FRONT SUSPENSION

CONTENTS

E33AA--

SPECIFICATIONS

GENERAL SPECIFICATIONS

E33CA--

Items	Standard specifications	Optional specifications
Suspension system	Independent, double wishbone with torsion bar and telescopic shock absorber	Independent, double wishbone with torsion bar and telescopic shock absorber
Torsion bar Length × O.D. mm (in.)		
<2400, 3000 – 12VALVE, 2500D>	1277.5 × 26.2 (50.295 × 1.031)	1277.5 × 27.0 (50.295 × 1.062)
<3000 – 24VALVE, 3500, 2800D>	1307.5 × 26.4 (51.476 × 1.039)	1307.5 × 27.2 (51.476 × 1.071)
Spring constant (wheel position) N/mm (kg/mm, lbs./in.)	25 (2.5, 140)	28 (2.8, 157)
Front shock absorbers Type	Hydraulic, cylindrical, double-acting type	Hydraulic, cylindrical, double-acting type with low-pressure nitrogen gas
Max. length mm (in.)	345 (13.6)	345 (13.6)
Min. length mm (in.)	225 (8.9)	230 (9.1)
Stroke mm (in.)	115 (4.5)	115 (4.5)
Damping force [at 0.3 m/sec (0.9 ft./sec.)] Expansion N (kg, lbs.)	2,450 (245, 540)	Hard: 3,150 (315, 694) Medium: 2,350 (235, 518) Soft: 1,700 (170, 375)
Contraction N (kg, lbs.)	1,500 (150, 331)	Hard: 1,600 (160, 353) Medium: 1,250 (125, 276) Soft: 850 (85, 187)

SERVICE SPECIFICATIONS

E33CB--

Items	Specifications
Standard value Toe-in	
At the centre of tyre tread mm (in.)	3.5 ± 3.5 (0.14 ± 0.14)
At the rim of disc wheel mm (in.)	1.8 ± 1.8 (0.07 ± 0.07)
Toe-in angle (per wheel)	0°–0°17′
Toe-out angle on turn (inner wheel when outer wheel is at 20°)	21° 56′

Items		Specifications
Camber		0°40′ ± 30′
Caster		3°00′ ± 1°00′
Kingpin inclination		14°52′
Upper ball joint starting torque	Nm (kgcm, in.lbs.)	0.8–3.5 (8–35, 7–30)
Shock absorber attaching dimension	mm (in.)	
Normal shock absorber		1–2 (0.04–0.08)
Remote-controlled variable shock absorber		1.5–2.5 (0.06–0.10)
Anchor arm attaching dimension	mm (in.)	138 (5.43)
Clearance between bump stopper and bump stopper bracket	mm (in.)	21–23 (0.83–0.91)
Stabilizer attaching bolt end attaching dimension	mm (in.)	6–7 (0.24–0.28)
Stabilizer link ball joint starting torque	Nm (kgcm, in.lbs.)	1.7–3.2 (17–32, 15–28)
Limit		
Lower ball joint end play	mm (in.)	0.3 (0.012)

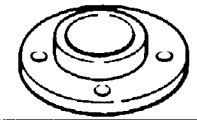
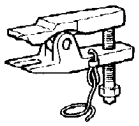
SEALANTS AND ADHESIVES

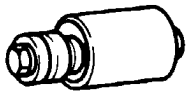
E33CE--

Items	Specified sealant
Upper ball joint dust cover to upper ball joint groove	3M ATD Part No. 8661 or equivalent

SPECIAL TOOLS

E33DA--

Tool	Number	Name	Use
	MB991034	Gauge attachment	Measurement of the wheel alignment
	MB991406	Steering linkage puller	Removal of ball joints and 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

Tool	Number	Name	Use
	MB991522	Torsion bar bushing remover and installer base	Removal and press-fitting of the lower arm bushing (A)
	MB990883	Arbor	Removal and press-fitting of the lower arm bushing (B).
	MB990957	Lower arm bushing remover and installer	

TROUBLESHOOTING
<Remote controlled variable shock absorbers>

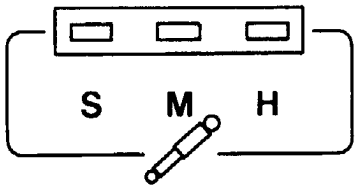
E33EAAF

SELECTION OF THE TROUBLESHOOTING CHART

Check the malfunction symptoms according to the following flow chart, and inspect according to the inspection chart.

Inspect with the engine idling

When the shock absorber control switch position is changed, do the indicators operate normally?



12E0025

No → Refer to Troubleshooting Chart [1] (malfunctions related to the indicators) (P.33-5).

Yes

When the control switch position is changed while the vehicle is being rocked up and down, does the damping force change? (Carry out at the 4 locations at front and rear, left and right)

No → Refer to Troubleshooting Chart [2] (malfunctions related to the dampers) (P.33-6).

CHART CLASSIFIED BY THE MALFUNCTION SYMPTOM

TROUBLESHOOTING [1] (MALFUNCTIONS RELATED TO THE INDICATORS)

Trouble Symptom	Inspection	Diagnosis		Probable cause
		Normal	Problem	
Even when switched to S (soft) mode, the indicator does not illuminate.	(1) Remove the shock absorber control switch connector and earth the harness connector No. 4 terminal.	The indicator illuminates	The indicator remains off	• Broken wire in fuse No.11 in the junction block • Light-emitting diode is defective • Broken harness wire between the combination meter and either the junction block or the shock absorber control switch
	(2) Remove the shock absorber control switch connector and check for continuity between switch connector terminals No. 4 and No. 2 when the switch is set to S (soft).	Continuity	No continuity	• Shock absorber control switch is defective
	(3) When the results of inspection items (1) and (2) are normal.	–	–	• Broken harness wire between the control switch and the earth • Earth connection is defective
Even when switched to M (medium) mode, the indicator does not illuminate.	(1) Remove the shock absorber control switch connector and earth the harness connector No. 5 terminal.	The indicator illuminates	The indicator remains off	• Broken wire in fuse No. 11 in the junction block • Light-emitting diode is defective • Broken harness wire between the combination meter and either the junction block or the shock absorber control switch
	(2) Remove the shock absorber control switch connector and check for continuity between switch connector terminals No. 5 and No. 2 when the switch is set to M (medium).	Continuity	No continuity	• Shock absorber control switch is defective
	(3) When the results of inspection items (1) and (2) are normal.	–	–	• Broken harness wire between the shock absorber control switch and the earth • Earth connection is defective

Trouble Symptom	Inspection	Diagnosis		Probable cause
		Normal	Problem	
Even when switched to H (hard) mode, the indicator does not illuminate.	(1) Remove the shock absorber control switch connector and earth the harness connector No. 6 terminal.	The indicator illuminates	The indicator remains off	• Broken wire in fuse No. 11 in the junction block • Light-emitting diode is defective • Broken harness wire between the combination meter and either the junction block or the shock absorber control switch
	(2) Remove the shock absorber control switch connector and check for continuity between switch connector terminals No. 6 and No. 2 when the switch is set to H (hard).	Continuity	No continuity	• Shock absorber control switch is defective
	(3) When the results of inspection items (1) and (2) are normal.	–	–	• Broken harness wire between the shock absorber control switch and the earth • Earth connection is defective

TROUBLESHOOTING CHART [2] (MALFUNCTION RELATED TO THE DAMPERS)

A Part of the damping force does not change.

NOTE
When the front or rear left and right mutual damping forces do not change, the problem is probably a broken harness wire between the actuator and either the shock absorber control unit or the shock absorber control switch, so the harness should be checked first.

Swap the actuators in the left and right wheels and check that the damping force is changed over by operation of the shock absorber control switch.

Has the malfunction disappeared?

No (The malfunction appears at the other wheel) → Actuator is defective

No → The malfunction remains on the initial wheel.

Remove the malfunctioning actuator.

Does the control rod inside the piston rod turn easily?

No → Shock absorber assembly is defective

Yes → Broken harness wire or short between the actuator and either the shock absorber control unit or the shock absorber control switch

B Damping force for all wheels does not change over.

Remove the shock absorber control unit connector.

Yes ↓

When the ignition switch is turned to ON, does a voltage of approximately 12 V show between the harness connector terminal No. 4 of the shock absorber control unit and the earth?

No → Broken harness wire between the shock absorber control unit and the junction block

Yes ↓

Is there continuity between the harness connector No. 1 terminal of the shock absorber control unit and the earth?

No → Broken harness wire between the shock absorber control unit and the earth

Yes ↓

Is there normal continuity between the shock absorber control unit harness connector terminal No. 3 and the earth, No. 7 and the earth, and No. 2 and the earth?

