

Brake System

GENERAL	BR -2
BRAKE SYSTEM	BR -8
PARKING BRAKE SYSTEM	BR -37
ABS (ANTI-LOCK BRAKE SYSTEM)	BR -39

GENERAL

SPECIFICATIONS EJMB0010

ITEMS	SPECIFICATIONS
Master cylinder Type I.D. Fluid level sensor	Tandem type 25.4 mm (1.0 in.) Provided
Brake booster Type Effective dia. Boosting ratio	Vacuum type with tandem booster 7 + 8 in.(Diesel), 8 + 9 in.(Gasoline) 7.0 : 1
Front brake Type Disc O.D. Disc thickness Pad thickness Cylinder type Cylinder I.D.	Floating with ventilated disc 280 mm (11.02 in.) 27 mm (1.06 in.) 10 mm (0.39 in.) Double piston 42.9 mm (1.689 in.) (x2)
Rear disk brake (ABS) Type Disc O.D. Disc thickness Pad thickness Cylinder type Cylinder I.D.	Floating with ventilated disc 315 mm (12.4 in.) 20 mm (0.787 in.) 10 mm (0.39 in.) Single piston 42.9 mm (1.69 in.)
Rear drum brake (CBS) Type Drum I.D. Cylinder I.D. Clearance adjustment Lining thickness	Leading & Trailing type 270 mm (10.63 in.) 23.81 mm (0.94 in.) Automatic 4.7 mm (0.19 in.)
Parking brake Type Brake type	Drum type (CBS), Disc type (ABS) Hand brake lever type

O.D. = Outer diameter

I.D. = Inner diameter

ABS = Anti-lock Brake System

CBS = Conventional Brake System

SERVICE STANDARD EJMB0020

ITEMS	SPECIFICATIONS
Standard value	
Brake pedal height	M/T : 188 mm (7.40 in.), A/T : 189 mm (7.44 in.)
Clearance between stop lamp switch outer case and pedal arm	0.5 - 1.0 mm (0.020 - 0.040 in.)
Brake pedal free play	3-8 mm (0.117 - 0.312 in.)
Clearance between brake pedal and floor board	M/T : 54 mm, A/T : 55 mm
Parking brake lever stroke	8 clicks (When lever assembly is pulled with 20kgf)
Service limit	
Front disc brake pad thickness	2.0 mm (0.079 in.)
Front disc thickness (minimum)	25.4 mm (1 in.)
Front disc runout	0.03 mm (0.0012 in.)
Front disc thickness variation	0.005 mm (0.0002 in.)
Rear disc brake pad thickness	2.0 mm (0.079 in.)
Rear disc thickness	18.4 mm (0.724 in.)
Rear drum I.D.	272 mm (10.71 in.)
Rear brake lining thickness	1.5 mm (0.059 in.)

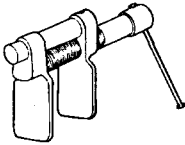
TIGHTENING TORQUE EJMB0030

ITEMS	Nm	Kg-cm	lb-ft
Brake support member mounting	18-25	180-250	13-18
Brake pedal stop lamp lock nut/ignition switch	10-15	100-150	0.73-11
Brake booster mounting nut	8-12	80-120	6-9
Brake booster vacuum warning switch	20-25	200-250	15-18
Bleeder screw	7-9	70-90	5-7
Brake tube flare nut, brake hose	13-17	130-170	9.5-13
Caliper guide rod bolt	22-32	220-320	16-23
Caliper assembly to knuckle	65-75	650-750	48-55
Brake hose to front caliper	25-30	250-300	18-22
Wheel cylinder mounting bolt	12-18	120-180	9-13
Parking brake mounting bolt	17-26	170-260	13-19

LUBRICANTS EJHA0150

Items	Recommended lubricant	Quantity
Brake fluid	DOT 3 or equivalent	As required
Brake pedal bushing and brake pedal bolt	Chassis grease SAE J310, NLGI No.0	As required
Clevis pin	Wheel bearing grease SAE J310, NLGI No.2	As required
Parking brake shoe and backing plate contact surfaces	Bearing grease, NLGI No.0-1	As required

SPECIAL TOOLS EJHA0200

Tool (Number and Name)	Illustration	Usage
09581 - 11000 Piston expander	 <p style="text-align: right; font-size: small;">EJDA043A</p>	Pushing back of the front disc and rear disc brake piston

TROUBLESHOOTING EJMB0040

Trouble symptom	Possible cause	Remedy
Noise or vibration when brakes are applied	Caliper improperly mounted Loose caliper mounting bolts Unevenly worn or cracked brake drum or brake disc Foreign material in brake drum Seized pad or lining contact surface Excessive clearance between pad assembly and caliper Uneven pad contact Lack of lubrication in sliding parts Loose suspension parts Excessive of disc runout Excessive variation of disc thickness	Correct Retighten Replace Clean Replace Correct Correct Lubricate Retighten Correct the runout Replace disc
Vehicle pulls to one side when brakes are applied	Difference in left and right tire inflation pressure Inadequate contact of pad Grease or oil on pad or lining surface Drum warped or uneven wear Incorrect wheel cylinder installation Auto adjuster malfunction	Adjust Correct Replace Replace Correct Repair
Insufficient braking power	Low or deteriorated brake fluid Air in the brake system Brake booster malfunction Inadequate contact of pad Grease or oil on pad surface Auto adjuster malfunction Overheated brake rotor due to dragging of pad Clogged brake line LCR valve malfunction	Refill or change Bleed the system Correct Correct Replace Correct Correct Replace Replace

SERVICE ADJUSTMENT PROCEDURES

EJMB0050

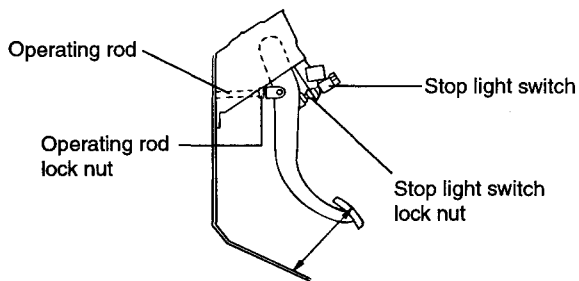
INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height. If the brake pedal height is not within the standard value, adjust as follows.

Standard value

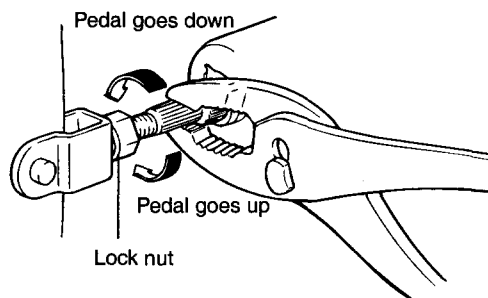
M/T : 188 mm (7.40 in.)

A/T : 189 mm (7.44 in.)



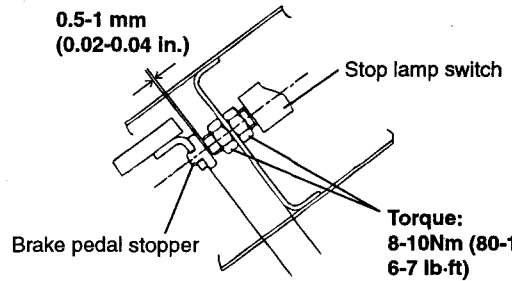
EJMB065A

- 1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it does not contact the brake pedal arm.
- 2) Adjust the brake pedal height by turning the operating rod with pliers (with the operating rod lock nut loosened), until the correct brake pedal height is obtained.



H7BR202A

- 3) After turning the stop lamp switch until it contacts the brake pedal stopper (just before the brake pedal is caused to move), return the stop lamp switch 1/2 to 1 turn and secure by tightening the lock nut.
- 4) Connect the connector of the stop lamp switch.
- 5) Check that the stop lamp is not illuminated with the brake pedal unpressed.



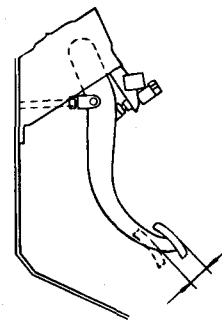
EHPBR01A

2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value.

Standard value

3 - 8 mm (0.118 - 0.315 in.)

If free play does not reach the standard value, check that clearance between the outer case of stop light switch and brake pedal is within the standard value. If free play exceeds the standard value, it is probably due to excessive clearance between the clevis pin and brake pedal arm. Check for excessive clearance and replace faulty parts as required.



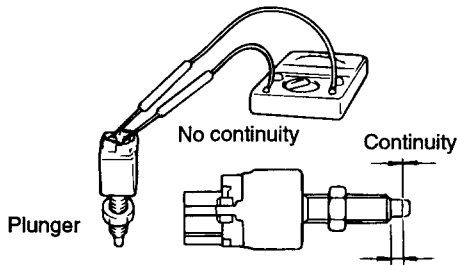
H7BR204A

3. Start the engine, depress the brake pedal with approximately 120kgf of force, and check for oil leakage in the master cylinder, brake line and each connecting part. Repair the faulty parts as required.

STOP LAMP SWITCH INSPECTION

Connect a circuit tester to the connector of stop lamp switch, and check whether or not there is continuity when the plunger of the stop lamp switch is pushed in and when it is released.

The stop lamp switch is in good condition if there is no continuity when the plunger is pushed.



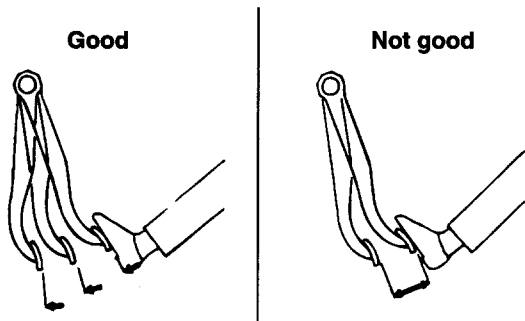
H7BR206A

BRAKE BOOSTER OPERATING TEST

For simple checking of the brake booster operation, carry out the following tests :

1. Run the engine for one or two minutes, and then stop it.

If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.

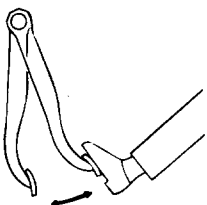


EJA9002A

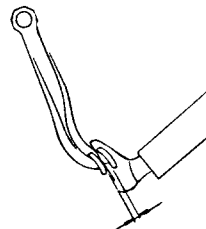
2. With the engine stopped, step on the brake pedal several times.

Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

When engine is stopped

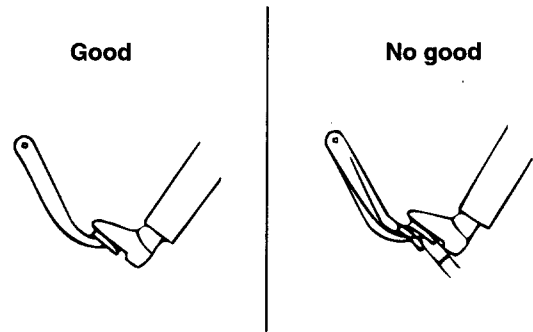


When engine is started



EJA9002B

3. With the engine running, step on the brake pedal and then stop the engine.
Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
If the above three tests are okay, the booster performance can be determined as good.
Even if one of the above three tests is not okay, check the check valve, vacuum hose and booster for defect.



H7BR209A

BLEEDING THE BRAKE SYSTEM

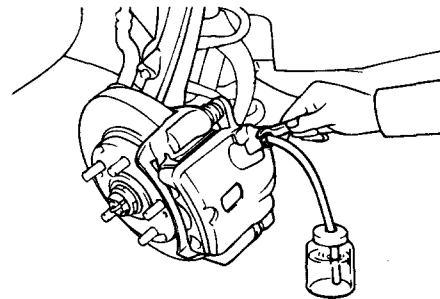
EJMB0060

1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

! CAUTION

- Do not allow brake fluid to remain on a painted surface. Wash it off immediately.
- Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

2. Connect a vinyl tube to the wheel cylinder bleeder screw and insert the other end of the tube in a container of brake fluid which is half full.



KJMB070A

3. Start the engine.
4. Slowly depress the brake pedal several times.
5. While depressing the brake pedal fully, loosen the bleeder screw until fluid runs out. Then close the bleeder screw and release the brake pedal.

EXHAUST EMISSION CONTROL SYSTEM

VEHICLES WITH CATALYTIC CONVERTER EEA90270

Exhaust emissions (CO, HC, NO_x) are controlled by a combination of engine modifications and the addition of special control components in the fuel.

Modifications to the combustion chamber, intake manifold, camshaft and ignition system form the basic control system. Additional control devices include a catalytic converter and the oxygen sensors which monitor mixture richness.

These systems have been integrated into a highly effective system which controls exhaust emissions while maintaining good driveability and fuel economy.

AIR/FUEL MIXTURE RATIO CONTROL SYSTEM [MULTIPOINT FUEL INJECTION (MFI) SYSTEM] EEA90280

The MFI system employs the signals from the heated oxygen sensor to activate and control the injector installed in the manifold for each cylinder, precisely regulating the air/fuel mixture ratio and reducing emissions.

This allows the engine to produce exhaust gases of the proper composition to permit the use of a three-way catalyst. The three-way catalyst is designed to convert the three pollutants (1) hydrocarbons (HC), (2) carbon monoxide (CO), and (3) oxides of nitrogen (NO_x) into harmless substances. The two operating modes in the MFI system are as follows:

1. Open loop-air/fuel ratio is controlled by information programmed into the PCM during the manufacturing process.
2. Closed loop-air/fuel ratio varies by the PCM based on information supplied by the heated oxygen sensor.

Driveshaft and Axle

GENERAL	DS - 2
PROPELLER SHAFT ASSEMBLY	DS -11
DRIVESHAFT	DS -15
FRONT AXLE	DS -28
REAR AXLE	DS -40
DIFFERENTIAL CARRIER ASSEMBLY	DS -48

GENERAL

SPECIFICATIONS EIMB0100

PROPELLER SHAFT

ITEMS	SPECIFICATION	
	2.5 DIESEL	3.5 GASOLINE
Joint type Front Rear	U.J. + U.J. U.J. + U.J.	U.J. + C.V.J. U.J. + U.J.
Length x O.D mm (in.) Front Rear (4WD) Rear (2WD)	749.5 x 50.8 (M/T) 817.5 x 50.8 (A/T) 1089 x 76.2 (M/T) 1022 x 76.2 (A/T) 1497 x 76.2 (M/T) 1420 x 76.2 (A/T)	775.5 x 63.5 (M/T) 753.5 x 63.5 (A/T) 1064 x 76.2 (M/T) 1084 x 76.2 (A/T) ← ←
Runout	0.5mm (0.020 in.) or less	0.5mm (0.020 in.) or less

U.J. : Universal Joint
C.V.J. : Constant Velocity Joint

2 WD : 2 Wheel Drive
4 WD : 4 Wheel Drive

M/T : Manual Transmission
A/T : Automatic Transmission

FRONT AXLE AND DRIVESHAFT

ITEMS	SPECIFICATION	
	2.5 DIESEL	3.5 GASOLINE
Front axle hub bearing type	Taper roller bearing	←
Driveshaft joint type (4WD) Outer Inner	B.J. D.O.J.	B.J., B.J. T.J., D.O.J.
Differential (4WD) Reduction gear type Reduction ratio	Hypoid gear 4,875 (NO.6) : 2.5 Diesel Engine	Hypoid gear 4,625 (NO.6) : 3.5 Gasoline Engine

B.J. : Birfield Joint

D.O.J. : Double Offset Joint

T.J. : Tripod Joint

REAR AXLE AND AXLE SHAFT

ITEMS	SPECIFICATION
Axle housing type	Banjo Type
Axle shaft supporting type	Semi-floating type
DIFFERENTIAL Reduction gear type Reduction gear ratio	Hypoid gear 4.875 (NO.7) : 2.5 Diesel Engine 4.625 (NO.7.5) : 3.5 Gasoline Engine

LUBRICANTS EIMB0200

Items	Specified lubricants	Quantity
B.J. - D.O.J. Driveshaft type (2.5 Diesel, 3.5 Gasoline) B.J. Boot grease D.O.J. Boot grease	Repair kit grease Repair kit grease	130(+10/-0) gr. (2.5 Diesel) 145 ± 10 gr. (3.5 Gasoline) 130(+10/-0) gr. (2.5 Diesel) 135 ± 10 gr. (3.5 Gasoline)
B.J. - T.J. Driveshaft type(GKN) (3.5 Gasoline) B.J. Boot grease D.O.J. Boot grease	Repair kit grease Repair kit grease	115 ± 5 gr. 230 ± 10 gr.
Differential Front Rear Conventional differential With LSD (Limited Slip Differential)	Hypoid gear oil GH90W (Warmer than -30°C) GH80W (Colder than -30°C) GH90W (Warmer than -30°C) GH80W (Colder than -30°C) Multi gear LS90 (MMC CO.LTD), SAE 90 INFILREX33 (MOBIL CO.LTD)	Fill the reservoir to the plug hole 1.8L 1.8L 2.8L (2.5 Diesel) 2.8L (3.5 Gasoline) 2.8L (2.5 Diesel) 2.8L (3.5 Gasoline)

SEALANTS AND ADHESIVES EIMB0300

Items	Specified sealants and adhesives
Contact surface of the drive flange and front axle hub Threaded holes for mounting of the drive flange and front axle hub Differential cover installation surface (to gear carrier) Contact surface of the rear axle housing and the bearing case	HERM SEAL NO.201 PRETONR #316 or equivalent THREEBOND #1215 or equivalent THREEBOND #1104 or equivalent

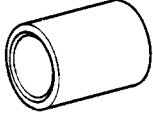

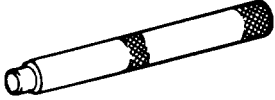
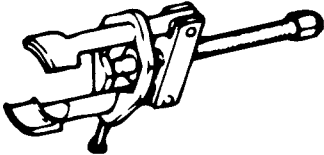
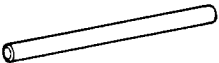

TORQUE SPECIFICATIONS EIMB0400

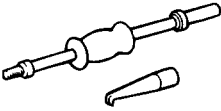

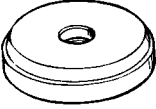
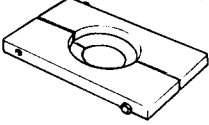
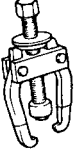
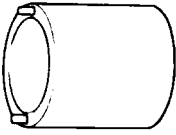
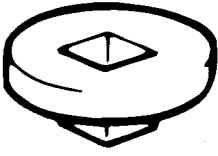
Items	Nm	Kg-cm	lb-ft
Propeller shaft			
Yoke flange mounting nut(Front, Rear)	50-60	500-600	37-44
LJ assembly to transfer flange mounting nut	35-40	350-400	26-29
Center bearing mounting self locking flange nut	40-50	400-500	29-37
Center bearing mounting bracket	40-50	400-500	29-37
Self locking nut to center yoke mounting lock nut(2WD)	230-250	2300-2500	168-183
Wheel nut	100-120	1000-1200	73-88
Front hub to brake disc mounting	50-60	500-600	37-44
Upper arm ball joint to knuckle mounting	60-90	600-900	44-66
Lower arm ball joint to knuckle mounting	120-180	1200-1800	88-132
Knuckle to tie rod end mounting	40-50	400-500	26-29
Front hub to drive flange mounting bolt	50-60	500-600	37-44
Driveshaft to inner shaft mounting	50-60	500-600	37-44
Rear axle housing to bearing case	120-140	1200-1400	88.8-103.6
Oil filler plug	40-60	400-600	29-44
Oil drain plug	60-70	600-700	44-51
Differential self-locking nut	160-220	1600-2200	117-161


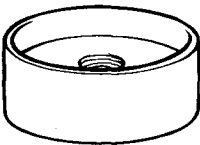
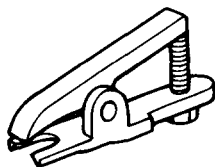


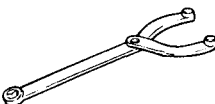
 **CAUTION**

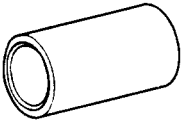
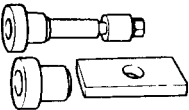
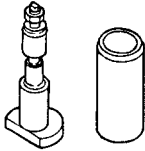
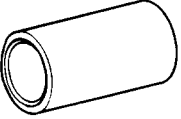
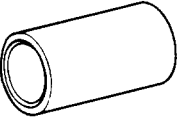
Replace self-locking nuts with new ones after removal.

SPECIAL TOOL EIMB0500

Tool (Number and Name)	Illustration	Use
Bushing remover and installer 09216-21100	 <p style="text-align: right;">B1621100</p>	Press-fitting of the inner shaft housing dust seal
Bearing outer race installer 09432-33700	 <p style="text-align: right;">D3233700</p>	Installation of the front hub bearing (Use with 09500-21000)
Bar 09500-21000	 <p style="text-align: right;">E0021000</p>	Installation of the front hub bearing (Use with 09432-33700)
Bearing and gear puller 09455-21000	 <p style="text-align: right;">HFR49-7</p>	Removal of the inner race from the front hub (Use with 09545-34100)
Draft 09517-21400	 <p style="text-align: right;">E1721400</p>	Removal of the knuckle needle bearing from the knuckle
Universal joint remover 09493-43000	 <p style="text-align: right;">D9343000</p>	Removal and installation of the journal bearing

Tool (Number and Name)	Illustration	Use
Sliding hammer 09526-11100	 <p style="text-align: right;">E2611100</p>	<ul style="list-style-type: none"> • Removal of the front hub and the inner shaft (Use with 09500-11001) • Removal of the rear axle housing oil seal
Axle puller 09526-11001	 <p style="text-align: right;">E2611001</p>	Removal of the front hub and the inner shaft (Use with 09500-11001)
Oil seal installer 09517-21000	 <p style="text-align: right;">E1721000</p>	Press-fitting of the differential drive pinion oil seal (Use with 09500-21000)
Remove plate 09527-4A000	 <p style="text-align: right;">E274A000</p>	Removal of the differential drive pinion rear bearing
Bearing puller 09517-43001	 <p style="text-align: right;">D9-8</p>	<ul style="list-style-type: none"> • Removal of the front lower arm ball joint • Removal of the differential side bearing
Lock nut remover 09518-4A000	 <p style="text-align: right;">E184A000</p>	Removal and installation of the front hub lock nut
Preload socket 09532-11600	 <p style="text-align: right;">HFR49-10</p>	Measurement of the drive pinion starting torque (Use with torque wrench)

Tool (Number and Name)	Illustration	Use
Oil seal installer 09532-32000	 <p style="text-align: right; font-size: small;">E3232000</p>	Installation of the differential drive pinion front bearing outer race
Oil seal installer 09542-4A000	 <p style="text-align: right; font-size: small;">E424A000</p>	Press-fitting of the oil seal into knuckle (Use with 09500-11000)
Ball joint puller 09568-34000	 <p style="text-align: right; font-size: small;">HFR49-1</p>	Disconnection of the tie rod ball joint and the upper arm ball joint
Oil seal installer 09532-32100B	 <p style="text-align: right; font-size: small;">E3231200</p>	Installation of the differential drive pinion rear bearing outer race (Use with 09500-11000)
Working base 09517-43401	 <p style="text-align: right; font-size: small;">E1743401</p>	Supporting for the differential carrier
End yoke holder 09517-21700	 <p style="text-align: right; font-size: small;">E1721700</p>	Removal and installation of the differential self-locking nut

Tool (Number and Name)	Illustration	Use
Pinion height gauge base 09500-H1000	 <p style="text-align: right;">E00H1000</p>	Measurement of the front differential drive pinion height (No.6)
Pinion height gauge 09500-43131 (6 $\bar{\text{H}}$)	 <p style="text-align: right;">E0043131</p>	
Pinion height gauge 09500-4A000	 <p style="text-align: right;">E004A000</p>	Measurement of the rear differential drive pinion height (No.7)
Pinion height gauge tube 09500-4A100	 <p style="text-align: right;">E004A100</p>	
Pinion height gauge base 09500-H1100	 <p style="text-align: right;">E00H1100</p>	

TROUBLESHOOTING EIMB0600

Symptom		Probable cause	Remedy
Propeller shaft	Noise at start	Worn journal bearing Worn sleeve yoke spline or flange yoke Loose propeller shaft installation	Replace Replace Retighten
	Noise and vibration at high speed	Unbalanced propeller shaft Improper snap ring selection Worn journal bearing	Replace Adjust the clearance Replace
Drive shaft, Inner shaft	Noise during wheel rotation	Housing tube bent Inner shaft bent Inner shaft bearing worn, pounding Drive shaft assembly worn damaged, bent	Replace Replace Check or replace
	Noise due to excessive play of wheel in turning direction	Inner shaft and side gear serration play Drive shaft and side gear serration play	Replace
Center Axle Disconnect System (CADS)	Does not lock	Negative pressure leakage Vacuum tank damaged Check valve damaged Actuator assembly damaged Shift fork damaged CADS clutch damaged Differential shaft damaged Actuator assembly attaching bolt loose	Correct or replace vacuum hose Replace Retighten attaching bolts
	Locks but does not become free	Foreign substances on tooth surfaces of differential shaft and clutch sleeve Foreign substances on tooth surfaces of CADS sleeve and CADS clutch	Clean tooth surfaces or replace
Axle shaft, axle housing	Noise while wheels are rotating	Bent axle shaft Worn or scarred axle shaft bearing	Replace Replace
	Grease leakage	Worn or damaged oil seal Malfunction of bearing seal	Replace Replace
Differential	Constant noise	Improper drive gear and drive pinion gear tooth contact Loose, worn or damaged side bearing Loose, worn or damaged drive pinion bearing Worn drive gear, drive pinion Worn side gear thrust washer or pinion shaft Deformed drive gear of differential case Damaged gear Foreign material Insufficient oil	Correct or replace Eliminate the foreign (Replace the parts if necessary) Replenish

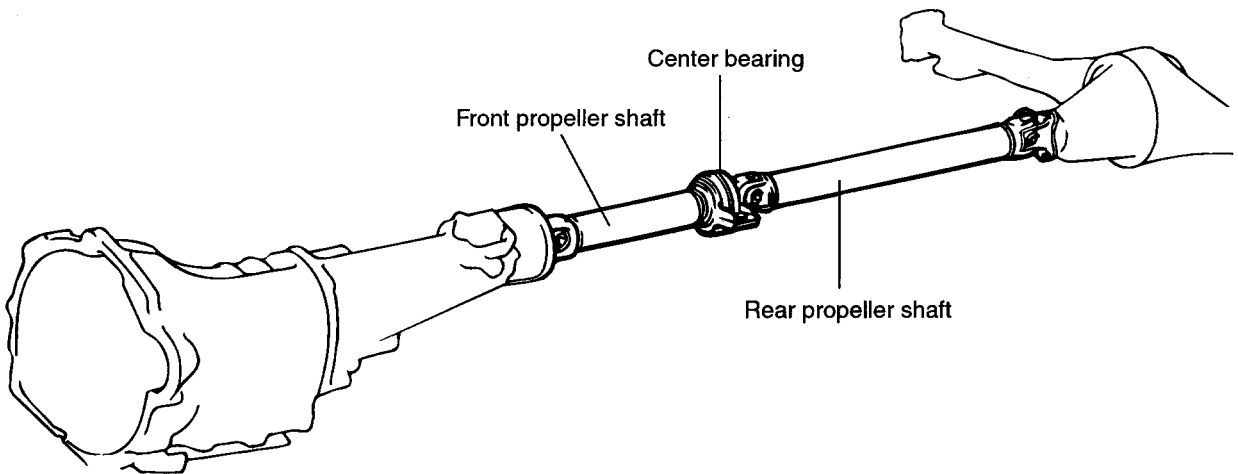
Symptom		Probable cause	Remedy
Differential	Gear noise while driving	Poor gear engagement Improper gear adjustment Improper drive pinion preload adjustment Damaged gear Foreign material Insufficient oil	Correct or replace Replace Eliminate the foreign material and check (Replace the parts if necessary) Replenish
	Gear noise while coasting	Improper drive pinion preload adjustment Damaged gear	Correct or replace Replace
	Bearing noise while driving or coasting	Cracked or damaged drive pinion rear bearing	Replace
	Noise while turning	Loose side bearing Damaged side gear, pinion gear or pinion shaft	Replace
	Heat	Improper gear backlash Excessive preload Insufficient oil	Adjust Replenish
	Oil leakage	Differential carrier not tightened Seal malfunction Worn or damaged oil seal Excessive oil	Retighten, apply sealant, or replace the gasket Replace Adjust the oil level

PROPELLER SHAFT ASSEMBLY

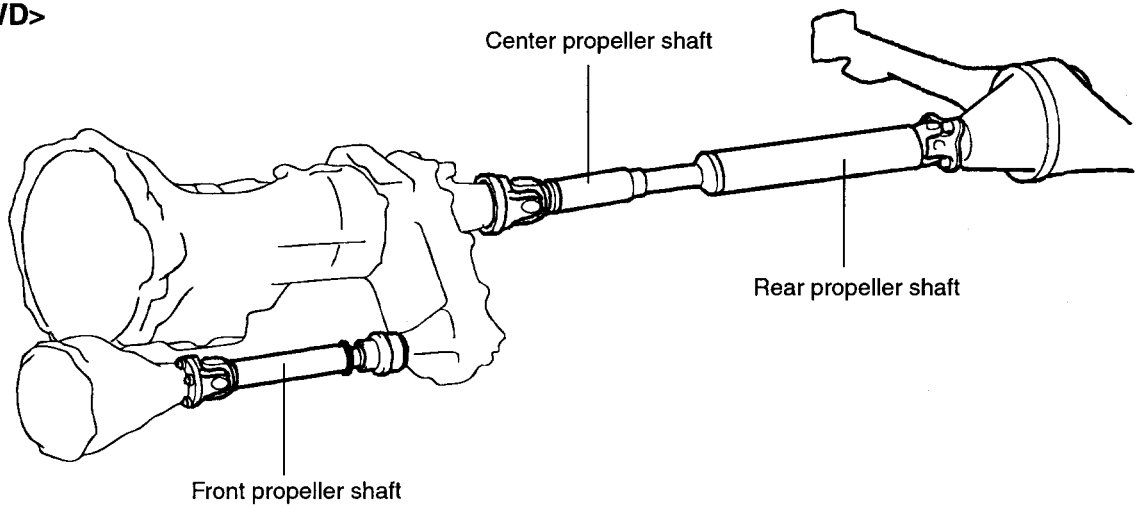
PROPELLER SHAFT

COMPONENTS EIMB0700

<2WD>

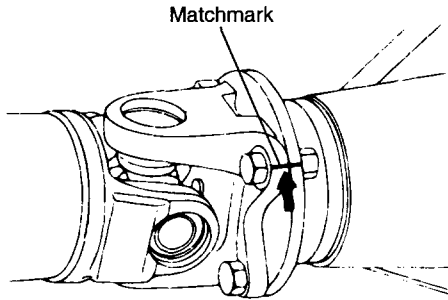


<4WD>



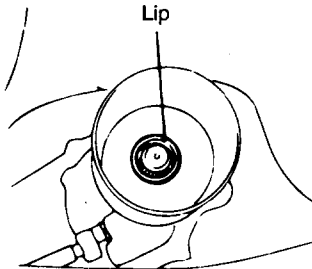
REMOVAL EIMB0800

1. Make a matchmark on the flange yoke and the differential companion flange.



KSRPS02A

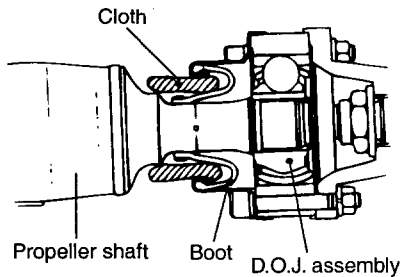
2. Use with the plug as a cover so that no foreign material gets into the transmission(2WD).



AU49-05A

NOTE

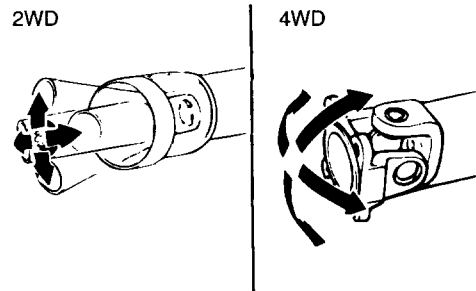
- When removing the propeller shaft, be careful not to damage the boot.
- Insert a piece of cloth into the boot to prevent it from being damaged.



A7PS0280

INSPECTION EIMB0900

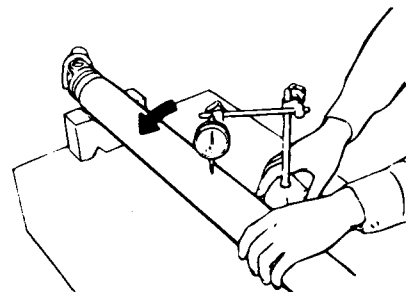
1. Check the sleeve yoke, center yoke and flange yoke for wear, damage or cracks.
2. Check the propeller shaft yokes for wear, damage or cracks.
3. Check the propeller shaft for bends, twisting or damage.
4. Check the universal joints for smooth operation in all directions.



KIMB090A

5. Check the center bearing for smooth movement(2WD).
6. Check the center bearing mounting rubber for damage or deterioration(4WD).
7. Measure the propeller shaft runout with a dial indicator.

Limit	Front	0.5 mm (0.02 in.) or less
	Rear	0.5 mm (0.02 in.) or less



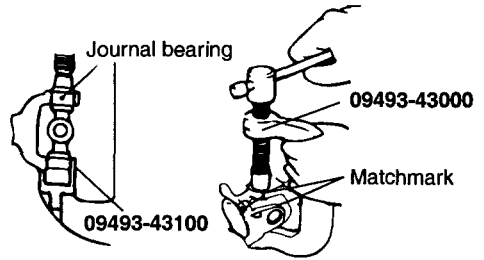
AU49-05C

INSTALLATION EIMB1000

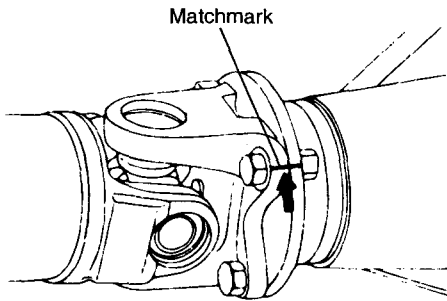
Align the matchmark on the flange yoke and the differential companion flange. Install the propeller shaft.

CAUTION

- Clean the thread of the mounting bolts and nuts before tightening these parts. Otherwise, they can become loose.
- Be careful not to damage the lip section of the transmission oil seal when installing the propeller shaft. (2WD)



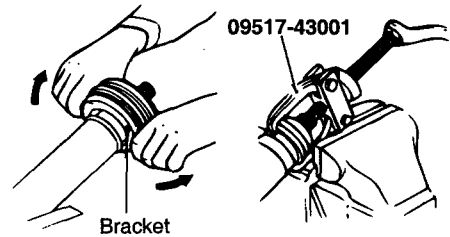
TU49-06C



KSRPS02A

3. REMOVAL OF CENTER BEARING ASSEMBLY

- Remove the center bearing bracket.
- Pull out the center bearing with a puller.

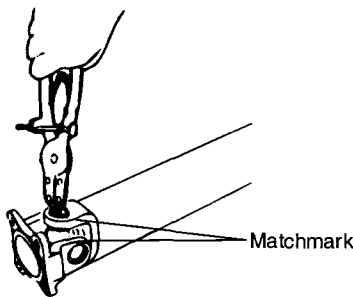


AIJA3190

DISASSEMBLY EIMB1100

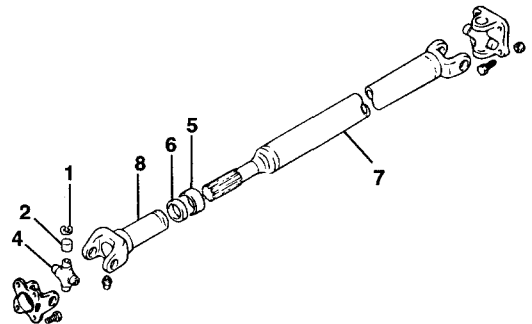
1. REMOVAL OF SNAP RINGS

- Make matchmarks on the yoke and universal joint that are to be disassembled.
- Remove the snap ring from the yoke with a snap ring pliers.



A7PS0320

4. REMOVAL OF REAR PROPELLER SHAFT (4WD)



Removal steps

- Snap ring
- Journal bearing
- Flange yoke
- Universal joint spider
- Packing retainer
- Shield packing
- Rear propeller shaft
- Sleeve yoke

2. REMOVAL OF JOURNAL BEARINGS

Remove the journal bearings from the yoke with a special tool.

CAUTION

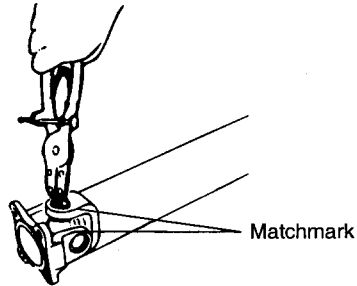
Do not tap the journal bearings to remove them, because this will cause imbalance of the propeller shaft.

EHPDS02A

REASSEMBLY EIMB1200

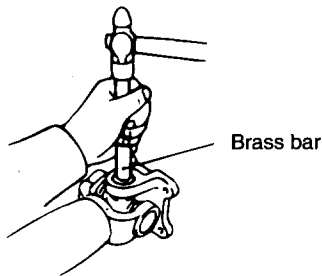
SNAP RING

1. Install snap rings of the same thickness onto both sides of each yoke.



ESRPS77A

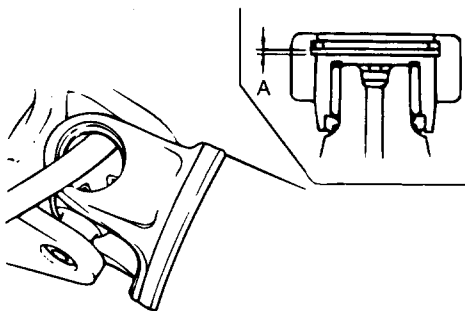
2. Press the bearing and journal into one side using a brass bar.



ESRPS05A

3. Measure the clearance between the snap ring and the groove wall of the yoke with a feeler gauge.

Standard value : 0.03 mm (0.0012 in.) or less

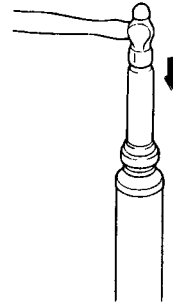


EJA3360

4. If the clearance exceeds the standard value, replace the snap rings.

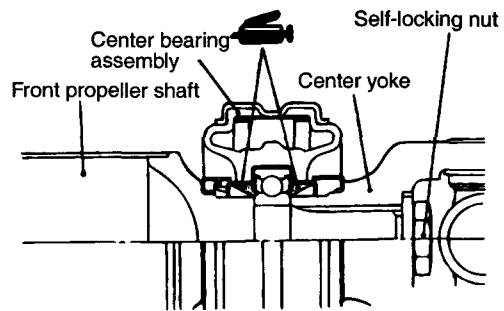
CENTER BEARING ASSEMBLY/CENTER YOKE

1. Install the center bearing assembly to the front propeller shaft as shown in the illustration.



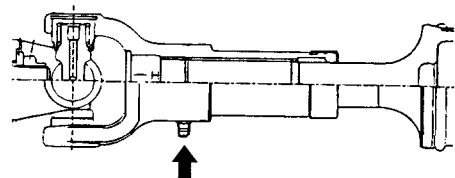
H7PS0260

2. Align the matchmarks on the center yoke and front propeller shaft.
3. Press-fit the center bearing with the center yoke while tightening the self-locking nut.



ESRPS10B

4. Install the propeller shaft so that the flange face of center mounting bracket spacer upward.
5. After installing the propeller shaft, fill the grease into the neeple until it comes out from the sleeve yoke plug hole

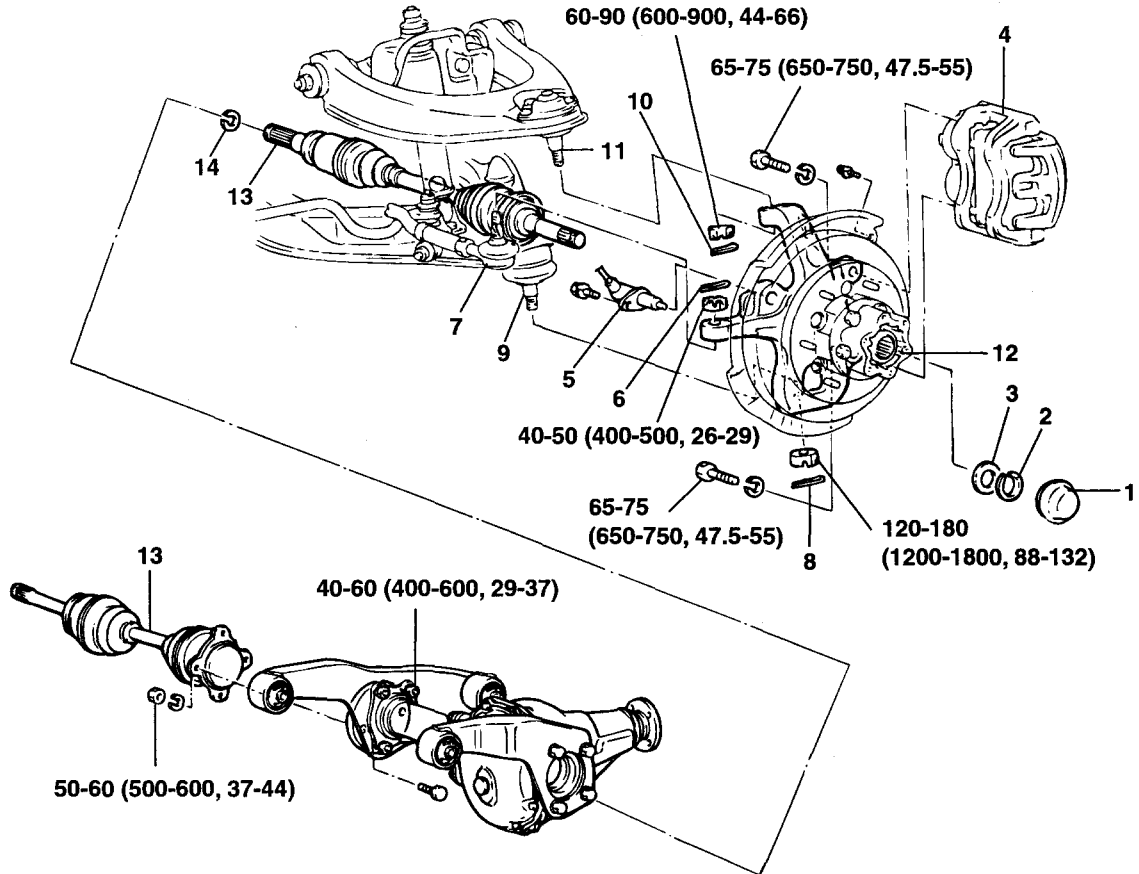


KSRPS03A

DRIVESHAFT

FRONT DRIVESHAFT ASSEMBLY

COMPONENTS EIMB1300



Removal steps

1. Hub cap
2. Snap ring
3. Shim
4. Front brake assembly
5. Speed sensor (ABS)
6. Split pin
7. Tie rod end
8. Split pin
9. Lower ball joint
10. Split pin
11. Upper ball joint
12. Front hub and knuckle assembly
13. Driveshaft
14. Circlip

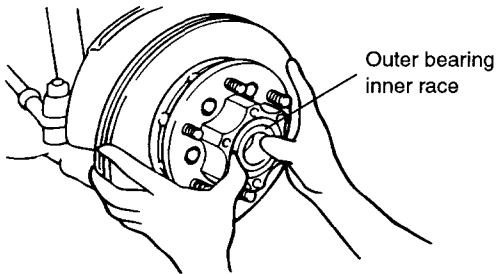
TORQUE : Nm (kg-cm, ft-lb)

REMOVAL EIMB1400

1. Remove the front hub and knuckle assembly. (Refer to front hub/knuckle for detail)

CAUTION

Do not drop the outer bearing inner race.

