

SUZUKI

SF413

**SUPPLEMENTARY SERVICE MANUAL
FOR FOUR-WHEEL DRIVE MODEL**

USE THIS MANUAL WITH:
SF413 SERVICE MANUAL (99500-63800-01E)

SUZUKI
Caring for Customers

99501-63B20-01E

(英)

FOREWORD

This SUPPLEMENTARY SERVICE MANUAL is a supplement to SF413 SERVICE MANUAL (99500-63B00-01E) and has prepared for four-wheel drive (4WD) model.

When servicing 4WD model, consult this manual first. And for any item or description not contained in this manual, refer to the above mentioned SERVICE MANUAL.

When replacing parts or servicing by disassembling, it is recommended to use SUZUKI genuine parts, tools and service materials (lubricants, sealants, etc.) as specified in each description.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

TABLE OF CONTENTS	SECTION
GENERAL INFORMATION Maintenance and Lubrication	0B
STEERING, SUSPENSION, WHEELS AND TIRES Wheel and Tires	3F
PROPELLER SHAFT	4B
REAR DRIVE SHAFT	4C
ENGINE Engine Mechanical Engine Fuel Engine Exhaust	6A 6C 6K
TRANS. Manual Transmission Clutch Transfer Differential (Front & Rear)	7A 7C 7D 7E
BODY ELECTRICAL SYSTEM	8
BODY SERVICE	9

SUZUKI MOTOR CORPORATION

*TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION*

SECTION 0B

MAINTENANCE AND LUBRICATION

CONTENTS

MAINTENANCE SCHEDULE 0B-1
 MAINTENANCE SERVICE 0B-2
 Chassis and Body 0B-2

NOTE:

Following items are added to 2WD maintenance schedule.

MAINTENANCE SCHEDULE

NORMAL CONDITION SCHEDULE

NOTE:

This schedule applies to carburetor equipped cars.

Interval: This interval should be judged by odometer reading or months, whichever comes first.	This table includes services as scheduled up to 48,000 miles (80,000 km) mileage. Beyond 48,000 miles (80,000 km), carry out the same services at the same intervals respectively.								
	km (x 1,000)	10	20	30	40	50	60	70	80
	miles (x 1,000)	6	12	18	24	30	36	42	48
	months	6	12	18	24	30	36	42	48
CHASSIS AND BODY									
1. Transmission oil	I	R	I	R	I	R	I	R	
2. Rear differential oil	I	R	I	R	I	R	I	R	

NOTES:

"R" : Replace or change

"I" : Inspect and correct or replace if necessary

MAINTENANCE RECOMMENDED UNDER SEVERE DRIVING CONDITIONS

If the car is usually used under the conditions corresponding to any severe condition code given below, it is recommended that applicable maintenance operation be performed at the particular interval as given in the below chart.

Severe condition code

A – Repeated short trips

B – Driving on rough and/or muddy roads

C – Driving on dusty roads

D – Driving in extremely cold weather
and/or salted roads

E – Repeated short trips in extremely cold weather

Severe Condition Code	Maintenance	Maintenance Operation	Maintenance Interval
- B C D - -	Propeller shafts	I	Every 6000 miles (10000 km) or 6 months

NOTES:

"R": Replace or change "I": Inspect and correct or replace if necessary

MAINTENANCE SERVICE

CHASSIS AND BODY

1. Transmission Oil Inspection and Change

[Inspection]

1) Inspect transmission and transfer cases for evidence of oil leakage.

Repair leaky point if any.

2) Make sure that car is placed level for oil level check.

3) Remove level plug of transmission.

4) Check oil level.

Oil level can be checked roughly by means of filler/level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.

If oil is found insufficient, pour specified oil up to level hole.

For specified oil, refer to description of oil change (p. 7A-7) under ON-CAR SERVICE in SECTION 7A.

[Change]

1) Place the car level and drain oil by removing drain plug.

2) Apply sealant to drain plug and tighten drain plug to specified torque.

3) Pour specified oil up to level hole.

4) Tighten filler plug to specified torque.

For recommended oil, its amount and tightening torque data, refer to ON-CAR SERVICE (p. 7A-7) of SECTION 7A.

2. Differential Oil Inspection and Change

[Inspection]

1) Inspect rear differential case for evidence of oil leakage.

Repair leaky point, if any.

2) Make sure that the vehicle is placed level for oil level check.

3) Remove level plug of differential. Oil level can be checked roughly by means of level plug hole. That is, if oil flows out of level plug hole or if oil level is found up to hole when level plug is removed, oil is properly filled.

If oil is found insufficient, pour specified amount of specified oil as given in SECTION 7E.

[Change]

Place the vehicle level and drain oil by removing drain plug. Pour specified amount of specified oil as shown in p. 7E-2 and tighten drain plug and filler plug to specified torque.

For location of oil drain plug and level plug of differential and their tightening torque, refer to ON-CAR SERVICE in SECTION 7E.

Propeller Shaft Inspection (severe conditions)

- Check propeller shaft joints for wear, play and damage. If any defect is found, replace.
- Check propeller shaft center support for biting of foreign matter, crack, abnormal noise and damage. If any defect is found, replace.

SECTION 3F

WHEELS AND TIRES

NOTE:

- For this model P165/70R 13 tires are used but the wheels are the same as those of 2WD MODEL. For service information on tires and wheels (except tire size), refer to the same section of SF413 SERVICE MANUAL.
- All wheel fasteners are important attaching parts in that they could affect the performance of vital parts and systems, and/or could result in major repair expense. They must be replaced with one of the same part number or with an equivalent part if replacement becomes necessary. Do not use a replacement part of lesser quality or substitute design. Torque values must be used as specified during reassembly to assure proper retention of all parts.
There is to be no welding as it may result in extensive damage and weakening of the metal.

SECTION 4B

PROPELLER SHAFTS

CONTENTS

GENERAL DESCRIPTION	4B-1
ON CAR SERVICE	4B-2
Removal	4B-2
Installation	4B-3
Inspection	4B-3
TORQUE SPECIFICATIONS	4B-4
REQUIRED SERVICE MATERIAL	4B-4

GENERAL DESCRIPTION

Most universal joints require no maintenance. They are lubricated for life and can not be lubricated on the vehicle. If a universal joint becomes noisy or worn, it must be replaced.

The propeller shaft is a balanced unit. Handle it carefully so that balance can be maintained.

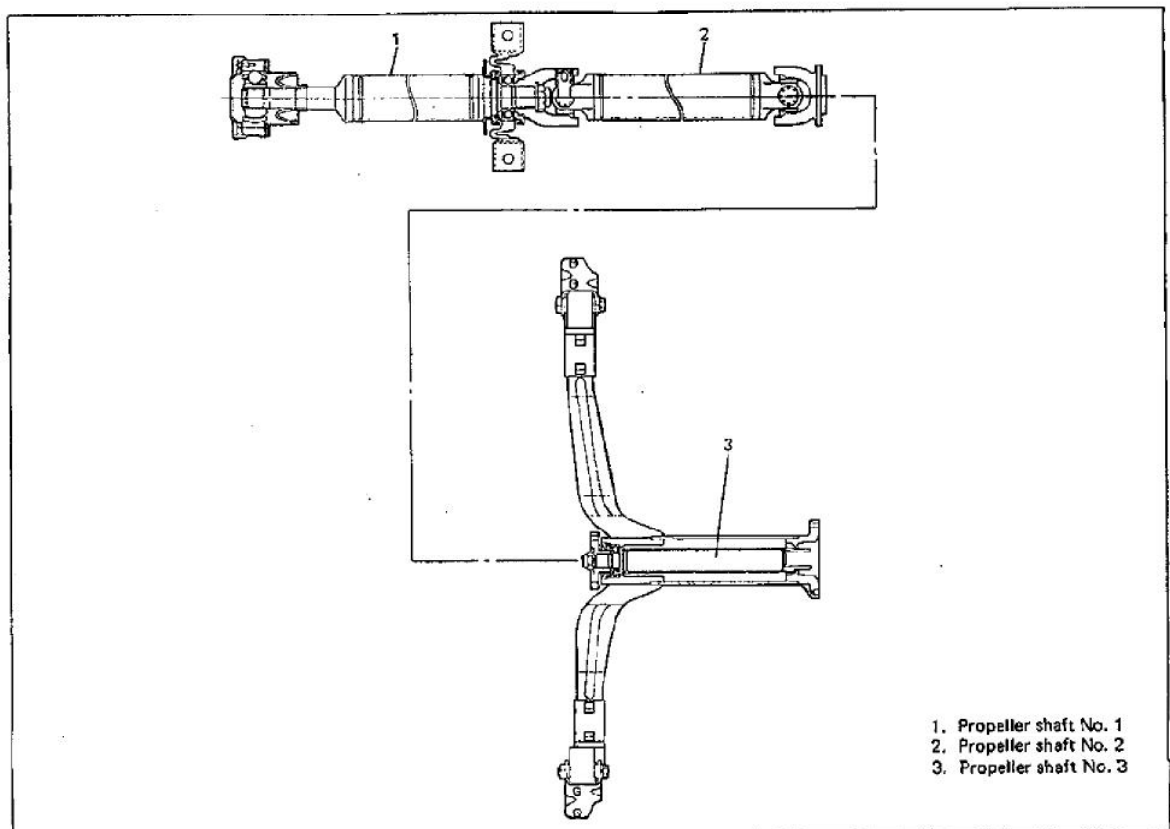


Fig. 4B-1

ON CAR SERVICE

REMOVAL (No. 1 & No. 2 Shaft)

- 1) Hoist car.
- 2) Separate No. 2 propeller shaft No. 3 propeller shaft.

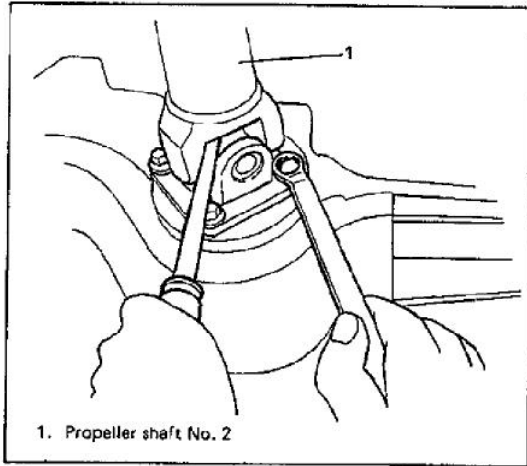


Fig. 4B-2

- 4) Remove propeller shaft center support bracket from car body. (Bracket and No. 1 & No. 2 shaft are removed in one without separation.) Use care not to drop it.

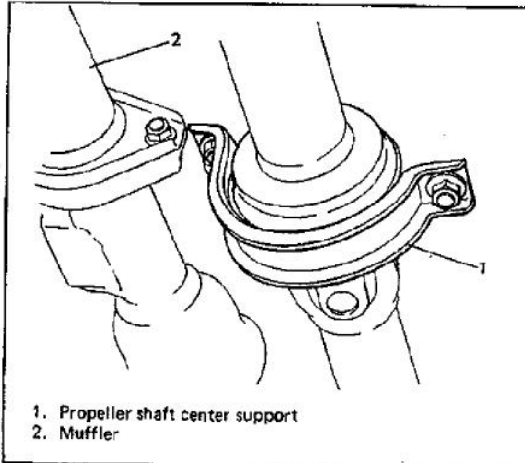


Fig. 4B-4

- 3) Remove No. 1 propeller shaft from transmission case flange.

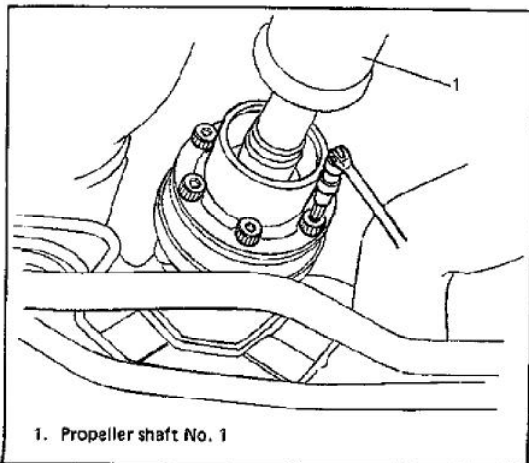


Fig. 4B-3

REMOVAL (No. 3 Shaft)

- 1) Hoist car.
- 2) Remove muffler and then separate No. 2 propeller shaft from No. 3 propeller shaft.
- 3) Remove No. 3 propeller shaft outer tube from viscous coupling case.

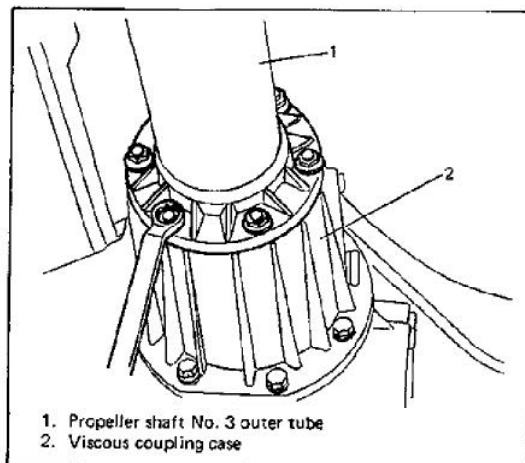


Fig. 4B-5

- 4) Remove No. 3 propeller shaft front mount member nuts from right & left mounts.

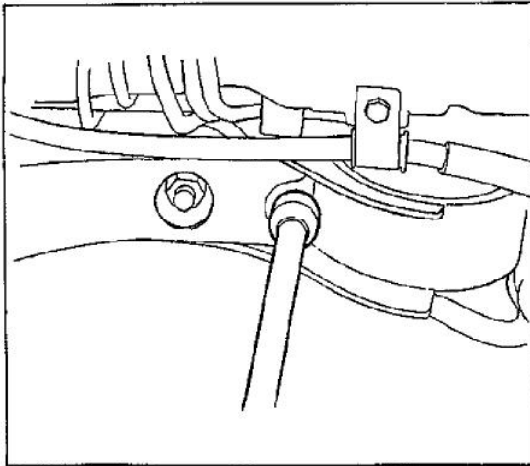


Fig. 4B-6

- 5) Remove propeller shaft No. 3.

CAUTION:

When removing, use care so that No. 3 propeller shaft front member does not contact fuel pipes.

INSTALLATION

Paying attention to the following, install in the reverse order of REMOVAL.

- For installation of bolts and nuts, refer to "A" and tighten to specified torque.
- Apply sealant to mating surface of No. 3 propeller shaft and viscous coupling.

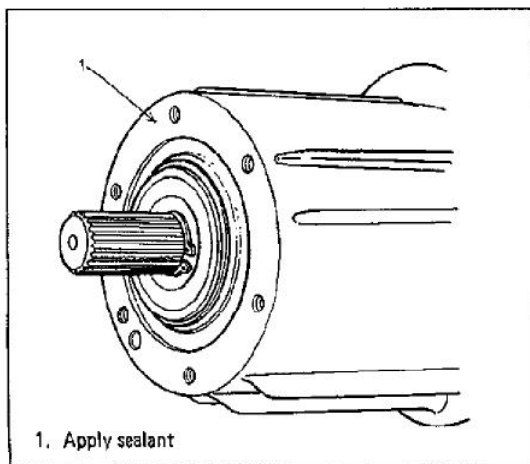


Fig. 4B-7

INSPECTION

- 1) Check propeller shaft connecting bolts for looseness. If looseness is found, tighten to specified torque.

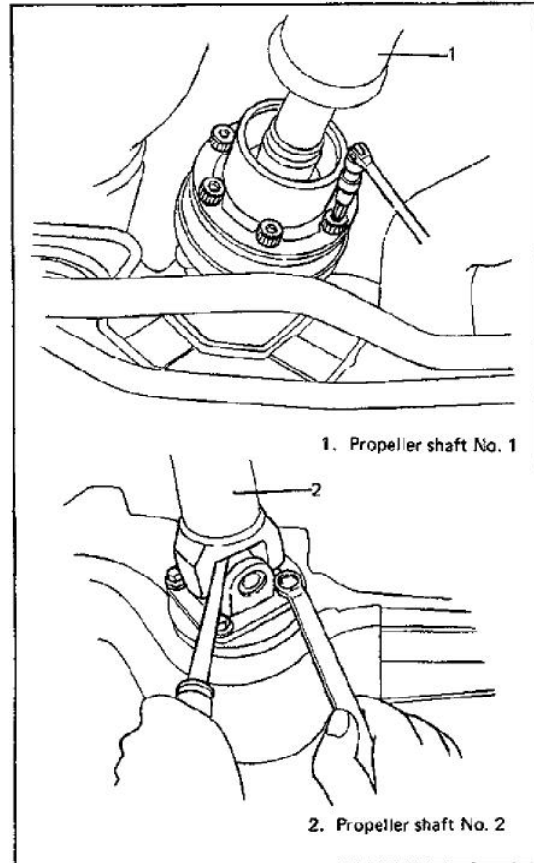


Fig. 4B-8

- 2) Check propeller shaft joints for wear, play and damage. If any defect is found, replace.
- 3) Check propeller shaft center support for biting of foreign matter, crack, abnormal noise and damage. If any defect is found, replace.

TORQUE SPECIFICATIONS

Fastening parts	Tightening torque		
	N·m	kg-m	lb-ft
1. Center bracket nuts	44 – 66	4.4 – 6.6	32.0 – 47.5
2. Propeller shaft No. 1 bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
3. Propeller shaft No. 2 bolts	27 – 37	2.7 – 3.7	20.0 – 26.5
4. Propeller shaft No. 3 front member nuts	44 – 66	4.4 – 6.6	32.0 – 47.5
5. Propeller shaft No. 3 to viscous case bolts	20 – 31	2.0 – 3.1	14.5 – 22.0

REQUIRED SERVICE MATERIAL

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	Matching surfaces of propeller shaft No. 3 and viscous case

SECTION 4C

REAR DRIVE SHAFT

CONTENTS

GENERAL DESCRIPTION 4C-1

ON CAR SERVICE 4C-2

 Drive Shaft Assembly 4C-2

RECOMMENDED TORQUE SPECIFICATIONS 4C-5

GENERAL DESCRIPTION

This drive shaft uses equal velocity ball joints which transmit the driving force smoothly even at an angle change.

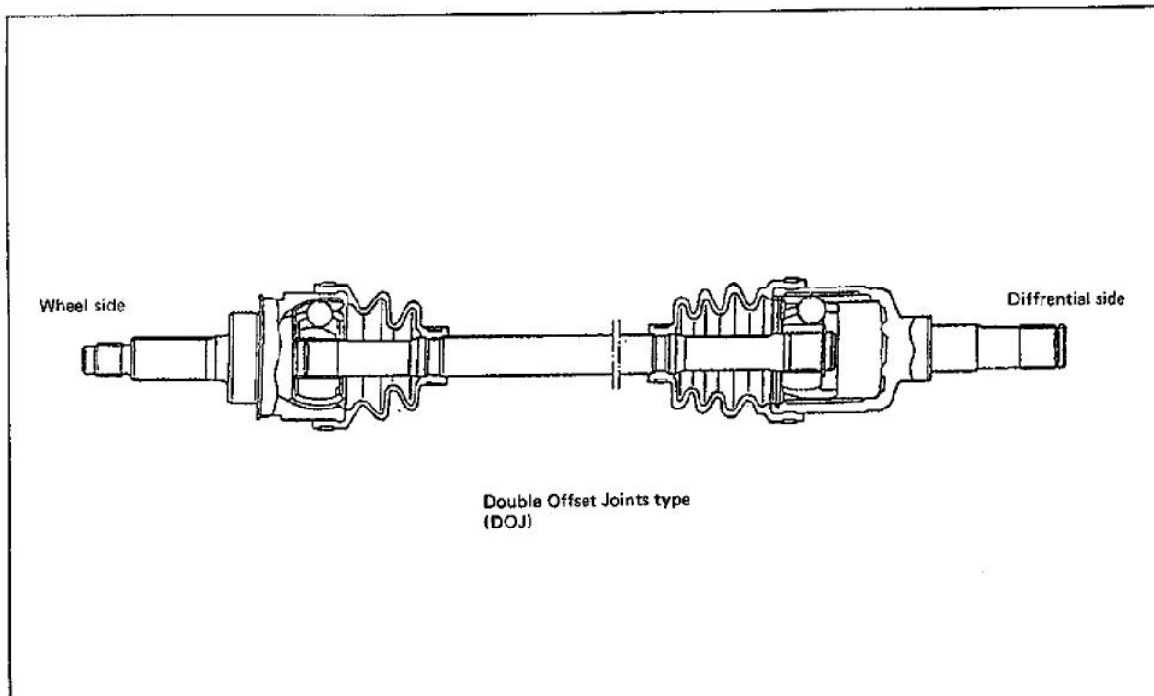


Fig. 4C-1

ON CAR SERVICE

DRIVE SHAFT ASSEMBLY

REMOVAL

1. Remove caulking of spindle nut and then remove spindle nut (30 mm) and washer.

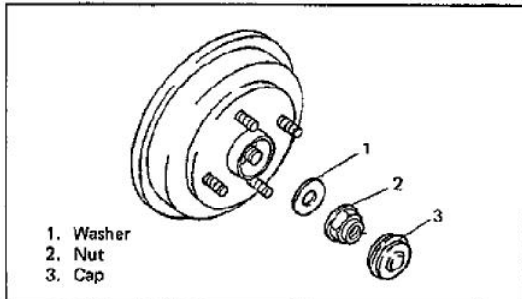


Fig. 4C-2

2. Dismount tire and drain differential oil.

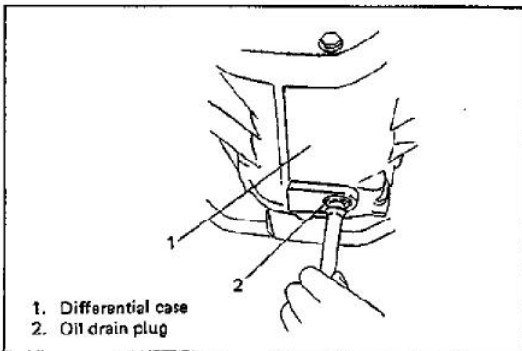


Fig. 4C-3

3. Pull out drive shaft joint and remove snap ring from differential side joint spline.
4. Place jack under suspension arm to prevent it from lowering.

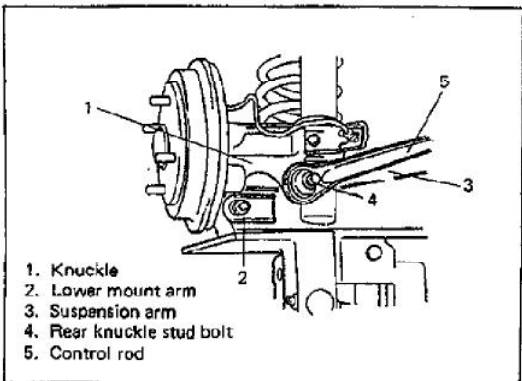


Fig. 4C-4

5. Disconnect brake hose from control rod.

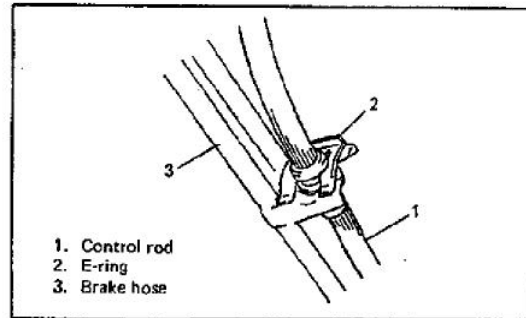


Fig. 4C-5

6. Remove control rod from rear knuckle stud bolt.
7. After removing strut lower mount bolt, pull strut out of rear knuckle by pulling it from above.

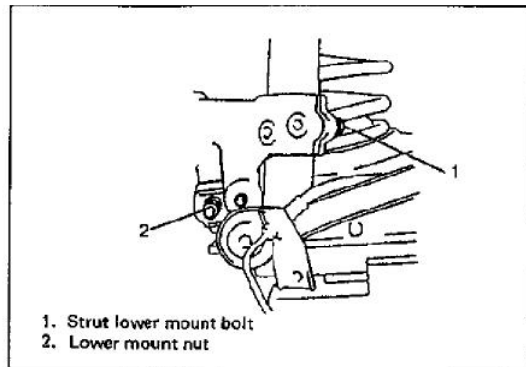


Fig. 4C-6

8. Remove lower mount nut.

NOTE:

Be careful not to pull brake hose or have it pinched.

9. Remove drive shaft assembly.

DISASSEMBLY

NOTE:

- Wheel side joint can't be disassembled.
Disassemble differential side joint when replacing wheel side boot.
- When replacing boot, use care not to damage it.

1. Remove differential side boot band and then remove joint housing.

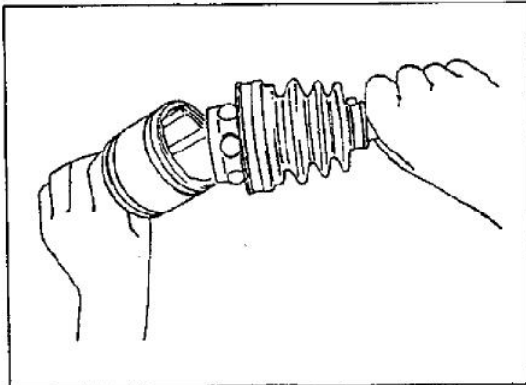


Fig. 4C-7

2. Using snap ring pliers, remove circlip and then take out ball joint.

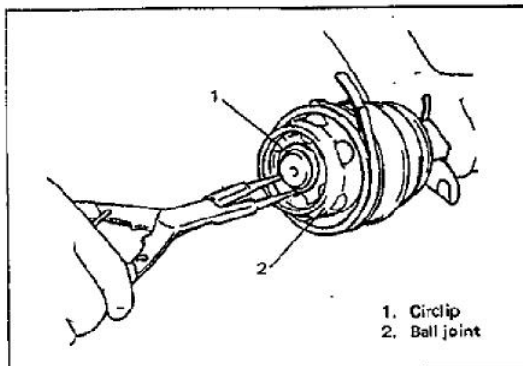


Fig. 4C-8

3. Remove differential side and shaft side boots from shaft.

INSPECTION

1. Check boots for damage and deterioration.
2. Check circlip, snap ring and boot band for breakage, deformation and any faulty condition and replace, if any.

ASSEMBLY

For assembly, reverse disassembly procedure, noting following points.

- Before reassembly, check that necessary parts have been replaced. For that, check where defect exists before disassembly and visually inspect disassembled parts carefully. Also, after washing disassembled joint housing in kerosene or the like, dry it completely by blowing air and clean boot with cloth.
- Apply ample amount of joint grease to wheel side joint and inside of boot.
- Install wheel side boot to shaft.
- Fill inside of boot with joint grease and then fix it with boot band.
- Install differential side boot to shaft and apply ample amount of grease to joint and inside of boot.
- After installing double offset joint to shaft, fix it with circlip.
- With differential side boot filled with grease, install joint assembly.
- Fix boot to joint assembly with boot band.

4C-4 REAR DRIVE SHAFT

INSTALLATION

For installation, reverse removal procedure noting following points.

- Connect brake hose to control rod properly.

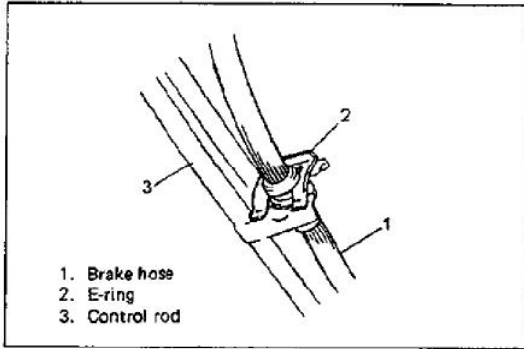


Fig. 4C-9

- Install strut to knuckle.
Fit lug "A" on strut into opening in knuckle and push down strut till "B" marked parts of strut contact upper end of knuckle as shown below.

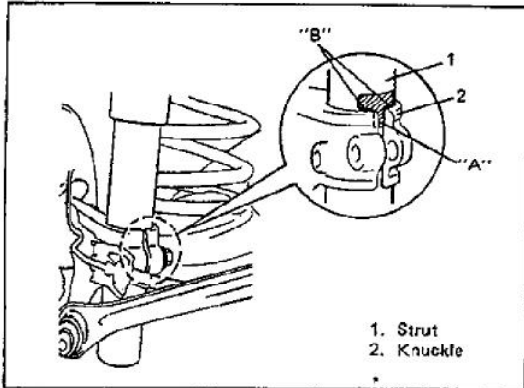


Fig. 4C-10

- Caulk spindle nut as shown below.

NOTE:

Replace spindle nut with a new one.

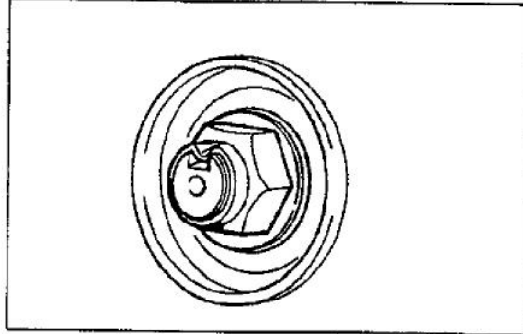
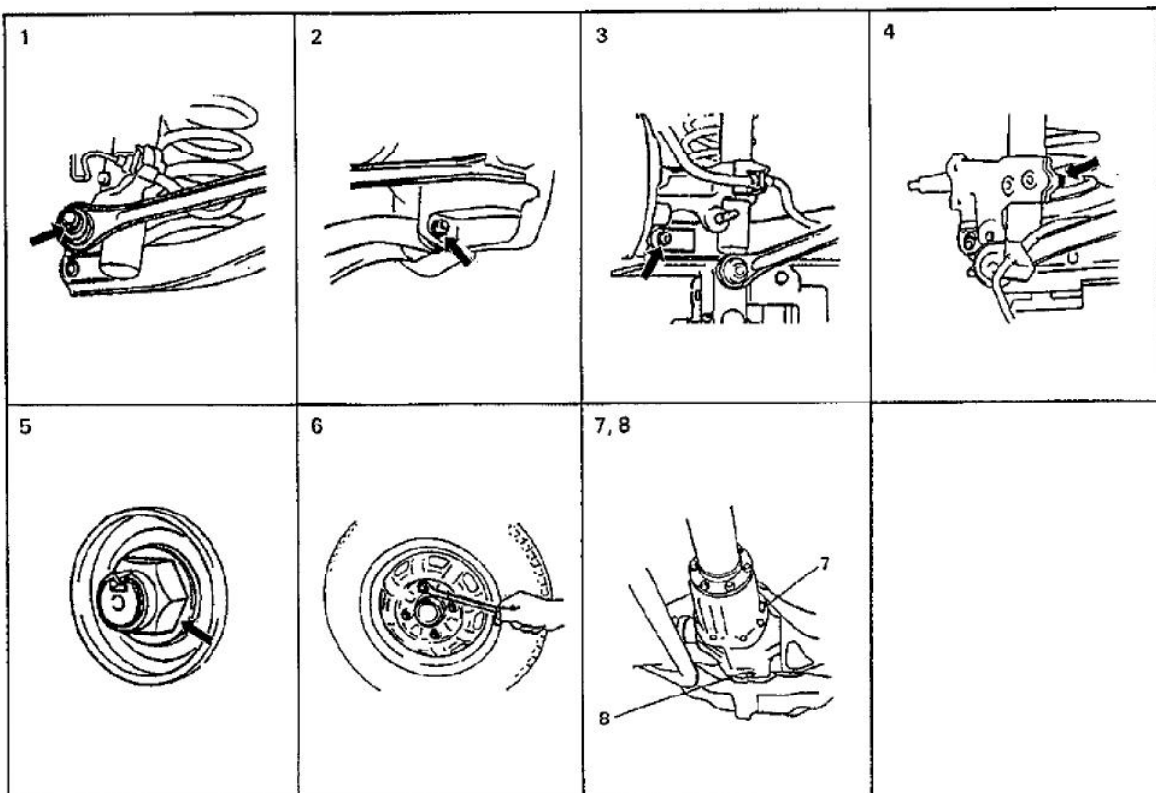


Fig. 4C-11

- Fill differential oil. (Refer to Section 7E.)

RECOMMENDED TORQUE SPECIFICATIONS

Fastener	Tightening torque		
	N·m	kg·m	lb·ft
1. Control rod nut (wheel nut)	70 – 90	7.0 – 9.0	51.0 – 65.0
2. Suspension arm rear nut	40 – 60	4.0 – 6.0	29.0 – 43.0
3. Knuckle arm lower mount nut	40 – 60	4.0 – 6.0	29.0 – 43.0
4. Strut lower mount bolt	50 – 70	5.0 – 7.0	36.5 – 50.5
5. Rear spindle nut	150 – 200	15.0 – 20.0	108.5 – 144.5
6. Wheel nut	50 – 70	5.0 – 7.0	36.5 – 50.5
7. Oil level plug	18 – 28	1.8 – 2.8	13.5 – 20.0
8. Oil drain plug	18 – 28	1.8 – 2.8	13.5 – 20.0



SECTION 6A

ENGINE MECHANICAL

CONTENTS

UNIT REPAIR OVERHAUL	6A-1
Engine Assembly	6A-1

UNIT REPAIR OVERHAUL

ENGINE ASSEMBLY

DISMOUNTING

1. Relieve fuel pressure according to procedure described in p. 6-3 SUPPLEMENTARY SERVICE MANUAL 99501-63B00-18E (for Electronic Fuel Injection model).
2. Remove battery cables at battery.
3. Remove engine hood panel.
4. Drain cooling system.
5. Remove battery and battery tray.
6. Remove air cleaner assembly.
7. Remove radiator with cooling fan.
8. Remove accelerator cable.
9. Remove electronic wire harness.
10. Disconnect clutch cable from transmission.
11. Disconnect shift and select cables from transmission.
12. Disconnect heater hoses.
13. Disconnect vacuum hoses.
14. Disconnect fuel hoses.
15. Remove exhaust pipe.
16. Remove front wheels.
17. Remove splash cover.
18. Remove stabilizer.
19. By using large size screwdrivers, pull out left drive shaft joint at differential side and right drive shaft joint at drive intermediate shaft so as to release snap ring fitting. Refer to SECTION 4.
20. Remove ball stud bolts and nuts from both side knuckles and detach suspension arms and then pull out both drive shaft joints from differential.
21. Separate propeller shaft No. 1 from transfer.
22. Support engine and remove engine mounting bolts and nuts.
23. Lower engine with transmission.

RECOUNTING

Reverse dismounting procedure for remounting and note follows.

- Tighten bolts and nuts to specified torque.

