MITSUBISHI L300

WORKSHOP MANUAL

FOREWORD

This Workshop Manual contains procedures for removal, disassembly, inspection, adjustment, reassembly and installation, etc. for service mechanics.

Use the following manuals in combination with this manual as required.

WORKSHOP MANUAL	
ENGINE GROUP	PWEE □□□□ (Looseleaf edition)
ELECTRICAL WIRING	PHWE8916
PARTS CATALOGUE	A0131809AC

All information, illustrations and product descriptions contained in this manual are current as at the time of publication. We, however, reserve the right to make changes at any time without prior notice or obligation.

MITSUBISHI MOTORS CORPORATION

E01AA–

GENERAL

CONTENTS

E01CA--

NOTES

HOW TO USE THIS MANUAL

E01BAAT0

SCOPE OF MAINTENANCE, REPAIR AND SERVICING EXPLANATIONS

This manual provides explanations, etc. concerning procedures for the inspection, maintenance, repair and servicing of the subject model. Note, however, that for engine- and transmission-related component parts, this manual covers only on-vehicle inspections, adjustments, and the removal and installation procedures for major components. For detailed information concerning the inspection, checking, adjustment, disassembly and reassembly of the engine, transmission and major components after they have been removed from the vehicle, please refer to the separate manuals covering the engine and the transmission.

SERVICE ADJUSTMENT PROCEDURES

"Service Adjustment Procedures" are procedures for performing inspections and adjustments of particularly important locations with regard to the construction and for maintenance and servicing, but other inspections (for looseness, play, cracking, damage, etc.) must also be performed.

INSPECTION

Under this title are presented inspection and checking procedures to be performed by using special tools and measuring instruments and by feeling, but, for actual maintenance and servicing procedures, visual inspections should always be performed as well.

DEFINITION OF TERMS

STANDARD VALUE

Indicates the value used as the standard for judging the quality of a part or assembly on inspection or the value to which the part or assembly is corrected and adjusted. It is given by tolerance.

LIMIT

Shows the standard for judging the quality of a part or assembly on inspection and means the maximum or minimum value within which the part or assembly must be kept functionally or in strength. It is a value established outside the range of standard value.

REFERENCE VALUE

Indicates the adjustment value prior to starting the work (presented in order to facilitate assembly and adjustment procedures, and so they can be completed in a shorter time).

CAUTION

Indicates the presentation of information particularly vital to the worker during the performance of maintenance and servicing procedures in order to avoid the possibility of injury to the worker, or damage to component parts, or a reduction of component or vehicle function or performance, etc.

EXPLANATION OF MANUAL CONTENTS

Indicates procedures to be performed before the work in that section is started, and procedures to be performed after the work in that section is finished.

Maintenance and Servicing Procedures

(1) A diagram of the component parts is provided near the front of each section in order to give the reader a better understanding of the installed condition of component parts.
(2) The numbers provided within the diagram indicate the sequence for maintenance and servicing procedures; the symbol N indicates a nonreusable part; the tightening torque is provided where applicable.

- Removal steps:
  The part designation number corresponds to the number in the illustration to indicate removal steps.
- Disassembly steps:
  The part designation number corresponds to the number in the illustration to indicate disassembly steps.
- Installation steps:
  Specified in case installation is impossible in reverse order of removal steps. Omitted if installation is possible in reverse order of removal steps.
- Reassembly steps:
  Specified in case reassembly is impossible in reverse order of disassembly steps. Omitted if reassembly is possible in reverse order of disassembly steps.

Indicates (by symbols) where lubrication is necessary. In this example, multipurpose grease is to applied (where indicated) to the steering gear box.

Classifications of Major Maintenance/Service Points

When there are major points relative to maintenance and servicing procedures (such as essential maintenance and service points, maintenance and service standard values, information regarding the use of special tools, etc.), these are arranged together as major maintenance and service points and explained in detail.

◆◆ : Indicates that there are essential points for removal or disassembly.
◆◆ : Indicates that there are essential points for installation or reassembly.

Symbols for Lubrication, Sealants and Adhesives

Information concerning the locations for lubrication and for application of sealants and adhesives is provided, by using symbols, in the diagram of component parts or on the page following the component parts page, and explained.

: Grease (multipurpose grease unless there is a brand or type specified)
: Sealant or adhesive
: Brake fluid or automatic transmission fluid
: Engine oil, gear oil or air conditioner compressor oil

Indicates the group number.

Indicates the page number.

Indicates the group title.

Indicates the section title.

This information is applicable for vehicles destined for Europe. This information is also applicable to vehicles (with specifications for Europe) that are shipped to General Export destinations.

37-24 STEERING – Power Steering Gear Box

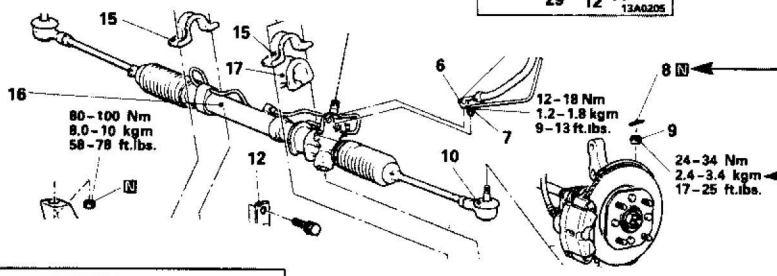
POWER STEERING GEAR BOX <VEHICLES FOR EUROPE>

REMOVAL AND INSTALLATION

E37PA-

Pre-removal Operation
- Draining of the Power Steering Fluid
- Removal of the Air Cleaner <Vehicles with a Carburettor>

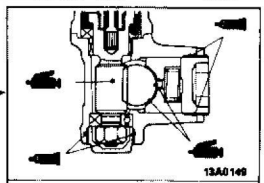
<2WD>



Repair kit or set parts are shown. (Only very frequently used parts are shown.)

Denotes non-reusable part.

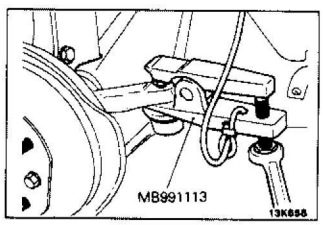
Denotes tightening torque.



Sealant: 3M ART Part No. 8661, No. 8663 or equivalent

Removal steps
- 1. Dust cover mounting bolts
- 5. Connection for joint assembly and gear box
- 6. Flare nut of return hose
- 7. Flare nut of pressure hose assembly
- 8. Split pins
- 9. Tie-rod end and knuckle connecting nuts
- 10. Tie-rod end ball joints
- 11. Crossmember support bracket

Operating procedures, cautions, etc. on removal, installation, disassembly and reassembly are described.



SERVICE POINTS OF REMOVAL

E37L8AF

5. DISCONNECTION OF JOINT ASSEMBLY AND GEAR BOX

Before disconnecting the joint assembly from the gear box, loosen the steering column assembly mounting bolts.

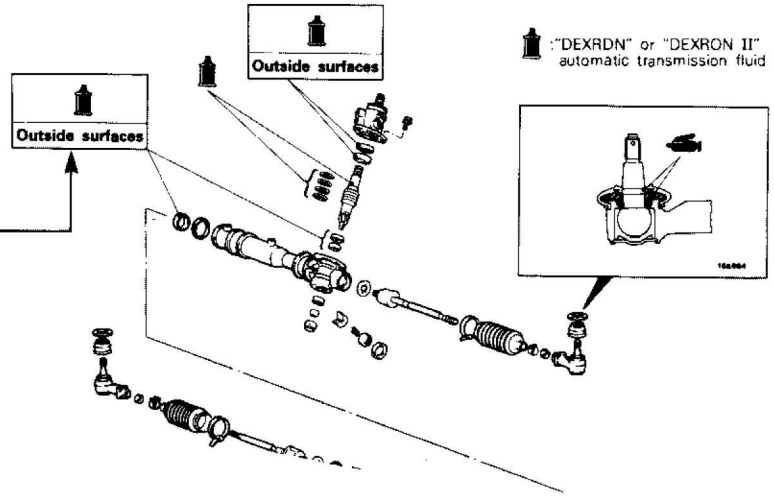
10. REMOVAL DF TIE-ROD END BALL JOINTS

Caution
To prevent the special tool from jumping out, secure it by cord to a nearby part.

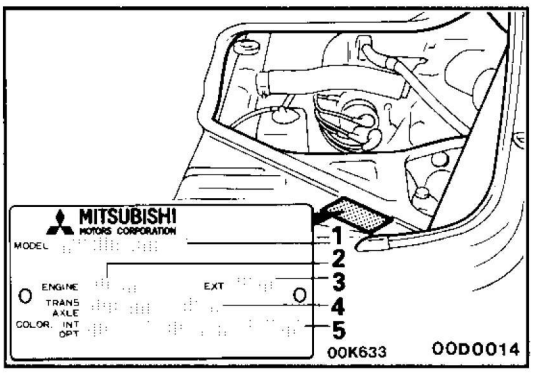
This number corresponds to the number appearing in "Removal steps", "Disassembly steps", "Installation steps" or "Reassembly steps".

37-28 STEERING – Power Steering Gear Box

LUBRICATION AND SEALING POINTS



The title of the page (following the page on which the diagram of component parts is presented) indicating the locations of lubrication and sealing procedures.



VEHICLE IDENTIFICATION

VEHICLE INFORMATION CODE PLATE E01DD--

Vehicle identification plate is riveted on the passenger's seat pan. The plate shows model code, engine model, transmission model and body color code.

1. MODEL
   L032P **YZL6**
   - YZL6 — Model series
   - L032P — Vehicle model
2. ENGINE
   4G32
   - 4G32 — Engine model
3. EXT
   CA6
   - CA6 — Exterior code
4. TRANSAXLE
   R5M21 **4625**
   - 4625 — Final gear ratio
   - R5M21 — Transmission model
6. COLOR, INT OPT
   S49 **87V** **03V**
   - 03V — Equipment code
   - 87V — Interior colour code
   - S49 — Body colour code

   For monotone colour vehicles, the body colour code shall be indicated. For two-tone or three-tone colour vehicles, each colour code only shall be indicated in series.

MODELS E01DA--

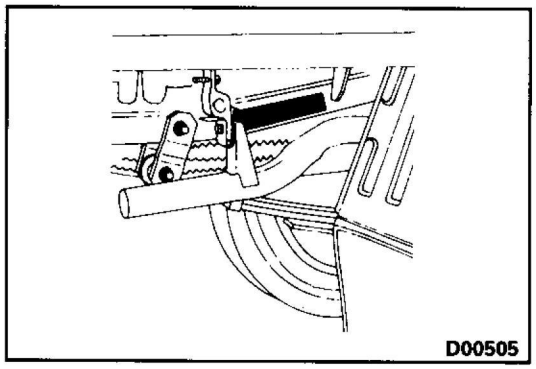
Model code	Engine model	Transmission model	Fuel supply system
L032PYZL6/R6	4G32 [1598 cc (96 cu.in.)]	R5M21 (5-speed, manual, column shift)	Carburettor
L039PYZL6/R6	4D56 [2477 cc (151 cu.in.)]		Injection

MODEL CODE

E01DB--

L 032 P Y Z L 6
1 2 3 4 5 6 7

1. Vehicle line
   L – MITSUBISHI L300
2. Engine displacement
   032 – 1598 cc (96 cu. in.), Petrol
   039 – 2477 cc (151 cu. in.), Diesel
3. Body type
   P – With frame
4. Body style
   Y – Cab and Chassis
5. Transmission type
   Z – 5-speed manual transmission, Column shift
6. Steering wheel location
   L – Left hand
   R – Right hand
7. Destination
   6 – For Europe



CHASSIS NUMBER

E01DCAP

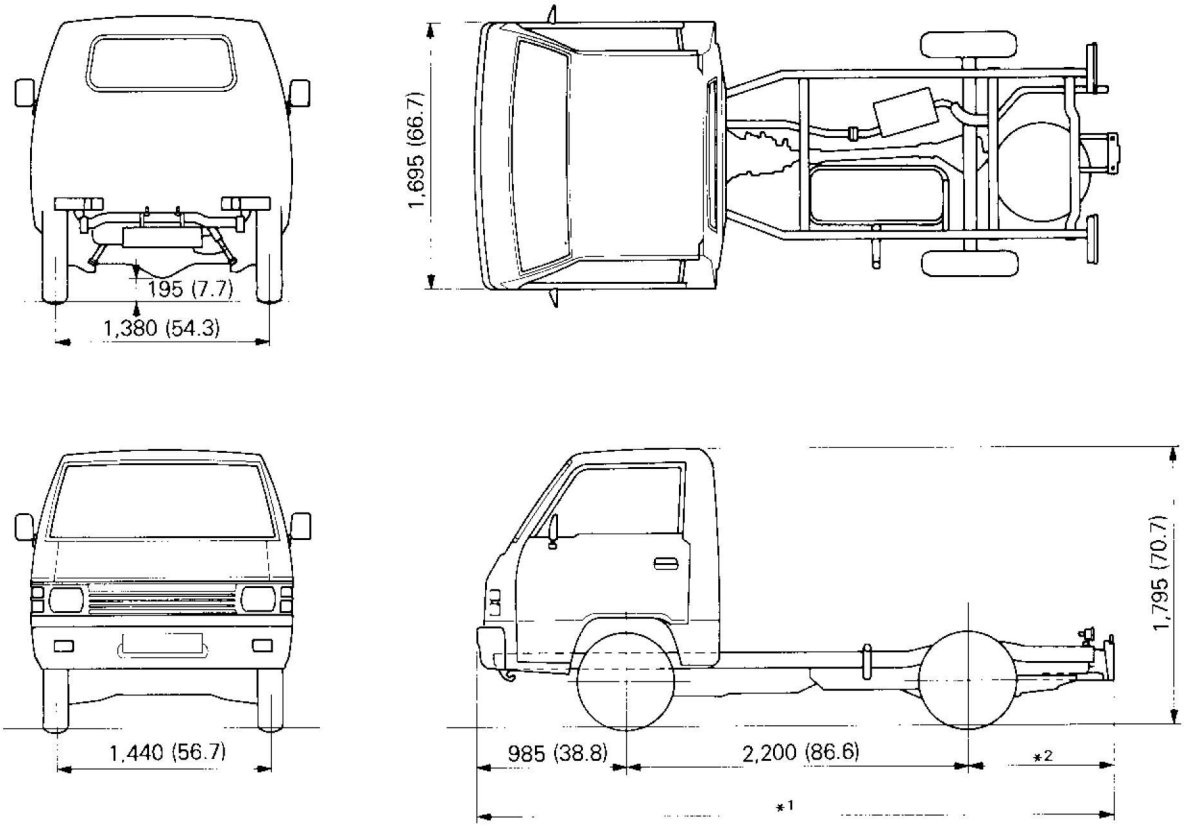
The chassis number is stamped on the side wall of the frame near the right rear spring hanger.

JMB L 032 P P L A 4 00001
1 2 3 4 5 6 7 8 9 10 11 12

1. Asia
2. Japan
3. A – For Europe, right hand drive
   B – For Europe, left hand drive
4. Sort
   L – Commercial car
5. Development order
   032 – 1598 cc (96 cu. in.), Petrol
   039 – 2477 cc (151 cu. in.), Diesel
6. Body type
   P – With frame
7. Vehicle type
8. Body style
   P – Cab and Chassis
9. Model year
   L – 1990
10. Plant
    A – Mizushima Motor Vehicle Works
11. Transmission type
    4 – 5-speed manual transmission
12. Serial number

DIMENSIONAL VIEWS

E01EA – –



NOTE

*1: <Petrol-powered vehicles>	4,105 (161.6)
<Diesel-powered vehicles>	4,205 (165.6)
*2 : <Petrol-powered vehicles>	920 (36.2)
<Diesel-powered vehicles>	1,020 (40.2)
	mm (in.)

00D0015

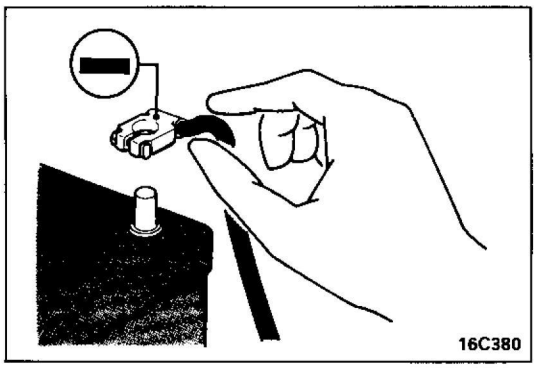
MAJOR SPECIFICATIONS

E01FA--

Items		L032PYZL6/R6	L039PYZL6/R6
Dimensions	mm (in.)		
Dverall length		4,105 (161.6)	4,205 (165.6)
Dverall width		1,695 (66.7)	1,695 (66.7)
Dverall height (unladen)		1,795 (70.7)	1,795 (70.7)
Wheelbase		2,200 (86.6)	2,200 (86.6)
Track-front		1,440 (56.7)	1,440 (56.7)
Track-rear		1,380 (54.3)	1,380 (54.3)
Overhang			
Front		985 (38.8)	985 (38.8)
Rear		920 (36.2)	1,020 (40.2)
Ground clearance (unladen)		195 (7.7)	195 (7.7)
Weight	kg (lbs.)		
Kerb weight		970 (2,138)	1,065 (2,347)
Front axle load		685 (1,510)	745 (1,642)
Rear axle load		285 (628)	320 (705)
Max. gross vehicle weight		2,205 (4,861) or 2,200 (4,850)*1	2,205 (4,861) or 2,200 (4,850)*1, *2
Front axle load		1,150 (2,535)	1,150 (2,535)
Rear axle load		1,330 (2,932)	1,330 (2,932)
Seating capacity		3	3
Performance			
Max. speed	km/h (mph)	130 (80)	120 (75)
Min. turning radius	m (ft.)	8.9 (29)	8.9 (29)
Engine			
Model		4G32	4D56
Total displacement	cc (cu.in.)	1,598 (96)	2,477 (151)
Fuel System			
Fuel supply system		Carburettor	Injection
Fuel pump type		Mechanical (Diaphragm)	Mechanical (Vane)
Fuel tank capacity	lit. (U.S.gal., Imp.gal.)	55 (14.5, 12.0)	55 (14.5, 12.0)
Cooling Sytem			
Cooling capacity	lit. (U.S.qts., Imp.qts.)	7.1 (7.5, 6.2)	8.1 (8.3, 7.1)
Clutch			
Type		Dry single-disc clutch with diaphragm spring	Dry single-disc clutch with diaphragm spring

NOTE
*1: Vehicles for West Germany
*2: Vehicles for Switzerland

Items	L032PYZL6/R6	L039PYZL6/R6
Transmission		
Type	5-speed manual, column shift	
Model	R5M21	
Wheels		
Tyre size	175R14C-8PR	
Disc wheel size	14 × 5J	
Suspension		
Type		
Front	Double wishbone	
Rear	Parallel leaf spring	
Steering System		
Type	Recirculating ball and nut	
Service Brakes		
Type	Hydraulic brake system with servo	
Front	Disc	
Rear	Drum	
Parking Brake	Mechanical type, acting on rear wheels	
Electrical System		
Battery type – Voltage – Capacity	55D23R – 12V – 48 Ah or 65D23R – 12V – 52 Ah	95D31R – 12V – 64 Ah or (55B24R – 12V – 36 Ah) × 2

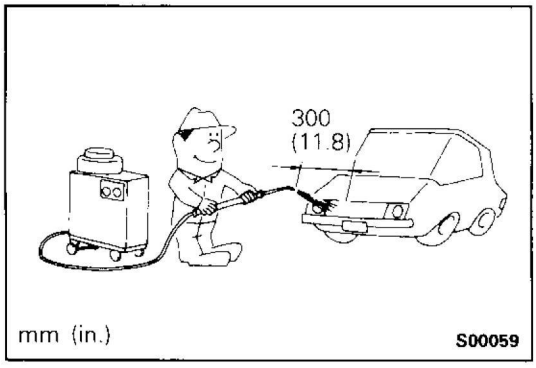


PRECAUTIONS BEFORE SERVICE E01GA--

SERVICING THE ELECTRICAL SYSTEM

Before replacing a component related to the electrical system and before undertaking any repair procedures involving the electrical system, be sure to first disconnect the negative (–) cable from the battery in order to avoid damage caused by short-circuiting.

Caution
Before connecting or disconnecting the negative (–) cable, be sure to turn off the ignition switch and the lighting switch.
(If this is not done, there is the possibility of semiconductor parts being damaged.)



VEHICLE WASHING

If high-pressure car-washing equipment or steam car-washing equipment is used to wash the vehicle, be sure to note the following information in order to avoid damage to plastic components, etc.

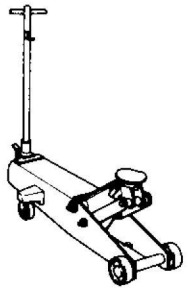
- Spray nozzle distance: 300 mm (11.8 in.) or more
- Spray pressure: 4 MPa (40 kg/cm^2, 569 psi) or less
- Spray temperature: 82°C (180°F) or less
- Time of concentrated spray to one point: within 30 sec.

SUPPORT LOCATIONS FOR LIFTING AND JACKING

E01LB--

Caution
Do not support the vehicle at locations other than specified supporting points. If do so, this will cause damage etc.

SUPPORT POSITIONS FOR A GARAGE JACK



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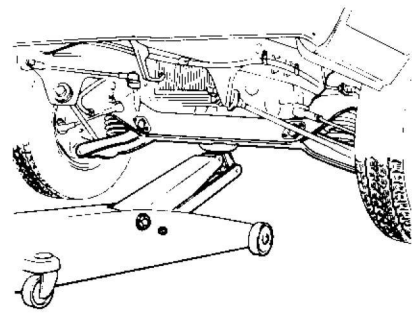

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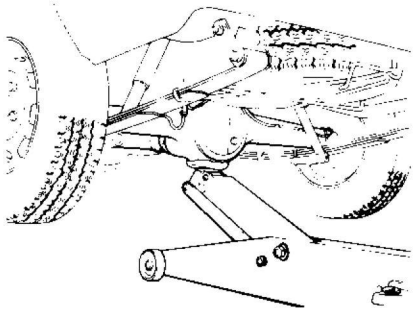

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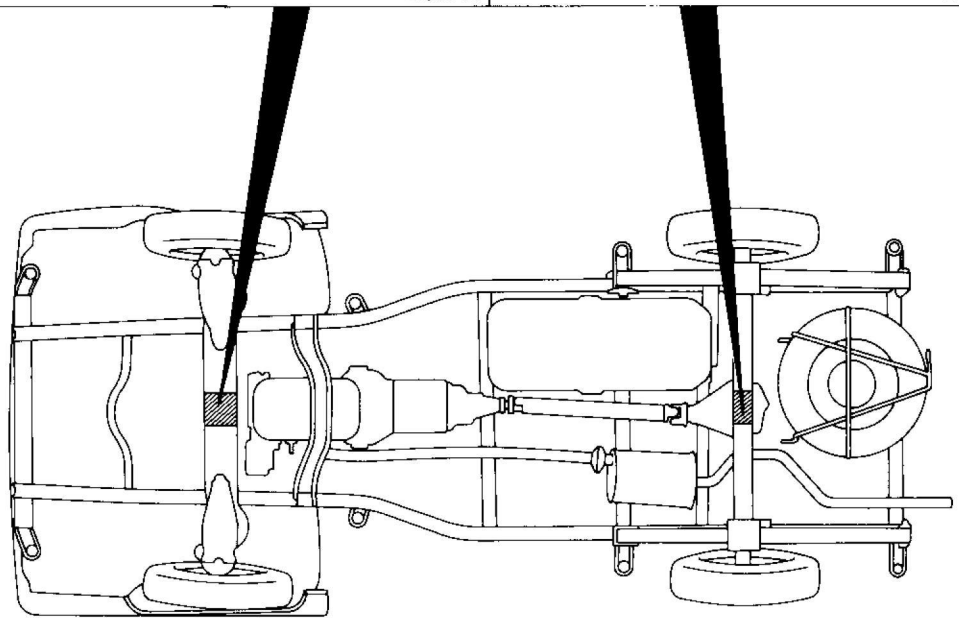

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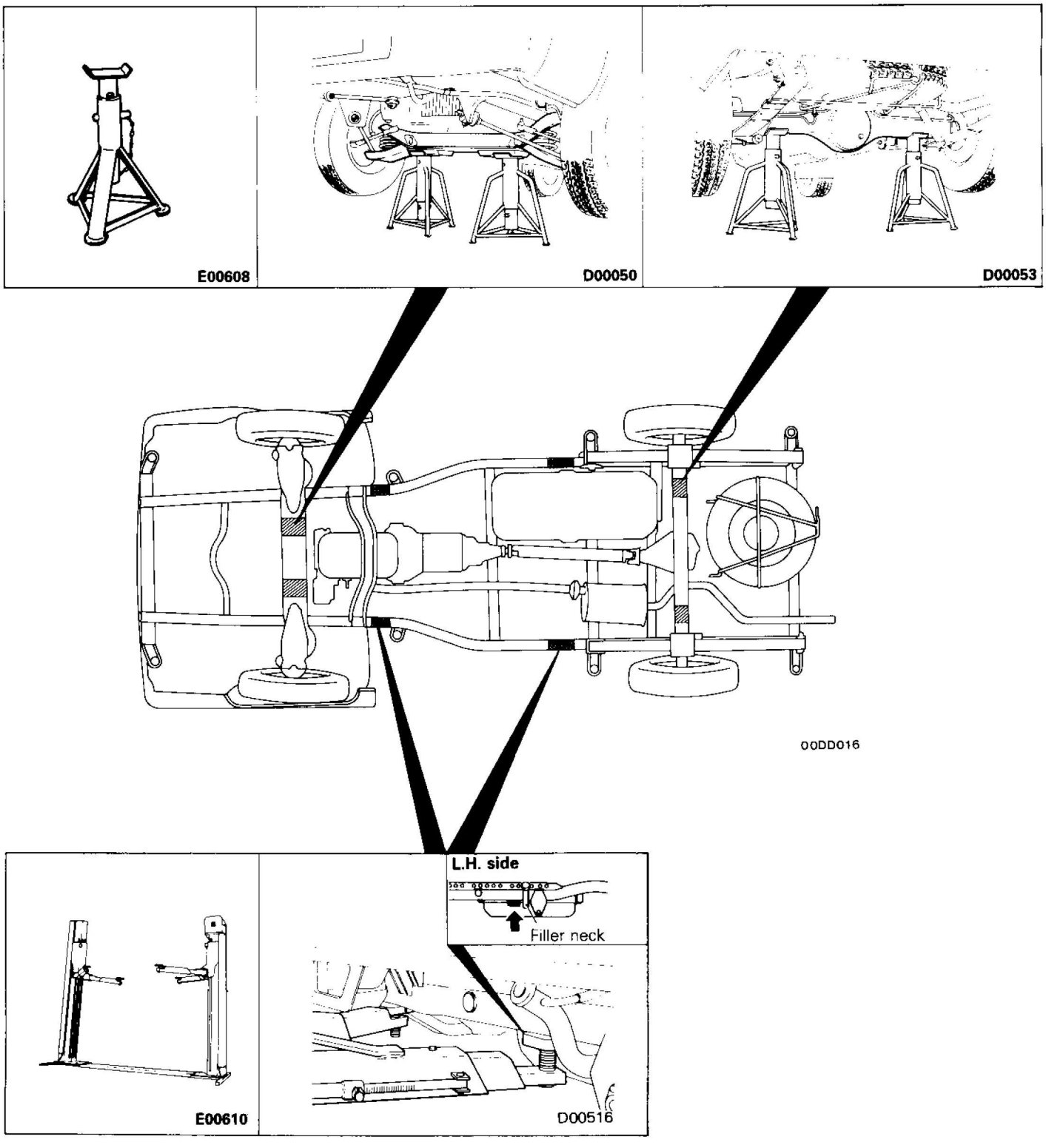
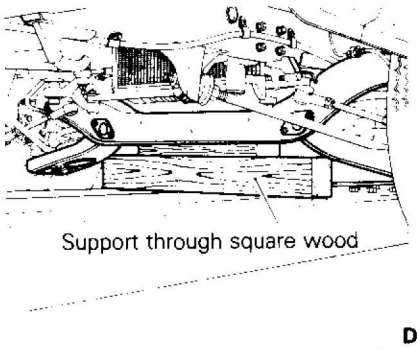
SUPPORT POSITIONS FOR AXLE STANDS, A SINGLE-POST LIFT OR FREE WHEEL TYPE AUTO LIFT

Caution
When service procedures require removing rear suspension, fuel tank and spare tyre, place additional weight on rear end of vehicle or anchor vehicle to hoist to prevent tipping of centre of gravity changes.





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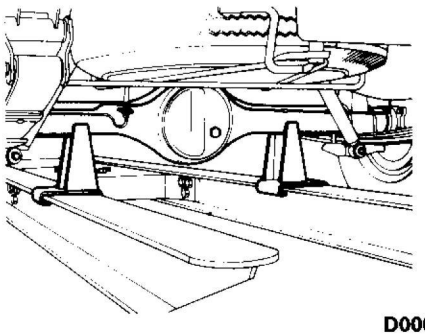

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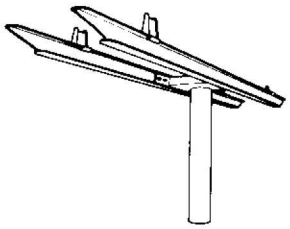

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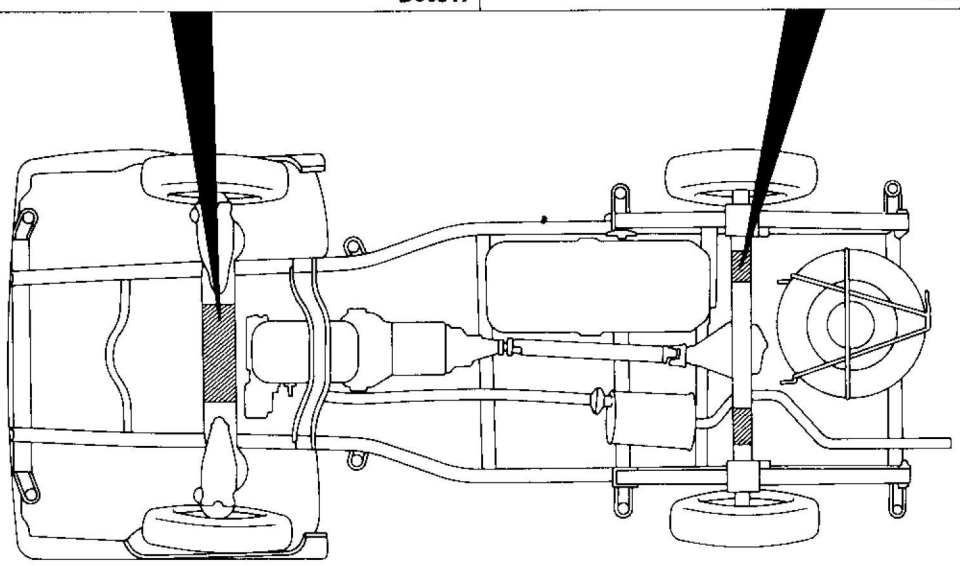

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STANDARD PARTS-TIGHTENING-TORQUE TABLE

E01MA--

Each torque value in the table is a standard value for tightening under the following conditions.
(1) Bolts, nuts and washers are all made of steel and plated with zinc.
(2) The threads and bearing surface of bolts and nuts are all in dry condition.

The values in the table are not applicable:
(1) If toothed washers are inserted.
(2) If plastic parts are fastened.
(3) If bolts are tightened to plastic or die-cast inserted nuts.
(4) If self-tapping screws or self-locking nuts are used.

Standard bolt and nut tightening torque

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (kgm, ft.lbs.)		
		Head mark (4)	Head mark (7)	Head mark (8)
M5	0.8	2–3 (0.2–0.3, 1.4–2.2)	4–6 (0.4–0.6, 2.9–4.3)	5–7 (0.5–0.7, 3.6–5.1)
M6	1.0	4–6 (0.4–0.6, 2.9–4.3)	7–11 (0.7–1.1, 5.1–8.0)	8–12 (0.8–1.2, 5.8–8.7)
M8	1.25	9–14 (0.9–1.4, 6.5–10)	17–26 (1.7–2.6, 12–19)	20–30 (2.0–3.0, 14–22)
M10	1.25	19–28 (1.9–2.8, 14–20)	35–55 (3.5–5.5, 25–40)	45–60 (4.5–6.0, 33–43)
M12	1.25	34–50 (3.4–5.0, 25–36)	70–95 (7.0–9.5, 51–69)	85–110 (8.5–11, 61–80)
M14	1.5	60–85 (6.0–8.5, 43–61)	120–160 (12–16, 87–116)	130–180 (13–18, 94–130)
M16	1.5	95–130 (9.5–13, 69–94)	180–240 (18–24, 130–174)	200–270 (20–27, 145–195)
M18	1.5	140–190 (14–19, 101–137)	260–350 (26–35, 188–253)	300–400 (30–40, 217–289)
M20	1.5	190–260 (19–26, 137–188)	360–480 (36–48, 260–347)	410–560 (41–56, 297–405)
M22	1.5	260–350 (26–35, 188–253)	480–650 (48–65, 347–470)	560–750 (56–75, 405–542)
M24	1.5	340–460 (34–46, 246–333)	630–860 (63–86, 456–622)	740–1,000 (74–100, 535–723)

Flange bolt and nut tightening torque

Bolt nominal diameter (mm)	Pitch (mm)	Torque Nm (kgm, ft.lbs.)		
		Head mark (4)	Head mark (7)	Head mark (8)
M6	1.0	4–6 (0.4–0.6, 2.9–4.3)	8–12 (0.8–1.2, 5.8–8.7)	9–14 (0.9–1.4, 6.5–10)
M8	1.25	10–15 (1.0–1.5, 7.2–11)	19–28 (1.9–2.8, 14–20)	22–33 (2.2–3.3, 16–24)
M10	1.25	21–31 (2.1–3.1, 15–22)	39–60 (3.9–6.0, 28–43)	50–65 (5.0–6.5, 36–47)
M10	1.5	19–29 (1.9–2.9, 14–21)	36–54 (3.6–5.4, 26–39)	45–65 (4.5–6.5, 33–47)
M12	1.25	38–55 (3.8–5.5, 27–40)	80–110 (8.0–11, 58–80)	90–120 (9.0–12, 65–87)
M12	1.75	34–52 (3.4–5.2, 25–38)	70–95 (7.0–9.5 51–69)	85–110 (8.5–11, 61–80)

Taper thread tightening torque

Thread size	Torque Nm (kgm, ft.lbs.)	
	Female thread material: Light alloy	Female thread material: Steel
NPTF 1/6	5–8 (0.5–0.8, 3.6–5.8)	8–12 (0.8–1.2, 5.8–8.7)
PT 1/8	8–12 (0.8–1.2, 5.8–8.7)	16–20 (1.6–2.0, 12–14)
PT 1/4, NPTF 1/4	20–30 (2.0–3.0, 14–22)	35–45 (3.5–4.5, 25–33)
PT 3/8	40–55 (4.0–5.5, 29–40)	60–75 (6.0–7.5, 43–54)

NOTE: NPTF is dry seat pipe thread, while PT is pipe thread.

NOTES

ENGINE

CONTENTS

E11AA--

ENGINE <4G32>

SPECIFICATIONS

E11CA – A

GENERAL SPECIFICATIONS

Items			Specifications
Type			In-line, 4 cylinders Single over head camshaft
Bore		mm (in.)	76.9 (3.03)
Stroke		mm (in.)	86.0 (3.39)
Total displacement		cc (cu. in.)	1,597 (97.5)
Compression ratio			8.8 : 1
Firing order			1-3-4-2
Valve timing			
Intake valve	Opens (BTDC)		20°
	Closes (ABDC)		48°
Exhaust valve	Opens (BBDC)		51°
	Closes (ATDC)		17°

SERVICE SPECIFICATIONS

E11CB – A

Items		Specifications
Standard value		
Valve clearance at hot engine	mm (in.)	
Inlet side		0.15 (0.0059)
Exhaust side		0..25 (0.0098)
Ignition timing		5°±2° BTDC
Idling speed	r/min.	800±50
Radiator cap valve-opening pressure	kPa (kg/cm^2, psi)	75 – 105 (0.75 – 1.05, 11 – 15)
Spark plug gap	mm (in.)	0.7 – 0.8 (0.028 – 0.031)
Drive belt tension	mm (in.)	9.0 – 11.5 (0.35 – 0.45)
Limit		
Radiator cap valve-opening pressure	kPa (kg/cm^2, psi)	65 (0.65, 9.2)

TORQUE SPECIFICATIONS

E11CC – A

Item	Nm	kgm	ft.lbs.
Alternator support bolt nut	20 – 25	2.0 – 2.5	14 – 18
Alternator brace bolt	12 – 15	1.2 – 1.5	9 – 11
Rocker cover bolt	5 – 7	0.5 – 0.7	4 – 5
Rocker shaft assembly to cylinder head assembly	19 – 21	1.9 – 2.1	14 – 15
Rocker shaft assembly to cylinder head assembly	10 – 12	1.0 – 1.2	7 – 9
Timing belt front upper cover bolt	10 – 12	1.0 – 1.2	7 – 9
Rocker arm adjusting nut	12 – 18	1.2 – 1.8	9 – 13
Camshaft sprocket	80 – 100	8.0 – 10.0	58 – 72
Distributor nut	10 – 13	1.0 – 1.3	7 – 9
Spark plug	20 – 30	2.0 – 3.0	14 – 22
Oil pan	6 – 8	0.6 – 0.8	4.3 – 5.7
Oil pan	5 – 7	0.5 – 0.7	3.6 – 5.0
Drain plug	35 – 45	3.5 – 4.5	25 – 33
Timing belt front upper cover	10 – 12	1.0 – 1.2	7 – 9
Reed valve	10 – 13	1.0 – 1.3	7 – 9
Air pipe to exhaust manifold	20 – 30	2.0 – 3.0	15 – 22
Air pipe bracket to exhaust manifold	12 – 15	1.2 – 1.5	9 – 11
Cylinder head assembly	70 – 75	7.0 – 7.5	51 – 54
Crankshaft pulley	15 – 18	1.5 – 1.8	11 – 13
Timing belt lower cover	10 – 12	1.0 – 1.2	7 – 9
Timing belt tensioner nut	22 – 30	2.2 – 3.0	16 – 22
Flywheel assembly	130 – 140	13 – 14	94 – 101
Exhaust pipe to bracket	20 – 30	2.0 – 3.0	15 – 22
Transmission mounting bolt	43 – 55	4.3 – 5.5	31 – 40
Propeller shaft	50 – 60	5.0 – 6.0	36 – 43
Transmission mounting nut	30 – 42	3.0 – 4.2	22 – 30
Front engine support assembly mounting bolt	40 – 50	4.0 – 5.0	29 – 36

LUBRICANTS

E11CD – A

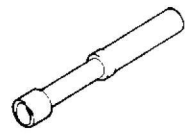
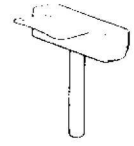
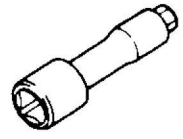
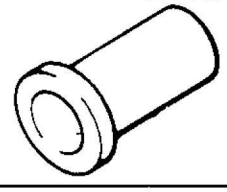
Items	Recommended lubricant (API classification)	Quantity lit. (U.S.qts., Imp.qts.)
Engine oil	SE or higher	4.0 (4.2, 3.5)

SEALANTS AND ADHESIVES

E11CE – A

Items	Specified sealant	Remarks
Semi-circular packing	3M ATD Part No.8660 or equivalent	Non-drying sealant
Oil pan	MITSUBISHI GENUINE PART MZ100168 or equivalent	Semi-drying sealant

SPECIAL TOOLS

Tool	Number	Name	Use
	MD998299	MAS screwdriver	Adjustment of mixture adjusting screw
	MD998364	Camshaft oil seal installer	Press-in of the camshaft oil seal
	MD998727	Oil pan sealer cutter	Removal of oil pan
	MD998360	Cylinder head bolt wrench	Removal and installation of cylinder head bolt
	MD998304	Crankshaft front oil seal installer	Installation of crankshaft front oil seal

ENGINE ADJUSTMENT

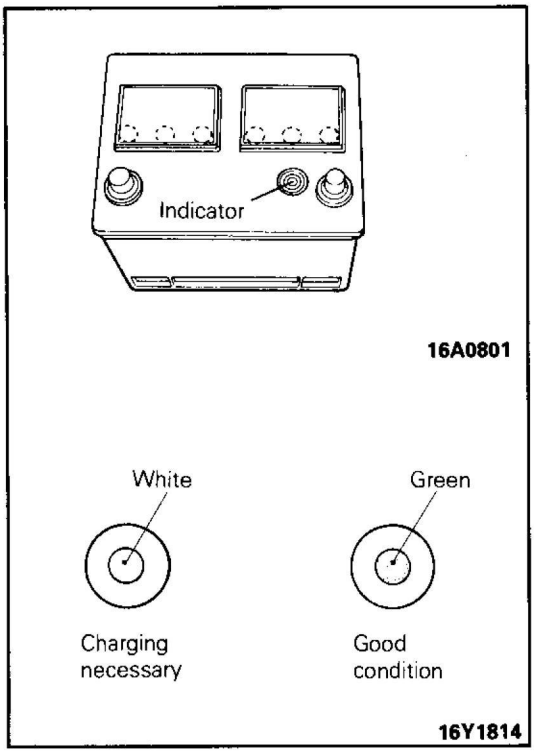
RADIATOR CAP VALVE-OPENING PRESSURE CHECK

E11FIAE0

Standard value: 75 – 105 kPa (0.75 – 1.05 kg/cm^2, 11 – 15 psi)
Limit: 65 kPa (0.65 kg/cm^2, 9.2 psi)

ENGINE COOLANT INSPECTION

E11FHAB0



BATTERY INSPECTION E11FMAE

BATTERY VISUAL INSPECTION (1)

The battery contains a visual test indicator which gives green signal when an adequate charge level exists, and white signal when charging is required.

BATTERY VISUAL INSPECTION (2)

Make sure ignition switch is in Off position and all battery feed accessories are Off.

1. Disconnect earth cable from battery before disconnecting (+) cable.
2. Remove battery from vehicle.

   Caution
   Care should be taken in the event battery case is cracked or leaking to protect hands from the electrolyte. A suitable pair of rubber gloves (not the household type) should be worn when removing battery by hand.
3. Inspect battery carrier for damage caused by loss of acid from battery. If acid damage is present, it will be necessary to clean area with a solution of clean warm water and baking soda . Scrub area with a stiff bristle brush and wipe off with a cloth moistened with ammonia or baking soda in water.
4. Clean top of battery with same solutions as described in Step (3).
5. Inspect battery case and cover for cracks. If cracks are present, battery must be replaced.
6. Clean the battery post with a suitable battery post cleaning tool.
7. Clean the inside surfaces of the terminal clamps with a suitable battery terminal cleaning tool. Replace damaged or frayed cable and broken terminal clamp.
8. Install the battery in vehicle.
9. Connect (+) and (–) cables to battery in the order of mention.
10. Tighten the clamp nut securely.

ENGINE OIL LEVEL INSPECTION E11FNAK0

AIR CLEANER ELEMENT INSPECTION AND CLEANING E11FPAN0

SPARK PLUG CHECK AND CLEANING E11FRAJ0

Standard value:

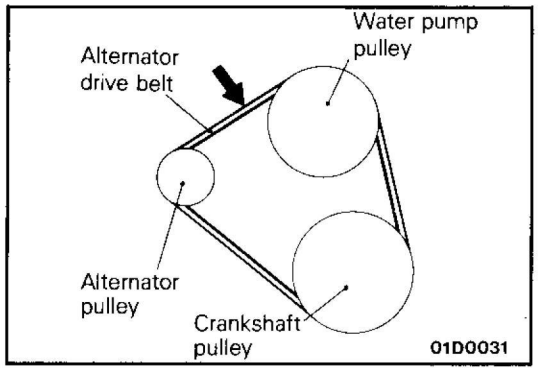
BP6ES, BPR6ES, W20EP, W20EPR, W20EX-U	**0.7 – 0.8 mm (0.028 – 0.031 in.)**

DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

E11FQAY

1. Check belt for damage or wear. Confirm that belt is set correctly in pulley groove.

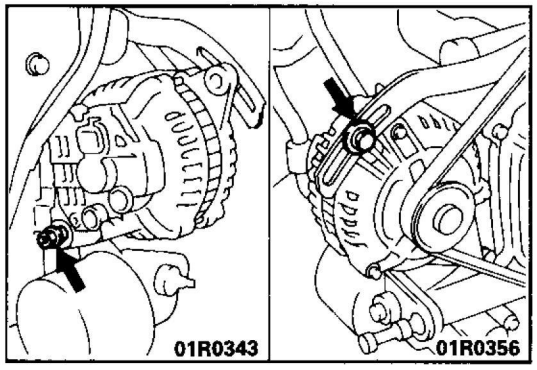
   NOTE
   If the belt "squeals" or slips, check belt for friction, damage or breaks and check pulley contact surface for damage.



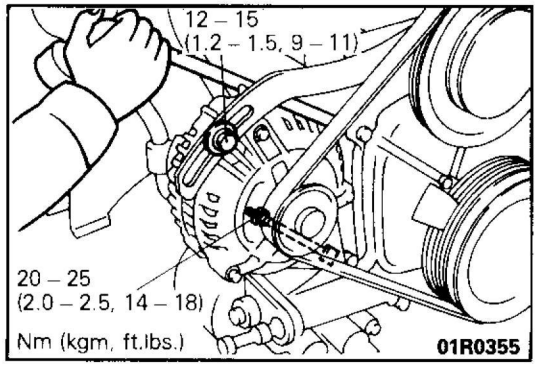
2. Press at 100N (10 kg, 22 lbs.) mid-point of belt between two pulleys as indicated in the illustration. Measure drive belt flex.

   Standard value: 7 – 10 mm (0.28 – 0.39 in.)

   Caution
   Measure belt flex between specified pulleys (⬅).



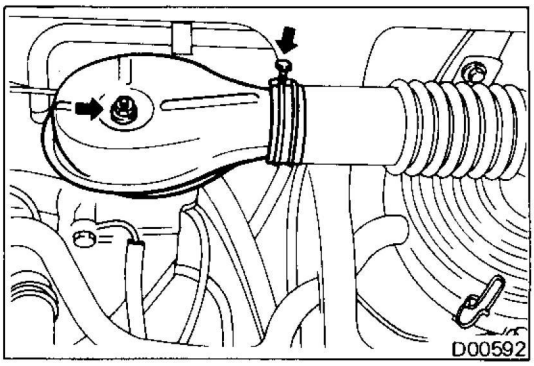
3. Adjust alternator drive belt deflection by the following procedures.
   (1) Loosen alternator pivot bolt nut and brace bolt.



   (2) Adjust belt deflection by using a rod as a lever against the alternator stator pushing it into the proper position.

   Standard value: 7 – 10 mm (0.28 – 0.39 in.)

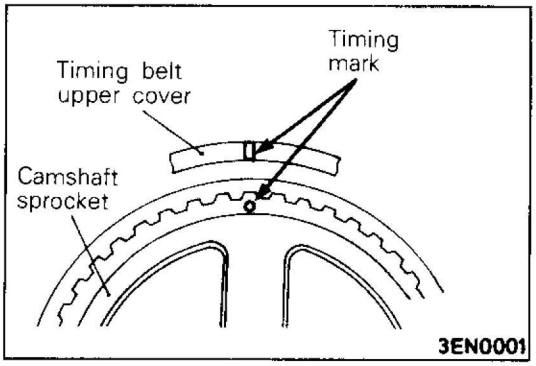
   (3) Retighten the alternator brace bolt and support pivot bolt nut to the specified torque.



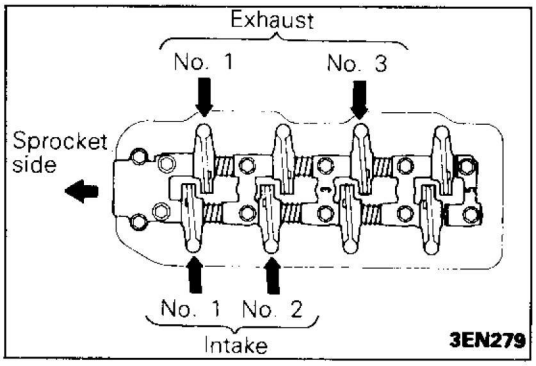
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

E11FDBOa

1. Start the engine and allow it to warm up until the engine coolant temperature reaches 80 to 90°C (176 to 194°F).
2. Remove air horn.
3. Remove rocker cover.
4. Remove timing belt front upper cover.



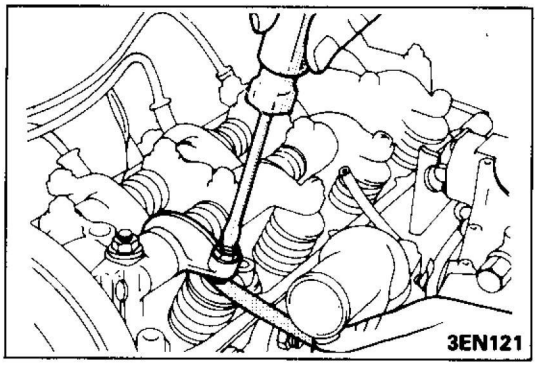
5. Turn crankshaft clockwise and align with camshaft sprocket timing mark.



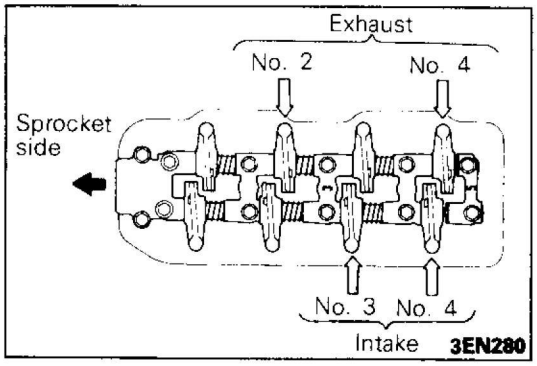
6. Check that valve clearance indicated in the diagram is at the standard value.

Standard value (hot engine):

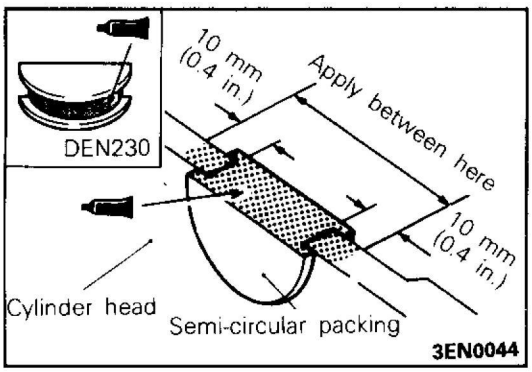
Intake	**0.15 mm (0.0059 in.)**
Exhaust	**0.25 mm (0.0098 in.)**



7. If valve clearance is off the standard value, loosen rocker arm adjusting screw locking nut. Use thickness gauge and adjust valve clearance by turning adjusting screw.
8. Secure rocker arm adjusting screw with screwdriver so that is it will not rotate and tighten locking nut.



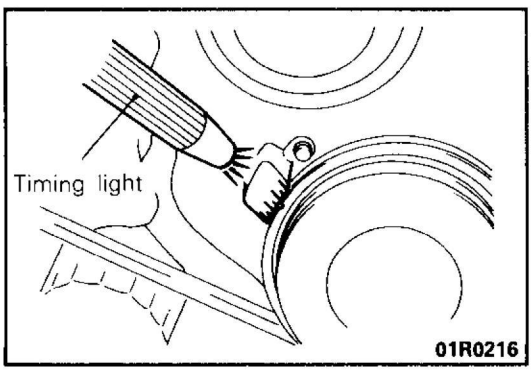
9. Rotate clockwise the crankshaft one complete turn (360° degree).
10. Check that valve clearance indicated in the diagram is at the standard value.
11. Repeat steps 7. and 8. to adjust the valve clearance of remaining valves.



12. When installing the rocker cover assembly to the cylinder head, apply a coating of the specified sealant to the semicircular packing and the cylinder head top surface, and then tighten at the specified torque.

Specified sealant: 3M ATD Part No. 8660 or equivalent

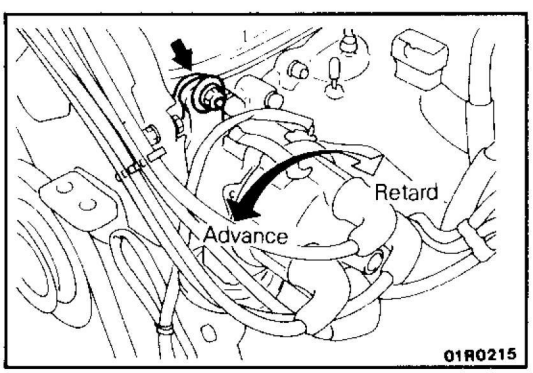
Caution
If they are overtorqued, a deformed rocker cover or oil leakage could result.



IGNITION TIMING INSPECTION AND ADJUSTMENT E11FVAH

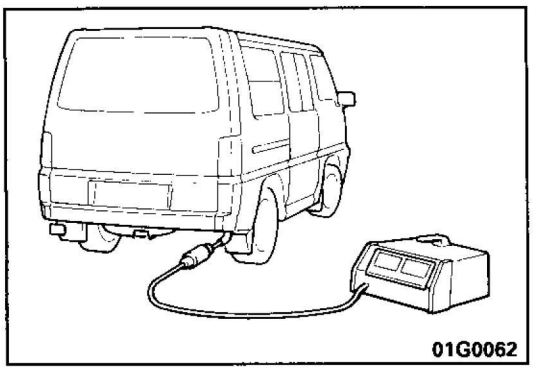
1. Before inspection and adjustment, set vehicle in the following condition.
   - Engine coolant temperature: 80–90°C (176–194°F)
   - Lamps and all accessories: OFF
   - Transmission: Neutral
2. Set timing light and tachometer.
3. Check to make sure the engine speed is between 600 to 900 r/min.
4. Check that basic ignition timing is within the standard value.

   Standard value: 5° ± 2° BTDC



5. If not within the standard value, loosen distributor fixing nut and adjust by rotating d distributor body.
6. After adjusting, tighten the fixing nut taking care that the distributor does not move.

   NOTE
   Sealing tape is attached to all vehicles when new.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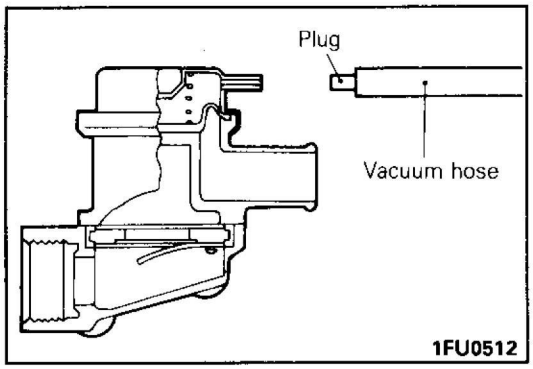

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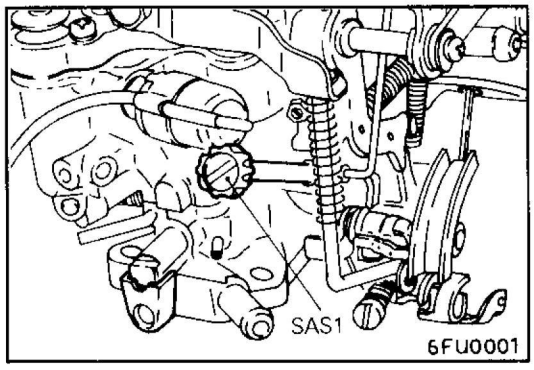

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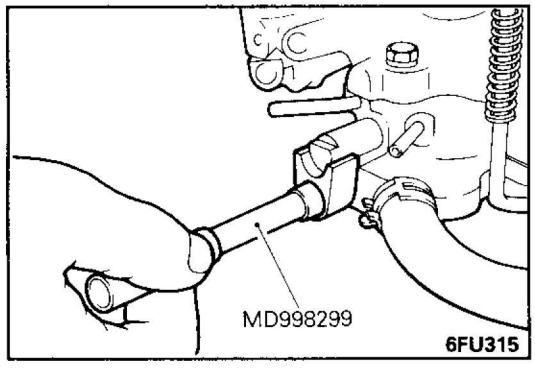


6FU315

IDLING SPEED/IDLE MIXTURE INSPECTION AND ADJUSTMENT E11FXCN

1. Before inspection and adjustment, set vehicle in the following condition.
   (1) Engine coolant temperature: 80 – 90°C (176 – 194°F)
   (2) Lamps and all accessories: OFF
   (3) Transmission: Neutral
2. Set timing light and tachometer.
3. Start engine and run at idle.
4. Check the basic ignition timing. (Refer to P. 11-8.)

   Standard value: 5° ± 2° BTDC
5. Set carbon monoxide concentration analyzer.
6. Disconnect the vacuum hose (hose with white stripe) from the secondary air control valve and plug the end of the vacuum hose.
7. Run engine at 2,000 – 3,000 r/min. and race 2 – 3 times.
8. Check the engine idle carbon monoxide concentration is within the standard value.

   Engine idling speed: 800 ± 50 r/min.
   Carbon monoxide concentration: 1.0 ± 0.5 % (at air cut)

   If not within the standard values, adjust idle r/min and idle mixture to standard value with speed adjusting screw (SAS) and mixture adjusting screw (MAS).

   NOTE
   1. Adjusting shall be done quickly and efficiently.
   2. The carburettor is fitted with an idling limiter cap, so the special tool (MAS driver) is required for adjusting carbon monoxide concentration.
9. Remove the plug from the end of the vacuum hose (hose with white stripe), and re-connect the vacuum hose to the secondary air control valve.
10. Run the engine at 2,000 to 3,000 r/min. for 15 to 30 seconds.
11. Check to make sure the engine idling speed and carbon monoxide concentration are within the standard values specified below.

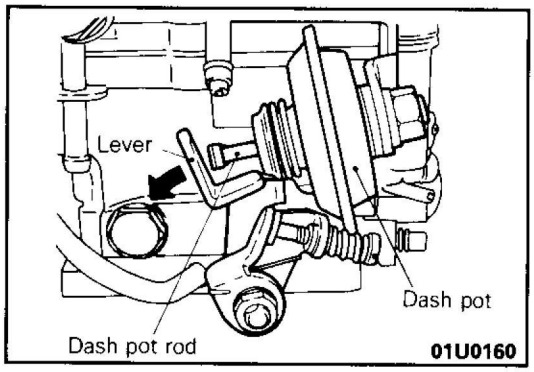
    Engine idling speed: 800 ± 50 r/min.
    Carbon monoxide concentration: 1.0% or less (at air in)

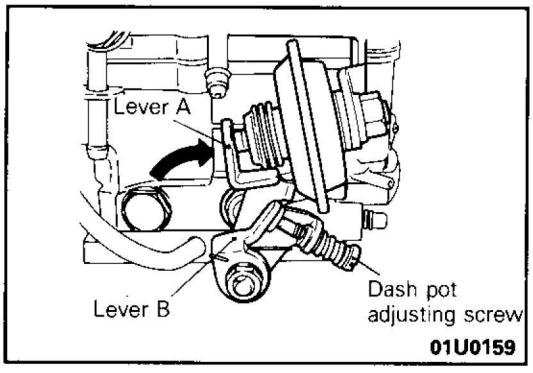
DASHPOT INSPECTION AND ADJUSTMENT

E11FYAT

NOTE
Dashpot inspection and adjustment must be done only after spark timing, engine idling speed and carbon monoxide concentration have been inspected and adjusted.

1. Before inspection and adjustment set vehicle in the following condition.
   - Engine coolant temperature: 80 – 90°C (176 – 194°F)
   - Lights and accessories: OFF
   - Transmission: Neutral
2. Set tachometer.
3. Start engine and run at idle.
4. Open throttle lever until dashpot rod makes full stroke.





5. Close the throttle valve gradually and locate the point at which dash pot lever A touches the dash pot rod (the point at which the dash pot rod begins to shrink). Maintain the position of the throttle valve at that point. At this time, dash pot lever B shall be touching the dash pot adjusting screw.
6. Check the engine speed (engine speed at which the dash pot starts to operate).

   Standard value: 1,600 ± 200 r/min.
7. If the engine speed is not within the standard value specified above, adjust the engine speed by turning the dash pot adjusting screw.
8. Starting from the time the throttle valve is released (from the position in which it was maintained), check the time required until the engine speed decreases to the check point engine speed (dash pot operating time).

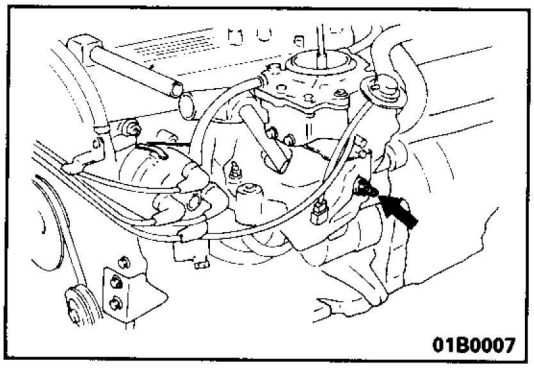
   Standard value:

Check point	**900 r/min.**
Dash pot operating time	**1.5 – 4.5 seconds**

9. If the time is not within the standard range specified above, adjust the dash pot operating time by increasing or decreasing the dash pot operation starting speed within the tolerance limit of the standard value.

MANIFOLD VACUUM INSPECTION

E11FWAR



1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80° C to 90°C (176°F to 194°F).
2. Set an engine tachometer in place.
3. Set the vacuum gauge at illustrated position on the intake manifold.
4. Start the engine and check that the idle speed is within the standard value range. Then read off the vacuum gauge.

   Standard value: 500 mmHg (19.7 in.Hg) or more
5. If not at standard value, refer to following chart for cause and repair.

Symptom	Probable cause	Remedy
Vacuum gauge reads under standard value but needle is stable	• Delayed ignition timing • Incorrect valve clearance	• Adjust ignition timing • Adjust valve clearance
Vacuum gauge needle fluctuates slowly	• Air/fuel mixture too rich	• Adjust carburettor
Vacuum gauge reading decreases irregularly	• Air /fuel mixture too lean	• Adjust carburettor
Vacuum gauge needle decreases about 30 – 160 mmHg (1.2 – 6.3 in.Hg) intermittently	• Improper seating of intake and exhaust valves.	• Check, repair valve
Vacuum gauge needle suddenly decreases about 250 mmHg (9.8 in. Hg) from standard value and then returns	• Broken cylinder head gasket	• Replace cylinder head gasket.

COMPRESSION PRESSURE INSPECTION E11FGBB0

(1) Check to be sure that the engine oil, starting motor and battery are in the normal condition.
(2) Start the engine and allow it to warm up until the temperature of the coolant reaches 80° C to 90°C (176°F to 194°F).
(3) Disconnect the high-tension cable.
(4) Remove all 4 spark plugs.
(5) Crank engine to discharge foreign material from cylinder.

Caution
Cover spark plug hole with rag etc., to prevent foreign material scattering when discharged. Keep people away from spark plug hole side. If compression is measured with water, oil, fuel etc., inside cylinder from cracks, hot water, oil, fuel etc., will gush out from spark plug hole, which is very dangerous.

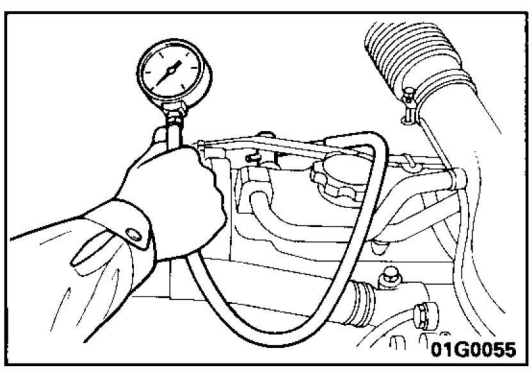
(6) Set an engine tachometer in place.
(7) Place a compression gauge adaptor and compression gauge in one of the spark plug holes.
(8) Crank the engine with the throttle valve fully open, and measure the compression at the place where the compression gauge indicator shows a stabilized reading.

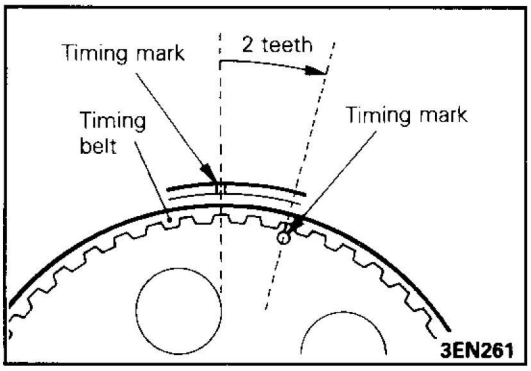
Limit (at engine speed of 250 r/min.):
Min. 840 kPa (8.4 kg/cm², 119 psi)

(9) Conduct steps 7, 8 with all cylinders and confirm pressure differences of all cylinders is within the limit.

Limit: Max. 100 kPa (1.0 kg/cm², 14 psi.)

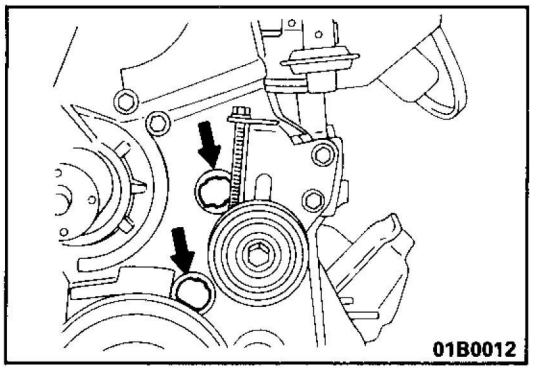
(10) If, after the measurement, the compression is below the limit, put a small amount of engine oil through the spark plug hole into the cylinder; then measure the compression once again and determine the cause of the malfunction.
(11) If, after oil is added, the compression rises, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
If, however, the compression does not rise, the cause is a bad valve or a bad gasket.
For information regarding the servicing procedures for these causes of malfunction, refer to the ENGINE AND TRANSMISSION MANUAL.



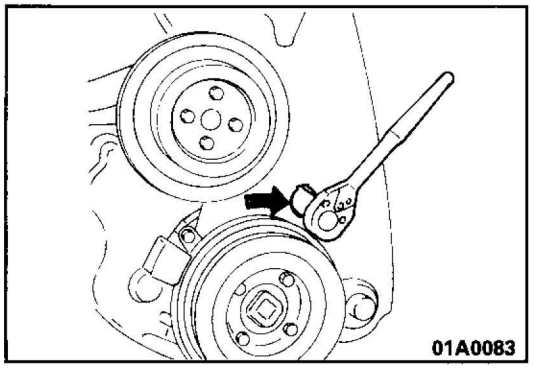


TIMING BELT TENSION ADJUSTMENT E11FFDB

1. Remove timing belt front upper cover.
2. Turn the crankshaft clockwise to align the timing mark on the cover with the position the timing mark on the camshaft sprocket.
3. Turn the crankshaft clockwise by two crankshaft sprocket teeth.

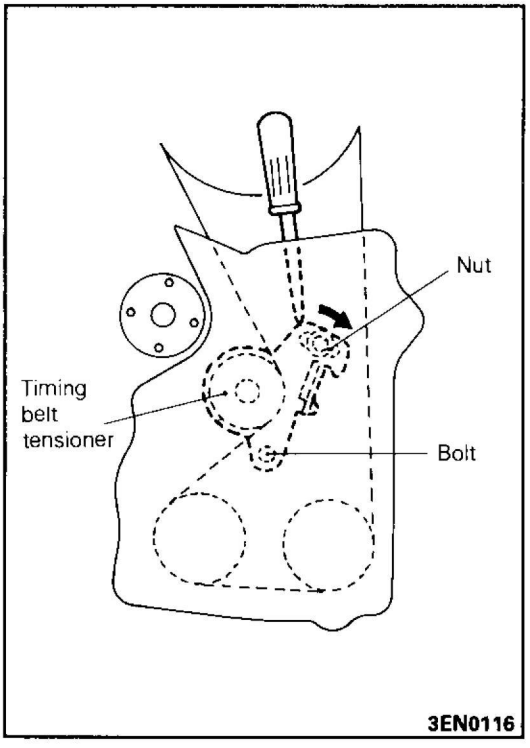


4. Remove the access covers.



5. Loosen the timing belt tensioner mounting nut and bolt.

Caution
Do not loosen the nut and bolt more than necessary. They could drop in the lower cover.

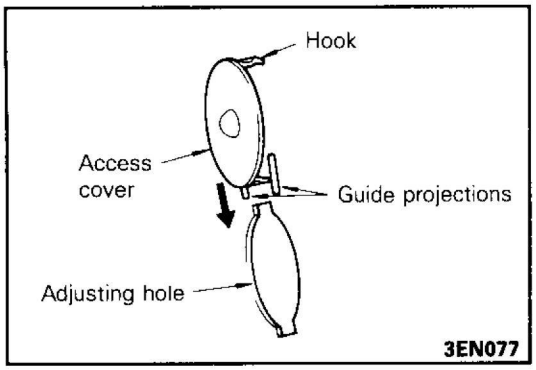


6. Insert a screwdriver from the top of the timing belt lower cover and push the tensioner in the belt tensioning direction and then release.

Caution
When inserting a screwdriver, use care not to damage the belt.

7. Tighten the timing belt tensioner mounting nut and bolt.

Caution
Tighten the tensioner nut (upper) first and then bolt (lower).



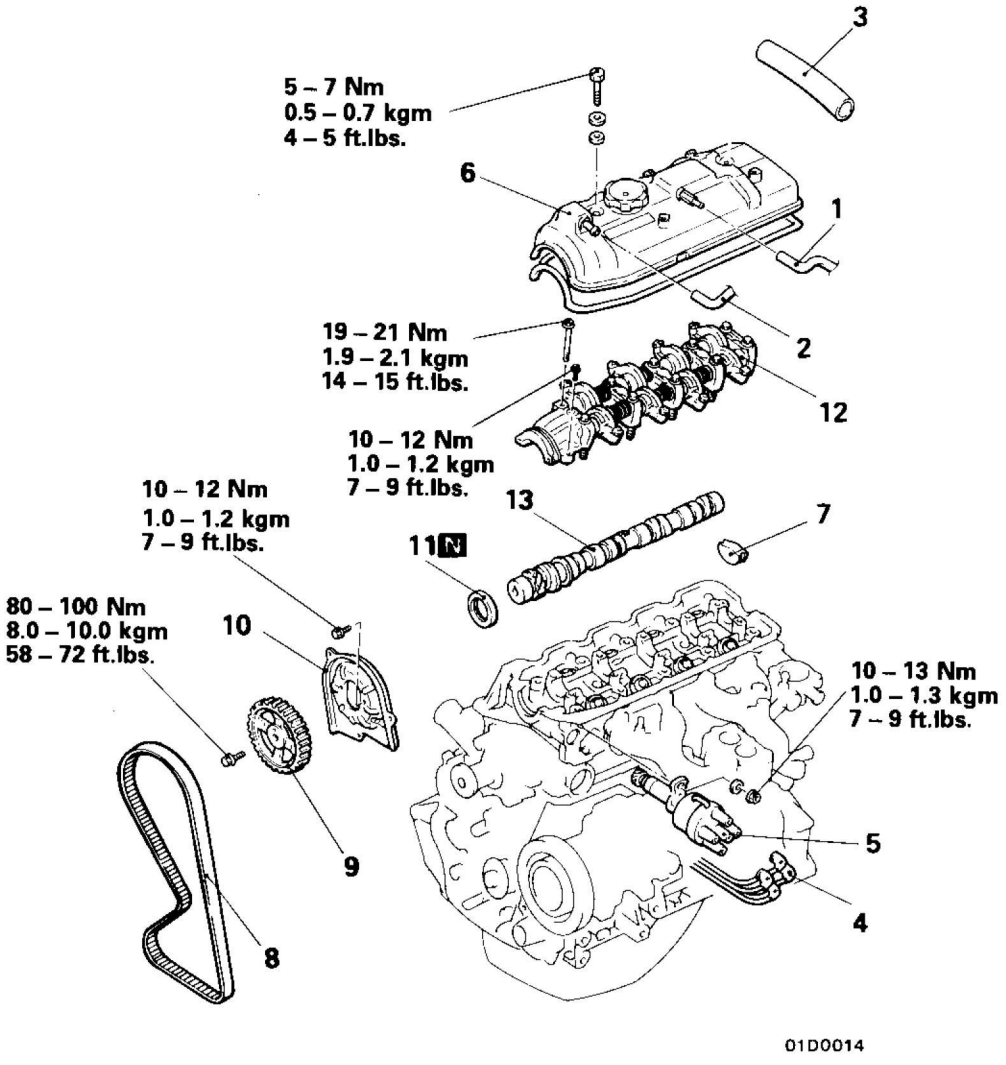
8. Install access cover. Access cover is easily installed by sliding hook between guide projections.
9. Install timing belt front upper cover.

CAMSHAFT AND CAMSHAFT OIL SEAL

E11HA – A

REMOVAL AND INSTALLATION

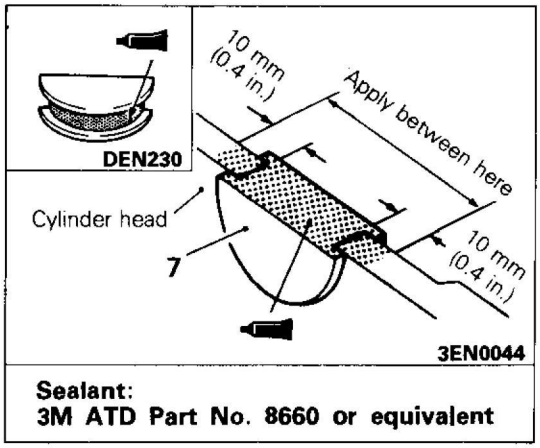
Post-installation Operation
- Engine Adjustment (Refer to P. 11-4)



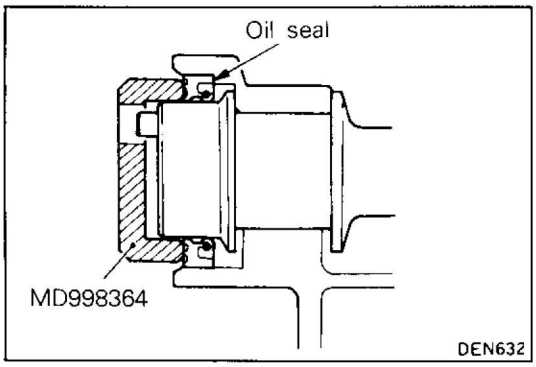
01D0014

Removal steps

1. Hose
2. Breather hose
3. Secondary air supply hose
4. Spark plug cable
5. Distributor
◆◆ 6. Rocker cover
7. Semi-circular packing
8. Timing belt (Refer to P. 11-21.)
9. Camshaft sprocket
10. Timing belt under upper cover
◆◆ 11. Oil seal
12. Rocker arm, rocker shaft assembly
13. Camshaft



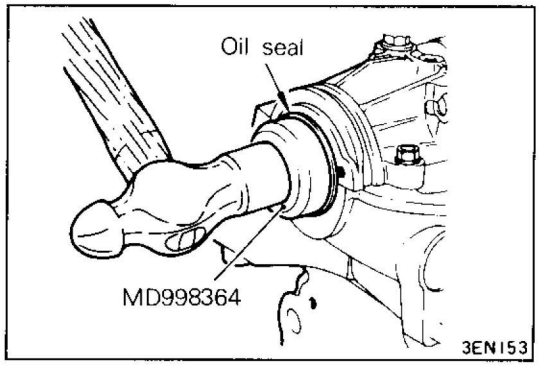
Sealant:
3M ATD Part No. 8660 or equivalent



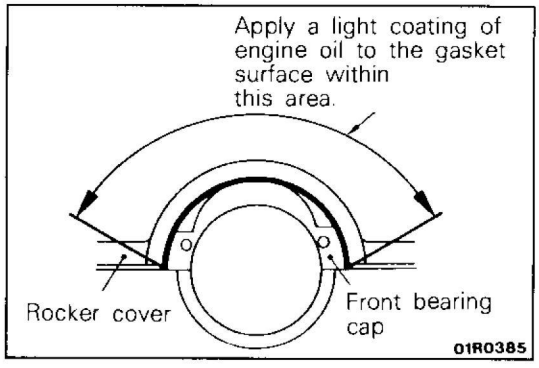
SERVICE POINTS OF INSTALLATION E11HCAJ0

11. INSTALLATION OF OIL SEAL

(1) Apply a small amount of engine oil to the oil seal lip, then insert it to the cylinder head.



(2) Use the special tool (oil seal installer) to tap the oil seal into the cylinder head.



6. INSTALLATION OF ROCKER COVER

(1) Apply a coating of engine oil to the gasket surface of the rocker cover (where shown in the figure).

(2) Install the rocker cover.

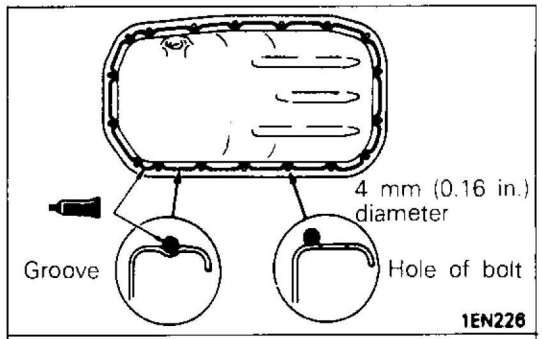
OIL PAN

E11KA – A

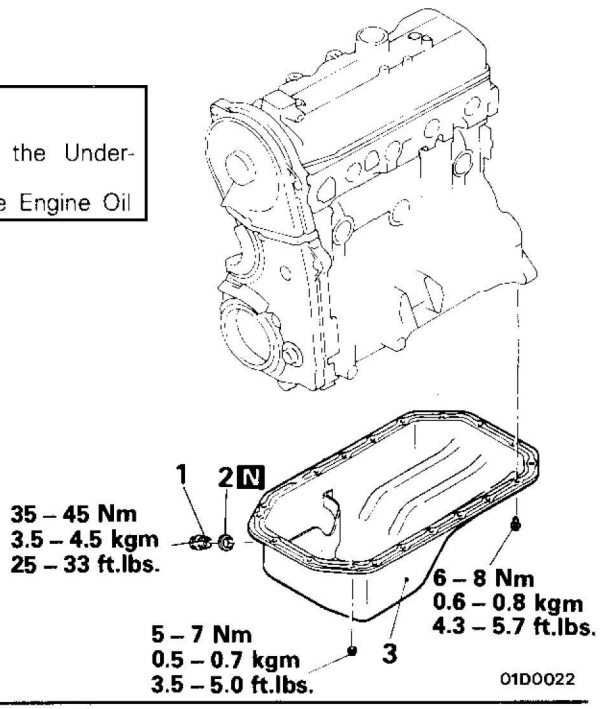
REMOVAL AND INSTALLATION

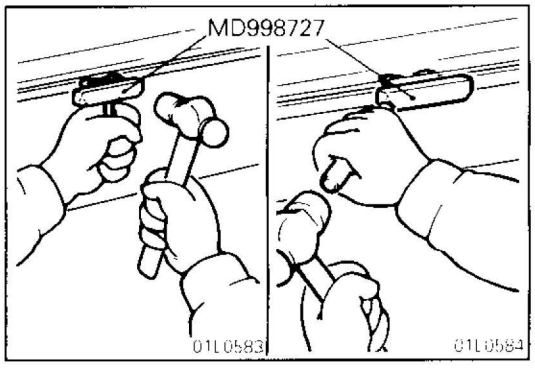
Removal steps
1. Drain plug
2. Drain plug gasket
3. Oil Pan

Pre-removal Operation and Post-installation Operation
- Removal and Installation of the Undercover
- Draining and Supplying of the Engine Oil



Sealant:
MITSUBISHI GENUINE PART
MZ100168 or equivalent





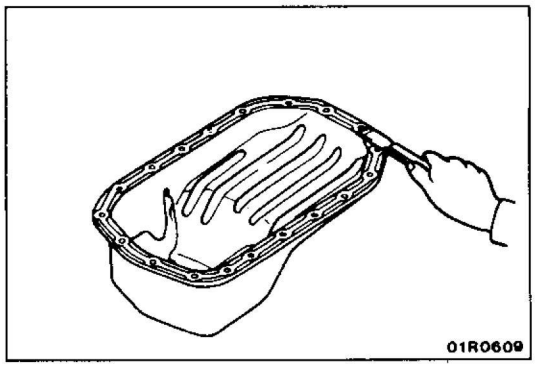
SERVICE POINTS OF REMOVAL

E12MBAD0

3. REMOVAL OF OIL PAN

After removing the oil pan mounting bolts and nuts, remove the oil pan with the special tool and a brass bar.

Caution
Perform this slowly to avoid deformation of the oil pan flange.

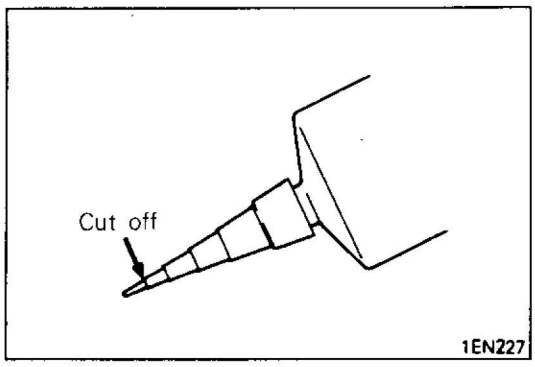


SERVICE POINTS OF INSTALLATION

E11KDBH0

3. INSTALLATION OF OIL PAN

(1) Remove all sealant from the oil pan and cylinder block with a scraper, etc.
(2) Degrease the areas to be coated with sealant and mating surfaces.



(3) To squeeze out proper amount of sealant, cut off the nozzle of sealant. This will provide a nozzle 4 mm (0.16 in.) in diameter.

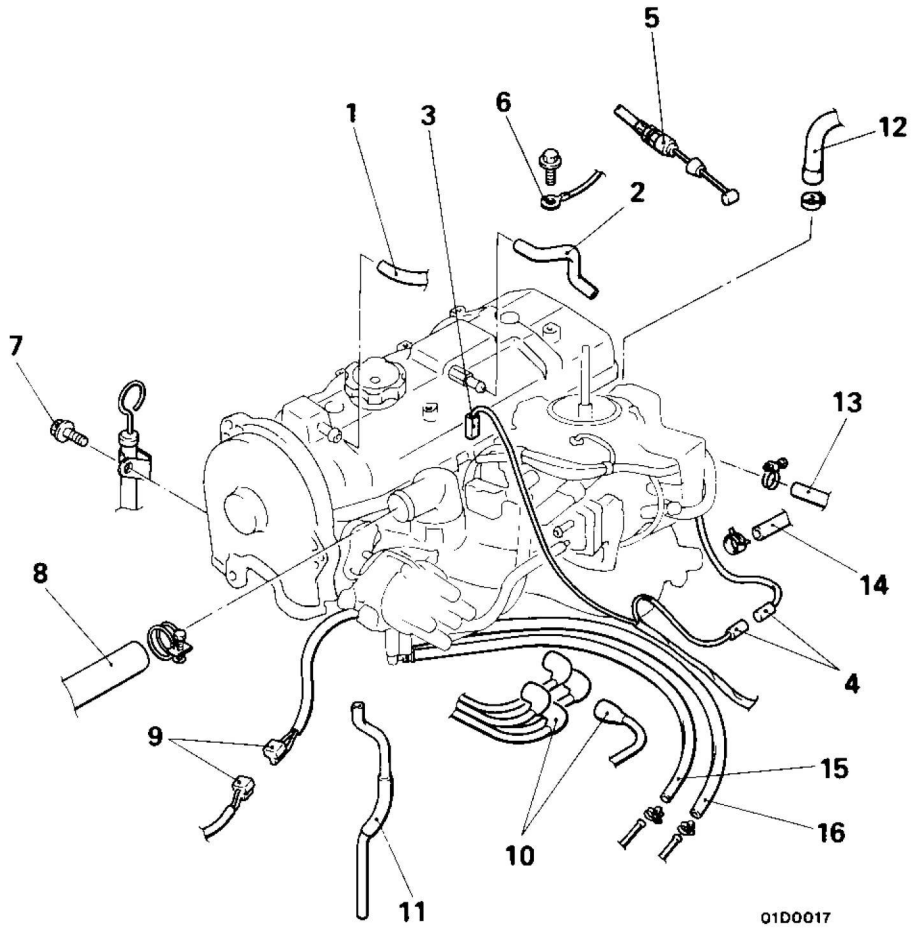
CYLINDER HEAD GASKET

E11JA – A

REMOVAL AND INSTALLATION

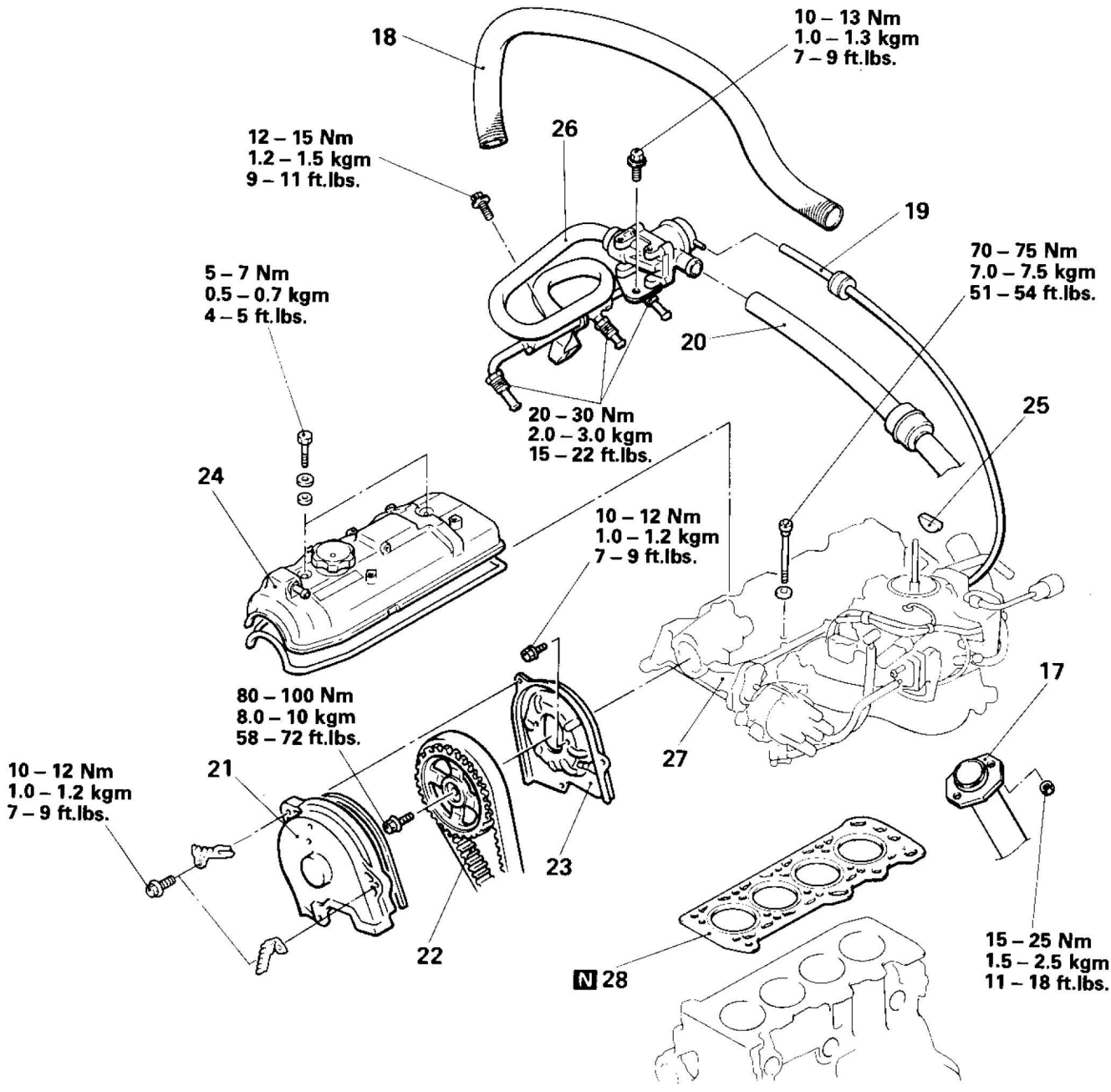
Pre-removal Operation
- Draining of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal of Seat
- Removal of Air Horn

Post-installation Operation
- Supplying of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Engine Adjustment (Refer to P. 11-4.)
- Installation of Air Horn
- Installation of Seat



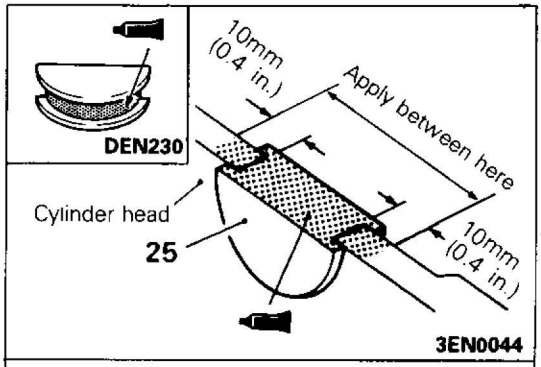
Removal steps

1. Breather hose
2. Hose
3. Engine coolant temperature connection
4. Fuel-cut solenoid valve connection
5. Accelerator cable connection
6. Earth cable connection
7. Bolt
8. Radiator upper hose connection
9. Distributor connection
10. High tension cable and spark plug cable connection
11. Breather tube
12. Vacuum hose connection
13. Water hose connection
14. Water by-pass hose connection
15. Fuel tube connection
16. Fuel return tube connection

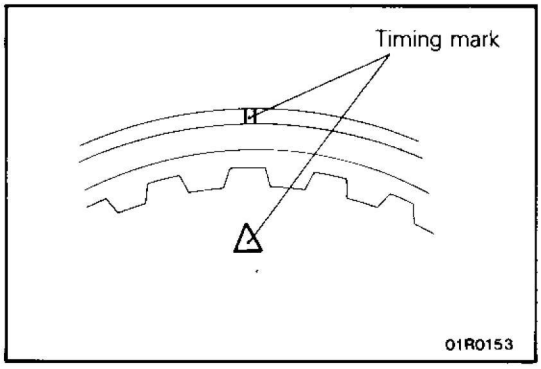


01D0013

17. Front exhaust pipe connection
18. Air cleaner heat duct
19. Vacuum hose connection
20. Secondary air supply hose connection
21. Timing belt front upper cover
◆◆ 22. Camshaft sprocket
23. Timing belt under upper cover
◆◆ 24. Rocker cover
25. Semi-circular packing
26. Reed valve and air pipe assembly
◆◆ ◆◆ 27. Cylinder head assembly
◆◆ 28. Cylinder head gasket



Sealant:
3M ATD Part No. 8660 or equivalent

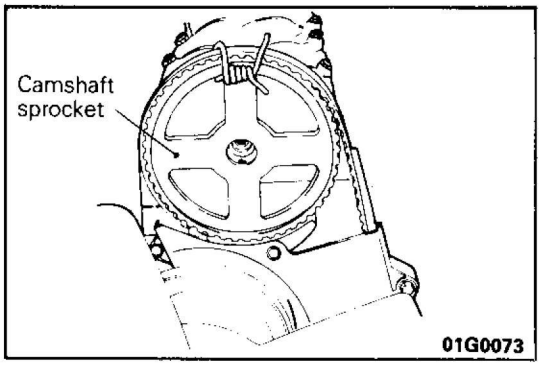


SERVICE POINTS OF REMOVAL E11JBAF

22. REMOVAL OF CAMSHAFT SPROCKET

(1) Rotate crankshaft clockwise (to the right) and align timing marks.

Caution
Always rotate crankshaft clockwise.



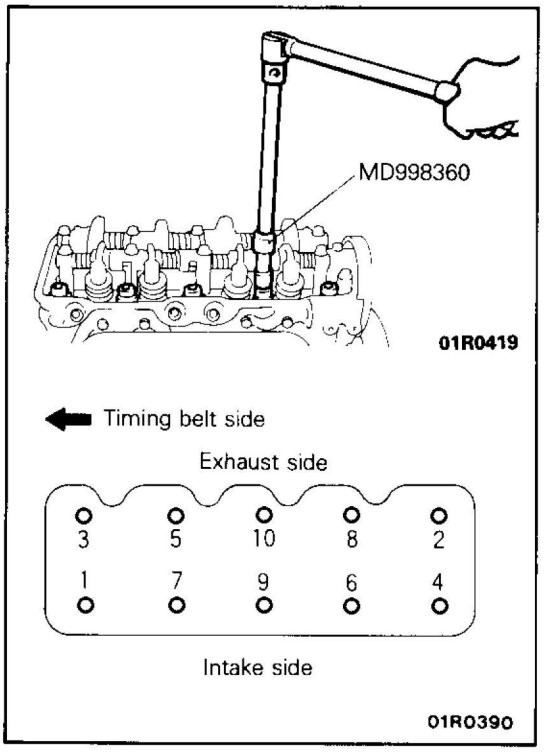
(2) Remove camshaft sprocket with timing belt and place it on timing belt front lower cover.

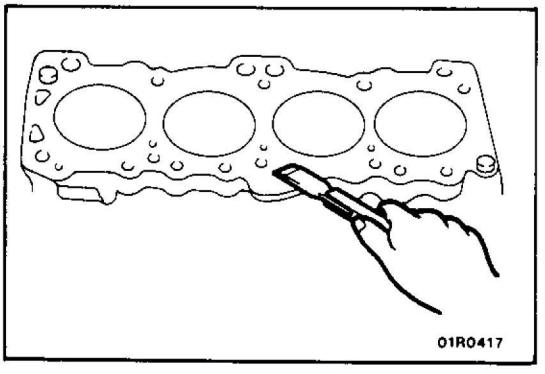
Caution
Do not rotate crankshaft after removing camshaft sprocket.

NOTE
Secure camshaft sprocket and timing belt with wire etc., to prevent them from slipping out of place.

27. REMOVAL OF CYLINDER HEAD ASSEMBLY

Loosen bolt in the numerical order indicated in the diagram with special tool and remove.



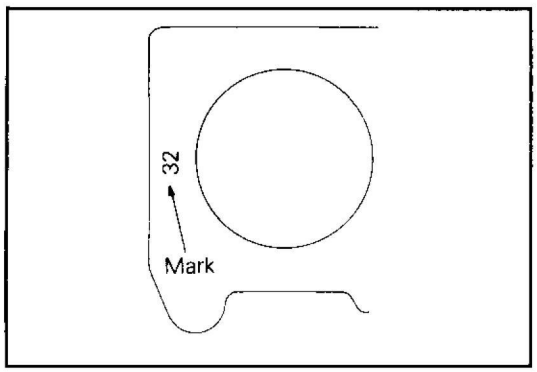


SERVICE POINTS OF INSTALLATION E11JDA0

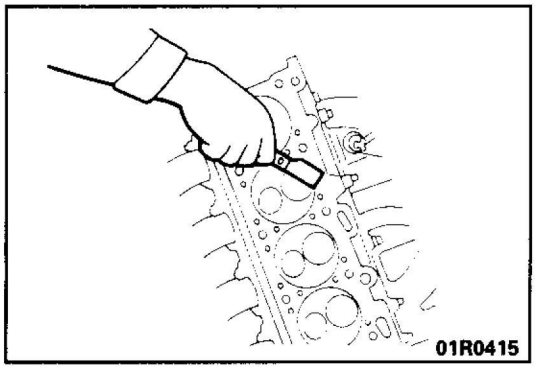
28. INSTALLATION OF CYLINDER HEAD GASKET

(1) Scrape off gasket adhered to cylinder block.

Caution
Be careful that foreign material does not fall into cylinder, or into coolant and oil passage ways.



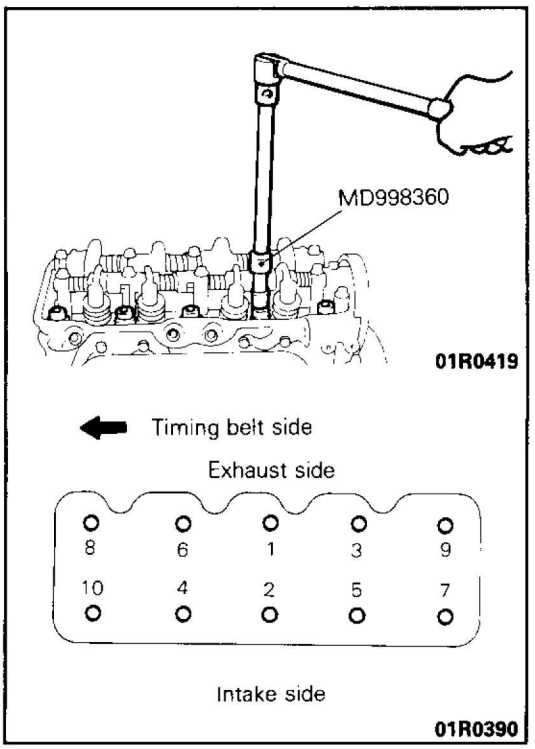
(2) Identification mark is provided on cylinder head gasket to ensure correct installation.
(3) Mount on cylinder block with mark at top.



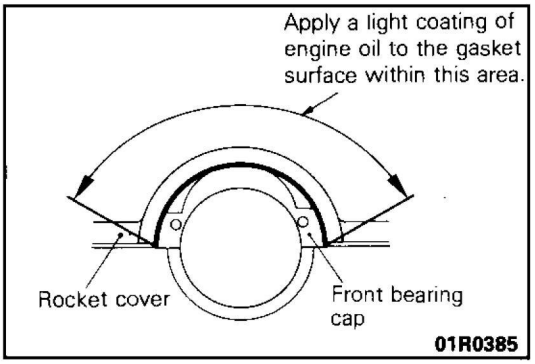
27. INSTALLATION OF CYLINDER HEAD ASSEMBLY

(1) Scrape off gasket adhered to cylinder head assembly.

Caution
Be careful that foreign material does not fall into coolant and oil passage ways.



(2) Tighten in the numerical order indicated in the diagram in two or three groups with special tool.



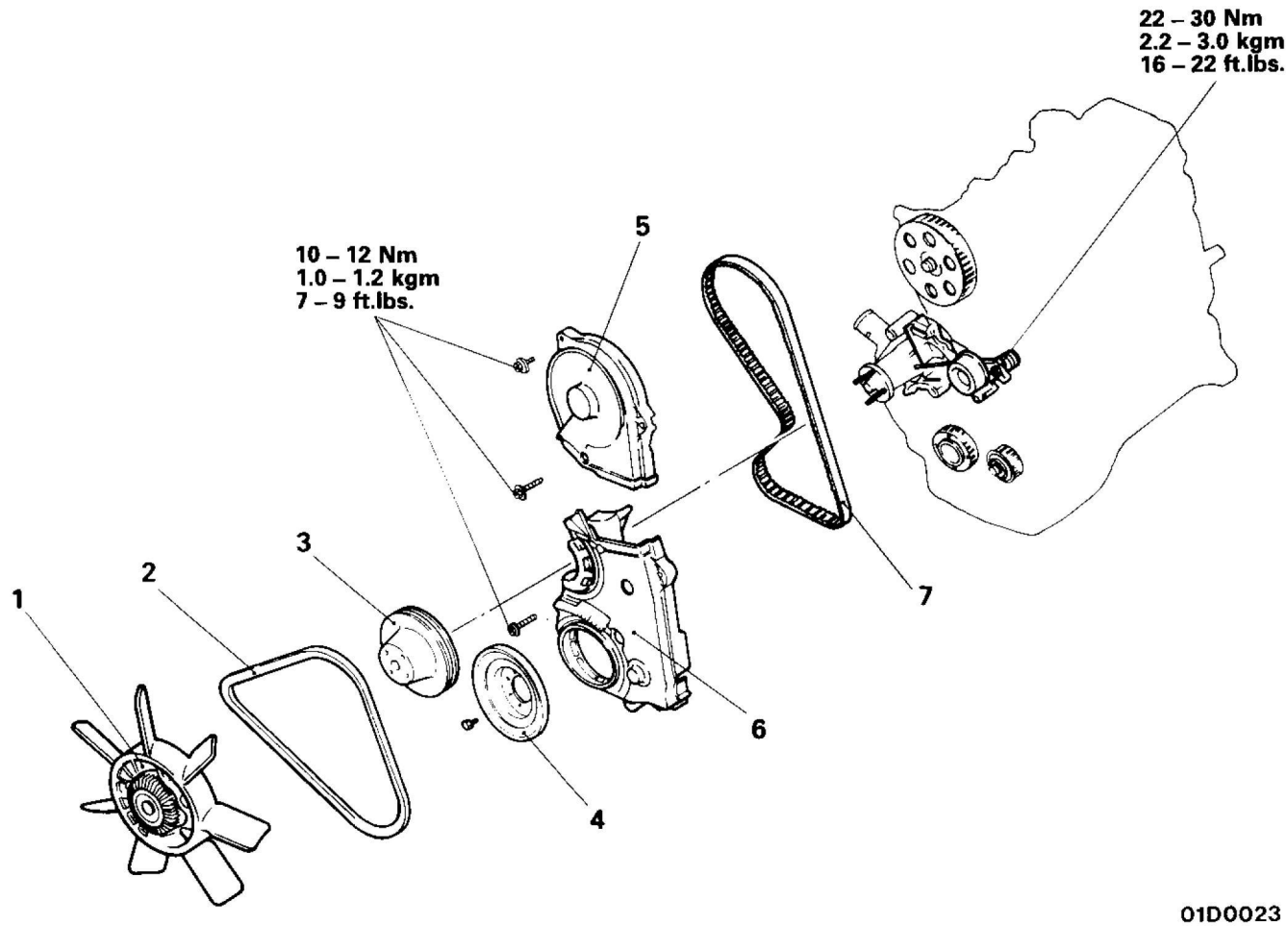
24. INSTALLATION OF ROCKER COVER

(1) Apply a coating of engine oil to the gasket surface of the rocker cover (where shown in the figure).
(2) Install the rocker cover.

TIMING BELT

E11GA – A

REMOVAL AND INSTALLATION



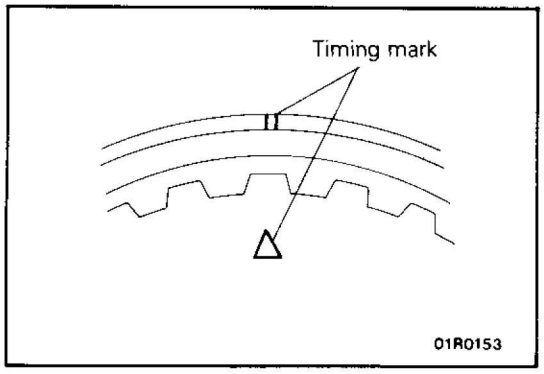
01D0023

Post-installation Operation
- Engine Adjustment (Refer to P. 11-4.)

Removal steps

1. Cooling fan
2. Alternator V-belt
3. Water pump pulley
4. Crankshaft pulley
5. Timing belt upper cover
6. Timing belt lower cover

◆◆▶◆ 7. Timing belt

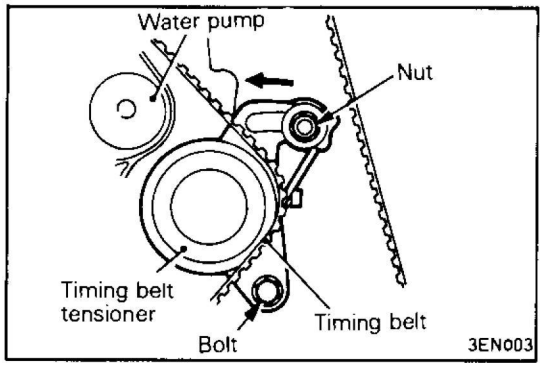


SERVICE POINTS OF REMOVAL E11GBCC

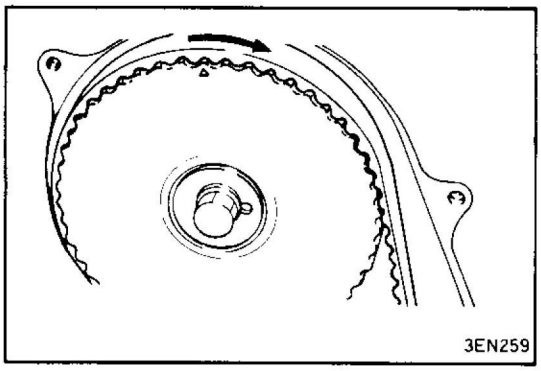
7. REMOVAL OF TIMING BELT

(1) Rotate crankshaft clockwise (to the right) and align timing marks.

Caution
Always rotate crankshaft clockwise.

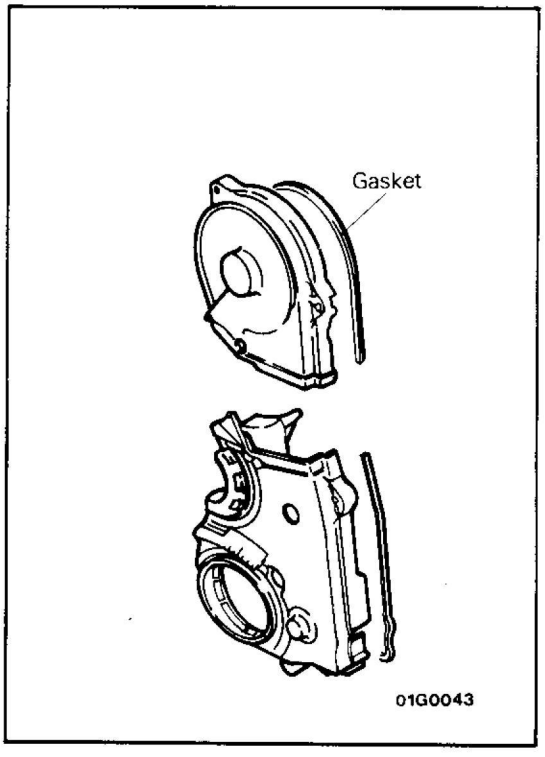


(2) Loosen timing belt tensioner bolt and nut.
(3) Push timing belt tensioner to water pump side and tighten nut. Secure so that tensioner will not move back.



(4) Remove timing belt.

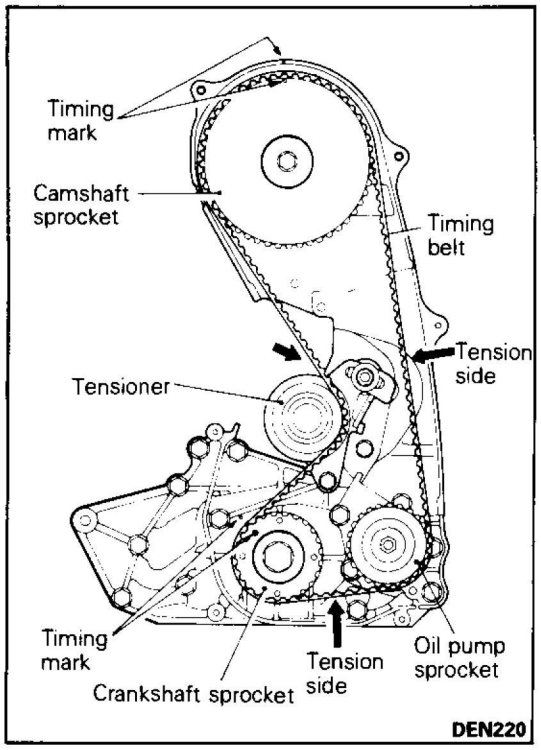
Caution
When reinstalling timing belt, mark an arrow at the back of belt with chalk to show rotation direction (rotate to right).



INSPECTION E11GCAB0

TIMING BELT COVER

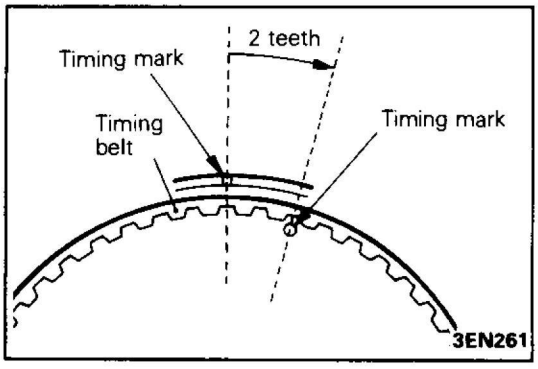
Cracking, splitting, deterioration of gasket.



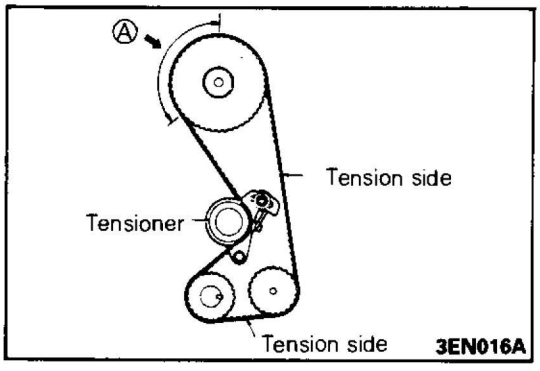
SERVICE POINTS OF INSTALLATION E11GDCC

7. INSTALLATION AND ADJUSTMENT OF TIMING BELT

(1) Align sprocket timing marks.
(2) First, put timing belt around crankshaft sprocket. Next, put timing belt around oil pump sprocket and then around camshaft sprocket. Install so that tension side has no slack.
(3) Push camshaft sprocket counter clockwise (to the left) and stretch belt tension side taut. Reconfirm correct timing mark alignments.
(4) Turn 1 – 2 times tensioner bolt and nut temporarily secured on water pump side first, and loosen. Stretch belt using tensioner spring force.

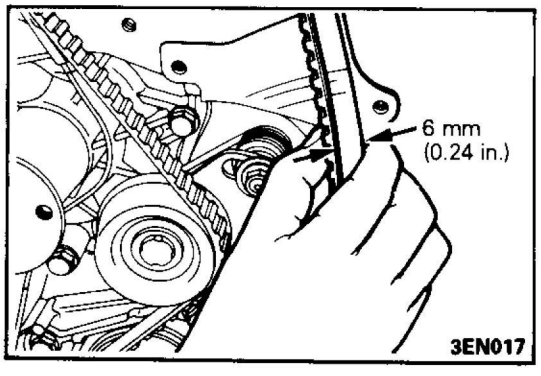


(5) Rotate crankshaft clockwise (to the right) for two teeth on the camshaft sprocket. This provides appropriate tension to timing belt, so do not rotate crankshaft counter clockwise (to the left) or check tension by pressing belt.



(6) Push tensioner in rotation direction (indicated in diagram). Adjust so that belt does not rise at point (A) and meshes completely with camshaft sprocket.
(7) Tighten tensioner installing nut (upper tensioner) to specified torque.
(8) Tighten tensioner installing bolt (lower tensioner) to specified torque.

Caution
If bolt is tightened first, tensioner will rotate and tension will be too tight.



(9) Press center of timing belt tension side (between camshaft sprocket and oil pump sprocket) with thumb and pointer from both sides and confirm that gap between belt back and cover is at the standard value.

Standard value: 6 mm (0.24 in.)

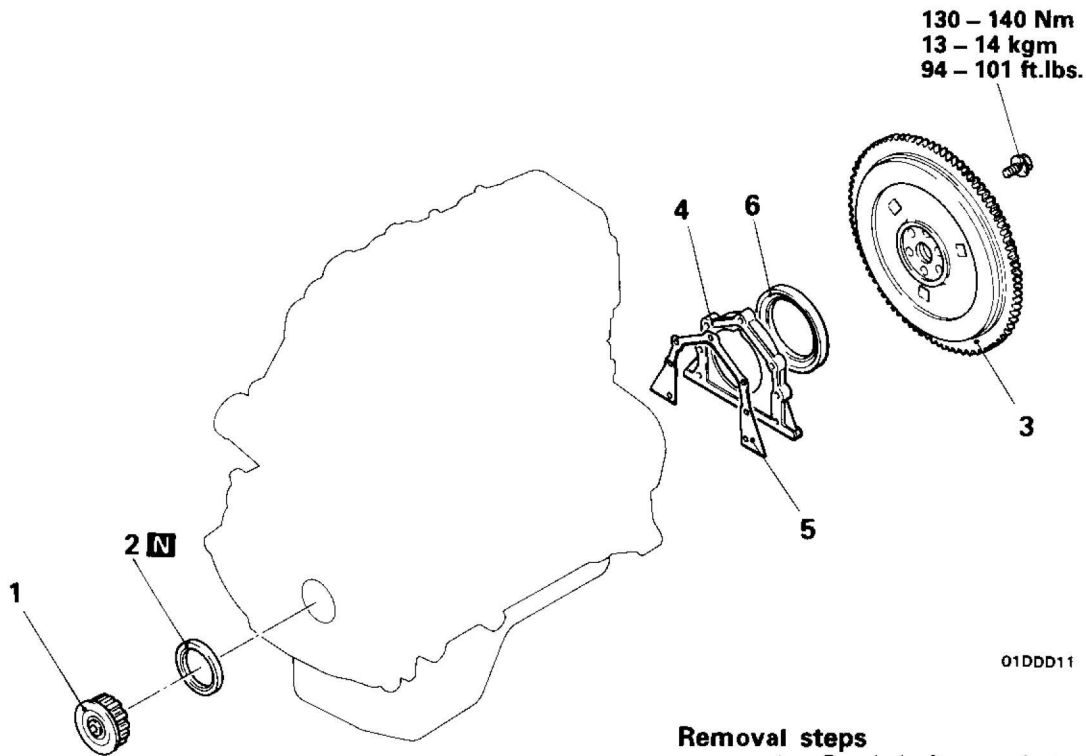
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION

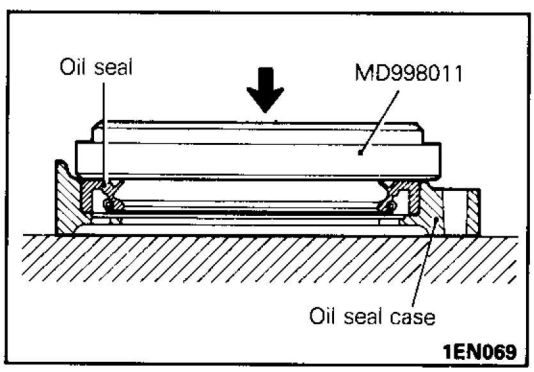
E11UA – A

Pre-removal Operation
- Removal of the Timing Belt <Removal of Crankshaft Front Oil Seal> (Refer to P. 11-21.)
- Removal of the Transmission <Removal of the Crankshaft Rear Oil Seal> (Refer to GROUP 22 – Transmission Assembly.)
- Removal of the Clutch <Removal of the Crankshaft Rear Oil Seal>

Post-installation Operation
- Installation of the Timing Belt <Installation of Crankshaft Front Oil Seal> (Refer to P. 11-21.)
- Installation of the Transmission <Installation of Crankshaft Rear Oil Seal> (Refer to GROUP 22 – Transmission Assembly.)
- Removal of the Clutch <Installation of the Crankshaft Rear Oil Seal>
- Engine Adjustment (Refer to P. 11-4.)



Removal steps
1. Crankshaft sprocket
◆◆ 2. Crankshaft front oil seal
3. Flywheel assembly
4. Oil seal case
5. Gasket
◆◆ 6. Crankshaft rear oil seal

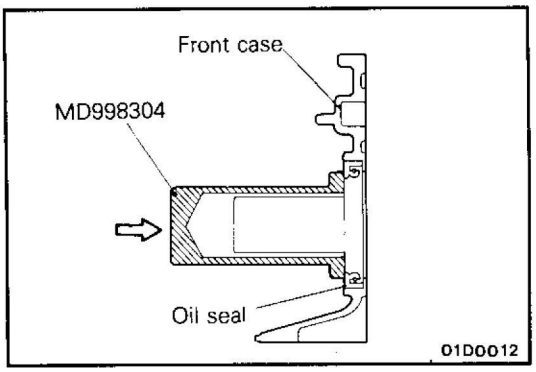


SERVICE POINTS OF INSTALLATION

E11UCAC

6. INSTALLATION OF CRANKSHAFT REAR OIL SEAL

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.



2. INSTALLATION OF CRANKSHAFT FRONT OIL SEAL

(1) Attach the special tool to the crankshaft and apply engine oil to the outer surface of the tool.
(2) Using the special tool, install the front oil seal into the front lower case.

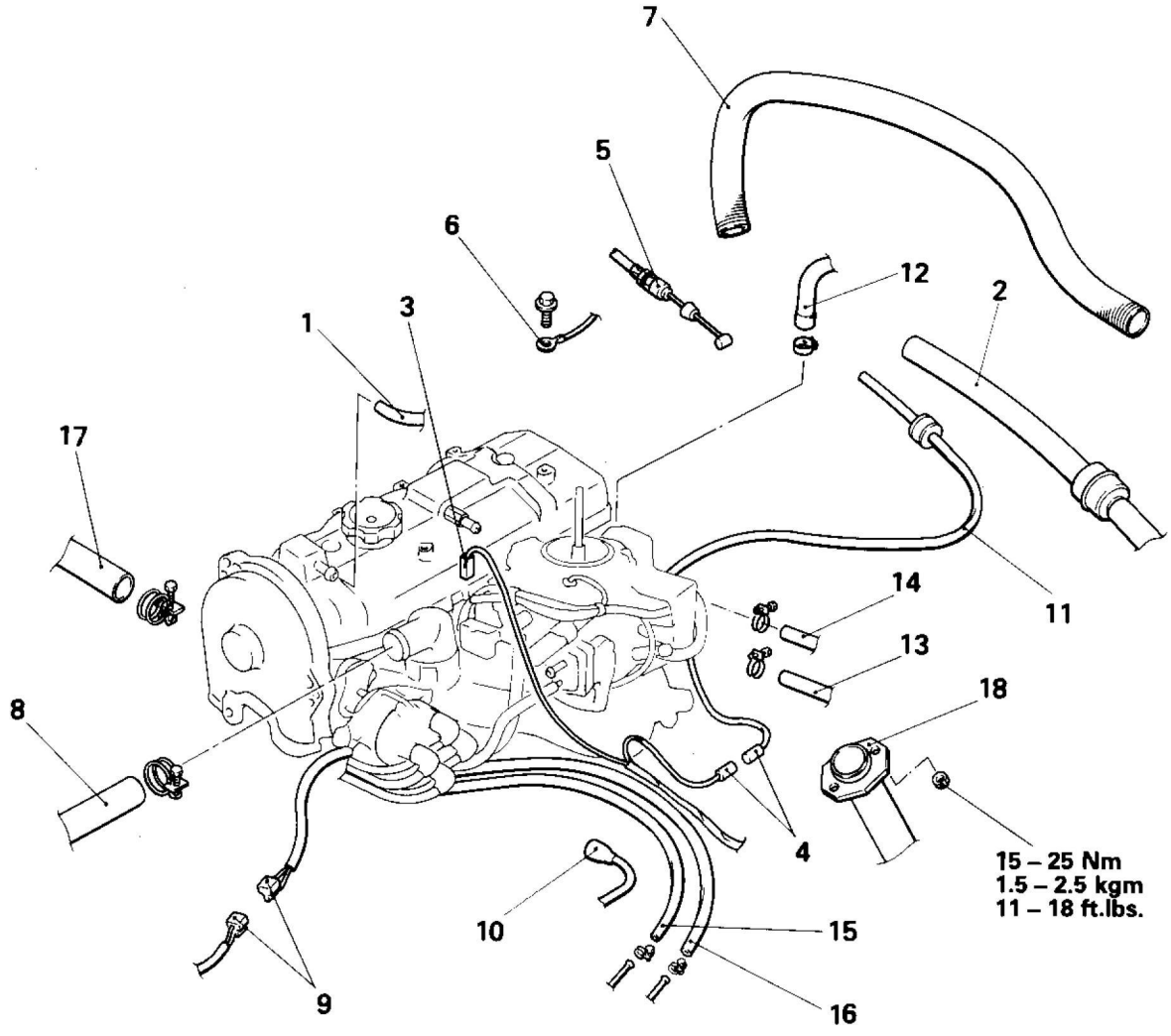
ENGINE AND TRANSMISSION ASSEMBLY

E11SA – A

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Removal of the Seat
- Removal of the Air Horn
- Removal of the Undercover

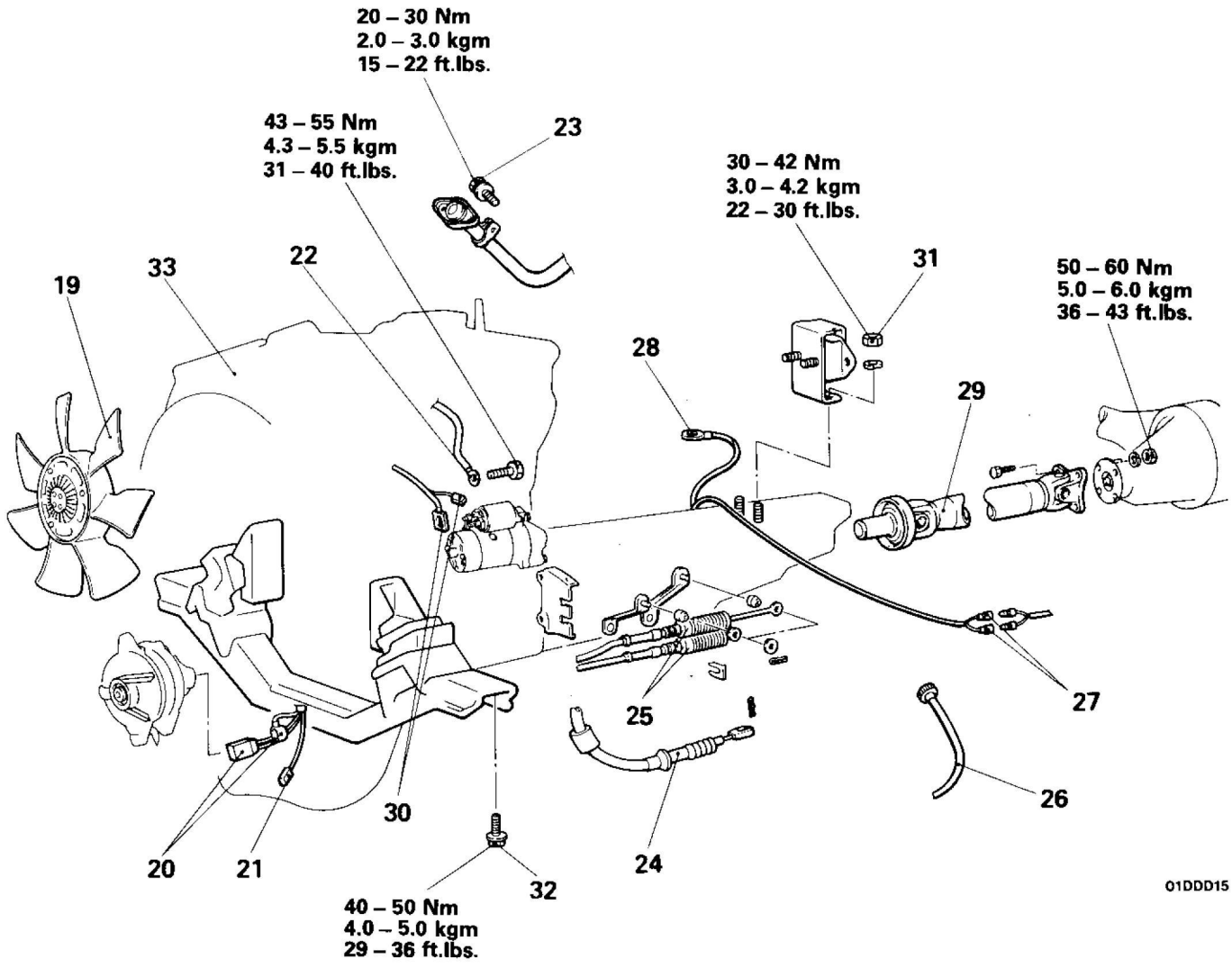
Post-installation Operation
- Installation of the Undercover
- Installation of the Seat
- Installation of the Air Horn
- Supplying of the Engine Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Engine Adjustment (Refer to P. 11-4.)



01DDD18

Removal steps

1. Breather hose
2. Secondary air supply hose connection
3. Engine coolant temperature connection
4. Fuel-cut solenoid valve connection
5. Accelerator cable connection
6. Earth cable connection
7. Air cleaner heat connection
8. Radiator upper hose connection
9. Distributor connector
10. High tension cable connection
11. Vacuum hose connection
12. Vacuum hose connection
13. Water hose connection
14. Water hose connection
15. Fuel tube connection
16. Fuel return tube connection
17. Radiator lower hose connection
18. Front exhaust pipe connection



19. Cooling fan
20. Alternator connector
21. Oil pressure switch connection
22. Earth cable connection
23. Bolt
24. Clutch control cable connection
25. Transmission control cable connection
26. Speedometer cable connection
27. Back-up lamp harness connection
28. Earth cable connection
29. Propeller shaft
    (Refer to GROUP 25 – Propeller shaft)
30. Starter motor connector
31. Transmission mounting nut
32. Front engine support assembly mounting bolt
33. Engine and transmission assembly

ENGINE <4D56>

SPECIFICATIONS

E11CA – B

GENERAL SPECIFICATIONS

Items		Specifications
Type		In-line, 4 cylinders Single Over Head Camshaft
Bore	mm (in.)	91.1 (3.59)
Stroke	mm (in.)	95.0 (3.74)
Total displacement	cc (cu.in.)	2.477 (151.1)
Compression ratio		21 : 1
Injection order		1-3-4-2
Counterbalance shaft		Equipped
Valve timing		
Intake valve	Opens (BTDC)	20°
	Closes (ABDC)	49°
Exhaust valve	Opens (BBDC)	55°
	Closes (ATDC)	22°

SERVICE SPECIFICATIONS

E11CB – B

Items		Specifications
Standard value		
Valve clearance at hot engine	mm (in.)	
Intake side		0.25 (0.0098)
Exhaust side		0.25 (0.0098)
Injection timing		
Except vehicles for Switzerland and Austria		7° ATDC
Vehicles for Switzerland and Austria		5° ATDC
Idle speed	r/min.	750±30
Radiator cap valve-opening pressure	kPa (kg/cm^2, psi)	75 – 105 (0.75 – 1.05, 11 – 15)
Drive belt tension	mm (in.)	
When a new belt is installed		9 – 12 (0.35 – 0.47)
When used belt is installed		11 – 14 (0.43 – 0.55)
Limit		
Radiator cap valve-opening pressure	kPa (kg/cm^2, psi)	65 (0.65, 9.2)

TORQUE SPECIFICATIONS

E11CC – B

Items	Nm	kgm	ft.lbs.
Alternator support bolt nut	20 – 25	2.0 – 2.5	14 – 18
Alternator brace bolt	12 – 15	1.2 – 1.5	9 – 11
Glow plug	15 – 20	1.5 – 2.0	11 – 15
Glow plug to glow plug plate	1.0 – 1.5	0.10 – 0.15	0.7 – 1.0
Adjusting screw locking nut	12 – 18	1.2 – 1.8	8.5 – 13
Timing belt tensioner	22 – 30	2.2 – 3.0	16 – 22
Fuel injection pipe clamp	4 – 6	0.4 – 0.6	2.9 – 4.3
Fuel injection pipe flare nut	23 – 37	2.3 – 3.7	17 – 27
Injection timing check plug	8 – 10	0.8 – 1.0	6 – 7
Crankshaft pulley	170 – 190	17 – 19	123 – 137
Rocker cover	5 – 7	0.5 – 0.7	3.6 – 5.1
Rocker arm shaft	35 – 40	3.5 – 4.0	25 – 29
Camshaft bearing cap	19 – 21	1.9 – 2.1	14 – 15
Camshaft sprocket	65 – 75	6.5 – 7.5	47 – 54
Dil pan	6 – 8	0.6 – 0.8	4.3 – 5.7
Drain plug	35 – 45	3.5 – 4.5	25 – 33
Cylinder head assembly	105 – 115	10.5 – 11.5	76 – 83
Timing belt upper cover	10 –12	1.0 – 1.2	7 – 9
Exhaust manifold to exhaust pipe	30 – 40	3.0 – 4.0	22 – 29
Timing belt lower cover	10 – 12	1.0 – 1.2	7 – 9
Flywheel assembly	130 – 140	13 – 14	94 – 101
Dil cooler hose	40 – 50	4.0 – 5.0	29 – 36
Exhaust pipe to bracket	20 – 30	2.0 – 3.0	15 – 22
Transmission mounting bolt	43 – 55	4.3 – 5.5	31 – 40
Propeller shaft	50 – 60	5.0 – 6.0	36 – 43
Transmission mounting nut	30 – 42	3.0 – 4.2	22 – 30
Clutch release cylinder	30 – 42	3.0 – 4.2	22 – 30
Front engine support assembly mounting bolt	40 – 50	4.0 – 5.0	29 – 36

LUBRICANTS

E11CD – B

Items	Recommended lubricant (API classification)	Quantity lit. (U.S.qts., Imp.qts.)
Engine oil	CC or higher	5.5 (5.8, 4.8)

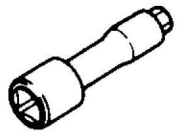
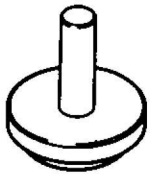
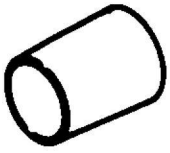
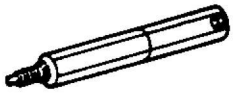
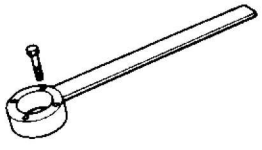
SEALANTS AND ADHESIVES

E11CE – B

Items	Specified sealant	Remarks
Semi-circular packing and rocker cover	3M ATD Part No. 8660 or equivalent	Non-drying sealant
Dil pan	MITSUBISHI GENUINE PART MZ100168 or equivalent	Semi-drying sealant

SPECIAL TOOLS

E11DA – B

Tool	Number	Name	Use
	MD998051	Wrench, cylinder head bolt	Loosening and tightening of cylinder head bolt
	MD998376	Crankshaft rear oil seal installer	Installation of crankshaft oil seal
	MD998381	Camshaft oil seal installer	Installation of camshaft oil seal
	MD998382	Crankshaft front oil seal guide	Guide for installation of crankshaft front oil seal
	MD998383	Crankshaft front oil seal installer	Installation of crankshaft front oil seal
	MD998384	Prestroke measuring adapter	Adjusting injection timing
	MD998721	Crank pulley holder	Removal and installation of crankshaft pulley
	MD998727	Oil pan sealer cutter	Removal of oil pan

ENGINE ADJUSTMENT

RADIATOR CAP VALVE-OPENING PRESSURE CHECK

E11F1AE2

Standard value: 75 – 105 kPa (0.75 – 1.05 kg/cm^2, 11 – 15 psi)
Limit: 65 kPa (0.65 kg/cm^2, 9.2 psi)

ENGINE COOLANT INSPECTION

E11FHAB2

BATTERY INSPECTION

E11FMAC

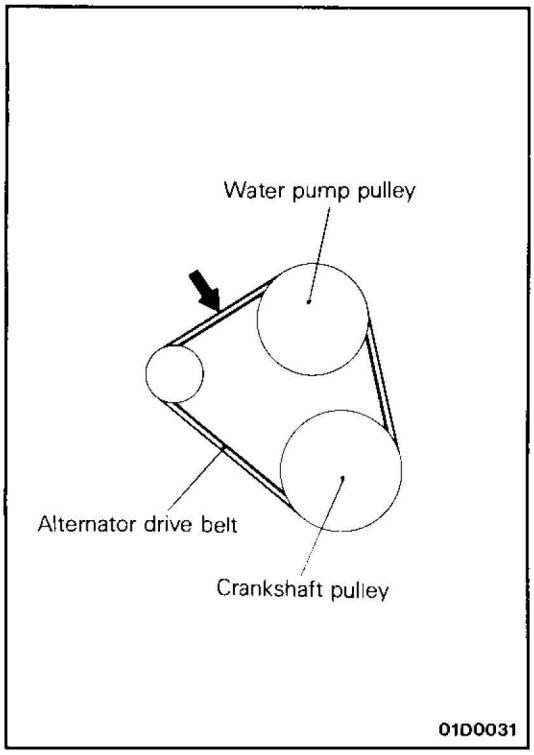
Refer to P. 11-5.

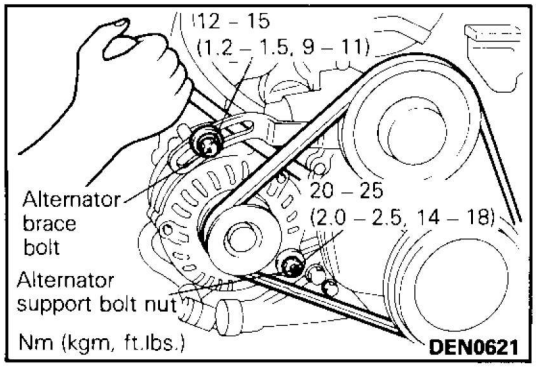
ENGINE OIL LEVEL INSPECTION

E11FNAK2

AIR CLEANER ELEMENT INSPECTION AND CLEANING

E11FPAN1





DRIVE BELT TENSION INSPECTION AND ADJUSTMENT

E11FQAZ

1. Check belt for damage or wear. Confirm that belt is set correctly in pulley groove.

   NOTE
   If the belt "squeals" or slips, check belt for friction, damage or breaks and check pulley contact surface for damage.

2. Press at 100N (10 kg, 22 lbs.) mid-point of belt between pulleys as indicated in the diagram. Measure drive belt deflection.

   Standard value:
   When equipped with new drive belt
   9 – 12 mm (0.35 – 0.47 in.)
   When belt currently being used is tightened
   11 – 14 mm (0.43 – 0.55 in.)

   Caution
   Measure belt flex between specified pulleys (⬅).

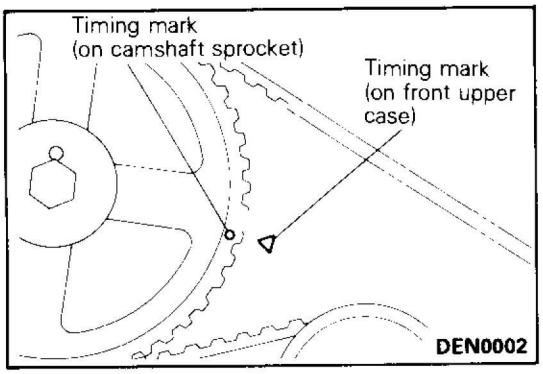
3. Adjust alternator drive belt deflection by the following procedures.
   (1) Loosen alternator support bolt nut.
   (2) Adjust belt deflection by using a rod as a level against the alternator stator pushing it into the proper position.
   (3) Retighten the alternator brace bolt and support bolt nut to the specified torque.

   Standard value:
   When equipped with new drive belt:
   9 – 12 mm (0.35 – 0.47 in.)
   When belt currently being used is tightened:
   11 – 14 mm (0.43 – 0.55 in.)

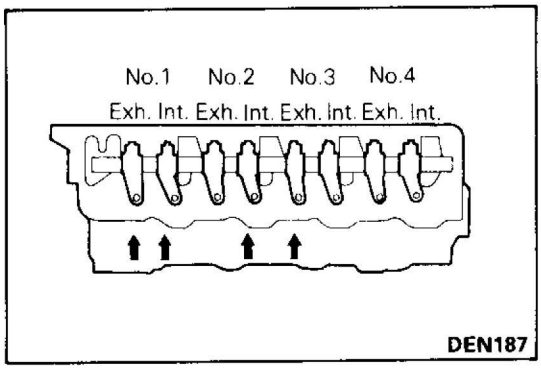
VALVE CLEARANCE INSPECTION AND ADJUSTMENT

E11FDAU

1. Start the engine and allow it to warm up until the temperature of the coolant reaches 80° C to 90°C (176°F to 194°F).
2. Check the injection timing and the idling speed, and adjust if necessary. (Refer to P. 11-34, 36.)
3. Remove the upper timing belt cover.
4. Remove the rocker cover.

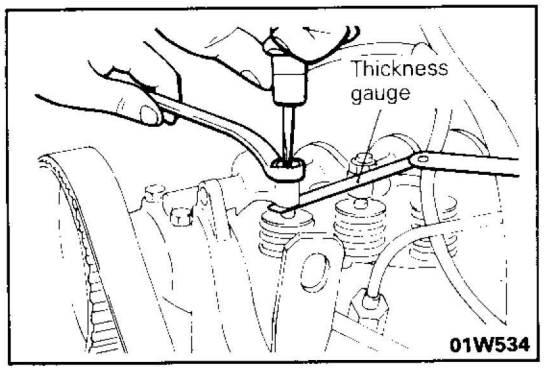


5. Turn the crankshaft clockwise and align the timing mark on the camshaft sprocket with the timing mark on the top of the front upper case.



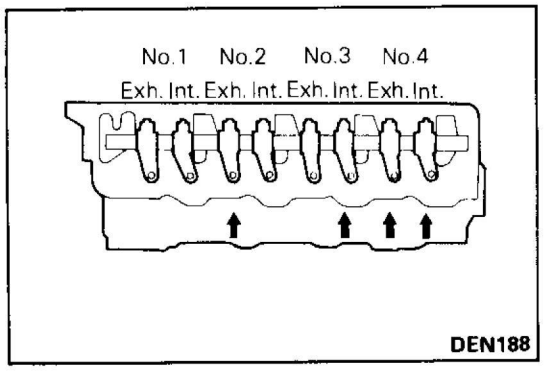
6. Check that valve clearance indicated in the diagram (⬅) is at the standard value.

Standard value (hot engine): 0.25 mm (0.0098 in.)



7. If not within the standard value, loosen the adjusting screw locking nut and, while turning the adjusting screw, use a thickness gauge to adjust the valve clearance to the standard value.
8. Block the adjusting screw with a screwdriver, so that it cannot move and tighten the lock nut to the specified torque.

Tightening torque: 12 – 18 Nm
(1.2 – 1.8 kgm, 8.7 – 13 ft.lbs.)



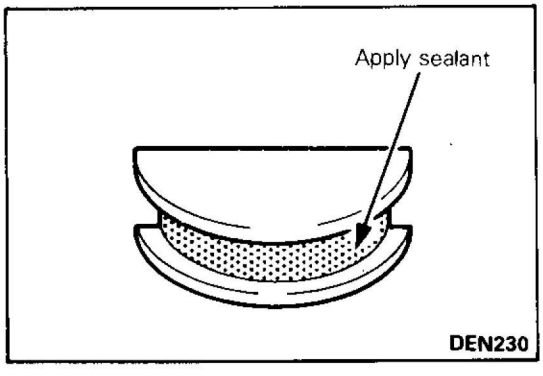
9. Rotate clockwise the crankshaft one complete turn (360° degree).
10. Check that valve clearance indicated in the diagram (⬅) is at the standard value.

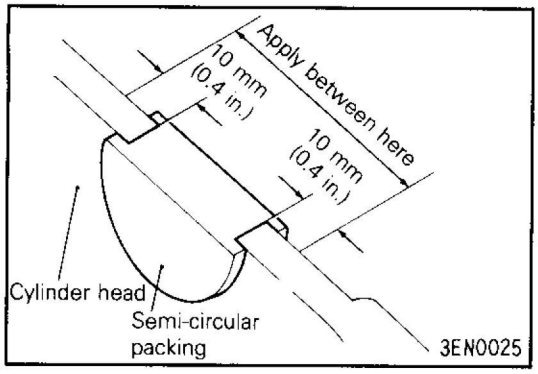
Standard value (hot engine): 0.25 mm (0.0098 in.)