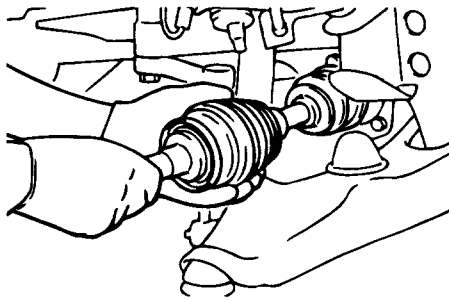


H7FA030A

2. Remove the driveshaft.

CAUTION

- When pulling the driveshaft out from the differential carrier, be careful that the spline part of the driveshaft does not damage the oil seal.
- Wrap cloth around the boot of the driveshaft so that the boot is not damaged when it is removed.



KHPDS13A

INSPECTION EIMB1500

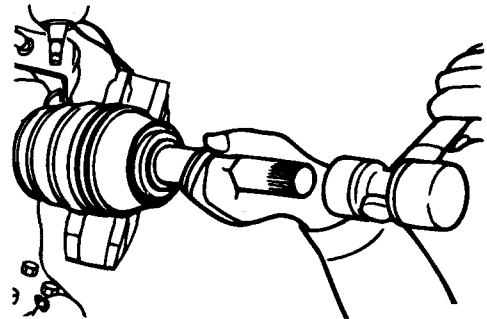
1. Check the boot for damage or deterioration.
2. Check the ball joint for operating condition and excessive looseness.
3. Check the splines for wear or damage.
4. Check the differential carrier oil seal(L.H.) for damaged.



S5DS008A

INSTALLATION EIMB1600

1. Installation is the reverse of removal.
2. If the driveshaft is not installed into the differential carrier easily, use a plastic hamer (LH).



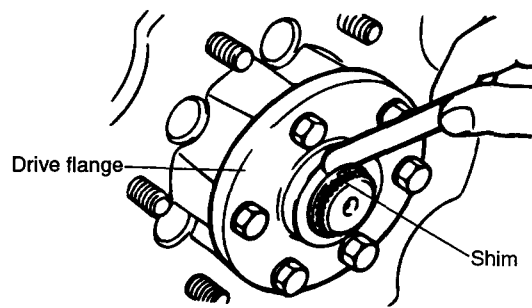
KHPDS14A

CAUTION

- Be careful not to damage the lip of the oil seal.
- Replace the circlip which is attached to the B.J side spline part with a new one.

3. Driveshaft end play adjustment.
 - a. Install the shim and snap ring to the driveshaft.
 - b. Push the driveshaft in by hand toward the knuckle until they touch.
 - c. Measure the clearance between the drive flange and the shim with a feeler gage.

Standard value : 0.2-0.5mm (0.008-0.2 in.)

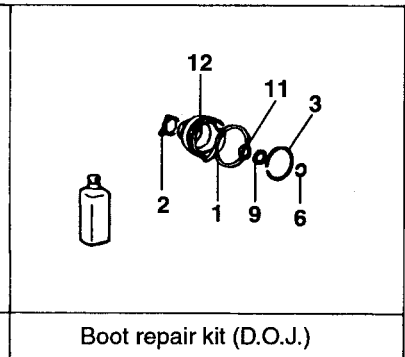
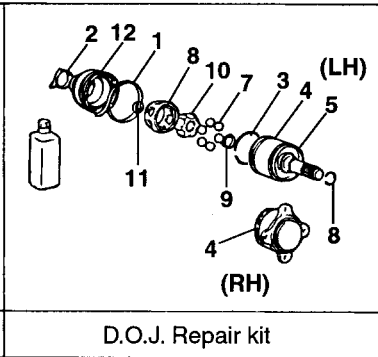
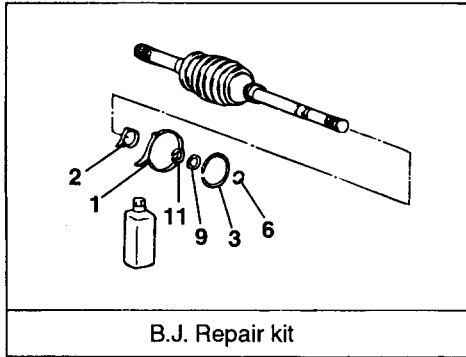
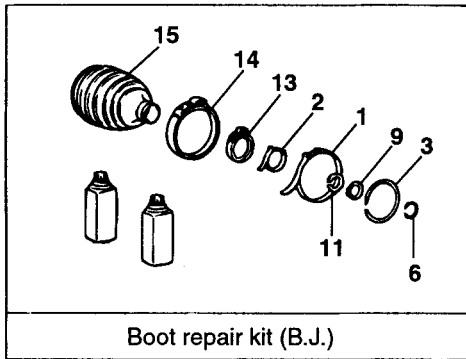
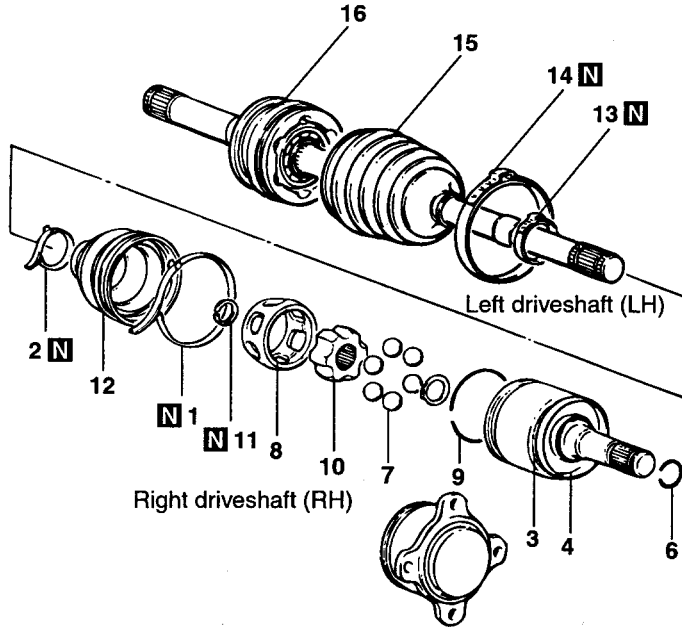


EHPDS11A

- d. If the amount of play is outside the standard value, adjust by selecting a shim that will bring the play to the standard value.

FRONT DRIVESHAFT (DOJ-BJ TYPE)

COMPONENTS EIMB1700



- | | |
|----------------------|----------------------------|
| 1. Boot band A | 9. Snap ring |
| 2. Boot band B | 10. D.O.J. inner race |
| 3. Circlip | 11. Circlip |
| 4. D.O.J. outer race | 12. D.O.J. boot |
| 5. Dust cover | 13. B.J. boot band (large) |
| 6. Circlip | 14. B.J. boot band (small) |
| 7. Ball | 15. B.J. boot |
| 8. D.O.J. cage | 16. B.J. assembly |

CAUTION : Replace the parts with new one after removal.

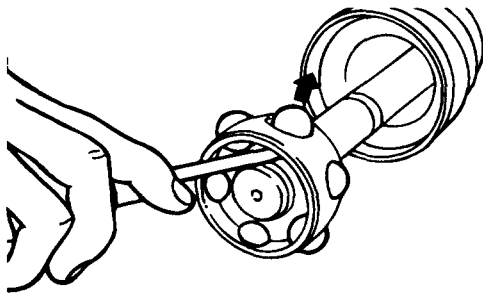
DISASSEMBLY EIMB1800

NOTE

1. Do not disassemble the B.J. assembly.
2. Special grease must be applied to the driveshaft joint. Do not substitute with another type of grease.
3. The boot band should be replaced with a new one.

1. REMOVAL OF BALLS

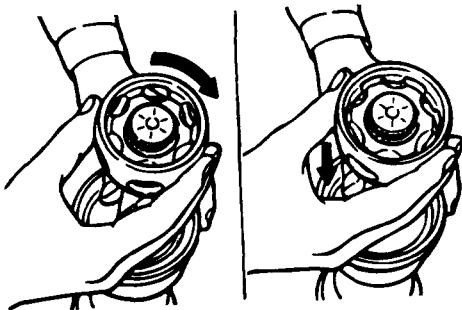
Remove the balls from the D.O.J cage.



KHPDS15A

2. REMOVAL OF D.O.J CAGE

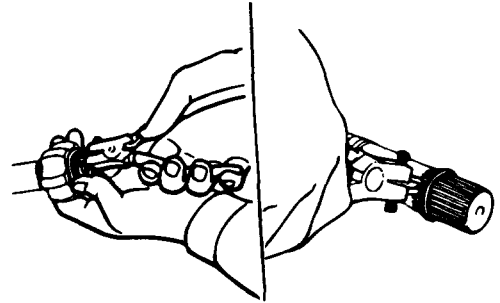
Remove the D.O.J cage from the D.O.J inner race in the direction of the B.J



KHPDS16A

3. REMOVAL OF SNAP RING/CIRCLIP

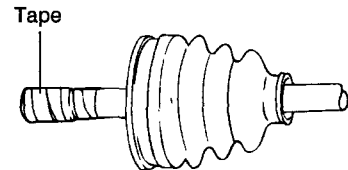
- a. Remove the snap ring from the driveshaft using a snap ring pliers, and then withdraw the D.O.J inner race and D.O.J cage from the driveshaft.
- b. Remove the circlip from the driveshaft using a pliers.



KHPDS17A

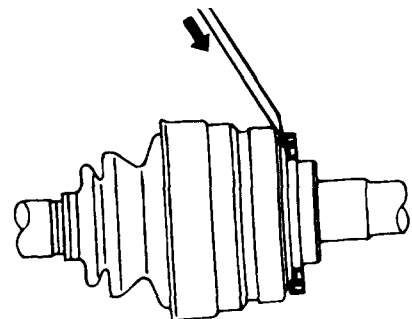
4. REMOVAL OF D.O.J BOOT

- a. Wrap vinyl tape around the spline part on the D.O.J side of the driveshaft so that the D.O.J boot is not damaged when they are removed.
- b. Remove the D.O.J boot from the driveshaft.



EIDA251D

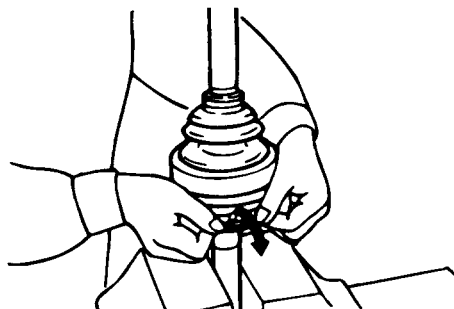
5. REMOVAL OF DUST COVER



KHPDS18A

6. REMOVAL OF BOOT PROTECTOR

After extending the folded over part of the boot protector and removing the boot protector band, push the boot protector to the B.J side and then remove it.



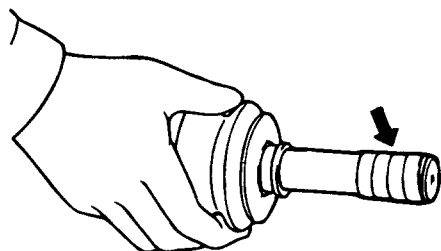
KHPDS19A

7. REMOVAL OF B.J BOOT

- a. Wrap vinyl tape around the spline part on the D.O.J side of the driveshaft so that the D.O.J boot is not damaged when they are removed.
- b. Withdraw the B.J boot from the driveshaft.

CAUTION

Do not disassembly the B.J.



KHPDS99A

INSPECTION

EIMB1900

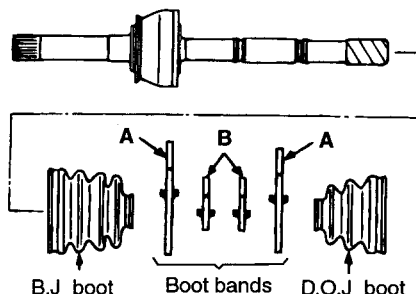
1. Check the driveshaft for bending or wear.
2. Check for water, foreign matter or rust in the boot.
3. Check the ball joint for wear or damage.
4. Check the boot for wear or damage.

REASSEMBLY

EIMB2000

1. INSTALLATION OF BOOTS AND BOOT BANDS.

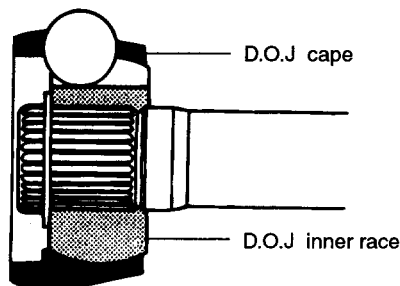
- a. Wrap vinyl tape around the spline part on the D.O.J side of the driveshaft.
- b. Install the B.J boot, boot bands(new ones), and D.O.J boot on the driveshaft.



EHPDS20A

2. INSTALLATION OF D.O.J CAGE/D.O.J INNER RACE

Install the D.O.J cage onto the driveshaft so that the smaller diameter side of the cage is installed first.



EHPDS21A

3. Apply the specified grease to the driveshaft and boot.

Items	Quantity (gr.)	
	2.5 Diesel	3.5 Gasoline
B.J	130 (+10/-0)	145±10
D.O.J	130 (+10/-0)	135±10

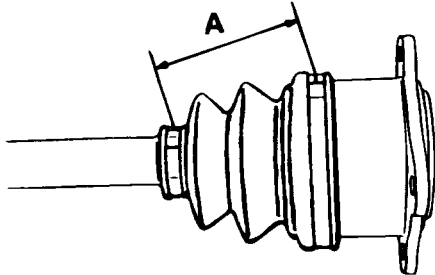
4. INSTALLATION OF D.O.J OUTER RACE

- a. Install the circlip onto the D.O.J outer race. Place the D.O.J boot over the D.O.J outer race, and then use boot band B to secure the boot.

CAUTION

Do not secure the boot band A.

- b. Secure the driveshaft, and then move the D.O.J outer race until it is at the position where the D.O.J boot assembly dimension is the standard value.



KHPDS22A

- c. Remove a part of the D.O.J boot from the D.O.J outer race and release the air within the boot.
- d. Secure the boot band A on D.O.J boot.

CAUTION

Be sure that the installation direction of the boot bands is correct.

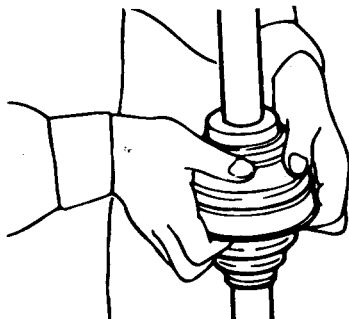
5. INSTALLATION OF BOOT PROTECTOR/BOOT PROTECTOR BAND

- a. Push in the boot protector with the hands and tighten it with the boot band.

CAUTION

Be sure that the installation direction of the boot bands is correct.

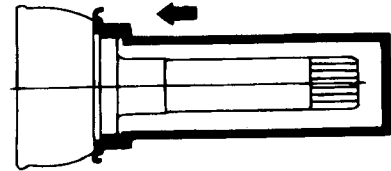
- b. Put the edge of the boot protector back into the original state.



KHPDS23A

6. INSTALLATION OF DUST COVER

Using a suitable tool, install the dust cover to B.J assembly.

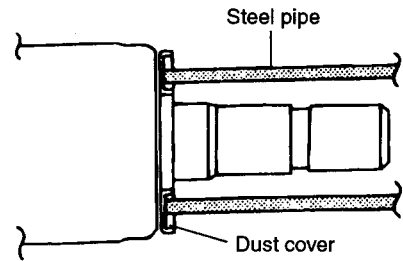


KHPDS24A

7. INSTALLATION OF DUST COVER

Using the steel pipe as specified below, force the dust cover to the D.O.J outer race.

Steel pipe	mm (in.)
Outside diameter	77 (3.03)

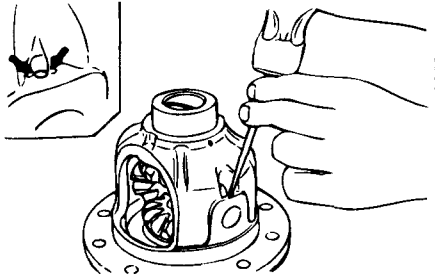


EHPDS25A

- When adjustment is impossible, replace the side gear and the pinion gear as a set.

9. INSTALLATION OF THE LOCK PIN

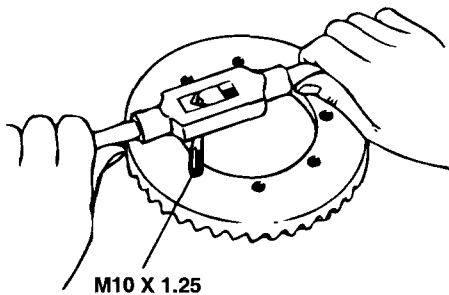
- 1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
- 2) Fix the lock pin in place by staking two points around the lock pin hole with a punch.



H7FA1010

10. INSTALLATION OF THE DRIVE GEAR

- 1) Clean the drive gear attaching bolts.
- 2) Remove the adhesive on the threaded holes of the drive gear use a tap (M10 x 1.25), and then clean the threaded holes with compressed air.

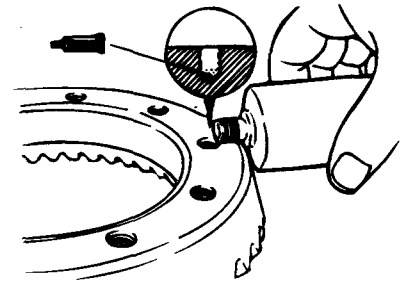


M10 X 1.25

H7FA1020

- 3) Apply the specified adhesive to the threaded holes of the drive gear.

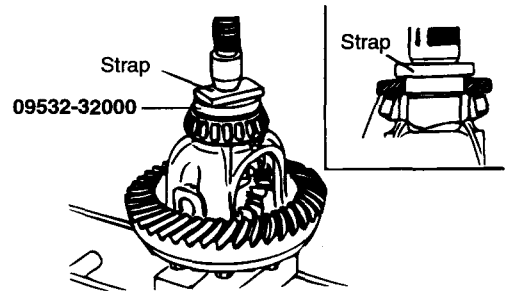
Specified adhesive : LOCTITE #262 or equivalent



H7FA1030

- 4) Install the drive gear in the differential case with the matchmarks properly aligned. Tighten the bolts to the specified torque in a diagonal sequence.

11. PRESS THE SIDE BEARING INNER RACE



EIMB670D

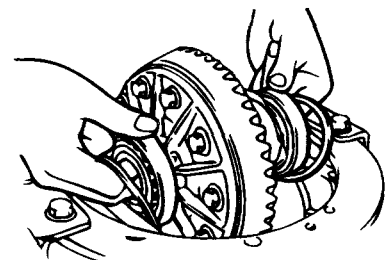
12. ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH

Adjust the final drive gear backlash according to the following procedures :

- 1) Install side bearing spacers which are thinner than those removed, to the side bearing outer races, and then mount the differential case assembly into the gear carrier.

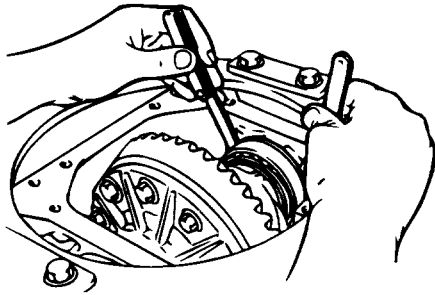
NOTE

Select side bearing spacers with the same thickness for both the drive pinion side and the drive gear side.



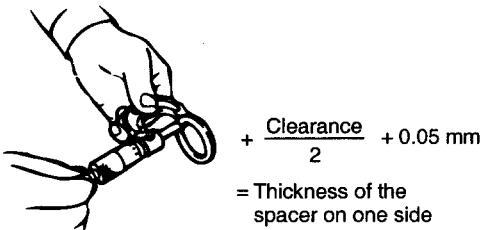
H7FA1050

- 2) Push the differential case to one side, and measure the clearance between the gear carrier and the side bearing with a feeler gauge.



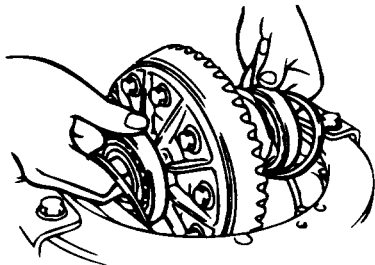
H7FA1060

- 3) Select two pairs of spacers which correspond to the value calculated according to the expression in the illustration. Install one pair each to the drive pinion side and the drive gear side.



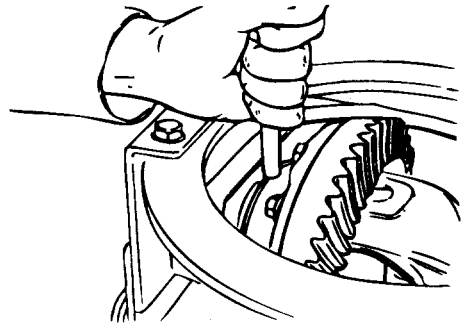
A7FA1070

- 4) Install the side bearing spacers and differential case assembly, as shown in the illustration, to the gear carrier.



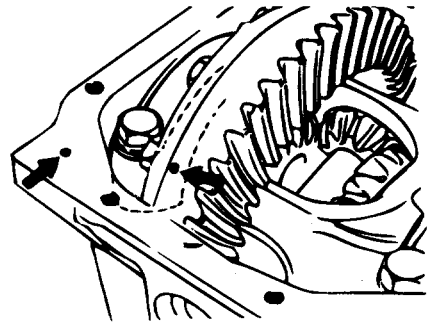
H7FA1080

- 5) Tap the side bearing spacers with a brass bar to fit them to the side bearing outer race.



H7FA1090

- 6) Align the matchmarks on the gear carrier and the bearing cap and tighten the bearing cap.



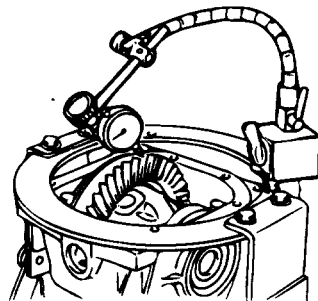
H7FA1100

- 7) With the drive pinion locked in place, measure the final drive gear backlash with a dial indicator on the drive gear.

NOTE

Measure at four points or more on the circumference of the drive gear.

Standard value : 0.11-0.16mm (0.0043-0.0063in.)

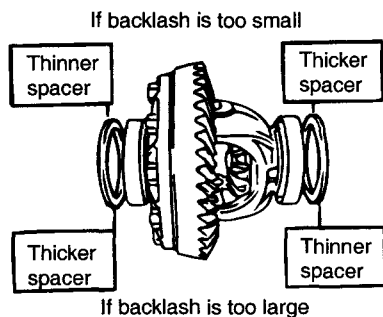


H7FA1110

- 8) Change the side bearing spacers as illustrated and then adjust the final drive gear backlash between the drive gear and the drive pinion.

 **NOTE**

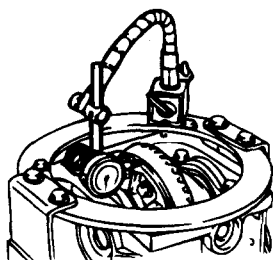
When increasing the number of side bearing spacers, use the same number for each and as few as possible.



A7FA1120

- 9) Check the drive gear and drive pinion for tooth contact. If poor contact is evident, adjust again.
- 10) Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

Limit : 0.05 mm (0.002 in.)

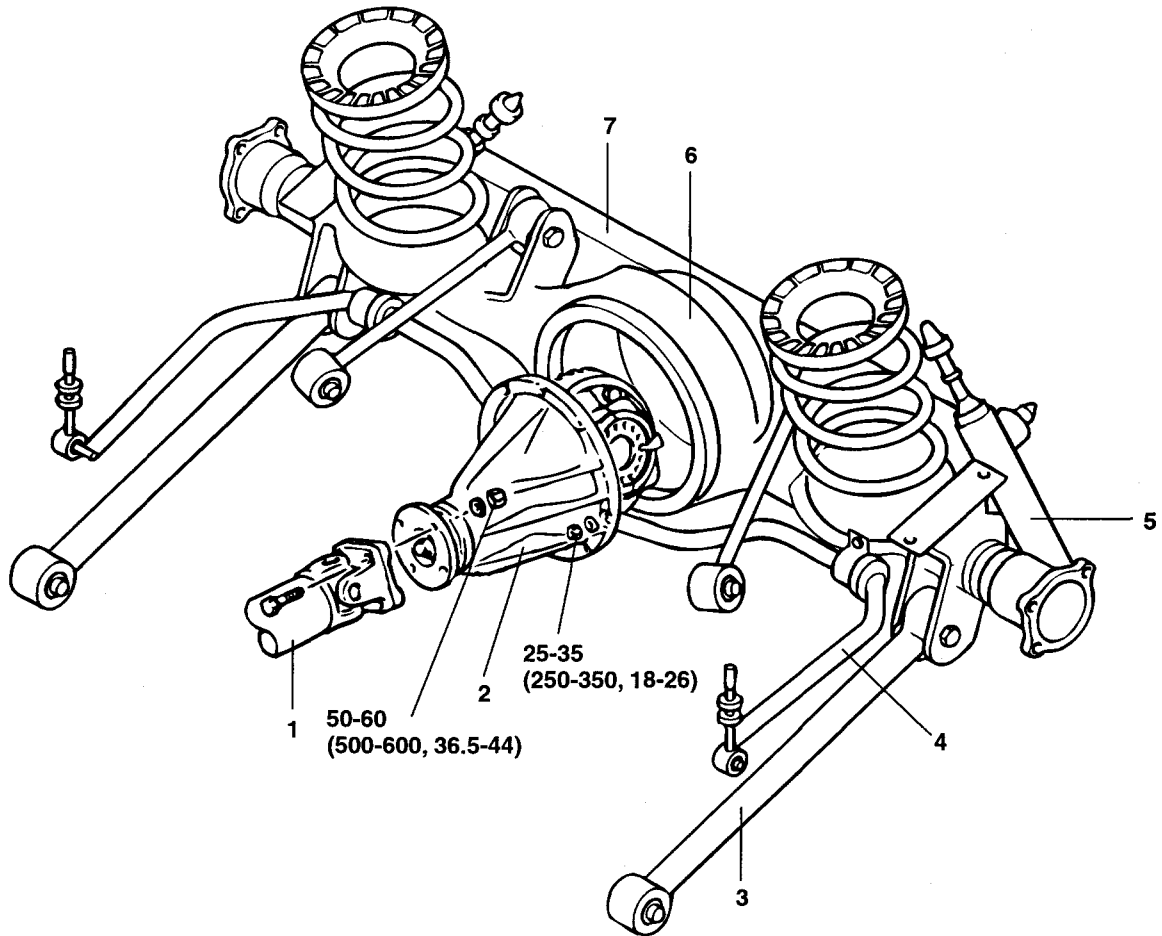


H7FA1130

- 11) If the drive gear runout exceeds the limit, reinstall by changing the position of the drive gear and differential case, and remeasure.

REAR DIFFERENTIAL CARRIER

COMPONENTS EIMB6800



1. Rear propeller shaft
2. Differential carrier assembly
3. Lower link
4. Stabilizer bar
5. Rear shock absorber
6. Rear axle housing
7. Lateral rod

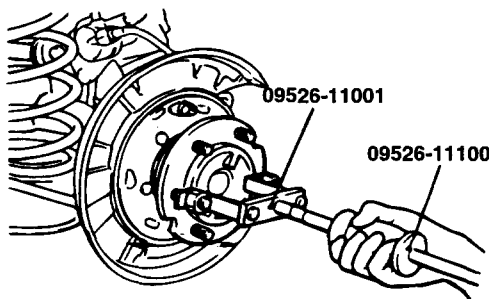
TORQUE : Nm (kg·cm, lb·ft)

REMOVAL EIMB6900

1. Drain the differential gear oil.
2. Remove the rear brake drum.
3. Remove the parking brake cable attaching bolt.
4. Remove the stabilizer bar.
5. Pull out the right and left axle shaft using the special tools(09526-11001, 09526-11000) after removing the coupling nuts.

CAUTION

Be careful not to damage the oil seal when pulling axle shaft.

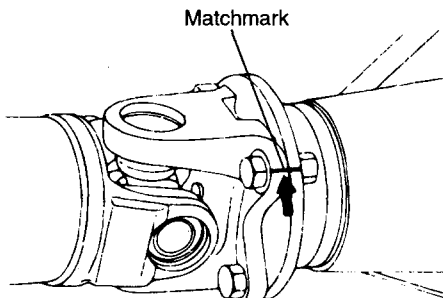


H7RA0870

6. After marking the matchmark on the flange yoke of the rear propeller shaft and the companion flange of the differential case, remove the rear propeller shaft assembly.

CAUTION

Suspend the propeller shaft from the body with wire, etc.

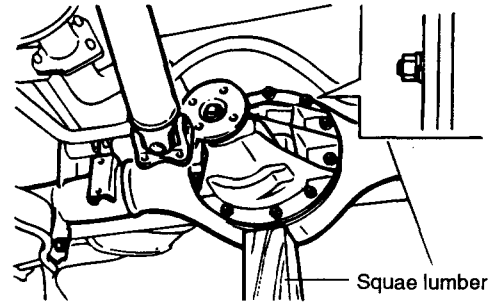


EIMB080A

7. Remove the attaching nuts and strike the lower part of differential carrier assembly with a piece of times several times to loosen, then remove the differential carrier assembly.

NOTE

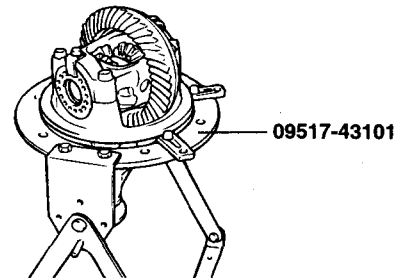
Use care not to strike the companion flange.



EIMB660A

INSPECTION BEFORE DISASSEMBLY EIMB7000

Secure the special tool(09517-43101) and install the differential carrier assembly with the attachment. Then carry out the following inspection.



H7RA1070

1. **FINAL DRIVE GEAR BACKLASH**
Check the final drive gear backlash by the following procedure.

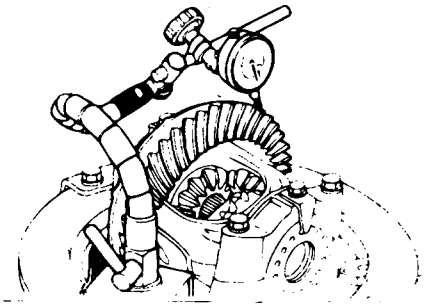
- 1) Place the drive pinion and move the drive gear to check backlash is within the standard range.

NOTE

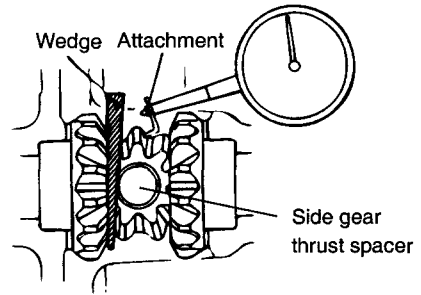
Measure at 4 points on the gear periphery.

Standard value

0.01-0.16 mm (0.0043-0.0063 in.)



AU52-23B



A7FA0710

- 2) Adjust with the side bearing nuts if backlash values are not within standard range.

NOTE

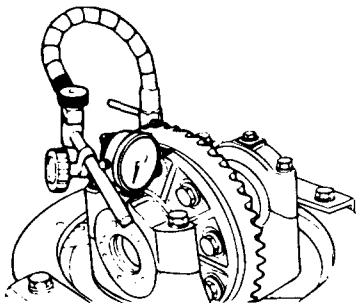
After adjusting, check the state of the final drive gear's tooth contact.

2. DRIVE GEAR RUNOUT

Check the back-face lash as follows:

- 1) Place a dial gauge on the back-face of the drive gear and measure the runout.

Limit : 0.05mm (0.0020in.)



AU52-32A

- 2) If the runout is beyond the limit, check that there are no foreign substances between the drive gear and differential case and, that the bolts fixing the drive gear are not loose.

3. DIFFERENTIAL GEAR BACKLASH

- 1) Fix the side gear with a wedge so it cannot move and measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE

Take the measurements at two places on the pinion gear.

Standard value : 0.01-0.25mm (0.0004-0.0098in.)

- 2) If the backlash exceeds the limit, adjust using side bearing spacers.

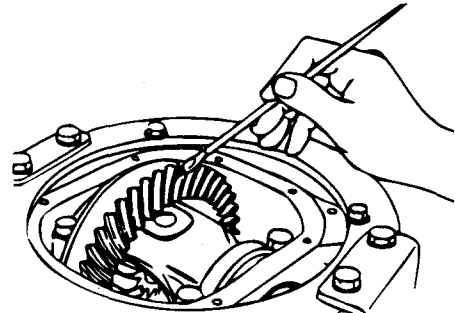
NOTE

If adjustment is impossible, replace the side gear and pinion gears as a set.

4. FINAL DRIVE GEAR TOOTH CONTACT

Check the final drive gear tooth contact by following the steps below :

- 1) Apply the same amount of machine blue slightly to both surfaces of the drive gear teeth.



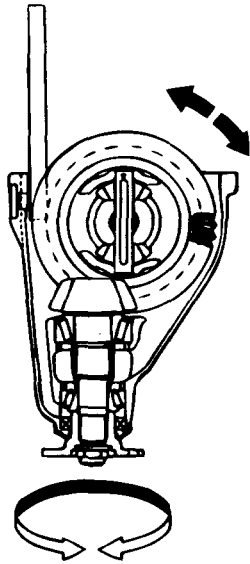
H7FA0720

- 2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear so that some torque (approximately 25-30kg·cm) is applied to the drive pinion.

CAUTION

If the drive gear is rotated too much, the tooth contact pattern will become unclear and difficult to check.

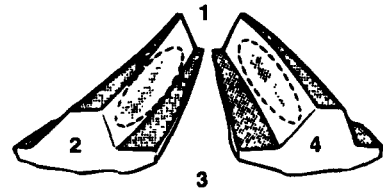
- 3) Check the tooth contact pattern.



EIJA001B

Standard tooth contact pattern

- 1. Narrow tooth side
- 2. Drive-side tooth surface (the side receiving power during acceleration)
- 3. Wide tooth side
- 4. Coast-side tooth surface (the side receiving power during coast-down)

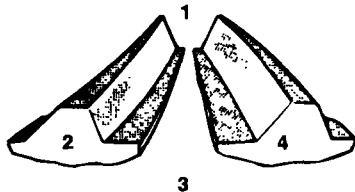


EIJA0011

Problem

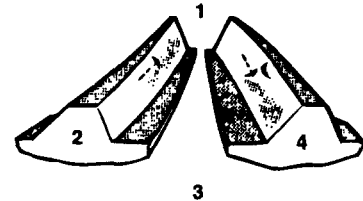
Solution

Tooth contact pattern resulting from excessive pinion height



EIJA0012

The drive pinion is positioned too far from the center of the drive gear.

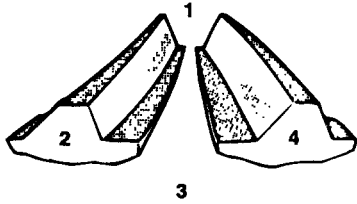


EIJA0013

Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the center of the drive gear.

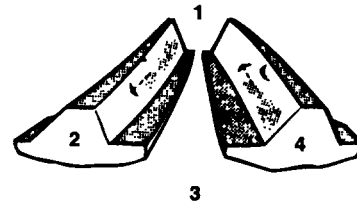
Also, for backlash adjustment, reposition the drive gear further from the drive pinion.

Tooth contact pattern resulting from insufficient pinion height



EIJA0014

The drive pinion is positioned too close to the center of the drive gear.



EIJA0015

Decrease the thickness of the pinion height adjusting shim, and position the drive pinion further from the center of the drive gear. Also, for backlash adjustment, reposition the drive gear closer to the drive pinion.

NOTE

- Tooth contact pattern is a method for judging the result of the adjustment of drive pinion height and final drive gear backlash. The adjustment of drive pinion height and final drive gear backlash should be repeated until the tooth contact patterns are similar to the standard tooth contact pattern.
- When you cannot obtain a correct pattern, the drive gear and drive pinion have exceeded their limits. Both gears should be replaced as a set.

INSTALLATION EIMB7100

1. DIFFERENTIAL CARRIER ASSEMBLY

Apply specified sealant to axle housing flange surface, and install the differential carrier assembly.

Specified sealant : Three bond 1215 or equivalent

2. PROPELLER SHAFT

Align the matchmarks on the flange yoke and companion flange, and install the propeller shaft.

Tightening torque

50-60Nm (500-600kg-cm, 37-44lb-ft)

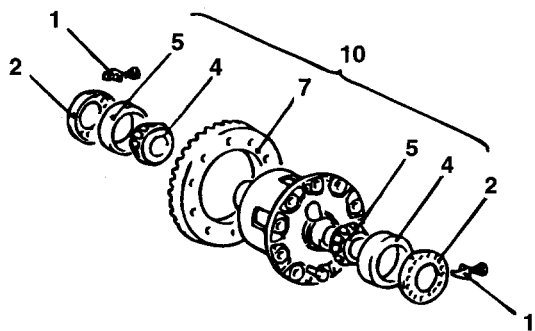
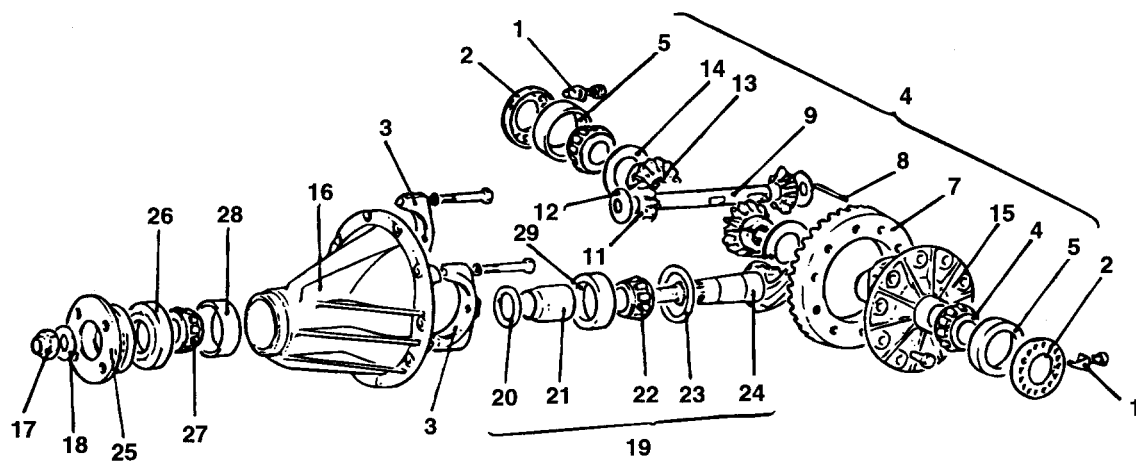
3. AXLE SHAFT ASSEMBLY

- 1) Apply specified sealant to the axle housing and bearing case end faces.

Specified sealant : Three bond 1104

- 2) Install the axle shaft assembly after installing new O-ring into the axle shaft.

COMPONENTS EILB0330



Disassembly steps

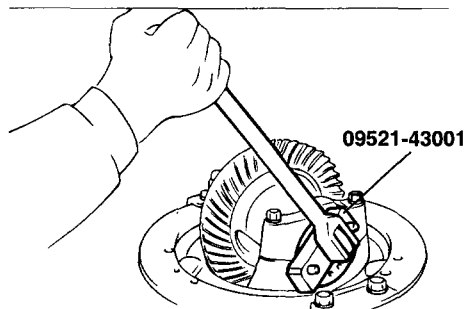
- | | |
|---|---|
| <ul style="list-style-type: none"> 1. Lock plate 2. Side bearing nut 3. Bearing cap 4. Differential case assembly 5. Side bearing inner race 7. Drive gear 8. Lock pin 9. Pinion shaft 10. Differential case assembly 11. Pinion gear 12. Pinion washer 13. Side gear 14. Side gear thrust spacer 15. Differential carrier case 16. Differential carrier 17. Self-locking nut 18. Washer | <ul style="list-style-type: none"> 19. Drive pinion assembly 20. Drive pinion front shim
(For preload adjustment) 21. Drive pinion spacer 22. Drive pinion rear bearing inner race 23. Drive pinion rear shim
(For drive pinion height adjustment) 24. Drive pinion 25. Companion flange 27. Drive pinion front bearing inner race 28. Drive pinion front bearing outer race 29. Drive pinion rear bearing outer race |
|---|---|

DISASSEMBLY EIMB7300**1. SIDE BEARING NUT**

Using the special tool (09521-43001), remove the side bearing nut.

NOTE

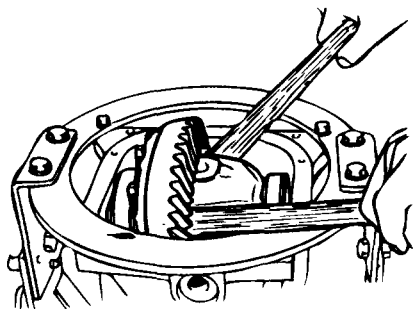
Keep the right and left side bearing nuts separate so that they are not mixed during reassembly.



AU52-25B

2. REMOVAL OF THE DIFFERENTIAL CASE ASSEMBLY**CAUTION**

- Remove the differential case assembly slowly and carefully.
- Be careful so that the side bearing outer race is not dropped.
- Keep the right and left side bearing outer races separate so that they are not mixed during reassembly.



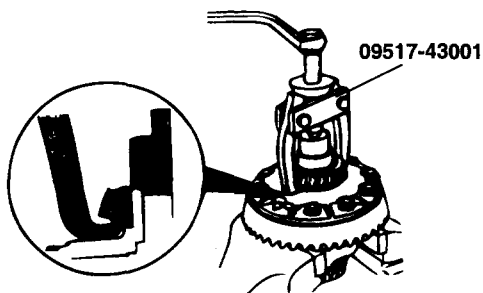
H7FA0740

3. REMOVAL OF THE SIDE BEARING INNER RACES

Fit the nut on top of the differential case, and then use the special tool to remove the side bearing inner race.

NOTE

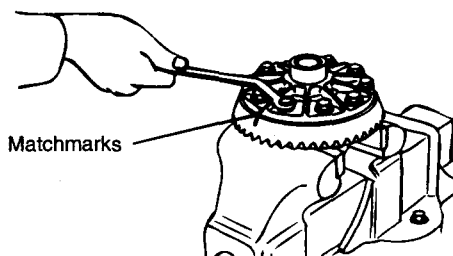
Attach the prongs of the special tool(09517-43001) to the inner race of the side bearing through the notched section in the differential case.



