a suitable 3rd-4th shift fork rod from the table in the Service Manual on STIS Web site. Main shaft snap ring thickness must be known to select proper shift fork rail.

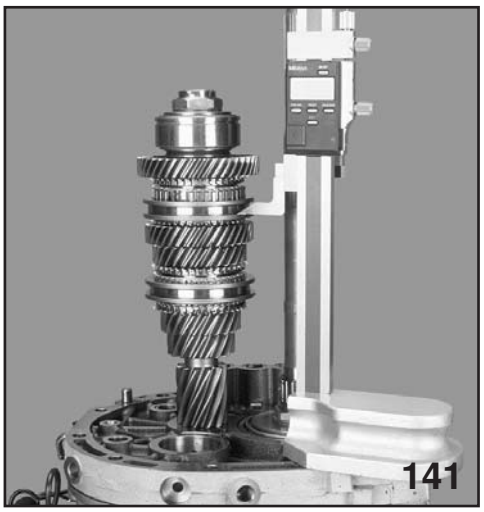
5th-6th Fork Rod Measurement

Zero



Slider in 6th Gear

1. Move the jaw of the height gauge upward until it touches the top position of the snap ring groove on the taper roller bearing retainer, and then zero the gauge indicator.
2. Shift the 5th-6th sleeve into 6th gear position fully, and then measure distance (D1) between the sleeve upper edge and the groove top surface, using the height gauge.



Slider in 5th Gear

3. Remove the jaw from the height gauge and reinstall it upside down.
4. Shift the 5th-6th sleeve into 5th gear position fully, and then measure distance (D2) between the sleeve lower edge and the groove top surface, using the height gauge.
5. Add Scribe Differential (SD) to measured value of D2.

D3 = D2 + Scribe Differential (SD)

See page 46 to determine Scribe Differential (SD)

NOTE: WHEN THE JAW IS INSTALLED UPSIDE DOWN COMPARED WITH ORDINARY POSITION, ADD SCRIBE DIFFERENTIAL (SD) (FIXING VALUE) TO THE MEASURED VALUE, FOR GETTING ACTUAL MEASUREMENT VALUE.

6. According to both measurement values (D1, D3), calculate the “Neutral position” of the 5th-6th sleeve.

NOTE: MEASURE EACH SLEEVE AT 5 LOCATIONS (APPROXIMATELY 72° APART) UTILIZE A HELPER TO HOLD THE SLEEVE. ENSURE THAT HELPER HOLDS SLEEVE IN STRAIGHT UP POSITION. AVERAGE THE FIVE MEASUREMENTS.

D = (D1 + D3)/2

D: Distance between the “Neutral position” of the 5th-6th sleeve and the groove top Surface

7. Select a suitable 5th-6th shift fork rod from the table in the Subaru Service Manual on STIS Web site. Main shaft snap ring thickness must be known to select proper shift fork rail.

Reverse Idler Gear

Point of reassemble work

Reverse Idler Base Shaft

1. Install the knock pin in the lowest hole of the base shaft.

Washer Installed

2. Install the washer with the grooves facing up.

Lower Bearing and Reverse Idler Bushing Installed

3. Install the lower needle bearing and reverse idler gear bushing.

Reverse Idler Gear

4. Install the reverse idler gear number 2.

Coupling Sleeve and Installed

5. Install the reverse coupling sleeve, rounded edge down, ensuring the shifting inserts are properly positioned. (Directional)

Coupling Sleeve and Insert

Outer Baulk Ring Installed &
Installing Synchronizer Cone

6. Install the outer baulk ring.
7. Install the synchronizer cone.

Installing Inner Baulk Ring

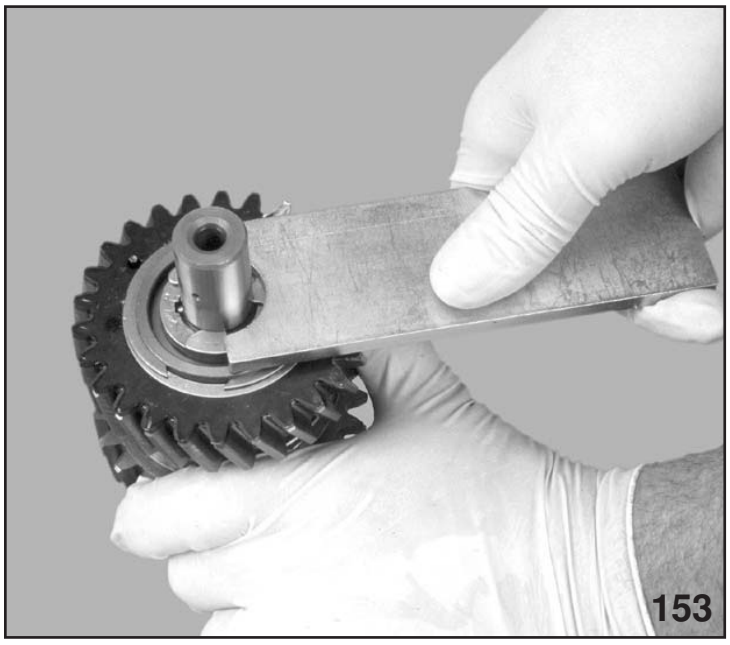
8. Install the outer baulk ring.

Inner Baulk Ring Installed

9. Install the upper needle bearing.
10. Install the Reverse idler gear while aligning the holes in the bottom of the gear to the protrusions of the synchronizer cone.

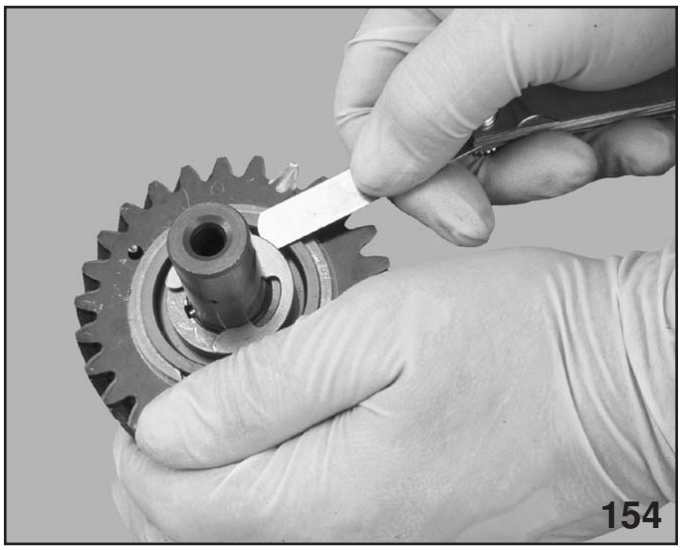
Washer and Upper Knock Pin Installed

11. Install the upper knock pin in the second hole from the top of the base shaft.
12. Install the upper washer with the groove facing down.



Installing Snap Ring

13. Install the snap ring using special tool. (18672AA000)



Checking Clearance

Using a feeler blade measure the clearance between the snap ring and the washer.

Standard clearance: 0.1 - 0.3 mm (0.0039 - 0.0118 in)

Select a snap ring from the following table.

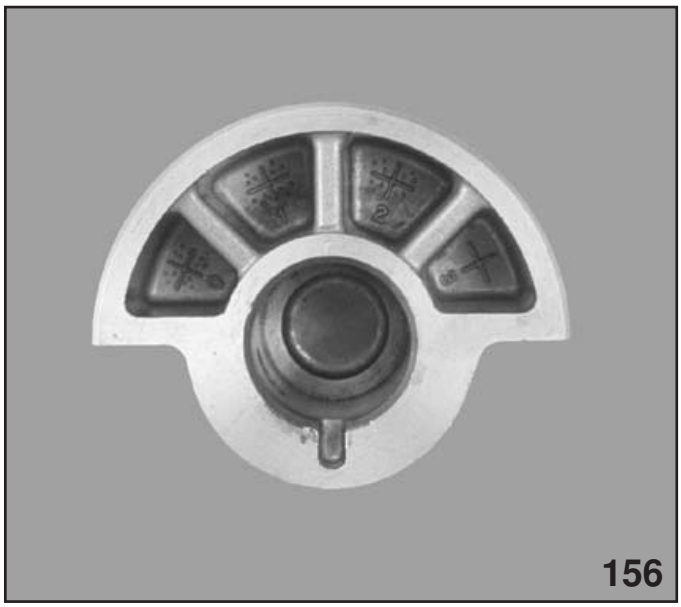
Snap ring selection table:

Snap ring

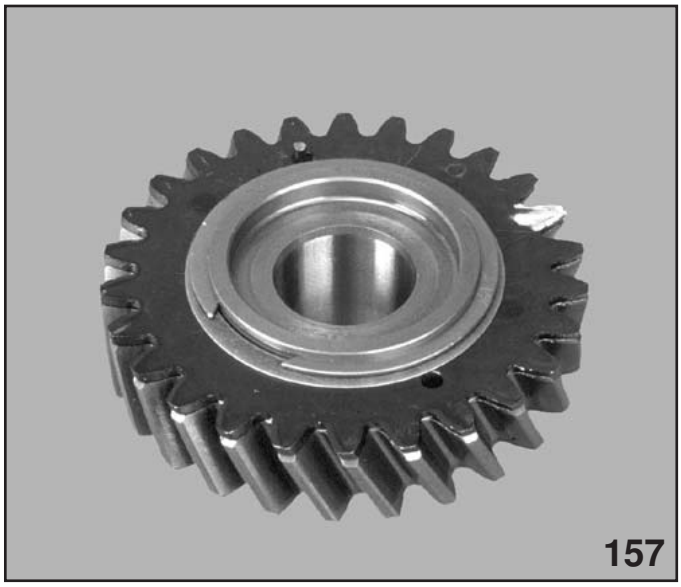
Parts No.	Thickness mm (in)
31319000	1.50 (0.059)
805019030	1.60 (0.062)
805019010	1.72 (0.068)

Spring Pin Installed

14. Install the spring pin in the top hole of the base shaft.

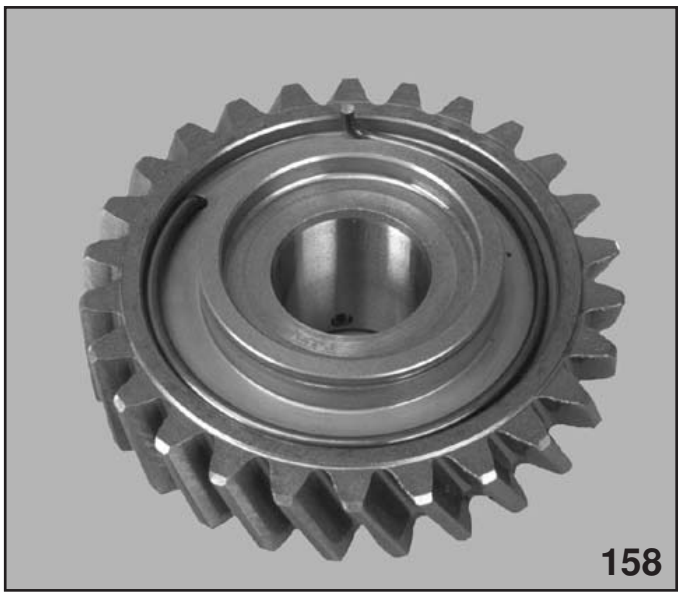


Reverse Shaft Holder



Sub Gear

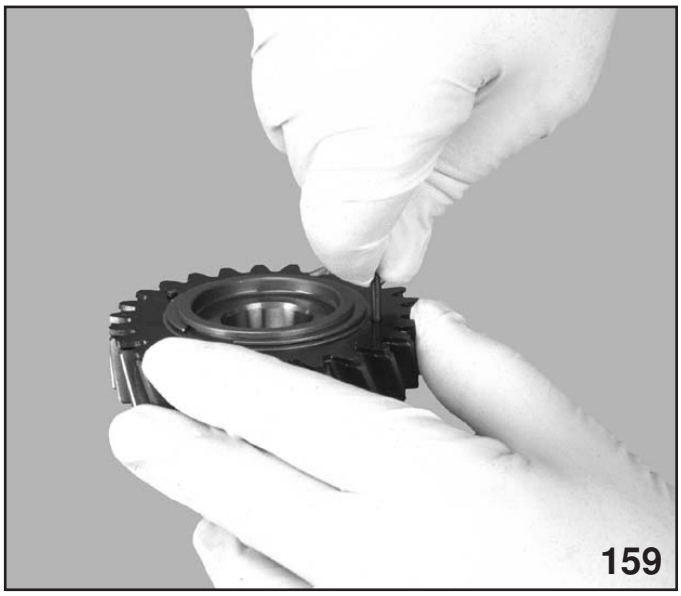
The upper reverse idler gear is equipped with a sub gear that reduces gear noise and assists with providing a smoother reverse gear engagement.



Sub Gear Spring

The top of the reverse idler gear has two holes. The sub gear also has two holes. These holes are used to secure the spring and to provide a method of preloading the sub gear during installation. Install the sub gear and spring on the reverse idler gear with white marking on hook part facing to the sub gear.

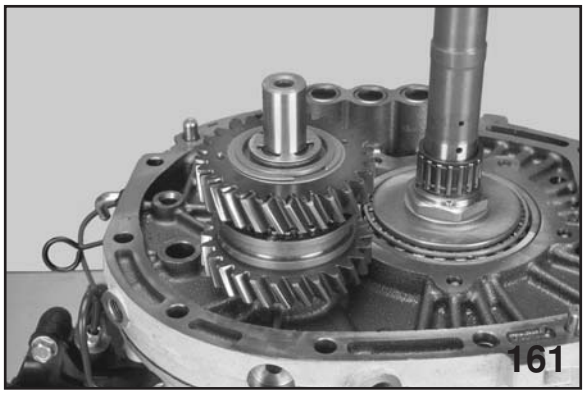
Install the snap ring using the special tool. (18672AA000)



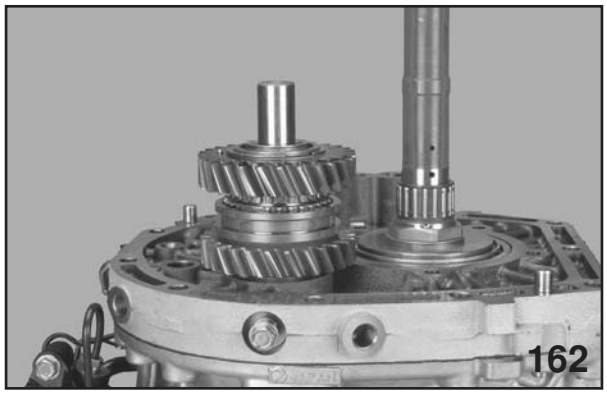
Preloading the Sub Gear

15. Turn the sub gear counter clockwise for approximately three teeth. Align the sub gear hole and reverse idler gear hole, and then insert the straight pin. (Special tool 18757AA000)

Reverse Fork Rod



Reverse Idler Top View

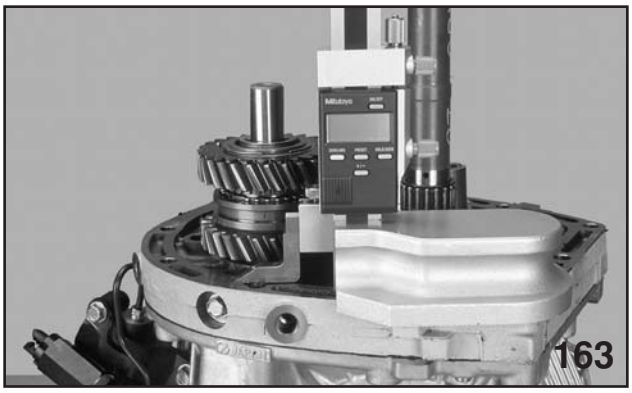


Reverse Idler Side View

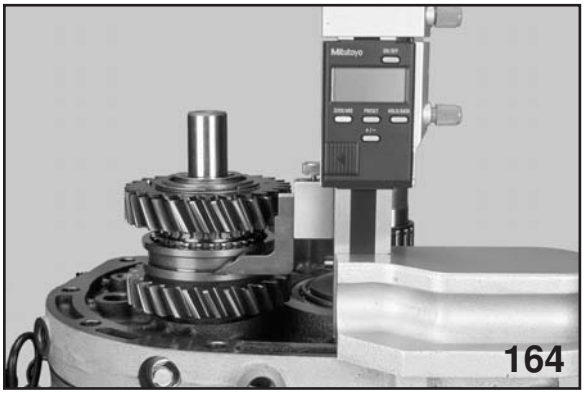
Reverse Fork Rod

1. Install the reverse idler shaft assembly onto the adapter plate.
2. Secure the reverse idler shaft by the fixing bolt.

   Tightening torque: 25N-m (2.5 kgf-m, 18.1 ft.-lb.)



Zero



E

3. Place the height gauge onto the adapter plate matching surface and move the jaw of the gauge downward until it touches the adapter plate matching surface, and then zero the gauge indicator.
4. Push down the reverse sleeve fully, and then measure distance (E) between the sleeve lower edge and the adapter plate, using the height gauge.

NOTE: MEASURE SLEEVE AT FIVE (5) POINTS (APPROXIMATELY 72° APART) AVERAGE YOUR MEASUREMENT.

5. According to the measurement valve, calculate the “Neutral position” of the reverse sleeve.

   D = E + 4.80 mm =

   D: Distance between the “Neutral position” of the reverse sleeve and the adapter plate
6. Select a suitable reverse fork rod from the table in the Service Manual.

Selection of Driven Gear Shim

1. Measure the depth (D) between the top surface of the ball bearing and transmission case surface.

   D =

2. Select the proper shim using the following formula.

   T = D - (5.75 to 5.85) - (0.1 to 0.3)

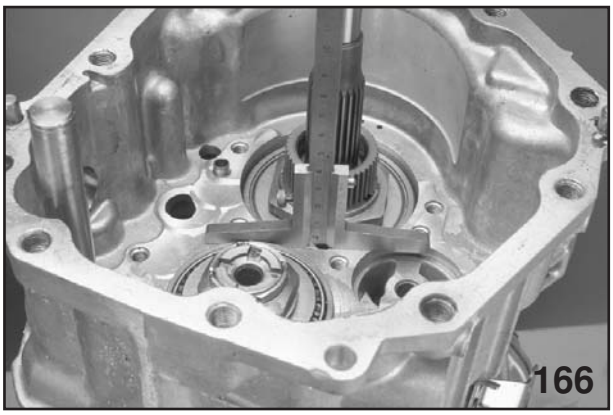
   T: Shim thickness
   5.75 to 5.85: collar height
   0. to 0.3: Standard end play

NOTE: THE NUMBER OF SHIMS MUST BE THREE OR LESS.

Shim section table:

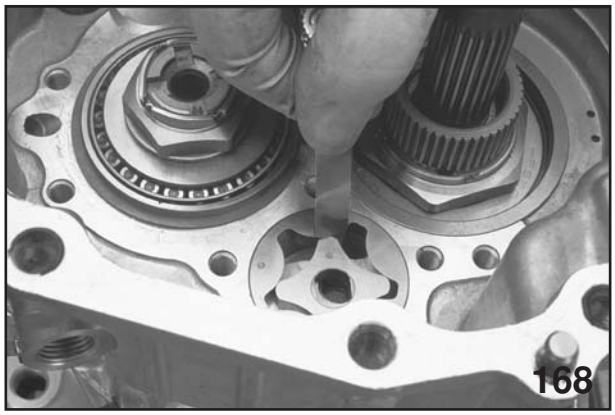
Part No. Thickness mm (in)

803072030 0.15 (0.0059
803072031 0.30 (0.0118)
803072032 0.45 (0.0177)
803072033 0.60 (0.0236)

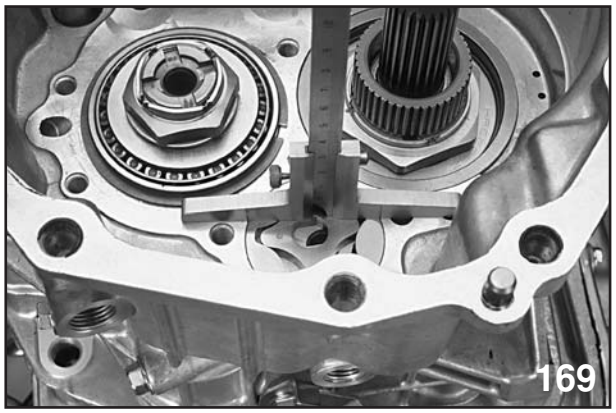


D

Oil Pump Inspection



Tip Clearance



Side Clearance

Visual Inspection

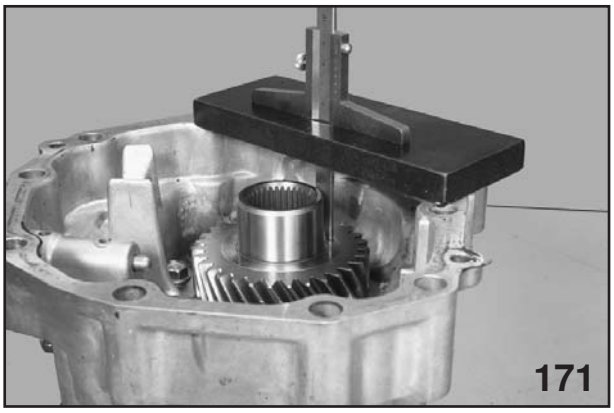
- Check the parts for damage, wear, seizing, etc.
- Check for clogged oil passages.

