Brake System

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 Clearance between stop lamp switch outer case and pedal arm Brake pedal free play Clearance between brake pedal and floor board Parking brake lever stroke	M/T : 188 mm (7.40 in.), A/T : 189 mm (7.44 in.) 0.5 - 1.0 mm (0.020 - 0.040 in.) 3-8 mm (0.117 - 0.312 in.) M/T : 54 mm, A/T : 55 mm 8 clicks (When lever assembly is pulled with 20kgf)
Service limit Front disc brake pad thickness Front disc thickness (minimum) Front disc runout Front disc thickness variation Rear disc brake pad thickness Rear disc thickness Rear drum I.D. Rear brake lining thickness	2.0 mm (0.079 in.) 25.4 mm (1 in.) 0.03 mm (0.0012 in.) 0.005 mm (0.0002 in.) 2.0 mm (0.079 in.) 18.4 mm (0.724 in.) 272 mm (10.71 in.) 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	EJDA043A	Pushing back of the front disc and rear disc brake piston

TROUBLESHOOTING EJMB0040

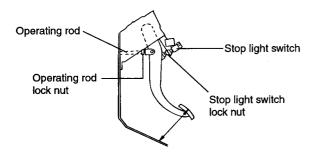| Trouble symptom	Possible cause	Remedy
Noise or vibration when brakes are applied	Caliper improperly mounted Loose caliper mounting bolts Unevenly worn or cracked brake drum or brake disc Foreign material in brake drum Seized pad or lining contact surface Excessive clearance between pad assembly and 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 Reair
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
PROCERDURES   EJMB0050

INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height. If the brake pedal height is not within the standard value, adjust as follows.
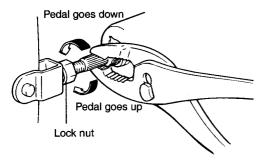
Standard value
M/T : 188 mm (7.40 in.)
A/T : 189 mm (7.44 in.)

EJMB065A
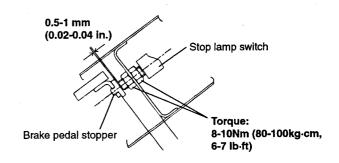
1) Disconnect the stop lamp switch connector, loosen the lock nut, and move the stop lamp switch to a position where it does not contact the brake pedal arm.

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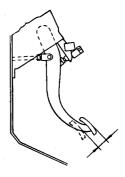
2. With the engine stopped, depress the brake pedal two or three times. After eliminating the vacuum in the power brake booster, press the pedal down by hand, and confirm that the amount of movement before resistance is met (the free play) is within the standard value.

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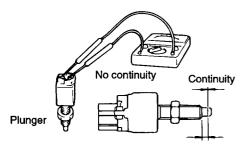
3. Start the engine, depress the break pedal with approximately 120kgf of force, and check for oil leakage in the master cylinder, brake line and each connecting part.
Repair the faulty parts as required.

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.
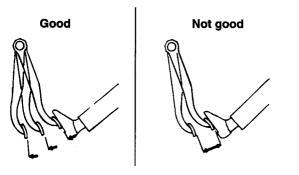
H7BR206A

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
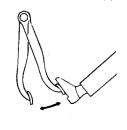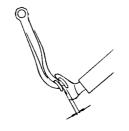
2. With the engine stopped, step on the brake pedal several times.
    Then step on the brake pedal and start the engine. If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.
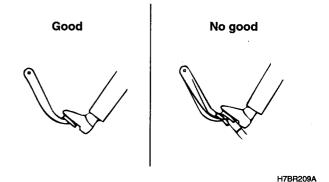
EJA9002B

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
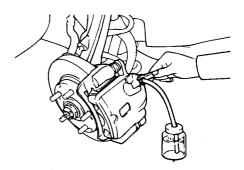
BLEEDING THE BRAKE SYSTEM   EJMB0060

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

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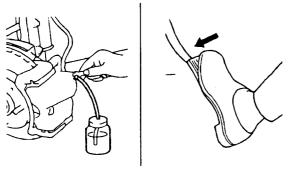
    - *Do not allow brake fluid to remain on a painted surface. Wash it off immediately.*
    - *Use the specified brake fluid. Avoid using a mixture of the specified brake fluid and other fluid.*

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.
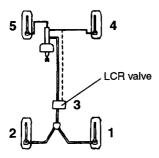
EAHA014B

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.

LCR valve

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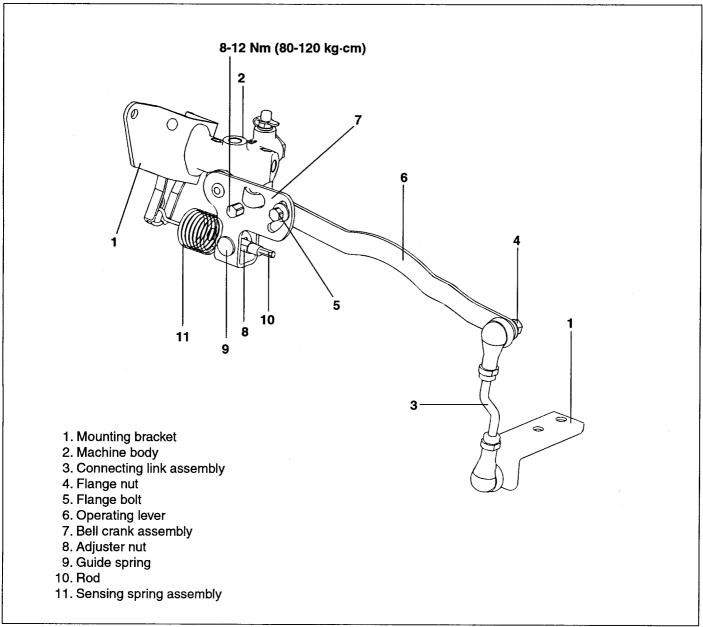
The brake fluid pressure of rear wheel may reduce as the vehicle weight is increased by heavy load or the number of passenger.

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

8-12 Nm (80-120 kg·cm)

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

EHPB367A

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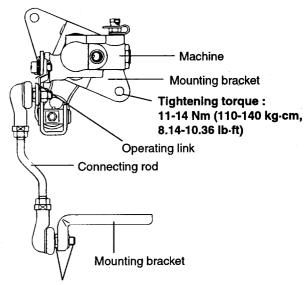
Tightening torque
11 - 14 Nm (110 - 140 kg·cm, 8.14 - 10.36 lb·ft)

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)

Machine

Mounting bracket

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

Operating link

Connecting rod

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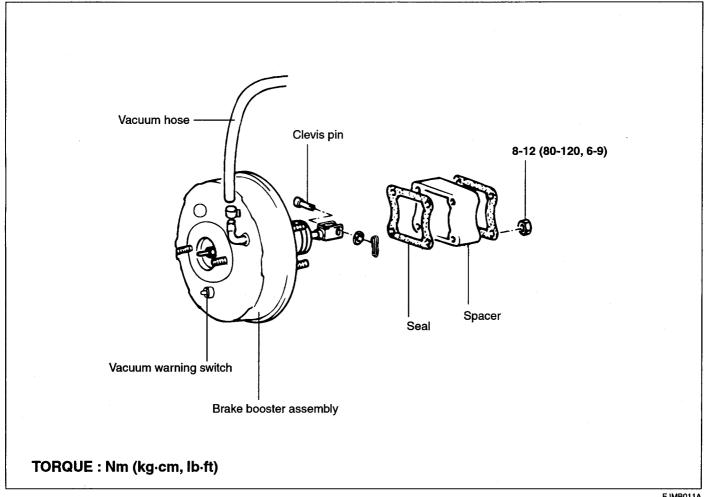
Tightening torque :
11-14 Nm (110-140 kg·cm, 8.14-10.36 lb·ft)

EHPBR02A

BRAKE BOOSTER

COMPONENTS　EJMB0110

Vacuum hose

Clevis pin

8-12 (80-120, 6-9)

Seal

Spacer

Vacuum warning switch

Brake booster assembly

TORQUE : Nm (kg·cm, lb·ft)

EJMB011A

REMOVAL　EJMB0120
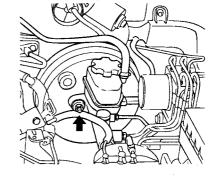
1.　Remove the master cylinder.

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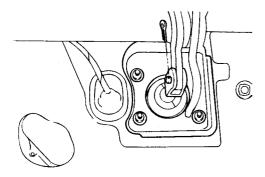
Do not allow brake fluid to remain on a painted surface. Wash it off immediately.

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
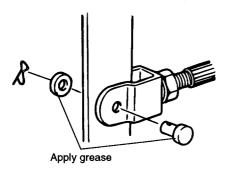
1. When installing the booster assembly, replace the packing of each end of booster installation holder.

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.

Apply grease

EJA9005B

4. Install the master cylinder.
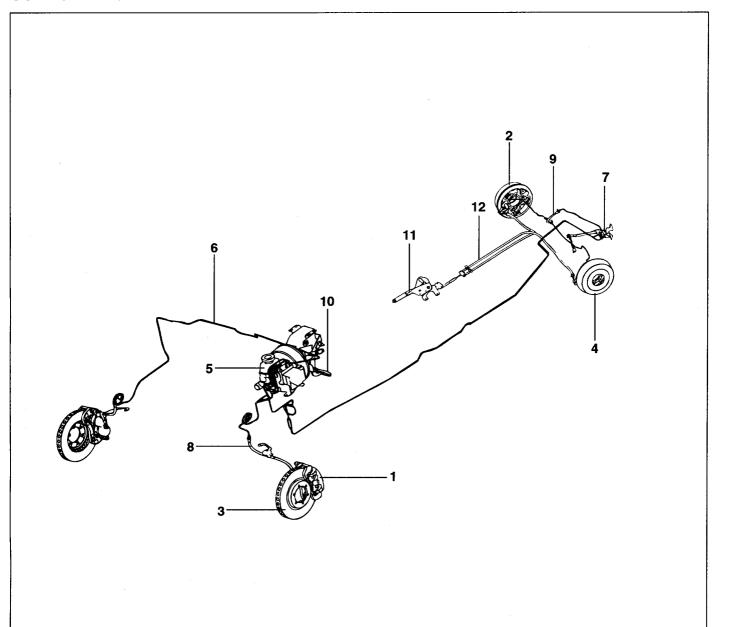
5. Connect the vacuum hose to the brake booster.

