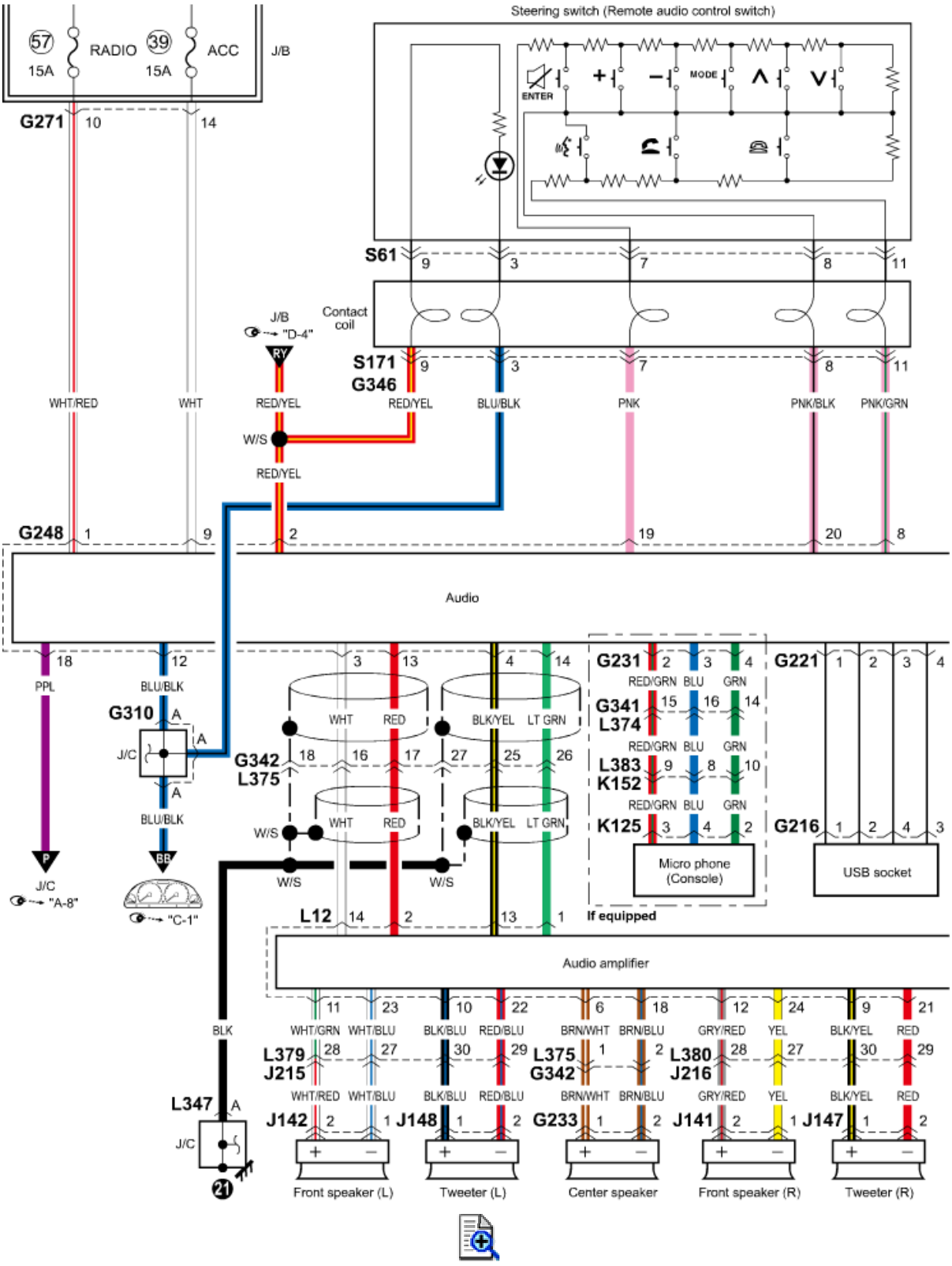
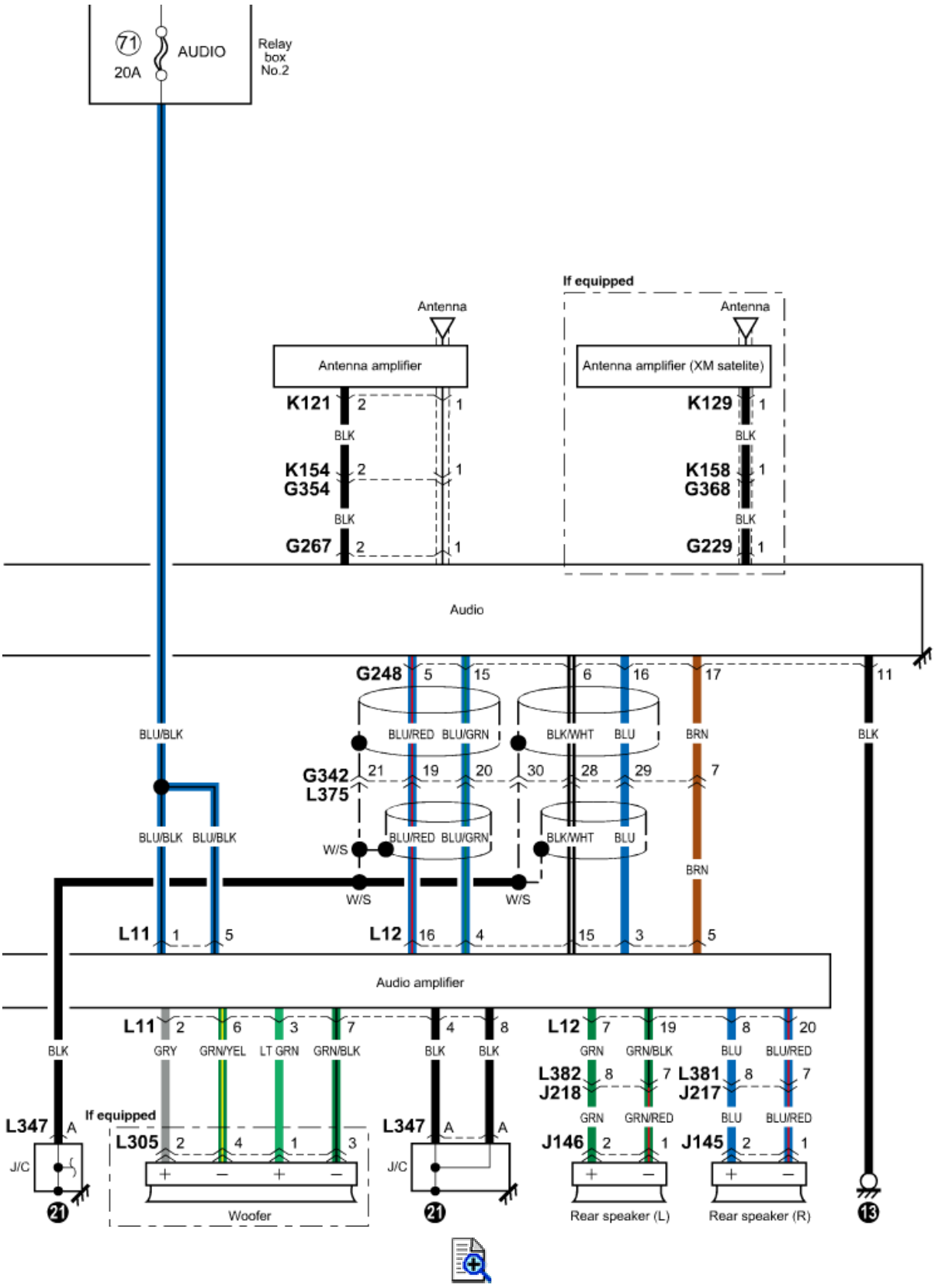
9A

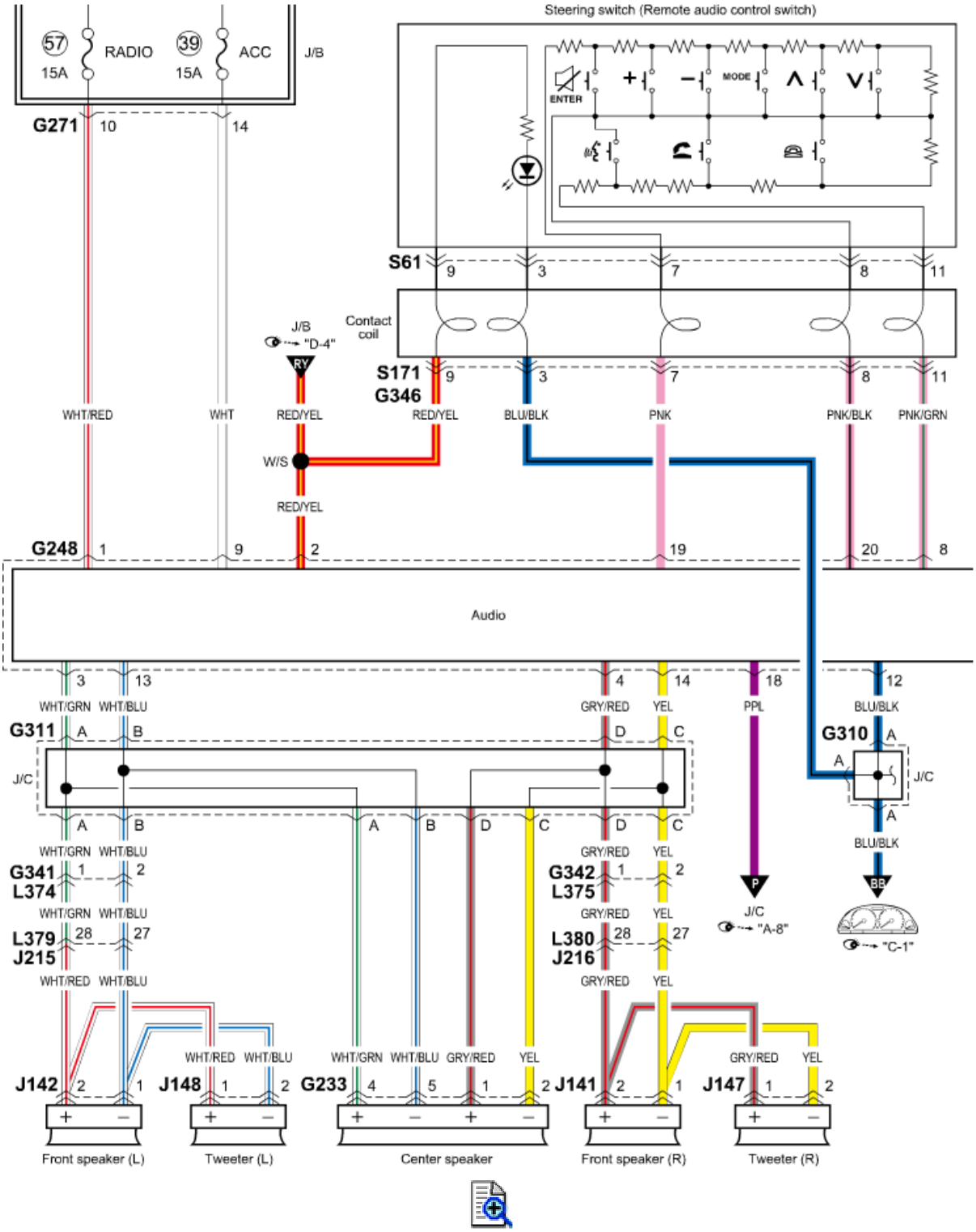
G-1 Audio System Circuit Diagram (with Audio Amplifier)

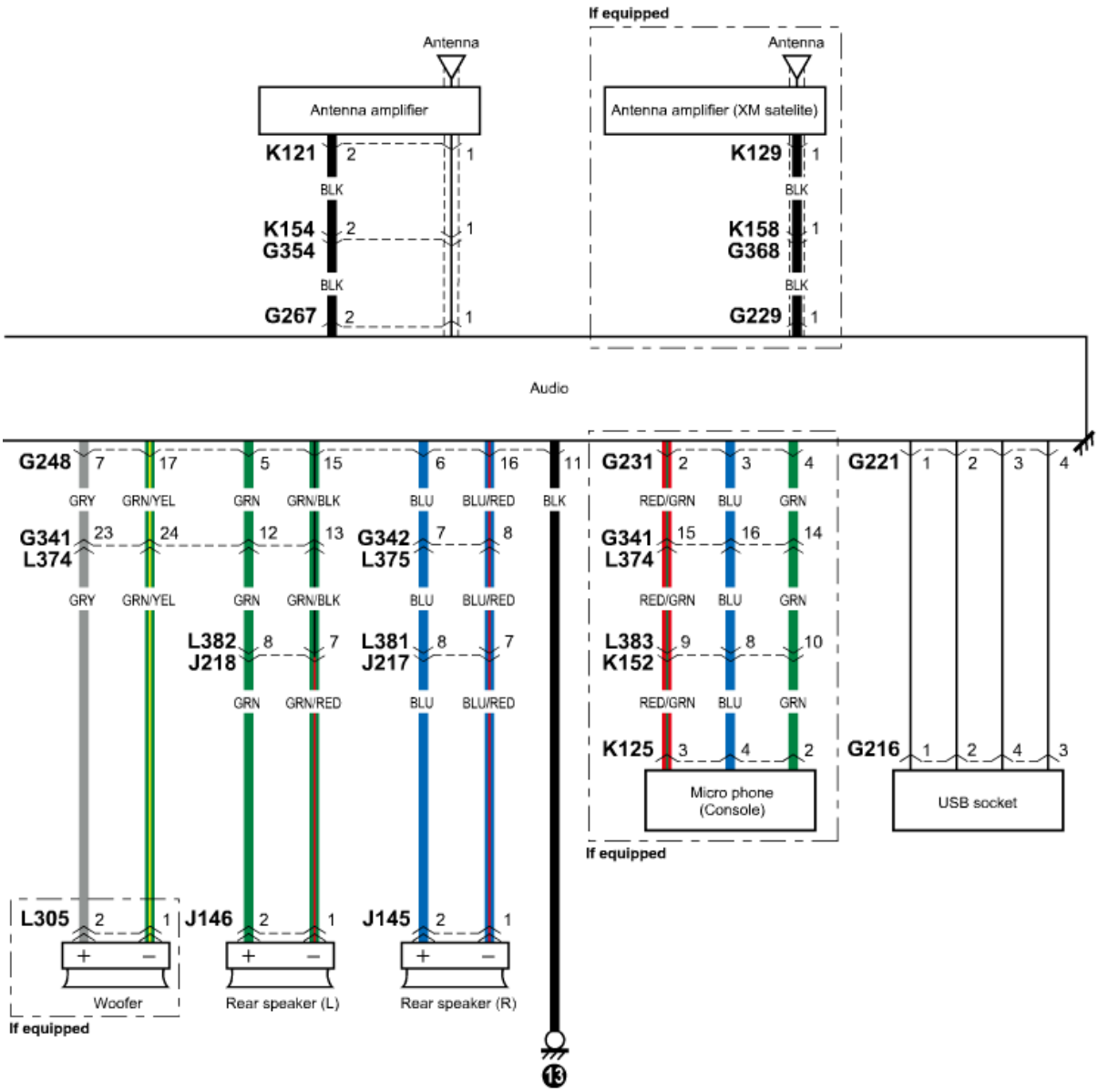



71
20A
AUDIO
Relay box No.2
If equipped
Antenna
Antenna amplifier
Antenna amplifier (XM satelite)
K121
K154
G354
G267
K129
K158
G368
G229
BLK
Audio
G248
G342
L375
BLU/BLK
BLU/RED
BLU/GRN
BLK/WHT
BLU
BRN
W/S
L11
L12
Audio amplifier
GRY
GRN/YEL
LT GRN
GRN/BLK
GRN
L382
J218
L381
J217
L347
J/C
L305
Woofer
J146
J145
Rear speaker (L)
Rear speaker (R)

9A

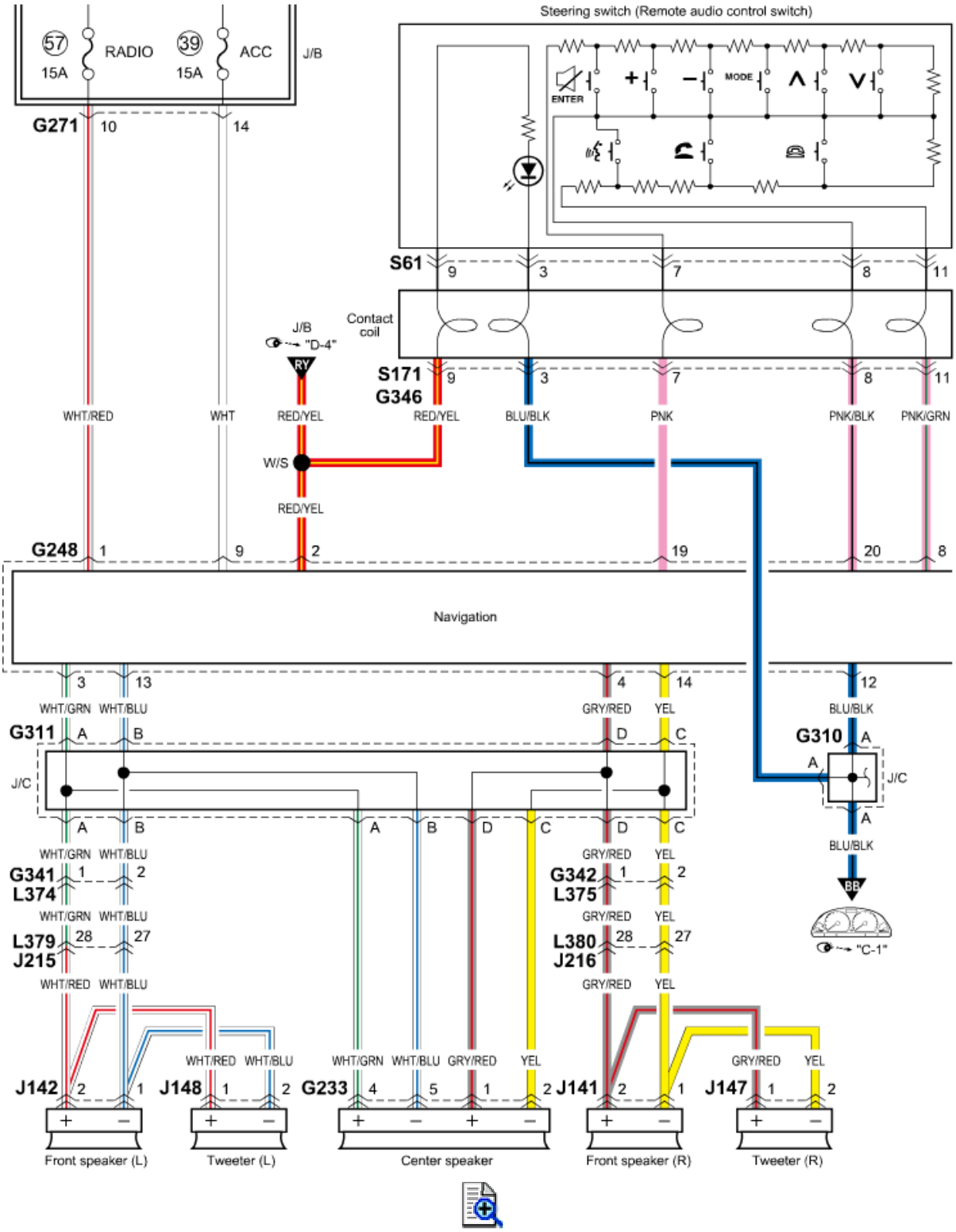
G-1 Audio System Circuit Diagram (without Audio Amplifier)

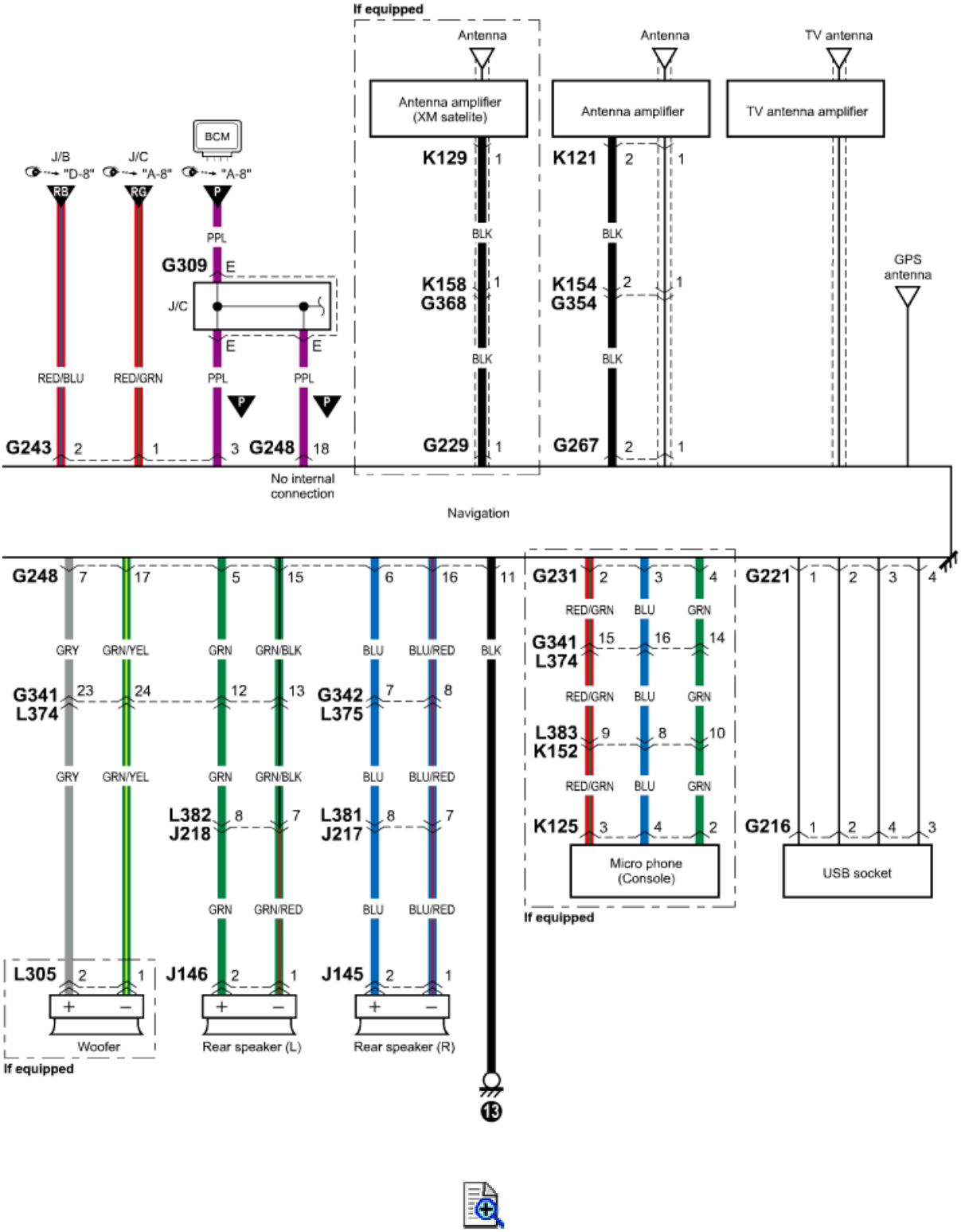



If equipped
Antenna
Antenna amplifier
K121
BLK
K154
G354
BLK
G267
Antenna
Antenna amplifier (XM satelite)
K129
BLK
K158
G368
BLK
G229
Audio
G248
GRY
GRN/YEL
GRN
GRN/BLK
BLU
BLU/RED
BLK
G341
L374
L382
J218
L381
J217
G342
L375
G231
RED/GRN
BLU
GRN
L383
K152
K125
Micro phone
(Console)
If equipped
G221
G216
USB socket
L305
Woofer
If equipped
J146
Rear speaker (L)
J145
Rear speaker (R)
13

9A

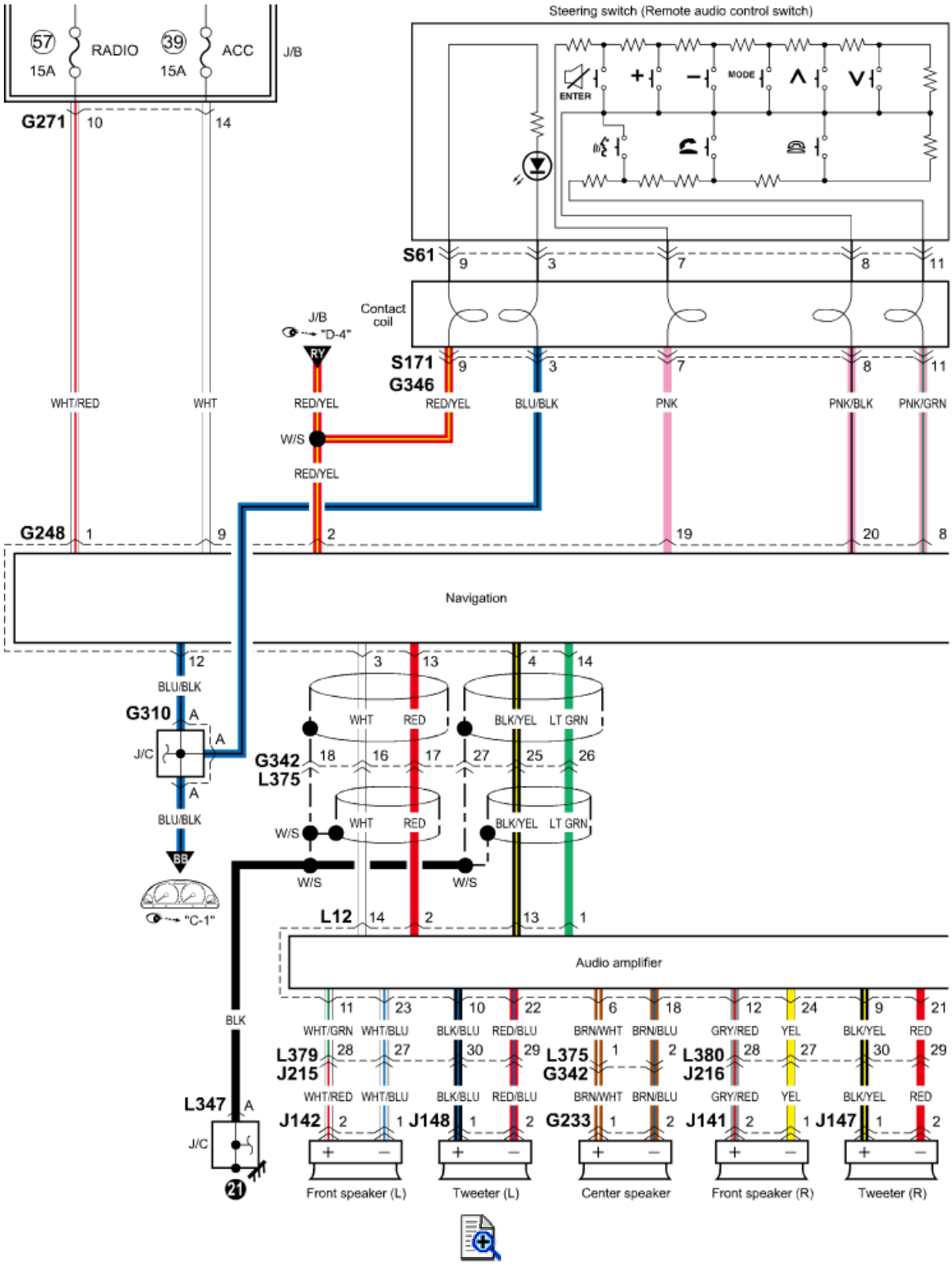
G-4 Navigation System Circuit Diagram (without Audio Amplifier)

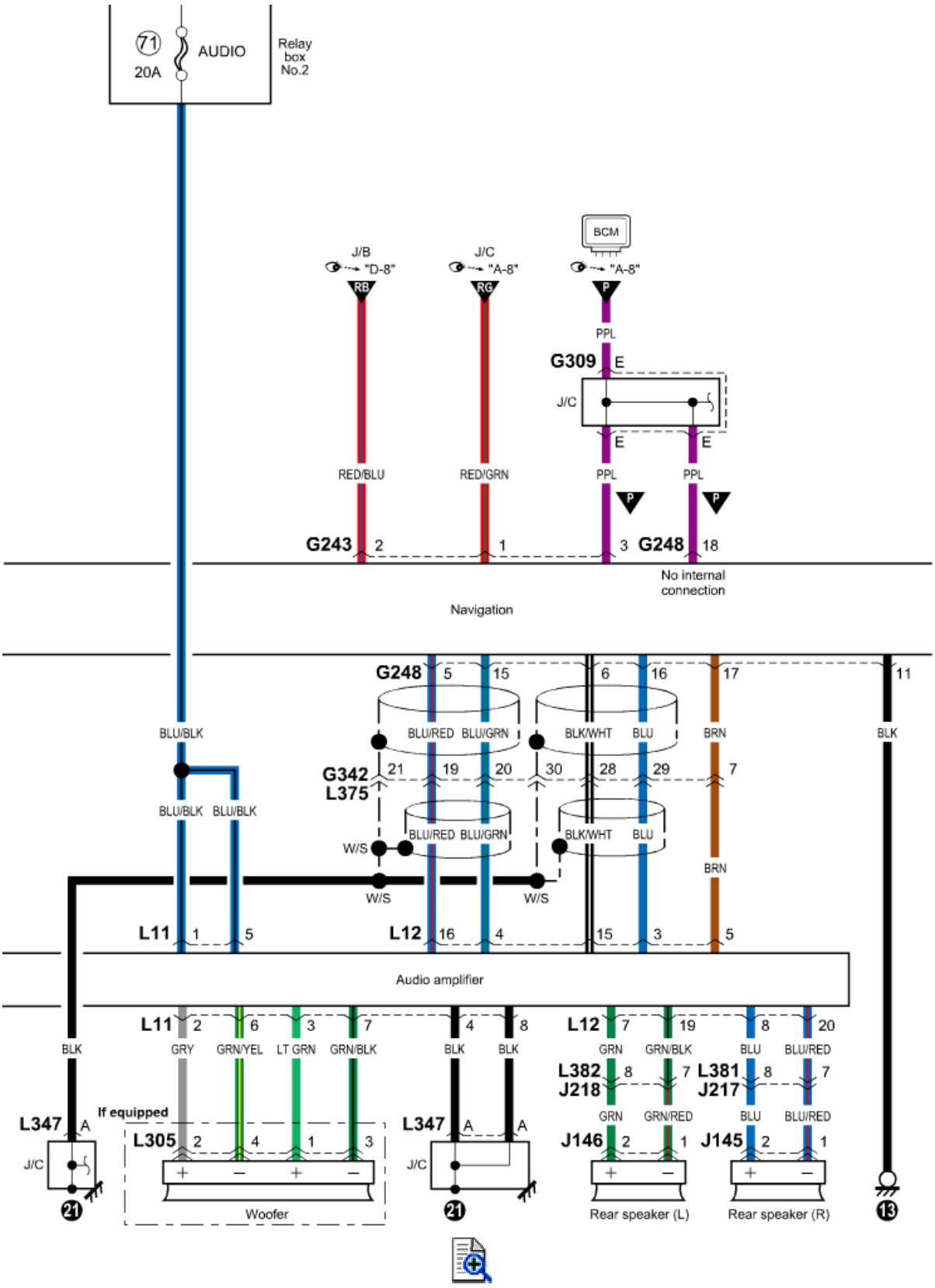


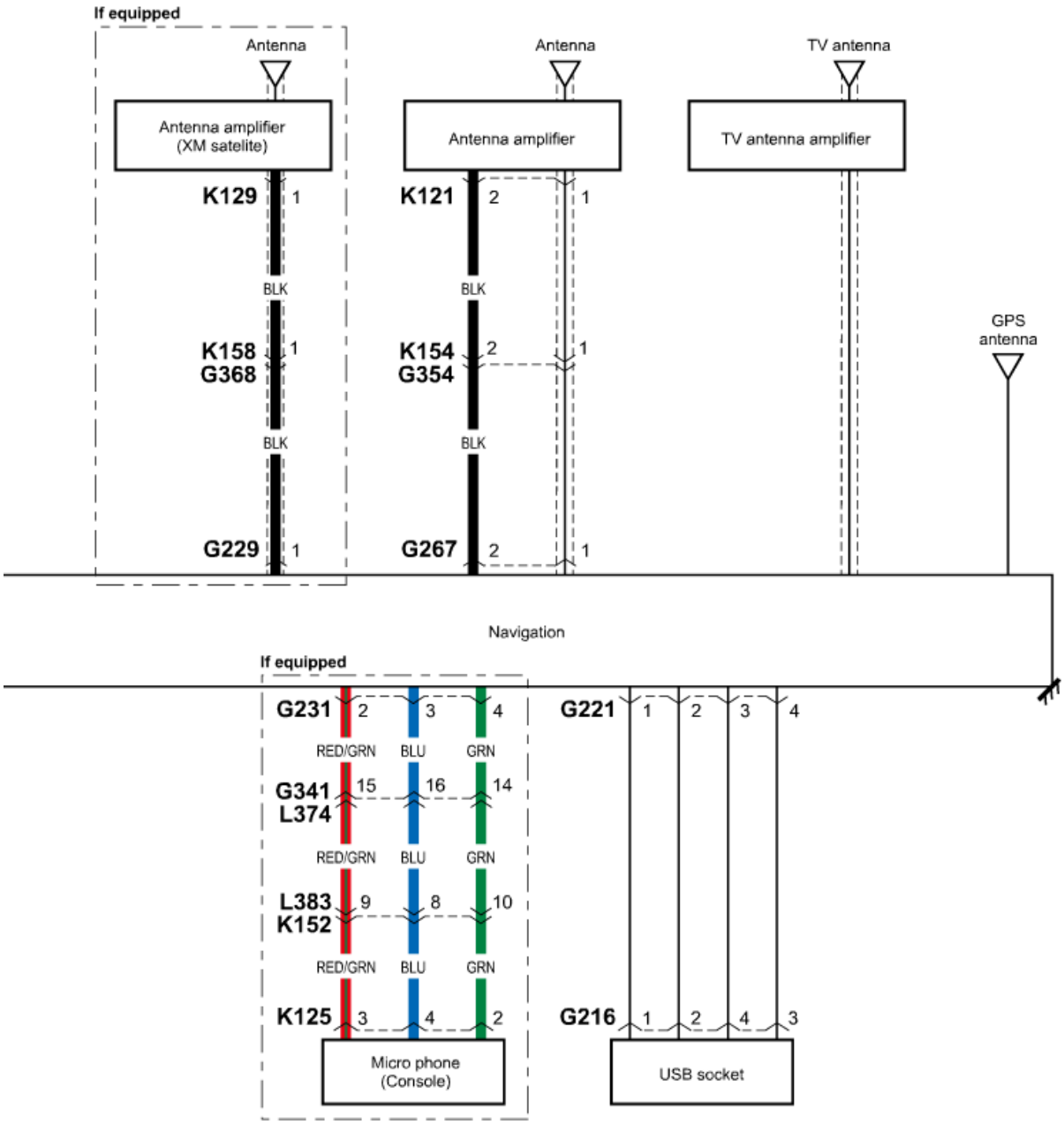

If equipped
Antenna
Antenna amplifier (XM satelite)
Antenna
Antenna amplifier
TV antenna
TV antenna amplifier
GPS antenna
BCM
J/B "D-8"
J/C "A-8"
"A-8"
RB
RG
P
PPL
G309 E
J/C
E
E
RED/BLU
RED/GRN
PPL
PPL
G243 2 1 3 G248 18
No internal connection
K129 1
BLK
K158 G368 1
BLK
G229 1
K121 2 1
BLK
K154 G354 2 1
BLK
G267 2 1
Navigation
G248 7 17 5 15 6 16 11
GRY GRN/YEL GRN GRN/BLK BLU BLU/RED BLK
G341 L374 23 24 12 13
GRY GRN/YEL GRN GRN/BLK
G342 L375 7 8
BLU BLU/RED
L382 J218 8 7
GRN GRN/RED
L381 J217 8 7
BLU BLU/RED
L305 2 1
Woofer
If equipped
J146 2 1
Rear speaker (L)
J145 2 1
Rear speaker (R)
G231 2 3 4
RED/GRN BLU GRN
G341 L374 15 16 14
RED/GRN BLU GRN
L383 K152 9 8 10
RED/GRN BLU GRN
K125 3 4 2
Micro phone (Console)
If equipped
G221 1 2 3 4
G216 1 2 4 3
USB socket

9A

G-4 Navigation System Circuit Diagram (with Audio Amplifier)



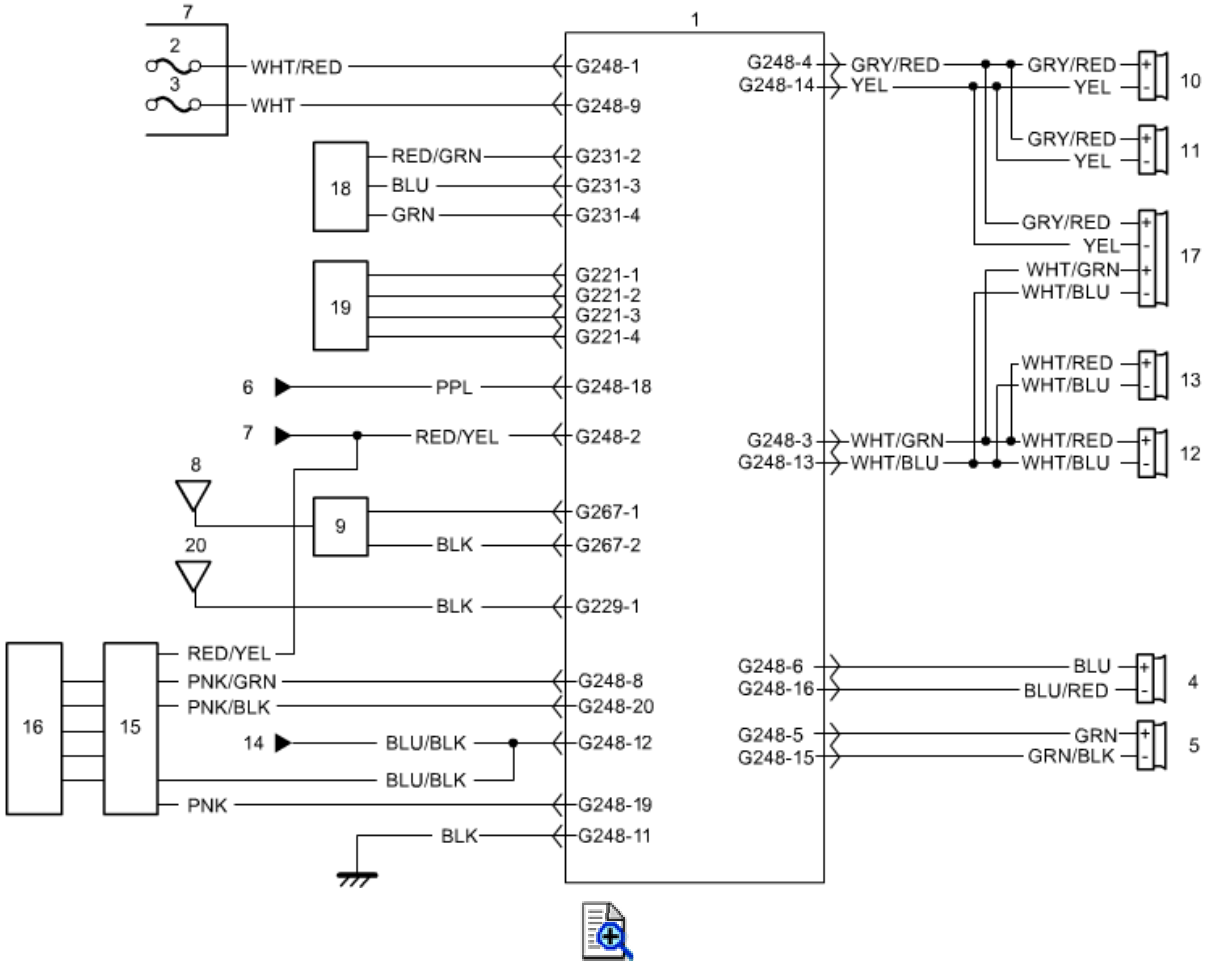

71
20A
AUDIO
Relay box No.2
J/B
"D-8"
RB
J/C
"A-8"
RG
BCM
"A-8"
P
PPL
G309
E
J/C
E
E
RED/BLU
RED/GRN
PPL
PPL
P
P
G243
2
1
3
G248
18
No internal connection
Navigation
G248
5
15
6
16
17
11
BLU/RED
BLU/GRN
BLK/WHT
BLU
BRN
BLK
BLU/BLK
G342
L375
21
19
20
30
28
29
7
BLU/BLK
BLU/BLK
BLU/RED
BLU/GRN
BLK/WHT
BLU
W/S
BRN
W/S
W/S
L11
1
5
L12
16
4
15
3
5
Audio amplifier
L11
2
6
3
7
4
8
L12
7
19
8
20
BLK
GRY
GRN/YEL
LT GRN
GRN/BLK
BLK
BLK
GRN
GRN/BLK
BLU
BLU/RED
L382
J218
8
7
L381
J217
8
7
GRN
GRN/RED
BLU
BLU/RED
L347
A
If equipped
L305
2
4
1
3
L347
A
A
J146
2
1
J145
2
1
J/C
J/C
Woofer
Rear speaker (L)
Rear speaker (R)
21
21
13


If equipped
Antenna
Antenna amplifier
(XM satelite)
K129
1
BLK
K158
G368
1
BLK
G229
1
Antenna
Antenna amplifier
K121
2
1
BLK
K154
G354
2
1
BLK
G267
2
1
TV antenna
TV antenna amplifier
GPS
antenna
Navigation
If equipped
G231
2
3
4
RED/GRN
BLU
GRN
G341
L374
15
16
14
RED/GRN
BLU
GRN
L383
K152
9
8
10
RED/GRN
BLU
GRN
K125
3
4
2
Micro phone
(Console)
G221
1
2
3
4
G216
1
2
4
3
USB socket

90

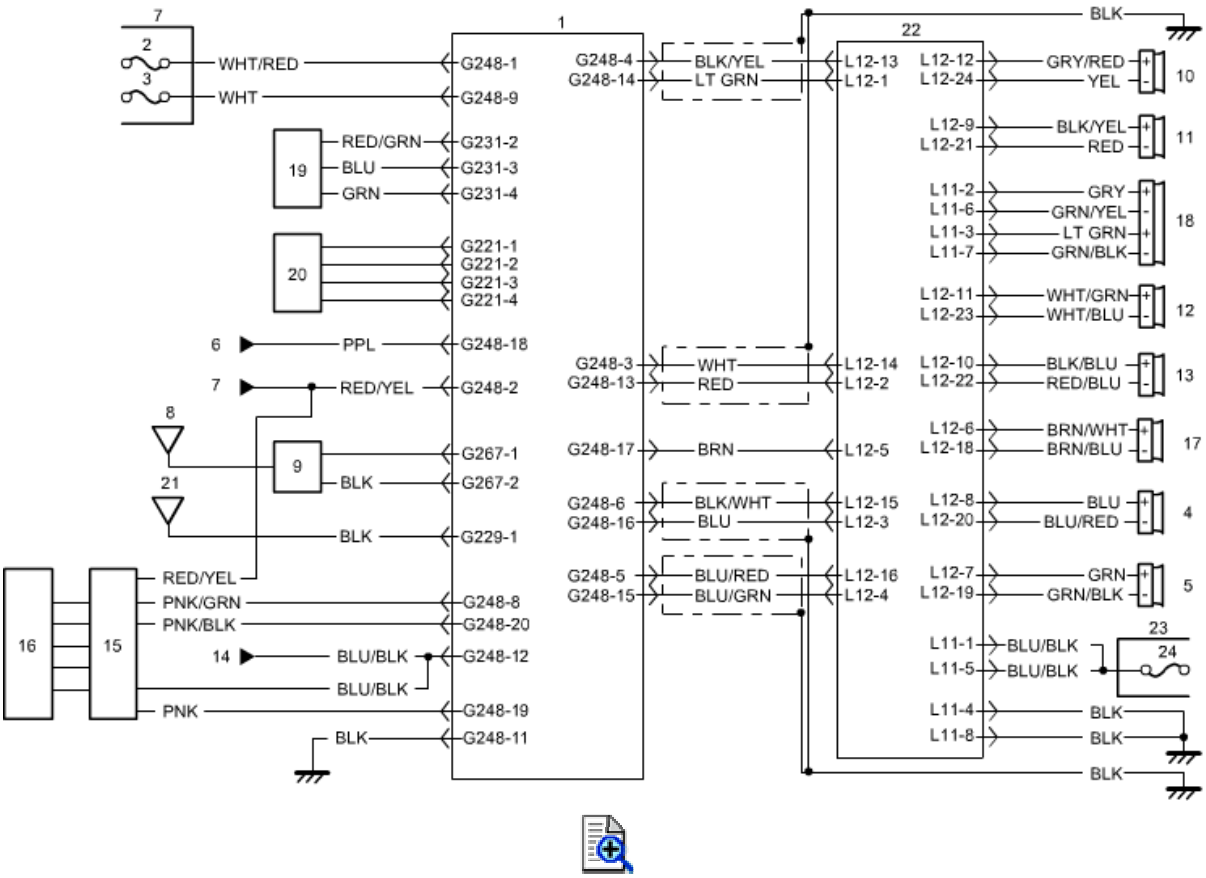
Audio System Circuit Diagram

Without Audio Amplifier



1. Audio unit	8. Printed radio antenna	15. Contact coil
2. "RADIO" fuse	9. Radio antenna amplifier	16. Steering switch (audio control switch / hands-free switch)
3. "ACC" fuse	10. Front speaker (R)	17. Center speaker
4. Rear speaker (R)	11. Front tweeter (R)	18. Microphone
5. Rear speaker (L)	12. Front speaker (L)	19. USB socket
6. BCM	13. Front tweeter (L)	20. XM antenna
7. Junction block	14. Combination meter	

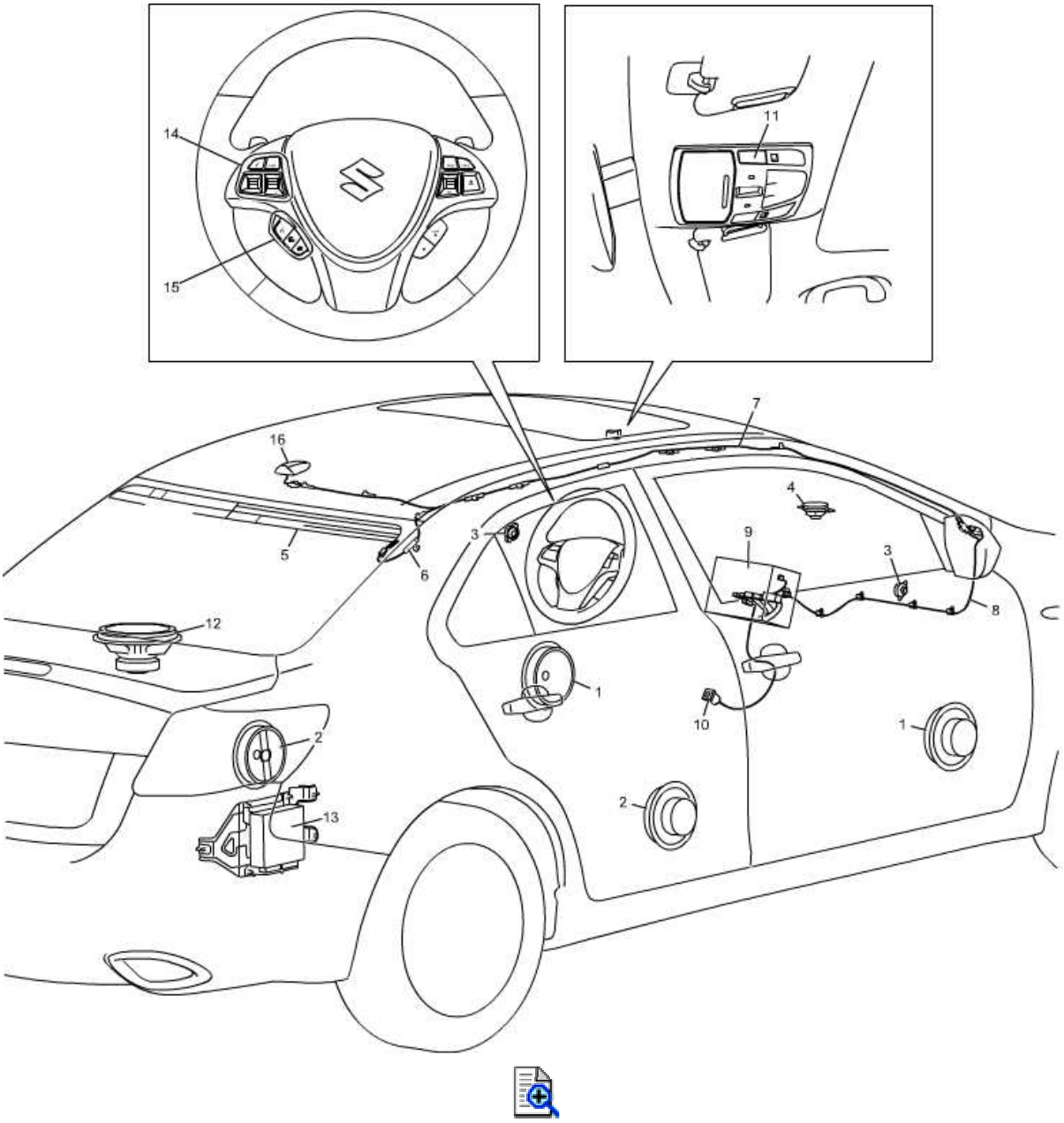
With Audio Amplifier



1. Audio unit	9. Radio antenna amplifier	17. Center speaker
2. "RADIO" fuse	10. Front speaker (R)	18. Sub woofer
3. "ACC" fuse	11. Front tweeter (R)	19. Microphone
4. Rear speaker (R)	12. Front speaker (L)	20. USB socket
5. Rear speaker (L)	13. Front tweeter (L)	21. XM antenna
6. BCM	14. Combination meter	22. Audio amplifier
7. Junction block	15. Contact coil	23. Relay box No. 2
8. Printed radio antenna	16. Steering switch (audio control switch / hands-free switch)	24. "AUDIO" fuse

9O

Audio System Component Location



1. Front speaker	7. Radio antenna feeder cable (roof)	13. Audio amplifier (if equipped)
2. Rear speaker	8. Radio antenna feeder cable (instrument panel)	14. Steering switch (audio control switch)
3. Tweeter	9. Audio unit	15. Steering switch (hands-free switch) (if equipped)
4. Center speaker	10. USB socket	16. XM antenna (if equipped)
5. Printed radio antenna	11. Microphone (if equipped)	
6. Radio antenna amplifier	12. Sub woofer (if equipped)	

9O

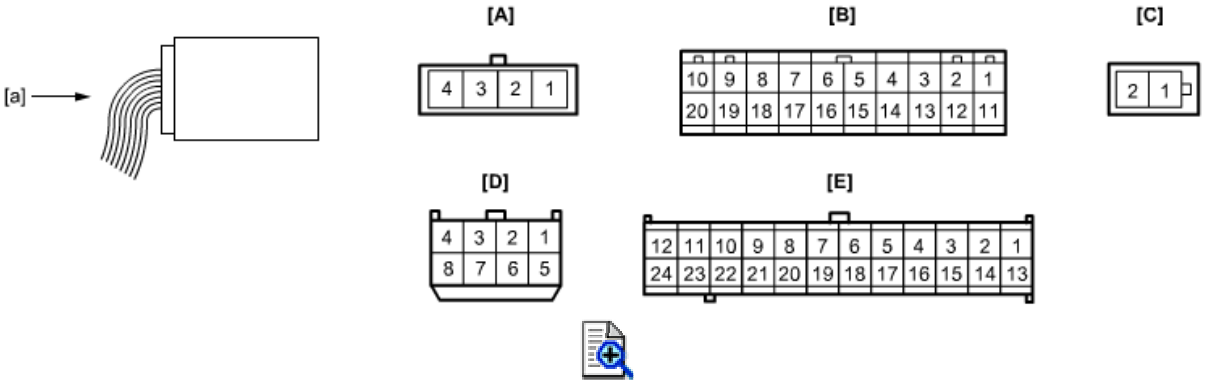
Audio System Inspection

Voltage and Signal Check

1) Remove audio unit or audio amplifier (with connector connected).
- Audio unit: ☞
- Audio amplifier: ☞

2) Check voltage using circuit tester and oscilloscope.

NOTE:
- **Confirm that battery voltage is 11 V or more.**
- **An "Ignition mode" in the following table, represents a power supply mode available with keyless push start system. For more details, refer to *Description of Keyless Engine Start Function*.**
- **Outputs from terminals marked with asterisk (*) cannot be measured with voltmeter because they are pulse signals. Use oscilloscope for measuring these outputs.**



[A]: "G231" connector (microphone (if equipped)) (View [a])	[D]: "L11" connector (audio amplifier (if equipped)) (View [a])
[B]: "G248" connector (audio unit) (View [a])	[E]: "L12" connector (audio amplifier (if equipped)) (View [a])
[C]: "G267" connector (radio antenna feeder) (View [a])	

[A] G231 connector (microphone (if equipped))

Terminal No.	Wire color	Circuit	Normal voltage	Condition
2*	RED/GRN	Microphone signal	—	Audio: ON
			Refer to reference waveform. *Speaker / microphone wave*	
3	BLU	Ground for microphone	Approx. 0 V	Ignition mode: OFF, ACC or ON
4	GRN	Power source for microphone	Approx. 5 V	Ignition mode: ACC or ON

[B] G248 connector (audio unit)

Terminal No.	Wire color	Circuit	Normal voltage	Condition

1	WHT/RED	Power source	Approx. 12 V	Ignition mode: OFF, ACC or ON
2	RED/YEL	Power source (illumination)	Approx. 12 V	When clearance light is on
			Approx. 0 V	Other than above condition
3*	WHT/GRN (without audio amplifier)	Front speaker (L) (+), tweeter (L) (+), center speaker (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	WHT (with audio amplifier)	Front speaker output for audio amplifier (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
4*	GRY/RED (without audio amplifier)	Front speaker (R) (+), tweeter (R) (+), center speaker (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	BLK/YEL (with audio amplifier)	Front speaker output for audio amplifier (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
5*	GRN (without audio amplifier)	Rear speaker (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	BLU/RED (with audio amplifier)	Rear speaker output for audio amplifier (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
6*	BLU (without audio amplifier)	Rear speaker (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	BLK/WHT (with audio amplifier)	Rear speaker output for audio amplifier (R)(+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
8	PNK/GRN	Steering switch (hands-free switch)	Approx. 3.2 V	Ignition mode: ACC or ON
9	WHT	Power source (ACC)	Approx. 12 V	Ignition mode: ACC or ON
11	BLK	Ground for audio unit	Approx. 0 V	Ignition mode: OFF, ACC or ON
12	BLU/BLK	Illumination signal	Refer to reference waveform. ***Illumination signal***	
13*	WHT/BLU (without audio amplifier)	Front speaker (L) (−), tweeter (L) (−), center speaker (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	RED (with audio amplifier)	Front speaker output for audio amplifier (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
14*	YEL (without audio amplifier)	Front speaker (R) (−), tweeter (R) (−), center speaker (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
			—	Audio: ON

	LT GRN (with audio amplifier)	Front speaker output for audio amplifier (R) (–)	Refer to reference waveform. ***Speaker / microphone wave***	
15*	GRN/BLK (without audio amplifier)	Rear speaker (L) (–)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	BLU/GRN (with audio amplifier)	Rear speaker output for audio amplifier (L) (–)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
16*	BLU/RED (without audio amplifier)	Rear speaker (R) (–)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
	BLU (with audio amplifier)	Rear speaker output for audio amplifier (R) (–)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
17	BRN (with audio amplifier)	Audio amplifier power supply ON signal output	Approx. 12 V	Ignition mode: ACC or ON
18*	PPL	Vehicle speed signal input	Refer to ***Inspection of BCM and Its Circuits***.	
19	PNK	Steering switch (audio control switch)	Approx. 3.2 V	Ignition mode: ACC or ON
20	PNK/BLK	Ground for steering switch (audio control switch)	Approx. 0 V	Ignition mode: OFF, ACC or ON

[C] G267 connector (radio antenna feeder)

Terminal No.	Wire color	Circuit	Normal voltage	Condition
2	BLK	Power source for antenna amplifier	Approx. 12 V	Audio: ON

[D] L11 connector (audio amplifier (if equipped))

Terminal No.	Wire color	Circuit	Normal voltage	Condition
1	BLU/BLK	Power source	Approx. 12 V	Ignition mode: OFF, ACC or ON
2	GRY	Sub woofer (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
3	LT GRN	Sub woofer (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
4	BLK	Ground for audio amplifier	Approx. 0 V	Ignition mode: OFF, ACC or ON
5	BLU/BLK	Power source	Approx. 12 V	Ignition mode: OFF, ACC or ON
6	GRN/YEL	Sub woofer (–)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
7	GRN/BLK	Sub woofer (–)	—	Audio: ON

			Refer to reference waveform. ***Speaker / microphone wave***	
8	BLK	Ground for audio amplifier	Approx. 0 V	Ignition mode: OFF, ACC or ON

[E] L12 connector (audio amplifier (if equipped))

Terminal No.	Wire color	Circuit	Normal voltage	Condition
1	LT GRN	Front speaker input from audio unit (R) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
2	RED	Front speaker input from audio unit (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
3	BLU	Rear speaker input from audio unit (R) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
4	BLU/GRN	Rear speaker input from audio unit (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
5	BRN	Audio amplifier power supply ON signal input	Approx. 12 V	Ignition mode: ACC or ON
6	BRN/WHT	Center speaker (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
7	GRN	Rear speaker (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
8	BLU	Rear speaker (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
9	BLK/YEL	Tweeter (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
10	BLK/BLU	Tweeter (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
11	WHT/GRN	Front speaker (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
12	GRY/RED	Front speaker (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
13	BLK/YEL	Front speaker input from audio unit (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
14	WHT	Front speaker input from audio unit (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
15	BLK/WHT	Rear speaker input from audio unit (R) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	

16	BLU/RED	Rear speaker input from audio unit (L) (+)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
18	BRN/BLU	Center speaker (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
19	GRN/BLK	Rear speaker (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
20	BLU/RED	Rear speaker (R) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
21	RED	Tweeter (R) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
22	RED/BLU	Tweeter (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
23	WHT/BLU	Front speaker (L) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	
24	YEL	Front speaker (R) (−)	—	Audio: ON
			Refer to reference waveform. ***Speaker / microphone wave***	

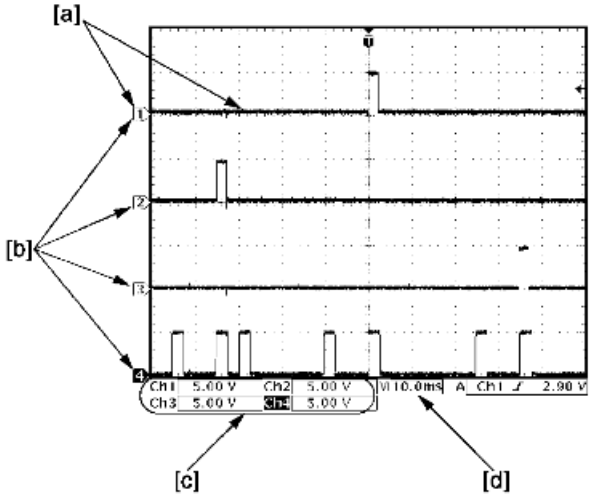
Reference Waveform

Oscilloscope display

Shown below is typical waveform display provided by oscilloscope.

NOTE:

- **Display includes the following types of data:**



[a]: Waveform of channel 1	[c]: VOLT/DIV of each channel
[b]: Ground level of each channel	[d]: TIME/DIV

- **Waveforms may vary with measurement conditions and vehicle specifications.**

Speaker / microphone wave

NOTE:
Voltage changes depending on sound volume and quality.

Microphone signal (1)

Channel	Probe	Terminal No.
1	+	G231-2
	–	G231-3

Speaker signal (1)

Channel	Probe	Terminal No.
1	+	G248-3, G248-4, G248-5, G248-6, L12-6, L12-7, L12-8, L12-9, L12-10, L12-11 or L12-12
	–	G248-13, G248-14, G248-15, G248-16, L12-18, L12-19, L12-20, L12-21, L12-22, L12-23 or L12-24

Audio amplifier signal (1)

Channel	Probe	Terminal No.
1	+	G248-3, G248-4, G248-5 or G248-6
	–	G248-11

Sub woofer signal (1)

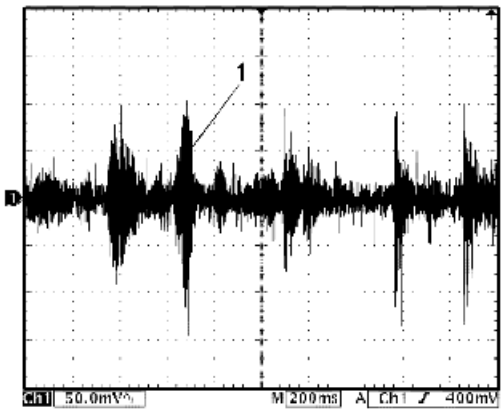
Channel	Probe	Terminal No.
1	+	L11-2 or L11-3
	–	L11-6 or L11-7

Audio unit signal (1)

Channel	Probe	Terminal No.
1	+	L12-1, L12-2, L12-3, L12-4, L12-13, L12-14, L12-15 or L12-16
	–	L11-4

Measurement condition

- Audio: ON

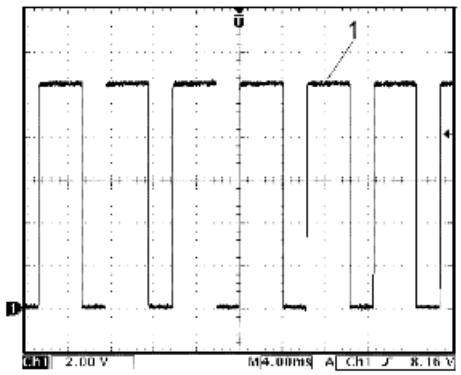


Illumination signal

Channel	Probe	Terminal No.
1	+	G248-12
	–	G248-11

Measurement condition

- When clearance lights or headlights are lighting.



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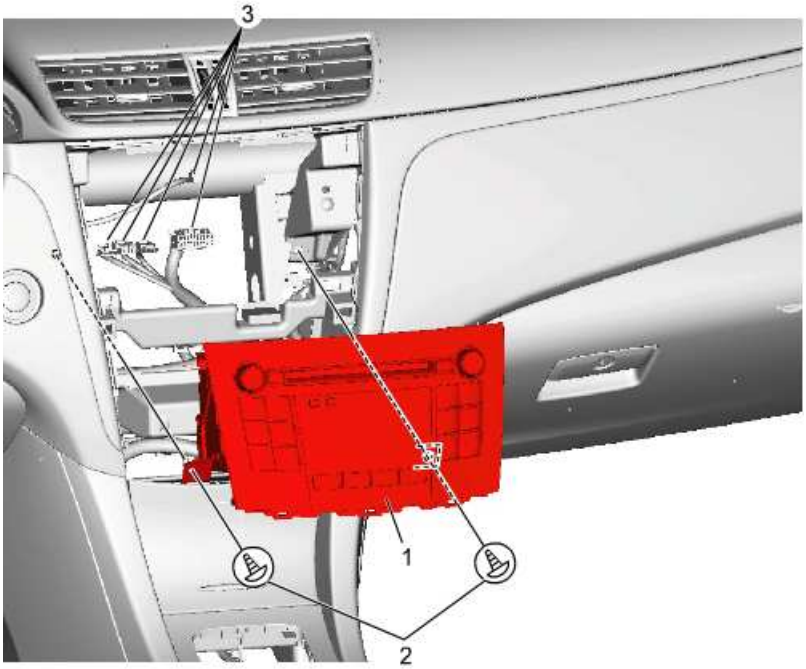
Audio Unit Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Remove HVAC control module. ☞
3) Remove audio unit (1) from instrument panel by removing 2 mounting screws (2).
4) Disconnect audio unit connectors (3).



Installation

Reverse removal procedure.

7B

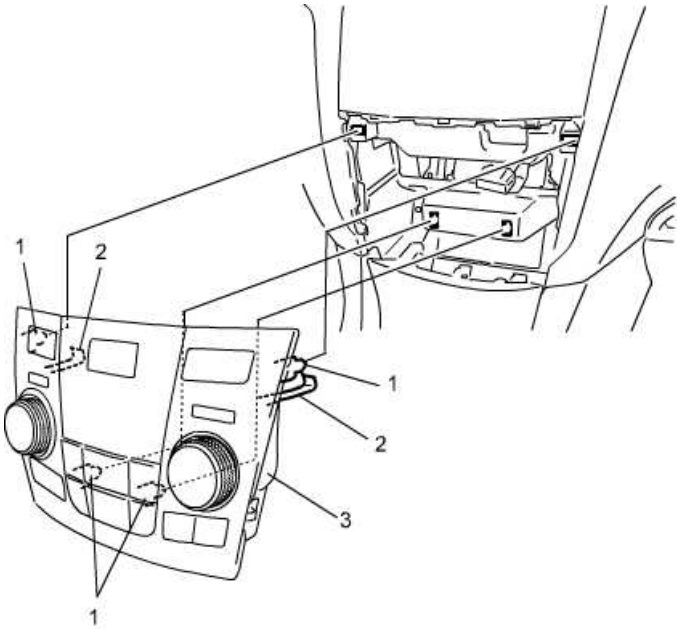
HVAC Control Module Removal and Installation

Removal

1) Release tabs (1) and claws (2) of auto A/C panel (3).

2) Disconnect connector and remove auto A/C panel.

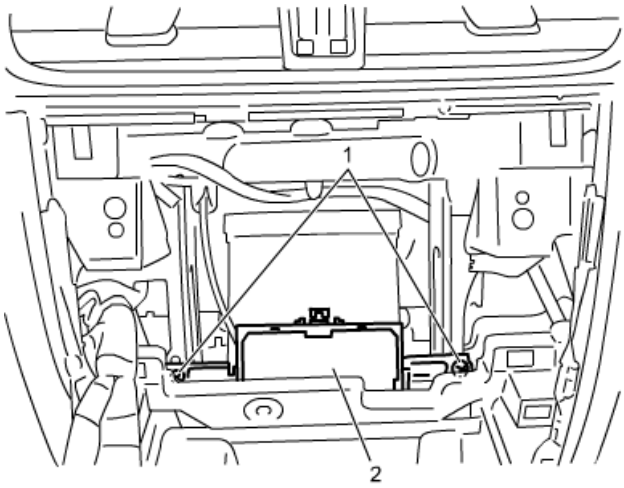
CAUTION:
Remove auto A/C panel from lower side and prevent the claws from damaging.



3) Remove audio unit. ☞

4) Remove screws (1), and then disconnect connector from HVAC control module (2).

5) Remove HVAC control module from steering support member.



Installation

Reverse removal procedure noting the following points.

CAUTION:
Be careful not to push hard knob of auto A/C panel to prevent it from damaging.

90

Steering Switch (Audio Control Switch, Display and Trip Switch and Hands-Free Switch) Inspection

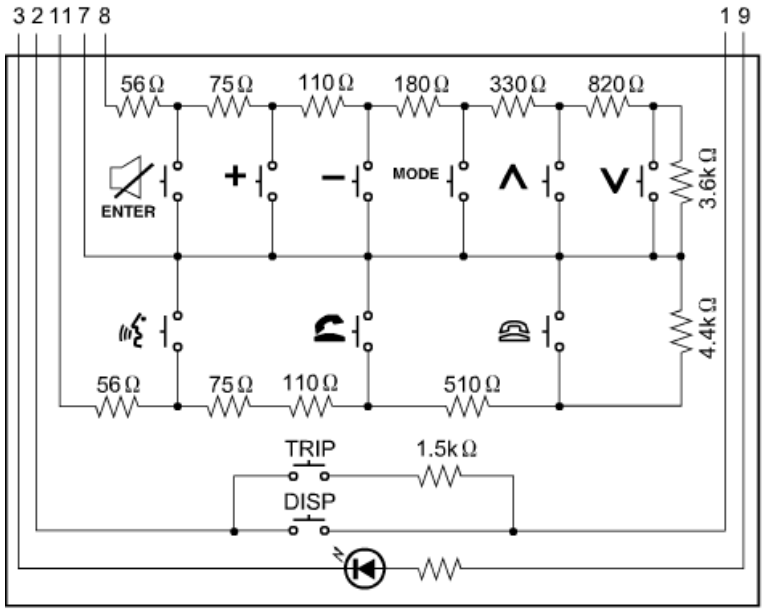
1) Remove driver air bag (inflator) module. ☞

2) Disconnect "S61" connector from steering switch and check resistance between the following terminals under each condition in the table.
If check result is not satisfactory, replace steering switch.

NOTE:
Set tester at diode range when measuring between terminals 3 and 9.

Steering switch resistance

Terminal position	Resistance value	Measurement condition
11 – 8	56 ± 0.6 Ω	Talk switch: ON
	241 ± 2.4 Ω	Off hook switch: ON
	751 ± 7.5 Ω	On hook switch: ON
	5151 ± 51.5 Ω	Except above: ON
7 – 8	56 ± 1.7 Ω	Mute switch: ON
	131 ± 3.9 Ω	Volume switch "+": ON
	241 ± 7.2 Ω	Volume switch "–": ON
	421 ± 12.6 Ω	Mode switch: ON
	751 ± 22.5 Ω	Seek switch "▲": ON
	1571 ± 47.1 Ω	Seek switch "▼": ON
	5171 ± 155.1 Ω	Except above
1 – 2	1500 ± 75 Ω	TRIP switch: ON
	Approx. 0 Ω	DISP switch: ON
	∞ Ω	Except above

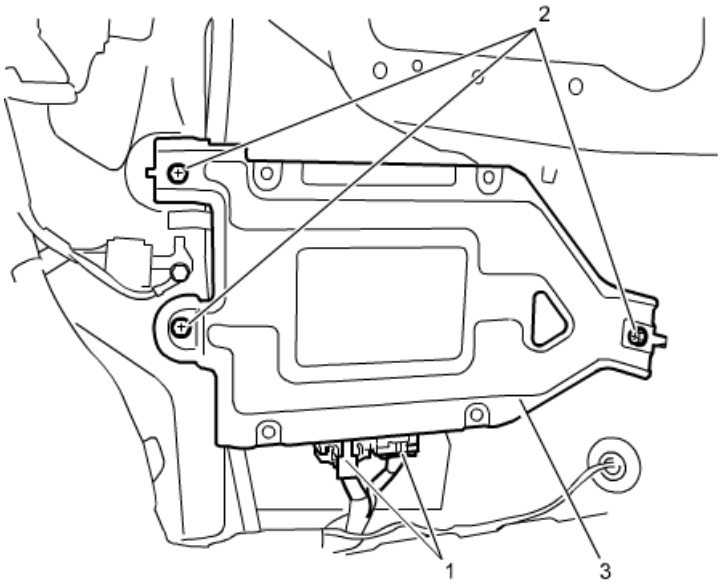

3 2 11 7 8
1 9
56Ω
75Ω
110Ω
180Ω
330Ω
820Ω
ENTER
+
−
MODE
^
v
3.6kΩ
4.4kΩ
56Ω
75Ω
110Ω
510Ω
TRIP
1.5kΩ
DISP

90

Audio Amplifier Removal and Installation (If Equipped)

Removal

1) Disconnect negative (–) cable at battery.
2) Remove trunk side trim. ☞
3) Disconnect audio amplifier connectors (1).
4) Remove 3 audio amplifier bolts (2).
5) Remove audio amplifier (3) from trunk.



Installation

Reverse removal procedure.

90

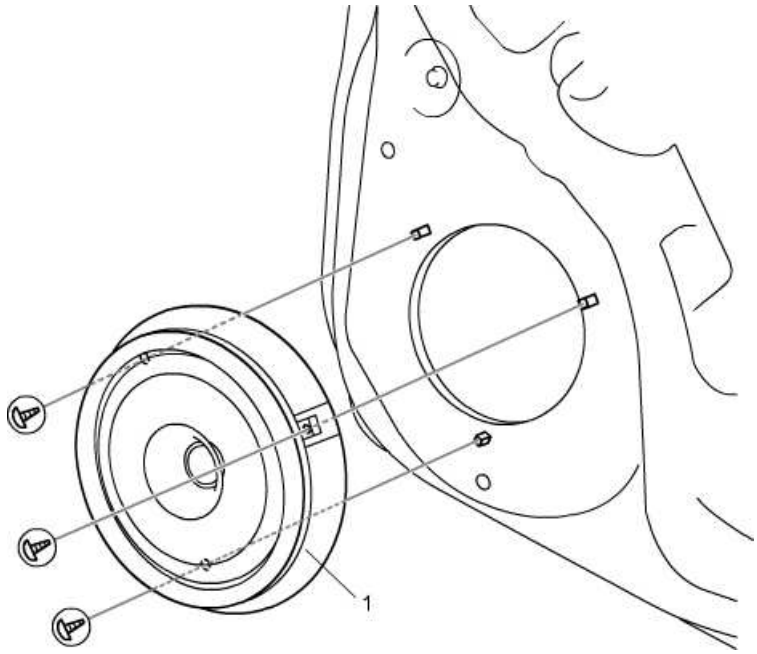
Front Speaker and Rear Speaker Removal and Installation

Removal

1) Remove door trim.
- Front: ☞
- Rear: ☞

2) Remove 3 screws and remove front or rear speaker (1).

3) Disconnect speaker connector.



Installation

Reverse removal procedure.

9O

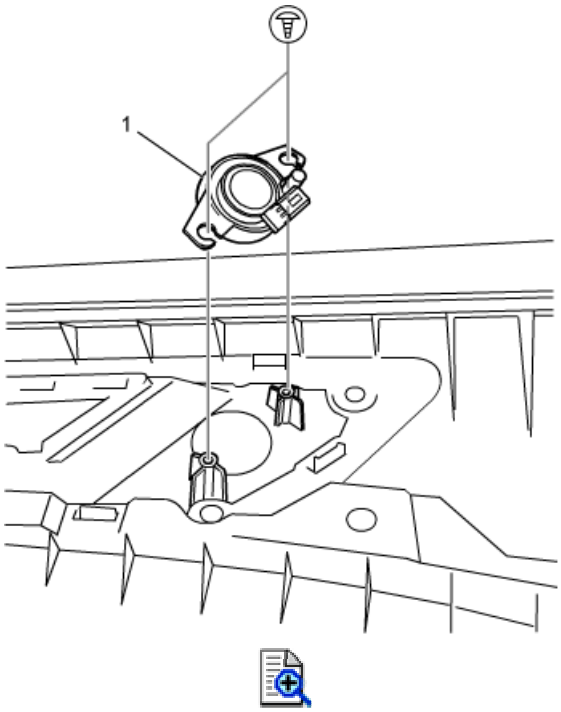
Tweeter Removal and Installation

Removal

1) Remove front door trim. ☞

2) Remove 2 screws and remove tweeter (1).

3) Disconnect tweeter connector.



Installation

Reverse removal procedure.

90

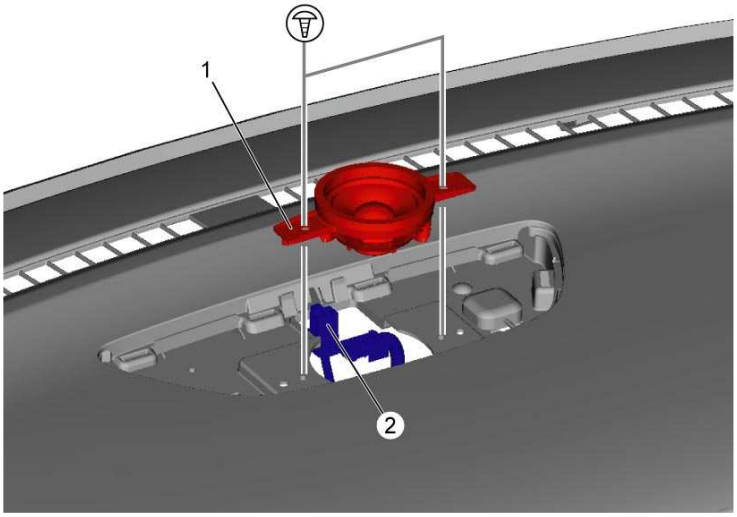
Center Speaker Removal and Installation

Removal

1) Remove instrument panel center speaker cover. ☞

2) Remove 2 screws and remove center speaker (1).

3) Disconnect speaker connector (2).



Installation

Reverse removal procedure.

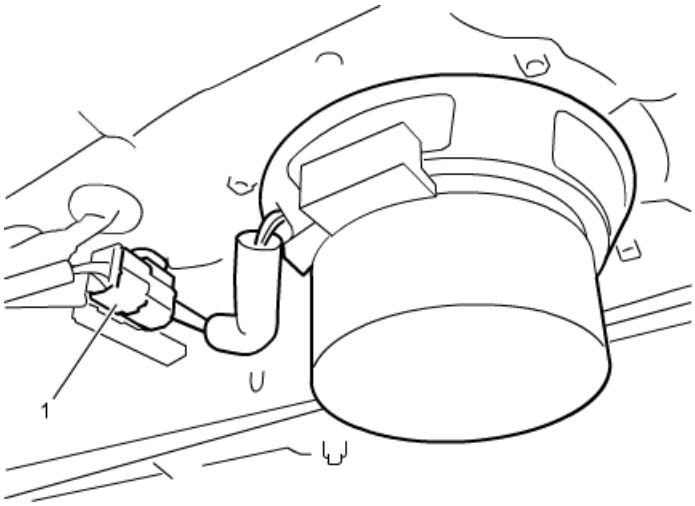
90

Sub Woofer Removal and Installation (If Equipped)

Removal

1) Open trunk lid.

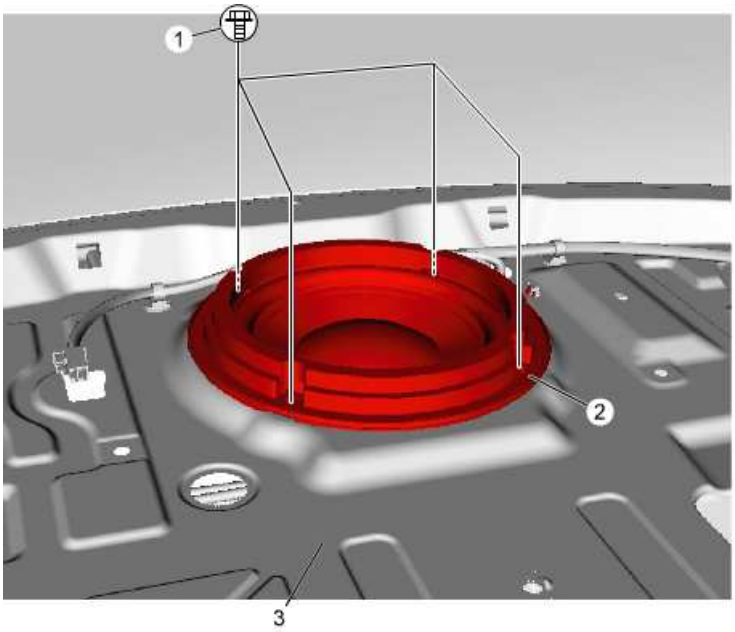
2) Disconnect sub woofer connector (1).



3) Remove partition trim. ☞

4) Remove 4 bolts (1).

5) Remove sub woofer (2) from partition panel (3).



Installation

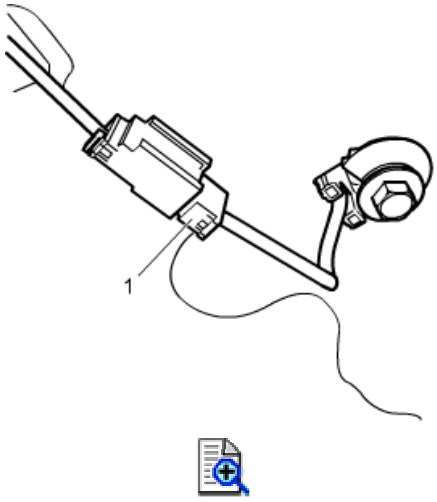
Reverse removal procedure.

90

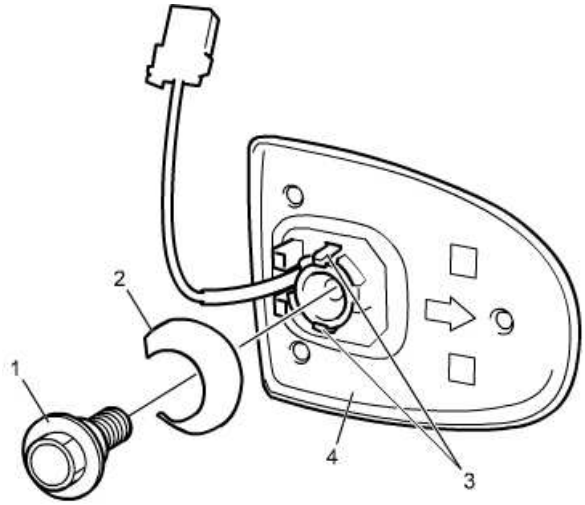
XM Antenna Removal and Installation (If Equipped)

Removal

1) Disconnect negative (–) cable at battery.
2) Remove roof lining. ☞
3) Disconnect XM antenna connector (1).



4) Remove antenna bolt (1) and washer (2).
5) Disengage claws (3) and remove XM antenna (4).



Installation

Reference: XM Antenna Inspection (If Equipped)
Reverse removal procedure noting the following point.
- Tighten antenna bolt to specified torque.

Tightening torque
Antenna bolt: 9.0 N·m (0.92 kg-m, 7.0 lbf-ft)

90

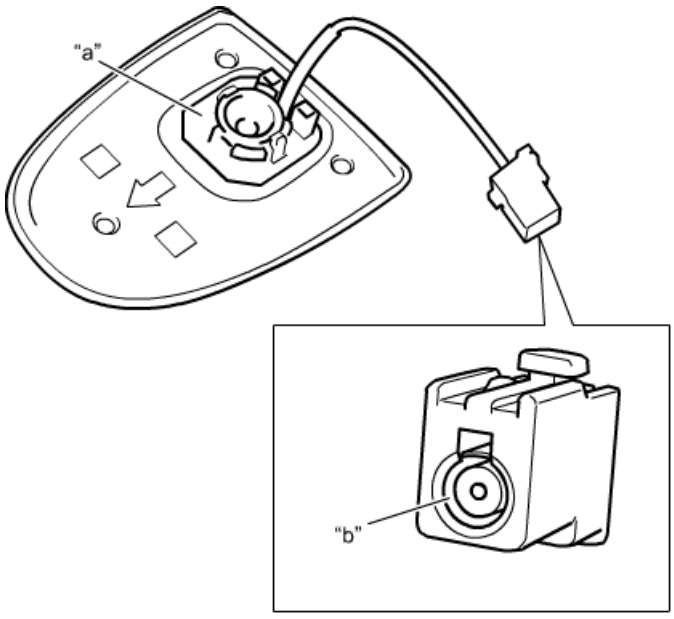
XM Antenna Inspection (If Equipped)

Reference: XM Antenna Removal and Installation (If Equipped)

Check continuity referring to figure. If check result is not as specified, replace XM antenna.

XM antenna continuity

XM antenna base	XM antenna terminal
"a"	"b"



90

Radio Antenna Feeder Cable Inspection

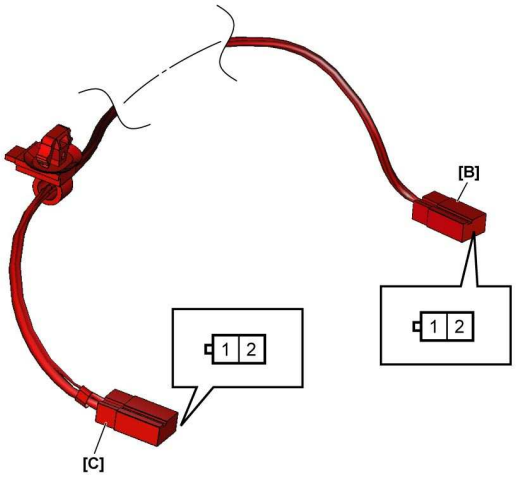
Radio Antenna Feeder Cable (Instrument Panel)

Disconnect radio antenna feeder cable (instrument panel) and check continuity as shown in figure. If check result is not as specified, replace radio antenna feeder cable (instrument panel).

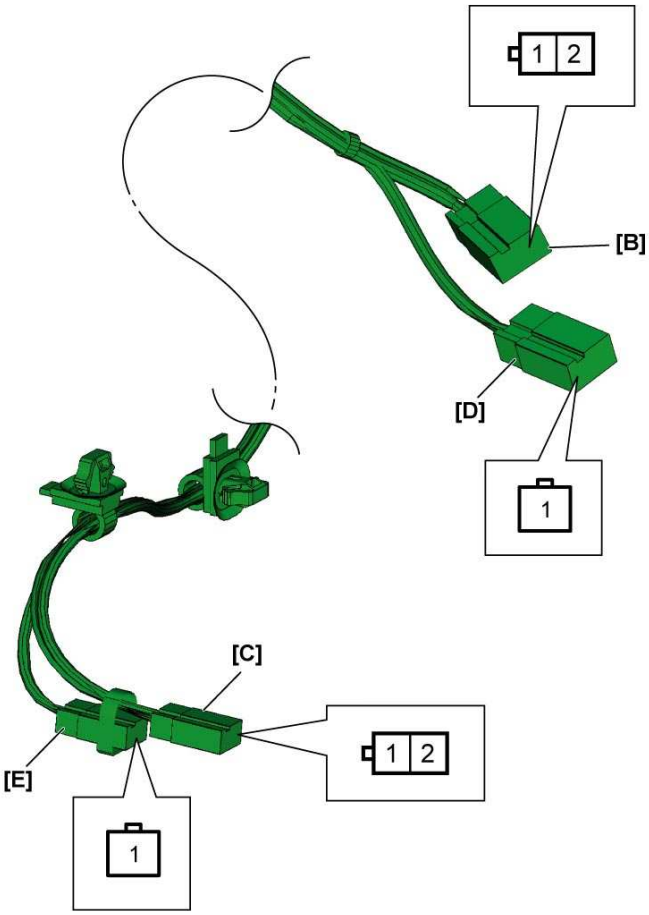
Radio antenna feeder cable (instrument panel) continuity

Connector / Terminal	G354	G267	G368	G229
1	○—○		○—○	
2	○—○			

Without XM antenna



With XM antenna



[B]:	To radio antenna feeder cable (roof) (“G354” connector)	[D]:	To radio antenna feeder cable (roof) (“G368” connector)
[C]:	To audio unit (“G267” connector)	[E]:	To audio unit (“G229” connector)

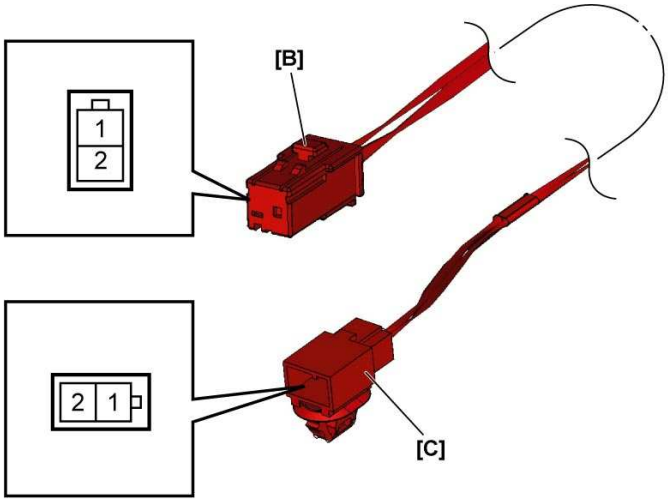
Radio Antenna Feeder Cable (Roof)

Disconnect radio antenna feeder cable (roof) and check continuity as shown in figure. If check result is not as specified, replace radio antenna feeder cable (roof).

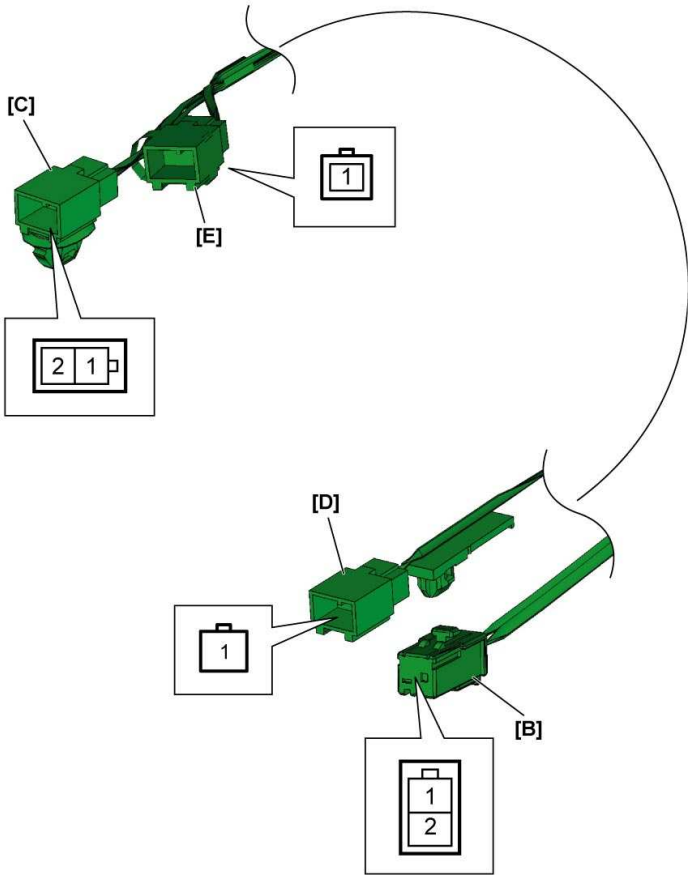
Radio antenna feeder cable (roof) continuity

Terminal \ Connector	K121	K154	K129	K158
1	○—○		○—○	
2	○—○			

Without XM antenna



With XM antenna



[B]: To antenna amplifier (“K121” connector)	[D]: To XM antenna (“K129” connector)
[C]: To radio antenna feeder cable (instrument panel) (“K154” connector)	[E]: To radio antenna feeder cable (instrument panel) (“K158” connector)

90

Steering Switch (Audio Control Switch, Display and Trip Switch and Hands-Free Switch) Inspection

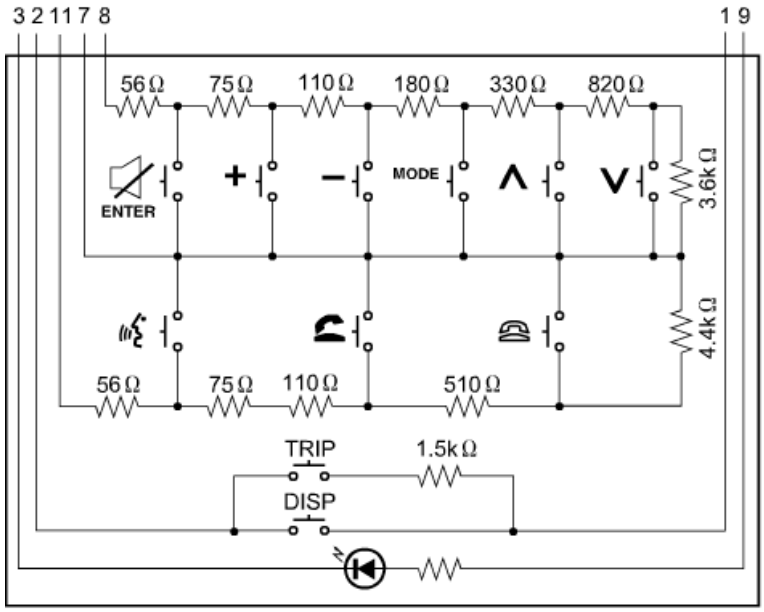
1) Remove driver air bag (inflator) module. ☞

2) Disconnect "S61" connector from steering switch and check resistance between the following terminals under each condition in the table.
If check result is not satisfactory, replace steering switch.

NOTE:
Set tester at diode range when measuring between terminals 3 and 9.

Steering switch resistance

Terminal position	Resistance value	Measurement condition
11 – 8	56 ± 0.6 Ω	Talk switch: ON
	241 ± 2.4 Ω	Off hook switch: ON
	751 ± 7.5 Ω	On hook switch: ON
	5151 ± 51.5 Ω	Except above: ON
7 – 8	56 ± 1.7 Ω	Mute switch: ON
	131 ± 3.9 Ω	Volume switch "+": ON
	241 ± 7.2 Ω	Volume switch "–": ON
	421 ± 12.6 Ω	Mode switch: ON
	751 ± 22.5 Ω	Seek switch "▲": ON
	1571 ± 47.1 Ω	Seek switch "▼": ON
	5171 ± 155.1 Ω	Except above
1 – 2	1500 ± 75 Ω	TRIP switch: ON
	Approx. 0 Ω	DISP switch: ON
	∞ Ω	Except above


3 2 11 7 8
1 9
56Ω
75Ω
110Ω
180Ω
330Ω
820Ω
ENTER
+
−
MODE
^
v
3.6kΩ
4.4kΩ
56Ω
75Ω
110Ω
510Ω
TRIP
1.5kΩ
DISP

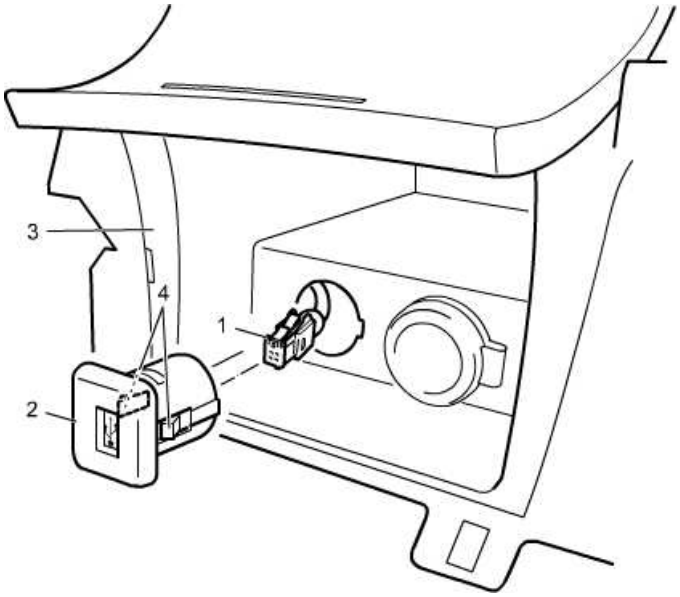
90

USB Socket Removal and Installation

Removal

1) Remove instrument panel center lower box. ☞

2) Disconnect USB socket connector (1), and then remove USB socket (2) from instrument panel center lower box (3) while releasing the locks (4).



Installation

Reference: USB Socket Inspection

Reverse removal procedure.

90

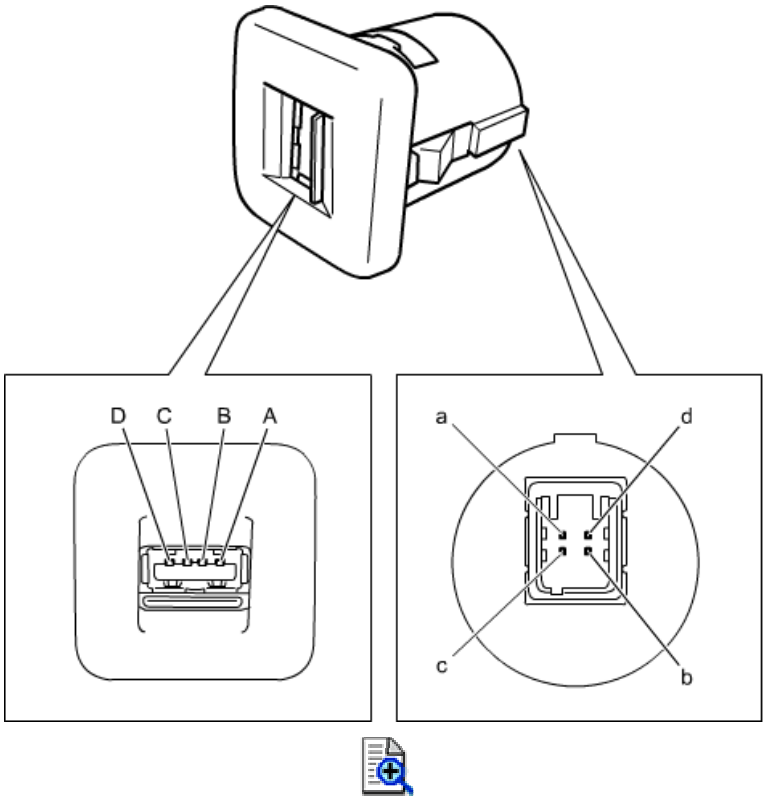
USB Socket Inspection

Reference: USB Socket Removal and Installation

Check continuity between each terminal of socket side and harness side of USB socket as shown in figure.
If check result is not as specified, replace USB socket.

USB socket continuity

Terminal	
A	a
B	b
C	c
D	d

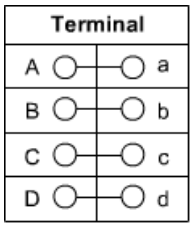


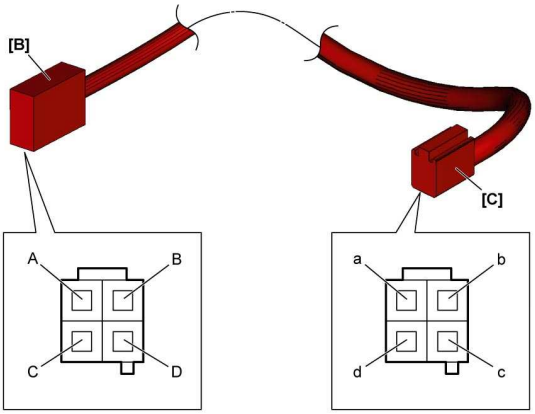
90

USB Harness Inspection

Check continuity between each terminal of USB socket side and audio unit side of USB harness connector as shown in figure.
If check result is not as specified, replace USB harness.

USB harness continuity

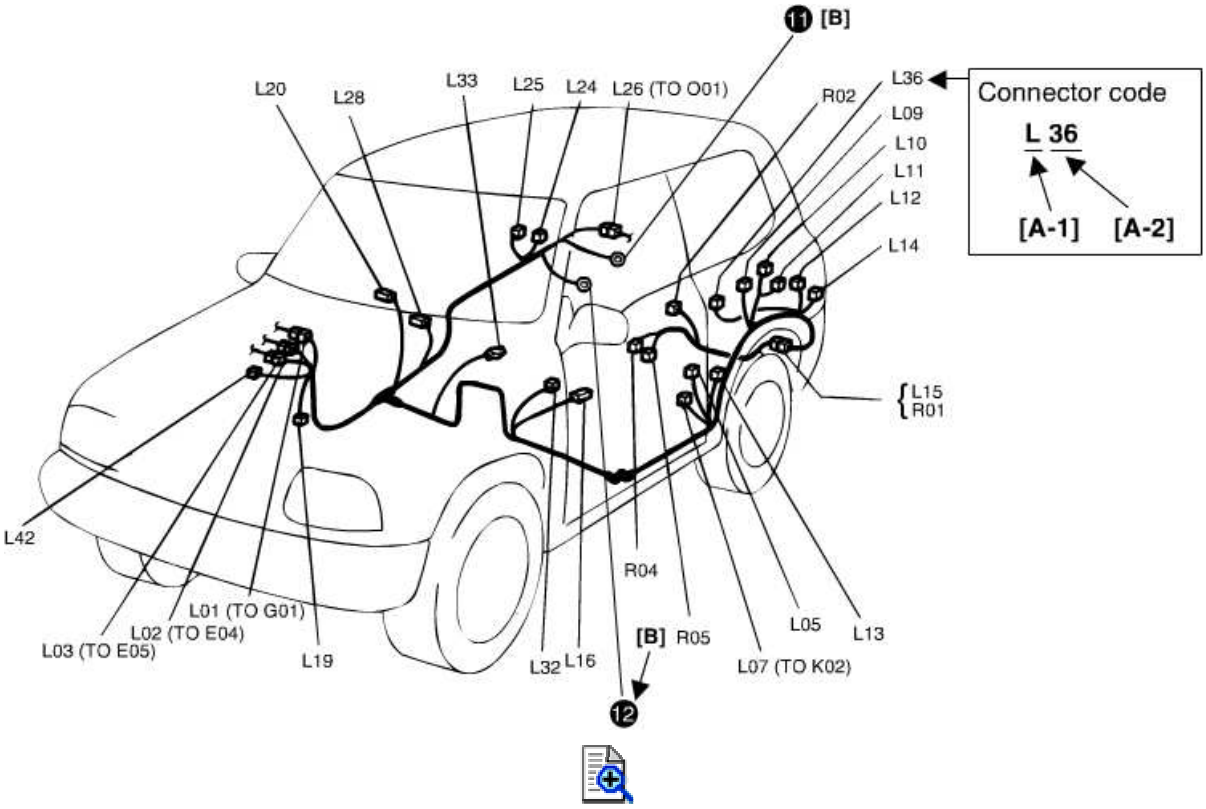




[B]:	To USB socket (“G216” connector)	[C]:	To audio unit (“G221” connector)

How to Read Connector Layout Diagram

[A-1]: Harness Symbol and Corresponding Harness Name
A: Battery cable
B: A/C harness
C: Engine harness
D: Injector harness, Oil pressure switch wire
E: Main harness, Power steering wire
F: Console wire
G: Instrument panel harness, Instrument panel antenna wire
J: Side door wire (including P/W related wires)
K: Interior light harness, Roof wire, Roof radio antenna wire, Rear speaker wire
L: Floor harness, Floor antenna wire, Coupling harness, Accessory socket wire, G sensor wire
M: Rear bumper wire
O: Rear end area harness/wires (except Rear bumper wire)
Q: Curtain air bag wire, Side air bag harness, Pretensioner wire
R: Fuel pump wire
S: Contact coil
[A-2]: Connector Number
[B]: Ground Point No.

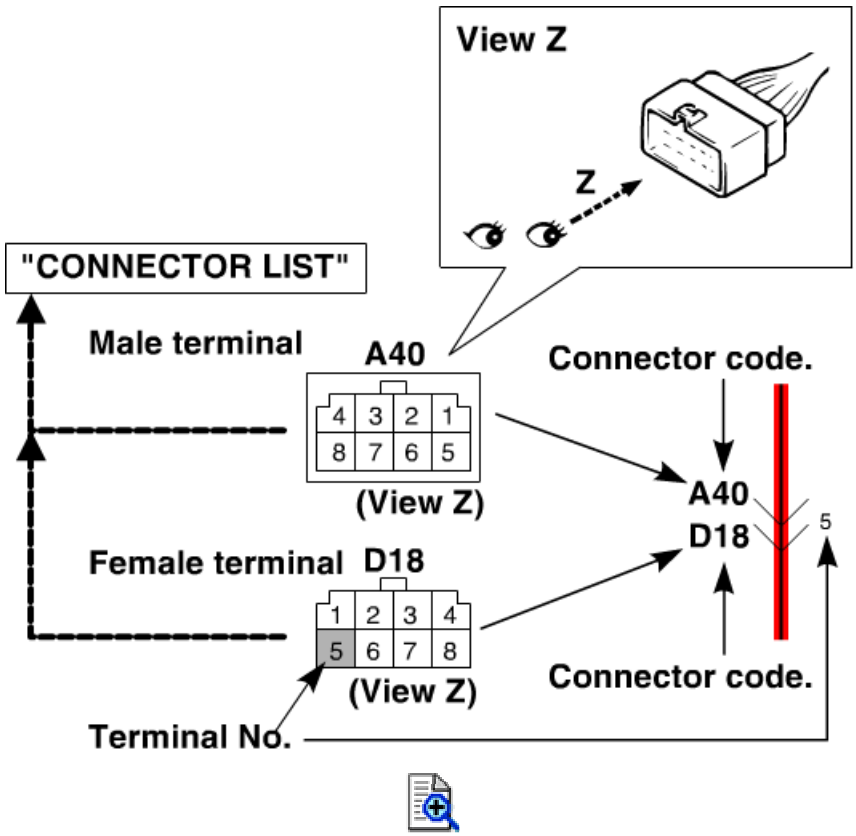


9A

How to Read Connector Codes and Terminal Nos.

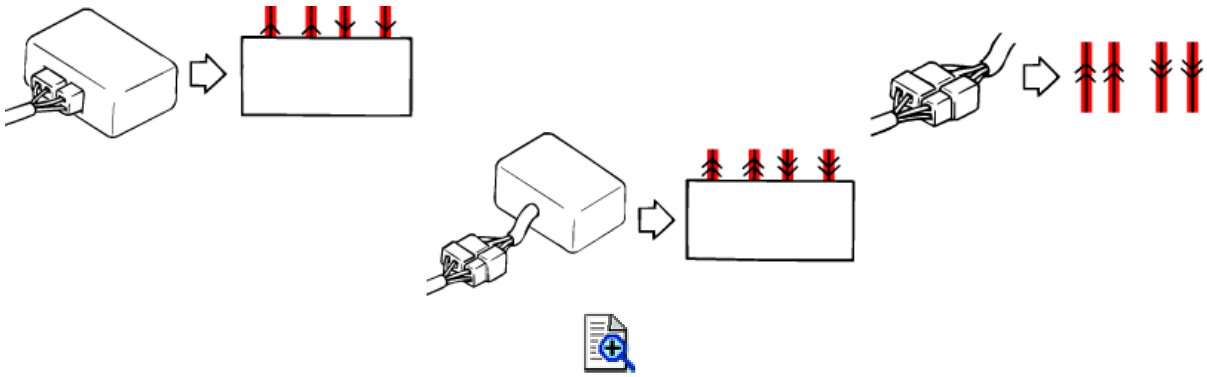
1) Connector code/Terminal No./Terminal layout

- The connector shape and terminal layout shown in this manual are those when viewed from "Z" in the illustration.
  Refer to ***List of Connectors***.

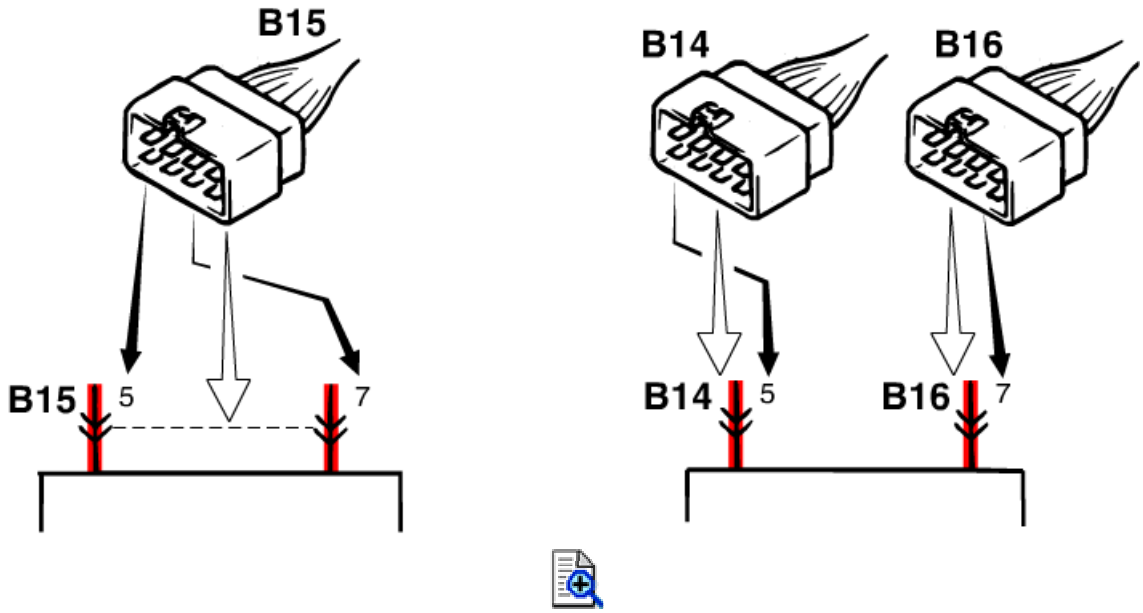


NOTE:
Molded terminal numbers that are different from the above can be found on some connectors in rare cases.
These molded numbers are not applied in this manual.

2) Connector type

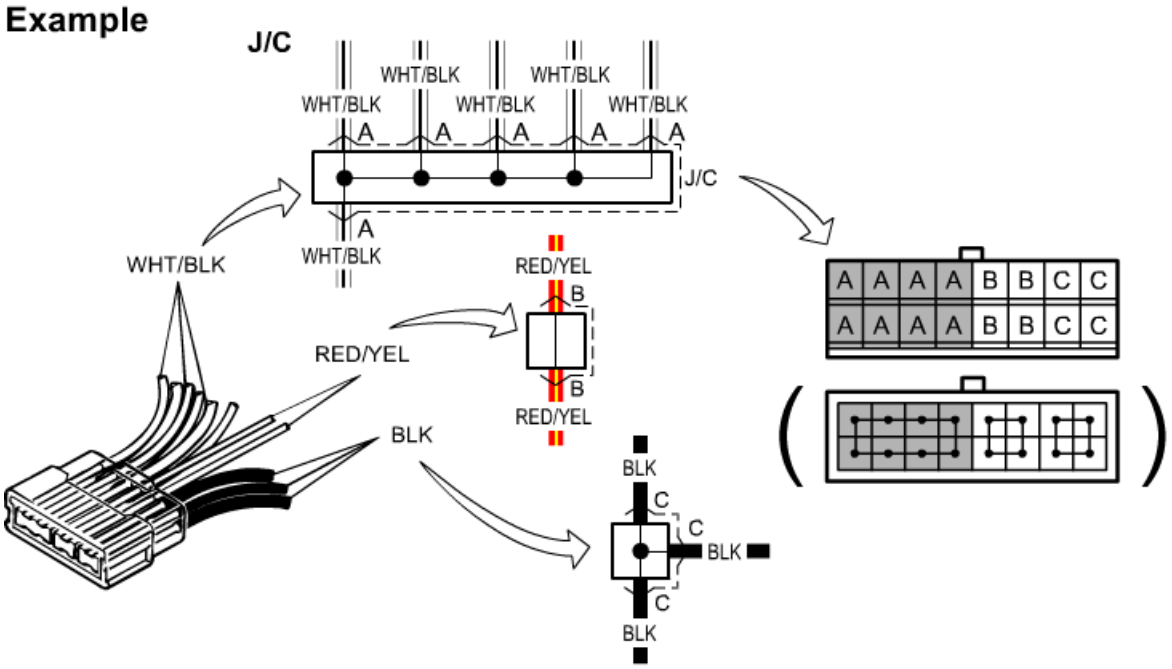


3) Terminals in one connector (Broken line) (B15)/Terminals in different connectors (B14, B16)



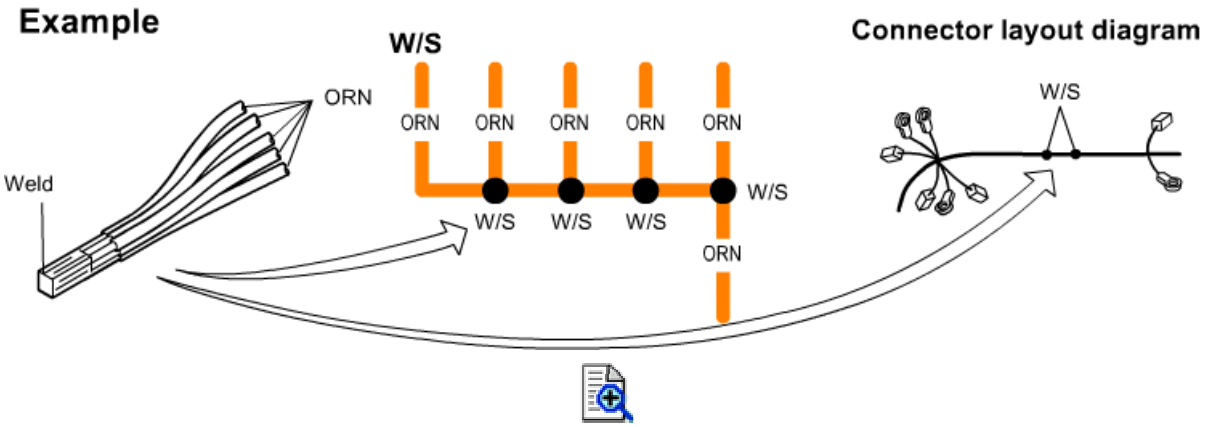
4) Joint connector (J/C)

- The joint connector (J/C) connects several different wires with the same wire color at one place instead of connecting them by welding or caulking one by one. It is not an ordinary connector but a part of the continuous wire in the harness.

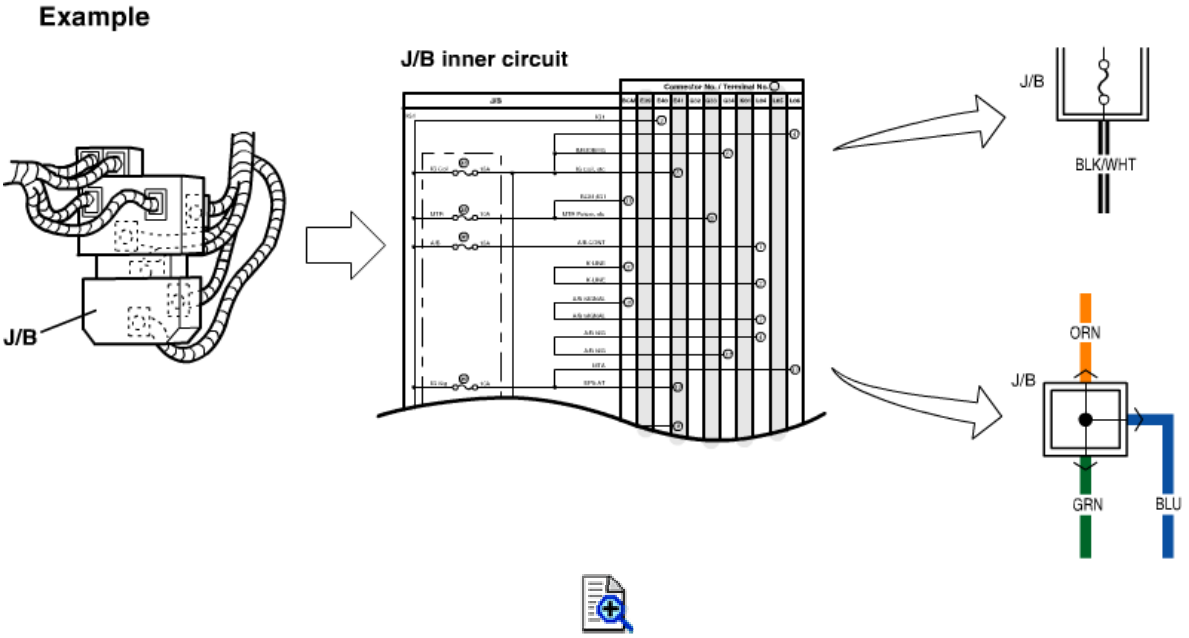


5) Weld splice (W/S)

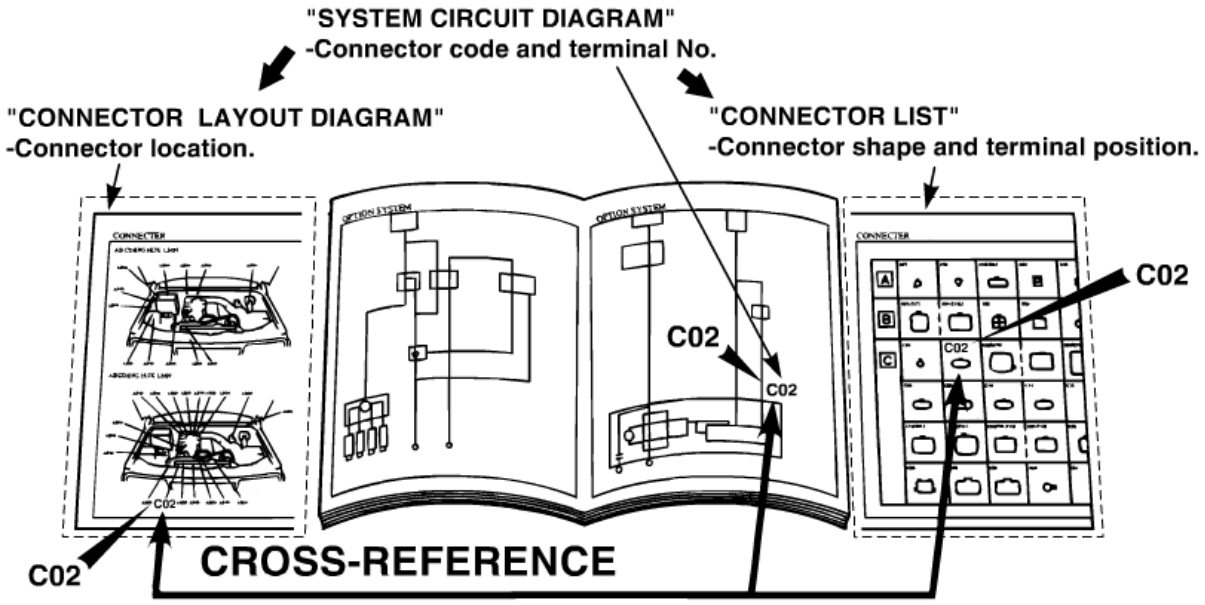
- Several different wires with the same wire color are joined by welding at a W/S.



6) Junction block (J/B)



7) Connector location, shape and terminal No.
Refer to ***Connector Layout Diagram***.
Refer to ***System Circuit Diagram***.
Refer to ***List of Connectors***.

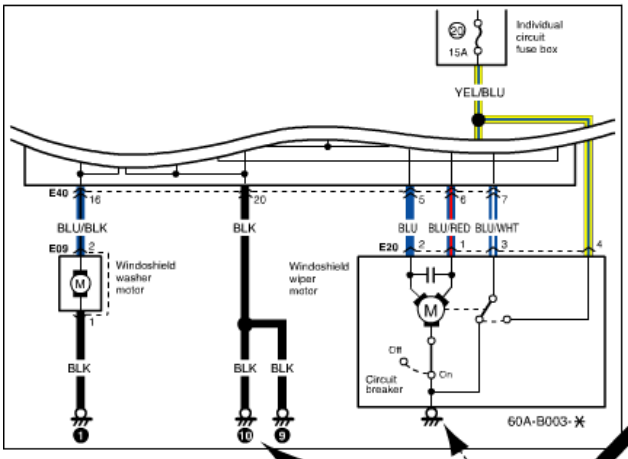

"SYSTEM CIRCUIT DIAGRAM"
-Connector code and terminal No.
"CONNECTOR LAYOUT DIAGRAM"
-Connector location.
"CONNECTOR LIST"
-Connector shape and terminal position.
C02
C02
C02
C02
C02
CROSS-REFERENCE

9A

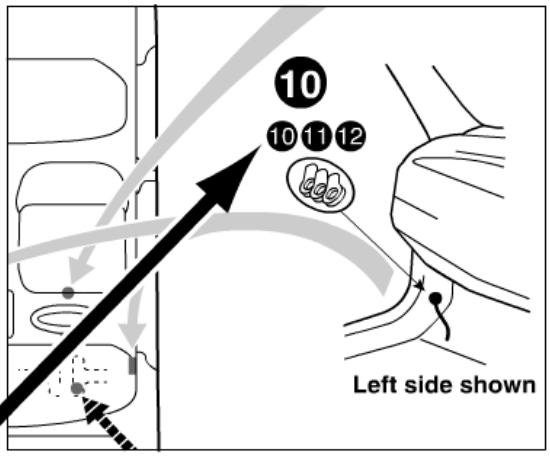
How to Read Ground Point

Refer to ***System Circuit Diagram***.
Refer to ***Ground (Earth) Point***.

"SYSTEM CIRCUIT DIAGRAM"



"GROUND POINT"



10

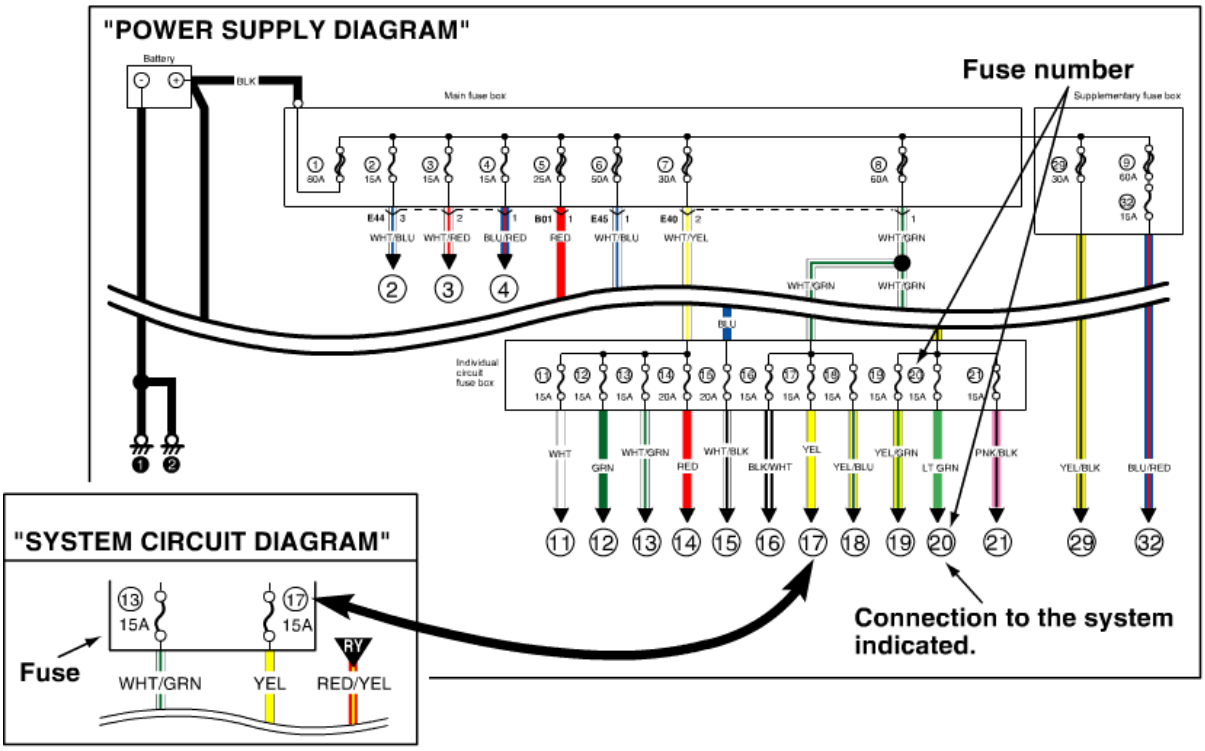
Device body grounding is not given the ground point number.

CROSS-REFERENCE

9A

How to Read Power Supply Diagram

Refer to ***Power Supply Diagram***.
Refer to ***System Circuit Diagram***.



9A

How to Read System Circuit Diagram

The circuit diagram is designed so the current flows from the top of the diagram (power source) to the bottom of the diagram (ground) as if giving an image of water flow.

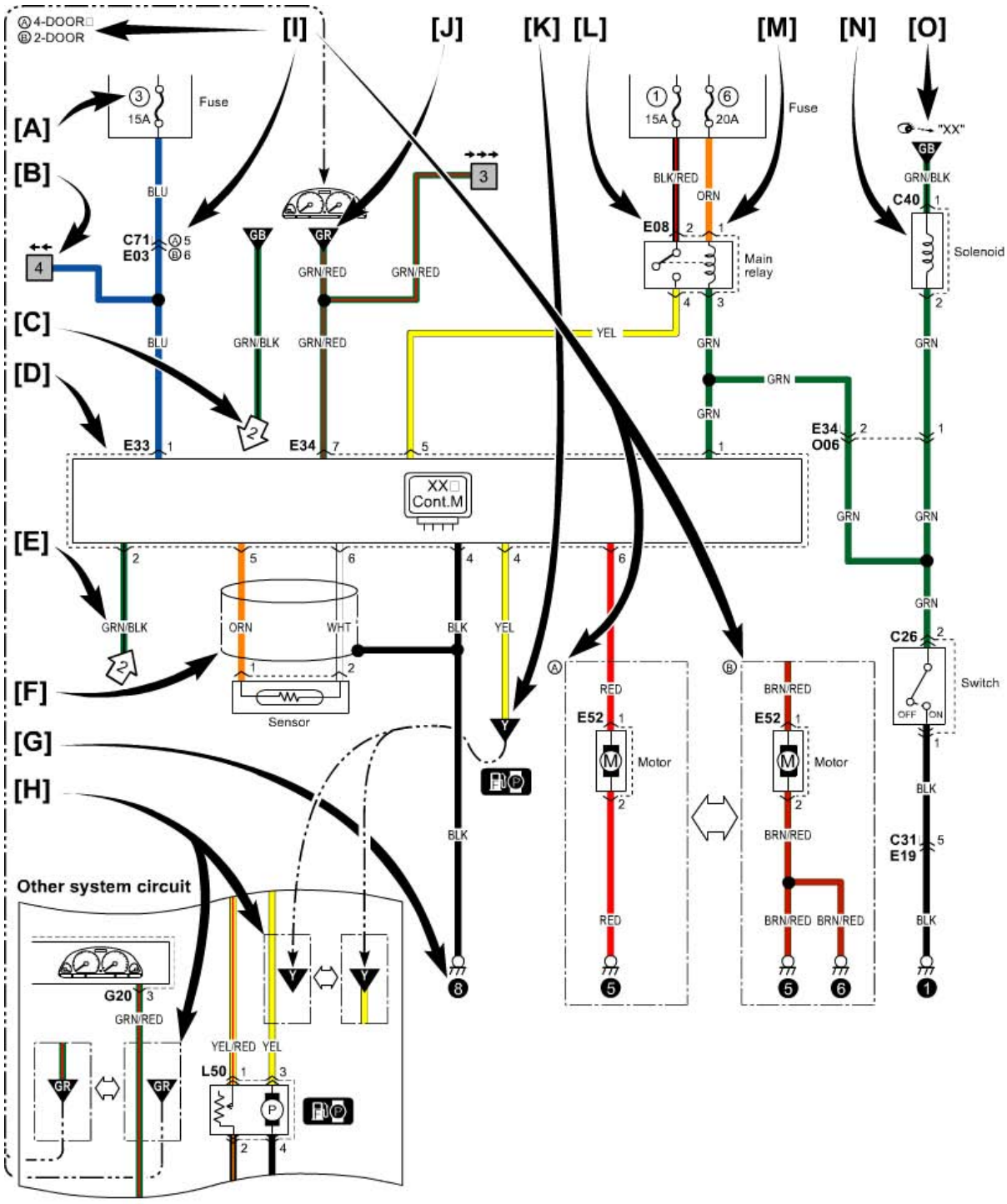
[A]: Fuse No.
[B]: Circuit Jumping Page / Direction

NOTE:
This means "Jump to the page directed with the arrow(s) by their number. (For example:" Two arrows directing left" means" Jump to two pages before".) You will find the same symbol with the arrows directing opposite in the referenced page. The circuit continues between the symbols.

[C]: Circuit Jumping Point / Direction

NOTE:
The circuit continues to the same symbol with opposite direction within the page.
You will find the other symbol in the direction of the arrow.

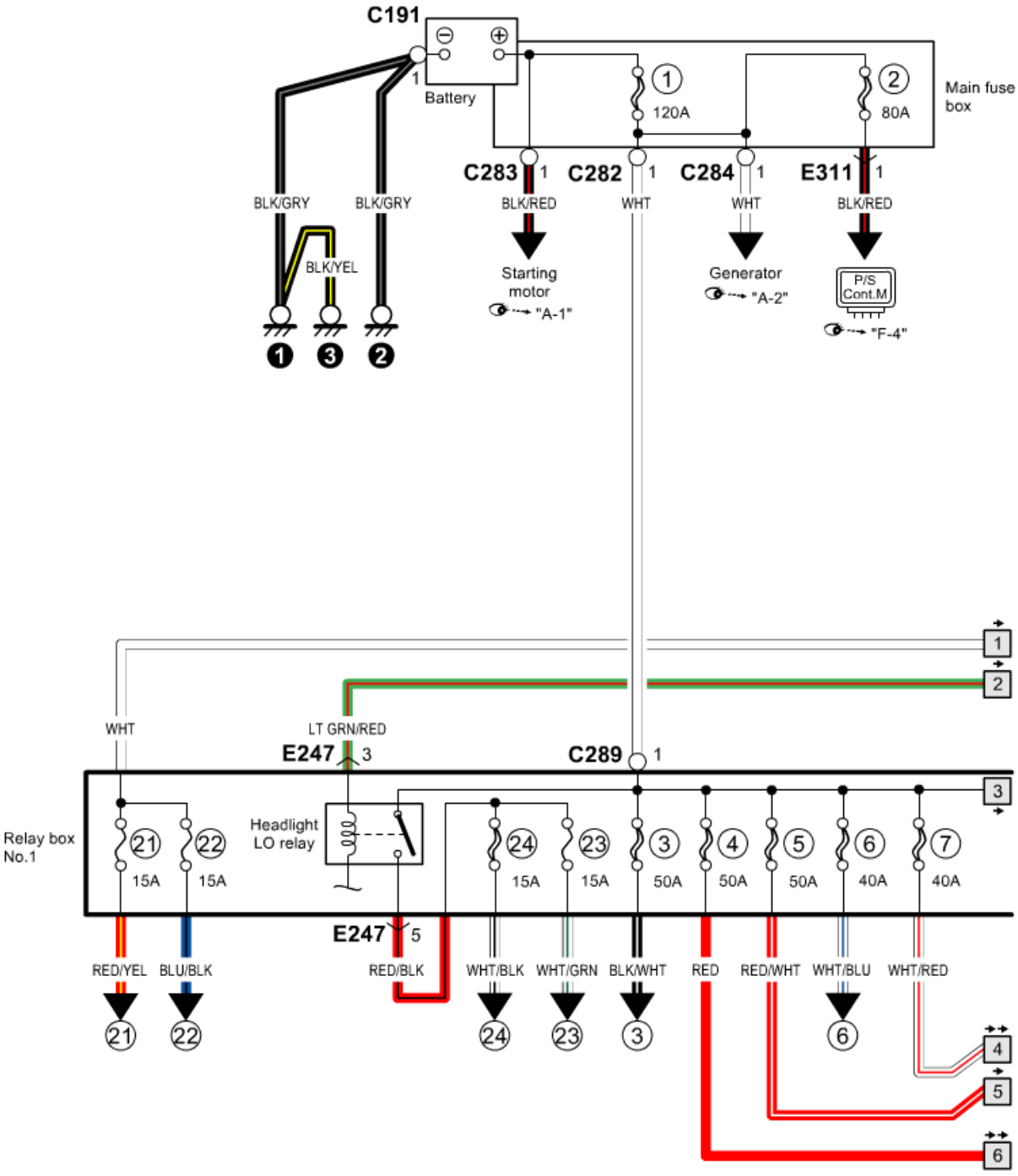
[D]: Terminals-in-One-Connector Mark
[E]: Wire Color
[F]: Shield Wire
[G]: Ground Point
[H]: "From" or "To" (With ID Letter (s))
[I]: Specification Variation
The white arrow between A and B means "or".
[J]: "From" (With ID Letter (s))
[K] "To" (With ID Letter (s))
[L]: Connector Code
[M]: Terminal No.
[N]: Symbol Mark
[O]: "SEE" Mark

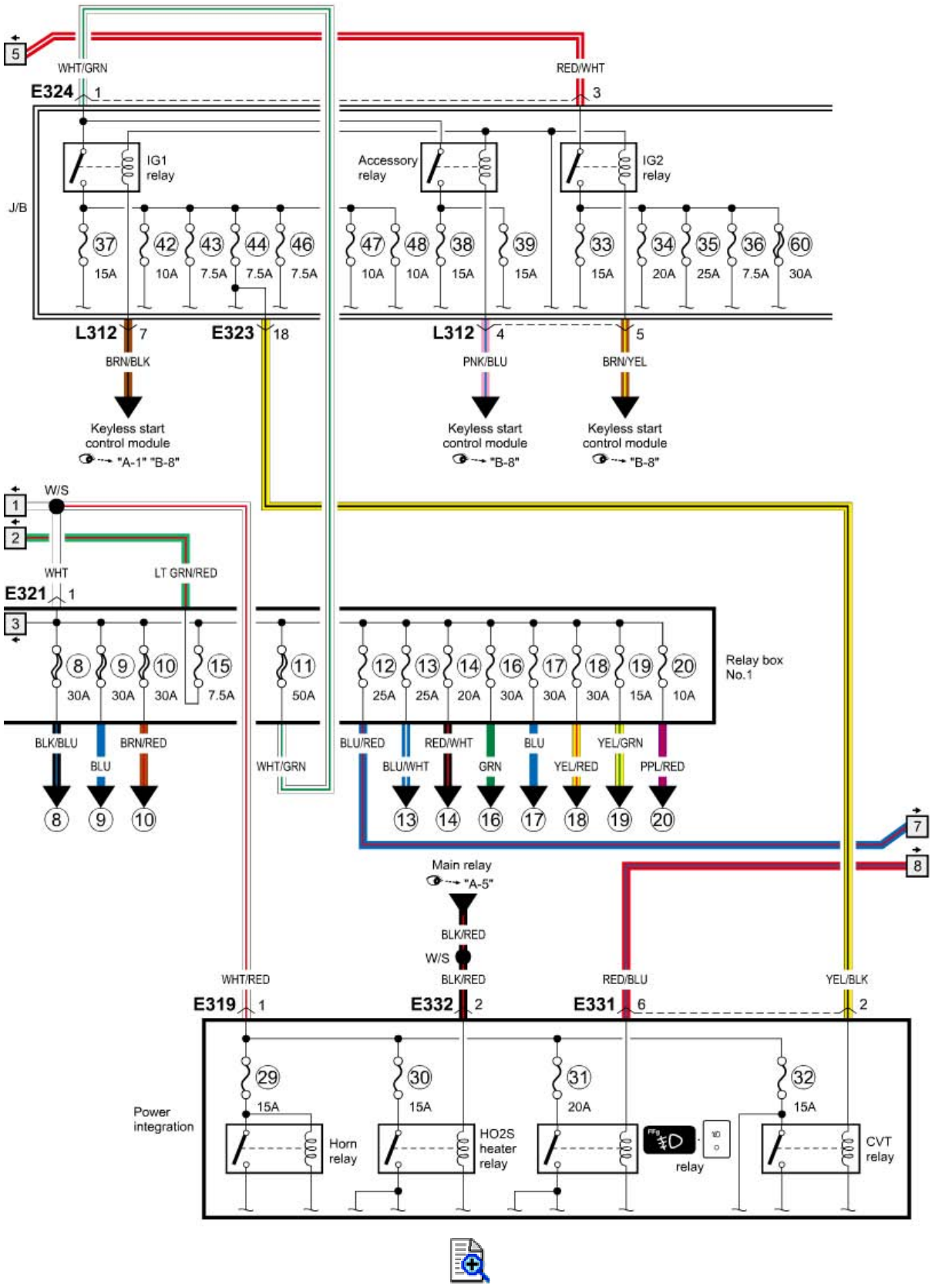

Ⓐ 4-DOOR
Ⓑ 2-DOOR
[I]
[J]
[K]
[L]
[M]
[N]
[O]
[A]
[B]
[C]
[D]
[E]
[F]
[G]
[H]
Fuse
15A
20A
BLU
BLK/RED
ORN
GRN/BLK
GRN/RED
YEL
GRN
RED
BRN/RED
BLK
WHT
C71
E03
E08
Main relay
C40
Solenoid
E33
E34
O06
XX
Cont.M
C26
Switch
OFF
ON
Sensor
E52
Motor
C31
E19
Other system circuit
G20
YEL/RED
L50

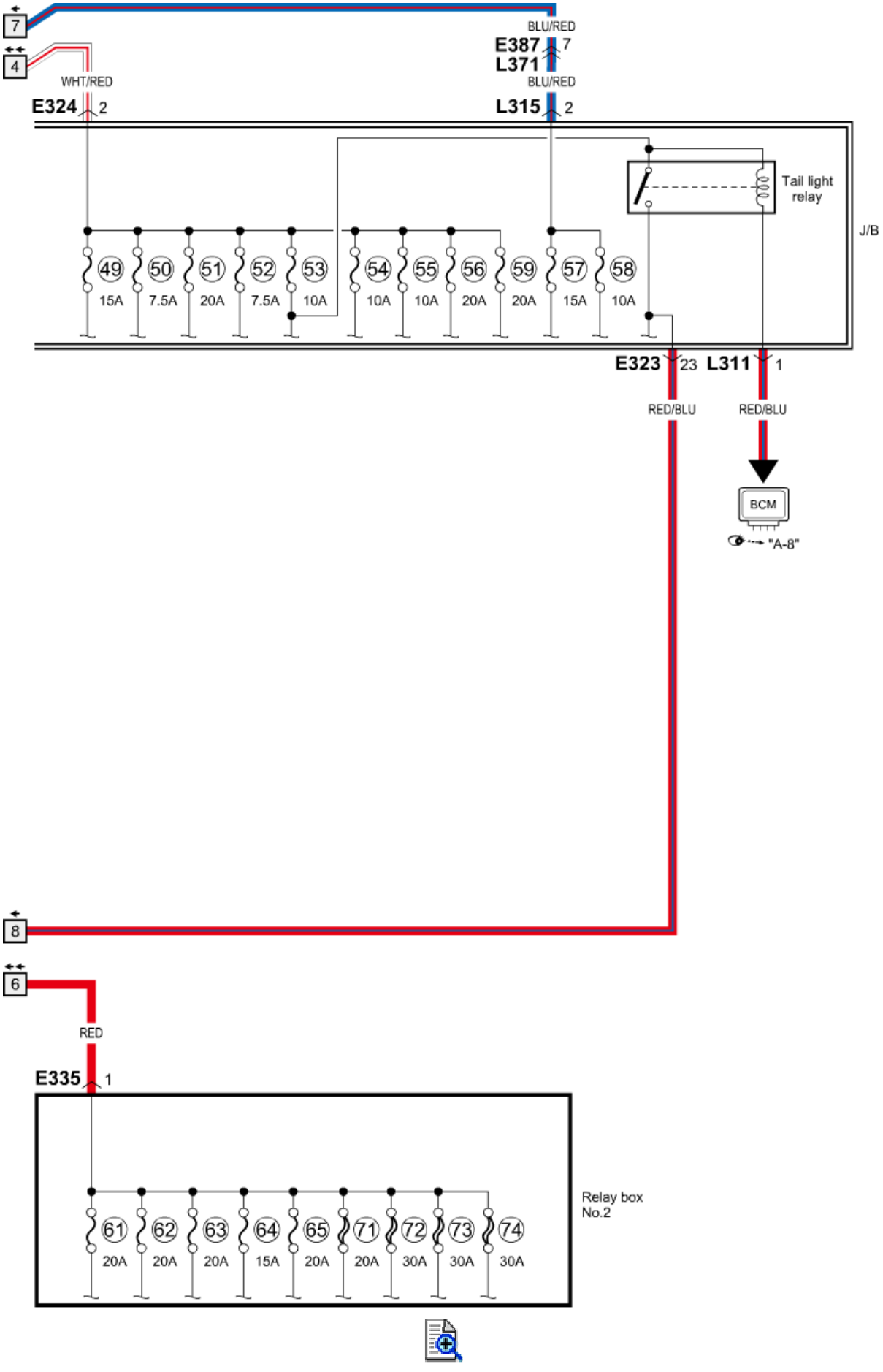
9A

Power Supply Diagram

ESP®: ESP is a registered trademark of Daimler AG.




5
WHT/GRN
E324 1
RED/WHT
3
IG1 relay
Accessory relay
IG2 relay
J/B
37 15A
42 10A
43 7.5A
44 7.5A
46 7.5A
47 10A
48 10A
38 15A
39 15A
33 15A
34 20A
35 25A
36 7.5A
60 30A
L312 7
E323 18
L312 4
5
BRN/BLK
PNK/BLU
BRN/YEL
Keyless start control module
"A-1" "B-8"
"B-8"
"B-8"
1
2
W/S
WHT
LT GRN/RED
E321 1
3
8 30A
9 30A
10 30A
15 7.5A
11 50A
12 25A
13 25A
14 20A
16 30A
17 30A
18 30A
19 15A
20 10A
Relay box No.1
BLK/BLU
BLU
BRN/RED
WHT/GRN
BLU/RED
BLU/WHT
RED/WHT
GRN
BLU
YEL/RED
YEL/GRN
PPL/RED
7
8
Main relay
"A-5"
BLK/RED
W/S
BLK/RED
WHT/RED
RED/BLU
YEL/BLK
E319 1
E332 2
E331 6
2
29 15A
30 15A
31 20A
32 15A
Power integration
Horn relay
HO2S heater relay
relay
CVT relay

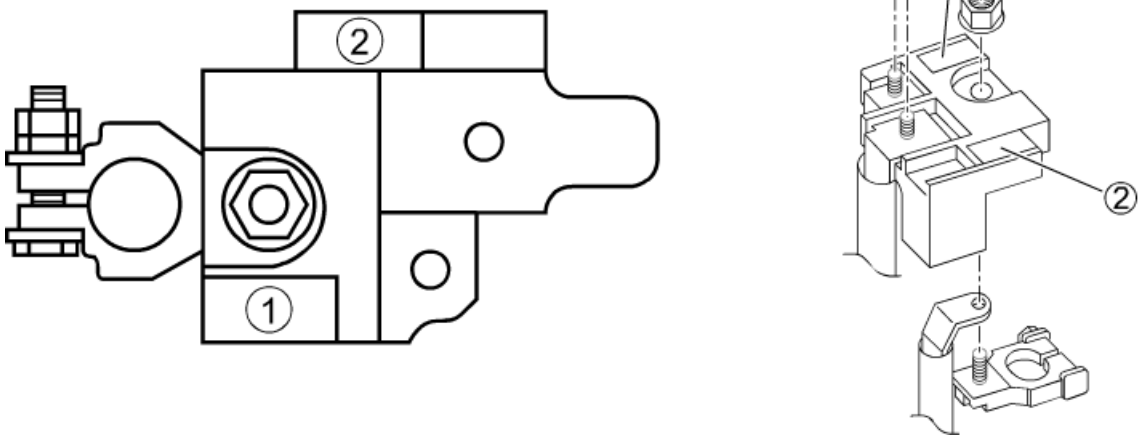

7
4
WHT/RED
E324 2
BLU/RED
E387 7
L371
BLU/RED
L315 2
Tail light relay
J/B
49 15A
50 7.5A
51 20A
52 7.5A
53 10A
54 10A
55 10A
56 20A
59 20A
57 15A
58 10A
E323 23
L311 1
RED/BLU
RED/BLU
BCM
"A-8"
8
6
RED
E335 1
61 20A
62 20A
63 20A
64 15A
65 20A
71 20A
72 30A
73 30A
74 30A
Relay box No.2

9A

Fuses and the Protected Parts

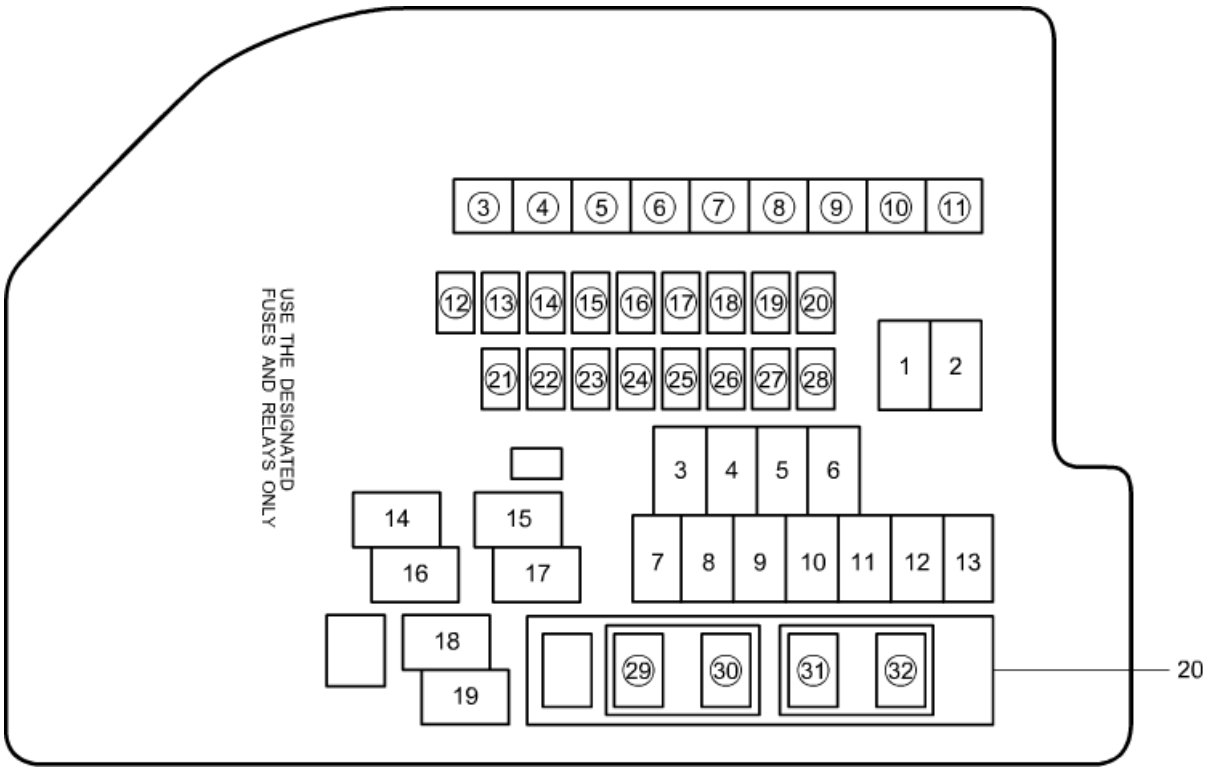
The chart below describes what parts each fuse protects.

Fuses in Main Fuse Box



No.	Fuse	Protected circuit
1	120 A	All electric circuit
		Battery
		Starting motor
		Generator
2	80 A	P/S control module

Individual Circuit Fuse Box No. 1, Power Integration (In Relay Box No. 1)



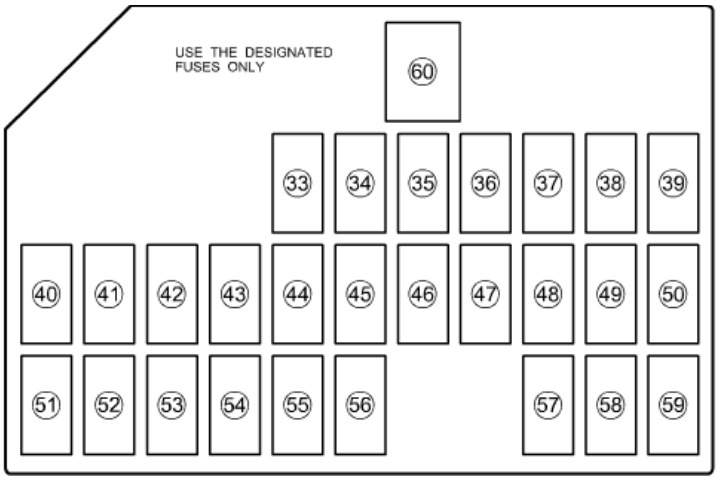
1. Headlight LO relay	6. BLANK	11. Windshield wiper HI/LO relay	16. Main relay
2. BLANK	7. Fuel pump relay	12. BLANK	17. Radiator cooling fan relay #3
3. A/C compressor relay	8. Starting motor relay	13. Rear defogger relay	18. Radiator cooling fan relay #2
4. BLANK	9. Windshield wiper relay	14. Throttle actuator control relay	19. Mirror heater relay
5. BLANK	10. BLANK	15. Radiator cooling fan relay #1	20. Power integration

No.	Fuse	Description on the cover	Protected circuit
3	50 A	BLW	Blower motor relay
4	50 A	BTRY2	Relay box No. 2
5	50 A	IGN2	J/B
6	40 A	ABS MOT	ESP® control module
7	40 A	BTRY	J/B

⑧	30 A	ST	Starting motor relay
⑨	30 A	RDTR	Radiator cooling fan relay #1
⑩	30 A	RDTR2	Radiator cooling fan relay #3
⑪	50 A	IGN	J/B
⑫	25 A	B/U	J/B
⑬	25 A	ABS SOL	ESP® control module
⑭	20 A	FI	Main relay
⑮	7.5 A	H/L	Headlight LO relay
⑯	30 A	H/L CLNR	BLANK
⑰	30 A	RR DEF	Rear defogger relay
⑱	15 A	THR MOT	Throttle actuator control relay
⑲	15 A	MRR HTR	Mirror heater relay
⑳	10 A	A/C	A/C compressor relay
㉑	15 A	H/L R	DRL control module
㉒	15 A	H/L L	DRL control module
㉓	15 A	H/L LO R	Headlight unit (R)
㉔	15 A	H/L LO L	Headlight unit (L)
㉕	BLANK	BLANK	BLANK
㉖	BLANK	BLANK	BLANK
㉗	BLANK	BLANK	BLANK

28	BLANK	BLANK	BLANK
29	15 A	HORN	Horn relay
30	15 A	O2 HTR	HO2S heater relay
31	20 A	FR FOG	Front fog light relay
32	15 A	AT	CVT relay
			TCM

Individual Circuit Fuse Box No. 2 (In J/B)

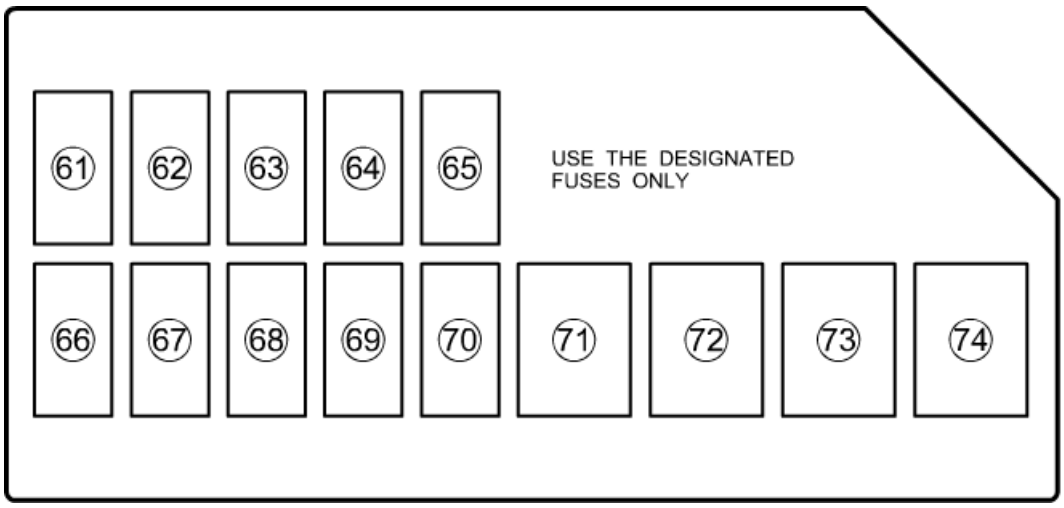


No.	Fuse	Description on the cover	Protected circuit
33	15 A	WIP	BCM
			Windshield washer motor
34	20 A	S/H	Seat heater (Driver side)
			Seat heater (Passenger side)
35	25 A	FR WIP	Windshield wiper motor
			Windshield wiper relay
			Windshield HI/LO relay
36	7.5 A	IG2 SIG	Rain / Light sensor
			Rear defogger relay
			Keyless start control module
			Sunroof unit
			Auto-dimming rearview mirror
			Blower motor relay
37	15 A	IG COIL	Generator
			Ignition coil #1
			Ignition coil #2

			Ignition coil #3
			Ignition coil #4
			ECM
38	15 A	ACC2	Accessory socket #2
39	15 A	ACC	Power mirror switch
			Keyless start control module
			Power seat control module
			Audio
			Navigation
			Accessory socket #1
40	BLANK	BLANK	BLANK
41	BLANK	BLANK	BLANK
42	10 A	ABS/ESP	ESP® control module
			Steering angle sensor
43	7.5 A	CRUISE	Brake light switch
44	7.5 A	IG1 SIG	CVT relay
			4WD control module
			P/S control module
45	7.5 A	BPIM	BLANK
46	7.5 A	MTR	Auto A/C panel
			BCM
			Keyless start control module
			Combination meter
47	10 A	BACK	Transaxle range sensor
			BCM
			Parking sensor system control module
			ESP® OFF / Parking sensor OFF switch
			Power seat control module
			HVAC control module
			Seat heater (Driver side)
			Seat heater (Passenger side)
			Back-up light switch
48	10 A	A/B	A/B SDM
			Occupancy classification ECM
49	15 A	STL	Keyless start control module
50	7.5 A	BCM	Keyless start control module

51	20 A	S/R	Sunroof unit
52	7.5 A	RR FOG	BLANK
53	10 A	TAIL	Tail light relay
54	10 A	STOP	Brake light switch
55	10 A	HAZ	BCM
56	20 A	DOOR FL	Power window master switch
			Front power window motor (Driver side)
57	15 A	RADIO	Audio
			Navigation
58	10 A	DOME	ECM
			BCM
			Keyless start control module
			Engine switch
			Auto A/C panel
			DLC
			Combination meter
			Console
			Rear dome light
			Vanity light (Driver side)
			Vanity light (Passenger side)
			Courtesy light (Driver side)
			Courtesy light (Passenger side)
			Trunk room light
			Glove box light
			Foot light (R)
			Foot light (L)
			Auto-dimming rearview mirror
			HVAC control module
59	20 A	D/L	BCM
60	30 A	P/W	Power window master switch
			Rear power window sub switch (R)
			Rear power window sub switch (L)

Individual Circuit Fuse Box No. 3 (In Relay Box No. 2)

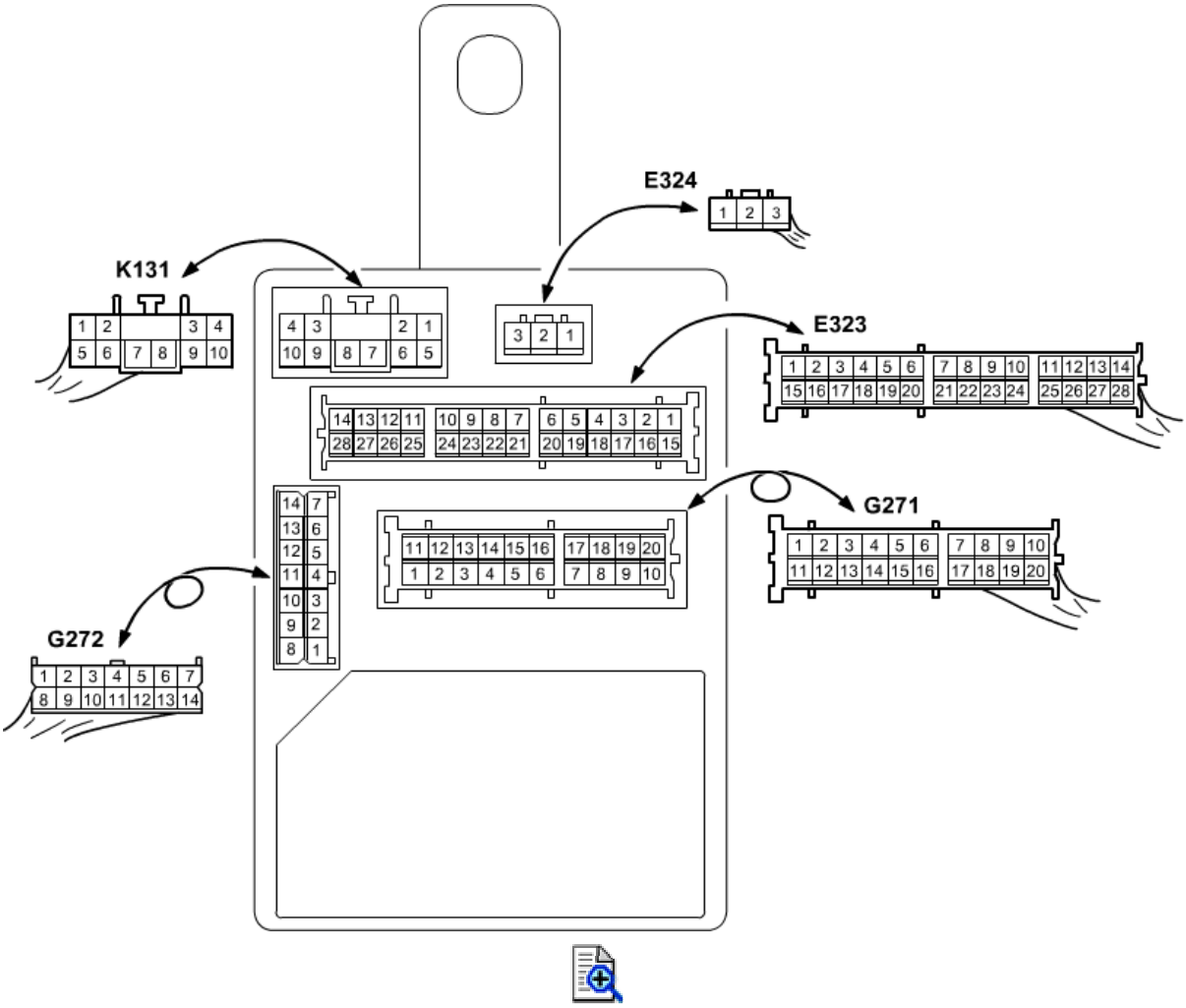


No.	Fuse	Description on the cover	Protected circuit
61	20 A	DOOR RR	BLANK
62	20 A	DOOR RL	BLANK
63	20 A	DOOR FR	Power window sub switch
			Front power window motor (Passenger side)
64	15 A	4WD	4WD control module
65	20 A	BTRY FAN	BLANK
66	BLANK	BLANK	BLANK
67	BLANK	BLANK	BLANK
68	BLANK	BLANK	BLANK
69	BLANK	BLANK	BLANK
70	BLANK	BLANK	BLANK
71	20 A	AUDIO	Audio amplifier
72	30 A	PWR SEAT R	Power seat sub switch
	30 A	PWR SEAT L	Power seat control module

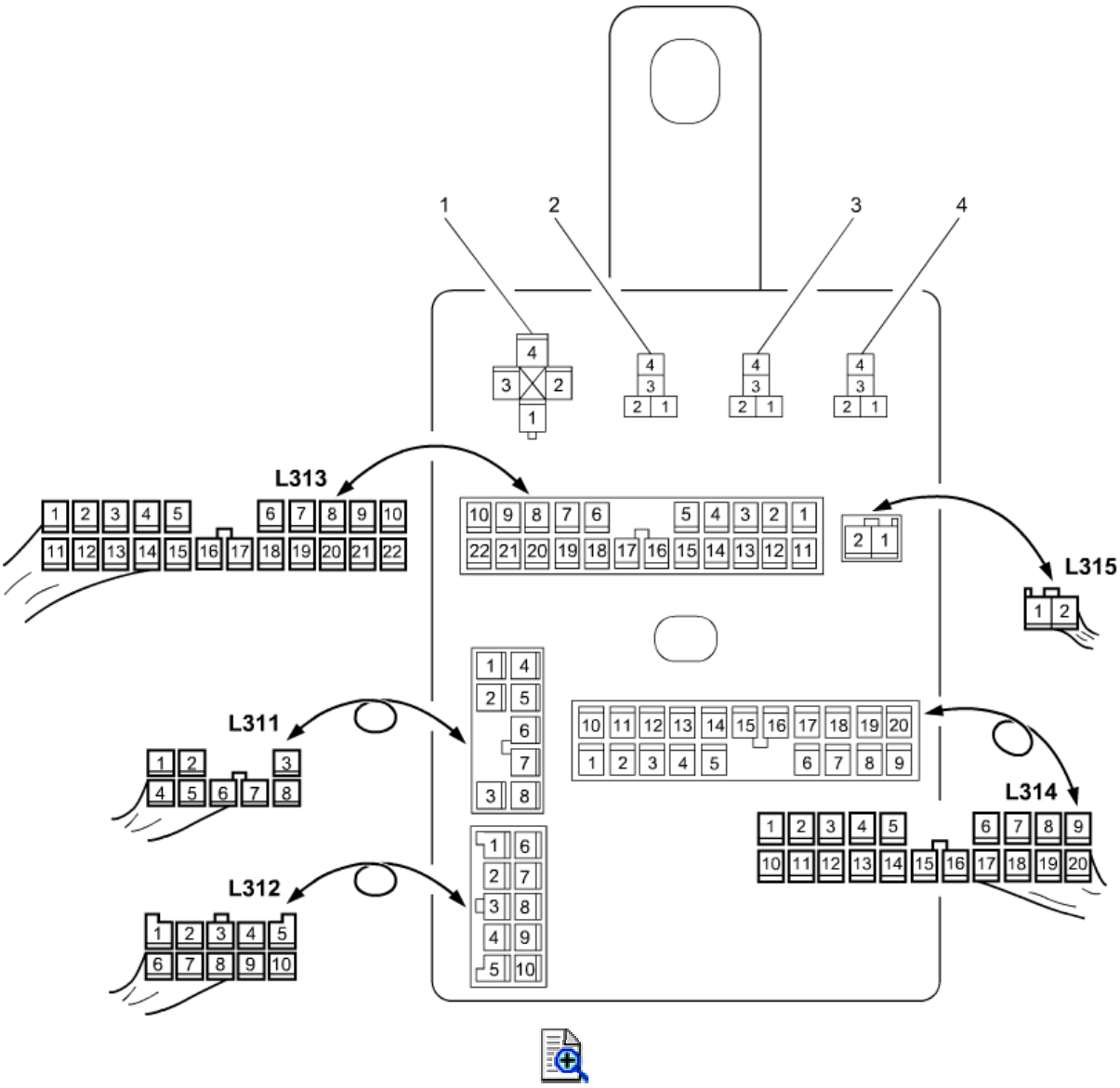
9A

Junction Block (J/B) Connector Layout

Fuse Side



Relay Side

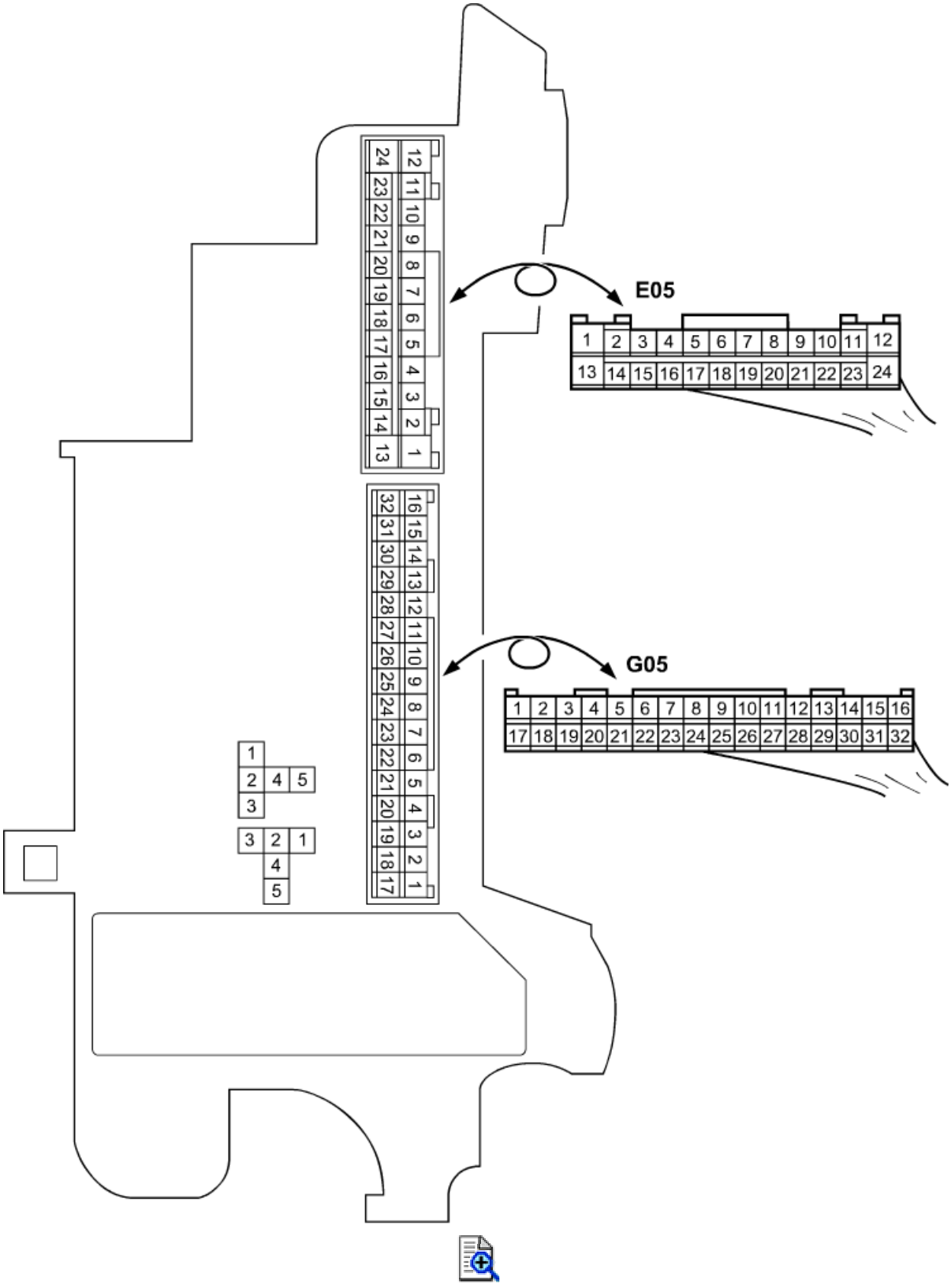


1. IG2 relay	3. IG1 relay
2. Accessory relay	4. Tail light relay

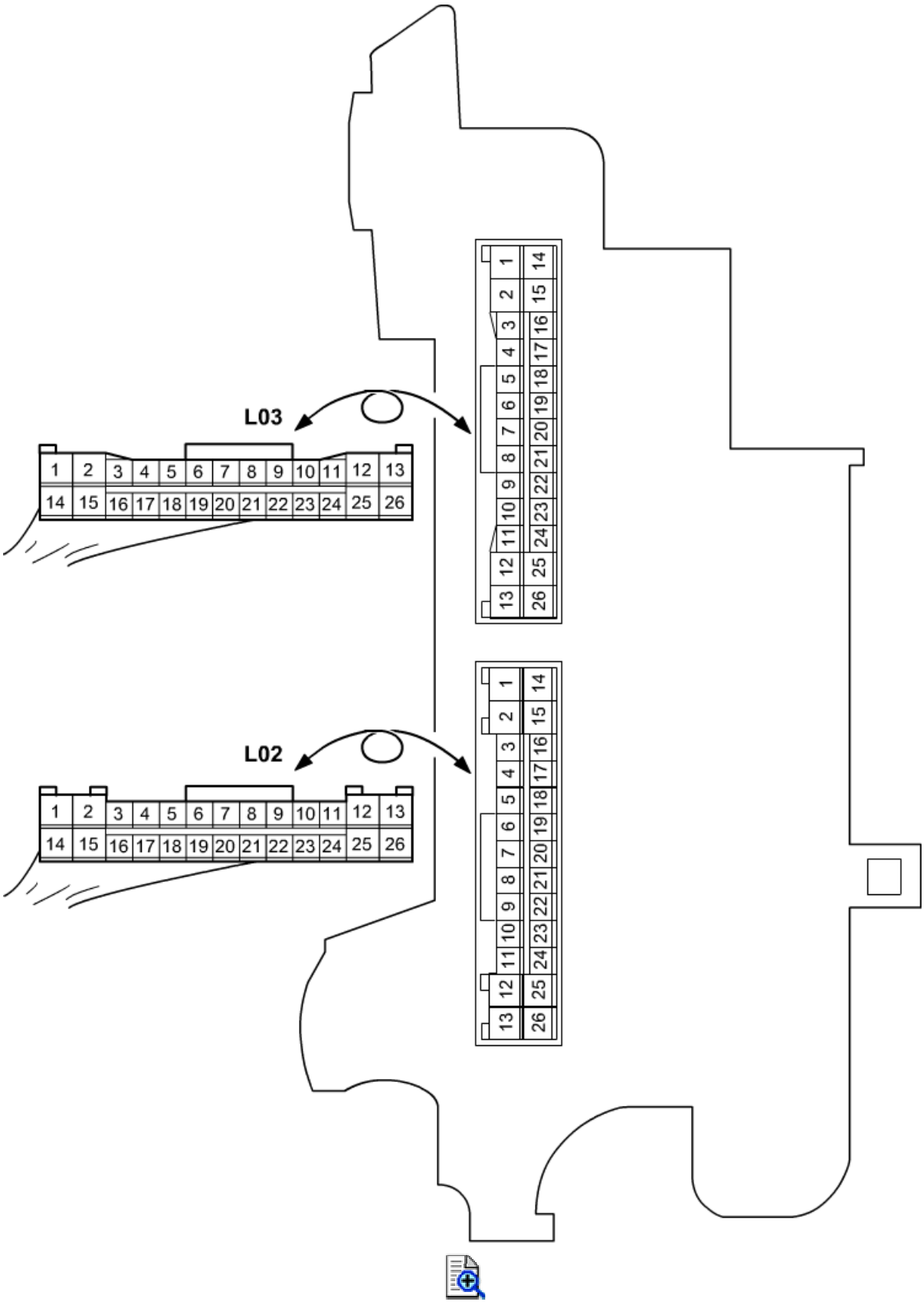
9A

Relay Box No. 2 Connector Layout

Fuse, Relay Side



The Other Side of Fuse, Relay

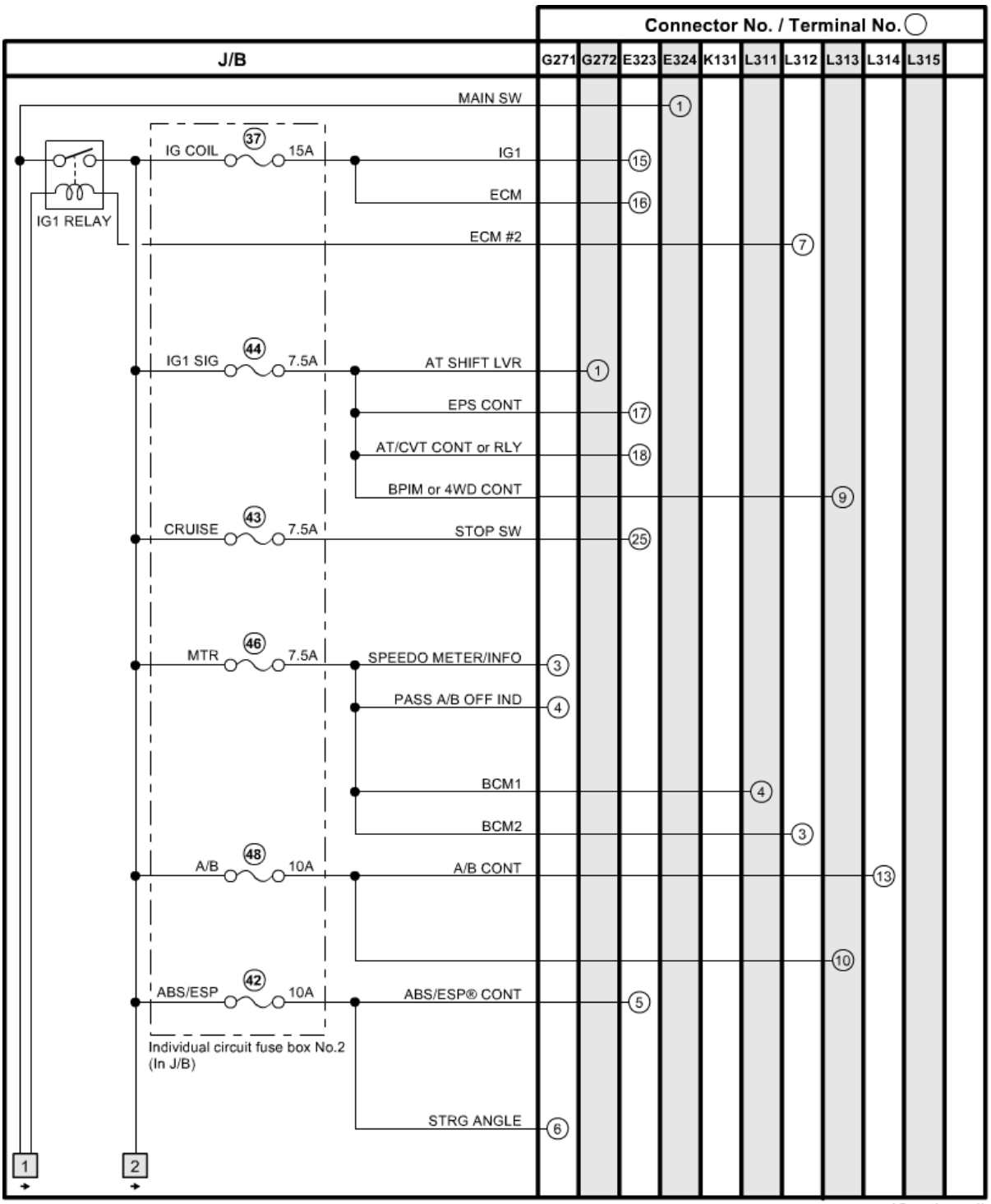

L03
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
L02
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26
1 2 3 4 5 6 7 8 9 10 11 12 13
14 15 16 17 18 19 20 21 22 23 24 25 26

9A

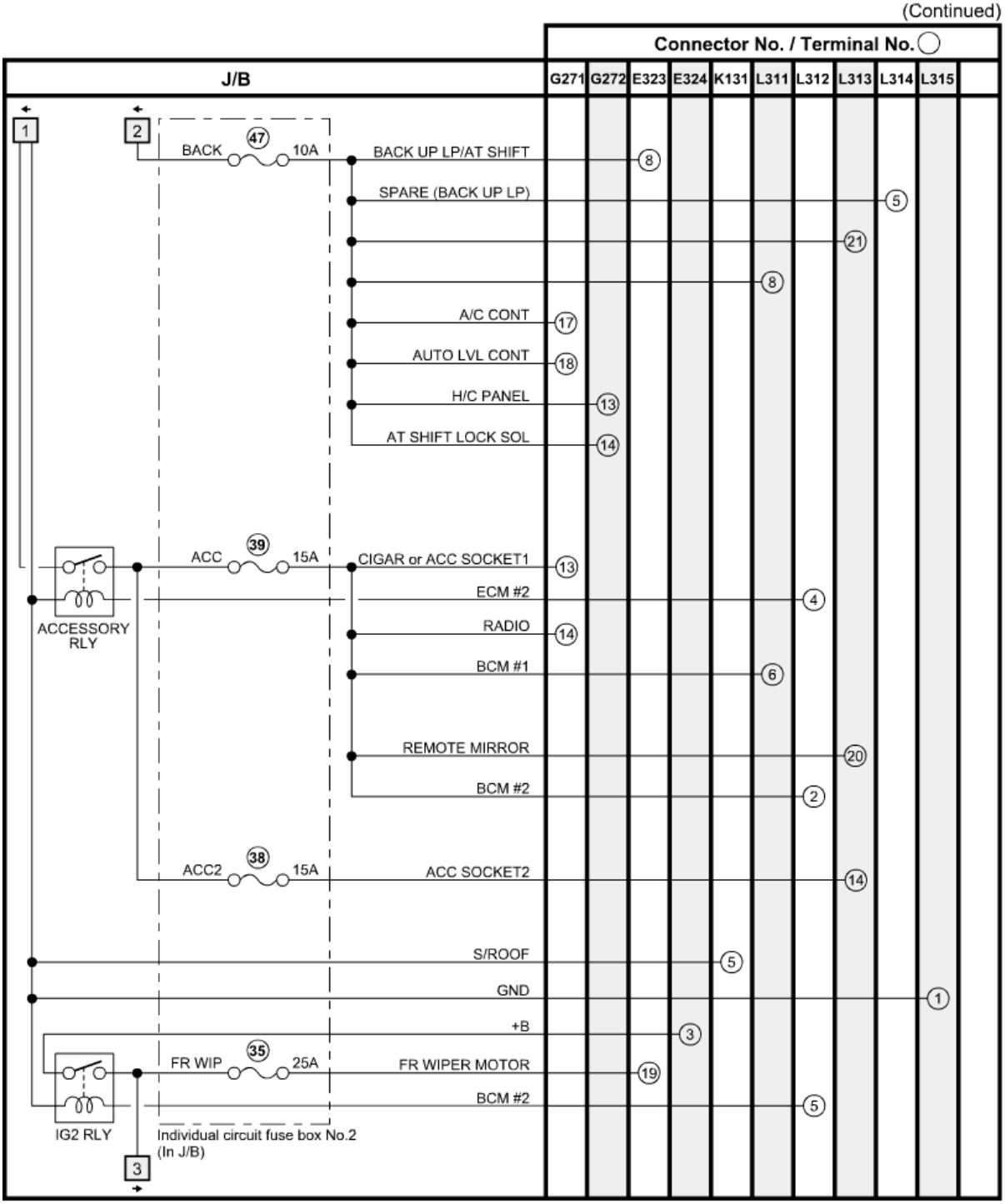
Junction Block Inner Circuit (Detail)

Abbreviations

Abbreviation	Full term	Abbreviation	Full term
AS	Assistant (Front passenger)	LP	Light
CTR	Center	O/H	Over head
DR	Driver	R/B	Relay box
F-L	Front L	R-L	Rear L
F-R	Front R	R-R	Rear R
FR	Front	RR	Rear
INP	Instrument panel	S/H	Seat heater
LEV	(Headlight) leveling		


Connector No. / Terminal No.
J/B
G271
G272
E323
E324
K131
L311
L312
L313
L314
L315
MAIN SW
IG COIL
37
15A
IG1
ECM
IG1 RELAY
ECM #2
IG1 SIG
44
7.5A
AT SHIFT LVR
EPS CONT
AT/CVT CONT or RLY
BPIM or 4WD CONT
CRUISE
43
7.5A
STOP SW
MTR
46
7.5A
SPEEDO METER/INFO
PASS A/B OFF IND
BCM1
BCM2
A/B
48
10A
A/B CONT
ABS/ESP
42
10A
ABS/ESP® CONT
Individual circuit fuse box No.2
(In J/B)
STRG ANGLE
1
2
(Continued)

(Continued)



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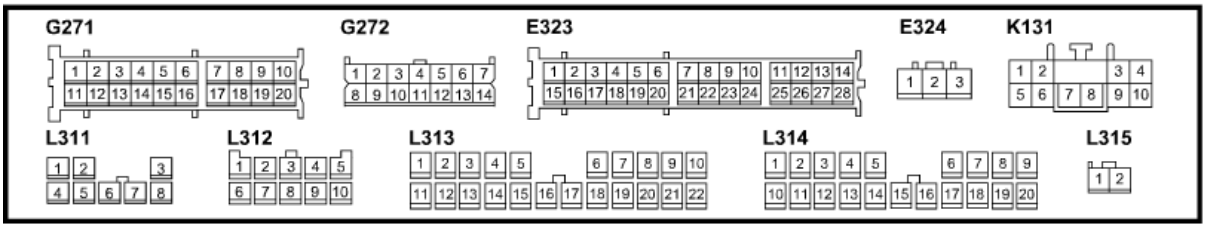

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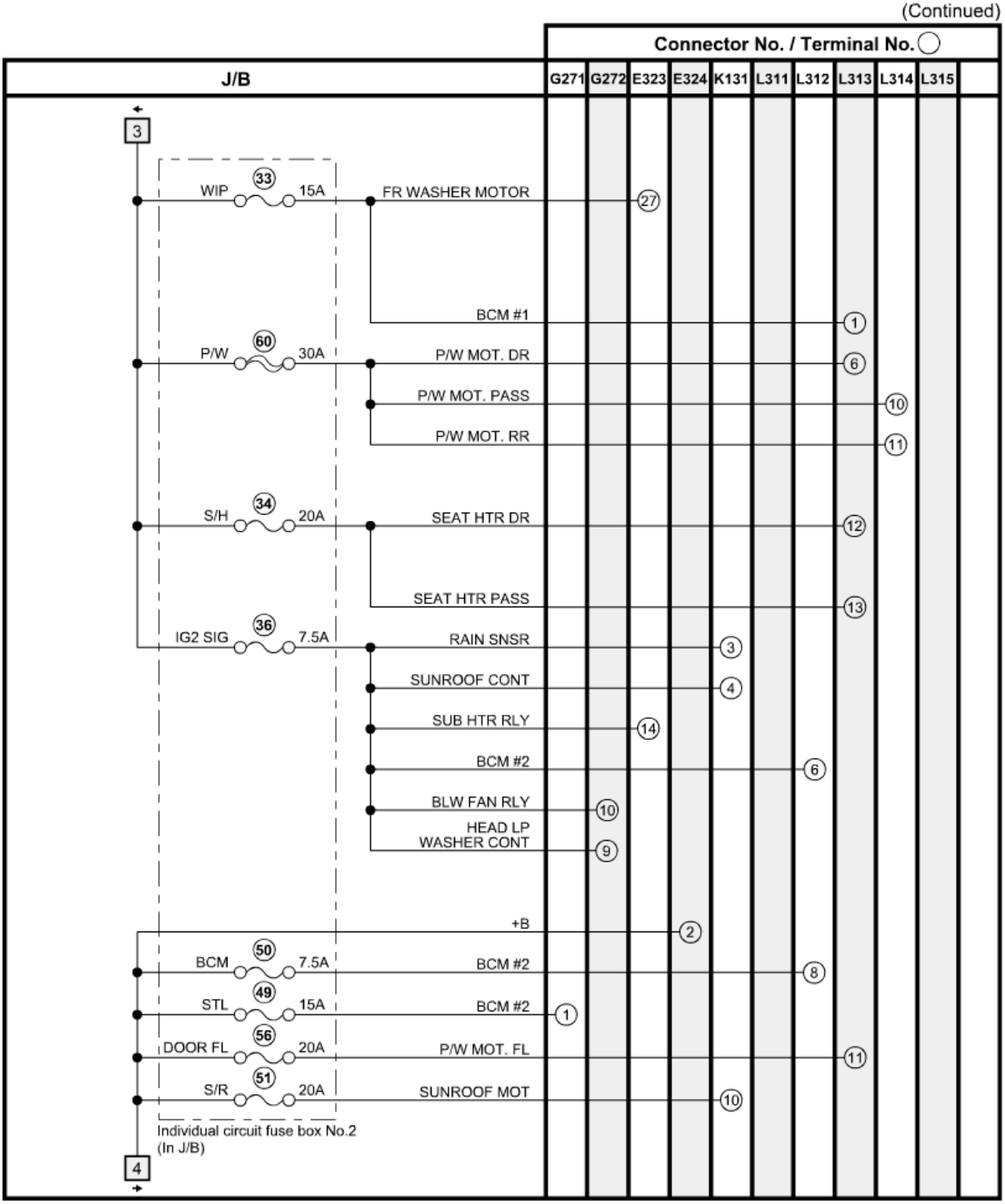

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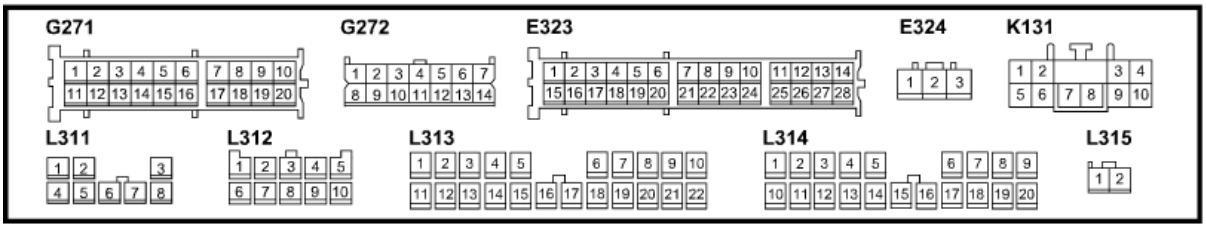
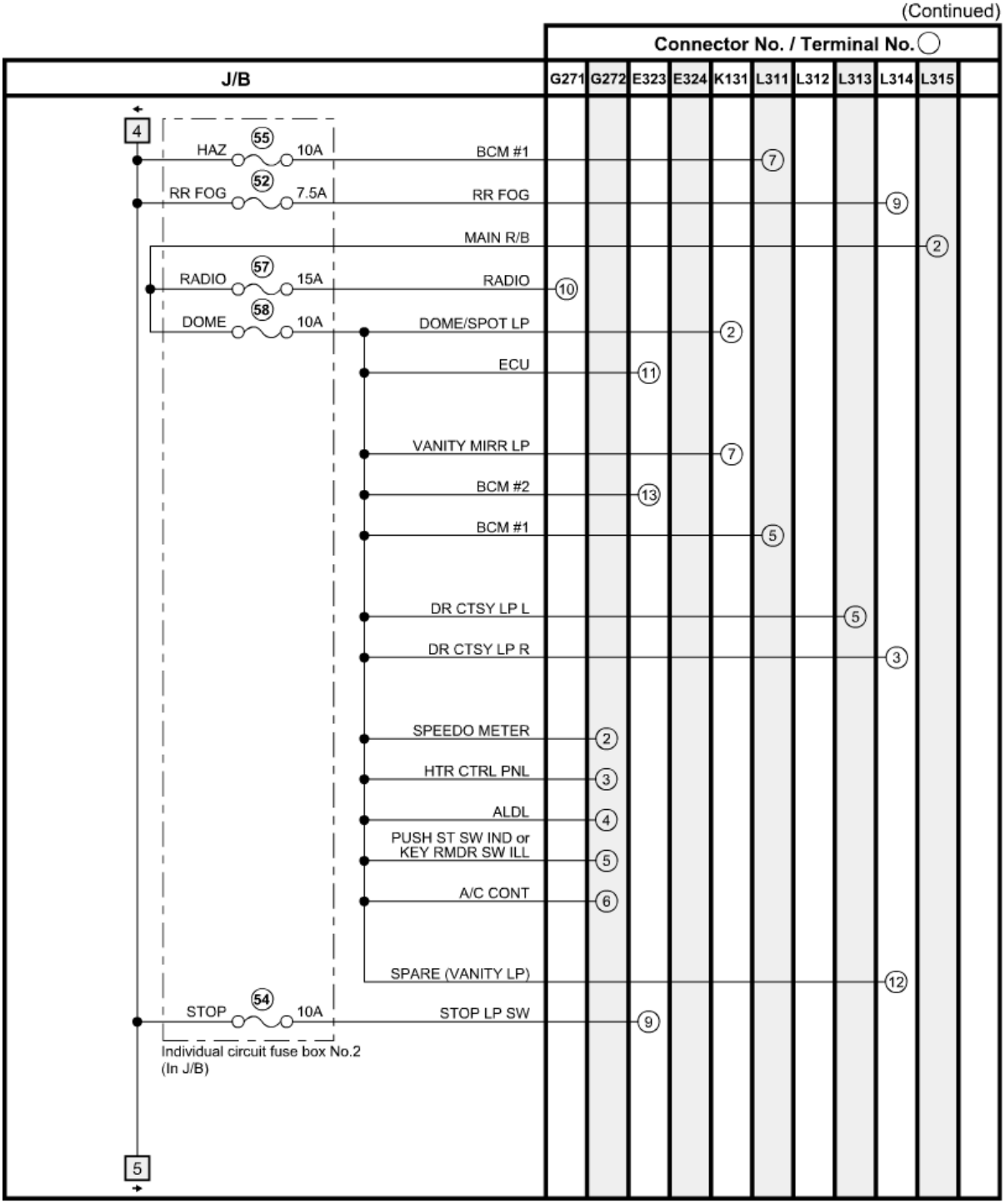


(Continued)



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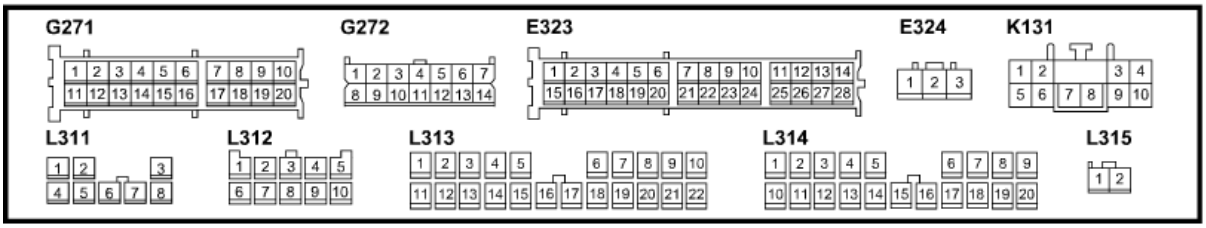

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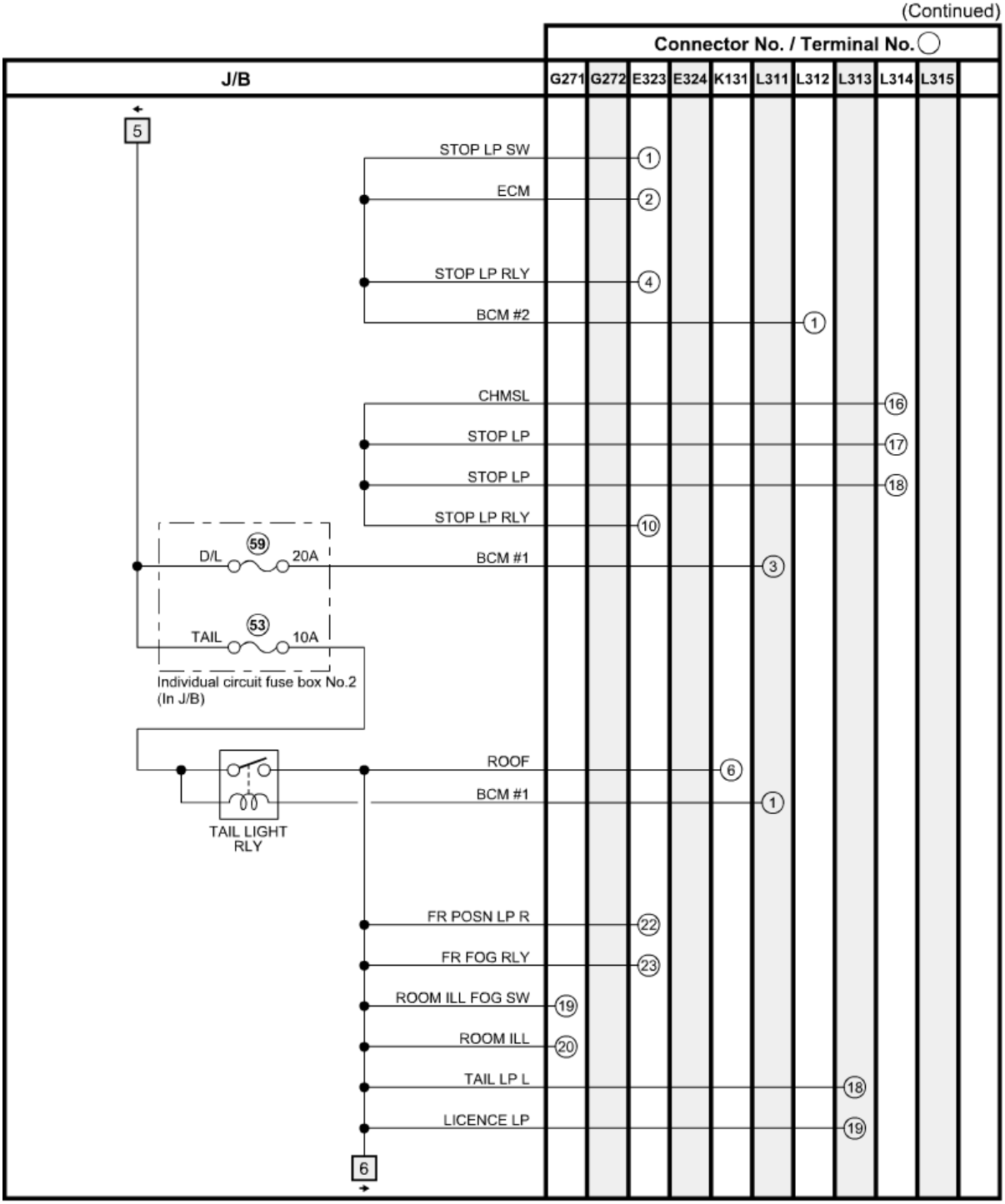

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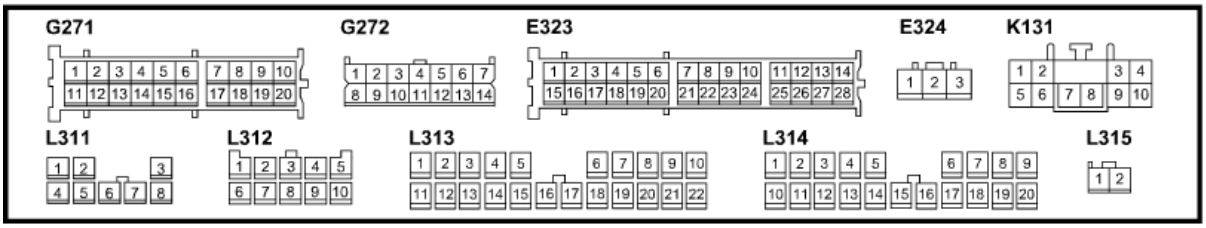

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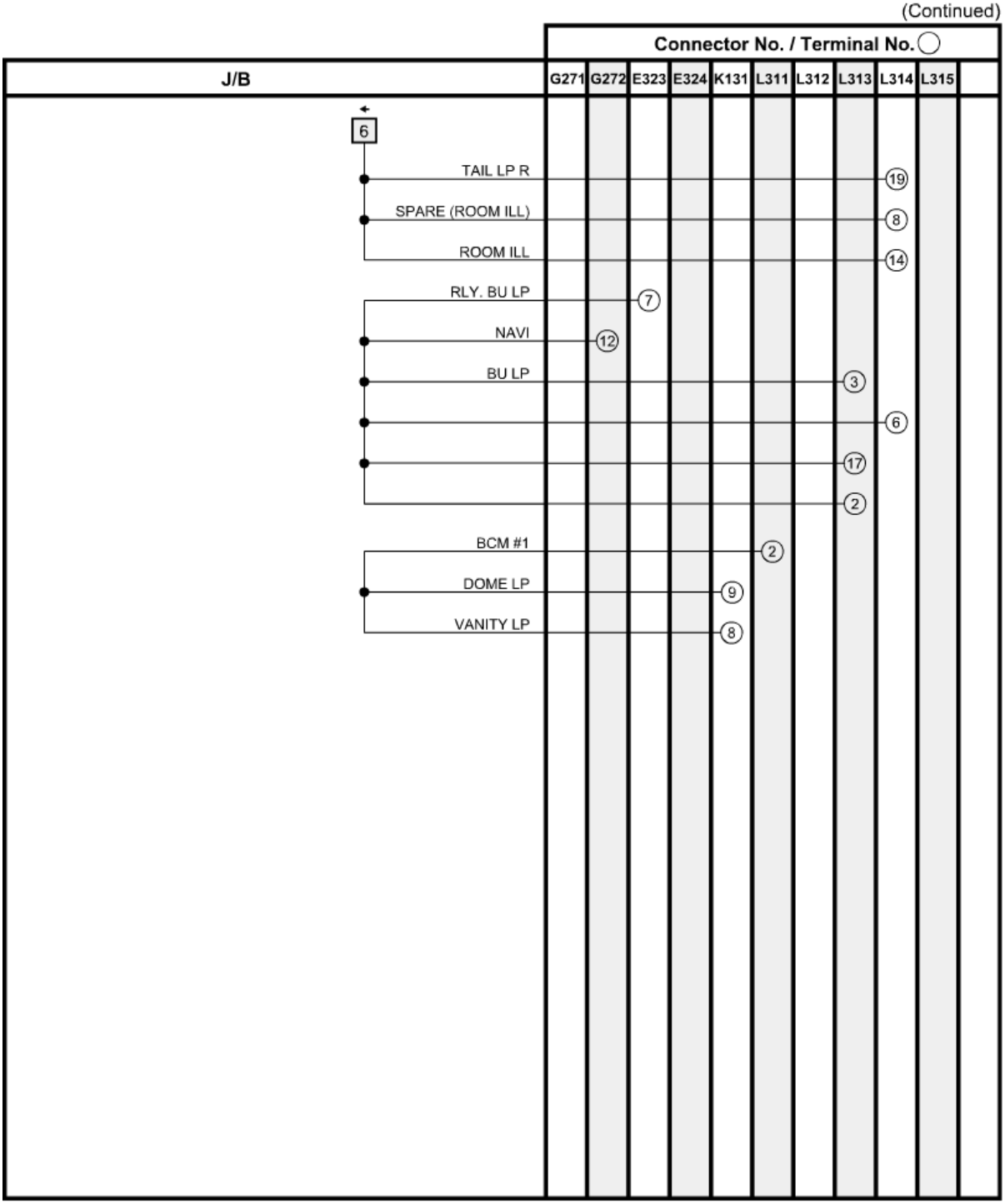
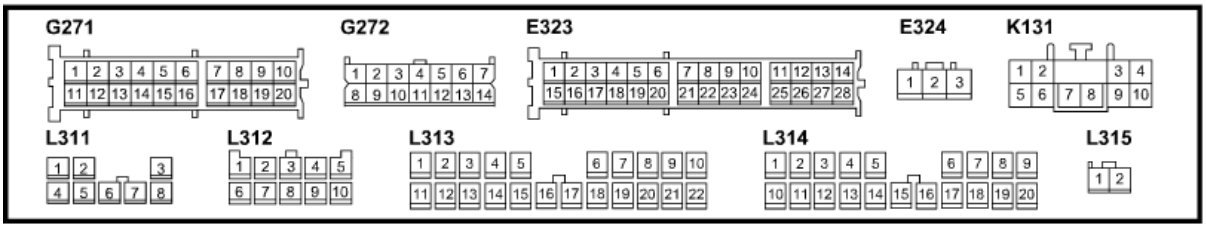
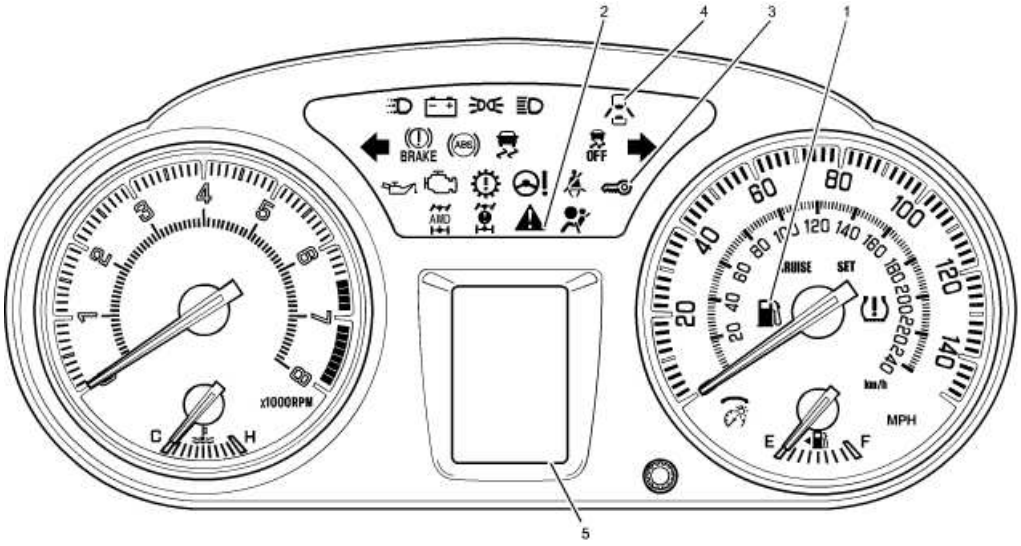

Connector No. / Terminal No.
J/B
G271
G272
E323
E324
K131
L311
L312
L313
L314
L315
6
TAIL LP R
SPARE (ROOM ILL)
ROOM ILL
RLY. BU LP
NAVI
BU LP
BCM #1
DOME LP
VANITY LP
19
8
14
7
12
3
6
17
2
2
9
8


G271
G272
E323
E324
K131
L311
L312
L313
L314
L315

9C

Combination Meter Description

- Information display indicates opening / ending screen, CVT shift position, odometer, tripmeter, outside air temperature, instantaneous fuel consumption, average fuel consumption, possible driving distance, average vehicle speed, meter brightness and direction / distance to obstacle from the bumper.
- The warning buzzer forms an integral part of the combination meter circuit.
- Fuel gauge data is supplied to the combination meter directly from the fuel level sensor.