Measuring Inspection

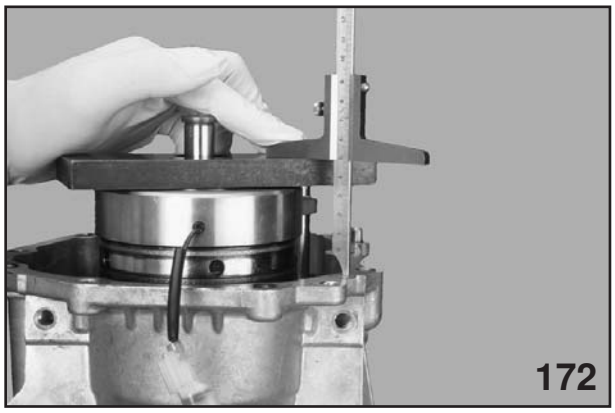
1. Tip clearance.
   Align tips of the inner rotor and outer rotor, then measure the clearance.
   Standard clearance: Less than 0.15 mm (0.0059 in)
2. Side clearance
   Measure the clearance between the oil pump body mating surface and the rotor.
   Standard clearance: 0.03 - 0.10 mm (0.0012 - 0.0039 in)

NOTE: WHEN INNER AND OUTER ROTORS ARE INSTALLED, DOTS ON ROTORS SHOULD FACE UP.

Selection of Transfer Drive Gear Washer



D



H

1. Place gauge tool (398643600) on the extension case end surface and measure the depth (D) between the top surface of the gauge and the transfer drive gear.

   D=

2. Place the gauge on the DCCD and measure the height (H) between the transmission case matching surface and the top surface of the gauge.

   H=

NOTE: ENSURE THAT DCCD IS SEATED PROPERLY BEFORE MEASURING.

3. Select the proper washer using the following formula.

   T = D - H - (0.45 to 0.65)

   T: Washer thickness

   0.45 to 0.65: Standard end play

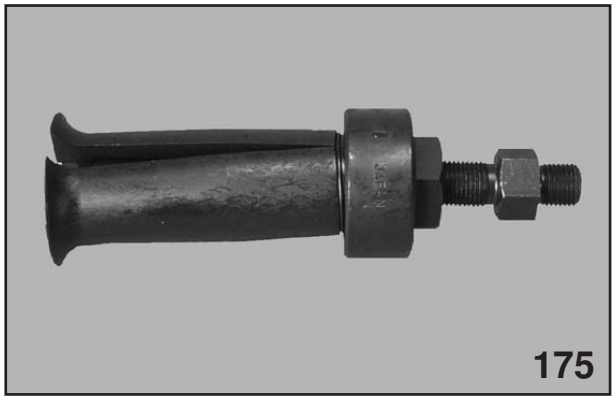
Washer Section Table:

Thrust Washer (36.3 x 52 x T)

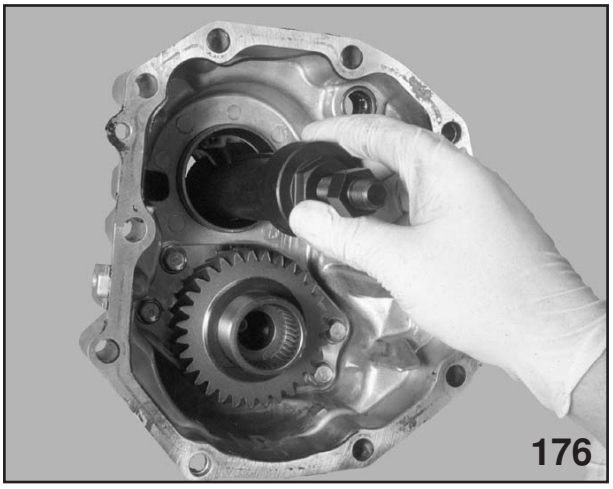
Part No	Thickness mm (in)
803036070	0.80 (0.0315)
803036071	0.95 (0.0374)
803036072	1.10 (0.0433)
803036073	1.25 (0.0492)
803036074	1.40 (0.0551)
803036075	0.65 (0.0256)

Selection of Transfer Driven Gear Washer

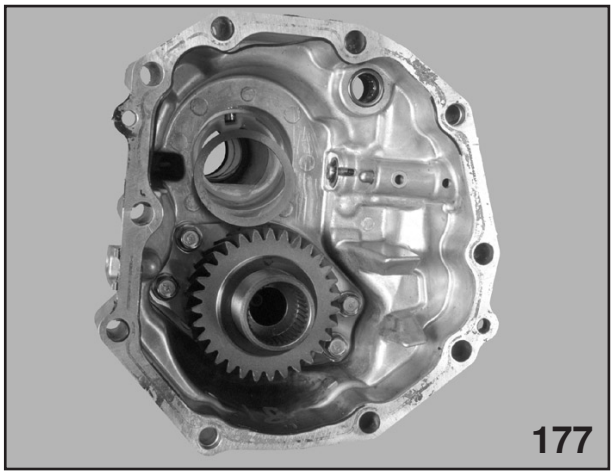
Bearing Race



Puller Tool

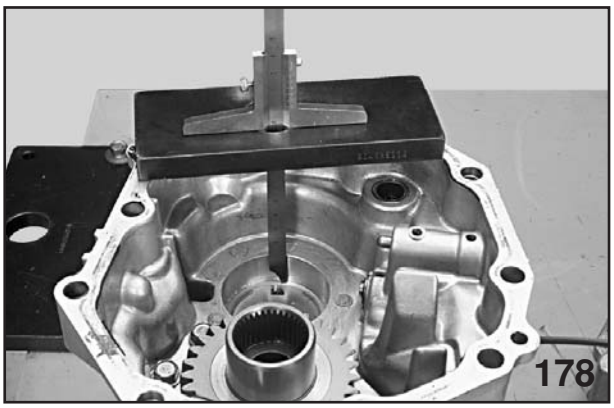


Tool in Use

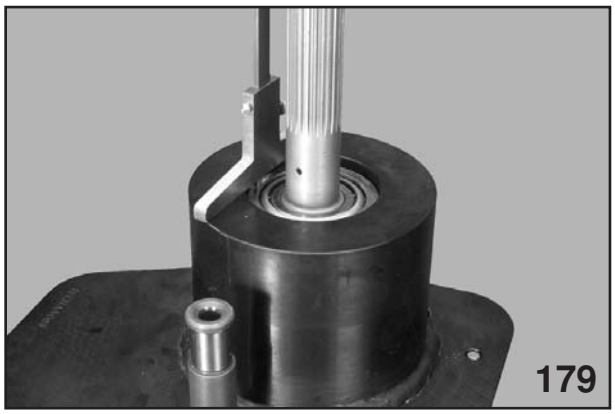


Driven Gear Washer Under Bearing Race

1. Pull the bearing cone out of the extension case, using the special tool (18758AA000), and remove a shim from bottom of the bearing holder on the extension case. Measure existing shim thickness.



A



B

2. Measure the depth (A) between the machined surface of the bearing seat and the extension case's machine surface.
   A =

> * *Measure the actual thickness of the gauge plate used as it may vary slightly from 15.0 mm.*

3. Subtract 15.0 mm* (Gauge Thickness) from the measured value (A)

   A1 = A - 15.0 mm

4. Install the bearing cone on the transfer driven gear, and then place transfer driven gear into the transmission case.
5. Position the gauge on the driven gear over the bearing cone with the two holes on the base of the gauge aligned with the two knock pins on the transmission case.
6. Rotate the transfer driven gear ten times to condition the bearing.
7. Measure the depth (B) between the top surface of the bearing cone and the gauge's machined surface.
   B =
8. Select the proper washer using the following formula.

   T = A1 - (100.0 mm - B) - (0.04 mm to 0.11 mm)

   T: Washer thickness
   **100.0 mm = Gauge height
   0.04 to 0.11: Standard end play

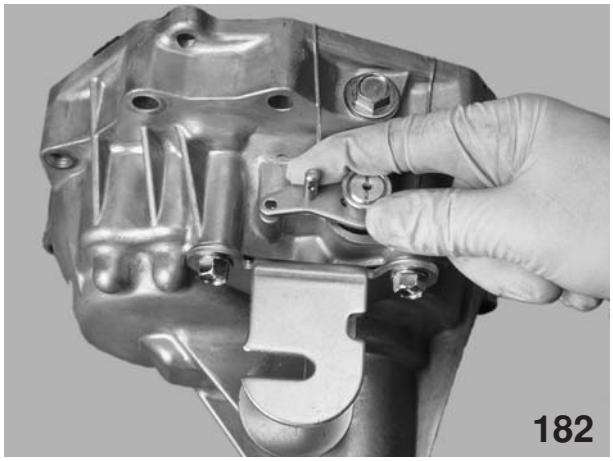
   Washer selection table:

> ** *Measure the actual height of the tool used against a machined surface. The actual height may differ slightly from 100.0 mm.*

Thrust Washer (50 x61 x T)
Part No. Thickness mm (in)
803050060 0.50 (0.0197)
803050062 0.60 (0.0236)
803050064 0.70 (0.0276)
803050066 0.80 (0.0315)
803050068 0.90 (0.0354)
803050070 1.00 (0.0394)
803050072 1.10 (0.0433)
803050074 1.20 (0.0472)
803050076 1.30 (0.0512)
803050078 1.40 (0.0551)

Reverse Lock Out

Shifter

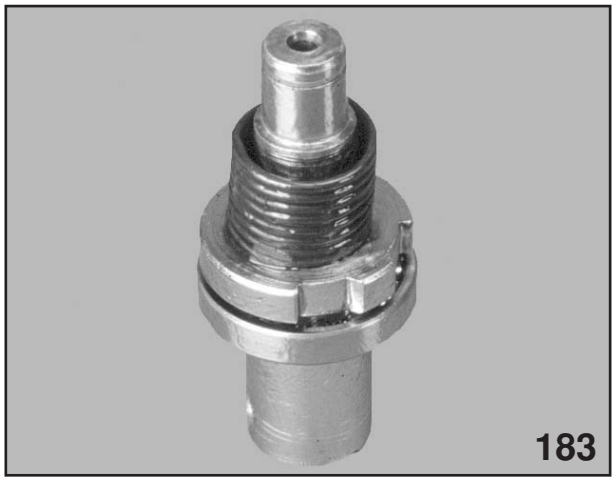


Reverse Check Lever

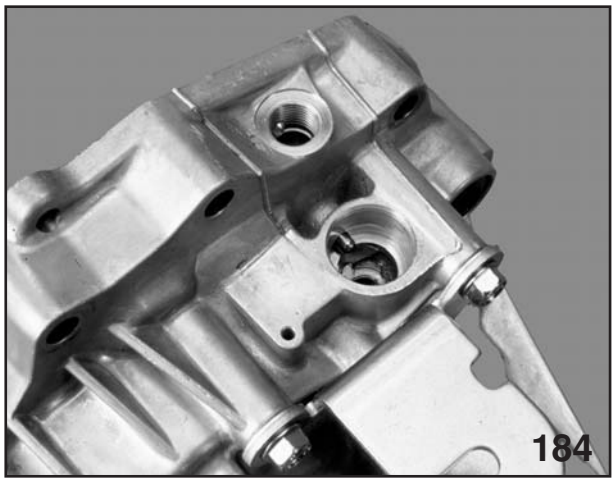
The reverse check system equipped on the new 6 speed manual transmission prevents the accidental attempt to shift into reverse while selecting 6th gear.

Normal shifting into reverse requires the motion of pulling up on a reverse slider while making the shift to reverse.

When the reverse check cable is activated the reverse check lever is pulled towards the rear of the transmission.

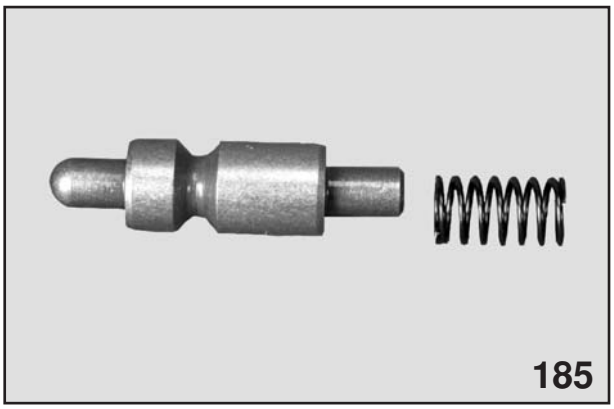


Reverse Check Plug

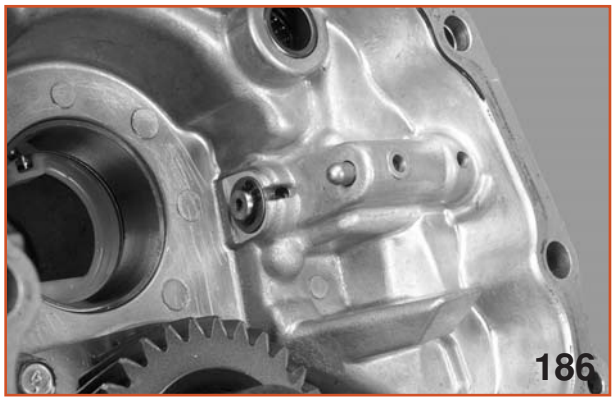


Plunger

The reverse check shaft, which is secured to the reverse check lever, will rotate at this time and position the plunger in line with a notch in the case.

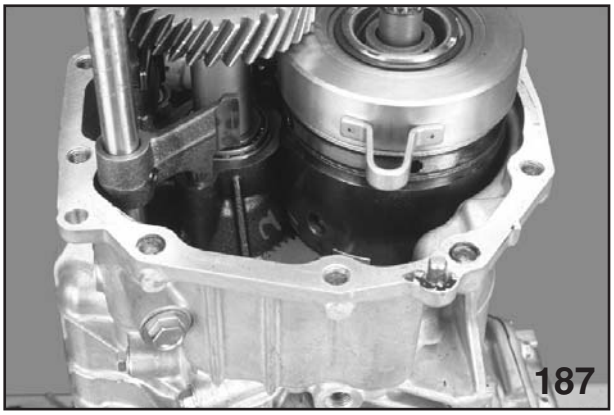


Spring and Reverse Check Plug



End of Reverse Check Plug Protruding

This provides the plunger with a space to move into when the spring loaded reverse check plug is forced up by the number one selector arm.



Number One Selector Arm

Fail-Safe Position

In the event the reverse check cable fails, the spring loaded reverse check lever will move towards the front of the transmission and will expose a fail safe notch for the plunger to align with. At that time no reverse lock out would be provided.

Cable into Shifter

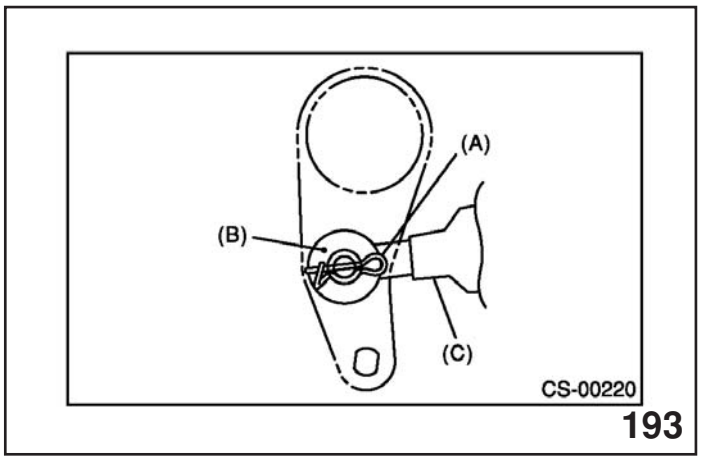
Shifter Area

The reverse check cable is routed into the passenger compartment through a grommet next to the shifter linkage.

The reverse check cable must be removed from under the vehicle. Turn the shift knob counter clockwise until the knob is removed form the threaded end of the reverse check cable housing.
Remove the spring pin from the reverse slider then remove the reverse slider, cover, and spring cut and remove the band clip.

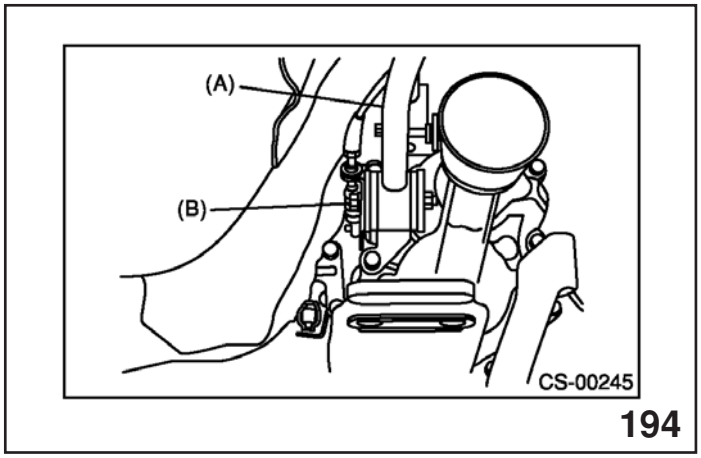
Cable in View

Cable below View



Snap Pin Artwork

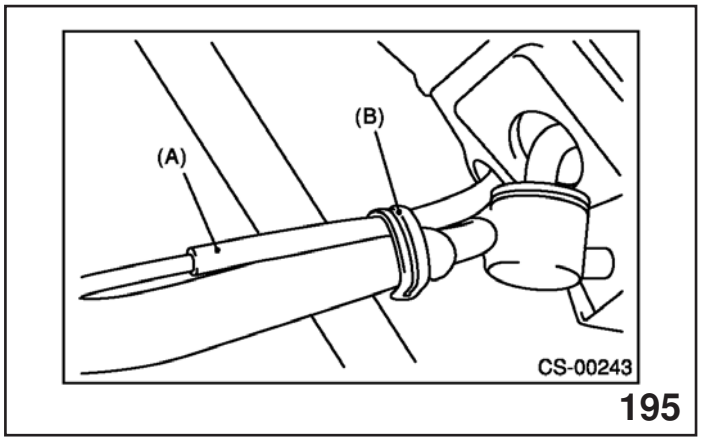
Raise the vehicle and remove the rear exhaust pipe and muffler.
Remove the cross member.
Remove the snap pin and washer.



Stay Bolt Artwork

Move the transmission to the right side and remove the stay bolt.

CAUTION: FAILURE TO MOVE TRANSMISSION TO THE RIGHT WILL RESULT IN DAMAGE TO THE VEHICLE BODY.



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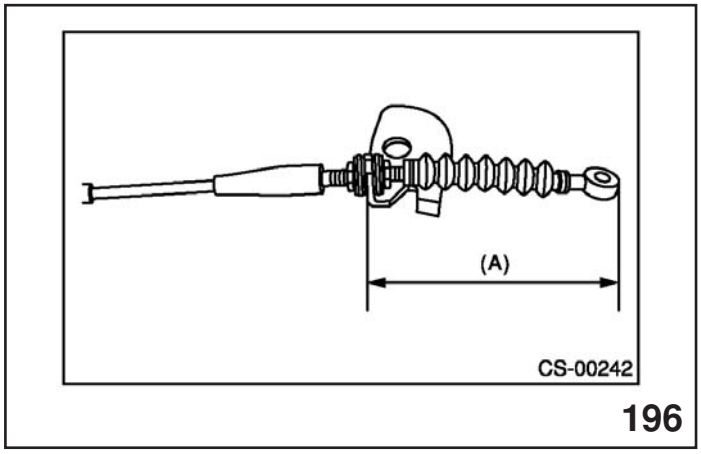
Stay Clip Artwork

Remove the stay clip from the cable.
Remove the cable by pulling from the vehicle underside.



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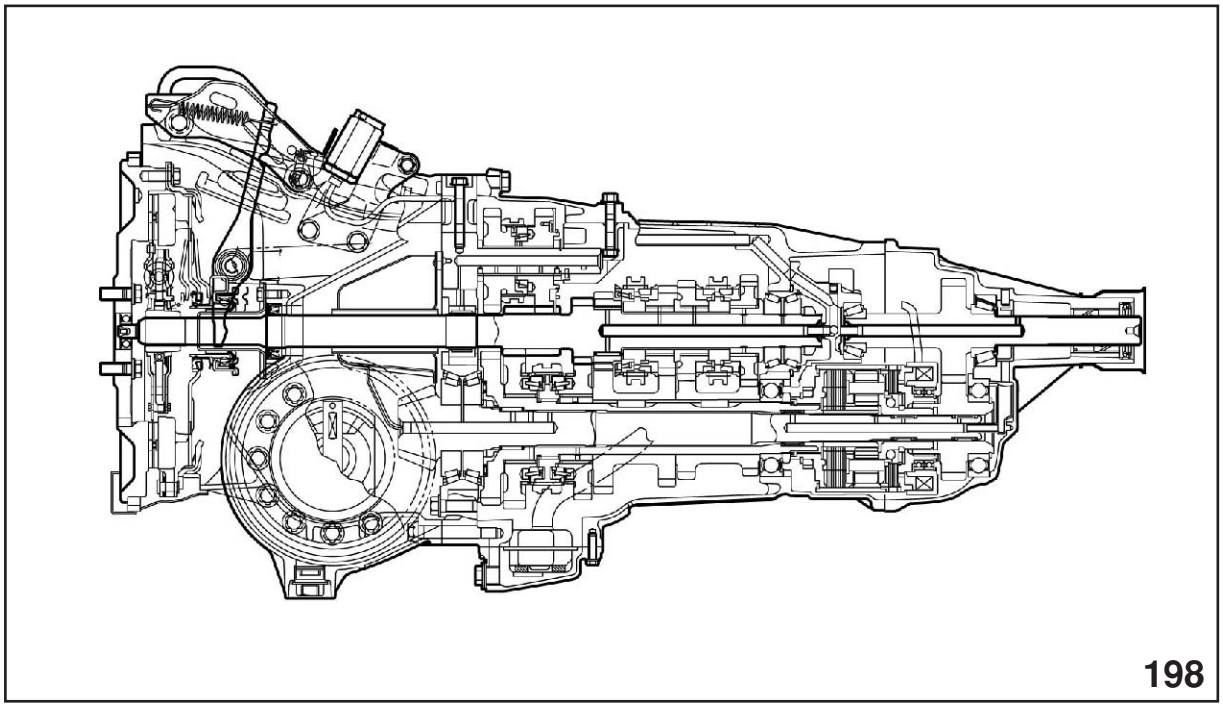
Cable

Adjust this length to 3.31 inches (84 mm) before installing new cable.