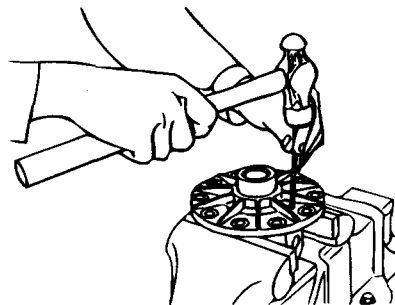
H7FA0750

4. REMOVAL OF DRIVE GEAR

- Make the matchmarks to the differential case and the drive gear.
- Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

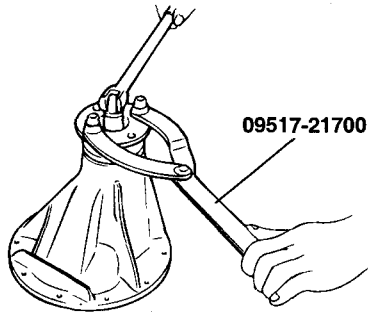


A7FA0760

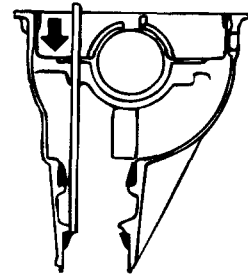
5. REMOVAL OF LOCK PIN (FOR CONVENTIONAL DIFFERENTIAL)

H7FA0770

6. REMOVAL OF SELF-LOCKING NUT



H7RA1100



H7FA0810

7. REMOVAL OF DRIVE PINION

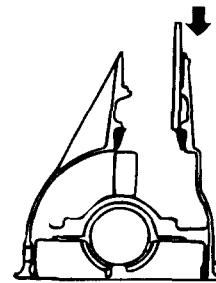
- a. Make the matchmarks on the drive pinion and companion flange.

CAUTION

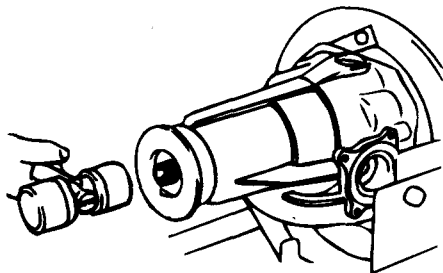
Matchmarks should not be made on the contact surfaces of the companion flange and the propeller shaft.

- b. Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.

10. REMOVAL OF DRIVE PINION REAR BEARING OUTER RACE

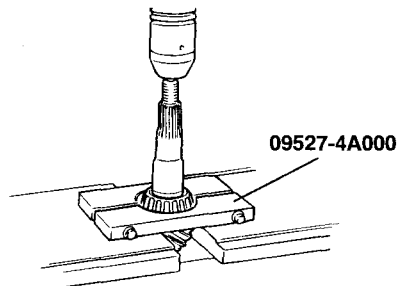


H7FA0820



H7FA0790

8. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE



H7RA1090

9. REMOVAL OF OIL SEAL / DRIVE PINION FRONT BEARING INNER RACE / DRIVE PINION FRONT BEARING OUTER RACE

INSPECTION EIJB0490

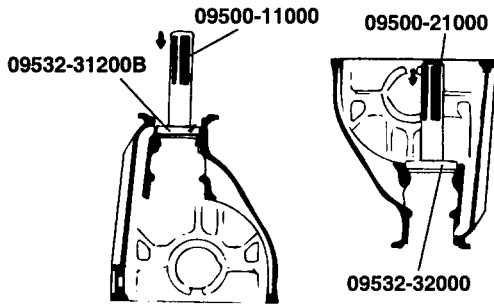
1. Check the companion flange for wear or damage.
2. Check the bearings for wear or discoloration.
3. Check the gear carrier for cracks.
4. Check the drive pinion and drive gear for wear or cracks.
5. Check the side gears, pinion gears and pinion shaft for wear or damage.
6. Check the side gear spline for wear or damage.

REASSEMBLY EIMB7500

Install the drive pinion rear bearing outer race and drive pinion front bearing outer race using the special tools (09500-11000, 09500-21000, 09532-31200B and 09532-32000).

CAUTION

Be careful not to press in the outer race when it is inclined.



EIJA005C

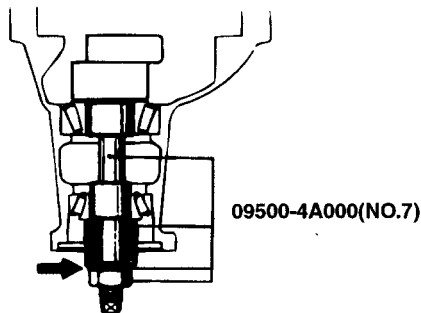
ADJUSTMENT OF PINION HEIGHT

Adjust the drive pinion height according to the following procedures:

1. Install the drive pinion inner and outer bearing races to the special tools (09500-43131, 09500-4A000) in sequence shown in the illustration.

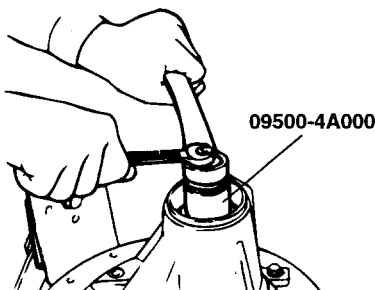
NOTE

Apply a thin coat of the multipurpose grease on the mating face of the washer of the special tool.



EIMB750A

2. Tighten the nut of the special tool slowly until the standard value of drive pinion turning torque is obtained.



EIMB750B

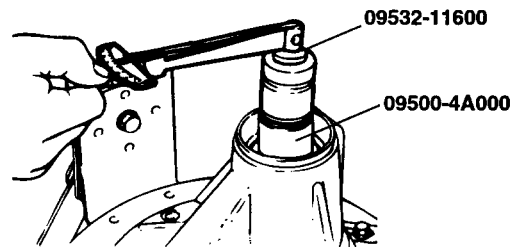
3. Measure the drive pinion turning torque (without the oil seal) using the special tool (09532-11600).

STANDARD VALUE :

Bearing division	Bearing lubrication	Rotation torque Nm (kg-cm)
New	None (with anti-rust agent)	0.6-0.9 (6-9)
New or reused	Oil application	0.4-0.9 (4-9)

NOTE

- Gradually tighten the nut of the special tool (09500-43131) while checking the drive pinion turning torque.
- Because the special tool cannot be turned one rotation, turn it several times within the range that it can be turned. After obtaining smooth bearing operation, measure the rotation torque.

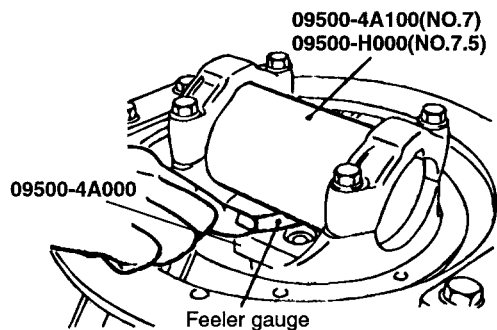


KIMB720C

4. Position the special tool in the side bearing seat of the gear carrier and select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

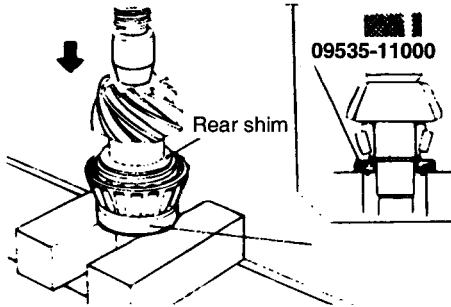
NOTE

- Clean the side bearing seat thoroughly. When positioning the special tool, confirm that the cut-out sections of the special tools touch the side bearing seat very closely.
- When selecting the drive pinion rear shims, use the fewest number of shims necessary.



EIMB750C

- Fit the selected drive pinion rear shim(s) to the drive pinion, and press-fit the drive pinion rear bearing inner race using the special tool (09535-11000).



AIJA030A

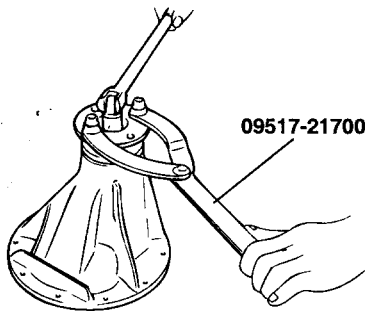
ADJUSTMENT OF DRIVE PINION PRELOAD

Adjust the drive pinion turning torque according to the following procedures :

- Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.
- Tighten the companion flange to the specified torque using the special tool (09517-21700).

NOTE

Do not install the oil seal.

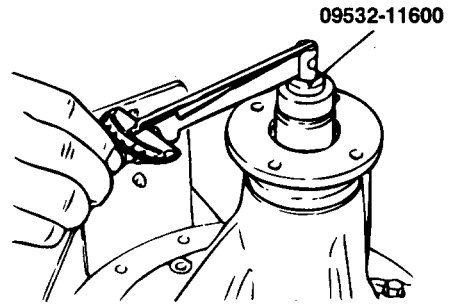


H7RA1100

- Measure the drive pinion turning torque (without the oil seal) using the special tool.

STANDARD VALUE :

Bearing use	Bearing lubrication	Rotation torque Nm (kg·cm)
New	None (with anti-rust agent)	0.6-0.9 (6-9)
New or reused	Oil application	0.4-0.9 (4-9)



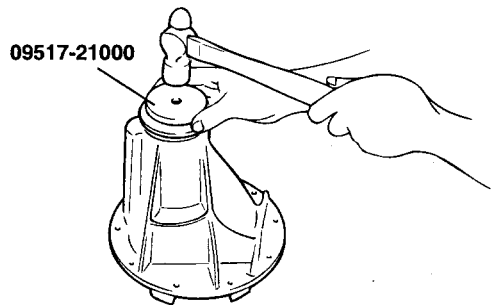
H7FA0940

- If the drive pinion turning torque is not within the range of the standard value, adjust the turning torque by replacing the drive pinion front shim(s) or the drive pinion spacer.

NOTE

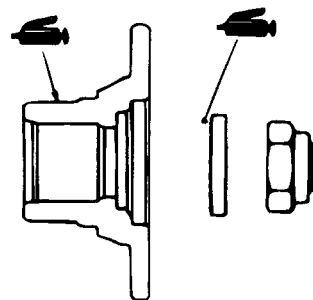
When selecting the drive pinion front shim pack, use the minimum number of shims.

- Remove the companion flange and drive pinion once again. Insert the oil seal into the gear carrier front lip using the special tool (09517-21000). Apply multipurpose grease to the oil seal lip.



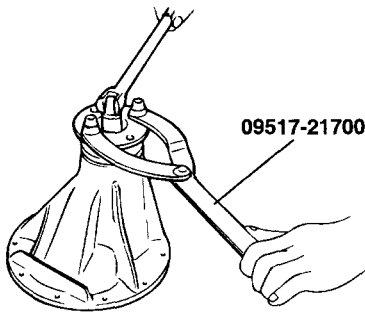
H7RA1080

- Apply a thin coat of multipurpose grease to the contacting surface of the oil seal in the companion flange and contacting surface of the washer of the flange before installing the drive pinion assembly.



EIJA007B

7. Install the drive pinion assembly, shim packs and companion flange with matchmarks properly aligned, and tighten the companion flange self-locking nut to the specified torque using the special tool (09517-21700).



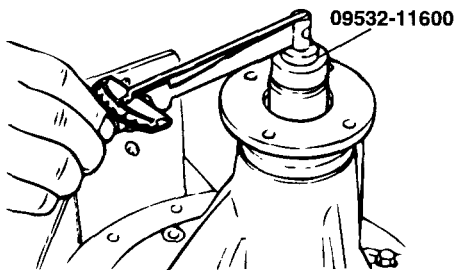
H7RA1100

8. Measure the drive pinion turning torque (with oil seal) by using the special tool (09552-11600) to verify that the drive pinion turning torque is within the standard value.

STANDARD VALUE :

Bearing use	Bearing lubrication	Rotation torque Nm (kg-cm)
New	None (with anti-rust agent)	0.8-1.15 (8-11.5)
New or reused	Oil application	0.65-0.75 (6.5-7.5)

9. If it is beyond the standard value, check the torque of the companion flange self-locking nut, or the assembly condition of the oil seal.



H7FA0980

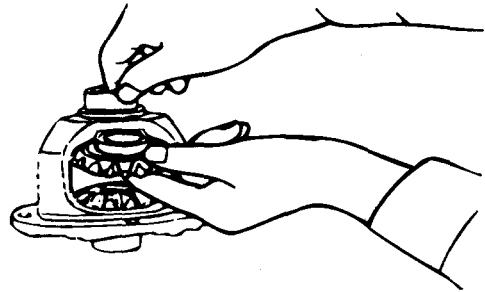
ADJUSTMENT OF DIFFERENTIAL GEAR BACKLASH

Adjust the differential gear backlash according to the following procedures :

1. Assemble the side gears, side gear spacers, pinion gears, and pinion washers into the differential case.
2. Temporarily, install the pinion shaft.

NOTE

Do not install the lock pin yet.



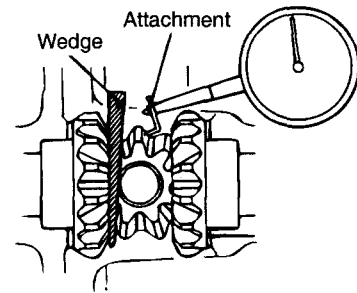
H7FA0990

3. Insert a wedge in the side gear and measure the differential gear backlash with a dial indicator on the pinion gear.

NOTE

Measure both pinion gears separately.

Standard value : 0-0.076mm (0-0.003in.)
Limit : 0.2mm (0.008in.)



A7FA1000

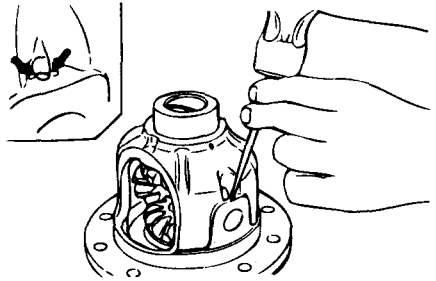
4. If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.
5. Measure the differential gear backlash once again, and confirm that it is within the limit.

NOTE

- After adjustment, check that the backlash is within the limit and the differential gear rotates smoothly.
- When adjustment is impossible, replace the side gear and the pinion gear as a set.

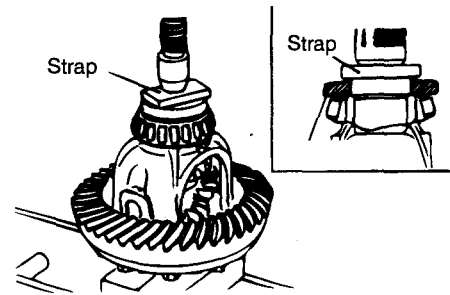
6. Installation of the lock pin
 - a. Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.

- b. Fix the lock pin in place by staking two points around the lock pin hole with a punch.



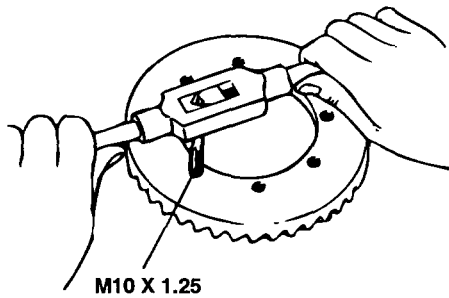
H7FA1010

- 8. Press-fit the side bearing inner race



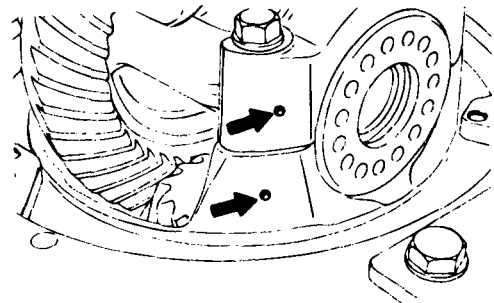
A7FA1040

- 7. Installation of the drive gear
 - a. Clean the drive gear attaching bolts.
 - b. Remove the adhesive on the threaded holes of the drive gear with a tap (M10 x 1.25), and then clean the threaded holes with compressed air.



H7FA1020

- 9. Align the matchmark on the gear carrier and the bearing cap, and then tighten the bearing cap.

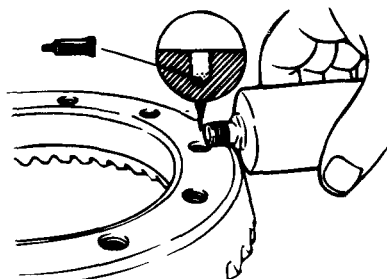


AU52-31D

- c. Apply the specified adhesive to the threaded holes of the drive gear.

Specified adhesive : LOCTITE #262 or equivalent

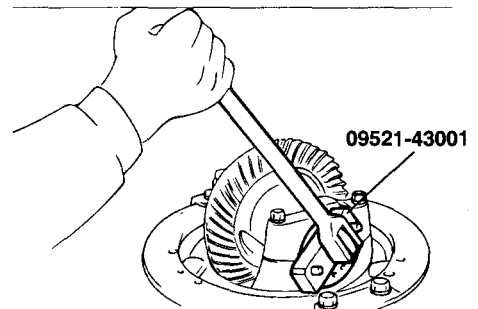
- d. Install the drive gear in the differential case with the matchmarks properly aligned. Tighten the bolts to the specified torque (800-900 kg.cm) in a diagonal sequence.



H7FA1030

- 10. ADJUSTMENT OF FINAL DRIVE GEAR BACKLASH
Adjust final drive gear backlash as follows :

- 1) Using the special tool(09521-43001), temporarily tighten the side bearing nut until it is in the state just before preloading of the side bearing.



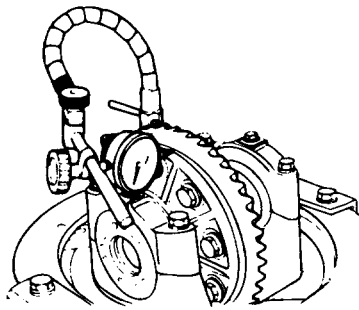
AU52-25B

- 2) Measure the final drive gear backlash.

Standard value : 0.11-0.16mm (0.0043-0.0063in.)

NOTE

Measure at least 4 point on the drive gear periphery.

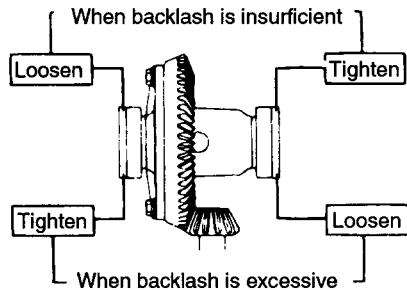


AU52-32A

- Using the special tool(09521-43000), adjust the backlash to standard value by moving the side bearing nut as shown.

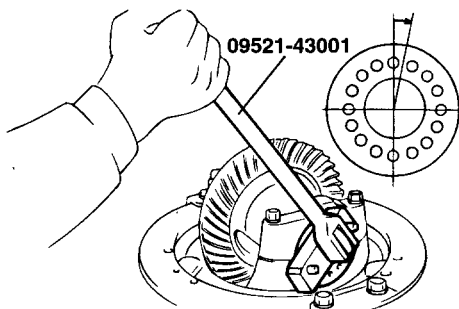
NOTE

First turn the side bearing nut for loosening, and then turn (by the same amount) the side bearing nut for tightening.



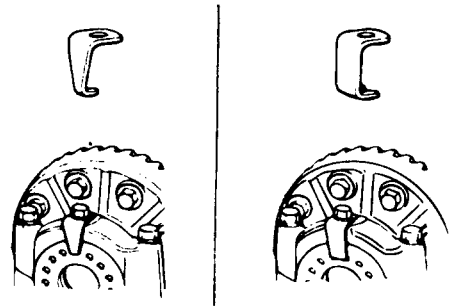
EIMB750D

- Using the special tool(09521-43001) to apply the preload, turn down both right and left side bearing nut on half the distance between centers of two neighboring holes.



AU52-32C

- Choose and install the lock plates two kinds.

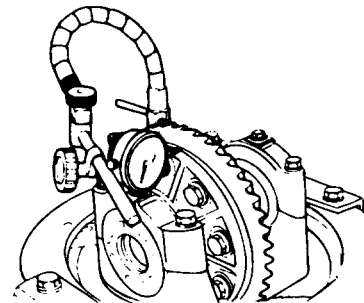


AU52-32D

- Check the final drive gear tooth contact. If poor contact is evident, make adjustment.
- Measure the drive gear runout.

Limit : 0.05mm (0.0020in.)

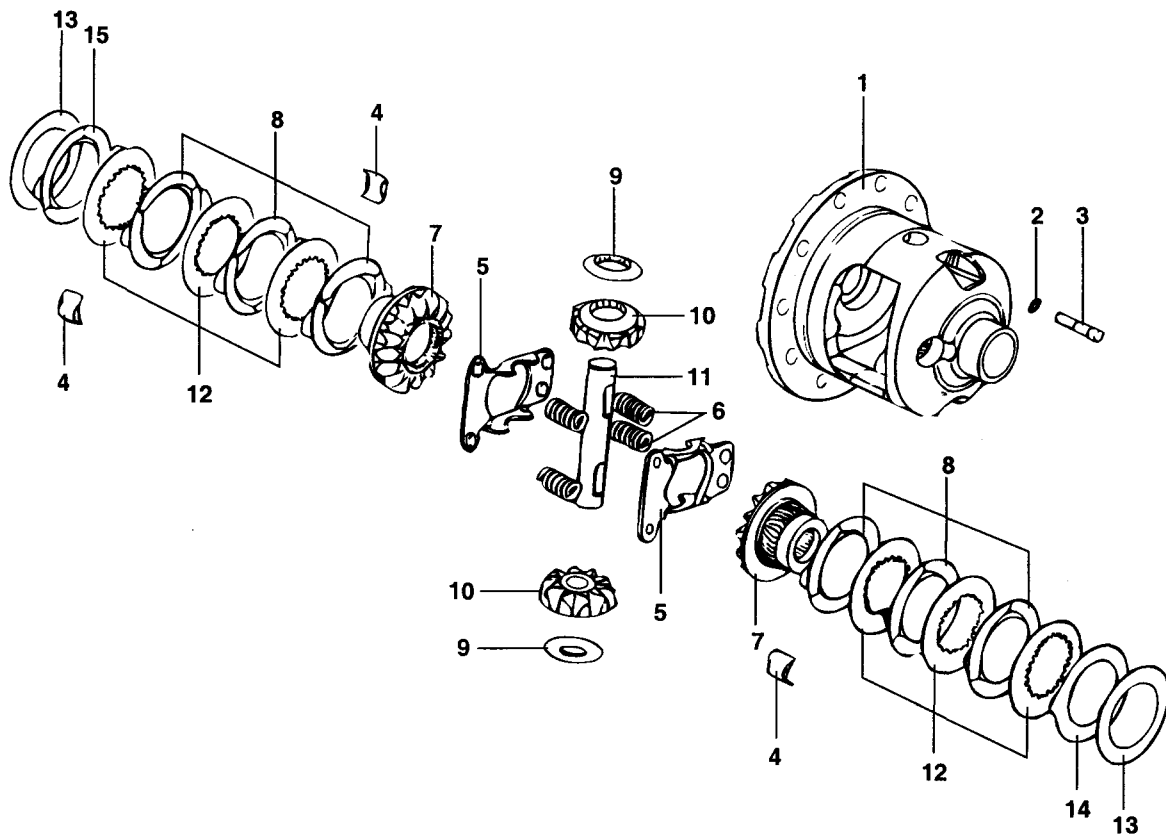
- When drive gear runout exceeds the limit, remove the differential case and then the drive gears, moving them to different positions and reinstalling them.



AU52-32A

**LIMITED SLIP DIFFERENTIAL
(LSD)**

COMPONENTS EIMB7600



- 1. Case
- 2. Washer-lock
- 3. Screw-lock
- 4. Guide-ear
- 5. Plate-preload
- 6. Spring-preload
- 7. Gear-side
- 8. Eared disc S/A (carbon on both sides)
- 9. Thrust washer-pinion
- 10. Pinion gear
- 11. Cross shaft-pinion
- 12. Disc-splined friction
- 13. Shim-side gear
- 14. Eared disc S/A (carbon on one side)

TORQUE : Nm (kg-cm, lb-ft)

DESCRIPTION EILB0390

This Carbon Disc Limited Slip Differential has a one piece case. Inside the case is a bevel gear set. The gear set has two side gears and two pinion gears. Each pinion gear is held in place by a spherical thrust washer and the cross shaft. The cross shaft fits into the holes in the case. The cross shaft is retained by a threaded lock pin with a lock washer. Behind each side gear is a friction disc pack. Between each disc pack and the internal pockets of the case is a shim. The thickness of these shims is selected to provide the correct backlash between the side gears and pinion gears. Between the side gears are a spring preload assembly and a thrust block. The preload plates are constructed so they straddle the cross shaft, hold the preload springs and position the thrust block.

DISASSEMBLY EILB0400

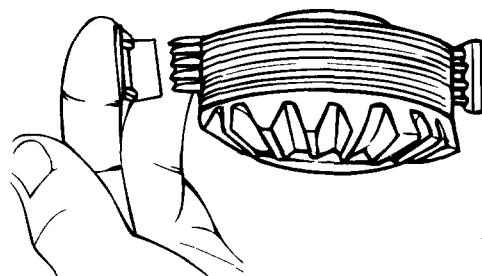
1. Remove the threaded lock screw and the cross shaft.
2. Remove the spring preload assembly. Use a hammer and punch to drive the spring plates out from the large window.
3. Without preload on the side gears, they can be turned by hand. Rotate the side gears until the pinions are in the window area. Remove the pinions and pinion thrust washers.
4. Remove the gear sub-assemblies (side gear, disc pack, ear guides and disc pack shims). Do not mix parts. Identify the parts so they can be reassembled to the original location.

INSPECTION EIMB7900

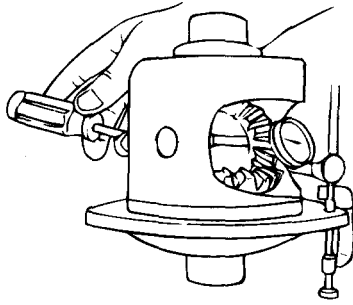
1. Check the side gears, pinions, pinion thrust washers, thrust block and cross shaft for wear or damage. If there is excessive wear, cracks, nicks, grooves or galling, replace the parts.
2. Inspect the carbon surfaces. After cleaning with a solvent, the carbon surface should appear like a coarse weave fabric with flat spots on the peaks of the weave. If the surface is smooth, either from wear or from the weave filled with debris, replace the entire disc pack.
3. Measure the thickness of the carbon friction discs. If any of the double sided discs are less than 2.56mm (0.101in.) or the single sided disc is less than 2.15mm (0.085in.), replace the entire disc pack.
4. Inspect the splined friction discs. If they have grooves or a mirror like finish, replace the entire disc pack. Small scratches on a buff like finish is okay.

REASSEMBLY AND SHIM**SELECTION** EIMB8000

1. Apply axle lubricant to all sliding surfaces. Be especially careful to coat the mating surfaces of the friction discs.
2. Starting with a double sided eared disc next to the side gear, stack four eared discs and three splined discs on to the spline of the side gear. A splined disc goes in between each eared disc with the last eared disc being single sided and the carbon surface facing the side gear. Use a heavy bearing grease in the ear guides to hold them in place during assembly.
3. Select a shim 0.76mm (0.023in.) thick and place on the hub side of the disc pack subassembly.
4. Lubricate and assemble the other side gears as above.
5. Install the flange end side gear subassembly and shim in the flange end of the differential case.
6. Position pinion gears and thrust washers on the side gears and install the cross shaft through the case and pinions.
7. Install a dial indicator on the case.
8. Compress the clutch pack with a large screw driver or pry bar as shown. Rotate the pinion gear back and forth to obtain backlash. Tooth backlash should be 0 to 0.10mm (0 to 0.004in.). If required, change the .76mm (0.023in.) shim to obtain the proper backlash.

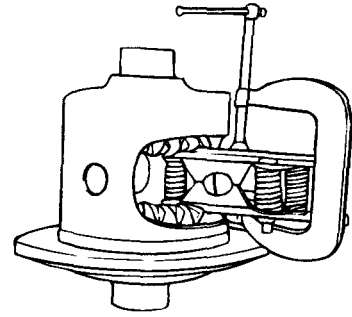


H7RA1240



H7RA1250

13. Position the spring pack between the side gears and remove the "C" clamp.

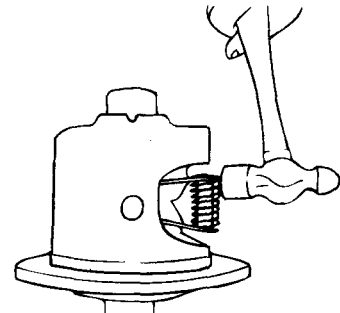


H7RA1190

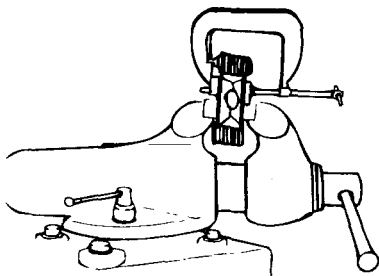
9. Remove the side gear subassembly and repeat the tooth backlash procedure for the other gear pack on the opposite side of the case.
10. Remove the cross shaft, pinions and thrust washers and reinstall the first side gear subassembly and shim in the flange end of the case.
11. Install a pinion and thrust washer through each window so that the gear teeth mesh and so that the pinions are in line with each other. Rotate one side gear so the pinions and thrust washers rotate at a position where they line up with the cross shaft holes in the case.
12. Mount springs and load plates in a vise. With the thrust block between the spring plates, compress the assembly until the load plates touch. Install a "C" clamp on the plates and install 6 mm bolts through each front spring. Retain nuts on the screws as shown in the illustration.

14. Drive the spring pack into the side gears far enough to retain the springs. Then remove the 6 mm bolts and complete the pack installation by driving the spring pack in position so that the cross shaft can slide through the middle as shown. Turn the thrust block so that the hole in the middle lines up with the hole in the case.

15. Install the pinion shaft, lock screw and lock washer. Tighten the lock screw to 30-40Nm (22-29lb·ft) torque.

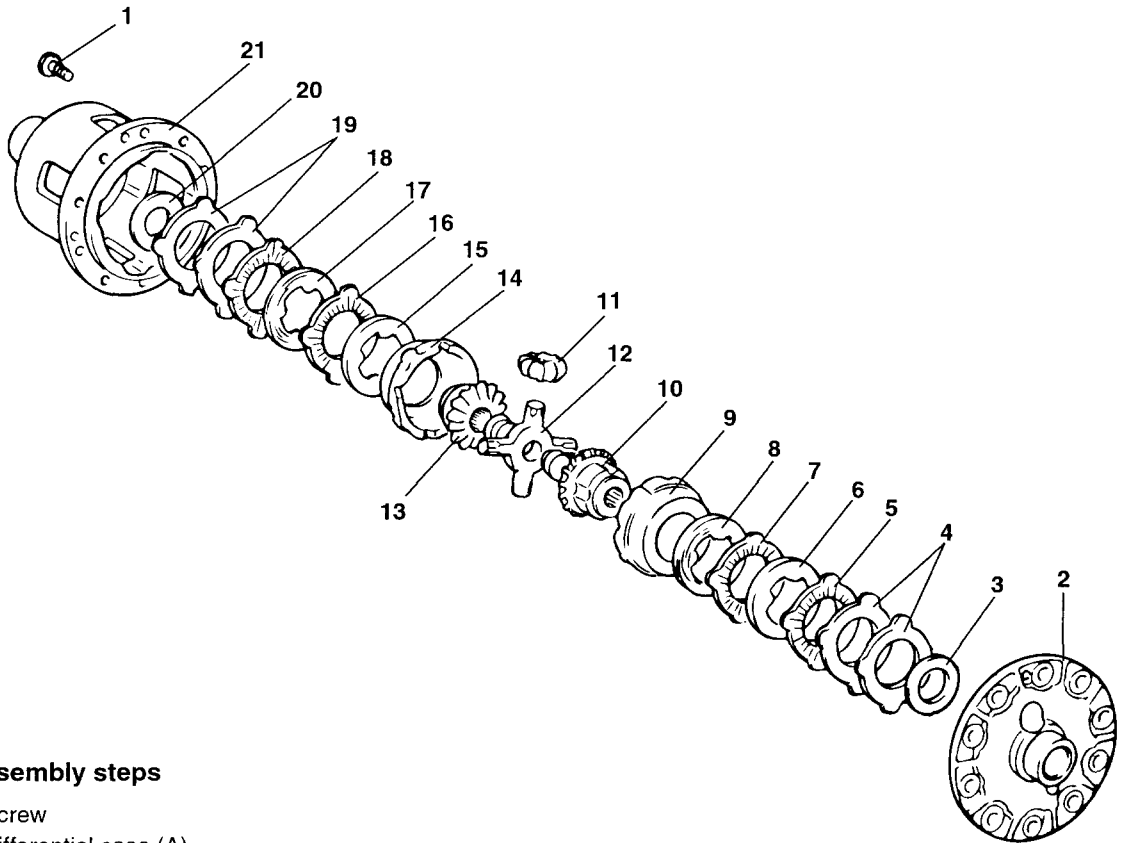


H7RA1170



H7RA1230

COMPONENTS EIMB8100

**Disassembly steps**

1. Screw
2. Differential case (A)
3. Thrut washer
4. Spring plate
5. Friction plate
6. Friction disc
7. Friction plate
8. Friction disc
9. Pressure ring
10. Side gear
11. Differential pinion gear
12. Differential pinion shaft
13. Side gear
14. Pressure ring
15. Friction disc
16. Friction plate
17. Friction disc
18. Friction plate
19. Spring plate
20. Thrust washer
(Adjustment of clutch plate friction force)
21. Differential case (B)

DISASSEMBLY EIMB8200

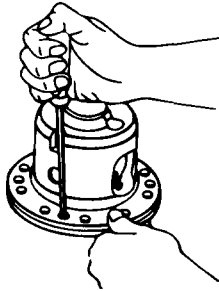
SERVICE POINTS OF DISASSEMBLY

REMOVAL OF SCREW

1. Loosen screws of the differential cases (A) and (B) uniformly a little at a time.
2. Separate differential cases (A) from differential case (B).

NOTE

Before disassembling the differential cases, confirm that the matchmark (numbers) on case A and case B are the same.



EIJA0301

3. Remove the components from the differential case (B).

NOTE

Keep the right and left thrust washers, spring plates, spring discs, friction plates, and friction discs separate in order to be able to distinguish them for reassembly.

INSPECTION EIMB8300

1. Check the side gears, pinion gears and pinion shaft for wear or damage.
2. Check the side gears spline for wear or damage.
3. Inspection of contact and sliding surfaces of parts.

Inspect the friction plate, friction disc, spring plate, spring disc and pressure ring.

- A. The friction surfaces of the friction plate, friction disc, spring plate, and spring disc. If there are any signs of seizure, severe friction, or color change from the heat, it will adversely affect the locking performance ; replace the part with a new one.

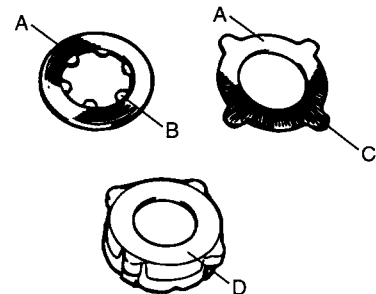
NOTE

The strong contact on the inner circumference of the friction surfaces is because of the spring plate and the spring disc : this wear is not abnormal.

- B. The six projections on the inner circumference of the friction disc.
If there are nicks and dents, it will cause abnormalities in the clutch pressure.
Repair the parts using an oil stone ; if the parts cannot be repaired, replace them.
- C. The four projections on the outer circumference of the friction disc.
If there are nicks and dents, it will cause abnormalities in the clutch pressure.
Repair the parts using an oil stone ; If the parts cannot be repaired, replace them.
- D. The friction surface of the friction disc of the pressure ring.
If there are nicks or scratches, repair the part by first grinding with an oil stone and them polishing with rubbing compound on a surface plate.

NOTE

The strong contact on the inner circumference of the friction surface is because of the spring plate and the spring disc ; this wear is not abnormal.

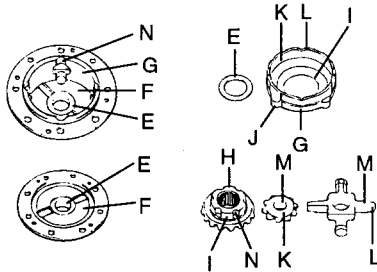


EHP1001A

Inspect the contact and sliding surfaces listed below, and repair any nicks and burrs using an oil stone.

- E. The sliding surfaces of the thrust washer and the case.
- F. The spring contacting surface of the differential case.
- G. The contact surfaces of the outer circumference of the pressure ring and the inner circumference of the differential case.
- H. The sliding surface of the thrust washer.
- I. The sliding surfaces of the hole in the pressure ring and the outer circumference of the side gear.

- J. The projection on the outer circumference of the pressure ring.
- K. The spherical surface of the differential pinion gear and the inner diameter of the pressure ring.
- L. The V-shaped groove in the pressure ring, and the V-shaped part in the pinion shaft.
- M. The outer diameter of the pinion shaft and the hole of the differential pinion gear.
- N. The outer circumference groove of the side gear.
- O. The inner circumference groove of the differential case.

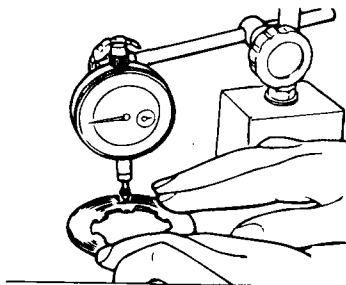


EHPDS63A

4. INSPECTION FOR WARPING OF FRICTION PLATED AND FRICTION DISC

Using a dial indicator, measure the amount of warping (the flatness) of the friction plate and the friction disc on a surface plate by turning the friction plate or disc.

Limit : 0.08mm (0.0031in.)



KHPDS64A

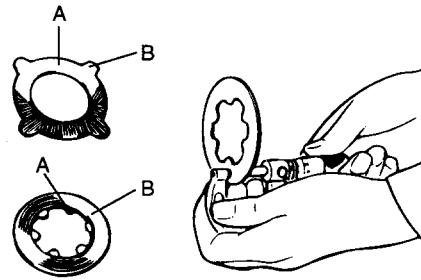
5. INSPECTION FOR WEAR OF FRICTION PLATE AND FRICTION DISC

- 1) In order to measure the wear, measure the thickness of the friction surfaces and projections of the friction disc and plate, and then find the difference.
(The same procedure is used for the spring discs and the spring plates.)

Limit : 0.1mm (0.0041in.)

NOTE

Make the measurement at several different points.



KHPDS65A

- 2) If the parts are worn beyond the limit value, replace them with new parts.

SERVICE POINT OF REASSEMBLY

EIMB8400

ADJUSTMENT OF CLUTCH PLATE FRICTION FORCE

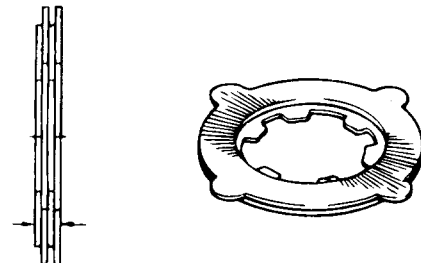
Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the axial clearance of the side gear when installing the internal components into the differential case.

- 1. Arrange the two (each) friction discs and friction plates for each side, one on top of another, as shown in the figure, combining them so that the difference in thickness between the left and the right is the standard value.

Standard value : 0.05mm (0.002in.) or less

NOTE

For new ones, there is one type of friction plate : 1.75mm (0.0689in.) ; there are two types of friction disc : 1.75mm (0.0689in.) and 1.85mm (0.0728in.).

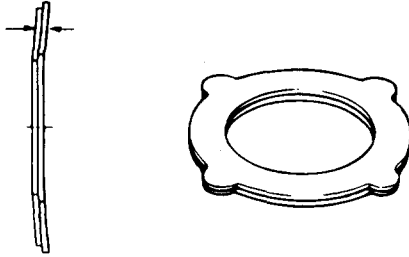


KHPDS66A

2. Arrange one spring disc and one spring plate for each side, one on top of the other, so that the difference between the left and the right thickness is minimized.

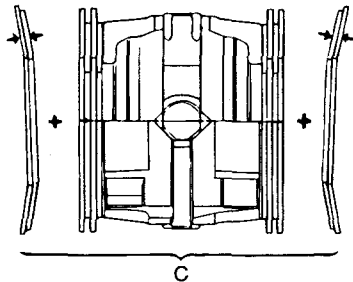
NOTE

For new ones, there is one type of spring disc and spring plate : 1.75mm (0.0689in.).



KHPDS67A

3. Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then, as shown in the figure, measure the overall width.
4. Calculate the total value (C) of the thickness of the spring discs and spring plates plus the value measured in (3) above.



EHPDS68A

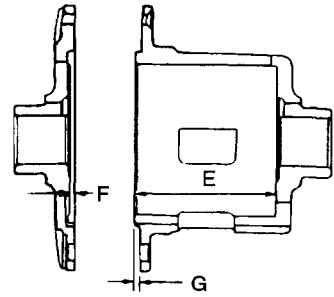
5. Obtain the dimension (D) between the spring plate contact surfaces when differential cases (A) and (B) are combined.

No 6. Diff : $D + F - G$

No 7. Diff : $E - F + H - G$

6. Change the thickness of the friction disc so that the clearance (D - C) between the differential case and the spring plate becomes the standard value.

Standard value : 0.06-0.20mm (0.0024-0.0079in.)



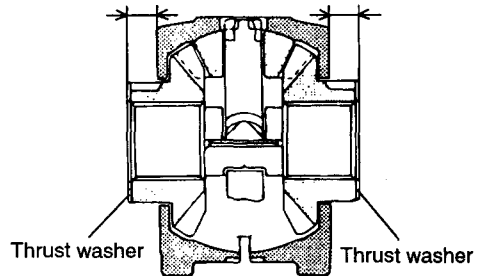
EHPDS69A

7. Remove the spring plates, spring discs, friction plates and friction disc.
8. Install the thrust washer as shown in the figure, and then select a thrust washer so that the difference between the left and right dimensions from the pressure ring rear face to the thrust washer end face is the standard value.

Standard value : 0.05mm (0.0020in.) or less

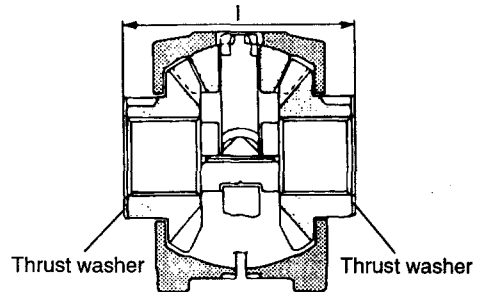
NOTE

Measure the distance while squeezing the V-shaped groove manually.



EIMB840A

9. Measure the dimension (I) from the thrust washer end surface to end surface.



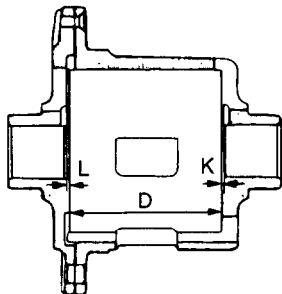
EHPDS70A

10. Obtain the dimension (J) between the thrust washer contact surfaces when differential cases (A) and (B) are combined.

$$J = K + L + D$$

 **NOTE**

Dimension (D) is the distance between the spring plate contact surfaces when differential cases (A) and (B) are combined.