<When normal>

Terminal \ Mode	S (soft)	M (medium)	H (hard)
No. 3	Continuity	No continuity	No continuity
No. 7	No continuity	Continuity	No continuity
No. 2	No continuity	No continuity	Continuity

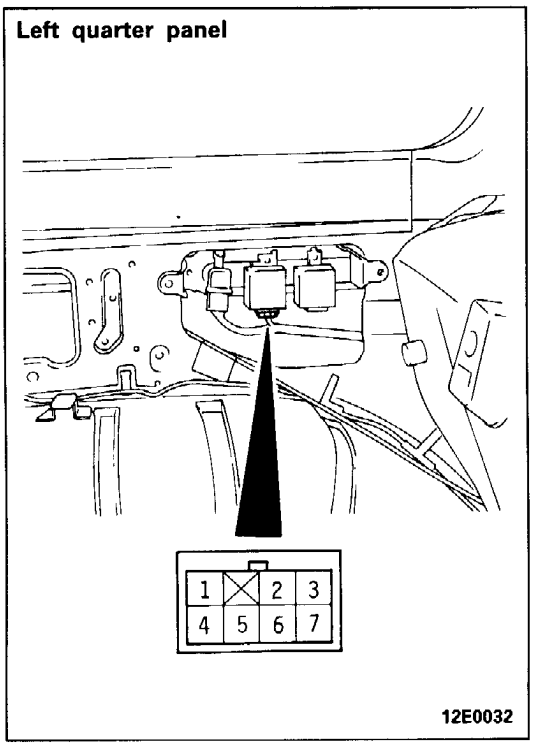
No → Broken harness wire between the shcok absorber control unit and the shcok absorber control switch

Yes ↓

When 12 V is applied to the harness connector No. 6 terminal of the shock absorber control unit, does the damping force change over?

No → Broken harness wire or short between the actuator and either the shock absorber control unit or the shock absorber control switch

Yes → Shock absorber control unit connection is defective, or the shock absorber control unit is defective



SHOCK ABSORBER CONTROL UNIT SIGNAL CIRCUIT INSPECTION

(1) Remove the shock absorber control unit connector, and inspect the harness-side connector.

BV: Battery Voltage

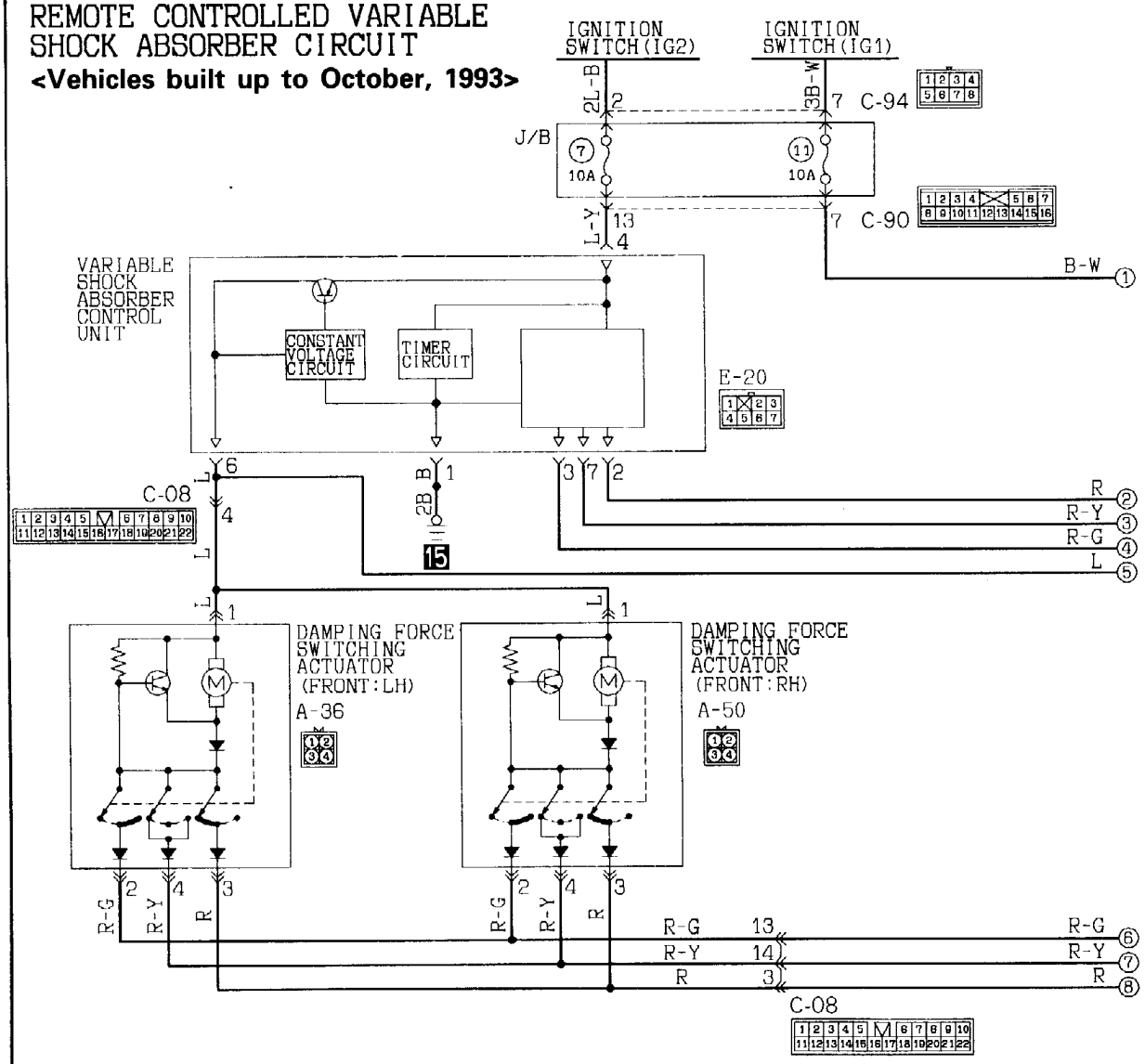
Terminal No.	Connection destination	Measure-ment	Tester connection	Check condition		Standard
1	Earth	Continuity	1 – Earth	Constantly		Continuity
2	Shcok absorber control switch (Hard)	Continuity	2 – Earth	Shcok absorber control switch condition	S (Soft mode)	No continuity
					M (Medium mode)	No continuity
					H (Hard mode)	Continuity
7	Shcok absorber control switch (Medium)	Continuity	7 – Earth	Shcok absorber control switch condition	S (Soft mode)	No continuity
					M (Medium mode)	Continuity
					H (Hard mode)	No continuity
3	Shcok absorber control switch (Soft)	Continuity	3 – Earth	Shcok absorber control switch condition	S (Soft mode)	Continuity
					M (Medium mode)	No continuity
					H (Hard mode)	No continuity
4	Power supply	Voltage	4 – Earth	Ignition switch	OFF	0 V
					ON	BV

(2) Connect the shock absorber control unit and inspect.

Terminal No.	Connection destination	Measure-ment	Tester connection	Check condition	Standard
6	Shock absorber actuator	Voltage	6 – Earth	5 seconds after operating the shock absorber control switch	Approx. 12 V
				Conditions except for above	0 V