Driver Control Center Differential (DCCD)

Outline



Transmission Artwork

The DCCD system is comprised of sensors, switches, DCCD control module and planetary gear type center differential with built-in LSD clutch.

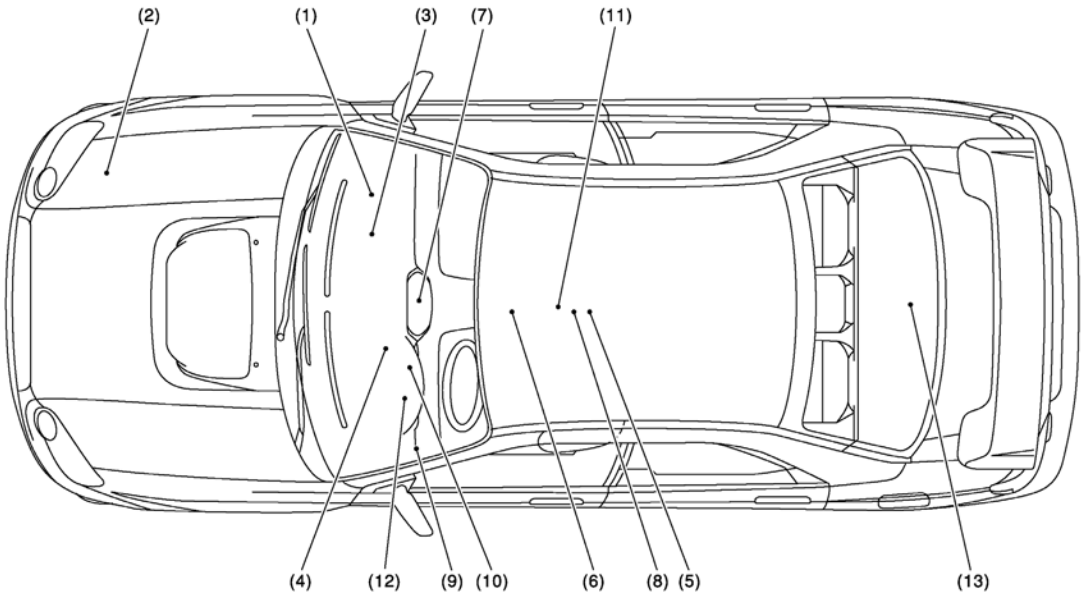
By varying the LSD clutch engagement torque from 0% to 100%, the DCCD control module can vary the drive torque distribution to the front wheels from 35:65 to 50:50 (direct AWD condition), using the planetary gear type center differential.

Utilizing the DCCD control module to suitably control the drive torque distribution to the front wheels according to the driving conditions, the system improves the running performance over rough roads and reduces tight cornering phenomenon.

Also, the driver can control the LSD clutch engagement torque by adjusting the DCCD control dial equipped beside the parking brake. (Manual Mode)

In the event of a system malfunction, a fail-safe control is activated to release the LSD clutch.

System Layout



(1) Engine control module (ECM)
(2) ABS control module & hydraulic control unit (ABSCM & H/U)
(3) Driver's control center differential control module
(4) Accelerator position sensor
(5) Lateral G sensor
(6) Center differential control dial
(7) Center differential
(8) Manual mode switch
(9) Driver's control center differential relay
(10) Driver's control center differential indicator (driver's control center differential diagnostic indicator)
(11) Parking brake switch
(12) Brake Light switch
(13) Rear differential oil temperature switch

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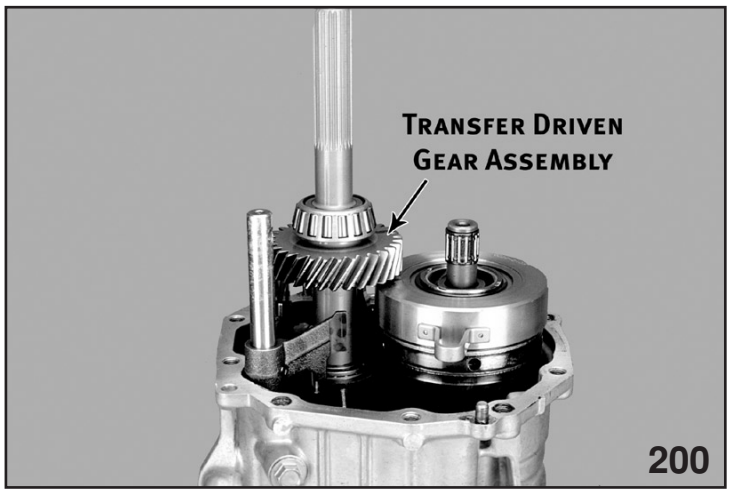
CAR ARTWORK

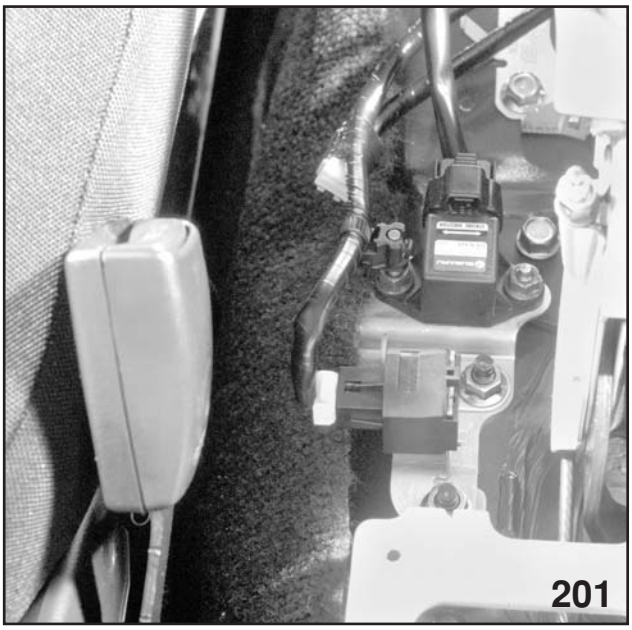
Center Differential



TRANSFER SECTION OF TRANSMISSION

The center differential is comprised of the planetary type differential, LSD clutch, pilot clutch, DCCD coil assembly, and other parts. The DCCD coil assembly (electromagnet) is controlled by the DCCD control module duty drive signal, which sets up a magnetic force that the coil assembly uses to vary the LSD clutch engagement force.

Lateral G Sensor



LATERAL G SENSOR

This sensor detects the lateral acceleration of a vehicle while it is cornering. The DCCD control module determines the vehicle cornering conditions based on signals from this sensor and controls the LSD clutch engagement torque accordingly, improving stability when a vehicle is cornering.

Manual Mode

Manual Mode Switch

The Manual Mode selector switch toggles between Manual Mode and Auto Mode each time it is pressed.

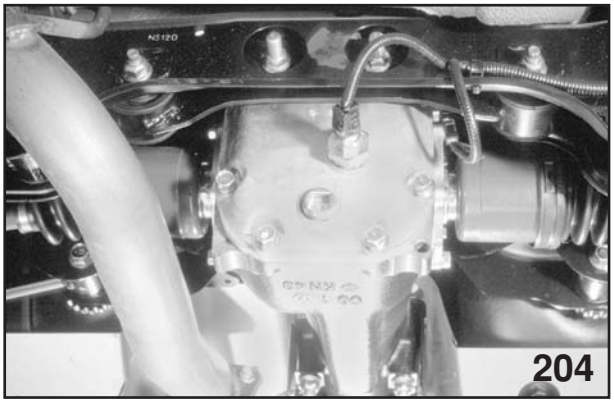
NOTE: WHEN THE ENGINE IS STARTED AUTO MODE IS ALWAYS SELECTED. EVEN IF MANUAL MODE IS SET WHEN THE IGNITION IS TURNED OFF, AUTO MODE WILL AUTOMATICALLY BE SELECTED THE NEXT TIME THE ENGINE IS STARTED.

DCCD Control Dial

DCCD Control Dial

By operating this dial, the driver can adjust the LSD clutch engagement torque to any desired setting. The DCCD control dial setting will be displayed in the DCCD indicator in the instrument panel when Manual Mode is selected with the Manual Mode switch.

Oil Temperature Switch



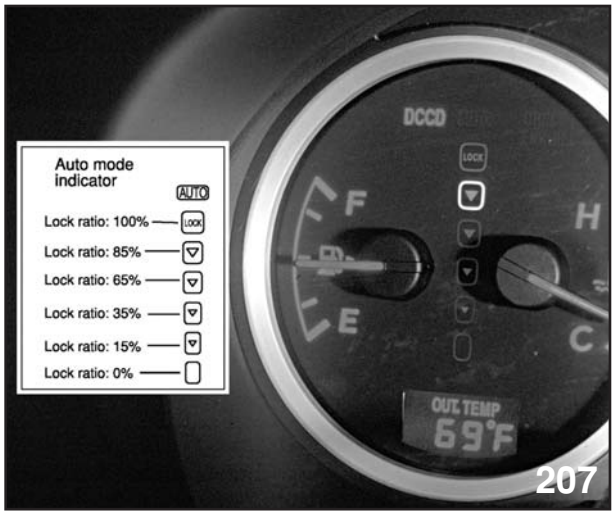
Oil Temperature Switch

R. Differential Temp

This is the temperature switch that is mounted on the rear of the rear differential case. This switch detects the temperature of the lubricating oil inside the case, and it is activated when the oil temperature reaches approximately 302°F (150°C). When this happens, a warning light in the instrument panel is illuminated and at the same time an abnormal signal is sent to the DCCD control module.

DCCD Indicator

DCCD Indicator



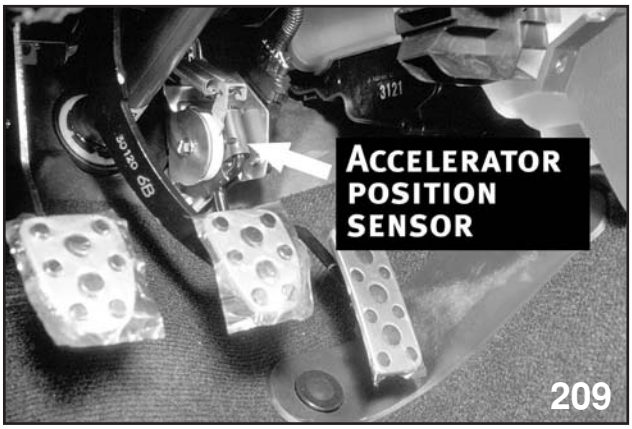
DCCD Indicator and Chart

In Auto Mode the top DCCD indicator light is illuminated, informing the driver that Auto Mode is activated. In Manual Mode the DCCD control dial setting is displayed.

Lowest Light Illuminated

When trouble occurs, the bottom DCCD indicator light flashes, warning the driver that trouble has occurred. By operating the DCCD control dial and the parking brake lever according to a predetermined procedure, the service technician can read the trouble code stored in the DCCD control module memory from the flashing pattern of the indicator light. (2004MY)

Accelerator Position Sensor



Accelerator Position Sensor

This sensor detects the position of the accelerator pedal as it is depressed by the driver.

Stop Light Switch

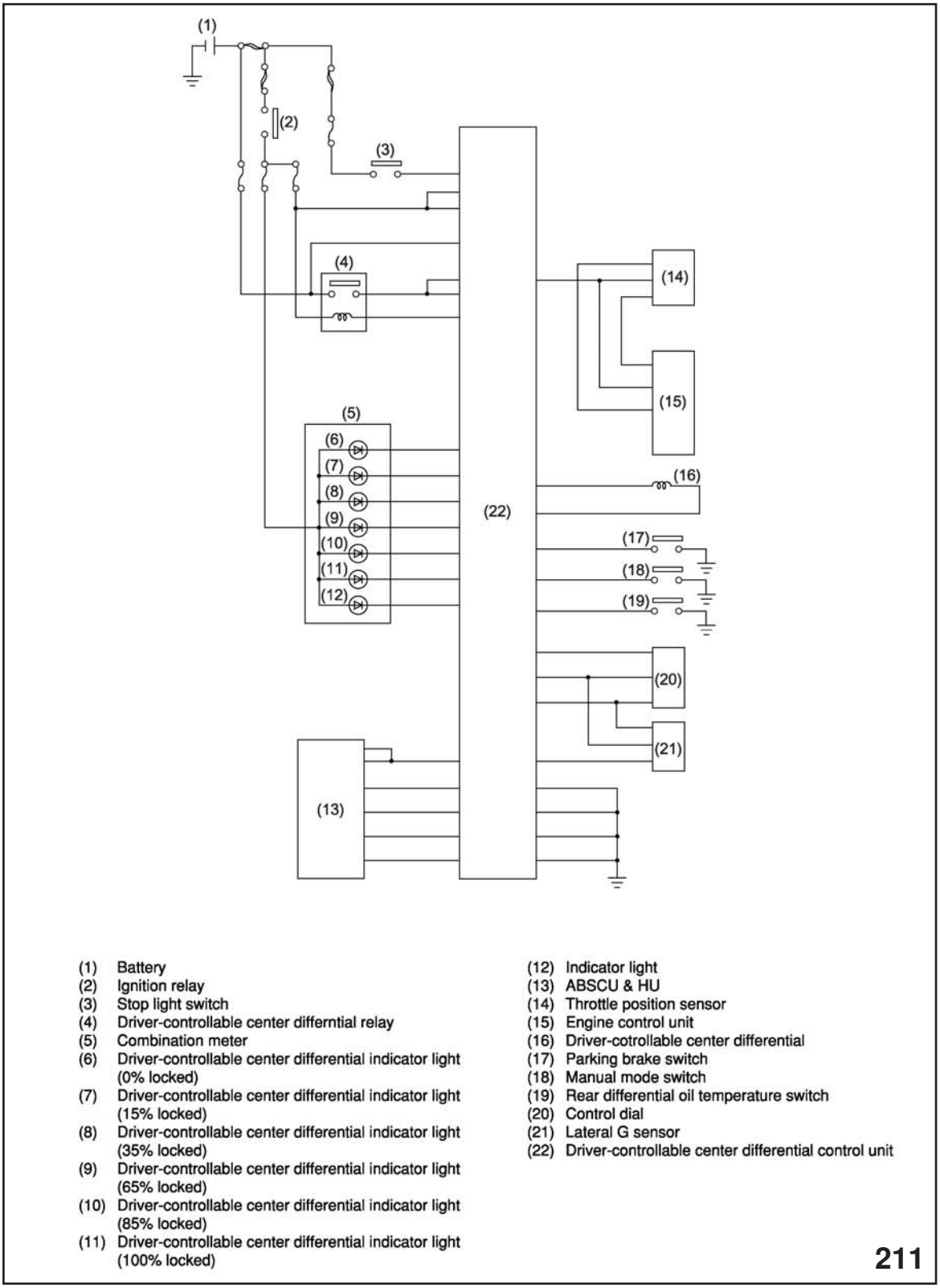
Mounted on the brake pedal bracket, this switch is activated when the driver operates the brake pedal.

Hand Brake Switch

Hand Brake Switch

This switch is mounted at the bottom of the parking brake lever and is activated when the driver operates the parking brake lever.

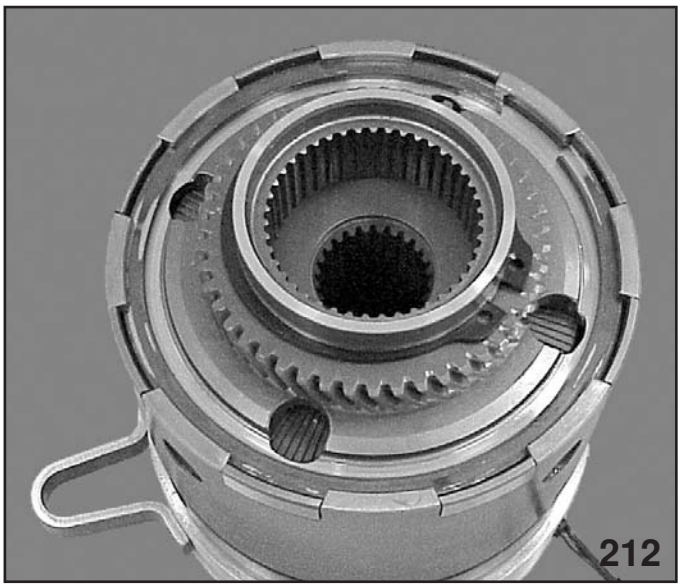
System Circuit



(1) Battery
(2) Ignition relay
(3) Stop light switch
(4) Driver-controllable center differntial relay
(5) Combination meter
(6) Driver-controllable center differential indicator light (0% locked)
(7) Driver-controllable center differential indicator light (15% locked)
(8) Driver-controllable center differential indicator light (35% locked)
(9) Driver-controllable center differential indicator light (65% locked)
(10) Driver-controllable center differential indicator light (85% locked)
(11) Driver-controllable center differential indicator light (100% locked)
(12) Indicator light
(13) ABSCU & HU
(14) Throttle position sensor
(15) Engine control unit
(16) Driver-cotrollable center differential
(17) Parking brake switch
(18) Manual mode switch
(19) Rear differential oil temperature switch
(20) Control dial
(21) Lateral G sensor
(22) Driver-controllable center differential control unit

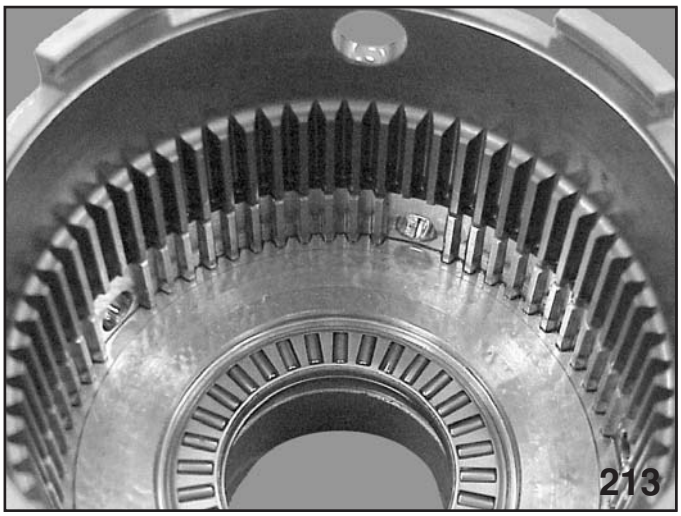
System Wiring Schematic

The following 11 pages explaining the DCCD are for general information only. Do not disassemble the DCCD center differential as it is not serviceable.



DCCD Top View

1. Controlled with chopper voltage signal (300 to 2 K HZ).
   Maximum current use is 4 amps.

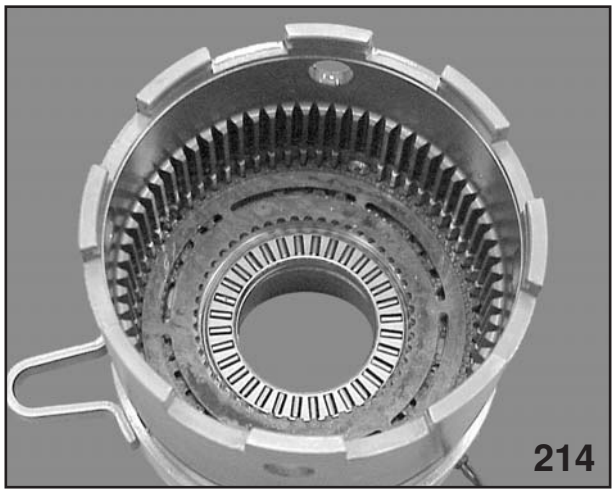


Empty Center Differential Case with Needle Bearing

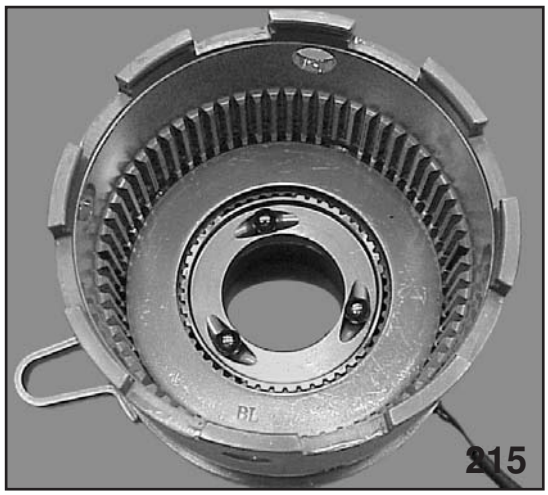
2. The electronic coil is press fitted to the differential case.