EHPDS71A

11. Change the thickness of the thrust washer so that the clearance (J-I) between the thrust washer and the differential case is the standard value.

Standard value : 0.05-0.20mm (0.0020-0.0079in.)

 **NOTE**

- Select the thrust washer so that the difference between the left and right dimensions from the pressure ring rear face and the thrust washer end surface are the standard value even when the thrust washer is changed.
- There are three sizes of new thrust washers : 1.50mm (0.0591in.), 1.60mm (0.0630in.), and 1.70mm(0.0670in.).

12. Place the each part in the differential case (B) as directions shown in the figure.

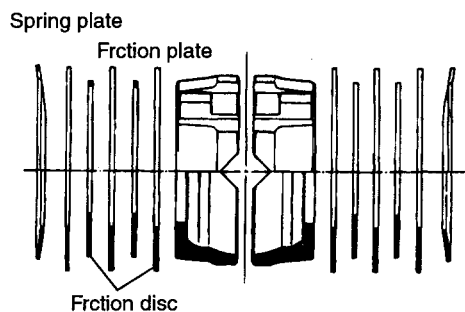
 **NOTE**

- Before assembly, apply the specified gear oil to each component especially careful to coat contact surfaces and sliding surfaces.

Specified gear oil :

MITSUBISHI Genuine gear oil Part No.
8149630EX or equivalent

- Be careful not to insert the friction plates and friction discs in the incorrect order and to install the spring plates and spring disc in incorrect direction.



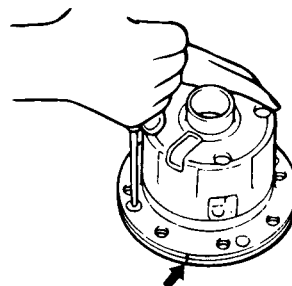
EHPP102A

INSTALLATION OF SCREW

1. Align the matchmark (the same numeral on each case) of differential case (A) and differential case (B).
2. Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

 **NOTE**

If even though the screw is tightened, the end surfaces of case (A) and case (B) do not come into close contact, probably the thrust washer and spring plate are not fit correctly into the groove, so make the assembly again.



KHPDS73A

3. After assembly, in order to check the frictional force of the clutch plate, use the special tools to measure the turning torque.

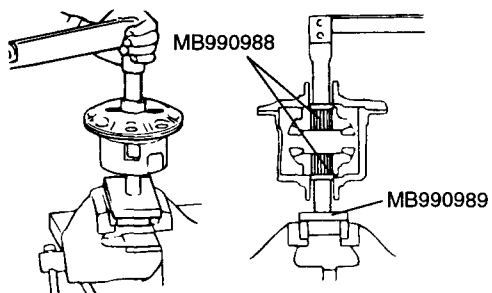
Standard value :

When a new clutch plate is used
40-75Nm (400-750kg·cm)

When an old clutch plate is used
25-75Nm (250-750kg·cm)

 **NOTE**

*Measure the turning torque after rotating slightly.
When measuring the torque, do so at the beginning
of movement.*



EHPDS74A

Clutch System

GENERAL	CH - 2
CLUTCH SYSTEM	CH - 6

GENERAL

SPECIFICATIONS EOMB0010

Clutch operating method	Hydraulic type
Clutch disc	
Type	Single, dry with diaphragm.
Facing diameter (Outside x Inside) mm (in.)	225 x 155 (8.9 x 6.1) : 2.5 TCI 240 x 155 (9.4 x 6.1) : 2.9 TCI 240 x 155 (9.4 x 6.1) : 3.5 V6
Clutch cover assembly	
Type	Diaphragm spring strap
Setting load N (lb)	5500-6100 (1232-1366) : 2.5 TCI More than 7250 (1624) : 2.9 TCI, 3.5 V6
Clutch release cylinder	
I.D.mm (in.)	19.05 (0.74)
Clutch master cylinder	
I.D.mm (in.)	15.87(0.62)

SERVICE STANDARD EOMB0020

ITEM	Standard value
Clutch disc thickness [When free]	8.3 ± 0.3 mm (0.326 ± 0.0118 in.) : 2.5 TCI 8.0 ± 0.3 mm (0.314 ± 0.0118 in.) : 2.9 TCI, 3.5 V6
Clutch pedal height	202 mm (7.95 in.)
Clutch pedal free play	6-13 mm (0.24-0.51 in.)
Clutch pedal stroke	155 mm (6.10 in.)
Limit	
Clutch disc rivet inset	0.3 mm (0.012 in.)
Diaphragm spring end height difference	0.5 mm (0.02 in.)
Clutch release cylinder clearance to piston	0.15 mm (0.006 in.)
Clutch master cylinder clearance to piston	0.15 mm (0.006 in.)

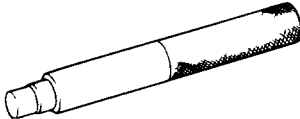
TIGHTENING TORQUE EOMB0030

Item	Nm	kg·cm	lb·ft
Clutch pedal bracket	18 - 25	180 - 250	13 - 18
Clutch master cylinder mounting bolt	7 - 9	70 - 90	5 - 6
Clutch tube flare nut	13 - 17	130 - 170	9 - 12
Clutch release cylinder mounting bolt	30 - 42	300 - 420	21 - 30
Clutch release cylinder union bolt	20 - 25	200 - 250	14 - 18
Clutch cover assembly	15 - 22	150 - 220	11 - 16
Clutch master cylinder reservoir	8 - 10	80 - 100	6 - 7
Ignition lock switch	5 - 7	50 - 70	4 - 5
Clutch pedal to pedal bracket	25 - 35	250 - 350	18 - 25

LUBRICANTS EOA90040

Items	Specified lubricants	Quantity
Contact surface of release bearing and fulcrum of clutch release fork	CASMOLY L 9508	As required
Inner surface of clutch release bearing	CASMOLY L 9508	As required
Inner surface of clutch release cylinder and outer circumference of piston and cup	Brake fluid DOT3	As required
Inner surface of clutch disc spline	CASMOLY L 9508	As required
Inner surface of clutch master cylinder and outer circumference of piston assembly	Brake fluid DOT 3	As required
Clutch master cylinder push rod, clevis pin and washer	Wheel bearing grease SAE J310, NLGI No.2	As required
Clutch pedal shaft and bushings	Chassis grease SAE J310, NLGI No.1	As required
Contact portion of release fork to release cylinder push rod	CASMOLY L9508	As required
Input shaft spline	CASMOLY L9508	As required

SPECIAL TOOLS EOMB0050

Tool (Number and name)	Illustration	Use
09411-43000 Clutch disc guide	 <p style="text-align: right;">D1143000</p>	Installation of the clutch disc

TROUBLESHOOTING

EOA90060

Trouble symptom		Probable cause	Remedy
Clutch slipping <ul style="list-style-type: none"> • Car will not respond to engine speed during acceleration • Insufficient car speed • Lack of power driving uphill 		Insufficient pedal free play	Adjust
		Clogged hydraulic system	Correct or replace parts
		Excessive wear of clutch disc facing	Replace
		Hardened clutch disc facing, or oil on surface	Replace
		Damaged pressure plate or flywheel	Replace
		Weak or broken pressure spring	Replace
Difficult gear shifting (gear noise during shifting)		Excessive pedal free play	Adjust
		Hydraulic system fluid leaks, air trapped or lines clogged	Repair or replace parts
		Unusual wear or corrosion of the clutch disc spring	Replace
		Excessive vibration (distortion) of the clutch disc	Replace
Clutch noisy	When the clutch is not used	Insufficient play of the clutch pedal	Adjust
		Excessive wear of the clutch disc facing	Replace
	A noise is heard after the clutch is disengaged	Unusual wear and/or damage of the release bearing	Replace
	A noise is heard when the clutch is disengaged	Insufficient grease on the sliding surface of the bearing sleeve	Repair
		Improperly installed the clutch assembly or bearing	Repair
	A noise is heard when the car suddenly jump starts with the clutch partially engaged	Damaged pilot bushing	Replace
Hard pedal effort		Insufficient lubrication of the clutch pedal	Repair
		Insufficient lubrication of the spline part of clutch disc	Repair
		Insufficient lubrication of the clutch release lever shaft	Repair
		Insufficient lubrication of the front bearing retainer	Repair
Hard to shift or will not shift		Excessive clutch pedal free play	Adjust the pedal free play
		Faulty clutch release cylinder	Repair the release cylinder
		Clutch disc out of place, runout is excessive or lining broken	Inspect the clutch disc
		Dirty spline on input shaft or the clutch disc	Repair as necessary
		Faulty clutch pressure plate	Replace the clutch cover
Clutch slips		Insufficient clutch pedal free play	Adjust the pedal free play
		Clogged hydraulic system	Repair or replace parts
		Clutch disc lining oily or worn out	Inspect the clutch disc
		Faulty pressure plate	Replace the clutch cover
		Binding release fork	Inspect the release fork

Trouble symptom	Probable cause	Remedy
Clutch grabs/chatters	Clutch disc lining oily or worn out	Inspect the clutch disc
	Faulty pressure plate	Replace the clutch cover
	Bent clutch diaphragm spring	Replace the clutch cover
	Worn or broken torsion spring	Replace the clutch disc
	Loose engine mounts	Repair as necessary
Noisy clutch	Damaged the clutch pedal bushing	Replace the clutch pedal bushing
	Loose part inside housing	Repair as necessary
	Worn or dirty release bearing	Replace the release bearing
	Sticking release fork or linkage	Repair as necessary

CLUTCH SYSTEM

SERVICE ADJUSTMENT PROCEDURE

EOMB0070

CLUTCH PEDAL INSPECTION AND ADJUSTMENT

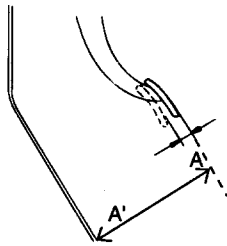
1. Measure the clutch pedal height (From the face of the pedal pad to the floorboard) and the clutch pedal free-play (measured at the face of the pedal pad).

 Standard value :

(A) 6-13 mm (0.24-0.51 in.)

(A') 202 mm

Clutch pedal free-play (A) and Pedal height (A')



EOMB007A

2. If the clutch pedal free-play is not within the standard value range, adjust as follows :
 - a. Turn and adjust the bolt, then secure it by tightening the lock nut.

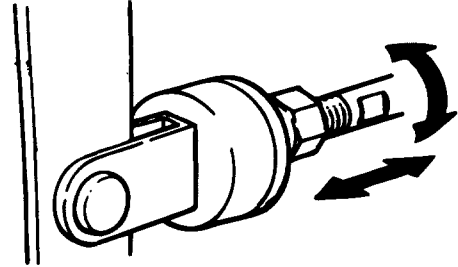
NOTE

After the adjustment, tighten the bolt until it reaches the pedal stopper, and then tighten the lock nut.

- b. Turn the push rod to coincide with the standard value and then secure the push rod with the lock nut.

CAUTION

When adjusting the clutch pedal height or the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.



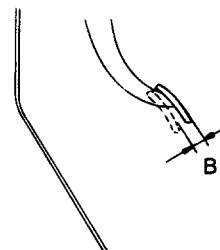
KOMB007B

3. After completing the adjustments, check that the clutch pedal free play (measured at the face of the pedal pad) falls within the standard value ranges.

 Standard value : 6-13 mm (0.2-0.5 in.)

4. If the clutch pedal free play and the distance between the clutch pedal and the floor board when the clutch is disengaged do not meet the standard values, the cause may be either air in the hydraulic system or a faulty master cylinder clutch. Bleed the system or disassemble and inspect the master cylinder or clutch.

Clutch pedal free play



EOA9007C

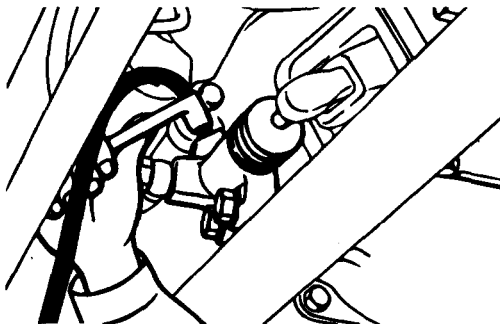
BLEEDING EOMB0080

Bleed the system whenever the clutch tube, the clutch hose, and/or the clutch master cylinder have been removed, or if the clutch pedal is spongy.

⚠ CAUTION

Use the specified fluid. Avoid mixing different brands of fluid.

Specified fluid : SAE J1703 (DOT3 or DOT4)

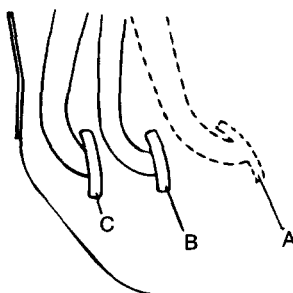


KOMB008A

1. Loosen the bleeder screw on the clutch release cylinder.
2. Pump the clutch pedal slowly until all air is expelled.
3. Hold the clutch pedal down until the bleeder is retightened.
4. Refill the clutch master cylinder with the specified fluid.

⚠ CAUTION

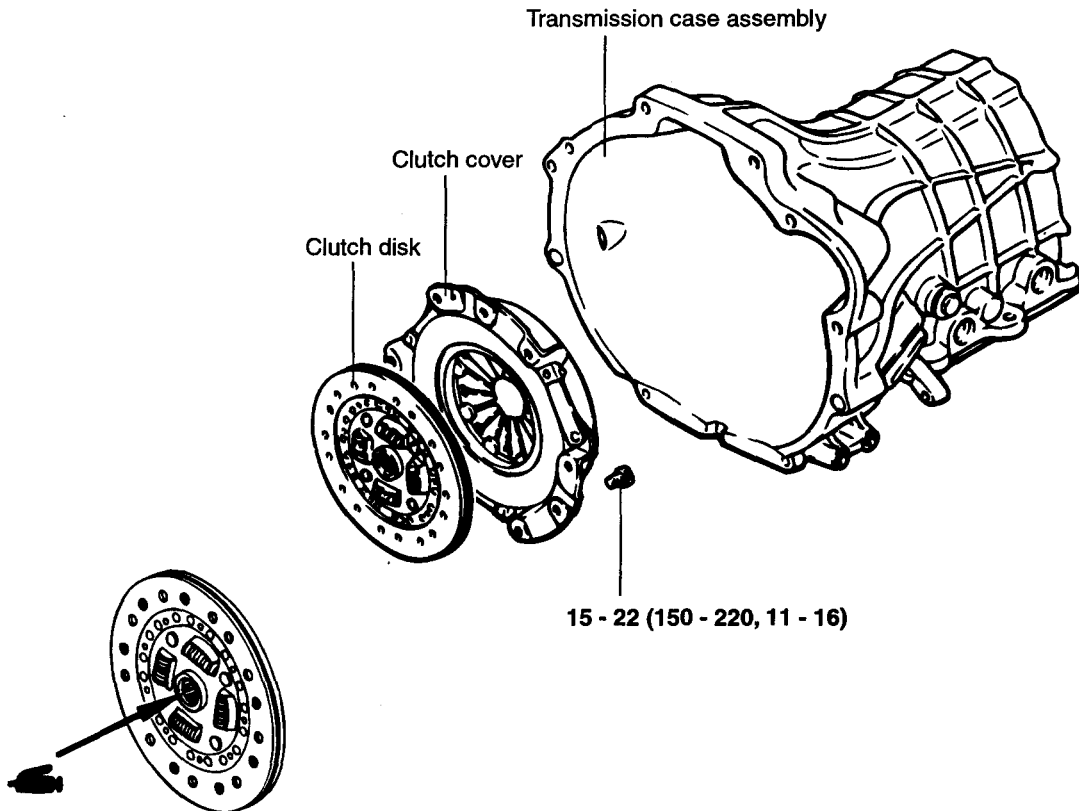
The rapidly-repeated operation of the clutch pedal in B-C range may disrupt the release cylinder's position. During the bleeding operation, press the clutch pedal to the floor after it returns to the "A" point.



EOA9008B

CLUTCH COVER AND DISC

COMPONENTS EOMB0270



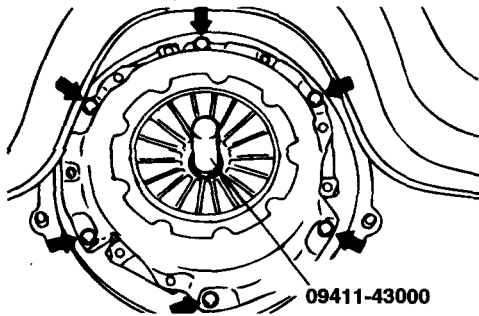
TORQUE : N·m (kg·cm, lb·ft)

REMOVAL EOMB0280

1. Insert the special tool (09411-43000) in the clutch disc to prevent the disc from shifting.
2. Loosen the bolts which attach the clutch cover to the flywheel in a star pattern. Loosen the bolts in succession, one or two turns at a time, to avoid bending the cover.

NOTE

Do not clean the clutch disc or the release bearing with cleaning solvent.

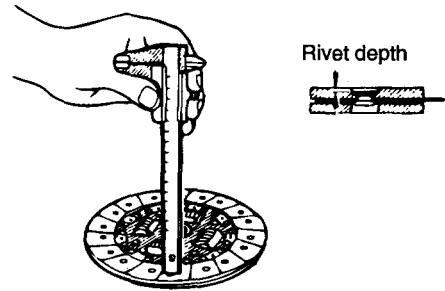


KOMB028A

INSPECTION EOA90290**CLUTCH COVER ASSEMBLY**

1. Clean the dust from the clutch housing using a vacuum or cloth, Do not use compressed air. Check for oil leakage from the engine rear bearing oil seal and transaxle front oil seal. If leaky, repair them.
2. The friction surface of the pressure plate must be uniform over the entire disc surface. If any part shows excessive wear, the pressure plate is installed badly.
3. Check the friction surface of the flywheel for color change, partial damage, small cracks, and wear.
4. Don't touch the clutch disc with contaminated hands or gloves. Replace the clutch disc if the facing is stained with oil or grease. Measure the rivet depth. Replace the clutch disc if the rivet depth is less than 3 mm.

Limit : 0.3 mm (0.012 in.)



EOA9029B

5. Check the hub spline and torsion spring of the clutch disc for excessive wear.
6. Clean the friction surface of the pressure plate with cleaning solvent.
7. Measure the flatness of the pressure plate with a square. If it exceeds 0.5 mm, replace it. Check the pressure plate surface of wear, cracks, and color change.
8. Check that the three-dowel on the flywheel is installed completely.

CLUTCH RELEASE BEARING**CAUTION**

The release bearing is packed with grease. Do not use cleaning solvent or oil on it.

1. Check the bearing for seizure, damage or abnormal noise. Also check the diaphragm spring contact points for wear.
2. Replace the bearing if the release fork contacting points are worn out.

CLUTCH RELEASE FORK

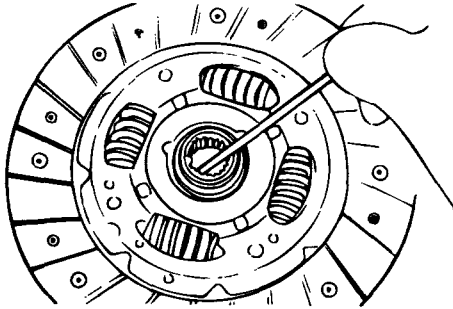
If there is abnormal wear at the point of contact with the bearing, replace the release fork.

INSTALLATION EOMB0300

1. Apply multipurpose grease to the spline of the disc.
Grease : CASMOLY L 9508

⚠ CAUTION

When installing the clutch, apply grease to each part, but be careful not to apply excessive grease. It can cause clutch slippage and judder.



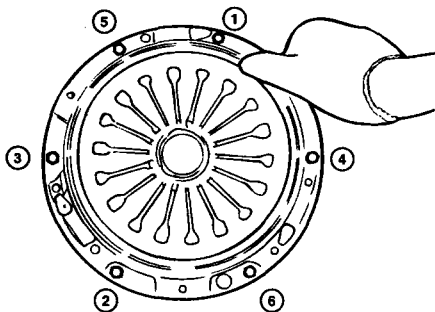
EOA9030F

2. Install the clutch disc assembly to the flywheel using the special tool (09411-43000).
3. Install the clutch cover assembly to the flywheel and temporarily tighten the bolts one or two steps at a time in a star pattern.

Tightening torque

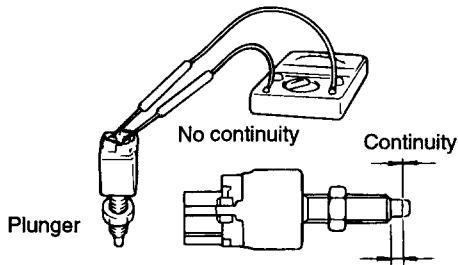
Clutch cover bolt :

15-22 Nm (150-220 kg-cm, 11-16 lb-ft)



EOA9030B

The stop lamp switch is in good condition if there is no continuity when the plunger is pushed.



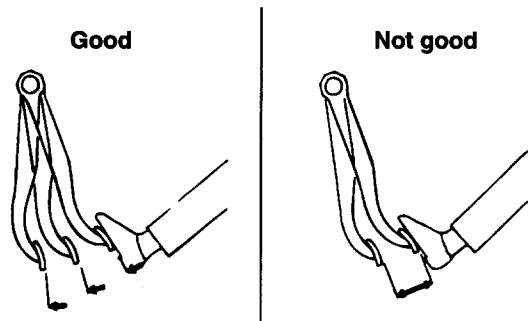
H7BR206A

BRAKE BOOSTER OPERATING TEST

For simple checking of the brake booster operation, carry out the following tests :

1. Run the engine for one or two minutes, and then stop it.

If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly, if the pedal height remains unchanged, the booster is defective.

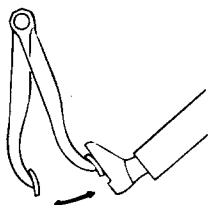


EJA9002A

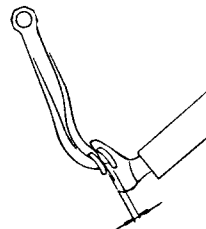
2. With the engine stopped, step on the brake pedal several times.

Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

When engine is stopped

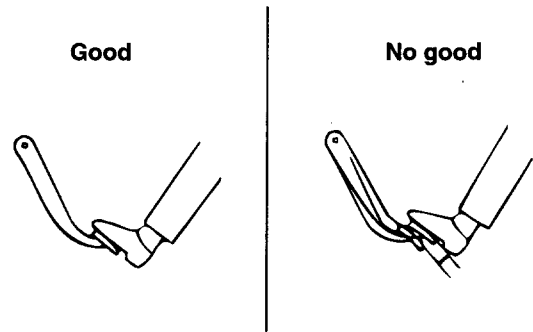


When engine is started



EJA9002B

3. With the engine running, step on the brake pedal and then stop the engine.
Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.
If the above three tests are okay, the booster performance can be determined as good.
Even if one of the above three tests is not okay, check the check valve, vacuum hose and booster for defect.



H7BR209A

BLEEDING THE BRAKE SYSTEM

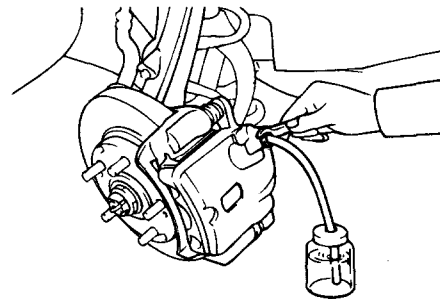
EJMB0060

1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

! CAUTION

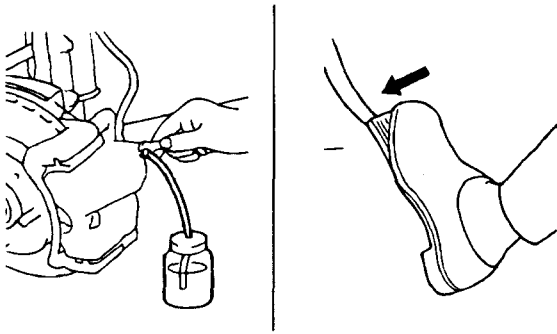
- Do not allow brake fluid to remain on a painted surface. Wash it off immediately.
- Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.

2. Connect a vinyl tube to the wheel cylinder bleeder screw and insert the other end of the tube in a container of brake fluid which is half full.



KJMB070A

3. Start the engine.
4. Slowly depress the brake pedal several times.
5. While depressing the brake pedal fully, loosen the bleeder screw until fluid runs out. Then close the bleeder screw and release the brake pedal.



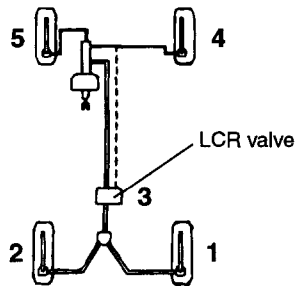
EAHA014B

6. Repeat steps 4 and 5 until there are no more bubbles in the fluid.
7. Tighten the bleeder screw.

Tightening torque

Bleeder screw : 7 - 9 Nm (70-90kg·cm, 5-6.6 lb·ft)

8. Repeat the above procedure for each wheel in the sequence shown in the illustration.



EHP1341A

BRAKE SYSTEM

L.C.R(LOAD CONSCIOUS REDUCING) VALVE

L.C.R (LOAD CONSCIOUS REDUCING) VALVE

EJMB0070

L.C.R valve is designed to provide maximum brake ability while controlling the brake according to the vehicle weight.

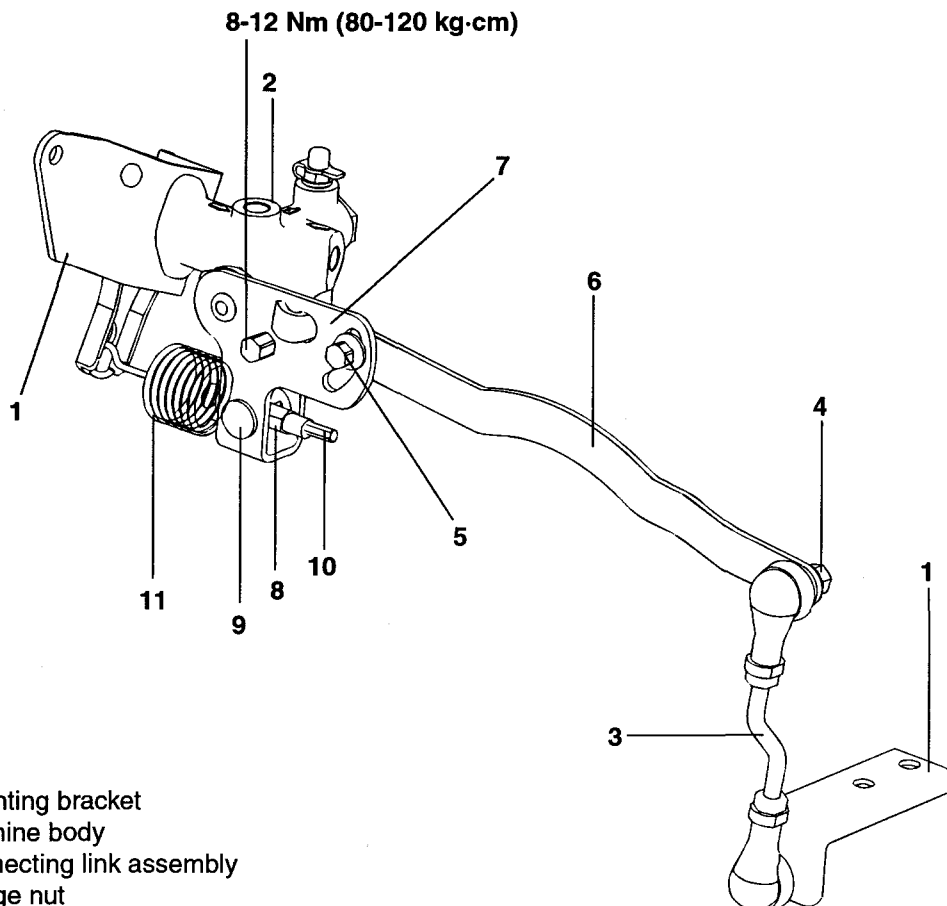
The brake fluid pressure of rear wheel may reduce as the vehicle weight is increased by heavy load or the number of passenger.

The changes of rear wheel suspension by the load of vehicle would affect to the valve body of L.C.R valve causing reducing or increasing the brake fluid into the rear brake system.

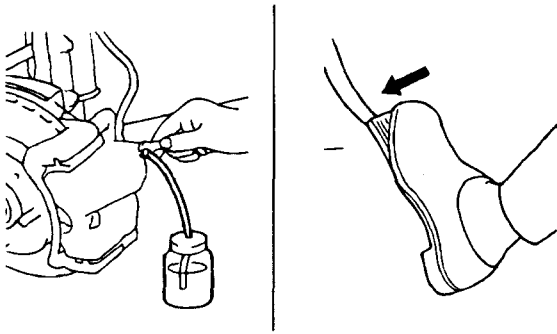
It is pre-setting type which does not need the difficult setting procedures.

EJMB0080

COMPONENTS



1. Mounting bracket
2. Machine body
3. Connecting link assembly
4. Flange nut
5. Flange bolt
6. Operating lever
7. Bell crank assembly
8. Adjuster nut
9. Guide spring
10. Rod
11. Sensing spring assembly



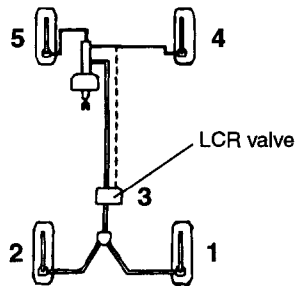
EAHA014B

6. Repeat steps 4 and 5 until there are no more bubbles in the fluid.
7. Tighten the bleeder screw.

Tightening torque

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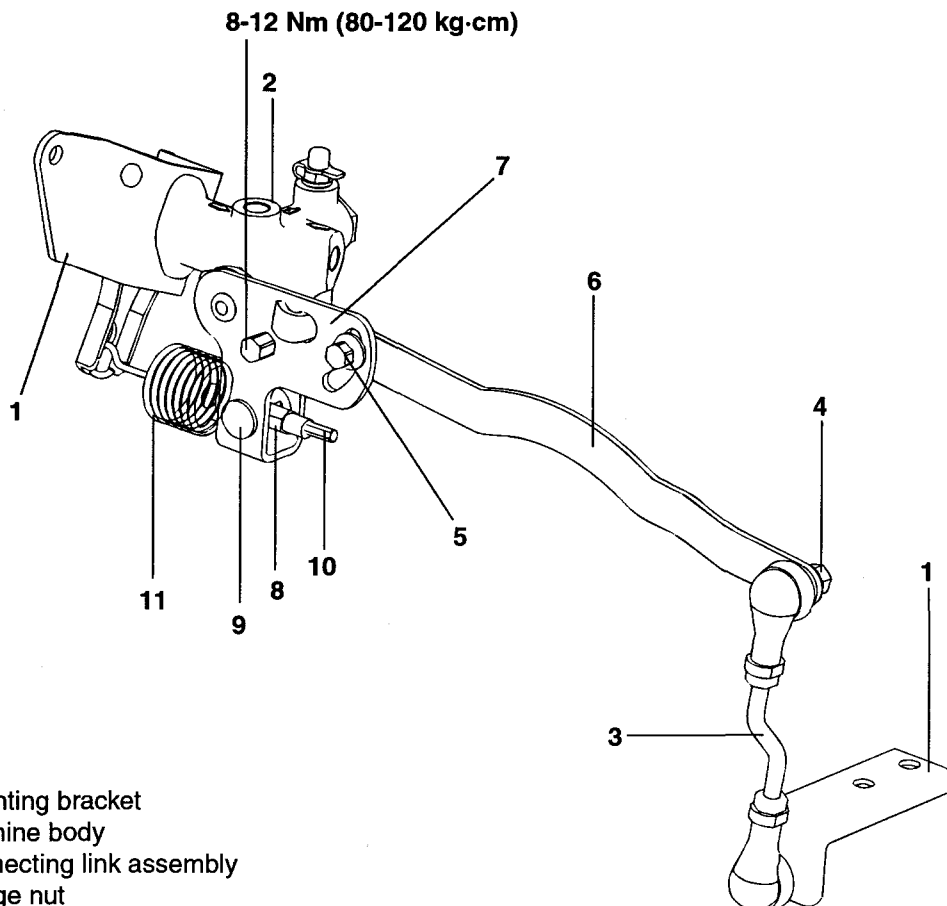
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It is pre-setting type which does not need the difficult setting procedures.

EJMB0080

COMPONENTS



1. Mounting bracket
2. Machine body
3. Connecting link assembly
4. Flange nut
5. Flange bolt
6. Operating lever
7. Bell crank assembly
8. Adjuster nut
9. Guide spring
10. Rod
11. Sensing spring assembly

THE L.C.R VALVE CONSISTS OF EJMB0090

1. Load sensing part : sensing spring, Lever
2. Linkage part : Connecting link, Operating lever, Bell crank
3. Pressure control part : Machine body, Piston, Valve seal
4. By-pass part : By-pass piston, O-ring

INSTALLATION EJMB0100

When the L.C.R valve is set, the adjustment procedure is unnecessary.

1. When the fuel tank is full, position the vehicle on a level surface. Don't load things or people in the vehicle.
2. Set the valve body to the vehicle with the hole of the mounting bracket.

Tightening torque

11 - 14 Nm (110 - 140 kg·cm, 8.14 - 10.36 lb·ft)

3. Tighten the bolt of the connecting rod end in the valve mounting bracket.

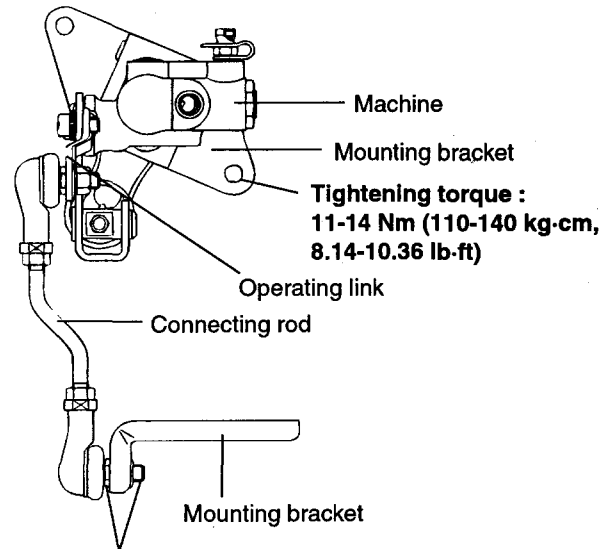
Tightening torque

11 - 14 Nm (110 - 140 kg·cm, 8.14 - 10.36 lb·ft)

4. When the machine body and the bolt of the connecting rod are fixed, tighten the flange bolt in the bell crank so that the connecting rod and operating lever can't move.

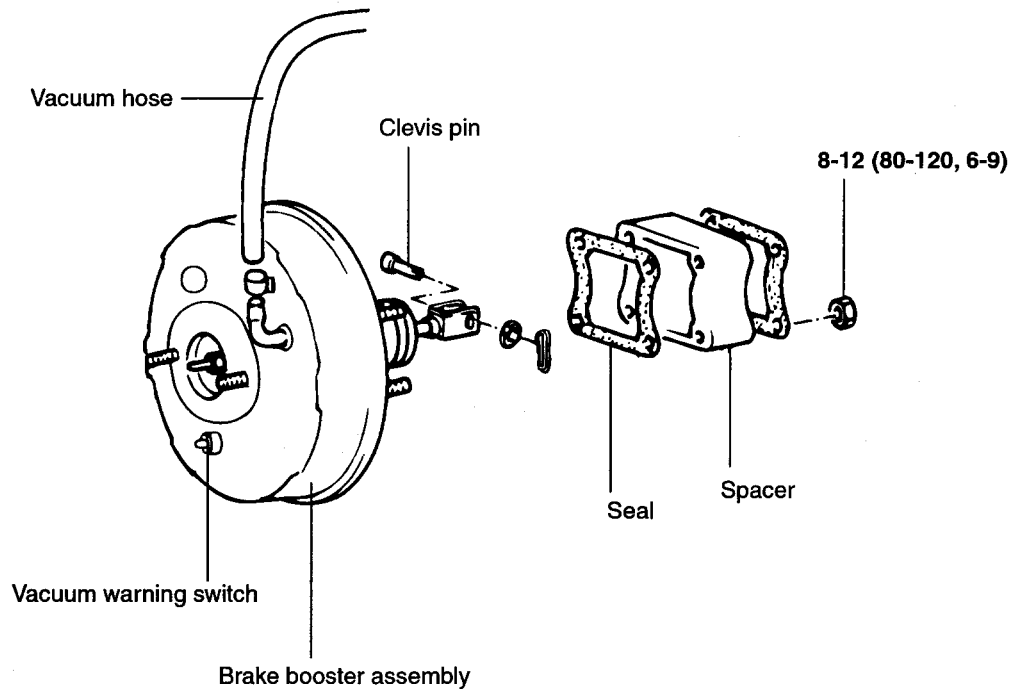
Tightening torque

19 - 23 Nm (190 - 230 kg·cm, 14.06 - 17.02 lb·ft)



Tightening torque :
11-14 Nm (110-140 kg·cm, 8.14-10.36 lb·ft)

BRAKE BOOSTER

COMPONENTS EJMB0110

TORQUE : Nm (kg-cm, lb-ft)

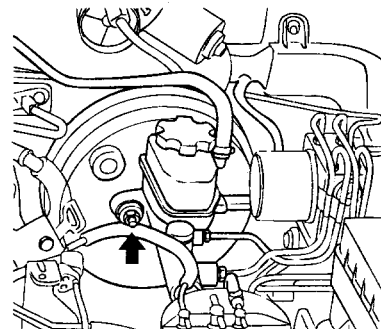
EJMB011A

REMOVAL EJMB0120

1. Remove the master cylinder.

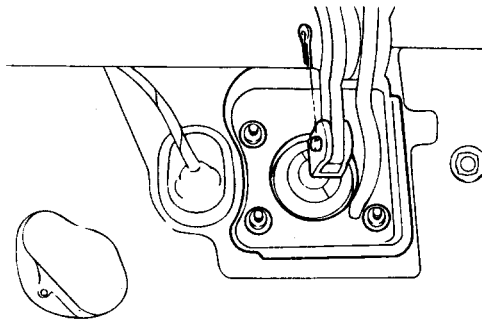
⚠ CAUTION

Do not allow brake fluid to remain on a painted surface. Wash it off immediately.



KHPBR07A

2. Separate the vacuum tube from the booster.
3. Remove the operating rod from the brake pedal.
4. Remove the booster installation nut.
5. Remove the booster assembly.



EJDA025B

CAUTION

While installing the split pin to the clevis pin connecting the booster push rod and brake pedal, the split pin must be bent to approx. 180°.

INSTALLATION

EJMB0130

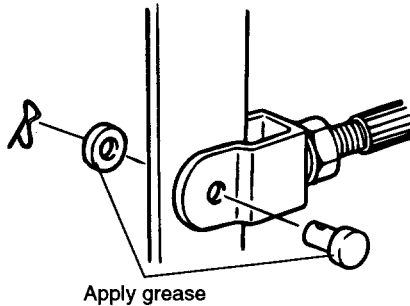
1. When installing the booster assembly, replace the packing of each end of booster installation holder.
2. Install the brake booster and tighten the mounting nut.

Tightening torque

Booster installation nut :

8 - 12 Nm (80 - 120 kg-cm, 6 - 9 in.)

3. Connect the booster push rod and brake pedal with a clevis pin and install a split pin to the clevis pin.

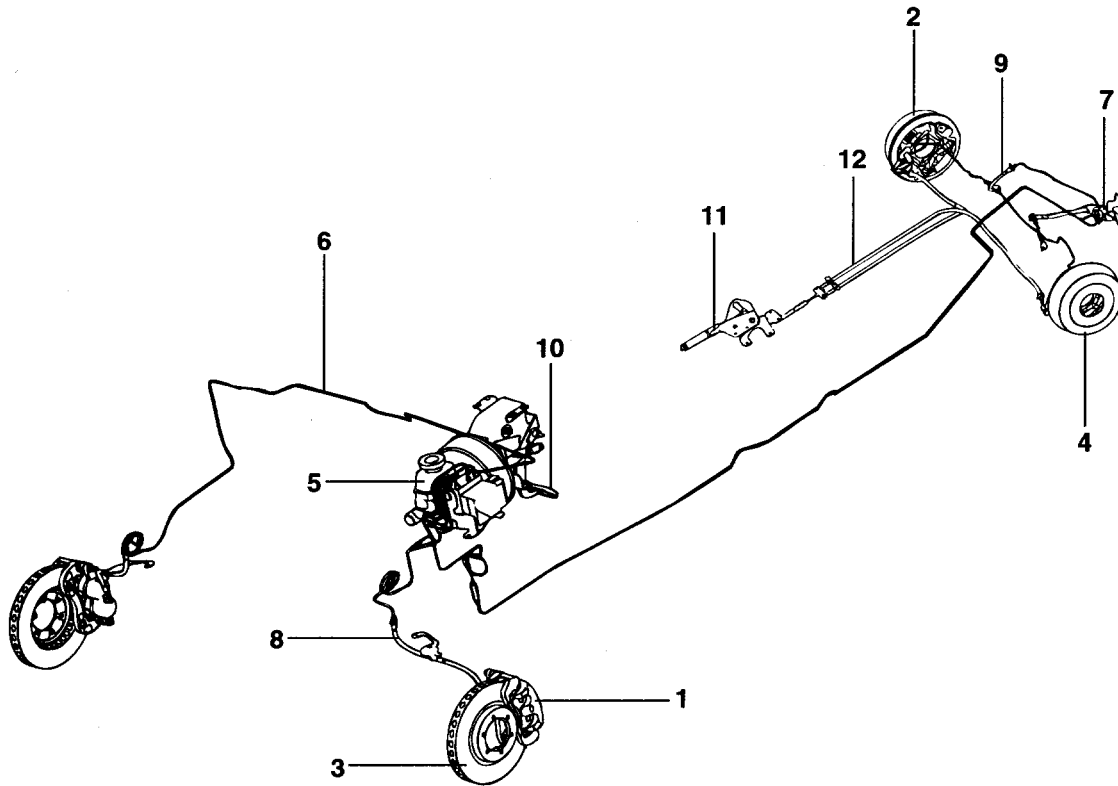


EJA9005B

4. Install the master cylinder.
5. Connect the vacuum hose to the brake booster.
6. After filling the brake reservoir with brake fluid, bleed the system.
7. Check for fluid leakage.
8. Check and adjust the brake pedal for proper operation.
9. After installing, apply grease to the contact parts of the clevis and brake pedal.

BRAKE LINE

COMPONENTS EJMB0140



1. Front brake assembly
2. Rear brake assembly
3. Front brake disc
4. Rear dum brake
5. Booster & master cylinder assembly
6. Brake tube

7. L.C.R valve
8. Front brake hose
9. Rear brake hose
10. Brake pedal assembly
11. Parking brake lever assembly
12. Parking brake cable assembly

REMOVAL EJMB0150

Holding the nut at the brake hose side, loosen the flare nut of the brake tube.

INSPECTION EJMB0160

- Check the brake tubes for cracks, crimps and corrosion.
- Check the brake hoses for cracks, damaged and oil leakage.
- Check the brake tube flare nuts for damage and oil leakage.