Information Display

The information display indicates various items of information including CVT selector position, odometer, trip meter, outside temperature, instantaneous fuel consumption, average fuel consumption, brightness of instrument panel, direction and distance of an obstacle sensed by the parking sensor. The information display can also indicate the following messages related to vehicle.

Information display messages

Message	
AWD SYSTEM HIGH TEMP AWD IS OFF	PRESS BRAKE SHIFT TO P TO START
CLEAN PARKING SENSORS	PRESS BRAKE AND CLUTCH TO START
DOOR OPEN	PUSH START SWITCH
GEARSHIFT NOT IN PARK	SERVICE AWD SYSTEM
HILL HOLD DISABLE	SERVICE BCM SYSTEM
ICE POSSIBLE DRIVE WITH CARE	SERVICE ESP SYSTEM
IGNITION SWITCH POSITION	SERVICE PARKING SENSORS
KEY FOB NOT DETECTED	SERVICE START SYSTEM
KEY FOB LOW BATTERY	SERVICE STEERING LOCK SYSTEM
LIGHTS ON	SERVICE TPMS
LOW FUEL	TPMS ID NOT REGISTERED
LOW TIRE PRESSURE	TRN. STEERING WHEEL TO RELEASE LOCK
MAINTENANCE MODE ACTIVE	UNEVEN TIRE SIZE AWD IS OFF
PLACE KEY FOB ON START SWITCH	

User customization function

The user customization function is activated when the “DISP” switch at the steering wheel is held pulled for more than 3 seconds when the keyless push start system ignition mode is “ON” and the vehicle is stationary. When activated, the function allows making the following settings.

- Distance units
- Fuel economy units
- Language
- Avg. fuel economy reset
- Temperature units
- Foot lights
- Default setting

9C

Parking Sensor System Description (If Equipped)

- The parking sensor system consists of the parking sensor system control module, combination meter (information display), parking sensors, parking sensor rear buzzer, parking sensor OFF switch, and back up light switch (M/T model) or shift switch (CVT model).
- If the parking sensors located on the rear bumper detect an obstacle, the parking sensor system control module causes a symbol representing the direction of and distance to the obstacle to be indicated on the information display, in addition to causing the parking sensor rear buzzer to sound.
- The parking sensor system works when the parking sensor OFF switch is in the released (ON) position and the gear is in the "R" range.
- The parking sensor control module communicates with the combination meter via the LIN communication system. (For LIN communication, refer to ***Communication System Description***.)

Information Display Indications and Buzzer Sounding Patterns

Obstacle detection by center-left / center-right parking sensor (Figures below represent indications when center-right parking sensor detects obstacle.)

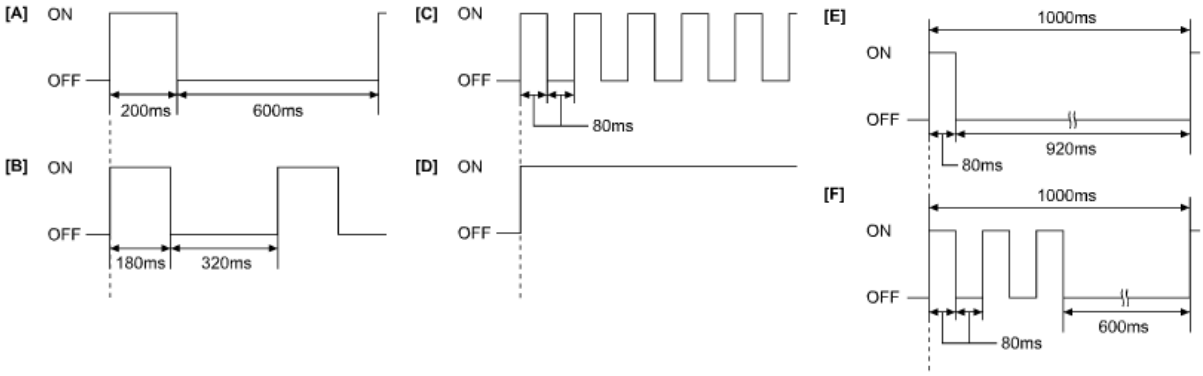
Information display indication				
Distance to obstacle (reference) mm (in.)	About 600 – 1,500 (23.7 – 59.05)	About 450 – 600 (17.8 – 23.6)	About 350 – 450 (13.8 – 17.7)	About 350 or less (13.8)
Buzzer sounding pattern	[A]	[B]	[C]	[D]

Obstacle detection by left-right parking sensor (Figures below represent indications when right parking sensor detects obstacle.)

Information display indication			
Detection distance (reference) mm (in.)	About 375 – 600 (14.8 – 23.6)	About 250 – 375 (9.85 – 14.7)	About 250 or less (9.84)
Buzzer sounding pattern	[B]	[C]	[D]

Parking sensor malfunction warnings (Figures below represent warnings for malfunctions related to center parking sensors.)

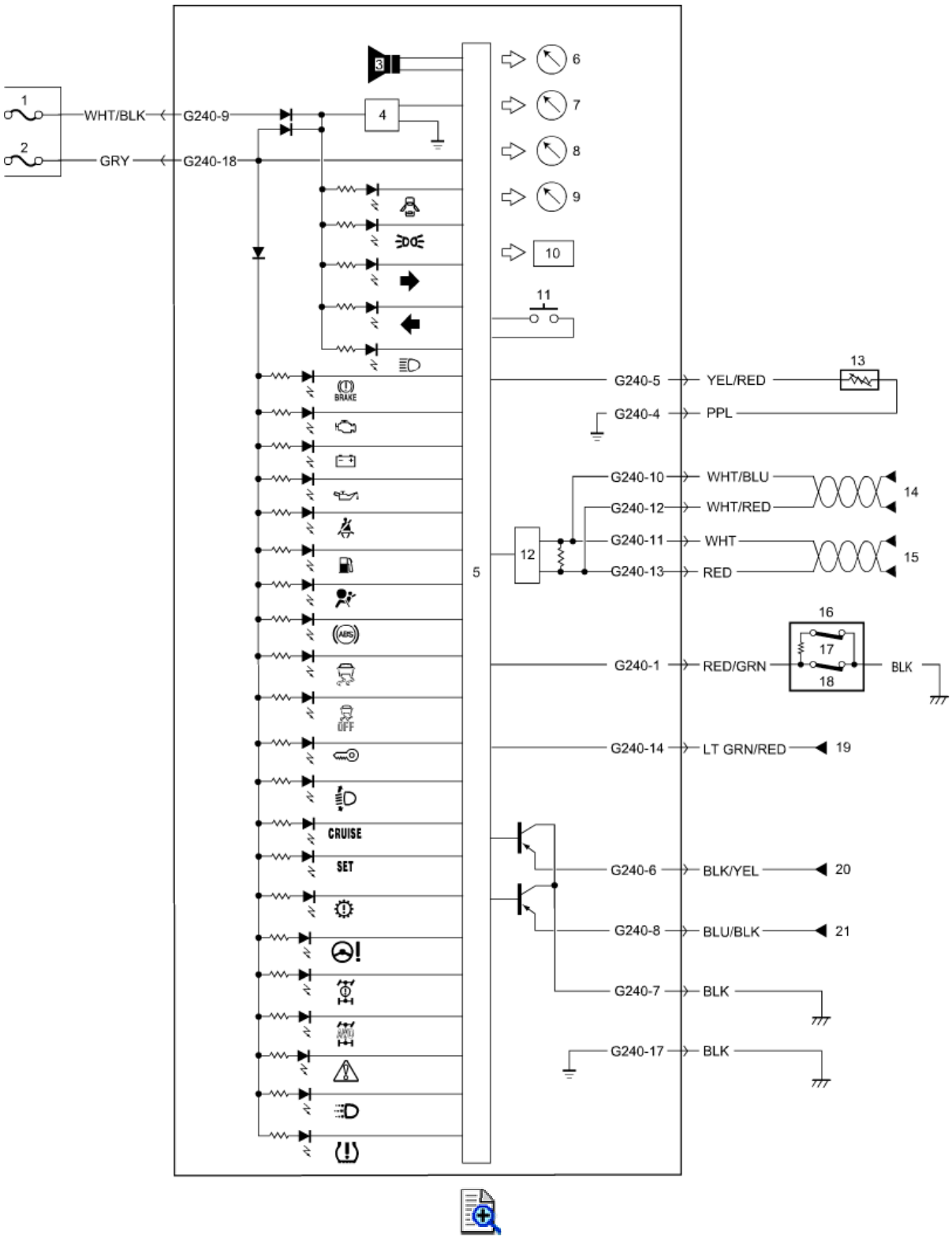
Information display indication	 (Flashing)	 (Flashing)	 (Flashing)
Malfunction condition (reference)	Temporarily detected parking sensor malfunction	Continuously detected parking sensor malfunction	Fault in communication bus between parking sensor(s) and parking sensor control module
Buzzer sounding pattern	[E]	[F]	[E] (temporary detection) [F] (continuous detection)



9C

Combination Meter Circuit Diagram

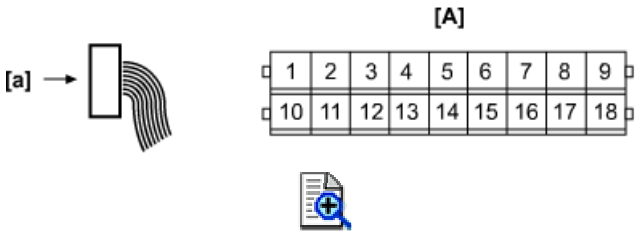
Circuit Diagram



1. "DOME" fuse	8. Fuel meter	15. J/C (CAN)
2. "METER" fuse	9. Temperature meter	16. Steering switch
3. Buzzer	10. LCD	17. Trip switch

4. Voltage change circuit	11. Mode switch	18. Display switch
5. CPU	12. CAN driver	19. Parking sensor system control module
6. Speedometer	13. Fuel pump and gauge	20. Bulb lighting signal
7. Tachometer	14. Data link connector (CAN)	21. LED lighting signal

Terminal Arrangement of Combination Meter



[A]: Combination meter connector (View: [a])

Terminal No.		Wire color	Circuit name	Terminal No.		Wire color	Circuit name
G240	1	RED/GRN	Display & Trip switch	G240	10	WHT/BLU	CAN communication LO (DLC)
	2	—	—		11	WHT	CAN communication LO (BCM)
	3	—	—		12	WHT/RED	CAN communication HI (DLC)
	4	PPL	Fuel pump and gauge (GND)		13	RED	CAN communication HI (BCM)
	5	YEL/RED	Fuel pump and gauge (power supply)		14	LT GRN/RED	Parking sensor system control module
	6	BLK/YEL	Bulb illumination signal		15	—	—
	7	BLK	GND		16	—	—
	8	BLU/BLK	LED illumination signal		17	BLK	GND
	9	WHT/BLK	Continual power supply		18	GRY	IG1 power supply

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DTC Table

DTC	DTC name	DTC detecting condition	Warning	Fail-safe
B1802 ☞	Power Source Voltage too Low	Voltage across "MTR" fuse is less than lower limit (8.0 V) for specified or longer time.	Off	—
B1803 ☞	SET/CRUISE Indicator Circuit Malfunction	LED is broken.	Off	—
B1810 ☞	Fuel Level Sensor Circuit / Open	Fuel level signal has not been input for specified or longer time.	Off	—
B1820 ☞	Internal Control Module EEPROM Error	Memory in combination meter is faulty.	Off	—
B1850 ☞	Lost Communication With Combination Meter	Parking sensor system control module detected fault in LIN communication with combination meter.	Off	Stop of parking sensor operation
B1852 ☞	Rear Parking Sensor Communication Bus Error	Combination meter cannot send / receive communication data to / from rear parking sensor.	Lights up	Stop of part of parking sensor operation
B1855 ☞	Lost Communication With Parking Sensor	Combination meter detected fault in LIN communication with parking sensor system.	Lights up	Stop of parking sensor operation
B1864 ☞	Rear-Left Parking Sensor	• Parking sensor system control module detected fault in inner part of parking sensor (rear-left). • Fault is detected in circuit for communication with parking sensor (rear-left).	Lights up	Stop of part of parking sensor operation
B1865 ☞	Rear-Center-Left Parking Sensor	• Parking sensor system control module detected fault in inner part of parking sensor (rear-center-left). • Fault is detected in circuit for communication with parking sensor (rear-center-left).	Lights up	Stop of part of parking sensor operation
B1866 ☞	Rear-Center-Right Parking Sensor	• Parking sensor system control module detected fault in inner part of parking sensor (rear-center-right). • Fault is detected in circuit for communication with parking sensor (rear-center-right).	Lights up	Stop of part of parking sensor operation
B1867 ☞	Rear-Right Parking Sensor	• Parking sensor system control module detected fault in inner part of parking sensor (rear-right). • Fault is detected in circuit for communication with parking sensor (rear-right).	Lights up	Stop of part of parking sensor operation
U0073 ☞	Control Module Communication Bus Off	Refer to ***CAN DTC (Lost Communication and Communication Bus Off) Table***.	Lights up	—
U0100 ☞	Lost Communication With ECM		Lights up	—
U0101 ☞	Lost Communication With TCM		Lights up	—

U0121	Lost Communication With ABS / ESP® Control Module
U0140	Lost Communication With Body Control Module
U0141	Lost Communication With Body Control Module “keyless start”
U0151	Lost Communication With Restraints Control Module

Lights up	—
Lights up	—
Lights up	—
Lights up	—

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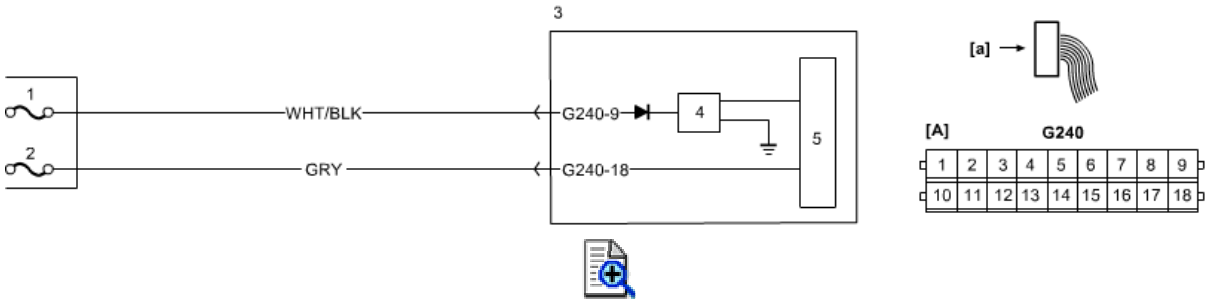
DTC B1802

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1802: Power supply voltage too low Voltage across "MTR" fuse is less than lower limit voltage (8.0 V) for specified or longer time.	• Combination meter power supply circuit • Combination meter ground circuit • Combination meter

Circuit Diagram



[A]: Combination meter connector (View: [a])	2. "BACK" fuse	4. Power supply circuit
1. "DOME" fuse	3. Combination meter	5. CPU

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1802 still detected?***	Go to Step 2.	Intermittent trouble. Check for intermittent trouble. ☞
2	**Combination meter power supply and ground circuits check** 1) Check combination meter power supply and ground circuits. ***Are they in good condition?***	Go to Step 3.	Repair defective wire harness.
3	**Combination meter power supply voltage check**	Replace combination meter	Check charging system. ☞

	1) Check power supply voltage with engine speed at 3,000 rpm. ***Is voltage 10 – 15 V?***	and recheck DTC.	

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DTC B1803

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1803: SET/CRUISE indicator circuit malfunction LED is broken.	Combination meter

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1803 still detected?***	Replace combination meter and recheck DTC. ☞	Intermittent trouble. Check for intermittent trouble. ☞

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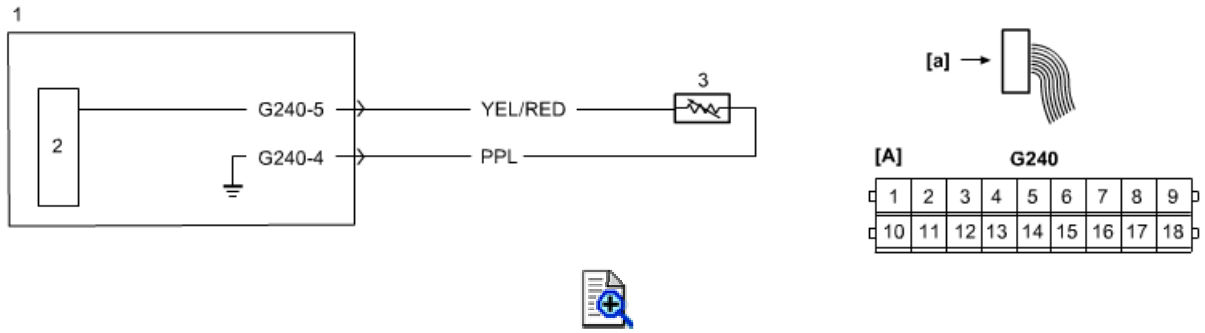
DTC B1810

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1810: Fuel level sensor circuit / open Fuel level signal has not been input for specified or longer time.	• Combination meter • Fuel level sensor • Fuel level sensor circuit

Circuit Diagram



[A]: Combination meter connector (View: [a])	2. CPU
1. Combination meter	3. Fuel level sensor

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1810 still detected?***	Go to Step 2.	Intermittent trouble. Check for intermittent trouble. ☞
2	**Fuel level sensor check** 1) Check fuel level sensor. ☞ ***Is it in good condition?***	Go to Step 3.	Replace fuel level sensor and recheck DTC. ☞ / ☞
3	**Fuel level sensor circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF".	Replace combination meter and recheck DTC. ☞	Repair defective wire harness and recheck DTC.

	2) Disconnect combination meter and fuel level sensor connectors. 3) Check for proper connection to combination meter and fuel level sensor terminals. 4) If connections are OK, check circuit between combination meter connector and fuel level sensor for open circuit, short to ground or short to power supply. ***Are they in good condition?***		

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DTC B1820

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1820: Internal control module EEPROM Error Memory in combination meter is faulty.	• Combination meter • Parking sensor system control module • LIN communication circuit

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1820 still detected?***	Replace combination meter and recheck DTC. ☞	Intermittent trouble. Check for intermittent trouble. ☞

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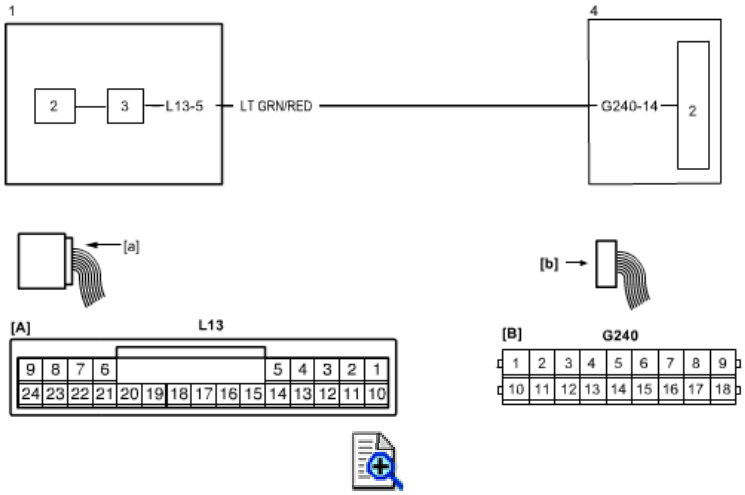
DTC B1850

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1850: Lost Communication with Combination Meter (Combination Meter) Parking sensor system control module detected fault in LIN communication with combination meter.	• Combination meter • Parking sensor system control module • LIN communication circuit

Circuit Diagram



[A]:	Parking sensor system control module connector (View: [a])	1.	Parking sensor system control module	3.	LIN driver
[B]:	Combination meter connector (View: [b])	2.	CPU	4.	Combination meter

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1850 still detected?***	Go to Step 2.	Intermittent trouble. Check for intermittent trouble. ☞

2	**LIN communication circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect combination meter and parking sensor system control module connectors. 3) Check for proper connection to combination meter and parking sensor system control module terminals. 4) If connections are OK, check circuit between combination meter connector and parking sensor system control module connector for open circuit, short to ground or short to power supply. ***Are they in good condition?***	Replace combination meter and recheck DTC. ☞ If DTC B1850 is detected again, replace parking sensor system control module. ☞	Repair LIN communication circuit.

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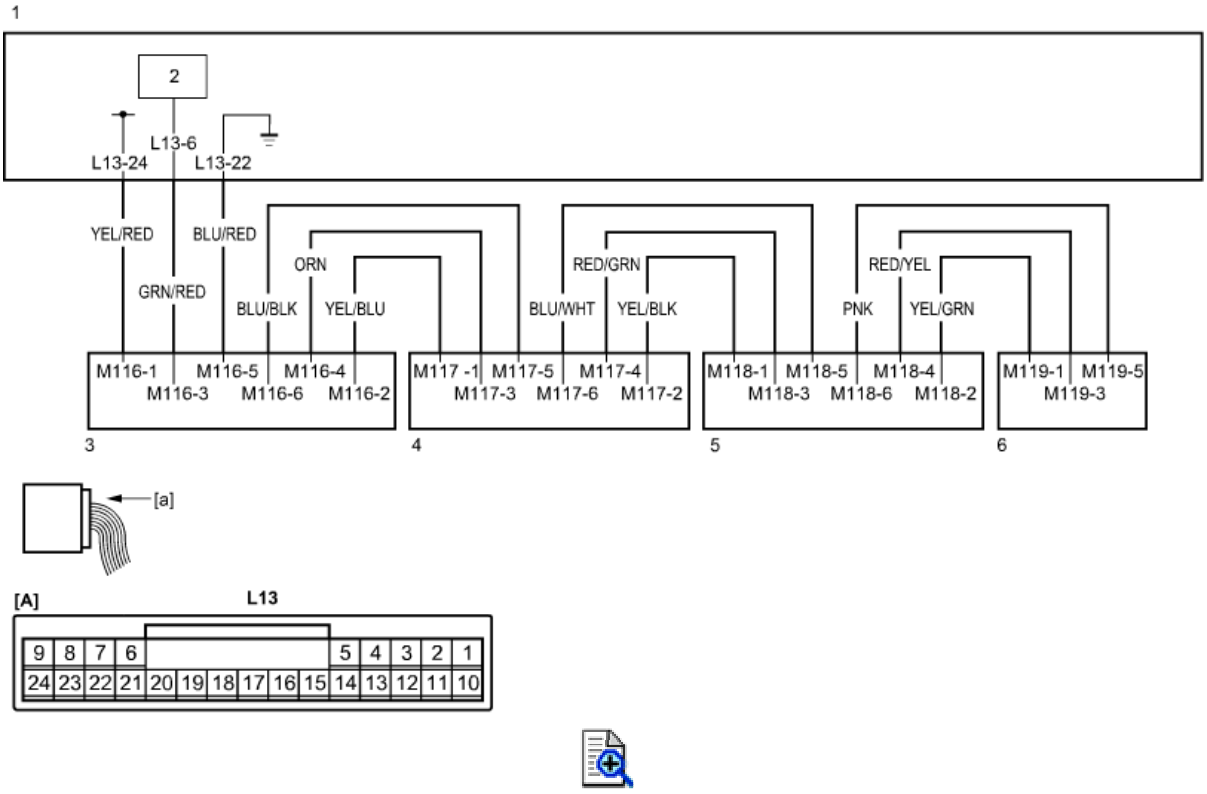
DTC B1852

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1852: Rear parking sensor communication bus error Combination meter cannot send / receive communication data to / from rear parking sensor.	• Parking sensor system control module • Parking sensor • Communication circuit

Circuit Diagram



[A]: Parking sensor system control module connector (View: [a])	3. Parking sensor (rear-left)	6. Parking sensor (rear-right)
1. Parking sensor system control module	4. Parking sensor (rear-center-left)	
2. Communication driver	5. Parking sensor (rear-center-right)	

DTC Troubleshooting

Step	Action	YES	NO
1	**Circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF".	Go to Step 2.	Repair defective wire harness.

	2) Disconnect parking sensor system control module connectors and all parking sensor connectors. 3) Check for proper connection parking sensor system control module connector and all parking sensor connectors. 4) If connections are OK, check circuits between parking sensor system control module connector and all parking sensor connectors for open circuit, short to ground or short to power supply. ***Are they in good condition?***		
2	**Parking sensor (rear-left) check** 1) Connect parking sensor system control module connector and all parking sensor connectors. 2) Replace parking sensor (rear-left). ☞ 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1852 still detected?***	Replace parking sensor (rear-left).	Go to Step 3.
3	**Parking sensor (rear-center-left) check** 1) Replace parking sensor (rear-center-left). ☞ 2) Push engine switch to change ignition mode of keyless push start system to "ON". 3) Check DTC. ☞ ***Is DTC B1852 still detected?***	Replace parking sensor (rear-center-left).	Go to Step 4.
4	**Parking sensor (rear-center-right) check** 1) Replace parking sensor (rear-center-right). ☞ 2) Push engine switch to change ignition mode of keyless push start system to "ON". 3) Check DTC. ☞	Replace parking sensor (rear-center-right).	Go to Step 5.

	Is DTC B1852 still detected?		
5	**Parking sensor (rear-right) check** 1) Replace parking sensor (rear-right). ☞ 2) Push engine switch to change ignition mode of keyless push start system to "ON". 3) Check DTC. ☞ ***Is DTC B1852 still detected?***	Replace parking sensor (rear-right).	Replace parking sensor system control module. ☞

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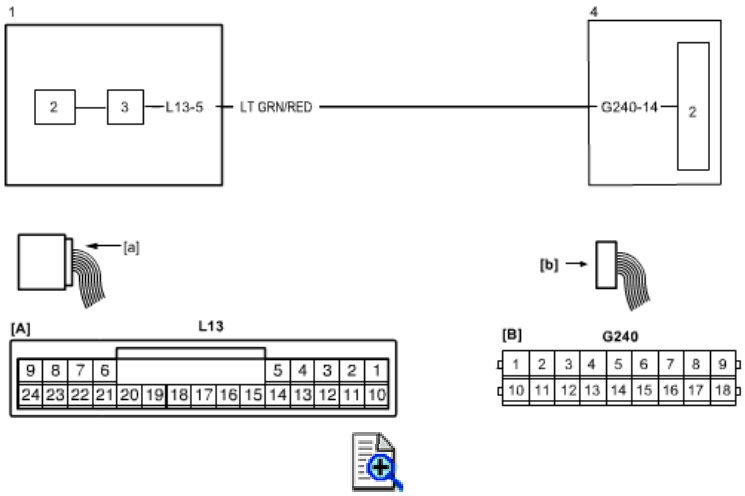
DTC B1855

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1855: Lost Communication with Parking Sensor Combination meter detected fault in LIN communication with parking sensor system.	• Parking sensor system control module • Combination meter • LIN communication circuit

Circuit Diagram



[A]:	Parking sensor system control module connector (View: [a])	1.	Parking sensor system control module	3.	LIN driver
[B]:	Combination meter connector (View: [b])	2.	CPU	4.	Combination meter

DTC Troubleshooting

Step	Action	YES	NO
1	**DTC check** 1) Clear DTC. ☞ 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Push engine switch to change ignition mode of keyless push start system to "ON". 4) Check DTC. ☞ ***Is DTC B1855 still detected?***	Go to Step 2.	Intermittent trouble. Check for intermittent trouble. ☞
2	**LIN communication circuit check**	Replace parking sensor system control module and recheck DTC. ☞	Repair LIN communication circuit.

	1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect combination meter and parking sensor system control module connectors. 3) Check for proper connection to combination meter and parking sensor system control module terminals. 4) If connections are OK, check circuits between combination meter connector and parking sensor system control module connector for open circuit, short to ground or short to power supply. ***Are they in good condition?***	Replace combination meter if DTC B1855 is still detected. ☞	

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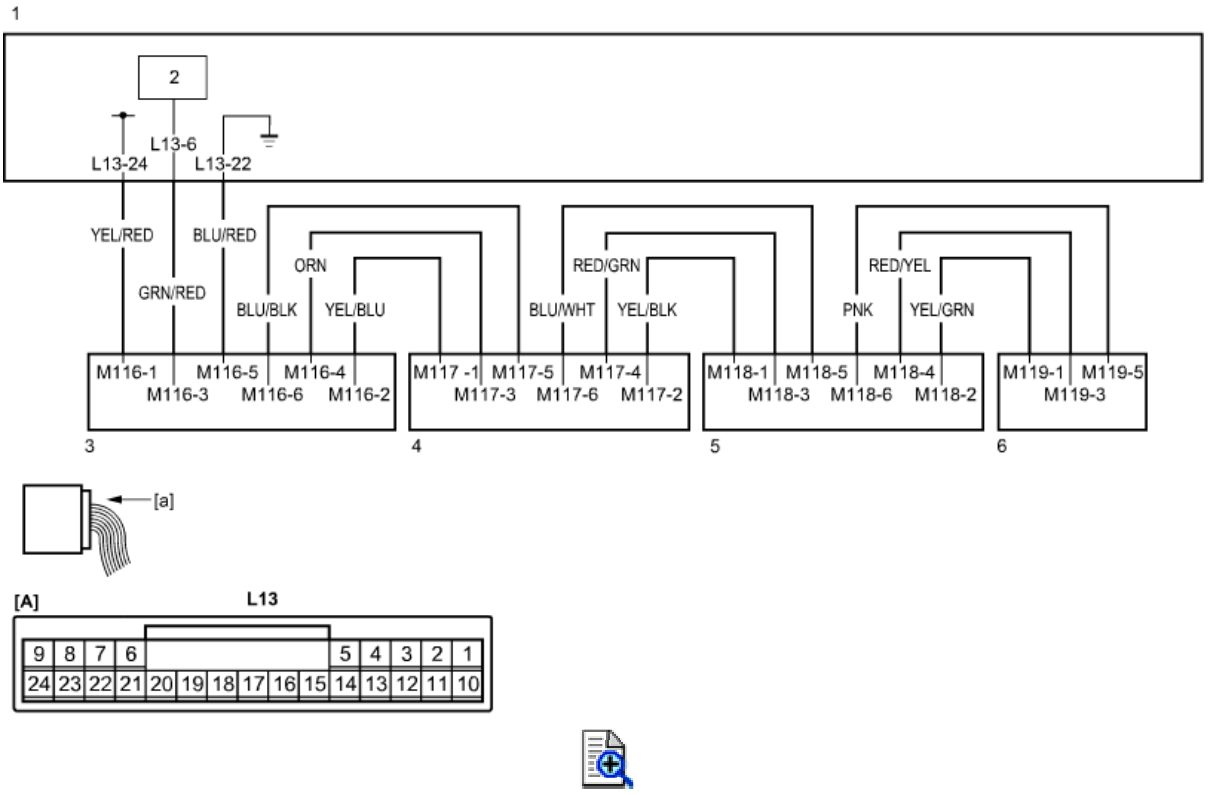
DTC B1864 / B1865 / B1866 / B1867

DTC Detecting Condition and Trouble Area

DTC detecting condition	Trouble area
B1864: Rear-left parking sensor • Parking system control module detected fault in inner part of parking sensor (rear-left). • Fault is detected in circuit for communication with parking sensor (rear-left).	• Parking sensor • Parking sensor system control module • Communication circuit
B1865: Rear-center-left parking sensor • Parking system control module detected fault in inner part of parking sensor (rear-center-left). • Fault is detected in circuit for communication with parking sensor (rear-center-left).	
B1866: Rear-center-right parking sensor • Parking system control module detected fault in inner part of parking sensor (rear-center-right). • Fault is detected in circuit for communication with parking sensor (rear-center-right).	
B1867: Rear-right parking sensor • Parking system control module detected fault in inner part of parking sensor (rear-right). • Fault is detected in circuit for communication with parking sensor (rear-right).	

Circuit Diagram



[A]: Parking sensor system control module connector (View: [a])	3. Parking sensor (rear-left)	6. Parking sensor (rear-right)

1. Parking sensor system control module	4. Parking sensor (rear-center-left)	
2. Communication driver	5. Parking sensor (rear-center-right)	

DTC Troubleshooting

NOTE:
The following procedure describes how to check DTC B1864: Parking sensor system error (rear-left). Follow the same procedure also for DTC B1865, B1866 and B1867.

Step	Action	YES	NO
1	**DTC check** 1) Perform ***DTC Check***. ***Is DTC B1852 detected?***	Go to ***DTC B1852***.	Go to Step 2.
2	**Parking sensor check** 1) Replace parking sensor with normal one and recheck DTC. ☞ ***Is there any DTC(s) detected?***	Replace parking sensor (rear-left).	Replace parking sensor system control module. ☞

9C

Combination Meter Diagnosis

Combination meter operates meters, indicators and information display according to input signals and CAN communication data from controllers. Conduct diagnosis as follows if there are problems with combination meter.

1) Check combination meter power supply and ground circuits.

2) Check every DTC relating to combination meter.

3) Using SUZUKI scan tool, check every DTC of all systems concerned.
- If DTC is found stored for any system during inspection in Step 2), go to applicable DTC diagnosis flow referring to the section for the system (control module) in question.
- If any of troubles described in table below has occurred independently even though display shows no abnormal DTC during inspection in Step 2), inspect concerned item according to instructions given below.

NOTE:
When checking each circuit, perform diagnosis of the circuit referring to "Circuit Diagram".

Defective item	Check item	Reference
Open door warning light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	Keyless start control module data list	Refer to ***Scan Tool Data***.
	Keyless start control module terminal voltage	Refer to ***Inspection of Keyless Start Control Module and Its Circuits***.
	Door switch	Refer to ***Front and Rear Door Switch Inspection***.
	Trunk lid switch	Refer to ***Trunk Lid Latch On-Vehicle Inspection***.
	Circuit (including relays and fuses)	—
Turn signal indicator light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.
	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Lighting and turn signal switch	Refer to ***Lighting and Turn Signal Switch Inspection***.
	Circuit (including relays and fuses)	—
Brake warning light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.
	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Parking brake switch	Refer to ***Parking Brake Switch On-Vehicle Inspection***.
	Brake fluid level switch	Refer to ***Brake Fluid Level Switch Inspection***.
	Circuit (including relays and fuses)	—
Driver seat belt reminder light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.
	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Seat belt switch	Refer to ***Front Seat Belt Inspection***.
	Circuit (including relays and fuses)	—
Oil pressure warning light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.

	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Oil pressure switch	Refer to ***Oil Pressure Switch On-Vehicle Inspection***.
	Circuit (including relays and fuses)	—
High beam indicator light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.
	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Lighting and turn signal switch	Refer to ***Lighting and Turn Signal Switch Inspection***.
	Circuit (including relays and fuses)	—
Charge warning light	Combination meter active test	Refer to ***Scan Tool Active Test***.
	BCM data list	Refer to ***Scan Tool Data***.
	BCM terminal voltage	Refer to ***Inspection of BCM and Its Circuits***.
	Generator	Refer to ***Generator Test***.
	Circuit (including relays and fuses)	—

9C

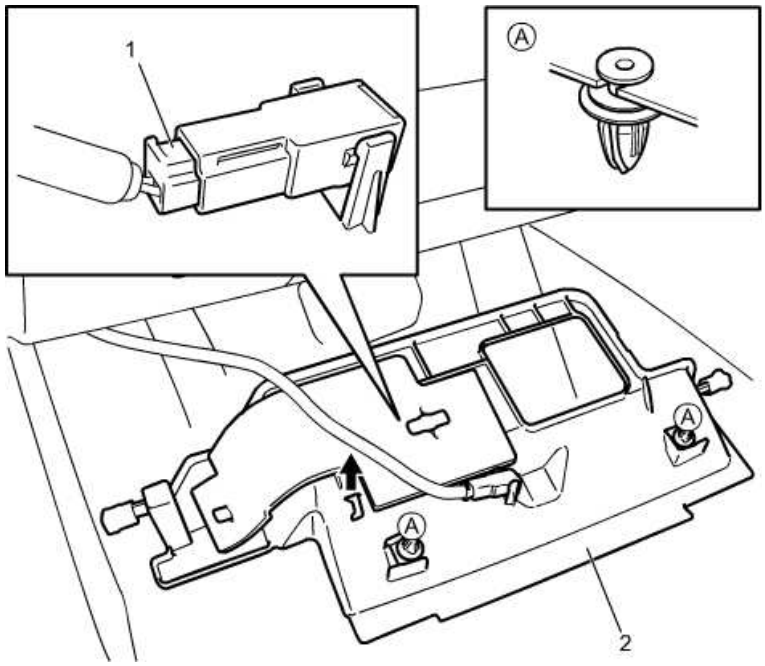
Combination Meter Removal and Installation

1) Remove floor console front garnish. ☞

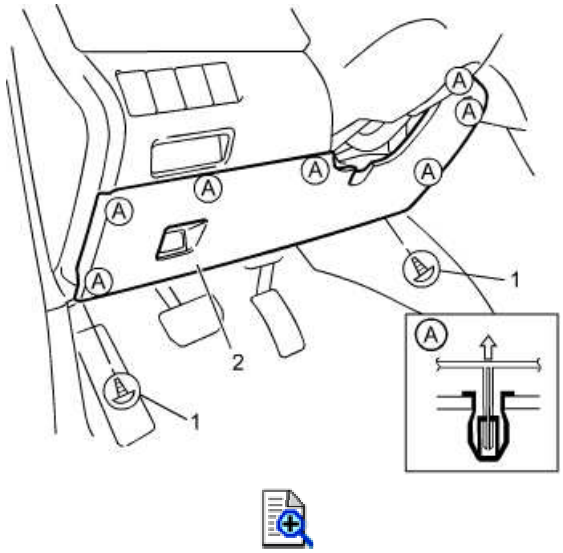
2) Remove audio unit. ☞

3) Remove column hole blind holder. ☞

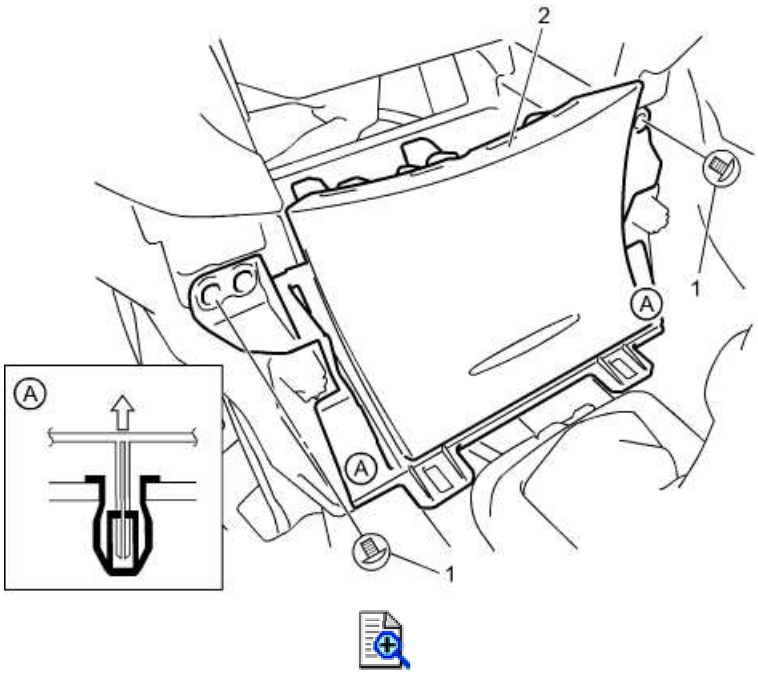
4) Remove driver side instrument panel undercover (2) and, while supporting it, disconnect connector (1).



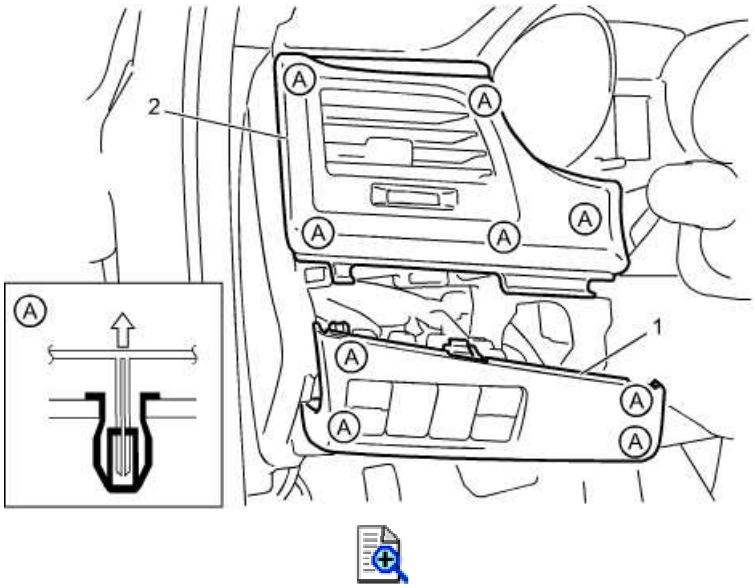
5) Remove screws (1) and remove steering column hole cover (2).



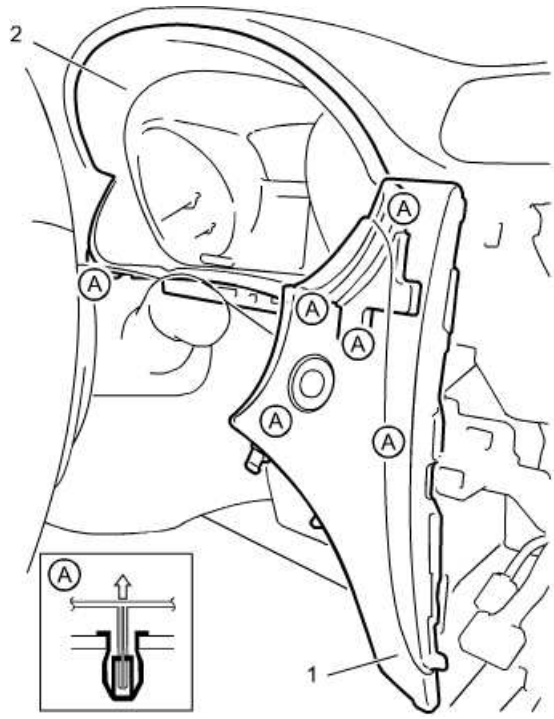
6) Remove screws (1) and remove instrument panel center lower box (2).



7) Remove instrument panel switch bezel (1), and then remove driver side instrument panel outside garnish (2).

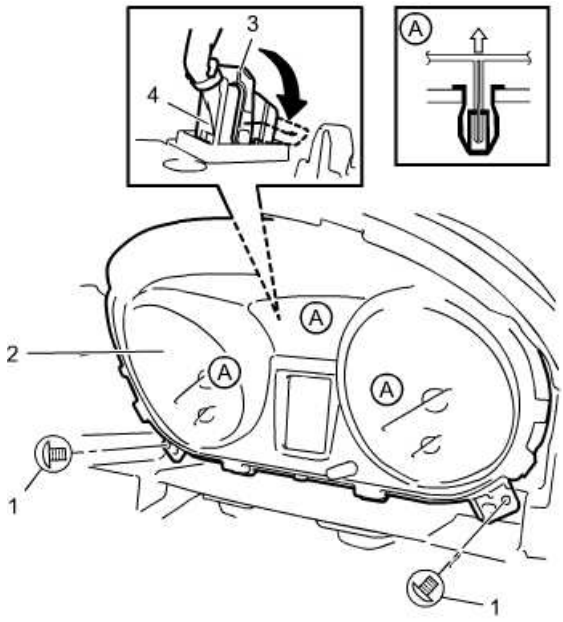


8) Remove driver side instrument panel inside garnish (1), and then remove instrument panel cluster panel (2).



9) Remove screws (1) and remove combination meter (2).

10) Release lock (3) and disconnect combination meter connector (4).



Installation

Reverse removal procedure.

9C

Instrument Panel Removal and Installation

Removal

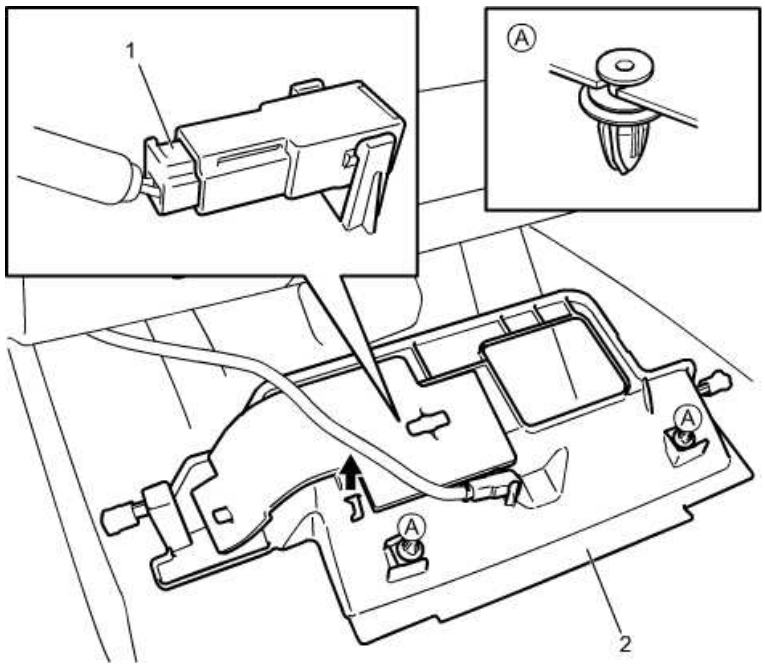
1) Disable air bag system. ☞

2) Remove floor console front panel. ☞

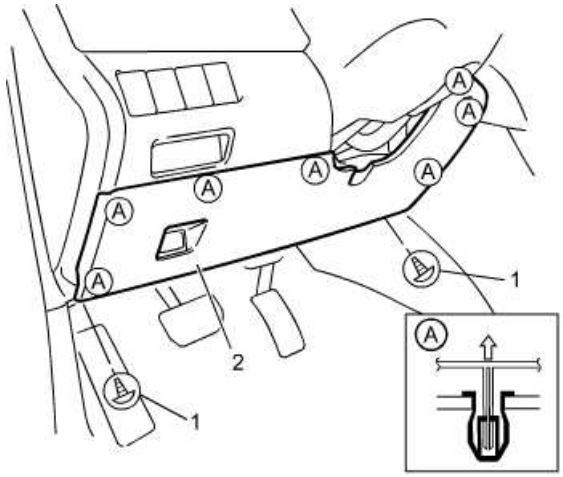
3) Remove front pillar trim. ☞

4) Remove dash side trim and side sill front scuff. ☞

5) Remove driver side instrument panel undercover (2), and then disconnect connector (1) while supporting it.

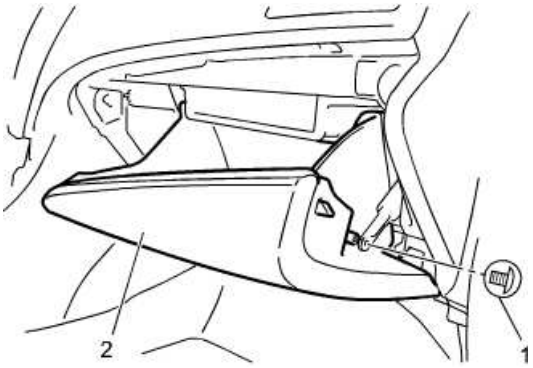


6) Remove screws (1) and remove steering column hole cover (2).

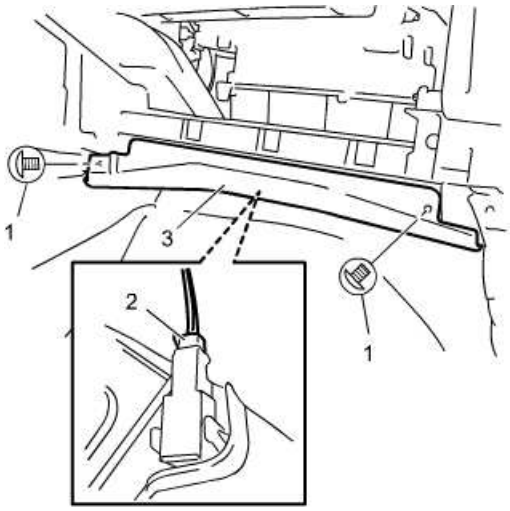


7) Remove steering column assembly. ☞

8) Remove screws (1) and remove glove box (2).

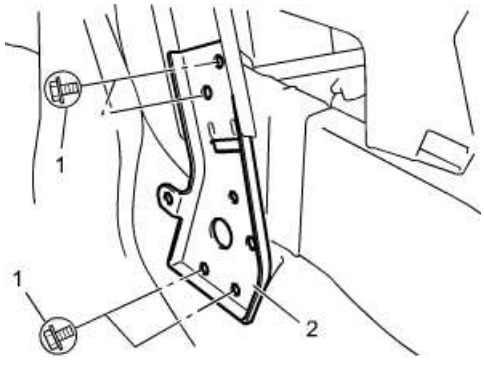


9) Remove screws (1) to detach instrument panel undercover (3), and then disconnect floor light connector while supporting it.

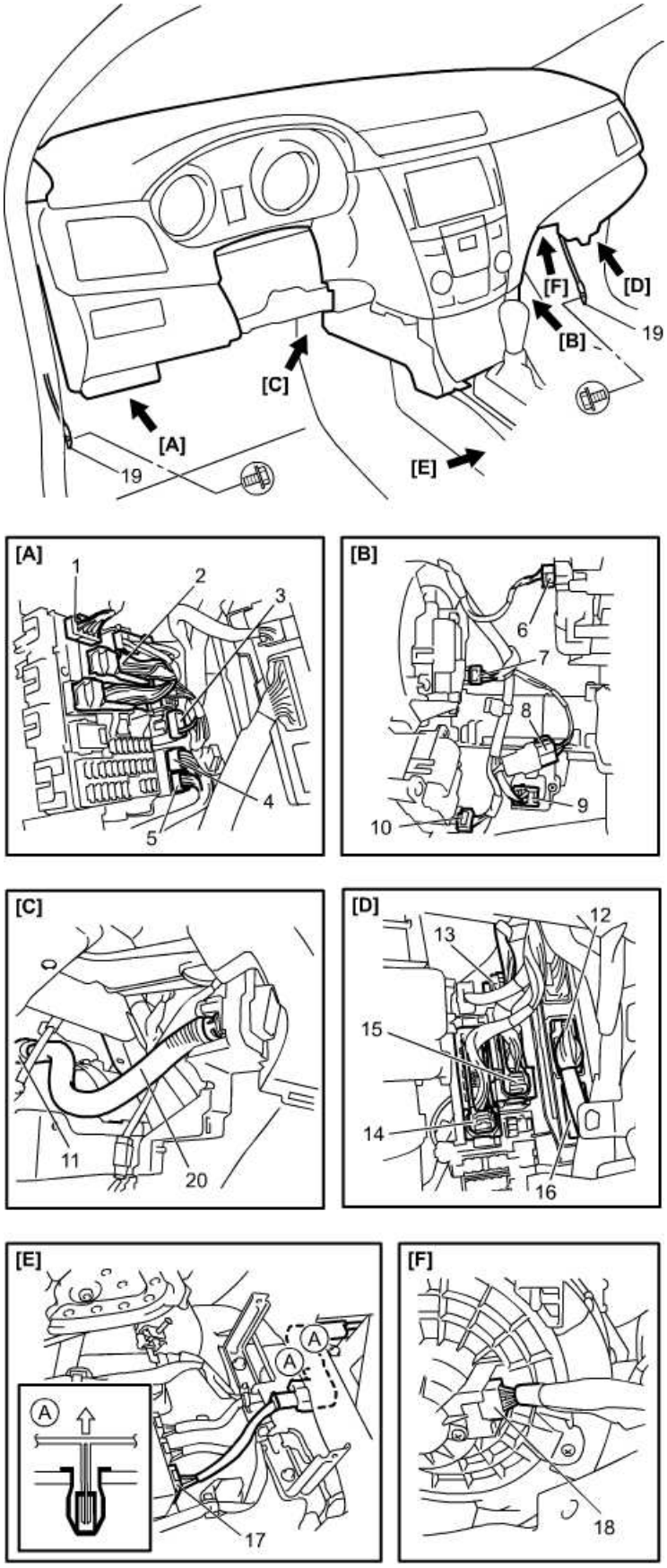


10) Remove foot duct. ☞

11) Remove steering support member lower bracket bolts (1) and remove steering support member lower bracket (2).



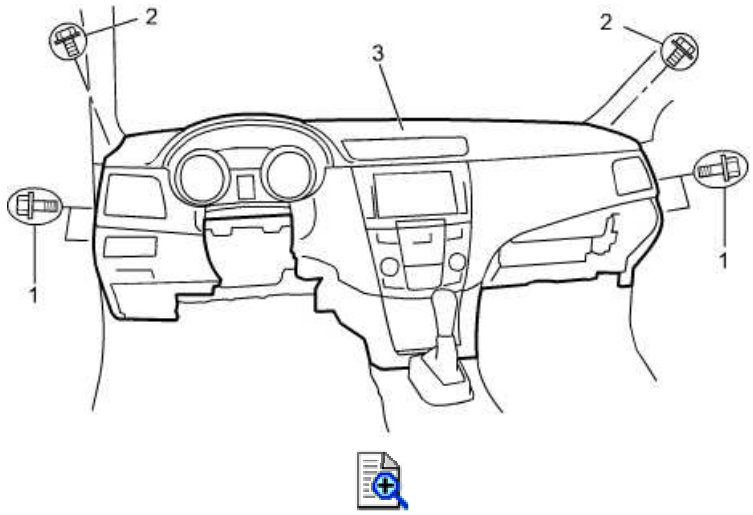
12) Disconnect / remove the following parts as shown in figure: connectors (1) to (18), ground connections (19) and inside air temperature sensor aspirator duct (20).



13) Remove steering support member bolts (1) and (2).

14) Check that there is no harness or ground wire connected between instrument panel and vehicle while slightly raising and supporting instrument panel (3).

15) Remove instrument panel, steering support member and instrument panel harness as assembly.



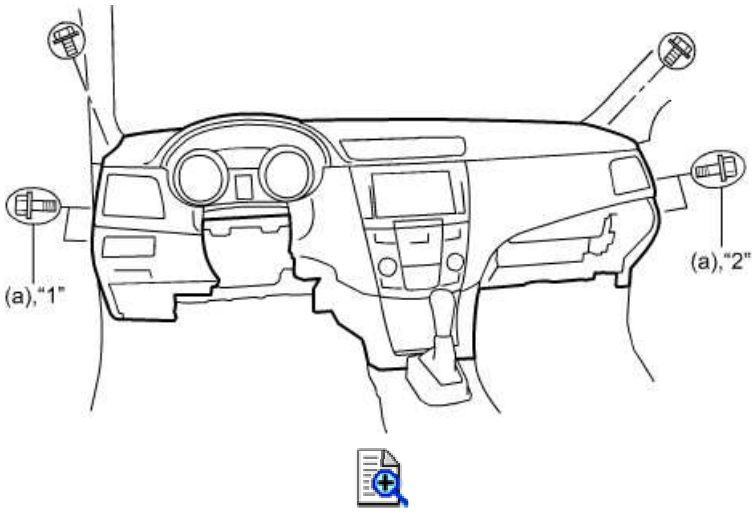
Installation

Reverse removal procedure noting the following points.

- Do not let cables or wire harnesses be pinched when installing parts.
- Enable air bag system.
- Tighten steering support member side bolts in numerical order ("1" – "2") to specified torque.

Tightening torque

Steering support member bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



- Conduct every initialization after all works are completed.

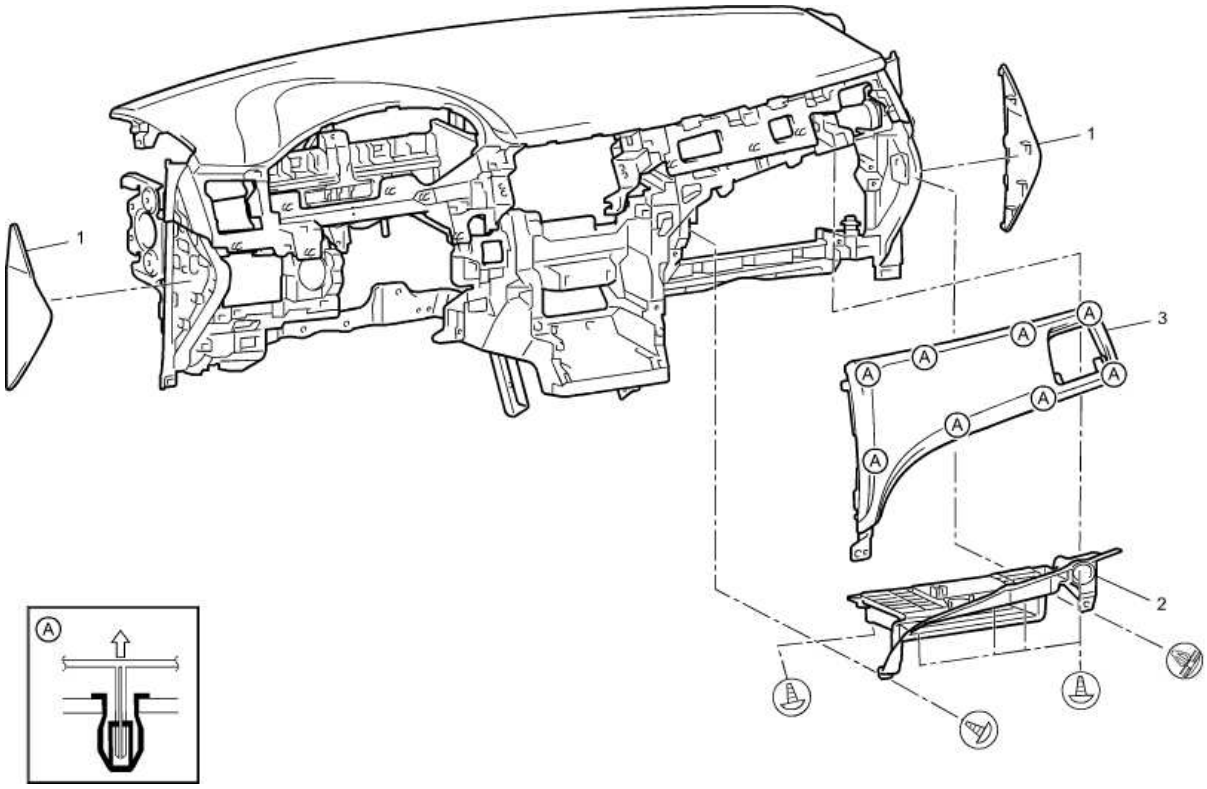
9C

Instrument Panel Disassembly and Reassembly

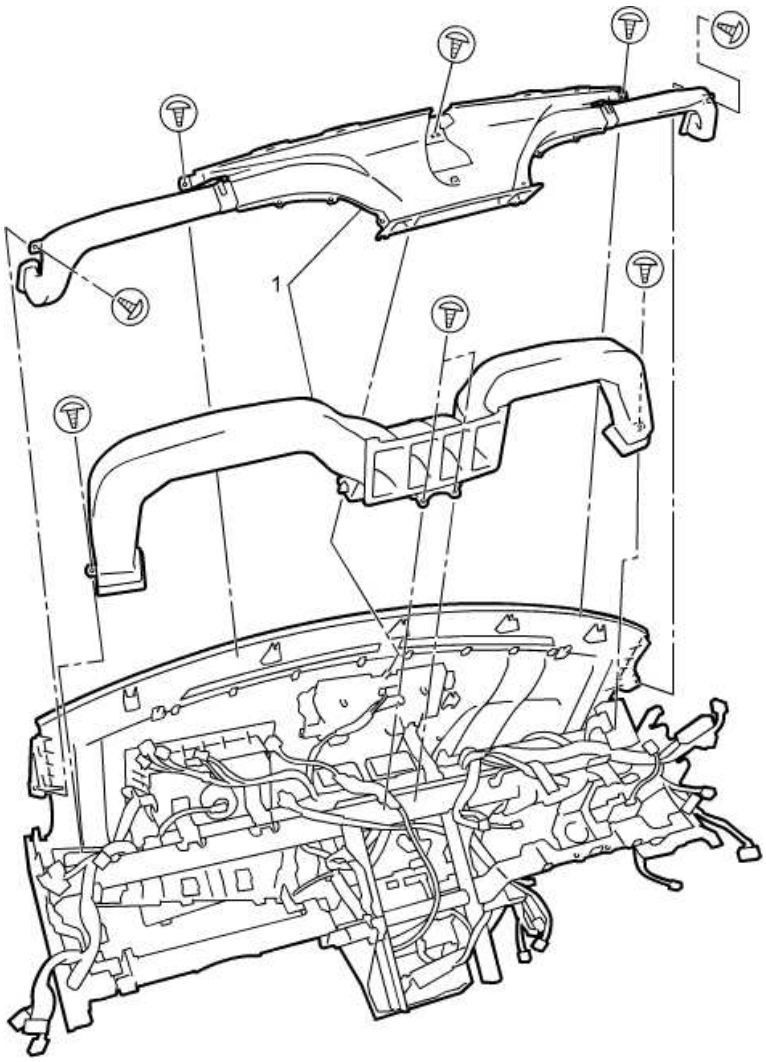
Reference: Instrument Panel Removal and Installation

Disassembly

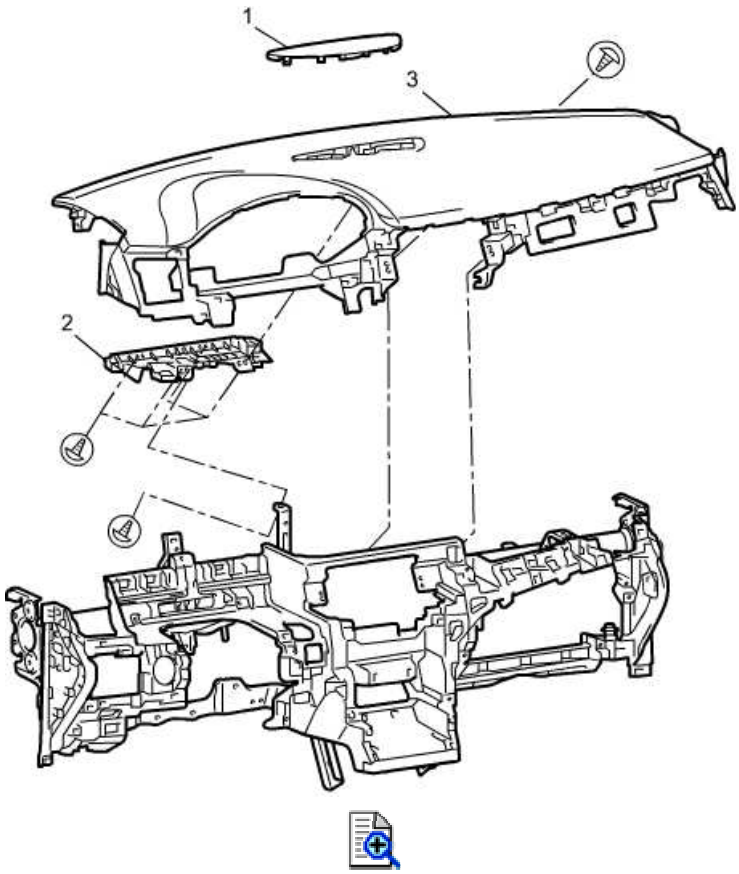
1) Remove the following parts as shown in figure.
- Instrument panel side cover (1)
- Service manual case (2)
- Passenger side instrument panel garnish (3)



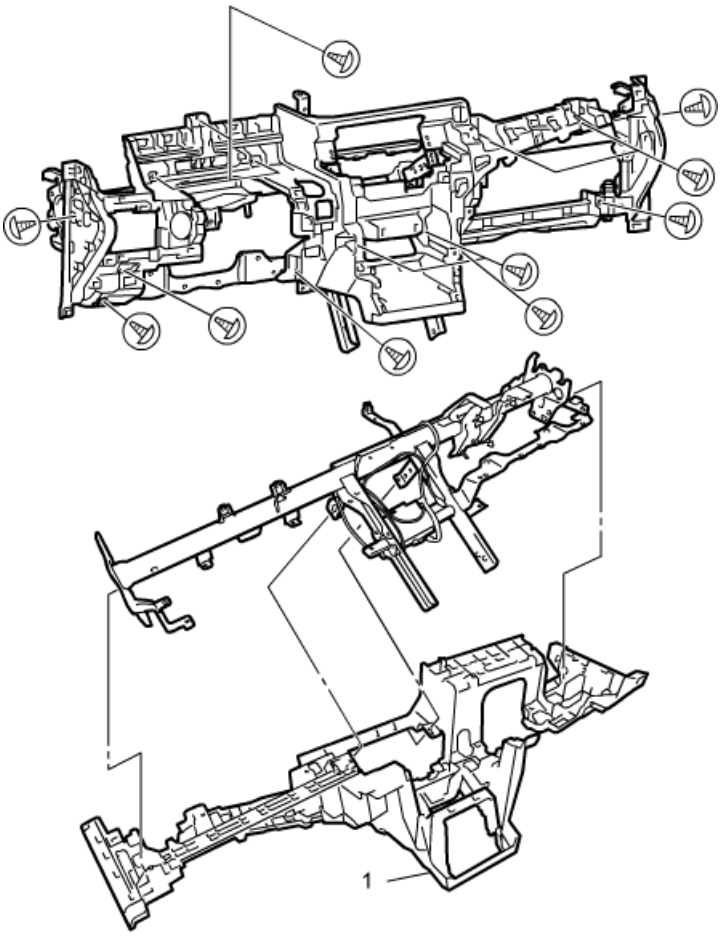
2) Remove screws and remove ventilator ducts (1).



3) Remove passenger air bag (inflator) module. ☞
4) Remove instrument panel speaker cover (1).
5) Disconnect instrument panel speaker connector.
6) Remove screws and remove instrument panel speaker base (2).
7) Remove screws and remove instrument panel main upper panel (3).



8) Remove screws and remove instrument panel main lower panel (1).



Reassembly

Reverse disassembly procedure.

9C

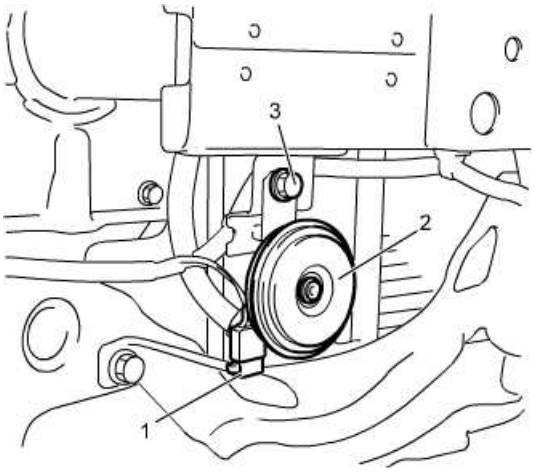
Horn Removal and Installation

Removal

1) Remove front bumper. ☞

2) Disconnect horn connector (1).

3) Remove horn bolt (3) and remove horn (2).



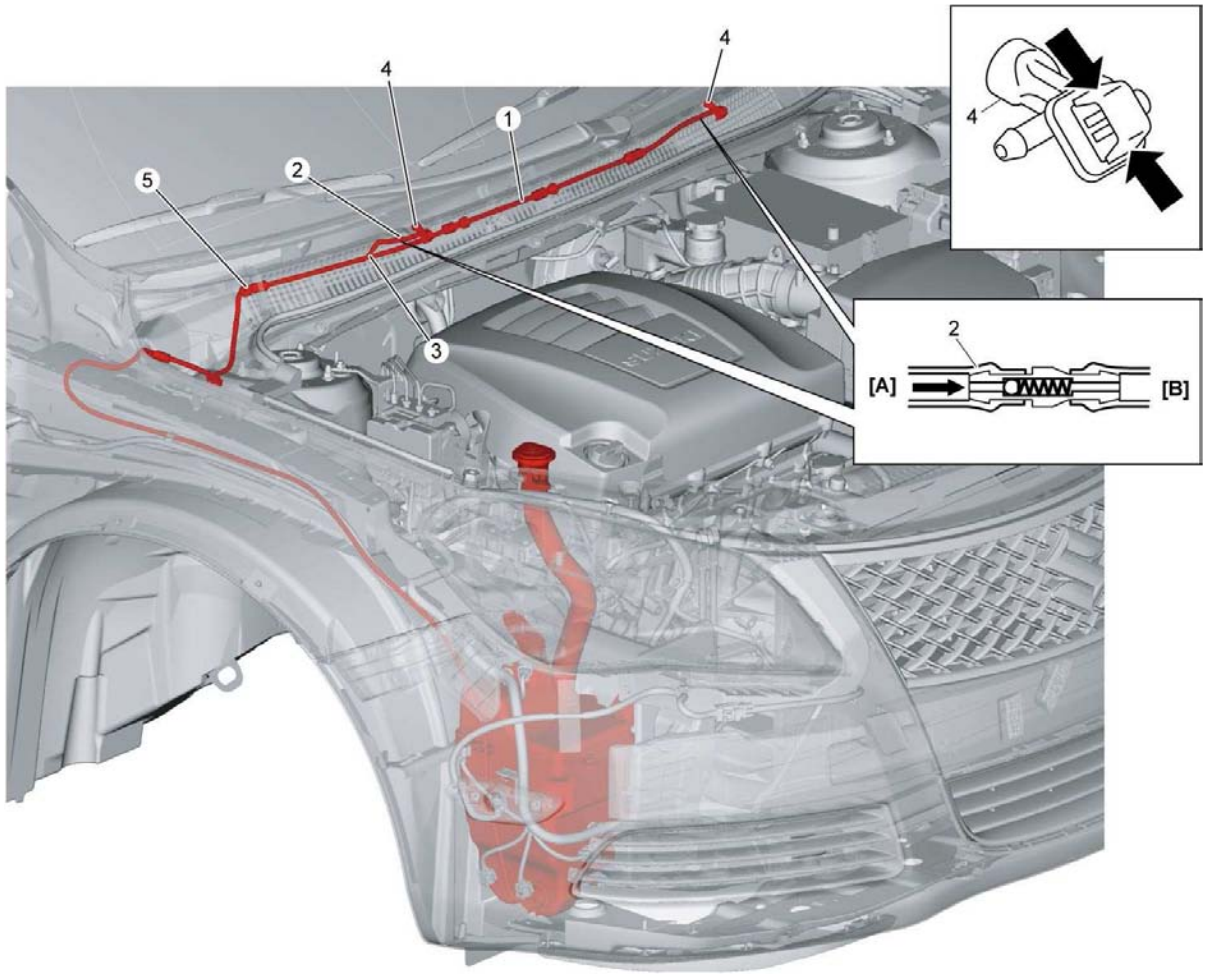
Installation

Reference: Horn Inspection

Reverse removal procedure.

9D

Washer Tank and Hose Component Location



[A]: Motor side	2. Check valve	5. Connector
[B]: Nozzle side	3. Connector (3-way)	
1. Washer hose	4. Nozzle	

9D

Scan Tool Data

BCM

NOTE:
If communication between SUZUKI scan tool and BCM is not possible, check related items according to the following points for recovery.
- **SUZUKI scan tool and communication cable**
- **DLC power circuit and ground circuit**
- **CAN communication system malfunction ("Control Module Communication Bus Off" is detected in any control module)**

The following table shows items that can be shown with BCM data list of SUZUKI scan tool

Scan tool data	Judgment	Detecting condition	Correction / Reference item
Abnormal-RainSensor1	Abnormal/normal	This parameter indicates whether rain sensor CPU is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-RainSensor2	Abnormal/normal	This parameter indicates whether rain sensor memory is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-RainSensorVolt	Abnormal/normal	This parameter indicates whether rain sensor input voltage is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-RainSensorTemp	Abnormal/normal	This parameter indicates whether rain sensor temperature is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-LightSensor	Abnormal/Normal	This parameter indicates whether light sensor is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-RainSensorSig	Abnormal/Normal	This parameter indicates whether rain sensor signal is abnormal or normal.	Check rain / light sensor. ☞
Abnormal-RainSensor Sen1	Abnormal/Normal	This parameter indicates MAX sensing level over of rain sensor.	Check rain / light sensor. ☞
Abnormal-RainSensor Sen2	Abnormal/Normal	This parameter indicates MIN sensing level over of rain sensor.	Check rain / light sensor. ☞
RainSensor InitialSet	Not regi/Regist	This parameter indicates whether initial setting of rain / light sensor is completed or not.	Initialize rain / light sensor. ☞
Abnormal-RainSenserData1	Abnormal/Normal	This parameter indicates whether vehicle speed data via CAN communication is abnormal or normal.	Perform diagnosis of CAN communication-related parts. ☞
Abnormal-RainSenserWip	Abnormal/Normal	This parameter indicates whether wiper switch data via CAN communication is abnormal or normal.	Perform diagnosis of CAN communication-related parts. ☞

Abnormal-RainSenserWipV	Abnormal/Normal	This parameter indicates whether wiper interval adjustment switch data via CAN communication is abnormal or normal.	Perform diagnosis of CAN communication-related parts. ☞
Abnormal-LitSensorLit	Abnormal/Normal	This parameter indicates whether lighting switch data via CAN communication is abnormal or normal.	Perform diagnosis of CAN communication-related parts. ☞
Abnormal-RainSensorMtr (Mtr: motor)	Abnormal/Normal	This parameter indicates whether wiper motor position data via CAN communication is abnormal or normal.	Perform diagnosis of CAN communication-related parts. ☞
RainsensorTemp	Detected/Not dete	This parameter indicates whether rain / light sensor operating temperature is within normal range or not.	Establish working environment properly (0 – 60 °C, 32 – 172 °F) referring to precautions for work and perform check again.

9D

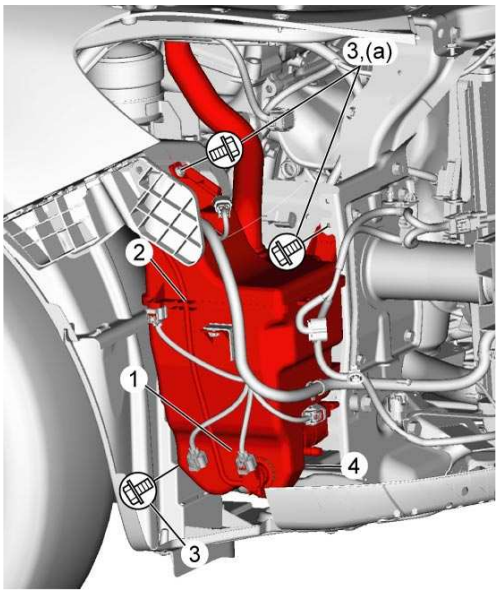
Washer Tank and Washer Pump Removal and Installation

Removal

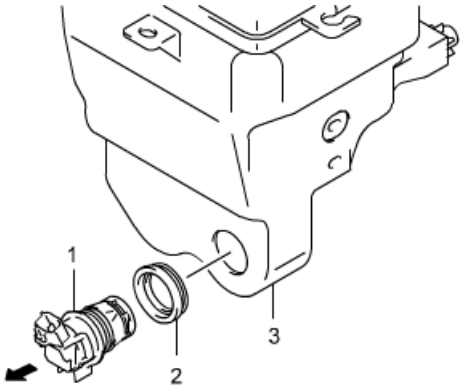
1) Remove right headlight unit.

2) Disconnect washer pump connector (1) and washer hose (2).

3) Remove washer tank bolts (3) and remove washer tank (4).



4) Pull washer pump (1) together with washer pump grommet (2) in direction of arrow to remove them from washer tank (3).



Installation

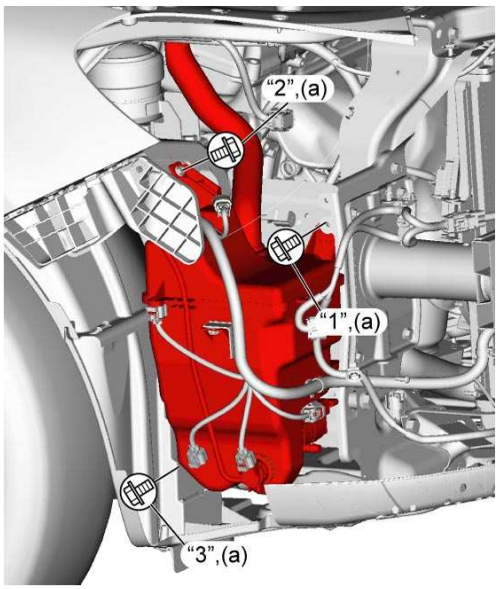
Reference: Washer Pump Inspection

Reverse removal procedure noting the following points.

- Tighten washer tank bolts in numerical order (“1” through “3”) to specified torque.

Tightening torque

Washer tank bolt (a): 6.0 N·m (0.61 kg-m, 4.5 lbf-ft)



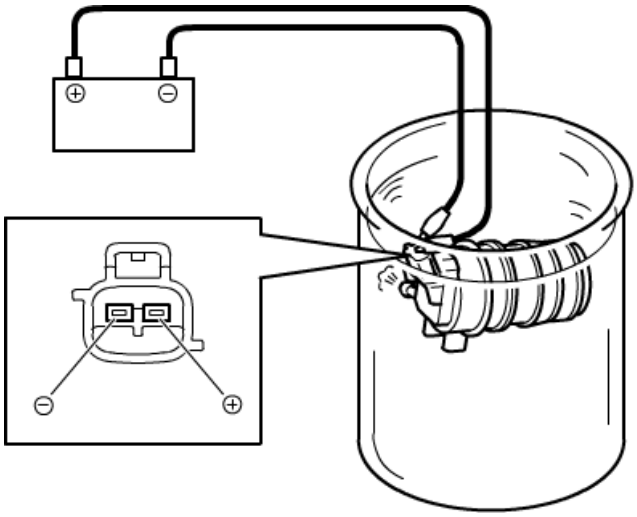
- Aim headlights after installing washer pump and tank.

9D

Washer Pump Inspection

Reference: Washer Tank and Washer Pump Removal and Installation

Connect battery positive (+) and negative (−) terminals to washer pump as shown. If washer pump does not operate, replace washer pump.

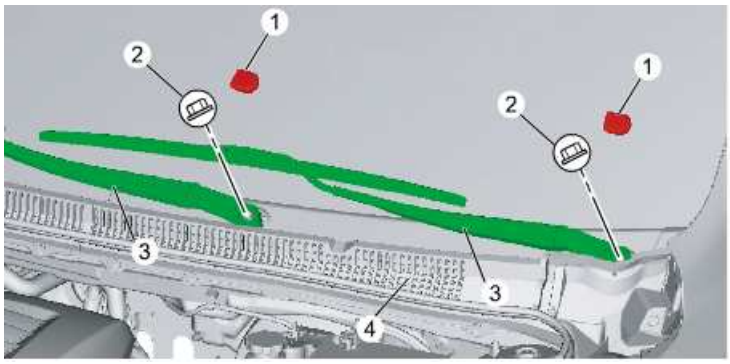


9D

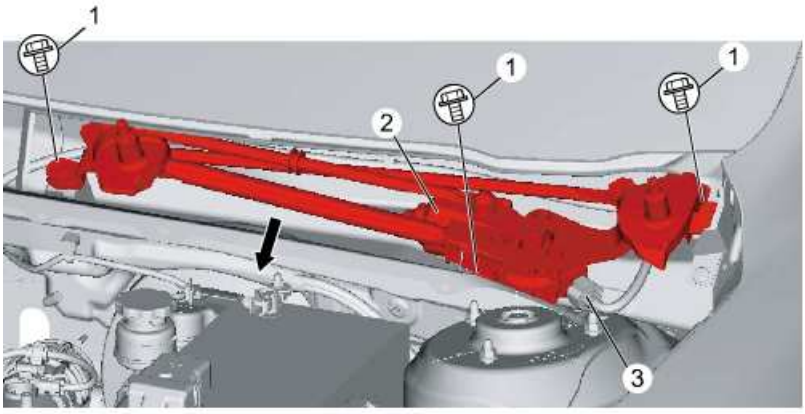
Wiper Motor Removal and Installation

Removal

1) Remove pivot caps (1) and wiper arm nuts (2), and remove wiper arms (3).
2) Remove cowl top garnish (4).



3) Disconnect wiper motor connector (3).
4) Remove wiper motor bolts (1) and remove wiper motor (2).

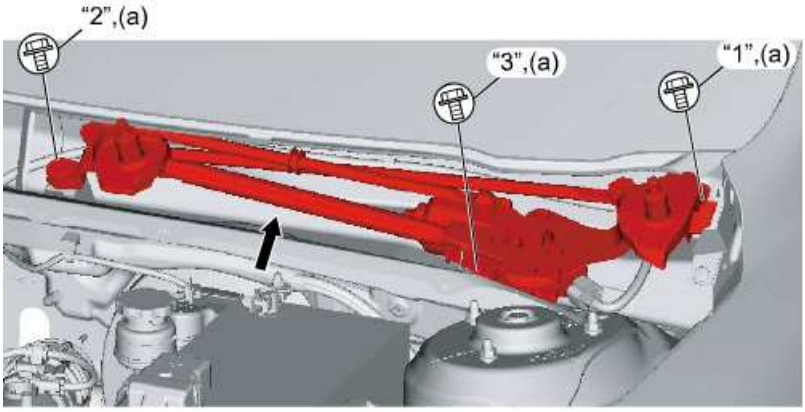


Installation

Reverse removal procedure noting the following points.

- Tighten wiper motor bolts in nurerical order (“1” through “3”) to specified torque.

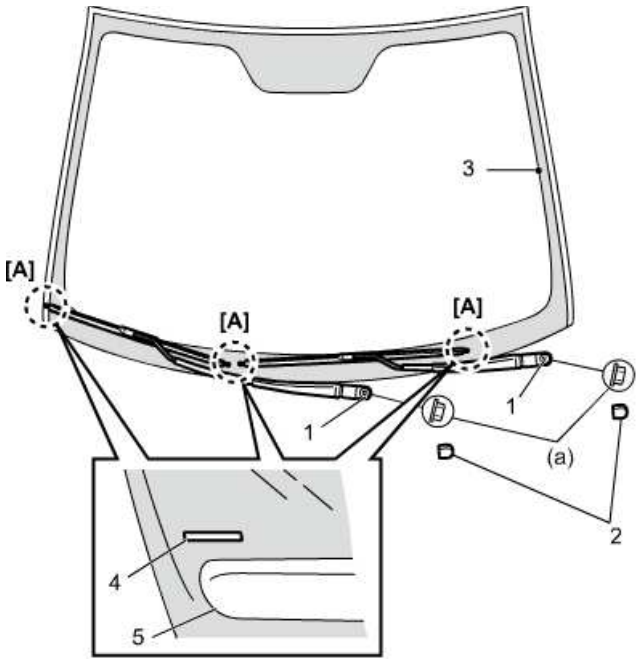
Tightening torque
Wiper motor bolt (a): 8.3 N·m (0.85 kg-m, 6.5 lbf-ft)



- Install wiper arms (1) in positions shown in figure and tighten wiper arm nuts to specified torque.

Tightening torque

Wiper arm nut (a): 20 N·m (2.0 kg-m, 15.0 lbf-ft)



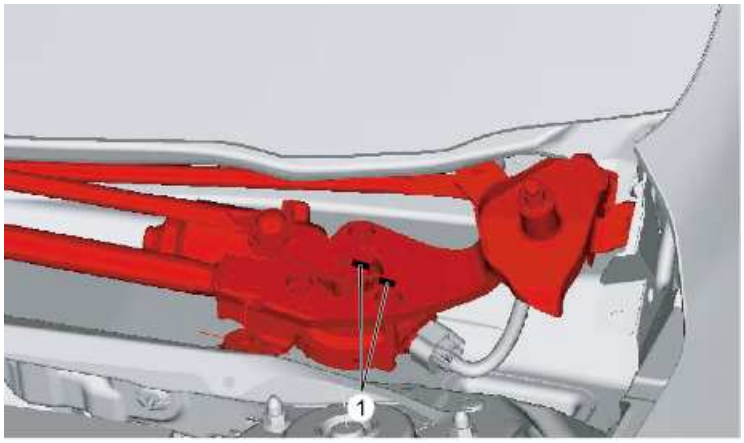
[A]:	Align tip of blade (5) with matchmark on ceramic line.
2.	Pivot cap
3.	Ceramic line
4.	Matchmark on ceramic line
5.	Wiper arm

9D

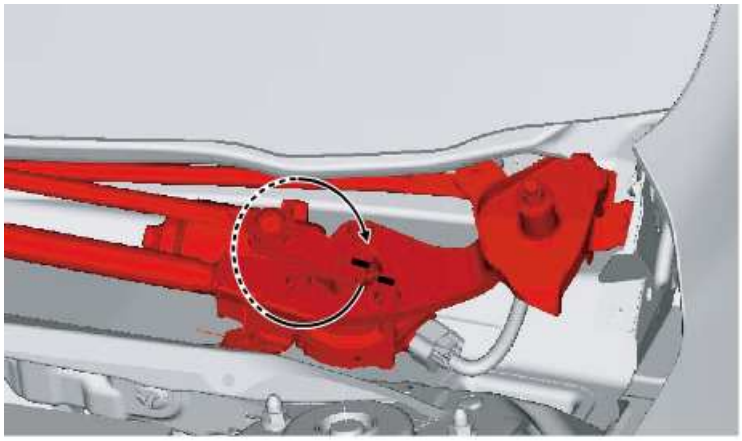
Wiper Motor Operation Inspection

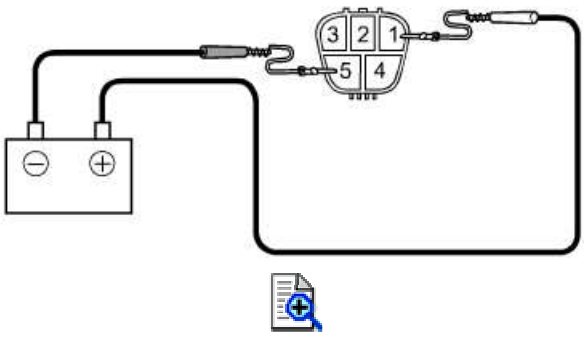
Reference: Wiper Motor Removal and Installation

1) Make marks (1) as shown in figure with wiper motor stopped.



2) Connect battery positive (+) and negative (–) terminals to wiper motor connector terminals as shown to operate motor at low speed. If wiper motor does not operate, replace wiper motor.





3) Connect battery positive (+) and negative (–) terminals to wiper motor connector terminals as shown to operate motor at high speed. If wiper motor does not operate, replace wiper motor.

9D

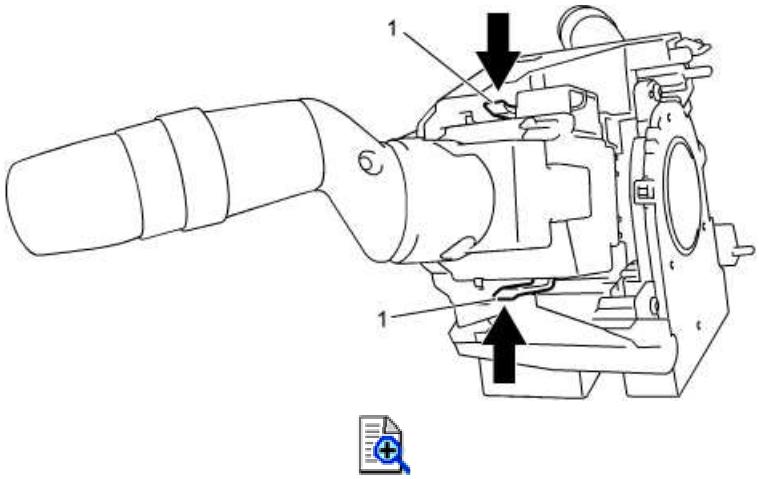
Wiper and Washer Switch Removal and Installation

Removal

1) Remove steering column cover. ☞

2) Disconnect wiper and washer switch connector.

3) Remove wiper and washer switch from steering column while pushing claws (1) in directions of arrows.



Installation

Reference: Wiper and Washer Switch Inspection

Reverse removal procedure.

9D

Wiper and Washer Switch Inspection

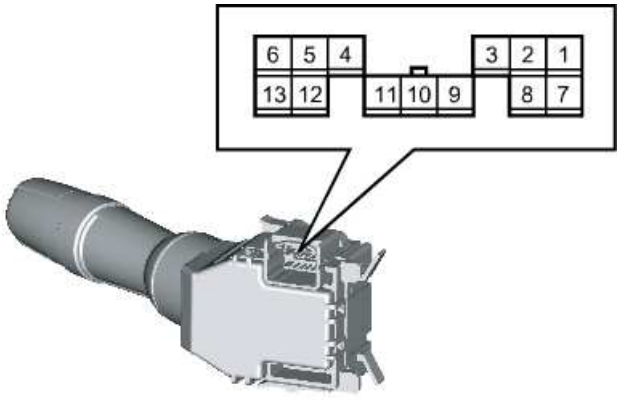
Reference: Wiper and Washer Switch Removal and Installation

Wiper and Washer Switch Circuit Continuity Check

Check continuity between terminals at each switch position. If check result is not as specified, replace wiper and washer switch.

Wiper switch continuity

Terminal / Switch position	1	5	4	3	2	6
MIST				○	○	
OFF						
AUTO/INT		○		○		
LO				○	○	
HI			○	○	○	
	○					○

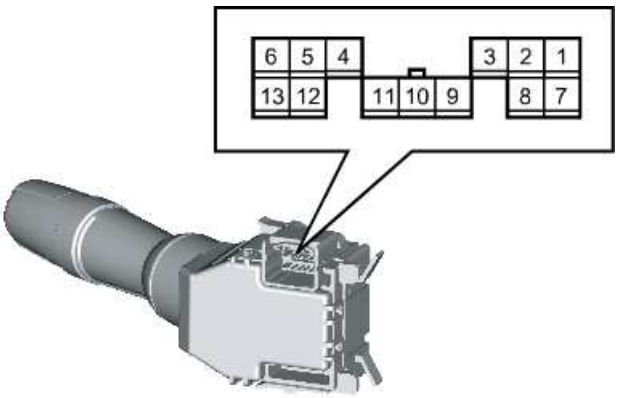


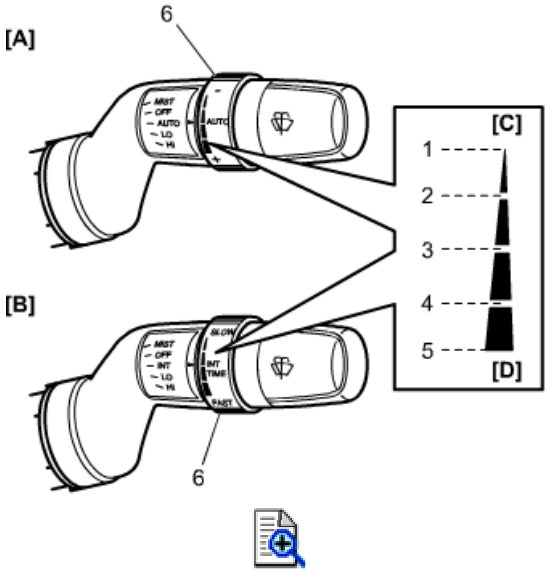
Adjustment Knob Check

Check resistance between terminal "9" and terminal "12" with adjustment knob (6) set at each position. If check result is not as specified, replace wiper and washer switch.

Wiper interval adjustment switch resistance

Wiper interval adjustment switch position	Resistance value
1	Approx. 0 kΩ
2	Approx. 2 kΩ
3	Approx. 5 kΩ
4	Approx. 8 kΩ
5	Approx. 10 kΩ





[A]:	Vehicle equipped with rain-sensing wiper system
[B]:	Vehicle not equipped with rain-sensing wiper system
[C]:	– (Vehicle equipped with rain-sensing wiper system) or SLOW (Vehicle not equipped with rain-sensing wiper system)
[D]:	+ (Vehicle equipped with rain-sensing wiper system) or FAST (Vehicle not equipped with rain-sensing wiper system)

9D

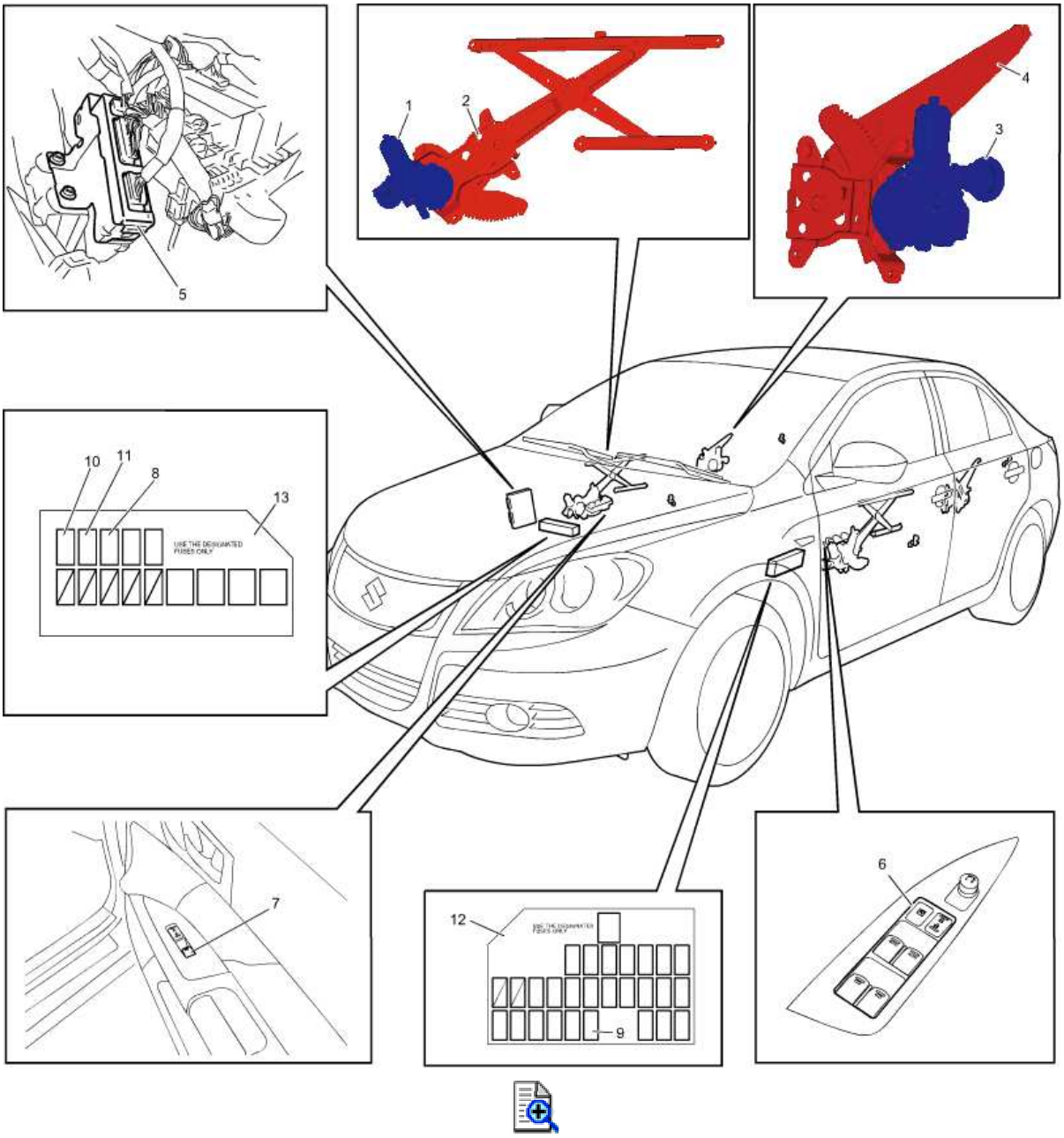
Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Washer tank bolt	6.0	0.61	4.5	☞
Wiper motor bolt	8.3	0.85	6.5	☞
Wiper arm nut	20	2.0	15.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

9E

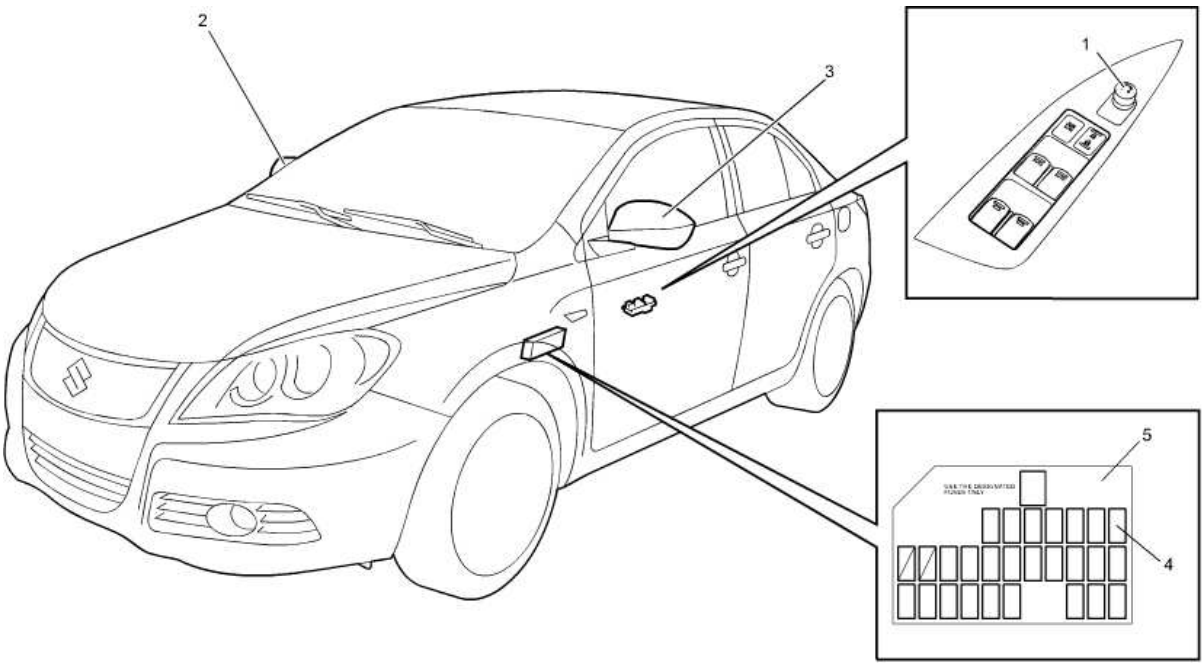
Power Window Component Location



1. Driver/Passenger power window motor	6. Power window master switch	11. "DOOR RL" fuse
2. Driver/Passenger power window regulator	7. Power window sub switch (passenger rear right/rear left)	12. Junction block
3. Rear power window motor (R)/(L)	8. "DOOR FR" fuse	13. Relay box No. 2
4. Rear power window regulator (R)/(L)	9. "DOOR FL" fuse	
5. Keyless start control module	10. "DOOR RR" fuse	

9E

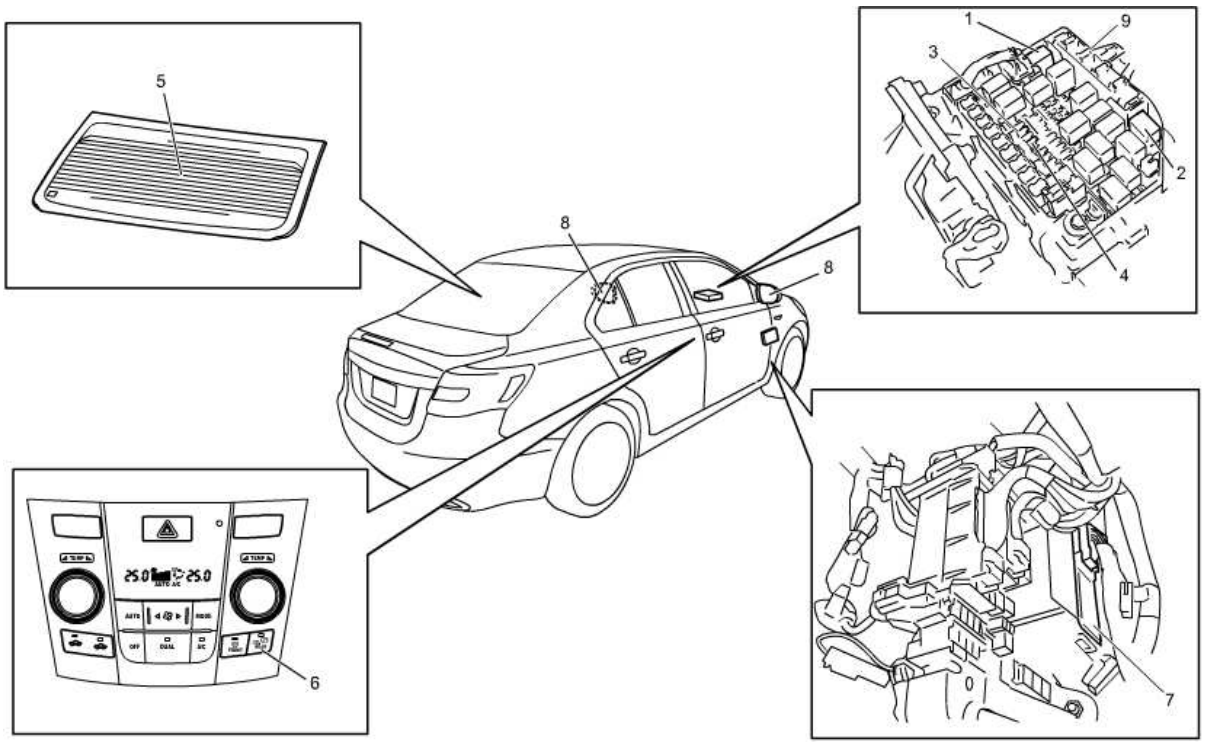
Power Door Mirror Component Location



1. Power door mirror knob	3. Mirror assembly (L)	5. Junction block
2. Mirror assembly (R)	4. "ACC" fuse	

9E

Rear Defogger and Mirror Heater Component Location



1. Rear defogger relay	4. "RR DEF" fuse	7. BCM
2. Mirror heater relay	5. Rear defogger	8. Mirror heater (4WD model)
3. "MRR HTR" fuse	6. Rear defogger switch	9. Fuse box No. 1

9E

Power Window System Fail-Safe Function (Front Doors Only)

Power window motor system operates in fail-safe mode when any of the following malfunctions is detected. The following tables show details.

Fail-Safe Mode Table

No.	Item	Act condition	Release condition
1	Pulse sensor error (one sensor)	After an error is detected from a sensor, no change of pulse from the sensor is detected while specified number of pulses are received from the other sensor.	When specified amount of "up" pulse is detected and motor is stopped at the fully closed position.
2	Pulse sensor direction error	More than specified number of pulses indicating opposite direction to detected motor rotating direction are successively.	
3	Pulse sensor stop error (both sensors)	No pulse is detected from both pulse sensors for more than specified time during closing operation.	
4	Memory error of full close position	When window is rising, ECU receives "up" pulses exceeding the specified amount from sensor.	
5	Initializing failure	Door glass position cannot be detected correctly when resetting ECU.	When initialization is conducted successfully.
6	LIN communication failure	LIN communication is interrupted.	When LIN communication is restored.

Fail-Safe Mode Operation Table

* Manual up operation with auto up held
** Operates full stroke treated as pinching detection area. Therefore, it reverses on reaching fully closed position.
O1: Operation permitted (with anti-pinching function)
O2: Operation permitted (without anti-pinching function)
X: Operation inhibited

Fail-safe mode No. 1 to No. 5 when no initialization

Switch operation / remote operation signal			Vehicle condition	
			Ignition mode: ON	Ignition mode: OFF
Operation of window switch on each door (Front door)	Manual	UP	X	X
		DOWN	O2	X
	Auto	Held to UP	O2*	X
		UP	X	X
		DOWN	X	X
Remote operation signal (Passenger seat)	Manual	UP	X	X
		DOWN	X	X
	Auto	Held to UP	X	X
		UP	X	X
		DOWN	X	X

Fail-safe mode No. 6

Vehicle condition

Switch operation / remote operation signal			Any time
Operation of window switch on each door (Front door)	Manual	UP	O1
		DOWN	O2
	Auto	Held to UP	O1
		UP	O1
		DOWN	O2
Remote operation on signal (Passenger seat)			X

Operation from own seat switch

Combination of fail-safe modes No. 6 and any of No. 1 to 3

Switch operation / remote operation signal			Vehicle condition
			Any time
Operation of window switch on each door (Front door)	Manual	UP	X
		DOWN	X
	Auto	Held to UP	X
		UP	X
		DOWN	X

Combination of fail-safe modes No. 4 and No. 6 or fail-safe modes No. 5 and No. 6

Switch operation / remote operation signal			Vehicle condition
			Any time
Operation of window switch on each door (Front door)	Manual	UP	O1**
		DOWN	O2
	Auto	Held to UP	O1**
		UP	—
		DOWN	—

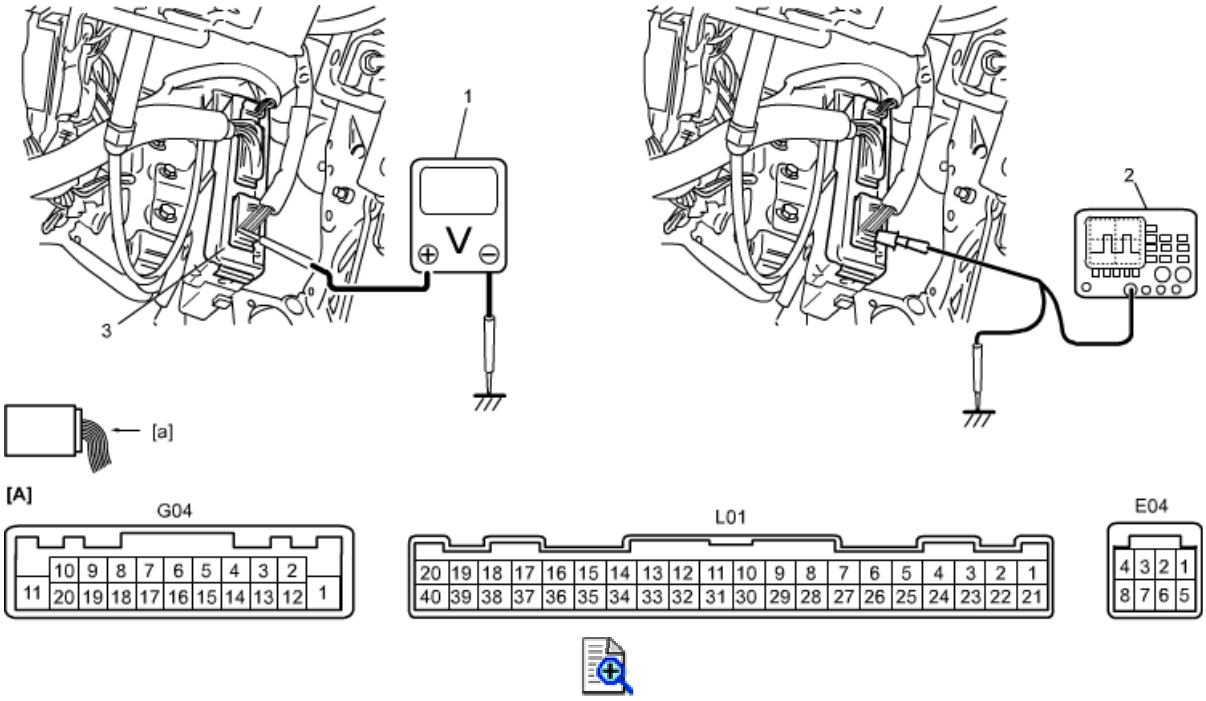
10E

Inspection of Keyless Start Control Module and Its Circuits

Voltage and Signal Check

Check voltage and/or pulse signal of keyless start control module (3) using voltmeter (1) and oscilloscope (2).

NOTE:
- **Check that battery voltage is 11 V or more.**
- **For "Ignition mode" described in the following table, it means power supply mode in keyless push start system.**
  For more details of ignition mode, refer to *Description of Keyless Engine Start Function*.
- **Voltage of terminal with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope if necessary.**



[A]: Keyless start control module connector (View: [a])

Terminal	Wire color	Circuit	Normal voltage	Condition
E04-1	WHT	Back-up power supply	10 – 14 V	—
E04-2	WHT/GRN	Hood switch signal	10 – 14 V	Hood: Close
			0 – 1 V	Hood: Open
E04-3	BLU/WHT	Horn relay	0 – 1 V	Horn: Sounds
			10 – 14 V	Other than above condition
E04-4	GRN	Transmission range sensor (CVT model)	0 – 1 V	Select lever: "P" or "N" range
			10 – 14 V	Other than above condition
		CPP switch (M/T model)	0 – 1 V	Clutch pedal: Depressed
			10 – 14 V	Other than above condition

E04-5	WHT/BLU	Outside warning buzzer	0 ⟷ 14 V	Outside warning buzzer: Sounds
E04-6	RED/BLU	Starting motor control relay signal	10 – 14 V	Engine: Cranking
			0 – 1 V	Other than above condition
E04-7	—	—	—	—
E04-8	PPL/WHT	Power supply for starting motor control relay	10 – 14 V	Engine: Cranking
			0 – 1 V	Other than above condition

Terminal	Wire color	Circuit	Normal voltage	Condition
G04-1	LT GRN/RED	Power supply for steering lock unit	10 – 14 V	—
G04-2	PPL	Steering lock unit	—	—
G04-3	—	—	—	—
G04-4	RED/YEL	Push switch 1 signal	0 – 1 V	Engine switch: Push
			4 – 6 V	Other than above condition
G04-5	BRN	Steering lock unit	—	—
G04-6	GRY/RED	Engine switch	—	—
G04-7	GRY/BLU	Engine switch	—	—
G04-8	—	—	—	—
G04-9*	RED	CAN communication line (high)	Refer to ***CAN communication signal***.	
G04-10	GRN	Steering lock unit	—	—
G04-11	BLU	Steering lock unit	—	—
G04-12	—	—	—	—
G04-13	BLU/YEL	Engine switch	—	—
G04-14	BLK	Ground for keyless start control module	0 – 1 V	—
G04-15	WHT/BLK	Push switch 2 signal	0 – 1 V	Engine switch: Push
			4 – 6 V	Other than above condition
G04-16	PNK/BLK	Theft deterrent light signal	0 ⟷ 14 V	Theft deterrent light: Blink
			10 – 14 V	Other than above condition
G04-17	PNK/BLU	Engine switch	—	—
G04-18	BLU/RED	Engine switch illumination signal	0 – 1 V	Engine switch illumination: Light up
			10 – 14 V	Engine switch illumination: Not light up
G04-19*	WHT	CAN communication line (low)	Refer to ***CAN communication signal***.	
G04-20	—	—	—	—

Terminal	Wire color	Circuit	Normal voltage	Condition
L01-1*	PPL	Mid inside antenna (+) signal	Refer to ***Mid inside antenna signal***.	
L01-2*	GRN/RED	Rear inside antenna (+) signal	Refer to ***Rear inside antenna signal***.	
L01-3*	GRY/BLK	Rear outside antenna (+) signal	Refer to ***Rear outside antenna signal***.	
L01-4*	BRN	Driver's side outside antenna (+) signal	Refer to ***Driver's side outside antenna signal and passenger's side outside antenna signal***.	

L01-5*	WHT/RED	Passenger's side outside antenna (+) signal	Refer to ***Driver's side outside antenna signal and passenger's side outside antenna signal***.	
L01-6	—	—	—	—
L01-7	BRN/BLK	Power supply for IG1 relay	10 – 14 V	Ignition mode: ON
			0 – 1 V	Other than above condition
L01-8	BRN/YEL	Power supply for IG2 relay	10 – 14 V	Ignition mode: ON
			0 – 1 V	Other than above condition
L01-9*	BLU/RED	Driver side door lock switch signal	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Driver side door lock switch: Unlock
L01-10	BLU	Passenger side door request switch signal	0 – 1 V	Passenger side door request switch: Push
			4 – 6 V	Other than above condition
L01-11	BLU/WHT	Driver side door request switch signal	0 – 1 V	Driver side door request switch: Push
			4 – 6 V	Other than above condition
L01-12*	RED/YEL	Keyless entry / TPMS receiver signal	Refer to ***Keyless entry / TPMS receiver signal***.	
L01-13*	GRY/BLU	Door key cylinder switch signal (Unlock)	Refer to ***Door key cylinder switch signal***.	
			0 – 1 V	Door key cylinder switch: Unlock
L01-14*	BLK/YEL	Trunk lid switch signal	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Trunk lid: Open
L01-15*	GRN/ORN	Rear door switch signal (R)	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Rear door (R): Open
L01-16*	BLK/ORN	Driver side door switch signal	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Driver side door: Open
L01-17	RED/BLK	Ground for keyless entry / TPMS receiver	0 – 1 V	—
L01-18*	LT GRN	Door key cylinder switch signal (Lock)	Refer to ***Door key cylinder switch signal***.	
			0 – 1 V	Door key cylinder switch: Lock
L01-19	WHT/BLK	ACC relay signal	10 – 14 V	Ignition mode: ACC or ON
			0 – 1 V	Other than above condition
L01-20	PNK/GRN	Back-up power supply	10 – 14 V	—
L01-21*	BLU/ORN	Mid inside antenna (–) signal	Refer to ***Mid inside antenna signal***.	
L01-22*	LT GRN/BLK	Rear inside antenna (–) signal	Refer to ***Rear inside antenna signal***.	
L01-23*	GRY/GRN	Rear outside antenna (–) signal	Refer to ***Rear outside antenna signal***.	
L01-24*	BRN/WHT	Driver's side outside antenna (–) signal	Refer to ***Driver's side outside antenna signal and passenger's side outside antenna signal***.	
L01-25*	BLK/RED	Passenger's side outside antenna (–) signal	Refer to ***Driver's side outside antenna signal and passenger's side outside antenna signal***.	
L01-26	—	—	—	—
L01-27	PNK/BLU	Power supply for ACC relay	10 – 14 V	Ignition mode: ACC or ON
			0 – 1 V	Other than above condition
L01-28	—	—	—	—

L01-29*	GRY	Passenger side door lock switch signal	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Passenger side door lock switch: Unlock
L01-30	YEL/RED	Trunk lid request switch signal	0 – 1 V	Trunk lid request switch: Push
			4 – 6 V	Other than above condition
L01-31*	RED/BLU	Power supply for keyless entry / TPMS receiver	Refer to ***Keyless entry / TPMS receiver signal***.	
L01-32*	PNK	LIN communication line	Refer to ***LIN communication signal***.	
L01-33	PNK/BLK	P position switch signal (CVT model)	0 – 1 V	Select lever: "P" range
			About 9 V	Other than above condition
		CPP switch (for cruise control) signal (M/T model)	0 – 1 V	Ignition mode: ON Clutch pedal: Depressed
			10 – 14 V	Ignition mode: ON Clutch pedal: Released
L01-34*	BLK/BLU	Rear door switch signal (L)	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Rear door (L): Open
L01-35*	GRN/YEL	Passenger side door switch signal	Refer to ***Door lock switch signal, trunk lid switch signal and door switch signal***.	
			0 – 1 V	Passenger side door: Open
L01-36	BLK	Ground for keyless start control module	0 – 1 V	—
L01-37	—	—	—	—
L01-38	GRN/WHT	Brake light switch signal	0 – 1 V	Brake pedal: Released
			10 – 14 V	Brake pedal: Depressed
L01-39	PPL/WHT	IG1 relay signal	10 – 14 V	Ignition mode: ON
			0 – 1 V	Other than above condition
L01-40	PPL/RED	IG2 relay signal	10 – 14 V	Ignition mode: ON
			0 – 1 V	Other than above condition

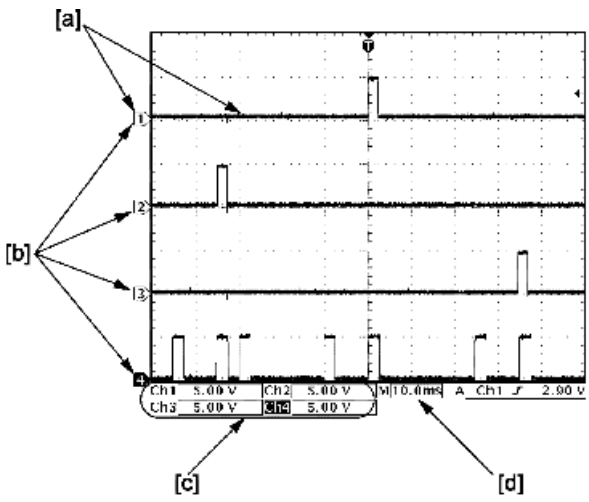
Reference Waveform

Oscilloscope display

Shown below is typical waveform display provided by oscilloscope.

NOTE:

- **Display includes the following types of data:**



[a]:	Waveform of channel 1	[c]:	VOLT/DIV of each channel
[b]:	Ground level of each channel	[d]:	TIME/DIV

- **Waveforms may vary with measurement conditions and vehicle specifications.**

CAN communication signal

CAN communication signal (high) (1):

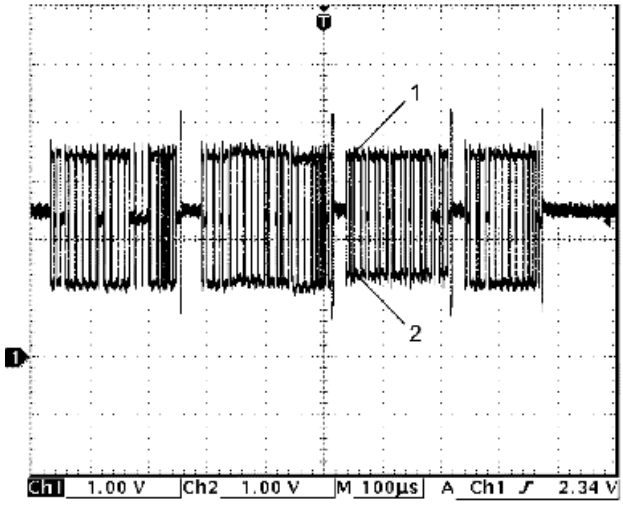
Channel	Probe	Terminal No.
1	+	G04-9
	–	G04-14

CAN communication signal (low) (2):

Channel	Probe	Terminal No.
2	+	G04-19
	–	G04-14

Measurement condition

- Ignition mode: ON



Mid inside antenna signal

Mid inside antenna (+) signal (1):

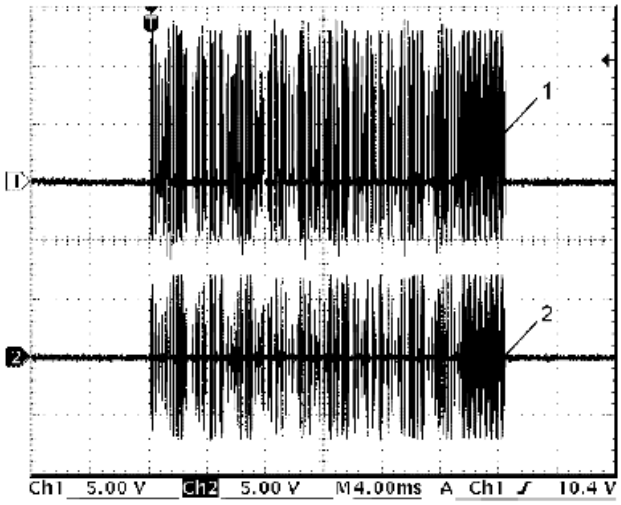
Channel	Probe	Terminal No.
1	+	L01-1
	–	G04-14

Mid inside antenna (–) signal (2):

Channel	Probe	Terminal No.
2	+	L01-21
	–	G04-14

Measurement condition

- Any one of doors: Open → Close



Rear inside antenna signal

Rear inside antenna (+) signal (1):

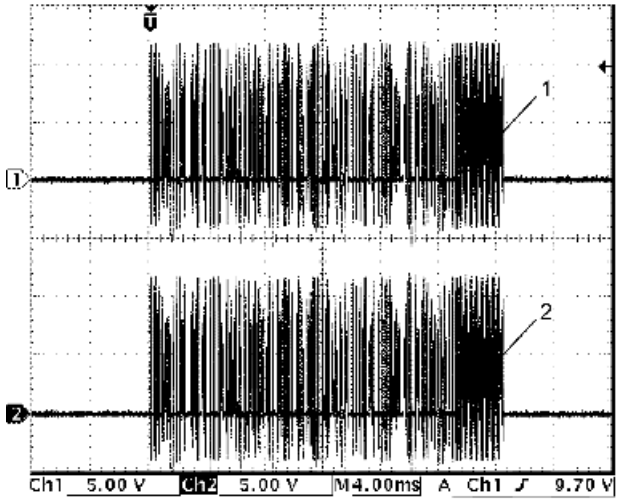
Channel	Probe	Terminal No.
1	+	L01-2
	–	G04-14

Rear inside antenna (–) signal (2):

Channel	Probe	Terminal No.
2	+	L01-22
	–	G04-14

Measurement condition

- Any one of doors: Open → Close



Rear outside antenna signal

Rear outside antenna (+) signal (1):

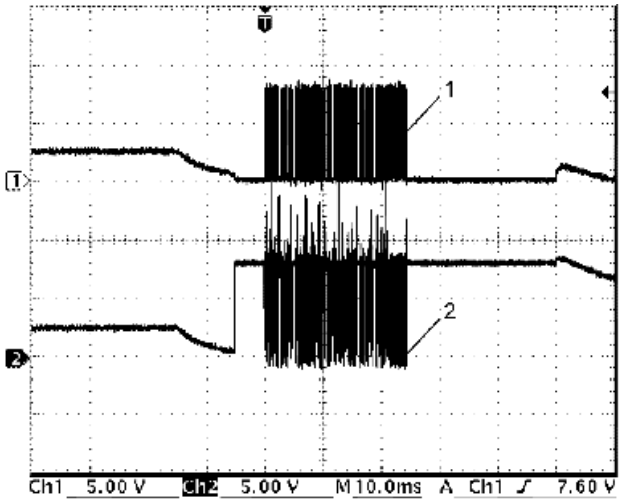
Channel	Probe	Terminal No.
1	+	L01-3
	–	G04-14

Rear outside antenna (–) signal (2):

Channel	Probe	Terminal No.
2	+	L01-23
	–	G04-14

Measurement condition

- Remote controller: Within rear outside antenna detection range
- Trunk lid request switch: ON



Driver's side outside antenna signal and passenger's side outside antenna signal

Driver's side outside antenna (+) signal (1):

Channel	Probe	Terminal No.
1	+	L01-4
	–	G04-14

Driver's side outside antenna (–) signal (2):

Channel	Probe	Terminal No.
2	+	L01-24
	–	G04-14

Measurement condition

- Remote controller: Within driver's side outside antenna detection range
- Driver side door request switch: ON

Passenger's side outside antenna (+) signal (1):

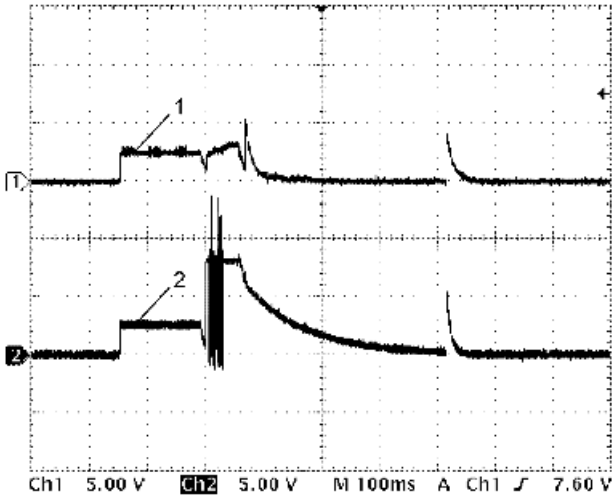
Channel	Probe	Terminal No.
1	+	L01-5
	–	G04-14

Passenger's side outside antenna (–) signal (2):

Channel	Probe	Terminal No.
2	+	L01-25
	–	G04-14

Measurement condition

- Remote controller: Within passenger's side outside antenna detection range
- Passenger side door request switch: ON



Door lock switch signal, trunk lid switch signal and door switch signal

Driver side door lock switch signal:

Channel	Probe	Terminal No.
1	+	L01-9
	–	G04-14

Measurement condition

- Driver side door lock switch: Lock

Trunk lid switch signal:

Channel	Probe	Terminal No.
1	+	L01-14
	–	G04-14

Measurement condition

- Trunk lid: Close

Rear door switch signal (R):

Channel	Probe	Terminal No.
1	+	L01-15
	–	G04-14

Measurement condition
- Rear door (R): Close

Driver side door switch signal:

Channel	Probe	Terminal No.
1	+	L01-16
	–	G04-14

Measurement condition
- Driver side door: Close

Passenger side door lock switch signal:

Channel	Probe	Terminal No.
1	+	L01-29
	–	G04-14

Measurement condition
- Passenger side door lock switch: Lock

Rear door switch signal (L):

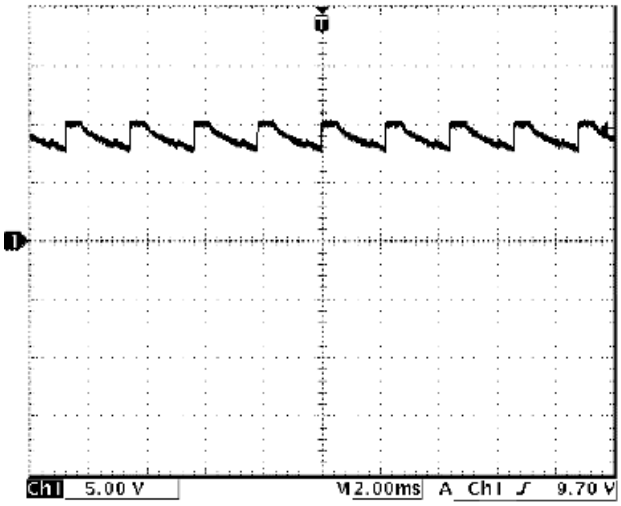
Channel	Probe	Terminal No.
1	+	L01-34
	–	G04-14

Measurement condition
- Rear door (L): Close

Passenger side door switch signal:

Channel	Probe	Terminal No.
1	+	L01-35
	–	G04-14

Measurement condition
- Passenger side door: Close



Keyless entry / TPMS receiver signal

Power supply for keyless entry / TPMS receiver (1):

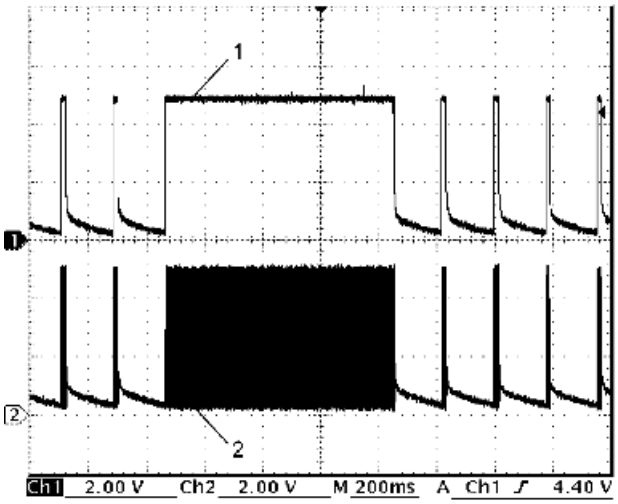
Channel	Probe	Terminal No.
1	+	L01-31
	–	G04-14

Keyless entry / TPMS receiver signal (2):

Channel	Probe	Terminal No.
2	+	L01-12
	–	G04-14

Measurement condition

- Remote controller: Any one of the buttons is pushed



Door key cylinder switch signal

Door key cylinder switch (Unlock) signal:

Channel	Probe	Terminal No.
1	+	L01-13
	–	G04-14

Measurement condition

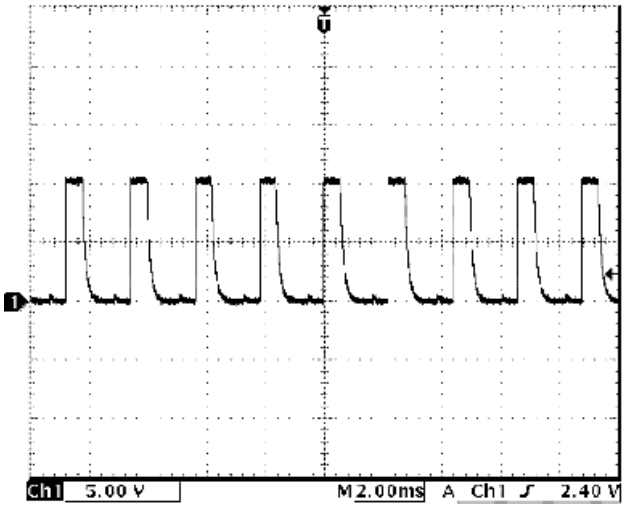
- Door key cylinder switch (Unlock): OFF

Door key cylinder switch (Lock) signal:

Channel	Probe	Terminal No.
1	+	L01-18
	–	G04-14

Measurement condition

- Door key cylinder switch (Lock): OFF

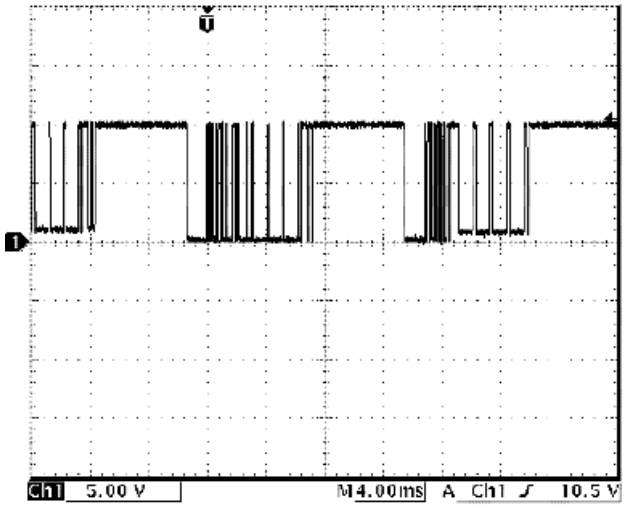


LIN communication signal

Channel	Probe	Terminal No.
1	+	L01-32
	–	G04-14

Measurement condition

- Ignition mode: ON



9E

Rear Defogger Inspection

NOTE:
Wind aluminum foil around tester probes when checking continuity and voltage of rear defogger lines.

1) Start engine, turn on rear defogger (and mirror heater) switch and measure voltage between center of each wire and ground.

Rear defogger voltage at center of each wire

4 – 6 V

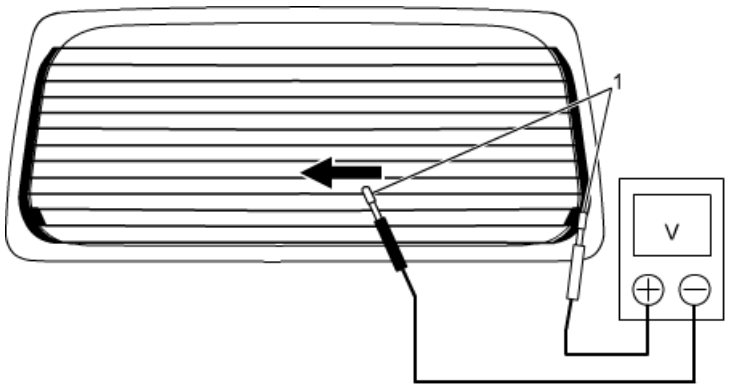
2) Check wires whose measurement is out of standard.

a) Apply both positive and negative probes of tester to positive side of rear defogger line.

b) Move negative probe toward negative side of rear defogger line slowly.

c) Check voltage change while sliding negative probe. If voltage remains 0 V halfway and then rises to battery voltage suddenly, the line is open just before there.

d) If defective is found, replace window or repair defogger harness or replace back if necessary.



1. Aluminum foil

9E

Rear View Mirror Removal and Installation

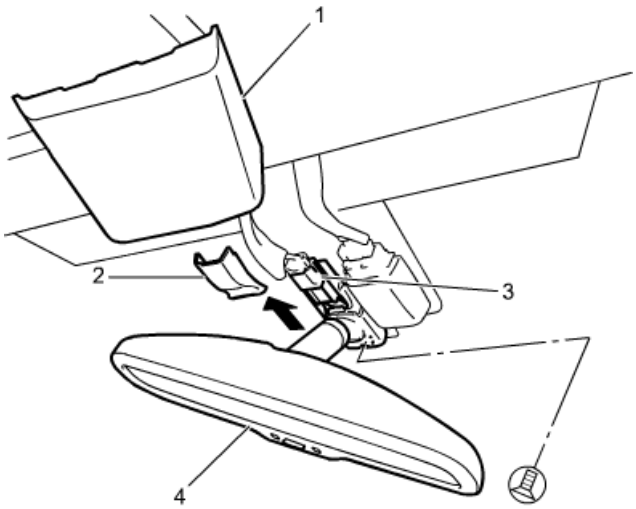
Reference: Rear View Mirror (with Auto Dimming) On-Vehicle Inspection

Removal

Equipped with auto dimming

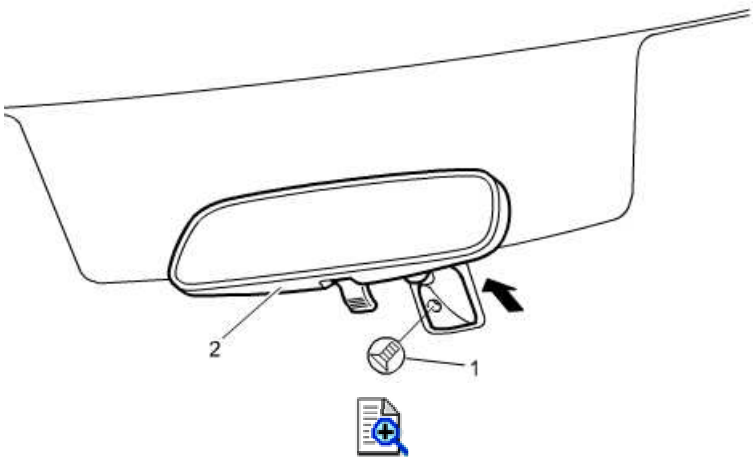
CAUTION:
- **If strong impact was applied by dropping mirror, replace it with new one.**
- **Make sure not to disassemble auto dimming rear view mirror.**
- **Replace mirror part with new one if it is broken.**
- **Mirror itself or windshield may be damaged if strong force is applied by hanging heavy load as mirror stay has no falling mechanism.**
- **Do not attach shielding material (sticker, etc.) on sensor.**
- **Do not spray glass cleaner directly on the mirror. Use a soft towel dampened with water.**

1) Remove harness cover (1) and mirror stay cover (2).
2) Disconnect mirror connector (3).
3) Remove screw and slide mirror (4) in arrow direction to remove it.



Not Equipped with auto dimming

1) Removal screw (1) and slide mirror (2) in arrow direction.



Installation

Reverse removal procedure.

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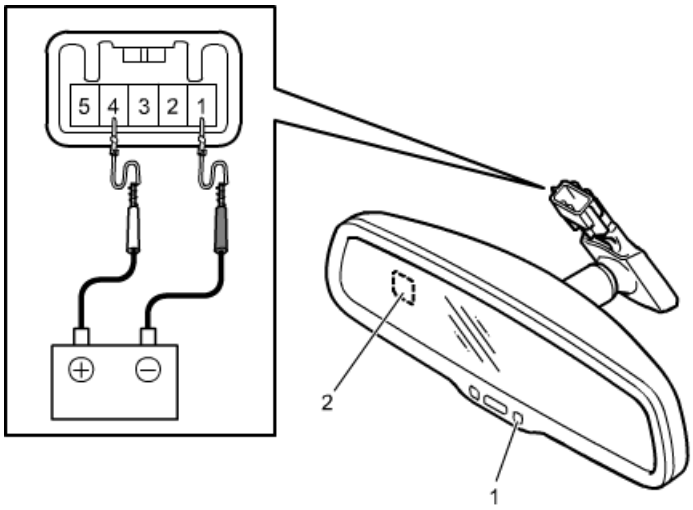
Rear View Mirror (with Auto Dimming) Inspection

Reference: Rear View Mirror Removal and Installation

1) Connect positive and negative battery terminals to terminals "4" and "1" of rear view mirror connector respectively.

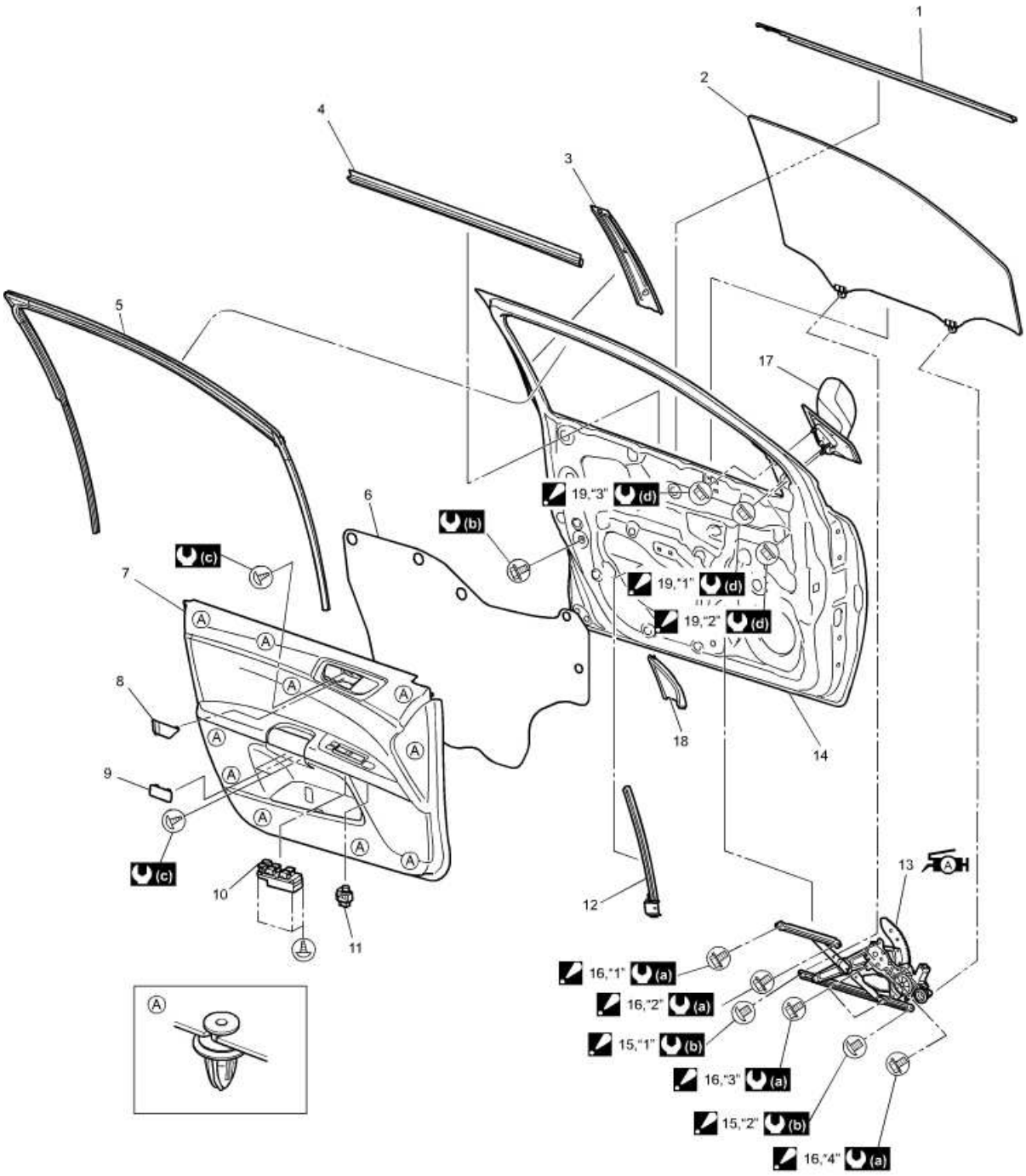
2) Cover the front light sensor (2) and apply light to the rear light sensor (1) to check if color of rear view mirror changes.



3) Under the same condition as Step 2), connect positive terminal of battery to terminal "5" and confirm if color of rear view mirror returns to the initial color.

9E

Front Door Components



1. Front outer weather-strip	9. Trim cap	17. Door mirror
2. Front door glass	10. Power window master switch	18. Sash bracket inner garnish

3. Front door center pillar garnish	11. Power door mirror switch	19. Door mirror nut Tighten door mirror nuts in order of "1" to "3".
4. Front door inner weather-strip	12. Front door rear sash	(a): 8.4 N·m (0.86 kgf-m, 6.5 lbf-ft)
5. Glass run	13. Front window regulator assembly Apply grease 99000-25011 to sliding parts. Tighten front window regulator bolts in order of "1" to "4".	(b): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
6. Door sealing cover	14. Door panel	(c): 3.0 N·m (0.31 kgf-m, 2.5 lbf-ft)
7. Door trim	15. Front door glass screw Tighten front door glass screws in order of "1" to "2".	(d): 11 N·m (1.2 kgf-m, 8.5 lbf-ft)
8. Inside handle cap	16. Front window regulator bolt Tighten front window regulator bolts in order of "1" to "4".	

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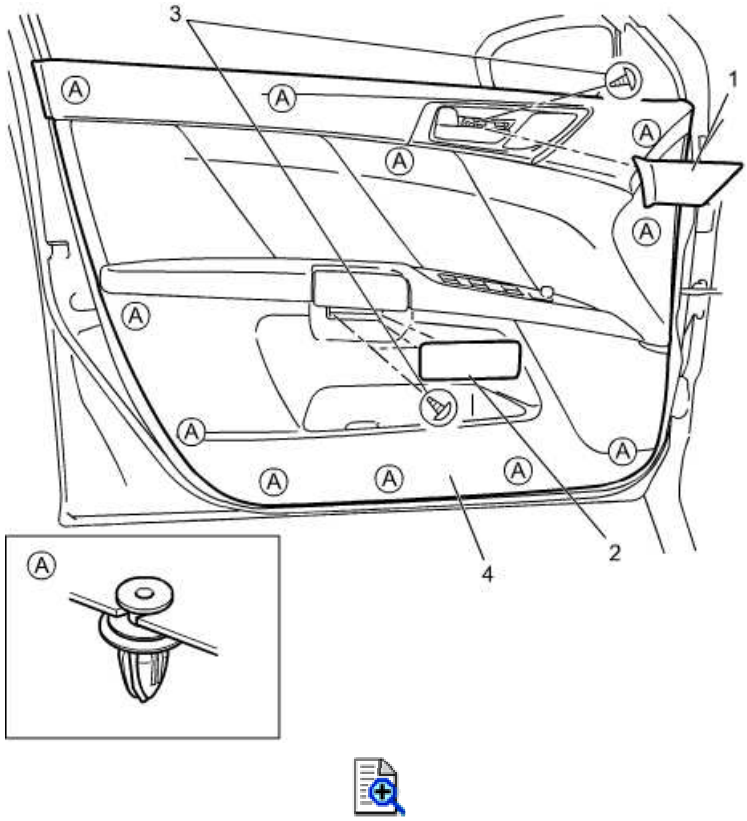
Front Door Glass Removal and Installation

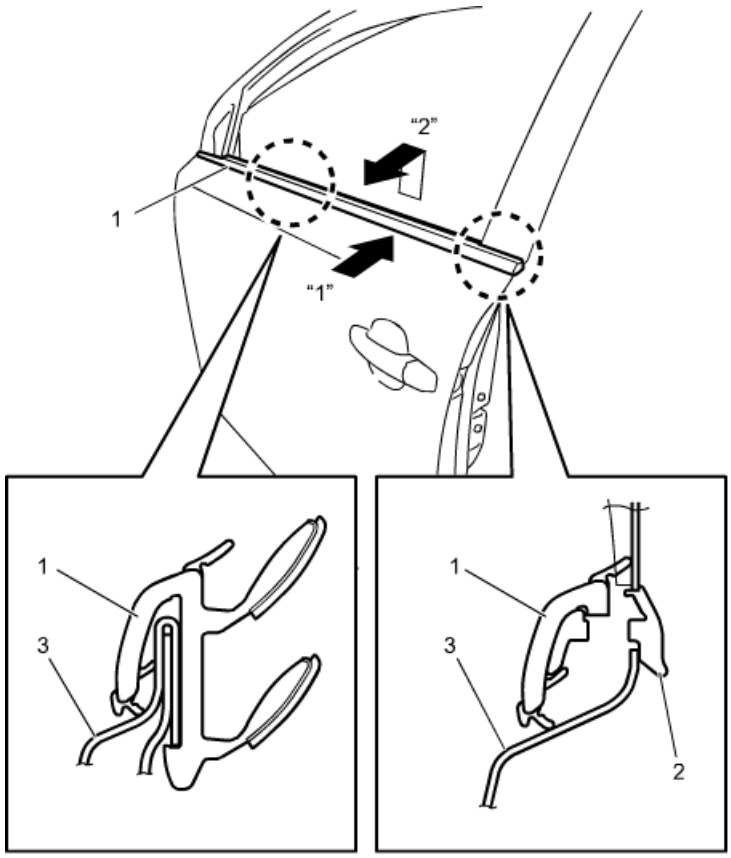
Reference: Front Door Components

Removal

1) Lower front door glass to about 30 mm (1.18 in) from the lower edge of window.
2) Disconnect negative (–) cable at battery.
3) Remove inside handle cap (1) and trim cap (2).
4) Remove screws (3), clips, and remove door trim (4) by pulling it toward you.
5) Disconnect connectors of door harness.

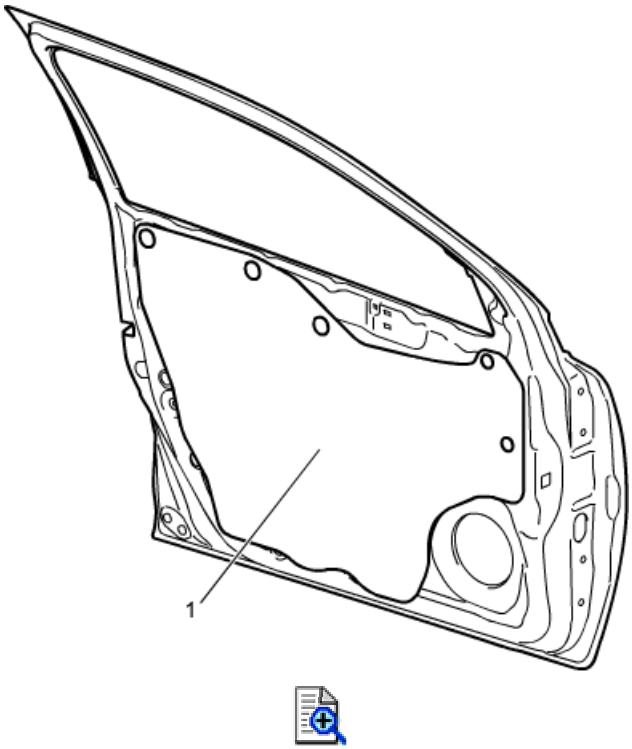


6) Remove front outer weather-strip (1) by moving it in arrow directions in order (“1” to “2”) as shown in figure.

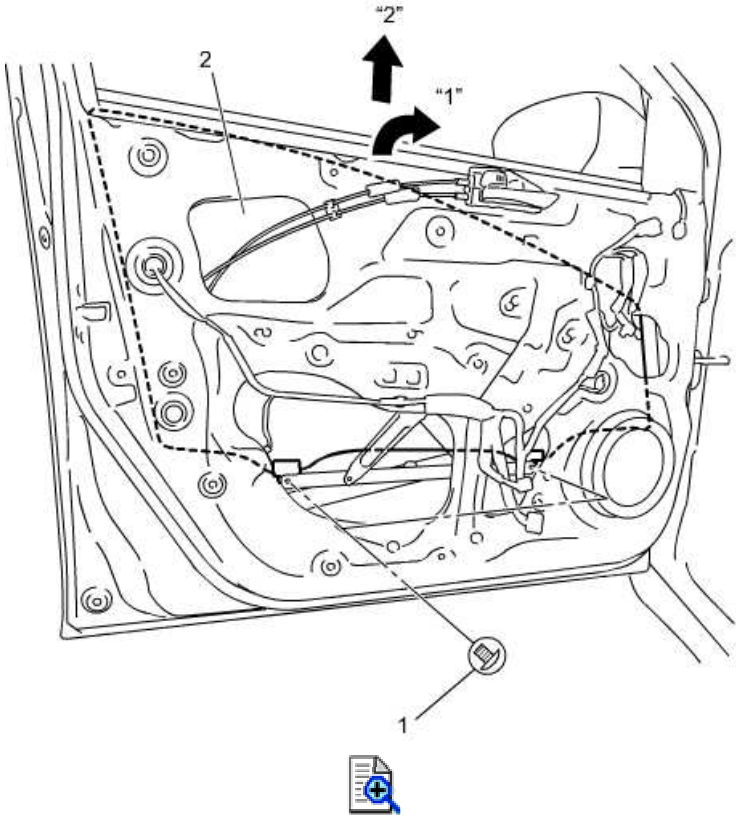


2. Claw	3. Front door outer panel

7) Remove door sealing cover (1).