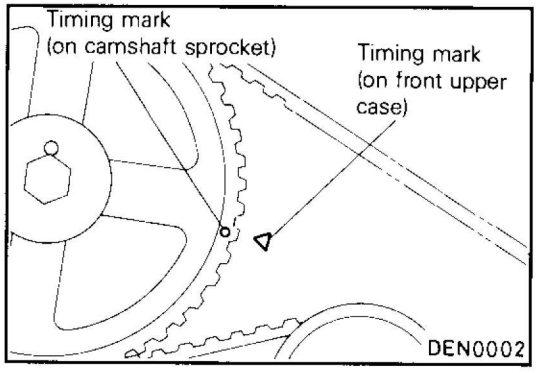
11. If not within the standard value, repeat steps (7) to (8) to adjust the valve clearance of remaining valves.
12. When installing the rocker cover assembly to the cylinder head, apply a coating of the specified sealant to the semi-circular packing and cylinder head top surfaces, and then tighten at the specified torque.

Specified sealant: 3M ATD Part No. 8660 or equivalent
Tightening torque: 5 – 7 Nm (0.5 – 0.7 kgm, 4 – 5 ft.lbs.)

Caution
If they are overtorqued, a deformed rocker cover or oil leakage could result.



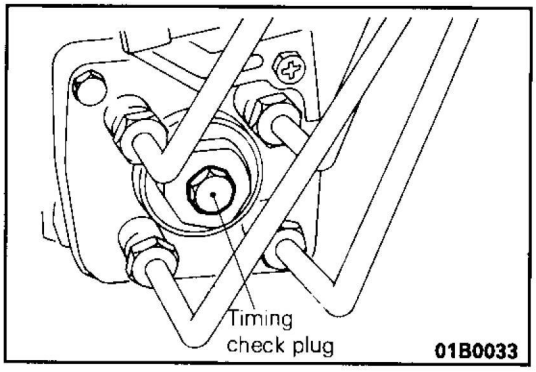




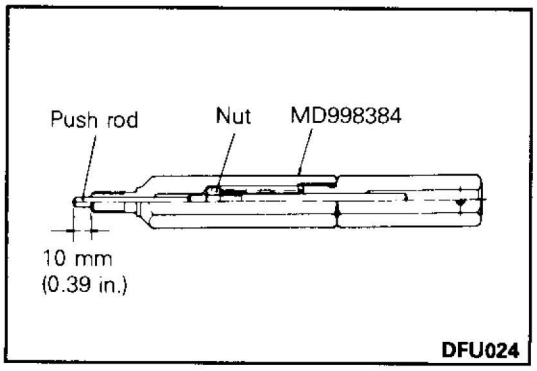
INJECTION TIMING INSPECTION AND ADJUSTMENT

E11FVAI

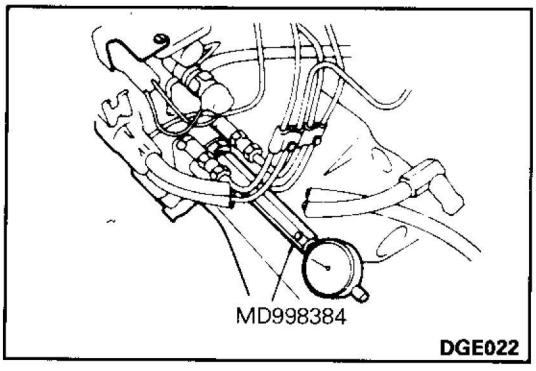
1. Remove the glow plugs (four) so that the crankshaft can be turned with greater ease.
2. Turn the crankshaft clockwise and align the two timing marks (located on the camshaft sprocket and on the front upper case). Then set the No.1 cylinder to the top dead center of compression.



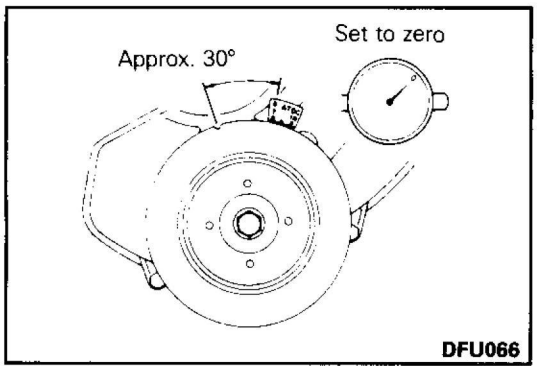
3. Remove the timing check plug installed on the back of the injection pump.



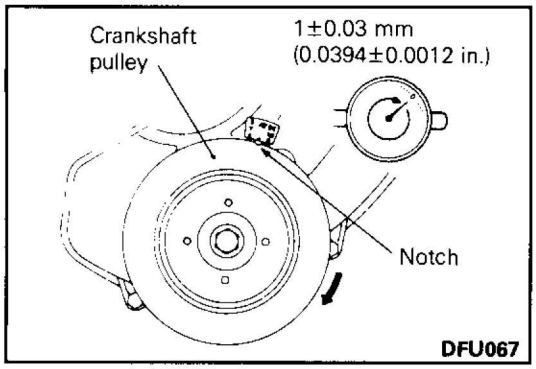
4. Before installation of special tool, make sure that push rod is protruding by 10 mm (0.39 in.). Protrusion of push rod can be adjusted with an inner nut.



5. After setting the dial gauge, install the special tool on the rear of the injection pump.

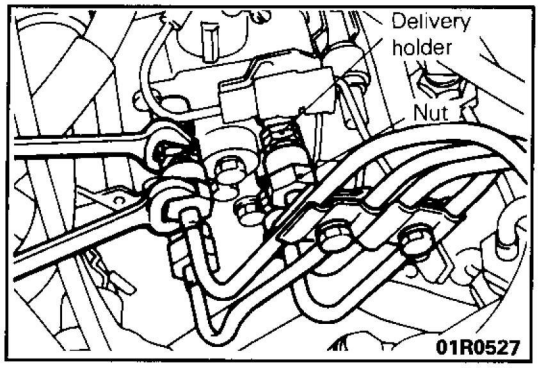


6. Turn crankshaft clockwise to such a position that the notch on pulley is at approximately 30° before top dead center on compression stroke of piston in No.1 cylinder.
7. Set dial indicator to zero.
8. Check to make sure that the indicator needle does not move when the crankshaft is turned slightly clockwise or slightly anti-clockwise (2 to 3°).

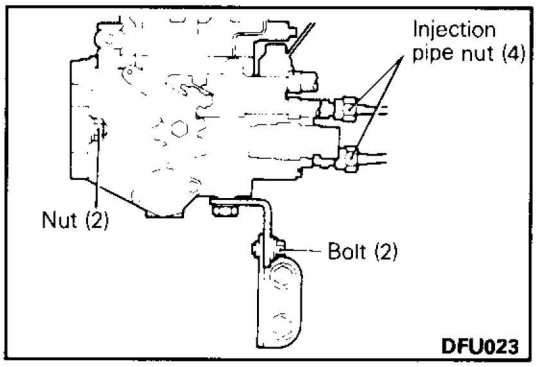


9. If the indicator needle moves, this means that the injection pump plunger is lifted. If so, turn and reset the crankshaft so that the indicator needle does not move.
10. Turn the crankshaft clockwise and set the notch located on the crankshaft pulley to 7° ATDC (set to 5° ATDC for vehicles for Switzerland and Austria).
11. Read the value indicated on the dial gauge.

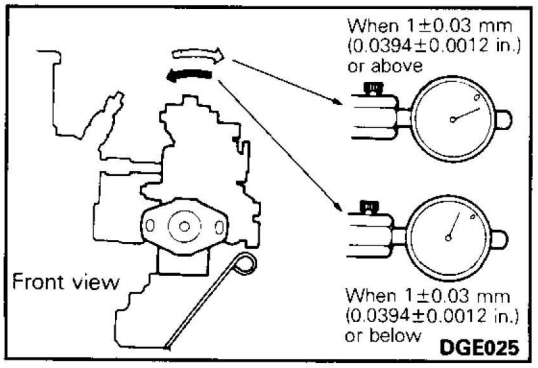
    Standard value: 1 ± 0.03 mm (0.0394 ± 0.0012 in.)



12. If the indicated value is not within the range specified above, adjust the injection timing by following the procedure below.
    (1) Loosen the injection pipe union nuts (four) located on the injection pump side. (Do not remove these union nuts.) Be sure to use a spanner to prevent the delivery valve holder from moving while loosening the nuts.



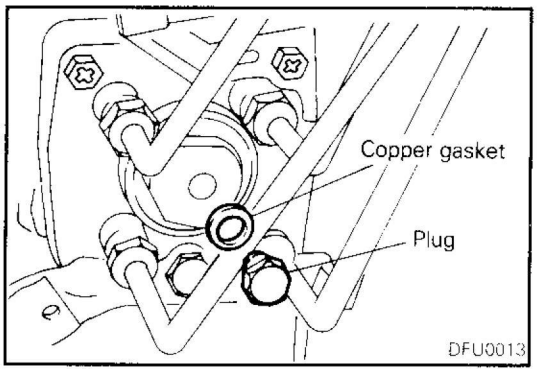
    (2) Slightly loosen the injection pump installation bolts (two) and nuts (two). (Do not remove these bolts and nuts.)



    (3) Tilt the injection pump to the right or left, and adjust the indicator needle of the dial gauge to the standard value.
    (4) Temporarily tighten the injection pump installation nuts (two) and bolts (two).

(5) Repeat Steps 6 to 11 to check that adjustment has been made correctly.
(6) Tighten the injection pump installation nuts (two) and bolts (two) by applying the torque specified below.

Tightning torque: Nut 15 – 22 Nm
(1.5 – 2.2 kgm, 11 – 16 ft.lbs.)
Bolt 20 – 27 Nm
(2.0 – 2.7 kgm, 14 – 20 ft.lbs.)



(7) Tighten injection pipe union nuts (4) to specified torque. When nuts are tightened, hold delivery valve holder with a spanner to prevent it from rotating with nut.

Tightening torque: 23 – 37 Nm
(2.3 – 3.7 kgm, 17 – 27 ft.lbs.)

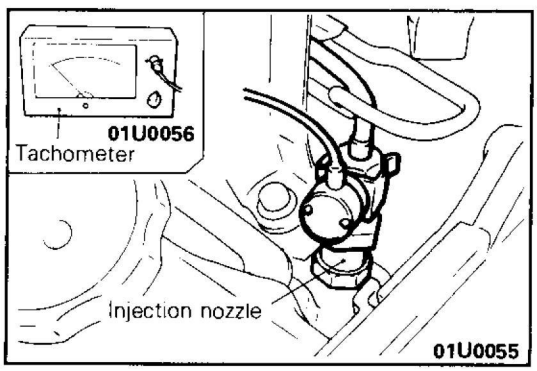
13. Remove the special tool.
14. Install new copper gasket, then tighten timing check plug to specified torque.

Tightening torque: 8 – 10 Nm
(0.8 – 1.0 kgm, 6 – 7 ft.lbs.)

IDLE SPEED INSPECTION AND ADJUSTMENT E11FXCO

NOTE
Idle speed inspection and adjustment must be done only after normal fuel injection timing has been confirmed.

1. Before inspection and adjustment set vehicle in the following condition.
   (1) Coolant temperature: 80 – 90°C (176 – 194°F)
   (2) Lights and all accessories: OFF
   (3) Transmission: Neutral

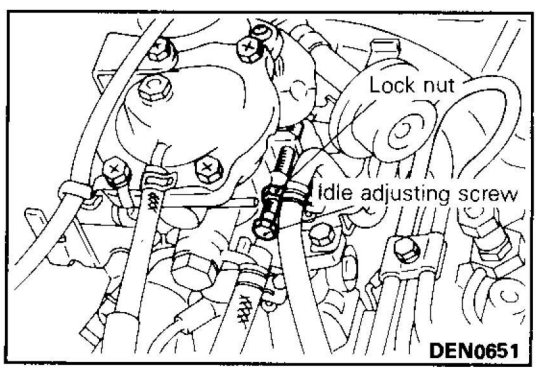


2. Connect the tachometer to the injection nozzle or to the injection pipe.

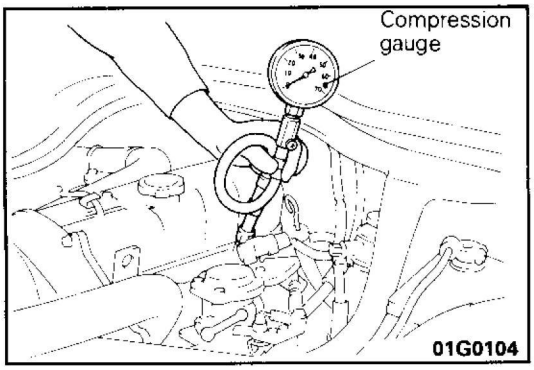
Caution
Before connecting the tachometer to the injection pipe, be sure to remove all pipe-securing clamps.

3. Check the engine idling speed.

Standard value: 750 ± 30 r/min.



4. If not within the standard value, loosen idle adjusting screw lock nut and adjust the standard value by rotating adjusting screw. After adjustment, tighten lock nut securely.



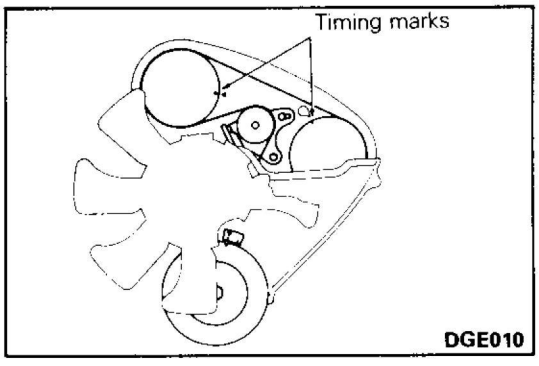
COMPRESSION PRESSURE INSPECTION E11FGAD

1. Check to be sure that the engine oil, starting motor and battery are in the normal condition.
2. Start the engine and allow it to warm up until the temperature of the coolant reaches 80° C to 90°C (176°F to 194°F).
3. Loosen the nuts at the nozzle side of the injection pipes, and disconnect the pipes from the nozzle holders.

   Caution
   Caps must be used to prevent entry of foreign materials into the nozzles.
4. Remove the glow plug plate and all 4 glow plugs.
5. Set an engine tachometer in place.
6. Place a compression gauge adaptor and compression gauge in the glow plug hole.
7. Crank the engine with the throttle valve fully open, and measure the compression at the place where the compression gauge indicator shows a stabilized reading.

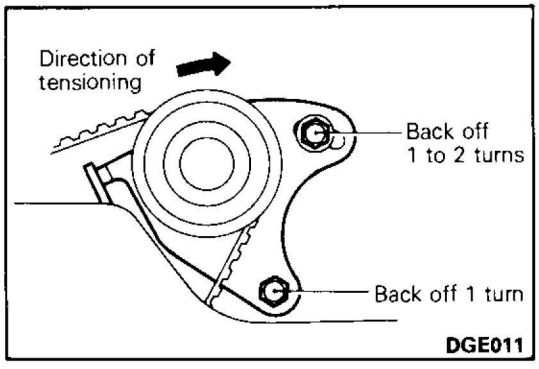
   Limit (at engine speed of 250 r/min.):
   Min. 1,920 kPa (19.2 kg/cm², 273 psi)
8. Conduct steps 6, 7 with all cylinders and confirm pressure differences of all cylinders is within the limit.

   Limit: Max. 300 kPa (3.0 kg/cm², 43 psi)
9. If after the measurement, the compression is below the limit, put a small amount of engine oil through the glow plug hole into the cylinder; then measure the compression once again and determine the cause of the malfunction.
10. If, after oil is added, the compression rises, the cause of the malfunction is a worn or damaged piston ring and/or cylinder inner surface.
    If, however, the compression does not rise, the cause is a bad valve or a bad gasket.
    For information regarding the servicing procedures for these causes of malfunction, refer to the ENGINE AND TRANSMISSION MANUAL.



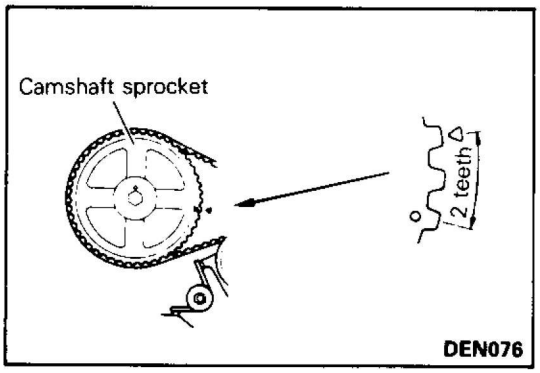
TIMING BELT TENSION ADJUSTMENT E11FFDC

1. Remove timing belt upper cover.
2. Turn the crankshaft clockwise to align the timing marks.

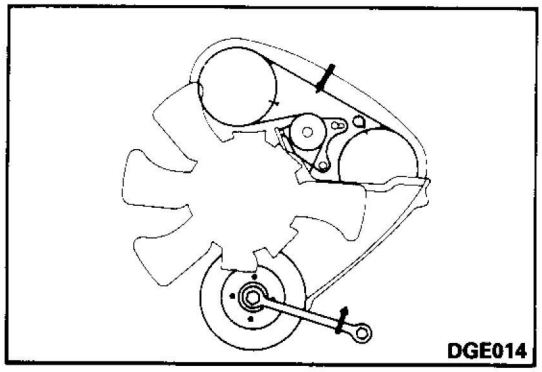


3. Loosen the timing belt tensioner mounting bolts.

   Caution
   Do not loosen the belts more than necessary. They could drop in the lower cover.



4. Turn crankshaft clockwise through two camshaft sprocket teeth and hold.



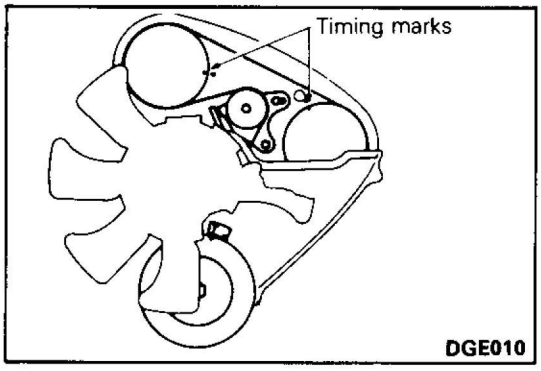
5. Tighten tensioner mounting bolts.

   Caution
   Tighten the upper bolts first and then the lower ones.

6. Reverse crankshaft to align timing marks, and push down belt at a point halfway with forefinger to check that tension of belt is up to standard value.

   Standard value: 4–5 mm (0.16–0.20 in.)

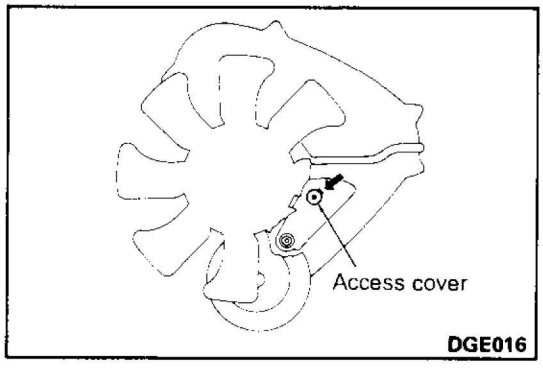
7. Mount the timing belt upper cover.



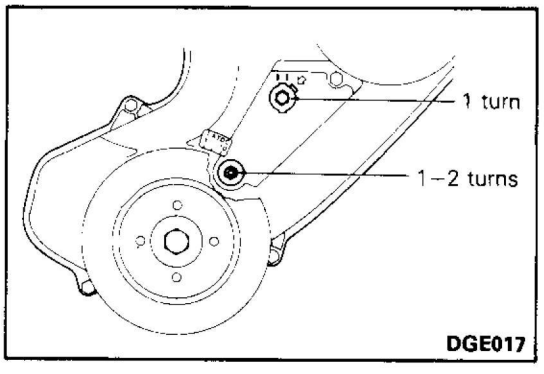
TIMING BELT "B" TENSION ADJUSTMENT

E11FFBE

1. Remove timing belt upper cover and bring piston in No.1 cylinder to top dead center on compression stroke. Check that timing marks of sprockets are aligned.
2. Turn the crankshaft clockwise to align timing marks.



3. Remove the access cover.



4. Loosen the timing belt "B" tensioner mounting nut and bolt.

   Caution
   Do not loosen the bolts (upper) more than necessary. They could drop in the lower cover.

5. Tighten tensioner mounting nut and bolt.

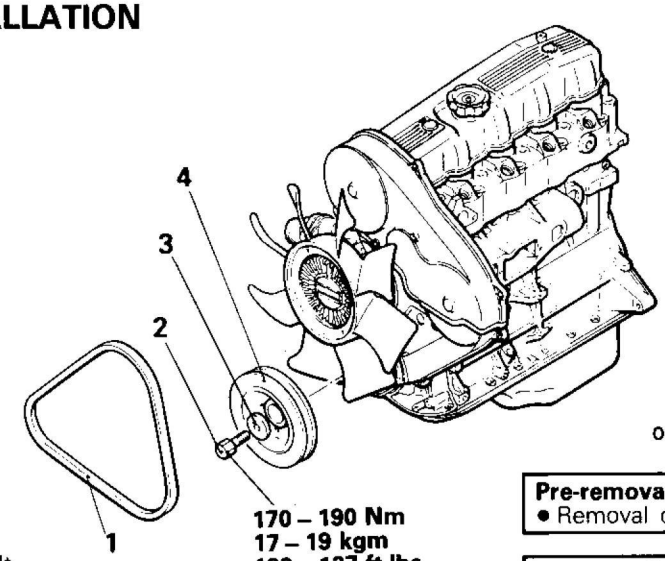
   Caution
   Tighten the nut (lower) first and then the bolt (upper).

6. Mount the access cover.
7. Mount the timing belt upper cover.

CRANKSHAFT PULLEY

E11LA--

REMOVAL AND INSTALLATION

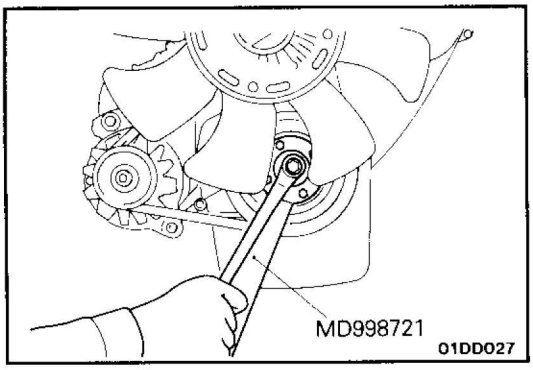


170 – 190 Nm
17 – 19 kgm
123 – 137 ft.lbs.

Pre-removal Operation
- Removal of the Undercover

Post-installation Operation
- Intallation of the Undercover
- Checking of the Alternator V-belt Tension (Refer to P. 11-32.)

Removal steps
1. Alternator V-belt
◆◆◆◆ 2. Crankshaft pulley bolt
3. Special washer
◆◆ 4. Crankshaft pulley

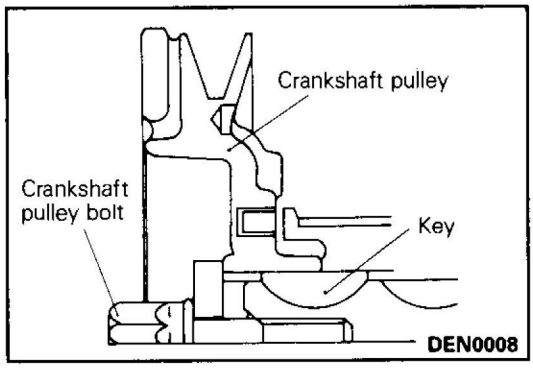


SERVICE POINTS OF REMOVAL

E11LBAD

2. REMOVAL OF CRANKSHAFT PULLEY BOLT

Use the special tool to keep the crankshaft from turning and remove the bolts.

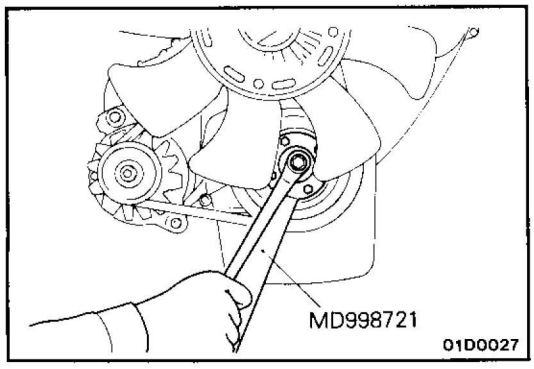


SERVICE POINTS OF INSTALLATION

E11LDAD

4. INSTALLATION OF CRANKSHAFT PULLEY

Align the crankshaft with the key and fasten the crankshaft pulley to the crankshaft.



2. INSTALLATION OF CRANKSHAFT PULLEY BOLT

Use the special tool to keep the crankshaft from turning and tighten the bolts.

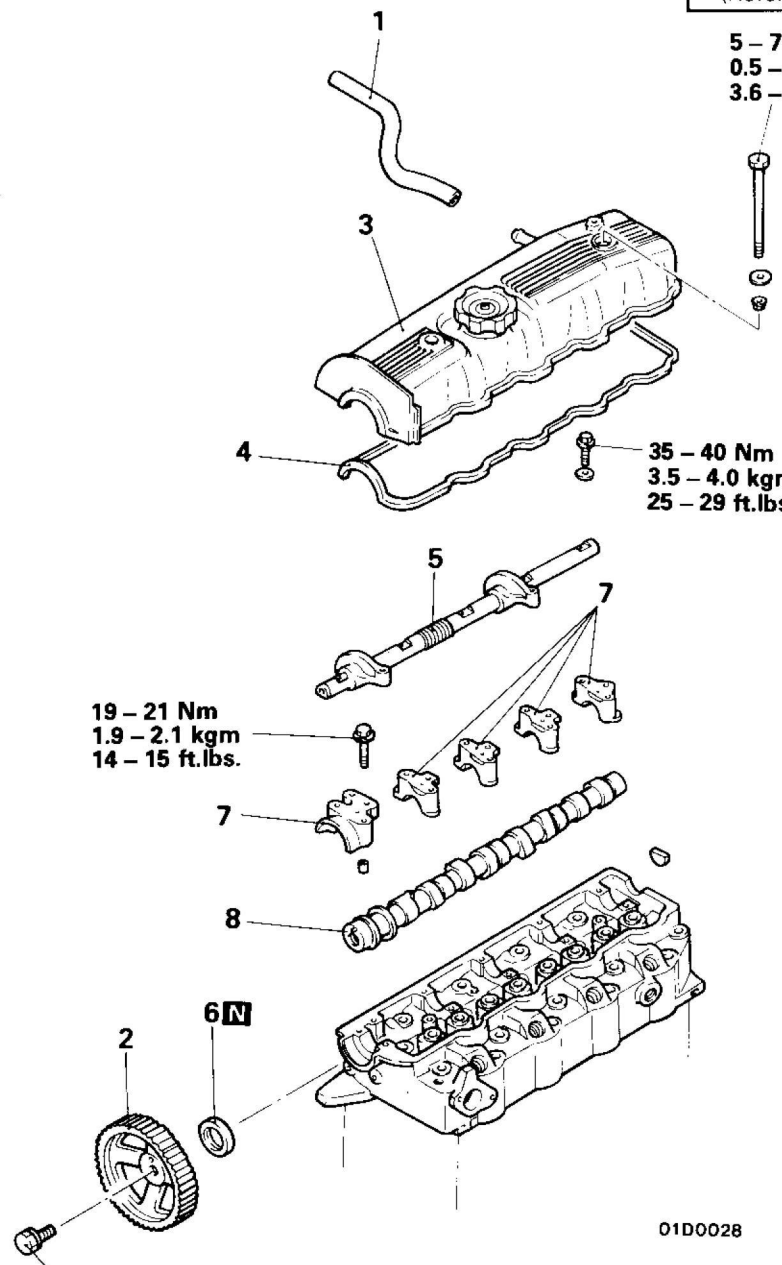
CAMSHAFT AND CAMSHAFT OIL SEAL

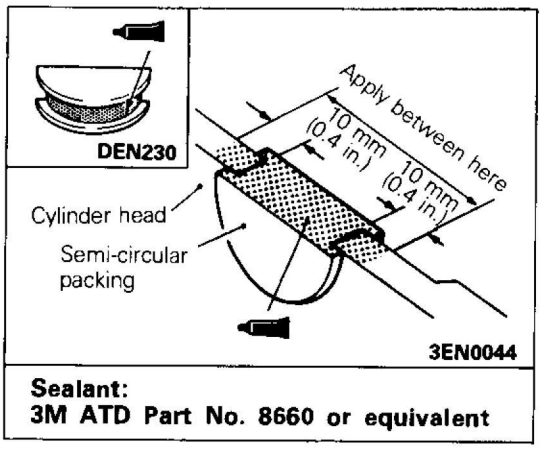
REMOVAL AND INSTALLATION

E11HA – B

Pre-removal Operation
- Removal of the Timing Belt (Refer to P. 11-46.)

Post-Installation Operation
- Installation of the Timing Belt (Refer to P. 11-46.)
- Adjustment of the Engine (Refer to P. 11-31.)

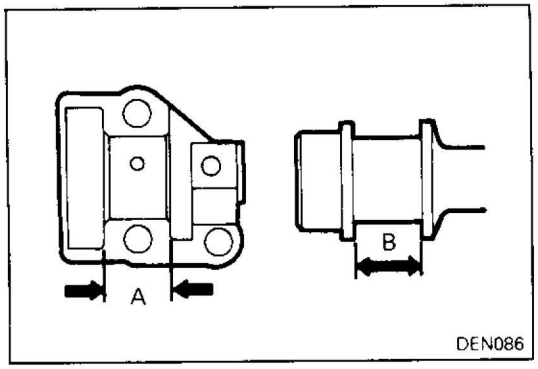




Sealant:
3M ATD Part No. 8660 or equivalent

Removal steps

1. Breather hose
2. Camshaft sprocket
3. Rocker cover
4. Rocker cover gasket
5. Rocker arms and rocker arm shaft
- ◆◆ 6. Oil seal
7. Camshaft bearing cap
- ◆◆ 8. Camshaft

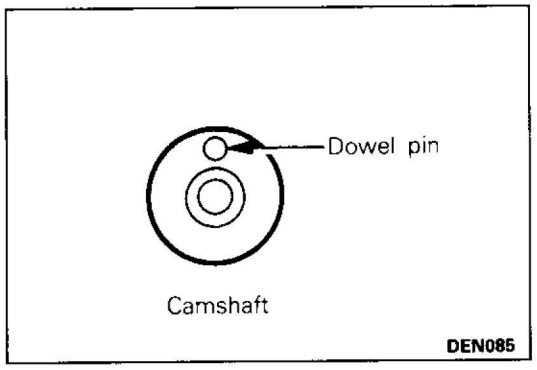


SERVICE POINTS OF INSTALLATION E11HCBC

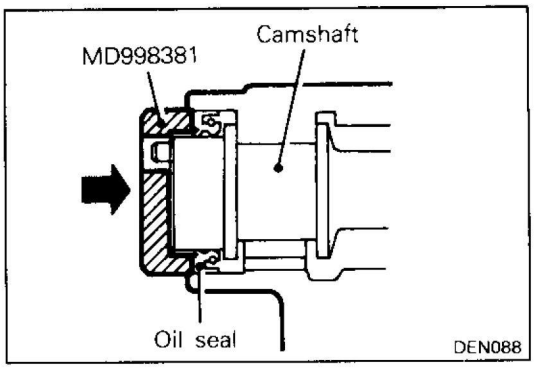
8. INSTALLATION OF CAMSHAFT

(1) To obtain the end play, measure A and B. Replace parts if the limit is exceeded.
End play = B – A

Standard value: 0.1 – 0.2 mm (0.0039 – 0.0079 in.)
Limit: 0.4 mm (0.016 in.)



(2) Install the camshaft to the cylinder head with the dowel pin at the highest position.



6. INSTALLATION OF CAMSHAFT OIL SEAL

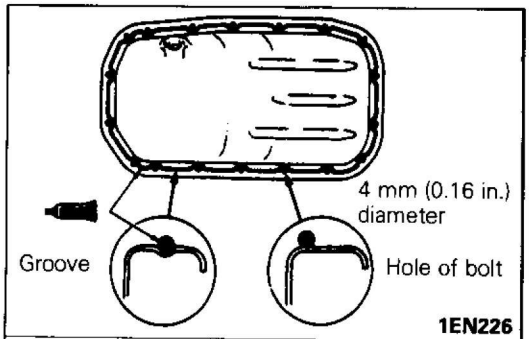
(1) Apply oil to the oil seal lips.
(2) Using special tool, press-fit a new camshaft oil seal into the front bearing cap.

OIL PAN

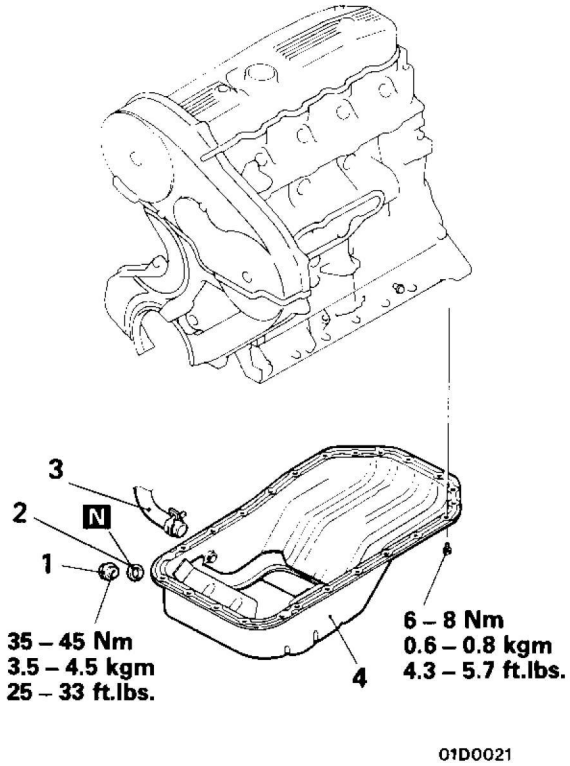
REMOVAL AND INSTALLATION

E11KA – B

Pre-removal and Post-installation Operation
- Removal and Installation of Undercover
- Draining and Supplying of Engine Oil



Sealant:
MITSUBISHI GENUINE Part No. MZ100168 or equivalent



Removal steps
1. Drain plug
2. Drain plug gasket
3. Oil hose
4. Oil pan (Refer to P. 11-16.)

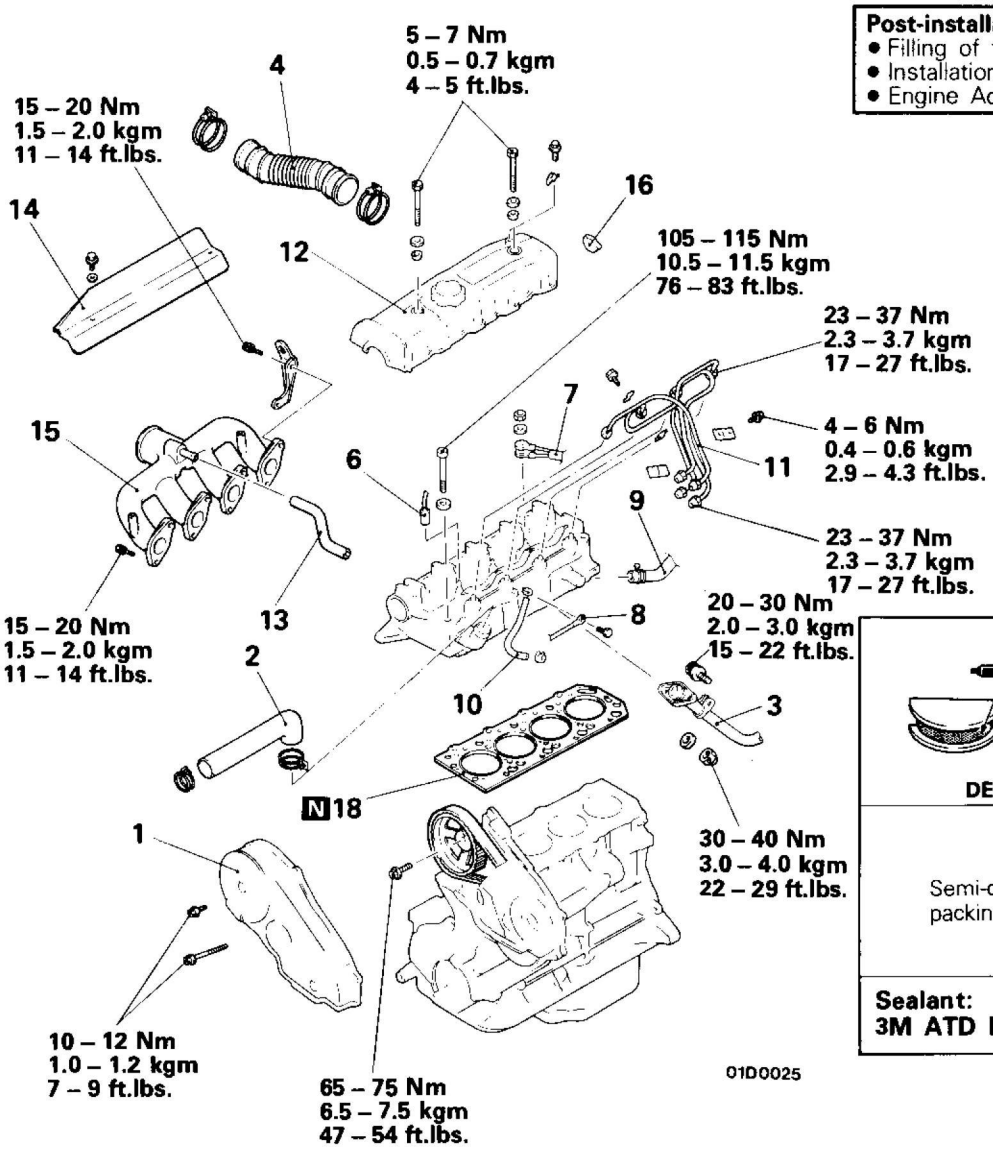
CYLINDER HEAD GASKET

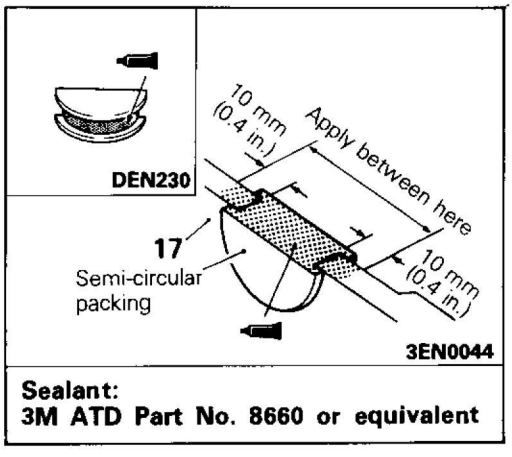
REMOVAL AND INSTALLATION

E11JA – B

Pre-removal Operation
- Removal of the Seat and Seat Underframe
- Drainage of the Engine Coolant

Post-installation Operation
- Filling of the Engine Coolant
- Installation of Seat and Seat Underframe
- Engine Adjustment (Refer to P. 11-31.)

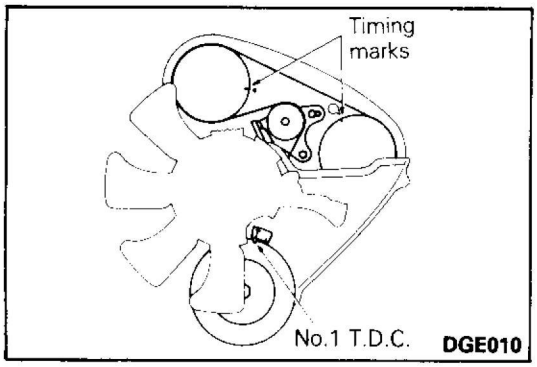




Sealant:
3M ATD Part No. 8660 or equivalent

Removal steps

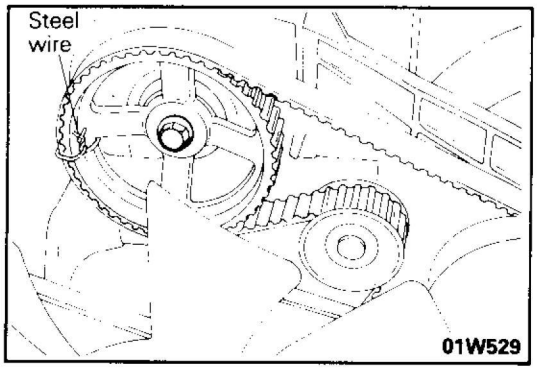
1. Timing belt upper cover
2. Radiator upper hose connection
3. Exhaust pipe connection
4. Intake hose
◆◆ 5. Camshaft sprocket
6. Water temperature sensor connector
7. Glow plug harness
8. Earth cable
9. Heater hose
10. Fuel return hose (injection pipe to injection pump)
11. Fuel injection pipe
12. Rocker cover
13. Breather hose
14. Exhaust manifold cover
15. Intake manifold
16. Semi-circular packing
◆◆ ◆◆ 17. Cylinder head assembly
◆◆ 18. Cylinder head gasket



SERVICE POINTS OF REMOVAL E11JBAHa

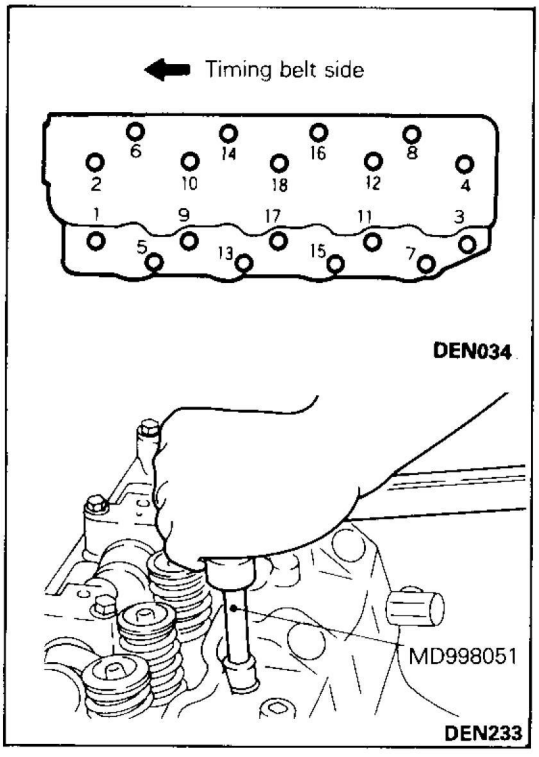
5. REMOVAL OF CAMSHAFT SPROCKET

(1) Rotate crankshaft clockwise (to the right) and align timing marks.



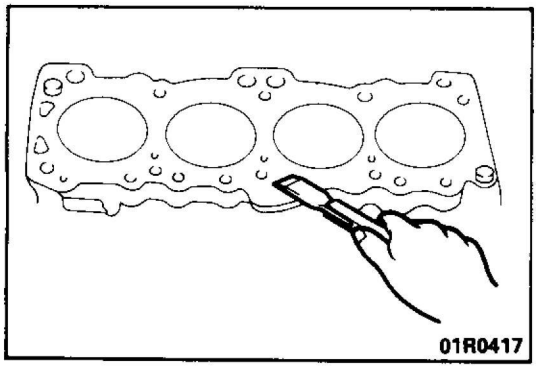
(2) Remove camshaft sprocket with timing belt and place it on timing belt front lower cover.

NOTE
1. Secure timing belt to sprocket with wire etc., to prevent them from slipping out of place.
2. Do not rotate crankshaft after removing camshaft sprocket.



17. REMOVAL OF CYLINDER HEAD ASSEMBLY

Loosen bolt in the numerical order indicated in the diagram with special tool (MD998051) and remove.

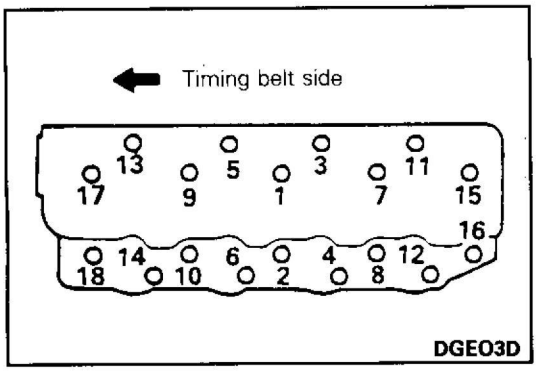


SERVICE POINTS OF INSTALLATION E11JDAVa

18. INSTALLATION OF CYLINDER HEAD GASKET

Scrape off gasket adhered to cylinder block.

Caution
Be careful that foreign material does not fall into cylinder, or into coolant and oil passage ways.



17. INSTALLATION OF CYLINDER HEAD ASSEMBLY

(1) Scrape off gasket adhered to cylinder head assembly.

Caution
Be careful that foreign material does not fall into coolant and oil passage ways.

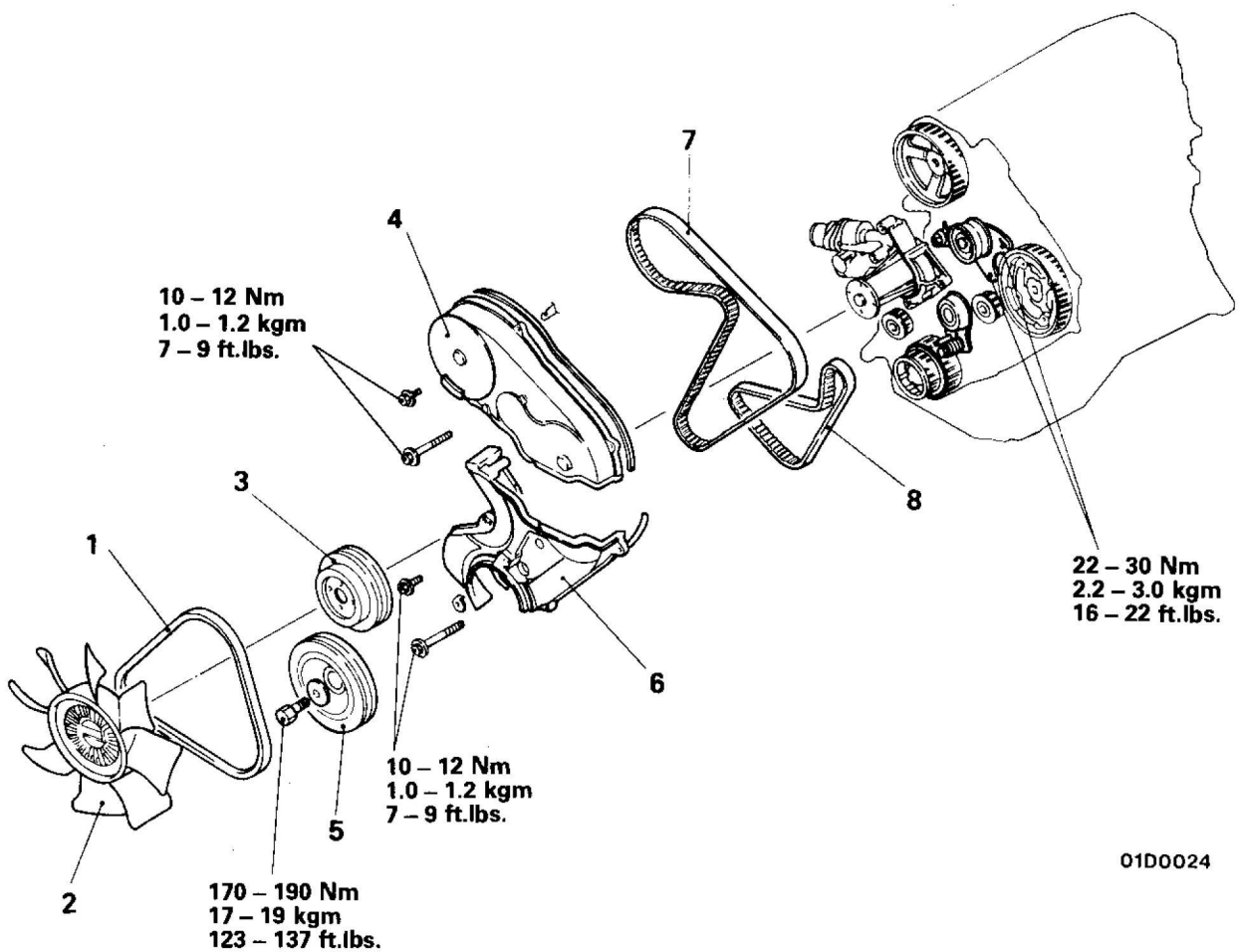
(2) Tighten in the numerical order indicated in the diagram in two or three groups with special tool.

TIMING BELT AND TIMING BELT B

REMOVAL AND INSTALLATION

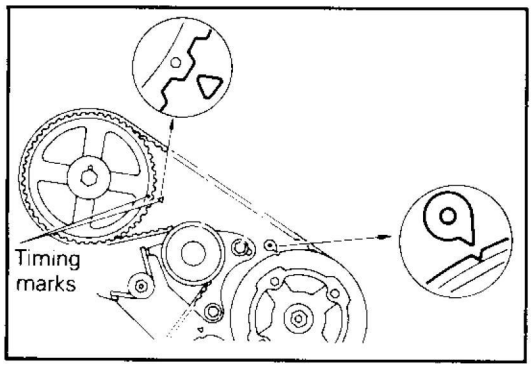
E11GA--

Post-installation Operation
- Adjustment of the Drive Belt Tension (Refer to P. 11-32.)



Removal steps

1. Alternator V-belt
2. Cooling fan
3. Water pump pulley
4. Timing belt upper cover
◆◆ 5. Crankshaft pulley
6. Timing belt lower cover
◆◆◆◆ 7. Timing belt
◆◆◆◆ 8. Timing belt B



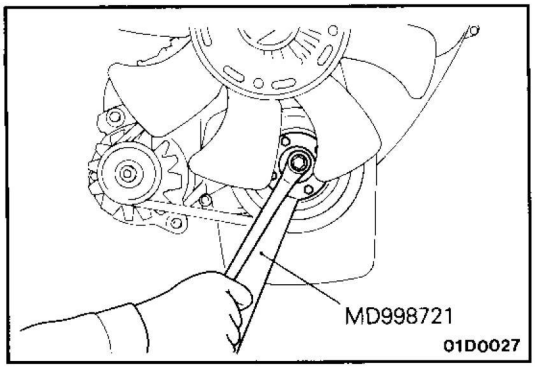
SERVICE POINTS OF REMOVAL

E11GBDM

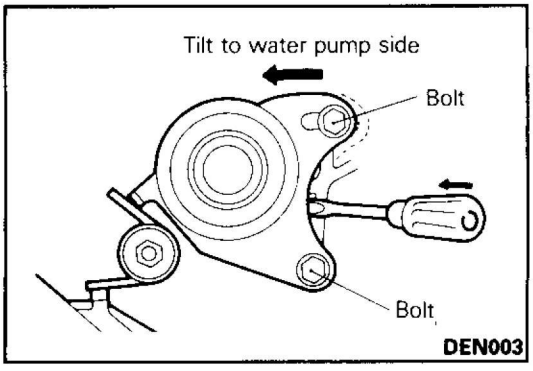
5. REMOVAL OF CRANKSHAFT PULLEY

(1) Position the No. 1 cylinder at compression TDC and remove the crankshaft pulley.

NOTE
The No. 1 cylinder is at compression TDC when the marks are aligned as shown in the diagram.

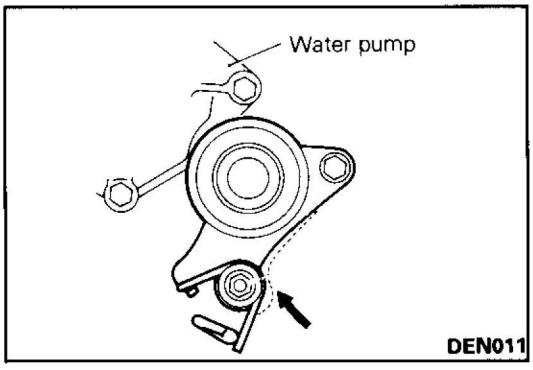


(2) Use the special tool to keep crankshaft from turning and remove the bolts.



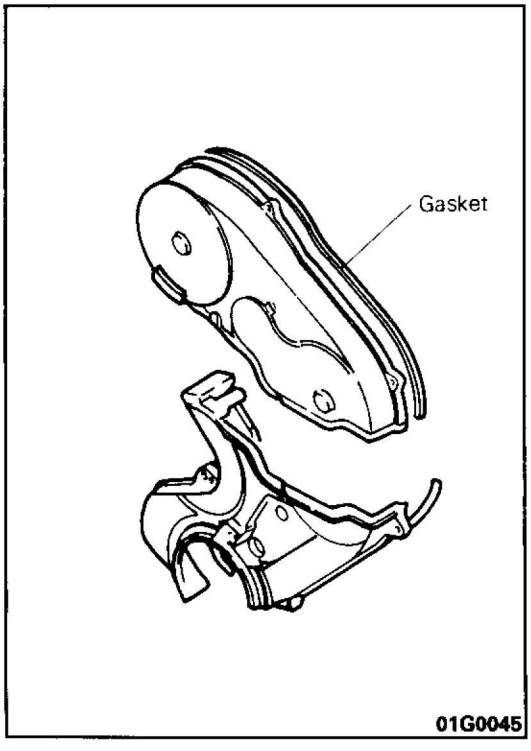
7. REMOVAL OF TIMING BELT

(1) When removing timing belt, mark an arrow at the belt to show rotation direction.
(2) Push timing belt tensioner to water pump side and tighten nut. Secure so that tensioner will not move back.



8. REMOVAL OF TIMING BELT B

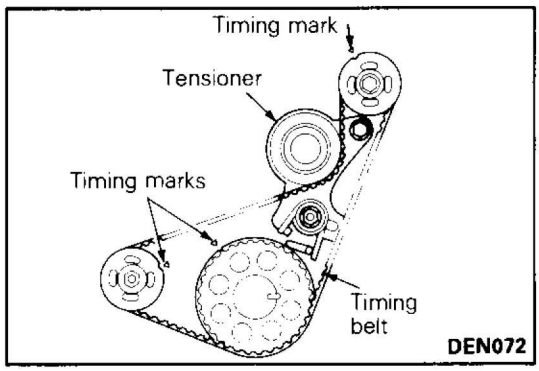
(1) When removing timing belt B, mark an arrow at the belt to show rotation direction.
(2) Push timing belt tensioner to water pump side and tighten nut. Secure so that tensioner will not move back.

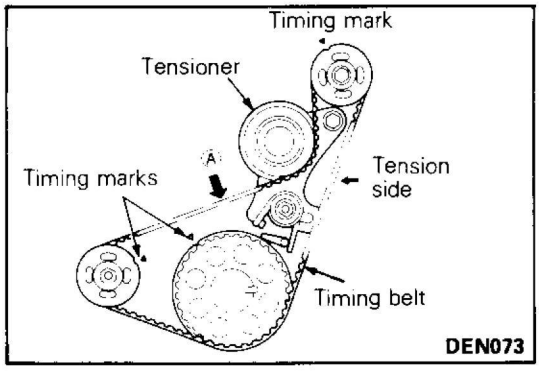


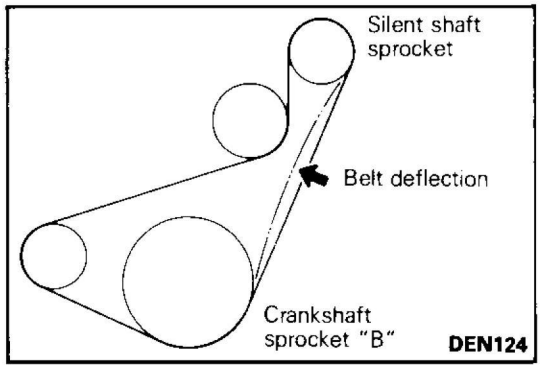
INSPECTION E11GCAB2

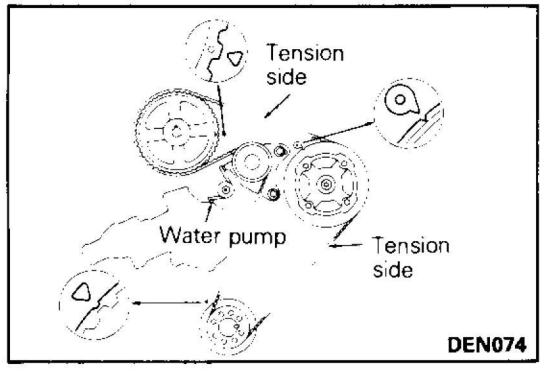
TIMING BELT COVER

Cracking, splitting, deterioration of gasket.









SERVICE POINTS OF INSTALLATION E11GDDC

8. INSTALLATION OF TIMING BELT B

(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt B, make sure the arrow mark is pointing in the same direction as when the belt was removed.
(3) Install timing belt B and make sure there is no deflection on the tension side.
(4) Press the deflection side of timing belt B (indicated by arrow (A)) with the hand and fully stretch the tensioner side.
(5) Make sure that the timing marks are aligned.
(6) Loosen the tensioner mounting bolt and nut so that only the pressure of the spring is applied to timing belt B.
(7) Tighten the tensioner mounting bolt and nut, tightening the nut first. If the bolt is tightened first, the tensioner will move and tension the belt.
(8) Press in the direction of the arrow in the diagram with the index finger to check the amount of deflection.

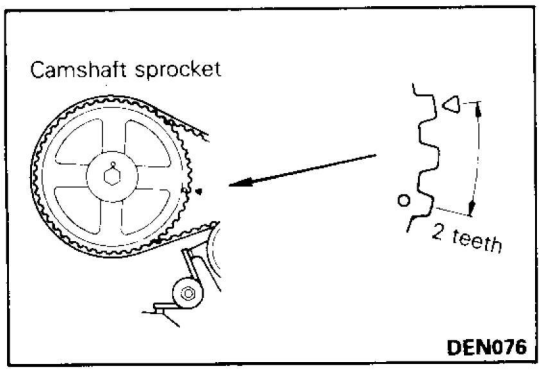
Standard value: 4—5 mm (0.16—0.20 In.)

7. INSTALLATION OF TIMING BELT

(1) Align the timing marks of the 3 sprockets.
(2) When reusing timing belt, make sure the arrow mark is pointing in the same direction as when the belt was removed.
(3) Install the timing belt to the crankshaft sprocket, to injection pump sprocket, to tensioner and to camshaft sprocket in that order, using care not to allow deflection on the tension side of the timing belt.

Caution

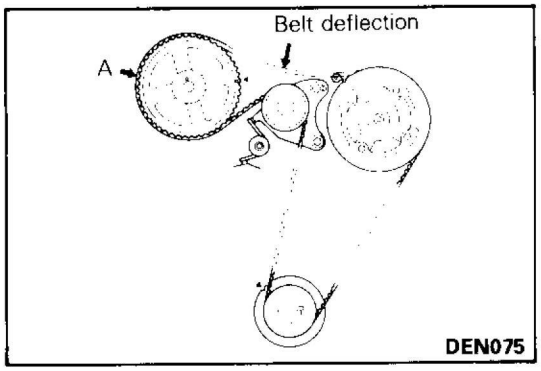
1. **Engage the belt on the various sprockets while maintaining tension on the belt of tension side.**
2. **Align the injection pump sprocket with the timing mark, hold the sprocket so that it does not turn and engage the belt.**

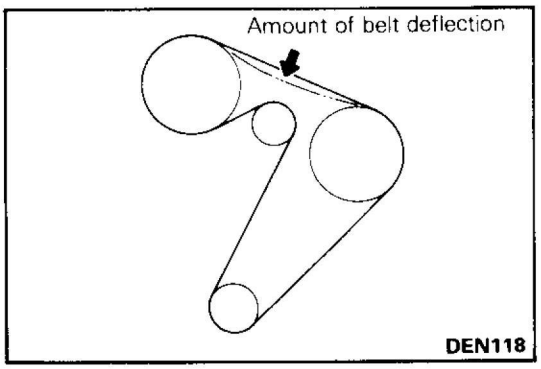


(4) Loosen the tensioner mounting bolts and apply tension with the spring.
(5) Turn the crankshaft clockwise and stop at the second lobe of the camshaft sprocket.

Caution
1. **When turning the crankshaft in item (5), strictly observe the specified amount of rotation (2 teeth on the camshaft sprocket) in order to apply a constant force to the tension side of the belt.**
2. **Do not turn the crankshaft counterclockwise.**
3. **Do not touch the belt during adjustment.**

(6) Inspect to make sure that the part indicated by arrow A dose not float upward.
(7) Tighten the tensioner mounting bolts, starting with the bolt in the elongated hole. If the lower bolt is tightened first, belt tension will become too tight.





(8) Turn the crankshaft conterclockwise and align the timing mark. Next, make sure that the timing marks of all sprockets are aligned.
(9) Press on the center of the belt with an index finger to check the amount of deflection.

Standard value: 4–5 mm (0.16–0.20 in.)

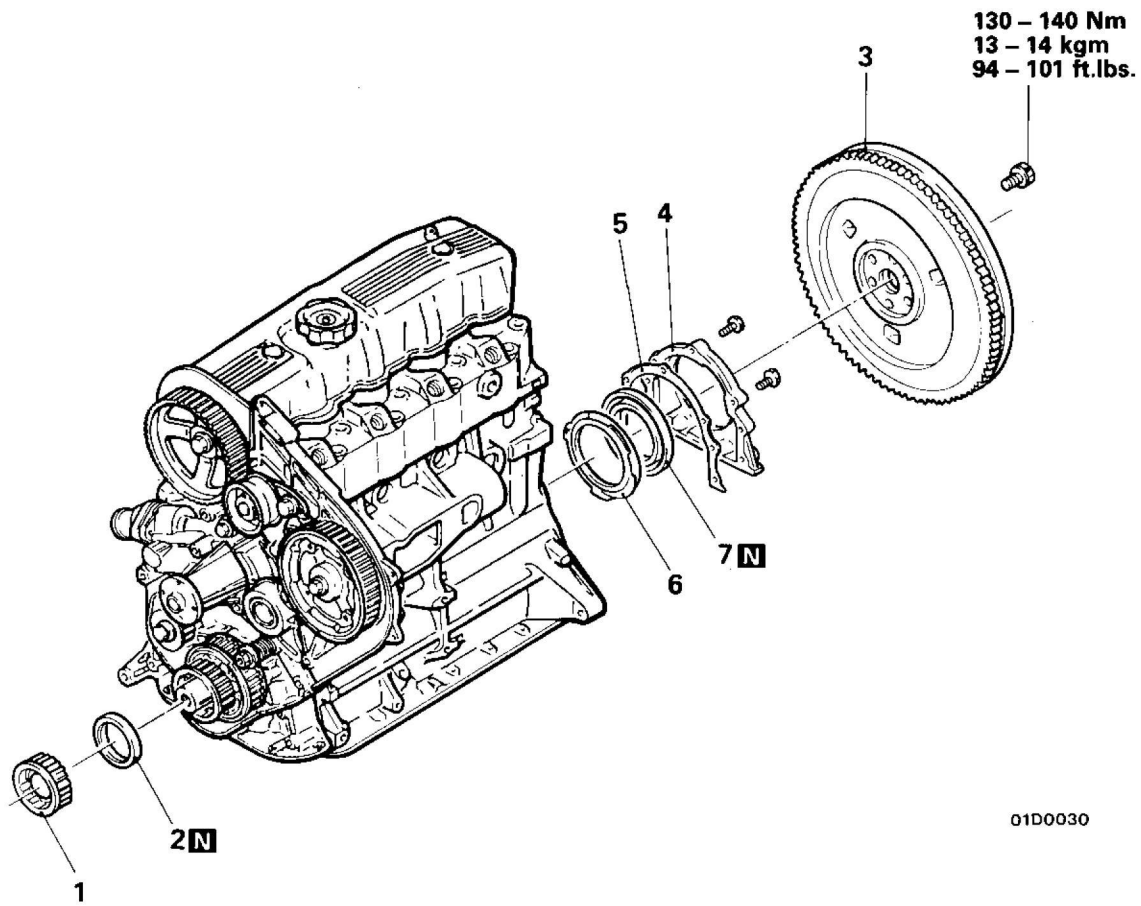
CRANKSHAFT OIL SEAL

REMOVAL AND INSTALLATION

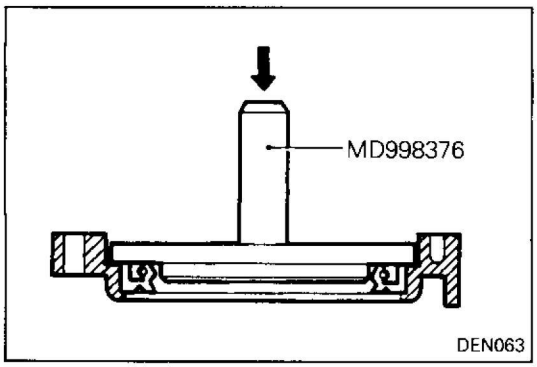
E11UA – B

Pre-removal Operation
- Removal of the Timing Belt <Removal of Crankshaft Front Oil Seal> (Refer to P. 11-46.)
- Removal of the Oil Pan (Refer to P. 11-42.)
- Removal of the Transmission <Removal of Crankshaft Rear Oil Seal> (Refer to GROUP 22 – Transmission Assembly.)
- Removal of the Clutch <Removal of the Crankshaft Rear Oil Seal>

Post-installation Operation
- Installation of the Timing Belt <Installation of Crankshaft Front Oil Seal> (Refer to P. 11-46.)
- Installation of the Oil Pan (Refer to P. 11-42.)
- Installation of the Transmission <Installation of Crankshaft Rear Oil Seal> (Refer to GROUP 22 – Transmission Assembly.)
- Installation of the Clutch <Installation of the Crankshaft Rear Oil Seal>
- Engine Adjustment (Refer to P. 11-31.)



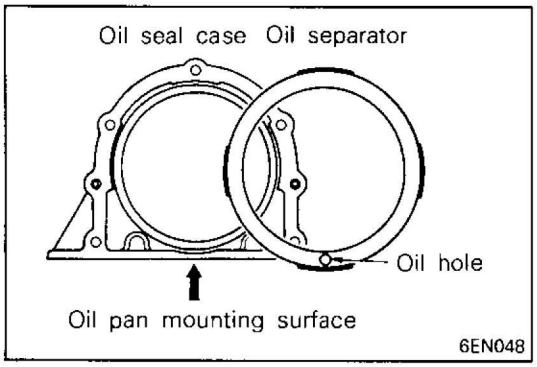
Removal steps
1. Crankshaft sprocket
◆◆ 2. Crankshaft front oil seal
3. Flywheel assembly
4. Oil seal case
5. Gasket
◆◆ 6. Oil separator
◆◆ 7. Crankshaft rear oil seal



SERVICE POINTS OF INSTALLATION E11UCBA

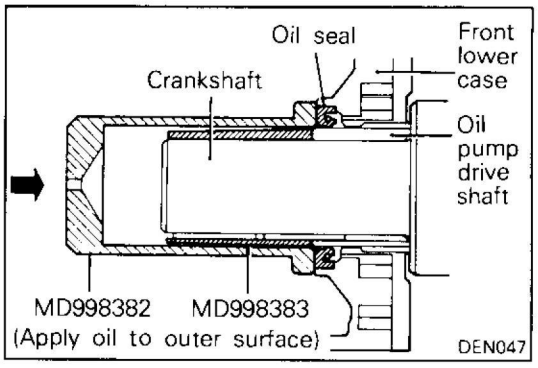
7. INSTALLATION OF CRANKSHAFT REAR OIL SEAL

Using the special tool, press-fit a new crankshaft rear oil seal into the oil seal case.



6. INSTALLATION OF OIL SEPARATOR

Install the oil separator in such a way that its oil hole come at the case bottom (indicated by an arrow in illustration).



2. INSTALLATION OF CRANKSHAFT FRONT OIL SEAL

(1) Attach the special tool to the crankshaft and apply engine oil to the outer surface of the tool.
(2) Using the special tool, install the front oil seal into the front lower case.

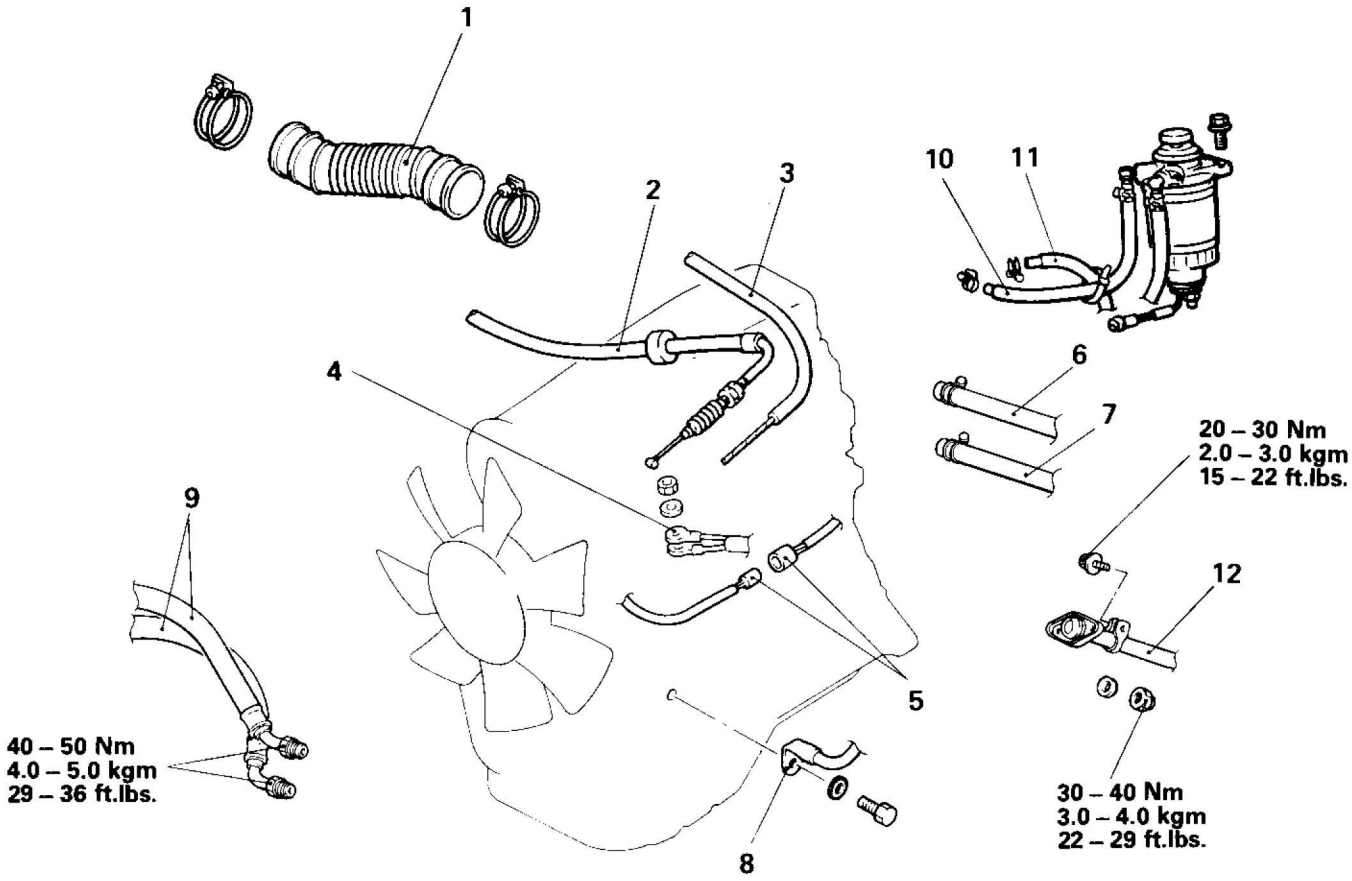
ENGINE AND TRANSMISSION ASSEMBLY

REMOVAL AND INSTALLATION

E11SA – B

Pre-removal Operation
- Removal of the Seat and Seat Underframe (Refer to GROUP 00 – Engine Compartment Work.)
- Drainage of the Engine Coolant
- Removal of the Undercover

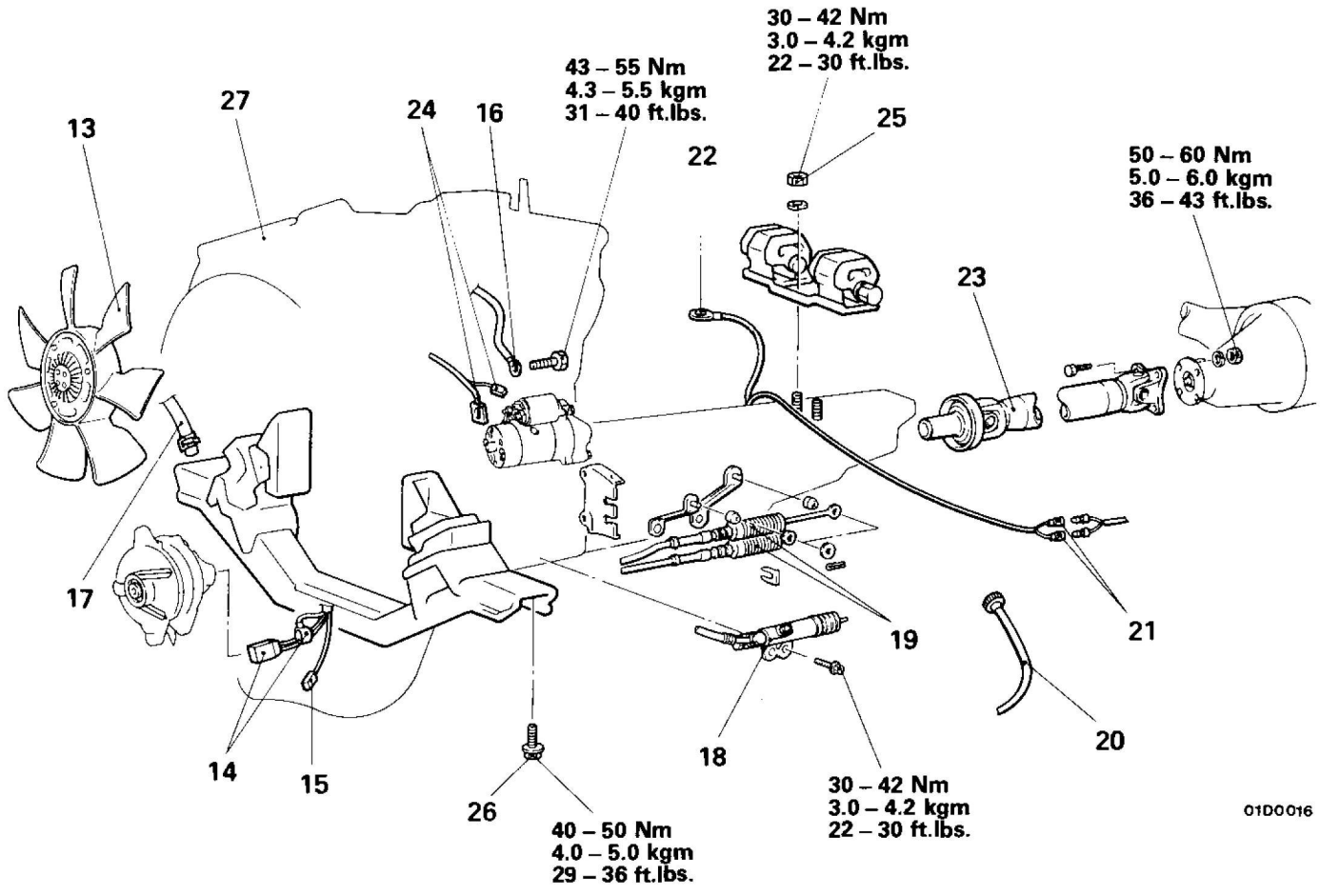
Post-installation Operation
- Installation of the Seat and Seat Underframe
- Filling of the Engine Coolant (Refer to GROUP 14 – Service Adjustment procedures.)
- Installation of the Undercover
- Engine Adjustment (Refer to P. 11-31.)



01D0029

Removal steps

1. Intake hose
2. Accelerator cable connection
3. Idle control cable connection
4. Glow plug cable connection
5. Fuel injection pump wiring harness connector
6. Water hose connection
7. Water hose connection
8. Earth cable connection
9. Oil cooler hose connection
10. Fuel tube connection
11. Fuel return tube connection
12. Front exhaust pipe connection



13. Cooling fan
14. Alternator connector
15. Oil pressure switch connection
16. Earth cable connection
17. Vacuum hose
18. Clutch release cylinder
19. Transmission control cable connection
20. Speedometer cable connection
21. Bach-up lamp harness connection
22. Earth cable connection
23. Propeller shaft
    (Refer to GROUP 25 – Propeller shaft)
24. Starter motor connector
25. Transmission mounting nut
26. Front engine support assembly mounting bolt
27. Engine and transmission assembly

NOTES

LUBRICATION

CONTENTS

E12AA--

SPECIFICATIONS

TORQUE SPECIFICATIONS

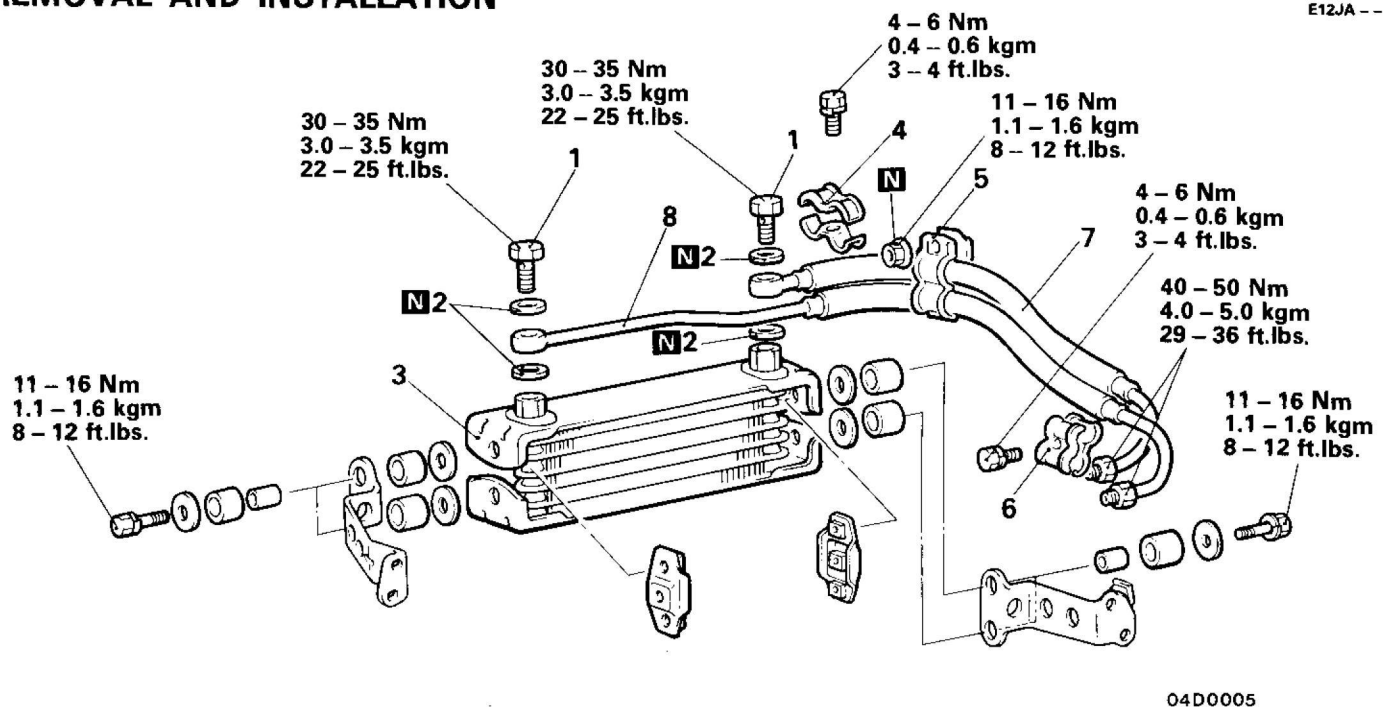
E12CC--

Items	Nm	kgm	ft.lbs.
Oil cooler mounting bolt	11 – 16	1.1 – 1.6	8 – 12
Eye bolt	30 – 35	3.0 – 3.5	22 – 25
Clamp bolt	4 – 6	0.4 – 0.6	3 – 4
Hose clamp self locking flange nut	11 – 16	1.1 – 1.6	8 – 12
Flare nut	40 – 50	4.0 – 5.0	29 – 36

ENGINE OIL COOLER <4D56>

REMOVAL AND INSTALLATION

E12JA--



04D0005

Pre-removal and Post-installation Operation
- Removal and Installation of the Undercover
- Draining and Supplying of the Engine Oil

Removal steps

◆◆ 1. Eye bolt
2. Gasket
3. Engine oil cooler
4. Clamp
5. Hose clamp
6. Clamp
7. Return hose
8. Feed hose

SERVICE POINT OF REMOVAL

E12JBAF

1. REMOVAL OF EYE BOLT

Caution
Be sure to hold the weld nut of the oil cooler while loosening the eye bolt.

FUEL

CONTENTS

E31AA--

SPECIFICATION

GENERAL SPECIFICATIONS

E13CA--

<Carburettor>

Items		Specifications
Fuel pump		
Type		Mechanical diaphragm
Driven by		Camshaft
Discharge pressure	kPa (kg/cm^2, psi)	17 – 24 (0.17 – 0.24, 2.4 – 3.4)
Carburettor		
Type		Down-draft, 2-barrel,
Choke type		Automatic (wax type)
Identification model No.		5ED A
Throttle bore		
Primary	mm (in.)	28 (1.1024)
Secondary	mm (in.)	32 (1.2598)
Fuel shut-off solenoid valve		ON/OFF type solenoid
Dash pot		Controlled vacuum type

<Diesel>

Items		Specifications
Fuel injection pump		
Type		Distribution type
Rotation direction		Clockwise (viewed from driving side)
Injection sequence		1-3-4-2
Plunger diameter	mm (in.)	10 (0.3937)
Governor type		All speed
Feed pump type		Vane type
Injection nozzle		
Nozzle type		Throttle type
Holder type		Screw-in type

SERVICE SPECIFICATIONS

E13CB--

<Carburettor>

Items		Specifications
Standard value		
Choke breaker opening	mm (in.)	1.6 – 1.8 (0.063 – 0.071)
Fuel shut-off solenoid valve		
Solenoid coil resistance [at 20°C (68°F)]	Ω	Approx. 90
Accelerator cable free play	mm (in.)	1.0 (0.04) or less
Fuel hose insertion distance	mm (in.)	20 – 30 (0.8 – 1.2)

<Diesel>

Items		Specifications
Sandard value		
Injection pressure	kPa (kg/cm^2, psi)	12,000 – 13,000 (120 – 130, 1,707 – 1,849)
Speed sensor resistance	kΩ	1.3 – 1.9
Fuel shut-off solenoid valve resistance [at 20°C (68°F)]	Ω	8 – 10
Accelerator cable free play	mm (in.)	1.0 (0.04) or less
Fuel hose insertion distance	mm (in.)	20 – 30 (0.8 – 1.2)

TORQUE SPECIFICATIONS

E13CC--

Items	Nm	kgm	ft.lbs.
Fuel tank mounting bolt	15 – 22	1.5 – 2.2	11 – 15
Injection pipe clamp attatching bolt <Diesel>	4 – 6	0.4 – 0.6	3 – 4
Injection pipe flare nut <Diesel>	27 – 37	2.7 – 3.7	17 – 27
Injection pipe lock nut <Diesel>	30 – 40	3.0 – 4.0	22 – 29
Fuel injection pump mounting bolt <Diesel>	20 – 27	2.0 – 2.7	14 – 20
Fuel injection pump mounting nut <Diesel>	15 – 22	1.5 – 2.2	11 – 16
Timing belt upper cover mounting bolt <Diesel>	10 – 12	1.0 – 1.2	7 – 9
Fuel injection pump sprocket <Diesel>	80 – 90	8.0 – 9.0	58 – 65
Fuel filter bracket mounting bolt <Diesel>	10 – 13	1.0 – 1.3	7 – 9
Fuel filter bracket mounting nut <Diesel>	11 – 16	1.1 – 1.6	8 – 11
Injection pump retaining nut to nozzle body <Diesel>	35 – 40	3.5 – 4.0	26 – 28

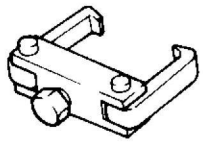
SEALANT

E13CE--

Items	Specified sealant	Remarks
Accelerator cable bracket to floor board <R.H. dirve vehicles>	3M ATD Part No. 8513 or equivalent	Drying sealant

SPECIAL TOOL

E13DA--

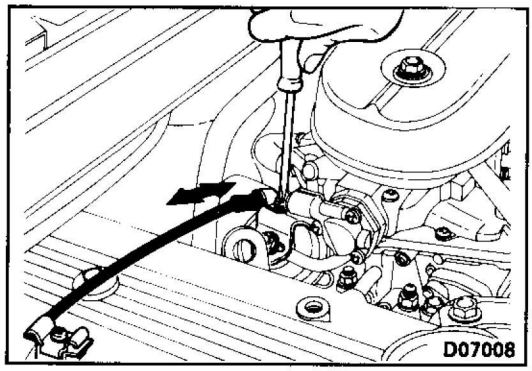
Tool	Number	Name	Use
	MD998388	Injection pump sprocket puller	Removal of sprocket from drive shaft of injection pump

SERVICE ADJUSTMENT PROCEDURES <CARBURETTOR>

E13FCAV

GENERAL INSPECTION

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT



(1) Turn lamps OFF.
Inspect and adjust at no load.
(2) Warm engine until stabilized at idle.
(3) Confirm idle speed is at prescribed rpm.
(4) Stop engine (ignition switch OFF).
(5) Confirm there are no sharp bends in accelerator cable.
(6) Check inner cable for correct slack.
(7) If there is too much slack or no slack, adjust play by the following procedures;

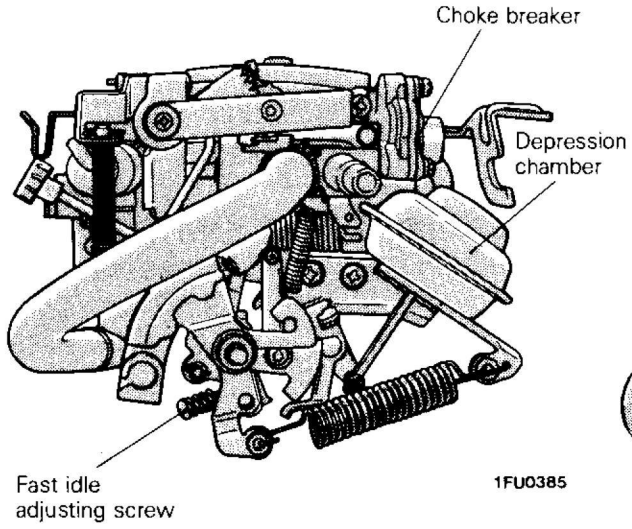
① Move the outer casing of accelerator cable to eliminate the play of inner cable.
② Move the outer casing 1 mm (0.04 in.) back toward the carburettor side to allow slight play for the inner cable.

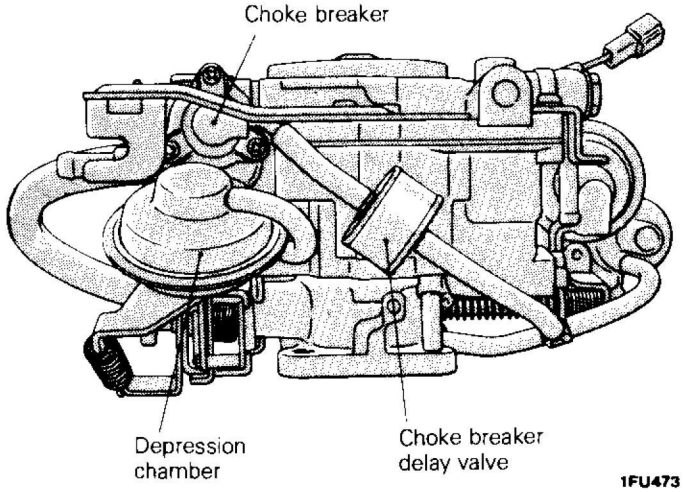
Standard value : 1.0 mm (0.04 In.) or less

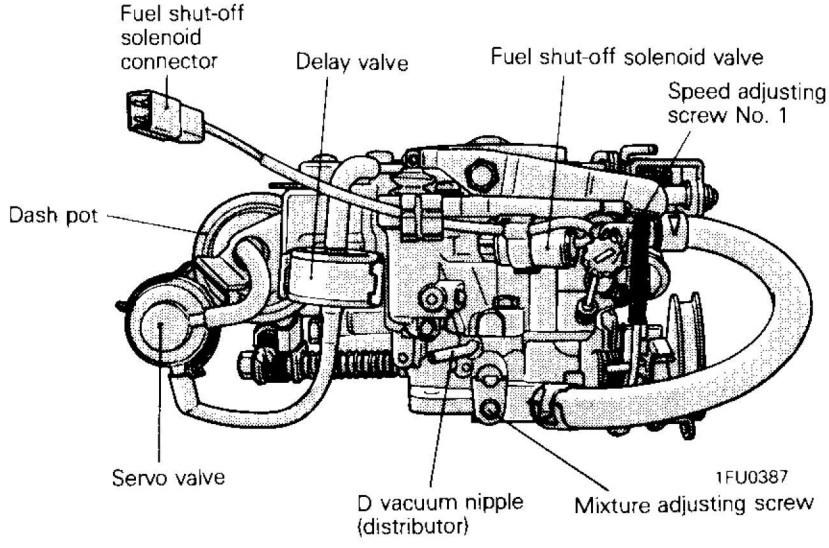
NOTE
If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.
If there is no play (excessive tension) of the acccelerator cable, the idling speed will increase.

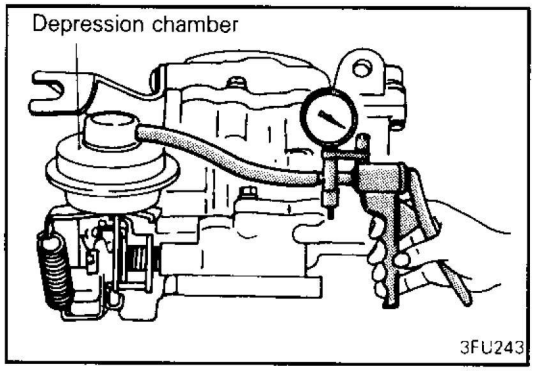
AUTO-CHOKE CARBURETTOR APPEARANCE

E13FBAO



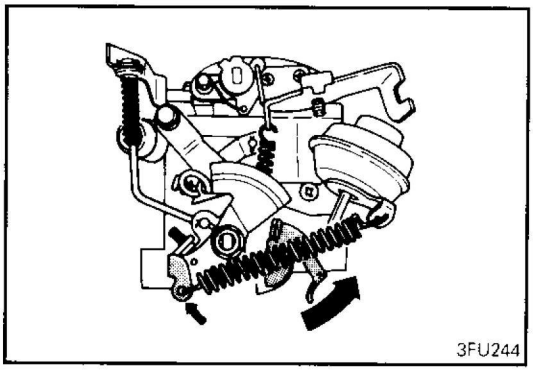






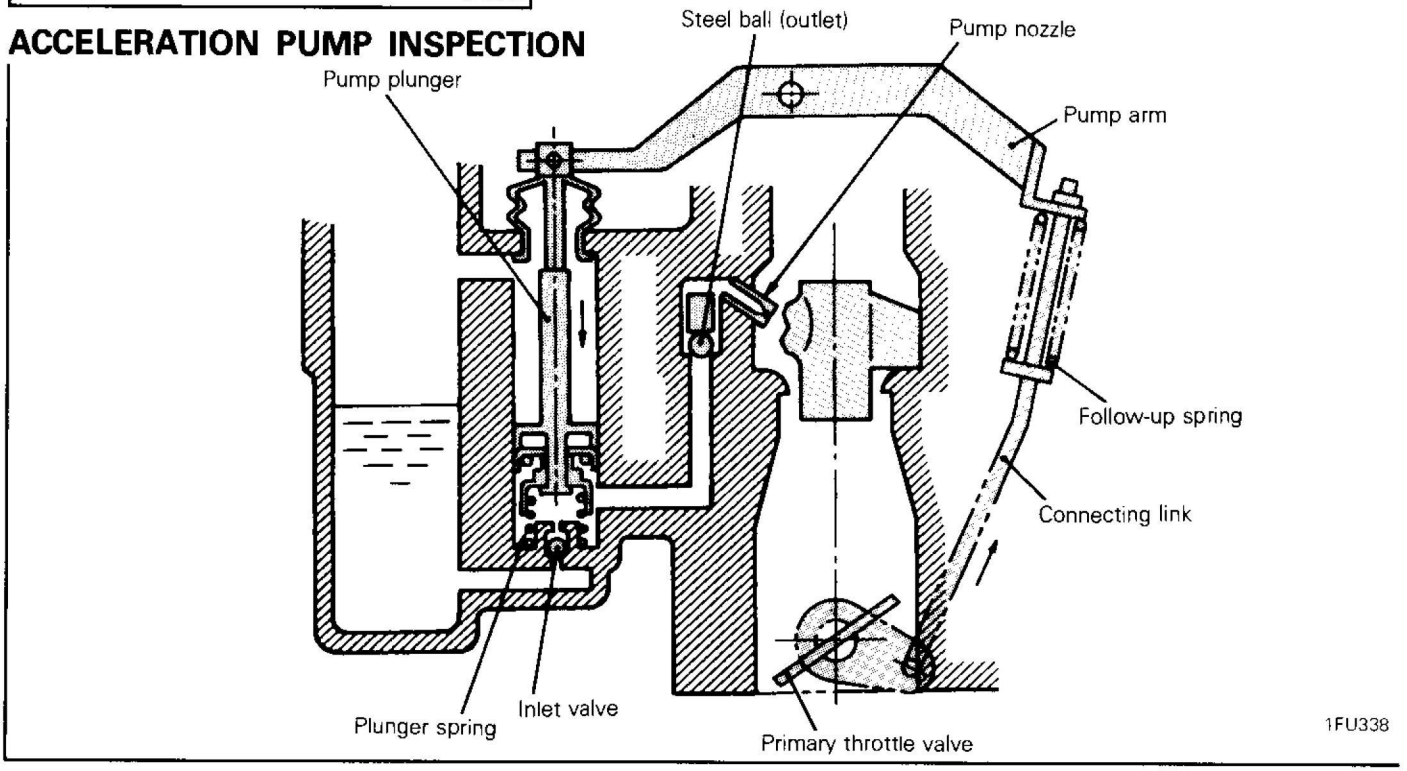
SECONDARY VALVE OPERATION INSPECTION

(1) Disconnect the vacuum hose for secondary valve operation from the depression chamber of the carburettor. Then connect a hand vacuum pump to the depression chamber.



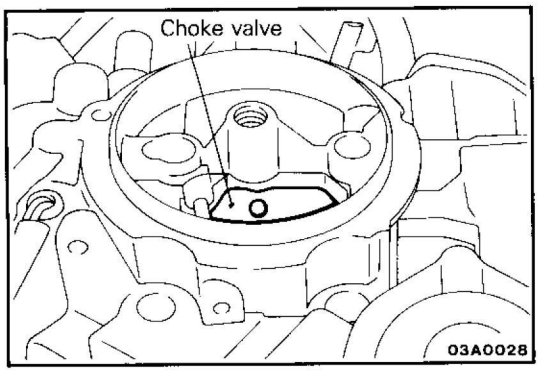
(2) Apply 100 mmHg (4 in.Hg) vacuum and make sure this vacuum is maintained.
(3) While vacuum is being applied, make sure the secondary throttle valve also becomes completely open when the primary throttle valve is completely opened.
(4) If the secondary throttle valve does not become completely open, clean the area around the secondary throttle valve.

ACCELERATION PUMP INSPECTION



(1) Remove the air cleaner cover.
(2) With the choke valve completely opened, make sure that a strong jet of fuel is sprayed out from the pump nozzle when the throttle valve is rapidly opened.
(3) If only a weak jet of fuel is sprayed out from the pump nozzle, clean the fuel path of the carburettor.

NOTE
Any defect in the accelerating pump may cause defective acceleration.

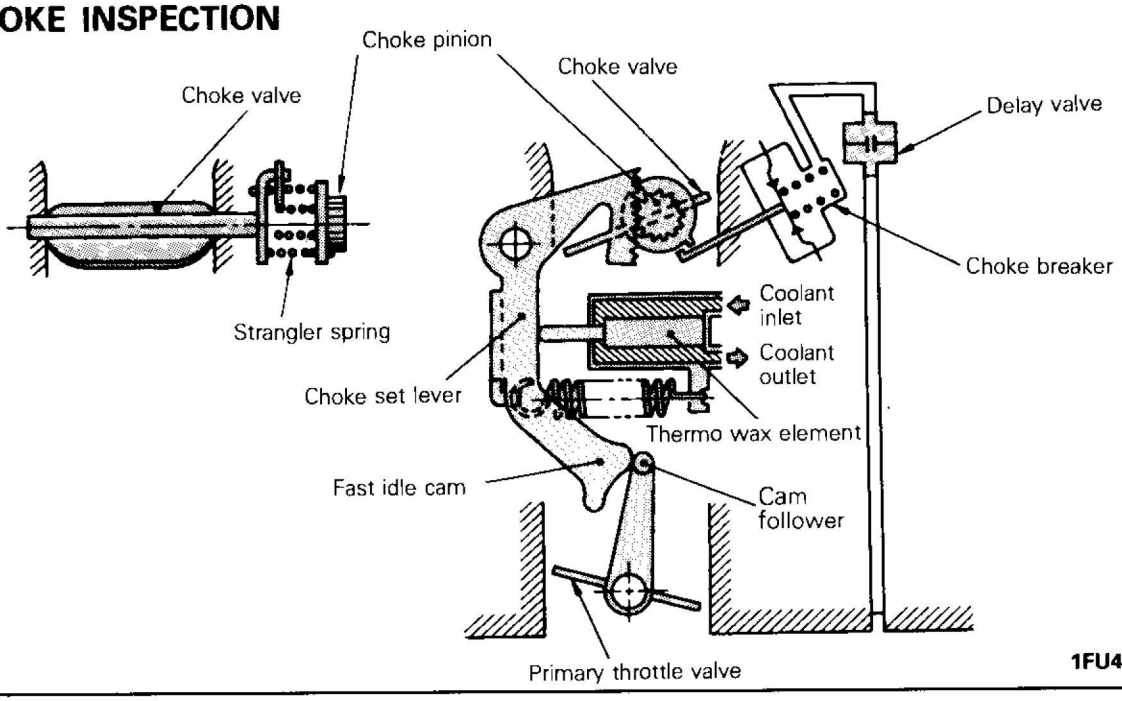


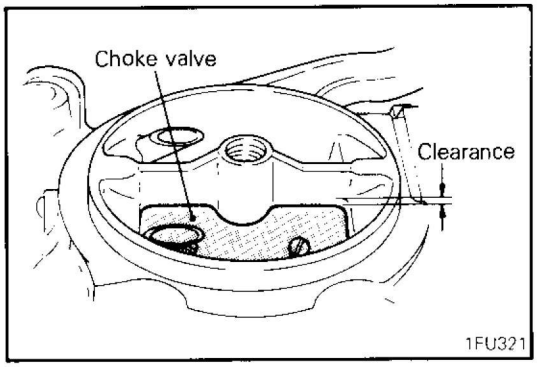
CHOKE VALVE INSPECTION

(1) Remove the air cleaner.
(2) Using your fingers, move the choke valve and check to make sure the valve is not loose and that it moves smoothly.

If the choke valve is very loose	Replace the float chamber cover assembly
If the valve does not operate correctly (if the valve is stuck)	Clean the area around the choke valve and apply a small amount of oil to the choke shaft

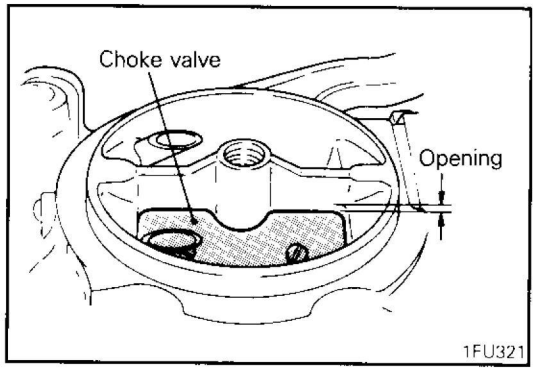
FULL-AUTO-CHOKE INSPECTION

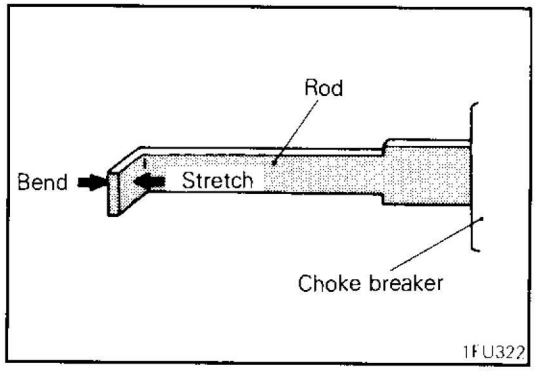




(1) Remove the air cleaner cover.
(2) Check to make sure the temperature of the engine coolant is 10°C (50°F) or lower.
(3) Follow the procedure in the chart below and inspect the condition of the choke valve.

Procedure	Inspection condition	Normal condition of choke valve
1	Before the engine is started	Completely closed
2	After the engine has been started	Slightly open [1.6 – 1.8mm (0.063 – 0.071 in.)]
3	While engine is warming up	Choke valve opens as the engine coolant temperature rises
4	After engine has been completely warmed up	Completely open.





CHOKE BREAKER OPENING INSPECTION AND ADJUSTMENT

(1) Adjust after performing a full-auto-choke inspection.
(2) Close the choke valve slowly with the fingers with the engine idling. Measure the clearance between the choke valve and choke bore at the moment the choke valve stops.

Standard value: 1.6 – 1.8 mm (0.063 – 0.071 in.)

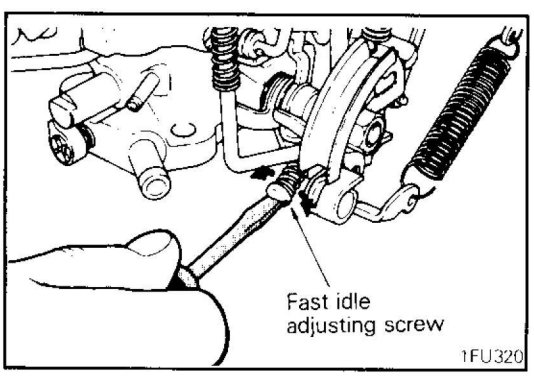
(3) If the clearance is not within the standard value range, stop the engine and adjust the clearance by altering the bend at the tip of the rod.
(4) Carry out the starting test, and re-adjust if required.

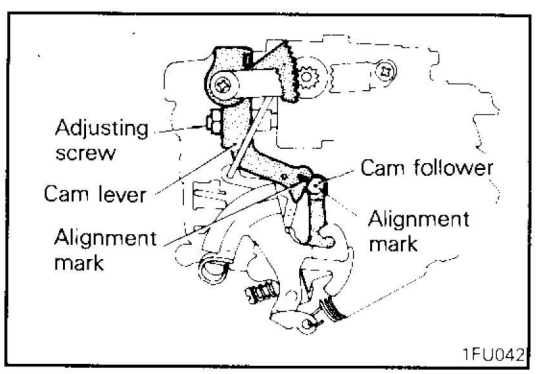
Rod tip	Valve opening	Conditions
Bend	Large	Difficult to start. Tends to stall.
Stretch	Small	Spark plug tends to smolder.

FAST IDLING INSPECTION AND ADJUSTMENT

(1) Make sure the engine coolant temperature is 10°C (50°F) or lower.
(2) Start the engine. While the engine is being warmed up, make sure that the idling speed of the engine decreases smoothly as the engine coolant temperature rises, and that the idling speed stabilizes at the standard value.
(3) If any abnormality is detected during the inspections above, turn the fast idle adjusting screw and adjust the fast idling speed.

Adjusting screw	Fast idling speed
Turned clockwise	Idling speed increases
Turned anticlockwise	Idling speed decreases



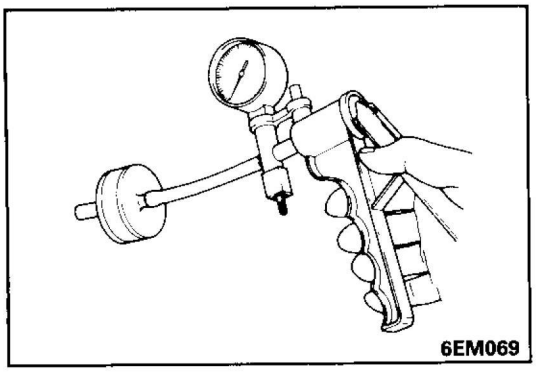


NOTE
If the fast idling speed does not become normal even after adjustment using the fast idle adjusting screw, perform the following inspection;

① With the thermo wax element temperature at 23°C (73°F), check to make sure the alignment mark (notch) on the cam lever is aligned with the alignment mark (punch mark) on the cam follower. The above alignment marks are correctly adjusted before the unit leaves the factory. Do not change the location of these marks.

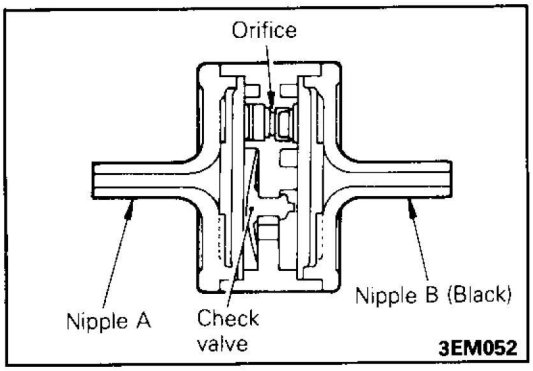
Condition of alignment marks when thermo wax element temperature is 23° (73°F).	Fast idling speed
Aligned	Normal
Not aligned	Defective

② If the alignment marks are not aligned, turn the adjusting screw until the alignment marks become aligned.


6EM069

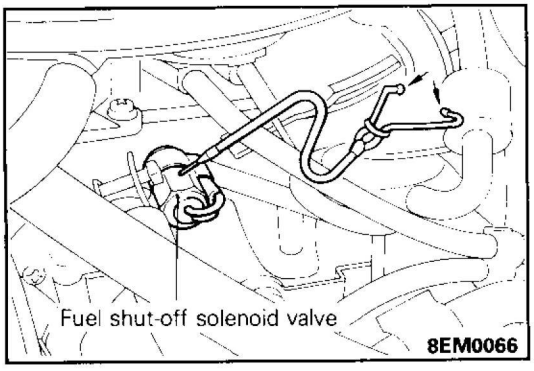
CHOKE BREAKER DELAY VALVE INSPECTION

(1) Connect a hand vacuum pump to the black nipple of the delay valve.
(2) Cover the other nipple with your finger and apply 500 mmHg (19.7 in.Hg) vacuum. Check to make sure this vacuum is maintained.
(3) Check to make sure this vacuum leaks out gradually when the finger covering the other nipple is removed.



3EM052

(4) Disconnect the hand vacuum pump from the black nipple and re-connect the vacuum pump to the other nipple.
(5) Check to make sure vacuum leaks out immediately when vacuum is applied.

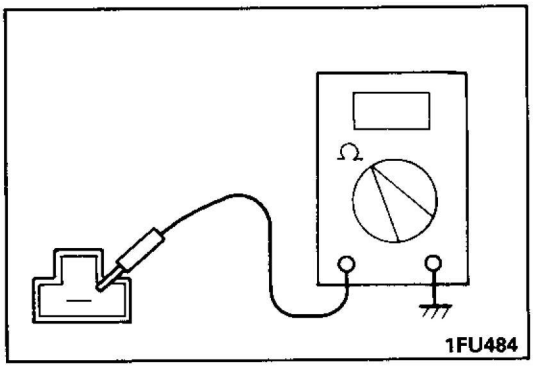


8EM0066

FUEL SHUT-OFF SOLENOID VALVE INSPECTION

OPERATING INSPECTION

(1) With a sound scope applied to the fuel shut-off solenoid valve, switch on the ignition switch and check to make sure the valve can be heard operating.
(2) Start the engine. With the engine idling, check to make sure the engine stalls when the connector of the fuel shut-off solenoid valve is disconnected.

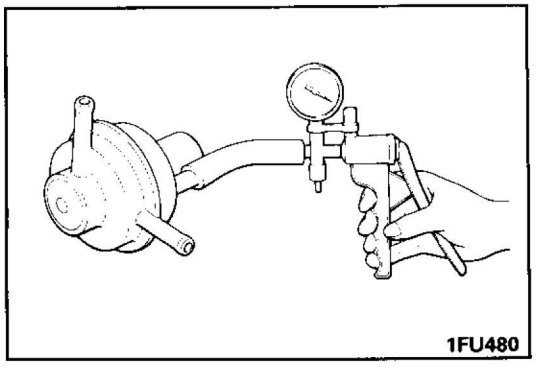


1FU484

COIL RESISTANCE INSPECTION

Measure the coil resistance of the fuel shut-off solenoid valve.

Standard value: approximately 90 Ω [at 20°C (68°F)]

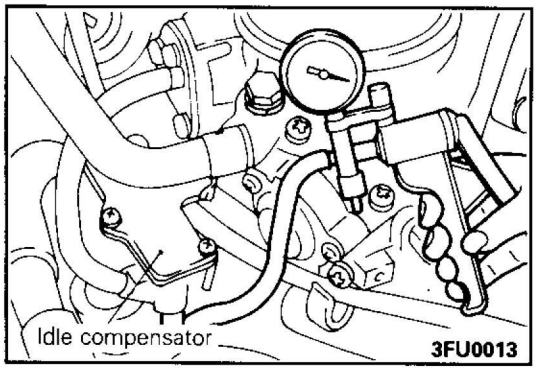

1FU480

SERVO VALVE INSPECTION

NOTE
When removing the vacuum hose, mark it so that it may be replaced to its original position.

(1) Remove the servo valve.
(2) Connect the hand vacuum pump to the blue servo valve nipple.
(3) Create an 82 kPa (0.82 kg/cm^2, 11.7 psi) vacuum, and confirm that the seal is maintained.
(4) Blow air in lightly from the black nipple and check air flow.

Hand vacuum pump vacuum	Normal state
570 mmHg (22.44 in.Hg) or less	Air flows through.
600 mmHg (23.62 in.Hg) or more	Air does not flow through.



IDLE COMPENSATOR INSPECTION

(1) Disconnect the air hose from the intake manifold or the idle compensator nipple located under the carburettor, and connect a hand vacuum pump to the air hose.
(2) Apply vacuum and check the air-tightness of the air bleed valve.

Air bleed valve temperature	Normal condition
50°C (122°F) or lower	Vacuum is maintained.
60°C (140°F) or higher	Vacuum leaks out.

NOTE
If required, cool valve by blowing compressed air or warm it with a hair dryer.

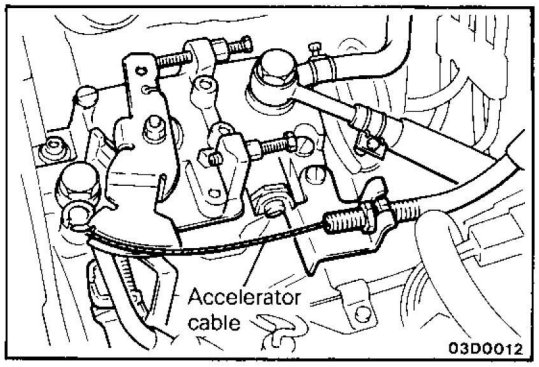
SERVICE ADJUSTMENT PROCEDURES <DIESEL>

E13FCAWa

GENERAL INSPECTION

ACCELERATOR CABLE INSPECTION AND ADJUSTMENT

(1) Warm engine until stabilized at idle.
(2) Confirm idle speed is at prescribed rpm.
(3) Stop engine (ignition switch OFF).
(4) Confirm there are no sharp bends in accelerator cable.
(5) Check inner cable for correct slack.

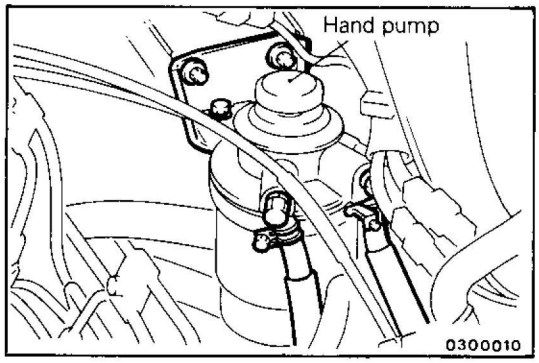


(6) If there is too much slack or no slack, adjust play by the following procedures.
  ① Loosen adjusting nut so that throttle lever is free.
  ② Tighten adjusting nut until throttle lever just starts moving, and lock with lock nut.

Standard value: 1.0 mm (0.04 in.) or less

NOTE
If there is excessive play of the accelerator cable, the vehicle speed drop ("undershoot") when climbing a slope will be large.
If there is no play (excessive tension) of the accelerator cable, the idling speed will increase.

  ③ After adjusting, confirm that throttle lever fully opens and closes by operating pedal.



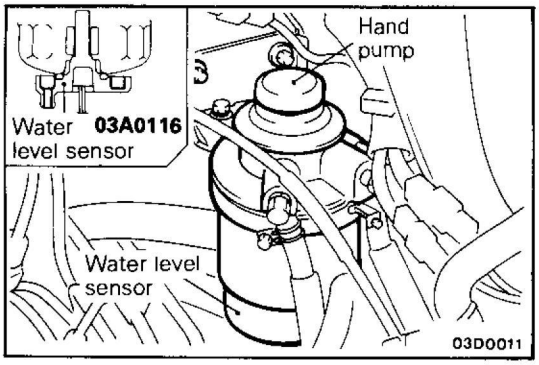
AIR BLEED FROM FUEL LINE

E13FSAC

Evacuate air after following services.

- When fuel is drained and re-filled for service.
- When fuel filter is replaced.
- When main fuel line is removed.

(1) Loosen fuel filter air plug.
(2) Place rags around air plug hole. Operate hand pump repeatedly until no bubbles come from plug hole. Tighten air plug.
(3) Repeat until hand pump operation becomes stiff.

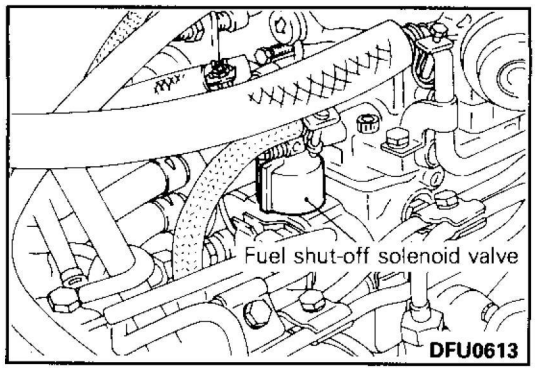


WATER BLEED FROM FUEL FILTER

E13FVAC

Water is in the filter when fuel filter indicator lights. Evacuate water by the following procedures.

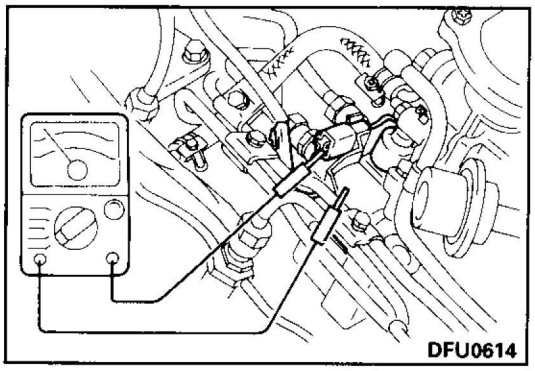
(1) Loosen water level sensor.
(2) Place rags around water level sensor. Drain water with hand pump. Finger-tighten water level sensor.



FUEL SHUT-OFF SOLENOID VALVE INSPECTION E13XAAA

OPERATING INSPECTION

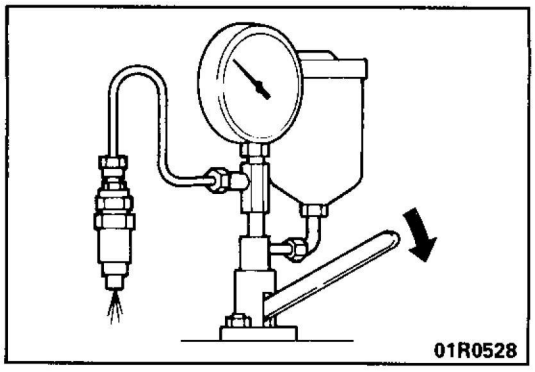
With a sound scope applied to the fuel shut-off solenoid valve, switch on the ignition switch and check to make sure the valve can be heard operating.



COIL RESISTANCE INSPECTION

Measure the resistance between the fuel shut-off solenoid valve terminal and the body of the injection pump.

Standard value: 8 – 10 Ω [at 20°C (68°F)]



INJECTION NOZZLE INSPECTION AND ADJUSTMENT

Caution
Never touch the mist sprayed out from the injection nozzle.

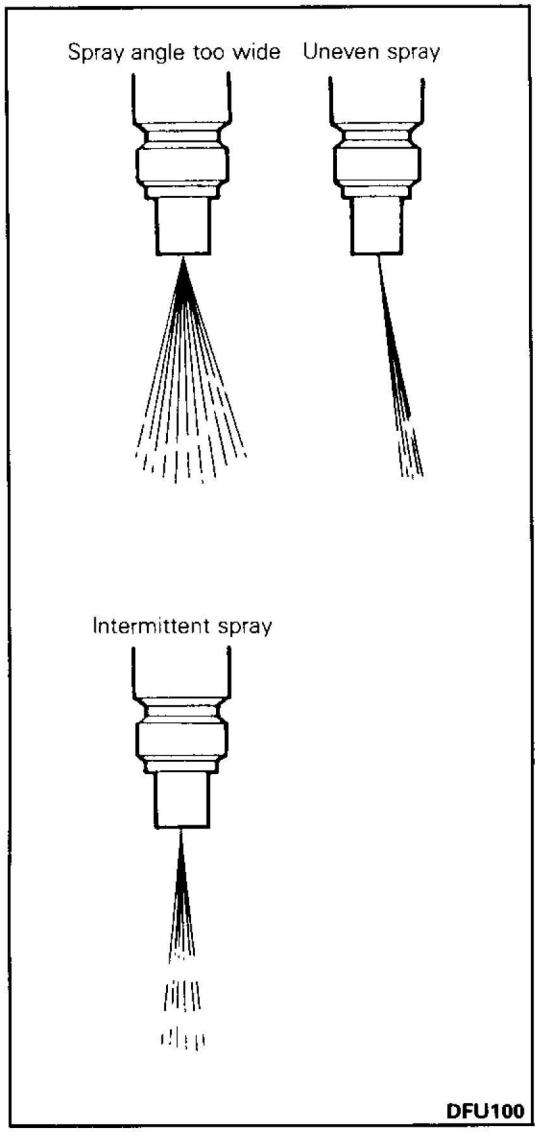
INJECTION STARTING PRESSURE INSPECTION

(1) Connect a nozzle tester to the injection nozzle.
(2) Move the lever of the nozzle tester and release any air by spraying out mist two or three times.
(3) Press down slowly on the lever of the nozzle tester and read the value indicated on the pressure gauge at the point where the needle of the pressure gauge drops suddenly after rising slowly.

Standard value: <Starting Pressure>
12,000 – 13,000 kPa
(120 – 130 kg/cm^2,
1,707 – 1,849 psi.)

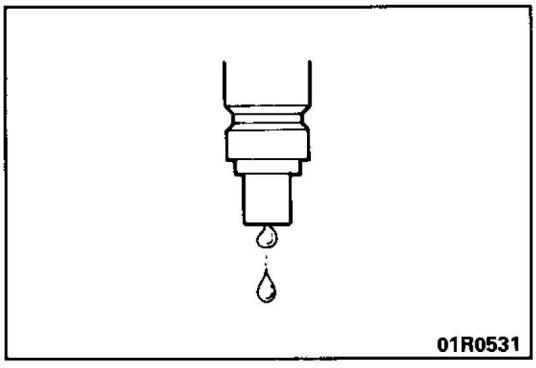
(4) If the injection starting pressure is not within the standard range specified above, disassemble and wash the nozzle holder. Then, change the shim thickness and adjust the injection starting pressure.

NOTE
1. There are ten different adjusting shims of varied thicknesses from 0.10 – 0.8mm (0.0039 – 0.0315 in.) thickness.
2. When shim thickness is increased by 0.1mm (0.004 in.), the injection starting pressure shall increase by 2,400 kPa, (24 kg/cm^2, 341 psi).

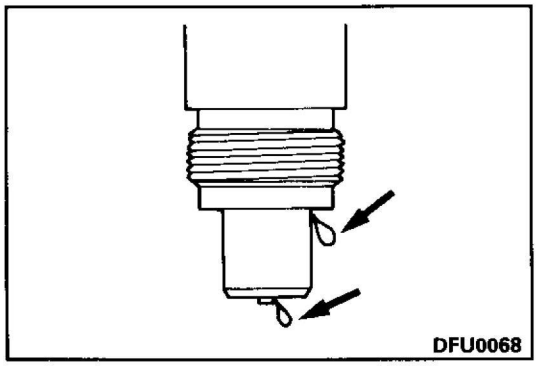


SPRAY INSPECTION

(1) Move the lever of the nozzle tester rapidly over a short distance (four to six times per second) so that a spray is continuously ejected. Check to make sure that the shape of this spray is a straight, even, thin cylinder (0° spray angle, and 15° spray angle for vehicles for Switzerland and Austria). The shapes illustrated at left are examples of flawed spray shapes.

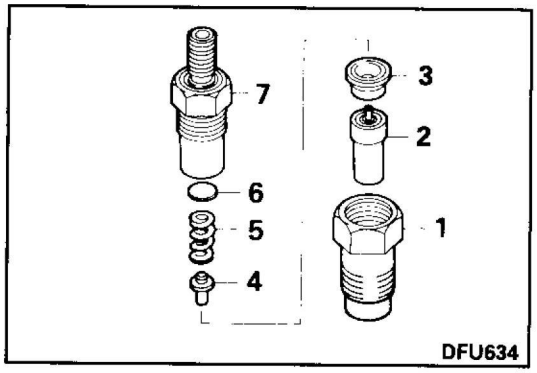


(2) Check to be sure no fuel drips out of the nozzle after a spray is ejected.
(3) If the spray is faulty, disassemble and wash the injection nozzle and then re-inspect the spray. Or, replace the injection nozzle.



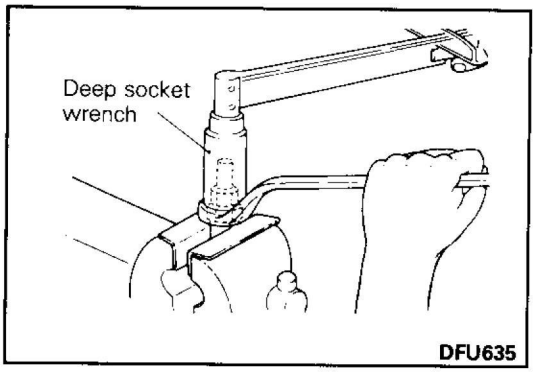
NOZZLE OIL-TIGHTNESS INSPECTION

(1) Press down slowly on the lever of the nozzle tester. After maintaining the pressure inside the nozzle (pressure indicated by the pressure gauge) at 10,000 – 11,000 kPa (100 – 110 kg/cm^2, 1,422 – 1,565 psi) for approximately ten seconds; check to make sure no fuel is leaking from the nozzle.
(2) If the nozzle is found to be defective (if fuel leaks out) during the inspection above, disassemble and wash the injection nozzle and then re-inspect the nozzle. Or, replace the injection nozzle.



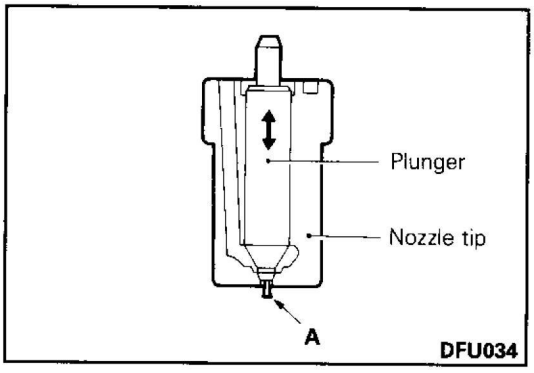
<SERVICE POINTS OF DISASSEMBLING , INSPECTING AND REASSEMBLING THE NOZZLE HOLDER>

1. Retaining nut
2. Nozzle tip
3. Distance piece
4. Retaining pin
5. Pressure spring
6. Shim
7. Nozzle holder body



RETAINING NUT DISASSEMBLY

(1) After applying a piece of protective metal to the retaining nut, secure the retaining nut with a vise.
(2) While holding the retaining nut in position with an offset wrench, use a deep socket wrench and loosen the body of the nozzle holder.



INSPECTION

Nozzle Tip

(1) Check to make sure there is no carbon adhering to the nozzle tip.

Caution
Remove any carbon deposit from the nozzle tip with a piece of wood etc. After washing each part with washing oil (gasoline), soak the parts in diesel fuel. Be especially careful not to damage the needle valve of the nozzle tip.

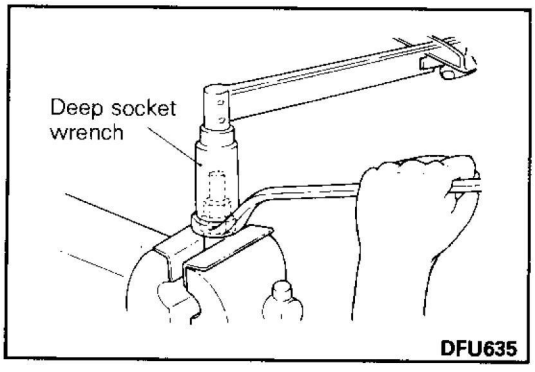
(2) With the nozzle tip soaked in diesel fuel, check to make sure the plunger of the nozzle tip slides smoothly. If the plunger does not slide smoothly, replace the nozzle tip. When replacing the nozzle tip with a new unit, be sure to wipe off the rust-preventing oil completely using clean diesel fuel.
(3) Check the area of the nozzle tip marked "A" in the illustration for any deformation or damage. If there is any deformation or damage, replace the nozzle tip.

Distance Piece

Apply red lead primer and check the bite of the nozzle holder body.

Pressure Spring

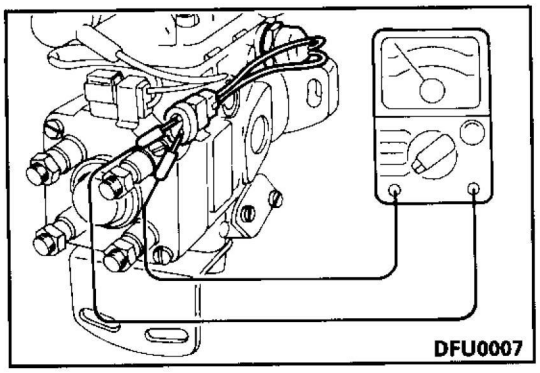
Check the pressure spring for settling or damage.



RETAINING NUT ASSEMBLY

(1) Using your hand, tighten the body of the nozzle holder as securely as possible.
(2) After applying a piece of protective metal to the retaining nut, secure the retaining nut with a vise.
(3) While holding the retaining nut in position with an offset wrench, use a deep socket wrench and tighten the body of the nozzle holder by applying the torque specified below.

Tightening torque: 35 – 40 Nm
(3.5 – 4.0 kgm, 26 – 28 ft.lbs.)



SPEED SENSOR INSPECTION

Using a circuit tester, measure the resistance of the speed sensor.

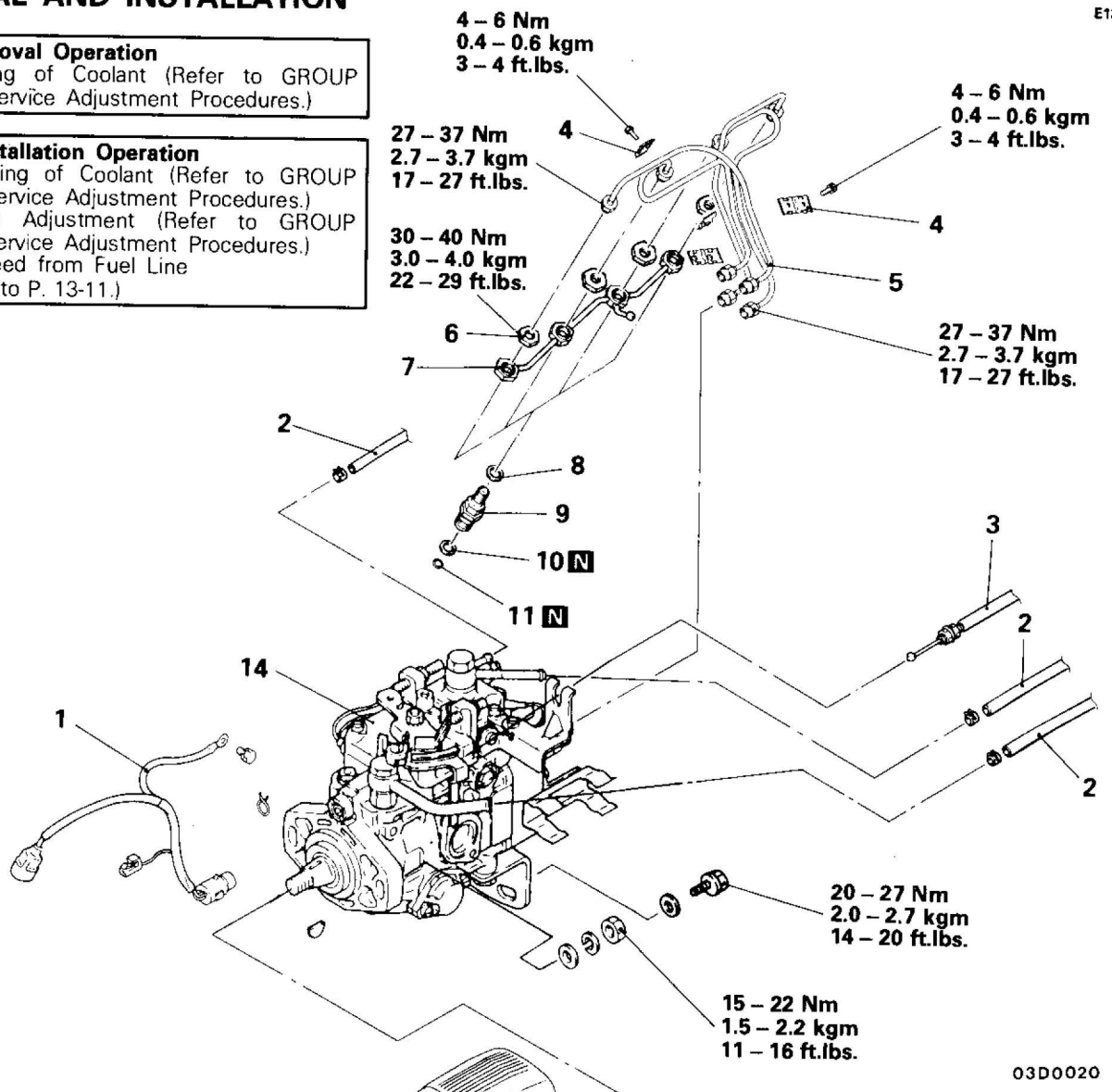
Standard value: 1.3 – 1.9 kΩ

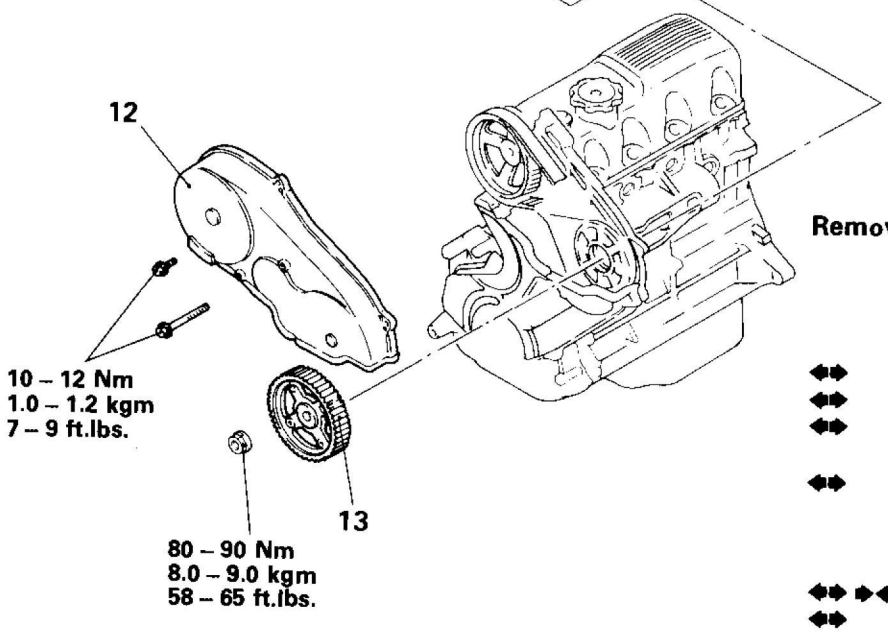
FUEL INJECTION PUMP <DIESEL>

REMOVAL AND INSTALLATION

Pre-removal Operation
- Draining of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)

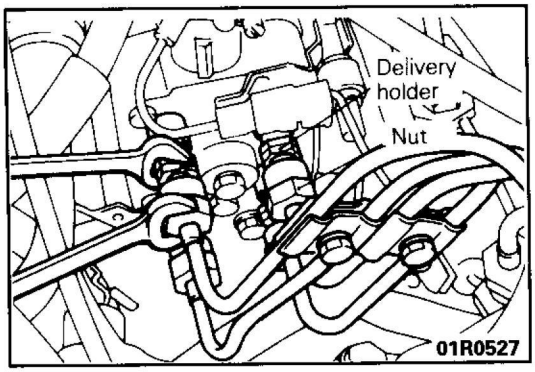
Post-installation Operation
- Supplying of Coolant (Refer to GROUP 14 – Service Adjustment Procedures.)
- Engine Adjustment (Refer to GROUP 11 – Service Adjustment Procedures.)
- Air Bleed from Fuel Line (Refer to P. 13-11.)





Removal steps

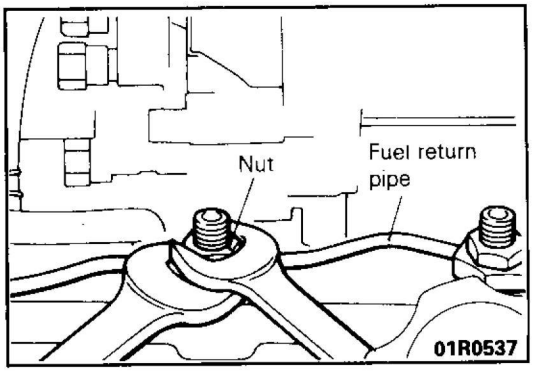
1. Connection for fuel injection pump
2. Fuel hose
3. Connection for accelerator cable
4. Clamp
5. Injection pipe
6. Nut
7. Fuel return pipe
8. Fuel return pipe gasket
9. Fuel injection nozzle
10. Holder gasket
11. Nozzle gasket
12. Timing belt upper cover
13. Fuel injection pump sprocket
14. Fuel injection pump



SERVICE POINTS OF REMOVAL E13NBAG

5. DISCONNECTION OF INJECTION PIPE

When loosening nuts at both ends of injection pipe, hold the other side (pump side : delivery holder, nozzle side : nozzle holder) with wrench and loosen nut.

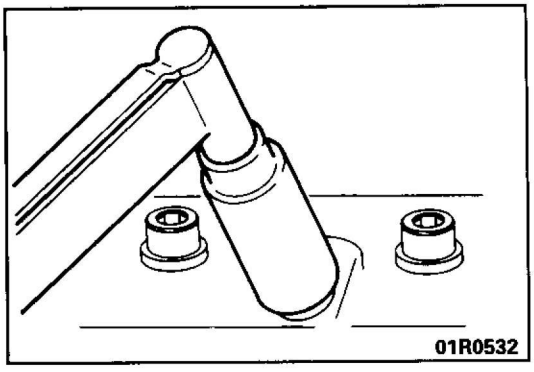


6. REMOVAL OF NUT/7. FUEL RETURN PIPE

(1) While using a spanner or similar tool to hold the hexagonal nut of the fuel return pipe, remove the nut.

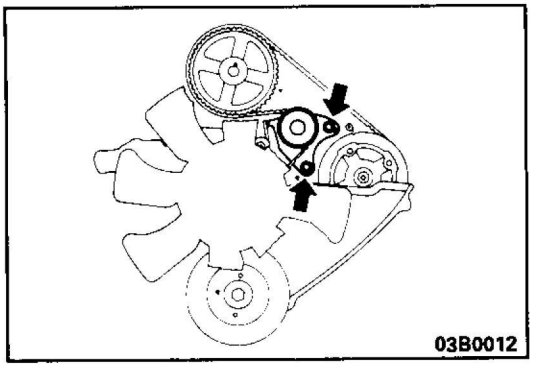
Caution
If an attempt is made to loosen the nut without first holding the fuel return pipe, the pipe may be broken or otherwise damaged.

(2) Disconnect the fuel return pipe.



9. REMOVAL OF FUEL INJECTION NOZZLE

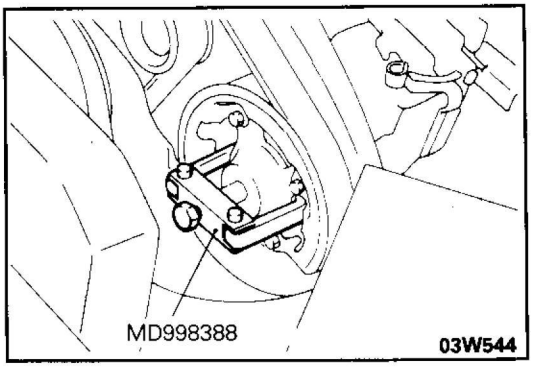
Caution
1. **Make a mark on the removed injection nozzle (the cylinder No.).**
2. **Use a cap to prevent foreign material, etc. from entering the injection nozzle hole.**



13. REMOVAL OF FUEL INJECTION PUMP SPROCKET

(1) Turn crankshaft and set No.1 cylinder at full compression stroke. (TDC)

(2) Adjust belt tensioner so that timing belt is completely loose.



(3) Remove sprocket installing nut and remove sprocket from pump drive shaft with special tool.

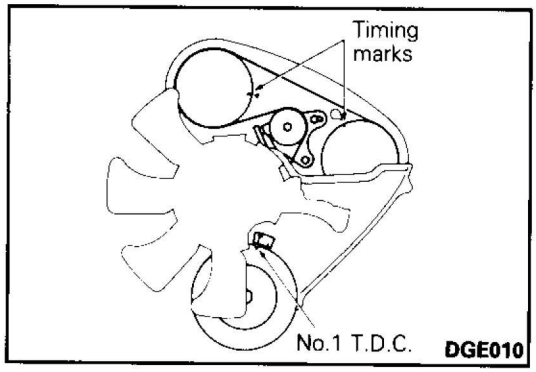
Caution
Do not hit pump drive shaft with hammer etc.

(4) Leave sprocket with timing belt attached in timing belt lower cover.

Caution
1. **Be careful not to exert excessive force (twist or bend) on timing belt.**
2. **Do not turn crankshaft after removal.**

14. REMOVAL OF FUEL INJECTION PUMP

Caution
When holding injection pump, do not allow to dangle by holding accelerator lever or fast idle lever. Do not remove these levers. Removal will cause injection pump malfunction.