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

EHP369A

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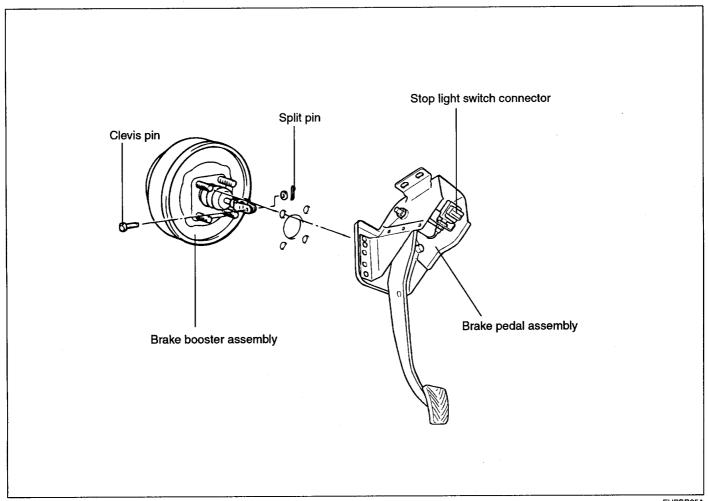
    When installing, be sure the brake hose does not contact edges, welding or moving parts.

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

Clevis pin

Split pin

Stop light switch connector

Brake booster assembly

Brake pedal assembly
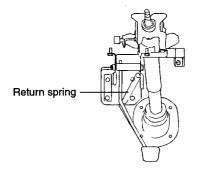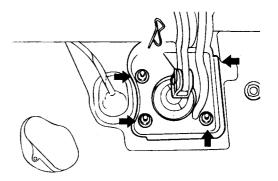
EHPBR05A

REMOVAL EJMB0190

1. Remove the lower crash pad assembly.

2. Remove the stop lamp switch connector.

3. Remove the return spring.

Return spring

EHPBR97A

4. Remove the split pin and clevis pin.

5. Remove the brake pedal assembly mounting nut.

EJKB010A

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.
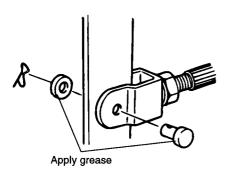
   ⚠ *CAUTION*

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

   Specified grease : Chassis grease LiG - 2
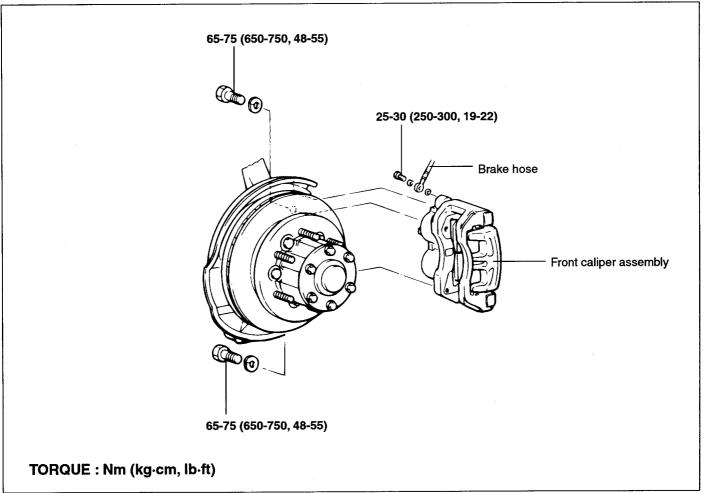
2.   Before inserting the clevis pin, apply the specified grease to the clevis pin and washer.

Apply grease

EJA9005B

FRONT DISC BRAKE

COMPONENTS   EJMB0220

65-75 (650-750, 48-55)

25-30 (250-300, 19-22)

Brake hose

Front caliper assembly

65-75 (650-750, 48-55)

TORQUE : Nm (kg·cm, lb·ft)
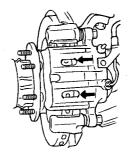
EHPBR10A

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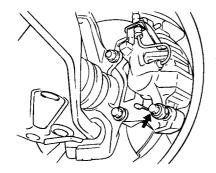
1. *If the pad lining thickness is out of specifica-
    tion, left and right pads must be replaced as
    a complete set.*

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*
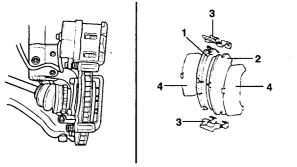
Be careful not to contaminate the lock pin and guide pin with grease.
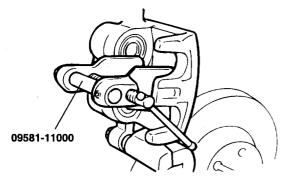
H7BR216A

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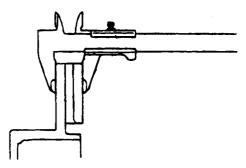
1.   Remove all rust and contamination from the disc surface, and then measure the disc thickness at 4 positions at least.

Front brake disc thickness
Standard value : 27mm (1.06 in.)
Limit : 25.4mm (1 in.)
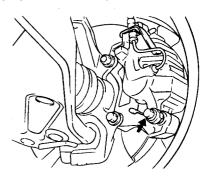
2.   Thickness variation should not exceed 0.005mm (circumference) and 0.05mm (radisu) at any directions.

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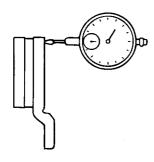
2.   Place a dial gauge about 5mm (0.2 in.) from the outer circumference of the brake disc, and measure the runout of the disc.

Brake disc runout
Limit : 0.03mm (0.0012 in.) or less

📖 *NOTE*
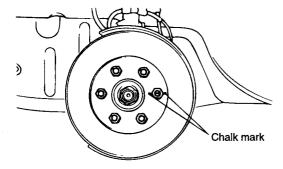
Fix the disc to the hub by tightening the nut.

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.

   Chalk mark

   EJMB240A

   2) If it is 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.
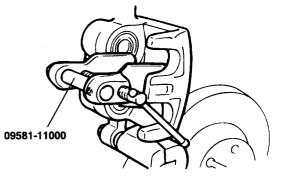
INSTALLATION   EJMB0250

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).

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.
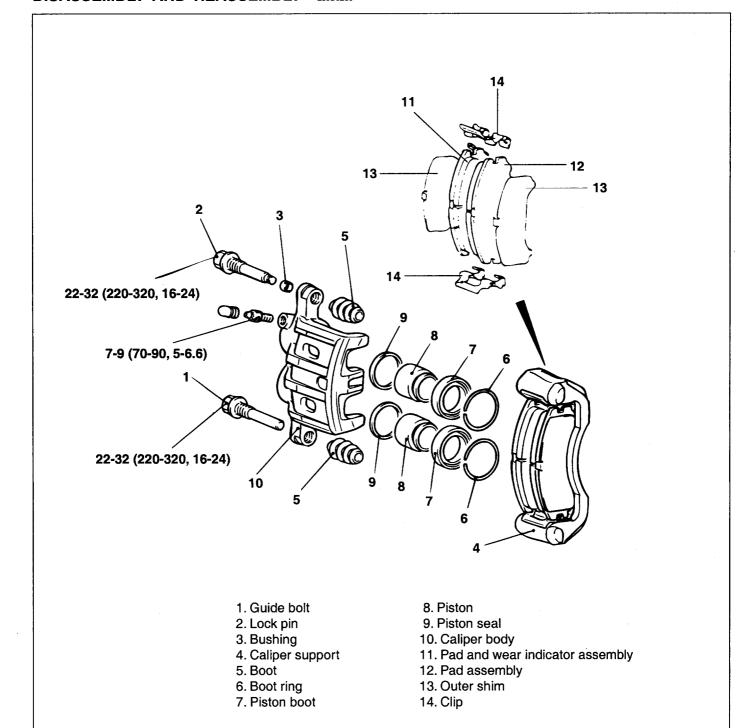
Tightening torque

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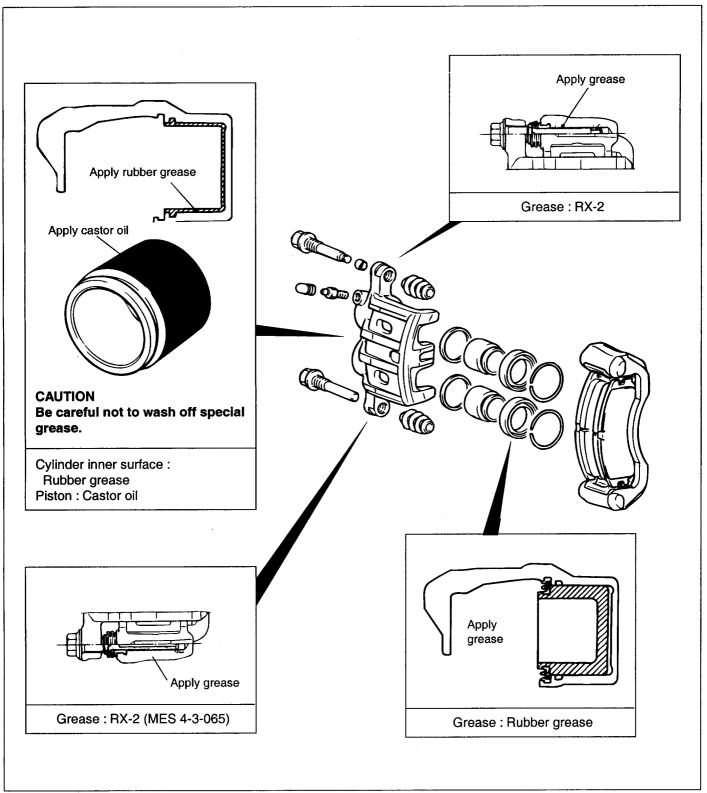
22 - 32 Nm (220 - 320 kg·cm, 16 - 24 lb·ft)

DISASSEMBLY AND REASSEMBLY EJJB0230

14

11

13

12

13

2

3

5

22-32 (220-320, 16-24)

7-9 (70-90, 5-6.6)

14

9

8

7

6

1

22-32 (220-320, 16-24)

10

5

9

8

7

6

5

4

1. Guide bolt
2. Lock pin
3. Bushing
4. Caliper support
5. Boot
6. Boot ring
7. Piston boot

8. Piston
9. Piston seal
10. Caliper body
11. Pad and wear indicator assembly
12. Pad assembly
13. Outer shim
14. Clip

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

AJJA050B

LUBRICATION POINTS   EJJB0240

Apply grease

Grease : RX-2

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 (MES 4-3-065)

Apply grease

Grease : Rubber grease

AGX8038A

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
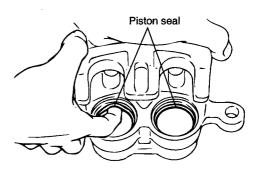
2. Remove the piston seal.