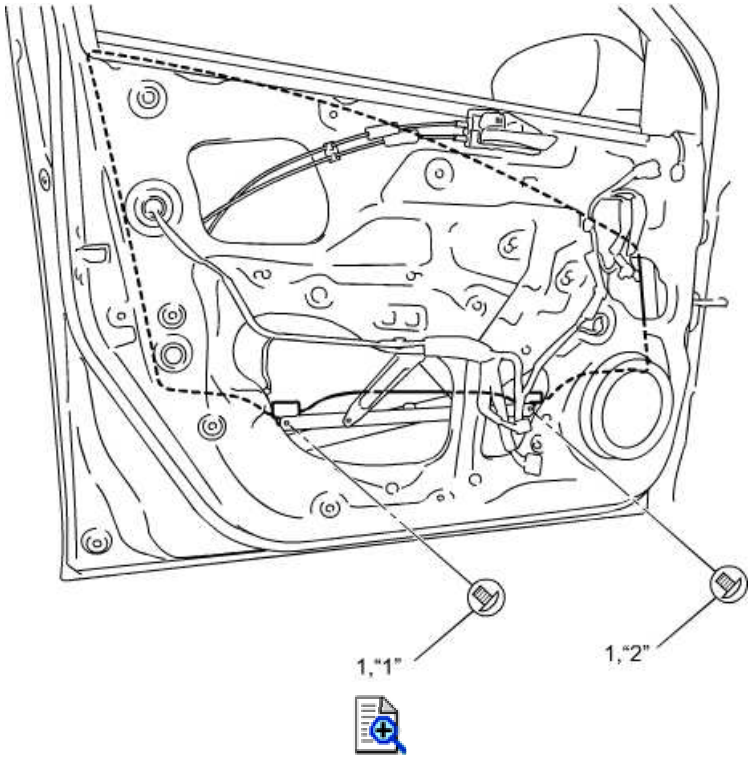
8) Remove screws (1) and remove front door glass (2) by moving it in arrow directions in order ("1" to "2") as shown in figure.



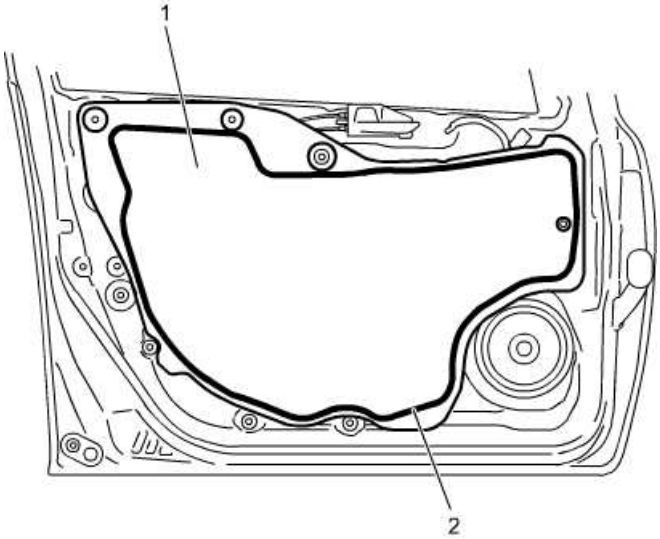
Installation

Reverse removal procedure noting the following points.

- Tighten each part to specified torque referring to ***Front Door Components***.
- Tighten front door glass screws (1) in order ("1" to "2") as shown in figure.



- If glass run is deformed, replace it with new one.
- Fix door sealing cover (1) with butyl tape (2).



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Front Window Regulator Assembly Removal and Installation

Reference: Front Door Components

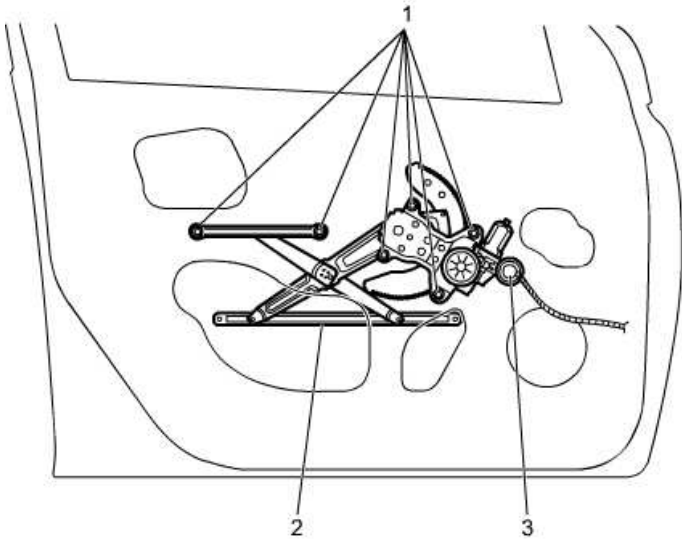
Removal

1) Remove front door glass. ☞

2) Disconnect negative (–) cable at battery.

3) Disconnect power window motor connector (3).

4) Remove front window regulator bolts (1) and remove front window regulator assembly (2).



Installation

Reference: Front Window Regulator Assembly Inspection

Reverse removal procedure noting the following points.

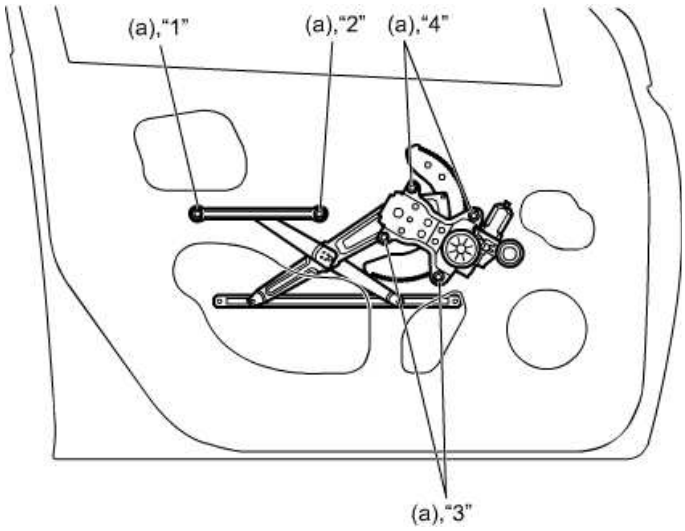
- Apply grease to sliding parts of front window regulator assembly.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Tighten each part to specified torque referring to ***Front Door Components***.
- Tighten front window regulator bolts in order (“1” to “4”) to specified torque.

Tightening torque

Front window regulator bolt (a): 8.4 N·m (0.86 kg-m, 6.5 lbf-ft)



- Initialize power window setup if front window regulator assembly is replaced. ☞

9E

Front Window Regulator Assembly Inspection

Reference: Front Window Regulator Assembly Removal and Installation

CAUTION:
- **Conduct initialization/reset of power window if window regulator assembly or power window motor is replaced.** ☞
- **Check front window regulator assembly with connectors disconnected from power window motor.**
- **Do not connect battery positive terminal "2" as doing so will break pulse sensor in a motor.**

Check motor movement as follows.

1) Connect battery positive terminal "2" and connect battery negative terminal "1" for 3 seconds.
Do not apply reversed polarity to terminal "1" and terminal "2" as doing so causes motor burnout.

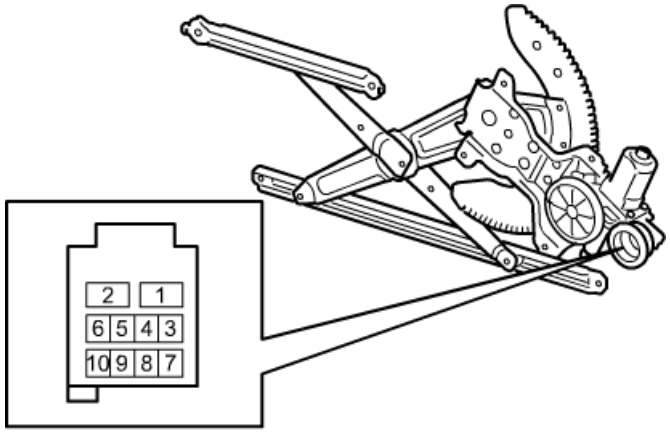
2) Connect terminal "7" (DOWN) or terminal "10" (UP) to battery negative terminal and disconnect it immediately.

3) Power window motor will operate if terminal "7" (DOWN) or terminal "10" (UP) is connected to battery negative terminal again within 2.5 seconds from above procedure.

If operation is not smooth, check glass run, door outer weather-strip, door inner weather-strip and grease in link. If those parts are in good condition, replace window regulator assembly.

Power window motor operation

Terminal number / Operation direction	1	2	7	10
UP	⊖	⊕		⊖
DOWN	⊖	⊕	⊖	



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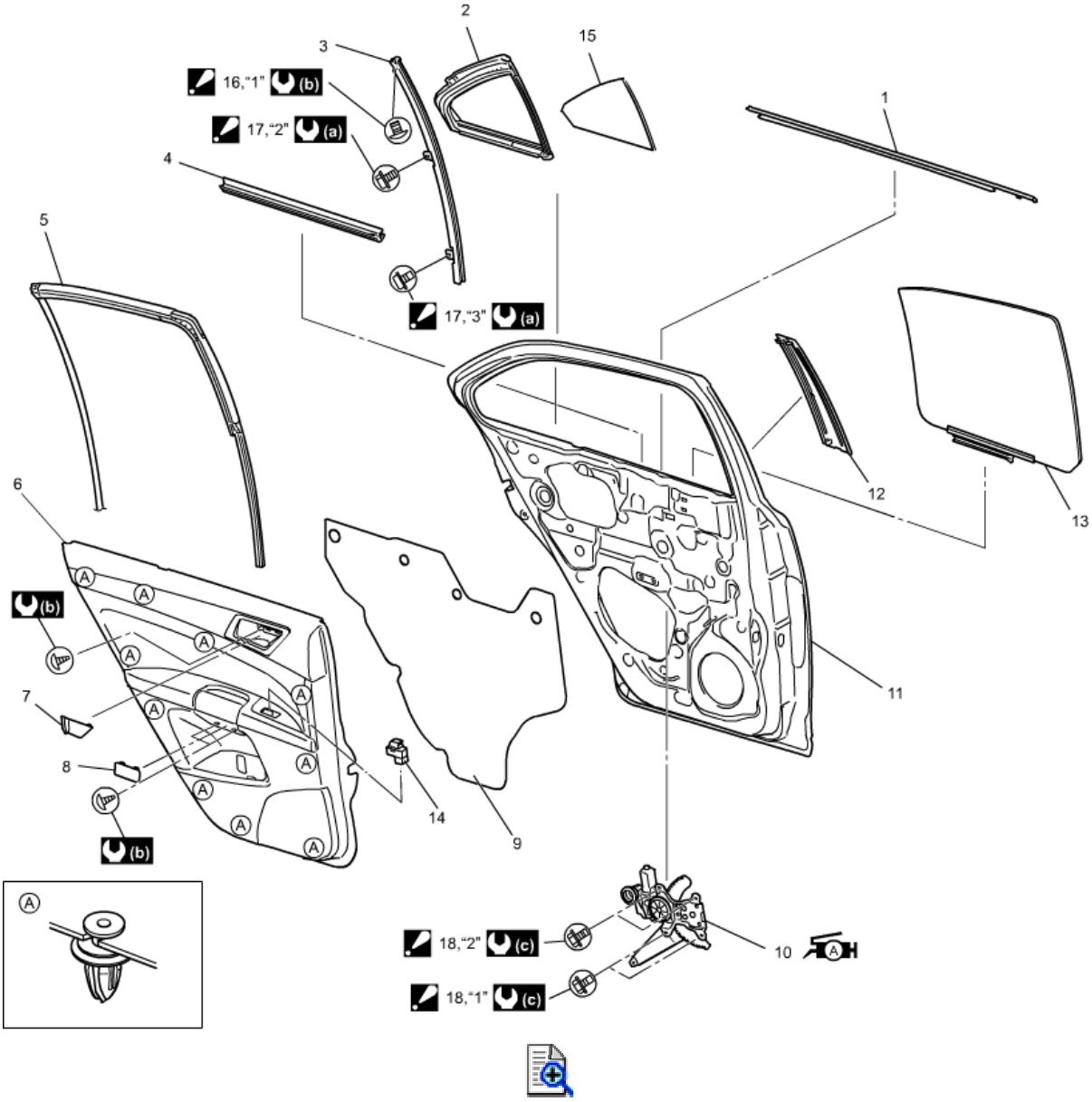
Rear Door Components



1. Rear outer weather-strip	8. Trim cap	15. Rear door quarter glass
2. Rear door quarter glass weather-strip	9. Door sealing cover	16. Rear door sash screw Tighten bolts and screw in order of "1" to "3".
3. Rear door sash	10. Rear window regulator assembly	17. Rear door sash bolt Tighten bolts and screw in order of "1" to "3".
4. Rear inner weather-strip	11. Door panel	18. Rear window regulator bolt Tighten bolts in order of "1" to "2".
5. Glass run	12. Rear door center pillar garnish	(a): 5.5 N·m (0.56 kgf-m, 4.0 lbf -ft)

6. Door trim	13. Rear door glass	(b) :	3.0 N·m (0.31 kgf-m, 2.5 lbf -ft)
7. Inside handle cap	14. Power window sub switch	(c) :	6.0 N·m (0.61 kgf-m, 4.5 lbf -ft)

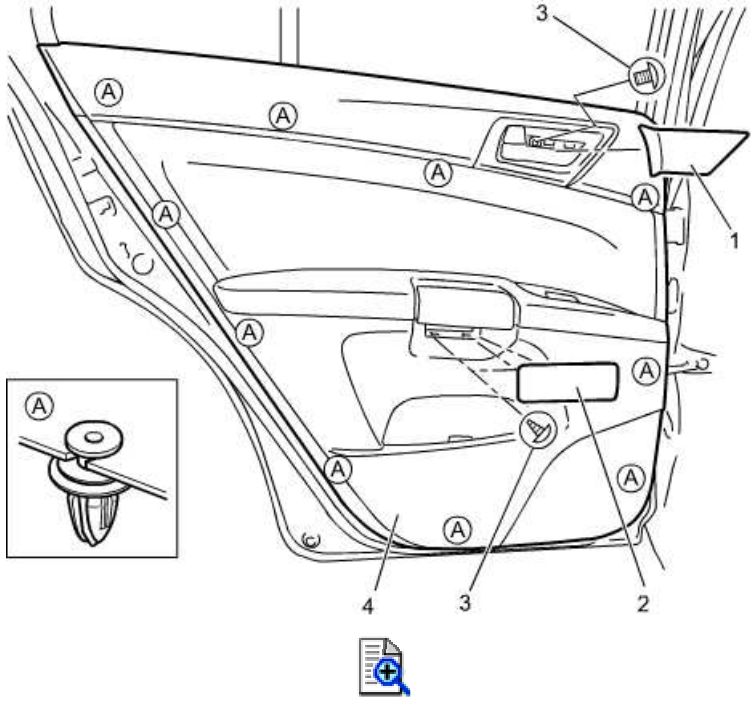
9E

Rear Door Glass Removal and Installation

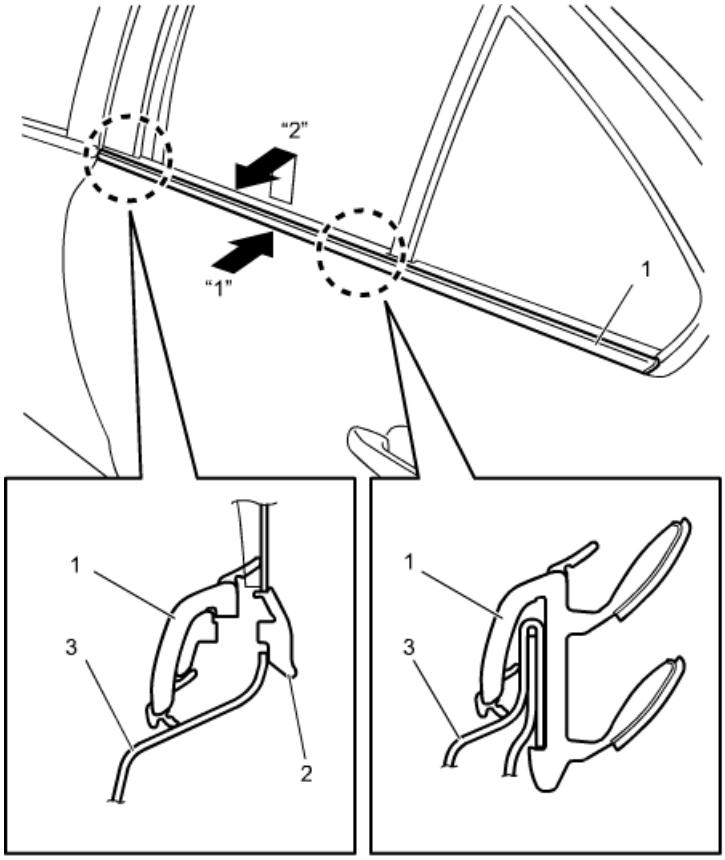
Reference: Rear Door Components

Removal

1) Lower rear door glass fully.
2) Disconnect negative (–) cable at battery.
3) Remove inside handle cap (1) and trim cap (2).
4) Remove screws (3), clips, and then remove door trim (4) by pulling it, and then disconnect connectors of door harness.

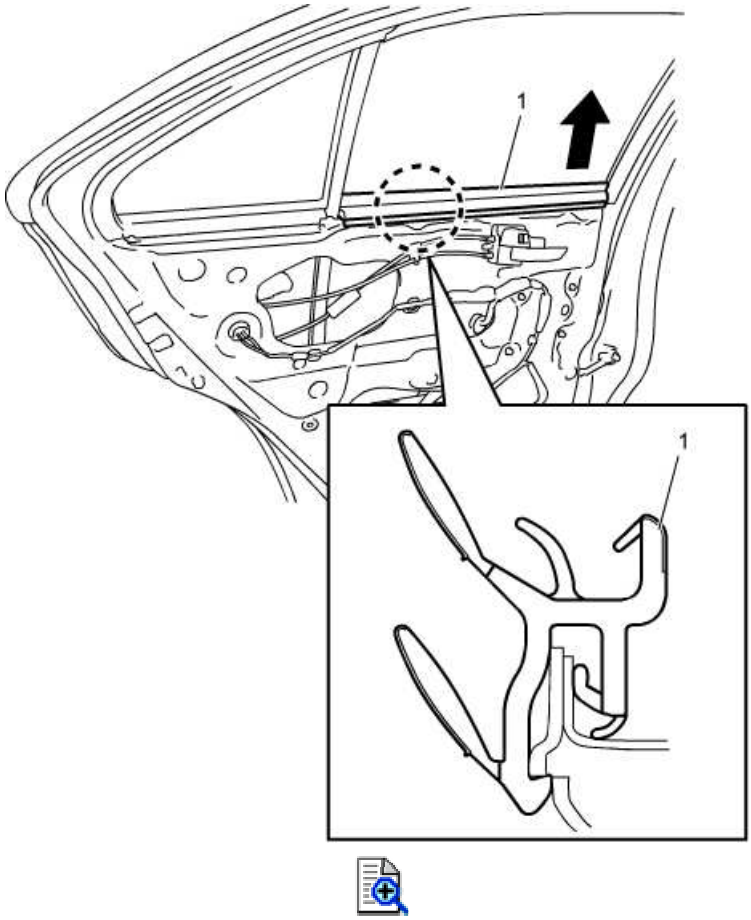


5) Remove rear outer weather-strip (1) by moving it in arrow directions in order (“1” to “2”) as shown in figure.

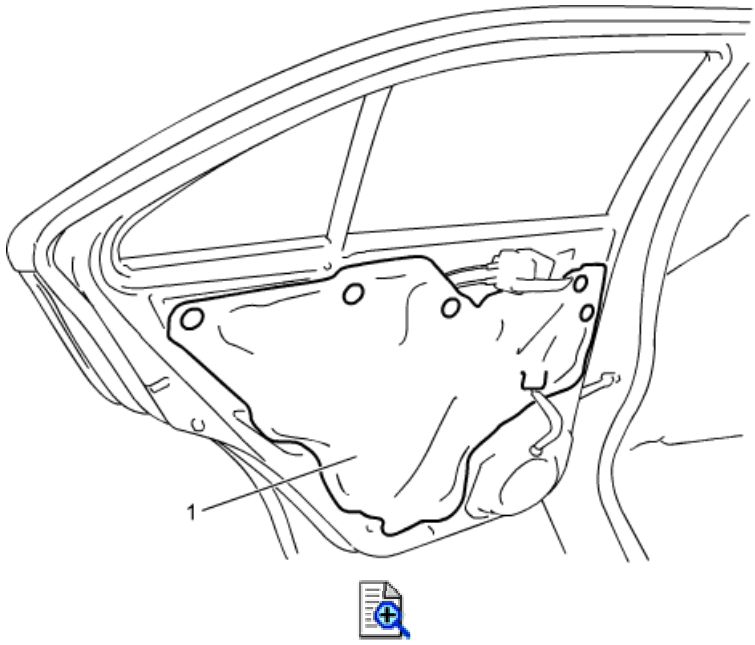


2. Claw	3. Rear door outer panel

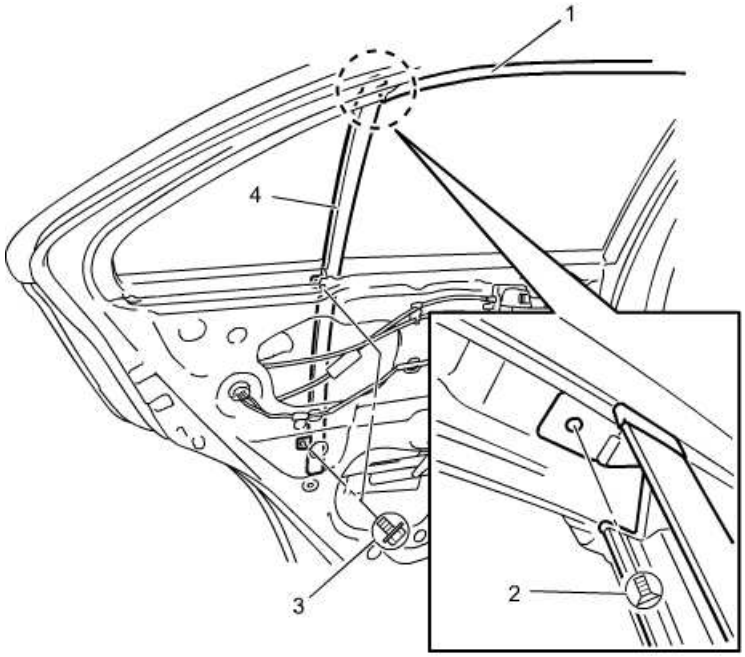
6) Remove rear inner weather-strip (1) by pulling it in arrow direction.



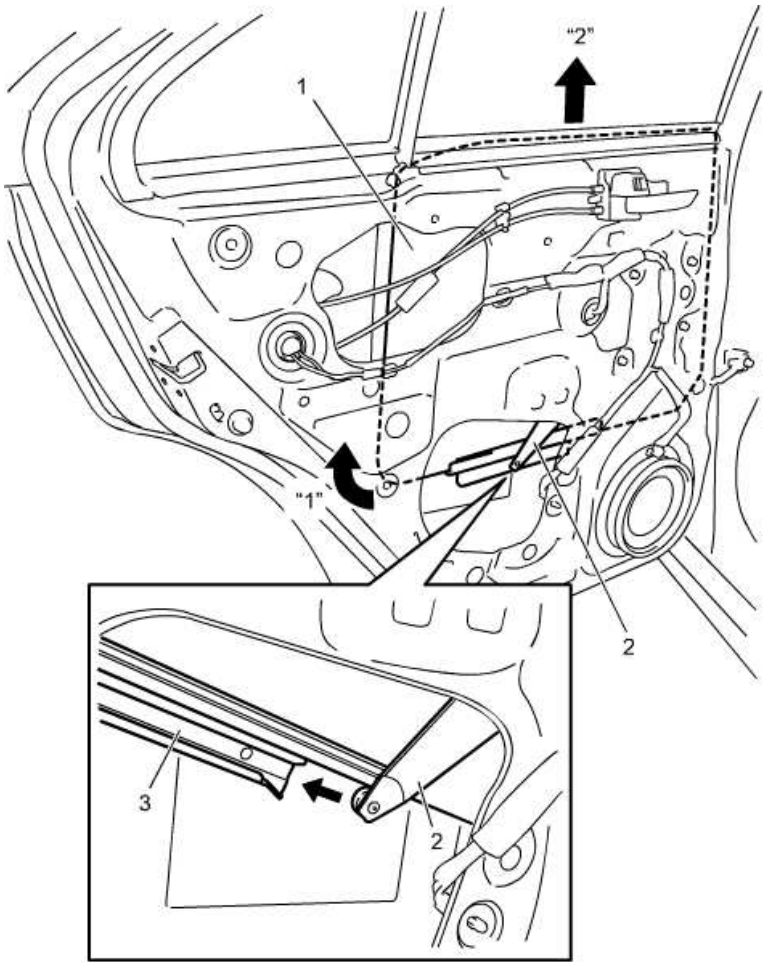
7) Remove door sealing cover (1).



8) Turn over glass run (1) and remove rear door sash screw (2).
9) Remove rear door sash bolt (3) and remove rear door sash (4).



10) Turn rear door glass (1) in direction of arrow "1" to remove glass bottom channel (3) from rear window regulator assembly (2) and then remove rear door glass (1) in direction of arrow "2".



11) Remove glass bottom channel from rear door glass if necessary.

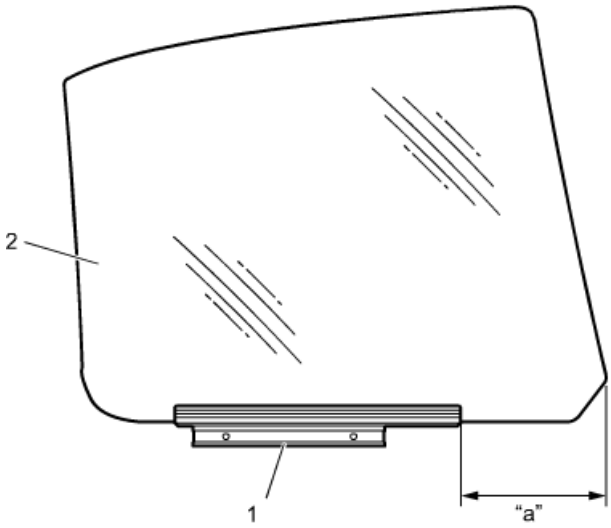
Installation

Reverse removal procedure noting the following points.

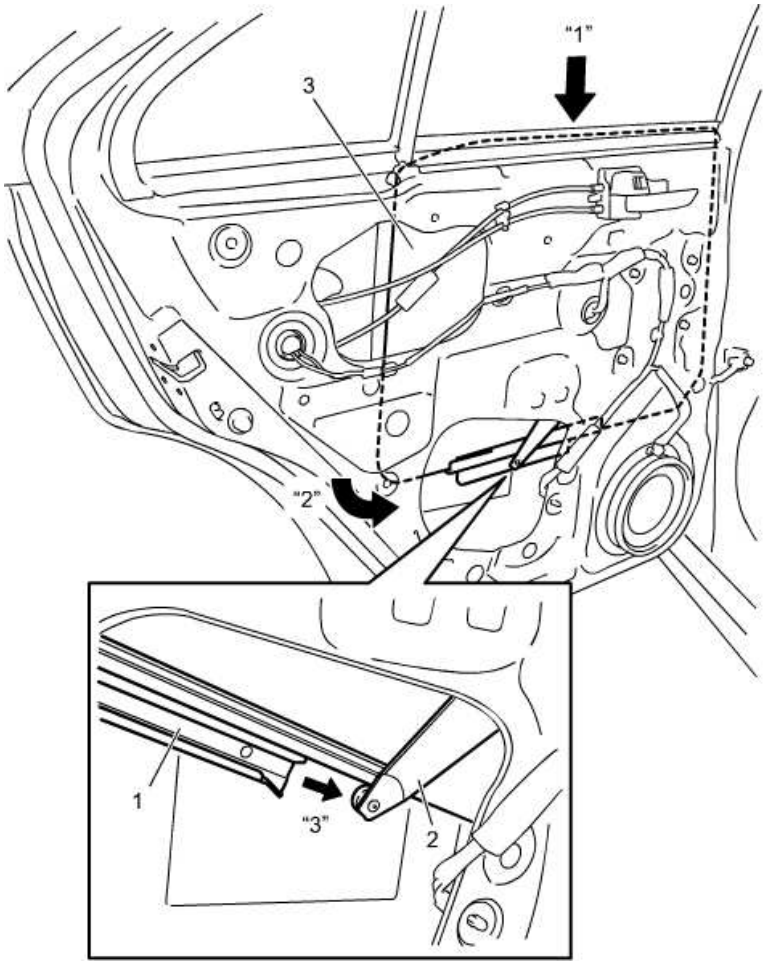
- Install glass bottom channel (1) to specified position of rear door glass (2) if it is removed from rear door glass.

Rear door glass installation position

"a": 148.5 ± 1.5 mm (5.8 ± 0.06 in.)



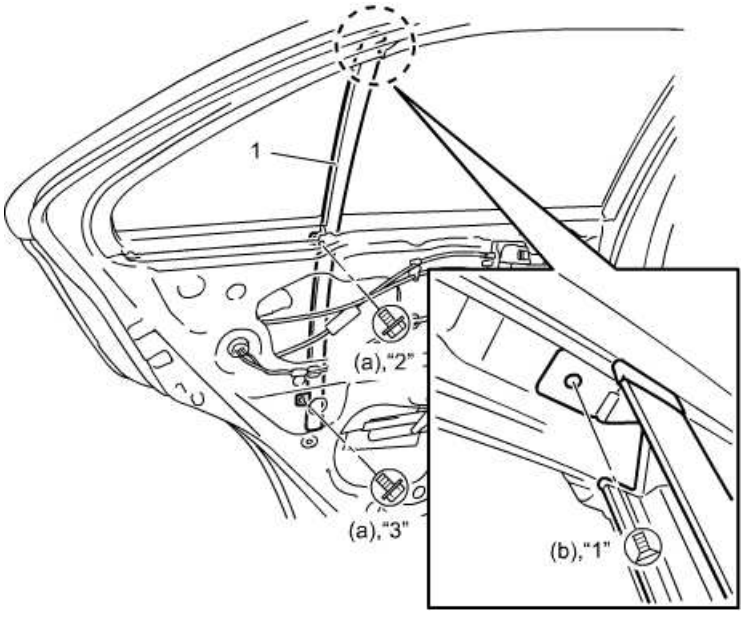
- Tighten each part to specified torque referring to ***Rear Door Components***.
- Insert rear door glass (3) in direction of arrow "1" and turn in direction of arrow "2" to move glass bottom channel (1) in direction of arrow "3" and fit to rear window regulator assembly (2).



- Tighten rear door sash screw and rear door sash bolts in order of "1" to "3" to specified torques.

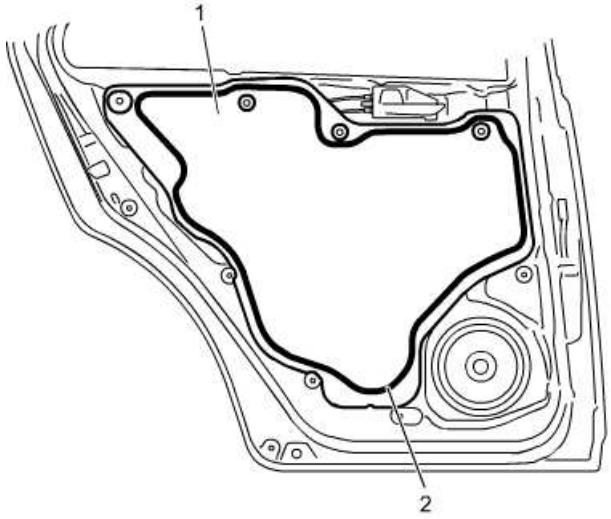
Tightening torque

Rear door sash bolt (a): 5.5 N·m (0.56 kg-m, 4.0 lbf-ft)
Rear door sash screw (b): 3.0 N·m (0.31 kg-m, 2.5 lbf-ft)



1. Rear door sash

- If glass run is deformed, replace it with new one.
- Fix door sealing cover (1) with butyl tape (2).



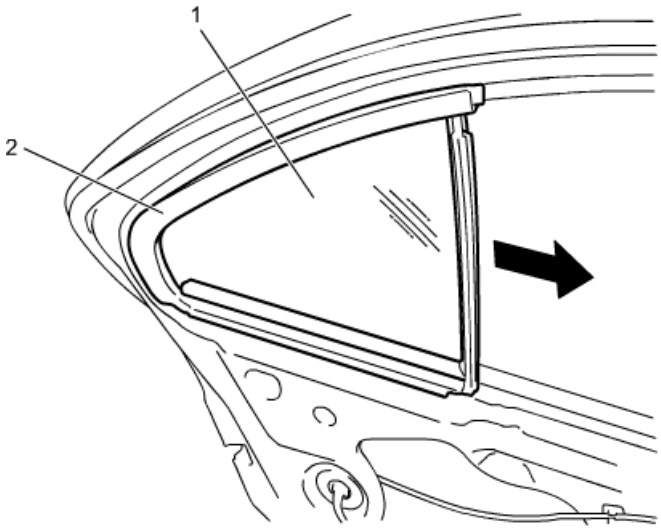
9E

Rear Door Quarter Glass Removal and Installation

Removal

1) Remove rear door sash referring to ***Rear Door Glass Removal and Installation***.

2) Pull to remove rear door quarter glass (1) and rear door quarter glass weather-strip (2) in arrow direction.



Installation

Reverse removal procedure.

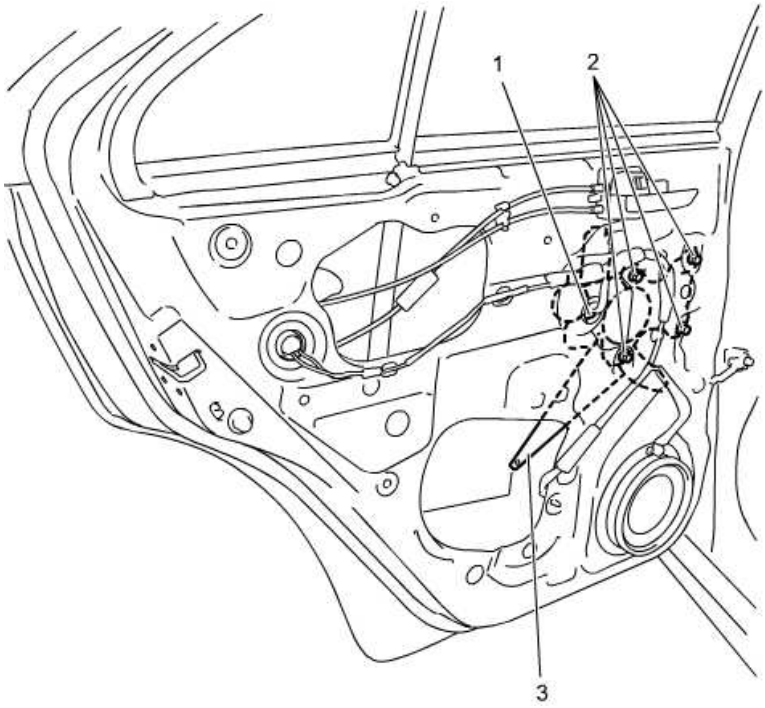
9E

Rear Window Regulator Assembly Removal and Installation

Reference: Rear Door Components

Removal

1) Disconnect negative (–) cable at battery.
2) Remove rear door glass. ☞
3) Disconnect power window motor connector (1).
4) Remove window regulator bolts (2) and remove rear window regulator assembly (3).



Installation

Reference: Rear Window Regulator Assembly Inspection

Reverse removal procedure noting the following points.

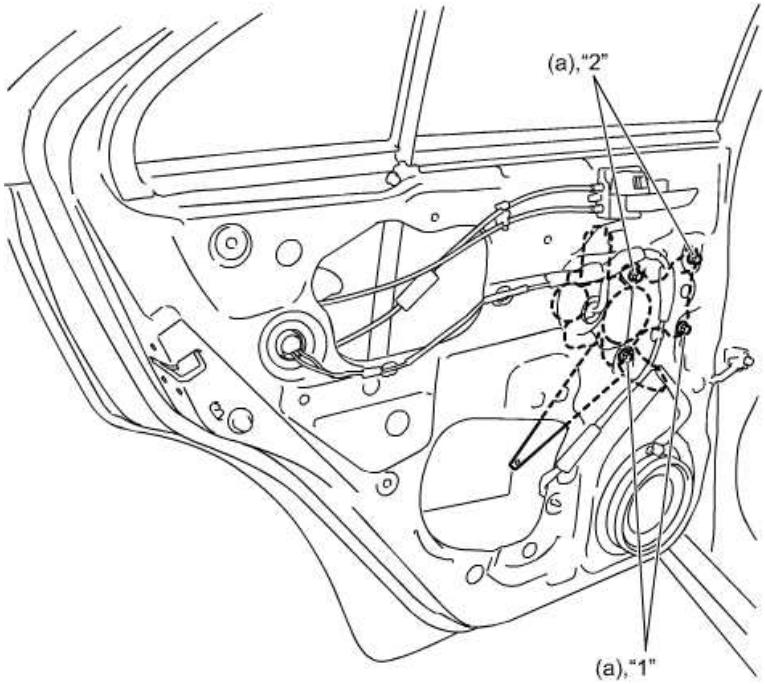
- Apply grease to sliding parts of rear window regulator assembly.

  : Grease 99000–25011 (SUZUKI Super Grease A)

- Tighten rear window regulator bolts in order (“1” to “2”) to specified torque.

Tightening torque

Rear window regulator bolt (a): 8.4 N·m (0.86 kg-m, 6.5 lbf-ft)



- Tighten each part to specified torque referring to ***Rear Door Components***.

9E

Rear Window Regulator Assembly Inspection

Reference: Rear Window Regulator Assembly Removal and Installation

CAUTION:
Check with connectors disconnected from power window motor.

Check motor movement as follows.

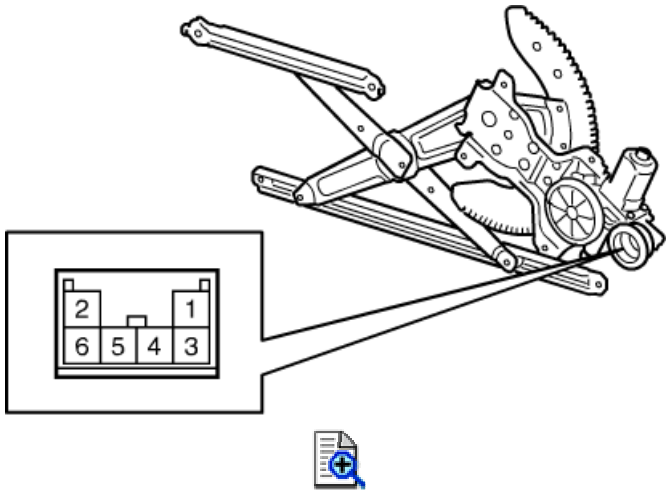
1) Connect battery positive terminal "1" (UP) and connect battery negative terminal "2".

2) Connect battery positive terminal "2" (DOWN) and connect battery negative terminal "1".

If operation is not smooth, check glass run, door outer weather-strip, door inner weather-strip and grease in link. If those parts are in good condition, replace window regulator assembly.

Power window motor operation

Terminal number / Operation direction	1	2
UP	⊕	⊖
DOWN	⊖	⊕



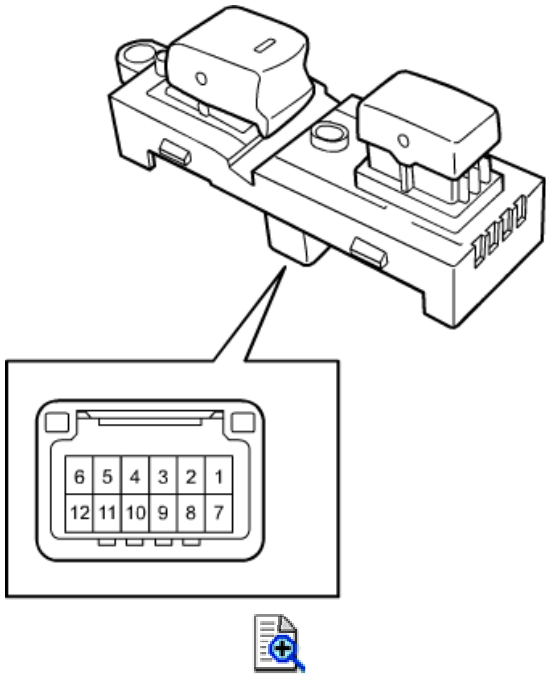
9E

Power Window Sub Switch Inspection

Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

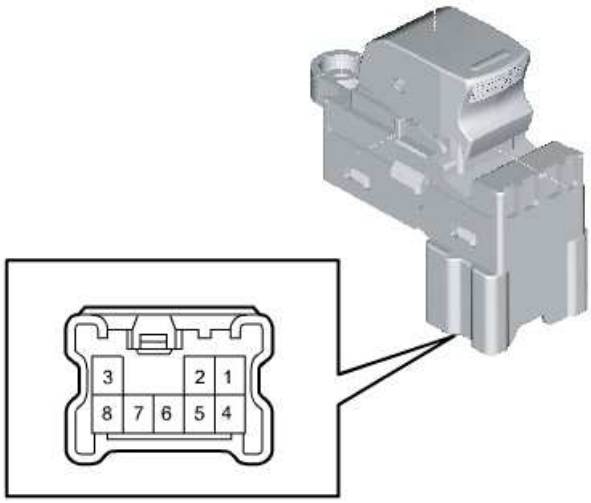
Front power window sub switch (passenger) continuity

Operation \ Terminal	1	2	3	4	5	6	7	8	9	10	11	12
UP	○					○						
OFF												
DOWN	○									○		
AUTO UP	○					○						○
AUTO DOWN	○									○		○
Illumination ON				○			○					



Rear power window sub switch continuity

Operation \ Terminal	1	2	3	4	5	6	7	8
UP					○			○
						○	○	
OFF				○	○	○	○	
DOWN							○	○
				○	○			
Illumination ON	○	○						


3
2
1
8
7
6
5
4

9E

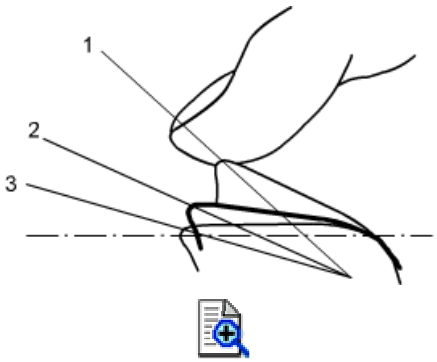
Power Window System Initialization/Reset (Front Windows Only)

NOTE:
Do not pinch any object during initialization/reset operation.

Make sure to conduct initialization/reset of power window when its part is replaced. Auto operation including anti-pinching function will be disabled if initialization/reset of power window is not conducted.

Initialization

1) Push engine switch to change ignition mode of keyless start system to "ON" (with vehicle stopped).
2) Press down and hold power window switch until window glass reaches its fully open position and continue holding it down for additional 2 or more seconds.
3) Pull up and hold power window switch in AUTO position until window glass reaches its fully closed position and continue holding it up for additional 2 or more seconds.



1. Auto UP	2. Manual UP	3. OFF

4) Perform Auto DOWN and Auto UP operations to check that door glass can be opened and closed fully. Repeat procedure from Step 1) if Auto DOWN or Auto UP function does not work.
5) Check anti-pinching function. ☞

Resetting after Replacing Front Window Regulator Assembly

1) Push engine switch to change ignition mode of keyless start system to "ON" (with vehicle stopped).
2) Pull up and hold power window switch in AUTO position until window glass reaches its fully closed position and continue holding it up for about 7 seconds.
3) Push down and hold power window switch until window glass reaches its fully open position (lowest position) and continue holding it down for about 2 seconds.
4) Release power window switch temporarily and then press down and hold the power window switch again for approximately 5 seconds at Auto DOWN position.
5) Pull up and hold power window switch in AUTO position until window glass reaches its fully closed position and continue holding it up for about 2 seconds.
6) Perform Auto DOWN and Auto UP operations to check that door glass can be opened and closed fully. Repeat procedure from Step 1) if Auto DOWN or Auto UP function does not work.
7) Check anti-pinching function. ☞

9E

Power Door Mirror On-Vehicle Inspection

Power Door Mirror Motor

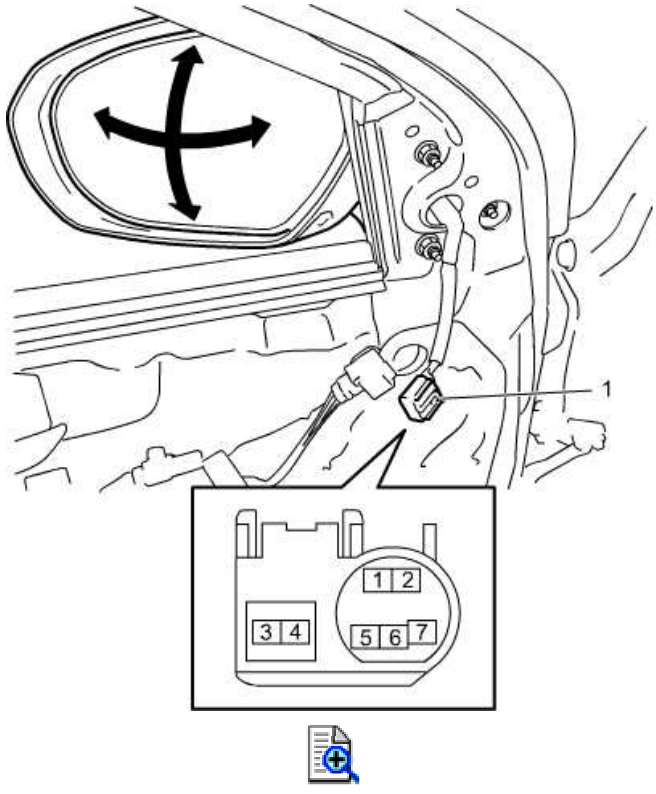
1) Remove front door trim. ☞

2) Disconnect power door mirror connector (1).

3) Check battery terminals to door mirror connector (1) as shown in following table and check operation of door mirror motor.
If check result is not as specified in the following operation, replace power door mirror.

Power door mirror motor operation

Operation direction \ Terminal		3	4	5	6	7
Mirror angle	Up	—	—	—	⊖	⊕
	Down	—	—	—	⊕	⊖
	Left	—	—	⊕	⊖	—
	Right	—	—	⊖	⊕	—



1. Power door mirror connector

Mirror Heater (If Equipped)

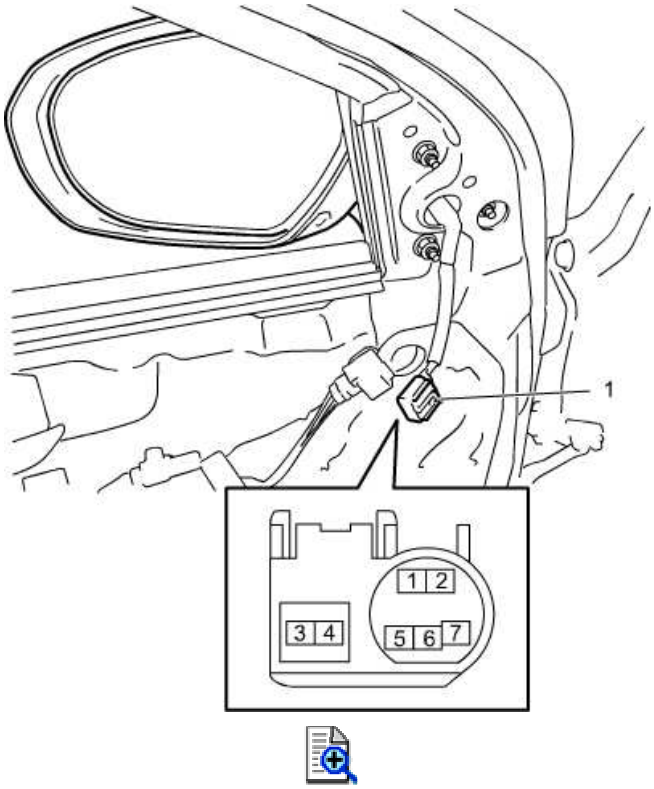
1) Remove front door trim. ☞

2) Disconnect power door mirror connector (1).

3) Check resistance between terminal "1" and terminal "2" of door mirror connector (1).
If check result is not as specified, replace power door mirror.

Mirror heater resistance

Approx. 7.6 Ω (25 °C) (77 °F)



9E

Power Door Mirror Removal and Installation

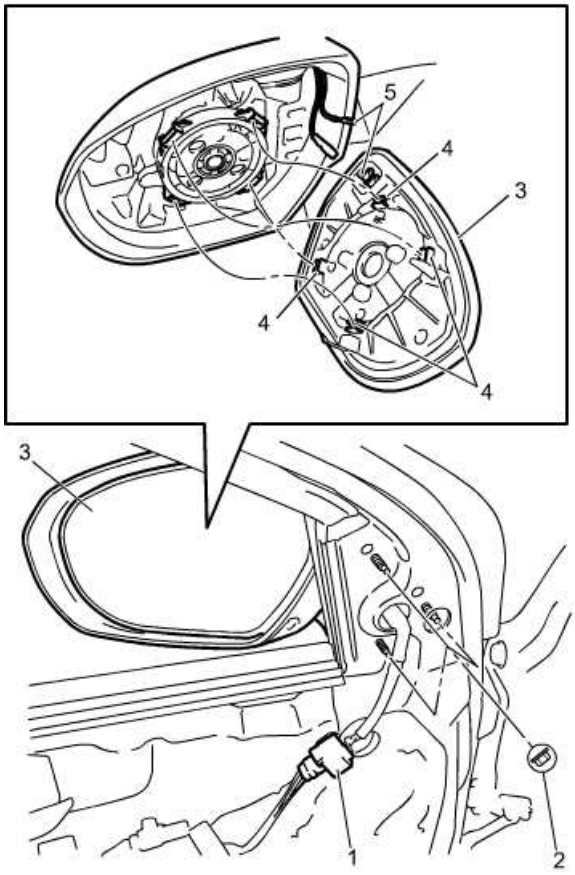
Removal

Reference: Power Door Mirror On-Vehicle Inspection

1) Remove front door trim.

2) Disconnect power door mirror connector (1).

3) Remove door mirror nuts (2) and remove door mirror (3).



3. Door mirror	4. Claw	5. Heater wire (If equipped)

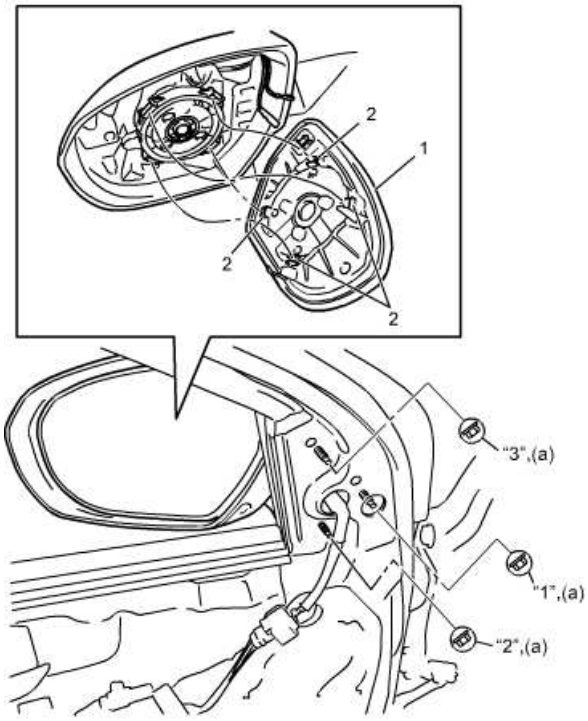
Installation

Reverse removal procedure noting the following points.

- Insert claws (2) securely when installing mirror (1).
- Check operation of door mirror after installation.
- Tighten door mirror nuts in order (“1” to “3”) to specified torque.

Tightening torque

Door mirror nut (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)


2
1
2
2
"3",(a)
"1",(a)
"2",(a)

9E

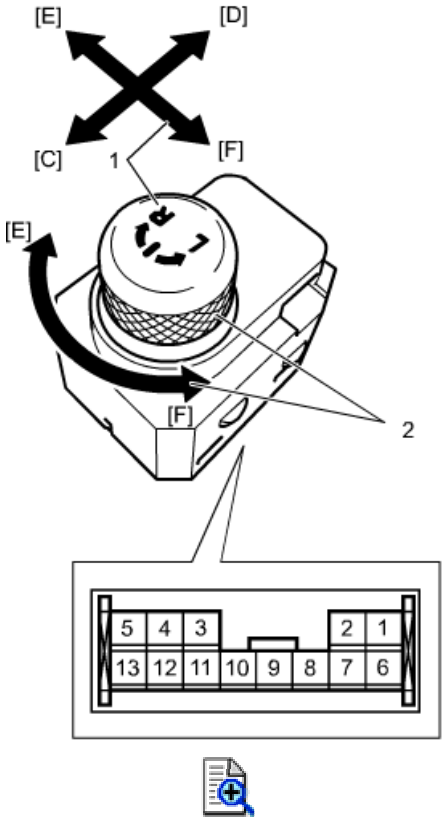
Power Door Mirror Switch Inspection

1) Remove power door mirror switch. ☞

2) Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Mirror switch continuity

Switch/Position \ Terminal		3	4	5	6	7	8	9	10	11	12	13
R/L switch	Angle switch											
L	Up	○						○	○			○
	Down	○						○	○			○
	Right	○	○					○	○			○
	Left	○	○						○			○
R	Up	○						○			○	○
	Down	○						○			○	○
	Right	○		○							○	○
	Left	○		○							○	○
Illumination					○		○		○	○		



[C]: Up	[F]: Left
[D]: Down	1. Angle switch

[E]: Right	2. R/L switch

9E

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Front window regulator bolt	8.4	0.86	6.5	☞
Rear door sash bolt	5.5	0.56	4.0	☞
Rear door sash screw	3.0	0.31	2.5	☞
Rear window regulator bolt	8.4	0.86	6.5	☞
Door mirror nut	11	1.1	8.5	☞

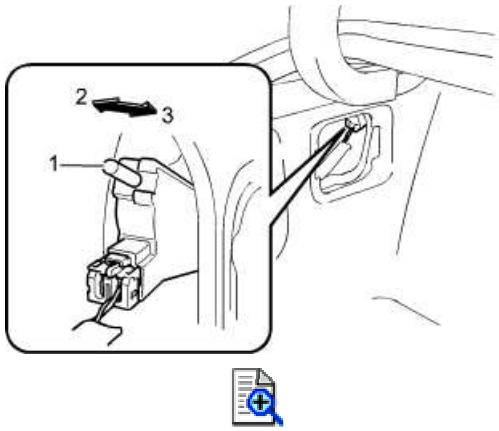
NOTE:
The specified tightening torque is described in the following.
Front Door Components
Rear Door Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

9F

Fuel Lid Opener Description

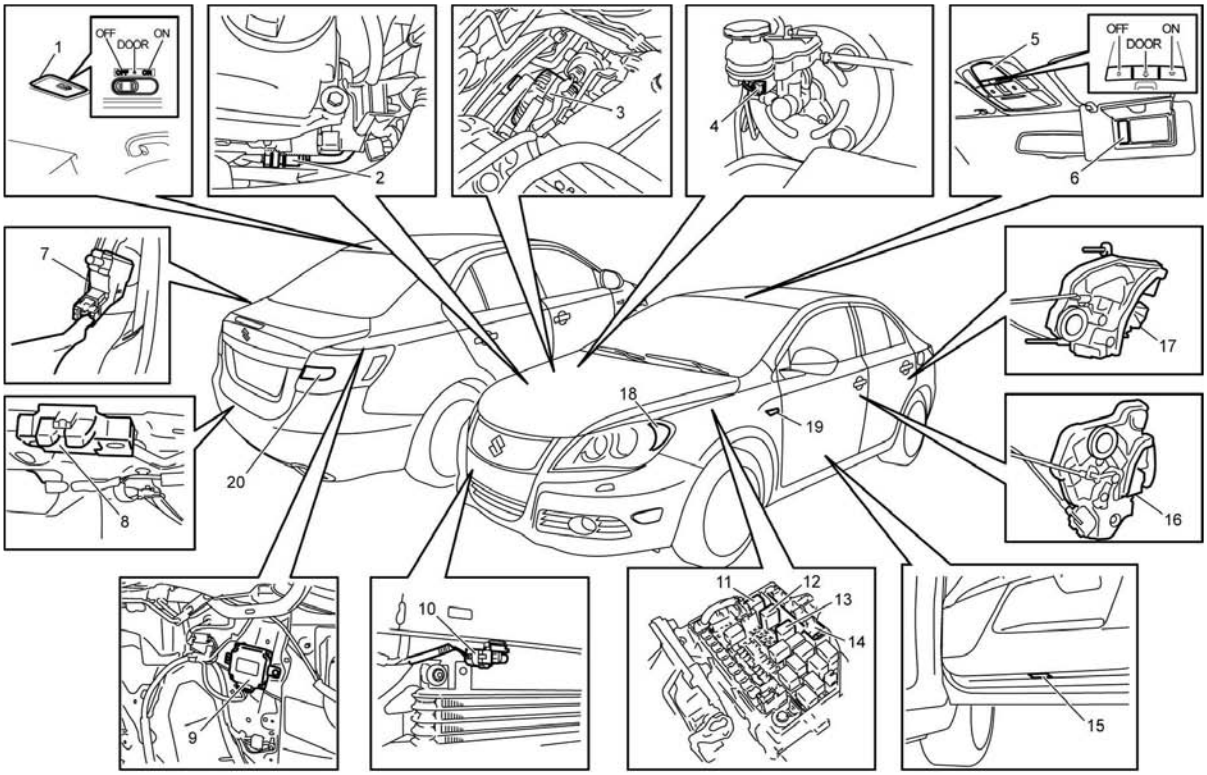
Fuel lid opener is located in the fuel lid box and is accessed by removing trunk side lid. The fuel lid can be opened by moving rod (1) in arrow (2) direction when battery is dead or malfunction occurs in the door lock system.

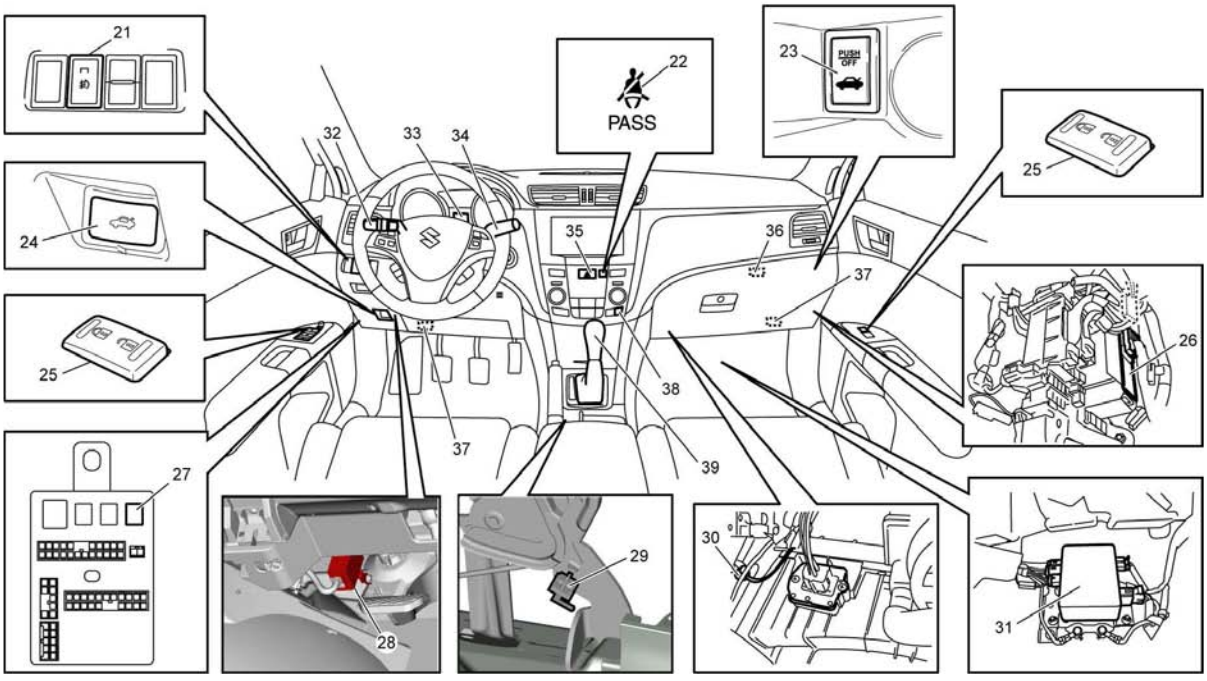


3. Lock

10B

BCM and Related System Component Location



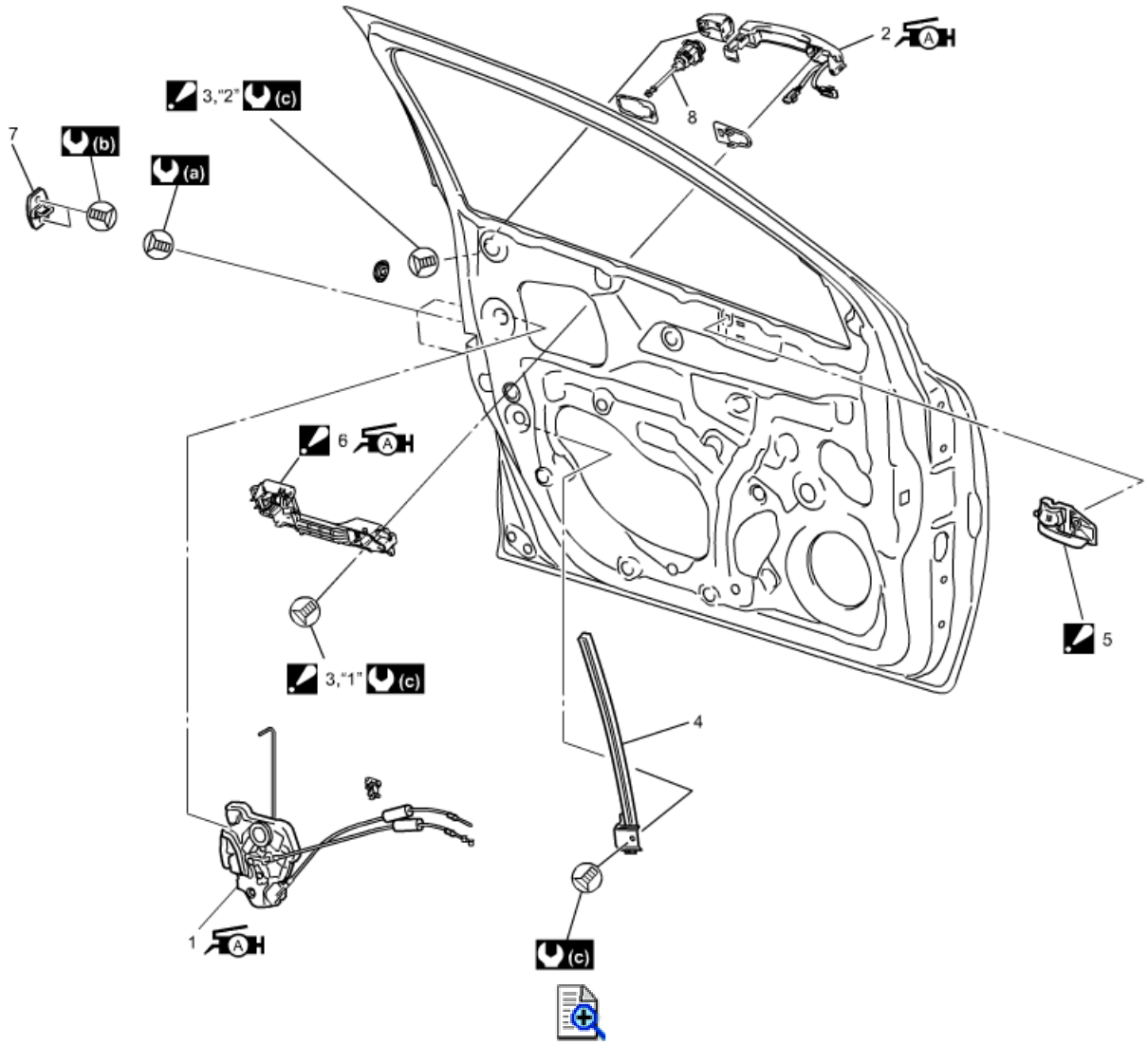


1. Rear dome light	14. Power integration	27. Tail light relay
2. Oil pressure switch	15. Door courtesy light	28. DRL control module
3. Generator	16. Front door lock actuator	29. Parking brake switch
4. Brake fluid level switch	17. Rear door lock actuator	30. Evaporator temperature sensor

5. Front dome light	18. Front turn signal light	31. P/S control module
6. Vanity mirror light	19. Side turn signal light	32. Lighting switch
7. Fuel lid actuator	20. Rear turn signal light	33. Information display
8. Trunk lid opener actuator	21. Fog light switch	34. Wiper and washer switch
9. 4WD control module (4WD model)	22. Passenger seat belt reminder light	35. Hazard warning switch
10. Outside air temperature sensor	23. Trunk lid opener cancel switch	36. Glove box light
11. Rear defogger relay	24. Trunk lid opener switch	37. Foot light
12. Wiper Hi/Lo relay	25. Power door lock switch	38. Rear defogger switch
13. Wiper relay	26. BCM	39. Select lever (CVT model)

9F

Front Door Lock Components



1. Front door lock assembly Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.	5. Inside door handle Install screw after installing door trim.	(a): 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)
2. Outside door handle (outer) Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.	6. Outside door handle (inner) Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.	(b): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Outside door handle screw Tighten in the shown order ("1" to "2").	7. Door latch striker	(c): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
4. Front door sash	8. Key cylinder	

9F

Front Door Lock Assembly Removal and Installation

Reference: Front Door Lock Components

Removal

1) Remove door trim and sealing cover referring to Step 1) to 7) of ***Front Door Glass Removal and Installation***.

NOTE:
Perform this work with front door glass fully closed.

2) Remove lock (1) in direction of arrow "1" and then move door lock open rod (2) in direction of arrow "2" to remove it from outside door handle (3).

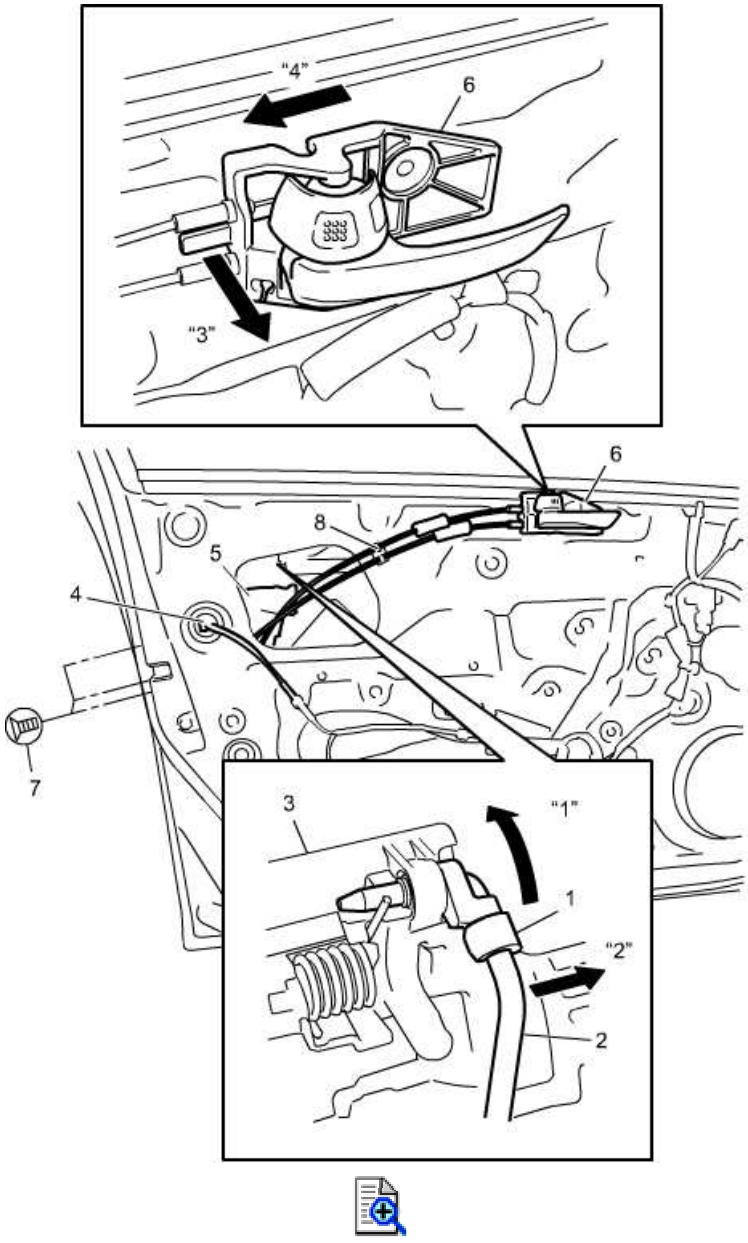
3) Disconnect door lock connector (4) from front door lock assembly (5).

4) Remove door lock screws (7).

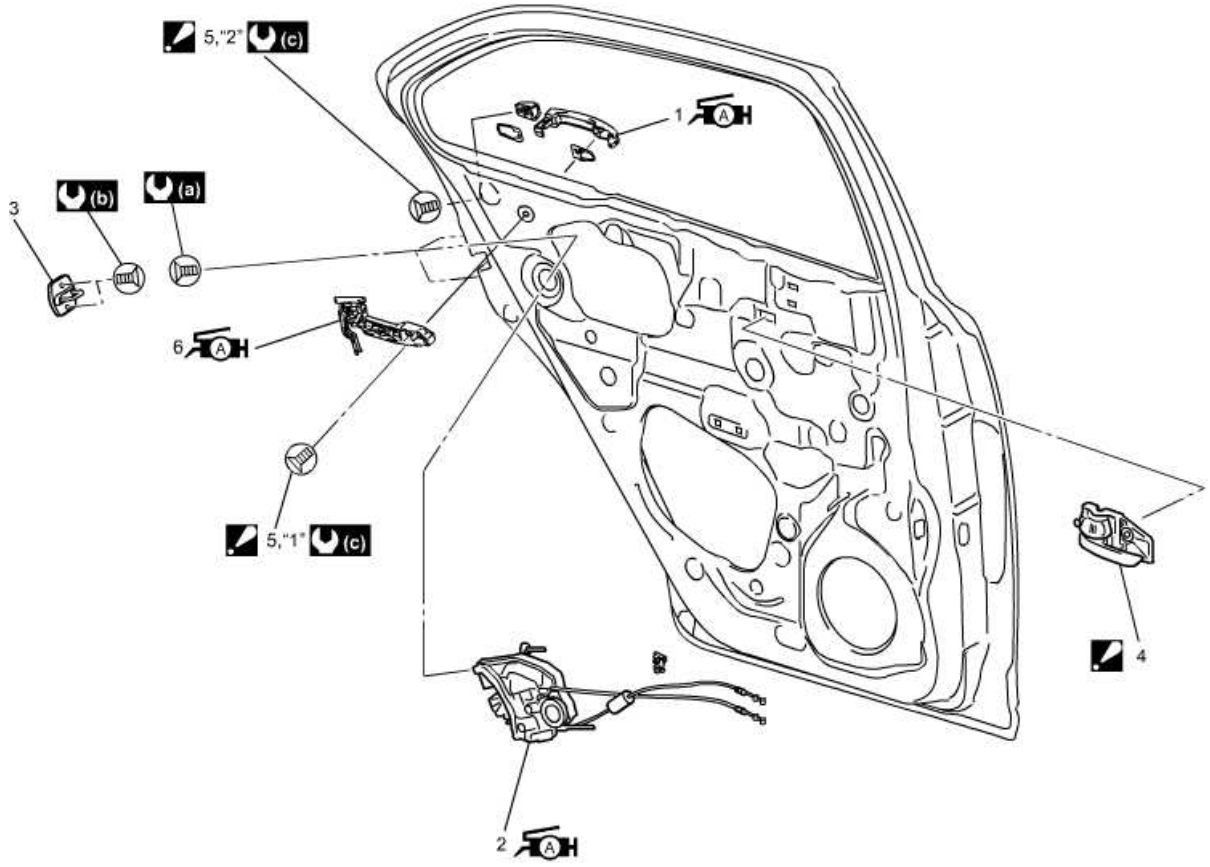
5) Remove inside door handle (6) by moving it in directions of arrow "3" and "4".

6) Remove inside door handle wire clip (8).

7) Remove inside door handle and door lock assembly as a unit.



Rear Door Lock Components



1. Outside door handle (outer) Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.	6. Outside door handle (inner) Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.
2. Rear door lock assembly Apply SUZUKI super grease A 99000-25011 to rotation/sliding parts.	(a): 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)
3. Door latch striker	(b): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
4. Inside door handle Install screw after installing door trim.	(c): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
5. Outside door handle screw Tighten in the shown order ("1" – "2").	

9F

Door Lock Switch and Motor On-Vehicle Inspection

1) Remove door trim.
- Front: ☞
- Rear: ☞

2) Disconnect door lock connector from rear door lock assembly.

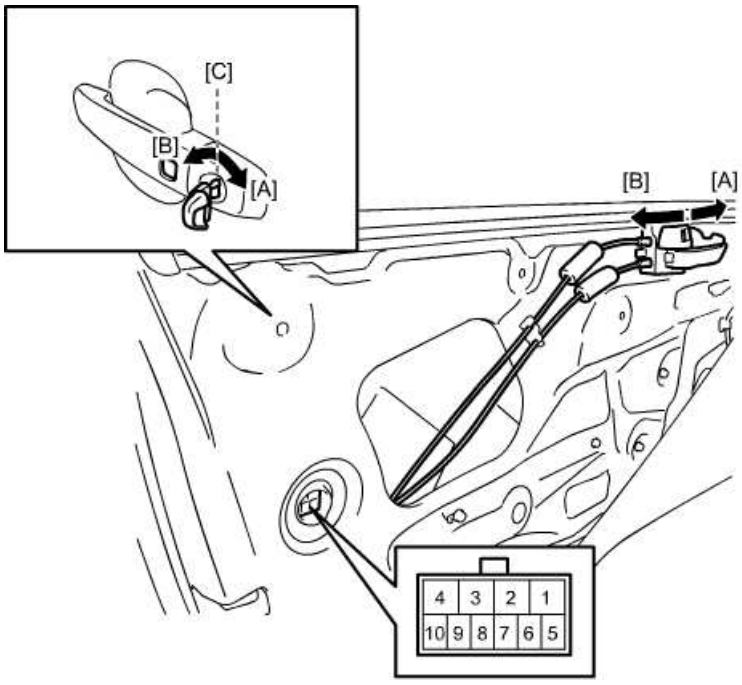
3) Check door lock switch for continuity between its terminals. Replace door lock assembly if defective.

4) Check door lock motor by checking operation of door lock lever when battery voltage is applied to the following terminals of door lock assembly as shown in tables. Replace door lock assembly if defective.

Driver Door Lock

Terminal / Operation	1	4	7	8	9	10
Lock			○	—	○	
Unlock			○	—	—	○
			○	○		
Off (only unlock position)			○	○		
Lock → Unlock	⊕	⊖				
Unlock → Lock	⊖	⊕				

Front door

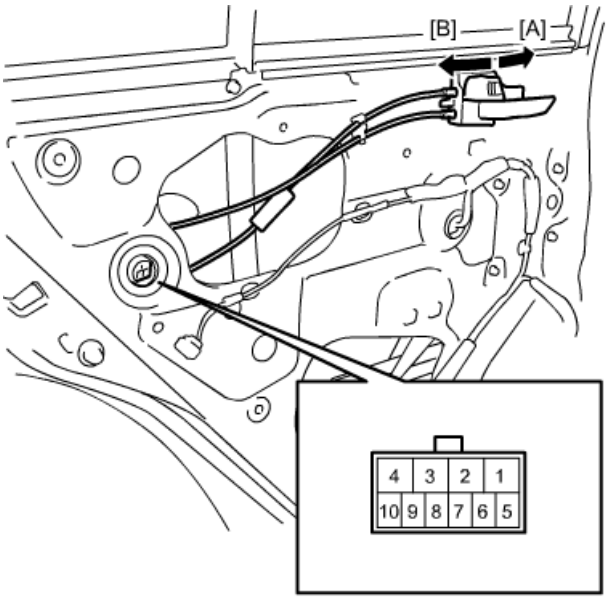


[A]: Lock	[C]: Off (only unlock position)
[B]: Unlock	

Passenger and Rear Door Lock

Operation \ Terminal		1	4	6	7	8	9
Lock							
Unlock	Rear			○			○
	Passenger				○	○	
Off							
Operation	Lock→Unlock	⊕	⊖				
	Unlock→Lock	⊖	⊕				

Rear door



[A]: Lock	[B]: Unlock

9F

Trunk Lid Latch On-Vehicle Inspection

- Check that trunk lid opens and closes smoothly.
- Check that trunk lid closes completely.

Trunk Lid Opener Motor

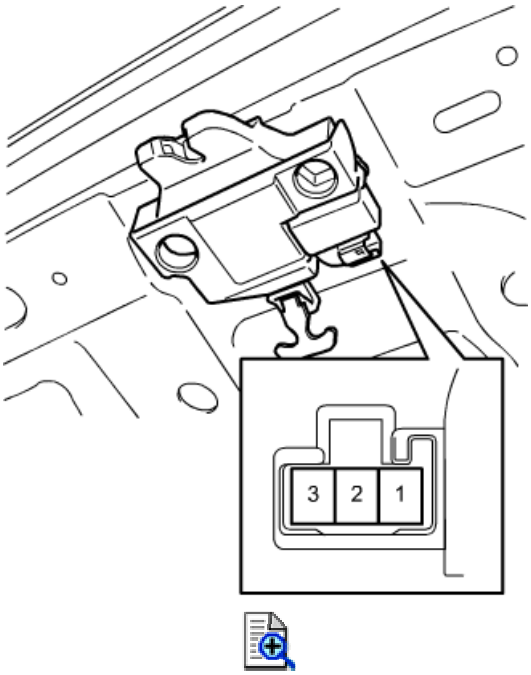
1) Remove trunk lid inner handle and trunk lid trim. ☞

2) Disconnect trunk lid latch connector from trunk lid latch assembly.

3) Check operation of motor with battery voltage applied to the following terminals of trunk lid latch assembly connector.
Replace trunk lid latch assembly if defective.

Trunk lid opener motor operation

Operation mode \ Terminal	1	2
Unlock	⊕	⊖



Trunk Lid Switch

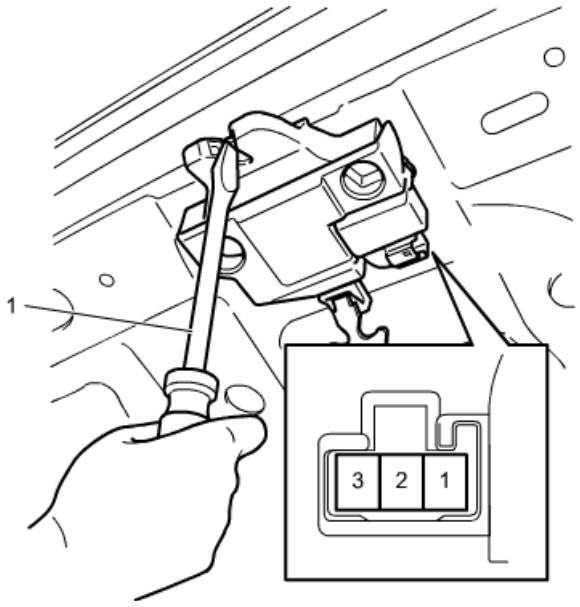
1) Remove trunk lid inner handle and trunk lid trim. ☞

2) Disconnect trunk lid latch connector from trunk lid latch assembly.

3) Check continuity between terminals of trunk lid latch assembly connector shown below when lock is held down with flat-end screwdriver (1).
Replace trunk lid latch assembly if defective.

Trunk lid switch continuity

Terminal / Position	2	3
Released	○	○
Pushed		



9F

Trunk Lid Latch Removal and Installation

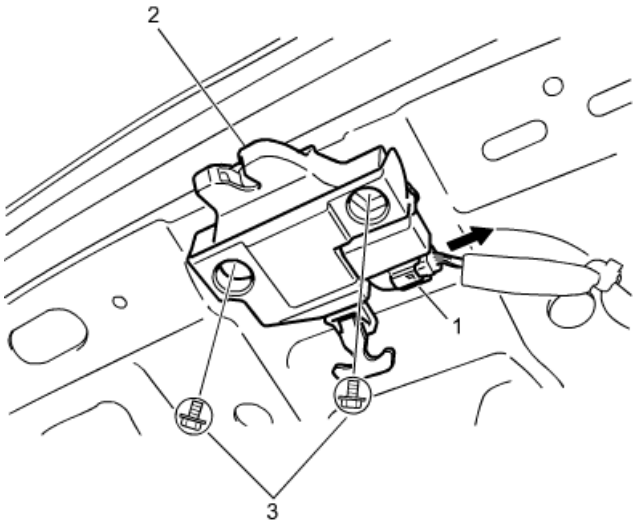
Reference: Trunk Lid Lock Components
Reference: Trunk Lid Latch On-Vehicle Inspection

Removal

1) Remove trunk lid inner handle and trunk lid trim. ☞

2) Disconnect trunk lid latch connector (1) from trunk lid latch assembly (2).

3) Remove trunk lid latch bolts (3) and remove trunk lid latch assembly (2).



Installation

Reverse removal procedure noting the following points.

- Tighten trunk lid latch bolts to specified torque.

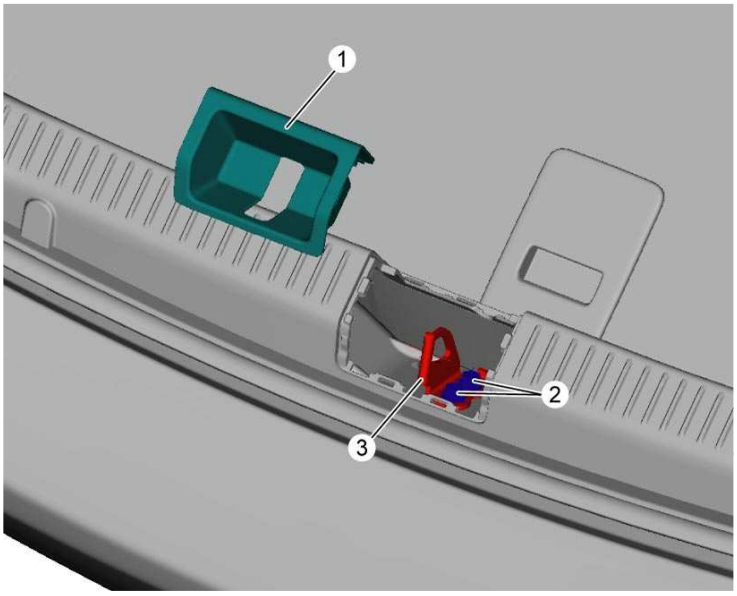
Tightening torque

Trunk lid latch bolt: 4.5 N·m (0.46 kg-m, 3.5 lbf-ft)

- Adjust trunk lid latch striker as follows if necessary.
  a. Remove tail end trim cap (1).
  b. Loosen trunk lid latch striker bolts (2)
  c. Adjust trunk lid latch striker (3) position so that trunk lid can be opened and closed smoothly.
  d. Tighten trunk lid latch striker bolts to specified torque.

Tightening torque

Trunk lid latch striker bolt: 4.5 N·m (0.46 kg-m, 3.5 lbf-ft)


1
2
3

9F

Trunk Lid Opener Switch On-Vehicle Inspection

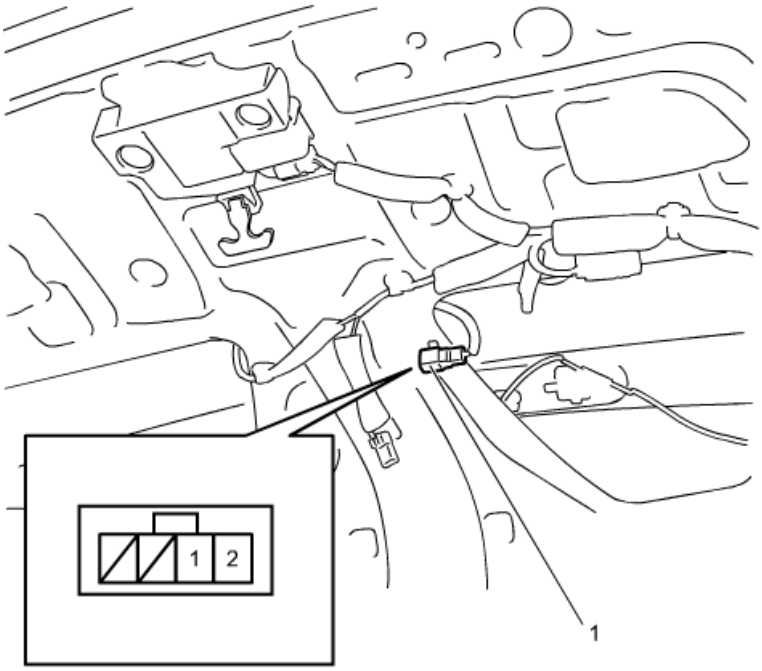
1) Remove trunk lid inner handle and trunk lid trim. ☞

2) Disconnect trunk lid opener switch connector (1).

3) Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Trunk lid opener switch continuity

Operation \ Terminal	1	2
Pushed	○	○
Released		



9F

Trunk Lid Opener Switch Removal and Installation

Reference: Trunk Lid Opener Switch On-Vehicle Inspection

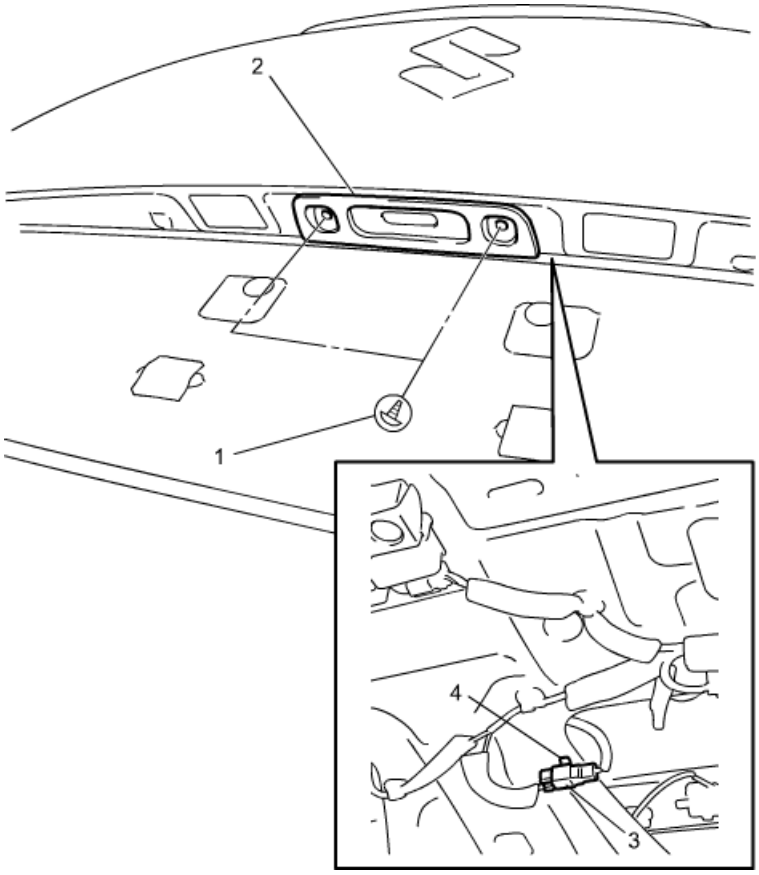
Removal

1) Remove trunk lid inner handle and trunk lid trim. ☞

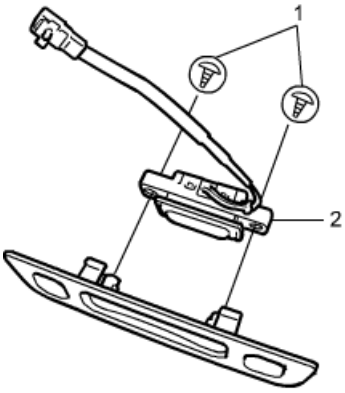
2) Disconnect trunk lid opener switch connector (3) and release connector clip (4).

3) Remove screws (1).

4) Release claws and remove trunk lid switch handle (2).



5) Remove screws (1) and remove trunk lid opener switch (2).

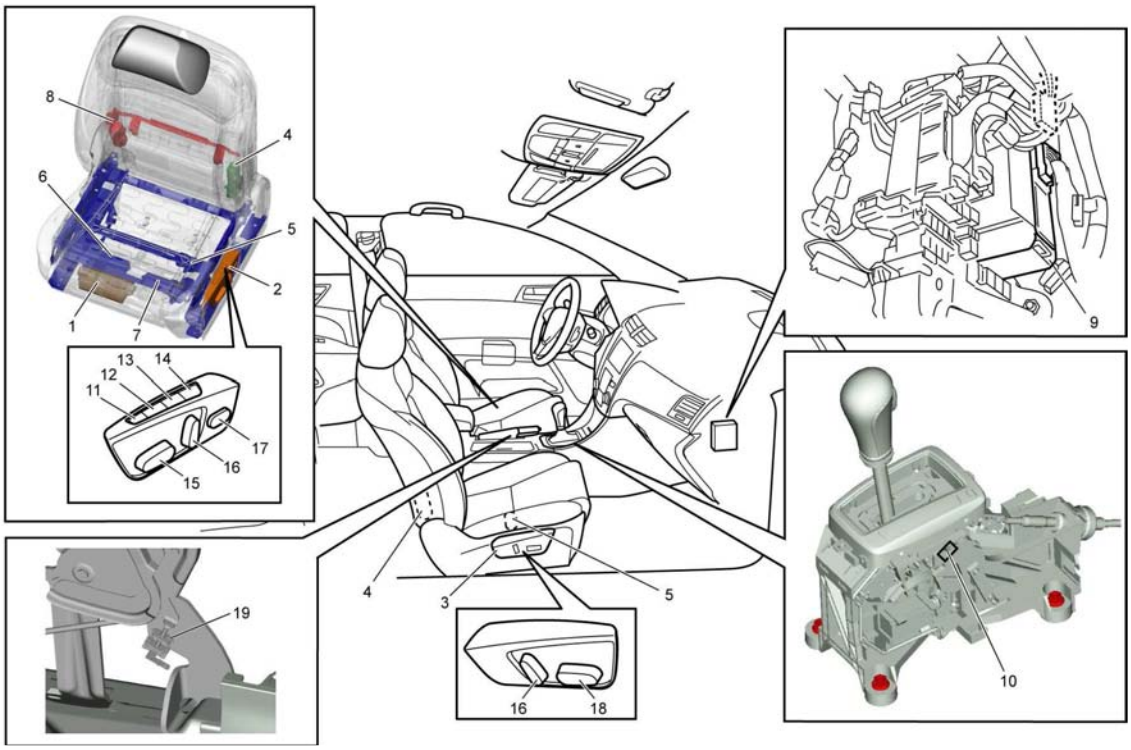


Installation

Reverse removal procedure.

9G

Power Seat Control System Component Location



1. Power seat control module	8. Lumbar support motor	15. Slide/lifter/tilt switch
2. Power seat main switch (driver side)	9. BCM	16. Reclining switch
3. Power seat sub switch (passenger side)	10. P position switch (CVT model)	17. Lumbar support switch
4. Reclining motor	11. Memory 1 switch	18. Slide switch
5. Slide motor	12. Memory 2 switch	19. Parking brake switch
6. Lifter motor	13. Memory 3 switch	
7. Tilt motor	14. Memory set switch	

9G

Inspection of Power Seat Control System and Its Circuits (If Equipped)

Power seat control module and its circuits can be checked by measuring voltage and resistance at each connector.

CAUTION:
Do not check power seat control module by directly applying tester probes to its terminals with connectors disconnected.

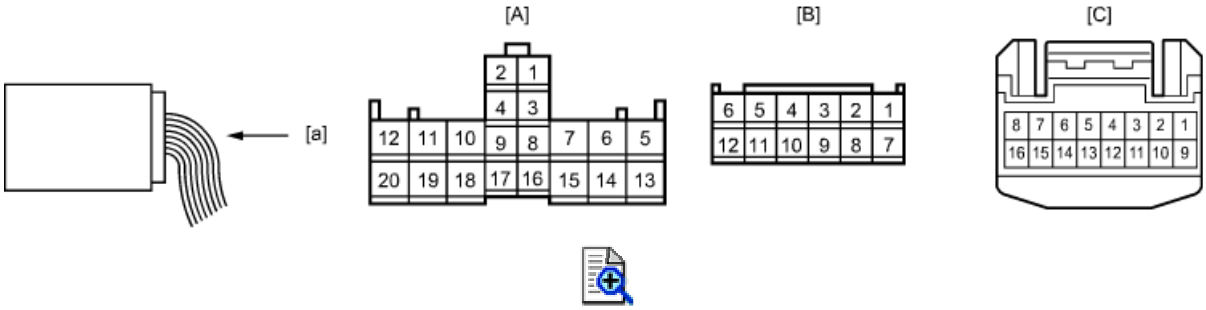
Voltage and Signal Check

1) Remove driver seat.

2) Remove power seat control module from driver seat with connectors connected.

3) Check terminal voltages and output waveforms using voltmeter and oscilloscope function of SUZUKI scan tool.

NOTE:
- **Confirm that battery voltage is 11 V or more.**
- **An "ignition mode" in the following table represents a power supply mode available with the keyless push start system. For more details, refer to *Description of Keyless Engine Start Function*.**
- **Outputs from terminals marked with asterisk (*) cannot be measured with voltmeter because they are pulse signals. Use oscilloscope for measuring these outputs.**



[A]: "L17" connector (power seat control module) (View: [a])	[C]: Power seat main switch connector (View: [a])
[B]: "L18" connector (power seat control module) (View: [a])	

[A] L17 connector (power seat control module)

Terminal No.	Wire color	Circuit	Normal voltage	Condition
3	YEL/RED	IG1 relay power supply	Approx. 12 V	Ignition mode: ON
5	BLU	Power supply	Approx. 12 V	Ignition mode: OFF, ACC or ON
6	YEL/BLU	Tilt drive motor (+)	Approx. 12 V	When tilt switch is operated upward
			0 V	Other than above condition
7	BLK	GND	0 V	Ignition mode: OFF, ACC or ON
8	WHT/RED	ACC relay power supply	Approx. 12 V	Ignition mode: ACC or ON

11	RED	Slide drive motor (–)	Approx. 12 V	When slide switch is operated rearward
			0 V	Other than above condition
13	YEL	Tilt drive motor (–)	Approx. 12 V	When tilt switch is operated downward
			0 V	Other than above condition
14	LT GRN	Reclining drive motor (+)	Approx. 12 V	When reclining switch is operated forward
			0 V	Other than above condition
15	GRN	Reclining drive motor (–)	Approx. 12 V	When reclining switch is operated rearward
			0 V	Other than above condition
17	BLK	Power seat control module GND	0 V	Ignition mode: OFF, ACC or ON
18	BLU/RED	Lifter drive motor (+)	Approx. 12 V	When lifter switch is operated upward
			0 V	Other than above condition
19	BLK/RED	Lifter drive motor (–)	Approx. 12 V	When lifter switch is operated downward
			0 V	Other than above condition
20	RED/WHT	Slide drive motor (+)	Approx. 12 V	When slide switch is operated forward
			0 V	Other than above condition

[B] L18 connector (power seat control module)

Terminal No.	Wire color	Circuit	Normal voltage	Condition
1	GRN/YEL	Magnetic sensor signal (reclining motor)	Refer to reference waveform. ☞	
2*	ORN	Magnetic sensor signal (lifter motor)	Refer to reference waveform. ☞	
3*	YEL/BLK	Magnetic sensor signal (tilt motor)	Refer to reference waveform. ☞	
7*	RED/YEL	Magnetic sensor signal (slide motor)	Refer to reference waveform. ☞	
8	RED/GRN	P position signal (CVT model) or parking brake switch signal (M/T model)	Approx. 12 V	Shift position is at P position and shift release button is not pressed (CVT model) or parking brake switch is ON (M/T model)
			0 V	Any conditions except above
9*	PPL	Vehicle speed signal	Refer to reference waveform. ***Inspection of BCM and Its Circuits***	
12*	BLU/YEL	Magnetic sensor GND	0 V	Ignition mode: OFF, ACC or ON

[C] Power seat main switch connector

Terminal No.	Wire color	Circuit	Normal voltage	Condition
1	BRN	Lifter switch (up)	0 V	When lifter switch is operated upward
			Approx. 12 V	Other than above condition
2	RED	Power seat switch GND	0 V	Ignition mode: OFF, ACC or ON

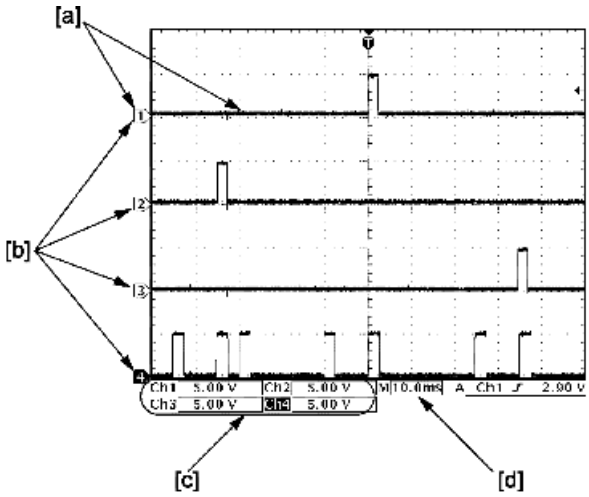
3	ORN	Reclining switch (rear)	0 V	When reclining switch is operated rearward
			Approx. 12 V	Other than above condition
4	YEL	Reclining switch (front)	0 V	When reclining switch is operated forward
			Approx. 12 V	Other than above condition
5	GRN	"Memory M" switch signal	0 V	When "Memory M" switch is pressed down
			Approx. 12 V	Other than above condition
6	BLU	"Memory 3" switch signal	0 V	When "Memory 3" switch is pressed down
			Approx. 12 V	Other than above condition
7	PPL	"Memory 2" switch signal	0 V	When "Memory 2" switch is pressed down
			Approx. 12 V	Other than above condition
8	GRY	"Memory 1" switch signal	0 V	When "Memory 1" switch is pressed down
			Approx. 12 V	Other than above condition
9	BLK/WHT	Memory switch illumination power	Approx. 12 V	Ignition mode: ACC
11	WHT	Tilt switch (down)	0 V	When tilt switch is operated downward
			Approx. 12 V	Other than above condition
12	BLK	Tilt switch (up)	0 V	When tilt switch is operated upward
			Approx. 12 V	Other than above condition
13	BRN/WHT	Slide switch (rear)	0 V	When slide switch is operated rearward
			Approx. 12 V	Other than above condition
14	RED/WHT	Slide switch (front)	0 V	When slide switch is operated forward
			Approx. 12 V	Other than above condition
16	ORN/WHT	Lifter switch (down)	0 V	When lifter switch is operated downward
			Approx. 12 V	Other than above condition

Reference Waveform

Oscilloscope display

Shown below is typical waveform display provided by oscilloscope.

NOTE:
- **Display includes the following types of data:**



[a]: Waveform of channel 1	[c]: VOLT/DIV of each channel
[b]: Ground level of each channel	[d]: TIME/DIV

- **Waveforms may vary with measurement conditions and vehicle specifications.**

Magnetic sensor signal (reclining motor)

Channel	Probe	Terminal No.
1	+	L18-1
	–	L18-12

Magnetic sensor signal (lifter motor)

Channel	Probe	Terminal No.
1	+	L18-2
	–	L18-12

Magnetic sensor signal (tilt motor)

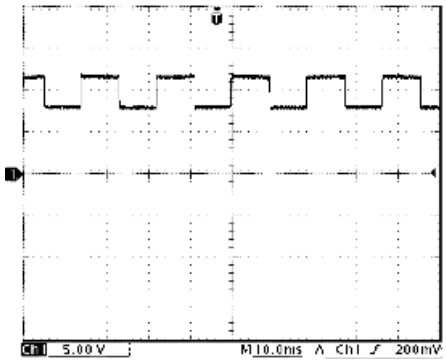
Channel	Probe	Terminal No.
1	+	L18-3
	–	L18-12

Magnetic sensor signal (slide motor)

Channel	Probe	Terminal No.
1	+	L18-7
	–	L18-12

Measurement condition

- When motor is operated.

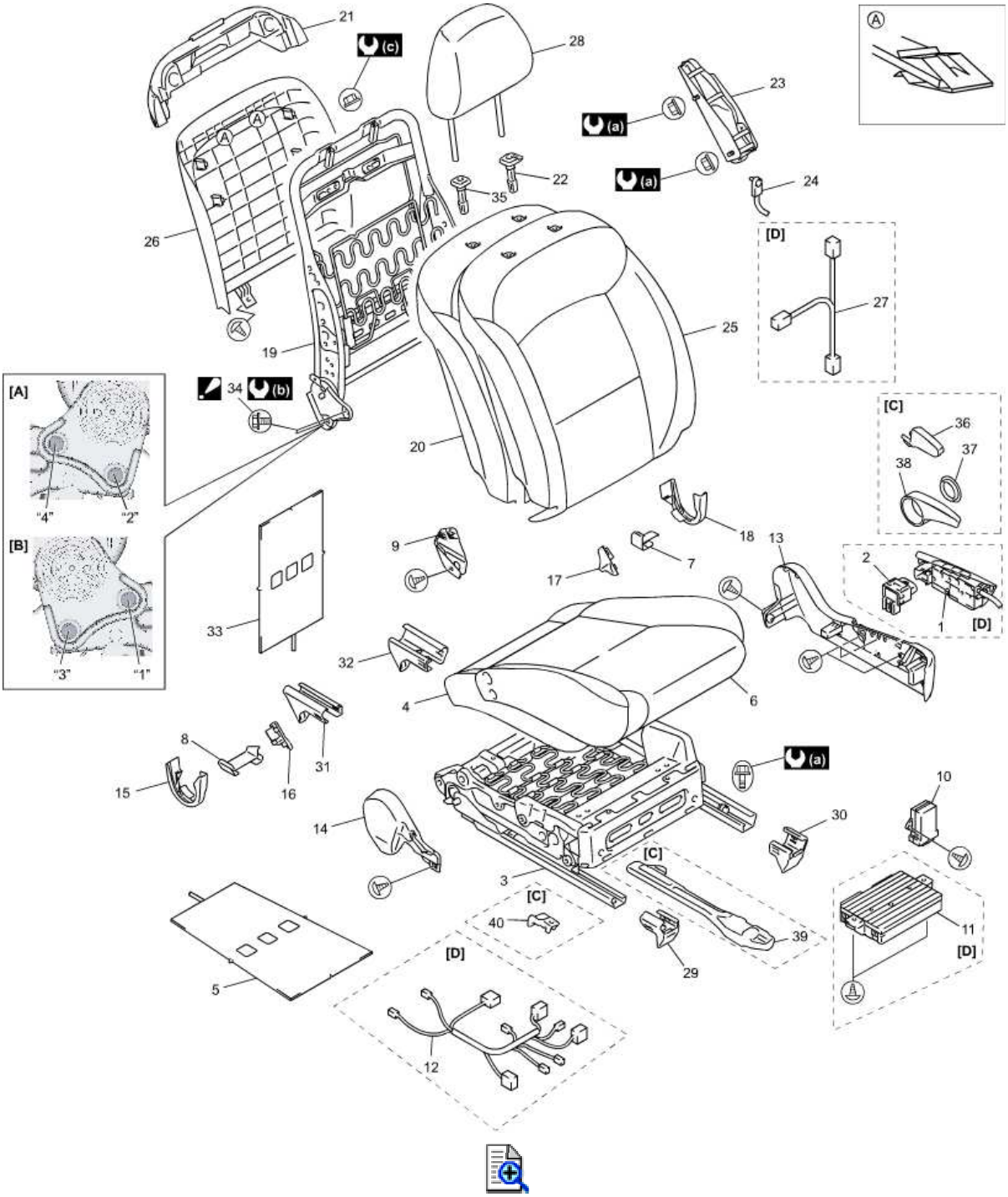

Ch1 5.00V
M10.0ms A Ch1 200mV

9G

Front Seat Components

This figure shows example of power seat components and specific components to manual seat. Although figure does not show manual seat components of identical names with power seat counterparts, there are differences in shape and design between them. When replacing any seat component, be sure to select correct one referring to parts catalog.

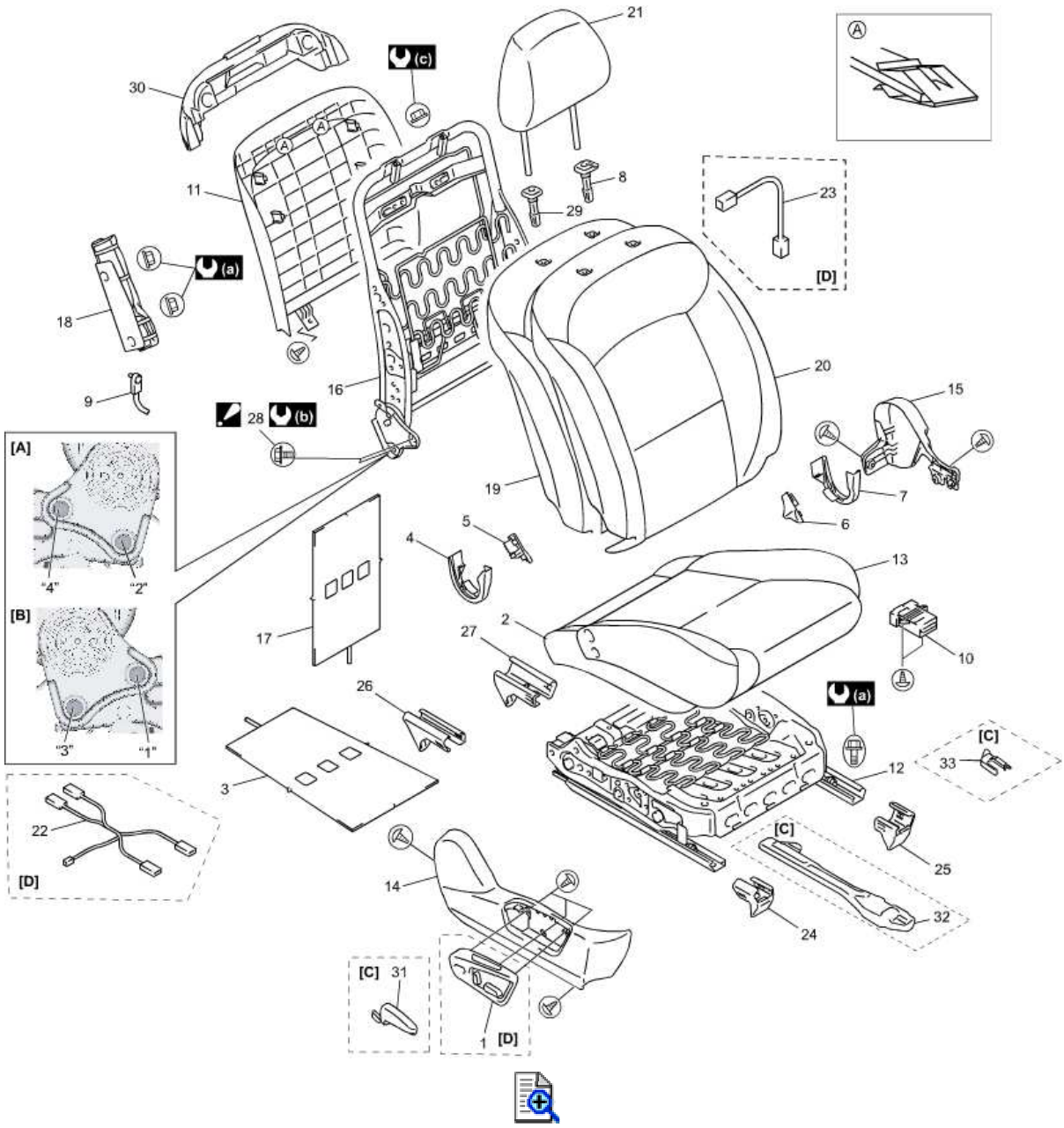
Driver Seat



[A]: Outside of vehicle	13. Reclining outside cover	29. Lower rail front end right cover
[B]: Inside of vehicle	14. Reclining inside cover	30. Lower rail front end left cover

[C]: Only for manual seat	15. Front back frame cover right	31. Lower rail rear end right cover
[D]: Only for power seat	16. Reclining inner cover right	32. Lower rail rear end left cover
1. Power seat main switch	17. Reclining inner cover left	33. Front seatback heater (if equipped)
2. Lumbar support switch	18. Front seatback frame cover left	 34. Seatback assembly mounting bolt : Tighten in order of "1" to "4".
3. Front cushion frame assembly	19. Front seatback frame assembly	35. Headrest guide (without lock)
4. Front cushion pad	20. Front seatback pad	36. Reclining knob
5. Front cushion heater (if equipped)	21. Front seatback rear support	37. Lifter lever cap
6. Front cushion trim	22. Headrest guide (lock side)	38. Lifter lever
7. Rear riser inside cover	23. Side air bag (inflator) module assembly	39. Rear riser outside
8. Rear riser outside cover	24. Side air bag harness	40. Rear riser inside
9. Lifter link cover	25. Front seatback trim	 : 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
10. Seat heater control module (if equipped)	26. Front seatback board	 : 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
11. Power seat control module	27. Power seat harness No. 2	 : 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)
12. Power seat harness No. 1	28. Headrest assembly	

Passenger Seat



[A]: Inside of vehicle	11. Front seatback board	25. Lower rail front end left cover
[B]: Outside of vehicle	12. Front cushion flame assembly	26. Lower rail rear end right cover
[C]: Only for manual seat	13. Front cushion trim	27. Lower rail rear end left cover
[D]: Only for power seat	14. Reclining outside cover	28. Seatback assembly mounting bolt : Tighten in order of "1" to "4".
1. Power seat sub switch	15. Reclining inside cover	29. Headrest guide (without lock)
2. Front cushion pad (Built-in OCM with sensor mat (if equipped))	16. Front seatback frame assembly	30. Front seatback rear support

3. Front cushion heater (if equipped)	17. Front seatback heater (if equipped)	31. Reclining knob
4. Front seatback frame cover right	18. Side air bag (inflator) module assembly	32. Rear riser outside
5. Reclining inner cover right	19. Front seatback pad	33. Rear riser inside
6. Reclining inner cover left	20. Front seatback trim	(a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. Front seatback frame cover left	21. Headrest assembly	(b): 35 N·m (3.5 kgf-m, 25.5 lbf-ft)
8. Headrest guide (lock side)	22. Power seat No. 1 harness	(c): 8.0 N·m (0.82 kgf-m, 6.0 lbf-ft)
9. Side air bag harness	23. Power seat No. 2 harness	
10. Seat heater control module (if equipped)	24. Lower rail front end right cover	

9G

Seat Switch Inspection (If Equipped)

Power Seat Main Switch (Driver Side)

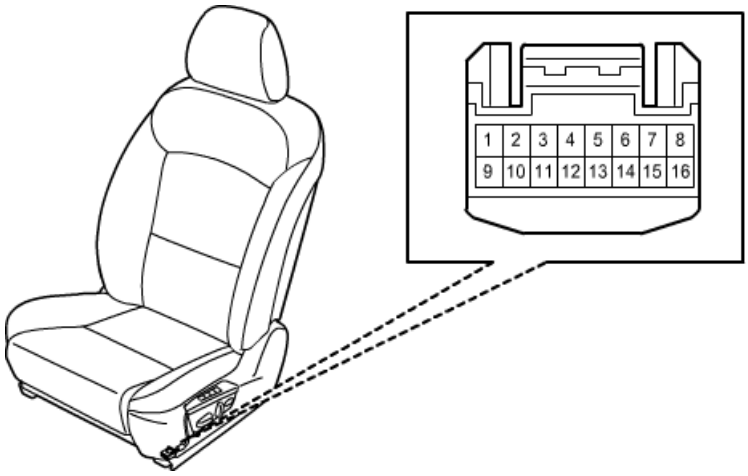
1) Disconnect power seat main switch connector from front seat control module (driver seat).

2) Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

NOTE:
Set tester to diode test range when measuring continuity between terminals "2" and "9".

Power seat main switch continuity

Switch position \ Terminal		1	2	3	4	5	6	7	8	9	11	12	13	14	16
Memory 1 switch			○	—	—	—	—	—	○						
Memory 2 switch			○	—	—	—	—	○							
Memory 3 switch			○	—	—	—	○								
Memory set switch			○	—	—	○									
Reclining switch	Front		○	—	○										
	Rear		○	○											
Lifter switch	Up	○	○												
	Down		○	—	—	—	—	—	—	—	—	—	—	—	○
Slide switch	Front		○	—	—	—	—	—	—	—	—	—	—	○	
	Rear		○	—	—	—	—	—	—	—	—	—	○		
Tilt switch	Up		○	—	—	—	—	—	—	—	—	○			
	Down		○	—	—	—	—	—	—	—	○				
Illumination			○	—	—	—	—	—	—	○					



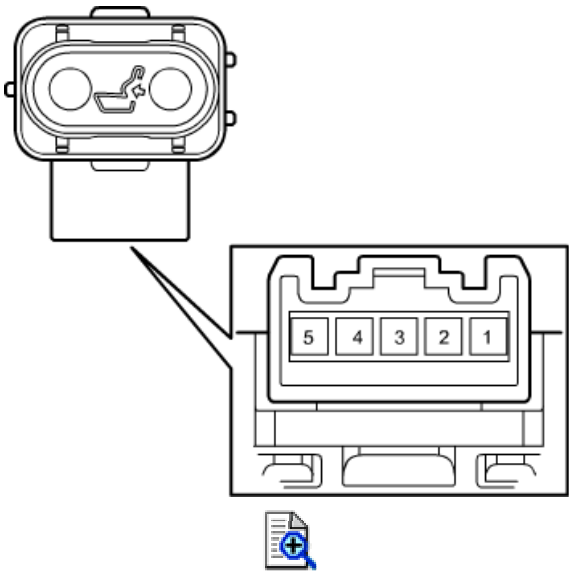
Lumbar Support Switch (Driver Side)

1) Remove lumbar support switch. ☞

2) Check continuity between terminals at each switch position.
If check result is not as specified, replace switch.

Lumbar support switch continuity

Switch position \ Terminal	1	2	4	5
OFF	○		○	○
Front	○	○	○	○
Rear	○	○	○	○



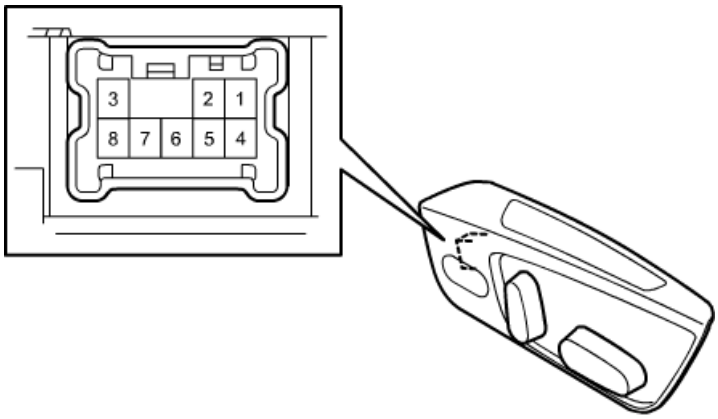
Power Seat Sub Switch (Passengers Side)

1) Remove power seat sub switch (passengers side). ☞

2) Check connection between terminals at each switch position.
If check result is not as specified, replace switch.

Power seat sub switch continuity

Switch position \ Terminal		1	2	3	4	6	8
OFF		○	○	○	○		○
Reclining switch	Front	○	○	○		○	○
	Rear			○		○	
		○	○		○		○
Slide switch	Front	○	○	○	○	○	○
	Rear	○				○	
			○	○	○		○


3
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5
4

9G

Seat Actuator Inspection (If Equipped)

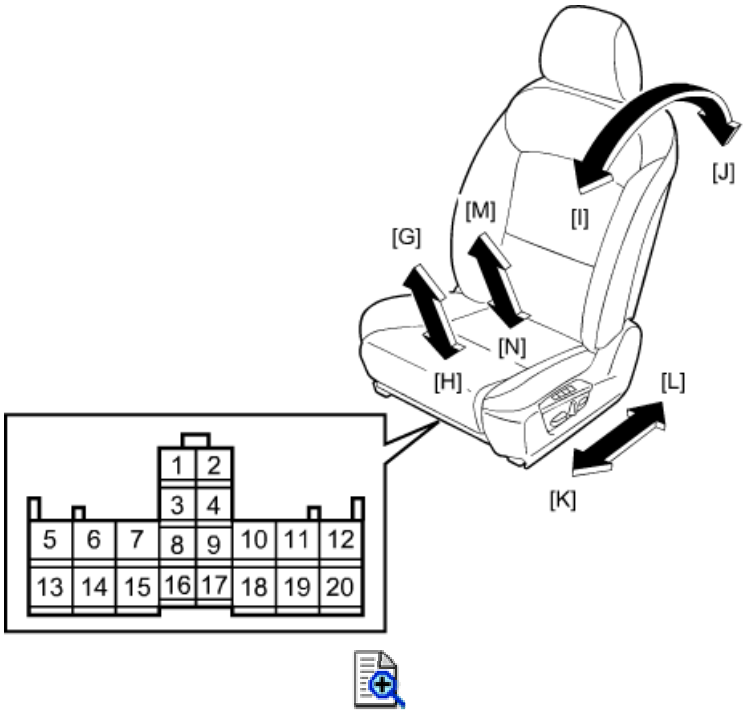
Driver Seat (Except Lumbar Support)

1) Disconnect seat actuator connector from power seat control module (driver seat).

2) Check operation of seat when battery positive (+) and negative (−) terminals are connected to terminals of seat actuator connector as indicated in the following table. If any defect is found, replace front cushion frame assembly or front seatback frame assembly.

3) Initialize seat position memory.

Switch position \ Terminal		6	11	13	14	15	18	19	20
Driver seat tilt drive motor	Up	⊕		⊖					
	Down	⊖		⊕					
Driver seat reclining drive motor	Front				⊕	⊖			
	Rear				⊖	⊕			
Driver seat slide drive motor	Front		⊖						⊕
	Rear		⊕						⊖
Driver seat lifter drive motor	Up						⊕	⊖	
	Down						⊖	⊕	



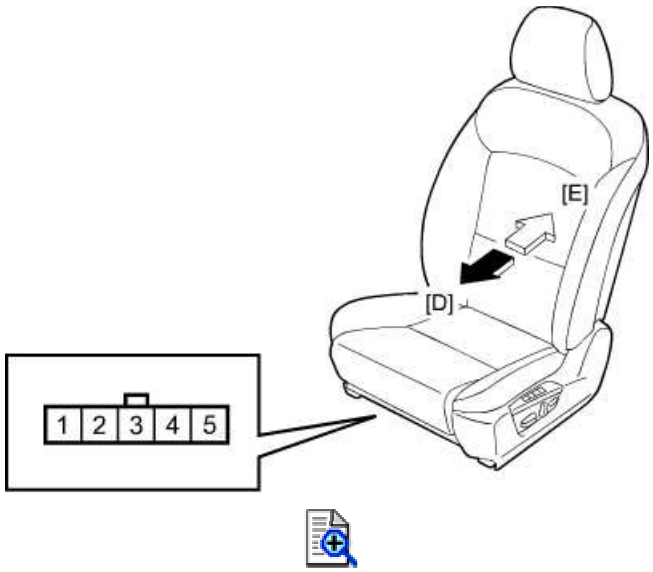
Driver Seat (Lumbar Support)

1) Disconnect seat actuator connector from lumbar support switch.

2) Check operation of seat when battery positive (+) and negative (−) terminals are connected to terminals of seat actuator connector as indicated in the following table. If any defect is found, replace front seatback frame assembly.

3) Initialize seat position memory. ☞

Switch position \ Terminal		1	5
Lumbar support drive motor	Front	⊖	⊕
	Rear	⊕	⊖

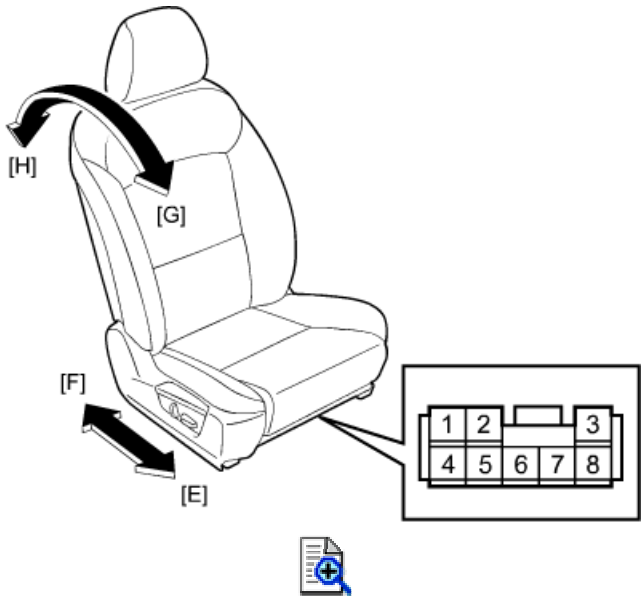


Passenger Seat

1) Disconnect seat actuator connector from power seat switch.

2) Check operation of seat when battery positive (+) and negative (−) terminals are connected to terminals of seat actuator connector as indicated in the following table. If any defect is found, replace front seatback frame assembly.

Switch position \ Terminal		1	3	4	8
Passenger seat slide drive motor	Front	⊖			⊕
	Rear	⊕			⊖
Passenger seat reclining drive motor	Front		⊖	⊕	
	Rear		⊕	⊖	


[H]
[G]
[F]
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1
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4
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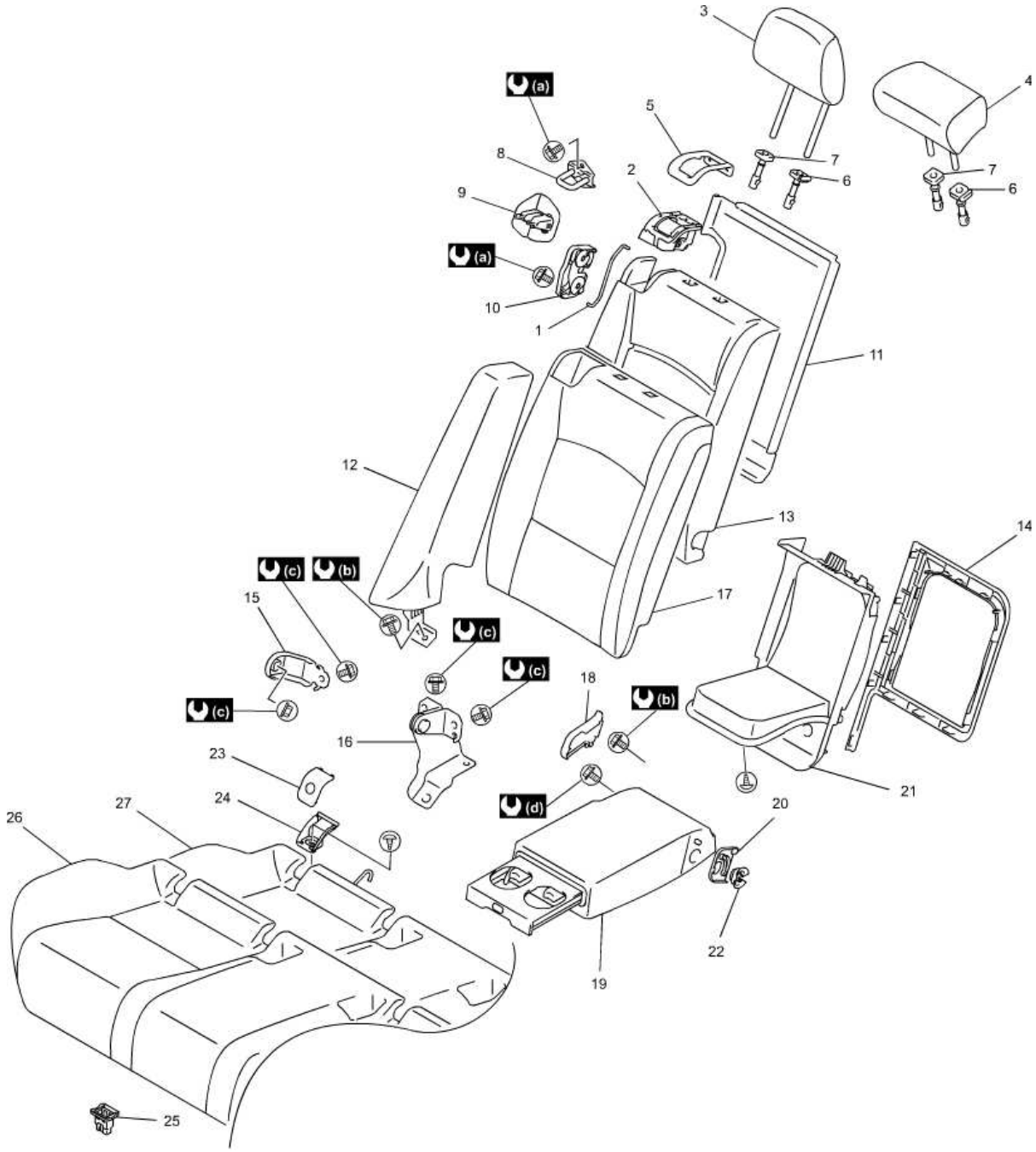
6
7
8

9G

Rear Seat Components



1. Seatback lock wire	12. Side back assembly	23. Lower anchor cover
2. Seatback lock knob assembly	13. Seatback assembly	24. Lower anchor guide
3. Headrest assembly	14. Armrest back board bezel	25. Seat cushion hook
4. Headrest (center)	15. Side hinge	26. Cushion trim
5. Seatback lock knob bezel	16. Seat center hinge	27. Cushion pad
6. Headrest guide (with lock)	17. Seatback trim	(a) 23 N·m (2.3 kgf-m, 17.0 lbf-ft) :

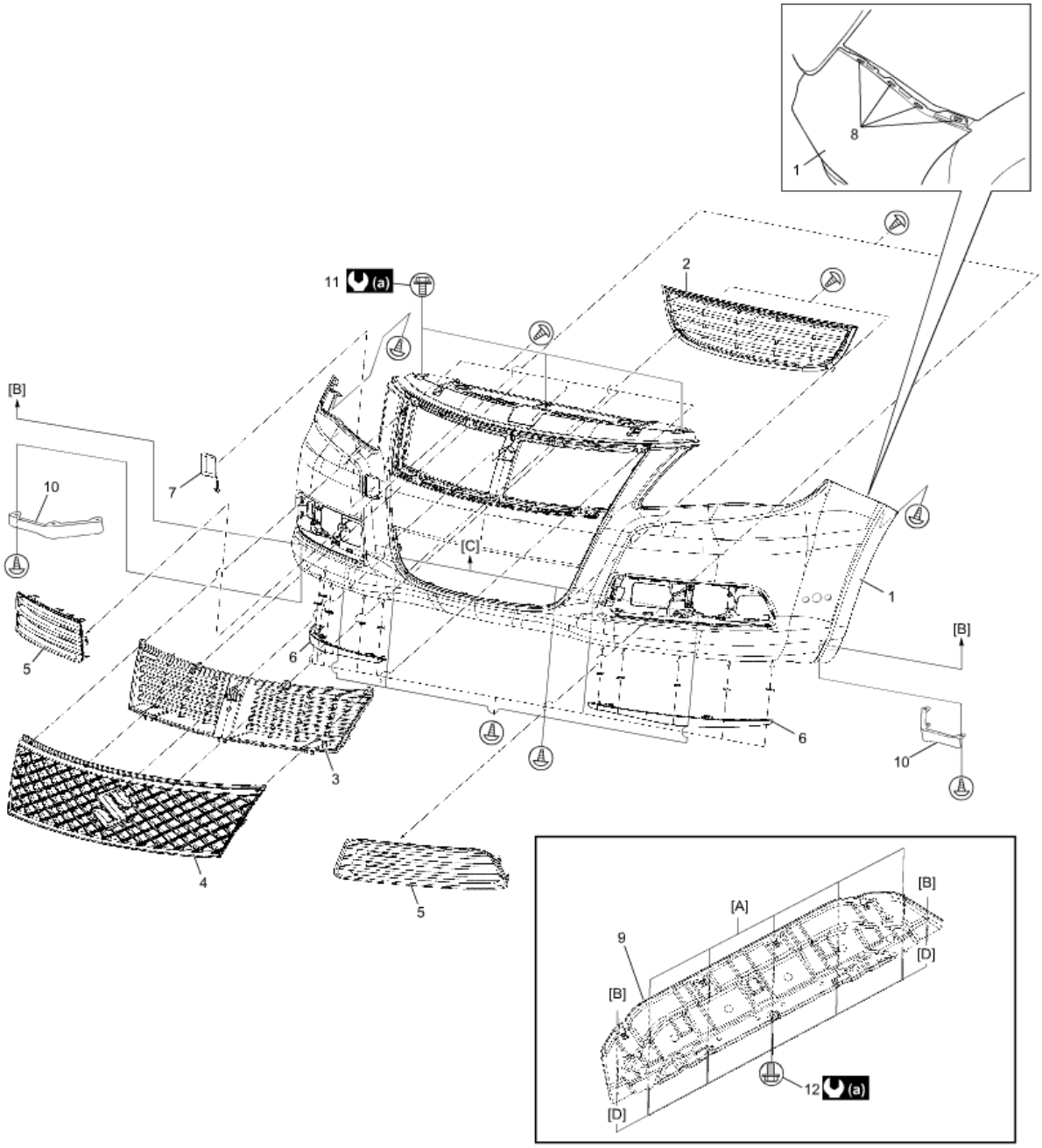
7. Headrest guide (without lock)	18. Armrest hinge cover	(b) 5.5 N·m (0.55 kgf-m, 4.0 lbf-ft) :
8. Striker	19. Armrest assembly	(c) 43 N·m (4.3 kgf-m, 31.5 lbf-ft) :
9. Seatback lock hole cover	20. Armrest hinge spring	(d) 21 N·m (2.1 kgf-m, 15.0 lbf-ft) :
10. Seatback lock assembly	21. Armrest back board assembly	
11. Seatback board	22. Armrest hinge bushing (L)	

9H

Front Bumper Removal and Installation

Removal

Remove parts referring to figure.



[A]: Body	3. Radiator upper grille cover	9. Front bumper lower cover
[B]: Front fender lower lining	4. Radiator upper grille	10. Front fender strake
[C]: Front bumper lower cover	5. Front fog light bezel	11. Front bumper upper bolt
[D]: Front bumper	6. Front air dam skirt	12. Front bumper lower cover bolt

1. Front bumper	7. Front bumper cap	13. Front bumper holder
2. Radiator lower grille	8. Lock	(a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

Installation

Reverse removal procedure noting the following point.

- Tighten front bumper upper bolts and front bumper lower cover bolts to specified torque.

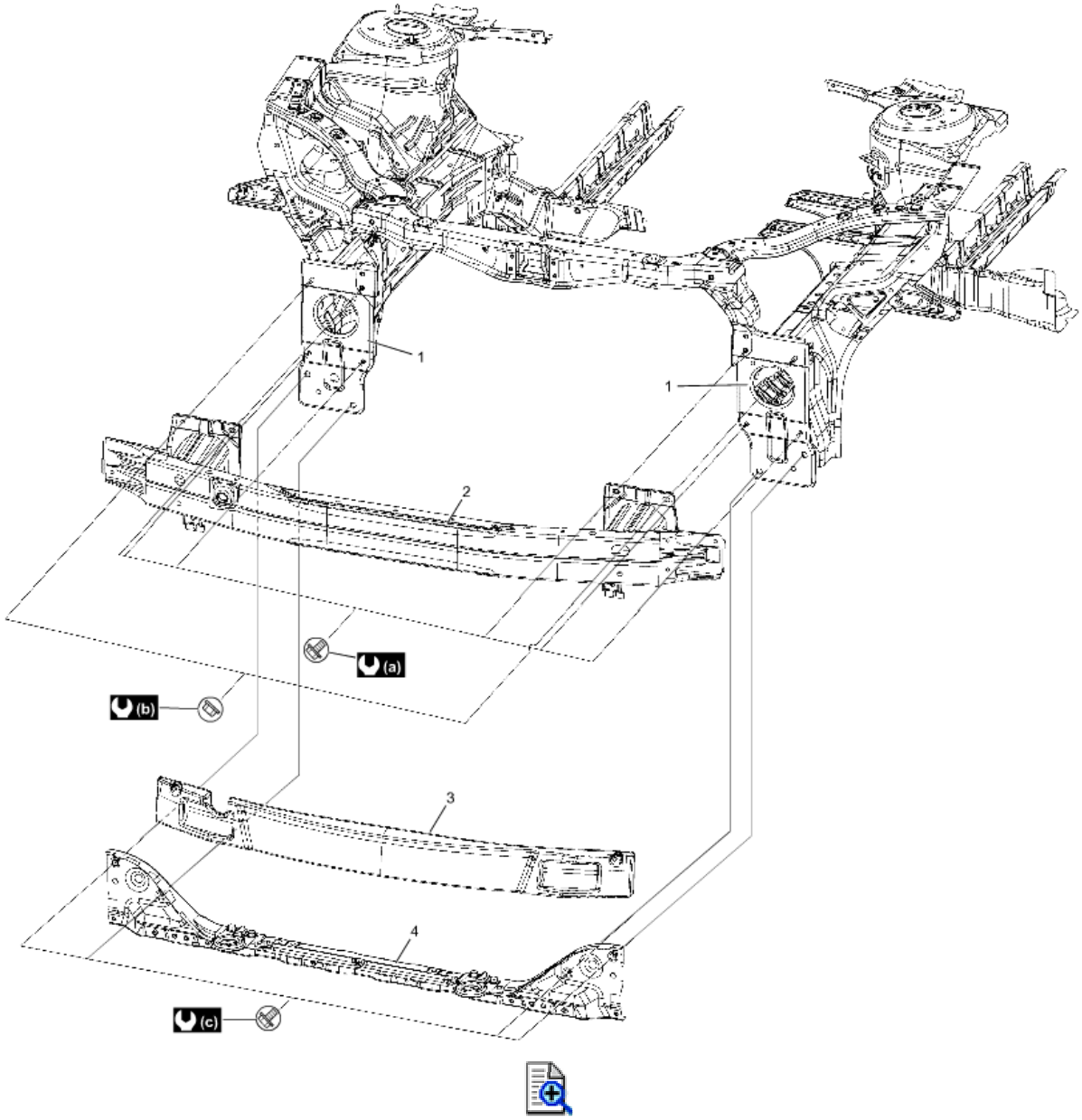
Tightening torque

Front bumper upper bolt: 5.5 N·m (0.56 kg-m, 4.0 lbf-ft)
Front bumper lower cover bolt: 5.5 N·m (0.56 kg-m, 4.0 lbf-ft)

9H

Front Bumper Member Removal and Installation

Remove and install parts referring to figure.

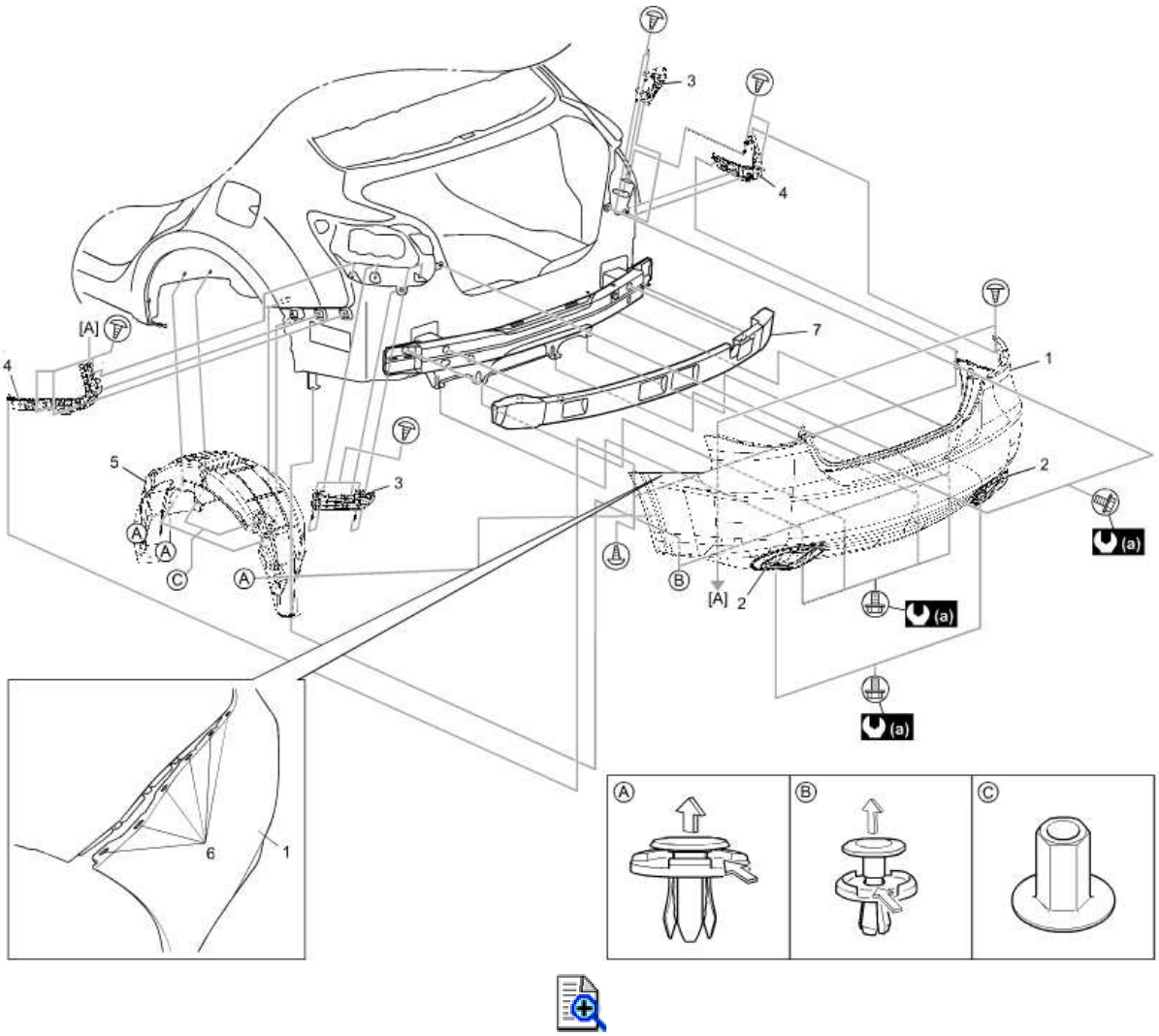


1. Front bumper member plate	4. Radiator support member	(c): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)
2. Front bumper member	(a): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)	
3. Front bumper absorber	(b): 29 N·m (3.0 kgf-m, 21.5 lbf-ft)	

9H

Rear Bumper Removal and Installation

Remove and install parts referring to figure.

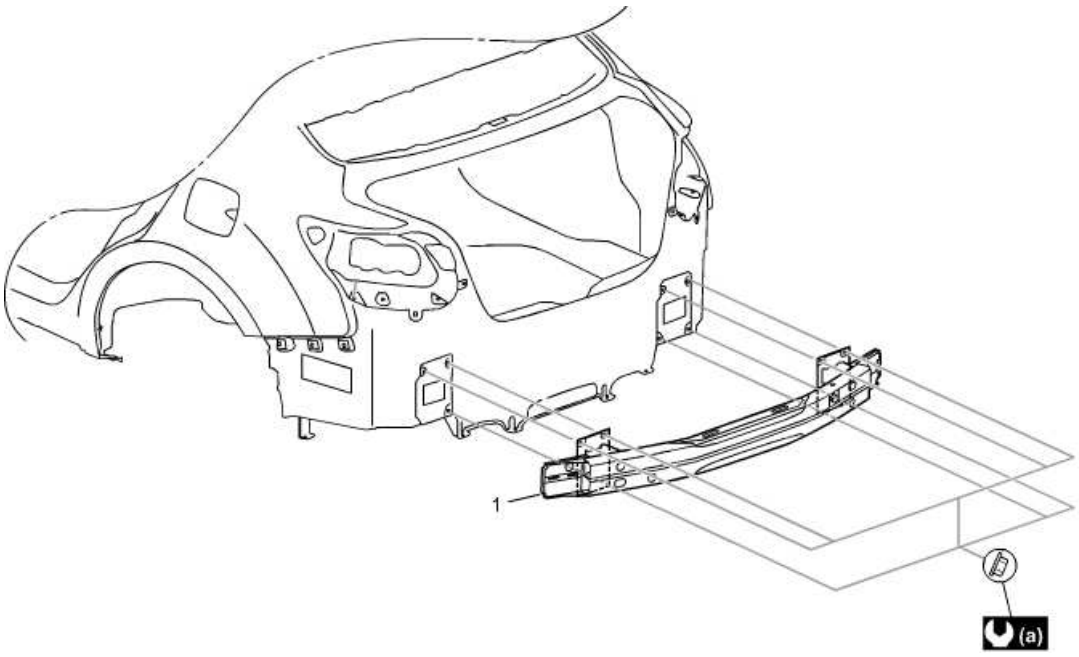


[A]: Rear bumper side holder	3. Rear bumper rear holder	6. Lock
1. Rear bumper	4. Rear bumper side holder	7. Rear bumper absorber
2. Rear bumper exhaust cover	5. Rear fender lining	(a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

9H

Rear Bumper Member Removal and Installation

Remove and install parts referring to figure.



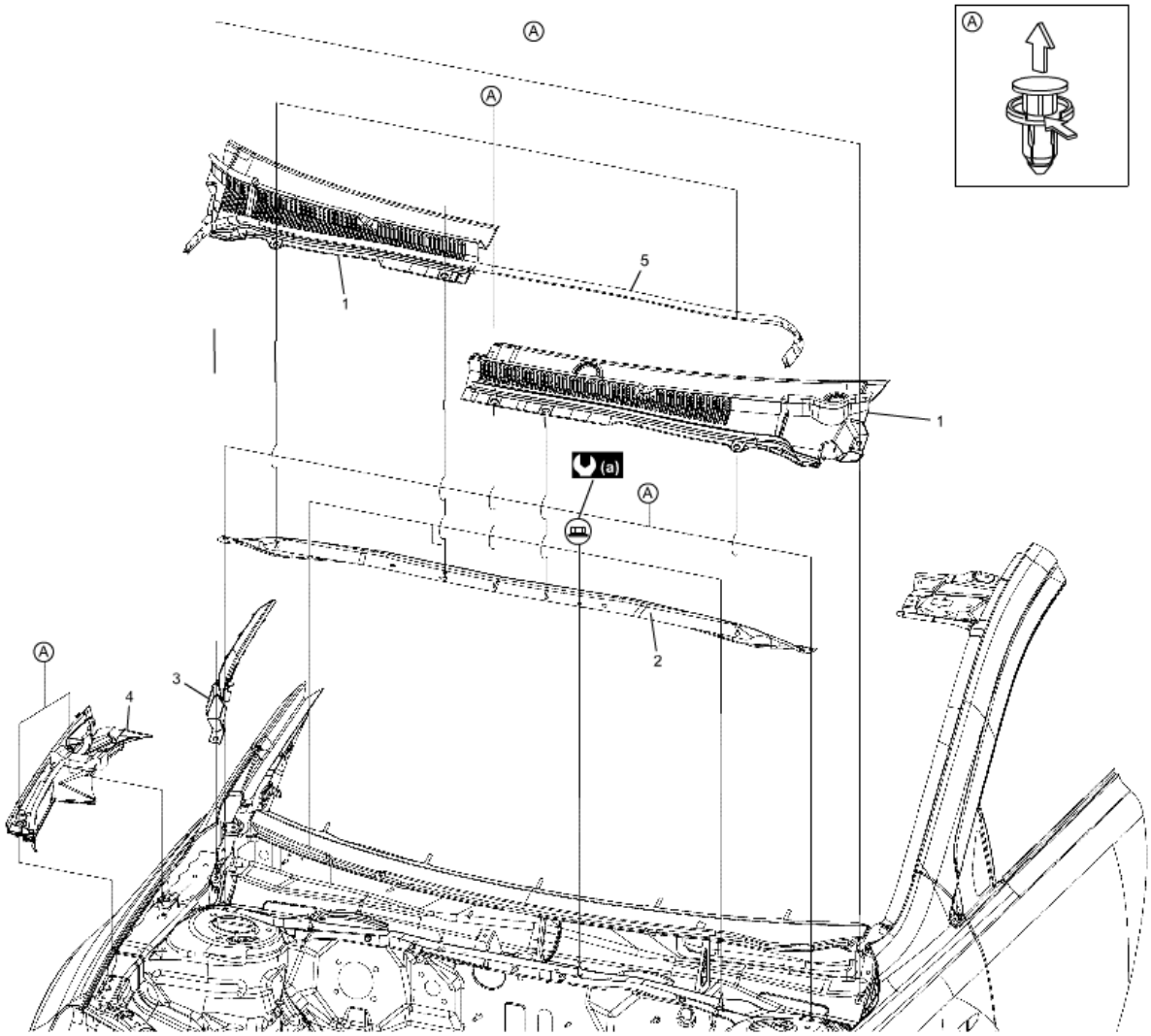
1. Rear bumper member	(a)	29 N·m (3.0 kgf-m, 21.5 lbf-ft)

9H

Front Fender Cover / Cowl Top Garnish Removal and Installation

Removal

1) Remove hood rear No. 1 seal (5).
2) Remove wiper arms. ☞
3) Remove clips and remove front fender front cover (4).
4) Remove clips and remove cowl top garnishes (1).
5) Remove nuts and remove cowl front panel (2).



3.	Cowl top side garnish	(a) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)

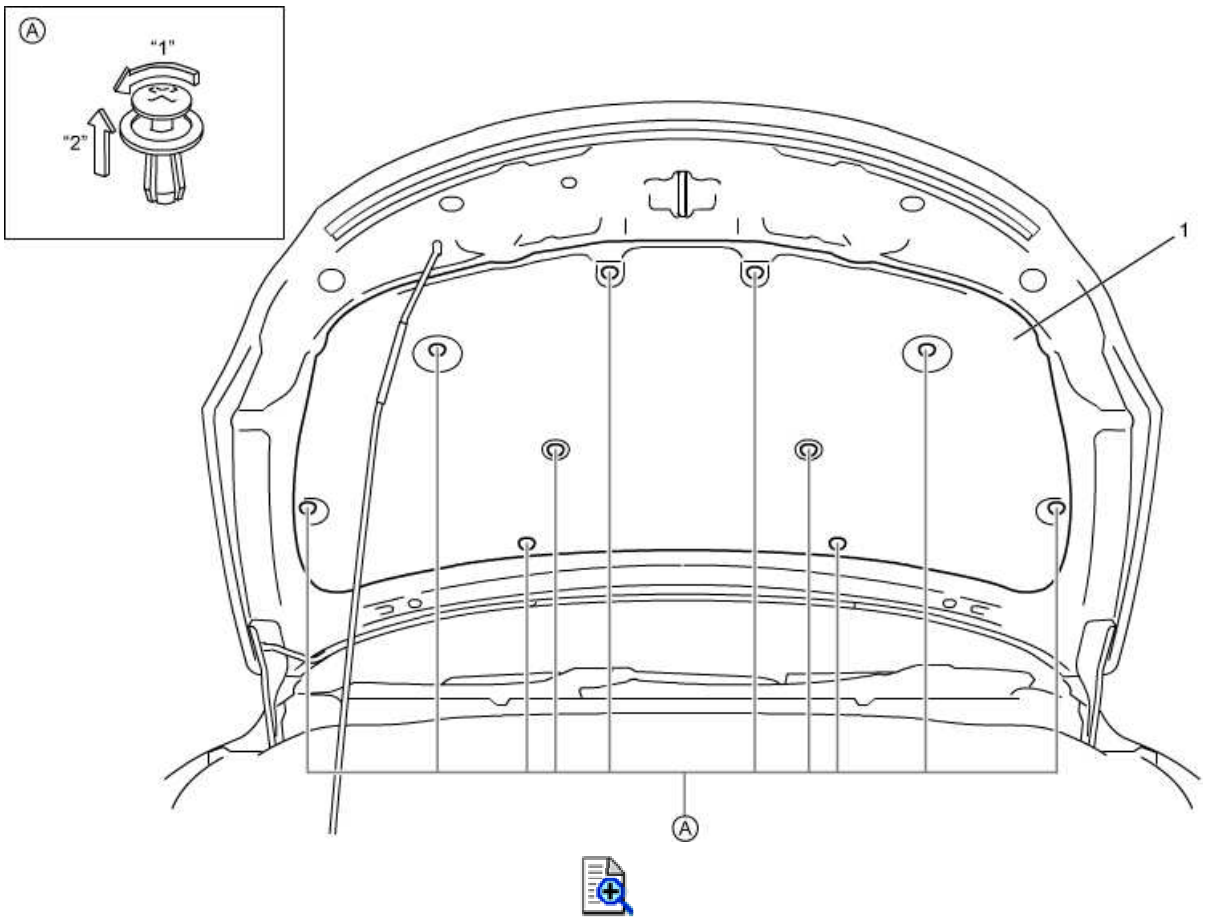
Installation

Reverse removal procedure.

9H

Hood Silencer Removal and Installation

Remove and install parts referring to figure.

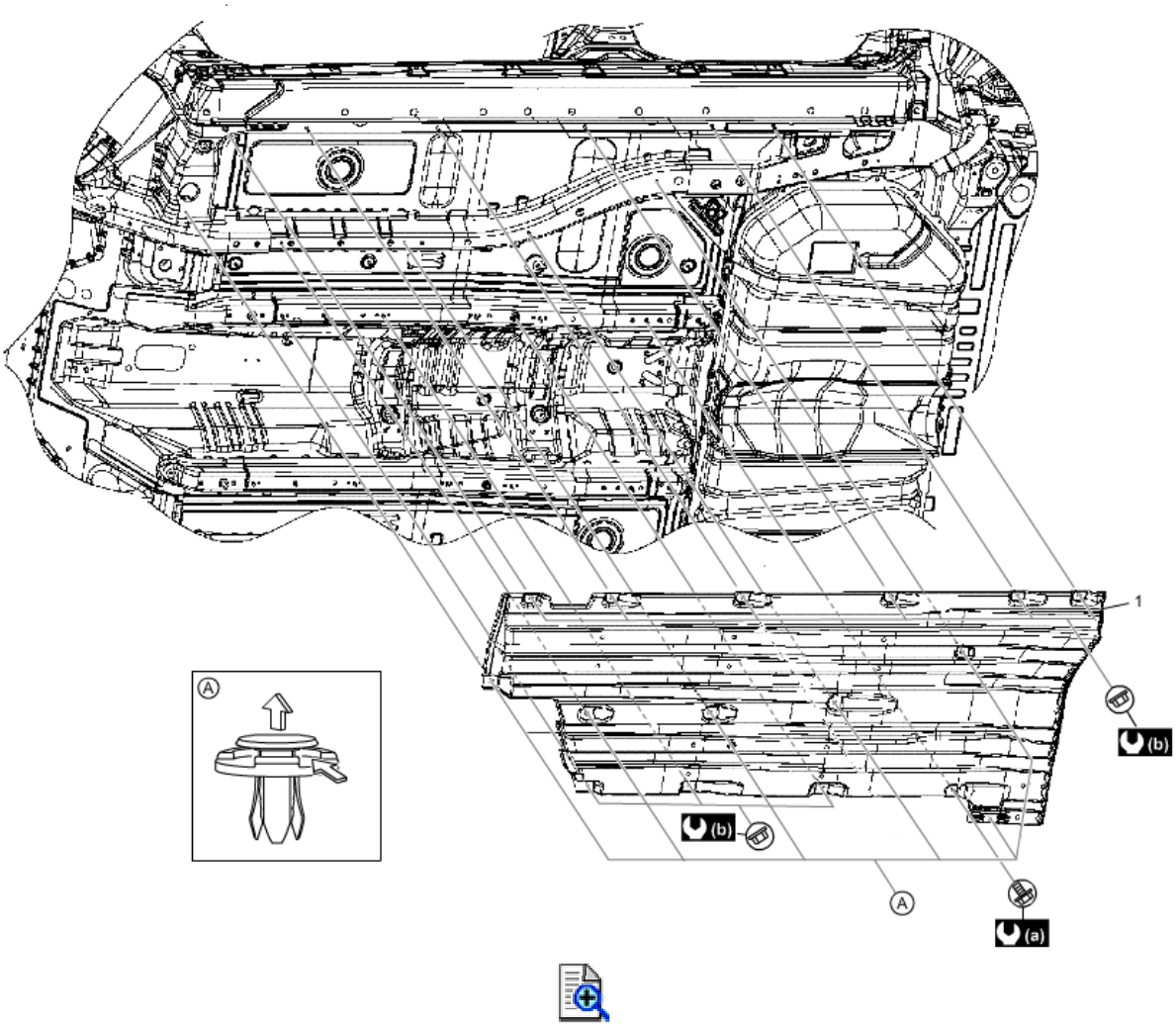


1.	Hood silencer

9H

Main Floor Undercover Removal and Installation

Remove and install parts referring to figure.

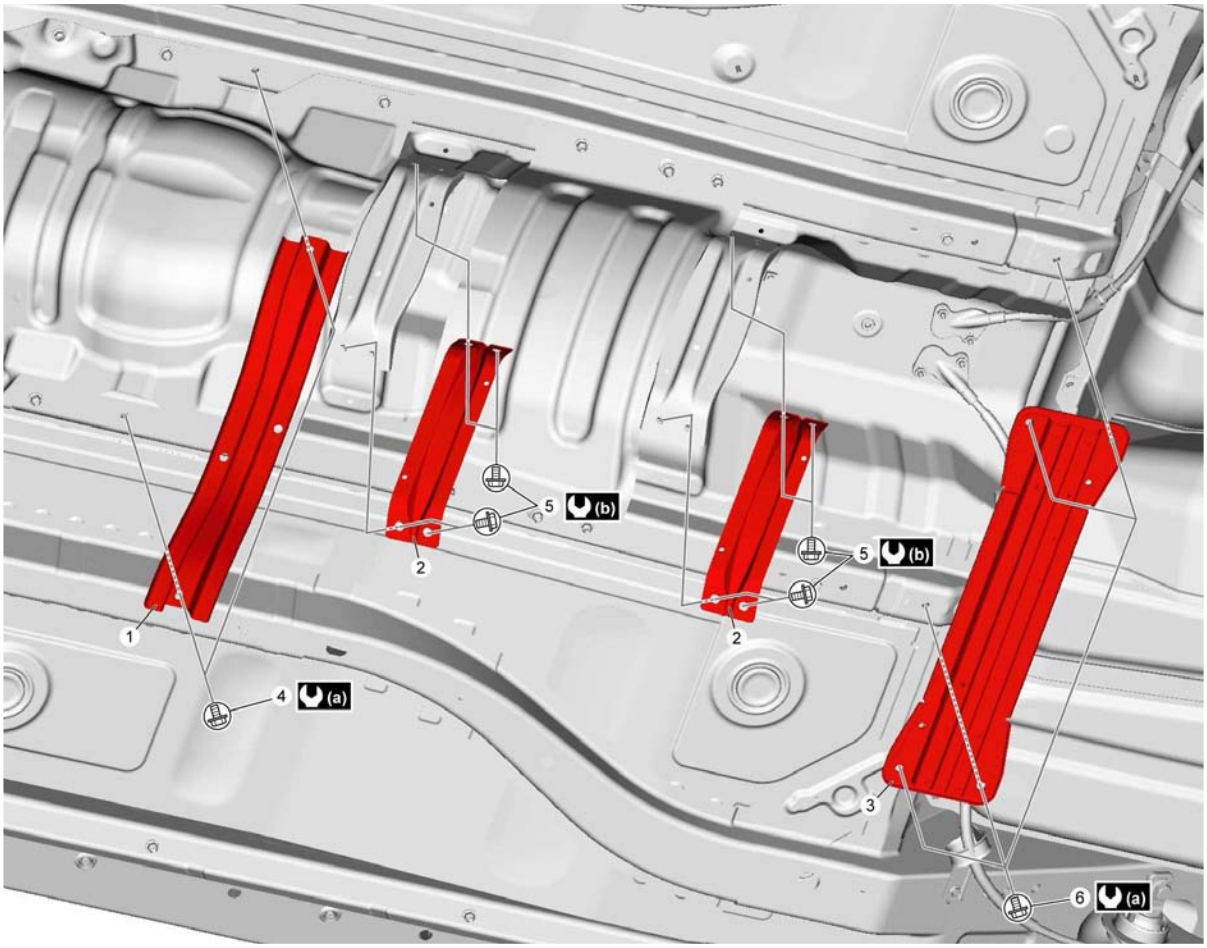


1.	Main floor undercover	(a) :	5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)	(b) :	2.4 N·m (0.24 kgf-m, 2.0 lbf-ft)

9H

Floor Tunnel Front Brace, Floor Tunnel Bar (2WD Model), Floor Tunnel Rear Bar Removal and Installation

Remove and install parts referring to figure.
Remove main floor undercover and exhaust pipe No. 2 if necessary. ☞ / ☞

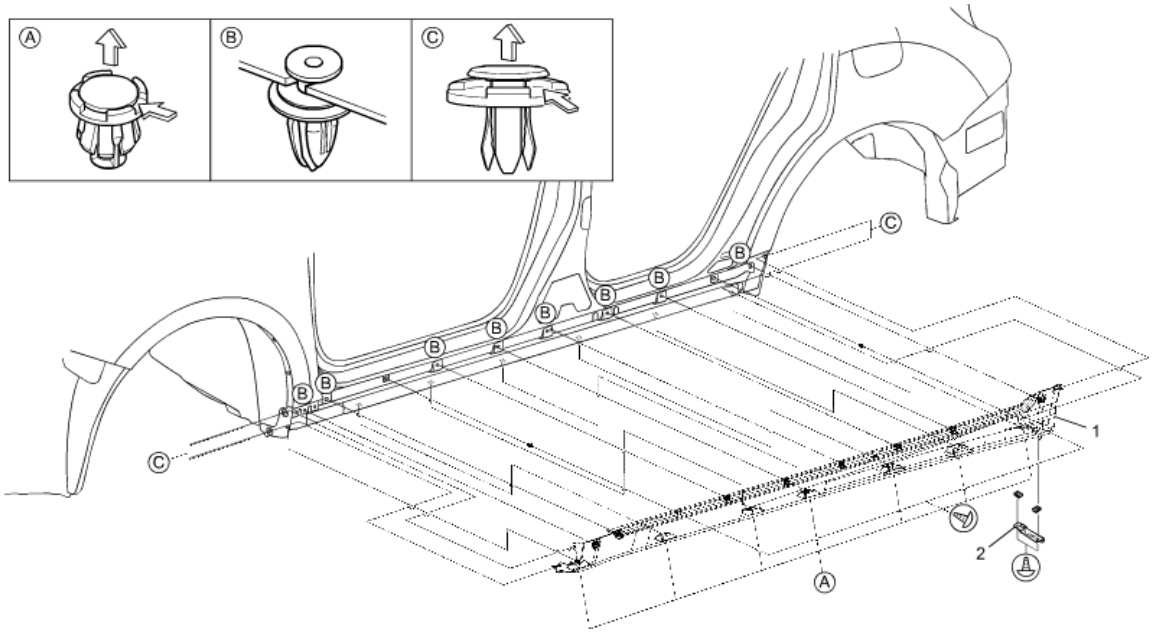


1.	Floor tunnel front brace	4.	Floor tunnel front brace bolt	(a) :	37 N·m (3.8 kgf-m, 27.5 lbf-ft)
2.	Floor tunnel bar (2WD model)	5.	Floor tunnel bar bolt	(b) :	23 N·m (2.3 kgf-m, 17.0 lbf-ft)
3.	Floor tunnel rear bar	6.	Floor tunnel rear bar bolt		

9H

Side Sill Guard Removal and Installation

Remove and install parts referring to figure.

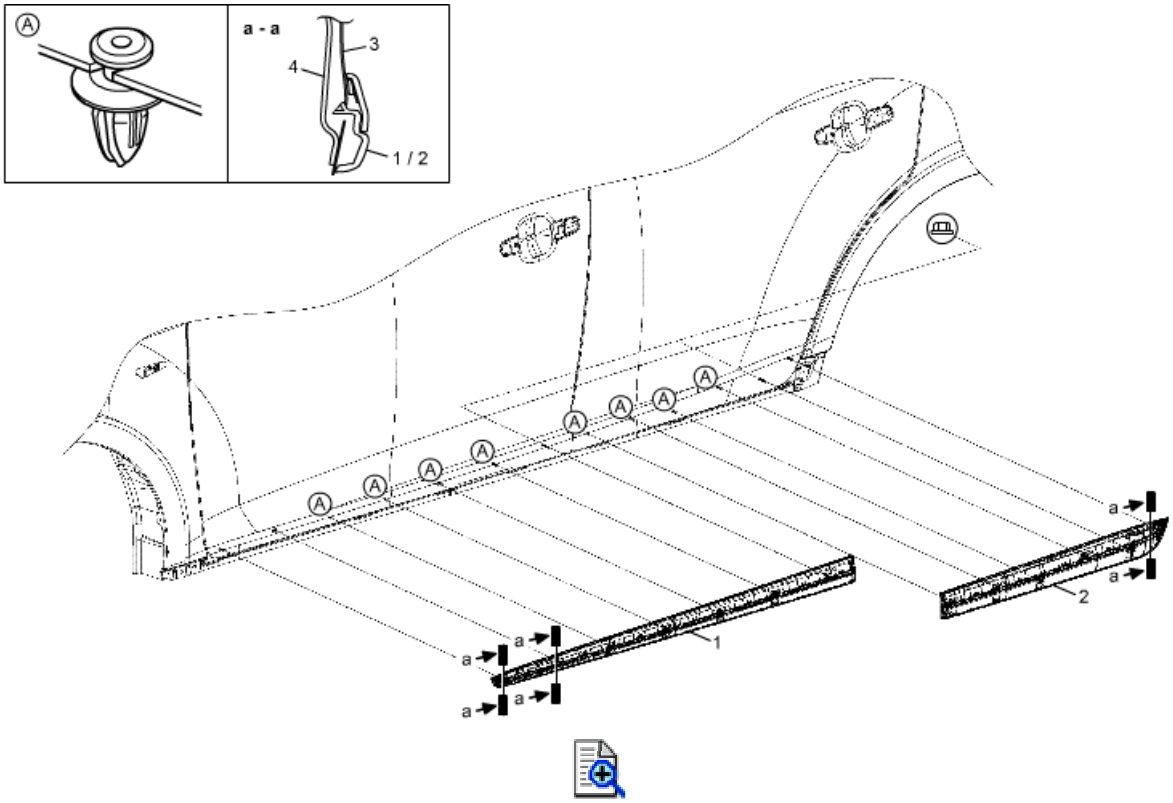


1. Side sill guard	2. Side sill rear strake

9H

Front Door Garnish / Rear Door Garnish Removal and Installation (If Equipped)

Remove and install parts referring to figure.

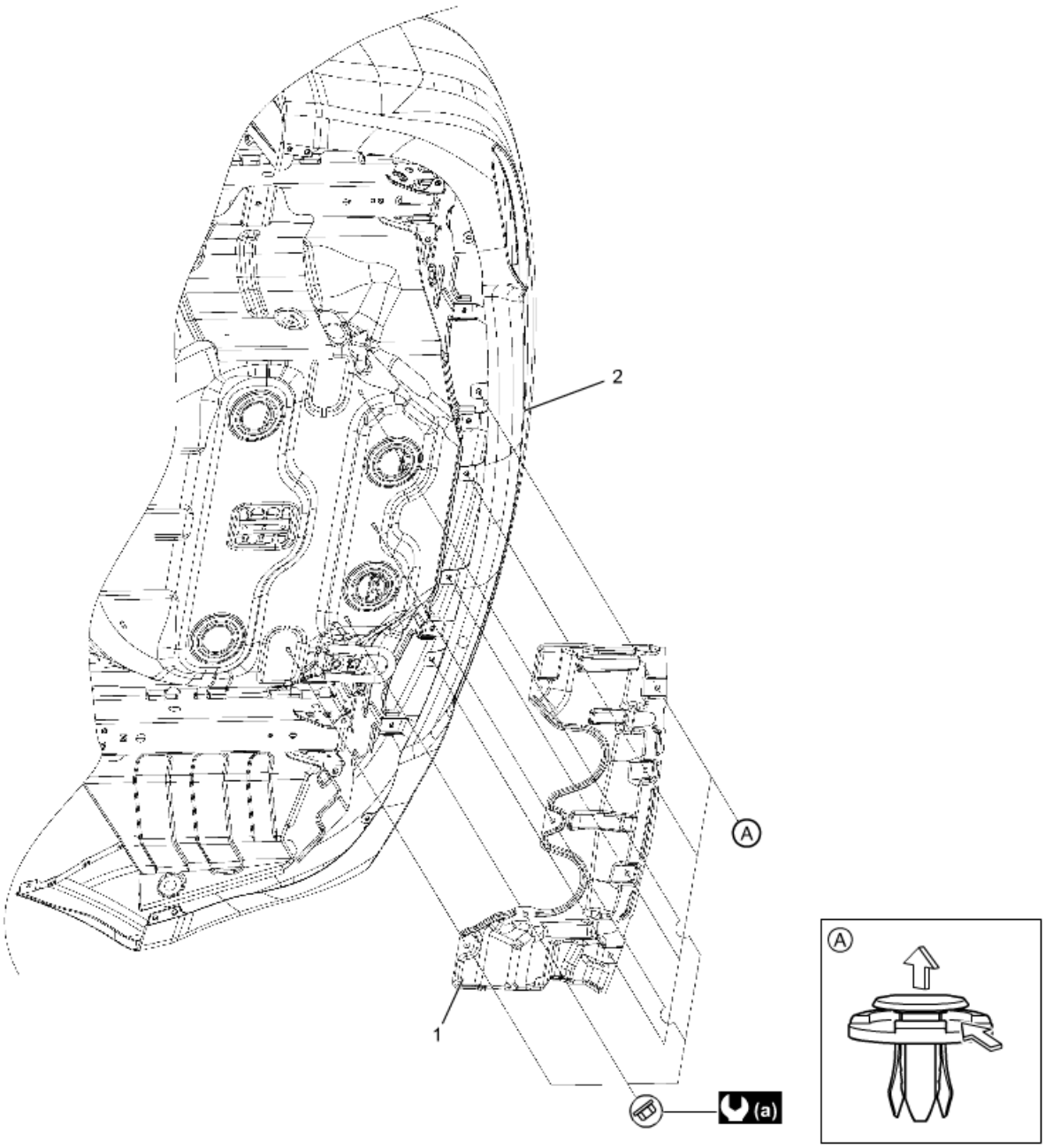


1. Front door garnish	3. Door outer panel
2. Rear door garnish	4. Door inner panel

9H

Rear Bumper Front Cover Removal and Installation

Remove and install parts referring to figure.



1. Rear bumper front cover	2. Rear bumper	(a): 2.4 N·m (0.24 kgf-m, 2.0 lbf-ft)

9H

Rear Spoiler Removal and Installation (If Equipped)

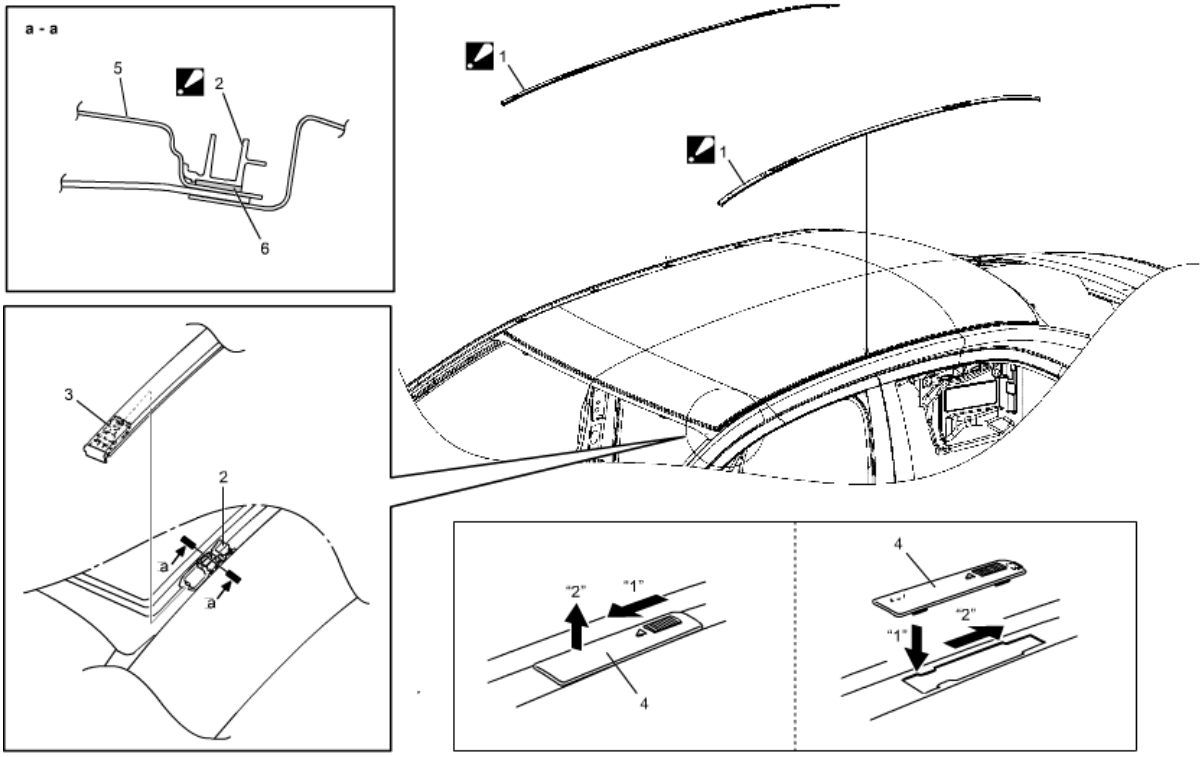
Remove and install parts referring to figure.

1. Rear spoiler	2. Double-stick tape

9H

Roof Molding Removal and Installation

Remove and install parts referring to figure.



1. Roof molding Press down until click is heard to install roof molding and roof molding clip.	3. Positioning rib Align with roof molding positioning location.	5. Roof panel
2. Roof molding clip Install roof molding clips so that they are in close contact with roof panel.	4. Roof molding cap	6. Double-stick tape

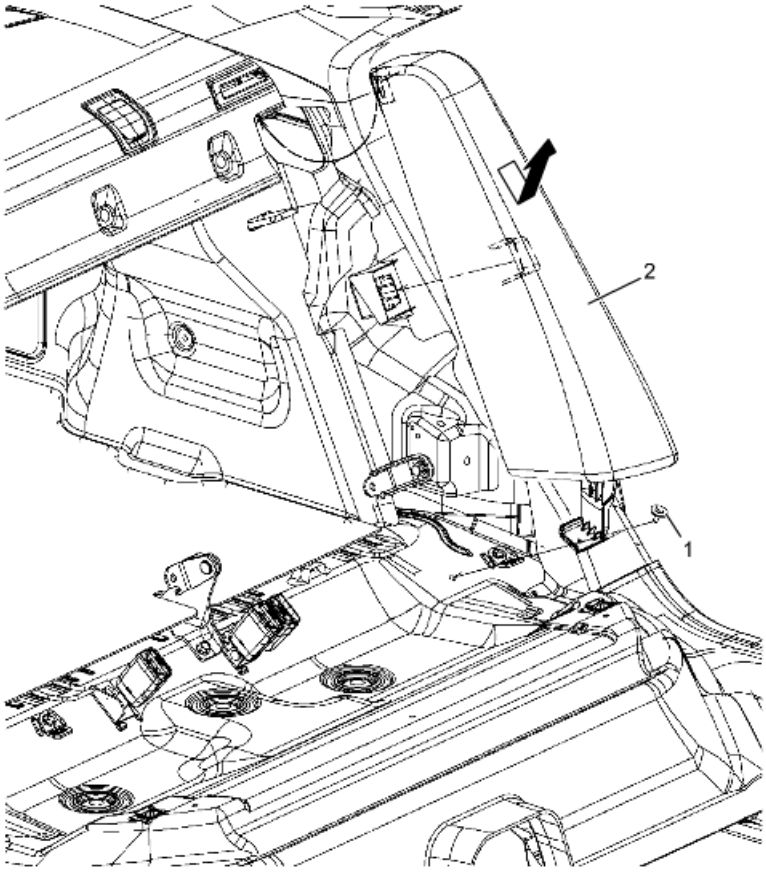
9H

Rear Bolster Removal and Installation

Removal

1) Remove rear seat cushion. ☞

2) Remove rear bolster retaining bolt (1) and remove rear bolster (2) in arrow direction.



Installation

Reverse removal procedure noting the following point.

- Tighten rear bolster retaining bolt to specified torque.

Tightening torque

Rear bolster retaining bolt: 5.5 N·m (0.56 kg-m, 4.0 lbf-ft)

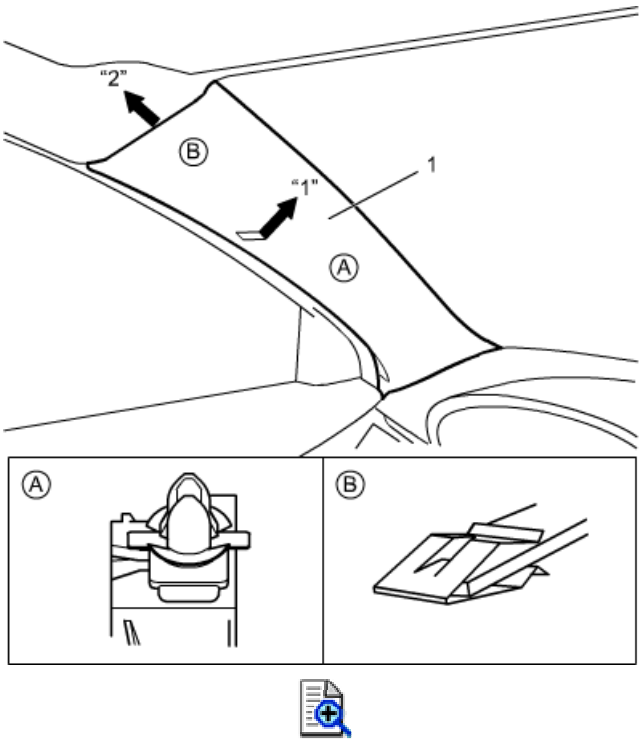
9H

Trim Removal and Installation

Removal

Front pillar trim

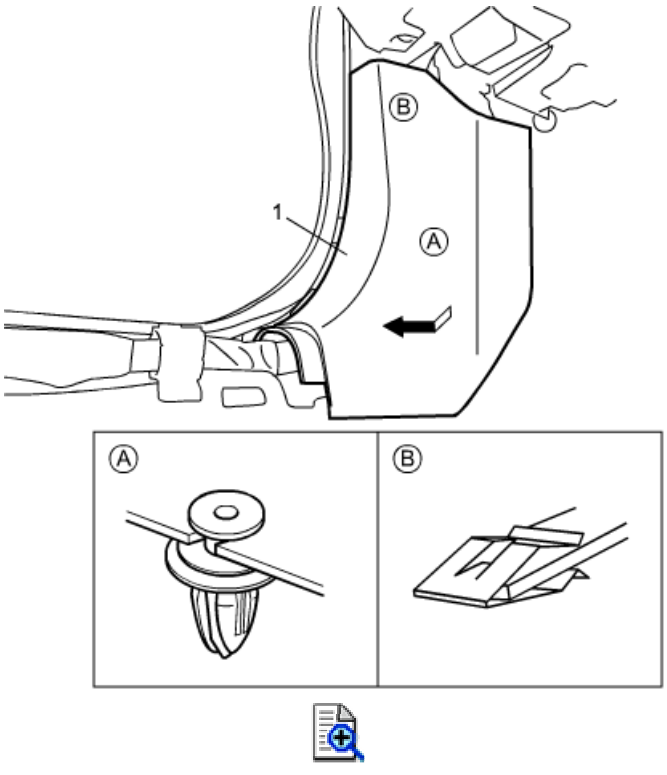
1) Remove front pillar trim (1) by pulling in arrow direction.