REMOTE CONTROLLED VARIABLE SHOCK ABSORBER CIRCUIT

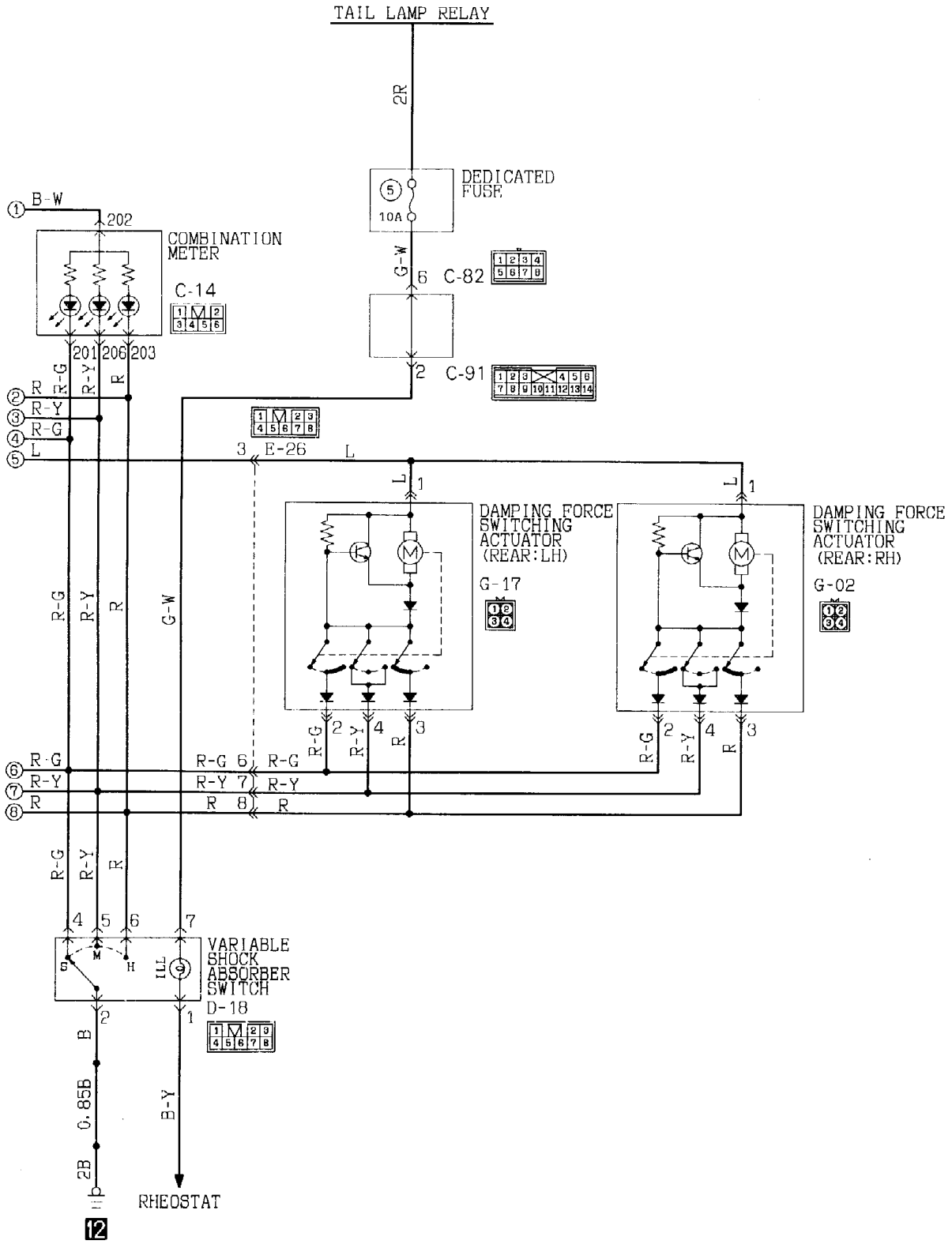
<Vehicles built up to October, 1993>



Wire colour code

B:Black	LG:Light green	G:Green	L:Blue	W:White	Y:Yellow	SB:Sky blue
BR:Brown	O:Orange	GR:Gray	R:Red	P:Pink	V:Violet	

KX35-AC-Q1504-EC


TAIL LAMP RELAY
2R
DEDICATED FUSE
10A
G-W
6 C-82
2 C-91
B-W
202
COMBINATION METER
C-14
201 206 203
R
R-G
R-Y
L
3 E-26
DAMPING FORCE SWITCHING ACTUATOR (REAR:LH)
G-17
DAMPING FORCE SWITCHING ACTUATOR (REAR:RH)
G-02
R-G 6
R-Y 7
R 8
VARIABLE SHOCK ABSORBER SWITCH
D-18
B
0.85B
2B
B-Y
RHEOSTAT
12

REMOTE CONTROLLED VARIABLE SHOCK ABSORBER CIRCUIT

<Vehicles built from November, 1993>

Refer to REMOTE CONTROLLED VARIABLE SHOCK ABSORBER SYSTEM of '94 PAJERO Workshop Manual Electrical Wiring (Pub No. PHJE 9026).

NOTES

SERVICE ADJUSTMENT PROCEDURES

FRONT WHEEL ALIGNMENT INSPECTION AND ADJUSTMENT

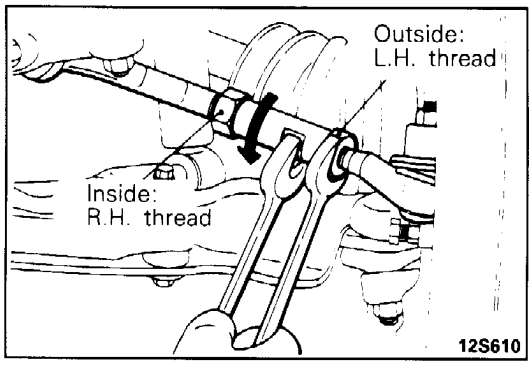
E33FAAW

TOE-IN

1. Measure the toe-in.

Standard value:

At the centre of tyre tread	**3.5 ± 3.5 mm (0.14 ± 0.14 in.)**
At the rim of disc wheel	**1.8 ± 1.8 mm (0.07 ± 0.07 in.)**
Toe angle (per wheel)	**0°–0°17′**



2. If the toe-in is not within the standard value, adjust the toe-in by turning the left and right tie rod turnbuckles by the same amount (in opposite directions).

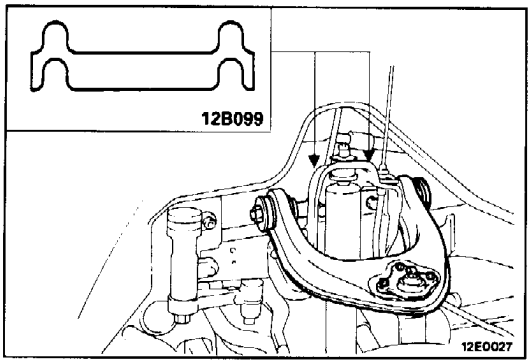
Caution
The difference between the left and right tie rods shall not exceed 5 mm (0.2 in.).

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.)

TOE-OUT ANGLE ON TURNS

To check the steering linkage, especially after the vehicle has been involved in an accident or if an accident is presumed, it is advisable to check the toe-out angle on turns in addition to the wheel alignment.
Conduct this test on the left turn as well as on the right turn.

Standard value: **21°56′ (inner wheel when outer wheel at 20°)**



CAMBER

Standard value:
CAMBER
0°40′ ± 30′
(Left/right deviation within 30′)

1. Make adjustment of the camber by increasing or decreasing the thickness of the adjusting shim provided between the upper arm shaft and the crossmember.

NOTE
- Standard thickness of the shim is 4 mm (0.16 in.).
- Number of shims is three or less.

Camber adjustment shim (yellow plating)

Part number	Thinkness mm (in.)
MB176288 MB176289	1.0 (0.039) 2.0 (0.079)

CASTER

Standard value: 3°00′±1°
(Left/right deviation within 30′)

NOTE
1. Caster is pre-set at the factory and cannot be adjusted.
2. If caster is not within the standard value, replace bent or damaged parts.

KINGPIN INCLINATION

Standard value: 14°52′

SIDE SLIP

Measure the side slip with a side slip tester.

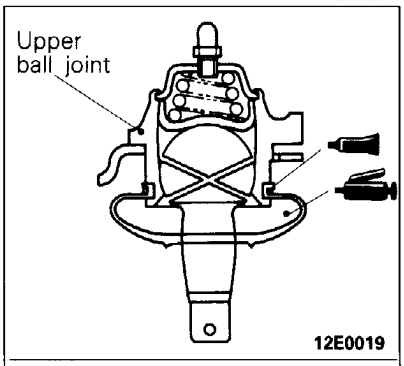
Standard value: 0±3 mm (0±0.12 in.)

SHOCK ABSORBER AND UPPER ARM

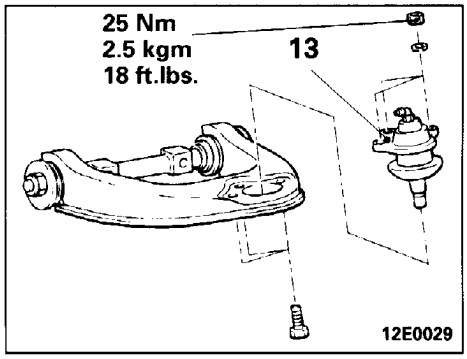
E33GA--

REMOVAL AND INSTALLATION

Post-installation Operation
- Inspection and Adjustment of Wheel Alignment (Refer to P.33-12.)
- Brake line Bleeding (Refer to GROUP 35 – Service Adjustment Procedures.)



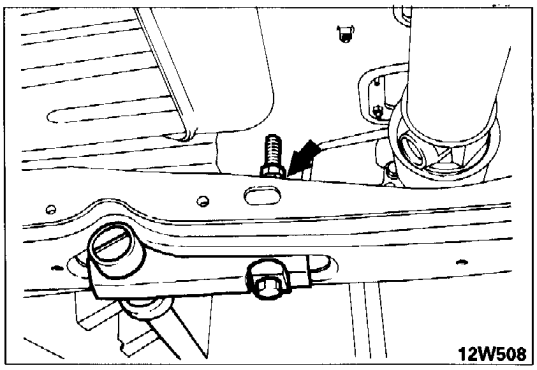
Sealant: 3M ATD Part No. 8661 or equivalent



Shock absorber removal steps
- ◆◆ 1. Actuator (Vehicles with remote controlled variable shock absorbers)
- ◆◆ 2. Shock absorber

Upper arm removal steps

Adjustment of clearance between bump stopper and bump stopper bracket (Refer to P.33-20).
- ◆◆ 3. Anchor arm assembly adjusting nut
- 4. Hose clip
- 5. Brake hose connection
- ◆◆ 6. Connection for upper ball joint and knuckle
- 7. Brake hose support
- 8. Rebound stopper
- 9. Speed sensor bracket (Vehicles with A.B.S.)
- 10. Rebound stopper
- 11. Shim
- ◆◆ 12. Upper arm
- 13. Upper ball joint



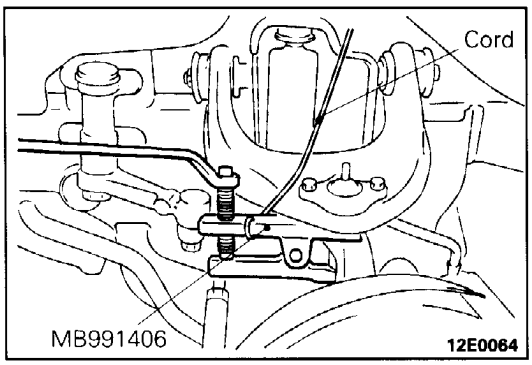
SERVICE POINTS OF REMOVAL

E33GBAE

3. LOOSENING OF ANCHOR ARM ASSEMBLY ADJUSTING NUT

Loosen the anchor bolt of the torsion bar all the way.