SERVICE POINTS OF INSTALLATION E13MDAB

13. INSTALLATION OF FUEL INJECTION PUMP SPROCKET

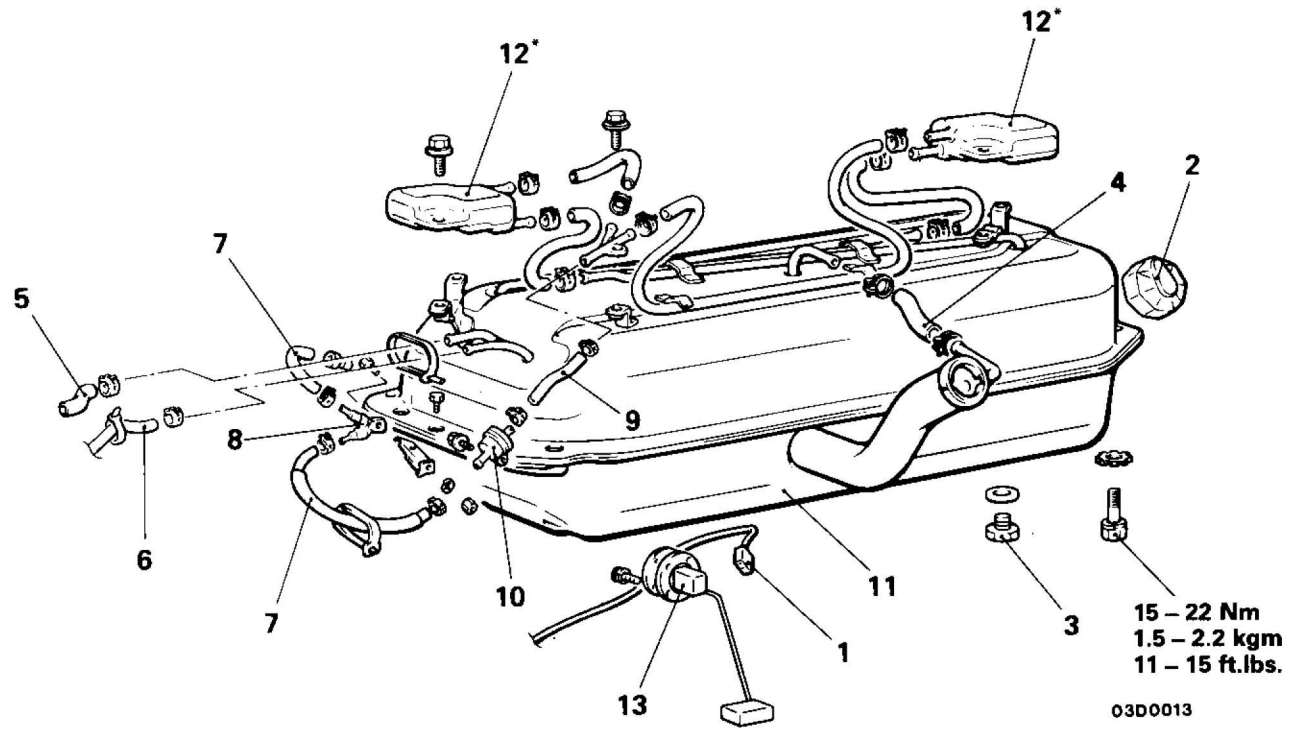
When installing sprocket to injection pump, confirm timing marks are aligned and tighten nut to specified torque.

FUEL TANK

E13GA--

REMOVAL AND INSTALLATION

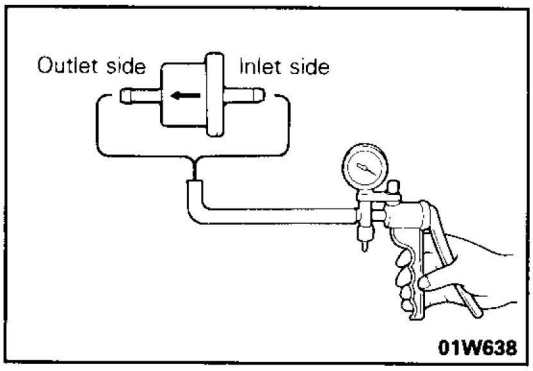
Post-installation Operation
- Supplying of the Fuel



Removal steps

1. Fuel gauge unit connector
2. Fuel filler cap
3. Drain plug
4. Leveling hose
◆◆ 5. Main hose
◆◆ 6. Return hose
◆◆ 7. Vapor hose
8. Fuel check valve
◆◆ 9. Vapor hose
◆◆ 10. Two-way valve
11. Fuel tank
12. Separator tank*
13. Fuel gauge unit

NOTE
*: <Petrol-powered vehicles>

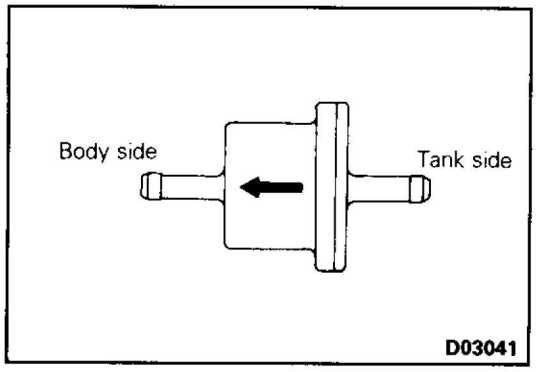


INSPECTION

E13GCAJ

CHECKING TWO-WAY VALVE

Connect a hand vacuum pump at the inlet side or outlet side. The valve is OK if, when a vacuum is applied, a vacuum is maintained for a short time and then air passes through.

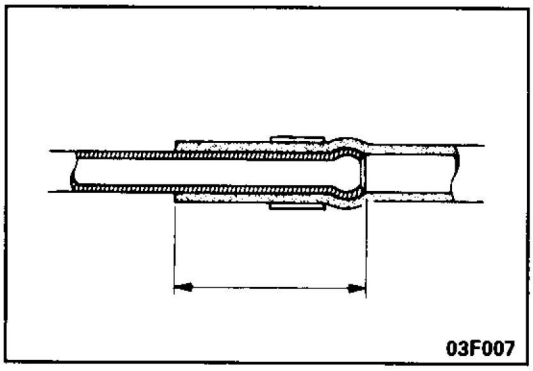


SERVICE POINTS OF INSTALLATION

E13GDAW

10. INSTALLATION OF TWO-WAY VALVE

Install so that the two-way valve is facing in the direction shown in the figure.



9./7. CONNECTION OF VAPOR HOSE/6. RETURN HOSE/5. MAIN HOSE

When attaching the fuel hose to the pipe, be sure that the hose is attached as shown in the illustration.

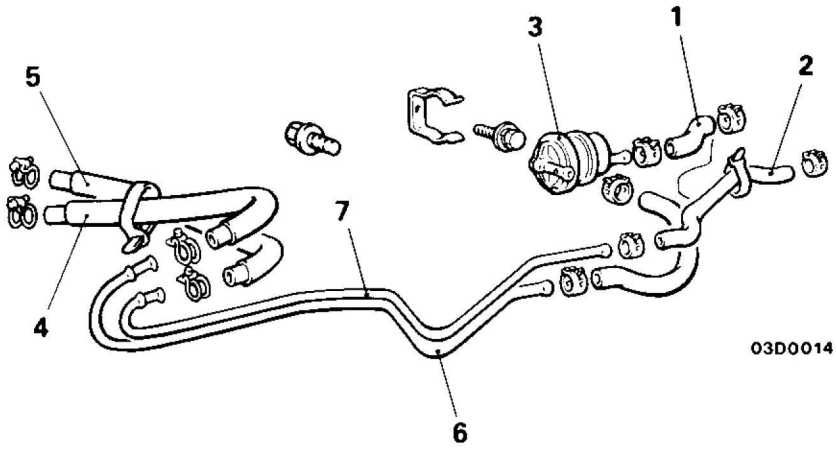
Standard value: 20 – 30 mm (0.8 – 1.2 in.)

FUEL LINE

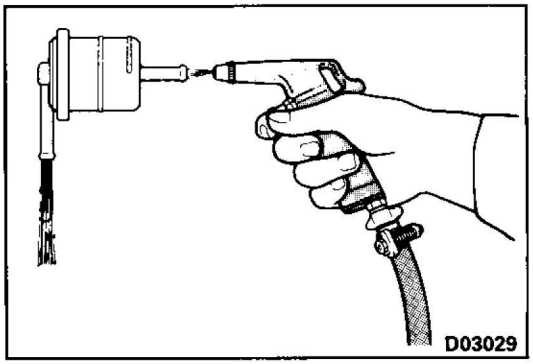
E13KA--

REMOVAL AND INSTALLATION

<Petrol-powered vehicles>



1. Main hose
2. Return hose
3. Fuel strainer
◆◆4. Main hose
◆◆5. Return hose
6. Main pipe
7. Return pipe

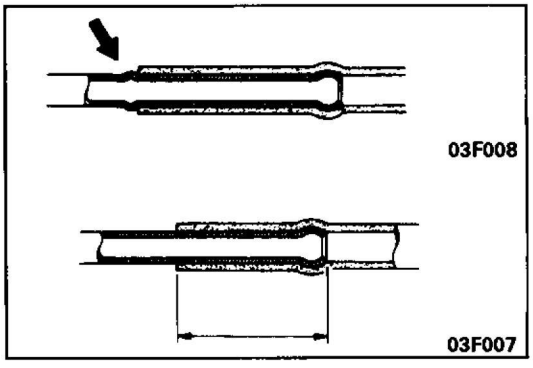


INSPECTION

E13KCAC

CHECKING OF FUEL STRAINER

If the fuel strainer traps a small amount of dust and water, place the outlet down and apply compressed air into the inlet.



SERVICE POINTS OF INSTALLATION

E13KDAWa

5. INSTALLATION OF RETURN HOSE/4. MAIN HOSE

(1) If the fuel pipe has a stepped part, connect the fuel hose to the pipe securely, up to the stepped part, as shown in the figure.

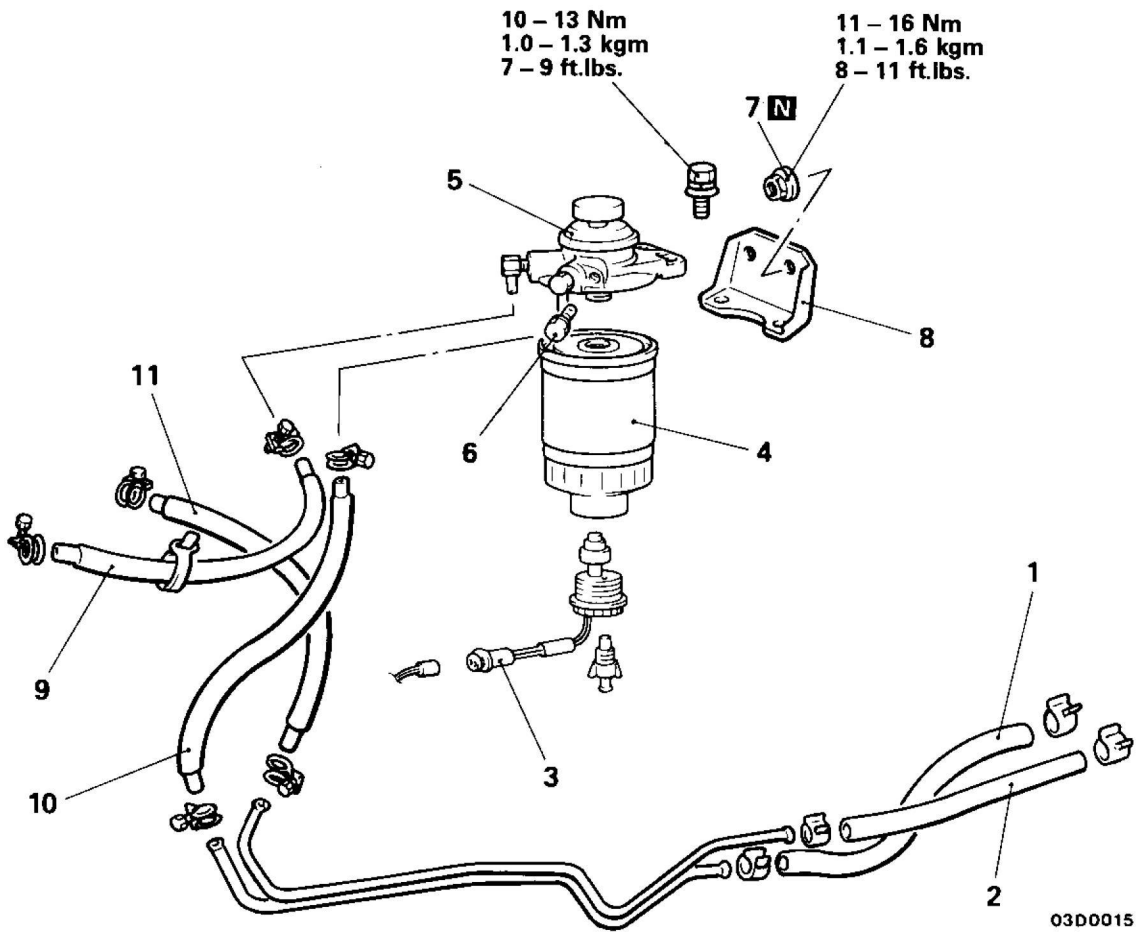
(2) If the fuel pipe does not have a stepped part, connect the fuel hose to the pipe securely, so that it is the standard value.

Standard value: 20 – 30 mm (0.8 – 1.2 in.)

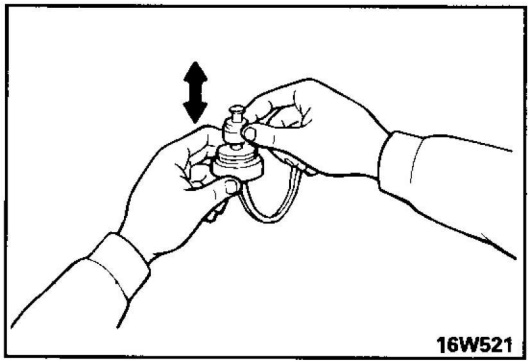
REMOVAL AND INSTALLATION

E13KA-1

<Diesel-powered vehicles>



1. Main hose
2. Return hose
3. Water level sensor connector
4. Fuel filter cartridge
5. Fuel filter pump
6. Air plug
7. Self-locking nut
8. Fuel filter bracket
9. Main hose (Refer to P. 13-20.)
10. Main hose (Refer to P. 13-20.)
11. Return hose (Refer to P. 13-20.)



INSPECTION

E13KCAQa

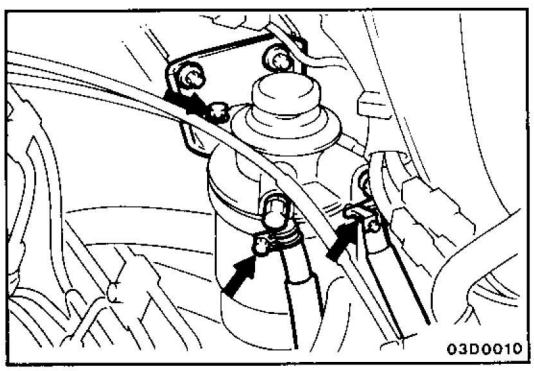
CHECKING OF WATER LEVEL SENSOR

(1) Connect the water level sensor to the connector of the vehicle.
(2) Check to make sure that the warning lamp illuminates when the ignition switch is turned to the ON position.
(3) If it does not illuminate, replace the warning lamp bulb, or check the diode.
(4) Check to make sure that the warning lamp ceases to illuminate when the engine is started.

(5) If the warning lamp does not cease to illuminate, move the float up and down, and check to make sure that the lamp flashes on and off.

FUEL FILTER REPLACEMENT E13KDAYa

(1) Remove the fuel filler cap to lower the pressure in the fuel tank.
(2) Disconnect the water level sensor connector.
(3) Remove the fuel filter cartridge from the fuel filter pump body by turning with hand.



(4) Disconnect the main hoses from the fuel filter pump.
(5) Remove the fuel filter pump.

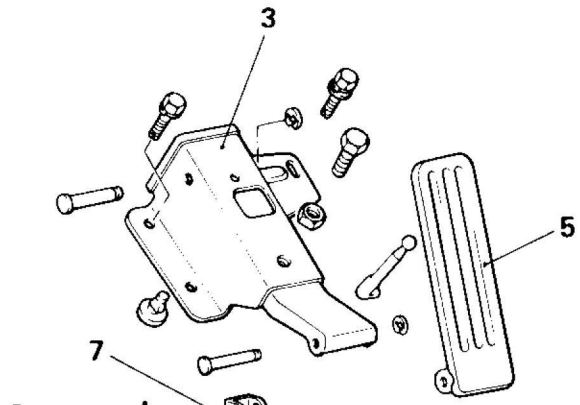
ACCELERATOR CABLE AND PEDAL

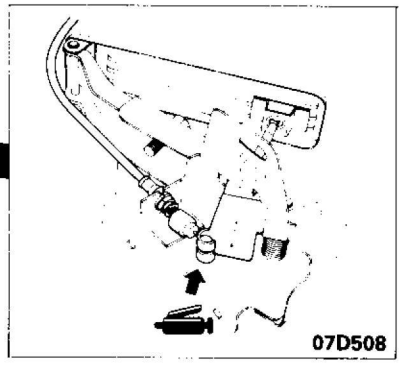
E130A--

REMOVAL AND INSTALLATION <L.H. drive vehicles>

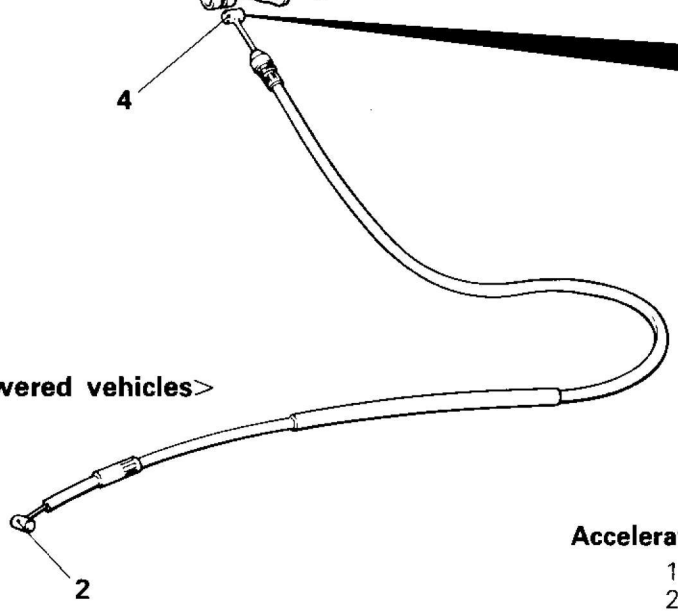
Pre-removal Operation
- Removal of the Air Cleaner <Petrol-powered vehicles>

Post-installation Operation
- Installation of the Air Cleaner <Petrol-powered vehicles>
- Adjustment of the Accelerator Cable

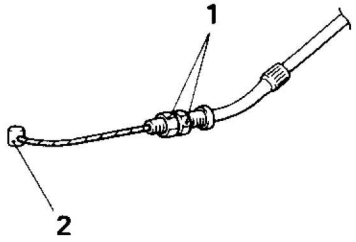




<Petrol-powered vehicles>



<Diesel-powered vehicles>



Accelerator cable removal steps
1. Adjusting nut
2. Accelerator cable connection (Engine compartment side)
3. Pedal support
4. Accelerator cable connection (Pedal side)

Accelerator pedal removal steps
3. Pedal support
5. Accelerator pedal
6. Spring
7. Lever

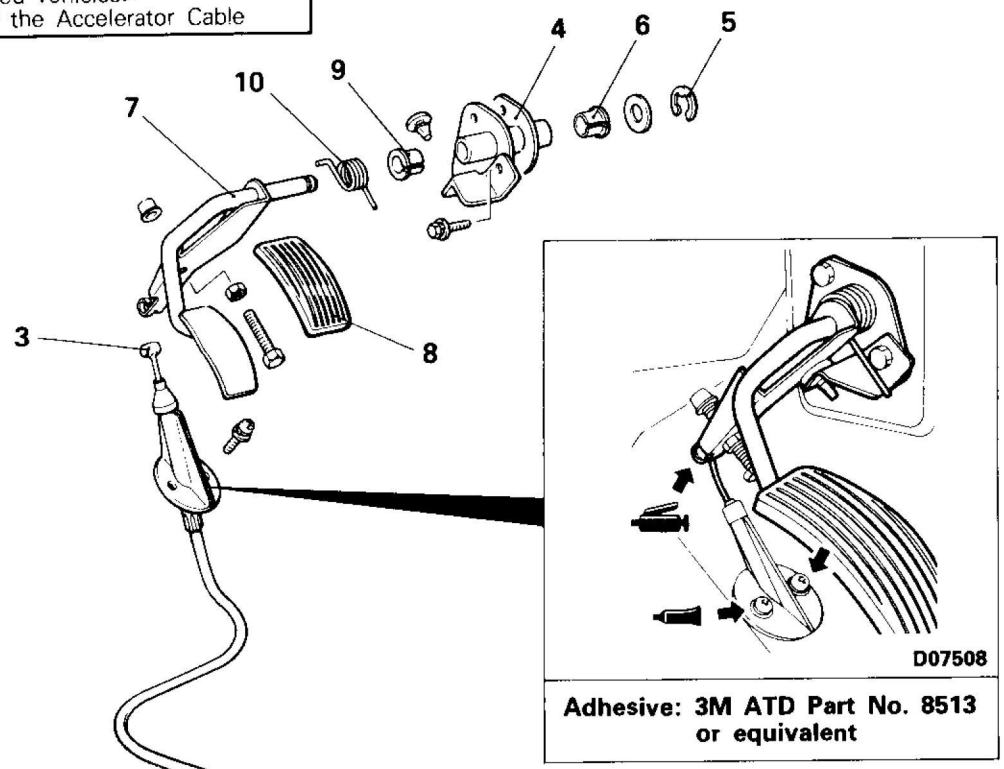
03D0016

REMOVAL AND INSTALLATION <R.H. drive vehicles>

E13OA-1

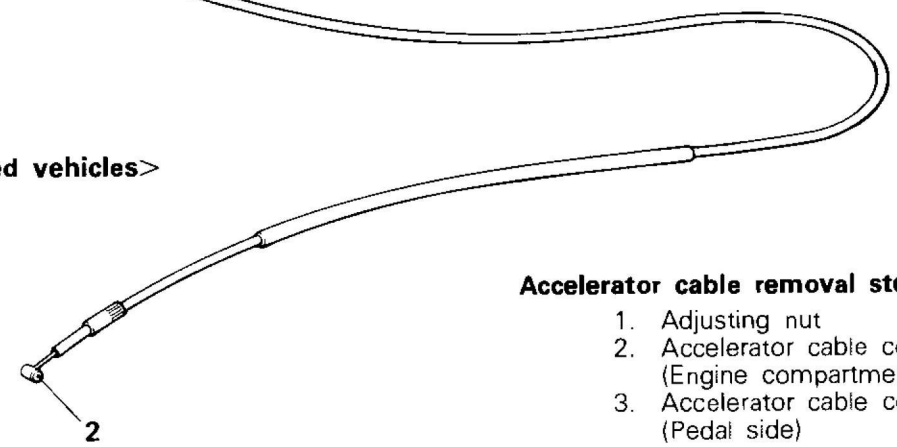
Pre-removal Operation
- Removal of the Air Cleaner <Petrol-powered vehicles>

Post-installation Operation
- Installation of the Air Cleaner <Petrol-powered vehicles>
- Adjustment of the Accelerator Cable



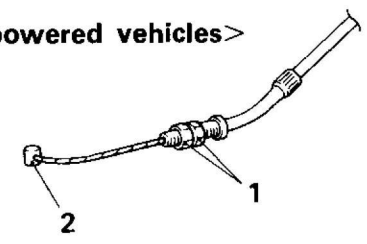
Adhesive: 3M ATD Part No. 8513 or equivalent

<Petrol-powered vehicles>



Accelerator cable removal steps
1. Adjusting nut
2. Accelerator cable connection (Engine compartment side)
3. Accelerator cable connection (Pedal side)

<Diesel-powered vehicles>



03D0017

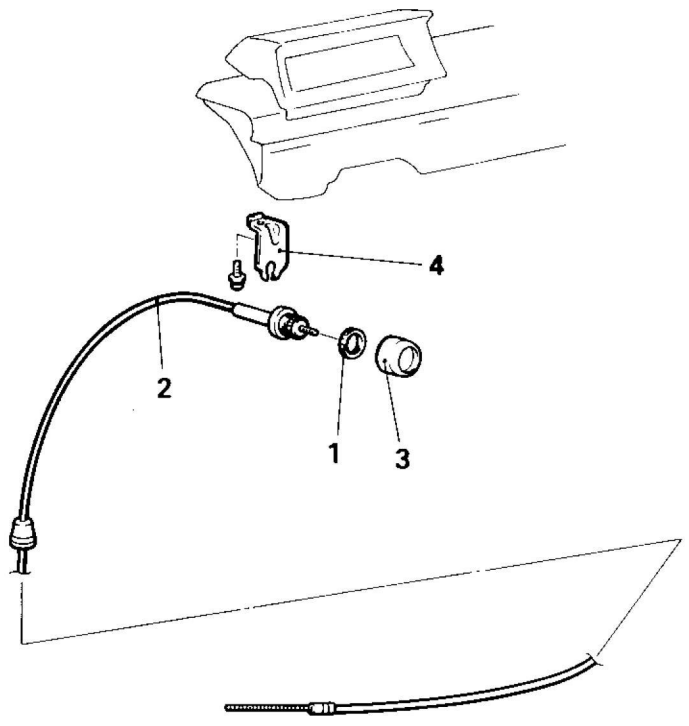
Accelerator pedal removal steps
4. Pedal support
5. Snap ring
6. Bearing
7. Pedal arm
8. Pedal pad
9. Bearing
10. Spring

IDLE CONTROL CABLE <Diesel>

REMOVAL AND INSTALLATION

E13VA--

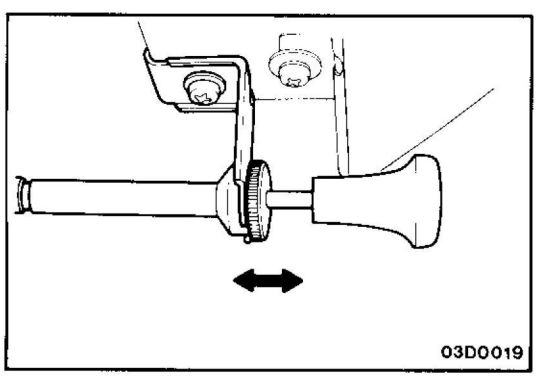
Post-Installation Operation
- Adjustment of Idle Control Cable



03D0018

Removal steps

1. Nut
2. ◆◆ Idle control cable
3. Knob
4. Cable bracket



03D0019

SERVICE POINTS OF INSTALLATION

E13VDAA

2. INSTALLATION OF IDLE CONTROL CABLE

Pull the knob out to its farmost position and tighten the nut while turning the knob 90° clockwise.

COOLING

CONTENTS

E14AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E14CA--

Items	Specifications
Cooling method	Water-cooled, pressurized, forced circulation
Radiator	
Type	Pressurized corrugated fin type
Performance kJ/h (kcal/h, B.T.U./h)	
<4G32>	113,442 (27,100, 107,540)
<4D56>	149,023 (35,600, 141,270)
Thermostat	
Type	
<4G32>	Wax type with jiggle valve
<4D56>	Wax type
Fan clutch	
Type	
<4G32>	Thermo type with spiral type bimetal
<4D56>	Thermo type with plate type bimetal
Water pump	
Type	Impeller of centrifugal type
Engine coolant temperature gauge unit	
Type	Thermistor type

SERVICE SPECIFICATIONS

E14CB--

Items		Specifications
Standard value		
Range of coolant antifreeze concentration	%	30 – 60
Engine coolant temperature gauge unit		
<4G32>		
At 70°C (158°F)	Ω	104±13.5
<4D56>		
Element A (for engine coolant temperature gauge)		
At 70°C (158°F)	Ω	104±13.5
Element B (for engine control)		
At 20°C (68°F)	kΩ	3.25±0.33
At 80°C (176°F)	Ω	300

TORQUE SPECIFICATIONS

E14CC--

Items	Nm	kgm	ft.lbs.
Cooling fan attaching bolt	10 – 12	1.0 – 1.2	7 – 9
Fan clutch attaching bolt	10 – 12	1.0 – 1.2	7 – 9
Timing belt cover attaching bolt	10 – 12	1.0 – 1.2	7 – 9
Crankshaft pulley attaching bolt			
<4G32>	15 – 18	1.5 – 1.8	11 – 13
<4D56>	170 – 190	17 – 19	123 – 137

Items	Nm	kgm	ft.lbs.
Water pump attaching bolt			
Bolt head mark "4T"	12 – 15	1.2 – 1.5	9 – 11
Bolt head mark "7T"	20 – 27	2.0 – 2.7	14 – 19
Water inlet fitting attaching bolt	10 – 13	1.0 – 1.3	7 – 9
Engine coolant temperature gauge unit	10 – 12	1.0 – 1.2	7 – 9

LUBRICANTS

E14CD--

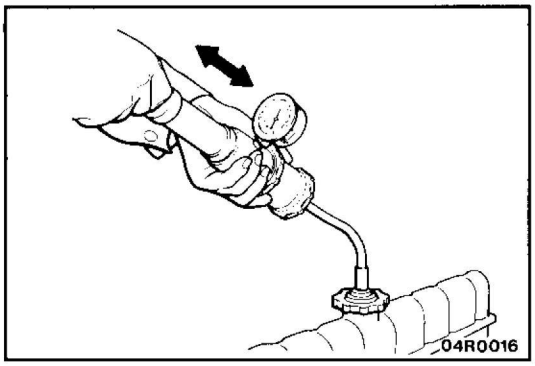
Items	Recommended antifreeze		Quantity*		
			lit.	U.S.qts.	Imp.qts.
Engine coolant	HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	<4G32>	7.1	7.5	6.2
		<4D56>	8.1	8.6	7.1

NOTE
*Quantity includes 0.65 liters (0.69 U.S. qts., 0.57 Imp.qts.) reserve tank capacity.

SEALANT AND ADHESIVE

E14CE--

Items		Specified sealant and adhesive	Remarks
Engine coolant temperature gauge unit	<4G32>	3M ATD Part No. 8660 or equivalent	Drying sealant
	<4D56>	3M Nut Locking Part No.4171 or equivalent	Semi-drying sealant



SERVICE ADJUSTMENT RPOCEDURES

ENGINE COOLANT LEAK CHECK

E14FAAB

1. Confirm that the coolant level is up to the filler neck. Install a radiator cap tester and apply 160 kPa (1.6 kg/cm^2, 23 psi) pressure, and then check for leakage from the radiator hose or connections.

   Caution
   1. **Be sure to completely clean away any moist the places checked.**
   2. **When the tester is taken out, be careful not to spill any coolant from it.**
   3. **Be careful, when installing and removing the tester and when testing, not to deform the filler neck of the radiator.**

2. If there is leakage, repair or replace the appropriate part.

RADIATOR CAP VALVE-OPENING PRESSURE CHECKE

E14FBAC

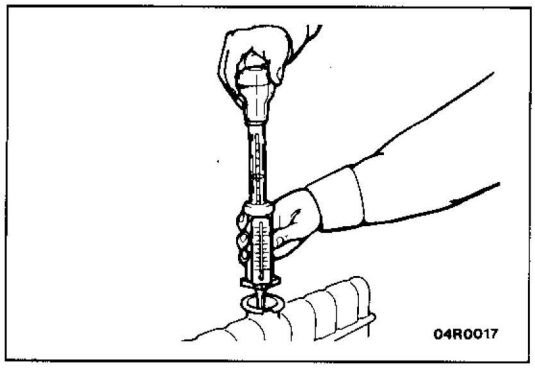
Refer to GROUP 11 – Engine Adjustment.

ENGINE COOLANT REPLACEMENT

E14FCAO

Recommended antifreeze:
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT
Quantity lit. (U.S.qts., Imp.qts.)
<4G32> 7.1 (7.5, 6.2)
<4D56> 8.1 (8.6, 7.1)

NOTE
For Norway, the non-amine type of antifreeze should be used.



CONCENTRATION MEASUREMENT E14FDAA

1. Measure the specific gravity of the coolant with a hydrometer.
2. Measure the coolant temperature, and calculate the concentration from the relation between the specific gravity and temperature, using the following table for reference.

RELATIONSHIP BETWEEN ANTIFREEZE CONCENTRATION AND SPECIFIC GRAVITY

Coolant temperature °C (°F) and specific gravity					Freezing temperature °C (°F)	Safe operating temperature °C (°F)	Coolant concentration (Specific volume)
10 (50)	20 (68)	30 (86)	40 (104)	50 (122)			
1.054	1.050	1.046	1.042	1.036	−16 (3.2)	−11 (12.2)	30%
1.063	1.058	1.054	1.049	1.044	−20 (−4)	−15 (5)	35%
1.071	1.067	1.062	1.057	1.052	−25 (−13)	−20 (−4)	40%
1.079	1.074	1.069	1.064	1.058	−30 (−22)	−25 (−13)	45%
1.087	1.082	1.076	1.070	1.064	−36 (−32.8)	−31 (−23.8)	50%
1.095	1.090	1.084	1.077	1.070	−42 (−44)	−37 (−35)	55%
1.103	1.098	1.092	1.084	1.076	−50 (−58)	−45 (−49)	60%

Example:
How to obtain safe operating temperature of coolant-antifreeze mixture
The safe operating temperature is down to −15°C (5°F) when the measured specific gravity is 1.058 at the coolant temperature of 20°C (68°F).

RECOMMENDED ANTIFREEZE

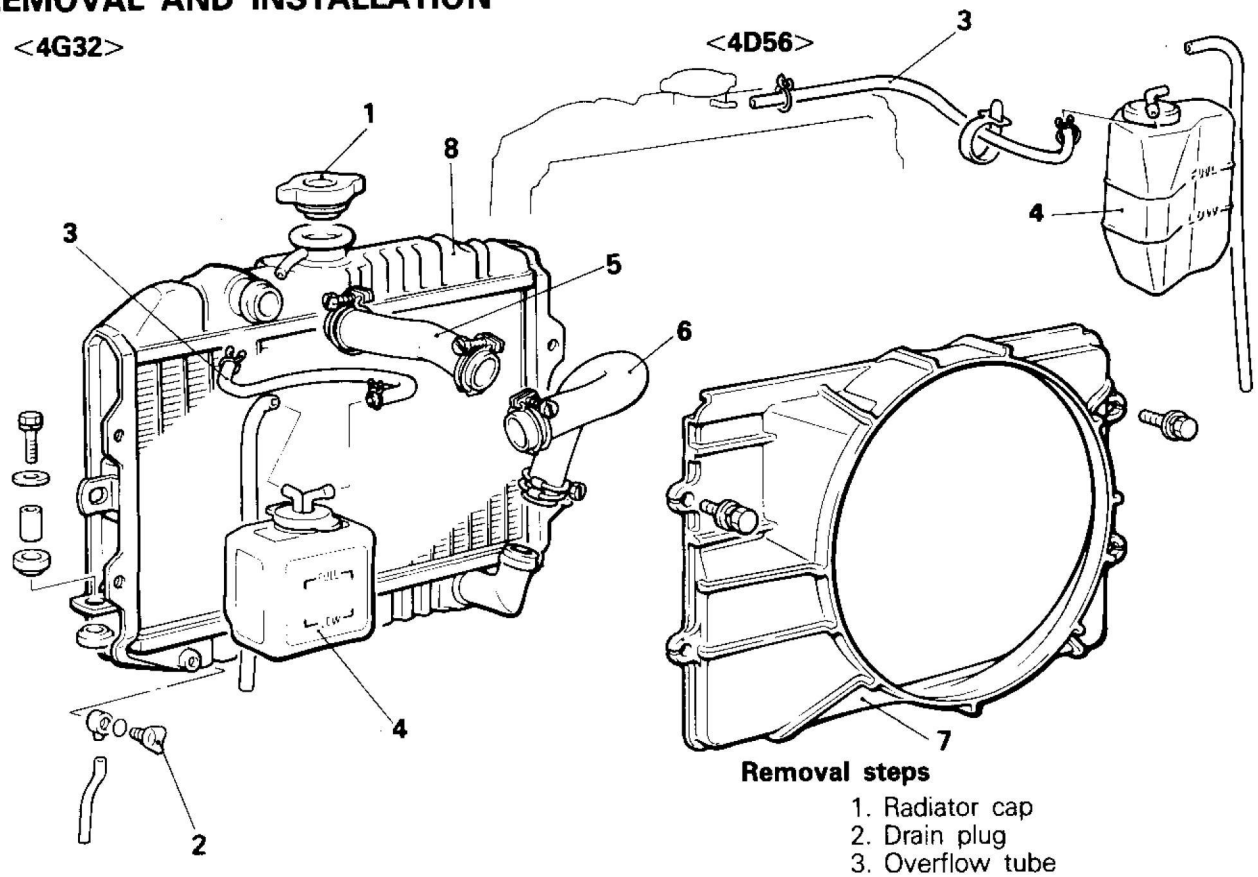
Antifreeze	Allowable concentration
HIGH QUALITY ETHYLENE GLYCOL ANTIFREEZE COOLANT	30–60 %

Caution
If the concentration of the antifreeze is below 30 %, the anti-corrosion property will be adversely affected. In addition, if the concentration is above 60 %, both the anti-freezing and engine cooling properties will decrease, affecting the engine adversely. For these reasons, be sure to maintain the concentration level within the specified range.

RADIATOR

REMOVAL AND INSTALLATION

E14QA--



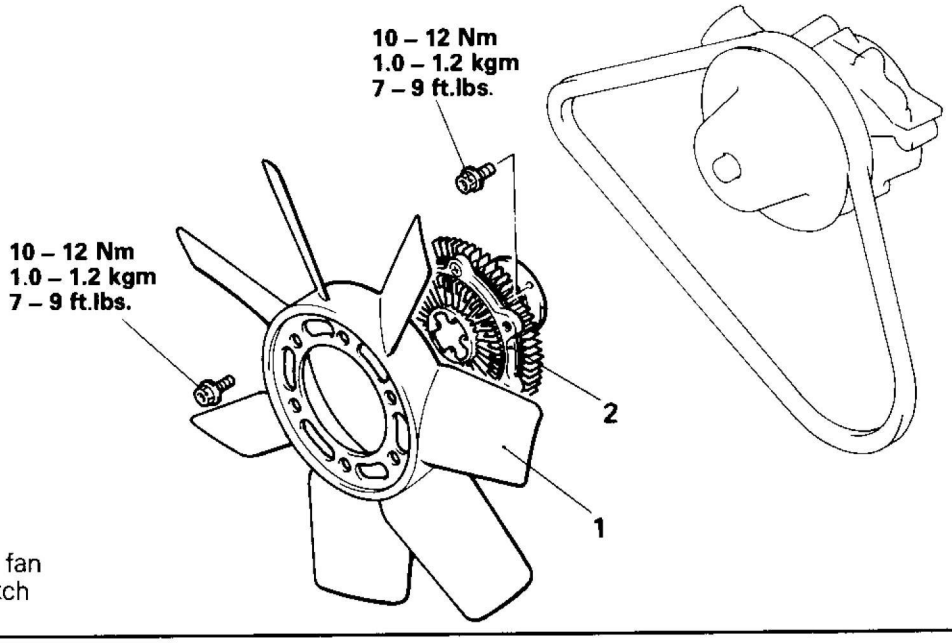
Removal steps
1. Radiator cap
2. Drain plug
3. Overflow tube
4. Reserve tank
5. Radiator upper hose
6. Radiator lower hose
7. Radiator shroud
8. Radiator

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant

COOLING FAN

REMOVAL AND INSTALLATION

E14JA--



Removal steps
1. Cooling fan
2. Fan clutch

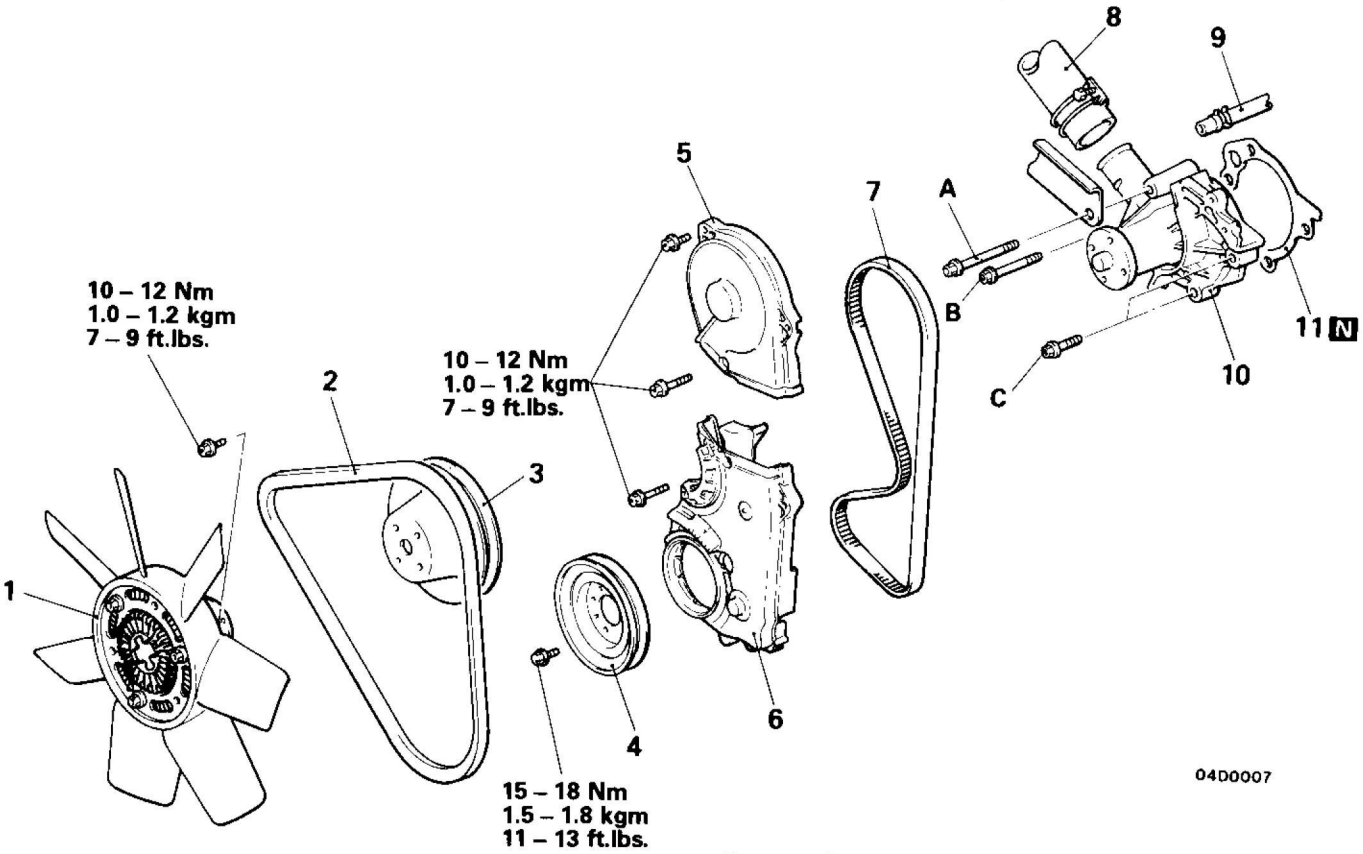
WATER PUMP<4G32>

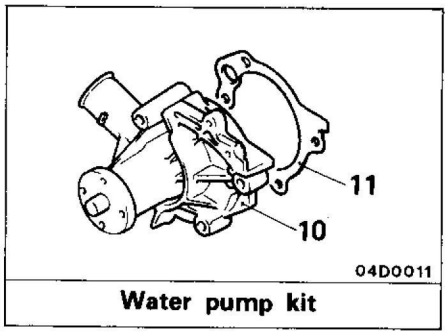
REMOVAL AND INSTALLATION

E14MA – A

Pre-removal Operation
- Draining of the Engine Coolant

Post-installation Operation
- Adjustment of Alternator Drive Belt (Refer to GROUP 11 – Engine Adjustment.)
- Supplying of the Engine Coolant



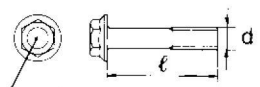


Water pump kit

Removal steps

1. Cooling fan and fan clutch assembly
2. Alternator drive belt
3. Water pump pulley
4. Crank shaft pulley
5. Timing belt upper cover
6. Timing belt lower cover
7. Timing belt
   (Refer to GROUP 11 – Timing Belt)
8. Radiator lower hose connection
9. Heater hose connection
10. Water pump
11. Water pump gasket

Symbol	Hardness category (Head mark)	d×ℓ mm (in.)	Torque Nm (kgm, ft.lbs.)
A	7T	8×70 (0.31×2.76)	20 – 27 (2.0 – 2.7, 14 – 19)
B	4T	8×55 (0.31×2.17)	12 – 15 (1.2 – 1.5, 9 – 11)
C		8×28 (0.31×1.10)	



Indication for hardness category 04U0025

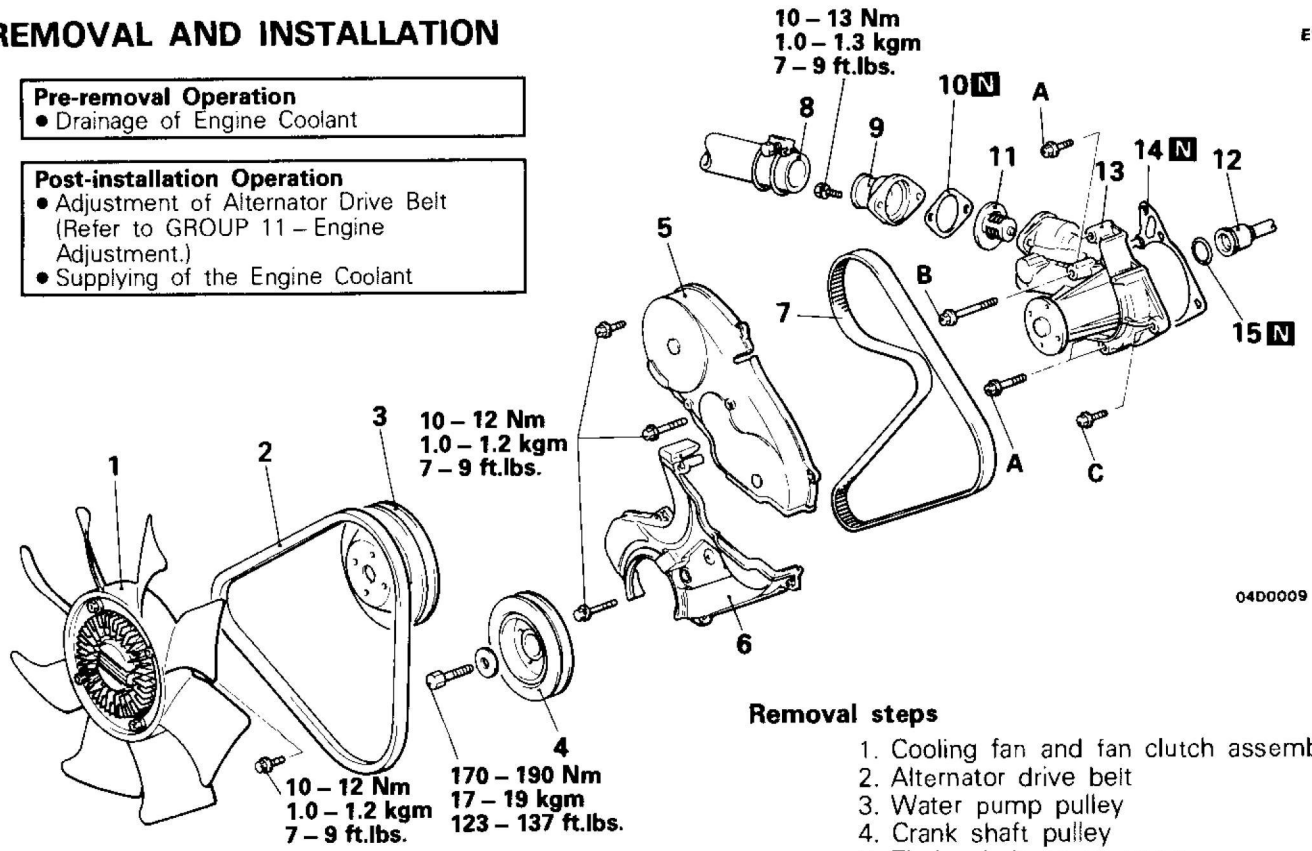
WATER PUMP<4D56>

REMOVAL AND INSTALLATION

E14MA – B

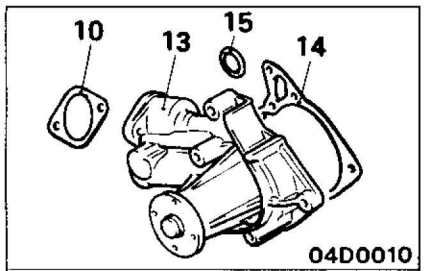
Pre-removal Operation
- Drainage of Engine Coolant

Post-installation Operation
- Adjustment of Alternator Drive Belt (Refer to GROUP 11 – Engine Adjustment.)
- Supplying of the Engine Coolant



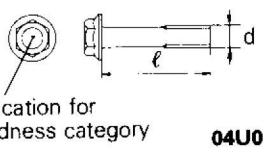
Removal steps

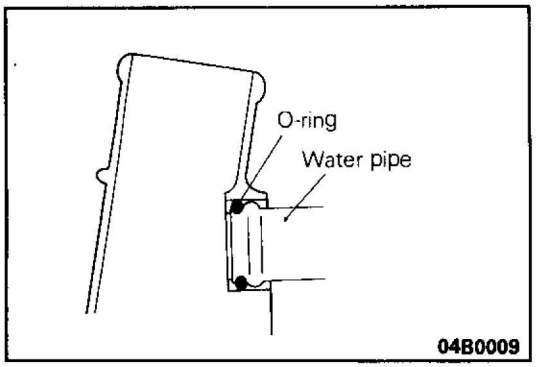
1. Cooling fan and fan clutch assembly
2. Alternator drive belt
3. Water pump pulley
4. Crank shaft pulley
5. Timing belt upper cover
6. Timing belt lower cover
7. Timing belt (Refer to GROUP 11 – Timing belt and Timing Belt B.)
8. Radiator lower hose connection
9. Water inlet fitting
10. Water inlet fitting gasket
11. Thermostat
12. Water pipe connection
13. Water pump
14. Water pump gasket
- ◆◆15. Water pipe O-ring



Water pump kit

Symbol	Hardness category (Head mark)	d×ℓ mm (in.)	Torque Nm (kgm, ft.lbs.)
A	4T	8×40 (0.31×1.57)	12 – 15 (1.2 – 1.5, 9 – 11)
B	7T	8×70 (0.31×2.76)	20 – 27 (2.0 – 1.7, 14 – 19)
C	4T	8×25 (0.31×0.98)	12 – 15 (1.2 – 1.5, 9 – 11)





SERVICE POINTS OF INSTALLATION

E14MDBA

15. INSTALLATION OF WATER PIPE O-RING

Fit water pipe O-ring in the groove provided at water pipe end, wet the periphery of water pipe O-ring and insert water pipe.

Caution

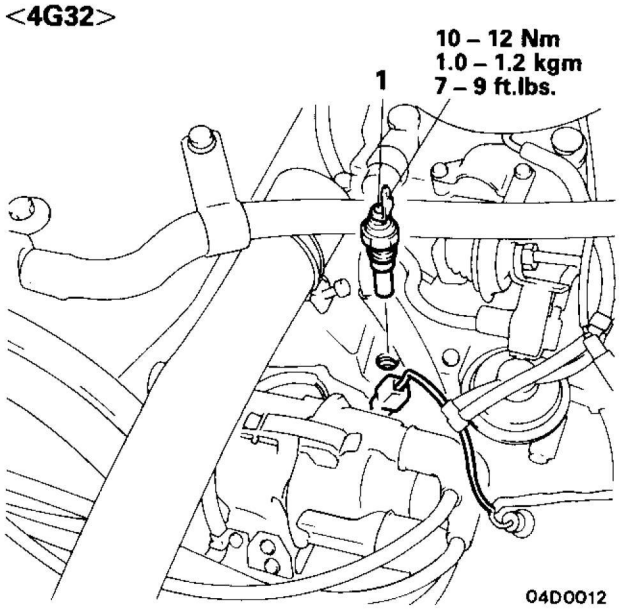
1. **Do not apply oil and grease to water pipe O-ring.**
2. **Keep the water pipe connections free of sand, dust, etc.**
3. **Insert water pipe until its end bottoms.**

ENGINE COOLANT TEMPERATURE GAUGE UNIT

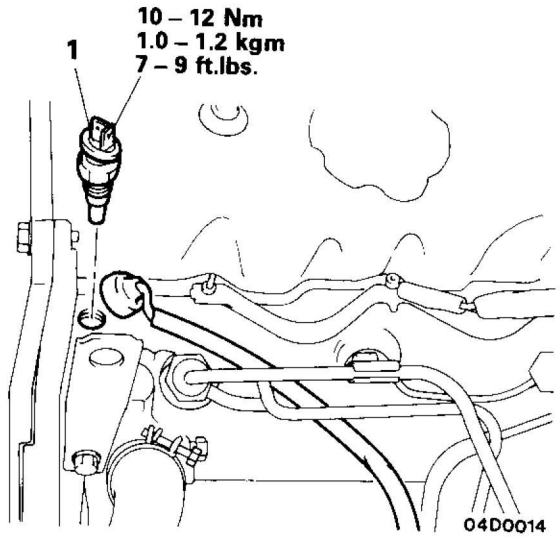
REMOVAL AND INSTALLATION

E14UA--

<4G32>

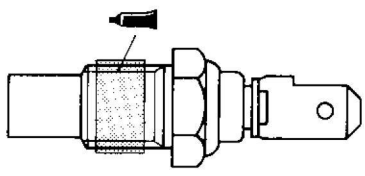


<4D56>



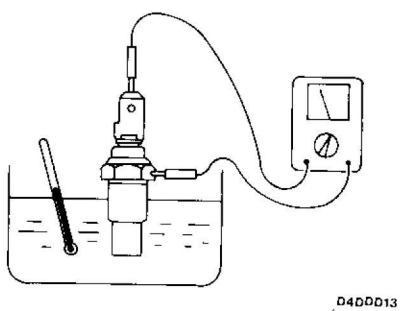
1. Engine coolant temperature gauge unit

Pre-removal and Post-installation Operation
- Draining and Supplying of the Engine Coolant



Sealant:
<4G32> 3M ATD Part No. 8660 or equivalent
<4D56> 3M Nut Locking Part No. 4171 or equivalent

<4G32>



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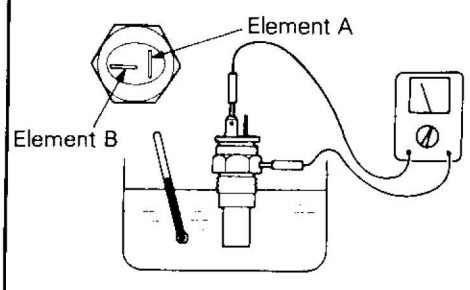


INSPECTION

E14UCAN

Standard value

<4G32>	
At 70°C (158°F)	**104±13.5 Ω**
<4D56>	
Element A (for engine coolant temperature gauge)	
At 70°C (158°F)	**104±13.5 Ω**
Element B (for engine control)	
At 20°C (68°F)	**3.25±0.33 kΩ**
At 80°C (176°F)	**300 Ω**

INTAKE AND EXHAUST

CONTENTS

E15AA--

SPECIFICATIONS

TORQUE SPECIFICATIONS

E15CC--

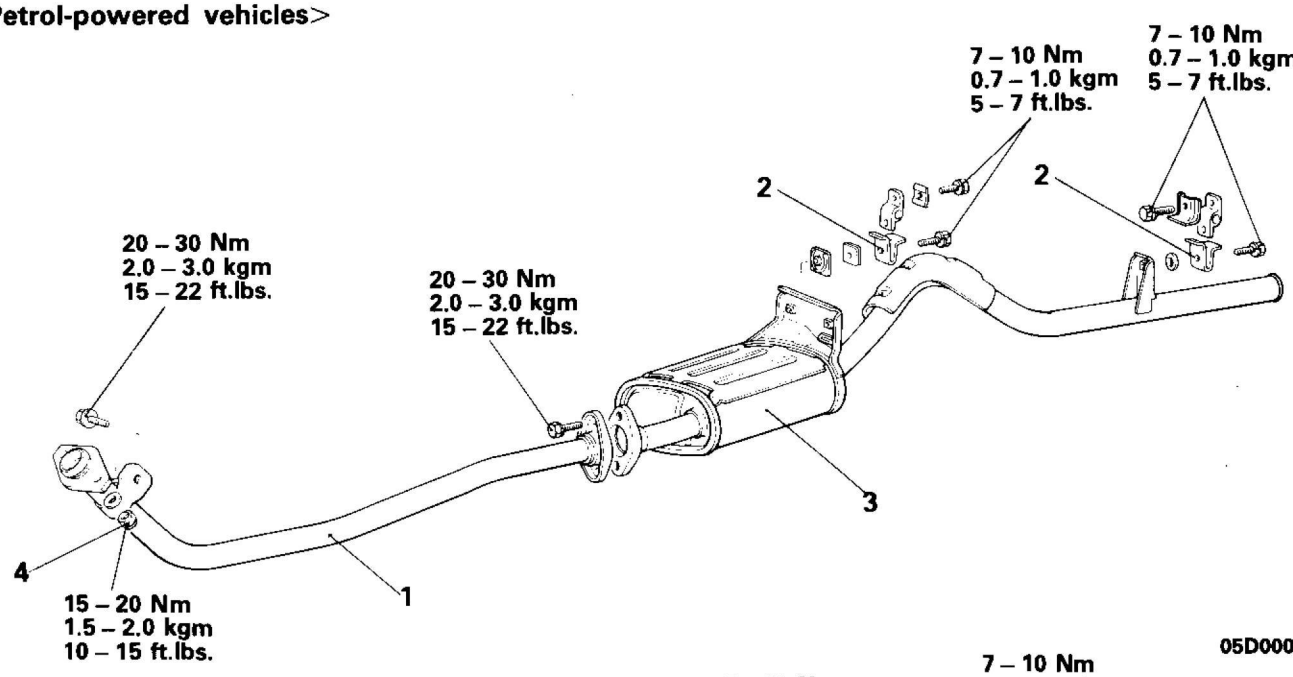
Items	Nm	kgm	ft.lbs.
Exhaust manifold to front exhaust pipe			
<Petrol-powered vehicles>	15 – 20	1.5 – 2.0	11 – 15
<Diesel-powered vehicles>	30 – 40	3.0 – 4.0	22 – 29
Front exhaust pipe to exhaust pipe mounting bracket	20 – 30	2.0 – 3.0	15 – 22
Front exhaust pipe to main muffler	20 – 30	2.0 – 3.0	15 – 22
Main muffler to hanger	7 – 10	0.7 – 1.0	5 – 7

EXHAUST PIPES AND MUFFLERS

REMOVAL AND INSTALLATION

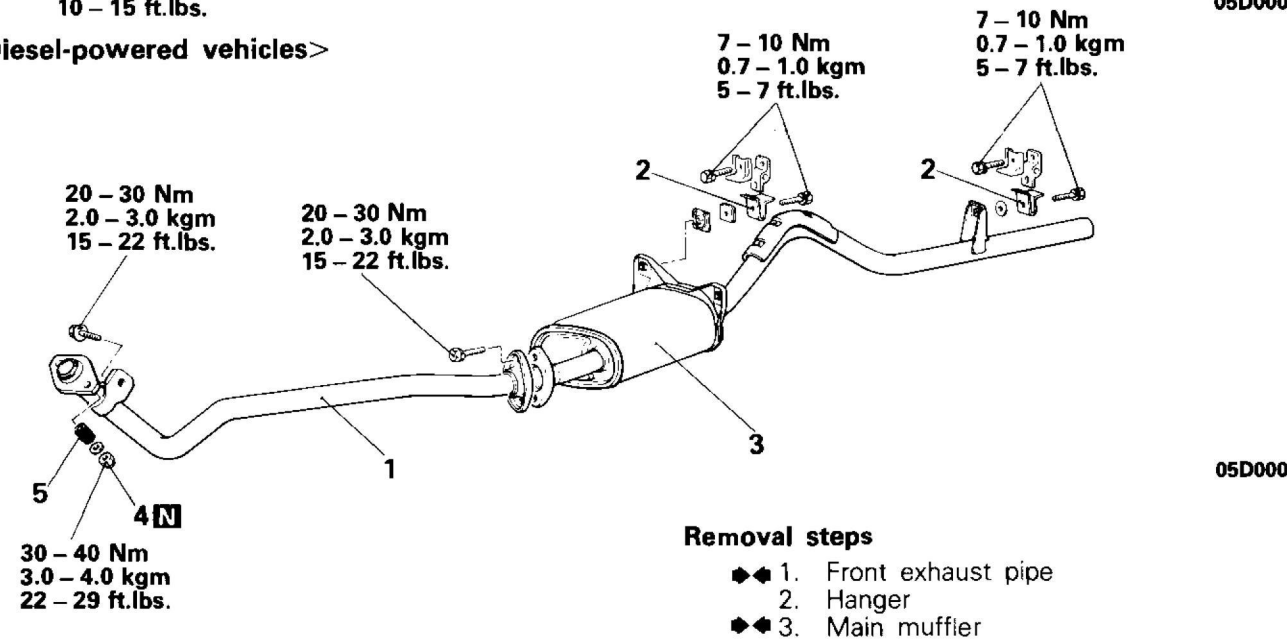
E15RA--

<Petrol-powered vehicles>



05D0004

<Diesel-powered vehicles>



05D0003

Removal steps

- ◆◆ 1. Front exhaust pipe
- 2. Hanger
- ◆◆ 3. Main muffler
- 4. Self-locking nut
- 5. Spring

INSPECTION

E15RCAA

- Check the mufflers and pipes for corrosion or damage.
- Check rubber hangers for deterioration or damage.
- Check for gas leakage from mufflers or pipes.

SERVICE POINTS OF INSTALLATION

E15RDAD

3. INSTALLATION OF MAIN MUFFLER/1.FRONT EXHAUST PIPE

After fully tightening front exhaust pipe and main muffler, check to be sure there is no contact with the chassis at any place and there is no twisted hanger.

NOTES

ENGINE ELECTRICAL

CONTENTS

E16AA--

CHARGING SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

E16BA--

ALTERNATOR

Items		<4G32>	<4D56>
Type		Battery voltage sensing	Battery voltage sensing
Identification No.		A2T02671	A2T02084
Rated output	V/A	12/40	12/50
Voltage regulator		Electronic built-in type	Electronic built-in type

SERVICE SPECIFICATIONS

E16BB--

ALTERNATOR

Items		Specifications
Standard value		
Voltage drop of alternator outlet line	V	0.2 or less
Regulated voltage	V	
Ambient temperature at voltage regulator		
– 20°C (– 4°F)		14.2 – 15.4
20°C (68°F)		13.9 – 14.9
60°C (140°F)		13.4 – 14.6
80°C (176°F)		13.1 – 14.5
Limit		
Output current		70% of nominal output current

TORQUE SPECIFICATIONS

E16BC--

Items	Nm	kgm	ft.lbs.
Alternator brace bolt	12 – 15	1.2 – 1.5	9 – 11
Alternator support nut	20 – 25	2.0 – 2.5	14 – 18
Oil tube eye bolt	14 – 19	1.4 – 1.9	10 – 14

SPECIAL TOOL

E16BF--

Tool	Number	Name	Use
	MD998467	Alternator harness connector	Checking the alternator (S terminal voltage)

SERVICE ADJUSTMENT PROCEDURES

E16BGAC

INSPECTION

Check the following items before inspecting the voltage regulator adjusting voltage and the alternator output current.

(1) Installation of alternator
(2) Alternator drive belt tension
(3) Battery specific gravity and voltage
(4) Fusible link
(5) Abnormal noise from alternator during operation

NOTE
1. Use a fully charged battery to obtain the standard value.
2. To check the alternator belt and battery, refer to GROUP 11 – Engine Adjustment.

VOLTAGE DROP TEST OF ALTERNATOR OUTPUT WIRE

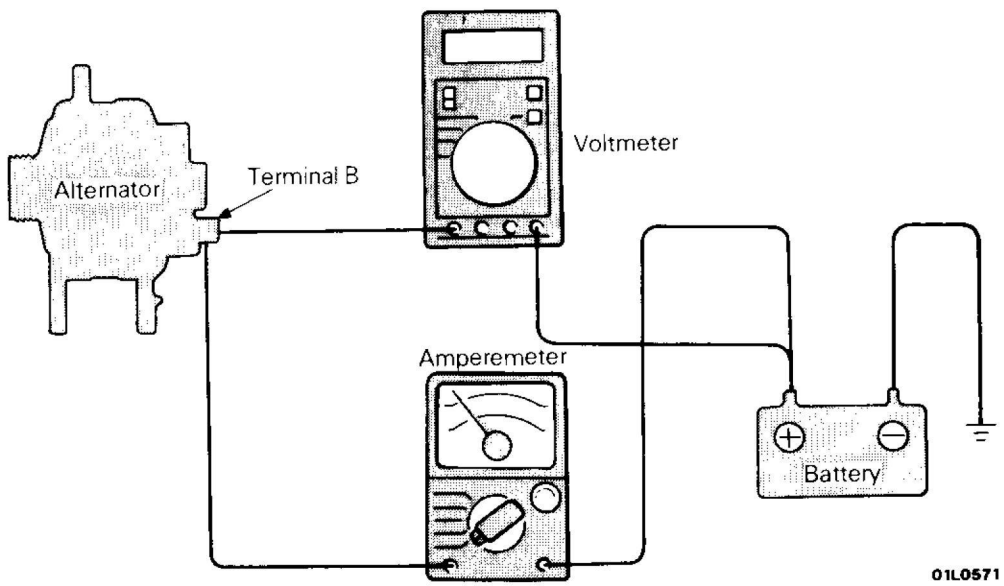
The potential-fall method determines if the wiring, including the fusible link, between the alternator "B" terminal and battery (+) terminal is adequate or not.

PREPARATION

(1) Turn the ignition switch "OFF".
(2) Remove the battery earth cable.
(3) Disconnect the alternator output line from the alternator "B" terminal.
(4) Connect 0 to 100A test DC ammeter in series between "B" terminal and the removed output line. Connect the (+) lead wire of the ammeter to the "B" terminal and the (–) lead wire to the removed output line.

NOTE
Use a magnetic flux ammeter which does not require removal of the harness.
When checking a vehicle which may have output current drop due to an incomplete "B" terminal connection, the sudden connection of a test ammeter loosening the "B" terminal may prevent the problem from being discovered due to completion of the connection.

(5) Connect a digital voltmeter to the alternator "B" terminal and battery (+) terminal. Connect the (+) lead wire of the voltmeter to the "B" terminal and the (–) lead wire to the battery (+) terminal.



(6) Connect the battery earth cable.

TEST

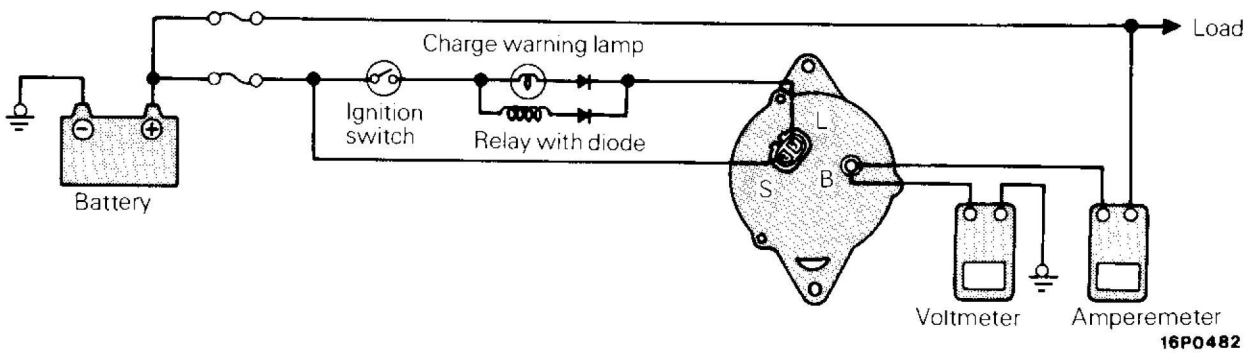
(1) Start the engine.
(2) Adjust the engine speed until the ammeter indicates 20A. (If the current is not 20A, turn on the position lamps to adjust.) Read the value on the voltmeter.

RESULT

(1) Check that the value on voltmeter is within the standard value range.

Standard value: 0.2 V or less

(2) When the value is larger than the standard value range, check for defective wiring between the alternator "B" terminal, fusible link, and battery (+) terminal. Repair loose contacts or discolored wires due to an overheated harness. Recheck.
(3) After testing, turn off lamps and turn the ignition switch OFF.
(4) Remove the battery earth cable.
(5) Remove the ammeter and voltmeter.
(6) Connect the alternator output line to the alternator "B" terminal.
(7) Connect the battery earth cable.



OUTPUT CURRENT TEST

This test determines whether the alternator outputs current equivalent to the nominal output.

PREPARATION

(1) Check the following items before testing. Repair if necessary.
  (a) Check that the battery is in good condition.

  NOTE
  The battery to be used for this test should be slightly discharged.
  A fully charged battery may not provide correct results due to insufficient load.

  (b) Check the alternator drive belt tension.
(2) Turn the ignition switch OFF.
(3) Remove the battery earth cable.
(4) Remove the alternator output line from the alternator "B" terminal.
(5) Connect 0 to 100A test ammeter DC between "B" terminal and the removed output line in series.
  Connect (+) lead wire to "B" terminal and (–) lead wire to the removed output line.

  NOTE
  Lock all high voltage connections firmly with nuts and bolts. Do not hold with a clip.

(6) Connect 0 to 20V test voltmeter between the "B" terminal and earth.
  Connect the voltmeter (+) lead wire to the alternator "B" terminal and (–) lead wire to earth.
(7) Set up an engine tachometer.
  Connect the battery earth cable.
(8) Keep the engine hood open.

TEST

(1) Check that the readings of the voltmeter and battery are the same.
0V is caused by a disconnected wire between the alternator "B" terminal and battery (+), a blown fusible link, or a defective earth.
(2) With the headlamp switch ON, start the engine.
(3) Set the headlamps at high beam and the heater blower switch at HIGH. Increase the engine speed to 2,500 r/min. and read the maximum output current on the ammeter.

NOTE
Read the maximum value quickly, as the charged current drops rapidly.

RESULT

(1) The value on the ammeter should be over the limit value. If the value is under the limit and the alternator outlet wiring [between alternator "B" terminal and battery (+) terminal] is normal, remove the alternator for inspection.

Output current
Limit: 70% of nominal output current

NOTE
1. The nominal output current value is indicated on a plate on the alternator.
2. The output current changes with the load level and the alternator temperature.
When the load is small, the specified output current may not be obtained even though the alternator is normal. In this case, turn on the headlamps to discharge the battery, or use another vehicle's lamps to increase the load for recheck.
The specified value may not be obtained if the alternator or the ambient temperature is high. Allow the alternator to cool, and recheck.

(2) After the output current test, lower the engine speed to idle. Turn the ignition switch OFF.
(3) Remove the battery earth cable.
(4) Remove the ammeter, voltmeter and the engine tachometer.
(5) Connect an alternator output line to the alternator "B" terminal.
(6) Connect the battery earth cable.

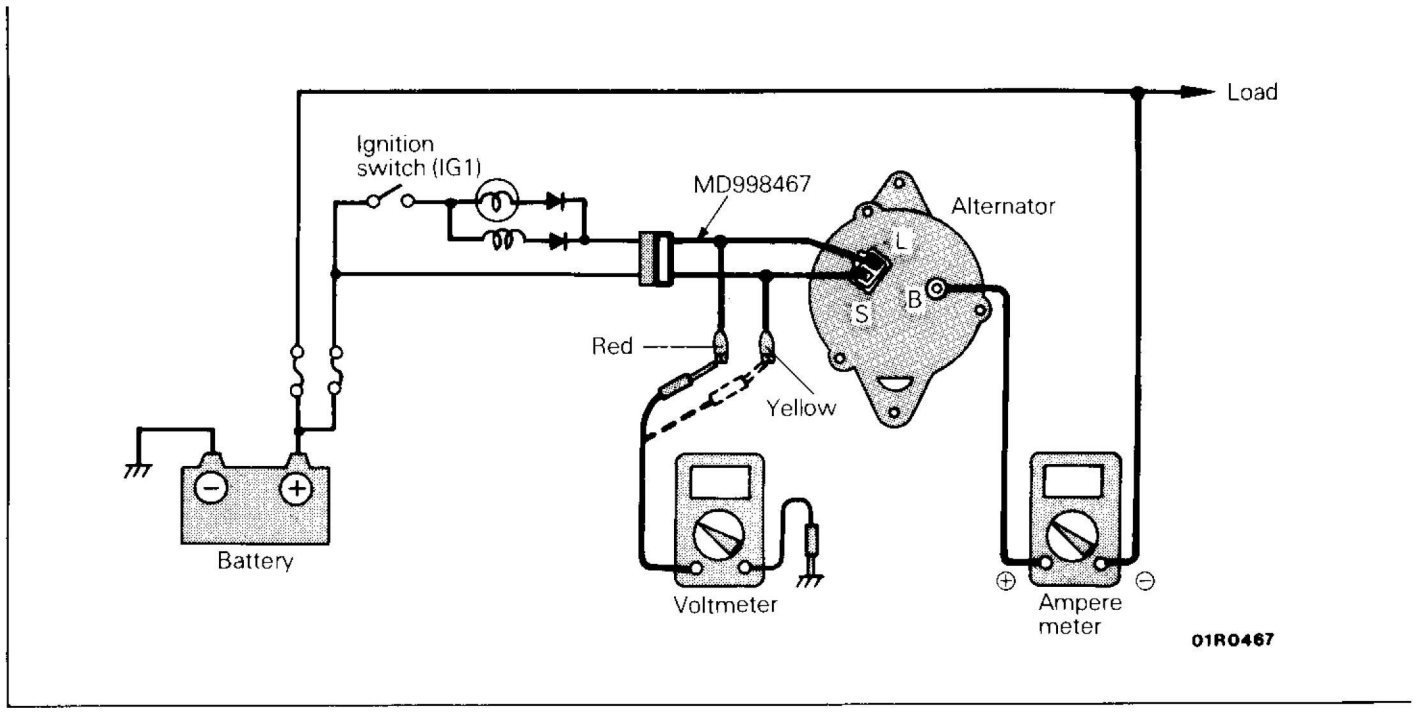
NOTE
1. Having headlamps on when checking alternator output current increases the load. Standard current is generated at low speeds of the alternator. However, output current is stabilized when the alternator speed is about 4,000 r/min.
Therefore, the output current at 2,500 r/min. engine speed exceeds the standard value, and the alternator can be considered as near normal.
2. Alternator output current changes with the amount of load. Therefore, the standard output current may not be obtained due to a small load despite the charging system being normal. In this case, increase the load and recheck.

REGULATED VOLTAGE TEST

This test determines whether the voltage regulator is correctly controlling the voltage.

PREPARATION

(1) Check the following before testing. Repair if necessary.
(a) Check that the battery is fully charged.
(b) Check the alternator drive belt tension. (Refer to GROUP 11 – Engine Adjustment.)
(2) Turn the ignition switch OFF.
(3) Remove the battery earth cable.
(4) Connect a digital voltmeter between the alternator "L" terminal or "S" terminal and earth. Use the special tool and connect the voltmeter (+) lead wire to the "L" or "S" terminal. Connect the (–) lead wire to earth or the battery (–) terminal.
(5) Remove the alternator outlet line from alternator "B" terminal.
(6) Connect 0 to 100A test DC ammeter in series to the "B" terminal and removed outlet line. Connect the ammeter (+) lead wire to the "B" terminal and the (–) lead wire to removed outlet line.
(7) Set up an engine tachometer.
Connect the battery earth cable.



TEST

(1) Turn the ignition switch ON. Check that the voltmeter indicates a value within the following range:

Voltage: 2 – 5V **"L" terminal**
Battery voltage **"S" terminal**

0V is caused by disconnected wire between the alternator "L" terminal, between the "S" terminal and the battery (+), or a blown fusible link.

(2) Start the engine. All lamps and accessories should be OFF.

(3) Set the engine speed at about 2,500 r/min. Read the voltmeter value when the alternator output current falls below 10A.

RESULT

(1) When the voltage matches the voltage adjusting table, the voltage regulator operation is correct. Either the voltage regulator or the alternator is defective if the voltage value is not within the standard value range.

Voltage Adjusting Table

Voltage regulator ambient temperature °C (°F)	Regulating voltage V
-20 (-4)	14.2 – 15.4
20 (68)	13.9 – 14.9
60 (140)	13.4 – 14.6
80 (176)	13.1 – 14.5

(2) After the test, drop the engine speed to idle. Turn the ignition switch OFF.

(3) Remove the battery earth cable.

(4) Remove the voltmeter, ammeter and the engine tachometer.

(5) Connect the alternator outlet line to the alternator "B" terminal.

(6) Connect the battery earth cable.

STARTING SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

E16CA--

STARTER

Items	<4G32>		<4D56>	
	Standard	Cold climate zone	Standard	Cold climate zone
Type	Direct drive	Direct drive	Reduction drive	Reduction drive
Identification No.	M3T32592	M3T41081	M2T56182	M2T61071
Rated output kW/ V	0.7/12	0.9/12	2.0/12	2.2/12
No. of pinion teeth	8	8	10	13

TORQUE SPECIFICATIONS

E16CC--

Items	Nm	kgm	ft.lbs.
Starter motor attaching bolt	27 – 34	2.7 – 3.4	20 – 25

IGNITION SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

E16DA – –

Part Name	Items	Specifications
DISTRIBUTOR	Type Identification No. Advance mechanism Firing order	Contact pointless T3T62981 Centrifugal + Vacuum 1 – 3 – 4 – 2
IGNITION COIL	Type Identification No.	Oil filled type E-064
SPARK PLUG	NGK DENSO CHAMPION	BPR5ES W16EPR RN11Y

SERVICE SPECIFICATIONS

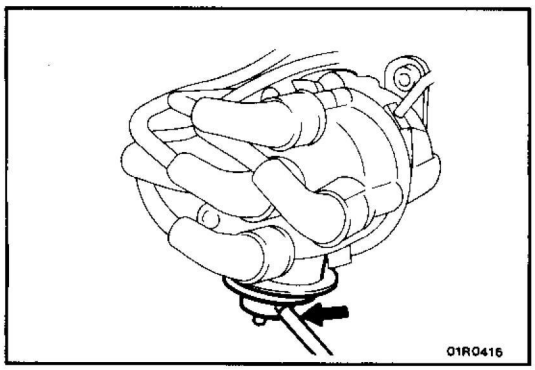
E16DB – –

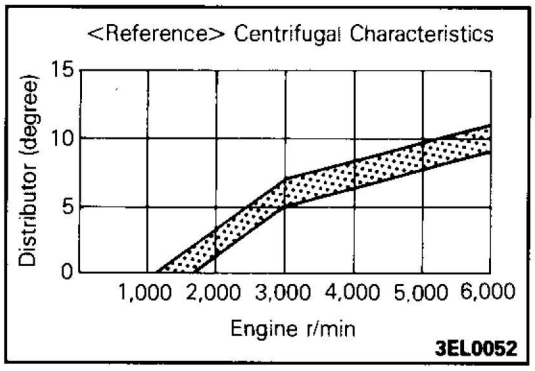
Part Name	Items	Specifications		
DISTRIBUTOR	Centrifugal timing advance crank angle/engine speed r/min.	Initial	Middle	Final
		0/1,400	12/3,000	20/6,000
	Vacuum characteristics crank angle/vacuum mmHg (in.Hg)	Initial	Middle	Final
		0/80 (3.15)	12/150 (5.91)	23/280 (11.02)
IGNITION COIL	Primary coil resistance Ω	1.08 – 1.32		
	Secondary coil resistance kΩ	12.75 – 17.25		
	External resistor resistance Ω	1.22 – 1.49		
SPARK PLUG	Gap mm (in.)	0.7 – 0.8 (0.028 – 0.031)		

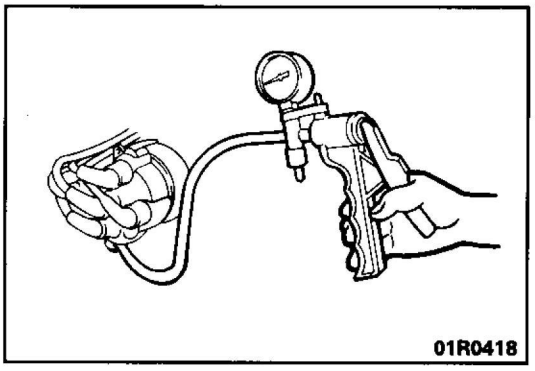
TORQUE SPECIFICATIONS

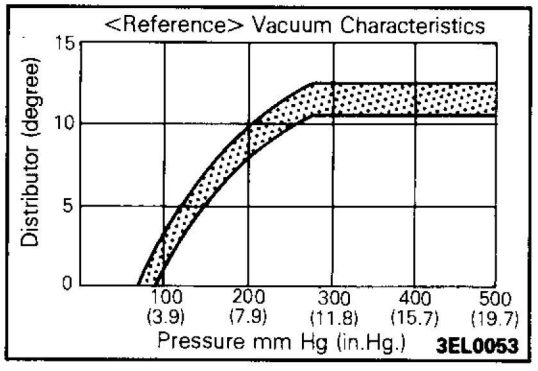
E16DC – –

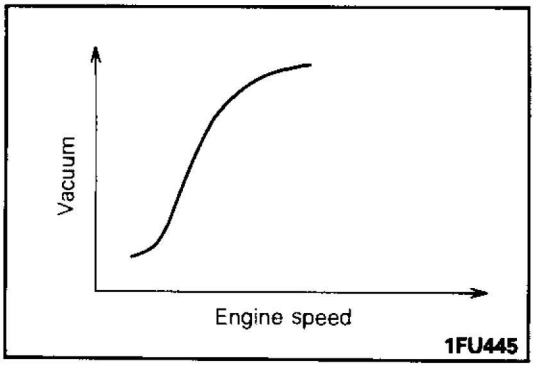
Items	Nm	kgm	ft.lbs.
Distributor mounting nut	10 – 13	1.0 – 1.3	7 – 9
Water outlet fitting attaching bolt	17 – 20	1.7 – 2.0	12 – 14











SERVICE ADJUSTMENT PROCEDURES

E16DGAO

CENTRIFUGAL TIMING CONTROL DEVICE INSPECTION

(1) Start engine and run at idle.
(2) Remove vacuum hose from vacuum controller.
(3) Increase engine speed gradually and check advance. It is normal if advances smoothly according with increased speed.

Symptom	Possible cause
Excessive advance	Worn or damaged governor spring
Start-up advance too sudden	Damaged spring
Inadequate advance or excessive hysteresis	Malfunction of governor weight or cam

(4) For the above symptoms, disassemble distributor and check.

VACUUM TIMING CONTROL DEVICE INSPECTION

(1) Start engine and run at idle.
(2) Remove vacuum hose from vacuum controller. Connect vacuum pump to nipple.
(3) Add vacuum on vacuum pump gradually and check advance. It is normal if advancing smoothly with increased negative pressure.

Symptom	Possible cause
Excessive advance	Worn or damaged vacuum controller spring
Start-up advance too sudden	Damaged spring
Inadequate advance or excessive hysteresis	Breaker base malfunction
Not advancing	Damaged diaphragm

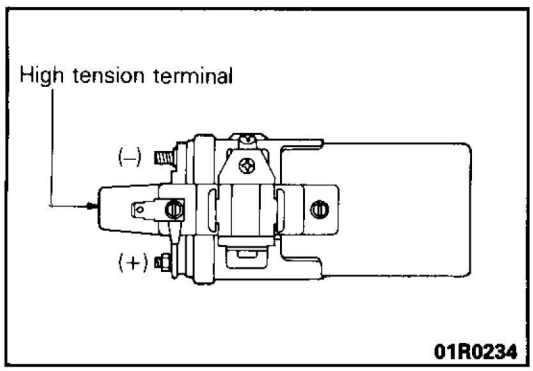
(4) For the above symptoms, disassemble distributor and check.

DISTRIBUTOR ADVANCE ANGLE CONTROL VACUUM (D VACUUM) INSPECTION

Inspection condition
- Engine coolant temperature: 80 – 90°C (176 – 194°F)

(1) Remove the vacuum hose from the carburettor D vacuum nipple. Connect a hand vacuum pump to the nipple.
(2) Start the engine and increase the engine speed by racing the engine. Confirm that the D vacuum increases together with the engine speed.

NOTE
If the vacuum is not normal, the carburettor D port may be clogged. Clean the port.

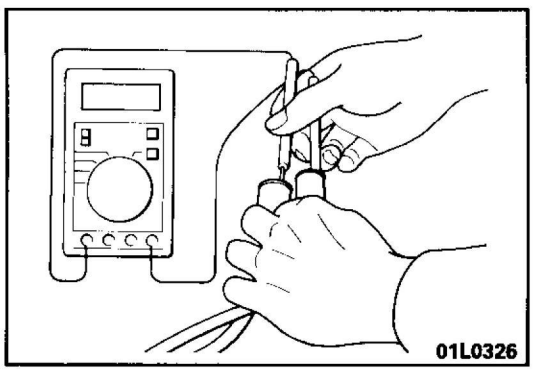


IGNITION COIL INSPECTION

With ohmmeter, check that the resistance of the external resistor, the primary coil resistance (between ignition coil (+) and (–) terminals), and the secondary coil resistance (between ignition coil (+) terminal and high tension terminal) are within the standard value.

Standard value:

External resistor	**1.22 – 1.49 Ω**
Primary coil	**1.08 – 1.32 Ω**
Secondary coil	**12.75 – 17.25 kΩ**



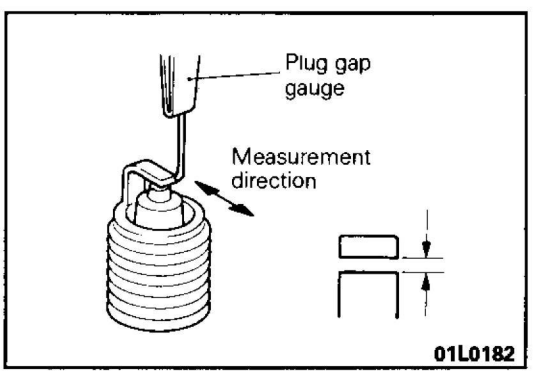
RESISTIVE CODE INSPECTION

Measure the resistance of the high tension cable and all spark plug cables. Replace any broken cables or cables with cracks on the surface.

Standard value: 9 – 15 kΩ

SPARK PLUG CHECK AND CLEANING

(1) Remove the spark plug cables.
(2) Remove the spark plugs.
(3) Check for burned out electrode or damaged insulator. Check for even burning.
(4) Remove carbon deposits with wire brush or plug cleaner. Remove sand from plug screw with compressed air.



(5) Use a plug gap gauge to check that the plug gap is within the standard value range. GLOW PLUG RELAY INSPECTION

Standard value: 0.7 – 0.8 mm (0.028 – 0.031 in.)

If the plug gap is not within the standard value range, adjust by bending the earth electrode.

(6) Clean the engine plug holes.

Caution
Use care not to allow foreign matter in cylinders.

(7) Install the spark plugs.

GLOW SYSTEM

SPECIFICATIONS

SERVICE SPECIFICATIONS

E16EB--

Items		Auto glow system	Super quick glow system
Standard value			
Engine coolant temperature sensor resistance [at 20°C (68°F)]	kΩ	2.92 – 3.58	2.92 – 3.58
Dropping resistor resistance [at 20°C (68°F)]	mΩ	–	143 – 157
Glow plug resistance [at 20°C (68°F)]	mΩ	200 – 280	200 – 280

TORQUE SPECIFICATIONS

E16EC--

Items	Nm	kgm	ft.lbs.
Engine coolant temperature sensor	20 – 40	2.0 – 4.0	15 – 30
Glow plug	15 – 20	1.5 – 2.0	11 – 14
Glow plug plate attaching nut	1 – 1.5	0.1 – 0.15	0.7 – 1.1

SEALANTS AND ADHESIVES

E16EE--

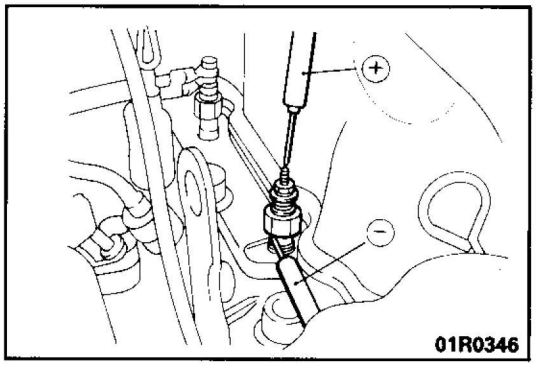
Items	Specified sealant and Adhesive	Remarks
Engine coolant temperature sensor	3M Nut Locking Part No. 4171 or equivalent	Drying sealant

SERVICE ADJUSTMENT PROCEDURES

E16EGAH

GLOW SYSTEM OPERATION INSPECTION

AUTO GLOW SYSTEM



Conditions before inspection:

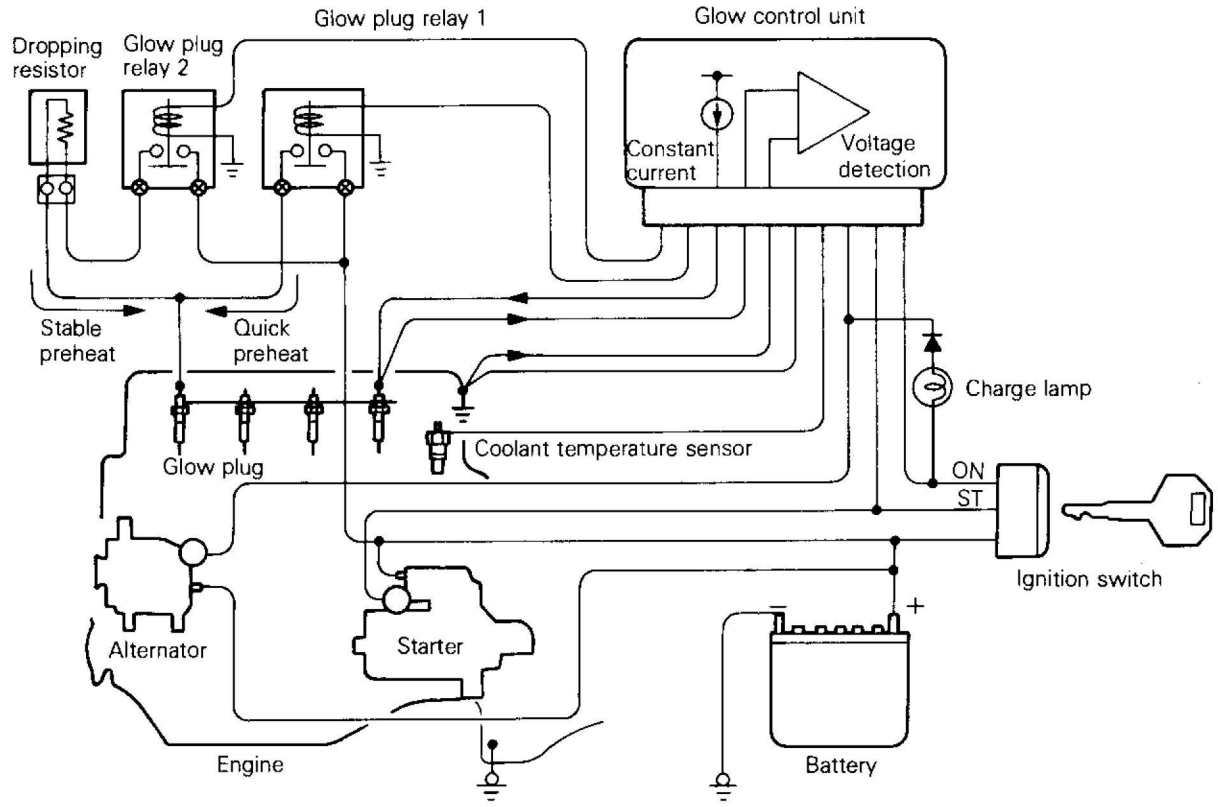
- Battery voltage: 12V

(1) Connect voltmeter between glow plug plate and plug body (earth).
(2) Check indicated value on voltmeter with ignition switch ON.
(3) Check that preheat indication lamp lights for about 6 seconds and indicates battery voltage (about 9V or over) for about 36 seconds immediately after ignition switch is turned on. [At cooling water temperature 20°C (68°F)]

NOTE
Continuity time varies depending upon coolant temperature.

(4) After checking (3), set ignition switch at START position.
(5) The system is normal if battery voltage (about 4V or over) is generated for about 6 seconds during engine cranking and after start operation. [at coolant temperature 20°C (68°F)]
(6) When the voltage or continuity time is not normal, check the terminal voltage in glow control unit, and single parts.

SUPER QUICK GLOW SYSTEM



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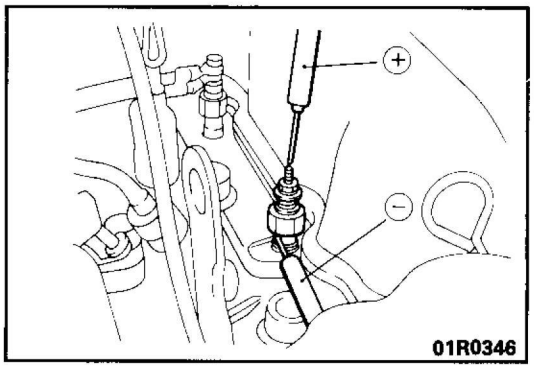
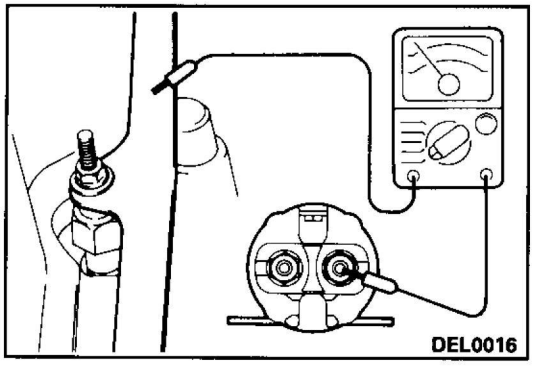




(1) Make sure the battery voltage is between 11V and 13V.
(2) Make sure that the temperature of engine coolant is 20°C (68°F) or lower. (If the temperature of engine coolant is higher than the above, disconnect the connector of coolant temperature sensor.)
(3) Measure the resistance between glow plug plate (power supply) and the body of glow plug (earth).

Standard value: 0.05 – 0.07 Ω [at 5 – 35°C (41 – 95°F)].

NOTE
The resistance value shall be the parallel resistance value of four glow plugs.

(4) Measure the resistance between terminal No. 3 of glow plug relay 2 and the glow plug plate.

Standard value: 0.15 – 0.17 Ω

Caution
Be sure to measure resistance only after confirming that no battery voltage is being applied to terminal No. 3.

(5) Connect a voltmeter between the glow plug plate and the body of glow plug.
(6) Measure the voltage immediately after the ignition switch has been switched ON (without starting the engine).

Standard value: 9 – 11V, and decreasing to 0V after 2 to 4 seconds.

NOTE
Time required for voltage to decrease may vary according to the temperature of glow plug or the voltage applied. (See reference drawing on the following page.)

(7) Measure the voltage while the engine is being cranked.

Standard value: 4V or higher.

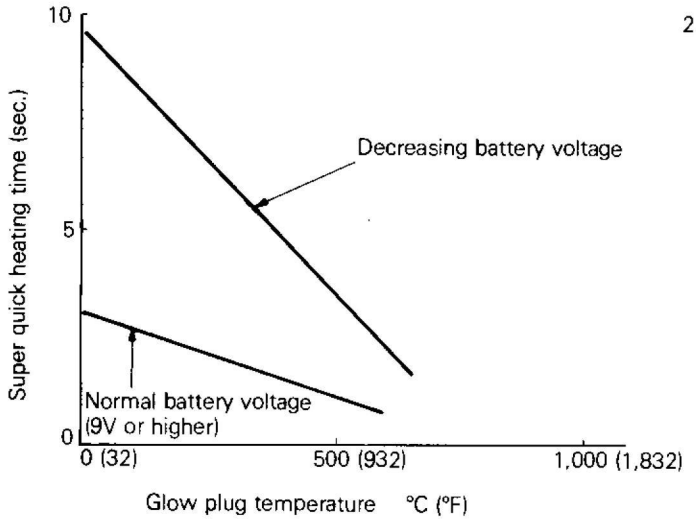
(8) Start the engine and measure the voltage while the engine is warming up.
If the engine coolant temperature rises to 30°C (86°F) or above, or if more than 30 seconds have passed after the engine has been started; the voltage shall constantly be 0V. (See reference drawing on following page.)

Standard value: 5 – 7V

[For reference]

Relationship between Glow Plug Temperature (resistance) and Heating Time

Examples
1. When the glow plug is cold and with normal battery voltage (9V or higher), approximately three seconds are required to heat the glow plug to 900°C (1,652°F).
2. When the glow plug is hot (500°C (932°F) or higher) and with normal battery voltage (9V or higher), less time is required to heat the glow plug.



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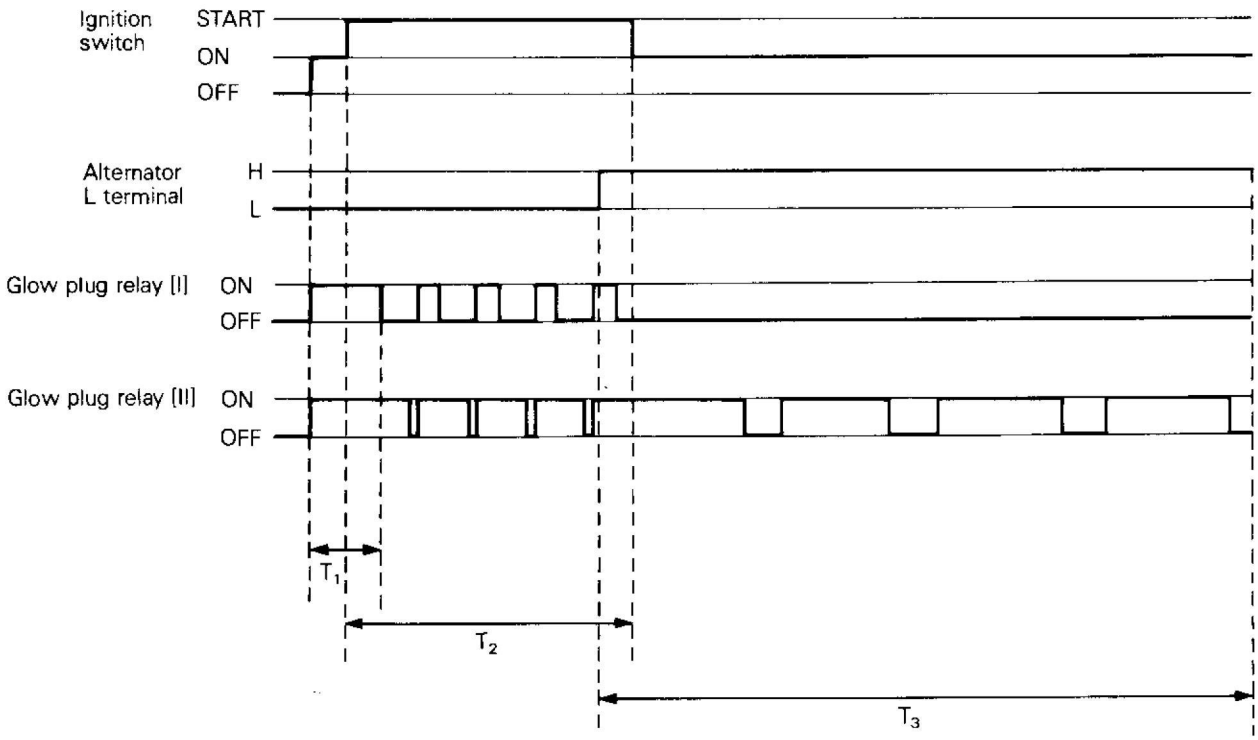
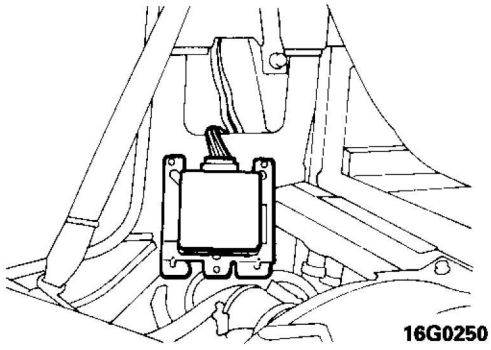
Timing Chart for Glow Plug Heating



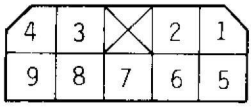
DEL0601

T_1 : Super quick heating time
T_2 : Glow plug relay (I) drive time when engine is being cranked
T_3 : Glow plug relay (II) drive time after engine has been started (afterglow)

NOTE
Afterglow occurs only when coolant temperature is lower than approximately 30°C (86°F). ON/OFF control is done for approximately 30 seconds after the engine is started in order to prevent the glow plug temperature from rising above the target temperature [approximately 900°C (1,652°F)].



Connector on harness side in glow control unit



16G0053

GLOW CONTROL UNIT INSPECTION

AUTO GLOW SYSTEM

Check terminal voltage in glow control unit and continuity on harness side.

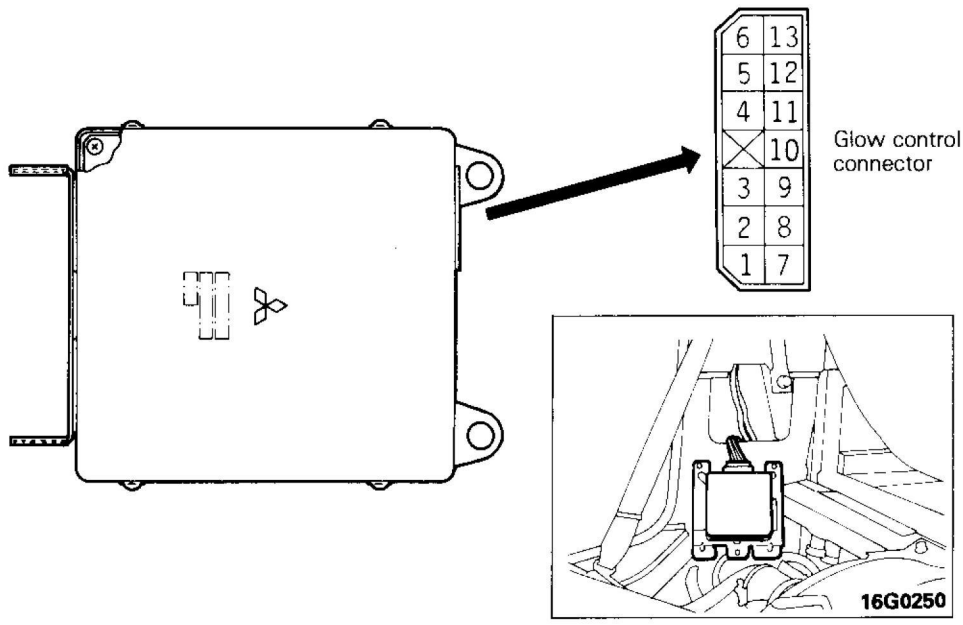
(1) Check with glow control unit connector connected.

Terminal	Connect area or measuring part	Measuring item	Tester connection	Check conditions	Standard value
5	Glow plug relay	Voltage	5-earth	Ignition switch ON	Indicates battery voltage for about 30 seconds after ON. [When engine coolant temperature is 20°C (68°F.)]

(2) Remove glow control unit connector. Check with harness side connector.

Terminal	Connect area or measuring part	Measuring item	Tester connection	Check condition	Standard value
1	Ignition switch (IG_1 power source)	Voltage	1-earth	Ignition switch ON	Battery voltage
2	Vacant terminal	–	–	–	–
3	Preheat indication lamp	Voltage	3-earth	Ignition switch ON	Battery voltage (1 – 30 seconds)
4	Alternator L terminal	Voltage	4-earth	Ignition switch ON	1 – 4 V
5	Glow plug relay coil	Resistance	5-earth	Constantly	About 20 Ω [at 20°C (68°F)]
6	Ignition switch	Voltage	6-earth	During engine cranking	Battery voltage
7	Control unit earth	Continuity	7-earth	Constantly	Continuity present
8	Start indication lamp	Voltage	8-earth	Ignition switch ON	Battery voltage (1 – 30 seconds later)
9	Coolant temperature sensor	Resistance	9-earth	– 20°C (– 4°F)	22.3 – 27.3 kΩ
				0°C (32°F)	8.6 kΩ
				20°C (68°F)	3.3 kΩ
				40°C (104°F)	1.5 kΩ

SUPER QUICK GLOW SYSTEM



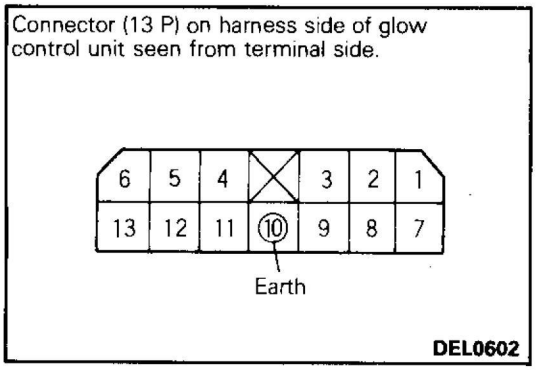
DFU0069

Terminal Voltage Measuring

NOTE
1. This inspection shall be carried out with the connector of the glow control unit connected.
2. The earth line used when measuring terminal voltage shall be terminal No.10 of the glow control unit.

- Terminal Voltage Check Table

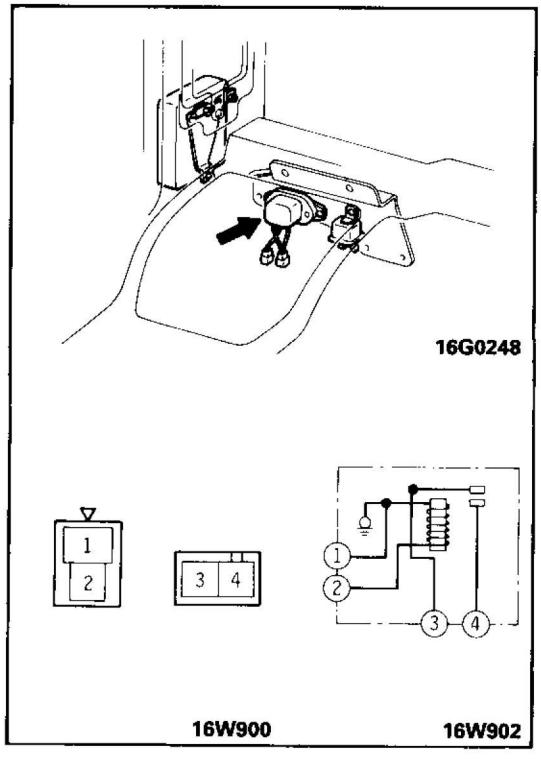
Glow control unit inspection terminal	Inspection item	Inspection condition		Standard value
①	Ignition switch – IG	Ignition switch	"OFF" → "ON"	11 – 13 V
			"ON" → "OFF"	0 – 0.5 V
②	Ignition switch – ST	Ignition switch "OFF" → "START"		8 V or more
⑥	Alternator L-terminal	Ignition switch "OFF" → "ON"		1 – 4 V
		Idle		11 V or more
⑦	Glow plug relay – 1	Ignition switch "OFF" → "ON"		9 – 12V Approx. 3 seconds later 0 – 0.5 V
⑧	Glow plug relay – 2	Ignition switch "OFF" → "ON"		9 – 12V Approx. 3 seconds later 0 – 0.5 V
⑬	Coolant temperature sensor	Ignition switch "OFF" → "ON"	When the coolant temperature is – 20 °C (– 4°F)	4.3 – 4.5 V
			When the coolant temperature is 0°C (32°F)	3.7 – 3.9 V
			When the coolant temperature is 20°C (68°F)	2.8 – 3.0 V
			When the coolant temperature is 40°C (104°F)	1.9 – 2.1 V
			When the coolant temperature is 80°C (176°F)	0.5 – 0.7 V



HARNESS CONTINUITY INSPECTION

(1) Disconnect the connector of the glow control unit.
(2) Check continuity between the terminals of the harness-side connector.

Terminals to be inspected	Inspection item	Continuity (resistance)
④ – ⑩	Constant current circuit of glow plug	Continuity present. (approximately 0.06 Ω)
⑤ – ⑪	Voltage measuring circuit of glow plug	Continuity present. (approximately 0.06 Ω)
⑦ – ⑩	Glow plug relay – 1	Continuity present. (approximately 3 Ω)
⑧ – ⑩	Glow plug relay – 2	Continuity present. (approximately 3 Ω)

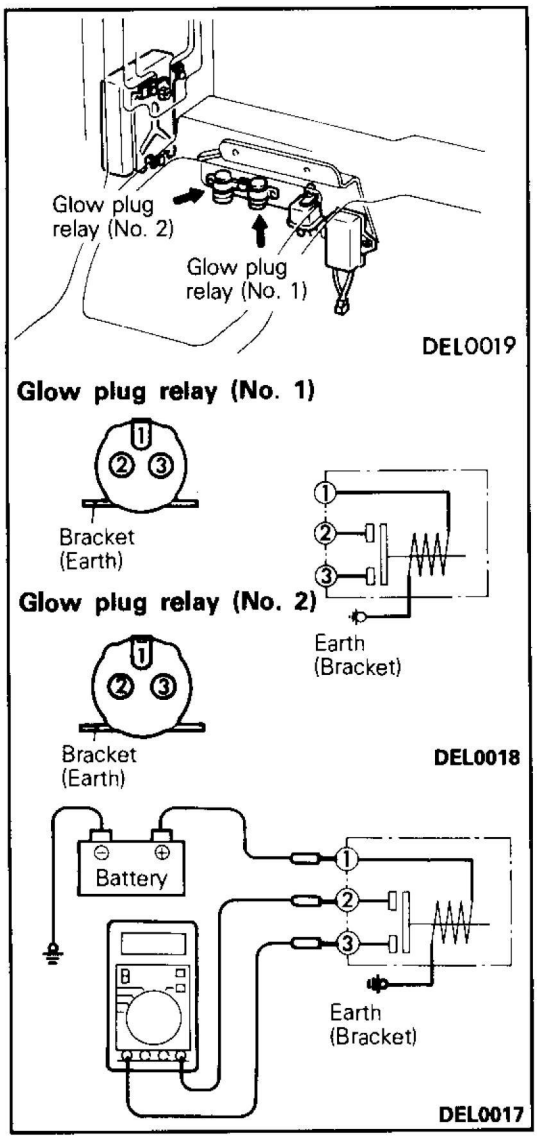


GLOW PLUG RELAY INSPECTION

AUTO GLOW SYSTEM

(1) Remove glow plug relay from relay bracket.
(2) Connect battery power source to terminal 2. Check continuity between terminals with terminal 1 earthed.

With power	Between terminals 3 and 4	Continuity (0.01 Ω or less)
Without power	Between terminals 1 and 2	Continuity (Approx. 20 Ω)
	Between terminals 3 and 4	No continuity



SUPER QUICK GLOW SYSTEM

(1) Check to make sure there is continuity (approximately 3 Ω) between the terminal of glow plug relay No.1 and the relay bracket.

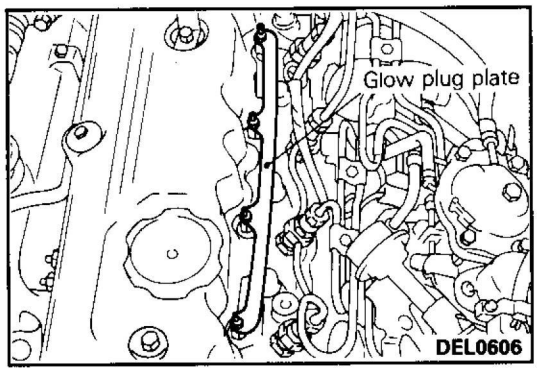
(2) Using jumper wires, connect terminal No.1 of the glow plug relay to the positive (+) terminal of the battery. Connect the relay bracket to the negative (–) terminal of the battery.

Caution

1. **Be sure to disconnect the harness connected to terminals No.2 and No.3 of the glow plug relay before connecting the jumper wires.**
2. **Do not connect the terminals of the disconnected harness to earth ground.**
3. **Be sure to connect the jumper wires correctly, because incorrect wiring of terminals will damage the relay.**

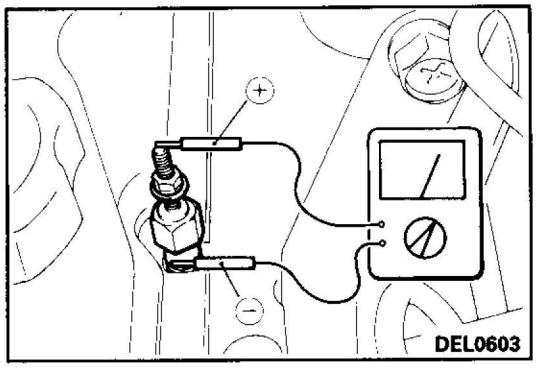
(3) Check continuity between terminals No. 2 and No. 3 of the glow plug relay by disconnecting and connecting the jumper wire to the negative (–) terminal of the battery.

Jumper wire	Continuity between terminals No. 2 and No. 3
Connected	Continuity present (0.01 Ω or less)
Disconnected	No continuity (∞ Ω)



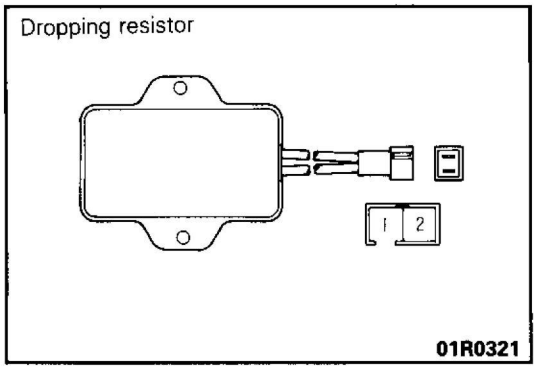
GLOW PLUG INSPECTION

(1) Remove the glow plug plate.



(2) Measure the resistance between the terminal of the glow plug and the body.

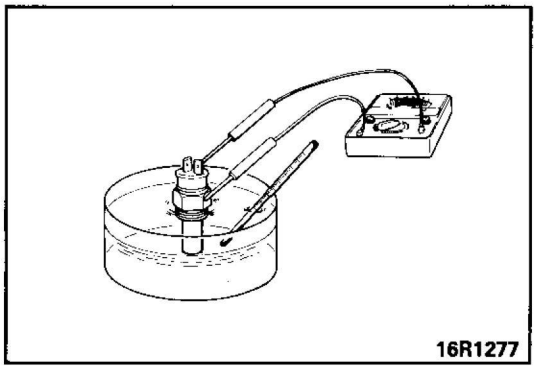
Standard value: 0.20 – 0.28 Ω
[at 5 – 35°C (41 – 95°F)]



DROPPING RESISTOR INSPECTION

(1) Disconnect the connector of the dropping resistor.
(2) Measure the resistance between the terminals of the dropping resistor.

Standard value: 0.15 – 0.17 Ω



COOLANT TEMPERATURE SENSOR INSPECTION

Place the temperature-sensing section of coolant temperature sensor in hot water and measure the resistance.

Temperature °C (°F)	Resistance (k Ω)
– 20 (– 4)	22.3 – 27.3
0 (32)	8.6
20 (68)	2.92 – 3.58
40 (104)	1.5
80 (176)	0.3

INSTALLATION

Apply sealant to the threaded part. Then, tighten the screw by applying the torque specified below.

Specified sealant: 3M NUT Locking Part No. 4171 or equivalent

Specified torque: 20 – 40 Nm (2.0 – 4.0 kgm, 15 – 30 ft.lbs.)

NOTES

EMISSION CONTROL

CONTENTS

E17AA--

SPECIFICATIONS <4G32 ENGINE>

GENERAL SPECIFICATIONS

E17CA--

Items	Name	Specifications
Crankcase emission control system	Positive crankcase ventilation valve	Variable flow type (Purpose: HC reduction)
Exhaust emission control system	Secondary air supply system Reed valve	 With air control valve (Purpose: CO. HC reduction)
	Exhaust gas recirculation system EGR valve Thermo valve	 Single type Bimetal type (Purpose: NOx reduction)
	Intake air temperature control system	Vacuum control type (Purpose: CO. HC reduction)
	Dash pot	Control valve type (Purpose: HC reduction)

SERVICE SPECIFICATIONS

E17CB--

Items		Specifications
Standard value		
EGR valve opening vacuum	kPa (kg/cm^2, psi)	5.3 (0.05, 0.77)
Thermo valve closing temperature	°C (°F)	70 (158)

TORQUE SPECIFICATIONS

E17CC--

Items	Nm	kgm	ft.lbs.
Positive crankcase ventilation valve	8 – 12	0.8 – 1.2	6 – 9
Thermo valve	20 – 40	2.0 – 4.0	15 – 29
EGR valve	19 – 28	1.9 – 2.8	14 – 20

SEALANTS AND ADHESIVE

E17CE--

Items	Specified sealant and adhesive	Remarks
Thermo valve thread	3M NUT LOCKING Part No. 4171 or equivalent	Drying sealant

SERVICE ADJUSTMENT PROCEDURES <4G32 ENGINE>

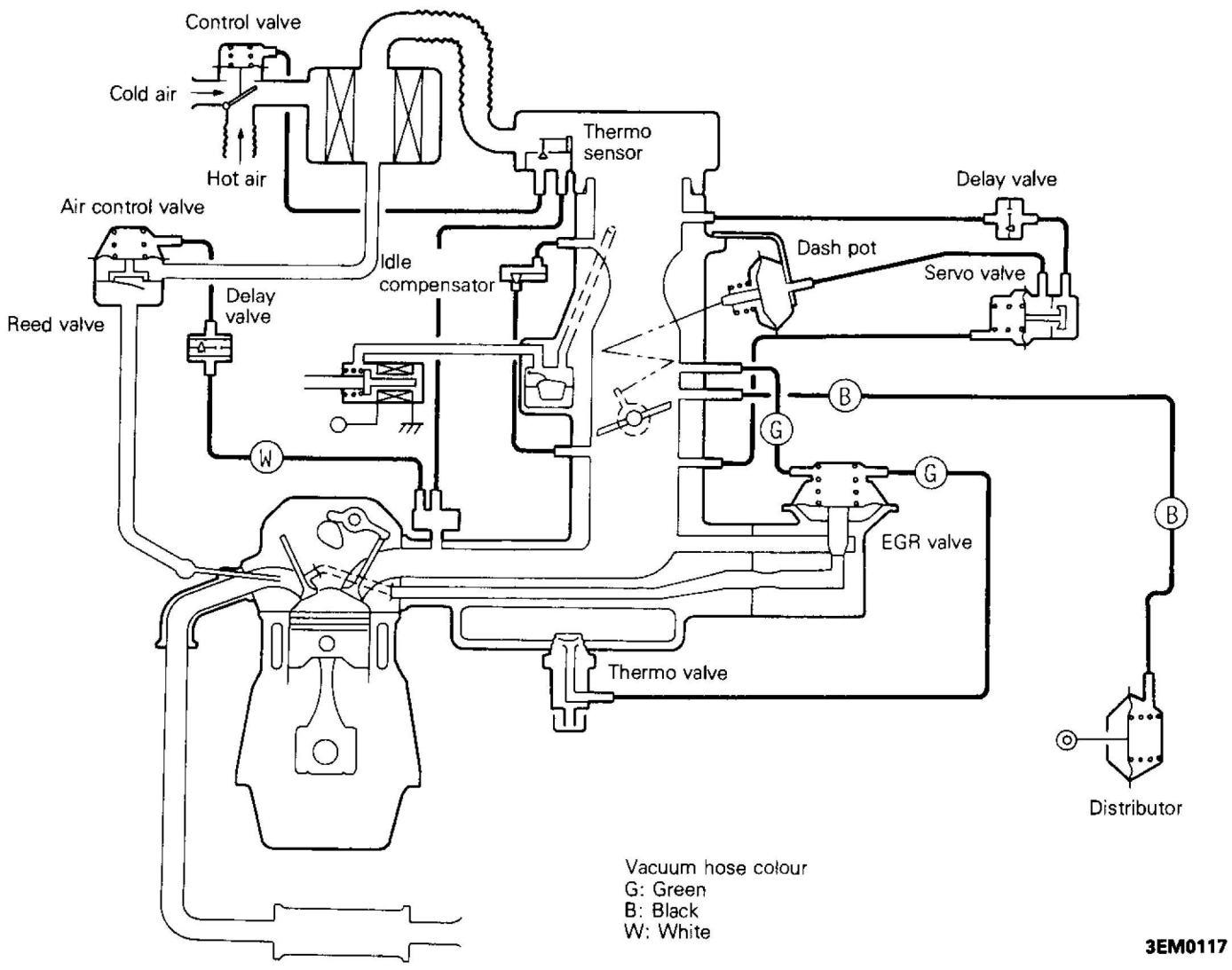
EMISSION CONTROL DEVICE REFERENCE TABLE

E17FDAE

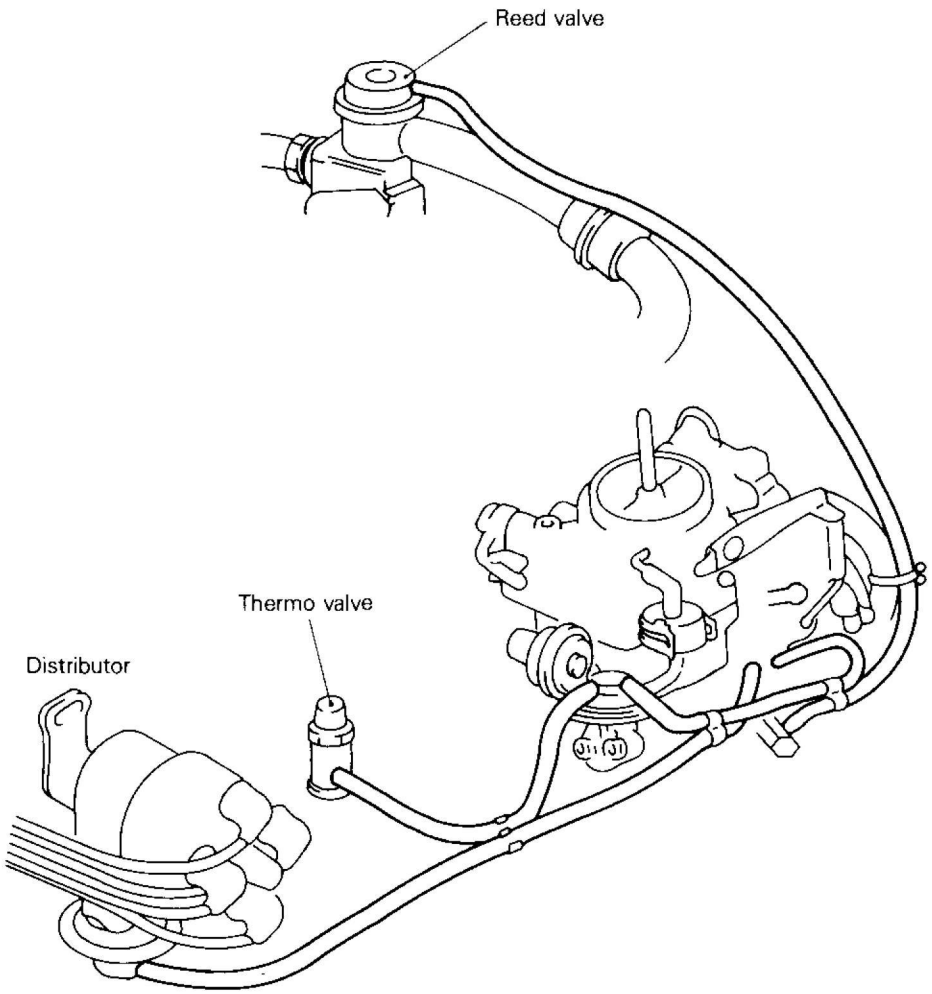
Emission control system / Related parts	Crankcase emission control system	Exhaust emission control system			Reference page for inspection of each part
		Exhaust gas recirculation (EGR) system	Secondary air supply system	Intake air temperature control system	
Positive crankcase ventilation valve	×				P.17 – 4
Secondary air control valve (with reed valve)			×		P.17 – 5
EGR valve		×			P.17 – 6
Thermo valve		×			P.17 – 7
Air control valve				×	P.17 – 9
Thermo sensor				×	P.17 – 9

VACUUM HOSE PIPING DIAGRAM

E17FE– –



VACUUM HOSE LAYOUT



3EM0118

INSPECTION

(1) Refer to the Vaccum Hose Layout Diagram above and check the vacuum hose to make sure it is properly connected.
(2) Check the vacuum hose (for any disconnection or looseness) and make sure that the vacuum hose is properly connected. Also check to make sure the hose is not bent or damaged.

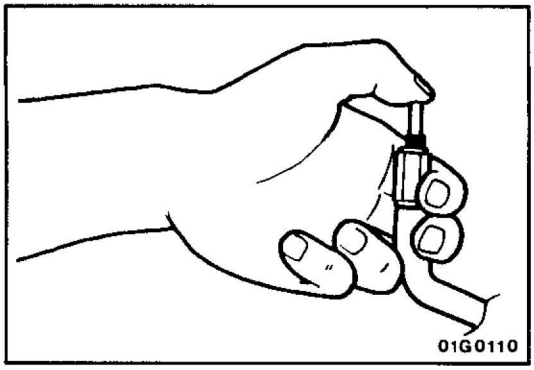
INSTALLATION

(1) When connecting the vacuum hose, make sure the nipple is securely inserted into the hose.
(2) Refer to the Vacuum Hose Layout Diagram above and make sure the hose is correctly connected.

CRANKCASE EMISSION CONTROL SYSTEM E170AA8

POSITIVE CRANKCASE VENTILATION SYSTEM INSPECTION

(1) Disconnect the ventilation hose from the positive crankcase ventilation (PCV) valve.
(2) Disconnect the PCV valve from the rocker cover.
(3) Re-connect the PCV valve to the ventilation hose.
(4) Start the engine and allow the engine to idle.



(5) Cover the opening of the PCV valve with your finger, and make sure negative pressure from the intake manifold can be felt.

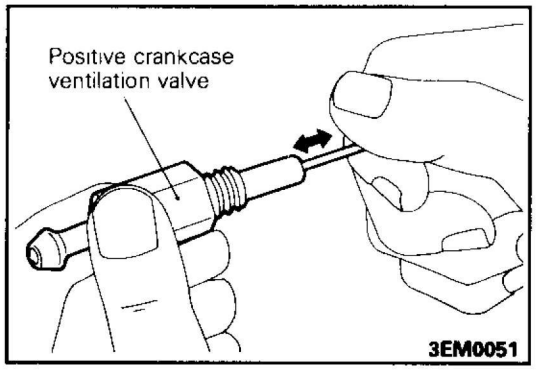
NOTE
At this time, the plunger inside the PCV valve shall move back and forth.

(6) If no negative pressure can be felt by the finger, clean or replace the PCV valve.
(7) Tighten the PCV valve by applying the torque specified below.

Tightening torque: 8 – 12 Nm (0.8 – 1.2 kgm, 6 – 9 ft.lbs.)

POSITIVE CRANKCASE VENTILATION VALVE INSPECTION

(1) From the screw side of the PCV valve, insert a thin rod into the PCV valve. Move the rod back and forth and make sure the plunger moves.
(2) If the plunger does not move, this means the inside of the PCV valve is clogged. If so, clean or replace the PCV valve.

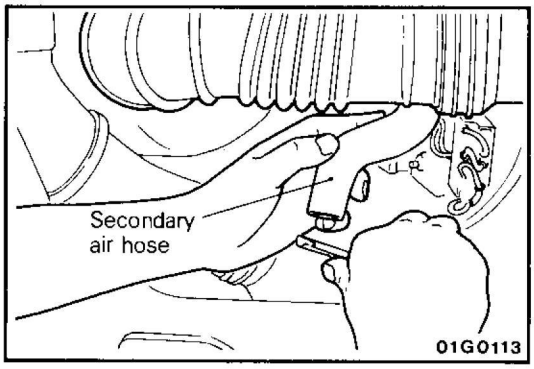


EXHAUST EMISSION CONTROL SYSTEM E17FCBJ

SECONDARY AIR SUPPLY SYSTEM INSPECTION

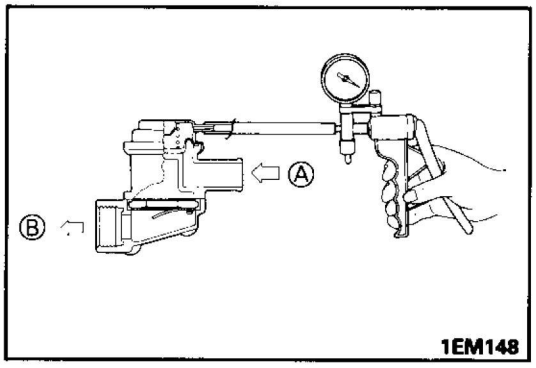
Caution
A malfunctioning secondary air control valve may cause exhaust air to be blown back into the air supply system.

Disconnect the secondary air hose from the air cleaner. With the engine idling, apply a small metal plate to the end of the hose and check to make sure that secondary air is being sucked into the hose.



SECONDARY AIR CONTROL VALVE INSPECTION

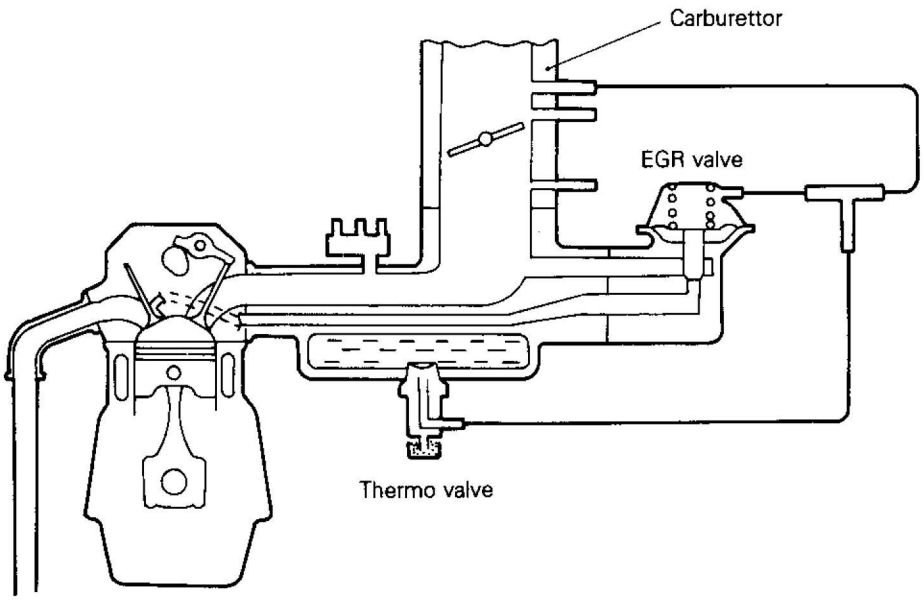
(1) Disconnect the secondary air control valve.
(2) Connect a hand vacuum pump to the nipple of the secondary air control valve.
(3) Apply 500mmHg (19.7 in. Hg.) negative pressure, and check to make sure this negative pressure is maintained.
(4) Blow in air from side A and from side B of the secondary air control valve and check the air flow.



Negative pressure	Direction of air	Airflow
0 mmHg (0 in.Hg) (negative pressure not applied)	Ⓐ → Ⓑ	No airflow
170 mmHg (6.7 in.Hg.) or greater	Ⓐ → Ⓑ	Airflow present
	Ⓑ → Ⓐ	No airflow

EXHAUST GAS RECIRCULATION (EGR) SYSTEM

E17QAAC



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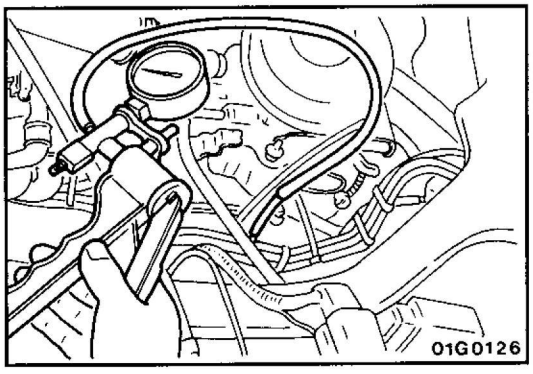


INSPECTION

(1) Disconnect the vacuum hose (hose with green stripes) from the throttle body of the carburettor, and connect a hand vacuum pump to the vacuum hose.
(2) Plug the nipple from which the vacuum hose was disconnected.
(3) Apply negative pressure while the engine is idling and check the condition of the engine and the condition of negative pressure when the engine is in cold state and in warm state.

Engine in cold state
(Coolant temperature: 55°C (131°F) or below)

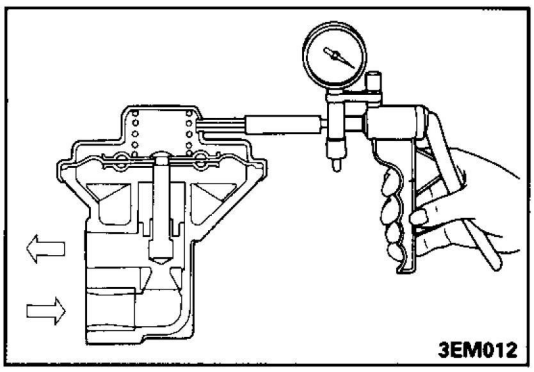
Hand vacuum pump	Normal condition	
	Engine	Negative pressure
With negative pressure applied	No change	Negative pressure leaks out.

Engine in warm state
(Coolant temperature: 70°C (158°F) or above)

Hand vacuum pump	Normal condition	
	Engine	Negative pressure
With 40 mmHg (1.6 in.Hg.) negative pressure applied	No change	Negative pressure is maintained.
With 120 mmHg (4.7 in.Hg.) negative pressure applied	Idling becomes unstable.	

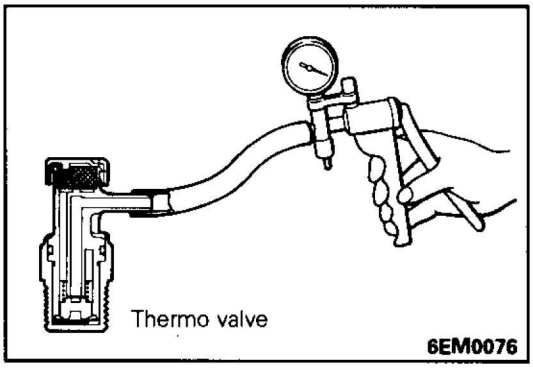
EGR VALVE INSPECTION

(1) Disconnect the EGR valve and check the EGR valve for any sticking or carbon deposits. If any sticking or carbon deposit is present, use a suitable solvent and clean the EGR valve so the valve sheet will adhere closely to the valve.



(3) Connect a hand vacuum pump to the EGR valve.
(4) Apply 500mmHg (19.7 in. Hg.) negative pressure and check to make sure this negative pressure is maintained.
(5) Blow in air through one of the two EGR paths, and check the airflow.

Negative pressure	Airflow
40mmHg (1.6 in. Hg.) or less	No airflow.
120mmHg (4.7 in. Hg.) or greater	Airflow present.



Installation

(1) Using a new gasket, tighten the valve by applying the torque specified below.

Tightening torque: 19 – 28 Nm (1.9 – 2.8 kgm, 14 to 20 ft.lbs.)

THERMO VALVE INSPECTION

(1) Connect a hand vacuum pump to the nipple of the thermo valve, and apply negative pressure to check airtightness.

Engine coolant temperature	Normal condition
55°C (131°F) or below	Negative pressure leaks out.
70°C (158°F) or above	Negative pressure is maintained.

Removal

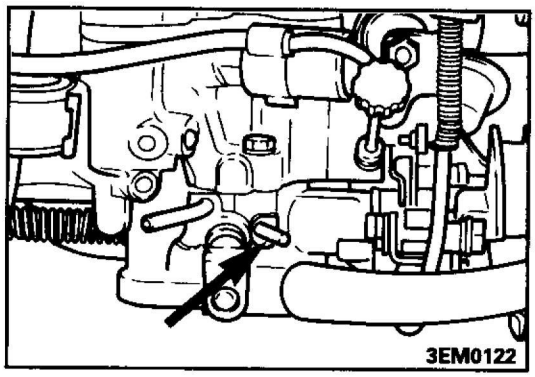
When disconnecting the thermo valve, do not apply a spanner to any area made of resin.

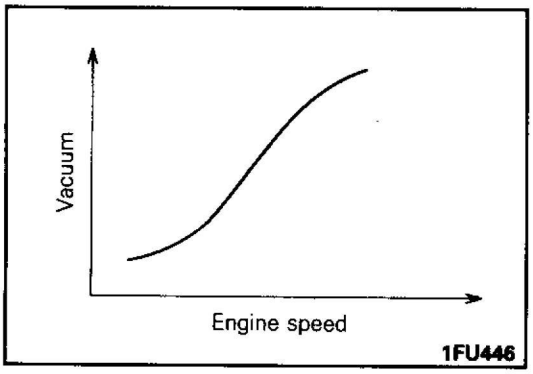
Installation

(1) Apply sealant to the threaded part. Then, tighten the thermo valve by applying the torque specified below.

Sealant: 3M NUT Locking Part No.4171 or equivalent.
Specified torque: 20 – 40 Nm (2.0 – 4.0 kgm, 15 – 29 ft.lbs)

(2) When installing the thermo valve, do not apply a spanner to any area made of resin.





EGR VALVE CONTROL VACUUM (E-VACUUM) INSPECTION

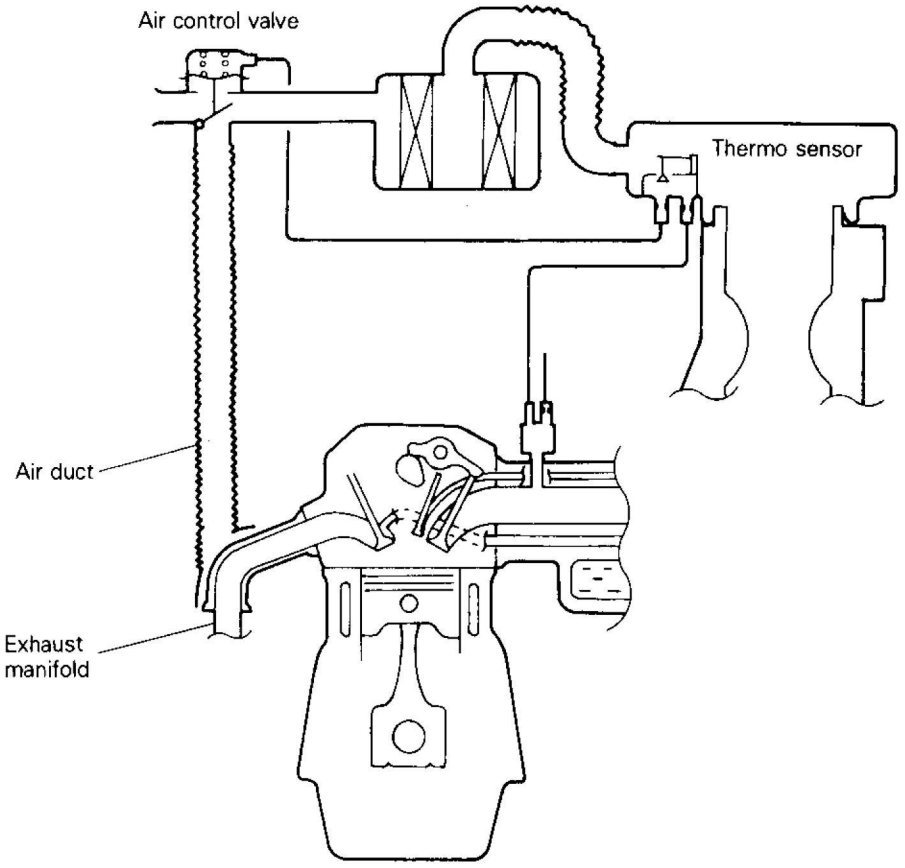
(1) Start the engine and warm up the engine until the coolant temperature becomes 80 – 90°C (176 – 194°F).