Dash side trim

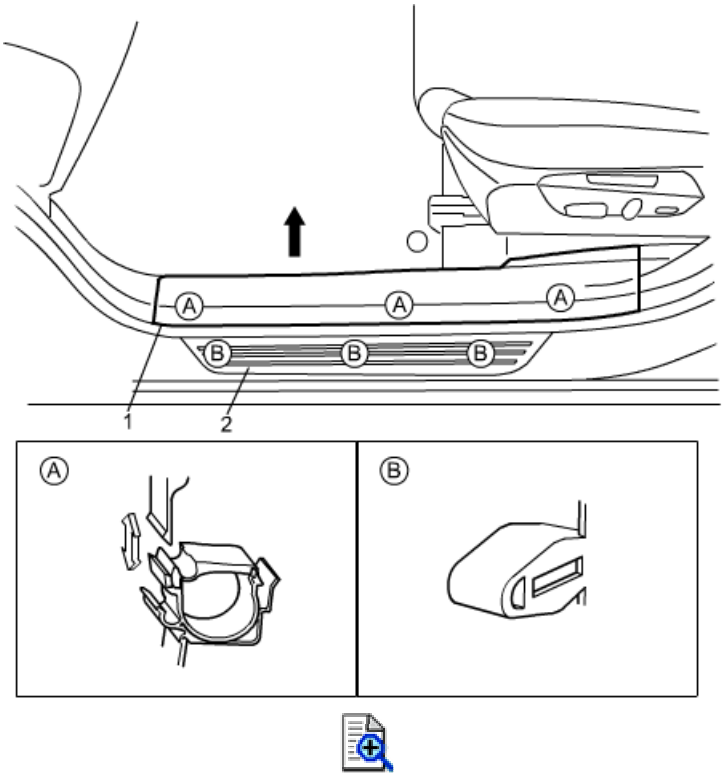
1) Remove side sill inner front scuff.

2) Remove dash side trim (1) by pulling it in arrow direction.



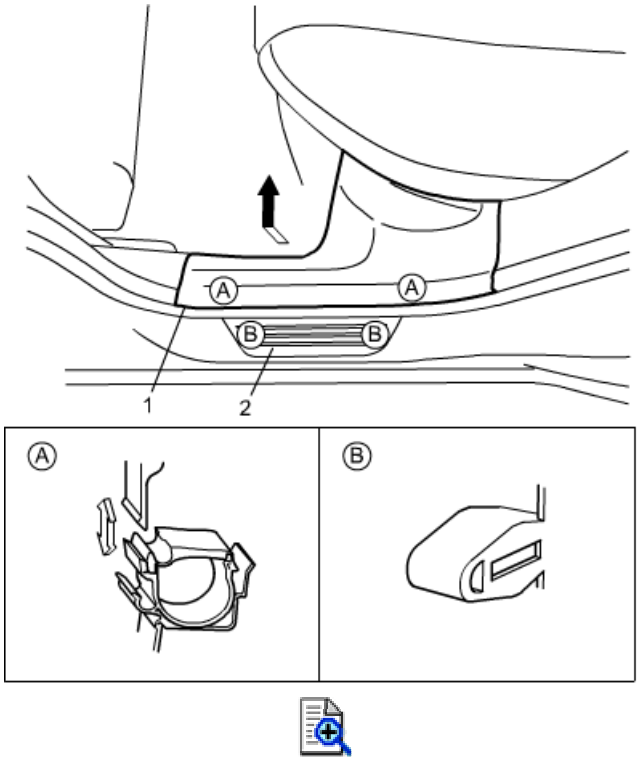
Side sill inner front scuff / Side body outer front scuff

1) Remove side sill inner front scuff (1) by pulling it in arrow direction.
2) Remove side body outer front scuff (2).



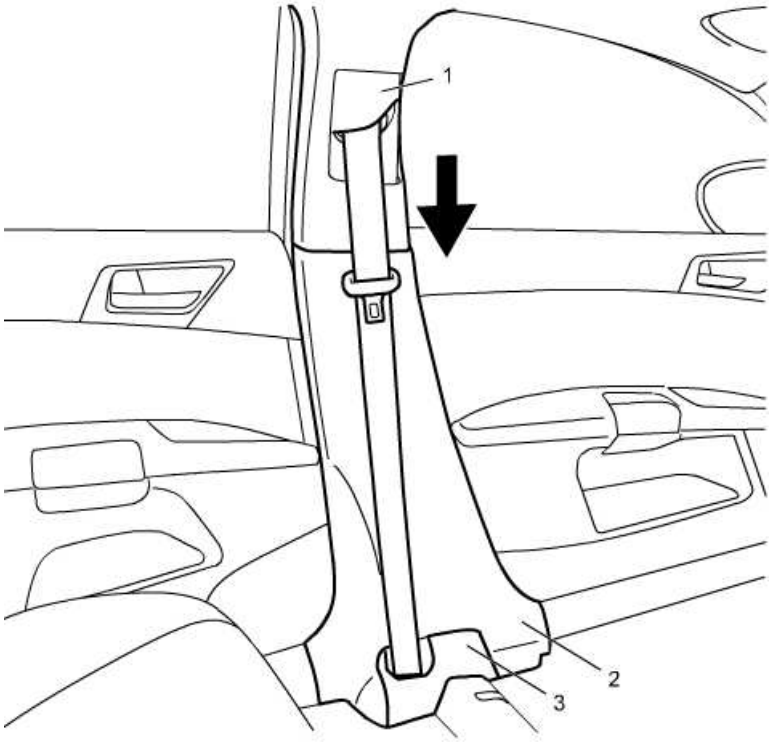
Side sill inner rear scuff / Side body outer rear scuff

1) Remove side sill inner rear scuff (1) by pulling it in arrow direction.
2) Remove side body outer rear scuff (2).

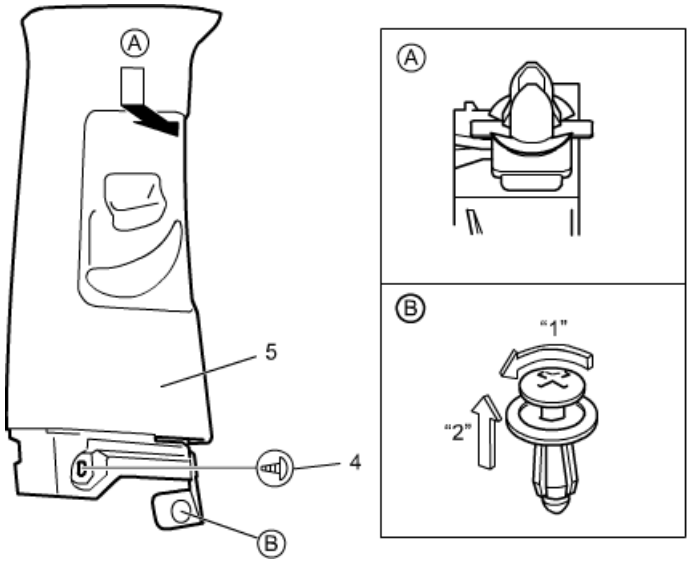


Center pillar upper trim/lower trim

1) Remove side sill inner front scuff and side sill inner rear scuff.
2) Set slider (1) at rear end position.
3) Remove cap (3) of center pillar lower trim.
4) Remove center pillar lower trim (2).



5) Remove seat belt anchor bolt. ☞
6) Remove center pillar upper trim screw (4) and center pillar upper trim (5).

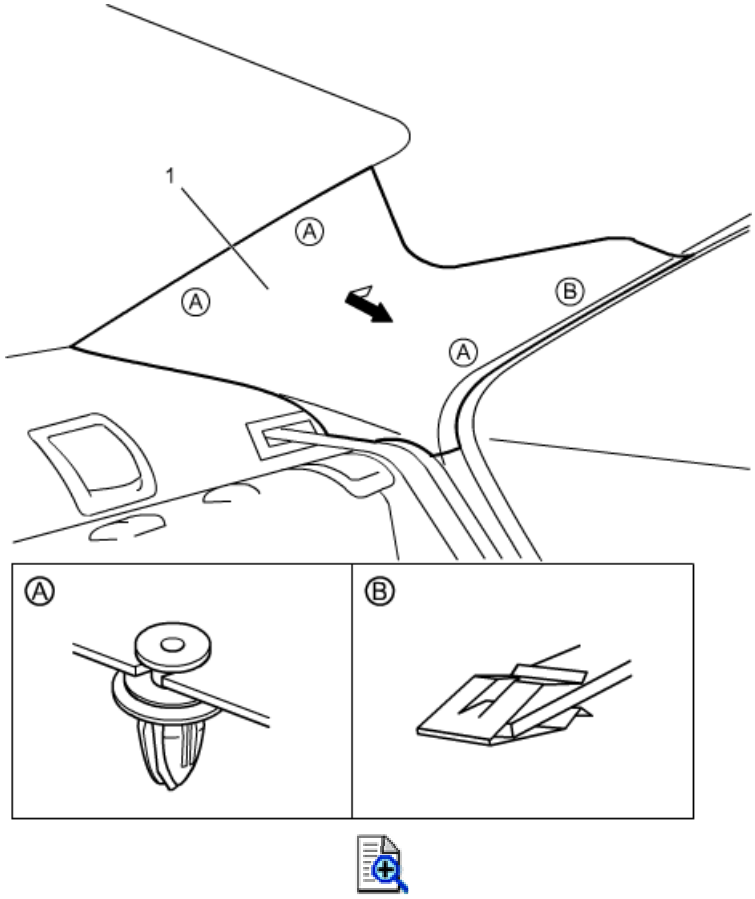


Rear pillar inner trim

1) Remove rear seat cushion. ☞
2) Fold down rear seat.

3) Remove rear bolster. ☞

4) Remove rear pillar inner trim (1) by pulling it in arrow direction.



Partition trim

1) Remove rear seat cushion. ☞

2) Fold down rear seat.

3) Remove rear bolsters. ☞

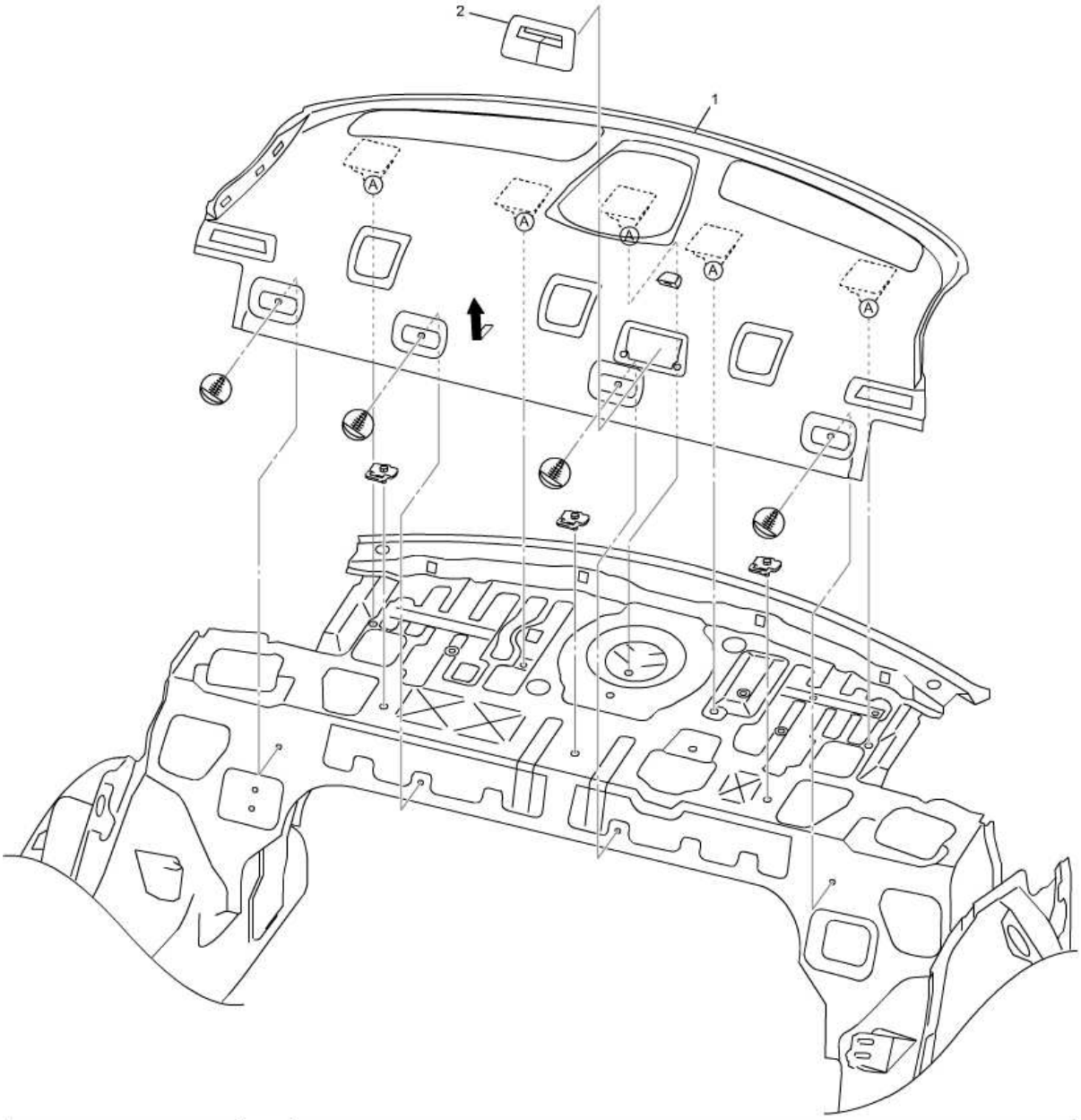
4) Remove rear pillar inner trims. ☞

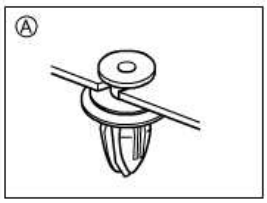
5) Remove rear side air bag (inflator) modules. ☞

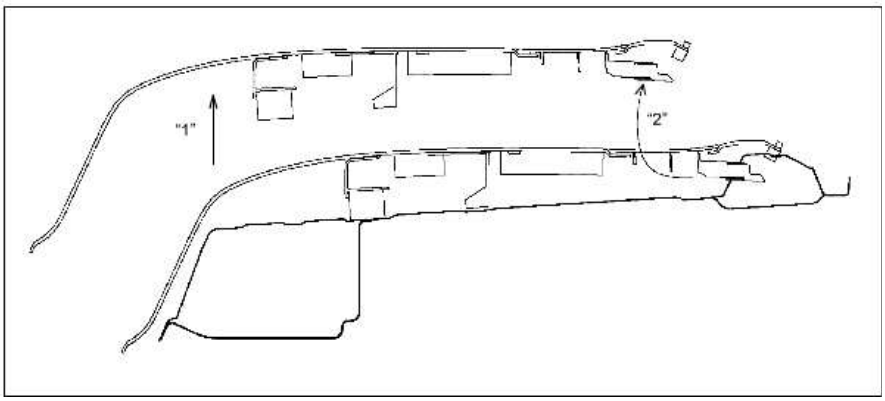
6) Remove seat belt center cover (2).

7) Remove rear seat belt anchor bolts. ☞

8) Remove partition trim (1) by pulling it in arrow direction.







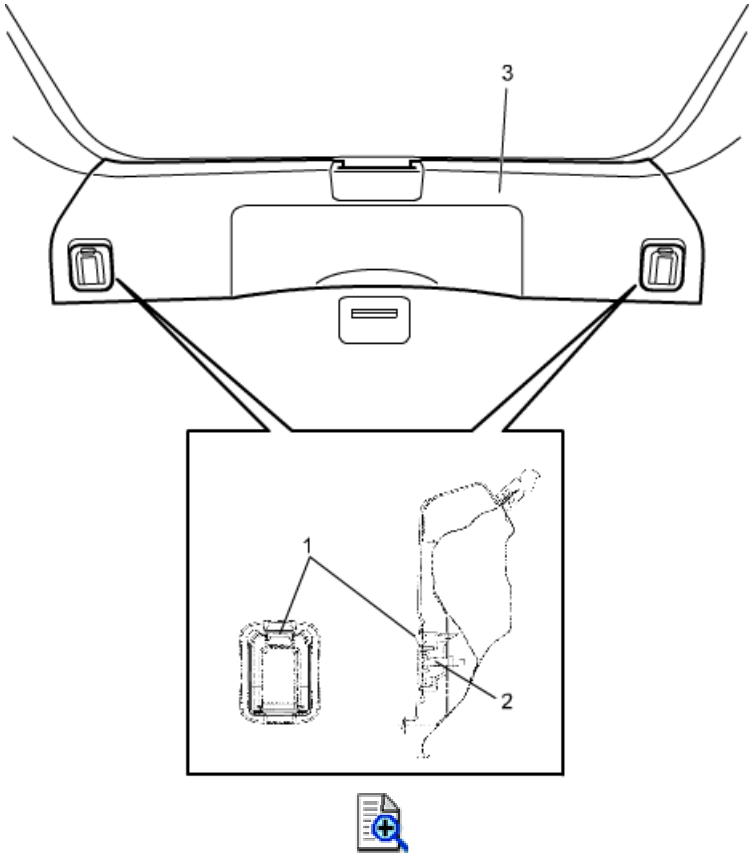
Trunk rear trim

1) Remove trunk lid opening weather-strip. ☞

2) Open cover of cargo net hooks (1).

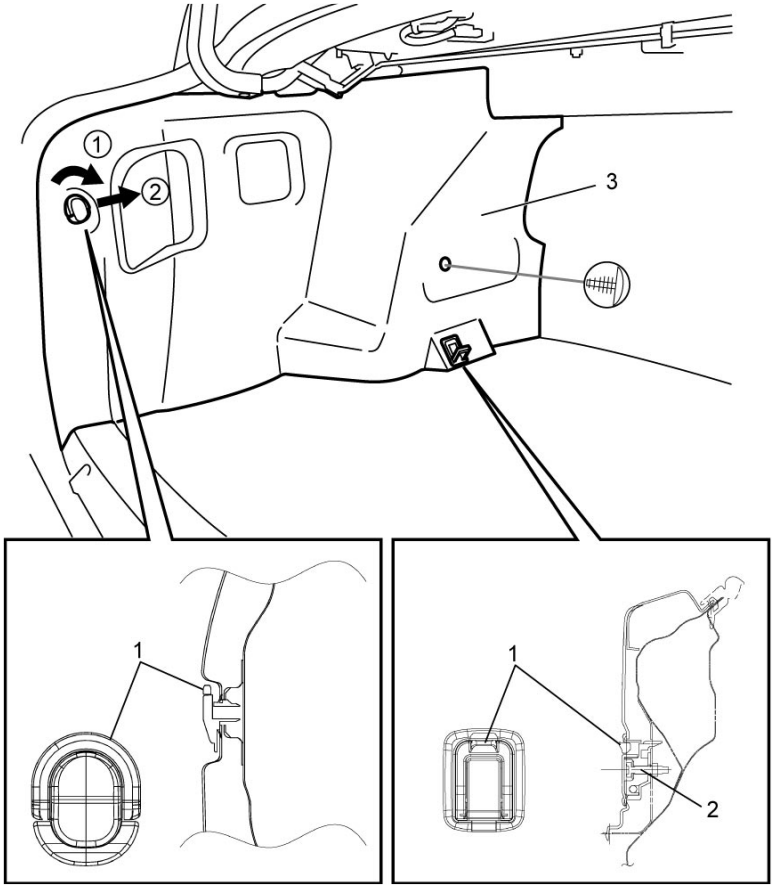
3) Remove cargo net hook screws (2).

4) Remove cargo net hooks.
5) Remove trunk room rear trim (3).



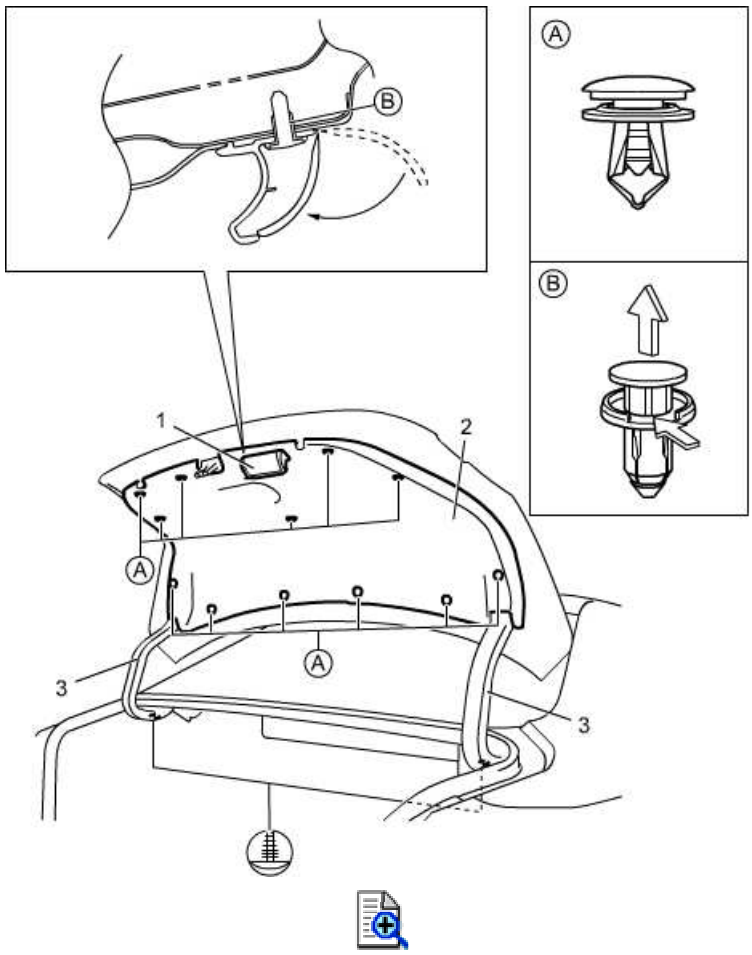
Trunk side trim

1) Remove trunk rear trim. ☞
2) Remove cargo net hooks (1) and cargo net hook screws (2). ☞
3) Remove trunk side trim (3).



Trunk lid trim

1) Remove trunk lid inner handle (1).
2) Remove trunk lid trim (2).
3) Remove trunk lid hinge garnish (3).



Installation

Reverse removal procedure noting the following points.

- Tighten rear seat belt anchor bolts to specified torque. ☞
- Do not pinch roof side air bags when installing front pillar trims.
- Face hook portion upward when installing cargo net hooks.

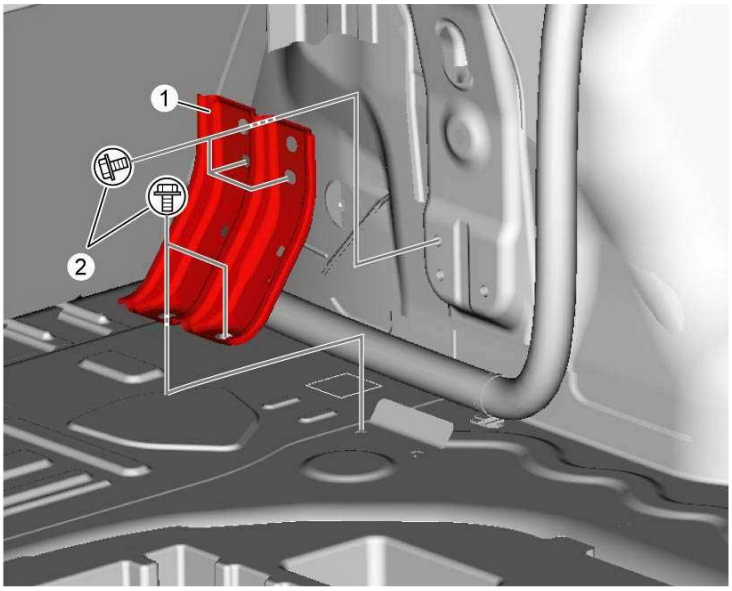
9H

Rear Floor Side Brace Removal and Installation

Removal

1) Remove trunk side trim. ☞

2) Remove rear floor side brace bolts (2) and remove rear floor side brace (1).



Installation

Reverse removal procedure noting the following point.

- Tighten rear floor side brace bolts to specified torque.

Tightening torque

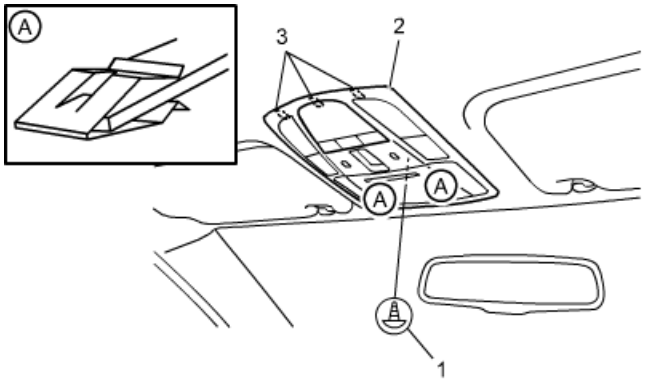
Rear floor side brace bolt: 30 N·m (3.1 kg-m, 22.5 lbf-ft)

9H

Overhead Console Box Removal and Installation

Removal

1) Remove screw (1).
2) Remove clips at front side of vehicle.
3) Release claws (3) from roof lining and remove overhead console box (2).
4) Disconnect connectors from overhead console box.



Installation

Reverse removal procedure.

9H

Floor Carpet Removal and Installation

Removal

1) Remove seat.
- Front seat: ☞
- Rear seat: ☞

2) Remove side sill inner front, side sill inner rear scuffs, dash side trims and center pillar lower trims. ☞

3) Remove center console box. ☞

4) Remove instrument panel undercover. ☞

5) Remove 4 clips and remove floor carpet.

Installation

Reverse removal procedure noting the following point.
- Tighten mounting bolts of each seat to specified torque. ☞ / ☞

9H

Roof Lining Removal and Installation

Removal

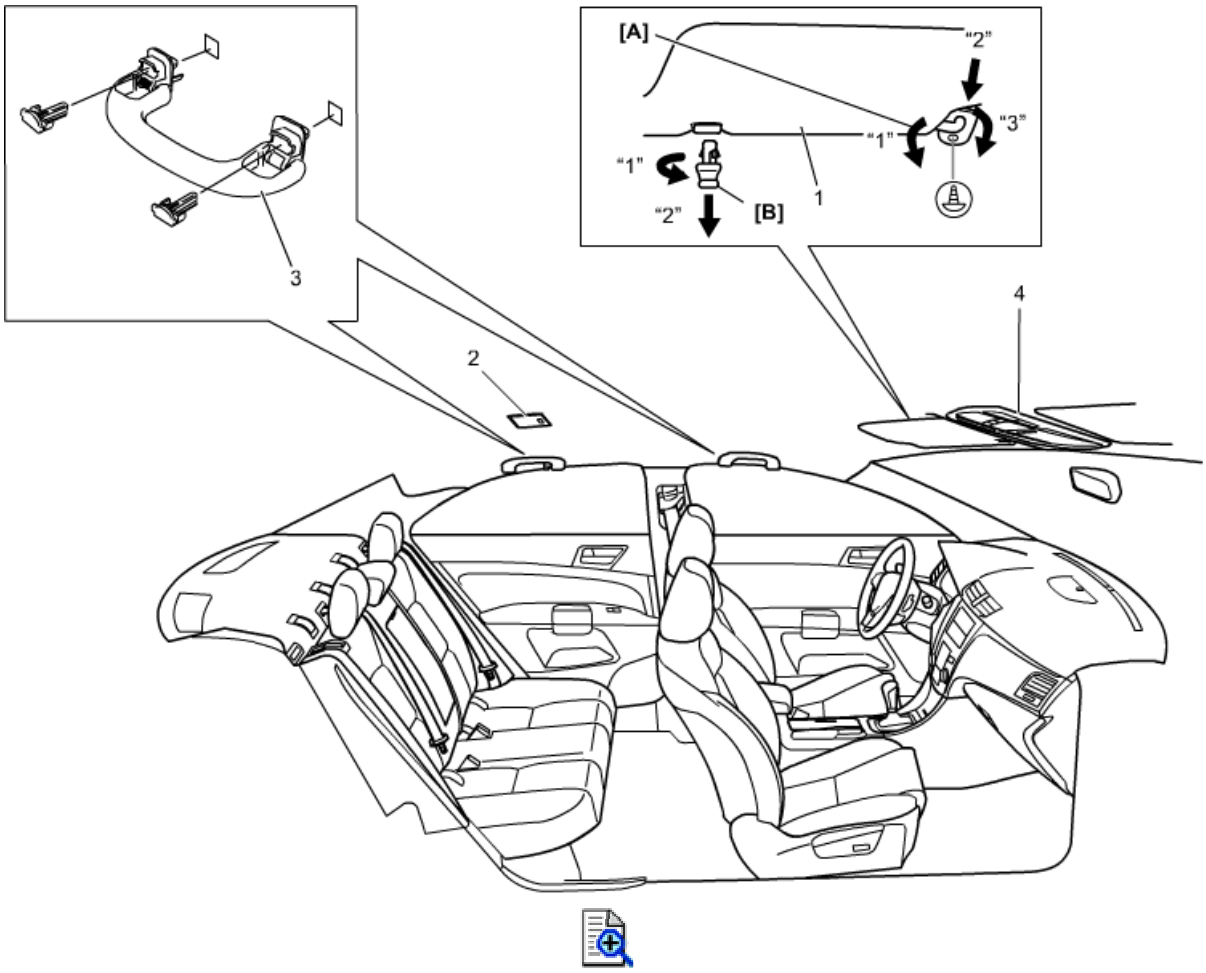
1) Disable air bag system. ☞

2) Remove sun visors (1) and disconnect vanity mirror light connectors.

3) Remove overhead console box (4) and rear dome light (2). ☞ / ☞

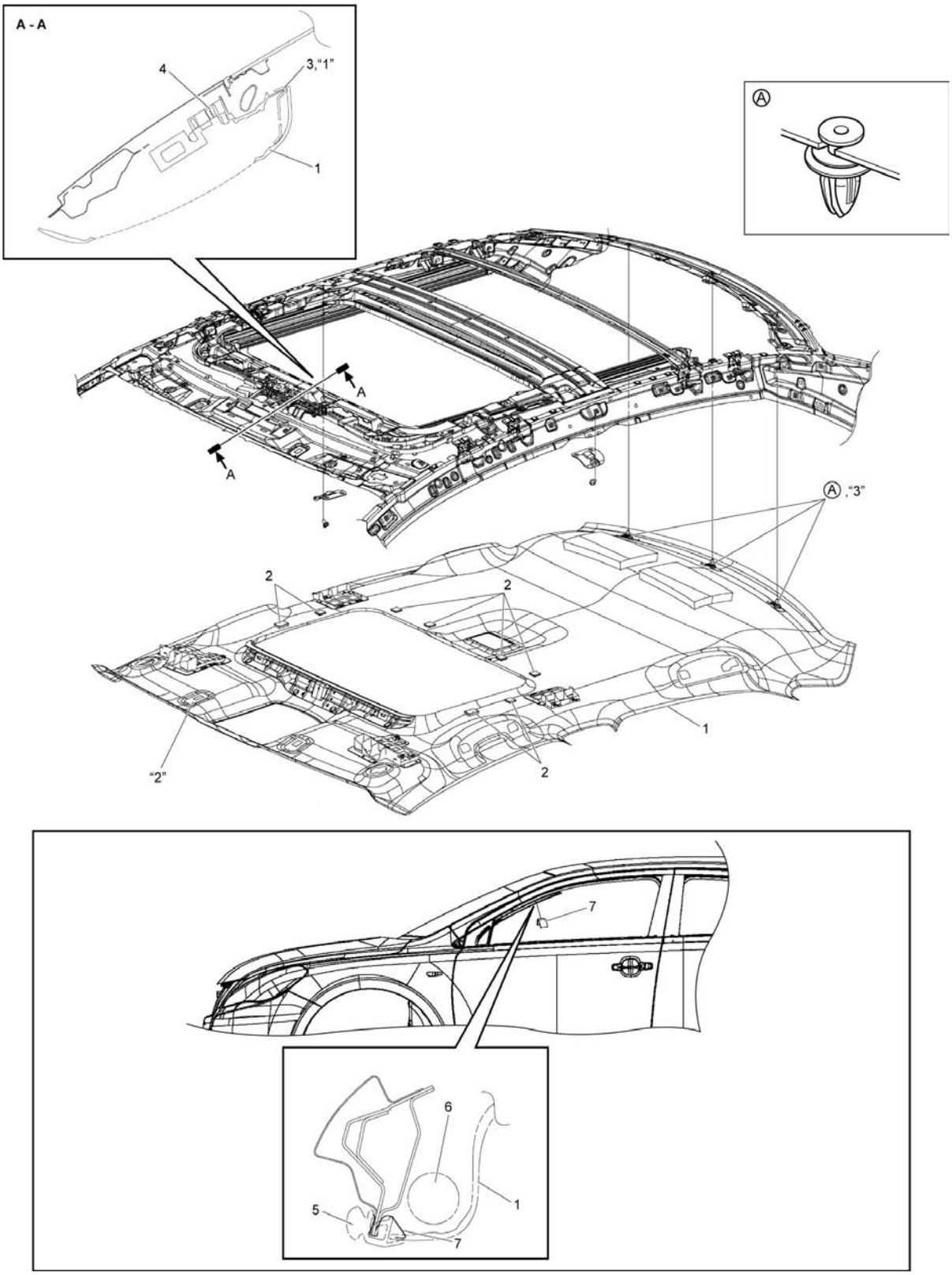
4) Remove front pillar trims, center pillar upper trims/lower trims and rear pillar inner trims. ☞

5) Remove assist grips (3).



[A]:	Turn visor by 90°.
[B]:	Remove with sun visor holder in [A] condition.

6) Remove roof lining.



1. Roof lining Install roof lining in the order of "1" → "3"	4. Sun roof unit	7. Roof lining holder

2. Dual lock fastener	5. Front door opening trim	
3. Headlining roof bracket	6. Roof side air bag module assembly	

7) Remove windshield if necessary. ☞

Installation

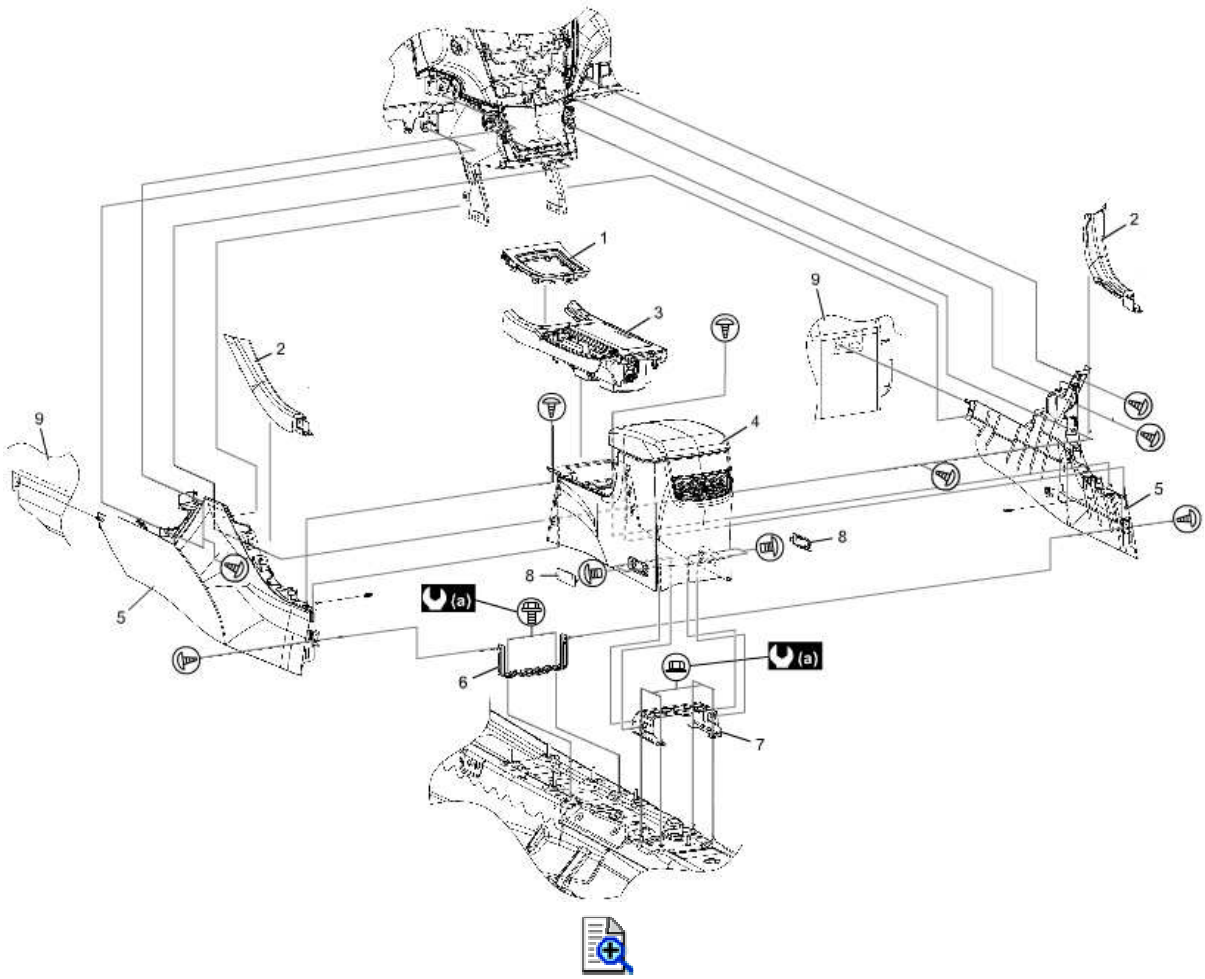
Reverse removal procedure noting the following point.

- Enable air bag system. ☞

9H

Center Console Box Removal and Installation

Remove and install parts referring to figure.



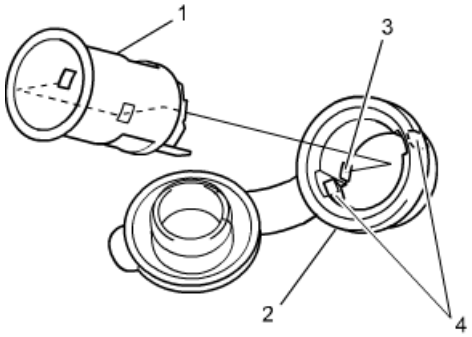
1. Gearshift garnish	5. Floor console panel front panel	9. HVAC unit
2. Floor console front garnish	6. Floor console box front bracket	(a): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3. Console rear panel	7. Floor console box rear bracket	
4. Floor console rear	8. Floor console rear cap	

9H

Accessory Socket Removal and Installation

Removal

1) Push claws (3) outward and pull out inner part (1) of accessory socket.
2) Push claws (4) inward and pull out outer cover (2) of accessory socket.



Installation

Reverse removal procedure.

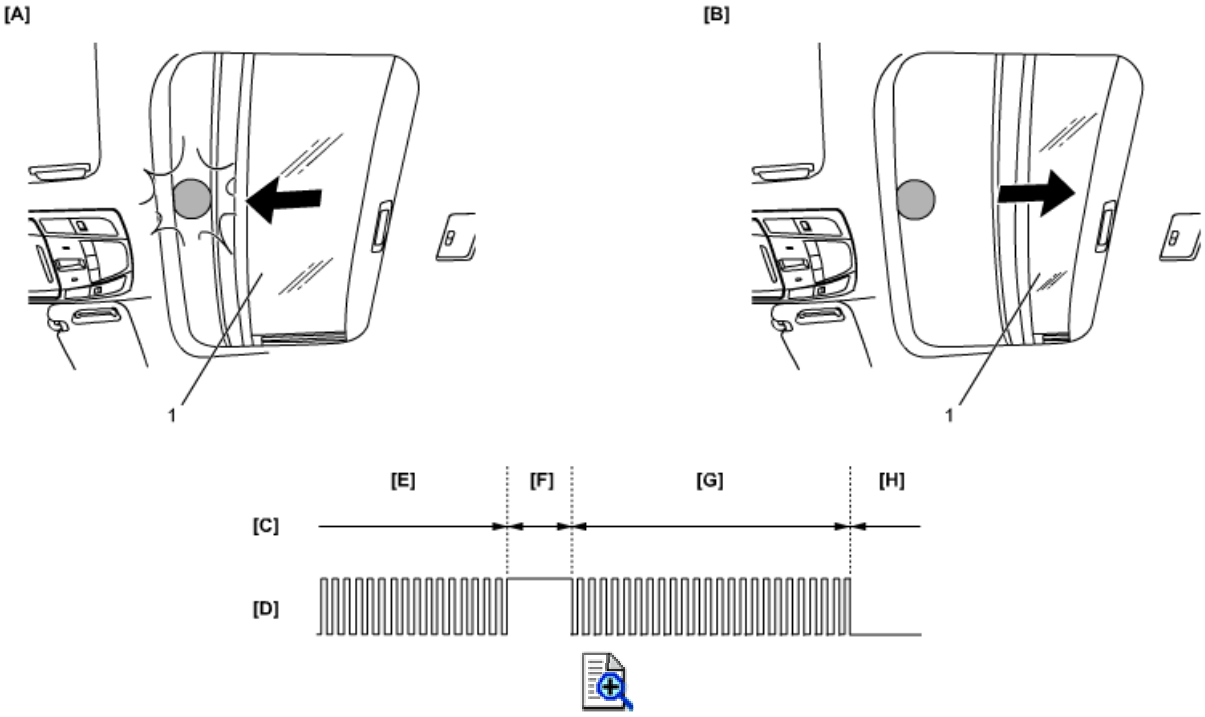
9I

Description of Anti-Pinching Function

The anti-pinching function reverses and then stops the auto-slide-closing sun roof when a load exceeding the preset value is applied to the sun roof glass due to pinching of something, etc.

Reverse Operation Stroke of Anti-Pinching Function

When a load exceeding the preset value is applied to the auto-slide-closing sun roof glass, it reverses by approx. 200 mm (7.87 in.).
The sun roof glass stops its motion if it opens fully before moving 200 mm (7.87 in.).



[A]: Pinching some object (during auto closing)	[D]: Pulse signal	[G]: Auto reverse (about 200 mm (7.87 in.))
[B]: Auto reverse	[E]: Closing	[H]: Stopping
[C]: Sun roof glass	[F]: Pinching	

Sun Roof Fail-Safe Function

The control module in sun roof motor stops auto sliding and auto tilting when the following errors are detected.

Fail-safe condition

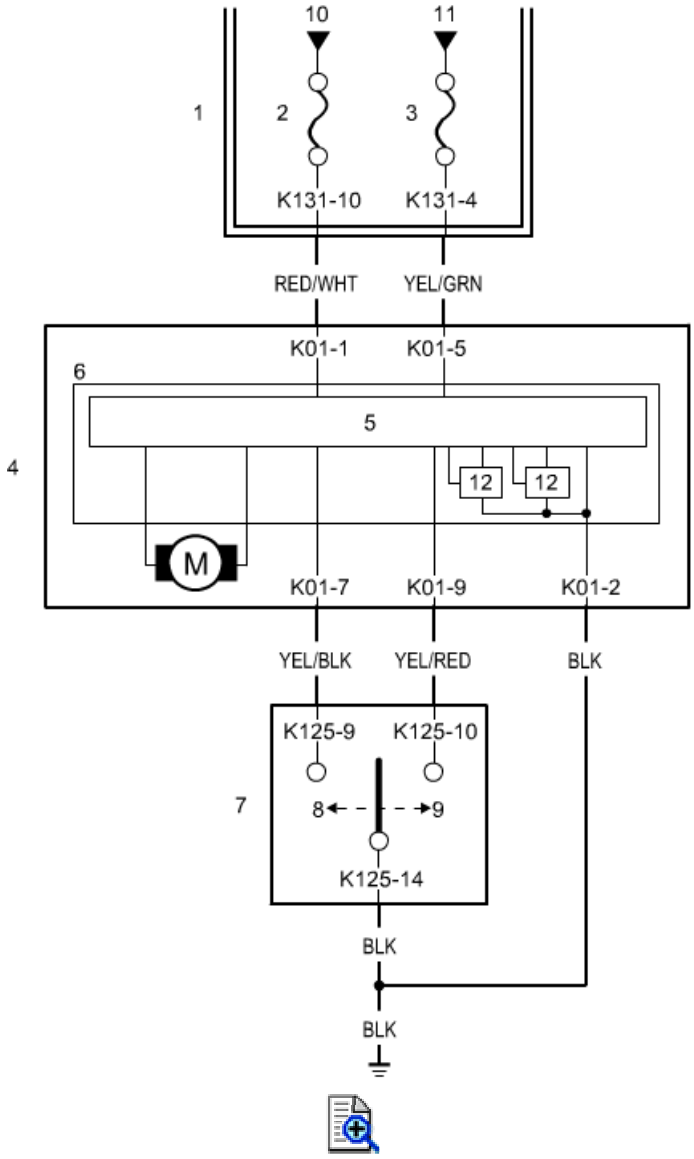
Sensor pulse count exceeds memorized MAX position data.
There is no signal from one sensor while there is signal from another sensor.

Fail-safe cancel condition

After initialization of sun roof motor.

9I

Sun Roof System Circuit Diagram



1. J/B	5. CPU	9. TILT UP
2. "S/R" fuse	6. Sun roof control module	10. Relay box No. 1
3. "IG2 SIG" fuse	7. Sun roof switch	11. IG2 relay
4. Sun roof motor	8. SLIDE OPEN	12. Magnetic sensor

9I

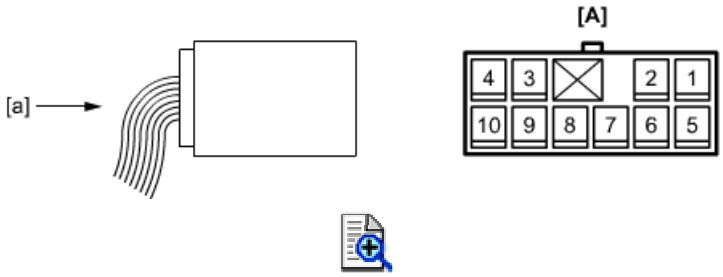
Inspection of Sun Roof Motor and Circuit

Voltage Check

1) Remove overhead console (with connector still connected). ☞

2) Check voltage using circuit tester.

NOTE:
- **Confirm that battery voltage is 11 V or more.**
- **An "ignition mode" in the following table represents a power supply mode available with the keyless push start system. For more details, refer to *Description of Keyless Engine Start Function*.**



[A]: Sun roof unit connector (View: [a])

K01 connector

Terminal No.	Wire color	Circuit	Normal voltage	Condition
1	RED/WHT	Power source	Approx. 12 V	Ignition mode "OFF, ACC or ON"
2	BLK	Ground for sun roof control module	Approx. 0 V	Ignition mode "OFF, ACC or ON"
5	YEL/GRN	IG1 power source	Approx. 12 V	Ignition mode "ON"
			Approx. 0 V	Ignition mode "OFF or ACC"
7	YEL/BLK	Sun roof switch (SLIDE OPEN)	Approx. 0 V	Ignition mode "ON" and "SLIDE OPEN"-side of sun roof switch is pressed
			Approx. 12 V	Ignition mode "ON" and "SLIDE OPEN"-side of sun roof switch is not pressed
9	YEL/RED	Sun roof switch (TILT UP)	Approx. 0 V	Ignition mode "ON" and "TILT UP"-side of sun roof switch is pressed
			Approx. 12 V	Ignition mode "ON" and "TILT UP"-side of sun roof switch is not pressed

9J

Hood Removal and Installation

Removal

CAUTION:
Cover the vehicle body with cloth to prevent any damage.

1) Disconnect washer hose (1).
2) Remove 4 hood hinge bolts (2) to detach hood (3).
3) Remove hood hinge, after removing front fender if necessary. ☞

Installation

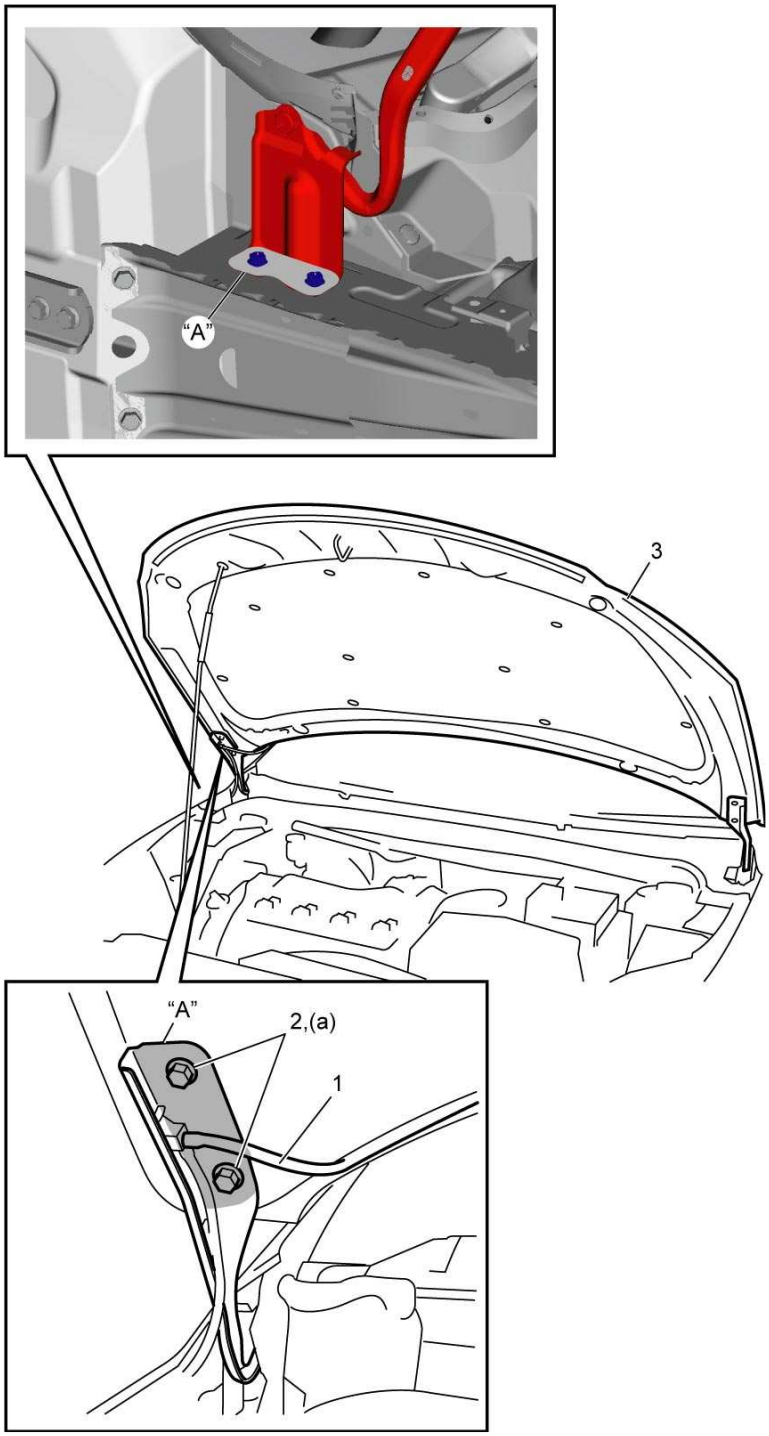
Reference: Hood Inspection and Adjustment
Reverse removal procedure noting the following points.

- Apply sealant to contact face "A" of hood hinge.

  "A": Sealant 99000–31110 (SUZUKI Bond No.1215)

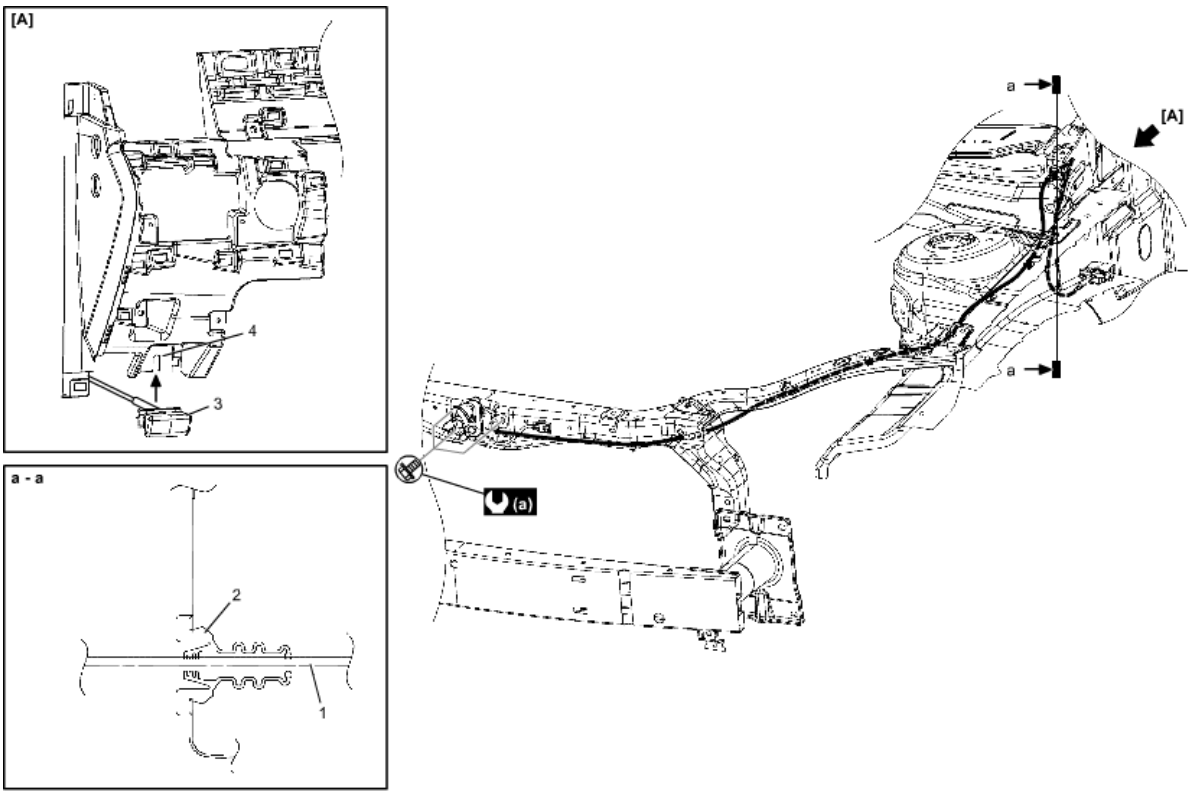
- Adjust hood lock position if necessary. ☞
- Tighten hood hinge bolts to specified torque.

Tightening torque
Hood hinge bolt (a): 10 N·m (1.0 kg-m, 7.5 lbf-ft)


"A"
3
"A"
2,(a)
1

9J

Hood Lock Release Cable Components



1. Hood lock release cable	4. Instrument panel
2. Grommet	(a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
3. Hood lock release lever	

9J

Front Fender Removal and Installation

Reference: Front Fender Components

Removal

1) Remove front bumper and front bumper holder. ☞
2) Remove cowl front fender cover, cowl top garnish and cowl top side garnish. ☞
3) Remove headlight unit. ☞
4) Remove side turn signal light. ☞
5) Remove side sill guard. ☞
6) Remove front fender lining.
7) Remove front pillar outer garnish.
8) Remove front fender and front fender rear pad.

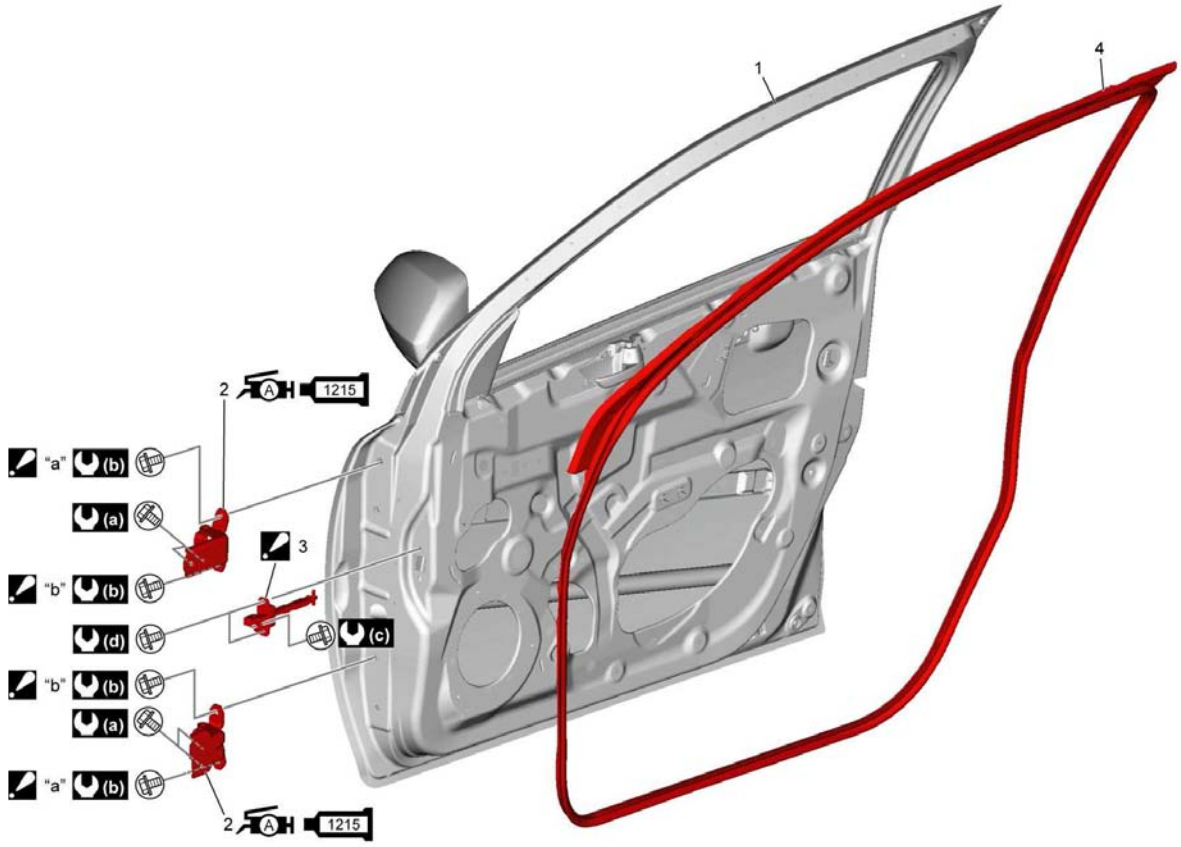
Installation

Reverse removal procedure noting the following points.

- Adjust front fender panel clearance. ☞
- Tighten front fender bolts to specified torque. ☞
- If paint on front fender bolts is peeled off, be sure to apply paint again to prevent rust.
- Perform headlight aiming after installation. ☞

9J

Front Door Components



1.	Door panel	4.	Front door opening weather-strip
2.	Door hinge : Apply grease 99000-25011 to rotating part. : Apply sealant 99000-31110 to mounting face. : Remove and tighten door hinge bolt (door side) in order of "a" → "b".	(a) :	27 N·m (2.8 kgf-m, 20.0 lbf-ft)
		(b) :	23 N·m (2.3 kgf-m, 17.0 lbf-ft)
		(c) :	21 N·m (2.1 kgf-m, 15.5 lbf-ft)
		(d) :	5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
3.	Door open stopper : Install in correct direction. ☞		

9J

Front Door Assembly Removal and Installation

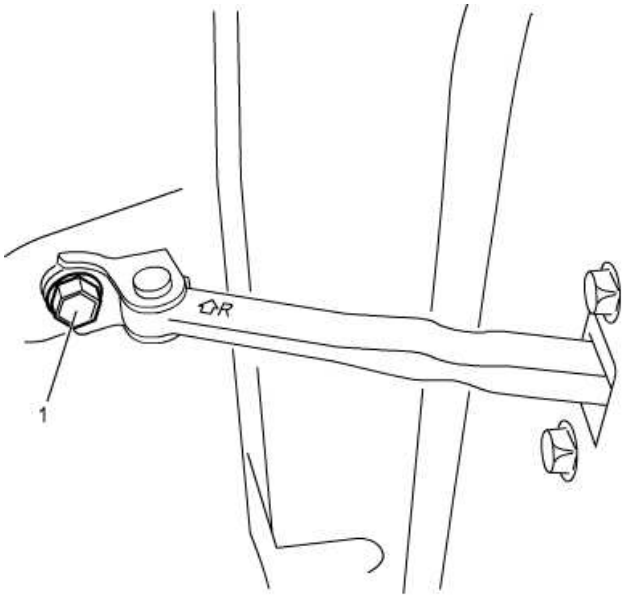
Reference: Front Door Components

Removal

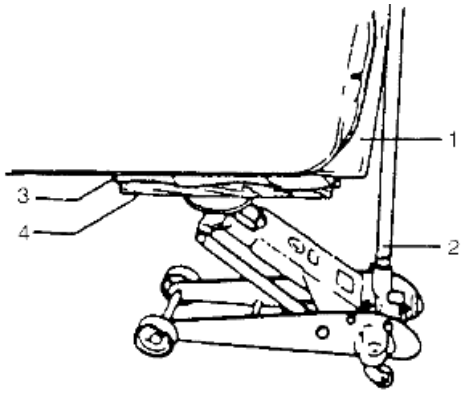
1) Remove door trim. ☞ / ☞

2) Disconnect door harness connectors from door.

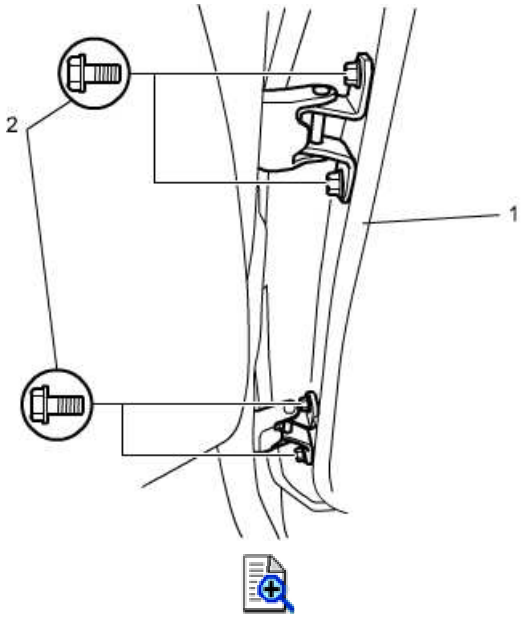
3) Remove door open stopper bolt (1).



4) Support door panel (1) using a jack (2) with rags (3) and a piece of wood (4) placed between jack (2) and panel (1) as shown in figure.



5) Remove bolts (2) and remove front door (1).



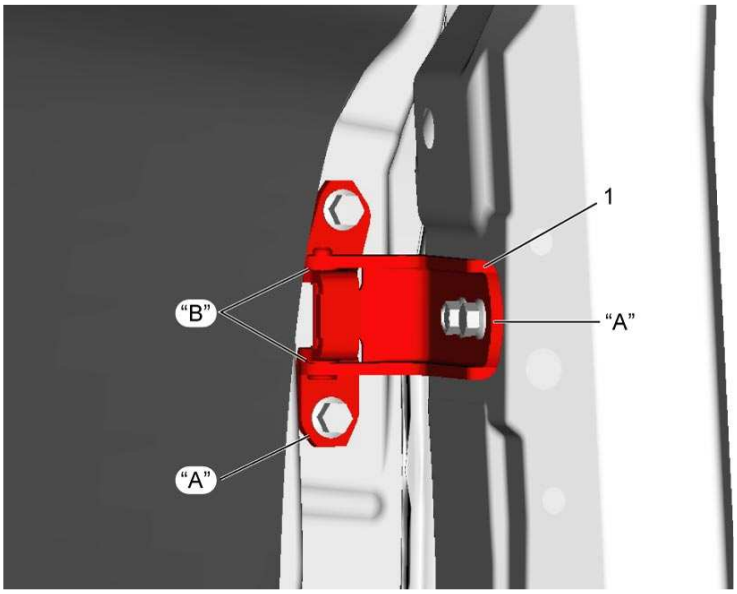
6) Remove door hinge after removing front fender if necessary. ☞

Installation

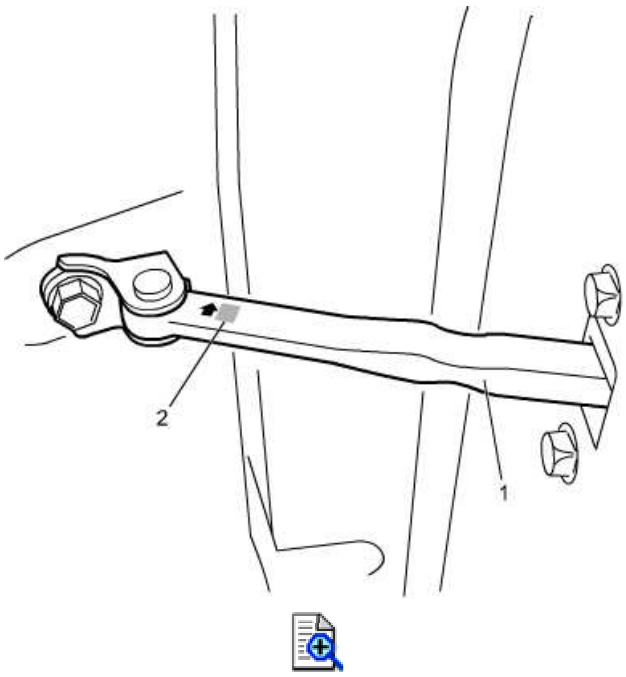
Reverse removal procedure noting the following points.

- When replacing door, coat inside of replacement door with anti-corrosion wax for proper anti-corrosion treatment. ☞
- Apply sealant to mounting face "A" of door hinge (1) and apply grease to rotating part "B" of door hinge (1).

  "A": Sealant 99000–31110 (SUZUKI Bond No.1215)
  "B": Grease 99000–25011 (SUZUKI Super Grease A)



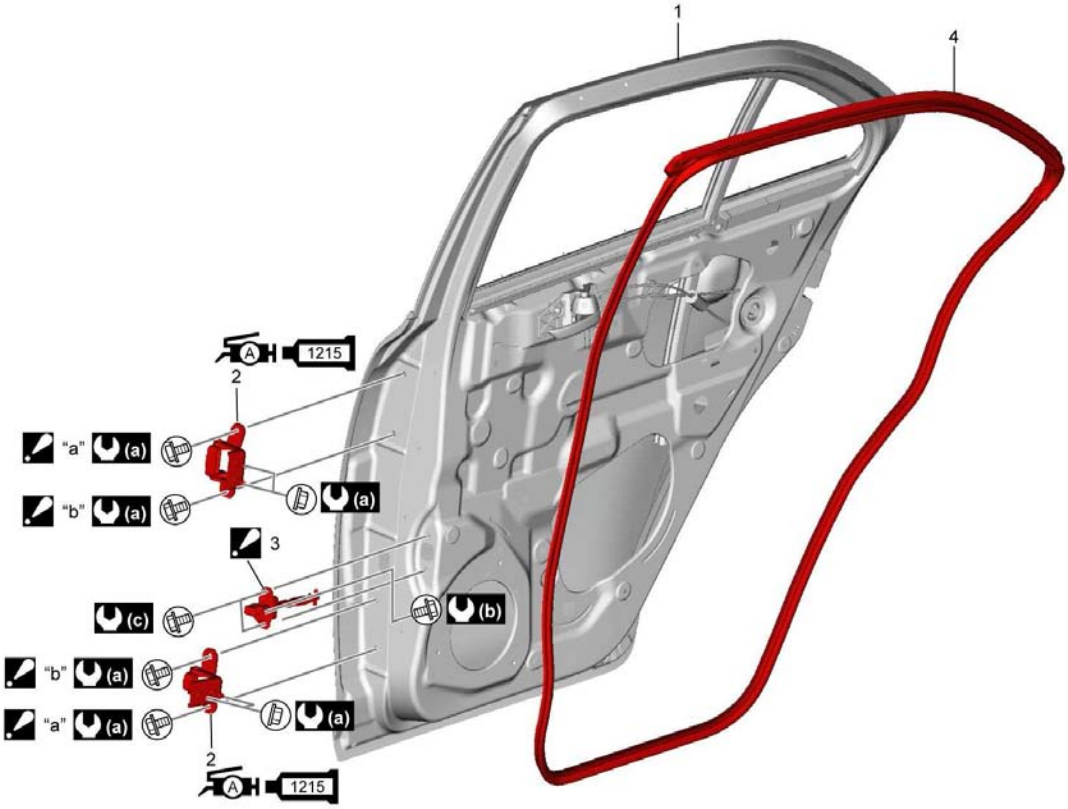
- Tighten front door hinge bolts and door open stopper bolt to specified torques. ☞
- When door open stopper (1) is installed, face proper matching mark (2) upward.
  - — Right side door: Mark "R" faces upward
  - — Left side door: Mark "L" faces upward



- Adjust door striker position. ☞
- After installation, open and close the door to check if it can be closed smoothly and securely.

9J

Rear Door Components

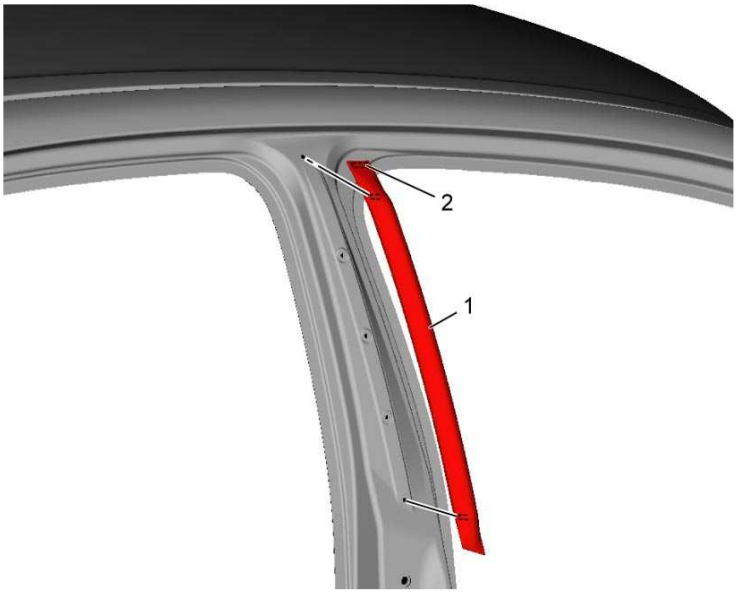


1.	Door panel	3.	Door open stopper : Install in correct direction. ☞
A 1215 2.	Door hinge : Apply grease 99000-25011 to rotating part. : Apply sealant 99000-31110 to mounting face. : Remove and tighten door hinge bolt (door side) in order of "a" → "b".	4.	Rear door opening weather-strip
		(a) :	23 N·m (2.3 kgf-m, 17.0 lbf-ft)
		(b) :	21 N·m (2.1 kgf-m, 15.5 lbf-ft)
		(c) :	5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

9J

Center Pillar Upper Weather-Strip Removal and Installation

Remove and install center pillar upper weather-strip referring to figure.



1.	Center pillar upper weather-strip
2.	Double-stick tape

9J

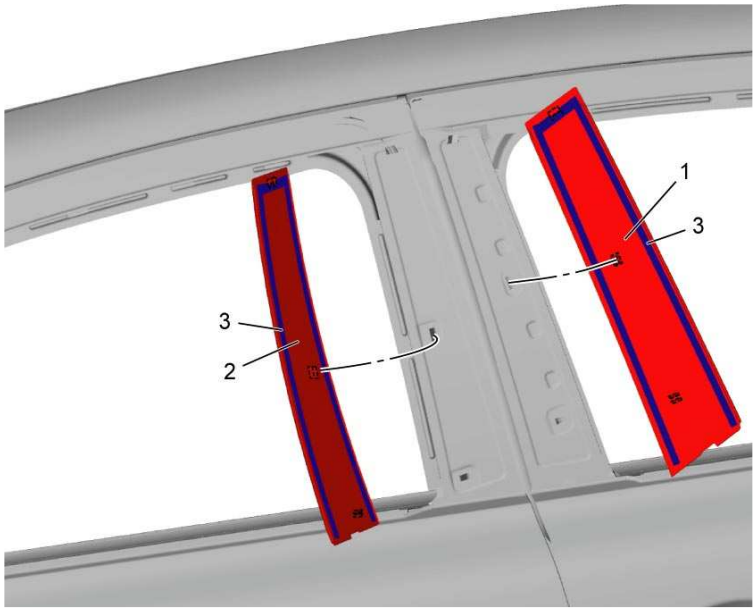
Center Pillar Garnish Removal and Installation

Removal

CAUTION:
Center pillar garnishes must be handled with care as they are easily scratched. Do not wipe them with stiff cloth or the like.

1) Remove front or rear outer weather-strip. ☞ / ☞

2) Remove center pillar garnish referring to figure.



1. Front door center pillar garnish	3. Double-stick tape
2. Rear door center pillar garnish	

Installation

Reverse removal procedure.

9J

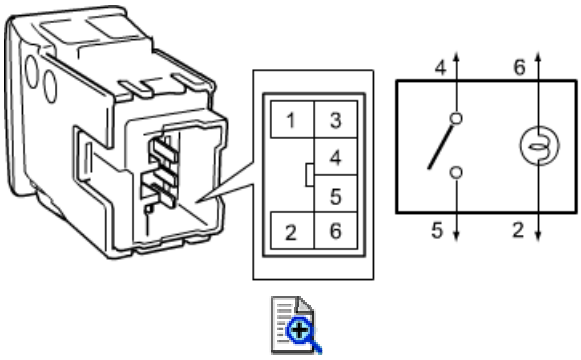
Trunk Lid Opener Switch Inspection

1) Remove trunk lid opener switch.

2) Check continuity between terminals of trunk lid opener switch connector at each switch position.
If check result is not as specified, replace switch.

Trunk lid opener switch continuity

Terminal / Switch position	4	5	2	6
Released			○	○
Pushed	○	○		



4

Precautions for Brakes

General Precautions

Refer to ***General Precautions***.

Precautions for Electrical Circuit Service

Refer to ***Precautions for Electrical Circuit Service***.

Fastener Caution

Refer to ***Fastener Caution***.

Precautions for Servicing 4WD Model

Refer to ***Precautions for Servicing 4WD Model***.

Wheel and Brake Caution

Refer to ***Wheel and Brake Caution***.

Precautions for Vehicle Equipped with ESP® System

Refer to ***Precautions for Vehicle Equipped with ESP® System***.

Air Bag Warning

Refer to ***Air Bag Warning***.

Reassembling Note for Wiring Harness

Be sure to observe ***Reassembling Note for Wiring Harness*** whenever installing wiring harness.
Otherwise, electrical trouble may occur.

Precautions for CAN Communication System

Refer to ***Precautions for CAN Communication System***.

Precautions for Brake Service

Road Test

NOTE:
Brakes should be tested on dry, clean, reasonably level, and smooth roadway. Road test brakes by applying brake with both light and heavy pedal forces at various speeds to determine if the vehicle stops evenly and effectively. Also drive vehicle to see if it pulls to one side without brake application. If it does, check the tire pressure, front wheel alignment and installing condition of front suspensions. See diagnosis table for other causes.

Brake Fluid Leaks

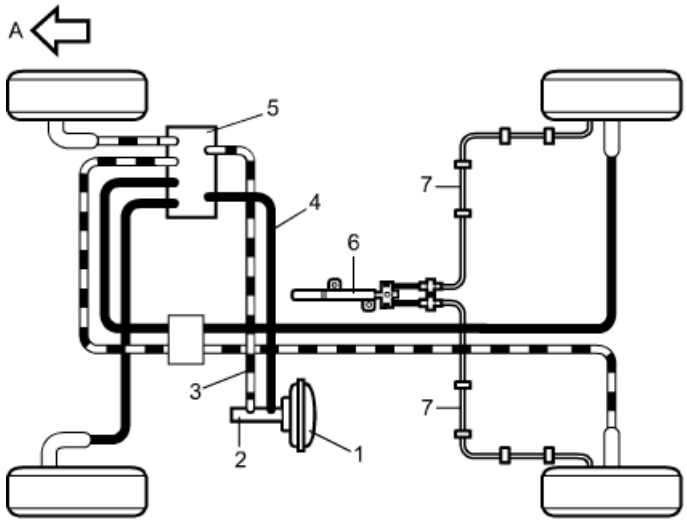
NOTE:
Check the brake fluid level. Although a slight drop results from normal lining wear, an abnormally low level indicates a leak of brake fluid. In such a case, check the entire brake system for leakage. If even a slight evidence of leakage is noted, the cause should be corrected or defective parts should be replaced.

Substandard or Contaminated Brake Fluid

Substandard or contaminated brake fluid with mineral oil or moisture will lower fade resistance or deteriorate rubber parts resulting in the leakage of brake fluid.
In case improper brake fluid as mentioned above entered into the brake system, or in case such doubt exists, disassemble the system and clean the parts with alcohol. For the parts which cannot be disassembled, replace them as an assembly. Rubber parts and brake hoses should be replaced with new ones.

Brake System Description

When the brake pedal is depressed, hydraulic pressure is developed in the brake master cylinder to actuate pistons in the front and rear brake calipers (two in front and two in rear). The brake master cylinder is a tandem master cylinder. The master cylinder and the brake pipes connected to it form two independent circuits - one is connected to the front right and rear left brakes and the other is connected to the front left and rear right brakes.



1. Brake booster	4. Primary side	7. Parking brake cable
2. Brake master cylinder	5. ESP® hydraulic unit / control module assembly	A: Vehicle forward
3. Secondary side	6. Parking brake lever	

Brake Symptom Diagnosis

Condition	Possible Cause	Action
Not enough braking force	Brake fluid leakage from brake lines	*Repair.*
	Brake disc or pads stained with fluid, grease or other oil	*Clean or replace.*
	Brake fading or vapor-lock occurs	*Determine cause and repair.*
	Badly worn brake pad	*Replace pad. Check brake discs and replace if necessary.*
	Faulty brake caliper assembly	*Repair or replace.*
	Malfunctioning brake booster	*Check brake booster and replace if necessary.*
	Malfunctioning brake master cylinder	*Check brake master cylinder and replace if necessary.*
	Air in brake system	*Bleed air from brake system.*
	Negative pressure for brake booster is insufficient	*Check engine condition and vacuum hose.*
	Malfunctioning ESP®	*Check ESP® and replace if necessary.*
Uneven braking (Brakes not working in unison)	Pads and discs in some brakes are wet with water or stained with brake fluid	*Clean or replace.*
	Disc is deformed	*Replace.*
	Tires are inflated unequally	*Inflate equally.*
	Incorrect wheel alignment	*Adjust.*
	Unmatched tires on the same axle	*Mount the same tires on one axle.*
	Poor installation of brake pipes or hoses	*Check for deformation and replace parts if necessary.*
	Faulty caliper assembly	*Repair or replace if necessary.*
	Loose suspension parts	*Retighten all suspension mountings.*
	Loose calipers	*Check and tighten bolts to specifications.*
Noise (High pitched squeak with brake released)	Worn brake disc or pads	*Replace brake disc or pads.*
Excessive pedal stroke	Partial brake system failure	*Check brake systems and repair wiring.*
	Leaking brake fluid	*Repair the leaking point, and bleed air from brake system.*
	Air in brake system (soft / spongy pedal)	*Bleed air from brake system.*
Brake locked	Malfunctioning ESP®	*Check ESP® system and replace if necessary.* ☞

Dragging brakes (Drag is present in all brakes after pedal is released.)	Brake master cylinder's pistons are not returned correctly	*Replace brake master cylinder.*
	Poor installation of brake pipes or hoses	*Check for deformation and replace parts if necessary.*
	Incorrect parking brake cable	*Repair or replace.*
	Weakened or broken return springs in the rear brakes	*Replace return springs.*
	Seized brake caliper piston	*Replace.*
	Badly worn piston seal in caliper	*Replace piston seal.*
	Improper brake pedal free height	*Adjust brake pedal free height.*
Pedal vibration (Brake pedal vibrates while the pedal is depressed)	Damaged or loosened wheel bearings	*Replace wheel bearings.*
	Distorted steering knuckle or spindle	*Replace knuckle or spindle.*
	Excessive disc lateral runout	*Check brake disc. If not within specifications, replace brake disc.*
	Parallelism between pad and disc not within specifications	*Check brake disc and brake pad. If not within specifications, replace disc.*
Braking noise	Glazed brake pad	*Replace brake pads.*
	Faulty front wheel bearings	*Replace wheel bearings.*
	Wear indicator contacts with brake disc	*Replace pads.*
ABS warning light keeps ON (for more than 2 sec) after pressing engine switch to change the ignition mode of keyless push start system to "ON".	Faulty ESP® function	*Perform ESP® check.* ☞
	ESP® control module power supply and ground circuit faulty	*Check ESP® control module power supply and ground circuit.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
ABS warning light does not turn ON after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Faulty combination meter power supply and ground circuit	*Check combination meter and its circuit.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Malfunctioning CAN communication system	*Check CAN communication system.* ☞
	Blown fuse	*Check "MTR" fuse and circuit led to "MTR" fuse and replace if necessary.*
ESP® warning light keeps ON (for more than 2 sec) after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Faulty ESP® function	*Perform ESP® check.* ☞
	Faulty ESP® control module power supply and ground circuit	*Check ESP® control module power supply and ground circuit.* ☞
	Faulty combination meter	*Replace combination meter.* ☞

	Faulty ESP® control module	*Replace ESP® control module.* ☞
ESP warning light dose not turn ON after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Faulty combination meter power supply and ground circuit	*Check combination meter and its circuit.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Malfunctioning CAN communication system	*Check CAN communication system.* ☞
	Blown fuse	*Check "MTR" fuse and circuit led to "MTR" fuse and replace if necessary.*
	Faulty ESP® control module	*Replace ESP® control module.* ☞
Brake warning light keeps ON (for more than 2 sec) after starting engine	ESP® control module connector is not connected properly	*Connect ESP® control module connector again.*
	Parking brake is applied	*Release parking brake.*
	Insufficient amount of brake fluid	*Check brake fluid level.* ☞
	ABS warning light is flashing	*Detect malfunction and repair.* ☞
	Faulty parking brake switch and/or brake fluid level switch	*Check brake switch and/or brake fluid level switch.* *Parking brake switch:* ☞ *Brake fluid level switch:* ☞
	Malfunctioning CAN communication system	*Check CAN communication system.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Faulty ESP® control module	*Replace ESP® control module.* ☞
Brake warning light does not turn ON after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Faulty combination meter power supply and ground circuit	*Check combination meter and its circuit.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	ABS warning light is flashing	*Detect malfunction and repair.* ☞
	Faulty ESP® control module	*Replace ESP® control module.* ☞

4A

Brake Fluid Level Inspection

WARNING:
Never use brake fluid other than specified.
Otherwise, brake hoses and rubber parts may get damaged or brake system may not operate normally.

CAUTION:
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

- Be sure to use brake fluid indicated on brake master cylinder reservoir cap or in owner's manual.
- Check that brake fluid level is between MAX and MIN marks on reservoir of brake master cylinder.

NOTE:
If brake warning light sometimes comes on during driving or brake fluid level on brake master cylinder reservoir is "MIN" or lower, check the following points:
- **Thickness of front brake pads and rear brake pads**
- **Fluid leakage from piston seal of brake caliper**
- **Cracks or damage on brake hoses and brake pipes**
- **Fluid leakage from brake master cylinder or reservoir**

If any abnormality is found, repair or replace faulty parts.
After the repair, replenish brake fluid so that fluid level is between "MAX" and "MIN" marks on brake master cylinder reservoir.

4A

Brake Fluid Level Inspection

WARNING:
Never use brake fluid other than specified.
Otherwise, brake hoses and rubber parts may get damaged or brake system may not operate normally.

CAUTION:
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

- Be sure to use brake fluid indicated on brake master cylinder reservoir cap or in owner's manual.
- Check that brake fluid level is between MAX and MIN marks on reservoir of brake master cylinder.

NOTE:
If brake warning light sometimes comes on during driving or brake fluid level on brake master cylinder reservoir is "MIN" or lower, check the following points:
- **Thickness of front brake pads and rear brake pads**
- **Fluid leakage from piston seal of brake caliper**
- **Cracks or damage on brake hoses and brake pipes**
- **Fluid leakage from brake master cylinder or reservoir**

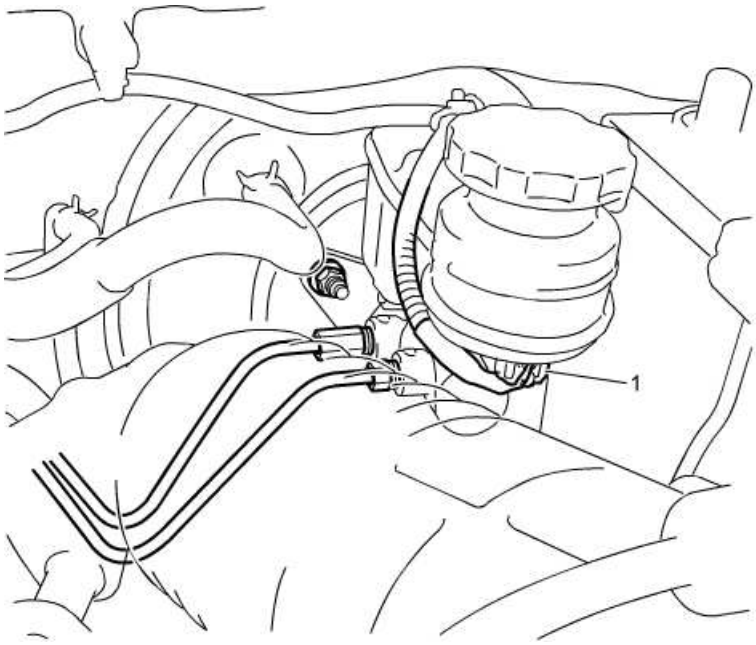
If any abnormality is found, repair or replace faulty parts.
After the repair, replenish brake fluid so that fluid level is between "MAX" and "MIN" marks on brake master cylinder reservoir.

Brake Fluid Level Switch Inspection

Check for continuity between terminals of brake fluid level switch connector (1). If faulty, replace reservoir.

Brake fluid level switch specification

MAX position (float up): No continuity
MIN position (float down): Continuity exists



4A

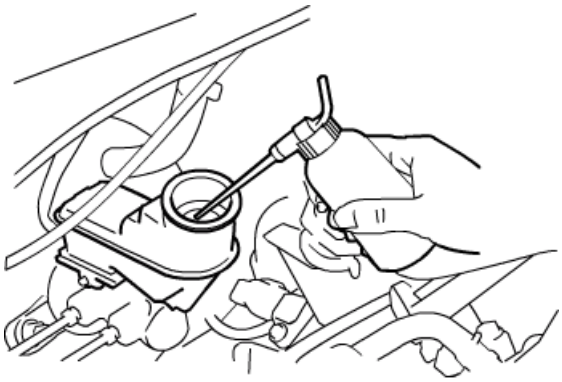
Brake Fluid Replacement

WARNING:
Never use brake fluid other than specified.
Otherwise, brake hose and rubber parts may get damaged or brake system may not be operate normally.

CAUTION:
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

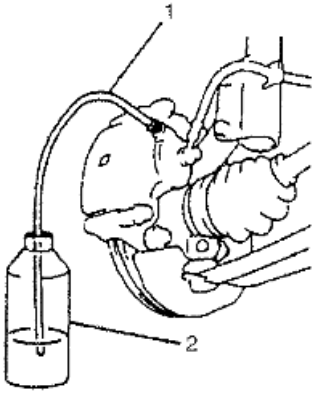
NOTE:
- **Replace brake fluid from the brake that is the closest to master cylinder.**
- **To prevent air getting into reservoir, be careful not to let fluid in the reservoir empty while operating brake pedal.**

1) Using a dropper or the like, extract some brake fluid from reservoir of brake master cylinder.



2) Add new brake fluid to reservoir.
Brake fluid
: Refer to reservoir cap of brake master cylinder or owner's manual.

3) Remove bleeder plug cap on brake caliper. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



4) Depress brake pedal several times with bleeder plug loosened.

5) When new brake fluid starts coming out, tighten bleeder plug to specified torque.

- Front: ☞
- Rear: ☞

6) Perform Steps 3) – 5) for remaining wheels as well.

7) If necessary, bleed air from brake system. ☞

4A

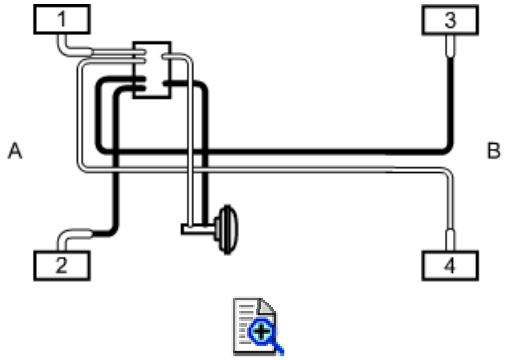
Air Bleeding of Brake System

WARNING:
Never use brake fluid other than specified.
Otherwise, brake hose and rubber parts may get damaged or brake system may not operate normally.

CAUTION:
Brake fluid extremely damages paint.
Do not allow brake fluid to get on painted surface. Painted surfaces will be damaged by brake fluid. If any fluid spilled, flush it with water immediately.

Air bleeding operation is necessary whenever air enters into brake hydraulic lines. Brake hydraulic lines are made of diagonally split construction. If any brake pipe or hose is disconnected, bleed the disconnected line at both ends of the line.

NOTE:
Perform bleeding operation starting from wheel cylinder farthest from brake master cylinder and then at front caliper of the same brake line.

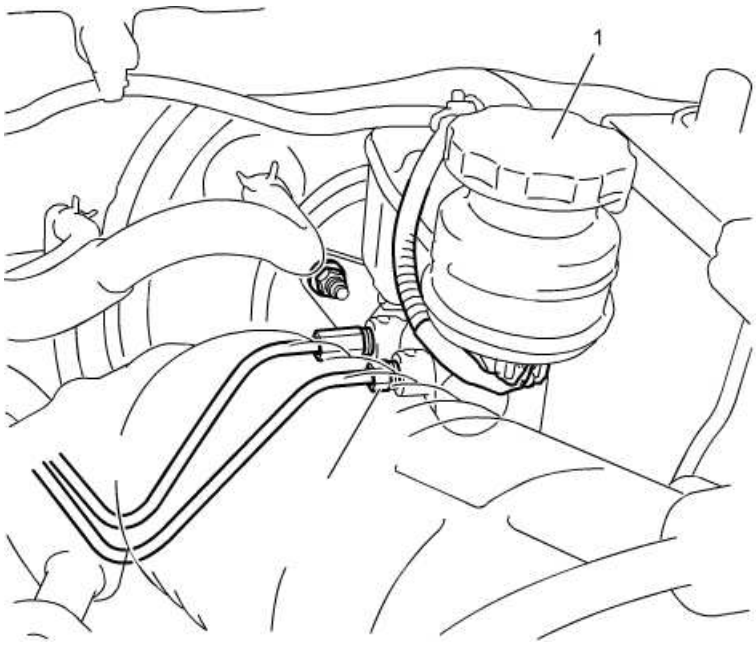


1. Right brake caliper	4. Left brake caliper
2. Left brake caliper	A: Front
3. Right brake caliper	B: Rear

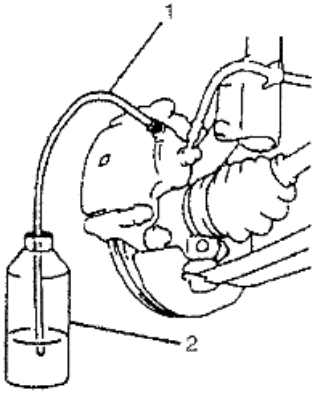
1) Fill brake master cylinder reservoir with new brake fluid and keep fluid level at least one-half of full level during bleeding operation.

Brake fluid

Refer to reservoir cap (1) of brake master cylinder or owner's manual.



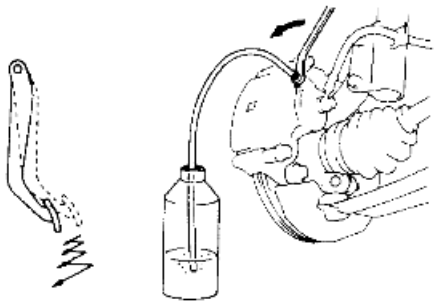
2) Remove bleeder plug cap. Attach a vinyl tube (1) to bleeder plug, and insert the other end into container (2).



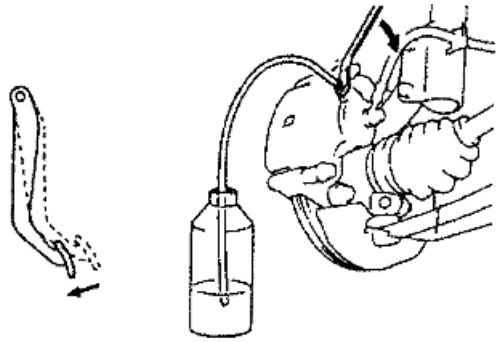
3) Depress brake pedal several times, and then while holding it depressed, loosen bleeder plug about one-half turn.

4) When fluid pressure from bleeder plug depleted, retighten bleeder plug.

5) Repeat this operation until air is completely removed from hydraulic line.



6) After removing air completely, tighten bleeder plug to specified torque while keeping brake pedal depressed.
- Front: ☞
- Rear: ☞



7) Attach bleeder plug cap.

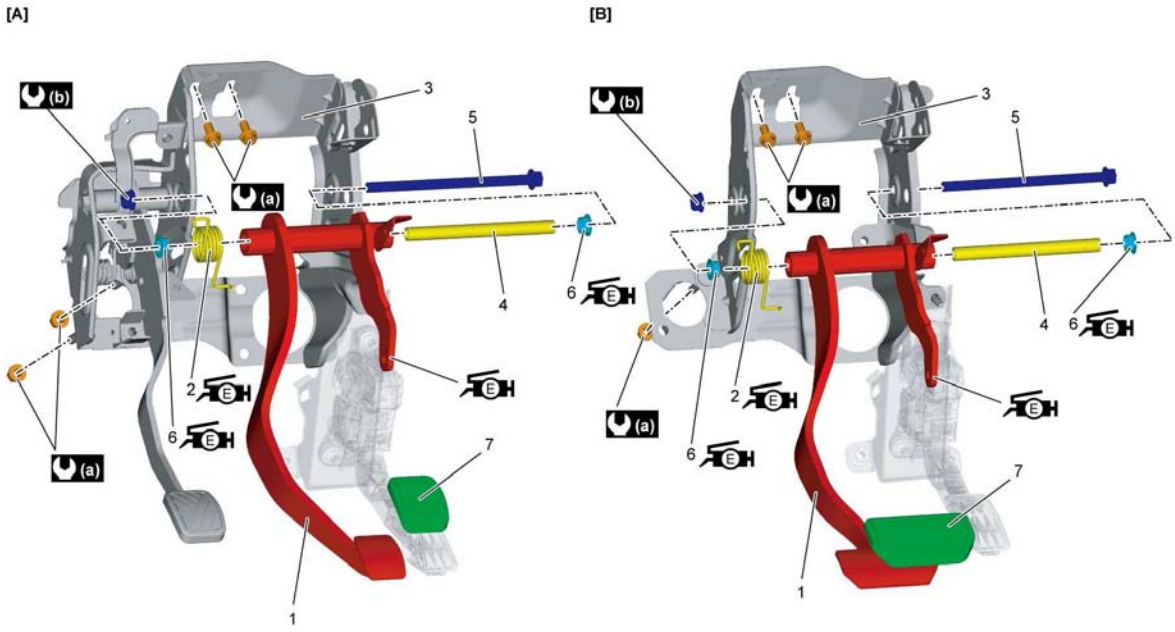
8) After completing bleeding operation, apply fluid pressure to brake lines and check for leakage.

9) Replenish new fluid into reservoir up to specified level. ☞

10) Check brake pedal stroke. If the stroke is so large, repeat entire procedure of bleeding.

4A

Brake Pedal Components



[A]:	M/T model	3.	Pedal bracket	7.	Pedal pad
[B]:	CVT model	4.	Brake pedal shaft spacer	(a):	13 N·m (1.3 kgf-m, 9.5 lbf-ft)
1.	Brake pedal: Apply grease 99000-25050 inside of hole.	5.	Brake pedal shaft bolt	(b):	23 N·m (2.3 kgf-m, 17.0 lbf-ft)
2.	Brake pedal spring: Apply grease 99000-25050 inner side of spring.	6.	Pedal boss bushing: Apply grease 99000-25050		

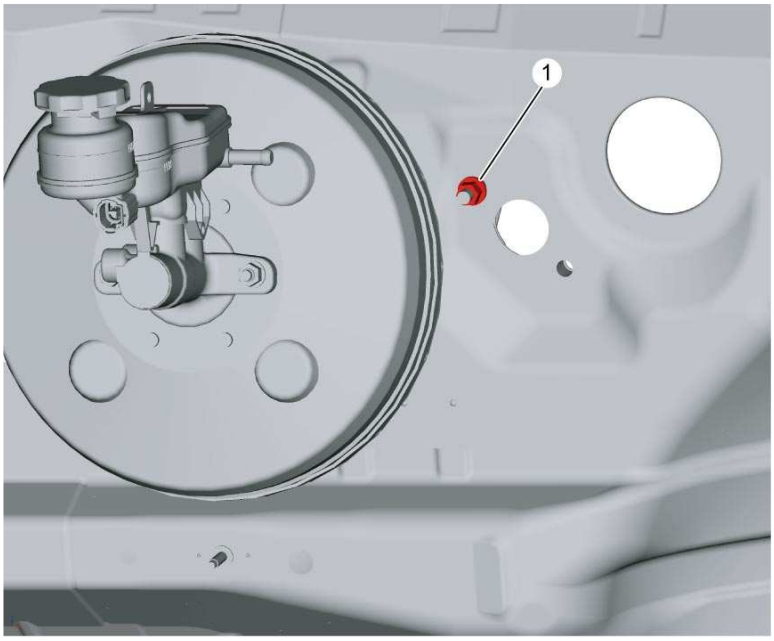
4A

Brake Pedal Assembly Removal and Installation

CAUTION:
Do not loosen nut of cylinder push rod clevis.

Removal

1) Remove steering column. ☞
2) Remove instrument panel. ☞
3) Disconnect brake light switch connector.
4) Remove battery.
5) For M/T model, disconnect clutch master cylinder. ☞
6) For CVT model, remove brake pedal bracket nut (1) located in engine compartment.



7) Remove clip (2) and clevis pin (3) from cylinder push rod clevis (1).

4A

Brake Pedal Removal and Installation

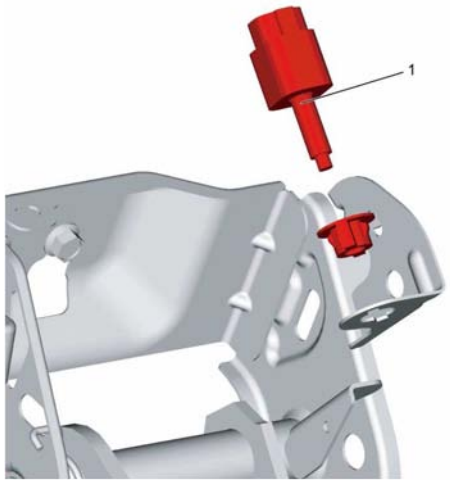
Reference: Brake Pedal Components

Removal

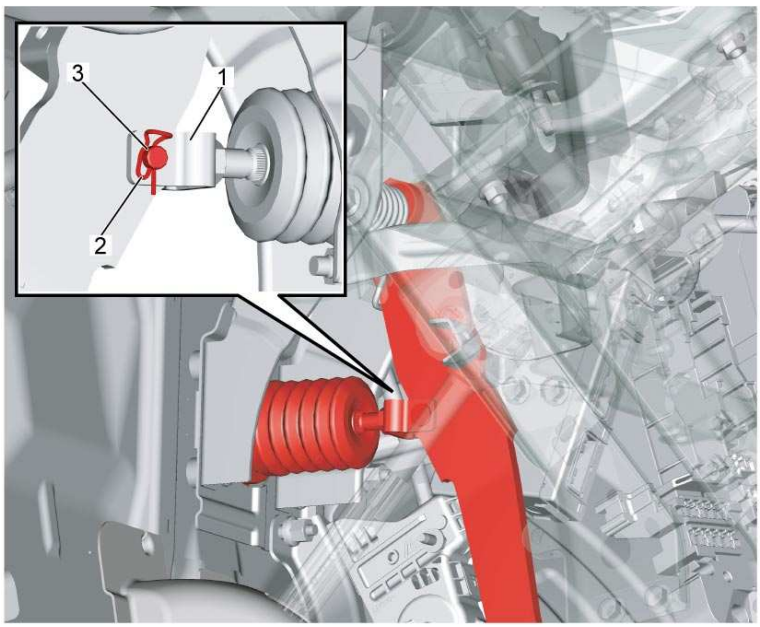
1) Remove instrument panel. ☞

2) Remove steering column. ☞

3) Disconnect brake light switch connector (1).



4) Remove clip (2) and clevis pin (3) from cylinder push rod clevis (1).



5) Loosen pedal shaft nut (1).

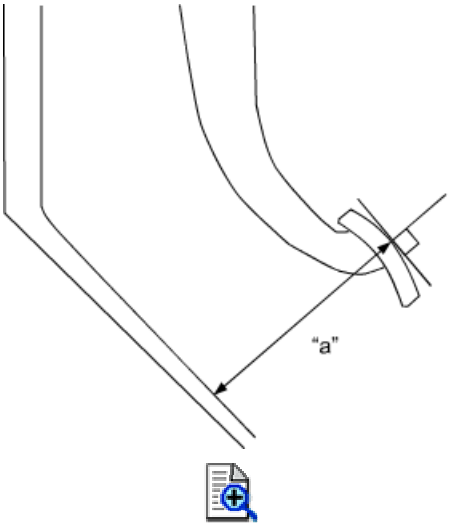
Brake Pedal Free Height Inspection

Check brake pedal free height. If it is not within specification, check and adjust the following items.

- Brake light switch position.
- Brake booster for installation.
- Length of brake booster push rod.

Brake pedal free height "a" from carpet

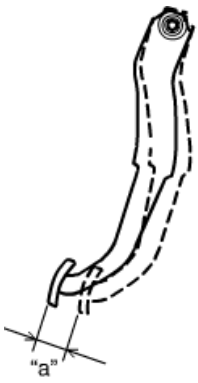
140 – 160 mm (5.51 – 6.30 in.)



Brake Pedal Play Inspection

Pedal play should be within the following specification. If out of specification, check brake light switch for proper installation position and adjust it if necessary.
Also check pedal shaft bolt and booster clevis pin installation for looseness and replace if defective.

Brake pedal play "a"
: 1 – 8 mm (0.04 – 0.30 in.)



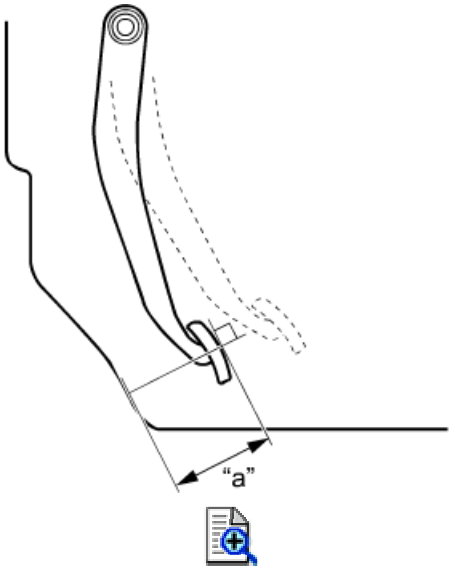
Pedal Travel Inspection

1) Start engine.

2) Depress brake pedal several times.

3) With brake pedal depressed with about 300 N (30.6 kgf, 67.4 lbf) load, measure clearance "a" between brake pedal and carpet. If clearance "a" is less than specification, probable reason is air in brake line. If clearance "a" remains less than specification even after bleeding of system, other possible but infrequent reason is that booster push rod length is out of specification.
- Bleed air from brake system. ☞

Brake pedal to carpet clearance "a"
When pedal depressed at 300 N (30.6 kgf, 67.4 lbf): Over 73 mm (2.9 in.)



4A

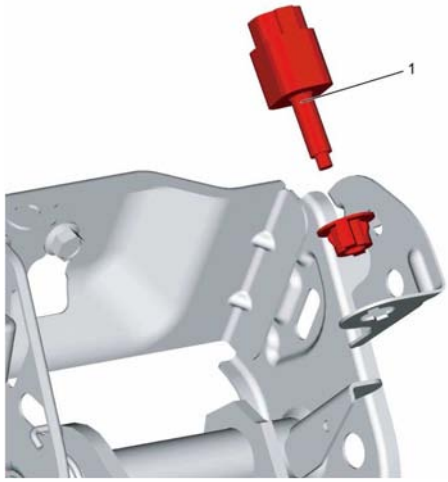
Brake Light Switch Removal and Installation

Removal

1) Remove steering column hole cover. ☞

2) Disconnect brake light switch connector.

3) Remove brake light switch (1) from brake pedal assembly.



Installation

Reference: Brake Light Switch Inspection

Reverse removal procedure, noting the following point.

- Adjust brake light switch. ☞

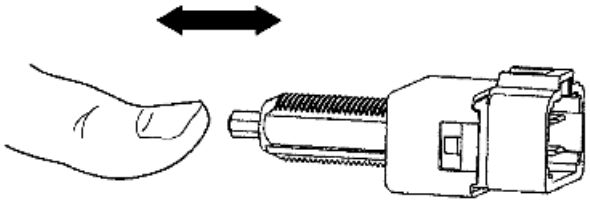
Brake Light Switch Inspection

Reference: Brake Light Switch Removal and Installation

Check brake light switch for continuity between terminals at each switch position.
If check result is not as specified, replace switch with attaching piece.

[B] \ [A]	1	2	3	4
Pushed			○	○
Free	○	○		

[A]: Terminal	[B]: Shaft condition

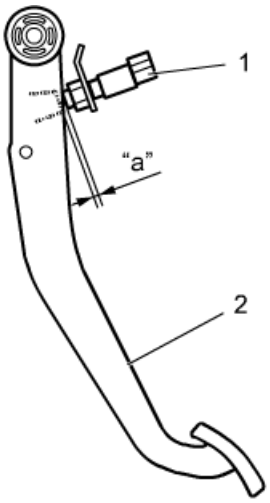


Brake Light Switch Adjustment

Pull up brake pedal (2) toward driver. While holding the pedal, adjust brake light switch (1) position so that clearance between end of thread and brake pedal is as specified. Then lock it by turning clockwise.

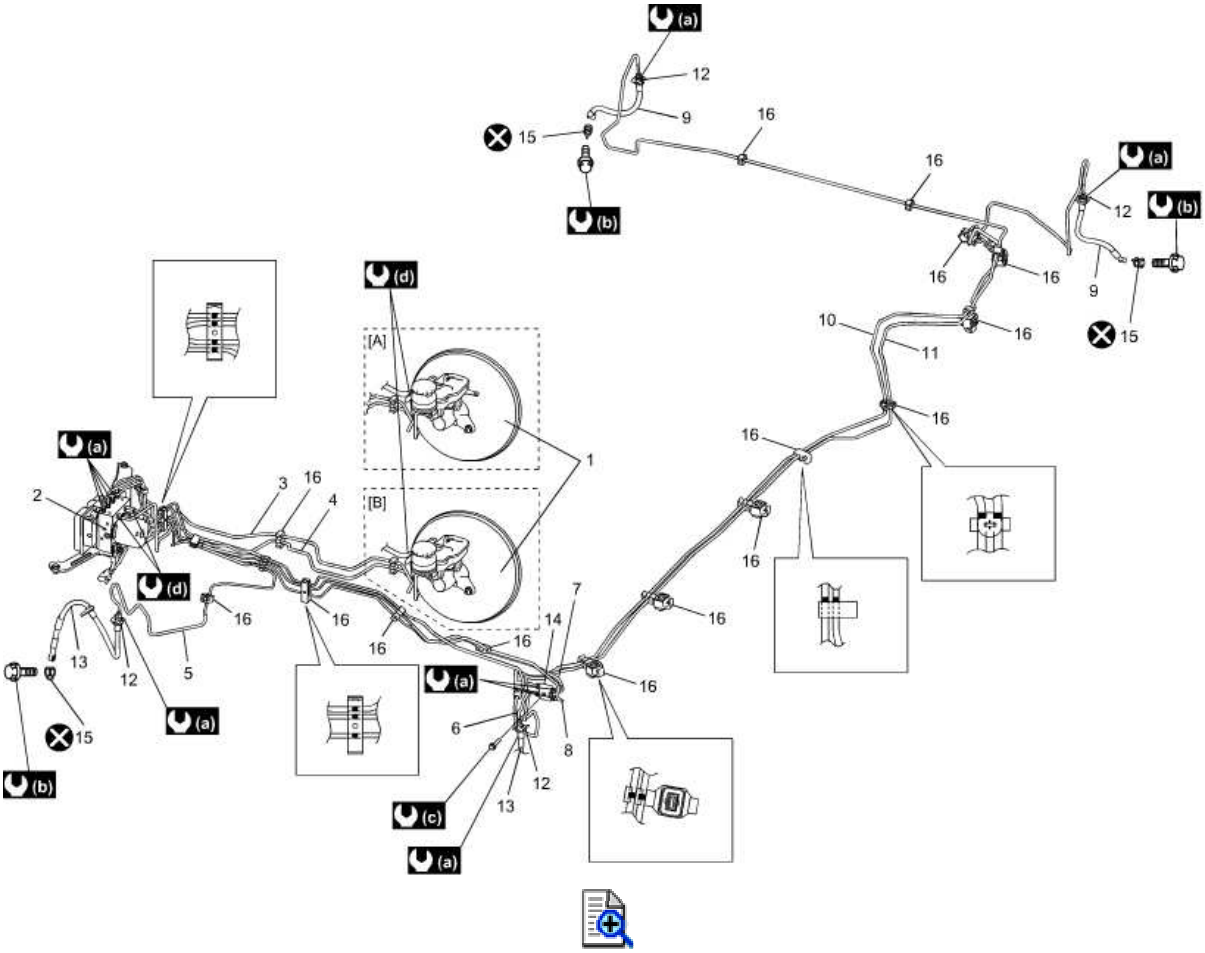
Clearance between brake pedal and brake light switch

"a": 1.0 – 2.0 mm (0.040 – 0.080 in.)



4A

Brake Hose and Pipe Components



[A]: M/T model	11. Joint to rear left pipe
[B]: CVT model	12. E-ring
1. Master Cylinder	13. Front brake flexible hose
2. ESP® control module	14. Brake 4-way joint
3. From brake master cylinder primary to ESP® control module	15. Flexible hose gasket
4. From brake master cylinder secondary to ESP® control module	16. Clamp
5. From ESP® control module to front hose right pipe	(a): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)
6. From ESP® control module to front hose left pipe	(b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. From ESP® control module to joint right pipe	(c): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
8. From ESP® control module to joint left pipe	(d): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)

9. Rear brake flexible hose	: Do not reuse.
10. Joint to rear right pipe	

Brake Hose and Pipe Removal and Installation

Reference: Brake Hose and Pipe Components

CAUTION:
Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If any fluid is spilled, flush it with water immediately.

Removal

1) Hoist vehicle and remove wheels. ☞

NOTE:
This operation is not necessary when removing pipes connecting brake master cylinder.

2) Clean dirt and foreign material from both flexible hose end and pipe end fittings.

3) Drain brake fluid in reservoir. ☞

4) Remove brake flexible hoses and pipes.

Installation

Reference: Brake Hose and Pipe Inspection

Reverse removal procedure, noting the following points.

- Install brake pipe clamps properly. ☞
- Make sure that steering wheel is in straight-forward position and flexible hoses are not twisted or kinked.
- Make sure that flexible hoses do not contact any part of suspension, when steering wheel is turned fully right and left. (Fill brake fluid to specified level in reservoir.)
- Bleed air from brake system. ☞
- Make sure that brake system works accurately and there is no fluid leakage.

Brake Hose and Pipe Inspection

Reference: Brake Hose and Pipe Removal and Installation

Hose

Check the following items. If any defect is found, replace brake hose.

- Check brake hose connections for leakage and damage.
- Check brake hose for deplete, blister, crack and damage.

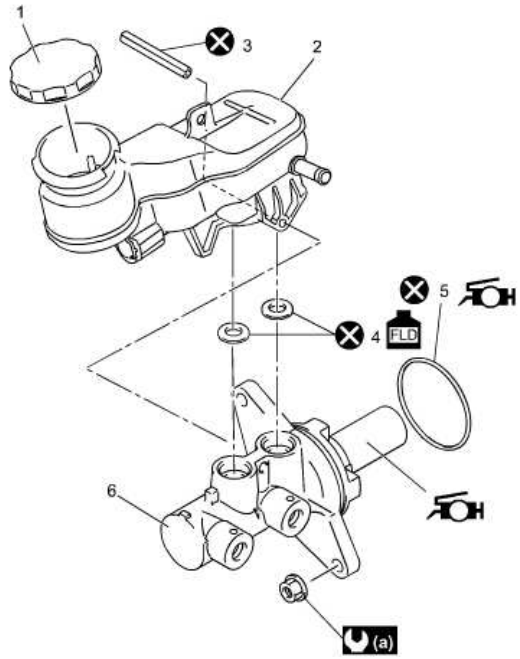
Pipe

Check brake pipes for damage, cracks, dents and corrosion. If any defect is found, replace.

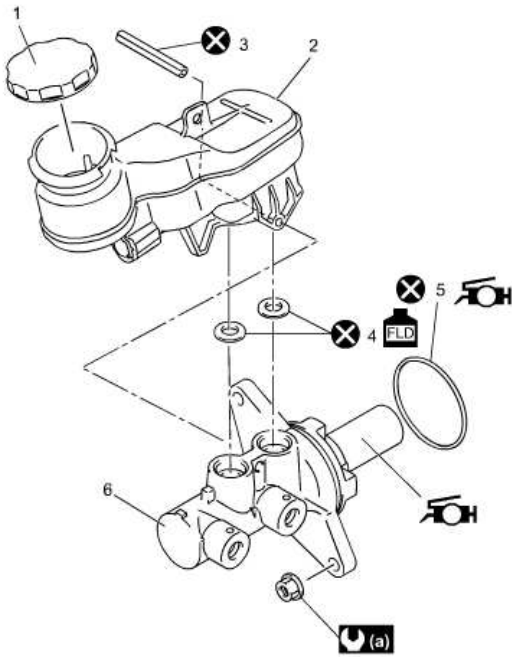
Brake Master Cylinder Components

CAUTION:
Never disassemble brake master cylinder. Disassembly will spoil its original performance.
If any fault is found, replace it with a new assembly.

[A]



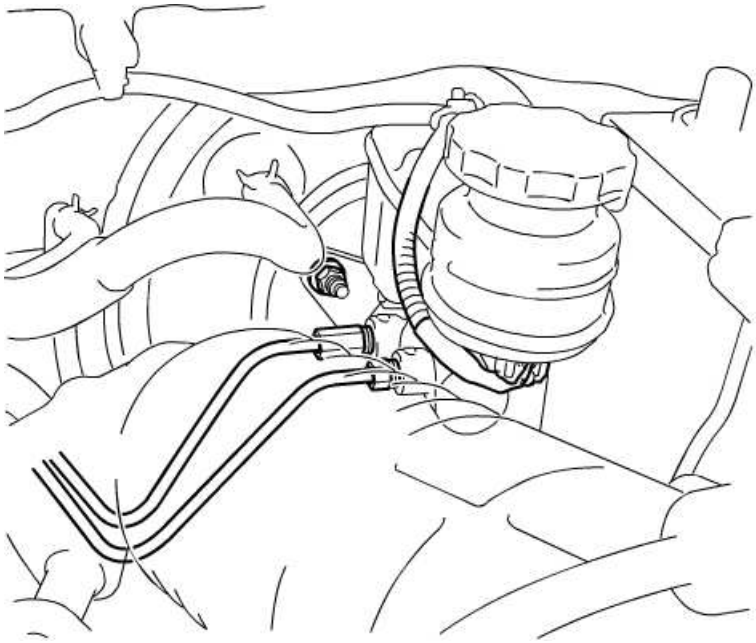
[B]



[A]:	M/T model	3.	Spring pin	(a):	13 N·m (1.9 kgf-m, 9.5 lbf-ft)
[B]:	CVT model	FLD 4.	Grommet : Apply brake fluid.	:	Apply grease. (Grease included in spare parts for brake master cylinder or brake booster)
1.	Reservoir cap	5.	Master cylinder O-ring	:	Do not reuse.
2.	Reservoir	6.	Master cylinder body		

Brake Master Cylinder Assembly On-Vehicle Inspection

Check brake master cylinder and reservoir for crack, damage and brake fluid leakage. If any fault is found, replace.



4A

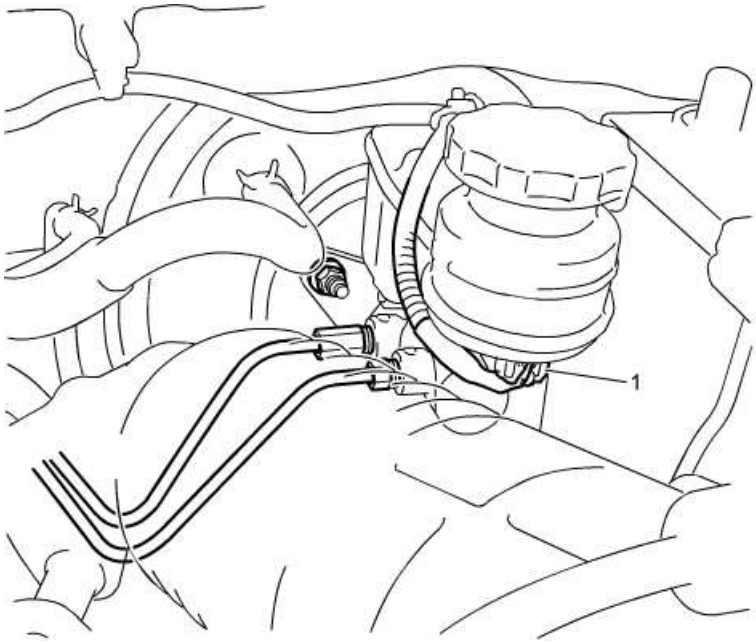
Brake Master Cylinder Assembly Removal and Installation

Reference: Brake Master Cylinder Components
Reference: Brake Master Cylinder Assembly On-Vehicle Inspection

CAUTION:
- **Never disassemble brake master cylinder. Disassembly will spoil its original performance.**
  If faulty condition is found, replace it with a new assembly.
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. If brake fluid is spilled, flush it with water immediately.**
- **Do not tilt piston side of master cylinder to down side.**
- **Do not touch piston of master cylinder directly.**

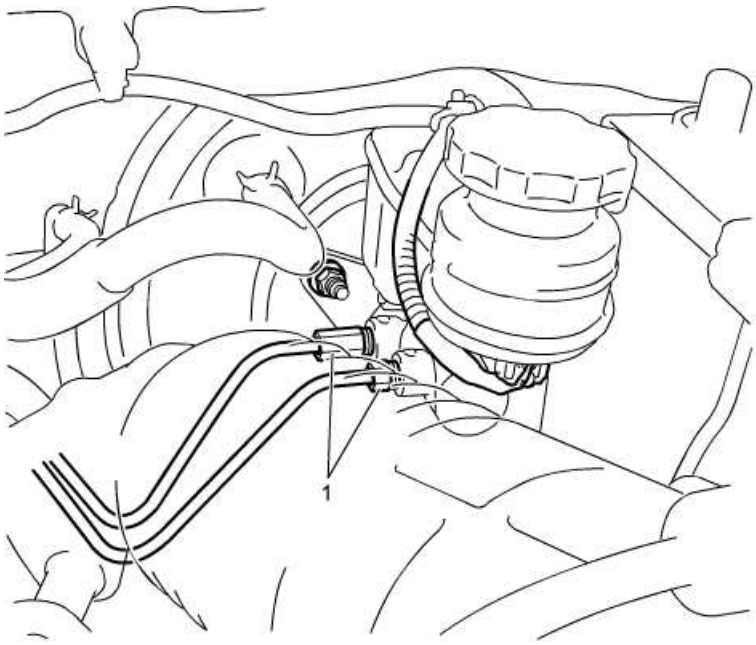
Removal

1) Clean external area of brake master cylinder assembly.
2) Depress brake pedal several times to release vacuum in brake booster.
3) Disconnect fluid level switch connector (1) from reservoir.
4) Remove battery.

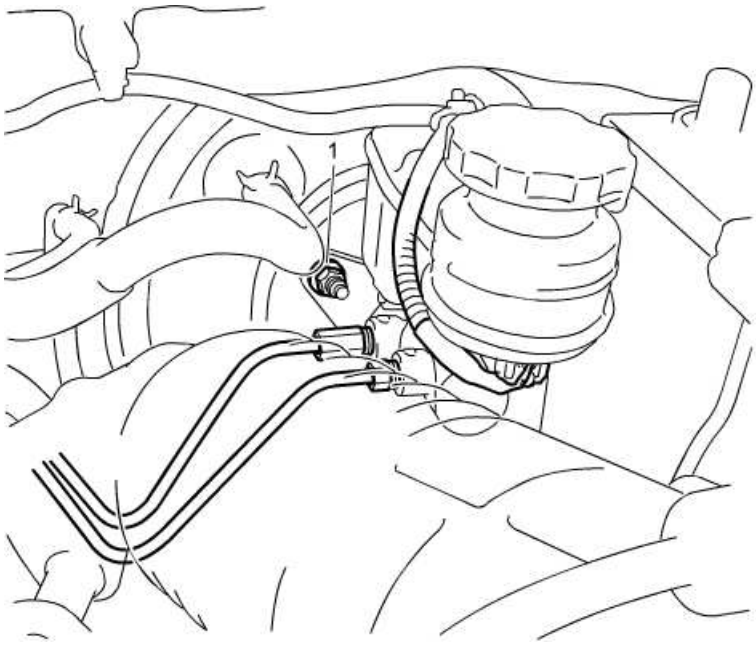


5) Remove brake fluid in reservoir. ☞
6) Using special tool, loosen flare nuts and disconnect brake pipes (1) from brake master cylinder.

Special Tool
: 09950–78220



7) Remove brake master cylinder fixing nuts (1).



Installation

Reference: Brake Master Cylinder Assembly Inspection

1) Install new O-ring to brake master cylinder assembly.

2) Install brake master cylinder to brake booster.

3) Tighten brake master cylinder fixing nuts (1) to specified torque.

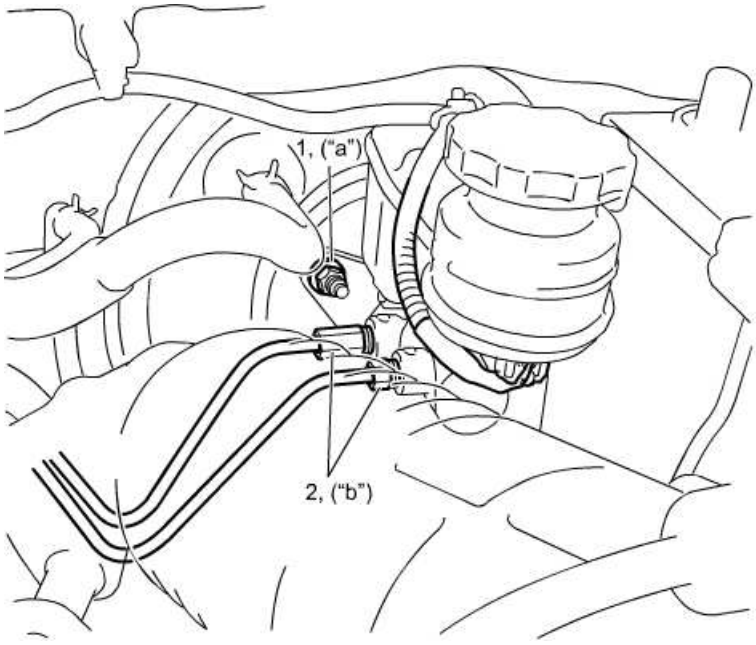
Tightening torque

Brake master cylinder fixing nut (a): 13 N·m (1.3 kg-m, 9.5 lbf-ft)

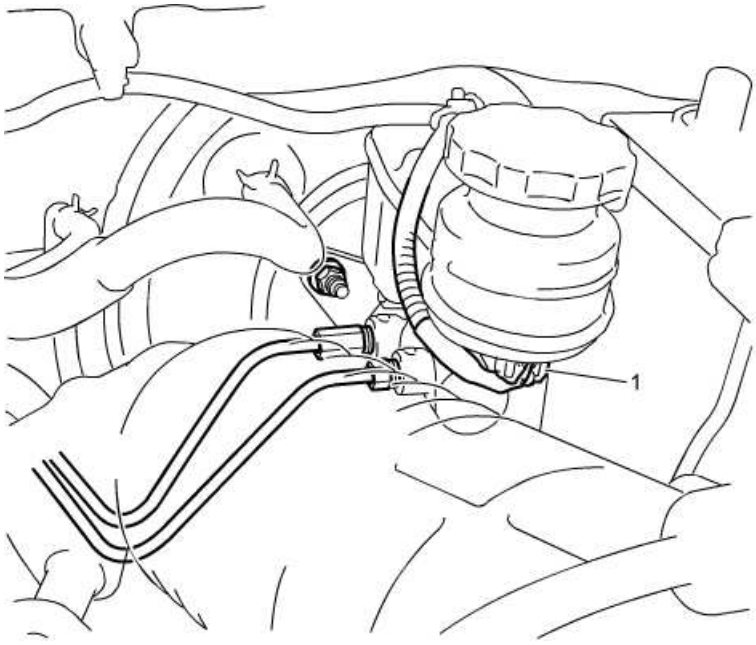
4) Connect brake pipe to brake master cylinder and tighten flare nuts (2) using special tool.

Special Tool
: 09950–78220

Tightening torque
Brake pipe flare nut (b): 19 N·m (1.9 kg-m, 14.0 lbf-ft)



5) Install battery.
6) Connect fluid level switch connector (1).



7) After installation, bleed air from brake system. ☞
8) Check installed parts for fluid leakage.
9) Check brake pedal for play. ☞

10) Make sure that brake system operates properly and check fluid leakage.

4A

Brake Master Cylinder Assembly Inspection

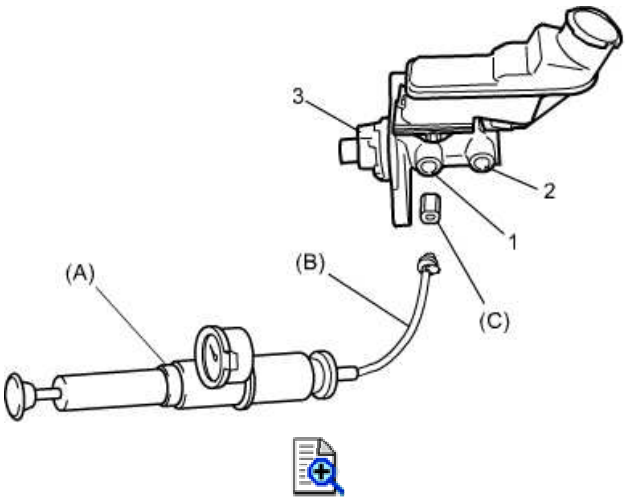
Reference: Brake Master Cylinder Assembly Removal and Installation

CAUTION:
After inspection, be sure to wash brake fluid off from special tool. Otherwise, brake fluid remaining on special tool may cause damage to it.

No-Load Inspection

1) Fit special tool to port of primary side (1) as shown below.

Special Tool
(A): 09918–78211
(B): 09952–46010
(C): 09952–48010



2.	Secondary side
3.	Brake master cylinder assembly

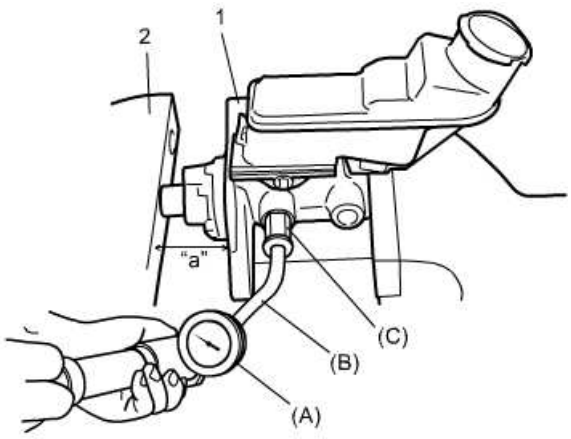
2) Apply pressure to brake master cylinder assembly by special tool (A) and confirm that pressure is not established in it.
If pressure is established, it means an abnormality in brake master cylinder assembly. In such case, replace brake master cylinder assembly.

3) Repeat Steps 1) and 2) for port of secondary side.

Air Tightness Inspection

1) With brake master cylinder assembly (1) fixed on vise (2) as shown below, fit special tool to port of primary side.

Special Tool
(A): 09918–78211
(B): 09952–46010
(C): 09952–48010



"a": 50 mm (2.0 in.)

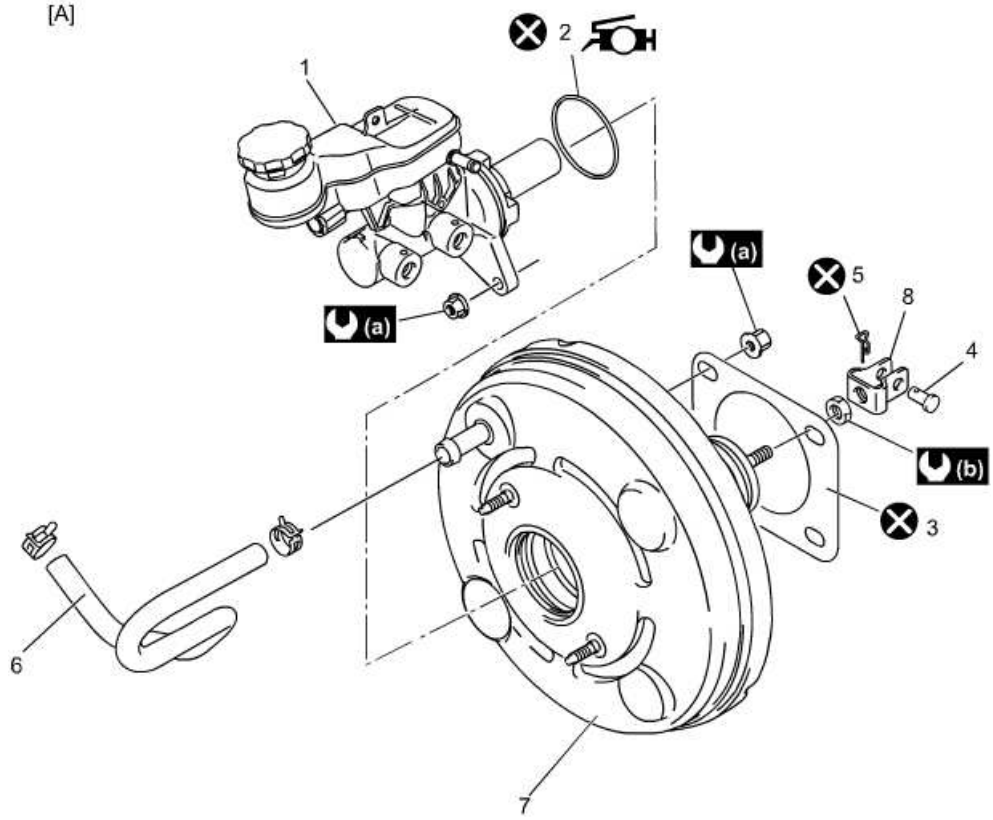
2) Using special tool, apply pressure of 50 kPa (0.5 kgf/cm², 7.25 psi, 0.5 bar) to brake master cylinder assembly.
If above specified pressure is not established, it means an abnormality in brake master cylinder assembly. In such case, replace brake master cylinder assembly.

3) Repeat Steps 1) and 2) for port of secondary side.

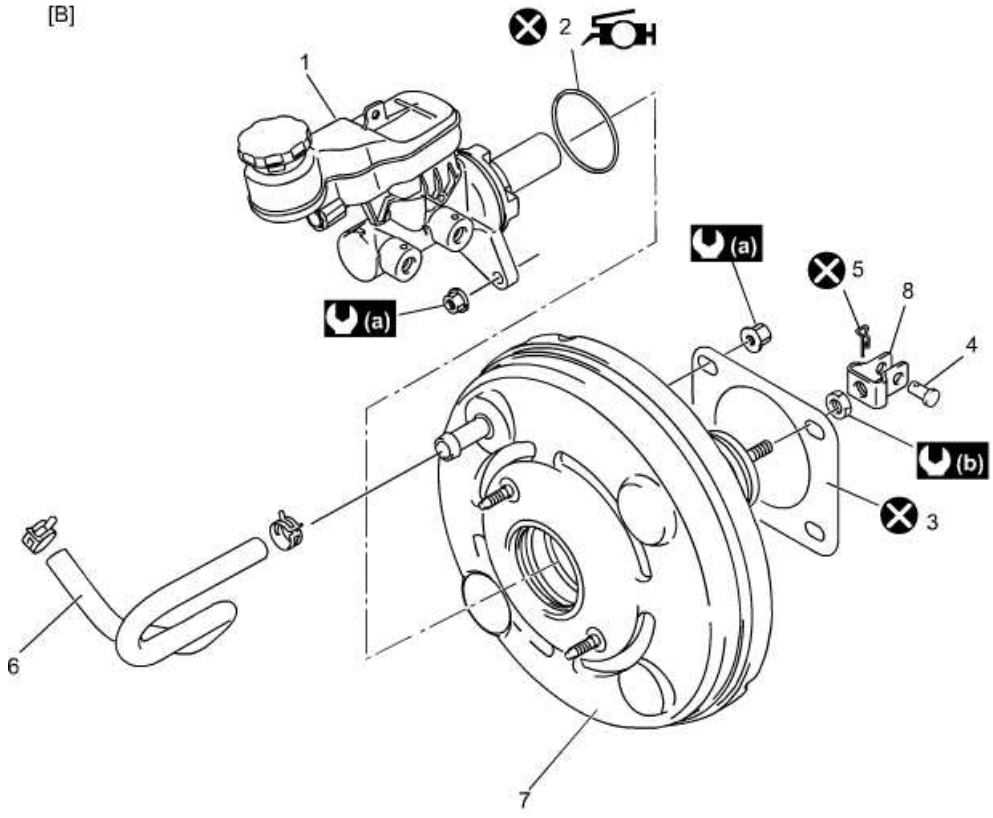
Brake Booster Components

CAUTION:
Never disassemble brake booster. Disassembly will spoil its original performance. If any fault is found, replace it with a new assembly.

[A]



[B]



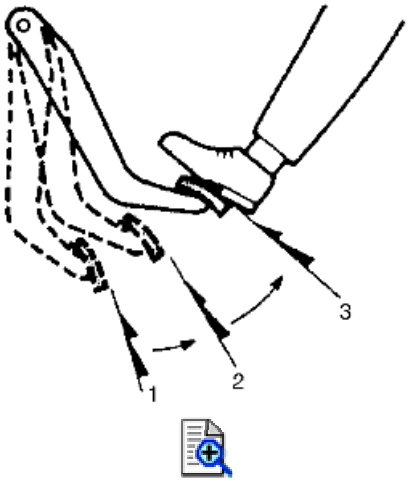
[A]: M/T model	4. Clip	: 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
[B]: CVT model	5. Snap pin	: 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
1. Brake master cylinder assembly	6. Vacuum hose	: Do not reuse.
2. Master cylinder O-ring (Apply grease included in spare parts to brake master cylinder or brake booster)	7. Brake booster	
3. Master cylinder packing	8. Cylinder push rod clevis	

Brake Booster Function Inspection

NOTE:
Make sure that air is not contained in hydraulic line before doing this check.

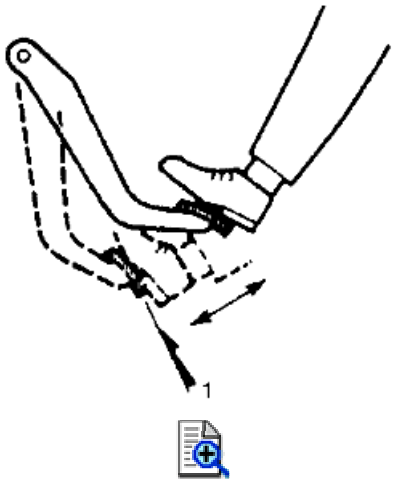
Air Tightness Inspection

1) Start engine.
2) Stop engine after running it for 2 minutes.
3) Depress brake pedal several times with the same load as in ordinary braking and observe pedal travel. If pedal goes down deep the first time but its travel decreases as it is depressed the second time and after, air tightness is obtained.



1. 1st	2. 2nd	3. 3rd

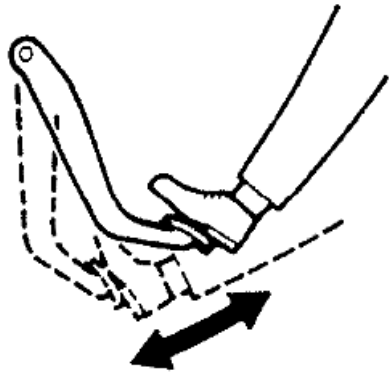
4) If pedal travel does not change, air tightness is not obtained.
5) If defective, inspect vacuum lines and sealing parts, and replace the faulty part. After this, repeat the entire test.



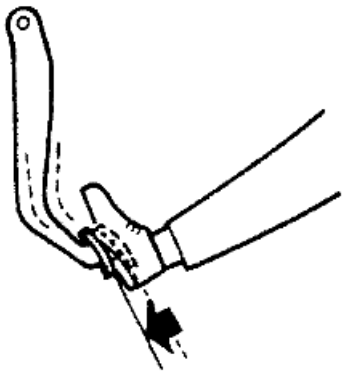
1. 1st, 2nd, 3rd

Operation Inspection

1) With engine stopped, depress brake pedal several times with the same load and make sure that pedal travel does not change.

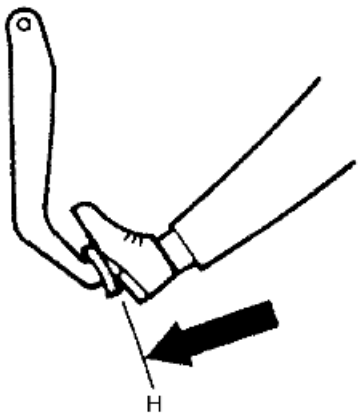


2) Start engine while depressing brake pedal. If pedal travel increases a little, operation is satisfactory. But no change in pedal travel indicates malfunction.



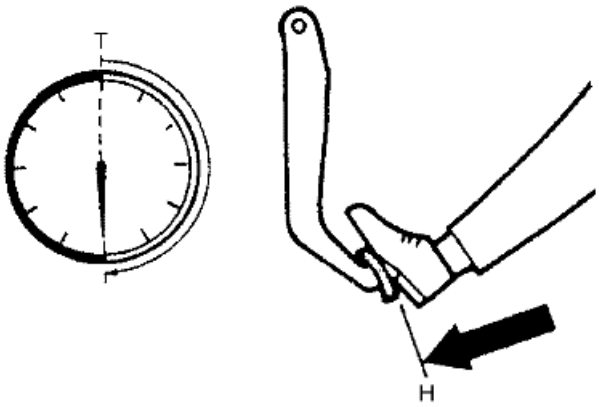
Air Tightness Inspection Under Loaded Condition

1) With engine running, depress brake pedal. Then stop engine while holding brake pedal depressed.



H: Hold

2) Hold brake pedal depressed for 30 seconds. If pedal height does not change, condition is good. But it is not if pedal rises.



H: Hold	T: 30 seconds

4A

Brake Booster Removal and Installation

Reference: Brake Booster Components

Removal

1) Remove following parts.
- Battery and battery tray. ☞
- Air cleaner. ☞

2) Disconnect brake pipes from ESP® hydraulic unit/control module assembly and from brake master cylinder assembly. ☞

3) Remove brake master cylinder assembly from brake booster. ☞

4) Disconnect vacuum hose from brake booster. ☞

5) Disconnect brake light switch connector.

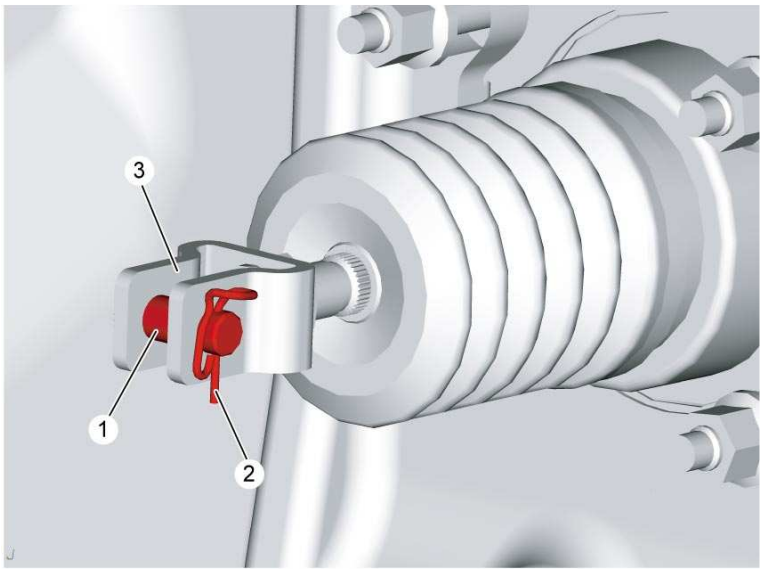
6) Remove push rod clevis pin.

7) Remove brake booster nuts to remove brake booster from dash panel.

Installation

Reference: Brake Booster Inspection

1) Install brake booster to dash panel. Then connect push rod clevis (3) to pedal arm with clevis pin (1) and clip (2).



2) Tighten brake booster nuts to specified torque.

Tightening torque

Brake booster nut: 13 N·m (1.3 kg-m, 9.5 lbf-ft)

3) Install brake master cylinder assembly to brake booster. ☞

4) Connect brake pipes to ESP® hydraulic unit/control module assembly and to brake master cylinder assembly. ☞

5) Install the following parts.
- Battery and battery tray. ☞
- Air cleaner. ☞

6) Bleed air from brake system. ☞

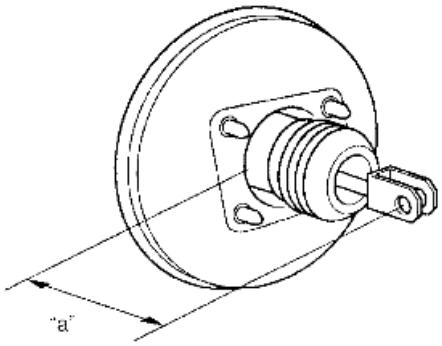
4A

Brake Booster Inspection

- Check brake booster for damage.
- Check brake booster for operation referring to "Operation Check" under ***Brake Booster Function Inspection***.
- Check boot for damage and deterioration.
- Check push rod length.
  If any fault is found, replace brake booster.

Push rod length

"a": 129 – 130 mm (5.08 – 5.12 in.)



Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pedal bracket bolt	13	1.3	9.5	☞
Brake booster nut	13	1.3	9.5	☞ ☞
Brake pedal bracket nut	13	1.3	9.5	☞
Pedal shaft nut	23	2.3	17.0	☞
Brake master cylinder fixing nut	13	1.3	9.5	☞
Brake pipe flare nut	19	1.9	14.0	☞

NOTE:
The specified tightening torque is described in the following.
Brake Pedal Components
Brake Hose and Pipe Components
Brake Master Cylinder Components
Brake Booster Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

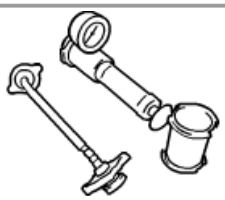
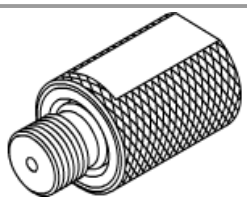
Recommended Service Material

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease E	P/No.: 99000–25050	☞

NOTE:
Required service material is also described in the following.
Brake Pedal Components
Brake Master Cylinder Components
Brake Booster Components

4A

Special Tool

09918–78211 Radiator cap tester kit 	09950–78220 Flare nut wrench 
09952–46010 Master cylinder attachment 	09952–48010 Adapter, master cylinder attachment 

Front Brake Description

The front brake system is ventilated disc brake type on all models.

4B

Front Brake Components

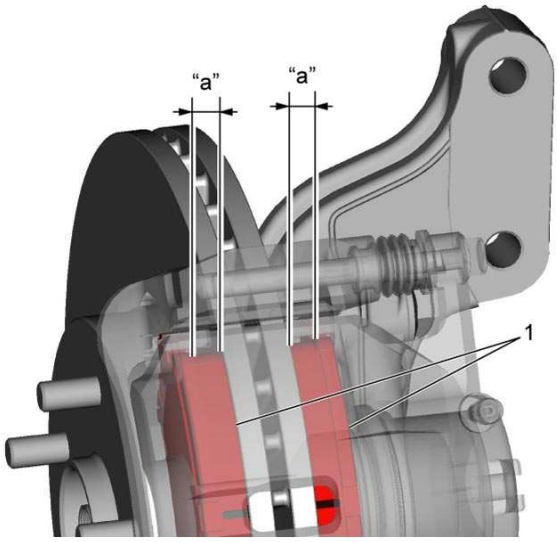
CAUTION:
- **When disconnecting brake flexible hose, plug its end so that brake fluid will not flow out and contact to vehicle or floor.**
- **Install front brake flexible hoses without twist.**

4B

Front Brake Pad On-Vehicle Inspection

Inspect pad linings (1) periodically according to maintenance schedule and whenever wheels are removed (for tire rotation or other reason). Check lining thickness of outside and inside pads.
If lining is worn and its thickness ("a" in figure) is less than the limit, all front brake pads must be replaced at the same time.

Front brake pad thickness (lining thickness) "a"
Standard: 11 mm (0.43 in.)
Limit: 2 mm (0.08 in.)



4B

Front Brake Pad Removal and Installation

Reference: Front Brake Components

CAUTION:
- **Be careful not to damage brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

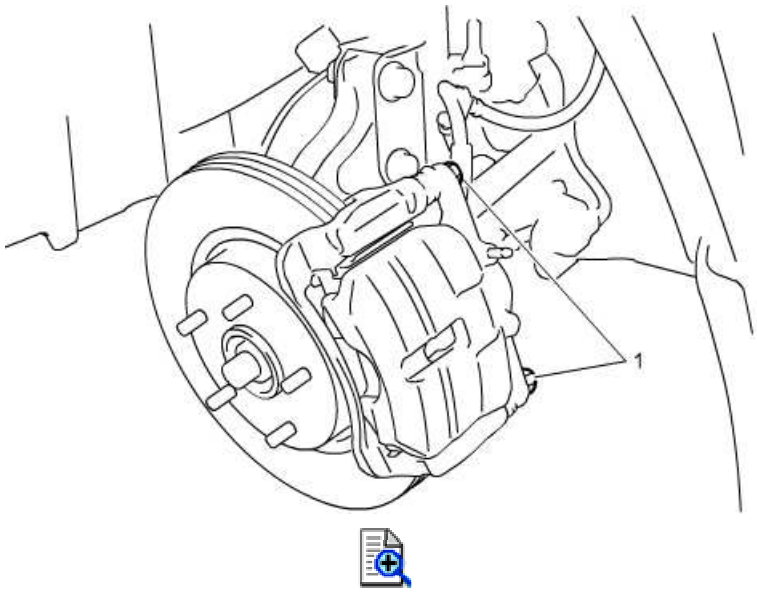
NOTE:
Replace all the front brake pads at the same time even if any brake pad needs to be replaced.

Removal

Reference: Front Brake Pad On-Vehicle Inspection

1) Hoist vehicle and remove front wheel.

2) Remove front brake caliper pin bolts (1).

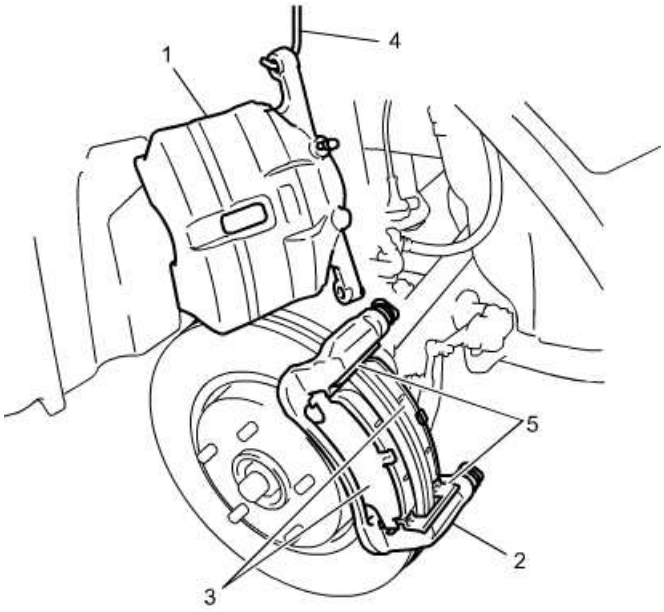


3) Remove front brake caliper (1) from front brake caliper carrier (2).

NOTE:
- **Hang removed front brake caliper (1) with a wire hook (4) to prevent brake flexible hose from bending, twisting excessively or being pulled.**
- **Do not operate brake pedal with brake pads removed.**

4) Check for leakage of brake fluid when removing brake pads and repair brake caliper if leakage is found.

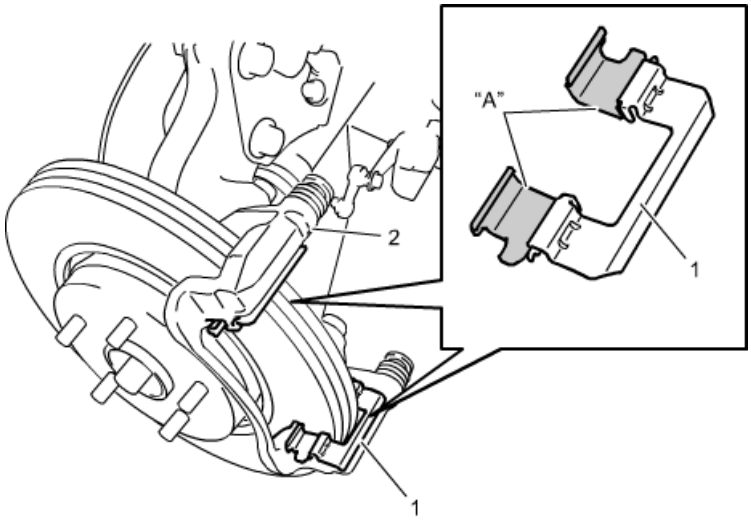
5) Remove brake pads (3) and pad springs (5) from front brake caliper carrier (2).



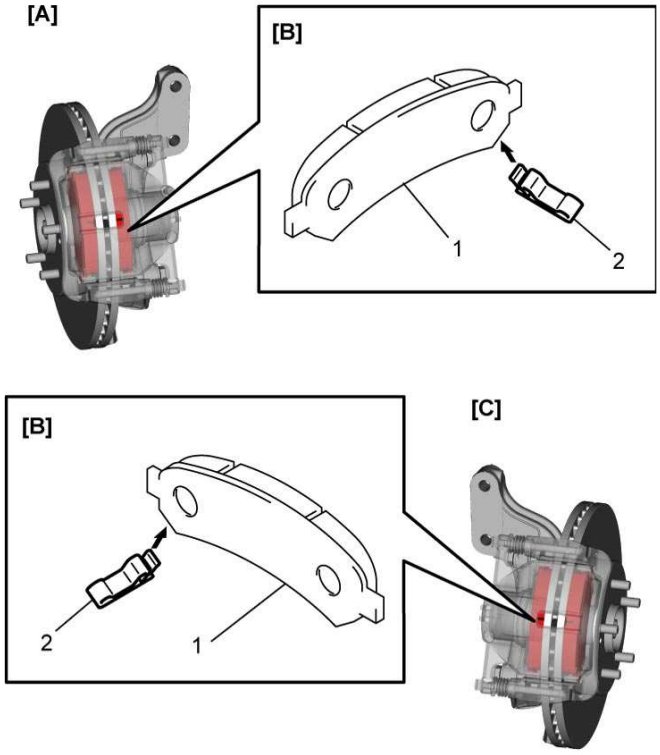
Installation

Reference: Front Brake Pad Inspection
Reference: Front Brake Caliper Inspection

1) Apply brake grease included in brake pad set to hatched areas "A" in pad springs (1) and install pad springs to front brake caliper carrier (2).

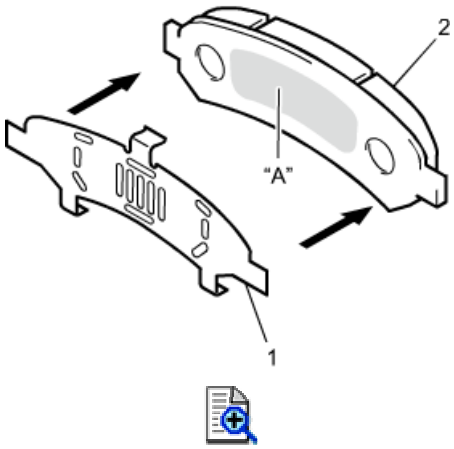


2) Install wear indicator (2) to arrow position of each inside brake pad (1).



[A]: Right side	[B]: Inside	[C]: Left side

3) Apply brake grease in brake pad set to hatched area "A" between brake pad (2) and antinoise shim (1).



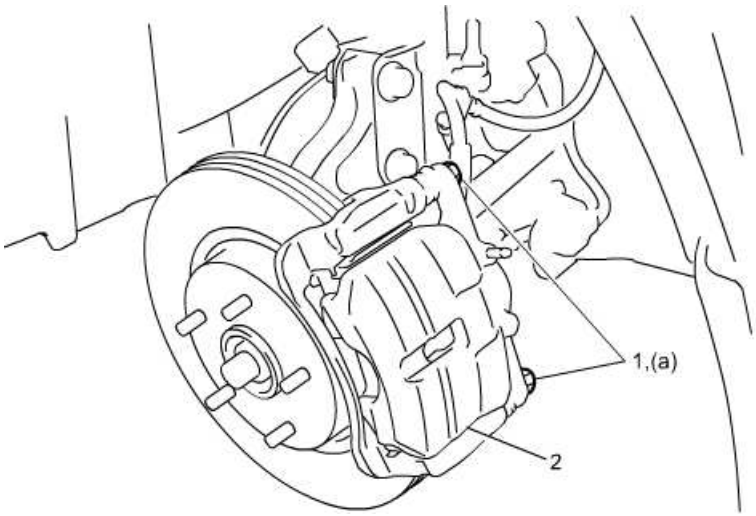
4) Install brake pad shims and brake pads.

5) Install front brake caliper (2) and tighten front brake caliper pin bolts (1) to specified torque.

CAUTION:
Make sure that brake flexible hose is not twisted while installing caliper.

Tightening torque

Front brake caliper pin bolt (a): 34 N·m (3.5 kg-m, 25.0 lbf-ft)



6) Install front wheel. ☞

7) Check that brake system operates properly after installation.

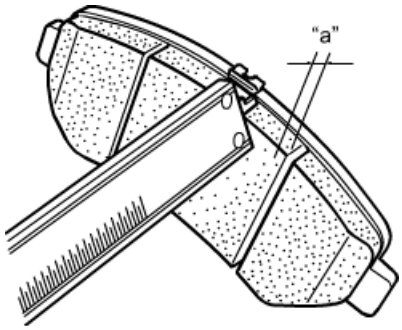
4B

Front Brake Pad Inspection

Reference: Front Brake Pad Removal and Installation

CAUTION:
Never polish brake pad lining with sandpaper.
If lining is polished with sandpaper, hard particles of sandpaper will remain on the lining and may damage brake disc. When brake pad lining is faulty, replace front brake pads with new ones.

- Check thickness of brake pad lining. If any lining is thinner than limit or one side is excessively worn, replace all front brake pads.
  Front brake pad lining thickness "a"
  Standard (new): 11 mm (0.43 in.)
  Limit: 2 mm (0.08 in.)



4B

Front Brake Disc Removal and Installation

Reference: Front Brake Components

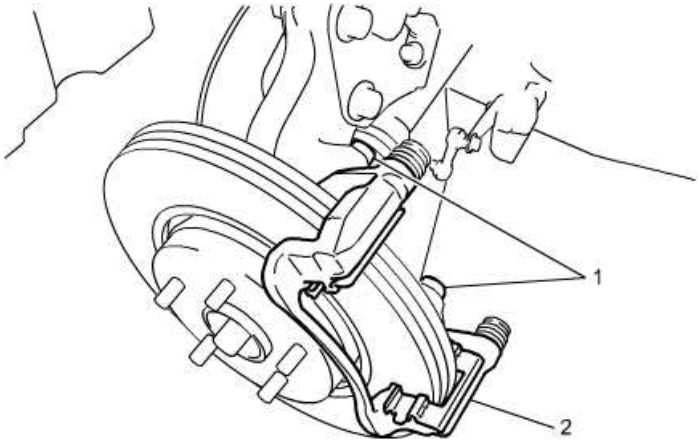
CAUTION:
- **Be careful not to damage brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

Removal

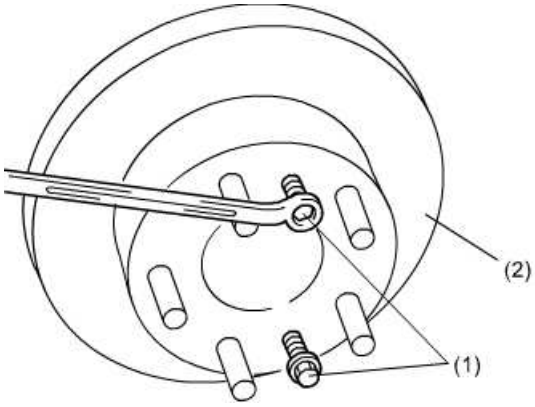
1) Hoist vehicle and remove front wheel. ☞

2) Remove front brake caliper and brake pads. ☞

3) Remove front brake caliper carrier bolts (1) and remove front brake caliper carrier (2) from steering knuckle.



4) Push out brake disc (2) by tightening two M8 bolts (1) evenly into jack bolt holes.

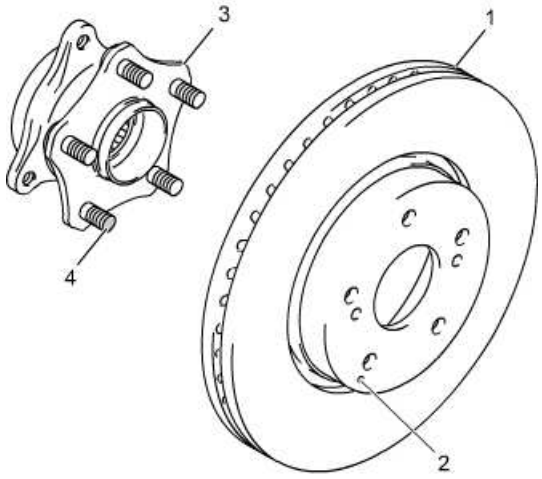


Installation

Reference: Front Brake Disc Inspection

CAUTION:
Make sure that brake flexible hose is not twisted while installing caliper.

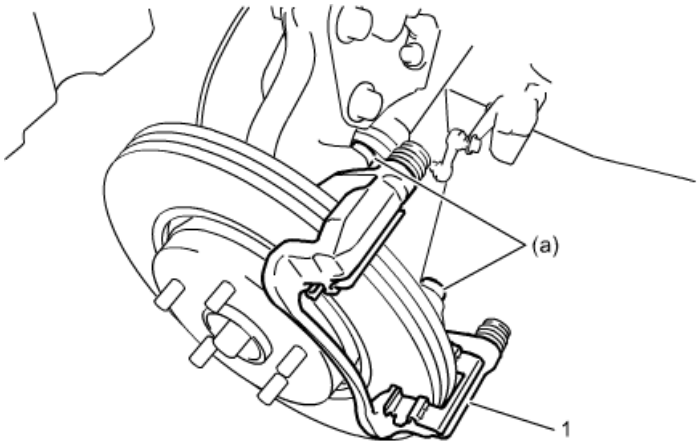
1) Align paint (2) on brake disc (1) with paint (4) on front wheel hub (3) and install brake disc.



2) Install front brake caliper carrier (1) to steering knuckle and tighten brake caliper bolts to specified torque.

Tightening torque

Front brake caliper carrier bolt (a): 155 N·m (15.8 kg-m, 114.5 lbf-ft)

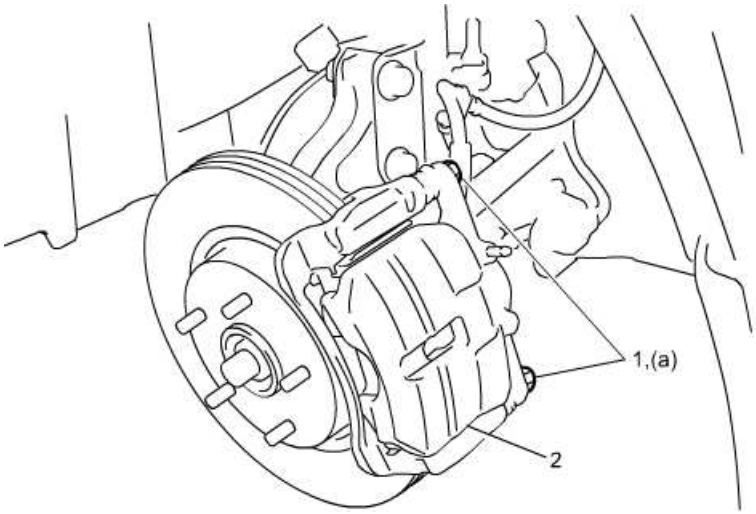


3) Install brake pad shim and brake pads. ☞

4) Install front brake caliper (2) and tighten front brake caliper pin bolts (1) to specified torque.

Tightening torque

Front brake caliper pin bolt (a): 34 N·m (3.5 kg-m, 25.0 lbf-ft)



5) Install front wheel. ☞

6) Check that brake system operates properly.

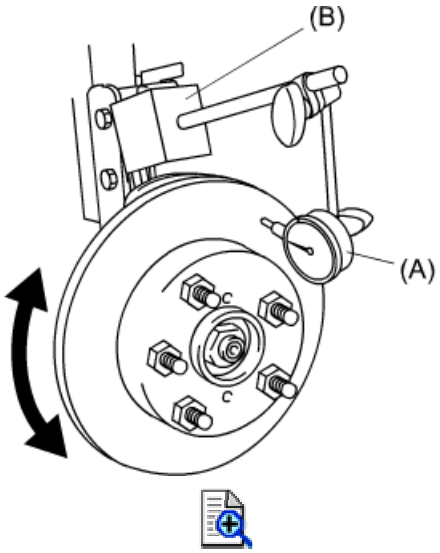
4B

Front Brake Disc Inspection

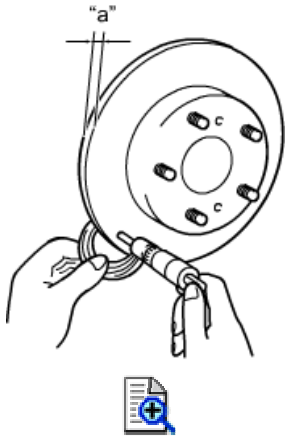
Reference: Front Brake Disc Removal and Installation

- Measure deflection of front brake disc at the point 10 mm inside from its edge using special tools and repair or replace the disc if defective.
  Front brake disc deflection
  Limit: 0.10 mm (0.004 in.)

  Special Tool
  (A): 09900–20607
  (B): 09900–20701



- Measure thickness of front brake disc with micrometer. If thickness is less than limit, replace the disc.
  Front brake disc thickness "a"
  Standard: 26.0 mm (1.02 in.)
  Limit: 24.0 mm (0.94 in.)



4B

Front Brake Caliper Removal and Installation

Reference: Front Brake Components

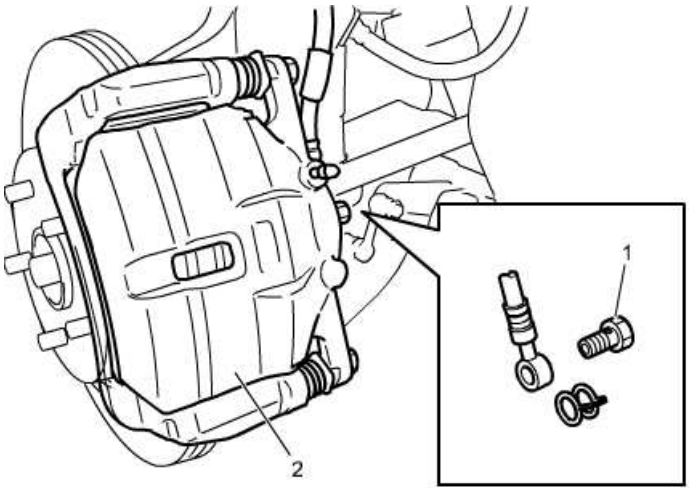
CAUTION:
- **Be careful not to damage brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

Removal

1) Hoist vehicle and remove front wheel. ☞

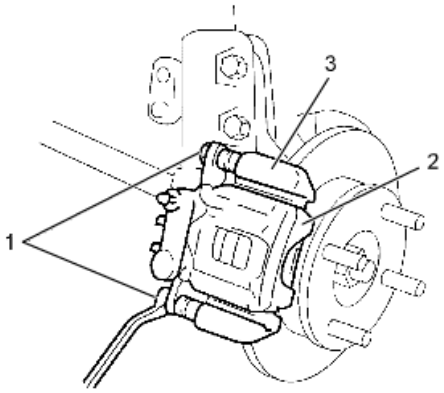
2) Place a container to catch brake fluid below front brake caliper (2).

3) Remove flexible hose joint bolt (1) from front brake caliper (2).



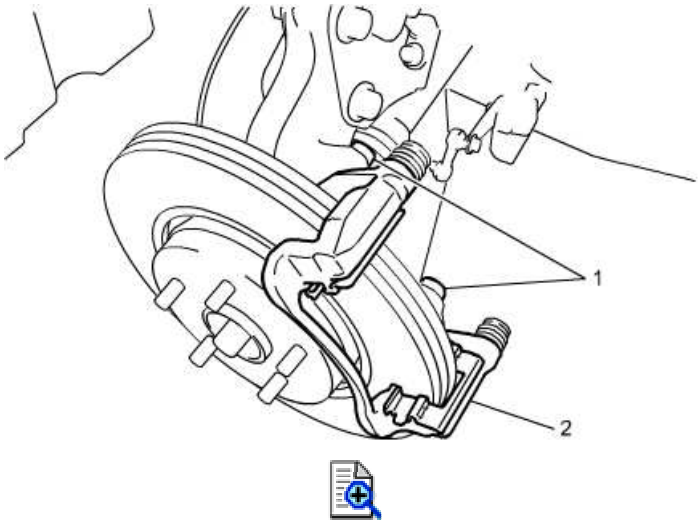
4) Remove front brake caliper pin bolts (1).

5) Remove front brake caliper cylinder (2) from front brake caliper carrier (3).



6) Remove brake pads. ☞

7) Remove brake caliper bolts (1) and remove caliper carrier (2) from steering knuckle.



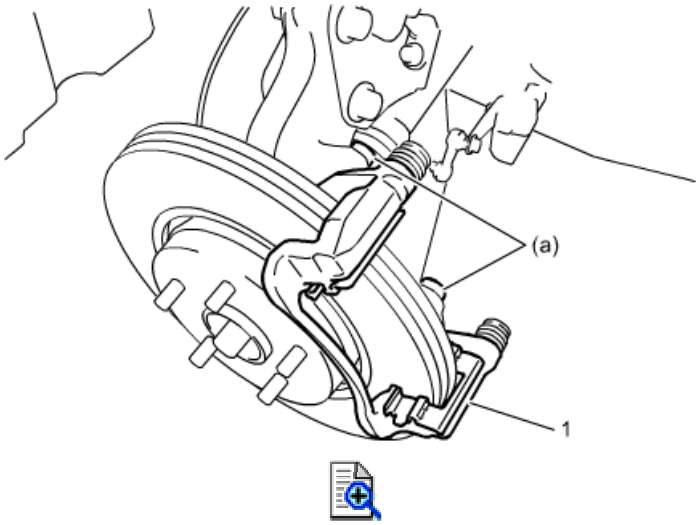
Installation

Reference: Front Brake Caliper Inspection

CAUTION:
Make sure that brake flexible hose is not twisted while installing caliper.

1) Install front brake caliper carrier (1) to steering knuckle and tighten brake caliper pin bolts to specified torque.

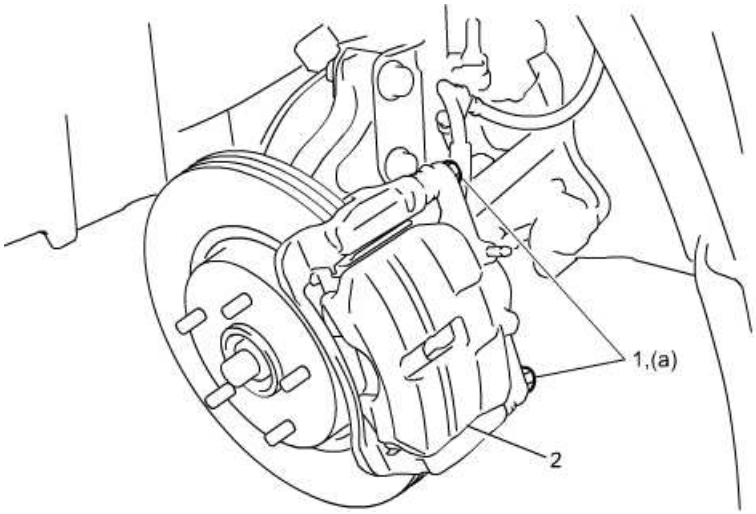
Tightening torque
Front brake caliper carrier bolt (a): 155 N·m (15.8 kg-m, 114.5 lbf-ft)



2) Install brake pads. ☞

3) Install front brake caliper (2) to front brake caliper carrier and tighten front brake caliper pin bolts (1) to specified torque.

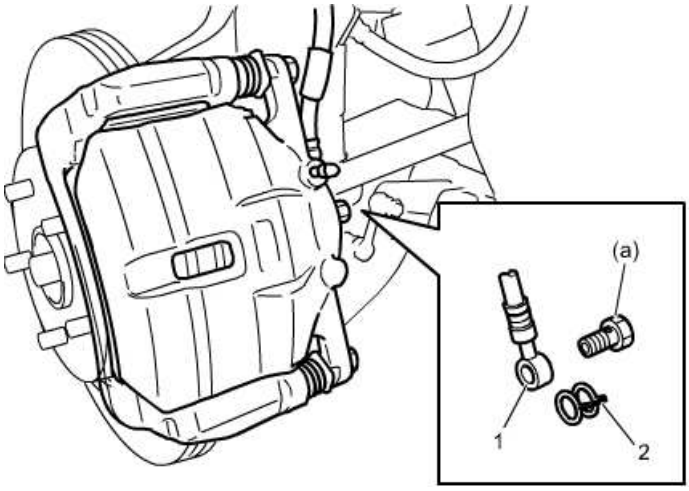
Tightening torque
Front brake caliper pin bolt (a): 34 N·m (3.5 kg-m, 25.0 lbf-ft)



4) Install brake flexible hose (1) to front brake caliper with new flexible hose gasket (2) and tighten flexible hose joint bolt to specified torque.

Tightening torque

Flexible hose joint bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



5) Fill reservoir with brake fluid and bleed air from brake system. ☞

6) Make sure there is no leakage of brake fluid.

7) Install front wheel. ☞

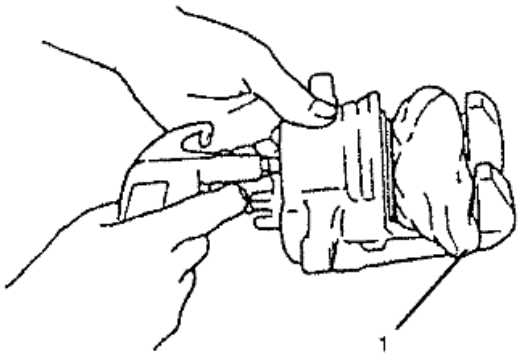
8) Check that brake system operates properly.

4B

Front Brake Caliper Disassembly and Reassembly

Reference: Front Brake Components

WARNING:
- **Do not place a finger between brake piston and front brake caliper when pushing out brake piston with compressed air.**
- **Place shop towel (1) between brake piston and front brake caliper so as not to damage brake piston.**
- **Push out brake piston slowly with appropriate air pressure to prevent piston from jumping out.**



CAUTION:
Take care not to damage piston and cylinder of front brake caliper.

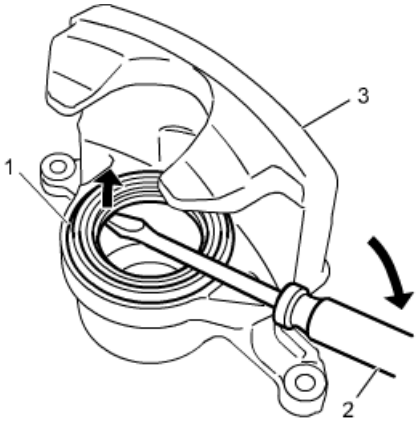
Disassembly

Caliper

1) Clean around front brake caliper.

2) Remove brake piston by blowing air into flexible hose joint bolt installation hole.

3) Remove cylinder boot (1) from caliper cylinder (3) of front brake caliper using flat-end screwdriver (2) or the like.



4) Remove piston seal and bleeder plug.

Slide pin

Remove slide pins (2) and pin boots (3) from front brake caliper carrier (1).

4B

Front Brake Caliper Inspection

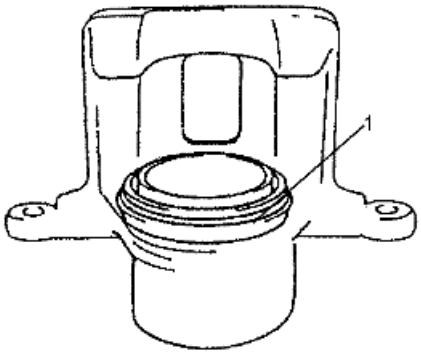
NOTE:
Perform this inspection in the following cases.
- **When replacing the brake pads with new ones.**
- **When checking the thickness of brake pad.**
- **Before reassembling the brake caliper.**

Caliper Cylinder and Caliper Carrier

Check front brake caliper cylinder and caliper carrier for distortion, crack, damage and rust. Replace front brake caliper or caliper carrier if any defect is found.