NOTE
When the anchor arm assembly adjusting nut is loosened, use a jack to support the lower arm of the side to be loosened, thus the work easier.

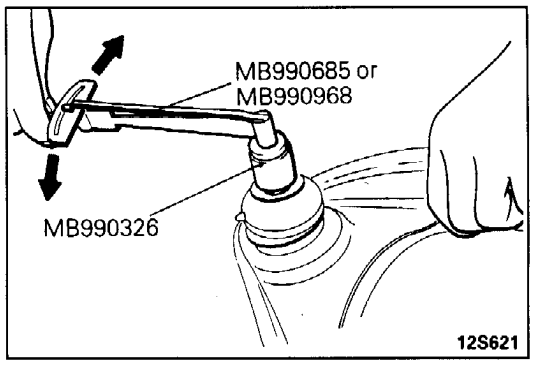


6. DISCONNECTION OF UPPER BALL JOINT AND KNUCKLE

Using the special tool, disconnect the upper arm ball joint from the knuckle.

Caution

1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**



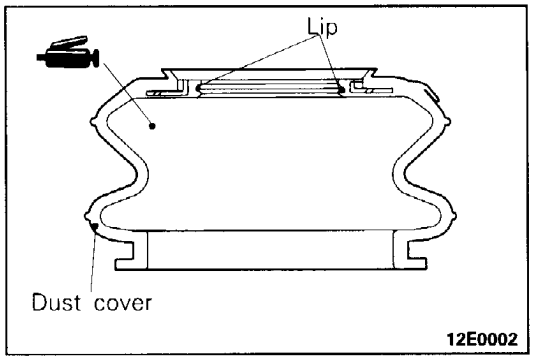
INSPECTION E33GCAE

UPPER BALL JOINT STARTING TORQUE CHECK

1. Measure the upper ball joint starting torque by using special tools.

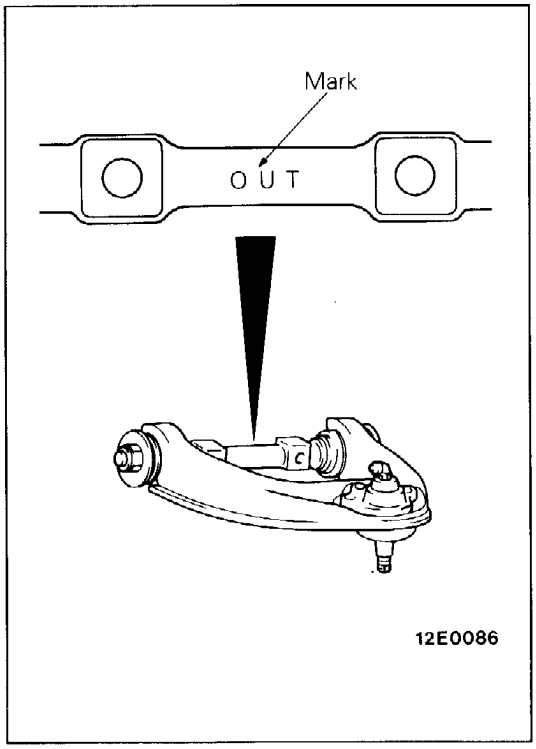
   Standard value: 0.8–3.5 Nm (8–35 kgcm, 7–30 in.lbs.)

2. If the upper ball joint starting torque is out of specification, replace the upper ball joint.



BALL JOINT DUST COVER REPLACEMENT

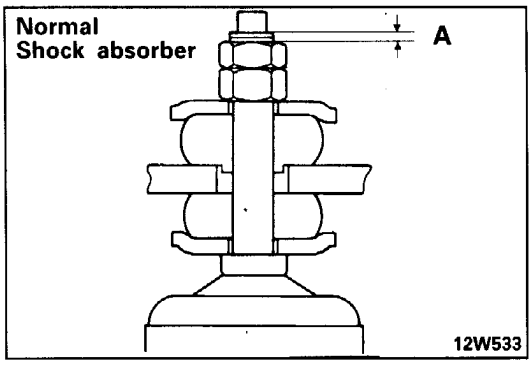
1. Remove the dust cover.
2. Apply multipurpose grease to both the interior of dust cover and the upper ball joint.

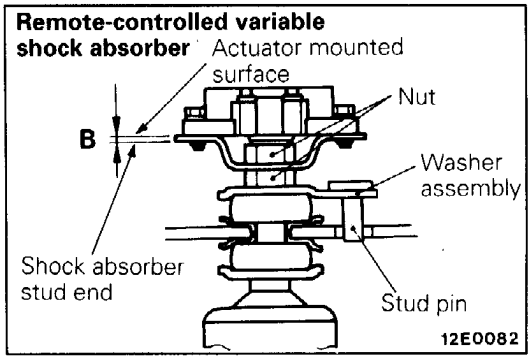


SERVICE POINT OF INSTALLATION E33GEAF

12. INSTALLATION OF UPPER ARM <Vehicles built from November, 1993>

Install the upper arm so that the OUT mark on the upper arm shaft is facing towards the outside of the vehicle.





2. INSTALLATION OF SHOCK ABSORBER/1. ACTUATOR (VEHICLES WITH REMOTE-CONTROLLED VARIABLE SHOCK ABSORBER)

Tighten the shock absorber installation nut so that the dimension shown in the figure (A and B) is the standard value.

Standard value A: 1–2 mm (0.04–0.08 in.)
B: 1.5–2.5 mm (0.06–0.10 in.)

Caution
When tightening the nut, be careful not to bend the stud pin of the washer assembly.