(2) Disconnect the vacuum hose (hose with green stripes) from the E-vacuum nipple of the carburettor, and connect a hand vacuum pump to this nipple.

(3) Start the engine. Check to make sure the E-vacuum increases according to any increase in engine rpm when the engine is raced and engine rpm is increased.

NOTE
Abnormality in vacuum changes may be caused by clogging of the carburettor E port. If such abnormality occurs, clean the E port of the carburettor.

INTAKE AIR TEMPERATURE CONTROL SYSTEM



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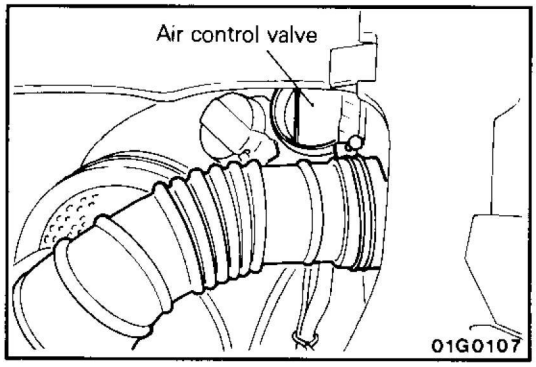
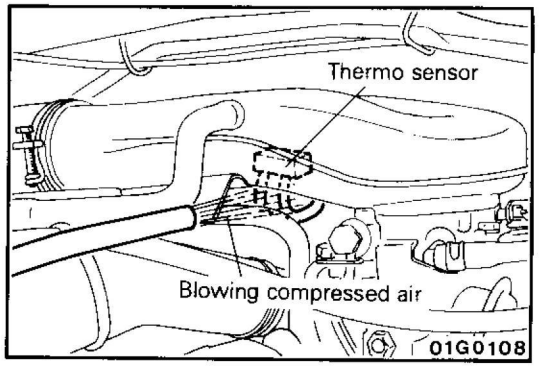




INSPECTION

(1) Remove the air cleaner cover assembly and air duct.
(2) Idle the engine and inspect the opening and closing of the air control valve.

Thermo sensor temperature	Normal condition
30°C (86°F) or less	The cool air port side closes
45°C (113°F) or higher	The cool air port side opens

NOTE
If necessary, cool by blowing compressed air or warm using a hair dryer, etc.

(3) Disconnect the intake manifold side vacuum hose from the thermo sensor, place a finger over the end of the hose and check for vacuum.

NOTES

CLUTCH

CONTENTS

E21AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E21CA--

Items		Petrol-powered vehicles	Diesel-powered vehicles
Clutch operating method		Cable type	Hydraulic type
Inside diameter of clutch master cylinder	mm (in.)	–	15.87 (0.62)
Inside diameter of clutch release cylinder	mm (in.)	–	19.05 (0.75)

SERVICE SPECIFICATIONS

E21CB--

Items		Cable type	Hydraulic type
Standard value			
Clutch pedal height	mm (in.)	244 – 249 (9.6 – 9.8)	75 – 80 (3.0 – 3.1)
Clutch pedal free play	mm (in.)	20 – 35 (0.8 – 1.4)	8 – 15 (0.31 – 0.59)
Clutch pedal backlash (clevis pin play)	mm (in.)	–	0 – 3 (0 – 0.12)

NOTE
Clutch pedal free play of hydraulic type clutch includes both pedal play and clevis pin play.

TORQUE SPECIFICATIONS

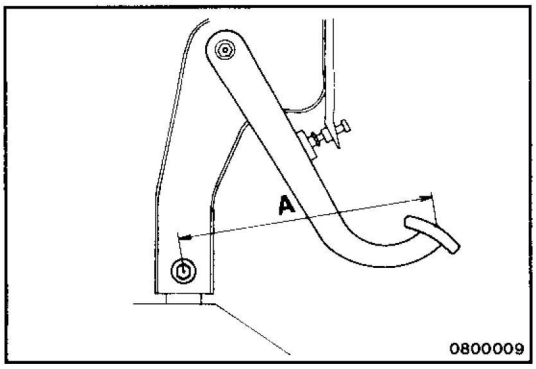
E21CC--

Items	Nm	kgm	ft.lbs.
Clutch pedal shaft nut			
<Cable type>	13 – 19	1.3 – 1.9	9 – 14
<Hydraulic type>	14 – 20	1.4 – 2.0	10 – 15
Clutch tube	15 – 20	1.5 – 2.0	11 – 15
Eye bolt	20 – 25	2.0 – 2.5	15 – 18
Clutch release cylinder mounting bolt	30 – 42	3.0 – 4.2	22 – 30

LUBRICANTS

E21CD--

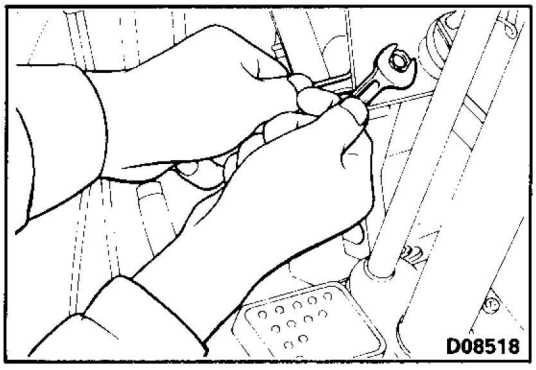
Items	Specified lubricants	Quantity
Fluid	Brake fluid SAE J1703 (or DOT3)	As required



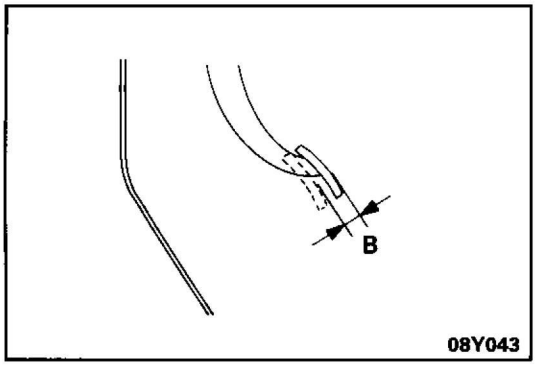
SERVICE ADJUSTMENT PROCEDURES E21FBAH

CLUTCH PEDAL INSPECTION AND ADJUSTMENT (CABLE TYPE)

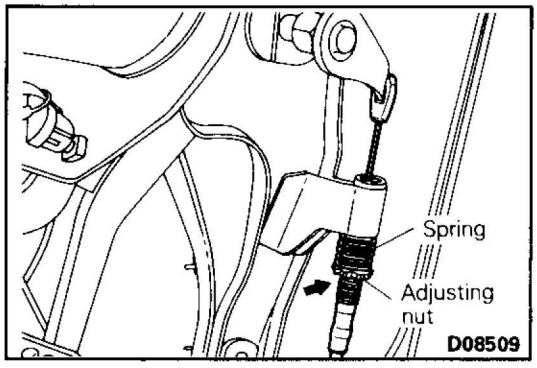
1. Measure the clutch pedal height (from the face of the pedal pad to the toeboard).
   Standard value (A): 244 – 249 mm (9.6 – 9.8 In.)



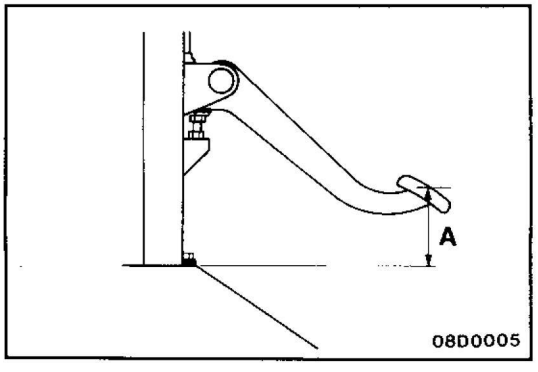
2. If the clutch pedal height is not within the standard value, adjust the clutch pedal height by using the adjusting bolt to obtain the standard value.



3. Measure the clutch pedal free play.
   Standard value (B): 20 – 35 mm (0.8 – 1.4 in.)

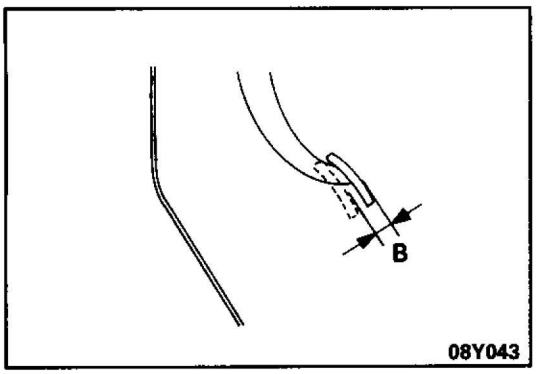


4. If the clutch pedal free play is not within the standard value, turn the outer cable adjusting nut at the toeboard and adjust the clutch cable free play to within the range.
5. After adjustment, use spring to lock the adjusting nut.

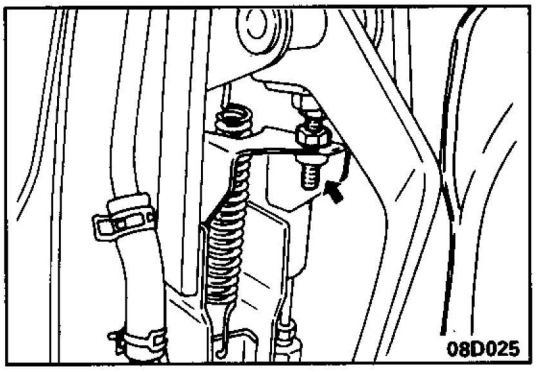


CLUTCH PEDAL INSPECTION AND ADJUSTMENT (HYDRAULIC TYPE) E21FAAM

1. Measure the clutch pedal height and the clutch pedal clevis pin play (measured at the face of the pedal pad.)
   Standard value (A): 75 – 80 mm (3.0 – 3.1 in.)

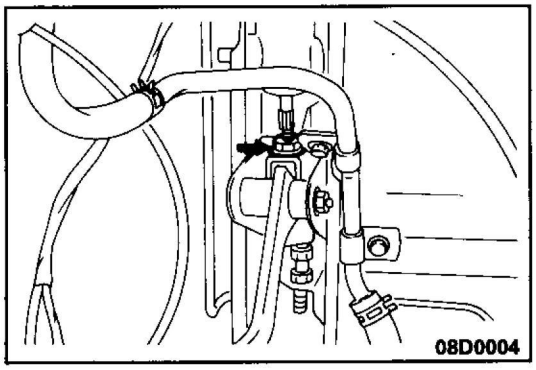


Standard value (B): 0 – 3 mm (0 – 0.12 In.)



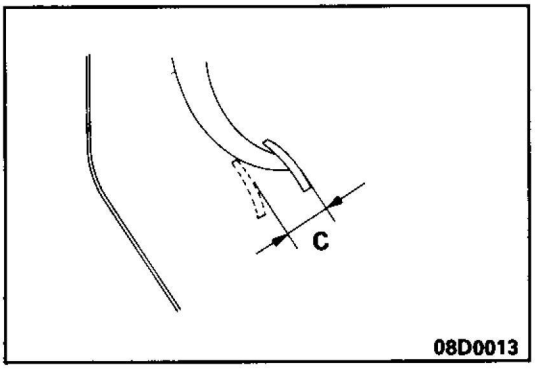
2. If either the clutch pedal height or the clutch pedal clevis pin play are not within the standard value range, adjust as follows;
   (1) Turn and adjust the bolt so that the pedal height is the standard value, and then secure by tightening the lock nut.

   NOTE
   When the pedal height is lower than the standard value, loosen the bolt, and then turn the push rod to make the adjustment. After making the adjustment, tighten the bolt to reach the pedal stopper, and then lock with the lock nut.



   (2) Turn the push rod to adjust the clutch pedal clevis pin play to agree with the standard value and then secure the push rod with the lock nut.

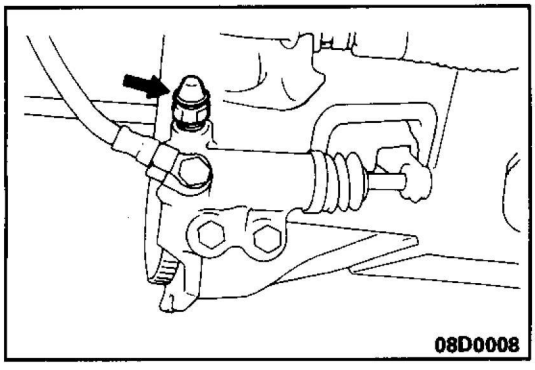
   Caution
   When adjusting the pedal helght or the clutch pedal clevis pin play, be careful not to push the push rod toward the master cylinder.



3. After completing the adjustment, confirm that the clutch pedal free play (measured at the face of the pedal pad) are within the standard value ranges.

   Standard value (C): 8 – 15 mm (0.31 – 0.59 in.)

4. If the clutch pedal free play do not agree with the standard values, it is probably the result of either air in the hydraulic system or a faulty master cylinder or clutch. Bleed the air, or disassemble and inspect the master cylinder or clutch.



BLEEDING E21FEAB

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

Specified fluid: SAE J1703 (or DOT3)

Caution
Use the specified fluid. Avoid using a mixture of the specified fluid and other fluid.

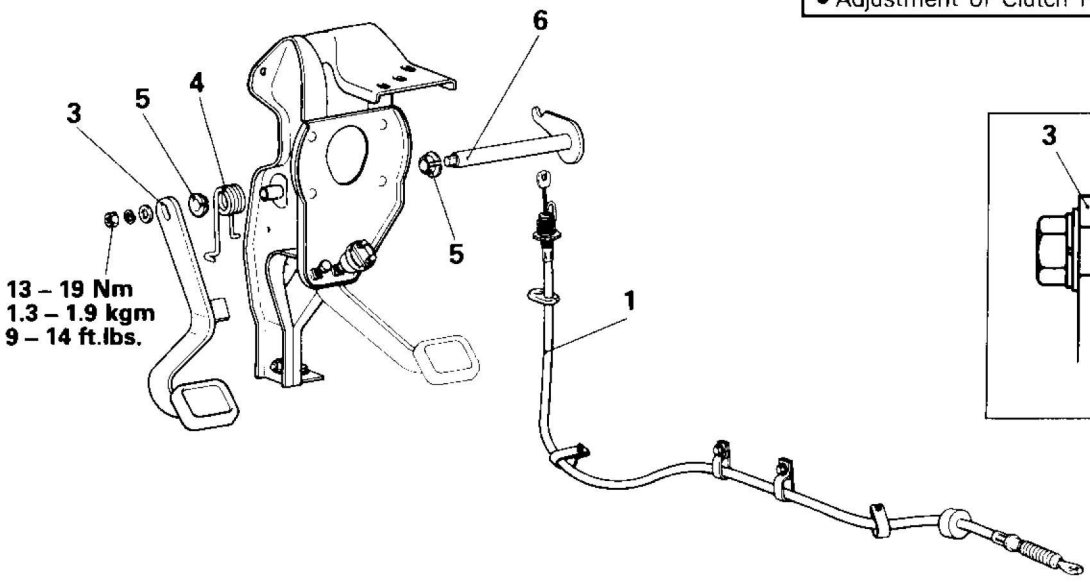
CLUTCH PEDAL <CABLE TYPE>

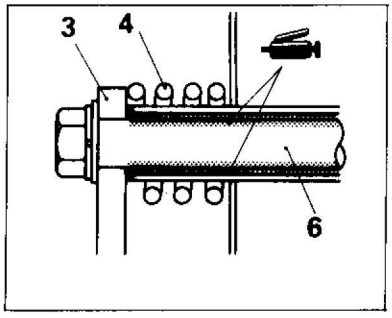
REMOVAL AND INSTALLATION

E21PA-A

Pre-removal Operation and Post-installation Operation
- Removal and Installation of Air Guid Panel
- Removal and Installation of Undercover
- Adjustment of Clutch Pedal (Refer to P. 21-3.)

L.H. drive vehicles





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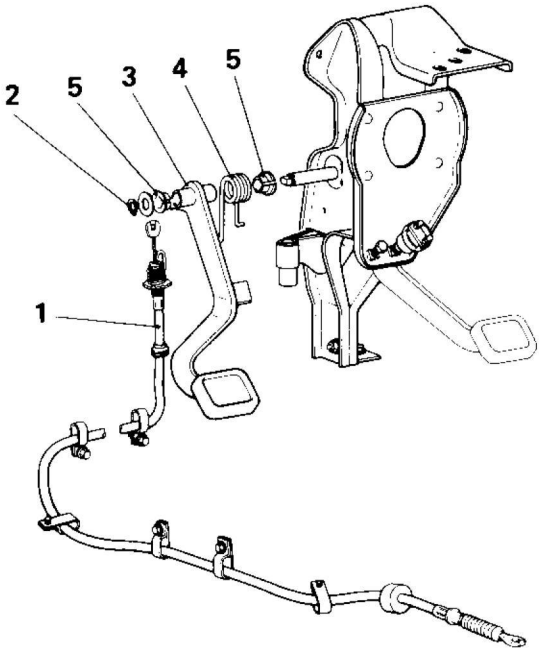
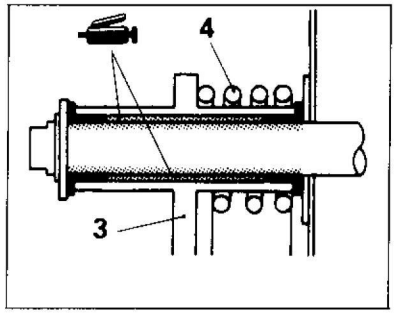
R.H. drive vehicles





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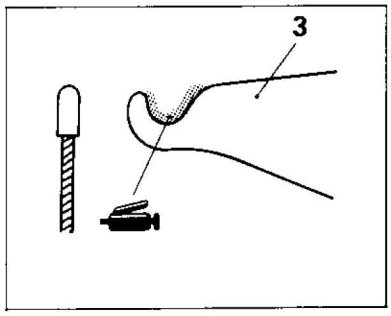


Removal steps

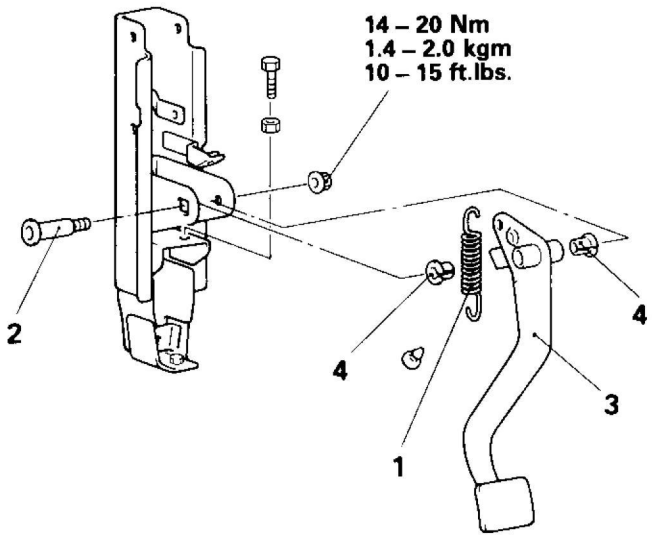
1. Clutch cable
2. Snap ring
3. Clutch pedal
4. Return spring
5. Bushing
6. Clutch pedal shaft

CLUTCH PEDAL <HYDRAULIC TYPE>

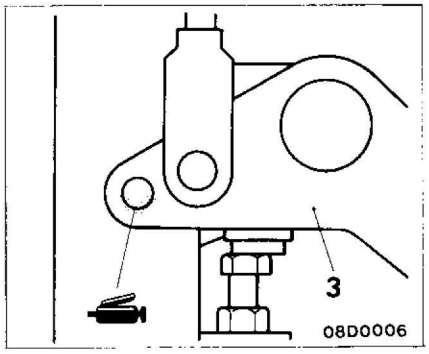
E21PA-B

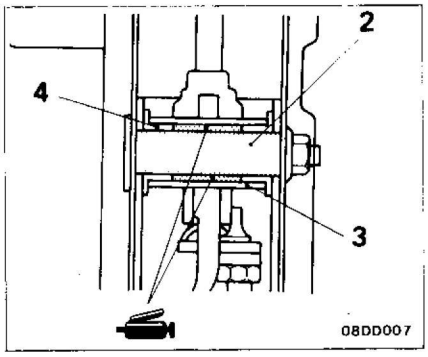
REMOVAL AND INSTALLATION

Post-installation Operation
- Adjustment of Clutch Pedal (Refer to P. 21-3.)



08D0010





Removal steps

1. Return spring
2. Clutch pedal shaft
3. Clutch pedal
4. Bushing

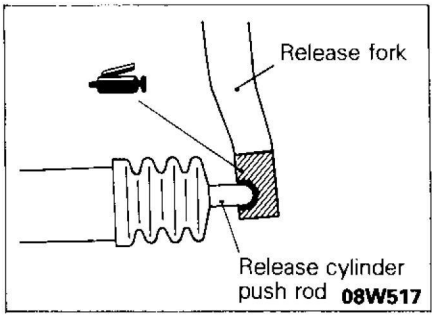
CLUTCH CONTROL <HYDRAULIC TYPE>

E21JA--

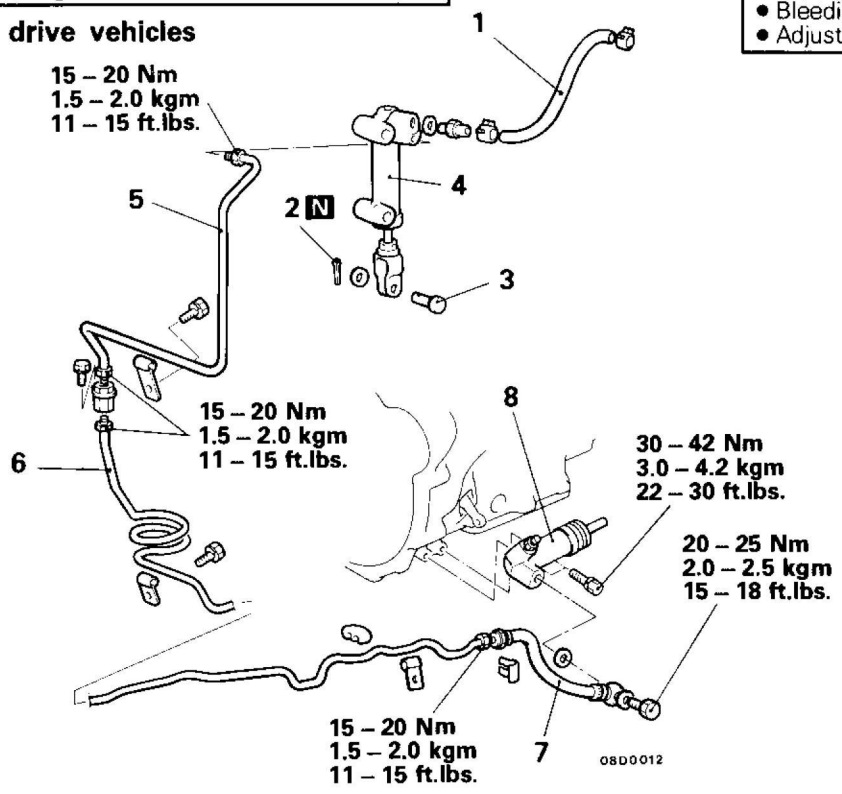
REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of Air Guid Panel
- Removal of Undercover
- Draining of Clutch Fluid

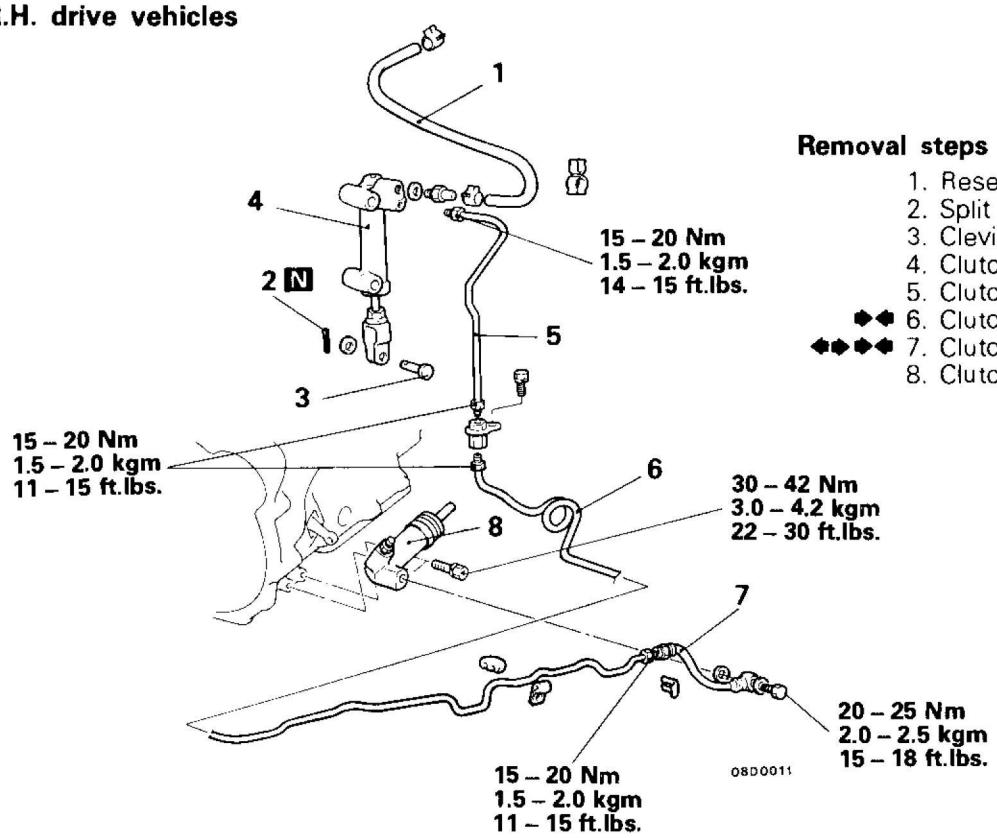
Post-installation Operation
- Installation of Undercover
- Installation of Air Guid Panel
- Supplying Clutch Fluid
- Bleeding (Refer to P. 21-4.)
- Adjustment of Clutch Pedal (Refer to P. 21-3.)



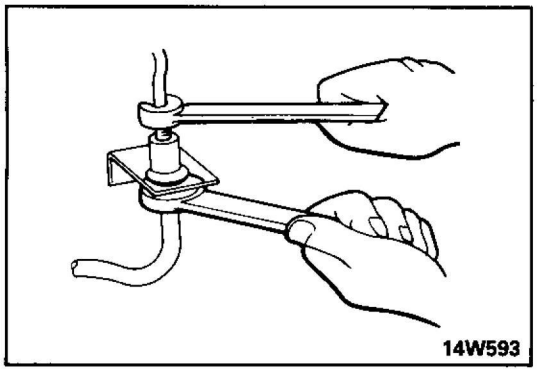
L.H. drive vehicles



R.H. drive vehicles



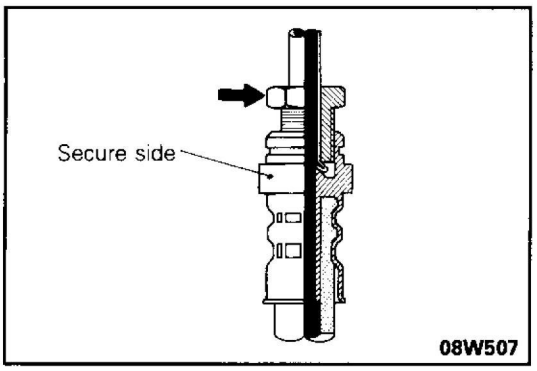
Removal steps
1. Reservoir hose
2. Split pin
3. Clevis pin
4. Clutch master cylinder assembly
5. Clutch tube
◆◆ 6. Clutch tube
◆◆◆◆ 7. Clutch hose
8. Clutch release cylinder



SERVICE POINTS OF REMOVAL E21JBBC

7. REMOVAL OF CLUTCH HOSE

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

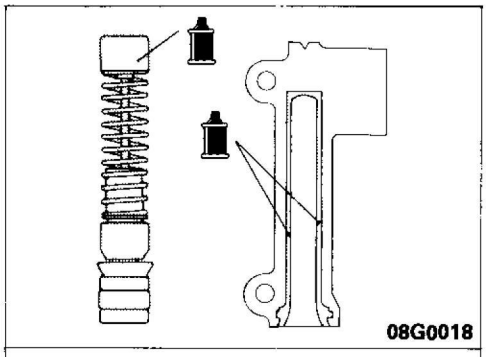


SERVICE POINTS OF INSTALLATION E21JDBFa

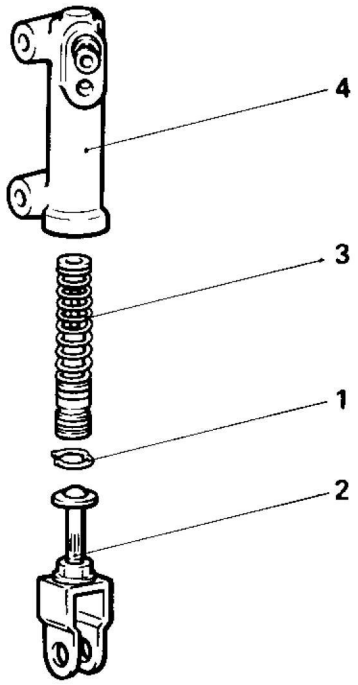
7. INSTALLATION OF CLUTCH HOSE/6. CLUTCH TUBE

Temporarily tighten the flare nut by hand, and then tighten it to the specified torque, being careful that the clutch hose does not become twisted.

DISASSEMBLY AND REASSEMBLY E21SE--



Brake fluid SAE J1703 (or DOT3)



Disassembly steps

1. Piston stopper ring
2. Push rod
3. ◆◆ Piston assembly
4. Clutch master cylinder

SERVICE POINTS OF DISASSEMBLY E21SFAF

3. REMOVAL OF PISTON ASSEMBLY

Caution

1. **Do not damage the master cylinder body and piston assembly.**
2. **Do not disassemble piston assembly.**

MANUAL TRANSMISSION

CONTENTS

E22AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E22CA--

Items	Vehicles with 4G32 engine	Vehicles with 4D56 engine
Transmission model	R5M21-3-CDW	R5M21-3-PC
Type	5-speed, column-shift	5-speed, column-shift
Gear ratio		
1st	3.967	4.330
2nd	2.136	2.355
3rd	1.360	1.509
4th	1.000	1.000
5th	0.856	0.827
Reverse	3.578	4.142
Final gear ratio	4.625	4.222
Speedometer gear ratio (driven/drive)	18/5	18/5

SERVICE SPECIFICATIONS

E22CB--

Items		Specifications
Standard value		
Distance between change lever knob and instrument panel	mm (in.)	
L.H.drive vehicles		120 – 130 (4.72 –5.11)
R.H.drive vehicles		160 – 170 (6.30 – 6.70)
Distance between change lever knob and steering wheel	mm (in.)	
L.H.drive vehicles		80 – 90 (3.15 – 3.54)
R.H.drive vehicles		95 – 105 (3.74 – 4.13)
Column support to support guide clearance	mm (in.)	1.2 – 2.2 (0.047 – 0.087)

TORQUE SPECIFICATIONS

E22CC--

Items	Nm	kgm	ft.lbs.
Filler plug	30 – 35	3.0 – 3.5	22 – 25
Transmission drain plug	35 – 45	3.5 – 4.5	25 – 33
Selector cable installing nut <R.H. drive vehicles>	4	0.4	3
Gear shift selector bracket installing bolt	15 – 24	1.5 – 2.4	11 – 17
Propeller shaft installing bolt	50 – 60	5.0 – 6.0	36 – 43
Exhaust pipe clamp bolt	20 – 30	2.0 – 3.0	14 – 22
Rear engine mounting bracket to body	30 – 42	3.0 – 4.2	22 – 30
Rear engine insulator to rear engine mounting bracket	30 – 42	3.0 – 4.2	22 – 30
Rear engine insulator to rear insulator support	18 – 25	1.8 – 2.5	13 – 18

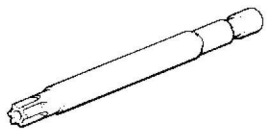
LUBRICANTS

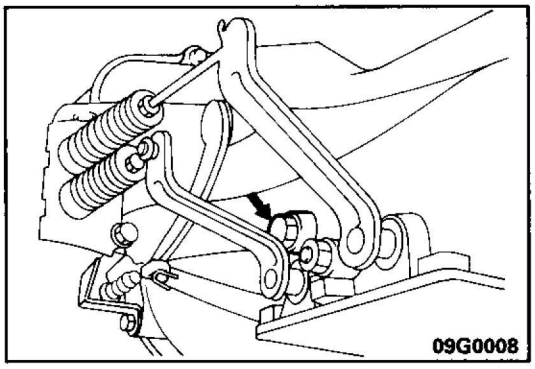
E22CD--

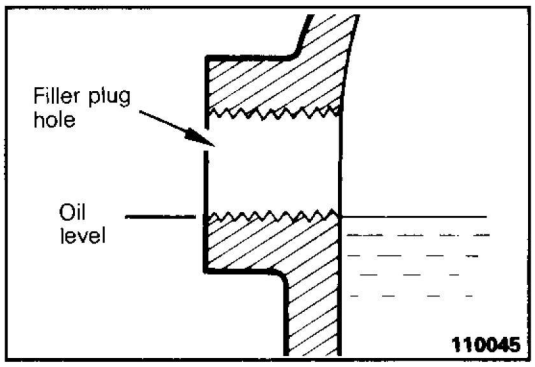
Items	Specified lubricant	Quantity lit. (US.qts., Imp.qts.)
Manual transmission	Hypoid gear oil SAE 80W or 75-85W conforming API GL-4 or higher	2.0 (2.0, 1.8)

SPECIAL TOOL

E22DA--

Tool	Number	Name	Use
	MB990826	Torx wrench	Removal of steering column installation special screw





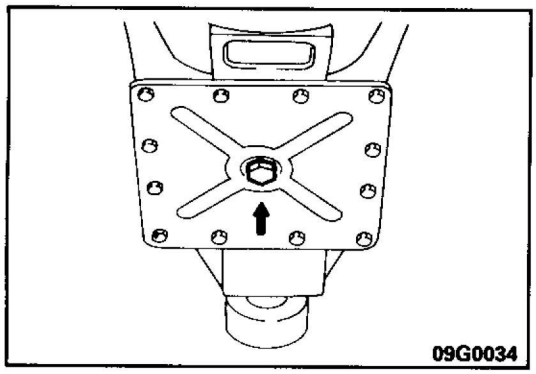
SERVICE ADJUSTMENT PROCEDURES

E22FDABa

OIL LEVEL CHECK

1. Remove filler plug and check oil level.
2. Oil level should be at the lower portion of the filler plug hole.
3. Tighten filler plug to specified torque.

Tightening torque: 30 – 35 Nm (3.0 – 3.5 kgm, 22 – 25 ft.lbs.)



CHANGING OIL

1. Remove transmission drain plug.
2. Drain oil.
3. Tighten drain plug to specified torque.

   Tightening torque: 35 – 45 Nm (3.5 – 4.5 kgm, 25 – 33 ft.lbs.)

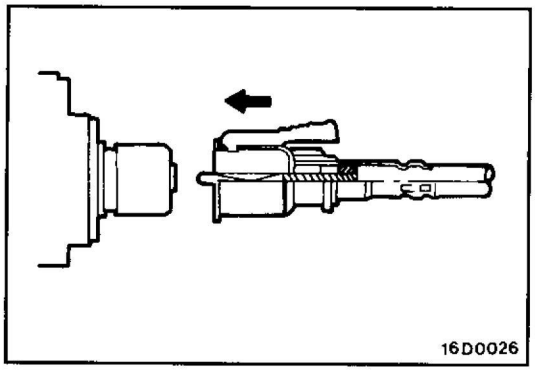
4. Remove filler plug and fill with specified oil till the level comes to the lower portion of filler plug hole.

   Specified transmission oil:
   Hypoid gear oil SAE 80W or 75-85W conforming to API GL-4 or higher

   Quantity: 2.0 lit. (2.1 U.S.qts., 1.8 Imp.qts.)

5. Tighten filler plug to specified torque.

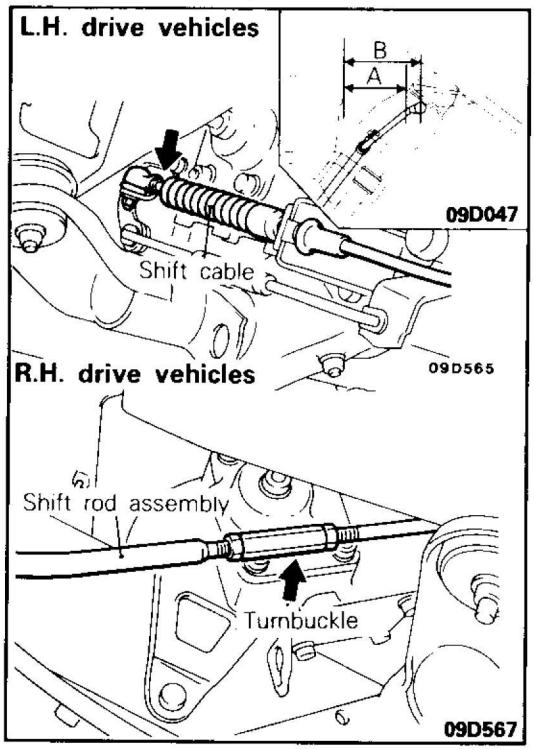
   Tightening torque: 30 – 35 Nm (3.0 – 3.5 kgm, 22 – 25 ft.lbs.)



SPEEDOMETER CABLE REPLACEMENT E22FCBG

(1) Replace the cable assembly if there is a malfunction.
(2) When connecting the cable to the meter, insert the cable until its stopper properly fits to the meter side groove.

Caution
Poor installation of the cable may cause a fluctuating meter pointer, or noise and a damaged harness inside the instrument panel.



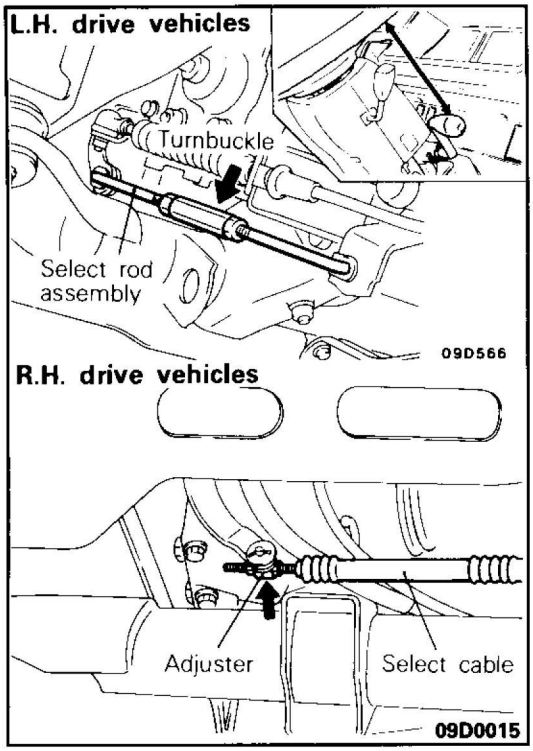
CHECKING AND ADJUSTMENT OF CHANGE LEVER POSITION E22FEAB

DISTANCE BETWEEN CHANGE LEVER KNOB AND INSTRUMENT PANEL

Check to be sure that, while in neutral but with the change lever knob closest to the 3rd gear side, the distance between the small end of the change lever knob (A) [knob centre (B) for R.H. drive vehicles] and the instrument panel is the standard value.

- L.H. drive vehicles
  Loosen the ball joint installation nut (at the end of the shift cable); then trun the ball joint to make the adjustment.
- R.H. drive vehicles
  Loosen the lock nut for the shift rod assembly turnbuckle; then turn the turnbuckle to make the adjustment.

Standad value:
L.H. drive vehicles (A): 120 – 130 mm (4.72 – 5.11 in.)
R.H. drive vehicles (B): 160 – 170 mm (6.30 – 6.70 in.)



DISTANCE BETWEEN CHANGE LEVER KNOB AND STEERING WHEEL

Check to be sure that, while in neutral, the distance between the centre of the change lever and the lower surface of the steering wheel is the standard value. If it is not the standard value, adjust by following the steps below.

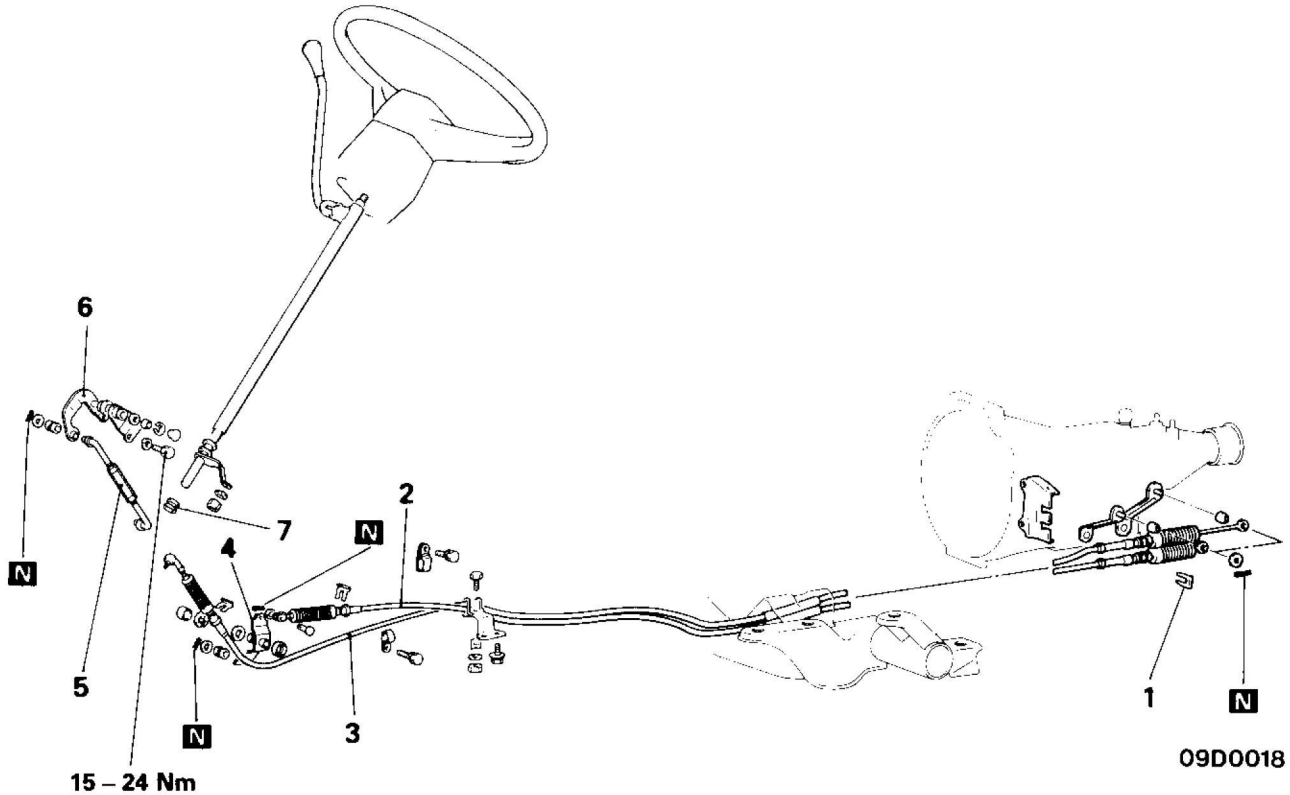
- L.H. drive vehicles
  Loosen the lock nut for the select rod assembly turnbuckle; then turn the turnbuckle to make the adjustment.
  Standard value: 80 – 90 mm (3.15 – 3.54 in.)
- R.H. drive vehicles
  Loosen the lock nut for the adjuster (at the end of the select cable); then move the adjuster to make the adjustment.
  Standard value: 95 – 105 mm (3.74 – 4.13 in.)

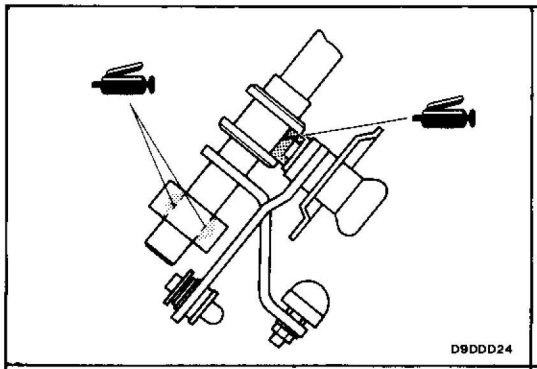
TRANSMISSION CONTROL

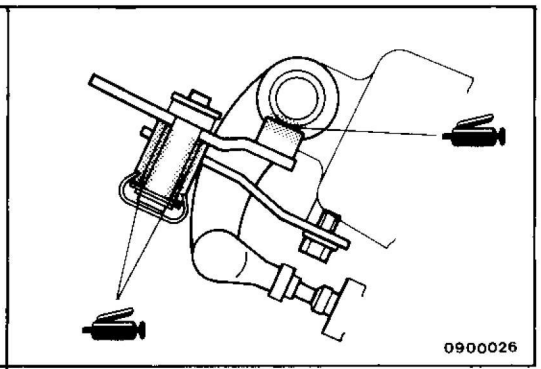
E22HA--0

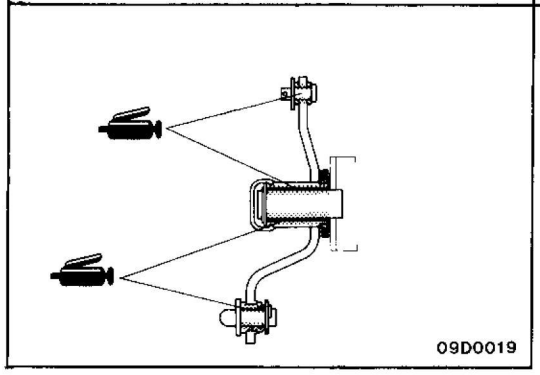
REMOVAL AND INSTALLATION (Control cable, selector lever bracket)

<L.H. drive vehicles>





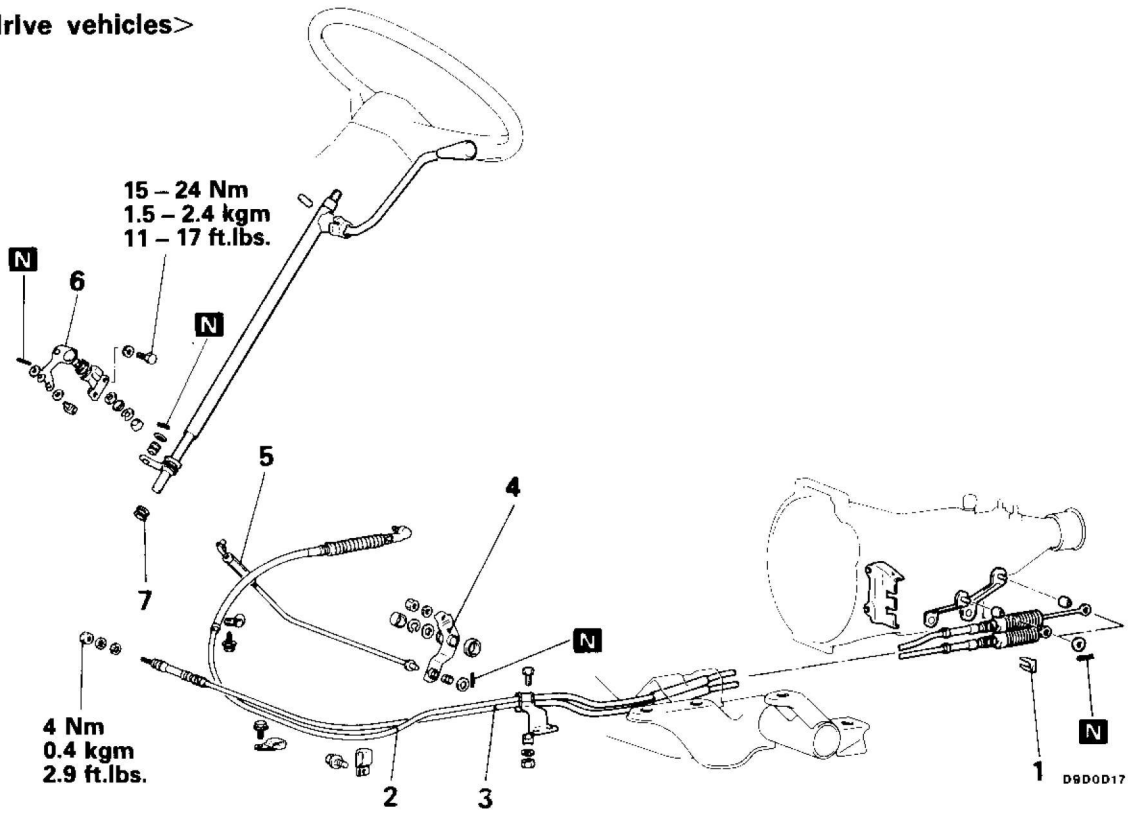


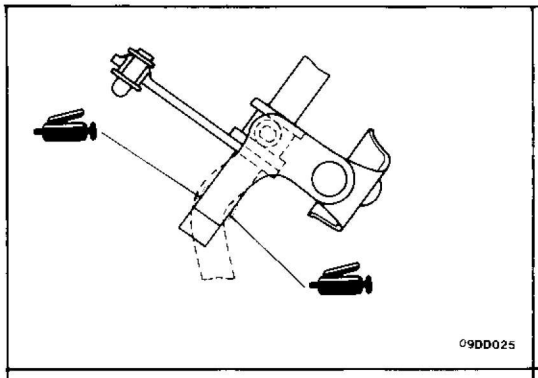


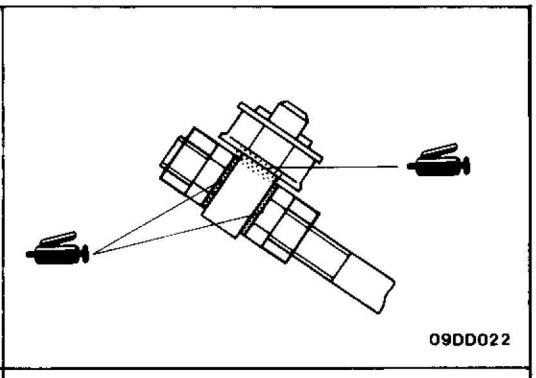
Removal steps

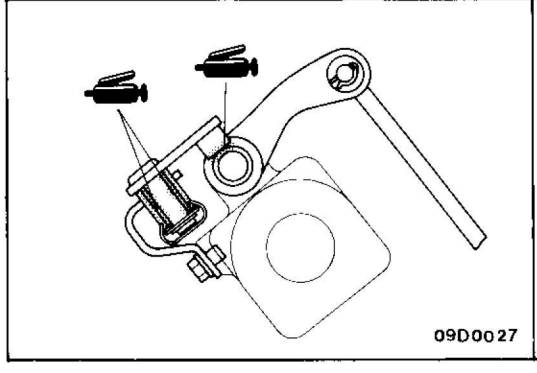
- ◆◆ 1. Clip
- ◆◆ 2. Selector control cable
- ◆◆ 3. Shift control cable
- 4. Selector lever
- 5. Shift rod
- 6. Shift lever
- 7. Bushing

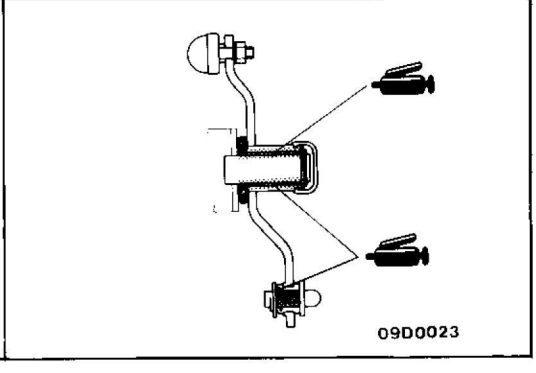
<R.H. drive vehicles>





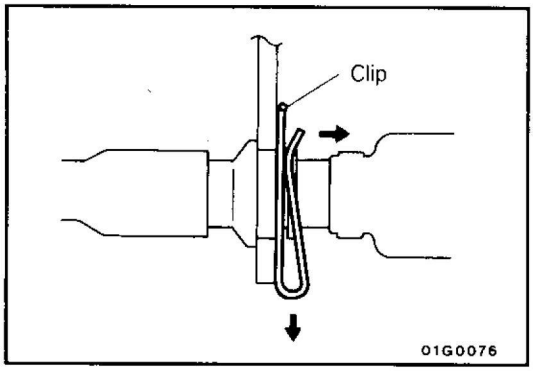






Removal steps

◆◆ 1. Clip
◆◆ 2. Selector control cable
◆◆ 3. Shift control cable
4. Selector lever
5. Shift rod
6. Selector lever
7. Bushing

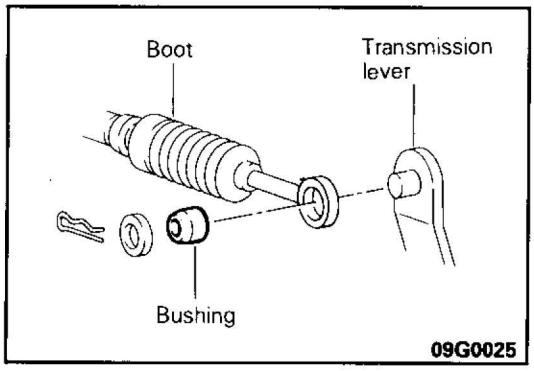


SERVICE POINTS OF REMOVAL

EE22HBAAa

1. REMOVAL OF CLIP

Expand the end and remove clip.



SERVICE POINTS OF INSTALLATION

E22GDAC

3. INSTALLATION OF SELECTOR CONTROL CABLE/2. SHIFT CONTROL CABLE

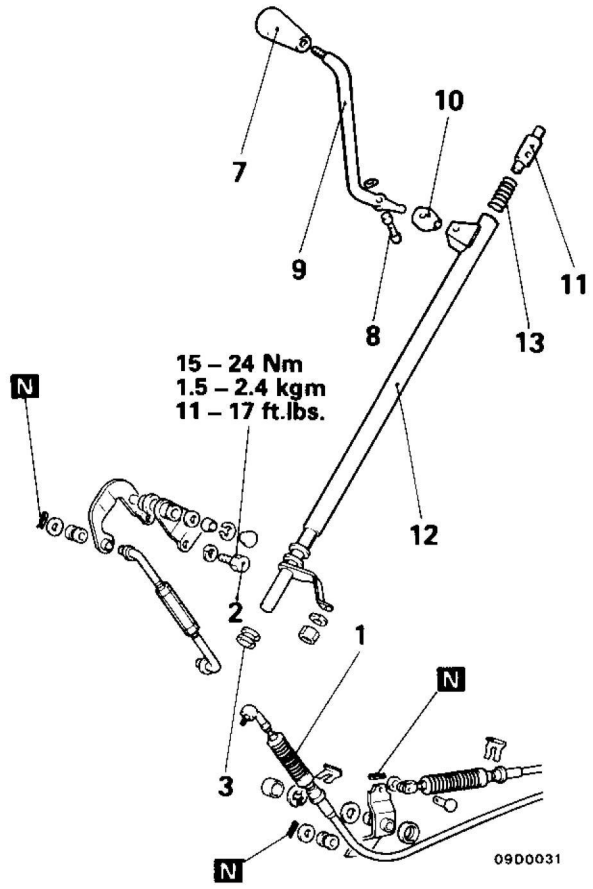
(1) Assemble bush in the direction shown in the figure.
(2) Be careful not to twist the boot when assembling.

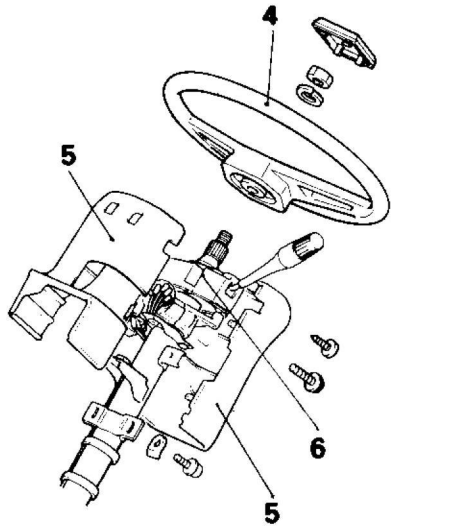
REMOVAL AND INSTALLATION (Change lever, control rod)

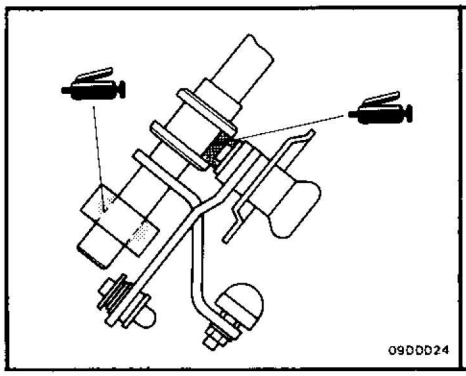
E22HA--1

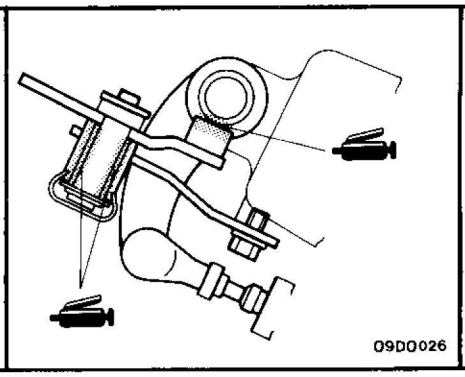
<L.H. drive vehicles>

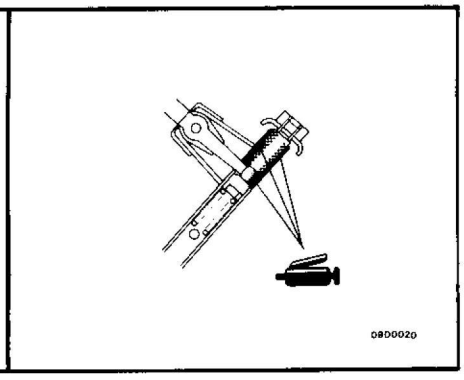
Post-installation Operation
- Checking Shift Lever Operating Condition.









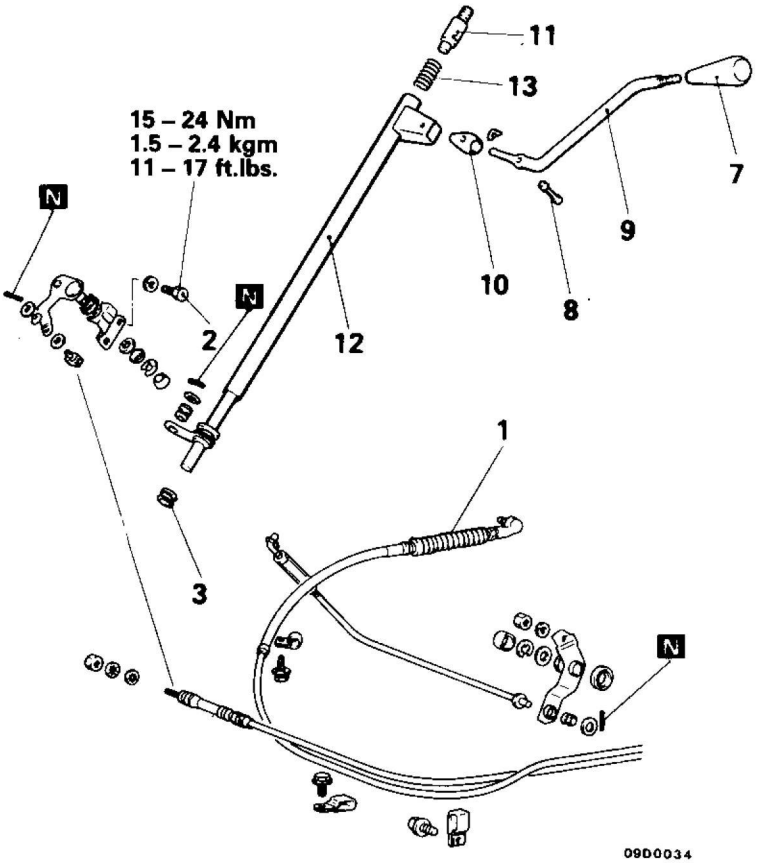


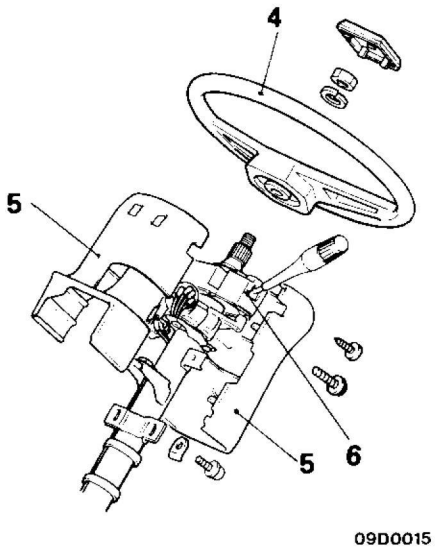
Removal steps

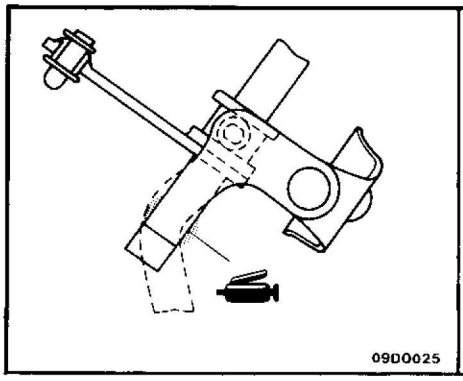
1. Selector control cable
2. Bolt
3. Bushing
◆◆ 4. Steering wheel
5. Column cover
6. Column switch (Refer to Group 37 – Steering Column and Shaft.)
7. Knob
8. Pin
9. Change lever
10. Change lever support cover
◆◆ 11. Change lever guide
12. Control rod
13. Spring

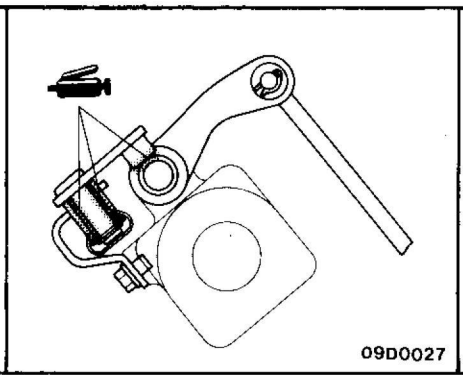
<R.H. drive vehicles>

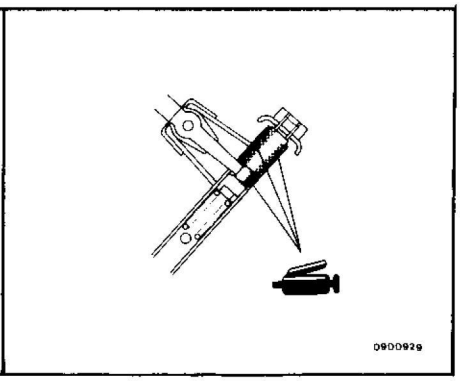
Post-installation Operation
- Checking Shift Lever Operating Condition.





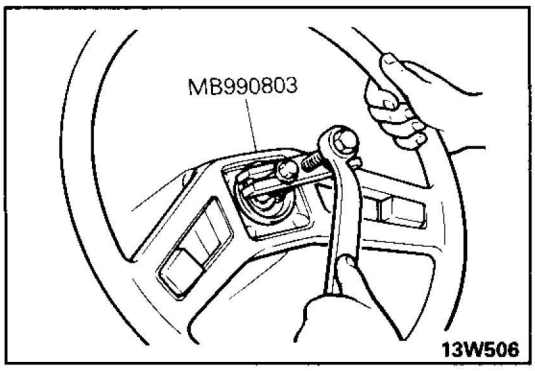






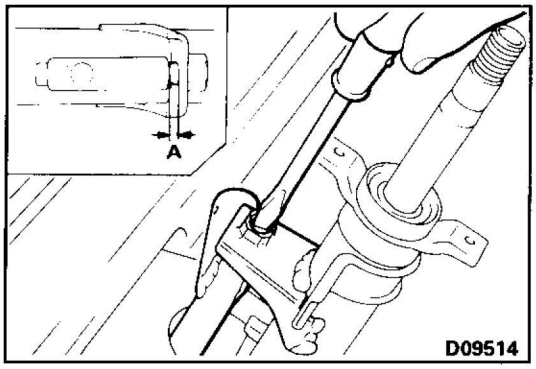
Removal steps

1. Selector control cable
2. Bolt
3. Bushing
4. Steering wheel
5. Column cover
6. Column switch
   (Refer to GROUP 37 – Steering Column and Shaft.)
7. Knob
8. Pin
9. Change lever
10. Change lever support cover
11. Change lever guide
12. Control rod
13. Spring



SERVICE POINTS OF REMOVAL E22HBAF

4. REMOVAL OF STEERING WHEEL ASSEMBLY



SERVICE POINTS OF INSTALLATION E22HDAL

11. INSTALLATION OF CHANGE LEVER GUIDE

(1) Screw in the change lever guide fully to the control rod.
(2) Adjust clearance "A" to the standard value by turning the change lever guide clockwise as illustrated.

Standard value: 1.2 – 2.2 mm (0.047 – 0.087 In)

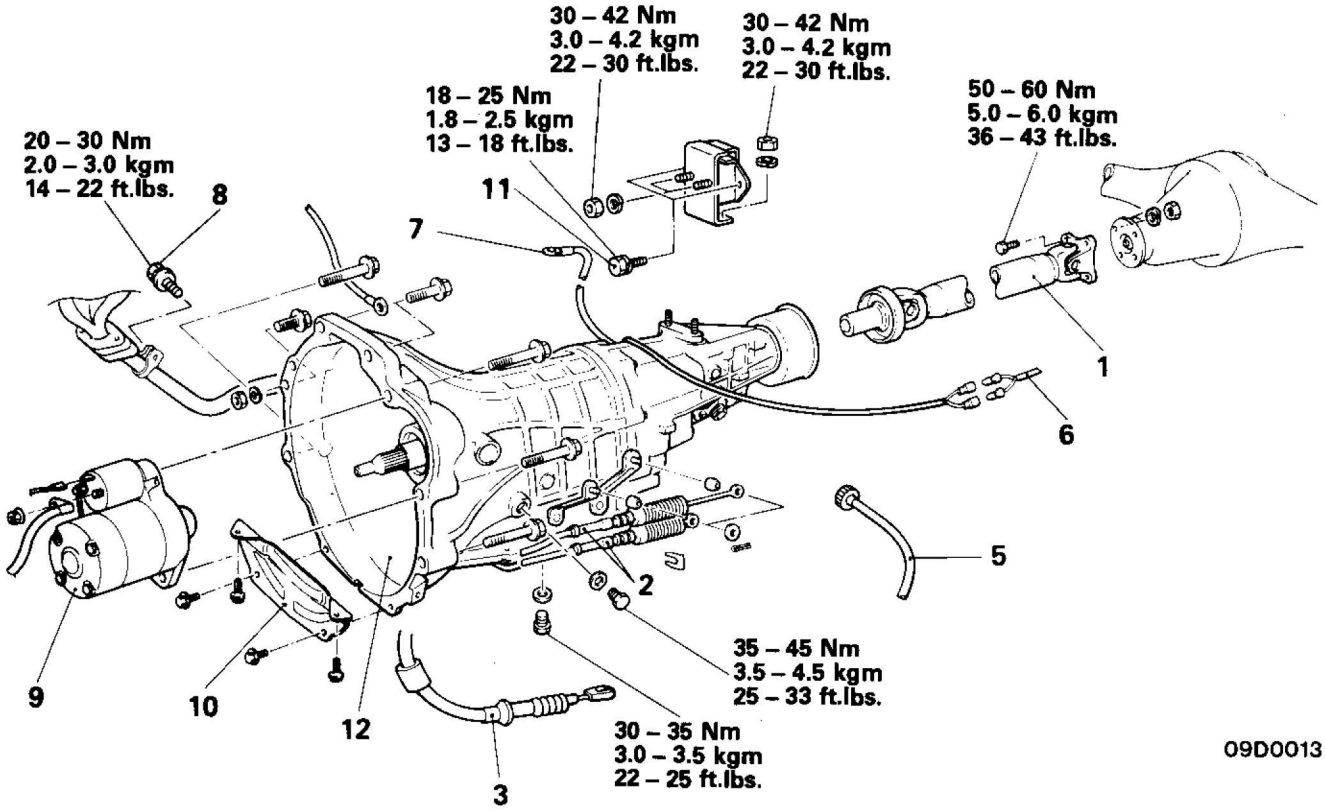
(3) Make certain that the hole in the change lever guide is in line with the hole in the control rod.
(4) If the holes do not align, turn the change lever guide anticlockwise until the holes line up.

TRANSMISSION ASSEMBLY

E22JA--

REMOVAL AND INSTALLATION

<Vehicles with 4G32 engine>



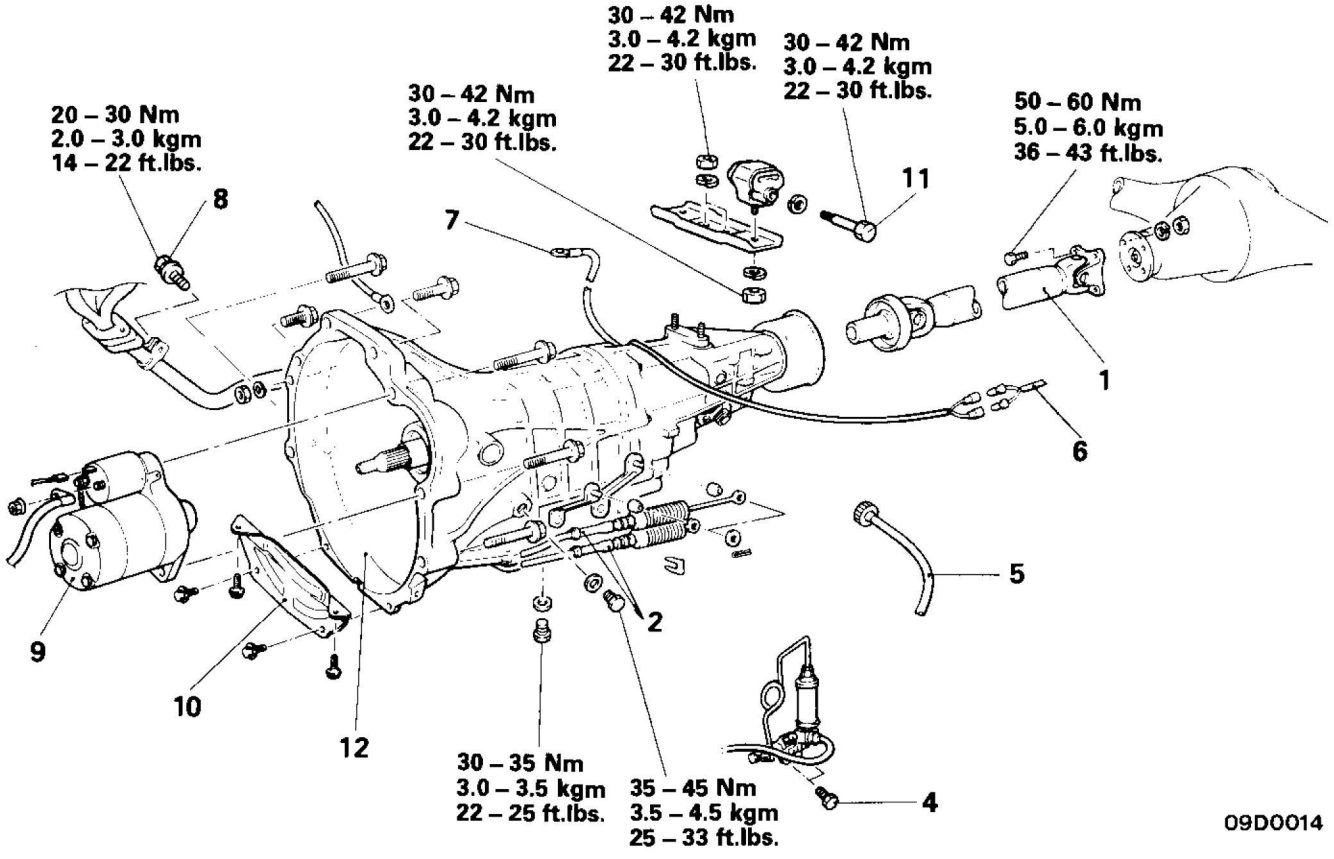
Removal steps

1. Propeller shaft
2. Shift control cable connection
3. Clutch cable connection
5. Speedometer cable connection
6. Back-up lamp harness connection
7. Earth cable
8. Exhaust pipe clamp bolt
9. Starter motor
10. Bell housing cover
11. Transmission mounting bolt
12. Transmission assembly

Pre-removal Operation
- Draining Transmission Oil (Refer to P.22-4.)

Post-installation Operation
- Filling Transmission Oil (Refer to P.22-4.)
- Confirmation of Clutch Operation (Refer to GROUP 21 – Service Adjustment Procedures.)
- Confirmation of Shift Lever Operating Condition
- Confirmation of All Gauge Operations

<Vehicles with 4D56 engine>

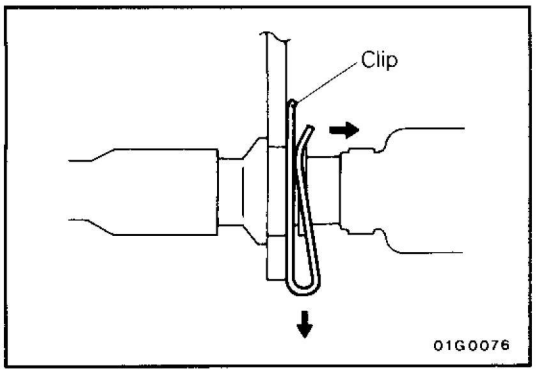


Removal steps

- 1. Propeller shaft
- ◆◆ 2. Shift control cable connection
- 4. Release cylinder and oil chamber installing bolts
- 5. Speedometer cable connection
- 6. Back-up lamp harness connection
- 7. Earth cable
- 8. Exhaust pipe clamp bolt
- 9. Starter motor
- 10. Bell housing cover
- 11. Transmission mounting bolt
- ◆◆ 12. Transmission assembly

Pre-removal Operation
- Draining Transmission Oil (Refer to P.22-4.)

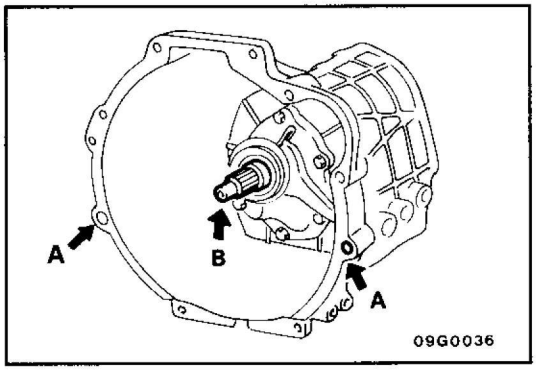
Post-installation Operation
- Filling Transmission Oil (Refer to P.22-4.)
- Confirmation of Clutch Operation (Refer to GROUP 21 – Service Adjustment Procedures.)
- Confirmation of Shift Lever Operating Condition
- Confirmation of All Gauge Operations



SERVICE POINTS OF REMOVAL E22JBBB0a

2. DISCONNECTION OF SHIFT CONTROL CABLE

Expand end and remove clip.



SERVICE POINTS OF INSTALLATION E22JDAB0

12. INSTALLATION OF TRANSMISSION

(1) Match knock pin with A hole and secure tightly to engine.
(2) Insert B along spline on clutch side.

PROPELLER SHAFT

CONTENTS

E25AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E25CA--

Items		Petrol-powered vehicles	Diesel-powered vehicles
Propeller shaft			
Type		2-joint type	2-joint type
Length × O.D.	mm (in.)	656 × 65 (25.8 × 2.56)	549 × 75 (21.6 × 2.95)
Universal joint			
Type		Cross type	
Bearing		Lubrication-free needle roller bearing	
Journal O.D.	mm (in.)	14.7 (0.58)	

SERVICE SPECIFICATIONS

E25CB--

Items		Specifications
Standard Value		
Journal axial play	mm (in.)	0 – 0.06 (0 – 0.0024)
Limit		
Propeller shaft runout	mm (in.)	0.6 (0.02)

TORQUE SPECIFICATIONS

E25CC--

Items	Nm	kgm	ft.lbs.
Flange yoke attaching bolts	50 – 60	5.0 – 6.0	36 – 43

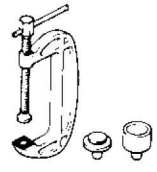
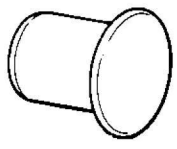
LUBRICANT

E25CD--

Item	Specified lubricant	Quantity
Sleeve yoke	Hypoid gear oil SAE 75W – 85W or 75W – 90 conforming to API GL-4 or higher	As required

SPECIAL TOOLS

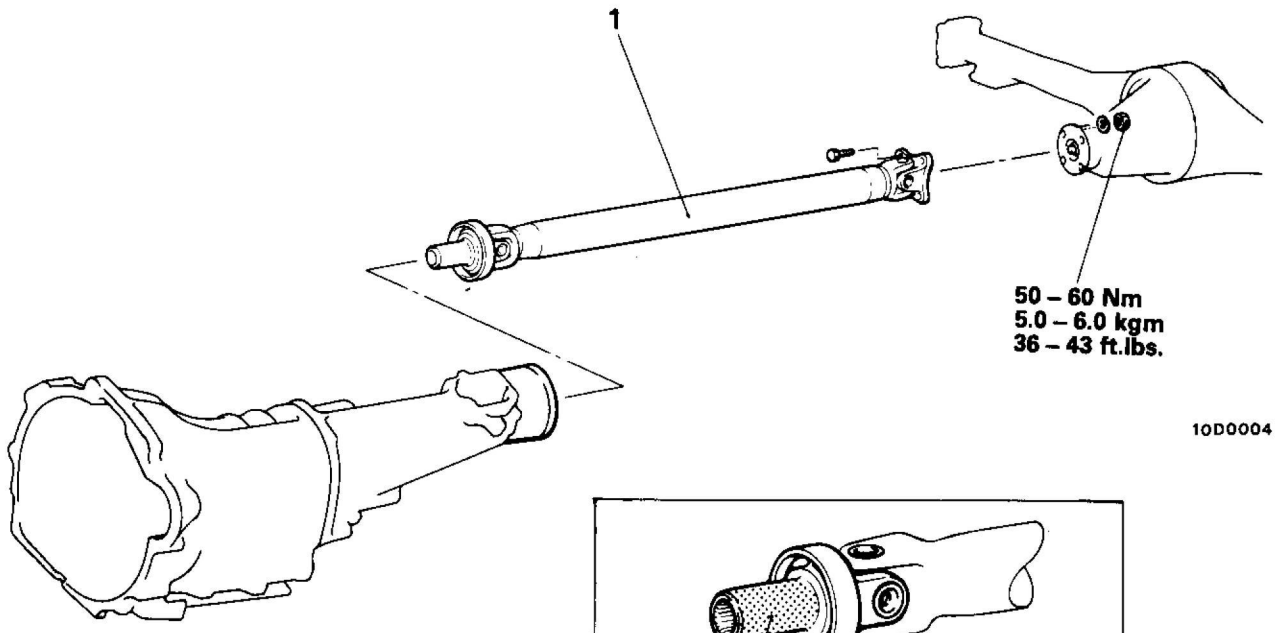
E25DA--

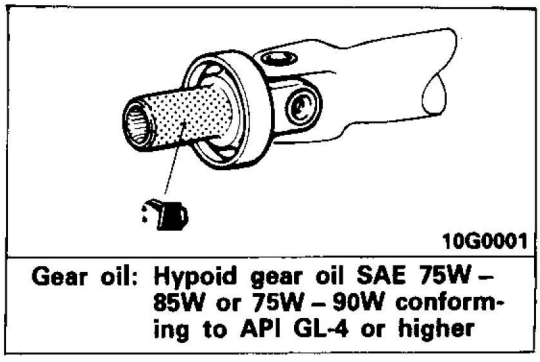
Tool	Number	Name	Use
	MB990840	Universal joint remover/installer	Disassembly and reassembly of universal joint
	MB991193	Plug	Preventing foreign substances from entering transmission

PROPELLER SHAFT

E25GA--

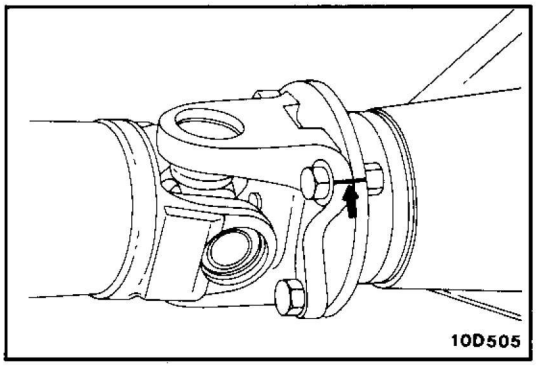
REMOVAL AND INSTALLATION

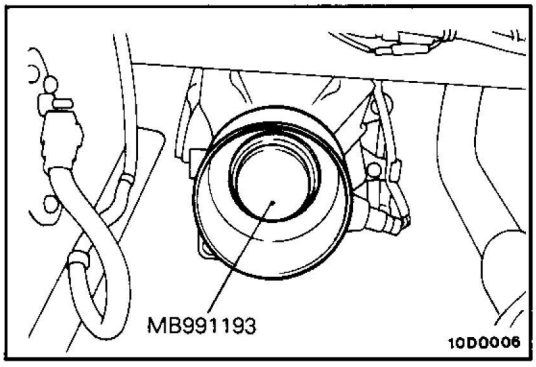




Gear oil: Hypoid gear oil SAE 75W – 85W or 75W – 90W conforming to API GL-4 or higher

◆◆◆◆ 1. Propeller shaft



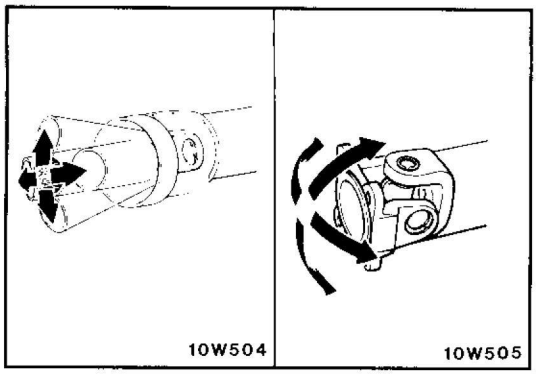


SERVICE POINTS OF REMOVAL

E25GBAFa

1. REMOVAL OF PROPELLER SHAFT

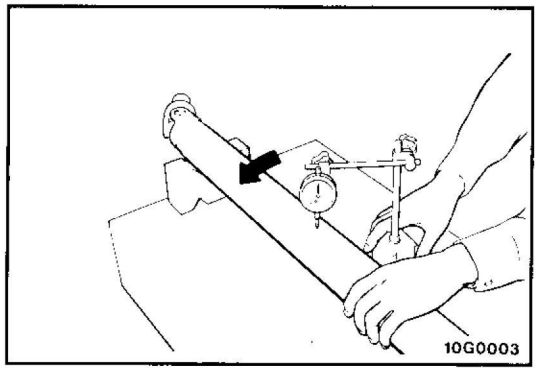
Make mating marks on the flange yoke and the differential companion flange.



INSPECTION

E25GCAFa

Check the universal joints for smooth operation in all directions.



PROPELLER SHAFT RUNOUT

Measure the propeller shaft runout with a dial indicator.

Limit: 0.6 mm (0.02 in.)

SERVICE POINTS OF INSTALLATION

E25GDAGa

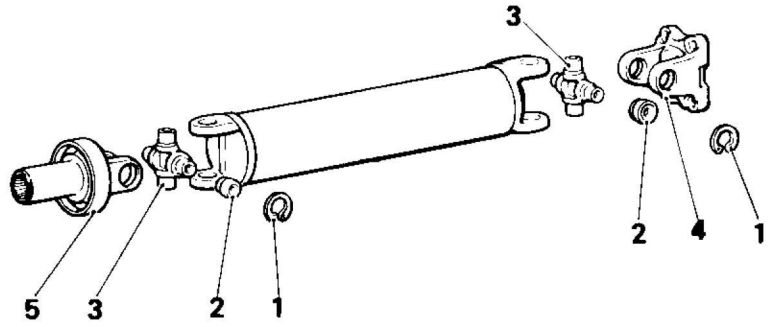
1. INSTALLATION OF PROPELLER SHAFT

Caution

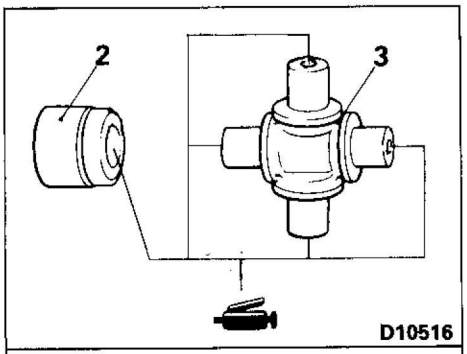
If the threads of the bolts and nuts are stained with oil or grease, they can become loose. Completely remove oil or grease from the threads before tightening the bolts and nuts.

DIASSEMBLY AND REASSEMBLY

E25GE--



1000005

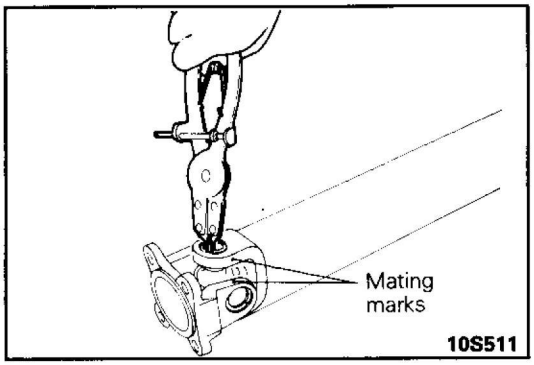


D10516

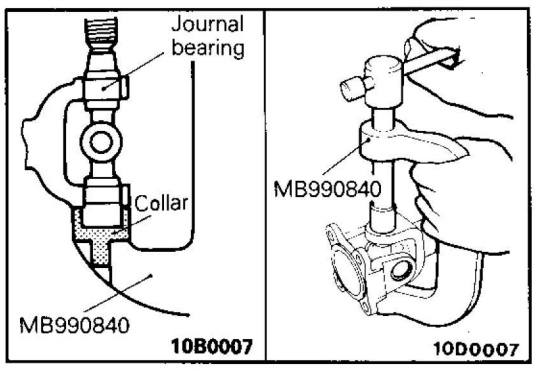
Caution
Do not apply grease excessively. Otherwise, faulty fitting of bearing caps and errors in the selection of snap rings may result.

Disassembly steps

- ◆◆ Adjustment of journal end play
- ◆◆ 1. Snap ring
- ◆◆◆◆ 2. Journal bearing
- ◆◆ 3. Journal
- 4. Flange yoke
- 5. Sleeve yoke



10S511



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SERVICE POINTS OF DISASSEMBLY

E25GFAF

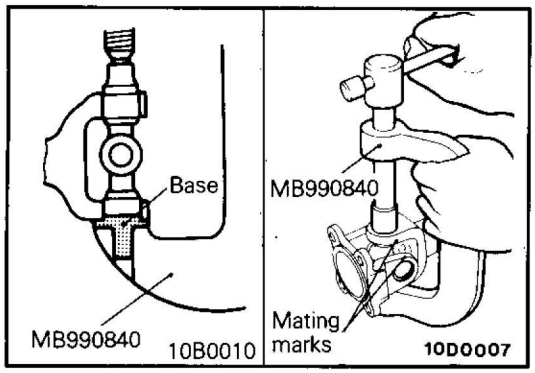
1. REMOVAL OF SNAP RING

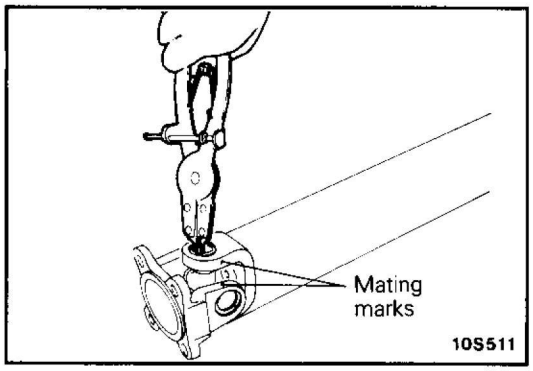
Make mating marks on the yokes of the universal joint that is to be disassembled.

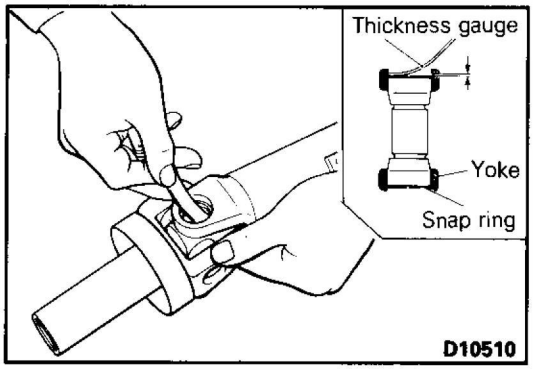
2. REMOVAL OF JOURNAL BEARING

Force out the journal bearings from the propeller shaft yoke with the special tool by the following procedures;

(1) Install collar to the special tool properly.
(2) Press the journal bearing by using the special tool to force out the journal bearing on opposite side.
(3) Remove the journal bearing from the yoke.
(4) Press the journal shaft using the special tool to remove the remaining bearing, and remove the yoke.







SERVICE POINTS OF REASSEMBLY E25GHAJ

3. REASSEMBLY OF JOURNAL/2.JOURNAL BEARING

Press fit the journal bearings to the yoke with the special tool according to the following procedures;

(1) Align the mating marks on the yoke and propeller shaft.
(2) Install the base to the special tool properly.
(3) Insert both bearings in the yoke, and hold and press fit them with the special tool.

NOTE
The guide of base stops the bearings at predetermined position.

ADJUSTMENT OF JOURNAL END PLAY

(1) Install the snap rings of the same thickness onto both sides of each yoke with the snap ring pliers.
(2) Press the bearing and journal into one side with the brass bar.

(3) Measure the clearance shown in the illustration with a thickness gauge. If the clearance exceeds the standard value, the snap rings should be replaced.

Standard value: 0 – 0.06 mm (0 – 0.0024 in.)

FRONT AXLE

CONTENTS

E26AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E26CA--

Items	Specifications
Wheel bearing	
Type	Tapered roller bearing
Dimensions (O.D. × I.D.) mm (in.)	
Outer	50 × 21 (1.97 × 0.83)
Inner	65 × 35 (2.56 × 1.38)

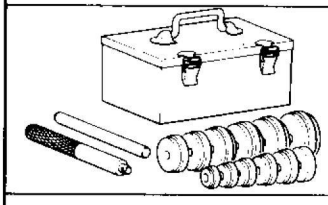
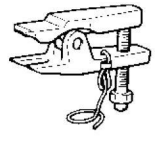
TORQUE SPECIFICATIONS

E26CC--

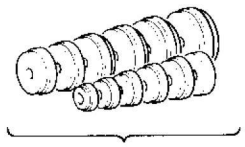
Items	Nm	kgm	ft.lbs.
Dust cover to caliper assembly	3 – 5	0.3 – 0.5	2 – 4
Knuckle to caliper assembly	80 – 100	8.0 – 10.0	58 – 72
Knuckle spindle to slotted nut	30→0→8	3.0→0→0.8	22→0→6
Front hub to brake disc	47 – 52	4.7 – 5.2	34 – 38
Knuckle to tie rod assembly	35 – 45	3.5 – 4.5	25 – 33
Knuckle to lower ball joint	120 – 180	12.0 – 18.0	87 – 130
Knuckle to upper ball joint	60 – 90	6.0 – 9.0	36 – 43
Brake tube flare nut	13 – 17	1.3 – 1.7	9 – 12
Lower arm to strut bar	15 – 20	1.5 – 2.0	11 – 14
Lower arm to stabilizer	70 – 85	7.0 – 8.5	51 – 61
Knuckle to dust cover	50–60	5.0 – 6.0	36 – 43

SPECIAL TOOLS

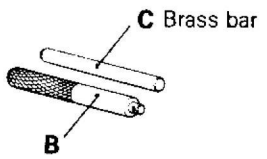
E26DE--

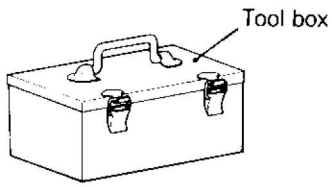
Tool	Number	Name	Use
	MB990925	Bearing and oil seal installer set	Pull-out of wheel bearing outer race MB990939 Press-fitting of the wheel bearing outer race MB990928, MB990933, MB990938 Press-fitting of the wheel bearing oil seal MB990936, MB990938
	MB991113	Steering linkage puller	Disconnection of the tie rod
	MB990804	Knuckle arm puller	Disassembly of upper/lower ball joint and knuckle

MB990925

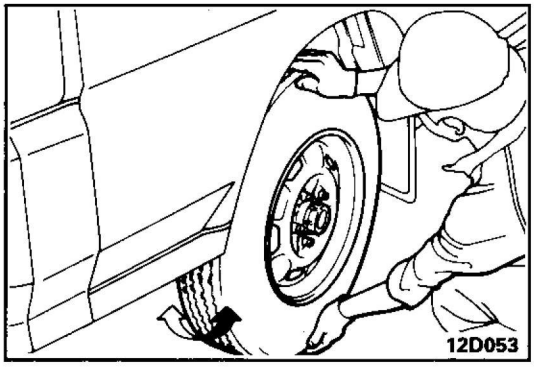


A Installer adapter





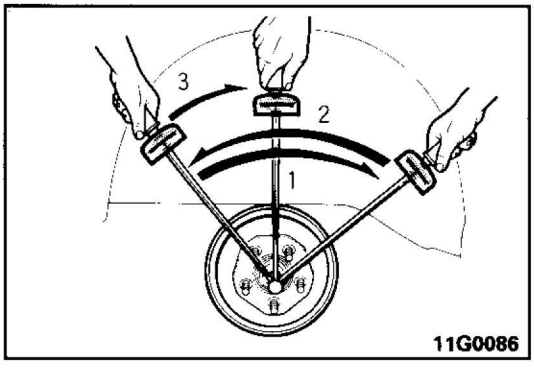
Type	Tool number	O.D. mm (in.)	Type	Tool number	O.D. mm (in.)
A	MB990926	39 (1.54)	A	MB990933	63.5 (2.50)
	MB990927	45 (1.77)		MB990934	67.5 (2.66)
	MB99092B	49.5 (1.95)		MB990935	71.5 (2.81)
	MB990929	51 (2.01)		MB990936	75.5 (2.97)
	MB990930	54 (2.13)		MB990937	79 (3.11)
	MB990931	57 (2.24)	B	MB990938	–
	MB990932	61 (2.40)	C	MB990939	–



SERVICE ADJUSTMENT PROCEDURES

WHEEL BEARING PLAY INSPECTION E26FAAA

1. Inspect the play of the bearings while the vehicle is jacked up.
2. If there is any play, remove the hub cap, split pin, and then loosen the slotted nut.



3. Tighten the slotted nut by the following procedures.

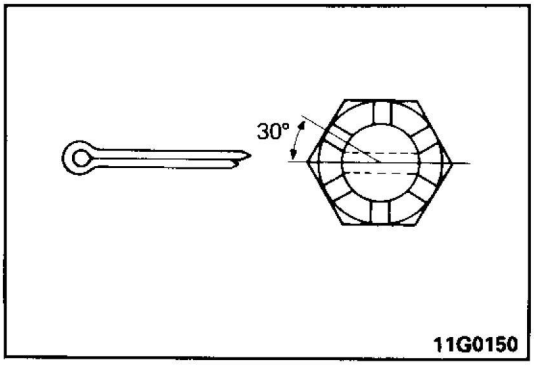
(1) Tighten to 30 Nm (3.0 kgm, 22 ft.lbs.)

↓

(2) Loosen to 0 Nm (0 kgm, 0 ft.lbs.)

↓

(3) Retighten to B Nm (0.8 kgm, 6 ft.lbs.)



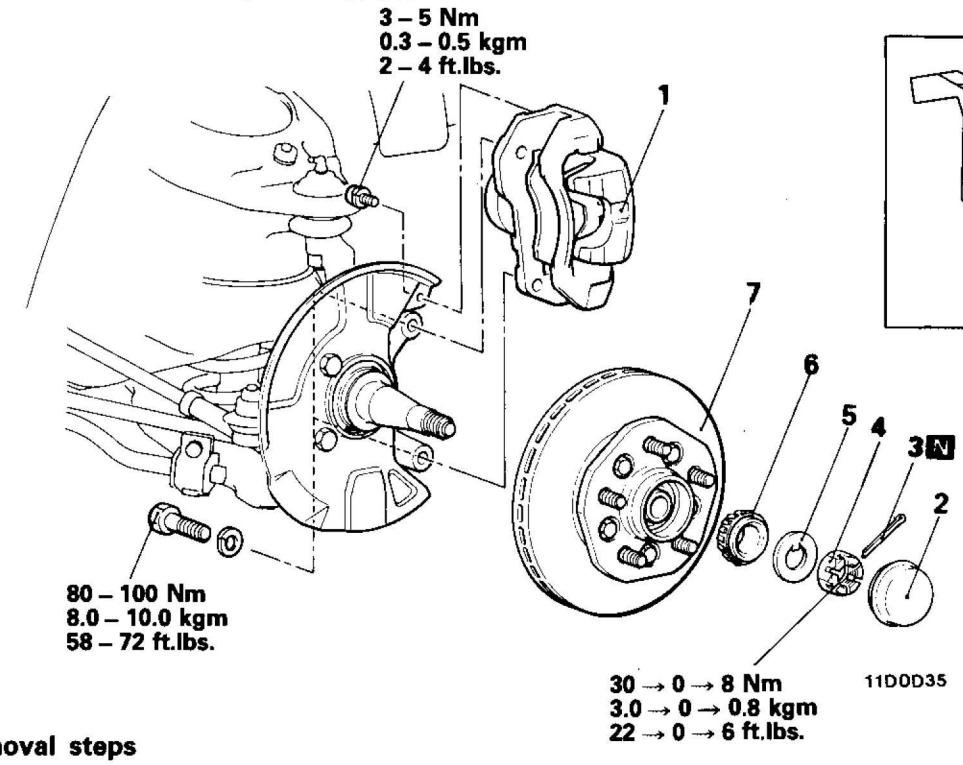
4. Fit the split pin. If the knuckle spindle hole and slotted nut groove are not in alignment, back off the slotted nut 30° maximum.

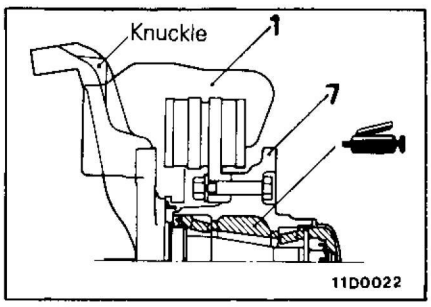
NOTE
If a bearing is worn, it should be replaced.

FRONT HUB

REMOVAL AND INSTALLATION

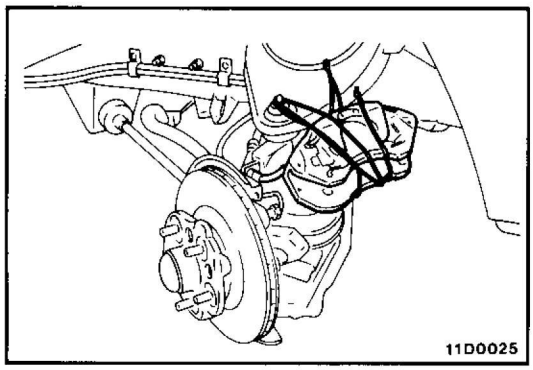
E26IA--





Removal steps

◆◆ 1. Caliper assembly
2. Hub cap
3. Split pin
Adjustment of wheel bearing
(Refer to P. 26-3.)
4. Slotted nut
5. Washer
6. Outer bearing inner race
7. Front hub assembly



SERVICE POINTS OF REMOVAL

E26IBBE

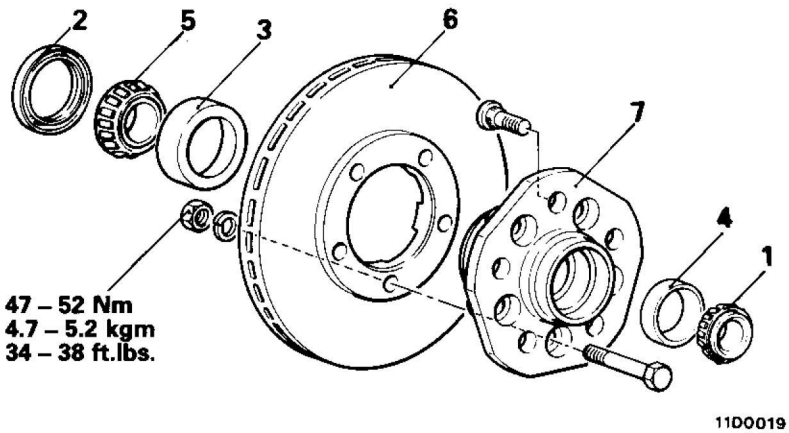
1. REMOVAL OF CALIPER ASSEMBLY

(1) Remove the caliper assembly with the brake hose connected.
(2) Use wire to suspend the caliper assembly from the upper arm so that the caliper assembly won't fall.

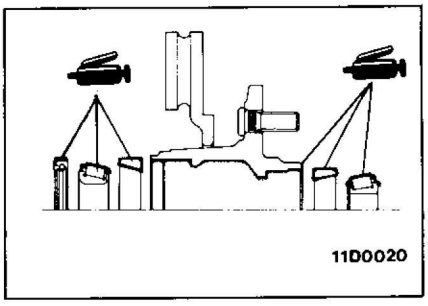
Caution
Do not twist the brake hose.

DISASSEMBLY AND REASSEMBLY

E26II--



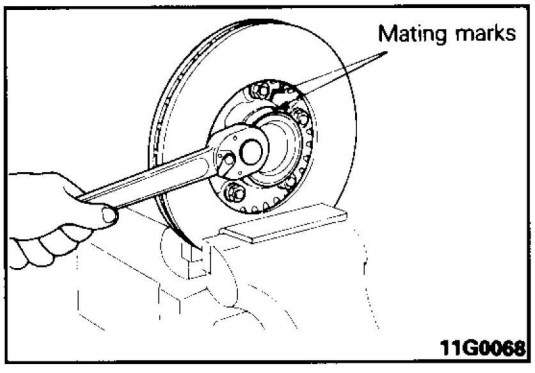
11D0019



11D0020

Disassembly steps

1. Outer bearing inner race
2. ◆◆ Oil seal
3. Inner bearing outer race
4. Outer bearing outer race
5. Inner bearing inner race
6. ◆◆ Brake disc
7. Front hub



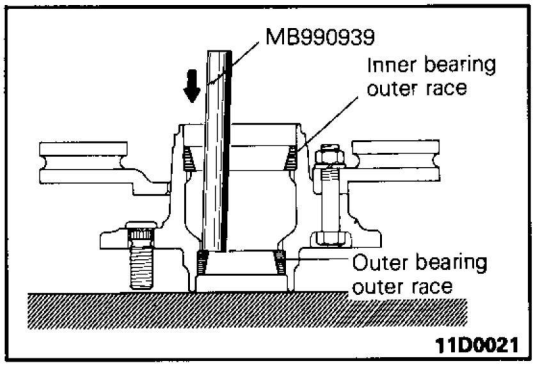
11G0068

SERVICE POINTS OF DISASSEMBLY

E26IJAC

6. REMOVAL OF BRAKE DISC

Make the mating marks on the brake disc and front hub, and then separate the front hub and brake disc, if necessary.

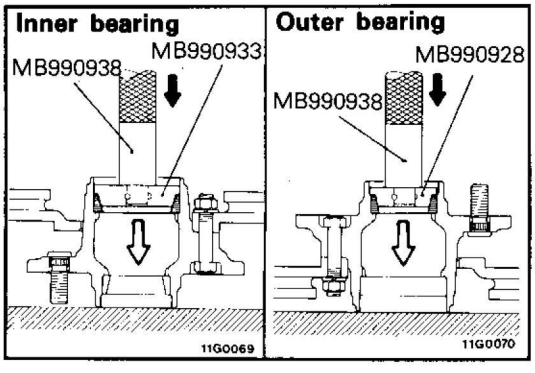


11D0021

BEARING REPLACEMENT

E26IKBC

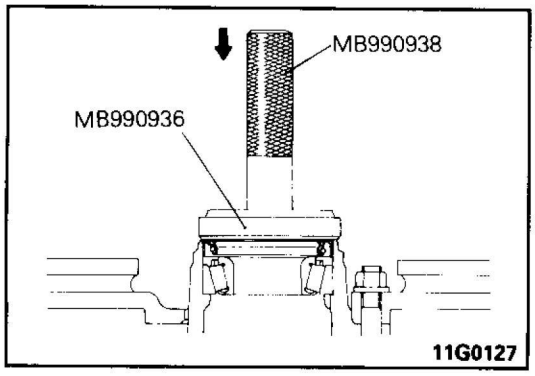
1. Remove the oil seal.
2. Wipe off grease from the front hub interior.
3. Using the special tool, drive out the inner and outer bearing outer races by tapping them uniformly.



11G0069 11G0070

4. Apply the multipurpose grease to the outside surface of the new inner and outer bearing outer races.
5. Press-fit the inner and outer bearing outer races by using the special tools.

   NOTE
   The bearing inner race and bearing outer race should be replaced as an assembly.



SERVICE POINTS OF REASSEMBLY

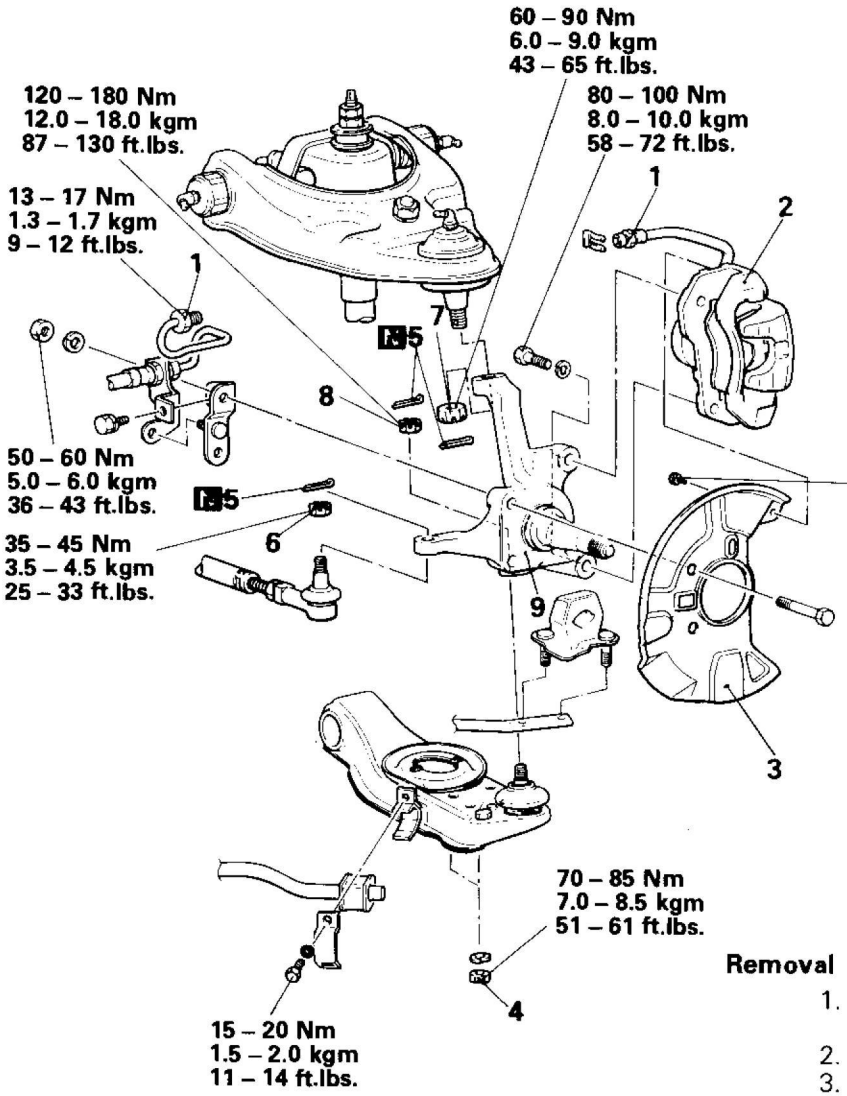
E26INAD

2. INSTALLATION OF OIL SEAL

KNUCKLE

REMOVAL AND INSTALLATION

E26NA – –

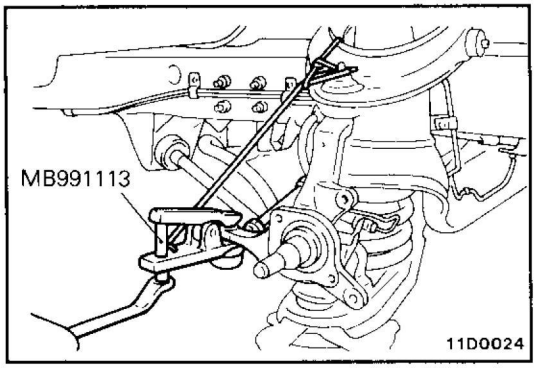


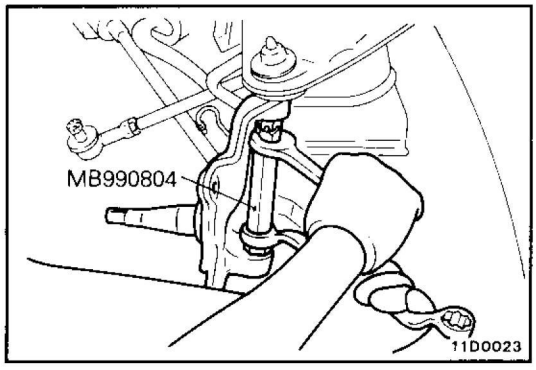
Pre-removal Operation
- Draining brake fluid
  (Refer to GROUP 35 – Service Adjustment Procedures.)
- Removal of front hub
  (Refer to P. 26-4.)

Post-installation Operation
- Installation of front hub
  (Refer to P. 26-4.)
- Inspection and adjustment of wheel alignment
  (Refer to GROUP 33 – Service Adjustment Procedures.)
- Bleeding brake system
  (Refer to GROUP 35 – Service Adjustment Procedures.)

Removal steps

1. Connection for brake tube and front brake
2. Caliper assembly
3. Dust cover
4. Nut
5. Split pin
◆◆ 6. Connection for tie rod assembly and knuckle
◆◆ 7. Connection for upper ball joint and knuckle
◆◆ 8. Connection for lower ball joint and knuckle
9. Knuckle





SERVICE POINTS OF REMOVAL E26NBBE

6. DISCONNECTION OF TIE ROD ASSEMBLY AND KNUCKLE

Caution

1. **Use cord to bind the special tool closely so it won't become separated.**
2. **The nut should be loosened only, not removed.**

7. DISCONNECTION OF UPPER BALL JOINT AND KNUCKLE/ 8. LOWER BALL JOINT AND KNUCKLE

Caution

1. **The nut should be loosened only, not removed.**
2. **Support the lower arm with a jack when removing the knuckle from the lower ball joint or the upper ball joint.**
3. **After the knuckle has been removed, lower the jack slowly.**

NOTES

REAR AXLE

CONTENTS

E27AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E27CA--

Items	Petrol-powered vehicle	Diesel-powered vehicle
Axle housing type	Banjo type	
Axle shaft Supporting type	Semi-floating type	
Differential		
Reduction gear type	Hypoid gear	Hypoid gear
Reduction ratio	4.625	4.222
Pinion gear type		
Conventional differential	2 pinions	2 pinions
Limited slip differential	4 pinions	4 pinions

SERVICE SPECIFICATIONS

E27CB--

Items	Vehicles with a conventional differential	Vehicles with a limited slip differential
Standard value		
Axle shaft axial play mm (in.)	0.05 – 0.20 (0.0020 – 0.0079)	0.05 – 0.20 (0.0020 – 0.0079)
Limited slip differential preload		
Using special tool Nm (kgm, ft.lbs.)	–	17.5 (1.75, 13) or more
Without using special tool Nm (kgm, ft.lbs.)	–	35 (3.5, 25) or more
Final drive gear backlash mm (in.)	0.11 – 0.16 (0.0043 – 0.0063)	0. 11 – 0.16 (0.0043 – 0.0063)
Differential gear backlash mm (in.)	0.010 – 0.076 (0.0004 – 0.0030)	–
Drive pinion turning torque		
Without oil seal Nm (kgcm, in.lbs.)	0.4 – 0.5 (4.0 – 5.0, 3.5 – 4.3)	0.4 – 0.5 (4.0 – 5.0, 3.5 – 4.3)
With oil seal Nm (kgcm, in.lbs.)	0.65 – 0.75 (6.5 – 7.5, 5.6 – 6.5)	0.65 – 0.75 (6.5 – 7.5, 5.6 – 6.5)
Difference in total thickness between the left and right clutch plates mm (in.)	–	0.05 (0.0020) or less
Clearance between spring plate and diffenrential case mm (in.)	–	0.06 – 0.20 (0.024 – 0.0079)
Difference between left and right dimensions from back thrust face of pressure ring to end of thrust washer mm (in.)	–	0.05 (0.0020) or less
Clearance between thrust washer and differential case mm (in.)	–	0.05 – 0.20 (0.0020 – 0.0079)
Clutch plate preload		
When equipped with new clutch plates Nm (kgm, ft.lbs.)	–	50 – 80 (5.0–8.0, 36–58)
When equipped with old clutch plates Nm (kgm, ft.lbs.)	–	35 – 80 (3.5 – 8.0, 25 – 58)
Limit		
Rear axle total backlash mm (in.)	5 (0.20)	5 (0.20)
Drive gear runout mm (in.)	0.05 (0.0020)	0.05 (0.0020)
Differential gear backlash mm (in.)	0.2 (0.079)	–
Friction plate and friction disc warping (flatness) mm (in.)	–	0.08 (0.0031)
Friction plate and friction disc wear (difference in the thickness of the friction surfaces and the projections) mm (in.)	–	0.1 (0.004)

TORQUE SPECIFICATIONS

E27CC--

Items	Nm	kgm	ft.lbs.
AXLE ASSEMBLY			
Propeller shaft attaching nut	50 – 60	5.0 – 6.0	36 – 43
Brake tube flare nut	13 – 17	1.3 – 1.7	9 – 12
Shackle assembly attaching nut	30 – 50	3.0 – 5.0	22 – 36
U-bolt attaching nut	85 – 110	8.5 – 11	61 – 80
AXLE SHAFT			
Bearing case to rear axle housing	50 – 60	5.0 – 6.0	36 – 43
Rear axle bearing lock nut	180 – 220	18 – 22	130 – 159
Brake tube flare nut	13 – 17	1.3 – 1.7	9 – 12
DIFFERENTIAL CARRIER			
Drain plug	60 – 70	6.0 – 7.0	43 – 51
Filler plug	40 – 60	4.0 – 6.0	29 – 43
Propeller shaft attaching nut	50 – 60	5.0 – 6.0	36 – 43
Differential carrier to rear axle housing	25 – 30	2.5 – 3.0	18 – 22
Bearing case to rear axle housing	50 – 60	5.0 – 6.0	36 – 43
Brake tube flare nut	13 – 17	1.3 – 1.7	9 – 12
Companion flange self locking nut	190 – 250	19 – 25	137 – 181
Differential case to drive gear	80 – 90	8.0 – 9.0	58 – 65
Bearing cap	50 – 60	5.5 – 6.5	36 – 43
Lock plate	15 – 22	1.5 – 2.2	11 – 16

LUBRICANTS

E27CD--

Items	Specified lubricants	Quantity lit. (U.S.qts., Imp.qts.)
Rear axle gear oil		
Conventional differential	Hypoid gear oil API classification GL-5 or higher SAE viscosity No. 90, 80W	1.20 (1.27, 1.06)
Limited slip differential	Hypoid gear oil MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent	1.20 (1.27, 1.06)

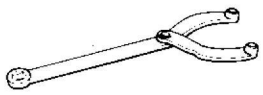
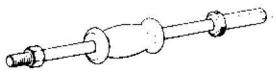
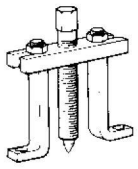
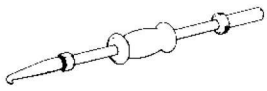
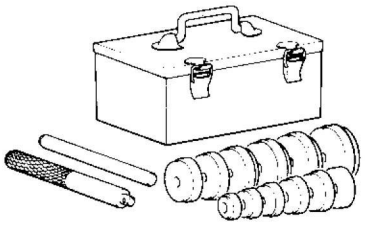
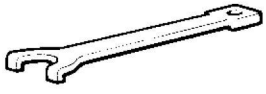
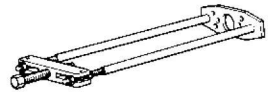
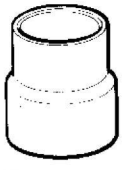
SEALANTS AND ADHESIVES

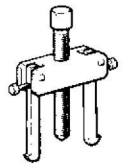
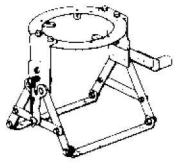
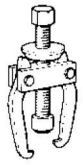
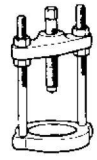
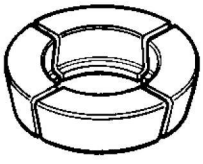
E27CE--

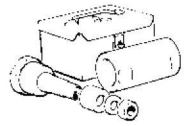
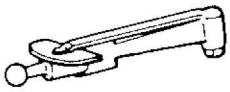
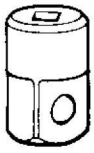
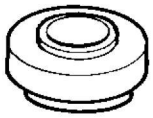
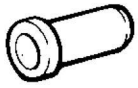
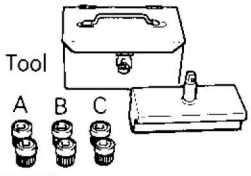
Items	Specified sealants and adhesives	Remarks
Axle shaft shim Differential carrier mounting surface of axle housing	3M ATD Part No. 8661 or equivalent	Semi-drying sealant
Drive gear threaded hole	3M Stud Locking Part No. 4170 or equivalent	Anaerobic adhesive

SPECIAL TOOLS

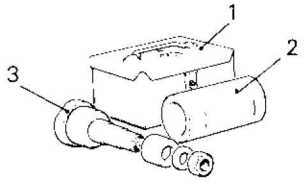
E27DA--

Tool	Number	Name	Use
	MB990767	End yoke holder	Measurement of the limited slip differential preload
	MB990211	Sliding hammer	Removal of axle shaft
	MB990241	Rear axle shaft puller	
	MB990590	Rear axle shaft oil seal remover	Removal of axle housing oil seal
	MB990925	Bearing and oil seal installer set	Press-fitting of the axle housing oil seal (MB990938, MB990930) Press-fitting of the axle shaft bearing outer race (MB990938, MB990933) Press-fitting of the axle shaft oil seal (MB990938, MB990936) Driving-out of the drive pinion bearing outer race (MB990939) Press-fitting of the drive pinion rear bearing outer race (MB990938, MB990936) Press-fitting of the drive pinion front bearing outer race (MB990938, MB990933) (Refer to GROUP 26)
	MB990785	Lock nut special spanner	Removal of the lock nut
	MB990861	Axle shaft bearing and case remover	Removal oof the axle shaft bearing and bearing case
	MB990799	Bearing inner race installer	Press-fitting of the axle shaft bearing inner race

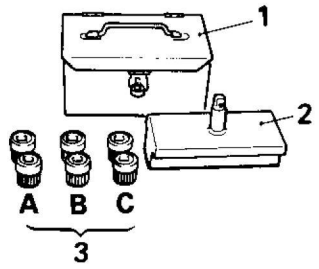
Tool	Number	Name	Use
	MB990801	Rear axle bearing outer race remover	Removal of bearing case and bearing outer race
	MB990786	Rear axle bearing outer race bridge	
	MB990909	Working base	Supporting of the differential carrier
	MB990722	Side bearing adjusting special spanner	Removal and adjustment of the side bearing nut
	MB990810	Side bearing puller	Removal of the side bearing inner race
	MB990811	Side bearing cup	
	MB990850	End yoke holder	Removal of the companion flange
	MB990339	Bearing puller	Removal of the drive pinion rear bearing inner race
	MB990648	Bearing remover	

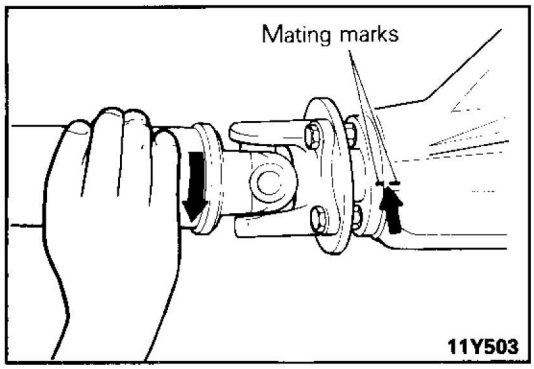
Tool	Number	Name	Use
	MB990856	Pinion height gauge set	Measurement of the pinion height
	MB991151 or MB990685	Torque wrench	Measurement of the starting torque of drive pinion
	MB990326	Preload socket	
	MB990728	Bearing installer	Press-fitting of the drive pinion rear bearing inner race Press-fitting of the side bearing inner race
	MB990727	Drive pinion oil seal installer	Press-fitting of the drive pinion oil seal
	MB990813	Tap	Removal of sealant
	MB990988	Side gear holding tool set	Measurement of the clutch plate preload

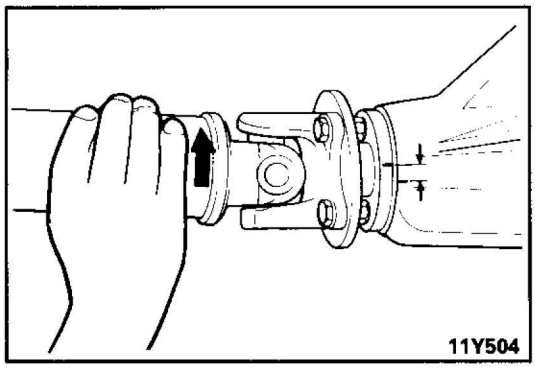
MB990856

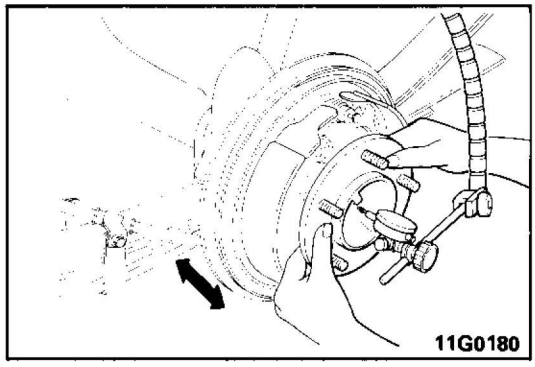


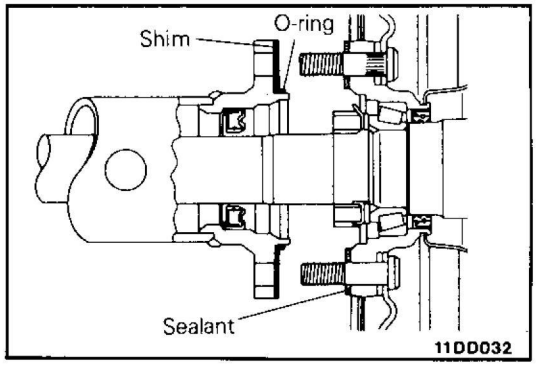
Tool number		Name
1	MB990824	Box
2	MB990720	Cylinder gauge
3	MB990858	Gauge assembly

MB990988	Tool number		Name	O.D. mm (in.)
	1	MB990551	Box	–
	2	MB990989	Base	–
	3	(MB990990)	Tool A	25 (0.98)
		(MB990991)	Tool B	28 (1.10)
		(MB990992)	Tool C	31 (1.22)









SERVICE ADJUSTMENT PROCEDURES

REAR AXLE TOTAL BACKLASH CHECK E27FCAF

If the vehicle vibrates and produces a booming sound due to the unbalance of the driving system, measure the rear axle total backlash by the following procedures to see if the differential carrier assembly requires removal.

1. Park the vehicle on a flat, level surface.
2. Place the transmission control lever to the neutral position, and place the transfer control lever to the neutral position. Then pull the parking brake lever and raise the vehicle on a jack.
3. Turn the companion flange clockwise as far as it will go. Make the mating mark on the dust cover of the companion flange and on the differential carrier.
4. Turn the companion flange anti-clockwise as far as it will go, and measure the amount of distance through which the mating marks moved. If the backlash exceeds the limit, remove the differential carrier assembly and adjust the backlash.

Limit: 5 mm (0.20 in.)

AXLE SHAFT AXIAL PLAY CHECK E27FEAA

Measure the axle shaft axial play by using a dial indicator.

Standard value: 0.05 – 0.20 mm (0.0020 – 0.0079 In.)

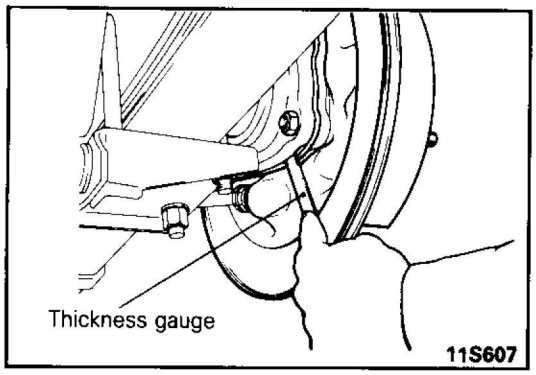
If the axle shaft axial play exceeds the standard value, withdraw the axle shaft, and then adjust to the standard value by changing the shim thickness.

AXLE SHAFT AXIAL PLAY ADJUSTMENT E27FLAC

1. Insert a 1mm (0.04 in.) thick shim and O-ring into the left side rear axle housing.
2. Apply the specified sealant to the mating surface of the bearing case, install the left axle shaft into rear axle housing and tighten the nuts [50–60 Nm (5.0 – 6.0 kgm, 36 – 43 ft.lbs.)].

Specified sealant: 3M ATD Part No. 8661 or equivalent

NOTE
Tighten the nuts in diagonal sequence.

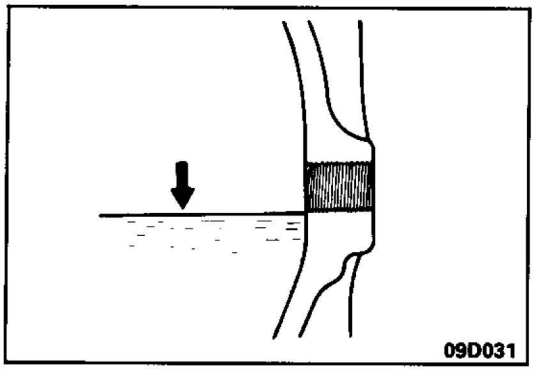


3. Install the right axle shaft without a shim(s) and O-ring and temporarily tighten the nuts in diagonal sequence in 2 stages to approx. 6 Nm (0.6 kgm, 4.3 ft.lbs.)
4. Measure the clearance between the bearing case and rear axle housing end with a thickness gauge.

   NOTE
   Confirm that the measurement values no differ in the horizontal and vertical positions.
5. Select shims of the thickness which is equal to the sum of the measured clearance and 0.06 – 0.20 mm (0.0023 – 0.0079 in.)
6. Remove the right axle shaft, and install shim(s) and O-ring on the right side rear axle housing end.
7. Apply the specified sealant to the mating surface of bearing case, install the right axle shaft into rear axle housing and tighten the nut in diagonal sequence [50 – 60 Nm (5.0 – 6.0 kgm, 36 – 43 ft.lbs.)].

   Specified sealant: 3M ATD Part No. 8661 or equivalent
8. Check to assure that the axle shaft axial play is within the standard value.

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

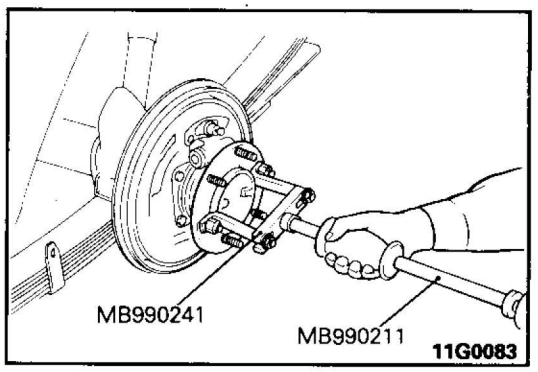


GEAR OIL LEVEL CHECK E27FGAD

1. Remove the filler plug, and check the oil level.
2. The oil level is sufficient if it reaches the filler plug hole.

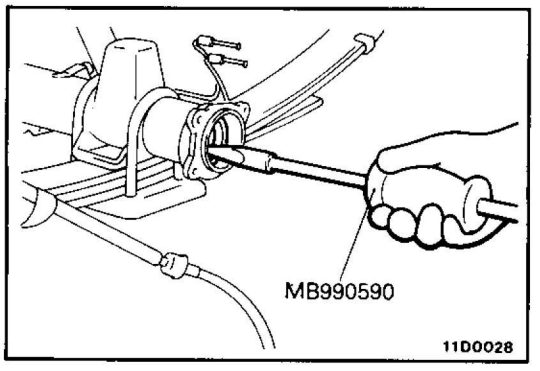
Specified gear oil:
<Conventional differential>
API classification GL-5 or higher
SAE viscosity No. 90, 80W
[1.20 lit. (1.27 U.S.qts., 1.06 Imp.qts.)]

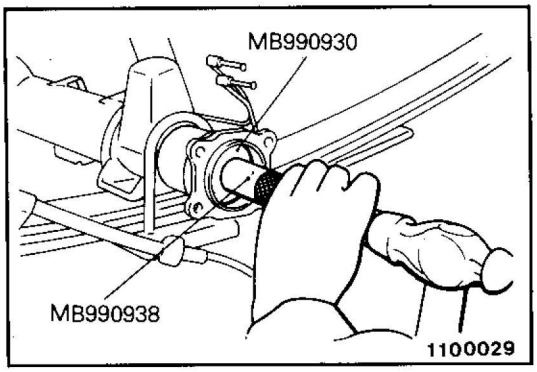
<Limited slip differential>
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL HYPOY LS (GL-5, SAE 90), SHELL-LSD (GL-5, SAE 80W-90) or equivalent
[1.20 lit. (1.27 U.S.qts., 1.06 Imp.qts.)]



AXLE HOUSING OIL SEAL REPLACEMENT E27FKAC

1. Release conpling between parking brake cable and backing plate. (Rear to GROUP 36 – Parking Brake Cable.)
2. Before disconnecting the brake tube, drain the brake fluid from the bleeder scr ew at the left side of the rear brake.
3. Remove the nuts securing the backing plate to the axle housing.
4. Pull the rear axle shaft with rear brake assembly atached. If the rear axle sha ft is hard to remove, use the special tools.
5. Use special tool with hook attached to remove the oil seal.
6. Apply multipurpose grease to the oil seal fitting area of the rear axle housing.

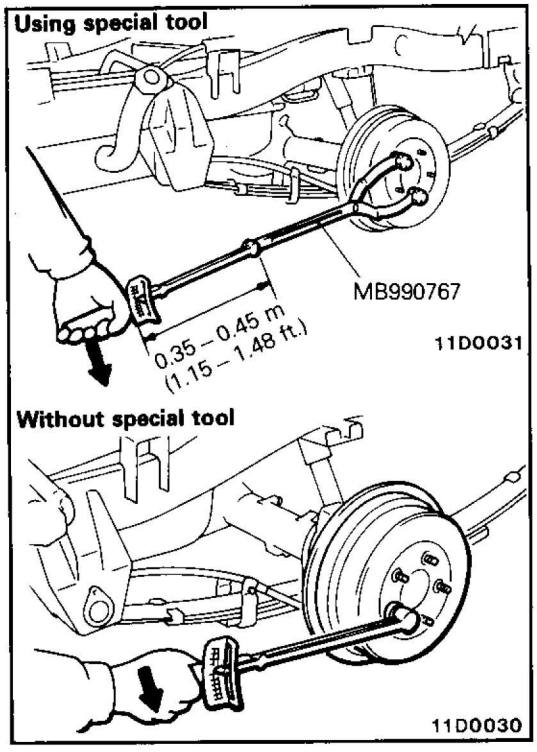




7. Drive the new oil seal into the rear axle housing end by using the special tools.
8. Apply mmultipurpose grease to the oil seal lip.
9. Adjust the clearance between the bearing case and rear axle housing end. (Refer to P. 27-7.)
10. Install the rear axle shft.
11. Install the brake tube and perform air bleeding of the brake systeem from the air bleeder at the left side of the rear brake. (Refer GROUP 35 – Service Adjustmen t Procedures.)
12. Install the parking brake cable and adjust the parking brake lever stroke. (Refer to GROUP 36 – Service Adjustment Procedures.)

LIMITED SLIP DIFFERENTIAL PRELOAD MEASUREMENT

E27RAC



1. To measure the preload of the limited slip differential, set the shift lever of the transmission to the neutral position, lock the front wheels, and fully release the parking brake. One of the rear wheels should be maintained in contact with the ground surface, and the other should be raised up.
2. Measure the starting torque at the side on which the wheel is in the raised position by using the following procedures.
   (1) Remove the wheel.
   (2) Mount the special tool to the hub bolts by using the hub nuts.
   (3) Find the limited slip differential preload by measuring the axle shaft starting torque in the forward direction with a torque wrench.

   Standard value:
   Using special tool
   17.5 Nm (1.75 kgm, 13 ft.lbs.) or more
   Without special tool
   35 Nm (3.5 kgm, 25 ft.lbs.) or more

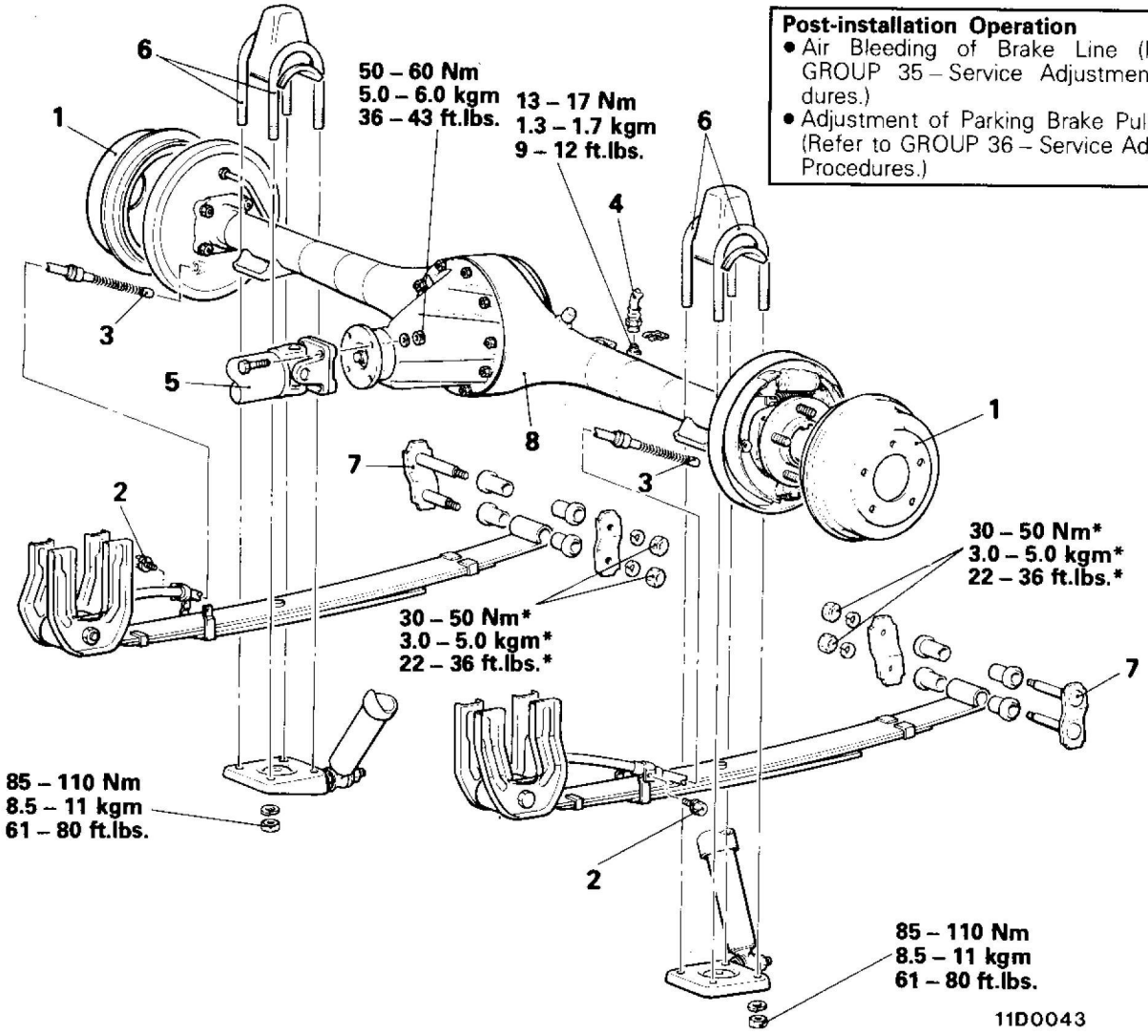
   NOTE
   To measure starting torque, first rotate hub to run-in and measure torque with hub rotating.

   (4) If the torque is less than the standard value, remove the limited slip differential from the vehicle and disassemble it.