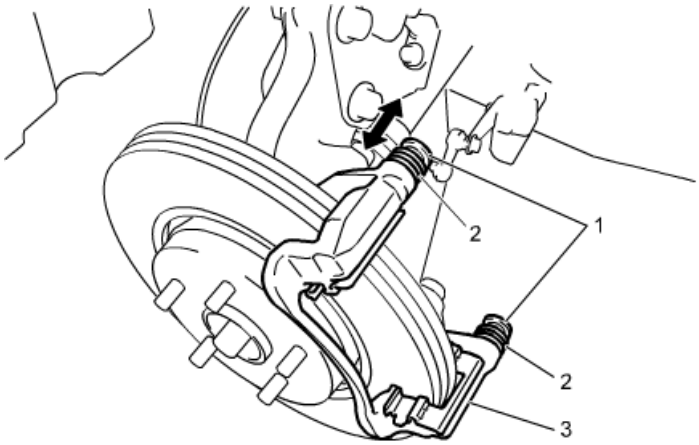
Cylinder Boot

Check cylinder boot (1) for break, crack and brake fluid leak. If any defect is found, replace front cylinder boot.



Slide Pin

Check that slide pins (1) move smoothly in lateral direction before installing front brake caliper to front brake caliper carrier (3). Replace slide pin (1) and pin boot (2) if defective.



4B

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Front brake caliper pin bolt	34	3.5	25.0	☞ ☞ ☞
Front brake caliper carrier bolt	155	15.8	114.5	☞ ☞
Flexible hose joint bolt	23	2.3	17.0	☞
Bleeder plug	8.0	0.82	6.0	☞

NOTE:
The specified tightening torque is described in the following.
Front Brake Components

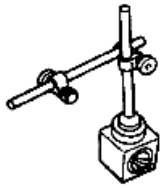
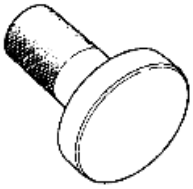
Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

Recommended Service Material

NOTE:
Required service material is also described in the following.
Front Brake Components

4B

Special Tool

09900–20607 Dial gauge 	09900–20701 Magnetic stand 
09913–75510 Bearing installer 	

4C

Rear Disc Brake Description

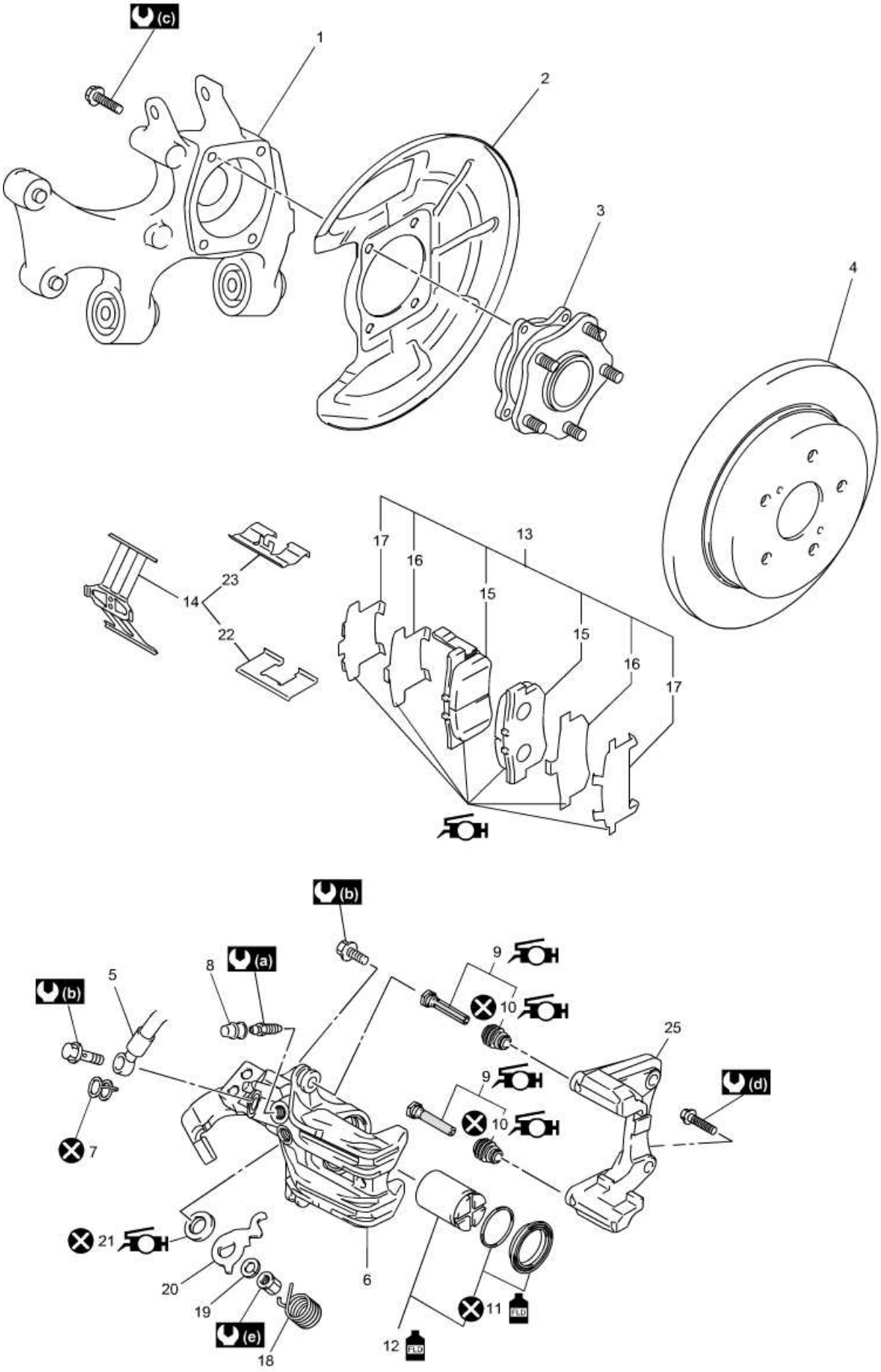
Rear brake is a disc type. Hydraulic force, created by applying force to the brake pedal, is converted by the caliper to friction. The hydraulic force acts equally against the piston and the bottom of the caliper bore to move the piston outward and to move (side) the caliper inward, resulting in a clamping action on the disc. This clamping action forces the pads (linings) against the disc, creating friction to stop the vehicle.
For components, refer to ***Rear Brake Components***.

WARNING:
If any hydraulic component is removed or brake line disconnected, the brake system. The torque values specified are for dry, unlubricated fasteners.

4C

Rear Brake Components

CAUTION:
- **When disconnecting rear brake flexible hose, plug its end so that brake fluid will not flow out and contact to vehicle or floor.**
- **Install rear brake flexible hoses without twist.**


(c)
1
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16
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22
(b)
(a)
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(b)
9
10
25
9
10
(d)
7
21
20
19
(e)
18
6
11
12

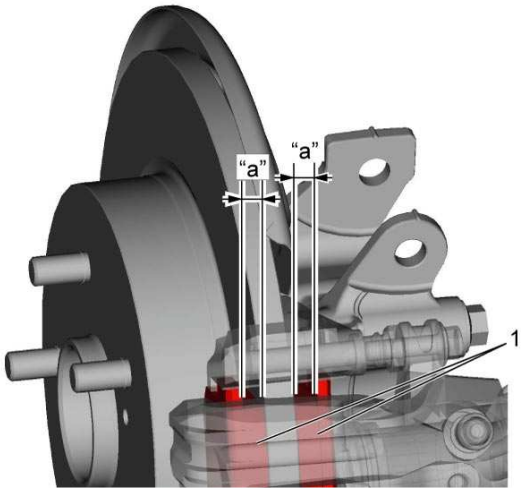
1. Suspension knuckle	11. Piston seal set : Apply small amount of brake fluid to all around part to piston boot and seal.	21. Shaft cover : Apply grease 99000-59124-006 to inside of shaft cover.
2. Rear brake disc dust cover	12. Piston and seal : Apply small amount of brake fluid to all around part to piston, piston boot and seal.	22. Pad spring lower
3. Rear wheel hub	13. Brake pad set	23. Pad spring upper
4. Rear rear brake disc	14. Pad spring	24. Rear brake caliper carrier
5. Rear rear brake flexible hose	15. Brake pad : Apply grease (supplied) between brake pad and antinoise shim.	(a): 7.0 N·m (0.71 kgf-m, 5.5 lbf-ft)
6. Rear brake caliper	16. Antinoise shim : Apply grease (supplied) between brake pad and anti-noise shim.	(b): 23 N·m (2.3 kgf-m, 17.0 lbf-ft)
7. Flexible hose gasket	17. Brake pad shim : Apply grease (supplied) between anti-noise system and brake pad shim.	(c): 75 N·m (7.6 kgf-m, 55.5 lbf-ft)
8. Bleeder plug cap	18. Return spring	(d): 60 N·m (6.1 kgf-m, 44.5 lbf-ft)
9. Pin/Boot set : Apply grease (supplied) to slide pin and apply inside of pin boot.	19. Washer	(e): 27 N·m (2.8 kgf-m, 20.0 lbf-ft)
10. Pin boot : Apply grease (supplied) to inside of pin boot.	20. Lever	: Do not reuse.

4C

Rear Brake Pad On-Vehicle Inspection

Inspect pad linings (1) periodically according to maintenance schedule and whenever wheels are removed (for tire rotation or other reason). Check lining thickness of outside and inside pads.
If lining is worn and its thickness ("a" in figure) is less than the limit, all rear brake pads must be replaced at the same time.

Rear brake pad thickness (lining thickness) "a"
Standard: 9 mm (0.35 in.)
Limit: 1.5 mm (0.06 in.)



4C

Rear Brake Pad Removal and Installation

Reference: Rear Brake Components

CAUTION:
- **Be careful not to damage rear brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

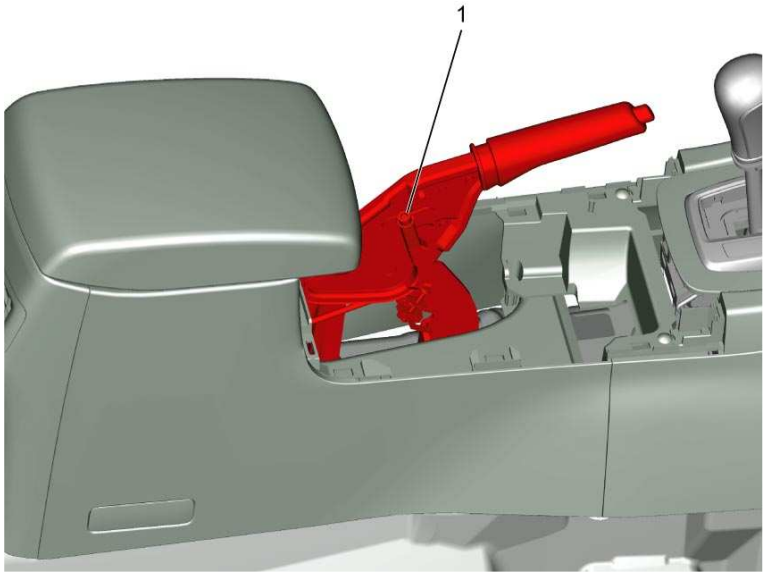
NOTE:
- **Check for leakage of brake fluid when removing brake pads and repair brake caliper if leakage is found.**
- **Replace all the rear brake pads at the same time even if any rear brake pad needs to be replaced.**

Removal

1) Remove console panel. ☞

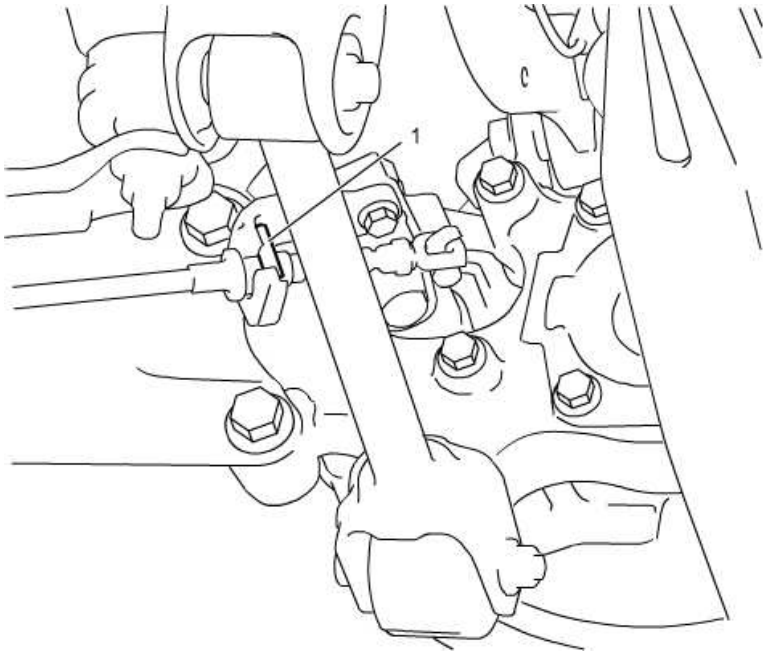
2) Release parking brake.

3) Loosen adjustment nut (1).

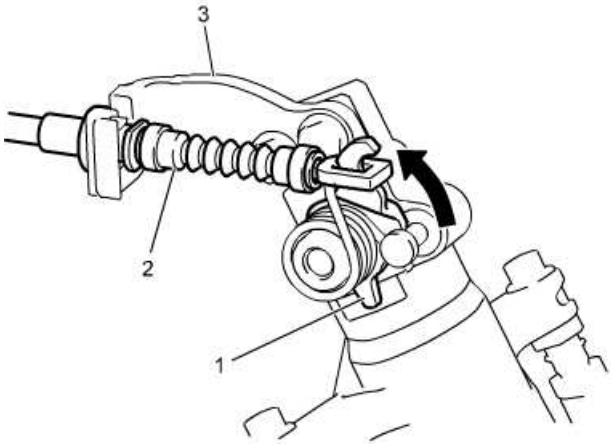


4) Hoist vehicle and remove rear wheel. ☞

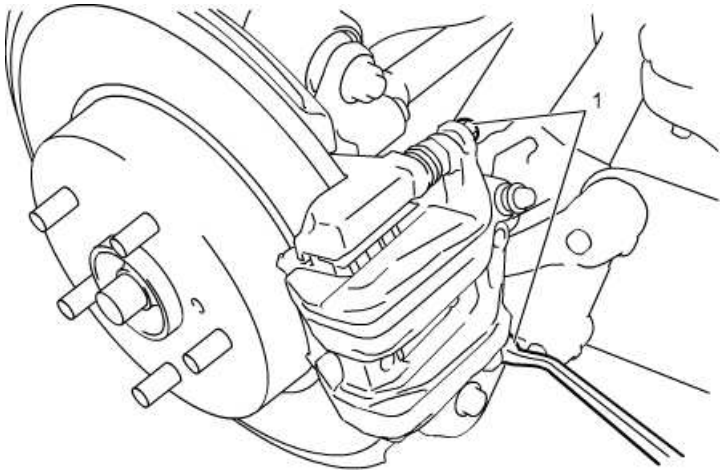
5) Remove E-ring (1).



6) Turn lever (1) in arrow direction and remove parking brake cable (2) from lever and bracket (3).



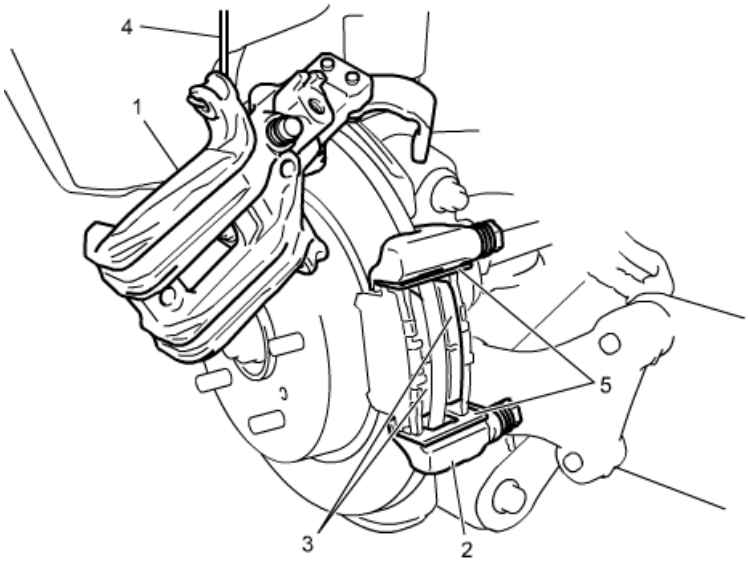
7) Remove rear brake caliper pin bolts (1).



8) Remove rear brake caliper (1) from rear brake caliper carrier (2).

NOTE:
Hang removed rear brake caliper (1) with a wire hook (4) to prevent rear brake flexible hose from bending, twisting excessively or being pulled.

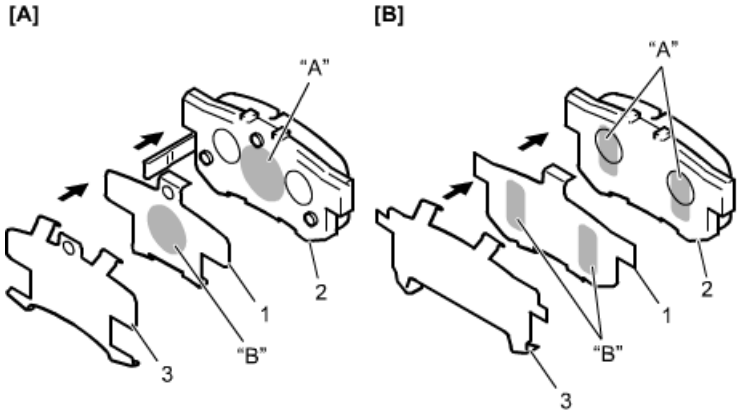
9) Remove brake pads (3) and pad springs (5) from rear brake caliper carrier (2).



Installation

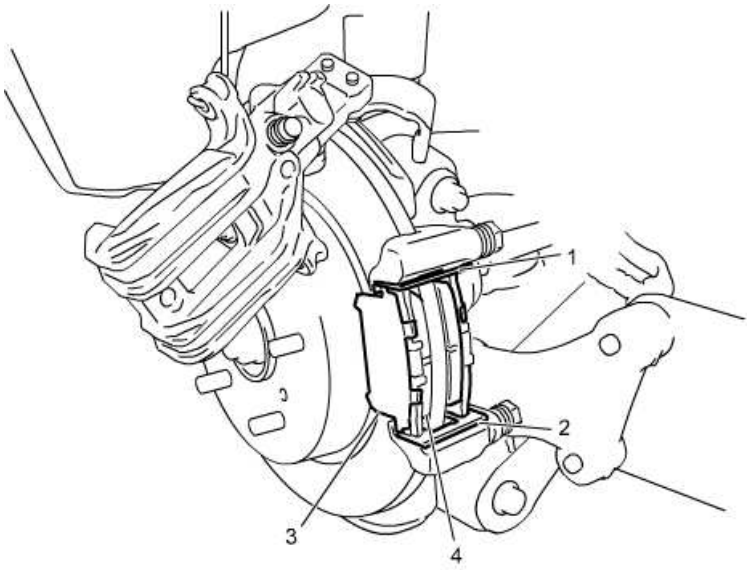
Reference: Rear Brake Pad Inspection
Reference: Rear Brake Caliper Inspection

1) Apply brake grease in brake pad set to hatched area "A" between brake pad (2) and antinoise shim (1), and hatched face "B" between antinoise shim (1) and brake pad shim (3).



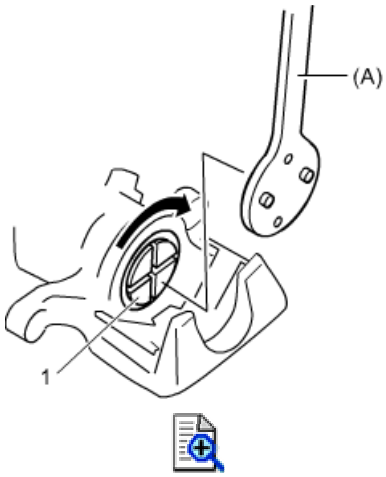
[A]: Inside	[B]: Outside

2) Install pad spring upper (1), pad spring lower (2), brake pad shims (3) and brake pads (4).

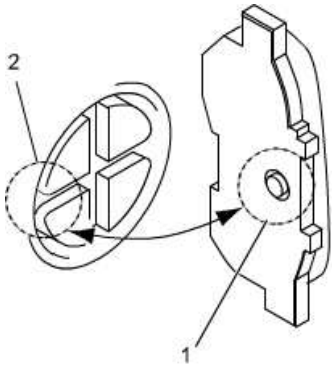


3) Turn piston (1) in arrow direction by quarter to half turn using special tool to screw piston into caliper cylinder.

Special Tool
(A): 09945–16060



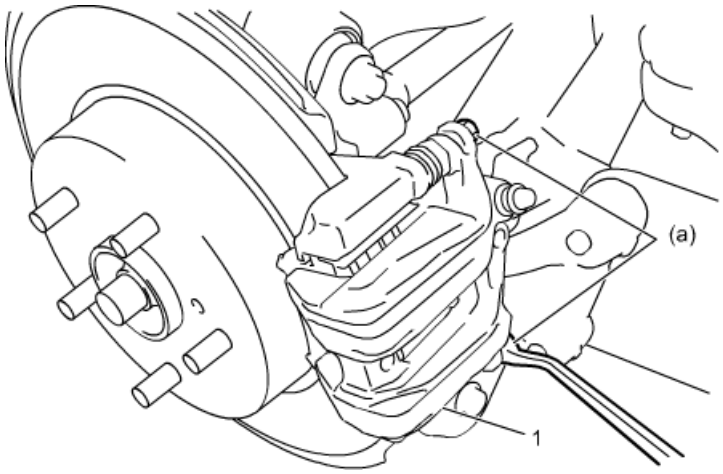
4) Install rear brake caliper cylinder while aligning slot of piston (2) with protrusion at back of brake pad (1).



5) Install rear caliper (1) to rear brake caliper carrier and tighten rear brake caliper pin bolts to specified torque.

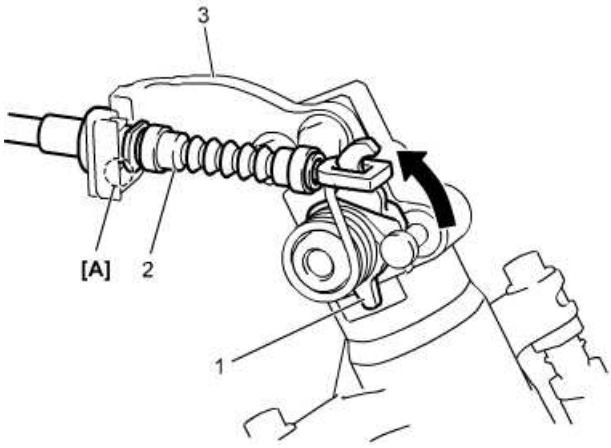
Tightening torque

Rear brake caliper pin bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



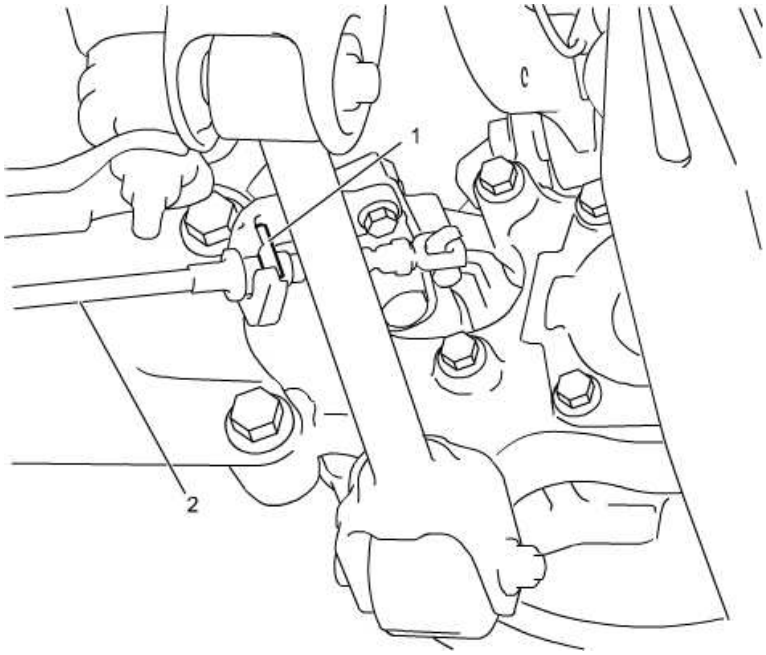
6) Pass parking brake cable through bracket.

7) Align positions of parking brake cable (2) and bracket (3). Turn lever (1) in arrow direction and install cable (2) to lever (1).



[A]:	Positioning part

8) Install E-ring (1) and fix parking brake cable (2).



9) Depress brake pedal three times or more with engine running to activate pad clearance adjustment mechanism so that clearance between rear brake disc and brake pad will be appropriate.

10) Check that brakes are not dragging and that appropriate stopping force can be obtained.

11) Install rear wheel and check if parking brake lever stroke is appropriate and if proper parking braking force can be obtained. ☞

12) Install console panel. ☞

4C

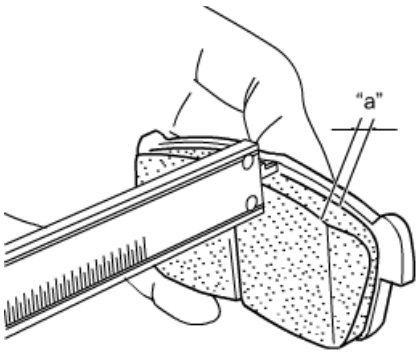
Rear Brake Pad Inspection

Reference: Rear Brake Pad Removal and Installation

CAUTION:
Never polish brake pad lining with sandpaper.
If lining is polished with sandpaper, hard particles of sandpaper will remain on the lining and may damage rear brake disc. When brake pad lining is faulty, replace rear brake pads with new ones.

NOTE:
- **Check for leakage of brake fluid when removing brake pads and repair brake caliper if leakage is found.**
- **Replace all the rear brake pads at the same time even if any rear brake pad needs to be replaced.**

- Check thickness of brake pad lining. If any lining is thinner than limit or one side is excessively worn, replace all rear brake pads.
  Rear brake pad lining thickness "a"
  Standard (new): 9 mm (0.35 in.)
  Limit: 1.5 mm (0.06 in.)



4C

Rear Brake Disc Removal and Installation

Reference: Rear Brake Components

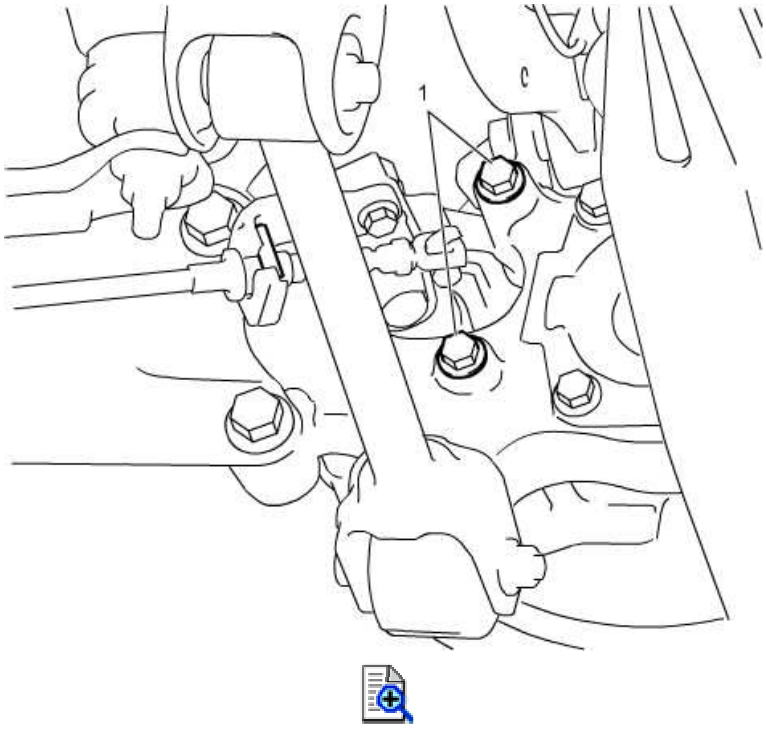
CAUTION:
- **Be careful not to damage rear brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

Removal

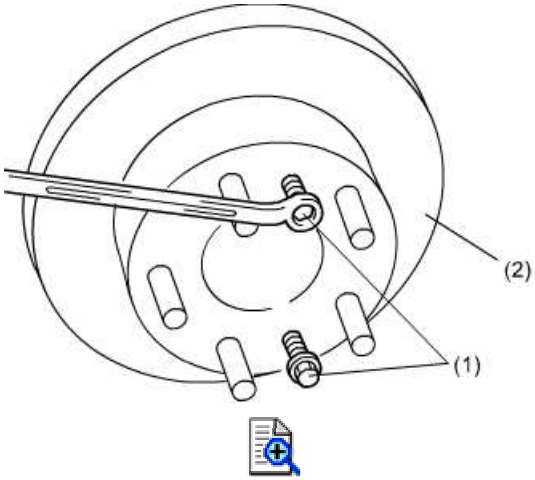
1) Hoist vehicle and remove rear wheel. ☞

2) Remove rear brake caliper and brake pads. ☞

3) Remove rear brake caliper carrier bolts (1) and remove rear brake caliper carrier from suspension knuckle.



4) Push out rear brake disc (2) by tightening two M8 bolts (1) evenly into jack bolt holes.

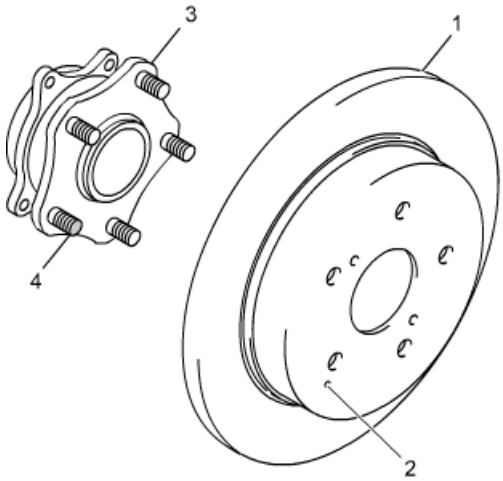


Installation

Reference: Rear Brake Disc Inspection

CAUTION:
Do not twist rear brake flexible hose when installing rear brake caliper.

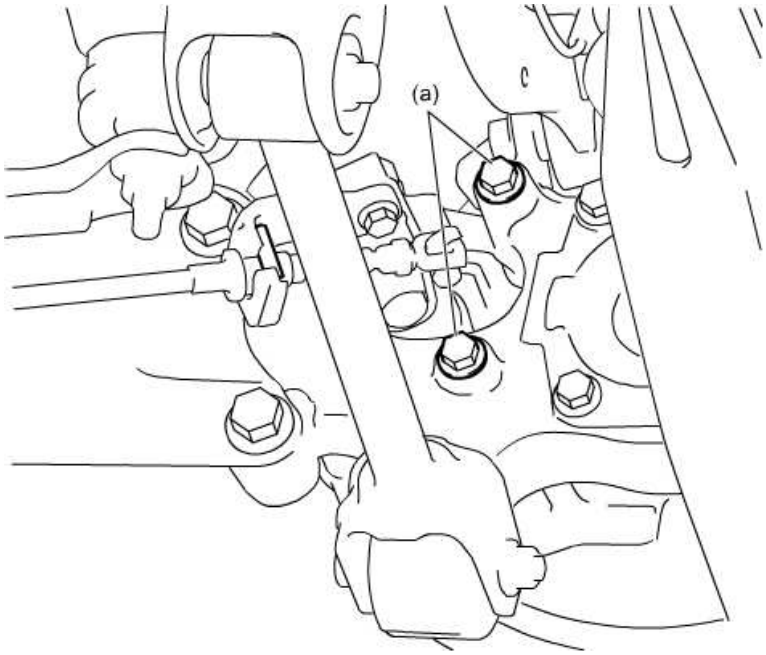
1) Align paint (2) on rear brake disc (1) with paint (4) on rear wheel hub (3) and install rear brake disc.



2) Install rear brake caliper carrier to suspension knuckle and tighten brake caliper bolts to specified torque.

Tightening torque

Rear brake caliper carrier bolt (a): 60 N·m (6.1 kg-m, 44.5 lbf-ft)



3) Install rear brake caliper and brake pads. ☞

4) Depress brake pedal three times or more with engine running to activate pad clearance adjustment mechanism so that clearance between rear brake disc and brake pads will be appropriate.

5) Check that brakes are not dragging and that appropriate stopping force can be obtained.

6) Install rear wheel and check if parking brake lever stroke is appropriate and if proper parking braking force can be obtained. ☞

4C

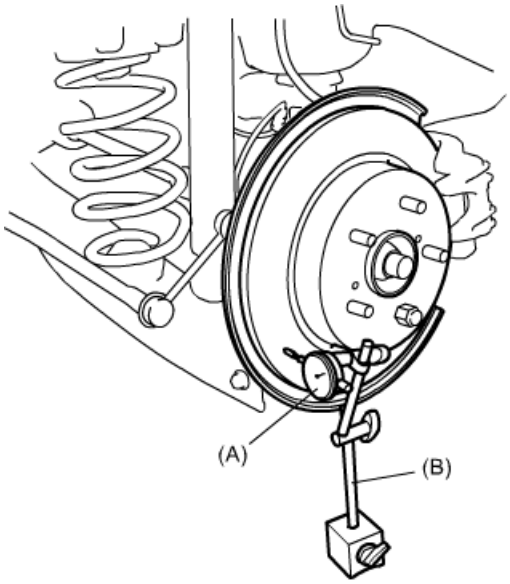
Rear Brake Disc Inspection

Reference: Rear Brake Disc Removal and Installation

Measure deflection of rear brake disc at the point 10 mm inside from its edge using special tools and repair or replace the disc if defective.

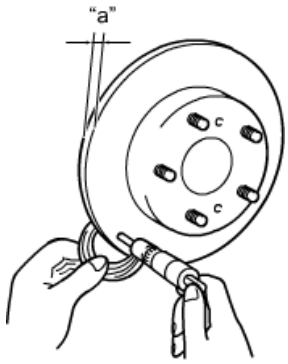
Rear rear brake disc deflection
Limit: 0.10 mm (0.004 in.)

Special Tool
(A): 09900–20607
(B): 09900–20701



Measure thickness of rear brake disc with micrometer. If thickness is less than limit, replace the disc.

Rear rear brake disc thickness "a"
Standard: 12 mm (0.47 in.)
Limit: 11 mm (0.43 in.)



4C

Rear Brake Caliper Removal and Installation

Reference: Rear Brake Components

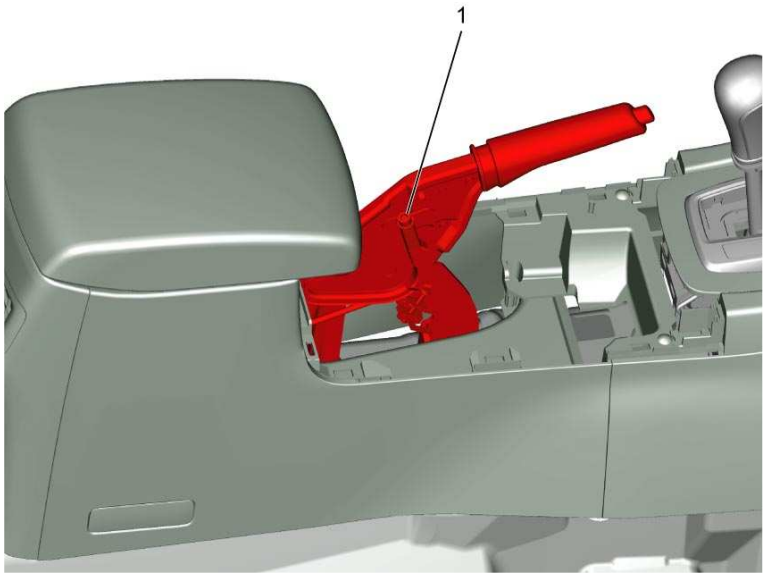
CAUTION:
- **Be careful not to damage rear brake flexible hoses.**
- **Never depress brake pedal during service procedures.**

Removal

1) Remove console rear panel. ☞

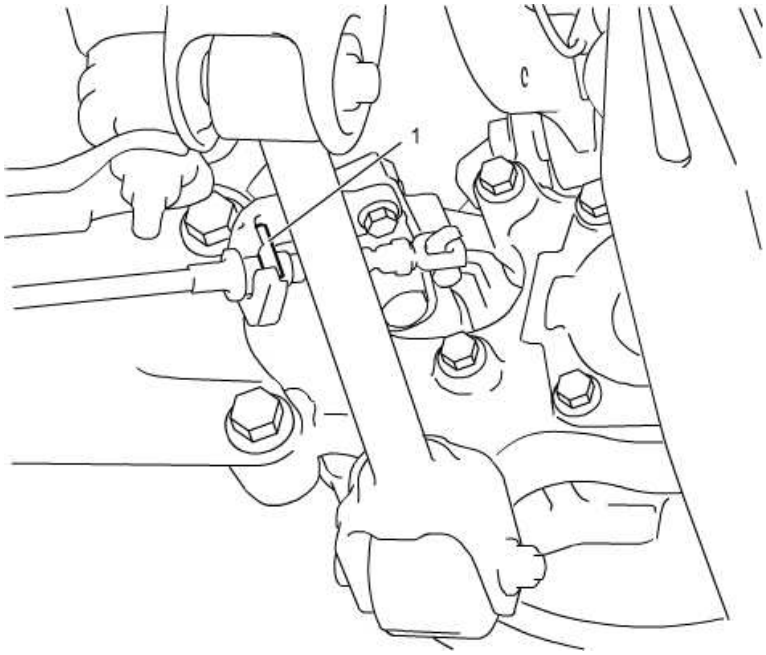
2) Release parking brake.

3) Loosen adjustment nut (1).

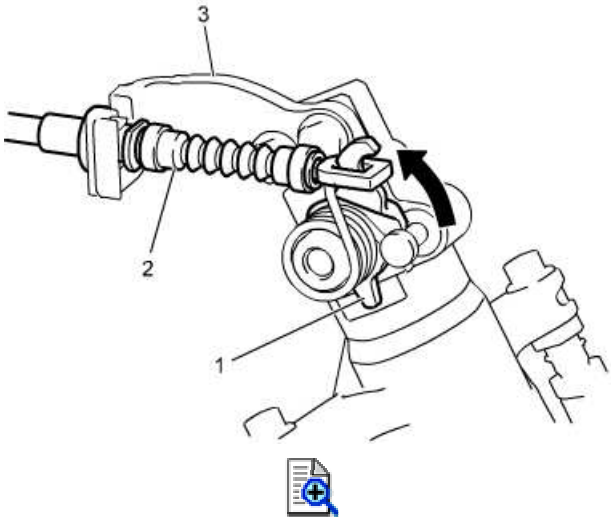


4) Hoist vehicle and remove rear wheel. ☞

5) Remove E-ring (1).

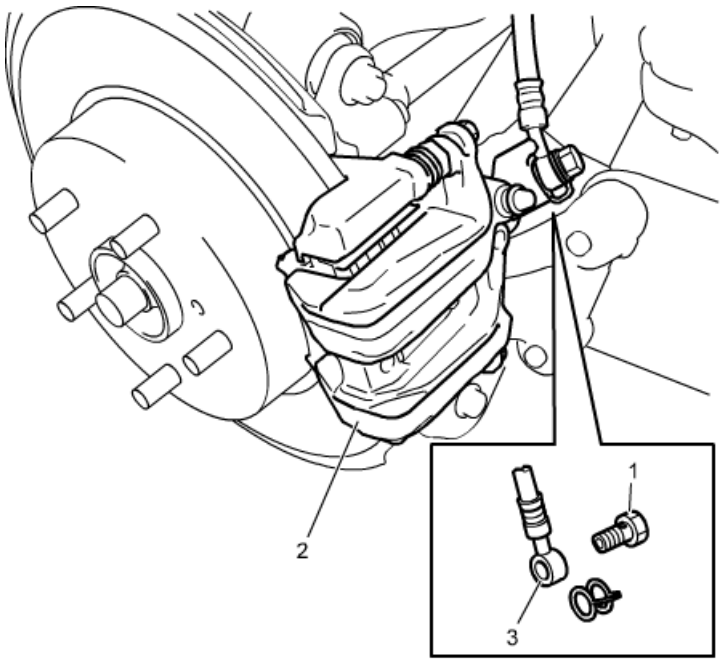


6) Turn lever (1) in arrow direction and remove parking brake cable (2) from lever and bracket (3).

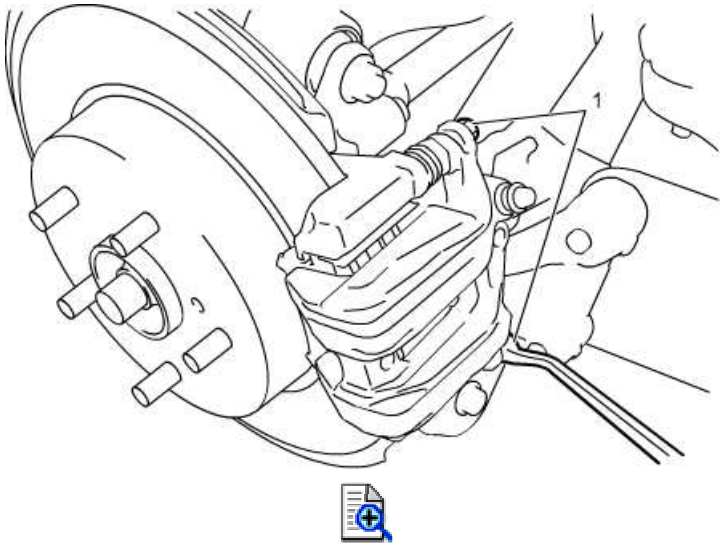


7) Place a container to catch brake fluid from disconnected rear brake flexible hose (3) below rear brake caliper (2).

8) Remove flexible hose joint bolt (1) from rear brake caliper (2).



9) Remove rear brake caliper pin bolts.



10) Remove rear brake caliper from rear brake caliper carrier.

11) Remove rear brake pad. ☞

12) Remove rear brake caliper carrier from suspension knuckle.

Installation

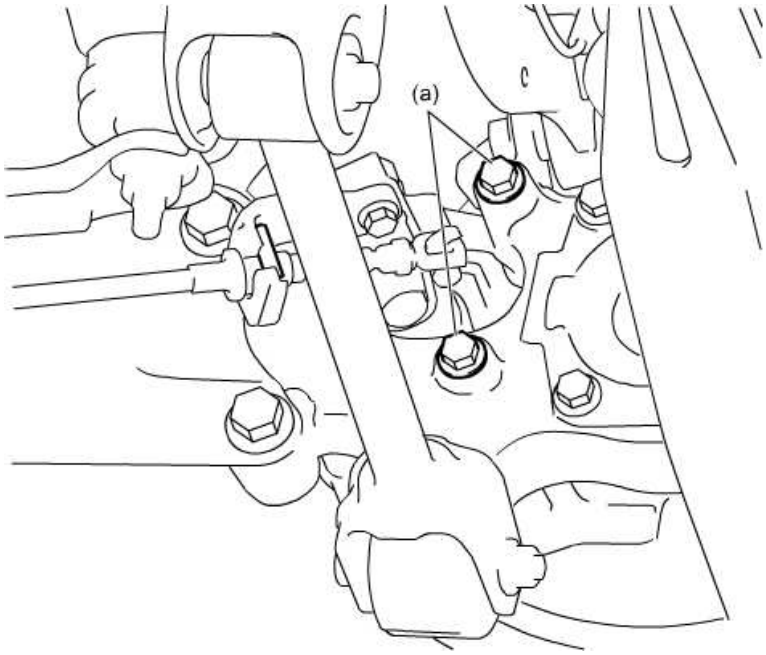
Reference: Rear Brake Caliper Inspection

CAUTION:
Do not twist rear brake flexible hose when installing rear brake caliper.

1) Install rear brake caliper carrier to suspension knuckle and tighten rear brake caliper carrier bolts to specified torque.

Tightening torque

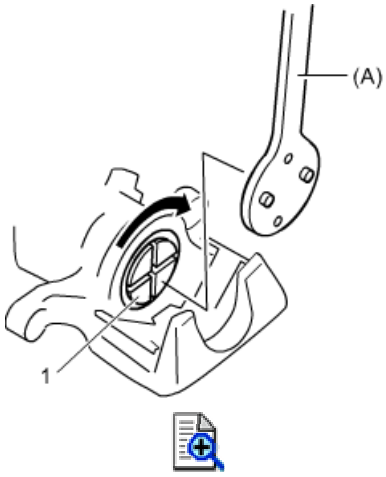
Rear brake caliper carrier bolt (a): 60 N·m (6.1 kg-m, 44.5 lbf-ft)



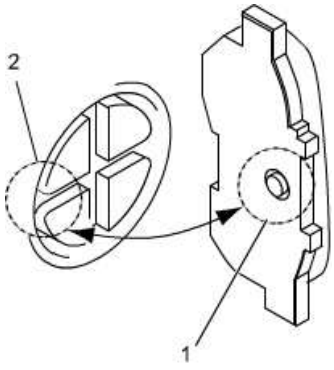
2) Turn piston (1) in arrow direction by quarter to half turn using special tool to screw piston into caliper cylinder.

Special Tool

(A): 09945–16060



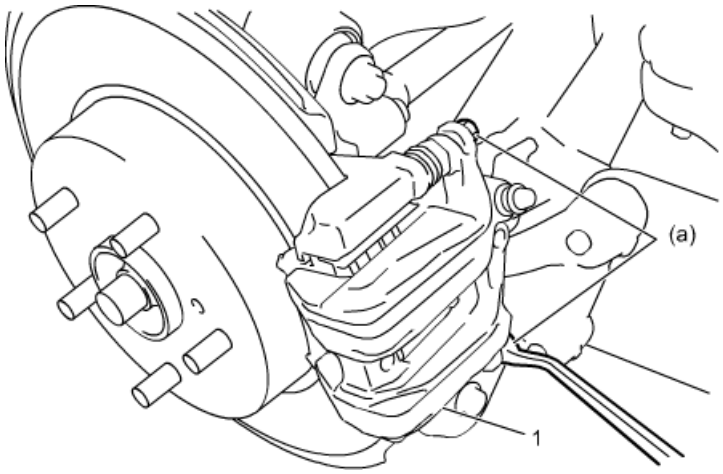
3) Install rear brake caliper while aligning slot of piston (2) with protrusion at back of brake pad (1).



4) Install caliper (1) to rear brake caliper carrier and tighten rear brake caliper pin bolt to specified torque.

Tightening torque

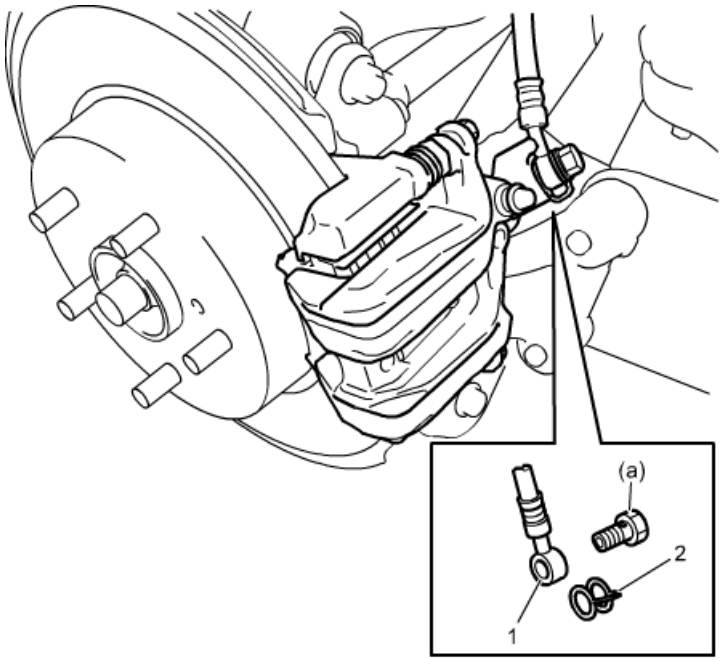
Rear brake caliper pin bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



5) Install rear brake flexible hose (1) to rear brake caliper with new flexible hose gasket (2) and tighten flexible hose joint bolt to specified torque.

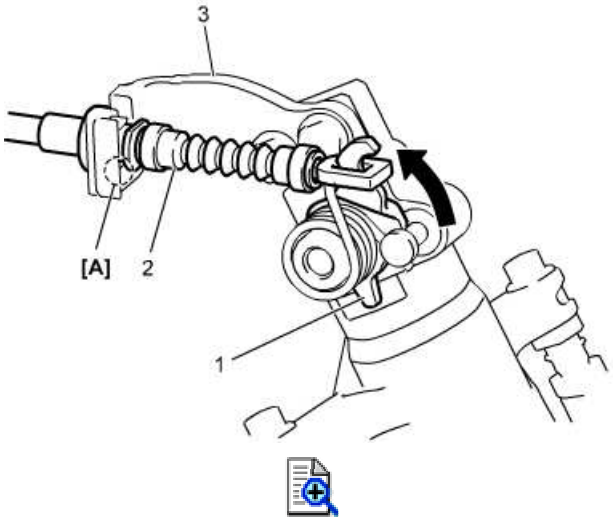
Tightening torque

Flexible hose joint bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



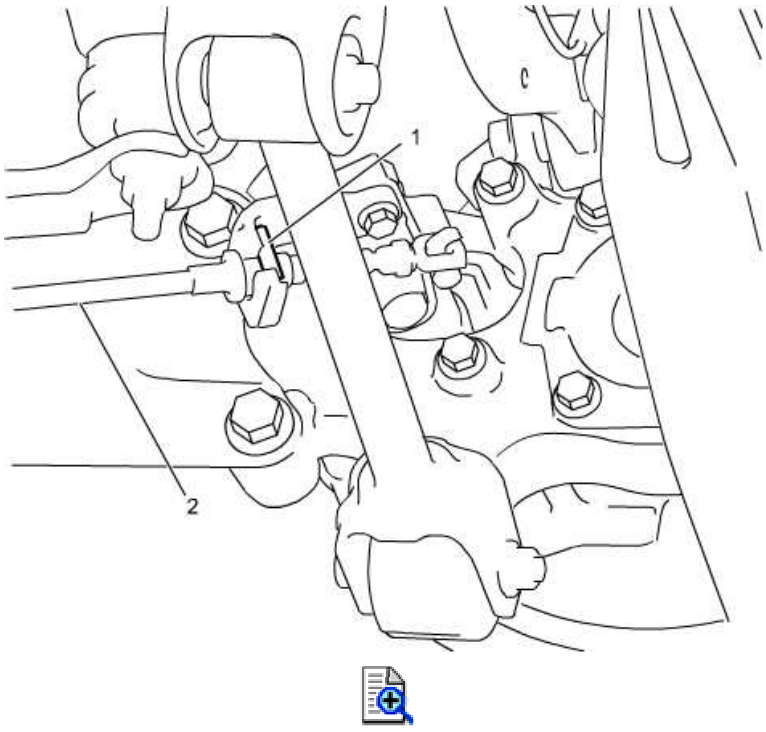
6) Pass parking brake cable through bracket.

7) Align positions of parking brake cable (2) and bracket (3). Turn lever (1) in arrow direction and install cable (2) to lever (1).



[A]:	Positioning part

8) Install E-ring (1) and fix parking brake cable (2).



9) Fill reservoir with brake fluid and bleed air from brake system. ☞

10) Make sure there is no leakage of brake fluid.

11) Depress brake pedal three times or more with engine running to activate pad clearance adjustment mechanism so that clearance between rear brake disc and brake pads will be appropriate.

12) Check that brakes are not dragging and that appropriate stopping force can be obtained.

13) Install rear wheel and check if parking brake lever stroke is appropriate and if proper parking braking force can be obtained. ☞

4C

Rear Brake Caliper Disassembly and Reassembly

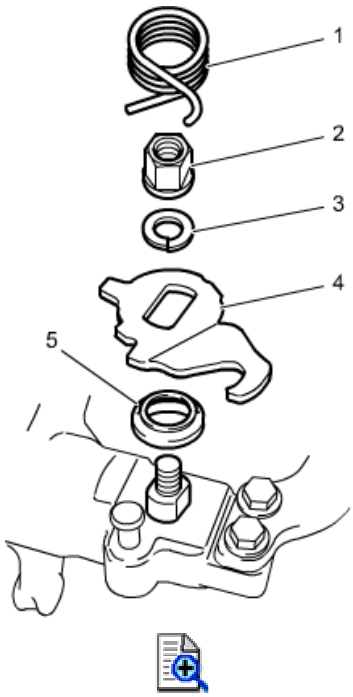
Reference: Rear Brake Components

CAUTION:
Take care not to damage piston and caliper cylinder of rear brake caliper.

DISASSEMBLY

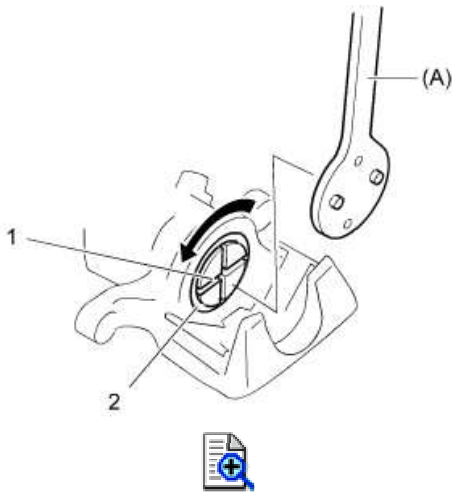
Caliper cylinder

1) Clean around caliper cylinder.
2) Remove return spring (1).
3) Remove parking nut (2), washer (3), lever (4) and shaft cover (5).



4) Loosen piston (1) by turning in arrow direction using special tool.

Special Tool
(A): 09945–16060

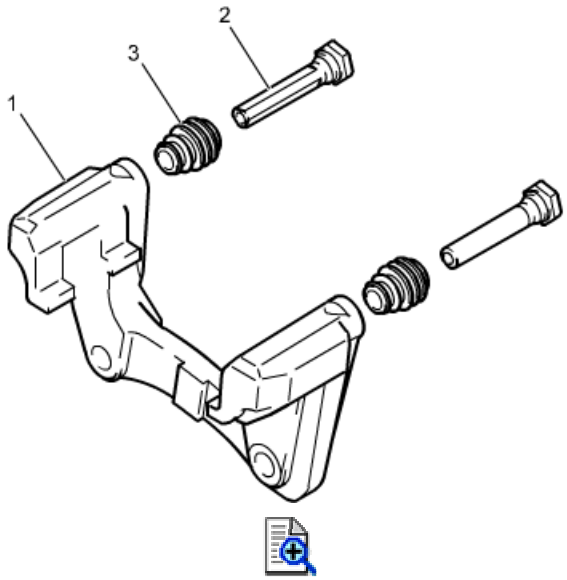


2.	Cylinder boot

5) Remove cylinder boot, piston seal and bleeder plug.

Slide pin

Remove slide pins (2) and pin boots (3) from caliper rear brake caliper carrier (1).



Reassembly

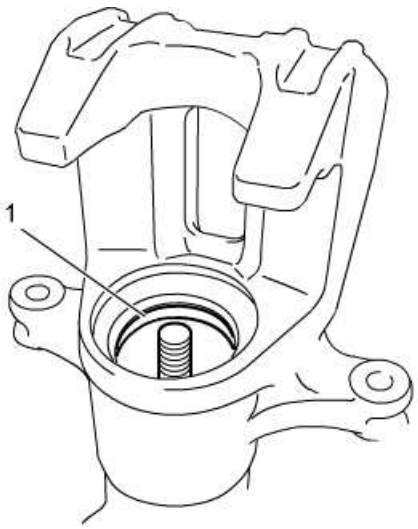
CAUTION:
- **Wash parts with specified brake fluid before assembling.**
- **Do not use other brake fluid or volatile solvent.**

Caliper

1) Perform the following procedures before installing brake piston to rear brake caliper.
a) Check entire periphery of brake piston and inside face of cylinder for rust, corrosion and any other damage. If any faulty is found, replace rear brake caliper.
b) Apply brake fluid to new piston seal (1) and install into groove in cylinder of rear brake caliper without twisting.

Brake fluid

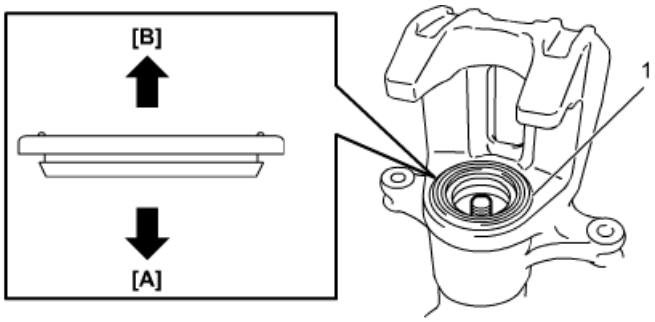
Refer to reservoir cap of brake master cylinder or owner's manual.



c) Apply brake fluid to new cylinder boot (1) and fit into cylinder boot groove of rear brake caliper as shown below.

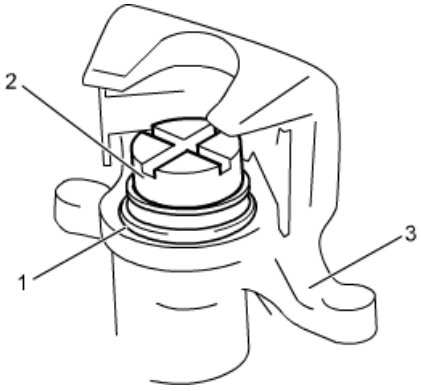
Brake fluid

Refer to reservoir cap of brake master cylinder or owner's manual.



[A]:	Caliper cylinder side	[B]:	Brake pad side

2) Expand cylinder boot (1) and install piston (2) into caliper cylinder (3).



3) Turn piston (1) in arrow direction using special tool to screw piston into caliper cylinder.

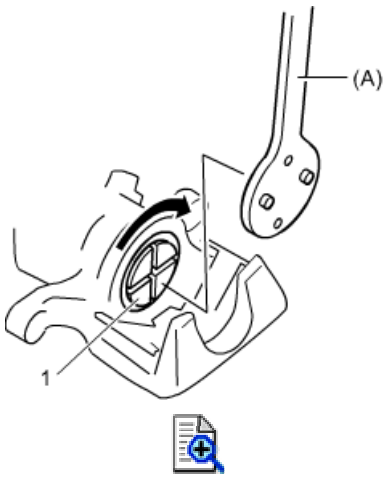
4) Fit cylinder boot into boot groove of piston.

CAUTION:
Cylinder boot should not be twisted when installing piston.

NOTE:
Check that cylinder boot is securely fitted to entire boot groove of cylinder inner face of rear brake caliper and that of piston.

Special Tool

(A): 09945–16060



5) Apply grease to new shaft cover (1) inner surface and install to rear brake caliper.

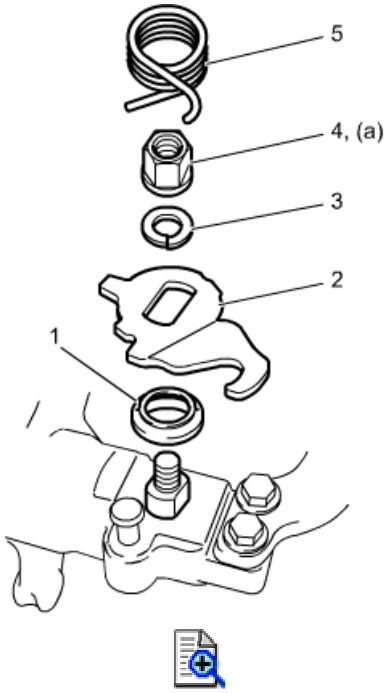
NOTE:
Use rubber grease of which viscosity varies very little even at –40°C (–40° F).

6) Install lever (2) and washer (3) and tighten parking nut (4) to specified torque.

Tightening torque

Parking nut (a): 27 N·m (2.8 kg-m, 20.0 lbf-ft)

7) Install return spring (5) and engage it with lever.



8) Install bleeder plug to rear brake caliper and tighten to specified torque.

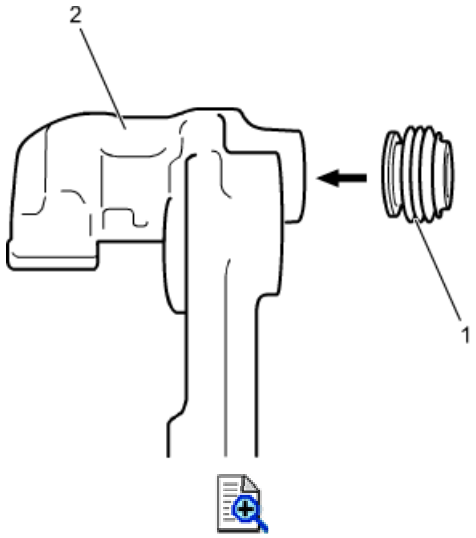
Tightening torque

Bleeder plug (a): 7.0 N·m (0.71 kg-m, 5.5 lbf-ft)

Slide pin

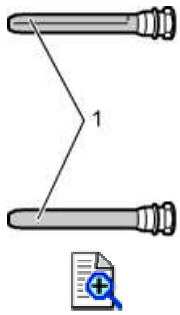
1) Check the following points before installing slide pin to rear brake caliper carrier.
a) Check slide pins for rust, corrosion and other damage and replace them if defective.
b) Apply grease to inner side of new pin boot (1).
c) Direct pin boots (1) as shown and install them to rear brake caliper carrier (2).

NOTE:
Use rubber grease of which viscosity varies very little even at –40°C (–40°F).

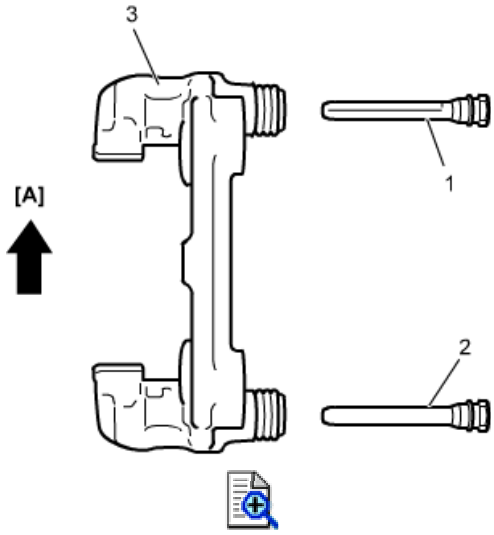


d) Apply grease to slide pin (1).

NOTE:
Use rubber grease of which viscosity varies very little even at –40°C (–40°F).



2) Install slide pin with three grooves (upper side) (1) and slide pin without groove (lower side) (2) to rear brake caliper carrier (3) as shown.



[A]: Upward

4C

Rear Brake Caliper Inspection

NOTE:
Perform this inspection in following cases.
- **When replacing the brake pads with new ones.**
- **When checking the thickness of brake pad.**
- **Before reassembling the rear brake caliper.**

Caliper Cylinder and Caliper Carrier

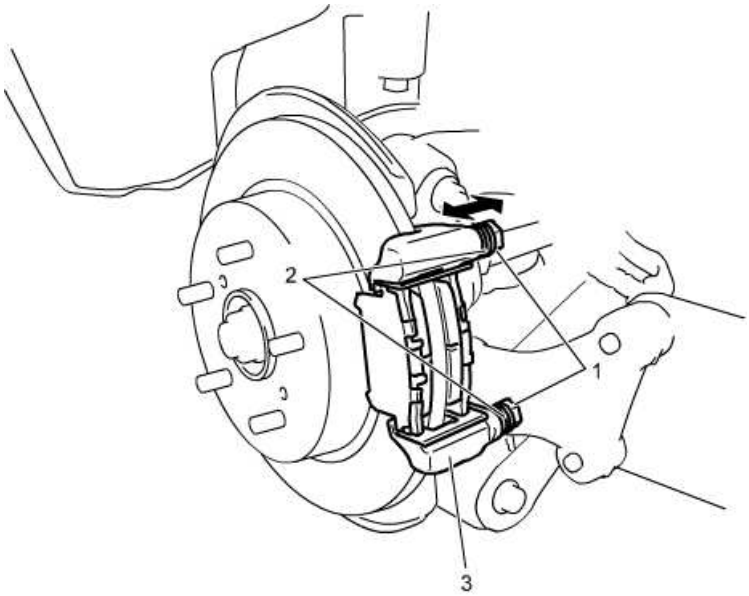
Check rear brake caliper cylinder and rear brake caliper carrier for distortion, crack, damage and rust. Replace rear brake caliper or rear brake caliper carrier if any defect is found.

Cylinder Boot

Check cylinder boot (1) for break, crack and brake fluid leak. If any defect is found, replace cylinder boot.

Slide Pin

Check that slide pins (1) move smoothly in lateral direction before installing rear brake caliper to caliper rear brake caliper carrier (3). Replace slide pins (1) and pin boots (2) if defective.



Caliper

Push in adjustment bolt (1) by hand. Then check that adjustment bolt (1) moves in arrow direction when lever (2) is moved.

3A

Rear Wheel Hub and Suspension Knuckle Removal and Installation (4WD Model)

Reference: Rear Wheel Hub and Suspension Knuckle Components:Rear

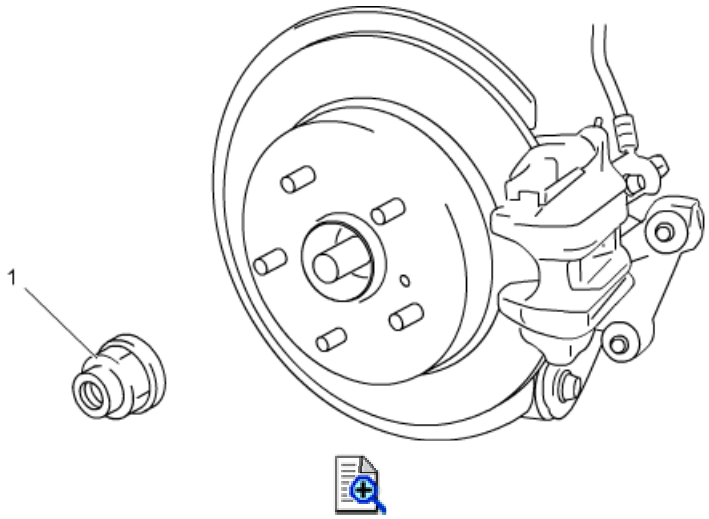
Removal

1) Hoist vehicle and remove rear wheel.

2) Release caulking from drive shaft nut (1) and remove drive shaft nut with brake pedal depressed.

CAUTION:
Insufficient release of caulking may cause damage to the drive shaft thread.

NOTE:
Carefully use a sharp-tipped bit to release the caulking.

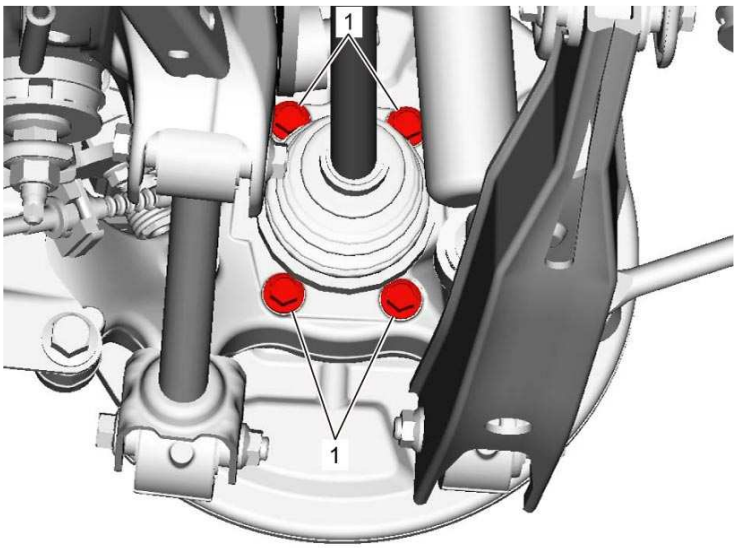


3) Remove rear brake disc. ☞

4) Disconnect rear wheel speed sensor from suspension knuckle. ☞

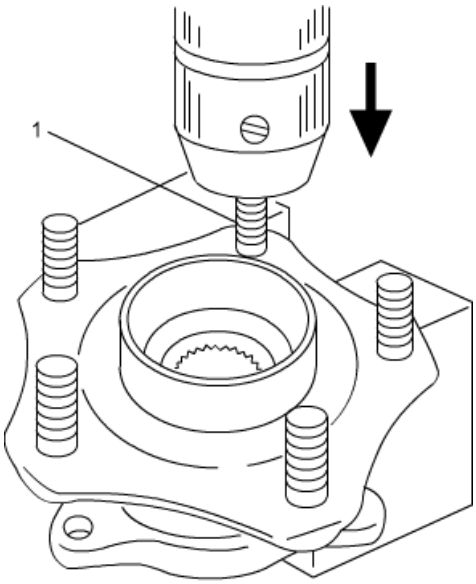
5) Remove rear wheel hub assembly bolts (1), and then remove rear wheel hub assembly with rear brake disc dust cover from suspension knuckle.

NOTE:
Lightly tap shaft end of wheel hub side when it is difficult to remove front drive shaft assembly.



6) Disconnect following parts from suspension knuckle and then remove suspension knuckle:
- Remove rear shock absorber. ☞
- Remove upper arm. ☞
- Remove lower arm. ☞
- Remove control rod. ☞
- Remove trailing arm. ☞
- Remove rear stabilizer joint bracket. ☞

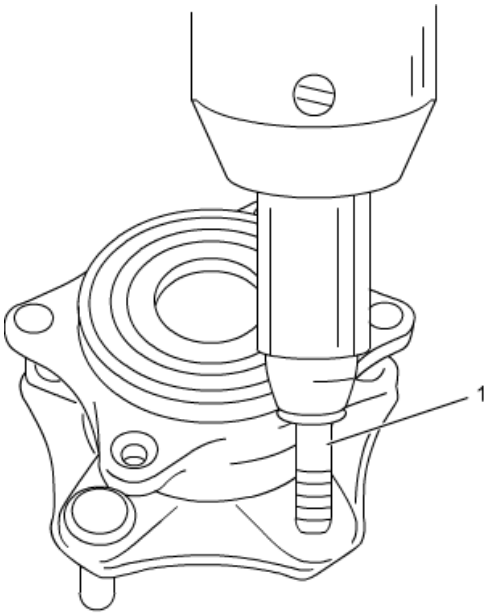
7) Remove hub bolts (1) with hydraulic press.



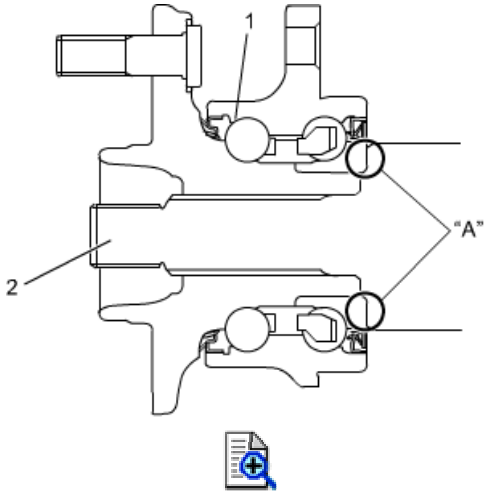
Installation

Reverse removal procedure, noting the following points:
- Insert new hub bolts (1) in hub holes. Rotate hub bolts slowly to assure that serrations are aligned with those made by original bolts.

CAUTION:
Be sure to use new hub bolts.



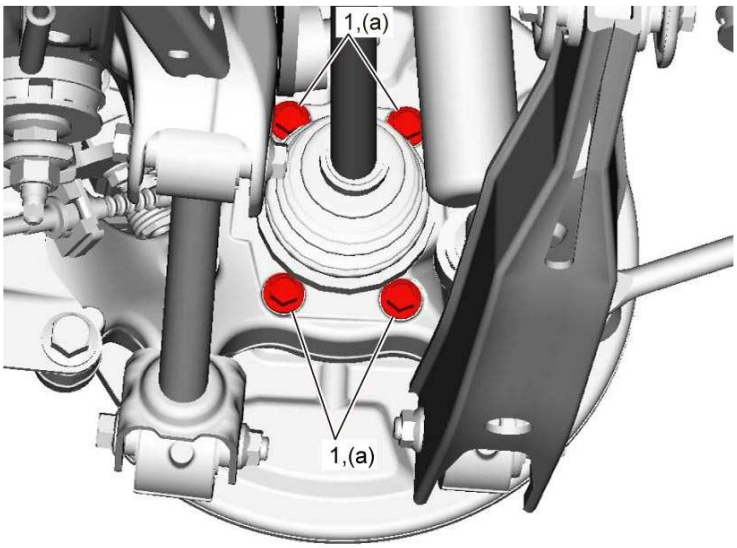
- Apply grease to mating surface of rear wheel hub assembly (1) and drive shaft (2).
  "A": Grease 99000–25011 (SUZUKI Super Grease A)



NOTE:
Mind the direction of rear brake disc dust cover when installing rear brake disc dust cover together with rear wheel hub assembly to suspension knuckle.

- Tighten rear wheel hub assembly bolts (1) to specified torque.

Tightening torque
Rear wheel hub assembly bolt (a): 75 N·m (7.6 kg-m, 55.5 lbf-ft)



- Tighten new drive shaft nut to specified torque, loosen it one rotation or more, and then retighten it to specified torque.

4C

Tightening Torque Specifications

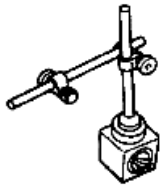
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Rear brake caliper pin bolt	23	2.3	17.0	☞ ☞
Rear brake caliper carrier bolt	60	6.1	44.5	☞ ☞
Flexible hose joint bolt	23	2.3	17.0	☞
Parking nut	27	2.8	20.0	☞
Bleeder plug	7.0	0.71	5.5	☞

NOTE:
The specified tightening torque is described in the following.
Rear Brake Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

4C

Special Tool

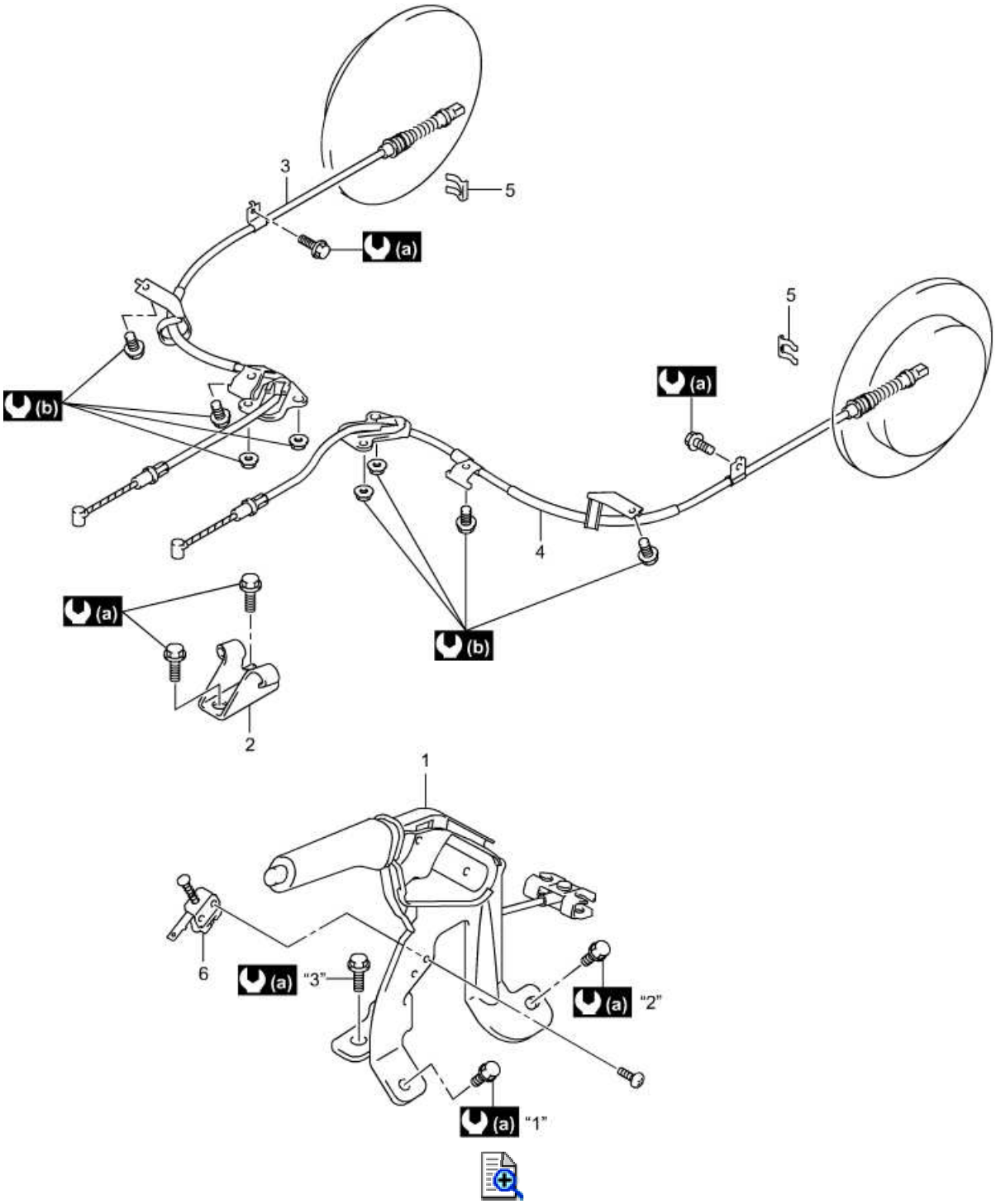
09900–20607 Dial gauge 	09900–20701 Magnetic stand 
09945–16060 Piston installer handle 	

Parking Brake Description

The parking brake system is mechanical. It applies brake force to only rear wheels by means of the cable and mechanical linkage system. The same brake pads are use for parking and foot brakes.

4D

Parking Brake Components



1. Parking brake lever Tighten bolts in sequence from "1" to "3"	4. Parking brake cable left	(a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
2. Parking cable bracket	5. E-ring	(b): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
3. Parking brake cable right	6. Parking brake switch	

4D

Parking Brake Inspection and Adjustment

NOTE:
- **Check the following conditions before parking brake inspection and adjustment.**
  - **— No air is trapped in brake system.**
  - **— Brake pedal travel is proper.**
  - **— Rear brake pads are not worn beyond limit.**
- **Brake warning light turns on and then off when engine switch is pressed to change ignition mode of keyless push start system to "ON".**

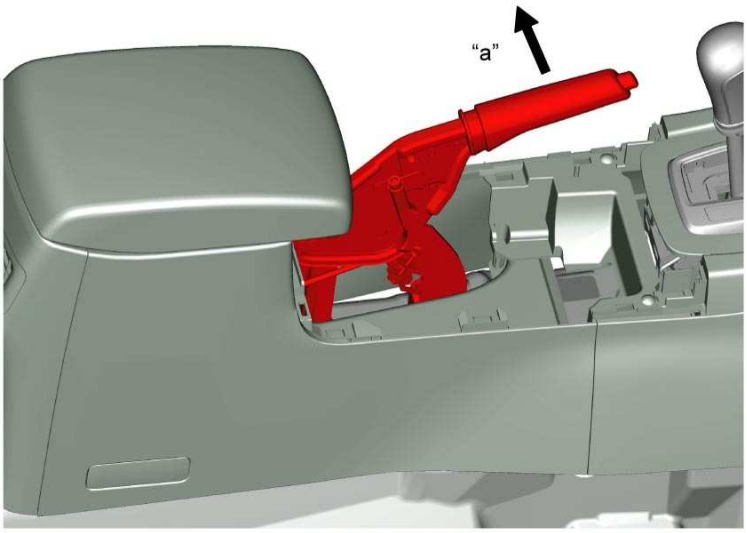
Inspection

Start engine, depress brake pedal 3 times or more with force of approx. 150 N, and then operate (pull) parking brake lever 2 to 3 times with force of approx. 500 N.

- When parking brake lever is pulled up, inspect the following items. If any defect is found, adjust or replace parking brake cable.
  a. Operation of parking brake lever is smooth.
  b. Rear wheels are locked firmly.
  c. Pull parking brake lever with 200 N (20.4 kgf, 45.0 lbf) and count ratchet notches.

NOTE:
One click sound corresponds to one notch.

Parking brake lever stroke "a"
Stroke: 6 to 8 notches



- Check that:
  a. Brake warning light turns off when parking brake lever is released.
  b. Brake warning light turns on within 1 notch when parking brake lever is pulled up.
  If faulty, check the following items and correct if necessary.

NOTE:
Check that ABS warning light is turned off.

4D

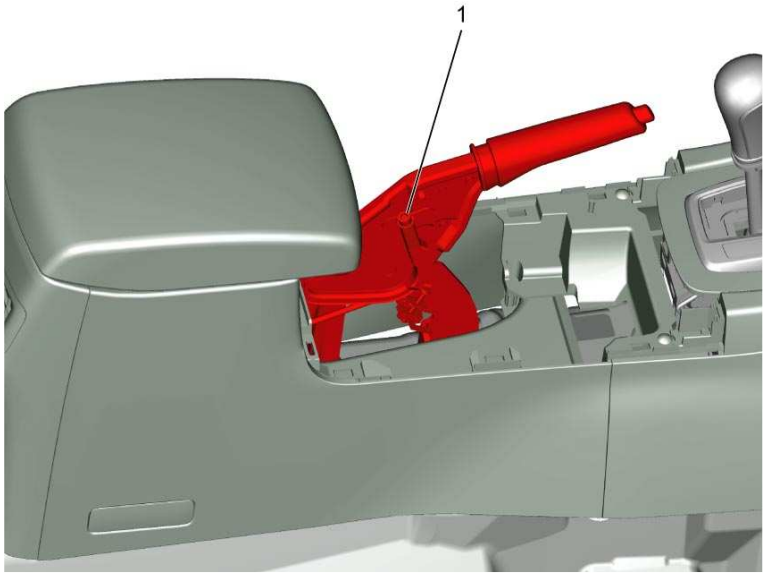
Parking Brake Cable Removal and Installation

Removal

1) Release parking brake cables from rear brake calipers. ☞

2) Remove console box. ☞

3) Loosen adjusting nut (1).



4) Remove parking brake cables from vehicle.

Installation

Install it by reversing removal procedure, noting the following points.

- Tighten each bolt to specified torque. ☞
- Inspect parking brake cable ends are installed to equalizer and levers of rear disc calipers securely.
- Adjust parking brake cable. ☞
- After adjusting parking brake lever stroke, make sure that brake system operates properly.

4D

Parking Brake Lever Removal and Installation

WARNING:
Make sure the following conditions are met before starting the work.
- **Work on a flat place.**
- **Shift gear is in "P" range or "1st" gear.**
- **Fix all wheels with chocks.**

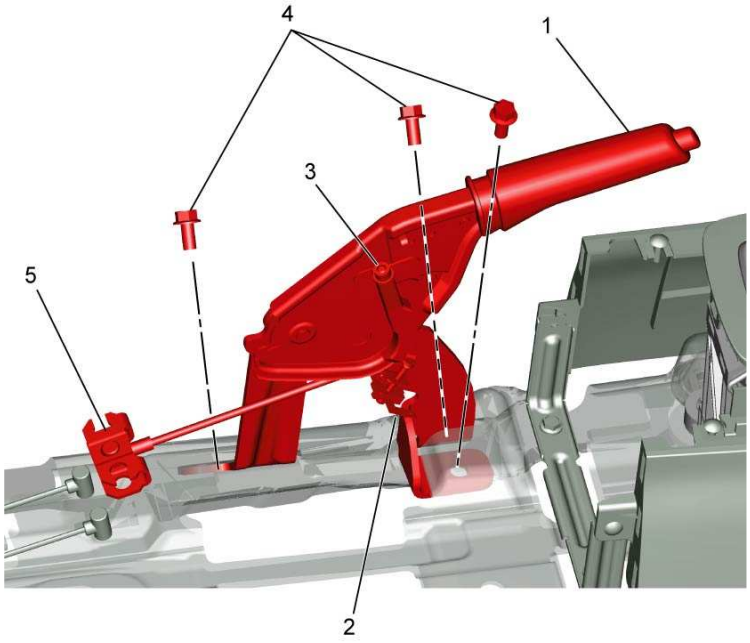
Removal

1) Remove console box. ☞

2) Disconnect parking brake switch connector (2) from parking brake switch.

3) Loosen parking brake cable adjusting nut (3).

4) Remove parking brake lever bolts (4) and remove parking brake lever assembly (1) with equalizer (5) from vehicle.



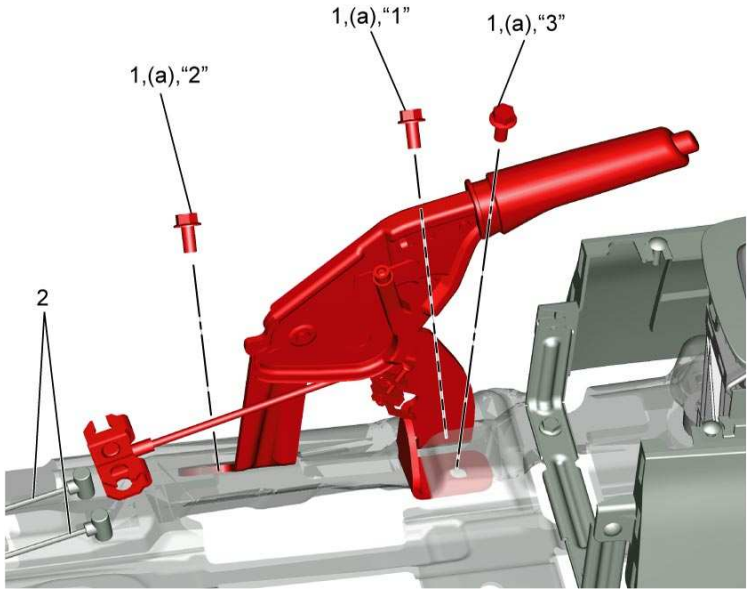
Installation

1) Tighten parking brake lever bolts (1) to specified torque in sequence from "1" to "3".

Tightening torque

Parking brake lever bolt (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

2) Connect parking brake cables (2) to equalizer and adjust parking brake cable. ☞



3) Make sure that brake system operates properly.

4D

Parking Brake Switch On-Vehicle Inspection

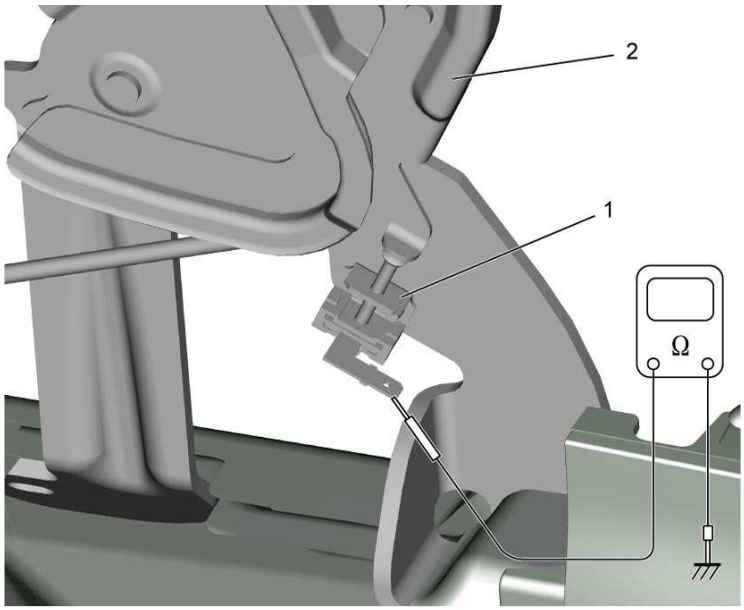
1) Remove floor console box.

2) Disconnect parking brake switch connector from parking brake switch on parking brake lever.

3) Check parking brake switch for continuity between parking brake switch terminal and vehicle body. If faulty, replace parking brake switch.

Parking brake switch specification

Parking brake released: No continuity
Parking brake lever pulled up: Continuity exists



1. Parking brake switch	2. Parking brake lever

4D

Parking Brake Switch Removal and Installation

Removal

1) Remove console box. ☞

2) Disconnect parking brake switch connector (2) from parking brake switch.

3) Remove parking brake switch from parking brake lever.

Installation

Install it by reversing removal procedure.

4D

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Parking brake lever bolt	25	2.5	18.5	☞

NOTE:
The specified tightening torque is described in the following.
Parking Brake Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

4F

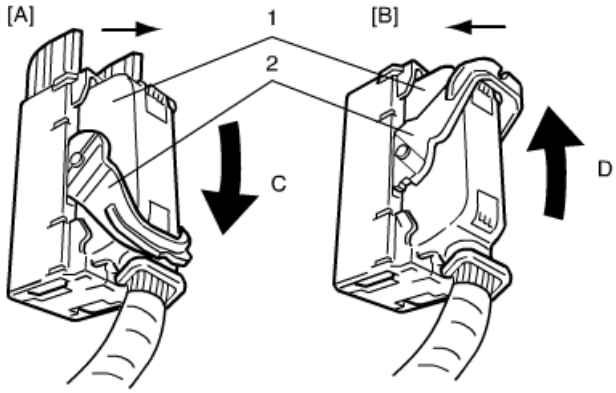
Precautions for Electronic Stability Program (ESP®)

When disconnecting ESP® hydraulic unit / control module assembly connector, be sure to disconnect the negative cable at battery since the battery voltage is constantly applied to ESP® hydraulic unit / control module assembly.

Precautions for Diagnosing Trouble

To ensure that the trouble diagnosis is done accurately and smoothly, observe the following and follow ***ESP® System Check***.

- Before using scan tool, read its "Operator's (Instruction) Manual" to know how to use it.
- If the vehicle was operated in any of the following ways, ABS warning light and ESP® warning light may light momentarily but this does not indicate any fault in ESP® system.
  - — The vehicle was driven with parking brake applied.
  - — The vehicle was driven with brake dragging.
  - — The vehicle was stuck in mud, sand, etc.
  - — Wheel spin occurred while driving.
  - — Wheel(s) was rotated while the vehicle was jacked up.
- Be sure to follow trouble diagnosis procedure described in ***ESP® System Check***. If trouble diagnosis procedure is not followed properly, it may result in incorrect diagnosis. (If incorrect procedure is performed, other DTC may be stored in the ESP® hydraulic unit / control module assembly.)
- When disconnecting ESP® control module connector (1), pull down the lock lever (2) of connector.
  When connecting, set the connector on ESP® hydraulic unit / control module assembly and pull up the lock lever (2) until it locks.



[A]: Disconnect	[C]: Pull down to unlock
[B]: Connect	[D]: Pull up to lock

- Communication of ECM, TCM, BCM, ESP® control module, 4WD control module, D/S control module, DLC, steering angle sensor and combination meter is established by CAN.
  Therefore, be sure to read ***Precautions for Installing Mobile Communication Equipment*** before inspection and handling CAN communication line.

4F

Test with Speedometer Tester or Other Equipments

NOTE:
Before performing speedometer test or other tests using speedometer tester or chassis dynamometer, traction control of ESP® function must be deactivated by ESP® OFF switch or using SUZUKI scan tool.

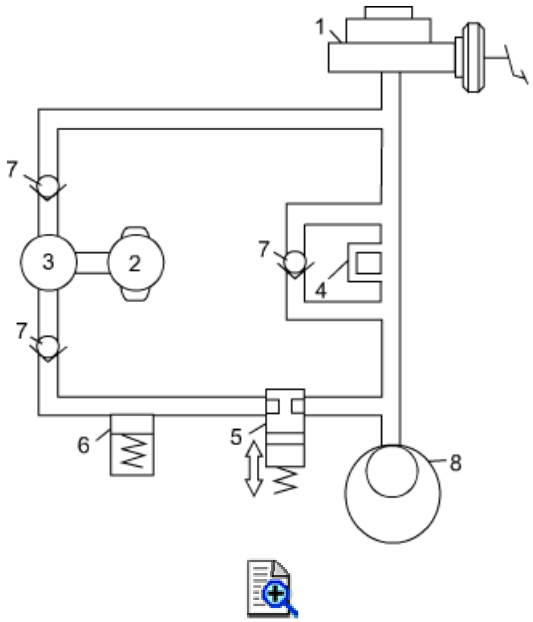
4F

ABS Description

The ABS (Anti-lock Brake System) controls the fluid pressure applied to the caliper of each brake from the master cylinder so that each wheel is not locked even when hard braking is applied.
This ABS is equipped with EBD function.
While brake is applied not so hard as to activate ABS control, brake force is proportionally distributed between the front and rear brakes to prevent rear wheels from being locked too early for better stability of the vehicle.
If the EBD system fails, the EBD warning light (brake warning light) lights to inform abnormality.

ESP® Hydraulic Unit / Control Module Assembly

- ESP® (ABS) hydraulic unit / control module assembly detects wheel slip by the signal from wheel speed sensor of each wheel and sends control signals to the hydraulic unit. ESP® hydraulic unit / control module assembly also monitors system conditions and stops the function of ABS and lights the ABS warning light in case it judges that the system is faulty.
- ESP® hydraulic unit is composed of inlet solenoid valves (4) (normally-opened valves), outlet solenoid valves (5) (normally-closed valves), pumps (3) pump motor (2), reservoirs (6) and check valves (7). It activates the inlet and outlet solenoid valves by the signals from ESP® hydraulic unit / control module assembly and controls the brake fluid pressure applied on each wheel brake. (The following figure shows the circuit for one wheel, with inlet and outlet solenoid valves in OFF positions.)



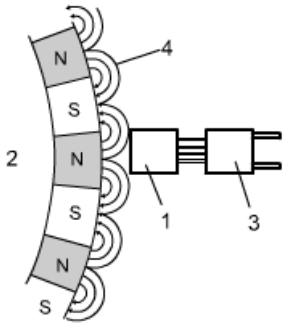
1. Master cylinder	8. Caliper

The hydraulic pressure control is performed in 3 modes of pressure increase, pressure keeping and pressure reduction.

- In the pressure increase mode, inlet and outlet solenoid valves are turned OFF, and the brake fluid pressure applied from the master cylinder to the caliper is increased.
- In the pressure keeping mode, the inlet solenoid valve is turned ON, and the brake fluid pressure in the caliper is kept constant.
- In the pressure reduction mode, inlet and outlet solenoid valves are turned ON, and the brake fluid pressure applied to the caliper is released to the reservoir. Thus the brake pressure applied to the wheel likely to be locked is reduced. The brake fluid temporarily stored in the reservoir is pumped back to the master cylinder.

Wheel Speed Sensor

All wheel speeds are detected by the Magnetic
Resistive Effect element type wheel speed sensor (1) and encoder (2). The wheel speed sensors are fixed to the steering knuckle and suspension knuckle.
The encoder consists of a permanent magnet which has south poles and north poles. As it is located on the wheel hub it turns along with the wheel.
The wheel speed sensor feeds pulse signals in proportion to the wheel speed to the ABS control module, which then calculates wheel speed based on such signal information.



3. Integrated Circuit	4. Magnetic field lines

4F

ESP® Description

NOTE:
ESP® is registered trademark of Daimler AG.

ESP® (Electronic Stability Program) is an auxiliary function to enable the vehicle to stabilize while the vehicle is running, stopping or turning.
ESP® consists of the following functions.

ABS (Antilock Brake System)

Refer to ***ABS Description***.

EBD (Electronic Brake force Distribution)

Refer to ***ABS Description***.

Traction Control

This function controls the engine and brakes to prevent the driving wheels from spinning at the time of starting and accelerating. Particularly, this function is helpful for safe driving on muddy or icy roads. When ESP® hydraulic unit / control module assembly detects wheel spinning using information from the yaw rate / G sensor assembly and wheel speed sensors, it lowers the engine torque by reducing throttle position and retarding the ignition timing. At the same time, brake is applied to the spinning tire so that the engine torque can be transmitted to other tire.

Stability Control

This function maintains the vehicle stability by controlling the engine and brakes to prevent the vehicle from oversteering or understeering while turning.
When understeering occurs, this function lowers the engine torque and applies brake to the inner rear wheel to prevent the vehicle from moving outward. When oversteering occurs, this function applies brake to the outer front wheel to prevent the vehicle from moving inward.

ESP® system is equipped with ESP® OFF switch. Refer to "ESP® OFF Switch" under ***ESP® Components Description***. Traction control function, stability control function and ESP® Cooperative Control under accelerative condition can be stopped and resumed by ESP® OFF switch or SUZUKI scan tool. However, traction control function, stability control function and μ-split control function under accelerative condition resume automatically when engine switch is pressed to change the ignition mode of keyless push start system to OFF and then to ON.

ESP® Cooperative Control

This function maintains the vehicle stability by assisting driver to turn steering with appropriate torque to prevent the vehicle from wheel shifting to one side on μ-split road. μ-split road means a road whose friction coefficient is different between the points contacting with right wheels and the left wheels.

4F

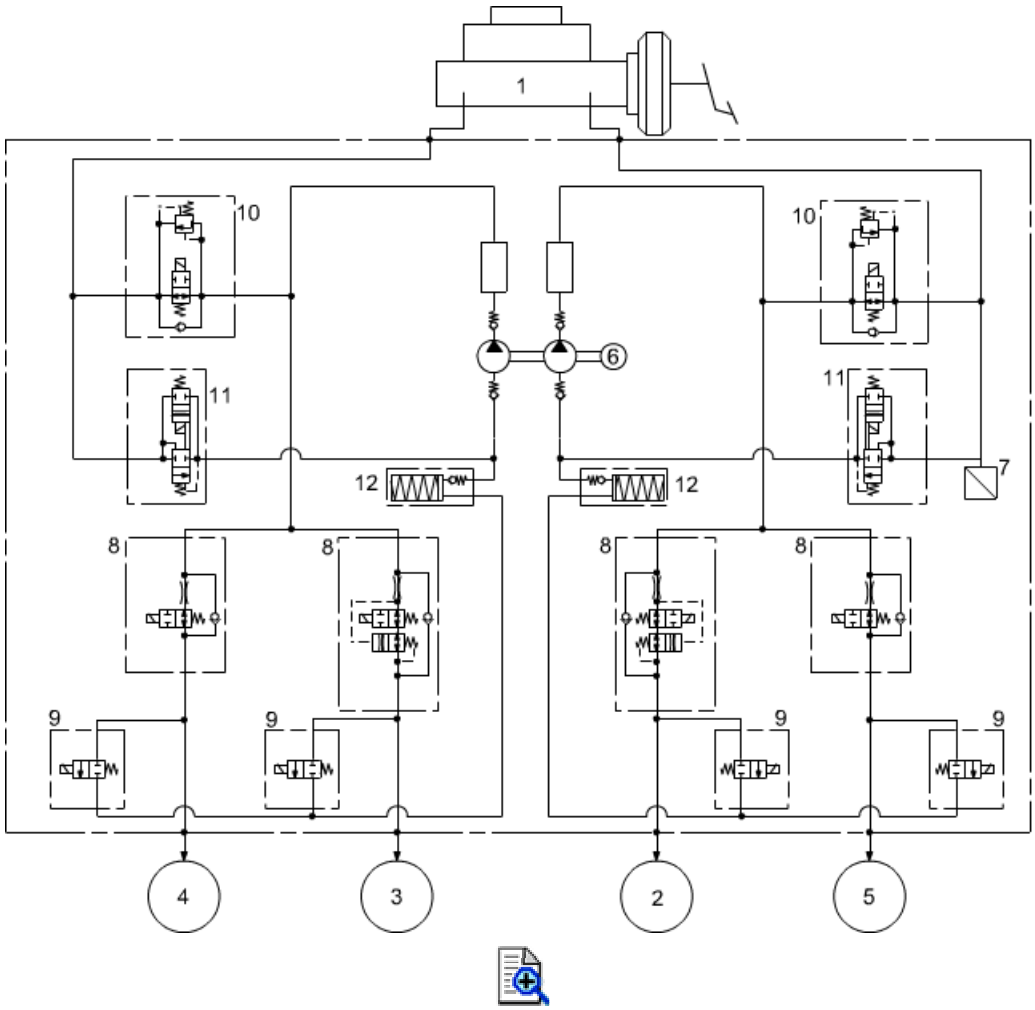
ESP® Components Description

ESP® hydraulic unit / control module assembly is composed of the following components. Regarding location, refer to ***ESP® Component Location***.

ESP® Hydraulic Unit / Control Module

The control module receives signals from each wheel speed sensor, ESP® OFF switch, brake master cylinder pressure sensor (7) and steering angle sensor. Based on these signals, the control module judges the vehicle conditions and controls the brake hydraulic pressure by combining the ON/OFF operation of the solenoid in the hydraulic unit and the pump motor operation.
The hydraulic unit contains an inlet solenoid valve (8) and an outlet solenoid valve (9) for each wheel as well as a cut solenoid valve (10) and a low pressure solenoid valve (11) for each hydraulic circuit. Also, a brake master cylinder pressure sensor, pump motor (6), etc. are included. The hydraulic pressure control is performed in 3 modes of pressure increase, pressure keeping and pressure reduction.

- Pump motor:
  The pump motor turns on and applies pressure to each brake when braking is activated in the traction control and stability control state. When in the pressure reduction mode, it returns the brake fluid in the reservoir (12) to the master cylinder (1).
- Brake master cylinder pressure sensor:
  This sensor detects the brake hydraulic pressure in the primary piping when brake is applied in the normal condition. Also, it detects the pump motor driving state when brake is applied in the traction control and stability control state.
- Inlet solenoid valve:
  In the ABS, traction control and stability control state, this valve is activated in the pressure keeping and pressure reduction modes to close the fluid passage, thereby restricting increase of the hydraulic pressure applied to the brake caliper.
- Outlet solenoid valve:
  In the ABS, traction control and stability control state, this valve is activated in the pressure reduction mode to open the fluid passage, thereby lowering the hydraulic pressure in the brake caliper.
- Cut solenoid valve:
  When brake application is commanded in the traction control and stability control state, this valve is activated to close the fluid passage to apply the hydraulic pressure generated by the pump motor to the brake caliper.
- Low pressure solenoid valve:
  When brake application is commanded in the traction control and stability control state, this valve is activated to open the fluid passage from the master cylinder to the pump motor.



1. Brake master cylinder	4. Wheel cylinder (right-rear)
2. Brake caliper (right-front)	5. Wheel cylinder (left-rear)
3. Brake caliper (left-front)	

Steering Angle Sensor

The steering angle sensor is assembled with the contact coil as a unit and mounted to the steering column. Detecting the angle as the steering wheel is turned, it sends that information to the ESP® hydraulic unit / control module assembly.

ESP® OFF Switch

This switch is momentary contact type, and is located at the left of instrument panel, next to parking sensor OFF switch. When the ESP® OFF switch is pressed, the ESP® hydraulic unit / control module assembly stops the traction control function and stability control function. The ESP® OFF light in the combination meter lights and informs driver that these functions are inactive. When the ESP® OFF switch is pressed again, the ESP® hydraulic unit / control module assembly resumes these functions.

Wheel Speed Sensor

Refer to “Wheel speed sensor” under ***ABS Description***.

4F

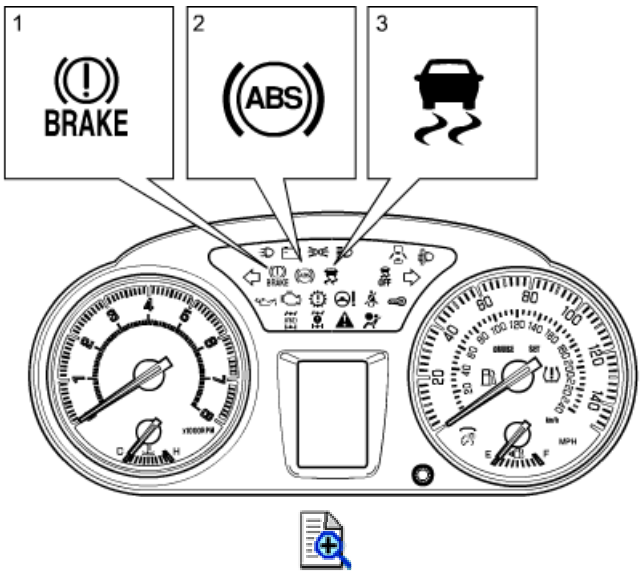
On-Board Diagnosis System Description

ESP® hydraulic unit / control module assembly is built in ESP® hydraulic unit / control module assembly and has the following functions.

Self-Diagnosis Function

ESP® hydraulic unit / control module assembly monitors each input and output signals. When ESP® hydraulic unit / control module assembly detects any malfunction, ABS warning light (1), EBD warning light (brake warning light) (2), ESP® warning light (3), and/or ESP® OFF light (4) are turned ON to indicate the abnormality to driver.

- When ignition mode of the keyless push start system is changed to "ON", ABS warning light, EBD warning light (brake warning light), ESP® warning light and ESP® OFF light turn ON for 2 seconds to check its circuit.
- When no abnormality is detected (the system is in good condition), these lights turn OFF after 2 seconds. However, when parking brake is operated, EBD warning light (brake warning light) remains ON.
- When an abnormality in the system is detected, ABS warning light, EBD warning light (brake warning light), ESP® warning light and/or ESP® OFF light are turned ON and DTC is stored in ESP® hydraulic unit / control module assembly.



Fail-Safe Mode

If ESP® hydraulic unit / control module assembly stores a DTC, ESP® hydraulic unit / control module assembly stops ABS, EBD, traction control function and/or stability control function corresponding to the faulty area. It is possible to confirm the stopped function(s) by the warning / indicator lights in combination meter.

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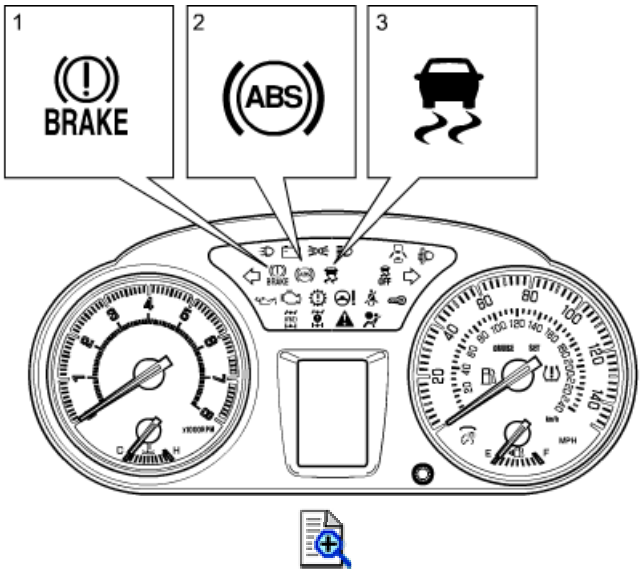
Warning / Indicator Light Description

There are four warning and indicator lights controlled by ESP® hydraulic unit / control module assembly in combination meter. They give warnings and indications to driver by changing their modes: light ON / flashing / light OFF.



1. ABS warning light	3. ESP® warning light
2. EBD warning light (brake warning light)	4. ESP® OFF light

Condition and Operation of Warning Lights and Indicator Lights

Warning light / Indicator light	Condition and operation
ABS warning light	If ABS has abnormality, the light turns “ON”.
EBD warning light (brake warning light)	• If EBD system has abnormality, the light turns “ON”. • If bake fluid level in reservoir is lower than minimum level, the light turns “ON”. • If parking brake lever is pulled up, the light turns “ON”.
ESP® warning light	If ESP® systems has abnormality, the light turns “ON”.
ESP® OFF light	ESP® OFF light turns “ON” to indicate that ESP® hydraulic unit / control module assembly stops traction control and stability control functions.

4F

Description of Sensor Calibrating Condition

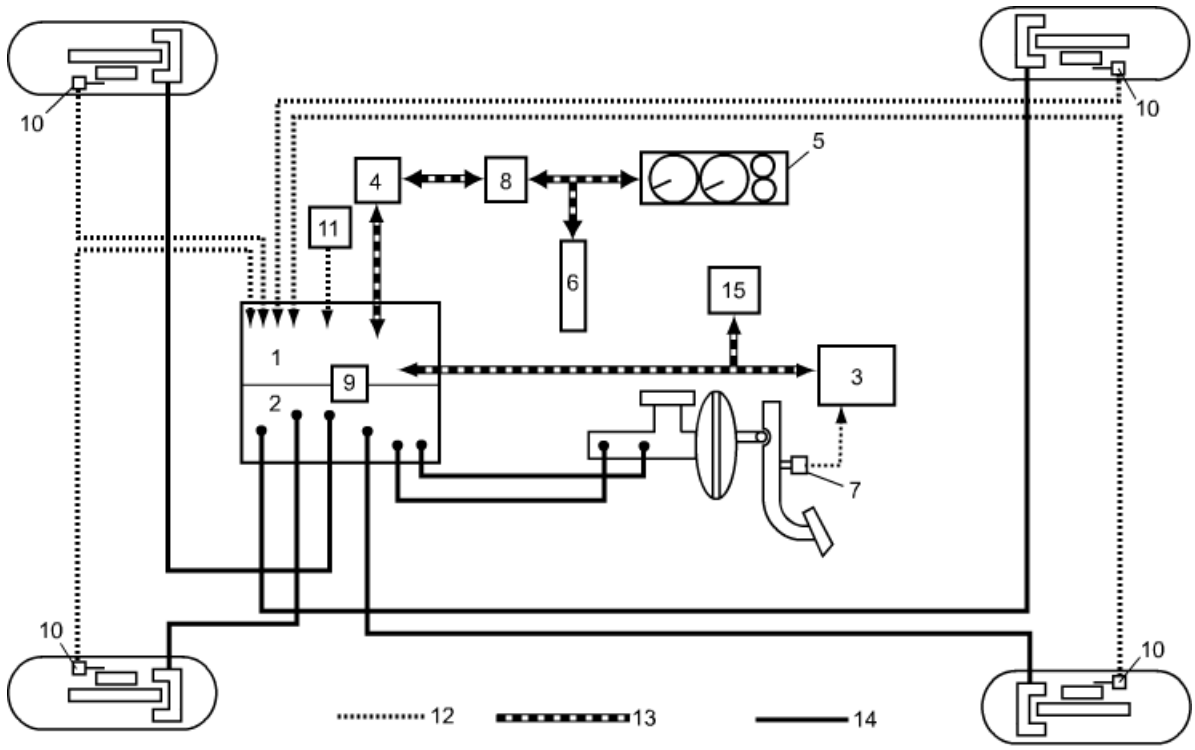
When the following conditions are met, sensor calibration should be performed since the original calibration data are deleted.

Sensor to be calibrated	Condition required calibration
Steering angle sensor	• Steering angle sensor is replaced. • ESP® hydraulic unit/control module assembly is replaced.
Brake master cylinder pressure sensor	• ESP® hydraulic unit / control module assembly is replaced. • ESP® hydraulic unit / control module assembly is removed.
Yaw rate / G sensor assembly	• ESP® hydraulic unit / control module assembly is replaced.

Perform sensor calibration according to ***Sensor Calibration of ESP®***.

4F

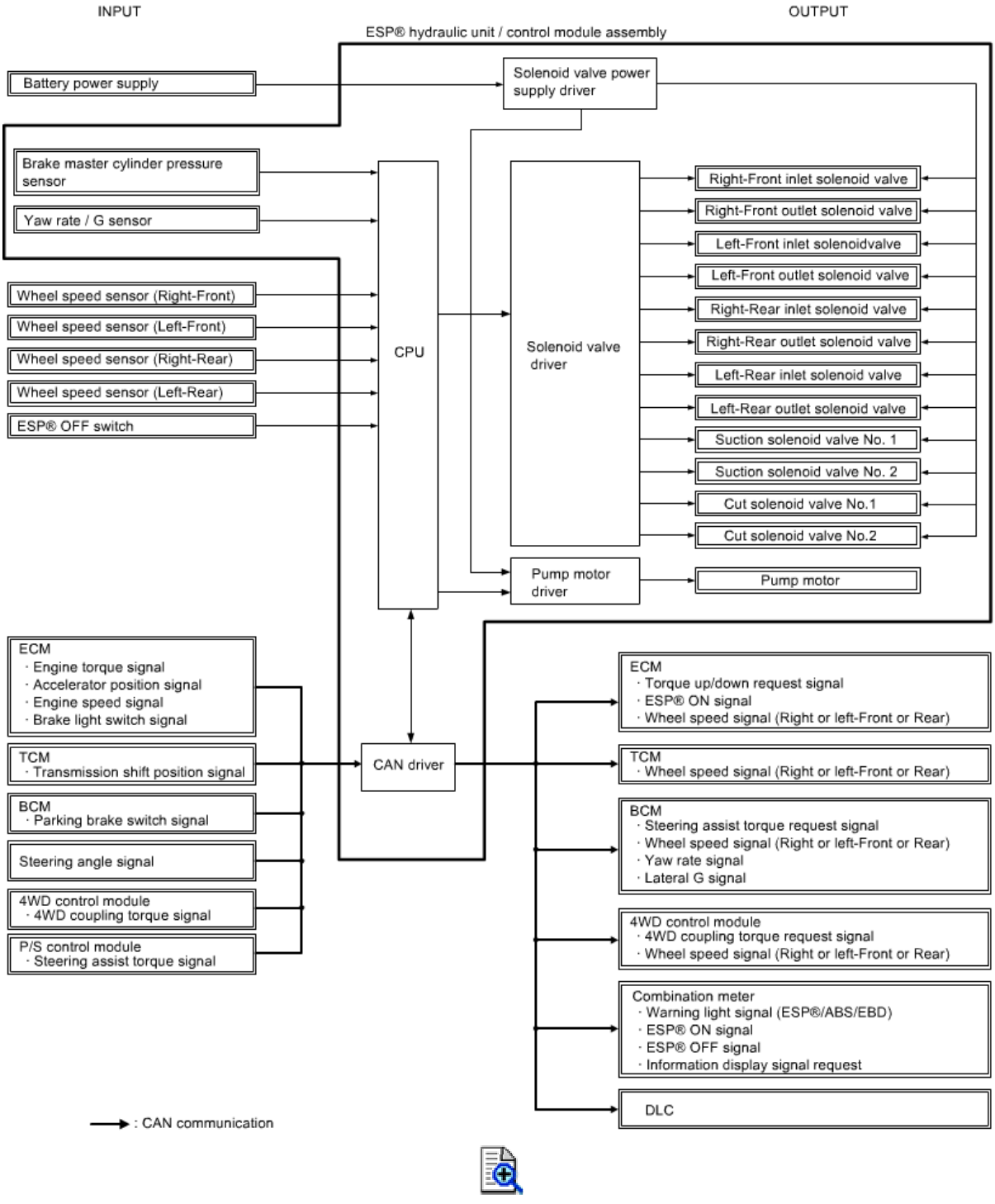
ESP® Schematic Diagram



1. ESP® hydraulic unit / control module assembly	6. Steering angle sensor	11. ESP® OFF switch
2. Hydraulic unit	7. Brake light switch	12. Electronic signal
3. ECM	8. 4WD control module	13. CAN signal
4. BCM	9. Brake master cylinder pressure sensor	14. Hydraulic circuit
5. Combination meter	10. Wheel speed sensor	15. P/S control module

4F

ESP® Input / Output Block Diagram



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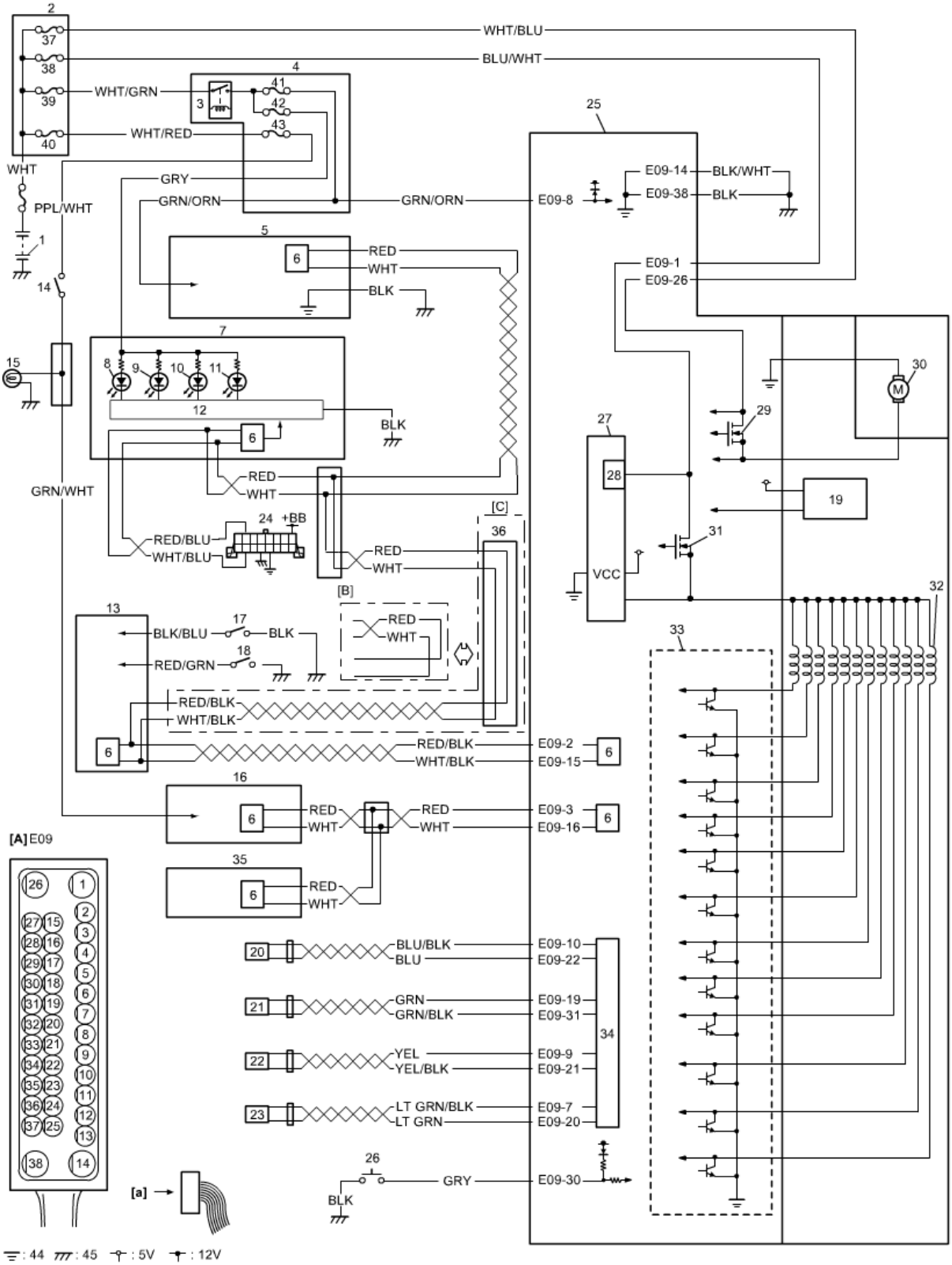
ESP® Circuit Diagram



[A]: ESP® hydraulic unit / control module assembly connector (view: [a])	14. Brake light switch	30. Pump motor

[B]: 2WD	15. Brake light	31. Solenoid valve power supply relay
[C]: 4WD	16. ECM	32. Solenoid valve
1. Battery	17. Brake fluid level switch	33. Solenoid valve relay
2. Relay box No. 1	18. Parking brake switch	34. Wheel speed sensor driver
3. IG1 relay	19. Yaw rate / G sensor	35. P/S control module
4. BCM & J/B	20. Left-front wheel speed sensor	36. 4WD control module
5. Steering angle sensor	21. Right-front wheel speed sensor	37. "ABS MOT" fuse
6. CAN driver	22. Left-front wheel speed sensor	38. "ABS SOL" fuse
7. Combination meter	23. Right-rear wheel speed sensor	39. "IGN" fuse
8. ESP® OFF light	24. DLC	40. "BT RX" fuse
9. ESP® warning light	25. ESP® hydraulic unit / control module assembly	41. "ESP" fuse
10. ABS warning light	26. ESP® OFF switch	42. "MTR" fuse
11. EBD warning light (Brake warning light)	27. CPU	43. "STOP" fuse
12. Light driver module	28. Internal memory	44. Engine ground
13. BCM	29. Pump motor relay	45. Ground

Terminal	Circuit	Circuit
1	BLU/WHT	Solenoid valve power supply driver
2	RED/BLK	CAN communication line (high) for BCM
3	RED	CAN communication line (high) for ECM
7	LT GRN/BLK	Right-rear wheel speed sensor (–)
8	GRN/ORN	Power source for ESP® hydraulic unit / control module assembly
9	YEL	Left-rear wheel speed sensor (+)
10	BLU/BLK	Left-front wheel speed sensor (–)
14	BLK/WHT	Ground
15	WHT/BLK	CAN communication line (low) for BCM
16	WHT	CAN communication line (low) for ECM
19	GRN	Right-front wheel speed sensor (+)
20	LT GRN	Right-rear wheel speed sensor (+)
21	YEL/BLK	Left-rear wheel speed sensor (–)
22	BLU	Left-front wheel speed sensor (+)
26	WHT/BLU	Pump motor power supply driver
30	GRY	ESP® OFF switch
31	GRN/BLK	Right-front wheel speed sensor (–)
38	BLK	Ground

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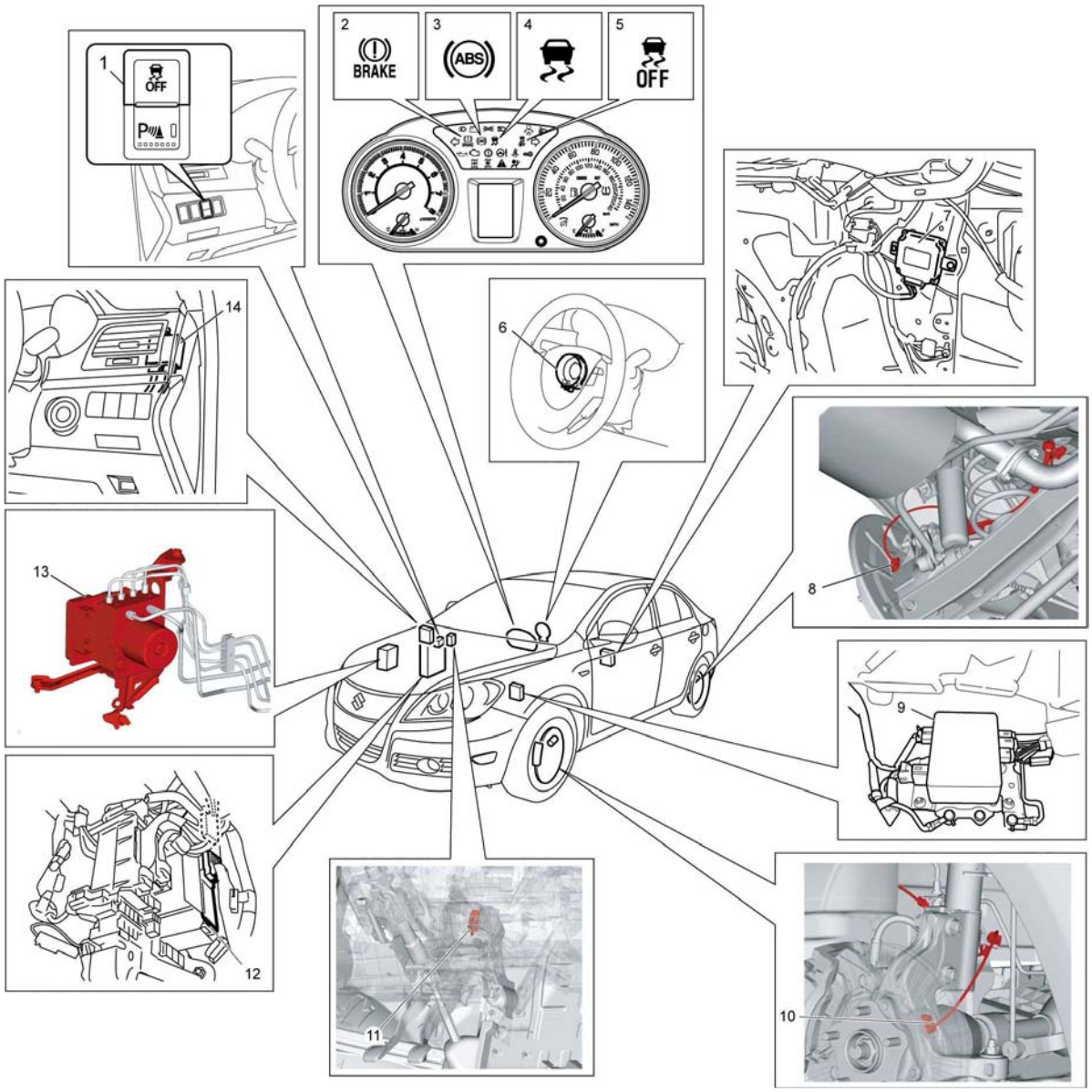
ESP® Component Location

NOTE:
The figure shows LHD. For RHD, parts with (*) are installed at the opposite side.



1. ESP® OFF switch	6. Steering angle sensor	11. Brake light switch
2. EBD warning light (brake warning light)	7. 4WD control module	12. BCM
3. ABS warning light	8. Rear wheel speed sensor	13. ESP® hydraulic unit / control module
4. ESP® warning light	9. P/S control module	14. TCM
5. ESP® OFF light	10. Front wheel speed sensor	

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ESP® System Check

Refer to the following items for the details of each step.

Step	Action	YES	NO
1	**Malfunction analysis** ☞ 1) Perform ***Customer complaint analysis***. 2) Perform ***Problem symptom confirmation***. 3) Perform ***DTC check, record and clearance*** and recheck DTC. ***Is same DTC detected again after performing DTC clearance?***	Go to Step 6.	Go to Step 2.
2	**Visual Inspection** ☞ 1) Perform ***Visual Inspection***. ***Is there any faulty condition?***	Repair or replace malfunction part, and go to Step 6.	Go to Step 3.
3	**Driving test** ☞ 1) Perform ***Step 3: Driving Test***. ***Is malfunction detected?***	Repair or replace malfunction part, and go to step 6.	Go to Step 4.
4	**Brakes diagnosis** ☞ 1) Inspect and repair referring to ***Brake Symptom Diagnosis***. ***Is malfunction detected?***	Repair or replace malfunction part, and go to step 6.	Go to Step 5.
5	**Intermittent problem check** ☞ 1) Check for intermittent troubles referring to ***Intermittent Connection and Poor Contact Inspection***. ***Is malfunction detected?***	Repair or replace malfunction part, and go to step 6.	Go to Step 6.
6	**Final confirmation test** ☞ 1) Perform ***Step 6: Final Confirmation Test***. ***Does trouble recur?***	Go to Step 4.	End.

Step 1: Malfunction Analysis

Customer complaint analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.

For this purpose, use of such a questionnaire form as shown in the following table will facilitate collecting information to the point required for proper analysis and diagnosis.

Customer questionnaire (Example)

Customer's name:	Model:	VIN:	
Date of issue:	Date of Reg:	Date of problem:	Mileage:

Problem Symptoms	• ESP® warning light abnormal: fails to turn on / fails to turn off • ABS warning light abnormal: fails to turn on / fails to turn off • EBD warning light abnormal: fails to turn on / fails to turn off • Abnormal noise while vehicle is running: from motor, from valve, other_____ • Wheel is locked at braking: • Wheel is skidded at turning: • Pump motor does not stop (running): • Braking does not work: • Other:
Frequency of occurrence	• Continuous/Intermittent (times a day, a month)/ other_____
Conditions for Occurrence of Problem	• Vehicle at stop & ignition switch ON: • When starting: at initial start only/at every start/other _____ • Vehicle speed: while accelerating/while decelerating/while stopping/ while turning/while running at constant speed/ other_____ • Road surface condition: paved road/rough road/snow-covered road/ other_____ • Chain equipment:
Environmental Condition	• Weather: fair/cloudy/rainy/snowy/other _____ • Temperature: °F (°C)
Diagnostic Trouble Code	• First check: normal code/malfunction code ( ) • Second check after test drive: normal code/malfunction code ( )

Problem symptom confirmation

If symptom in "Customer Questionnaire" is found or reproduced in the vehicle, confirm the symptom is problem or not. (This step should be done with the customer if possible.) Check warning light related to brake system referring to "EBD Warning Light (Brake Warning Light) Check", "ABS Warning Light Check" and "ESP® Warning Light Check" under ***Warning Light Check***.

DTC check, record and clearance

Perform ***DTC Check*** procedure, record it and then clear it. ☞

Recheck DTC. ☞

When DTC which is recorded at DTC check procedure is detected again after performing DTC clearance, go to ***DTC Check*** to proceed the diagnosis.
When DTC which is recorded at DTC check procedure is not indicated anymore after performing DTC clearance, ESP® control module does not perform the system diagnosis, or temporary abnormality may occur, therefore go to ***Step 3: Driving Test*** to proceed the diagnosis.

Step 2: Visual Inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of the ESP® system.

Step 3: Driving Test

Test the vehicle at 40 km/h (25 mile/h) for more than a minute including left and right turns and check if any trouble symptom (such as ESP® warning light and/or ABS warning light) exists.

Step 4: Brakes Diagnosis

Check the parts or system suspected as a possible cause referring to ***Brake Symptom Diagnosis*** and based on symptoms appearing on the vehicle (symptom obtained through Steps 1 to 3). Repair faulty parts or replace them, if necessary).

Step 5: Intermittent Problem

Check parts where an intermittent trouble is easy to occur (e.g. wire harness, connector), referring to ***Intermittent Connection and Poor Contact Inspection*** and related circuit of trouble code recorded in Step 1 to 5.

Step 6: Final Confirmation Test

Confirm that the problematic symptom has gone and ESP® is free from any abnormal conditions. If what has been repaired is related to malfunction DTC, clear DTC once referring to ***DTC Clearance***and perform test driving and confirm that no DTC is indicated.

Visual Inspection

Check the following parts and systems visually.

Inspection Item		Referring section
Battery	Level, leakage	***Battery Description***
Connectors of electric wire harness	Disconnection, friction	***Intermittent Connection and Poor Contact Inspection***
Fuses	Burning	
Brake fluid	Level, leakage	***Brake Fluid Level Inspection***
ABS warning light	Operation	***Warning Light Check***
EBD warning light (Brake warning light)	Operation	
ESP® warning light	Operation	
Other parts that can be checked visually		

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ESP® Symptom Diagnosis

Condition	Possible Cause	Action
ESP® warning light keeps lighting on more than 2 seconds after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Perform ESP® check.* ☞
	Malfunctioning ESP® warning light circuit	*Check ESP® system.* ☞
ABS warning light keeps lighting on more than 2 seconds after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Perform ESP® check.* ☞
	Malfunctioning ABS warning light circuit	*Repair circuit.*
ABS and/or ESP® warning light does not turn ON after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Check ESP® system.* ☞
	Faulty combination meter	*Check ESP® system.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.* ☞
ABS warning light flashes	Brake system is not filled with brake fluid	*Fill brake fluid into brake system.*
EBD warning light (Brake warning light) lights more than 2 seconds after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Parking brake applied	*Release parking brake and check that EBD warning light (brake warning light) turns OFF.*
	Insufficient amount of brake fluid	*Check brake fluid level.* ☞
	Faulty parking brake switch circuit and/or brake fluid level switch circuit	*Check BCM and its circuit.* ☞
	Faulty parking brake switch and/or brake fluid level switch	*Check parking brake switch and/or brake fluid level switch. Parking brake switch:* ☞ *Brake fluid level switch:* ☞
	Malfunctioning EBD function	*Perform ESP® system check.* ☞
	Faulty ESP® control module power supply and ground circuit	*Check ESP® control module power supply and ground circuit.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Faulty BCM	*Check BCM and its circuit.* ☞

	Faulty ESP® control module	*Replace ESP® control module.* ☞
EBD warning light (Brake warning light) does not turn ON after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Check ESP® system.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.*

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ESP® Symptom Diagnosis

Condition	Possible Cause	Action
ESP® warning light keeps lighting on more than 2 seconds after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Perform ESP® check.* ☞
	Malfunctioning ESP® warning light circuit	*Check ESP® system.* ☞
ABS warning light keeps lighting on more than 2 seconds after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Perform ESP® check.* ☞
	Malfunctioning ABS warning light circuit	*Repair circuit.*
ABS and/or ESP® warning light does not turn ON after pressing engine switch to change ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Check ESP® system.* ☞
	Faulty combination meter	*Check ESP® system.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.* ☞
ABS warning light flashes	Brake system is not filled with brake fluid	*Fill brake fluid into brake system.*
EBD warning light (Brake warning light) lights more than 2 seconds after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Parking brake applied	*Release parking brake and check that EBD warning light (brake warning light) turns OFF.*
	Insufficient amount of brake fluid	*Check brake fluid level.* ☞
	Faulty parking brake switch circuit and/or brake fluid level switch circuit	*Check BCM and its circuit.* ☞
	Faulty parking brake switch and/or brake fluid level switch	*Check parking brake switch and/or brake fluid level switch. Parking brake switch:* ☞ *Brake fluid level switch:* ☞
	Malfunctioning EBD function	*Perform ESP® system check.* ☞
	Faulty ESP® control module power supply and ground circuit	*Check ESP® control module power supply and ground circuit.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Faulty BCM	*Check BCM and its circuit.* ☞

	Faulty ESP® control module	*Replace ESP® control module.* ☞
EBD warning light (Brake warning light) does not turn ON after pressing engine switch to change the ignition mode of keyless push start system to "ON"	Malfunctioning ESP® function	*Check ESP® system.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Malfunctioning CAN communication system function	*Check CAN communication system.*

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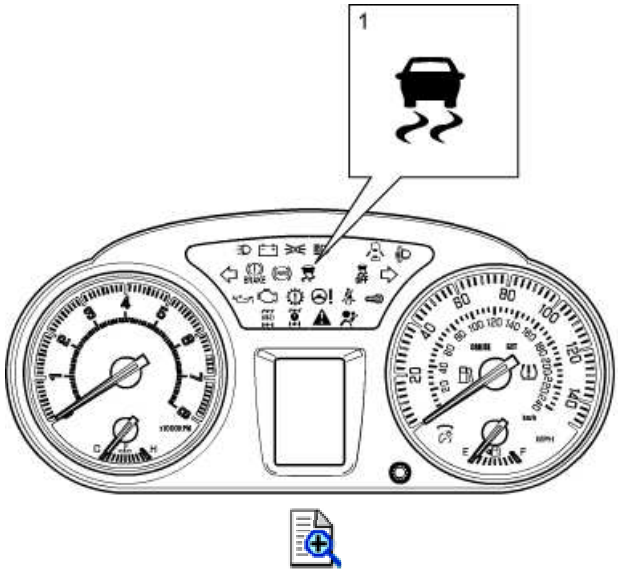
Warning Light Check

ESP® Warning Light Check

1) Push engine switch to change the ignition mode of keyless push start system to "ON".

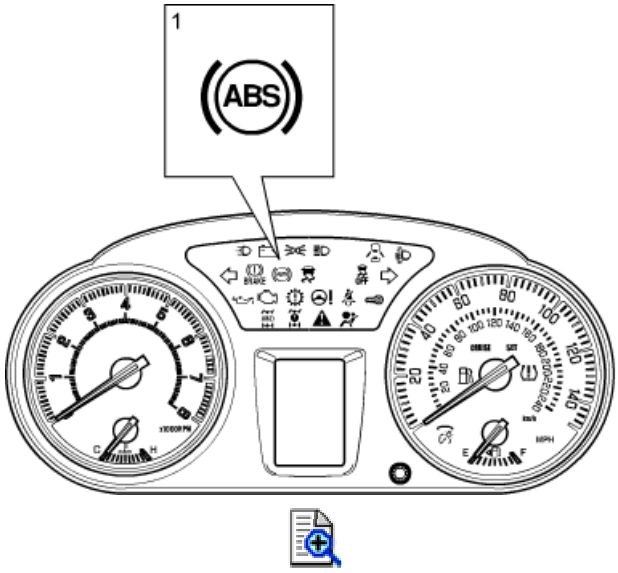
2) Check that ESP® warning light (1) comes ON for about 2 seconds and then goes OFF. If ESP® warning light never light up, go to ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***. If ESP® warning light remains ON and no DTC is stored in ESP® control module, go to ***ESP® Warning Light Comes ON Steady***.



ABS Warning Light

1) Push engine switch to change ignition mode of keyless push start system to "ON".

2) Check that ABS warning light (1) comes ON for about 2 seconds and then goes OFF. If ABS warning light never light up, go to ***ABS Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***. If ABS warning light remains ON and no DTC is stored in ABS control module, go to ***ABS Warning Light Comes ON Steady***.



EBD Warning Light (Brake Warning Light)

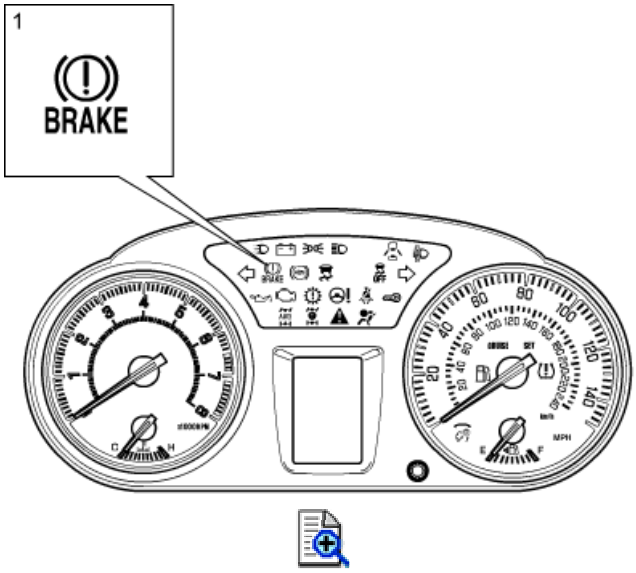
NOTE:
Perform this check on a level place.

1) Check brake fluid level. ☞

2) Pull parking brake lever.

3) Push engine switch to change ignition mode of keyless push start system to "ON".

4) Check that EBD warning light (brake warning light) (1) comes ON. If EBD warning light (brake warning light) never light up, go to ***EBD Warning Light (Brake Warning Light) Does Not Come ON after Pressing Engine Switch to Change Ignition Mode to "ON".***.



5) Release parking brake lever and check that EBD warning light goes OFF. If EBD warning light (brake warning light) remains ON and no DTC is stored in ABS control module, go to ***EBD Warning Light (Brake Warning Light) Comes ON Steady***.

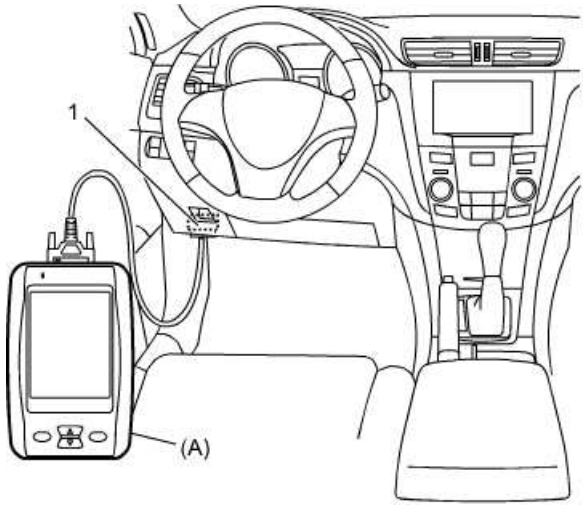
DTC Check

1) Confirm that ignition mode of keyless push start system is in "OFF".

2) Connect SUZUKI scan tool to DLC (1).

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Push engine switch to change ignition mode of keyless push start system to "ON".

4) Read DTC according to instructions displayed on SUZUKI scan tool and prints it or write it down. Refer to SUZUKI scan tool operator's manual for further details. If communication between scan tool and ESP® control module is not possible, check that power supply and ground circuits of ESP® control module. ☞ If they are OK, go to ***Troubleshooting for Communication Bus Off***.

5) Confirm that ignition mode of keyless push start system is in "OFF" and disconnect SUZUKI scan tool from DLC after completing check.

DTC Clearance

WARNING:
When performing driving test, select safe place where there is neither traffic jam nor any traffic accident possibility and take care not to occur an accident.

1) Confirm that ignition mode of keyless push start system is in "OFF".
2) Connect SUZUKI scan tool connector to DLC.
3) Push engine switch to change the ignition mode of keyless push start system to "ON".
4) Erase DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
5) Perform "Step 3: Driving Test" in ***ESP® System Check*** and ***DTC Check*** and confirm that NO DTC is displayed on scan tool.
6) Disconnect SUZUKI scan tool connector from DLC after completing the DTC clearance.

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DTC Table

CAUTION:
Be sure to perform *ESP® System Check* before starting diagnosis.

NOTE:
- ***1: If three or more wheel speed sensors are defective, ABS warning light, EBD warning light (brake warning light) and ESP® warning light are lit and all the control functions are deactivated. If one or two wheel speed sensors are defective, ABS warning light and ESP® warning light are lit and ABS and traction control / stability control are deactivated.**
- ***2: Only current DTCs are represented.**
- ***3: DTC is cleared automatically when sensor is calibrated.**
- ***4: In case that both DTC C1024 and C1075 are detected, go to DTC C1024 troubleshooting.**

DTC	DTC name	DTC detecting condition	ABS warning light	EBD warning light	ESP® warning light
NO DTC	Normal	—	—	—	—
C1015 ☞	Longitudinal G Sensor in Yaw Rate / G sensor Assembly failure	Longitudinal G sensor signal is out of specified range.	OFF (4WD: Lights up)	OFF	Lights up
		Sensor adhesion is detected by comparing vehicle acceleration and G signal.	Lights up	OFF	Lights up
C1016 ☞	Brake light switch circuit performance	Master cylinder pressure input signal is detect in spite of no signal from brake light switch.	OFF	OFF	Lights up
		ECM detects the brake light switch signal for more than the specified time provided that the vehicle speed is over the specified and accelerator pedal is depressed.	OFF	OFF	Lights up
C1017 ☞	Lateral G sensor circuit performance	Lateral G sensor signal is out of specified range.	OFF (4WD: Lights up)	OFF	Lights up
C1020 ☞	Master cylinder pressure sensor power supply voltage	Power supply voltage of brake master cylinder pressure sensor in ESP® control module is out of specification.	OFF	OFF	Lights up
C1021 ☞	Right-front wheel speed sensor circuit voltage	Wheel speed sensor signal is out of specified range.	Lights up	Lights up *1	Lights up
C1022 ☞	Right-front wheel speed sensor or encoder signal performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	Lights up *1	Lights up
C1023 ☞	Yaw rate sensor circuit performance	Yaw rate sensor signal is out of range.	OFF	OFF	Lights up
		Although vehicle is stop, yaw rate signal is detected.	OFF	OFF	

C1024 *4	Steering angle sensor circuit performance	CPU in steering angle sensor detects internal defect.	OFF	OFF	Lights up
		Steering angle sensor signal is out of specified range.	OFF	OFF	
C1025	Left-front wheel speed sensor circuit voltage	Wheel speed sensor signal is out of specified range.	Lights up	Lights up *1	Lights up
C1026	Left-front wheel speed sensor or encoder signal performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	Lights up *1	Lights up
C1027	ESP® OFF switch failure	ESP® OFF switch keeps ON more than specified time.	OFF	OFF	Lights up
C1028	Master cylinder pressure sensor circuit voltage	Input signal voltage of brake master cylinder pressure sensor in ESP® control module is too high or low.	OFF	OFF	Lights up
C1031	Right-rear wheel speed sensor circuit voltage	Wheel speed sensor signal is out of specified range.	Lights up	Lights up *1	Lights up
C1032	Right-rear wheel speed sensor or encoder signal performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	Lights up *1	Lights up
C1033	Wheel speed sensor deviation	Abnormal wheel speed sensor signal is detected continuously.	Lights up	Lights up *1	Lights up
		ABS system is operated for more than specified time.	Lights up	Lights up	Lights up
		Abnormal voltage is detected from wheel speed sensor power supply.	Lights up	OFF	Lights up
C1035	Left-rear wheel speed sensor circuit voltage	Wheel speed sensor signal is out of specified range.	Lights up	Lights up *1	Lights up
C1036	Left-rear wheel speed sensor or encoder signal performance	Abnormal wheel speed sensor signal is detected continuously.	Lights up	Lights up *1	Lights up
C1037 *2	Steering angle sensor power supply voltage	Steering angle sensor detects abnormal voltage.	OFF	OFF	Lights up
C1038	Steering angle sensor detects rolling counter failure	Steering angle sensor detects abnormal CAN data from ESP® control module.	OFF	OFF	Lights up
C1039	Yaw rate / G sensor assembly internal failure	Yaw rate / G sensor internal failure is detected.	OFF (4WD: Lights up)	OFF	Lights up
C1040	ESP® continuous operation	Stability control is operated for more than specified time.	Lights up	Lights up	Lights up
C1041	Right-front inlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1042	Right-front outlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1043	Cut solenoid No. 1 valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1044	Cut solenoid No. 2 valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1045	Left-front inlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up

C1046 ☞	Left-front outlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1047 ☞	Both-front wheel speed sensor or encoder signal performance	Yaw rate measured from both front wheel speed sensor does not match with estimated yaw rate.	Lights up	OFF	Lights up
C1048 ☞	Both-rear wheel speed sensor or encoder signal performance	Yaw rate measured from both rear wheel speed sensor does not match with estimated yaw rate.	Lights up	OFF	Lights up
C1051 ☞	Right-rear inlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1052 ☞	Right-rear outlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1053 ☞	Low pressure solenoid No. 1 valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1054 ☞	Low pressure solenoid No. 2 valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1055 ☞	Left-rear inlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1056 ☞	Left-rear outlet solenoid valve circuit correlation	Solenoid output and solenoid monitor is mismatched.	Lights up	Lights up	Lights up
C1057 ☞	Power supply voltage	ESP® control module power supply voltage is over 16.8 V.	Lights up	Lights up	Lights up
		ESP® control module power supply voltage is between 7.8 V and 9.3 V.	Lights up	OFF	Lights up
		ESP® control module power supply voltage is under 7.7 V.	Lights up	Lights up	Lights up
C1061 ☞	Pump motor circuit performance	Pump motor is stuck.	Lights up	Lights up	Lights up
		Pump motor power supply is too low.			
C1063 ☞	Solenoid valve power supply driver circuit performance	Solenoid valve relay output is ON, although its output is monitored OFF.	Lights up	Lights up	Lights up
		Solenoid valve relay output is OFF, although its output is monitored ON.	Lights up	OFF	Lights up
C1071 ☞	ESP® control module internal failure	ESP® control module internal failure is detected.	Lights up	Lights up	Lights up
C1074 *3, *4 ☞	G sensor calibration	G sensor calibration is not completed.	OFF (4WD: Lights up)	OFF	Lights up
C1075 *3, *4 ☞	Steering angle sensor calibration	Steering angle sensor calibration is not completed.	OFF	OFF	Lights up
C1084 ☞	ESP® detects message counter failure from EPS	Invalid CAN data is received from P/S controller. (counter value)	OFF	OFF	OFF

C1085 ☞	ESP® detects check sum failure from EPS	Invalid CAN data is received from P/S controller. (sum value)	OFF	OFF	OFF
C1090 ☞	ECM detect rolling counter failure from ESP® control module	Invalid CAN data is received from ECM. (about engine torque control)	OFF	OFF	Lights up
C1091 ☞	CAN invalid data from ECM	DTC concerned with ECM is detected.	OFF	OFF	Lights up
C1092 ☞	CAN invalid data from TCM	DTC concerned with TCM is detected.	OFF	OFF	OFF
C1093 ☞	4WD control module data in CAN line failure	DTC concerned with 4WD is detected.	OFF	OFF	Lights up
C1094 ☞	Torque request reject status	Invalid CAN data is received from ECM. (about engine torque control)	OFF	OFF	Lights up
C1096 ☞	Yaw rate / G sensor assembly message counter error	Invalid CAN data is received from Yaw rate / G sensor.	OFF (4WD: Lights up)	OFF	Lights up
C1097 ☞	DTC concerning power steering control module	DTC concerned with P/S is detected.	OFF	OFF	OFF
U0073 ☞	Control module communication bus off	Impossible to receive and transmit CAN data.	OFF	OFF	Lights up
U0100 ☞	Lost communication with ECM	ECM message data is missing from CAN communication.	OFF	OFF	Lights up
U0101 ☞	Lost communication with TCM	CVT message data is missing from CAN communication.	OFF	OFF	OFF
U0114 ☞	Lost communication with 4-wheel drive control module	4WD message data is missing from CAN communication.	OFF	OFF	Lights up
U0126 ☞	Lost communication with steering angle sensor	Steering angle sensor message data is missing from CAN communication.	OFF	OFF	Lights up
U0134 ☞	Lost communication with power steering control module	P/S message data is missing from CAN communication.	OFF	OFF	OFF
U0140 ☞	Lost communication with body control module	BCM message data is missing from CAN communication.	OFF	OFF	OFF

Fail-Safe Table

When any of the following DTC(s) is detected, ESP® system is in fail-safe mode per its DTC and ABS, EBD, traction control, stability control are deactivated until the resolution is applied.

NOTE:
- **O: Activated**
- **–: Deactivated**
- ***1: If one or two wheel speed sensors are defective, EBD control function is activated. If three or more wheel speed sensors are defective, EBD control function is deactivated.**
- ***2: ESP® OFF mode is canceled and all control functions are activated.**
- ***3: EBD control function is activated only power supply circuit becomes 7.6 – 9.6 V malfunction.**
- ***4: EBD control function is activated if solenoid valve keeps ON position. EBD control function is deactivated if solenoid valve keeps OFF position.**
- ***5: Back up control**

DTC	Fail-safe operation				Fail-safe condition resolution
	ABS	EBD	Traction control / Stability control	Hill hold control	
C1015 ☞	O (2WD) – (4WD)	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1016 ☞	O	O	O	–	–
C1017 ☞	O (2WD) – (4WD)	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1020 ☞	O	O	–	–	
C1021 ☞	–	*1	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1022 ☞	–	*1	–	–	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 15 km/h (9 mile/h), after changing ignition mode from OFF to ON.
C1023 ☞	O	O	X (Brake TCS is *5)	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1024 ☞	O	O	–	–	
C1025 ☞	–	*1	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1026 ☞	–	*1	–	–	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 15 km/h (9 mile/h), after changing ignition mode from OFF to ON.
C1027 *2 ☞	O	O	–	–	–
C1028 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.

C1031 ☞	–	*1	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1032 ☞	–	*1	–	–	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 15 km/h (9 mile/h), after changing ignition mode from OFF to ON.
C1033 ☞	–	*1	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1035 ☞	–	*1	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1036 ☞	–	*1	–	–	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 15 km/h (9 mile/h), after changing ignition mode from OFF to ON.
C1037 ☞	O	O	–	–	When ESP® control module detects the system as normal.
C1038 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1039 ☞	O (2WD) – (4WD)	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1040 ☞	–	–	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1041 ☞	–	–	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1042 ☞	–	–	–	–	
C1043 ☞	–	–	–	–	
C1044 ☞	–	–	–	–	
C1045 ☞	–	–	–	–	
C1046 ☞	–	–	–	–	
C1047 ☞	–	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1048 ☞	–	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1051 ☞	–	–	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1052 ☞	–	–	–	–	
C1053 ☞	–	–	–	–	
C1054 ☞	–	–	–	–	
C1055 ☞	–	–	–	–	
C1056 ☞	–	–	–	–	
C1057 ☞	–	*3	–	–	When ESP® control module detects the system as normal. In case of FSA test, when ESP® control module detects system as normal after changing ignition mode from OFF to ON.

C1061 ☞	–	*5	–	–	When ESP® control module detects the system as normal. And estimated vehicle speed exceeds 15 km/h (9 mile/h), after changing ignition mode from OFF to ON.
C1063 ☞	–	*4	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1071 ☞	–	–	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1074 ☞	O (2WD) – (4WD)	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1075 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1084 ☞	O	O	O	O	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1085 ☞	O	O	O	O	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1090 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1091 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1092 ☞	O	O	O	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1093 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1094 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1096 ☞	O (2WD) – (4WD)	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
C1097 ☞	O	O	O	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
U0073 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
U0100 ☞	O	O	–	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.
	O	O	O	O	
U0101 ☞	O	O	O	–	
U0114 ☞	O	O	–	–	
U0126 ☞	O	O	–	–	
U0134 ☞	O	O	O	O	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.

U0140 ☞	O	O	O	–	When ESP® control module detects the system as normal, after changing ignition mode from OFF to ON.

Scan Tool Data

ESP® Control Module

As the data values are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.

NOTE:
Ignition mode stands for power supply mode according to engine switch operation in keyless push start system.

Scan tool data	Vehicle condition	Condition / reference values
Battery Voltage	Ignition mode ON (Engine at stop)	13.0 – 15.0 V
Pump Motor Driver	Inactive (Pump motor is not working)	0.0 V
	Active (Pump motor is working)	13.0 – 15.0 V
RF Wheel Speed	At stop (Vehicle is in stationary condition)	0 km/h (0 mph)
LF Wheel Speed	At stop (Vehicle is in stationary condition)	0 km/h (0 mph)
RR Wheel Speed	At stop (Vehicle is in stationary condition)	0 km/h (0 mph)
LR Wheel Speed	At stop (Vehicle is in stationary condition)	0 km/h (0 mph)
Brake Switch	Depressed brake pedal	ON
	Released brake pedal	OFF
Master Cyl Press	Depressed brake pedal	over 0 ± 0.8 MPa
	Released brake pedal	0 ± 0.8 MPa
G Sensor (Lateral)	Parking (Ignition mode ON, On the level)	0 G
	Right turning	–0.1 G
	Left turning	0.1 G
G sensor (In front and behind)	Parking (Ignition mode ON, On the level)	0 G
	Accelerating	0.1 G
	Decelerating	–0.1 G
Yaw Rate Sensor	Parking (Ignition mode ON, On the level)	0 ± 4 deg/s
	Right turning	0 ± 4 deg/s or more
	Left turning	0 ± 4 deg/s or less
Steering Angle Sen	Front wheels are in straight-ahead position	0 ± 3°
	Rotate steering wheel once in clockwise	360° ± 3°
	Rotate steering wheel once in counterclockwise	–360° ± 3°
ESP® OFF SW State	ESP® OFF switch button is released	OFF
	ESP® OFF switch button is pushed	ON
Steering Angle Sig	Front wheels are in straight-ahead position (–5° to 5°)	Neutral
	Other than above condition, or not calibrated	Not N
Stability Control	Operating	ON
	Not operating	OFF
Hill Hold Control	Active brake is applied to vehicle on upslope	ON
	Other than above condition	OFF
TCSS Control (Brake)	Active brake is applied to wheel	ON
	Other than above condition	OFF

TCSS Control (Engine)	Engine torque control is operating	ON
	Other than above condition	OFF

Scan Tool Data Definition

Battery Volt (V)	Battery voltage is an analog input signal read by ESP® control module. ESP® control module functions may be stopped if battery voltage falls below or rises above programmed thresholds.
Pump Motor Driver (V)	This parameter indicates operational condition of pump motor driver (transistor).
RF Wheel Speed, LF Wheel Speed, RR Wheel Speed and LR Wheel Speed (km/h, MPH)	Wheel speed is ESP® control module internal parameter. It is computed by reference pulses from the wheel speed sensor.
Brake Switch (ON, OFF)	This switch signal informs ESP® control module whether the brake is active or not.
Master Cyl Press (MPa)	This indicates brake fluid pressure from brake master cylinder.
G Sensor (Lateral) (G)	Lateral acceleration is measured by yaw rate / G sensor in ESP® control module.
G Sensor (In front and behind) (G)	Acceleration and deceleration is measured by yaw rate / G sensor in ESP® control module.
Yaw Rate Sensor (Deg/s)	Yaw rate sensor is measured by yaw rate / G sensor assembly and output to ESP® control module by pulse signal.
Steering Angle Sen (°)	Steering wheel rotation angle is measured by steering angle sensor and output to ESP® control module by pulse signal.
ESP® OFF SW State (ON, OFF)	This indicates state of ESP® OFF switch.
Steering Angle Sig (Neutral, Non N)	This indicates steering wheel angle measured by steering angle sensor is in straight-ahead or not.

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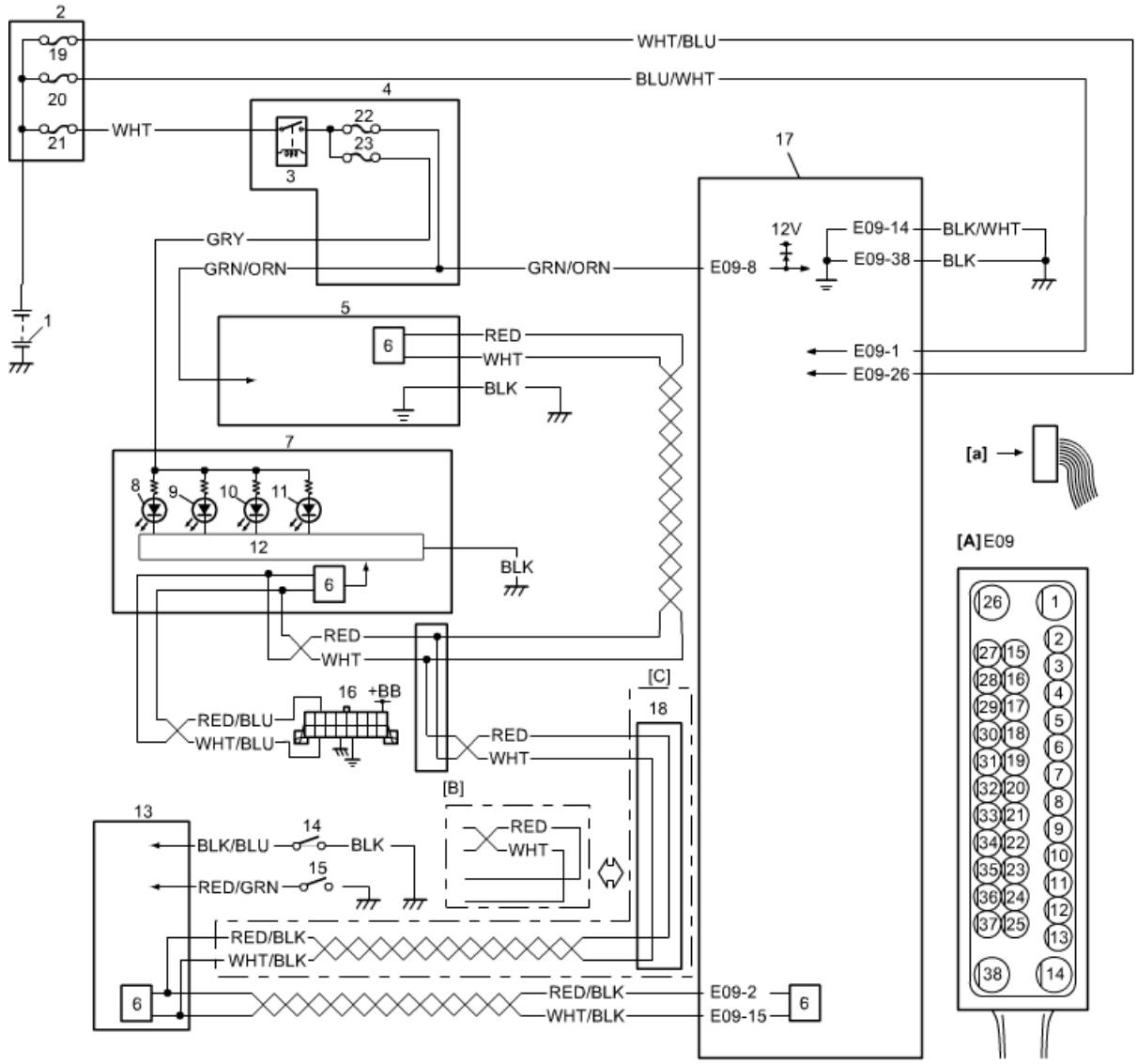
ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"

Stability Control (ON, OFF)	This parameter informs whether active brake is operated or not when vehicle is over or understeering.
Hill Hold Control (ON, OFF)	This informs whether active brake is operated or not when vehicle is on upslope.
TCSS Control (Brake) (ON, OFF)	This informs whether active brake is operated or not when vehicle is accelerating.
TCSS Control (Engine) (ON, OFF)	This informs whether engine torque control is operated or not when vehicle is accelerating.

Circuit Diagram



[A]: ESP® control module connector (View: [a])	7. Combination meter	16. DLC
[B]: 2WD	8. ESP® OFF light	17. ESP® control module
[C]: 4WD	9. ESP® warning light	18. 4WD control module
1. Battery	10. ABS warning light	19. "ABS MOT" fuse
2. Relay box No. 1	11. EBD warning light	20. "ABS SOL" fuse
3. IG1 relay	12. Light driver module	21. "IGN" fuse
4. BCM & J/B	13. BCM	22. "ESP" fuse
5. Steering angle sensor	14. Blake fluid level switch	23. "MTR" fuse
6. CAN driver	15. Parking brake switch	

Circuit Description

Operation (ON/OFF) of ESP® warning light is controlled by ESP® control module through light driver module in combination meter.
If ESP® system is in good condition, ESP® control module turns ON ESP® warning light with ignition mode of keyless push start system in "ON", keeps it ON for 2 seconds and then turns it OFF. If any abnormality in the system is detected, ESP® warning light is turned ON continuously by ESP® control module. Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Step	Action	YES	NO
1	**Warning light check** 1) Push engine switch to change ignition mode of keyless push start system to "ON". ***Do other indicator lights come ON?***	Go to Step 2.	Go to Step 4.
2	**DTC check** 1) Confirm that ignition mode of keyless push start system is in "OFF". 2) Connect scan tool to DLC. 3) Push engine switch to change ignition mode "ON". 4) Check DTC. ***Is DTC U0073 detected?***	Go to "Troubleshooting for Communication Bus Off":.	Go to Step 3.
3	**Scan tool parameter check** 1) Select "Indicator" function in "Active test".	Substitute a known -good ESP®	Substitute a known -good combination

	Doses ESP® warning light come ON?	control module and recheck DTC. ☞	meter and recheck DTC.
4	**Fuse check** ***Is "MTR" fuse for combination meter in good condition?***	Go to Step 5.	Replace "MTR" fuse and check for short circuit to ground.
5	**CAN communication circuit check** 1) Check CAN communication circuit between ESP® control module and combination meter. ***Is it in good condition?***	Go to Step 6.	Repair or replace defective wire harness.
6	**Combination meter power supply circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Remove combination meter. 3) Check for proper connection to "GRY" and "BLK" wire of combination meter connector. 4) If OK, push engine switch to change ignition mode of keyless push start system to "ON" and measure voltage between connector terminal "G240-1" and ground. 5) Measure voltage between "GRY" wire and ground. ***Is it 10 – 14 V?***	Go to Step 7.	Repair power supply circuit for combination meter.
7	**Combination meter ground circuit check** 1) Measure resistance between "BLK" wire and ground. ***Is resistance less than 2 Ω?***	Substitute a known -good combination meter and recheck DTC.	"BLK" circuit open.

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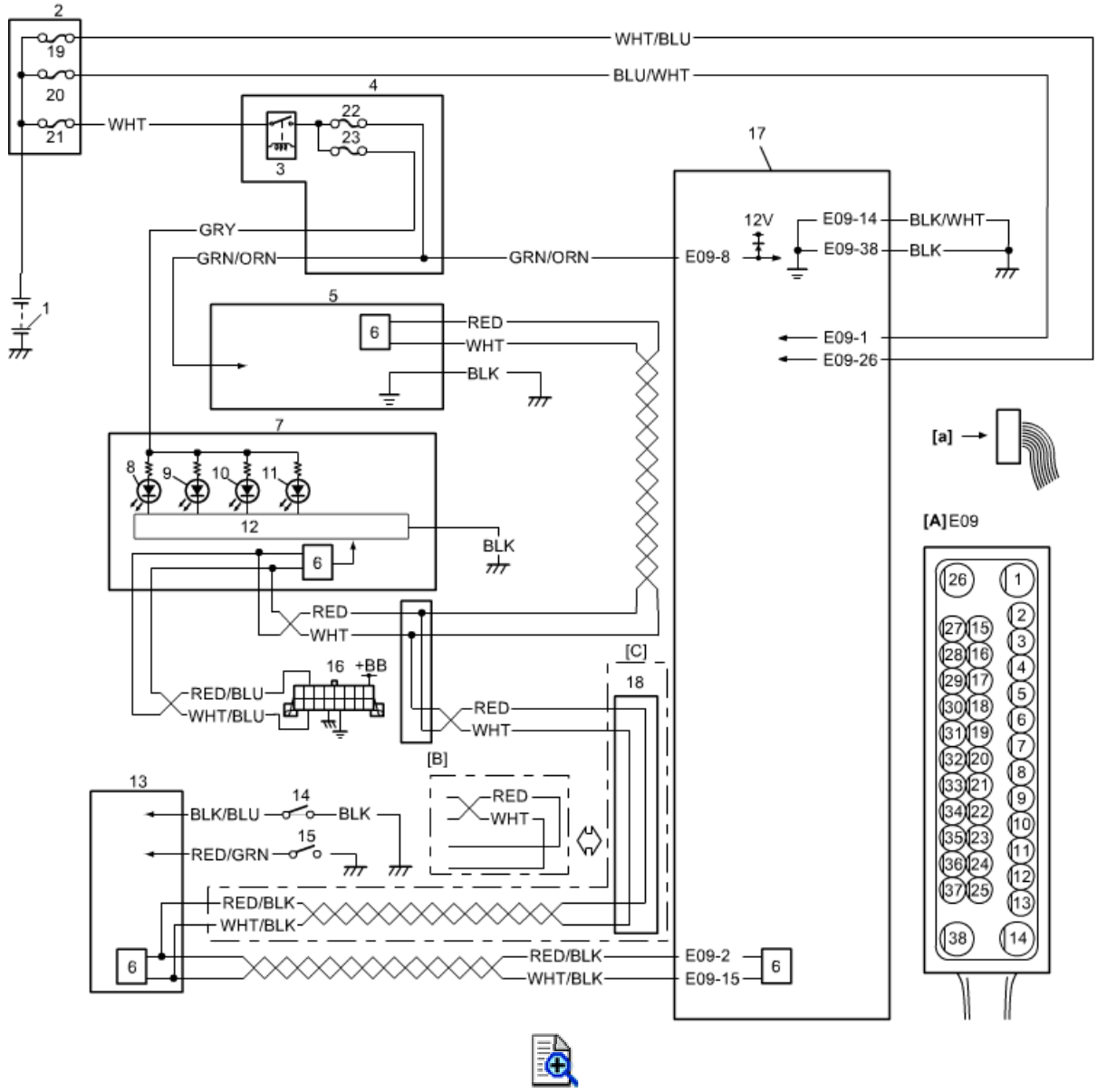
ESP® Warning Light Comes ON Steady

Circuit Diagram



[A]: ESP® control module connector (View: [a])	7. Combination meter	16. DLC
[B]: 2WD	8. ESP® OFF light	17. ESP® control module
[C]: 4WD	9. ESP® warning light	18. 4WD control module
1. Battery	10. ABS warning light	19. "ABS MOT" fuse
2. Relay box No. 1	11. EBD warning light	20. "ABS SOL" fuse
3. IG1 relay	12. Light driver module	21. "IGN" fuse
4. BCM & J/B	13. BCM	22. "ESP" fuse
5. Steering angle sensor	14. Blake fluid level switch	23. "MTR" fuse
6. CAN driver	15. Parking brake switch	

Circuit Description

Refer to "Circuit Description" under ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

Troubleshooting

Step	Action	YES	NO
1	**ESP® control module connector check** 1) Check for proper connection to ESP® control module connector. ***Is it in good condition?***	Go to Step 2.	Connect connector securely.
2	**DTC Check for ESP®** 1) Perform ***DTC Check***. ***Is there any DTC(s)?***	Go to applicable DTC troubleshooting.	Go to Step 3.
3	**ESP® control module power supply and ground circuit check** 1) Check ESP® control module power supply circuit and ground circuit. ☞ ***Are they in good condition?***	Substitute a known -good combination meter and recheck DTC. ☞ If ESP® warning light remains ON, substitute a known -good ESP® control module and recheck DTC. ☞	Repair ESP® control module power supply and ground circuit.

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ABS Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"

Circuit Diagram

Refer to "Circuit Diagram" under ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

Circuit Description

Operation (ON/OFF) of ABS warning light is controlled by ESP® control module through light driver module in combination meter.
If antilock brake system is in good condition, ESP® control module turns ON ABS warning light when engine switch is pressed to change ignition mode to "ON", keeps it "ON" for 2 seconds and then turns it OFF. If any abnormality in the system is detected, ABS warning light is turned ON continuously by ESP® control module. Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Refer to "Troubleshooting" under ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

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ABS Warning Light Comes ON Steady

Circuit Diagram

Refer to "Circuit Diagram" under ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

Circuit Description

Refer to "Circuit Description" under ***ABS Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

Troubleshooting

Refer to "Troubleshooting" under ***ESP® Warning Light Comes ON Steady***.

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EBD Warning Light (Brake Warning Light) Does Not Come ON after Pressing Engine Switch to Change Ignition Mode to "ON".

Circuit diagram

Refer to "Circuit Diagram" under ***ESP® Warning Light Does Not Come ON after Pressing Engine Switch to Change the Ignition Mode of Keyless Push Start System to "ON"***.

Circuit Description

Refer to "Circuit Description" under ***EBD Warning Light (Brake Warning Light) Comes ON Steady***.

Troubleshooting

Step	Action	YES	NO
1	**Warning light check** 1) Push engine switch to change ignition mode of keyless push start system to "ON". ***Does not "ABS" warning light come ON steady?***	Perform "ABS Warning Light Come ON Steady.	Go to Step 2.
2	**Scan tool parameter check** 1) Select "Indicator" function in "Active test". ***Dose EBD warning light come ON?***	Substitute a known -good ESP® control module and recheck DTC. ☞	Substitute a known -good combination meter and recheck DTC.

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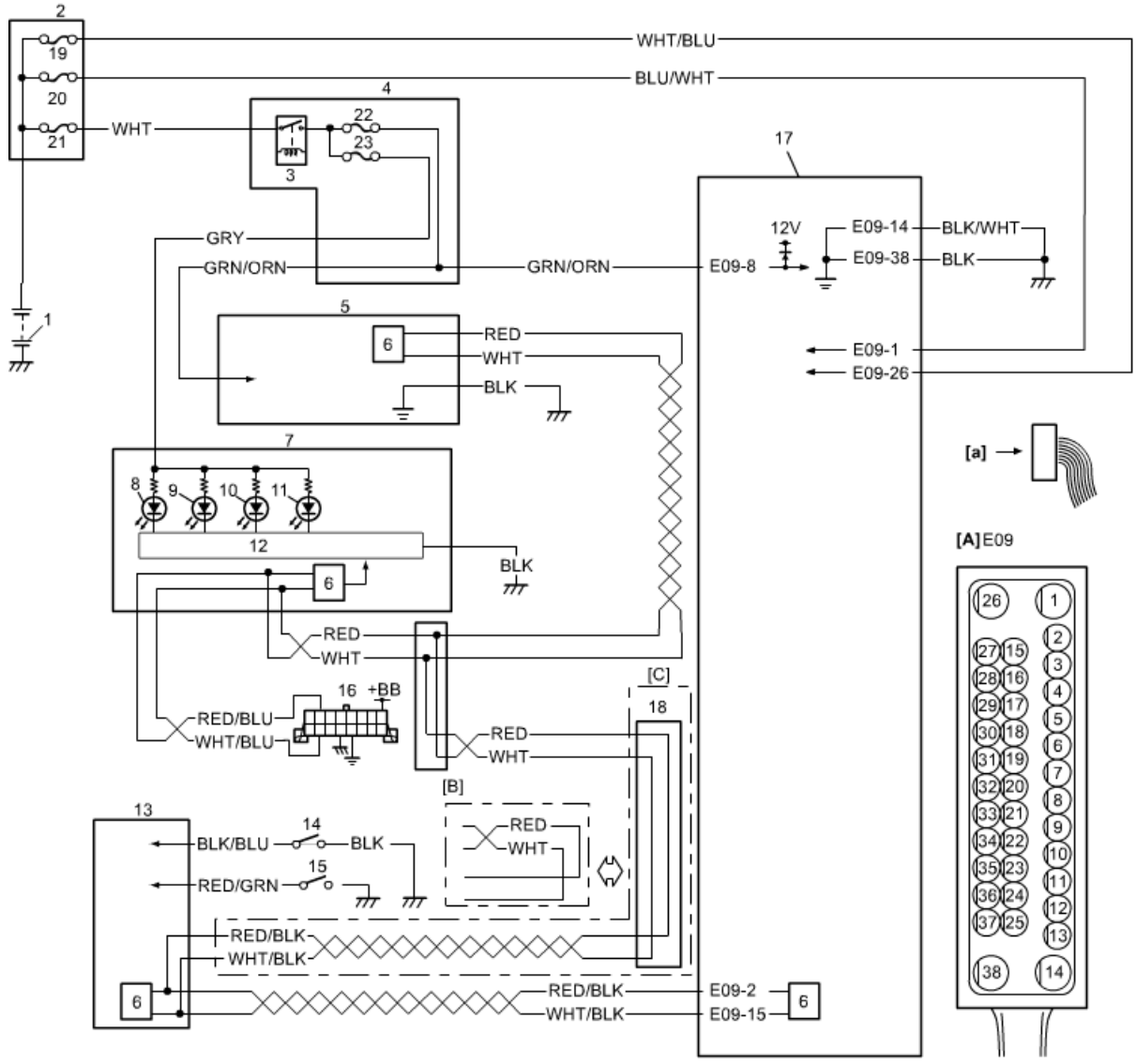
EBD Warning Light (Brake Warning Light) Comes ON Steady

Circuit Diagram



[A]: ESP® control module connector (View: [a])	7. Combination meter	16. DLC
[B]: 2WD	8. ESP® OFF light	17. ESP® control module
[C]: 4WD	9. ESP® warning light	18. 4WD control module
1. Battery	10. ABS warning light	19. "ABS MOT" fuse
2. Relay box No. 1	11. EBD warning light	20. "ABS SOL" fuse
3. IG1 relay	12. Light driver module	21. "IGN" fuse
4. BCM & J/B	13. BCM	22. "ESP" fuse
5. Steering angle sensor	14. Blake fluid level switch	23. "MTR" fuse

6. CAN driver	15. Parking brake switch	

Circuit Description

EBD warning light (brake warning light) is controlled by ESP® control module and BCM through light driver module in combination meter.
If EBD system is in good condition, ESP® control module turns ON EBD warning light (brake warning light) when engine switch is pressed to change ignition mode of keyless push start system to ON, keeps it ON for 2 seconds and then turns it OFF.
EBD warning light (brake warning light) is turned ON continuously at the following conditions.