The lower splines are for the placement of the pilot clutch plates.

The upper teeth are for delivering power to the planet gears of the planetary assembly.



Pilot Clutch Plates in Place



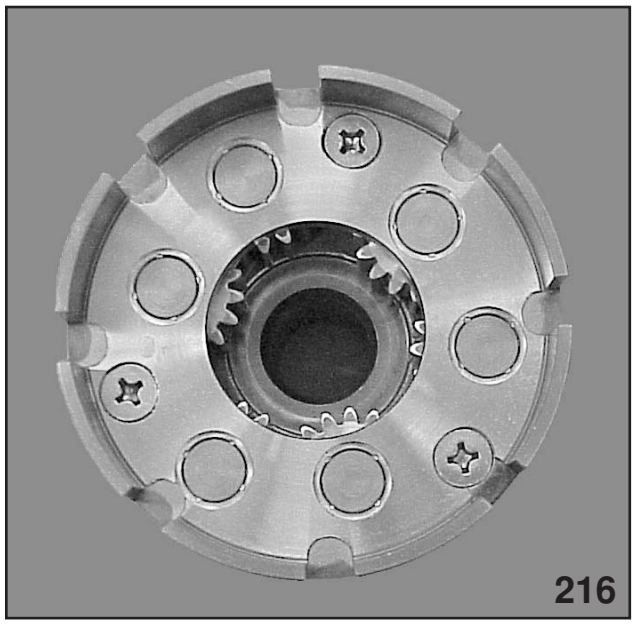
Armature, Pilot Clutch Hub and 3 Balls Installed

3. The needle bearing provides a support for the pilot clutch hub.

The inner splines of the pilot clutch plates engage with the pilot clutch hub.

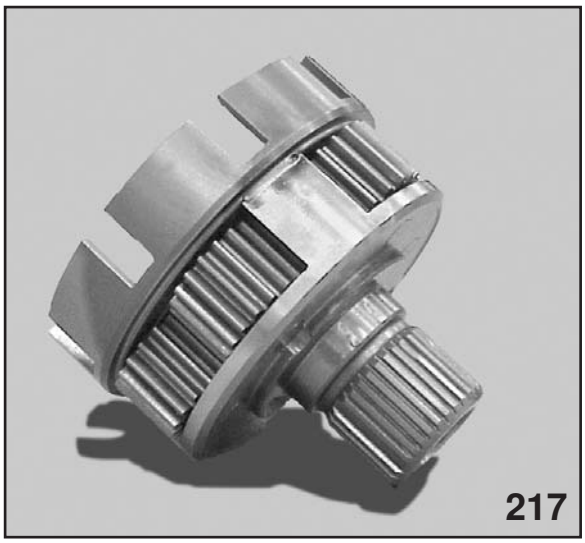
The armature is located on top of the pilot clutch plates to apply pressure, engaging the pilot clutch hub to the differential case.

The three metal balls are used to push up on the planetary assembly.

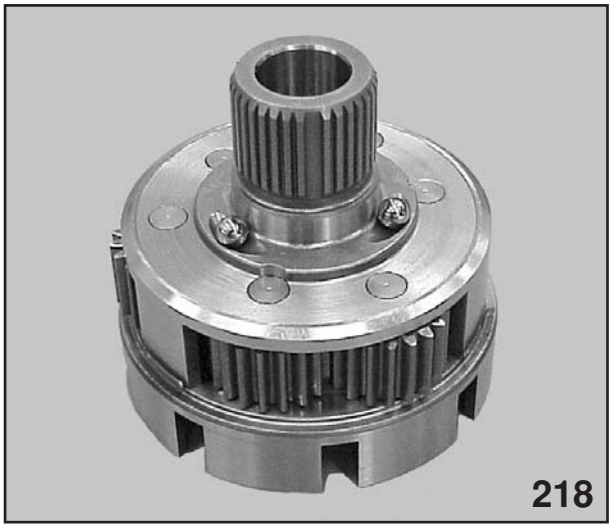


Planetary Top View

4. The top of the planetary assembly houses the LSD clutch which is used to control the speed of the sun gear and planetary carrier.

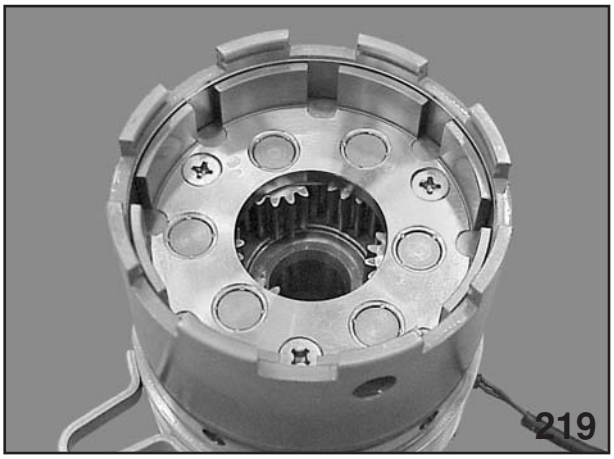


Planetary Side View

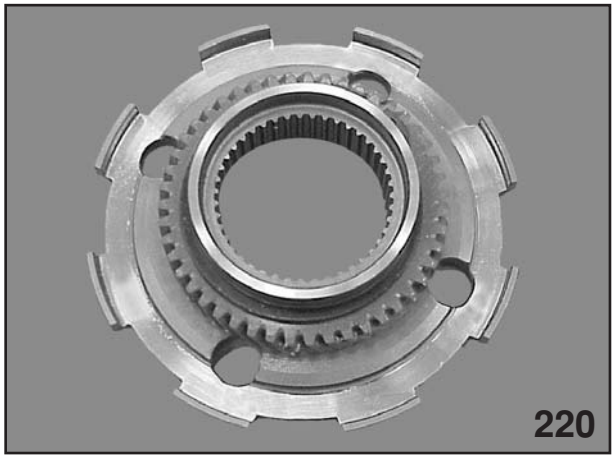


3 Balls on Planetary

5. The splines at the bottom of the planetary assembly are used to secure the transfer drive gear.



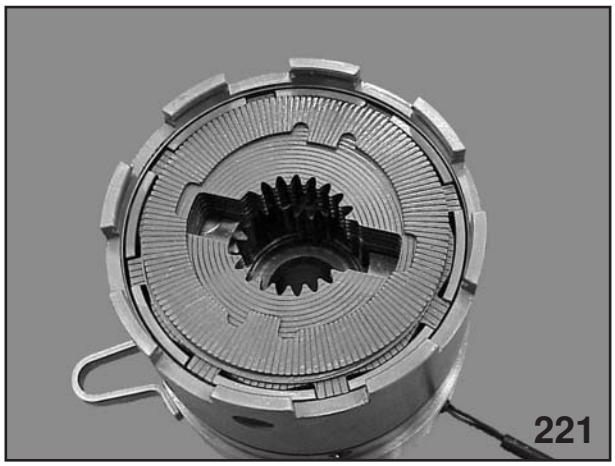
Planetary in Differential Case



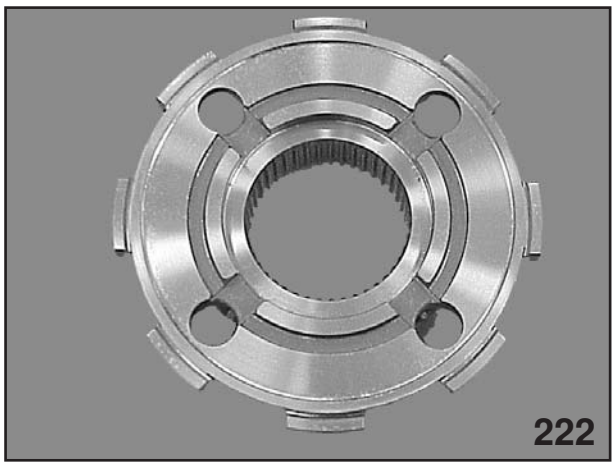
Differential Case Top

6. Power flows into the differential case to the planet gears. Power then splits, the planetary carrier driven by the planet gears power the rear wheels. The sun gear, powered by the planet gears powers the front wheels.

The speed of the sun compared to the speed of the planetary carrier determines the power split of the front and rear wheels.

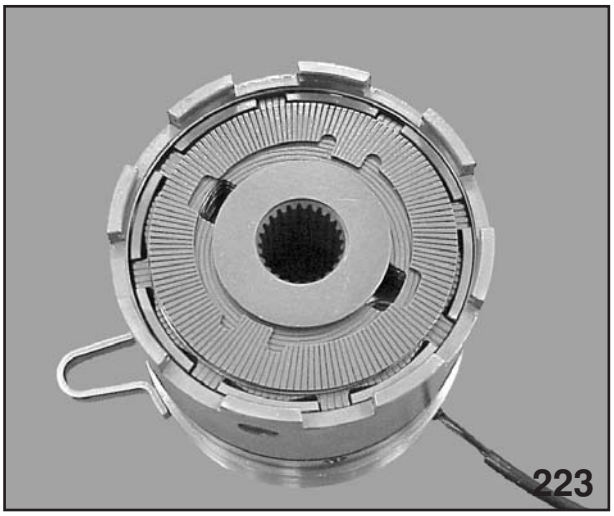


Limited Slip Differential Clutch Plates in Place



Bottom Side of Differential Top

7. The limited slip differential clutch is used to hold the sun gear and push down on the planetary carrier. This braking action changes the output distribution of power.



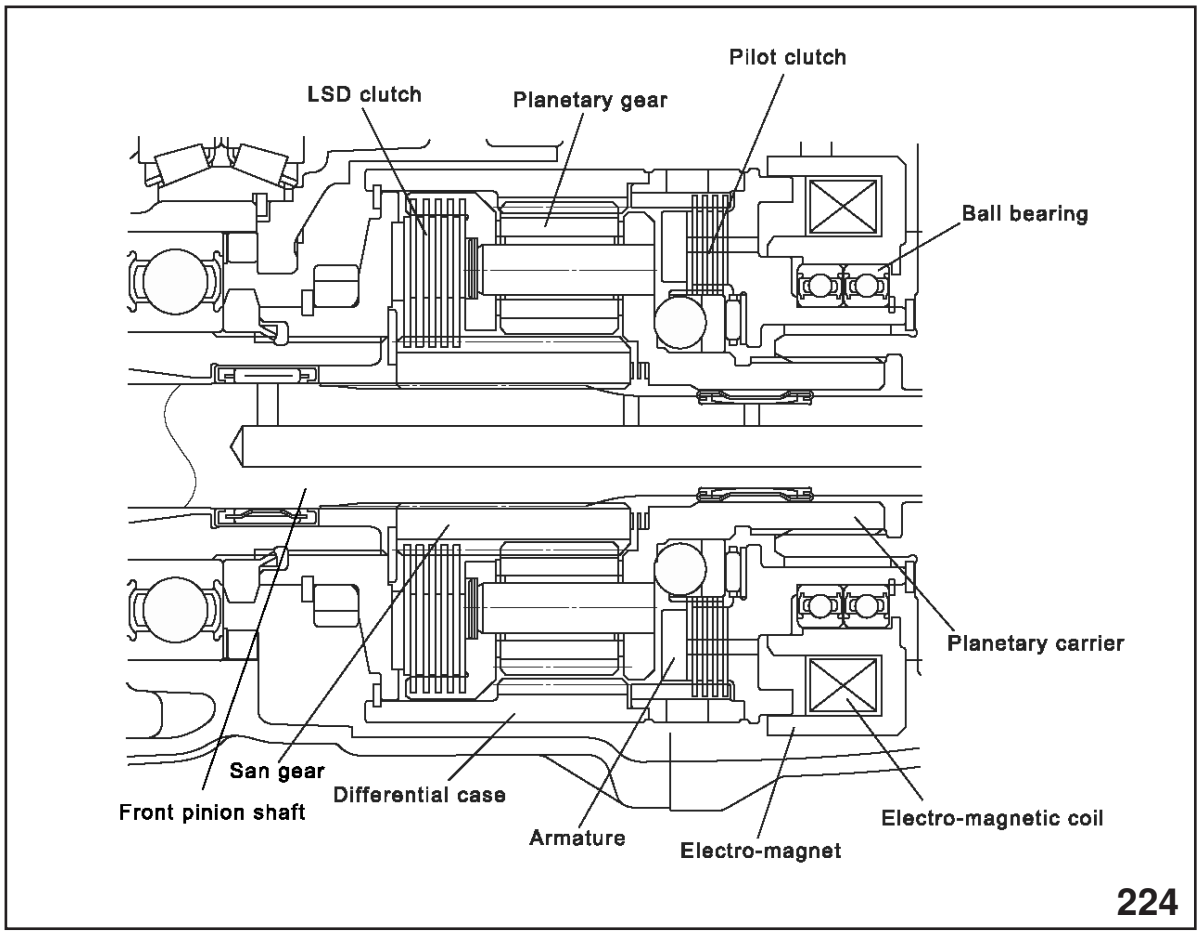
Case with Sun Gear Installed

8. Case with sun gear installed.

No current applied to the DCCD coil results in a power split of 35% to the front wheels and 65% to the rear wheels.
The more current is applied to the coil, the faster the transfer rate changes towards a 50% front and 50% rear.
The armature pulls down on the pilot clutch in proportion to the amount of current applied to the coil. This results in the pilot clutch hub partially or fully rotating with the differential case.
The differential carrier, rotating in the same direction as the pilot clutch hub is now used as reference of the rear wheel power output. When the planetary carrier rotates faster than the pilot clutch hub the alignment of the three balls to the recesses in the bottom of the planetary carrier changes. This will force the planetary carrier to move into the LSD clutch, slowing down the sun gear and planet carrier. The resulting action removes power from the rear wheels and redirects it to the front wheels. Power split is determined by the difference in rotation of the sun gear and planetary carrier and the difference in rotation of differential case to the planet gears. If the planetary carrier slows down or stops rotating the power from the differential case passes straight through the planetary assemble as if the planetary assembly was part of the case.

The center differential consists of a planetary gear type differential mechanism, a pilot clutch that is engaged by the DCCD coil assembly, and an LSD clutch placed between the planetary gear unit sun gear and the planetary carrier.

The planetary gear unit sun gear is connected to the front drive pinion shaft, which turns the front wheels, and the planetary carrier is connected to the transfer drive gear, which turns the rear wheels. When the LSD clutch is released, the center differential distributes the drive torque to the front and rear wheels in a 35:65 proportion.

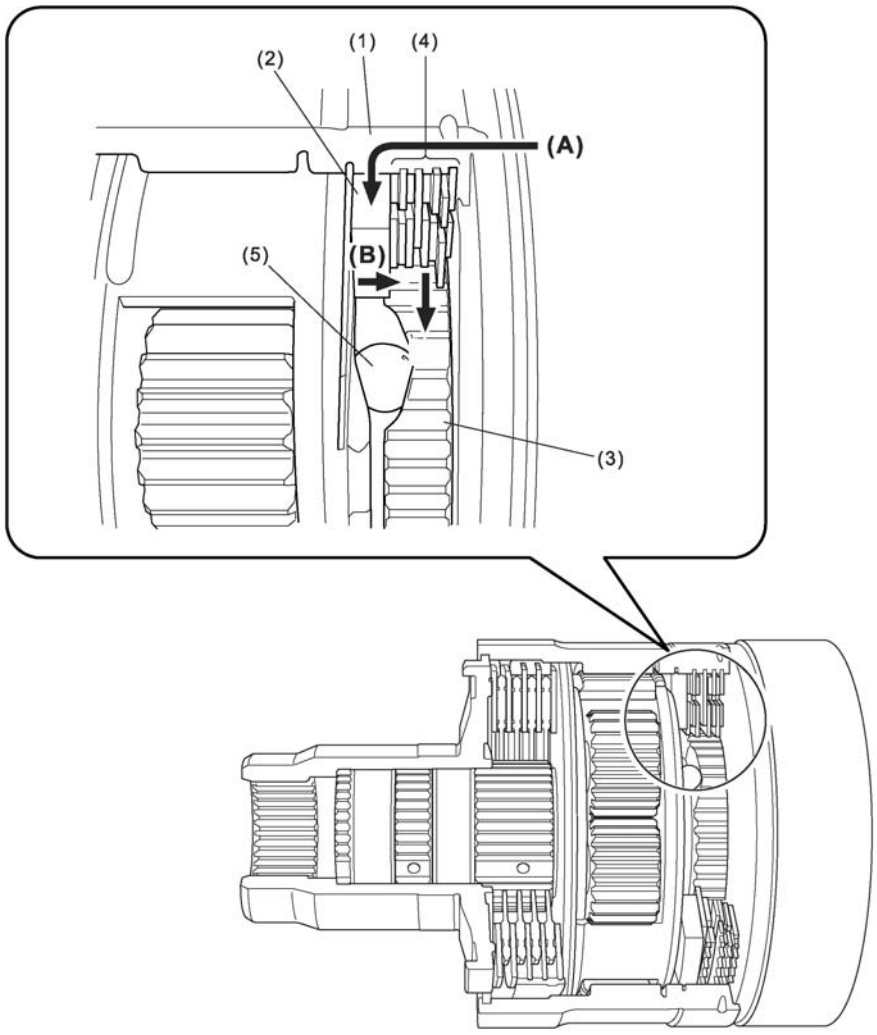


CENTER DIFFERENTIAL ARTWORK

Three steel balls are equipped between the pilot clutch hub and planetary carrier inside the center differential case. These steel balls are mounted in hollows in the clutch hub and planetary carrier, and they work to widen the clearance between these parts when their relative position changes. In this explanatory note, the clutch hub hollow is referred to as cam 1 and the planetary carrier hollow as cam 2.

When current flows through the electromagnetic coils, magnetism is generated at components in the following sequence: electromagnet, differential case, armature (A). The armature is moved to the right (B) by this magnetism causing the pilot clutch to engage, and a magnetic field is formed in the area from the electromagnet, differential case, armature, and to the pilot clutch.

The pilot clutch locks the differential case side and cam 1 side together, thus the rotational speed of the cam 1 and differential case are synchronized. The engagement of the pilot clutch is controlled by adjusting the current flowing through the electromagnetic coils.



(1) Differential case
(2) Armature
(3) Cam 1
(4) Pilot clutch
(5) Steel ball

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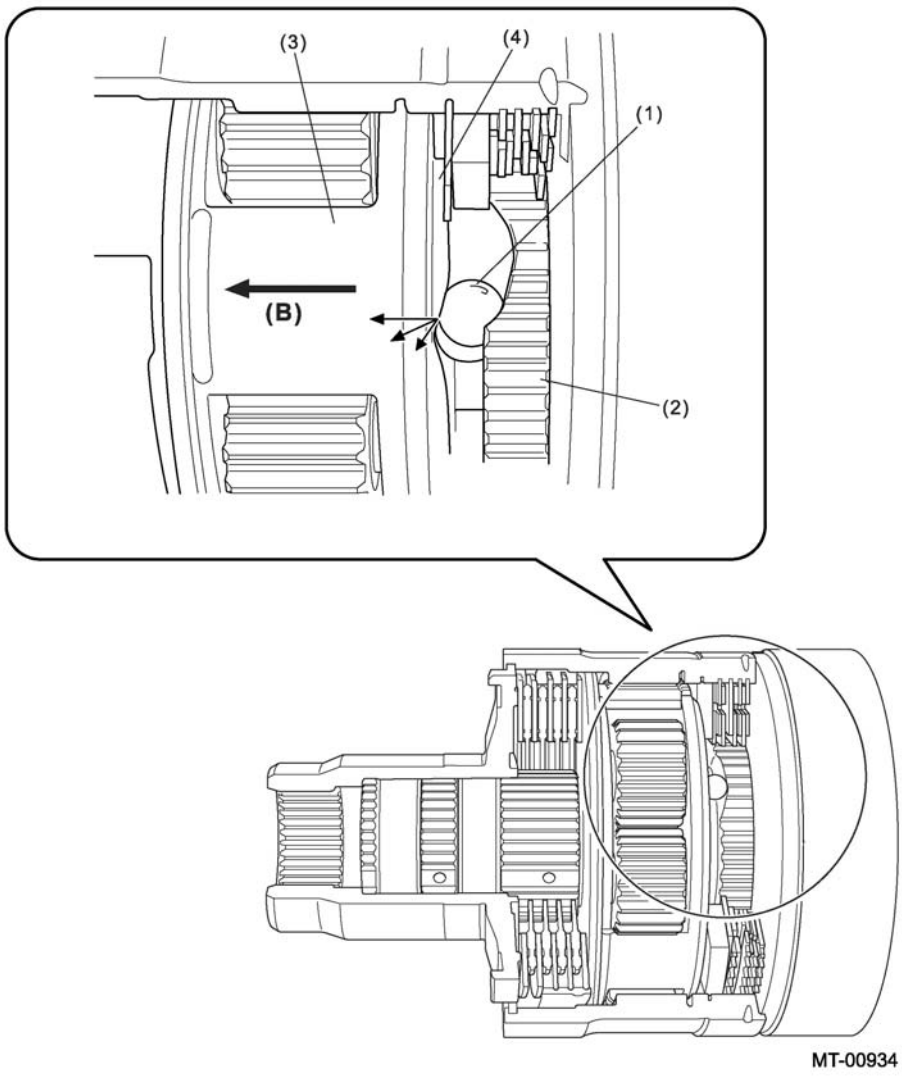
Cam 1 and Cam 2

When a speed difference occurs, a force (B) pushing the cam 2 to the left is generated at the steel balls that are sandwiched between cam 1 and cam 2. This pushes the planetary carrier to the left.