AXLE ASSEMBLY

REMOVAL AND INSTALLATION

E27JA – –

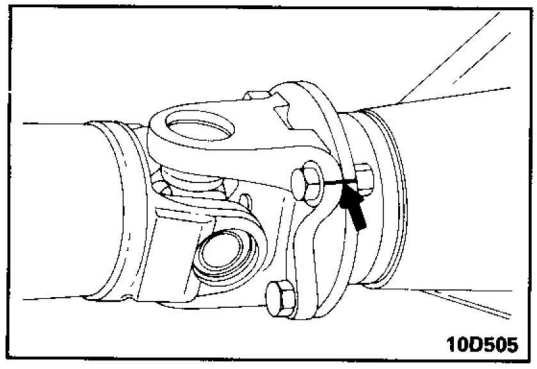


Post-installation Operation
- Air Bleeding of Brake Line (Refer to GROUP 35 – Service Adjustment Procedures.)
- Adjustment of Parking Brake Pull Rod (Refer to GROUP 36 – Service Adjustment Procedures.)

Removal steps

1. Brake drum
2. Parking brake cable attaching bolt
3. Connection for parking brake cable end and brake shoe assembly (Refer to GROUP 36 – Parking Brake Cable.)
4. Brake hose connection
5. Propeller shaft
6. U-bolt
7. Shackle assembly
8. Axle assembly

NOTE
The part with * must be tightened with the vehicle lowered to the ground.

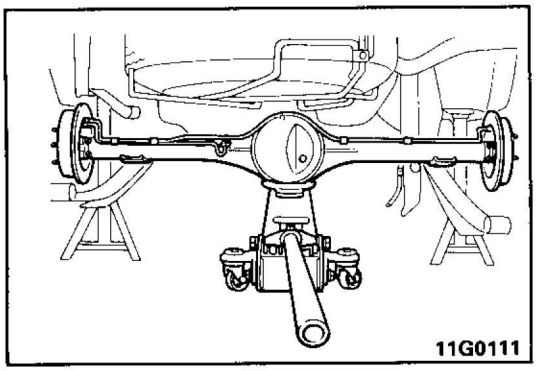


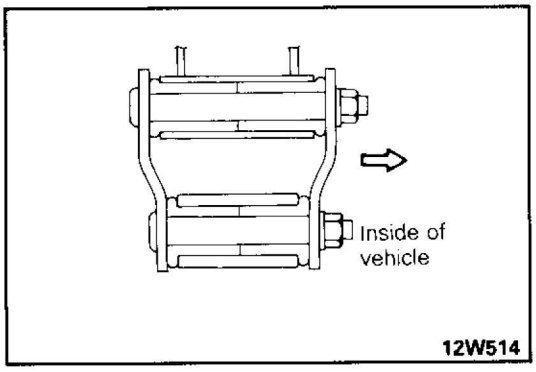
SERVICE POINTS OF REMOVAL

E27JBAF

5. REMOVAL OF PROPELLER SHAFT

Make the mating marks on the flange yoke of the propeller shaft and the companion flange of the differential case.





6. REMOVAL OF U-BOLT

Before removing the U-bolt and the bump stopper, place the jack underneath the centre of the axle assembly to hold it slightly upward.

8. REMOVAL OF AXLE ASSEMBLY

Draw out the axle assembly toward the rear of the vehicle.

Caution
The axle assembly is unstable on the jack; be careful not to allow it to fall.

SERVICE POINTS OF INSTALLATION E27JDAG

7. INSTALLATION OF SHACKLE ASSEMBLY

Install the shackle assembly from the outside toward the inside of vehicle.

5. INSTALLATION OF PROPELLER SHAFT

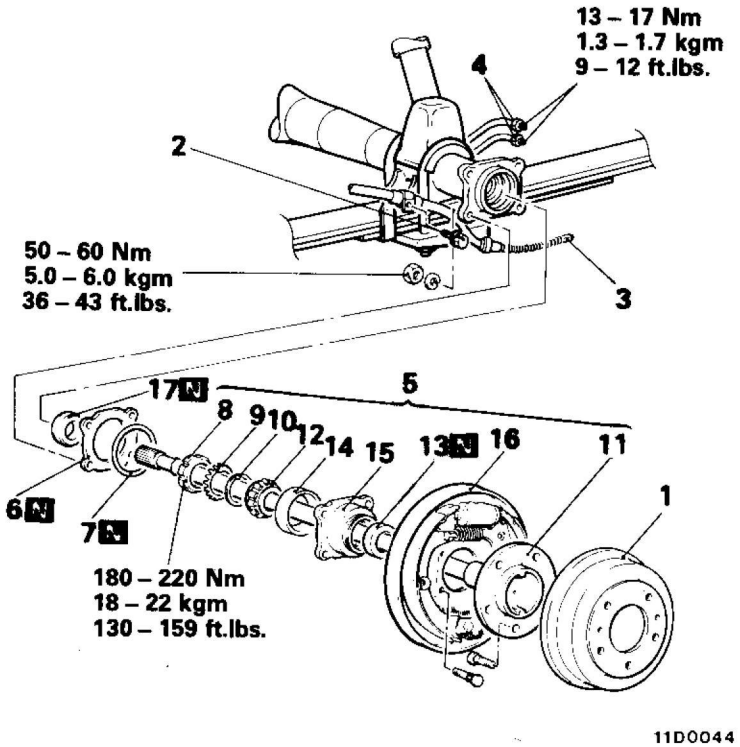
Align the mating marks on the flange yoke and the companion flange to install the propeller shaft.

AXLE SHAFT

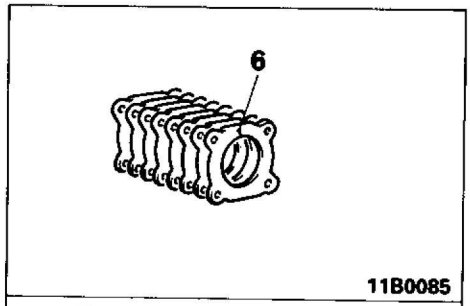
REMOVAL AND INSTALLATION

E27HA--

Post-installation Operation
- Air Bleeding of Brake Line (Refer to GROUP 35 – Service Adjustment Procedure.)
- Adjustment of Parking Brake Pull Rod (Refer to GROUP 36 – Service Adjustment Procedures.)

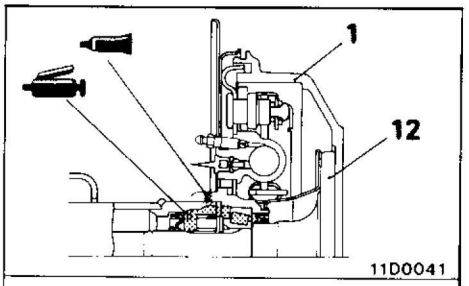


11D0044



11B0085

Rear axle shaft shim set



11D0041

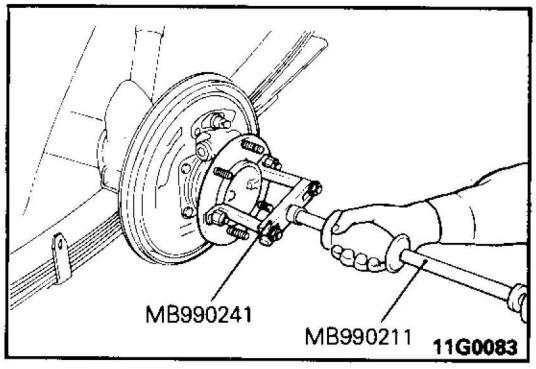
Sealant: 3M ATD Part No. 8661 or equivalent

Removal steps

1. Brake drum
2. Parking brake cable attaching bolt
3. Connection for parking brake cable end and rear brake asembly (Refer to GROUP 36 – Parking Brake Rear Cable and Lever Assembly.)
4. Brake tube connection
- ◆◆ 5. Axle shaft assembly
6. Shim
7. O-ring

Axle shaft axial play adjustment (Refer to P. 27-7.)

- ◆◆ ◆◆ 8. Lock nut
- ◆◆ 9. Lock washer
- ◆◆ 10. Washer
- ◆◆ ◆◆ 11. Axle shaft
- ◆◆ 12. Bearing inner race
- ◆◆ 13. Oil seal
- ◆◆ ◆◆ 14. Bearing outer race
- 15. Bearing case
- 16. Rear brake assembly
- ◆◆ ◆◆ 17. Oil seal



11G0083

SERVICE POINTS OF REMOVAL

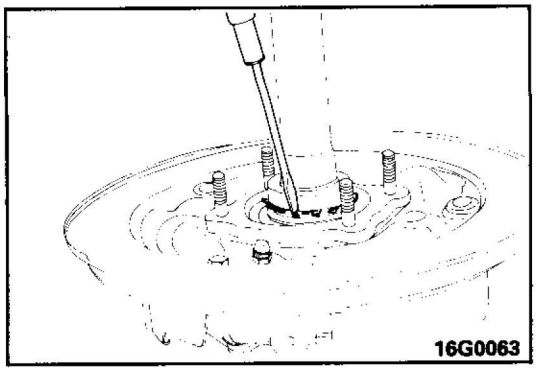
E27HBAF

5. REMOVAL OF AXLE SHAFT ASSEMBLY

(1) Remove the nuts coupling the backing plate to the axle housing.

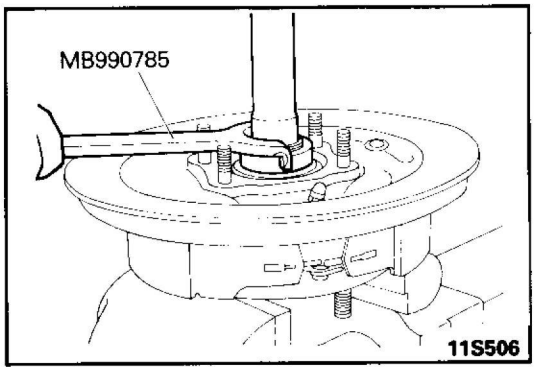
(2) Pull axle shaft from axle housing. If difficult to pull, use special tools.

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

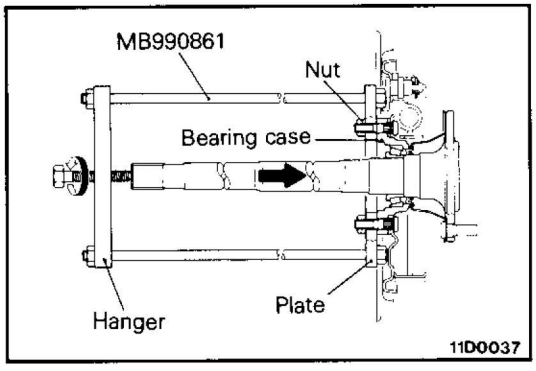


8. REMOVAL OF LOCK NUT

(1) Straighten the bent tab of the lock washer with the screwdriver.



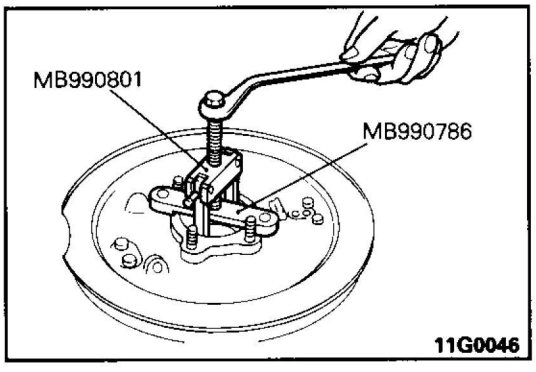
(2) To remove the wheel bearing, first remove the lock washer then remove the lock nut, using special tool.
(3) Remove lock washer and washer.



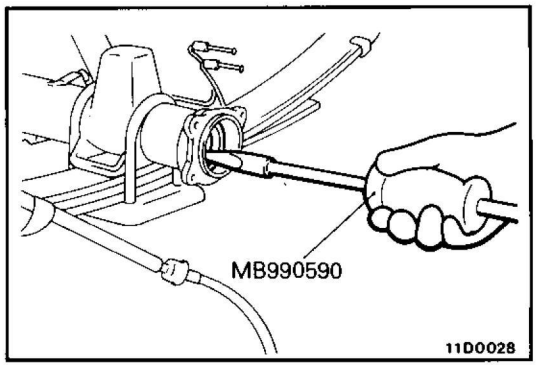
11. REMOVAL OF AXLE SHAFT

(1) Set the special tool by fixing its plate to the bearing case as shown in the figure.
(2) Place the special tool bolt tip to the centre of the shaft. Screw in the bolt and pull the axle shaft from the bearing case assembly.

Caution
Set the hanger parallel with the plate.

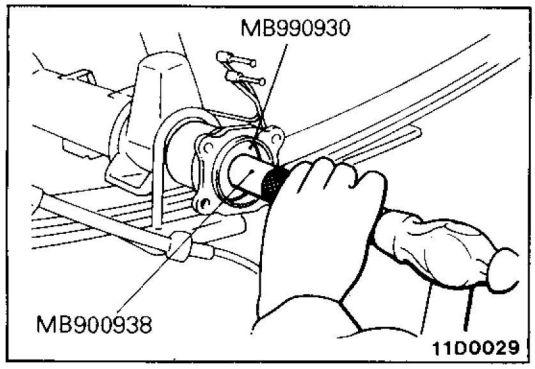


14. REMOVAL OF BEARING OUTER RACE

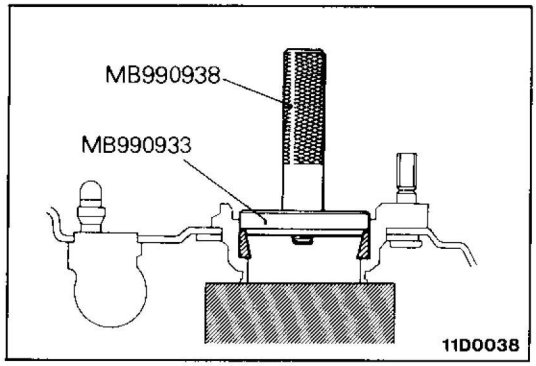


17. REMOVAL OF OIL SEAL

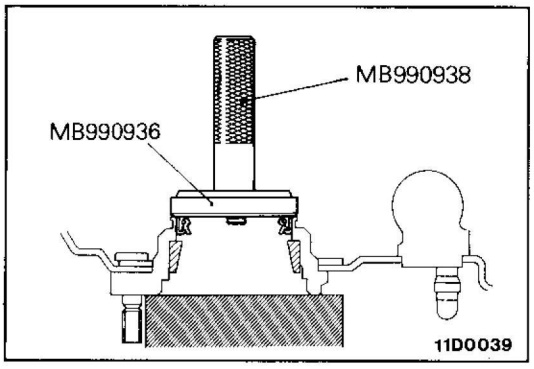
SERVICE POINTS OF INSTALLATION E27HDAF



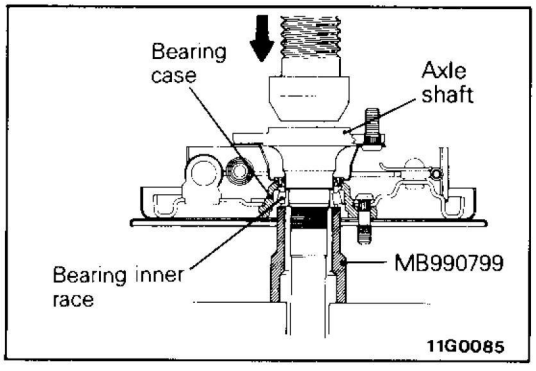
17. INSTALLATION OF OIL SEAL



14. INSTALLATION OF BEARING OUTER RACE

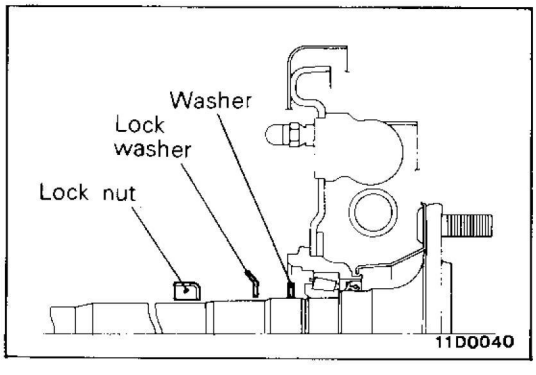


13. INSTALLATION OF OIL SEAL



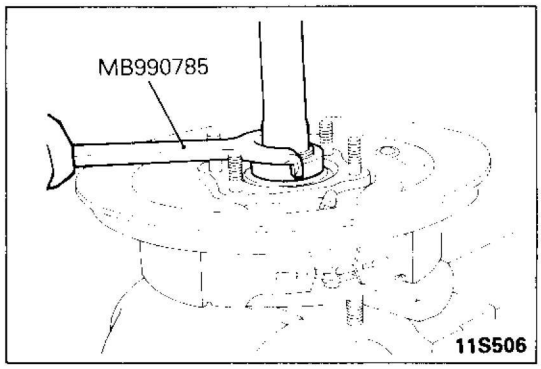
12. INSTALLATION OF BEARING INNER RACE/11. AXLE SHAFT

(1) Install the rear brake assembly attached with bearing case and the bearing inner race in that order to the axle shaft.
(2) Press-fit the bearing inner race into the axle shaft by using the special tool.

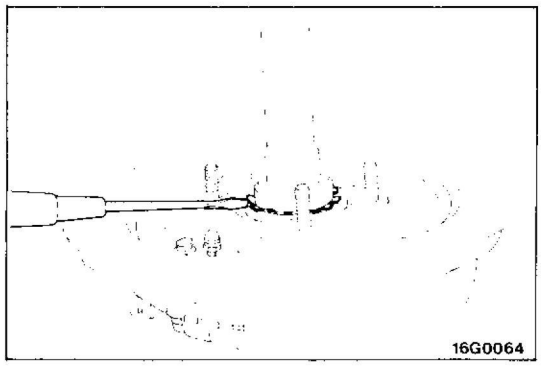


10. INSTALLATION OF WASHER/9. LOCK WASHER/8. LOCK NUT

(1) Align the washer tab with the slot of the axle shaft to install the washer.
(2) Align the lock washer tab with the slot of the axle shaft to install the lock washer as figure.
(3) Install the lock nut with its chamfering in the directions shown in the illustration.



(4) Tighten the lock nut to the specified torque by using the special tool.



(5) Bend the tab of the lock washer into the slot of the lock nut.

NOTE
If the slot in the lock nut and the tab of the lock washer are out of alignment, turn the lock nut in until they are in alignment.

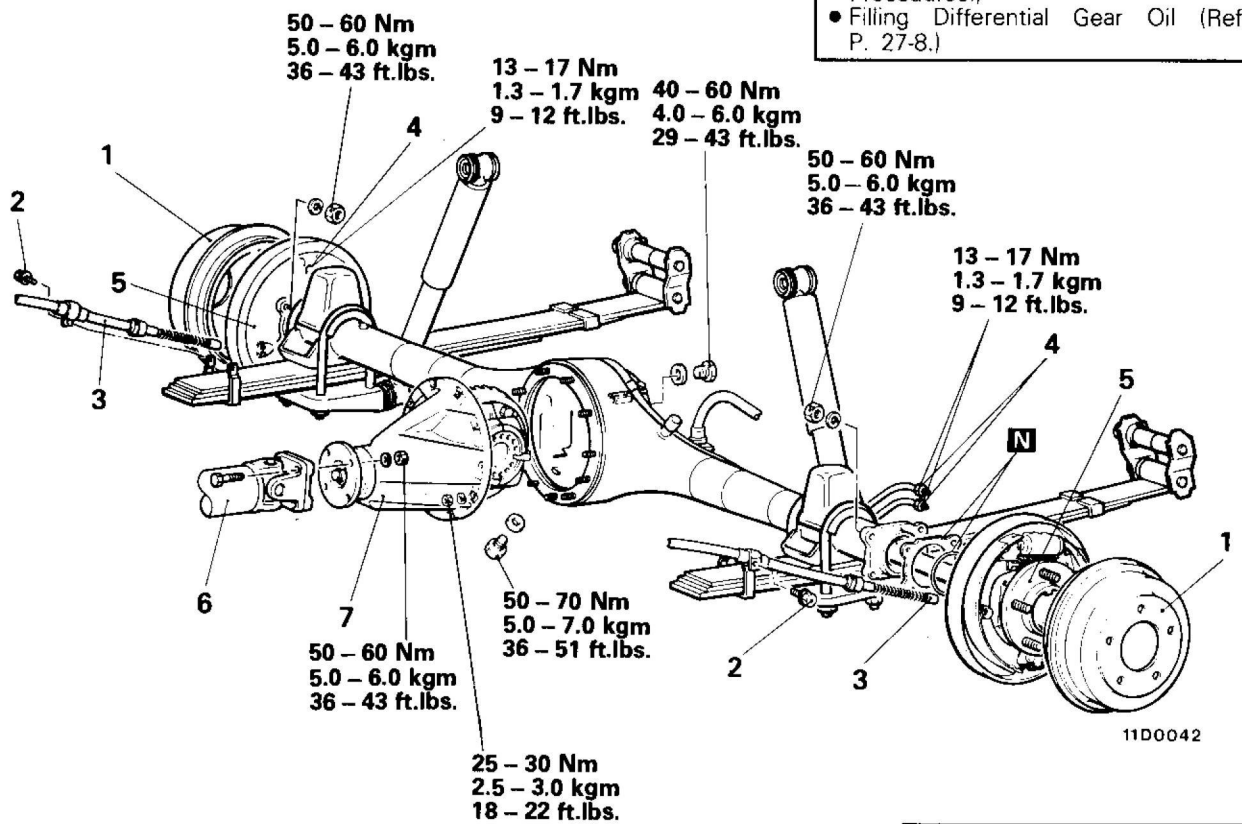
DIFFERENTIAL CARRIER

E27QA--

REMOVAL AND INSTALLATION

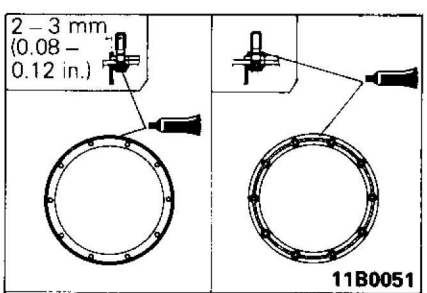
Pre-removal Operation
- Drainage of Differential Gear Oil

Post-installation Operation
- Air Bleeding of Brake Line (Refer to GROUP 35 – Service Adjustment Procedures.)
- Adjustment of Parking Brake Pull Rod (Refer to GROUP 36 – Service Adjustment Procedures.)
- Filling Differential Gear Oil (Refer to P. 27-8.)

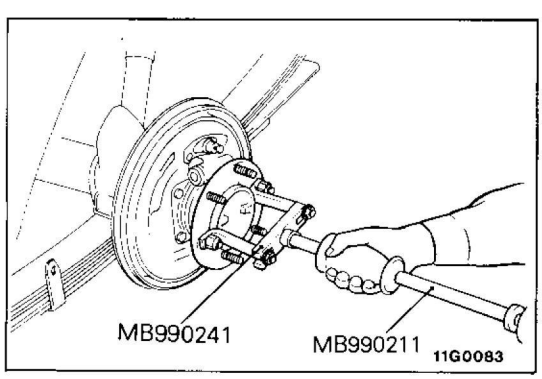


Removal steps

1. Brake drum
2. Parking brake cable attaching bolt
3. Connection for parking brake cable end and brake shoe assembly (Refer to GROUP 36 – Parking Brake Cable.)
4. Brake tube connection
◆◆ 5. Axle shaft assembly
6. Propeller shaft (Refer to P. 27-10.)
◆◆ 7. Differential carrier



Sealant: 3M ATD Part No. 8661 or equivalent

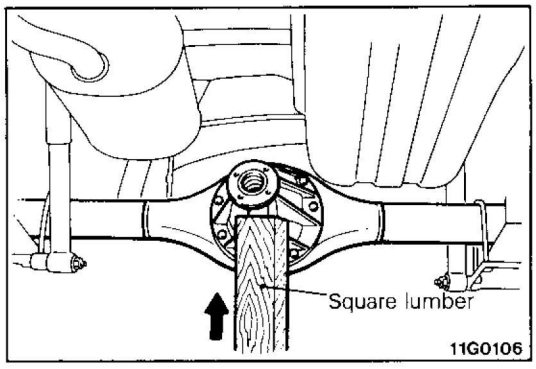


SERVICE POINTS OF REMOVAL

E27QBAI

5. REMOVAL OF REAR AXLE SHAFT ASSEMBLY

Pull out the right and left axle shafts by approx. 70 mm (3 in.). If it is hard to pull out, use the special tools.

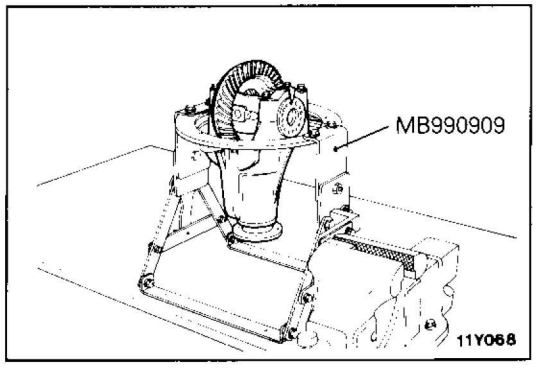


7. REMOVAL OF DIFFERENTIAL CARRIER

Remove the attaching nuts and strike the lower part of differential carrier assembly with a square lumber several times, to remove the assembly.

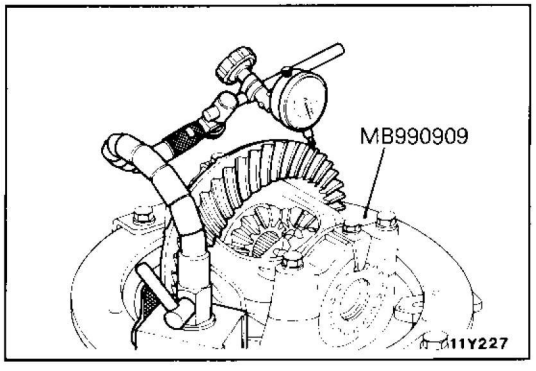
Caution

1. **Do not remove the uppermost nut but keep it loosened all the way to the stud bolt end.**
2. **Use care not to strike the companion flange.**



INSPECTION BEFORE DISASSEMBLY E27ODAL

Hold the special tool in a vise, and install the differential carrier to the special tool.



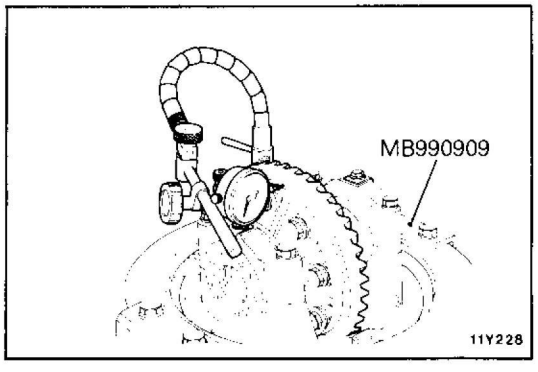
FINAL DRIVE GEAR BACKLASH

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

NOTE

Measure at 4 points or more on the circumference of the drive gear.

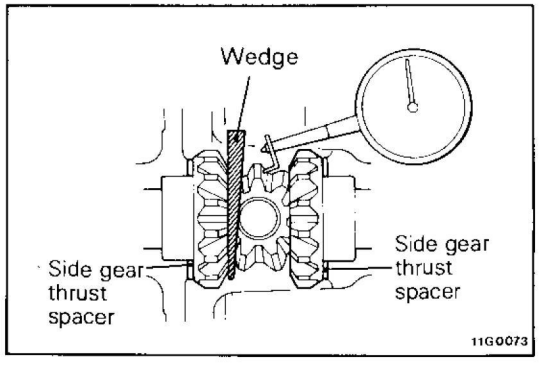
Standard value: 0.11 – 0.16 mm (0.0043 – 0.0063 in.)



DRIVE GEAR RUNOUT

Measure the drive gear runout at the shoulder on the reverse side of the drive gear.

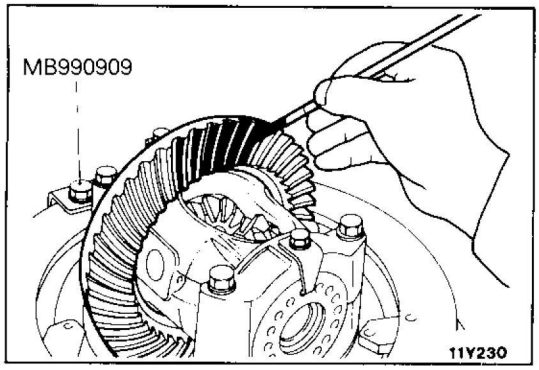
Limit: 0.05 mm (0.0020 in.)



DIFFERENTIAL GEAR BACKLASH <CONVENTIONAL DIFFERENTIAL>

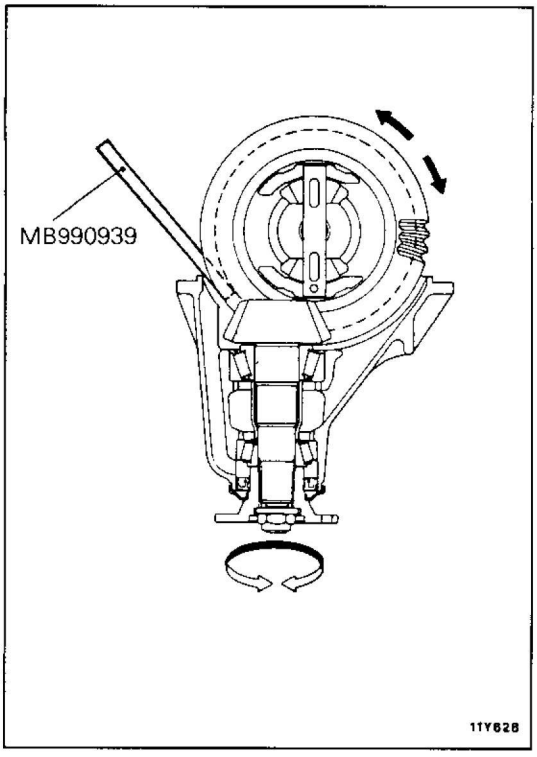
While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

Standard value: 0.010 – 0.076 mm (0.0004 – 0.0030 in.)
Limit: 0.2 mm (0.0079 in.)



FINAL DRIVE GEAR TOOTH CONTACT

(1) Apply a thin, uniform coat of machine blue to both surfaces of the drive gear teeth.



(2) Insert a brass rod between the differential carrier and the differential case, and then rotate the companion flange by hand (once in the normal direction, and then once in the reverse direction) while applying a load to the drive gear, so that the revolution torque [approximately 2.5 – 3.0 Nm (25 – 30 kgcm, 28 – 33 in.lbs.)] is applied to the drive pinion.

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

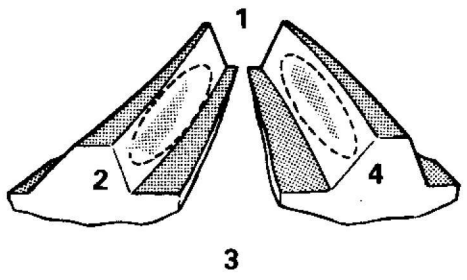
(3) Check the tooth-contact condition of the drive gear and drive pinion.

NOTE
Checking the tooth contact pattern is the way to confirm that the adjustments of the pinion height and backlash have been done properly. Continue to adjust the pinion height and backlash until the tooth contact pattern resembles the standard pattern.
If, even after adjustments have been made, the correct tooth contact pattern cannot be obtained, it means that the drive gear and the drive pinion have become worn beyond the allowable limit. Replace the gear set.

Caution
If either the drive gear or the drive pinion is to be replaced, be sure to replace both gears as a set.

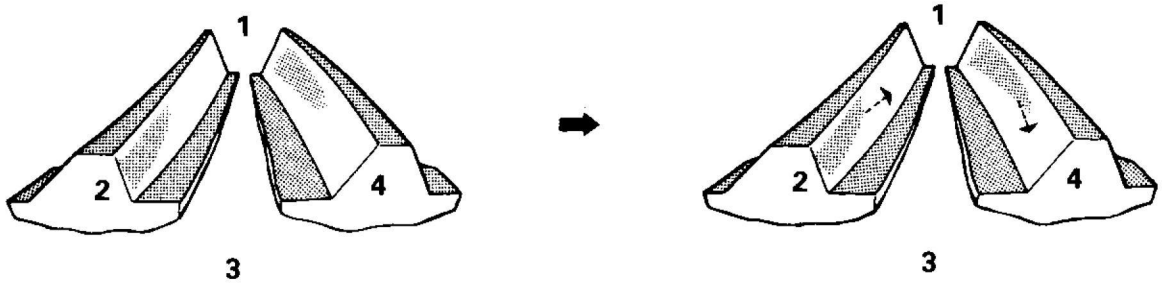
Standard tooth contact pattern

1 Narrow tooth side
2 Drive-side tooth surface (the side applying power during forward movement)
3 Wide tooth side
4 Coast-side tooth surface (the side applying power during reverse movement)



Problem	Solution

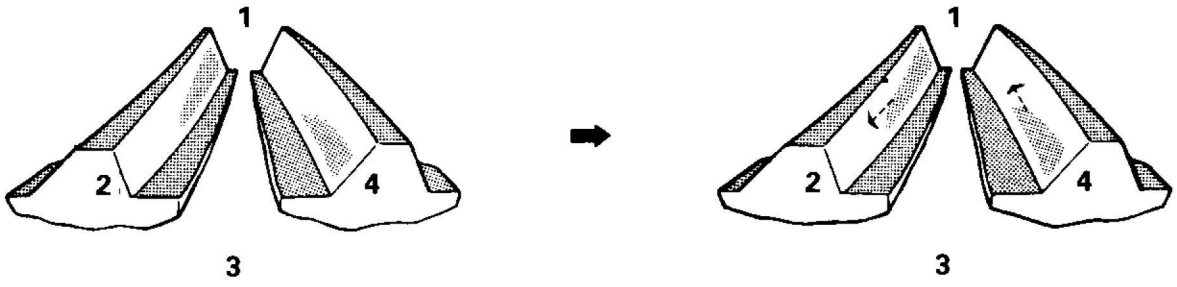
Tooth contact pattern resulting from excessive pinion height



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

Increase the thickness of the pinion height adjusting shim, and position the drive pinion closer to the centre of the drive gear.
Also, for backlash adjustment, position the drive gear farther from the drive pinion.

Tooth contact pattern resulting from insufficient pinion height



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

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

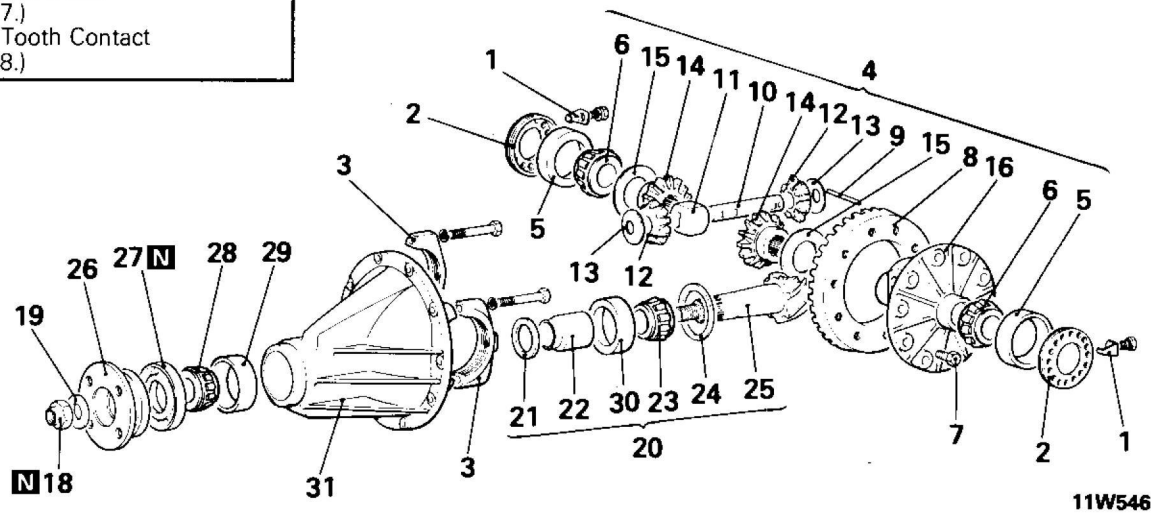
11S642

DISASSEMBLY

E27QI-

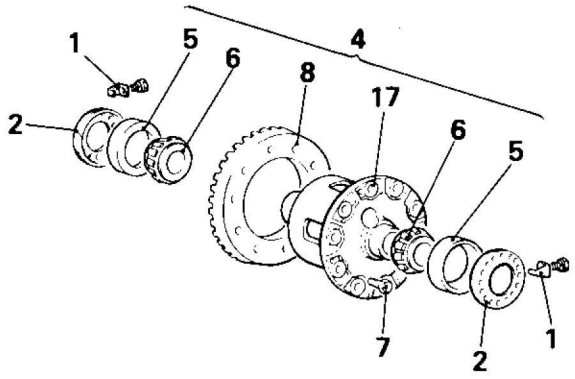
Inspection Before Disassembly
- Final Drive Gear Backlash (Refer to P. 27-17.)
- Drive Gear Runout (Refer to P. 27-17.)
- Differential Gear Backlash <Conventional differential> (Refer to P. 27-17.)
- Final Drive Gear Tooth Contact (Refer to P. 27-18.)

<Conventional differential>



11W546

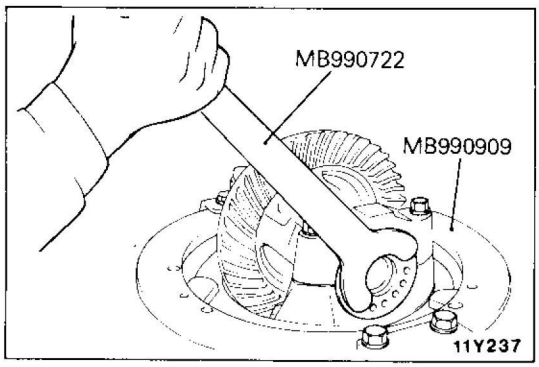
<Limited slip differential>



11B0097

Disassembly steps

- 1. Lock plate
- ◆◆ 2. Side bearing nut
- 3. Bearing cap
- ◆◆ 4. Differential case assembly
- 5. Side bearing outer race
- ◆◆ 6. Side bearing inner race
- 7. Bolt (10)
- ◆◆ 8. Drive gear
- 9. Lock pin
- 10. Pinion shaft
- 11. Thrust block
- 12. Pinion gear
- 13. Pinion washer
- 14. Side gear
- 15. Side gear thrust spacer
- 16. Differential case
- 17. Limited slip differential case assembly (Refer to P. 27-29.)
- ◆◆ 18. Self-locking nut
- 19. Washer
- ◆◆ 20. Drive pinion assembly
- 21. Drive pinion front shim (for preload adjustment)
- 22. Drive pinion spacer
- ◆◆ 23. Drive pinion rear bearing inner race
- 24. Drive pinion rear shim (for pinion height adjustment shim)
- 25. Drive pinion
- 26. Companion flange
- ◆◆ 27. Oil seal
- ◆◆ 28. Drive pinion front bearing inner race
- ◆◆ 29. Drive pinion front bearing outer race
- ◆◆ 30. Drive pinion rear bearing outer race
- 31. Differential carrier

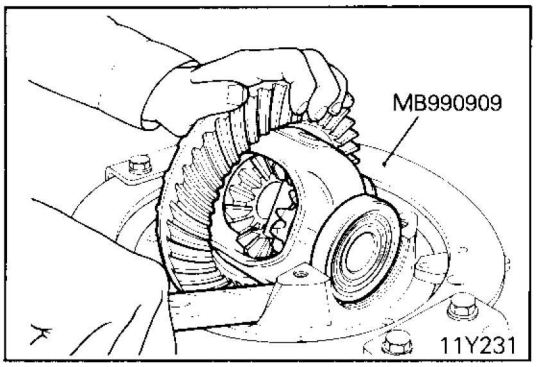


11Y237

SERVICE POINTS OF DISASSEMBLY

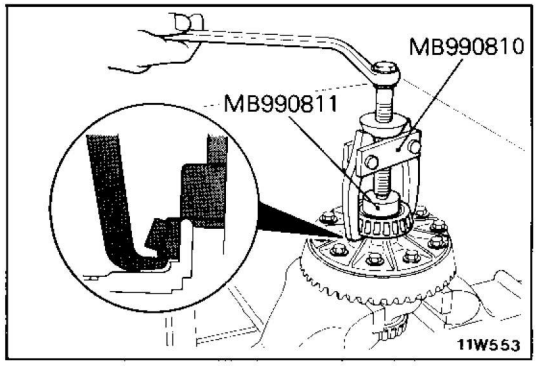
E27QFAF

2. REMOVAL OF SIDE BEARING NUT



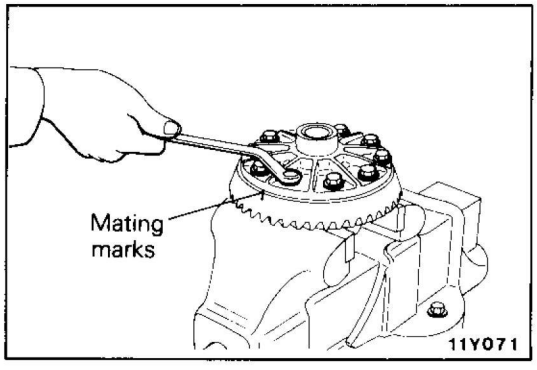
4. REMOVAL OF DIFFERENTIAL CASE ASSEMBLY

NOTE
Keep the right and left side bearings and side bearing nuts separate, so that they do not become mixed at the time of reassembly.



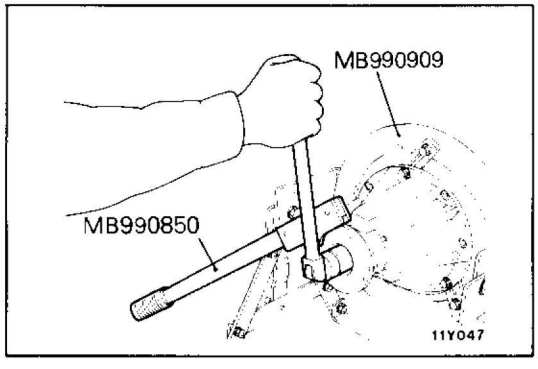
6. REMOVAL OF SIDE BEARING INNER RACE

NOTE
Attach the prongs of the special tool to the inner race of the side bearing through the openings in the differential case.

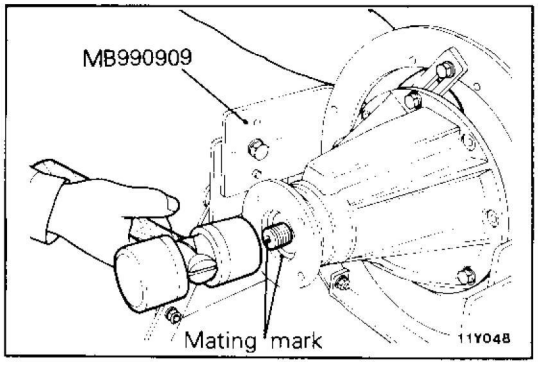


8. REMOVAL OF DRIVE GEAR

(1) Make the mating marks to the differential case and the drive gear.
(2) Loosen the drive gear attaching bolts in diagonal sequence to remove the drive gear.

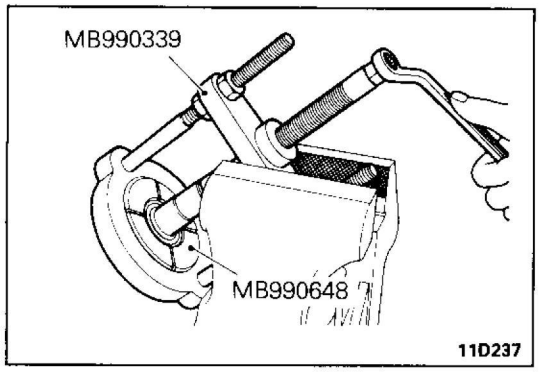


18. REMOVAL OF SELF-LOCKING NUT



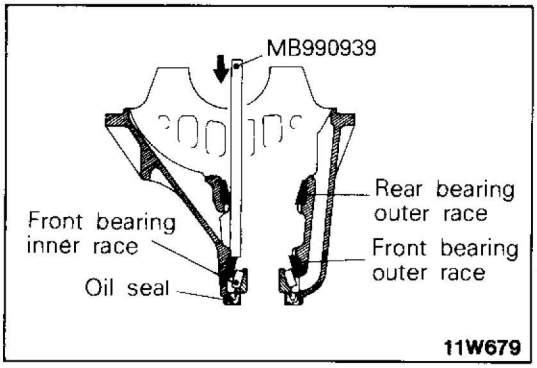
20. REMOVAL OF DRIVE PINION ASSEMBLY

(1) Make the mating marks to the drive pinion and companion flange.
(2) Drive out the drive pinion together with the drive pinion spacer and drive pinion front shims.



23. REMOVAL OF DRIVE PINION REAR BEARING INNER RACE

Pull out the drive pinion rear bearing inner race by using the special tools.

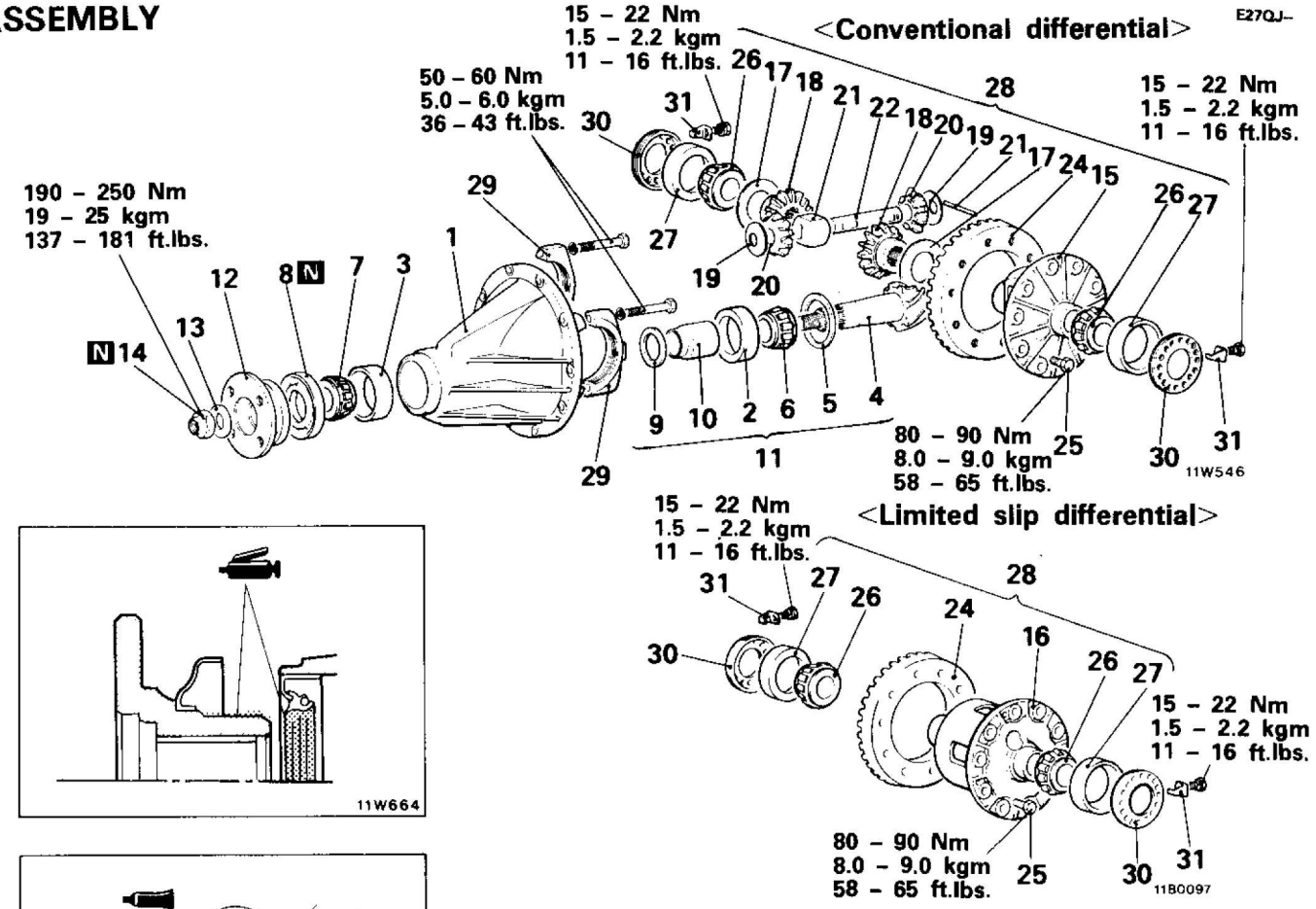


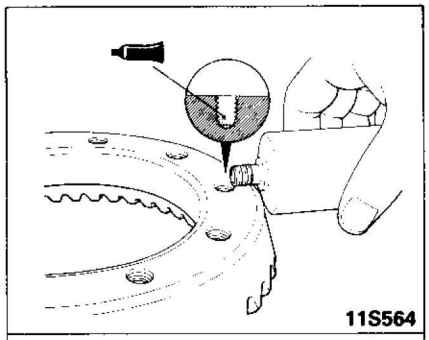
27. REMOVAL OF OIL SEAL/28. DRIVE PINION FRONT BEARING INNER RACE/29. DRIVE PINION FRONT BEARING OUTER RACE/30. DRIVE PINION REAR BEARING OUTER RACE

(1) Using the special tool, drive out the drive pinion front bearing outer race with drive pinion front bearing inner race and oil seal from the gear carrier.

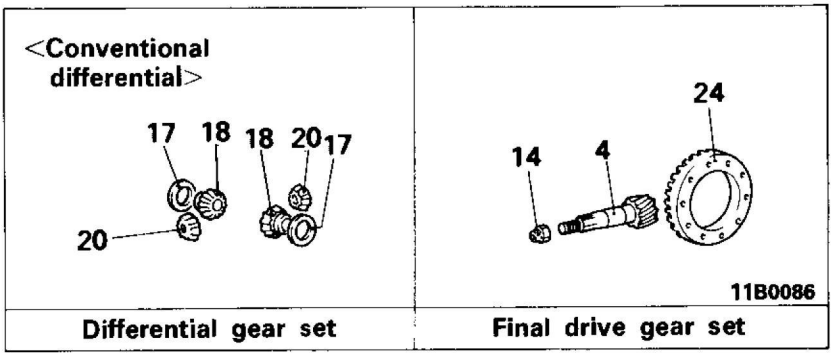
(2) Drive out the drive pinion rear bearing outer race in the same manner.

REASSEMBLY





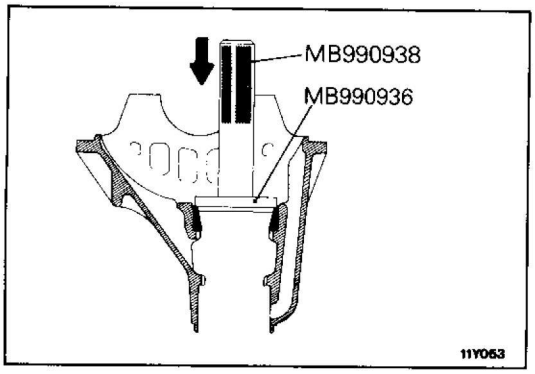
Adhesive:
3M Stud Locking Part No. 4170 or equivalent



Differential gear set | **Final drive gear set**

Reassembly steps

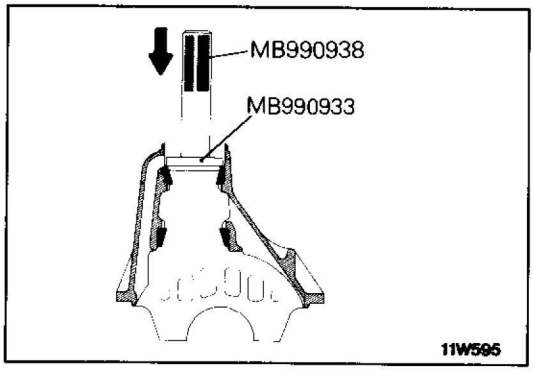
1. Differential carrier
2. ◆◆ Drive pinion rear bearing outer race
3. ◆◆ Drive pinion front bearing outer race
4. ◆◆ Pinion height adjustment
5. Drive pinion
6. Drive pinion rear shim (for pinion height adjustment shim)
7. Drive pinion rear bearing inner race
8. Drive pinion front bearing inner race
9. Oil seal
10. Drive pinion front shim (for preload adjustment)
11. Drive pinion spacer
12. ◆◆ Drive pinion preload adjustment
13. Drive pinion assembly
14. Companion flange
15. Washer
16. Self-locking nut
17. Differential case
18. Limited slip differential case assembly (Refer to P. 27-29.)
19. Side gear thrust spacer
20. Side gear
21. Pinion washer
22. Pinion gear
23. ◆◆ Differential gear backlash adjustment
24. Thrust block
25. Pinion shaft
26. ◆◆ Lock pin
27. ◆◆ Drive gear
28. Bolt (10)
29. ◆◆ Side bearing inner race
30. Side bearing outer race
31. Differential case assembly
32. ◆◆ Bearing cap
33. ◆◆ Final drive gear backlash adjustment
34. Side bearing nut
35. Lock plate



SERVICE POINTS OF REASSEMBLY E27QHAJ

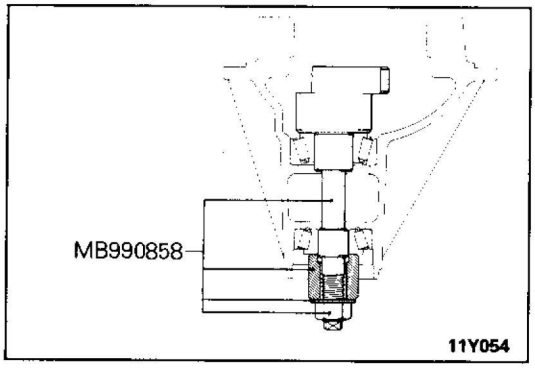
2. INSTALLATION OF DRIVE PINION REAR BEARING OUTER RACE

Caution
Perform press-fitting carefully so as not to tilt the outer race.



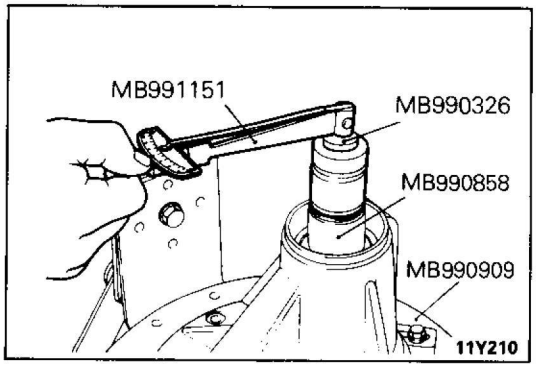
3. INSTALLATION OF DRIVE PINION FRONT BEARING OUTER RACE

Caution
Perform press-fitting carefully so as not to tilt the outer race.



- **PINION HEIGHT ADJUSTMENT**

(1) Install special tools and drive pinion front and rear bearing inner races to the gear carrier in the sequence shown in the illustration.

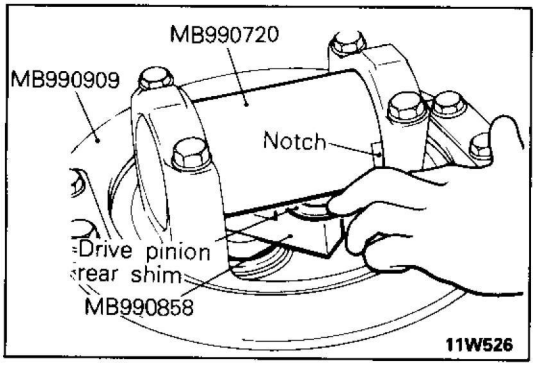


(2) Tighten the nut of the special tool until standard value of drive pinion turning torque is obtained.

(3) Measure the drive pinion turning torque (without the oil seal).

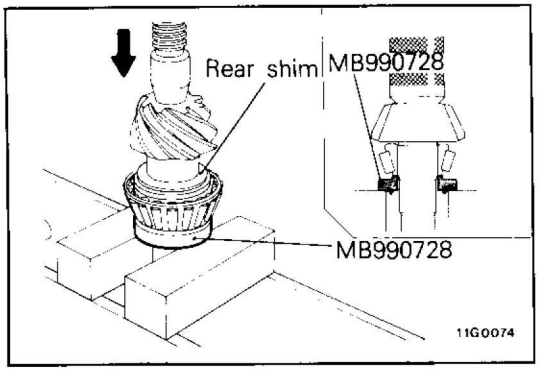
Standard value:
0.4 – 0.5 Nm (4.0 – 5.0 kgcm, 3.5 – 4.3 in.lbs.)

NOTE
Gradually tighten the nut of the special tool while checking the drive pinion turning torque.

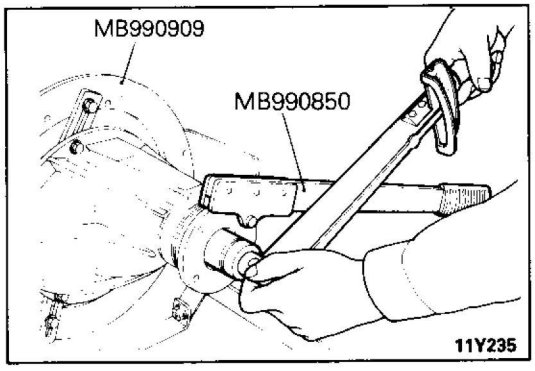


(4) Position the special tool in the side bearing seat of the gear carrier, then select a drive pinion rear shim of a thickness which corresponds to the gap between the special tools.

NOTE
Be sure to clean the side bearing seat thoroughly. When positioning the special tool, be sure that the cut-out sections of the special tool are in the position shown in the illustration, and also confirm that the special tool is in close contact with the side bearing seat.
When selecting the drive pinion rear shims, keep the number of shims to a minimum.



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



- **DRIVE PINION PRELOAD ADJUSTMENT**

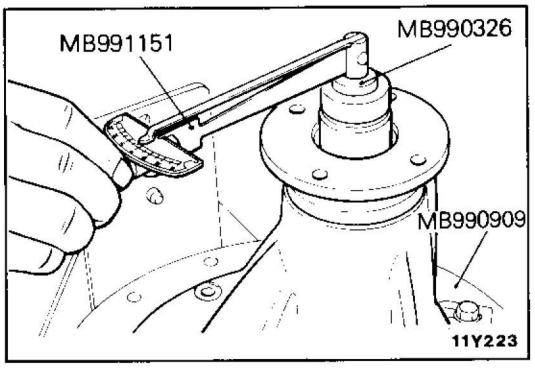
Adjust the drive pinion turning torque by using the following procedure:

Without oil seal

(1) Fit the drive pinion front shim(s) between the drive pinion spacer and the drive pinion front bearing inner race.

(2) Tighten the companion flange to the specified torque by using the special tools.

NOTE
Do not install the oil seal.



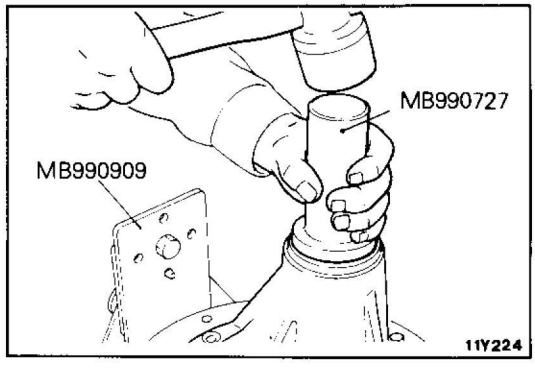
(3) Measure the drive pinion turning torque. (without the oil seal)

Standard value: 0.4 – 0.5 Nm
(4.0 – 5.0 kgcm, 3.5 – 4.3 in.lbs.)

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

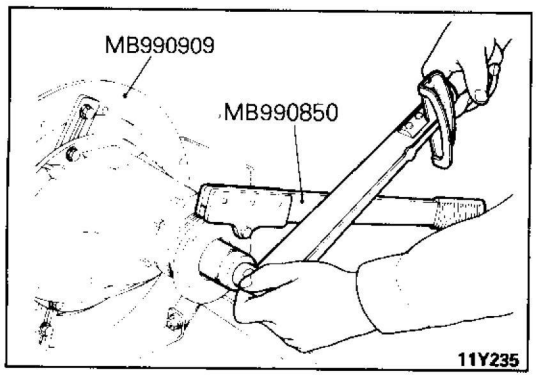
NOTE
When selecting the drive pinion front shims, if the number of shims is large, reduce the number of shims to a minimum by selecting the drive pinion spacers.

(5) Remove the companion flange and drive pinion once again.

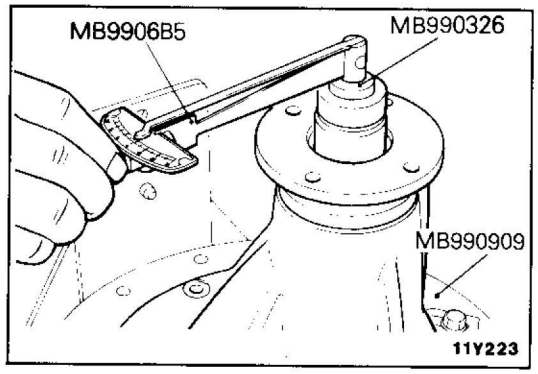


With oil seal

(1) After setting the drive pinion front bearing inner race, drive the oil seal into the gear carrier front lip by using the special tool.

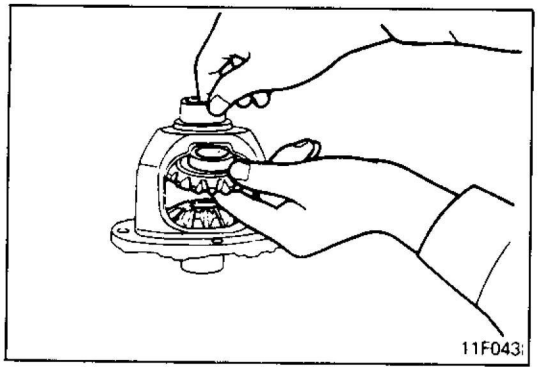


(2) Install the drive pinion assembly and companion flange with mating marks properly aligned, and tighten the companion flange self-locking nut to the specified torque by using the special tools.



(3) Measure the drive pinion turning torque (with oil seal) to verify that the drive pinion turning torque complies with the standard value.

Standard value: 0.65 – 0.75 Nm (6.5 – 7.5 kgcm, 5.6 – 6.5 in.lbs.)

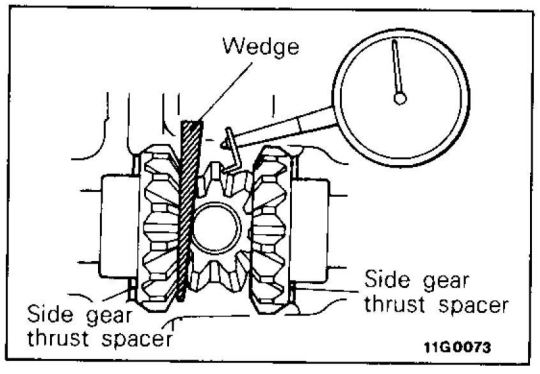


- **DIFFERENTIAL GEAR BACKLASH ADJUSTMENT <CONVENTIONAL DIFFERENTIAL>**

(1) Assemble the side gears, side gear thrust spacers, pinion gears, and pinion washers into the differential case.

(2) Temporarily install the pinion shaft.

NOTE
Do not assemble the thrust block and lock pin yet.



(3) Insert a wedge between the side gear and the pinion shaft to lock the side gear.

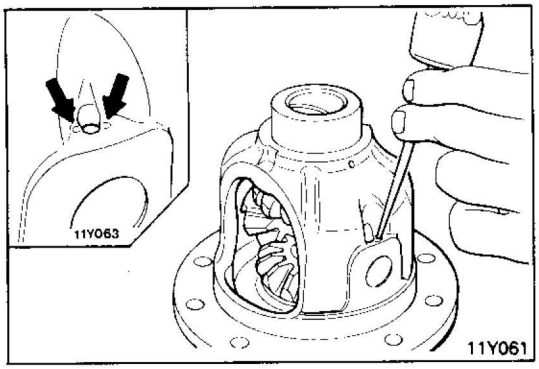
(4) While locking the side gear with the wedge, measure the differential gear backlash with a dial indicator on the pinion gear.

Standard value:
0.010 – 0.076 mm (0.0004 – 0.0030 in.)
Limit: 0.2 mm (0.0079 in.)

NOTE
Measure both pinion gears.

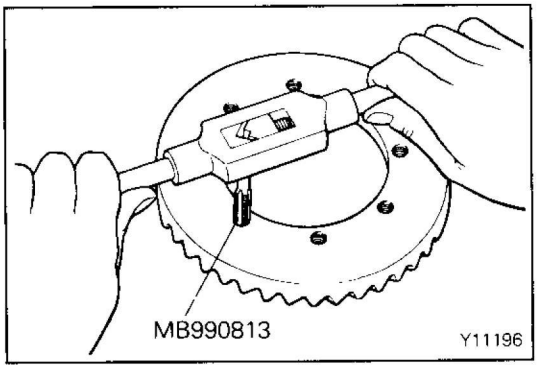
(5) If the differential gear backlash exceeds the limit, adjust the backlash by installing thicker side gear thrust spacers.

(6) Measure the differential gear backlash once again, and confirm that it is within the limit.
If adjustment is not possible, replace the side gears and pinion gears as a set.



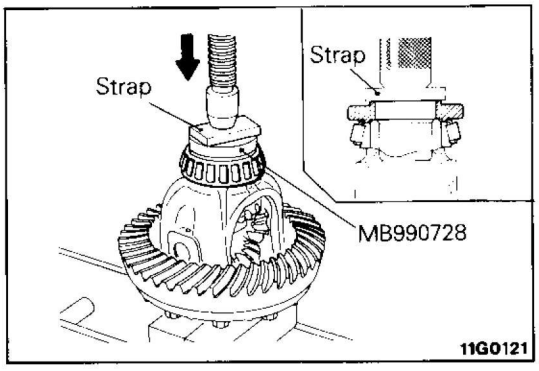
23. INSTALLATION OF LOCK PIN

(1) Align the pinion shaft lock pin hole with the differential case lock pin hole, and drive in the lock pin.
(2) Stake the lock pin with a punch at 2 points.



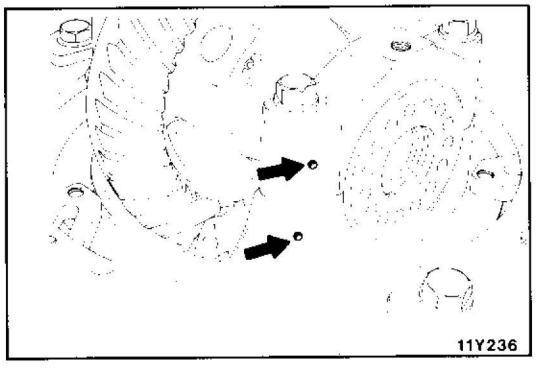
24. INSTALLATION OF DRIVE GEAR

(1) Clean the drive gear attaching bolts.
(2) Remove the adhesive adhered to the threaded holes of the drive gear by turning the special tool (tap M10 x 1.25), and then clean the threaded holes by applying compressed air.
(3) Install the drive gear onto the differential case with the mating marks properly aligned. Be sure to tighten the bolts to the specified torque in a diagonal sequence.



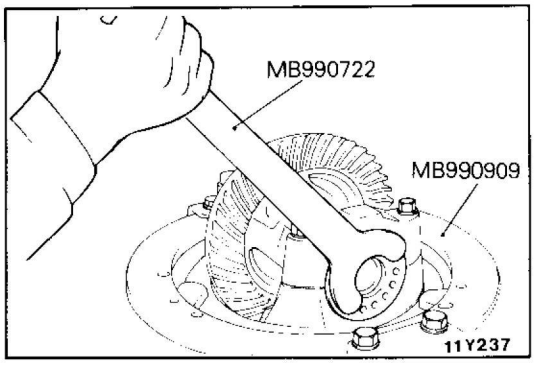
26. PRESS-FIT OF SIDE BEARING INNER RACE

Caution
When only one side bearing inner race is installed, be sure to only place load on the differential case.



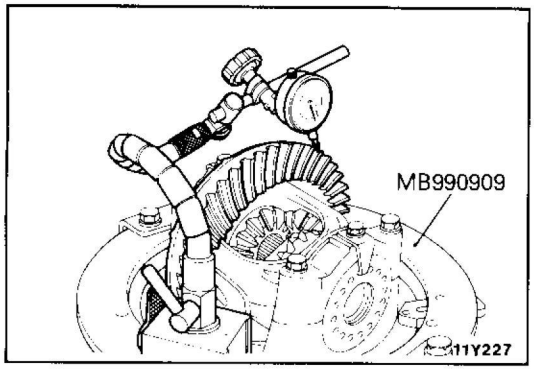
29. INSTALLATION OF BEARING CAP

Align the mating marks on the gear carrier and the bearing cap, and then tighten the bearing cap.



• FINAL DRIVE GEAR BACKLASH ADJUSTMENT

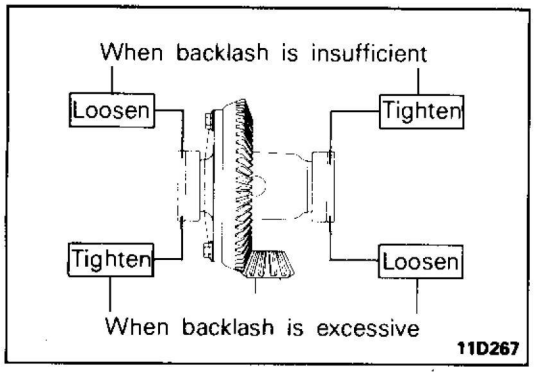
(1) Using the special tools, temporarily tighten the side bearing nut until it is in the state just before preloading of the side bearing.



(2) Measure the final drive gear backlash.

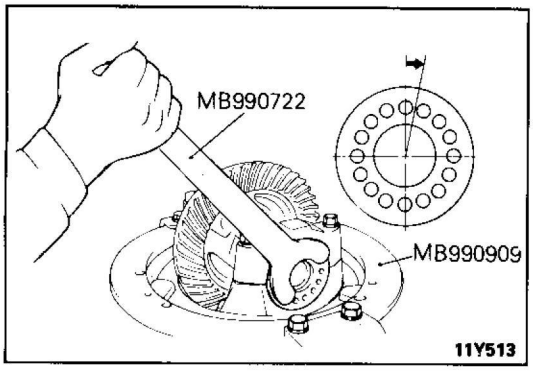
Standard value: 0.11 – 0.16 mm (0.0043 – 0.0063 in.)

NOTE
Measure at least 4 points on the drive gear periphery.

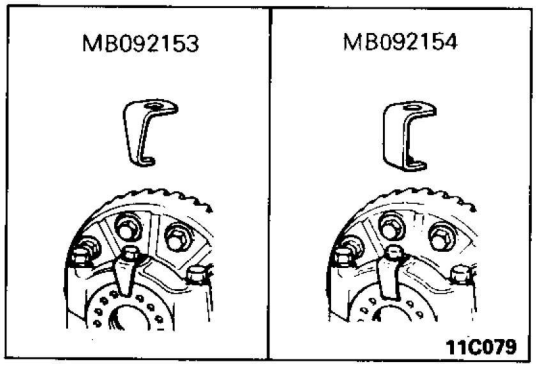


(3) Using the special tool (MB990722), adjust the backlash to standard value by moving the side bearing nut as shown.

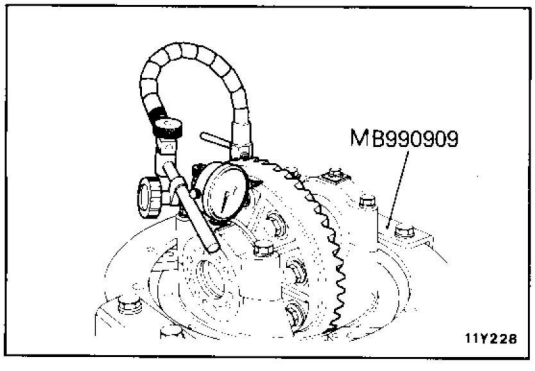
NOTE
First turn the side bearing nut for loosening, and then turn (by the same amount) the side bearing nut for tightening.



(4) Using the special tools, to apply the preload, turn down both right and left side bearing nuts on half the distance between centres of 2 neighbouring holes.



(5) Choose and install the lock plates (2 kinds).
(6) Check the final drive gear tooth contact. If poor contact is evident, make adjustment. (Refer to P. 27-18.)



(7) Measure the drive gear runout.

Limit: 0.05 mm (0.0020 In.)

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

LIMITED SLIP DIFFERENTIAL CASE ASSEMBLY

DISASSEMBLY AND REASSEMBLY

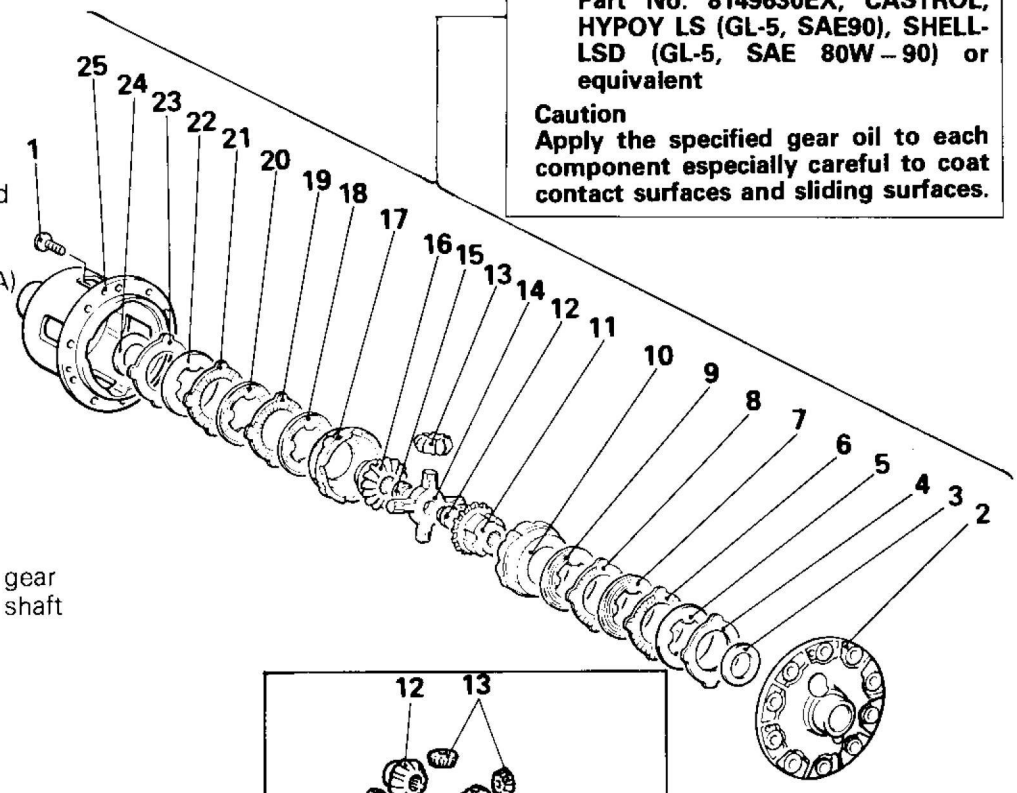
E27TI–

Gear oil:
MITSUBISHI Genuine Gear Oil Part No. 8149630EX, CASTROL, HYPOY LS (GL-5, SAE90), SHELL-LSD (GL-5, SAE 80W – 90) or equivalent

Caution
Apply the specified gear oil to each component especially careful to coat contact surfaces and sliding surfaces.

Disassembly steps

- ◆◆ Clutch plate preload adjustment
- ◆◆ 1. Screw
- 2. Differential case (A)
- 3. Thrust washer
- 4. Spring plate
- 5. Spring disc
- 6. Friction plate
- 7. Friction disc
- 8. Friction plate
- 9. Friction disc
- 10. Pressure ring
- 11. Side gear
- 12. Thrust block
- 13. Differential pinion gear
- 14. Differential pinion shaft
- 15. Thrust block
- 16. Side gear
- 17. Pressure ring
- 18. Friction disc
- 19. Friction plate
- 20. Friction disc
- 21. Friction plate
- 22. Spring disc
- 23. Spring plate
- 24. Thrust washer
- ◆◆ Clutch plate friction force adjustment
- 25. Differential case (B)



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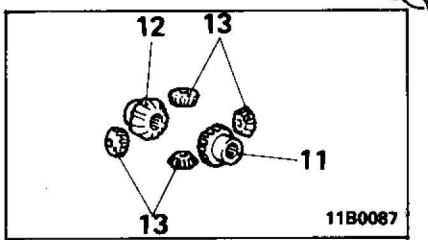

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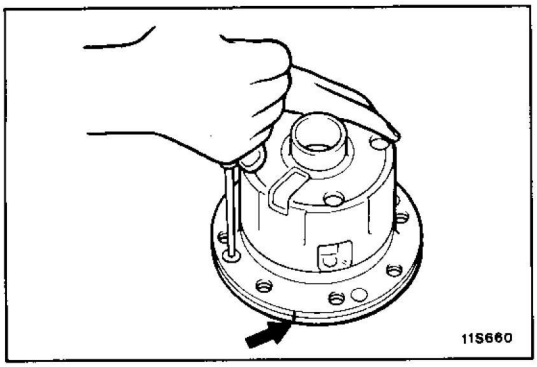
Differential gear set



11S660

SERVICE POINTS OF DISASSEMBLY

E27TJAG

1. REMOVAL OF SCREW

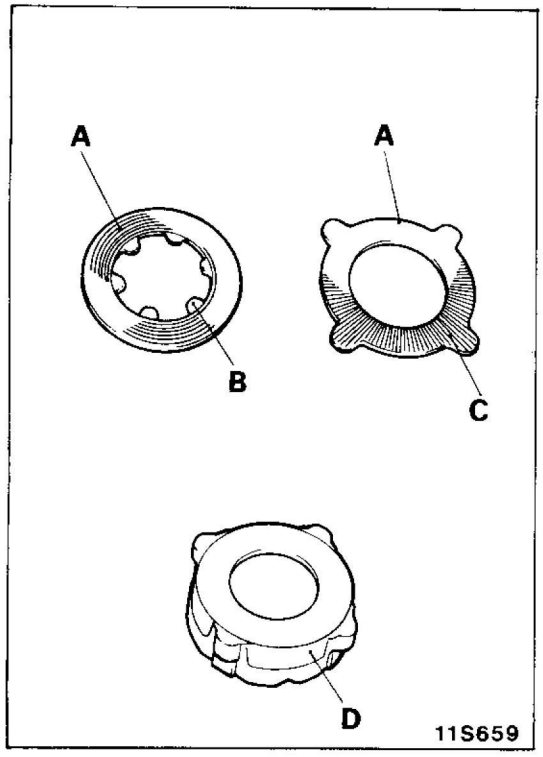
(1) Loosen screws of the differential cases (A) and (B) uniformly a little at a time.

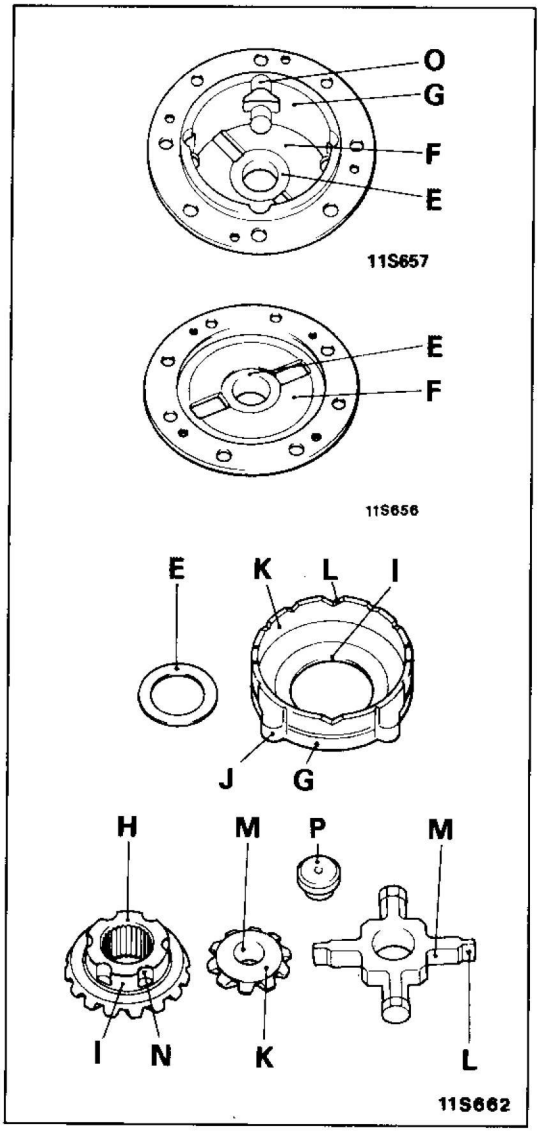
(2) Separate differential case (A) from differential case (B).

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

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

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





INSPECTION

E27TKAE

INSPECTION OF THE CONTACT AND SLIDING SURFACES OF PARTS

(1) Inspect the friction plate, friction disc, spring plate, spring disc and pressure ring.

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

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

B. The 6 projections on the inner circumference of the friction disc.
If there are nicks and dents, it will cause abnormalities in the clutch pressure.
Repair the parts by using an oil stone; if the parts cannot be repaired, replace them.

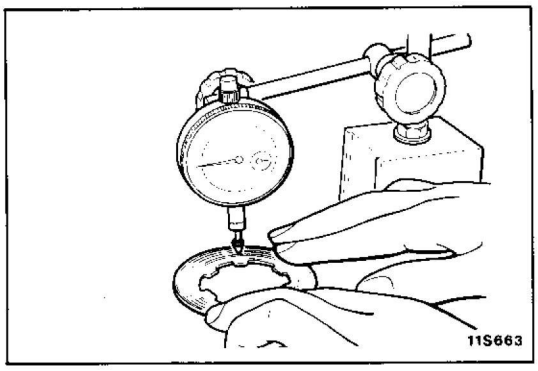
C. The 4 projections on the outer circumference of the friction disc.
If there are nicks and dents, it will cause abnormalities in the clutch pressure.
Repair the parts by using an oil stone, if the parts cannot be repaired, replace them.

D. The friction surface of the friction disc of the pressure ring. If there are nicks or scratches, repair the part by first grinding with an oil stone and then polishing with rubbing compound on a surface plate.

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

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

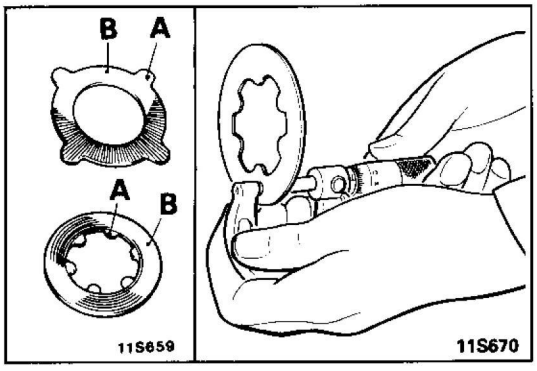
E. The sliding surfaces of the thrust washer and the case.
F. The spring contacting surface of the differential case.
G. The contact surfaces of the outer circumference of the pressure ring and the inner circumference of the differential case.
H. The sliding surface of the thrust washer.
I. The sliding surfaces of the hole in the pressure ring and the outer circumference of the side gear.
J. The projection on the outer circumference of the pressure ring.
K. The spherical surface of the differential pinion gear and the inner diameter of the pressure ring.
L. The V-shaped groove in the pressure ring, and the V-shaped part in the pinion shaft.
M. The outer diameter of the pinion shaft and the hole of the differential pinion gear.
N. The outer circumference groove of the side gear.
O. The inner circumference groove of the differential case.
P. The sliding surface of the thrust block.



INSPECTION FOR WARPING OF THE FRICTION PLATE AND FRICTION DISC

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

Limit: 0.08 mm (0.0031 in.)



INSPECTION FOR WEAR OF THE FRICTION PLATE AND FRICTION DISC

(1) In order to measure the wear, measure the thickness of the friction surfaces and projections of the friction disc and plate, and then find the difference.

Limit: 0.1 mm (0.004 in.)

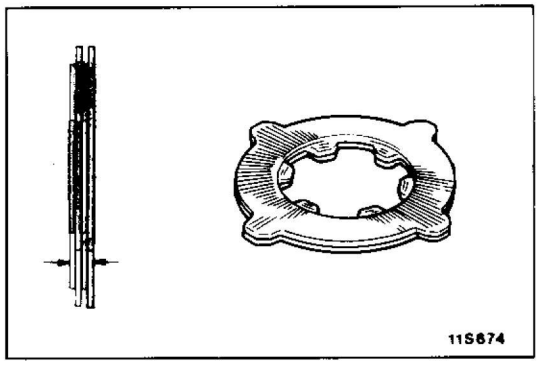
NOTE
Make the measurement at several different points.

(2) If the parts are worn beyond the allowable limit, replace them with new parts.

SERVICE POINTS OF REASSEMBLY E27TLAH

• CLUTCH PLATE FRICTION FORCE ADJUSTMENT

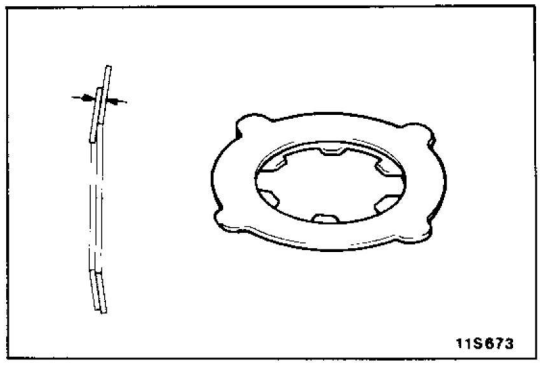
Before assembly, use the following method to adjust the clearance between the spring plates and differential cases (for adjustment of the clutch plate friction force), and to adjust the end play of the side gear when installing the internal components into the differential case.



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

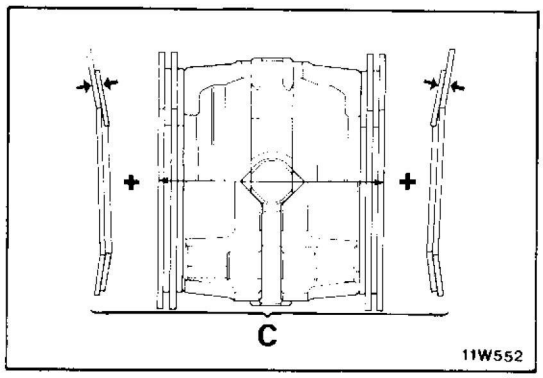
Standard value: 0.05 mm (0.0020 in.) or less

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

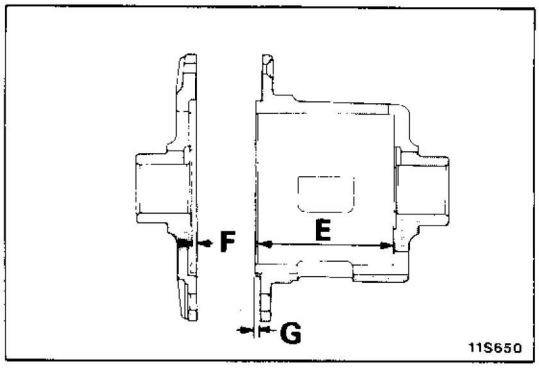


(2) Arrange one spring disc and one spring plate for each side, one on top of the other, so that the difference between the left and the right thickness is minimized.

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

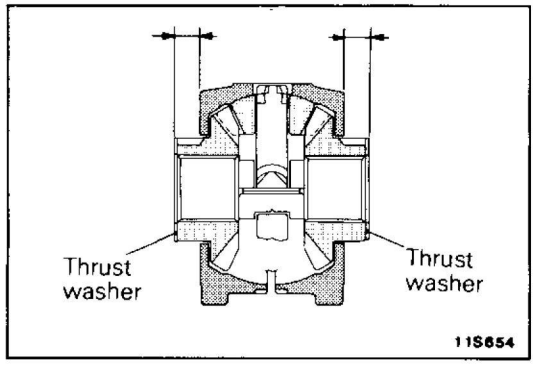


(3) Assemble the pressure ring's internal components (differential pinion shaft and pressure ring) and the friction discs and friction plates, and then as shown in the figure, measure the overall width.
(4) Calculate the total value (C) of the thickness of the spring discs and spring plates plus the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



(5) Obtain the dimension (D) between the spring plate contact surfaces when differential cases (A) and (B) are combined.
(D = E + F – G)
(6) Change the thickness of the friction disc so that the clearance (D–C) between the differential case and the spring plate becomes the standard value.

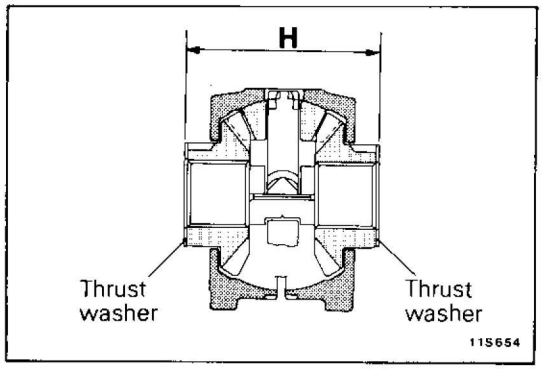
Standard value: 0.06–0.20 mm (0.0024–0.0079 In.)



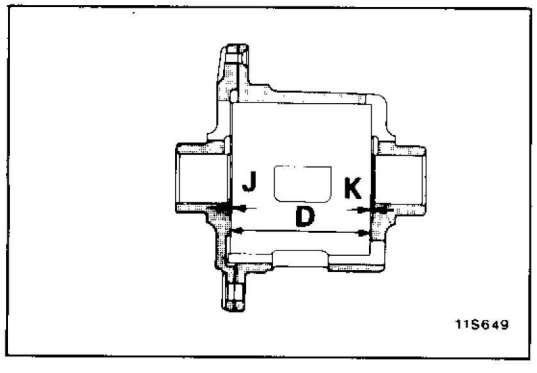
(7) Remove the spring plates, spring discs, friction plates and friction disc.
(8) Install the thrust washer as shown in the figure, and then select a thrust washer so that the difference between the left and right dimensions from the prssure ring rear face to the thrust washer end face is the standard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

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

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



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



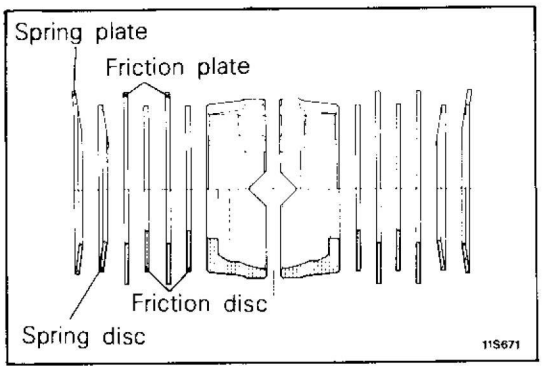
(10) Obtain the dimension (I) between the thrust washer contact surfaces when differential cases (A) and (B) are combined.
(I = D + J + K)

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

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

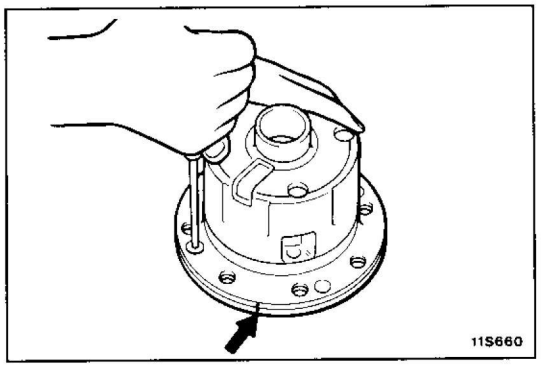
Standard value: 0.05 – 0.20 mm (0.0020 – 0.0079 In.)

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



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

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

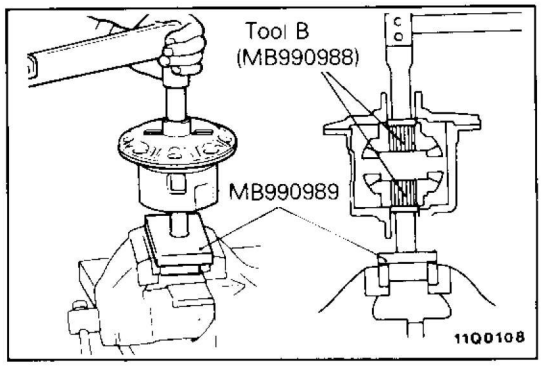


- **CLUTCH PLATE PRELOAD ADJUSTMENT**

(1) Align the mating marks (the same numeral on each case) of differential case (A) and differential case (B).

(2) Turning the screwdriver slowly several times, tighten the screw so that the cases are in close contact.

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



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

Standard value:

When a new clutch plate is used
50 – 80 Nm (5.0 – 8.0 kgm, 36 – 58 ft.lbs.)

When an old clutch plate is used
35 – 80 Nm (3.5 – 8.0 kgm, 25 – 58 ft.lbs.)

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

NOTES

WHEEL AND TYRE

CONTENTS

E31AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E31CA – –

Items		Specifications
Wheel		
Tyre size		175R14C 8PR
Wheel type		Steel
Wheel size		14 × 5JJ
Amount of wheel offset	mm (in.)	40 (1.57)
Tyre inflation pressure	kPa (kg/cm^2, psi)	
Front wheels		
2 passengers		300 (3.0, 42.7)
3 passengers and cargo		300 (3.0, 42.7)
Rear wheels		
2 passengers		300 (3.0, 42.7)
3 passengers and cargo		450 (4.5, 64.0)

SERVICE SPECIFICATIONS

E31CB – –

Items		Specifications
Limit		
Wheel runout		
Radial	mm (in.)	2.0 (0.08)
Lateral	mm (in.)	2.0 (0.08)
Tread depth of tyre	mm (in.)	1.6 (0.06)

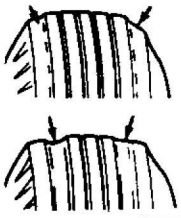
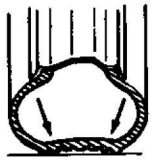
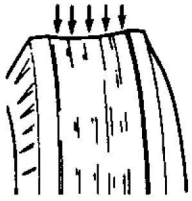
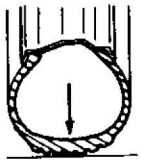
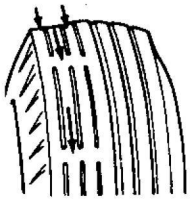
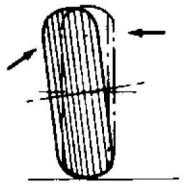
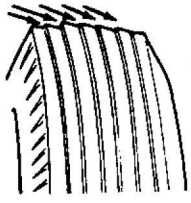
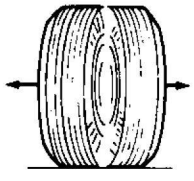
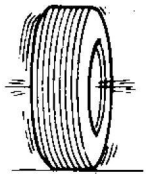
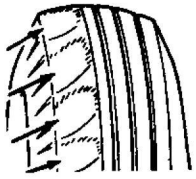
TORQUE SPECIFICATIONS

E31CC – –

Items	Nm	kgm	ft. lbs.
Hub nuts	120 – 140	12 – 14	87 – 101
Hook assembly installing bolt	15 – 22	1.5 – 2.2	11 – 16

TROUBLESHOOTING

E31EA--

Symptom	Probable cause	Remedy	Reference page
Rapid wear at shoulders 	Under-inflation or lack of rotation 	Adjust the tyre pressure	31-2
Rapid wear at centre 	Over-inflation or lack of rotation 		
Cracked treads 	Under-inflation		
Wear on one side 	Excessive camber 	Inspect the camber	Refer to GROUP 33 – Service Adjustment Procedures
Feathered edge 	Incorrect toe-in 	Adjust the toe-in	
Bald spots 	Unbalanced wheel 	Adjust the imbalanced wheels	–
Scalloped wear 	Lack of rotation of tyres or worn or out-of-alignment suspension	Rotate the tyres Inspect the front suspension alignment	Refer to GROUP 33 – Service Adjustment Procedures

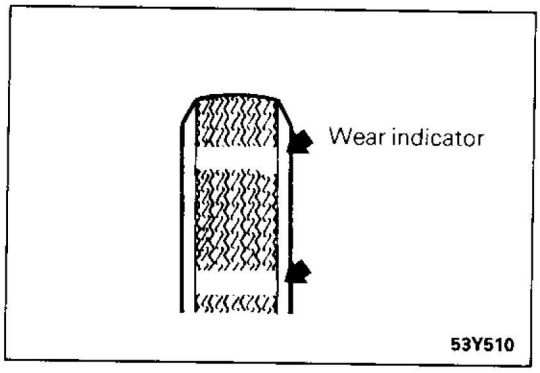
11U0047

SERVICE ADJUSTMENT PROCEDURES

E31FAAA

TYRE INFLATION PRESSURE CHECK

Check the inflation pressure of the tyres. If it is not within the standard value, make the necessary adjustment.



TYRE WEAR CHECK

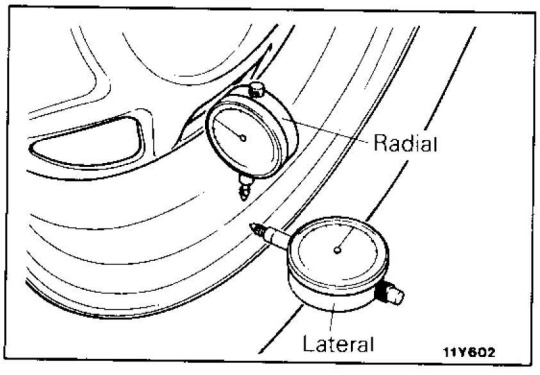
E31FBAA

Measure the tread depth of tyres.

Limit: 1.6 mm (0.06 in.)

If the remaining tread depth is less than the limit, replace the tyre.

NOTE
When the tread depth of tyres is reduced to 1.6 mm (0.06 in.) or less, wear indicators will appear.



WHEEL RUNOUT CHECK

E31FCAA

Jack up the vehicle so that the wheels are clear of the floor. While slowly turning the wheel, measure wheel runout with a dial indicator.

Limit:

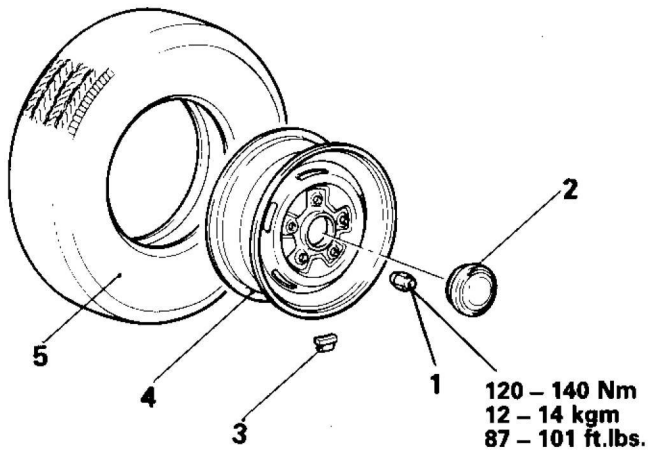
Radial	**2.0 mm (0.08 in.)**
Lateral	**2.0 mm (0.08 in.)**

If wheel runout exceeds the limit, replace the wheel.

WHEEL AND TYRE

REMOVAL AND INSTALLATION

331GA--



11D0026

Removal steps

1. Hub nut
2. Center cap
3. Balance weight
4. Wheel
5. Tyre

TYRE CHAINS AND SNOW TYRES

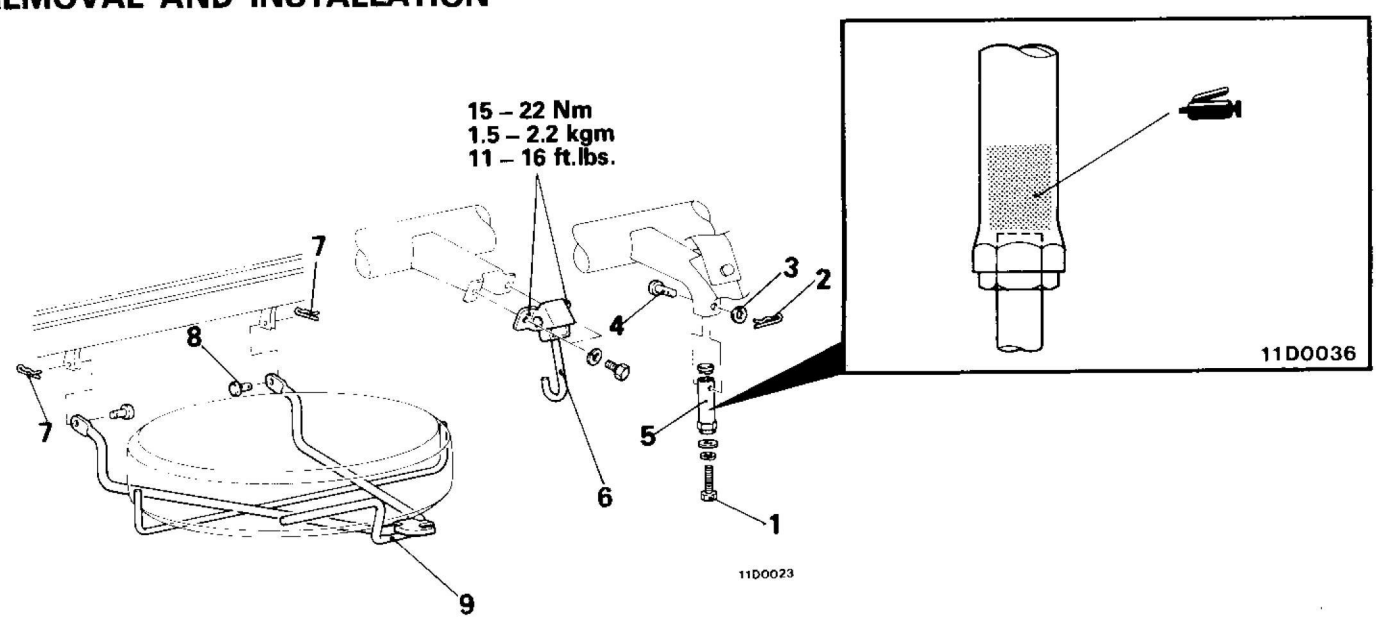
E31GGACa

1. Use tyre chains only on rear wheels. Do not use tyre chain on front wheels.
2. When using snow tyres, use them on all four wheels for maneuverability and safety.

SPARE TYRE CARRIER

E31HA--

REMOVAL AND INSTALLATION



Removal steps

1. Bolt
2. Snap pin
3. Washer
4. Clevis pin
5. Holder assembly
6. Hook assembly
7. Snap pin
8. Clevis pin
9. Spare tyre hanger assembly

NOTES

POWER PLANT MOUNT

CONTENTS

E32AA--

SPECIFICATIONS

TORQUE SPECIFICATIONS

E32CA--

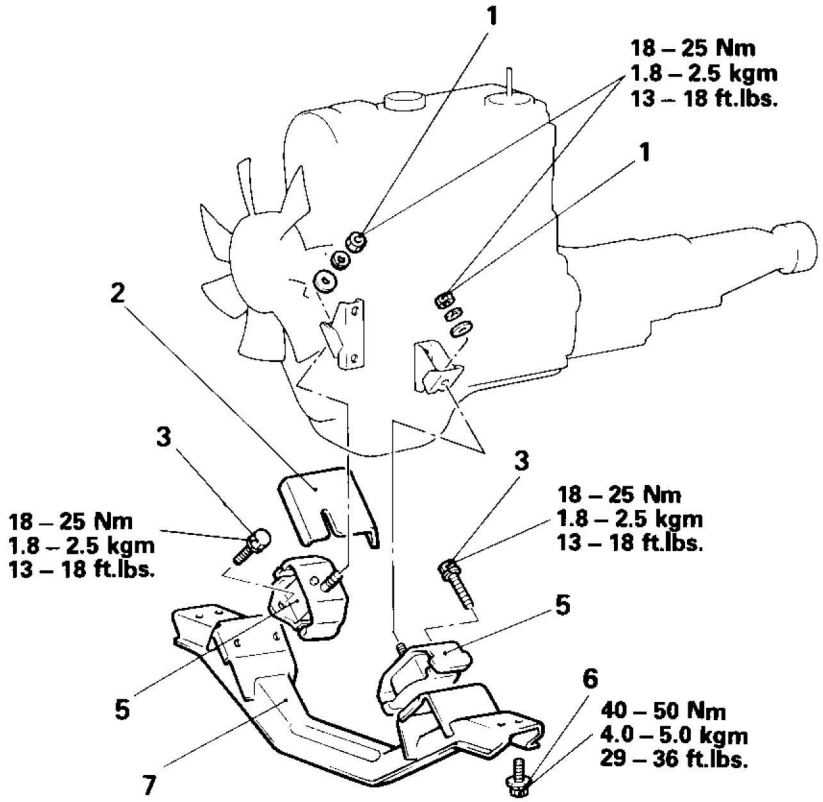
Items	Nm	kgm	ft.lbs.
Engine support front insulator to engine	18 – 25	1.8 – 2.5	13 – 18
Engine support front insulator to front engine support assembly	18 – 25	1.8 – 2.5	13 – 18
Front engine support assembly to frame	40 – 50	4.0 – 5.0	29 – 36
Heat protector to engine support front insulator	8 – 12	0.8 – 1.2	6 – 9
Rear engine insulator to transmission (nut)	18 – 25	1.8 – 2.5	13 – 18
Rear engine insulator to transmission (bolt)	30 – 42	3.0 – 4.2	22 – 30
Rear engine insulator to frame	30 – 42	3.0 – 4.2	22 – 30
Rear insulator support to transmission	30 – 42	3.0 – 4.2	22 – 30
Rear engine mounting insulator to rear insulator support	30 – 42	3.0 – 4.2	22 – 30
Rear engine mounting insulator to frame	30 – 42	3.0 – 4.2	22 – 30

FRONT ENGINE MOUNTING

REMOVAL AND INSTALLATION

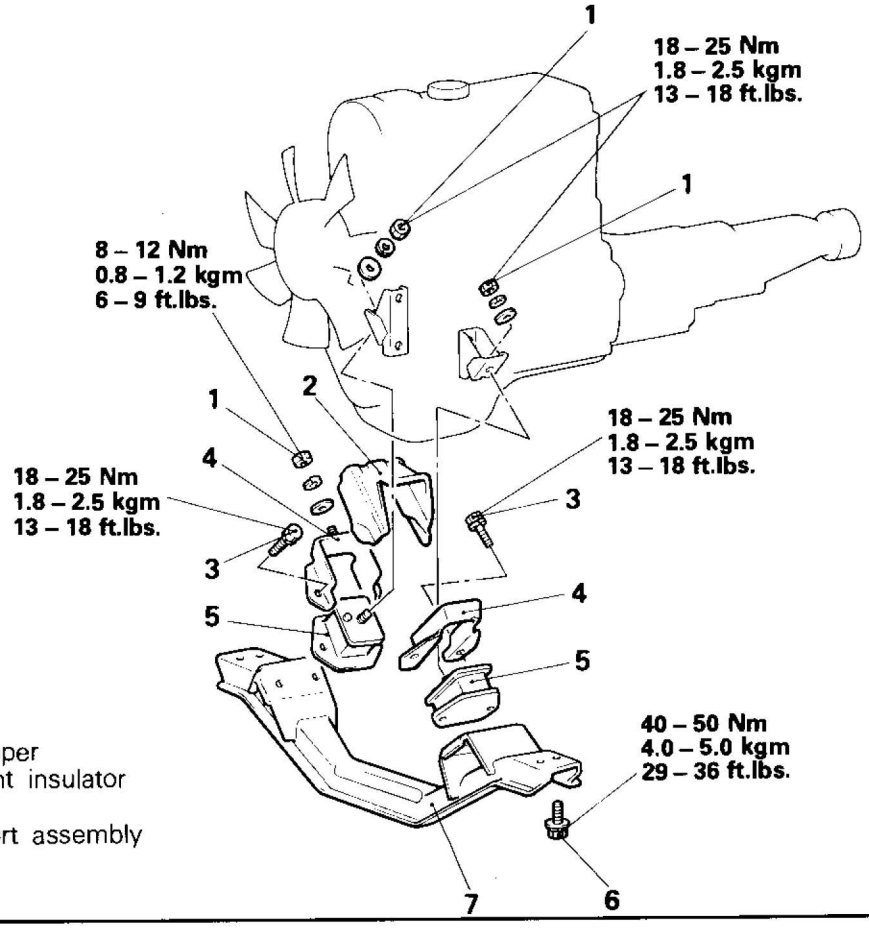
E32GA – –

<Petrol-powered vehicles>



01D0032

<Diesel-powered vehicles>



01D0033

Removal steps

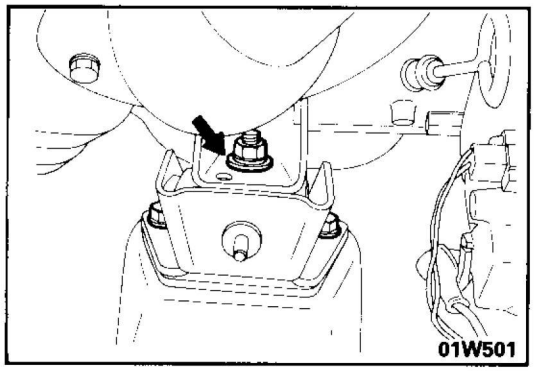
1. Nut
2. Heat protector
3. Bolt
4. Front insulator stopper
◆◆ ◆◆ 5. Engine support front insulator
6. Bolt
7. Front engine support assembly

SERVICE POINTS OF REMOVAL E32GBACa

5. REMOVAL OF ENGINE SUPPORT FRONT INSULATOR

Firmly support oil pan with jacks and wooden blocks. Remove insulator.

Caution
Do not raise the engine too much, as this may damage hoses and cables.



SERVICE POINTS OF INSTALLATION E32GDACa

5. INSTALLATION OF ENGINE SUPPORT FRONT INSULATOR

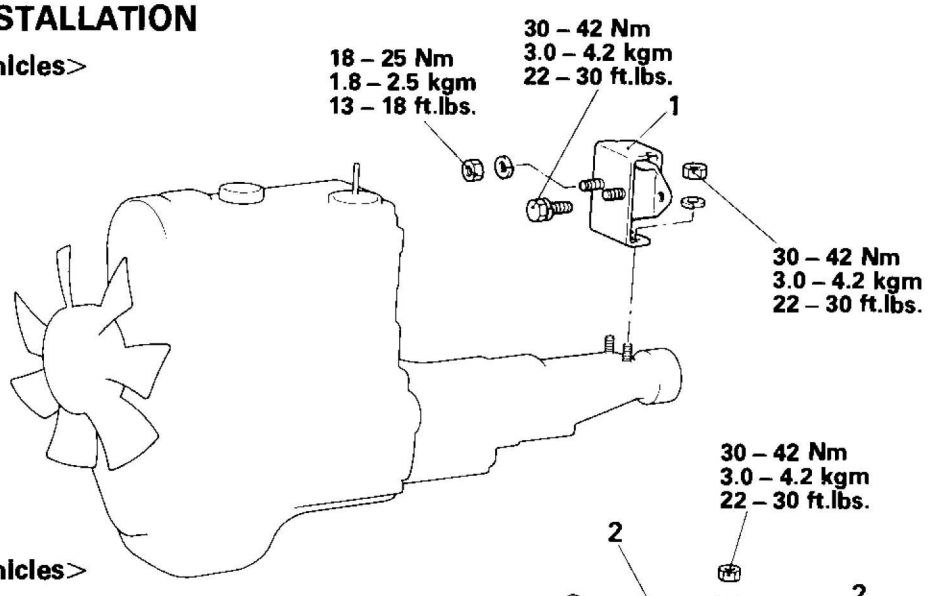
Align the hole to the positioning boss and assemble.

Caution
Do not allow gasoline or oil to contact insulator.

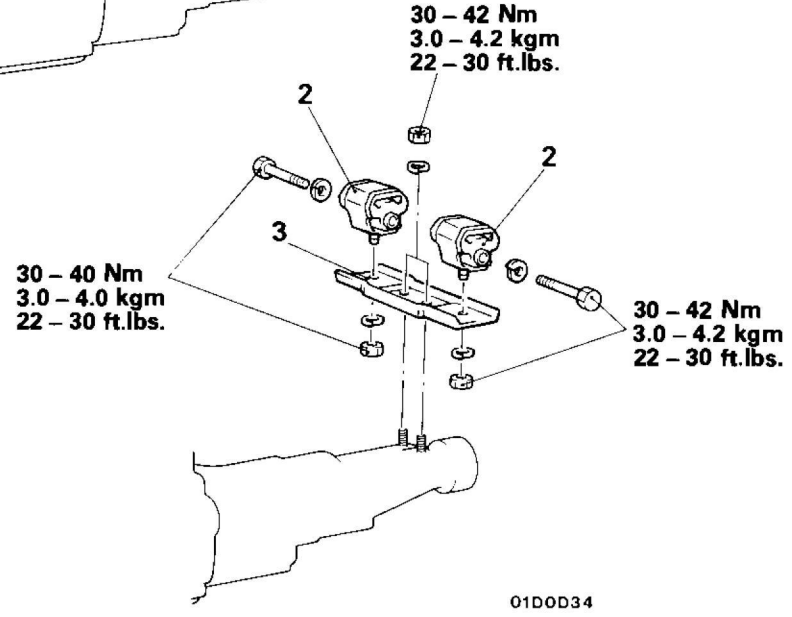
REAR ENGINE MOUNTING

REMOVAL AND INSTALLATION E32HA--

<Petrol-powered vehicles>



<Diesel-powered vehicles>



Removal steps
1. Rear engine insulator
2. Rear engine mounting insulator
3. Rear insulator support

FRONT SUSPENSION

CONTENTS

E33AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E33CA – –

Items		Petrol-powered vehicles	Diesel-powered vehicles
Suspension system		Independent, double wishbone with coil spring and telescopic shock absorber	Independent, double wishbone with coil spring and telescopic shock absorber
Coil spring			
Wire dia. × O.D. × free length	mm (in.)	17 × 122 × 278 (0.67 × 4.80 × 10.9)	17 × 122 × 284 (0.67 × 4.80 × 11.2)
Spring constant	N/mm (kg/mm, lbs./in.)	118.1 (11.81, 661)	118.1 (11.81, 661)
Shock absorber			
Type		Hydraulic, cylindrical, double acting type	Hydraulic, cylindrical, double acting type
Maximum length	mm (in.)	355 (13.9)	355 (13.9)
Compressed length	mm (in.)	225 (8.8)	225 (8.8)
Stroke	mm (in.)	130 (5.1)	130 (5.1)
Damping force [at 0.3 m (0.984 ft.)/sec.]			
Expansion	N (kg, lbs.)	3,500 (350, 771)	2,350 (235, 518)
Compression	N (kg, lbs.)	1,500 (150, 330)	1,100 (110, 242)
Stabilizer bar			
O.D.	mm (in.)	22 (0.87)	22 (0.87)

SERVICE SPECIFICATIONS

E33CB – –

Items		Specifications
Standard Value		
Toe-in		
At the centre of tyre tread	mm (in.)	2 – 8 (0.08 – 0.32)
At the rim of disc wheel	mm (in.)	1 – 4 (0.04 – 0.16)
Toe-in angle (per wheel)		5′ – 21′
Camber		1° ± 45′
Caster		2° ± 1°
King pin inclination		8°
Upper ball joint starting torque	Nm (kgcm, in.lbs.)	0.8 – 2.5 (8 – 25, 7 – 21)
Limit		
Lower ball joint axial play	mm (in.)	0.5 (0.02)

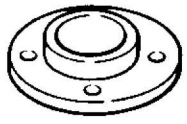
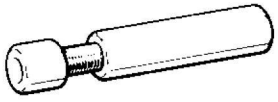
TORQUE SPECIFICATIONS

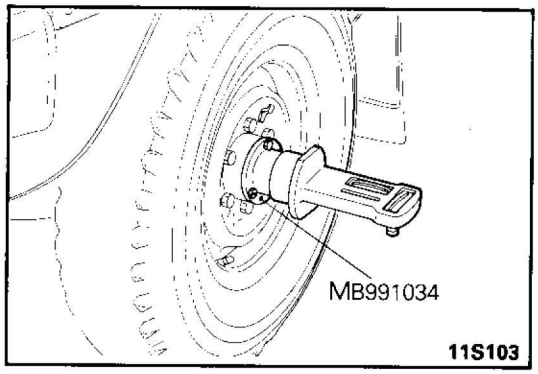
E33CC--

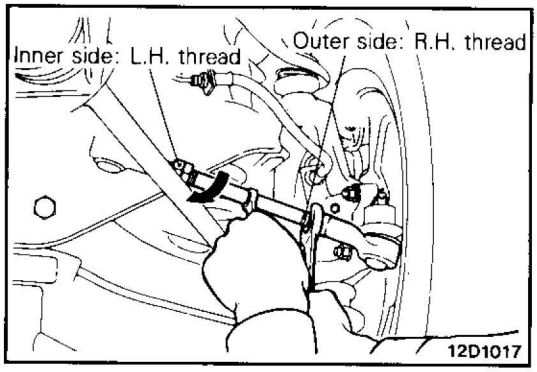
Items	Nm	kgm	ft.lbs.
Upper arm shaft to crossmember	60 – 85	6.0 – 8.5	43 – 61
Shock absorber locking nut	15	1.5	10
Shock absorber to lower arm	15 – 22	1.5 – 2.2	10 – 15
Upper ball joint to knuckle	60 – 90	6.0 – 9.0	43 – 65
Lower arm attaching nut	80 – 110	8.0 – 11	58 – 79
Lower ball joint to knuckle	120 – 180	12 – 18	87 – 130
Lower ball joint to lower arm	30 – 42	3.0 – 4.2	22 – 30
Bump stopper attaching nut	70 – 85	7.0 – 8.5	51 – 61
Strut bar mounting nut	90 – 125	9.0 – 12.5	65 – 90
Stabilizer bar locking nut	17 – 23	1.7 – 2.3	12 – 16
Clamp A to hanger	8 – 12	0.8 – 1.2	6 – 8
Clamp B to lower arm	15 – 20	1.5 – 2.0	10 – 14

SPECIAL TOOLS

E33DA--

Tool	Number	Name	Use
	MB991034	Gauge attachment	Measurement of the wheel alignment
	MB990792	Coil spring compressor	Compression of coil spring
	MB990804	Knuckle arm puller	Removal of upper and lower ball joint from knuckle
	MB990685 or MB990968	Torque wrench	Measurement of the upper ball joint starting torque
	MB990326	Preload socket	Measurement of the upper ball joint starting torque





SERVICE ADJUSTMENT PROCEDURES

E33FAAS

FRONT WHEEL ALIGNMENT INSPECTION AND ADJUSTMENT

1. Measure the wheel alignment with the vehicle parked on a level surface and with the front wheels placed in the straight ahead position.
2. The front suspension, steering system, and wheels should be serviced to mormal condition prior to measurement of wheel alignment.

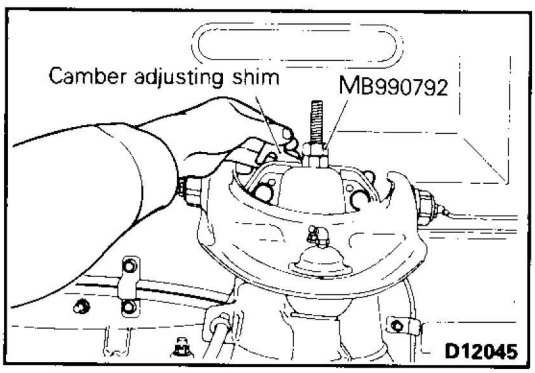
TOE-IN

Standard value:

At the centre of tyre tread	**2 – 8 mm (0.08 – 0.32 In.)**
At the rim of disc wheel	**1 – 4 mm (0.04 – 0.16 in.)**
Toe angle (per wheel)	**5′ – 21′**

1. If the toe-in is out of the standard value, adjust by turning the right and left turnbuckles an equal amount.
2. Turn the turnbuckle in the direction of the arrow shown in the illustration to increase the toe-in.

   NOTE
   (1) When the right and left turnbuckles are turned 1/2 turn at the same time, the toe-in can be adjusted approx. 4 mm (0.16 in.).
   (2) This illustration shows toe-in adjustment of left wheel. To increase toe-in of right wheel, reverse the turnbuckle turning direction shown in the illustration.
3. After making the adjustments, use a turning radius gauge to confirm that the steering wheel turning angle is within the standard value range. (Refer to GROUP 37.)



CAMBER

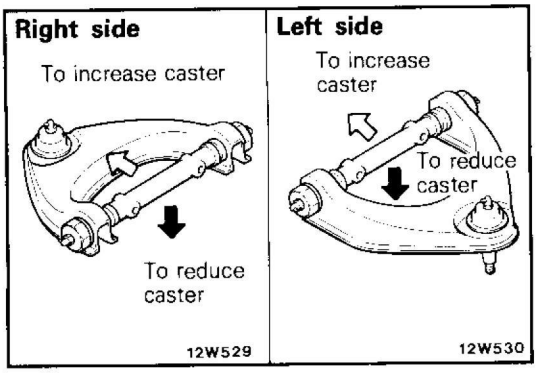
Standard value: 1° ± 45′

NOTE
1. If camber is out of the standard value, make adjustment of camber by increasing or decreasing the thickness of the camber adjusting shim provided between the upper arm shaft and the crossmember.
2. The standard thickness of the shim is 4 mm (0.16 in.).
3. The camber changes by about 8′ when the thickness of the shim is changed by 0.6 mm (0.024 in.).

Caution
When camber is adjusted, remove load from the arm by compressing the sprlng with a speclal tool.

CAMBER ADJUSTING SHIMS
Camber adjusting shims are as shown in the table below;

Part No.	Thickness mm (in.)
MT141215	0.6 (0.024)
MT141216	1.2 (0.048)
MT141217	2.3 (0.09)



CASTER

Standard value: 2° ± 1°

NOTE

1. If caster is out of the standard value, make adjustment of the caster by turning the upper arm shaft with the upper arm shaft removed from the crossmember.
2. The upper arm shaft moves forward or backward by 1.25 mm (0.049 in.) when it is turned by 180°, and the caster changes by about 16'.

KINGPIN INCLINATION

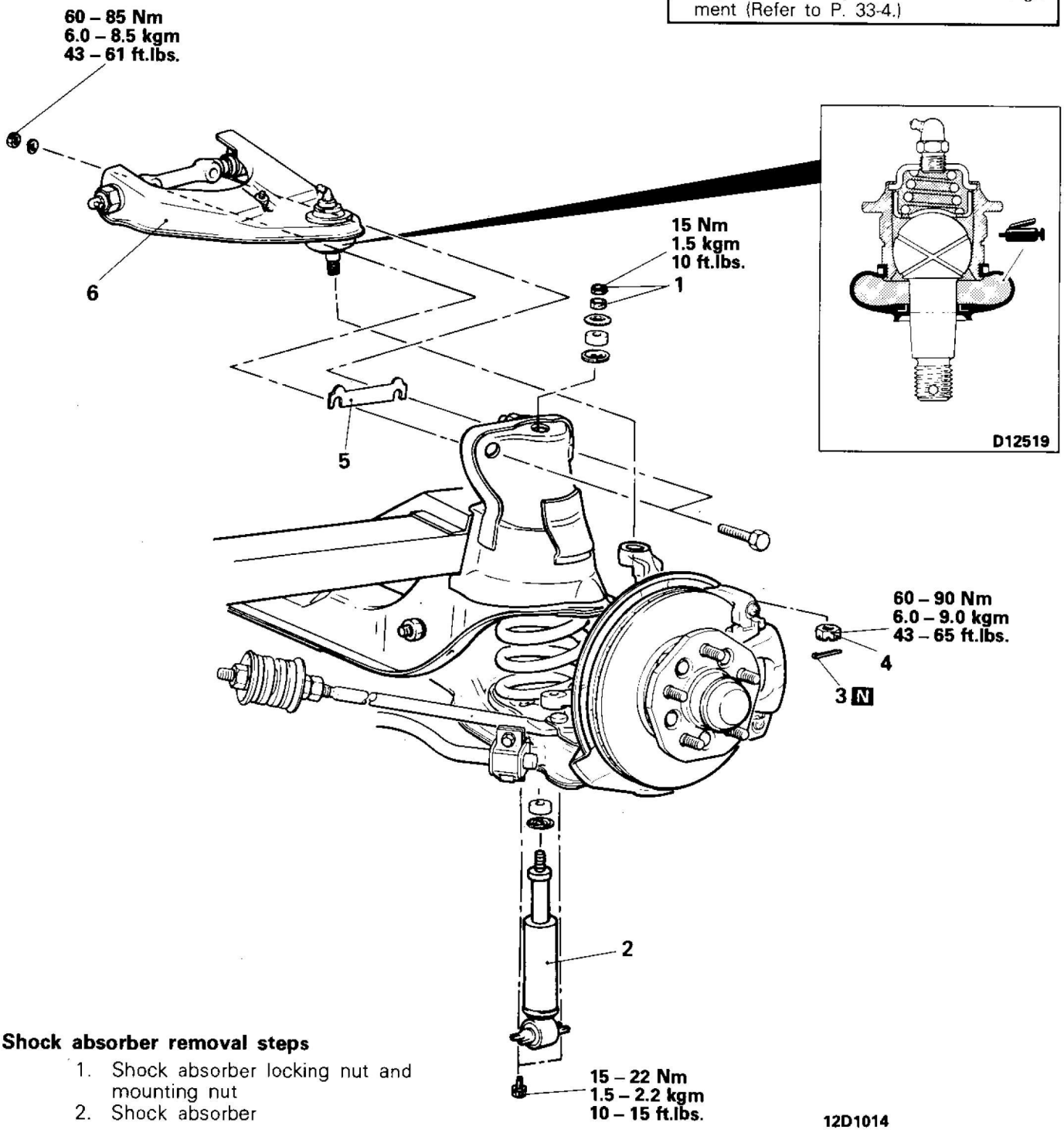
Standard value: 8°

SHOCK ABSORBER AND UPPER ARM

E33GA--

REMOVAL AND INSTALLATION

Post-installation Operation
- Inspection and adjustment of wheel alignment (Refer to P. 33-4.)



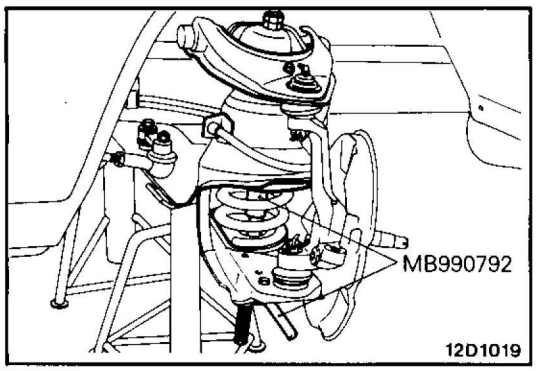
Shock absorber removal steps

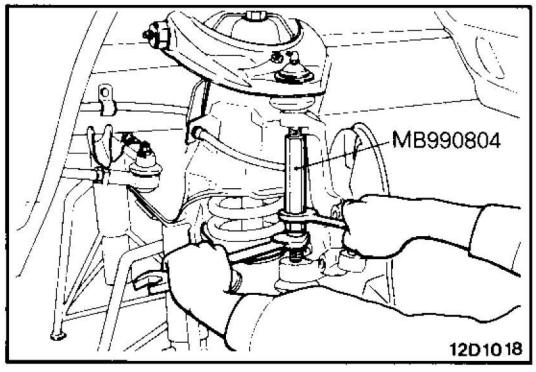
1. Shock absorber locking nut and mounting nut
2. Shock absorber

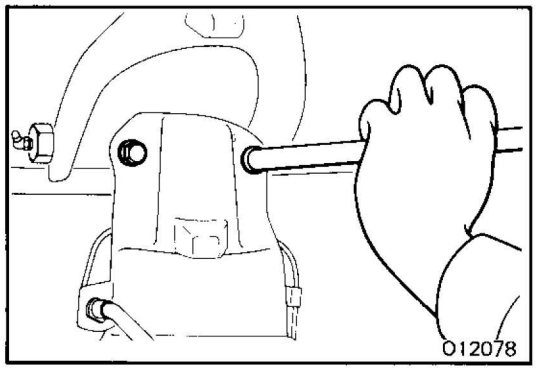
Upper arm removal steps

3. Split pin
4. Slotted nut
5. Shims

◆◆ 6. Upper arm







SERVICE POINTS OF REMOVAL E33GBABa

6. REMOVAL OF UPPER ARM

(1) Remove the shock absorber and install the special tool to compress the coil spring slightly.

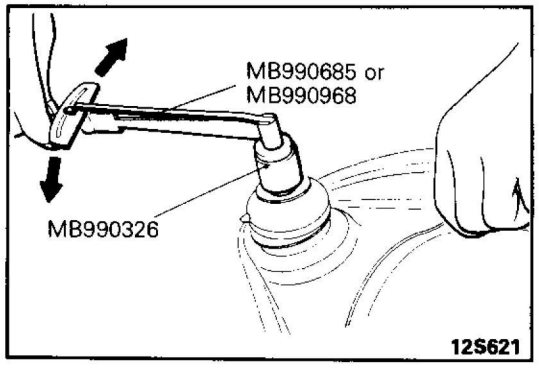
(2) Use the special tool to disconnect the upper ball joint from the knuckle.

(3) Remove the upper arm from the crossmember.

NOTE
The camber adjustment shims should be stored for reference at assembly.

INSPECTION E33GCACa

- Check the upper arm for cracks or deformation.
- Check the upper arm shaft for cracks or bends.
- Check the shock absorbers for oil leakage, noise or malfunction.



CHECKING UPPER BALL JOINT STARTING TORQUE

Check the upper ball joint starting torque by following the steps below.

1. Measure the upper ball joint starting torque by using the special tools.

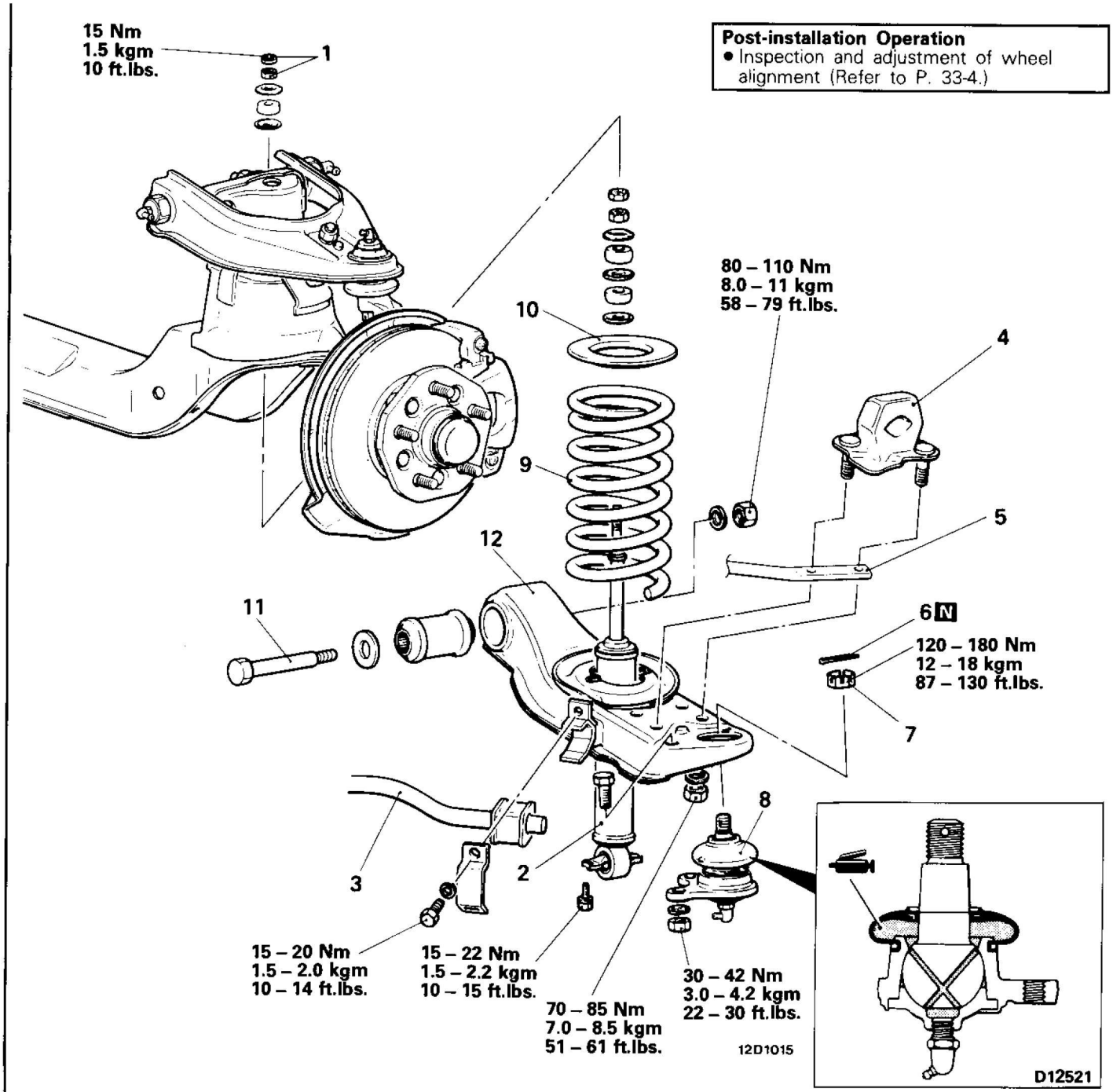
   Standard value: 0.8 – 2.5 Nm
   (8 – 25 kgcm, 7 – 21 in.lbs.)

2. If the upper ball joint starting torque is out of specification, replace the upper arm assembly.

LOWER ARM AND COIL SPRING

E31HA--

REMOVAL AND INSTALLATION

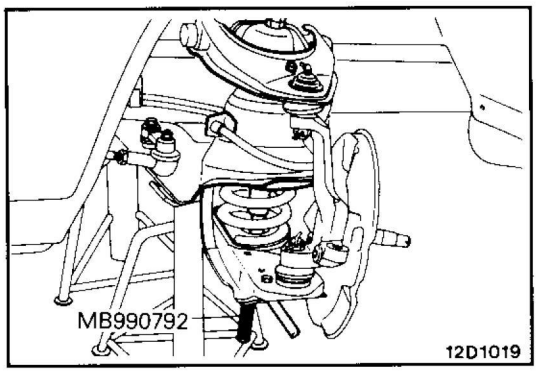


Lower arm removal steps

1. Shock absorber locking nut and mounting nut
2. Shock absorber
3. Stabilizer bar (Refer to P. 33-10.)
4. Bump stopper
5. Strut bar (Refer to P. 33-10.)
6. Split pin
7. Slotted nut
- ◆◆ 8. Lower ball joint
9. Coil spring
10. Spring seat
11. Bolt
12. Lower arm

Coil spring removal steps

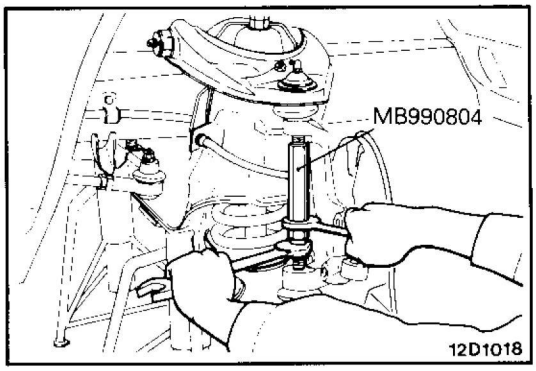
1. Shock absorber locking nut and mounting nut
2. Shock absorber
6. Split pin
7. Slotted nut
- ◆◆ 8. Lower ball joint
9. Coil spring
10. Spring seat



SERVICE POINT OF REMOVAL E33JBAAa

8. REMOVAL OF LOWER BALL JOINT

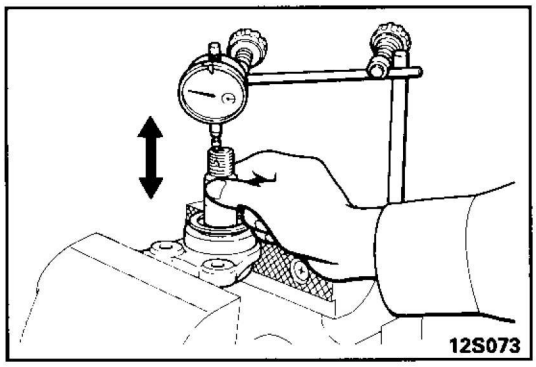
(1) Remove the shock absorber and install the special tool to compress the coil spring slightly.



(2) Use the special tool to disconnect the lower ball joint from the knuckle.

INSPECTION E33HCAD

- Check the lower arm for cracks or deformation.
- Check the bushing for wear or damage.
- Check the lower ball joint dust cover for cracks or deterioration.
- Check the coil spring for cracks or deterioration.
- Check the coil spring for damage.



CHECKING LOWER BALL JOINT AXIAL PLAY

Check the lower ball joint axial play by following the steps below.

1. Measure the lower ball joint axial play with a dial indicator.

   Limit: 0.5 mm (0.02 in.)

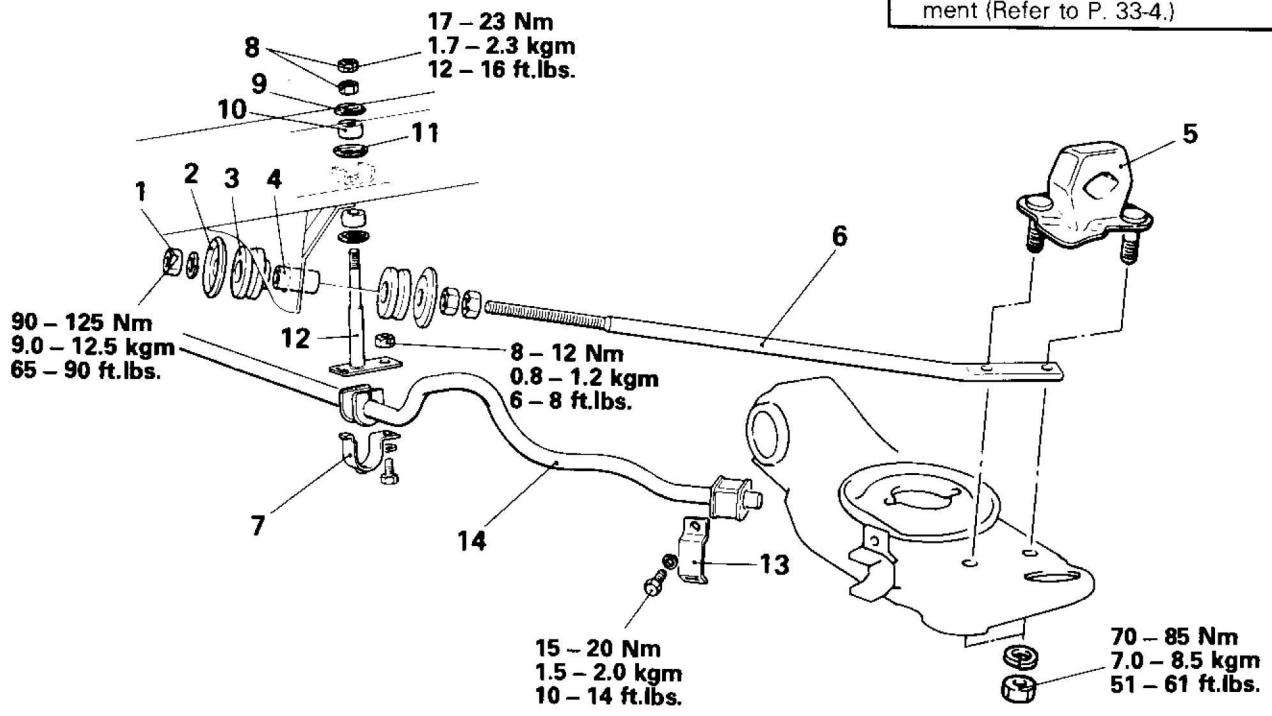
2. If the lower ball joint axial play exceeds the service limit, replace the lower ball joint.