INSTALLATIONS EJMB0170

1. Install the brake hoses without twisting them.

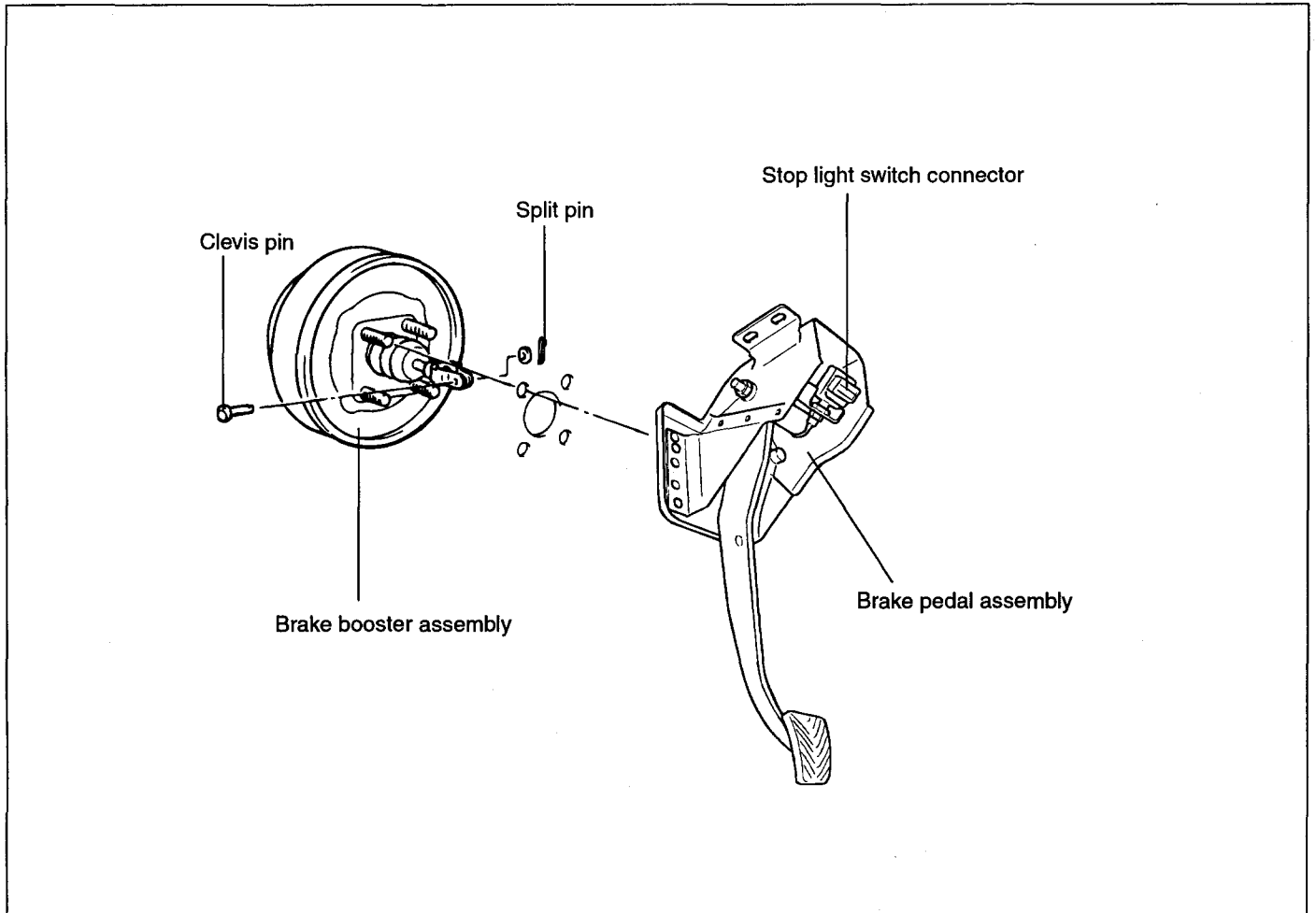
 **CAUTION**

When installing, be sure the brake hose does not contact edges, welding or moving parts.

2. Tighten to the specified torque as follows.

Items	Torque Nm (kg·cm, lb·f)
Brake flare nut and brake hose	13-17 (130-170, 9.5-12)
Brake hose and caliper	25-30 (250-300, 18-22)
Air bleed screw	7-9 (70-90, 5-7)
Brake tube and connector	20 (200, 15) or less

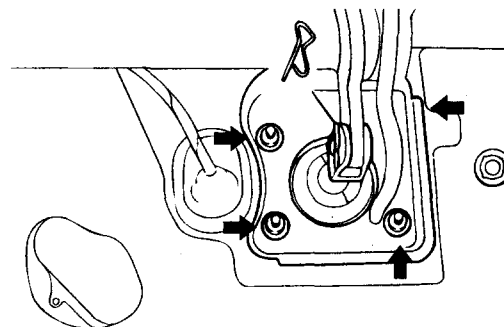
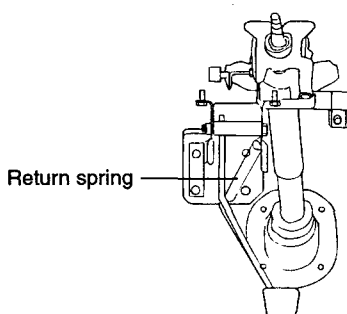
BRAKE PEDAL

COMPONENTS EJMB0180

EHPBR05A

REMOVAL EJMB0190

1. Remove the lower crash pad assembly.
2. Remove the stop lamp switch connector.
3. Remove the return spring.
4. Remove the split pin and clevis pin.
5. Remove the brake pedal assembly mounting nut.



EJKB010A

EHPBR97A

INSPECTION EJJB0095

1. Check the bushing for wear.
2. Check the brake pedal for bending or twisting.
3. Check the brake pedal return spring for damage.
4. Check all parts for crack and wear.

INSTALLATION EJMB0210

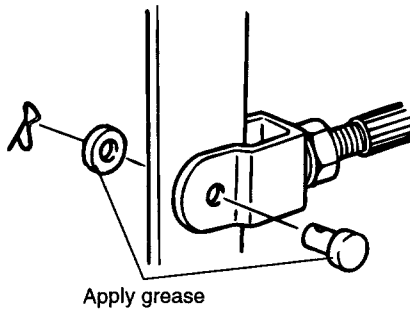
1. Installation is the reverse of removal.

 **CAUTION**

Coat the inner surface of the bushings with the specified grease.

Specified grease : Chassis grease LiG - 2

2. Before inserting the clevis pin, apply the specified grease to the clevis pin and washer.

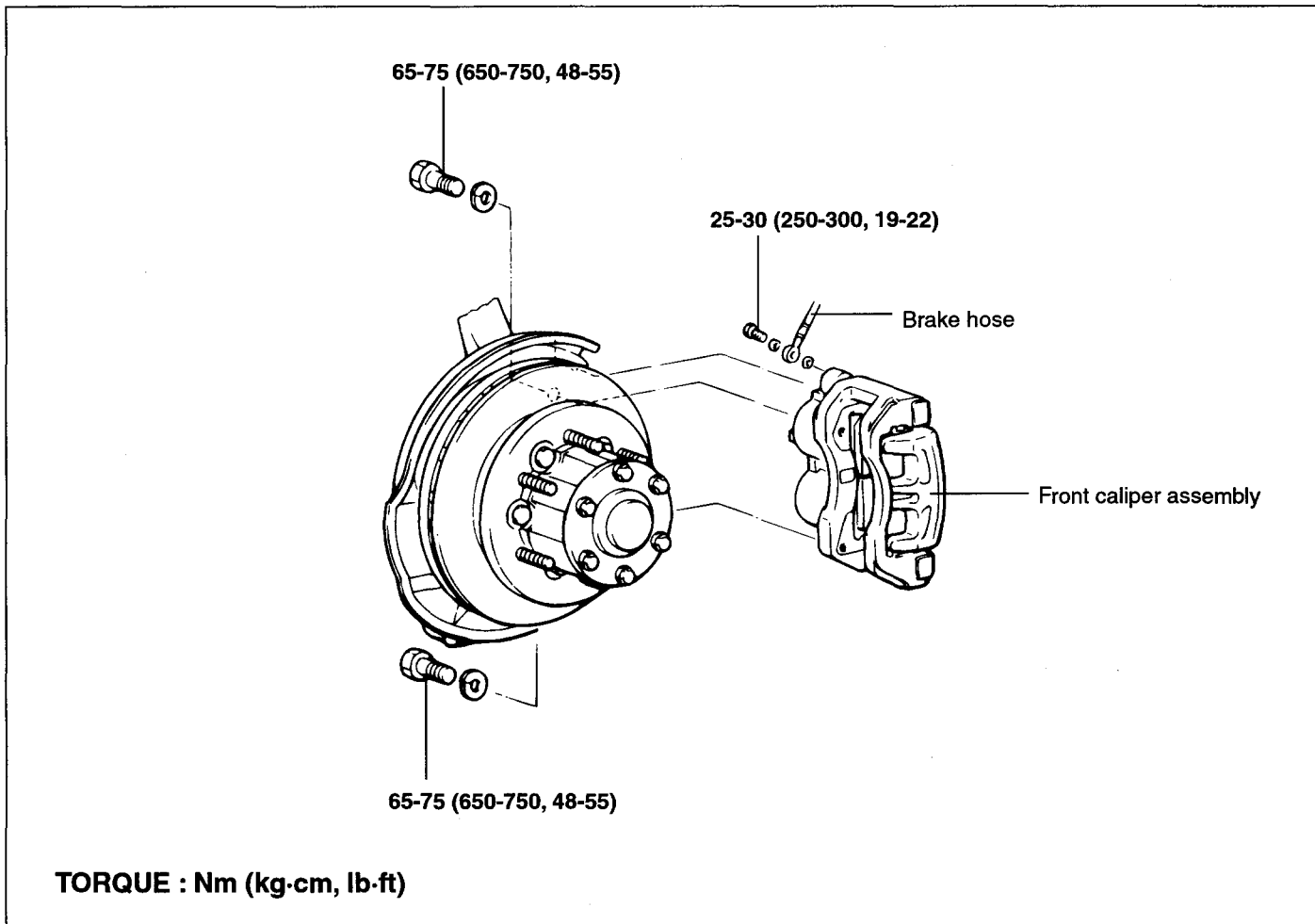


EJA9005B

FRONT DISC BRAKE

COMPONENTS

EJMB0220



EHPBR10A

INSPECTION AND REPLACEMENT OF FRONT DISC BRAKE PAD

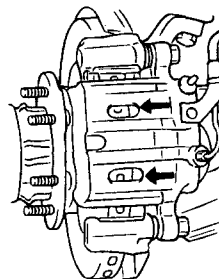
EJMB0230

1. Check the brake pad thickness through the caliper body inspection hole.

Pad lining thickness

Standard value : 10mm (0.394 in.)

Service limit : 2.0mm (0.079 in.)



H7BR215A

CAUTION

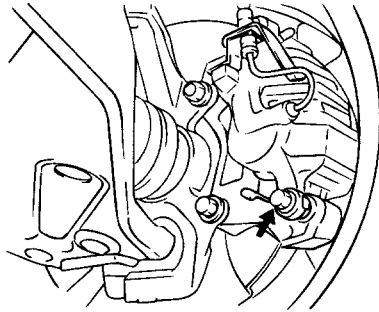
1. If the pad lining thickness is out of specification, left and right pads must be replaced as a complete set.

2. *When the thickness difference between the left pad and right pad is large, check the sliding condition of the piston, the lock pin and the guide pin.*

2. Remove the guide pin, lift the caliper assembly up and suspend it with a wire.

CAUTION

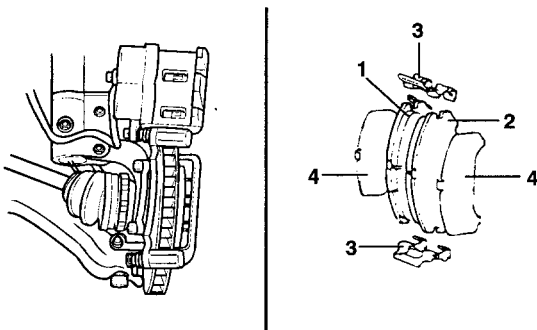
Be careful not to contaminate the lock pin and guide pin with grease.



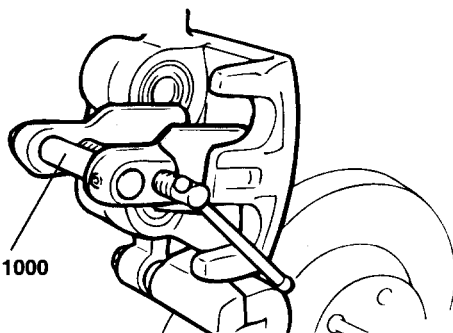
H7BR216A

3. Remove the following parts from the caliper support.

1. Pad and wear sensor assembly
2. Pad assembly
3. Clip
4. Outer shim



KJMB230A



09581-11000

KGX8029A

INSPECTION EJMB0240

FRONT BRAKE THICKNESS CHECK

1. Remove all rust and contamination from the disc surface, and then measure the disc thickness at 4 positions at least.

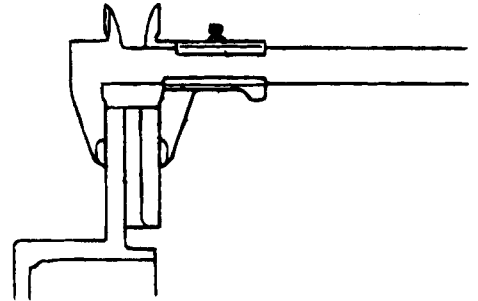
Front brake disc thickness

Standard value : 27mm (1.06 in.)

Limit : 25.4mm (1 in.)

2. Thickness variation should not exceed 0.005mm (circumference) and 0.05mm (radisu) at any directions.

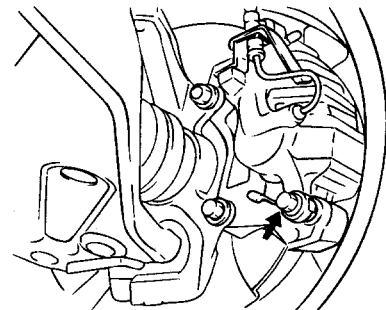
3. If wear exceeds the limit, replace the discs and pad assembly for left and right of the vehicle.



KGX8031A

FRONT BRAKE DISC RUNOUT CHECK

1. Remove the caliper support, then raise the caliper assembly upward and suspend with a wire.



H7BR216A

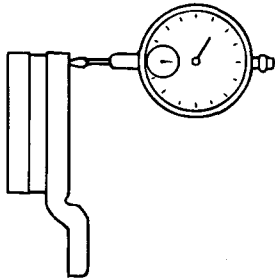
2. Place a dial gauge about 5mm (0.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

Brake disc runout

Limit : 0.03mm (0.0012 in.) or less

NOTE

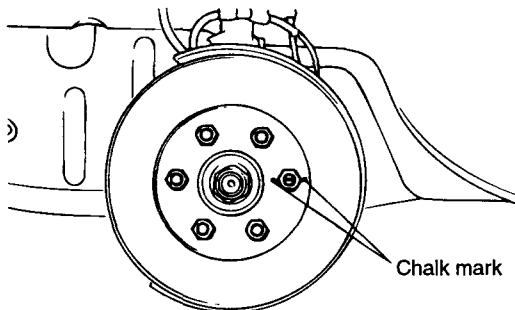
Fix the disc to the hub by tightening the nut.



H7BR221A

FRONT BRAKE DISC RUN OUT CORRECTION

1. If the runout of the brake disc is equivalent to or exceeds the limit specification, replace the disc and hub, and then measure the runout again.
 - 1) Before removing the brake disc, chalk both sides of the wheel stud on the side at which the runout is greatest.



EJMB240A

- 2) If it exceeds the limit, disassemble the hub knuckle and check each part.
 - 3) If the runout does not exceed the limit specification, install the brake disc after turning it 180° from the chalk mark, and then check the runout of the brake disc again.
2. If the runout cannot be corrected by changing the position of the brake disc, replace the brake disc.

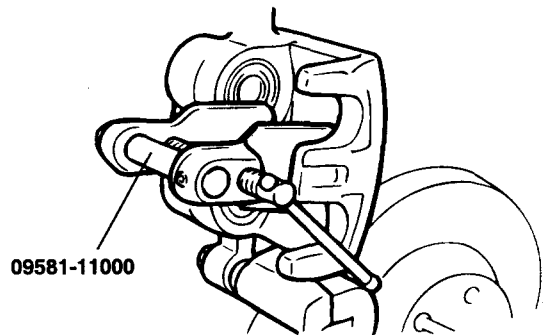
INSTALLATION

EJMB0250

1. Install the pad clips.
2. Install the pads on each pad clip.

CAUTION

1. **All four pads must be replaced as a complete set.**
 2. **When replacing the brake pads, check for deformation. When replacing the guide spring, use a new one or thoroughly clean the used one.**
3. Press-fit the piston with a hammer handle or the special tool (09581-11000).



KGX8029A

4. Lower and insert the brake cylinder carefully so as not to damage the boot.
5. Tighten the two guide rod bolts to the specified torque.

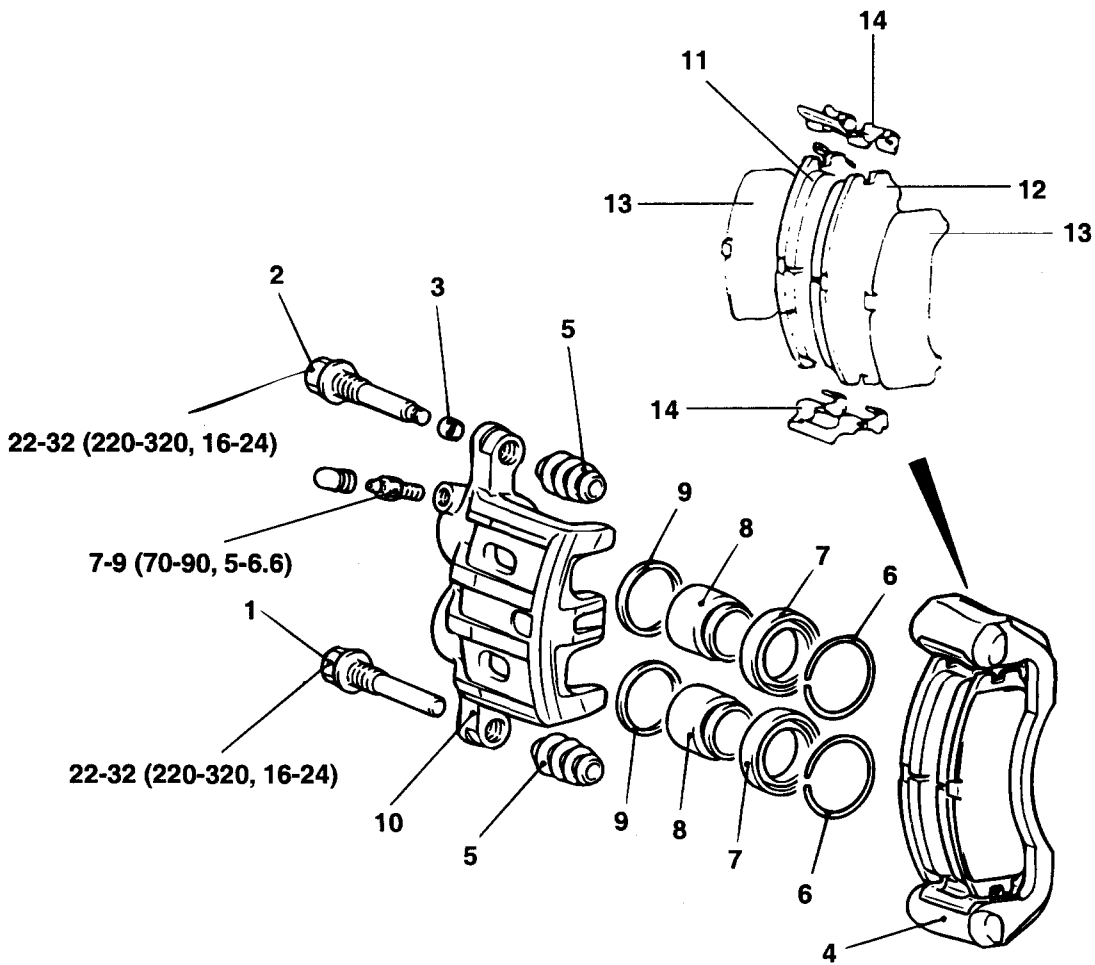
Tightening torque

Guide rod bolt :

22 - 32 Nm (220 - 320 kg·cm, 16 - 24 lb·ft)

DISASSEMBLY AND REASSEMBLY

EJJB0230

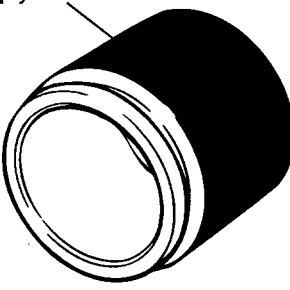
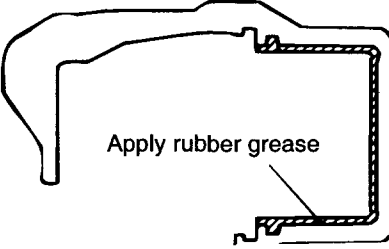


- | | |
|--------------------|-------------------------------------|
| 1. Guide bolt | 8. Piston |
| 2. Lock pin | 9. Piston seal |
| 3. Bushing | 10. Caliper body |
| 4. Caliper support | 11. Pad and wear indicator assembly |
| 5. Boot | 12. Pad assembly |
| 6. Boot ring | 13. Outer shim |
| 7. Piston boot | 14. Clip |

TORQUE : Nm (kg.cm, lb.ft)

LUBRICATION POINTS

EJJB0240

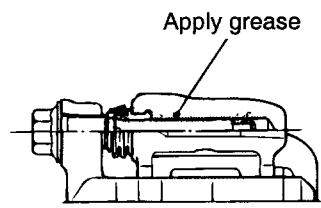


Apply rubber grease

Apply castor oil

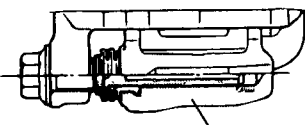
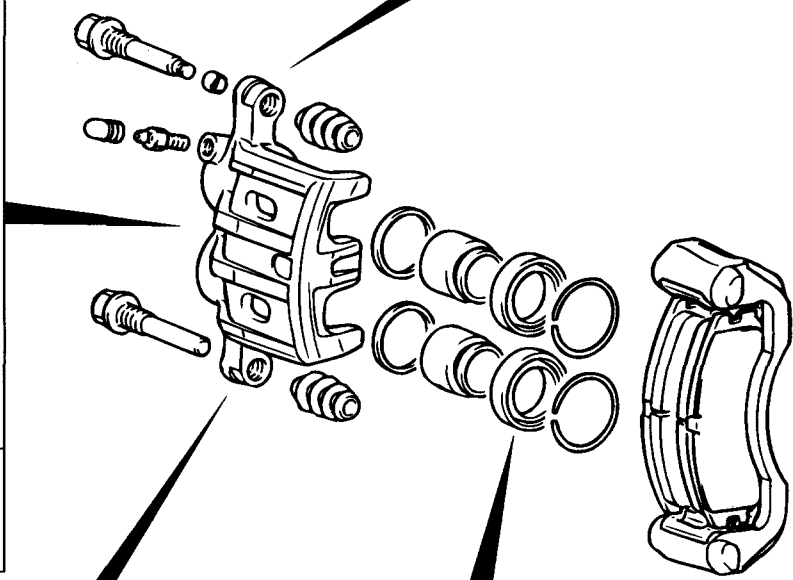
CAUTION
Be careful not to wash off special grease.

Cylinder inner surface :
Rubber grease
Piston : Castor oil



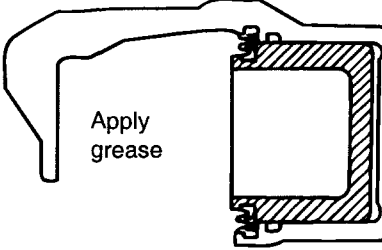
Apply grease

Grease : RX-2



Apply grease

Grease : RX-2 (MES 4-3-065)



Apply grease

Grease : Rubber grease

DISASSEMBLY EJMB0260

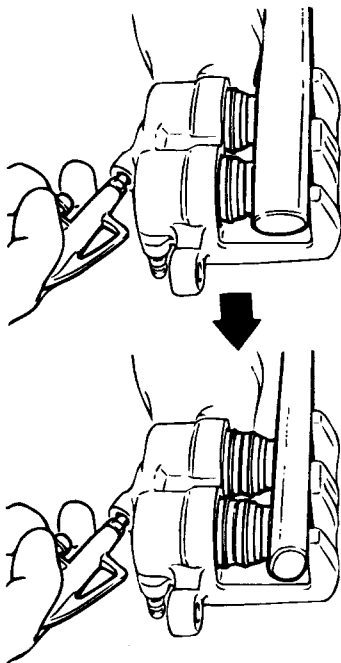
Front disc brakes should be disassembled separately into the left and right as a set.

1. Remove the piston boot/piston.
Blow compressed air into the brake hose seating hole so as to remove the piston and the piston boot.

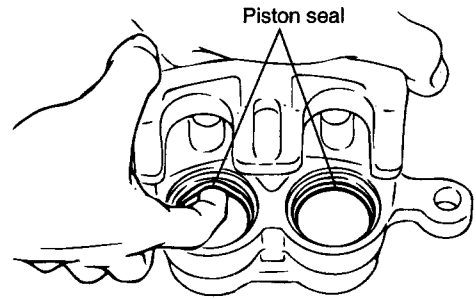
NOTE

When removing the piston, blow air slowly, adjusting the heights of the two pistons to push them out equally.

The secondary piston should not be removed before the primary piston is removed completely. Otherwise the secondary piston can't be removed.



KGX8039A



KGX8040A

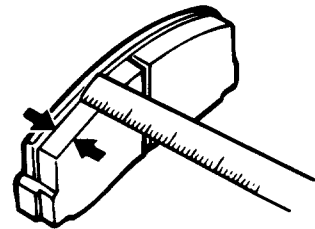
INSPECTION EJJB0260

1. Check the cylinder for wear, damage and rust.
2. Check the piston surface for wear, damage and rust.
3. Check the caliper body and sleeve for wear.
4. Check that grease is applied, and the pad and backing metal are not damaged.
5. Check the pad wear. Measure the pad thickness and replace it if it is less than the specified value.

Pad thickness

Specification : 10.0 mm (0.39 in.)

Service limit : 2.0 mm (0.08 in.)



KGX8041A

2. Remove the piston seal.
 - 1) Remove the piston seal with your finger.

CAUTION

Do not use a screwdriver or another tool because it may damage the cylinder.

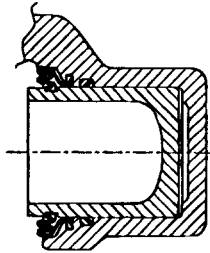
- 2) Clean the piston surface and inner cylinder using alcohol or the specified brake fluid.

Brake fluid : DOT 3 or DOT 4

REASSEMBLY

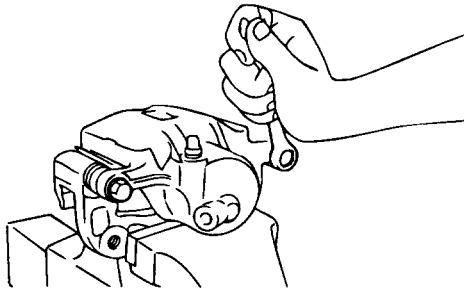
EJJB0270

1. Clean all components with isopropyl alcohol except for the pad and shim.
2. Install the piston seal.
3. After applying the specified brake fluid to the piston outer surface, install the piston into the cylinder.
4. Install the piston boot and boot ring.



EJHA008A

5. Install the guide pin boots and guide pin.



EJA9015J

INSTALLATION

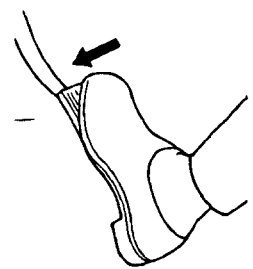
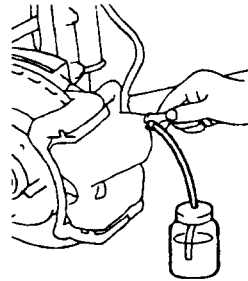
EJMB0280

1. Install the pads and brake cylinder.
2. Install the brake hose to the caliper.

Tightening torque

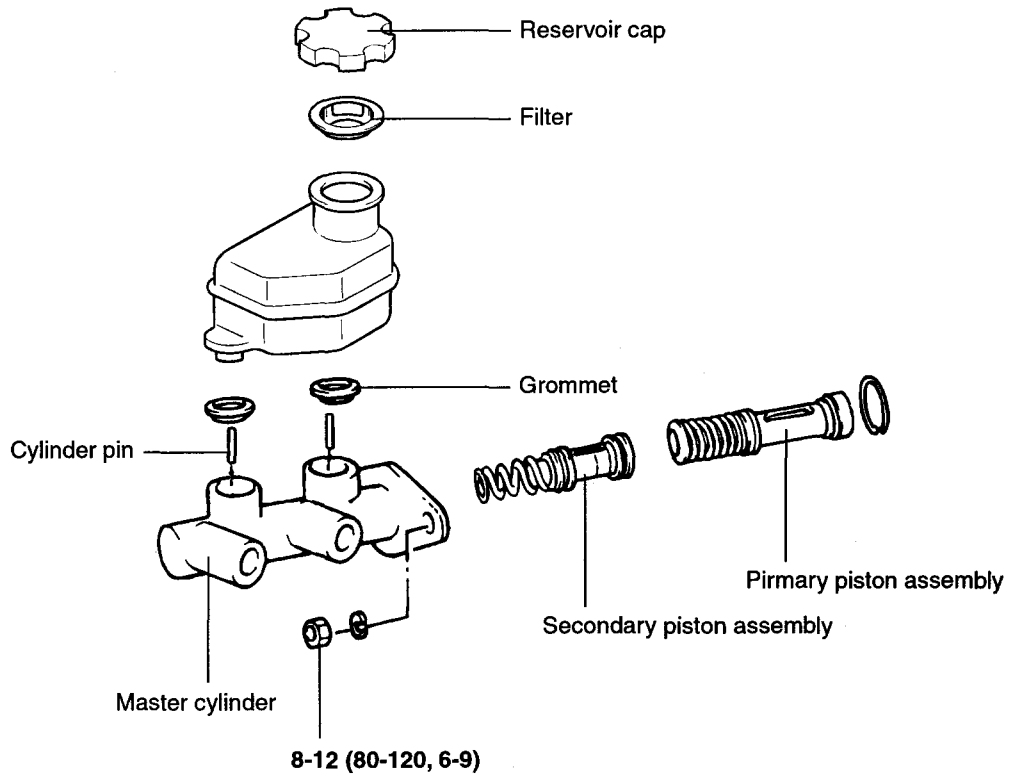
 Bleeder screw : 7-9 Nm (70-90 kg-cm, 5-6.6 lb-ft)

3. Fill the brake reservoir with brake fluid.
4. Bleed the system.



EAHA014B

MASTER CYLINDER

COMPONENTS EJMB0290

TORQUE : Nm (kg-cm, lb-ft)

EHPBR06A

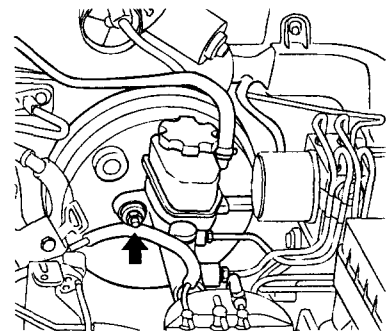
REMOVAL EJMB0291

1. Detach the brake tubes from the master cylinder, and then install the plug.

⚠ CAUTION

Do not allow brake fluid to remain on a painted surface. Wash it off immediately.

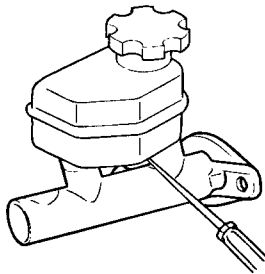
2. Remove the master cylinder mounting nuts and then remove the master cylinder.



KHPBR07A

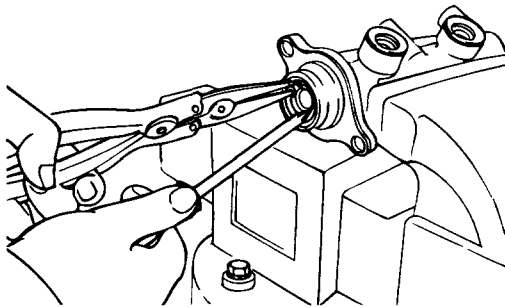
DISASSEMBLY EJMB0300

1. Remove the reservoir cap and drain the brake fluid into a suitable container.
2. Remove the reservoir from the master cylinder.



KHPBR08A

3. Using a snap ring pliers, remove the retainer ring.

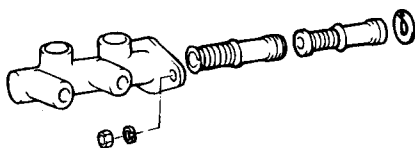


EJDA027B

4. Remove the cylinder pin with the primary piston pushed completely using a screwdriver. Remove the primary piston assembly.
5. Remove the cylinder pin with the secondary piston pushed completely using a screwdriver. Remove the secondary piston assembly.

NOTE

Do not disassemble the primary and secondary piston assembly.



EJDA027C

INSPECTION EJMB0310

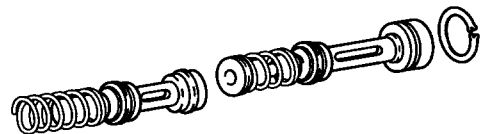
1. Check the master cylinder bore for rust or scratch.
2. Check the master cylinder for wear or damage. If necessary, clean or replace the cylinder.

CAUTION

1. If the cylinder bore is damaged, replace the master cylinder assembly.
2. Wash the contaminated parts in alcohol.

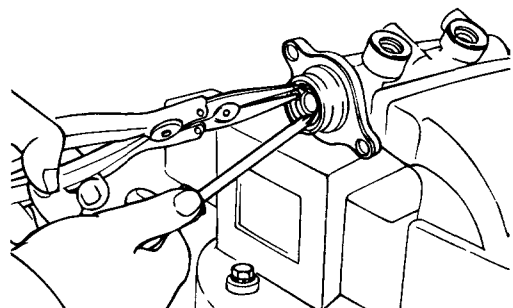
REASSEMBLY EJMB0320

1. Apply genuine brake fluid to the rubber parts of the cylinder kit and grommets.



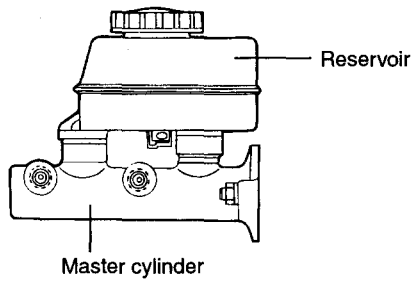
KFW8016A

2. Carefully insert the springs and pistons in the proper direction.
3. Press the piston with a screwdriver and install the retainer ring.



EJDA027B

4. With the piston pushed completely by a screwdriver, install the piston pin.
5. Mount two grommets.
6. Install the reservoir on the cylinder.



EJMB170A

INSTALLATION

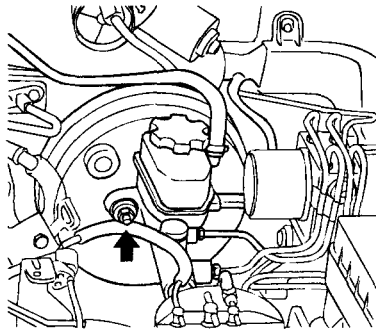
EJMB0330

1. Install the master cylinder the on brake booster with 2 nuts.

Tightening torque

Master cylinder installation nut :

8-12 Nm (80-120 kg·cm, 6-9 lb·ft)



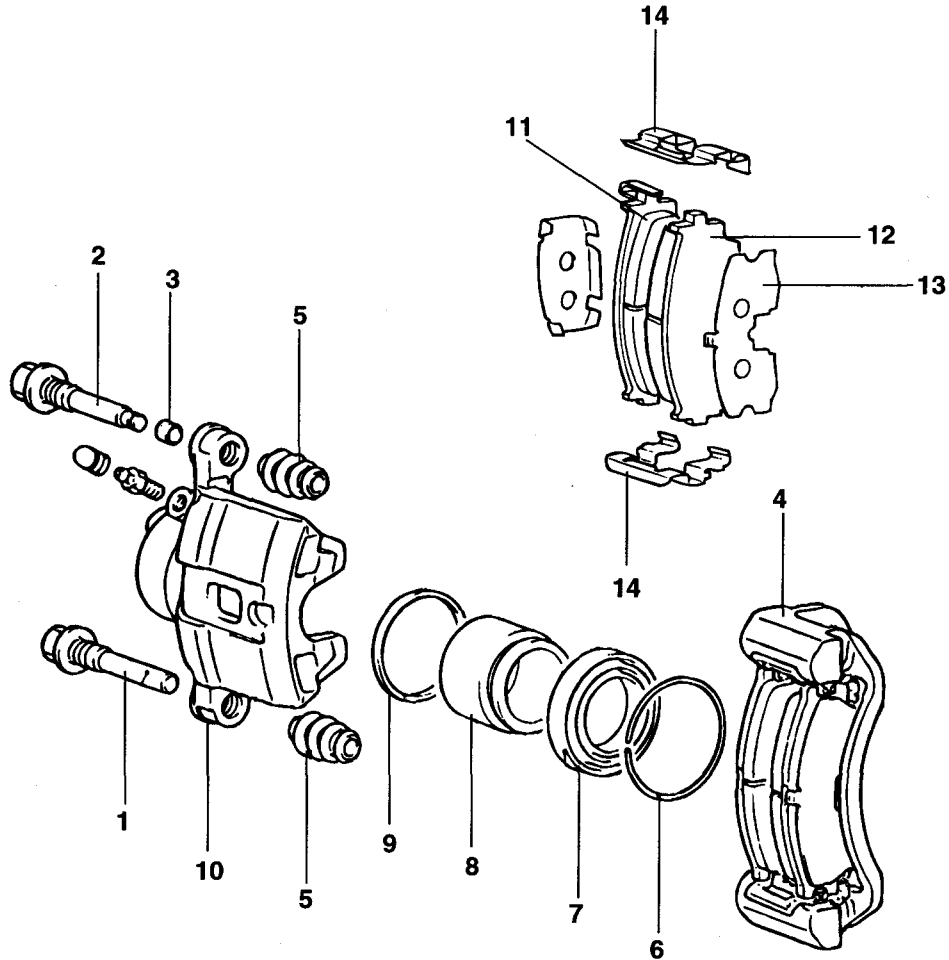
KHPBR07A

2. Connect 2 brake tubes and the brake fluid level warning connector.

Tightening torque

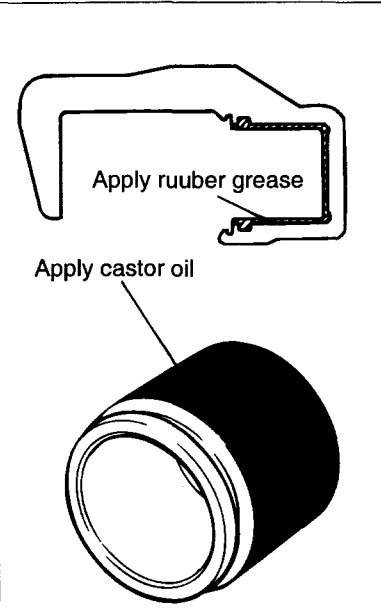
Brake tube flare nut : 13-17 (130-170 kg·cm, 9.5-12 in.)

REAR DISC BRAKE

COMPONENTS EJMB0340

- | | |
|--------------------|-------------------------------------|
| 1. Guide bolt | 8. Piston |
| 2. Lock pin | 9. Piston seal |
| 3. Bushing | 10. Caliper body |
| 4. Caliper support | 11. Pad and wear indicator assembly |
| 5. Boot | 12. Pad |
| 6. Boot ring | 13. Outer shim |
| 7. Piston boot | 14. Clip |

LUBRICATION POINTS EJJ80300

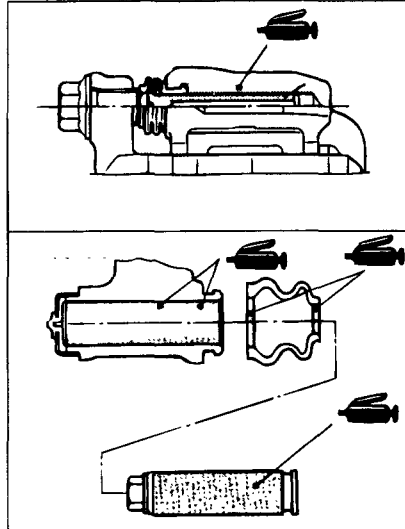


Apply rubber grease

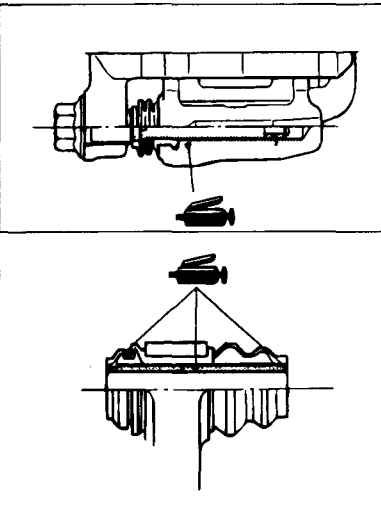
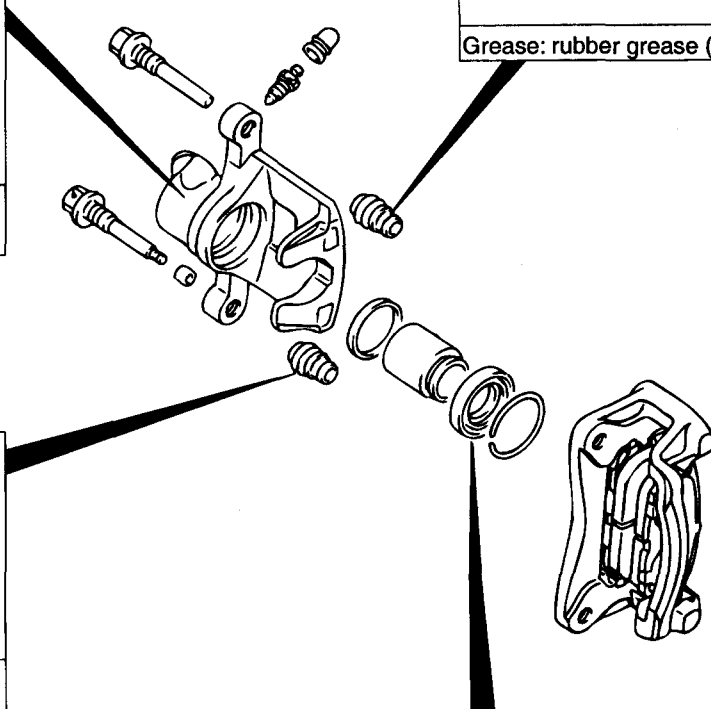
Apply castor oil

CAUTION
Be careful not to wash off special grease.