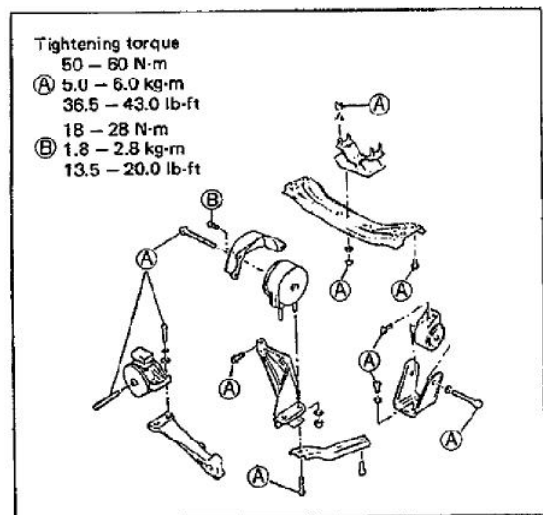


Fig. 6A-1

- Upon completion of installation, verify that there is no fuel leakage, water leakage or exhaust gas leakage at each connection.

SECTION 6C

ENGINE FUEL

CONTENTS

GENERAL DESCRIPTION	6C-1
Fuel System	6C-1
Fuel Pump	6C-2
Fuel Level Gauge	6C-2
ON CAR SERVICE	6C-3
Fuel Tank	6C-3

GENERAL DESCRIPTION

FUEL SYSTEM

The main components of the fuel system are fuel tank, fuel pump, circulation pump, fuel filter and main fuel level gauge, sub fuel level gauge and it includes three lines; fuel feed line, fuel return line and fuel vapor line.

Whether equipped with a canister in the fuel vapor line or not depends on the vehicle specifications.

Because the fuel tank of a four-wheel drive vehicle is configured in two sections, a circulation pump is provided inside the sub-tank so that fuel can be transferred from the sub-tank to the main tank. This prevents fuel from being left in one tank.

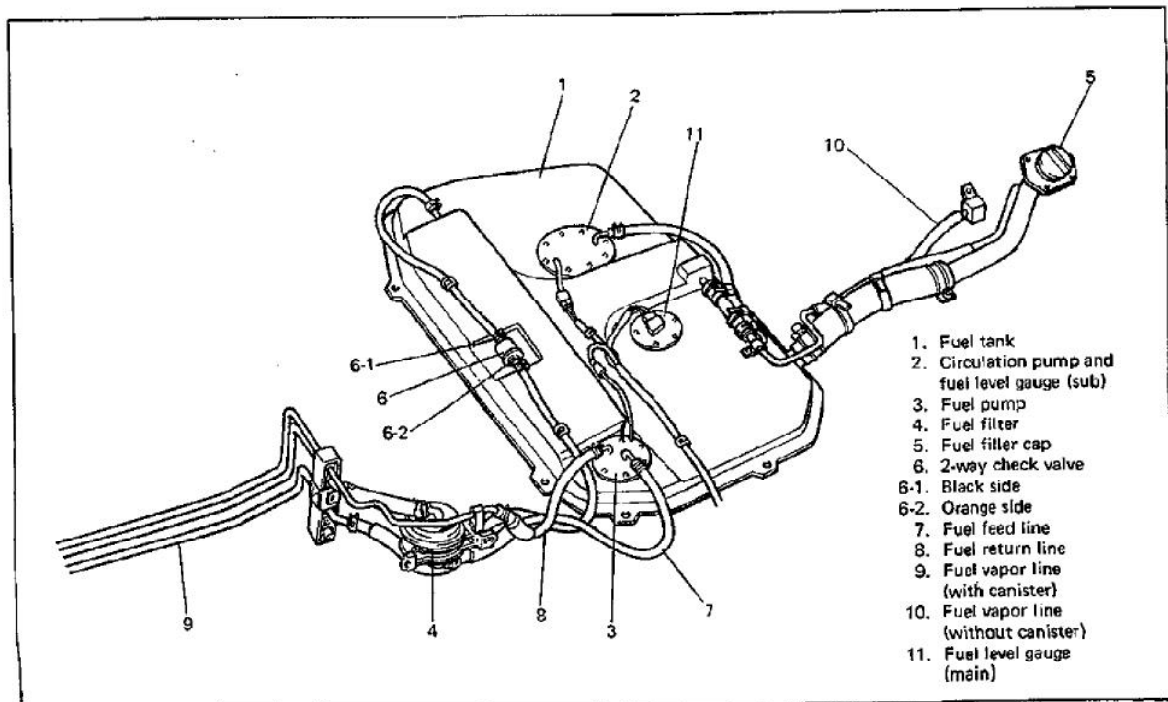


Fig. 6C-1 Fuel System

6C-2 ENGINE FUEL

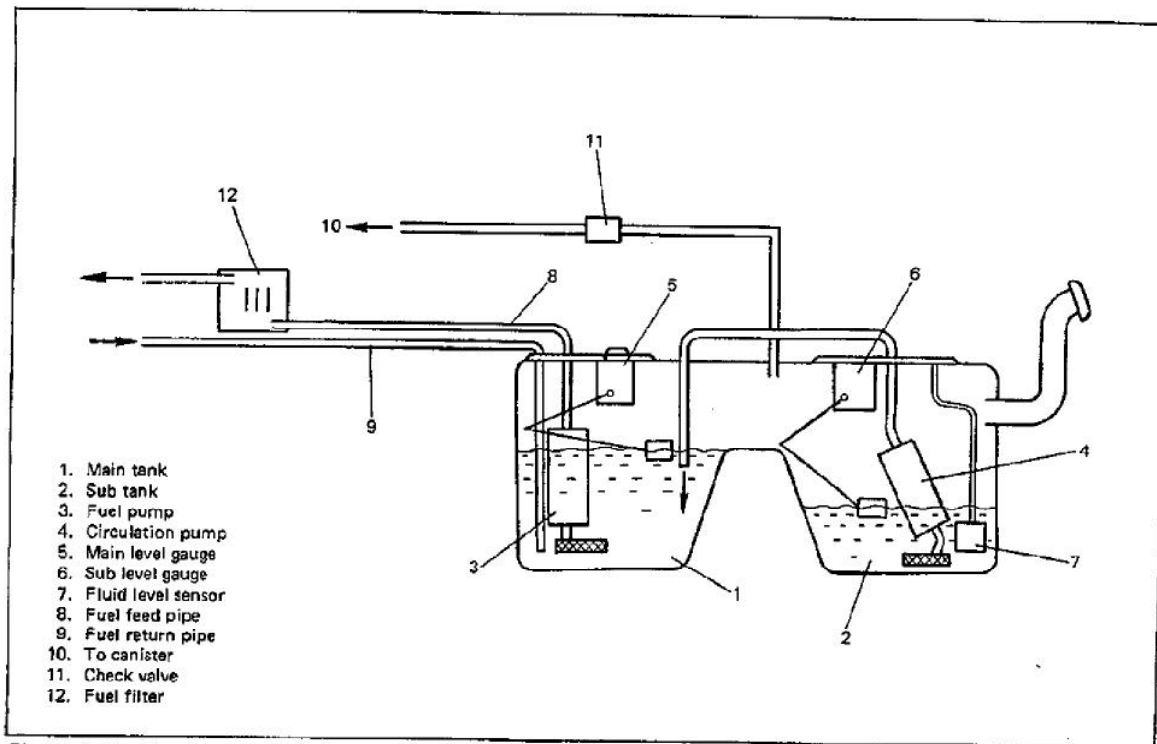


Fig. 6C-2 Fuel Lines

FUEL PUMP

The fuel pump and circulation pump are both housed inside the tank. When the fuel level rises above the fluid level sensor, the circulation pump operates when the ignition switch is turned on, and the fuel in the sub-tank is supplied to the main tank. The fuel pump operates simultaneously with the startup of the engine, so that fuel is supplied to the engine. When the level of fuel in the sub-tank drops below the operation level of the fluid level sensor, the relay operates, and the circulation pump stops. If, because of the swaying of the car or for other reasons, fuel spills from the main tank back into the sub-tank, raising the level there above the sensor level the circulation pump begins to operate again.

FUEL LEVEL GAUGE

The fuel meter indication is displayed by means of compound resistance value deriving from two fuel level gauges connected in series. In other words, the value indicated on the meter is the averaged value of the fuel level in the main tank and that in the sub-tank.

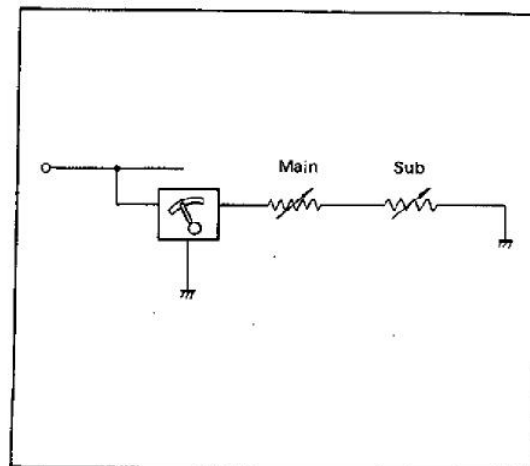


Fig. 6C-3

ON CAR SERVICE

FUEL TANK

REMOVE OR DISCONNECT

1. Relieve fuel pressure in fuel feed line according to procedure described on p. 6-3 of SF413 Supplementary Service Manual (for EPI model).
2. Negative cable at battery.
3. Rear seat cushion referring to SECTION 9.
4. Fuel level gauge (main & sub), fuel pump and circulation pump lead wire couplers, and detach wire tape.

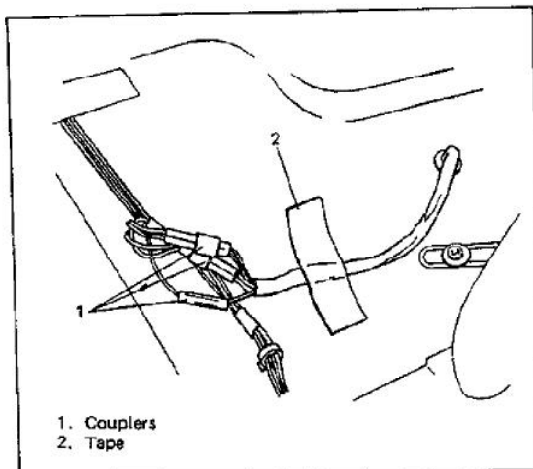


Fig. 6C-4 Disconnecting Couplers

5. Hoist car.
6. Fuel filler hose and breather hose from filler neck.

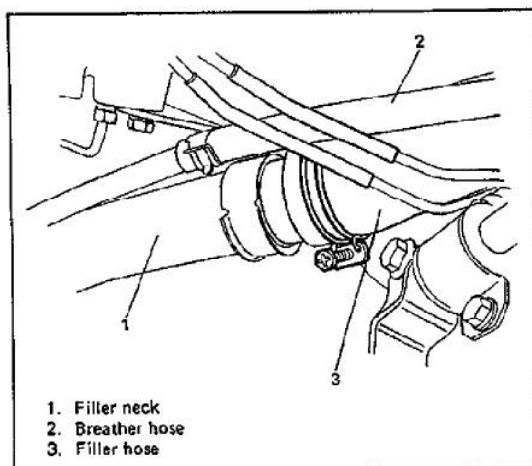


Fig. 6C-5 Breather and Filler Hoses

7. As fuel tank has no drain plug, drain fuel tank by pumping fuel out through fuel tank filler.

Use hand operated pump device to drain fuel tank.

CAUTION:

Never drain or store fuel in an open container to avoid possibility of fire or explosion.

8. Fuel hoses from filter and pipes.

WARNING:

A small amount of fuel may be released after the fuel hose is disconnected. In order to reduce the chance of personal injury, cover the hose and pipe to be disconnected with a shop cloth. Be sure to put that cloth in an approved container when disconnection is completed.

9. Propeller shaft No. 3, refer to Section 4B.
10. After draining rear differential oil, viscous coupling case from rear differential case.
11. Fuel tank heat protector from body.

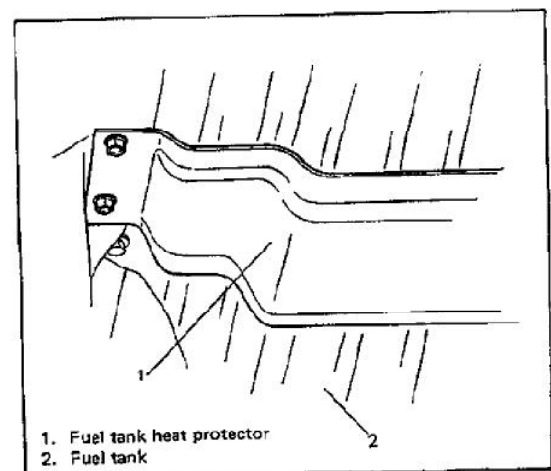


Fig. 6C-6

12. Fuel tank from car.

INSTALLATION

Reverse removal procedure for installation.

SECTION 6K

EXHAUST SYSTEM

CONTENTS

GENERAL DESCRIPTION	6K-1
MAINTENANCE	6K-2
ON CAR SERVICE	6K-2

NOTE:

The catalytic converter is provided or not depending on specification.

GENERAL DESCRIPTION

The exhaust system consists of an exhaust manifold, an exhaust center pipe, a muffler, a tail pipe, and seals and gaskets etc., and the exhaust center pipe has the catalytic converter.

The catalytic converter is an emission control device added to the exhaust system to lower the

levels of Hydrocarbon (HC), Carbon Monoxide (CO), (and Oxides of Nitrogen (NOx)) pollutants in the exhaust gas.

THE CATALYTIC CONVERTER REQUIRES USE OF UNLEADED FUEL ONLY.

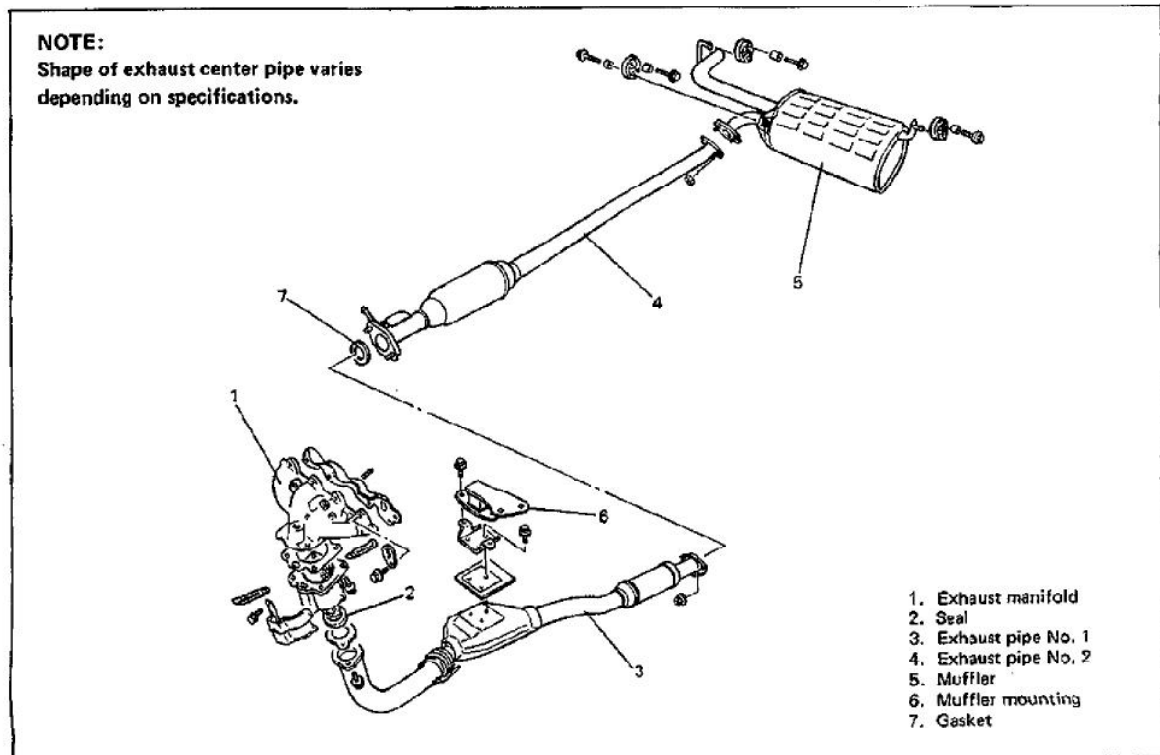


Fig. 6K-1 Exhaust System

MAINTENANCE

WARNING:

To avoid the danger of being burned, do not touch the exhaust system when the system is hot. Any service on the exhaust system should be performed when the system is cool.

At every interval of periodic maintenance service, and when car is raised for other service, check exhaust system as follows:

- Check rubber mountings for damage, deterioration, and out of position.
- Check exhaust system for leakage, loose connection, dent and damage.
If bolts or nuts are loosened, tighten them to specified torque. Refer to "ON CAR SERVICE" for torque data.
- Check nearby body areas for damaged, missing, or mispositioned part, open seam, hole, loose connection or any other defect which could permit exhaust fumes to seep into car.
- Make sure that exhaust system components have enough clearance from underbody to avoid overheating and possible damage to passenger compartment carpet.
- Any defect should be fixed at once.

ON CAR SERVICE

- Refer to Section 6A for removal and installation procedures of exhaust manifold.
- For replacement of center pipe, muffler, tail pipe or any part used to mount or connect them, be sure to hoist car and observe WARNING given at the left of this page.

CAUTION:

As muffler center pipe has catalytic converter in it, it should not be exposed to any impulse. Be careful not to drop it or hit it against something.

- When exhaust manifold is removed, check gaskets and seal for deterioration or damage. Replace them as necessary.
- Tighten bolts and nuts to specified torques when reassembling.
Refer to Fig. 6K-2 for location of bolts and nuts.

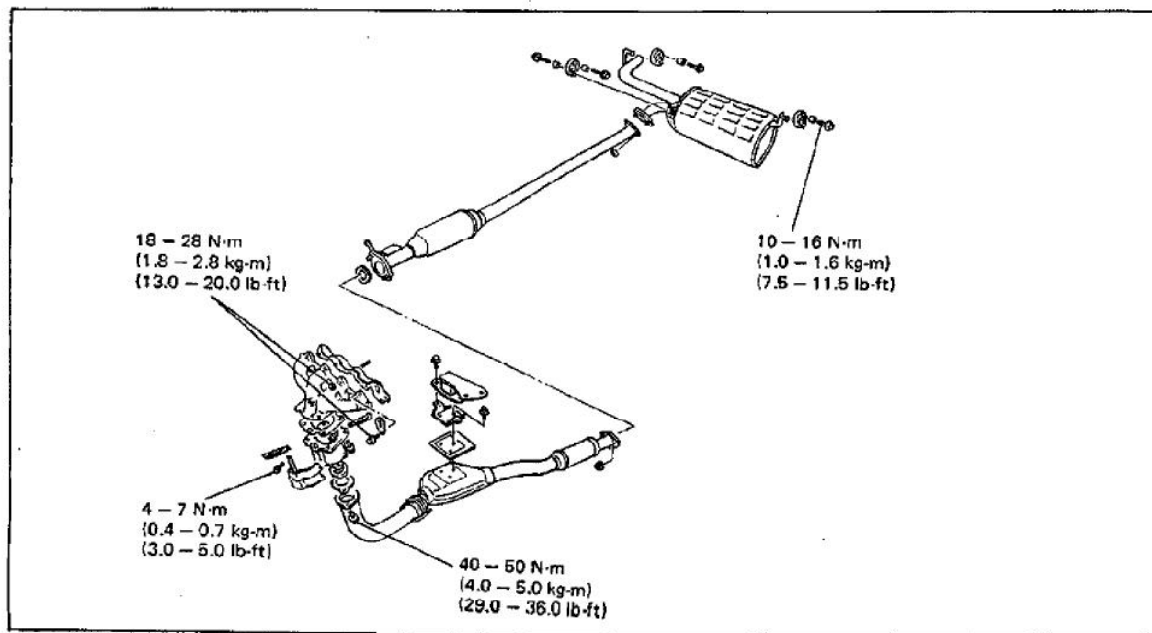


Fig. 6K-2 Recommended Torque Specification

SECTION 7A

MANUAL TRANSMISSION

CONTENTS

<p>GENERAL DESCRIPTION 7A- 1</p> <p>DIAGNOSIS 7A- 6</p> <p>ON-CAR SERVICE 7A- 7</p> <p style="padding-left: 20px;">Oil Change 7A- 7</p> <p style="padding-left: 20px;">Differential Side Oil Seal 7A- 7</p> <p style="padding-left: 20px;">Gear Shift Control 7A- 9</p> <p style="padding-left: 20px;">Speedometer Driven Gear 7A-10</p> <p>UNIT REPAIR OVERHAUL 7A-11</p> <p style="padding-left: 20px;">Dismounting of Transmission 7A-11</p> <p style="padding-left: 20px;">Remounting 7A-12</p> <p style="padding-left: 20px;">Removal of Transfer ass'y & Differential 7A-13</p> <p style="padding-left: 20px;">Disassembling Unit 7A-13</p>	<p style="padding-left: 20px;">Sub Assembly Service 7A-16</p> <p style="padding-left: 40px;">Right case 7A-16</p> <p style="padding-left: 40px;">Left case 7A-16</p> <p style="padding-left: 20px;">Input shaft assembly 7A-17</p> <p style="padding-left: 20px;">Countershaft assembly 7A-20</p> <p style="padding-left: 20px;">Gear shifter 7A-23</p> <p style="padding-left: 20px;">Assembling Unit 7A-25</p> <p style="padding-left: 40px;">Fifth gears 7A-26</p> <p style="padding-left: 40px;">Gear shift & select shaft assembly . 7A-29</p> <p>RECOMMENDED TORQUE</p> <p>SPECIFICATIONS 7A-31</p> <p>REQUIRED SERVICE MATERIALS .. 7A-32</p> <p>SPECIAL TOOLS 7A-32</p>
---	---

GENERAL DESCRIPTION

CONSTRUCTION AND SERVICING

The transmission provides five forward speeds and one reverse speed by means of three synchronizers and three shafts — input shaft, countershaft and reverse gear shaft. All forward gears are in constant mesh, and reverse uses a sliding idler gear arrangement.

The low speed synchronizer is mounted on counter shaft and engaged with counter shaft first gear or second gear, while the high speed synchronizer is done on input shaft and engaged with input shaft third gear or fourth gear.

The fifth speed synchronizer on input shaft is engaged with input shaft fifth gear mounted on the input shaft.

The countershaft turns the final gear and differential assembly, thereby turning the front drive shafts which are attached to the front wheels.

For servicing, it is necessary to use genuine sealant or its equivalent on mating surfaces of transmission case which is made of aluminum. The case fastening bolts must be tightened to specified torque by means of torque wrench. It is also important that all parts are thoroughly cleaned with cleaning fluid and air dried before reassembling.

Further, care must be taken to adjust preload of counter shaft taper roller bearings. New synchronizer rings are prohibited from being lapped with respective gear cones by using lapping compound before they are assembled.

7A-2 MANUAL TRANSMISSION

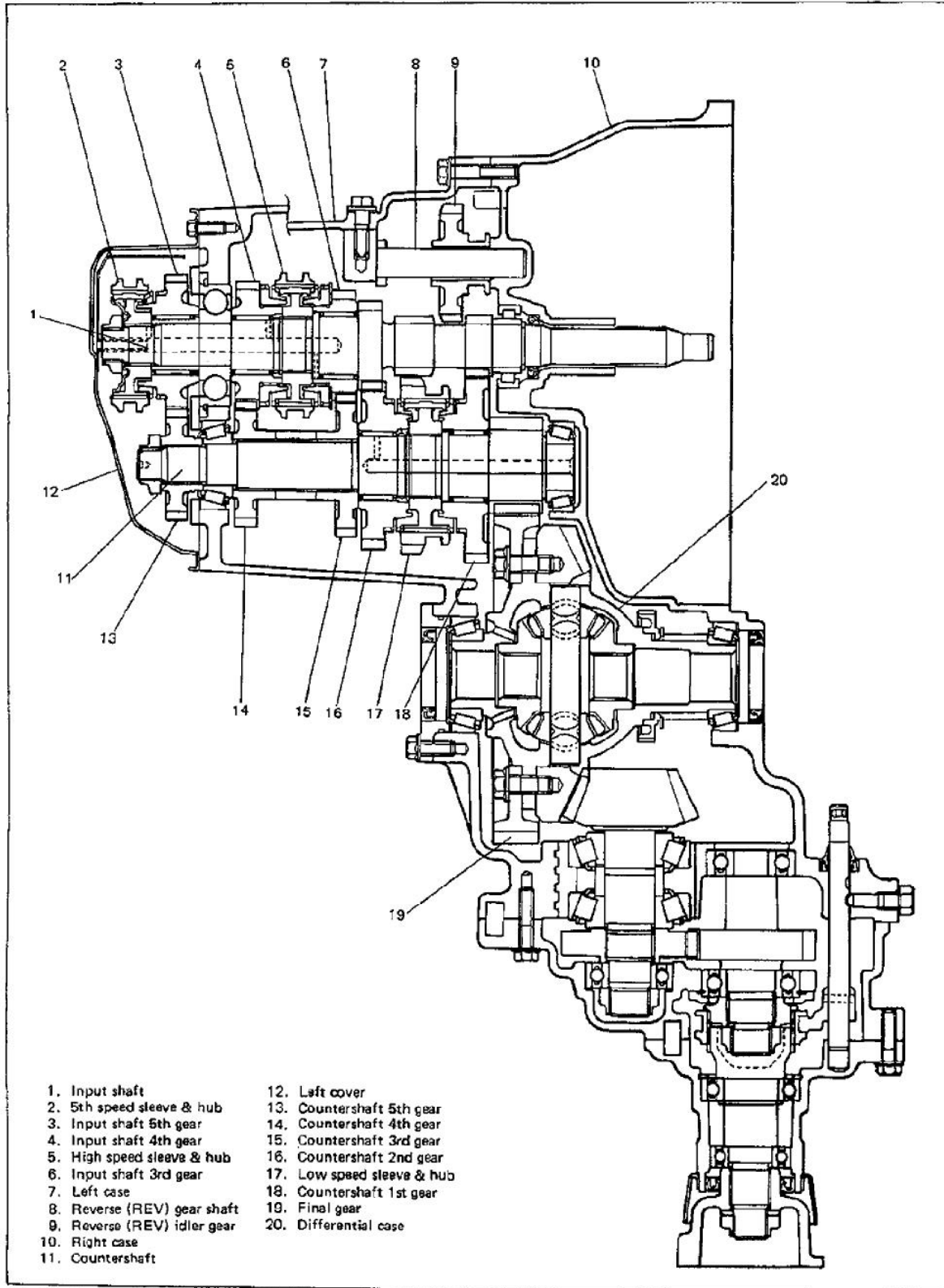


Fig. 7A-1 Manual Transmission Cutaway

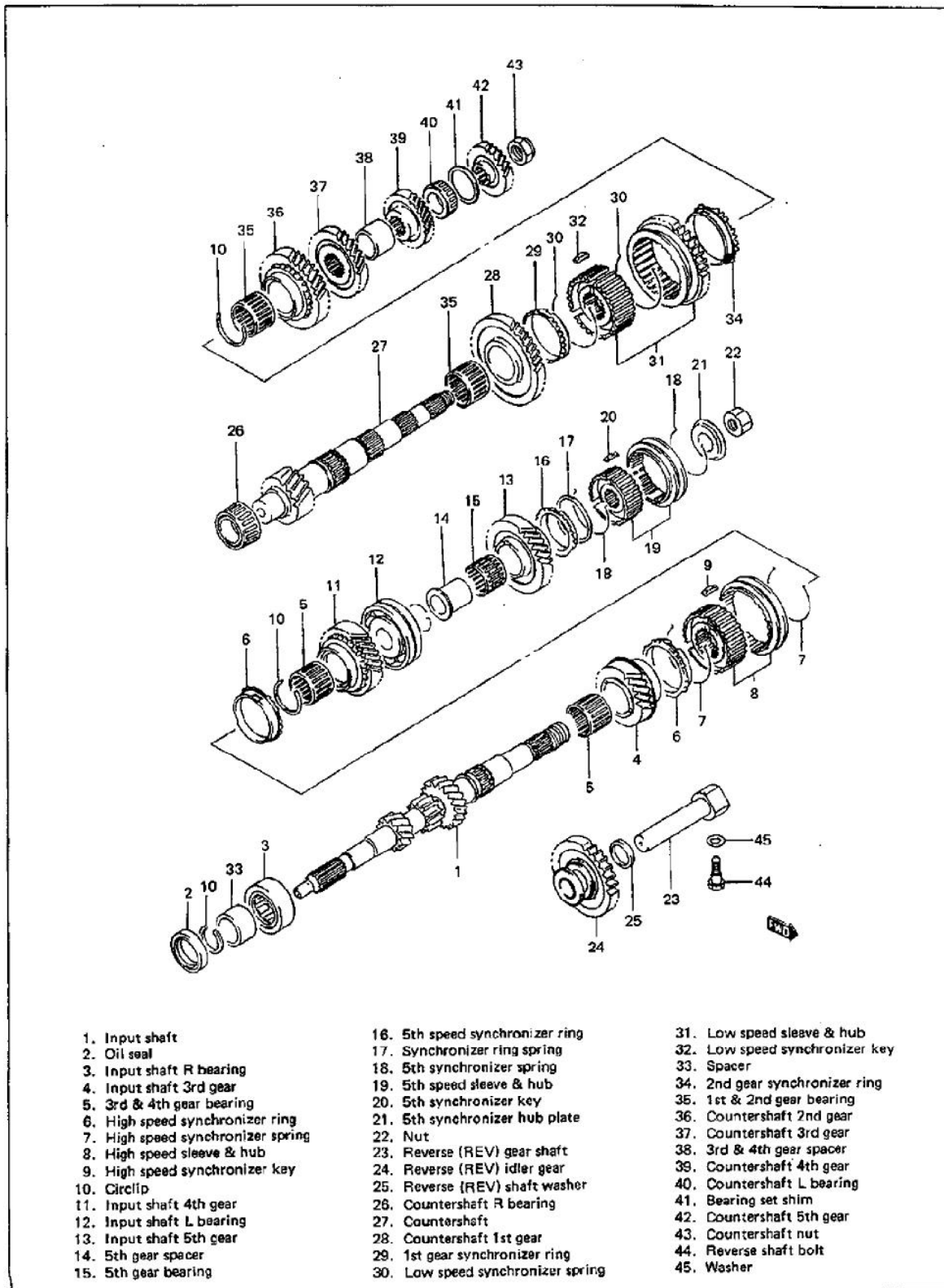


Fig. 7A-2 Manual Transmission Exploded View

GEAR SHIFT MECHANISM

The gear shifting control system consists of following main parts. Movement of gear shift

control lever is transmitted to gear shift & select shaft through gear shift and gear select cables.

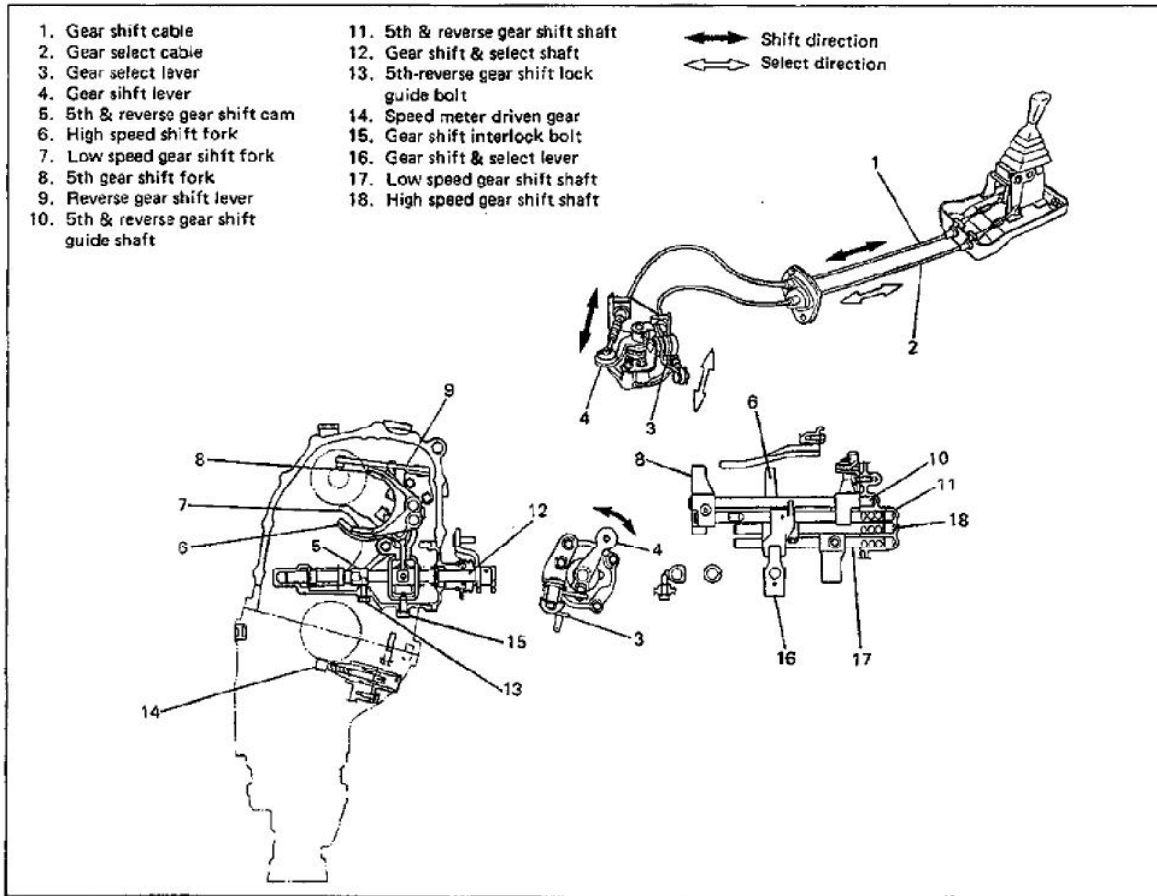


Fig. 7A-3 Gear Shifting Mechanism

5TH & REVERSE GEAR SHIFT CAM

5th & reverse gear shift cam, cam guide return spring and 5th to reverse interlock guide bolt are provided to prevent the gear from being directly shifted from 5th to reverse.

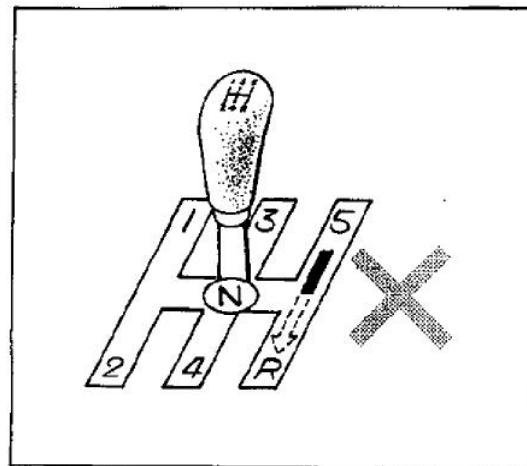


Fig. 7A-4 Gear Shifting Pattern

1. When shift lever is at neutral position between 3rd and 4th gear, shift cam is under guide bolt and can turn freely clockwise (to 3rd gear) and counterclockwise (to 4th gear).