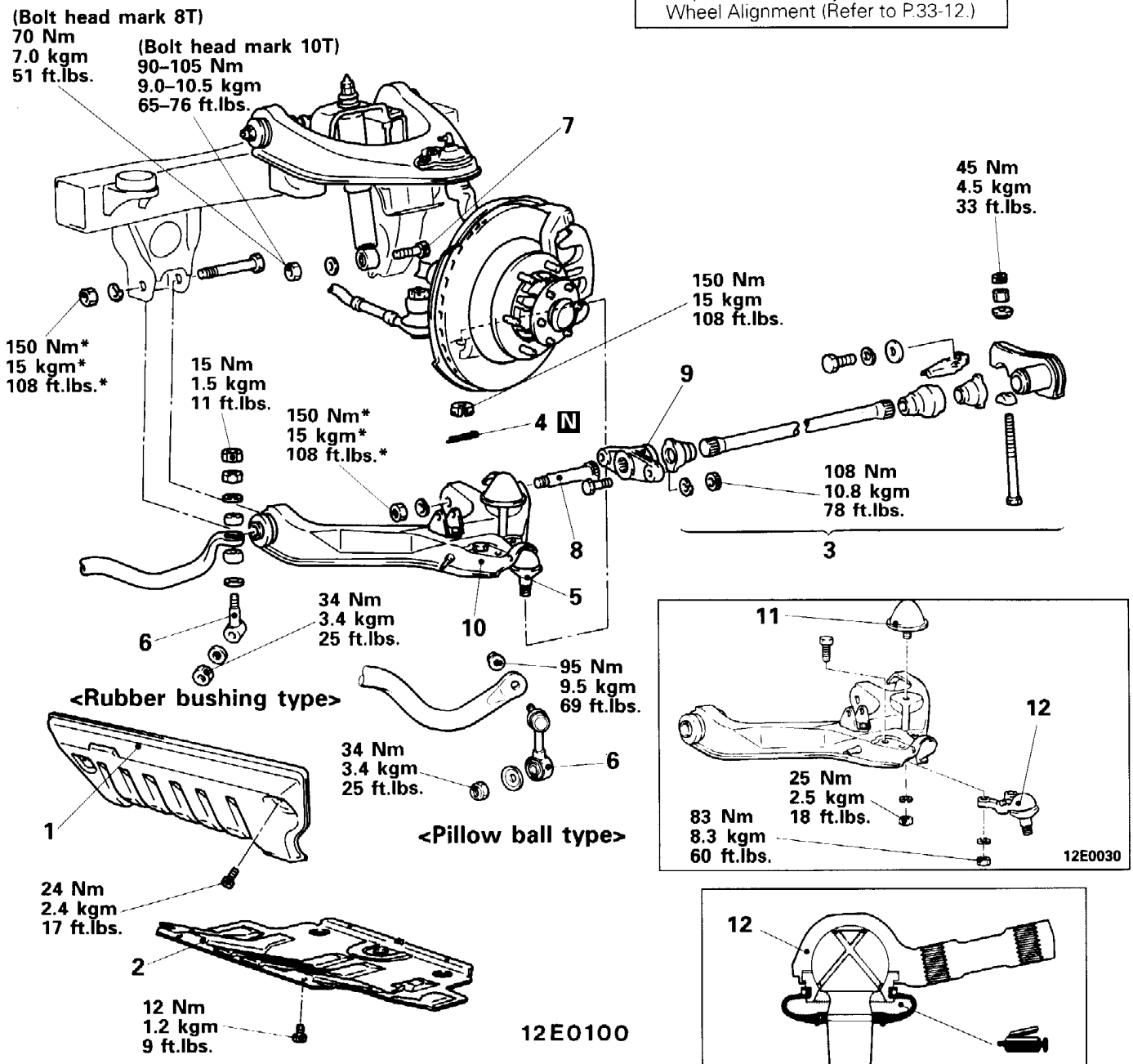
NOTES

LOWER ARM

E33HA--

REMOVAL AND INSTALLATION

Post-installation Operation
- Inspection and Adjustment of Wheel Alignment (Refer to P.33-12.)

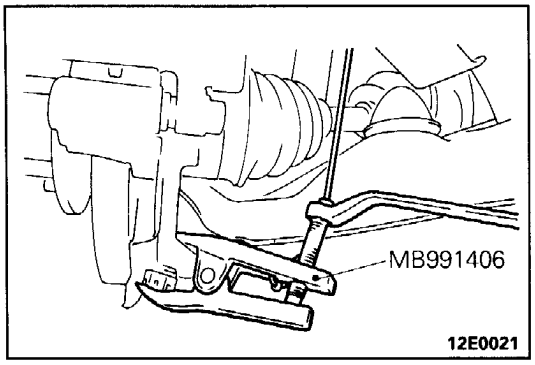


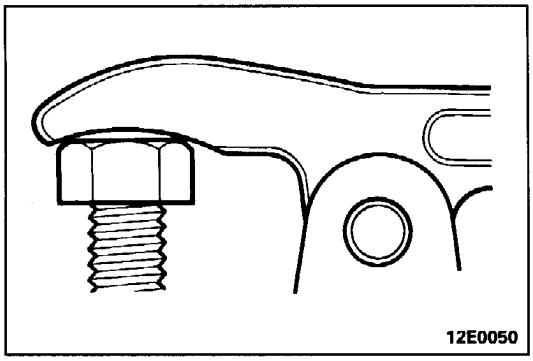
Removal steps

1. Under skid plate
2. Under cover
   Adjustment of clearance between bump stopper and bump stopper bracket (Refer to P.33-20.)
3. Torsion bar (Refer to P.33-19.)
4. Split pin
5. ◀▶ Connection for lower ball joint and knuckle
6. ▶◀ Stabilizer link assembly (Refer to P.33-21.)
7. Shock absorber mounting bolts
8. Lower arm shaft
9. Anchor arm B
10. Lower arm
11. Bump stopper
12. Lower ball joint

Caution

***: Indicates part which should be temporarily tightened, and then fully tightened with the vehicle on the ground in the unladen condition.**





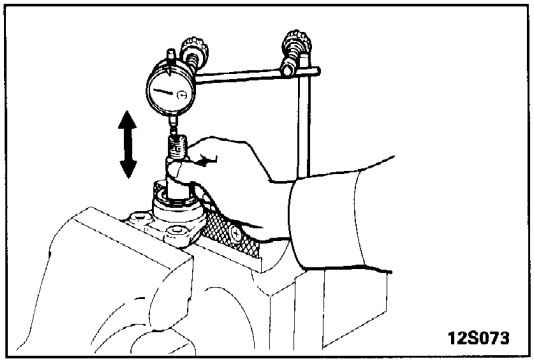
SERVICE POINT OF REMOVAL E33HBAD

5. DISCONNECTION OF LOWER BALL JOINT AND KNUCKLE

Using the special tool, disconnect the lower arm ball joint from the knuckle.

Caution

1. **Be sure to tie the cord of the special tool to the nearby part.**
2. **Loosen the nut but do not remove it.**
3. **Insert the special tool securely.**

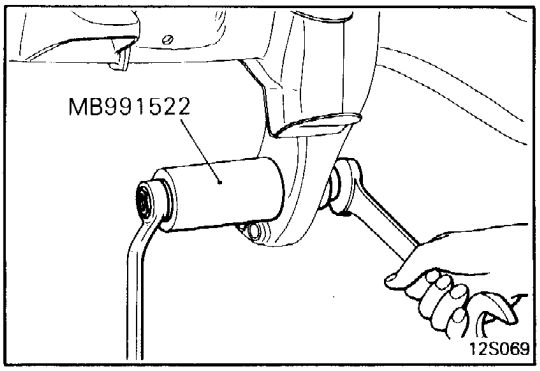


INSPECTION E33HCAE

LOWER BALL JOINT END PLAY

Check the lower ball joint end play by following the steps below.

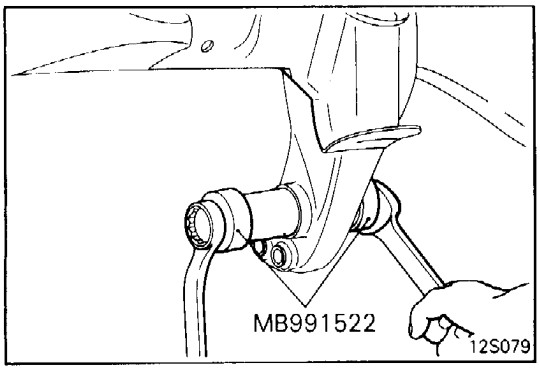
1. Measure the lower ball joint end play with a dial indicator.
   Limit: 0.3 mm (0.012 in.)
2. If the lower ball joint end play exceeds the service limit, replace the lower ball joint.



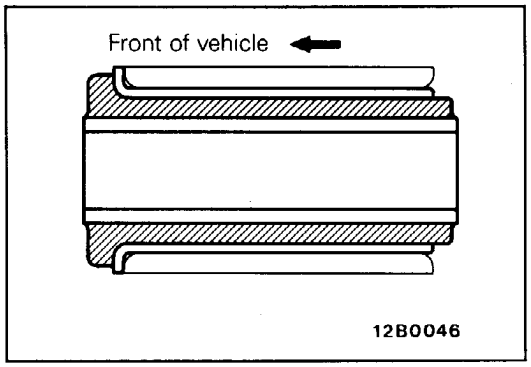
LOWER ARM BUSHING (A) REPLACEMENT

1. Using the special tool, remove the bushing A from the bracket.

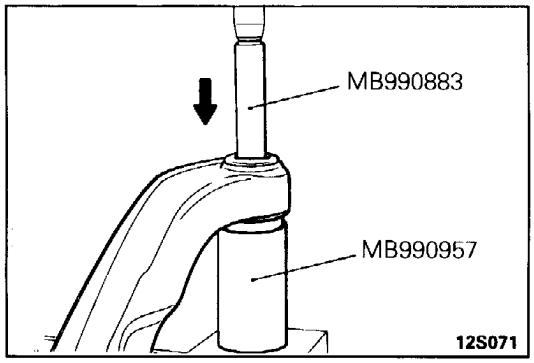
   NOTE
   When removing the left hand bushing A, detach the differential carrier. (Refer to Group 26.)



2. Using the special tool, press-fit the bushing A into the bracket.

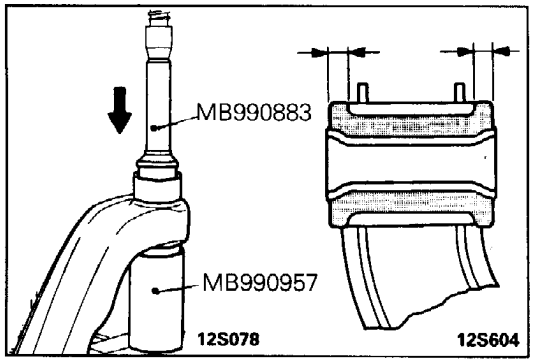


NOTE
Install the bushing A in a arrow direction.