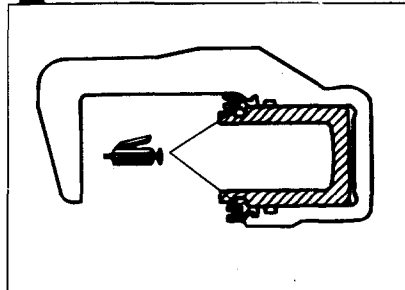
Brake fluid : DOT3 or DOT4



Grease: rubber grease (MES4-3-602)



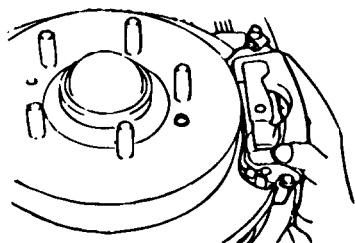
Grease: rubber grease(MES4-3-602)



Grease: rubber grease(MES4-3-602)

DISC BRAKE PAD EJMB0350**REMOVAL**

1. Remove the wheel.
2. Remove the guide bolt, lift up the caliper assembly, and remove the pad assembly.



EJJA030B

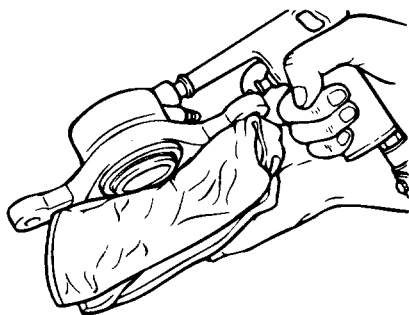
DISASSEMBLY SERVICE POINT

Rear disc brakes should be disassembled separately as a set of left and right as a set.

1. Remove the piston boot/piston.
Wrap the caliper body with a rag. Blow compressed air into the brake hose, and remove the piston and the piston boot.

CAUTION

Blow air slowly.



KGX8057A

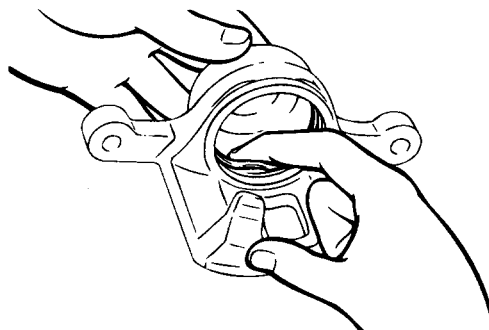
2. Remove the piston seal.
 - 1) Remove the piston seal with your finger.

CAUTION

Do not use a screwdriver or another tool in order to avoid damage the inside of the cylinder.

- 2) Clean the piston surface and the inside of the cylinder using trichloro-ethylene, alcohol or the specified brake fluid.

Brake fluid : DOT 3 or DOT 4



KGX8058A

EJMB0360

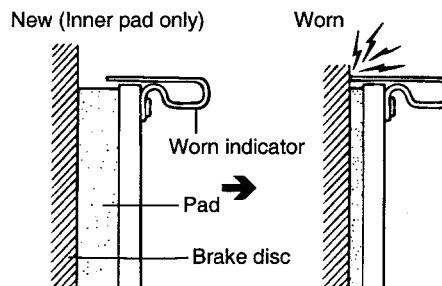
INSPECTION

1. Check the cylinder for wear, damage and rust.
2. Check the piston surface for wear, damage and rust.
3. Check the caliper body and sleeve for wear.
4. Check that grease is adhesive, and the pad and backing metal are damaged.
5. Check the pads for wear or oil contamination and replace if necessary.

NOTE

The pads for the right and left wheels should be replaced at the same time.

Pad thickness wear limit : 2.0mm (0.08 in.)



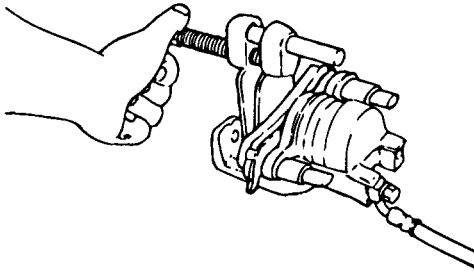
EJA9015E

6. Check for worn or damaged dust boots. If dust or mud had entered the caliper assembly through the seal, the caliper assembly must be replaced or repaired.

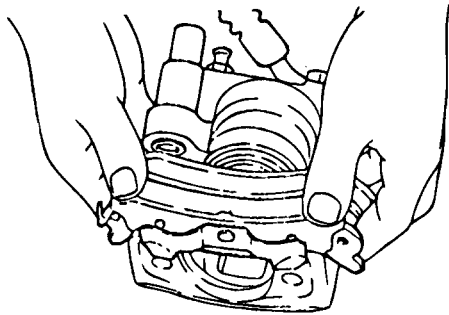
EJMB0370

INSTALLATION

1. Before replacing the brake pads, drain brake fluid from the master cylinder reservoir until it remains half full.
2. Remove the brake pad by turning the piston in the housing assembly. Using the special tool (09581-11000), remove the piston.



EJJA035A



EJJA035B

3. Install two caliper guide rods and tighten to a torque of 22-32 Nm (220-320 kg-cm, 16-23 lb-ft)
4. After filling the master cylinder reservoir with the fluid, bleed the brake line.

Recommended brake fluid : DOT 3 or DOT 4

CALIPER EJMB0380**REMOVAL**

1. Remove the rear wheel.
2. Remove the caliper assembly.
3. Remove the brake hose from the caliper.

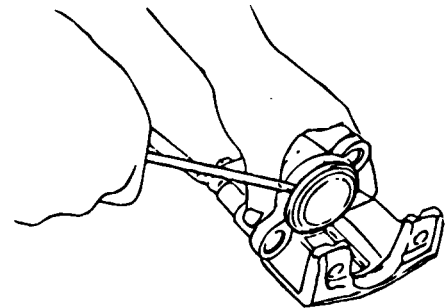
EJMB0390

DISASSEMBLY

1. Remove the pad.
2. Remove the piston boot from the housing, and then remove the piston.

NOTE

Using a wire hanger or equivalent, remove the caliper so as not to damage the brake hose.

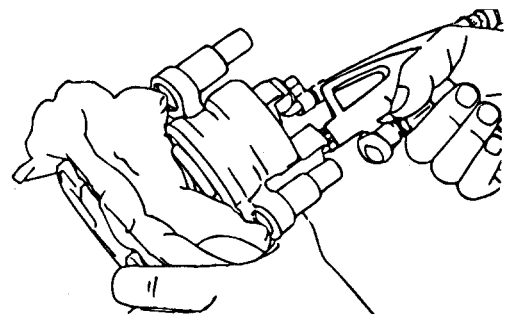


EJJA035D

3. Remove the piston by applying compressed air through the brake hose fitting.

NOTE

Do not place your fingers in front of the piston when using compressed air.



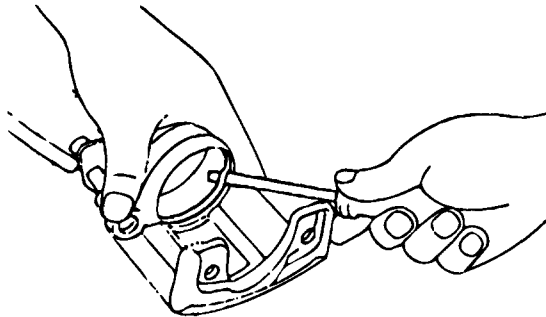
EJJA035E

4. Remove the piston seal carefully so as not to damage the cylinder wall.
5. Clean all removed parts with the specified fluid.

Item	Specified fluid
Metal section	Trichloroethylene, alcohol or brake fluid
Piston seal	If the oil level is low, add fluid (about 70cc).
Piston boot and other rubber parts	Alcohol

CAUTION

Rubber parts should be replaced with new ones but if you want to reuse them, don't put them in alcohol for more than thirty minutes.

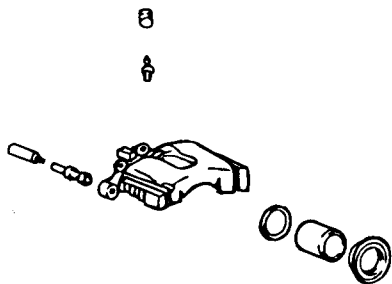


EJJA035F

EJJB0370

INSPECTION

1. Check the piston and its inside for wear, damage and rust. Replace the damaged parts if necessary.
2. Check the piston seal, boot, and pin insulators for wear and damage.



EJJA035G

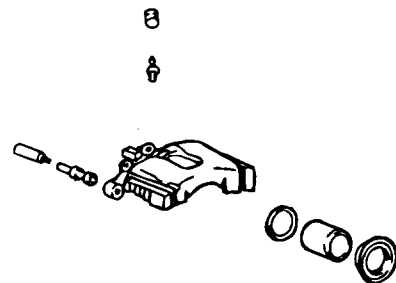
EJMB0400

REASSEMBLY

1. When disassembling the caliper assembly, use a new piston seal and boot.
2. Apply the recommended fluid to the bearing part of the piston seal and piston. Insert the piston seal into grooves inside the caliper, being careful not to twist the seal.

Item	Recommended fluid	Quantity
Piston seal	Brake fluid (DOT3, DOT4)	As required
Inside of piston cylinder	Brake fluid (DOT3, DOT4)	As required
Piston boot	Brake fluid (DOT3, DOT4)	As required
Locating pin insulator	White silicone grease	As required

3. Install the piston boot to the piston. Confirm that the concave part of the piston is placed outward and the boot is seated in grooves of the piston completely.



EJJA035G

4. Install the piston and boot in the caliper housing. Insert the boot flange in the caliper housing and check that the boot fits in grooves around the piston.
5. Apply the recommended oil to the inside of the locating pin insulator.

EJMB0410

INSTALLATION

1. Refer to "Brake pad installation" for detail.
2. Install the brake hose connector
3. Install the caliper installation bolt.
4. Bleed the system.

 **CAUTION**

When replacing the piston seal, check the pedal stroke.

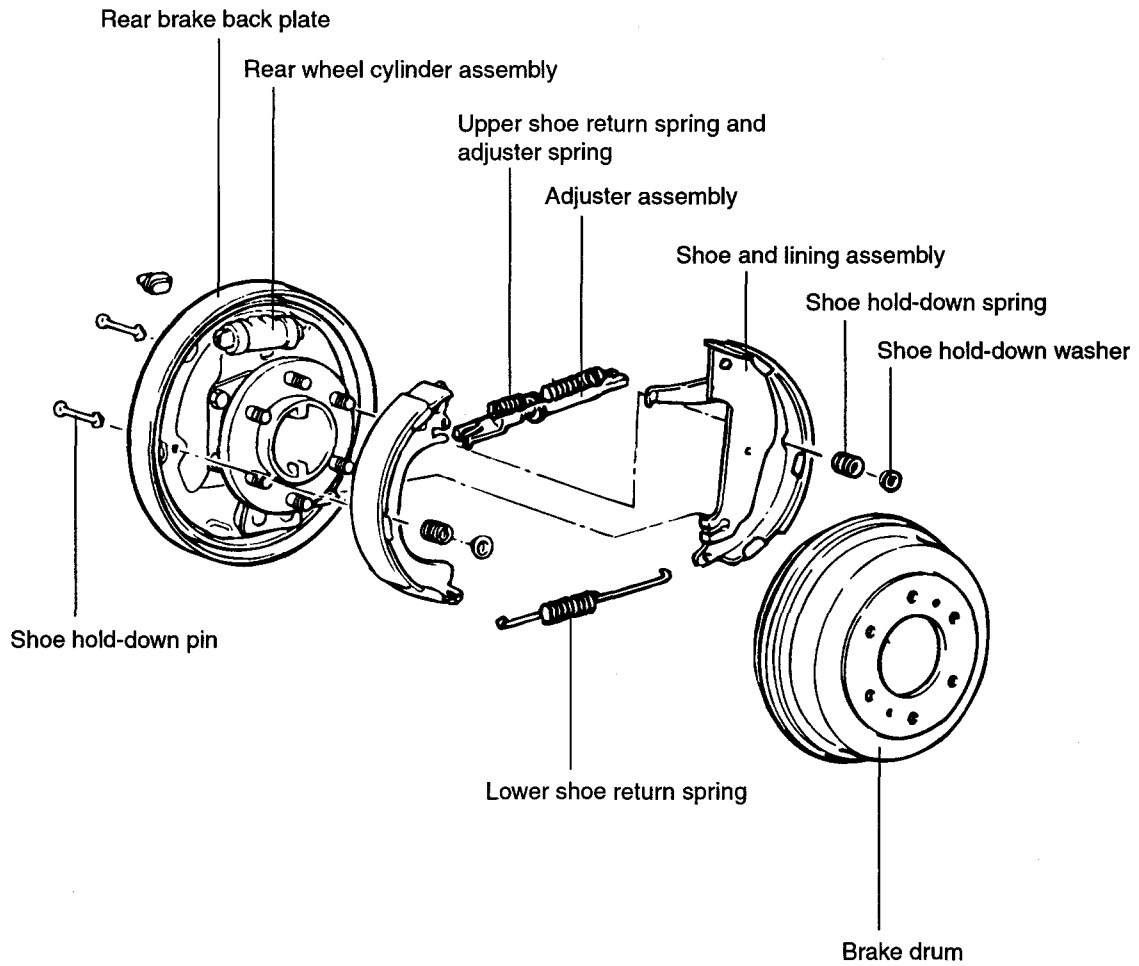
If the pedal stroke is too excessive, the piston may not retain the piston seal.

Adjust as follows :

1. ***After removing the pad from the piston, push the piston into the cylinder 3-5mm. Put a lever or steel plate (1m x 0.3m) between the piston and disc, being careful not to damage the contact surface of the disc or the piston end.***
2. ***Install the pad. To restore the brake pedal to the original position, step on it 2-3 times.***
3. ***Repeat the above procedure more than 5 times and move the piston outward and inward to assure that the piston seal is properly installed.***
4. ***Before driving a vehicle, step on the brake pedal and release it several times.***
5. ***Perform the road test.***

REAR DRUM BRAKE

COMPONENTS EJMB0420



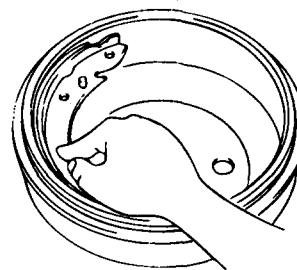
Removal steps

1. Wheel and tire
2. Brake drum
3. Shoe hold-down spring
4. Adjuster assembly
5. Shoe return spring
6. Shoe and lining assembly

INSPECTION EJMB0430

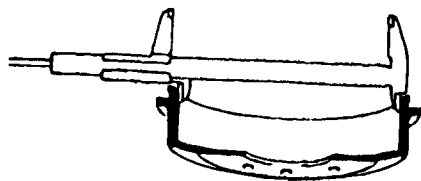
1. Measure the brake drum inside diameter. Check the runout of the brake drum using a dial indicator.

Standard value : 270mm (10.63 in.)
Service limit : 272mm (10.71 in.)

**⚠ CAUTION**

If the brake drum inner diameter is greater than the service limit, replace the brake drum.

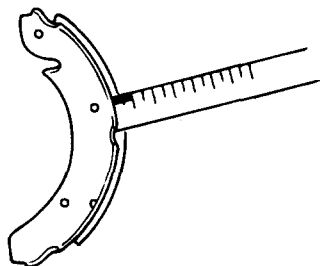
EJA9018E



EJA9018C

2. Measure the brake lining thickness.

Standard value : 4.7mm (0.185 in.)
Service limit : 1.5mm (0.059 in.)



EJA9018D

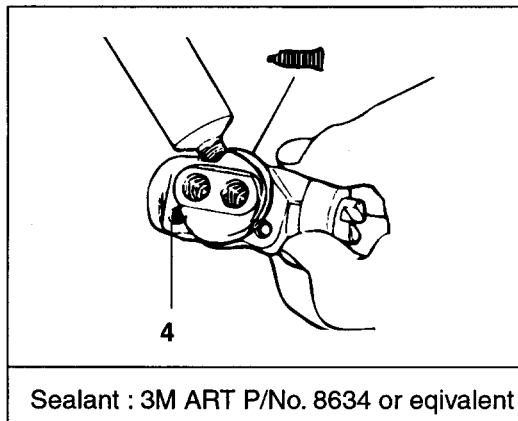
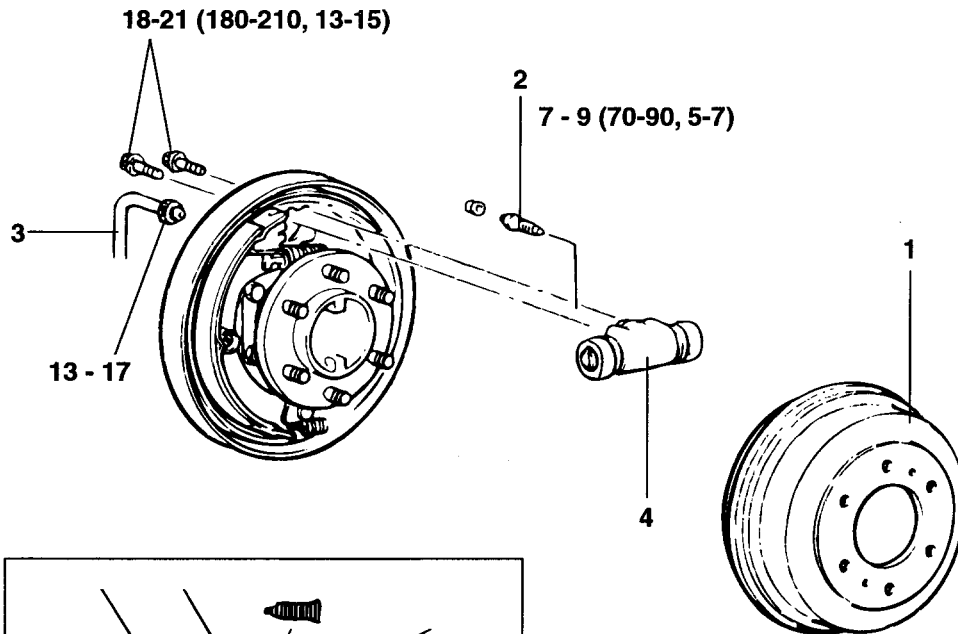
⚠ CAUTION

If the brake lining thickness is less than the service limit, replace the brake lining.

3. Inspect the brake lining and drum for proper contact.
4. Inspect the outside of the wheel cylinder for excessive corrosion and damage.

REMOVAL AND INSTALLATION

EJMB0440

**Removal steps**

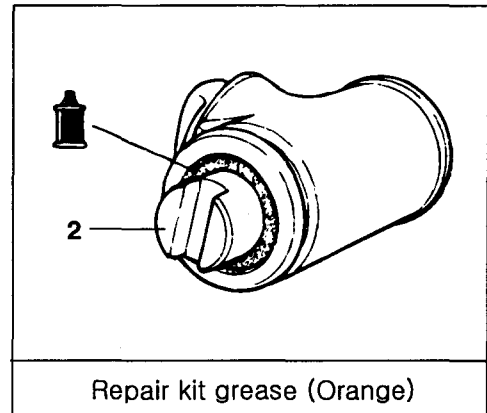
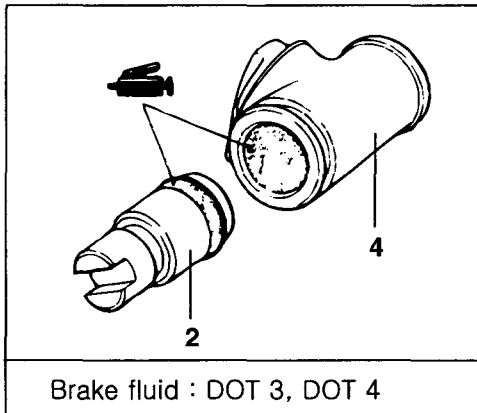
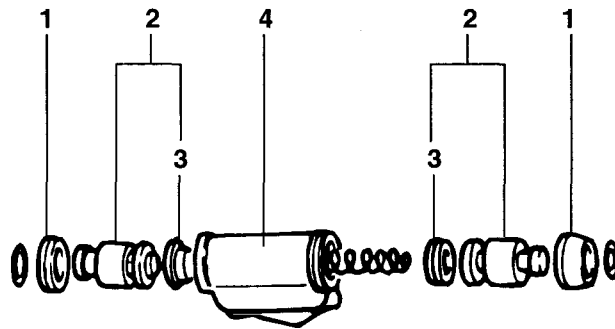
1. Brake drum
2. Bleeder screw
3. Brake tube
4. Wheel cylinder assembly

Procedures after installation

- Applying brake fluid
- Air bleeding

TORQUE : Nm (kg-cm, lb-ft)

DISASSEMBLY AND REASSEMBLY EJMB0450

**Disassembly steps**

1. Wheel cylinder boot
2. Piston assembly
3. Piston cup
4. Body machining

REASSEMBLY EJMB0460**PISTON CUP**

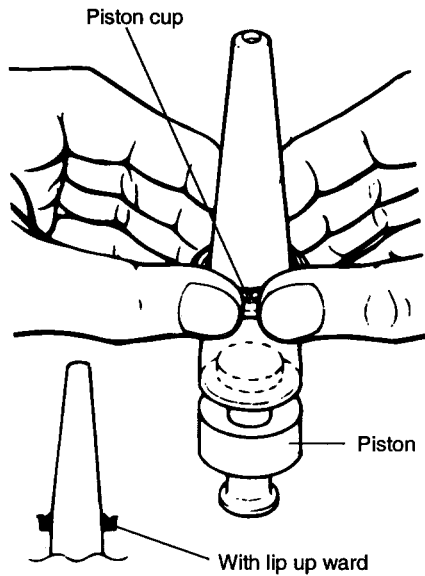
1. Clean the inside of the wheel cylinder and the outside of the piston with alcohol or brake fluid.
2. Apply the specified brake fluid on piston cup.

Specified brake fluid : DOT 3 or DOT 4

3. Until the piston cup is seated completely, push the special tool with fingers as shown in the illustration.

⚠ CAUTION

When pushing down the piston cup, push slowly with both hands without stopping so that deformation or turn-over will not result.

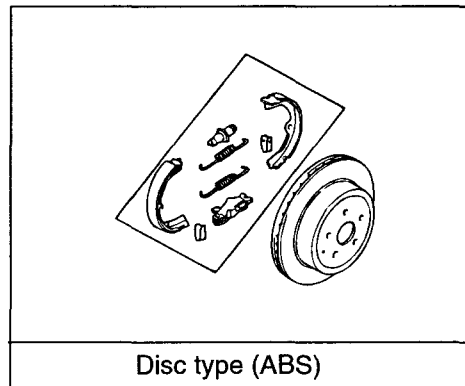
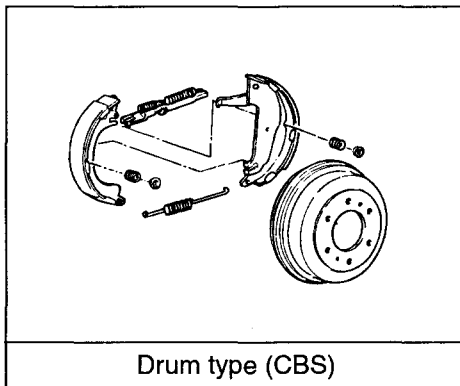
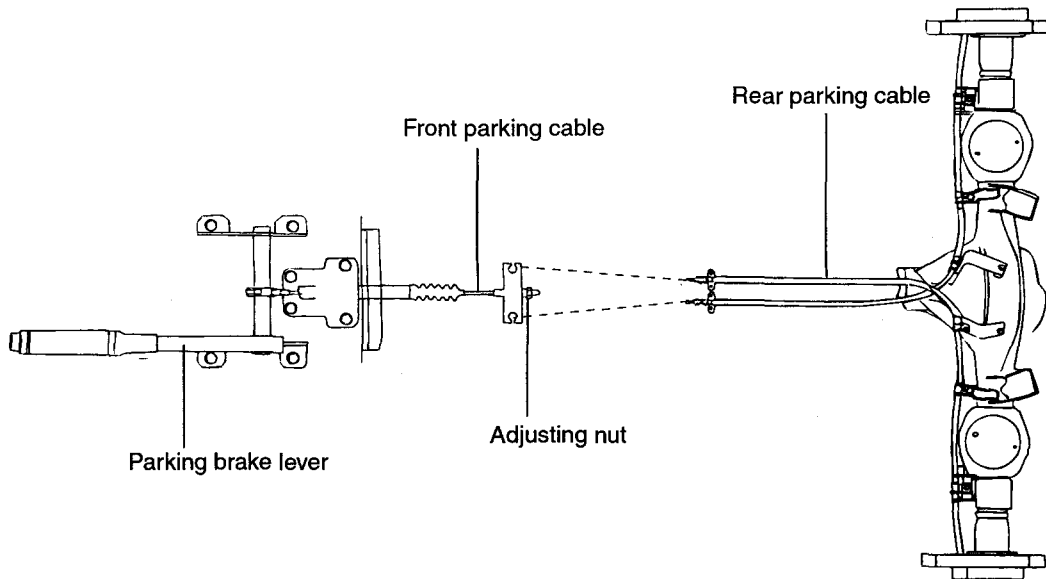


AHBR0840

PARKING BRAKE SYSTEM

PARKING BRAKE

REMOVAL AND INSTALLATION EJMB0470



Removal steps for the lever

1. Remove the console
2. Loosen the lever adjusting nut
3. Detach the cable from the lever
4. Remove the lever mounting bolts
5. Disconnect the parking brake switch connector

Removal steps for cable

1. Remove the console
2. Loosen the lever adjusting nut
3. Detach the cable from the lever
4. Connect the cable to the body and install the axle housing
5. Remove the cable clip
6. Remove the parking cable from the operating lever

ADJUSTMENT PROCEDURE EJMB0480

PARKING BRAKE STROKE ADJUSTMENT

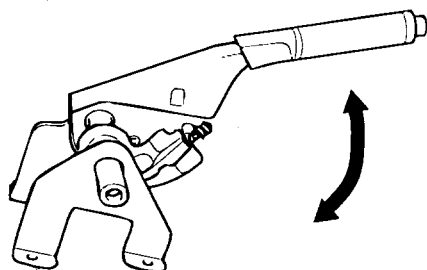
1. Pull the brake lever with force of 200N (20kg, 44lbs) and count the number of notches.

CAUTION

After operating the parking brake at full stroke more than 3 times, operate it in the position of 40mm of lever so as to seat the cable completely.

Parking brake stroke

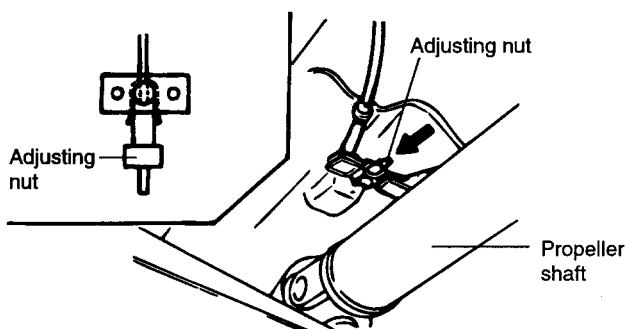
Standard value : 8 clicks



KHPBR13A

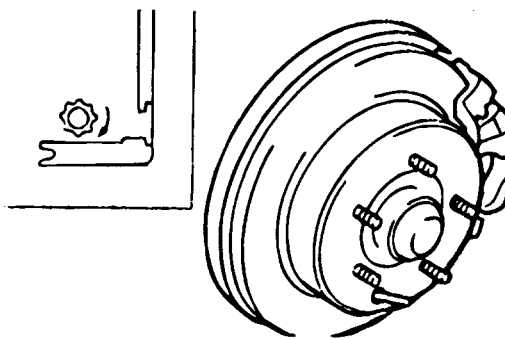
2. If the parking brake stroke is out of the standard value, adjust it as follows :

- 1) Loosen the adjusting nut to release the parking brake cable.



EHPB320A

- 2) Remove the adjusting hole plug, and then turn the adjuster the direction of the arrow. To prevent the disc from rotating, use a screwdriver (flat tip (-)).
- 3) Turn the adjuster 5 notches in the opposite direction of arrow.



EJJA040B

- 4) Turn the adjuster nut to adjust the parking brake stroke to the specification.

CAUTION

If the number of parking brake notches is less than the specification, loosen the adjusting nut and readjust.

- 5) After adjusting, check that there is no gap between the adjusting nut and pin and that the adjusting nut is fixed in the nut holder precisely.
- 6) After adjusting the parking brake stroke, raise the rear of vehicle with a jack.
- 7) Check that the rear brakes do not drag by turning the rear wheel when the parking brake lever is released.

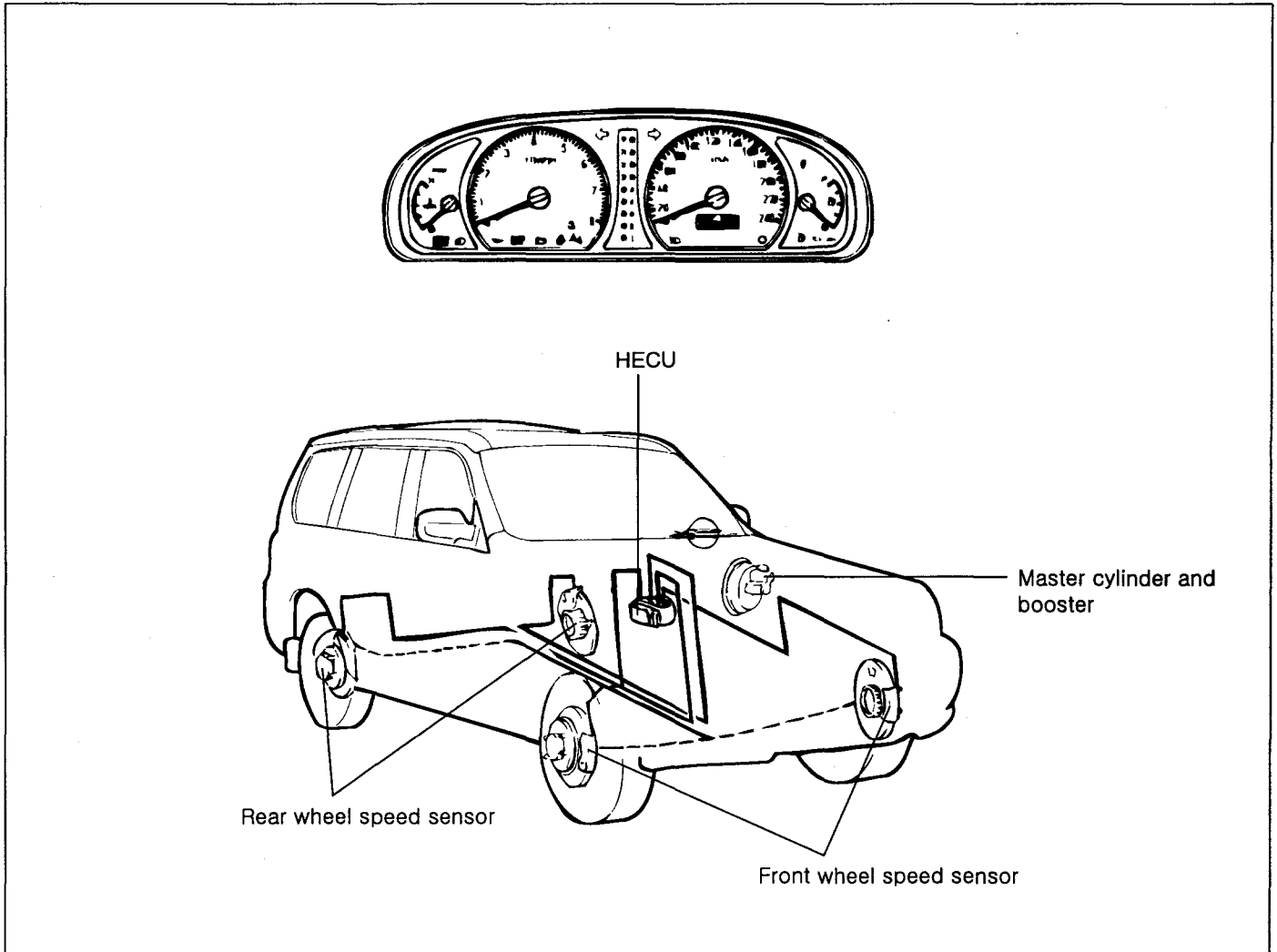
PARKING BRAKE BED-IN (DIH)

1. When the parking brake lever is pulled with force of 20-25 kg(f), drive the vehicle 400m at 60 kph.
2. Repeat step 1 more than 2 times.
3. Parking should be possible on a hill of 30%.

ABS (ANTI-LOCK BRAKE SYSTEM)

SYSTEM COMPONENT

EJMB2100



EJMB210A

The Anti-Lock Brake System (ABS) controls the hydraulic brake pressure of all four wheels during sudden braking and braking on hazardous road surfaces, preventing the wheels from locking up. ABS provides the following benefits :

1. Enables steering around obstacles with a greater degree of certainty, even during emergency braking.
2. Enables stopping during emergency braking while keeping stability and steerability even on curves.

If a malfunction occurs, a diagnosis function and fail-safe system are included for serviceability.

The traction control is a variable system designed to enhance traction during acceleration and cornering. It does

so by determining the optimum amount of wheel spin for any given driving situation, and then suppressing surplus engine power accordingly.

The hydraulic electronic control unit (HECU) receives signals concerning the vehicle's speed, direction and road conditions from sensors at the wheels. Based on these signals, the control unit will determine the optimum amount of wheel spin. Because the system is variable, the control unit may determine, depending on the driving conditions, that some wheel spin is beneficial (thus enhancing straight-line acceleration), or that no wheel spin is beneficial (thus enhancing cornering). For any given driving situation, the control unit will determine the amount of wheel

spin best suited to the driver's needs. The system is automatically read whenever the engine is started, but can be manually canceled with the TCS switch.

However, once actuated, the system cannot be canceled until it is once again in the ready state.

EBD (ELECTRONIC BRAKE-FORCE DISTRIBUTION)

EJMB2150

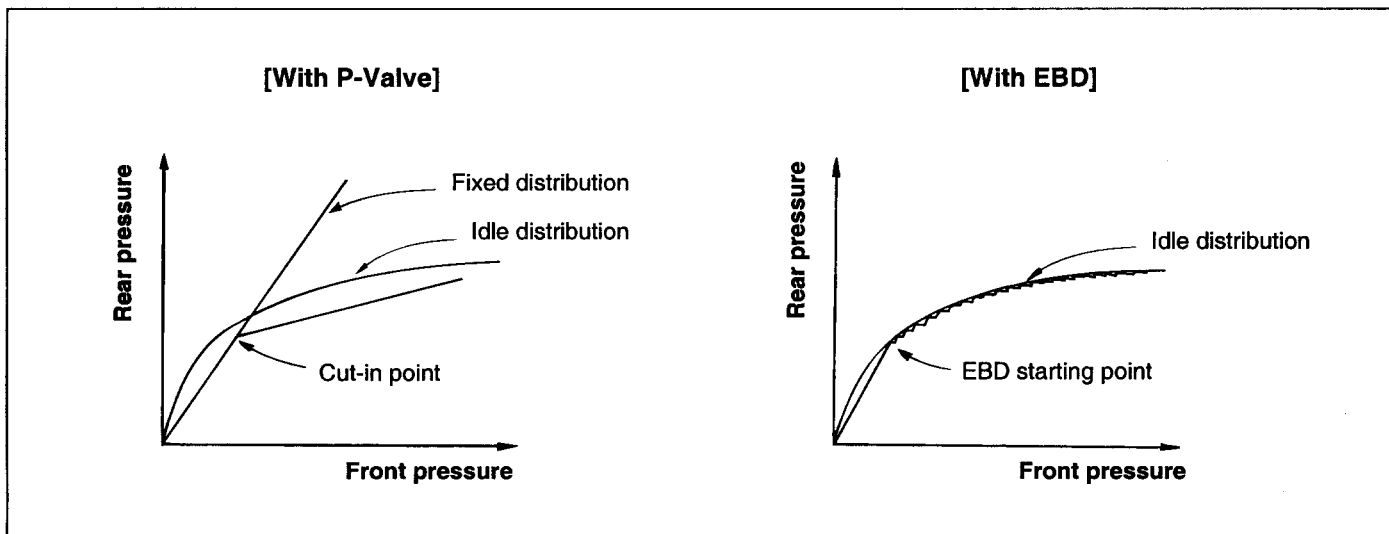
EBD is additionally applied, instead of the proportioning valve, to deliver ideal distribution of fluid pressure to the

front and rear brakes. This prevents the brakes from skidding in the event of rear wheel lock up and provides higher brake efficiency within the range of brake application.

ADVANTAGES

- Functional improvement of base-brake system
- Compensation of different friction coefficients
- Elimination of proportioning valve
- Failure recognition by warning lamp

COMPARISON BETWEEN PROPORTIONING VALVE AND EBD

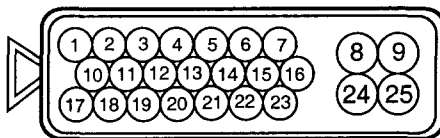


EJA0032A

INSPECTION AT HECU TERMINALS

EJMB2200

TERMINAL VOLTAGE CHART



EJHA025A

Terminal No.	Description	Condition	Output
9	<ul style="list-style-type: none"> Battery power source 1 Solenoid valve power source 	Always	System voltage
8	Ground	G12	
7	Diagnosis interface (K-Line)	Data to the Hi-Scan	
5 1 19 23	Wheel speed sensor (Left rear) Wheel speed sensor (Left front) Wheel speed sensor (Right front) Wheel speed sensor (Right rear)		Resistance $R=1.1k\Omega \pm 50\%$ Min. detectable voltage 130mV peak to peak voltage at 50Hz
6 2 20 22	Wheel speed sensor (Left rear) Wheel speed sensor (Left front) Wheel speed sensor (Right front) Wheel speed sensor (Right rear)		
4	Start/ON input	Ignition 2 condition	Over voltage detection : between $16.5V \pm 0.5V$ and 20V Suspend voltage detection : between $7.0V \pm 0.5$ and $9.5V \pm 0.5$ System off : below $5.5V \pm 0.5$
25	<ul style="list-style-type: none"> Battery power source 2 Motor power source 	Always	<ul style="list-style-type: none"> System voltage Max. current : below 100A (before 100msec.) Rated current : below 30A (after 100msec.)
24	Ground	G12	
16	ABS & EBD warning lamp	Energized ABS relay	Max. current : below 200mA Max. voltage 40V
18	Stop lamp switch input		Input voltage threshold $1.00V - 2.75V$ $5.00V - 16.00V$
14	ECU Check pin		
3	Front right speed sensor output		
12	Rear left speed sensor output		
17	Front right speed sensor output		
21	Rear right speed sensor output		

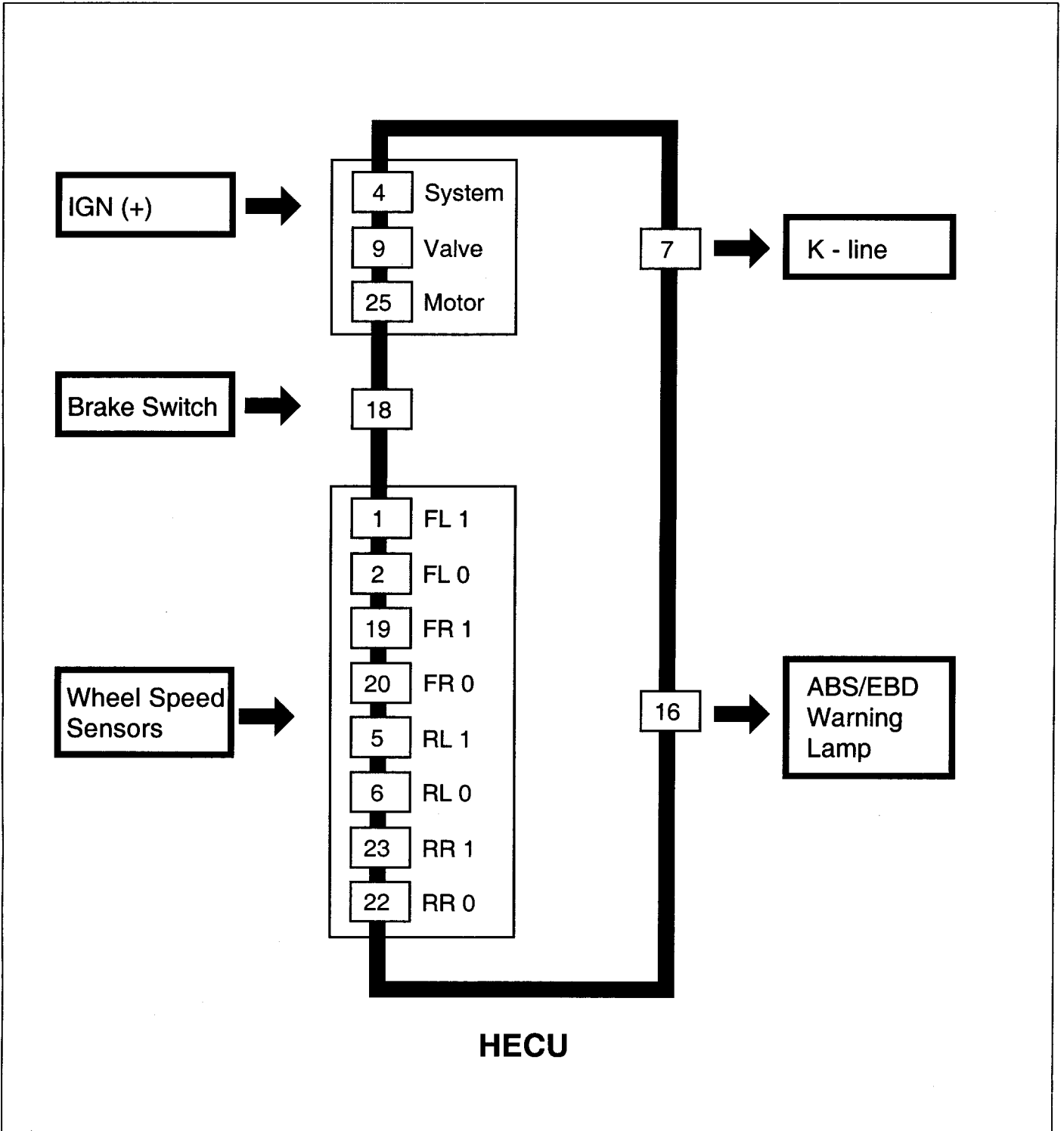
Input-output specification

No.	Mark	Terminal Name	Specification	Note
9	BATT1	Battery power source 1 terminal (Valve power source)	Max. current : $I < 20A$ Rated current : $I < 20mA$ Dark current: $I < 1mA$	When all valves activated When non ABS control
25	BATT2	Battery power source 2 terminal (Motor power source)	Max. current : $I < 100A$ Rated current : $I < 40A$	Rush current
4	IGN	Power source via IG2 SW terminal	Rated voltage : 12V Over voltage detection : $16.5V < V < 20.2V$ Suspend voltage detection : $8.5V < V < 9.5V$ System off : $4.5V < V < 7.5V$ Rated current : $I < 300mA$	
8 24	GND1 GND2	Ground terminal	Max. current : (Total of 2 terminals) Continuous valve Activated time : 14s Rated current : $I < 300mA$	In ABS control When non ABS control
18	STP	Brake Lamp Switch input terminal	Voltage range : $-5V \leq V_{in} \leq 16V$ Input voltage threshold : $V_{IL} < 1.2V, V_{IH} > 4.0V$	
1 19 5 23 2 20 6 22	FL1 FR1 RL1 RR1 FL0 FR0 RL0 RR0	Wheel sensor input terminal	Detectable frequency range : $F = 15 - 2000Hz$ Resistance : $1.1k\Omega \pm 50\%$ Inductance : $L=0.7H \pm 50\%$	Should be use the twist pair cable for connect between sensor and ECU
16 3	WLAS WLE	ABS Warning Lamp output terminal Brake warning lamp output terminal	Max. current : $I < 200mA$ Max. voltage : 40V Low level output voltage : $V < 2.0V(at 200mA)$ Leakage current : $I < 1mA$	
7	K	Diagnosis interface terminal	Input voltage threshold : $V_{IL} < 0.3VB V$ $V_{IH} < 0.7VB V$ Output voltage threshold : $V_{OL} < 0.2VB V$ $V_{OH} > 0.8VB V$ Receiving, sending signal "1" : $R > 50k\Omega$ Sending signal "0" : $R < 110k\Omega$	VB : Ignition voltage Should be no use the unsettled unsettled voltage area $0.3*IGN \text{ voltage} - 0.7*GN$ voltage
17	IDL	Idle-up Solenoid output	Coil current : $I \leq 400mA$ Output voltage threshold : $V_{OL} 1.5V(ON), V_{OH} > V_{IGN} - 1.0V(OFF)$ Max. voltage : 40V Low level output voltage	
11	DMY IDL	Dummy idle-up output	Input voltage : $-0.5V \leq V \leq 16V$ Output current : $I \leq 1mA$	
13	GS	G-sensor input	Input voltage range : $-0.5V \leq V \leq 5.0V$	No connection to the chassis GND out of ECU.