STABILIZER BAR AND STRUT BAR

E33NA--

REMOVAL AND INSTALLATION

Post-installation Operation
- Inspection and adjustment of wheel alignment (Refer to P. 33-4.)



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Strut bar removal steps

1. Strut bar mounting nut
2. Washer
3. Strut bar bushing
4. Collar
5. Bump stopper
◆◆ 6. Strut bar

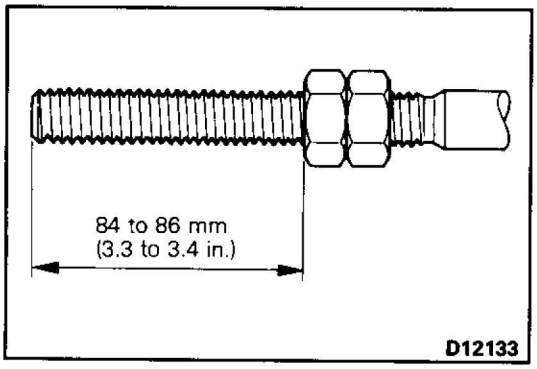
Stabilizer bar removal steps

7. Clamp A
8. Stabilizer bar locking nut and mounting nut
9. Joint cup A
10. Rubber bushing
11. Joint cup B
12. Hanger
13. Clamp B
14. Stabilizer bar

INSPECTION

E33NCBB

- Check the stabilizer bar for deformation or deterioration.
- Check the rubber bushing for cracks and damage.
- Check the strut bar for cracks or bend.
- Check the bushings for cracks or damage.



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SERVICE POINTS OF INSTALLATION

E33NEBF

6. INSTALLATION OF STRUT BAR

Make adjustment so that the distance between the end of the strut bar and the front surface of the locking nut is 84 to 86 mm (3.3 to 3.4 in.).

REAR SUSPENSION

CONTENTS

E34AA--

SPECIFICATIONS

E34CA – –

GENERAL SPECIFICATIONS

Items	Specification
Suspension system	Asymmetrical semielliptic leaf spring
Leaf spring	
Number of leaf springs	3
Straight span mm (in.)	1,200 (47.2)
Free camber mm (in.)	119 (4.7)
Spring constant – individually N/mm (kg/mm, lbs./in.)	
Unladen	38.6 (3.86, 216)
Laden	69.4 (6.94, 388)
Shock absorber	
Type	Hydraulic cylinder, double – acting type
Max. length mm (in.)	488 (19.2)
Min. length mm (in.)	298 (11.7)
Stroke mm (in.)	190 (7.5)
Damping force [at 0.3 m/sec. (0.984 ft./sec.)] N (kg, lbs.)	
Expansion	1,420 (142, 313)
Compression	540 (54, 119)

TORQUE SPECIFICATIONS

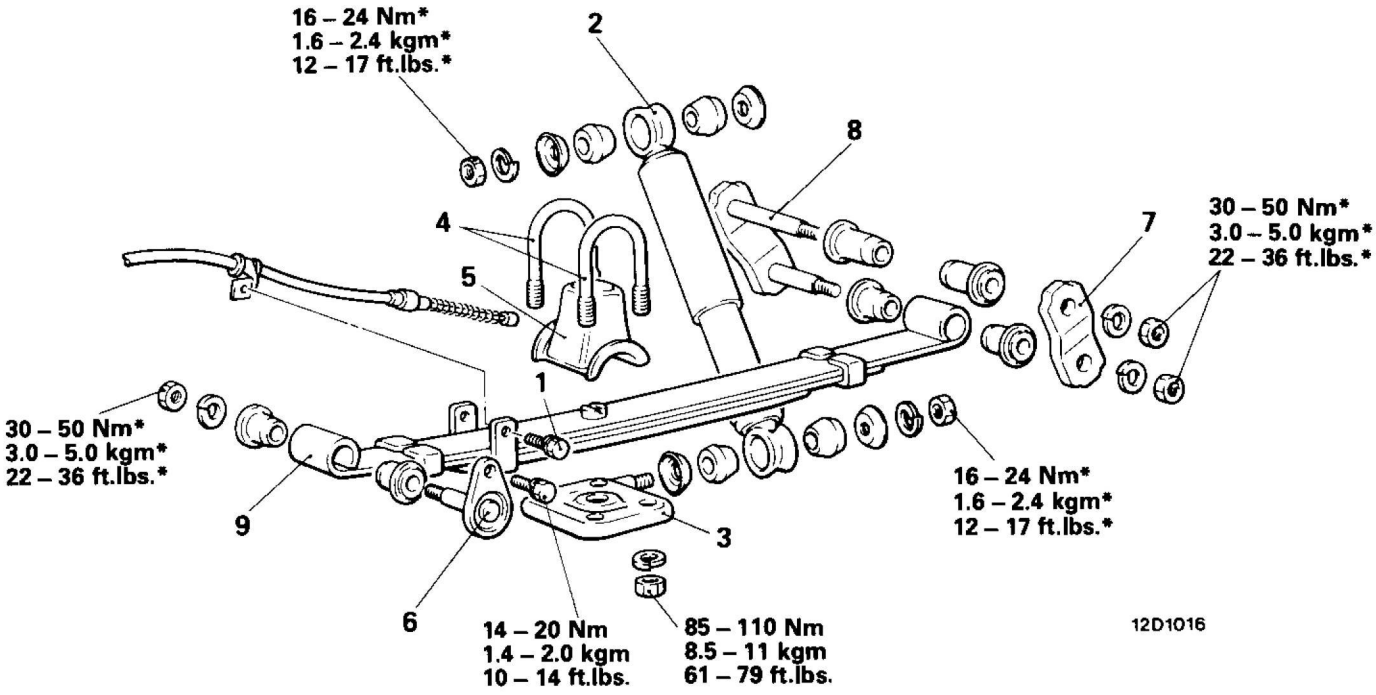
E34CC – –

Items	Nm	kgm	ft.lbs.
Shackle assembly attaching nut	30 – 50	3.0 – 5.0	22 – 36
Leaf spring front mounting bolt	30 – 50	3.0 – 5.0	22 – 36
Shock absorber mounting nuts	16 – 24	1.6 – 2.4	12 – 17
Spring pin attaching nut	14 – 20	1.4 – 2.0	10 – 14
U-bolt nuts	85–110	8.5 – 11	61 – 79

REAR SUSPENSION ASSEMBLY

E34GA--

REMOVAL AND INSTALLATION



Removal steps

1. Parking brake cable attaching bolt
2. Shock absorber
3. U-bolt seat
4. U-bolts
5. Bump stopper
6. Spring pin
7. Shackle plate
8. Shackle assembly
9. Rear spring

NOTE
*: Tighten when the vehicle is unloaded.

INSPECTION

E34GCAA

- Check the shock absorbers for oil leakage, noise or malfunction.
- Check the leaf springs for damage or deterioration.
- Check the U-bolt for cracks or bends.
- Check the rubber parts for cracks or deterioration.

NOTES

SERVICE BRAKES

CONTENTS

E35AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E35CA

Items		Specifications
Master cylinder		
Type		Tandem type
I.D.	mm (in.)	23.81 (0.97)
Brake booster		
Type		Vacuum type
Effective dia. of power cylinder	mm (in.)	230 (9.0)
Boosting ratio		4.0
Front brakes		
Type		AD54 type, disc
Disc O.D.	mm (in.)	255 (10)
Pad thickness	mm (in.)	10.5 (0.41)
Cylinder I.D.	mm (in.)	53.97 (2.12)
Clearance adjustment		Automatic
Rear brakes		
Type		Leading-trailing, drum
Drum I.D.	mm (in.)	254 (10)
Cylinder I.D.	mm (in.)	20.64 (0.81)
Clearance adjustment		Automatic

SERVICE SPECIFICATIONS

E35CB

Items		Specifications
Standard value		
Brake pedal height	mm (in.)	232 – 237 (9.1 – 9.3)
Brake pedal free play	mm (in.)	
Petrol-powered vehicles		10 – 15 (0.40 – 0.59)
Diesel-powered vehicles		3 – 8 (0.12 – 0.31)
Brake pedal to toeboard clearance	mm (in.)	67 (2.64) or more
G sensing proportioning valve function test	MPa (kg/cm^2, psi)	
When equivalent with no load		
At 4.0 MPa (40 kg/cm^2, 569 psi) input pressure		1.14 – 1.74 (11.4 – 17.4, 162 – 247)
When equivalent with load		
At 9.0 MPa (90 kg/cm^2, 1280 psi) input pressure		2.21 – 3.81 (22.1 – 38.1, 314 – 542)
Booster push rod to master cylinder piston clearance	mm (in.)	1.5 – 1.9 (0.059 – 0.075)
Brake dragging force	N (kg, lbs.)	70 (7.0, 15.4) or less
[Brake dragging torque Nm (kgm, ft.lbs.)]		[4 (0.4, 3) or less]

Item		Specifications
Limit		
Pad thickness	mm (in.)	2.0 (0.079)
Disc thickness	mm (in.)	18.4 (0.72)
Brake disc runout	mm (in.)	0.14 (0.0055)
Lining thickness	mm (in.)	1.0 (0.039)
Rear Drum I.D.	mm (in.)	256.0 (10.079)

TORQUE SPECIFICATIONS

E35CC--

Items	Nm	kgm	ft.lbs.
Pedal bracket to body	14 – 20	1.4 – 2.0	10 – 15
Bracket to pedal bracket	13 – 19	1.3 – 1.9	9 – 14
Pedal shaft	13 – 19	1.3 – 1.9	9 – 14
Brake tube	13 – 17	1.3 – 1.7	9 – 12
Stopper bolt	6 – 9	0.6 – 0.9	5 – 7
Brake hose	13 – 17	1.3 – 1.7	9 – 12
Knuckle and front brake assembly	80 – 100	8.0 – 10.0	59 – 74
Brake assembly to dust cover	3 – 5	0.3 – 0.5	2.2 – 3.7
Wheel cylinder assembly to backing plate	18 – 21	1.8 – 2.1	13 – 15
Bleeder screw	7 – 9	0.7 – 0.9	5 – 7

LUBRICANTS

E35CD--

Items	Specified lubricant	Quantity
Brake fluid	SAE J1703 (or DOT3)	As required
Brake booster inner parts Push rod seal lip, push rod perimeter, push rod body perimeter, reaction disc, bearing and valve body seal lip, diaphragm plate and valve body, diaphragm to shell contact surface	Silicon grease	Small quantity
Front brake piston boot inner surfaces	Repair kit grease (orange)	Small quantity
Front brake piston seal inner surfaces	Repair kit grease (orange)	Small quantity
Front brake plug plate surfaces	Brake grease SAE J310, NLGI No. 1	Small quantity
Rear brake shoe and backing plate contact surfaces	Brake grease SAE J310, NLGI No. 1	Small quantity
Wheel cylinder boot	Repair kit grease (orange)	Small quantity

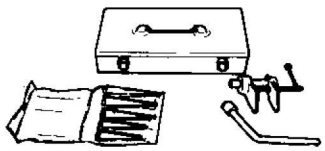
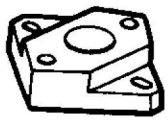
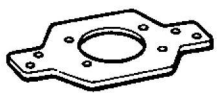
SEALANTS

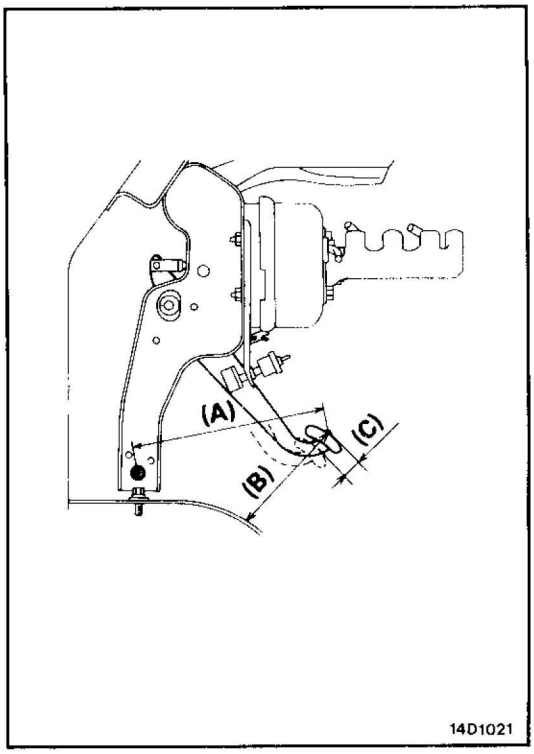
E35CE--

Items	Specified sealants	Remarks
Thread part of vacuum switch	3M ATD Part No. 8082 or equivalent	Non-drying sealant
Thread part of fitting	3M ATD Part No. 8663 or equivalent	Semi-drying sealant
Shoe hold-down pin	3M ATD Part No. 8513 or equivalent	Drying sealant
Wheel cylinder assembly	3M ATD Part No. 8513 or equivalent	Drying sealant

SPECIAL TOOLS

E35DA--

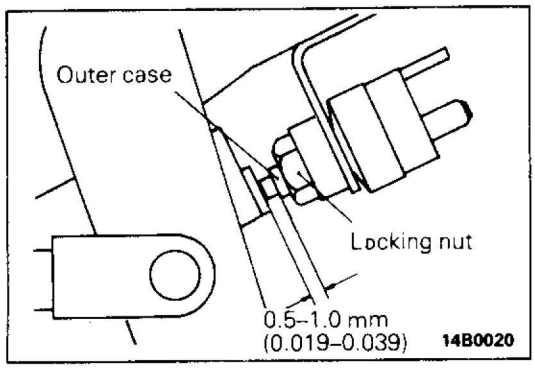
Tool	Number	Name	Use
	MB990964 MB990520 (CT1029) MB990619-(A)	Brake tool set Piston expander Piston cup installer	Pushing-in of the front disc brake piston Installation of rear wheel cylinder piston cup
	MB990750	Brake booster holder	Disassembly and reassembly of the brake booster
	MB990749	Lever attachment	Disassembly and reassembly of the brake booster



SERVICE ADJUSTMENT PROCEDURES E35FAAH

BRAKE PEDAL INSPECTION AND ADJUSTMENT

1. Measure the brake pedal height (A) as illustrated.
   Standard value (A): 232 – 237mm (9.1 – 9.3 in.)
2. Start the engine, depress the brake pedal with approximately 500N (50 kg, 110 lbs.) of force, and measure the clearance between the brake pedal and the floorboard.
   Standard value (B): 67mm (2.64 in) or more
3. While the engine is stopped, depress the brake pedal two or three times. After thus eliminating the vacuum in the brake booster, press the pedal down by hand, and confirm that the free play (C) is within the standard value range.
   Standard value (C):
   <Petrol-powered vehicles> 10 – 15 mm (0.40 – 0.59 in)
   <Diesel-powered vehicles> 3 – 8 mm (0.12 – 0.31 In.)

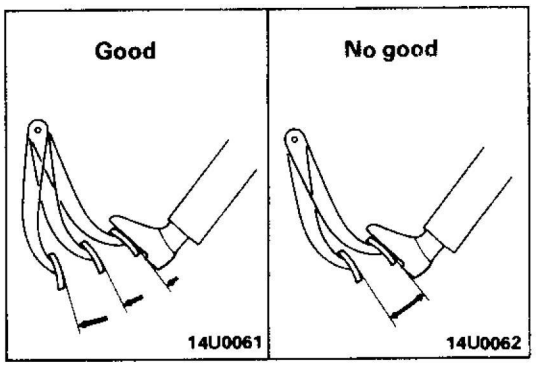


4. Adjust the brake pedal height.
   (1) Sufficiently loosen the stop lamp switch by loosening lock nut.
   (2) Adjust the brake pedal height by turning the operating rod with pliers (with locking nut loosened).
   (3) After turning the stop lamp switch until it contacts the pedal stop (until immediately before the brake pedal begins to move), turn the stop lamp switch back 1/2 to 1 revolution and secure with the lock nut.

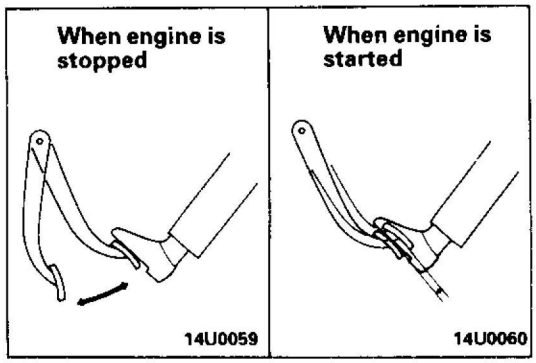
BRAKE BOOSTER OPERATING TEST E35FCAAa

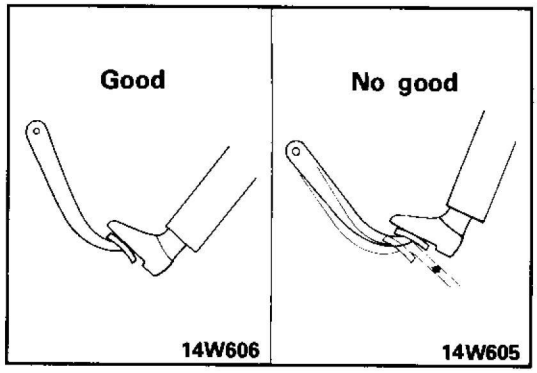
For simple checking of the brake booster operation, carry out the following tests;

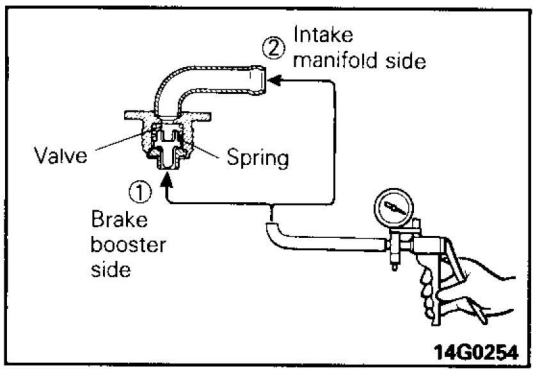
1. Run the engine for one or two minutes, and then stop it.
   If the pedal depresses fully the first time but gradually becomes higher when depressed succeeding times, the booster is operating properly. If the pedal height remains unchanged, the booster is defective.

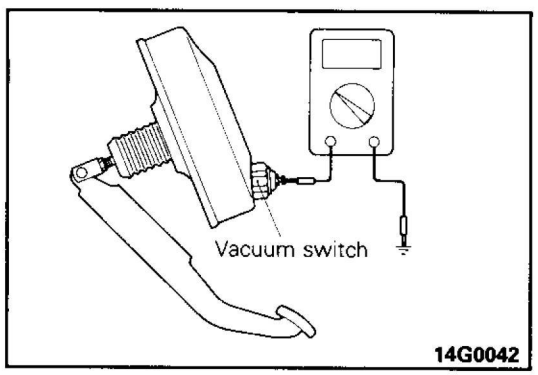


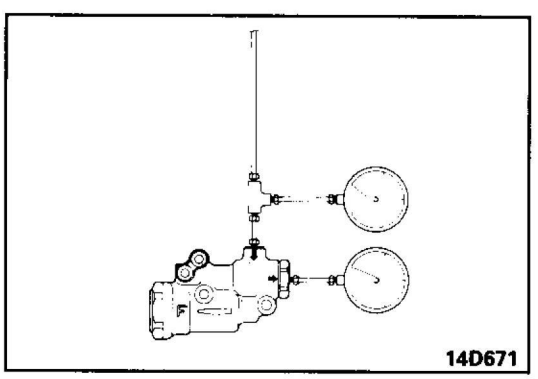
2. With the engine stopped, step on the brake pedal several times.
   Then step on the brake pedal and start the engine.
   If the pedal moves downward slightly, the booster is in good condition. If there is no change, the booster is defective.

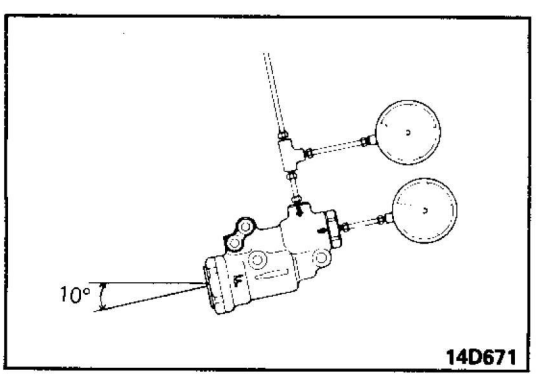












3. With the engine running, step on the brake pedal and then stop the engine.
   Hold the pedal depressed for 30 seconds. If the pedal height does not change, the booster is in good condition, if the pedal rises, the booster is defective.

If the above three tests are okay, the booster performance can be determined as good.
If one of the above three tests is not okay at last, the check valve, vacuum hose, or booster will be defective.

CHECK VALVE OPERATION CHECK E35FEAA

1. Remove the vacuum hose at the brake booster side.
2. Remove the check valve from the brake booster.
3. Check the operation of the check valve by using a vacuum pump.

Vacuum pump connection	Accept/reject criteria
Connection at the brake booster side ①	A negative pressure (vacuum) is created and held.
Connection at the intake manifold side ②	A negative pressure (vacuum) is not created.

BRAKE BOOSTER VACUUM SWITCH CHECK (Diesel-powered vehicles) E35FDABa

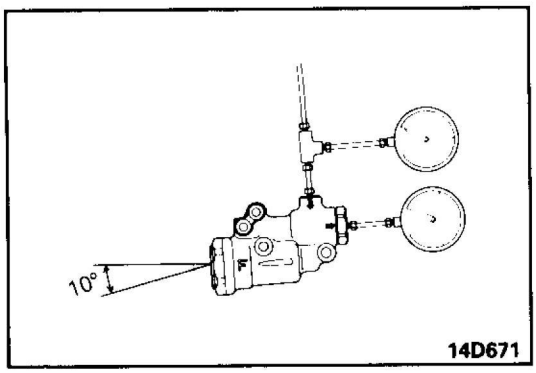
1. Disconnect vacuum switch. Connect circuit tester to vacuum switch.
2. Start engine. Vacuum switch is in good condition if no circuit continuity when sufficient load is generated, and circuit continuity when brake pedal is pumped several times after stopping engine.

G SENSING PROPORTIONING VALVE FUNCTION TEST E35FKEAa

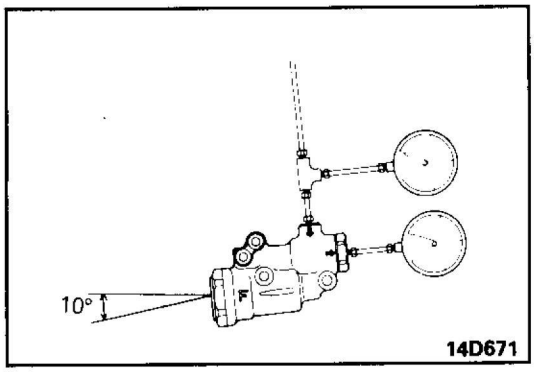
1. Remove G sensing proportioning valve from bracket. Connect pressure gauges to input and output sides of G sensing proportioning valve.
2. Bleed air from brake line and pressure gauge.

3. No load Test (equivalent to unloaded vehicle)
   (1) Incline G sensing proportioning valve about 10° forward and downward as illustrated, to firmly contact G sensing ball to cut valve seal.
   (2) Depress brake pedal gradually to assure output hydraulic pressure is within the standard value when input hydraulic pressure at 4.0 MPa (40 kg/cm^2, 569 psi).

   Standard value:
   1.14 – 1.74 MPa (11.4 – 17.4 kg/cm^2, 162 – 247 psi)

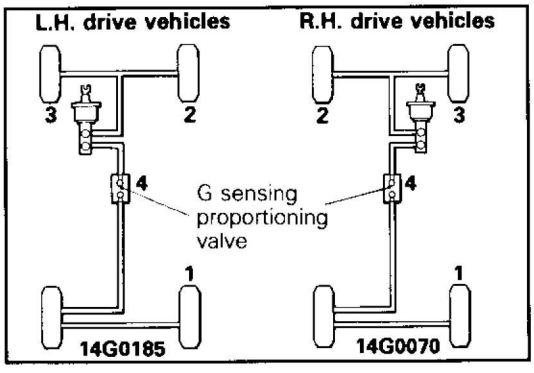


4. Load Test (equivalent with load)
   (1) Incline G sensing proportioning valve about 10° forward and upward as illustrated. Maintain G sensing ball so that it does not touch cut valve seal. Increase input hydraulic pressure to 3.0 MPa (30 kg/cm^2, 427 psi) and retain.



   (2) Incline G sensing proportioning valve about 10° forward /downward to contact G sensing ball to cut valve seal. Increase input hydraulic pressure to 9.0 MPa (90 kg/cm^2, 1280 psi) to assure the output hydraulic pressure is within standard value.

   Standard value:
   2.21 – 3.81 MPa (22.1 – 38.1 kg/cm^2, 314 – 542 psi)



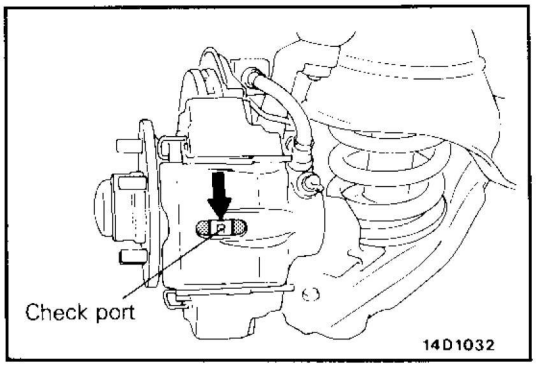
BLEEDING E35FYAA

The brake hydraulic system should be bled whenever the brake tube, brake hose, master cylinder or wheel cylinder has been removed or whenever the brake pedal feels spongy when depressed. Bleed the brake system in the sequence shown in the illustration.

Specified brake fluid: SAE J1703 (or DOT3)

Caution

1. **Use the specified brake fluid. Avoid using a mixture of the specifled brake fluid and other fluid.**
2. **If brake fluid is exposed to the air, it will absorb moisture; as water is absorbed from the atmosphere, the boiling point of the brake fluid will decrease and the braking performance will be seriously impaired. For this reason, use a hermetically sealed 1 lit. (1.06 U.S.qt., 0.88 Imp.qt.) or 0.5 lit. (0.52 U.S.qt., 0.44 Imp.qt.) brake fluid container.**
3. **Firmly close the cap of the brake fluid container after use.**

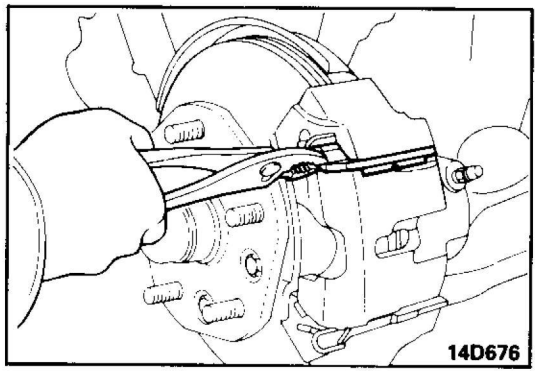


FRONT DISC BRAKE PAD CHECK E35FQAI

Check brake pad thickness through caliper body check port.

Limit: 2.0 mm (0.079 in.)

Replace brake pads on both sides when wear exceeds limit value. Replace both left and right brake pads at a time.

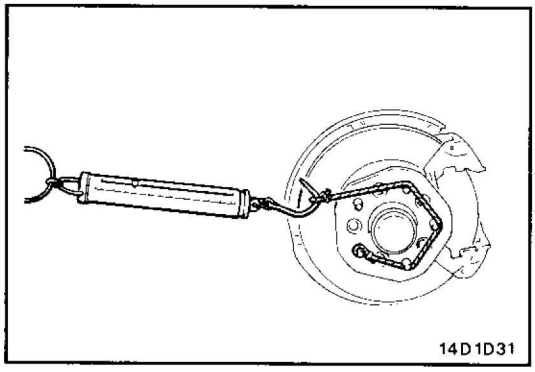


FRONT DISC BRAKE PAD REPLACEMENT AND BRAKE DRAG CHECK

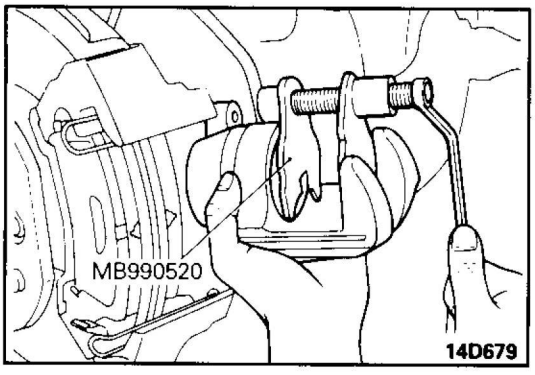
E35FQBB

1. Pull out the spigot pins.
2. Pull out the stopper plugs and remove the plug plates.
3. Remove the caliper body.

Caution
Hold the caliper body by suspending it with wires or other suitable means in such a manner that the brake hose is not twisted.

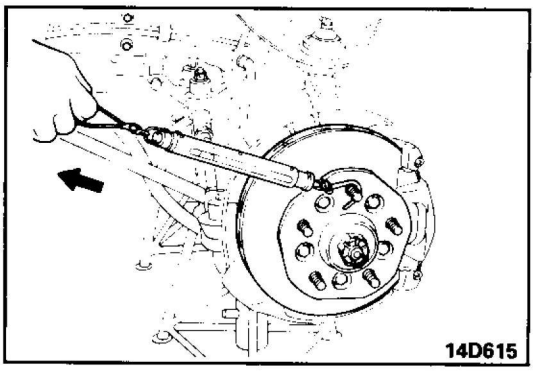


4. Measure hub torque with pad removed to measure brake drag torque after pad installation.



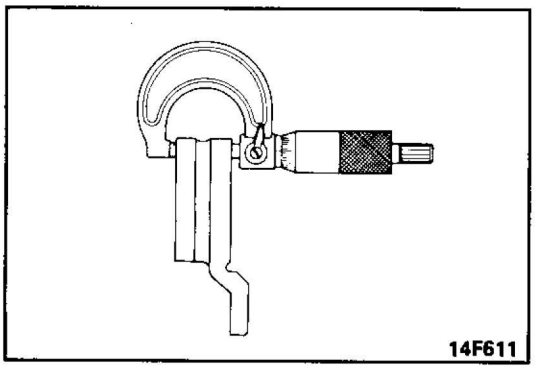
5. Assemble anti-rattle springs, pad clip, outer pad clip and inner pad clip to the mounting support.
6. Clean piston and insert into cylinder with special tool.

Caution
Do not deposit grease or other dirt on pad or brake disc friction surfaces.



7. Check brake drag torque as follows.
   (1) Start engine and hold brake pedal down for 5 seconds.
   (2) Stop engine.
   (3) Turn brake disc forward 10 times.
   (4) Check brake drag torque with spring balance.
8. If the difference between brake drag torque and hub torque exceeds the standard value, disassemble piston and clean piston driving part. Check for corrosion or worn piston seal.

Standard value: 70N (7.0 kg, 15.4 lbs.) or less
[4 Nm (0.4 kgm, 3 ft. lbs.)] or less



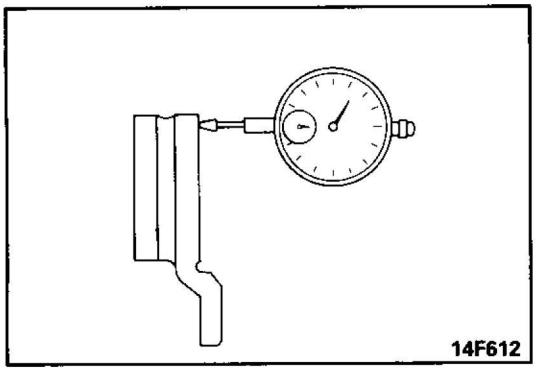
BRAKE DISC THICKNESS CHECK

E35FRACa

Measure the thickness of the brake disc at least four places on the sliding surface of the brake disc and the pad.

Limit: 18.4 mm (0.72 in.)

If the thickness of the brake disc is less than the limit (even at only one location) or there is wear, replace the brake discs and brake pads for both sides (left and right) of the vehicle as a set.

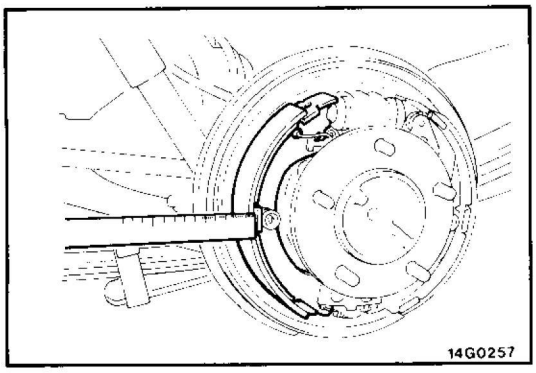


BRAKE DISC RUNOUT CHECK E35FSAD

Limit: 0.14 mm (0.0055 In.)

BRAKE DISC RUNOUT CORRECTION E35FTAB

Change its position on the hub and/or retorque evenly. Check the runout again, and if it cannot be corrected, replace the brake disc.

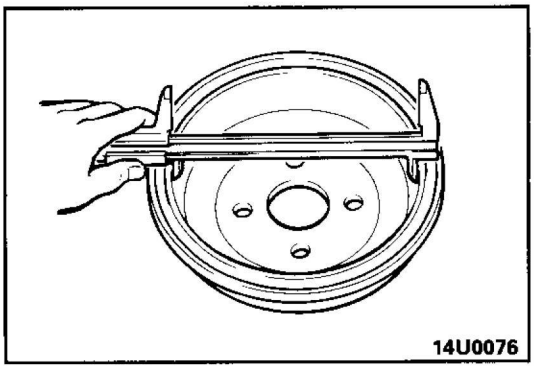


BRAKE LINING THICKNESS CHECK E35FFABa

Limit: 1.0 mm (0.04 in.)

Caution

Whenever the shoe and lining assembly is replaced, replace both RH and LH assemblies as a set to prevent vehicle from pulling to one side when braking. If there is a significant difference in the thicknesses of the shoe and lining assemblies on the left and right sides, check the sliding condition of the piston.

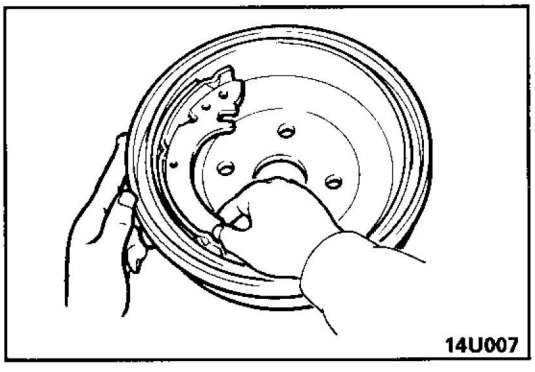


BRAKE DRUM INSIDE DIAMETER CHECK E35FGABa

1. Measure the inside diameter of the hub and drum at two or more locations.

   Limit: 256.0 mm (10.079 in.)

2. Replace brake drums and shoe and lining assembly when wear exceeds the limit value or is badly imbalanced.



BRAKE LINING AND BRAKE DRUM CONNECTION CHECK E35FIAB

1. Chalk inner surface of brake drum and rub with shoe and lining assembly.
2. Replace shoe and lining assembly or brake drums if very irregular contact area.

   NOTE
   Clean off chalk after check.

BRAKE PEDAL

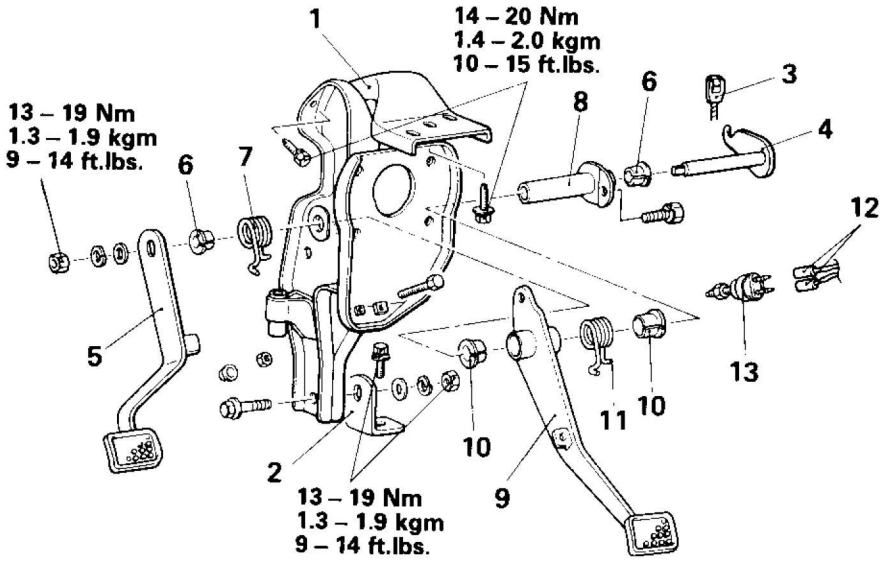
REMOVAL AND INSTALLATION <Petrol-powered vehicles>

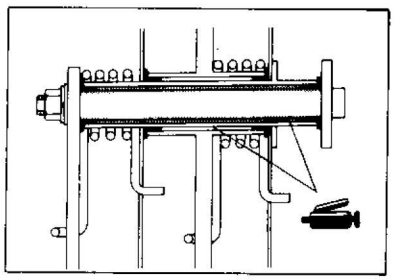
E35GA – A

Pre-removal Operation
- Removal of the Brake Booster (Refer to P. 35-16.)
- Removal of the Fuse Block <R.H. drive vehicles>
- Removal of the Side Ventilator Box Assembly <R.H. drive vehicles>

Post-installation Operation
- Installation of the Brake Booster (Refer to P. 35-16.)
- Installation of the Fuse Block <R.H. drive vehicles>
- Installation of the Side Ventilator Box assembly <R.H. drive vehicles>
- Adjustment of the Brake Pedal (Refer to P. 35-5.)
- Adjustment of the Clutch Pedal (Refer to GROUP 21 – Service Adjustment Procedures.)

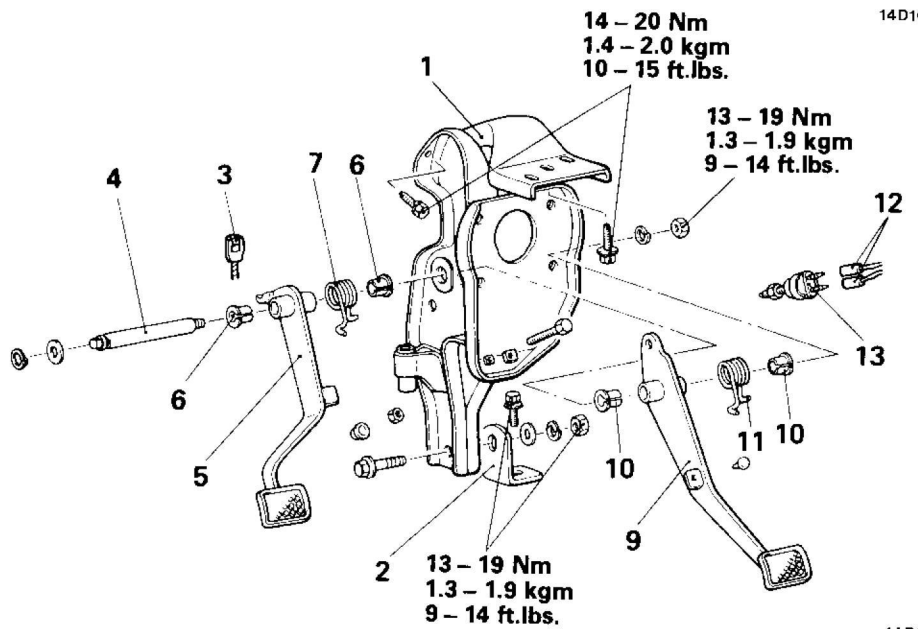
<L.H. drive vehicles>

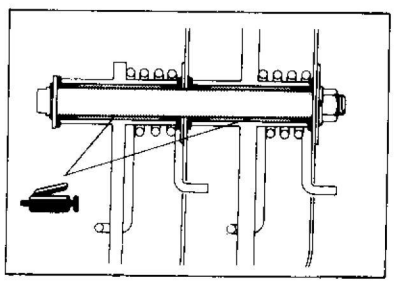




<R.H: drive vehicles>

14D1013

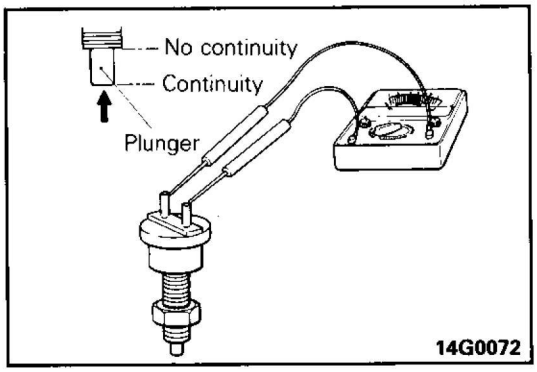




14D1014

Removal steps

1. Pedal bracket
2. Bracket
3. Connection for clutch cable and clutch pedal
4. Pedal shaft
5. Clutch pedal
6. Bushing
7. Return spring
8. Brake pedal shaft
9. Brake pedal
10. Bushing
11. Return spring
12. Stop lamp switch connector
13. Stop lamp switch



INSPECTION

E35GCAF

STOP LAMP SWITCH CHECK

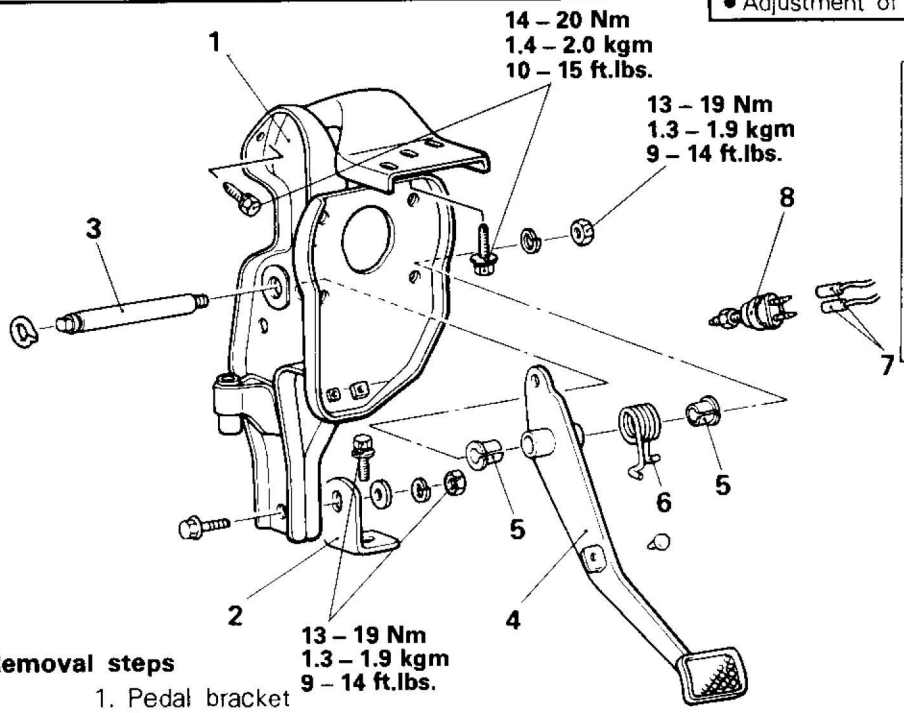
The stop lamp switch is in good condition if there is no continuity when the plunger is pressed in, and if there is continuity when the plunger is released outward.

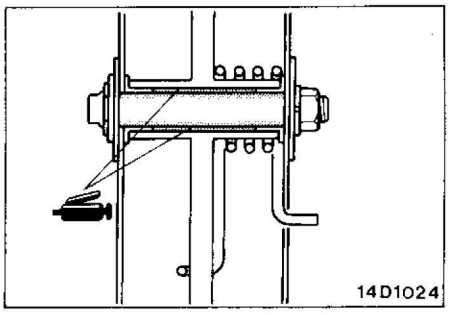
REMOVAL AND INSTALLATION <Diesel-powered vehicles>

E35GA-B

Pre-removal Operation
- Removal of the Brake Booster (Refer to P. 35-16.)
- Removal of the Fuse Block <R.H. drive vehicles>
- Removal of the Side Ventilator Box Assembly <R.H. drive vehicles>

Post-installation Operation
- Installation of the Brake Booster (Refer to P. 35-16.)
- Installation of the Fuse Block <R.H. drive vehicles>
- Installation of the Side Ventilator Box Assembly <R.H. drive vehicles>
- Adjustment of the Brake Pedal (Refer to P. 35-5.)





Removal steps
1. Pedal bracket
2. Bracket
3. Pedal shaft
4. Brake pedal
5. Bushing
6. Return spring
7. Stop lamp switch connector
8. Stop lamp switch

INSPECTION

E35GCAG

STOP LAMP SWITCH CHECK

Refer to the paragraph of "Inspection" for the petrol-powered vehicles.

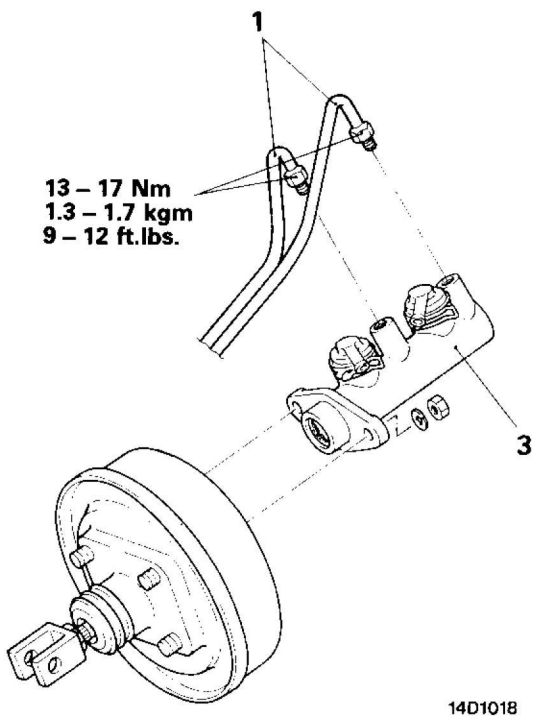
MASTER CYLINDER

E35IA--

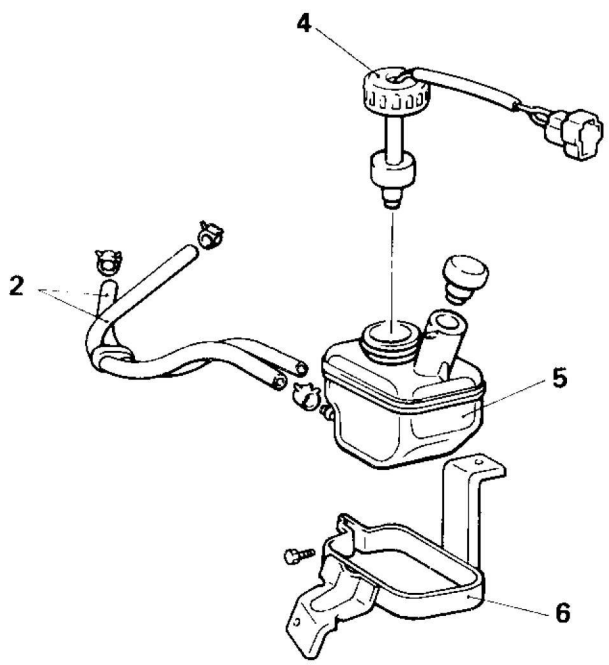
REMOVAL AND INSTALLATION

Pre-removal Operation
- Drainning of Brake Fluid

Post-installation Operation
- Filling of Brake Fluid and Bleeding System (Refer to P. 35-7.)



14D1018



14D1011

Removal steps

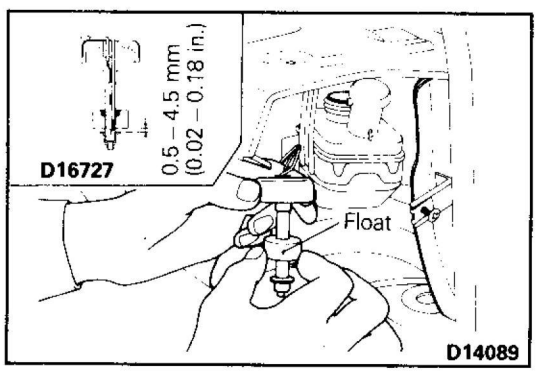
1. Brake tube
◆◆ 2. Reservoir hose
3. Master cylinder
4. Brake fluid level sensor
5. Reservoir
6. Reservoir bracket

SERVICE POINTS OF REMOVAL

E35IBAG

2. DISCONNECTION OF RESERVOIR HOSE

Plug reservoir hose after disconnecting to prevent brake fluid dripping into instrument panel.

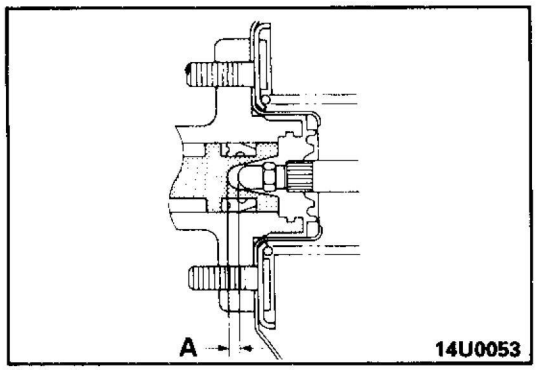


INSPECTION

E35ICAC

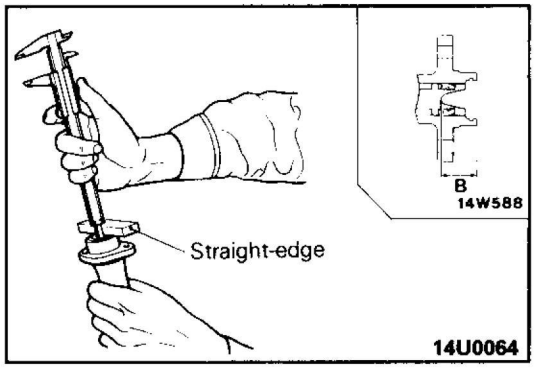
BRAKE FLUID LEVEL SENSOR

(1) Hold and move the float up and down by fingers.
(2) If the indicator lamp illuminates when the float bottom end to stopper clearance is 0.5 to 4.5 mm (0.02 to 0.18 in.), the level sensor is good.
(3) Replace it as an assembly if defective.



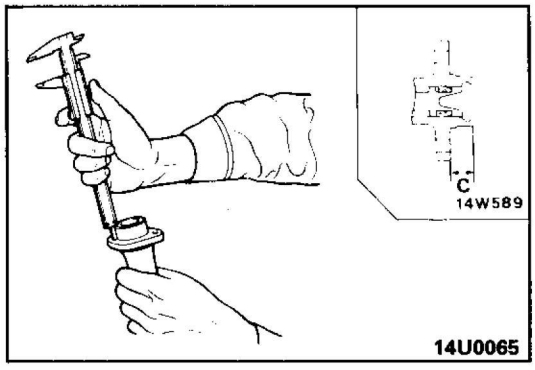
GAP ADJUSTMENT BETWEEN MASTER CYLINDER PRIMARY PISTON AND BRAKE BOOSTER PUSH ROD E35IDAE

Measure gap (A) as follows;

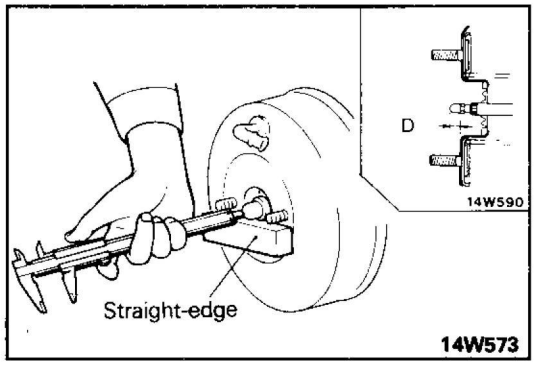


(1) Measure the distance (B) between master cylinder edge and the back of primary piston.

NOTE
Calculate (B) attaching a straight-edge to master cylinder edge and deduct straight-edge thickness.

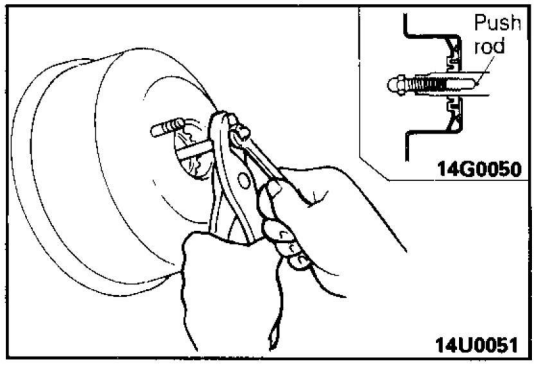


(2) Measure (C) between master cylinder edge and installing surface.



(3) Measure (D) between push rod edge and master cylinder installing surface.

NOTE
Attach straight-edge on master cylinder installing surface of brake booster, calculate (D) by deducting straight-edge thickness.



(4) Calculate space (A = B – C – D) with the measurements in (1), (2) and (3).

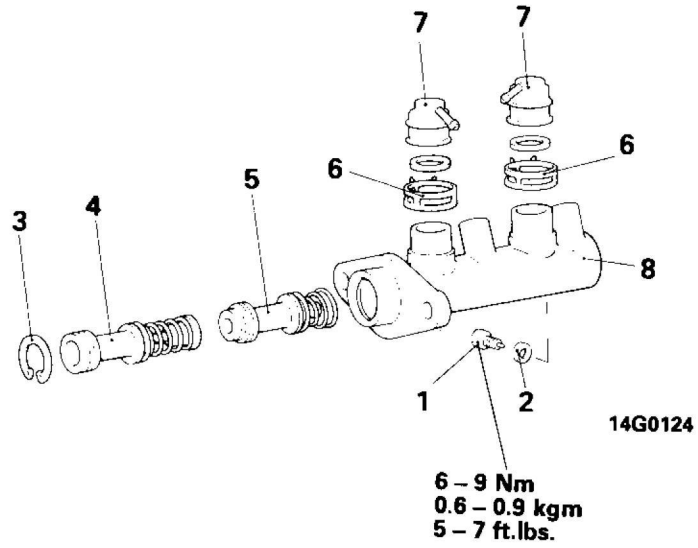
Standard value: 1.5 – 1.9 mm (0.059 – 0.075 in.)

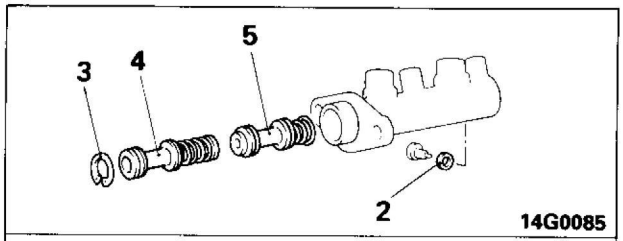
(5) Adjust push rod length turning push rod edge when the space is not within the standard value.

Caution
A gap smaller then the standard value causes brake drag.

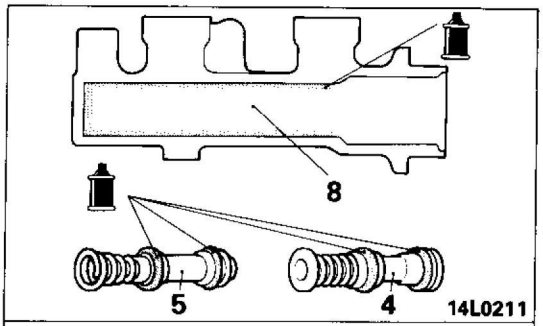
DISASSEMBLY AND REASSEMBLY

E35IE--





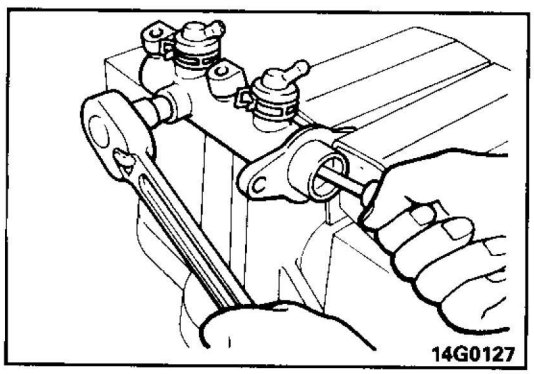
Brake master cylinder kit

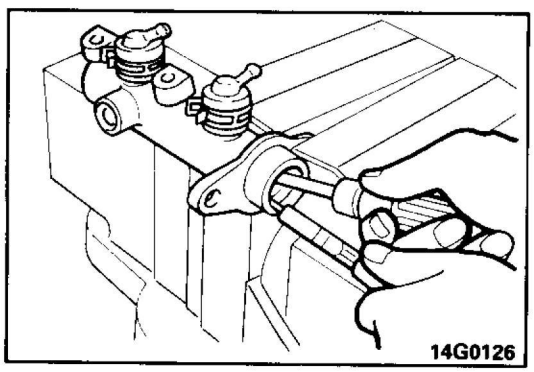


Brake fluid: SAE J1703 (or DOT3)

Removal steps

◆◆ 1. Stopper bolt
2. Gasket
◆◆ 3. Snap ring
◆◆ 4. Primary piston assembly
◆◆ 5. Secondary piston assembly
6. Clip
◆◆ 7. Union collar
8. Master cylinder body





SERVICE POINTS OF DISASEMBLY

E35IFAC

1. REMOVAL OF STOPPER BOLT

Press in primary piston and remove stopper bolt.

3. REMOVAL OF SNAP RING

Press in primary piston and remove snap ring.

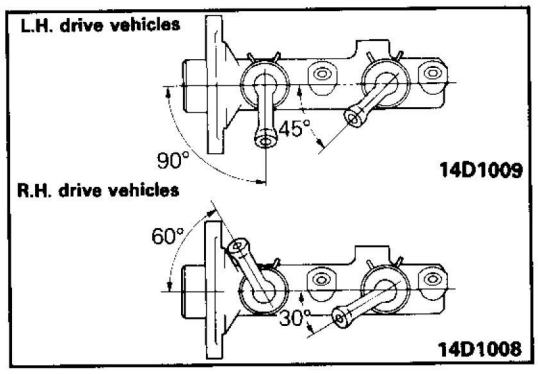
4. CAUTION FOR PRIMARY PISTON ASSEMBLY/5. SECONDARY PISTON ASSEMBLY

Caution
Do not disassemble primary or secondary piston assemblies.

NOTE
When secondary piston assembly cannot be removed from master cylinder, direct compressed air through secondary side output port of master cylinder to remove.

INSPECTION E35IGACa

- Check inner master cylinder for rust or damage.
- Check primary and secondary piston for rust, damage or wear.
- Check primary and secondary piston cups for damage.



SERVICE POINTS OF REASSEBLY E35IHAE

7. INSTALLATION OF UNION COLLAR

Install as illustrated.

BRAKE BOOSTER

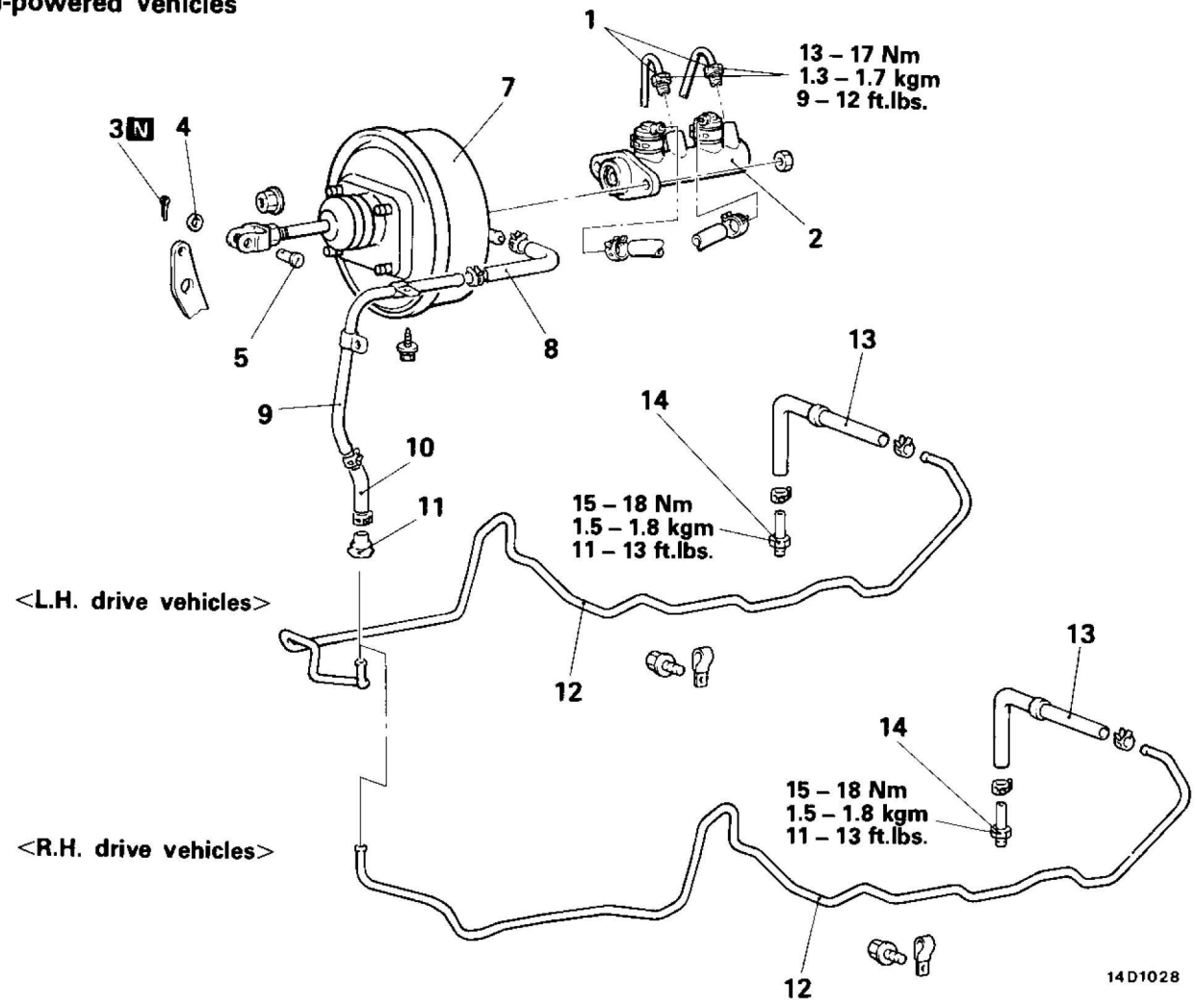
E35JA--

REMOVAL ANO INSTALLATION

Pre-removal Operation
- Removal of the Steering Column (Refer to GROUP 37 – Steering Column and Shaft.)
- Removal of the Rear Fog Lamp Switch Bracket
- Drainning of Brake Fluid

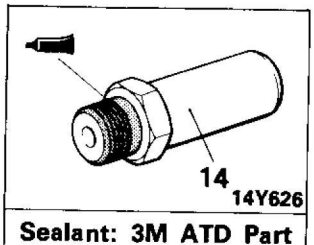
Post-installation Operation
- Installation of the Rear Fog Lamp Switch Bracket
- Installation of the Steering Column (Refer to GROUP 37 – Steering Column and Shaft.)
- Filling of the Brake Fluid and Bleeding System (Refer to P. 35-7.)

Petrol-powered vehicles

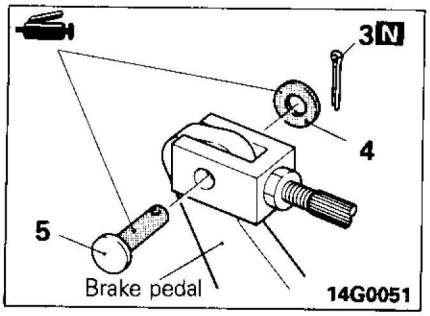


Removal steps

1. Brake tube
2. Master cylinder (Refer to P. 35-12.)
3. Split pin
4. Washer
5. Clevis pin
7. Brake booster
8. Vacuum hose
9. Vacuum tube
10. Vacuum hose
11. Grommet
12. Vacuum tube
13. Vacuum hose
14. Fitting

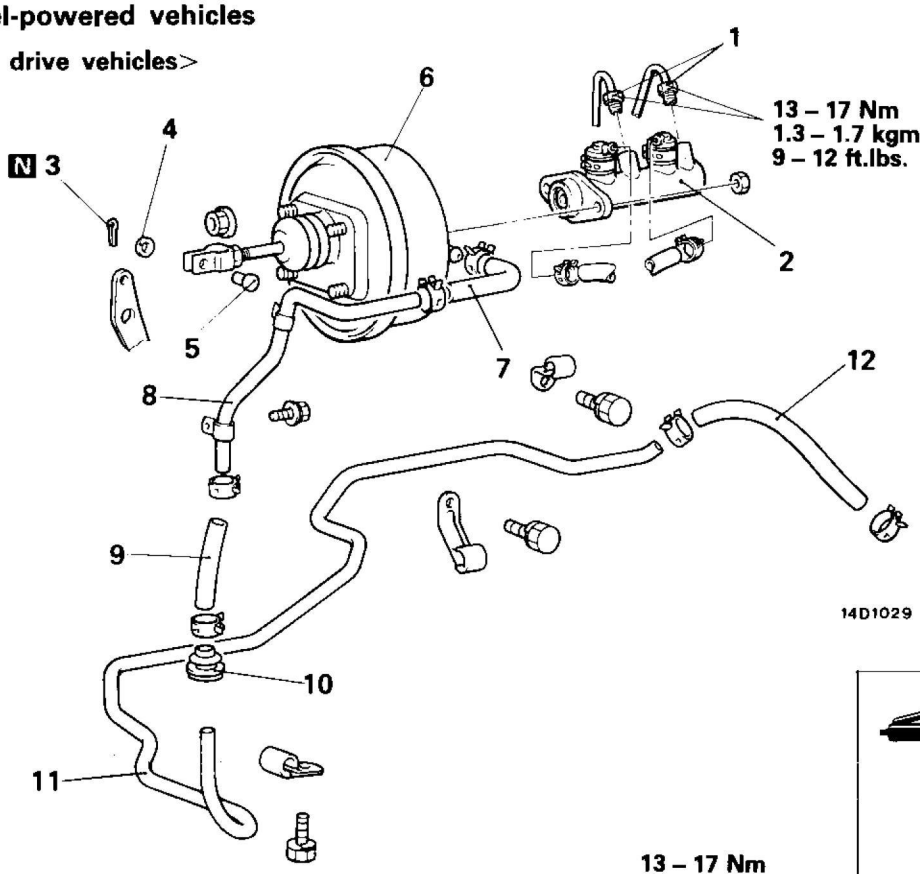


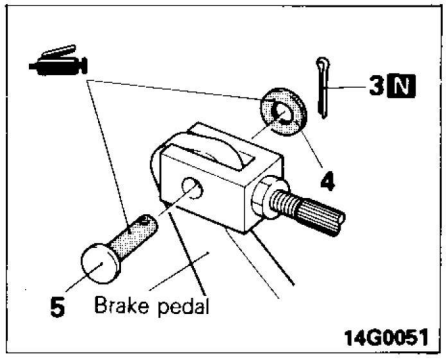
Sealant: 3M ATD Part No. 8663 or equivalent



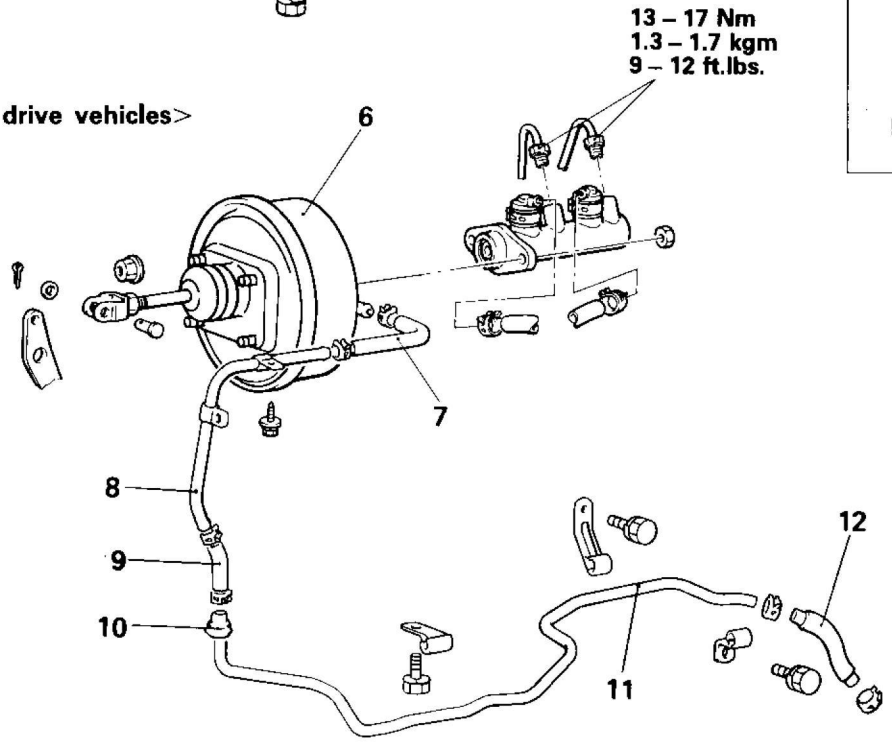
Diesel-powered vehicles

<L.H. drive vehicles>





<R.H. drive vehicles>

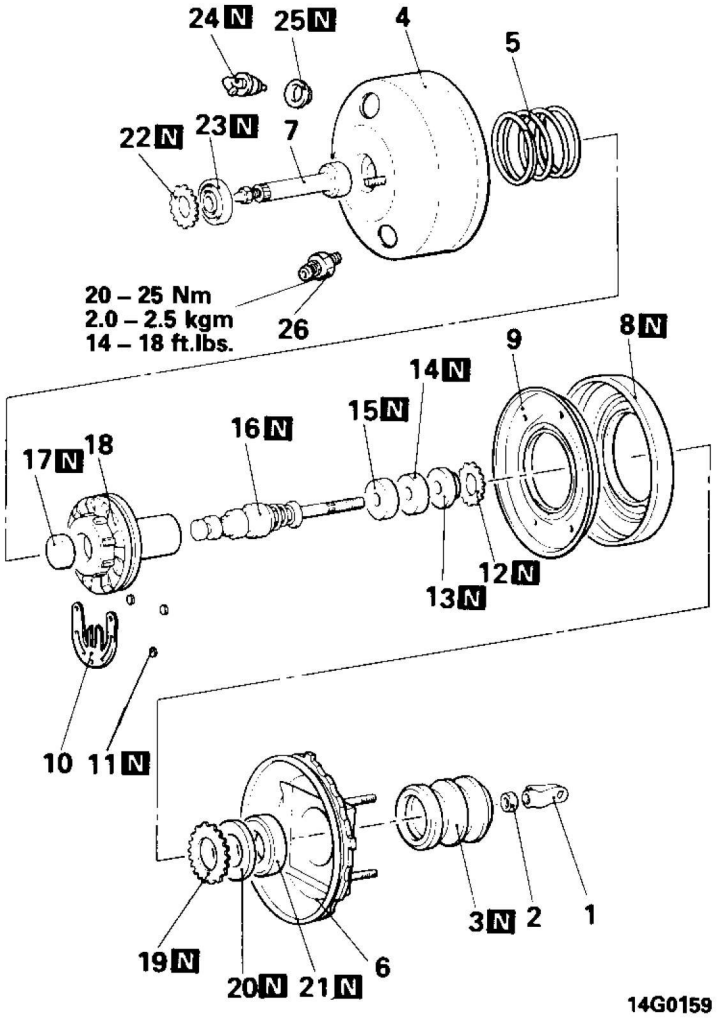


Removal steps

1. Brake tube
2. Master cylinder (Refer to P. 35-12.)
3. Split pin
4. Washer
5. Clevis pin
6. Brake booster
7. Vacuum hose
8. Vacuum tube
9. Vacuum hose
10. Grommet
11. Vacuum tube
12. Vacuum hose

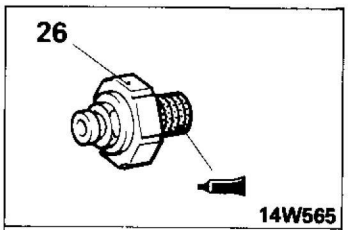
DISASSEMBLY AND REASSEMBLY

E35JE – –

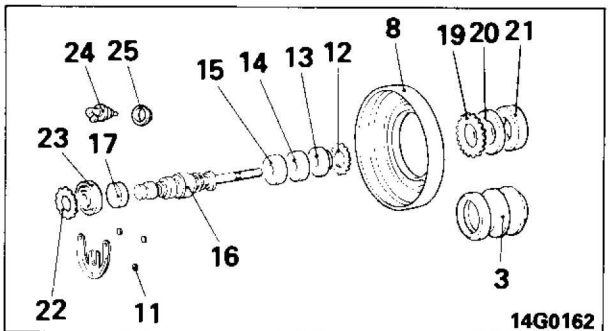


Disassembly steps

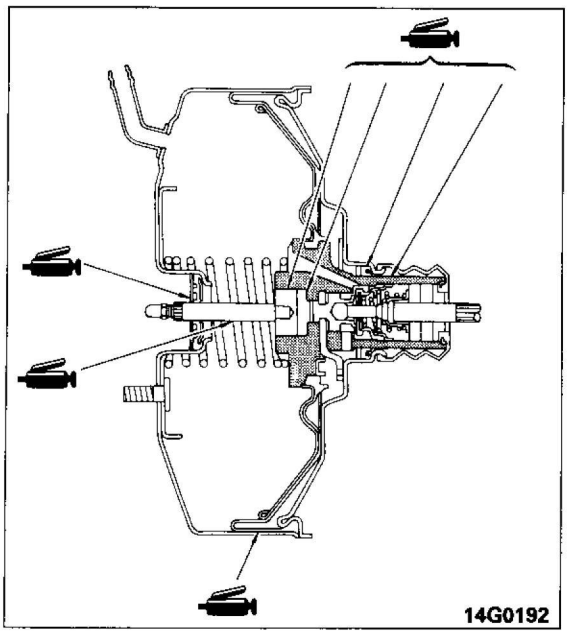
1. Operating rod yoke
2. Locking nut
3. Boot
4. Front shell ◆◆
5. Spring
6. Rear shell
7. Push rod
8. Diaphragm ◆◆ ◆◆
9. Diaphragm plate
10. Valve plunger stop key ◆◆
11. Stopper
12. Retainer ◆◆ ◆◆
13. Filter
14. Silencer
15. Filter
16. Valve rod and plunger ◆◆
17. Reaction disc
18. Valve body assembly (with diaphragm plate assembly)
19. Retainer ◆◆ ◆◆
20. Bearing ◆◆
21. Valve body seal ◆◆
22. Retainer ◆◆ ◆◆
23. Push rod seal and plate assembly ◆◆
24. Check valve
25. Grommet
26. Vacuum switch (diesel-powered vehicles)

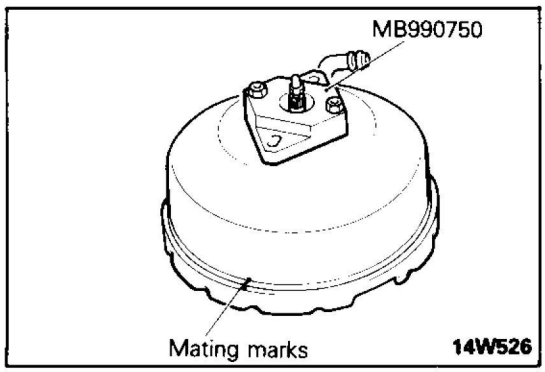


Sealant: 3M ATD Part No. 8082 or equivalent



Brake booster kit





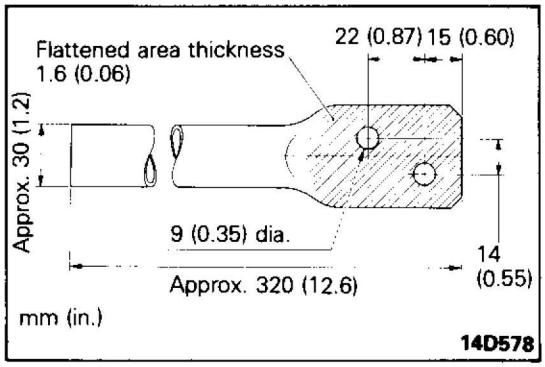
SERVICE POINTS OF DISASSEMBLY E35JFAB

4. REMOVAL OF FRONT SHELL

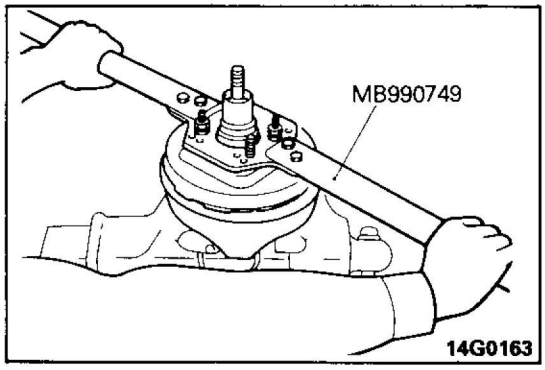
(1) Clean the booster body before starting disassembly.

Caution
During disassembly, do not allow dust, dirt, water or other impurities into the brake booster.

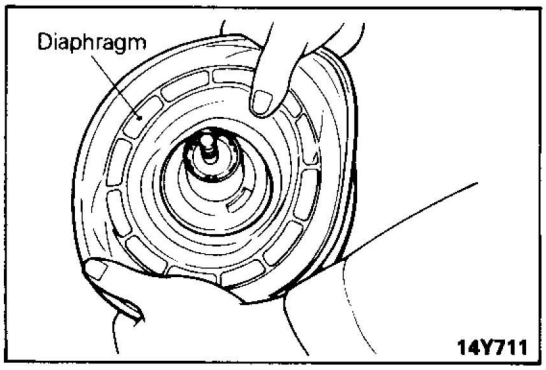
(2) Set the special tool to the front shell and hold it in a vice.
(3) Make the mating marks on the front and rear shells.



(4) Make two arms of steel pipe as shown in the illustration, and attach the arms to the special tool with suitable bolts.



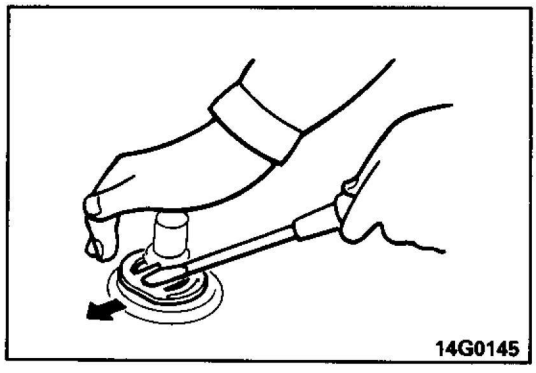
(5) Set the special tool to the rear shell. Rotate the special tool counterclockwise to remove the rear shell.



8. REMOVAL OF DIAPHRAGM

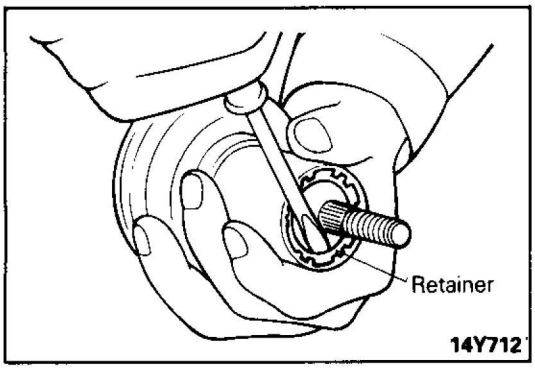
Pull of the diaphragm from the diaphragm plate.

Caution
The valve body, being made of plastic, should be carefully handled. Do not drop it or subject it to impact.



10. REMOVAL OF VALVE PLUNGER STOP KEY

Remove the valve plunger stop key while pushing the valve rod and plunger assembly.

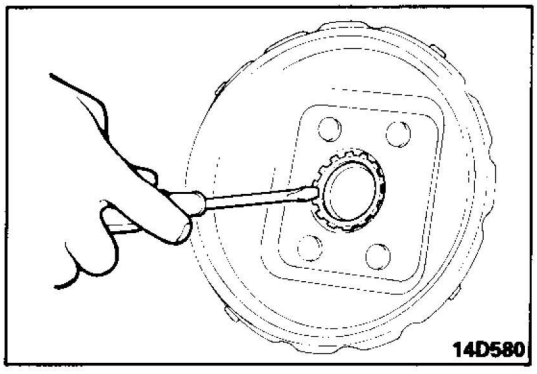


12. REMOVAL OF RETAINER

Using a screwdriver, remove the retainer from the valve body.

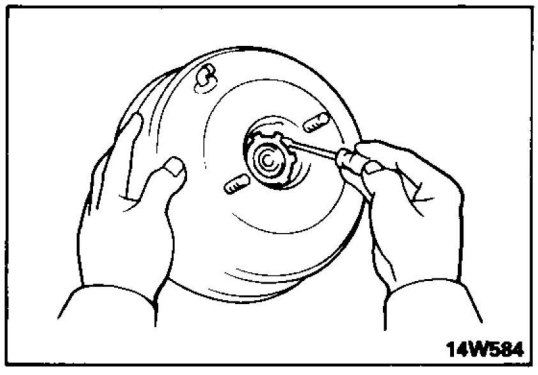
16. REMOVAL OF VALVE ROD AND PLUNGER

Slowly pull out the valve rod and plunger with the filter and silencer from the valve body.



19. REMOVAL OF RETAINER

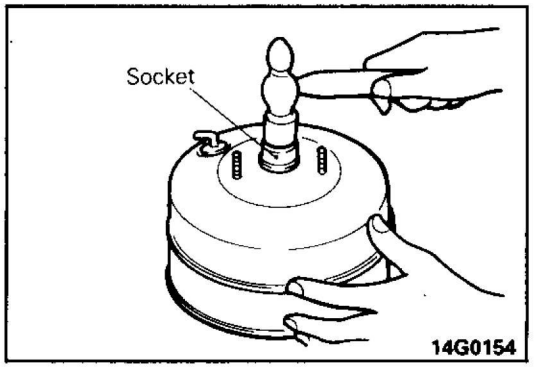
Using a screwdriver, remove the retainer from the rear shell.



22. REMOVAL OF RETAINER

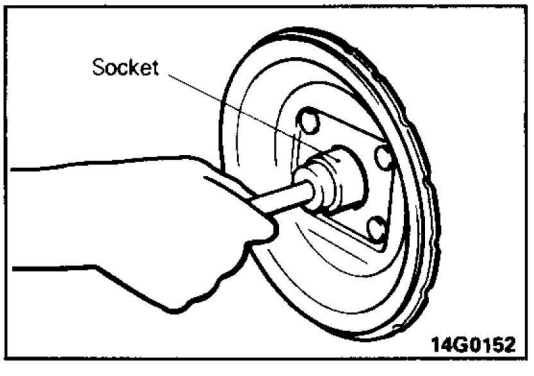
Using a screwdriver, remove the retainer from the front shell.

SERVICE POINTS OF REASSEMBLY E35JHAI



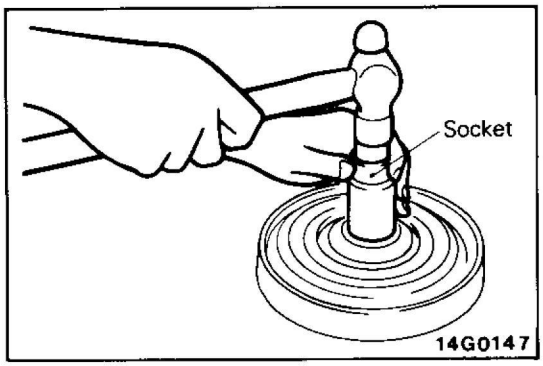
23. INSTALLATION OF PUSH ROD SEAL AND PLATE ASSEMBLY/22. RETAINER

Use 27 mm (1 1/16 in.) socket and install push rod seal, plate assembly and retainer to front shell.



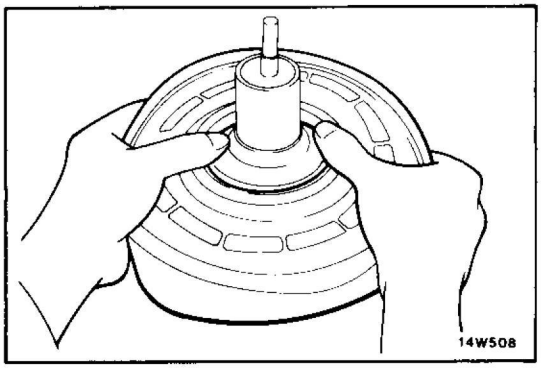
21. INSTALLATION OF VALVE BODY SEAL/20. BEARING/19. RETAINER

Use 32 mm (1 1/4 in.) socket and install retainer seal, bearing and retainer to rear shell.



12. INSTALLATION OF RETAINER

Use 22 mm (7/8 in.) socket and install retainer to valve body.



8. INSTALLATION OF DIAPHRAGM

(1) Mount the diaphragm plate to the valve body, and then push the diaphragm securely into the groove in the valve body.
(2) Confirm that the valve body, the diaphragm plate, and the diaphragm are securely assembled.

BRAKE LINE

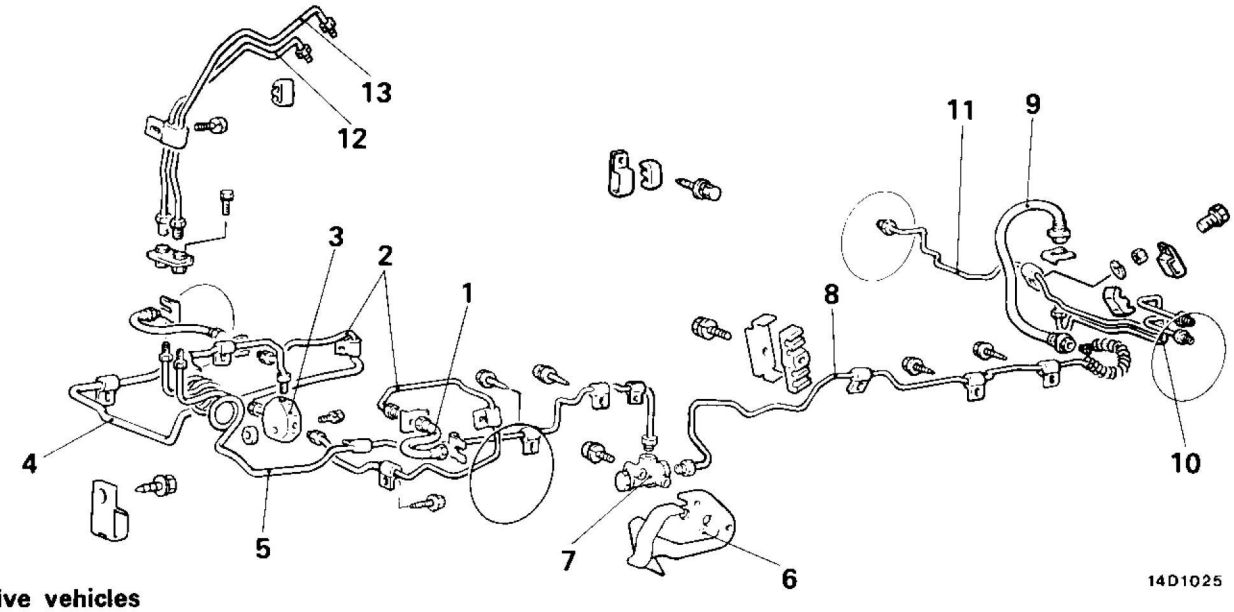
REMOVAL AND INSTALLATION

E35KA – –

Pre-removal Operation
- Draining of Brake Fluid

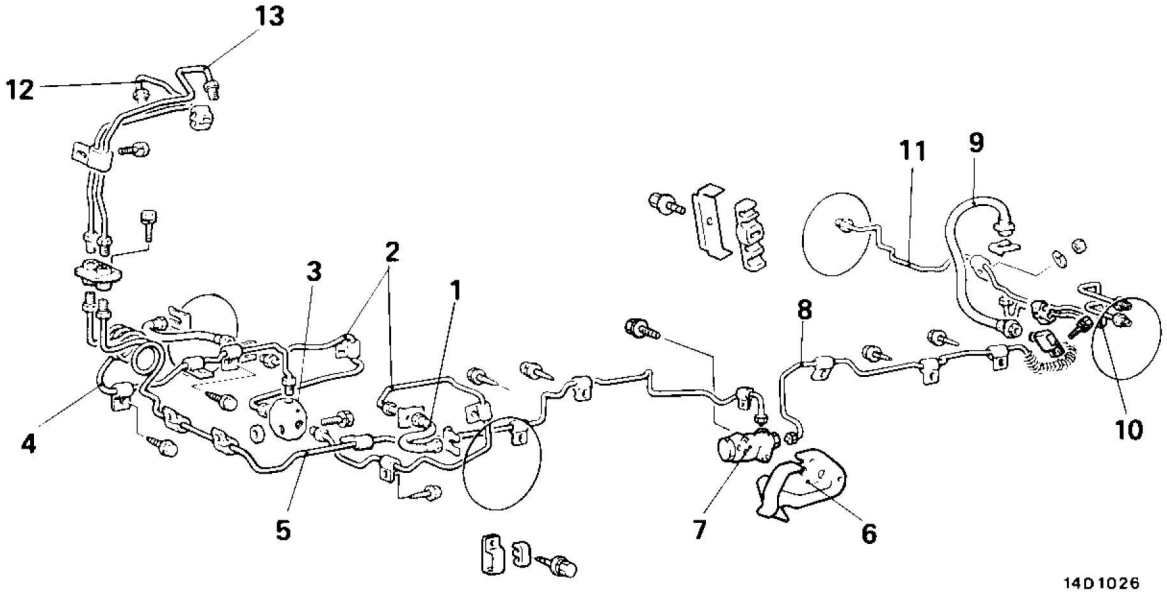
Post-installation Operation
- Supplying Brake Fluid
- Bleeding (Refer to P. 35-7.)

L.H. drive vehicles



14D1025

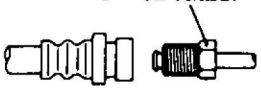
R.H. drive vehicles



14D1026

Brake tube flare nuts

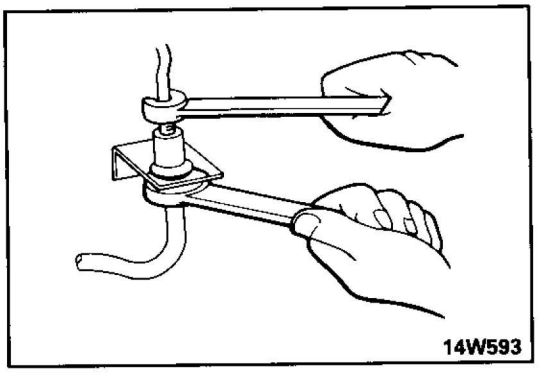
13 – 17 Nm
1.3 – 1.7 kgm
9 – 12 ft.lbs.



14F038

Removal steps

◆◆ 1. Brake hose
2. Brake tube
3. 3-way connector
4. Brake tube
5. Brake tube
6. Protector
7. G sensing proportioning valve
8. Brake tube
9. Brake hose
10. Brake tube
11. Brake tube
12. Brake tube
13. Brake tube



SERVICE POINTS OF REMOVAL E35KBALa

1. REMOVAL OF BRAKE HOSE

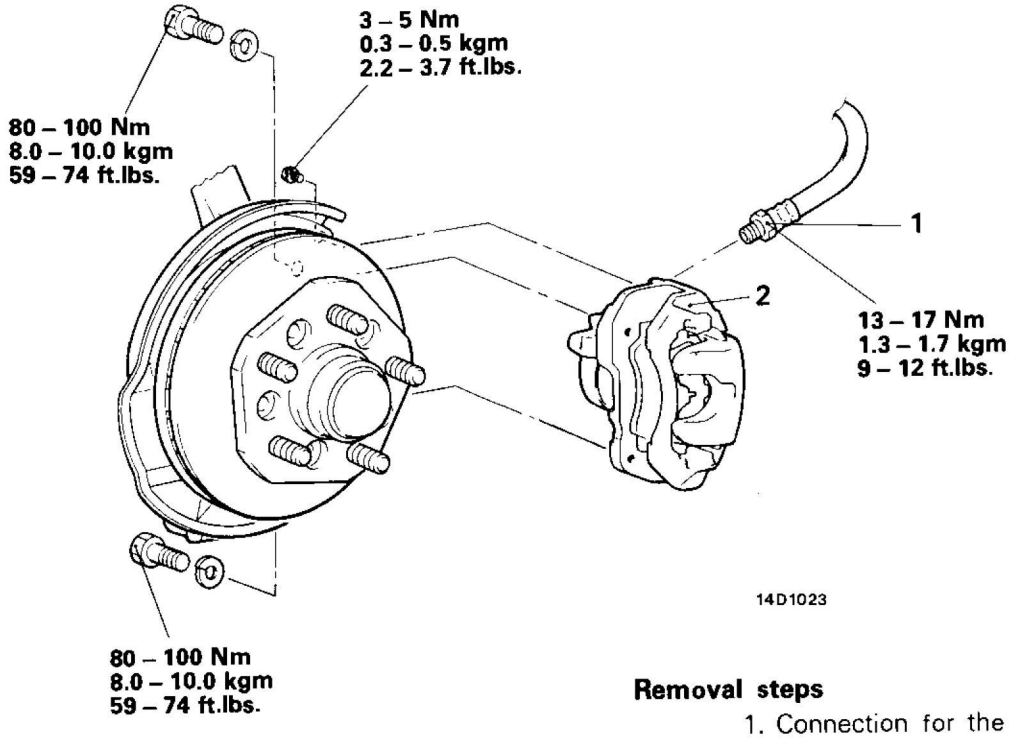
Holding the nut at the brake hose side, loosen the flare nut of the brake tube.

FRONT BRAKE E35LA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Drainning of Brake Fluid

Post-installation Operation
- Brake Fluid Filling
- Bleeding (Refer to P. 35-7.)

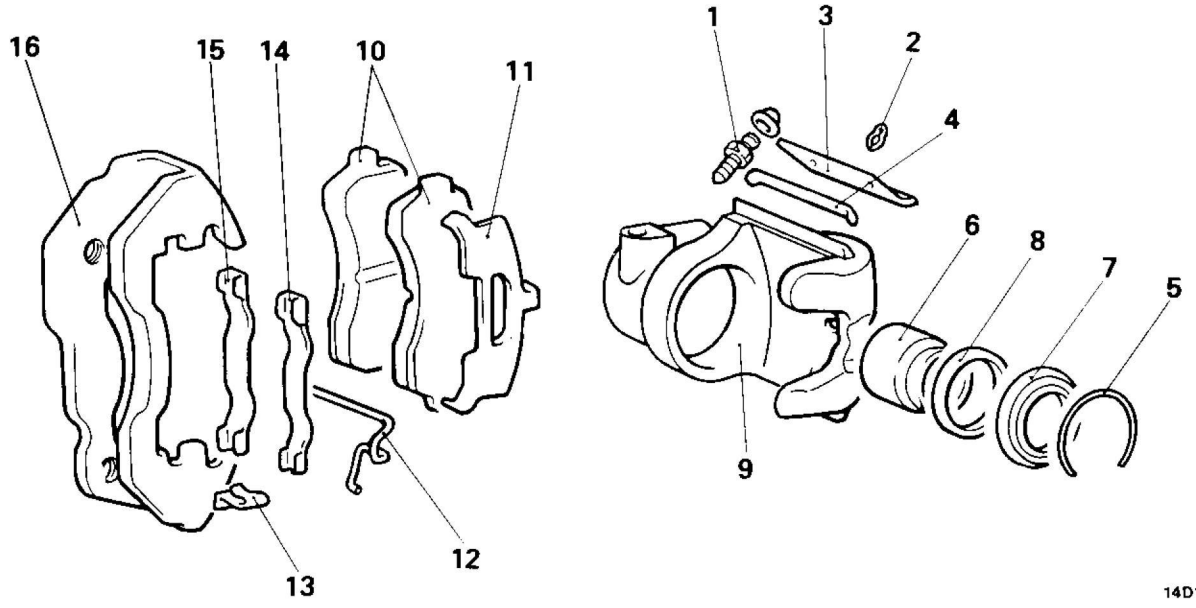


Removal steps

1. Connection for the brake hose
2. Front brake assembly

DISASSEMBLY AND REASSEMBLY

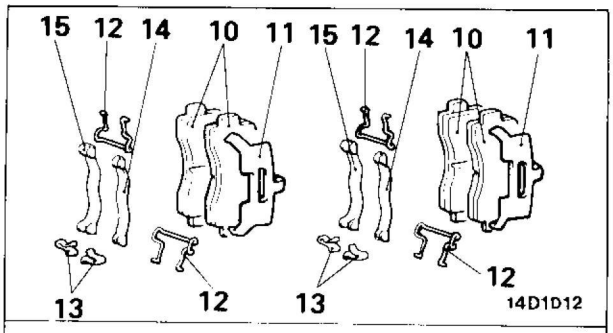
E35LF--



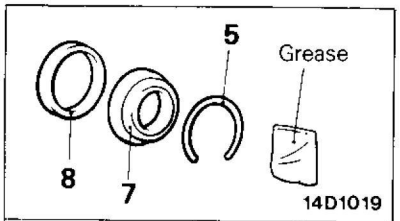
14D1016

Removal steps

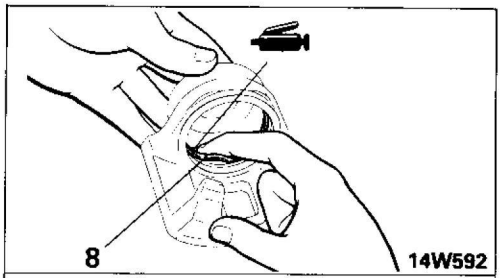
1. Bleeder screw
2. Pin
3. Plug
4. Plug plate
5. Boot ring
6. Piston
7. Piston boot
8. Piston seal
9. Caliper body
10. Pad assembly
11. Shim
12. Anti-rattle spring
13. Pad clip
14. Outer pad clip
15. Inner pad clip
16. Mounting support



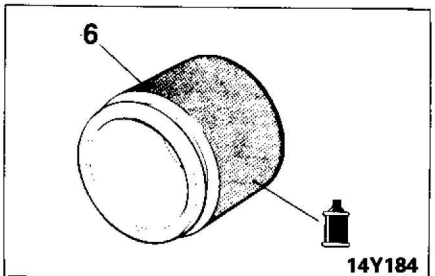
Brake pad kit



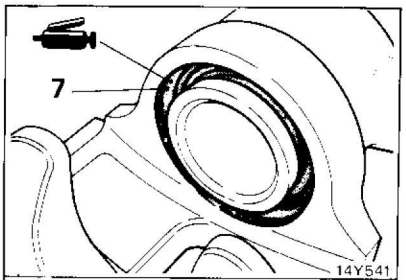
Boot and seal kit



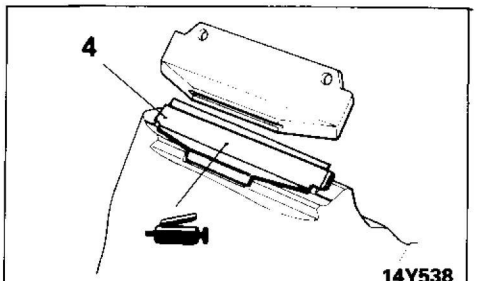
Repair kit grease (orange)



Brake fluid: SAE J1703 (or DOT3)



Repair kit grease (orange)



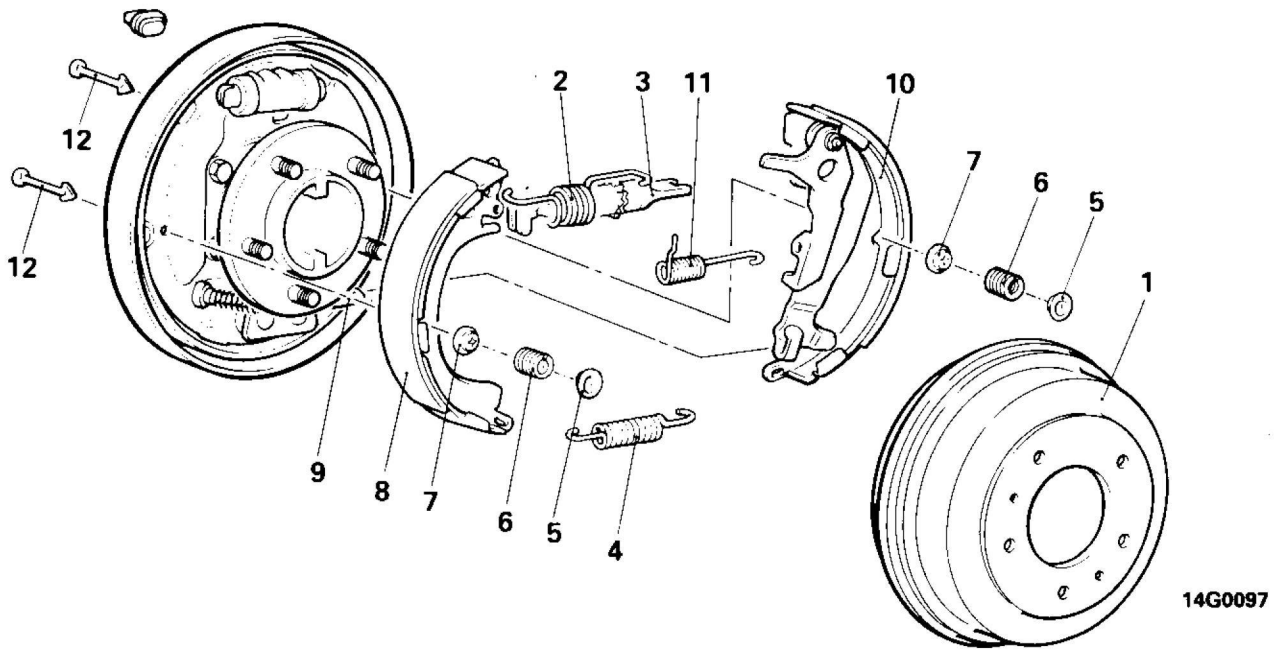
Brake grease: SAE J310, NLGI No. 1

REAR BRAKE SHOE

REMOVAL AND INSTALLATION

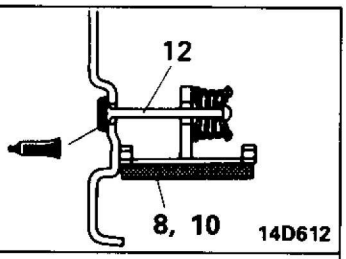
E35UA--

Post-installation Operation
- Adjustment of Parking Brake Lever stroke
  (Refer to Group 36 – Service Adjustment Procedures.)

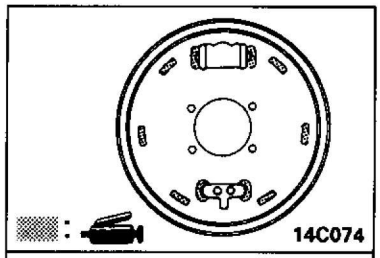


Removal steps

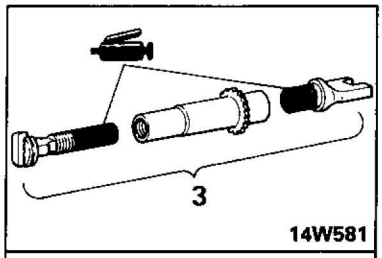
1. Brake drum
2. Shoe return spring
3. Brake shoe adjuster
4. Shoe retainer spring
5. Shoe hold-down cup
6. Shoe hold-down spring
7. Shoe hold-down cup
8. Shoe assembly
9. Connection for parking brake cable
10. Shoe assembly
11. Adjusting spring
12. Shoe hold-down pin



Sealant: 3M ATD Part No. 8513 or equivalent



Brake grease: SAE J310, NLGI No. 1



Brake grease: SAE J310, NLGI No. 1

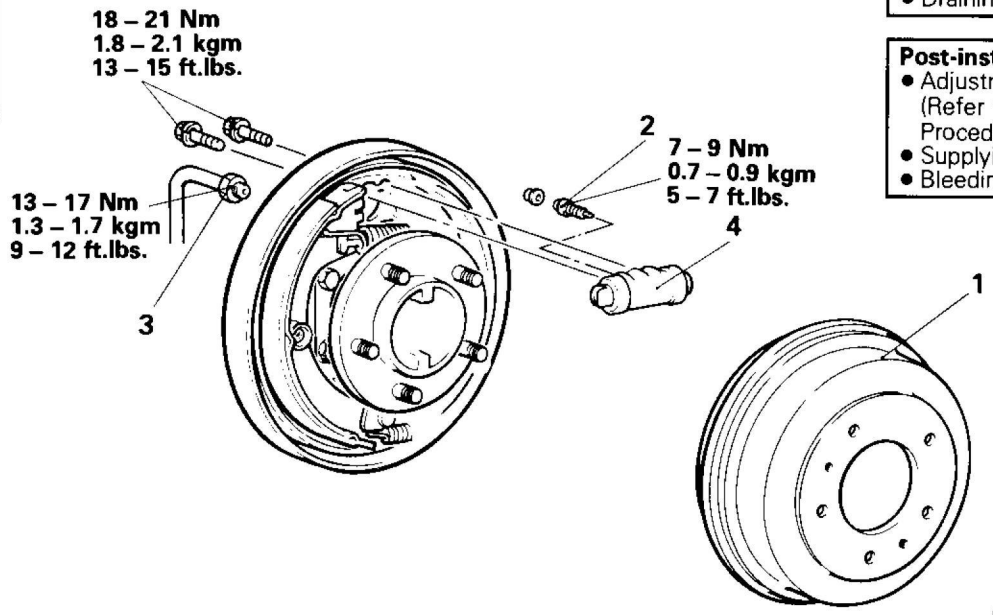
REAR BRAKE WHEEL CYLINDER

REMOVAL AND INSTALLATION

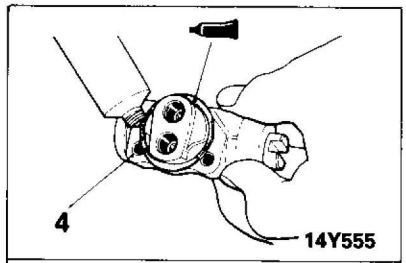
E35VA--

Pre-removal Operation
- Draining of Brake Fluid

Post-installation Operation
- Adjustment of Parking Brake Lever Stroke (Refer to GROUP 36 – Service Adjustment Procedures.)
- Supplying Brake Fluid
- Bleeding (Refer to P. 35-7.)



14D1017

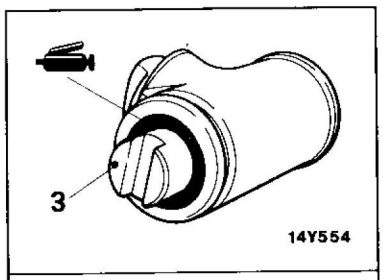


Sealant: 3M ATD Part No. 8513 or equivalent

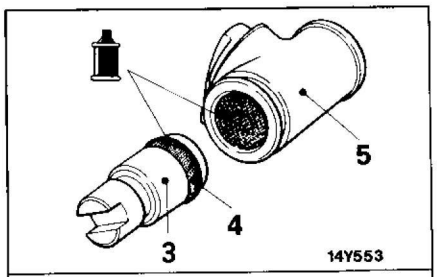
Removal steps
1. Brake drum
2. Bleeder screw
3. Brake tube
4. Wheel cylinder assembly

DISASSEMBLY AND REASSEMBLY

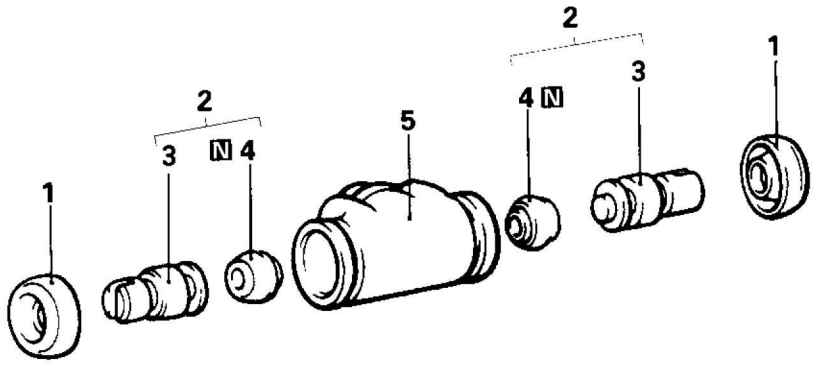
E35VE--



Repair kit grease (orange)

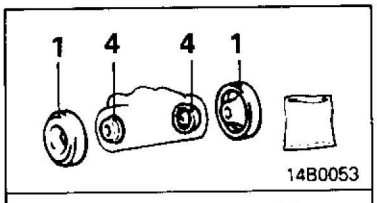


Brake fluid: SAE J1703 (or DOT3)

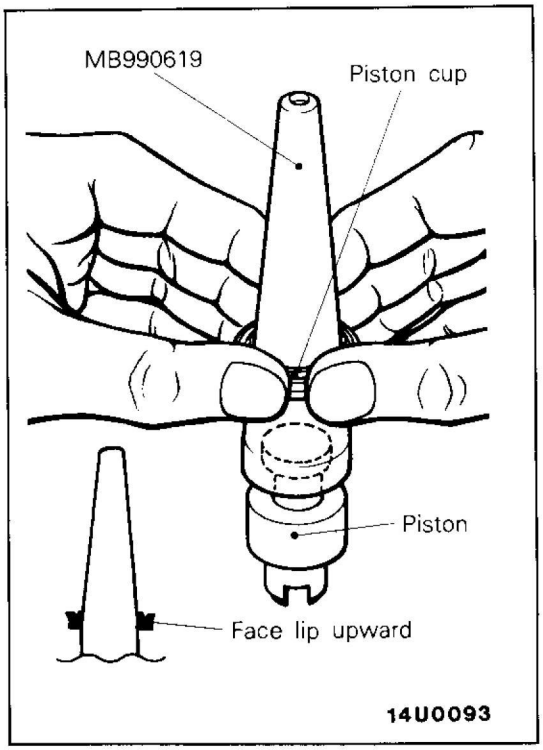


Disassembly steps

1. Wheel cylinder boot
2. Piston assembly
3. Piston
4. ◆◆ Piston cup
5. Wheel cylinder body



Wheel cylinder kit



SERVICE POINTS OF REASSEMBLY

E35VHAD

4. INSTALLATION OF PISTON CUP

(1) Wash the inner surface of the wheel cylinder and outer surface of the piston with trichloroethylene, alcohol or brake fluid.

(2) Apply the specified brake fluid to the entire surface of the piston cups and to the external periphery of the special tool.

Specified brake fluid: SAE J1703 (or DOT3)

(3) Attach the special tool to the piston, fit the piston cup onto the special tool with the lips of the piston cup directed upward, and push down (with finger tips) to let it slide along the outer surface of the special tool until it fits into position.

Caution
When pushing down the piston cup, push uniformly and slowly with both hands, without stopping, so that deformation or turning over will not result.

NOTES

PARKING BRAKES

CONTENTS

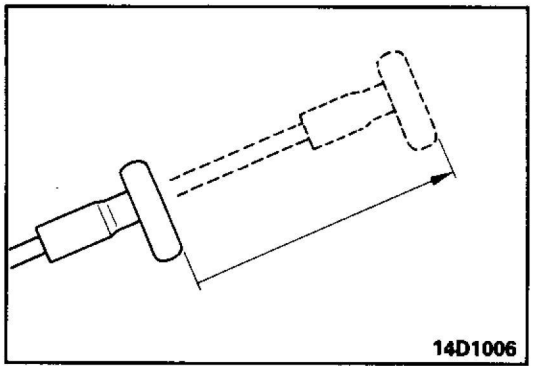
E36AA--

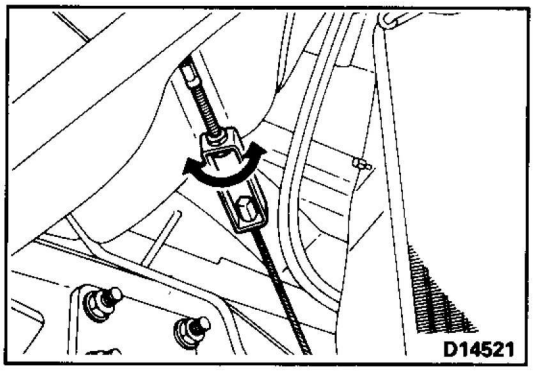
SPECIFICATIONS

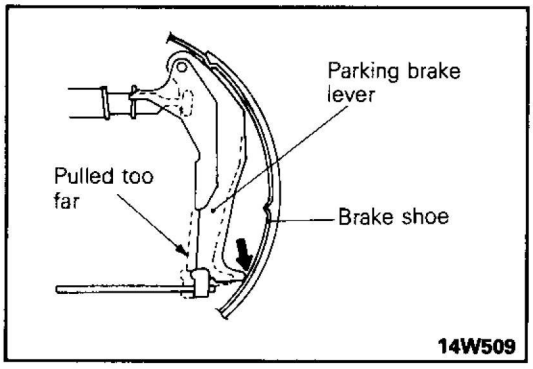
E36CB--

SERVICE SPECIFICATION

Item	Specification
Standard value Parking brake pull rod stroke	18 – 22 notches







SERVICE ADJUSTMENT PROCEDURES

E36FAAS

PARKING BRAKE PULL ROD STROKE INSPECTION AND ADJUSTMENT

1. Pull parking brake pull rod with a force of approx. 300N (30 kg, 67 lbs.), and count the number of notches.

   Standard value: 18 – 22 notches

2. If the parking pull rod stroke is not within the standard value range, make adjustment by the following procedures;
   (1) Loosen the turnbuckle to slacken parking cable.
   (2) Repeating pulling and releasing the parking brake pull rod, to adjust the brake shoe clearance.
   (3) Turn the turnbuckle until the parking brake pull rod stroke has the standard value.

   Caution
   If the number of brake pull rod notches engaged is less than the standard value, the cable has been pulled excessively and failure of the automatic adjuster mechanism will result. Be sure to adjust it to within the standard value.

3. Return the parking brake pull rod, remove the brake drum, and check that the brake pull rod adjuster is touching the shoe.

   Caution
   If the parking brake cable is pulled too far, the adjuster lever does not fit the adjuster, resulting in faulty operation of the brake shoe adjuster.

4. With the parking brake pull rod in the released position, turn the rear wheel to confirm that the rear brakes are not dragging.

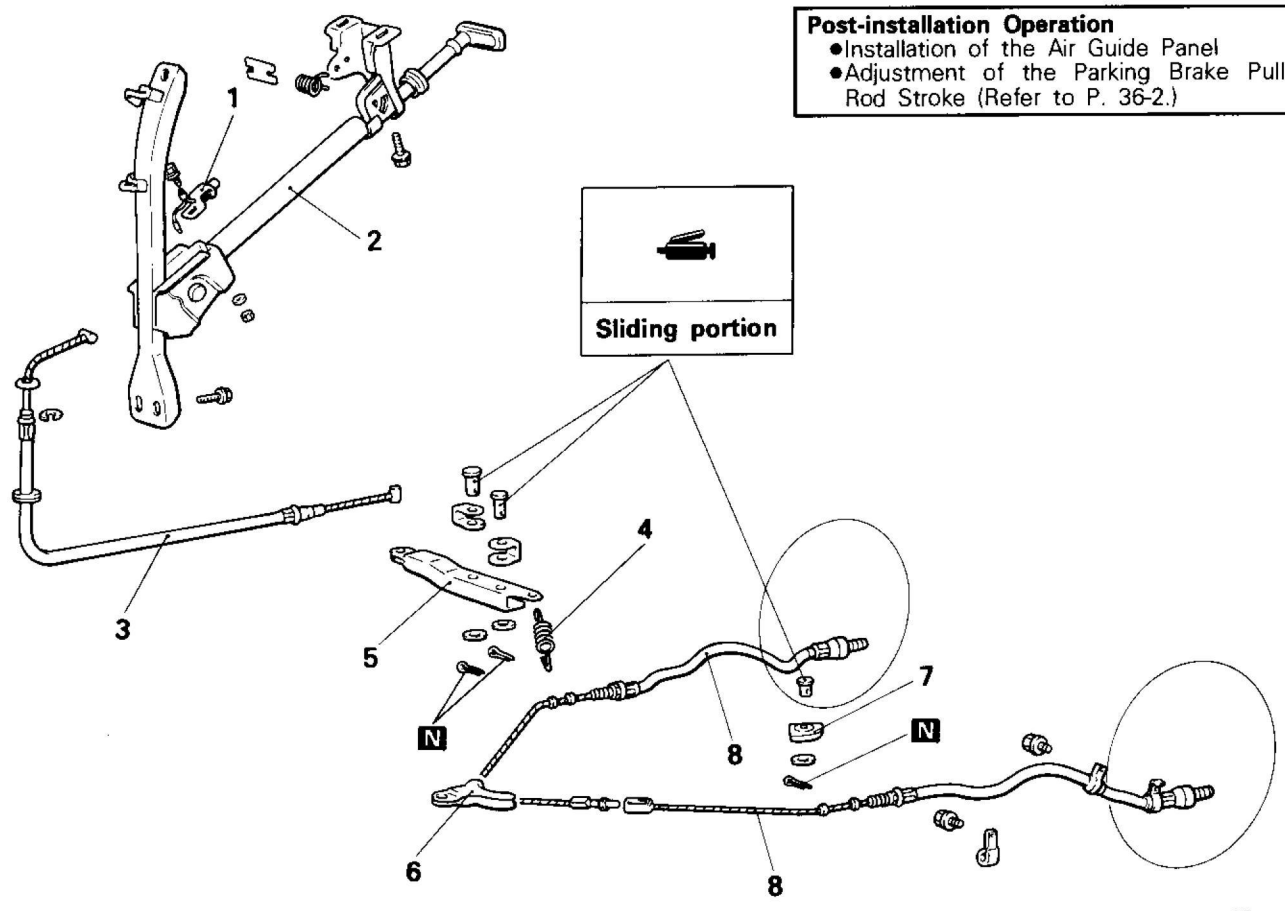
PARKING BRAKES

E36GA--

REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Air Guide Panel

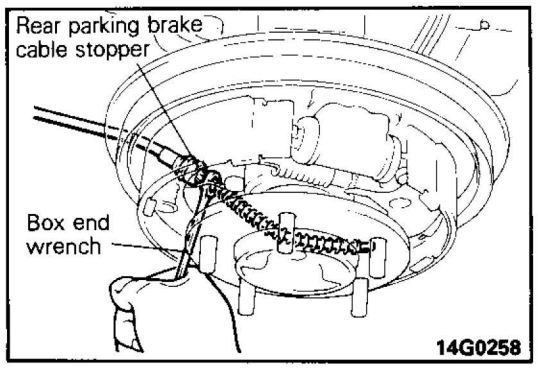
Post-installation Operation
- Installation of the Air Guide Panel
- Adjustment of the Parking Brake Pull Rod Stroke (Refer to P. 36-2.)



Removal steps

1. Parking brake indicator lamp switch
2. Pull rod assembly
3. Front parking brake cable
4. Return spring
5. Parking lever
6. Balancer
7. Cable guide

◆◆ 8. Rear parking brake cable



SERVICE POINTS OF REMOVAL

E36KBAF

8. REMOVAL OF REAR PARKING BRAKE CABLE

Pass the rear parking brake cable through an offset box-end wrench (12 mm) and push the wrench further on the rear parking brake cable until it reaches the stopper part. In that condition, pull the rear parking brake cable out from the rear side of the backing plate.

NOTE
Push the offset box-end wrench until the tab of the stopper is pushed in.

NOTES

STEERING

CONTENTS

E37AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E37CA – –

Items		Specifications
Steering wheel diameter	mm (in.)	403 (15.87)
Steering gear box		
Steering gear type		Recirculating ball type
Steering gear ratio		21.5

SERVICE SPECIFICATIONS

E37CB – –

Items		Specifications
Standard value		
Steering angle		
Inner wheel		36° $^{0}_{-4'}$
Outer wheel		34° 30′
Mainshaft starting torque	Nm (kgcm, in.lbs.)	0.4 – 0.6 (4 – 6, 3.5 – 5.2)
Cross-shaft axial play	mm (in.)	0.05 (0.0020)
Mainshaft total starting torque	Nm (kgcm, in.lbs.)	0.8 – 1.1 (8 – 11, 6.9 – 9.5)
Bellcrank arm starting torque	Nm (kgcm, in.lbs.)	7 – 10 (70 – 100, 61 – 86)
Ball joint starting torque	Nm (kgcm, in.lbs.)	0.5 – 2.5 (5 – 25, 4.3 – 22)
Idler arm turning torque	Nm (kgcm, in.lbs.)	3 – 9 (30 – 90, 26 – 78)
Spring balance reading	N (kg, lbs.)	25 – 75 (2.5 – 7.5, 5.5 – 16.5)
Limit		
Steering wheel free play	mm (in.)	
Petrol-powered vehicles		50 (1.97)
Diesel-powered vehicles		40 (1.57)
Steering gear backlash	mm (in.)	0.5 (0.020)
Ball joint axial play	mm (in.)	1.5 (0.059)

TORQUE SPECIFICATIONS

E37CC – –

Items	Nm	kgm	ft.lbs.
Steering column and shaft			
Steering wheel to steering shaft	40	4.0	29
Steering column support to body	14 – 20	1.4 – 2.0	10 – 15
Support A to support B			
Standard bolt	14 – 20	1.4 – 2.0	10 – 15
Special screw	8 – 12	0.8 – 1.2	6 – 9
Steering column cover	8 – 12	0.8 – 1.2	6 – 9
Steering column shaft to steering gear box	30 – 35	3.0 – 3.5	22 – 25
Steering gear box			
Steering gear box to frame	40 – 55	4.0 – 5.5	29 – 39
Side cover	40 – 50	4.0 – 5.0	29 – 36
End cover	15 – 24	1.5 – 2.4	11 – 17
Jam nut	130 – 170	13 – 17	94 – 123

Items	Nm	kgm	ft.lbs.
Steering linkage			
Pitman arm to drag link	35 – 45	3.5 – 4.5	25 – 33
Drag link to bellcrank arm assembly	35 – 45	3.5 – 4.5	25 – 33
Bellcrank arm assembly to frame	40 – 50	4.0 – 5.0	29 – 36
Bellcrank arm assembly to relay rod	35 – 45	3.5 – 4.5	25 – 33
Relay rod to idler arm	35 – 45	3.5 – 4.5	25 – 33
Idler arm to frame	40 – 50	4.0 – 5.0	29 – 36
Tie rod end assembly to relay rod	35 – 45	3.5 – 4.5	25 – 33
Tie rod end assembly to knuckle	35 – 45	3.5 – 4.5	25 – 33
Idler arm to support	40 – 60	4.0 – 6.0	29 – 43
Bellcrank arm to bellcrank shaft	80 – 120	8.0 – 1.2	58 – 87
Bellcrank shaft housing to cap	10	1.0	7

LUBRICANTS

E37CD – –

Items	Specified lubricant	Quantity
Steering gear oil	Hypoid gear oil API classification GL-4 or higher SAE viscosity No. 80 or 90	370 cc (22.58 cu.in.)

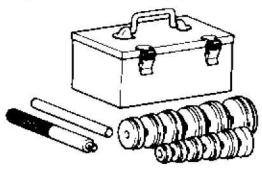
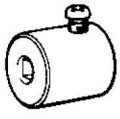
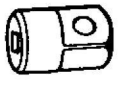
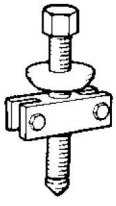
SEALANTS AND ADHESIVES

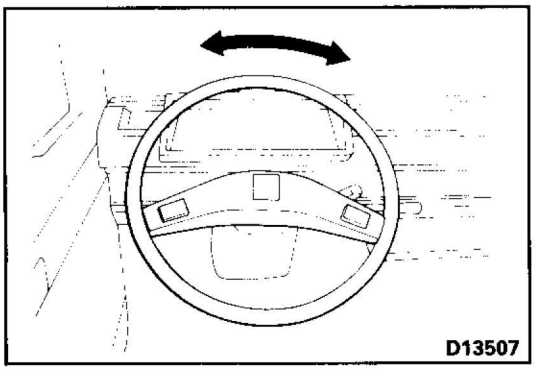
E37CE – –

Items	Specified sealant and adhesive	Remarks
Steering gear box end cover shim Steering gear box cross-shaft adjusting bolt and lock nut Steering gear box side cover bolt Steering gear box adjusting side cover Dust cover installed surface	3M ATD Part No. 8661 or equivalent	Semi-drying sealant

SPECIAL TOOLS

E37DA--

Tool	Number	Name	Use
	MB991113	Steering linkage puller	Disconnection of the steering linkage
	MB990803	Steering wheel puller	Removal of the steering wheel
	MB990826	Torx wrench	Removal and installation of the steering column
	MB990925	Bearing and oil seal installer set (Refer to GROUP 26.)	Installation of the oil seal MB990938 MB990926 MB990927
	MB991151 MB990685	Torque wrench	Measurement of the mainshaft starting torque
	MB991006 or MB990228	Preload socket	Measurement of the mainshaft total starting torque
	MB990326	Preload socket	Measurement of the ball joint starting torque
	MB990197	Puller body	Removal of bellcrank arm and pitman arm
	MB990302	Hook	


D13507

SERVICE ADJUSTMENT PROCEDURES
E37FAAEa

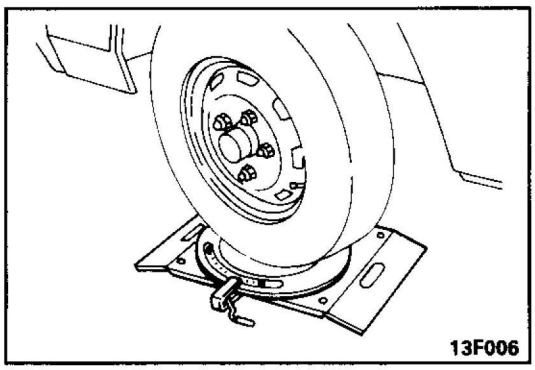
STEERING WHEEL FREE PLAY CHECK

1. Set front wheels straight ahead.
2. Measure the play on steering wheel circumference before wheels move when slightly moving steering wheel in both directions.

   Limit:

<Petrol-powered vehicles>	**50 mm (1.97 in.)**
<Diesel-powered vehicles>	**40 mm (1.57 in.)**

3. When the play exceeds the limit, check play in steering shaft connection and steering linkage. Correct or replace.
4. When (3) check provides good results, check the following to adjust:
   - Remove the steering gear box, check and adjust total pinion starting torque.

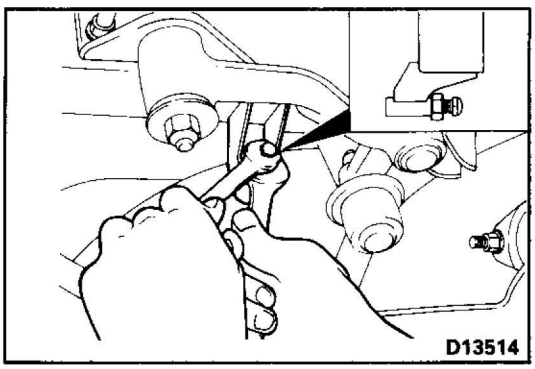

13F006

STEERING ANGLE CHECK
E37FDAG

1. Locate front wheels on turning radius gauge and measure steering angle.

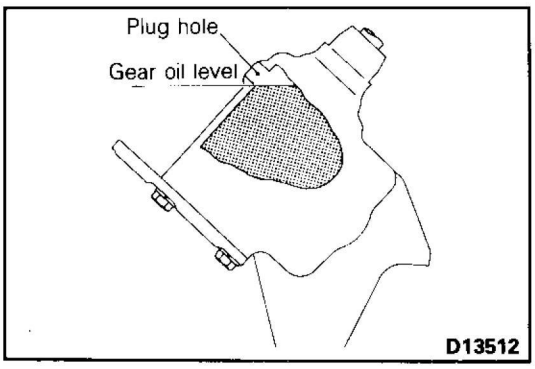
   Standard value:

Inner wheel	**36° $^{0}_{-4'}$**
Outer wheel	**34° 30'**


D13514

2. If the measured value is out of the standard value, adjust by turning the stopper bolt in or out.

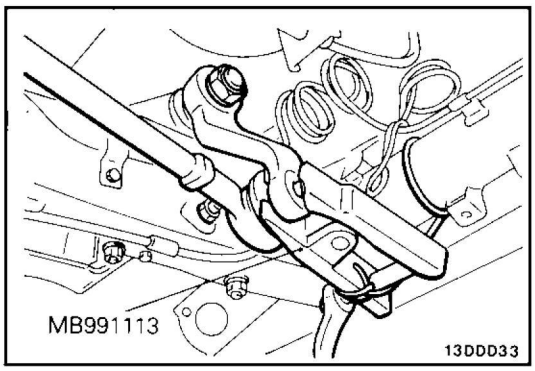
   NOTE
   Adjust toe-in before adjustment of the steering angle. For adjustment of toe-in, refer to GROUP 33 – Service Adjustment Procedures.



D13512

STEERING GEAR OIL LEVEL CHECK
E37FEAB

1. Park the vehicle on a flat surface.
2. Remove the plug of the steering gear box, and check to make sure the distance between the surface of the gear oil and the plug hole are as illustrated.

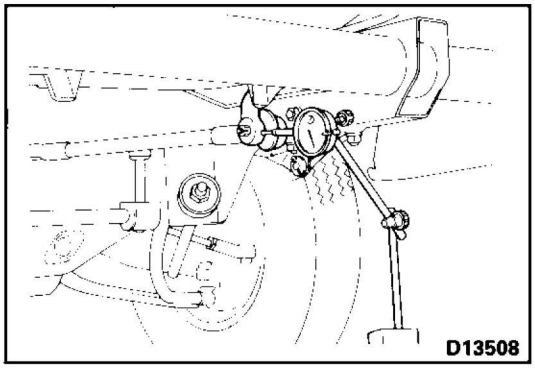


STEERING GEAR BACKLASH CHECK E37FBAC

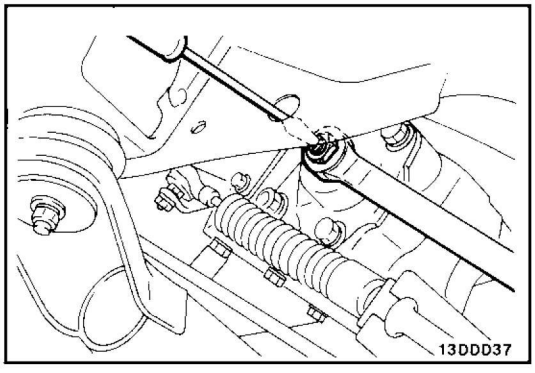
1. Jack up to the vehicle front and hold the steering wheel in the straight ahead position.
2. Apart the pitman arm and the relay rod.

Caution

1. Use cord to bind the special tool closely so it will not become separated.
2. The nut should be loosened only, not removed.



Limit: 0.5 mm (0.020 in.)



3. If the measured value exceeds the limit, screw in the steering gear box adjusting bolt until steering wheel free play is within the range of standard value.

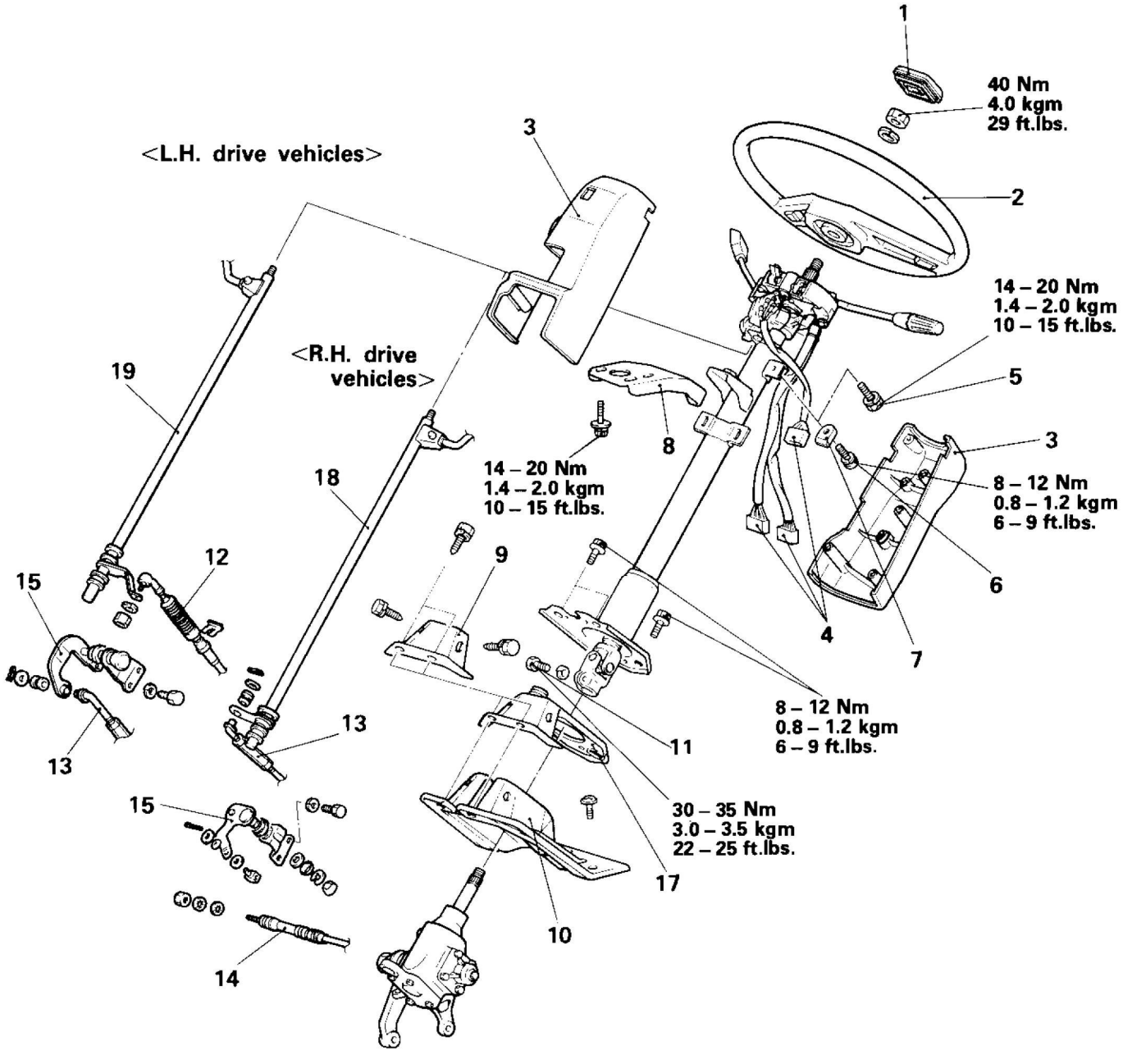
Caution

1. Be sure to make the adjustment with the steering wheel in the straight-ahead position.
2. If the adjusting bolt is overtightened, more steering effort will be required, and return of the wheel will be adversely affected.

STEERING COLUMN AND SHAFT

E37HA--

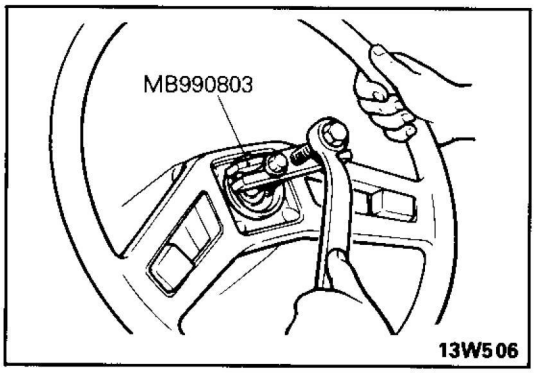
REMOVAL AND INSTALLATION



13D0054

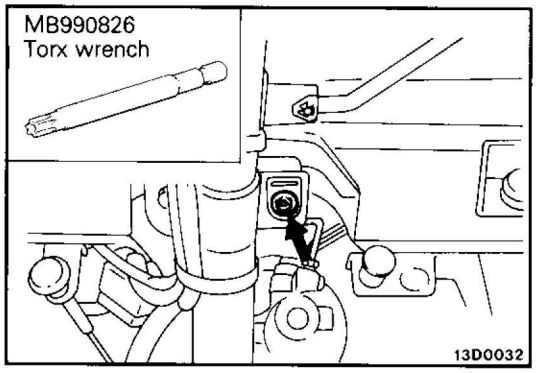
Removal steps

1. Center pad assembly
◆◆ 2. Steering wheel
3. Steering column cover
4. Connector
5. Steering column mounting bolt
◆◆ 6. Steering column mounting special screw
7. Special washer
8. Steering column support
9. Steering column dust cover plate
10. Steering column dust cover plate
11. Connection for steering shaft assembly
12. Connection for gear shift control cable
13. Connection for gear shift select control rod
14. Connection for gear shift select cable
15. Gear shift select lever bracket
16. Steering column
17. Steering column dust cover
18. Gear shift control linkage rod



SERVICE POINTS OF REMOVAL E37HBAR

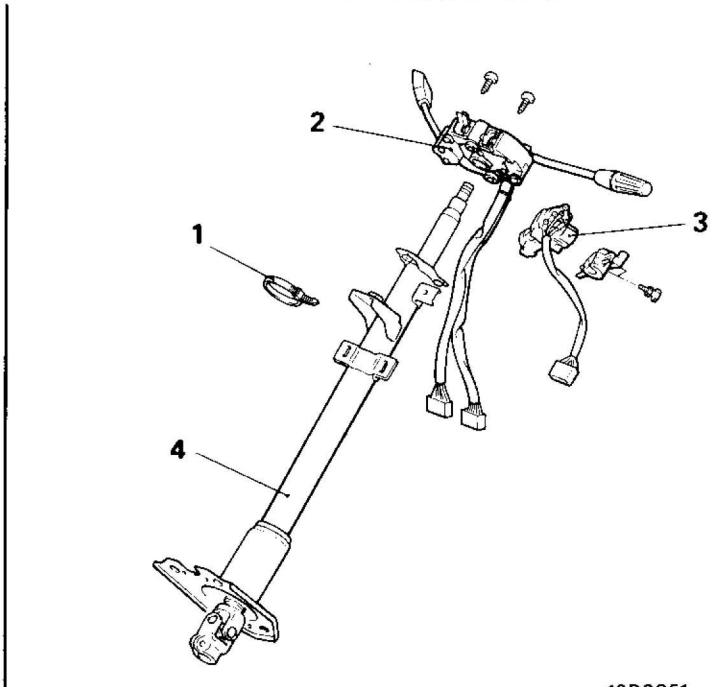
2. REMOVAL OF STEERING WHEEL ASSEMBLY



6. REMOVAL OF BOLTS

Remove the bolts by using the special tool.