   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

Piston seal
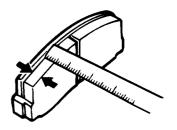
KGX8040A

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.)
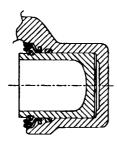
KGX8041A
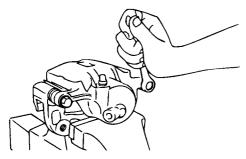
REASSEMBLY EJJB0270

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
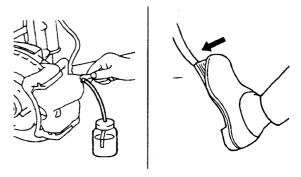
INSTALLATION EJMB0280

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.
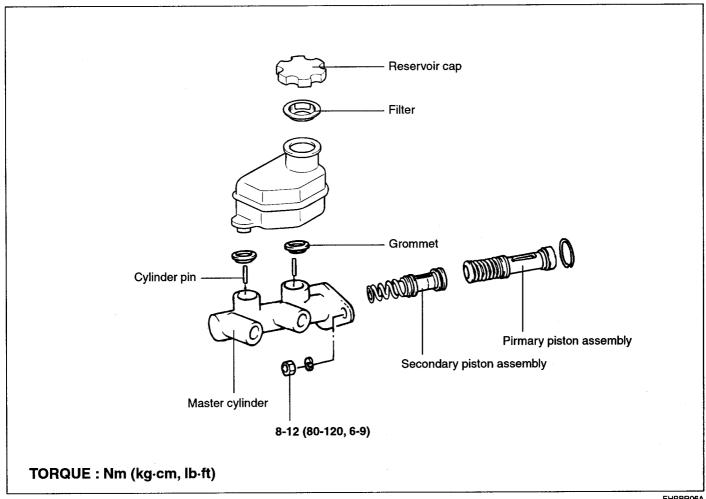
EAHA014B

MASTER CYLINDER

COMPONENTS EJMB0290

- Reservoir cap
- Filter
- Grommet
- Cylinder pin
- Pirmary piston assembly
- Secondary piston assembly
- Master cylinder
- 8-12 (80-120, 6-9)

TORQUE : Nm (kg·cm, lb·ft)

EHPBR06A

REMOVAL EJMB0291
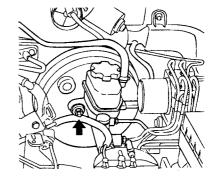
1. Detach the brake tubes from the master cylinder, and then install the plug.

    ⚠ *CAUTION*

    Do not allow brake fluid to remain on a painted surface. Wash it off immediately.
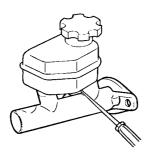
2. Remove the master cylinder mounting nuts and then remove the master cylinder.

KHPBR07A
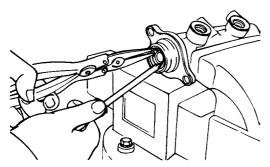
DISASSEMBLY   EJMB0300

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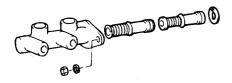
4. Remove the cylinder pin with the primary piston pushed completely using a screwdriver. Remove the primary piston assembly.

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 alchohol.**
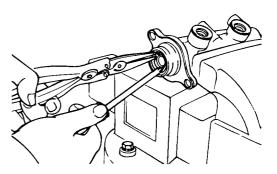
REASSEMBLY   EJMB0320

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

KFW8016A
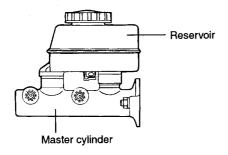
2. Carefully insert the springs and pistons in the proper direction.

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.

Reservoir

Master cylinder

EJMB170A
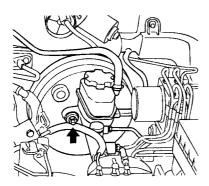
INSTALLATION   EJMB0330

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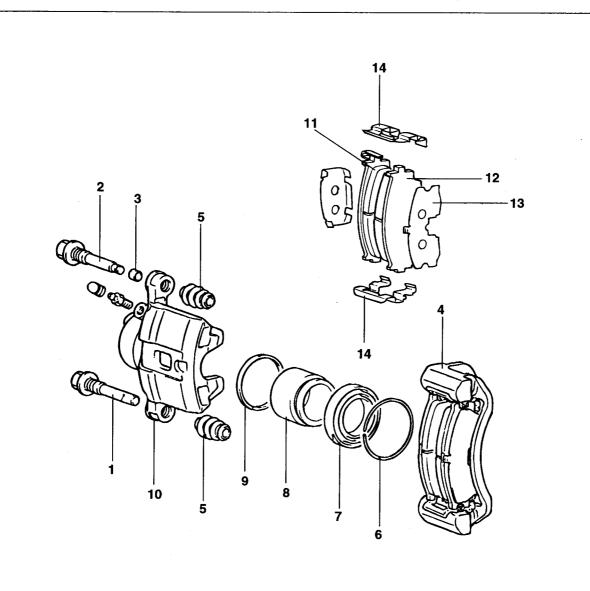
2. Connect 2 brake tubes and the brake fluid level warning connector.

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

REAR DISC BRAKE
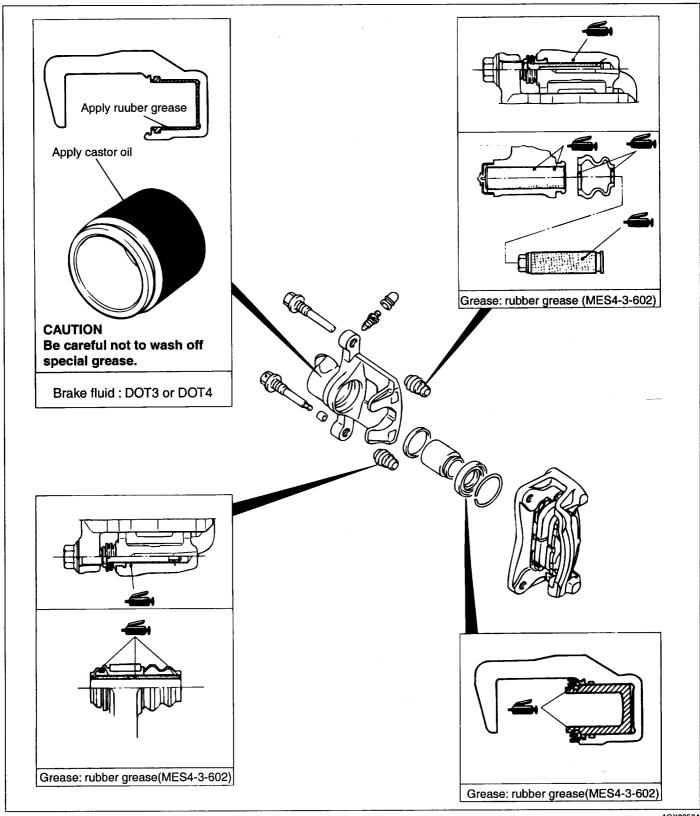
COMPONENTS   EJMB0340

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

EJMB320A

LUBRICATION POINTS   EJJB0300

Apply ruuber 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)

AGX8056A
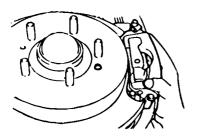
DISC BRAKE PAD EJMB0350

REMOVAL

1. Remove the wheel.

2. Remove the guide bolt, lift up the caliper assembly, and remove the pad assembly.
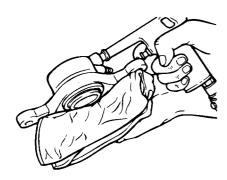
EJJA030B

DISASSEMBLY SERVICE POINT

Rear disc brakes should be disassembled seperately 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**
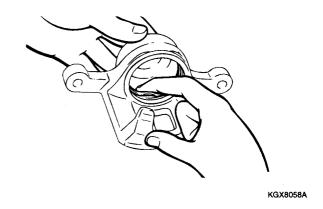
Do not use a screwdriver or another tool in order to avoid damage the inside of the cylinder.

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
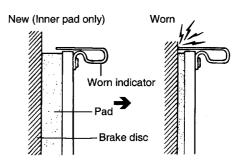
INSPECTION

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.)

New (Inner pad only)　　　　Worn

Worn indicator

Pad

Brake disc

EJA9015E
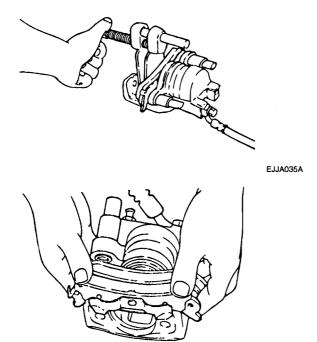
6. Check for worn or damaged dust boots. If dust or mud had entered the caliper assembly through the seal, the caliper assembly must be replaced or repaired.

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.
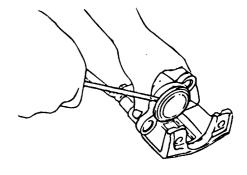
EJMB0390

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.
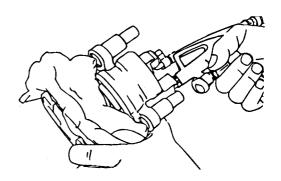
EJJA035D

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
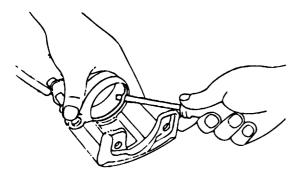
4. Remove the piston seal carefully so as not to damage the cylinder wall.

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.
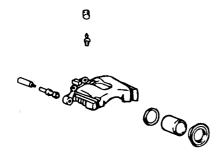
EJJA035F

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
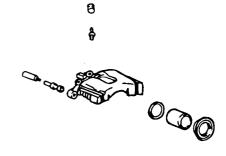
EJMB0400

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.*
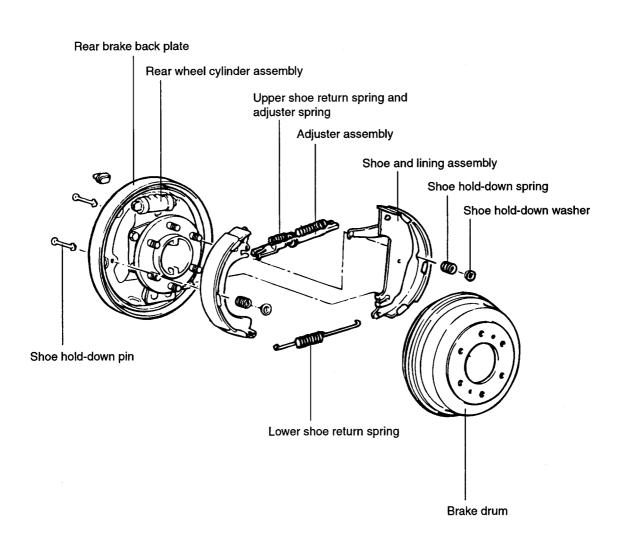
REAR DRUM BRAKE

COMPONENTS EJMB0420

Rear brake back plate

Rear wheel cylinder assembly

Upper shoe return spring and adjuster spring

Adjuster assembly

Shoe and lining assembly

Shoe hold-down spring

Shoe hold-down washer

Shoe hold-down pin

Lower shoe return spring

Brake drum

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

EHPBR11A

INSPECTION EJMB0430
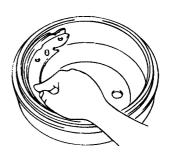
1. Measure the brake drum inside diameter. Check the runout of the brake drum using a dial indicator.