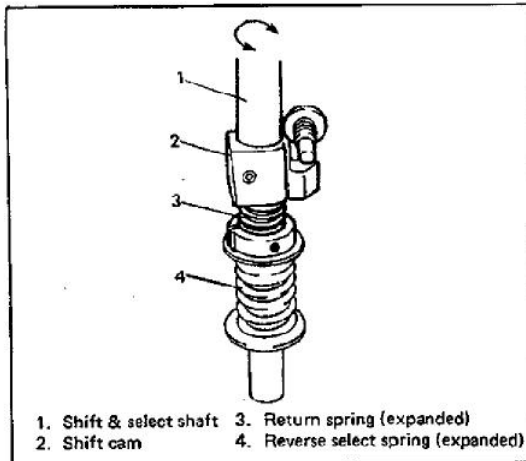


Fig. 7A-5 Neutral of 3rd - 4th Position

2. When shift lever is shifted toward the right from neutral position, shift and select shaft moves up but shift cam is restricted by guide bolt and return spring is contracted.

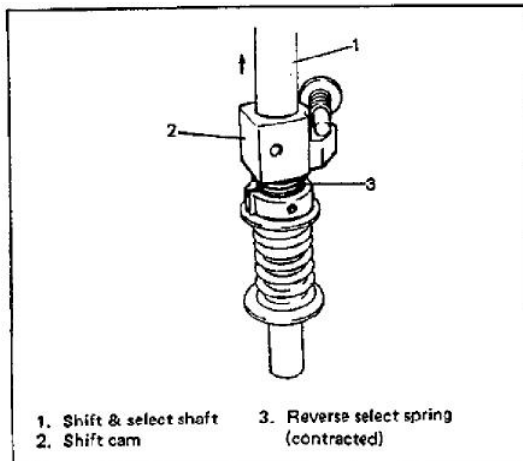


Fig. 7A-6 Neutral of 5th - REV Position

3. When shift lever is shifted to 5th gear, shift & select shaft turns clockwise letting shift cam off from guide bolt and pushed up by return spring. In this state, movement of shift cam is restricted by guide bolt and therefore, gear-shift to reverse is not attainable.

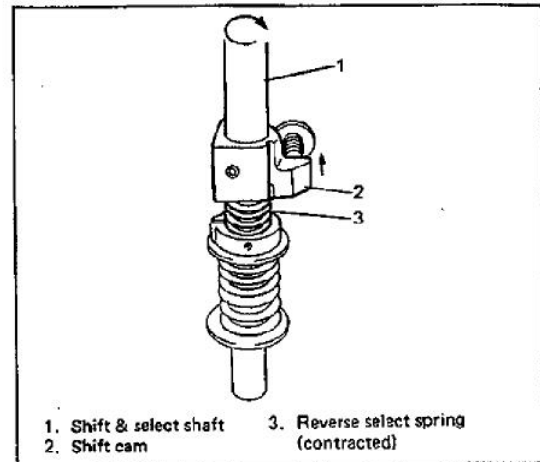


Fig. 7A-7 Shifted in 5th Speed

4. When shift lever is shifted from neutral position between 5th gear and reverse gear to reverse gear, shift cam turns counterclockwise to attain reverse gear.

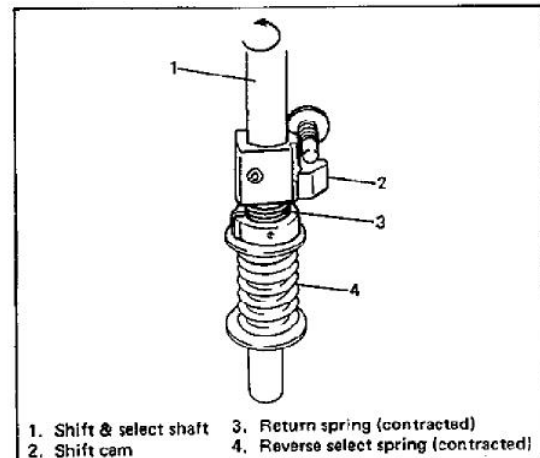


Fig. 7A-8 Shifted in Reverse

DIAGNOSIS

Condition	Possible cause	Correction
Gears slipping out of mesh	<ul style="list-style-type: none"> ● Worn shift fork shaft ● Worn shift fork or synchronizer sleeve ● Weak or damaged locating springs ● Worn bearings on input shaft or countershaft ● Worn chamfered tooth on sleeve and gear 	Replace Replace Replace Replace Replace sleeve and gear
Hard shifting	<ul style="list-style-type: none"> ● Inadequate lubricant ● Improper clutch pedal free travel ● Distorted or broken clutch disc ● Damaged clutch pressure plate ● Worn synchronizer ring ● Worn chamfered tooth on sleeve or gear ● Worn gear shift control shaft joint bush ● Distorted shift shaft 	Replenish Replace clutch arm or master cylinder Replace Replace clutch cover Replace Replace sleeve or gear Replace Replace
Noise	<ul style="list-style-type: none"> ● Inadequate or insufficient lubricant ● Damaged or worn bearing(s) ● Damaged or worn gear(s) ● Damaged or worn synchronizer parts 	Replenish Replace Replace Replace

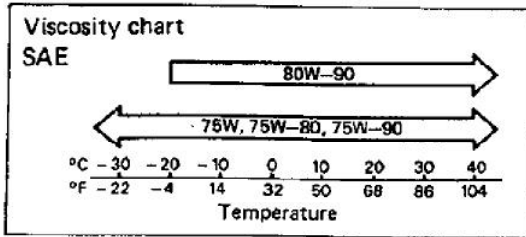
ON-CAR SERVICE

OIL CHANGE

1. Before changing or inspecting oil, be sure to stop engine and lift car horizontally.
2. With car lifted up, check oil level and leakage. If leakage exists, correct it.
3. Drain old oil and fill new specified oil as in the following table by specified amount (up to level hole).
4. Torque drain and level/filler plugs as specified below. Apply sealant to drain plug before installation.

NOTE:

- It is recommended to use API GL-4 SAE 75W-90 gear oil.
- Whenever car is hoisted for any other service work than oil change, also be sure to check for oil leakage.



Oil specification	API GL-4 or GL-5 For SAE classification, refer to above viscosity chart.
Oil capacity	4.5 liters 9.5/7.9 US/Imp. pt

Tightening torque	N-m	kg-m	lb-ft
Filler/level plug	36 - 54	3.6 - 5.4	26.5 - 39.0
Drain plug	25 - 30	2.5 - 3.0	18.5 - 21.5

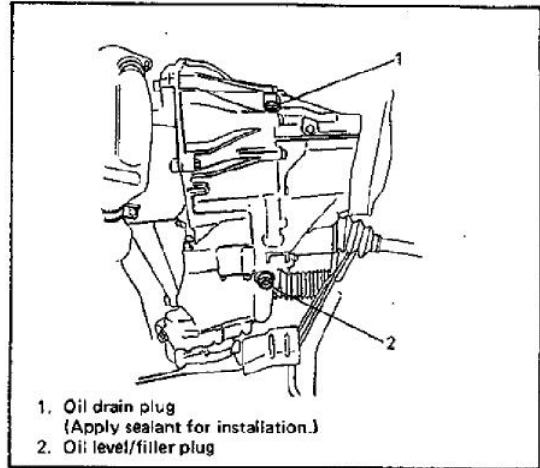


Fig. 7A-9 Changing Transmission Oil

DIFFERENTIAL SIDE OIL SEAL REPLACEMENT

1. Lift up car and drain transmission oil.
2. Remove ball stud bolt and nut, and then separate suspension arm from knuckle.

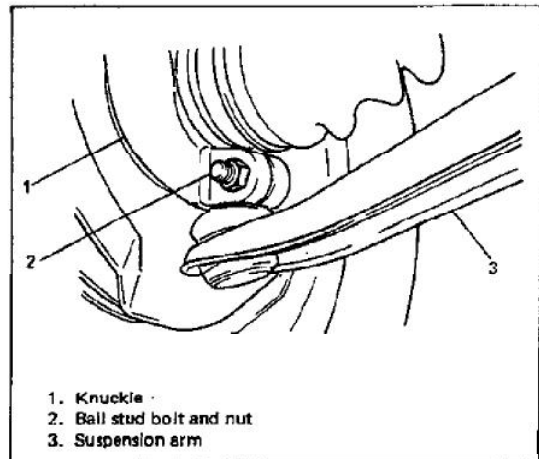


Fig. 7A-10 Detaching Suspension Arm from Knuckle

- 3. • In case of left side oil seal removal:
By using large size screwdrivers, pull out left side drive shaft joint so as to release snap ring fitting of joint spline at differential side. Remove bearing retainer.

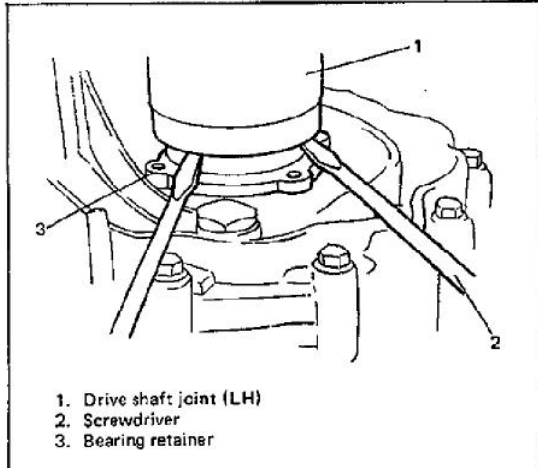


Fig. 7A-11 Detaching Left Side Drive Shaft Joint from Differential Gear

- In case of right side oil seal removal:
After removing center bearing support bolts, pull out center drive shaft from differential gear.

- 4. Pushing knuckle portion outward, detach drive shaft at differential side.
- 5. Remove oil seal and install a new one until it becomes flush with case surface by using special tool and hammer.

NOTE:

When install oil seal, face its spring side inward.

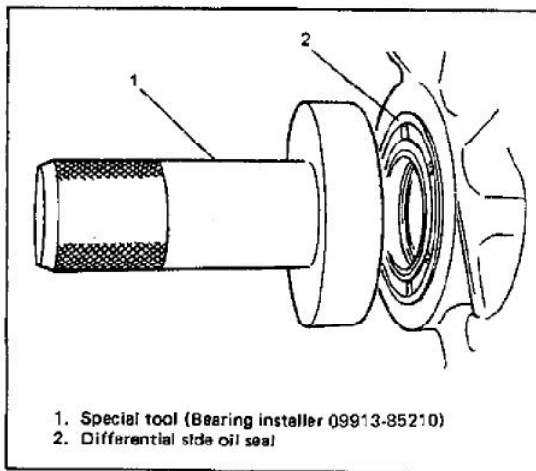


Fig. 7A-12 Installing Differential Side Oil Seal

- 6. Apply grease to oil seal lip and at the same time check drive shaft where oil seal contacts and make sure of its smoothness.
- 7. Insert left side drive shaft joint or center drive shaft to differential gear.
With right side drive shaft, install center bearing support.

Tightening torque of support bolt	N-m	kg-m	lb-ft
	40 - 60	4.0 - 6.0	29.0 - 43.0

CAUTION:

- Be careful not to scratch oil seal lip with drive shaft joint while inserting.
- Make sure to insert drive shaft joint fully and seat its snap ring as it was.
- Do not hit joint boot with hammer or the like. Nothing but hands is allowed to use when inserting joint.

- 8. Connect ball stud with knuckle and fasten with bolt to specification.

Tightening torque	N-m	kg-m	lb-ft
Ball stud bolt and nut	50 - 70	5.0 - 7.0	36.5 - 50.5

- 9. Fill transmission oil as specified and make sure that oil has been sealed with oil seal.

GEAR SHIFT CONTROL

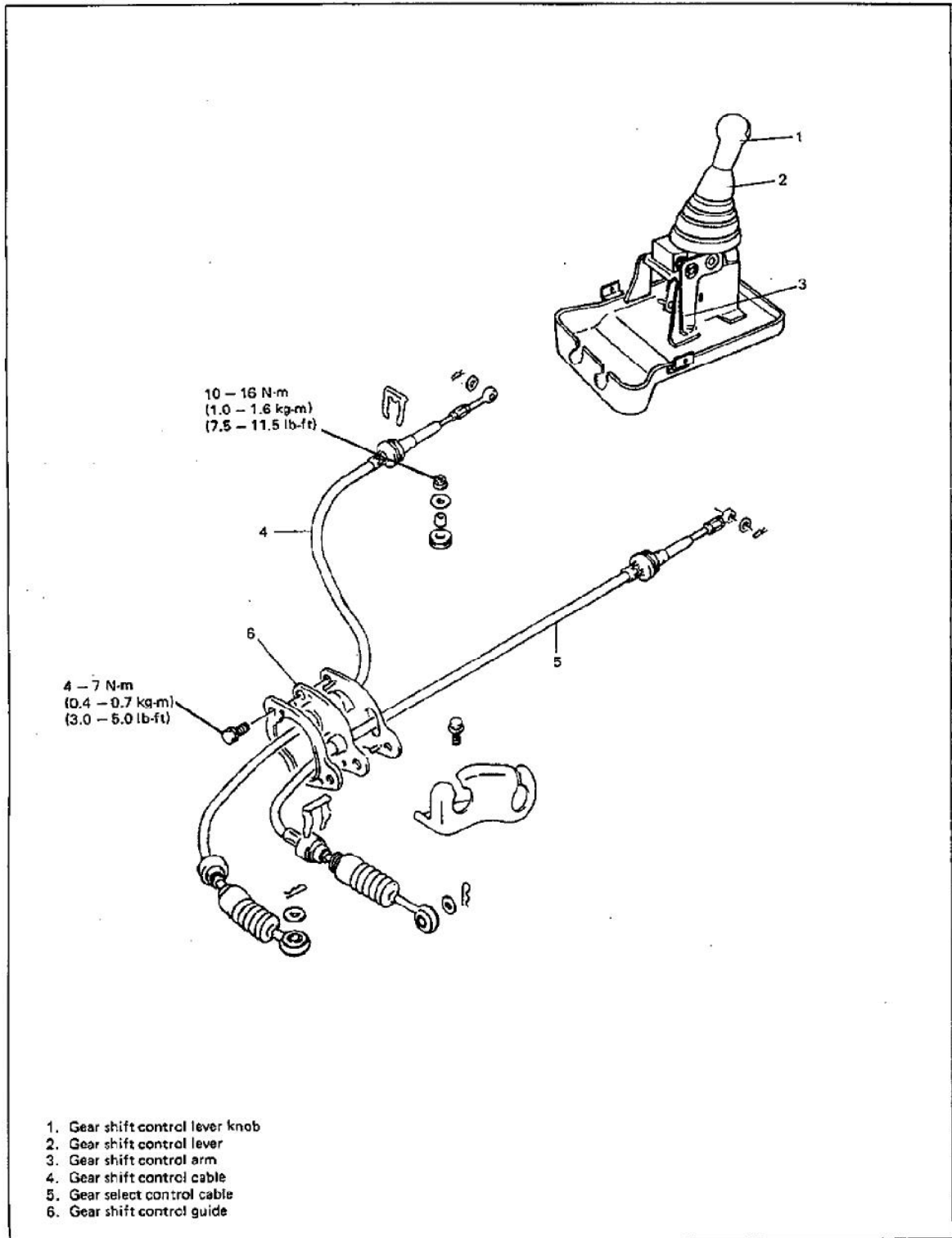


Fig. 7A-13 Gear Shift Control Components

REMOVAL

1. Remove console box and E-ring.
2. Remove shift control and select control cables.
3. Remove gear control guide.

INSTALLATION

Reverse removal procedure for installation and note as follows.

- Adjustment of shift cable.
With shift lever in NEUTRAL position, adjust shift cable adjusting nut so that distance "A" between edge of instrument panel above ashtray and center of shift knob measured as shown below is 270 mm.

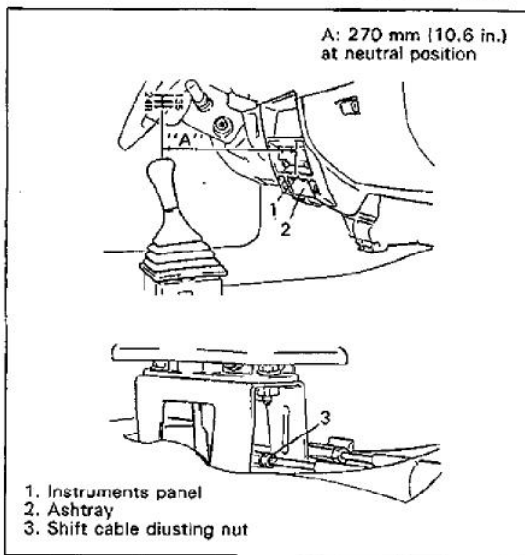


Fig. 7A-14

- Adjustment of select cable.
With shift lever in NEUTRAL position, adjust select cable adjusting nut so that front side end surface (A) of select arm and rear side line of rib (B) are aligned.

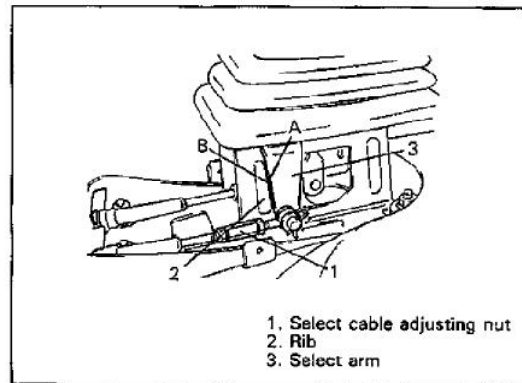


Fig. 7A-15

SPEEDOMETER DRIVEN GEAR**REMOVAL**

1. Pull up speedometer cable boot, pull out speedometer case clip and then disconnect speedometer cable from case.
2. Remove bolt and pull out speedometer driven gear case assembly by hand.
3. Using pin remover of 2.8 – 3.0 mm (0.11 in) diameter, drive out spring pin and then take out speedometer driven gear.
4. Remove oil seal by using special tools (Bearing remover and sliding hammer) holding flat portion of driven gear case by soft jawed vise.

INSTALLATION

1. Apply grease to a new oil seal and install it to case bore up to the bottom with its spring side facing down. Valve guide remover may be used for installation.
2. Check driven gear for abnormal wear or distortion and insert good one into case after applying oil.
3. Install spring pin supporting flat portion of case by wood block, and then make sure that gear rotates smoothly.
4. Check O-ring and case surface for their flawlessness, apply oil to O-ring and then install case assembly to transmission.
5. Connect cable, set case clip and boot as they were.

CAUTION:

- Do not compress oil seal excessively so as to prevent its distortion.
- Never hit driven gear and gear case.
- While inserting case assembly into transmission, rotate driven gear by using small screwdriver so that gear will mesh smoothly.
- Never push or hit slit portion of case when installing it to transmission.

Tightening torque for case bolt	N-m	kg-m	lb-ft
	4-7	0.4-0.7	3.0-5.0

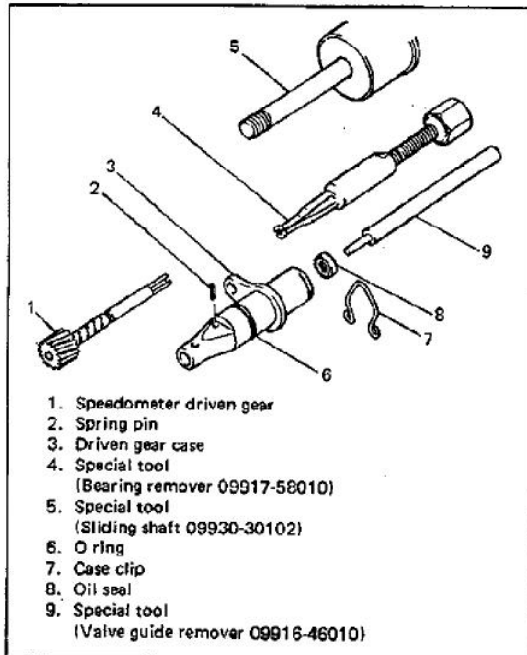


Fig. 7A-16 Speedometer Driven Gear

6. Make sure that oil level is as specified.

UNIT REPAIR OVERHAUL

DISMOUNTING OF TRANSMISSION

UNDER HOOD

1. Disconnect battery ground cable and then remove battery and its tray.
2. Remove clutch operating cylinder from M/T.
3. Remove E-ring, shift and select cables from control cable bracket.

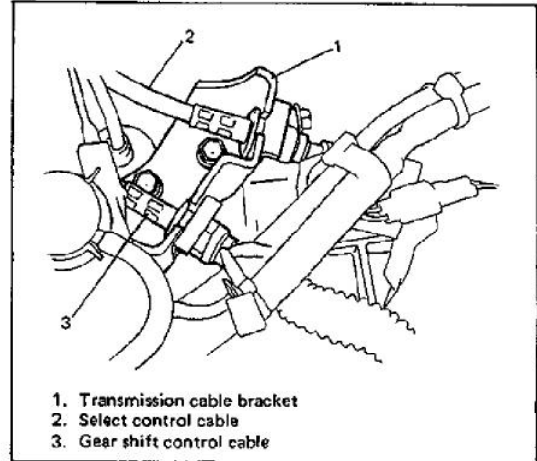


Fig. 7A-18 Removing Rear Portion

4. Undo wiring harness clamps and couplers.
5. Take off speedometer cable boot, speedometer case clip and then speedometer cable from case.
6. Remove transmission fastening bolts.
7. Remove starter taking out its 2 bolts. Starting motor plate should also come down.
8. Hook chain between engine and strut support and prevent engine from being declined excessively at removal of mounting supports.

ON LIFT

1. Drain transmission oil.
2. Remove left front wheel and left side fender apron extension.
3. Remove exhaust pipe No.1 and No.2.

12. Remove clutch housing lower plate.
13. Remove ball stud bolt and nut from right and left knuckles, then disconnect each suspension arm.
14. By using large size screwdrivers, pull out left drive shaft joints at differential side so as to release snap ring fitting of joint.

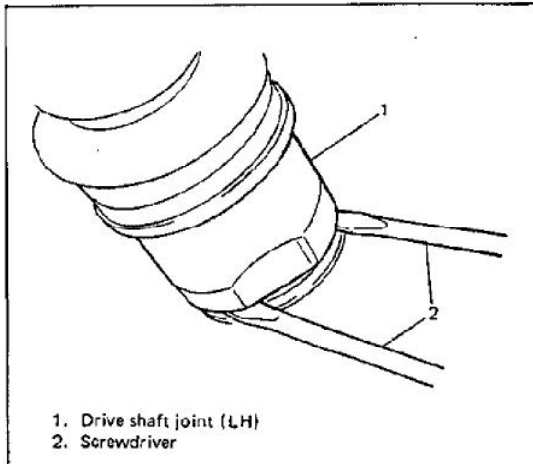


Fig. 7A-19 Detaching Snap Ring From Differential

15. Remove center bearing support mounting bolts and center drive shaft.

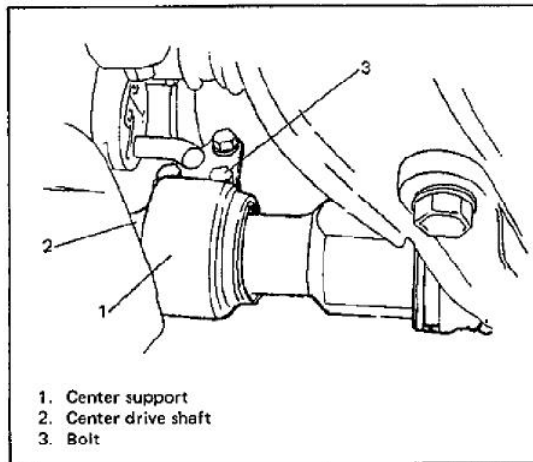


Fig. 7A-20

16. Support engine by using hoist.
17. Remove transmission stiffener.
18. Remove transmission to engine bolt and nut.
19. Remove engine rear mounting bracket bolt.
20. Support transmission with transmission jack.

21. Remove engine mounting LH bracket and its stiffener.
22. Check all around transmission for any other parts required to be removed or disconnected for removal of transmission and remove or disconnect whatever necessary.
23. Pull transmission out so as to disconnect input shaft from clutch disc and then lower it.

REMountING

For remounting, reverse dismounting procedure. Use specified torque as given below.

Tightening torque	N-m	kg-m	lb-ft
• Transmission to engine bolts and nuts			
• Engine rear mounting bracket bolts	40	4.0	29.0
• Engine mounting LH bracket bolts	60	6.0	43.0
• Center bearing support bolts			
Engine mounting LH bracket nuts	50 60	5.0 6.0	36.5 43.0
Ball stud bolt and nut	50 70	5.0 7.0	36.5 50.5
Extension rod nut	25 40	2.5 4.0	18.5 28.5
Gear shift control shaft bolt and nut	15 20	1.5 2.0	11.0 14.5
Exhaust pipe to manifold bolts	40 50	4.0 5.0	29.0 36.0
Exhaust pipe to muffler mounting nuts	35 45	3.5 4.5	25.5 32.5

- When installing engine mounting LH bracket bolt (upper side), apply sealant (SUZUKI BOND NO. 1215) to thread part.
- Push in each drive shaft joint fully so as to snap ring of shaft engages with differential gear.

NOTE:

Apply grease to gear shift control shaft bushes, however, DO NOT lubricate extension rod bush.

CAUTION:

- Care should be taken not to scratch oil seal lip with drive shaft while raising transmission.
- Do not hit drive shaft joint with hammer when installing it into differential gear.

- Set each clamp for wiring securely.
- After connecting clutch cable, be sure to adjust its play properly (Refer to SECTION 7C1).

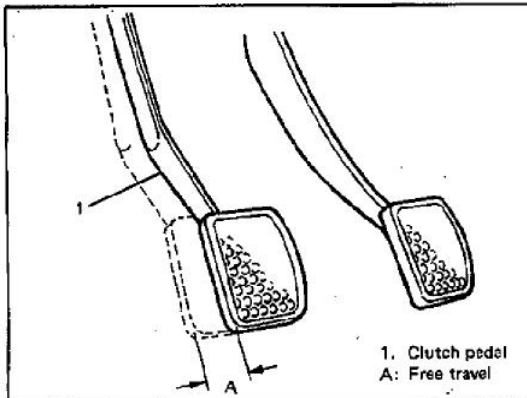


Fig. 7A-21 Adjusting Clutch Play

- Fill transmission with oil as specified.
- Connect battery and check function of engine, clutch and transmission.

REMOVAL OF TRANSFER & DIFFERENTIAL

1. Remove differential side bearing retainer.

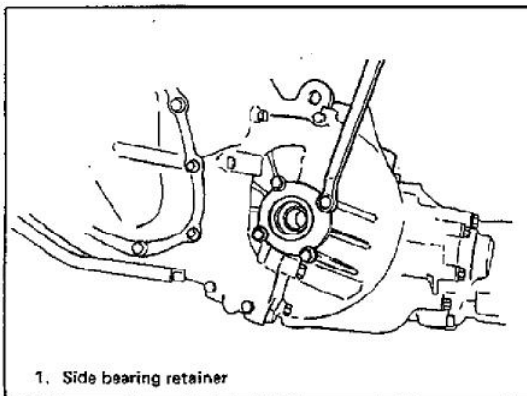


Fig. 7A-21-1

2. Remove speedometer driven gear case.
3. Remove transfer assembly & differential from M/T.

CAUTION:

Be careful not to damage gear teeth surface.

For servicing of transfer assembly & differential, refer to SECTION 7D.

Reverse removal procedure for installation.

DISASSEMBLING UNIT

1. Remove gear shift interlock bolt and 5th to REV interlock guide bolt from transmission case.
2. Remove gear shift & select shaft assembly.

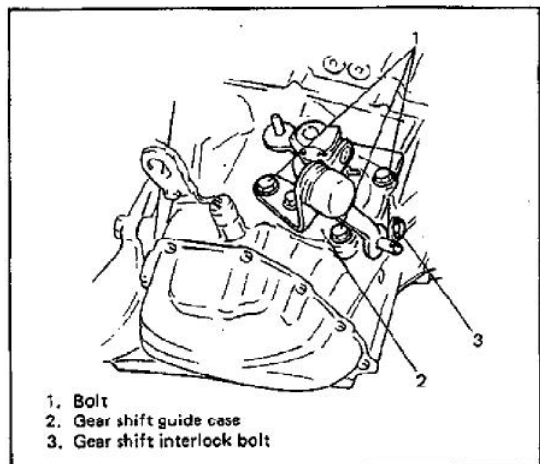


Fig. 7A-22

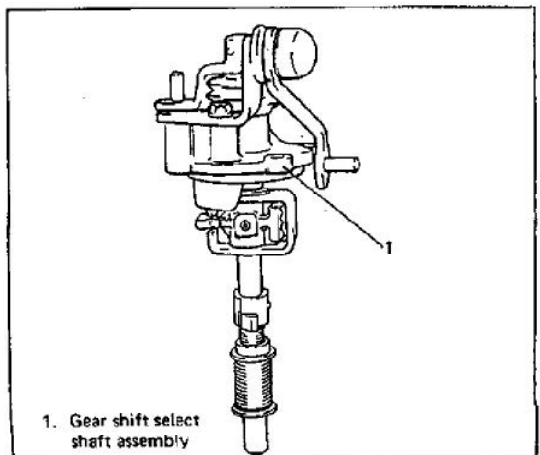


Fig. 7A-23

3. Remove transmission side cover.

CAUTION:

Care should be taken not to distort side cover when it is removed from left case.

4. Engage gear double meshing to loosen counter shaft and input shaft nuts.

5. Remove shaft nuts and then hub plate.

NOTE:

Do not hammer when loosening nuts.

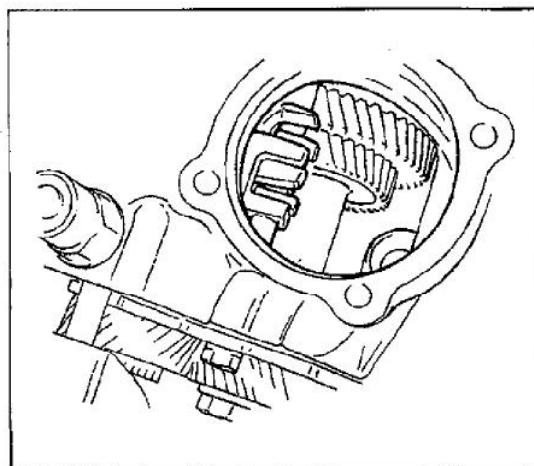


Fig. 7A-24

6. Remove 5th shift fork plug and guide ball.

7. Remove circlip and C-ring.

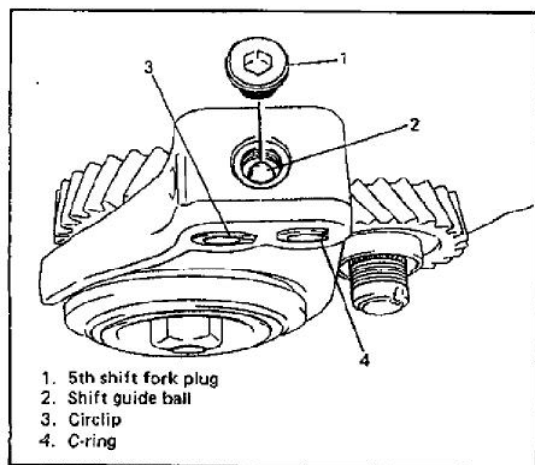


Fig. 7A-25

8. Remove gear shift fork, sleeve & hub assembly, synchronizer ring spring, synchronizer ring and 5th gear all together. Gear puller is required for this work.

CAUTION:

Be careful not to pinch synchronizer ring spring when removing.

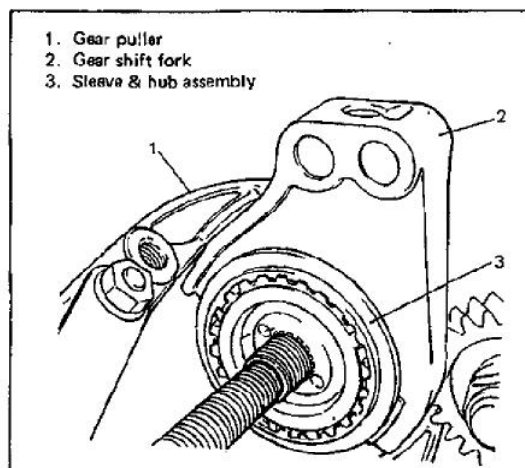


Fig. 7A-26 Removing Sleeve & Hub Assembly

9. Remove counter shaft 5th gear. Gear puller would be necessary if spline fitting of counter shaft 5th gear is tight.

10. Remove screws and take off left case plate, and then bearing set shim.

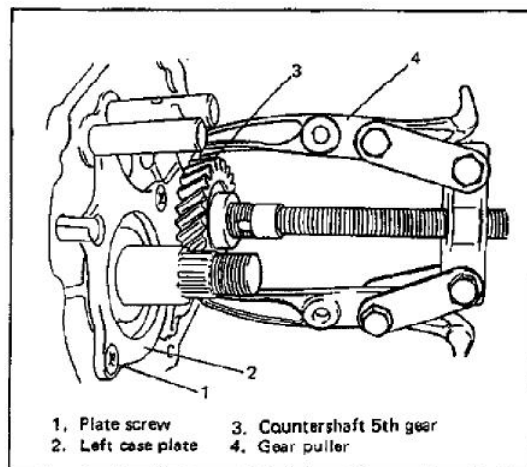


Fig. 7A-27 Removing 5th Gear and Left Case Plate

11. Remove C-ring of input shaft bearing.
12. Remove 3 gear shift fork shaft bolts with washers, then take out locating springs and steel balls.
13. Remove back up light switch.
14. Remove reverse shaft bolt with washer.
15. Remove transmission case outside bolts and clutch housing bolts.

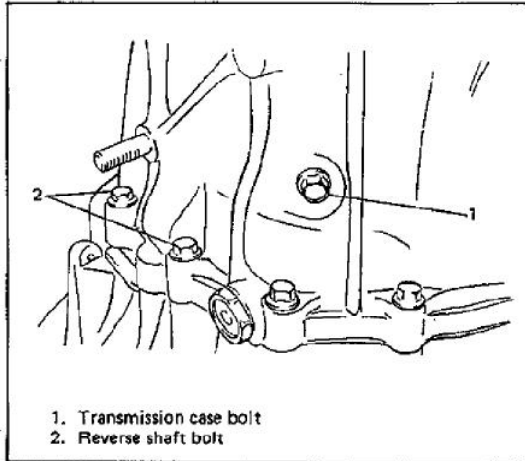


Fig. 7A-29 Removing Case Bolts

16. Tapping left case flanges with plastic hammer, remove left case.
17. Pull out reverse gear shaft, then take off reverse idler gear.
18. Pull out 5th & reverse (REV) gear shift guide shaft together with 5th & reverse (REV) gear shift shaft.

NOTE:

When removing 5th & REV gear shift shaft and guide shaft, push up high speed gear shift shaft and shift it to 4th to facilitate removal of 5th & REV shifter.