- EBD system has an abnormality
- Parking brake lever is pulled up
- Brake fluid level is lower than minimum level

The information of parking brake switch and brake fluid level is transmitted from BCM to light driver module in combination meter through CAN communication line.
Also, it is turned ON continuously by light driver module when the connector of ESP® control module is disconnected.

Troubleshooting

Step	Action	YES	NO
1	**ESP® control module connector check** 1) Check for proper connection to ESP® control module connector. ***Is it in good condition?***	Go to Step 2.	Connect connector securely.
2	**Parking brake and brake fluid level check** 1) Check the following points. • Parking brake is completely released. • Brake fluid level is upper than minimum level. ☞ ***Are they in good condition?***	Go to Step 3.	Release parking brake and check brake fluid level.
3	**ABS warning light operation check** 1) Push engine switch to change ignition mode to "ON". ***Does "ABS" warning light come ON steady?***	Perform "ABS Warning Light Comes ON Steady".	Go to Step 4.
4	**Parking brake switch circuit and brake fluid level switch circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect "E05" and "L03" connectors from BCM.	Check each applicable circuit for short to ground. If OK, check parking brake switch and/or brake fluid level switch.	Go to Step 5.

	3) Check the following points. • Resistance between "E05-18" and ground: 2 Ω or less • Resistance between "L03-21" and ground: 2 Ω or less ***Are they in good condition?***	- Parking brake switch: ☞ - Brake fluid level switch: ☞	
5	**CAN communication circuit check** 1) Connect "E05" and "L03" connectors to BCM. 2) Connect scan tool to DLC. 3) Push engine switch to change ignition mode to "ON". 4) Check DTC. ***Is DTC U0073 detected?***	Go to "Troubleshooting for Communication Bus Off":.	Go to Step 6.
6	**DTC check for BCM** 1) Connect scan tool to DLC. 2) Push engine switch to change ignition mode to "ON". 3) Check DTC for BCM. ***Is DTC U0073 detected?***	Go to "Troubleshooting for Communication Bus Off":.	Substitute a know-good combination meter and recheck DTC. IF "ABS" warning light comes ON steady, substitute a know-good ESP® control module. ☞

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ESP® Hydraulic Unit Operation Check

CAUTION:
Make sure of the following conditions before ESP® hydraulic unit operation check.
Otherwise, ESP® hydraulic unit operation check can not be performed properly.
- **No air is trapped in brake system.**
- **Battery voltage is 11 V or more.**
- **Brake is not dragged.**
- **ESP® hydraulic unit / control module assembly does not detect DTC.**

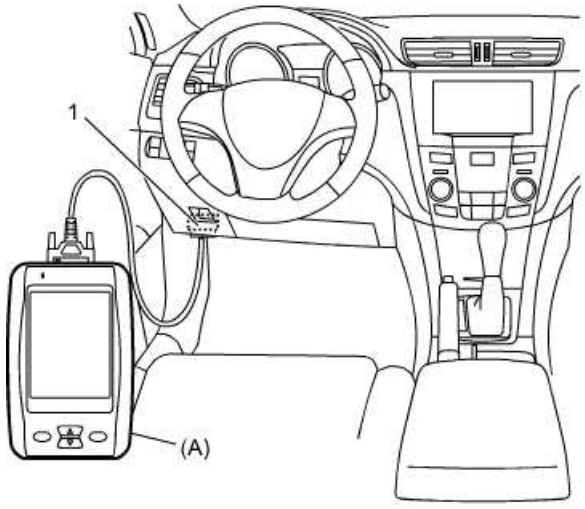
NOTE:
- **Operation check must be performed by 2 persons.**
- **DTC C1074, C1075 are detected, and ESP® warning light and ABS warning light are lit when ESP® hydraulic unit / control module assembly (hydraulic unit) is replaced. Perform ESP® hydraulic unit operation check after sensor calibration. (Sensor calibration of ESP®)**
- **Lighting or blinking warning light turn OFF when engine switch is pressed to change the ignition mode to ON after ESP® hydraulic unit operation check.**

1) Push engine switch to change ignition mode of keyless push start system to "ON".

2) Connect SUZUKI scan tool to DLC (1) located underside of instrument panel at driver's seat side.

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Hoist vehicle until tire can be rotated.

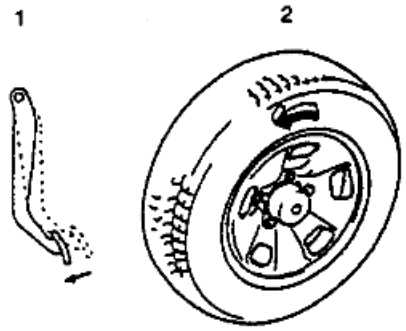
4) Set transmission to neutral and release parking brake.

5) Push engine switch to change ignition mode of keyless push start system to "ON" and select menu "Depressurization check" / "Pressurization check" in "hydraulic control test" under "Utility" mode of SUZUKI scan tool.
Refer to SUZUKI scan tool operator's manual for further details.

6) Perform the following checks with help of another person.
- Depressurization check
  Step on brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person's hand. At this time, check whether the wheel rotates freely due to brake depressurization.
- Pressurization check

Step off brake pedal (1) and then select testing wheel by SUZUKI scan tool and the wheel (2) should be turned by another person's hand. At this time, check whether the wheel is locked due to brake pressurization.

NOTE:
Pressurization / Depressurization by SUZUKI scan tool is available for 0.5 seconds.



7) Check for all 4-wheels respectively.

8) Confirm ABS warning light and ESP® warning light are turned off after changing ignition mode of keyless push start system from "OFF" to "ON". Check for DTC and repair trouble if lights are still lit.

9) If any faulty condition is found, replace ESP® hydraulic unit /control module assembly.

10) After completing the check, confirm that ignition mode of keyless push start system is in "OFF" position and disconnect SUZUKI scan tool from DLC.

4F

Sensor Calibration of ESP®

NOTE:

- **If any DTC other than C1074, C1075 are detected, sensor calibration can not be completed. Repair trouble cause of DTC first.**
- **ESP® hydraulic unit / control module assembly stores reference point of master cylinder pressure sensor and yaw rate / G sensor. Also steering angle sensor stores its own reference point.**
  Traction control or stability control is performed according to amount of variation from these reference points. If a reference point is lost or shifted due to following maintenance, calibration is needed.

Sensor	Maintenance
Yaw rate / G sensor	Replace ESP® hydraulic unit / control module assembly (C1074)
Steering angle sensor	Replace ESP® hydraulic unit / control module assembly Replace steering angle sensor (C1075)
Master cylinder pressure sensor	Replace ESP® hydraulic unit / control module assembly Disconnect ESP® hydraulic unit / control module assembly

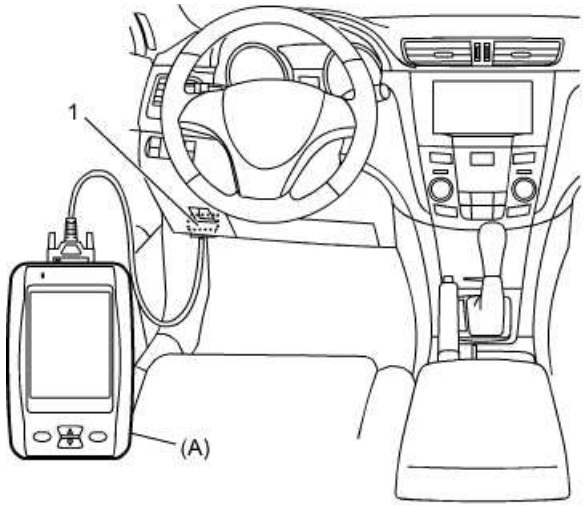
- **All sensors are calibrated at once when calibration is performed.**

1) Set steering wheel in straight state.

2) Connect SUZUKI scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Push engine switch to change ignition mode of keyless push start system to "ON" and confirm that no DTC is detected except C1074, C1075. If any DTC is detected, repair or replace trouble area.

4) Park vehicle on level surface, apply parking brake, stop engine with ignition mode of keyless push start system to "ON", set steering wheel in straight-ahead position and release brake pedal.

NOTE:
Keep the above condition in Step 4) to calibrate sensor correctly until sensor calibration is completed.

5) Select menu "Sensor Calibration" under "Utility" mode of SUZUKI scan tool and calibrate sensor with ignition mode of keyless push start system in "ON". Refer to scan tool operator's manual for further details.

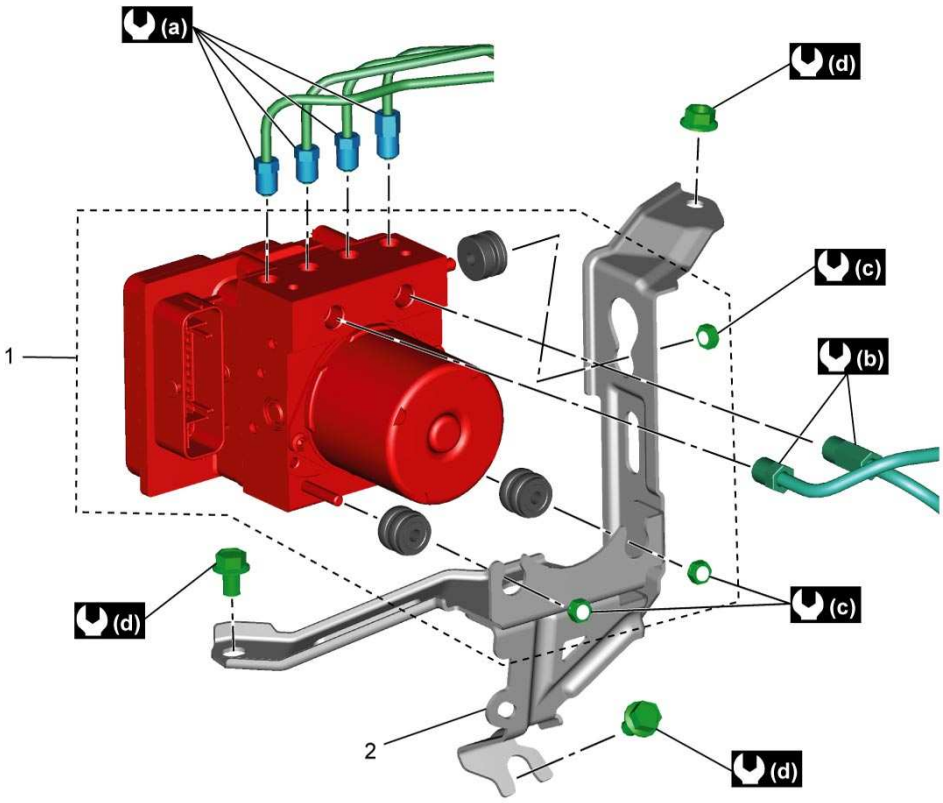
6) After completing the calibration, check DTC(s) is not stored in ESP® hydraulic unit / control module assembly.

7) Confirm that ignition mode of keyless push start system is in "OFF" and disconnect SUZUKI scan tool from DLC.

4F

ESP® Hydraulic Unit / Control Module Assembly Components

CAUTION:
Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will spoil original performance of ESP® hydraulic unit / control module assembly.



1. ESP® hydraulic unit/control module	(a): 16 N·m (1.6 kgf-m, 12.0 lbf-ft)	(c): 8 N·m (0.8 kgf-m, 5.9 lbf-ft)
2. Actuator bracket	(b): 19 N·m (1.9 kgf-m, 14.0 lbf-ft)	(d): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)

4F

ESP® Hydraulic Unit / Control Module Assembly On-Vehicle Inspection

CAUTION:
Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will spoil original performance of ESP® hydraulic unit / control module assembly.

Check hydraulic unit for fluid leakage.
Replace ESP® hydraulic unit / control module assembly if defective.

4F

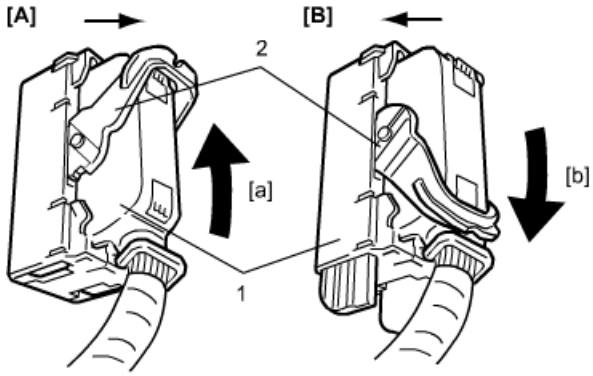
ESP® Hydraulic Unit / Control Module Assembly Removal and Installation

CAUTION:
- **Be careful not to allow dust to enter in ESP® hydraulic unit / control module assembly.**
- **Do not place ESP® hydraulic unit / control module assembly on its side or turn it upside down. Handling it in inappropriate way will spoil its original performance.**
- **Never disassemble ESP® hydraulic unit / control module assembly, loosen blind plug or remove motor. Performing any of these prohibited services will spoil original performance of ESP® hydraulic unit / control module assembly.**
- **Do not allow brake fluid to get on painted surfaces. Painted surfaces will be damaged by brake fluid. Flush it with water immediately if any fluid is spilled.**
- **Be sure to tighten fastener to specified torque using torque wrench to avoid damage.**
- **Do not give an impact to hydraulic unit.**

Removal

1) Disconnect negative (–) cable at battery.

2) Disconnect ESP® hydraulic unit / control module assembly connector (1) by pulling down the lock lever (2).

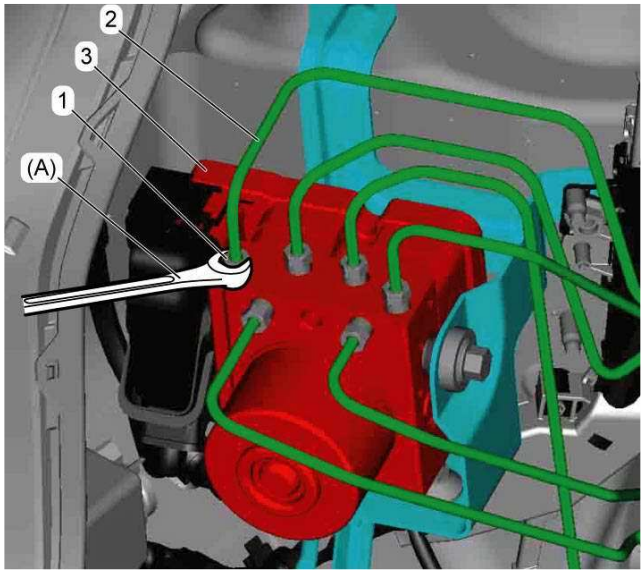


A:	Pull down to disconnect

3) Loosen flare nuts (1) using special tool and disconnect brake pipes (2) from ESP® hydraulic unit / control module assembly (3).

Special Tool
(A): 09950–78220

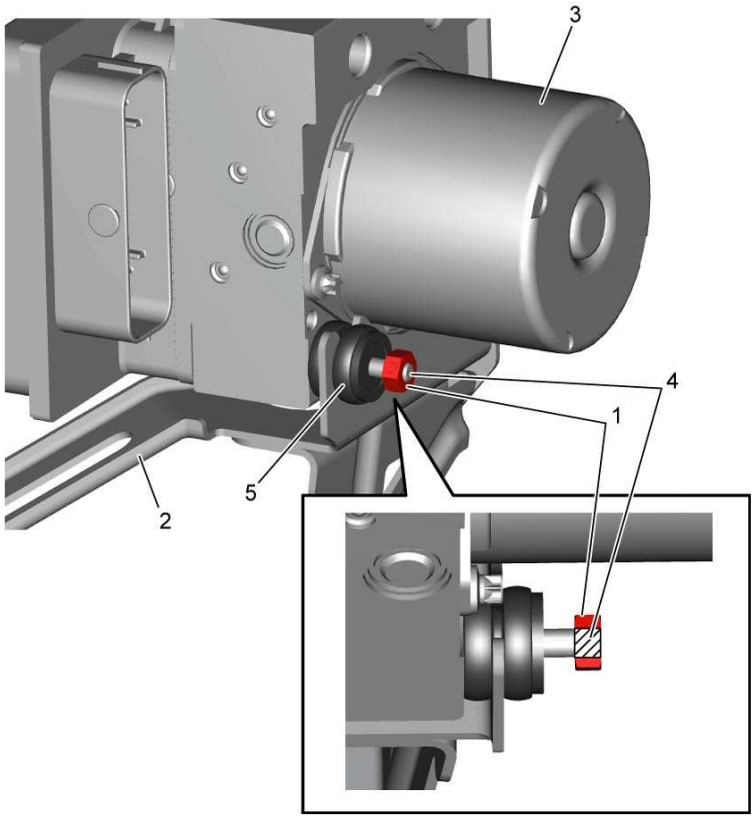
NOTE:
Put bleeder plug cap or the like onto pipe to prevent fluid from spilling.



4) Remove or loosen ESP® hydraulic unit / control module assembly nuts (1) and remove ESP® hydraulic unit / control module assembly (3) from actuator bracket (2).

CAUTION:
Be careful not to damage bushing (5).

NOTE:
If ESP® hydraulic unit / control module assembly nuts are not removed, loosen nuts by the end of screw (4) as shown in figure.



Installation

Reverse removal procedure, noting the following points.

- Tighten brake pipe flare nuts using special tool and ESP® hydraulic unit / control module assembly nuts to specified torque.

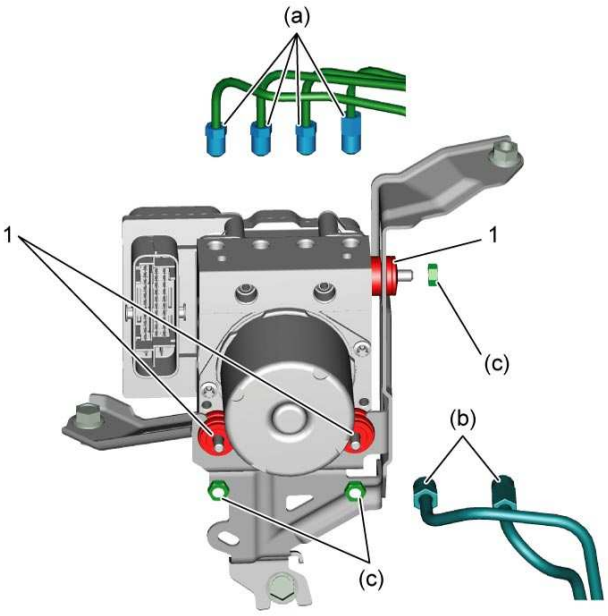
Special Tool

(A): 09950–78220

Tightening torque

Brake pipe flare nut (M10) (a): 16 N·m (1.6 kg-m, 12.0 lbf-ft)
Brake pipe flare nut (M12) (b): 19 N·m (1.9 kg-m, 14.0 lbf-ft)
ESP® hydraulic unit / control module assembly nut (c): 8.0 N·m (0.8 kg-m, 6.0 lbf-ft)

CAUTION:
Be careful not to deform or scratch to bushing when installing ESP® hydraulic unit / control module assembly.



- Bleed air from brake system. (Blake fluid replacement)
- Check for leakage of brake fluid and perform ESP® hydraulic unit operation check. (ESP® Hydraulic Unit Operation Check)

4F

Front and Rear Wheel Speed Sensor On-Vehicle Inspection

CAUTION:
Incorrect voltage and/or wrong connection cause damage to wheel speed sensor.

Output Voltage Inspection

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle a little.
3) Disconnect wheel speed sensor connector (1).
4) Set up measuring devices as shown in figure.

2. Resistance (75Ω)	4. "BLU" wire terminal
3. "WHT" wire terminal	5. Power supply (12 V)

5) Measure voltage at both ends of resistance without wheel rotation. If check result is not as specified, check sensor, mating encoder and their installation conditions.

Voltage at resistance (75Ω) without wheel rotation.

443 – 630 mV

6) Measure voltage at both ends of resistance with wheel rotation and check high (1) and low (2) voltages are in specification. Confirm that waveform is not disordered.

Voltage at resistance (75Ω) with wheel rotating.

LO voltage 443 – 630 mV
HI voltage 885 – 1260 mV

4F

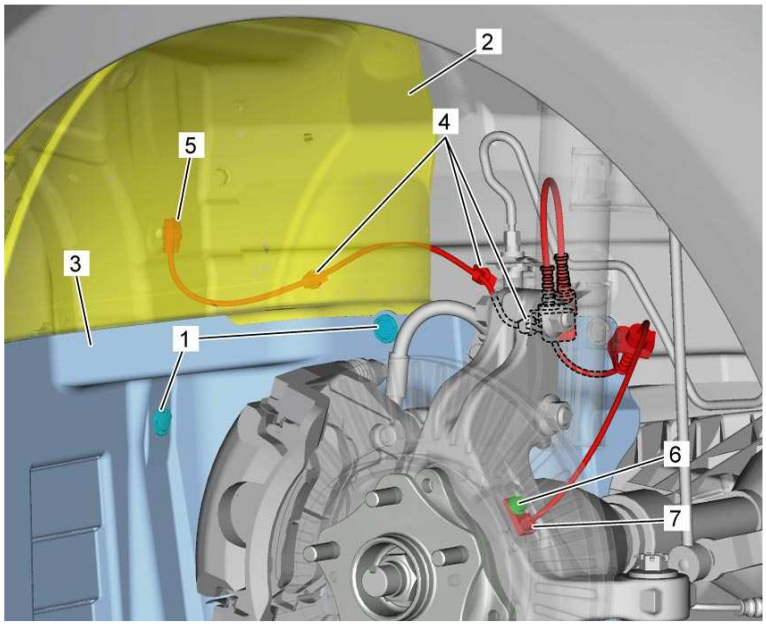
Front Wheel Speed Sensor Removal and Installation

Reference: Front and Rear Wheel Speed Sensor On-Vehicle Inspection

CAUTION:
Do not pull or twist wire harness strongly when removing or installing wheel speed sensor.

Removal

1) Disconnect negative (–) cable at battery.
2) Hoist vehicle a little and remove wheel.
3) Remove clips (1) and separate front fender lower lining (3) from front fender lining (2).
4) Remove clips (4) and disconnect front wheel speed sensor connector (5).
5) Remove front wheel speed sensor bolt (6).
6) Remove front wheel speed sensor (7) from steering knuckle.



Installation

Reference: Front and Rear Wheel Speed Sensor Inspection

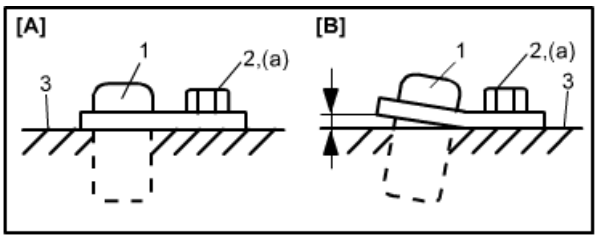
Reverse removal procedure, noting the following points.

- Check detective area of wheel speed sensor (1) is not covered with iron powder.
- Tighten wheel sensor bolt (2) to specified torque.

Tightening torque

Front wheel speed sensor bolt (a): 11 N·m (110 kg-m, 8.5 lbf-ft)

- Confirm that there is no space between front wheel speed sensor and steering knuckle (3).



[A]: OK	[B]: NG

- Install wheel. ☞

4F

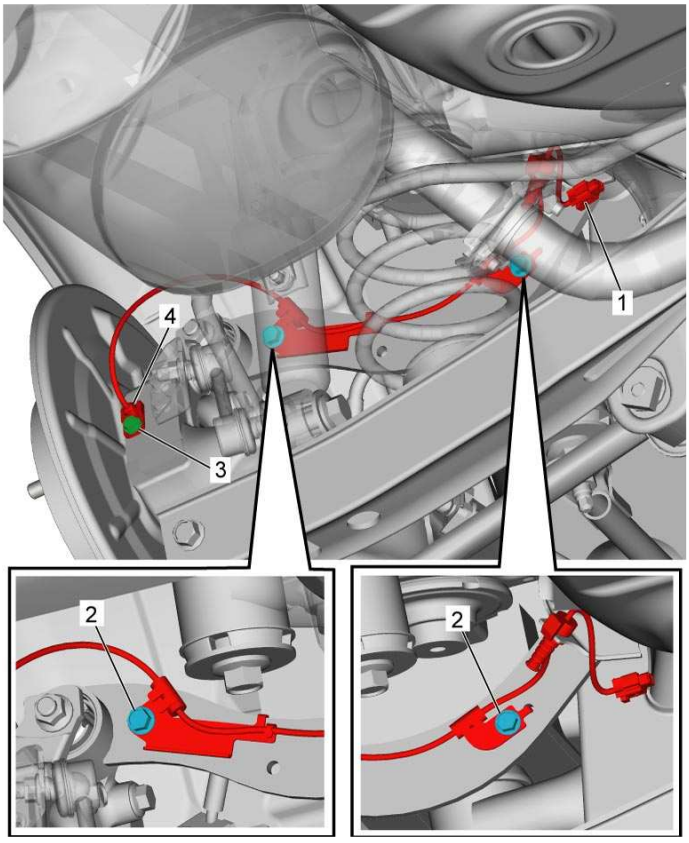
Rear Wheel Speed Sensor Removal and Installation

Reference: Front and Rear Wheel Speed Sensor On-Vehicle Inspection

CAUTION:
Do not pull or twist wire harness strongly when removing or installing wheel speed sensor.

Removal

1) Disconnect negative (−) cable at battery.
2) Hoist vehicle a little and remove wheel.
3) Disconnect rear wheel speed sensor connector (1).
4) Remove rear wheel speed sensor bracket bolt (2) and wheel speed sensor bolt (3).
5) Remove rear wheel speed sensor (4) from suspension knuckle.



Installation

Reference: Front and Rear Wheel Speed Sensor Inspection

Reverse removal procedure, noting the following points.

- Check detective area is not covered with iron powder.
- Tighten rear wheel speed sensor bolt (1) and rear wheel speed sensor bracket bolt (2) to specified torque.

Tightening torque

Rear wheel speed sensor bolt (a): 11 N·m (110 kg-m, 8.5 lbf-ft)
Rear wheel speed sensor bracket bolt (b): 25 N·m (250 kg-m, 18.5 lbf-ft)

Front and Rear Wheel Speed Sensor Inspection

Reference: Front Wheel Speed Sensor Removal and Installation
Reference: Rear Wheel Speed Sensor Removal and Installation
Replace or clean the wheel speed sensor if detective area of wheel speed sensor is damaged or covered with iron powder.

4F

Front Wheel Speed Sensor Encoder Removal and Installation

Refer to ***Front Wheel Hub and Steering Knuckle Removal and Installation:Front***.

Front and Rear Wheel Speed Sensor Encoder Inspection

Reference: Front Wheel Speed Sensor Encoder Removal and Installation
Reference: Rear Wheel Speed Sensor Encoder Removal and Installation

NOTE:
Wheel speed sensor encoder is united to wheel hub assembly. Replace wheel hub assembly if wheel speed sensor encoder needs to be replaced.

Check front and rear wheel speed sensor encoders for crack, damage, or deformation. Replace wheel speed sensor encoder if defective.

Brake Master Cylinder Pressure Sensor On-Vehicle Inspection

1) Calibrate sensors. ☞

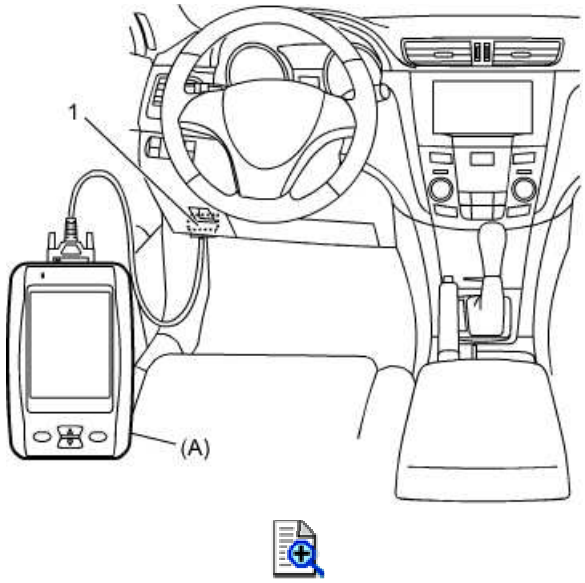
2) Check basic brake system other than ESP®. ☞

3) Confirm that ignition mode of keyless push start system is in "OFF".

4) Connect SUZUKI scan tool to DLC (1).

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



5) Push engine switch to change ignition mode of keyless push start system to "ON" and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.

6) Check "Master Cyl Press" under "DATA LIST" of SUZUKI scan tool with brake pedal released.
If check result is not as specified, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification

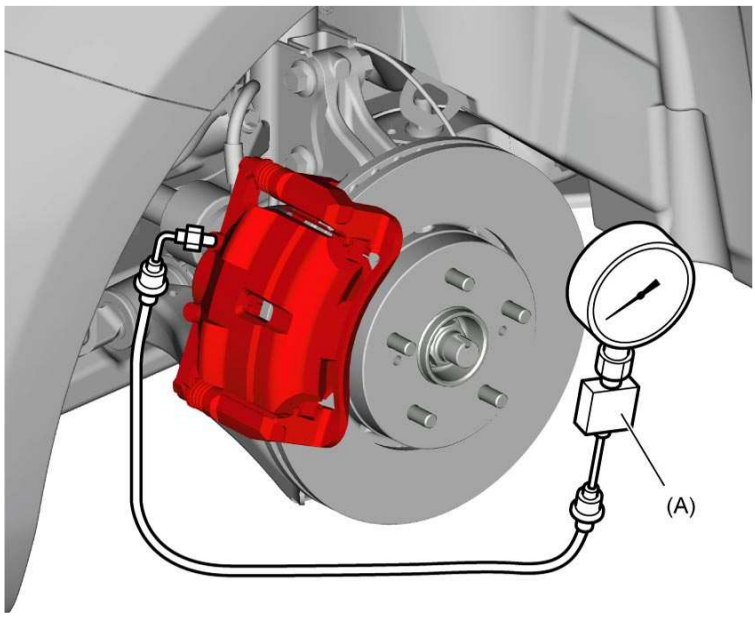
Brake pedal released: 0 ± 0.8 MPa (0 ± 8.2 kgf/cm², 0 ± 116 psi)

7) Hoist vehicle and remove left-side front wheel.

8) Remove bleeder plug from left-side front caliper and install special tool to left-side front caliper.

Special Tool

(A): 09956–02311



9) When depressing brake pedal up to special tool gauge reading 10 MPa (102 kgf/cm², 1450 psi), check "Master Cyl Press" under "DATA LIST" of SUZUKI scan tool.
If check result displayed on SUZUKI scan tool is not as specified, replace ESP® hydraulic unit / control module assembly.

Master cylinder pressure specification

Brake pedal depressed 10 MPa (102.0 kgf/cm², 1450 psi): 10 ± 1.2 MPa (102 ± 12.2 kgf/cm², 1450 ± 174 psi)

10) After completing the check, push engine switch to change ignition mode of keyless push start system to "OFF" and disconnect SUZUKI scan tool from DLC.

11) Remove special tool, tighten bleeder plug and bleed air from brake system. ☞

Tightening torque

Bleeder plug: 8.0 N·m (0.82 kg-m, 6.0 lbf-ft)

12) Check brake fluid level in master cylinder reservoir.

4F

Yaw Rate / G Sensor Assembly On-Vehicle Inspection

Lateral G Inspection

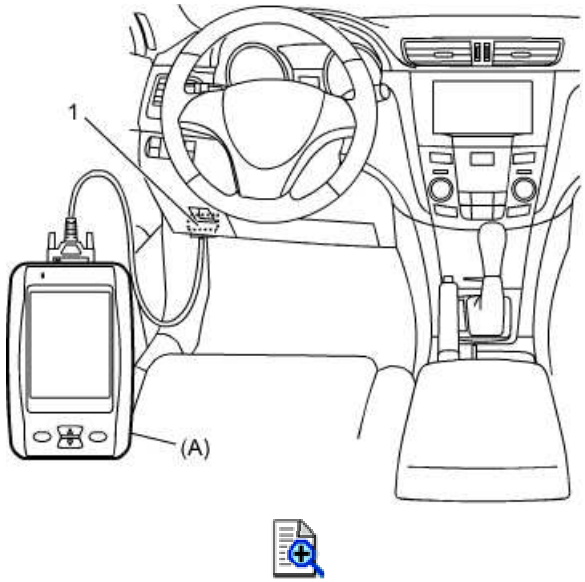
1) Calibrate yaw rate / G sensor assembly. ☞

2) Park vehicle on level surface with parking brake applied and fix wheels with chokes.

3) Connect SUZUKI scan tool to DLC (1) with ignition OFF.

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



4) Push engine switch to change ignition mode of keyless push start system to "ON" and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.

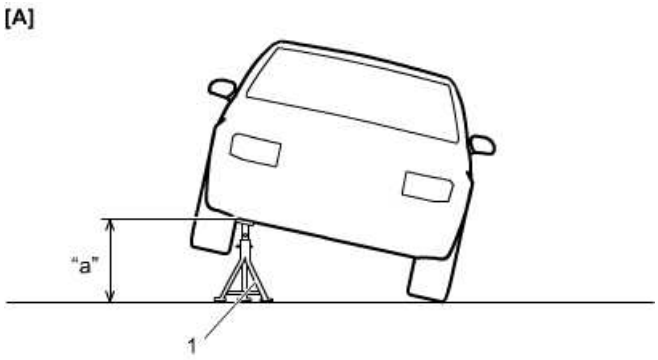
5) Check "G Sensor (Lateral)" under "DATA LIST" of SUZUKI scan tool in the following vehicle conditions.

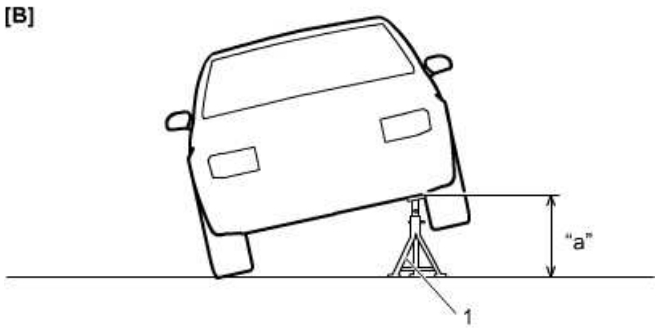
- Level condition
- Right-up condition
- Left-up condition

ESP® hydraulic unit / control module if check result is not as specified.

Lateral G specification

Vehicle condition	G Sensor (lateral)
Level condition	0 ± 0.1 G
Right-up condition	0.1 ± 0.1 G
Left-up condition	–0.1 ± 0.1 G





[A]: Right-up condition	"a": Approx. 180 mm (7.09 in.)
[B]: Left-up condition	1. Safety stand

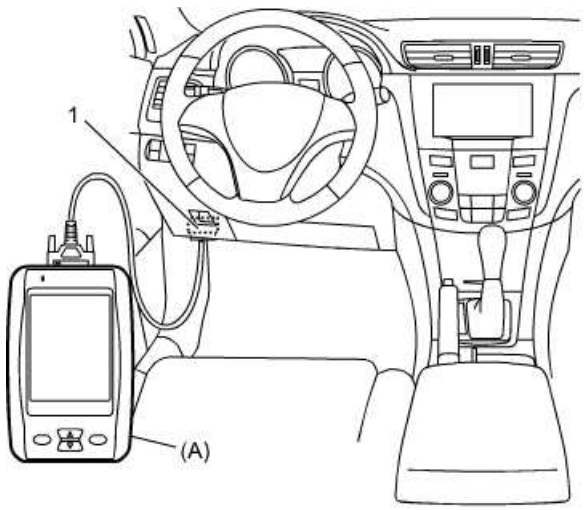
Yaw Rate Inspection

1) Calibrate yaw rate / G sensor. ☞

2) Connect SUZUKI scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Push engine switch to change ignition mode of keyless push start system to "ON" and select menu "DATA LIST" mode of SUZUKI scan tool. Refer to scan tool operator's manual for further details.

4) Check "Yaw Rate Sensor" under "DATA LIST" of SUZUKI scan tool in the following vehicle conditions.

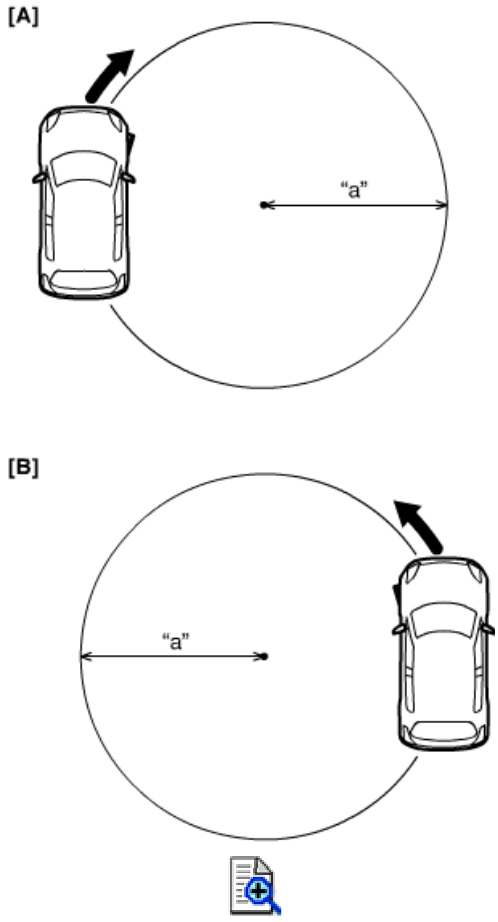
- Parking condition
- Drive vehicle in right turning condition with steering wheel fully turned
- Drive vehicle in left turning condition with steering wheel fully turned

Replace ESP® hydraulic unit / control module, if check result is not as specified.

Yaw rate specification

Vehicle condition	Yaw rate
Parking	0 ± 4 deg/s
Right turning	38.9 ± 4 deg/s
Left turning	–37.2 ± 4 deg/s

NOTE:
- **Drive vehicle on level ground and at 10 km/h (6 mile/h).**
- **Minimum turning radius is 5.5 m (18.0 ft).**



[A]: Right turning	"a": Approx 5.5 m (18.0 ft.)

[B]: Left turning	

4F

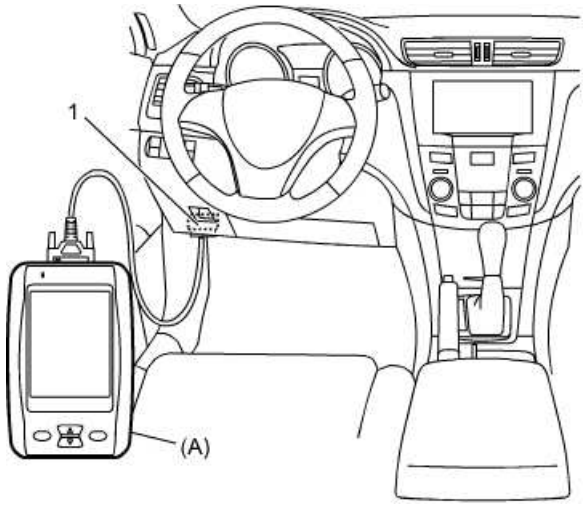
Steering Angle Sensor On-Vehicle Inspection

CAUTION:
Before each inspection, confirm steering angle sensor calibration is completed. If calibration is incomplete, calibrate sensor. ☞

1) Connect SUZUKI scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



2) Push engine switch to change ignition mode of keyless push start system to "ON" and select menu "DATA LIST" mode of SUZUKI scan tool.
Refer to scan tool operator's manual for further details.

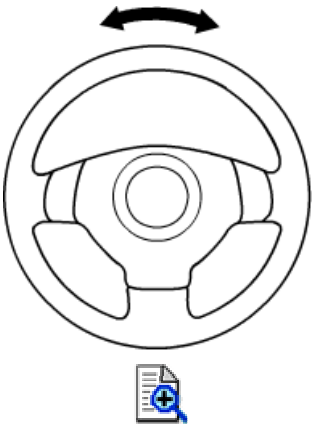
3) Check "Steering Angle Sen" under "DATA LIST" of SUZUKI scan tool in the following steering wheel conditions.

- Front wheels in straight-ahead position
- Rotate steering wheel once clockwise from straight-ahead position
- Rotate steering wheel once counterclockwise from straight-ahead position

Replace steering angle sensor, if check result is not as specified.

Steering angle specification

Vehicle condition	Steering angle
Front wheels in straight-ahead position	0 ± 3°
Rotate steering wheel once clockwise	360 ± 3°
Rotate steering wheel once counterclockwise	−360 ± 3°



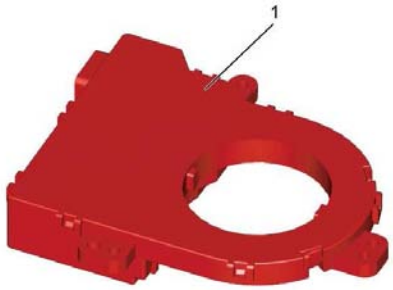
4F

Steering Angle Sensor Inspection

Reference: Steering Angle Sensor Removal and Installation

- Check sensor for dents, cracks or deformation.
- Check sensor connector (sensor side and harness side) and sensor connector lock mechanism for damage.
- Check connector terminals for bend, corrosion or rust.

Replace steering angle sensor (1) if defective.



4F

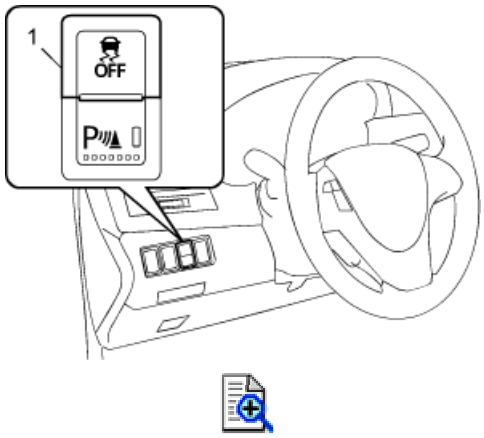
ESP® OFF Switch Removal and Installation

Removal

1) Remove instrument panel switch bezel. ☞

2) Disconnect ESP® OFF and parking sensor OFF switch connector.

3) Remove ESP® OFF and parking sensor OFF switch (1) from instrument panel switch bezel.



Installation

Reference: ESP® OFF Switch Inspection

Reverse removal procedure.

4F

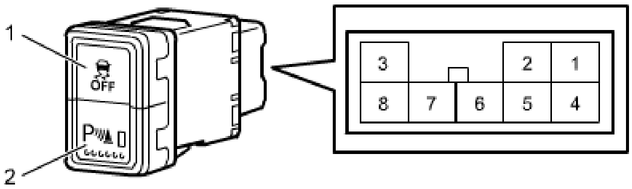
ESP® OFF Switch Inspection

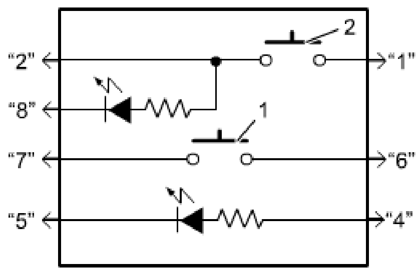
Reference: ESP® OFF Switch Removal and Installation

Check ESP® OFF & parking sensor OFF switch for continuity between terminals at each switch position.
If check result is not as specified, replace ESP® OFF and parking sensor OFF switch.

> **NOTE:**
> **Select diode test and capacitance measurements position and measure connection when measuring between terminal 2 – 8 or 4 – 5.**

Switch position \ Terminal		1	2	8	6	7	4	5
Parking sensor OFF switch	OFF		○ (diode)	○			○ (diode)	○
	ON	○	○ (diode)	○			○ (diode)	○
ESP OFF® switch	OFF						○ (diode)	○
	ON				○	○	○ (diode)	○





1. ESP® OFF switch	2. Parking sensor OFF switch

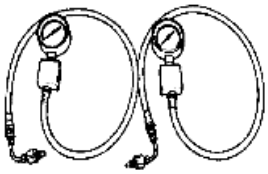
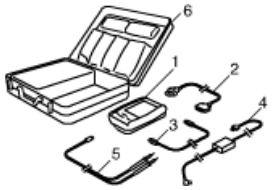
Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Brake pipe flare nut (M10)	16	1.6	12.0	☞
Brake pipe flare nut (M12)	19	1.9	14.0	☞
ESP® hydraulic unit / control module assembly nut	8.0	0.8	6.0	☞
Front wheel speed sensor bolt	11	110	8.5	☞
Rear wheel speed sensor bolt	11	110	8.5	☞
Rear wheel speed sensor bracket bolt	25	250	18.5	☞
Bleeder plug	8.0	0.82	6.0	☞

NOTE:
The specified tightening torque is described in the following.
ESP® Hydraulic Unit / Control Module Assembly Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

Special Tool

09950–78220 Flare nut wrench  	09956–02311 Brake pressure gauge  
SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case  	

Precautions for Diagnosing Trouble

- Before using scan tool, read its "Operator's (Instruction) Manual" to know how to use it.
- TCM replacement
  When substituting a known-good TCM, check that all relays and actuators have resistance of specified value.
  Neglecting this check may result in damage to good TCM.

Precautions for Disassembly and Reassembly

As the CVT consists of high precision component, the following cautions should be strictly observed when handling its parts in disassembly and reassembly.

- Never disassemble the CVT except where indicated in this section. Otherwise, disassembly will spoil its original performance.
- Make sure to wash dirt off from the CVT so that no such dirt will enter the CVT during dismounting and remounting.
- When servicing, select a clean place free from dust and dirt.
- Place a rubber mat on the work bench to protect parts from damage.
- Use lint-free paper not cloth rags.
- Replace each gasket, oil seal and O-ring with a new one.
- Keep component parts in group for each subassembly and avoid mixing them up.
- Clean all parts with cleaning solvent thoroughly and air-dry them.
- Keep face and eyes away from solvent spray while air blowing parts.
- Check mating surface for irregularities and remove them, if necessary. Clean it again.
- Apply CVT fluid to all O-rings.
- Replace oil seals that are removed and apply grease to their lips.

CVT Service Description

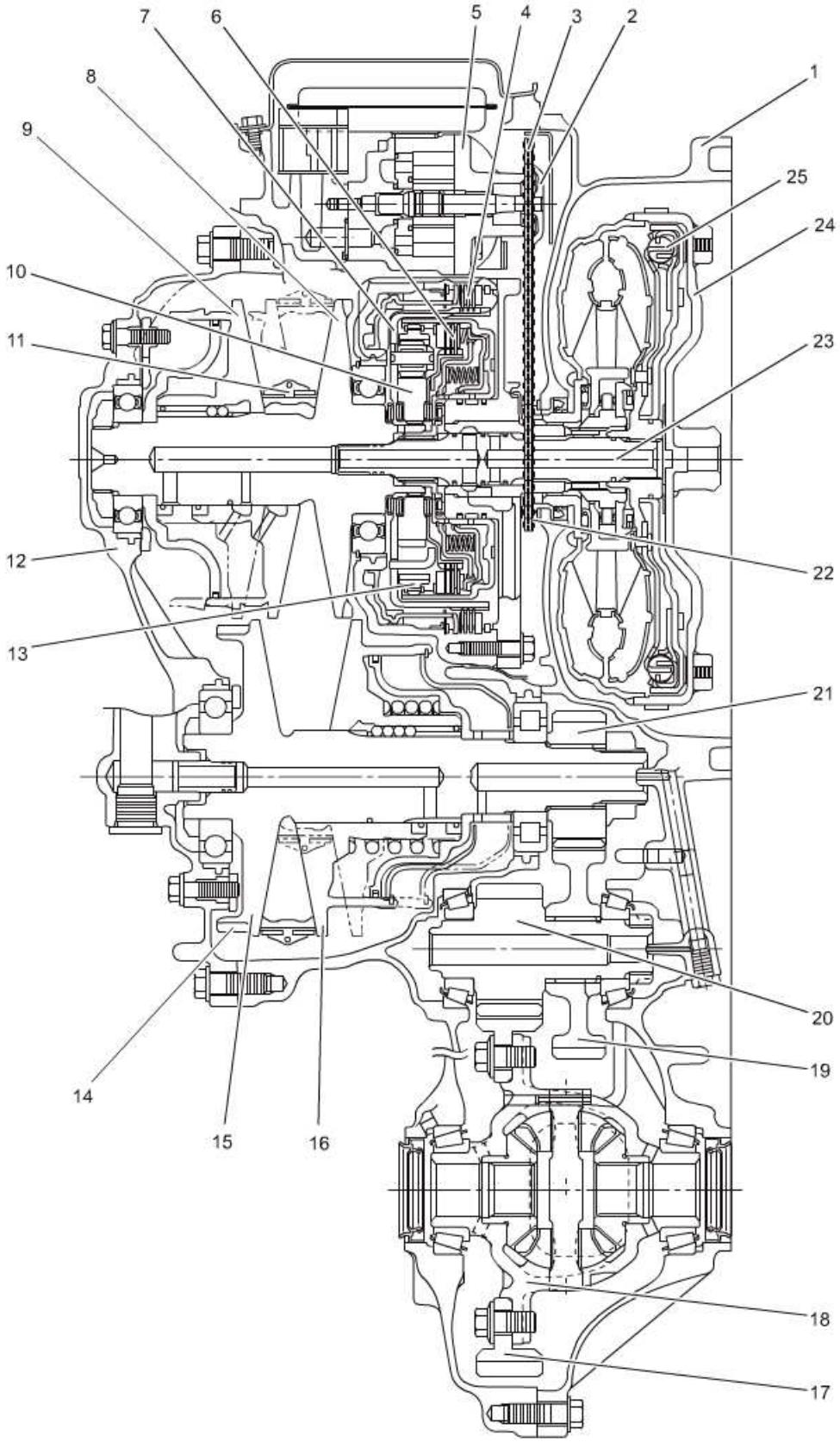
When repairing CVT, it is necessary to conduct the on-vehicle test to investigate where the cause of the trouble lies first.
If the CVT is repaired without such preliminary procedure, not only the cause of the trouble would be unknown, but also a secondary trouble may occur and often time would be wasted.

CVT Description

CVT Mechanical Description

CVT can vary the actual gear ratio continuously and stepless from low-speed to high-speed range depending on the driving conditions. The CVT allows an improved driveability with reduced shift-shock in comparison with an existing A/T.
This transaxle is an electronic control fully automatic transaxle with forward continuously variable and reverse 1-speed.
The torque converter is a 3-element, 1-step and 2-phase type and is equipped with an automatically controlled lock-up mechanism.
The gear change device consists of a ravigneaux type planetary gear unit, multiple disc type clutch, multiple disc type brake, steel belt, primary pulley and secondary pulley.
The hydraulic pressure control device consists of a valve body assembly, line pressure control solenoid valve (linear solenoid), secondary pressure control solenoid valve (linear solenoid), TCC solenoid valve (linear solenoid) and lock-up / select switching solenoid valve.
Optimum line pressure complying with engine torque is produced by the pressure control solenoid valves in dependence upon control signal from TCM. This makes it possible to control the line pressure with high accuracy in accordance with the engine power and running conditions to achieve smooth shifting characteristics and high efficiency.
The TCM can change the dimension between the two pulley surfaces. To continuously vary its gear ratio, the TCM simultaneously adjusts the diameter of the primary pulley that transmits torque from engine and the secondary pulley that transfers torque to the wheels.
With continuously shifting of gear ratio, the CVT can avoid the shift-shock and deliver smooth driving.

NOTE:
This figure shows 2WD model.



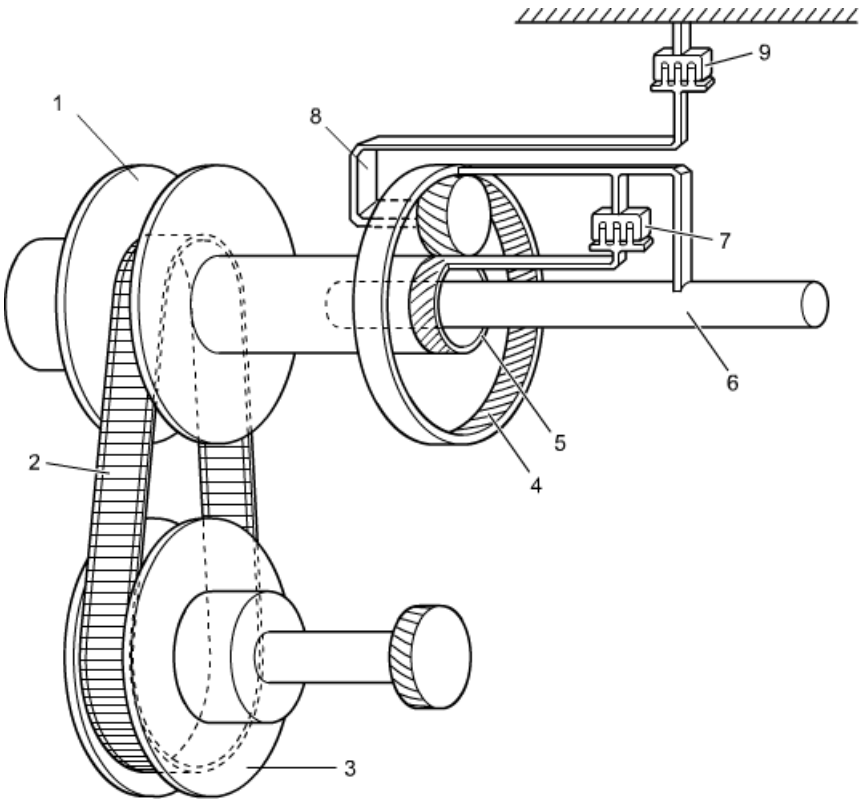
1. Converter housing	10. Sun gear	19. Reduction driven gear
2. Driven sprocket	11. Steel belt	20. Final drive pinion gear

3. Oil pump chain	12. Side cover	21. Reduction drive gear
4. Reverse brake	13. Internal gear	22. Drive sprocket
5. Oil pump	14. Parking gear	23. Input shaft
6. Forward clutch	15. Secondary pulley (fix side)	24. Torque converter
7. Planetary carrier	16. Secondary pulley (slide side)	25. Torque converter clutch (TCC)
8. Primary pulley (fix side)	17. Final driven gear	
9. Primary pulley (slide side)	18. Differential case	

Specifications

Item			Specifications	
Torque converter	Type		3-element, 1-step, 2-phase type (with TCC (lock-up) mechanism)	
	Stall torque ratio		1.826	
Oil pump	Type		Vane type oil pump (non crescent type)	
	Drive system		Engine drive	
Gear change device	Type		Forward continuously variable, reverse 1-step planetary gear type	
	Shift position	"P" range	Gear in neutral, output shaft fixed, engine start	
		"R" range	Reverse	
		"N" range	Gear in neutral, engine start	
		"D" range	Forward continuously variable gear ratio	
		Manual mode	UP (+)	1 → 2 → 3 → 4 → 5 → 6
			DOWN (−)	6 → 5 → 4 → 3 → 2 → 1
	Gear ratio	Forward (continuously variable)	2.349 – 0.394	
		Reverse (reverse gear)	1.750	
	Control elements		Steel belt and pulleys… 1 sets	
			Wet type multiple-disc clutch... 1 sets	
			Wet type multiple-disc brake... 1 sets	
	Final gear reduction ratio		5.798	
Lubrication	Lubrication system		Force feed system by oil pump	
Cooling	Cooling system		• CVT fluid cooler (air-cooled) • Radiator assisted cooling (water-cooled)	
Fluid used			SUZUKI CVT FLUID GREEN 1 or Shell GREEN-1 V	
CVT fluid capacity			8.3 liters (17.54/14.61 US/Imp pt.)	

CVT Mechanical Function



1. Primary pulley	4. Internal gear	7. Forward clutch
2. Steel belt	5. Sun gear	8. Planetary carrier
3. Secondary pulley	6. Input shaft	9. Reverse brake

Functions

Part name	Function
Forward clutch	Meshes input shaft and sun gear.
Reverse brake	Fixes planetary carrier.
Planetary carrier	Switches forward or reverse.
Internal gear	When reverse operates, transmits driving force input shaft to sun gear.
Sun gear	Transmits driving force to primary pulley.
Input shaft	Transmits driving force torque converter to forward clutch.
Primary pulley	Transmits driving force input shaft to secondary pulley.
Secondary pulley	Transmits driving force primary pulley to reduction drive gear.
Steel belt	Transmits driving force primary pulley to secondary pulley.

Operation Table of Mechanical Components

	Forward clutch	Reverse brake	Primary pulley	Secondary pulley
P	×	×	—	—
R	×	O	△	△
N	×	×	—	—

D	O	×	△	△
M	O	×	△	△

O: Engage
×: Disengage
△: Controlled
—: Not applicable

CVT Control Description

Gear Ratio Control
In order to achieve the optimum gear ratio for the driving force in accordance with the vehicle operating conditions, TCM detects vehicle conditions based on vehicle speed or input signals such as an accelerator pedal position.
TCM selects the optimum gear ratio and determines the gear change steps based on each input signal.
By outputting these command signals to the stepper motor, TCM controls the line pressure to the primary pulley, decides the adjustable pulley position of the primary pulley, and controls the gear ratio.
Lock up control:
When the vehicle speed exceeds the specified value, the TCC solenoid valve completely engages the TCC upon control signal from TCM. This control helps to improve the transaxle efficiency.
Manual mode control:
When the select lever is shifted to "M" position, or when the shift paddle switch is operated with the select lever in "D" range, TCM switches the control mode from automatic mode to manual mode, while maintaining the actual gear ratio.
In manual mode, every time the paddle-up switch, paddle-down switch, shift-up switch or shift-down switch is turned on, TCM selects the predetermined gear ratio for 1-speed to 6-speed, and performs shift up or shift down depending on the vehicle speed.
Slope shift control:
TCM distinguishes uphill or downhill according to vehicle speed, accelerator pedal position and/or brake pedal position, and controls gear ratio as follows:
- Uphill: To improve acceleration, gear ratio in the high speed range is limited.
- Downhill: To obtain effective engine brakes, gear ratio is downshifted.

Garage shift control:
If the select lever is shifted from "D" to "R" range while the vehicle is running at a specified speed or higher, TCM controls the transaxle operation and automatically shifts the transaxle to neutral in order to protect CVT inside parts from damage.

Operation Table of Solenoid Valves and Stepper Motor

NOTE:
***: This part operates at vehicle speed of 50 km/h (31 mile/h) or more.**

	Line pressure control solenoid valve	Secondary pressure control solenoid valve	TCC solenoid valve	Lock-up / select switching solenoid valve	Stepper motor
P or N (In 5 sec. after shifting to "P" or "N" range)	O	O	×	O	O
P	O	×	×	×	×
R	O	O	O	×	O
N	O	×	×	×	×
D	O	O	O	×	O
M	O	O	O*	×	O

O: Operate
×: Not operate

	Valve status	
	Operate	**Not operate**
Line pressure control solenoid valve	Close	Open
Secondary pressure control solenoid valve	Close	Open
TCC solenoid valve	Open	Close
Lock-up / select switching solenoid valve	Open	Close

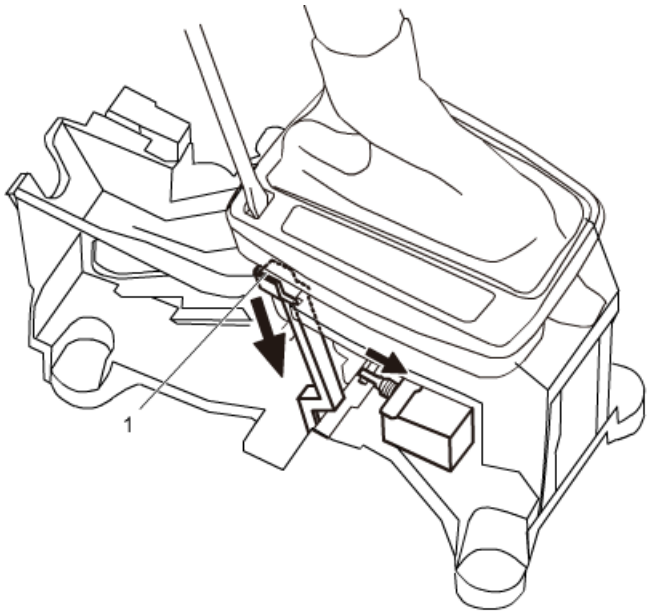
Brake Interlock System Construction

Shift Lock Solenoid Control

This system consists of shift lock solenoid control system and interlock control system.
The shift lock solenoid control system is so designed that the select lever can not be shifted from “P” range position unless engine switch is pressed to change the ignition mode to “ON” or “ACC” and the brake pedal is depressed.
And interlock control system is so designed that select lever cannot be shifted from “P” range position unless engine switch is pressed to change the ignition mode to “ON” or “ACC”.

Shift Lock Solenoid Manual Release

Remove plug cap of select lever and push down shift lock solenoid release plate (1) inside of plug hole with a flat-end screwdriver or the like. Then, select lever can be moved from “P” range position to another range even without depressing the brake pedal. (To shift select lever from “P” range to any other position, push engine switch to change the ignition mode to “ON” or “ACC”.)



CVT Diagnosis General Description

This vehicle is equipped with an electronic transaxle control system, which controls the gear ratio control, TCC operation, etc. suitably to vehicle driving conditions.
TCM has an OBD system which detects a malfunction in this system and abnormality of those parts that influence the engine exhaust emission.
When diagnosing a trouble in transaxle including this system, be sure to have full understanding of the outline of ***OBD System Description*** and each item in ***Precautions for Diagnosing Trouble*** and execute diagnosis according to ***CVT System Check*** to obtain correct result smoothly.

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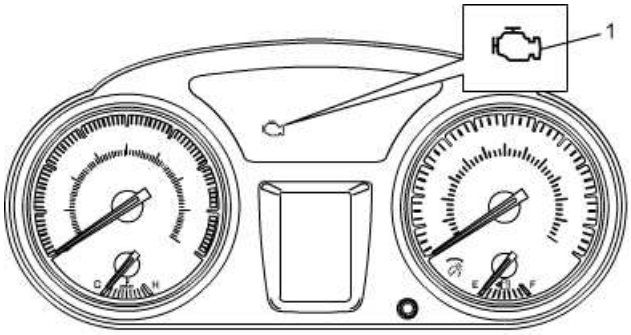
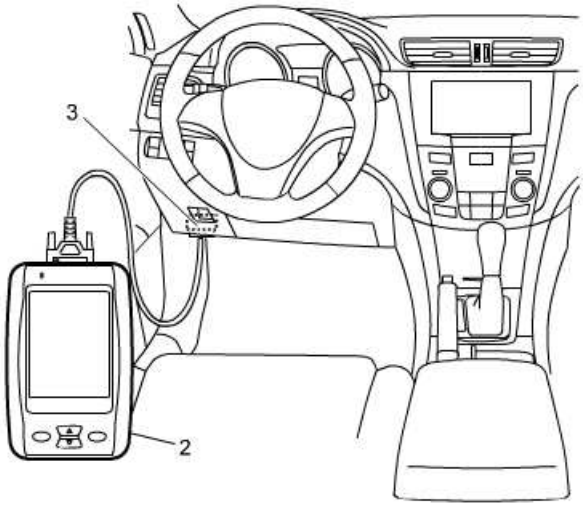
OBD System Description

For CVT control system, TCM has the following functions.

- When ignition mode of keyless push start system in "ON", MIL (1) turns ON to check the MIL and its circuit.
- When TCM detects a malfunction in CVT control system (and/or a malfunction which gives an adverse effect to vehicle emission) while the engine is running, TCM requires ECM to make the MIL in the combination meter of the instrument panel turn ON. TCM stores the malfunction area (DTC according to SAE J2012) in TCM memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL turn OFF although DTC stored in its memory will remain.)
- Malfunctions detected by TCM are stored in its memory as pending DTC, confirmed DTC (current and history) and permanent DTC. The permanent DTC, among others, will be stored in the memory that cannot be manually erased. (For the details, refer to description on ***Permanent DTC***)
- It is possible to communicate through DLC (3) by using not only SUZUKI scan tool (2) but also CAN communication OBD generic scan tool which are in compliance with SAE J1978. (Diagnostic information can be accessed by using a scan tool.)





- For information about the following items, refer to ***OBD System Description***.
  — Warm-up cycle
  — Driving cycle
  — 2 driving cycle detection logic
  — Pending DTC
  — Freeze frame data

Permanent DTC

In accordance with SAE J1979, TCM stores DTCs that adversely affect vehicle emission (i.e. DTCs with MIL turning on) in a non-volatile RAM (NVRAM) separately from that for pending and confirmed DTCs. This DTC is called a permanent DTC.
Unlike pending and confirmed DTCs, the permanent DTC will not be cleared even when executing the clear command of scan tool or when shutting off the power to TCM. Only when does TCM detect no malfunction in the trouble area of the stored permanent DTC with the condition determined normal the permanent DTC will be cleared. (For permanent DTC clearance, refer to ***DTC Clearance***)
The maximum of four earliest detections of the permanent DTCs will be stored in memory. The DTCs are cleared in the order of completing determination as normal.

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OBD System Description - Comprehensive Component Circuit Monitor

Monitoring Procedure

Input signal of the following are checked for open, short of circuit by monitoring input voltage.

- Primary and secondary pressure sensor power supply circuit (P0641)
- Transmission range sensor (P0707)
- CVT fluid temperature sensor (P0712, P0713)
- Primary pulley pressure sensor (P0842, P0843)
- Secondary pressure sensor (P0847, P0848)
- Line pressure control solenoid valve (P0962, P0963)
- Secondary pressure control solenoid valve (P0966, P0967)
- Sensor ground circuit (P1970)
- TCC solenoid valve (P2763, P2764)

DTC Description / Detecting Condition / Confirmation Procedure

P0641
Refer to ***DTC P0641***.
P0707
Refer to ***DTC P0707***.
P0712
Refer to ***DTC P0712***.
P0713
Refer to ***DTC P0713***.
P0842
Refer to ***DTC P0842 / P0843***.
P0843
Refer to ***DTC P0842 / P0843***.
P0847
Refer to ***DTC P0847 / P0848***.
P0848
Refer to ***DTC P0847 / P0848***.
P0962
Refer to ***DTC P0962 / P0963***.
P0963
Refer to ***DTC P0962 / P0963***.
P0966
Refer to ***DTC P0966 / P0967***.
P0967
Refer to ***DTC P0966 / P0967***.
P1970
Refer to ***DTC P1970***.
P2763
Refer to ***DTC P2763***.
P2764
Refer to ***DTC P2764***.

Primary and Secondary Pressure Sensor Power Supply Circuit Monitor

Operation

DTC(s)	P0641
Monitor execution	Continuous
Monitoring duration	5 sec.

Enabled conditions

Parameter	Minimum	Maximum
Battery voltage	10.5 V	—
Engine speed	1000 rpm	—

Typical malfunction thresholds

Primary pressure sensor voltage < 0.005 V
Secondary pressure sensor voltage < 0.005 V

Transmission Range Sensor Circuit Monitor

Operation

DTC(s)	P0707
Monitor execution	Continuous
Monitoring duration	10 sec.

Enabled conditions

Parameter	Minimum	Maximum
Battery voltage	10.5 V	—
Vehicle speed	0 km/h (0 mile/h)	—
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

Range sensor signal: No signal

Transmission Fluid Temperature Sensor Circuit Monitor

Operation

DTC(s)	P0712, P0713
Monitor execution	Continuous
Monitoring duration	5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0712:		
Battery voltage	10.5 V	—
Sensor ground	No DTC (P1970)	
CAN communication	No DTC (U0073, U0100)	
P0713:		
Battery voltage	10.5 V	—
Vehicle speed	10 km/h (6 mile/h)	—
Sensor ground	No DTC (P1970)	
CAN communication	No DTC (U0073, U0100)	

Typical malfunction thresholds

P0712:
Signal voltage <= 0.157 V

P0713:
Signal voltage >= 2.476 V

Primary Pressure Sensor Circuit Monitor

Operation

DTC(s)	P0842, P0843
Monitor execution	Continuous
Monitoring duration	5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0842:		
Transmission fluid temperature	–20 °C (–4 °F)	—
Primary pulley pressure sensor	No DTC (P0843)	
Transmission fluid temperature sensor	No DTC (P0712, P0713)	
Sensor ground	No DTC (P1970)	
Battery voltage	10.5 V	—
P0843:		
Transmission fluid temperature	–20 °C (–4 °F)	—
Primary pulley pressure sensor	No DTC (P0842)	
Transmission fluid temperature sensor	No DTC (P0712, P0713)	
Sensor ground	No DTC (P1970)	
Battery voltage	10.5 V	—

Typical malfunction thresholds

P0842:
Primary pressure sensor voltage < 0.09 V
P0843:
Primary pressure sensor voltage > 4.70 V

Secondary Pressure Sensor Circuit Monitor

Operation

DTC(s)	P0847, P0848
Monitor execution	Continuous
Monitoring duration	5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0847:		
Transmission fluid temperature	–20 °C (–4 °F)	—
Secondary pressure sensor	No DTC (P0848)	
Transmission fluid temperature sensor	No DTC (P0712, P0713)	
Sensor ground	No DTC (P1970)	
Battery voltage	10.5 V	—
P0848:		

Transmission fluid temperature	–20 °C (–4 °F)	—
Target secondary pressure	—	5.70 MPa (58.1 kgf/cm², 826 psi, 57 bar)
Secondary pressure sensor	No DTC (P0847)	
Transmission fluid temperature sensor	No DTC (P0712, P0713)	
Sensor ground	No DTC (P1970)	
Battery voltage	10.5 V	—

Typical malfunction thresholds

P0847:
Secondary pressure sensor voltage < 0.09 V
P0848:
Secondary pressure sensor voltage > 4.70 V

Line Pressure Control Solenoid Valve Circuit Monitor

Operation

DTC(s)	P0962, P0963
Monitor execution	Continuous
Monitoring duration	P0962: 1 sec.
	P0963: 5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0962:		
Battery voltage	10.5 V	—
P0963:		
Target current	0.75 A	—
Battery voltage	10.5 V	—
Line pressure control solenoid valve	No DTC (P0962)	

Typical malfunction thresholds

P0962:
(Target voltage x 0.7) - monitored voltage > 0 V
P0963:
Monitored current <= 0.40 A

Secondary Pressure Control Solenoid Valve Circuit Monitor

Operation

DTC(s)	P0966, P0967
Monitor execution	Continuous
Monitoring duration	P0966: 1 sec.
	P0967: 5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0966:		

Battery voltage	10.5 V	—
P0967:		
Target current	0.75 A	—
Battery voltage	10.5 V	—
Secondary pressure control solenoid valve	No DTC (P0966)	

Typical malfunction thresholds

P0966:
(Target voltage x 0.7) - monitored voltage > 0 V
P0967:
Monitored current <= 0.40 A

Sensor Ground Circuit Monitor

Operation

DTC(s)	P1970
Monitor execution	Continuous
Monitoring duration	0.2 sec.

Enabled conditions

Parameter	Minimum	Maximum
Engine speed	1000 rpm	—
Battery voltage	10.5 V	—
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

Transmission fluid temperature sensor voltage >= 2.5 V
Primary pressure sensor voltage >= 5.0 V
Secondary pressure sensor voltage >= 5.0 V

TCC Solenoid Valve Circuit Monitor

Operation

DTC(s)	P2763, P2764
Monitor execution	Continuous
Monitoring duration	P2763: 5 sec.
	P2764: 1 sec.

Enabled conditions

Parameter	Minimum	Maximum
P2763:		
Target current	0.75 A	—
Battery voltage	10.5 V	—
Lock-up / select switching solenoid valve	No DTC (P1810)	
P2764:		
Battery voltage	10.5 V	—

Typical malfunction thresholds

P2763:
(Target voltage x 0.7) - monitored voltage > 0 V
P2764:
Monitored current <= 0.40 A

5E

OBD System Description - Comprehensive Component Rationality Monitor

Monitoring Procedure

Input signal of the following are checked for circuit strategy rationality by monitoring each sensor, actuator and vehicle condition.

- TCM (P062F)
- Brake switch (P0703)
- Transmission range sensor (P0705)
- Transmission fluid temperature sensor (P0711)
- Primary pulley speed sensor (P0716, P0717)
- Secondary pulley speed sensor (P0721, P0722)
- TCC solenoid valve (P0741)
- Secondary pressure control solenoid valve (P0776, P0777)
- Primary pressure sensor / secondary pressure sensor (P0871)
- Line pressure control solenoid valve (P0961)
- Lock-up / select switching solenoid valve (P1810)
- Stepper motor (P1816, P1818)
- CAN communication (U0073, U0100)

DTC Description / Detecting Condition / Confirmation Procedure

P062F
Refer to ***DTC P062F***.
P0703
Refer to ***DTC P0703***.
P0705
Refer to ***DTC P0705***.
P0711
Refer to ***DTC P0711***.
P0716
Refer to ***DTC P0716***.
P0717
Refer to ***DTC P0717***.
P0721
Refer to ***DTC P0721***.
P0722
Refer to ***DTC P0722***.
P0741
Refer to ***DTC P0741***.
P0776
Refer to ***DTC P0776 / P0777***.
P0777
Refer to ***DTC P0776 / P0777***.
P0871
Refer to ***DTC P0871***.
P0961
Refer to ***DTC P0961***.
P1810
Refer to ***DTC P1810***.
P1816
Refer to ***DTC P1816***.
P1818
Refer to ***DTC P1818***.
U0073
Refer to ***DTC U0073***.
U0100

Refer to ***DTC U0100***.

TCM Internal Circuit / Memory Monitor

Operation

DTC(s)	P062F
Monitor execution	Continuous
Monitoring duration	1 times

Enabled conditions

Parameter	Minimum	Maximum
Not applicable		

Brake Switch Rationality Monitor

Operation

DTC(s)	P0703
Monitor execution	Continuous
Monitoring duration	Not applicable

Enabled conditions

Parameter	Minimum	Maximum
Vehicle speed > 29 km/h (18 mile/h)	10 sec.	—
CAN communication with ECM	No DTC (U0100)	

Typical malfunction thresholds

Brake switch signal during driving cycle: no change (CAN communication signal)

Transmission Range Sensor Rationality Monitor

Operation

DTC(s)	P0705
Monitor execution	Continuous
Monitoring duration	2 sec.

Enabled conditions

Parameter	Minimum	Maximum
Battery voltage	10.5 V	—

Typical malfunction thresholds

The number of range sensor signal >= 2

Transmission Fluid Temperature Sensor Rationality Monitor

Operation

DTC(s)	P0711
Monitor execution	Continuous
Monitoring duration	Not applicable

Enabled conditions

Parameter	Minimum	Maximum
Shift position	"D" range	
Vehicle speed	10 km/h (6 mile/h)	—
Engine speed	450 rpm	—
Accelerator pedal position	5%	—
Battery voltage	10.5 V	—
Transmission range sensor	No DTC (P0707, P0705)	
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

Time within the temperature range > Table P0711

Table P0711

NOTE:
***: Time required to raise the transmission fluid temperature by 1 °C (33 °F).**

Transmission fluid temperature range (°C)	−30 – −15	−15 – 0	0 – 5	5 – 10	10 – 12	12 – 15	15 – 18	18 – 20
(°F)	−22 – 5	5 – 32	32 – 41	41 – 50	50 – 53	53 – 59	59 – 64	64 – 68
Time required* (sec.)	300	240	300	360	360	360	360	360

Primary Pulley Speed Sensor Rationality Monitor

Operation

DTC(s)	P0716, P0717
Monitor execution	Continuous
Monitoring duration	P0716: 5 sec.
	P0717:
	Monitor 1: 5 sec.
	Monitor 2: 0.5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0716:		
TCC ON command = True Consisting of: Engine speed >= 800 rpm Transmission fluid temperature >= 10 °C (50 °F) Accelerator pedal position > Table TCC ON command		
Battery voltage	10.5 V	—
Engine speed - (secondary speed x estimated ratio)	—	1000 rpm
Primary pulley speed sensor	No DTC (P0717)	
Secondary pulley speed sensor	No DTC (P0722)	
Stepper motor	No DTC (P1816)	
CAN communication	No DTC (U0100, U0073)	

Table TCC ON command

Accelerator pedal position (%)	0.0	12.5	20.0	25.0	35.0	62.5	75.0	87.5	100.0
Vehicle speed (km/h)	16	16	16	16	24	29	29	29	29
(mile/h)	10	10	10	10	15	18	18	18	18

Parameter	Minimum	Maximum
P0717:		
Monitor 1:		
Secondary pulley speed	500 rpm	—
Battery voltage	10.5 V	—
Secondary pulley speed sensor	No DTC (P0721)	
Sensor ground	No DTC (P1970)	
CAN communication	No DTC (U0100, U0073)	
Monitor 2:		
Last primary pulley speed	1000 rpm	—
Battery voltage	10.5 V	—
Secondary pulley speed sensor	No DTC (P0721)	
Sensor ground	No DTC (P1970)	
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

P0716:
Engine speed - primary speed > 1000 rpm and (Secondary speed x estimated ratio) - primary speed > 1000 rpm
P0717:
Monitor 1:
Primary pulley speed < 150 rpm
Monitor 2:
Primary pulley speed = 0 rpm

Secondary Pulley Speed Sensor Rationality Monitor

Operation

DTC(s)	P0721, P0722
Monitor execution	Continuous
Monitoring duration	P0721: 5 sec.
	P0722:
	Monitor 1: 5 sec.
	Monitor 2: 0.5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0721:		
TCC ON command = True Consisting of: Engine speed >= 800 rpm		

Transmission fluid temperature >= 10 °C (50 °F) Accelerator pedal position > Table TCC ON command		
Battery voltage	10.5 V	—
Stepper motor	No DTC (P1816)	
Primary pulley speed sensor	No DTC (P0717)	
Secondary pulley speed sensor	No DTC (P0722)	
CAN communication	No DTC (U0100, U0073)	

Table TCC ON command

Accelerator pedal position (%)	0.0	12.5	20.0	25.0	35.0	62.5	75.0	87.5	100.0
Vehicle speed (km/h)	16	16	16	16	24	29	29	29	29
(mile/h)	10	10	10	10	15	18	18	18	18

Parameter	Minimum	Maximum
P0722:		
Monitor 1:		
Primary pulley speed	1000 rpm	—
Battery voltage	10.5 V	—
Primary pulley speed sensor	No DTC (P0716)	
CAN communication	No DTC (U0100, U0073)	
Monitor 2:		
Last vehicle speed calculated by secondary pulley speed	10 km/h (6 mile/h)	—
Battery voltage	10.5 V	—
Primary pulley speed sensor	No DTC (P0716)	
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

P0721:
Engine speed - (secondary speed x estimated ratio) > 1000 rpm and Primary speed - (secondary speed x estimated ratio) >1000 rpm
P0722:
Monitor 1:
Secondary pulley speed < 150 rpm
Monitor 2:
Secondary pulley speed = 0 rpm

TCC Solenoid Valve Rationality Monitor

Operation

DTC(s)	P0741
Monitor execution	Continuous
Monitoring duration	30 sec.

Enabled conditions

Parameter	Minimum	Maximum
TCC ON command = True Consisting of:		

Engine speed >= 800 rpm Transmission fluid temperature >= 10 °C (50 °F) Accelerator pedal position > Table TCC ON command		
Primary pulley speed sensor	No DTC (P0716, P0717)	
CAN communication	No DTC (U0100, U0073)	
Battery voltage	10.5 V	—

Table TCC ON command

Accelerator pedal position (%)	0.0	12.5	20.0	25.0	35.0	62.5	75.0	87.5	100.0
Vehicle speed (km/h)	16	16	16	16	24	29	29	29	29
(mile/h)	10	10	10	10	15	18	18	18	18

Typical malfunction thresholds

Engine speed - primary speed > 130 rpm

Secondary Pressure Control Solenoid Valve Rationality Monitor

Operation

DTC(s)	P0776, P0777
Monitor execution	Continuous
Monitoring duration	P0776: 30 sec.
	P0777:
	Monitor 1: 1.52 sec. x 2 times
	Monitor 2: 0.8 sec.

Enabled conditions

Parameter	Minimum	Maximum
P0776:		
Shift position	"D" range	
Vehicle speed	10 km/h (6 mile/h)	—
Accelerator pedal position	12.5%	—
Engine speed	450 rpm	—
Line pressure control solenoid valve	No DTC (P0962, P0963)	
Stepper motor	No DTC (P1816)	
Transmission range sensor	No DTC (P0707, P0705)	
Secondary pressure control solenoid valve	No DTC (P0966, P0967)	
Primary pulley speed sensor	No DTC (P0717, P0716)	
Secondary pulley speed sensor	No DTC (P0722, P0721)	
Primary pressure sensor	No DTC (P0842, P0843)	
Secondary pressure sensor	No DTC (P0847, P0848)	
TCC solenoid valve	No DTC (P2764, P2763)	
Lock-up / select switching solenoid valve	No DTC (P1810)	
CAN communication	No DTC (U0100, U0073)	
Battery voltage	10.5 V	—
P0777:		
Shift position	Other than "N" range	

Brake light switch	OFF	
Transmission fluid temperature	–20 °C (–4 °F)	—
Change rate of vehicle speed	—	+/– 14 km/h (9 mile/h) / 10 ms
Change rate of accelerator pedal position	—	+/– 6.25% / 10 ms
CAN communication	No DTC (U0100, U0073)	
Line pressure control solenoid valve	No DTC (P0962)	
Secondary pressure control solenoid valve	No DTC (P0966)	

Typical malfunction thresholds

P0776:
Measured secondary pressure - target secondary pressure > 1.2 MPa (12.2 kgf/cm², 174 psi, 12 bar)
P0777:
Monitor 1:
Target secondary pressure - measured secondary pressure >= 0.25 MPa (2.5 kgf/cm², 36.2 psi, 2.5 bar)
Monitor 2:
Target secondary pressure - measured secondary pressure >= 2.0 MPa (20.4 kgf/cm², 290 psi, 20 bar)

Primary Pressure Sensor / Secondary Pressure Sensor Rationality Monitor

Operation

DTC(s)	P0871
Monitor execution	Continuous
Monitoring duration	5 sec.

Enabled conditions

Parameter	Minimum	Maximum
Gear ratio	0.5	1.0
Gear ratio change rate	—	0.1 / sec.
Primary pulley speed sensor	No DTC (P0716, P0717)	
Secondary pulley speed sensor	No DTC (P0721, P0722)	
Primary pressure sensor	No DTC (P0842, P0843)	
Secondary pressure sensor	No DTC (P0847, P0848)	
Battery voltage	10.5 V	—

Typical malfunction thresholds

Monitor 1:
Indicated primary pressure sensor < Table P0871 low (lower limit of primary pressure sensor correlated with secondary pressure)
Monitor 2:
Indicated primary pressure sensor > Table P0871 high (upper limit of primary pressure sensor correlated with secondary pressure)

Table P0871 low

Secondary pressure sensor [MPa, kgf/cm², psi, bar]	0.000	2.3 (23.5, 333, 23)	6.375 (65, 924, 63)
Lower limit of primary pressure sensor [MPa, kgf/cm², psi, bar]	0.010 (0.1, 1.45, 0.1)	0.010 (0.1, 1.45, 0.1)	3.000 (30.6, 435, 30)

Table P0871 high

Secondary pressure sensor [MPa, kgf/cm², psi, bar]	0.000	4.375 (44.6, 634, 43)	6.375 (65, 924, 63)
Upper limit of primary pressure sensor [MPa, kgf/cm², psi, bar]	2.000 (20.4, 290, 20)	6.375 (65, 924, 63)	6.375 (65, 924, 63)

Line Pressure Control Solenoid Valve Rationality Monitor

Operation

DTC(s)	P0961
Monitor execution	Continuous
Monitoring duration	0.2 sec.

Enabled conditions

Parameter	Minimum	Maximum
Primary pulley speed	500 rpm	—
Battery voltage	10.5 V	—
Primary pulley speed sensor	No DTC (P0716, P0717)	

Typical malfunction thresholds

Primary pulley speed / secondary pulley speed > 2.7

Lock-up / Select Solenoid Valve Rationality Monitor

Operation

DTC(s)	P1810
Monitor execution	Continuous
Monitoring duration	0.2 sec.

Enabled conditions

Parameter	Minimum	Maximum
Battery voltage	10.5 V	—

Typical malfunction thresholds

Monitor solenoid status = Command solenoid status (ON/OFF) = False

Stepper Motor Circuit Rationality Monitor

Operation

DTC(s)	P1816, P1818
Monitor execution	Continuous
Monitoring duration	P1816: 0.2 sec.
	P1818: 5 sec.

Enabled conditions

Parameter	Minimum	Maximum
P1816:		
Battery voltage	10.5 V	—
P1818:		
Shift position	"D" range	
Vehicle speed	10 km/h (6 mile/h)	—
Accelerator pedal position	12.5%	—
Engine speed	450 rpm	—
Battery voltage	10.5 V	—
Transmission fluid temperature sensor	No DTC (P0712, P0713)	
Transmission range sensor	No DTC (P0707, P0705)	
Line pressure control solenoid valve	No DTC (P0962, P0963)	
Stepper motor	No DTC (P1816)	
Primary pulley speed sensor	No DTC (P0717)	
Secondary pulley speed sensor	No DTC (P0722)	
Primary pressure sensor	No DTC (P0842, P0843)	
Secondary pressure sensor	No DTC (P0847, P0848)	
CAN communication	No DTC (U0100, U0073)	

Typical malfunction thresholds

P1816:
Monitor motor status = Command motor status (ON/OFF) = False
P1818:
Estimated primary speed - measured primary speed > 1000 rpm

CAN Communication Signal Rationality Monitor

Operation

DTC(s)	U0073, U0100
Monitor execution	Continuous
Monitoring duration	U0073: 100 ms x 30 times
	U0100: 2 sec.

Enabled conditions

Parameter	Minimum	Maximum
U0073:		
Battery voltage	9.0 V	—
U0100:		
Battery voltage	9.0 V	—
CAN communication bus off	No DTC (U0073)	

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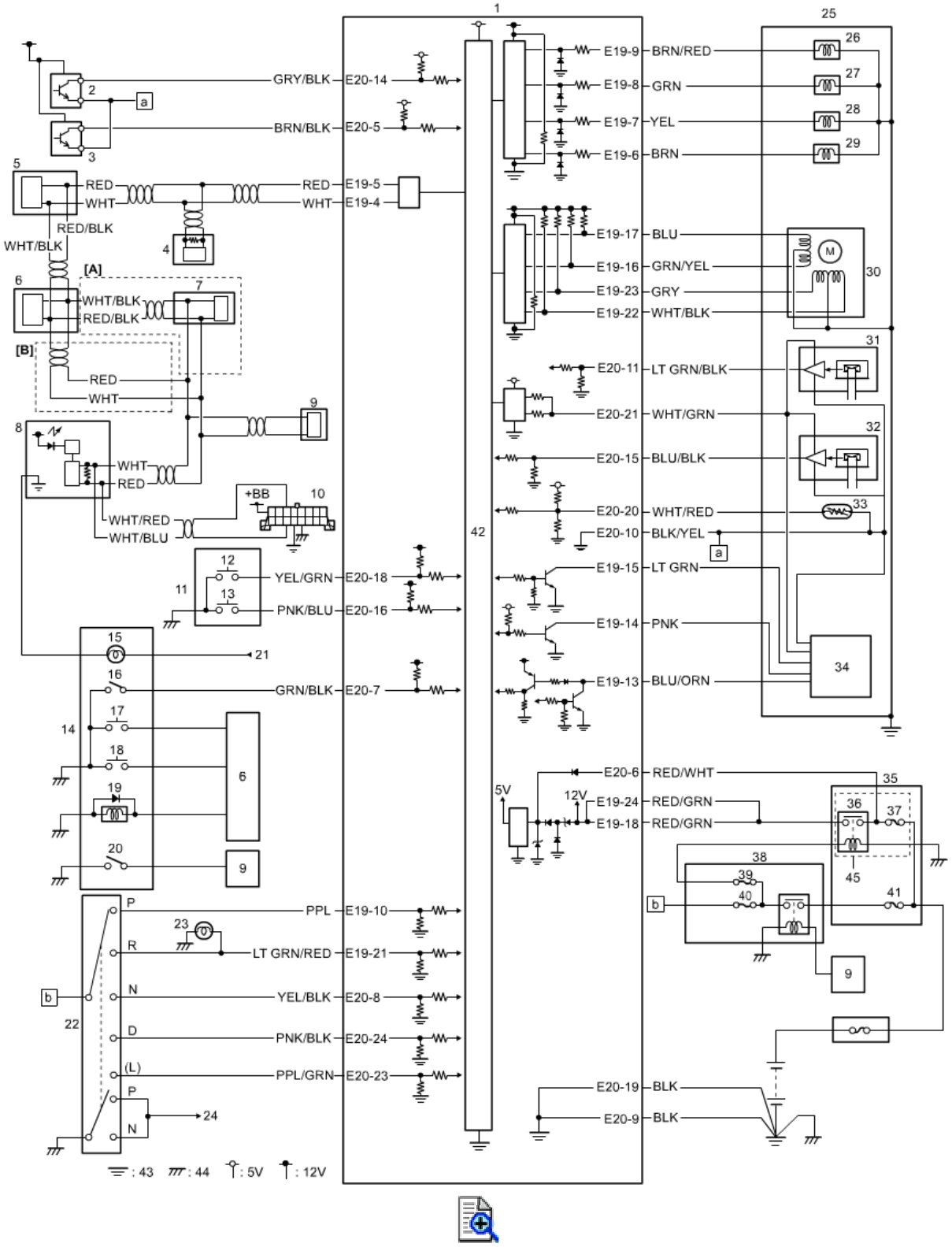
TCM Circuit Diagram



[A]: 4WD model	11. Shift paddles	23. Back up light	35. Main fuse box
[B]: 2WD model	12. Paddle-up switch	24. To starting relay	36. CVT relay
1. TCM	13. Paddle-down switch	25. Valve body	37. "AT" fuse

2. Primary pulley speed sensor	14. Select lever assembly	26. Line pressure control solenoid valve	38. Junction block
3. Secondary pulley speed sensor	15. Illumination light	27. Secondary pressure control solenoid valve	39. "IG1 SIG" fuse
4. ECM	16. Manual mode switch	28. TCC solenoid valve	40. "BACK" fuse
5. ESP® control module	17. Manual shift-up switch	29. Lock-up / select switching solenoid valve	41. "IGN" fuse
6. BCM	18. Manual shift-down switch	30. Stepper motor	42. CPU
7. 4WD control module	19. Shift lock solenoid	31. Primary pressure sensor	43. Engine ground
8. Combination meter	20. P position switch	32. Secondary pressure sensor	44. Ground
9. Keyless start control module	21. To tail light relay	33. CVT fluid temperature sensor	45. Power integration
10. DLC	22. Transmission range sensor	34. ROM	

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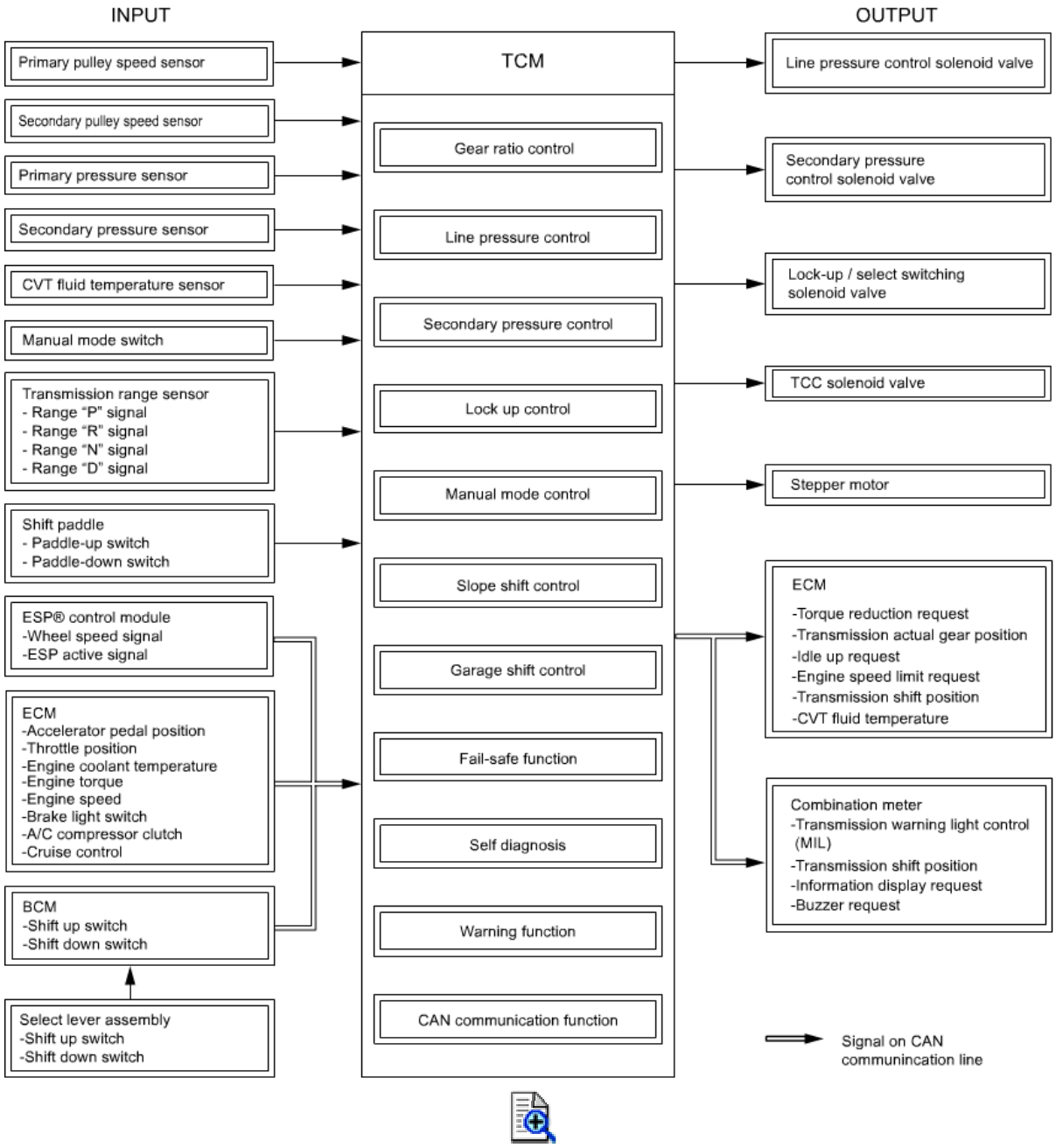
Electronic Shift Control Input / Output Diagram



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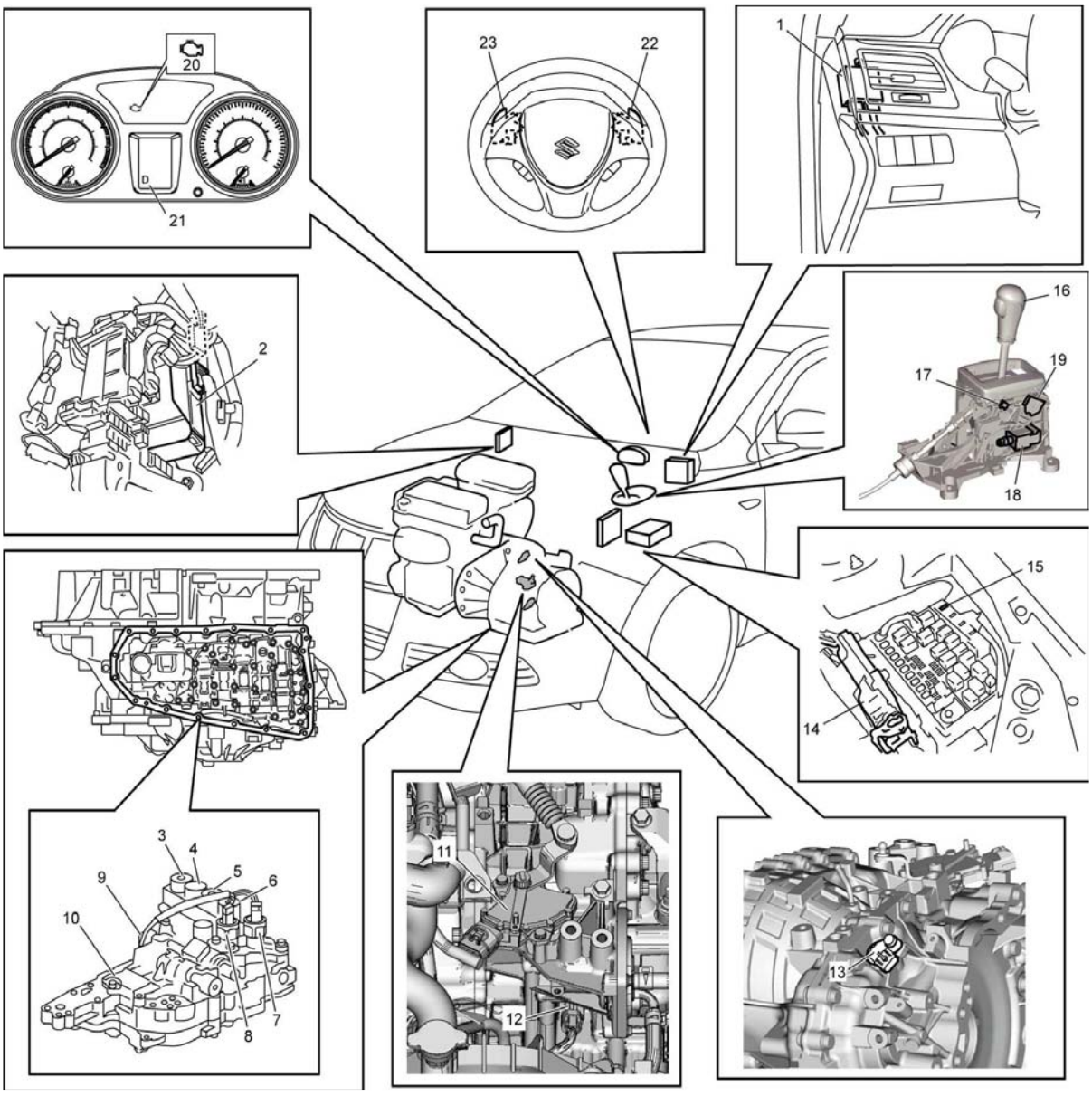
Electronic Shift Control System Component Location



1. TCM	9. CVT fluid temperature sensor	17. P position switch
2. BCM	10. Valve body assembly	18. Shift lock solenoid
3. Line pressure control solenoid valve	11. Transmission range sensor	19. Manual mode switch
4. Secondary pressure control solenoid valve	12. Primary pulley speed sensor	20. MIL
5. TCC solenoid valve	13. Secondary pulley speed sensor	21. Shift position indicator (included in information display)

6. Lock-up / select switching solenoid valve	14. ECM	22. Paddle-up switch
7. Primary pressure sensor	15. "AT" fuse	23. Paddle-down switch
8. Secondary pressure sensor	16. Select lever	

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CVT System Check

Step	Action	YES	NO
1	**Customer complaint analysis** ☞ 1) Perform customer complaint analysis. ***Was customer complaint analysis performed?***	Go to Step 2.	Perform customer complaint analysis.
2	**DTC / freeze frame data check, record and clearance** ☞ 1) Check for DTC (including pending DTC). ***Is there any DTC(s)?***	Print DTC and freeze frame data or write them down and clear them by referring to ***DTC Clearance***. Then go to Step 3.	Go to Step 4.
3	**Visual inspection** ☞ 1) Perform visual inspection. ***Is there any faulty condition?***	Repair or replace malfunction part. Then go to Step 11.	Go to Step 5.
4	**Visual inspection** ☞ 1) Perform visual inspection. ***Is there any faulty condition?***	Repair or replace malfunction part. Then go to Step 11.	Go to Step 8.
5	**Trouble symptom confirmation** ☞ 1) Confirm trouble symptom. ***Is trouble symptom identified?***	Go to Step 6.	Go to Step 7.
6	**Rechecking and recording of DTC / freeze frame data** ☞ 1) Recheck for DTC (current and pending DTC) and freeze frame data. ☞ ***Is there any DTC(s)?***	Go to Step 9.	Go to Step 8.
7	**Rechecking and recording of DTC / freeze frame data** ☞ 1) Recheck for DTC and freeze frame data. ☞ ***Is there any DTC(s)?***	Go to Step 9.	Go to Step 10.

8	**CVT basic check and CVT symptom diagnosis** ☞ 1) Perform CVT basic check and CVT symptom diagnosis. ***Are check and repair completed?***	Go to Step 11.	Check and repair malfunction part (s). Then go to Step 11.
9	**Troubleshooting for DTC** ☞ 1) Perform troubleshooting for applicable DTC. ***Are check and repair completed?***	Go to Step 11.	Check and repair malfunction part (s). Then go to Step 11.
10	**Intermittent problems check** ☞ 1) Check for intermittent problem. ***Is there any faulty condition?***	Repair or replace malfunction part (s). Then go to Step 11.	Go to Step 11.
11	**Final confirmation test** ☞ 1) Perform final confirmation test. ***Is there any problem symptom, DTC or abnormal condition?***	Go to Step 6.	End.

Step 1. Customer Complaint Analysis

Record details of the problem (failure, complaint) and how it occurred as described by the customer.
For this purpose, use of such an inspection form as shown in the following table as an example will facilitate collecting information to the point required for proper analysis and diagnosis.

NOTE:
The form is a standard sample. It should be modified according to characteristics of each market.

Customer problem inspection form (Example)

User name:	Model:	VIN:	
Date of issue:	Date of reg.:	Date of problem:	Mileage:

PROBLEM SYMPTOMS	
☐ No cranking (☐ P ☐ N)	☐ No upshift
☐ Vehicle does not move (R, D, or any range)	☐ No downshift
☐ TCC no lock-up ☐ TCC no lock-up off	
☐ Excessive gear change shock	
☐ Others_____	

VEHICLE / ENVIRONMENTAL CONDITION WHEN PROBLEM OCCURS	
Environmental Condition	
Weather Temperature Frequency Road	☐ Fair ☐ Cloudy ☐ Rainy ☐ Snowy ☐ Always ☐ Other _____ (°F / °C) ☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Always ☐ Always ☐ Sometimes (times / day, month) ☐ Only once ☐ Under certain condition ☐ Urban ☐ Suburb ☐ Highway ☐ Mountainous ☐ Uphill ☐ Downhill ☐ Tarmacadam ☐ Gravel ☐ Other_____
Vehicle Condition	
Engine & transaxle condition	☐ Cold ☐ Warming up phase ☐ Warmed up Engine speed (r/min.) Throttle opening (☐ Idle ☐ About % ☐ Full)
Vehicle condition	☐ At stop ☐ During driving (☐ Constant speed ☐ Accelerating ☐ Decelerating ☐ Braking ☐ Manual mode) ☐ Right hand corner ☐ Left hand corner ☐ Vehicle speed (km/h mile/h) ☐ Other_____

Malfunction indicator lamp	☐ Blink ☐ Always ON ☐ Sometimes ON ☐ Always OFF ☐ Good condition	
DTC	First check: ☐ No code	☐ Malfunction code ( )
	Second check: ☐ No code	☐ Malfunction code ( )

Step 2. DTC / Freeze Frame Data Check, Record and Clearance

First, check DTC (current and pending DTC). ☞

If DTC is indicated, print DTC and freeze frame data or write them down and then clear them. ☞

Step 3 and 4. Visual Inspection

As a preliminary step, be sure to perform visual check of the items that support proper function of engine and CVT. ☞

Step 5. Trouble Symptom Confirmation

In case that there is no DTC at Step 2:

Based on information obtained in ***Step 1. Customer Complaint Analysis*** and ***Step 2. DTC / Freeze Frame Data Check, Record and Clearance***, confirm trouble symptoms.

In case that there is any DTC at Step 2:

Recheck DTC according to "DTC Confirmation Procedure" described in each DTC troubleshooting.

Step 6 and 7. Rechecking and Record of DTC and Freeze Frame Data

Refer to ***DTC Check*** for checking procedure.

Step 8. CVT Basic Check and CVT Symptom Diagnosis

1) Perform CVT basic check. ☞

2) In case there is no faulty part found in inspection procedure of "CVT basic check", perform ***CVT Symptom Diagnosis*** based on symptom found in vehicle checking in the following items.
- Customer complaint analysis
- Trouble symptom confirmation

Step 9. Troubleshooting for DTC

Perform applicable DTC troubleshooting and repair or replace faulty parts.

Step 10. Intermittent Problems Check

In case that there is no DTC at Step 2:

Check for intermittent problem. ☞

In case that there is any DTC at Step 2:

Check parts related to detected DTC (e.g., wire harness, connector, etc.). ☞

Step 11. Final Confirmation Test

Confirm that the problem symptom has gone and the vehicle is free from any abnormal conditions. If what has been repaired is related to DTC, clear DTC once, perform DTC confirmation procedure and confirm that no DTC is indicated.

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Visual Inspection

Visually check the following parts and systems.

Inspection item	Referring section
• CVT fluid ----- level, leakage, color, smell	***CVT Fluid Check***
• CVT fluid cooler ----- leakage	***CVT Fluid Cooler and CVT Fluid Cooler Hoses Inspection***
• CVT fluid hoses ----- disconnection, looseness, deterioration	***CVT Fluid Cooler Hoses Replacement***
• CVT select cable ----- installation, operation	***Select Cable Inspection***
• Engine oil ----- level, leakage	***Engine Oil and Filter Change***
• Engine coolant ----- level, leakage	***Engine Cooling System Inspection***
• Engine mountings ----- play, looseness, damage	***Engine Mountings Components***
• Drive shafts ----- damage	***Front Drive Shaft Assembly On-Vehicle Inspection:Front***
• Battery ----- indicator condition, corrosion of terminal	***Battery Inspection***
• Connectors of electric wire harness ----- disconnection, friction	***Electronic Shift Control System Component Location***
• Fuses ----- burning	
• Parts ----- installation, damage	
• Bolts ----- looseness	
• Other parts that can be checked visually	
Also check the following items at engine start, if possible.	
• Malfunction indicator lamp ----- Operation	***MIL Check***
• Charge warning light ----- Operation	***Generator Symptom Diagnosis***
• Engine oil pressure warning light ----- Operation	***Combination Meter Diagnosis***

Road Test

This test is performed to diagnose trouble conditions accurately and to check the condition after servicing. Also check for shift shock or abnormal noise.

WARNING:
- **Perform road test in a place where there is no traffic to prevent an accident.**
- **Road test should be performed by two persons, a driver and a tester, on a level road.**

1) Connect scan tool to DLC.

2) Select "Data list" mode on scan tool.

3) Drive vehicle so that CVT fluid temperature reaches normal operating temperature (50 – 80 °C (122 – 176 °F)). ☞

NOTE:
Engine coolant temperature rises when revving engine in "P" or "N" position, but CVT fluid temperature does not rise in "P" or "N" position. Be sure to drive vehicle in order to raise CVT fluid temperature.

4) While driving in "D" range, check if gear shift and lock-up occur properly as shown in ***CVT Gear Shift Table***.

CVT Gear Shift Table

CVT gear shift schedule is shown in the following table. Test-drive the vehicle on a flat road in the "D" position.

NOTE:
The values are for reference only.

Shift table

Throttle opening	Shift position	Engine speed (rpm)	
		When drive vehicle at 40 km/h (25 mile/h)	When drive vehicle at 60 km/h (37 mile/h)
100%	"D" range	3400 – 4400	4000 – 5000
25%		1400 – 2000	1500 – 2100

Lock-up point

Lock-up clutch status	Throttle opening	Vehicle speed (km/h (mile/h))
Connected	10 – 50%	17 – 40 (11 – 25)
Released		3 – 10 (2 – 6)

Stall Test

This test is performed to check overall performance of CVT and engine by measuring stall speed at "D" and "R" ranges.

CAUTION:
- **Do not run engine at stall more than 5 seconds continuously, or fluid temperature may rise excessively.**
- **After performing stall test, be sure to leave engine running at idle for longer than 1 minute before performing another stall test.**

1) Connect scan tool to DLC.
2) Select "Data list" mode on scan tool.
3) Drive vehicle so that CVT fluid temperature reaches normal operating temperature (50 – 80 °C (122 – 176 °F)). ☞

NOTE:
Engine coolant temperature rises when revving engine in "P" or "N" position, but CVT fluid temperature does not rise in "P" or "N" position. Be sure to drive vehicle in order to raise CVT fluid temperature.

4) Apply parking brake and block wheels.
5) Start engine with select lever shifted to "P" range.
6) Depress brake pedal fully.
7) Shift select lever to "D" range and depress accelerator pedal fully. Read engine rpm quickly when it has become constant (stall speed).
8) Release accelerator pedal immediately after stall speed is checked.
9) In the same way, check stall speed in "R" range.
10) Stall speed should be within the following specification.

Engine stall speed
Standard: 2,100 – 2,500 rpm

Troubleshooting

Condition	Possible Cause	Action
Lower than standard level in both "D" and "R" range	Faulty throttle body assembly	*Replace throttle body assembly.* ☞
	Failure engine output torque	*Perform engine basic Inspection.* ☞
	Faulty torque converter	*Replace CVT assembly.*
Higher than standard level only in "D" range	Faulty valve body component	*Replace CVT assembly.*
	Slippery forward clutch	*Replace CVT assembly.*
Higher than standard level only in "R" range	Faulty valve body component	*Replace CVT assembly.*
	Slippery reverse brake	*Replace CVT assembly.*
Higher than standard level in both "D" and "R" range	Faulty torque converter	*Replace CVT assembly.*
	Low line pressure	*Perform "Line Pressure Test".* ☞
	Faulty steel belt	*Replace CVT assembly.*
	Faulty primary pulley	*Replace CVT assembly.*
	Faulty secondary pulley	*Replace CVT assembly.*
	Faulty valve body component	*Replace CVT assembly.*

Time Lag Test

This test is performed to check conditions of clutch, brake and fluid pressure. "Time lag" means time elapsed since select lever is shifted with engine idling till shock is felt.

1) Connect scan tool to DLC.

2) Select "Data list" mode on scan tool.

3) Drive vehicle so that CVT fluid temperature reaches normal operating temperature (50 – 80 °C (122 – 176 °F)). ☞

> **NOTE:**
> **Engine coolant temperature rises when revving engine in "P" or "N" position, but CVT fluid temperature does not rise in "P" or "N" position. Be sure to drive vehicle in order to raise CVT fluid temperature.**

4) Apply parking brake and block wheels.

5) Start engine.

6) Depress brake pedal.

7) With stopwatch ready, shift select lever from "N" to "D" range and measure time from that moment till shock is felt.

8) Similarly measure time lag by shifting select lever from "N" to "R" range.

Gear shifting time lag

"N" → "D": Less than 3.0 sec.
"N" → "R": Less than 3.0 sec.

> **NOTE:**
> - **When repeating this test, be sure to wait at least 1 minute after select lever is shifted back to "N" range.**
> - **Engine should be warmed up fully for this test.**
> - **Repeat test 3 times and take average of those data for final time lag data.**

Troubleshooting

Condition	Possible Cause	Action
"N" → "D" time lag exceeds specification	Low line pressure	*Perform "Line Pressure Test".* ☞
	Slippery forward clutch	*Replace CVT assembly.*
	Broken forward clutch piston oil seal	*Replace CVT assembly.*
"N" → "R" time lag exceeds specification	Low line pressure	*Perform "Line Pressure Test".* ☞
	Slippery reverse brake	*Replace CVT assembly.*
	Broken reverse brake piston oil seal	*Replace CVT assembly.*

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Line Pressure Test

This test is performed to check operating conditions of each part by measuring fluid pressure in fluid pressure line.

1) Connect scan tool to DLC.

2) Select "Data list" mode on scan tool.

3) Drive vehicle so that CVT fluid temperature reaches normal operating temperature (50 – 80 °C (122 – 176 °F)). ☞

NOTE:
Engine coolant temperature rises when revving engine in "P" or "N" position, but CVT fluid temperature does not rise in "P" or "N" position. Be sure to drive vehicle in order to raise CVT fluid temperature.

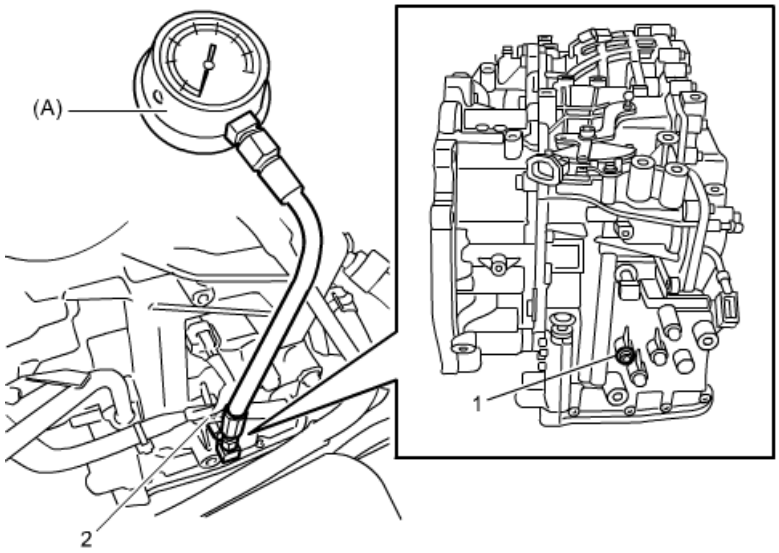
4) Apply parking brake and block wheels.

5) Remove fluid pressure check hole bolt (1).

6) Attach oil pressure gauge to fluid pressure check hole (2) in transaxle case.

NOTE:
After attaching oil pressure gauge, check that no fluid leakage exists.

Special Tool
(A): 09925–37910



7) Depress brake pedal fully, run engine at idle and stall then check fluid pressure in "D" or "R" range.

CAUTION:
- **Do not continue running engine at stall speed longer than 5 seconds.**
- **After performing line pressure test, be sure to leave engine running at idle for longer than 1 minute before performing another line pressure test.**

CVT line pressure

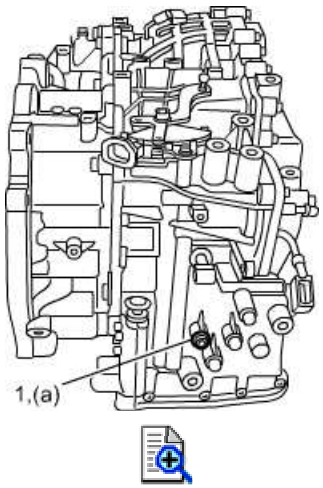
	"D" range	"R" range

At idle speed	**0.5 – 1.0 MPa (5.1 – 10.2 kgf/cm², 72.5 – 145 psi, 5 – 10 bar)**
At stall speed (Reference)	**4.9 – 6.1 MPa (50.0 – 62.2 kgf/cm², 710 – 884 psi, 49 – 61 bar)**

8) If check result is OK, disconnect special tool and then tighten fluid pressure check hole bolt (1) to specified torque.

Tightening torque

Fluid pressure check hole bolt (a): 7.5 N·m (0.76 kg-m, 5.5 lbf-ft)



Troubleshooting

Condition	Possible Cause	Action
Higher than standard level in "D" and "R" range	Faulty valve body component	*Perform "Solenoid Valve On-Vehicle Inspection.* ☞
Lower than standard level in "D" and "R" range	Faulty valve body component	*Perform "Solenoid Valve On-Vehicle Inspection.* ☞
	Clogged oil strainer	*Replace CVT assembly.*
	Faulty oil pump	*Replace CVT assembly.*
	Faulty primary pulley	*Replace CVT assembly.*
	Faulty secondary pulley	*Replace CVT assembly.*
	Faulty torque converter	*Replace CVT assembly.*
Lower than standard level only in "D" range	Faulty forward clutch	*Replace CVT assembly.*
Lower than standard level only in "R" range	Faulty reverse brake	*Replace CVT assembly.*

"P" Range Test

WARNING:
Before test, make sure no one is around vehicle or down on a slope and keep watchful for safety during test.

1) Stop vehicle on a slope of 5 degrees or more, shift select lever to "P" range and at the same time apply parking brake.
2) After stopping engine, depress brake pedal and release parking brake.
3) Release brake pedal gradually and check that vehicle remains stationary.
4) Depress brake pedal and shift select lever to "N" range.
5) Release brake pedal gradually and check that vehicle moves.

Troubleshooting

Condition	Possible Cause	Action
Vehicle moves at "P" range or remains stationary at "N" range	Faulty select cable position	*Check select cable position.* ☞
	Faulty transmission range sensor	*Check transmission range sensor.* ☞
	Faulty valve body component	*Replace CVT assembly.*
	Faulty parking system	*Replace CVT assembly.*

5E

CVT Symptom Diagnosis

Driving performance problems

Symptom \ Diagnostic item	Engine system	Improper CVT fluid level	Line pressure out of specification	Select cable position	Electrical system: TCM	CAN communication	Power supply circuit	Transmission range sensor	Manual mode switch	Shift paddle switch	Primary pulley speed sensor	Secondary pulley speed sensor	Primary pressure sensor	Secondary pressure sensor	Secondary pressure control solenoid valve	Line pressure control solenoid valve	TCC solenoid valve	Lock-up / select switching solenoid valve	Stepper motor	CVT fluid temperature sensor	Hydraulic system: Valve body component	Oil pump	Transmission system: Torque converter	Pulleys and steel belt	Forward clutch	Reverse brake	Bearings	Planetary gear	Reduction gear	Final gear	Parking system
Unable to start in "D" ("M") range	●	●	●	●	●		●	●			●	●		●	●	●			●	▲	●	●	▲	▲	●		▲	▲	▲	●
Unable to start in "R" range	●	●	●	●	●		●	●			●	●		●	●	●			●	▲	●	●	▲	▲		●		▲	▲	▲	●
Unable to run in all ranges	●	●	●	●	●		●	●			●	●		●	●	●			●	●	●	●	●	●	●	●		▲	▲	▲	●
Unable to run in "D" ("M") range	●	●	●	●	●		●	●			●	●		●	●	●			●	●	●	●	●	▲	●			▲	▲	▲	●
Unable to run in "R" range	●	●	●	●	●		●	●			●	●		●	●	●			●	●	●	●	●	▲		●		▲	▲	▲	●
Poor startability and acceleration in "D" ("M") range	●	▲	▲	▲	●	▲	▲	▲			●	●	▲	▲	●	●	▲		●	▲	●	▲	●	▲	●						
Poor startability and acceleration in "R" range	●	▲	▲	▲	●	▲	▲	▲			●	●	▲	▲	●	●	▲		●	▲	●	▲	●	▲		●					
Unable to run or extremely poor acceleration in "R" range	●	●	●	●	●		●	●			●	●		●	●	●	●		●	●	●	●	●	▲		●		▲	▲	▲	●
Engine brake does not work	▲	●	●	●	●	●					●	●			▲	●	●		●		●	▲	▲	●	●						
When decelerating in "D" ("M") range, lock-up is not released until just before stop	▲	▲	▲		●	▲											●				●	▲	▲								
When running in "D" ("M") range, lock-up function does not work	▲	▲	▲		●	●		●			●	●		▲			●	●	▲	●	●	▲	●								
When running in "D" ("M") range, lock-up ON cannot be maintained	▲	▲	▲		●	●		●			●	●		▲		▲	▲	●	▲	●	●	▲	●								
No gear shift in "D" ("M") range	▲	●	●	●	●	●	●	●			●	●	●	●	●	●			●	▲	●	●		▲							
Does not switch to manual mode					●	●			●		●	●																			
No gear shift in manual mode	▲	●	●		●	●			●	●	●	●	●	●	●	●			●		●	●									

(●:Applicable ▲ :Possible)

Shock / vibration / abnormal noise

Symptom \ Diagnostic item	Engine system	Improper CVT fluid level	Line pressure out of specification	Select cable position	Electrical system: TCM	CAN communication	Power supply circuit	Transmission range sensor	Manual mode switch	Shift paddle switch	Primary pulley speed sensor	Secondary pulley speed sensor	Primary pressure sensor	Secondary pressure sensor	Secondary pressure control solenoid valve	Line pressure control solenoid valve	TCC solenoid valve	Lock-up / select switching solenoid valve	Stepper motor	CVT fluid temperature sensor	Hydraulic system: Valve body component	Oil pump	Transmission system: Torque converter	Pulleys and steel belt	Forward clutch	Reverse brake	Bearings	Planetary gear	Reduction gear	Final gear	Parking system
Excessive shock at lock-up ON when running in "D" ("M") range	●	▲			●												●	▲			●		●								
Slippage at lock-up ON	●	●	●								●	●				▲	●	●		●	●	●	●								
Judder occurs at lock-up ON	●	●									●	●				▲	●	▲			●	●	●								
Excessive shock at "N" to "D" range	●	●	●	▲	▲	▲		●									●	●		●	●			●							
Excessive shock at "N" to "R" range	●	●	●	▲	▲	▲		●									●	●		●	●				●						
Abnormal noise in "D" ("M") range	●	●																			●	●	●	●		●	●	●	●	●	
Abnormal noise in "R" range	●	●																			●	●	●			●	●	●	●	●	
Abnormal noise in "N" range	●	●																			●	●	●					▲	▲	▲	

(●:Applicable ▲ :Possible)

Others

Symptom \ Diagnostic item	Engine system	Improper CVT fluid level	Line pressure out of specification	Select cable position	Electrical system: TCM	CAN communication	Power supply circuit	Transmission range sensor	Manual mode switch	Shift paddle switch	Primary pulley speed sensor	Secondary pulley speed sensor	Primary pressure sensor	Secondary pressure sensor	Secondary pressure control solenoid valve	Line pressure control solenoid valve	TCC solenoid valve	Lock-up / select switching solenoid valve	Stepper motor	CVT fluid temperature sensor	Hydraulic system: Valve body component	Oil pump	Transmission system: Torque converter	Pulleys and steel belt	Forward clutch	Reverse brake	Bearings	Planetary gear	Reduction gear	Final gear	Parking system
Starting motor operates in ranges other than “P” or “N”	●			●	●	●		●																						
Starting motor does not operate in “P” or “N” range	●			●	●	●		●																						
Parking lock does not lock or cannot be released in “P” range				●				●																▲						●
Engine stalls in “D” (“M”) or “R” range when stopping	●	▲															●	●			●		●							
Engine stalls in “P” or “N” range when stopping	●	▲												●			●	●			●		●							
Low maximum vehicle speed	●	●	●								●	●	●	●	●	●	▲	▲	●	●	●	●	●		●			▲	▲	
Does not creep at all in “D” (“M”) or “R” range	●	●	●	●				●			●	●	●	●			▲	▲	●	●	●	●	●	▲	●	●		▲	▲	▲	
When decelerating, engine speed does not decrease to engine idle speed	●	▲				●						●									●			●						
Shift position does not indicated in information display					●	●		●																						
Vehicle moves in “P” range		▲		●				●													●			▲				▲	▲	●
Vehicle moves in “N” range		▲		●	▲			●													●				● Forward	● Reverse		▲			

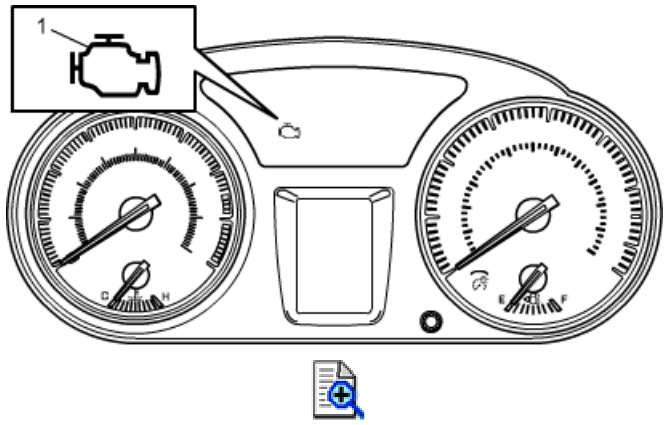
(●:Applicable ▲ :Possible)

1A

MIL Check

1) Push engine switch to change the ignition mode to "ON" (with engine stopped) and check that MIL (1) lights up.
If MIL does not light up (or MIL dims) but engine can be started, go to ***MIL Does Not Come ON with Ignition Mode of Keyless Push Start System in "ON" and Engine Stopped (but Engine Can Be Started)*** for troubleshooting.
If MIL does not light with ignition mode of keyless push start system in "ON" and engine does not start even though it is cranked up, go to ***ECM Power and Ground Circuit Check***.

2) Start engine and check that MIL turns OFF.
If MIL remains ON and no DTC is stored in ECM, go to ***MIL Remains ON after Engine Starts*** for troubleshooting.

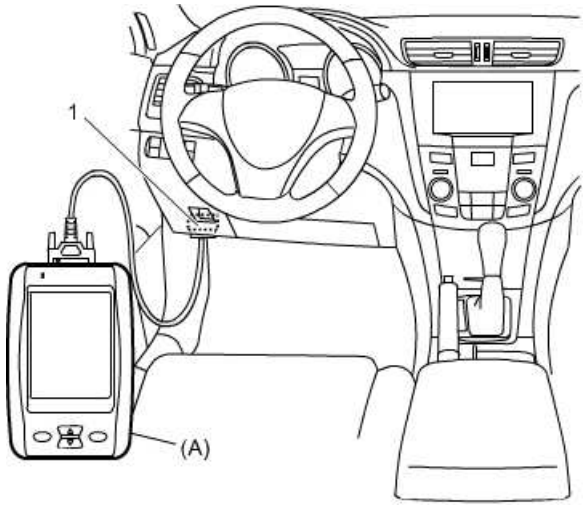


DTC Check

NOTE:
In case that MIL turns on, the malfunction(s) is detected in either ECM or TCM and it stores the trouble information (DTC, freeze flame data, etc.) in its memory.
According to the varieties of scan tool, check the trouble information as follows.
- **SUZUKI scan tool:**
  It is necessary to check both ECM and TCM separately because the trouble information of both modules can not be read and displayed at once.
- **CAN communication OBD generic scan tool:**
  It is not necessary to check both ECM and TCM separately because the trouble information of both modules can be read and displayed at once.

1) Prepare CAN communication OBD generic scan tool or SUZUKI scan tool.
2) Confirm that ignition mode of keyless push start system is in "OFF".
3) Connect scan tool to DLC (1).

Special Tool
(A): SUZUKI scan tool (SUZUKI-SDT)



4) Push engine switch to change ignition mode to "ON".
5) Read DTC, pending DTC and freeze frame data according to instructions displayed on scan tool and print it down. Refer to scan tool operator's manual for further details.
If communication between scan tool and TCM is not possible, go to ***CAN Communication Check***.
6) After completing check, push engine switch to change ignition mode to "OFF" and disconnect scan tool from DLC.

DTC Clearance

Pending and Confirmed DTC

1) Confirm that ignition mode of keyless push start system is in "OFF".

2) Connect CAN communication OBD generic scan tool or SUZUKI scan tool to DLC. ☞

3) Push engine switch to change ignition mode to "ON".

4) Erase DTC and pending DTC according to instructions displayed on scan tool. Refer to scan tool operator's manual for further details.
If communication between scan tool and TCM is not possible, go to ***CAN Communication Check***.

5) After completing clearance, push engine switch to change ignition mode to "OFF" and disconnect scan tool from DLC.

NOTE:
Pending and confirmed DTC and freeze frame data stored in TCM memory are also cleared in the following cases. Be careful not to clear them before recording their record.
- **When the same malfunction (DTC) is not detected again during 40 engine warm-up cycles.**
- **Even though the pending and confirmed DTCs are cleared, the permanent DTC will not be cleared.**

Permanent DTC

1) Confirm that ignition mode of keyless push start system is in "OFF".

2) Connect CAN communication OBD generic scan tool or SUZUKI scan tool to DLC. ☞

3) Push engine switch to change ignition mode to "ON".

4) Clear pending and confirmed DTCs. ☞

5) Select "Permanent DTC" display mode on scan tool. (Refer to scan tool operator's manual for details.)

6) Execute corresponding DTC confirmation procedure in DTC diagnostic flow and confirm that pending and current DTCs cannot be detected. At this time, if DTC confirmation procedure does not satisfy any of the following conditions, execute DTC confirmation procedure so as to satisfy such condition.
- Engine operated for more than 12 minutes.
- Vehicle driven for more than 6 minutes at more than 45 km/h (28 mile/h).
- Engine idled for more than 1 minute.

7) Display permanent DTC on scan tool and check that permanent DTC is cleared.
If permanent DTC has not been cleared, repeat Step 5) again.

DTC Table

NOTE:
- **With the CAN communication OBD generic scan tool, DTC No. with delta (△) mark in the following table can not be read.**
- **For details of D/C (driving cycle), refer to *OBD System Description*.**

DTC	DTC name	DTC detecting condition	DTC detection logic	MIL
△P0602 ☞	Control Module Programming Error	TCM internal failure (data programming error).	1 D/C	Off
P062F ☞	Internal Control Module EEPROM Error	TCM internal failure (EEPROM error).	1 D/C	Lights up
P0641 ☞	Sensor Reference Voltage "A" Circuit / Open	Primary and secondary pressure sensor power supply circuit voltage is out of specified value for 5 sec.	1 D/C	Lights up
P0703 ☞	Brake Switch "B" Circuit	Brake light switch signal received from ECM is no change.	2 D/C	Lights up
P0705 ☞	Transmission Range Sensor "A" Circuit (PRNDL Input)	Two or more transmission range sensor signals are input simultaneously for 2 sec.	1 D/C	Lights up
P0707 ☞	Transmission Range Sensor "A" Circuit Low	Transmission range signal is not input for 10 sec.	2 D/C	Lights up
P0711 ☞	Transmission Fluid Temperature Sensor "A" Circuit Range / Performance	CVT fluid temperature variation is lower than specified value even if engine was running for specified time after engine start.	2 D/C	Lights up
P0712 ☞	Transmission Fluid Temperature Sensor "A" Circuit Low	CVT fluid temperature signal circuit voltage is lower than specified value for 5 sec.	1 D/C	Lights up
P0713 ☞	Transmission Fluid Temperature Sensor "A" Circuit High	CVT fluid temperature signal circuit voltage is higher than specified value for 5 sec.	1 D/C	Lights up
P0716 ☞	Input / Turbine Speed Sensor "A" Circuit Range / Performance	This DTC is detected if all the following conditions are met. • Difference between engine speed and primary pulley speed is higher than 1000 rpm for 5 sec. when lock-up ON. • Difference between measured value and estimated value of primary pulley speed is higher than 1000 rpm for 5 sec. when lock-up ON.	2 D/C	Lights up
P0717 ☞	Input / Turbine Speed Sensor "A" Circuit No Signal	Primary pulley speed signal is no signal even if secondary pulley speed signal is input.	1 D/C	Lights up
P0721 ☞	Output Speed Sensor Circuit Range / Performance	This DTC is detected if all of the following conditions are met. • Difference between measured engine speed and the estimated secondary pulley speed is higher than 1000 rpm for 5 sec. when lock-up ON. • Difference between measured primary pulley speed and the estimated	2 D/C	Lights up

		secondary pulley speed is higher than 1000 rpm for 5 sec. when lock-up ON.		
P0722 ☞	Output Speed Sensor Circuit No Signal	This DTC is detected if any one of the following conditions is met. • The secondary pulley speed is lower than 150 rpm for 5 sec. in a row when the primary pulley speed is higher than 1000 rpm. • The secondary pulley speed is 0 rpm for specified times when the vehicle speed is higher than 10 km/h (6 mile/h).	1 D/C	Lights up
P0741 ☞	Torque Converter Clutch Circuit Performance or Stuck Off	Difference between engine speed and primary pulley speed is more than 130 rpm for 30 sec. even if TCC solenoid valve is ON.	2 D/C	Lights up
P0776 ☞	Pressure Control Solenoid "B" Performance / Stuck Off	Secondary pressure value is 1.2 MPa (12.2 kgf/cm², 174 psi, 12 bar) or higher for 30 sec. or more.	2 D/C	Lights up
P0777 ☞	Pressure Control Solenoid "B" Stuck On	Secondary pressure value is equal to or lower than specified value.	2 D/C	Lights up
△P0826 ☞	Manual Mode Control Switch Circuit	This DTC is detected if any one of the following conditions is met. • Manual mode switch ON signal continues to be input for longer than 5 sec. even after "P", "R" or "N" range signal input. • ON signal of manual shift-down switch or manual shift-up switch is input for longer than 5 sec. even while manual mode switch is OFF.	1 D/C	Off
P0842 ☞	Transmission Fluid Pressure Sensor / Switch "A" Circuit Low	Primary pressure sensor signal circuit voltage is lower than specified value for 5 sec.	1 D/C	Lights up
P0843 ☞	Transmission Fluid Pressure Sensor / Switch "A" Circuit High	Primary pressure sensor signal circuit voltage is higher than 4.7 V for 5 sec.	1 D/C	Lights up
P0847 ☞	Transmission Fluid Pressure Sensor / Switch "B" Circuit Low	Secondary pressure sensor signal circuit voltage is lower than specified value for 5 sec.	1 D/C	Lights up
P0848 ☞	Transmission Fluid Pressure Sensor / Switch "B" Circuit High	Secondary pressure sensor signal circuit voltage is higher than 4.7 V for 5 sec.	1 D/C	Lights up
P0871 ☞	Transmission Fluid Pressure Sensor / Switch "C" Circuit Range / Performance	Measured line pressure is out of specified line pressure that calculate base on secondary pressure for 5 sec.	2 D/C	Lights up
P0961 ☞	Pressure Control Solenoid "A" Control Circuit Range/Performance	Gear ratio calculated from primary pulley speed and secondary pulley speed is higher than specified value.	2 D/C	Lights up
P0962 ☞	Pressure Control Solenoid "A" Control Circuit Low	Monitored circuit voltage of line pressure control solenoid valve is lower than limit value even if TCM outputs power to its control circuit.	1 D/C	Lights up

P0963 ☞	Pressure Control Solenoid "A" Control Circuit High	Monitored circuit current of line pressure control solenoid valve is lower than limit value for 5 sec. even if TCM outputs power to its control circuit.	1 D/C	Lights up
P0966 ☞	Pressure Control Solenoid "B" Control Circuit Low	Monitored circuit voltage of secondary pressure control solenoid valve is lower than limit value even if TCM outputs power to its control circuit.	1 D/C	Lights up
P0967 ☞	Pressure Control Solenoid "B" Control Circuit High	Monitored circuit current of secondary pressure control solenoid valve is lower than limit value for 5 sec. even if TCM outputs power to its control circuit.	1 D/C	Lights up
△P1706 ☞	Torque Request Communication Error from TCM	ECM detects abnormality of CAN communication data which TCM transmits.	1 D/C	Off
P1810 ☞	Lockup / Select Control Circuit	Monitor signal of the lock-up / select switching solenoid valve is different from its command signal.	1 D/C	Lights up
P1816 ☞	Stepper Motor Circuit Malfunction	Monitor signal of stepper motor is different from its command signal.	1 D/C	Lights up
P1818 ☞	Stepper Motor Performance	Difference between measured primary pulley speed and estimated primary pulley speed is higher than 1000 rpm for 5 sec.	2 D/C	Lights up
P1970 ☞	Sensor Ground Circuit Malfunction	Ground circuit of following sensors is open circuit for specified times. • CVT fluid temperature sensor • Primary pressure sensor • Secondary pressure sensor	1 D/C	Lights up
P2763 ☞	Torque Converter Clutch Pressure Control Solenoid Control Circuit High	Monitored circuit current of TCC (Torque Converter Clutch) solenoid valve is lower than limit value for 5 sec. even if TCM outputs power to its control circuit.	1 D/C	Lights up
P2764 ☞	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low	Monitored circuit current of TCC (Torque Converter Clutch) solenoid valve is higher than limit value even if TCM outputs power to its control circuit.	1 D/C	Lights up
U0073 ☞	Control Module Communication Bus Off	Refer to ***CAN DTC (Lost Communication and Communication Bus Off) Table***.	1 D/C	Lights up
U0100 ☞	Lost Communication With ECM		1 D/C	Lights up
△U0121 ☞	Lost Communication With ABS		1 D/C	Off
△U0140 ☞	Lost Communication With BCM		1 D/C	Off

Fail-Safe Table

This function is provided by the safe mechanism that assures safe driveability even when the solenoid valve, sensor or its circuit fails. The following table shows the fail-safe function for each fail condition of solenoid valve, sensor or its circuit.

DTC	DTC name	Fail-safe operation
P0602	Control Module Programming Error	—
P062F	Internal Control Module EEPROM Error	—
P0641	Sensor Reference Voltage "A" Circuit / Open	—
P0703	Brake Switch "B" Circuit	TCM controls actuators assuming that brake light switch is always on.
P0705	Transmission Range Sensor "A" Circuit (PRNDL Input)	• TCM controls actuators assuming that select range is "D" range. • TCM stops following operation / function. — Lock-up control operation — Manual shift mode function • TCM transmits torque request signal to ECM (torque reduction). • TCM transmits engine speed upper limit request signal to ECM.
P0707	Transmission Range Sensor "A" Circuit Low	
P0711	Transmission Fluid Temperature Sensor "A" Circuit Range / Performance	TCM controls actuators assuming that CVT fluid temperature is specified value.
P0712	Transmission Fluid Temperature Sensor "A" Circuit Low	
P0713	Transmission Fluid Temperature Sensor "A" Circuit High	
P0716	Input / Turbine Speed Sensor "A" Circuit Range / Performance	• TCM controls actuator in presumption gear ratio calculated from secondary pulley speed and stepper motor position. • TCM inhibits following operation / function. — Lock-up control operation — Manual shift mode function • TCM delays changing speed of gear ratio.
P0717	Input / Turbine Speed Sensor "A" Circuit No Signal	
P0721	Output Speed Sensor Circuit Range / Performance	• TCM controls actuator by gear ratio depending on accelerator pedal position and primary pulley speed. • TCM inhibits following operation / function. — Lock-up control operation — Manual shift mode function • TCM delays changing speed of gear ratio.
P0722	Output Speed Sensor Circuit No Signal	
P0741	Torque Converter Clutch Circuit Performance or Stuck Off	TCM stops lock-up control operation.
P0776	Pressure Control Solenoid "B" Performance / Stuck Off	—
P0777	Pressure Control Solenoid "B" Stuck On	TCM transmits torque request signal to ECM (torque reduction).
P0826	Up and Down Shift Switch Circuit	TCM stops manual shift mode control.

P0842	Transmission Fluid Pressure Sensor / Switch "A" Circuit Low	• TCM controls actuators assuming that line pressure is 0 MPa (0 kgf/cm², 0 psi, 0 bar). • TCM transmits torque request signal to ECM (torque reduction).
P0843	Transmission Fluid Pressure Sensor / Switch "A" Circuit High	
P0847	Transmission Fluid Pressure Sensor / Switch "B" Circuit Low	• TCM controls actuators assuming that secondary pressure is 0 MPa (0 kgf/cm², 0 psi, 0 bar). • TCM transmits torque request signal to ECM (torque reduction).
P0848	Transmission Fluid Pressure Sensor / Switch "B" Circuit High	
P0871	Transmission Fluid Pressure Sensor / Switch "C" Circuit Range / Performance	• TCM transmits torque request signal to ECM (torque reduction). • Gear ratio is fixed at gear ratio of point that this DTC was detected.
P0961	Pressure Control Solenoid "A" Control Circuit Range /Performance	• TCM transmits torque request signal to ECM (torque reduction). • The following items are executed according to the detection frequency. — TCM transmits torque request signal to ECM (torque reduction). — TCM stops lock-up control. — TCM limits shift speed of gear ratio. — TCM controls gear ratio assuming that is specified value.
P0962	Pressure Control Solenoid "A" Control Circuit Low	TCM maximizes line pressure value (duty 0%).
P0963	Pressure Control Solenoid "A" Control Circuit High	
P0966	Pressure Control Solenoid "B" Control Circuit Low	TCM maximizes secondary pressure value (duty 0%).
P0967	Pressure Control Solenoid "B" Control Circuit High	
P1706	Torque Request Communication Error from TCM	—
P1810	Lockup / Select Control Circuit	TCM controls actuators assuming that lock-up / select switching solenoid valve is OFF.
P1816	Stepper Motor Circuit Malfunction	• Gear ratio is fixed at gear ratio of point that this DTC was detected. • TCM stops lock-up control.
P1818	Stepper Motor Performance	—
P1970	Sensor Ground Circuit Malfunction	• TCM stops following operation / function. — Lock-up control operation — Manual shift mode function • TCM controls actuators assuming that CVT fluid temperature is specified value. • TCM controls actuators assuming that line pressure is 0 MPa (0 kgf/cm², 0 psi, 0 bar). • TCM controls actuators assuming that secondary pressure is 0 MPa (0 kgf/cm², 0 psi, 0 bar). • TCM transmits torque request signal to ECM (torque reduction).

		• Gear ratio is fixed at gear ratio of point that this DTC was detected.
P2763 ☞	Torque Converter Clutch Pressure Control Solenoid Control Circuit High	TCM stops lock-up operation.
P2764 ☞	Torque Converter Clutch Pressure Control Solenoid Control Circuit Low	
U0073 ☞	Control Module Communication Bus Off	—
U0100 ☞	Lost Communication With ECM	• Engine speed is assumed to be specified value. • Engine torque is assumed to be maximum value. • TCM stops lock-up control. • Throttle opening angle is assumed to be 0%.
U0121 ☞	Lost Communication With ABS	—
U0140 ☞	Lost Communication With BCM	—

5E

Scan Tool Data

TCM

As the data values given in the following table are standard values estimated on the basis of values obtained from the normally operating vehicles by using a scan tool, use them as reference values. Even when the vehicle is in good condition, there may be cases where the checked value does not fall within each specified data range. Therefore, judgment as abnormal should not be made by checking with these data alone.
Also, condition in the following table that can be checked by the scan tool are those detected by TCM and output from TCM as commands and there may be cases where the CVT or actuator is not operating (in the condition) as indicated by the scan tool.

NOTE:
The following scan tool data related to CVT can be checked only by communicating with TCM.

Scan tool data	Vehicle condition	Normal condition / Reference values
Vehicle Speed ☞	Vehicle: Running	Value as same as speedometer reading
Engine Speed ☞	• Engine: Specified idle speed after warming up • Select lever: "N" range	650 rpm
Primary Pulley Speed ☞	Vehicle: Stop	0 rpm
	Lock-up: On	Value as same as engine speed
Secondary Pulley Speed ☞	Vehicle: Stop	0 rpm
	Vehicle: Running at 40 km/h (25 mile/h)	Approx. 1950 rpm
Torque converter Slip ☞	• Engine: Specified idle speed • Select lever: "N" range	Approx. 127 rpm
Primary Oil Pres ☞	• Engine: Specified idle speed • Select lever: "N" range	1.0 – 1.5 MPa
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	3.5 – 4.5 MPa
Secondary Oil Pres ☞	• Engine: Specified idle speed • Select lever: "N" range	1.0 – 1.2 MPa
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	5.0 – 5.8 MPa
CVTF Temperature ☞	• Engine: Specified idle speed after warming up • Vehicle: After running	70 – 80 °C (158 – 176 °F)
ECT ☞	Engine: Specified idle speed after warming up	80 – 100 °C (176 – 230 °F)
Battery Voltage ☞	Engine: Specified idle speed	13 – 15 V
Throttle position ☞	• Engine: Stop • Accelerator pedal: Released	0%
	• Engine: Stop • Accelerator pedal: Depressed fully	99.96%

Accel Actual Position ☞	• Engine: Stop • Accelerator pedal: Released	0%
	• Engine: Stop • Accelerator pedal: Depressed fully	99.96%
Gear Actual Ratio ☞	Vehicle: Running	0.40 – 2.34
Lock Up Solenoid (Com) ☞	• Vehicle: Running • Lock-up: Off	250 – 270 mA
	• Vehicle: Running • Lock-up: On	550 – 650 mA
Lock Up Solenoid (Mon) ☞	• Vehicle: Running • Lock-up: Off	250 – 270 mA
	• Vehicle: Running • Lock-up: On	550 – 650 mA
Line Press Solenoid (Com) ☞	• Engine: Specified idle speed • Select lever: "N" range • Accelerator pedal: Released	650 – 680 mA
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	200 – 250 mA
Line Press Solenoid (Mon) ☞	• Engine: Specified idle speed • Select lever: "N" range • Accelerator pedal: Released	650 – 680 mA
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	200 – 250 mA
Secondary Solenoid (Com) ☞	• Engine: Specified idle speed • Select lever: "N" range • Accelerator pedal: Released	600 – 640 mA
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	60 – 80 mA
Secondary Solenoid (Mon) ☞	• Engine: Specified idle speed • Select lever: "N" range • Accelerator pedal: Released	600 – 640 mA
	• Engine: Running • Select lever: "D" or "R" range • Accelerator pedal: Depressed fully	60 – 80 mA
Torque Converter Clutch ☞	Lock-up: Off	Release
	Lock-up: Off ↔ On	Slip
	Lock-up: On	Connect
Manual Gear Position ☞	Select lever: other than "M" range	deactive
	• Select lever: "M" range • Manual mode gear position: 1	1st
	• Select lever: "M" range • Manual mode gear position: 2	2nd
	• Select lever: "M" range • Manual mode gear position: 3	3rd
	• Select lever: "M" range • Manual mode gear position: 4	4th
	• Select lever: "M" range • Manual mode gear position: 5	5th

	• Select lever: "M" range • Manual mode gear position: 6	6th
Shift Down SW ☞	Select lever: "-" position	ON
	Other than above condition	OFF
Shift Up SW ☞	Select lever: "+" position	ON
	Other than above condition	OFF
Manual Mode SW ☞	Select lever: "M" range	ON
	Other than above condition	OFF
Transaxle Range ☞	Select lever is in "P" position	P
	Select lever is in "R" position	R
	Select lever is in "N" position	N
	Select lever is in "D" position	D
ABS Active ☞	ABS operating	ON
	ABS not operating	OFF
A/C Comp Clutch ☞	A/C compressor magnet clutch: Connected	ON
	A/C compressor magnet clutch: Released	OFF
Brake Switch ☞	Brake pedal: Depressed fully	ON
	Brake pedal: Released	OFF
Paddle Up SW ☞	Right side shift paddle "+": Pulled	ON
	Right side shift paddle "+": Released	OFF
Paddle Down SW ☞	Left side shift paddle "-": Pulled	ON
	Left side shift paddle "-": Released	OFF
Switching Solenoid (Mon) ☞	Select lever: "P" or "N" range	ON
	Select lever: "D" or "R" range	OFF
Switching Solenoid (Com) ☞	Select lever: "P" or "N" range	ON
	Select lever: "D" or "R" range	OFF

Scan Tool Data Definitions:

Vehicle Speed (km/h / mph)

This parameter indicates vehicle speed calculated by TCM based on secondary pulley speed sensor signal.

Engine Speed (rpm)

This parameter indicates engine speed information received from ECM.

Primary Pulley Speed (rpm)

This parameter indicates primary pulley speed detected by primary pulley speed sensor.

Secondary Pulley Speed (rpm)

This parameter indicates secondary pulley speed detected by secondary pulley speed sensor.

Torque converter Slip (rpm)

This parameter indicates the slip speed of the torque converter according to the difference between engine speed and the secondary pulley speed.

Primary Oil Pres (Primary Oil Pressure, MPa)

This parameter indicates line pressure detected by primary pressure sensor.

Secondary Oil Pres (Secondary Oil Pressure, MPa)

This parameter indicates secondary pressure detected by secondary pressure sensor.

CVTF Temperature (°C, °F)

This parameter indicates CVT fluid temperature detected by CVT fluid temperature sensor.

ECT (Engine Coolant Temperature, °C, °F)

This parameter indicates engine coolant temperature information received from ECM.

Battery Voltage (V)

This parameter indicates battery positive voltage inputted through CVT relay to TCM.

Throttle Position (%)

This parameter indicates throttle position information received from ECM.

Accel Actual Position (%)

This parameter indicates accelerator pedal opening ratio information from ECM.

Gear Actual Ratio

This parameter indicates current gear ratio calculated by TCM based on primary pulley speed and secondary pulley speed.

Lock Up Solenoid (Com) (Lock Up Solenoid Command, mA)

This parameter indicates control current value that TCM outputs to TCC solenoid valve.

Lock Up Solenoid (Mon) (Lock Up Solenoid Monitor, mA)

This parameter indicates current value that flows to TCC solenoid valve.

Line Press Solenoid (Com) (Line Pressure Solenoid Command, mA)

This parameter indicates control current value that TCM outputs to line pressure control solenoid valve.

Line Press Solenoid (Mon) (Line Pressure Solenoid Monitor, mA)

This parameter indicates current value that flows to line pressure control solenoid valve.

Secondary Solenoid (Com) (Secondary Solenoid Command, mA)

This parameter indicates control current value that TCM outputs to secondary pressure control solenoid valve.

Secondary Solenoid (Mon) (Secondary Solenoid Monitor, mA)

This parameter indicates current value that flows to secondary pressure control solenoid valve.

Torque Converter Clutch (Release / Slip / Connect)

This parameter indicates the state of the torque converter clutch according to the difference between engine speed and the secondary pulley speed.
Open: The difference between engine speed and secondly pulley speed is more than specified speed.
Conclude: The speed of engine and secondly pulley is completely corresponding.
Slip: TCC is opening or it is concluding.

Manual Gear Position (deactive, 1st, 2nd, 3rd, 4th, 5th, 6th)

This parameter indicates manual mode shift position information received from BCM.

Shift Down SW (Shift Down Switch, ON/OFF)

This parameter indicates the states of shift-down switch.

Shift Up SW (Shift Up Switch, ON/OFF)

This parameter indicates the states of shift-up switch.

Manual Mode SW (Manual Mode Switch, ON/OFF)

This parameter indicates the states of manual mode switch.

Transaxle Range (P, R, N, D)

This parameter indicates the state of each range switch in transmission range sensor.

ABS Active (ON/OFF)

This parameter indicates ABS status.

A/C Comp Clutch (A/C Compressor Clutch, ON/OFF)

This parameter indicates air conditioner compressor clutch information received from ECM.
ON: A/C compressor clutch engaged.
OFF: A/C compressor clutch disengaged.

Brake Switch (ON/OFF)

This parameter indicates brake light switch information received from ECM.
ON: Brake light switch is ON. (Brake pedal depressed)
OFF: Brake light switch is OFF. (Brake pedal released)

Paddle Up SW (Paddle Up Switch, ON/OFF)

This parameter indicates the states of paddle-up switch "+".

Paddle Down SW (Paddle Down Switch, ON/OFF)

This parameter indicates the states of paddle-down switch "–".

Switching Solenoid (Mon) (Switching Solenoid Monitor, ON/OFF)

This parameter indicates the state of lock-up / select switching solenoid valve.

Switching Solenoid (Com) (Switching Solenoid Command, ON/OFF)

This parameter indicates the output state of TCM to lock-up / select switching solenoid valve.

5E

Inspection of TCM and Its Circuits

TCM and its circuits can be checked at TCM wiring connectors by measuring voltage and pulse signal.

CAUTION:
It is strictly prohibited to connect voltmeter or ohmmeter to TCM with connector disconnected from it.

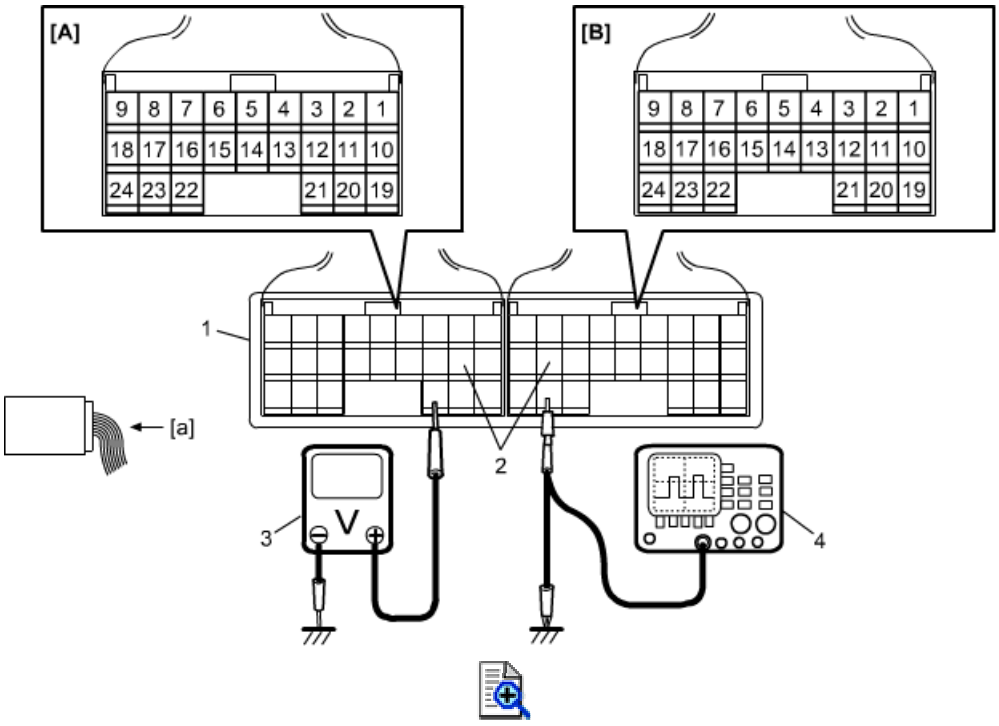
Voltage and Signal Check

1) Remove TCM (1) from vehicle. ☞ .

2) Connect TCM connectors (2) to TCM.

3) Check voltage and/or pulse signal at each terminal of connectors using voltmeter (3) and oscilloscope (4).

NOTE:
- **As each terminal voltage is affected by battery voltage, confirm that it is 11 V or more when ignition mode of keyless push start system is "ON".**
- **Voltage with asterisk (*) cannot be measured by voltmeter because it is pulse signal. Check it with oscilloscope.**
- ***1: Reference voltage**
- **For "Ignition mode" described in the following table, it means power supply mode in keyless push start system.**
  For more details of ignition mode, refer to *Description of Keyless Engine Start Function*.



[A]: TCM connector "E19" (View: [a])	[B]: TCM connector "E20" (View: [a])

Connector "E19"

Terminal No.	Wire color	Circuit	Normal voltage	Condition

E19-1	—	—	—	—
E19-2	—	—	—	—
E19-3	—	—	—	—
E19-4*	WHT	CAN communication (Low)	Refer to reference waveform. ***CAN communication signal***	
E19-5*	RED	CAN communication (High)		
E19-6	BRN	Lock-up / select solenoid valve	10 – 14 V	Ignition mode: ON Select lever position: "P" or "N" range
			0 – 1 V	Ignition mode: ON Select lever position: After 5 sec. in "D" or "R" position
E19-7*	YEL	TCC solenoid valve	Refer to reference waveform. ***TCC solenoid valve signal***	
E19-8*	GRN	Secondary pressure control solenoid valve	Refer to reference waveform. ***Secondary pressure control solenoid valve signal***	
E19-9*	BRN/RED	Line pressure control solenoid valve	Refer to reference waveform. ***Line pressure control solenoid valve signal***	
E19-10	PPL	Transmission range sensor ("P" range)	10 – 14 V	Ignition mode: ON Select lever position: "P" range
			0 – 1 V	Other than above condition
E19-11	—	—	—	—
E19-12	—	—	—	—
E19-13	BLU/ORN	ROM (SEL2) *1	10 – 14 V	Ignition mode: ON
E19-14	PNK	ROM (SEL1) *1	Approx. 5 V	Ignition mode: ON
E19-15	LT GRN	ROM (SEL3) *1	Approx. 5 V	Ignition mode: ON
E19-16*	GRN/YEL	Stepper motor No.2	Refer to reference waveform. ***Stepper motor signal***	
E19-17*	BLU	Stepper motor No.1		
E19-18	RED/GRN	Power source	10 – 14 V	Ignition mode: ON
			0 – 1 V	Ignition mode: OFF
E19-19	—	—	—	—
E19-20	—	—	—	—
E19-21	LT GRN/RED	Transmission range sensor ("R" range)	10 – 14 V	Ignition mode: ON Select lever position: "R" range
			0 – 1 V	Other than above condition
E19-22*	WHT/BLK	Stepper motor No.4	Refer to reference waveform. ***Stepper motor signal***	
E19-23*	GRY	Stepper motor No.3		
E19-24	RED/GRN	Power source	10 – 14 V	Ignition mode: ON
			0 – 1 V	Ignition mode: OFF

Connector "E20"

Terminal No.	Wire color	Circuit	Normal voltage	Condition
E20-1	—	—	—	—
E20-2	—	—	—	—
E20-3	—	—	—	—
E20-4	—	—	—	—
E20-5*	BRN/BLK	Secondary pulley speed sensor	Refer to reference waveform. ***Secondary pulley speed sensor signal***	

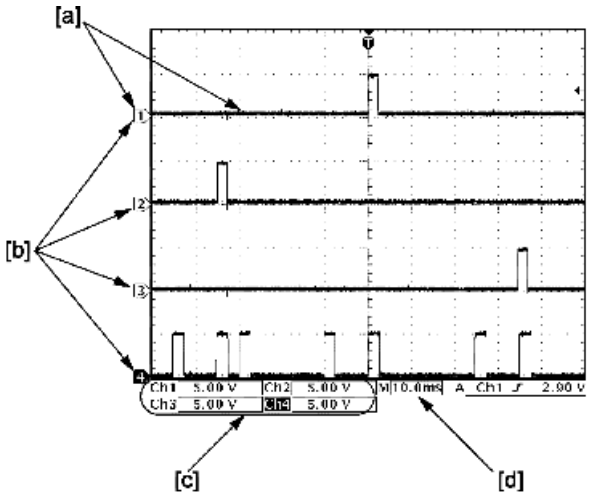
E20-6	RED/WHT	Power source for back-up	10 – 14 V	Constantly
E20-7	GRN/BLK	Manual mode switch	0 – 1 V	Ignition mode: ON Manual mode switch: ON
			10 – 14 V	Other than above condition
E20-8	YEL/BLK	Transmission range sensor (“N” range)	10 – 14 V	Ignition mode: ON Select lever position: “N” range
			0 – 1 V	Other than above condition
E20-9	BLK	Ground	Below 0.3 V	Constantly
E20-10	BLK/YEL	Sensor ground	Below 0.3 V	Constantly
E20-11	LT GRN/BLK	Primary pressure sensor	0.7 – 3.5 V	Engine: Idle speed Select lever position: “N” range
E20-12	—	—	—	—
E20-13	—	—	—	—
E20-14*	GRY/BLK	Primary pulley speed sensor	Refer to reference waveform. ***Primary pulley speed sensor signal***	
E20-15	BLU/BLK	Secondary pressure sensor	Approx. 1.0 V	Engine: Idle speed Select lever position: “N” range
E20-16	PNK/BLU	Paddle-down switch	0 – 1 V	Ignition mode: ON Paddle-down switch: Pulled
			10 – 14 V	Ignition mode: ON Paddle-down switch: Released
E20-17	—	—	—	—
E20-18	YEL/GRN	Paddle-up switch	0 – 1 V	Ignition mode: ON Paddle-up switch: Pulled
			10 – 14 V	Ignition mode: ON Paddle-up switch: Released
E20-19	BLK	Ground	Below 0.3 V	Constantly
E20-20	WHT/RED	CVT fluid temperature sensor	Approx. 2.0 V	Ignition mode: ON CVT fluid temperature: 20 °C (68 °F)
			Approx. 1.0 V	Ignition mode: ON CVT fluid temperature: 80 °C (176 °F)
E20-21	WHT/GRN	Sensor power supply	Approx. 5.0 V	Ignition mode: ON
E20-22	—	—	—	—
E20-23	PPL/GRN	Transmission range sensor (“L” range)	0 – 1 V	Ignition mode: ON Select lever position: “P”, “R” or “D” (“M”) range
E20-24	PNK/BLK	Transmission range sensor (“D” range)	10 – 14 V	Ignition mode: ON Select lever position: “D” range
			0 – 1 V	Ignition mode: ON Select lever position: Other than “D” range

Reference Waveform

Oscilloscope display

Shown below is typical waveform display provided by oscilloscope.

NOTE:
- **Display includes the following types of data:**



[a]:	Waveform of channel 1	[c]:	VOLT/DIV of each channel
[b]:	Ground level of each channel	[d]:	TIME/DIV

- **Waveforms may vary with measurement conditions and vehicle specifications.**

CAN communication signal

CAN communication signal (High) (1):

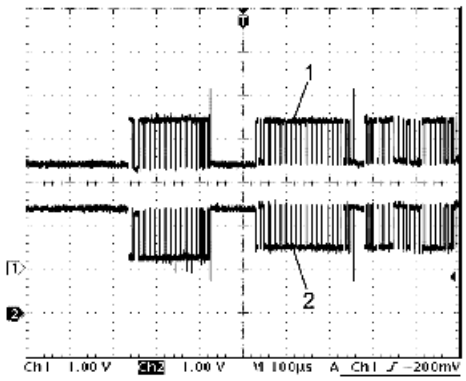
Channel	Probe	Terminal No.
1	+	E19-5
	–	E20-9

CAN communication signal (Low) (2):

Channel	Probe	Terminal No.
2	+	E19-4
	–	E20-9

Measurement condition

- Engine: Stop
- Ignition mode: ON



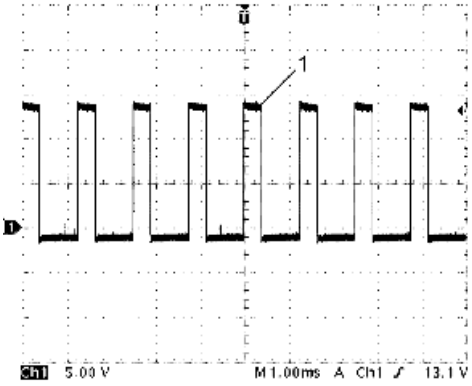
TCC solenoid valve signal

TCC solenoid valve signal (1):

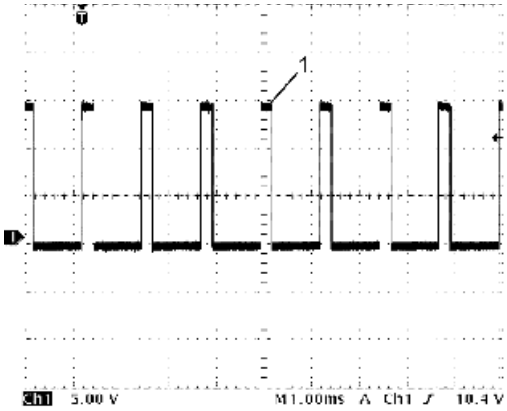
Channel	Probe	Terminal No.
1	+	E19-7
	–	E20-9

Measurement condition

- Vehicle: Running
- CVT: Lock-up on after warming up



- Vehicle: Running
- CVT: Lock-up off after warming up



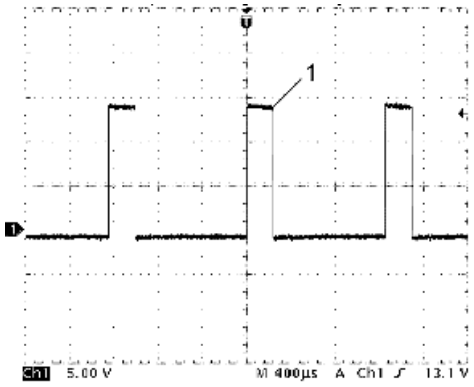
Secondary pressure control solenoid valve signal

Secondary pressure control solenoid valve signal (1):

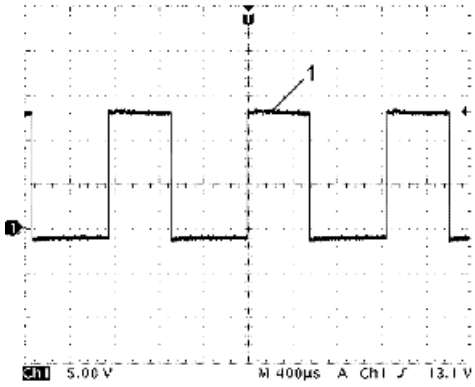
Channel	Probe	Terminal No.
1	+	E19-8
	–	E20-9

Measurement condition

- Engine: Running after warming up
- Select lever position: "D" range
- Accelerator pedal: Depressed fully



- Engine: Idle speed
- Select lever position: "D" range
- Accelerator pedal: Released



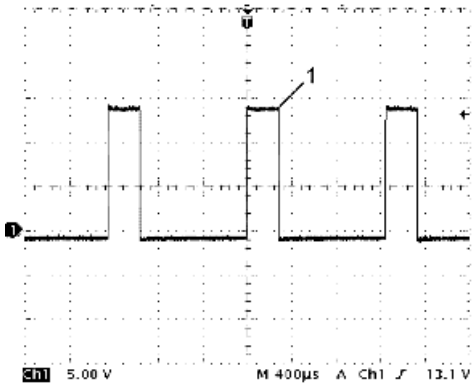
Line pressure control solenoid valve signal

Line pressure control valve signal (1):

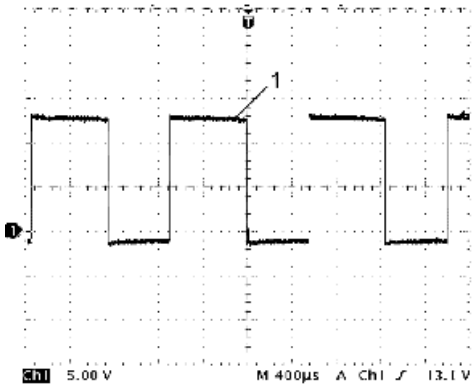
Channel	Probe	Terminal No.
1	+	E19-9
	–	E20-9

Measurement condition

- Engine: Running after warming up
- Select lever position: "D" range
- Accelerator pedal: Depressed fully



- Engine: Idle speed
- Select lever position: “D” range
- Accelerator pedal: Released



Stepper motor signal

Stepper motor No.1 signal (1):

Channel	Probe	Terminal No.
1	+	E19-17
	–	E20-9

Stepper motor No.2 signal (2):

Channel	Probe	Terminal No.
2	+	E19-16
	–	E20-9

Stepper motor No.3 signal (1):

Channel	Probe	Terminal No.
1	+	E19-23
	–	E20-9

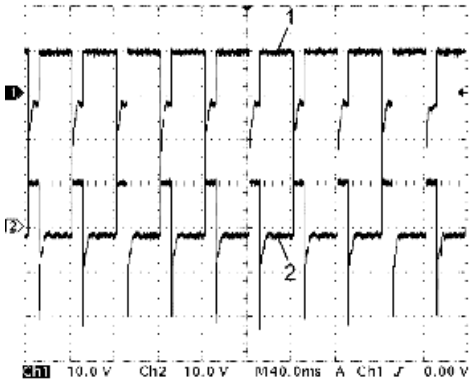
Stepper motor No.4 signal (2):

Channel	Probe	Terminal No.

2	+	E19-22
	–	E20-9

Measurement condition

- Engine switch: For 10 sec. from ignition mode to "ON"



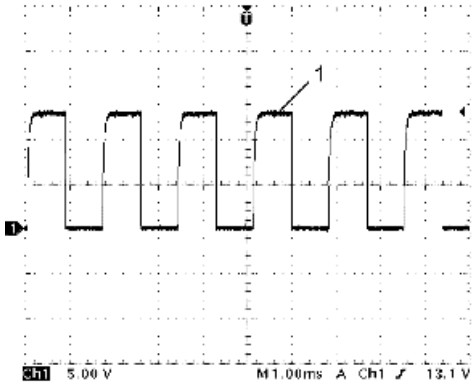
Secondary pulley speed sensor signal

Secondary pulley speed sensor signal (1):

Channel	Probe	Terminal No.
1	+	E20-5
	–	E20-9

Measurement condition

- Vehicle: Drive vehicle at 20 km/h (12 mile/h)
- CVT: After warming up



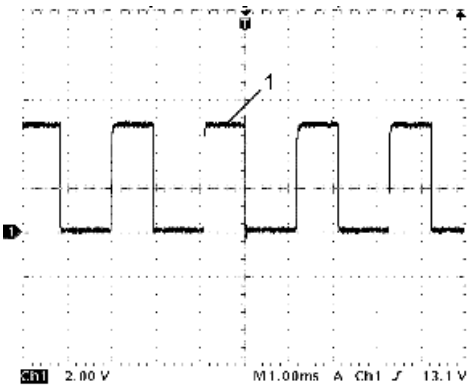
Primary pulley speed sensor signal

Primary pulley speed sensor signal (1):

Channel	Probe	Terminal No.
1	+	E20-14
	–	E20-9

Measurement condition

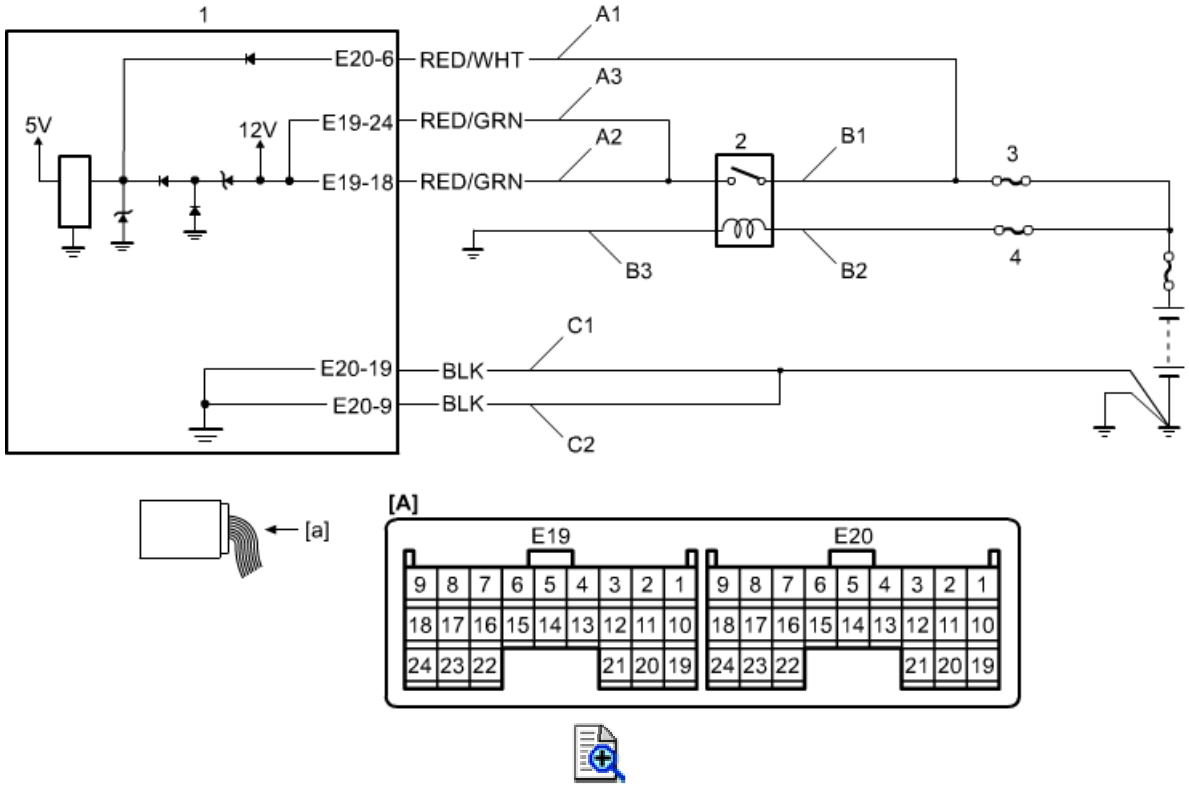
- Vehicle: Drive vehicle at 20 km/h (12 mile/h)
- CVT: After warming up


1
Ch1 2.00 V
M1.00ms A Ch1 13.1 V

5E

TCM Power Supply and Ground Circuit Check

Circuit Diagram



[A]: TCM connector (View: [a])	B2: CVT relay power supply circuit (coil side)	2. CVT relay (built power integration)
A1: Back up power supply circuit	B3: CVT relay ground circuit	3. "AT" fuse
A2: TCM power supply circuit 1	C1: TCM ground circuit 1	4. "IG1 SIG" fuse
A3: TCM power supply circuit 2	C2: TCM ground circuit 2	
B1: CVT relay power supply circuit (switch side)	1. TCM	

Troubleshooting

Step	Action	YES	NO
1	**Back up power supply circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect "E19" and "E20" connectors. 3) Check for proper terminal connection to "E19" and "E20" connectors.	Go to Step 2.	Repair or replace defective wire harness.

	4) If connections are OK, check that voltage between "A1" circuit and ground is battery voltage. ***Is it in good condition?***		
2	**CVT relay power supply circuit (switch side) check** 1) Remove power integration from main fuse box. 2) Check for proper terminal connection for power integration connector. 3) If connections are OK, check that voltage between "B1" circuit and ground is battery voltage. ***Is it in good condition?***	Go to Step 3.	Repair or replace defective wire harness.
3	**CVT relay power supply (coil side) circuit check** 1) Push engine switch to change ignition mode to "ON". 2) Check that voltage between "B2" circuit and ground is battery voltage. ***Is it in good condition?***	Go to Step 4.	Repair or replace defective wire harness.
4	**CVT relay ground circuit check** 1) Check that voltage between "B2" and "B3" circuits are battery voltage. ***Is it in good condition?***	Go to Step 5.	Repair or replace defective wire harness.
5	**CVT relay check** 1) Check CVT relay. ☞ ***Is it in good condition?***	Go to Step 6.	Replace CVT relay (power integration).
6	**Main power supply circuit check** 1) Push engine switch to change ignition mode to "OFF". 2) Install power integration. 3) Push engine switch to change ignition mode to "ON". 4) Check that voltage between each of "A2" and "A3" circuits and ground are battery voltage. ***Are they in good condition?***	Go to Step 7.	Repair or replace defective wire harness.

7	**TCM ground circuit check** 1) Push engine switch to change ignition mode to "OFF". 2) Check that resistance between each of "C1" and "C2" circuits and ground are less than 1 Ω. ***Are they in good condition?***	TCM power and ground circuit is in good condition.	Repair or replace defective wire harness.

TCM Initialization and Learning Control

In this operation, perform initialization procedure before performing learning control procedure.

CAUTION:
- **When replacing TCM and CVT assembly, be sure to perform "TCM Initialization and Learning Control".**
- **When replacing TCM and CVT assembly, replace CVT assembly first and then replace TCM. If CVT assembly is replaced before replacing TCM, be sure to perform initialization procedure [B].**
- **Neglecting this initialization may result in excessive shift shock.**

Initialization Procedure

1) Select initialization procedure from table below.

Initialization procedure	Service item
[A]	Replace TCM with new one
[B]	• Replace TCM with used one • Replace CVT assembly

2) Perform selected initialization procedure as follows.

Initialization procedure [A]:

a) Push engine switch to change ignition mode to "ON" and shift select lever to "P" range.