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

EJA9018E
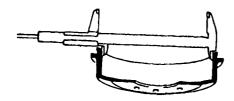
⚠ CAUTION

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

EJA9018C
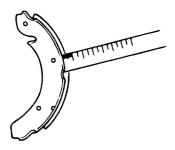
2. Measure the brake lining thickness.

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

EJA9018D
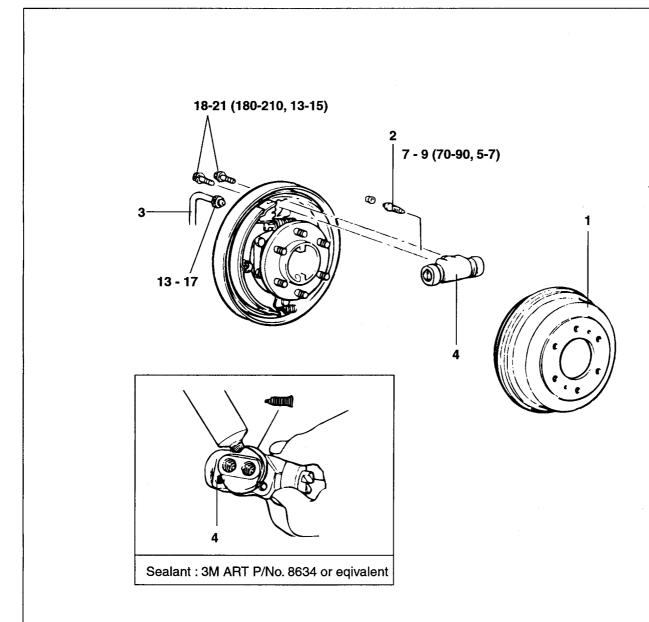
⚠ CAUTION

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

18-21 (180-210, 13-15)

2

7 - 9 (70-90, 5-7)

3

1

13 - 17

4

4

Sealant : 3M ART P/No. 8634 or eqivalent

Removal steps
1. Brake drum
2. Bleeder screw
3. Brake tube
4. Wheel cylinder assembly
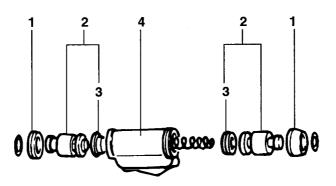
Procedures after installation
• Applying brake fluid
• Air bleeding
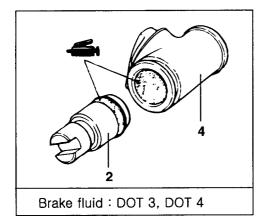
TORQUE : Nm (kg·cm, lb·ft)

EHPBR20A

DISASSEMBLY AND REASSEMBLY   EJMB0450

Brake fluid : DOT 3, DOT 4

Repair kit grease (Orange)
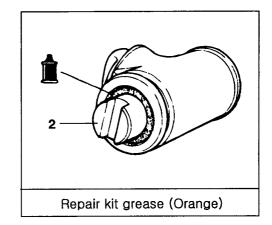
Disassembly steps
1. Wheel cylinder boot
2. Piston assembly
3. Piston cup
4. Body machining

EHPBR21A

REASSEMBLY   EJMB0460

PISTON CUP
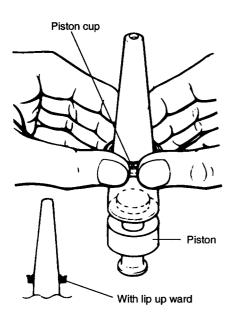
1. Clean the inside of the wheel cylinder and the outside of the piston with alcohol or brake fluid.

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.
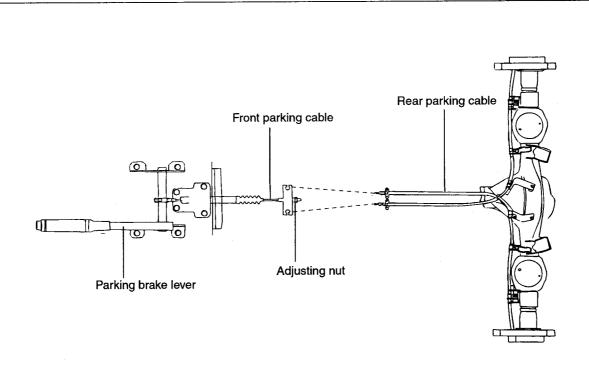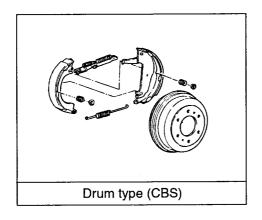
AHBR0840
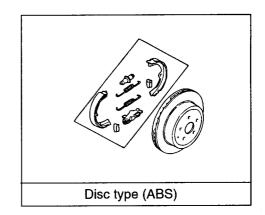
PARKING BRAKE SYSTEM

PARKING BRAKE

REMOVAL AND INSTALLATION   EJMB0470

Rear parking cable

Front parking cable

Adjusting nut

Parking brake lever

| Drum type (CBS) | Disc type (ABS) |

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

EJMB492A

ADJUSTMENT PROCEDURE EJMB0480

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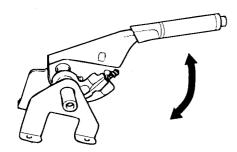
1. Pull the brake lever with force of 200N (20kg, 44lbs) and count the number of notches.

⚠ *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.
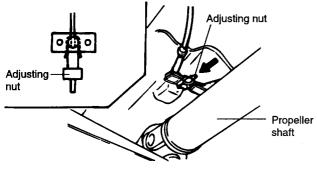
Parking brake stroke
Standard value : 8 clicks

KHPBR13A
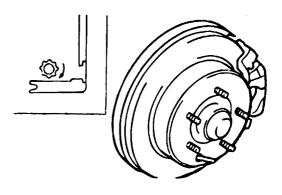
2. If the parking brake stroke is out of the standard value, adjust it as follows :

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

Adjusting nut

Adjusting nut

Propeller shaft

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.
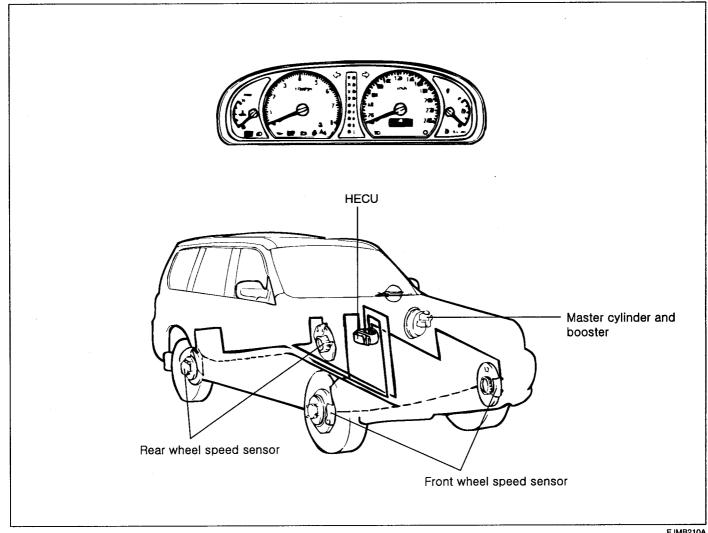
PARKING BRAKE BED-IN (DIH)

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

HECU

Master cylinder and booster

Rear wheel speed sensor

Front wheel speed sensor

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
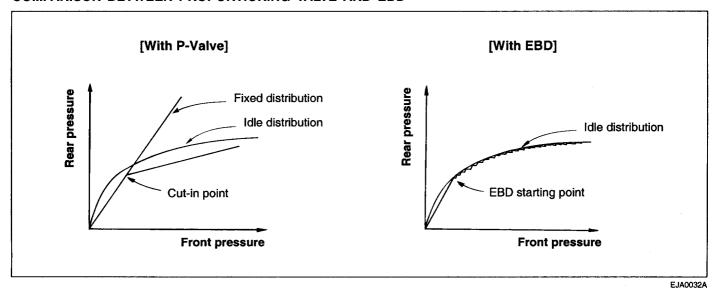
EBD is additionally applied, instead of the proportioning valve, to deliver ideal distribution of fluid pressure to the front and rear brakes. This prevents the brakes from skidding in the event of rear wheel lock up and provides higher brake efficiency within the range of brake application.

ADVANTAGES

- Functional improvement of base-brake system
- Compensation of different friction coefficients
- Elimination of proportioning valve
- Failure recognition by warning lamp
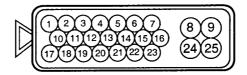
COMPARISON BETWEEN PROPORTIONING VALVE AND EBD

EJA0032A

INSPECTION AT HECU TERMINALS EJMB2200

TERMINAL VOLTAGE CHART

EJHA025A

Terminal No.	Description	Condition	Output
9	• 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=1.1kΩ ± 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 ± 0.5V and 20V Suspend voltage detection : between 7.0V ± 0.5 and 9.5V ± 0.5 System off : below 5.5V ± 0.5

25	• Battery power source 2
	• Motor power source
		Always	• 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		
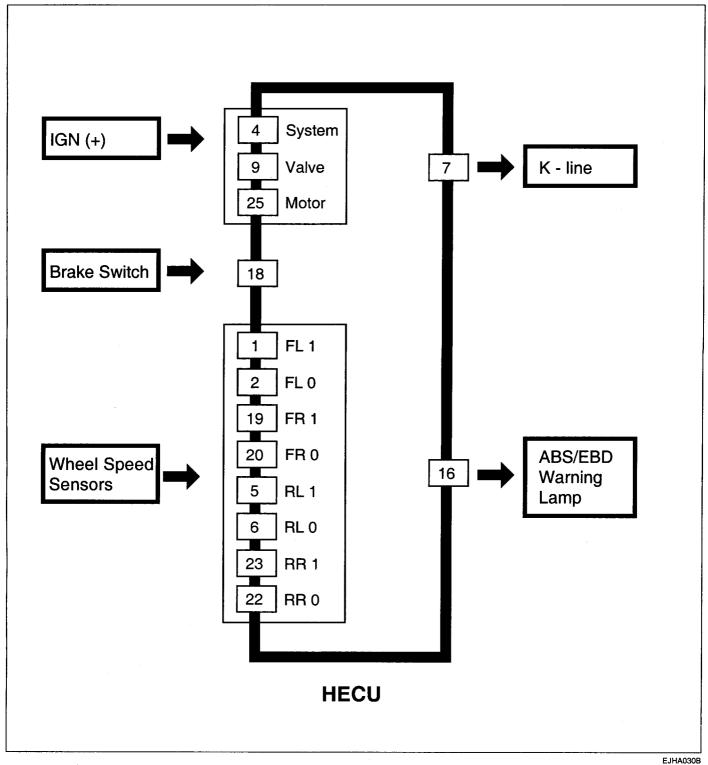
Input-output specification