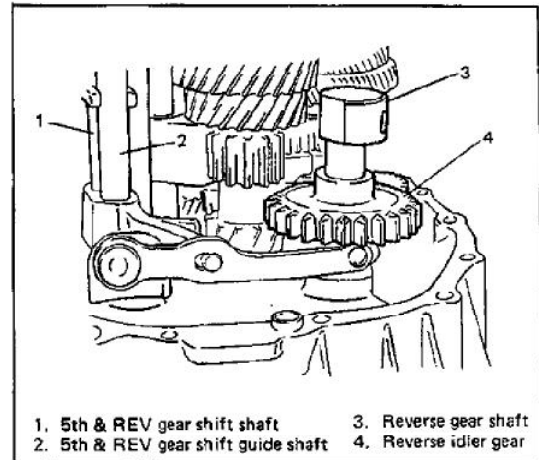


Fig. 7A-30 Removing Reverse Idler Gear

19. Tapping input shaft end with plastic hammer, push it out as assembly from case a little, then take out input shaft assembly, countershaft assembly, high speed gear shift shaft and low speed gear shift shaft all at once.

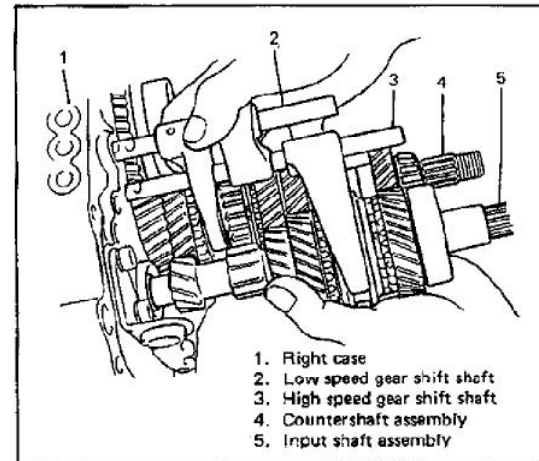
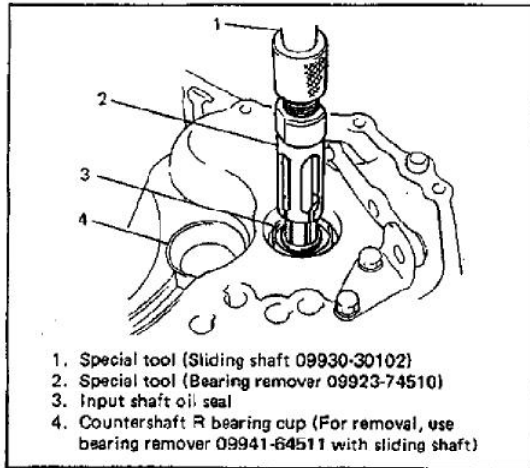


Fig. 7A-31 Removing Input and Counter Shafts

20. Remove countershaft left bearing cup from left case.
21. Remove differential side left oil seal also from left case.
22. Remove input bearing stopper bolt and plate.
23. Remove input shaft right bearing and oil seal by using special tool.
24. Remove input shaft oil seal by using special tools (combination of bearing remover and sliding shaft).

25. Also pull out countershaft right bearing cup by using special tool.



1. Special tool (Sliding shaft 09930-30102)
2. Special tool (Bearing remover 09923-74510)
3. Input shaft oil seal
4. Countershaft R bearing cup (For removal, use bearing remover 09941-64511 with sliding shaft)

Fig. 7A-33 Removing Input Shaft Oil Seal

26. Take out magnet from case.
 27. Remove differential side R oil seal from right case.

SUB ASSEMBLY SERVICE

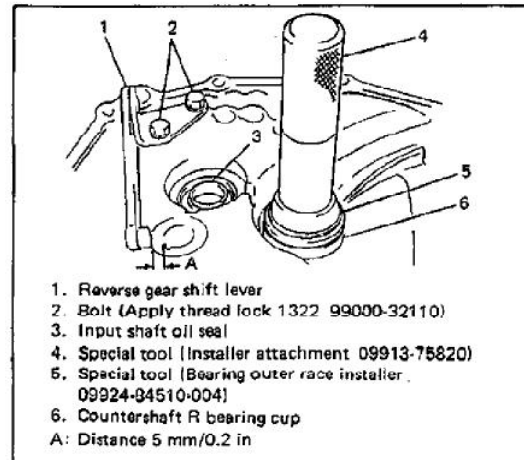
RIGHT CASE

1. If reverse gear shift lever has been removed, fasten it with 2 bolts after applying thread lock cement.
2. Install input shaft oil seal facing its spring side upward. Use special tool and hammer for installation and apply grease to oil seal lip.
3. Install countershaft R bearing cup by using special tools and hammer.

NOTE:

- When installing reverse gear shift lever, set distance A between lever end and shaft bore to be 5 mm (0.2 in).
- Distance A can be measured by installing reverse gear shaft provisionally.
- When A is 5 mm (0.2 in), clearance between reverse idler gear groove and shift lever end will be 1 mm (0.04 in).

Tightening torque for reverse gear shift lever bolts	N-m	kg-m	lb-ft
	18 - 28	1.8 - 2.8	13.5 - 20.0



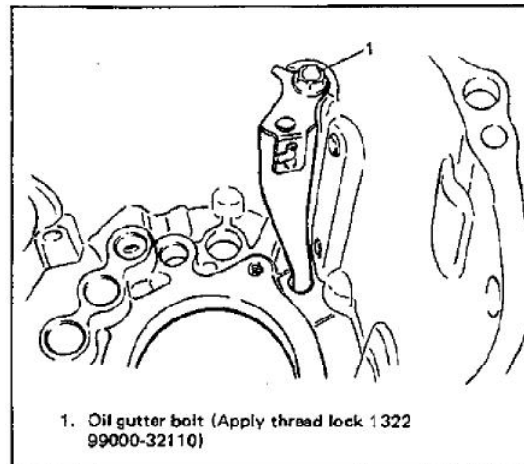
1. Reverse gear shift lever
 2. Bolt (Apply thread lock 1322 99000-32110)
 3. Input shaft oil seal
 4. Special tool (Installer attachment 09913-75820)
 5. Special tool (Bearing outer race installer, 09924-94510-004)
 6. Countershaft R bearing cup
- A: Distance 5 mm/0.2 in

Fig. 7A-34 Installing Reverse Gear Shift Lever

LEFT CASE

1. If input oil gutter has been removed, install it with bolt applied with thread lock cement.

Tightening torque for oil gutter bolt	N-m	kg-m	lb-ft
	4 - 7	0.4 - 0.7	3.0 - 5.0



1. Oil gutter bolt (Apply thread lock 1322 99000-32110)

Fig. 7A-35 Installing Oil Gutter

2. Install countershaft L bearing cup into case bore by tapping it with plastic hammer lightly.

INPUT SHAFT ASSEMBLY

Disassembly

1. Remove input shaft R bearing spacer and circlip.
2. Drive out 5th gear spacer, L bearing and 4th gear all at once by using puller and press.

CAUTION:

- To avoid gear tooth from being damaged, support it at flat side of bearing puller.
- Stop press work in the middle way and take out 5th gear bush to prevent it from being compressed and then continue to remove bearing with gear.

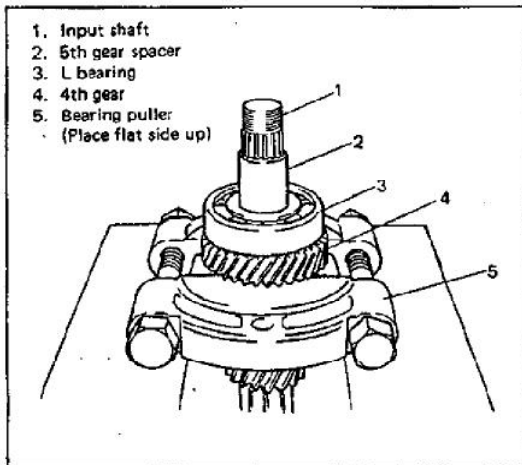


Fig. 7A-38 Removing Input Shaft L Bearing

3. Take out 4th gear needle bearing and high speed synchronizer ring.
4. Using special tool, remove circlip.

NOTE:

For smooth removal of circlip, it is recommended to correct tool tips to be flat.

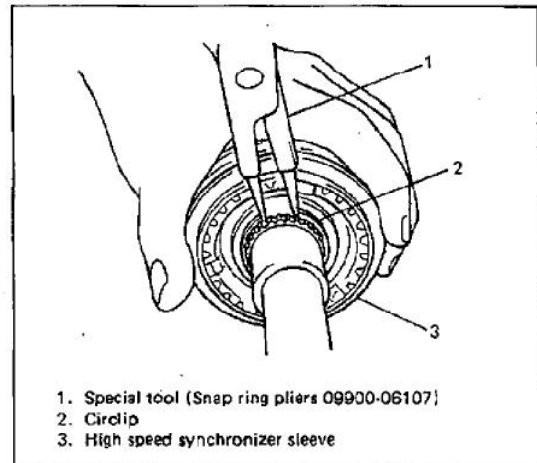


Fig. 7A-39 Removing Circlip

5. Drive out high speed synchronizer sleeve & hub assembly together with 3rd gear by using puller and press.

CAUTION:

Make sure to use flat side of puller to avoid causing damage to 3rd gear tooth.

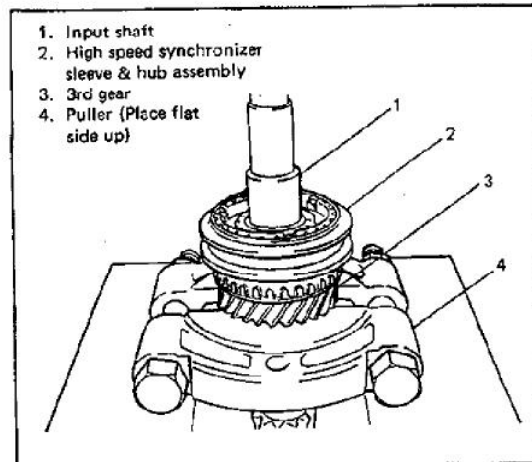


Fig. 7A-40 Removing High Speed Sleeve & Hub

6. Take out 3rd gear needle bearing from shaft.
7. Disassemble synchronizer sleeve & hub assembly.

Inspection and Reassembly

1. Clean all components thoroughly, inspect them for any abnormality and replace with new ones as necessary.
2. If synchronizer parts need to be repaired, check clearance A between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

Standard clearance A	Service limit
1.0 – 1.4 mm 0.039 – 0.055 in	0.5 mm 0.019 in

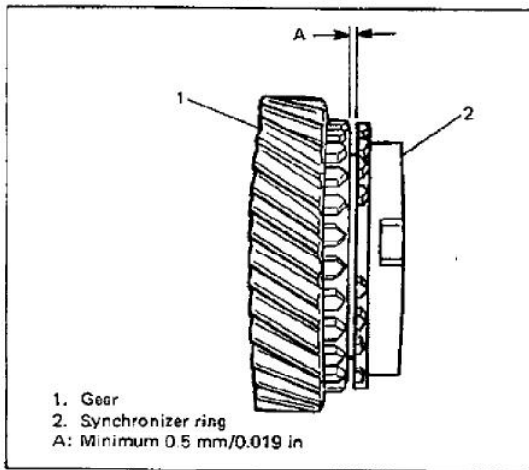


Fig. 7A-41 Checking Gear and Synchronizer Ring

3. To ensure lubrication, air blow oil holes and make sure that they are free from any obstruction.

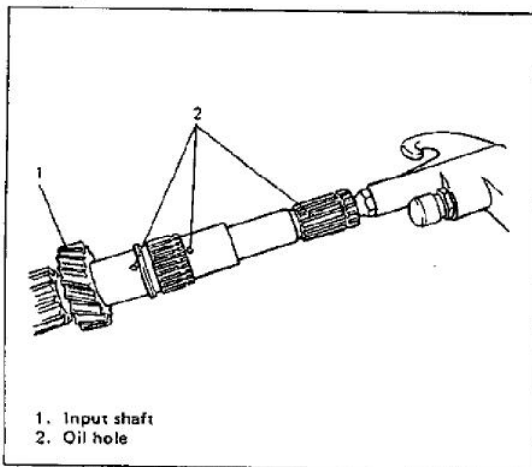


Fig. 7A-42 Air Checking Oil Holes

4. Fit high speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated below.

NOTE:

- No specific direction is assigned to high speed synchronizer sleeve or each key but it is assigned as assembly.
- Size of high speed synchronizer sleeve, hub, keys and springs is between those of low speed and 5th speed ones.

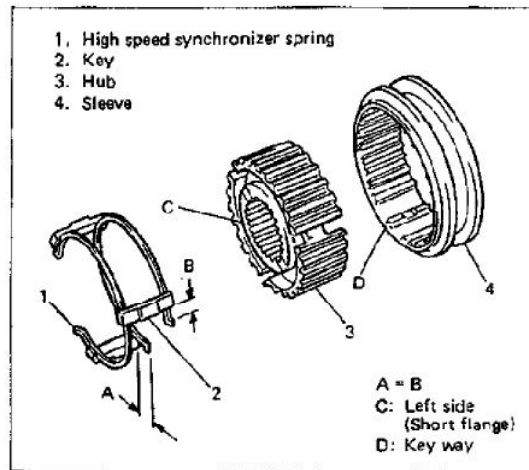


Fig. 7A-43 Assembling High Speed Sleeve & Hub

5. Install input shaft R bearing spacer and circlip.
6. Install 3rd gear needle bearing, apply oil to it, then install 3rd gear and synchronizer ring.
7. Drive in high speed sleeve & hub assembly by using special tool and hammer.

NOTE:

- While press-fitting sleeve & hub, make sure that synchronizer ring key slots are aligned with keys in sleeve & hub assembly.
- Check free rotation of 3rd gear after press-fitting sleeve & hub assembly.
- Needle bearings and synchronizer rings for 3rd and 4th are identical respectively.

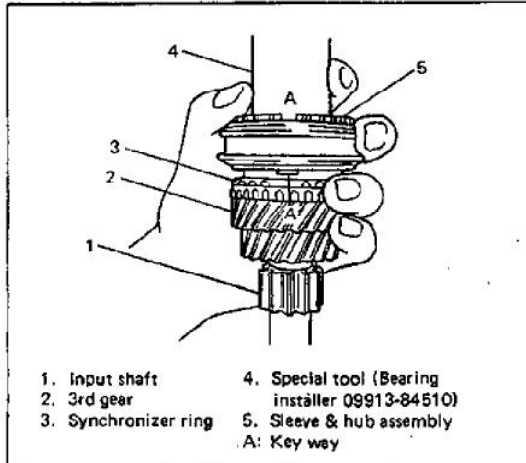


Fig. 7A-44 Press-fitting High Speed Sleeve & Hub

8. Install circlip, needle bearing, apply oil to bearing, then install synchronizer ring and 4th gear.

CAUTION:

Confirm that circlip is installed in groove securely.

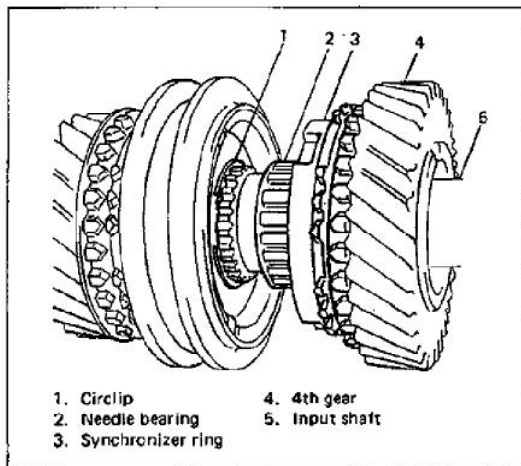


Fig. 7A-45 Installing Circlip

9. Press-fit L bearing by using special tool and hammer.
10. Using the same special tool, drive in 5th gear spacer.

CAUTION:

To prevent 5th gear spacer from being distorted because of excessive compression, do not press-fit it with L bearing at once.

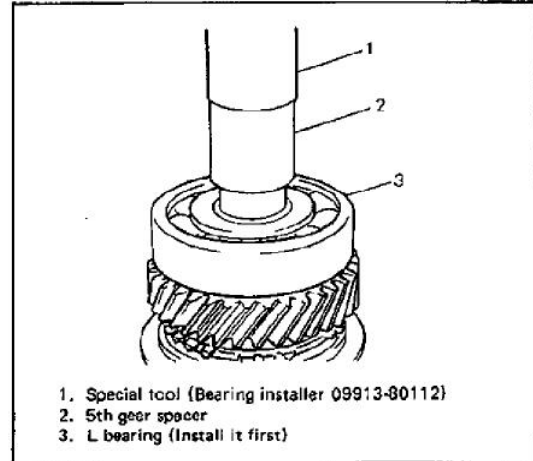


Fig. 7A-46 Press-fitting L Bearing and Spacer

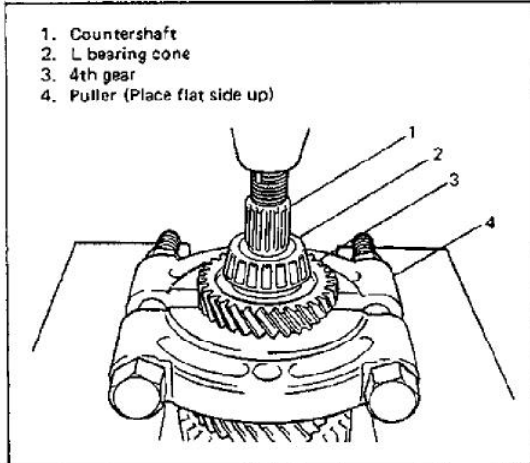
COUNTERSHAFT ASSEMBLY

Disassembly

1. Drive out L bearing cone with 4th gear by using puller and press.

CAUTION:

- Use puller and press that will bear at least 5 ton (11,000 lb) safely.
- To avoid tooth damage, support 4th gear at flat side of puller.



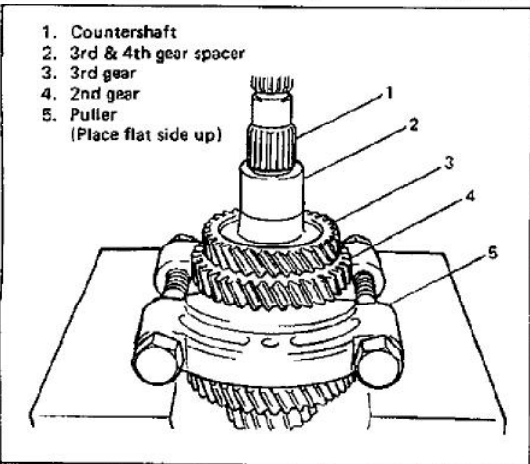
1. Countershaft
2. L bearing cone
3. 4th gear
4. Puller (Place flat side up)

Fig. 7A-47 Removing Countershaft 4th Gear

2. Apply puller to 2nd gear and drive out 3rd & 4th gear spacer together with 2nd gear by using press. Needle bearing would come out with 2nd gear.

CAUTION:

If compression exceeds 5 ton (11,000 lb), release compression once, reset puller support and then continue press work again.



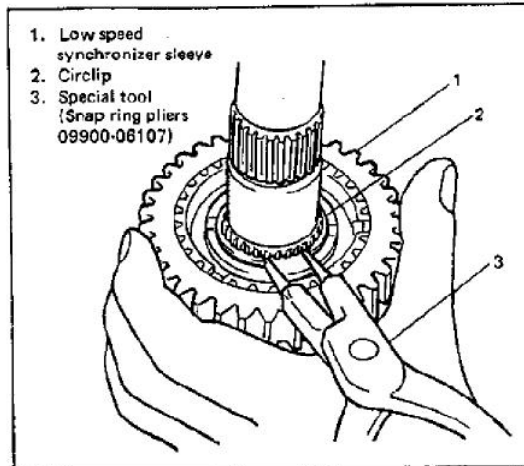
1. Countershaft
2. 3rd & 4th gear spacer
3. 3rd gear
4. 2nd gear
5. Puller (Place flat side up)

Fig. 7A-48 Removing Spacer and 3rd Gear

3. Take out 2nd synchronizer ring.
4. Using special tool, remove circlip.

NOTE:

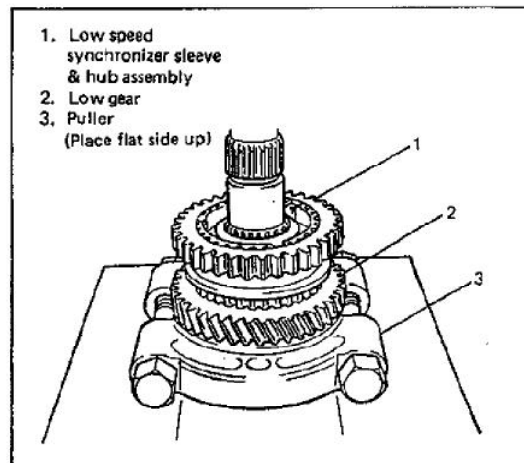
Correct tool tips to be flat to facilitate removal of circlip.



1. Low speed synchronizer sleeve
2. Circlip
3. Special tool (Snap ring pliers 09900-08107)

Fig. 7A-49 Removing Circlip

5. Apply puller to 1st gear and drive out low speed synchronizer sleeve & hub assembly with gear by using press.



1. Low speed synchronizer sleeve & hub assembly
2. Low gear
3. Puller (Place flat side up)

Fig. 7A-50 Removing Low Speed Sleeve & Hub

6. Disassemble synchronizer sleeve & hub assembly.
7. Take out needle bearing from shaft.
8. Remove R bearing cone by using puller, metal stick and press.

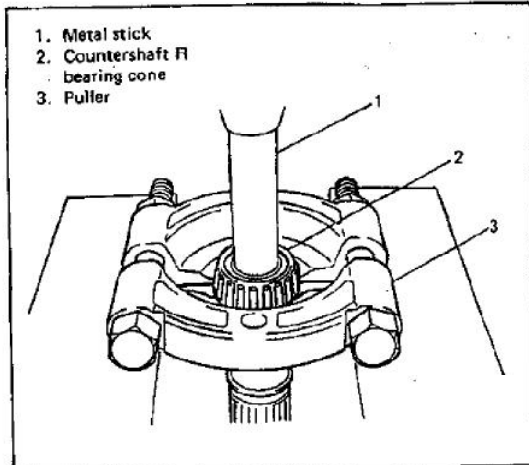


Fig. 7A-51 Removing Countershaft R Bearing Cone

Inspection and Reassembly

1. Clean all components thoroughly, inspect them and replace with new ones as necessary.
2. If synchronizer parts need to be repaired, check clearance A between ring and gear, each chamfered tooth of gear, ring and sleeve, then determine parts replacement.

Standard clearance A	Service limit
1.0 – 1.4 mm	0.5 mm
0.039 – 0.055 in	0.019 in

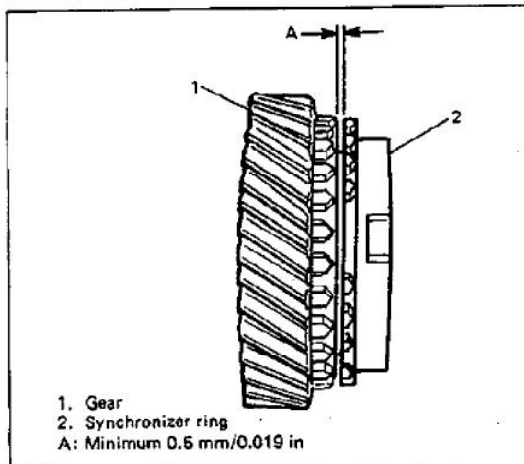


Fig. 7A-52 Checking Gear and Synchronizer Ring

3. To ensure lubrication, air blow oil holes and make sure that they are free from any obstruction.

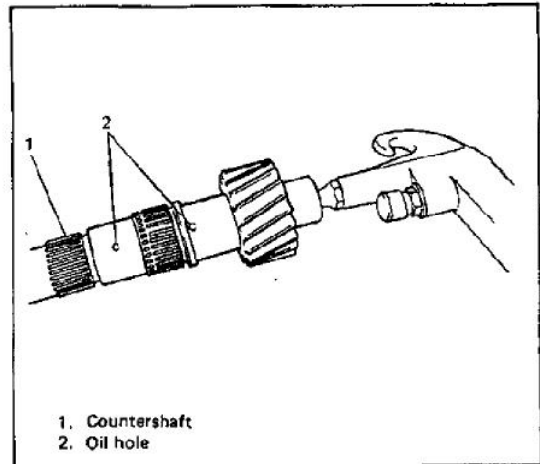


Fig. 7A-53 Air Checking Oil Holes

4. Fit high speed synchronizer sleeve to hub, insert 3 keys in it and then set springs as illustrated below.

NOTE:

- No specific direction is assigned to low speed synchronizer hub or each key but it is assigned as assembly.
- Size of low speed synchronizer keys and springs are the largest compared with those of high speed and 5th speed ones.

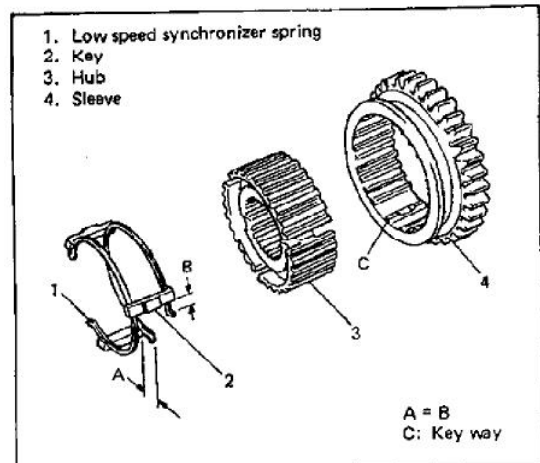


Fig. 7A-54 Assembling Low Speed Sleeve & Hub

5. Install R bearing cone by using special tool and hammer.

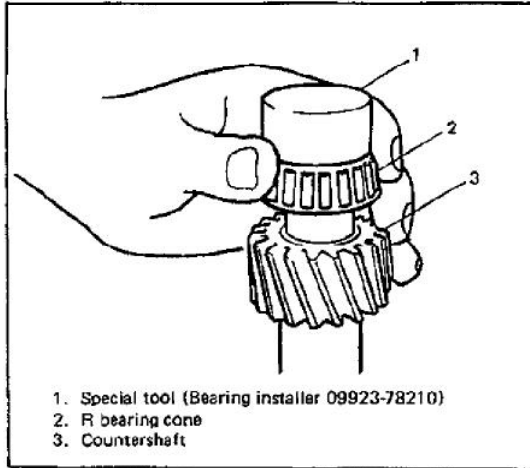


Fig. 7A-55 Press-fitting R Bearing Cone

6. Install needle bearing, apply oil to it, then install 1st gear and 1st gear synchronizer ring.

NOTE:

- Key slot width of 1st synchronizer ring is smaller than that of 2nd synchronizer ring. Distinguish the difference properly.
- Needle bearings for 1st and 2nd gear are identical.

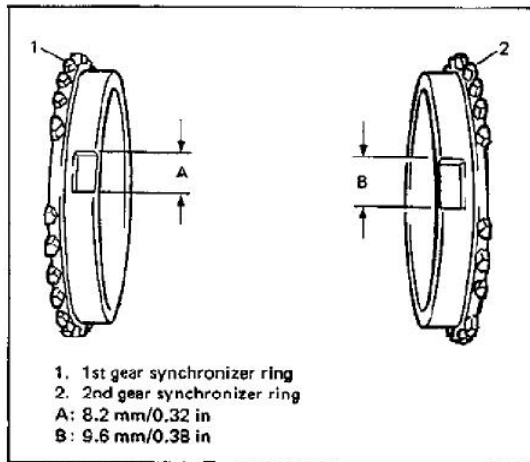


Fig. 7A-56 Difference of 1st and 2nd Rings

7. Drive in low speed sleeve & hub assembly by using special tool and hammer.

NOTE:

- Support shaft with special tool as illustrated below so that retainer of bearing cone will be free from compression.
- Make sure that synchronizer ring key slots are aligned with keys while press-fitting sleeve & hub assembly.
- Check free rotation of 1st gear after press-fitting sleeve & hub assembly.

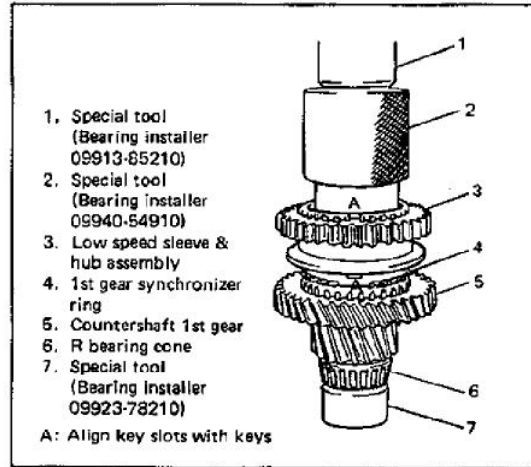


Fig. 7A-57 Press-fitting Low Speed Sleeve & Hub

8. Install circlip, needle bearing, apply oil to bearing, then install 2nd gear synchronizer ring and 2nd gear.

CAUTION:

Confirm that circlip is installed in groove securely.

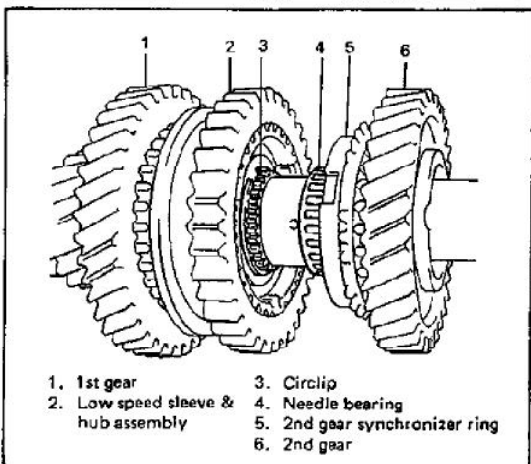


Fig. 7A-58 Installing Circlip

9. Press-fit 3rd gear and spacer by using special tool and press.

NOTE:

It is recommended to press-fit spacer and 3rd gear first, and then 4th gear later separately so that countershaft will not be compressed excessively.

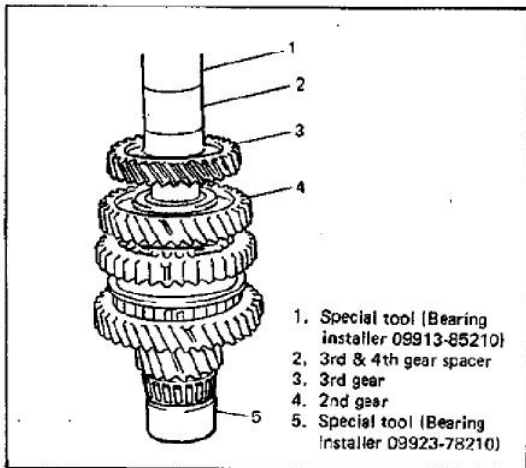


Fig. 7A-59 Press-fitting 3rd Gear and Spacer

10. Press-fit 4th gear by using the same procedure as the above.
11. Install L bearing cone by using special tool and hammer.

NOTE:

For protection of bearing cone, always support shaft with special tool as illustrated.

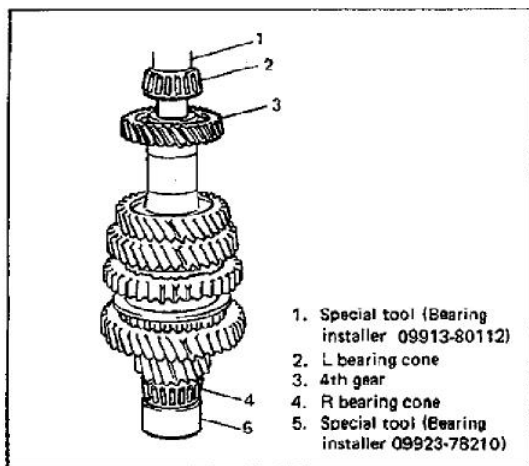


Fig. 7A-60 Press-fitting L Bearing Cone

GEAR SHIFTER

Gear Shift & Select Shaft Assembly

1. To disassemble component parts, use special tools (spring pin remover 4.5 mm 09922-85811, 6 mm 09925-78210) and 2.8 – 3.0 mm (0.11 in) pin remover in addition.
2. Clean all parts thoroughly, inspect them and replace with new ones as required.
3. Assemble component parts by reversing removal procedure.

NOTE:

- When driving in spring pins, prevent shaft from being bent by supporting it with wood block.
- Assemble 5th & REV gear shift cam by winding cam guide return spring, and then drive in spring pin.
- Locate low speed select spring (Blue – Lower position) and reverse select spring (Red – Upper position) correctly.

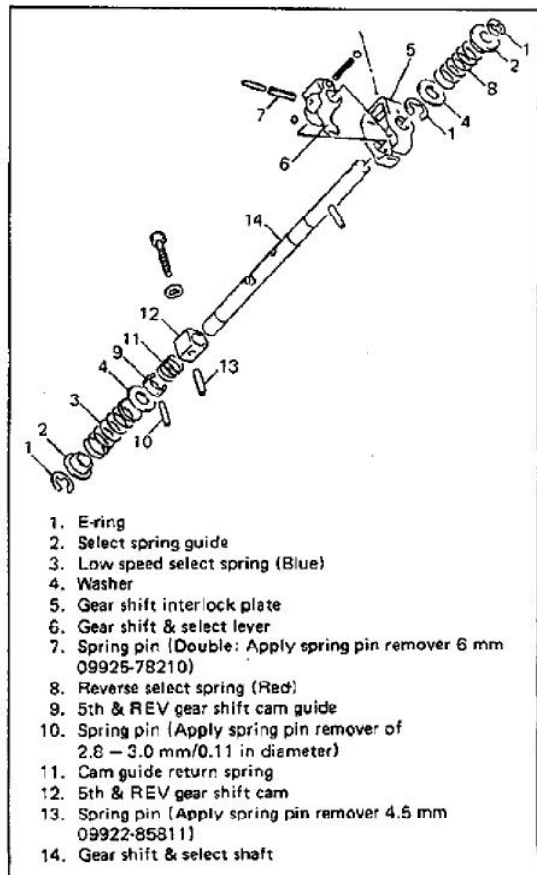


Fig. 7A-61 Gear Shift & Select Shaft Assembly

High Speed and Low Speed Gear Shift Shafts

1. Before disassembling shift shaft assemblies, determine necessity of parts replacement by checking them for abnormal wear or distortion. Use feeler gauge for checking clearance A between sleeve and shift fork.

NOTE:

For correct judgement of parts replacement, carefully inspect contact portion of fork and sleeve.