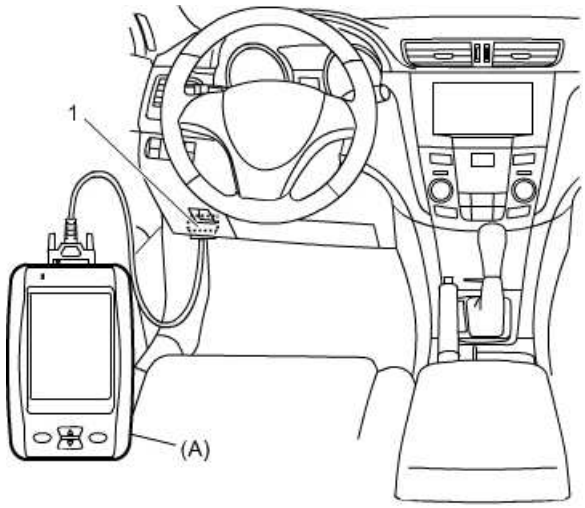
b) Check that the shift position indicated in information display comes on in approx. 2 sec. after engine switch is pressed to change ignition mode to "ON". If the shift position does not come on, check the following items:
- Check for open or shorted to ground in wiring harness between TCM and ROM in CVT assembly. ☞
- Check for proper terminal connection to TCM connector and solenoid connector.

Initialization procedure [B]:

a) Confirm that ignition mode of keyless push start system is "OFF" and connect SUZUKI scan tool to DLC (1).

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



b) Push engine switch to turn "ON" ignition switch.
c) Select "Learning Value Initialization" function under "Utility" mode on SUZUKI scan tool, and follow the instructions displayed on SUZUKI scan tool.
d) Push engine switch to change ignition mode to "OFF" and leave ignition mode in "OFF" for 10 sec.
e) Shift select lever to "P" range.
f) Check that the shift position indicated in information display comes on in approx. 2 sec. after engine switch is pressed to change ignition mode to "ON". If the shift position does not come on, check the following items:
- Check for open or shorted to ground in wiring harness between TCM and ROM in CVT assembly.
- Check for proper terminal connection to TCM connector and solenoid connector.

Learning Control Procedure

CAUTION:
To perform the learning function normally, follow instructions below:
- **When operating the select lever, hold it for more than 2 sec. in each position.**
- **Do not shift the select lever from "N" position to other positions until specified idle engine speed is obtained.**

Cold condition

1) Select "Data List" mode on SUZUKI scan tool.
2) Cool down CVT fluid to ambient temperature.
3) Start engine.
4) Depress brake pedal fully and repeat shift operation from "N" range to "D" range, and from "N" range to "R" range 3 times for each gear shift. If excessive shift shock is observed, repeat this operation 10 times.
5) Depress brake pedal fully at idle speed and hold in "D" range for 20 sec.
6) Drive vehicle so that CVT fluid temperature reaches 40 °C (104 °F)
7) Drive vehicle at 40 – 50 km/h (25 – 31 mile/h) constantly for 5 sec. in "D" range.

Hot condition

1) Drive vehicle so that CVT fluid temperature reaches 80 °C (176 °F)
2) Depress brake pedal fully and repeat shift operation from "N" position to "D" position and from "N" position to "R" position 3 times each. If excessive shift shock is observed, repeat this operation 10 times.
3) Depress brake pedal fully at idle speed and hold in "D" position for 20 sec.
4) Drive vehicle at 40 – 50 km/h (25 – 31 mile/h) constantly for 5 sec. in "D" position.

5E

CVT Fluid Check

CAUTION:
- **To obtain proper data from CVT performance test, check and adjust the fluid level before the test.**
- **If any checking of CVT is carried out without checking and adjusting the fluid level, the checking result may show a discrepancy.**

1) Check CVT fluid for deterioration referring to factors shown below.
Replace CVT fluid and also check functioning of CVT and the vehicle if any faulty conditions are found. ☞

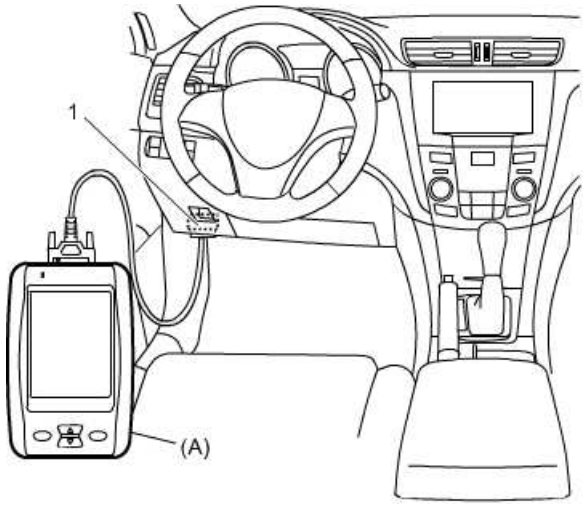
NOTE:
Burning smell or heavy discoloration of CVT fluid suggests that dust-size friction material particles are mixed in the fluid. In that case, replacement of CVT assembly may be required.

- Varnish-like appearance
- Milky or whitish appearance
- Large amount of metal particles mixed in fluid

2) Confirm that ignition mode of keyless push start system is "OFF" and connect SUZUKI scan tool to DLC (1).

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Display "Data List" mode on SUZUKI scan tool.

4) Drive vehicle so that CVT fluid temperature reaches normal operating temperature (70 – 80 °C (158 – 176 °F)).

NOTE:
Engine coolant temperature rises when racing engine at "P" or "N" range. But CVT fluid temperature does not rise at "P" or "N" range. Be sure to drive vehicle in order to rise CVT fluid temperature.

5) Stop vehicle with engine running and place it horizontally.

6) With select lever at "P" range, apply parking brake and block wheels.

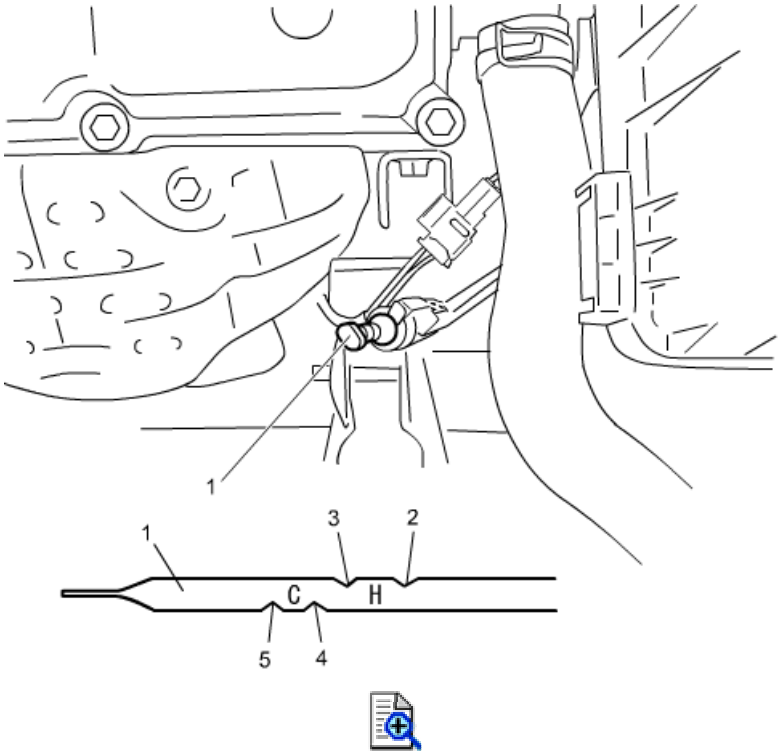
7) Keep engine idling, depress brake pedal fully and shift select lever slowly to "D" and back to "P" position.

8) With engine idling and A/C switch turned off, pull out fluid level gauge (1), wipe it off with lint-free paper towel and put it back into place.

9) Pull out fluid level gauge (1) again and check CVT fluid level indicated on it. Lowest fluid level should be between full hot (2) and low hot (3). If it is below low hot, add specified CVT fluid up to full hot.

CVT fluid specification

: SUZUKI CVT FLUID GREEN 1 or Shell GREEN-1 V



4.	Full cold mark
5.	Low cold mark

NOTE:

- **Do not race engine while checking fluid level, even after engine start.**
- **Although fluid level can be checked temporarily at room (cold) temperature of 20 – 30 °C (68 – 86 °F), this level check is considered to be preparation before performing level check under normal operating (hot) temperature.**
- **Bringing level from low hot to full hot requires 0.6 liters (1.27 / 1.06 US / Imp. pt.).**
- **If vehicle was driven under high load such as pulling trailer, fluid level should be checked about half an hour after it is stopped.**
- **Check lower position of fluid on both sides of level gauge.**

CVT Fluid Change

CAUTION:
- **Do not use any fluid other than specified CVT fluid. Use of any fluid other than specified CVT fluid may cause juddering or some other faulty condition to occur.**
- **Do not overfill. Overfilling can cause foaming and loss of fluid through breather. Then slippage and transaxle failure can result.**
- **After changing CVT fluid, check drain plug for CVT fluid leakage.**
- **Do not change or drain CVT fluid before each test.**

NOTE:
CVT fluid does not drain completely.

1) Hoist vehicle.

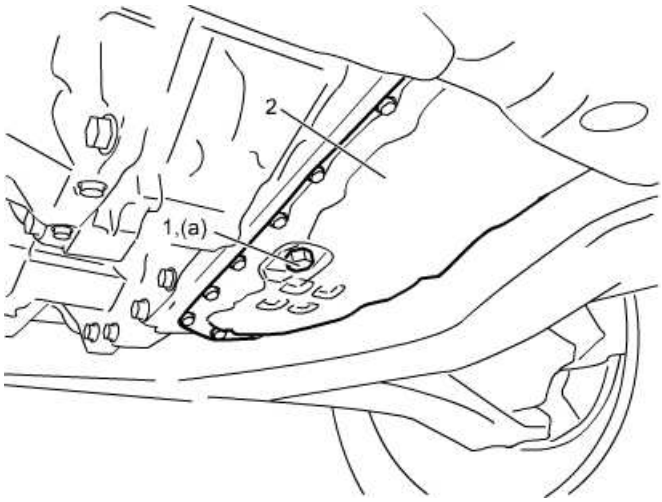
2) Remove left side engine undercover.

3) When engine is cool, remove CVT fluid drain plug (1) from CVT oil pan (2) and drain CVT fluid.

4) Install CVT fluid drain plug (1) with new gasket and then tighten it to specified torque.

Tightening torque

CVT fluid drain plug (a): 34 N·m (3.5 kg-m, 25.0 lbf-ft)



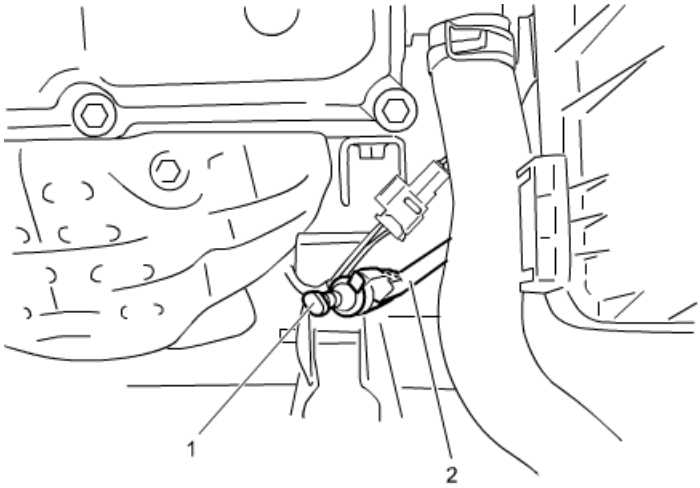
5) Lower vehicle and replenish proper amount of specified CVT fluid from fluid filler tube (2).

CVT fluid specification

: SUZUKI CVT FLUID GREEN 1 or Shell GREEN-1 V

CVT fluid capacity

Reference: 8.3 liters (17.54 / 14.61 US / Imp.pt.).



1.	Fluid level gauge

6) Check CVT fluid level. ☞
7) Check drain plug for CVT fluid leakage.
8) Install left side engine undercover.

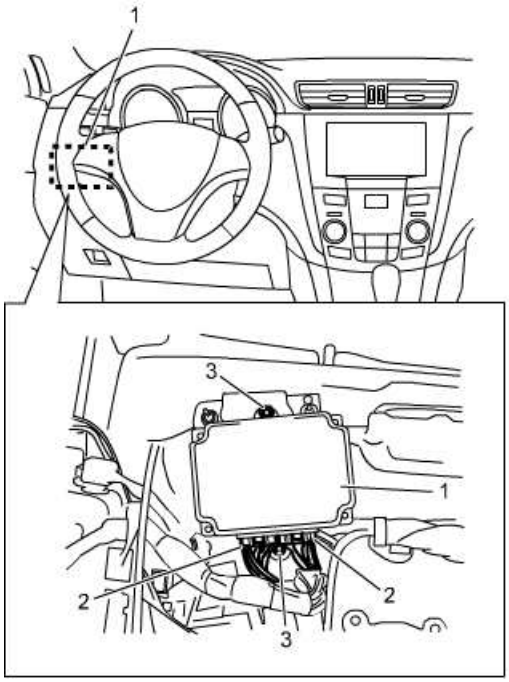
5E

Transmission Control Module (TCM) Removal and Installation

CAUTION:
- **TCM consists of highly precise parts, therefore when handling it, be careful not to expose to excessive shock.**
- **When performing the replacing TCM with used one, all learned controls which are stored in TCM memory should be erased after the replacement.** ☞
  Neglecting this initialization may cause excessive shift shock.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove driver side instrument panel undercover. ☞
3) Disconnect connectors (2) from TCM (1).
4) Remove TCM by removing nuts (3).



Installation

Reverse removal procedure noting the following points.
- After replacing TCM, perform ***TCM Initialization and Learning Control***.

5E

Shift Paddle Switch Removal and Installation

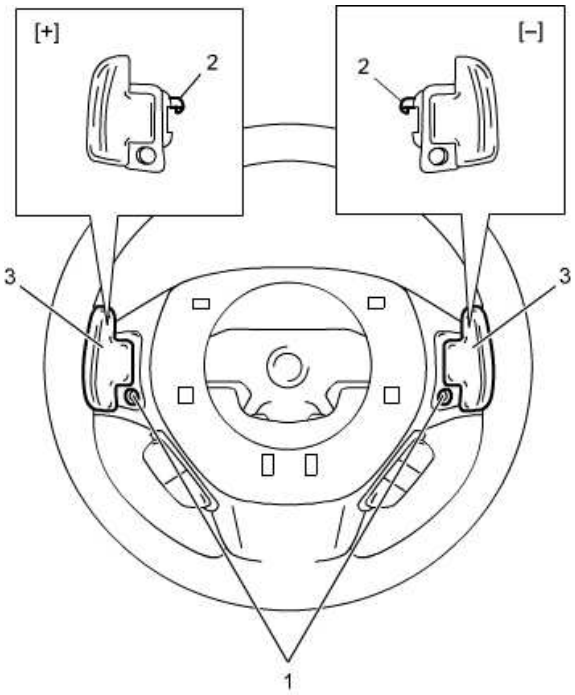
CAUTION:
To avoid impairment of the original performance, do not remove horn plate from steering wheel assembly. If it is removed, one replace the entire steering wheel assembly with new one.

Removal

1) Remove steering wheel. ☞

2) Remove screws (1) and release claws (2).

3) Disconnect connectors and then remove shift paddle switches (3).



Installation

Reference: Shift Paddle Switch Inspection

Reverse removal procedure.

5E

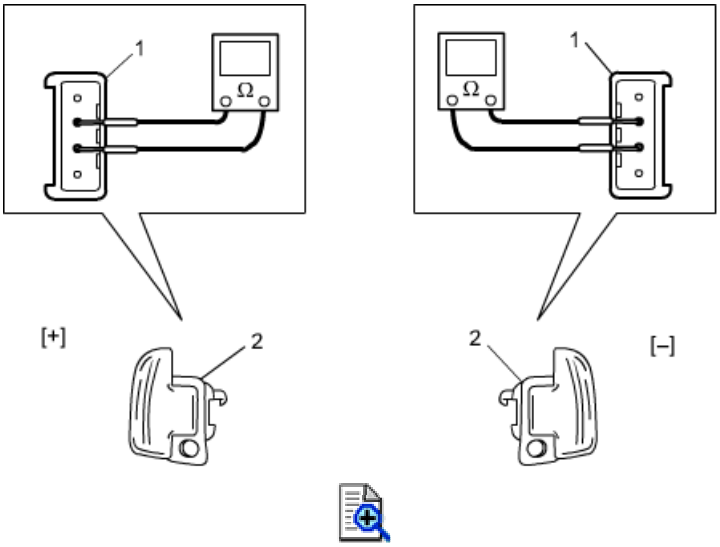
Shift Paddle Switch Inspection

Reference: Shift Paddle Switch Removal and Installation

Check for continuity between terminals of shift paddle switch connectors (1). Replace steering wheel assembly if check result is not as specified.

Shift paddle switch specification

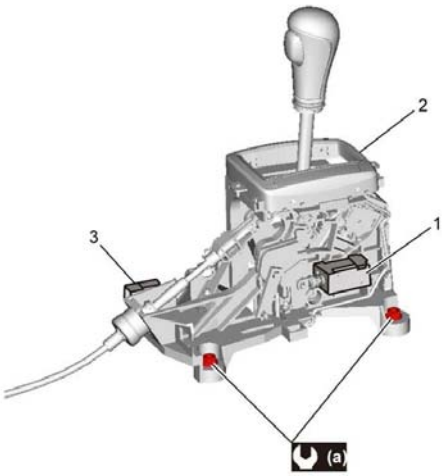
Condition	Specification
Pulled	Continuity
Released	No continuity



2. Shift paddle switch

5E

Select Lever Assembly Components



1.	Shift lock solenoid	3.	Select lever connector
2.	Select lever assembly	(a) :	13 N·m (1.3 kgf-m, 9.5 lbf-ft)

5E

Select Lever Assembly Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Remove console box. ☞
3) Disconnect adjuster case (select cable end) from select lever assembly. ☞
4) Disconnect select lever connector.
5) Remove select lever nuts and detach select lever assembly from floor panel.

Installation

Reverse removal procedure noting the following points.

- Tighten select lever nuts to specified torque. ☞
- After installing select lever assembly, adjust select cable. ☞

5E

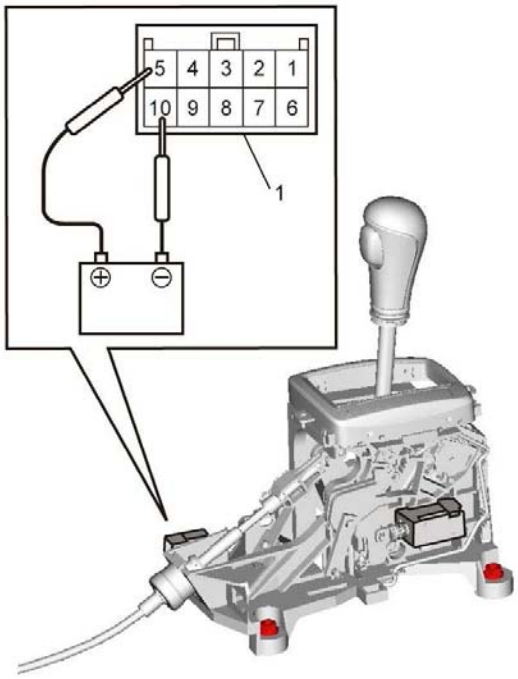
Shift Lock Solenoid Inspection

CAUTION:
- **When connecting cables from battery for operation check, make sure not to create any accidental shorts.**
- **Reverse connection of polarity may damage shift lock solenoid.**

1) Remove console box.

2) Disconnect select lever connector (1).

3) Check that shift lock solenoid rod moves smoothly and returns when positive terminal of battery is connected to terminal "5" and negative terminal of battery is connected to terminal "10".
If solenoid rod does not move smoothly, replace select lever assembly.

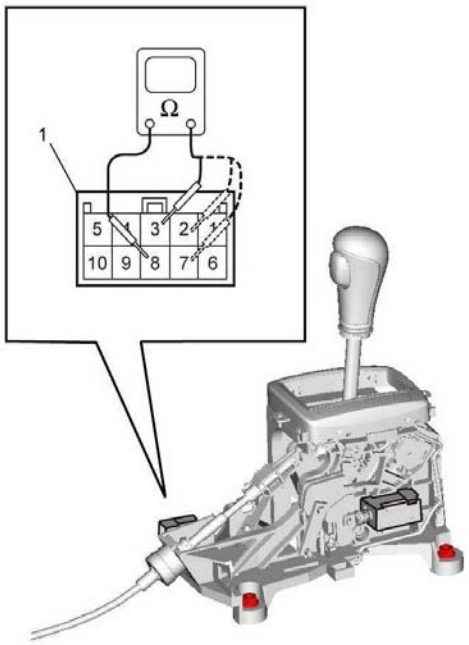


Manual Mode Shift Switch Inspection

1) Remove console box.

2) Disconnect select lever connector (1).

3) Check for continuity between terminals at each switch position. If check result is not as specified, replace select lever assembly.



		Terminal			
		2	3	7	8
Select lever position	"M" (Manual mode on)		○		○
	"+" (Shift up)	○			○
	"-" (Shift down)			○	○

P Position Switch Inspection

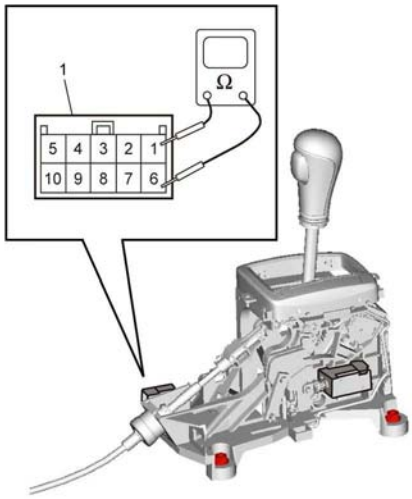
1) Remove console box.

2) Disconnect select lever connector.

3) Check for continuity between terminals "1" and "6" of select lever connector (1). If check result is not as specified, replace select lever assembly.

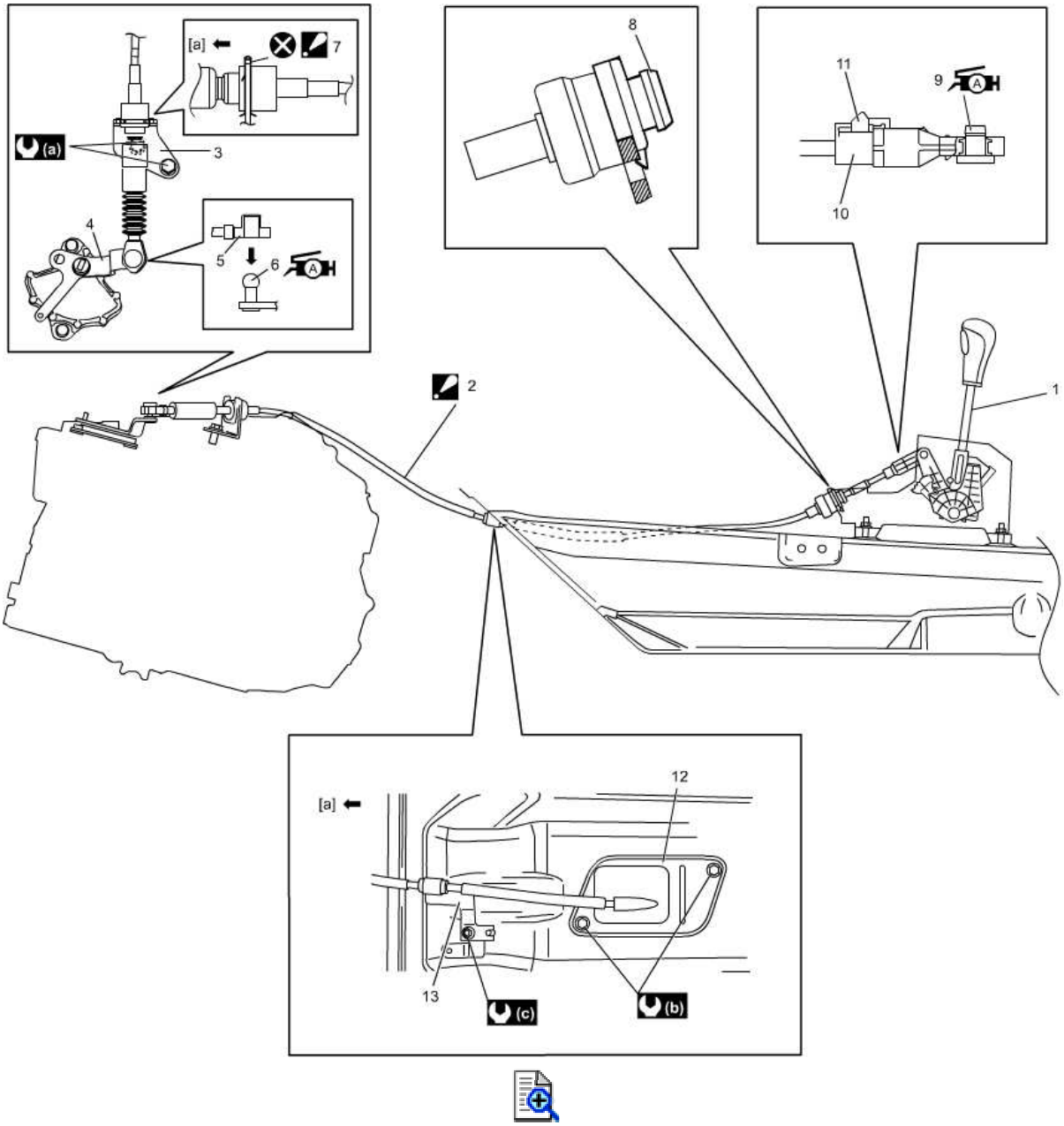
P position switch specification

Condition	Specification
"P" range	Continuity
Other than "P" range	No continuity



5E

Select Cable Components



[a]: Vehicle forward	Manual select lever pin : Apply grease 99000-25011 6.	12. Select cable retainer
1. Select lever assembly	7. Clip : Insert clip so that the claw is positioned toward the vehicle forward.	13. Clamp
Select cable After completing installation, 2. adjust select cable.	8. Casing cap : Make sure that claw of the casing cap fit completely to the select lever assembly.	(a) : 23 N·m (2.3 kgf -m, 17.0 lbf-ft)
3. Select cable bracket	Select lever pin : Apply grease 99000-25011 9.	(b) : 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)

4. Manual select lever	10. Adjuster case	: 10 N·m (1.0 kgf -m, 7.5 lbf-ft)
5. Select cable clip	11. Lock plate	: Do not reuse

5E

Select Cable Removal and Installation

Reference: Select Cable Components

WARNING:
To avoid getting burned, do not work on exhaust system when it is hot. Exhaust system must be completely cool before beginning any work on it.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞
3) Remove console box. ☞
4) Disconnect select cable from select lever and then detach it from bracket. ☞
5) Remove clip of select cable and disconnect select cable from manual select lever.
6) Remove select cable retainer from dash panel.

Installation

Reference: Select Cable Adjustment

Reverse removal procedure noting the following points.

- Apply grease to pin and cable joint. ☞
- Use new clip.
- Tighten bolts to specified torque. ☞
- Adjust select cable. ☞

Select Cable Inspection

Perform ***Select Cable Adjustment*** if check results are not satisfactory:
Check the following points:

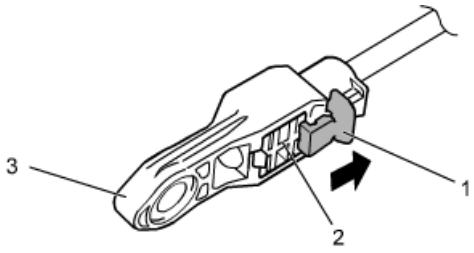
- Check that engine starts at "P" and "N" positions, and check that it does not start at other positions.
- Perform ***"P" Range Test***.
- Check that back-up light turns on when select lever is shifted to "R" position.
- Check that shift position indicator display is consistent with select lever position.

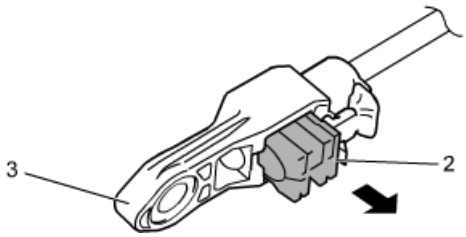
5E

Select Cable Adjustment

Reference: Select Cable Removal and Installation

1) Apply parking brake and block wheels.
2) Push engine switch to change ignition mode to "ON", shift select lever to "N" range.
3) Remove air cleaner assembly. ☞
4) Remove console box. ☞
5) Remove adjuster case (cable end) from select lever pin of select lever assembly. ☞
6) Release lock plate (1) which restricts moving of lock piece (2).
7) Pull out lock piece (2) from adjuster case (3) using pliers or the like to disengage cable.

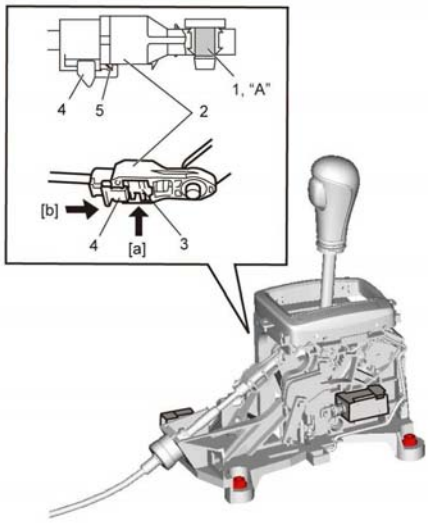




8) Check that manual select lever is "N" range, referring to Step 4) of ***Transmission Range Sensor Inspection***.
9) Apply grease to select lever pin (1), and then install adjuster case (2) into select lever pin securely.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

10) Push lock piece (3) in arrow direction [a] as shown in figure.
11) Slide lock plate (4) in arrow direction [b] as shown in figure, until it gets over the claw (5).



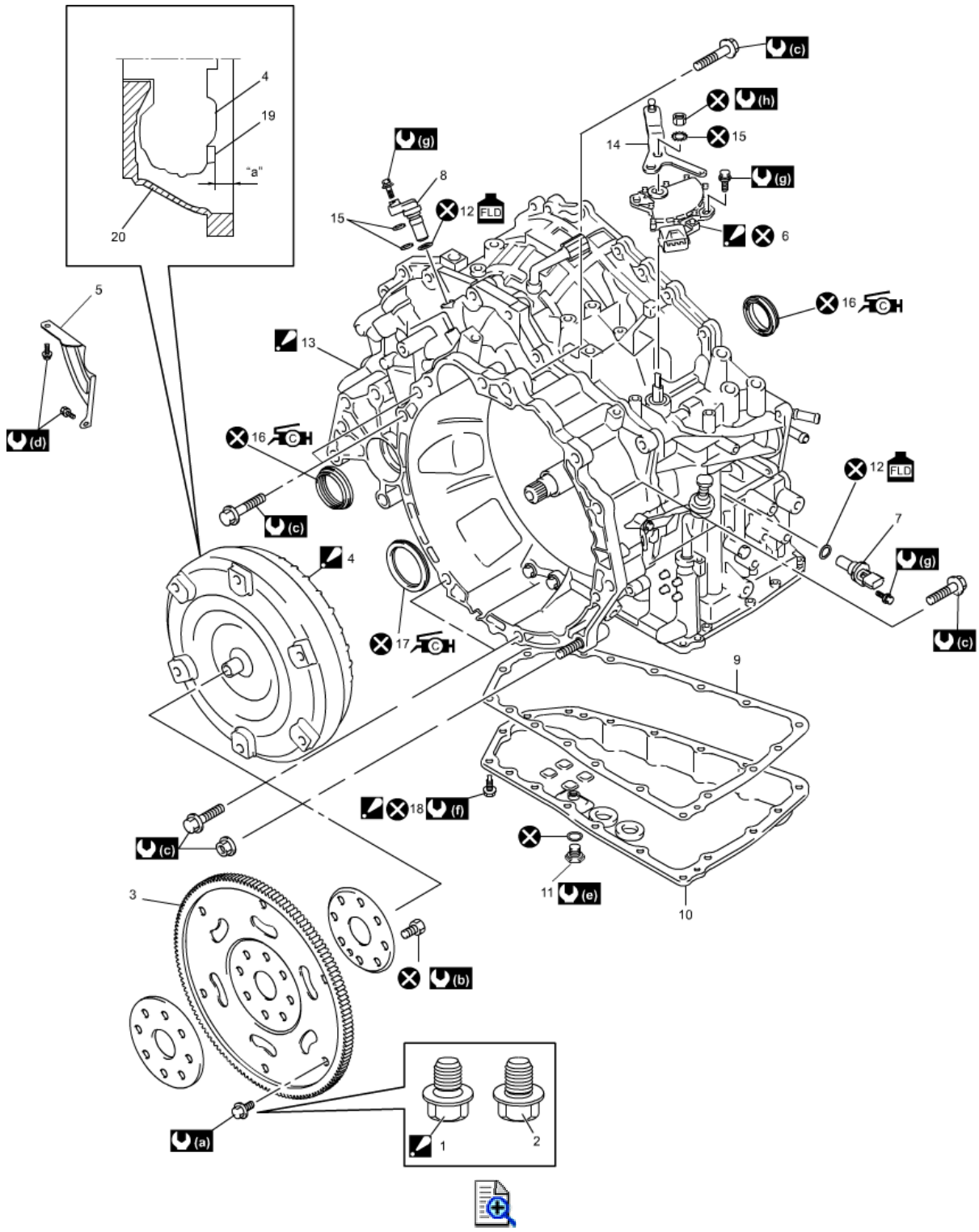
12) After installing select cable, check the following points.
- Perform ***"P" Range Test***.
- Check back-up light is turned on when shifting select lever to "R" range.
- Check shift position indicated in information display is consistent with select lever range.
- Check engine starts at "P" and "N" ranges but does not start at other than "P" and "N" ranges.

13) Install air cleaner assembly.

5E

CVT Assembly Components

CAUTION:
Check that distance "a" is more than 17.0 mm (0.669 in.) when installing.



1. Torque converter bolt No.1 : For installation, refer to ***CVT Assembly Dismounting and Remounting***.	11. Drain bolt	(a) : 23 N·m (2.3 kgf -m, 17.0 lbf-ft)

2. Torque converter bolt No.2	12. O-ring	(b): 70 N·m (7.1 kgf-m, 52.0 lbf-ft)
3. Drive plate	13. CVT assembly : Never disassemble CVT assembly.	(c): 80 N·m (8.2 kgf-m, 59.0 lbf-ft)
4. Torque converter : For installation, refer to ***Input Shaft Oil Seal Replacement***.	14. Manual select lever	(d): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
5. Drive plate cover	15. Washer	(e): 34 N·m (3.5 kgf-m, 25.0 lbf-ft)
6. Transmission range sensor : After completing installation, Adjust transmission range sensor.	16. Differential side oil seal : Apply grease 99000-25030 to oil seal lip.	(f): 7.9 N·m (0.81 kgf-m, 6.0 lbf-ft)
7. Primary pulley speed sensor	17. Input shaft oil seal : Apply grease 99000-25030 to oil seal lip.	(g): 5.9 N·m (0.60 kgf-m, 4.5 lbf-ft)
8. Secondary pulley speed sensor	18. CVT oil pan bolt : For tightening order, refer to ***CVT Oil Pan Removal and Installation***	(h): 17 N·m (1.7 kgf-m, 12.5 lbf-ft)
9. CVT oil pan gasket	19. Flange nut	FLD: Apply CVT fluid
10. CVT oil pan	20. CVT case	: Do not reuse.

5E

CVT Assembly Dismounting and Remounting

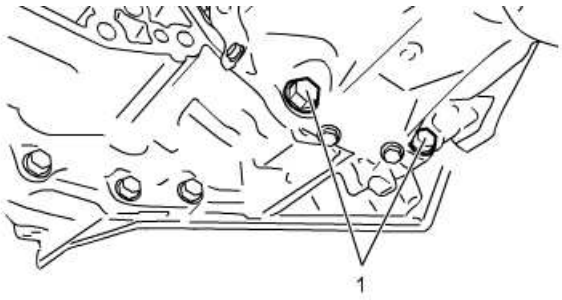
Reference: CVT Assembly Components

WARNING:
Be sure to keep CVT assembly with torque converter horizontal or facing up throughout the work. Torque converter should be tilted to avoid fall it off. Otherwise, personal injury may occur.

CAUTION:
When replacing CVT assembly, all learned controls which are stored in TCM memory should be erased after the replacement. ☞
Neglecting this initialization may cause excessive shift shock.

Dismounting

1) Remove bolts (1) fastening engine and CVT assembly.



2) Dismount CVT assembly with engine. ☞

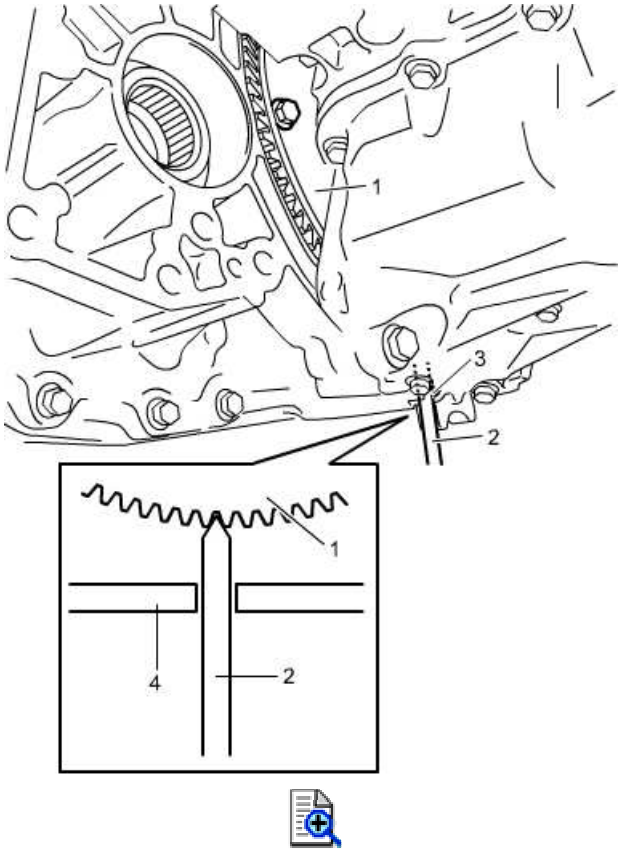
3) Remove front drive shafts. ☞

4) For 4WD model, remove transfer. ☞

5) For 2WD model, remove drive intermediate shaft. ☞

6) Remove drive plate cover. ☞

7) Remove torque converter No.1 and No.2 bolt as follows.
a) Insert flat-end screwdriver or the like (2) to hole (3) of CVT assembly as shown in figure.
b) Lock drive plate (1), engage a flat-end screwdriver or the like with gear of drive plate as shown in figure.
c) Remove torque converter No.1 or No.2 bolt through drive plate cover opening.
d) Turn crankshaft by 60° by turning crankshaft pulley bolt using wrench.
e) Repeat Step a) through c) 5 times.



4.	CVT case

8) Remove starting motor. ☞

9) Remove the following parts. ☞

- Front mounting bracket
- Rear mounting
- Engine rear mounting bracket No.1
- Engine rear mounting bracket No.2

10) Remove bolts and nut fastening engine and CVT assembly, and then detach CVT assembly from engine.

CAUTION:
When detaching CVT assembly from engine, move it in parallel with crankshaft and be careful not to apply excessive force to drive plate and torque converter.

Remounting

1) Make sure that torque converter is installed correctly to CVT assembly. ☞

2) Attach CVT assembly to engine.

3) Tighten bolts and nut to specified torque. ☞

4) Install the following parts. ☞

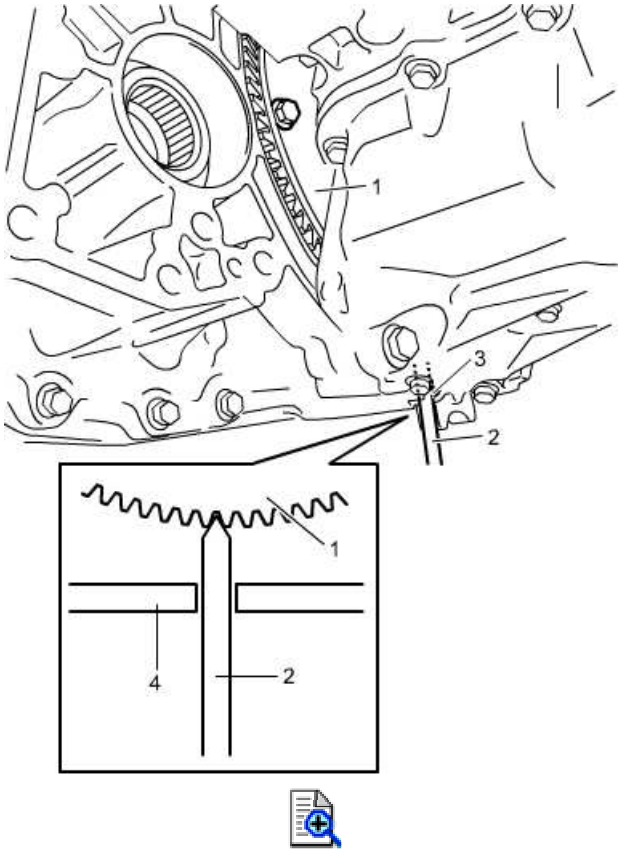
- Front mounting bracket
- Rear mounting
- Engine rear mounting bracket No.1
- Engine rear mounting bracket No.2

5) Tighten torque converter No.1 and No.2 bolts as follows.

NOTE:

Torque converter No.1 bolt is used for accurate positioning.
Tighten torque converter No.1 bolt first so that bolt holes for torque converter and drive plate are positioned properly, and that torque converter No.2 bolt is tightened securely.
One torque converter No.1 bolt and five torque converter No.2 bolts are required to secure torque converter and drive plate.

a) Align bolt hole of drive plate with bolt hole of torque converter by turning crankshaft.
b) Insert flat-end screwdriver or the like (2) to hole (3) of CVT assembly as shown in figure.
c) Lock drive plate (1), engage a flat-end screwdriver or the like with gear of drive plate as shown in figure.



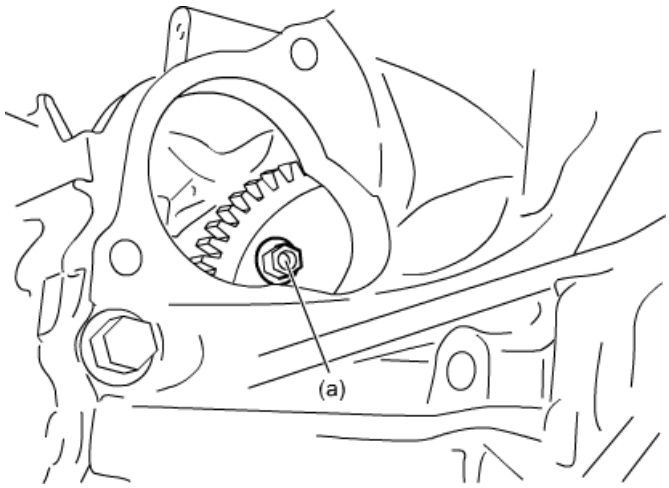
4. CVT case

d) Tighten torque converter No.1 bolt to 5 N·m (0.51 kgf-m, 4.0 lbf-ft) through starting motor opening.
e) Turn crankshaft by 60° and tighten torque converter No.2 bolts by hand through starting motor opening.
f) Tighten torque converter No.1 bolt to specified torque.

Tightening torque
Torque converter No.1 bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)

g) Turn crankshaft by 60° and tighten torque converter No.2 bolts to specified torque.

Tightening torque
Torque converter No.2 bolt (a): 23 N·m (2.3 kg-m, 17.0 lbf-ft)



6) Install starting motor.

7) Install drive plate cover.

8) For 2WD model, install drive intermediate shaft.

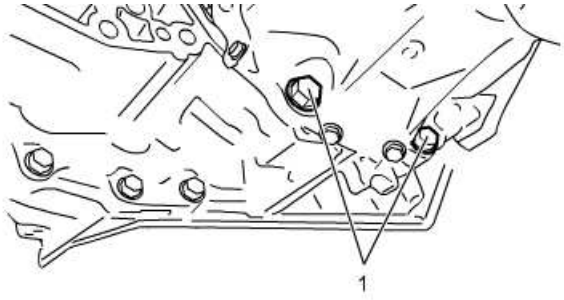
CAUTION:
Be careful not to scratch oil seal lip with center shaft while installing.

9) For 4WD model, install transfer.

10) Install front drive shaft.

11) Remount engine with CVT assembly to vehicle.
Refer to ***Engine Assembly Removal and Installation***.

12) Tighten engine fastening bolts (1) and CVT assembly to specified torque.



13) Refill CVT fluid.

14) Check CVT fluid level.

15) After installation, check for CVT fluid leakage at each connection.

16) After replacing CVT assembly, perform learning control initialization.

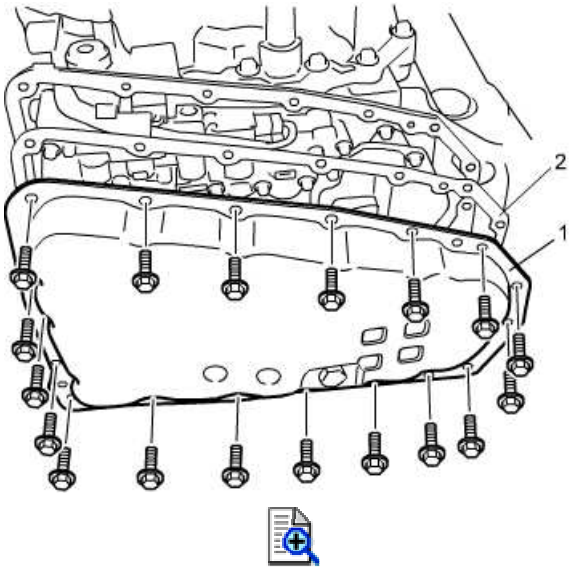
5E

CVT Oil Pan Removal and Installation

CAUTION:
- **Do not use any fluid other than specified CVT fluid. Use of any fluid other than specified CVT fluid may cause juddering or some other faulty condition to occur.**
- **Use lint-free paper not cloth rags.**
- **Do not reuse CVT fluid.**

Removal

1) Hoist vehicle.
2) Remove left side engine undercover.
3) Drain CVT fluid.
4) Remove CVT oil pan (1) and oil pan gasket (2).



Installation

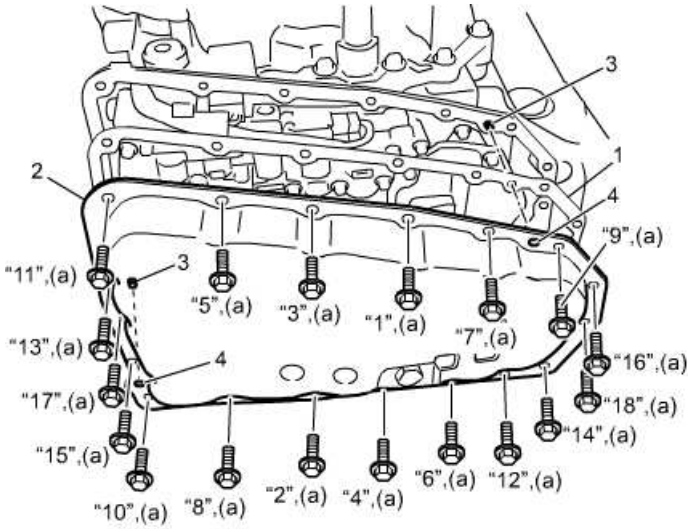
Reference: CVT Oil Pan Inspection

Reverse removal procedure noting the following points.
- Clean matching surface of CVT case and CVT oil pan. Remove CVT fluid, old gasket and dust from matching surface.
- Use new gasket (1) for CVT oil pan (2).
- Align the dowel pin (3) of CVT case and the dowel pin hole (4) of CVT oil pan, and then install CVT oil pan.
- Tighten CVT oil pan bolts in numerical order (“1” – “18”) evenly and gradually to specified torque.

CAUTION:
Be sure to use new oil pan bolts pre-coated with adhesive. Otherwise, bolts may loosen.

Tightening torque

CVT oil pan bolt* (a): 7.9 N·m (0.81 kg-m, 6.0 lbf-ft)



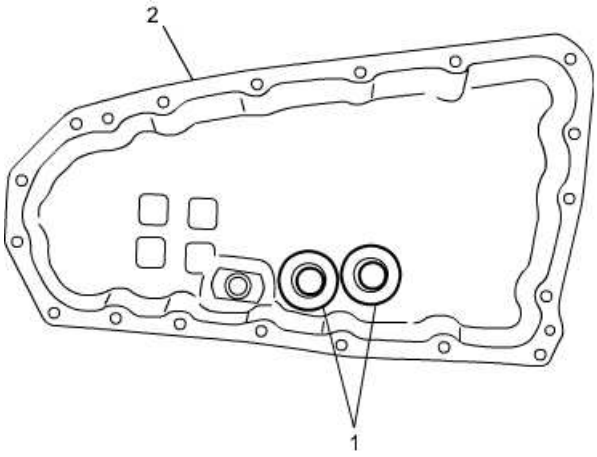
- Replenish CVT fluid. ☞
- Check CVT fluid level. ☞
- Check for CVT fluid leakage after warming up CVT.

5E

CVT Oil Pan Inspection

Reference: CVT Oil Pan Removal and Installation

- Check that no metal particle is attached to the oil cleaner magnets (1). If attached, clean it.
- Check CVT oil pan (2) for crack, deformation, and damage. If any defect is found, replace CVT oil pan.



5E

Transmission Range Sensor Inspection

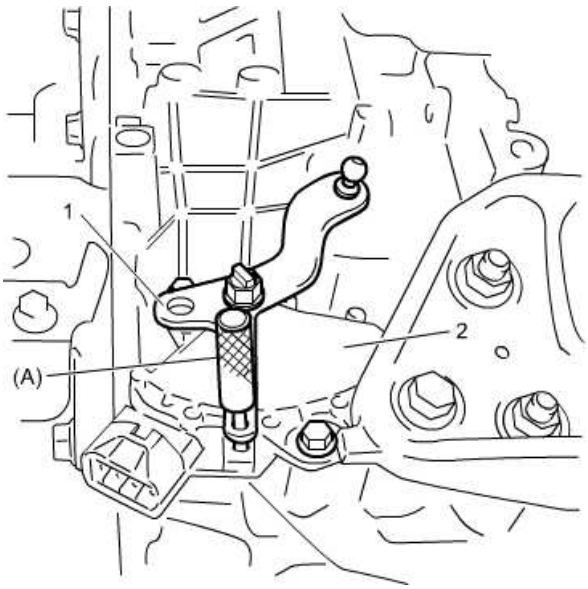
CAUTION:
Do not reuse transmission range sensor.
Reusing of transmission range sensor may affect the performance of CVT system.

1) Disconnect negative (–) cable at battery.

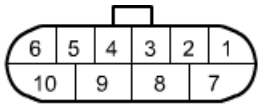
2) Remove air cleaner assembly. ☞

3) Shift select lever to "N" position and use special tool to check that aligning holes on manual select lever (1) and transmission range sensor (2) are aligned as shown in figure. If not, adjust transmission range sensor. ☞

Special Tool
(A): 09916–44310



4) Check for continuity between terminals of transmission range sensor connector over each range shown in figure.



		Terminal									
		1	2	3	4	5	6	7	8	9	10
Select lever position	P				○	○		○			○
	R				○				○		
	N				○					○	
								○			○
	D		○		○						

5E

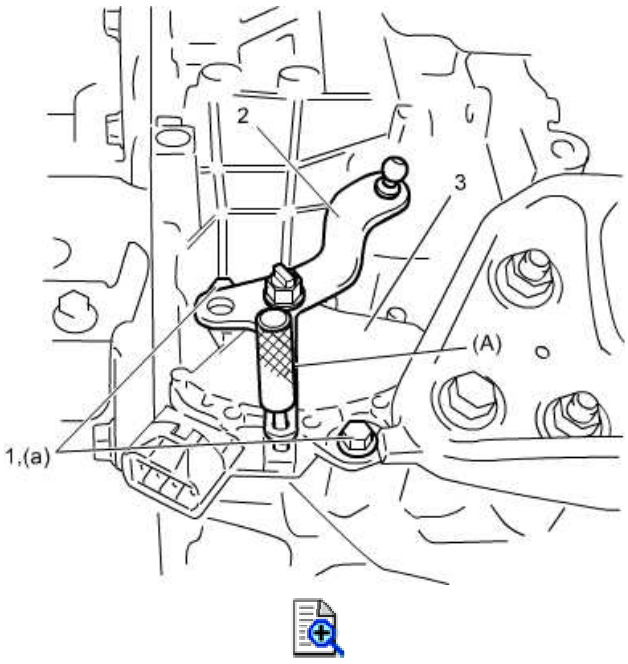
Transmission Range Sensor Adjustment

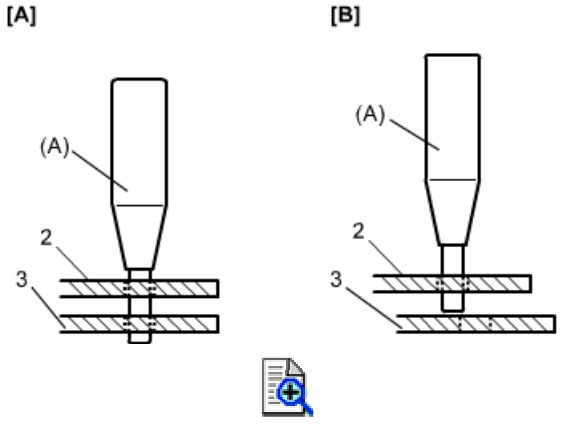
CAUTION:
Do not reuse transmission range sensor.
Reusing of transmission range sensor may affect the performance of CVT system.

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞
3) Shift select lever to "N" position and loosen transmission range sensor bolts (1).
4) Use special tool to align aligning holes on manual select lever (2) and transmission range sensor (3) as shown in figure.
5) Tighten transmission range sensor bolts to specified torque.

Special Tool
(A): 09916–44310

Tightening torque
Transmission range sensor bolt (a): 5.9 N·m (0.60 kg-m, 4.5 lbf-ft)





[A]: OK

[B]: NG

6) Check transmission range sensor for the following points.
- Check engine starts at "P" and "N" ranges but does not start at other than "P" and "N" ranges.
- Perform ***"P" Range Test***.
- Check back-up light is turned on when shifting select lever to "R" range.
- Check shift position indicated in information display is consistent with select lever range.

Transmission Range Sensor Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.

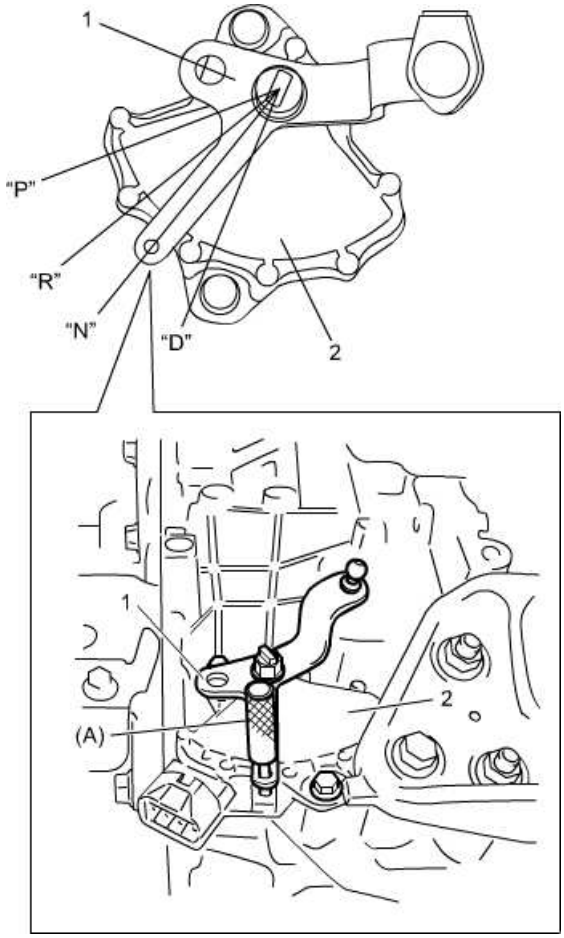
2) Remove air cleaner assembly. ☞

3) Shift manual select lever (1) to "N" position.
Insert special tool to aligning hole on manual select lever (1) and check that the position of aligning hole on transmission range sensor (2) as shown in figure.

4) Remove clip of select cable and disconnect select cable from manual select lever. ☞

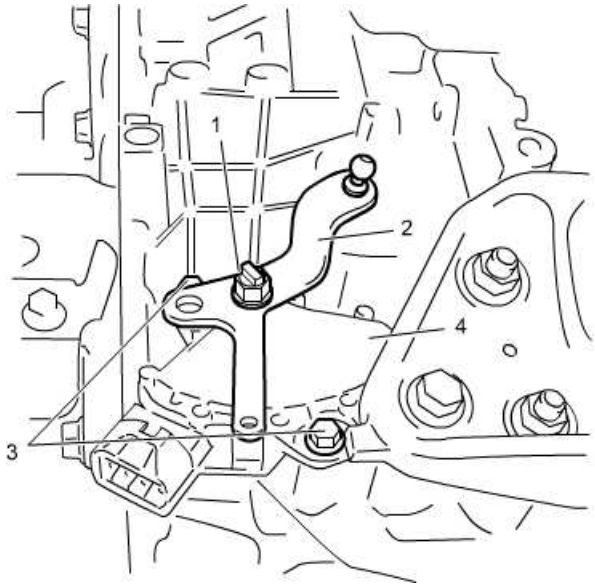
Special Tool
(A): 09916–44310

5) Disconnect transmission range sensor connector.



6) Remove manual select lever nut (1) and manual select lever (2).

7) Remove transmission range sensor bolts (3) and transmission range sensor (4).



Installation

Reference: Transmission Range Sensor Inspection

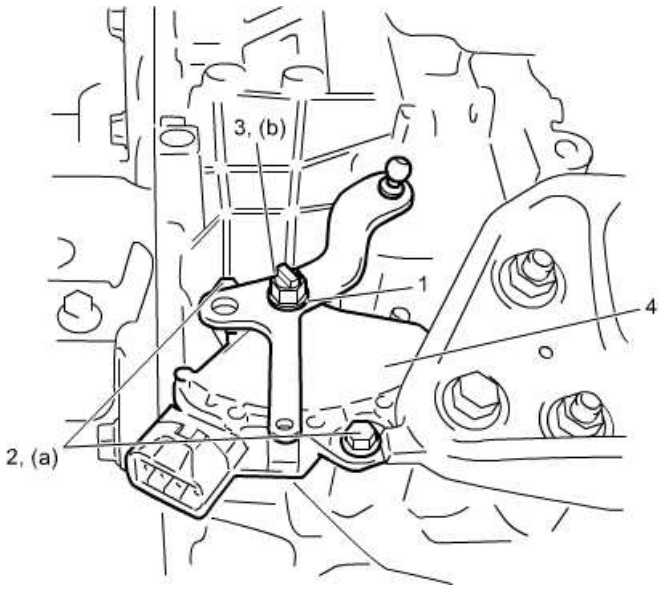
CAUTION:
Do not reuse transmission range sensor.
Reusing of transmission range sensor may affect the performance of CVT system.

Reverse removal procedure noting the following points.

- Adjust select cable. ☞
- Use new transmission range sensor (4).
- Use new washer (1).
- Adjust transmission range sensor. ☞
- Tighten transmission range sensor bolts (2) and new manual select lever nut (3) to specified torque.

Tightening torque

Transmission range sensor bolt (a): 5.9 N·m (0.60 kg-m, 4.5 lbf-ft)
Manual select lever nut (b): 17 N·m (1.7 kg-m, 12.5 lbf-ft)


3, (b)
1
4
2, (a)

Primary Pulley Speed Sensor Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.

2) Remove air cleaner inlet hose. ☞

3) Disconnect connector (1) from primary pulley speed sensor.

4) Remove primary pulley speed sensor (3) from transaxle by removing primary pulley speed sensor bolt (2).

Installation

Reference: Primary Pulley Speed Sensor and Secondary Pulley Speed Sensor Inspection

Reverse removal procedure noting the following points.

- Apply CVT fluid to new O-ring of sensor.
- Tighten primary pulley speed sensor bolt to specified torque.

Tightening torque

Primary pulley speed sensor bolt (a): 5.9 N·m (0.60 kg-m, 4.5 lbf-ft)

- Connect connector and fix wire harness with clamp securely.

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Secondary Pulley Speed Sensor Removal and Installation

CAUTION:
Be careful not to drop washer when removing and installing secondary pulley speed sensor.

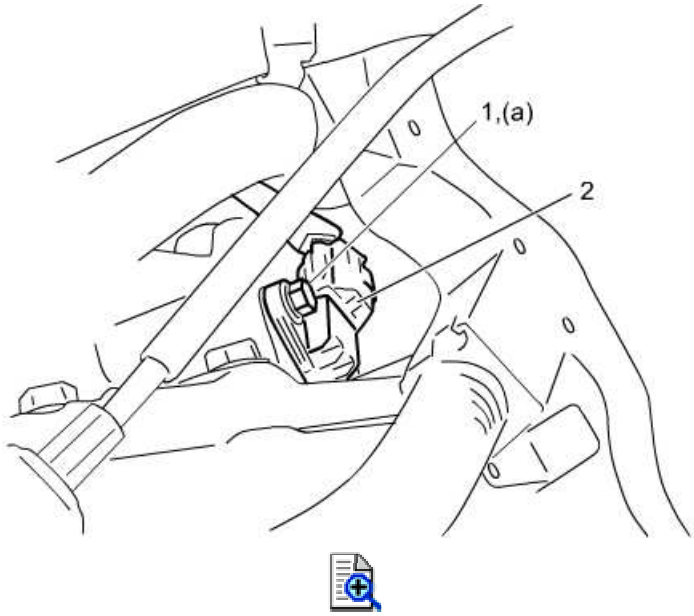
Removal

1) Disconnect negative (–) cable at battery.
2) Remove air cleaner assembly. ☞
3) Disconnect connector from secondary pulley speed sensor.
4) Remove secondary pulley speed sensor (2) from transaxle by removing secondary pulley speed sensor bolt (1).

Installation

Reference: Primary Pulley Speed Sensor and Secondary Pulley Speed Sensor Inspection
Reverse removal procedure noting the following points.
- Apply CVT fluid to new O-ring of sensor.
- Tighten secondary pulley speed sensor bolt to specified torque.

Tightening torque
Secondary pulley speed sensor bolt (a): 5.9 N·m (0.60 kg-m, 4.5 lbf-ft)



- Connect connector and fix wire harness with clamp securely.

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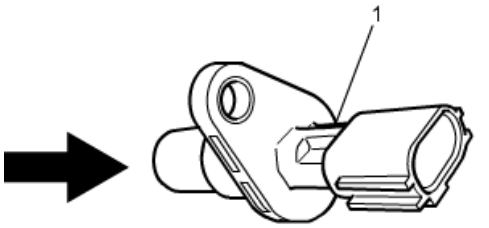
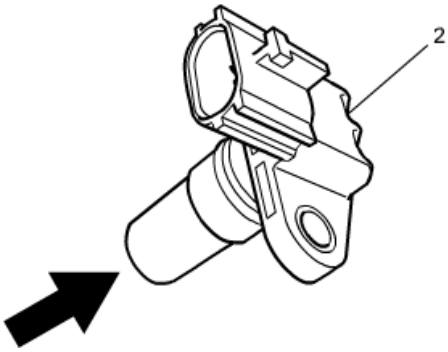
Primary Pulley Speed Sensor and Secondary Pulley Speed Sensor Inspection

Reference: Primary Pulley Speed Sensor Removal and Installation
Reference: Secondary Pulley Speed Sensor Removal and Installation

1) Check the following points:
- O-ring is free of damage.
- End face of sensor is free of any metal particles and damage.

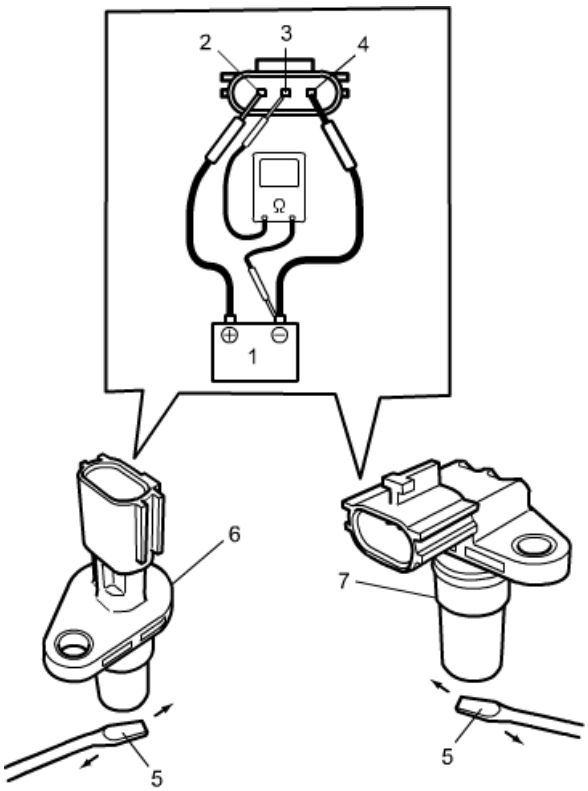




1.	Primary pulley speed sensor
2.	Secondary pulley speed sensor

2) Check sensors by the following procedure:
a) Arrange 12 V battery (1) and connect its positive terminal to terminal "2" (2) and negative terminal to terminal "4" (4) of primary pulley speed sensor connector or secondary pulley speed sensor connector.
b) Use ohmmeter to measure resistance between terminal "3" (3) of sensor connector and negative terminal of battery by passing flat-end screwdriver or the like (5) between them while maintaining an approximately 1 mm (0.03 in) gap with respect to end face of primary pulley speed sensor (6) or secondary pulley speed sensor (7).

Primary pulley speed sensor and secondary pulley speed sensor resistance
Less than 220 Ω (ON) ←→ Infinity (OFF)



3) If resistance does not vary, replace primary pulley speed sensor or secondary pulley speed sensor.

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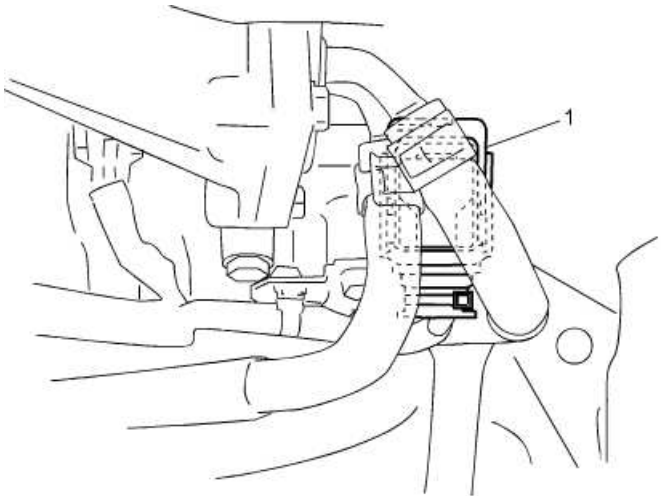
Solenoid Valve On-Vehicle Inspection

NOTE:
Do not remove valve body from CVT assembly. If faulty condition is found, replace CVT assembly.

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) from solenoid harness.



3) Check for proper terminal connection to solenoid connector.
4) Check resistance of each solenoid valve and its circuit.
If faulty condition is found, replace CVT assembly.

Line pressure control solenoid valve resistance: [A]

Between line pressure control solenoid valve terminal "8" and CVT case: 3.0 – 9.0 Ω at 20 °C (68 °F)

Secondary pressure control solenoid valve resistance: [B]

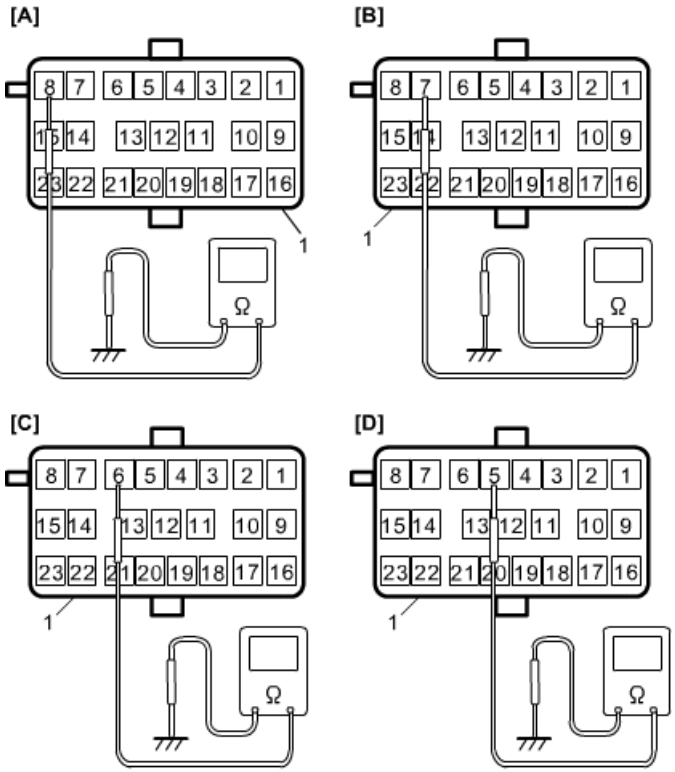
Between secondary pressure control solenoid valve terminal "7" and CVT case: 3.0 – 9.0 Ω at 20 °C (68 °F)

TCC solenoid valve resistance: [C]

Between TCC solenoid valve terminal "6" and CVT case: 3.0 – 9.0 Ω at 20 °C (68 °F)

Lock-up / select switching solenoid valve resistance: [D]

Between Lock-up / select switching solenoid valve terminal "5" and CVT case: 17 – 38 Ω at 20 °C (68 °F)


[A]
8 7 6 5 4 3 2 1
15 14 13 12 11 10 9
23 22 21 20 19 18 17 16
1
Ω
[B]
8 7 6 5 4 3 2 1
15 14 13 12 11 10 9
23 22 21 20 19 18 17 16
1
Ω
[C]
8 7 6 5 4 3 2 1
15 14 13 12 11 10 9
23 22 21 20 19 18 17 16
1
Ω
[D]
8 7 6 5 4 3 2 1
15 14 13 12 11 10 9
23 22 21 20 19 18 17 16
1
Ω

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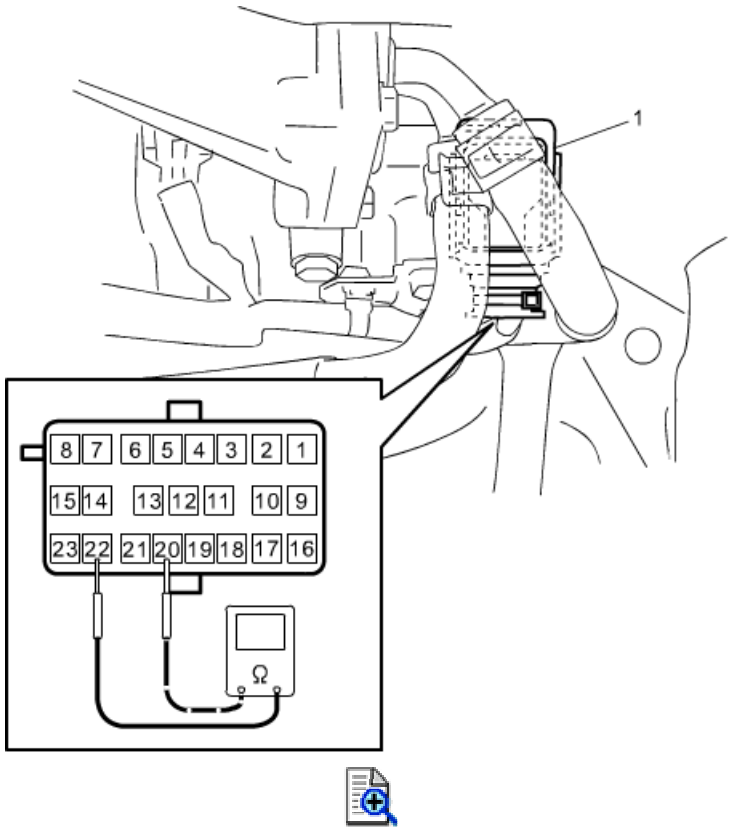
CVT Fluid Temperature Sensor On-Vehicle Inspection

NOTE:
Do not remove CVT fluid temperature sensor from CVT assembly. If faulty condition is found, replace CVT assembly.

1) Disconnect negative (–) cable at battery.
2) Disconnect connector (1) from solenoid harness.
3) Check for proper terminal connection to solenoid harness connector.
4) Check resistance of CVT fluid temperature sensor and its circuit between terminals "20" and "22" at connector of solenoid harness.
If faulty condition is found, replace CVT assembly.

CVT fluid temperature sensor resistance:

20 °C (68 °F): Approx. 6.5 kΩ
80 °C (176 °F): Approx. 0.9 kΩ



5E

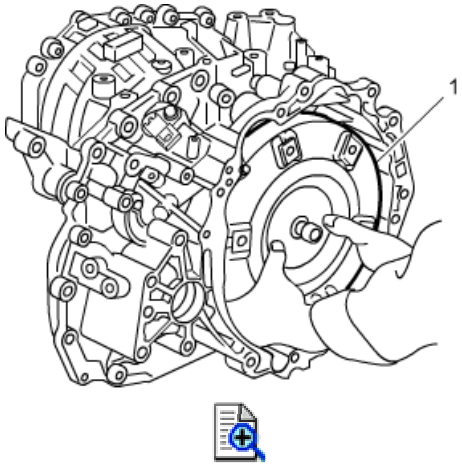
Input Shaft Oil Seal Replacement

CAUTION:
Be careful to handle aluminum parts so as not to damage them.

NOTE:
- **Thoroughly clean CVT assembly exterior before servicing it.**
- **Keep working table, tools and hands clean while servicing.**
- **Do not expose removed parts to dust.**
  Keep them always clean.

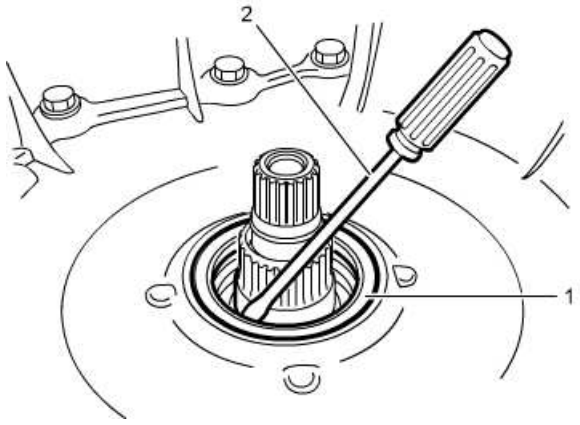
1) Dismount CVT assembly. ☞

2) Remove torque converter (1) from CVT assembly.



3) Remove input shaft oil seal (1) by using flat-end screwdriver or the like (2).

CAUTION:
When removing oil seal, be careful not to scratch the oil seal press-fit part of transaxle housing. Otherwise CVT fluid may cause leakage.



4) Apply grease to new input shaft oil seal lip.
: Grease 99000–25030 (SUZUKI Super Grease C)

5) Using special tool, install input shaft oil seal (1) at specified position as shown in figure.
Special Tool

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Differential Side Oil Seal Replacement

1) Hoist vehicle and drain CVT fluid. ☞

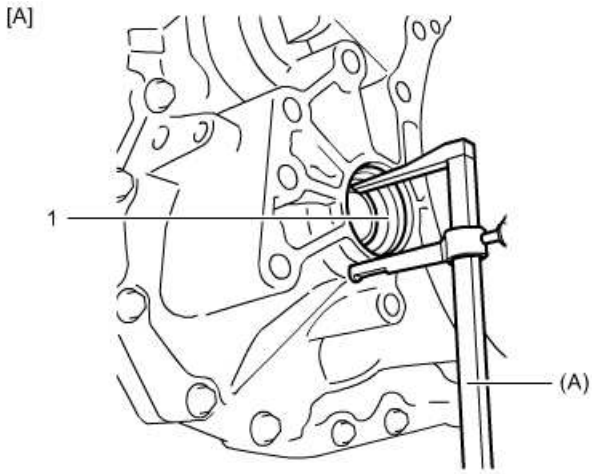
2) Remove drive shaft joints from differential gear of transaxle. Refer to ***Front Drive Shaft Assembly Removal and Installation:Front*** for procedure to disconnect drive shaft joints.

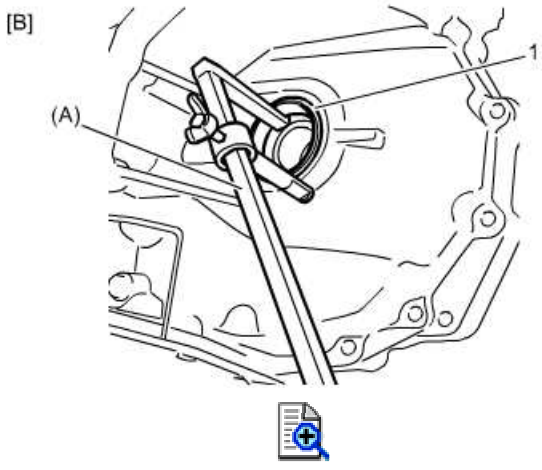
NOTE:
For differential side oil seal removal, it is not necessary to remove drive shafts from steering knuckle.

3) Remove differential side oil seal (1) using special tool.

Special Tool
(A): 09913–50121

CAUTION:
When removing oil seal, be careful not to scratch the oil seal press-fit part of transaxle housing. Otherwise, CVT fluid may cause leakage.





[A]:	Right side
[B]:	Left side

4) Apply grease to new differential side oil seal lip.

: Grease 99000–25030 (SUZUKI Super Grease C)

5) Using special tool, install new differential side oil seals (1) at specified position as shown in figure.

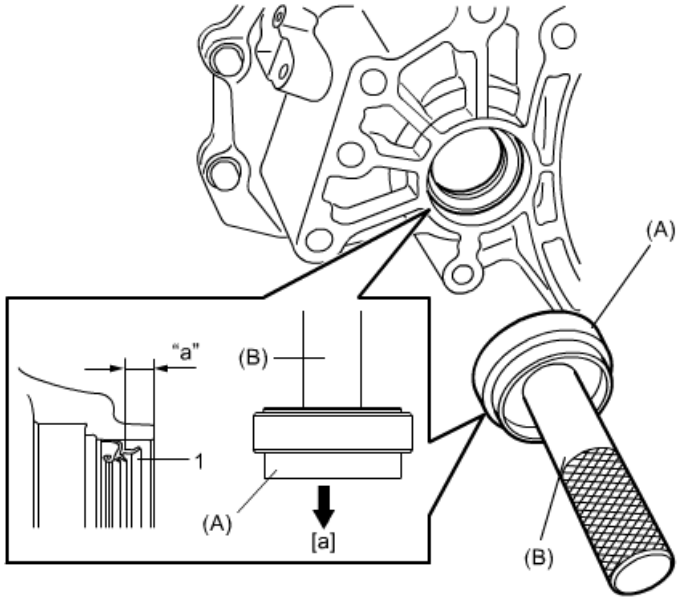
Special Tool

(A): 09925–17910
(B): 09924–74510

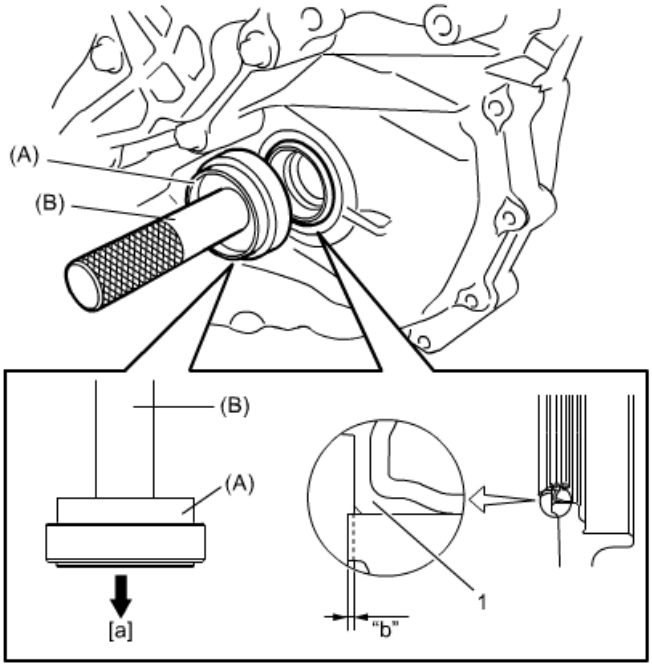
Differential side oil seal installing depth

Right side "a": 9.2 – 10.2 mm (0.363 – 0.401 in.) (2WD model)
Left side "b": 1.3 – 2.3 mm (0.052 – 0.090 in.)

[A]



[B]

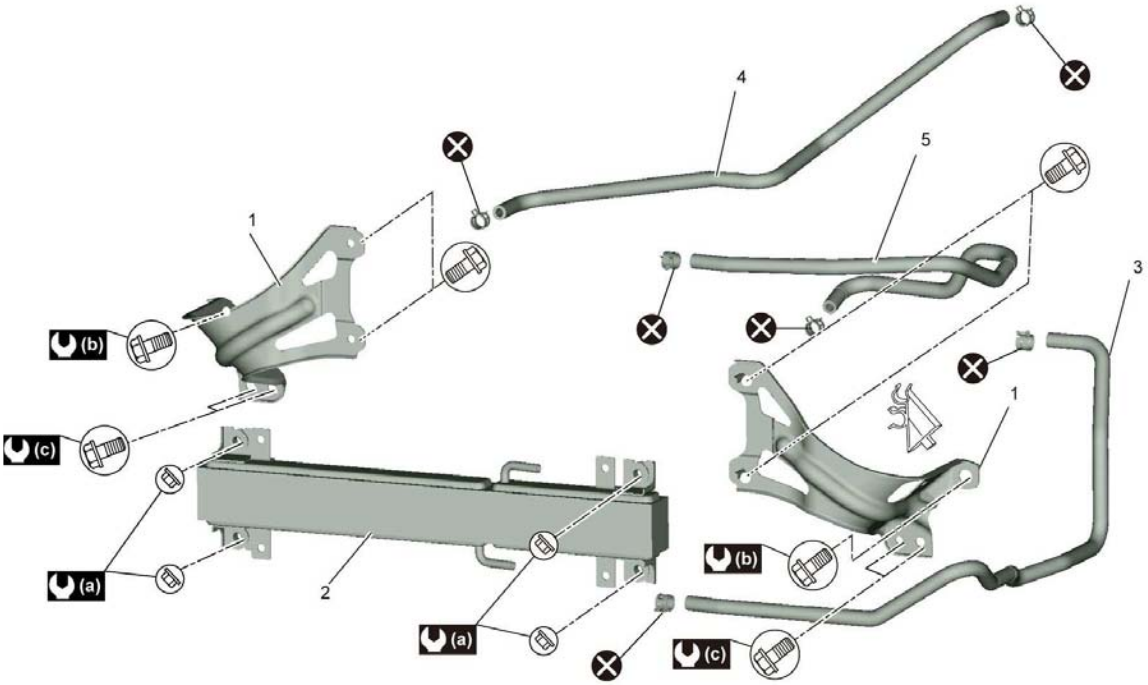


[A]: Right side	[a]: Oil seal installing direction
[B]: Left side	

6) Install drive shaft. ☞
7) Replenish CVT fluid. ☞
8) Check CVT fluid level. ☞
9) Check for fluid leakage.

5E

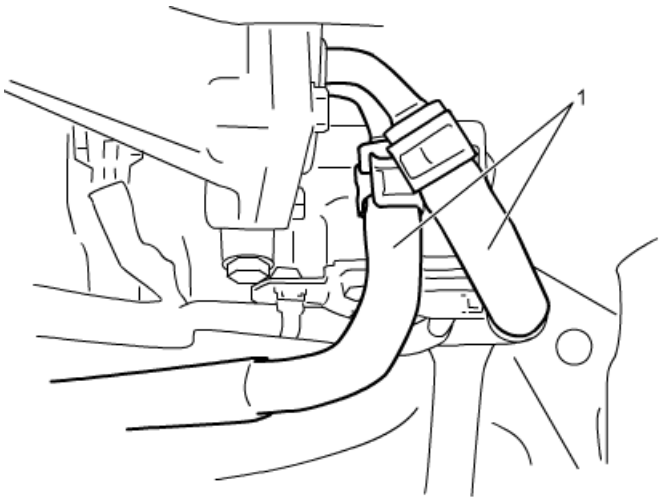
CVT Fluid Cooler Components



1. CVT fluid cooler bracket	4. CVT fluid cooler hose No.2	(b): 85 N·m (8.7 kgf-m, 63.0 lbf-ft)
2. CVT fluid cooler	5. CVT fluid cooler hose No.3	(c): 20 N·m (2.0 kgf-m, 15.0 lbf-ft)
3. CVT fluid cooler hose No.1	(a): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)	: Do not reuse.

CVT Fluid Cooler and CVT Fluid Cooler Hoses Inspection

Check CVT fluid cooler and CVT fluid cooler hoses (1) for fluid leakage, cracks, damage and deterioration. Replace CVT fluid cooler, CVT fluid cooler hose and/or clamp if any faulty condition is found.



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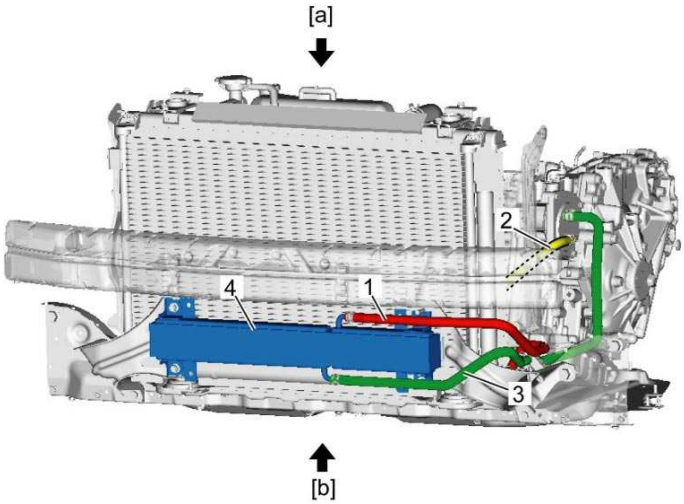
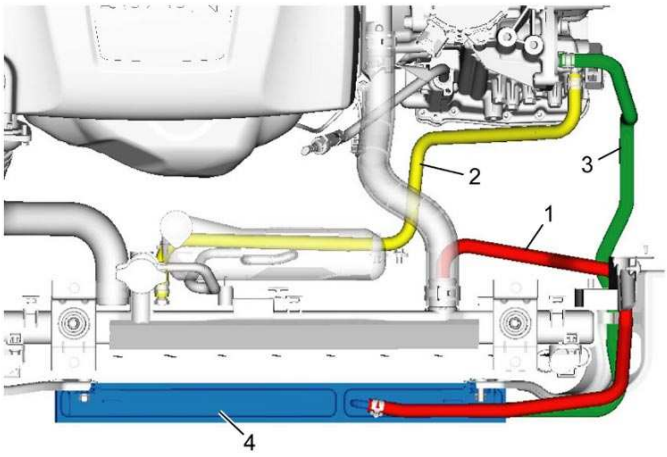
CVT Fluid Cooler Hoses Replacement

Rubber hoses for CVT fluid cooler should be checked at specified interval. If replacing them, be sure to note the following points.

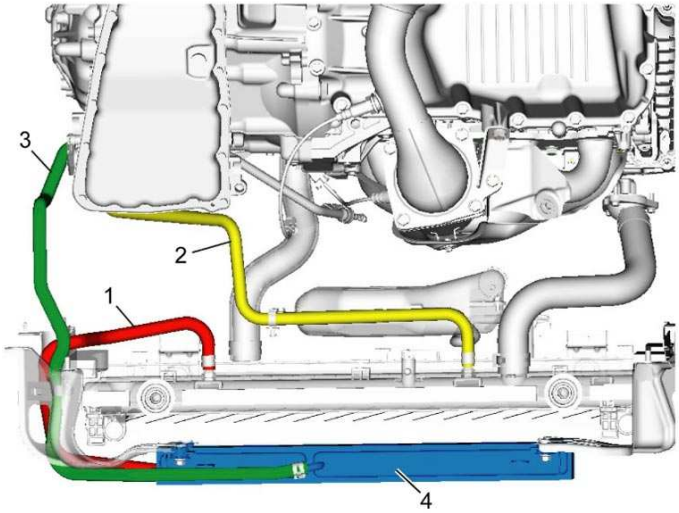
- Remove front bumper, if necessary. ☞
- Replace clamps with new ones at the same time.
- Clamp new clamps securely.



[A]



[B]



[A]: View: [a]	2. CVT fluid cooler No.2 hose
[B]: View: [b]	3. CVT fluid cooler No.1 hose
1. CVT fluid cooler No.3 hose	4. CVT fluid cooler

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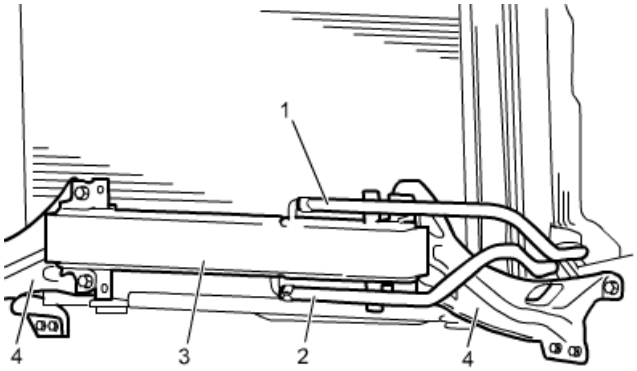
CVT Fluid Cooler Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect CVT fluid cooler No.1 hose (2) and No.3 hose (1).
3) Remove CVT fluid cooler bolts, and then remove CVT fluid cooler (3).
4) Remove fluid cooler bracket (4), if necessary.



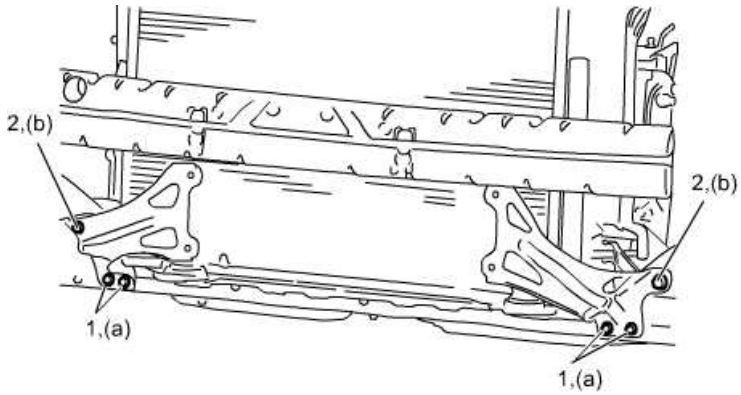
Installation

Reverse removal procedure noting the following points.

- Tighten CVT fluid cooler bracket bolts, if removed.

Tightening torque

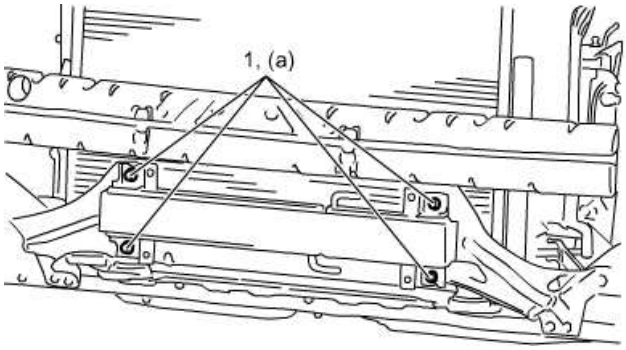
CVT fluid cooler bracket bolt No.1 (a): 20 N·m (2.0 kg-m, 15.0 lbf-ft)
CVT fluid cooler bracket bolt No.2 (b): 85 N·m (8.7 kg-m, 63.0 lbf-ft)



- Tighten CVT fluid cooler bolts (1) to specified torque.

Tightening torque

CVT fluid cooler bolt (a): 13 N·m (1.3 kg-m, 9.5 lbf-ft)



- Clamp new clamps securely.
- Refill CVT fluid. ☞
- Check CVT fluid level. ☞
- After installation, check CVT fluid leakage each connection.

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Tightening Torque Specifications

CAUTION:
For fastener with * (asterisk) below, be sure to tighten it according to specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fluid pressure check hole bolt	7.5	0.76	5.5	☞
CVT fluid drain plug	34	3.5	25.0	☞
Torque converter No.1 bolt	23	2.3	17.0	☞
Torque converter No.2 bolt	23	2.3	17.0	☞
CVT oil pan bolt*	7.9	0.81	6.0	☞
Transmission range sensor bolt	5.9	0.60	4.5	☞ ☞
Manual select lever nut	17	1.7	12.5	☞
Primary pulley speed sensor bolt	5.9	0.60	4.5	☞
Secondary pulley speed sensor bolt	5.9	0.60	4.5	☞
CVT fluid cooler bracket bolt No.1	20	2.0	15.0	☞
CVT fluid cooler bracket bolt No.2	85	8.7	63.0	☞
CVT fluid cooler bolt	13	1.3	9.5	☞

NOTE:
The specified tightening torque is described in the following.
Select Lever Assembly Components
Select Cable Components
CVT Assembly Components
CVT Fluid Cooler Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

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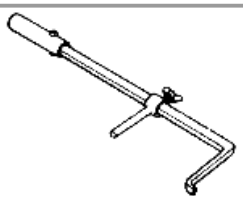
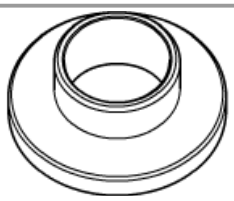
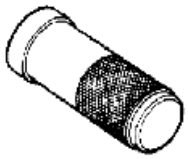
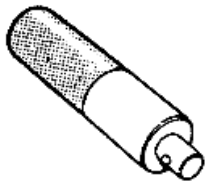
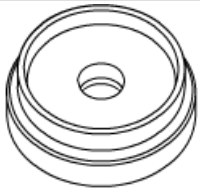
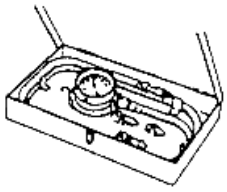
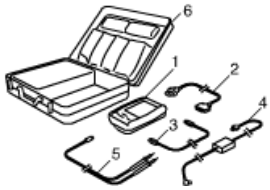
Recommended Service Material

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞
	SUZUKI Super Grease C	P/No.: 99000–25030	☞ ☞

NOTE:
Required service material is also described in the following.
Select Cable Components
CVT Assembly Components

5E

Special Tool

09913–50121 Oil seal remover 	09914–87910 Oil seal installer 
09916–44310 Valve guide remover (5 mm) 	09922–59420 Installer handle 
09924–74510 Bearing and oil seal handle 	09925–17910 Oil seal installer 
09925–37910 Oil pressure gauge 	SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case 

1C

ECM Removal and Installation

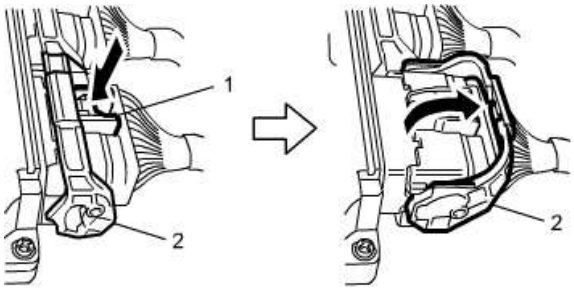
CAUTION:
As ECM consists of precision parts, be careful not to expose it to excessive shock.

NOTE:
After ECM is replaced with new one, perform *Procedure after ECM Replacement*.

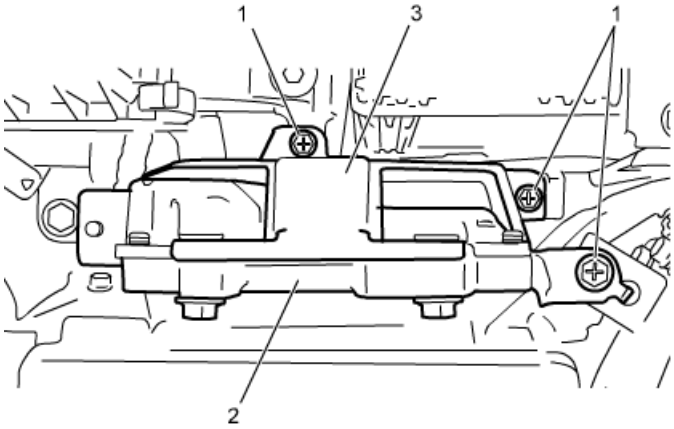
Removal

1) Disconnect negative (–) cable at battery.

2) Disconnect connectors from ECM as follows.
a) Push lock (1) to release locking of lock lever (2).
b) Turn lock lever in arrow direction until it stops.



3) Remove ECM (2) and bracket (3) from front fender bracket and battery tray by removing their mounting bolts (1).



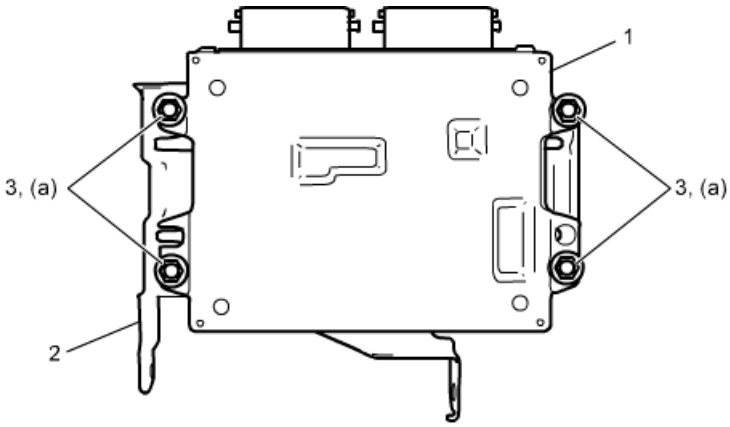
4) Remove ECM from bracket by removing ECM mounting nuts.

Installation

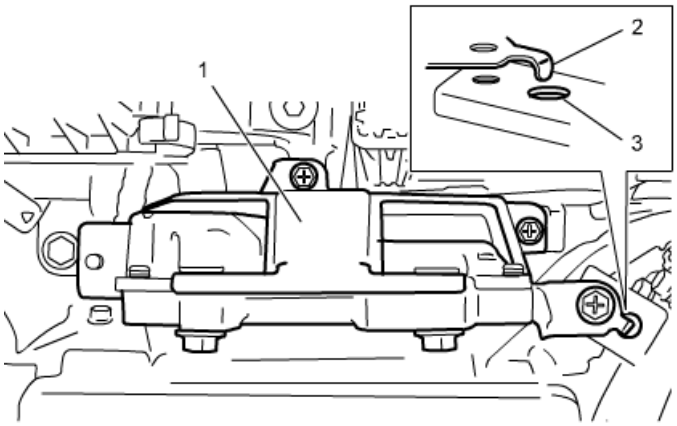
1) Install ECM (1) to bracket (2).

2) Tighten ECM mounting nuts (3) to specified torque.

Tightening torque
ECM mounting nut (a): 5.5 N·m (0.56 kg-m, 4.0 lbf-ft)

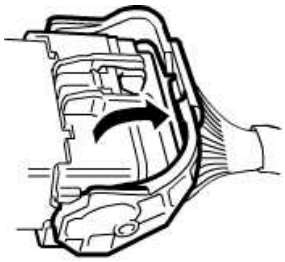


3) Install ECM and bracket (1) to front fender bracket and battery tray aligning its locating pin (2) of front fender bracket with fitting hole (3).

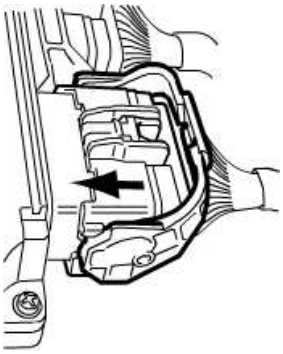


4) Connect connectors to ECM as follows.

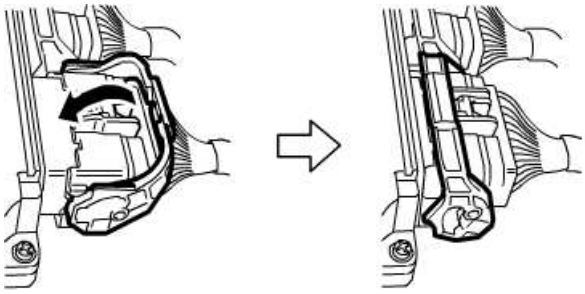
a) Make sure that lock lever of ECM connector is in unlock position.



b) Insert ECM connectors to ECM until it stops.



c) Lock ECM connectors securely by setting their lock levers in their locked position.



5) Perform electric throttle control system calibration. ☞

1C

Procedure after ECM Replacement

CAUTION:
When ECM is replaced with new one, check the following conditions. Neglecting this check may cause damage to ECM.
- **Resistance value of all relays, actuators are as specified respectively.**
- **APP sensor, TP sensor, A/C refrigerant pressure sensor and EVAP leak check pressure sensor are in good condition and none of power circuits of these sensors is shorted to ground.**

NOTE:
- **Check and record BCM for DTC before programming the calibration data to ECM because DTC B1691, B1693 and B1695 may be detected in BCM as history DTC after performing the programming to ECM. Then, repair BCM for detected DTC if necessary. However, it is normal even if those DTC are detected in BCM after performing the programming to ECM. Therefore, clear DTC for BCM after performing the programming to ECM.**
- **When ECM and keyless start control module are replaced with new ones at the same time, perform "Immobilizer Key Registration" instead of "ECM Registration" using SUZUKI scan tool and immobilizer cable. Refer to "SUZUKI SDT Immobilizer Control System Operator's Manual" for the immobilizer registration.**

After ECM is replaced with new one, perform the following procedures:

1) Program calibration data to ECM. Refer to "Suzuki ECU Programming System Operator's Manual".

2) Register VIN data to ECM. ☞

3) Perform "ECM Registration". ☞

4) Perform electric throttle control system calibration. ☞

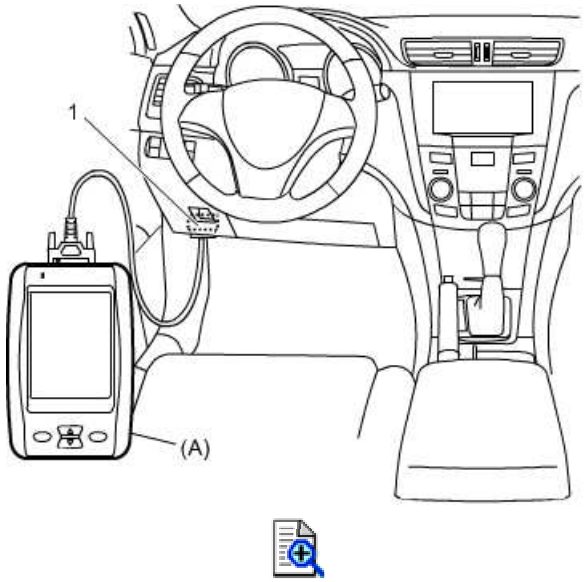
1C

VIN Registration

1) With ignition mode of keyless push start system in "OFF", connect SUZUKI scan tool to DLC (1) located on underside of instrument panel at driver's seat side.

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



2) Check VIN shown on the left side of the instrument panel.

3) Push engine switch to change the ignition mode to "ON".

4) Select "VIN Registration" mode of SUZUKI scan tool.

5) Register VIN according to the instructions indicated on the SUZUKI scan tool.

NOTE:
For further details, refer to the operator's manual for SUZUKI scan tool.

6) Before completing VIN registration, confirm that VIN data indicated on SUZUKI scan tool is correct. If not, re-register VIN data into ECM correctly.

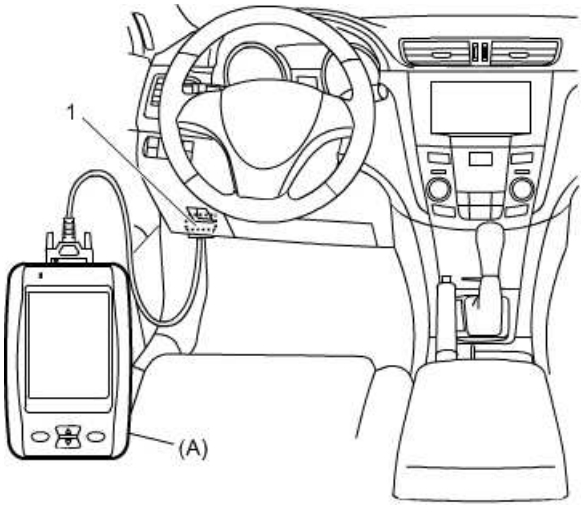
1C

Registered VIN Data Check

1) With ignition mode of keyless push start system in "OFF", connect SUZUKI scan tool to DLC (1) located on underside of instrument panel at driver's seat side.

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



2) Push engine switch to change ignition mode to "ON".

3) Select "VIN Registration" mode of SUZUKI scan tool.

4) Confirm whether code of 17 digits displayed on SUZUKI scan tool is corresponding to VIN shown on the left side of the instrument panel. If displayed VIN does not correspond to instrument panel VIN, register VIN data into ECM referring to ***VIN Registration***.

5) Push "EXIT" button of SUZUKI scan tool.

1C

Electric Throttle Body Assembly On-Vehicle Inspection

WARNING:
Never touch throttle valve with finger while ignition mode of keyless push start system is in "ON" and accelerator pedal is depressed. Otherwise, injury may result from getting a finger caught between throttle valve and throttle body.

CAUTION:
- **Do not disassemble electric throttle body assembly.**
- **Do not drop electric throttle body assembly or subject it to strong impact. If the electric throttle body assembly is subjected to strong impact it must be replaced.**
- **Be careful to prevent foreign materials such as dust or metallic particles from coming into contact with throttle body and throttle valve. Otherwise, electric throttle body assembly will break down by throttle valve accretion.**
- **Do not apply excessive force to throttle valve for throttle valve operation check and TP sensor performance check. Otherwise, electric throttle body assembly will break down by damaging internal resinous gear of throttle valve actuator.**

NOTE:
After replacing electric throttle body assembly, calibrate throttle valve position. ☞

Throttle Valve Visual Check

1) Remove air cleaner outlet hose with ignition mode of keyless push start system in "OFF". ☞

2) Check that there is not any foreign materials caught between throttle valve and throttle body. If there is, take it out after removing throttle body and clean inside of throttle body thoroughly. ☞

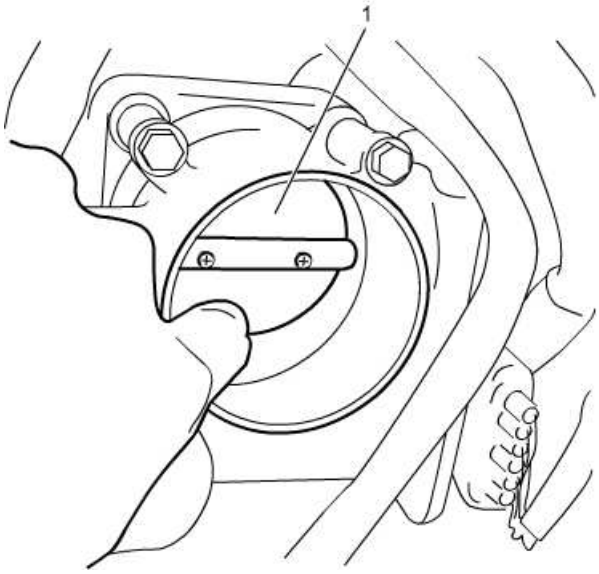
Throttle Valve Operation Check

1) Remove air cleaner outlet hose with ignition mode of keyless push start system in "OFF". ☞

2) Disconnect connector from electric throttle body assembly.

3) Check throttle valve operation as follows.
If faulty condition is found, replace throttle body. ☞

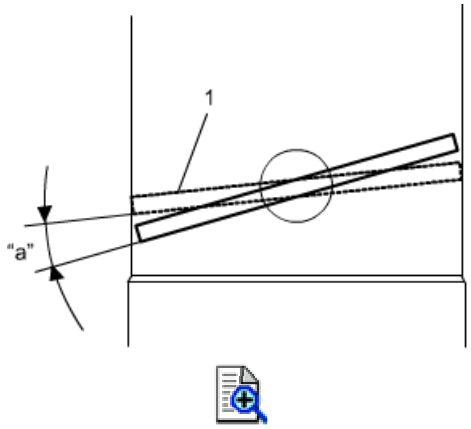
a) Check that throttle valve (1) moves smoothly from fully closed position and fully open position with finger.



b) Check that throttle valve returns to default position.

Throttle valve default position "a":

7° from completely closed position (1)



Electric Throttle Body System Operation Check

1) Remove air cleaner outlet hose with ignition mode of keyless push start system in "OFF".

2) Push engine switch to change the ignition mode to "ON".

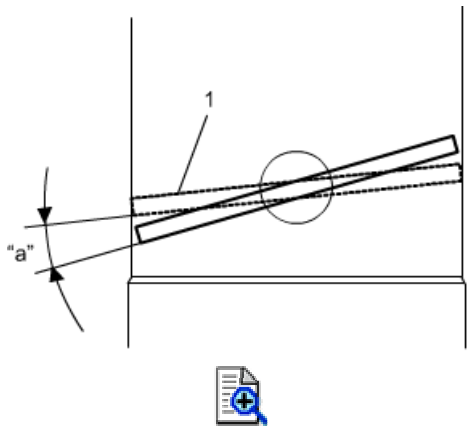
3) Check electric throttle body system as follows.
If faulty condition is found, go to step 4).

a) Depress accelerator pedal gradually and check that throttle valve moves smoothly until it opens fully.

b) Release accelerator pedal and check that throttle valve moves back to applicable position.

Throttle valve opening angle "a":

3 to 15° from completely closed position (1)



4) Check the following points:
If check results are not satisfactory, replace throttle body assembly.
- Wire harness and connections
- APP sensor: ☞
- TP sensor: ☞
- Throttle motor: ☞

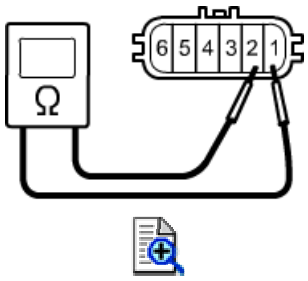
Throttle Motor Check

1) Disconnect connector from electric throttle body assembly with ignition mode of keyless push start system in "OFF".

2) Measure resistance between terminals "1" and "2" of throttle body assembly.
If faulty condition is found, replace electric throttle body assembly. ☞

Throttle motor resistance

0.3 – 100 Ω at 20 °C (68 °F)



Throttle Position (TP) Sensor Performance Check

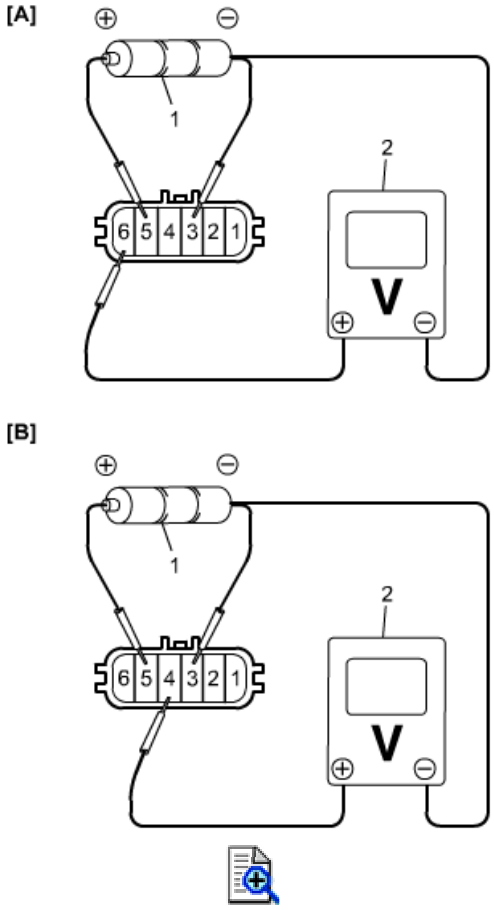
1) Remove air cleaner outlet hose with ignition mode of keyless push start system in "OFF". ☞

2) Disconnect connector from electric throttle body assembly.

3) Check TP sensor (main and sub) output voltage as follows.
If faulty condition is found, replace throttle body. ☞

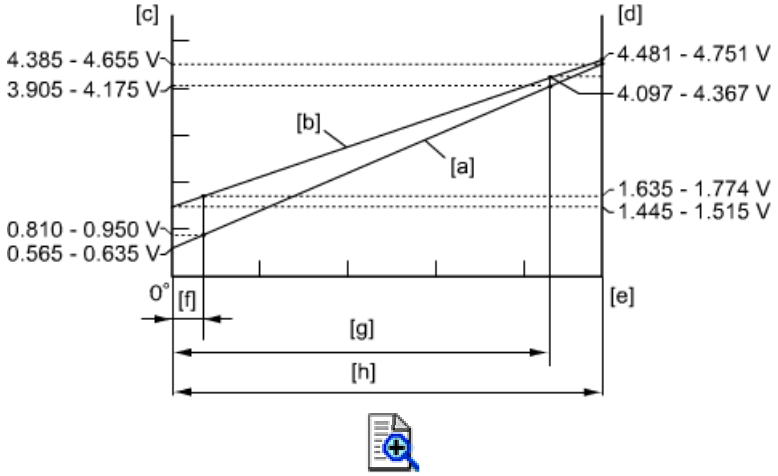
a) Connect 3 new 1.5 V batteries (1) in series and check that total voltage is 4.5 – 5.0 V.

b) Connect voltmeter (2) and batteries to TP sensor as shown in figure.



[A]:	TP sensor (main)
[B]:	TP sensor (sub)

c) Check that voltage varies depending on throttle opening angle as shown in figure while throttle valve is opened and closed by finger.



[a]:	TP sensor (main) voltage
[b]:	TP sensor (sub) voltage
[c]:	TP sensor (main) output voltage

[d]:	TP sensor (sub) output voltage
[e]:	Throttle valve opening
[f]:	Position where throttle valve is open by 7° from completely closed position (default position)
[g]:	Angle obtained when accelerator pedal is depressed fully (86°)
[h]:	Angle obtained when throttle valve is fully opened with finger (98°)

1C

Electric Throttle Control System Calibration

1) It is necessary to perform calibration when carrying out any of the "job details" listed below. The calibration procedures differ depending on the job being carried out. Select the proper calibration procedure from the table below, and then perform calibration.

Job details	Procedure
• ECM power supply shutoff (i.e. disconnection of battery cable, replacement of battery, "DOME" fuse or "B/U" fuse blown) • ECM replacement • Clearance of DTC(s) related to electric throttle control system	[A]
• Throttle body assembly replacement • APP sensor assembly replacement	[B]

2) Perform selected calibration procedure as follows.

Calibration procedure [A]:

a) Push engine switch to change the ignition mode to "ON" without depressing brake pedal (CVT model) or clutch pedal (M/T model) and leave the ignition mode in "ON" for 5 sec. or more.

Calibration procedure [B]:

a) Disconnect negative cable from battery.

b) Disconnect ECM connectors for 30 seconds or more to clear calibration data of closed throttle position from ECM.

c) Connect ECM connectors and connect negative cable to battery.

d) Push engine switch to change the ignition mode to "ON" without depressing brake pedal (CVT model) or clutch pedal (M/T model) and leave the ignition mode in "ON" for 5 sec. or more.

1C

APP Sensor On-Vehicle Inspection

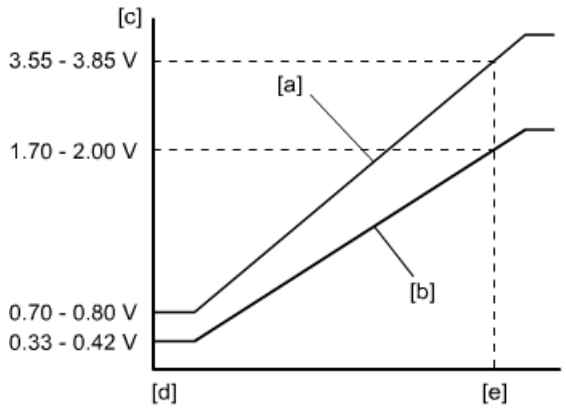
CAUTION:
- **Do not drop accelerator pedal assembly or subject it to strong impact. If the accelerator pedal assembly (incorporating APP sensor) is subjected to strong impact it must be replaced.**
- **Be careful not to expose sensor section of accelerator pedal assembly (incorporating APP sensor) to water and oil.**
- **Do not disassemble accelerator pedal assembly (incorporating APP sensor).**

1) Check that accelerator pedal assembly (incorporating APP sensor) has been mounted to vehicle body properly (no pinched floor carpet, etc.).
Reinstall accelerator pedal assembly (incorporating APP sensor) if it is not properly mounted. ☞

2) Connect SUZUKI scan tool to DLC with ignition mode of keyless push start system in "OFF".

3) Push engine switch to change the ignition mode to "ON", select "Data List" mode on SUZUKI scan tool.

4) Check that voltage varies depending on accelerator position as the following graph.
If faulty condition is found, check the following points:
- Wire harness and connections
- APP sensor: ☞



[a]:	APP sensor (main) voltage
[b]:	APP sensor (sub) voltage
[c]:	Voltage
[d]:	Accelerator pedal: Idle position
[e]:	Accelerator pedal: Fully depressed position

1C

Accelerator Pedal Assembly (Incorporating APP Sensor) Removal and Installation

CAUTION:
- **Do not drop accelerator pedal assembly or subject it to strong impact. If the accelerator pedal assembly is subjected to strong impact it must be replaced.**
- **Be careful not to expose sensor section of accelerator pedal assembly (incorporating APP sensor) to water and oil.**
- **Do not disassemble accelerator pedal assembly (incorporating APP sensor).**

NOTE:
After replacing accelerator pedal assembly (incorporating APP sensor), calibrate throttle valve position.

Removal

1) Disconnect negative (–) cable at battery.
2) Remove instrument panel undercover. ☞
3) Disconnect connector from accelerator pedal assembly (incorporating APP sensor).
4) Remove accelerator pedal assembly (incorporating APP sensor) from its bracket.
5) Remove accelerator pedal assembly bracket from vehicle body.

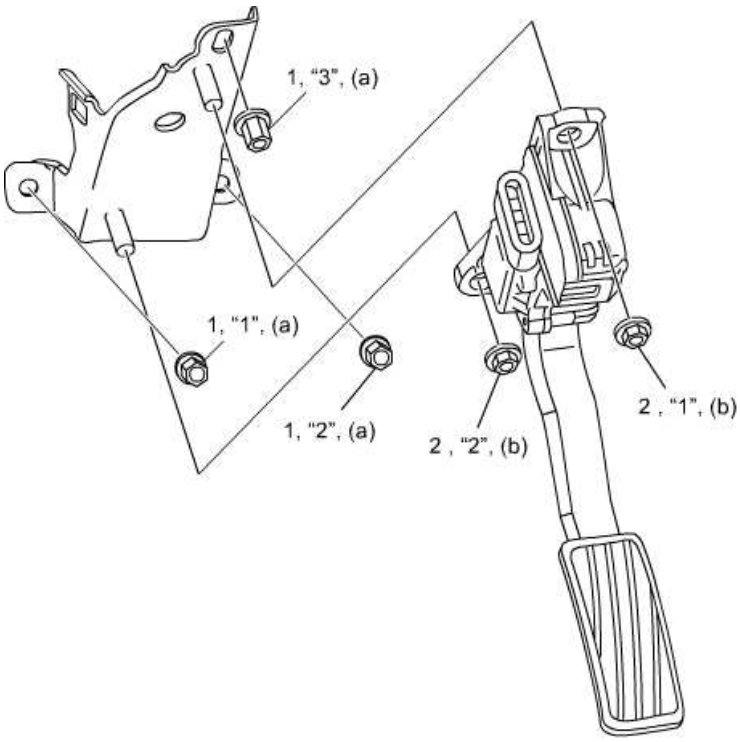
Installation

1) Tighten accelerator pedal assembly bracket nuts (1) to specified torque in numerical order (“1” – “3”).

Tightening torque
Accelerator pedal assembly bracket nut (a): 13 N·m (1.3 kg-m, 9.5 lbf-ft)

2) Tighten accelerator pedal assembly nuts (2) to specified torque in numerical order (“1” – “2”).

Tightening torque
Accelerator pedal assembly nut (b): 13 N·m (1.3 kg-m, 9.5 lbf-ft)



3) Connect connector to APP sensor assembly securely.
4) Install instrument panel undercover. ☞
5) Connect negative cable to battery.

1C

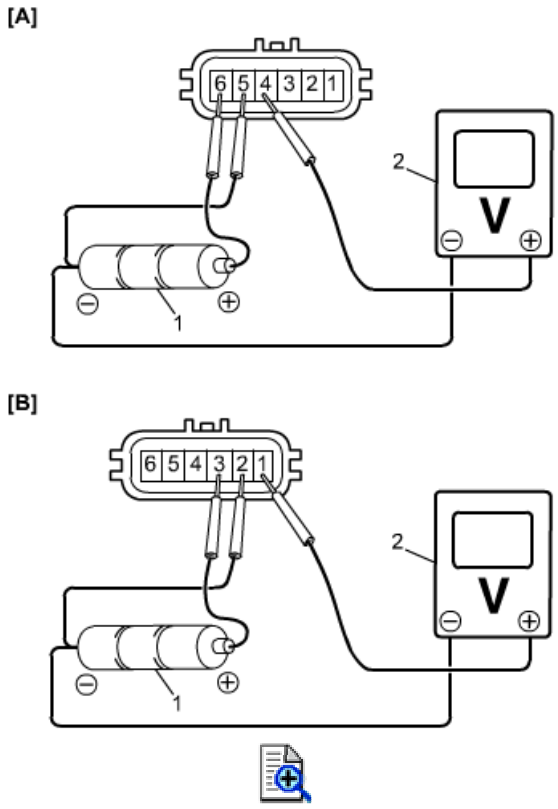
APP Sensor Inspection

1) Remove accelerator pedal assembly. ☞

2) Check APP sensor output voltage as follows.
If faulty condition is found, replace accelerator pedal assembly (incorporated with APP sensor). ☞

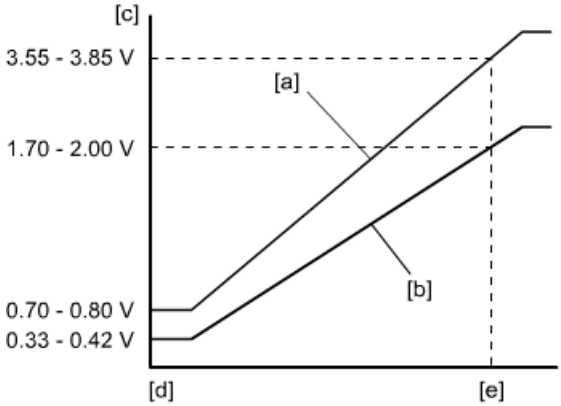
a) Connect 3 new 1.5 V batteries (1) in series and check that total voltage is 4.5 – 5.0 V.

b) Connect voltmeter (2) and batteries to APP sensor as shown in figure.



[A]:	APP sensor (main)
[B]:	APP sensor (sub)

c) Check that voltage varies depending on accelerator opening angle as the following graph.



[a]:	APP sensor (main) voltage
[b]:	APP sensor (sub) voltage
[c]:	Voltage
[d]:	Accelerator pedal: Idle position
[e]:	Accelerator pedal: Fully depressed position

1C

ECT Sensor Removal and Installation

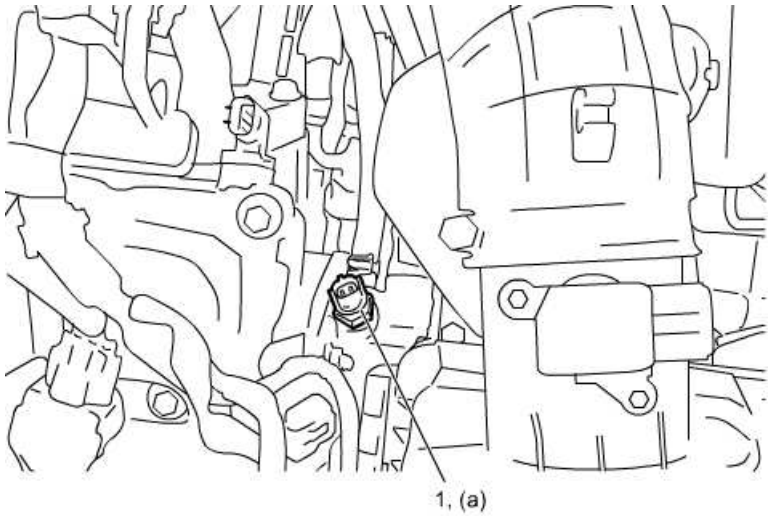
Removal

1) Disconnect negative cable from battery.
2) Remove engine cover.
3) Drain coolant. ☞
4) Disconnect connector from ECT sensor.
5) Remove ECT sensor (1) from water outlet cap.

Installation

Reverse removal procedure, noting the following points:
- Check O-ring for damage and replace if necessary.
- Tighten ECT sensor to specified torque.

Tightening torque
ECT sensor (a): 13 N·m (1.3 kg-m, 9.5 lbf-ft)



- Connect connector to ECT sensor.
- Fill radiator with coolant. ☞
- Check for cooling system for leakage. ☞

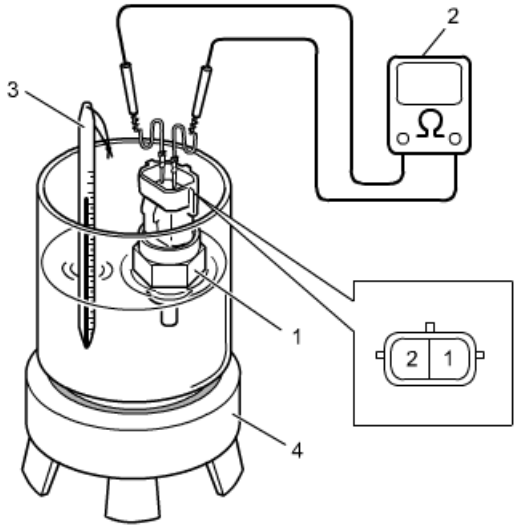
1C

ECT Sensor Inspection

Reference: ECT Sensor Removal and Installation

Check ECT sensor resistance as follows.

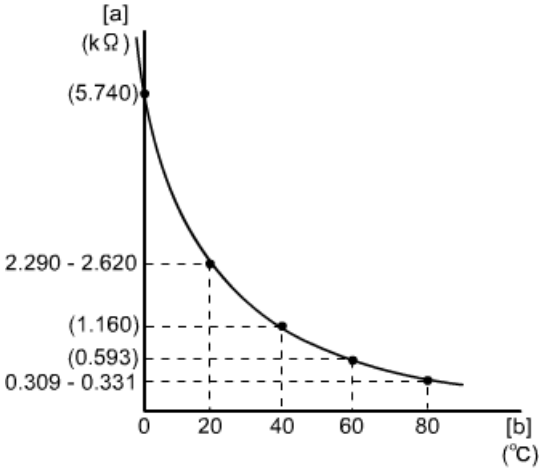
- Check resistance between terminals "1" and "2". Make sure its resistance decreases as its temperature increases.
  If measured resistance is out of specification, replace ECT sensor (1).



2.	Ohmmeter
3.	Temperature gauge
4.	Heater

ECT sensor resistance

–20 °C (–4 °F): 13.51 – 16.17 kΩ
20 °C (68 °F): 2.290 – 2.620 kΩ
80 °C (176 °F): 0.309 – 0.331 kΩ



[a]:	Resistance
[b]:	Temperature

1C

A/F Sensor On-Vehicle Inspection

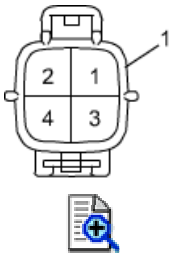
A/F Sensor Heater

1) Disconnect A/F sensor connector with ignition mode of keyless push start system in "OFF".

2) Measure resistance of A/F sensor connector (sensor side) between terminals "3" and "4" at A/F sensor connector with ohmmeter. Replace A/F sensor if any faulty conditions are found.

NOTE:
Sensor temperature affects resistance value largely. Make sure that sensor heater is at specified temperature.

A/F sensor heater resistance
2.16 – 2.90 Ω at 20 °C (68 °F)



1.	A/F sensor connector (sensor side)

1C

HO2S On-Vehicle Inspection

HO2S Heater

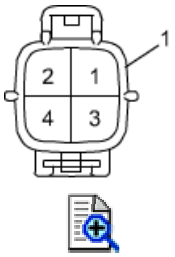
1) Disconnect HO2S connector with ignition mode of keyless push start system in "OFF".

2) Using ohmmeter, measure resistance of HO2S connector (sensor side) between terminals "3" and "4" at sensor connector.
If faulty condition is found, replace HO2S. ☞

NOTE:
Sensor temperature affects resistance value largely. Make sure that sensor heater is at specified temperature.

HO2S heater resistance

5.0 – 6.4 Ω at 20 °C (68 °F)



1.	HO2S connector (sensor side)

1C

A/F Sensor and HO2S Removal and Installation

Removal

WARNING:
To avoid danger of being burned, do not touch exhaust system when system is hot.
A/F sensor and HO2S removal should be performed when system is cool.

1) Disconnect negative (–) cable at battery.
2) Disconnect connector of A/F sensor and/or HO2S.
3) Remove exhaust manifold cover. ☞
4) Remove A/F sensor (1) and/or HO2S (2).

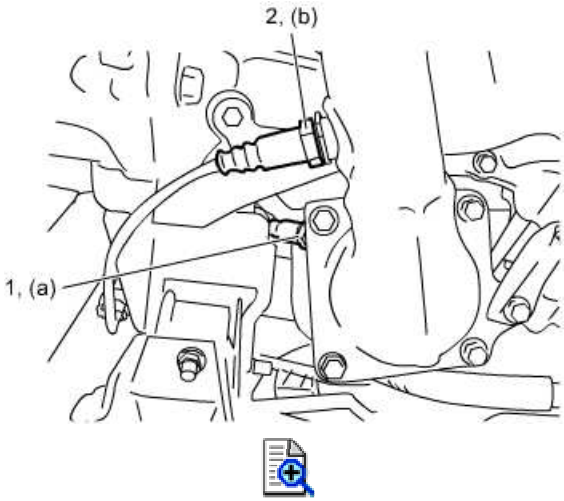
Installation

Reverse removal procedure, noting the following points:
- Tighten A/F sensor (1) to specified torque.

Tightening torque
A/F sensor (a): 45 N·m (4.6 kg-m, 33.5 lbf-ft)

- Tighten HO2S (2) to specified torque.

Tightening torque
HO2S (b): 45 N·m (4.6 kg-m, 33.5 lbf-ft)



- After installation, check exhaust system for leakage from sensor with engine running.

1C

CMP Sensor On-Vehicle Inspection

Check that CMP sensor signal is output properly. ☞

Check the following points if any faulty conditions are found:

- Wire harness and connections
- CMP sensor: ☞

1C

CMP Sensor Removal and Installation

Removal

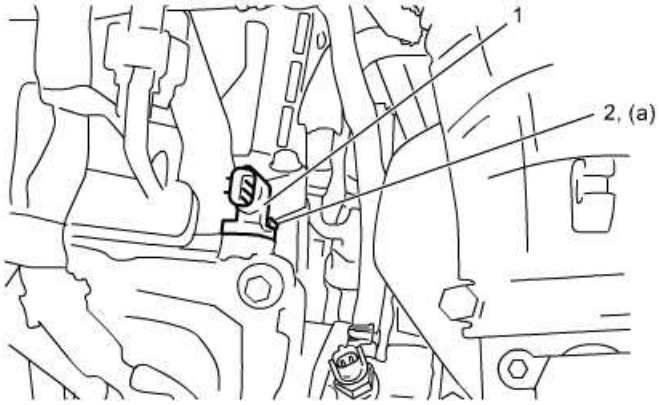
1) Disconnect negative cable from battery.
2) Remove engine cover.
3) Disconnect connector from CMP sensor.
4) Remove CMP sensor from cylinder head.

Installation

Reverse removal procedure, noting the following points:
- Apply engine oil to O-ring of CMP sensor (1).
- Tighten CMP sensor bolt (2) to specified torque.

Tightening torque

CMP sensor bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)

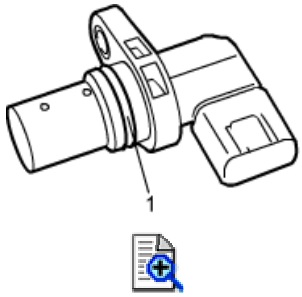


1C

CMP Sensor Inspection

Reference: CMP Sensor Removal and Installation

1) Check the following points:
- Check that O-ring (1) is free from damage.
- Check that end face of sensor and signal rotor tooth are free from any metal particles and damage.



2) Check CMP sensor as follows.
If faulty condition is found, replace CMP sensor. ☞

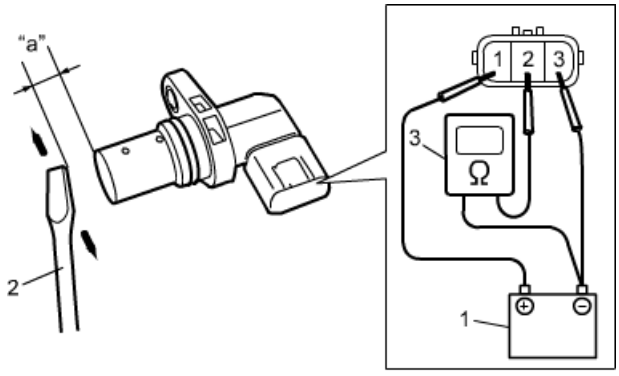
a) Connect battery (1) and ohmmeter (3) to CMP sensor as shown in figure.

b) Check that CMP sensor resistance varies as specified below by bringing magnetic substance (iron) to CMP sensor.

NOTE:
Be sure to keep approximately 1 mm (0.03 in) gap "a" between magnetic substance (iron) and end face of CMP sensor.

CMP sensor resistance

Resistance varies between less than 220 Ω (ON) and infinity (OFF)



CKP Sensor On-Vehicle Inspection

Check that CKP sensor signal is output properly. ☞

If faulty condition is found, check the following points:

- Wire harness and connections
- CKP sensor: ☞

1C

CKP Sensor Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Remove generator. ☞
3) Disconnect connector from CKP sensor.
4) Remove CKP sensor (1) from cylinder block (2).

Installation

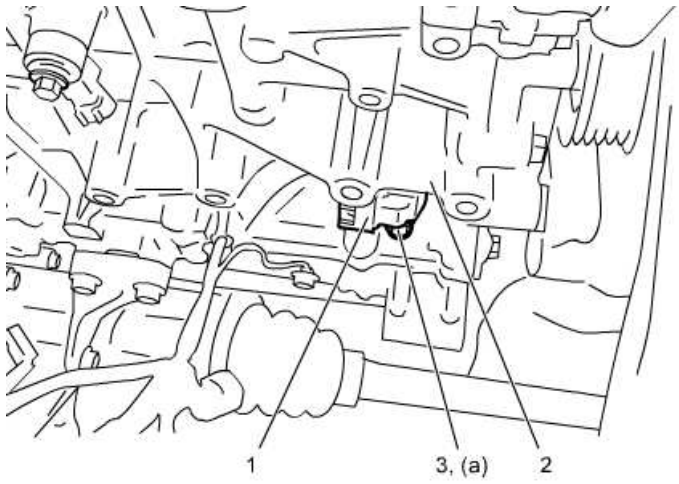
Reverse removal procedure, noting the following points:

- Apply engine oil to O-ring of sensor.

CAUTION:
Use new CKP sensor bolt (3).

- Tighten CKP sensor bolt to specified torque.

Tightening torque
CKP sensor bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)

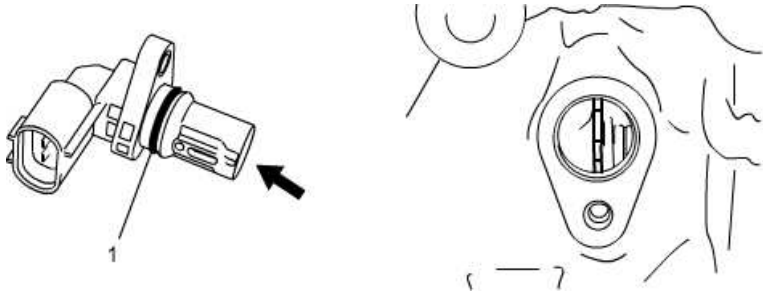


1C

CKP Sensor Inspection

Reference: CKP Sensor Removal and Installation

1) Check the following points:
- Check that O-ring (1) is free from damage.
- Check that end face of sensor and signal plate tooth are free from any metal particles and damage.



2) Check CKP sensor as follows.
If faulty condition is found, replace CKP sensor.

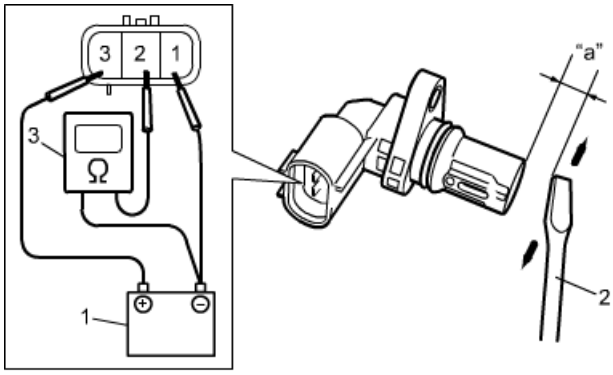
a) Connect battery (1) and ohmmeter (3) to CKP sensor as shown in figure.

b) Check that CKP sensor resistance varies as specified below by bringing magnetic substance (iron) to CKP sensor.

NOTE:
Be sure to keep approximately 1 mm (0.03 in) gap "a" between magnetic substance (iron) and end face of CKP sensor.

CKP sensor resistance

Resistance varies between less than 220 Ω (ON) and infinity (OFF)



1C

Knock Sensor Removal and Installation

Removal

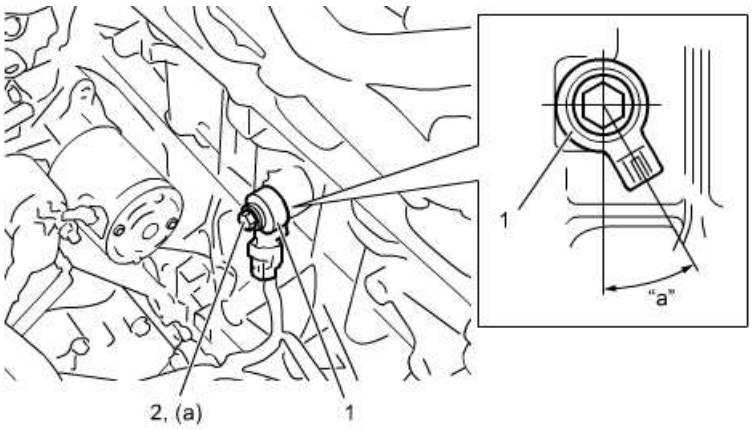
1) Disconnect negative (–) cable at battery.
2) Remove generator. ☞
3) Disconnect knock sensor connector.
4) Remove knock sensor (1) from cylinder block.

Installation

Reverse removal procedure, noting the following points:
- Install knock sensor (1) as shown in figure.
- Tighten knock sensor bolt (2) to specified torque.

Tightening torque

Knock sensor bolt (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)



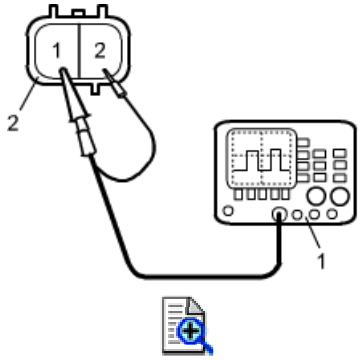
"a":	20 – 30°

1C

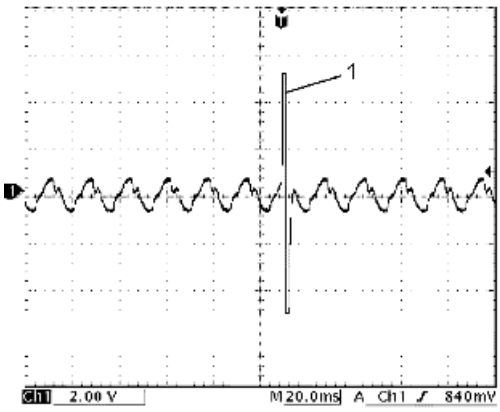
Knock Sensor Inspection

1) With ignition mode of keyless push start system in "OFF", disconnect connector (2) from knock sensor.

2) Connect oscilloscope (1) as shown in figure.



3) Check that knock sensor signal (1) shows the following waveform when plastic hammer inflicts a strong impact on the cylinder block.
If faulty condition is found, replace knock sensor. ☞



1C

MAF and IAT Sensor On-Vehicle Inspection

NOTE:
Before performing this inspection, be sure to read the "Precautions for ECM Circuit Inspection" under *Precautions for Engine*.

Check that MAF sensor signal and IAT sensor signal are output properly. ☞

If faulty condition is found, check the following points:

- Wire harness and connections
- MAF and IAT sensor ☞

1C

MAF and IAT Sensor Removal and Installation

CAUTION:
When servicing MAF and IAT sensor, be sure to observe the following items.
- **Do not disassemble MAF and IAT sensor.**
- **Do not expose MAF and IAT sensor to any shock. If it has been dropped, it should be replaced.**
- **Do not clean MAF and IAT sensor.**
- **Do not blow compressed air using air gun or the like.**
- **Do not put finger or any other object into MAF and IAT sensor.**

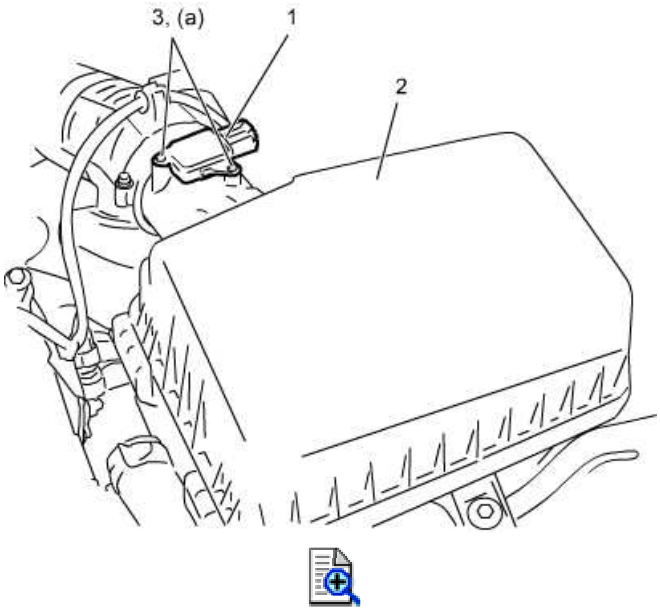
Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect MAF and IAT sensor connector.
3) Remove MAF and IAT sensor (1) from air cleaner case (2).

Installation

Reference: MAF and IAT Sensor Inspection
Reverse removal procedure, noting the following points:
- Tighten MAF and IAT sensor screws (3) to specified torque.

Tightening torque
MAF and IAT sensor screw (a): 0.9 N·m (0.09 kg-m, 1.0 lbf-ft)



1C

MAF and IAT Sensor Inspection

Reference: MAF and IAT Sensor Removal and Installation

CAUTION:
- **When servicing MAF and IAT sensor, be sure to observe the following items.**
  - **— Do not disassemble MAF and IAT sensor.**
  - **— Do not expose MAF and IAT sensor to any shock. If they have been dropped, they should be replaced.**
  - **— Do not clean MAF and IAT sensor.**
  - **— Do not blow compressed air using air gun or the like.**
  - **— Do not put finger or any other object into MAF and IAT sensor.**
- **Do not heat MAF and IAT sensor higher than 100 °C (212 °F). Otherwise, it will be damaged.**

IAT Sensor Inspection

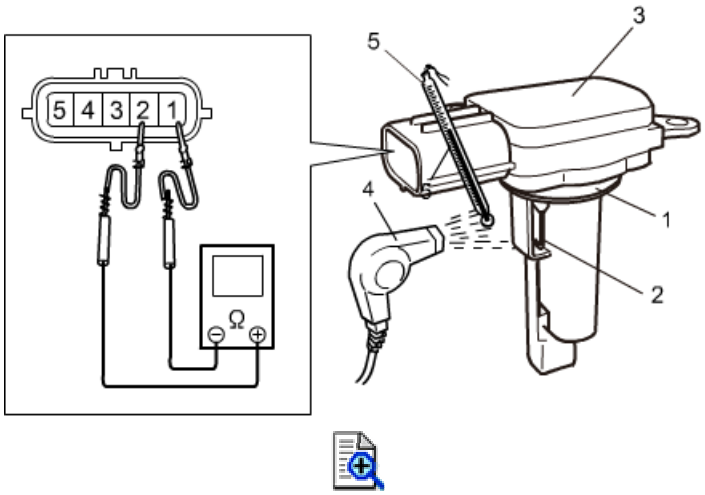
1) Remove MAF and IAT sensor. ☞

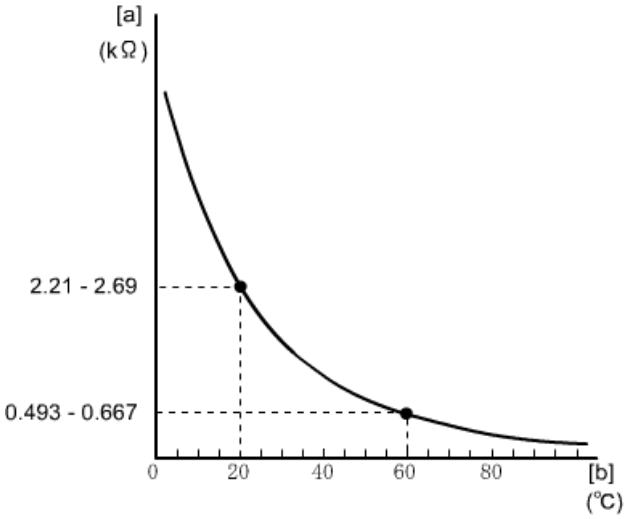
2) Check sensor O-ring (1) for damage and deterioration. Replace if necessary.

3) Measure resistance between sensor terminals "1" and "2" while blowing hot air to temperature sensing part (2) of MAF and IAT sensor (3) using hot air drier (4). If faulty condition is found, replace MAF and IAT sensor. ☞

Intake air temperature sensor resistance

–20 °C (–4 °F): 13.6 – 18.4 kΩ
20 °C (68 °F): 2.21 – 2.69 kΩ
60 °C (140 °F): 0.439 – 0.667 kΩ





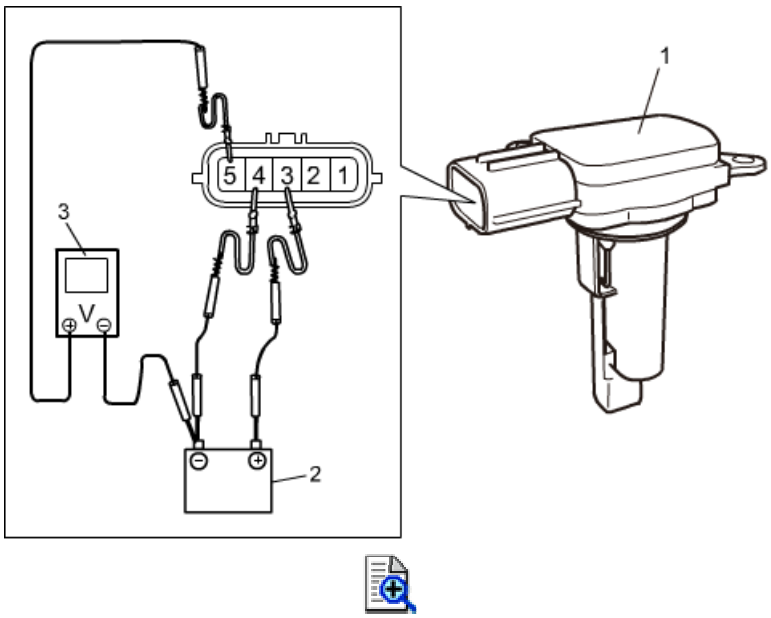
[a]:	Resistance
[b]:	Temperature
5.	Temperature gauge

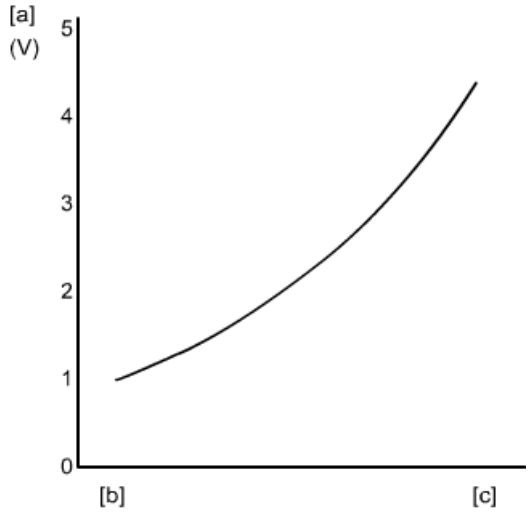
MAF Sensor Inspection

1) Remove MAF and IAT sensor. ☞

2) Connect battery (2) and voltmeter (3) to MAF and IAT sensor (1) as shown in figure.

3) Check that voltage varies depending on amount of blowing air as the following graph. If faulty condition is found, replace MAF and IAT sensor. ☞





[a]:	Voltage
[b]:	Blowing air: Small
[c]:	Blowing air: Large

1C

IMT Valve Actuator On-Vehicle Inspection

Check that IMT valve actuator signal is outputted properly. ☞

If faulty condition is found, check the following points:

- Wire harness and connections
- IMT valve actuator ☞

1C

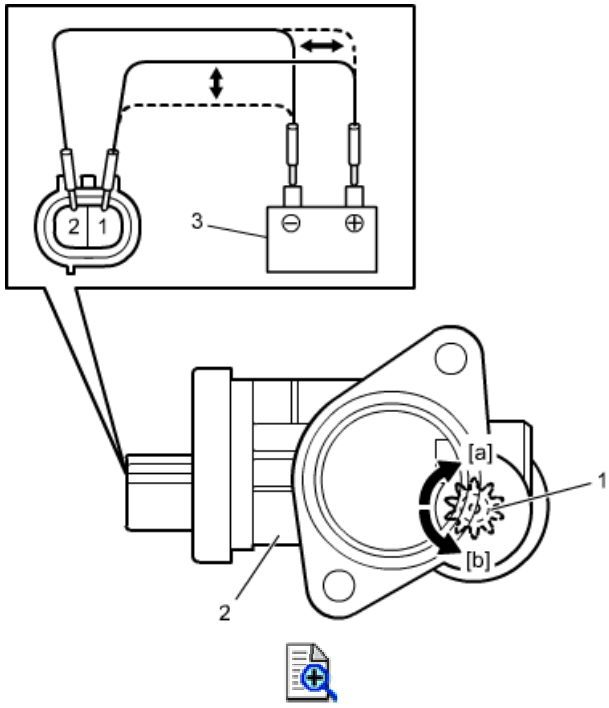
IMT Valve Actuator Inspection

CAUTION:
Be sure not to apply battery voltage to IMT valve actuator for 10 seconds or more.

Connect battery positive (+) and negative (–) terminals to IMT valve actuator (2) as shown in table below. If IMT valve actuator pinion gear (1) does not operate as specified direction, replace IMT valve actuator.

IMT valve actuator pinion gear rotative direction

Rotative direction	Terminal	
	"1"	"2"
Clockwise	+	–
Counterclockwise	–	+



[a]: Clockwise	3. Battery
[b]: Counterclockwise	

1C

OCV Inspection

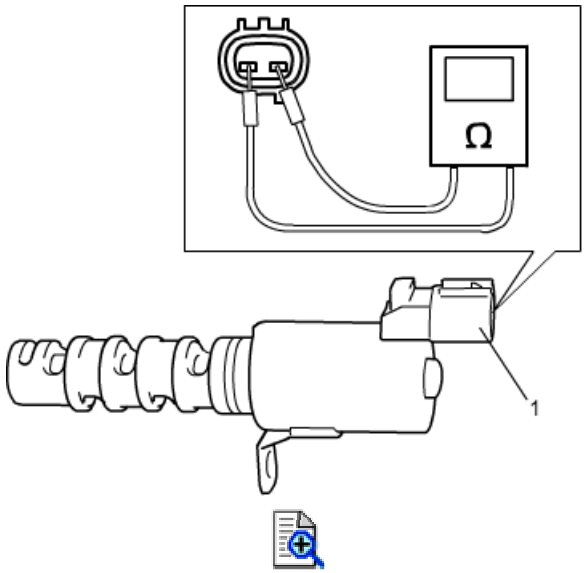
1) Remove oil control valve. ☞

2) Check OCV as follows.

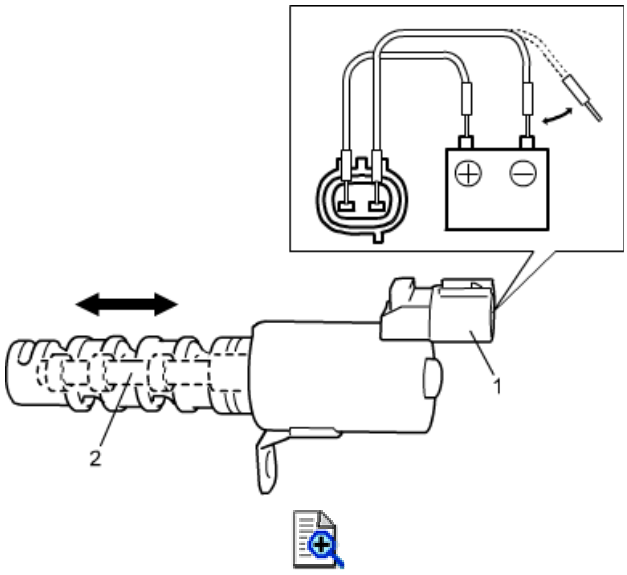
- Check oil control valve for clog or damage.
  If check result is not satisfactory, clean or replace OCV.
- Check resistance between terminals of oil control valve connector (1).
  If faulty condition is found, replace OCV.

Oil control valve resistance

6.7 – 7.7 Ω at 20 °C (68 °F)



- Connect battery to OCV connector (1) as shown in figure, and check that there is operating sound and that spool valve (2) is properly operating.
  If faulty condition is found, replace OCV. ☞



1C

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
ECM mounting nut	5.5	0.56	4.0	☞
Accelerator pedal assembly bracket nut	13	1.3	9.5	☞
Accelerator pedal assembly nut	13	1.3	9.5	☞
ECT sensor	13	1.3	9.5	☞
A/F sensor	45	4.6	33.5	☞
HO2S	45	4.6	33.5	☞
CMP sensor bolt	11	1.1	8.5	☞
CKP sensor bolt	11	1.1	8.5	☞
Knock sensor bolt	25	2.5	18.5	☞
MAF and IAT sensor screw	0.9	0.09	1.0	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1C

Special Tool

SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case☞ ☞		

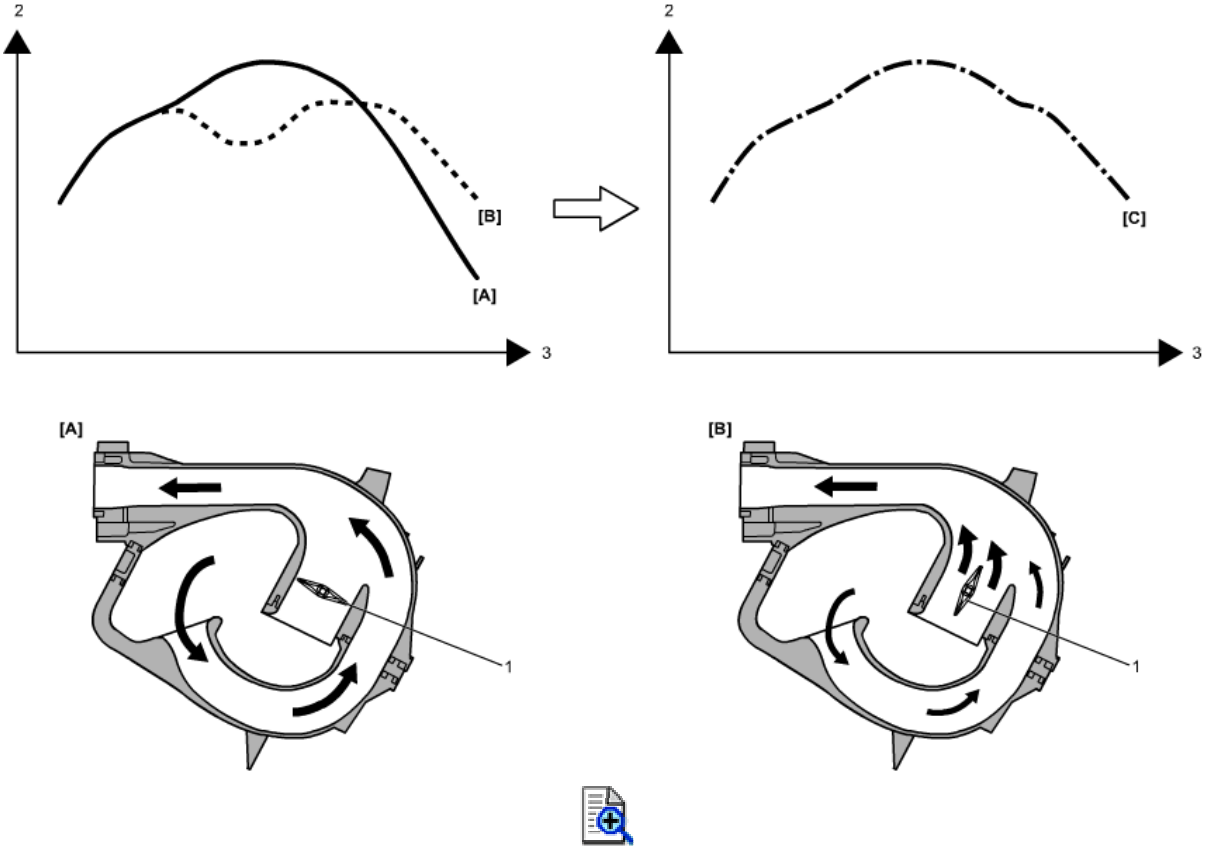
1D

Engine Construction Description

The engine is a water-cooled, in-line 4 cylinder, 4-stroke-cycle gasoline unit with a DOHC valve mechanism arranged in a “V” type valve configuration and has 16 valves (4 valves / one cylinder). The intake camshaft equipped with a VVT actuator and the exhaust camshaft are mounted over the cylinder head and are driven by a crankshaft with a silent-type timing chain. In addition, balancer shafts are combined with the oil pump located under the lower crankcase and driven by another silent chain.

1D

IMT System Description



[A]: IMT valve closed	[C]: IMT valve controlled	2. Engine torque
[B]: IMT valve open	1. IMT valve	3. Engine speed

The IMT system varies the effective intake pipe length by opening and closing the IMT valve in order to improve air volumetric efficiency.
As the intake valve in the cylinder head is opened and closed repeatedly, intake air pulsation occurs. If the intake valve is opened when air pressure is momentarily at the maximum level, the intake air volumetric efficiency increases. This momentary maximum air pressure depends on the effective intake pipe length.
When IMT valve is totally closed [A]:
The effective intake pipe length is longer. Engine torque in the high engine speed range drops, while it improves in the middle range.
When IMT valve is fully open [B]:
The effective intake pipe length is shorter. Engine torque in the high engine speed range improves, while it drops in the middle engine speed range.
IMT system utilizes this characteristic of engine. IMT valve is closed in middle engine speed range, and opened in high engine speed range.
In this way, engine torque is improved in whole engine speed range.

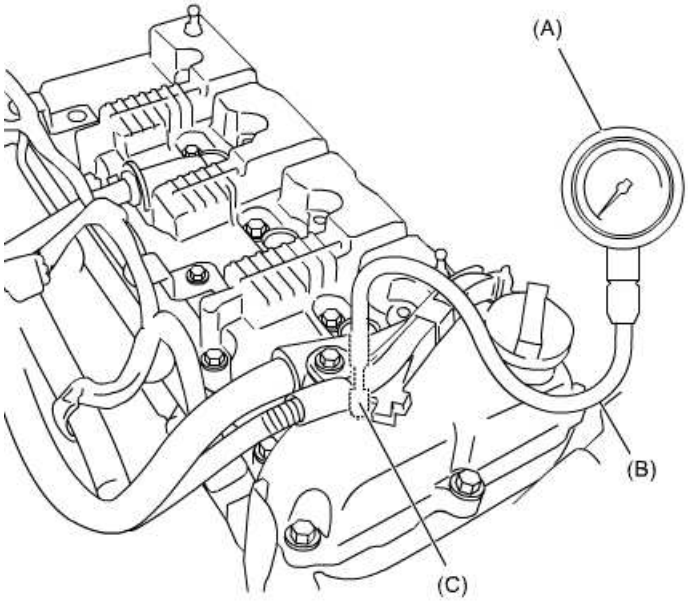
1D

Compression Check

1) Warm up engine to normal operating temperature.
2) Stop engine after warm-up.
3) For CVT model, place select lever in "P" and apply parking brake.
   For M/T model, place gear shift lever in "Neutral" and apply parking brake.
4) Remove engine cover.
5) Remove all ignition coils and spark plugs. ☞
6) Disconnect all fuel injector connectors.
7) Connect special tools together and install then into spark plug hole.

Special Tool

(A): 09915–64512
(B): 09915–64530
(C): 09915–67010



8) Depress accelerator pedal all the way to fully open throttle.

NOTE:
For M/T model, disengage clutch to lighten starting load on engine, and depress accelerator pedal all the way to fully open throttle.

9) Crank engine with fully charged battery, and read the highest pressure on compression gauge.

NOTE:
- **For measuring compression pressure, crank engine up to at least 200 rpm with fully charged battery.**
- **Check resting position of special tool if measured compression pressure is lower than the limit.**
- **If the measured compression pressure of particular cylinder is lower than the limit, add a bit of engine oil into the cylinder through the spark plug hole, and then repeat the compression check.**
  - **If the compression pressure increases after adding engine oil, the following may be the cause:**
    - **Pressure leakage due to worn piston rings or worn cylinder**

— **If the compression pressure does not increase, one of the following may be the causes:**
  — **Incorrect valve timing**
  — **Pressure leakage from the valve or valve seats**
  — **Pressure leakage from the cylinder head gasket**

Compression pressure

Standard: 1,400 kPa (14.3 kgf/cm², 203 psi)
Limit: 1,100 kPa (11.2 kgf/cm², 160 psi)
Max. difference between any two cylinders: 100 kPa (1.0 kgf/cm², 14.5 psi)

10) Carry out Steps 7) through 9) on each cylinder.
11) Install spark plugs and ignition coil assemblies. ☞
12) Connect fuel injector connectors.
13) Install engine cover.

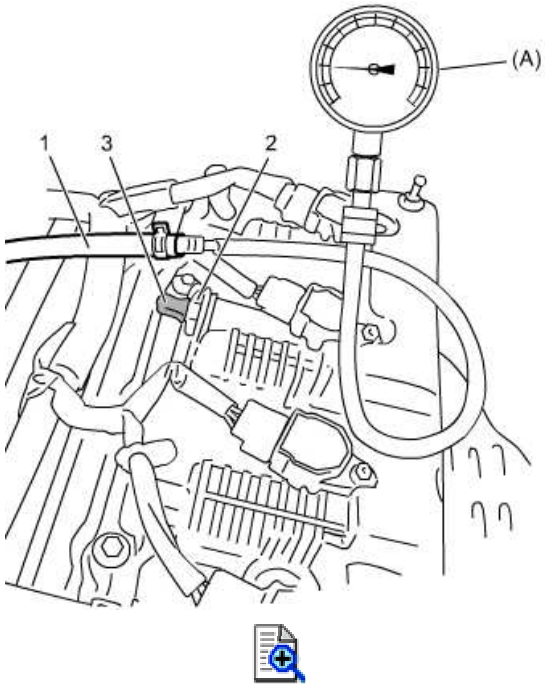
1D

Engine Vacuum Check

1) Warm up engine to normal operating temperature.
2) For CVT model, place select lever in "P" and apply parking brake.
For M/T model, place gear shift lever in "Neutral" and apply parking brake.
3) Remove engine cover.
4) Remove PCV hose (1) from PCV valve (2).
5) Connect special tool to PCV hose (1).

Special Tool
(A): 09915–67311

6) Close PCV valve (2) using tape (3) or the like.



7) Start engine and turn off all electric loads.
8) Read vacuum gauge at specified idle speed. ☞

Vacuum specification (at sea level)
Standard: –65 kPa (–0.66 kgf/cm², –9.43 psi, –0.65 bar) or less at specified idle speed

9) After checking, disconnect special tool from PCV hose.
10) Peel off tape from PCV valve.
11) Connect PCV hose to PCV valve.
12) Install engine cover.

1D

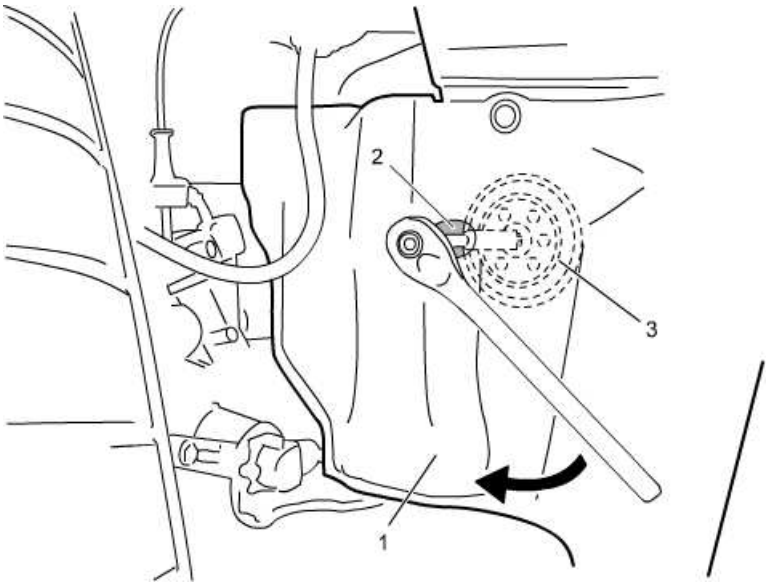
Valve Clearance Inspection and Adjustment

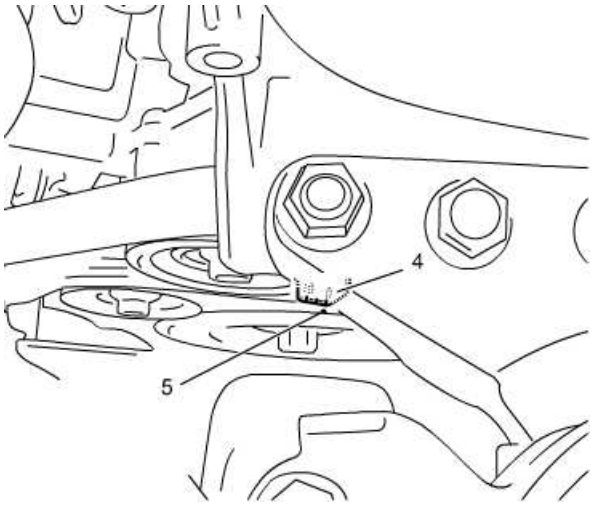
Inspection

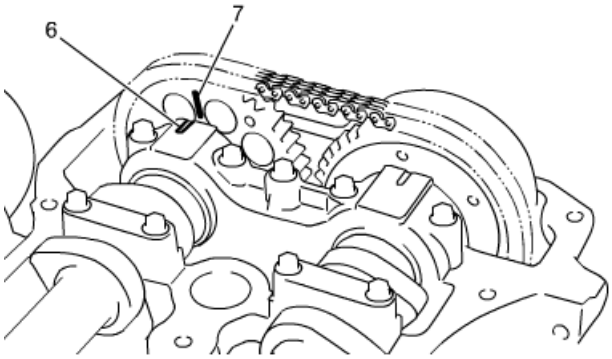
1) Disconnect negative (–) cable at battery.

2) Remove cylinder head cover. ☞

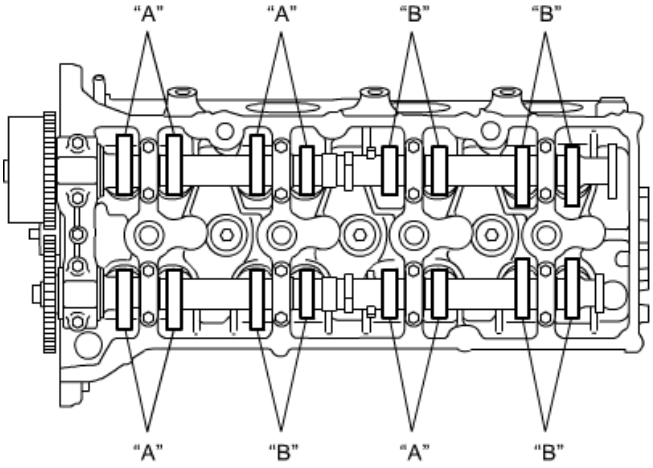
3) Insert socket wrench through service hole (2) of front fender lower lining (1). Turn crankshaft pulley (3) clockwise and align crankshaft pulley notch mark (5) with timing chain cover at 0° (TDC) mark (4). Matchmark camshaft housing No.1 (6) and exhaust camshaft timing sprocket (7) have to be aligned.







4) Measure valve clearances with feeler gauge using the following procedures.
a) Measure valve clearances of "A" valves as indicated in the following figure.
b) Turn crankshaft pulley 360° clockwise.
c) Measure valve clearances of "B" as indicated as valves in the following figure.



If valve clearance is out of specification, record valve clearance and adjust it to specified value.

Valve clearance specification

When cold (ECT: 15 – 25 °C (59 – 77 °F)):
- **Intake: 0.16 – 0.24 mm (0.0063 – 0.0094 in.)**
- **Exhaust: 0.31 – 0.39 mm (0.0122 – 0.0153 in.)**

Adjustment

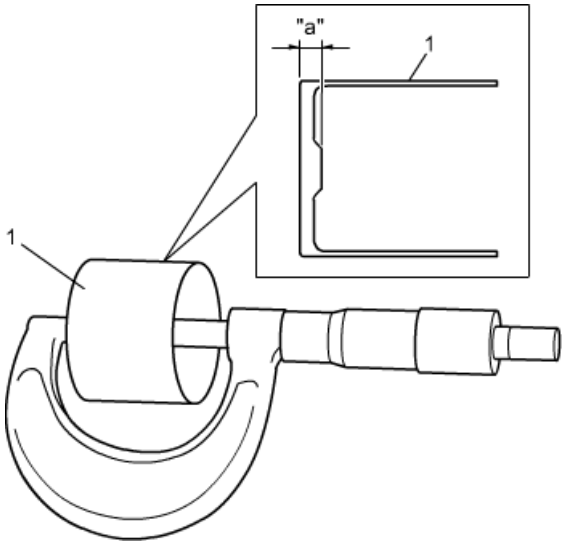
1) Remove tappet to be replaced. ☞

2) Select proper size of tappet as follows.
a) Using a micrometer, measure the thickness of the removed tappet (1).
b) Calculate the thickness of new tappet using the following formula.

NOTE:
If the number in the second decimal places is odd, use (A – 0.01) tappet.

Intake side:
A = B + C – 0.20 mm (0.0078 in.)
Exhaust side:
A = B + C – 0.35 mm (0.0137 in.)

A: Thickness "a" of new tappet
B: Thickness "a" of removed tappet
C: Measured valve clearance



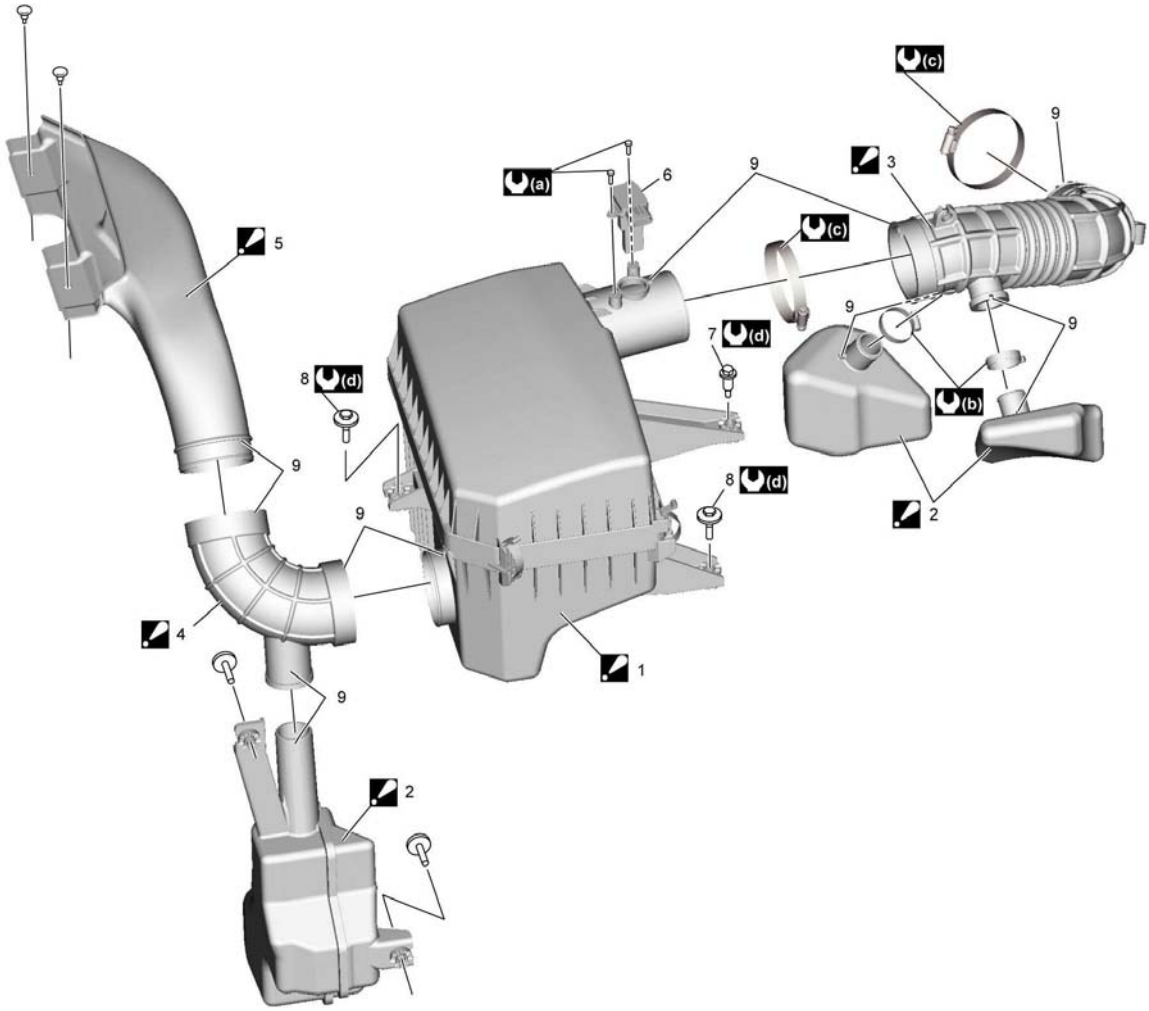
c) Select new tappet from available spare parts that is closest in size to the calculated value.