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. curent : 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 votlage 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 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 ouput	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

IGN (+) → 4 System

9 Valve   7 → K - line

25 Motor

Brake Switch → 18

Wheel Speed Sensors →

1 FL 1

2 FL 0

19 FR 1

20 FR 0

5 RL 1   16 → ABS/EBD Warning Lamp

6 RL 0

23 RR 1

22 RR 0

HECU

EJHA030B
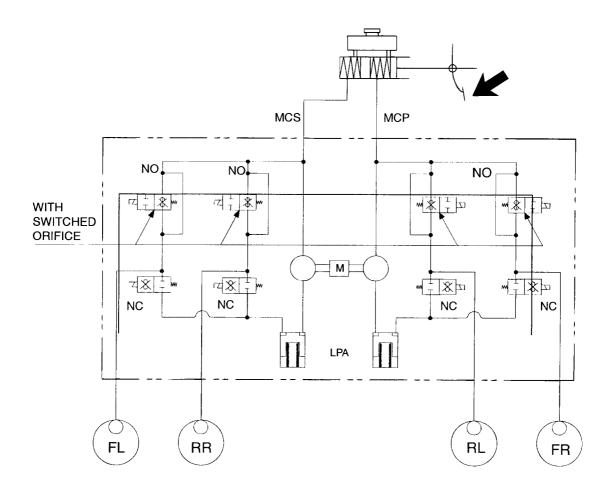
SYSTEM DIAGRAM   EJHA2300

[ABS]

WITH
SWITCHED
ORIFICE

MCS   MCP

NO   NO   NO

NC   NC   NC   NC

M

LPA

FL   RR   RL   FR
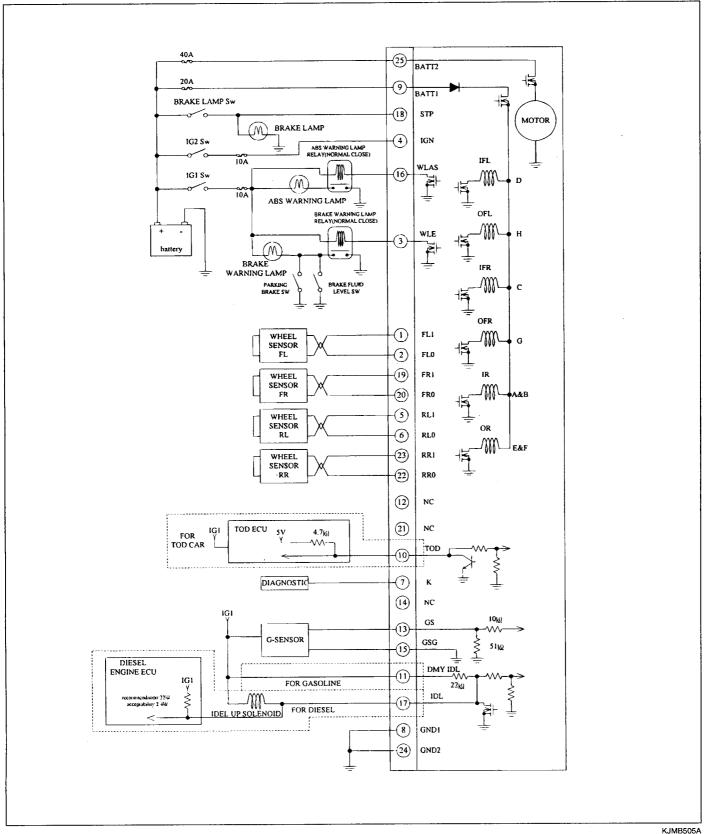
MCS : Master Cylinder Secondary
MCP : Master Cylinder Primary
NO : Normal Open
NC : Normal Close
M : Motor & Pump
LPA : Low Pressure Accumulator
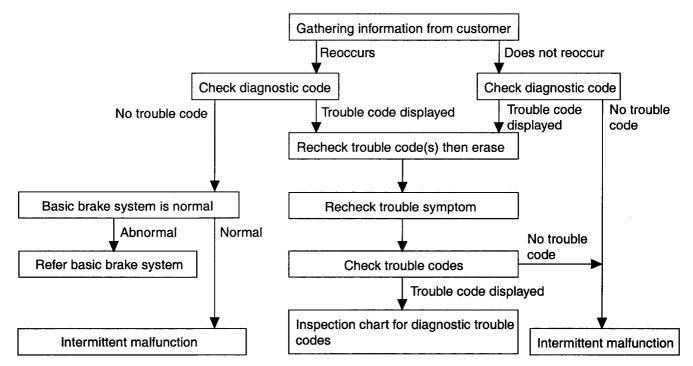
EJHA015A

INPUT/OUTPUT CIRCUIT DIAGRAM EJMB5050

ABS E.C.U

STANDARD FLOW OF DIAGNOSTIC
TROUBLESHOOTING   EJHA2400

```
                          ┌─────────────────────────────────────┐
                          │ Gathering information from customer  │
                          └─────────────────────────────────────┘
                           │ Reoccurs              │ Does not reoccur
                           ▼                        ▼
              ┌────────────────────────┐   ┌────────────────────────┐
              │ Check diagnostic code  │   │ Check diagnostic code  │
              └────────────────────────┘   └────────────────────────┘
   No trouble code │    │ Trouble code displayed   │ Trouble code    │ No trouble
                   │    ▼                           │ displayed       │ code
                   │   ┌──────────────────────────┐ ▼
                   │   │ Recheck trouble code(s)  │
                   │   │ then erase               │
                   │   └──────────────────────────┘
                   ▼    ▼
  ┌──────────────────────────────┐  ┌──────────────────────────┐
  │ Basic brake system is normal │  │ Recheck trouble symptom  │
  └──────────────────────────────┘  └──────────────────────────┘
       │ Abnormal   │ Normal              │
       ▼            │                     ▼            No trouble
  ┌──────────────────────┐    ┌──────────────────────┐ code
  │ Refer basic brake    │    │ Check trouble codes  │──────────►
  │ system               │    └──────────────────────┘
  └──────────────────────┘       │ Trouble code displayed
                   │              ▼
                   ▼   ┌────────────────────────────────────┐  ┌──────────────────────────┐
  ┌──────────────────────────┐│ Inspection chart for diagnostic │  │ Intermittent malfunction │
  │ Intermittent malfunction ││ trouble codes                   │  └──────────────────────────┘
  └──────────────────────────┘└────────────────────────────────────┘
```

* 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	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.	
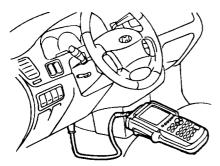
ABS CHECK SHEET   _{EJHA2500}

| | 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 Occurence of Problem	☐ Continuous ☐ Intermittent (times a day)

Symptoms	☐ ABS does not operate.	
	☐ ABS does not operate efficiently. ☐ Intermittent (times a day)	
	ABS Warning Light Abnormal	☐ Remains ON ☐ Does not light up

Diagnostic Trouble Code Check	1st Time	☐ Normal Code ☐ Malfunction Code (Code)
	2nd Time	☐ Normal Code ☐ Malfunction Code (Code)
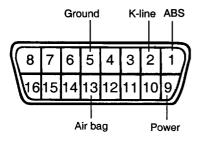
EJDA017A

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

Ground   K-line ABS

8	7	6	5	4	3	2	1
16	15	14	13	12	11	10	9

Air bag   Power

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	ON/OFF
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	O	O	O	O	O	O	
	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.	O	-	O				
			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	O	O					
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	O	O	O *1	O	O	O	
	C2112 VREF< 6V	Main relay	Interruption or short circuit of main relay								O *1	O	O	O	

EJHA105A

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Management Out of control	EBD control mode	ABS control mode	Conditions for Restoration	ABS W/L	EBD W/L	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	O	O	O				
			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	O	O	O				
	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	O	O	O *1	O	O	O	
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	O	O *a	O	O	O	O	

Inner detection table (C1604 main relay):

OFF	voltage is below 2.5V, voltage is over 4.2V (short or leak)	105ms	
ON	voltage is velow 6V (open)	105ms	If the ECU detects un-usual VIGN, failure isn't detected

EJHA105B

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. $V_{MAX} \geq 40$km/h and $V_{ref} \leq 0.6 \times V_{MAX}$ Monitoring time 120s.	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		
				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.	Management B	-	-				O				
				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	-	-				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		

EJHA105C

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. over 6.5V / 1785ms below 6.5V / 196ms When VIGN is unusual, ECU does not detect the failure.	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 uncon- ditionally 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 *2	O *2	O	O	
			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 ab- normal, motor ON for 553ms and ECU repeats the same process. After that, in case of abnormal condition, ECU recog- nizes the failure. If VIGN is abnormal, ECU does not detect the failure.							O *3	O *3	O *3		
			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.				Restart			O	O	O	O	

EJHA105D

No.	DTC	Failure Locations	Detect mode	Condition for Detection	Out of control	EBD control mode	ABS control mode	Conditions for Restoration	ABS W/L	EBD W/L	A	B	C	D	E
															Detect timing
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	O	O	O				O
				2. IGN After IGN ON, main and sub CPU communicate each other for synchronization. When one or the other CPU can't synchronize within 1 sec., the main CPU shuts system down and sub CPU stops running.	System down	System down	System down	Restart	O	O	O				O
				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	O	O	O	O	O	O	O

EJHA105E

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 300μ sec, main CPU shuts the system down and sub CPU stops running.	System down	System down	System down	Restart	O	O	O	O			O
				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	O	O	O	O	O		