(1) Steel ball
(2) Cam 1
(3) Planetary carrier
(4) Cam 2

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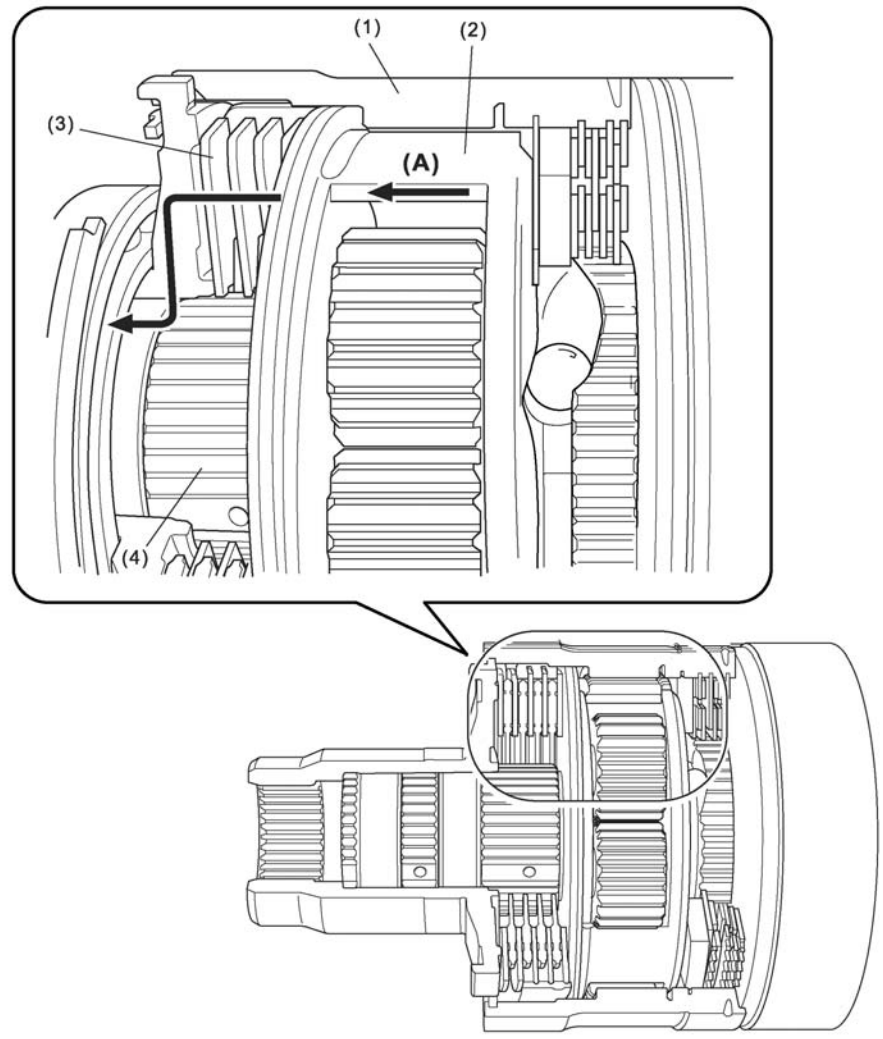
Speed Difference

The planetary gears and the sun gear generate a differential action.



(1) Differential case
(2) Planetary carrier
(3) Main clutch
(4) Sun gear

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LSD Clutch Application

DCCD System Operation

The DCCD system has two modes: Manual Mode and Auto Mode. In Manual Mode, operation of the DCCD control dial (to whatever setting the driver wants) is given priority, and the LSD clutch engagement torque is increased or decreased accordingly. In Auto Mode, on the other hand, the LSD clutch is automatically controlled according to various input signals, such as, the lateral G sensor input signal (turn status signal) and the wheel speed sensor input signal.

The most fundamental control in the DCCD system is the throttle-response engagement-torque control. This control increases or decreases the LSD clutch engagement torque according to the driver's operation of the accelerator pedal (accelerator position sensor signal). (The basic control theory is the same as that of the VTD transfer system.)

Besides the throttle-response engagement-torque control, the DCCD system also executes the following controls.

CONTROL	AUTO MODE	MANUAL MODE
Throttle-response engagement-toque control	○	○
ABS actuation signal input control	○	○
Brake switch signal input control	○	○
Parking brake signal input control	○	○
Tight cornering control	○	○
Slip control	○	X
Cornering control	○	X
DCCD control dial control	X	○
Fail-safe control	○	○
Rear differential oil temperature control	○	○

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X means not available

Logic Chart

ABS Actuation Signal Input Control

Once the ABS Actuation signal has been inputted to the DCCD control module from the ABS CM & H/U, the DCCD control module decreases the LSD clutch engagement torque.

(Purpose: To reduce the number of factors that will disturb the ABS control.)

Brake Switch Signal Input Control

Once the brake switch signal has been inputted to the DCCD control module, the module reduces the LSD clutch engagement torque.

(Purpose: To prevent delays in the start of the ABS control and prepare the system for when all the wheels slow down simultaneously.)

Parking Brake Signal Input Control

Once the parking brake switch signal has been inputted to the DCCD control module, the module releases the LSD clutch.

(Purpose: To enable the vehicle to drift when the rear wheels lock by the operation of parking brake lever.)

Tight Cornering Control

In order to prevent the tight cornering phenomenon, this control determines the vehicle driving conditions from the left and right wheel speed ratios and the vehicle speed, as well as reduces the LSD clutch engagement torque accordingly.

Slip Control

This control determines the amount of slip for each wheel, based on signals from all four wheels speed sensors, and corrects the LSD clutch engagement torque according to the amount of slip.

Cornering Control

In order to improve stability when a vehicle is cornering, this control determines the cornering conditions on the basis of the throttle position sensor signal, lateral G sensor signal, all four wheel speed sensor signals, and other signals, and optimally controls the LSD clutch engagement torque.

Control Based on Lateral G Sensor Signal

In the DCCD system, the purpose of control based on the lateral G sensor signal is to improve the road handling characteristics of a vehicle. Accordingly, the philosophy behind this control is different than that of the Vehicle Dynamic Control System (which works to maintain vehicle stability when the tires lose their grip).

The DCCD control module varies the LSD clutch engagement conditions as described below, according to the lateral G sensor signal (vehicle cornering conditions). This distributes the drive torque to the front and rear wheels in suitable proportions, according to the cornering conditions.

If the lateral G force is large

LSD clutch engagement strength is reduced —> Drive torque distribution to rear wheels increases —> Pushing force of rear wheels increases —> Vehicle cornering performance is given priority.

If the lateral G force is small

LSD clutch engagement strength is increased —> Drive torque distribution to front wheels increases —> Pushing force of all wheels is equal —> Vehicle acceleration performance is given priority.

Control Based on Accelerator Position Sensor Signal

When the LSD clutch is released completely, 35% of the drive torque is distributed to the front wheels and 65% to the rear wheels. When the LSD clutch operates and distributes 45% of the drive torque to the front wheels and 55% to the rear wheels, it takes 10% of the drive torque from the rear wheels and transfers it to the front wheels.

When the drive torque input into the center differential from the engine increases, the LSD clutch engagement strength must increase to maintain the 45% drive torque distribution to the front wheels and 55% to the rear wheels. Consequently, when the throttle opening is large (the drive torque generated by the engine is large), the LSD clutch engagement strength increases.

Control Based on Wheel Speed Sensors

The difference in speed of the left and right wheels is determined on the basis of signals from four wheel speed sensors. The LSD clutch engagement strength is reduced in order to prevent the tight cornering phenomenon, which occurs in low-speed situations such as when a vehicle is being put into a garage.

DCCD Control Dial Control

The LSD clutch engagement torque increases or decreases according to the DCCD control dial setting selected by the driver. (Manual mode)

Fail-safe Control

When the DCCD control module detects any trouble in the system, it illuminates the bottom DCCD indicator light to inform the driver that trouble has occurred.

When a major malfunction related to the DCCD coil assembly occurs, the DCCD control module will turn the DCCD coil assembly off and fully release the LSD clutch. The DCCD control module will preserve as much of the system operation as it can, provided that the malfunction does not involve a sensor or other critical part.

Rear Differential Oil Temperature Control

If the rear differential oil temperature rises abnormally (to approximately 302°F (150°C) because of continued hard driving or for any other reason, the rear differential oil temperature switch will turn on and the rear differential oil temperature warning light in the combination meter will come on. At the same time, the DCCD control module will reduce the LSD clutch engagement torque. (Normal control will automatically be restored once the oil temperature drops.)

LSD Clutch Engagement Torque Control Applied to Cornering Vehicle by DCCD System

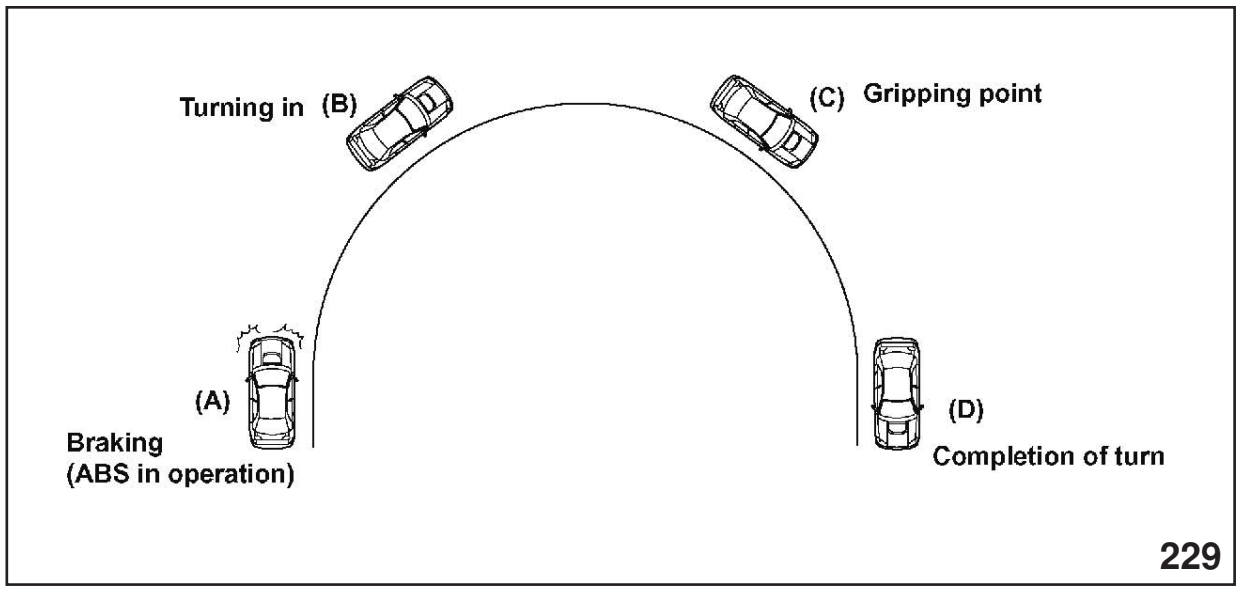
Let's consider the LSD clutch conditions at points A, B, C, and D, using slow-in quick-out cornering as a model.

A: The vehicle is decelerating and has not yet started to turn. Since the brake pedal is depressed and the ABS is working, the system is operating under ABS actuation signal input control conditions and the LSD clutch is practically released.

B: The vehicle is starting to corner, generating a lateral G force. Since the accelerator pedal is not depressed, the system gives cornering performance priority, so the LSD clutch engages weakly.

C: The vehicle has passed the top of the curve and is starting to accelerate. Although the lateral G force is large, the accelerator pedal is depressed, so the LSD clutch engagement strength is increased proportionally to the increasing engine driving force.

D: The vehicle has finished cornering and is traveling straight ahead. Since the lateral G force is small, the system gives priority to acceleration performance, so the LSD clutch engages strongly, approaching direct AWD conditions.



VEHICLE IN TURN ARTWORK

Diagnostics

How To Read the Diagnostic Trouble Code (DTC) with diagnostic indicator light.

(1) Engage the parking brake.

(2) Turn the ignition switch to the ON position.

(3) Set the DCCD control dial to the MIN or MAX position.

(4) Fully depress the accelerator pedal and hold in that position.

(5) Turn the DCCD control dial from MIN to MAX and back to MIN, and repeat 10 times.

(6) Release the accelerator pedal.

If no trouble code has been recorded

The bottom indicator light repeatedly flashes at approximately 2Hz.

If a trouble code has been recorded

The trouble code is read from the flashing pattern of the bottom indicator light.

The Bottom DCCD indicator light flashes the code corresponding to faulty part.

The long segment (1.2 sec. on) indicates a “ten”, and the short segment (0.2 sec. on) signifies a “one”.

D-Check Procedure

(1) Engage the parking brake.
(2) Set the DCCD control dial to the MIN position.
(3) Start the engine.
(4) Set the DCCD control dial to the MAX position.
(5) Release the parking brake.
(6) Set the DCCD control dial to the MIN position.
(7) Engage the parking brake.
(8) Repeat steps 4 to 7 twice within 30 seconds.

NOTE: THE INDICATOR WILL DISPLAY THE TROUBLE CODE FOR A WHEEL SPEED SENSOR MALFUNCTION.

Continue the procedure listed below.

(9) Operate the parking brake.
(10) Operate the brake pedal.
(11) Operate the Manual Mode switch.
(12) Operate the DCCD control dial and then set it to the MAX position and wait 3 seconds.
(13) Drive the vehicle (above 15 km/h for at least 5 seconds) and check the ON/OFF status of the bottom indicator light.

If no trouble code has been recorded

The bottom indicator light repeatedly flashes at approximately 2Hz.

If a trouble code has been recorded

The trouble code is read from the flashing pattern of the bottom indicator light.

NOTE: AFTER THE TROUBLE HAS BEEN REPAIRED, IF A DIAGNOSTIC CHECK IS EXECUTED AND THE SAME TROUBLE IS FOUND NOT TO RECUR, THE RECORDED TROUBLE CODE WILL BE ERASED FROM THE SYSTEM MEMORY THE NEXT TIME THE IGNITION SWITCH IS TURNED ON.

NOTE: ONLY SEVEN TROUBLE CODES STORED IN THE MEMORY APPLY TO TROUBLE DETECTED BY THE DCCD CONTROL MODULE. THESE ARE: CODES 11, 12, 13, 14, 21, 22, AND 23. THE DCCD MODULE WILL CAUSE THE BOTTOM INDICATOR LIGHT TO FLASH AND WARN THE DRIVER OF TROUBLE ONLY WHEN ONE OF THESE SEVEN CODES IS DETECTED.

THERE ARE NO TROUBLE CODES RELATED TO THE REAR DIFFERENTIAL OIL TEMPERATURE SWITCH. IF FOR ANY REASON THE REAR DIFFERENTIAL OIL TEMPERATURE RISES ABNORMALLY AND ACTIVATES THE TEMPERATURE SWITCH, THE REAR DIFFERENTIAL OIL TEMPERATURE WARNING LIGHT IN THE COMBINATION METER WILL COME ON TO WARN THE DRIVER THAT THE OIL TEMPERATURE IS TOO HIGH. AT THE SAME TIME, THE DCCD CONTROL MODULE WILL START THE BOTTOM INDICATOR LIGHT FLASHING. NEVERTHELESS, THE DCCD CONTROL MODULE HAS NO TROUBLE CODES RELATED TO THIS PROBLEM. (NORMAL CONTROL WILL AUTOMATICALLY BE RESTORED ONCE THE OIL TEMPERATURE DROPS.)

Component Parts Test

Lateral G sensor

Measure the sensor output voltage with the sensor connector disconnected.
Between connector terminal No. 1(+) and connector No. 2(-)
In horizontal position: 2.3 - 2.7V
Inclined 90° to the right: 3.5 - 4.1V
Inclined 90° to the left: 0.8 - 1.5V

DCCD coil assembly

Measure the coil resistance.

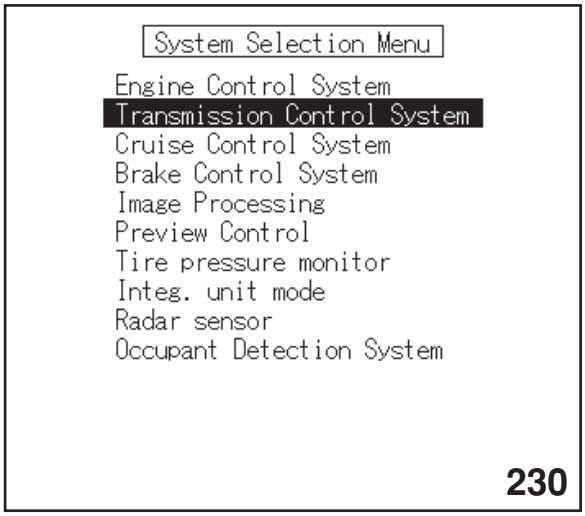
Resistance value: 1.0 - 2.0 ohms

Check the DCCD control module drive voltage (duty signal).

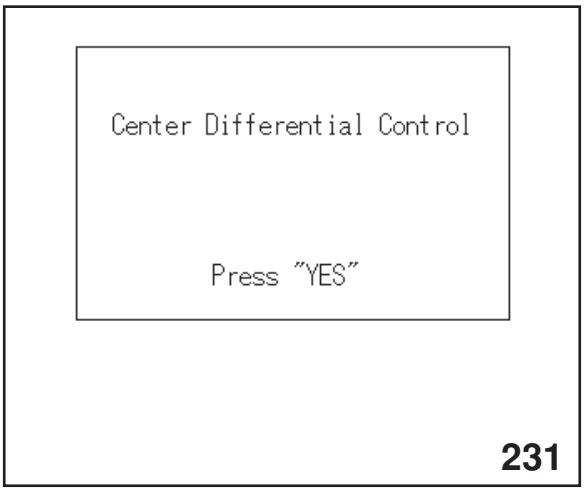
Voltage value: 6.0 - 7.0V

2005 DCCD Diagnostics

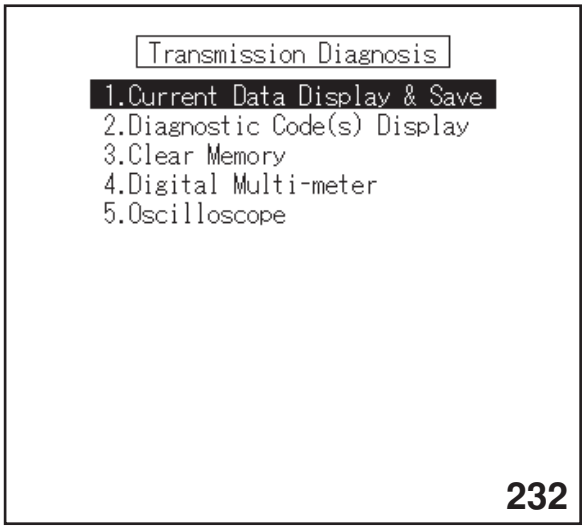
Beginning with the 2005 WRX STi, the Select Monitor can be used to diagnosis the DCCD. Select Transmission Control System and follow the instructions on the Select Monitor Display to access the DCCD operational and diagnostic information.



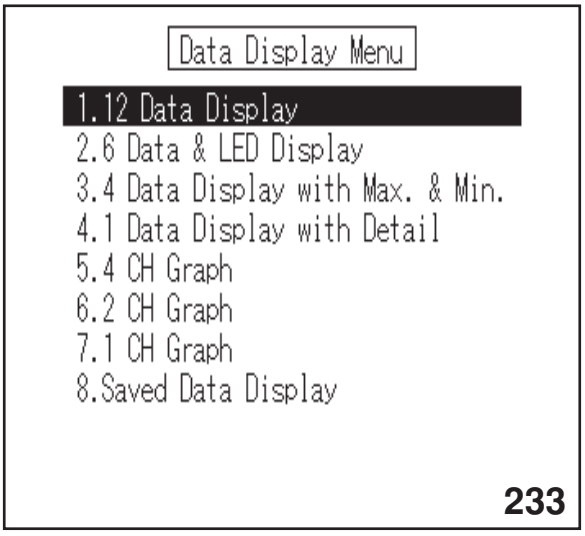
SELECT MONITOR IMAGE 1



SELECT MONITOR IMAGE 2



SELECT MONITOR IMAGE 3



SELECT MONITOR IMAGE 4

The DCCD coil current (C-Diff. Real Current) is displayed along with Target Current (C-Diff. Indicate Current). These two displays indicate the value of the present coil current and the coil current targeted by the DCCD control unit that will provide the best operation for present driving condition or a manual setting controlled by the driver.