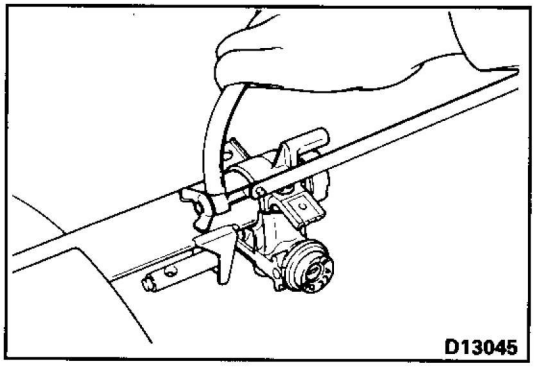
DISASSEMBLY AND REASSEMBLY E37HE--



Removal steps

1. Cable band
2. Column switch
3. Steering wheel lock cylinder
4. Steering column assembly

◆◆



SERVICE POINTS OF DISASSEMBLY E37HFAP

3. REMOVAL OF STEERING WHEEL LOCK CYLINDER

If it is necessary to remove the steering lock, use a hacksaw to cut a groove on the head of the special bolt, and then use a screwdriver to remove the steering lock.

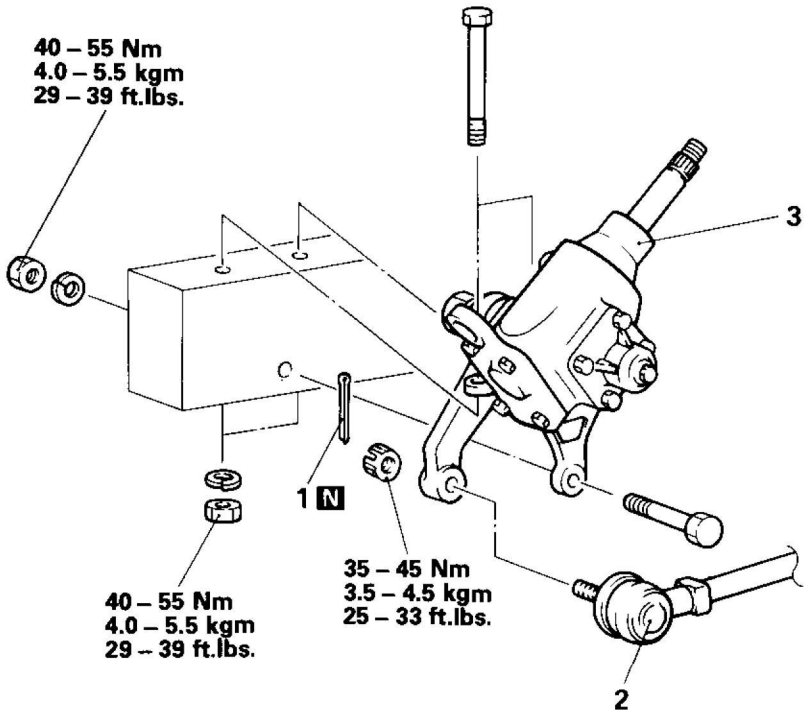
STEERING GEAR BOX

E37JA--

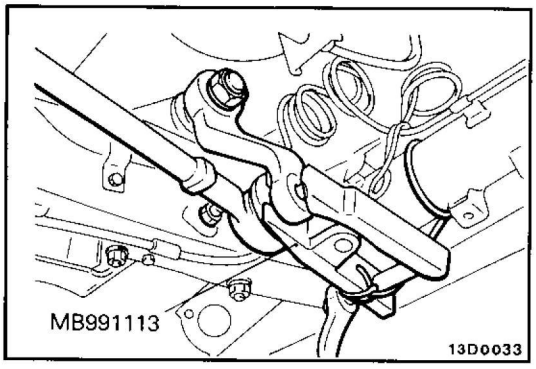
REMOVAL AND INSTALLATION

Pre-removal Operation
- Removal of the Air Guide Panel
- Removal of the Steering Column (Refer to P. 37-7.)

Post-installation Operation
- Installation of the Steering Column (Refer to P. 37-7.)
- Installation of the Air Guide Panel
- Checking of the Steering Angle (Refer to P. 37-5.)
- Adjustment of the Front Wheel Alignment (Refer to GROUP 33 – Service Adjustment Procedures.)



Removal steps
1. Split pin
2. Connection for drag link
3. Steering gear box



SERVICE POINTS OF REMOVAL

E37JBACa

2. DISCONNECTION OF DRAG LINK

Caution

1. Use cord to bind the special tool closely so it will not become separated.
2. The nut should be loosened only, not removed.

SERVICE POINTS OF INSTALLATION

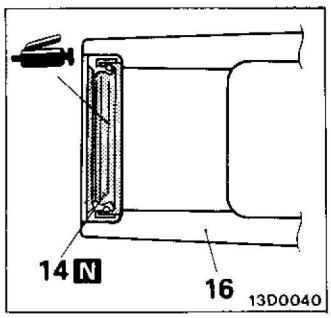
E37JDAC

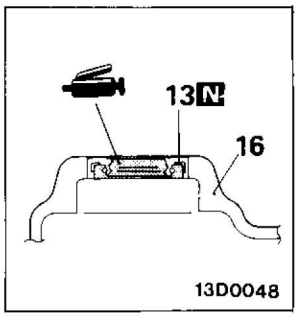
3. INSTALLATION OF STEERING GEAR BOX

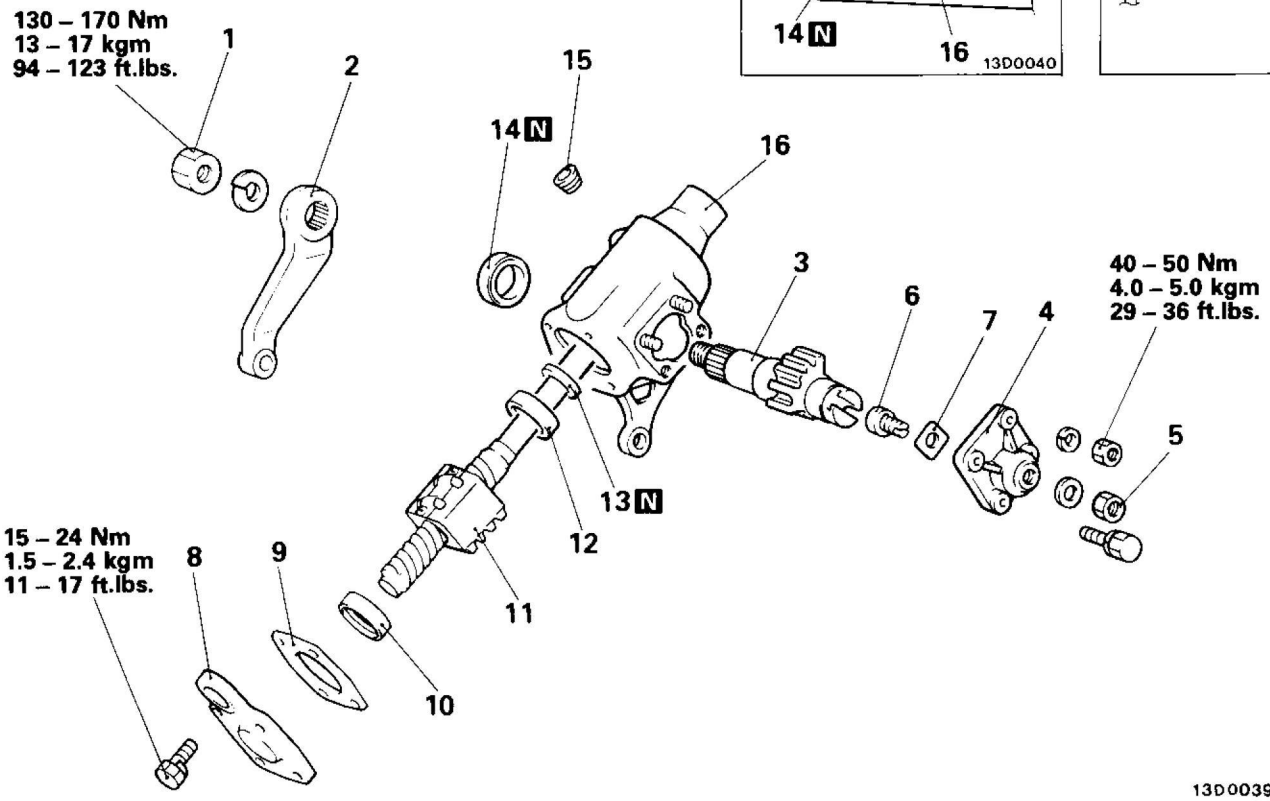
Install the steering gear box to the frame after inserting the steering gear box mainshaft into the joint assembly.

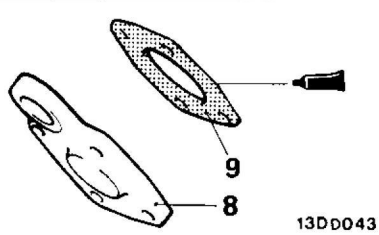
DISASSEMBLY AND REASSEMBLY

E37LE--



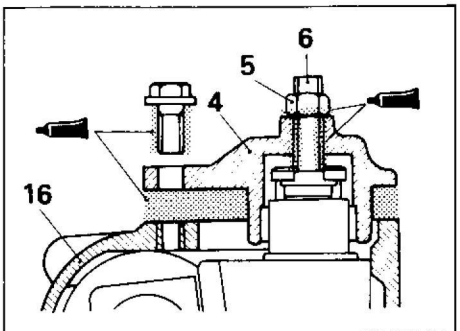






NOTE
Make sure that the adjusting shim(s) have the same thickness as the ones before disassembly.

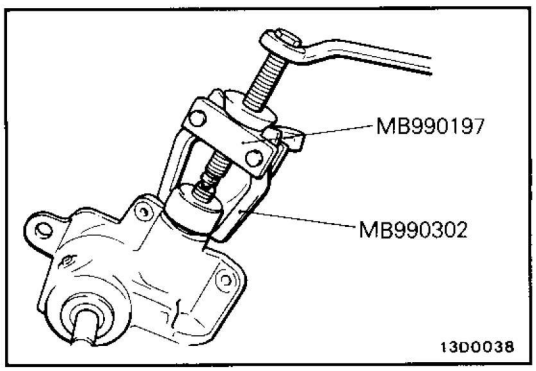
Sealant: 3M ATD Part No. 8661 or equivalent



Sealant: 3M ATD Part No. 8661 or equivalent

Disassembly steps

1. Jam nut
2. ◆◆ ◆◆ Pitman arm
3. ◆◆ ◆◆ Cross-shaft
4. ◆◆ Side cover
5. Lock nut
6. Adjusting bolt
7. ◆◆ Adjusting plate
8. ◆◆ End cover
9. Shim
10. Bearing
11. Mainshaft assembly
12. Bearing
13. Oil seal
14. ◆◆ Oil seal
15. Plug
16. Gear housing assembly

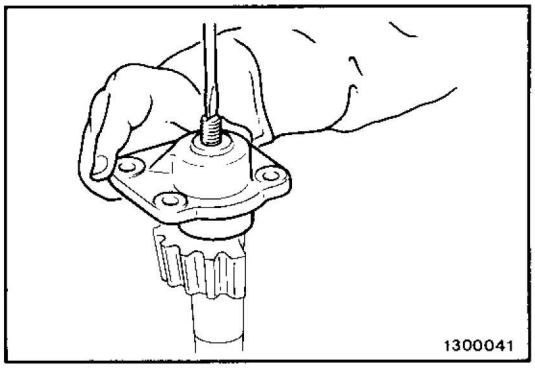


SERVICE POINTS OF DISASSEMBLY E37JFAD

2. REMOVAL OF PITMAN ARM

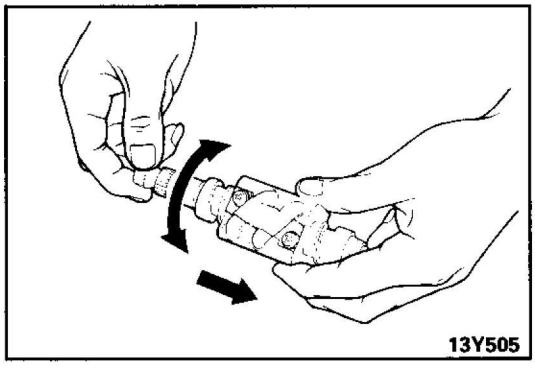
3. REMOVAL OF CROSS-SHAFT

With the mainshaft and cross-shaft placed in the straight ahead position, tap the bottom of cross-shaft with a plastic hammer to take out the cross-shaft together with the top cover.



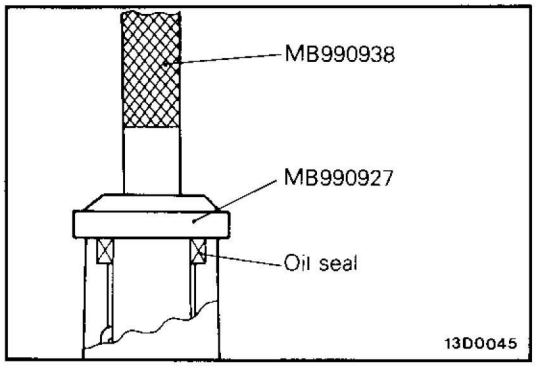
4. REMOVAL OF SIDE COVER

Remove the side cover by turning the adjusting bolt.



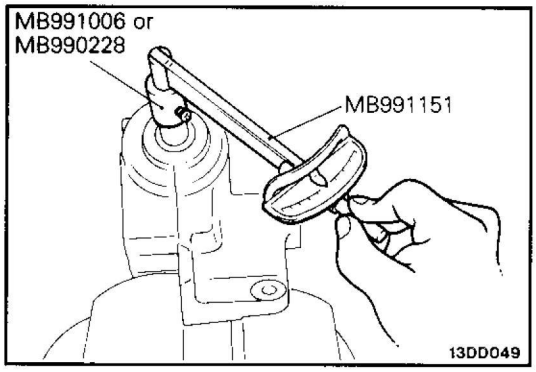
INSPECTION E37JGAB

- Check the ball nut for smooth rotation and axial play.
- Check the bearing for seizure and discolouration, and the rough rolling surface of ball nut raceway.



SERVICE POINTS OF REASSEMBLY E37JHAD

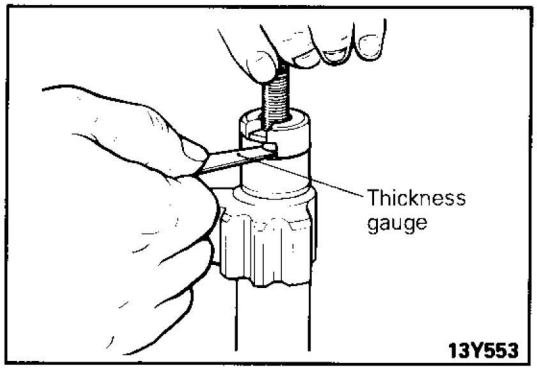
14. INSTALLATION OF OIL SEAL



8. INSTALLATION OF END COVER

Standard value: 0.4 – 0.6 Nm
(4 – 6 kgcm, 3.5 – 5.2 in.lbs.)

(1) If the measured value is not within the standard value, make adjustment by changing the adjusting shim(s).
(2) Remove the shim(s) to increase starting torque. Add shim(s) to reduce starting torque.



7. INSTALLATION OF ADJUSTING PLATE

(1) Install the adjusting plate to the adjusting bolt and measure the cross-shaft axial play.

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

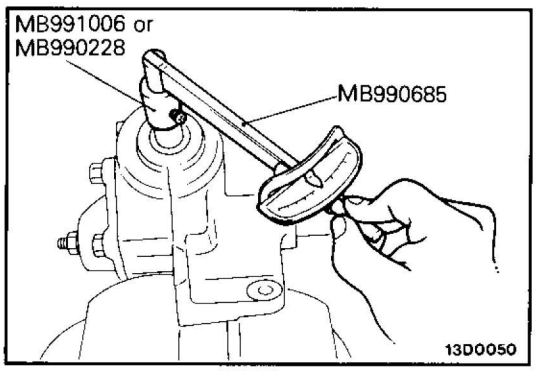
(2) If the measured value is not within the standard value, make adjustment by changing the adjusting plate.

3. INSTALLATION OF CROSS-SHAFT

Lubricate the bearings and the gear teeth of each shaft.
(1) Move the ball nut of the mainshaft to the centre position (straight-ahead position).

Caution
Use care not to damage the cross-shaft oil seal.

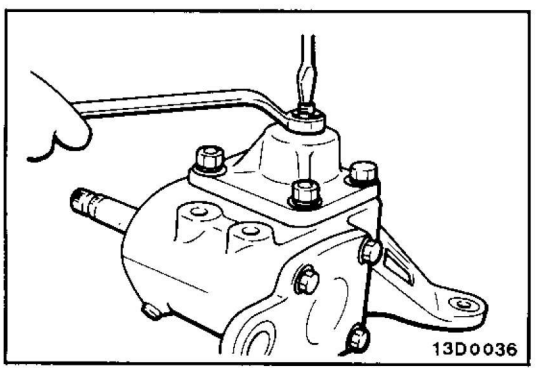
(2) Turn the adjusting bolt 2 or 3 times until the tooth surfaces are in contact.



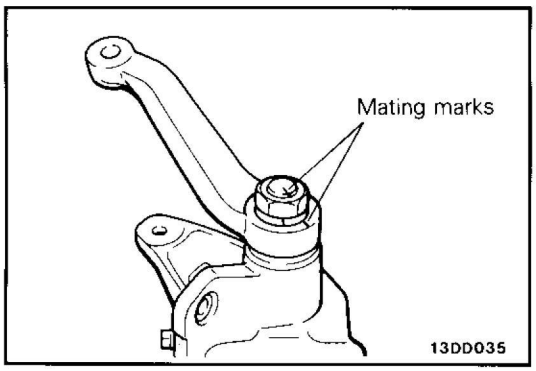
(3) Measure the mainshaft total starting torque.
① Secure the flange part of the gear box housing in a vise.
② Measure the mainshaft total starting torque by using the special tools.

Standard value: 0.8 – 1.1 Nm
(8 – 11 kgcm, 6.9 – 9.5 in.lbs.)

NOTE
The mainshaft should rotate smoothly across the entire range.

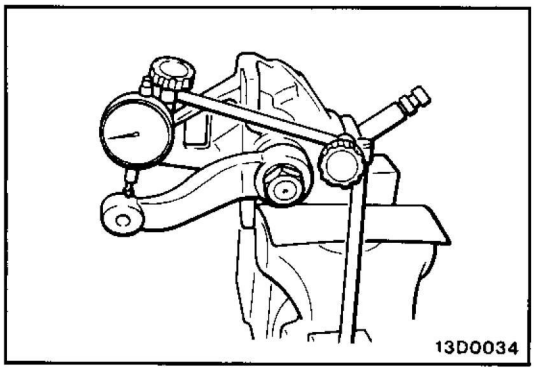


③ If the measured value is not within the standard value, adjust by turning the adjusting bolt in or out.
④ If it can not be adjusted to the standard value by turning the adjusting bolt, check the following points.
A. Cross-shaft eccentricity due to improperly installed top cover
B. Cross-shaft needle roller bearing damaged
C. End cover improperly installed



2. INSTALLATION OF PITMAN ARM

(1) Install the pitman arm to the gear box with the mating marks aligned.



(2) Check the steering gear backlash.
   ① Move the pitman arm to the right and left 3 to 5 times to be sure that the tooth surfaces sufficiently contact with each other.
   ② Measure the steering gear backlash at the end of the pitman arm with a dial indicator.

   Limit: 0.5 mm (0.020 in.)
   Caution
   Measure the steering gear backlash when the mainshaft, cross-shaft and pitman arm are in the straight ahead position.
   ③ If the reading exceeds the limit, replace the mainshaft.

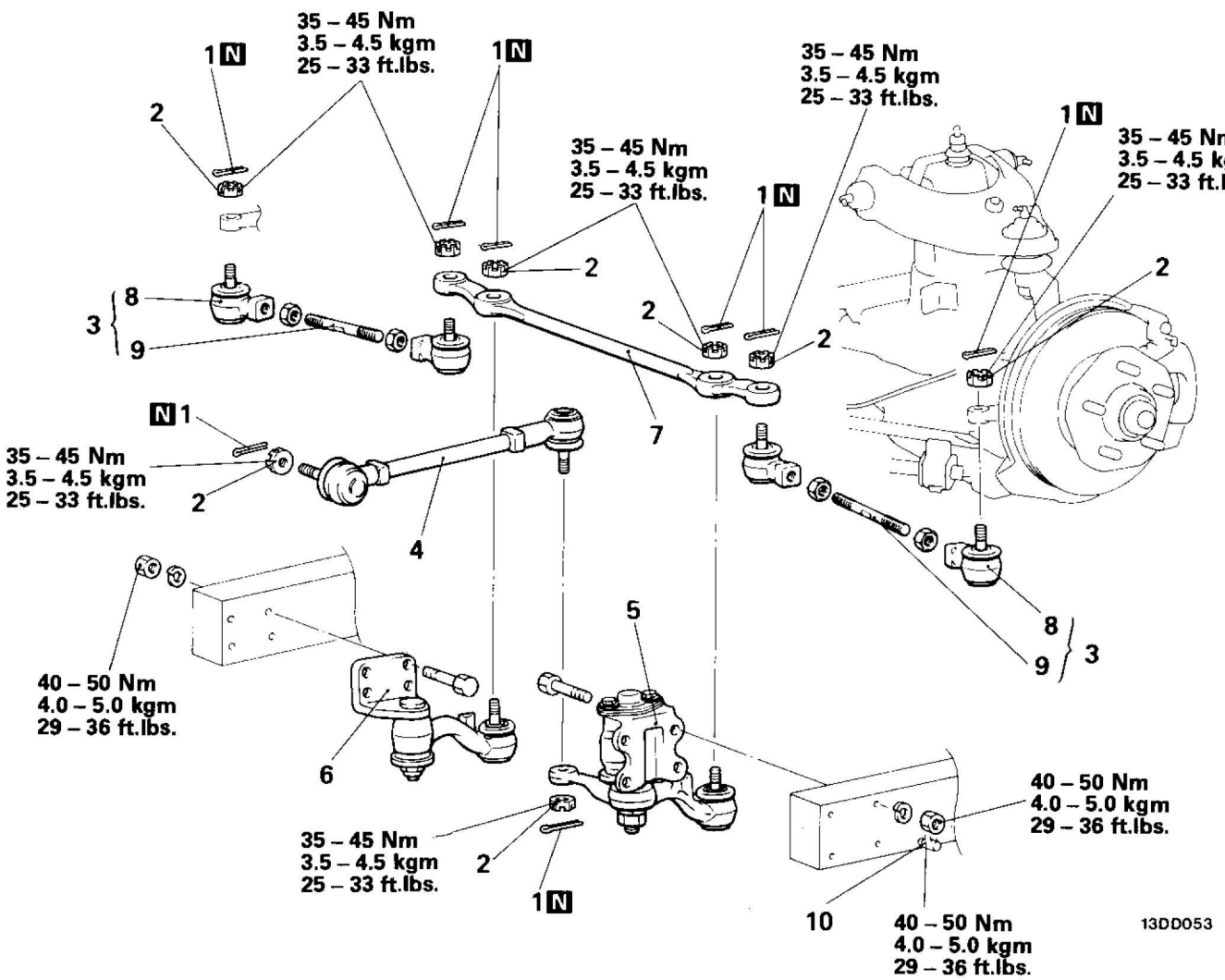
STEERING LINKAGE

E37VA--

REMOVAL AND INSTALLATION

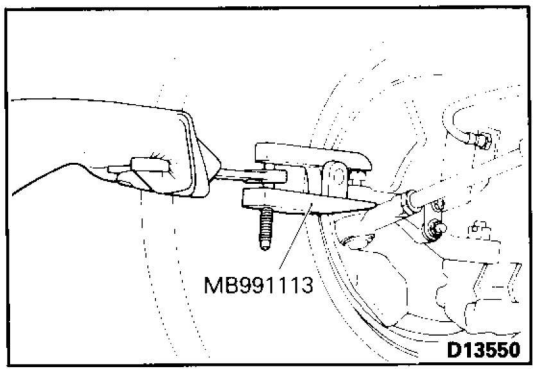
Per-removal Operation
- Removal of the Air Guide Panel

Post-installation Operation
- Installation of the Air Guide Panel
- Checking of steering Angle (Refer to P. 37-5.)
- Adjustment of the Front Wheel Alignment (Refer to GROUP 33 – Service Adjustment Procedures.)



Removal steps

1. Split pin
2. Slotted nut
3. Tie rod assembly
4. Drag link
5. Bellcrank arm assembly
6. Idler arm assembly
7. Relay rod
8. Tie rod end assembly
9. Tie rod
10. Stopper bolt

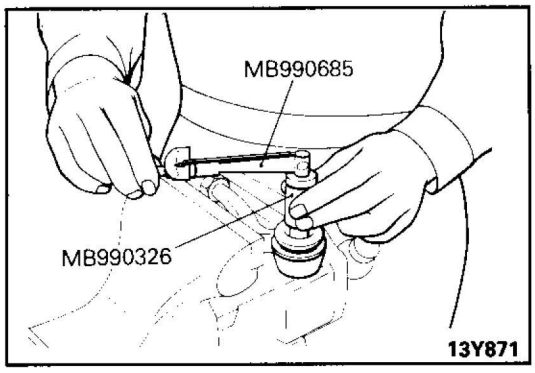


SERVICE POINTS OF REMOVAL E37VBACa

3. DISCONNECTION OF TIE ROD ASSEMBLY

Caution

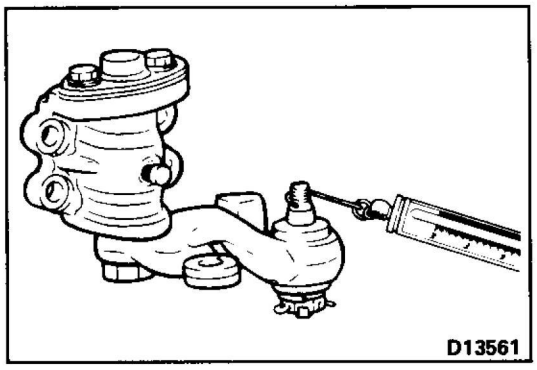
1. **Use cord to bind the special tool closely so it will not become separated.**
2. **The nut should be loosened only, not removed.**



INSPECTION E37VCAC

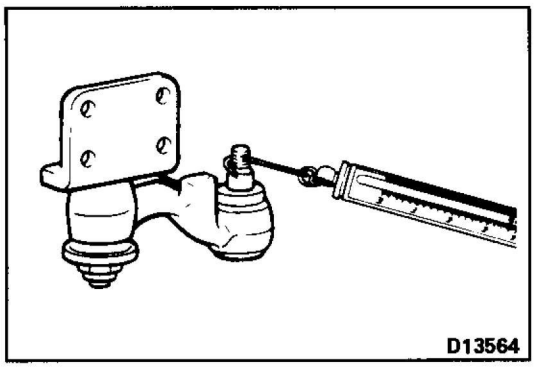
CHECKING BALL JOINT STARTING TORQUE

Standard value: 0.5 – 2.5 Nm (5 – 25 kgcm, 4.3 – 22 in.lbs.)



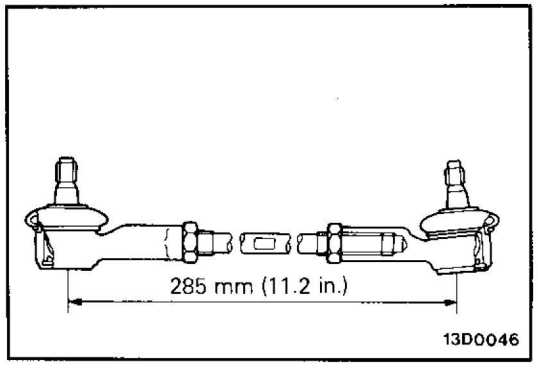
CHECKING BELLCRANK ARM STARTING TORQUE

Standard value: 7 – 10 Nm (70 – 100 kgcm, 61 – 86 in.lbs.)



CHECKING IDLER ARM TURNING TORQUE

Standard value: 3 – 9 Nm (30 – 90 kgcm, 26 – 78 in.lbs.)
[25 – 75 N (2.5 – 7.5 kg, 5.5 – 16.5 lbs.)]



SERVICE POINTS OF INSTALLATION E37VFAC

3. INSTALLATION OF TIE ROD ASSEMBLY

(1) Temporarily tighten the tie rod so that the distance between stud bolts of the tie rod is the value shown in the figure.

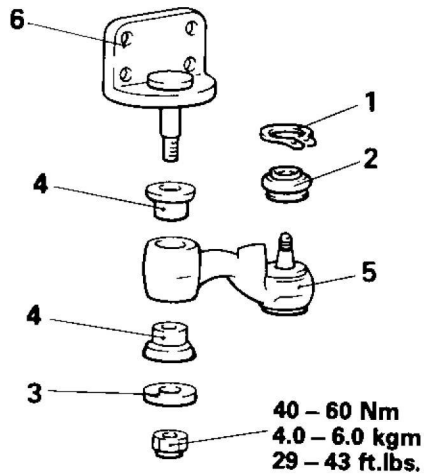
Caution
Tie rod end tightness, left and right, should be uniform.

(2) Install the tie rod assembly after first confirming which side is the relay rod side and which side is the knuckle side.

DISASSEMBLY AND REASSEMBLY

E37VG--

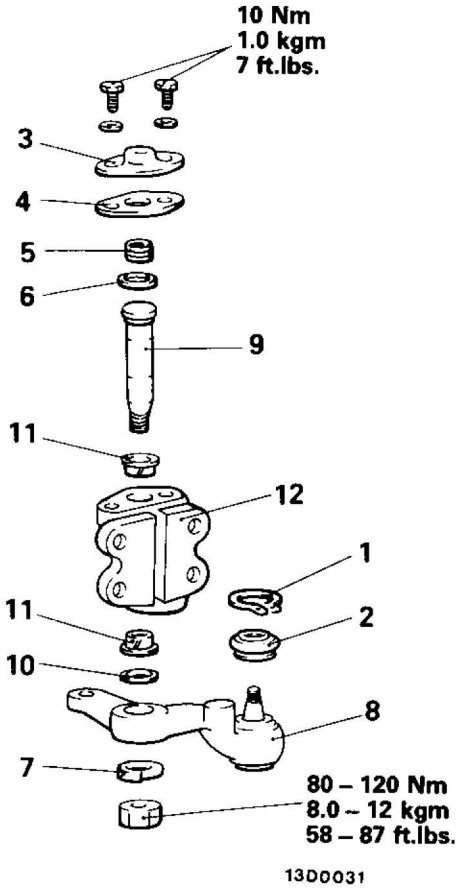
<Idler arm>



Idler arm disassembly

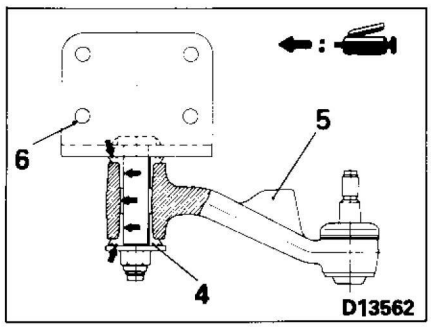
1. Clip ring
2. Dust cover
3. Washer
4. Bushing
5. Idler arm
6. Support

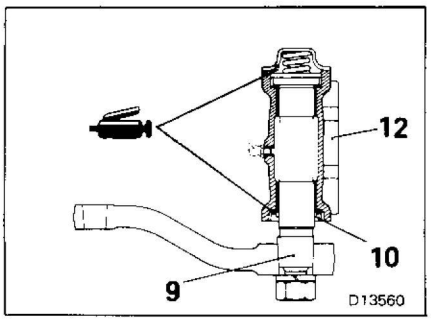
<Bellcrank arm>

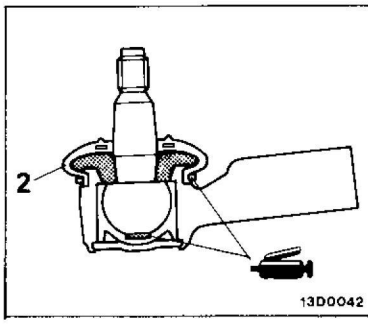


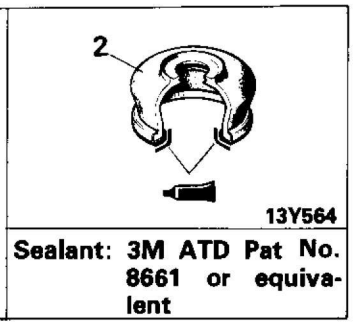
Bellcrank arm disassembly

1. Clip ring
2. Dust cover
3. Cap
4. Gasket
5. Spring
6. Seat
7. Washer
8. Bellcrank arm
9. Bellcrank shaft
10. Oil seal
11. Bushing
12. Bellcrank shaft housing

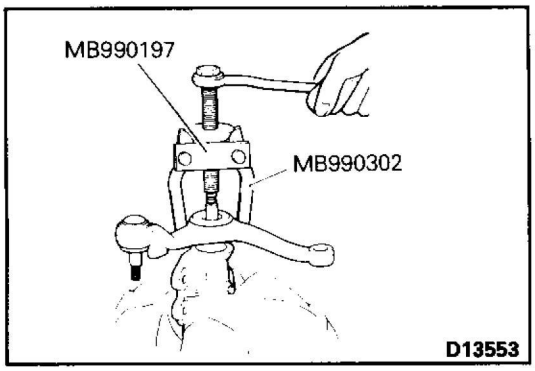






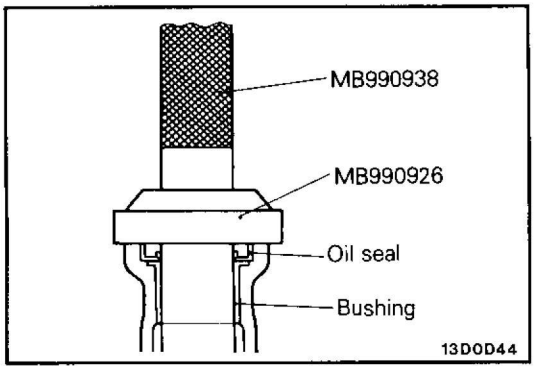


Sealant: 3M ATD Pat No. 8661 or equivalent



SERVICE POINTS OF DISASSEMBLY E37VHAA

8. REMOVAL OF BELLCRANK ARM



SERVICE POINTS OF REASSEMBLY E37VJAB

10. INSTALLATION OF OIL SEAL

NOTES

BODY

CONTENTS

E42AA--

SPECIFICATIONS

SERVICE SPECIFICATIONS

E42CB – –

Items		Specifications
Standard values		
Door glass holder attaching position	mm (in.)	126 – 136 (5.0 – 5.4) [from glass edge]
Door inside handle play	mm (in.)	4 – 10 (0.16 – 0.40)
Door outside handle play	mm (in.)	4 – 12 (0.16 – 0.47)

TORQUE SPECIFICATIONS

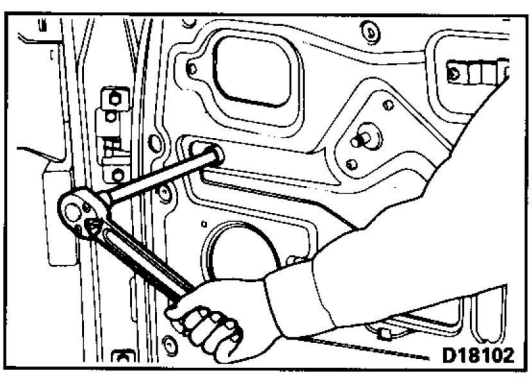
E42CC –

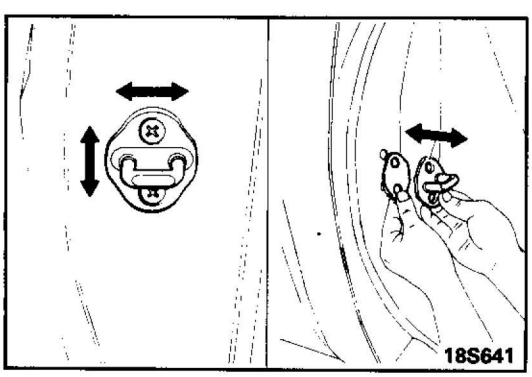
Items	Nm	kgm	ft.lbs.
Cab body mounting nut	35 – 45	3.5 – 4.5	25 – 32
Door to body	9 – 14	0.9 – 1.4	7 – 10

SEALANTS AND ADHESIVES

E42CE – –

Items	Specified sealant and adhesive	Remarks
Windshield or rear window glass to body	3M ATD Part No. 8513 or equivalent	Drying sealant
Door waterproof film, door opening weatherstrip	3M ATD Part No. 8625 or equivalent	Ribbon sealer
Corner area for door opening weatherstrip	3M ATD Part No. 8001 or No. 8011, or equivalent	Drying adhesive
Door window glass runchannel	3M ATD Part No. 8001 or No. 8011, or equivalent	Drying adhesive



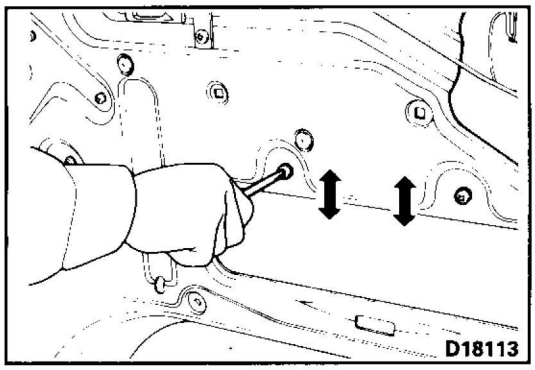


SERVICE ADJUSTMENT PROCEDURES

DOOR FIT ADJUSTMENT

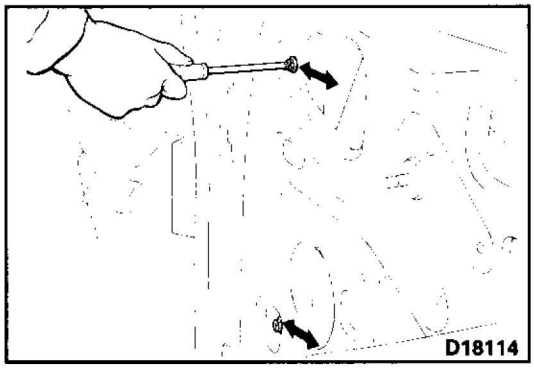
E42FDAH

1. Loosen the door mounting bolts to adjust alignment of the door panel.
2. Loosen door striker mounting screws to adjust alignment of door panel.
3. Increase or decrease the number of shims and move striker to adjust engagement of striker with door latch.

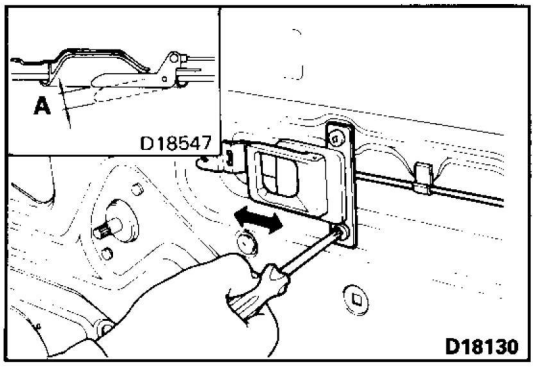


DOOR GLASS ADJUSTMENT E42FEAS

1. Remove the door trim and waterproof film. (Refer to P. 42A-7.)
2. Raise the door glass fully, and then adjust the following items so that the door glass fits evenly into the window glass runchannel all the way around:
   ① Make adjustment of the contact between glass and runchannel at the attaching screws of the channel guide.



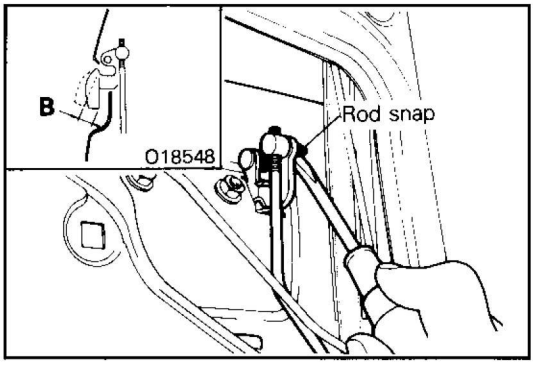
   ② Adjust the operating force of the regulator handle with the attaching screws of the lower sash.



INSIDE HANDLE PLAY ADJUSTMENT E42FGAC

1. Remove the door trim and waterproof film. (Refer to P. 42A-7.)
2. Move the door inside handle installation position back and forth to adjust so that the inside handle play allowance agrees with the standard value.

   Standard value (A): 4 – 10 mm (0.16 – 0.40 in.)



OUTSIDE HANDLE PLAY ADJUSTMENT E42FHAC

1. Remove the door trim and waterproof film. (Refer to P. 42A-7.)
2. Remove the outside handle rod from the outside handle, and then adjust the play of the outside handle by turning the top of the rod.

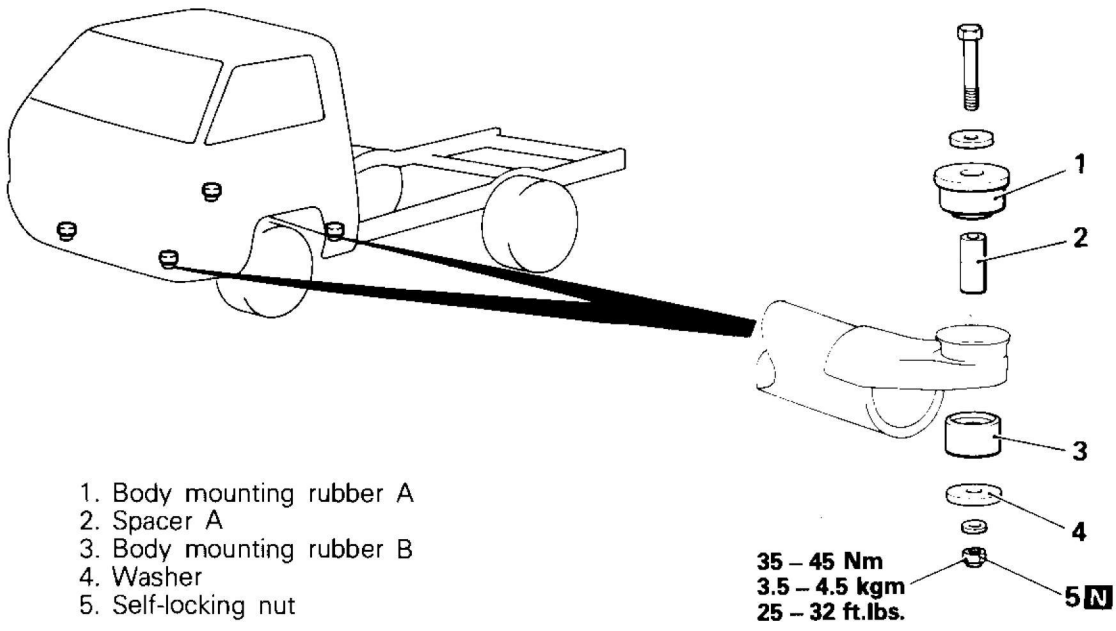
   Standard value (B): 4 – 12 mm (0.16 – 0.47 in.)

   NOTE
   Always install a new rod snap.

BODY MOUNTING

E42GAAF

REMOVAL AND INSTALLATION



1. Body mounting rubber A
2. Spacer A
3. Body mounting rubber B
4. Washer
5. Self-locking nut

18D1030
D18503

REMOVAL

(1) Remove or disconnect the following parts;
- Battery negative terminal and frame wiring harness
- High-tension cable
- Air horn
- Steering wheel and column
- Steering control rod
- Clutch cable
- Speedometer cable
- Blow-by gas hose
- Distributor wiring harness
- Heater hose
- Vacuum hose for brake booster
- Accelerator cable
- Throttle cable for Diesel engine
- Engine earth
- Engine coolant temperature gauge haness
- Starter motor harness
- Alternator harness
- Oil pressure gauge harness
- Front bumper
- Brake pipe
- Parking brake cable
- Horn wiring harness

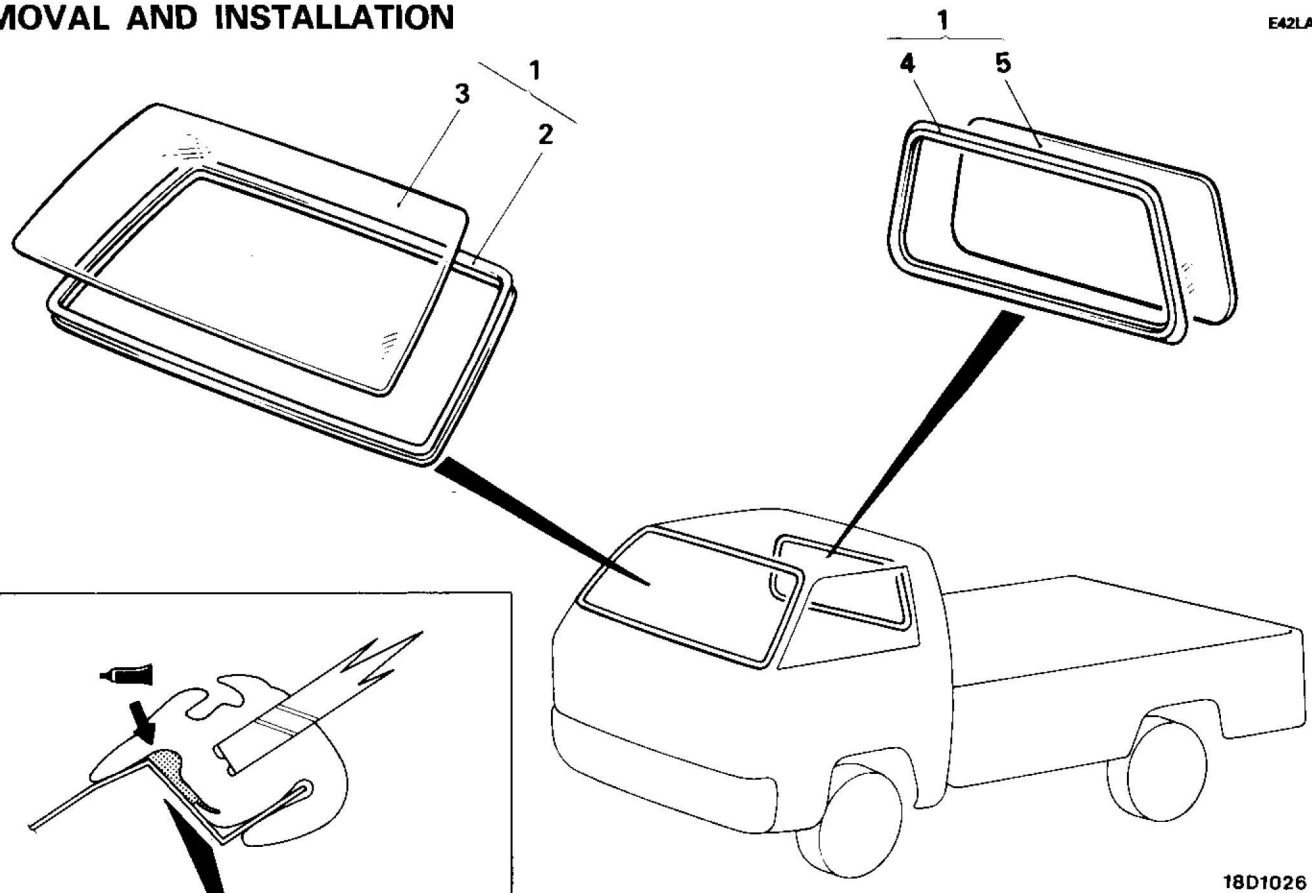
(2) After removing the body mounting bolts, insert wood blocks into the cab body and gently lift with a crane.

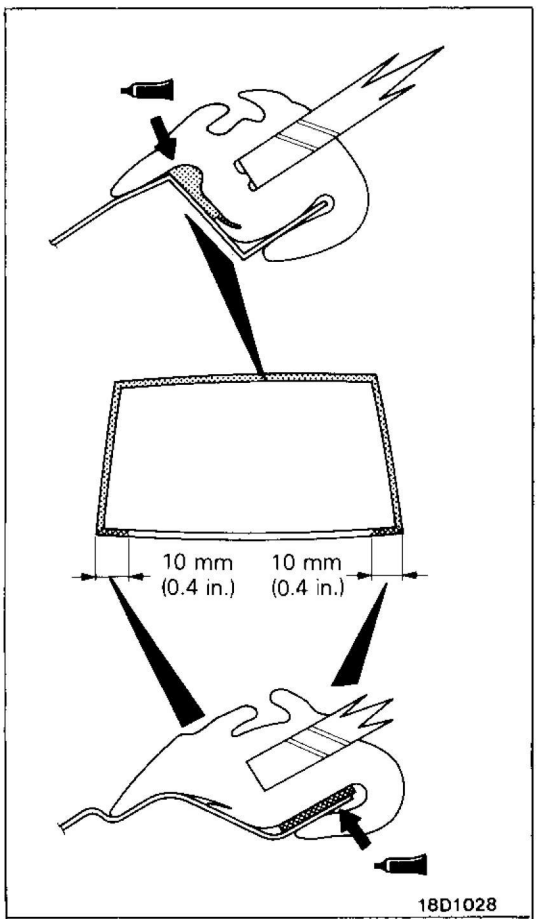
Caution
Hoist the cab body carefully after assuring that all the connections between cab body and frame and engine are separated.
Sling wires with a suitable bar or frame used and with good protection made by fitting coverings at necessary points.

WINDSHIELD AND REAR WINDOW GLASS

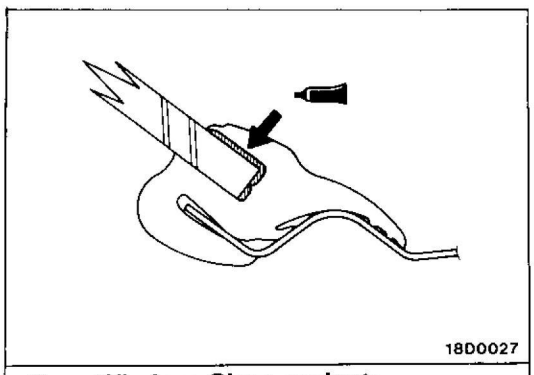
REMOVAL AND INSTALLATION

E42LABH





Windshield sealant:
3M ATD Part No.8513 or equivalent



Rear Window Glass sealant:
3M ATD Part No.8513 or equivalent

Windshield removal steps

1. Glass and weatherstrip assembly
2. Windshield weatherstrip
3. Windshield

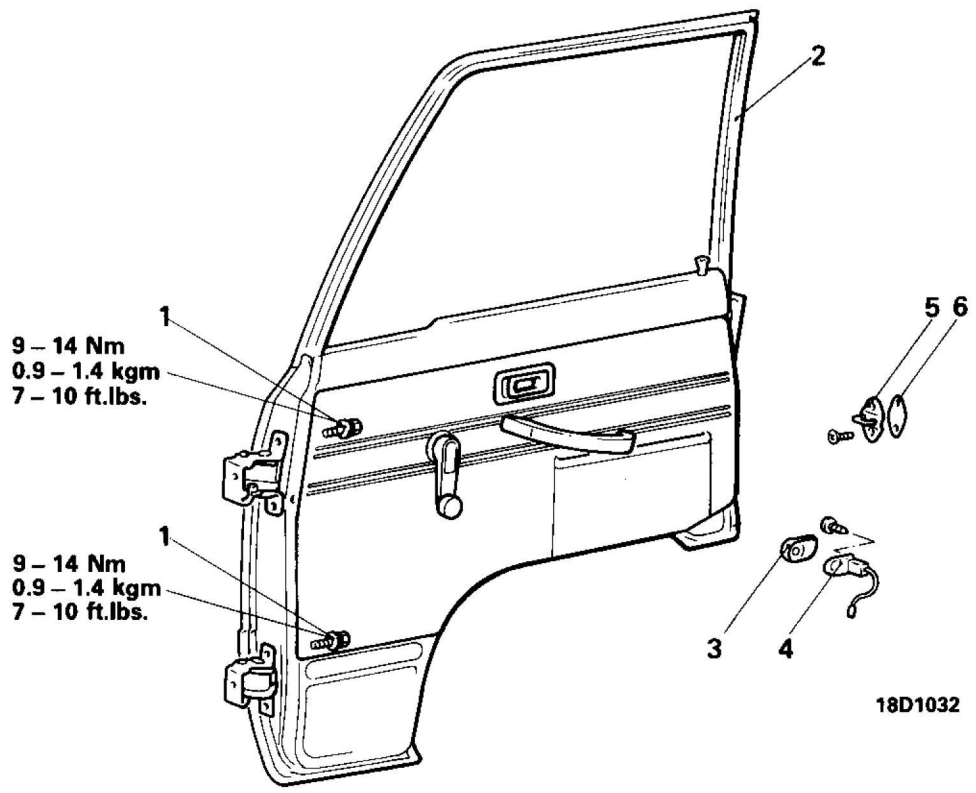
Rear window glass removal steps

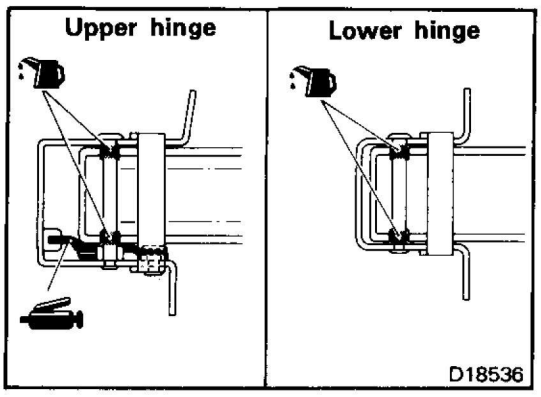
1. Glass and weatherstrip assembly
4. Rear window weatherstrip
5. Rear window glass

DOOR ASSEMBLY

REMOVAL AND INSTALLATION

E42MAAL





Door removal steps

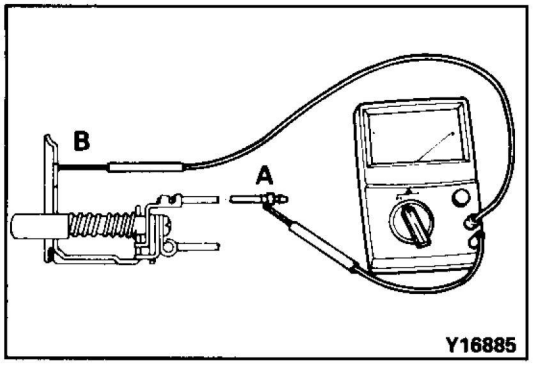
1. Door mounting bolt
2. Door

Door switch removal steps (driver's side)

3. Door switch cap
4. Door switch

Striker removal steps

5. Striker
6. Striker shim



INSPECTION

DOOR SWITCH

Operate the switch, and check the continuity between the terminals.

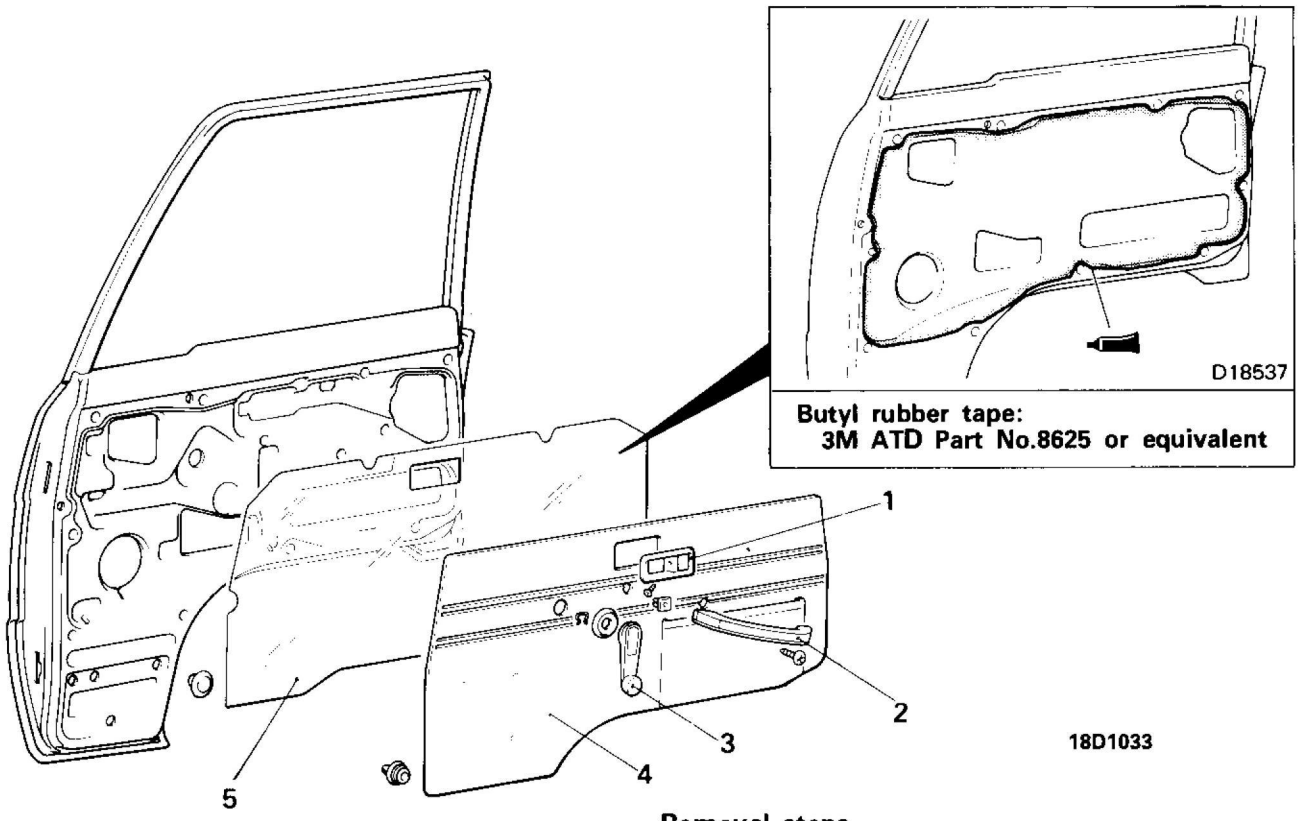
Switch \ Test probe	A	B
Release	○	○
Push		

NOTE
○—○ indicates that there is continuity between the terminals.

DOOR TRIM AND WATERPROOF FILM

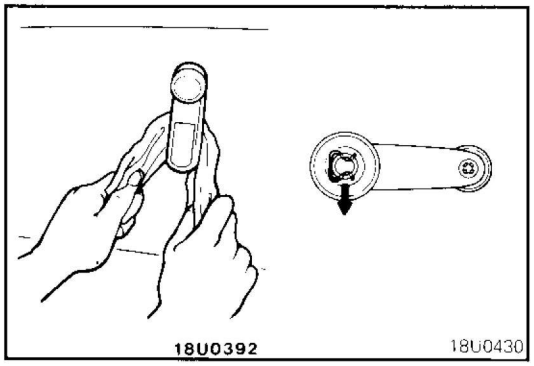
E42M8AP

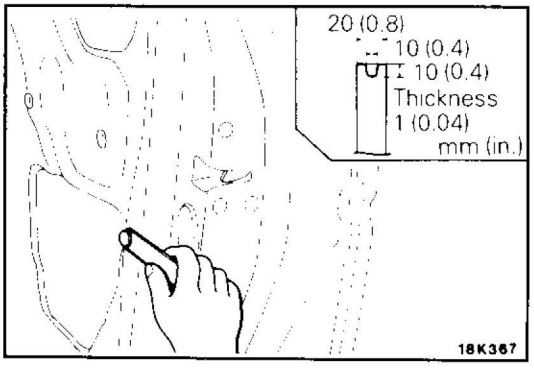
REMOVAL AND INSTALLATION



Removal steps

1. Inside handle cover
2. Door pull handle
◆◆ 3. Door window regulator handle
◆◆ 4. Door trim
5. Waterproof film





SERVICE POINTS OF REMOVAL

3. REMOVAL OF DOOR WINDOW REGULATOR HANDLE

Remove the clip by using a rag, and then remove the regulator handle.

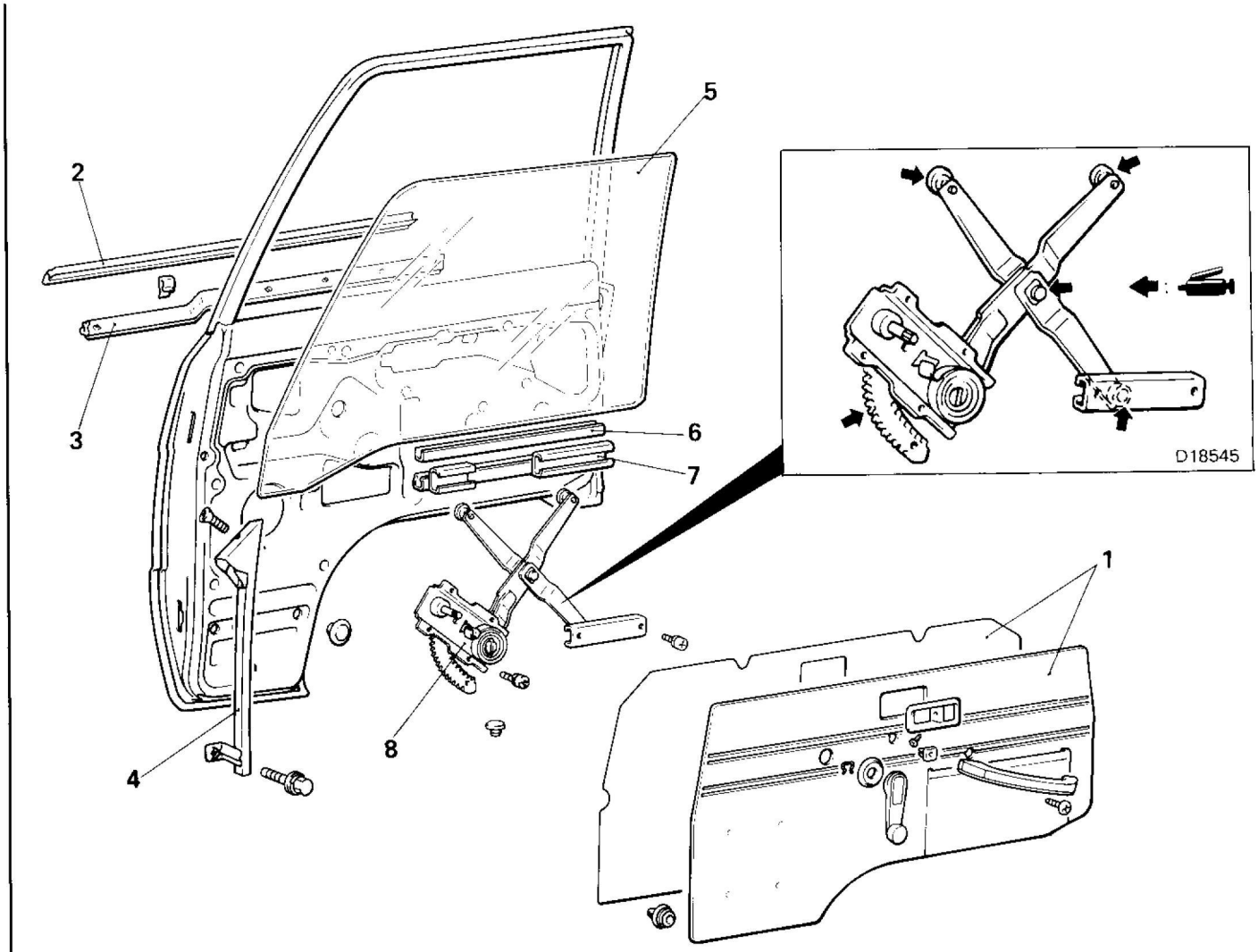
4. REMOVAL OF TRIM

If trim clips remain at the door side when the door trim is removed, improvise a tool (such as shown in the figure) to remove them.

DOOR GLASS AND REGULATOR

E42MCAJ

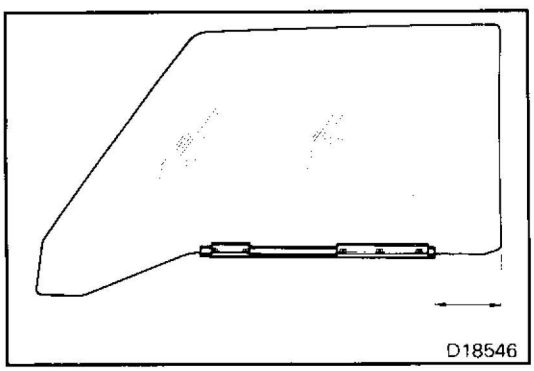
REMOVAL AND INSTALLATION



18D1034

Removal steps

1. Door trim and waterproof film (Refer to P. 42A-7.)
2. Door window outer weatherstrip
3. Door window inner weatherstrip
4. Lower sash
5. Door window glass
6. Glass pad
- ◆◆ 7. Glass holder
8. Door window regulator



SERVICE POINT OF INSTALLATION

7. INSTALLATION OF GLASS HOLDER

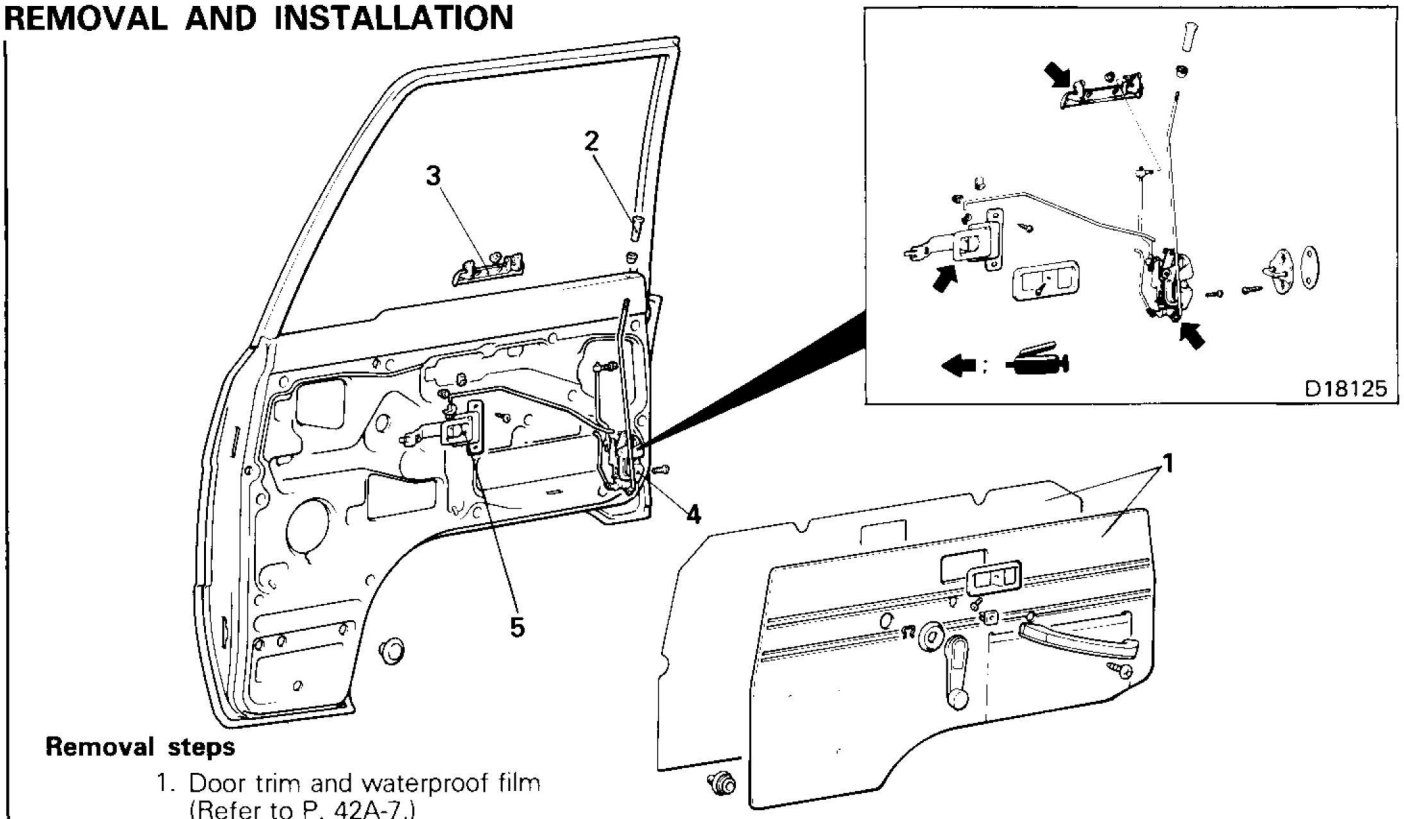
Install the glass holder at the position shown in the figure.

Standard value: 126 – 136 mm (5.0 – 5.4 in.)

DOOR HANDLE AND LATCH

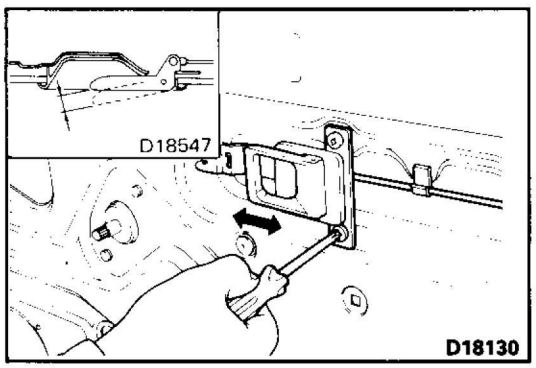
E42MDAS

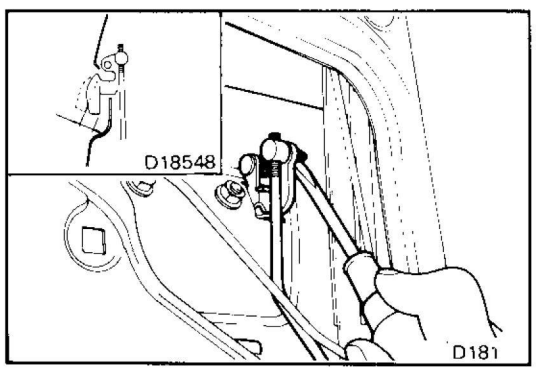
REMOVAL AND INSTALLATION



Removal steps

1. Door trim and waterproof film (Refer to P. 42A-7.) Adjustment of outside handle (Refer to P. 42A-3.) Adjustment of inside handle (Refer to P. 42A-3.)
2. Inside lock knob
◆◆ 3. Outside handle
4. Door latch
◆◆ 5. Inside handle





SERVICE POINTS OF INSTALLATION

5. INSTALLATION OF INSIDE HANDLE

Move the mounting position of the inside handle longitudinally in order to adjust the play of the inside handle.

Standard value: 4 – 10 mm (0.16 – 0.40 in.)

3. INSTALLATION OF OUTSIDE HANDLE

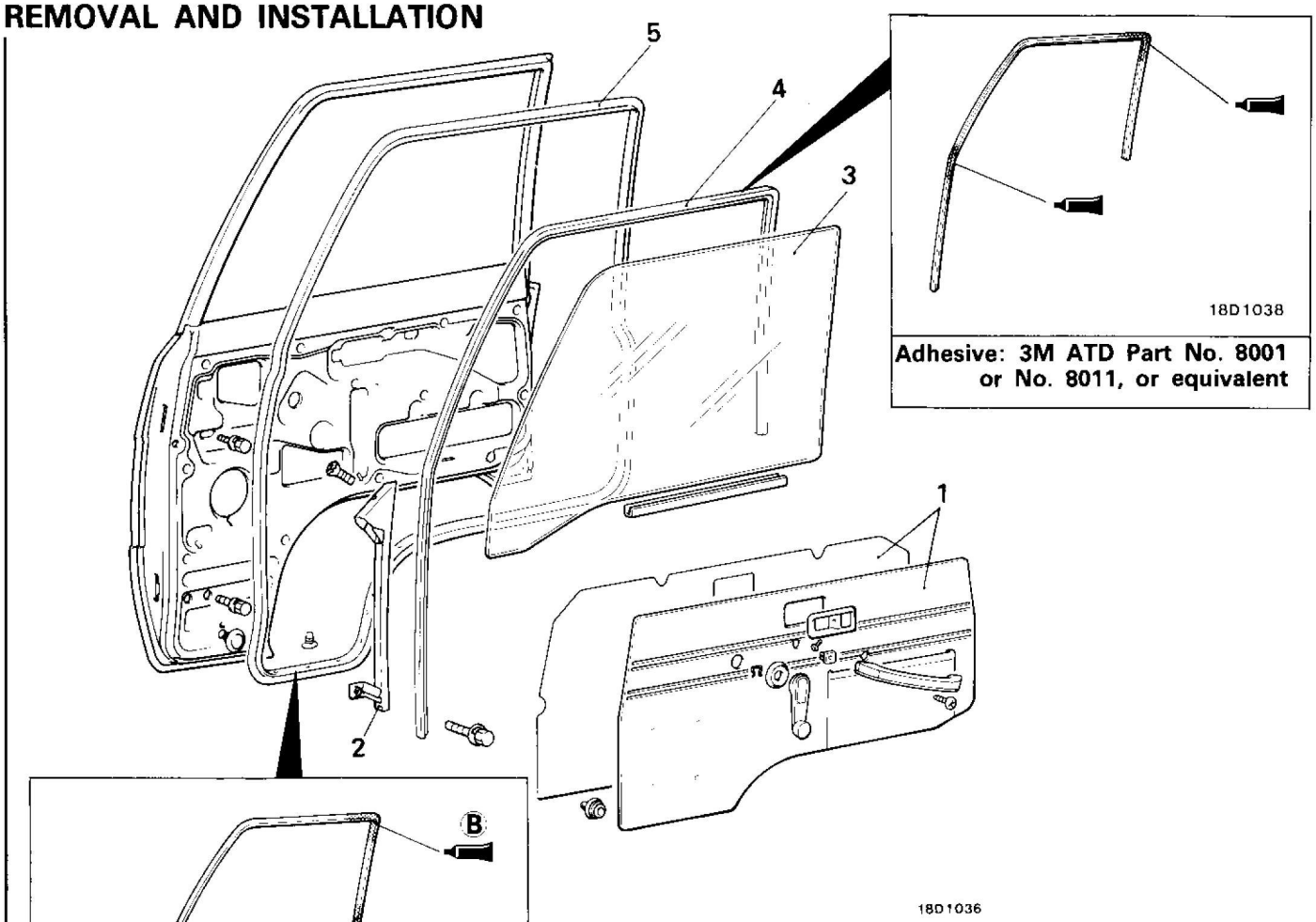
Disconnect the outside handle from the outside handle rod, and turn it right to left to adjust the outside handle play.

Standard value: 4 – 12 mm (0.16 – 0.47 in.)

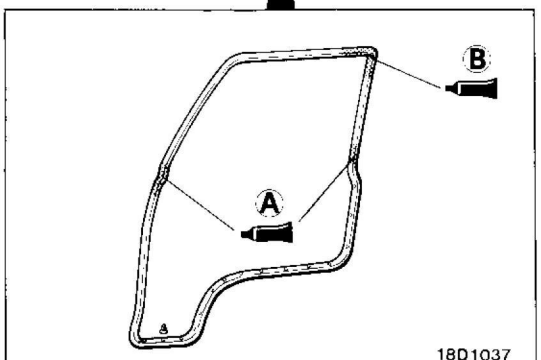
WINDOW GLASS RUNCHANNEL AND DOOR OPENING WEATHERSTRIP

E42MEAD

REMOVAL AND INSTALLATION



Adhesive: 3M ATD Part No. 8001 or No. 8011, or equivalent



Adhesive (A): 3M ATD Part No. 8625 or equivalent

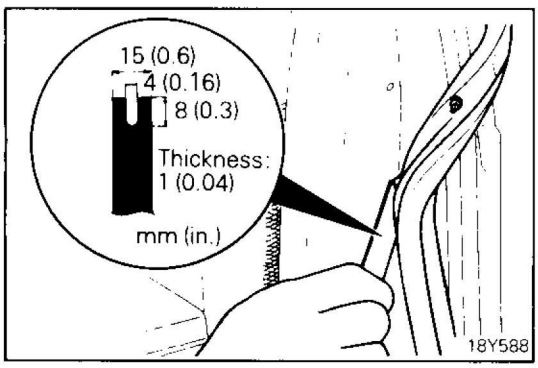
Adhesive (B): 3M ATD Part No. 8001 or No. 8011, or equivalent

Window glass runchannel removal steps

1. Door trim and waterproof film (Refer to P. 42A-7.)
2. Lower sash
3. Door window glass
4. Window glass runchannel

Door opening weatherstrip removal

◆◆ 5. Door opening weatherstrip



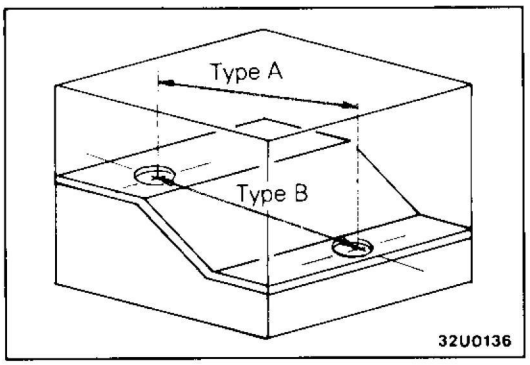
SERVICE POINT OF REMOVAL

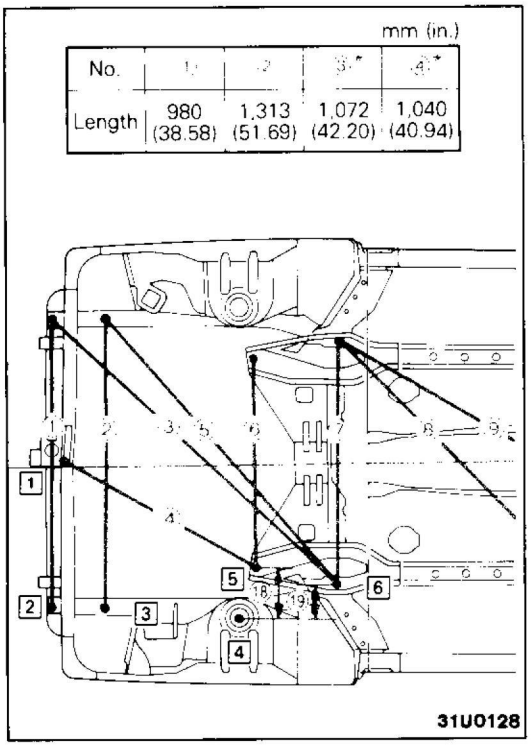
5. REMOVAL OF DOOR OPENING WEATHERSTRIP

Remove the door opening weatherstrip by using the tool shown in the illustration.

BODY REPAIR

CONTENTS





BODY DIMENSIONS

BODY DIMENSIONS AND MEASUREMENT METHODS

HOW BODY DIMENSIONS ARE INDICATED

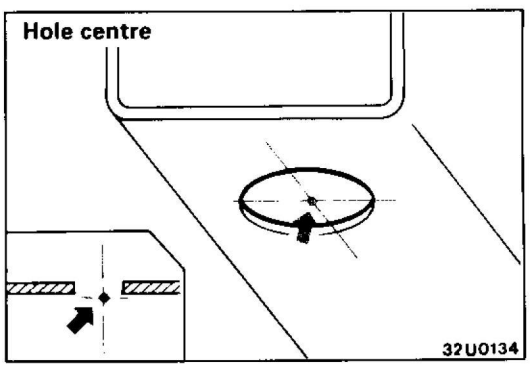
(1) Type A (projected dimensions)
These dimensions are the dimensions measured when the measurement points are projected into the reference plane.
These dimensions are the reference dimensions used for body alterations.

(2) Type B (actual-measurement dimensions)
These dimensions indicate the actual linear distance between measurement points, and are the reference dimensions for use if a tracking gauge is used for measurements.

NOTE
The units given for the dimensions of both types (A and B) are mm (in.).

STANDARD REFERENCE DIMENSIONS

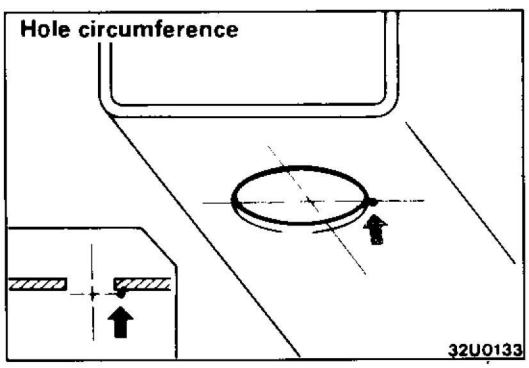
The ★ symbol used in the "No." line of the table which shows standard reference dimensions indicates that there is the same dimension as that number at left and right symmetrical positions.



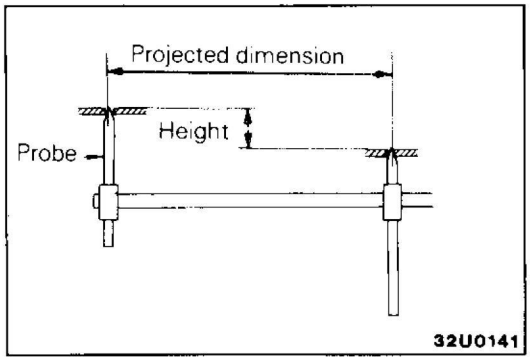
MEASUREMENT POINTS

Measurement points are used to indicate the following:

(1) Hole centres
If a measurement is to be made at a hole centre, the point of the surface from which the measuring instrument is applied is the measurement point.



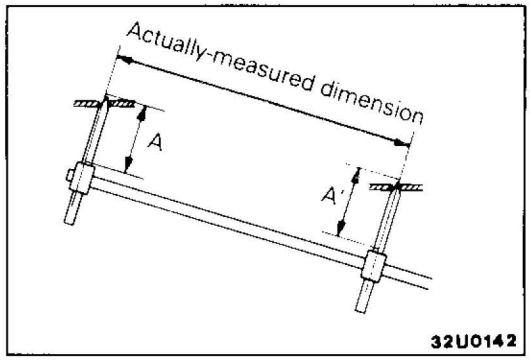
(2) Hole circumferences
If a measurement is to be made at the circumference of a hole, the point of the hole circumference of the surface from which the measuring instrument is applied is the measurement point.



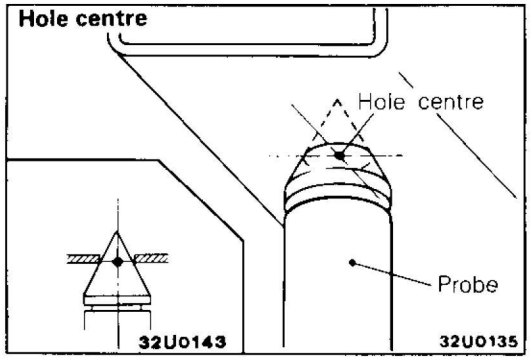
MEASUREMENT METHODS (using a tracking gauge)

NOTE
Use a tracking gauge with no play between the probes and the body.

(1) Type A (projected dimensions)
If the length of the tracking gauge probes are adjustable, make the measurement by lengthening one probe by the amount equivalent to the difference in height of the two surfaces.

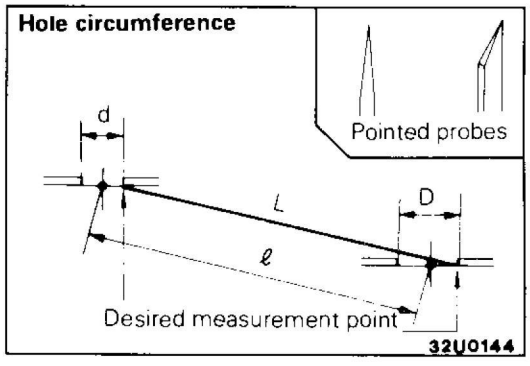


(2) Type B (actual-measurement dimensions)
Measure by first adjusting both probes to the same length (A = A')



(3) If hole diameters are same and the probes are conical for both Type A and Type B, insert the probes into the holes, and then make the measurement. This method of measurement should be used if the diameters of the holes in the location to be measured are the same.

(4) If hole diameters are different, or the probes are pointed. Because measurement at the hole centres is impossible, the circumferences must be used instead.



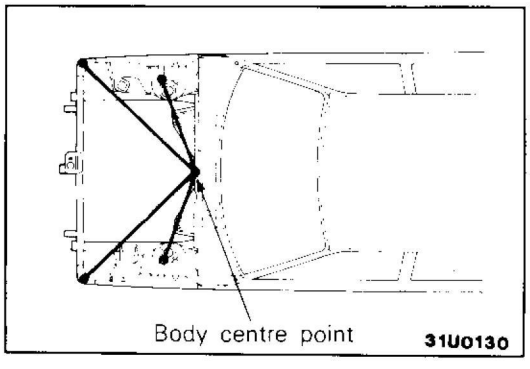
How to Determine Dimensions

Desired dimensions: $L = \ell + \frac{D-d}{2}$

Example: mm (in.)
Reference dimensions: $\ell = 600\ (23.6)$
Measured hold diameters: $D = 20\ (0.79)$, $d = 10\ (0.39)$

Desired dimensions:

$$L = 600\ (23.6) + \frac{20\ (0.79) - 10\ (0.39)}{2} = 605\ (23.8)$$



BODY CENTRE POINTS

When measuring locations that should be symmetrical left and right and there are no specific instructions with regard to measurements in "Body Dimensions", the body centre points should be used to confirm that the left and right measurements from these points are the same. One body centre point is specified for the front of the body and another is specified for the rear.

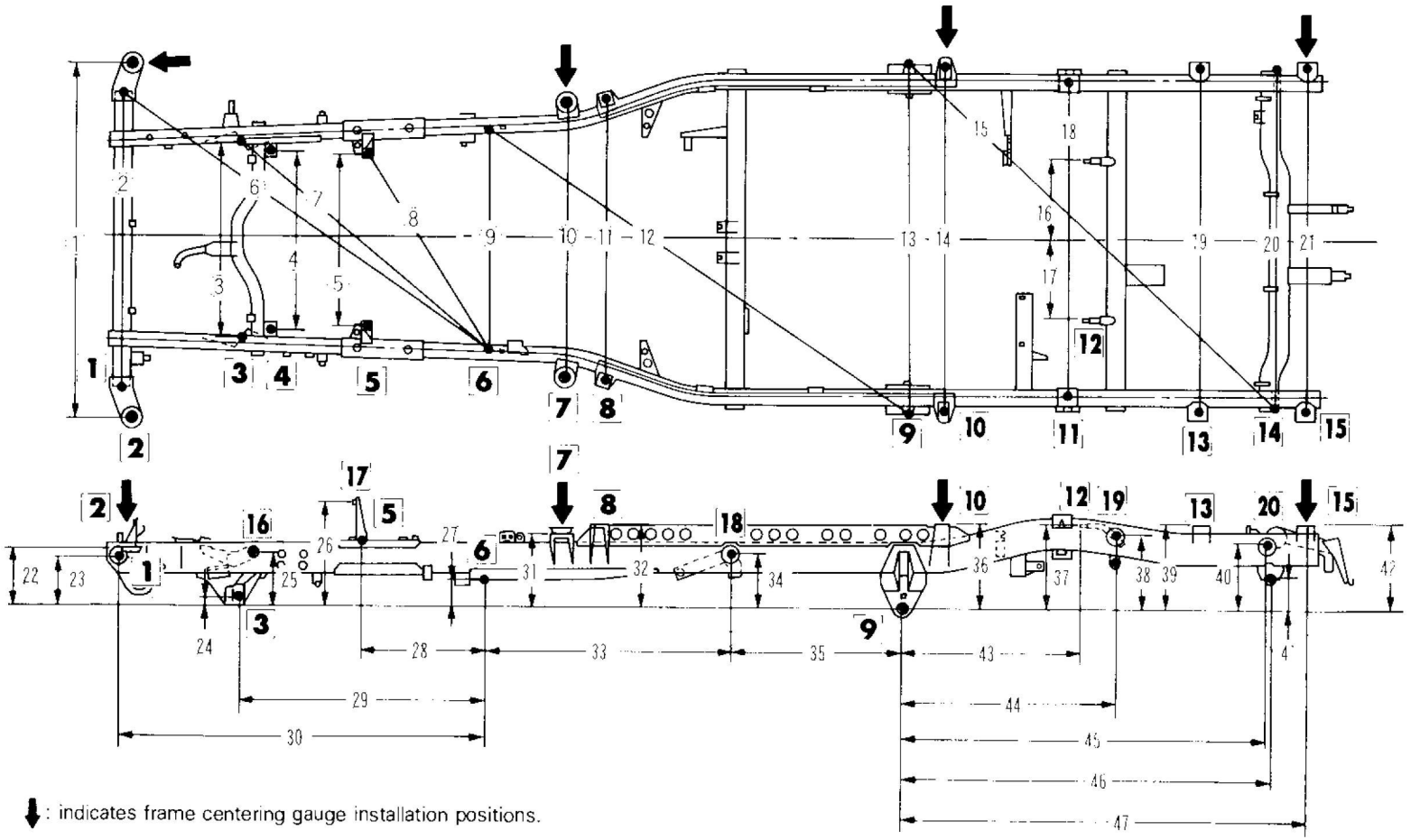
TYPE A (PROJECTED DIMENSIONS)

<L032P>

mm (in.)

No.	1	2	3	4	5	6 ★	7 ★	8 ★	9	10	11	12 ★	13	14	15 ★	16	17	18	19	20
Length	1,140 (44.88)	950 (37.40)	628 (24.72)	550 (21.65)	550 (21.65)	1,428 (56.22)	1,025 (40.35)	741 (29.17)	724 (28.50)	880 (34.65)	902 (35.51)	1,640 (64.57)	1,120 (44.09)	1,100 (43.31)	1,430 (56.30)	255 (10.04)	255 (10.04)	1,010 (39.76)	1,100 (43.31)	1,120 (44.09)
No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Length	1,100 (43.31)	198 (7.80)	164 (6.46)	42 (1.65)	180 (7.09)	338 (13.31)	90 (3.54)	376 (14.80)	769 (30.28)	1,156 (45.51)	236 (9.29)	271 (10.67)	808 (31.81)	170 (6.69)	550 (21.65)	268 (10.55)	260 (10.24)	230 (9.06)	268 (10.55)	200 (7.87)
No.	41	42	43	44	45	46	47													
Length	100 (3.94)	268 (10.55)	556 (21.89)	660 (25.98)	1,150 (45.28)	1,160 (45.67)	1,269 (49.96)													

The ★ symbol used in the "No." line of the table which shows standard reference dimensions indicates that there is the same dimension as that number at left and right symmetrical positions.



⬇: indicates frame centering gauge installation positions.

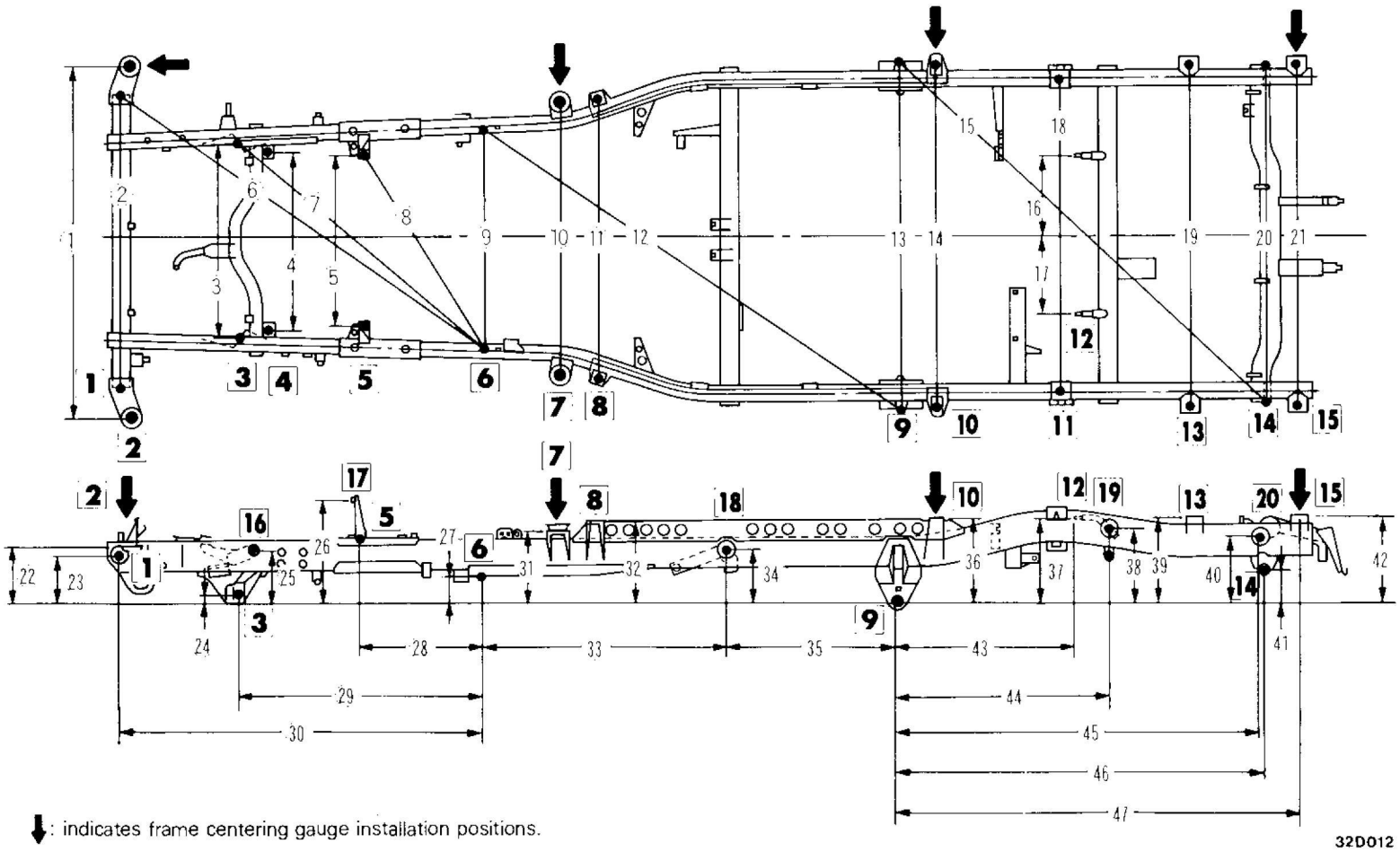
32D012

<L039P>

mm (in.)

No.	1	2	3	4	5	6 ★	7 ★	8 ★	9	10	11	12 ★	13	14	15 ★	16	17	18	19	20
Length	1,140 (44.88)	950 (37.40)	628 (24.72)	550 (21.65)	550 (21.65)	1,506 (59.29)	1,098 (43.23)	779 (30.67)	730 (28.74)	880 (34.65)	972 (38.27)	1,566 (61.65)	1,120 (44.09)	1,100 (43.31)	1,613 (63.50)	255 (10.04)	255 (10.04)	1,010 (39.76)	1,100 (43.31)	1,120 (44.09)
No.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Length	1,100 (43.31)	198 (7.80)	164 (6.46)	42 (1.65)	180 (7.09)	338 (13.31)	90 (3.54)	444 (17.48)	863 (33.98)	1,250 (49.21)	236 (9.29)	271 (10.67)	714 (28.11)	170 (6.69)	550 (21.65)	268 (10.55)	260 (10.24)	230 (9.06)	268 (10.55)	200 (7.87)
No.	41	42	43	44	45	46	47													
Length	100 (3.94)	268 (10.55)	556 (21.89)	660 (25.98)	1,150 (45.28)	1,160 (45.67)	1,369 (53.90)													

The ★ symbol used in the "No." line of the table which shows standard reference dimensions indicates that there is the same dimension as that number at left and right symmetrical positions.



⬇: indicates frame centering gauge installation positions.

32D012

TYPE B (ACTUAL-MEASUREMENT DIMENSIONS)

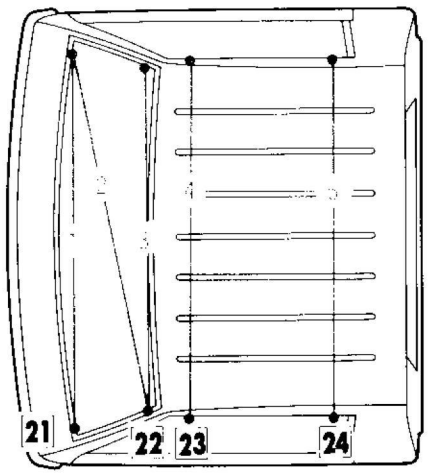
UPPER BODY, SIDE BODY AND INTERIOR

mm (in.)

No.	1	2 ★	3	4	5	6	7	8	9	10	11	12	13	14
Length	1,445 (56.89)	1,445 (56.89)	1,242 (48.90)	1,264 (49.76)	1,266 (49.84)	1,259 (49.57)	1.058 (41.65)	1,508 (59.37)	942 (37.09)	544 (21.42)	886 (34.88)	1,588 (62.52)	1,626 (64.02)	1,354 (53.31)

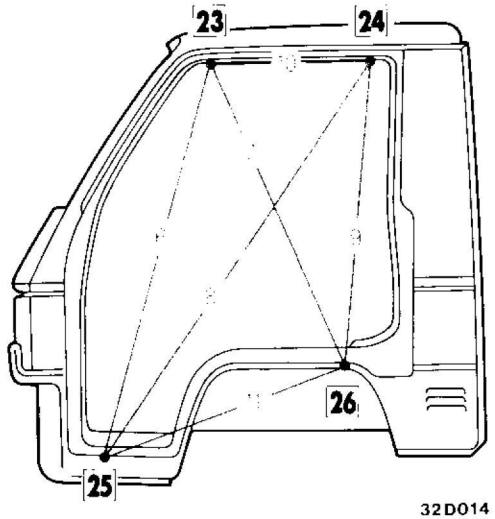
The ★ symbol used in the "No." line of the table which shows standard reference dimensions indicates that there is the same dimension as that number at left and right symmetrical positions.

UPPER BODY



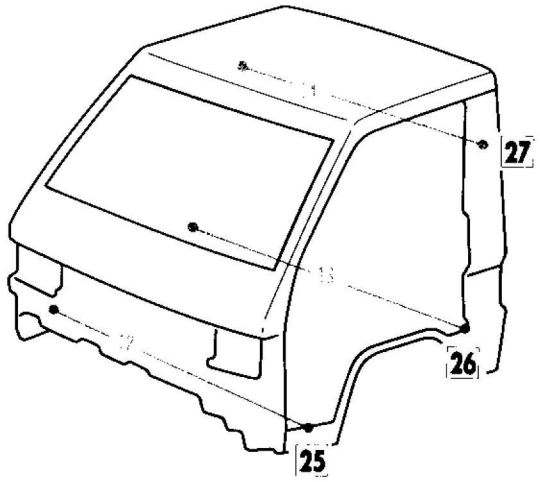
32D015

SIDE BODY



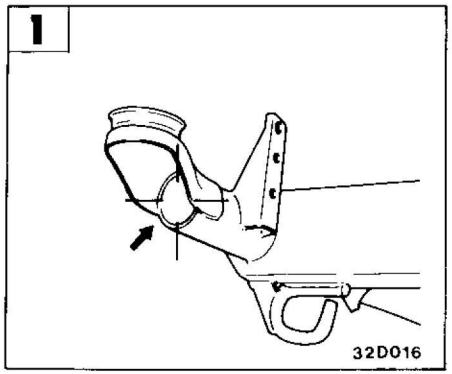
32D014

INTERIOR



32D013

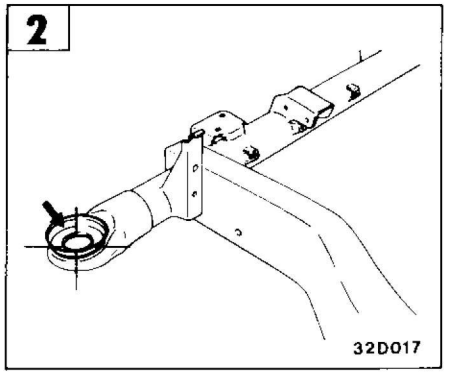
1



Centre of No. 1 crossmember hole

[diameter: 55 mm (2.17 in.)]

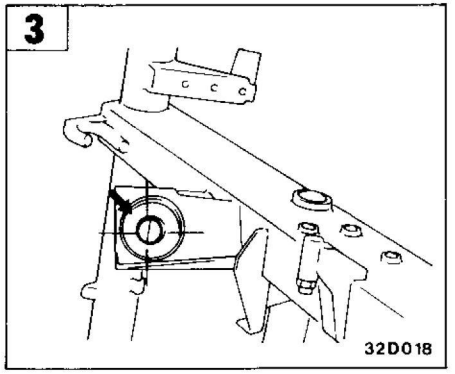
2



Centre of cab mounting hole

[diameter: 30 mm (1.18 in.)]

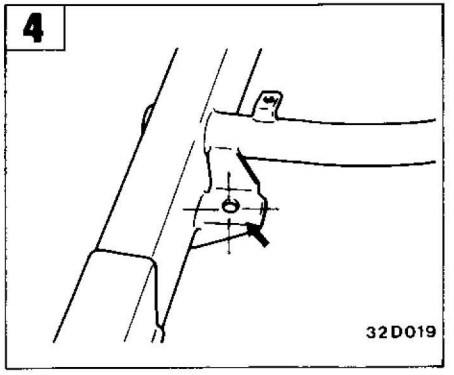
3



Centre of strut bar mounting hole

[diameter: 27 mm (1.06 in.)]

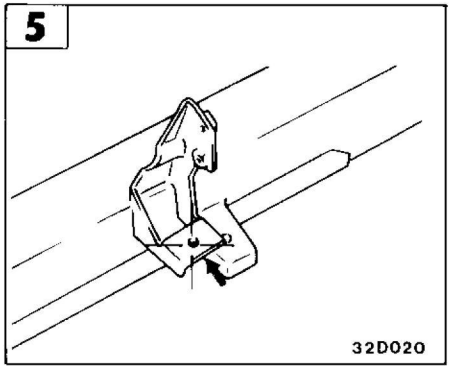
4



Centre of stabilizer link mounting hole

[diameter: 16 mm (0.63 in.)]

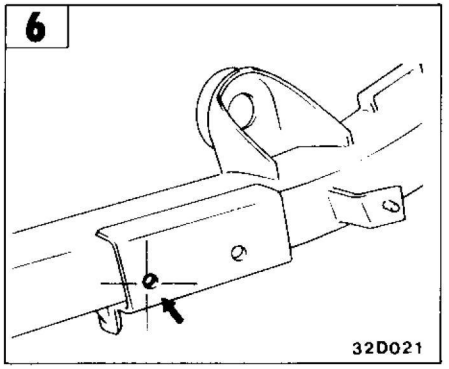
5



Centre of radiator mounting hole

[diameter: 8.8 mm (0.35 in.)]

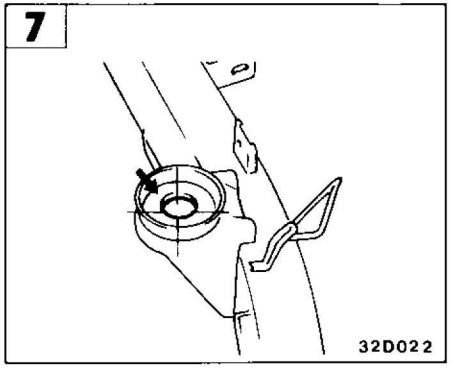
6



Centre of engine support assembly mounting hole

[diameter: 11 mm (0.43 in.)]

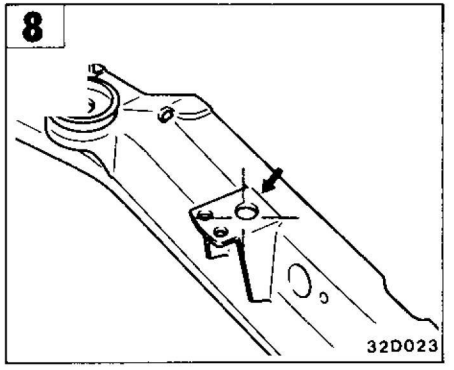
7



Centre of cab mounting hole

[diameter: 30 mm (1.18 in.)]

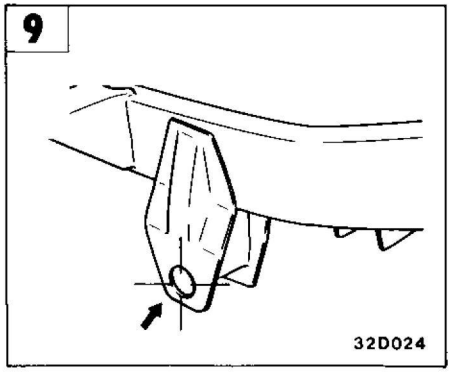
8



Centre of rear body mounting hole

[diameter: 18 mm (0.71 in.)]

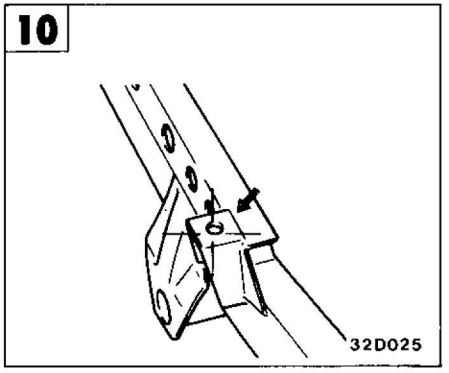
9



Centre of spring pin mounting hole

[diameter: 44 mm (1.73 in.)]

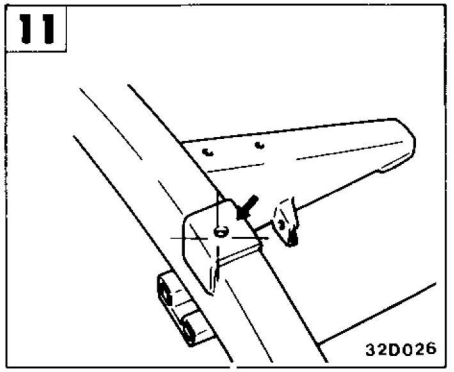
10



Centre of rear body mounting hole

[diameter: 18 mm (0.71 in.)]

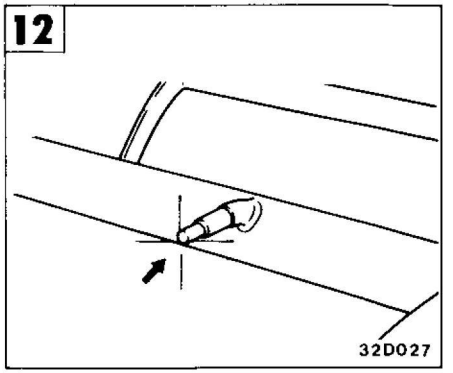
11



Centre of rear body support hole

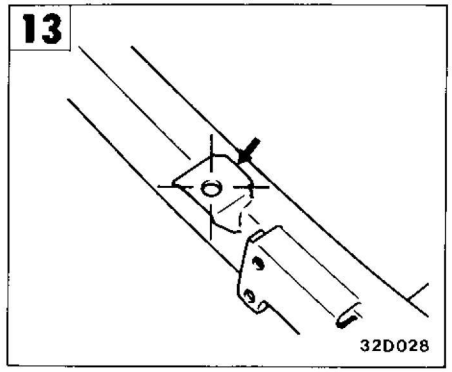
[diameter: 9 mm (0.35 in.)]

12



Centre of shock absorber mounting tip

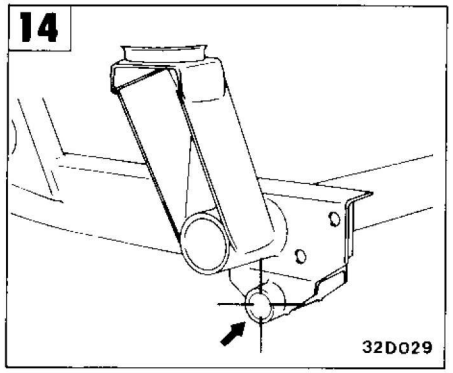
13



Centre of rear body mounting hole

[diameter: 9 mm (0.35 in.)]

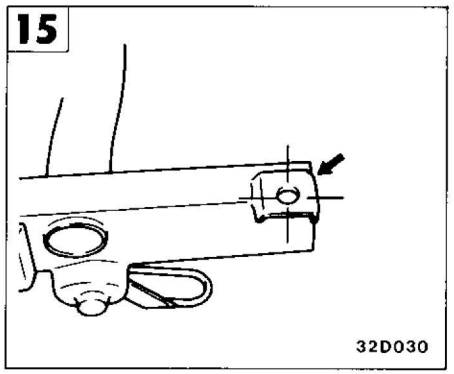
14



Centre of rear spring shackle mounting hole

[diameter: 28 mm (1.10 in.)]

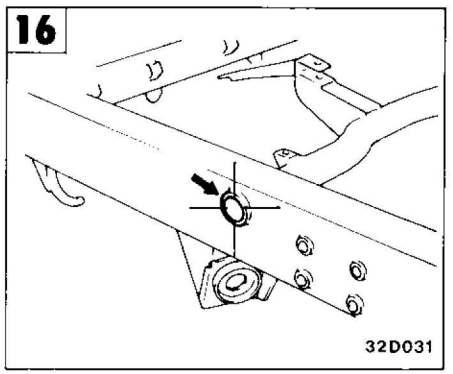
15



Centre of rear body mounting hole

[diameter: 18 mm (0.71 in.)]

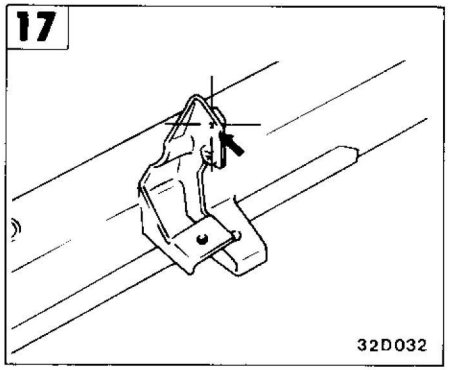
16



Centre of No. 1.5 crossmember hole

[diameter: 56 mm (2.20 in.)]

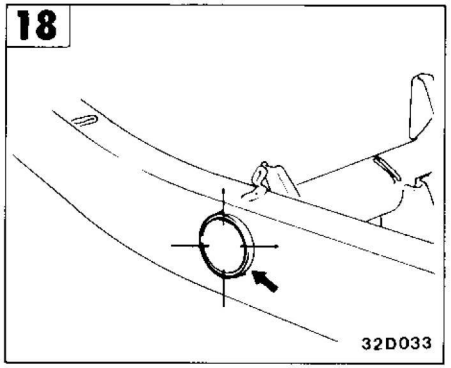
17



Centre of radiator mounting hole

[diameter: 8.8 mm (0.35 in.)]

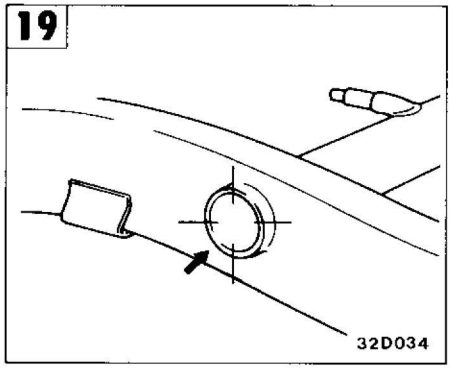
18



Centre of No. 2 crossmember hole

[diameter: 56 mm (2.20 in.)]

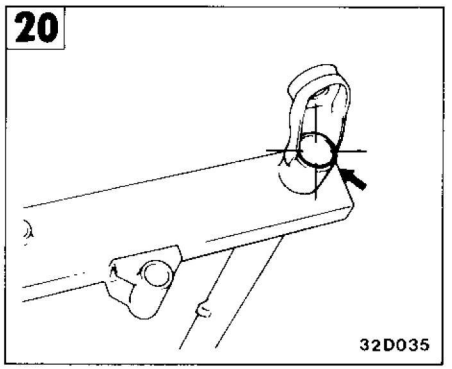
19



Centre of No. 3 crossmember hole

[diameter: 56 mm (2.20 in.)]

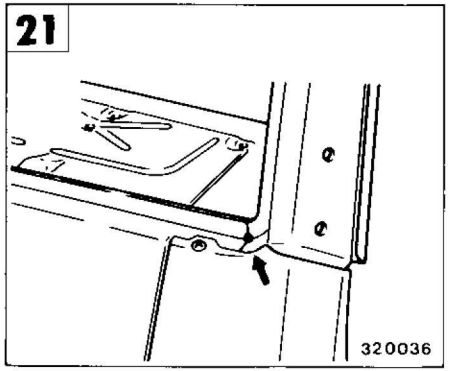
20



Centre of No. 4 crossmember hole

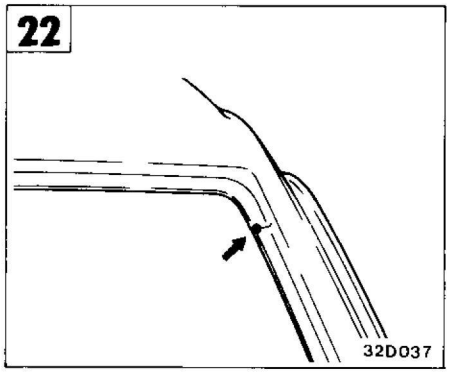
[diameter: 56 mm (2.20 in.)]

21



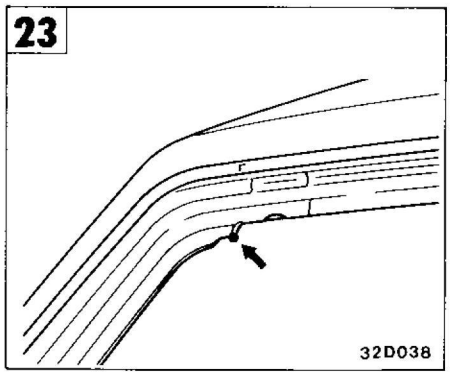
Joint of front panel and front pillar

22



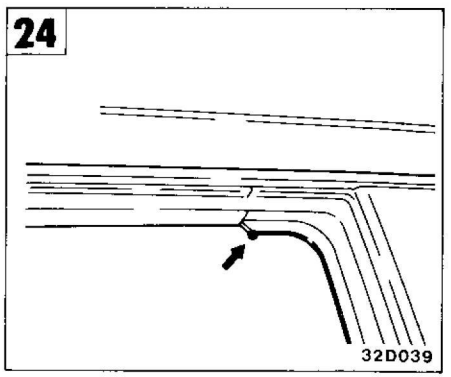
Joint of roof panel and front pillar

23



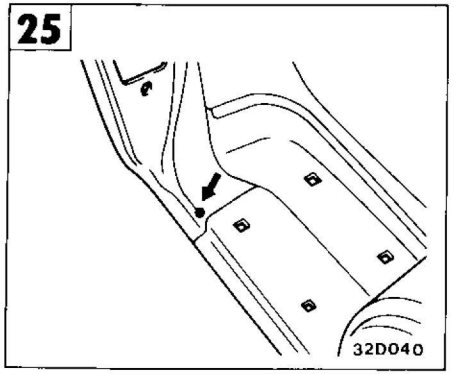
Joint of front pillar and roof side rail

24



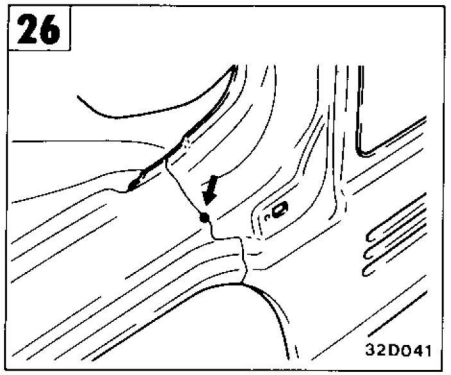
Joint of center pillar and roof side rail

25



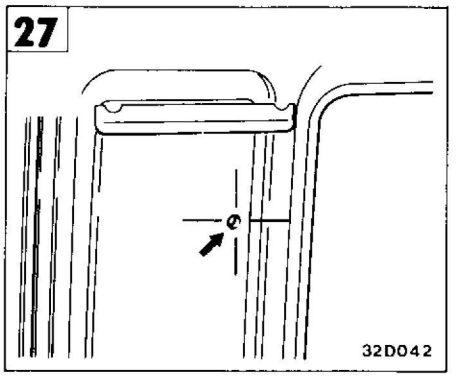
Joint of front pillar and front floor sill

26



Joint of center pillar and front floor sill

27



Centre of front seat belt mounting hole
[diameter: 15 mm (0.59 in.)]

NOTES

EXTERIOR

CONTENTS

E51AA--

SPECIFICATIONS

SERVICE SPECIFICATIONS

E51CB--

Items	Specifications
Standard value Windshield wiper blade stopping position (distance between blade tip and front deck garnish) mm (in.)	 50 – 60 (1.9 – 2.3)

TORQUE SPECIFICATIONS

E51CC--

Items	Nm	kgm	ft.lbs.
Windshield wiper arm locking nuts	10 – 16	1.0 – 1.6	7 – 12
Windshield wiper pivot shaft installing nuts	10 – 16	1.0 – 1.6	7 – 12

SPECIAL TOOL

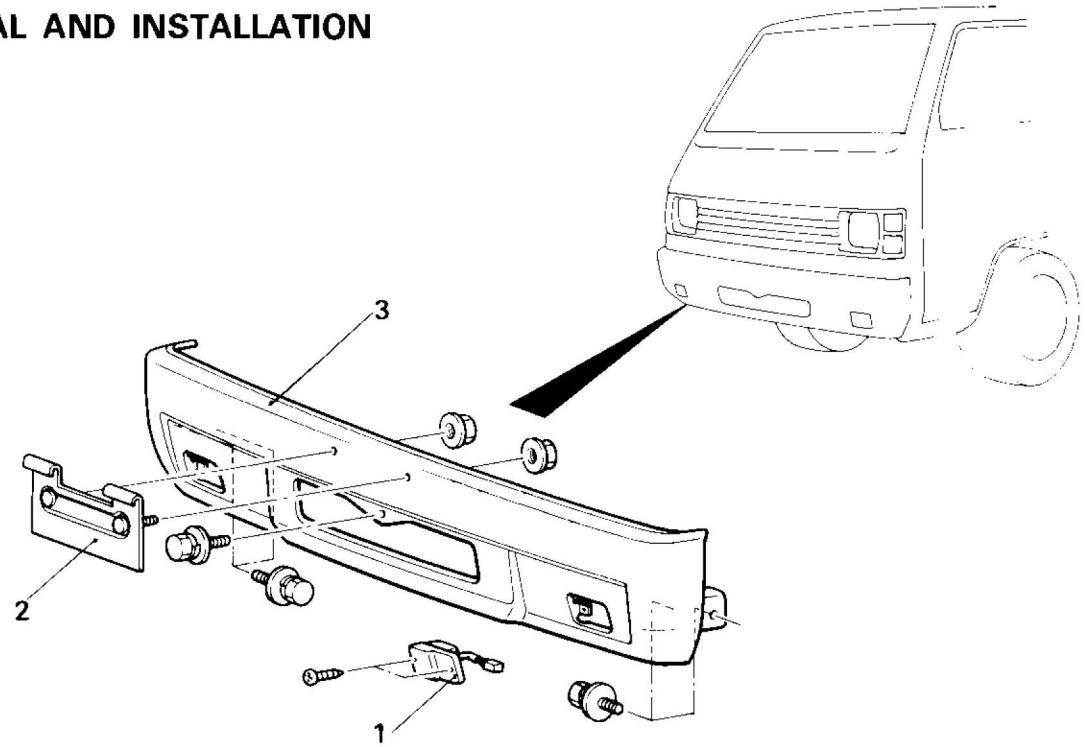
E51DA--

Tool	Number	Name	Use
	MB990784	Moulding remover	Removal of garnish

FRONT BUMPER

REMOVAL AND INSTALLATION

E51GABB



18D0023

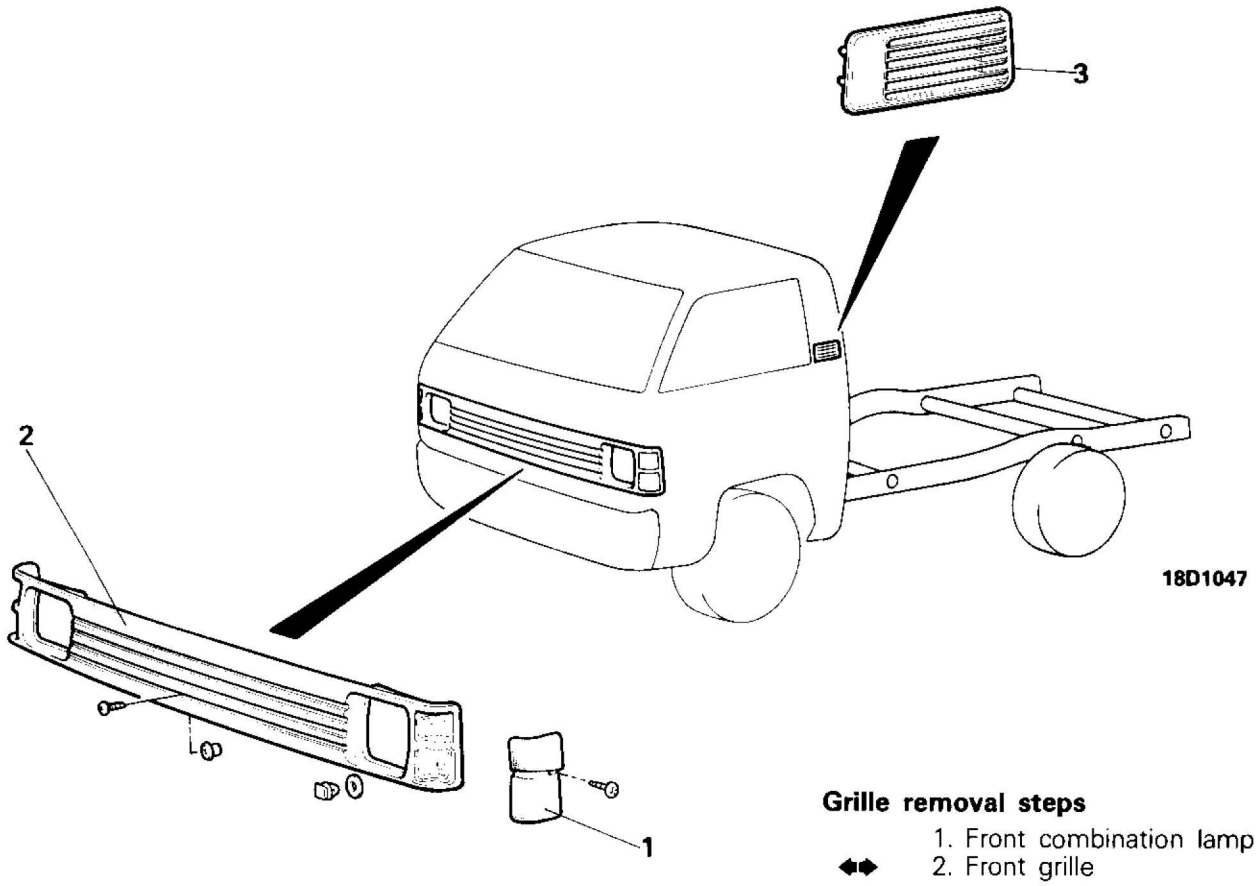
Removal steps

1. Licence plate bracket assembly
2. Front turn signal lamp
3. Front bumper assembly

GRILLE, GARNISH

E51IAAF

REMOVAL AND INSTALLATION

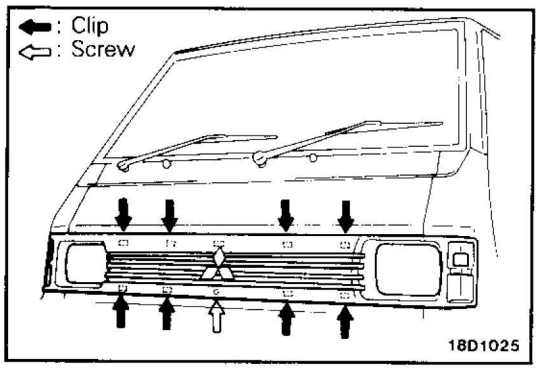


Grille removal steps

1. Front combination lamp
2. Front grille

Air outlet garnish removal

3. Air outlet garnish



SERVICE POINTS OF REMOVAL

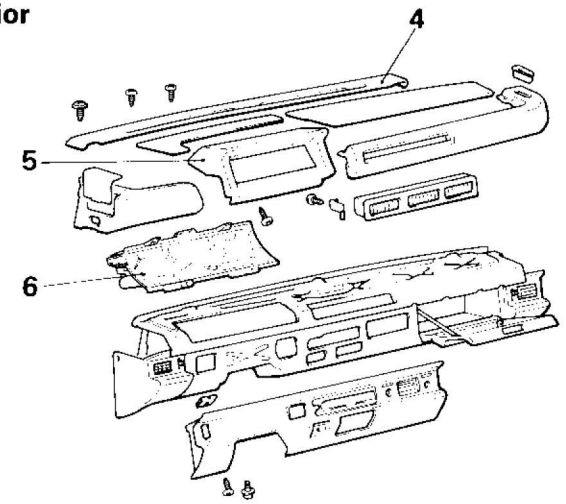
2. REMOVAL OF FRONT GRILLE

WIPERS AND WASHER

REMOVAL AND INSTALLATION

E51KCAC

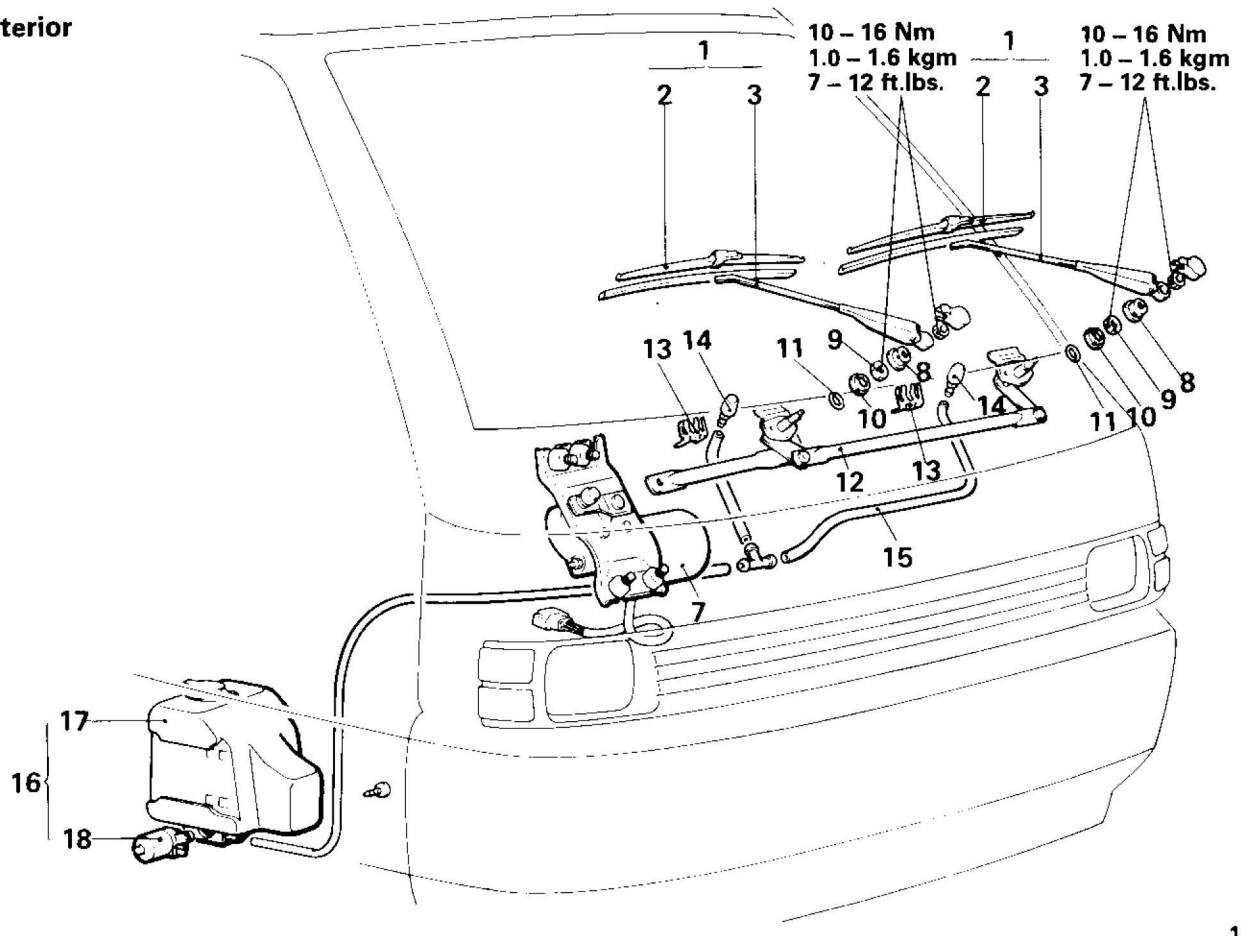
Interior



Washer removal steps

- 4. Defroster garnish
- ◆◆ 5. Meter hood
- 6. Meter assembly
- 13. Holder
- ◆◆ 14. Washer nozzle
- 15. Washer tube
- 16. Washer tank assembly
- 17. Washer tank
- 18. Washer motor and pump

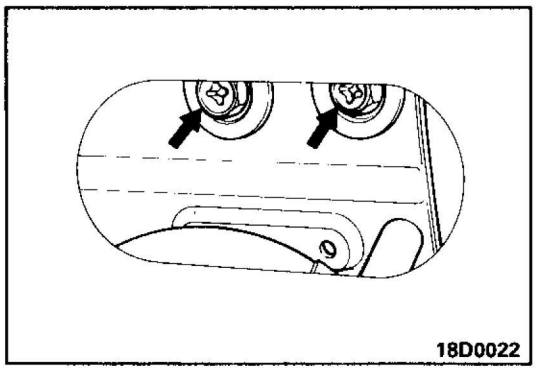
Exterior



18D1024

Wipers removal steps

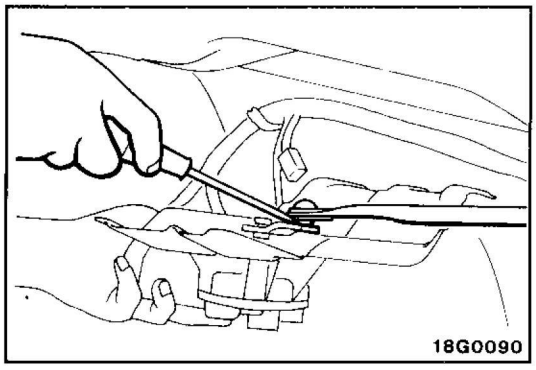
- ◆◆ 1. Wiper blade arm assembly
- 2. Wiper blades
- 3. Wiper arm
- 4. Defroster garnish
- ◆◆ 5. Meter Hood
- 6. Meter assembly
- 7. Wiper motor assembly
- 8. Cap
- 9. Wiper pivot nut
- 10. Washer with packing
- 11. Bushing
- 12. Wiper linkage



SERVICE POINTS OF REMOVAL

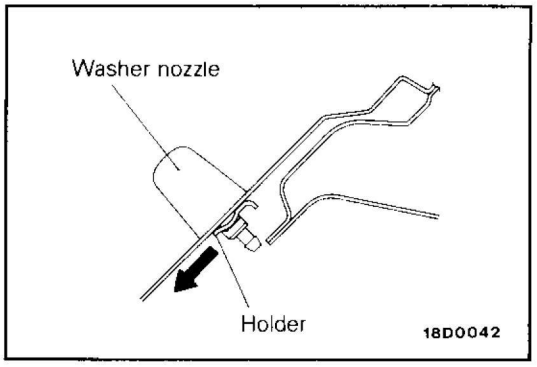
5. REMOVAL OF WIPER MOTOR ASSEMBLY

(1) Remove the attaching bolts of the wiper motor assembly from the service hole located at the rear of the glove box.



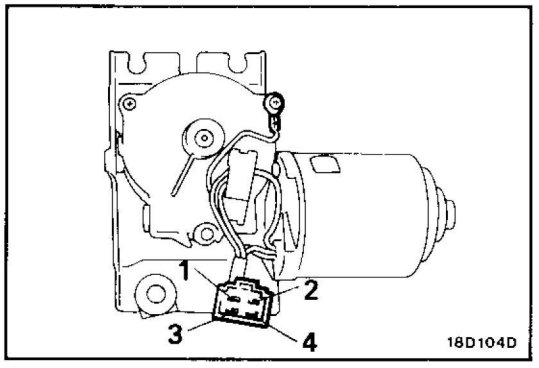
(2) Disconnect wiper motor and wiper linkage as an assembly. Remove wiper motor assembly.

Caution
Auto-stop angle is controlled so do not remove crank arm from wiper motor unless necessary. When removing, mark crank arm and wiper motor.



14. REMOVAL OF WASHER NOZZLE

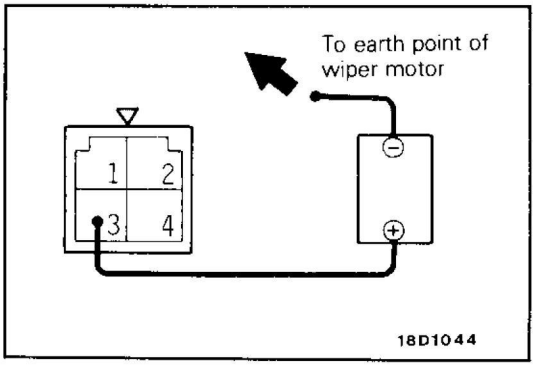
Remove holder from inside and remove washer nozzle.



INSPECTION

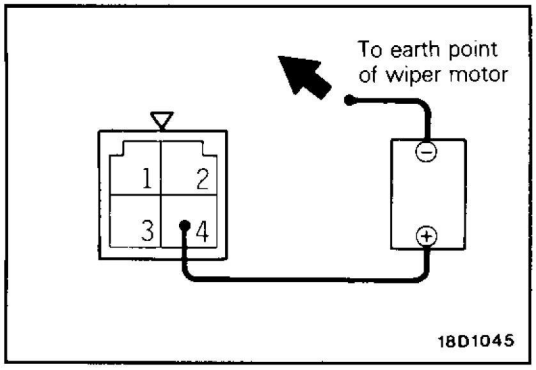
WIPER MOTOR

Disconnect the wiring connector from the wiper and connect battery to the wiper motor connector to check that the wiper motor runs.



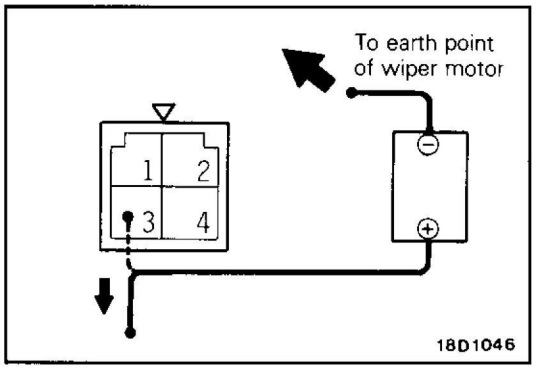
LOW SPEED OPERATION CHECK

Connect the positive (+) terminal of the battery to terminal 3, and connect the negative (–) terminal of the battery to the earth point of the wiper motor. Then, check to make sure the motor operates at low speed.



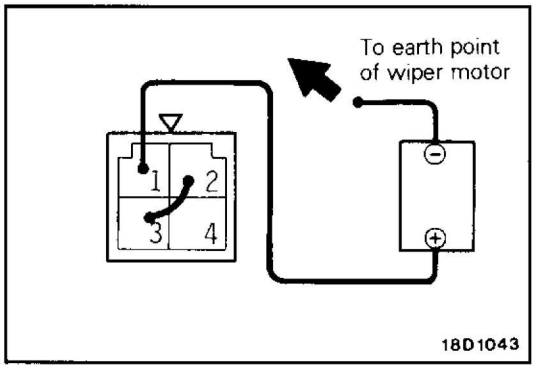
HIGH SPEED OPERATION CHECK

Connect the positive (+) terminal of the battery to terminal 4, and connect the negative (–) terminal of the battery to the earth point of the wiper motor. Then, check to make sure the motor operates at high speed.

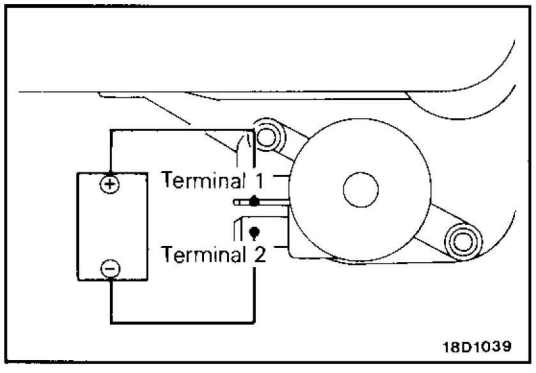


AUTOMATIC STOP OPERATION CHECK

(1) When the positive (+) terminal of the battery is connected to terminal 3, and the negative (–) terminal of the battery is connected to the earth point of the wiper motor; the motor shall start to operate at low speed.
(2) Disconnect terminal 3 during operation to stop the motor.

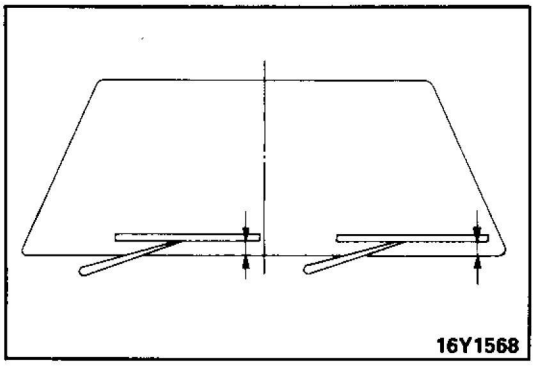


(3) Connect terminal 2 to terminal 3 and connect battery (+) to terminal 1 and battery (–) to the wiper motor earth point to check that the motor starts to run at low speed and then stops.



WASHER MOTOR AND PUMP

Make the check while the motor is installed to the washer tank.
(1) Check to be sure that there is washer fluid in the washer tank.
(2) Check to be sure that the washer motor operates and the fluid is forced out under pressure when the battery positive (+) terminal is connected to terminal 2 and the negative (–) terminal is connected to terminal 1.



SERVICE POINT OF INSTALLATION

1. INSTALLATION OF WIPER BLADE ARM ASSEMBLY

Install wiper blade so that it is within the standard value.

Standard value: 50 – 60 mm (1.9 – 2.3 in.)