Maximum clearance A	1.0 mm/0.039 in
---------------------	-----------------

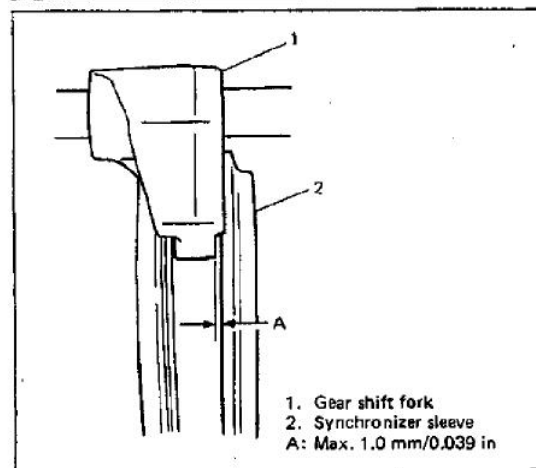


Fig. 6A-62 Checking Sleeve-to-Fork Clearance

2. Disassemble component parts by using spring pin remover 4.5 mm (09922-85811) and hammer.
3. Assemble shift shafts as shown below while making sure that component parts are in proper order.

NOTE:

- Correct shaft surface by using oil stone, if any scratch or dent is found.
- Support shaft with wood blocks when driving in spring pins.

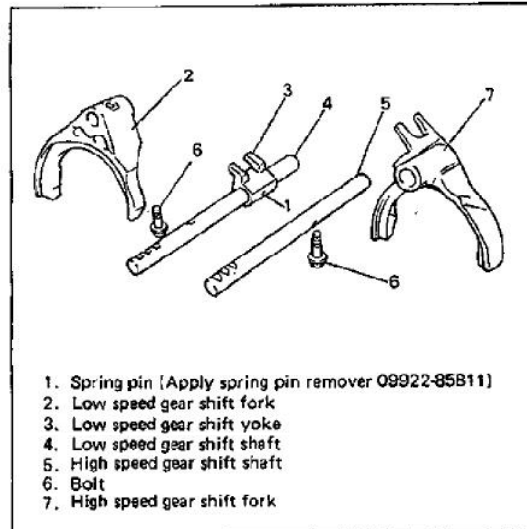


Fig. 7A-63 Assembling Low and High Speed Shifters

5th & REV Gear Shifter

1. Disassemble component parts by using spring pin remover 4.5 mm (09922-85811) and hammer.
2. Replace or correct parts as required and assemble shafts making sure that component parts are in proper order as shown below.

NOTE:

Install 2 steel balls in reverse gear shift arm without fail.

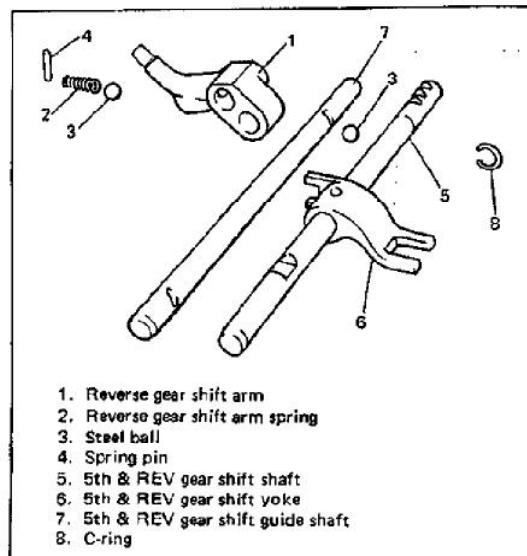


Fig. 7A-64 Assembling 5th & REV Shifter

ASSEMBLING UNIT

1. Join input shaft, countershaft, low speed gear shift shaft and high speed gear shift shaft assemblies all together, then install them into right case.

NOTE:

- Input shaft R bearing on shaft can be installed into right case by tapping shaft with plastic hammer.
- Check to make sure that counter shaft is engaged with final gear while installing.

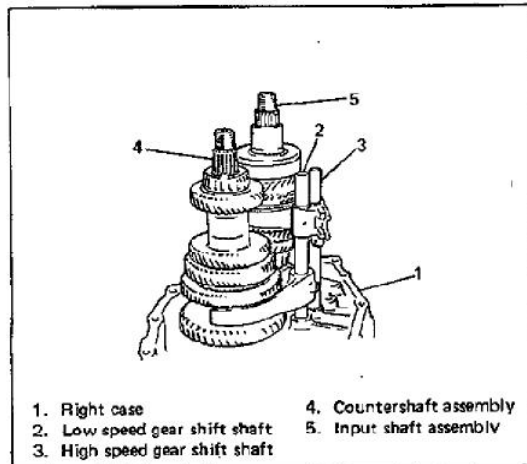


Fig. 7A-71 Installing Input Shaft and Countershaft

2. Install 5th & REV gear shift shaft with 5th & REV gear shift guide shaft into right case. Reverse gear shift arm has to be joined with reverse gear shift lever at the same time.

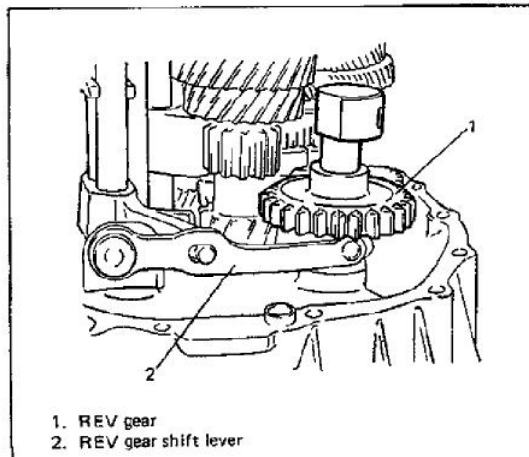


Fig. 7A-72 Installing 5th & REV Shifter

3. Make reverse idler gear with reverse gear shift lever, insert reverse gear shaft into case through idler gear and then align A in shaft with B in case.

NOTE:

- Make sure that washer has been installed in shaft at above the gear.
- Check to confirm that reverse gear shift lever end has clearance 1 mm (0.04 in) to idler gear groove.

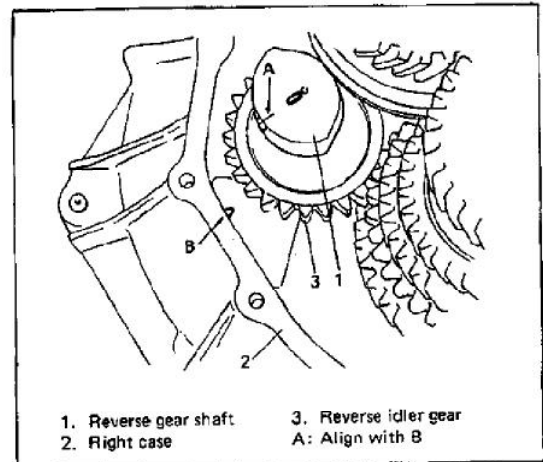
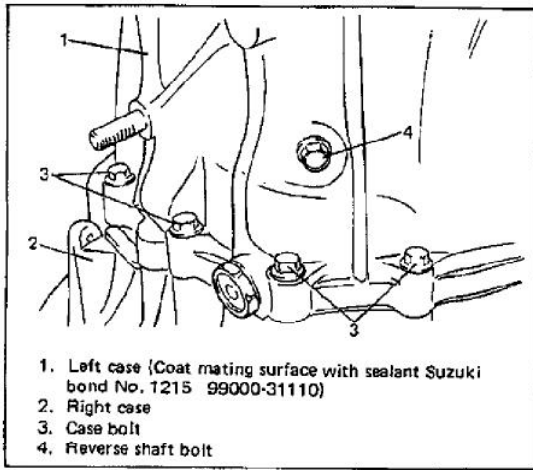


Fig. 7A-73 Aligning Reverse Gear Shaft

7A-26 MANUAL TRANSMISSION

4. Clean mating surfaces of both right and left case, coat mating surface of left case with sealant evenly then mate it with right case.
5. Tighten transmission outside case bolts to specified torque.
6. Install reverse shaft bolt and tighten it.

Tightening torque	N·m	kg·m	lb·ft
Case bolt	15 – 22	1.5 – 2.2	11.0 – 15.5
Reverse shaft bolt	18 – 28	1.8 – 2.8	13.5 – 20.0



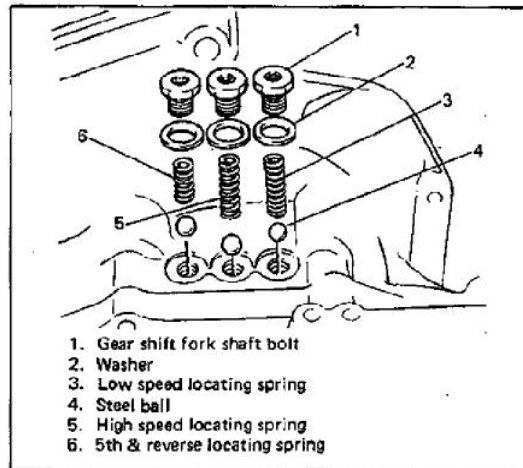
1. Left case (Coat mating surface with sealant Suzuki bond No. 1215 99000-31110)
2. Right case
3. Case bolt
4. Reverse shaft bolt

Fig. 7A-74 Fastening Case Bolts

7. Install clutch housing bolts and tighten them to specification.
8. Check locating springs for deterioration and replace with new ones as necessary.
9. Install steel ball and locating spring for respective gear shift shaft and tighten with bolt.

Locating spring free length	Standard	Service limit
Low speed	53.1 mm 2.091 in	50.5 mm 1.988 in
High speed	46.1 mm 1.815 in	44.0 mm 1.732 in
5th & reverse	29.8 mm 1.173 in	28.5 mm 1.122 in

Tightening torque for gear shift fork shaft bolts	N·m	kg·m	lb·ft
	10 – 16	1.0 – 1.6	7.5 – 11.5

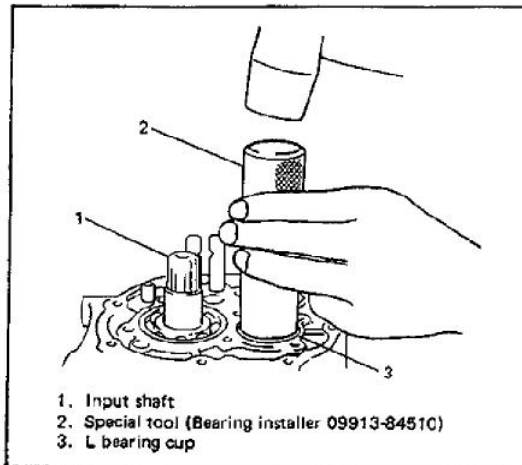


1. Gear shift fork shaft bolt
2. Washer
3. Low speed locating spring
4. Steel ball
5. High speed locating spring
6. 5th & reverse locating spring

Fig. 7A-75 Installing Locating Springs

FIFTH GEARS

1. To seat countershaft L bearing cup to bearing cone, tap cup by using special tool and plastic hammer.



1. Input shaft
2. Special tool (Bearing installer 09913-84510)
3. L bearing cup

Fig. 7A-76 Seating Counter Shaft L Bearing Cup

- Put a shim on bearing cup provisionally, place straight edge over it and compress it by hand through straight edge, and then measure A (Clearance between case surface and straight edge) by using feeler gauge.
- By repeating above step, select a suitable shim which adjusts clearance A to specification and put it on bearing cup.

NOTE:

Insert 0.1 mm (0.004 in) feeler to know whether or not a shim fulfills specification quickly.

Clearance A:	0.08 – 0.12 mm
Shim protrusion	0.0032 – 0.0047 in

Available shim thickness	0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.05 and 1.1 mm 0.021, 0.023, 0.025, 0.027, 0.029, 0.031, 0.033, 0.035, 0.037, 0.039, 0.041 and 0.043 in
--------------------------	--

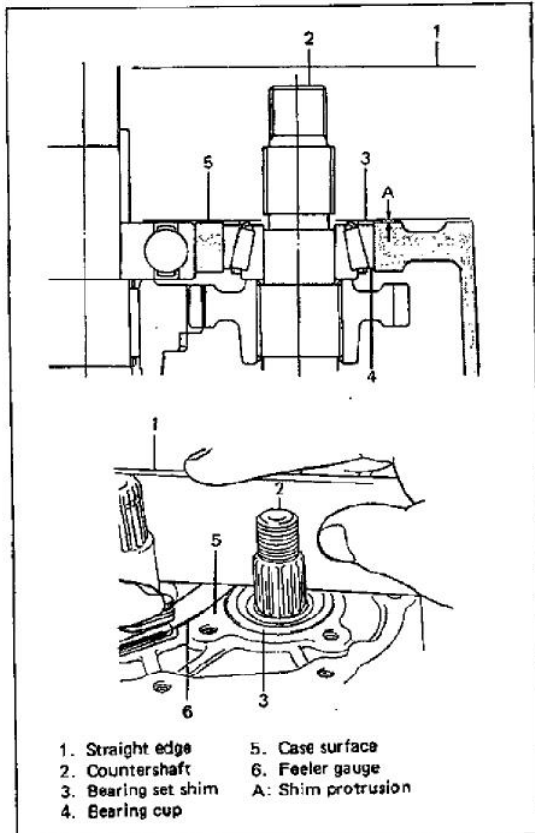


Fig. 7A-77 Selecting Bearing Set Shim

- Place left case plate inserting its end in groove of shift guide shaft and then tighten it with 6 screws applied with thread lock cement.

NOTE:

After tightening screws, make sure that countershaft can be rotated by hand feeling some load.

Tightening torque for left case plate screws	N-m	kg-m	lb-ft
	18 – 28	1.8 – 2.8	13.5 – 20.0

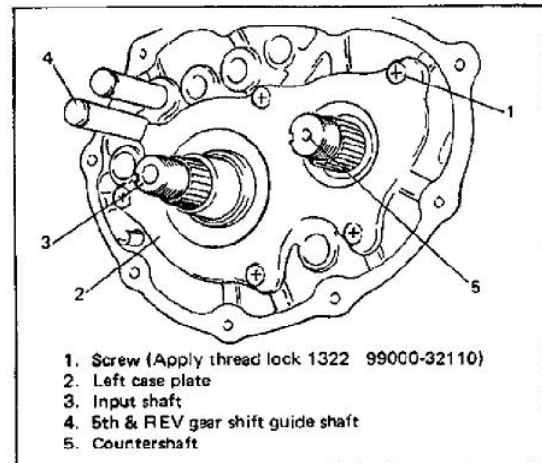


Fig. 7A-78 Fastening Left Case Plate Screw

- Assemble 5th speed synchronizer sleeve and hub with keys and springs.

NOTE:

Short side C in keys, long boss D in hub and chamfered spline F in sleeve should face inward (5th gear side).

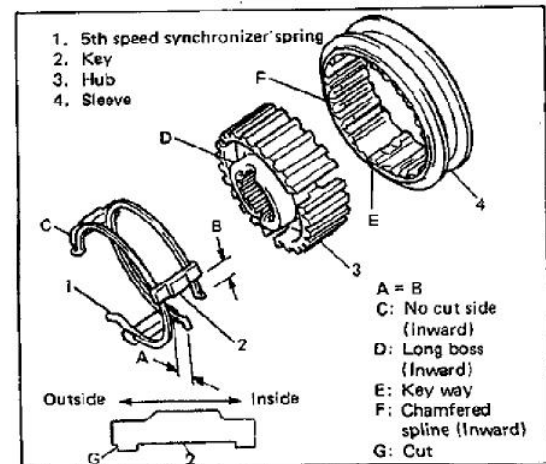


Fig. 7A-79 Assembling 5th Speed Sleeve & Hub

6. Install 5th gear to counter shaft facing machined boss A inward.

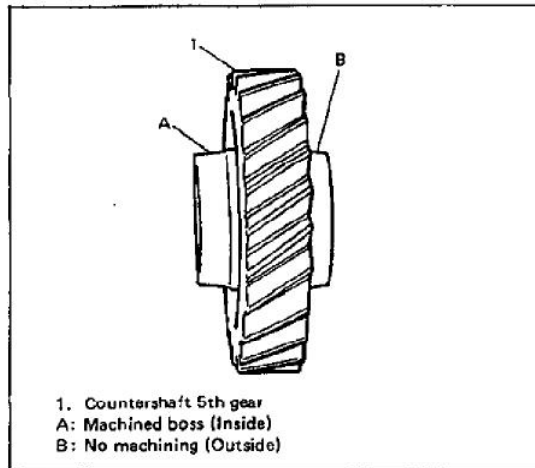


Fig. 7A-80 Counter Shaft 5th Gear

7. Install needle bearing to input shaft, apply oil then install 5th gear
8. Engage gear double meshing to tighten countershaft nut and tighten it to specification.

Tightening torque for countershaft nut	N-m	kg-m	lb-ft
	60 - 80	6.0 - 8.0	43.5 - 57.5

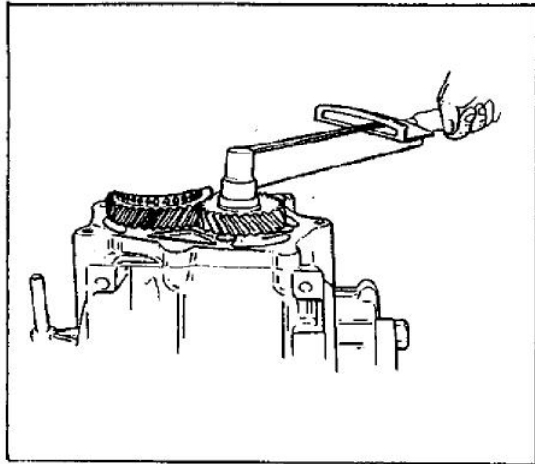


Fig. 7A-81 Tightening Countershaft Nut

9. Then caulk countershaft nut with caulking tool and hammer.
10. Install synchronizer ring then ring spring.
11. Fit 5th gear shift fork to sleeve & hub assembly and install them into input shaft, shift shaft and shift guide shaft.

NOTE:

Long boss of hub faces inward (gear side).

CAUTION:

Be careful not to pinch synchronizer ring spring by hub.

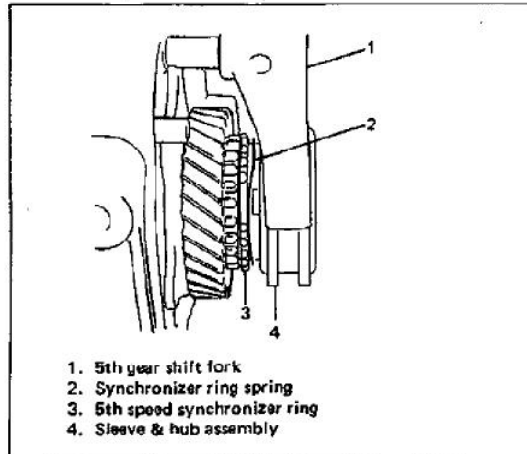


Fig. 7A-82 Installing 5th Speed Sleeve & Hub

12. Install steel ball, tighten shift fork plug applied with thread lock cement.
13. Set hub plate so that pit "A" in it is aligned with pit in 5th speed hub and synchronizer key is fitted in its pit "B" and tighten input shaft nut to specified torque.

CAUTION:

- Coat shift fork plug with thread lock cement reasonably. If it is done to much, excess may interfere in ball movement and cause hard shift to 5th speed.
- Make sure circlip is installed in shaft groove securely.

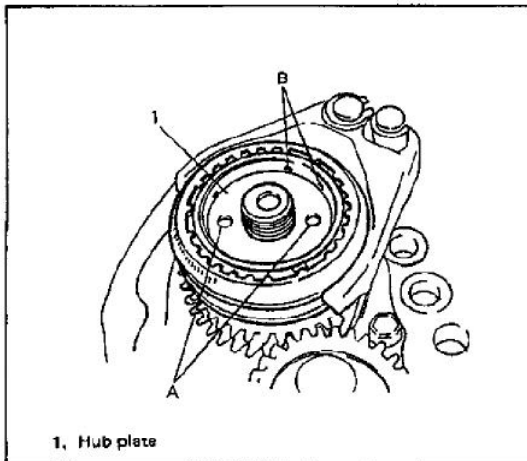


Fig. 7A-82-1

Tightening torque for shift fork plug	N-m	kg-m	lb-ft
	10 - 15	1.0 - 1.5	7.5 - 10.5

Tightening torque input shaft nut	N-m	kg-m	lb-ft
	60 - 80	6.0 - 8.0	43.5 - 57.5

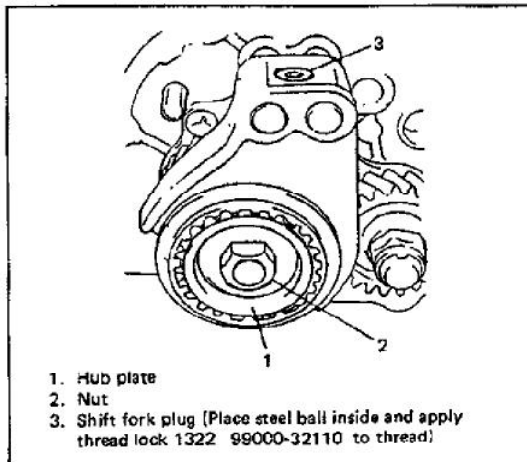


Fig. 7A-83

14. Clean mating surface of both left case and left cover, coat mating surface A with sealant evenly, mate it with left case and then tighten with bolts.

Tightening torque for left cover bolts	N-m	kg-m	lb-ft
	8 - 12	0.8 - 1.2	6.0 - 8.5

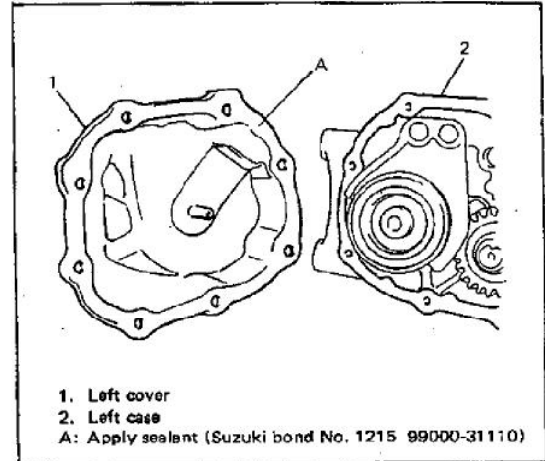


Fig. 7A-84 Installing Side Cover

GEAR SHIFT & SELECT SHAFT ASSEMBLY

1. If gear shift guide case has been disassembled or replaced, tighten bolts as specified below.
2. Clean mating surface of guide case and coat it with sealant evenly.

Tightening torque	N-m	kg-m	lb-ft
5th to REV interlock guide bolt	18 - 28	1.8 - 2.8	13.5 - 20.0

3. Install gear shift & select shaft assembly into transmission.
4. Install gear shift interlock bolt with washer and tighten it to specification.

NOTE:

When installing gear shift & select shaft assembly, position gear in neutral so that gear shift interlock plate will go in smoothly.

Tightening torque	N-m	kg-m	lb-ft
Gear shift interlock bolt	18 - 28	1.8 - 2.8	13.5 - 20.0

7A-30 MANUAL TRANSMISSION

5. Place wiring harness clamp bracket and fasten it together with gear shift guide case.
6. Install back up light switch and clamp its lead.
7. Tighten gear case bolts to specified torque.

Tightening torque	N-m	kg-m	lb-ft
Gear shift guide case bolts	18 - 28	1.8 - 2.8	13.5 - 20.0
Back up light switch	16 - 23	1.6 - 2.3	12.0 - 16.5

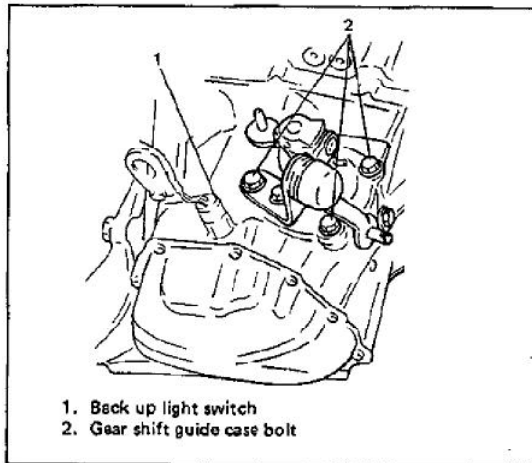


Fig. 7A-85

8. Check input shaft for rotation in each gear position.
9. Also confirm function of back up light switch in reverse position by using ohmmeter.

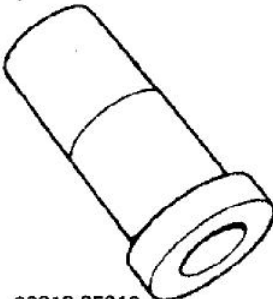

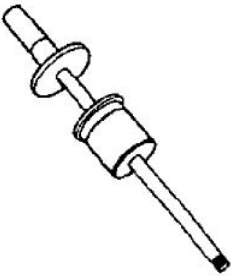
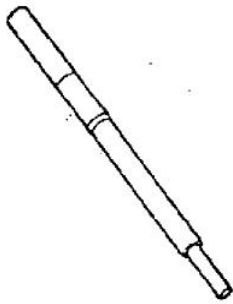
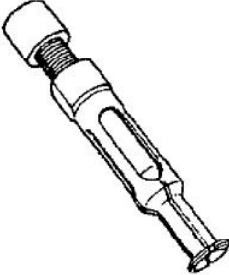


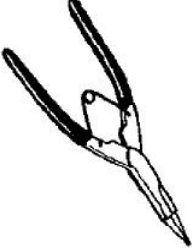
RECOMMENDED TORQUE SPECIFICATIONS

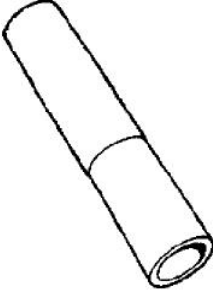

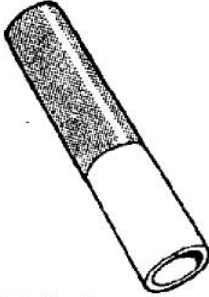
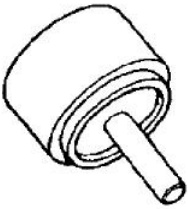

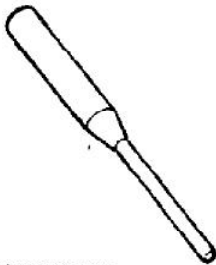
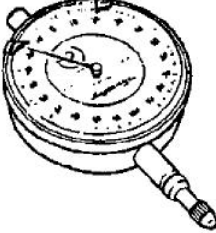
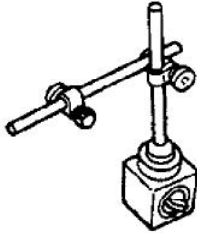
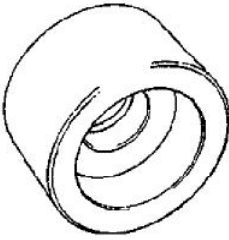
Fastening portion	Tightening torque		
	N·m	kg-m	lb-ft
1. Oil filler/level plug	36 – 54	3.6 – 5.4	26.5 – 39.0
2. Oil drain plug	25 – 30	2.5 – 3.0	18.5 – 21.5
3. Housing nuts for control housing	18 – 28	1.8 – 2.8	13.5 – 20.0
4. Speedometer driven gear case bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
5. Transmission to engine bolt and nuts	40 – 60	4.0 – 6.0	29.0 – 43.0
6. Engine rear mounting bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
7. Engine mounting LH bracket bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
8. Exhaust pipe to manifold bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
9. Center bearing support bolts	40 – 60	4.0 – 6.0	29.0 – 43.0
10. Reverse gear shift lever bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
11. Oil gutter bolt	4 – 7	0.4 – 0.7	3.0 – 5.0
12. Transmission case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5
13. Reverse shaft bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
14. Left case plate screws	6 – 7	0.6 – 0.7	4.5 – 5.0
15. Counter shaft nut	60 – 80	6.0 – 8.0	43.5 – 57.5
16. Input shaft nut	60 – 80	6.0 – 8.0	43.5 – 57.5
17. 5th shift fork plug	10 – 15	1.0 – 1.5	7.5 – 10.5
18. Left cover bolts	8 – 12	0.8 – 1.2	6.0 – 8.5
19. 5th to REV interlock guide bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
20. Gear shift interlock bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
21. Gear shift guide case bolts	18 – 28	1.8 – 2.8	13.5 – 20.0
22. Back up light switch	16 – 23	1.6 – 2.3	12.0 – 16.5
23. Exhaust pipe to muffler nuts	35 – 45	3.5 – 4.5	25.5 – 32.5
24. Transfer rear case bolts	15 – 22	1.5 – 2.2	11.0 – 15.5

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Lithium grease	SUZUKI SUPER GREASE A (99000-25010)	<ul style="list-style-type: none"> • Oil seal lips • Gear shift control lever • Gear shift control shaft bushes
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	<ul style="list-style-type: none"> • Oil drain plug • Gear shift shaft bolt • Mating surface of transmission case • Mating surface of side cover
Thread lock cement	THREAD LOCK 1322 (99000-32110)	<ul style="list-style-type: none"> • Control lever knob • Reverse gear shift lever bolts • Oil gutter bolt • Left case plate screws

SPECIAL TOOLS

1 	2 	3 	4 
09913-85210 Bearing installer	09917-58010 Bearing installer	09930-30102 Sliding shaft	09916-46010 Valve guide remover
5 	6 	7 	8 
09923-74510 Bearing remover	09913-75820 Installer attachment	09924-84510-004 Bearing installer adapter (C)	09900-06107 Snap ring pliers (Opening type)

<p>9</p>  <p>09913-84510 Bearing installer</p>	<p>10</p>  <p>09927-08210 Output shaft remover</p>	<p>11</p>  <p>09913-80112 Bearing installer</p>	<p>12</p>  <p>09923-78210 Bearing installer</p>
<p>13</p>  <p>09940-54910 Bearing installer</p>	<p>14</p>  <p>09922-85811 Spring pin remover 4.5 mm</p>	<p>15</p>  <p>09900-20606 Dial gauge</p>	<p>16</p>  <p>09900-20701 Magnetic stand</p>
<p>17</p>  <p>09951-16060 Bush remover</p>			

SECTION 7C

CLUTCH

NOTE:

Clutch disc and flywheel are different from those of 2WD model, so note following points and practice service of clutch.

- Inspection of rivet head depth.

Rivet head depth	Standard	Service limit
	1.3 mm 0.05 in.	0.5 mm 0.02 in.

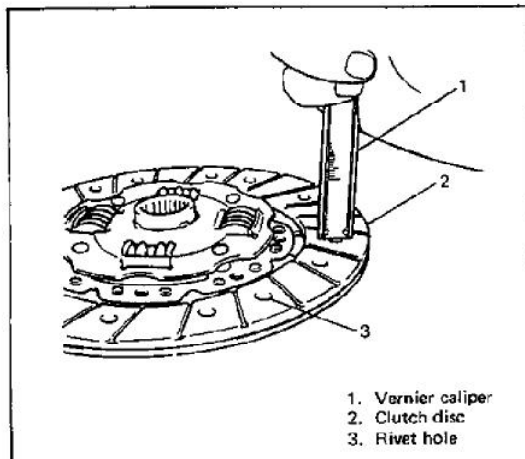


Fig. 7C-1

- Special tool (clutch center guide).

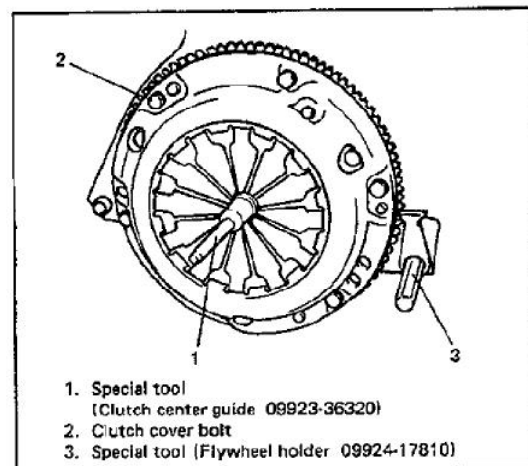


Fig. 7C-2

- Tightening torque of flywheel bolts.

Tightening torque for flywheel bolts	N·m	kg·m	lb·ft
	75 - 80	7.5 - 8.0	54.5 - 57.5

SECTION 7D

TRANSFER

CONTENTS

GENERAL DESCRIPTION	7D- 2
Viscous Coupling	7D- 3
ON CAR SERVICE	7D- 5
Precaution In Servicing	7D- 5
Switchin from 4WD to 2WD	7D- 5
Transfer Assembly	7D- 6
Disassembly	7D- 6
Assembly	7D- 8
Bevel Pinion Shim Adjustment (Bevel pinion bearing shim adjustment)	7D- 8
Bevel Pinion Shim Adjustment (Mounting distance adjustment)	7D-10
Drive Bevel Gear Backlash Adjustment and Side Bearing Preload Adjustment	7D-12
Inspection of Gear Tooth Surface Contact	7D-13
RECOMMENDED TORQUE SPECIFICATIONS	7D-14
SPECIAL TOOLS	7D-15
REQUIRED SERVICE MATERIALS	7D-15

GENERAL DESCRIPTION

This transfer uses a full-time 4WD system in which a viscous coupling is installed in front of rear differential so that optimum amount of drive force is distributed to the front and rear wheels according to the driving conditions. Also, a 2WD to 4WD selector lever is installed to the front transfer case to improve serviceability.

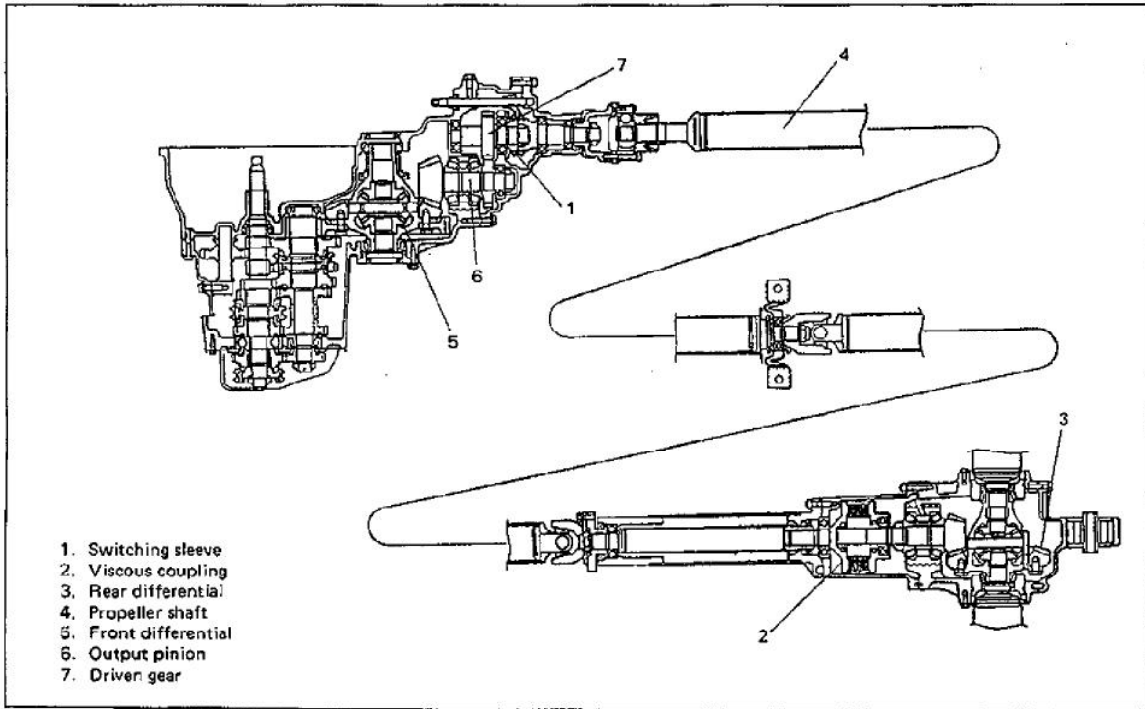


Fig. 7D-1

VISCOUS COUPLING

The full-time 4WD model car is equipped with a viscous coupling which transmits optimum driving force to the rear wheels to make the car 4WD without anything done by the driver. This takes place as soon as a revolution difference occurs between the front and rear wheels due to road conditions and driving conditions.