	Engine Speed	933 rpm
	Lateral G Sensor	2.56 V
	Voltage C-diff. SW	2.25 V
→	C-Diff. Real Current	0.09 A
→	C-Diff. Indicate Current	0.00 A
	Sub-Accelerator Sensor	1.16 V
	Yaw rate sensor voltage	2.04 V
	Yaw rate&G sensor ref. V	2.51 V
	FR Wheel Speed	0 MPH
	FL Wheel Speed	0 MPH
	RR Wheel Speed	0 MPH
	RL Wheel Speed	0 MPH
	Neutral Position Switch	ON
	ABS Signal	OFF
	Stop Light Switch	OFF
	RR Diff. Oil Temp SW	ON
	Signal of identified ECM	ON
	Center Diff. Lamp1	OFF
	Center Diff. Lamp2	OFF
	Center Diff. Lamp3	OFF
	Center Diff. Lamp4	OFF
	Center Diff. Lamp5	OFF
	Center Diff. Lamp6	OFF
	Parking Position Switch	ON
	Center Diff. Relay	ON
	AUTO/MANUAL Mode Switch	OFF
	AUTO Mode Lamp	ON

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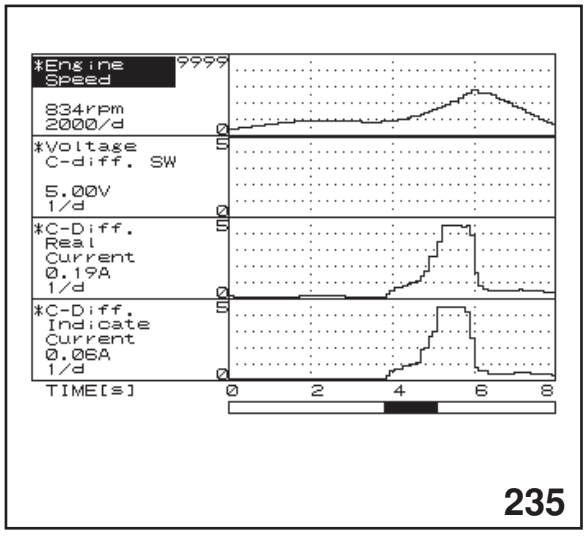
SELECT MONITOR IMAGE 5



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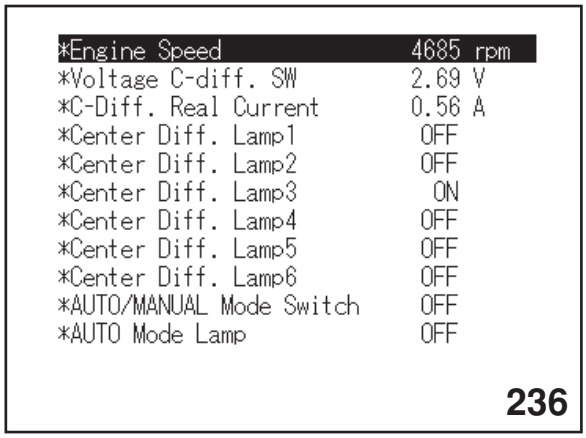
SELECT MONITOR IMAGE 6

The DCCD manual control switch value display will indicate the value of the switch setting but it will not influence the DCCD coil until the manual switch has been activated.



SELECT MONITOR IMAGE 7

The Auto/Manual mode switch is a momentary contact type. The Select Monitor display will indicate "ON" only while the switch is being pushed.

The "AUTO Mode Lamp" display indicating off is a result of the manual mode being activated.

Driver Control Center Differential System (DCCD) (2006MY)

Beginning with the 2006 model year, a mechanical limited slip differential has been added to the DCCD. This enhances DCCD operation by controlling large speed differences between the front and rear wheels even when the driver has set the DCCD into free mode.

Servicing the transmission is not affected as the DCCD must be replaced as a unit.

Additional enhancements to the STi include a yaw rate, lateral G sensor and steering angle sensor. These components are utilized by the DCCD control unit to determine the driver's intended path and make corrections to the DCCD to assist with controlling under and over steering.

These new components are not able to be zeroed with the select monitor, relying only on the correct steering wheel angle for proper neutral placement.

Driver Control Center Differential System (DCCD) (2008MY)

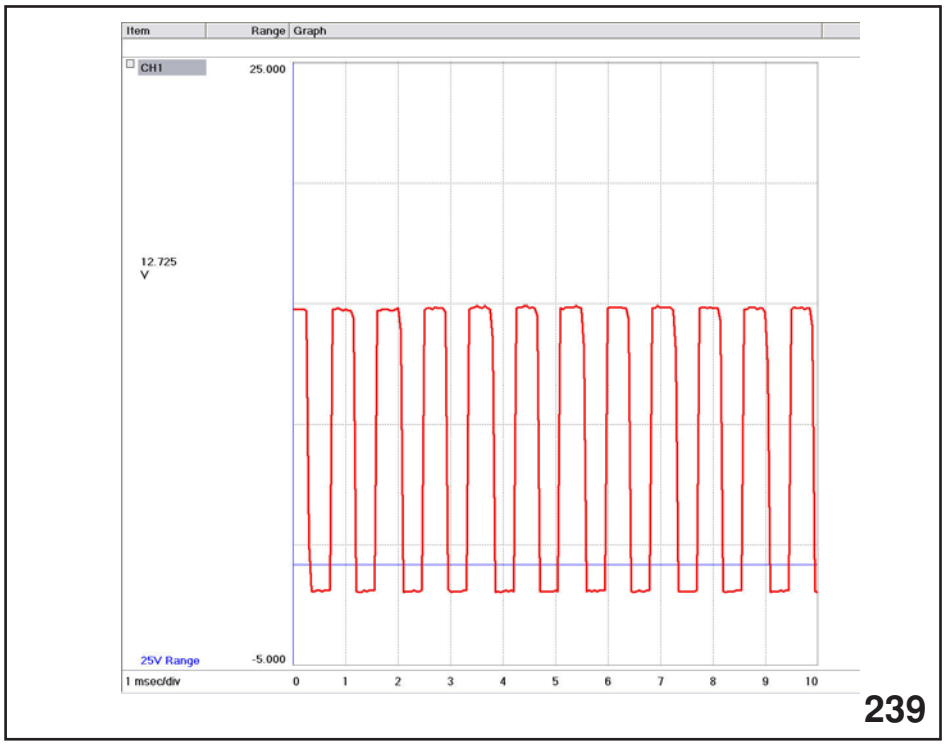
The DCCD controls have changed for the 2008 model year. Instead of a rotary dial that varies in resistance for manual mode, a Multi-Select switch is used that sends ground pulses to the DCCD Control Unit. The plus and minus switch add or subtract from the lock up ratio for the DCCD.

Also new, is the Auto Mode. Three modes are now available, Auto, Auto Plus and Auto Minus

Auto Mode begins with a duty ratio of 0 to the DCCD and advances at a rate that best suits the vehicle driving conditions.

Auto Plus is a little more aggressive increasing the duty ratio at a faster rate. This provides more power to the front wheels.

Auto Minus increases the duty ratio at a slower rate, keeping more power available to the rear wheels.



Manual Full Lock

Example of Duty ratio (53.9) for the DCCD at the DCCD Control Unit.

NOTE: THE FASTEST SAMPLING TIME ON THE SMIII OSCILLOSCOPE IS 5 MILLISECONDS PER DIVISION. THIS SAMPLE WAS ADJUSTED TO 1 MILLISECOND PER DIVISION AFTER SAVING THE DATA FOR BETTER VISIBILITY.

2008 DCCD Power Split Chart			
Duty Ratio	**Lock Ratio**	**Rear**	**Front**
53.9	100	50	50
43.5	85	51.8	48.2
34.1	65	53.6	46.4
25.7	35	55.4	44.6
17.6	15	57.2	42.8
0	0	59	41

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2008 DCCD Power Split Chart

The power split from the front to rear is 41 (front) to 59 (rear). The difference between the two percentages to 50 % is affected by the DCCD controls.

Item	Value
☑ DCCD Mode	2
☑ Neutral Position Switch	ON
☑ Down Switch	OFF
☑ Stop Light Switch	OFF
☑ Up Switch	OFF
☑ RR Diff. Oil Temp SW	ON
☑ Parking Position Switch	ON
☑ Center Diff. Relay	ON
☑ AUTO/MANUAL Mode Switch	OFF

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SSMIII file of Auto Mode when starting vehicle

The DCCD setting will always default to the Auto Mode when starting the vehicle. Normal Auto Mode is displayed on the Select Monitor with a number 2 in the DCCD Mode. A number 1 indicates Auto Minus and 3 represents Auto Mode Plus.

This file “STI DCCD” has not been altered. Review this file to become familiar with the data available from the DCCD control unit.

DCCD file

Item	Value	Unit	Maximum	Minimum	Average
Engine Speed	1576	rpm	4758	477	1421
Battery Voltage	14.0	V	14.2	13.5	14.0
Accel. Opening Angle	14.1	%	100.0	0.0	12.2
C-Diff. Real Current	0.91	A	2.09	0.00	0.19
C-Diff. Indicate Current	0.91	A	2.13	0.00	0.19
FR Wheel Speed	8	MPH	42	0	10
FL Wheel Speed	8	MPH	40	0	10
RR Wheel Speed	8	MPH	42	0	10
RL Wheel Speed	8	MPH	41	0	10
Steering Angle Sensor	-40	deg	222	-508	-59
Yaw Rate	-5	deg/s	24	-38	-4
Lateral G	0.00	m/s^2	5.54	-4.40	-0.38
DCCD Torque Allocation	0		0	0	0
DCCD Mode	2		2	2	2
Neutral Position Switch	OFF		-	-	-
Down Switch	OFF		-	-	-
Stop Light Switch	OFF		-	-	-
Up Switch	OFF		-	-	-
RR Diff. Oil Temp SW	ON		-	-	-
Parking Position Switch	OFF		-	-	-
Center Diff. Relay	ON		-	-	-
AUTO/MANUAL Mode Switch	OFF		-	-	-

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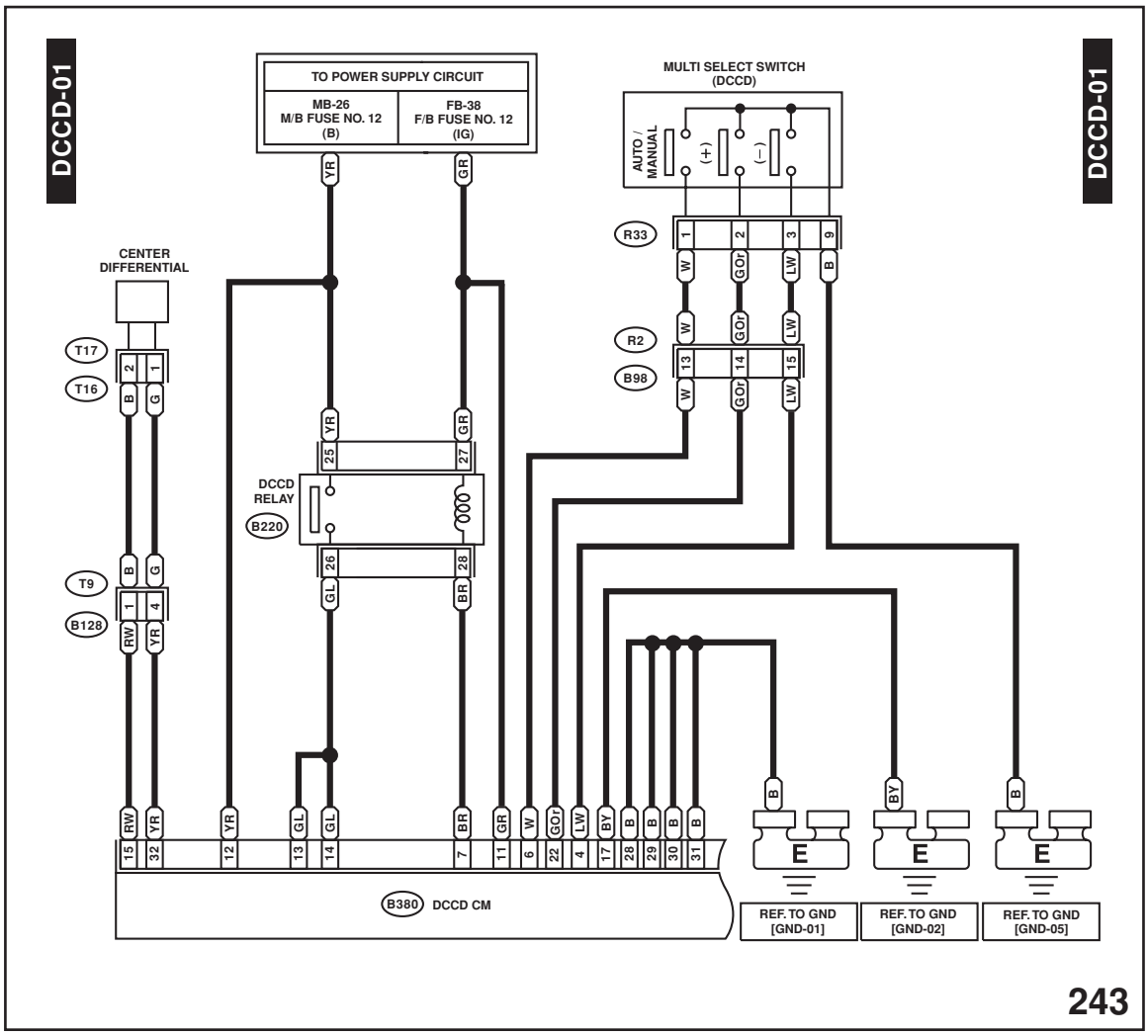
DCCD File



DCCD Wire Schmatic

The Up Switch, Down Switch and AUTO/MANUAL SWITCH are all momentary contact switches so they will indicate on only when the respective switch is activated.

AUTO/MANUAL AND C.DIFF BUTTONS

[S] - AUTO MODE

Controlling DCCD is accomplished by starting the engine, the DCCD will be in Auto Mode.

[S] - [—] AUTO MODE

Pushing the C.Diff Switch to Minus will activate Auto Minus.

[S] - [+] AUTO MODE

Pushing the C.Diff Switch to Plus will activate Auto Plus.

AUTO/MANUAL AND C.DIFF BUTTONS

Pushing the AUTO/MANUAL Switch will activate Manual Mode.

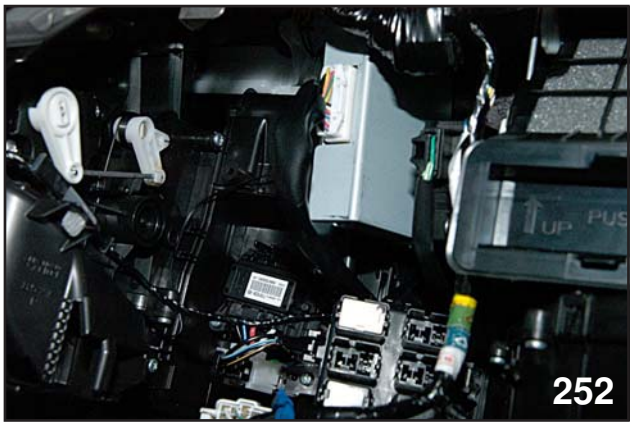
[S] ONE BAR

[S] TWO BARS

Pushing the C.Diff Switch to Plus will increase the Lock Ratio (Duty Ratio). Each successive push of the switch to the Plus side will increase Lock Ratio (Duty Ratio) until Full Lock is indicated.

[S] LOCK

Pushing the C.Diff Switch to Minus will decrease Lock Ratio (Duty Ratio).

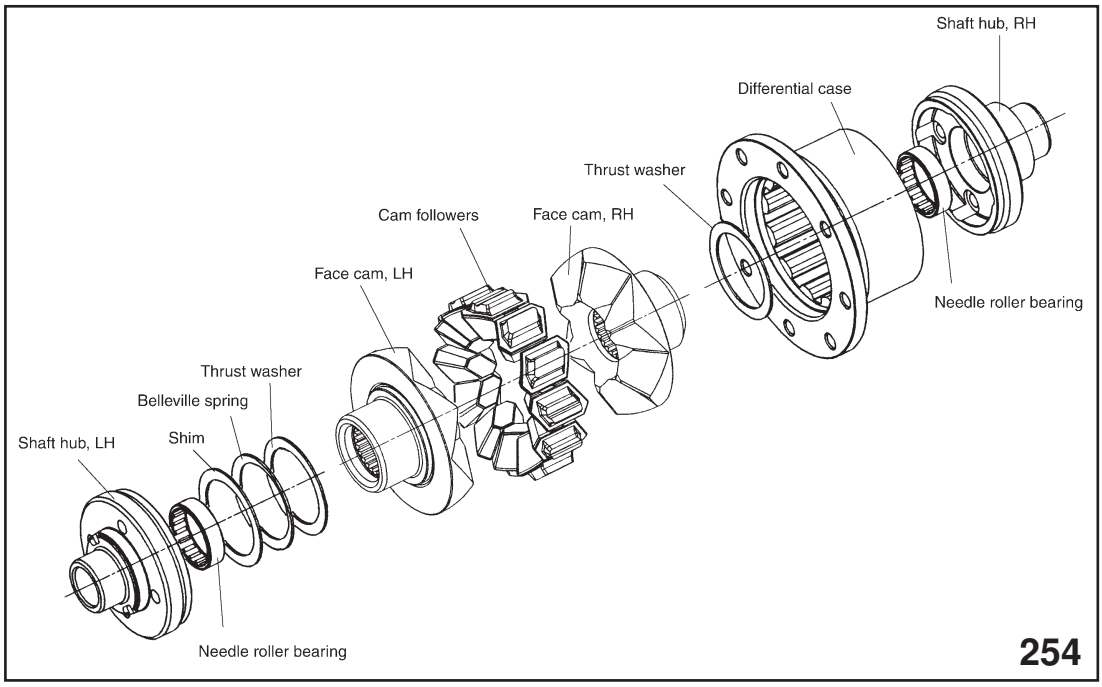


DCCD Control Unit

The DCCD control unit is located behind the glove box. The following inputs/outputs are no longer directly wired to the DCCD Control Unit but communicate with it through the LAN/CAN:

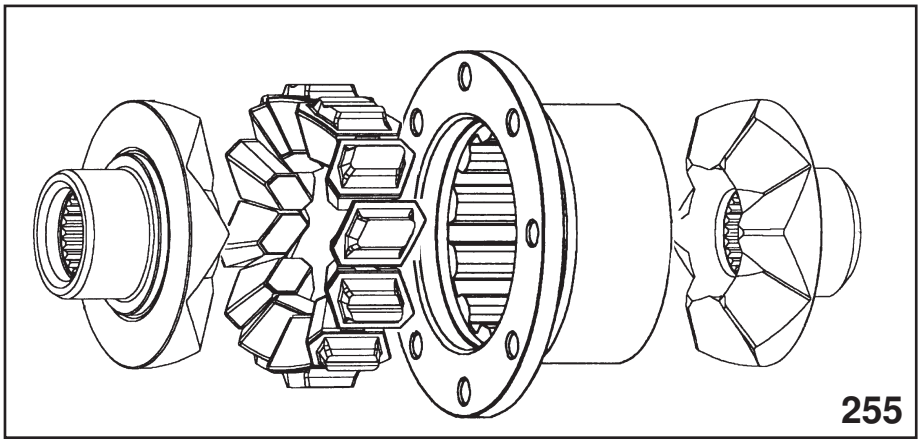
- Accelerator pedal position sensor
- Parking Brake Switch
- All of the status lights and warning lights (except Rear Differential Oil Temp)
- Stop light Switch
- Neutral Position Switch
- Engine speed Signal
- Yaw Rate and Lateral G Sensor
- Steering Angle Sensor

Front Differential (Cam Type)



FRONT DIFFERENTIAL

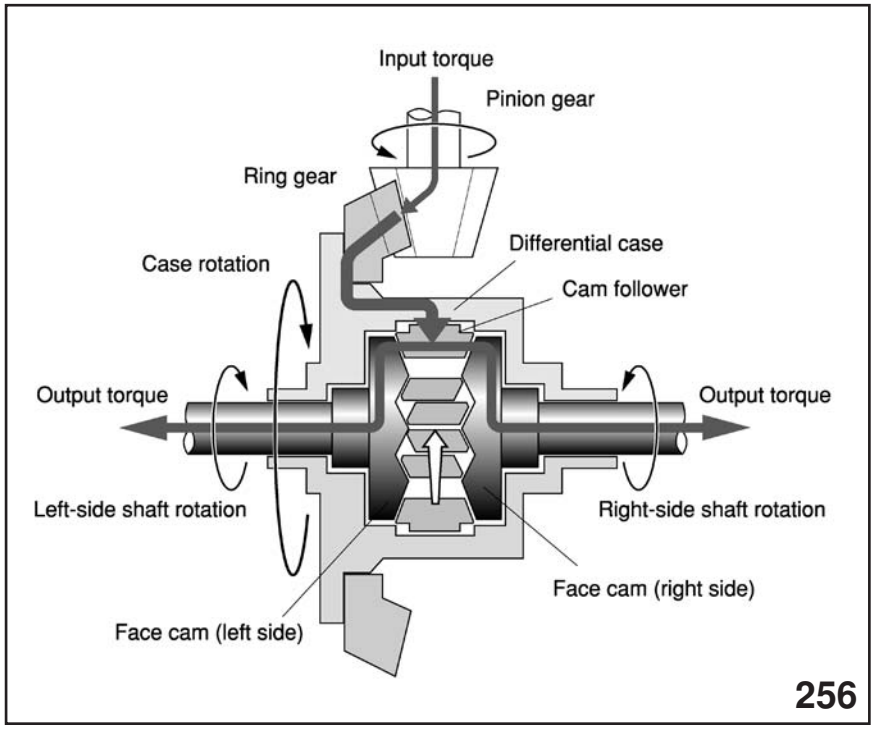
On the 2004MY WRX STi the front differential is a cam type limited slip differential. It is a sealed unit and must be replaced as an assembly. The main components of the differential are a differential case, cam followers and two face cams. The bottom side of the cam followers is shaped to fit into slots made into the inner diameter of the differential case. These slots allow the cam followers to slide left and right as well as deliver power from the differential case to the left and right face cams. The top side of the cam followers are shaped to work with the shape provided to the cam followers.