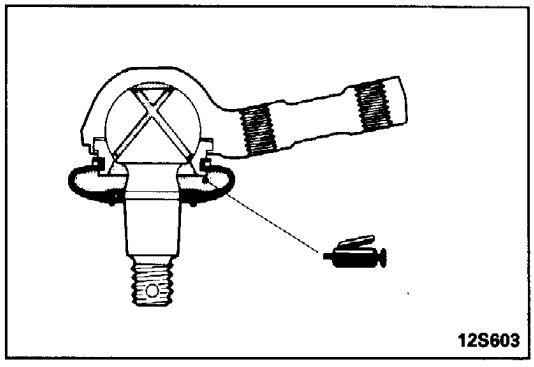
LOWER ARM BUSHING (B) REPLACEMENT E33HDAF

1. Remove the bushing B from the lower arm by using special tools.



2. Coat the bushing B and the lower arm with soap solution and press-fit the bushing B into the lower arm by using special tools and taking care not to twist or tilt the bushing B.

   NOTE
   Press-fit the bushing again from the opposite side to equalize bushing projections at both ends.



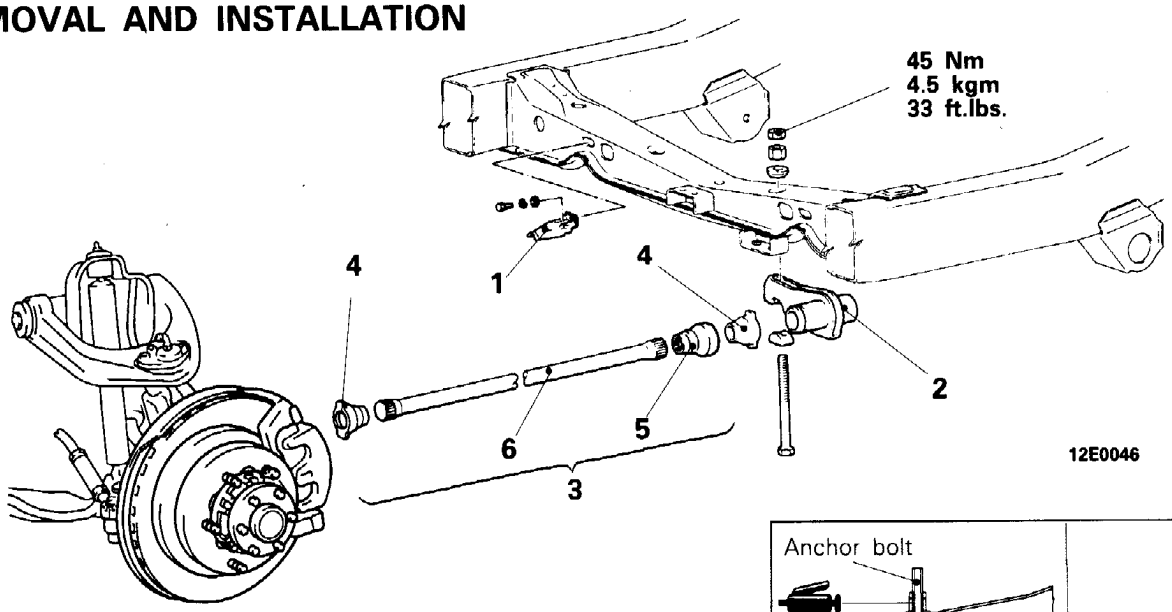
LOWER BALL JOINT DUST COVER REPLACEMENT E33HEAE

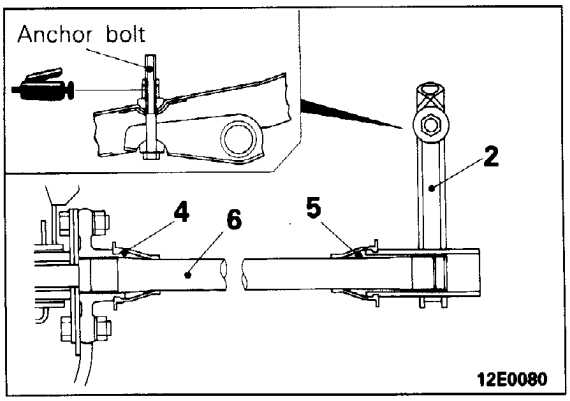
1. Apply multipurpose grease to the interior of the dust cover and the lower ball joint.
2. Secure the dust cover to the lower ball joint with a ring.

TORSION BAR

E331A--

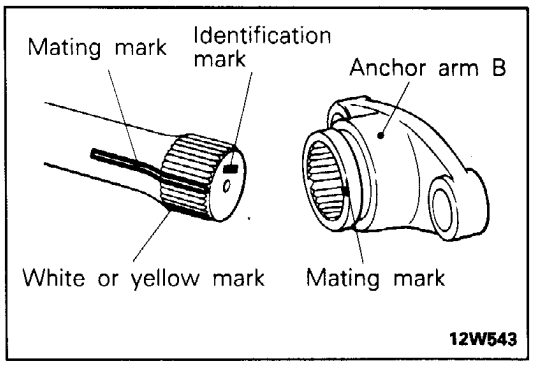
REMOVAL AND INSTALLATION





Removal steps

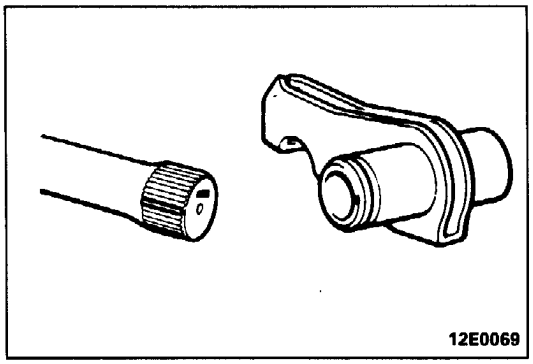
1. Heat protector (right side only)
- ◆◆ • Adjustment of clearance between bump stopper and bump stopper bracket
2. Anchor arm assembly
- ◆◆ 3. Torsion bar assembly
4. Dust covers
5. Heat cover (right side only)
6. Torsion bar



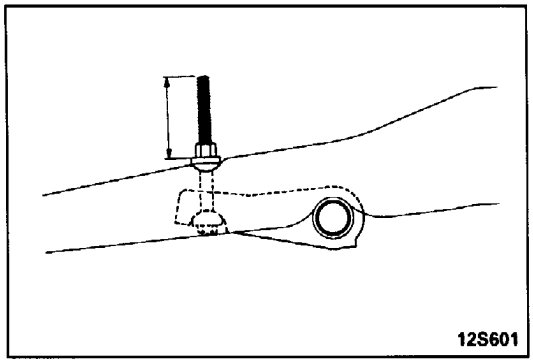
SERVICE PPOINTS OF INSTALLATION E33IDAG

3. INSTALLATION OF TORSION BAR ASSEMBLY

(1) Check the identification marks at the end of the left and right shock absorbers.
R →for right side
L →for left side

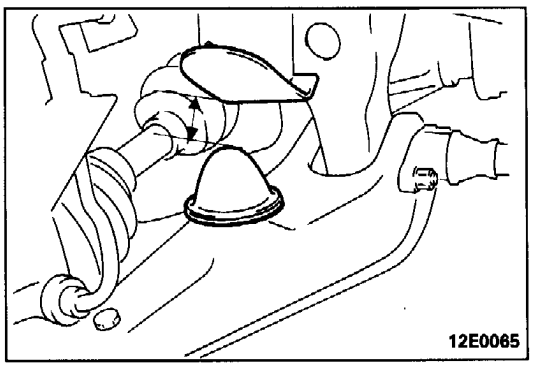


(2) When installing the torsion bar, align the white mark on the serrated section of the torsion bar with the mating mark on the anchor arm.



- **ADJUSTMENT OF CLEARANCE BETWEEN BUMP STOPPER AND BUMP STOPPER BRACKET**

(1) Tighten the adjusting nut until the protruding length of the anchor bolt is 80 mm (3.15 in.) or less.



(2) With the vehicle in an unladen condition, measure the distance from the bump stopper to the bump stopper bracket to check if it is at the standard value.