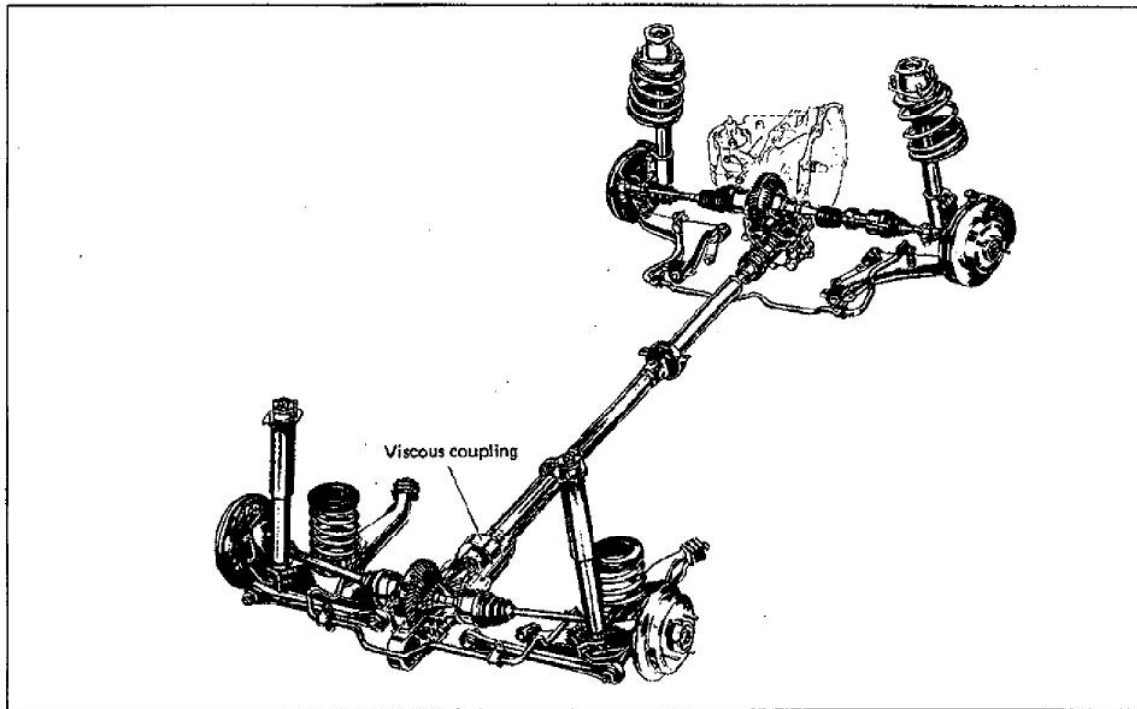


Fig. 7D-2

FEATURES OF VISCOUS COUPLING

- The structure is simple and is free from maintenance.
- It is designed lightweight and compact.
- Stable driving is assured as optimum driving force is transmitted to the rear wheels automatically according to driving conditions.
- Premature locking of the rear wheels is prevented when the brake is applied.
- As the front wheels and rear wheels are not connected directly, no "tight corner brake phenomenon" occurs.

7D-4 TRANSFER

The viscous coupling consists of a housing, hub, outer plates, inner plates, wire & bearing and oil seal. The housing is joined to the propeller shaft and hub to the bevel pinion of the rear differential. The outer plates are fitted to the housing and inner plates to the hub, and they are arrayed alternately with a space inbetween, where silicon oil with high viscosity is filled. When a revolution speed difference occurs between inner plates and outer plates, driving force is conveyed to the rear wheels through viscosity resistance of silicon oil. And the larger the difference is, the more driving force is conveyed.

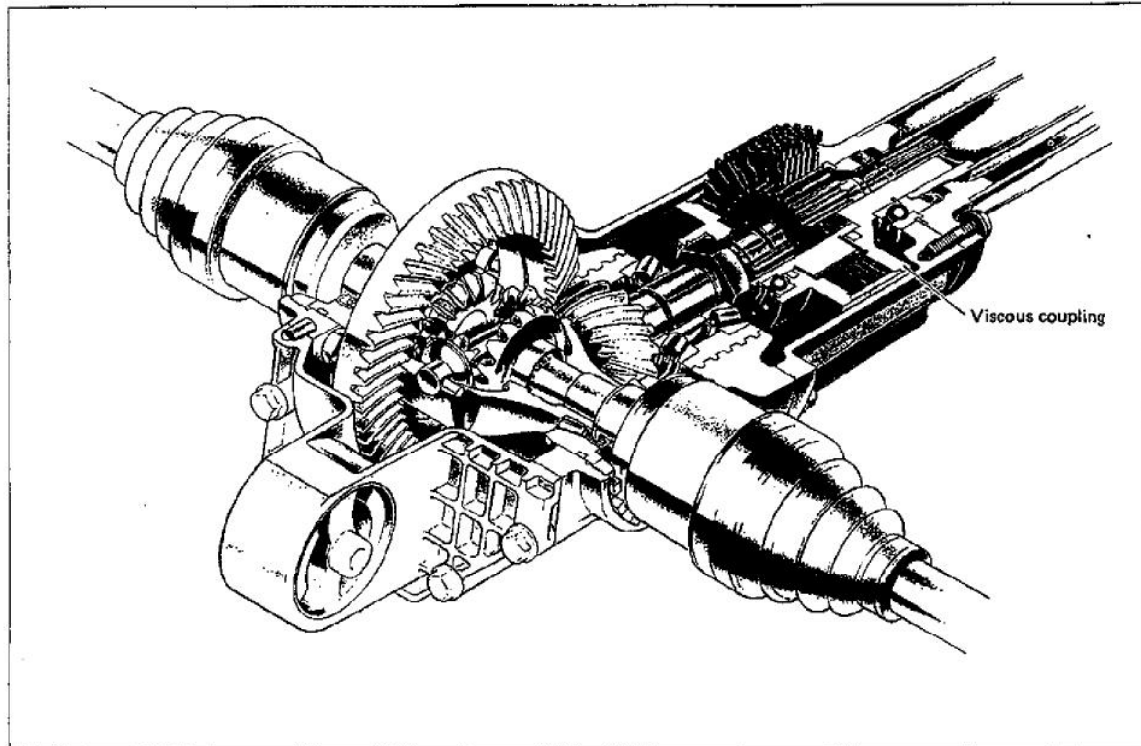


Fig. 7D-3

ON CAR SERVICE

PRECAUTION IN SERVICING (FULL-TIME 4WD)

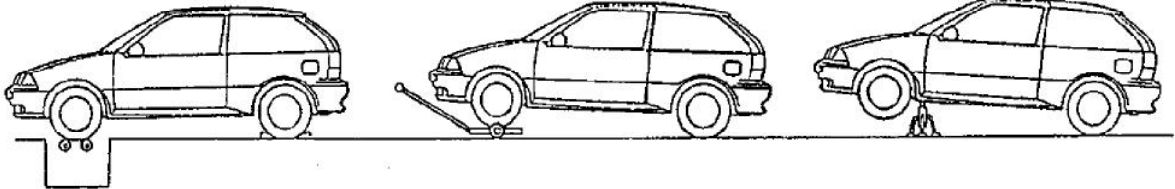
When performing any of the following types of work, it is necessary to make the car as front wheel drive by cutting transmission of driving force to the rear wheels.

Testing following items

- Speedometer
- Chassis dynamo
- Brake
- Wheel balance (on car type)

Towing car with front or rear wheels lifted up

Driving front wheels which are jacked up



SWITCHING FROM 4WD TO 2WD

Set 4WD/2WD selector lever located at lower side of transfer driven case to 2WD.

1. Loosen transfer lock bolt.
2. Push in shift fork shaft fully.
3. With shift fork shaft pushed in, tighten transfer lock bolt.

Tightening torque for transfer lock bolt	N·m	kg·m	lb·ft
	15 - 22	1.5 - 2.2	11.0 - 15.5

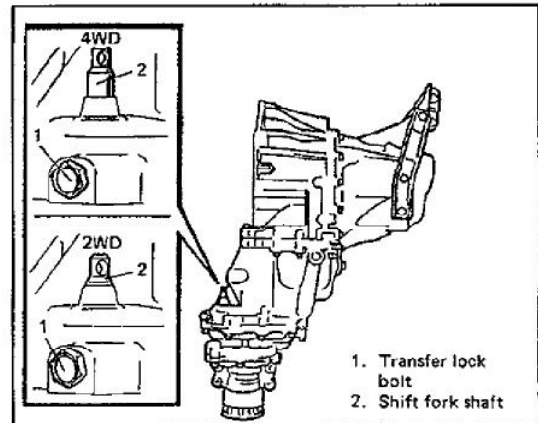


Fig. 7D-4

NOTE:

- If shift fork shaft is hard to move, try to move it while turning it to the right and left little by little. Do the same when setting back to 4WD after servicing car.
- Upon completion of servicing, always set shift fork shaft back to 4WD.

7D-6 TRANSFER

For removal of transmission unit, disassembly of internal structure of transmission and removal of transfer assembly, refer to Section 7A.

TRANSFER ASSEMBLY

DISASSEMBLY

1. Remove output case bolts.

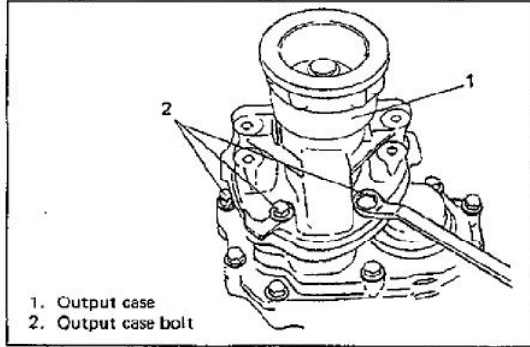


Fig. 7D-5

2. Remove transfer lock bolt from rear case.

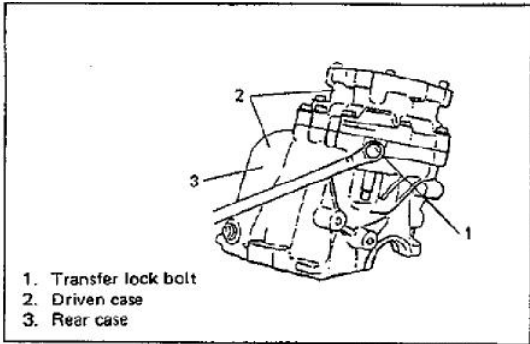


Fig. 7D-6

3. Remove shift fork shaft and then sleeve.

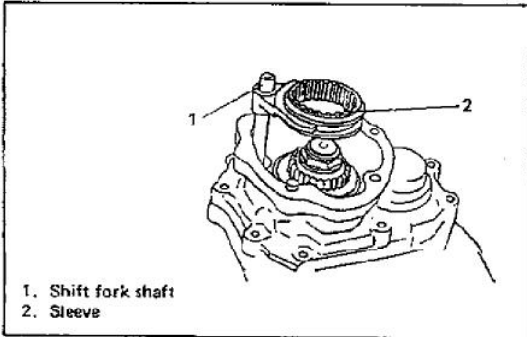


Fig. 7D-7

4. Remove caulking of driven gear nut, loosen nut as shown below and remove clutch dog.

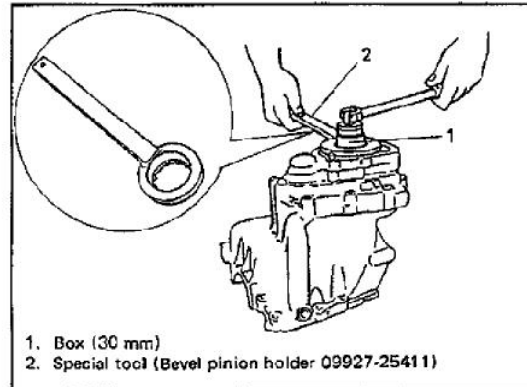


Fig. 7D-8

5. Remove driven gear plate and then circlip of ball bearing.

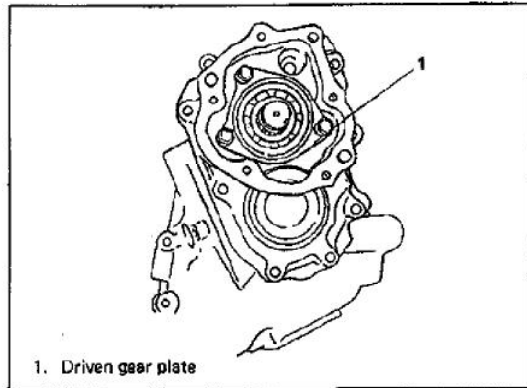


Fig. 7D-9

6. Loosen driven case bolt and remove driven case.

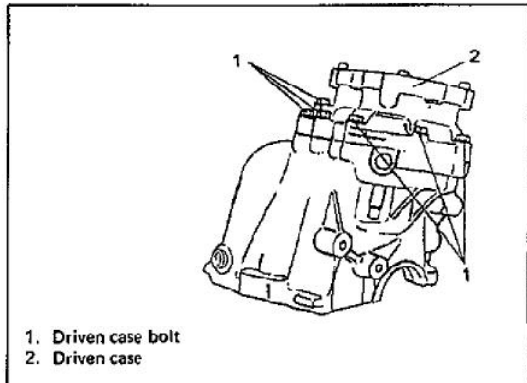


Fig. 7D-10

7. Drive driven gear out of rear case.

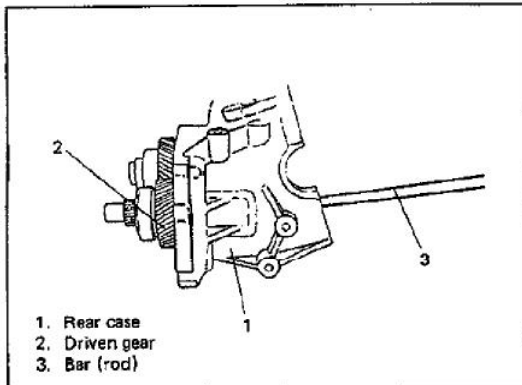


Fig. 7D-11

10. Drive pinion bearing outer race out of rear case.

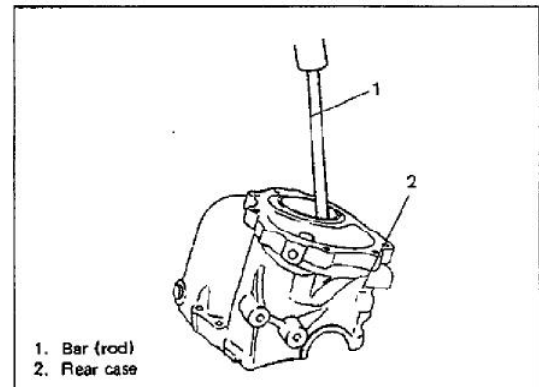


Fig. 7D-14

8. Using special tool, hold drive gear securely and loosen output pinion nut.

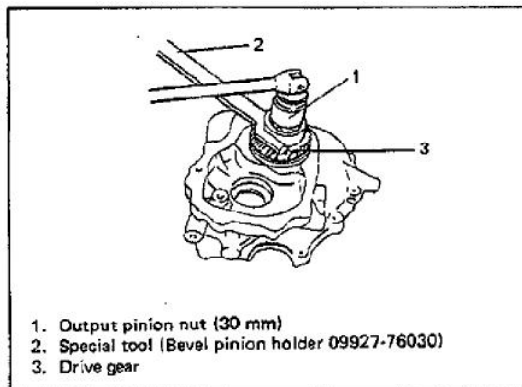


Fig. 7D-12

11. Remove caulking of output shaft nut and loosen it with flange fixed as shown below.

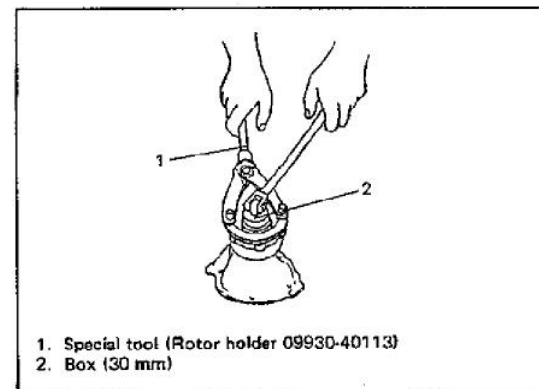


Fig. 7D-15

9. Drive out output pinion with plastic hammer.

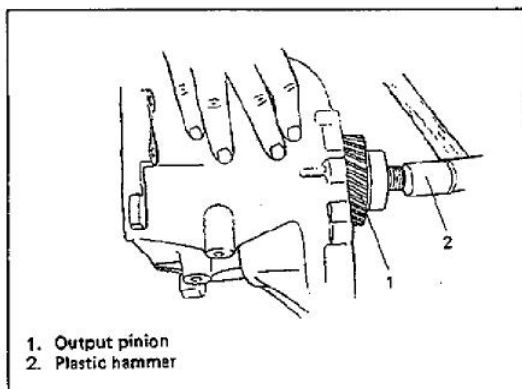


Fig. 7D-13

12. Remove output shaft bearing circlip.

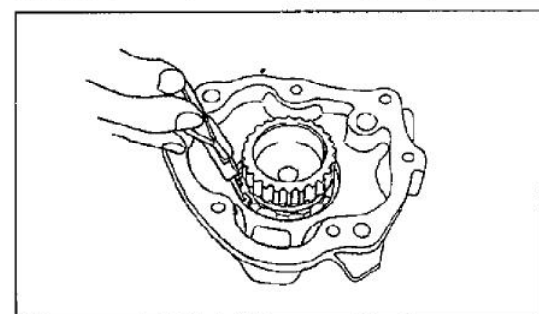


Fig. 7D-16

13. Using plastic hammer, drive out output shaft bearing.

ASSEMBLY

Reverse disassembly procedure, noting following points.

- Apply SUZUKI Bond No. 1215 to mating surface of case before assembly.
- Make sure to put clutch dog with right side up as shown below.

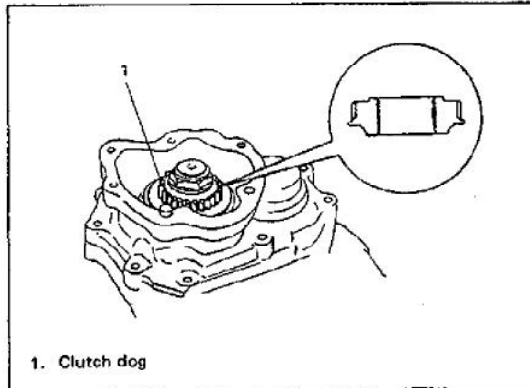


Fig. 7D-17

- Make sure to put clutch sleeve with right side up as shown below.

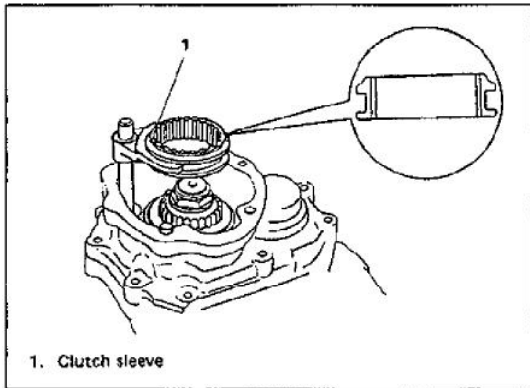


Fig. 7D-18

BEVEL PINION SHIM ADJUSTMENT

(Bevel pinion bearing shim adjustment)

1. Measure drive pinion spacer length A.

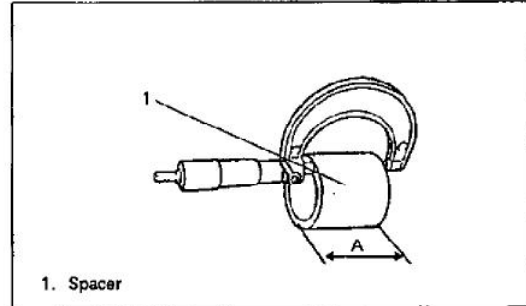


Fig. 7D-19

2. Measure level difference B between outer race and inner race of bevel pinion bearing (at both front and rear).

Level difference at front bearing B +
Level difference at rear bearing B' = C

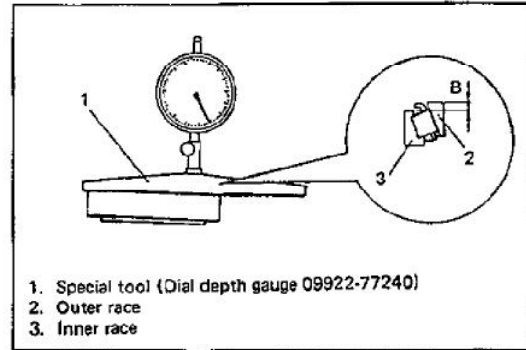


Fig. 7D-20

3. Measure dimension D of differential carrier.

$C + D = E$
Measured level difference = $E - A$

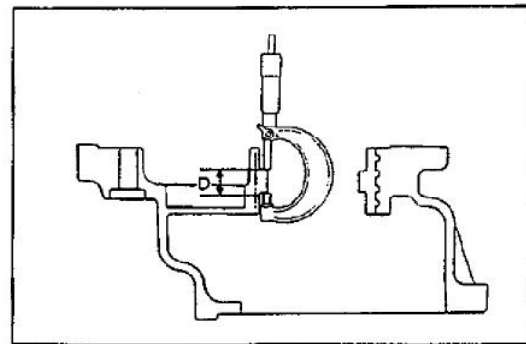


Fig. 7D-21

4. Using following table, select necessary shim(s).

Shim to use Measured level difference	0.60	0.63	0.66	0.69	0.72	0.75	0.78	0.81	0.84	0.87	0.30
0.976 – 1.005	•										•
1.006 – 1.035		•									•
1.036 – 1.065			•								•
1.066 – 1.095				•							•
1.096 – 1.125					•						•
1.126 – 1.155						•					•
1.156 – 1.185							•				•
1.186 – 1.215								•			•
1.216 – 1.245									•		•
1.246 – 1.275										•	•
1.276 – 1.305	••										
1.306 – 1.335	•	•									
1.336 – 1.365	•		•								
1.366 – 1.395	•			•							
1.396 – 1.425	•				•						
1.426 – 1.455	•					•					
1.456 – 1.485	•						•				
1.486 – 1.515	•							•			
1.516 – 1.545	•								•		
1.546 – 1.575	•									•	
1.576 – 1.605		•								•	
1.606 – 1.635			•							•	
1.636 – 1.665				•						•	

7D-10 TRANSFER

5. Press-fit bevel pinion bearing and outer race into rear case.

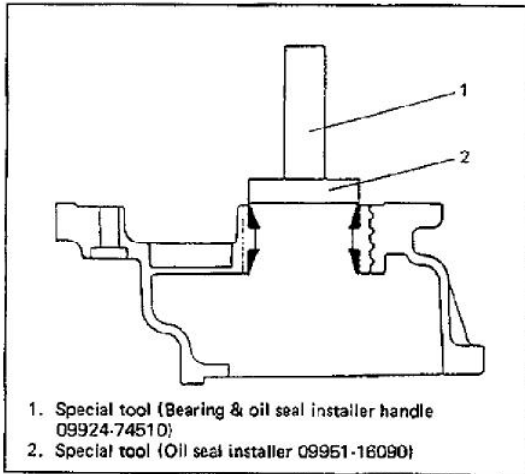


Fig. 7D-22

6. Place bearing, spacer and shim(s) on bevel pinion dummy of special tool (Bevel pinion dummy set) and tighten bevel pinion nut to specified torque.

Tightening torque for bevel pinion	N-m	kg-m	lb-ft
	90-150	9.0-15.0	65.5-108.0

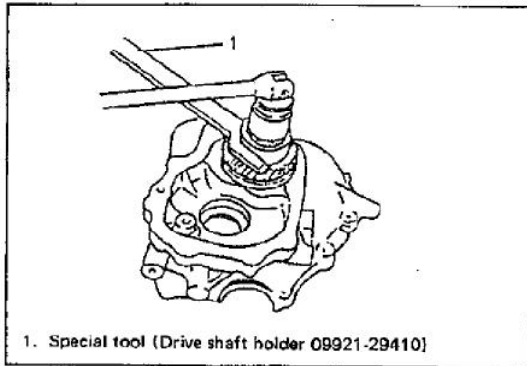


Fig. 7D-23

7. Using torque wrench, measure preload.

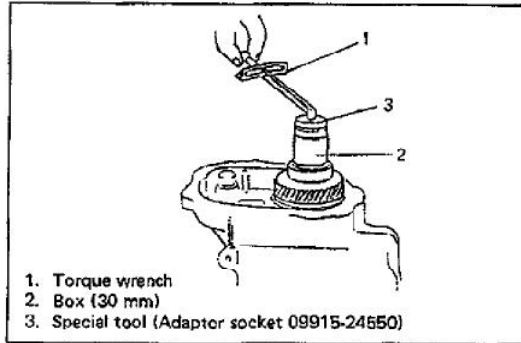


Fig. 7D-24

Standard value of preload

5 - 13 kg-cm
0.37 - 1.08 lb-ft

NOTE:

- Apply thin coat of gear oil to bearing before measurement.
- Also before measuring preload, turn taper bearing a few times to ensure its good fitting.

BEVEL PINION SHIM ADJUSTMENT (Mounting distance adjustment)

1. Place bevel pinion adjuster on surface plate as shown and set dial gauge to "0".

NOTE:

As bearing size is different between right and left, use shim supplied in bevel pinion dummy set under smaller size bearing as shown below.

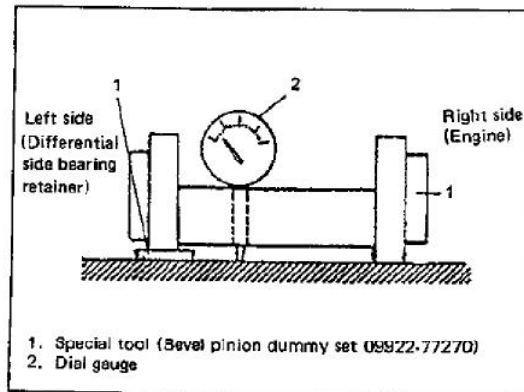


Fig. 7D-25

5. Press-fit bearing into bevel pinion bearing.

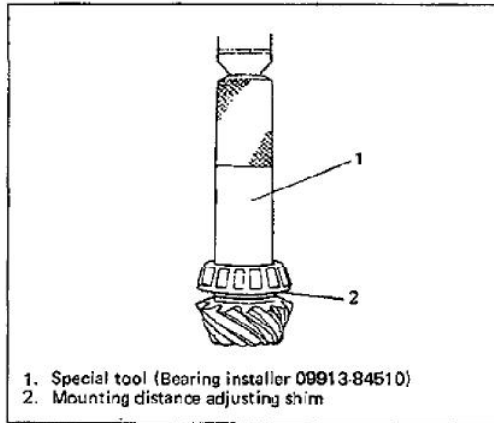


Fig. 7D-27

DRIVE BEVEL GEAR BACKLASH ADJUSTMENT AND SIDE BEARING PRELOAD ADJUSTMENT

1. Using special tool, install differential assembly into rear case.

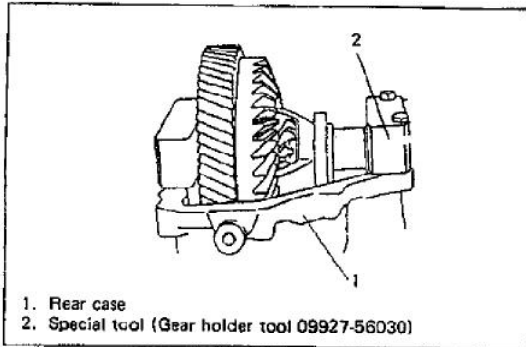


Fig. 7D-28

2. Using depth gauge, measure depth A down to bearing outer race and obtain difference with dimension B of bearing retainer; $A - B = C$.

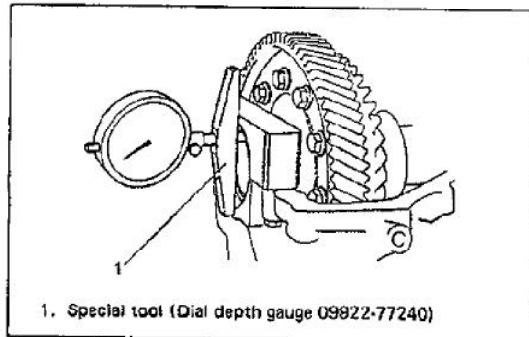


Fig. 7D-29

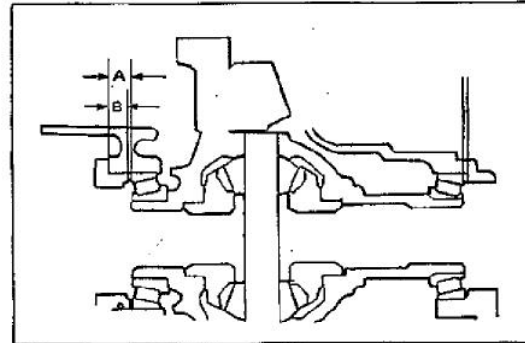


Fig. 7D-29-1

3. Calculate shim thickness to be inserted into differential side bearing.

$$\text{Shim thickness} = C + (0.1 \text{ to } 0.5 \text{ mm})$$

$$(0.004 \text{ to } 0.019 \text{ in.})$$

4. Select shim(s) to fit within calculated value.

5. Install bevel pinion to case.

Available shims	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm
	0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.

6. Adjust drive bevel gear backlash by adding/subtracting the shims into/from the right and left bearing-to-case (retainer) gap so that the backlash becomes within specified value below.

7. To measure drive bevel gear backlash, set dial gauge at right angle to bevel gear tooth, fix drive bevel pinion and rear dial gauge while moving bevel gear.

Drive gear backlash	0.10 – 0.18 mm (0.004 – 0.007 in.)
---------------------	---------------------------------------

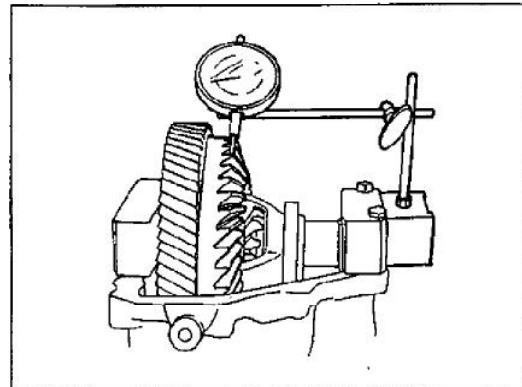


Fig. 7D-30

8. With bevel gear installed, measure starting torque by using differential preload adjusting tool. If bevel pinion starting torque and side bearing starting torque with bevel gear installed (bevel pinion bearing + side bearing preload) is within standard value, side bearing preload is satisfactory.

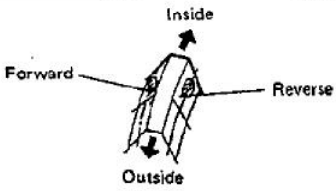


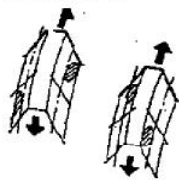
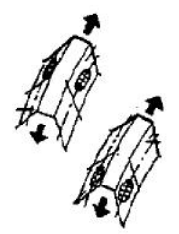
Side bearing preload standard value	Measured bevel pinion preload + 3 – 5 kg-cm (0.217 – 0.361 lb-ft)
-------------------------------------	---

INSPECTION OF GEAR TOOTH SURFACE CONTACT

Upon completion of assembly, apply red lead paste to tooth surface of drive bevel gear and turn it by hand to check its contact with drive bevel pinion. Adjust if check result is not satisfactory.

NOTE:

Apply red lead paste all around bevel gear but not so much as to become sticky.

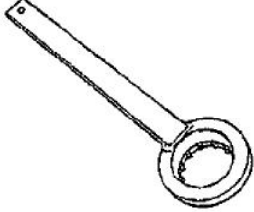
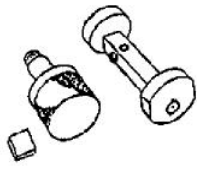
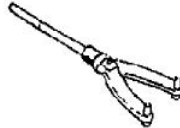
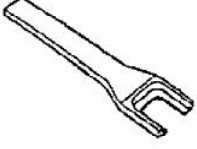
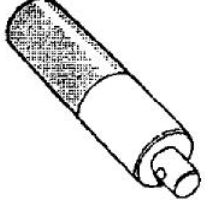
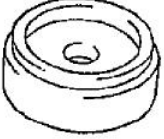
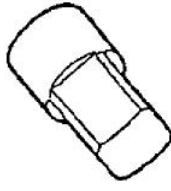
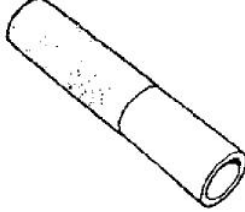
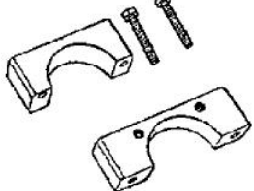
	Tooth surface contact	Possible cause and correction
Correct		Both forward and reverse contacts should occur a little toward inside from the center.
Poor shim adjustment		Forward contact occurs toward outside and reverse contact toward inside from the center and both at higher position. In such case, bevel pinion shim is too thin. Correction: Adjust shim thickness by increasing it.
		Forward contact occurs toward inside and reverse contact toward outside from the center and both at lower position. In such case, bevel pinion shim is too thick. Correction: Adjust shim thickness by reducing it.
Defect in part(s)		When tooth contacts occur as shown at the left, proper rear case offset (18 mm) is not obtained. Correction: Replace rear case (rear case, right case and left case assembly).
		When tooth contacts are deviated toward inside or outside of gear, possible causes are as follows. <ul style="list-style-type: none"> • Drive bevel gear or drive bevel pinion defective. • Poor squareness of rear case. • Rear case surface where gear is installed is defective. Correction: Replace defective part as an assembly.