CAM FOLLOWERS AND FACE CAMS

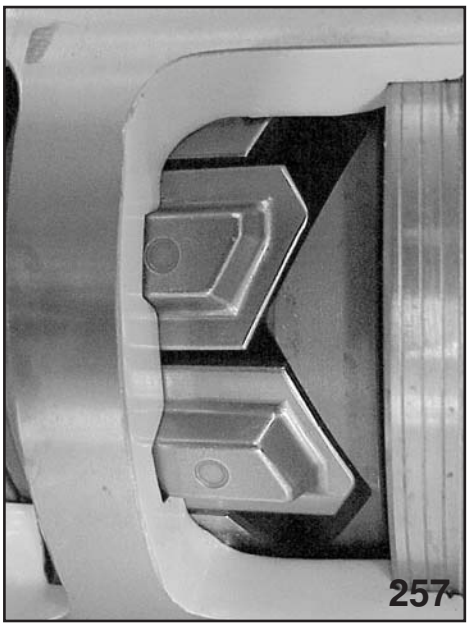
The cam followers have two different cam shapes (the shapes of the surfaces in contact with the face cams), which are alternately arranged. Because of this design, the left and right face cams each have 6 teeth.

Operation



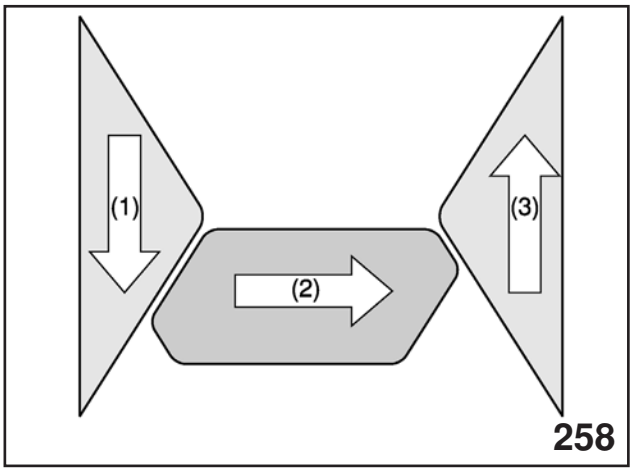
Complete Differential in Operation

When the vehicle is driving on a level, uniform road surface, the left and right wheels are turning at the same speed, so there is no difference in the rotational speed of the left and right face cams. The drive force transmitted from the drive pinion gear to the ring gear is transmitted to the 12 cam followers via the slots on the inside of the differential case.



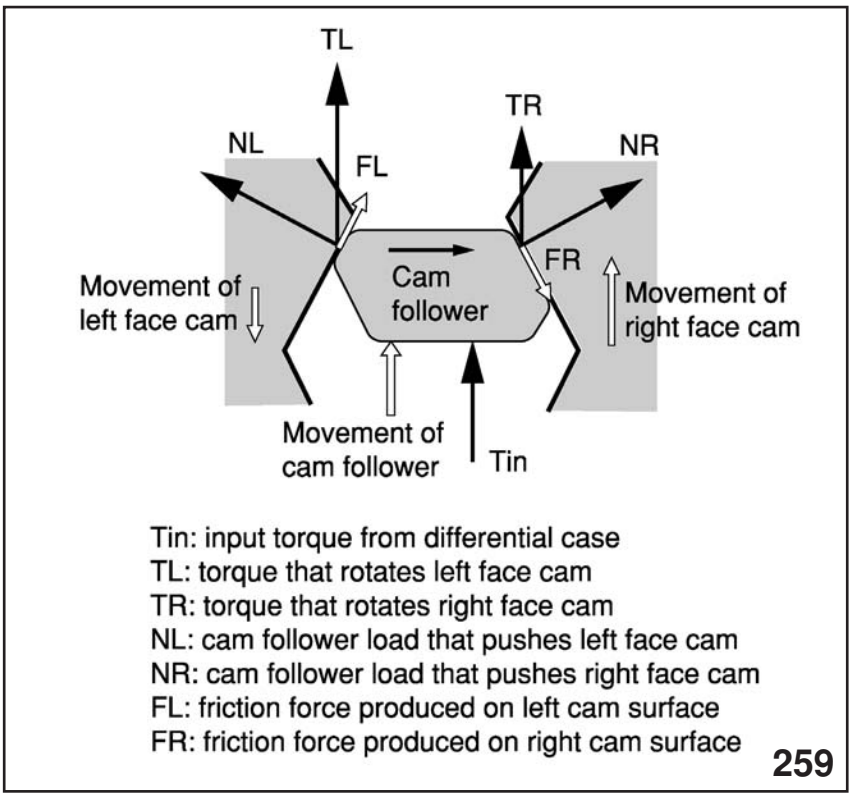
Cut Away-Cam Followers and Face Cam

The drive force is uniformly transmitted to the left and right face cams by the cam followers in contact with the left and right face cams. This causes all the cam followers and the left and right face cams to rotate together as a single unit.



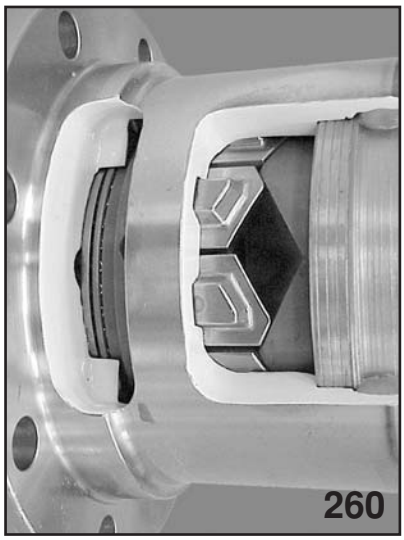
Face Cam - Cam Follower - Face Cam

When a vehicle turns, producing a difference in rotational speed between the left and right wheels, there is a shift in the relative position of the left and right face cams. When the left face cam moves downward, the cam followers are pushed by the left face cam to the right. This pushes the right face cam upward. As a result, the upward movement of the right face cam is equal to the downward movement of the left face cam. This operation between the left and right face cams and the cam followers in contact with them occurs continuously thus it absorbs the difference in rotational speed between the left and right wheels produced by the turning vehicle.



LSD Forces

The limited slip function is created by the friction between the cam followers and the face cams. When the relative position of the left and right face cams change the cam followers start to move producing forces on the face cams. At the same time frictional forces which counteract the movement of the left and right face cams are produced.



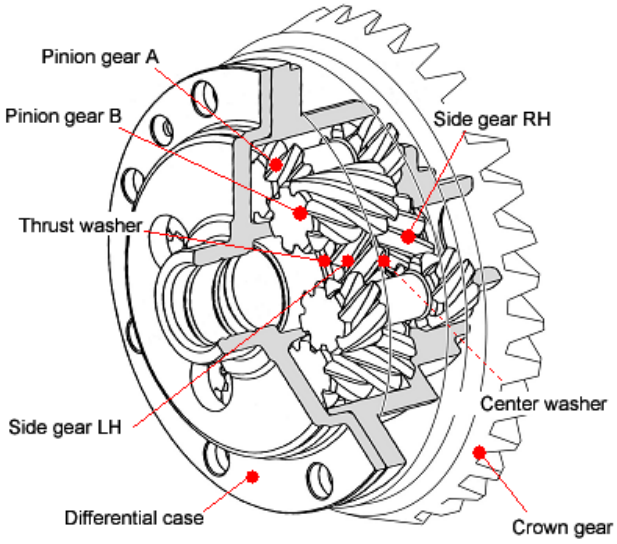
LSD Cutaway

Additionally the friction created between the cam followers and the slots in the differential case and the friction between the face cams and the differential case enhance the LSD effect.

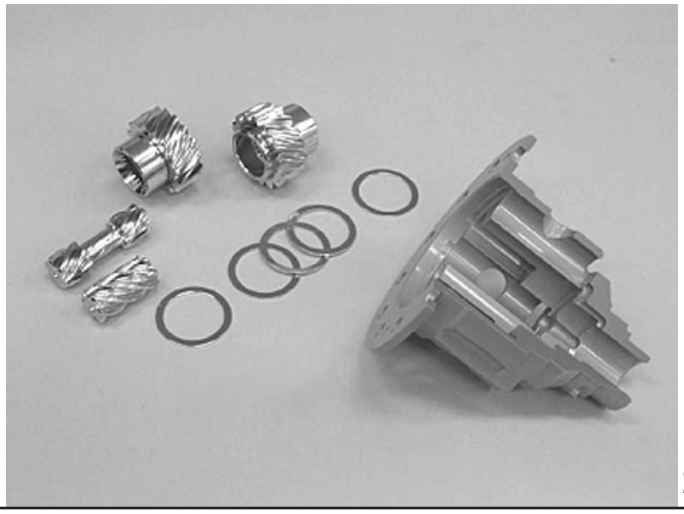
Front Differential (Helical Type)

Starting with 2005MY STi, front differentials are a helical type design.

The shape of all gear teeth are Helical type.



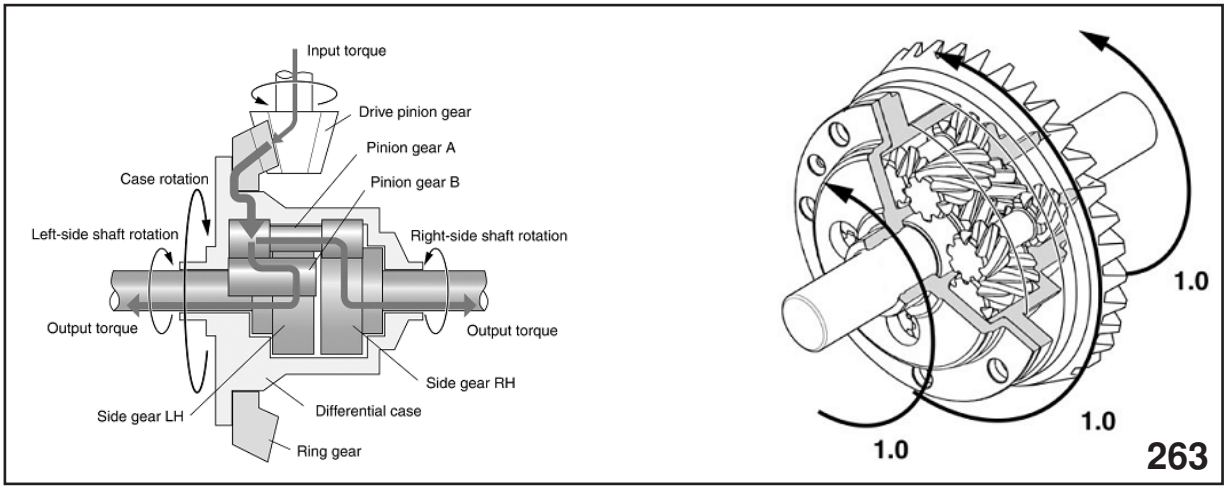
HELICAL LSD



COMPONENT PARTS

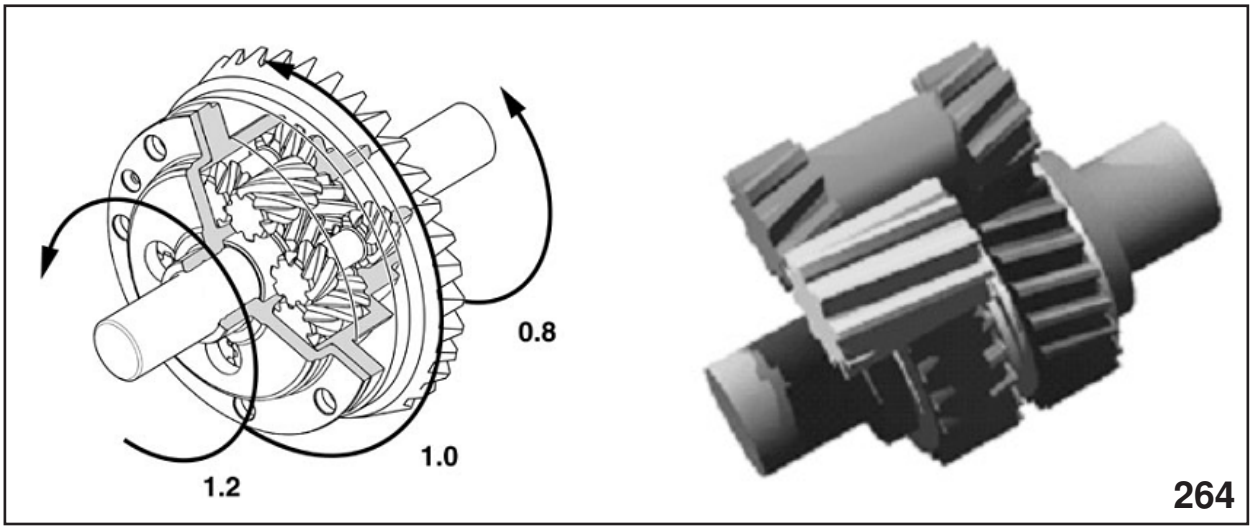
The components of the helical LSD are side gears, four sets of pinion gears A and B, four thrust washers and a center washer. These component parts are encased within the differential case and a crown gear is bolted to the flange of the differential case. The front differential must be replaced as an assembly.

Differential Function



Power Transfer *Straight Driving*

When the vehicle is moving down a straight road, the left and right wheels are turning at the same speed, so there is no difference in the rotational speed of the left and right side gears. Therefore, pinion gears do not rotate against other gears and all component parts rotate as a unit.

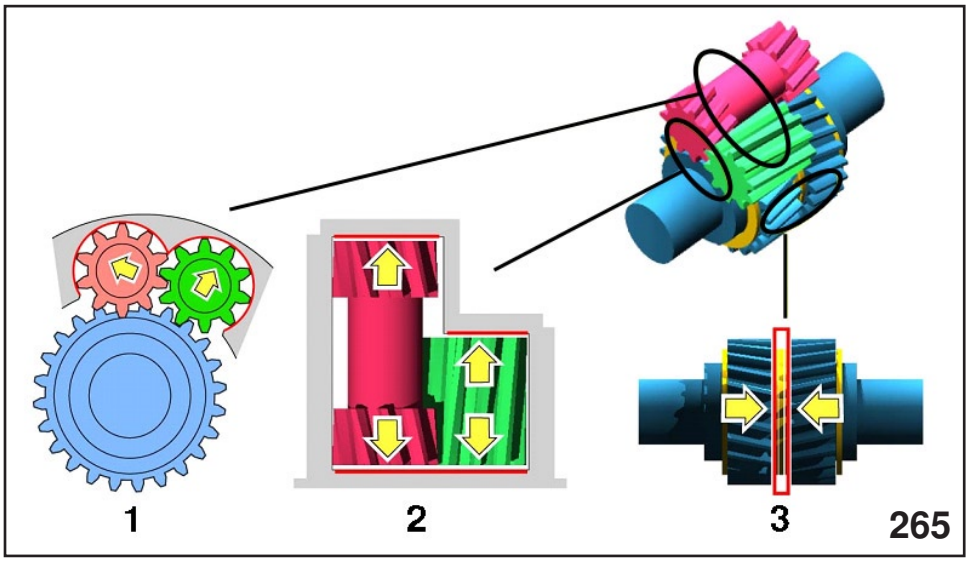


Right Turn *Pinion Gears A and B*

When a vehicle turns, it produces a difference in rotational speed between the left and right side gears, the pinion gear A and B start to rotate. This is because the pinion gear A or B must revolve around the slower-turning side gear. This means that they carry additional rotary motion to the faster-turning side gear.

LSD Function

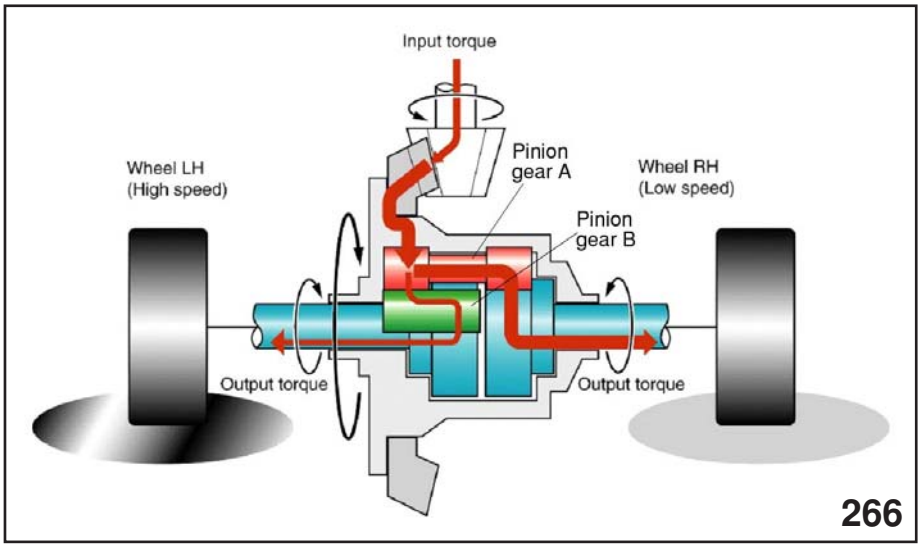
When one wheel attempts to spin, the pinion gears start to rotate and there are three types of friction forces produced in the differential case.



Three Types of Friction Forces

1. The friction between pinion gear tooth and differential case
2. The friction between pinion gear end surface and differential case
3. The friction between LH and RH Side gears

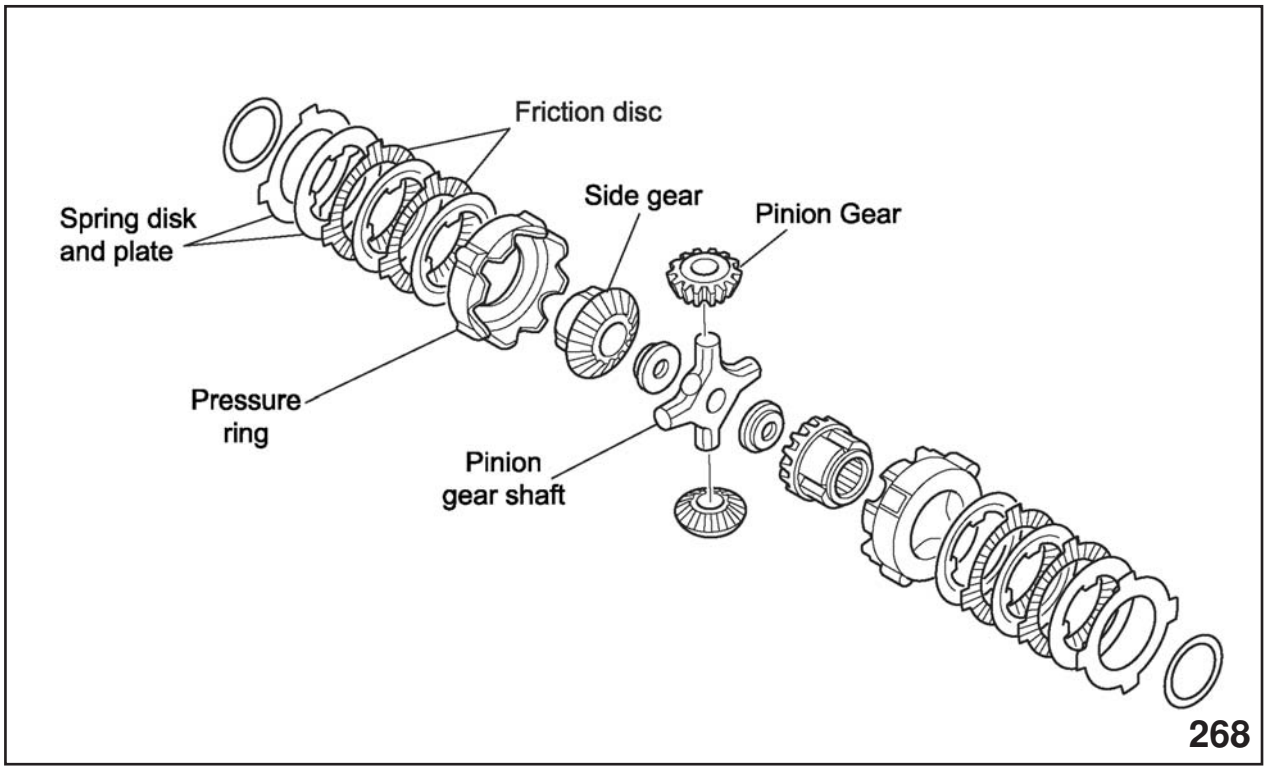
These friction forces work against rotation of the two side gears, pinion gear A and pinion gear B, and the speed differences of the side gears are limited.



Torque Distribution

As a result, the input torque from the crown gear is distributed along the left and right side gears according to the sum of three types of friction forces.