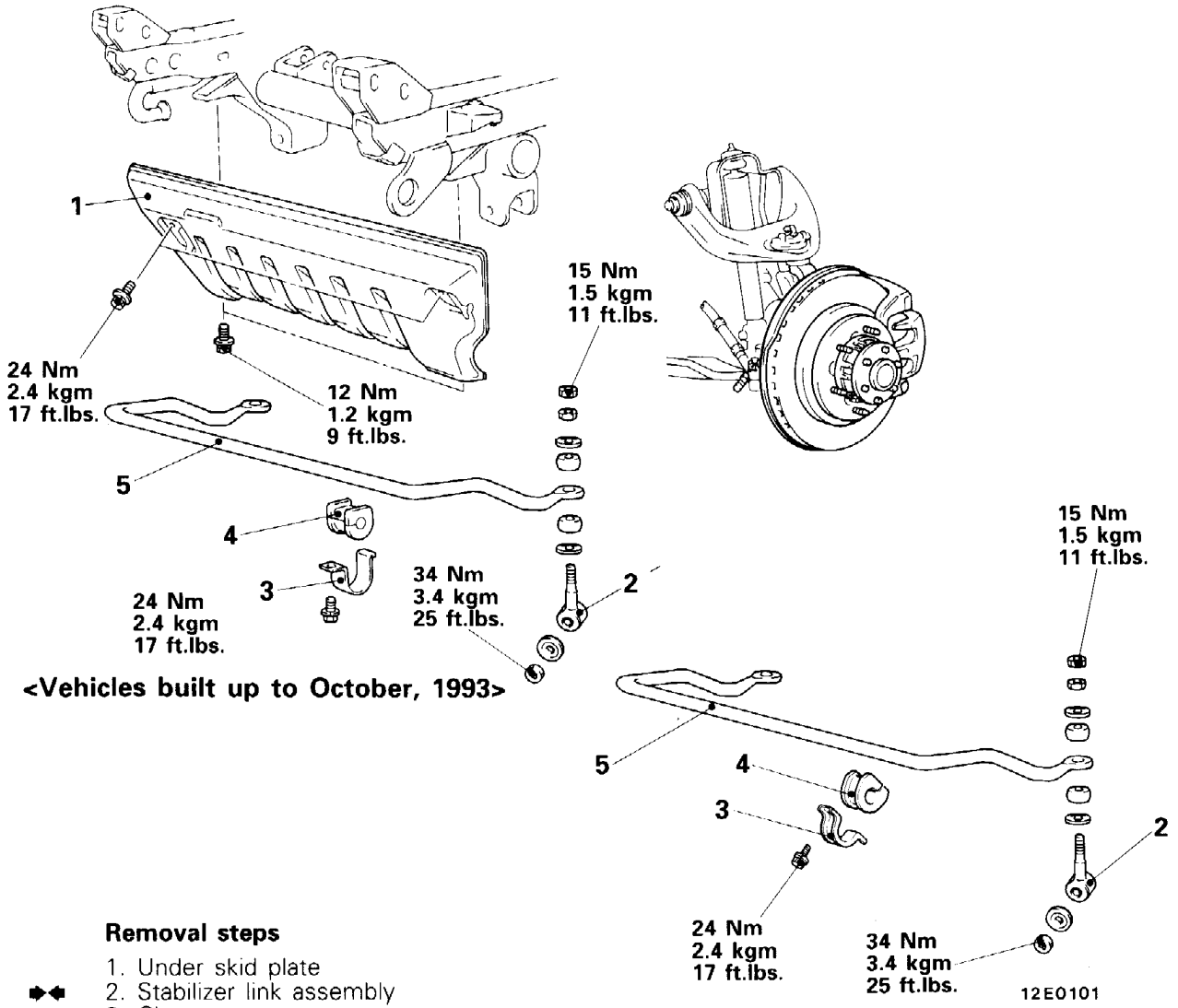
Standard value: 21–23 mm (0.83–0.91 in.)

(3) If outside the standard value, adjust the anchor bolt with the adjusting nut.

STABILIZER BAR

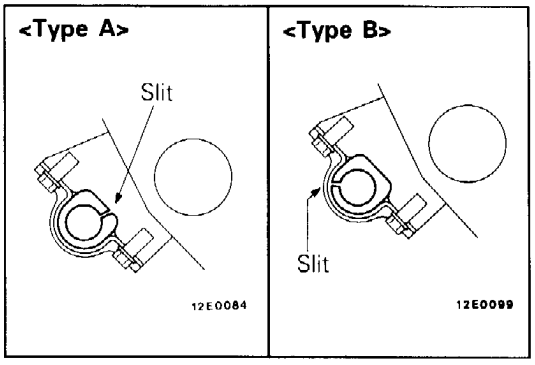
E33KA--

<RUBBER BUSHING TYPE>
REMOVAL AND INSTALLATION



Removal steps

1. Under skid plate
2. Stabilizer link assembly
3. Clamp
4. Bushing
5. Stabilizer bar

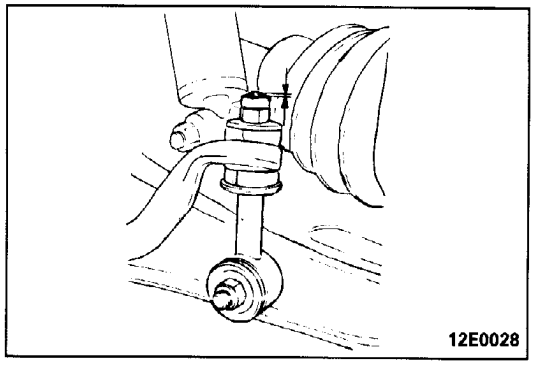


SERVICE POINTS OF INSTALLATION

E33KDAE

4. INSTALLATION OF BUSHING
<Vehicles built from November, 1993>

Check which type of busing is being used by the position of the slit, and then install the bushing so that the slit is in the position shown in the illustration.

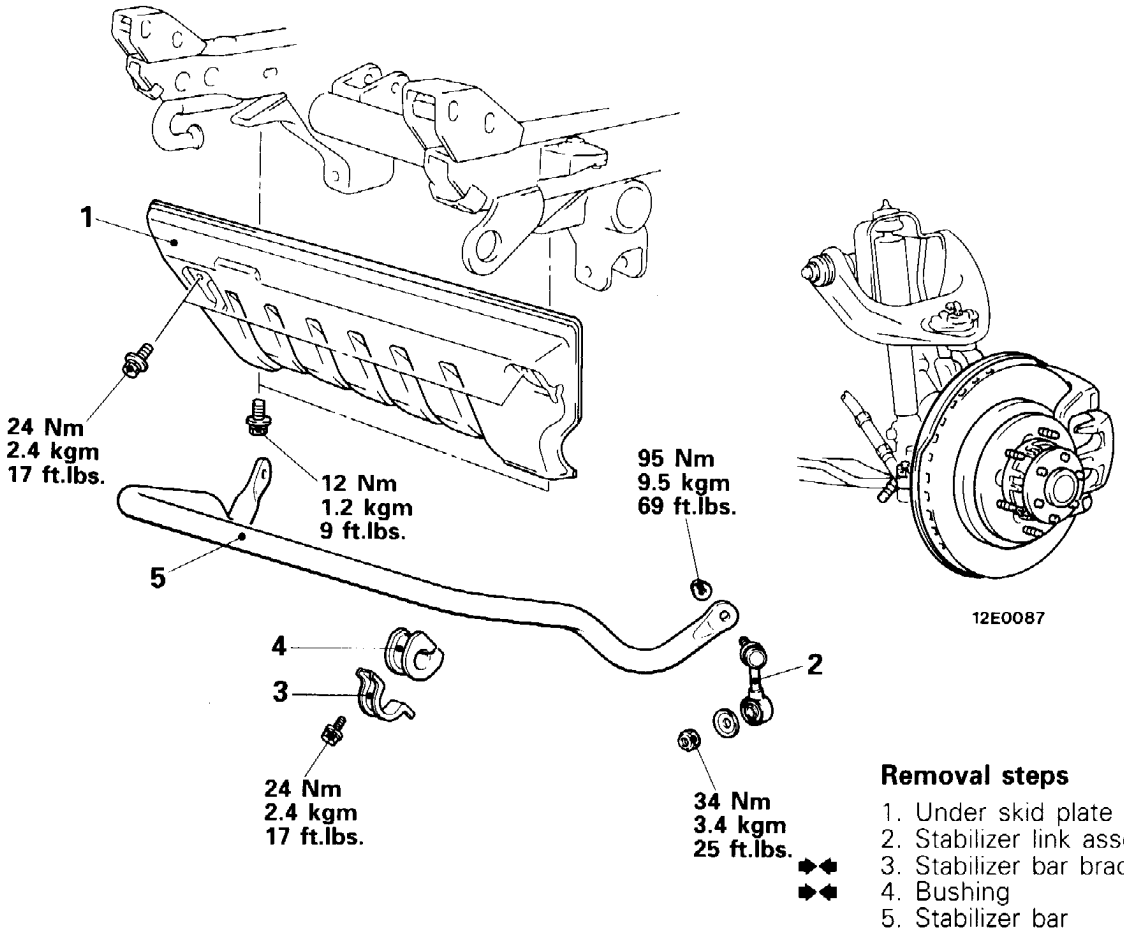


2. INSTALLATION OF STABILIZER LINK ASSEMBLY

Tighten the adjusting nut so that the dimensions shown in the figure are at the standard value.

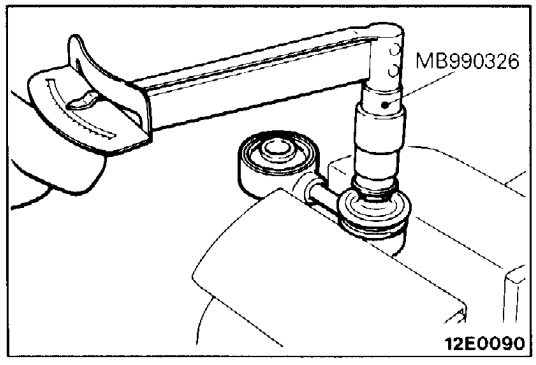
Standard value: 6–7 mm (0.24–0.28 in.)