INTERIOR

CONTENTS

E52AA--

SPECIFICATIONS

TORQUE SPECIFICATIONS

E52CC--

Items	Nm	kgm	ft.lbs.
Clamp assembly	4 – 6	0.4 – 0.6	3 – 4
Seat adjuster	9 – 14	0.9 – 1.4	7 – 10
Seat attaching bolt	9 – 14	0.9 – 1.4	7 – 10
Retractor	35 – 55	3.5 – 5.5	25 – 40
Buckle stalk	35 – 55	3.5 – 5.5	25 – 40

SPECIAL TOOL

E52DA--

Tool	Number	Name	Use
	MB990784	Ornament remover	Removal of trim panel (A), trim panel (B)

INSTRUMENT PANEL

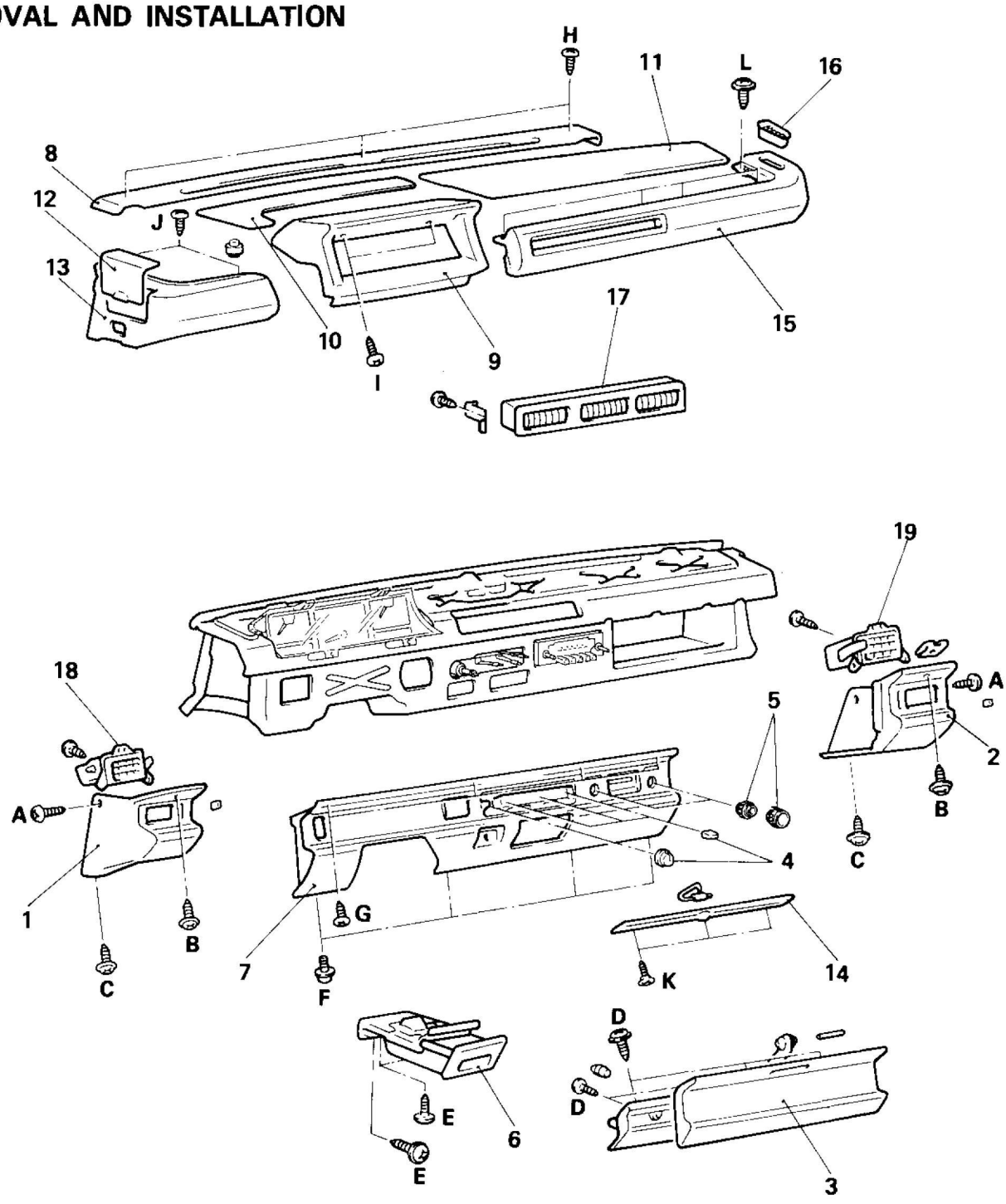
For installation of the instrument panel, the bolts and screws described below are used. They are indicated by symbols in the illustration.

Symbol	Name and shape	Dimensions mm (in.)	Symbol	Name and shape	Dimensions mm (in.)
A	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)	G	Tapping screw  18U418	O.D. = 5 (0.20) L = 20 (0.79)
B	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)	H	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)
C	Washer assembled screw  18U419	O.D. = 5 (0.20) L = 16 (0.63)	I	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)
D	Tapping screw  18U416	O.D. = 5 (0.20) L = 16 (0.63)	J	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)
E	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)	K	Tapping screw  18U415	O.D. = 5 (0.20) L = 16 (0.63)
F	Washer assembled screw  18U419	O.D. = 5 (0.20) L = 16 (0.63)	L	Tapping screw  18U418	O.D. = 5 (0.20) L = 12 (0.47)

O.D. = Thread diameter
L = Effective thread length

REMOVAL AND INSTALLATION

E52GB--



Removal steps

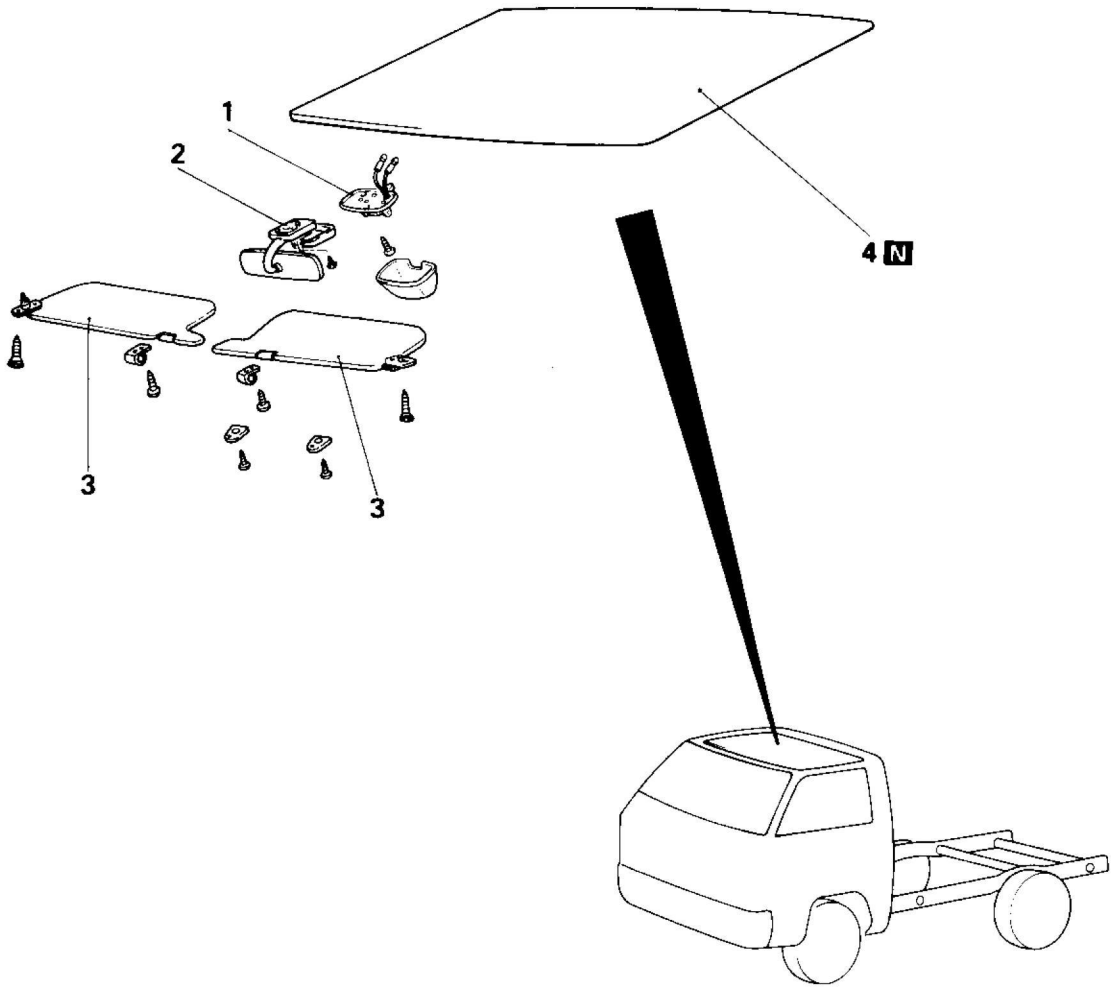
19D1012

1. Corner panel (L.H.)
2. Corner panel (R.H.)
3. Glove box
4. Heater control knob
5. Radio knob
6. Ashtray
7. Center panel
8. Defroster garnish
9. Meter hood
10. Trim panel (A)
11. Trim panel (B)
12. Inspection lid
13. Upper corner panel
14. Glove box plate
15. Instrument pad
16. Side defroster air outlet grille
17. Center air outlet grille
18. Duct assembly (L.H.)
19. Duct assembly (R.H.)

HEADLINING

E521A--

REMOVAL AND INSTALLATION

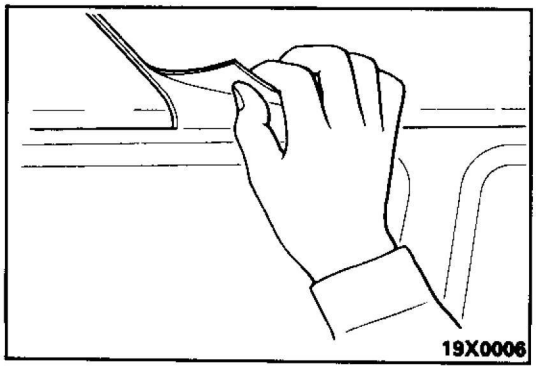


18D1031

Removal steps

1. Room lamp assembly
2. Inside rearview mirror
3. Sunvisor

◆◆▶◆ 4. Headlining

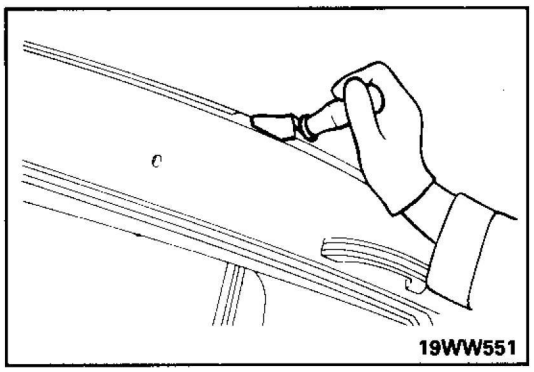


SERVICE POINT OF REMOVAL

E521BAF

4. REMOVAL OF HEADLINING

Remove the headlining slowly from corner without leaving headlining sponge on roof panel.
Use triol solution to remove adhesive or sponge remaining on roof panel.



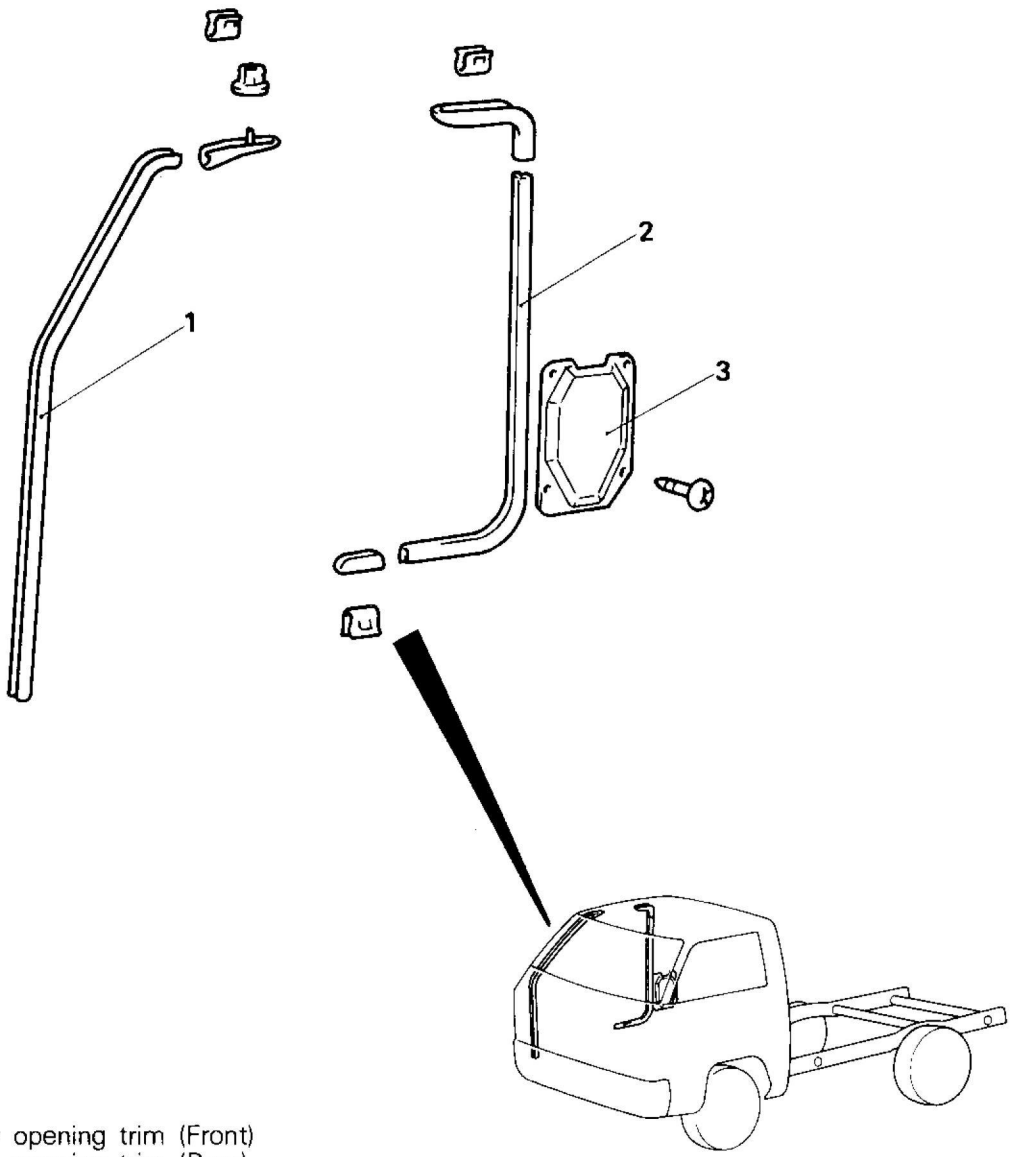
SERVICE POINT OF INSTALLATION E52IDABC

4. INSTALLATION OF HEADLINING

(1) Glue headlining without creasing or sagging.
(2) Put the edge of the headlining into a space between the roof panel and the inner panel.

TRIM

REMOVAL AND INSTALLATION E52JA--



Removal steps

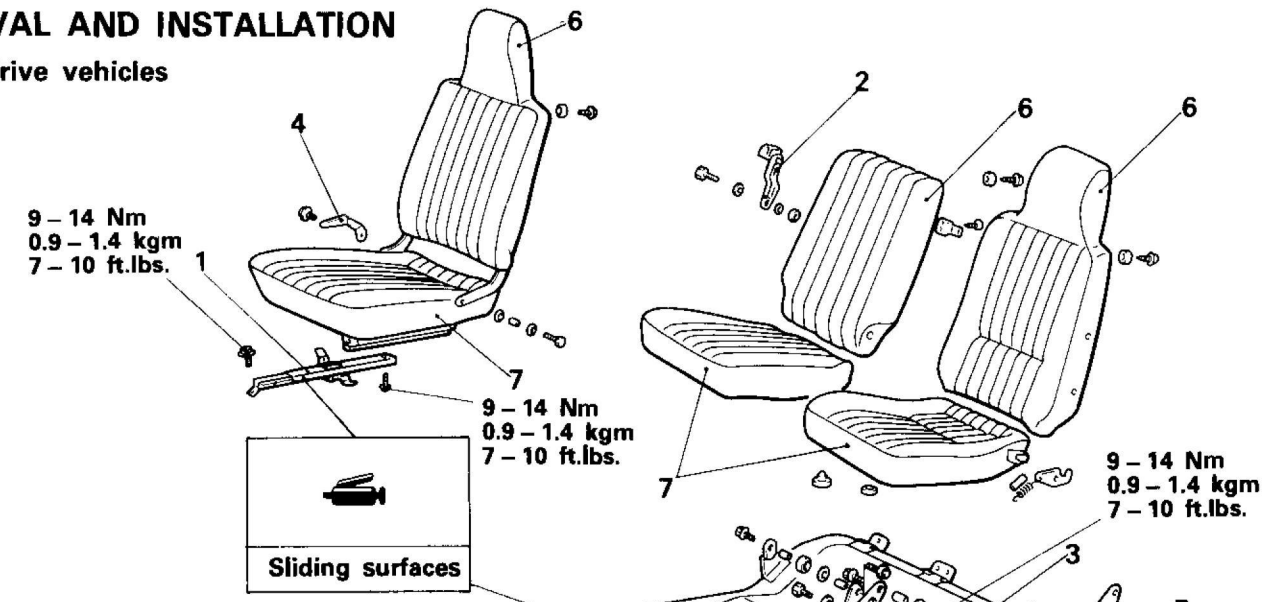
1. Door opening trim (Front)
2. Door opening trim (Rear)
3. Pillar trim

FRONT SEAT

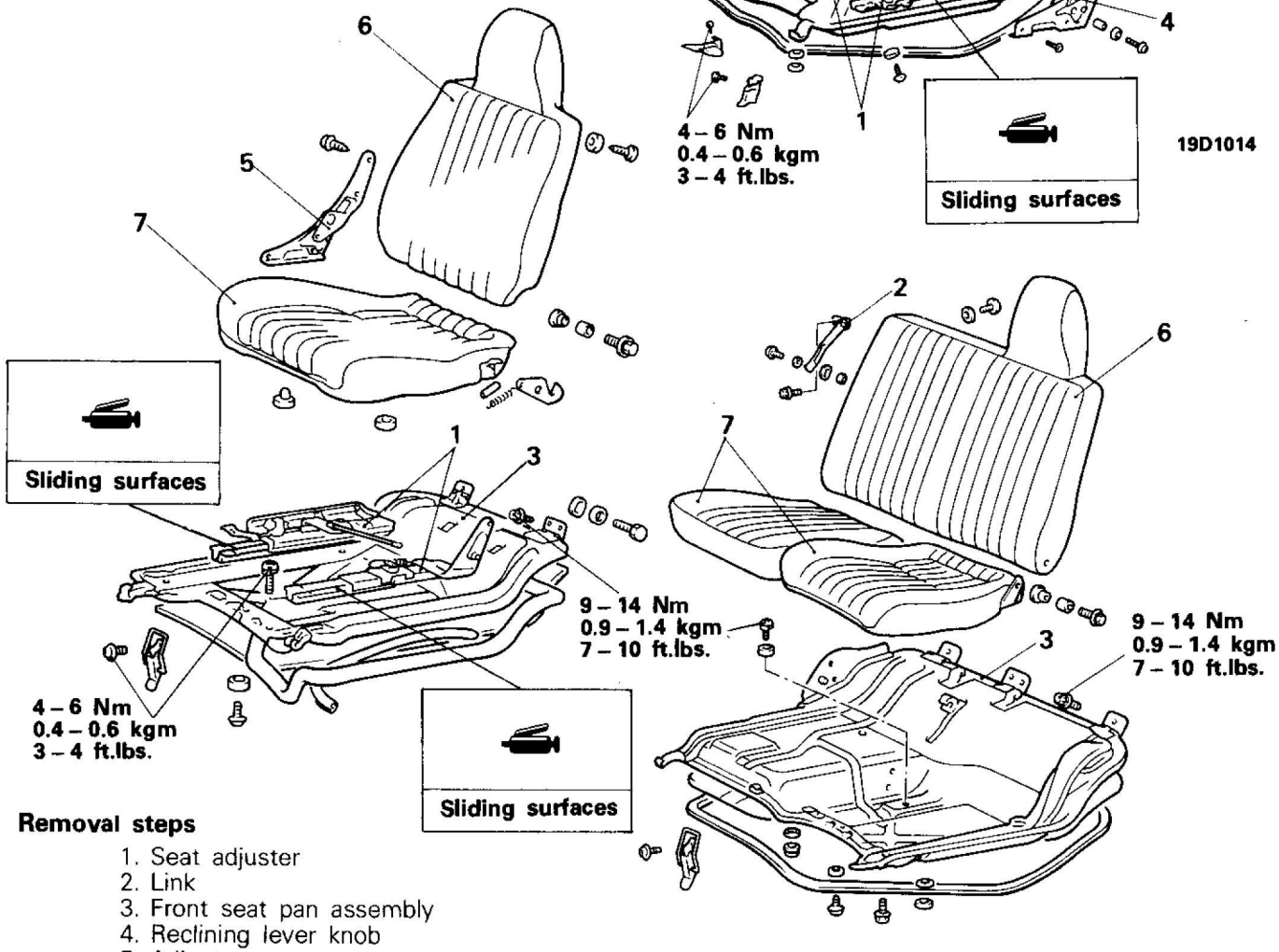
E52KA – –

REMOVAL AND INSTALLATION

L.H. drive vehicles



R.H. drive vehicles



19D1014

19D1013

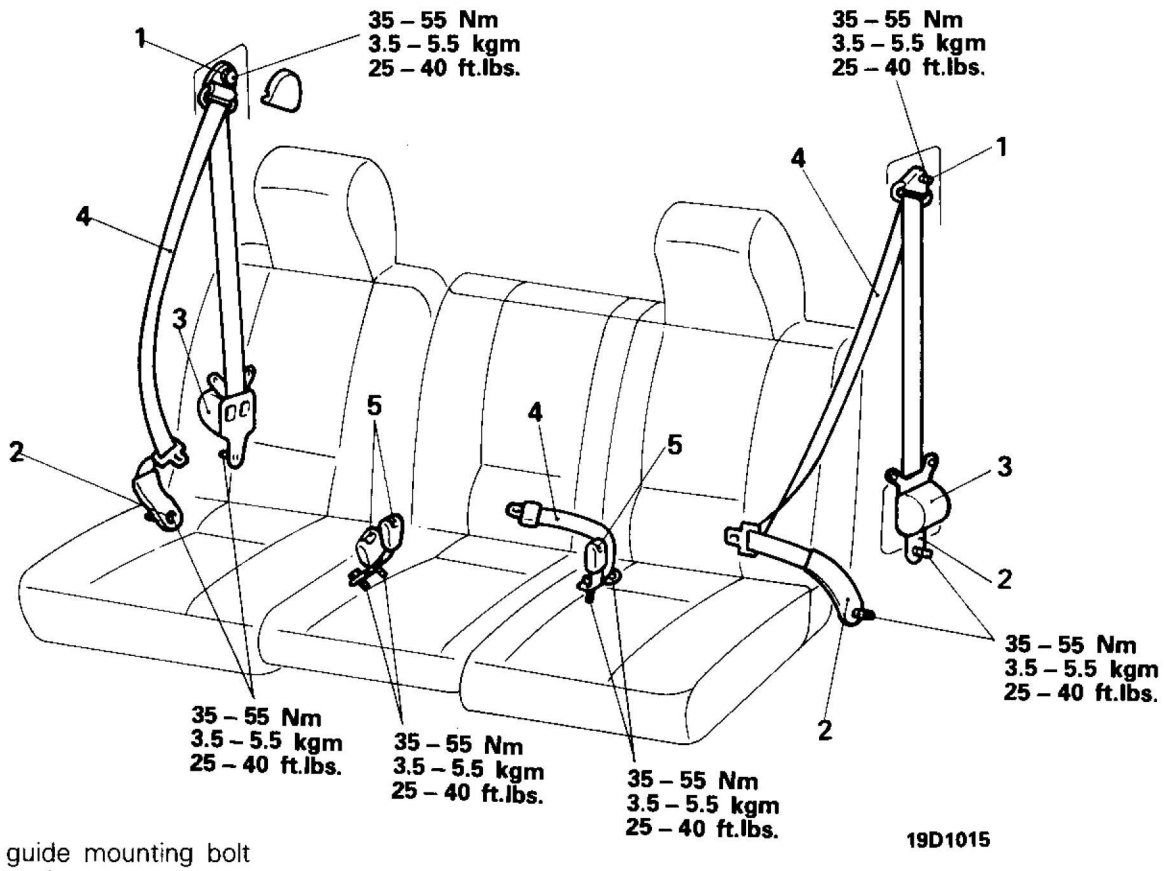
Removal steps

1. Seat adjuster
2. Link
3. Front seat pan assembly
4. Reclining lever knob
5. Adjuster cover
6. Front seat back
7. Front seat cushion

FRONT SEAT BELT

E52MA--

REMOVAL AND INSTALLATION



Removal steps

1. Sash guide mounting bolt
2. Anchor plate
3. Retractor
4. Front seat belt
5. Buckle stalk
6. Buckle stalk

CHASSIS ELECTRICAL

CONTENTS

E54AA--

BATTERY

SPECIFICATIONS

GENERAL SPECIFICATIONS

E54CA--

Items	Petrol-powered vehicles	Diesel-powered vehicles	
		STANDARD	OPTION
Type	55D23R-MF	95D31R-MF	55B24R(S)-MF
Capacity (5HR) Ah	48	64	36
Reserve capacity min.	99	159	79
Cold cranking current A	356	622	433

SERVICE ADJUSTMENT PROCEDURES

BATTERY TEST

TEST STEP	RESULT ▶	ACTION TO TAKE
A0 VISUAL INSPECTION • Remove negative cable, then positive cable. • Check for dirty or corroded connections.	~~OK~~ ▶ OK ▶	CLEAN terminals and clamps. Go to A1 . Go to A1 .
A1 LOOSE BATTERY POST • Check for loose battery post.	~~OK~~ ▶ OK ▶	REPLACE battery. Go to A2
A2 CRACKED BATTERY COVER • Remove holddowns and shields. • Check for broken/cracked case or cover.	~~OK~~ ▶ OK ▶	REPLACE battery. Go to A3 .
A3 TEST INDICATOR/OPEN CIRCUIT VOLTAGE TEST • Turn headlamps on for 15 seconds. • Turn headlamps off for 2 minutes to allow battery voltage to stabilize. • Disconnect cables. • Read open circuit voltage.	~~OK~~ ▶ Blue dot invisible and open circuit voltage under 12.4 volts. OK ▶	CHARGE battery at 5 amps, then go to A3 . Go to A4 .
A4 LOAD TEST • Connect a load tester to the battery. • Load the battery at the recommended discharge rate (See LOAD TEST RATE CHART) for 15 seconds. • Read voltage after 15 seconds, then remove load.	~~OK~~ ▶ Voltage is less than minimum listed (white indicator). OK ▶ Voltage is more than minimum listed.	REPLACE battery. Battery OK.

LOAD TEST RATE CHART

Load test (amps)	Cranking rating [– 18°C (0°F)]	Reserve capacity	Application
207	433	79	55B24R(S)-MF
170	356	99	55D23R-MF
298	622	159	95D31R-MF

LOAD TEST CHART

Minimum voltage	Temperature °C (°F)	Minimum voltage	Temperature °C (°F)
9.6	21 (70) and above	9.1	– 1 (30)
9.5	16 (60)	8.9	– 7 (20)
9.4	10 (50)	8.7	– 12 (10)
9.3	4 (40)	8.5	– 18 (0)

INSPECTION

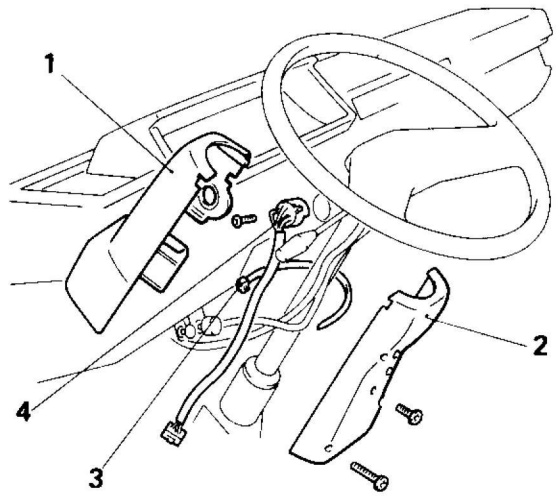
E54CJAA

Refer to GROUP 11 ENGINE – Engine Adjustment.

IGNITION SWITCH

REMOVAL AND INSTALLATION

E54DH--

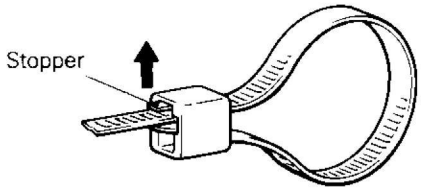


16D0053

Removal steps

1. Lower column cover
2. Upper column cover
3. Cable band
4. Ignition switch

◆◆



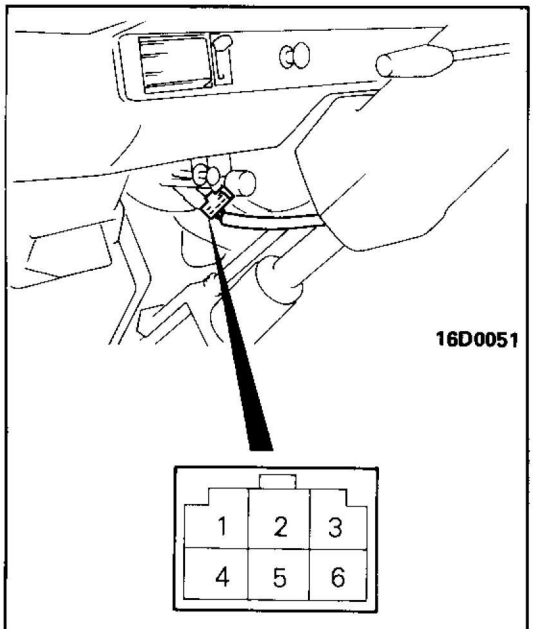
16G0171

SERVICE POINTS OF REMOVAL

E54DIAA

3. REMOVAL OF CABLE BAND

Push up stopper and remove cable band.



16D0051

16D0027

INSPECTION

E54DJAL

Operate the switch and check for continuity between the terminals.

Position \ Terminal	1	5	4	3	6
LOCK					
ACC				○—○	
ON			○	○—○	
START	○	○	○		○

NOTE
○—○ indicates that there is continuity between the terminals.

METERS AND GAUGES

SPECIFICATIONS

GENERAL SPECIFICATIONS

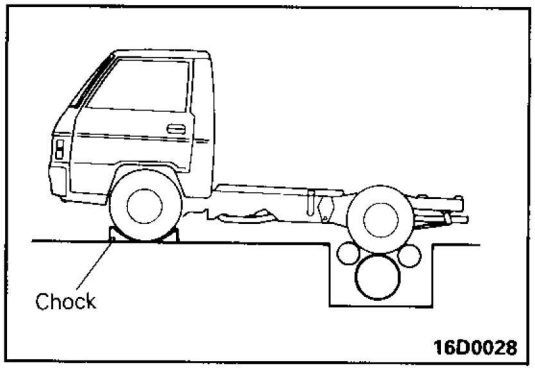
E54EA--

Items	Specifications
Speedometer	
Type	Rotary magnet type
Fuel gauge	
Type	Bimetal type (voltage regulator incorporated for 7V)
Fuel gauge unit	
Type	Variable resistance type (with fuel level sensor)
Engine coolant temperature gauge	
Type	Bimetal type (7V operation)
Engine coolant temperature gauge unit	
Type	Thermistor type

SERVICE SPECIFICATIONS

E54EB--

Items		Specifications
Standard value		
Speedometer indication error		
km/h Speed indicator	km/h	
40		40 – 48
80		80 – 92
120		120 – 136
MPH Speed indicator	MPH	
20		20 – 25
40		40 – 47
60		60 – 69
80		80 – 91
Fuel gauge unit float position	mm (in.)	
Float point "F"		18.5 – 22.5 (0.728 – 0.886)
Float point "E"		167.5 – 171.5 (6.594 – 6.752)
Fuel gauge unit resistance value	Ω	
Float point "F"		14.9 – 19.1
Float point "E"		113.5 – 126.5
Fuel gauge resistance value	Ω	
Between terminals power supply and fuel gauge unit		23 – 27
Between terminals fuel gauge unit and earth		122 – 148
Between terminals power supply and earth		99 – 121
Engine coolant temperature gauge resistance value	Ω	50 – 60



SERVICE ADJUSTMENT PROCEDURES

E54EGAR

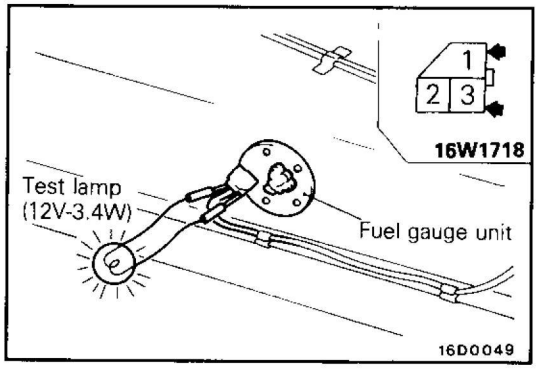
SPEEDOMETER INSPECTION

1. Assure tyre pressure at standard value.
   (Refer to GROUP 31 – General Specifications.)
2. Use speedometer tester to check indicator difference.

Caution
When checking with speedometer tester, block non-operating wheels to prevent vehicle moving.

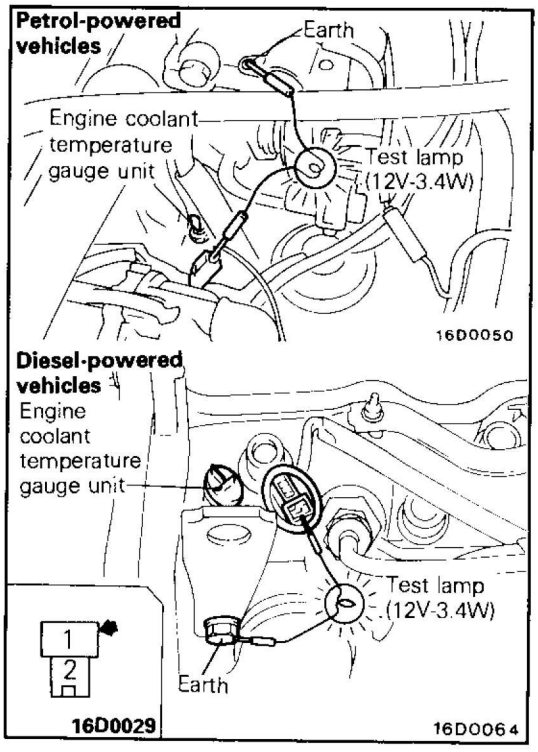
Standard value:

km/h Speed indicator	km/h	MPH Speed indicator	MPH
Set speed	Acceptable indication range	Set speed	Acceptable indication range
40	40 – 48	20	20 – 25
80	80 – 92	40	40 – 47
120	120 – 136	60	60 – 69
		80	80 – 91



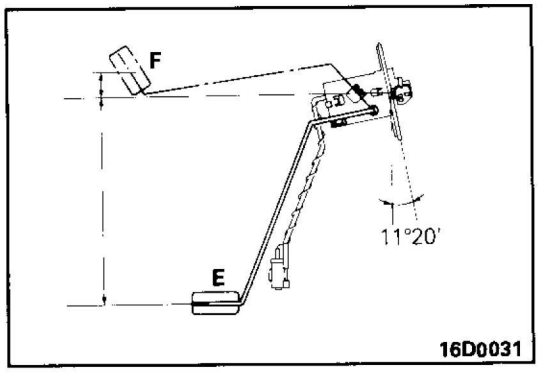
FUEL GAUGE SIMPLE TEST

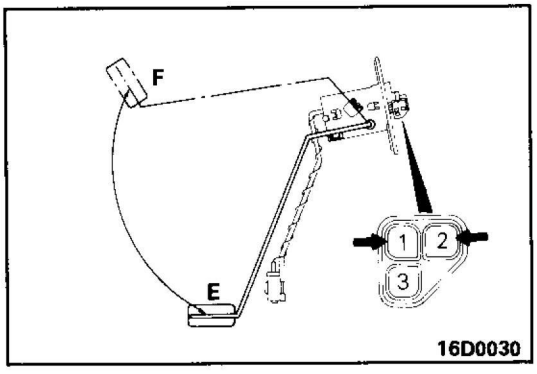
1. Remove the connector from fuel gauge unit in fuel tank.
2. Connect the terminals as illustrated or the wire harness side connector through a test lamp (12V-3.4W).
3. Turn ON ignition switch.
4. Assure test lamp flashes and gauge needle moves.
5. If test lamp flashes but gauge needle does not move, replace fuel gauge.
   If test lamp does not flash (and gauge needle does not move), check fuse, fuel gauge, or break in harness.

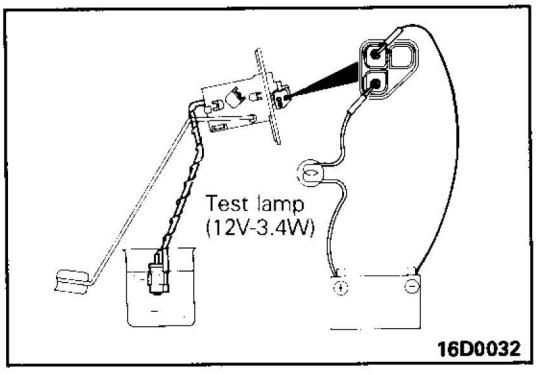


ENGINE COOLANT TEMPERATURE GAUGE SIMPLE TEST

1. Remove the connector from engine coolant temperature gauge unit in engine compartment.
2. Earth the harness side connector as illustrated through a test lamp (12V-3.4 W).
3. Turn ON ignition switch.
4. Check that test lamp flashes and gauge needle moves.
5. If test lamp flashes but the gauge needle does not move, replace engine coolant temperature gauge.
   If test lamp does not flash (and gauge needle does not move), check fuse, engine coolant temperature gauge or break in harness.







FUEL GAUGE UNIT INSPECTION

To check the fuel gauge unit, remove the unit from the fuel tank. (Refer to GROUP 13 – Fuel Tank.)

FUEL GAUGE UNIT FLOAT POSITION CHECK

Move the float and measure the float position at points "F" and "E" when the float arm contacts the stopper.

Standard value:

Point F	**18.5 – 22.5 mm (0.728 – 0.886 in.)**
Point E	**167.5 – 171.5 mm (6.594 – 6.752 in.)**

FUEL GAUGE UNIT RESISTANCE CHECK

1. Check that the resistance between terminals is within the standard value when the fuel gauge unit float is between positions "F" and "E".

   Standard value:

Point F	**14.9 – 19.1 Ω**
Point E	**113.5 – 126.5 Ω**

2. Also check that the resistance changes smoothly when the float is moved to "F" and "E".

FUEL LEVEL SENSOR CHECK

1. Connect the gauge unit with a test lamp (12V-3.4W) to the battery, and immerse it in the water.
2. The lamp should be off while thermistor of the gauge unit is beneath the water, and should illuminate when the unit is taken out of the water.

   NOTE
   If there is a malfunction, replace the fuel gauge unit as an assembly.

   Caution
   After completing this test, wipe the unit dry and install it in the fuel tank.

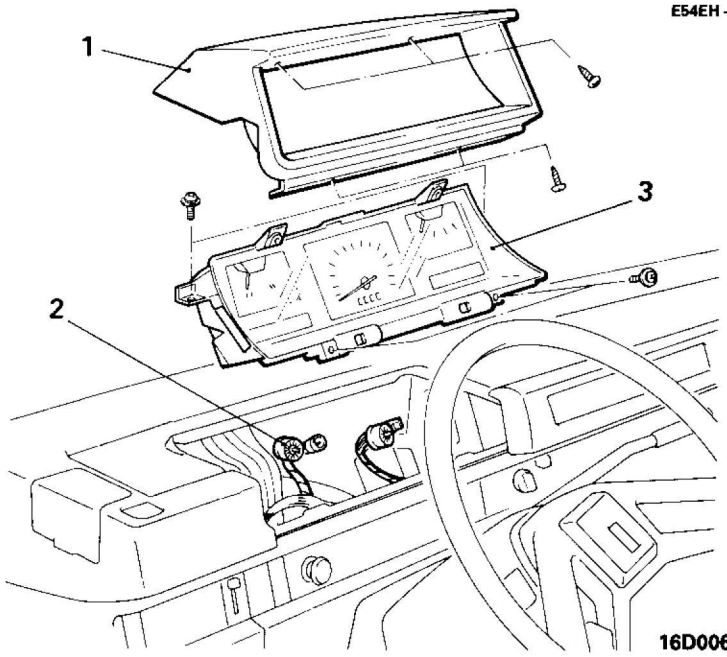
ENGINE COOLANT TEMPERATURE GAUGE UNIT INSPECTION

Refer to GROUP 14 – Engine Coolant Temperature Gauge Unit.

COMBINATION METER

REMOVAL AND INSTALLATION

E54EH--



Removal steps

1. Combination meter hood
2. ◆◆ Connection for speedometer cable
3. Meter assembly

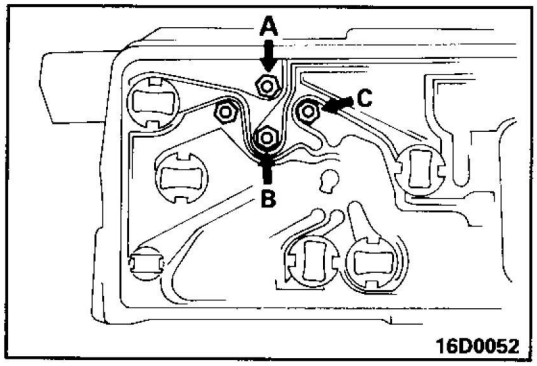
INSPECTION

E54EJAN

Measure resistance between the terminals.

Caution

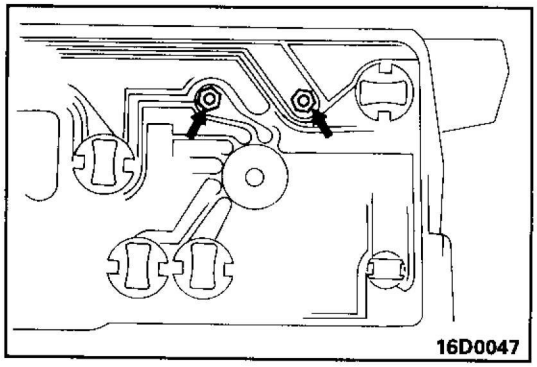
If there is a malfunction of the earth contact of the voltage regulator even once during vehicle operation, the excessive current flowing through the heat coil of the engine coolant temperature gauge and the fuel gauge will cause permanent distortion of the bimetal, resulting in the indications being consistently lower than the actual value.
For this reason, therefore, be sure to make the earth contact securely.



FUEL GAUGE

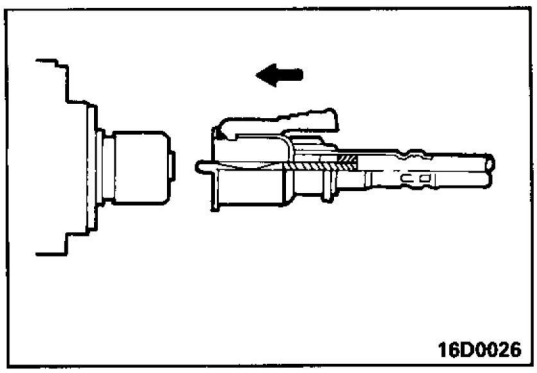
Standard value: Between	**A – B**	**99 – 121Ω**
	B – C	**23 – 27 Ω**
	A – C	**122 – 148 Ω**

NOTE
A: Earth
B: Voltage regulator output
C: Fuel gauge unit



ENGINE COOLANT TEMPERATURE GAUGE

Standard value:	**50 – 60 Ω**


16D0026

SERVICE POINTS OF INSTALLATION E54EKAC

2. INSTALLATION OF SPEEDOMETER CABLE

Insert the cable until its stopper properly fits to the speedometer goove.

Caution
Poor installation of the cable may cause a fluctuating meter pointer, or noise and a damaged harness inside the instrument panel.

INDICATORS AND WARNING LAMPS

SPECIFICATIONS

GENERAL SPECIFICATIONS E54FA--

Items	Petrol-powered vehicles W	Diesel-powered vehicles W
Turn-signal indicator lamp	1.4	1.4
Upper beam indicator lamp	3.4	3.4
Oil pressure warning lamp	3.4	3.4
Charging warning lamp	3.4	3.4
Brake warning lamp	3.4	3.4
Fuel remaining warning lamp	3.4	3.4
Hazard warning lamp*	1.4	1.4
Fuel filter warning lamp	–	1.4
Diesel pre-heat indicator lamp	–	1.4

NOTE
*: L.H. drive vehicles

LIGHTING SYSTEM

SPECIFICATIONS

GENERAL SPECIFICATIONS

E54GA--

Items		Specifications	Items		Specifications
Exterior lamp			Rear combination lamp	W	
Headlamp	W		Turn-signal lamp		21
Incandescent bulb		45/40	Stop and tail lamp		21/5
Halogen bulb		60/55	Back-up lamp		21
Front turn-signal lamp	W	21	Licence plate lamp	W	10
Front combination lamp	W		Rear fog lamp	W	21
Side turn-signal lamp		5	Interior lamp		
Position lamp		5	Room lamp	W	5

SERVICE SPECIFICATIONS

E54GB--

Items		Specifications
Standard value		
Headlamp aiming		
Vertical direction	mm (in.)	60.2 (2.37)
Horizontal direction		Position where the intersecting point of the cut-off line crosses the vertical line.
Limit		
Headlamp intensity	cd	
Incandescent bulb		20,000
Halogen bulb		30,000

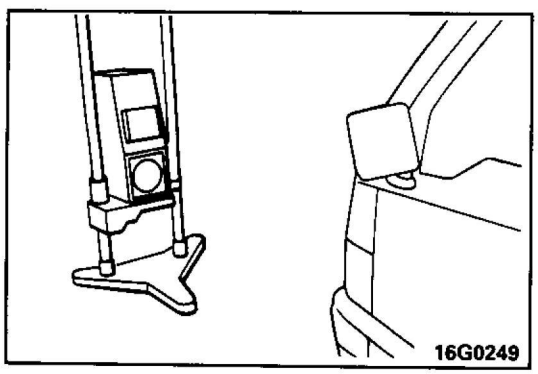
SERVICE ADJUSTMENT PROCEDURES

HEADLAMP AIMING

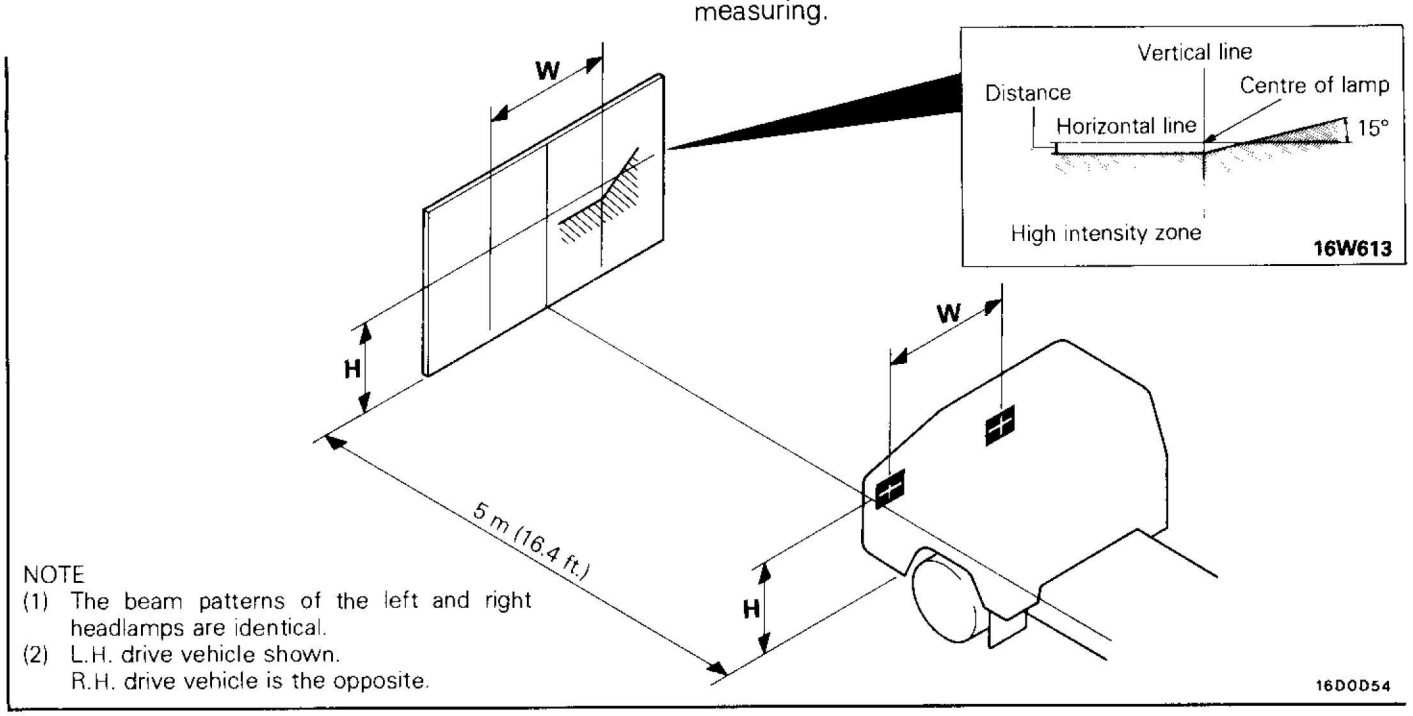
E54GGAU

1. Adjust the condition of the vehicle as follows :
   (1) Make sure the air pressures of the tyres are set to the standard value. (Refer to GROUP 31 – Specifications.)
   (2) Remove all loads (including passengers) from the vehicle and make sure the vehicle is in a level place.
   (3) Have one person [weighting approximately 75 kg (165 lbs)] get into the driver's seat.
   (4) If the vehicle is equipped with a headlamp levelling device,set the levelling switch to "0".
2. To adjust the headlamp beams, follow the procedure below.
   (1) The headlamps should be aimed with the proper beam-setting equipment, and in accordance with the equipment manufacturer's instructions.

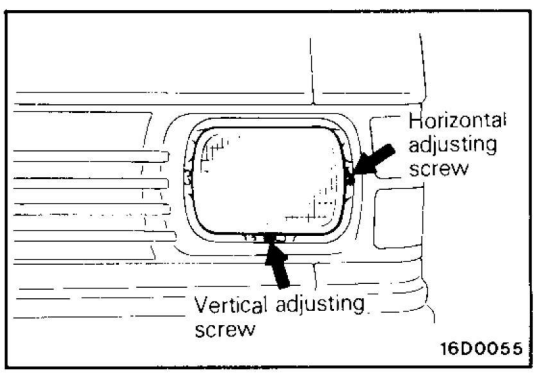
   NOTE
   If there are any regulations pertinent to the aiming of headlamps in the area where the vehicle is to be used, adjust so as to meet those requirements.



(2) If beamsetting equipment is not available, use a screen for measuring.



NOTE
(1) The beam patterns of the left and right headlamps are identical.
(2) L.H. drive vehicle shown.
R.H. drive vehicle is the opposite.



3. Make the vertical and horizontal adjustment of the beam to the standard values by using the adjusting screws.

Caution
Be sure to adjust the aiming adjusting screws in the tightening direction.

Standard value:

Vertical direction	
Distance	**60.2mm (2.37 in.)**
Horizontal direction	**Position where the intersecting point of the cut-off line crosses the vertical line.**

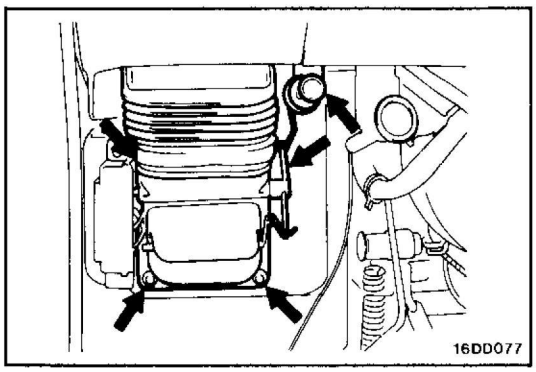
INTENSITY MEASUREMENT

Using a photometer, and following its manufactuer's instruction manual, measure the headlamp intensity and check to be sure that the limit value is satisfied.

Limit:

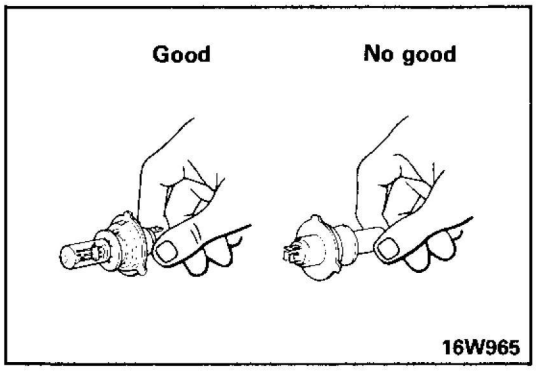
Incandescent bulb	**20,000 cd or more**
Halogen bulb	**30,000 cd or more**

NOTE
1. When measuring the intensity, maintain an engine speed of 2,000 r/min, with the battery in the charging condition.
2. There may be special local regulations pertaining to headlamp intensity; be sure to make any adjustments necessary to satisfy such regulations.
3. If an illuminometer is used to make the measurements, convert its values to photometer values by using the following formula.
$I = Er^2$
where: I = intensity (cd)
E = illumination (lx)
r = distance from headlamps to illuminometer



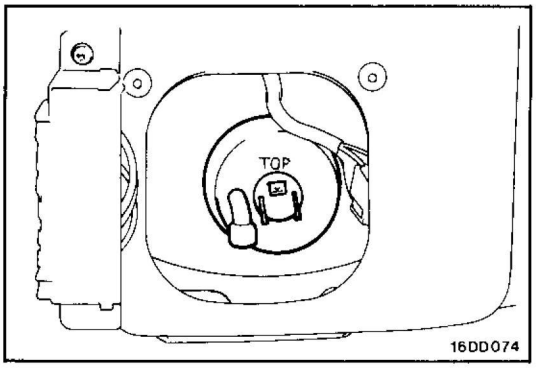
REPLACEABLE BULB REPLACEMENT

1. Remove the air flow box.
2. Disconnect the harness connector, and then pull out the socket cover.
3. Turn the bulb setting and then take out the lamp bulb and bulb setting.



Caution

1. **Never hold the halogen lamp bulb with a bare hand, dirty glove, etc.**
2. **If the glass surface is dirty, be sure to clean it with alcohol, paint thinner, etc., and install it after drying it thoroughly.**



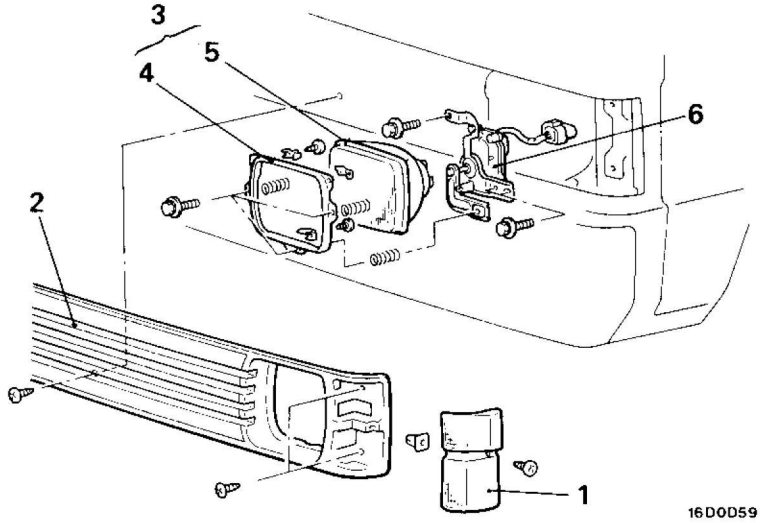
4. Install the socket cover with the "TOP" mark in the uppermost position.
5. Fit the socket cover closely to the lamp bulb flange and the unit.

HEADLAMP LEVELLING <VEHICLES FOR WEST GERMANY>

REMOVAL AND INSTALLATION

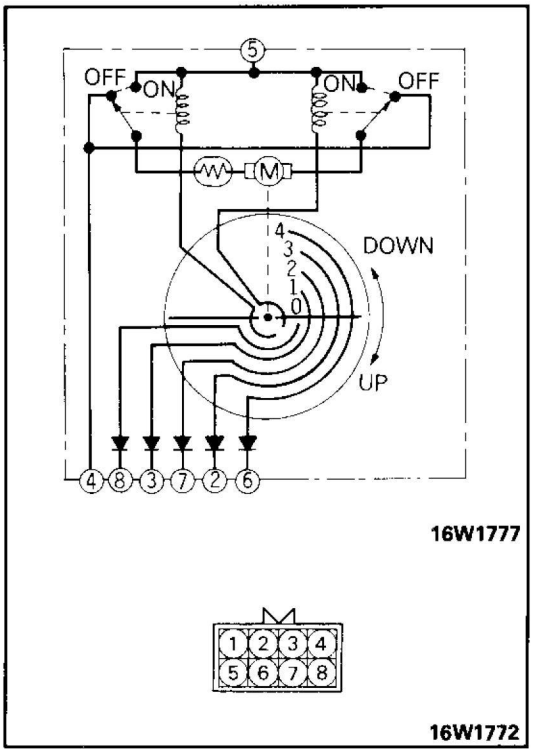
E54GHAL

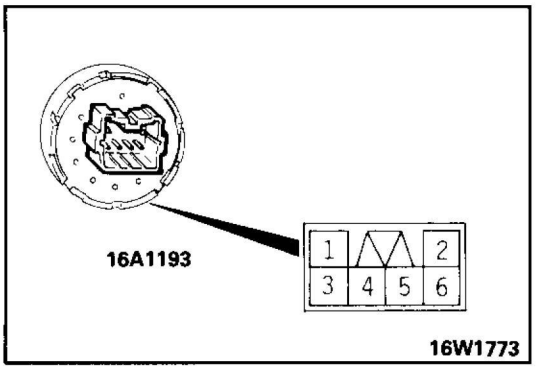
Post-installation Operation
- Headlamp Aiming

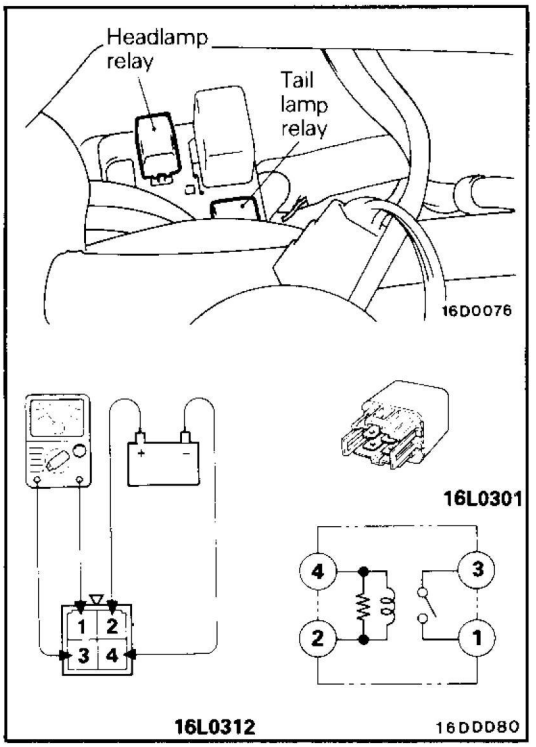


Removal steps

1. Front combination lamp
2. Front grill
3. Headlamp assembly
4. Headlamp retaining ring
5. Headlamp unit
6. Headlamp levelling unit







INSPECTION

HEADLAMP LEVELLING UNIT

1. After connecting the connector of the headlamp levelling unit to the harness connector, set the headlamp levelling switch to "0". Then disconnect the connectors.

   NOTE
   The headlamp levelling system operates when the lighting switch is in the headlamp on position.
2. Check to be sure there is no continuity between terminal ⑤ and terminal ④.
3. Apply battery voltage to terminal ⑤ and connect terminal ④ to earth.
   (1) Make sure the motor operates for 0.6 to 1.0 seconds when terminals ③, ⑦, ② and 6 are connected to earth in this order.
   (2) Make sure the motor operates for 0.6 to 1.0 seconds when terminals ②, ⑦, ③ and 8 are connected to earth in this order.

HEADLAMP LEVELLING SWITCH

Operate the switch and check the continuity between the terminals.

Switch postition \ Terminal	1	2	3	4	5	6
0	○	○				
1	○					○
2	○				○	
3	○			○		
4	○		○			

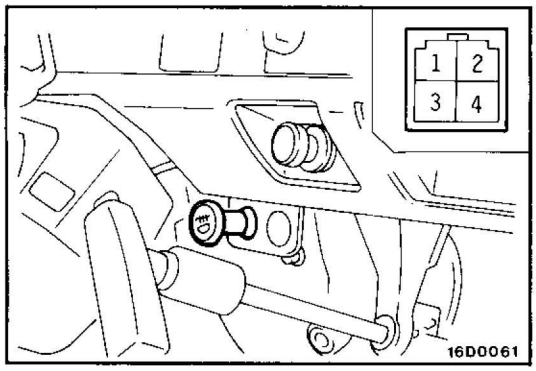
NOTE
○—○ indicates that there is continuity between the terminals.

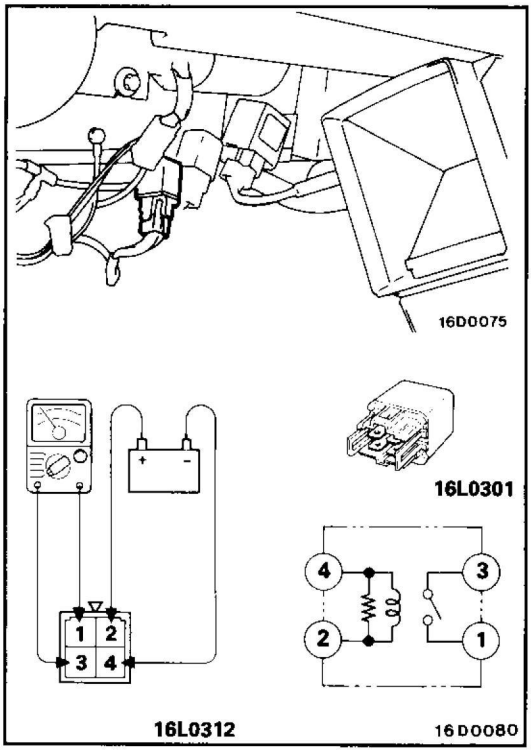
HEADLAMP-, TAIL LAMP RELAY E54GIAK

INSPECTION

Check for continuity between the terminals.

Power is supplied	① – ③ terminals	Continuity
Power is not supplied	① – ③ terminals	No continuity
	② – ④ terminals	Continuity





REAR FOG LAMP

E54GMAF

INSPECTION

REAR FOG LAMP SWITCH

Operate the switch and check the continuity between the terminals.

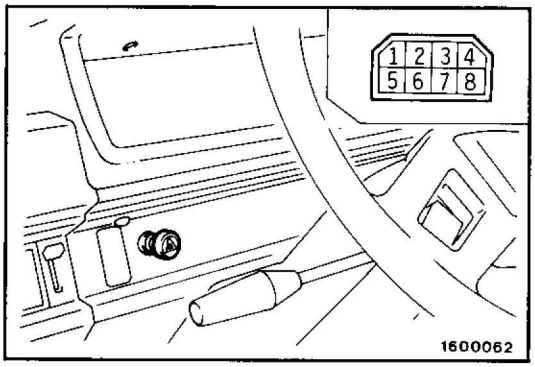
Switch positon \ Terminal	2	4	Indicator lamp	3
OFF		○	⓪	○
ON	○	○	⓪	○

NOTE
○–○ indicates that there is continuity between the terminals.

REAR FOG LAMP RELAY

Check for continuity between the terminals.

Power is supplied	①—③ terminals	Continuity
Power is not supplied	①—③ terminals	No continuity
	②—④ terminals	Continuity



HAZARD LAMP SWITCH <L.H. DRIVE VEHICLES>

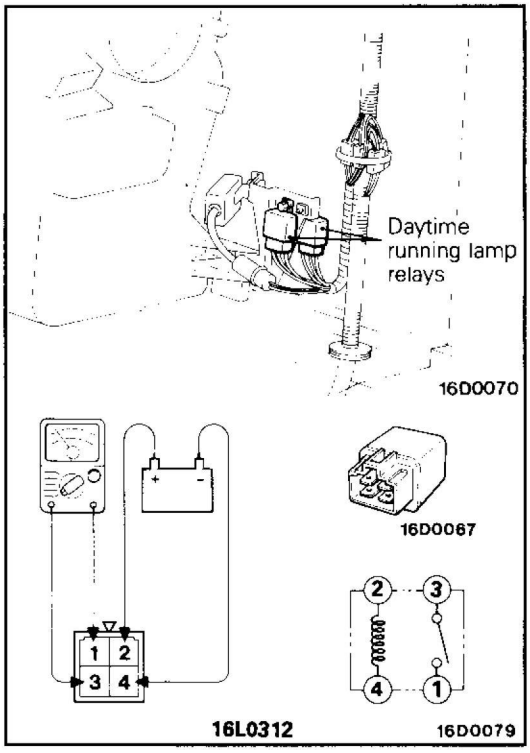
E54GLAH

INSPECTION

Operate the switch and check the continuity between the terminals.

Switch position \ Terminal	1	5	2	6	3	7	4	8
OFF	○	○						
ON			○	○	○	○	○	○

NOTE
○–○ indicates that there is continuity between the terminals.



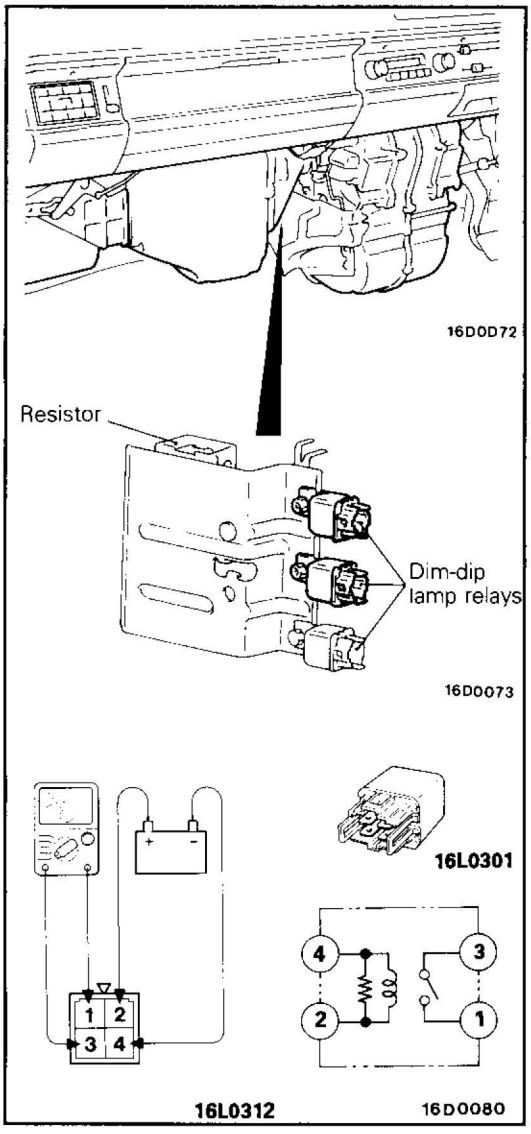
DAYTIME RUNNING LAMP RELAY <VEHICLES FOR NORWAY>

E54GJAE

INSPECTION

Check for continuity between the terminals.

Power is supplied	① – ③ terminals	Continuity
Power is not supplied	① – ③ terminals	No continuity
	② – ④ terminals	Continuity



DIM-DIP LAMP <R.H. DRIVE VEHICLES>

E54GKAF

INSPECTION

DIM-DIP LAMP RELAY

Check for continuity between the terminals.

Power is supplied	① – ③ terminals	Continuity
Power is not supplied	① – ③ terminals	No continuity
	② – ④ terminals	Continuity

RESISTOR

Check resistance between resistor terminals is approx. 1 Ω.

COLUMN SWITCH

SPECIFICATIONS

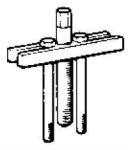
TORQUE SPECIFICATIONS

E54HC--

Items	Nm	kgm	ft.lbs.
Steering wheel installing nut	40	4.0	29

SPECIAL TOOLS

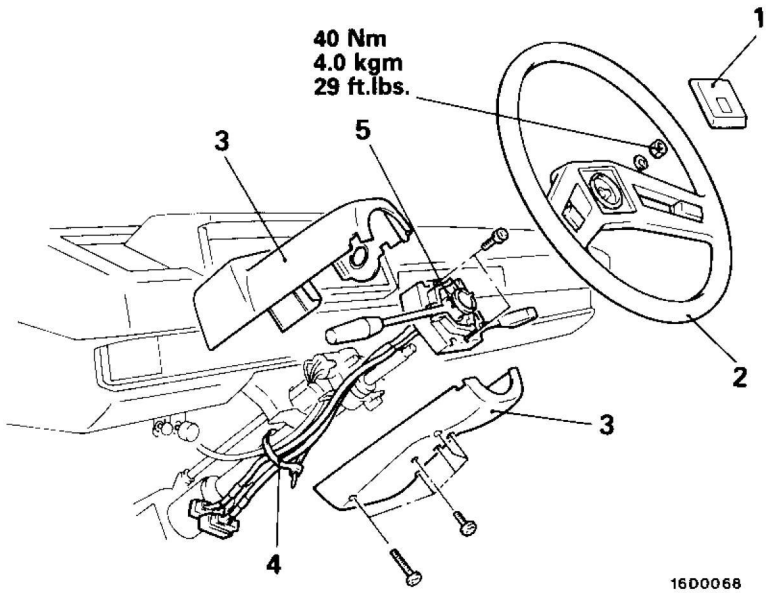
E54HF--

Tool	Number	Name	Use
	MB990803	Steering wheel puller	Removal of the steering wheel

COLUMN SWITCH

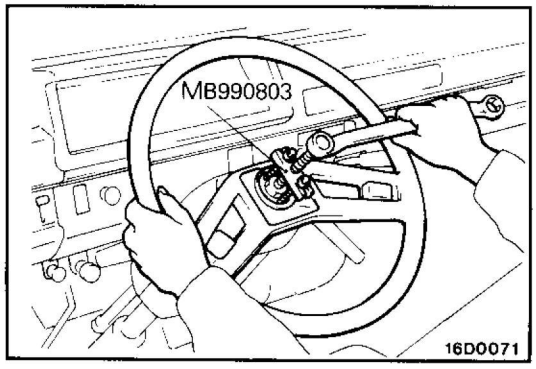
REMOVAL AND INSTALLATION

E54HH--



Removal steps

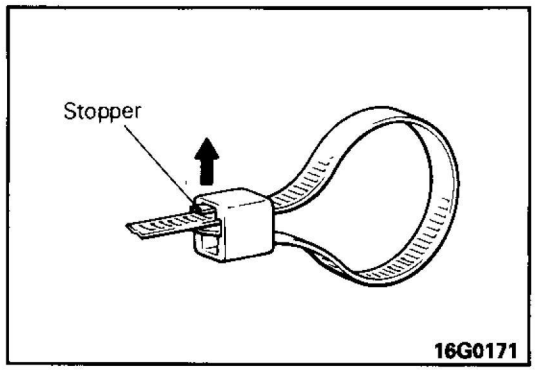
1. Horn pad
◆◆ 2. Steering wheel
3. Column cover
◆◆ 4. Cable band
5. Column switch

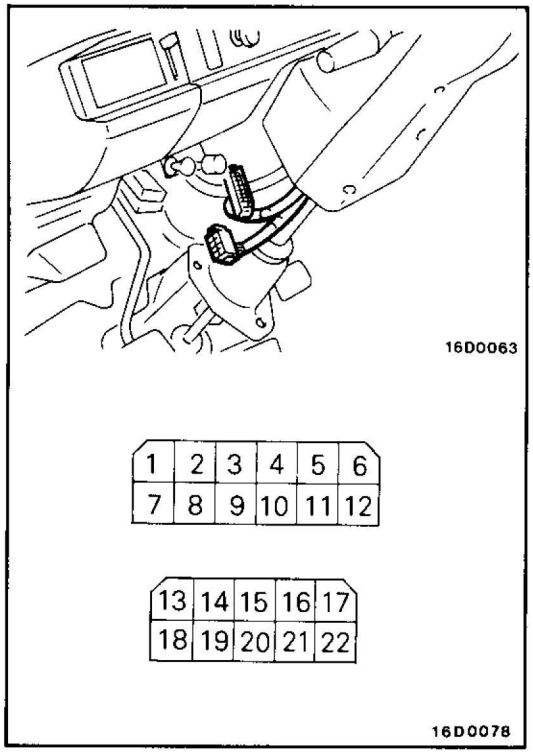


SERVICE POINTS OF REMOVAL

E54HIAF

2. REMOVAL OF STEERING WHEEL





4. REMOVAL OF CABLE BAND

Push up stopper and remove cable band.

INSPECTION E54HJAN

1. Disconnect the wiring connector from the column switch and conneect an ohmmeter to the switch side connector.
2. Operate the switch and check the continuity between the terminals.

NOTE
○—○ indicates that there is continuity between the terminals.

LIGHTING SWITCH

Switch position \ Terminal		1	7	5	14	4	10	11
Lighting switch	OFF							
	≡D	○	—	○				
	≡D	○	○	○				
Dimmer passing switch	D_1				○	○		
	D_2				○	—	○	
	P				○	—	○	○

66C003

TURN SIGNAL SWITCH/HAZARD SWITCH

L.H. Drive Vehicles

Switch position \ Terminal	2	3	9
Left	○	○	
Neutral			
Right	○	—	○

R.H. Drive Vehicles

Switch position \ Terminal				2	3	9	17	12	8
Hazard switch	OFF	Turn signal switch	Left	○	—	○	○	○	
			Neutral				○	○	
			Right	○	○		○	○	
	ON		L/N/R	○	○	○	○	—	○

WIPER AND WASEHR SWITCH

Refer to GROUP 51 – Windshield Wipers and Washer.

AUDIO SYSTEM

TROUBLESHOOTING

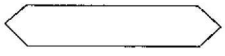
E54L0AE

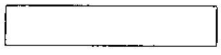
QUICK-REFERENCE TROUBLESHOOTING CHART

Items	Relevant cahrt	Problem symptom
Noise	A-1	Noise appears at certain places when traveling (AM).
	A-2	Noise appears at certain places when traveling (FM).
	A-3	Mixed with noise, only at night (AM).
	A-4	Broadcasts can be heard but both AM and FM have a lot of noise.
	A-5	There is more noise either on AM or on FM.
	A-6	Noise appears when engine is running.
	A-7	Some noise appears when there is vibration or shocks during traveling.
	A-8	Noise sometimes appears on FM during traveling.
	A-9	Ever-present noise.
Radio	B-1	No sound.
	B-2	There is noise but no reception for both AM and FM.
	B-3	No sound from AM, or no sound from FM.
	B-4	Insufficient sensitivity.
	B-5	Distortion on AM or on both AM and FM.
	B-6	Distortion on FM only.

NOTE
Refer to problem symptoms of AM radio for LW and MW radios.

Key to flow chart :


Work or inspection item.

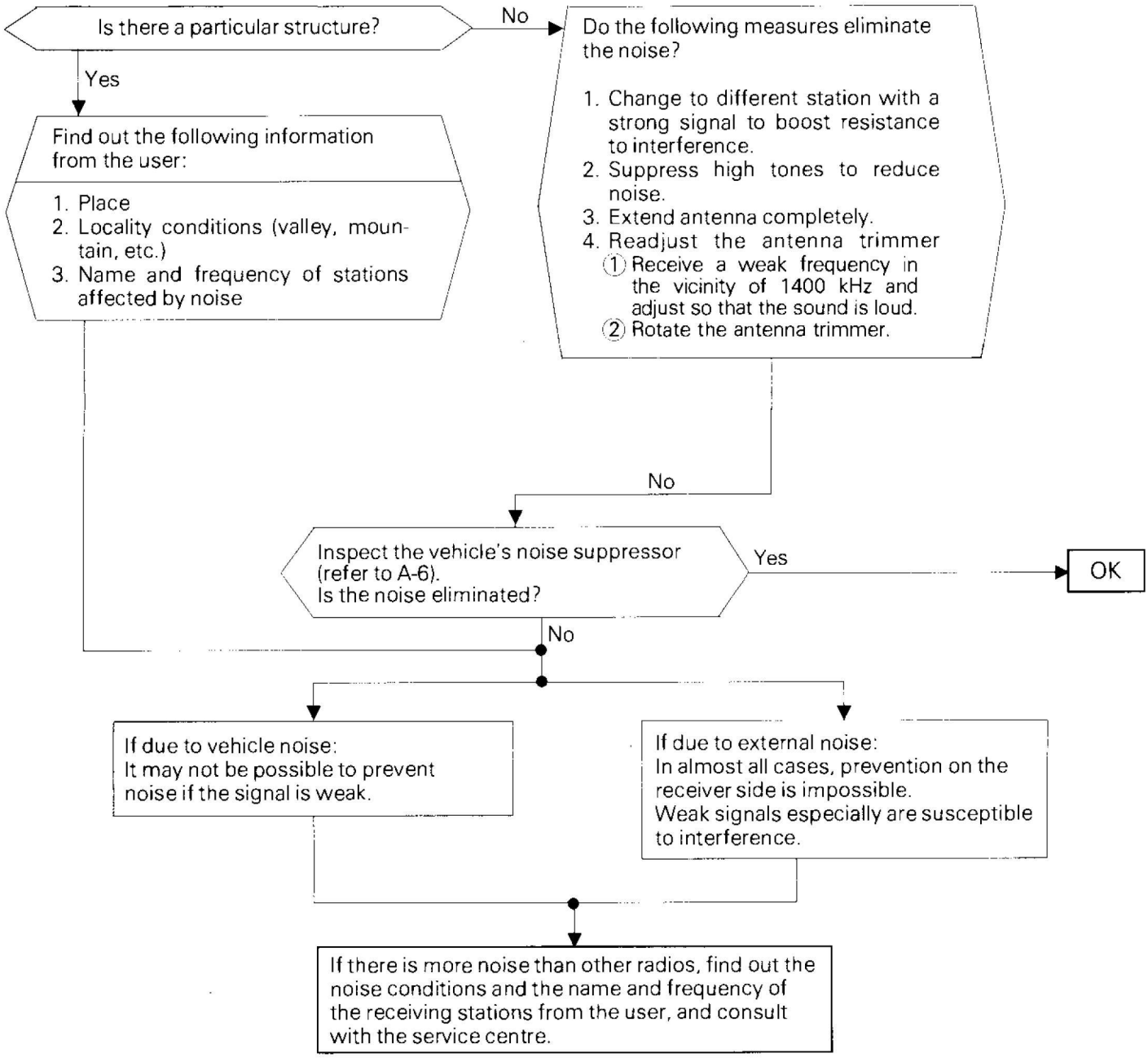

Possible cause of problem.


Description of symptom or remedy.

CHART

NOISE

A-1	Noise appears at certain places when traveling (AM).



A-2 Noise appears at certain places when traveling (FM).

Do the following measures eliminate the noise?

1. Change to a different station with a strong signal to boost resistance to interference.
2. Suppress high tones to reduce noise.
3. Extend antenna completely.

Yes → OK

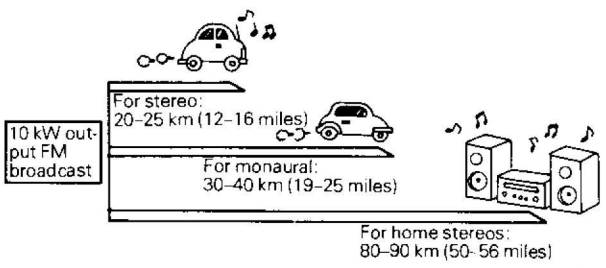
No →

If there is more noise than other radios, find out the noise conditions and the name and frequency of the receiving stations from the user, and consult with the service centre.

NOTE
FM waves have the following characteristics

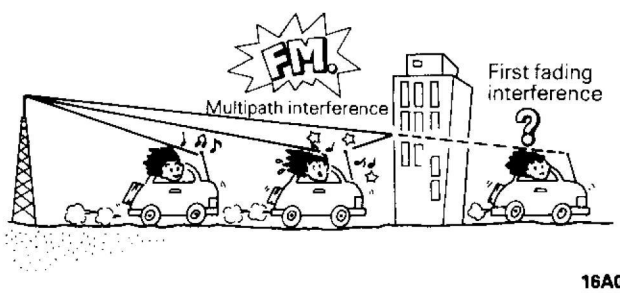
1. The signal becomes weak as the distance from the station's transmission antenna increases. Although this may vary according to the signal strength of the transmitting station and intervening geographical formations or buildings, the area of good reception is approx. 20–25 km (12–16 miles) for stereo reception, and 30–40 km (19–25 miles) for monaural reception.
2. The signal becomes weak when an area of shadow from the transmitting antenna (places where there are obstructions such as mountains or buildings between the antenna and the car), and noise will appear. <This is called first fading, and gives a steady buzzing noise.>
3. If a direct signal hits the antenna at the same time as a signal reflected by obstructions such as mountains or buildings, interference of the two signals will generate noise. During traveling, noise will appear each time the vehicle's antenna passes through this kind of obstructed area. The strength and interval of the noise varies according to the signal strength and the conditions of deflection. <This is called multipath noise, and is a repetitious buzzing.>
4. Since FM stereo transmission and reception has a weaker field than monaural, it is often accompanied by a hissing noise.

FM Broadcast Good Reception Areas



16A0663

FM Signal Characteristics and Signal Interference

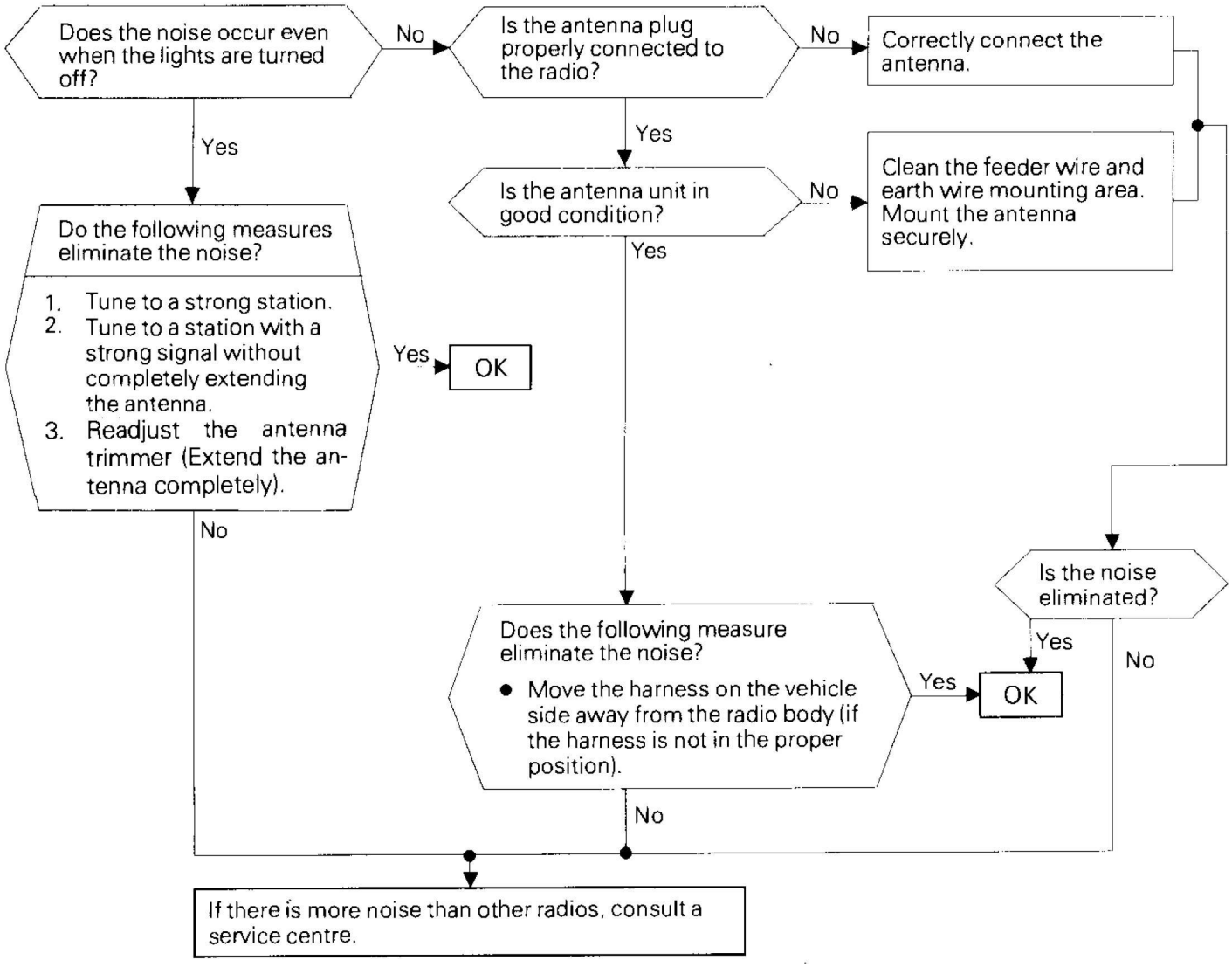


16A0664

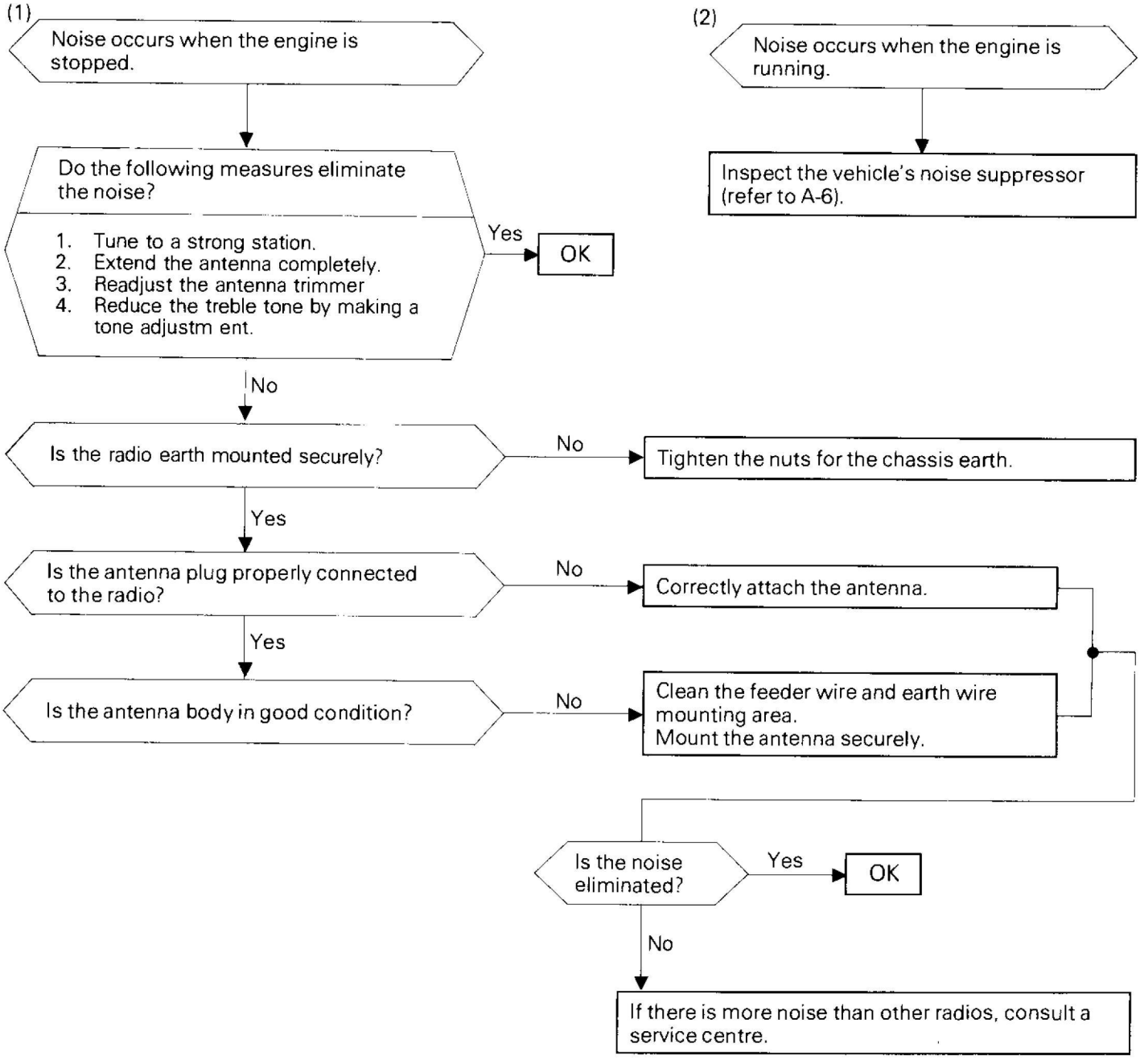
A-3 Mixed with noise, only at night (AM).

The following factors can be considered as possible causes of noise appearing at night.

1. Factors due to signal conditions:
   Due to the fact that long-distance signals are more easily received at night, even stations that are received without problem during the day may experience interference in a general worsening of reception conditions. The weaker a station is the more susceptible it is to interference, and a change to a different station or the appearance of a beating sound* may occur.
   * Beat sound: Two signals close in frequency interfere with each other, creating a repetitious high-pitched sound. This sound is generated not only by sound signals but by electrical waves as well.
2. Factors due to vehicle noise:
   Noise may be caused by the alternator. This can be checked using the procedure below;

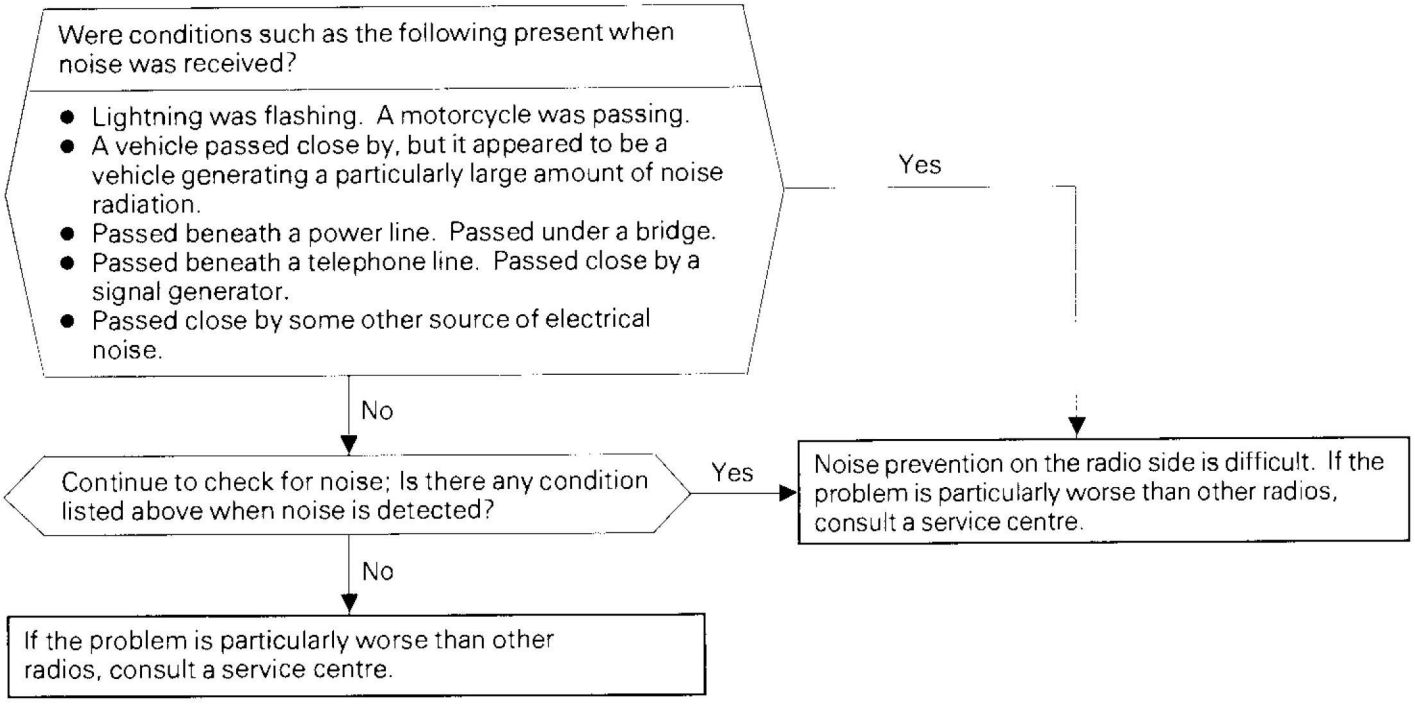


A-4 Broadcasts can be heard but both AM and FM have a lot of noise.



A-5	There is more noise either on AM or on FM.

1. There is much noise only on AM
   Due to differences in AM and FM systems, AM is more susceptible to noise interference.



2. There is much noise only on FM
   Due to differences in FM and AM systems, FM is not as susceptible as AM to interference from engines, power lines, lightning, etc. On the other hand, there are cases due to the characteristics of FM waves of noise or distortion generated by typical noise interference (first fading and multipath). (Refer to A-2.)
   <Noise (hissing) occurs in weak signal areas such as mountainous regions, but this is not due to a problem with the radio.>

A-6	Noise appears when engine is running.

Caution

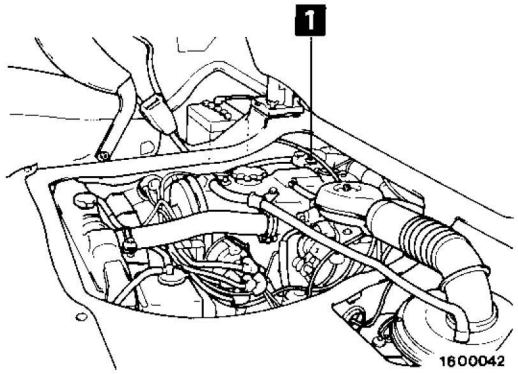
1. **Connecting a high tension cable to the noise filter may destroy the noise filter and should never be done.**
2. **Check that there is no external noise. Since failure due to this may result in misdiagnosis due to inability to identify the noise source, this operation must be performed.**
3. **Noise prevention should be performed by suppressing strong sources of noise step by step.**

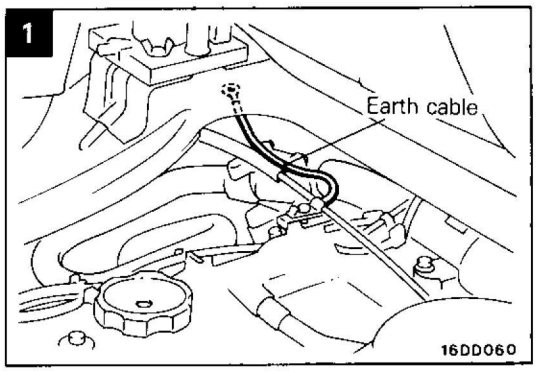
Noise type Sounds are in parentheses [ ].	Conditions	Cause	Response	
			Noise-preventing part	Installation position
Ignition noise [popping, snapping, cracking, buzzing]	• Increasing the engine speed causing the popping sound to speed up, and volume decreases. • Disappears when the ignition switch is turned to ACC.	• Mainly due to the spark plugs. • Due to the engine noise.	• Noise filter • Noise condenser • Earth cable	– – 1
Alternator noise [swishing]	• Noise becomes higher as engine speed increases, and in many cases is not present at idle speed.	• Due to ripples* contained in the voltage produced by the alternator. * The amount of fluctuation in voltage during full wave rectification of the three phase A.C. current of the alternator is called a ripple.	• Noise condenser	–
Wiper motor noise [low-pitched buzzing, electrical buzzing]	• Appears with wiper operation and increases with wiper speed. Disappears when the wiper is stopped.	• Due to the wiper motor brushes.	• Noise filter	–
Other electrical components	–	Noise may appear as electrical components become older.	Repair or replace electrical components.	
Static electricity [cracking, crinkling]	• Disappears when the vehicle is completely stopped. • Severe when the clutch is disengaged.	Occurs when parts or wiring move for some reason and contact metal parts of the body.	Return parts of wiring to their proper position.	
	• Various noises are produced depending on the body part of the vehicle.	Due to detachment from the body of the front hood, bumpers, exhaust pipe and muffler, suspension, etc.	Earth parts by bonding. Cases where the problem is not eliminated by a single response to one area are common, due to several body parts being imperfectly earthed.	

NOTE

1. Capacitor
   The capacitor (C) does not permit DC current to pass but allows AC current to pass. AC current impedance (resistance to AC current) becomes lower as the frequency becomes higher, and current flow is facilitated. These characteristics can be used to suppress noise by inserting a noise-preventing capacitor between the power line of the noise source and the earth, and allowing the noise-causing elements (AC signals or pulse signals) to be passed to earth via the body of the vehicle.
2. Coil
   Coil (L) allows DC current to pass. However, AC current impedance increases as the frequency becomes higher. This characteristic can be used to suppress noise by inserting a noise-preventing coil in the power line of the noise source and preventing the noise-causing elements from flowing out or radiating out from the line.

NOISE SUPPRESSOR MOUNTING LOCATIONS





A-7 Some noise appears when there is vibration or shocks during traveling.

Are connectors properly connected?
- No → Ensure proper connection.
- Yes ↓

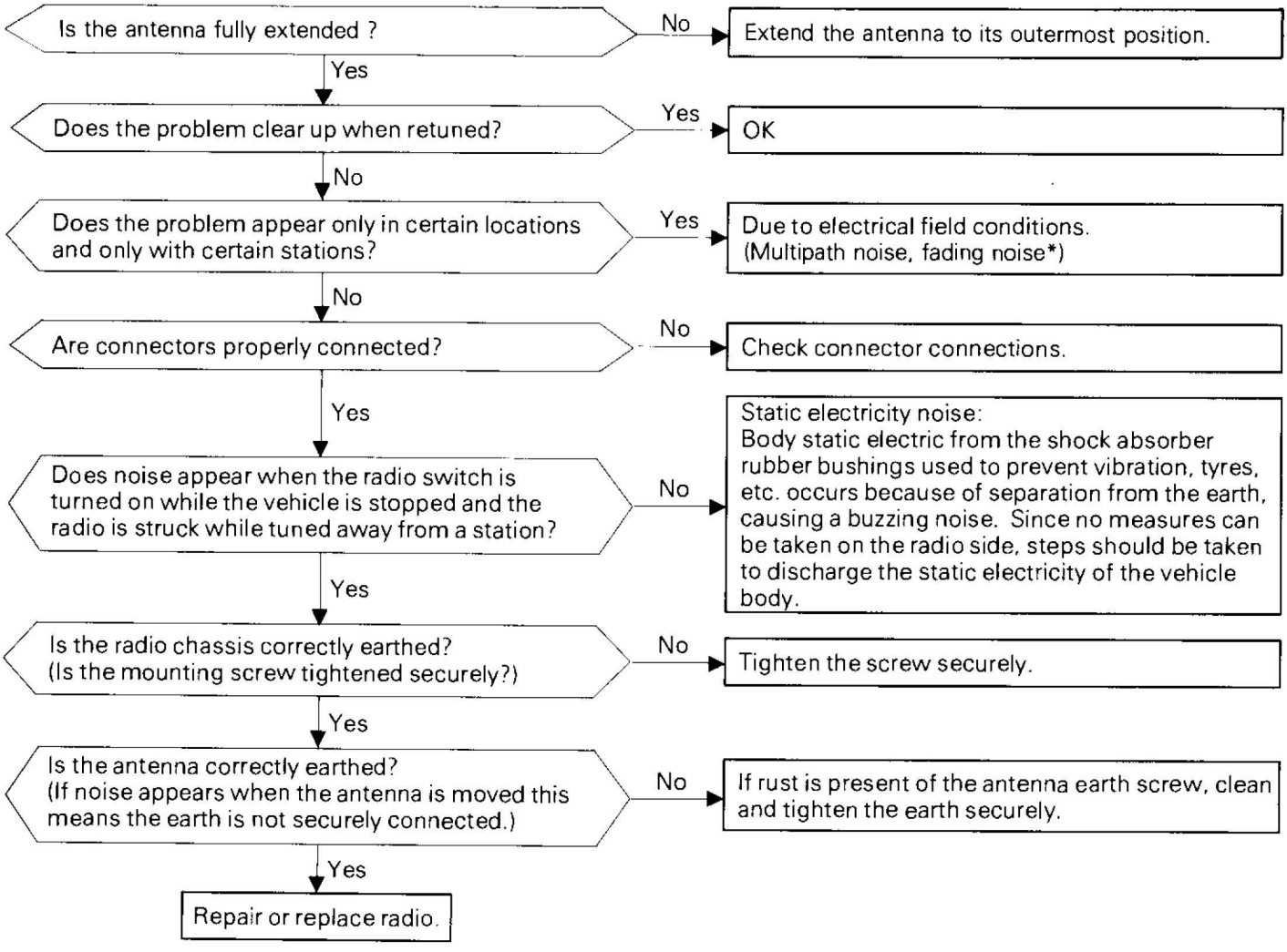
Does noise appear when the radio switch is turned on while the vehicle is stopped and the radio is struck while tuned away from a station?
- No → Static electricity noise: Body static electric from the shock absorber rubber bushings used to prevent vibration, tyres, etc. occurs because of separation from the earth, causing a buzzing noise. Since no measures can be taken on the radio side, steps should be taken to discharge the static electricity of the vehicle body.
- Yes ↓

Is the radio correctly earthed? (Is the mounting screw tightened securely?)
- No → Tighten the screw securely.
- Yes ↓

Is the antenna correctly earthed? (If noise appears when the antenna is moved this means the earth is not securely connected.)
- No → If rust is present of the antenna earth screw, clean and tighten the earth securely.
- Yes ↓

Repair or replace radio.

A-8 Noise sometimes appears on FM during traveling.



*Multipath and fading noise

Because the frequency of FM waves is extremely high, it is highly susceptible to effects from geological formations and buildings. These effects disrupt the broadcast signal and obstruct reception in several ways.

- Multipath noise
  This describes the echo that occurs when the broadcast signal is reflected by a large obstruction and enters the receiver with a slight time delay relative to the direct signal (repetitious buzzing.)
- Fading noise
  This is a buzzing noise that occurs when the broadcast beam is disrupted by obstructing objects and the signal strength fluctuates intricately within a narrow range.

A-9 Ever-present noise.

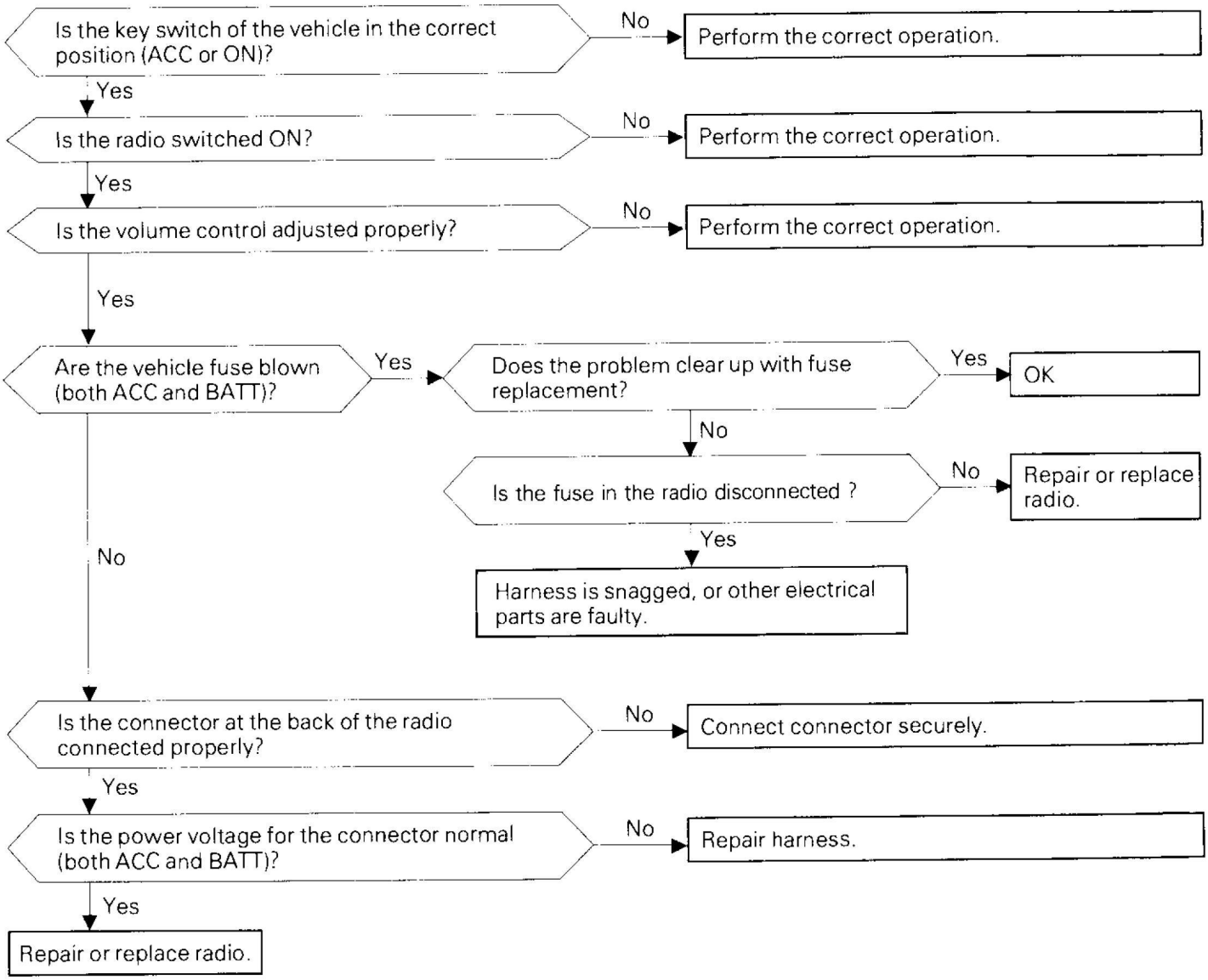
Noise is often created by the following factors, and often the radio is OK when it is checked individually.

- Traveling conditions of the vehicle
- Terrain of area traveled through
- Surrounding buildings
- Signal conditions
- Time period

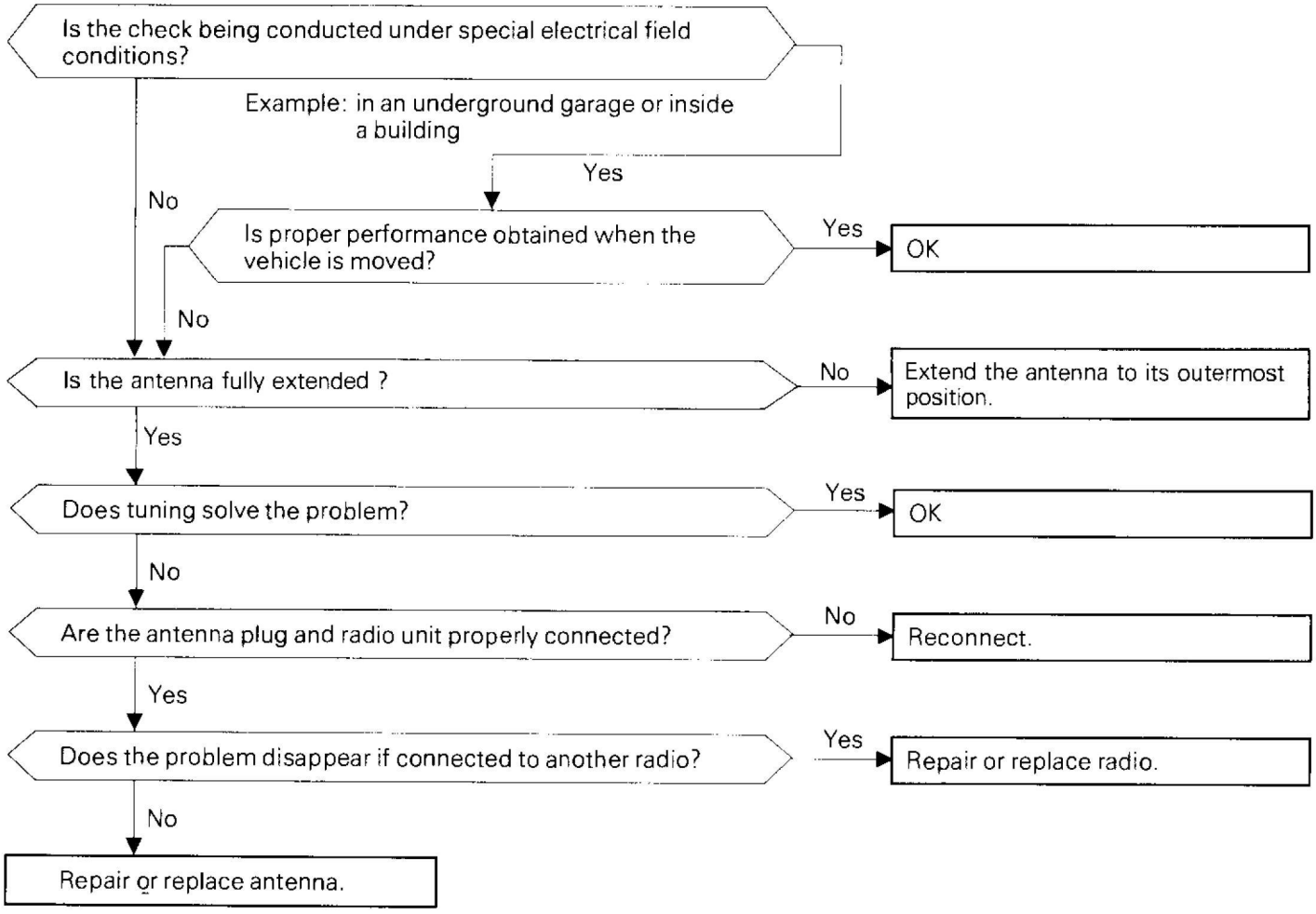
For this reason, if there are still problem with noise even after the measures described in steps A-1 to A-8 have been taken, get information on the factors listed above as well as determining whether the problem occurs with AM or FM, the station names, frequencies, etc., and contact a service centre.

RADIO

B-1	No sound.



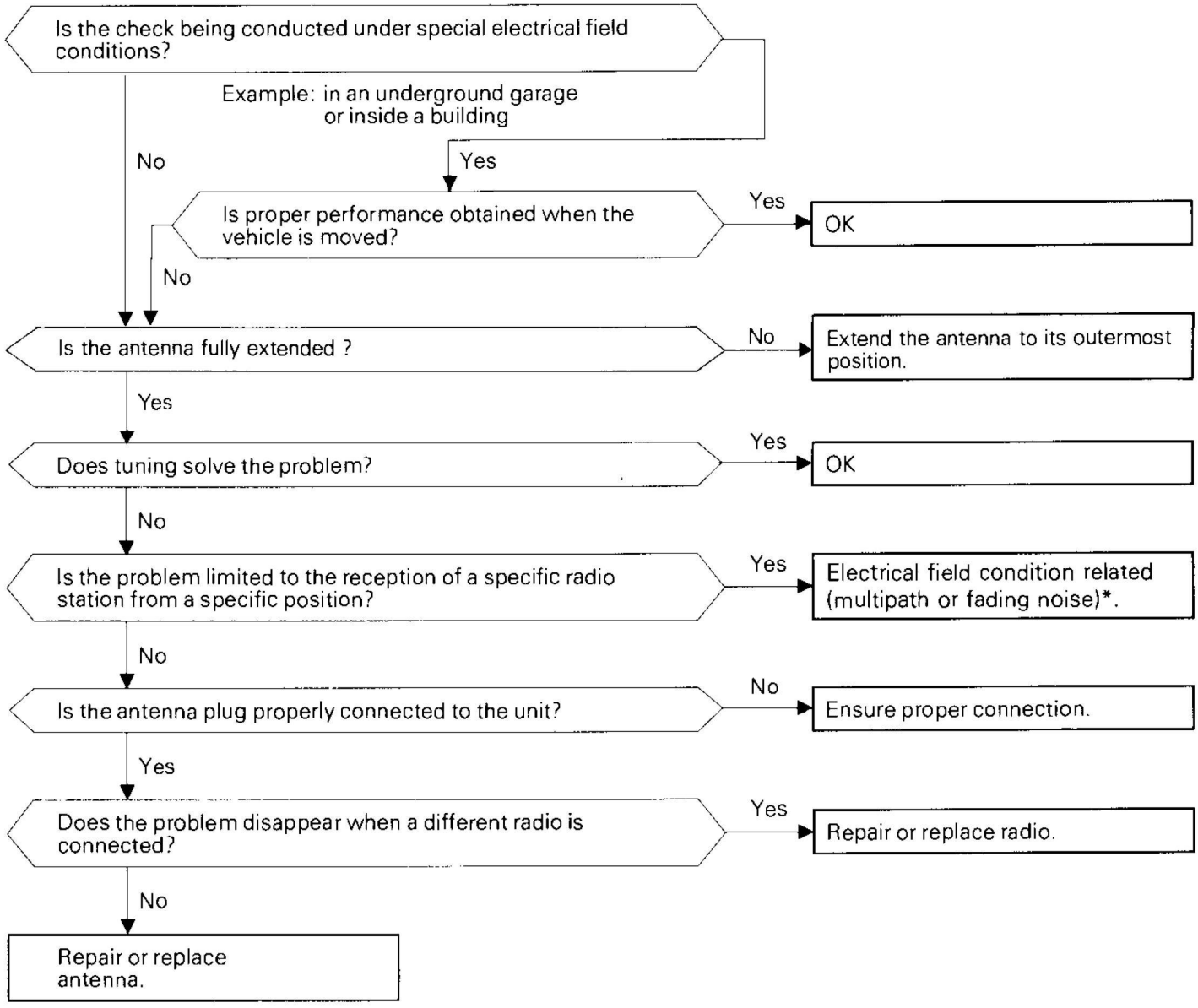
B-2 There is noise but no reception for both AM and FM.



B-3 No sound from AM, or no sound from FM.

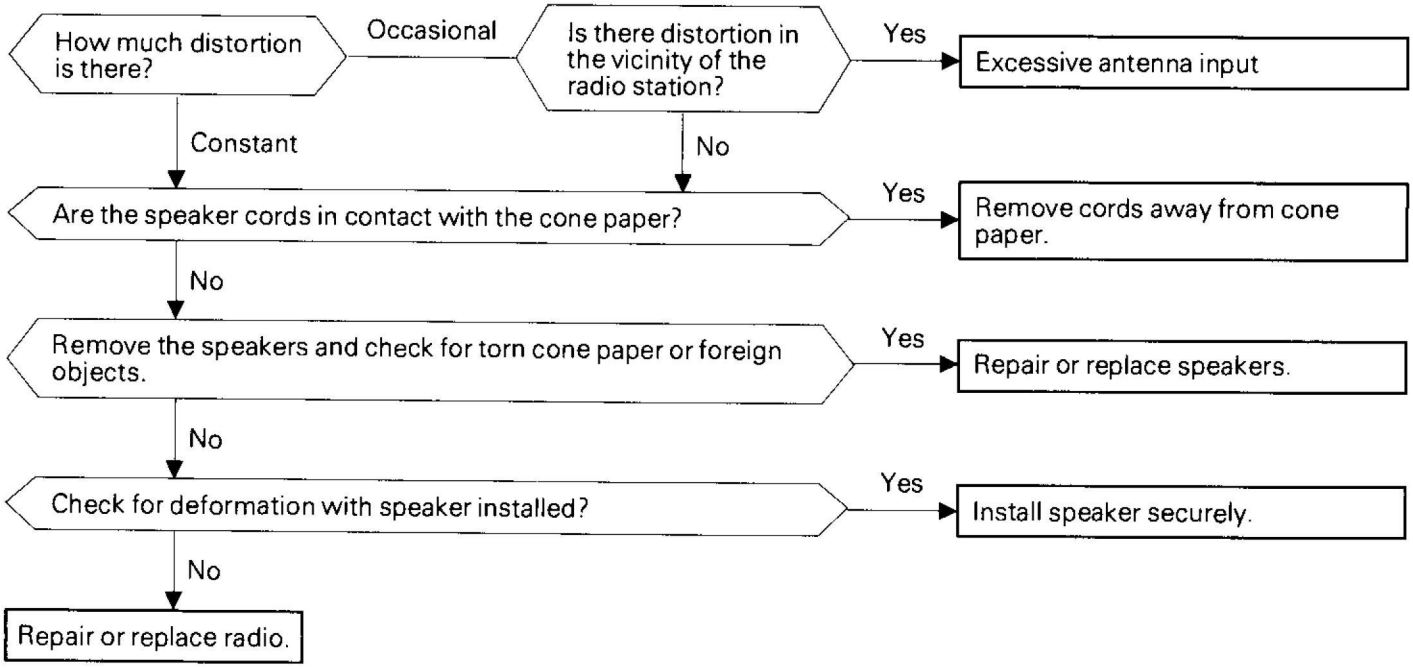
Refer to B-2.

B-4	Insufficient sensitivity.

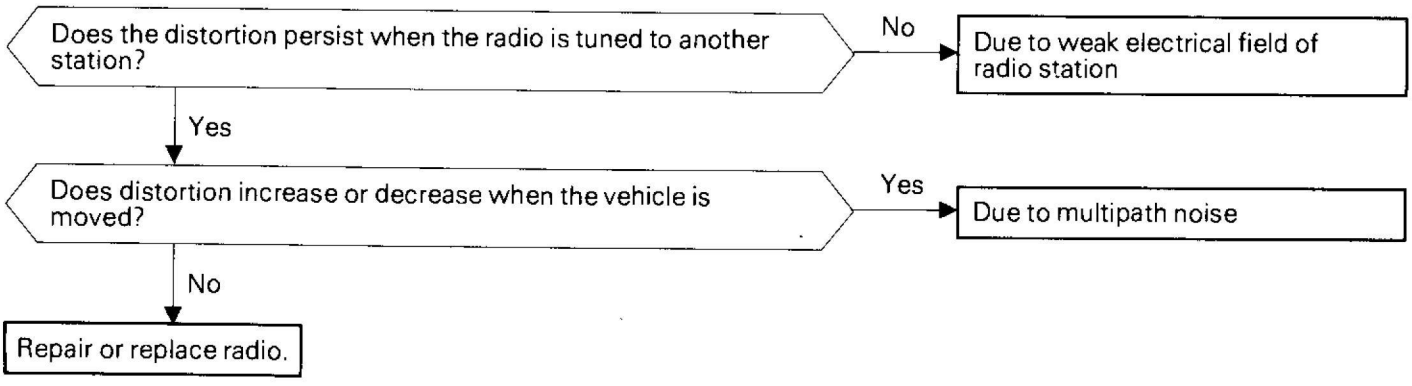


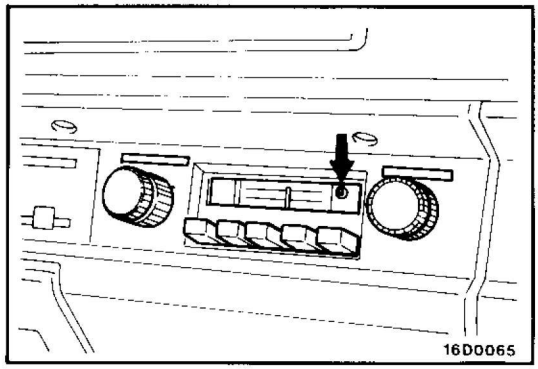
*For multipath and fading noise problems, refer to page 54-25.

B-5 Distortion on AM or on both AM and FM.



B-6 Distortion on FM only.





SERVICE ADJUSTMENT PROCEDURES

E54LGAE

ANTENNA TRIMMER

The antenna trimmer is essential for matching the antenna with the radio in order to obtain the maximum sensitivity of the radio. It must be adjusted with the antenna actually mounted on the vehicles. If the trimmer is not adjusted properly, the radio suffers from not only low sensitivity but also noises, such as external noise and noise from passing vehicles. In the following cases, therefore, adjust it as described below.

(1) When radio is installed.
(2) If antenna is replaced.
(3) If radio has low sensitivity.
(4) If radio is noisy.

TRIMMER ADJUSTMENT

Make the following preparations for adjustment.

(1) Turn the ignition key to the "ACC" position.
(2) Extend the antenna as far as it will go.
(3) Tune accurately to a station near 1,400 kHz in order to receive a broadcast in as weak an electric field as can be barely received. If there is no station near 1,400 kHz, tune to any high-frequency station (above 1,000 kHz) available. If there are two or more stations near 1,400 kHz, choose the louder one.
(4) Set the volume control to the proper volume.
(5) Set the tone control to treble position.
(6) Be sure that preparations (1) through (5) have been correctly made.
(7) Insert a screwdriver into the trimmer adjusting hole. Turn the screwdriver clockwise or counterclockwise for maximum sensitivity (maximum broadcast wave sound).
(8) If the optimum sensitivity point cannot be found, check for an antenna malfunction or a broken wire.

HEATER AND VENTILATION

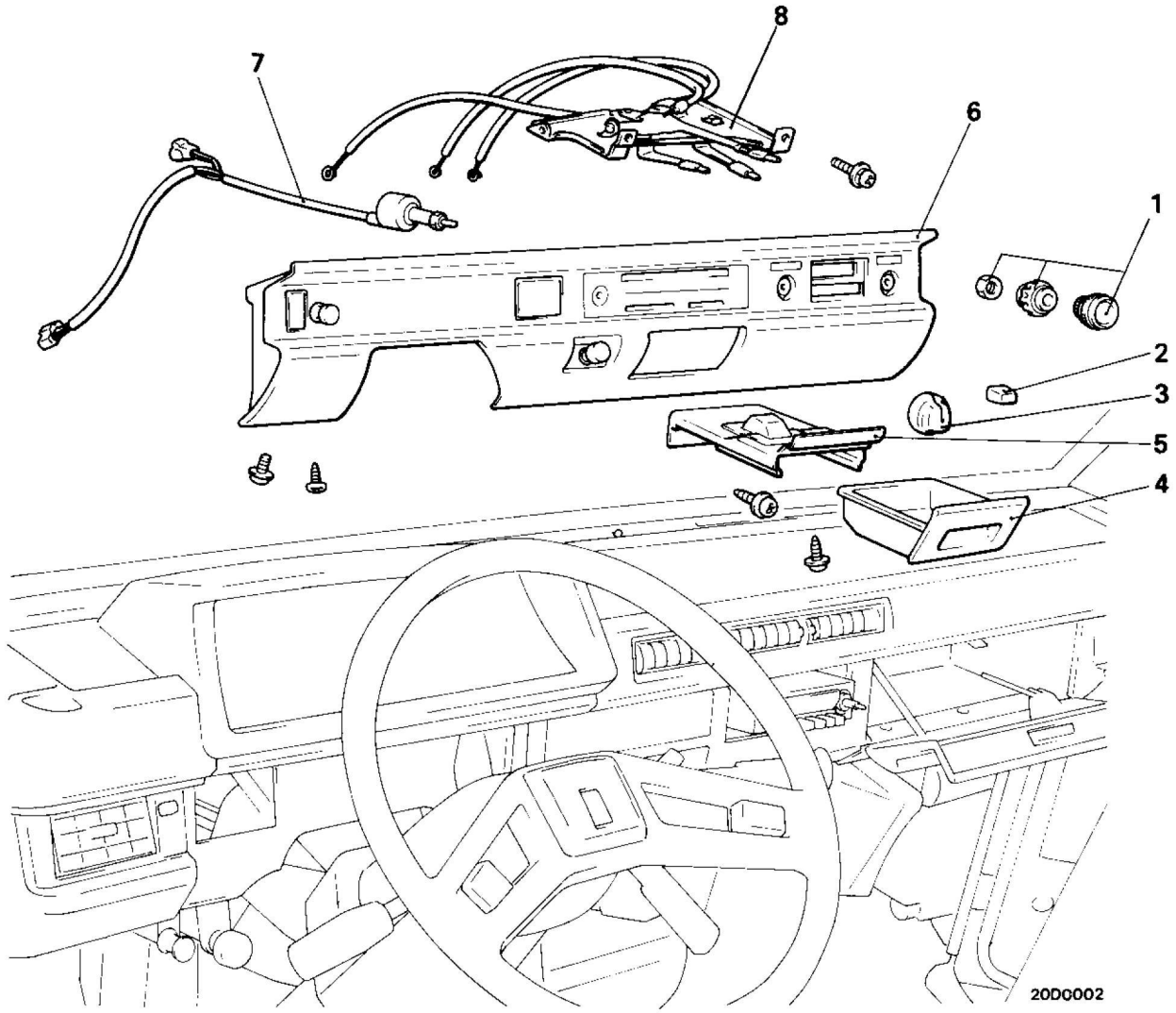
CONTENTS

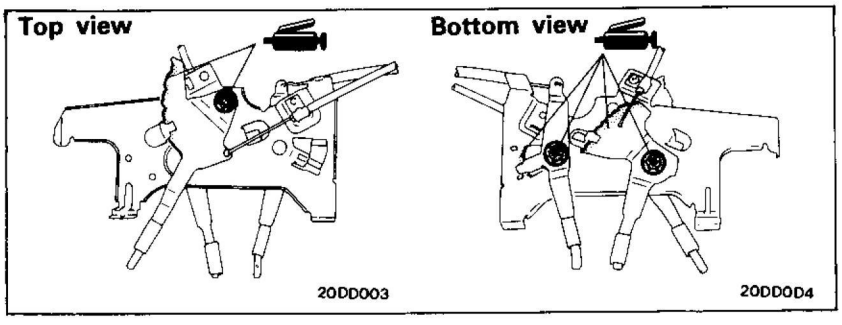
E55AA--

HEATER CONTROL

REMOVAL AND INSTALLATION

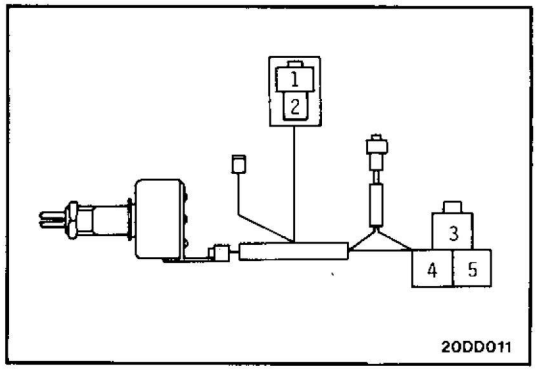
E55GA--





Removal steps

1. Radio knob
2. Heater control knob
3. Blower switch knob
4. Ashtray inner case
5. Ashtray outer case
6. Center panel
7. Blower switch
- ◆◆ 8. Heater control assembly



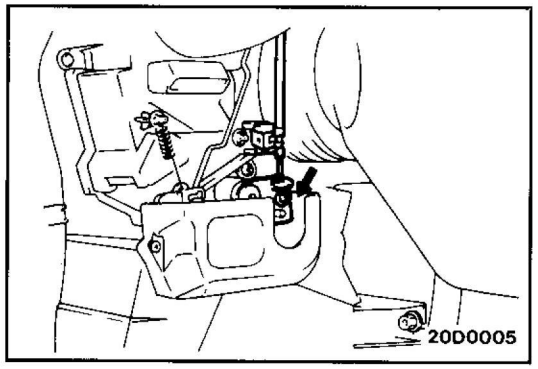
INSPECTION E55GCAJ

BLOWER SWITCH

Operate the switch and check the continuity between the terminals.

Switch position \ Terminal	2	5	3	4
OFF				
•	○—○			
●	○—		—○	
●	○—			—○

NOTE
○—○ indicates that there is continuity between the terminals.

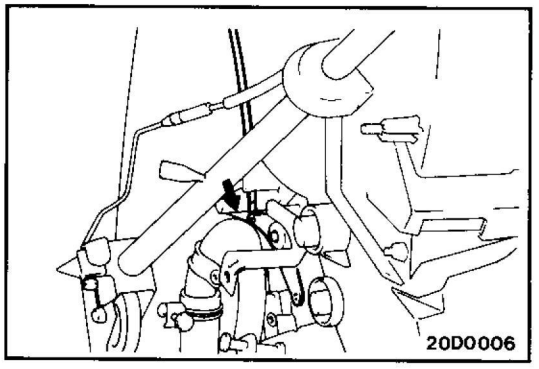


SERVICE POINTS OF INSTALLATION E55GDAL

8. INSTALLATION OF HEATER CONTROL ASSEMBLY

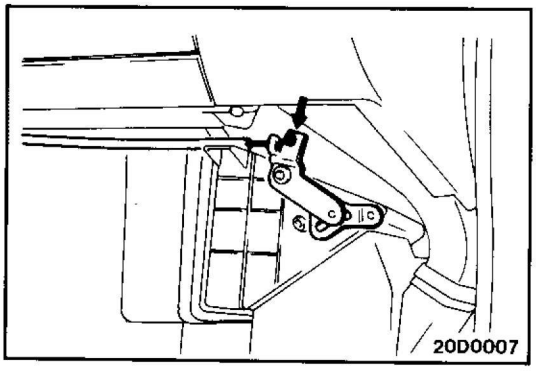
Air-outlet Changeover Control Lever Adjustment

Set the heater unit to the "DEF" mode by setting the air-outlet changeover control lever of the heater control to the "  " position. Then, adjust and secure the wire.



Warm Water Flow Control Lever Adjustment

Set the heater unit to the "OFF" mode by setting the warm water flow control lever of the heater control to the left side position. Then, adjust and secure the wire.



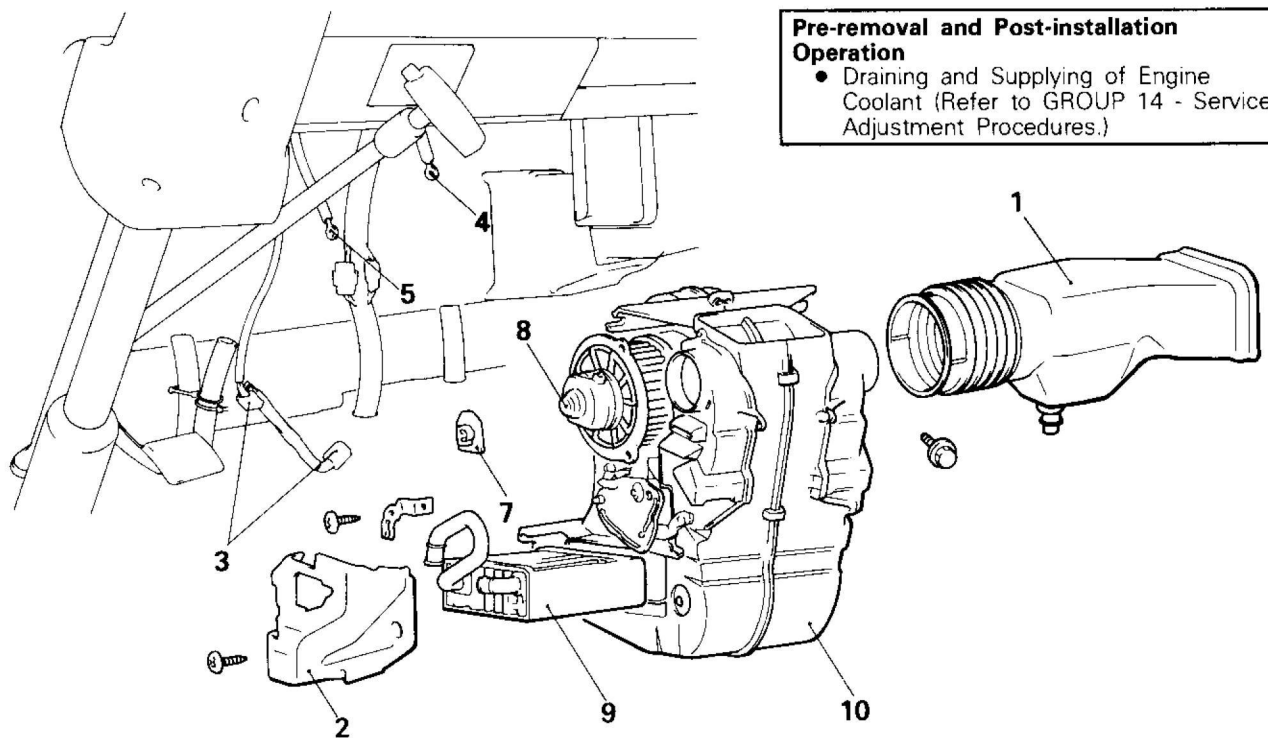
Recirculation/Fresh Air Changeover Control Lever Adjustment

Set the air flow box to the "RECIRCULATION" mode by setting the recirculation/fresh air changeover control lever of the heater control to the "  " position. Then, adjust and secure the wire.

HEATER UNIT

REMOVAL AND INSTALLATION

E55IA--

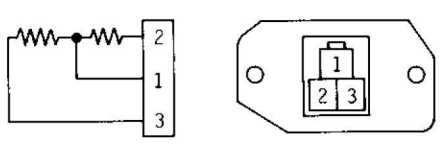


20D0008

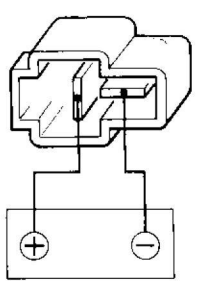
Pre-removal and Post-installation Operation
- Draining and Supplying of Engine Coolant (Refer to GROUP 14 - Service Adjustment Procedures.)

Removal steps

1. Air duct
2. Heater cover
3. Blower switch connector
4. Air-outlet changeover control wire
5. Warm water flow control wire
6. Heater unit assembly (Step 7 to 10)
7. Blower resistor
8. Fan and motor assembly
9. Heater core
10. Heater case



20DD012



20W779

INSPECTION

E55ICAH

BLOWER RESISTOR

Connect an ohmmeter to each terminal of the resistor and measure the resistance.

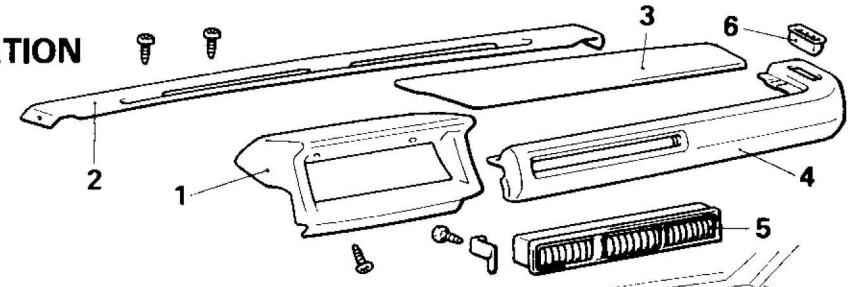
Terminal connections	Resistance Ω
②–①	2.139 – 2.461
②–③	2.604 – 2.996
①–③	0.465 – 0.535

BLOWER MOTOR

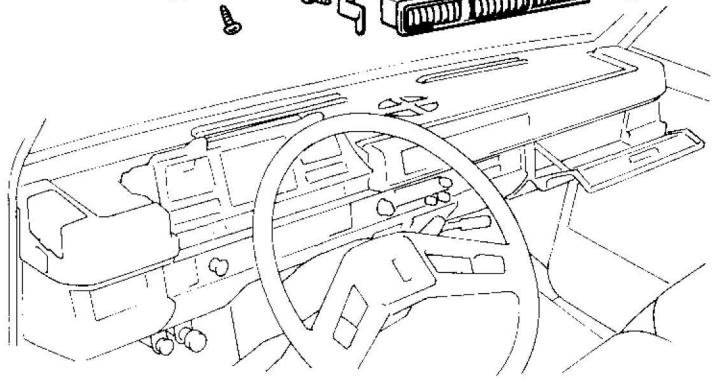
1. Connect the blower motor terminals directly to the battery and check that the blower motor operates smoothly.
2. Next, reverse the polarity and check that the blower motor operates smoothly in the reverse direction.

VENTILATORS

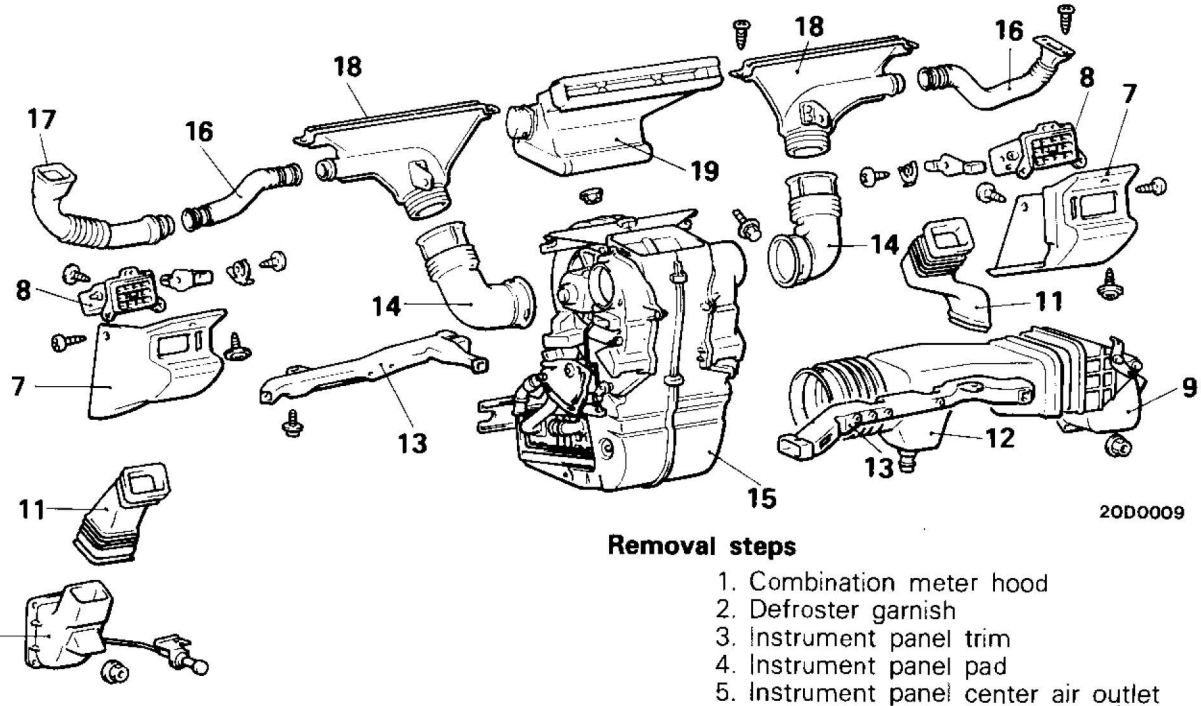
REMOVAL AND INSTALLATION



E55MA--



Pre-removal and Post-installation Operation
- Draining and Supplying of Engine Coolant (Refer to GROUP 14 - Service Adjustment Procedures.)



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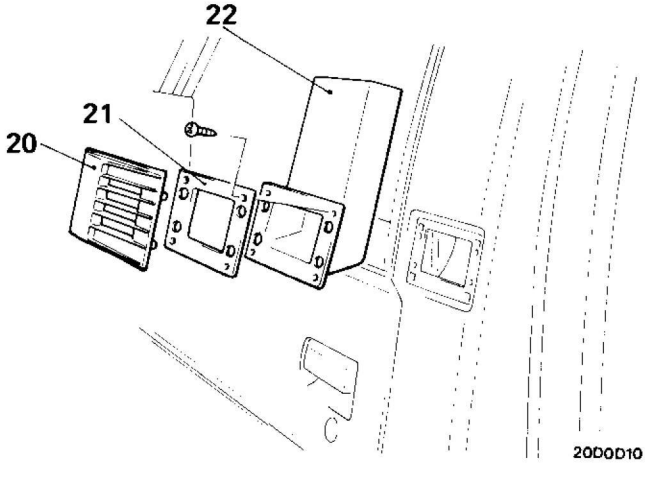

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Removal steps

1. Combination meter hood
2. Defroster garnish
3. Instrument panel trim
4. Instrument panel pad
5. Instrument panel center air outlet
6. Side demister nozzle
7. Instrument corner lower panel
8. Instrument panel side air outlet
9. Air flow box
10. Side ventilation box
11. Side ventilation duct
12. Air duct
13. Lap heater duct
14. Defroster duct
15. Heater unit (Refer to P.55-4)
16. Side defroster duct
17. Side demister duct
18. Defroster nozzle
19. Center ventilation duct
20. Air outlet garnish
21. Plate
22. Rear ventilation duct

NOTES