Rear Differential



Rear Differential Artwork

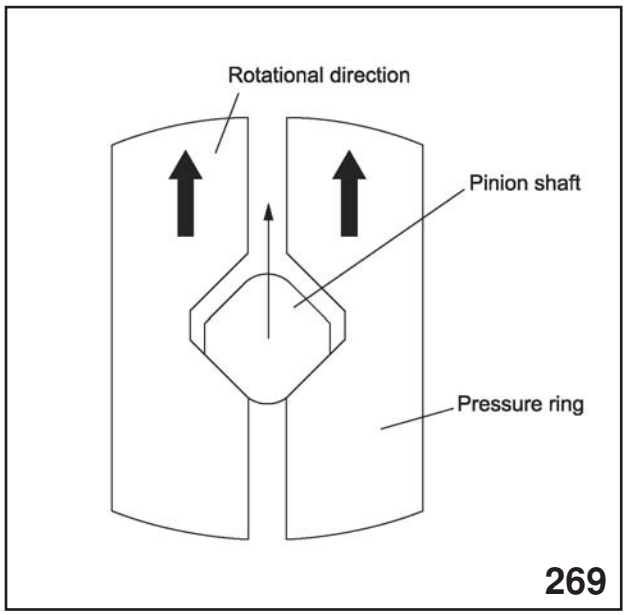
The rear differential of the WRX STi is equipped with a Mechanical Type Limited Slip Differential. The rear differential is non serviceable and must be replaced as an assembly. The Limited Slip Differential functions by slowing down the rear wheel with reduced or low traction and transfers that power to the wheel with the most traction.

Another feature of the Mechanical Type Limited Slip Differential is the ability to lock the rear differential into a 50% left and 50% right power split of the rear wheels under very high engine output conditions.

Mechanical Type Limited Slip Differential operation is accomplished through the mechanical application of a set of friction plates that are splined to the differential side gears and the differential case. The friction plates are applied by a set of pressure rings, one for each side of the differential, which are acted upon by the pinion gear shaft.

The pressure rings are splined to and rotate with differential carrier, but the pressure rings can move in and out. The force required to move them out is determined by the spring tension from a set of spring disks and plates, one set for each side of the differential. It is also this spring force that assists with returning the pressure rings back to the static position.

The outward movement of the pressure rings pushes on and applies the friction plates. The degree of friction plate application is determined by how much outward movement is applied from the pressure rings.



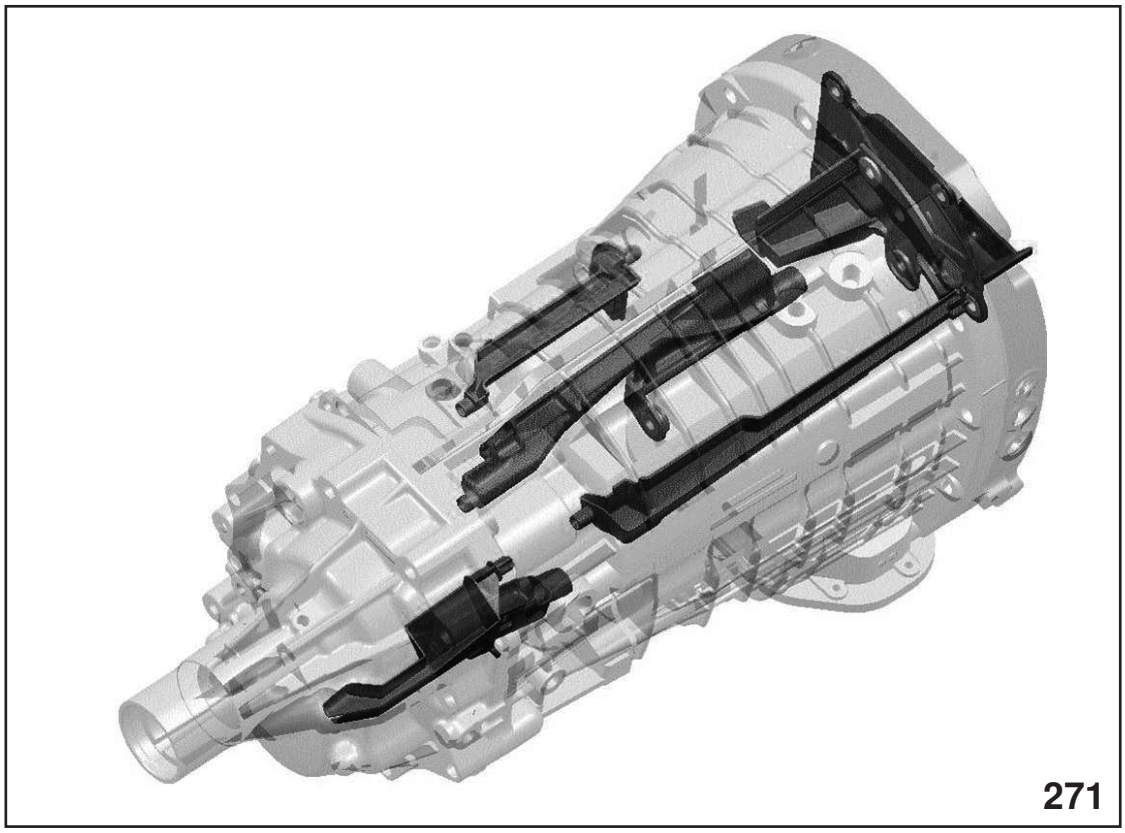
Pressure Rings and Pinion Shaft

The force that moves the pressure rings outward is generated by the pinion gear shaft. The static position of the pinion gear shaft is in the center of a space created by the pressure rings as they surround the pinion and side gears.

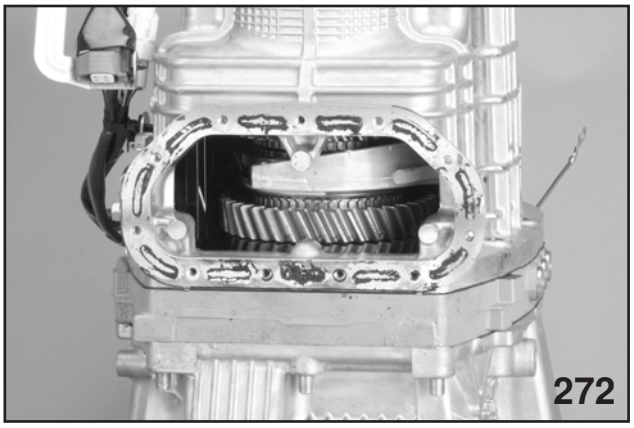
Power from the differential carrier is delivered to the pressure rings and depending on the amount of force created by the movement of the pressure rings into the pinion gear shaft, pulls the pinion gear shaft in the direction of forward movement or uses the pinion gear shaft to split or move the pressure rings outward.

This will apply the friction plates and allow the power to flow partially into the side gears and partially through the differential pinion gears to the side gears and finally to the rear wheels. Higher degrees of friction plate application result in the power flowing from the differential carrier straight to the side gears and to the rear wheels.

6 Speed Manual Transmission (2008MY)



Construction

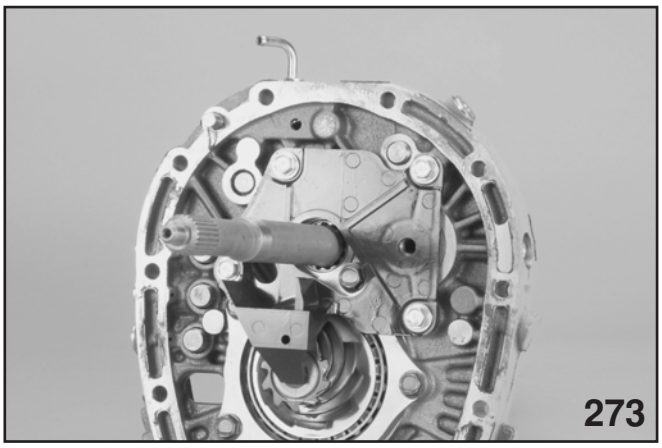


Oil Sump

The 6 MT for 2008 model year has replaced the oil pump with oil guides. The oil pump pick up screen has been deleted.

The oil guides are positioned to catch oil splashed by moving gears and provides a path for the oil to flow, lubricating bearings, bushings and all moving parts inside the transmission.

NOTE: THERE HAS BEEN NO CHANGE IN THE POSITION OF THE BUSHINGS AND THE OILING DELIVERY HOLES MACHINED IN THE MAIN AND HOLLOW SHAFTS.



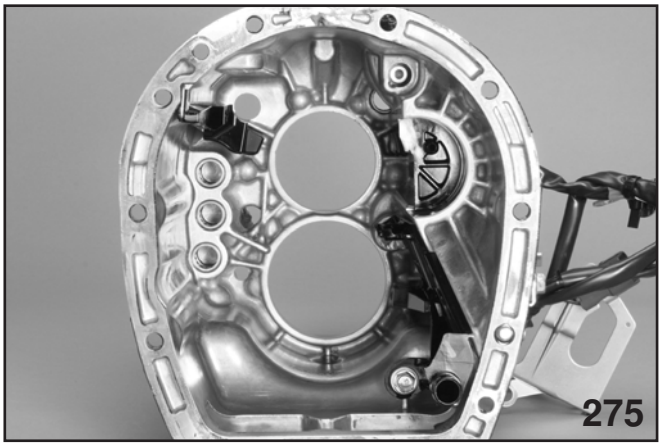
Front Oil Guides

Oil splashed in the differential is delivered from the pinion oil guide to the pinion bearing, 1st gear and 2nd gear bushings, sliders, gears and all moving parts of their gear sets.

The front main shaft bearing is lubricated by the front main case oil guide.

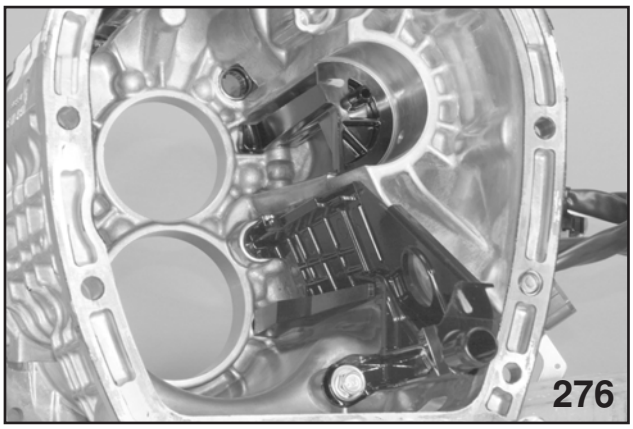
Previous Oil Pump

The main case is equipped with three (3) oil guides.



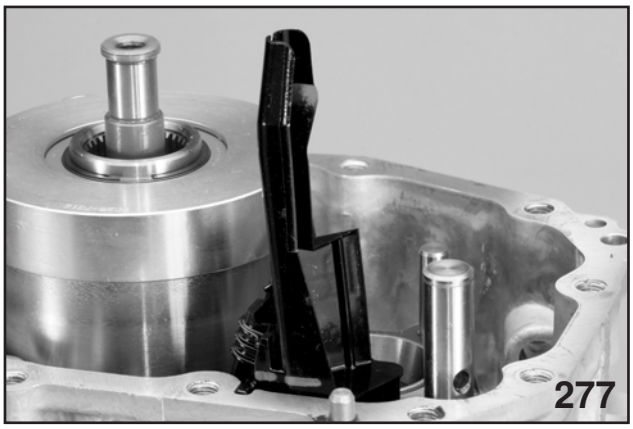
Main Case Oil Guides

The two (2) on the left side carry oil to the rear main shaft and hollow shaft bearings.

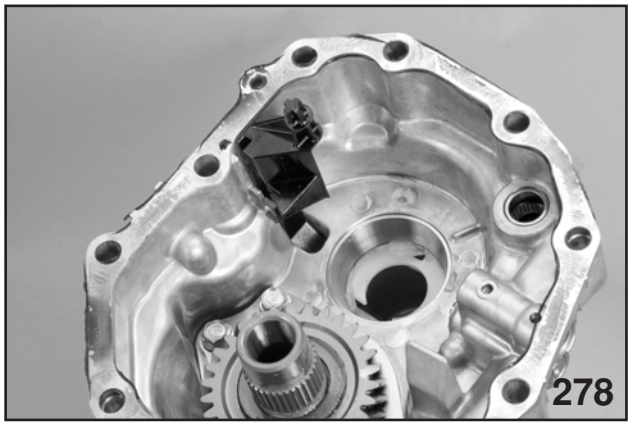


Main Case Oil Guides Close up

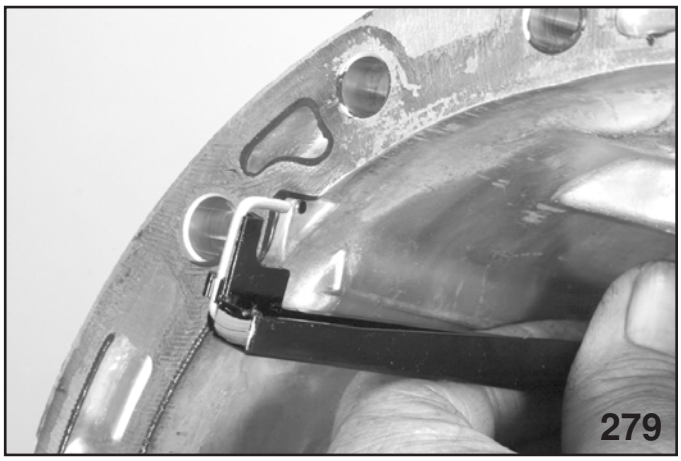
The one (1) on the right side carries oil to the extension housing. An oil guide in the extension housing routes oil to the transfer driven shaft bushing.



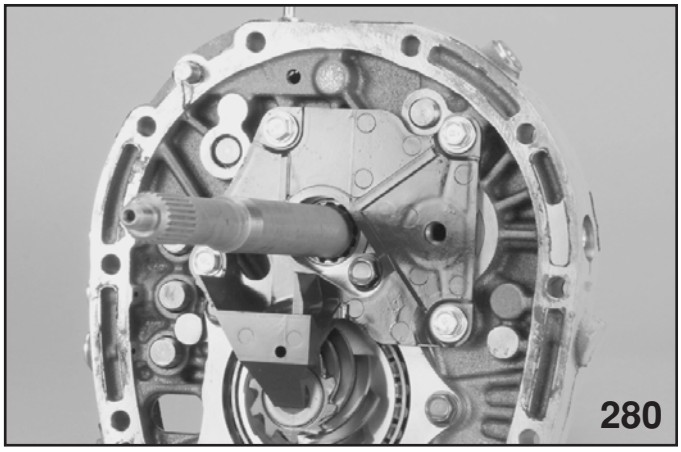
Extension Housing Oil Guide



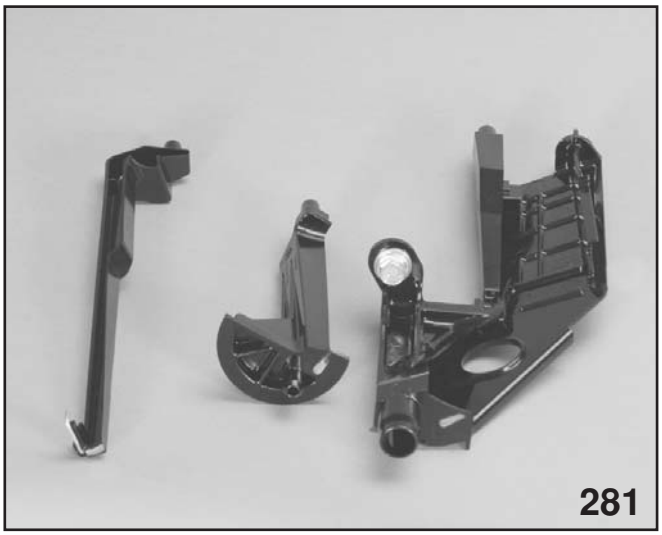
Friction Tab



Clip



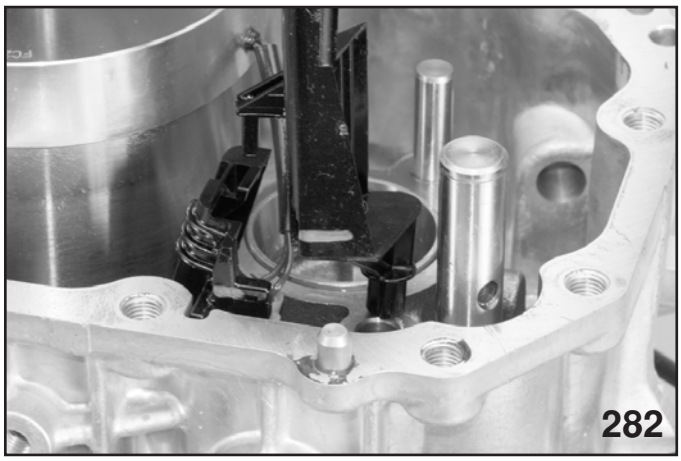
Bolts



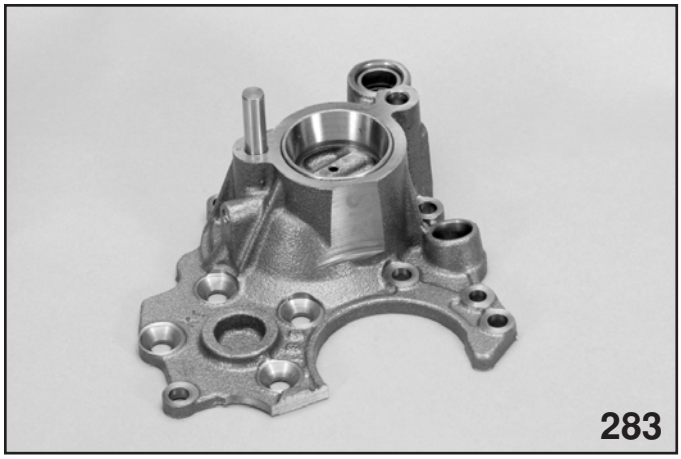
Main Case Oil Guides Bench Shot

The oil guides are positioned into place by friction, bolts and incorporated clips.

Use care when removing the oil guides from the transmission.

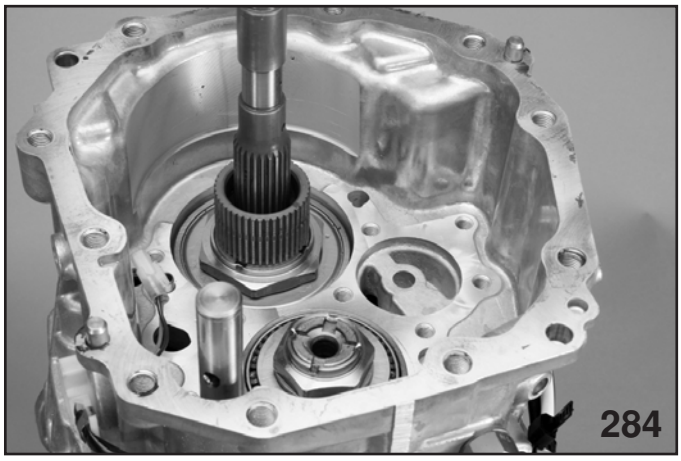


Clip



End Plate

Bearing end plate, previously the oil pump cover.



Previous Oil Pump location

New case design, no oil pump.

TOOL LIST

Tool Number	Description
398177700	Installer
398497701	Seat
398643600	Gauge
499247400	Installer
499757002	Installer
899864100	Installer
498515700	Remover
18620AA000	Adapter Wrench
18621AA000	Adapter Wrench
18630AA000	Wrench Assembly
18631AA000	Handle
18632AA000	Stand Assembly
18651AA000	Installer
18654AA000	Installer
18657AA000	Installer
18657AA010	Installer
18663AA000	Socket
18664AA000	Base (Tool Kit)
18665AA000	Holder
18666AA000	Holder
18667AA000	Holder
18668AA000	Punch
18669AA000	Punch
18670AA000	Punch
18671AA000	Oil Seal Guide
18672AA000	Guide Clip
18720AA000	Remover
18722AA000	Remover
18723AA000	Remover
18754AA000	Remover
18757AA000	Straight Pin Remover
18758AA000	Puller
18831AA000	Gauge
18852AA000	Torque Wrench
18853AA000	Height Gauge
42099AE000	Full Line Disconnect
J-47711	Tool Tags

Service Bulletins

No.	Date	Subject	Applicability-Title
01-156-03	11/18/03	Warranty Information Update	All Manual Transmission Vehicles
01-162-05	06/28/05	Towing Recommendations	STi Vehicles, All Model Years
03-53-04 16-54-04	08/20/04	Transmission Rear Cross-Member	All A/T amd M/T Vehicles
02-101-07	02/28/07	Turbo Vehicle and Operation	All Turboe Equipped Models
18-73-03	12/01/03	Service Manual Corrections	2001-2004MY Legacy, Forester, and Impreza Service Manuals
18-88-05	06/03/05	Service Manual Corrections	2004MY Impreza Vehicles

Tech TIPS

Date	Subject
07/05	STi - Towing behind motor home
07/05	STi - Rear differential oil

Slide Sequence

Slide Sequence

Slide Sequence

Slide Sequence

Slide Sequence

Slide Sequence

TOOLS AND EQUIPMENT

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18852AA000	Torque Wrench
18853AA000	Height Gauge
42099AE000	Full Line Disconnect
J-47711	Tool Tags


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