*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

EJHA105F

Management A

Conditions	Management
Vmax > 5km/h	Management B
Vmax < 5km/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.)
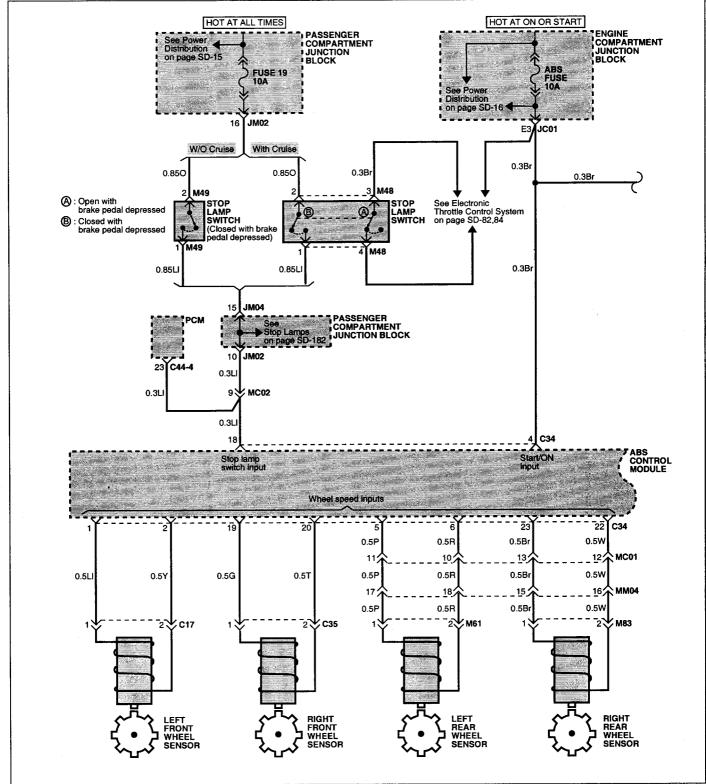
TERM COMMENTARY
VIGN : Terminal voltage of IGN, VREF : Terminal voltage of REF
VMAX : Maximum wheel velocity, Vref : estimated vehicle velocity
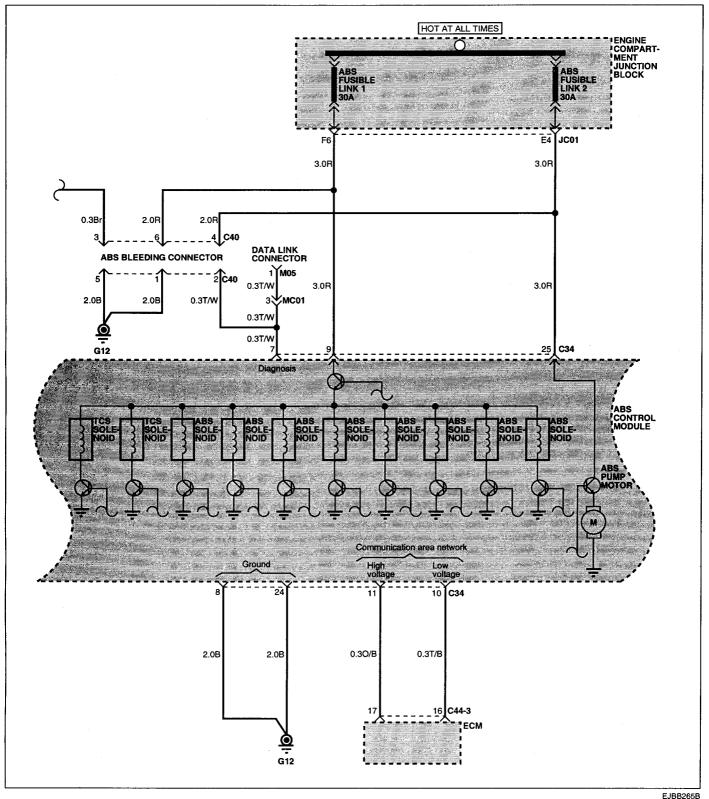
SCHEMATIC DIAGRAM   EJBB2650

ABS CIRCUIT (1)

HOT AT ALL TIMES

See Power Distribution on page SD-15

PASSENGER COMPARTMENT JUNCTION BLOCK

FUSE 19 10A

16 JM02

W/O Cruise | With Cruise

HOT AT ON OR START

See Power Distribution on page SD-16

ENGINE COMPARTMENT JUNCTION BLOCK

ABS FUSE 10A

E3 JC01

0.85O   0.85O   0.3Br   0.3Br

0.3Br

Ⓐ : Open with brake pedal depressed
Ⓑ : Closed with brake pedal depressed

2 M49   STOP LAMP SWITCH

1 M49

2   3 M48   STOP LAMP SWITCH (Closed with brake pedal depressed)

Ⓑ   Ⓐ

1   4 M48

See Electronic Throttle Control System on page SD-82,84

0.85LI   0.85LI   0.3Br

PCM

15 JM04

See Stop Lamps on page SD 182

PASSENGER COMPARTMENT JUNCTION BLOCK

10 JM02

23 C44-4   0.3LI

0.3LI   9 MC02

0.3LI

18   4 C34

Stop lamp switch input   Start/ON Input   ABS CONTROL MODULE

Wheel speed inputs

1	2	19	20	5	6	23	22 C34
				0.5P	0.5R	0.5Br	0.5W
				11	10	13	12 MC01
0.5LI	0.5Y	0.5G	0.5T	0.5P	0.5R	0.5Br	0.5W
				17	18	15	16 MM04
				0.5P	0.5R	0.5Br	0.5W
1	2 C17	1	2 C35	1	2 M61	1	2 M83

LEFT FRONT WHEEL SENSOR

RIGHT FRONT WHEEL SENSOR

LEFT REAR WHEEL SENSOR

RIGHT REAR WHEEL SENSOR

EJBB265A

ABS CIRCUIT (2)

EJBB265B

ABS CIRCUIT (3)

HOT AT ON OR START

PASSENGER
COMPARTMENT
JUNCTION
BLOCK

See Power
Distribution
on page SD-17

FUSE 28
10A

16   6   15 JI01

0.3P   0.3P   0.3P

19 I18-2   13 I18-3

INSTRUMENT
CLUSTER

See Illuminations
on page SD-192

0.3Br/W

BRAKE   ABS   TCS

(I)(P)
BRAKE   ABS   TCS

See Brake
Warning System
on page SD-94

Indicator
control
circuit

See Indicators
on page SD-109

3   5 I26

TCS
SWITCH
(With TCS)

ON   OFF   ILL

4   3 I18-3   4   2 I26

0.3L/B   0.3L   0.3L   0.3Gr

See Illuminations
on page SD-192

2   12 MI01

0.3L/B   0.3L

1   9 MC01

0.5T   0.3L/B   0.3L

14   3   16   15 C34

ECU
Check Pin

Front Right Speed
Sensor Output

ABS/EBD
Warning Indicator
Control

TCS Funtion
Indicator Control

ABS
CONTROL
MODULE

EJBB265C

INSPECTION PROCEDURE FOR
DIAGNOSTIC TROUBLE CODES   EJBB2700

DTC No. C1200, C1203, C1206, C1209 Wheel speed sensor open or short to GND circuit	Probable cause
The HECU determines that an open or short circuit has occured in more than one wire of the wheel speed sensors	• Malfunction of wheel speed sensor • Malfunction of wiring harness or connector • Malfunction of HECU

```
┌─────────────────────────┐ NG
│ Inspect wheel speed      │────────▶ Repair
│ sensor installation      │
└─────────────────────────┘
         │ OK
         ▼
┌─────────────────────────┐ NG ┌─────────────────────────┐ NG
│ Measure the resistance   │───▶│ Check the following      │───▶ Repair
│ at the HECU connectors   │    │ connectors. C17, C35,    │
│ C34                      │    │ M61, M83, MC01, MM04     │
│ o Disconnect connector   │    └─────────────────────────┘
│   and measure from the   │             │ OK
│   harness side.          │             ▼
│ o Resistance values      │    ┌─────────────────────────┐ NG ┌──────────────────────────┐
│   between 1-2, 22-23,    │    │ Check symptoms of        │───▶│ Check the harness wire   │
│   5-6,19-20              │    │ trouble                  │    │ between each wheel speed │
│   OK :1100Ω ± 50%Ω       │    └─────────────────────────┘    │ sensor and HECU, and     │
└─────────────────────────┘                                    │ repair if necessary      │
         │ OK                                                  └──────────────────────────┘
         ▼
┌─────────────────────────┐ NG ┌─────────────────────────┐ NG ┌──────────────────────────┐
│ Inspect wheel speed      │───▶│ Wheel speed sensor       │───▶│ Replace the wheel speed  │
│ sensor output voltage    │    │ inspection               │    │ sensor                   │
└─────────────────────────┘    └─────────────────────────┘    └──────────────────────────┘
         │ OK                            │ OK
         ▼                               ▼
┌─────────────────────────┐ NG ┌─────────────────────────┐ NG ┌──────────────────────────┐
│ Check the following      │───▶│ Rotor inspection         │───▶│ Replace the rotor        │
│ connectors. C17, C35,    │    └─────────────────────────┘    └──────────────────────────┘
│ M61, M83, MC01, MM04     │             │ OK
└─────────────────────────┘             ▼
         │ OK                  ┌─────────────────────────┐
         ▼                     │ Wheel bearing inspection │
┌─────────────────────────┐    └─────────────────────────┘
│ Check symptoms of        │
│ trouble                  │
└─────────────────────────┘
         │ NG
         ▼
┌─────────────────────────┐
│ Replace the HECU         │
└─────────────────────────┘
```

EJBB270A

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).	• 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

Inspect wheel speed sensor installation ──NG──▶ **Repair**

│OK

Inspect wheel speed sensor output voltage inspection ──NG──▶ Inspect wheel speed sensor ──NG──▶ Replace the wheel speed sensor

│OK   │OK

Check the related connectors ──NG──▶ Inspect rotor inspection ──NG──▶ Replace the rotor

│OK   │OK

Check symptoms of trouble   Check symptoms of trouble ──OK──▶ Check the harness wire between each wheel speed sensor and HECU, and repair if necessary

│NG

Replace the HECU

EJBB275A

EJBB2800

DTC No. C1202, C1205, C1208, C1211 (Large air gap)	Probable cause
A wheel speed sensor outputs no signal	• Malfunction of wheel speed sensor • Improper installation of wheel speed sensor • Malfunction of rotor (excitor) • Malfunction of wiring harness or connector • Malfunction of HECU

```
┌─────────────────────────┐  NG
│ Inspect wheel speed      │ ──────►  Repair
│ sensor installation      │
└─────────────────────────┘
            │ OK
            ▼
┌─────────────────────────┐
│ Inspect air gap between  │  NG
│ wheel speed sensor and   │ ──────►  Repair
│ tone wheel               │
│ Air gap : 0.3-0.9 mm (front)│
│           0.2-0.7 mm (rear) │
└─────────────────────────┘
            │ OK
            ▼
┌─────────────────────────┐
│ Check the following      │
│ connectors.              │
│ C17, C35, M61, M83       │
└─────────────────────────┘
            │ OK
            ▼
┌─────────────────────────┐
│ Replace the HECU         │
└─────────────────────────┘
```