	Tooth surface contact	Possible cause and correction
Defect in part(s)		<p>When tooth contacts occur as shown at the left, gear itself is defective. Correction: Replace drive bevel gear and drive bevel pinion as a set.</p>
		<p>When contact is not oval in shape, gear itself is defective. Abnormal contact is also caused by nick in tooth surface or faulty condition of differential case at its drive bevel gear mounting part. Correction: Replace drive bevel gear and drive bevel pinion as a set and differential gear case as well, if found defective.</p>

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg·m	lb·ft
Output shaft nut	80 – 100	8.0 – 10.0	58.0 – 72.0
Output pinion nut	90 – 150	9.0 – 15.0	65.5 – 108.0
Bearing plate bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Output flange nut	80 – 100	8.0 – 10.0	58.0 – 72.0
Driven case bolt	18 – 28	1.8 – 2.8	13.5 – 20.0
Output case bolt			

SPECIAL TOOLS

 <p>09927-25411 Bevel pinion holder</p>	 <p>09922-77270 Bevel pinion dummy set</p>	 <p>09930-40113 Rotor holder</p>	 <p>09927-76030 Bevel pinion holder</p>
 <p>09924-74510 Bearing & oil seal installer handle</p>	 <p>09951-16090 Oil seal installer</p>	 <p>09915-24550 Adapter socket</p>	 <p>09913-84510 Bearing installer</p>
 <p>09927-56030 Gear holder tool</p>			

REQUIRED SERVICE MATERIALS

MATERIAL	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND NO. 1215 (99000-31110)	<ul style="list-style-type: none"> • Mating surface of transmission and transfer cases • Mating surface of transfer output and driven cases

SECTION 7E

DIFFERENTIAL

CONTENTS

GENERAL DESCRIPTION	7E- 1
ON CAR SERVICE	7E- 2
Differential Oil Change	7E- 2
Front Differential	7E- 2
Rear Differential	7E- 3
Bevel Pinion Shim Admusement (Bevel pinion bearing shim adjustment)	7E- 7
Bevel Pinion Shim Adjustment (Mounting Distance Adjustment)	7E- 8
Drive Bevel Gear Backlash Adjustment and Side Bearing Preload Adjustment	7E- 9
Inspection of Gear Tooth Surface Contact	7E-10
RECOMMENDED TORQUE SPECIFICATIONS	7E-11
SPECIAL TOOLS	7E-12
REQUIRED SERVICE MATERIALS	7E-12

GENERAL DESCRIPTION

For the rear differential, a hypoid gear is used and a viscous coupling is provided in front of it.

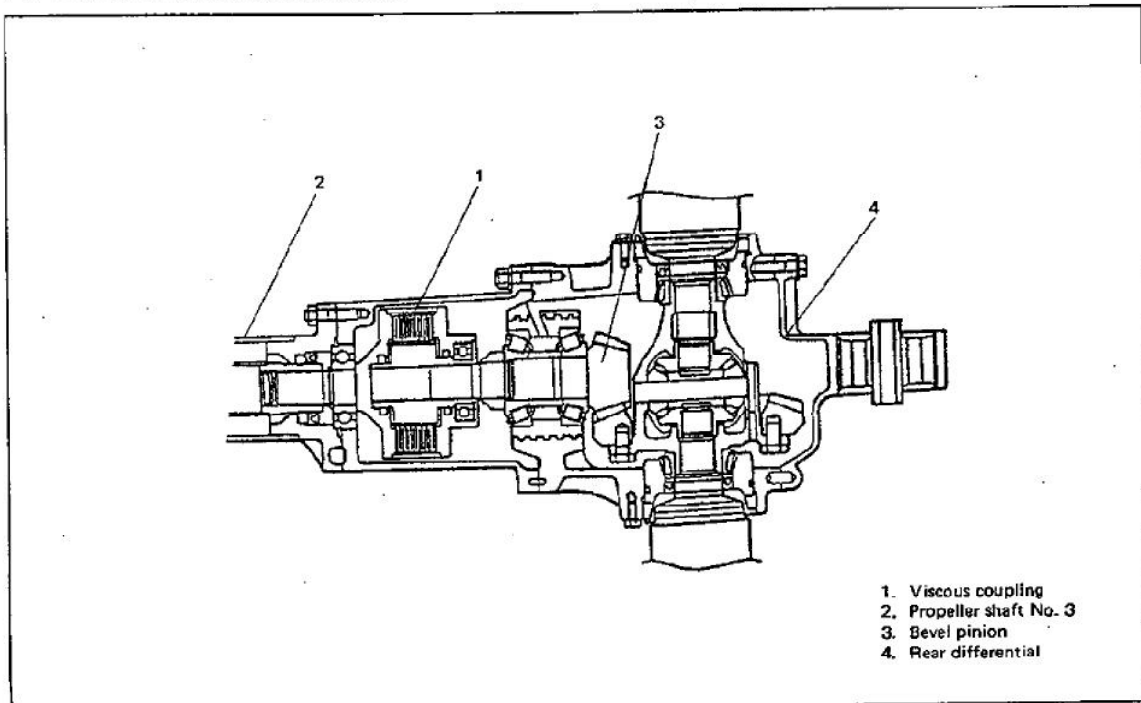


Fig. 7E-1

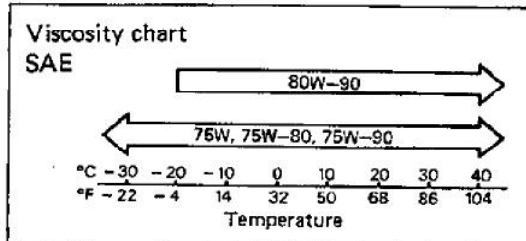
ON CAR SERVICE

DIFFERENTIAL OIL CHANGE

Fill specified gear oil up to mouth of oil level plug.

NOTE:

- It is highly recommended to use API GL-5 SAE 75W-90 hypoid gear oil.
- Whenever car is hoisted for any other service work than oil change, also be sure to check for oil leakage.



Oil capacity	1.1 liters 2.4/2.0 US/Imp. pt
--------------	----------------------------------

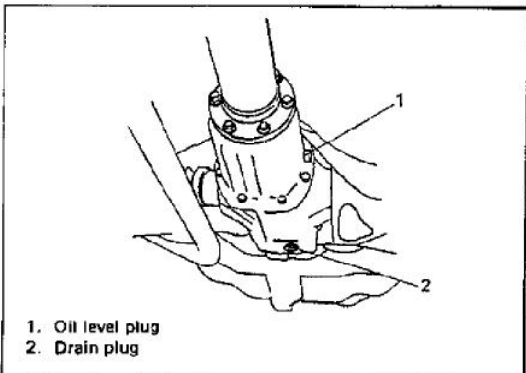


Fig. 7E-2

Tightening torque for oil drain plug	N·m	kg-m	lb-ft
	12 - 22	1.2 - 2.2	9.0 - 15.5

FRONT DIFFERENTIAL

DISASSEMBLY

For removal of differential assembly, refer to Section 7A.

1. Remove differential side bearing.
2. Remove circlip and then speedometer drive gear.
3. Remove final gear bolts (10 pcs.), final gear and bevel gear.

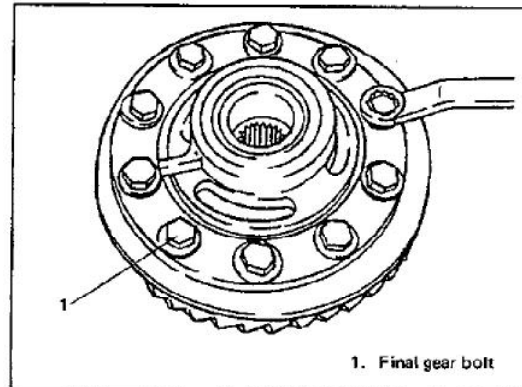


Fig. 7E-3

ADJUSTEMENT AND ASSEMBLY

Before disassembly, check each part for wear and damage. Replace any defective part with new one. Clean all disassembled parts and re-assemble by reversing disassembly procedure.

1. After assembling differential gear, measure its play in thrust direction.

Left Side

- Apply pointed end of dial gauge to gear thread as shown below.
- While moving gear up and down with two large slotted screwdrivers, read dial gauge.

Right Side

- Apply pointed end of dial gauge to gear shoulder as shown below.
- While moving gear up and down with fingers, read dial gauge.

Play in thrust direction	0.03 - 0.31 mm (0.001 - 0.012 in.)
--------------------------	---------------------------------------

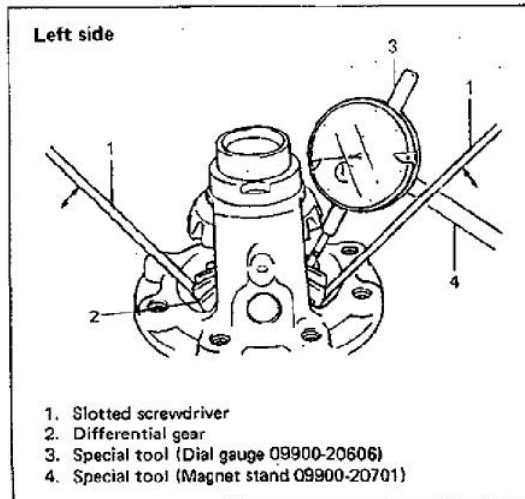


Fig. 7E-4

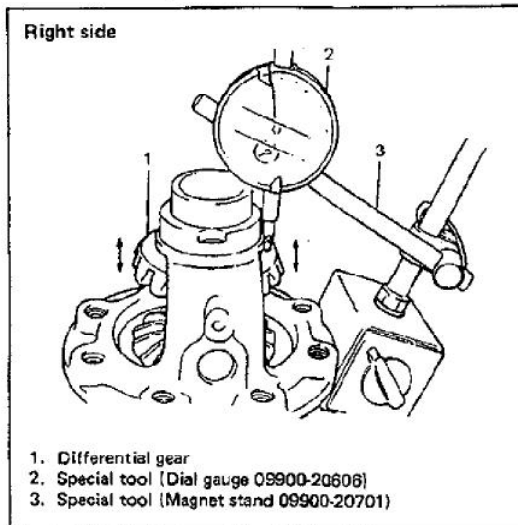


Fig. 7E-5

2. If measured play in thrust direction is not within specified range, insert thrust washer of suitable thickness from among available ones listed below. Measure play again to make sure it is within specification.

Available thrust washer thickness	0.9, 0.95, 1.0, 1.05, 1.1, 1.15 and 1.2 mm 0.035, 0.037, 0.039, 0.041, 0.043, 0.045 and 0.047 in.
-----------------------------------	--

3. Install left bearing.
4. Install speedometer drive gear and right bearing. When press-fitting right bearing, use such appropriate tool as not to apply load to left bearing.
5. Install final gear and tighten its fixing bolts (8 pcs.) to specified torque.

Tightening torque for final gear fixing bolt	N-m	kg-m	lb-ft
	80 - 90	8.0 - 9.0	58.0 - 65.0

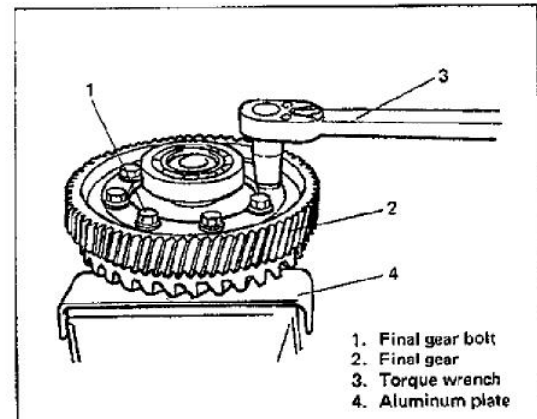


Fig. 7E-6

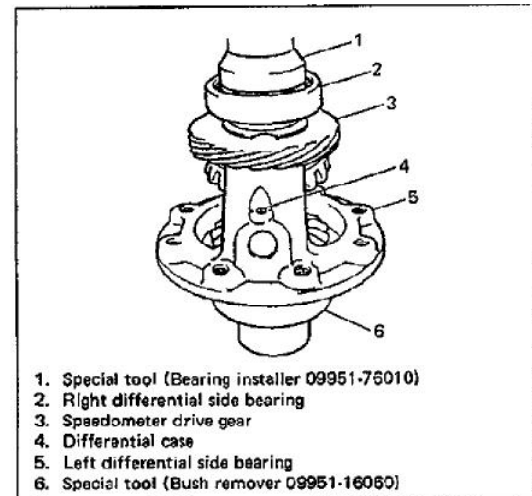


Fig. 7E-7

REAR DIFFERENTIAL

REMOVAL

1. Remove rear drive shaft. (Refer to Section 4C.)
2. Remove exhaust muffler. (Refer to Section 6K.)

7E-4 DIFFERENTIAL

3. Remove propeller shafts No. 2 to No. 3 fixing bolts.

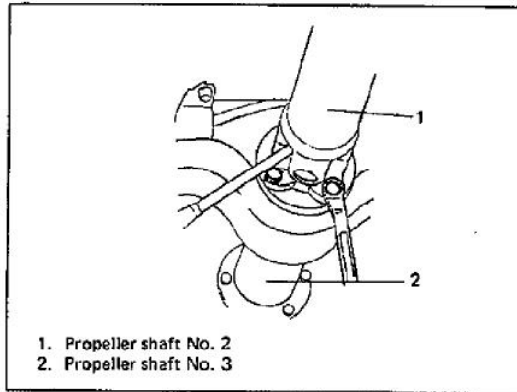


Fig. 7E-8

4. Place jack so that differential assembly will not tilt.
5. Remove differential mounting bracket nut.

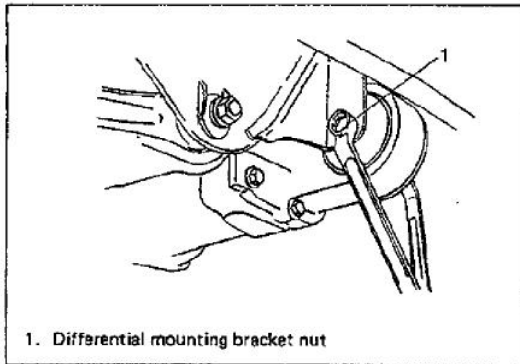


Fig. 7E-9

6. Remove differential mounting nuts and then remove differential viscous coupling propeller shaft No. 3 assembly.

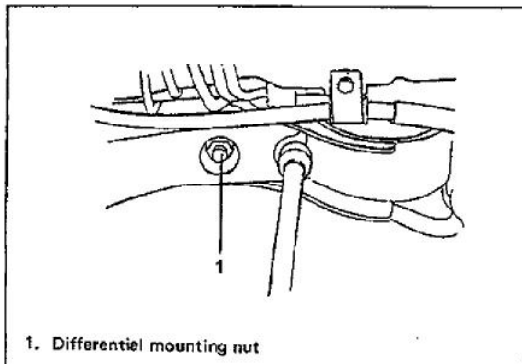


Fig. 7E-10

7. Remove viscous coupling case and propeller shaft No. 3 from differential.

INSTALLATION

For installation, reverse removal procedure, noting following points.

- When installing rear drive shaft, refer to Section 4C and tighten to specified torque.

DISASSEMBLY

1. Remove rear cover.

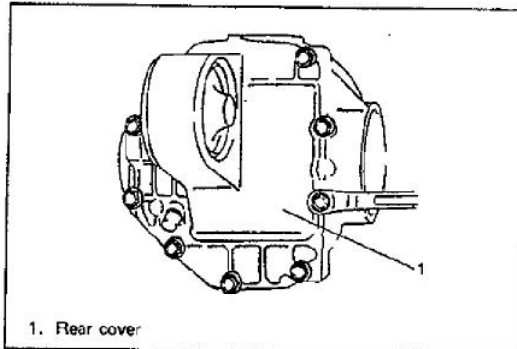


Fig. 7E-11

2. Remove differential side bearing stopper and then remove differential side bearing retainer.

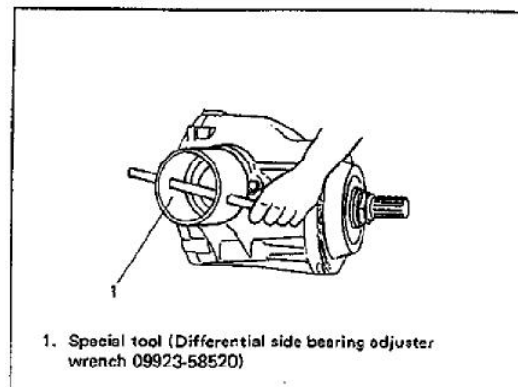


Fig. 7E-12

- Using some appropriate rod, drive out differential side bearing assembly.

NOTE:

When driving out differential side bearing, be very careful not to cause damage to tooth surface of bevel gear.

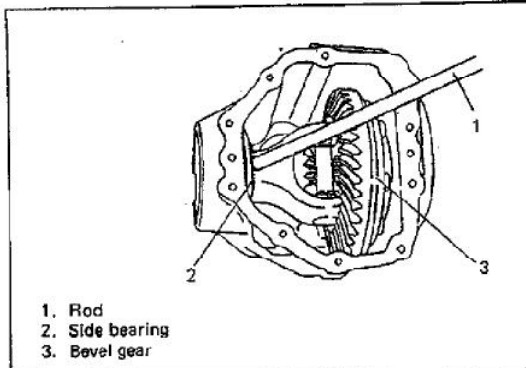


Fig. 7E-13

- Remove bevel gear assembly.
- Remove caulking of bevel pinion nut and loosen it as shown below.

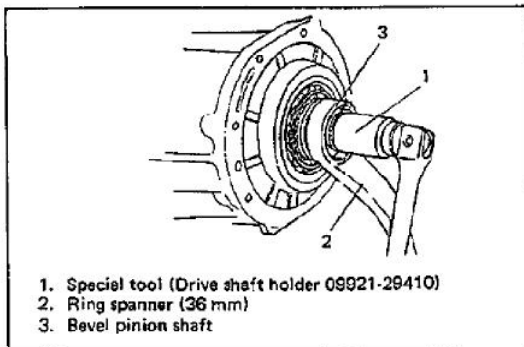


Fig. 7E-14

- Drive out bevel pinion with plastic hammer.
- Pull out bearing from bevel pinion.

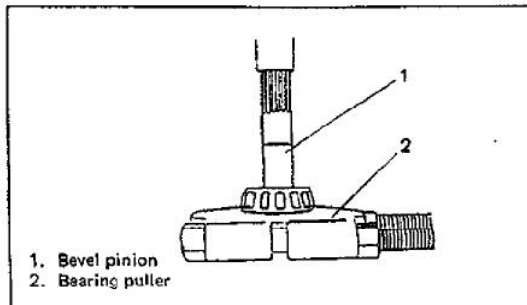


Fig. 7E-15

- Using some appropriate rod, drive out outer bevel pinion bearing.

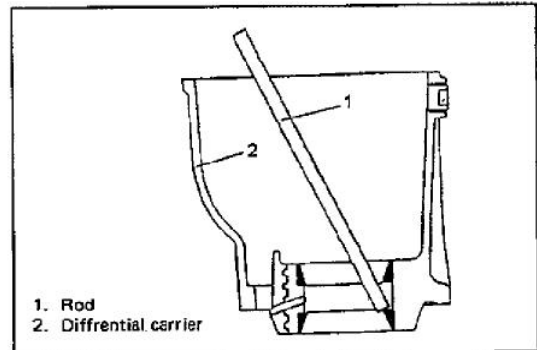


Fig. 7E-16

- Remove bevel gear bolts.

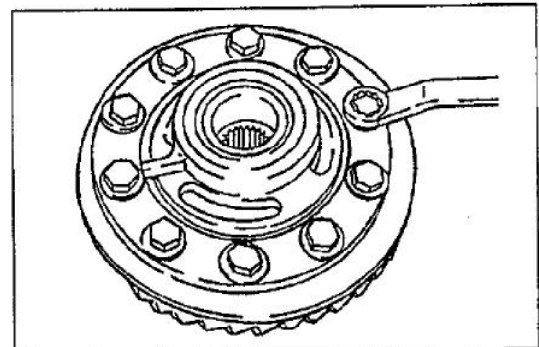


Fig. 7E-17

- Remove differential side bearing.
- Remove differential side pinion shaft pin.
- Remove pinion shaft.

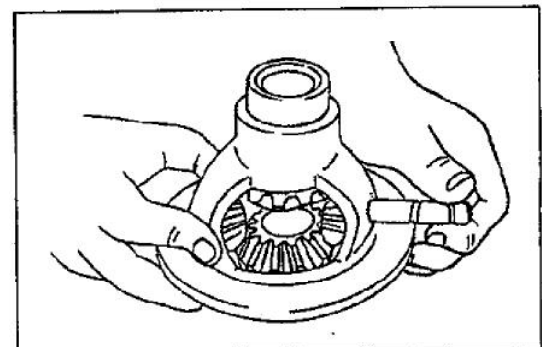


Fig. 7E-18

- Remove side pinion and side gear.

NOTE:

Be sure to keep washers for side gear and spring washers separately from other shims.

7E-6 DIFFERENTIAL

ASSEMBLY

For assembly, reverse disassembly procedure noting following points.

- Tighten bevel pinion nut to specified torque and measure preload of bevel pinion bearing to check that it is within its standard value range.

Tightening torque for bevel pinion nut	N-m	kg-m	lb-ft
	90 – 150	9.0 – 15.0	65.5 – 108.0

Standard value of preload	5 – 13 kg-cm (4.4 – 11.2 lb-in)

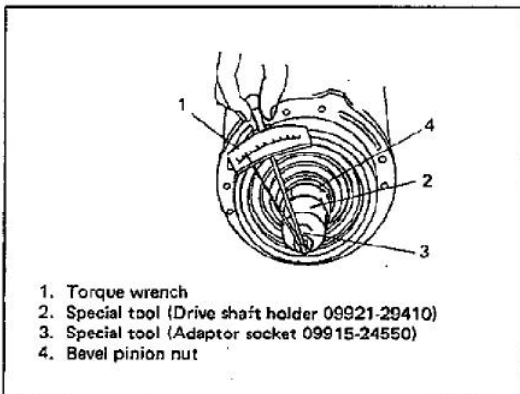


Fig. 7E-19

- Install side gear washer and spring washer in correct order, also making sure that spring washer is in correct direction.

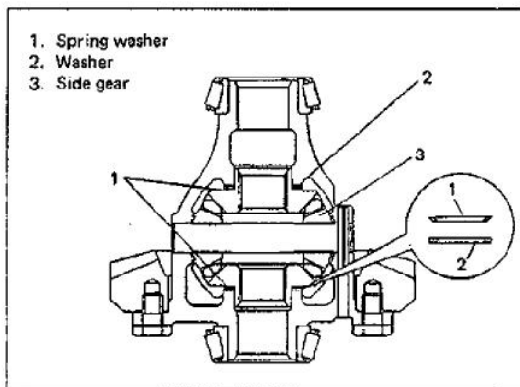


Fig. 7E-20

- Tighten bevel gear bolt to specified torque.

Tightening torque for bevel gear bolt	N-m	kg-m	lb-ft
	65 – 80	6.5 – 8.0	47.5 – 57.5

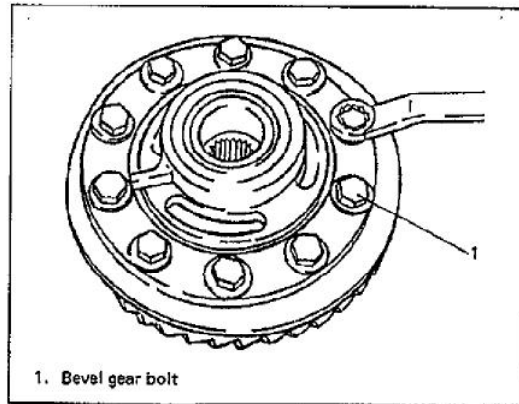


Fig. 7E-21

- Apply SUZUKI Bond No. 1215 to mating surface of case before installing it.

BEVEL PINION SHIM ADJUSTMENT (Bevel pinion bearing shim adjustment)

1. Measure drive pinion spacer length A.

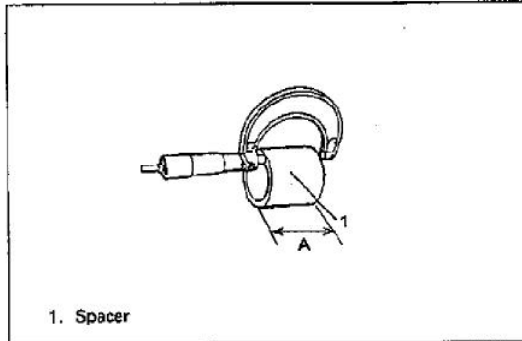


Fig. 7E-22

2. Measure level difference B between outer race and inner race of bevel pinion bearing (at both front and rear).

$$\text{Level difference at front bearing } B + \text{Level difference at rear bearing } B = B'$$

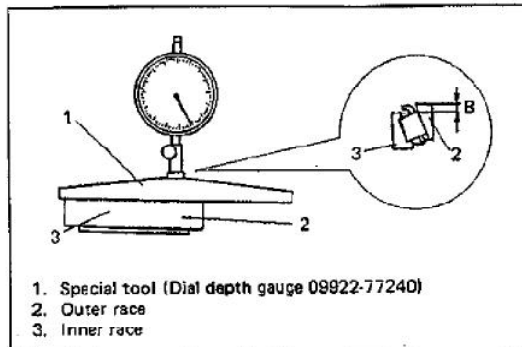


Fig. 7E-23

3. Measure dimension C of differential carrier.
 $B' + C = D$

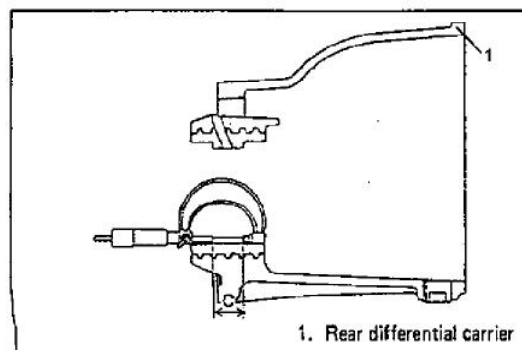


Fig. 7E-24

4. Calculate thickness of shim to be inserted into (M) in figure below.

$$\text{Shim thickness} = (D - A - 0.1 \pm 0.015 \text{ (mm)})$$

5. Select necessary shim(s) so that thickness will be within above calculated value.

Available shim thickness	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm
	0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.

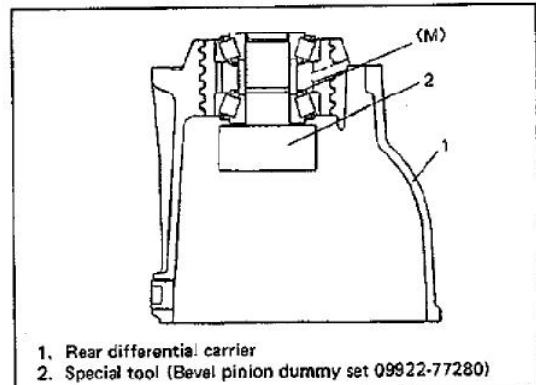


Fig. 7E-25

6. Press-fit bevel pinion bearing and outer race into differential carrier.

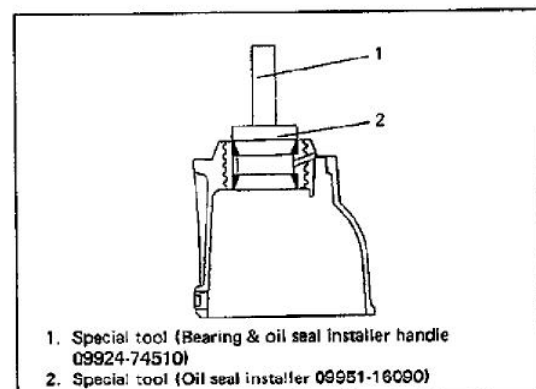


Fig. 7E-26

7E-8 DIFFERENTIAL

- Place bearing, spacer and shim(s) on bevel pinion dummy of special tool (Bevel pinion dummy set) and tighten bevel pinion nut to specified torque.

Tightening torque for bevel pinion nut	N·m	kg·m	lb·ft
	90-150	9.0-15.0	65.5-108.0

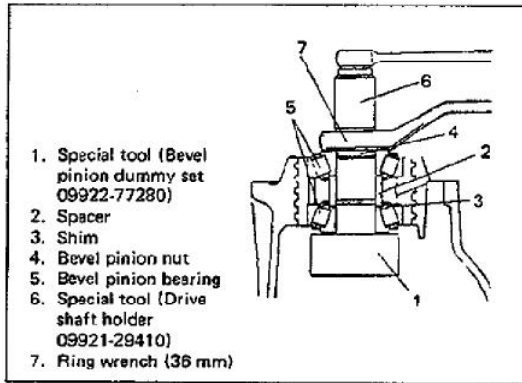


Fig. 7E-27

- Using torque wrench, measure starting torque.

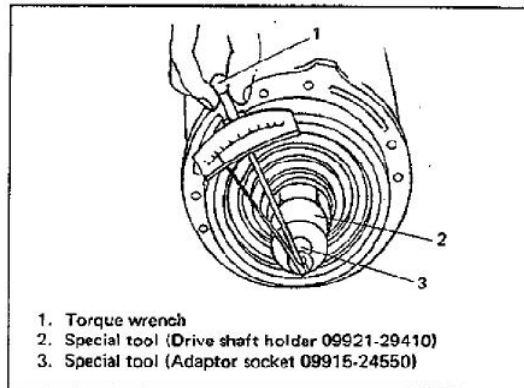


Fig. 7E-28

Standard value of preload	5 - 13 kg·cm (4.4 - 11.2 lb·in)
---------------------------	------------------------------------

NOTE:

- Apply thin coat of gear oil to bearing before measurement.
- Also before measuring preload, turn taper bearing a few times to ensure its good fitting.
- Preload can be adjusted, if only a little, by adjusting tightening torque of bevel pinion (but only within its specified range).

BEVEL PINION SHIM ADJUSTMENT

(Mounting distance adjustment)

- Place bevel pinion adjuster on surface plate as shown and set dial gauge to "0".

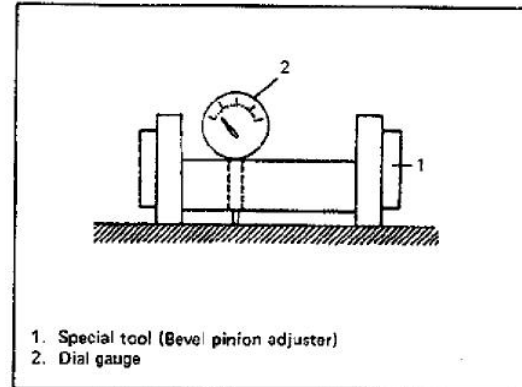


Fig. 7E-29

- Set bevel pinion dummy, bevel pinion and bevel pinion adjuster on differential carrier. Tighten dummy pinion nut to specified torque which is 90 - 150 N·m (9.0 - 15.0 kg·m, 65.5 - 108.0 lb·ft).

NOTE:

Before setting bevel pinion dummy, adjust bevel pinion bearing shim as described previously.

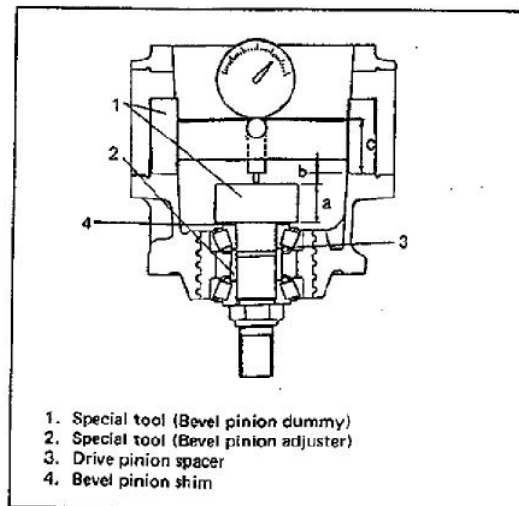


Fig. 7E-30

3. Measure dimension b in figure by reading dial gauge.

4. Calculate thickness of shim to be inserted into (4) in figure above.

$$\text{Shim thickness} = (a + b + c) - 8.0 \pm 0.02$$

$$= b \pm 0.02 \text{ mm}$$

a + c: Measurement of special tool (mounting distance) which is 80 mm

b: Reading on dial gauge

5. Select necessary shim(s) so that thickness will be within above calculated value.

Available shim thickness	0.30, 0.87, 0.84, 0.81, 0.78, 0.75, 0.72, 0.69, 0.66, 0.63 and 0.60 mm 0.012, 0.034, 0.033, 0.032, 0.031, 0.029, 0.028, 0.027, 0.026, 0.025 and 0.024 in.
--------------------------	--

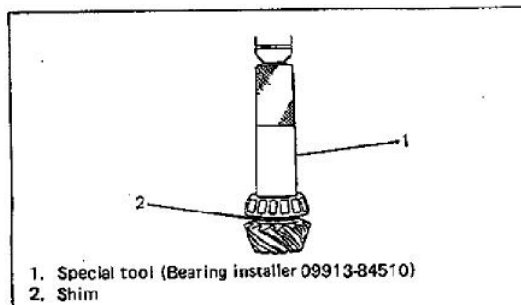


Fig. 7E-31

DRIVE BEVEL GEAR BACKLASH ADJUSTMENT AND SIDE BEARING PRELOAD ADJUSTMENT

1. Using special tool, tighten bearing retainer.

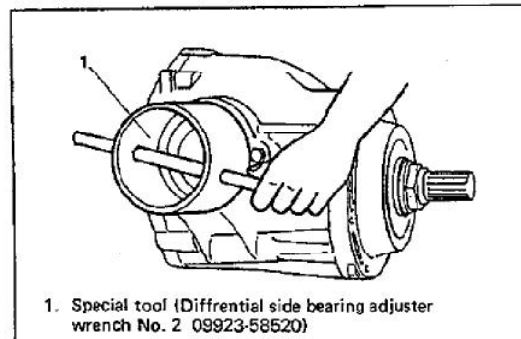


Fig. 7E-32

2. To measure drive bevel gear backlash, set dial gauge at right angle to bevel gear tooth, fix drive bevel pinion and read dial gauge while moving bevel gear.

Drive bevel gear backlash	0.1 – 0.2 mm (0.004 – 0.008 in.)
---------------------------	-------------------------------------

Tightening torque for retainer stopper bolt	N-m	kg-m	lb-ft
	9 – 13	0.9 – 1.3	7.0 – 9.0

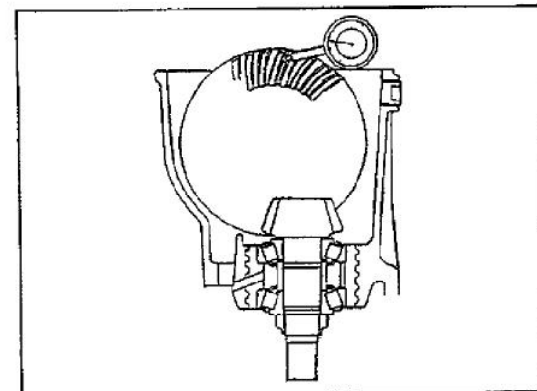


Fig. 7E-33

3. With bevel gear installed, measure starting torque by using differential preload adjusting tool. If bevel pinion starting torque and side bearing starting torque with bevel gear installed (bevel pinion bearing + side bearing preload) is within standard value, side bearing preload is satisfactory.