No.	Mark	Terminal Name	Specification	Note
15	GSG	G-sensor input	Input voltage range : $-0.5V \leq V \leq 5.0V$	No connection to the chassis GND out of ECU.
10	TOD	TOD ECU Communication output	Output voltage threshold : $V_{OL} < 0.5V$ Output current : $I < 2mA$	NO ABS CONTROL > 4.0V (High) ABS IN CONTROL < 0.5V
12	NC	No connection		
14	NC	No connection		
21	NC	No connection		

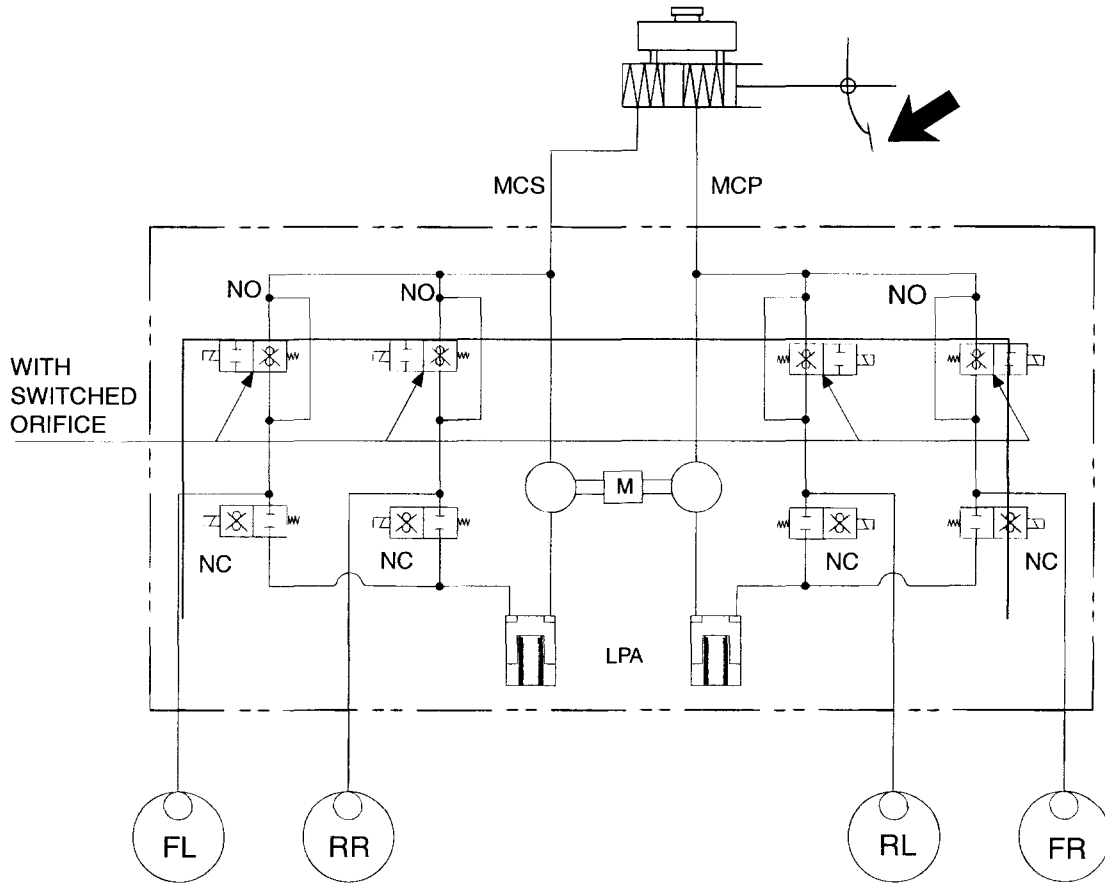
DIAGRAM OF INPUT/OUTPUT FOR
HECU

EJHA2250



SYSTEM DIAGRAM EJHA2300

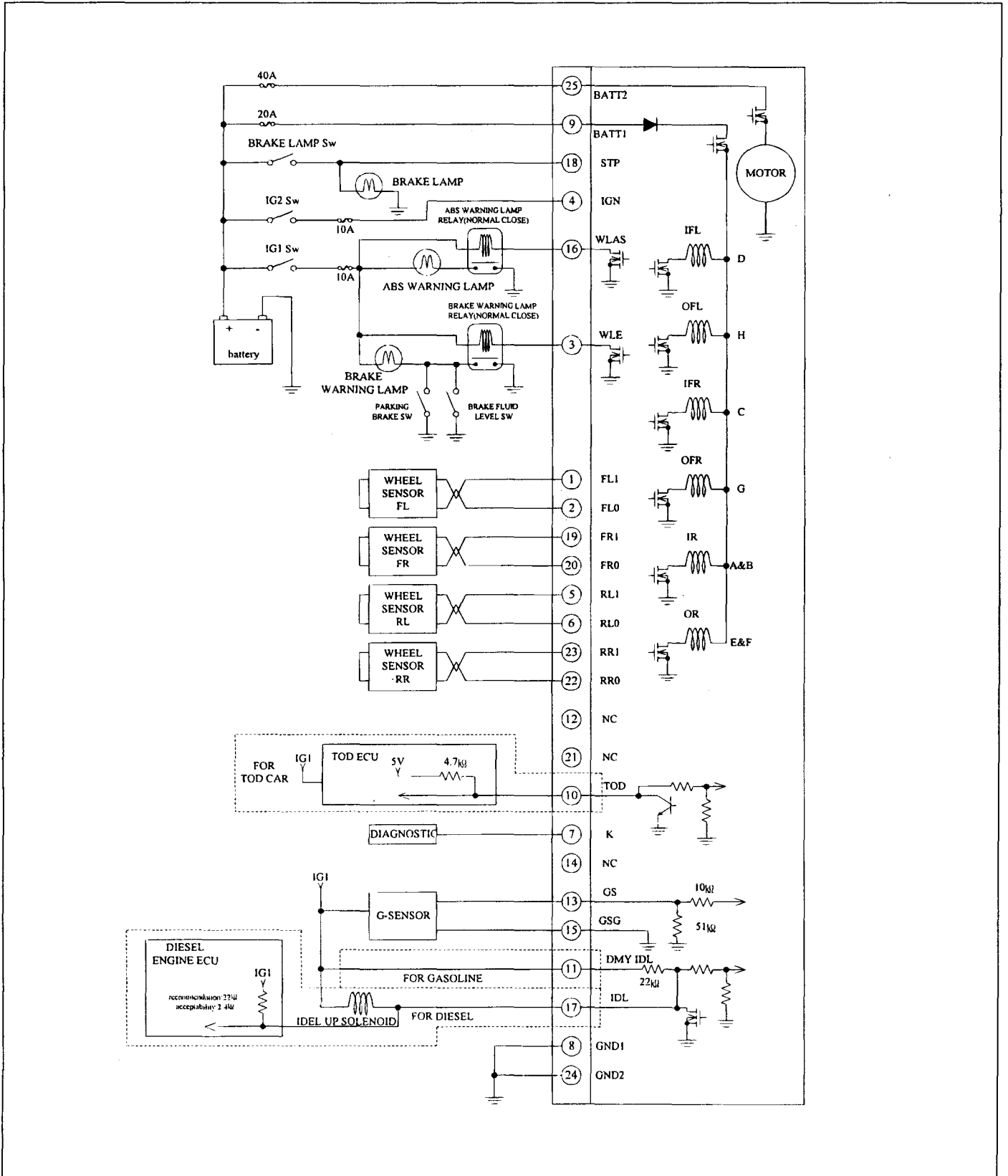
[ABS]



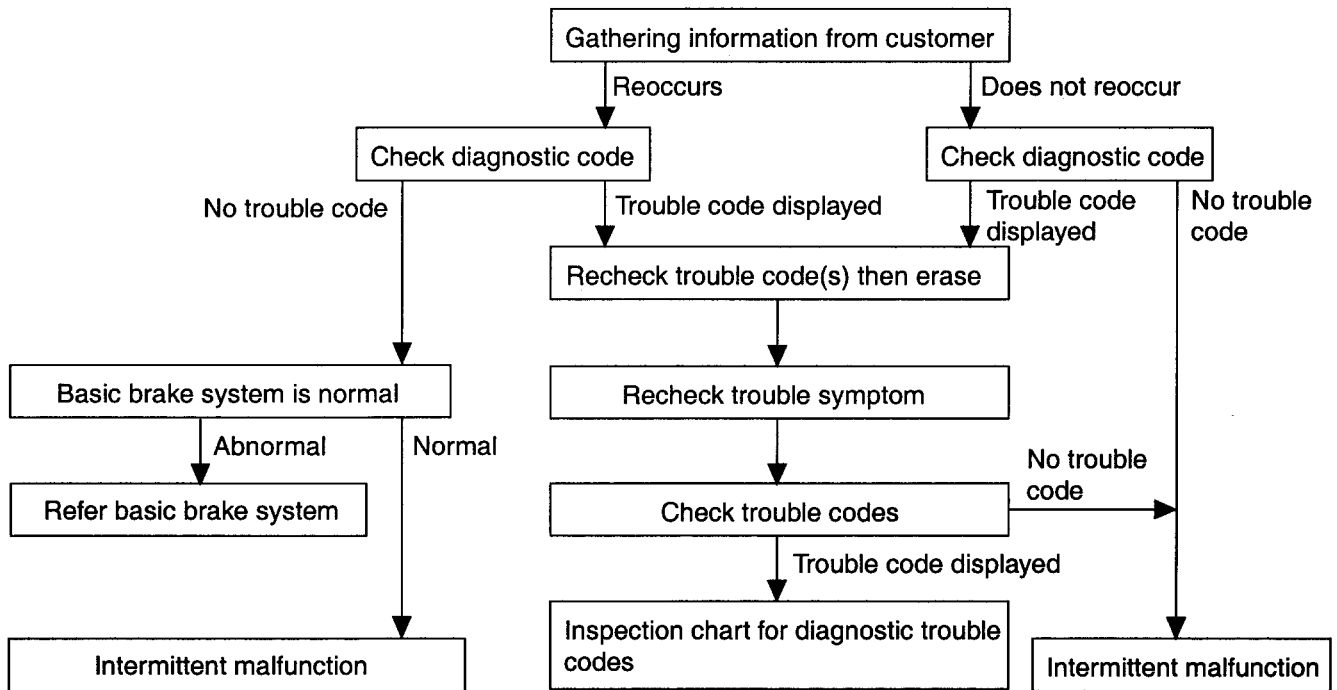
MCS : Master Cylinder Secondary
 MCP : Master Cylinder Primary
 NO : Normal Open
 NC : Normal Close
 M : Motor & Pump
 LPA : Low Pressure Accumulator

INPUT/OUTPUT CIRCUIT DIAGRAM EJM5050

ABS E.C.U



STANDARD FLOW OF DIAGNOSTIC TROUBLESHOOTING EJHA2400



* Using the customer problem analysis check sheet for reference, ask the customer as much detail as possible about the problem.

EJDA015A

NOTES WITH REGARD TO DIAGNOSIS EJHA2450

The phenomena listed in the following table are not abnormal.

Phenomenon	Explanation
System check sound	When starting the engine, a thudding sound can sometimes be heard coming from inside the engine compartment. This is because the system operation check is being performed.
ABS operation sound	<ol style="list-style-type: none"> 1. Sound of the motor inside the ABS hydraulic unit operation (whine). 2. Sound is generated along with vibration of the brake pedal (scraping). 3. When ABS operates, sound is generated from the vehicle chassis due to repeated brake application and release. (Thump : suspension; squeak: tires)
ABS operation (Long braking distance)	For road surfaces such as snow-covered and gravel roads, the braking distance for vehicles with ABS can sometimes be longer than that for other vehicles. Accordingly, advise the customer to drive safely on such roads by lowering the vehicle speed.
Pedal kickback	It's normal operation.

Diagnosis detection conditions can vary depending on the diagnosis code. When checking the trouble symptom after the diagnosis code has been erased, ensure that the requirements listed in "Comment" are met.

ABS CHECK SHEET EJHA2500

ABS Check Sheet

Inspector's Name _____

Customer's Name		Registration No.	
		Registration Year	/ /
		VIN.	
Date Vehicle Brought In	/ /	Odometer	Km Miles

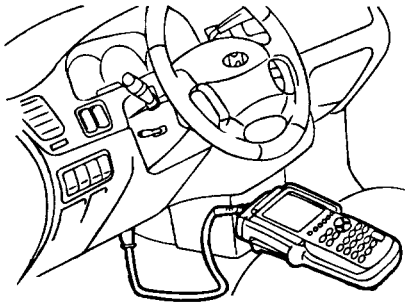
Date the Problem First Occurred	/ /
Frequency of Occurrence of Problem	<input type="checkbox"/> Continuous <input type="checkbox"/> Intermittent (times a day)

Symptoms	<input type="checkbox"/> ABS does not operate.	
	<input type="checkbox"/> ABS does not operate efficiently.	<input type="checkbox"/> Intermittent (times a day)
	ABS Warning Light Abnormal	<input type="checkbox"/> Remains ON <input type="checkbox"/> Does not light up

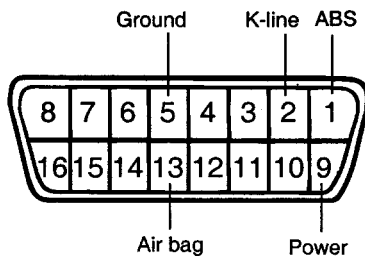
Diagnostic Trouble Code Check	1st Time	<input type="checkbox"/> Normal Code	<input type="checkbox"/> Malfunction Code (Code)
	2nd Time	<input type="checkbox"/> Normal Code	<input type="checkbox"/> Malfunction Code (Code)

HI-SCAN (PRO) CHECK EJHA2550

1. Turn the ignition "OFF".
2. Connect the Hi-scan to the data link connector located underneath low crash pad panel.
3. Turn the ignition "ON".
4. Use the Hi-scan to check the self-diagnosis codes.
5. After completion of the repair or correction of the problems, turn the ignition switch; then erase the stored faults codes using the clear key.
6. Disconnect the Hi-scan.



ERHA006A

**DATA LINK CONNECTOR**

EJHA100A

INSPECTION CHART FOR DIAGNOSTIC TROUBLE CODES

EJMB2600

Inspect according to the inspection chart that is appropriate for the malfunction code.

DTC on Hi-Scan	Description
C1101	Too high battery voltage (over 18V)
C1102	Too low battery voltage (below 9V)
C1200	FL wheel sensor : open or short to GND
C1201	-Range / Performance : exciter or speed jump error
C1202	- No signal : air-gap error
C1203	FR wheel sensor : open or short to GND
C1204	- Range / Performace : exciter or speed jump error
C1205	- No signal : air-gap error
C1206	RL wheel sensor : open or short to GND
C1207	- Range / Performanace : exciter or speed jump error
C1208	Battery voltage over volt (over 18V)
C1209	RR whel sensor : open or short to GND
C1210	- Range / Performance : exciter or speed jump error
C1211	Battery voltage over volt (over 18V)
C1274	G-sensor signal is fail
C1275	G-sensor open or short to GND
C1506	Idle-up failure
C1604	Harware (including valve failures)
C1615	TOD line failure
C2112	Valve relay (including fuse failure)
C2201	Without setting vehicle selection code
C2402	Electrical (Pump-Motor)

ACTUATOR DRIVING

No.	Description	Condition	Recognition	Time
01	Motor	KEY ON ENG. OFF	Motor pump relay operation (Click sounds)	2 seconds
02	Front left valve (In)		Front left solenoid valve operation (Click sounds)	
03	Front right valve (In)		Front right solenoid valve operation (Click sounds)	
04	Rear left valve (In)		Rear left solenoid valve operation (Click sounds)	
05	Rear right valve (In)		Rear right solenoid valve operation (Click sounds)	
06	Front left valve (Out)		Front left solenoid valve operation (Click sounds)	
07	Front right valve (Out)		Front right solenoid valve operation (Click sounds)	
08	Rear left valve (Out)		Rear left solenoid valve operation (Click sounds)	
09	Rear right valve (Out)		Rear right solenoid valve operation (Click sounds)	

CURRENT DATA

No.	Description	Recognition	Unit
1	Battery	Battery	Voltage
2	FL wheel speed SNSR	Front left wheel speed sensor	km/h
3	FR wheel speed SNSR	Front right wheel speed sensor	
4	RL wheel speed SNSR	Rear left wheel speed sensor	
5	RR wheel speed SNSR	Rear right wheel speed sensor	
6	ABS SRI status	Warning lamp	
7	Brake SW	Brake switch	
8	Motor pump relay	Motor relay	
9	Valve relay	Valve relay	
10	Motor pump status	Motor	
11	FL valve (In)	Front left valve (In)	
12	FR valve (In)	Front right valve (In)	
13	RL valve (In)	Rear left valve (In)	
14	RR valve (In)	Rear right valve (In)	
15	FL valve (Out)	Front left valve (Out)	
16	FR valve (Out)	Front right valve (Out)	
17	RL valve (Out)	Rear left valve (Out)	
18	RR valve (Out)	Rear right valve (Out)	

FAILSAFE SPECIFICATION

Detect timing A : Initial check mode B : Out of control C : ABS control mode D : EBD control mode E : Diagnostic mode

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing				
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E
1	C1101	Power supply	Over voltage of VIGN	When VIGN>18V continue 224ms, ECU detects the failure.	All wheel inhibit	All wheel inhibit	All wheel inhibit	VIGN < 17V	○	○	○	○	○	○	
	C1102		Voltage drop of VIGN	When VIGN<9V or VREF<9V continues 224ms, ECU detects the failure.	ABS inhibit (permit EBD control)	Continue EBD control	ABS inhibit	VIGN>10V and VREF>10V continue 224ms. But in case of ABS control mode, all wheels inhibit until end of ABS control.	○	-	○	○	○	○	
			Voltage drop of VIGN (EBD inhibit)	When VIGN<7.5V or VREF<7.5V continues 70ms, ECU detects the failure.	All wheel inhibit	All wheel inhibit	All wheel inhibit	VIGN>9V and VREF>9V continue 70ms	○	○					
2	C1604	Actuator	Interruption or short circuit of actuator	Master CPU always sends a test pulse (about 200s) to valves, and feedback signal returns into master and slave CPU. When feedback signal is not equal to test signal, CPU recognizes the actuator failure. Monitoring time is 56ms. If the CPU detects a voltage drop or overvoltage, failure of the actuator is not detected.	System down	System down	System down	Restart	○	○	○	○	○	○	
	C2112	Main relay	Interruption or short circuit of main relay												

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing					
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E	
3	C1604	Main relay	Interruption or short circuit of inhibit signal	With the initial check, the main CPU checks the functions of sub CPU inhibit signal and custom IC inhibit circuit.	System down	-	-	Restart	○	○	○					
			Interruption or short circuit of main relay	1) IG-SW ECU checks VREF just after IGN-SW ON, and detects the failure.	System down	-	-	Restart	○	○	○					
	C112		When voltage is below for 224ms, ECU detects the failure. But if the ECU detects a voltage drop or overvoltage, the failure is not detected.	System down	System down	System down	Restart	○	○	○	○	○	○	○		
4	FL : C1200 FR : C1203 RL : C1206 RR : C1209	Wheel speed sensor	Interruption or short circuit of wheel speed sensor	The CPU detects the failure by checking voltage of the wheel speed sensor with a velocity of 0km/h. Sensor voltage is below 0.4V or over 2.7V Monitoring time=196ms	Management A	Management B	Management C	Restart	○	○ *a	○	○	○	○		

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing				
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E
4	FL : C1201 FR : C1204 RL : C1207 RR : C1210	Wheel speed sensor	Intermittent interruptions or short circuit of sensor. Defect of air gap, or sensor wheels, or clearance of bearing	After wheel velocity changes over 30km/h per 7ms (over 120G), if there is the difference between calibrated wheel velocity and monitoring velocity continuously beyond the constant, ECU detects the failure.	Management B	Management B	Management C	To meet EC regulations, all wheel sensing inhibits and ABS warning lamp turns on until vehicle velocity > 20km/h after restart.	O	O *a	O	O	O	O	
	FL : C1202 FR : C1205 RL : C1208 RR : C1211		Missing sensor signal Too large air gap Sensor wheel is not installed	When starting the vehicle, ECU detects the following conditions. 1. $V_{MAX} \geq 40\text{km/h}$ and $V_{ref} \leq 0.6 \times V_{MAX}$ Monitoring time 120s. 2. Within the range of 7 to 20km/h, if the wheel speed sensor reports 6 km/h continuously, the ECU will report a failure for that wheel. 3. If the vehicle speed is over 20km/h for 120 seconds but the wheel speed sensor reports 6km/h continuously for 120 seconds, the ECU will report failure for that wheel.	Management B	Management B	Management C	To meet EC regulations, all wheel sensing inhibits and ABS warning lamp turns on until vehicle velocity > 20km/h after restart.	O	O *a	O	O	O		
					Management B	-	-				O				
					Management B	-	-				O				
			Too large air gap Long term EMI	In ABS control, if the pressure decrease mode and hold mode continue, for 14sec., ECU detects the failure.	-	-	Management C	To meet EC regulations, all wheel sensing inhibits and ABS warning lamp turns on until vehicle velocity > 20km/h after restart.	O	O *a		O			
C1604	Defect of clearance of bearing EMI/IGN noise	When there are over 32 pulses from the wheel sensor within 7ms, ECU detects the failure.	System down	System down	System down	Restart	O	O	O	O	O	O			

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing								
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E				
5	C2402	Motor Motor relay	Interruption or short circuit of motor/motor relay	Monitoring VMS, ECU detects the failure. <table border="1" style="margin-left: 20px;"> <tr> <td>over 6.5V</td> <td>1785ms</td> </tr> <tr> <td>below 6.5V</td> <td>196ms</td> </tr> </table> <p>When VIGN is unusual, ECU does not detect the failure.</p>	over 6.5V	1785ms	below 6.5V	196ms	ABS inhibit (permit EBD control)	Continue EBD control	ABS inhibit	If ECU detects the failure of motor relay output ON or motor lock(see 7-(2)), after checking main relay failure at initial check, ECU unconditionally checks motor and motor relay with motor ON for 560ms. If ECU detects motor lock, ECU repeats the same check. After that, in case of an unusual condition, ECU recognizes the failure. This step meets the EC regulation.	O	-	O	O	O	O	
			over 6.5V	1785ms															
			below 6.5V	196ms															
Interruption of motor Motor lock	1. Monitoring decrease of Vms, ECU detects the failure. Monitoring Vms every 7ms after the, motor relay output changes from ON to OFF. It is recognized as normal condition in case that ECU detects Vms>5V over 6 times. If it is abnormal, ECU does the same check again with motor ON for 560ms. If it is abnormal again, ECU repeats the same process with motor ON for 553ms. After that, if the state is abnormal again, ECU recognizes the failure. After initial check, in case that more than predetermined acceleration continues for a fixed period, ECU checks in the same way as the above, with motor ON for 560ms. If that is abnormal, motor ON for 553ms and ECU repeats the same process. After that, in case of abnormal condition, ECU recognizes the failure. If VIGN is abnormal, ECU does not detect the failure.	O	O	O	O														
Failure of motor relay circuit / motor relay over current	By comparing the voltage of the motor relay monitor and DIAG signal output from the custom IC, ECU detects the failure. But ECU does not check the failure for 1000ms from the time the motor is turned off.	O	O	O	O														
							Restart			O	O	O	O						

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing						
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E		
6	C1604	ECU	CPU failure	1. When ECU starts, main and sub CPU execute the following checks : a) ECU checks the value of the result of fixed multiplications, whether it becomes the value decided in advance or not. b) ECU executes read/write for RAM. c) ECU executes sum check of ROM.	System down	System down	System down	Restart	○	○	○					○	
				2. IGN After IGN ON, main and sub CPU communicate each other for synchronization. When one or the other CPU can't synchronize within 1sec., the main CPU shuts system down and sub CPU stops running.	System down	System down	System down	Restart	○	○	○						○
				3. Main and sub CPU always execute the following checks. ECU checks whether the program is finished or not	System down	System down	System down	Restart	○	○	○	○	○	○	○	○	○

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management			Conditions for Restoration	ABS W/L	EBD W/L	Detect timing				
					Out of control	EBD control mode	ABS control mode				A	B	C	D	E
6	C1604	ECU	CPU failure	4. In every program cycle, the main CPU and sub CPU communicate with each other for synchronization. When one or the other can't synchronize within 300 μ sec, main CPU shuts the system down and sub CPU stops running.	System down	System down	System down	Restart	○	○	○	○	○	○	○
				5. Sub CPU checks the following : a) Sub CPU always compares the result of analog sent by main CPU with the result of data calculated by sub CPU, in case that there is a difference above 7 bits for 112ms, ECU recognizes the failure. b) In case that wheel velocity of FL calculated by main CPU is different from that calculated by sub CPU above 10km/h for 504ms, ECU recognizes the failure. c) Sub CPU calculates the slip from Vref calculated by main CPU and wheel velocity of FL calculated by sub CPU. ECU recognizes a failure when the main CPU judges ABS phase as pressure decrease phase for 1sec. with no slip calculated by sub CPU break. d)When the main CPU does not judge ABS phase as pressure decrease phase, in that case the main CPU sets the valves as pressure decrease state for 1 sec., ECU recognizes the failure. e)When main CPU judges ABS phase as out of ABS control, in which case the valve driven information from main CPU is in a pressure hold state for 1 sec., ECU recognizes the failure.	System down	System down	System down	Restart	○	○	○	○	○	○	○

*1 In case of main relay ON only

*2 In case of motor initial check only, ECU detects the failure of motor relay output ON.

*3 In case of motor initial check only

*4 In case of over two wheels failure

Management A

Conditions	Management
$V_{max} > 5\text{km/h}$	Management B
$V_{max} < 5\text{km/h}$	One front wheel failure detected causes ABS inhibit
	One rear wheel or more than two wheels failure causes all wheels to inhibit ABS

Management B

Conditions	Management
Failure of one wheel	ABS inhibit (permit EBD control)
Failure of over two wheels	System down

Management C

Conditions Management	Management
Failure of one front wheel	ECU discontinues ABS control of defective wheel and continues ABS control of normal wheels. ABS inhibit after end of ABS control.
Failure of two front wheels	ECU discontinues ABS control of defective wheel and continues ABS control of normal wheels. System down after end of ABS control.
Failure of one rear wheel	ECU continues ABS control of rear wheels using information of normal rear wheel and front wheels. System down after end of ABS control.
Failure of two rear wheels	System down
Failure of one front wheel and one rear wheel	ECU discontinues ABS control of defective front wheel, and continues rear wheels using information of normal rear wheel. System down after end of ABS control.
Failure of over three wheels	System down

ADDITIONAL EXPLANATION OF FAILSAFE

1. Warning lamp initial lighting time

- 1) Immediately after IG-SW ON, warning lamp is lit for 3 sec. This term is called 'warning lamp initial lighting time'.
- 2) Within this term, in case that the ECM detects the failure, warning lamp is lighted continuously.

NOTE

1. System down

The system changes to normal braking with warning lamp ON after detecting the failure by its software. ECM restart is caused by IG-SW OFF → ON once.

After the failure is corrected, the ECM returns a to normal mode with warning lamp OFF.

2. All wheel inhibit

ECM discontinues ABS control of all wheels. (Equivalent to normal brake)

When the failure is corrected, it returns to normal mode with warning lamp OFF.

(But during ABS control, it does not return to a normal mode.)

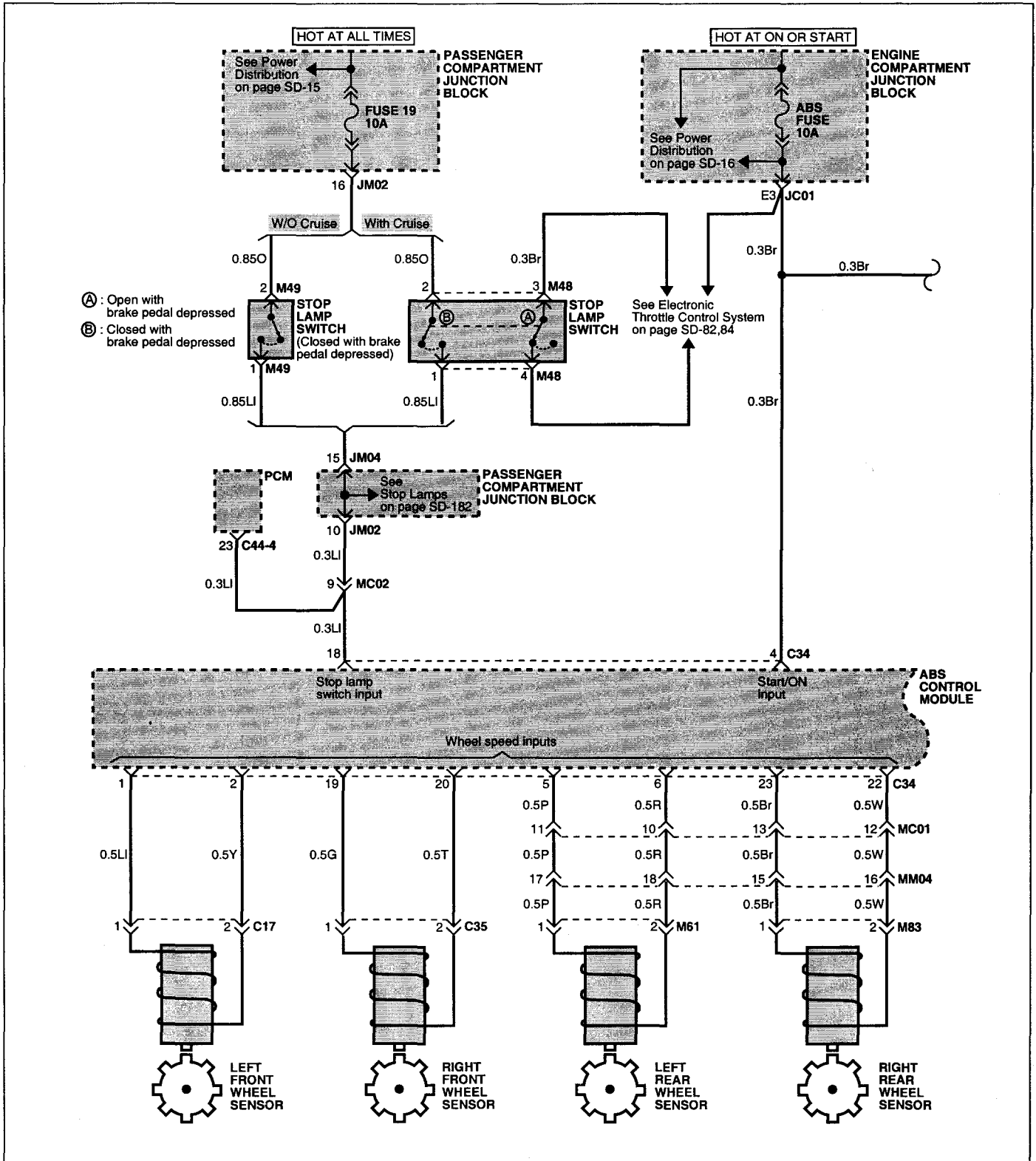
TERM COMMENTARY

VIGN : Terminal voltage of IGN, VREF : Terminal voltage of REF

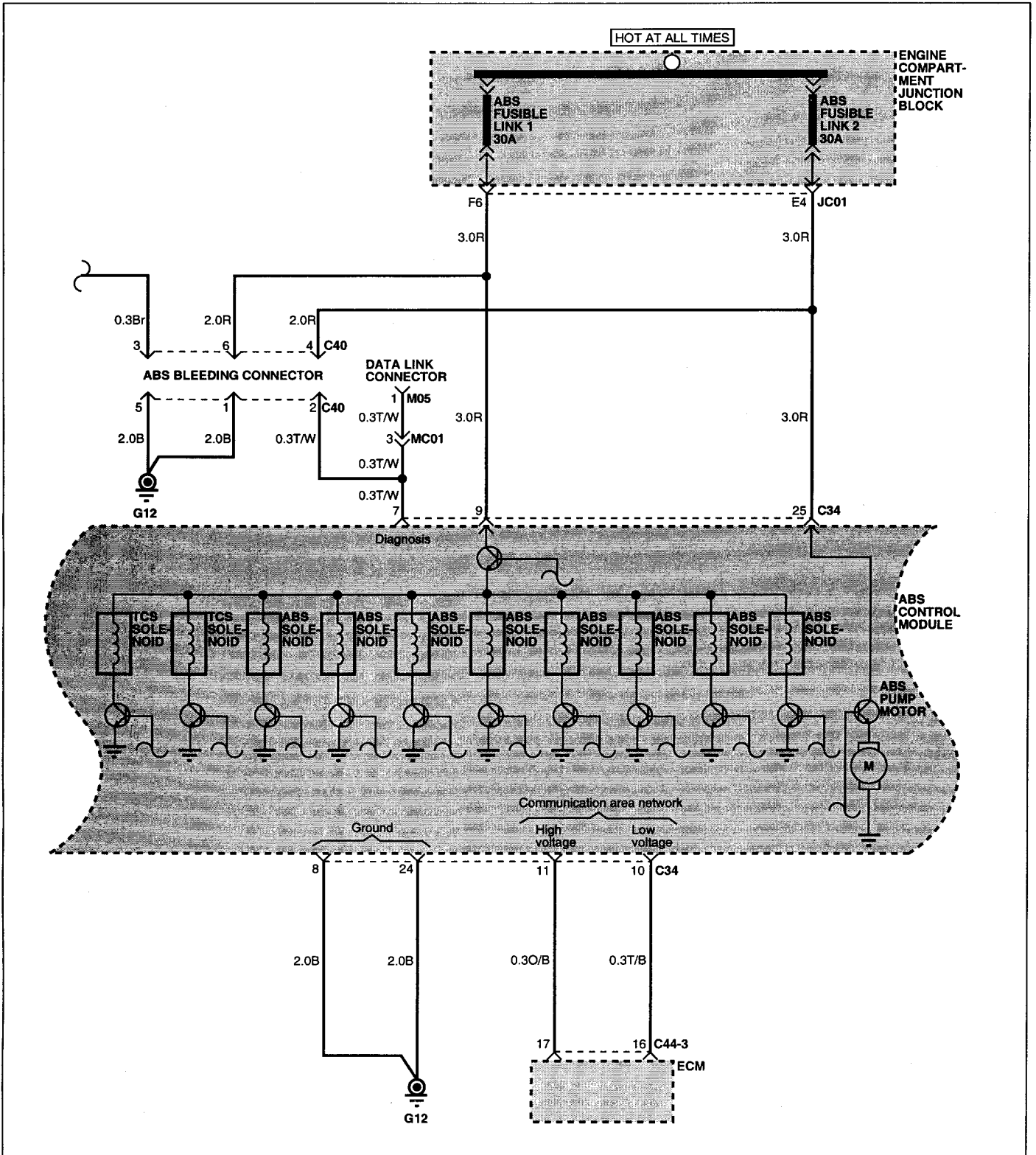
VMAX : Maximum wheel velocity, Vref : estimated vehicle velocity

SCHEMATIC DIAGRAM EJB2650

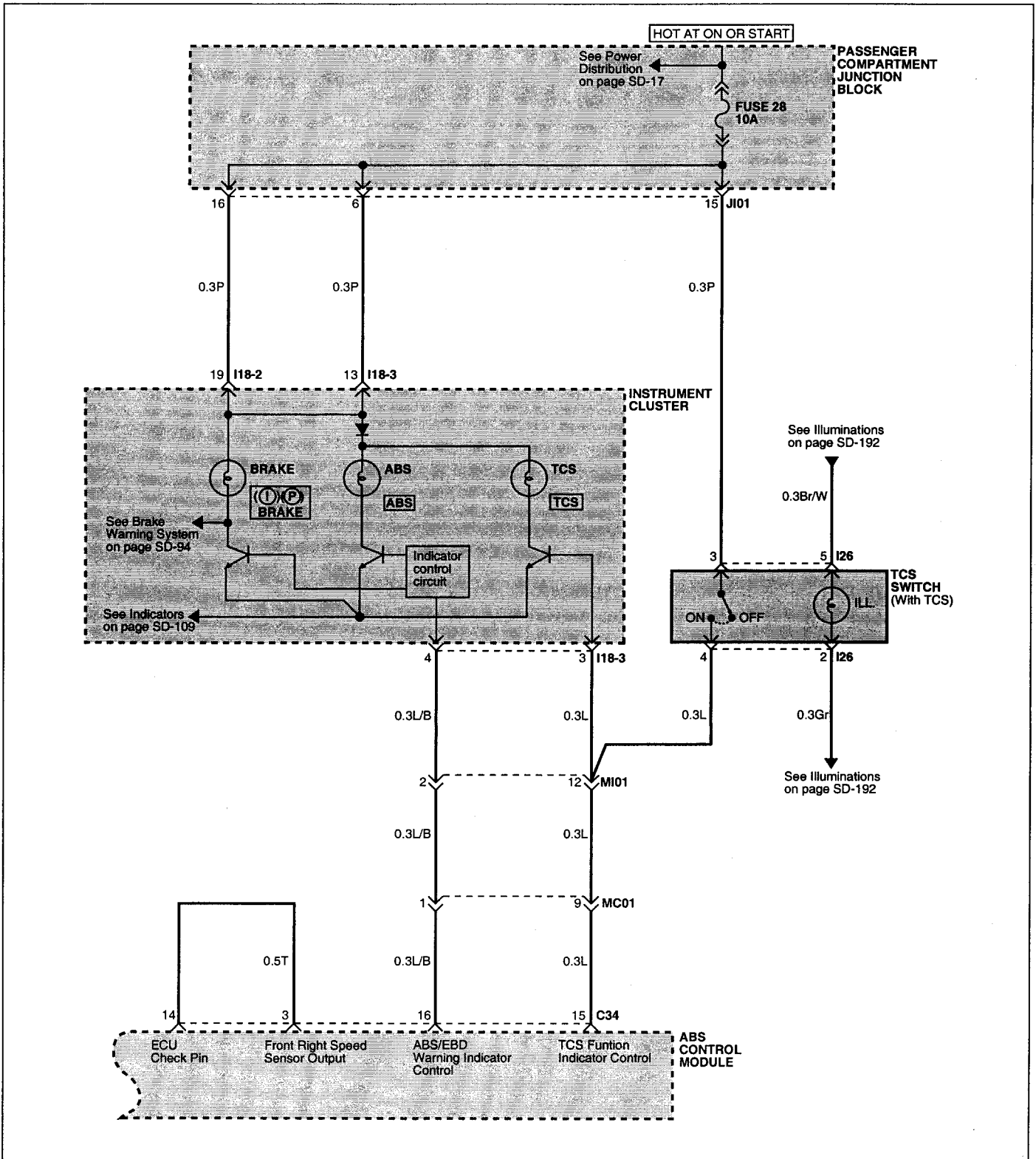
ABS CIRCUIT (1)



ABS CIRCUIT (2)



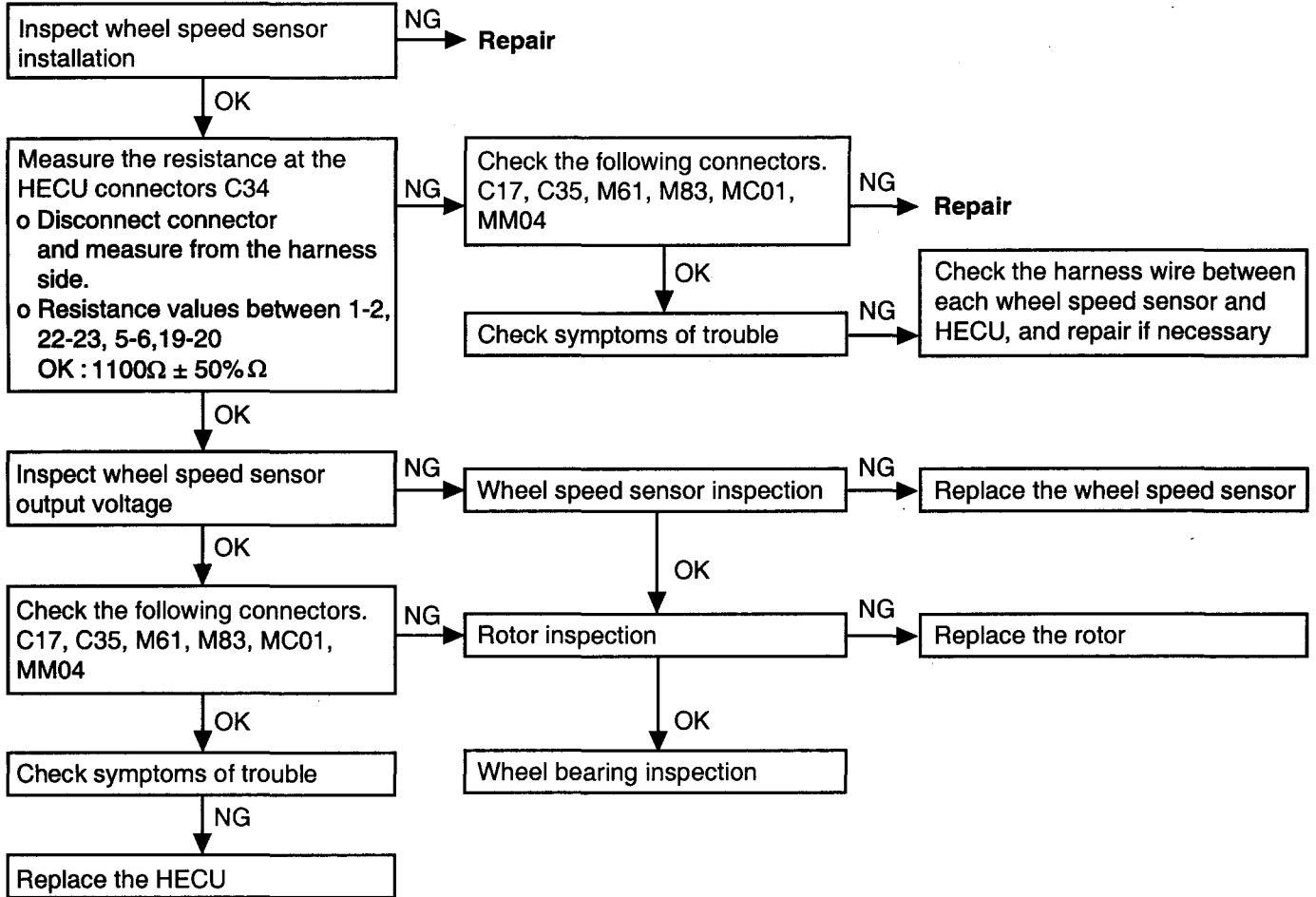
ABS CIRCUIT (3)