<PILLOW BALL TYPE> REMOVAL AND INSTALLATION



Removal steps

1. Under skid plate
2. Stabilizer link assembly
3. Stabilizer bar bracket
4. Bushing
5. Stabilizer bar

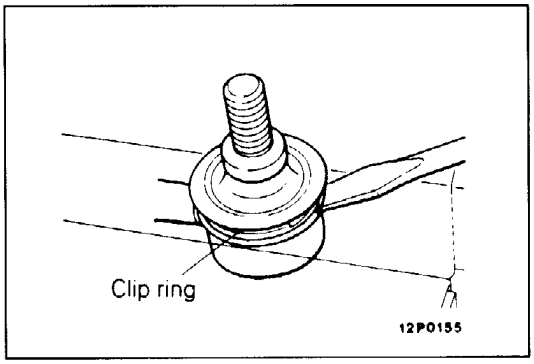


INSPECTION

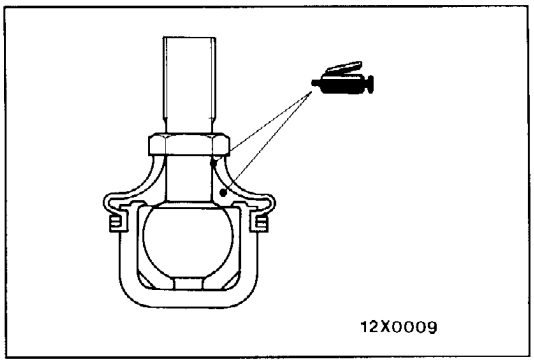
STABILIZER LINK BALL JOINT FOR STARTING TORQUE CHECK

Standard value: 1.7–3.2 Nm (17–32 kgcm, 15–28 in.lbs.)

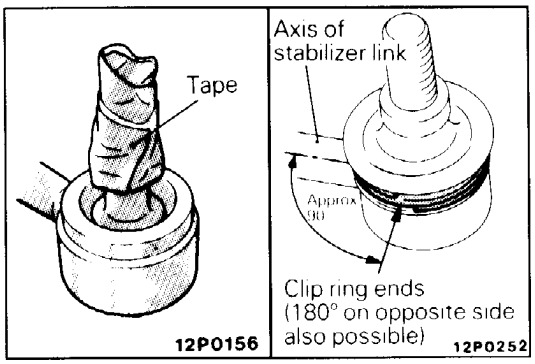
BALL JOINT DUST COVER REPLACEMENT



(1) Remove the clip ring and the dust cover.



(2) Apply multi-purpose grease to the lip and inside of the dust cover.

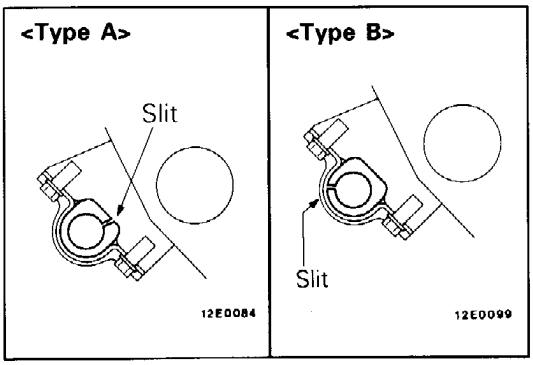


(3) Use vinyl tape to tape the stabilizer link where shown in the illustration, and then install the dust cover to the stabilizer link.
(4) Secure the dust cover with the clip ring.

NOTE
When installing the clip ring, align it so that its ends are located at a 90° angle from the axis of the stabilizer link.

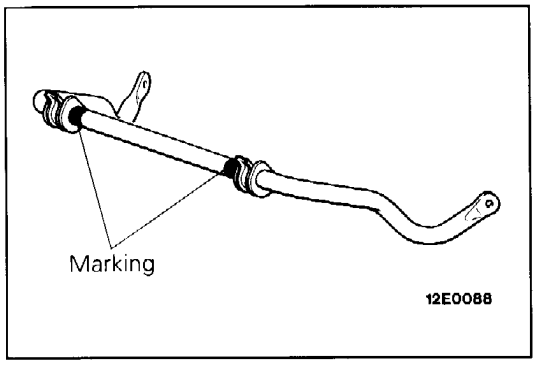
SERVICE POINTS OF INSTALLATION

4. INSTALLATION OF BUSHING



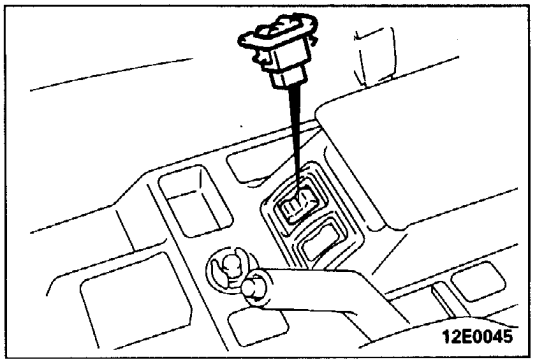
Check which type of busing is being used by the position of the slit, and then install the bushing so that the slit is in the position shown in the illustration.

3. INSTALLATION OF STABILIZER BAR BRACKET



Position the stabilizer bar so that the marking on the stabilizer bar and the edge of the bracket becomes the reference value, and then tighten the stabilizer bar bracket mounting bolt.

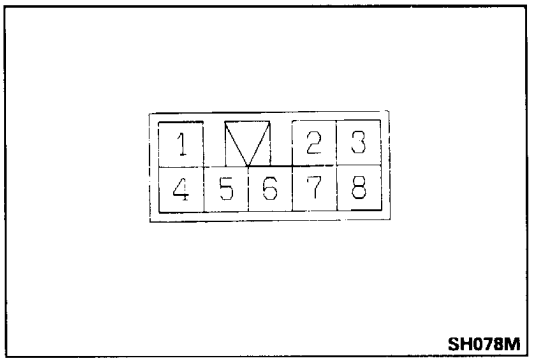
Reference value: Approx. 10 mm (0.4 in.)



SHOCK ABSORBER CONTROL SWITCH

E33UA--

REMOVAL AND INSTALLATION



INSPECTION

E33UABA

Operate the switch to check for continuity between terminals.

Switch position \ Terminal	4	5	6	2	7	1
H (Hard)			○	○		
M (Medium)		○		○		○
S (Soft)	○			○		

NOTE
○–○ indicates that there is continuity between the terminals.

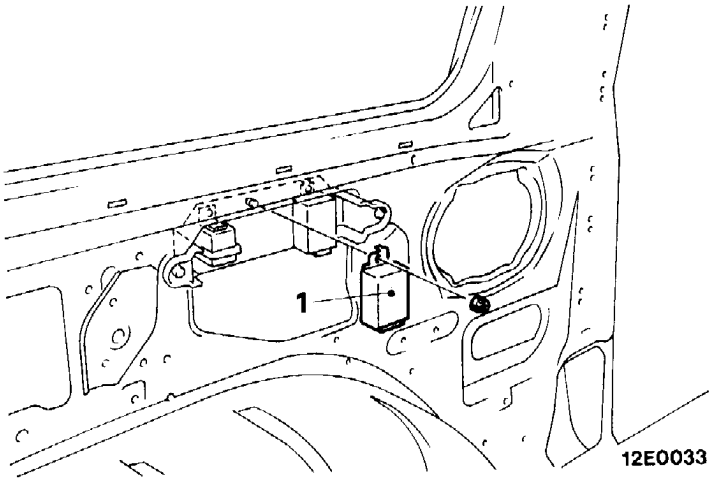
SHOCK ABSORBER CONTROL UNIT

E33UB--

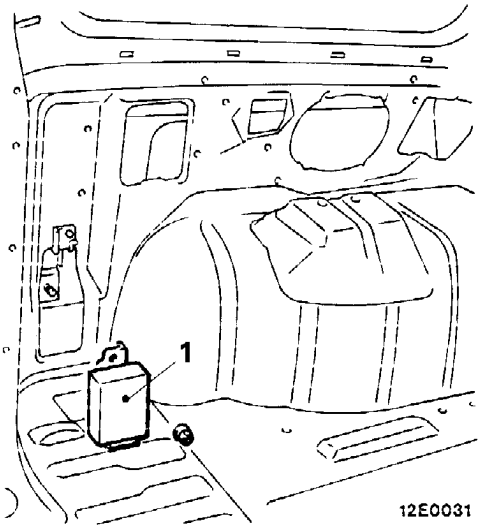
REMOVAL AND INSTALLATION

Pre-removal and Post-installation Operation
- Removal and Installation of Quarter Trim Lower (Refer to GROUP 52 – Trims.)

<Standard wheelbase>



<Long wheelbase>



1. Shock absorber control unit

INSPECTION

E33UBBA

Refer to TROUBLESHOOTING.