Side bearing preload standard value	Measured bevel pinion preload + 4 kg-cm 3.5 lb-in)
-------------------------------------	---

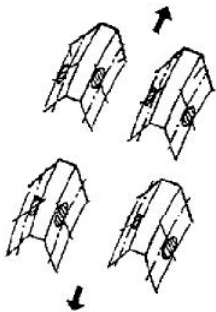
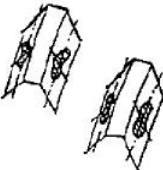
INSPECTION OF GEAR TOOTH SURFACE CONTACT

Upon completion of assembly, apply red lead paste to tooth surface of drive bevel gear and turn it by hand to check its contact with drive bevel pinion. Adjust if check result is not satisfactory.

NOTE:

Apply red lead paste all around bevel gear but not so much as to become sticky.

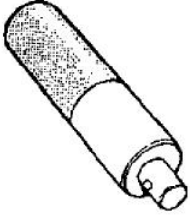
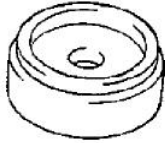
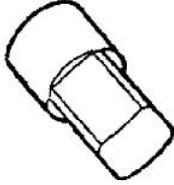

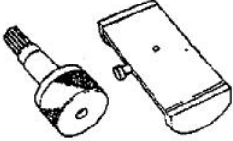
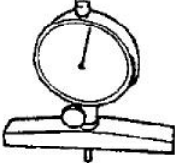
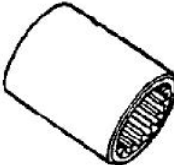
	Tooth surface contact	Possible cause and correction
Correct		Both forward and reverse contacts should occur a little toward inside from the center.
Poor shim adjustment		Forward contact occurs toward outside and reverse contact toward inside from the center and both at higher position. In such case, bevel pinion shim is too thin. Correction: Adjust shim thickness by increasing it.
		Forward contact occurs toward inside and reverse contact toward outside from the center and both at lower position. In such case, bevel pinion shim is too thick. Correction: Adjust shim thickness by reducing it.
Defect in part(s)		When tooth contacts occur as shown at the left, proper differential carrier offset (18 mm) is not obtained. Correction: Replace differential carrier.
		When tooth contacts are deviated toward inside or outside of gear, possible causes are as follows. <ul style="list-style-type: none"> • Drive bevel gear or drive bevel pinion defective. • Poor squareness of differential carrier. • Differential carrier surface where gear is installed is defective. Correction: Replace defective part as an assembly.

	Tooth surface contact	Possible cause and correction
Defect in part(s)		<p>When tooth contacts occur as shown at the left, gear itself is defective.</p> <p>Correction: Replace drive bevel gear and drive bevel pinion as a set.</p>
		<p>When contact is not oval in shape, gear itself is defective. Abnormal contact is also caused by nick in tooth surface or faulty condition transmission case at its drive bevel gear mounting part.</p> <p>Correction: Replace drive bevel gear and drive bevel pinion as a set and differential gear case as well, if found defective.</p>

RECOMMENDED TORQUE SPECIFICATIONS

Fastening portion	Tightening torque		
	N·m	kg·m	lb·ft
Rear differential oil drain plug	12 – 22	1.2 – 2.2	9.0 – 15.5
Bevel pinion nut	90 – 150	9.0 – 15.0	65.5 – 108.0
Bevel gear bolt	65 – 80	6.5 – 8.0	47.5 – 57.5
Differential mount bolt	40 – 60	4.0 – 6.0	29.0 – 43.0

SPECIAL TOOLS

 <p>09924-74510 Bearing & oil seal installer</p>	 <p>09951-16090 Oil seal installer</p>	 <p>09915-24550 Adapter socket</p>	 <p>09923-58520 Differential side bearing adjuster No. 2</p>
 <p>09922-77280 Bevel pinion adjuster set</p>	 <p>09922-77240 Dial depth gauge</p>	 <p>09921-29410 Drive shaft holder</p>	

REQUIRED SERVICE MATERIALS

MATERIALS	RECOMMENDED SUZUKI PRODUCT	USE
Sealant	SUZUKI BOND No. 1215 (99000-31110)	<ul style="list-style-type: none"> • Mating surface of differential carrier and rear cover • Mating surface of differential carrier and viscous case • Mating surface of viscous case and propeller shaft No. 3

SECTION 8

BODY ELECTRICAL SYSTEM

CONTENTS

INSTRUMENTS AND GAUGES 8-1

 Fuel Level Meter and Gauge Unit 8-1

 Wiring Diagram Wiring diagrams are attached at the end of this manual.

INSTRUMENTS AND GAUGES

FUEL LEVEL METER AND GAUGE UNIT

DESCRIPTION OF CIRCUIT

The fuel level meter circuit consists of the fuel level meter installed inside the combination meter and the fuel level gauge installed to the fuel tank.

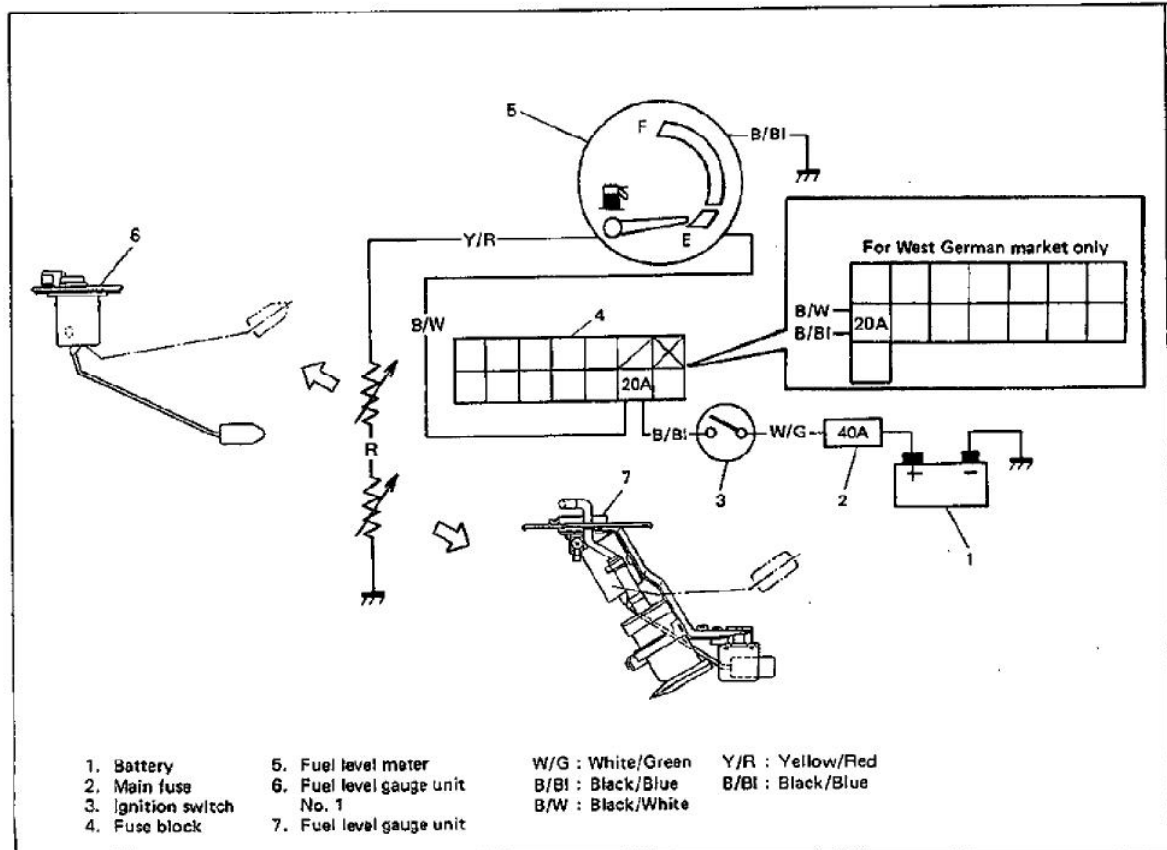


Fig. 8-1

8-2 BODY ELECTRICAL SYSTEM

INSPECTION

GAUGE UNIT

Use an ohmmeter to confirm that resistance of level gauge unit changes with change of float position. Float position-to-resistance relationship can be plotted in a graph as shown below.

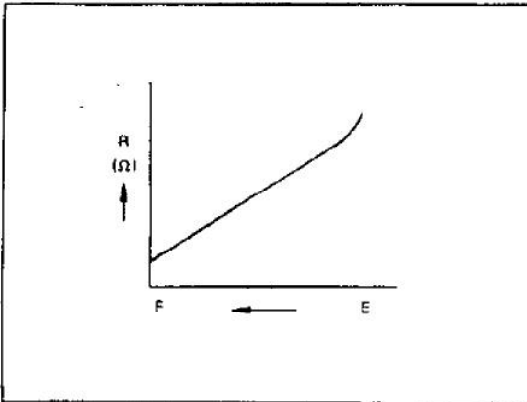


Fig. 8-2 Resistance-Fuel Level Relationship

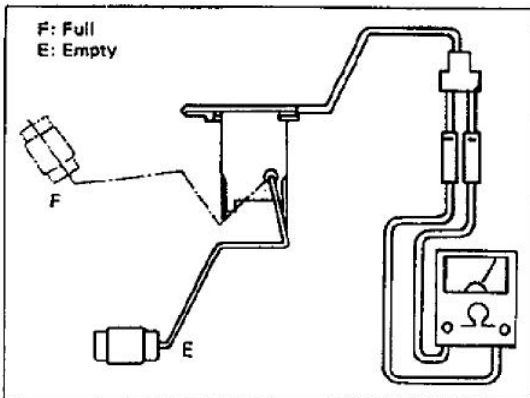


Fig. 8-3 Checking Fuel Gauge Unit

- Fuel level gauge No. 1

Position	Resistance
E	$78 \pm 7 \Omega$
F	$2 \pm 2 \Omega$

- Fuel level gauge No. 2

Position	Resistance
E	$43 \pm 1 \Omega$
F	$1 \pm 1 \Omega$

SECTION 9

BODY SERVICE

UNDERBODY DIMENSIONS

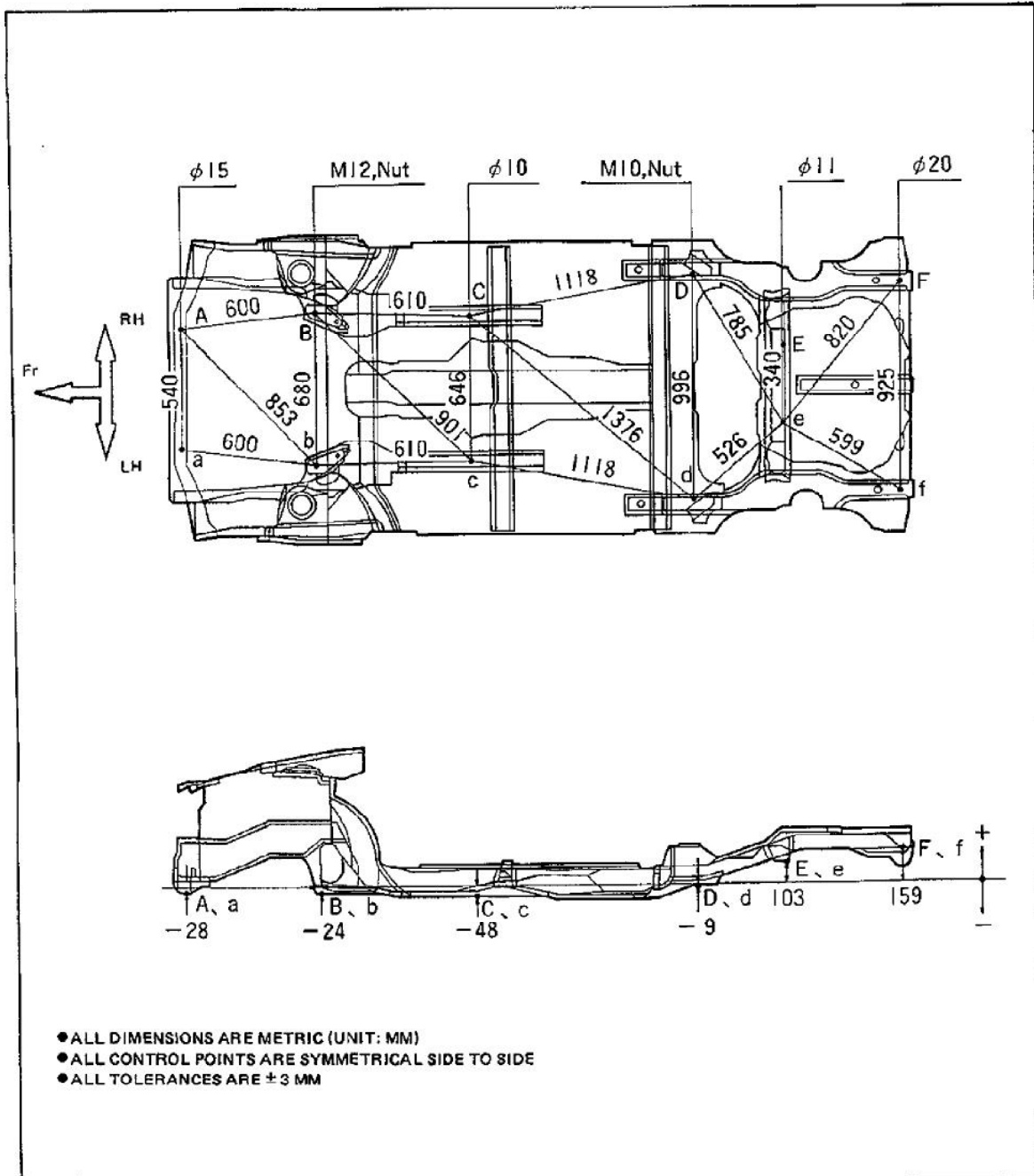
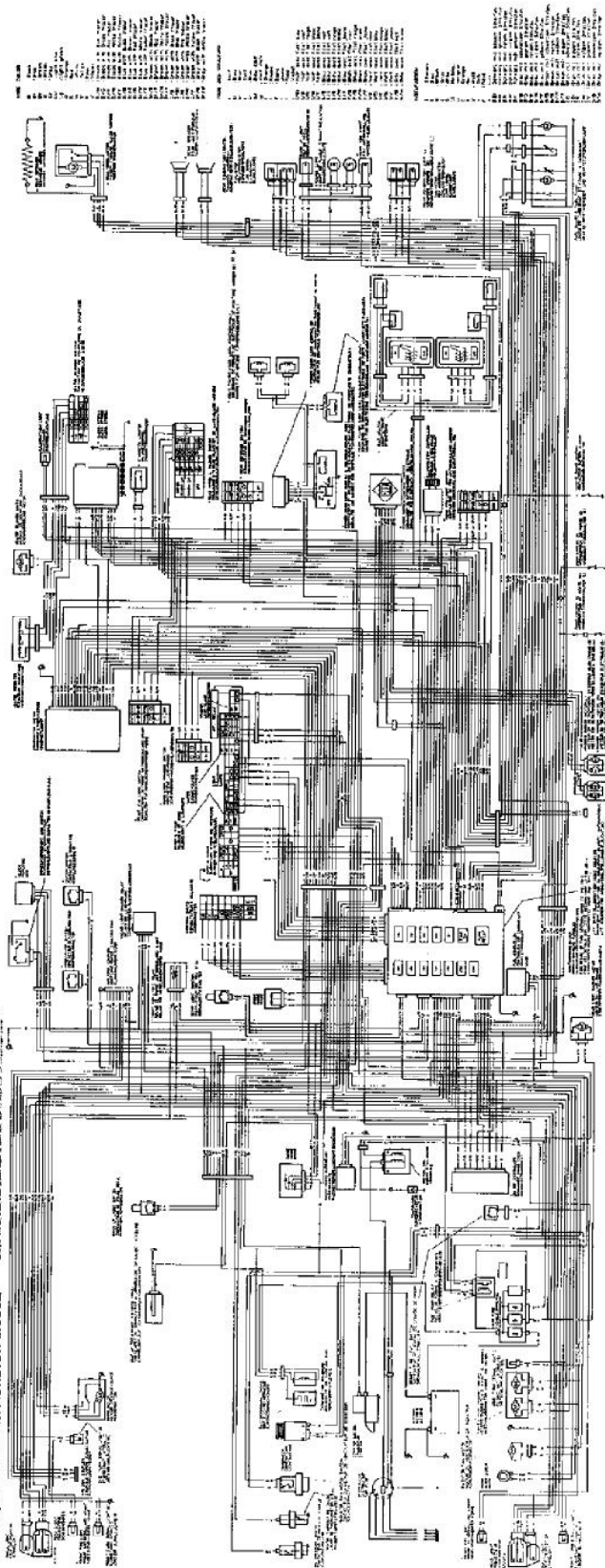


Fig. 9-1 Underbody Dimensions - 4WD Model

WIRING DIAGRAM

For European Markets (CABRIOLET MODEL)

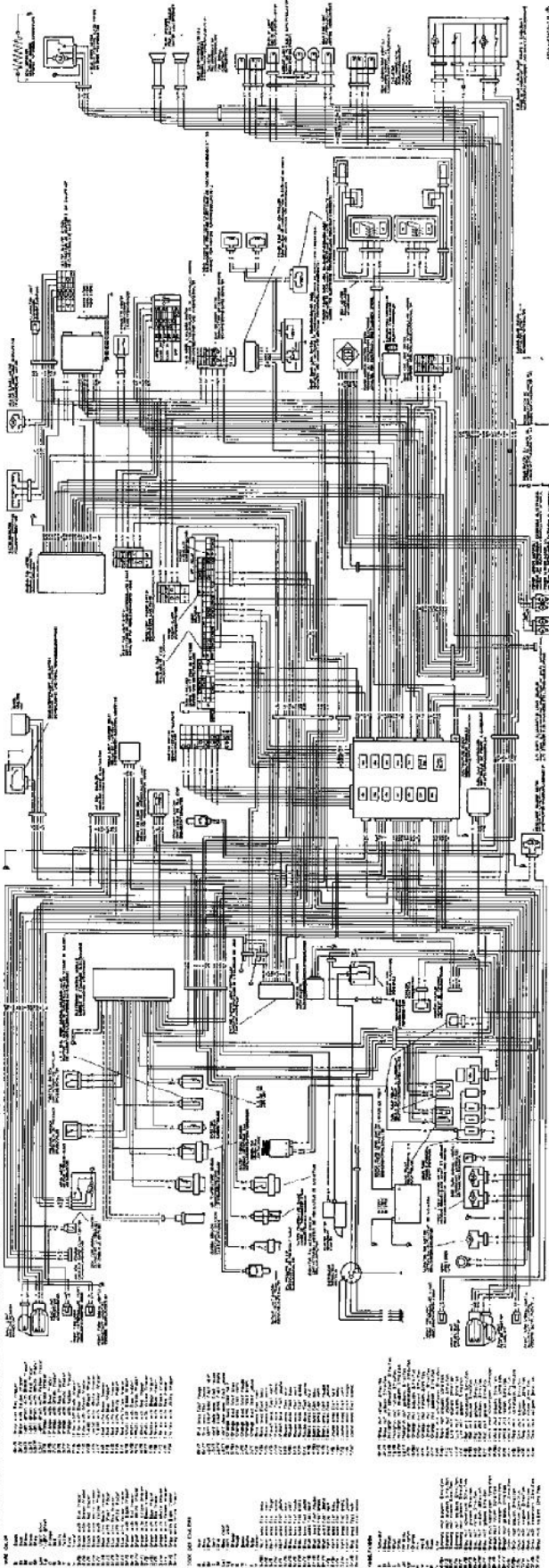


WIRING DIAGRAM

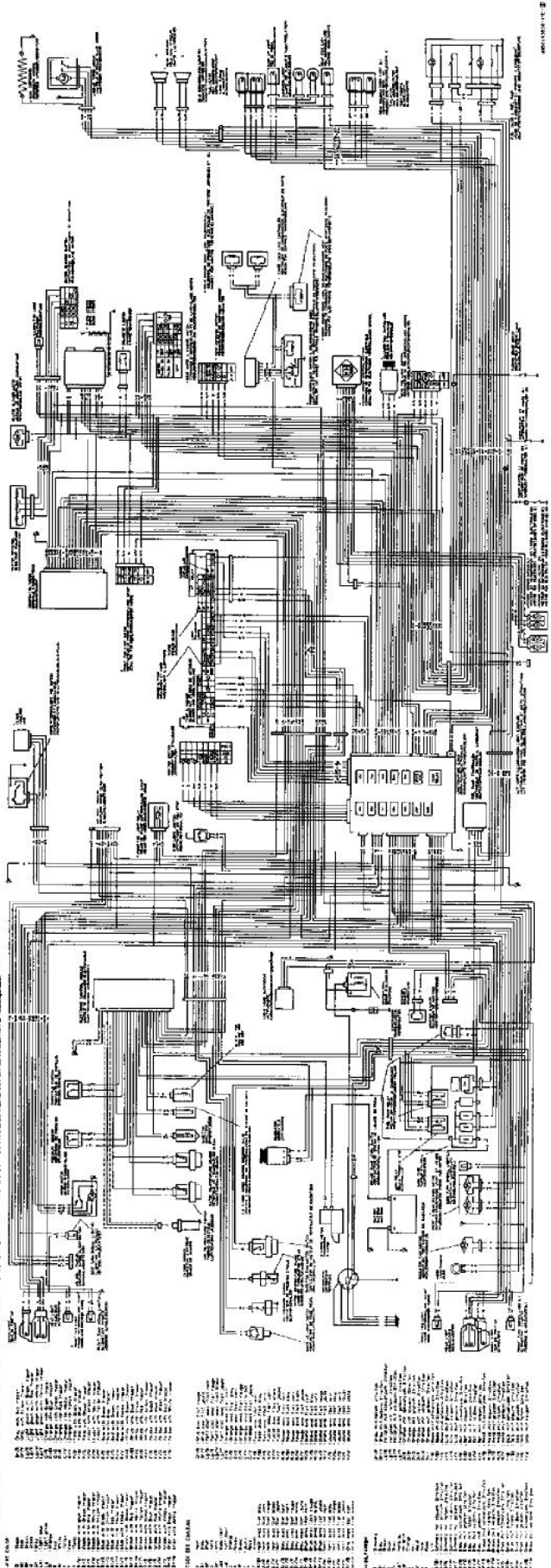
WIRING DIAGRAM

WIRING DIAGRAM

**FOR EUROPEAN MARKETS
FOR CENTRIC FUEL INJECTION MODEL WITH O.R.L. SYSTEM**



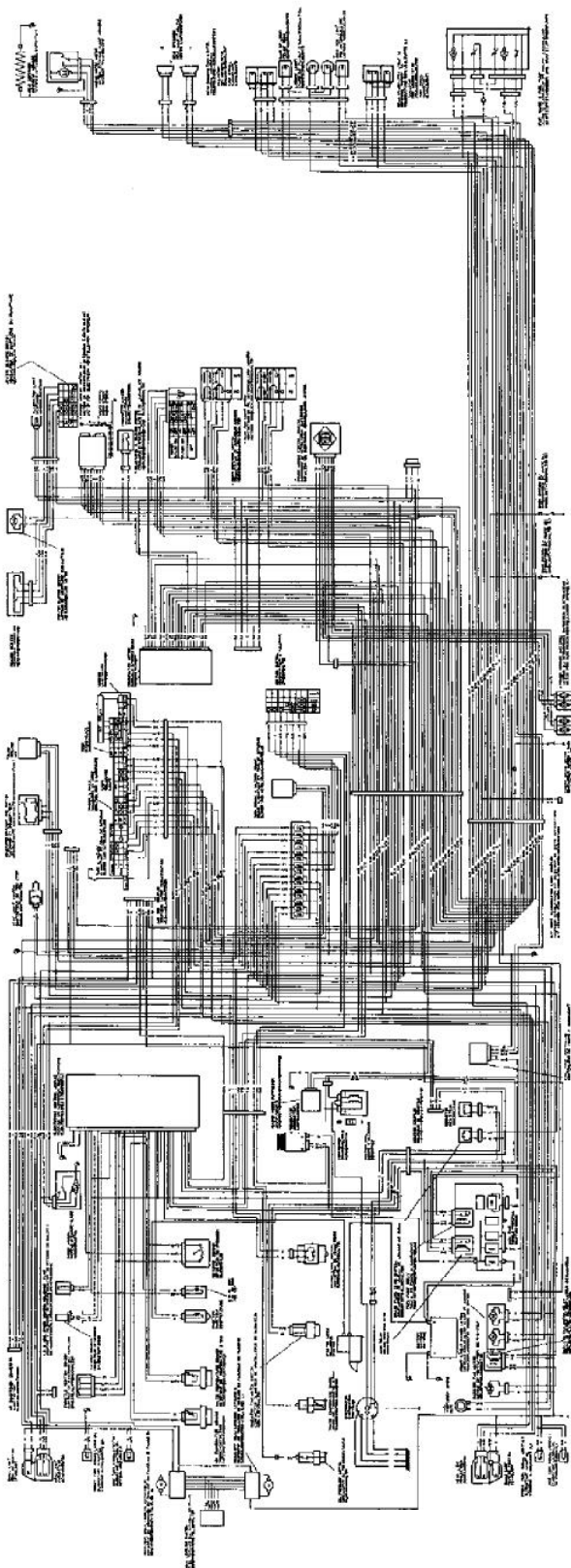
**FOR EUROPEAN MARKETS
ELECTRONIC FUEL INJECTION MODEL WITHOUT D. R. L. SYSTEM**



- 1. 12V BATTERY
- 2. 12V BATTERY
- 3. 12V BATTERY
- 4. 12V BATTERY
- 5. 12V BATTERY
- 6. 12V BATTERY
- 7. 12V BATTERY
- 8. 12V BATTERY
- 9. 12V BATTERY
- 10. 12V BATTERY
- 11. 12V BATTERY
- 12. 12V BATTERY
- 13. 12V BATTERY
- 14. 12V BATTERY
- 15. 12V BATTERY
- 16. 12V BATTERY
- 17. 12V BATTERY
- 18. 12V BATTERY
- 19. 12V BATTERY
- 20. 12V BATTERY
- 21. 12V BATTERY
- 22. 12V BATTERY
- 23. 12V BATTERY
- 24. 12V BATTERY
- 25. 12V BATTERY
- 26. 12V BATTERY
- 27. 12V BATTERY
- 28. 12V BATTERY
- 29. 12V BATTERY
- 30. 12V BATTERY
- 31. 12V BATTERY
- 32. 12V BATTERY
- 33. 12V BATTERY
- 34. 12V BATTERY
- 35. 12V BATTERY
- 36. 12V BATTERY
- 37. 12V BATTERY
- 38. 12V BATTERY
- 39. 12V BATTERY
- 40. 12V BATTERY
- 41. 12V BATTERY
- 42. 12V BATTERY
- 43. 12V BATTERY
- 44. 12V BATTERY
- 45. 12V BATTERY
- 46. 12V BATTERY
- 47. 12V BATTERY
- 48. 12V BATTERY
- 49. 12V BATTERY
- 50. 12V BATTERY
- 51. 12V BATTERY
- 52. 12V BATTERY
- 53. 12V BATTERY
- 54. 12V BATTERY
- 55. 12V BATTERY
- 56. 12V BATTERY
- 57. 12V BATTERY
- 58. 12V BATTERY
- 59. 12V BATTERY
- 60. 12V BATTERY
- 61. 12V BATTERY
- 62. 12V BATTERY
- 63. 12V BATTERY
- 64. 12V BATTERY
- 65. 12V BATTERY
- 66. 12V BATTERY
- 67. 12V BATTERY
- 68. 12V BATTERY
- 69. 12V BATTERY
- 70. 12V BATTERY
- 71. 12V BATTERY
- 72. 12V BATTERY
- 73. 12V BATTERY
- 74. 12V BATTERY
- 75. 12V BATTERY
- 76. 12V BATTERY
- 77. 12V BATTERY
- 78. 12V BATTERY
- 79. 12V BATTERY
- 80. 12V BATTERY
- 81. 12V BATTERY
- 82. 12V BATTERY
- 83. 12V BATTERY
- 84. 12V BATTERY
- 85. 12V BATTERY
- 86. 12V BATTERY
- 87. 12V BATTERY
- 88. 12V BATTERY
- 89. 12V BATTERY
- 90. 12V BATTERY
- 91. 12V BATTERY
- 92. 12V BATTERY
- 93. 12V BATTERY
- 94. 12V BATTERY
- 95. 12V BATTERY
- 96. 12V BATTERY
- 97. 12V BATTERY
- 98. 12V BATTERY
- 99. 12V BATTERY
- 100. 12V BATTERY

FOR WEST GERMAN MARKET

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
---	---	---	---	---	---	---	---	---	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	-----



Prepared by

SUZUKI MOTOR CORPORATION

TECHNICAL DEPARTMENT
AUTOMOBILE SERVICE DIVISION

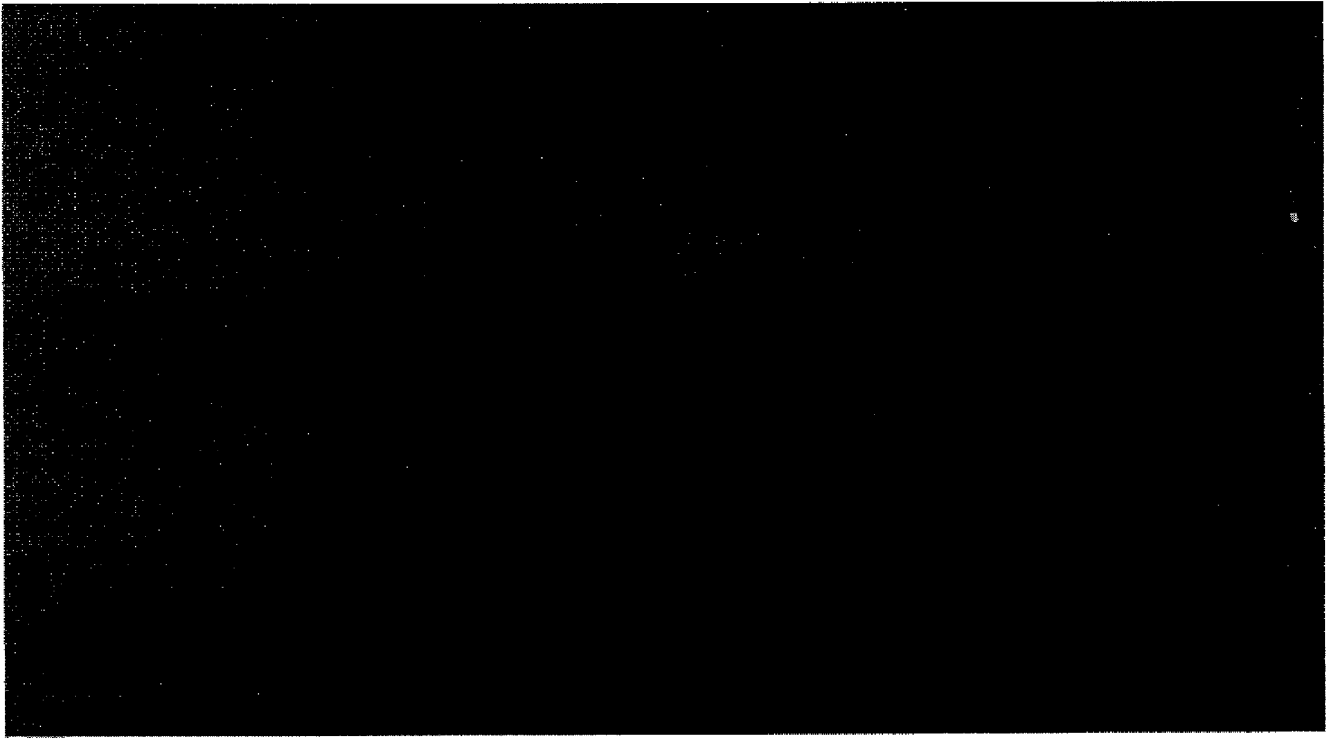
1st Ed. September, 1989

Printed in Japan

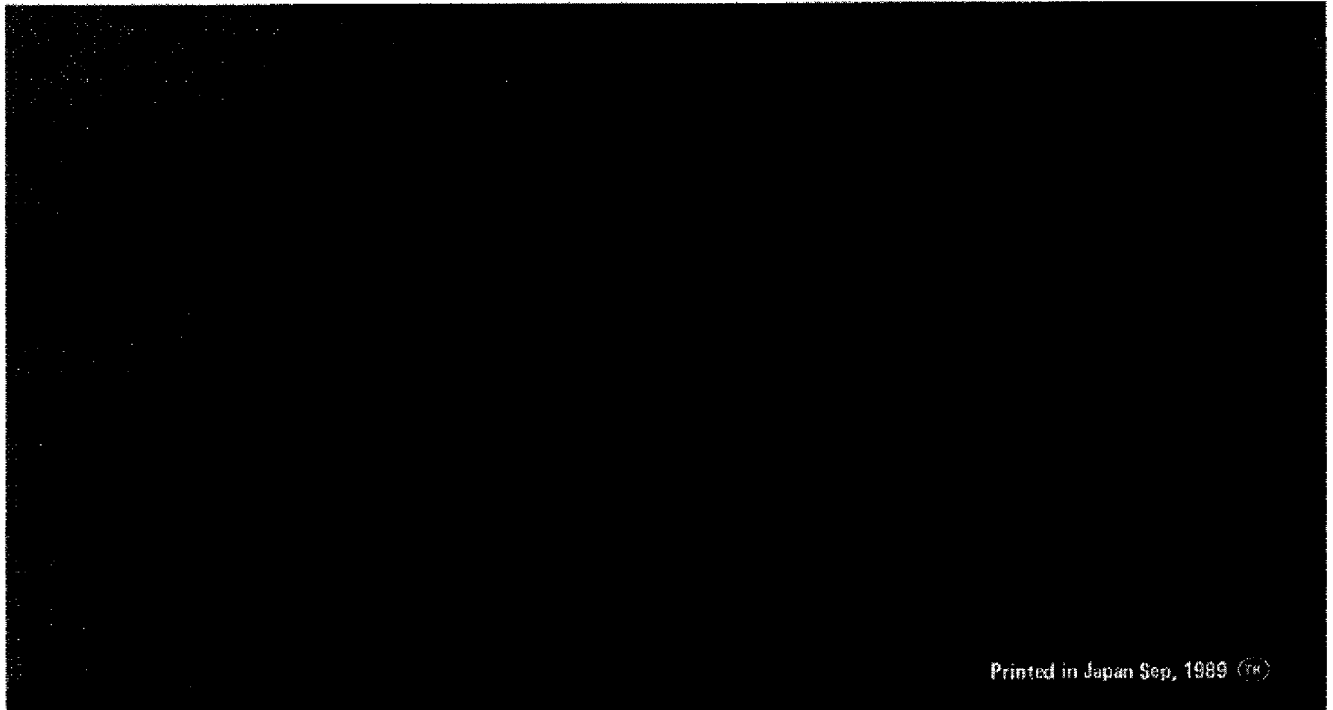
Printing: Oct. 1991

96

* EDIT Date: 14.04.2004 *



SUZUKI MOTOR CORPORATION



Printed in Japan Sep, 1989 (TM)