EJBB280A

EJBB2850
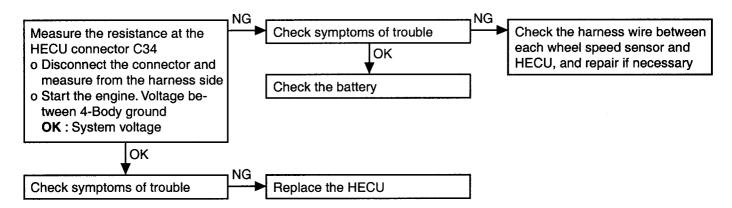
DTC No. C1101, C1102 Voltage out of range (Low and over voltage)	Probable cause
The voltage of the HECU power supply drops lower than or rises higher than the specified value. If the voltage returns to the specified value, this code is no longer output.	• Malfunction of wiring harness or connector • 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.

```
Measure the resistance at the        NG     Check symptoms of trouble    NG    Check the harness wire between
HECU connector C34          ───────▶                            ───────▶   each wheel speed sensor and
o Disconnect the connector and                   │ OK                           HECU, and repair if necessary
  measure from the harness side                  ▼
o Start the engine. Voltage be-          Check the battery
  tween 4-Body ground
  OK : System voltage
         │ OK
         ▼
Check symptoms of trouble    NG    Replace the HECU
                          ───────▶
```

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.	• Malfunction of wiring harness • Malfunction of hydraulic unit • Malfunction of HECU

EJHA2950

DTC No. C2112 Valve relay (Including fuse failure)	Probable cause
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.	• Malfunction of wiring harness or connector • Malfunction of HECU

```
Fuse (30A/10A) inspection  --NG-->  Replace the fuse
        |
        OK
        v
Replace the HECU
```

EJFA029B

EJBB3000
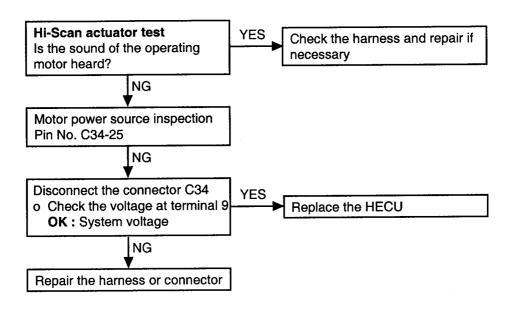
DTC No. C2402 Electrical (Motor relay, motor)	Probable cause
When the motor power line is normal but no signal is input to the motor monitor line, it is abnormal.	• Malfunction of hydraulic unit • Malfunction of HECU

⚠ *CAUTION*

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

```
┌─────────────────────────────┐   YES  ┌──────────────────────────────┐
│ Hi-Scan actuator test       │ ─────→ │ Check the harness and repair if│
│ Is the sound of the operating│        │ necessary                     │
│ motor heard?                │        └──────────────────────────────┘
└─────────────────────────────┘
            │ NG
            ▼
┌─────────────────────────────┐
│ Motor power source inspection│
│ Pin No. C34-25              │
└─────────────────────────────┘
            │ NG
            ▼
┌─────────────────────────────┐   YES  ┌──────────────────────────────┐
│ Disconnect the connector C34│ ─────→ │ Replace the HECU             │
│ o  Check the voltage at terminal 9    └──────────────────────────────┘
│    OK : System voltage      │
└─────────────────────────────┘
            │ NG
            ▼
┌─────────────────────────────┐
│ Repair the harness or connector│
└─────────────────────────────┘
```
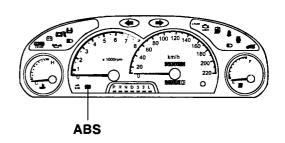
EJBB300A

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.
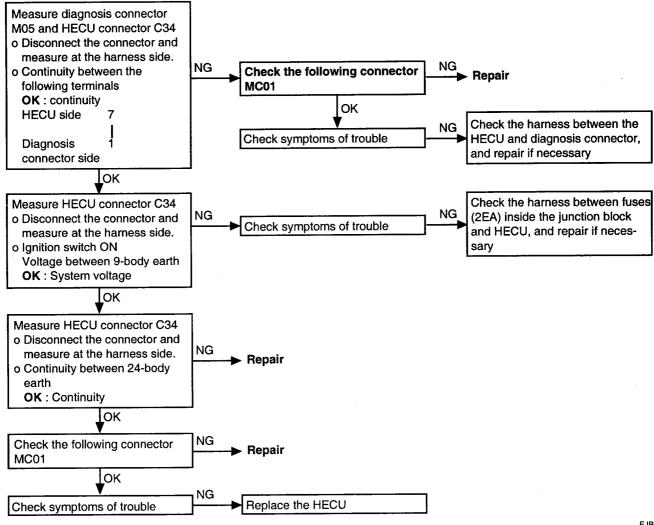
INSPECTION PROCEDURE FOR TROUBLE SYMPTOMS EJBB3150

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.	• Malfunction of connector • Malfunction of wiring harness

INSPECTION PROCEDURE 2
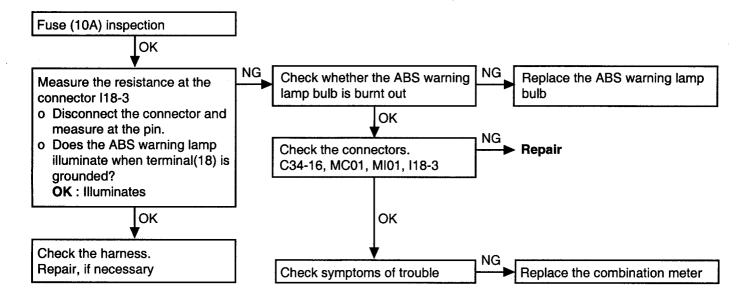
Communication with Hi-Scan is not possible. (Communication with ABS only is not possible.)	Probable cause
When communication with Hi-Scan is not possible, the cause is probably an open circuit in the HECU power circuit or an open circuit in the diagnosis output circuit.	• Blown fuse • Malfunction of wiring harness or connector • Malfunction of HECU

Measure diagnosis connector M05 and HECU connector C34
o Disconnect the connector and measure at the harness side.
o Continuity between the following terminals
OK : continuity
HECU side   7
|
Diagnosis   1
connector side

NG → **Check the following connector MC01** — NG → **Repair**

OK → Check symptoms of trouble — NG → Check the harness between the HECU and diagnosis connector, and repair if necessary

OK ↓

Measure HECU connector C34
o Disconnect the connector and measure at the harness side.
o Ignition switch ON
Voltage between 9-body earth
OK : System voltage

NG → Check symptoms of trouble — NG → Check the harness between fuses (2EA) inside the junction block and HECU, and repair if necessary

OK ↓

Measure HECU connector C34
o Disconnect the connector and measure at the harness side.
o Continuity between 24-body earth
OK : Continuity

NG → **Repair**

OK ↓

Check the following connector MC01

NG → **Repair**

OK ↓

Check symptoms of trouble — NG → Replace the HECU

EJBB315A

INSPECTION PROCEDURE 3

When the ignition key is turned "ON" (engine stopped), ABS warning lamp does not illuminate	Probable cause
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. 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.	• Blown fuse • Burnt out ABS warning lamp bulb • Malfunction of wiring harness or connector

```
┌─────────────────────────────┐
│ Fuse (10A) inspection       │
└─────────────────────────────┘
              │ OK
              ▼
┌─────────────────────────────┐  NG  ┌──────────────────────────────┐  NG  ┌──────────────────────────────┐
│ Measure the resistance at   │─────▶│ Check whether the ABS warning│─────▶│ Replace the ABS warning lamp │
│ the connector I18-3         │      │ lamp bulb is burnt out       │      │ bulb                         │
│ o Disconnect the connector  │      └──────────────────────────────┘      └──────────────────────────────┘
│   and measure at the pin.   │                  │ OK
│ o Does the ABS warning lamp │                  ▼
│   illuminate when           │      ┌──────────────────────────────┐  NG
│   terminal(18) is           │      │ Check the connectors.        │─────▶ **Repair**
│   grounded?                 │      │ C34-16, MC01, MI01, I18-3    │
│   **OK** : Illuminates      │      └──────────────────────────────┘
└─────────────────────────────┘                  │ OK
              │ OK                                ▼
              ▼                      ┌──────────────────────────────┐  NG  ┌──────────────────────────────┐
┌─────────────────────────────┐     │ Check symptoms of trouble    │─────▶│ Replace the combination meter│
│ Check the harness.          │     └──────────────────────────────┘      └──────────────────────────────┘
│ Repair, if necessary        │
└─────────────────────────────┘
```

EJBB315B

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	• Malfunction of combination meter • Malfunction of HECU • Malfunction of wiring harness
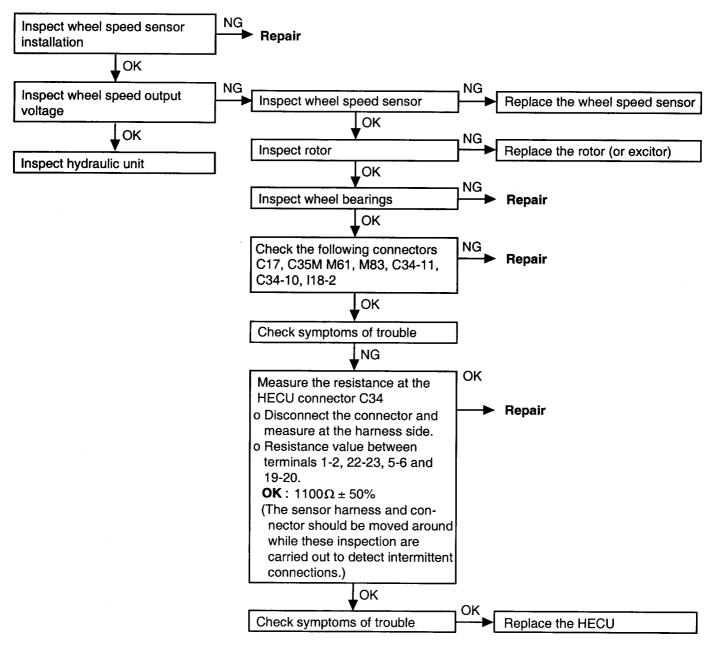
This trouble symptom is limited to cases where communication with the Hi-Scan is possible (HECU power supply is normal) and the diagnosis code is normal.

```
┌──────────────────────────────────────────┐
│ Disconnect connector I18-3 and turn the  │  YES   ┌─────────────────────────────────┐
│ ignition switch "ON"                     │ ─────► │ Replace the combination meter   │
│ o Does the ABS warning lamp remain       │        └─────────────────────────────────┘
│   illuminated?                           │
└──────────────────────────────────────────┘
                │ NO
                ▼
┌──────────────────────────────────────────┐
│ o Disconnect HECU connector C34          │  YES   ┌─────────────────────────────────┐
│ o Ignition switch : ON                   │ ─────► │ Replace the HECU                │
│ o Does the ABS warning lamp switch off ? │        └─────────────────────────────────┘
└──────────────────────────────────────────┘
                │ NO
                ▼
┌──────────────────────────────────────────┐
│ Check the harnesses between the          │
│ combination meter and the HECU.          │
│ Repair if necessary.                     │
└──────────────────────────────────────────┘
```