**INSPECTION PROCEDURE FOR
DIAGNOSTIC TROUBLE CODES**

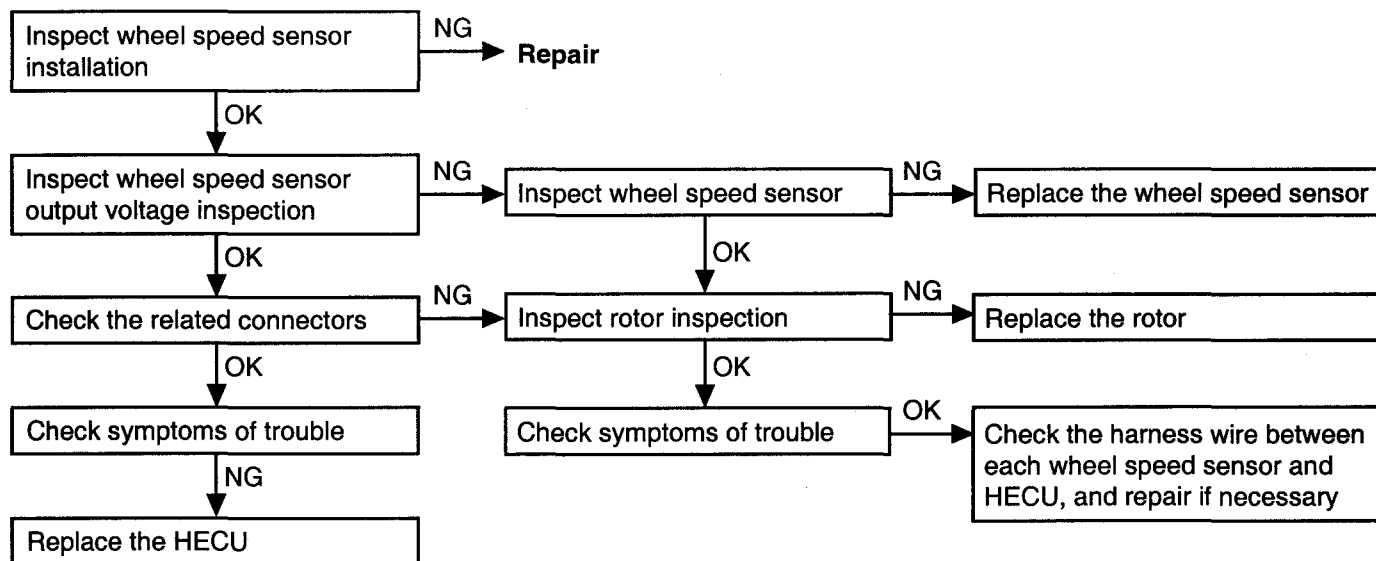
EJBB2700

<p>DTC No. C1200, C1203, C1206, C1209 Wheel speed sensor open or short to GND circuit</p>	<p>Probable cause</p>
<p>The HECU determines that an open or short circuit has occurred in more than one wire of the wheel speed sensors</p>	<ul style="list-style-type: none"> • Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of HECU



EJBB2750

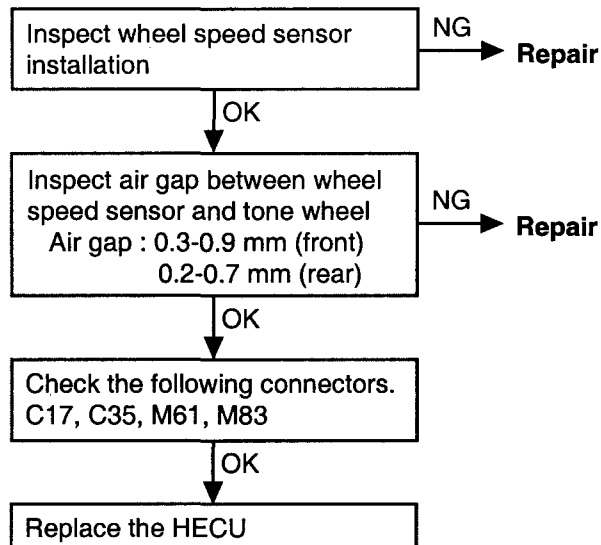
DTC No. C1201, C1204, C1207, C1210 (Speed jump or wrong exciter)	Probable cause
A wheel speed sensor outputs an abnormal signal (other than an open short-circuit).	<ul style="list-style-type: none"> • Improper installation of wheel speed sensor • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of wiring harness or connector • Malfunction of HECU



EJBB275A

EJBB2800

DTC No. C1202, C1205, C1208, C1211 (Large air gap)	Probable cause
A wheel speed sensor outputs no signal	<ul style="list-style-type: none"> • Malfunction of wheel speed sensor • Improper installation of wheel speed sensor • Malfunction of rotor (excitor) • Malfunction of wiring harness or connector • Malfunction of HECU



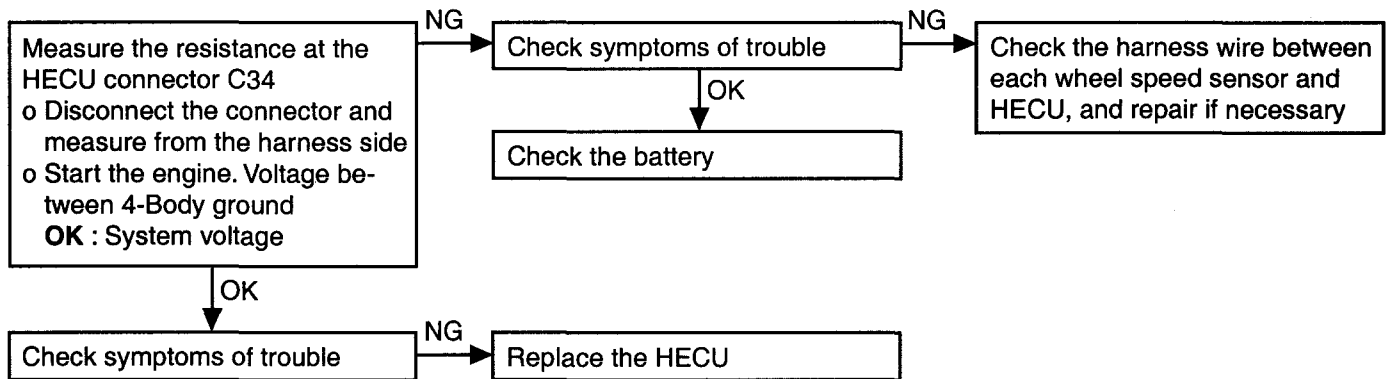
EJBB280A

EJBB2850

DTC No. C1101, C1102 Voltage out of range (Low and over voltage)	Probable cause
The voltage of the HECU power supply drops lower than or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	<ul style="list-style-type: none"> • Malfunction of wiring harness or connector • Malfunction of HECU.

⚠ CAUTION

If battery voltage drops or rises during inspection, this code will be output as well. If the voltage returns to the standard value, the code is no longer output. Before carrying out the following inspection, check the battery level and refill if necessary.



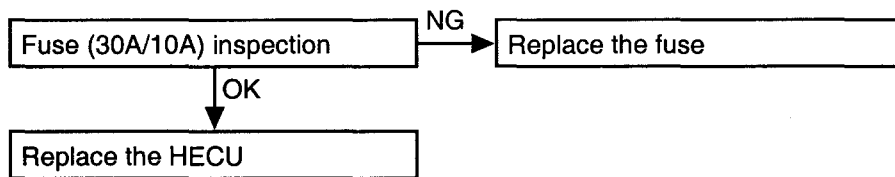
EJBB285A

EJHA2900

DTC No. C1604 ECU Hardware (EEPROM and ECU failure)	Probable cause
The HECU always monitors the solenoid valve drive circuit. It determines that there is an open or short-circuit in the solenoid coil or in a harness even if no current flows in the solenoid or through the HECU.	<ul style="list-style-type: none"> • Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of HECU

EJHA2950

DTC No. C2112 Valve relay (Including fuse failure)	Probable cause
<p>When the ignition switch is turned ON, the HECU switches the valve relay off and on during the initial check. In that way, the HECU compares the signals sent to the valve relay with the voltage in the valve power monitor line. That is how to check if the valve relay is operating normally. The HECU always checks if current flows in the valve power monitor line. It determines that there is an open circuit when no current flows. If no current flows in the valve power monitor line, this diagnosis code is output.</p>	<ul style="list-style-type: none">• Malfunction of wiring harness or connector• Malfunction of HECU

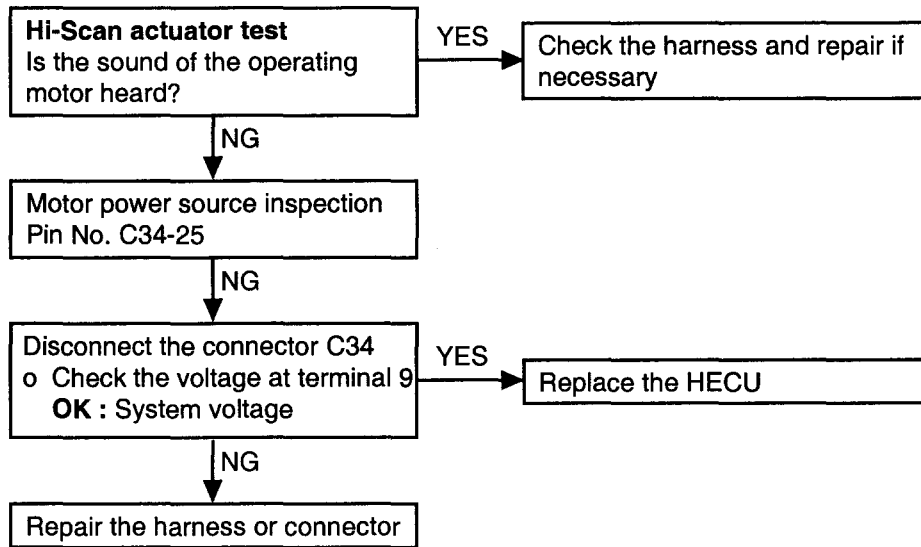


EJBB3000

DTC No. C2402 Electrical (Motor relay, motor)	Probable cause
When the motor power line is normal but no signal is input to the motor monitor line, it is abnormal.	<ul style="list-style-type: none"> • Malfunction of hydraulic unit • Malfunction of HECU

⚠ CAUTION

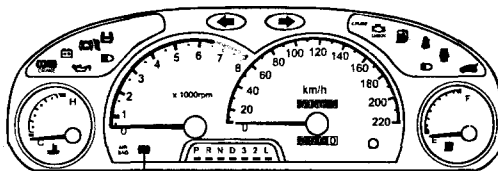
Because powering of the motor with the Hi-Scan or Hi-Scan Pro 3 will discharge the battery, the engine should be run for a while after testing is completed.



ABS WARNING LAMP INSPECTION EJHA3050

Check that the ABS warning lamp illuminates as follows.

When the ignition key is turned "ON", the ABS warning lamp comes on for approximately 2 seconds and then goes out.



ABS

ERHA003A

INSPECTION CHART FOR TROUBLE SYMPTOMS EJHA3100

Find out the symptoms and check according to the inspection procedure chart.

Trouble system		Inspection procedure No.
Communication with Hi-Scan is not possible	Communication with any system is not possible.	1
	Communication with ABS only is not possible.	2
When the ignition key is turned "ON" (engine stopped), the ABS warning lamp does not illuminate.		3
After the engine starts, the lamp remains illuminated.		4
Faulty ABS operation	Unequal braking power on both sides	5
	Insufficient braking power	
	ABS operates under normal braking conditions	
	ABS operates before vehicle stops under normal braking conditions	
	Large brake pedal vibration (Caution 2.)	-

 **CAUTION**

During ABS operation, the brake pedal may vibrate or may not be able to be depressed. Such phenomena are due to intermittent changes in hydraulic pressure inside the brake line to prevent the wheels from locking and is not an abnormality.

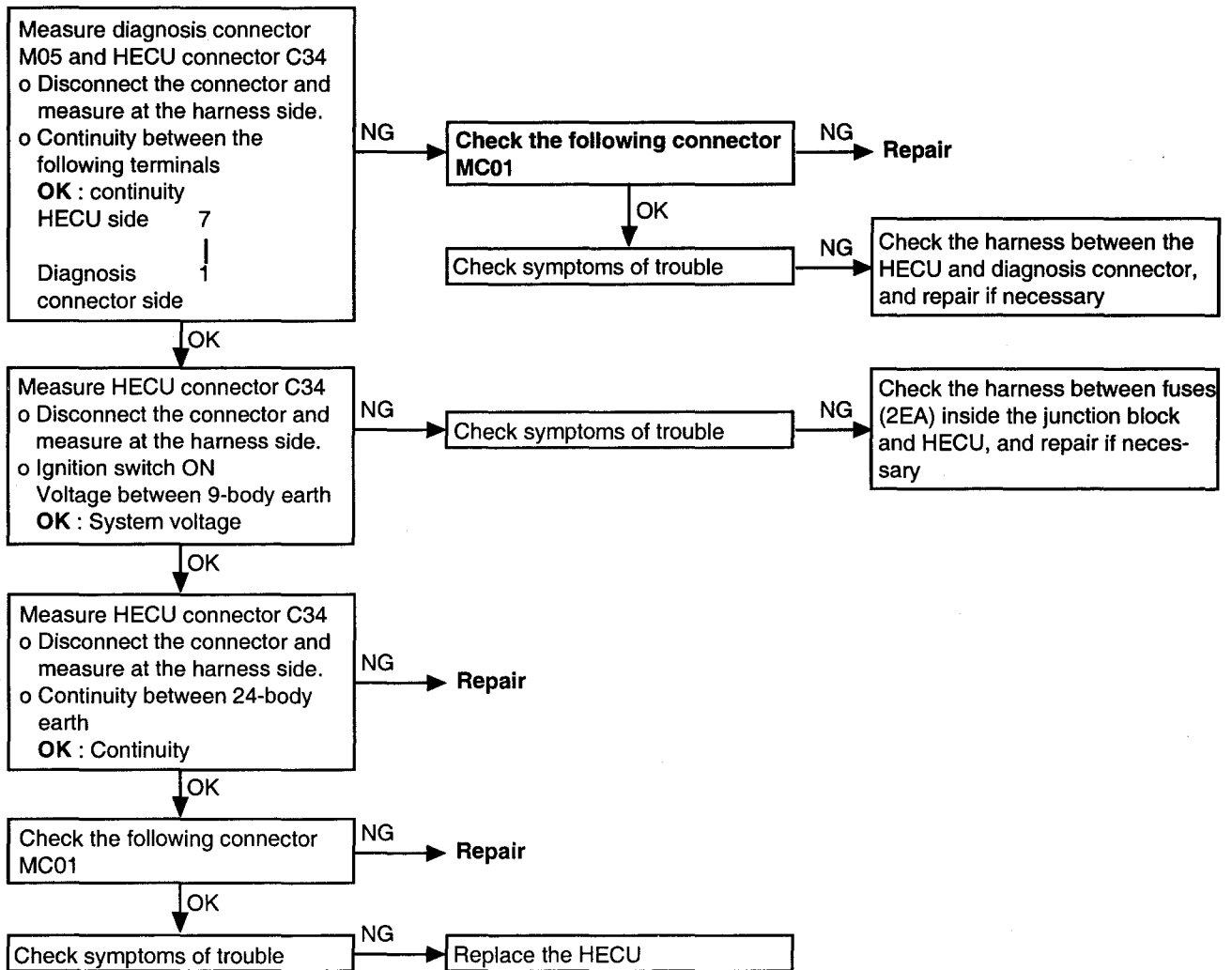
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS EJB83150

INSPECTION PROCEDURE 1

Communication with Hi-Scan is not possible. (Communication with all systems is not possible.)	Probable cause
The reason is probably a defect in the power supply system (including ground) for the diagnosis line.	<ul style="list-style-type: none"> • Malfunction of connector • Malfunction of wiring harness

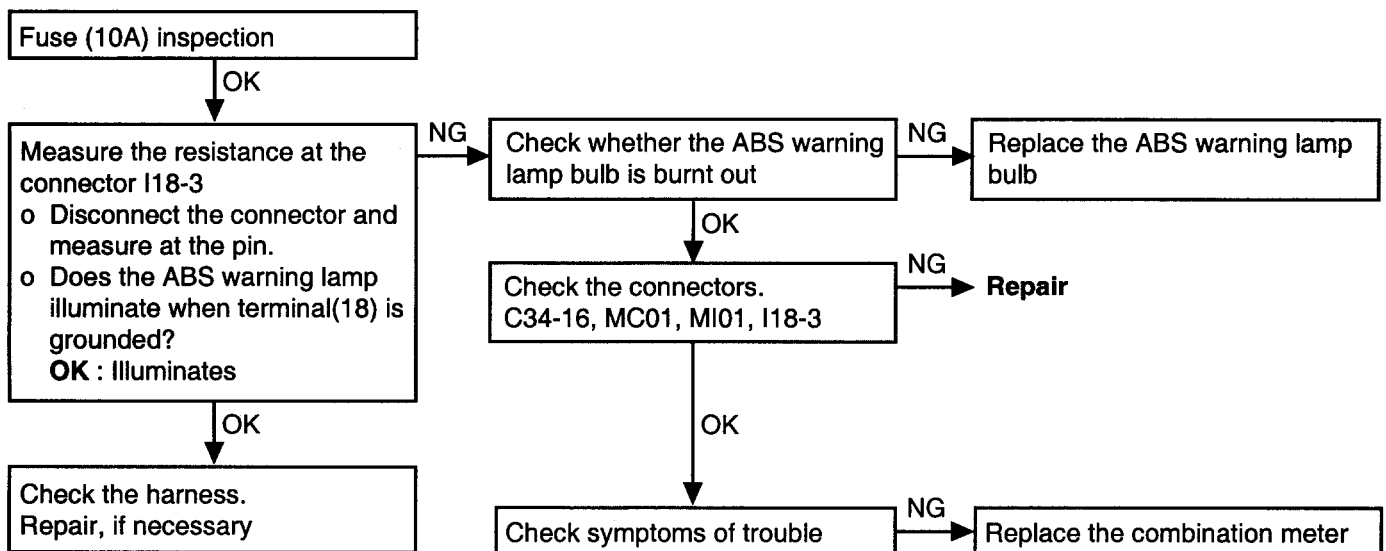
INSPECTION PROCEDURE 2

Communication with Hi-Scan is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with Hi-Scan is not possible, the cause is probably an open circuit in the HECU power circuit or an open circuit in the diagnosis output circuit.	<ul style="list-style-type: none"> • Blown fuse • Malfunction of wiring harness or connector • Malfunction of HECU



INSPECTION PROCEDURE 3

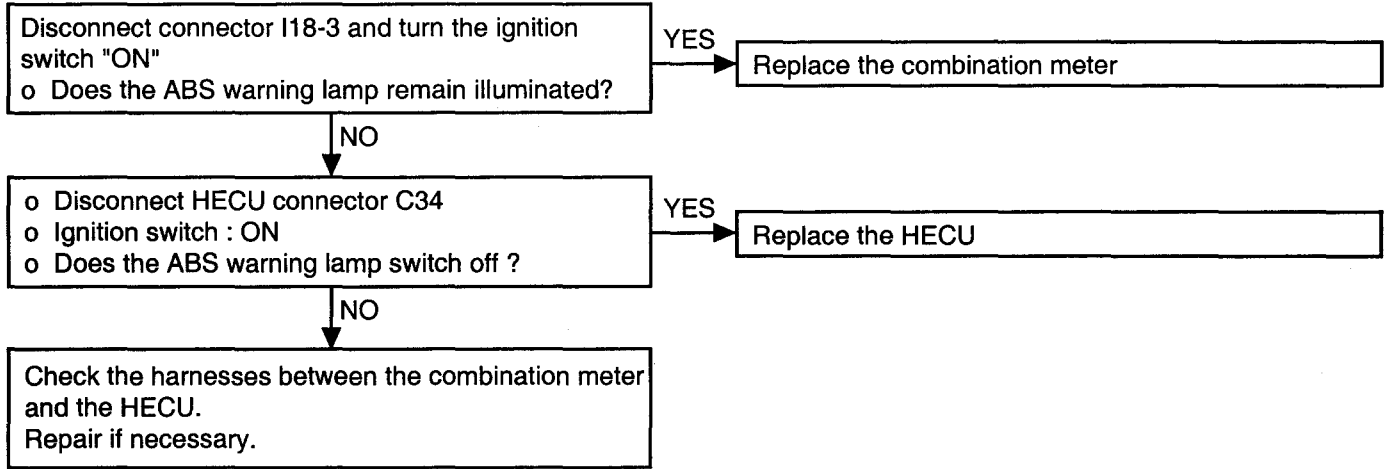
When the ignition key is turned "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
<p>When current flows through the HECU, the ABS relay turns from on to off as the initial check. The ABS warning lamp will illuminate when the ABS relay is "Off" even if there is a problem with the circuit between the ABS warning lamp and the HECU.</p> <p>Therefore, if the lamp does not illuminate, the cause may be an open circuit in the lamp power supply circuit, a blown bulb, or an open circuit in both the circuits between the ABS warning lamp and the HECU and in the circuit between the ABS warning lamp and the ABS relay.</p>	<ul style="list-style-type: none"> • Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector



INSPECTION PROCEDURE 4

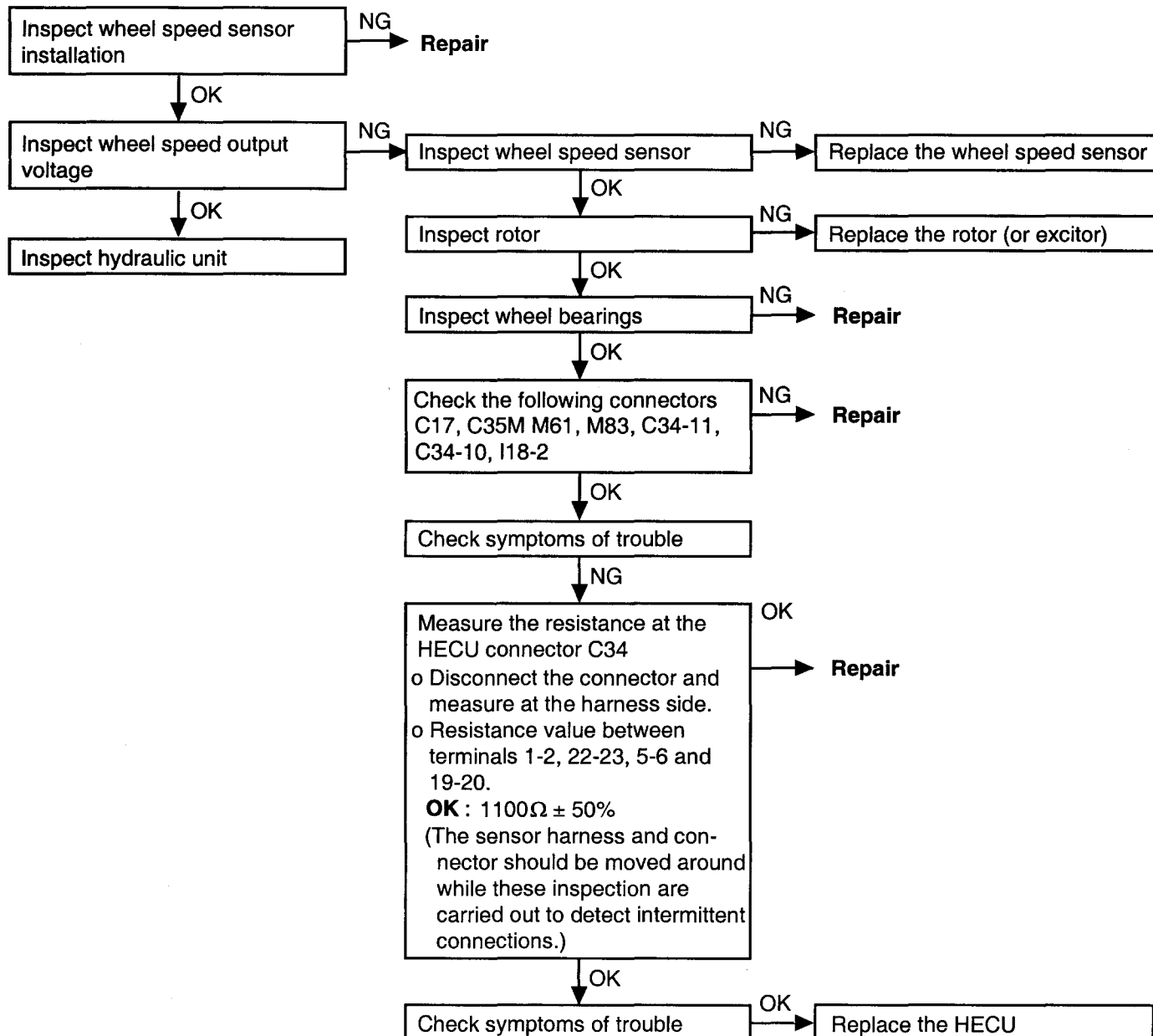
Even after the engine is started, the ABS warning lamp remains illuminated	Probable cause
The cause is probably a short-circuit in the ABS warning lamp illumination circuit	<ul style="list-style-type: none"> • Malfunction of combination meter • Malfunction of HECU • Malfunction of wiring harness

This trouble symptom is limited to cases where communication with the Hi-Scan is possible (HECU power supply is normal) and the diagnosis code is normal.



INSPECTION PROCEDURE 5

Brake operation is abnormal	Probable cause	
This varies depending on driving conditions and road surface conditions, so problem diagnosis is difficult. However, if a normal diagnosis code is displayed, carry out the following inspection.	<ul style="list-style-type: none"> • Improper installation of wheel speed sensor • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor 	<ul style="list-style-type: none"> • Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of HECU



BLEEDING OF BRAKE SYSTEM EJBB3560

This procedure should be used to insure adequate bleeding and filling of ABS unit, brake lines, master cylinder.

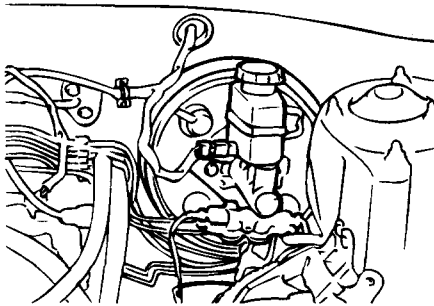
1. Remove the reservoir cap and fill the brake reservoir with brake fluid.

CAUTION

Do not allow brake fluid remain on a painted surface. Wash it off immediately.

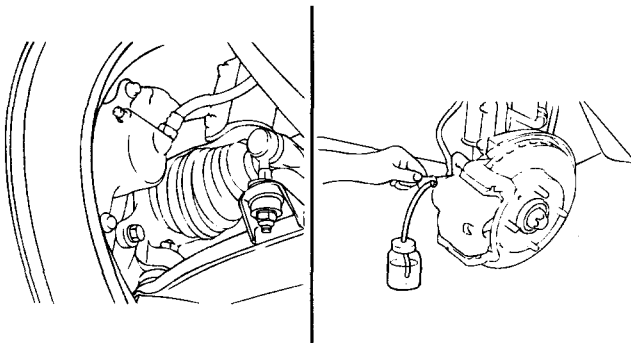
NOTE

*When bleeding by pressured fluid, do not depress the brake pedal.
Recommended fluid.....DOT3 or equivalent*



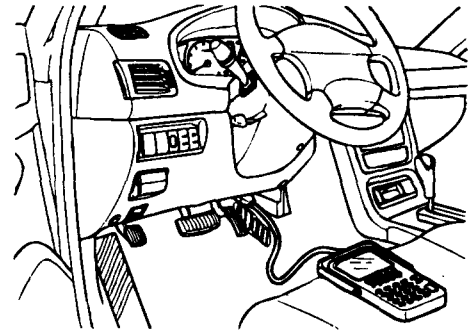
EJA9003A

2. Connect the clear plastic tube to the wheel cylinder bleeder plug and insert the other end of tube in a half filled clear plastic bottle.



EJBB356A

3. Connect Hi-Scan to Data Link Connector located underneath the dash panel.



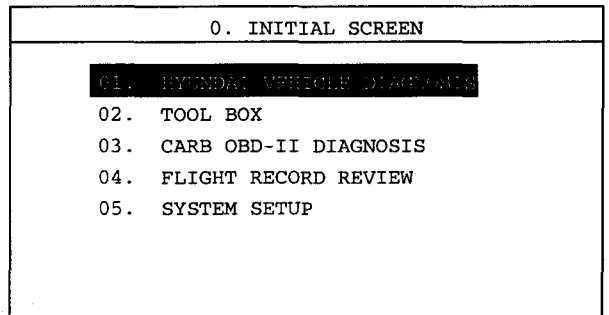
EJBB356B

4. Select and operate according to the instruction on the Hi-Scan screen.

CAUTION

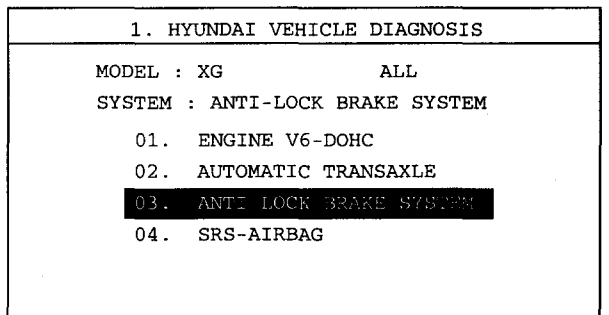
You have to obey maximum operating time (60sec) of ABS motor with Hi-Scan to prevent motor pump burnt.

- 1) Select hyundai vehicle diagnosis.



EJBB356C

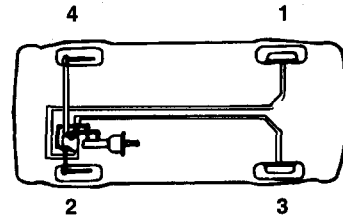
- 2) Select Anti-Lock brake system.



EJBB356D

- 3) Select air bleeding mode.

1. HYUNDAI VEHICLE DIAGNOSIS	
MODEL :	XG ALL
SYSTEM :	ANTI-LOCK BRAKE SYSTEM
01.	DIAGNOSTIC TROUBLE CODES
02.	CURRENT DATA
03.	FLIGHT RECORD
04.	ACTUATION TEST
05.	SIMU-SCAN
	1.6 AIR BLEEDING MODE



EJBB356E

EJA9004A

- 4) Press 'YES' to operate motor pump and solenoid valve.

1.6 AIR BLEEDING MODE	
ABS AIR BLEEDING STATUS	
0.1	SOLENOID VALVE STATUS CLOSE
02.	MOTOR PUMP STATUS OFF
DO YOU WANT TO START ?	
(PRESS [YES] KEY)	

EJBB356F

- 5) 'ON' and 'OFF' controls are automatically performed to prevent the motor pump from being burnt. (If not, you may damage the motor)

1.6 AIR BLEEDING MODE	
ABS AIR BLEEDING STATUS	
0.1	SOLENOID VALVE STATUS OPEN
02.	MOTOR PUMP STATUS ON
TIME : 2SEC	

EJBB356G

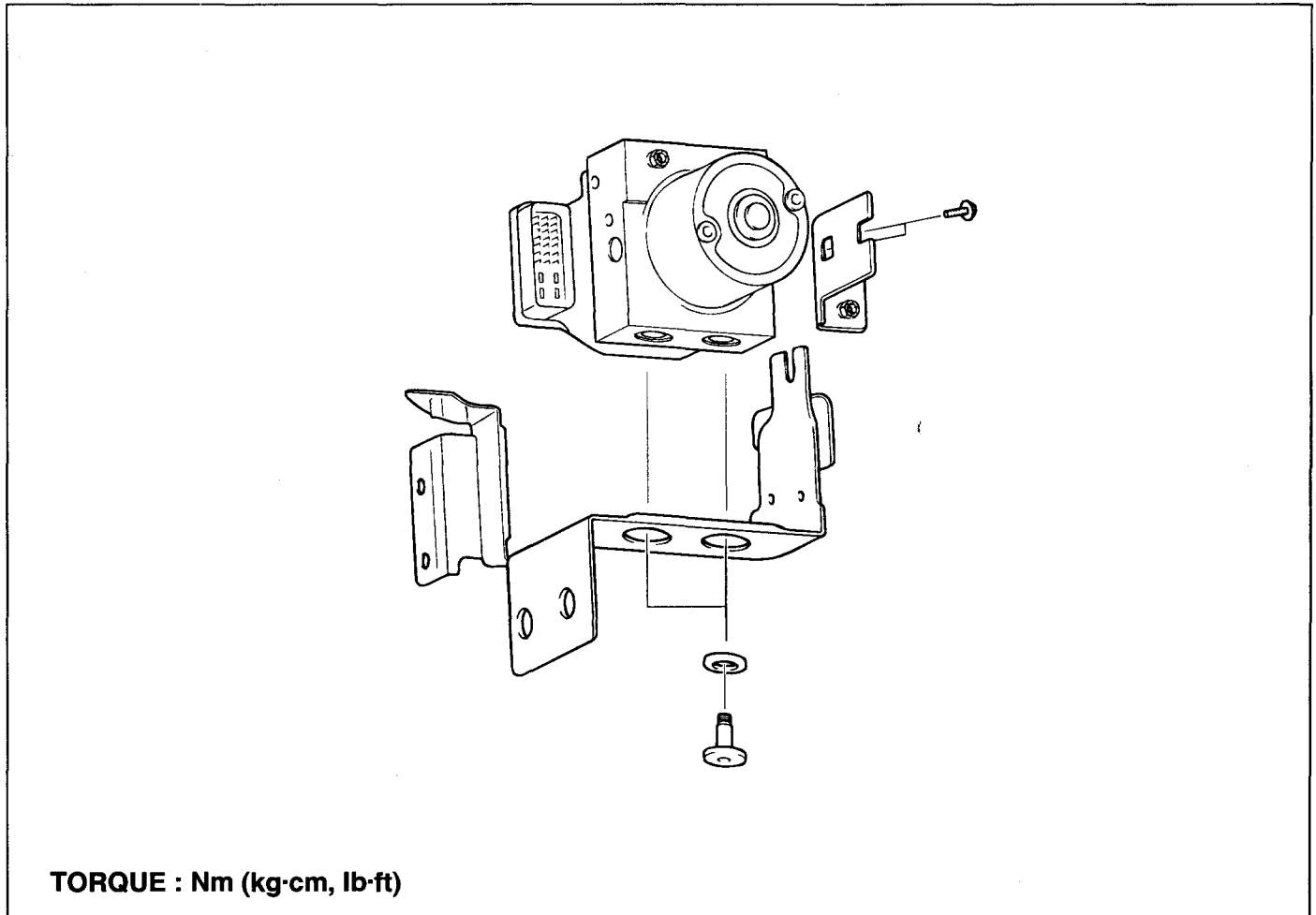
5. Pump the brake pedal several times, and then loosen the bleeder screw until fluid starts to run out without bubbles. Then close the bleeder screw.
6. Repeat the step 5. until there are no more bubbles in the fluid for each wheel in the sequence shown in the illustration.
7. Tighten the bleeder screw.

Bleeder screw tightening torque

7-9 Nm (70-90 kg-cm, 5-6.6 lb-ft)

ANTI-LOCK BRAKING SYSTEM CONTROL MODULE

COMPONENTS EJHA3200

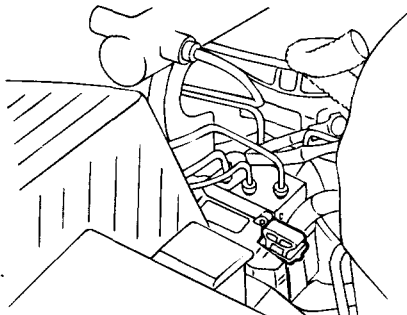


TORQUE : Nm (kg-cm, lb-ft)

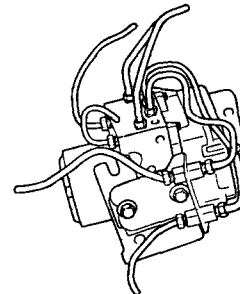
EJHA040A

REMOVAL EJHA3250

1. Disconnect the HECU (Hydraulic and electronic Control Unit) and motor connector.



EJHA022A



EJHA045A

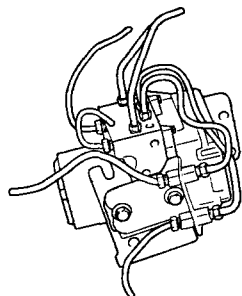
3. Remove the HECU bracket mounting bolt and the HECU.

! CAUTION

1. **Never attempt to disassemble the HECU.**

2. Disconnect the brake lines from the HECU.

2. *The HECU must be transported and stored in the upright position and with sealed ports. The HECU must not be drained.*



EJHA045A

INSTALLATION

EJHA3300

1. Follow the reverse order for removal.
2. Tighten the modulator mounting bolts and brake tube nuts to the specified torque.

Tightening torque

HECU mounting bolt :

8-10 Nm (80-100 kg·cm, 5.6-6.9 lb·ft)

Brake tube nut :

13-17 Nm (130-170 kg·cm, 9-12 lb·ft)

ANTI-LOCK BRAKING SYSTEM MODULATOR

HYDRAULIC MODULE INSPECTION EJHA3600

 **CAUTION**

Turn the ignition switch off before connecting or disconnecting the Hi-Scan.

1. Jack the vehicle up and support the vehicle with rigid racks at the specified jack-up points or replace the wheels which are checked on the rollers of the braking force tester.

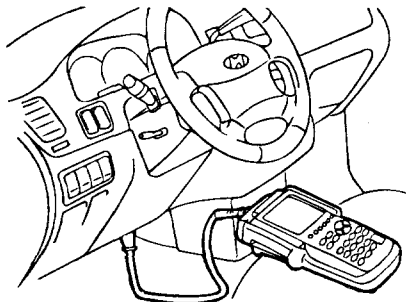
 **CAUTION**

1. *The roller of the braking force tester and the tire should be dry during testing.*
2. *When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.*
2. Release the parking brake and feel the drag force (drag torque) on each road wheel.
When using the braking force tester, take a reading of the brake drag force.
3. Turn the ignition key "OFF" and set the Hi-Scan or Hi-Scan Pro as shown in the diagram.
4. After checking that the shift lever <M/T> or the selector lever <A/T> is in neutral, start the engine.

 **NOTE**

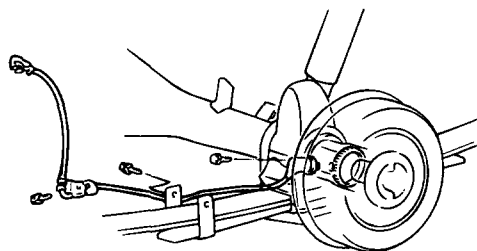
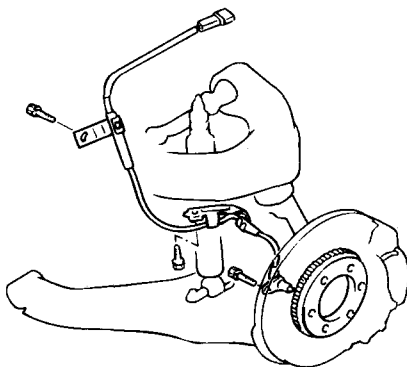
If the ABS is in fail-safe mode, the Hi-Scan actuator test cannot be used.

5. Use the Hi-Scan to force-drive the ABS actuator.



ANTI-LOCK BRAKING SYSTEM WHEEL SPEED SENSOR

COMPONENTS EJHA3350



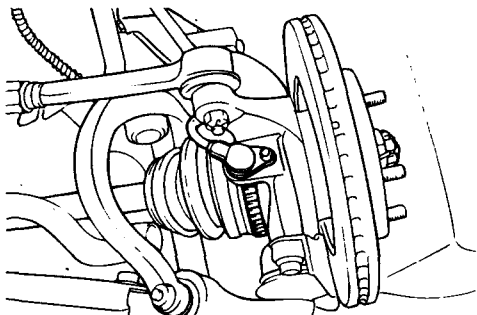
TORQUE : Nm (kg-cm, lb-ft)

EJHA055A

REMOVAL EJHA3400

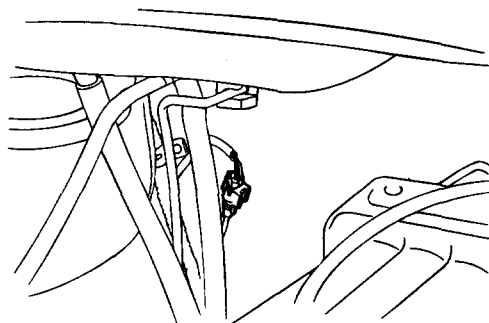
FRONT WHEEL SPEED SENSOR

1. Remove the front wheel speed sensor mounting bolt.



KFW8059A

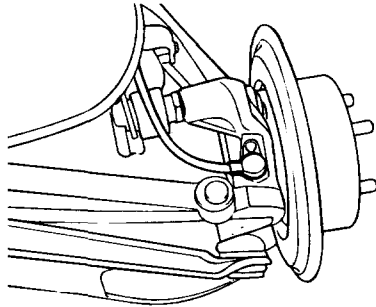
2. Remove the front wheel speed sensor after disconnecting the wheel speed sensor connector.



EJHA023B

REAR WHEEL SPEED SENSOR

Remove the rear wheel speed sensor after disconnecting the wheel speed sensor connector.



KFW8060A

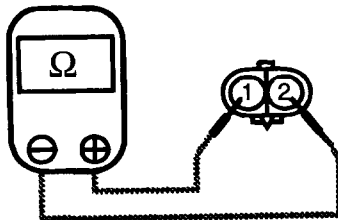
INSPECTION EJBB3450

1. Connect an ohmmeter between the wheel speed sensor terminals and measure the resistance.

Service standard

Front : $1385 \pm 110\Omega$

Rear : $1385 \pm 110\Omega$

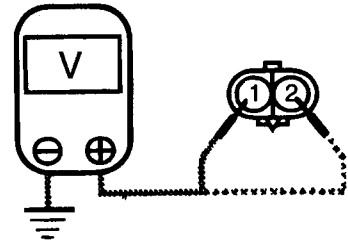


EJA9031E

2. Connect a voltmeter between the wheel speed sensor terminals and measure the voltage by turning the wheel.

NOTE

Set the voltmeter to measure AC voltage.
Service standard : AC voltage detected.



EJA9031F

ABS OPERATION CHECK EJHA3550

WHEEL SPEED SENSOR OUTPUT VOLTAGE CHECK

1. Lift the vehicle up and release the parking brake.
2. Disconnect the HECU harness connector and measure from the harness side connector.

CAUTION

Be sure to remove the connector double lock and insert the probe into the harness side. Inserting it into the terminal side will result in a bad connection.

3. Rotate the wheel to be measured at approximately 1/2–1 rotation per second, and check the output voltage using a circuit tester or an oscilloscope.

Wheel speed sensor	Front left	Front right	Rear left	Rear right
Terminal No.	1	19	5	22
	2	20	6	23

Output voltage

When measuring with an oscilloscope : 130 mV peak-to-peak or more