EJBB315C

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.	• Improper installation of wheel speed sensor • Incorrect sensor harness contact • Foreign material adhering to wheel speed sensor	• Malfunction of wheel speed sensor • Malfunction of rotor • Malfunction of wheel bearing • Malfunction of hydraulic unit • Malfunction of HECU

```
┌─────────────────────────┐   NG
│ Inspect wheel speed      │──────▶ Repair
│ sensor installation      │
└─────────────────────────┘
          │ OK
          ▼
┌─────────────────────────┐   NG   ┌──────────────────────────┐  NG   ┌───────────────────────────────┐
│ Inspect wheel speed      │──────▶ │ Inspect wheel speed sensor│─────▶ │ Replace the wheel speed sensor │
│ output voltage           │        └──────────────────────────┘       └───────────────────────────────┘
└─────────────────────────┘                    │ OK
          │ OK                                  ▼
          ▼                         ┌──────────────────────────┐  NG   ┌───────────────────────────────┐
┌─────────────────────────┐        │ Inspect rotor             │─────▶ │ Replace the rotor (or exciter) │
│ Inspect hydraulic unit   │        └──────────────────────────┘       └───────────────────────────────┘
└─────────────────────────┘                    │ OK
                                               ▼
                                    ┌──────────────────────────┐  NG
                                    │ Inspect wheel bearings    │─────▶ Repair
                                    └──────────────────────────┘
                                               │ OK
                                               ▼
                                    ┌──────────────────────────┐  NG
                                    │ Check the following       │─────▶ Repair
                                    │ connectors C17, C35M M61, │
                                    │ M83, C34-11, C34-10, I18-2│
                                    └──────────────────────────┘
                                               │ OK
                                               ▼
                                    ┌──────────────────────────┐
                                    │ Check symptoms of trouble │
                                    └──────────────────────────┘
                                               │ NG
                                               ▼
                                    ┌──────────────────────────┐  OK
                                    │ Measure the resistance at │─────▶ Repair
                                    │ the HECU connector C34    │
                                    │ o Disconnect the connector│
                                    │   and measure at the      │
                                    │   harness side.           │
                                    │ o Resistance value between│
                                    │   terminals 1-2, 22-23,   │
                                    │   5-6 and 19-20.          │
                                    │ OK : 1100Ω ± 50%          │
                                    │ (The sensor harness and   │
                                    │  connector should be moved│
                                    │  around while these       │
                                    │  inspection are carried   │
                                    │  out to detect intermittent│
                                    │  connections.)            │
                                    └──────────────────────────┘
                                               │ OK
                                               ▼
                                    ┌──────────────────────────┐  OK   ┌───────────────────┐
                                    │ Check symptoms of trouble │─────▶ │ Replace the HECU   │
                                    └──────────────────────────┘       └───────────────────┘
```

EJBB315D

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.
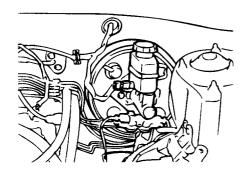
⚠ CAUTION

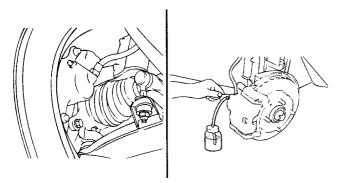***Do not allow brake fluid remain on a painted surface. Wash it off immediately.***

📖 NOTE

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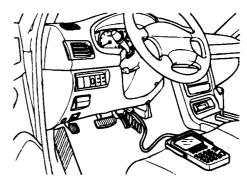*Recommended fluid.........DOT3 or equivalent*

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.

```
┌─────────────────────────────────────┐
│        0. INITIAL SCREEN            │
│ ███████████████████████████████████ │
│  01.  HYUNDAI VEHICLE DIAGNOSIS     │
│  02.  TOOL BOX                      │
│  03.  CARB OBD-II DIAGNOSIS         │
│  04.  FLIGHT RECORD REVIEW          │
│  05.  SYSTEM SETUP                  │
│                                     │
└─────────────────────────────────────┘
```

EJBB356C

2) Select Anti-Lock brake system.

```
┌─────────────────────────────────────┐
│   1. HYUNDAI VEHICLE DIAGNOSIS      │
│ MODEL : XG            ALL           │
│ SYSTEM : ANTI-LOCK BRAKE SYSTEM     │
│   01.  ENGINE V6-DOHC               │
│   02.  AUTOMATIC TRANSAXLE          │
│ ██03.  ANTI LOCK BRAKE SYSTEM████   │
│   04.  SRS-AIRBAG                   │
│                                     │
└─────────────────────────────────────┘
```

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
              AIR BLEEDING MODE
```
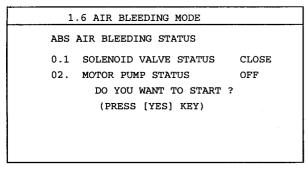
EJBB356E

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 per-
     fomed to prevent the motor pump from being
     burnt. (If not, you may damage the motor)
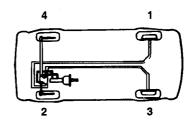
```
        1.6 AIR BLEEDING MODE

    ABS AIR BLEEDING STATUS

    0.1   SOLENOID VALVE STATUS     OPEN
    02.   MOTOR PUMP STATUS         ON
              TIME : 2SEC
```

EJBB356G

EJA9004A

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.

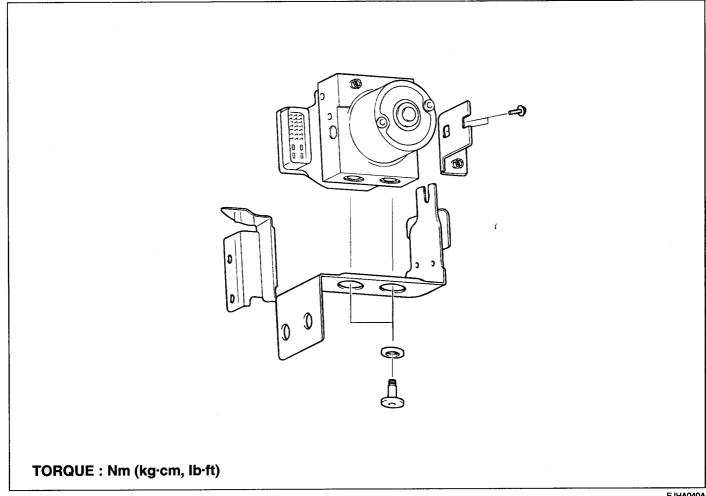7.   Tighten the bleeder screw.

Bleeder screw tightening torque

7-9 Nm (70-90 kg·cm, 5-6.6 lb·ft)

ANTI-LOCK BRAKING SYSTEM CONTROL MODULE

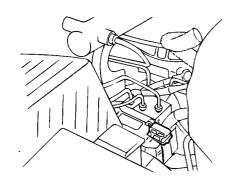## COMPONENTS EJHA3200

TORQUE : Nm (kg·cm, lb·ft)

EJHA040A

REMOVAL EJHA3250

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

EJHA022A

2. Disconnect the brake lines from the HECU.

EJHA045A

3. Remove the HECU bracket mounting bolt and the HECU.
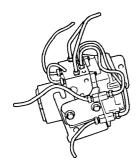
⚠ *CAUTION*

1. *Never attempt to disassemble 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 toque

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*
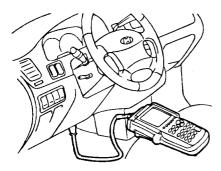
1. *The roller of the braking force tester and the tire should be dry during testing.*
2. *When testing the front brakes, apply the parking brake, and when testing the rear brakes, stop the front wheels by chocking them.*

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*

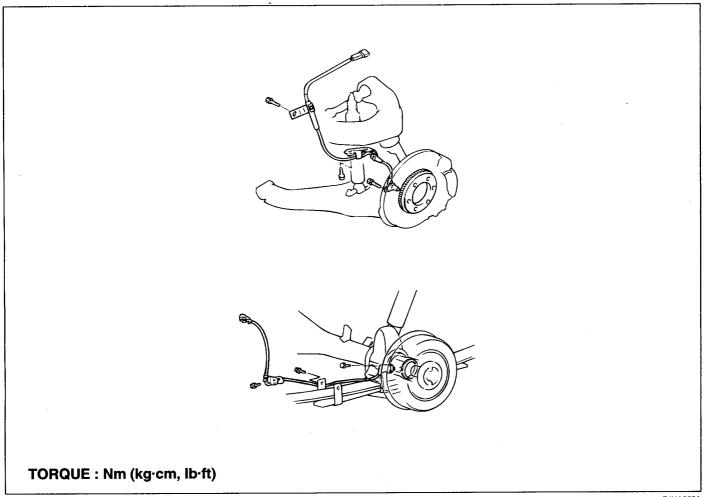*If the ABS is in fail-safe mode, the Hi-Scan actuator test cannot be used.*

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

ERHA006A

ANTI-LOCK BRAKING SYSTEM
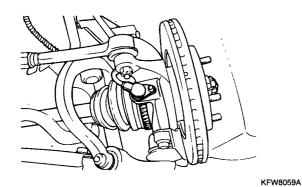# WHEEL SPEED SENSOR

COMPONENTS   EJHA3350
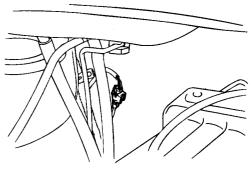

TORQUE : Nm (kg·cm, lb·ft)

EJHA055A

REMOVAL   EJHA3400

FRONT WHEEL SPEED SENSOR

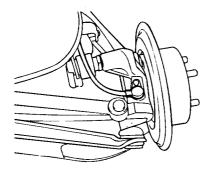1. Remove the front wheel speed sensor mounting bolt.

KFW8059A

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

EJHA023B

REAR WHEEL SPEED SENSOR

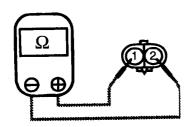Remove the rear wheel speed sensor after disconnecting the wheel speed sensor connector.

KFW8060A

INSPECTION EJBB3450

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

Service standard

Front : 1385 ± 110Ω

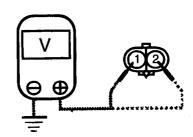Rear : 1385 ± 110Ω

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