3) Install tappets and camshafts. ☞

4) Recheck valve clearance.

1D

Air Cleaner Components



Air cleaner assembly 1. : Align matchmark	Air cleaner suction pipe 5. : Align matchmark	9. Matchmark	(d) 10 N·m (1.00 kgf-m, 7.5 lbf-ft) :
Resonator 2. : Align matchmark	6. MAF and IAT sensor	(a) 0.9 N·m (0.09 kgf-m, 1.0 lbf-ft) :	
Air cleaner outlet hose 3. : Align matchmark	7. Air cleaner bolt No.1	(b) 1.0 N·m (0.10 kgf-m, 1.0 lbf-ft) :	
Air cleaner suction hose 4. : Align matchmark	8. Air cleaner bolt No.2	(c) 2.0 N·m (0.20 kgf-m, 1.5 lbf-ft) :	

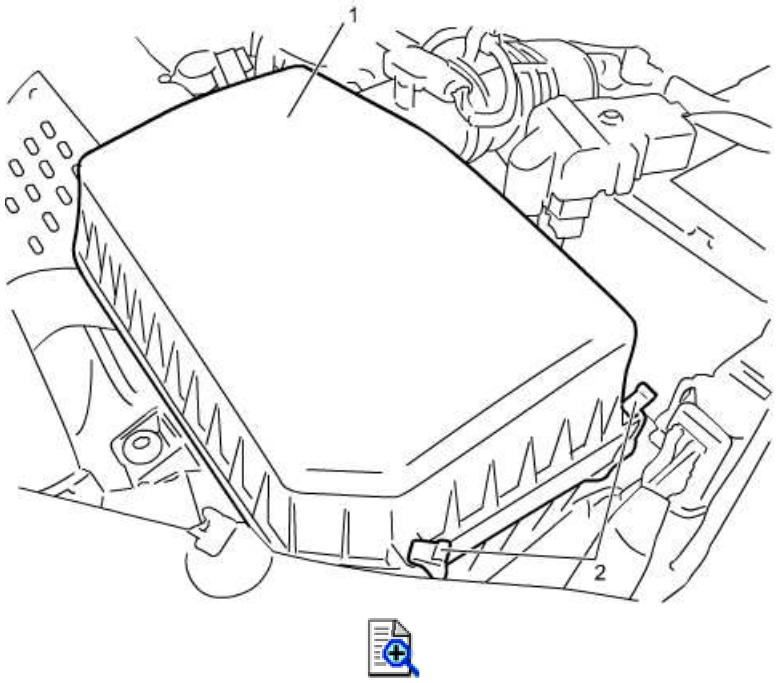
1D

Air Cleaner Filter Removal and Installation

Reference: Air Cleaner Components

Removal

1) Open air cleaner case (1) by unhooking the clamps (2).



2) Remove air cleaner filter from case.

Installation

Reference: Air Cleaner Filter Inspection and Cleaning

Reverse removal procedure.

1D

Air Cleaner Filter Inspection and Cleaning

Reference: Air Cleaner Filter Removal and Installation

Inspection

Check air cleaner filter for dirt.
Replace filter if excessively dirty.

Cleaning

Blow off dust with compressed air from air outlet side of filter.

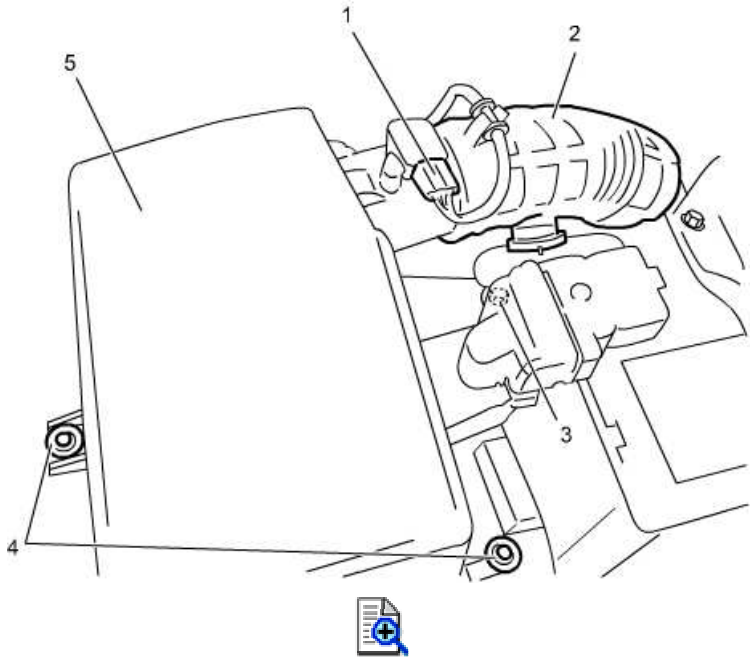
1D

Air Cleaner Assembly Removal and Installation

Reference: Air Cleaner Components

Removal

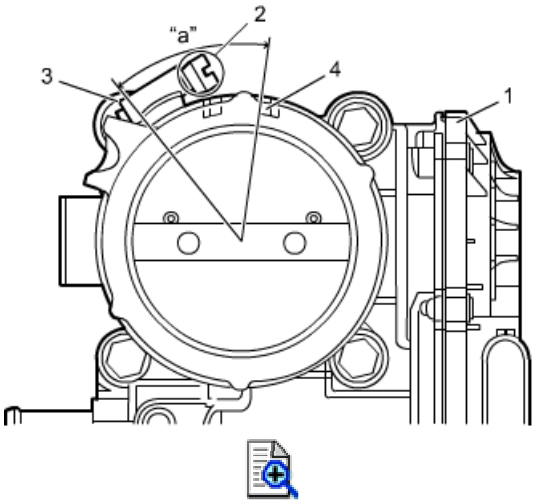
1) Disconnect negative (–) cable at battery.
2) Disconnect MAF and IAT sensor connector (1).
3) Remove air cleaner outlet hose (2).
4) Remove air cleaner bolts No.1 (3) and No.2 (4).
5) Remove air cleaner assembly (5).



Installation

Reverse removal procedure for installation noting the following points:

- Align matchmark of air cleaner outlet hose and air cleaner suction hose when installing. ☞
- Install throttle body (1) side clamp bolt head (2) within specified range "a" shown below and tighten it to specified torque. ☞

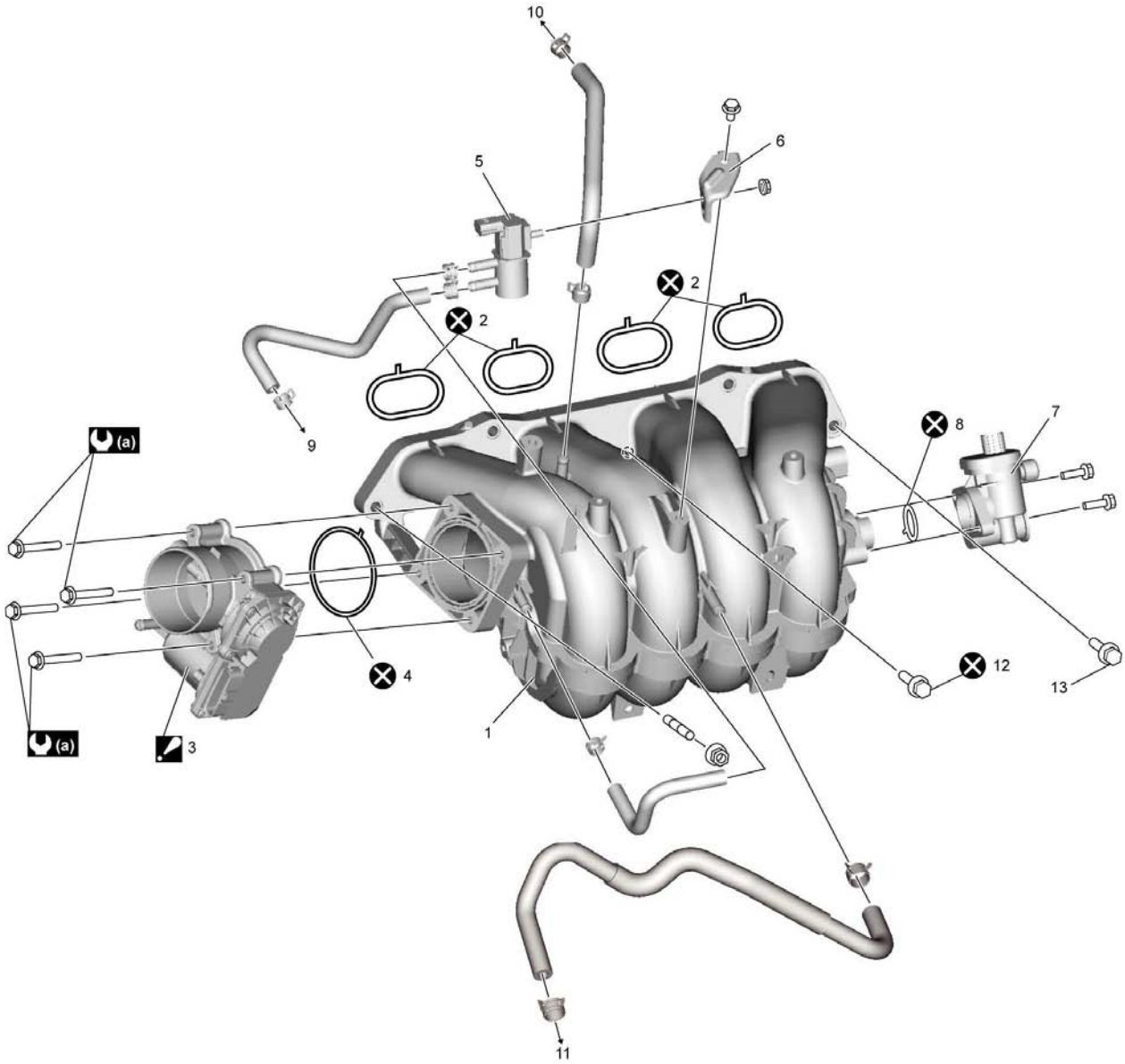


3.	Throttle body bolt
4.	Air cleaner outlet hose matchmark

- Tighten clamps and bolts to specified torque. ☞

1D

Throttle Body and Intake Manifold Components



1D

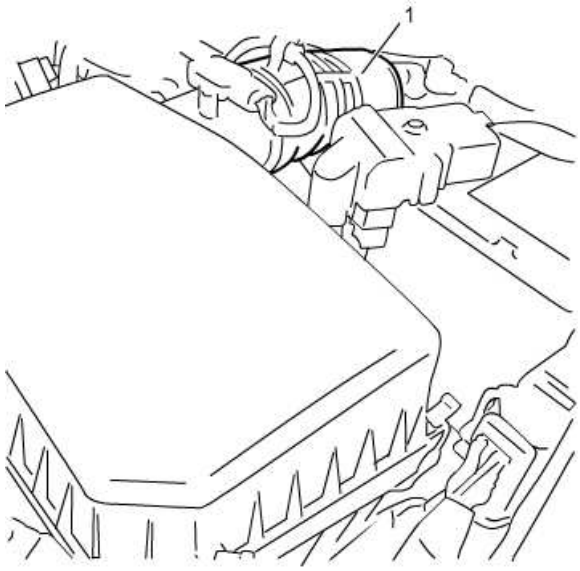
Throttle Body Assembly Removal and Installation

Reference: Throttle Body and Intake Manifold Components

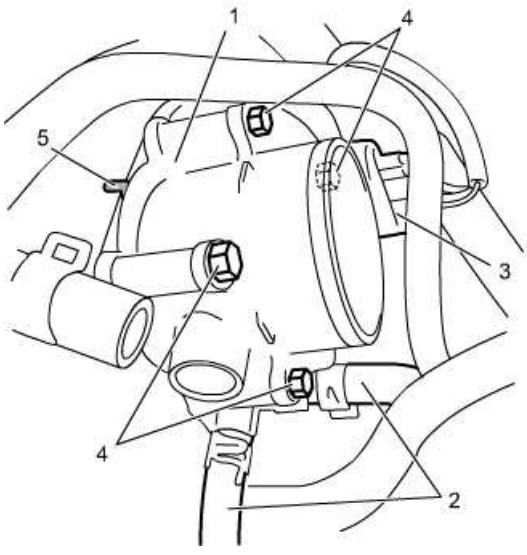
CAUTION:
Do not perform disassembly. Even if reassembly is performed, performance will be inferior to the original performance. If throttle body is found faulty, replace it with new one as an assembly.

Removal

1) Disconnect negative (–) cable at battery.
2) Drain coolant.
3) Remove air cleaner outlet hose (1).



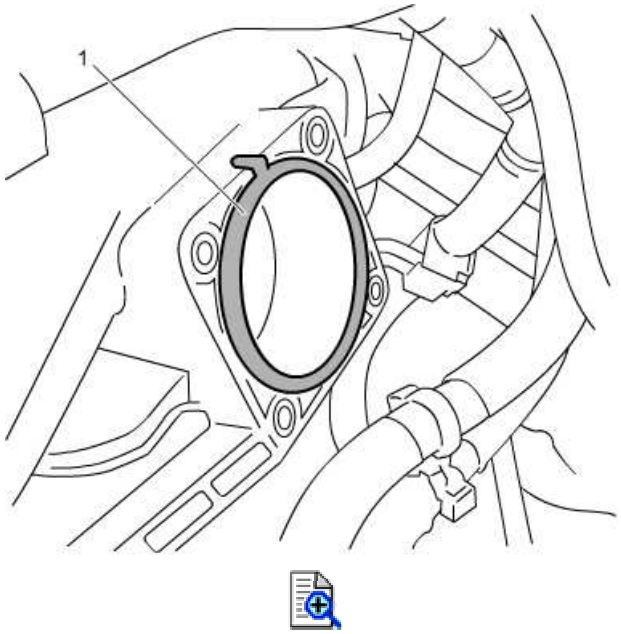
4) Disconnect engine coolant hoses (2) and connector (3) from throttle body assembly (1).
5) Remove throttle body bolts (4), and then remove throttle body assembly and gasket (5) from intake manifold.



Installation

Reference: Throttle Body Cleaning

1) Clean mating surfaces and install new throttle body gasket (1) to intake manifold.

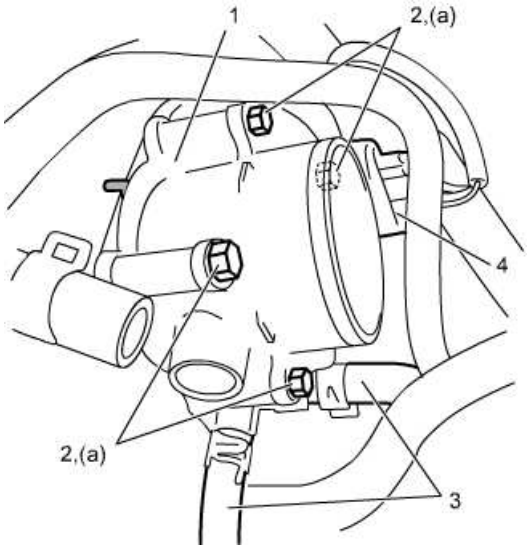


2) Install throttle body assembly (1) to intake manifold, and then tighten throttle body bolt (2) to specified torque.

Tightening torque

Throttle body bolt (a): 12 N·m (1.2 kg-m, 9.0 lbf-ft)

3) Connect connector (4) and coolant hoses (3) to throttle body assembly (1).



4) Install air cleaner outlet hose. ☞

5) Refill cooling system with coolant. ☞

6) Connect negative (–) cable at battery.

7) Check for coolant leaks. ☞

1D

Throttle Body Cleaning

Reference: Throttle Body Assembly Removal and Installation

Clean throttle body assembly according to "Throttle Valve Visual Check" under ***Electric Throttle Body Assembly On-Vehicle Inspection***.

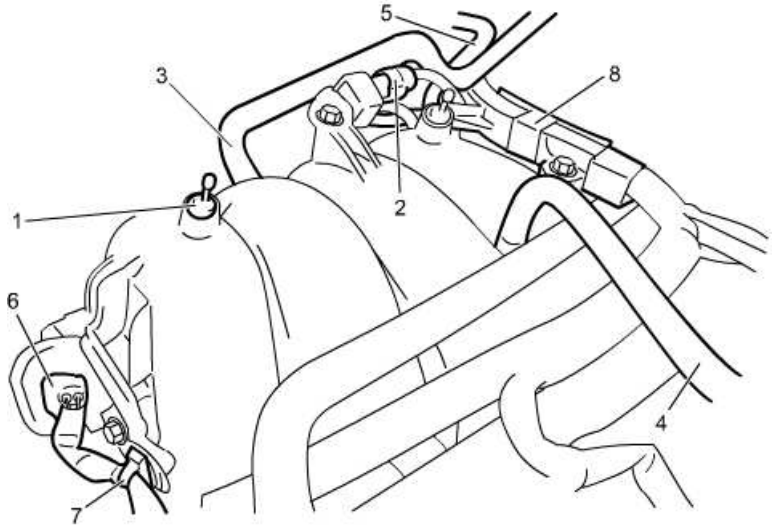
1D

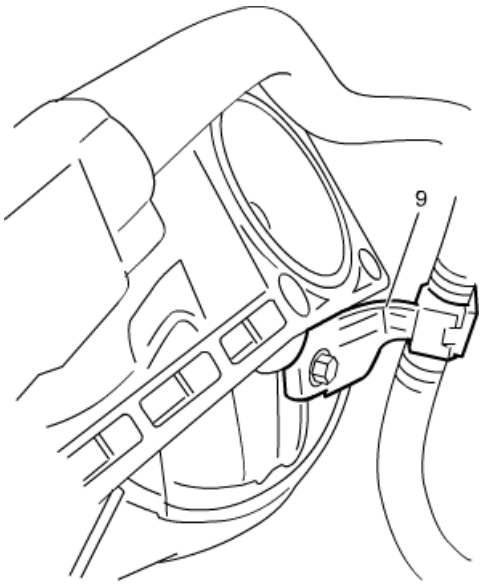
Intake Manifold Removal and Installation

Reference: Throttle Body and Intake Manifold Components

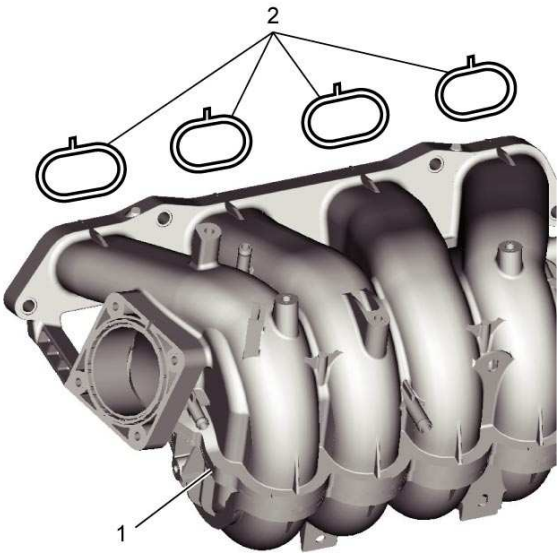
Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Remove throttle body assembly. ☞
4) Remove engine cover bolt (1).
5) Disconnect the following connectors and hoses.
- EVAP canister purge valve connector (2)
- Brake booster hose (3)
- PCV valve hose (4)
- Purge hose (5)
- IMT valve actuator connector (6)
- IMT valve actuator clamp (7)
- Engine harness bracket (8)
- Engine harness clamp (Intake manifold lower side) (9)





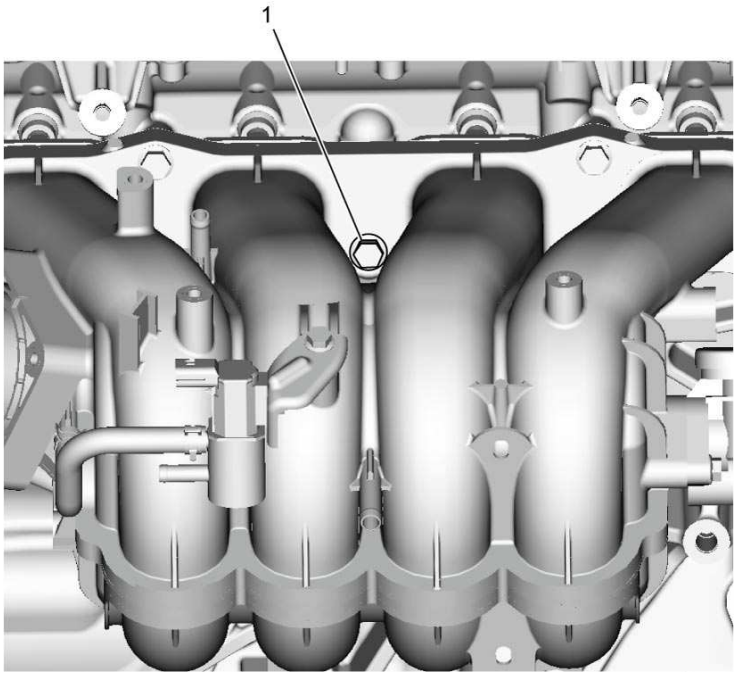
6) Remove intake manifold (1) and gasket (2) from cylinder head.



Installation

Reverse removal procedure for installation noting the following points:

- Use New gaskets
- The Intake manifold bolt No.1 (1) is not reusable so use a new one.



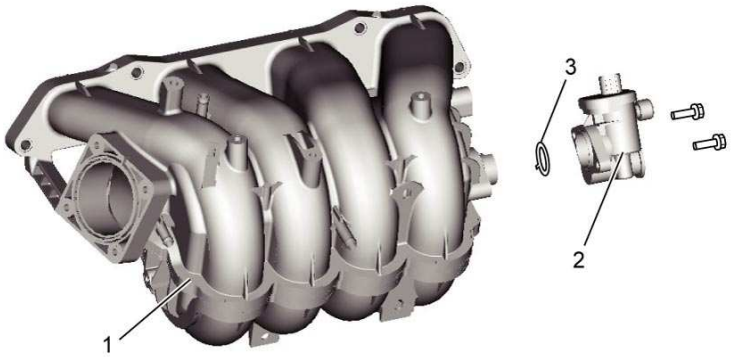
- Refill cooling system. ☞
- Check for coolant leaks. ☞

1D

IMT Valve Actuator Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Disconnect IMT valve actuator connector.
3) Remove IMT valve actuator (2) and gasket (3) from intake manifold (1).



Installation

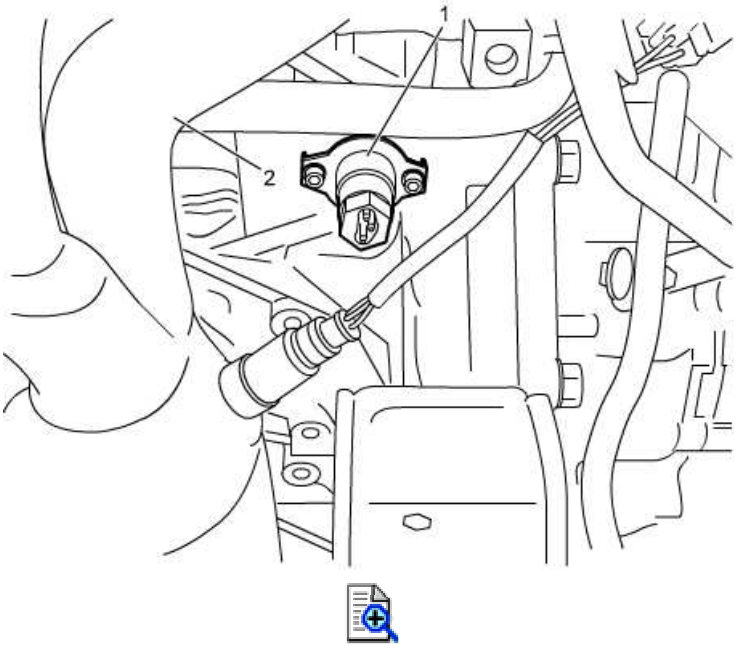
Reverse removal procedure noting the following points:
- Use new gasket.
- Check that IMT valve operates properly after installation.

1D

Cylinder Block Heater Removal and Installation (If Equipped)

Removal

1) Disconnect negative (−) cable at battery.
2) Drain coolant.
3) Remove exhaust manifold cover.
4) Remove block heater protector, and then disconnect block heater harness connector.
5) Remove cylinder block heater (1).



2.	Exhaust manifold

Installation

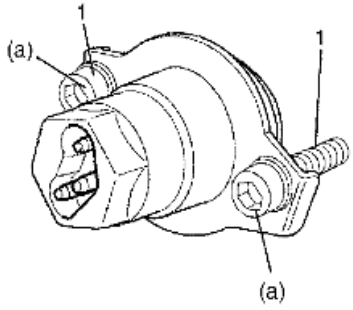
Reference: Cylinder Block Heater Inspection (If Equipped)

Reverse removal procedure for installation noting the following points:

- Use new cylinder block heater bolts.
- Tighten cylinder block heater bolts (1) to specified torque.

Tightening torque

Cylinder block heater bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



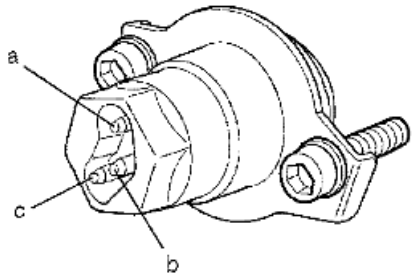
- Refill coolant. ☞
- Check for coolant leaks. ☞

1D

Cylinder Block Heater Inspection (If Equipped)

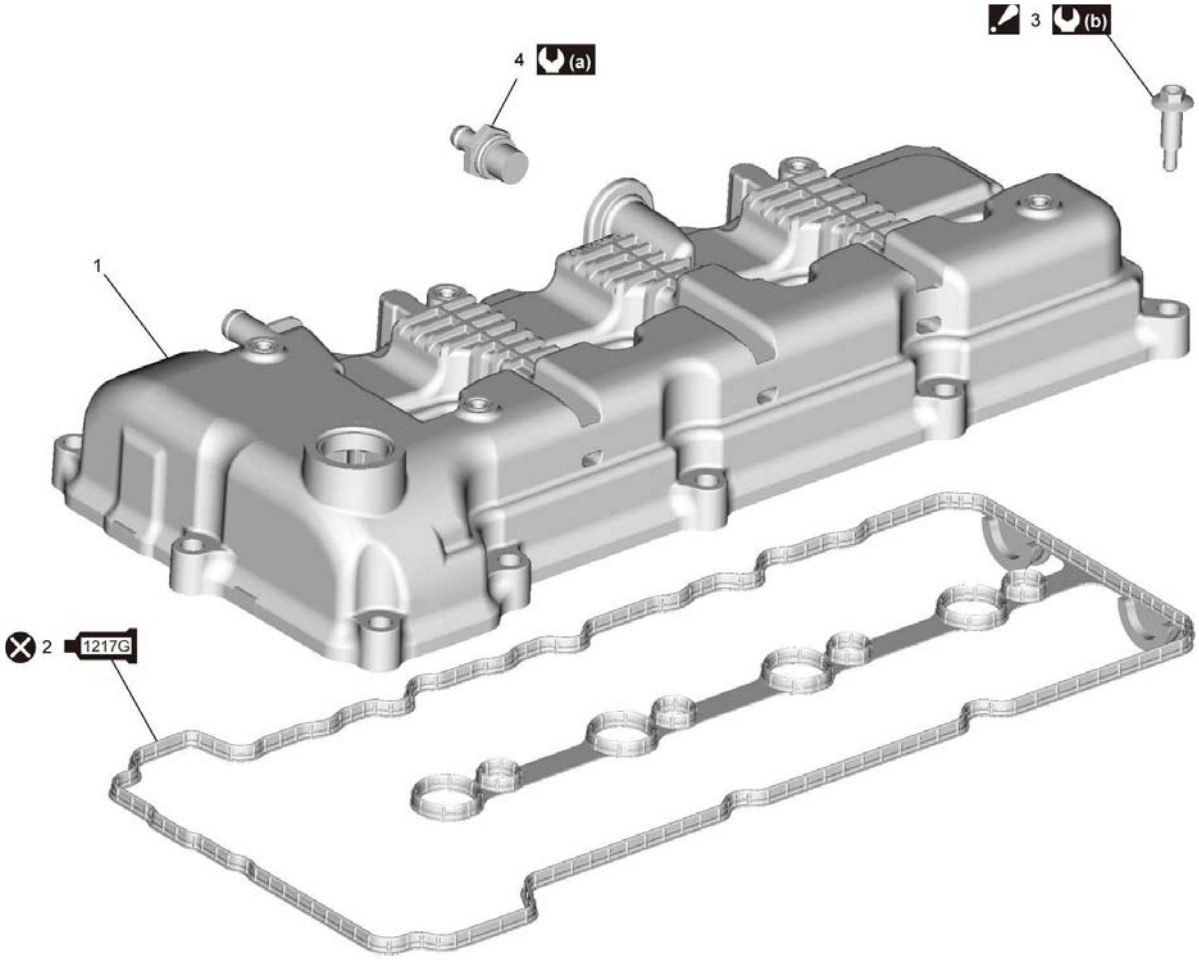
Reference: Cylinder Head Cover Removal and Installation

- Check continuity between terminals “a” and “c”.
  Replace cylinder block heater. If there is no continuity. ☞
- Check that there is no continuity between terminal “a” and “b”.
  Replace cylinder block heater. If there is continuity. ☞
- Check continuity between terminal “b” and cylinder block heater body.
  Replace cylinder block heater. If there is no continuity. ☞



1D

Cylinder Head Cover Components



1. Cylinder head cover	4. PCV valve	: Do not reuse.
1217G 2. Cylinder head cover gasket : Apply sealant 99000-31260 referring to ***Cylinder Head Cover Removal and Installation***.	(a) : 2.5 N·m (0.25 kgf-m, 2.0 lbf-ft)	
3. Cylinder head cover bolt : For tightening order, refer to ***Cylinder Head Cover Removal and Installation***.	(b) : 3.0 N·m → 5.0 N·m → 7.5 N·m (0.31 kgf-m → 0.51 kgf-m → 0.76 kgf-m, 2.5 lbf-ft → 4.0 lbf-ft → 5.5 lbf-ft)	

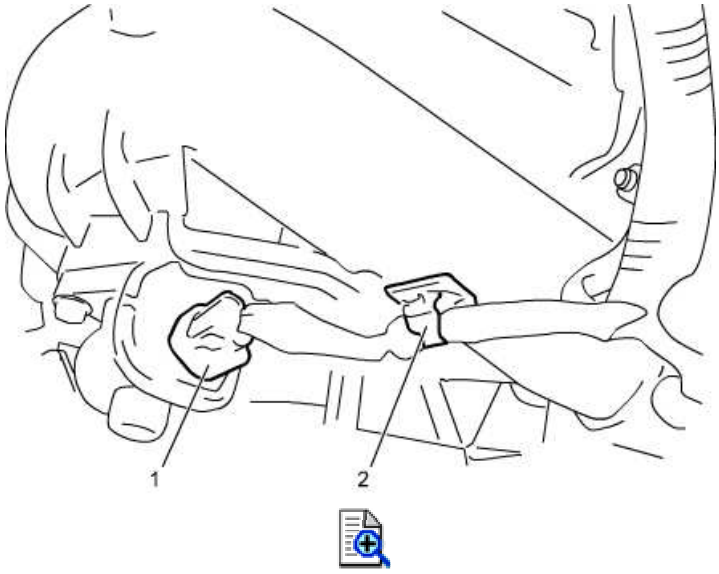
1D

Cylinder Head Cover Removal and Installation

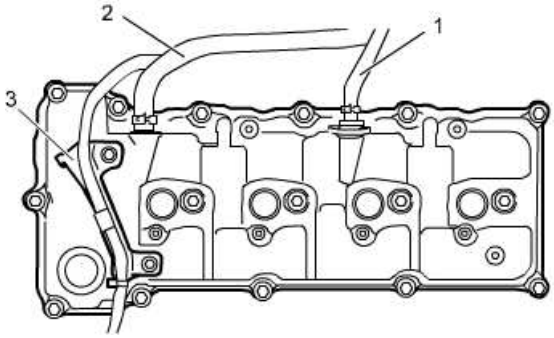
Reference: Cylinder Head Cover Components

Removal

1) Disconnect negative (−) cable at battery.
2) Remove engine cover.
3) Remove ignition coil assemblies from cylinder head cover. ☞
4) Disconnect IMT valve connector (1) and IMT valve harness clamp (2).



5) Disconnect PCV valve hose (1) and breather hose (2).
6) Detach engine harness clamps.
7) Remove engine harness bracket (3).



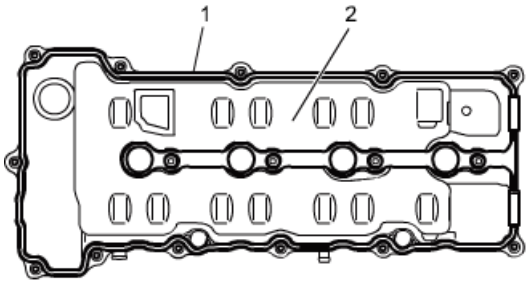
8) Remove cylinder head cover bolts.
9) Remove cylinder head cover with its gasket.
10) Remove PCV valve if necessary.

Installation

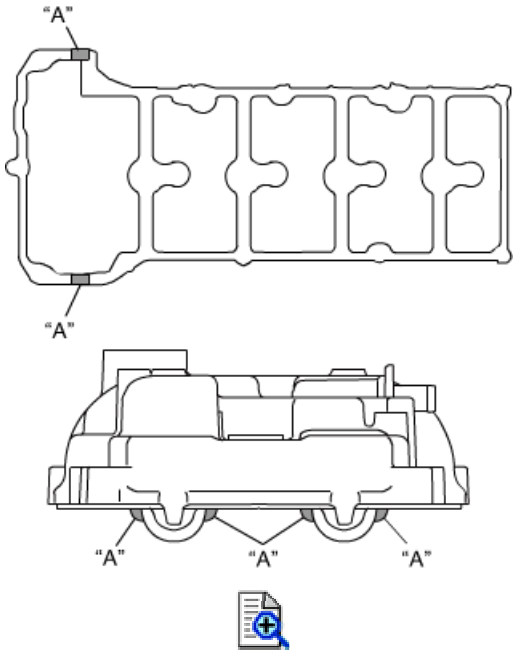
1) Tighten PCV valve to specified torque, if removed.

Tightening torque
PCV valve: 2.5 N·m (0.25 kg-m, 2.0 lbf-ft)

2) Remove oil, old sealant, and dust from sealing surfaces on cylinder head and cover.
3) Install new cylinder head cover gasket (1) to cylinder head cover (2) as shown in figure.



4) Apply sealant "A" to the designated area as shown in figure.
"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)



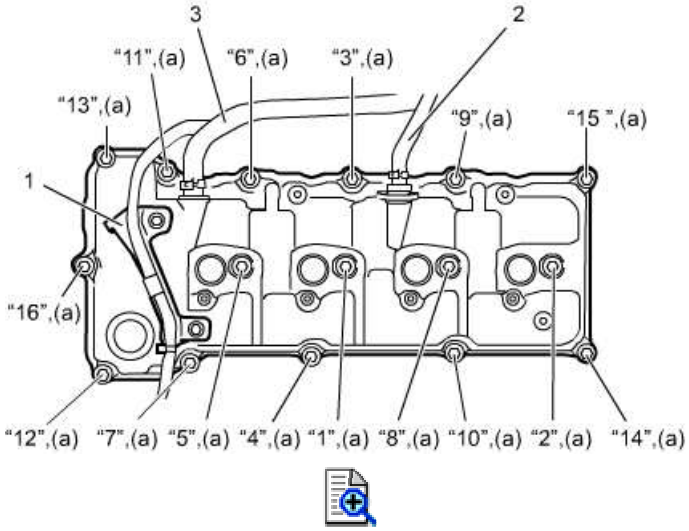
5) Install cylinder head cover to cylinder head.

> **NOTE:**
> **Install cylinder head cover, making sure cylinder head cover gasket for proper fit in cylinder head cover.**

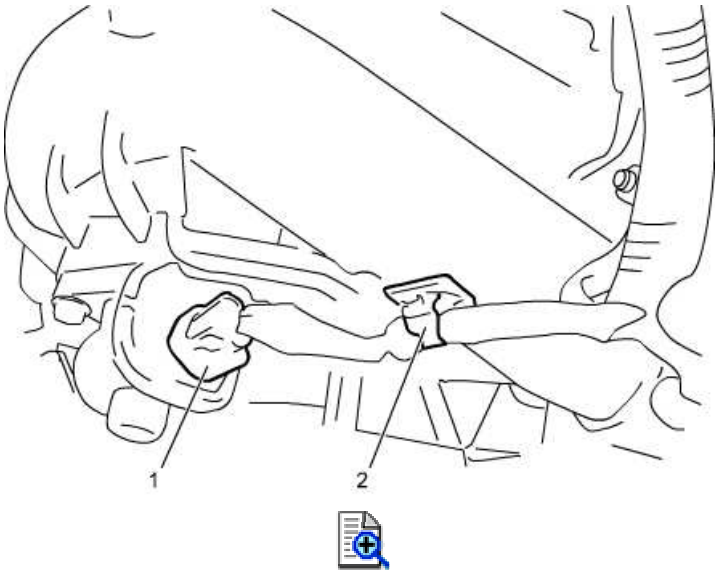
6) Tighten cylinder head cover bolts using the following procedures:
a) Tighten cylinder head cover bolts to 3.0 N·m (0.31 kgf-m, 2.5 lbf-ft) in numerical order ("1" – "16") evenly and gradually.
b) Retighten them to 5.0 N·m (0.51 kgf-m, 4.0 lbf-ft). In the same manner as in Step a).
c) Retighten them to 7.5 N·m (0.76 kgf-m, 5.5 lbf-ft). In the same manner as in Step a).

Tightening torque
Cylinder head cover bolt* (a): 3.0 N·m → 5.0 N·m → 7.5 N·m (0.31 kgf-m → 0.51 kgf-m → 0.76 kgf-m, 2.5 lbf-ft → 4.0 lbf-ft → 5.5 lbf-ft)

7) Install engine harness bracket (1).
8) Connect PCV valve hose (2) to PCV valve and breather hose (3) to cylinder head cover.



9) Connect IMT valve connector (1) and IMT valve harness clamp (2).



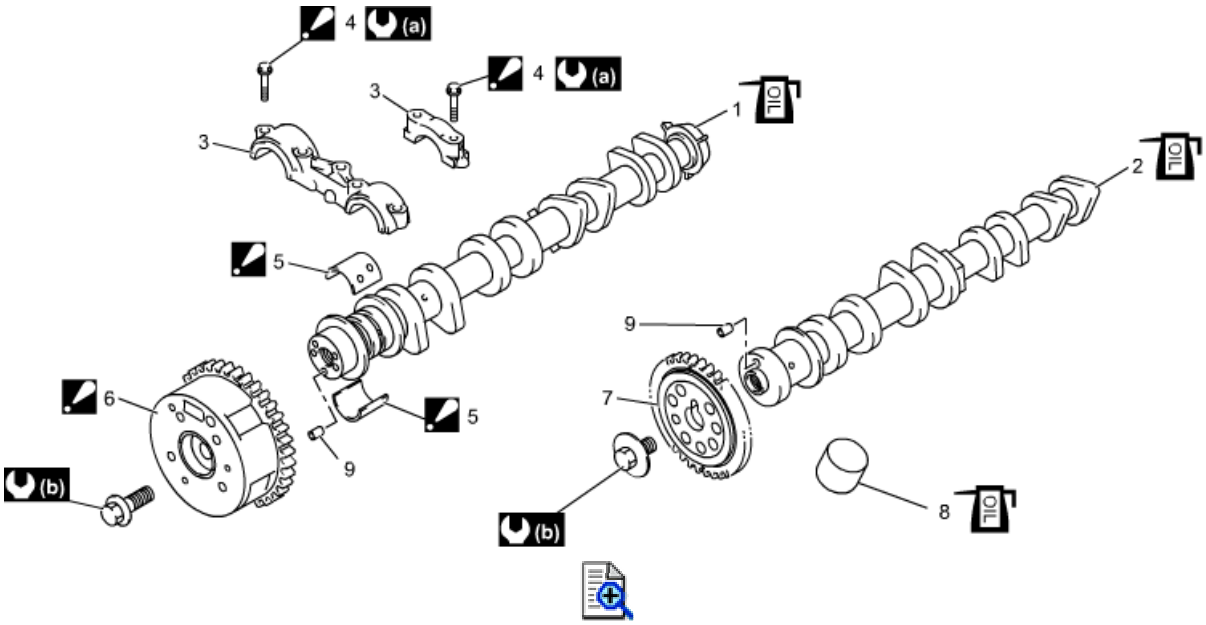
10) Install ignition coil assemblies. ☞

11) Install engine cover.

12) Connect negative (–) cable at battery.

1D

Camshaft and Tappet Components



OIL 1. Intake camshaft : Apply engine oil to sliding surface.	5. Camshaft bearing : For applying engine oil, refer to ***Camshaft and Tappet Removal and Installation***. : To distinguish upper and lower, refer to ***Camshaft and Tappet Removal and Installation***.	9. Dowel pin
OIL 2. Exhaust camshaft : Apply engine oil to sliding surface.	6. CMP actuator : Do not disassemble.	(a) : 11 N·m (1.1 kgf -m, 8.5 lbf-ft)
3. Camshaft housing	7. Exhaust camshaft timing sprocket	(b) : 60 N·m (6.1 kgf -m, 44.5 lbf-ft)
4. Camshaft housing bolt : For tightening order, refer to***Camshaft and Tappet Removal and Installation***.	OIL 8. Tappet : Apply engine oil to sliding surface.	

1D

Camshaft and Tappet Removal and Installation

Reference: Camshaft and Tappet Components

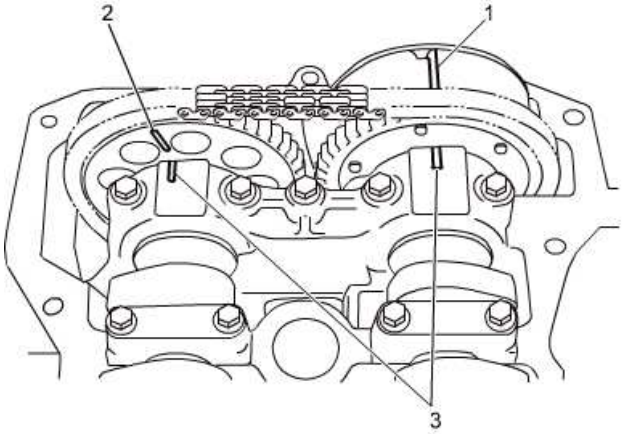
Removal

1) Remove cylinder head cover. ☞

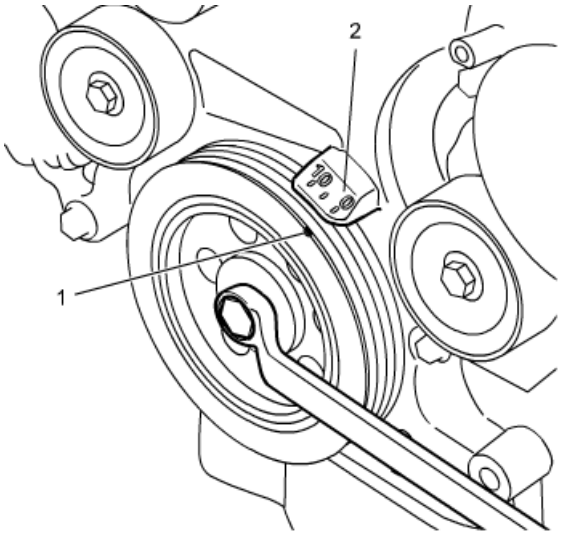
2) Remove accessory drive belt. ☞

3) Turn crankshaft clockwise, and position piston No.1 at TDC on the compression stroke using the following procedures:

a) Align the timing mark (1) on the CMP actuator and the timing mark (2) on the exhaust camshaft timing sprocket with the matchmark (3) on the camshaft housing No.1.

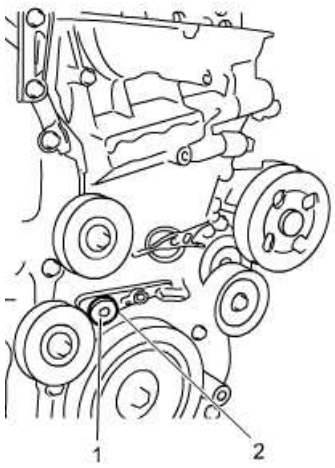


b) Align notch mark (1) on the crankshaft pulley with "0" (2) on the timing chain cover.



4) Fix timing chain tensioner using the following procedures:

a) Remove timing chain cover plug (1) and gasket (2).



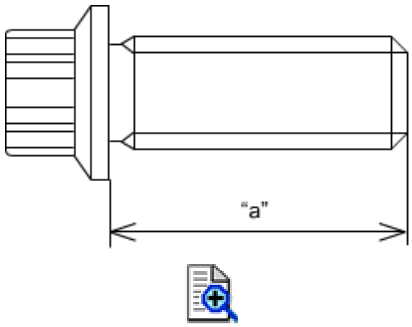
b) Insert fore-end of special tool into timing chain tensioner hole (1) from timing chain cover plug hole.

NOTE:
Make sure that special tool is inserted in timing chain tensioner hole, with mirrors or the like.

Special Tool
(A): 09917–16710

c) Fix special tool by special tool fixing bolt (2) to specified torque.

CAUTION:
- **Failure to observe the following cautions result in engine damage or incorrect installing of timing chain.**
- **Use the following bolt for special tool fixing bolt.**



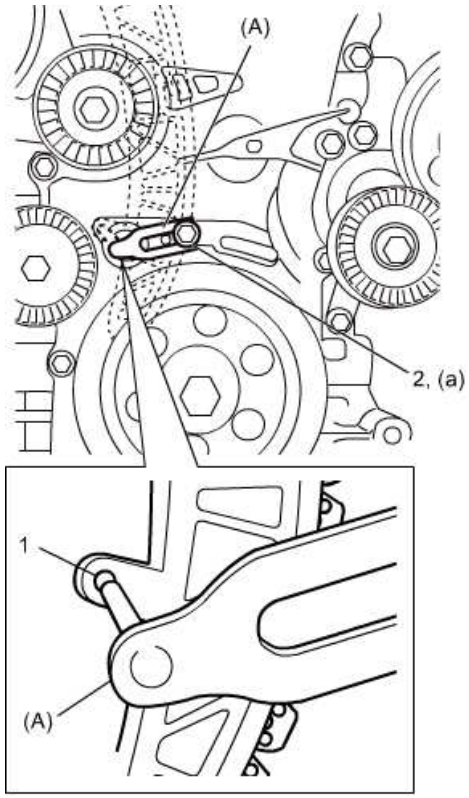
Special tool fixing bolt

Bolt size	M6
Pitch	1.0 mm (0.039 in.)
Length "a"	15.0 mm (0.590 in.)

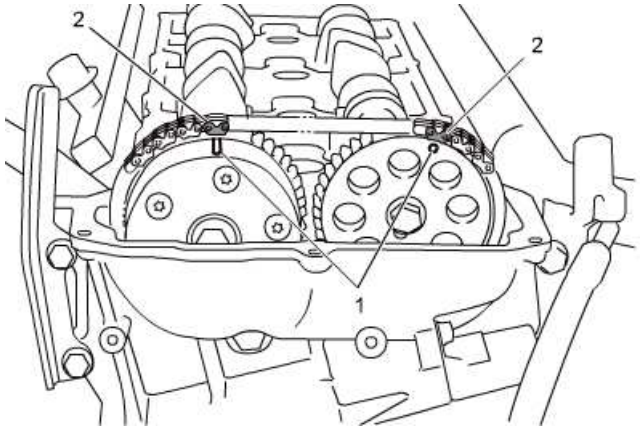
- **Be sure to tighten specified tool fixing bolt (2) to specified torque. If bolt becomes loose, plunger of timing chain tensioner adjuster may extend, making it difficult to properly reinstall timing chain.**
- **Do not turn crankshaft after timing chain is fixed with special tool.**

Tightening torque

Special tool fixing bolt (a): 8 N·m (0.82 kg-m, 6.0 lbf-ft)



5) Apply a dab of paint to two timing chain links (2) which meet timing marks (1) on CMP actuator and exhaust camshaft timing sprocket.

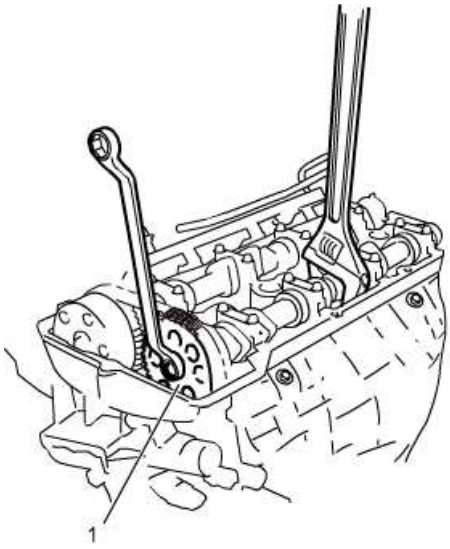


6) Remove exhaust camshaft timing sprocket using the following procedures:

a) Hold the hexagonal section of exhaust camshaft using a wrench.

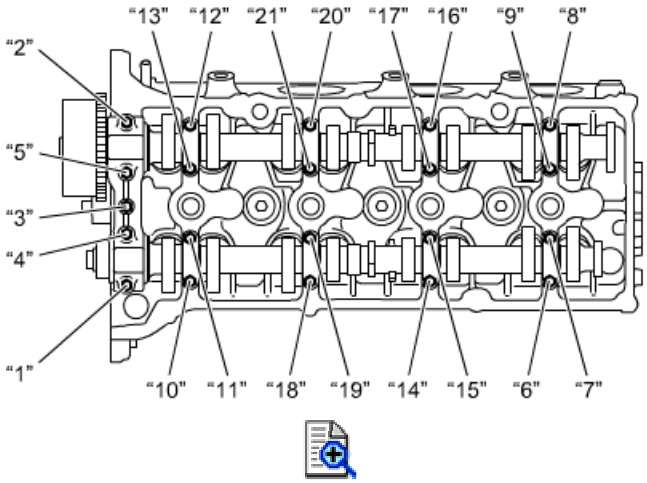
b) Remove exhaust camshaft timing sprocket bolt, then remove sprocket (1).

NOTE:
Be careful not to drop dowel pin into the space between timing chain cover and cylinder block.



7) Remove dowel pin from exhaust camshaft.

8) Loosen camshaft housing bolts in numerical order ("1" – "21") evenly and gradually.



9) Remove intake camshaft and exhaust camshaft.

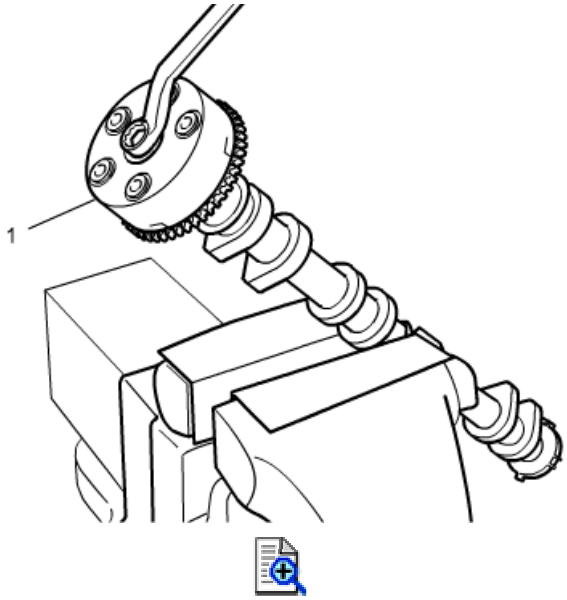
10) Remove camshaft bearings and tappets if necessary.

11) Remove CMP actuator from intake camshaft using the following procedures if necessary.

a) Hold hexagonal section of intake camshaft using vice.

b) Remove CMP actuator bolt, and then remove CMP actuator (1).

CAUTION:
Do not disassemble CMP actuator.



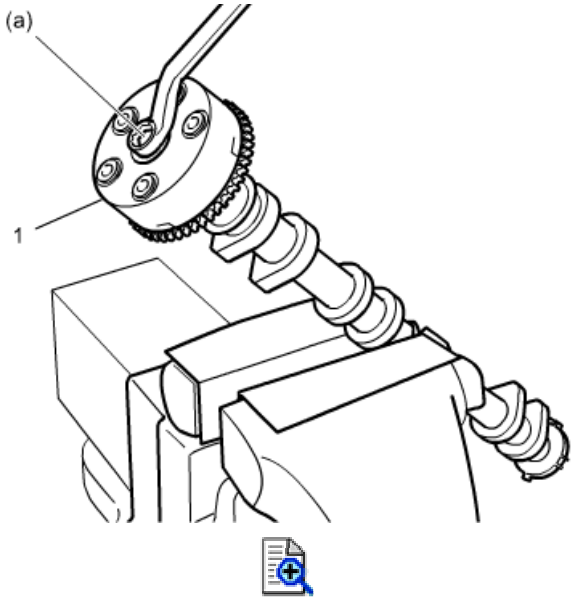
Installation

Reference: Camshaft and Tappet Inspection

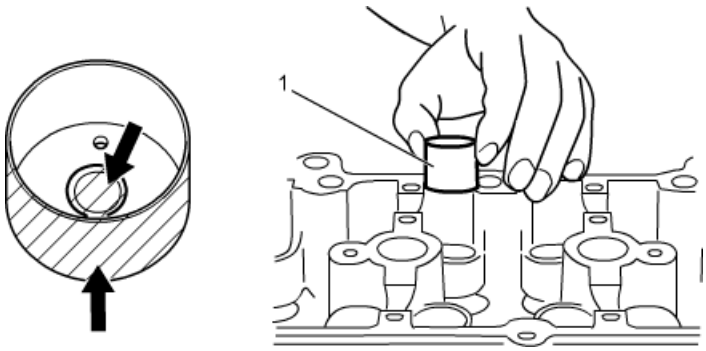
1) Install CMP actuator (1) to intake camshaft.

Tightening torque

CMP actuator bolt (a): 60 N·m (6.1 kg-m, 44.5 lbf-ft)

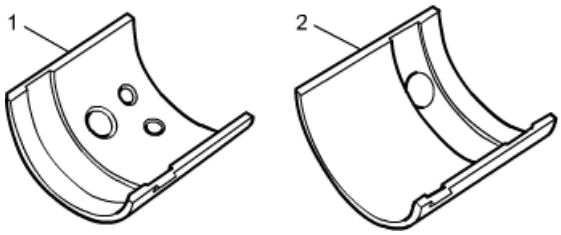


2) Apply engine oil to contact surface of tappets (hatched area), and then Install tappets (1) to cylinder head.



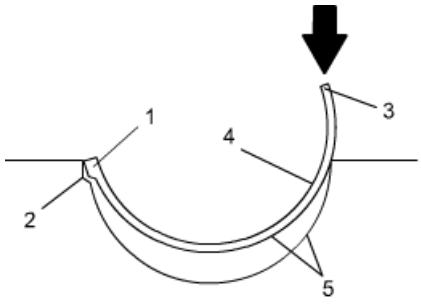
3) Install camshaft bearings using the following procedures:

CAUTION:
When installing, distinguish between upper bearing (1) and lower bearing (2) referring to the following figure.

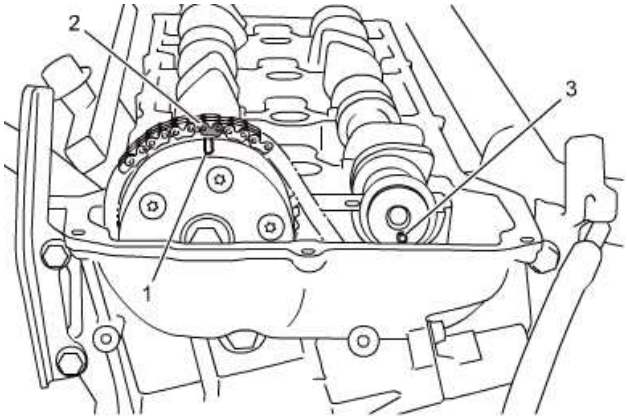


a) Fit tab (1) of camshaft bearing to groove (2) of cylinder head or camshaft housing.
b) Press camshaft bearing end (3) until it is firmly seated on the cylinder head or camshaft housing.
c) Apply engine oil to sliding surface (4) of camshaft bearing halves.

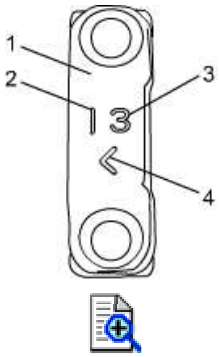
CAUTION:
Do not apply engine oil between bearing halves (5) and camshaft housing or cylinder head (5).



4) Apply engine oil to sliding surfaces of camshafts, and then install camshafts to cylinder head using the following procedures:
a) Align the timing chain link (2), which is painted in Step 5) of "Removal" under this section, with timing mark (1) on CMP actuator and install intake camshaft.
b) Install the exhaust camshaft so that the dowel pin hole (3) is positioned downwards.



5) Install camshaft housings (1) to proper places distinguished by letter (2), number (3) and arrow direction (4) on each camshaft housing.



2.	I: For intake camshaft E: For exhaust camshaft
3.	Position from timing chain side
4.	Point arrowhead to timing chain side

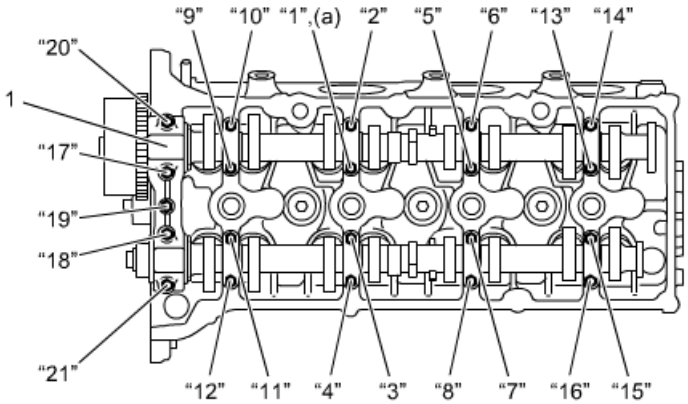
6) Tighten camshaft housing bolts using the following procedures:

a) Install camshaft housing No.1 (1).
Install camshaft housing bolts, and tighten them by hand.

b) Tighten camshaft housing bolts in numerical order (“1” – “21”) evenly and gradually.

Tightening torque

Camshaft housing bolt*: 11 N·m (1.1 kg-m, 8.5 lbf-ft)



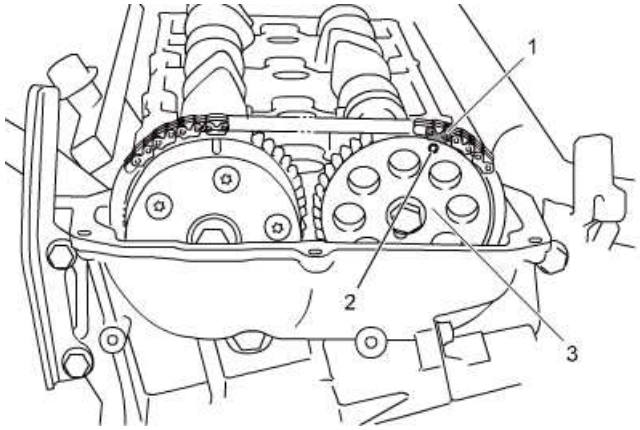
7) Install dowel pin to exhaust camshaft.

CAUTION:
Be careful not to drop dowel pin into the space between timing chain cover and cylinder block.

8) Install exhaust camshaft timing sprocket (3) to exhaust camshaft using the following procedures.

a) Align the timing chain link (1), which is painted in Step 5) of "Removal", with timing mark (2) on exhaust camshaft timing sprocket (3), and loop timing chain up over exhaust camshaft timing sprocket.

b) Install exhaust camshaft timing sprocket (3) with timing chain to the exhaust camshaft.



9) Tighten exhaust camshaft timing sprocket bolt (1) using special tool.

Special Tool

(A): 09911–05120

Tightening torque

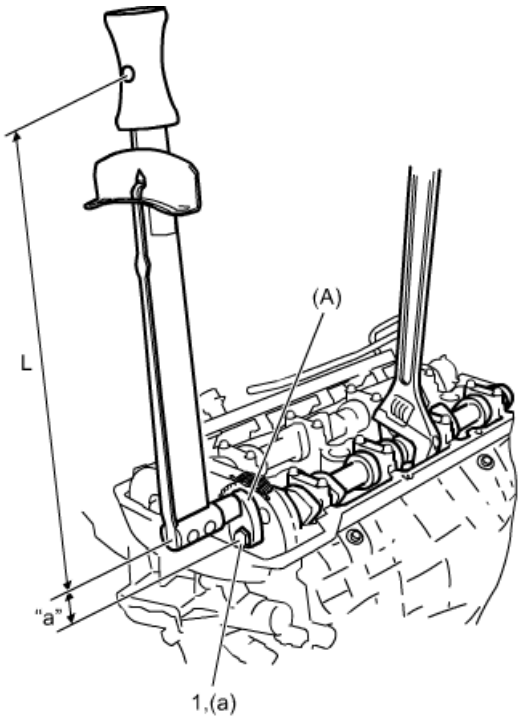
Exhaust camshaft timing sprocket bolt (a): 60 N·m (6.1 kg-m, 44.5 lbf-ft)

CAUTION:
When using an extension special tool with a torque wrench, the reading value of the torque wrench is smaller than specified torque. When using extension special tool, reading value should be calculated using the formula below:

Formula for reading value of torque wrench.

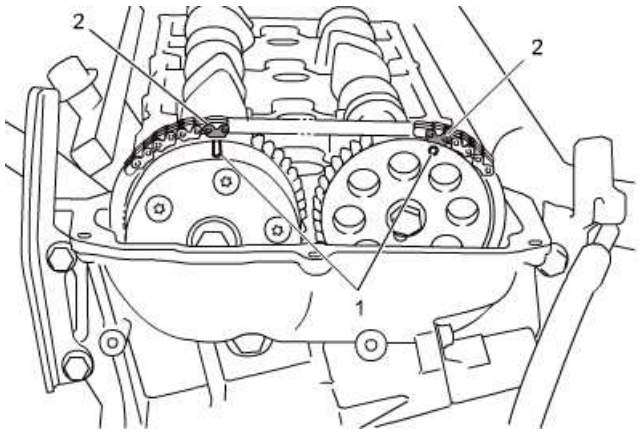
M = T X L / (L + "a")

- **M: Reading value using extension special tool**
- **T: Specified torque**
- **L: Torque wrench length**
- **"a": Dimension of special tool**



"a":	20 mm (0.78 in.)

10) Confirm that painted timing chain links (2) are aligned with timing marks (1) on CMP actuator and exhaust camshaft timing sprocket.

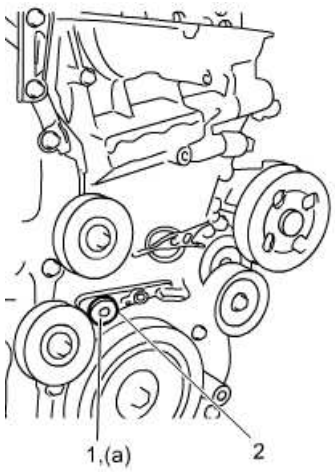


11) Remove special tool from timing chain cover.

12) Install timing chain cover plug (1) with new gasket (2), and tighten it to specified torque.

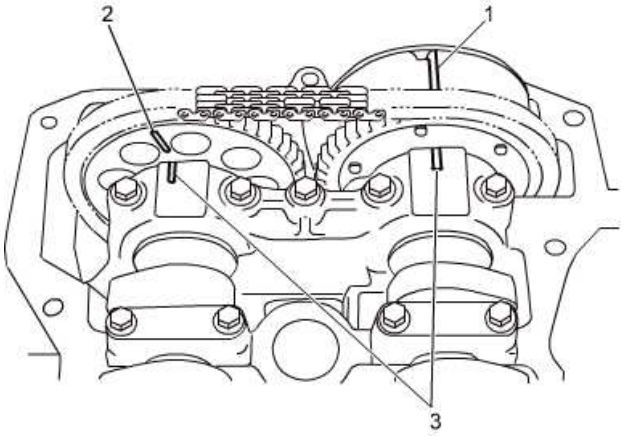
Tightening torque

Timing chain cover plug (a): 27 N·m (2.8 kg-m, 20.0 lbf-ft)

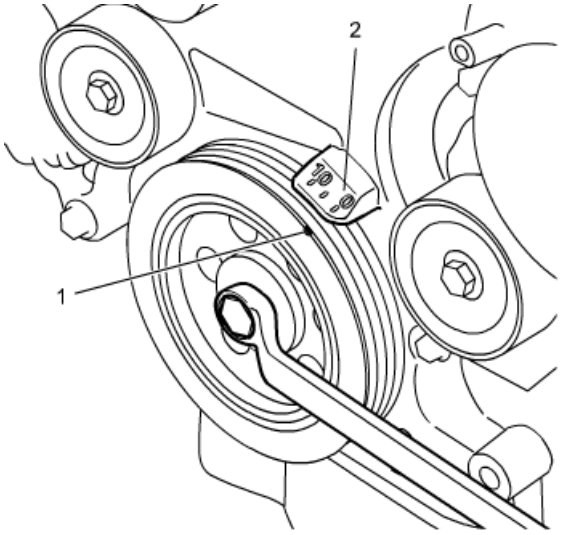


13) Check that camshaft and timing chain are properly installed as follows:

a) Check that timing mark (1) on CMP actuator and timing mark (2) on exhaust camshaft timing sprocket are aligned with matchmark (3) on camshaft housing No.1.



b) Check that notch mark (1) on crankshaft pulley is aligned with "0" (2) on timing chain cover.



c) Turn crankshaft clockwise 720° twice and repeat Step a) and b).

NOTE:
- **Be sure to turn crankshaft 720°. If it is turned only 360°, the timing marks on CMP actuator and exhaust camshaft timing sprockets will not meet matchmark on camshaft housing No.1.**
- **After turning crankshaft 720°, the painted links of the timing chain will not be aligned with the timing marks on the CMP actuator and the exhaust timing sprocket, but this is normal.**

14) Check valve clearance. ☞

15) Install cylinder head cover. ☞

1D

Camshaft and Tappet Inspection

Reference: Camshaft and Tappet Removal and Installation

Cam Height

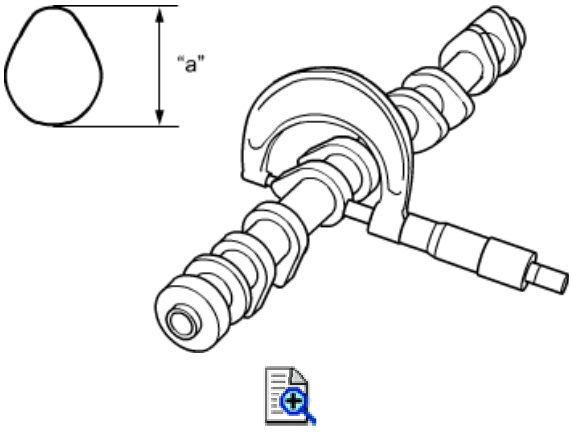
Use a micrometer to measure cam height "a". Replace camshaft if measured height is out of standard values.

Cam Height (IN)

Standard: 47.620 – 47.780 mm (1.8748 – 1.8811 in.)
Limit: 47.490 mm (1.8696 in.)

Cam Height (EX)

Standard: 46.543 – 46.703 mm (1.8324 – 1.8387 in.)
Limit: 46.420 mm (1.8275 in.)



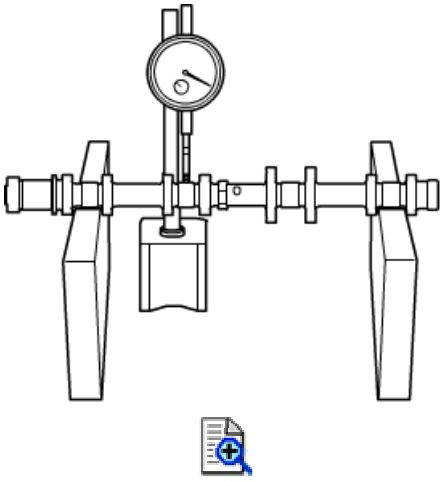
Camshaft Runout

Set camshaft between two "V" blocks and measure its runout using a dial gauge.
Replace camshaft if measured camshaft runout exceeds limit.

CAUTION:
Do not attempt to fix camshaft runout for the purpose of reuse.

Camshaft runout limit

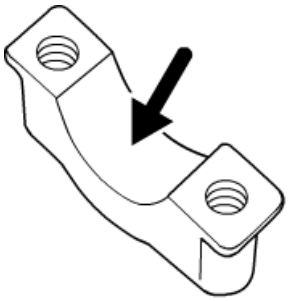
0.015 mm (0.00059 in.)



Camshaft Journal

- Check camshaft journals and camshaft housings for pitting, scratches, wear or damage. Replace camshaft or cylinder head with camshaft housings if any defective conditions are found.

CAUTION:
Do not attempt to fix faults in camshaft journal and camshaft housing for the purpose of reuse.



Camshaft Journal Clearance

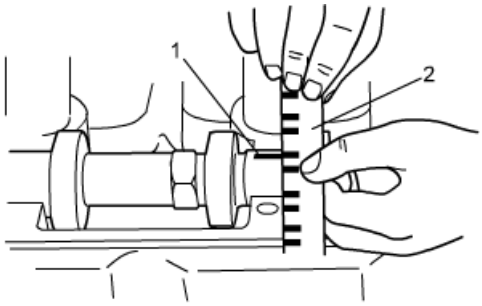
1) Clean camshaft housings and camshaft journals.
2) Remove all tappets.
3) Install lower bearing half and camshafts to cylinder head.
4) Place plastic gauge with the same width as the camshaft journal parallel to the camshaft, avoiding the oil hole.
5) Install camshaft housing referring to steps 5) to 6) in "Installation" under ***Camshaft and Tappet Removal and Installation***.

CAUTION:
Do not rotate camshaft while gauging plastic is installed.

6) Remove housings, and use scale (2) on plastic gauge envelope to measure plastic gauge (1) width at the widest point.

Camshaft journal clearance (intake side of camshaft housing No.1)
Standard: 0.020 – 0.072 mm (0.00078 – 0.00283 in.)
Limit: 0.10 mm (0.0039 in.)

Camshaft journal clearance (except intake side of camshaft housing No.1)
Standard: 0.020 – 0.062 mm (0.00078 – 0.00244 in.)
Limit: 0.095 mm (0.00374 in.)



If measured camshaft journal clearance exceeds limit, recheck camshaft journal clearance using the following procedures:

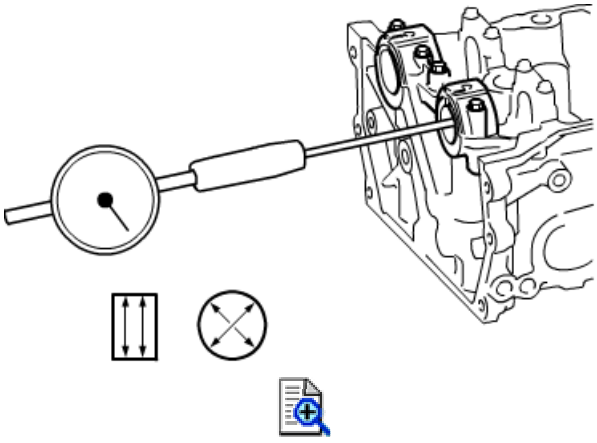
a) Install camshaft upper bearing half and camshaft housings without camshafts to cylinder head.
b) Tighten camshaft housing bolts referring to Step 6) in "Installation" under ***Camshaft and Tappet Removal and Installation***.
c) For intake camshaft journal No.1, measure journal outside diameter at positions shown in figure.
Replace camshaft and recheck camshaft journal clearance if measured diameter is out of standard values.
Replace camshaft bearings and recheck camshaft journal clearance if measured diameter is within standard values.
d) For all other camshaft journals, measure camshaft journal outside diameters and camshaft housing inside diameters.
Replace corresponding camshaft or cylinder head and camshaft housings if measured diameters are out of standard values.

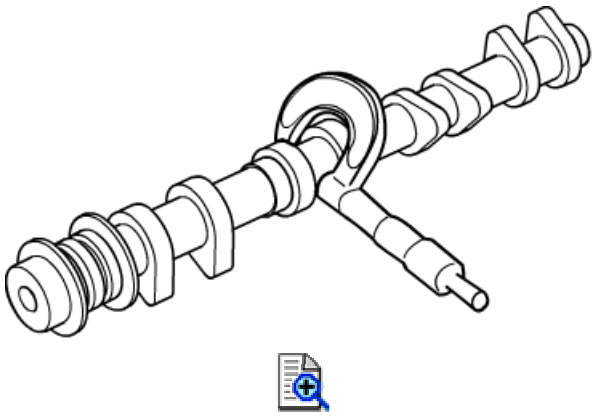
Camshaft journal outside diameter

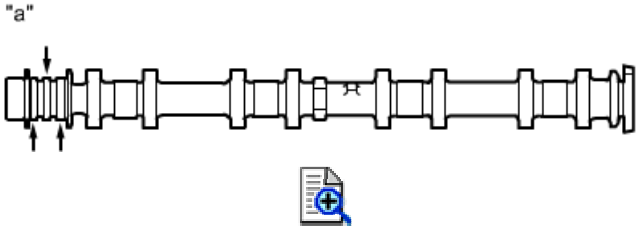
Item	Standard
Intake camshaft journal No.1 "a"	28.959 – 28.980 mm (1.1402 – 1.1409 in.)
Exhaust camshaft journal No.1	26.959 – 26.980 mm (1.0614 – 1.0622 in.)
Others	25.959 – 25.980 mm (1.0220 – 1.0228 in.)

Camshaft housing inside diameter

Item	
Camshaft housing No.1 (intake)	32.000 – 32.025 mm (1.2599 – 1.2608 in.)
Camshaft housing No.1 (exhaust)	27.000 – 27.021 mm (1.0630 – 1.0638 in.)
Others	26.000 – 26.021 mm (1.0237 – 1.0244 in.)



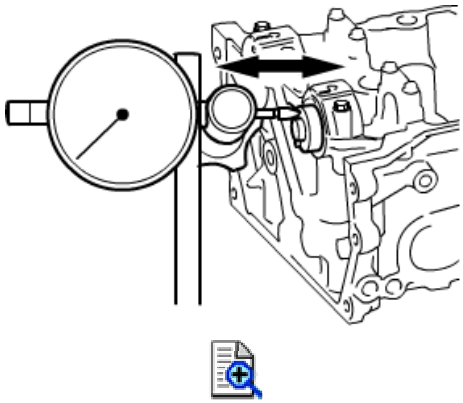




7) Install intake and exhaust camshaft without tappet, and then measure intake and exhaust camshaft housing thrust clearance using a dial gauge.
Replace camshaft or cylinder head and camshaft housings if measured clearance exceeds limit.

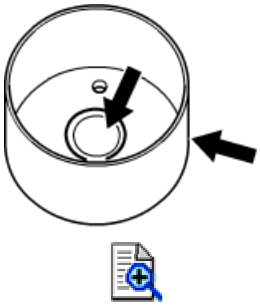
Camshaft housing thrust clearance

Standard: 0.10 – 0.35 mm (0.0039 – 0.0137 in.)
Limit: 0.50 mm (0.019 in.)



Wear of Tappet

Check tappet for pitting, scratches, or damage.
Replace tappet if any defective conditions are found.



Measure tappet bore of cylinder head inside diameter, and tappet outside diameter, and then determine cylinder head-to-tappet clearance. Replace tappet or cylinder head if clearance exceeds limit.

Cylinder head to tappet clearance

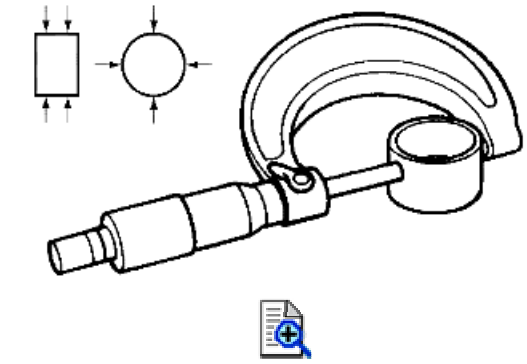
Standard: 0.025 – 0.066 mm (0.0010 – 0.0025 in.)
Limit: 0.10 mm (0.0039 in.)

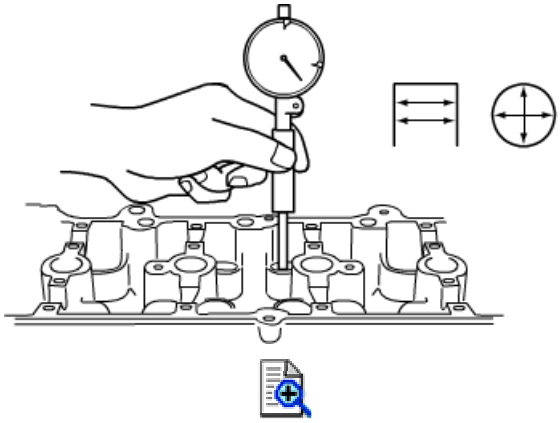
Tappet outside diameter

Standard: 32.459 – 32.475 mm (1.2780 – 1.2785 in.)

Cylinder head tappet bore

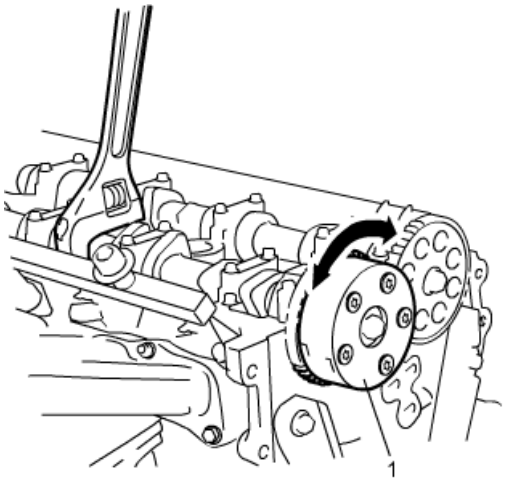
Standard: 32.500 – 32.525 mm (1.2796 – 1.2805 in.)





CMP actuator

- Check CMP actuator for wear or damage.
  Replace CMP actuator if any defective conditions are found.
- Install CMP actuator to intake camshaft and hold hexagonal section of intake camshaft stationary using wrench.
  Check that CMP actuator (1) cannot be turned by hand.
  Replace CMP actuator if it can be turned by hand.



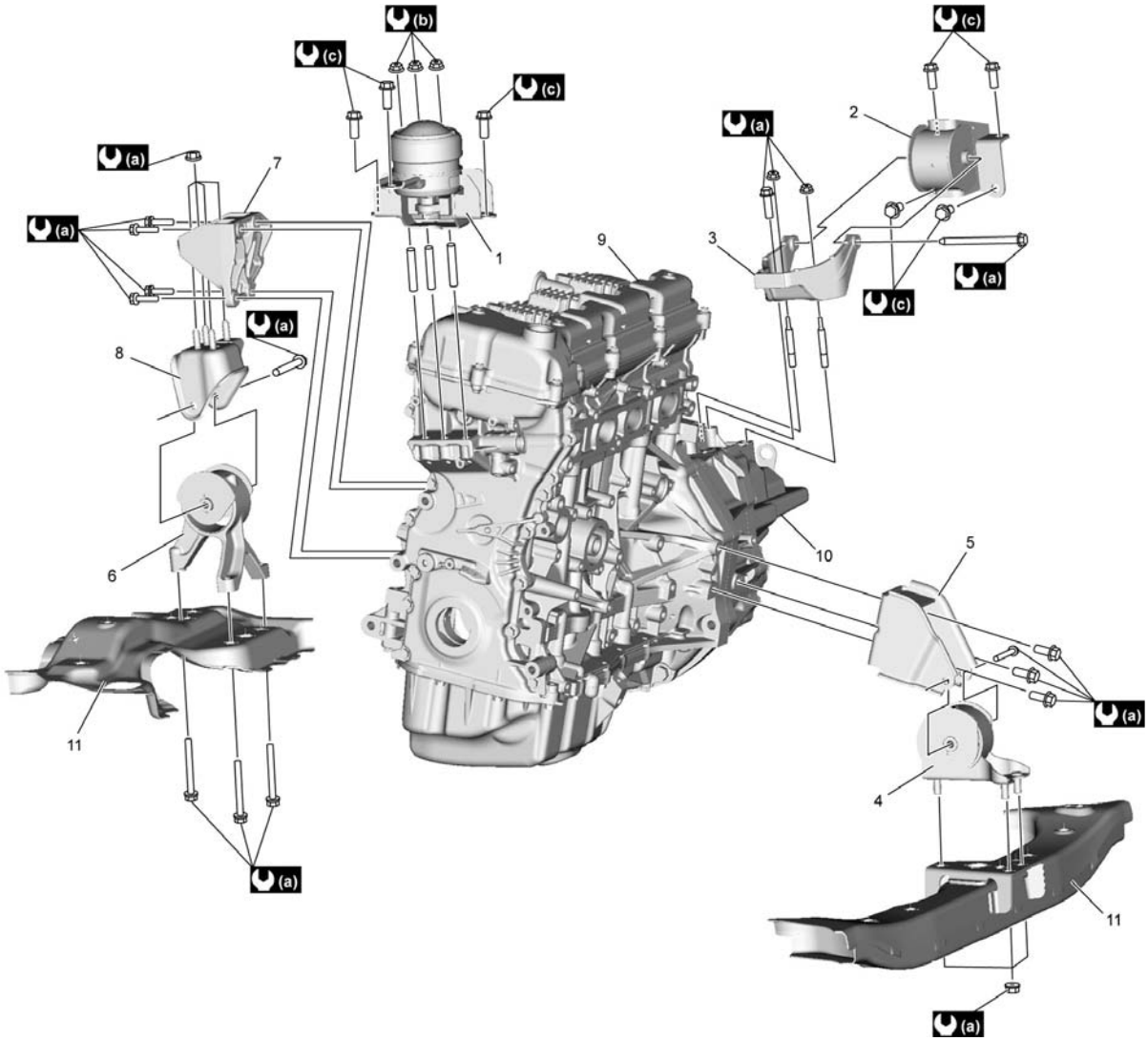
Exhaust Camshaft Timing Sprocket

Check exhaust camshaft timing sprocket for wear and damage.
Replace exhaust camshaft timing sprocket if any defective conditions are found.

1D

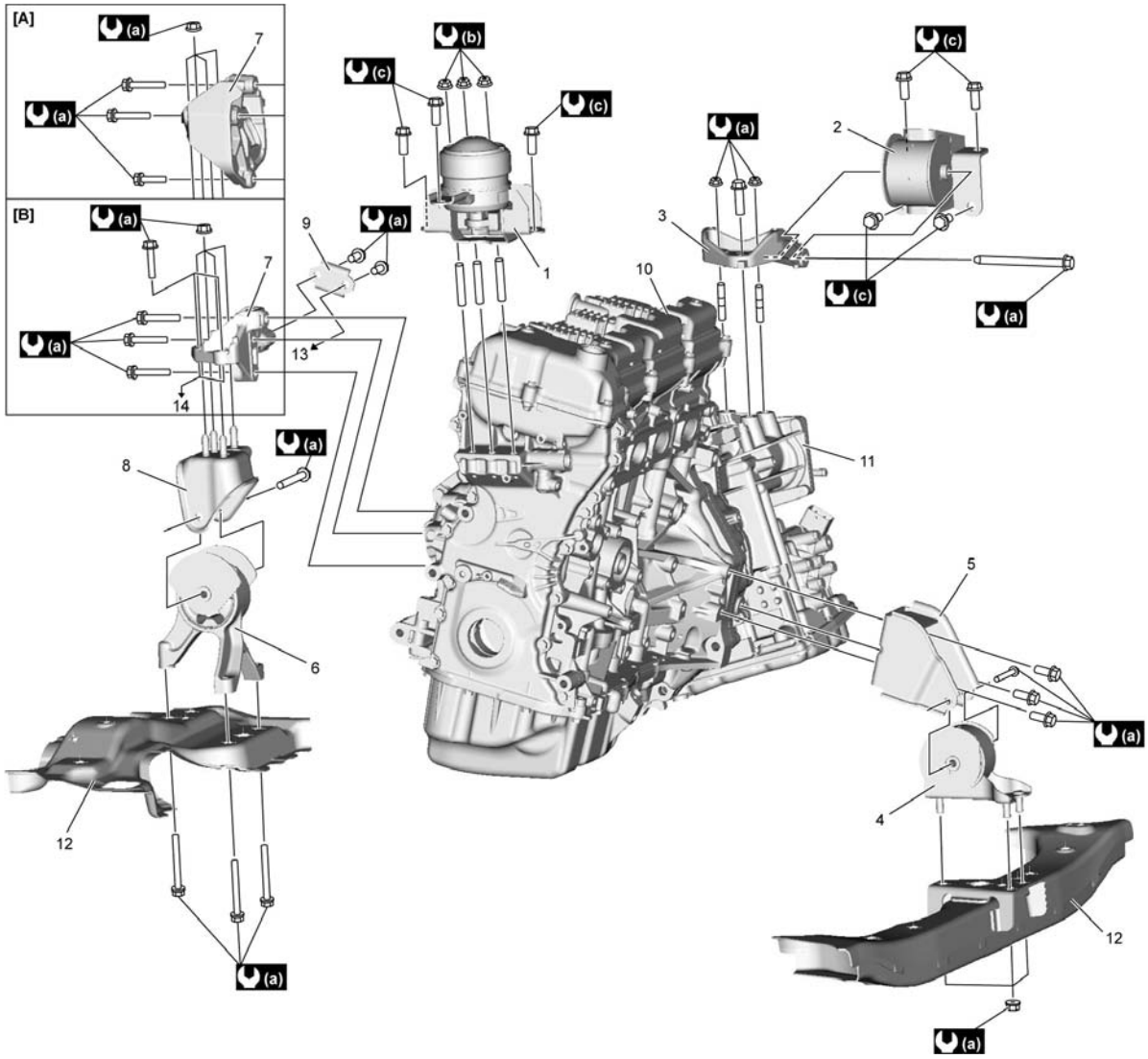
Engine Mountings Components

M/T Model



1. Engine right mounting	6. Engine rear mounting	11. Suspension frame
2. Engine left mounting	7. Engine rear mounting bracket No.1	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
3. Engine left mounting bracket	8. Engine rear mounting bracket No.2	(b) : 65 N·m (6.6 kgf-m, 48.0 lbf-ft)
4. Engine front mounting	9. Engine assembly	(c) : 93 N·m (9.5 kgf-m, 68.5 lbf-ft)
5. Engine front mounting bracket	10. Transaxle	

CVT Model



[A]: 2WD model	6. Engine rear mounting	13. To CVT assembly
[B]: 4WD model	7. Engine rear mounting bracket No.1	14. To transfer
1. Engine right mounting	8. Engine rear mounting bracket No.2	(a) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
2. Engine left mounting	9. Engine rear mounting bracket stiffener	(b) : 65 N·m (6.6 kgf-m, 48.0 lbf-ft)
3. Engine left mounting bracket	10. Engine assembly	(c) : 93 N·m (9.5 kgf-m, 68.5 lbf-ft)
4. Engine front mounting	11. CVT assembly	
5. Engine front mounting bracket	12. Suspension frame	

1D

Engine Assembly Removal and Installation

Removal

1) Relieve fuel pressure. ☞

2) Disconnect negative (–) and positive (+) cables at battery.

3) Disconnect ECM connectors.

4) Remove ECM, battery, battery tray and battery bracket. ☞

5) Remove right and left side engine under covers.

6) Remove right and left side front fender lower linings.

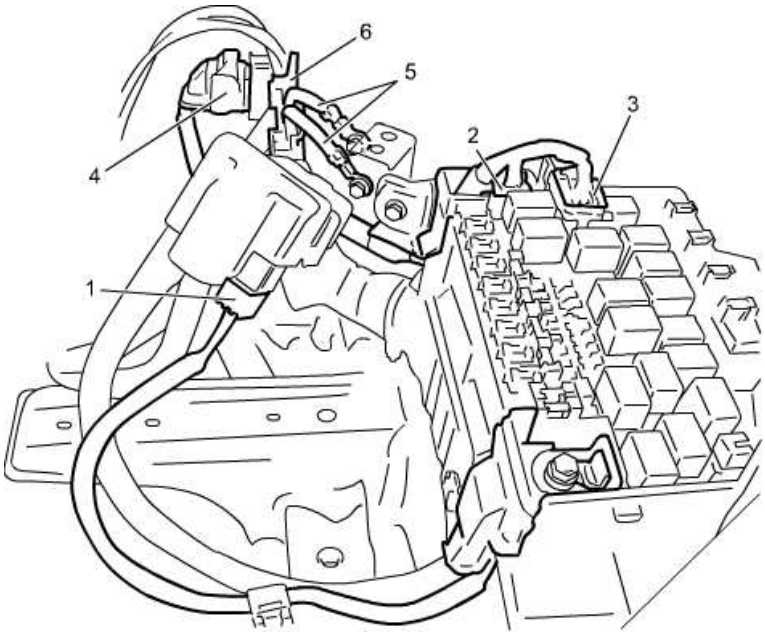
7) Remove front bumper and front bumper lower cover. ☞

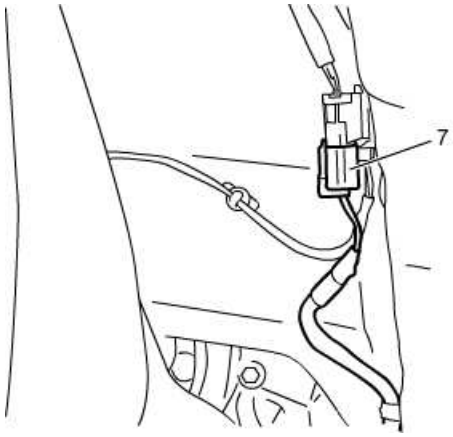
8) Remove engine cover.

9) Drain coolant. ☞

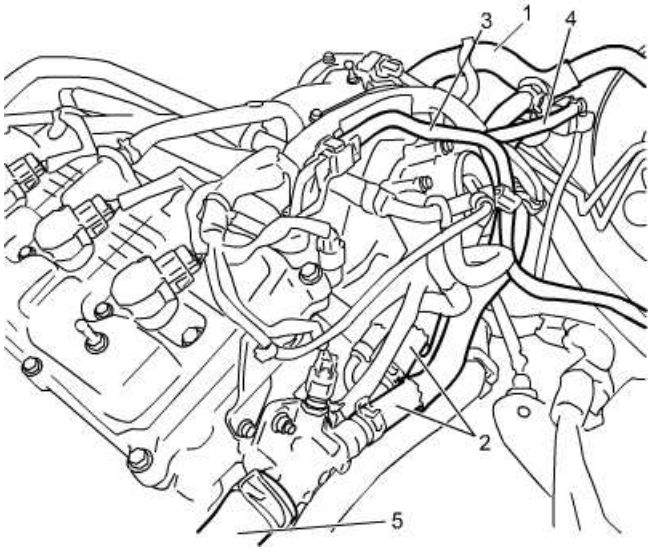
10) Drain the following oils and fluid if necessary.
- Engine oil: ☞
- Manual transaxle oil (M/T model): ☞
- CVT fluid (CVT model): ☞
- Transfer oil (4WD model): ☞

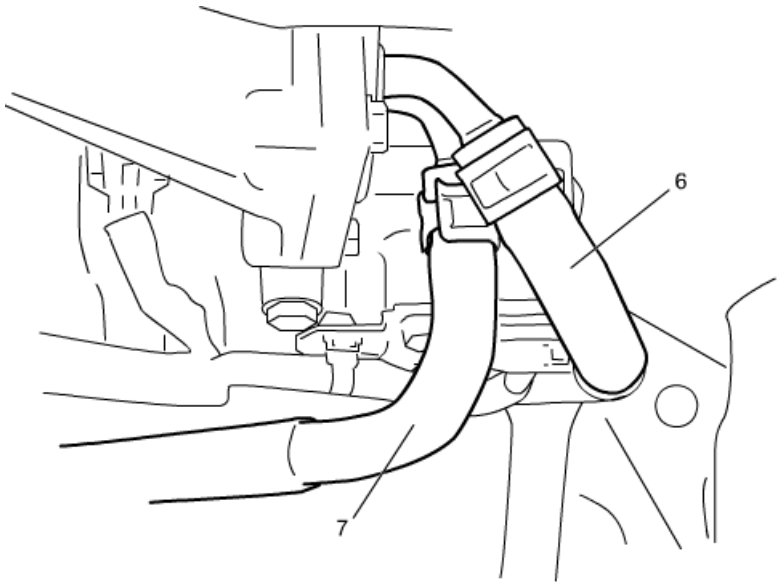
11) Disconnect the following electric wires, connectors and clamp:
- Connector (1) in main fuse box
- Connector (2) in fuse box No.1
- Connector (3) in fuse box No.2
- Engine harness connector to main harness connector (4) (CVT model)
- Battery ground cable (5)
- Engine harness clamp (6)
- Front height sensor connector (7)





12) Disconnect the following hoses:
- Brake booster hose (1)
- Heater inlet and outlet hoses (2)
- Fuel hose (3)
- EVAP canister purge hose (4)
- Radiator inlet hose (5)
- CVT Fluid Cooler No.1 Hose (6) (CVT model)
- CVT Fluid Cooler No.2 Hose (7) (CVT model)

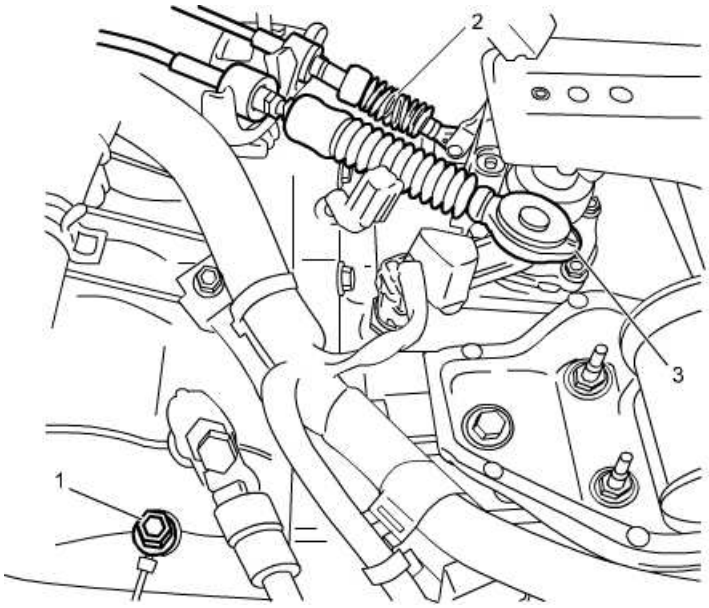




13) Remove radiator outlet hose, thermostat cap and thermostat. ☞

14) Remove battery ground terminal bolt (1) after disconnecting the following cables:

- Gear select control cable (2) (M/T model): ☞
- Gear shift control cable (3) (M/T model): ☞
- Battery ground terminal bolt (M/T model): ☞
- Select cable (4) (CVT model): ☞



15) Remove accessory drive belt. ☞

16) With A/C hoses connected, remove A/C compressor from bracket. ☞

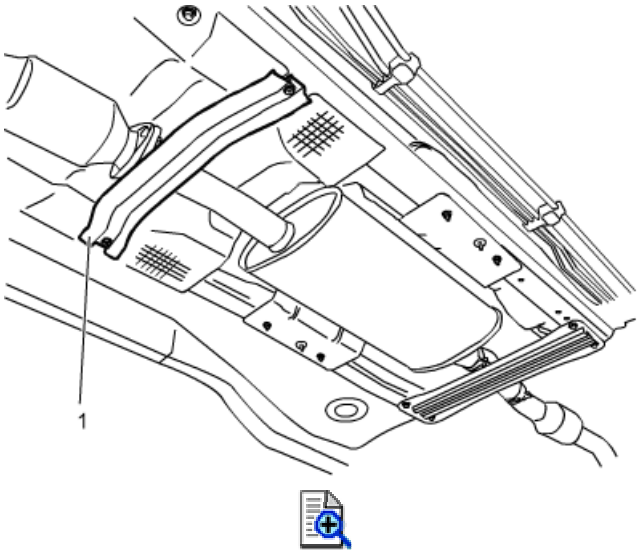
CAUTION:
Secure the A/C compressor to the body with a rope or the like so that it does not get damaged during removal and installation of engine assembly.

17) Remove front brake caliper and brake pads. ☞

18) Remove front wheel speed sensor harness clamp bolt, and then detach front speed sensor harness from strut bracket. ☞

19) Remove front strut nuts and bolts referring to steps 1) to 5) in "removal" under ***Front Strut Assembly Removal and Installation***.

20) Remove floor tunnel front brace (1).

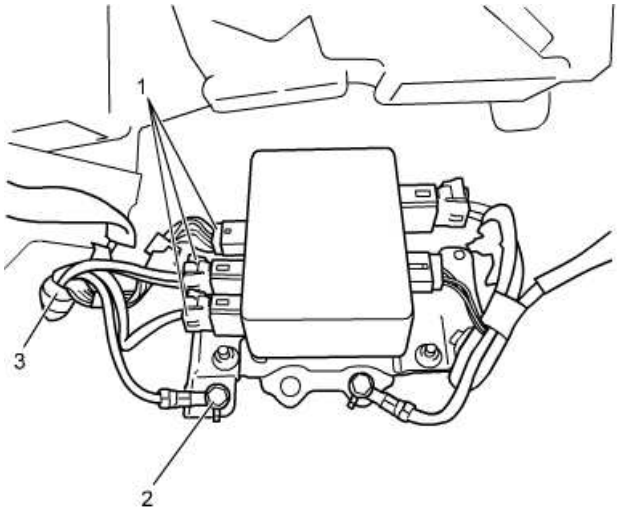


21) Remove exhaust pipe No.1 and heat protector panel No.1. ☞

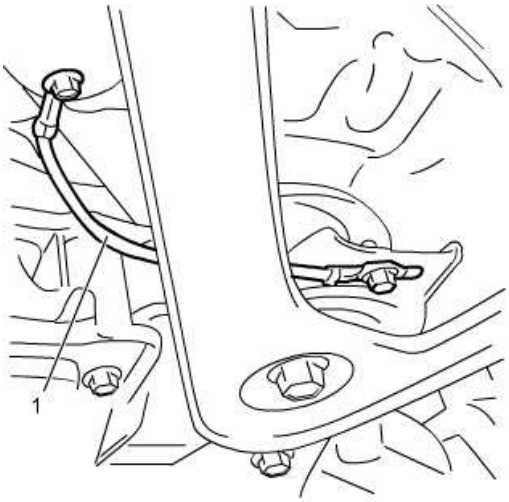
22) For 4WD model, remove propeller shaft assembly. ☞

23) Remove steering lower shaft referring to steps 4) to 7) in "removal" under ***Steering Column Removal and Installation***.

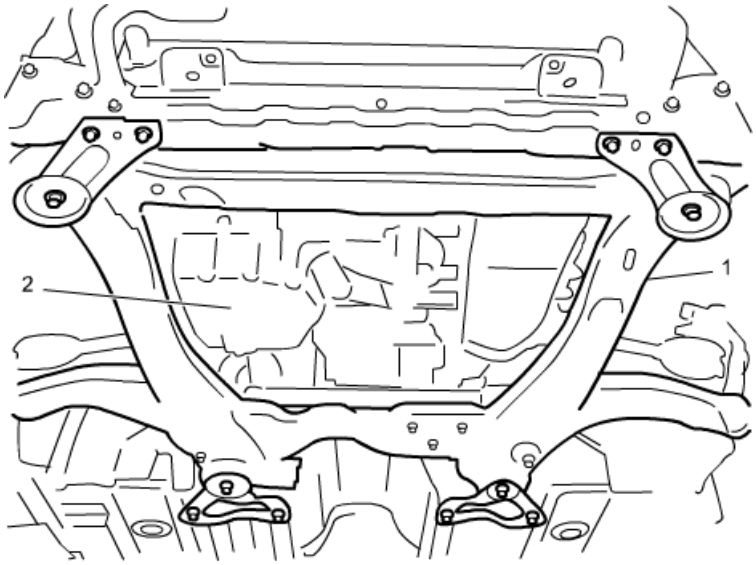
24) Remove P/S control module cover after turning over passenger side carpet, disconnect P/S control module connector (1) and remove ground bolt (2). Then, pull the harness (3) out to engine compartment.



25) Disconnect ground cable (1) from suspension frame rear mounting bracket and body.

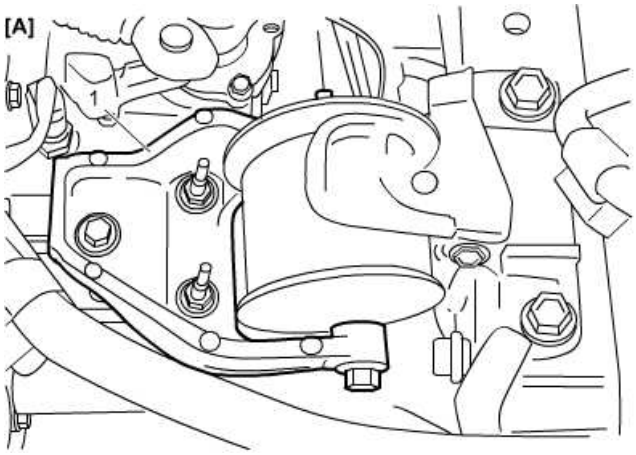


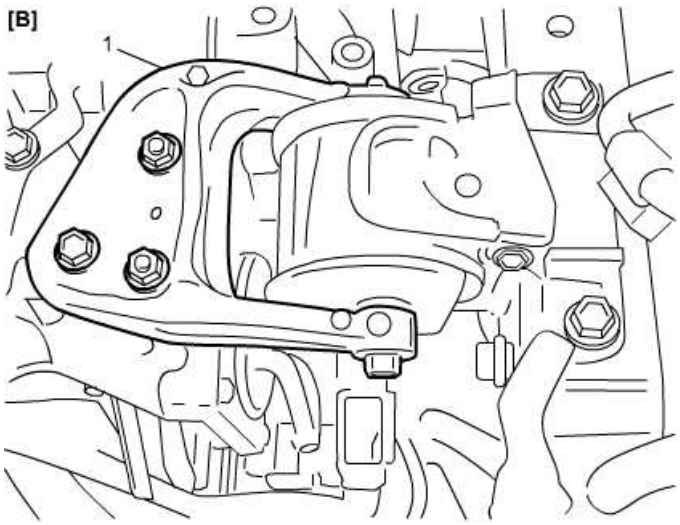
26) Support suspension frame (1) and engine assembly (2) using engine lifter.



27) Remove suspension frame mounting brackets. ☞

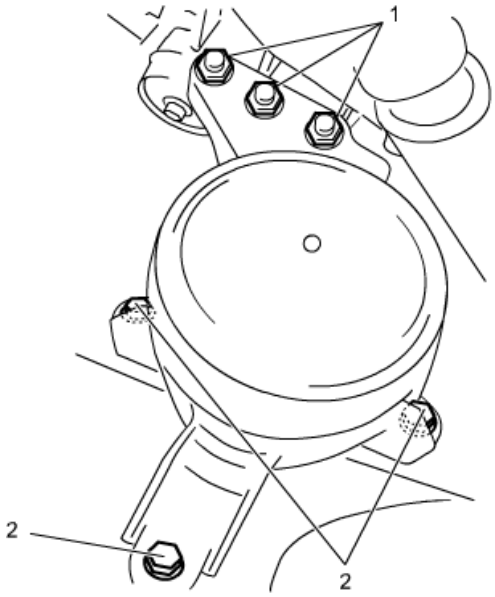
28) Remove engine left mounting bracket (1).





[A]:	M/T model
[B]:	CVT model

29) Remove engine right mounting bracket nuts (1), then loosen engine right mounting bolts (2).



30) Before lowering engine, make sure that all hoses, electric wires and cables are disconnected from engine.

31) Lower engine assembly with transaxle, transfer (4WD model), front drive shafts and suspension frame all together.

NOTE:
- **When removing engine assembly, CVT assembly, transfer (4WD model), front drive shafts or suspension frame from vehicle, maintain clearance with A/C compressor.**
- **Prior to removing engine rear mounting bracket No.1 on 4WD model, it is necessary to remove transfer and disconnect engine rear mounting bracket No.2.**

32) Remove front drive shaft assembly if necessary. ☞

33) For 4WD model, remove transfer if necessary. ☞

34) Remove engine mounting bracket from engine assembly if necessary. ☞

35) Remove transaxle if necessary.
- M/T model: ☞
- CVT model: ☞

36) For M/T model, remove clutch cover and clutch disc if necessary. ☞

37) For M/T model, remove flywheel if necessary. ☞
For CVT model, remove drive plate if necessary. ☞

38) Remove engine harness from engine assembly if necessary.

Installation

1) Install engine harness to engine assembly if removed.

2) For M/T model, install flywheel if removed. ☞

3) For CVT model, install drive plate if removed. ☞

4) For M/T model, install clutch cover and clutch disc if removed. ☞

5) Install transaxle to engine if removed.
- For M/T model: ☞
- For CVT model: ☞

6) Install engine mounting bracket to engine assembly if removed. ☞

7) For 4WD model, install transfer if removed. ☞

8) Install front drive shaft assembly if removed. ☞

9) Lift up engine assembly together with transaxle, transfer (4WD model), front drive shafts and suspension frame into engine compartment using engine lifter.

NOTE:
When removing engine chassis, CVT chassis, transfer (4WD model), front drive shafts or suspension frame from vehicle, maintain clearance with A/C compressor.

10) Tighten engine right mounting bracket bolts and nuts to specified torque. ☞

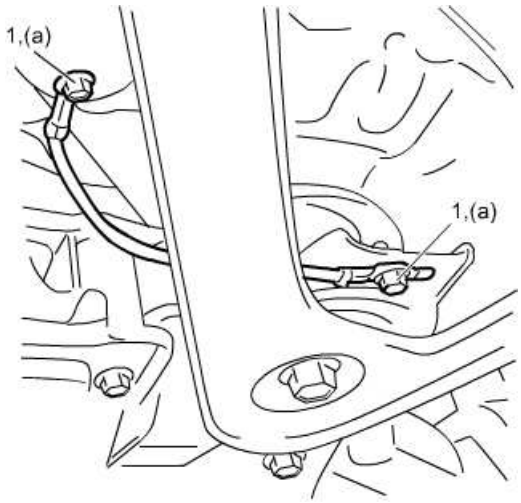
11) Install left mounting bracket, then tighten left mounting bracket bolts and nuts to specified torque. ☞

12) Install suspension frame mounting brackets, then tighten suspension frame mounting bracket bolts to specified torque. ☞

13) Connect ground cable to suspension frame mounting bracket and body, then tighten ground cable bolts (1) to specified torque.

Tightening torque

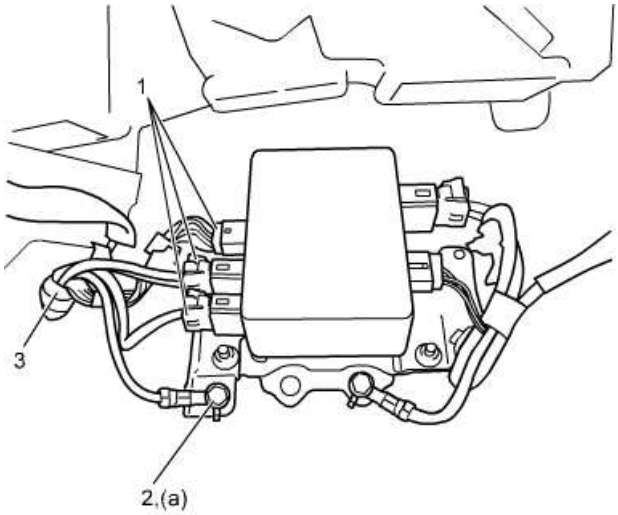
Ground cable bolt (a): 9.0 N·m (0.92 kg-m, 7.0 lbf-ft)



14) Insert EPS harness (3) into cabin, connect P/S control module connector (1), tighten ground bolt (2) to specified torque, and then install P/S control module cover.

Tightening torque

P/S control module ground bolt (a): 9.0 N·m (0.92 kg-m, 7.0 lbf-ft)

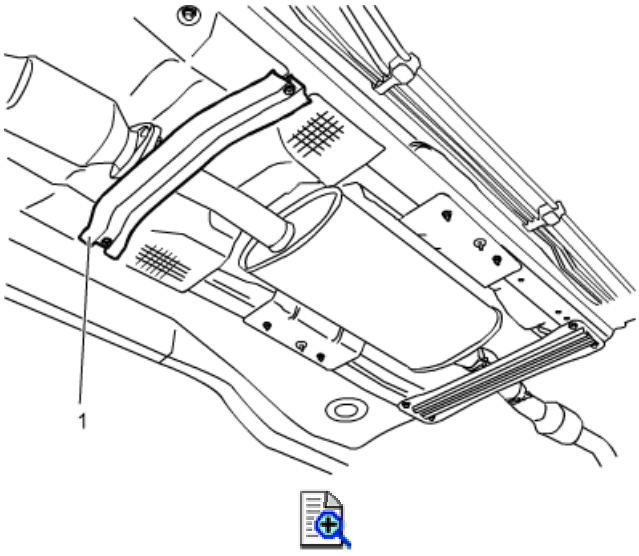


15) Connect steering lower shaft to pinion shaft, then tighten lower joint bolt to specified torque. ☞

16) For 4WD model, install propeller shaft assembly. ☞

17) Install exhaust pipe No.1 and heat protector panel No.1. ☞

18) Install floor tunnel front brace (1).



19) Tighten front strut bolts and nuts to specified torque. ☞

20) Connect front wheel speed sensor harness to strut bracket, then tighten front wheel speed sensor harness clamp bolt. ☞

21) Install brake pads and caliper. ☞

22) Install A/C compressor to bracket. ☞

23) Install accessory drive belt. ☞

24) For M/T model, connect gear select control cable, gear shift control cable, then tighten battery ground terminal bolt to specified torque. ☞

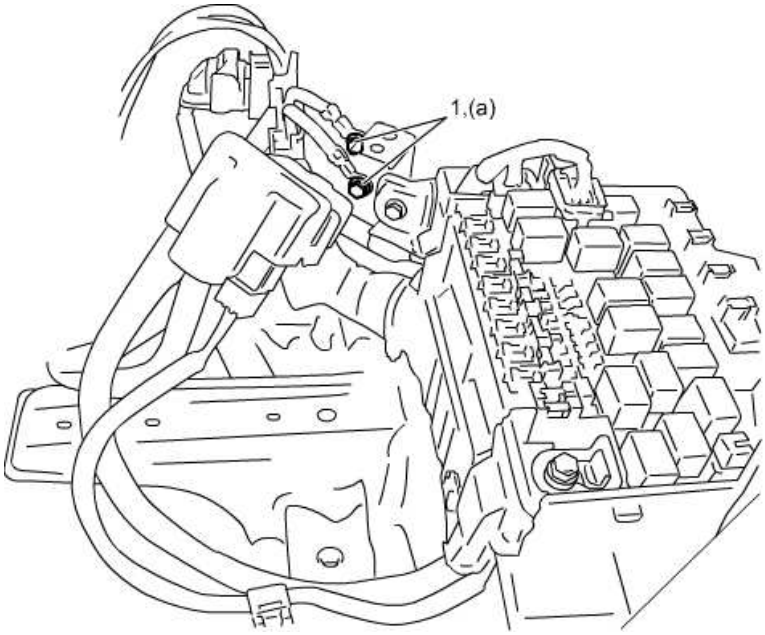
25) For CVT model, connect select cable. ☞

26) Install thermostat, thermostat cap and radiator outlet hose. ☞

27) Install engine harness clamps.

28) Install all other removed electric wires, connectors and hoses to original locations.
29) Tighten battery ground terminal bolts (1) to specified torque.

Tightening torque
Battery ground terminal bolts (a): 9.0 N·m (0.92 kg-m, 7.0 lbf-ft)



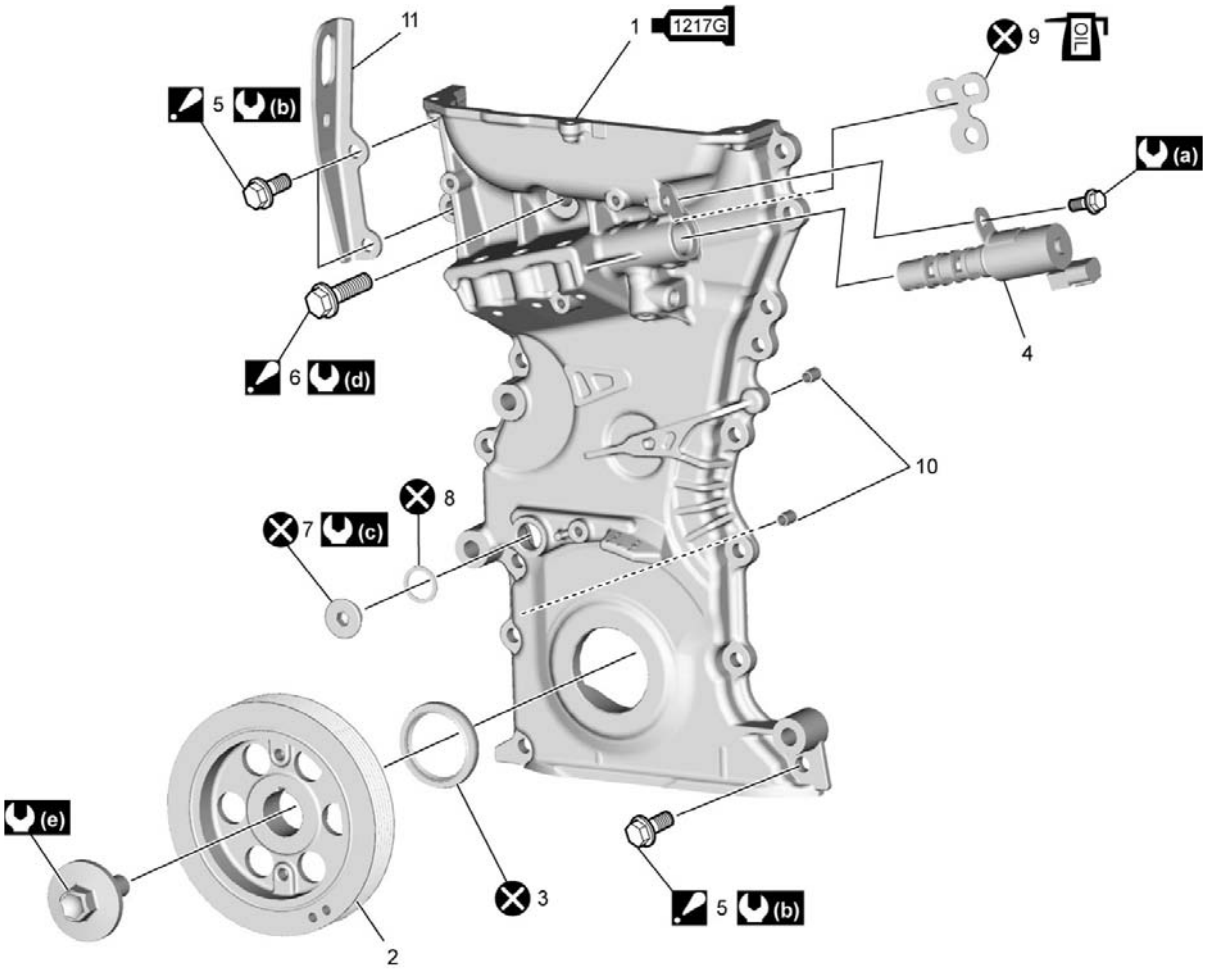
30) Install air cleaner assembly. ☞
31) Refill oils and fluid.
- Engine oil: ☞
- Manual transmission oil (M/T model): ☞
- CVT fluid (CVT model): ☞
- Transfer oil (4WD model): ☞

32) Refill cooling system with coolant. ☞
33) Install right and left side engine under covers.
34) Install battery bracket, battery tray, battery and ECM. ☞
35) Connect ECM connectors.
36) Connect positive (+) cables and negative (−) at battery.
37) Check any leakage of fuel, coolant, oil and exhaust.
- Fuel leak: ☞
- Coolant leak: ☞

38) Install engine cover.
39) Install front bumper and front bumper lower cover. ☞
40) Install right and left side front fender lower linings.

1D

Timing Chain Cover Components



1217G 1. Timing chain cover : Apply sealant 99000-31260 referring to ***Timing Chain Cover Removal and Installation***.	7. Timing chain cover plug	(b) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
2. Crankshaft pulley	8. Timing chain cover plug gasket	(c) : 27 N·m (2.8 kgf-m, 20.0 lbf-ft)
3. Oil seal	9. Gasket	(d) : 55 N·m (5.6 kgf-m, 40.5 lbf-ft)
4. Oil control valve	10. Dowel pin	(e) : 150 N·m (15.3 kgf-m, 111.0 lbf-ft)
5. Timing chain cover bolt (M8) : For tightening order, refer to ***Timing Chain Cover Removal and Installation***.	11. Engine hook	: Do not reuse.

6. Timing chain cover bolt (M10) : For tightening order, refer to ***Timing Chain Cover Removal and Installation***.	11 N·m (1.1 kgf-m, 8.5 lbf-ft) :	Apply engine oil. :

1D

Timing Chain Cover Removal and Installation

Reference: Timing Chain Cover Components

CAUTION:
- **Keep working table, tools and hands clean while overhauling.**
- **Take special care when handling aluminum parts so as not to damage them.**
- **Do not expose removed parts to dust. Always keep them clean.**

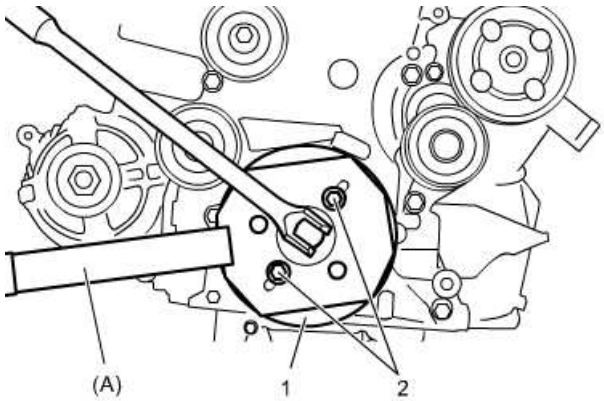
Removal

1) Remove engine assembly from vehicle. ☞

2) Remove crankshaft pulley bolt.
To lock crankshaft pulley (1), use special tool as shown in the following figure.

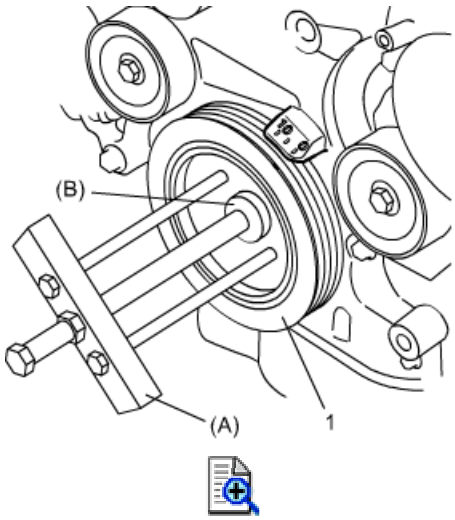
CAUTION:
- **Use special tool to prevent unnecessary load on timing chain, sprockets and any other related parts.**
- **Use specified bolts (2) to install special tool to crankshaft pulley. Bolt size: M8**
  Pitch: 1.25 mm (0.0492 in.)
  Length: 25 mm (0.98 in.)
  Strength: 7T

Special Tool
(A): 09917–68221



3) Remove crankshaft pulley (1).
Use special tools as shown in figure if it is hard to remove.

Special Tool
(A): 09944–36011
(B): 09926–58010



4) Remove cylinder head cover. ☞

5) Remove oil pan. ☞

6) Remove tensioner pulley and idler pulley. ☞

7) Remove timing chain cover bolts, then remove timing chain cover with engine hook.

8) Remove crankshaft oil seal from timing chain cover using flat-end screwdriver or the like, if necessary.

9) Remove oil control valve from timing chain cover if necessary. ☞

Installation

Reference: Timing Chain Cover Inspection

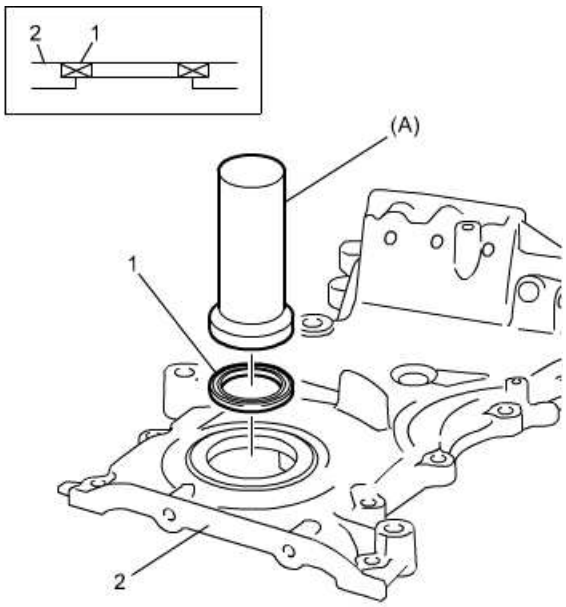
1) Install oil control valve if removed. ☞

2) Clean mating surface of timing chain cover, cylinder block and cylinder head by removing old sealant and oil.

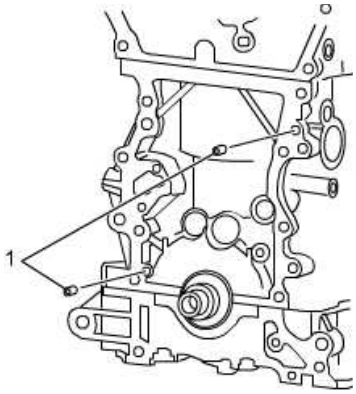
3) Check oil seal (1) for any damage.
Replace oil seal if any abnormalities are found.

NOTE:
When installing new oil seal, press it into timing chain cover (2) using special tool as shown in figure.

Special Tool
(A): 09913–75510



4) Install dowel pins (1) to cylinder block.



5) Apply sealant "A" as follows:

a) Fill sealant "A" to mating clearance of cylinder block and cylinder head.

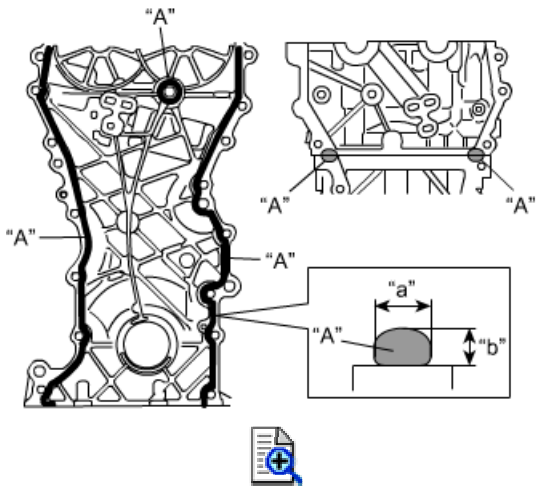
b) Apply sealant "A" to mating surface of timing chain cover as specified.

NOTE:
- **Before applying sealant, make sure mating surfaces are clean and dry.**
- **Install timing chain cover within 2 minutes after applying sealant.**
- **Wipe off excessive sealant of upper and lower end of the cover.**

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant bead size for timing chain cover

Width "a": 3 mm (0.11 in.)
Height "b": 2 mm (0.07 in.)

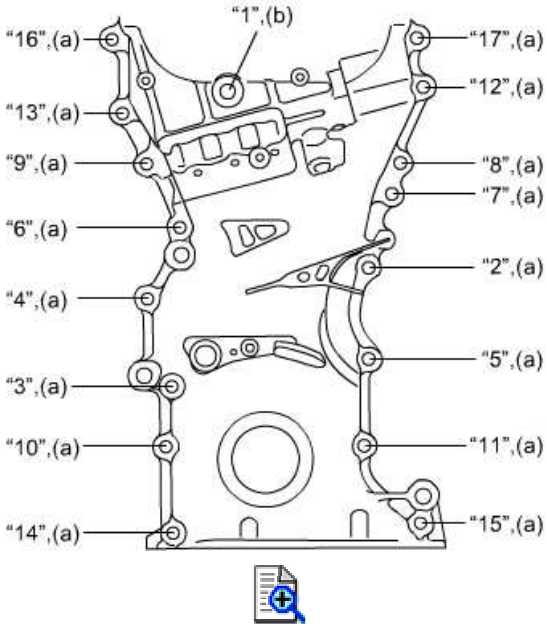


6) Apply engine oil to oil seal lip, and then install timing chain cover with engine hook. Tighten timing chain cover bolts to specified torque in numerical order ("1" – "17") evenly and gradually.

NOTE:
Before installing timing chain cover, check that dowel pins are securely fitted.

Tightening torque

Timing chain cover bolt* (M8 bolt) (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)
Timing chain cover bolt* (M10 bolt) (b): 55 N·m (5.6 kg-m, 40.5 lbf-ft)



7) Install tensioner pulley and idler pulley. ☞

8) Install cylinder head cover. ☞

9) Install oil pan. ☞

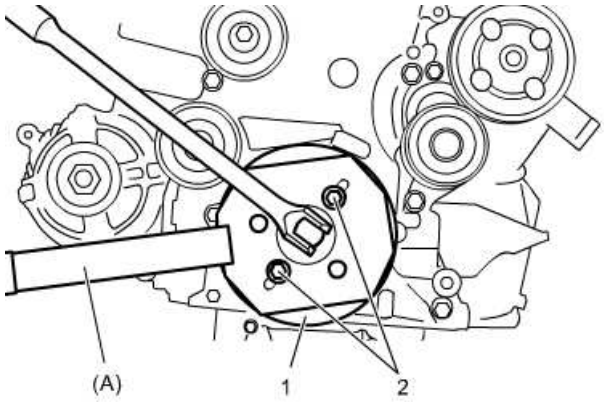
10) Install crankshaft pulley (1) and tighten crankshaft pulley bolt to specified torque. To lock crankshaft pulley, use special tool as shown in figure.

CAUTION:
- **Use special tool to prevent unnecessary load on timing chain, sprockets and any other related parts.**

- **Use specified bolts (2) to install special tool to crankshaft pulley.**
  Bolt size: M8
  Pitch: 1.25 mm (0.0492 in.)
  Length: 25 mm (0.98 in.)
  Strength: 7T

Special Tool
(A): 09917–68221

Tightening torque
Crankshaft pulley bolt (a): 150 N·m (15.3 kg-m, 111.0 lbf-ft)



11) Install engine assembly to vehicle. ☞

1D

Timing Chain Cover Inspection

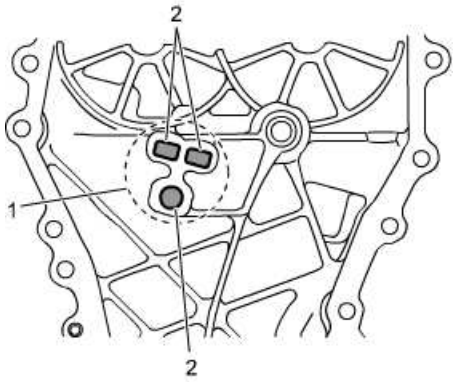
Reference: Timing Chain Cover Removal and Installation

Oil Seal

Check oil seal lip for any damage. Replace oil seal if any abnormalities are found.

Timing Chain Cover

Inspect oil passage (1) for driving CMP actuator and strainer (2).
Clean passage and strainer if clog or foreign matter exists.



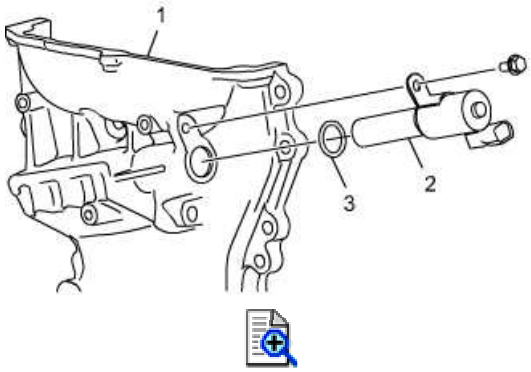
1D

OCV Removal and Installation

Reference: Timing Chain Cover Components

Removal

Remove OCV (2) and O-ring (3) from timing chain cover (1).



Installation

Reverse removal procedure noting the following point:

- Tighten OCV bolt to specified torque.

Tightening torque

OCV bolt: 11 N·m (1.1 kg-m, 8.5 lbf-ft)

1D

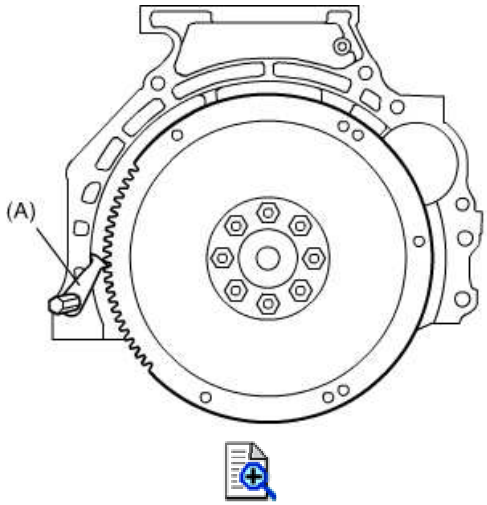
Flywheel / Drive Plate Removal and Installation

Removal

1) Remove transmission assembly.
- M/T model: ☞
- CVT model: ☞

2) Wedge a special tool in ring gear teeth to lock flywheel or drive plate as shown in figure.

Special Tool
(A): 09924–17811



3) Remove flywheel or drive plate from engine assembly.

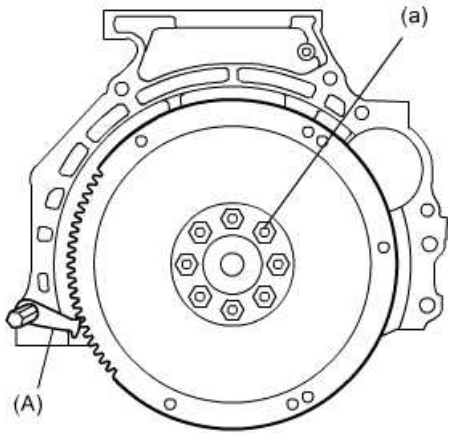
Installation

Reverse removal procedure noting the following points:
- Install new flywheel bolts or drive plate bolts.
- Wedge a special tool in ring gear teeth to lock flywheel or drive plate as shown in figure.

Special Tool
(A): 09924–17811

- Tighten flywheel bolts or drive plate bolts to specified torque.

Tightening torque
Flywheel bolt (a): 70 N·m (7.1 kg-m, 52.0 lbf-ft)
Drive plate bolt (a): 70 N·m (7.1 kg-m, 52.0 lbf-ft)



1D

Flywheel/Drive Plate Inspection

Reference: Main Bearings, Crankshaft and Cylinder Block Removal and Installation

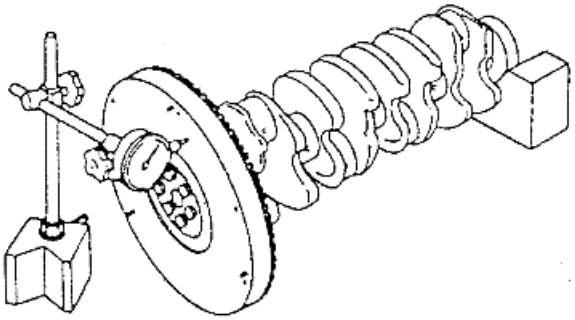
Visual Inspection

- Check ring gear of flywheel for M/T model or drive plate for CVT model, for cracking, wear or any damage.
  Replace flywheel for M/T model or drive plate for CVT model if defective condition is found. ☞

Flywheel/Drive Plate Face Runout

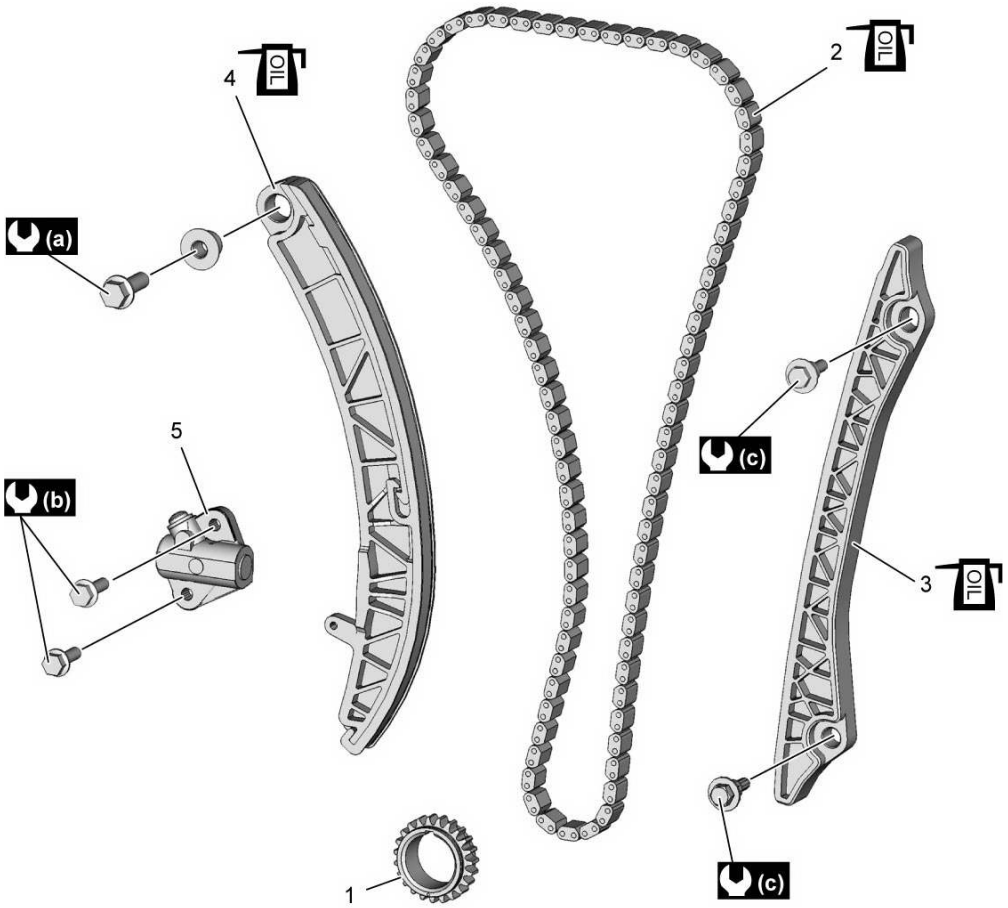
- Check flywheel for M/T model or drive plate for CVT model for runout using dial gauge and "V" blocks.
  Replace flywheel for M/T model or drive plate for CVT model if measured runout exceeds the limit. ☞

Flywheel/drive plate face runout
Limit: 0.2 mm (0.0078 in.)



1D

Timing Chain and Chain Tensioner Components



1. Crankshaft timing sprocket	4. Timing chain tensioner	(b) : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
2. Timing chain	5. Timing chain tensioner adjuster	(c) : 9 N·m (0.92 kgf-m, 7.0 lbf-ft)
3. Timing chain guide	(a) : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)	OIL : Apply engine oil to sliding surface.

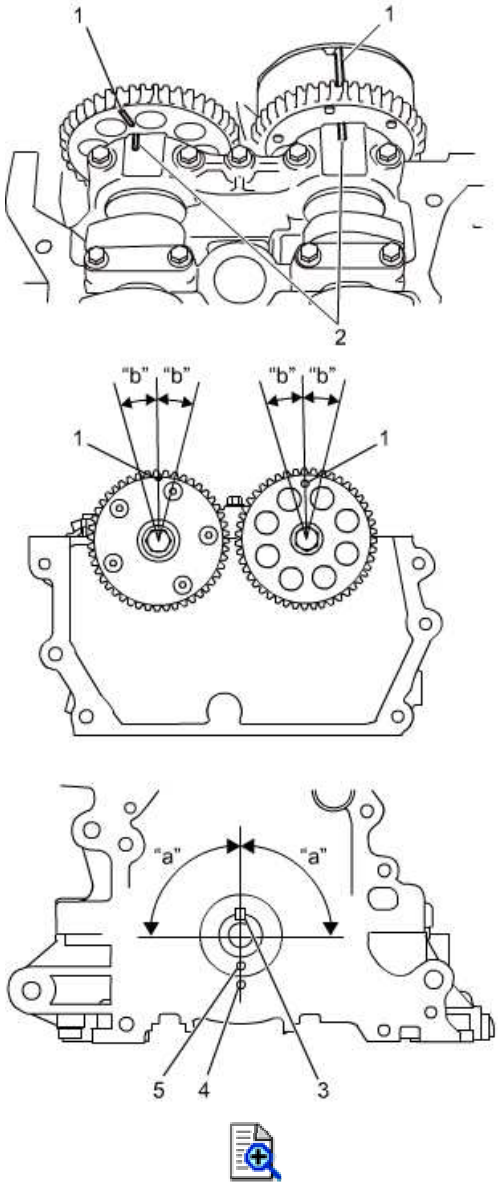
1D

Timing Chain and Chain Tensioner Removal and Installation

Reference: Timing Chain and Chain Tensioner Components

Removal

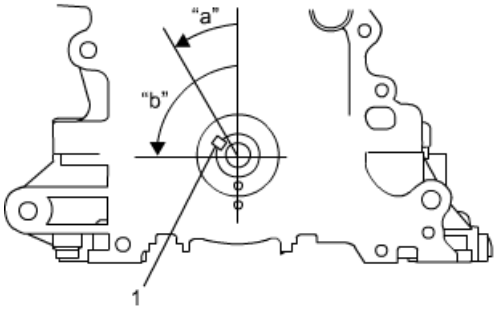
CAUTION:
After timing chain is removed, never turn crankshaft and camshafts independently more than specified range ("a" and "b") as shown in figure. If either of those shafts is turned, interference may occur between pistons and valves and valves themselves, and parts related to piston and valves may be damaged.



1.	Timing marks on camshaft timing sprockets
2.	Matchmark on camshaft housing No.1
3.	Key

4.	Matchmark on lower crankcase
5.	Timing mark on crankshaft timing sprocket
"a":	90°
"b":	15°

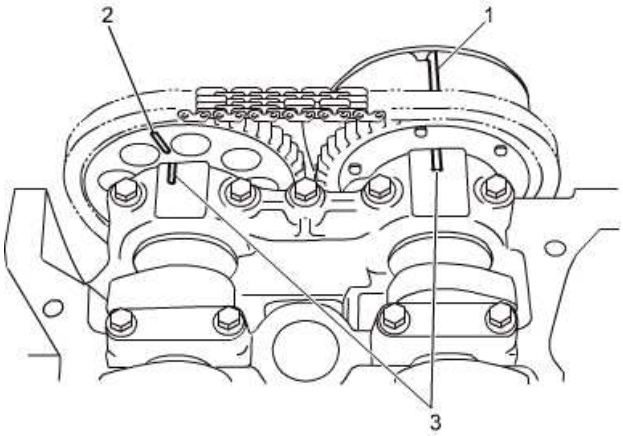
NOTE:
If it is necessary to rotate the camshaft after removing timing chain, turn crankshaft counterclockwise and position the key (1) within an angle of 30 to 90° from TDC before rotating the camshaft as shown in the following figure and keep the valves from coming in contact with the pistons.



"a":	30°
"b":	90°
1.	Key

1) Remove timing chain cover. ☞

2) Align camshafts and crankshaft by turning the crankshaft at specific position as follows:
a) Align timing marks on CMP actuator (1) and timing mark (2) on exhaust camshaft timing sprocket with matchmark (3) on camshaft housing No.1.



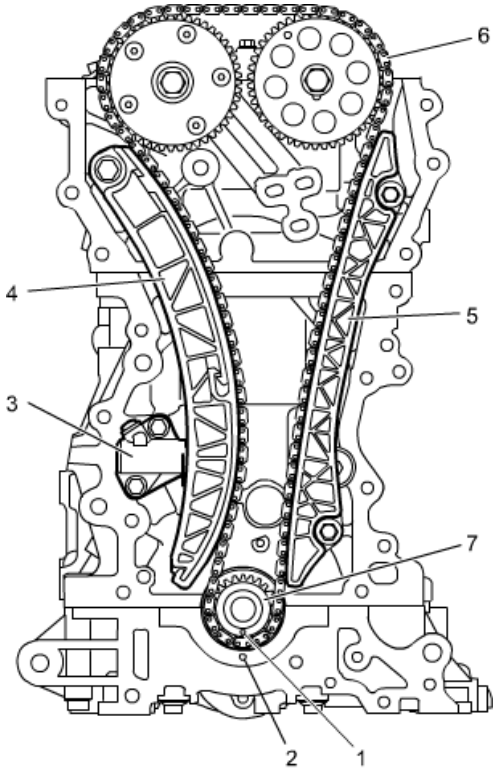
b) Align timing mark (1) on crankshaft timing sprocket with matchmark (2) on lower crankcase.

3) Remove timing chain tensioner adjuster (3).

4) Remove timing chain tensioner (4).

5) Remove timing chain guide (5).

6) Remove timing chain (6) and crankshaft timing sprocket (7).



Installation

Reference: Timing Chain and Chain Tensioner Inspection

1) Turn camshaft position key slot (1) within specified range (30 – 90°) (2) in counterclockwise direction from top as shown in figure.

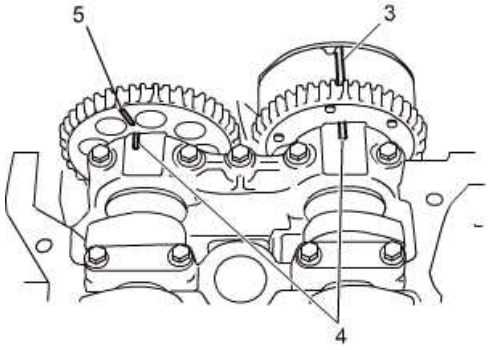
2) Align timing mark (3) on CMP actuator with matchmark (4) on camshaft housing No.1.

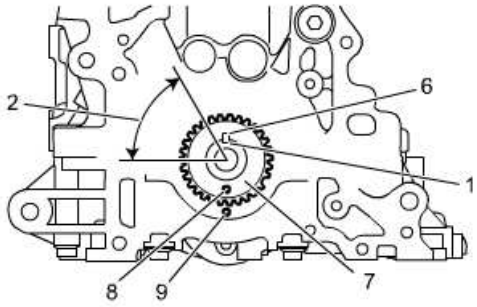
3) Align timing mark (5) on exhaust camshaft timing sprocket with matchmark (4) on camshaft housing No.1.

4) Install key (6) to key slot (1) of crankshaft.

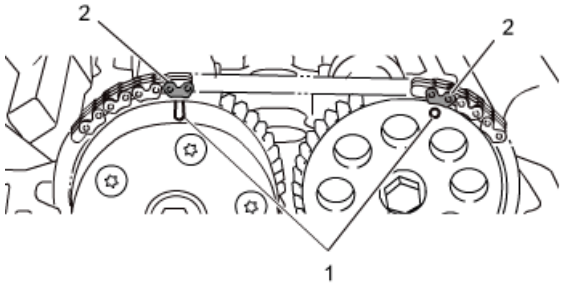
a) Align key slot of crankshaft timing sprocket (7) with key, and then Install crankshaft timing sprocket to crankshaft.

b) Align timing mark (8) on crankshaft timing sprocket with matchmark (9) on lower crankcase.

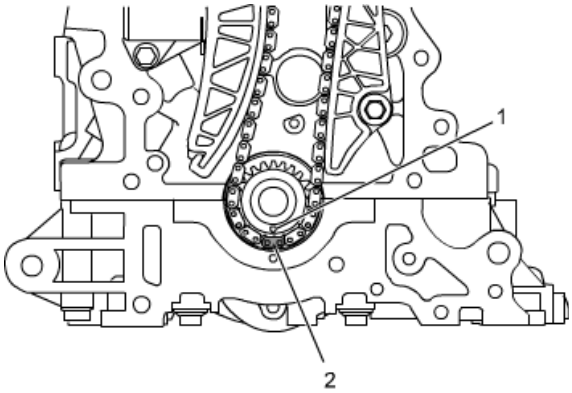




5) Install timing chain while aligning two blue plates (2) with timing marks (1) on CMP actuator and exhaust camshaft timing sprockets.



6) Install timing chain while aligning blue plate (2) with timing mark (1) on crankshaft timing sprocket.



7) Install timing chain guide (1) and tighten timing chain guide bolts (2) to specified torque.

Tightening torque

Timing chain guide bolt (a): 9.0 N·m (0.92 kg-m, 7.0 lbf-ft)

8) Apply engine oil to sliding surface of timing chain guide.

9) Attach spacer (4) to timing chain tensioner (3).

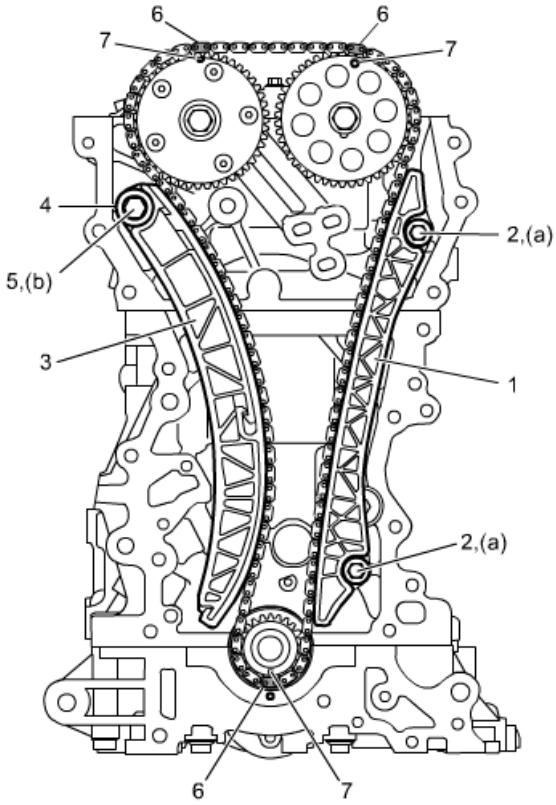
10) Install timing chain tensioner (3) and tighten timing chain tensioner bolt (5) to specified torque.

Tightening torque

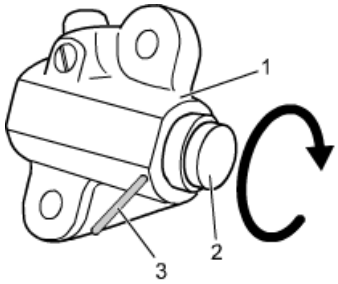
Timing chain tensioner bolt (b): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

11) Apply engine oil to sliding surface of timing chain tensioner.

12) Make sure that all blue plates (6) are aligned with timing marks (7) on corresponding timing sprockets.



13) Screw in plunger (2) of timing chain tensioner adjuster (1) clockwise and install a retainer (3) (1.4 mm (0.055 in.) diameter wire or the like) to hold plunger in place.



14) Install timing chain tensioner adjuster (1) with a retainer.
Tighten timing chain tensioner adjuster bolts (2) to specified torque, and then remove a retainer from timing chain tensioner adjuster.

Tightening torque

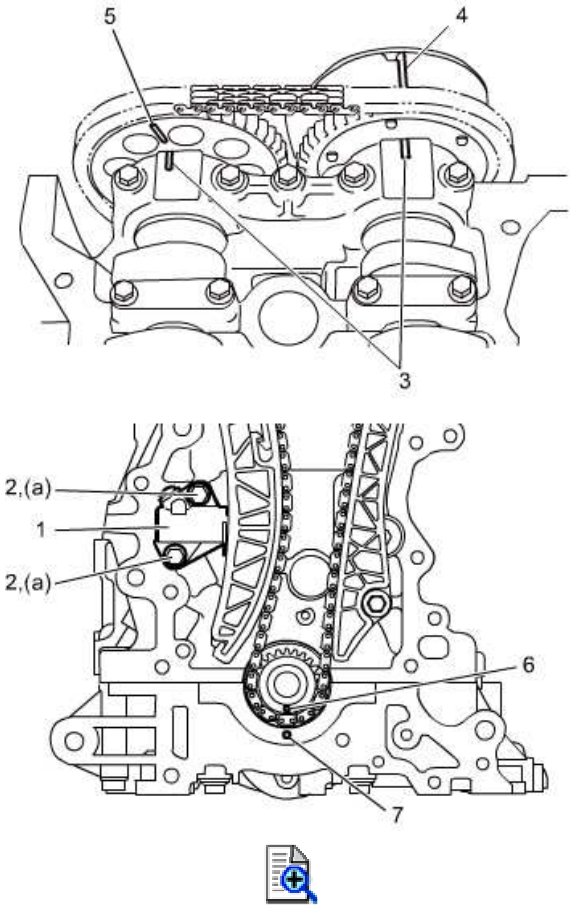
Timing chain tensioner adjuster bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)

15) Apply engine oil to timing chain, turn crankshaft clockwise 720°, and confirm that the following conditions have been met:

- Timing mark (4) on CMP actuator is aligned with matchmark (3) on camshaft housing No.1.
- Timing mark (5) on exhaust camshaft timing sprocket is aligned with matchmark (3) on camshaft housing No.1.
- Timing mark (6) on crankshaft timing sprocket is aligned with matchmark (7) on lower crankcase.

NOTE:

- **Be sure to turn crankshaft 720°. If it is turned only 360°, the timing marks on CMP actuator and exhaust camshaft timing sprockets will not meet matchmark on camshaft housing No.1.**
- **After turning crankshaft 720°, the painted links of the timing chain will not be aligned with the timing marks on the CMP actuator and the exhaust timing sprocket, but this is normal.**



16) Install timing chain cover. ☞

17) Install cylinder head cover. ☞

18) Install oil pan. ☞

19) Install engine assembly. ☞

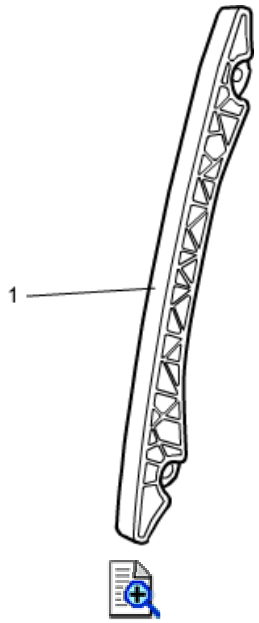
1D

Timing Chain and Chain Tensioner Inspection

Reference: Timing Chain and Chain Tensioner Removal and Installation

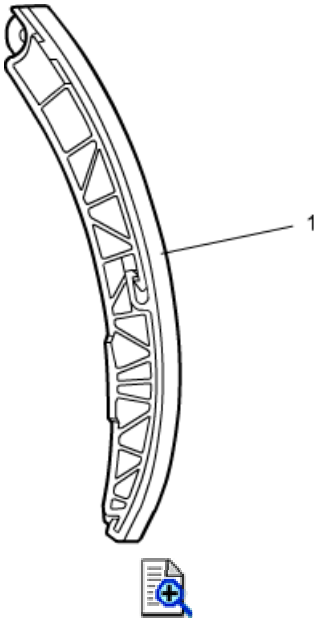
Timing Chain Guide

Check sliding surface of timing chain guide (1) for wear or damage.
Replace timing chain guide if any abnormalities are found.



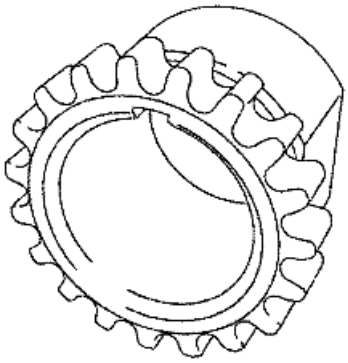
Timing Chain Tensioner

Check sliding surface of timing chain tensioner (1) for wear or damage.
Replace timing chain tensioner if any abnormalities are found.



Crankshaft Timing Sprocket

Check sprocket teeth for wear or damage.
Replace crankshaft timing sprocket if any abnormalities are found.

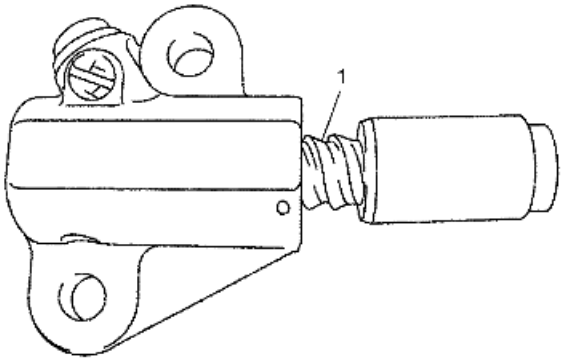


Timing Chain

Check timing chain for wear or damage.
Replace timing chain if any abnormalities are found.

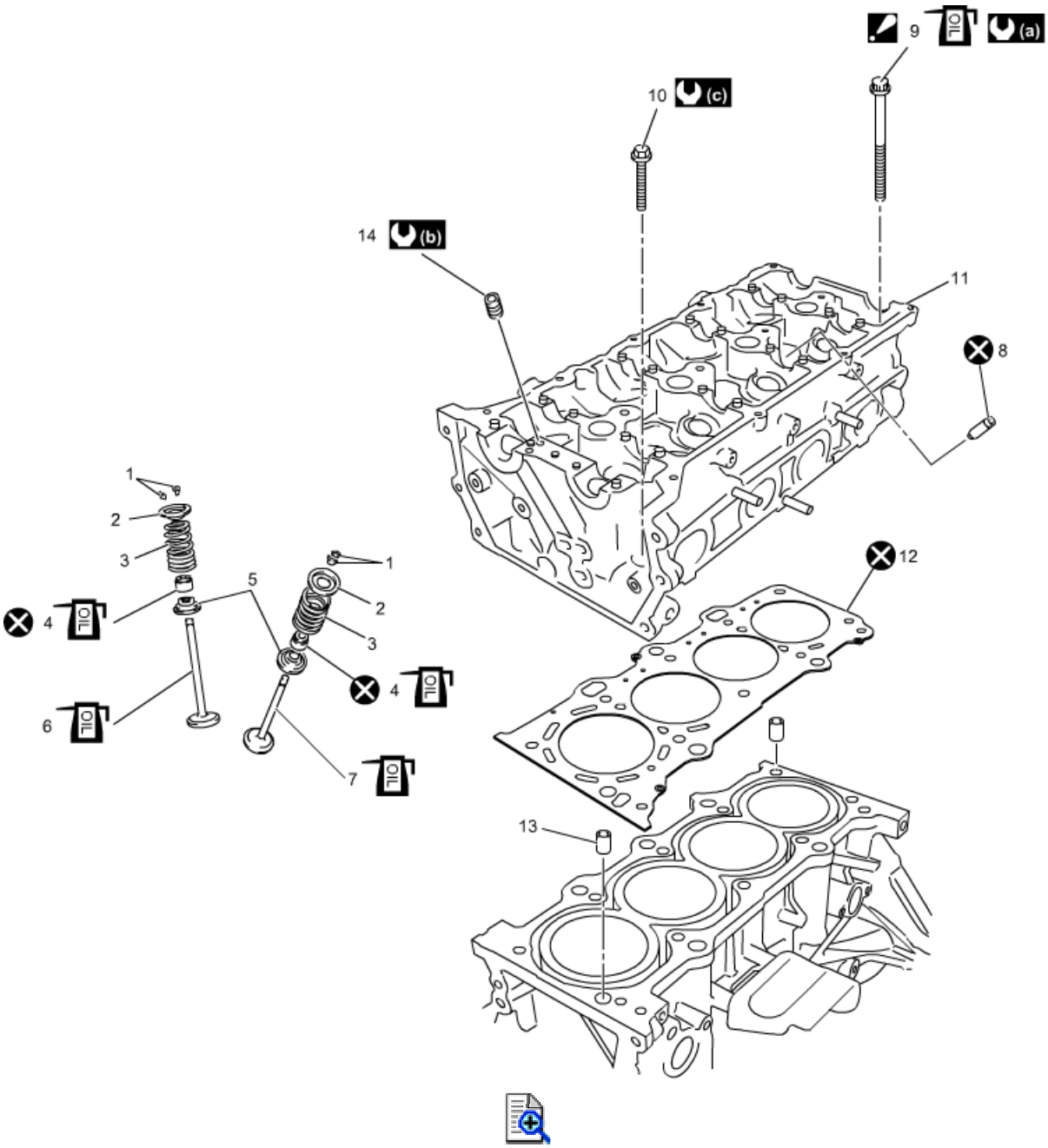
Timing Chain Tensioner Adjuster

Check that tooth surface (1) are free from damage.
Replace timing chain tensioner adjuster if any abnormalities are found.



1D

Valve and Cylinder Head Components



1. Valve cotters	OIL 7. Exhaust valve: Apply engine oil to sliding surface.	13. Dowel pin
2. Valve spring retainer	8. Valve guide	14. Venturi plug
3. Valve spring	9. Cylinder head bolt No.1 : Check cylinder head bolt No.1 for deformation to reuse. ☞ : Apply engine oil to bolt thread. : For tightening order, refer to ***Valve and***	(a) : 20 N·m → 40 N·m → +60° → +80° (2.0 kgf-m → 4.1 kgf-m → +60° → +80°, 15.0 lbf-ft → 29.5 lbf-ft → +60° → +80°)

	Cylinder Head Removal and Installation.	
 Valve stem seal : Apply engine oil to valve stem seal lip. 4.	10. Cylinder head bolt No.2	 : 3.5 N·m (0.37 kgf-m, 2.5 lbf-ft)
5. Valve spring seat	11. Cylinder head	 : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
 Intake valve : Apply engine oil to sliding surface. 6.	12. Cylinder head gasket	 : Do not reuse.

1D

Valve and Cylinder Head Removal and Installation

Reference: Valve and Cylinder Head Components

Removal

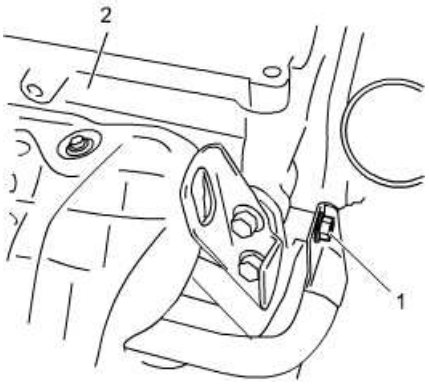
1) Remove timing chain. ☞

2) Remove spark plugs. ☞

3) Remove intake camshaft and exhaust camshaft. ☞

4) Remove camshaft bearings.

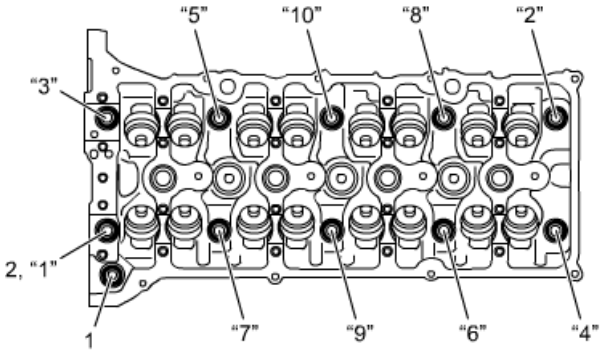
5) Remove heater outlet pipe bolt (1) from cylinder head (2).



6) Remove cylinder head bolt No.2 (1).

7) Loosen cylinder head bolts No.1 (2) in numerical order ("1" – "10") evenly and gradually.

NOTE:
Use 12-point socket wrench for cylinder head bolts No.1.



8) Remove cylinder head with gasket, intake manifold and exhaust manifold from cylinder block.

9) Remove following components of cylinder head if necessary.

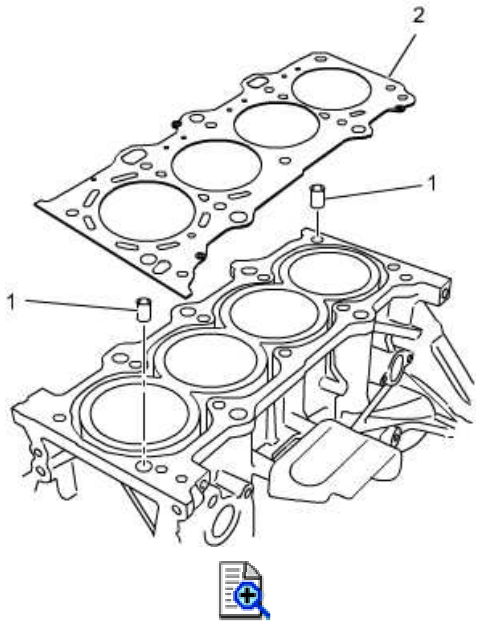
- Intake manifold: ☞
- Exhaust manifold: ☞
- Fuel injector: ☞
- Water outlet cap: ☞
- Oil venturi plug: ☞

Installation

Reference: Valve and Cylinder Head Disassembly and Reassembly
Reference: Cylinder Head Inspection
Reference: Cylinder Head Bolt No.1 Inspection

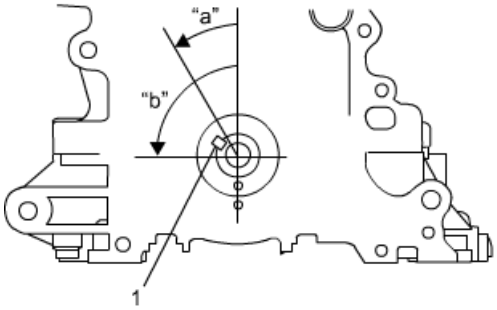
CAUTION:
Check them for deformation if cylinder head bolts No.1 are reused.

1) Clean mating surface of cylinder head and cylinder block removing old gasket, dust and oil.
2) Install dowel pins (1) to cylinder block.
3) Install new cylinder head gasket (2) to cylinder block.



4) Install cylinder head to cylinder block as follows:

NOTE:
Before Installing the cylinder head to the cylinder block, turn crankshaft counterclockwise and position the key (1) within an angle of 30 to 90° from TDC before rotating the camshaft as shown in the following figure and keep the valves from coming in contact with the pistons.



"a":	30°
"b":	90°

a) Install cylinder head to cylinder block.
b) Apply engine oil to cylinder head bolts No.1 threads.
c) Tighten cylinder head bolts No.1 to 20 N·m (2.0 kgf-m, 15.0 lbf-ft) in numerical order ("1" – "10") evenly and gradually.

NOTE:
Use 12-point socket wrench for cylinder head bolts No.1.

d) Retighten them to 40 N·m (4.1 kgf-m, 29.5 lbf-ft) in the same manner as in Step c).
e) Retighten them to 60° in the same manner as in Step c).
f) Retighten them to 80° in the same manner as in Step c).

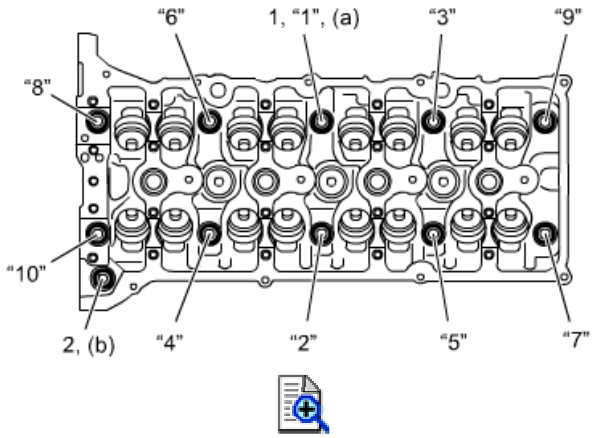
Tightening torque

Cylinder head bolt No.1* (a): 20 N·m → 40 N·m → +60° → +80° (2.0 kgf-m → 4.1 kgf-m → +60° → +80°, 15.0 lbf-ft → 29.5 lbf-ft → +60° → +80°)

g) Tighten cylinder head bolt No.2 (2) to specified torque.

Tightening torque

Cylinder head bolt No.2 (b): 25 N·m (2.5 kg-m, 18.5 lbf-ft)



5) Install oil venturi plug if removed.
6) Install intake camshaft and exhaust camshaft.
7) Install timing chain.
8) Install timing chain cover.
9) Install cylinder head cover.
10) Install oil pan.
11) Install water outlet cap if removed.
12) Install heater outlet pipe bolt to cylinder head.
13) Install spark plugs.
14) Install exhaust manifold if removed.
15) Install intake manifold if removed.
16) Install fuel injectors if removed.
17) Install engine assembly.

1D

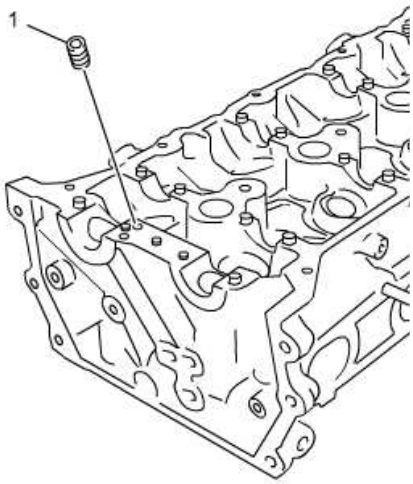
Valve and Cylinder Head Disassembly and Reassembly

Disassembly

Reference: Valve and Cylinder Head Removal and Installation

NOTE:
Parts must go back in the position where they were. Keep them in the following order:
- **Valve cotter**
- **Valve spring retainer**
- **Valve spring**
- **Valve spring seat**
- **Intake valve**
- **Exhaust valve**
- **Tappet**

1) Remove oil venturi plug (1).

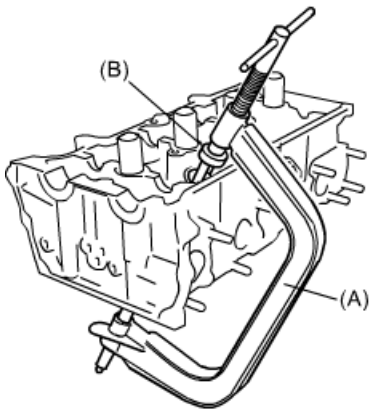


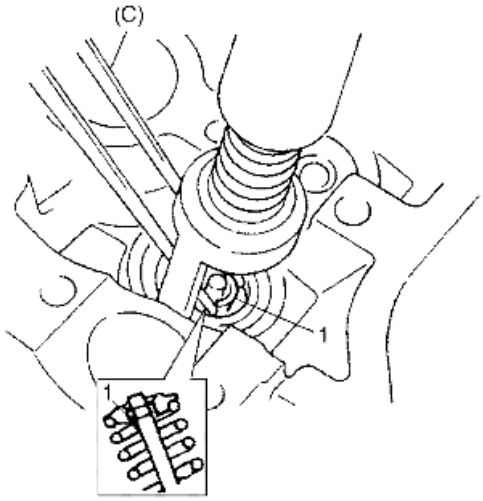
2) Remove tappets from cylinder head.

3) Use special tools (A) and (B) to compress valve spring and use special tool (C) to remove valve cotters (1).

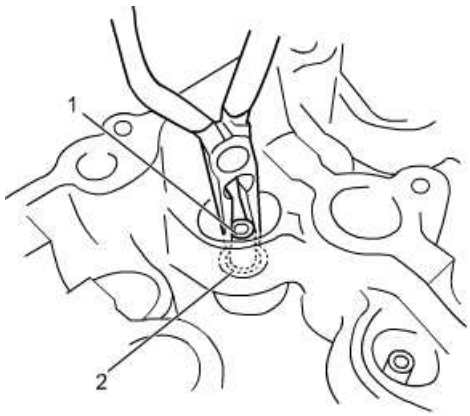
CAUTION:
When compressing the valve spring, be careful not to damage inner side of the tappet installing hole.

Special Tool
(A): 09916–14510
(B): 09916–14522
(C): 09916–84511





4) Release special tools (A) and (B), and remove spring retainer and valve spring.
5) Remove valve.
6) Remove valve stem seal (1) and valve spring seat (2).

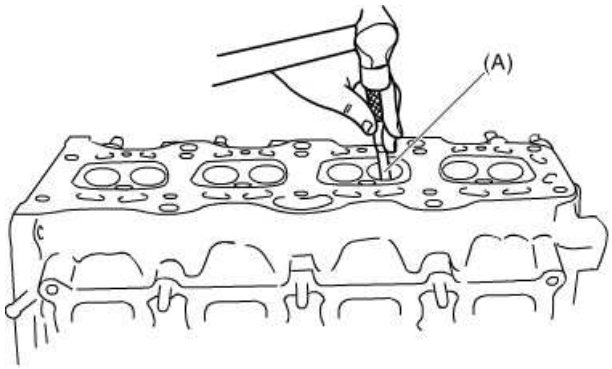


7) Use special tool to remove valve guide from combustion chamber side to valve spring side.

NOTE:

Heating cylinder head 80 to 100 °C (176 to 212 °F) may facilitate valve guide removal.

Special Tool
(A): 09916–44910



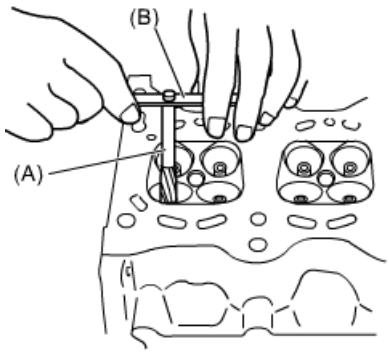
Reassembly

Reference: Valve and Valve Guide Inspection
Reference: Cylinder Head Inspection
Reference: Valve Spring Inspection

1) Before installing valve guide into cylinder head, ream guide hole with special tool (A) so as to remove burrs and make it truly round.

CAUTION:
Clean away shavings from reamed hole.

Special Tool
(A): 09916–37320
(B): 09916–34542



2) Use special tools to install valve guide to cylinder head as follows.

Special Tool
(A): 09916–58210
(B): 09916–56510

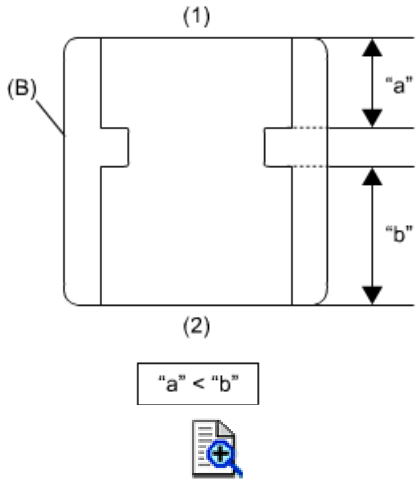
NOTE:

- **Never reuse valve guide.**
  Install new oversized valve guide.
- **Intake and exhaust valve guides are identical.**

a) Uniformly heat cylinder head to a temperature of 80 to 100 °C (176 to 212 °F) so that it will not be distorted, and drive new valve guide into guide hole with special tools.

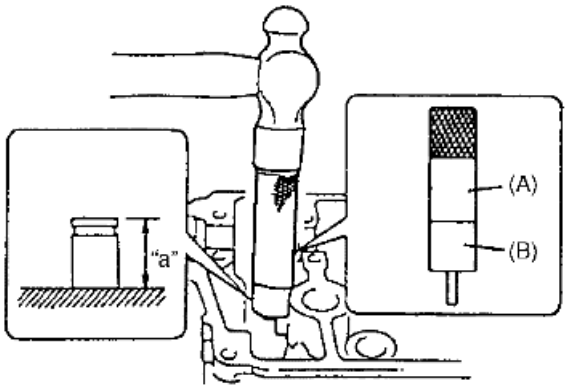
b) Install new valve guide until special tool contacts cylinder head.
After installation, make sure that valve guide protrudes from cylinder head by specified dimension "a".

CAUTION:
The same special tool (B) is used to install intake valve guide and exhaust valve guide but the direction in which it is applied differs.
- **For intake valve guide**
  The side (2) should be directed to valve guide.
- **For exhaust valve guide**
  The side (1) should be directed to valve guide.



Valve guide protrusion "a"

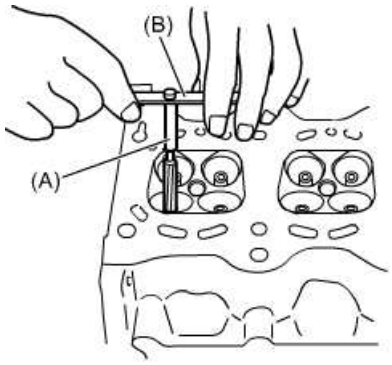
IN: 16.3 – 16.7 mm (0.642 – 0.657 in.)
EX: 12.3 – 12.7 mm (0.485 – 0.500 in.)



3) Ream valve guide bore with special tool.

CAUTION:
Clean away shavings from reamed hole.

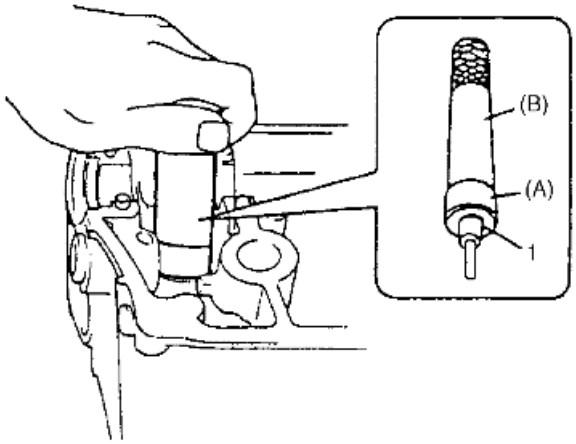
Special Tool
(A): 09916–34550
(B): 09916–34542



4) Install valve spring seat to cylinder head.
5) Install new valve stem seal (1) to valve guide.
After applying engine oil to valve stem seal and spindle of special tool (A), fit valve stem seal to spindle, and then install valve stem seal to valve guide pushing special tool by hand.
After installation, check that valve stem seal is properly fixed to valve guide.

CAUTION:
When installing, never tap or hit special tool with a hammer or the like.
Install seal to guide only pushing special tool by hand.
Tapping or hitting special tool may cause damage to seal.

Special Tool
(A): 09917–98221
(B): 09916–58210



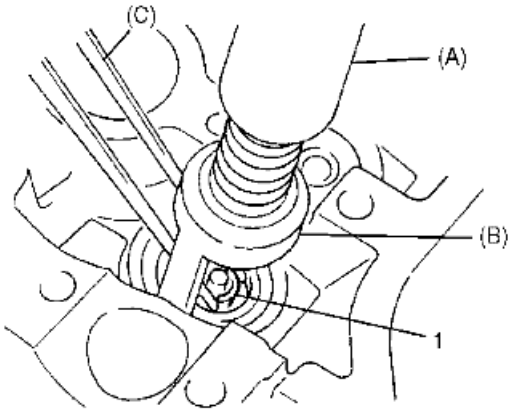
6) Apply engine oil to valve stem, then install valve to valve guide.
7) Install valve spring and valve spring retainer.

NOTE:
Valve spring does not have specific direction for installation.

8) Use special tools to compress valve spring and fit two valve cotters (1) into groove in valve stem.

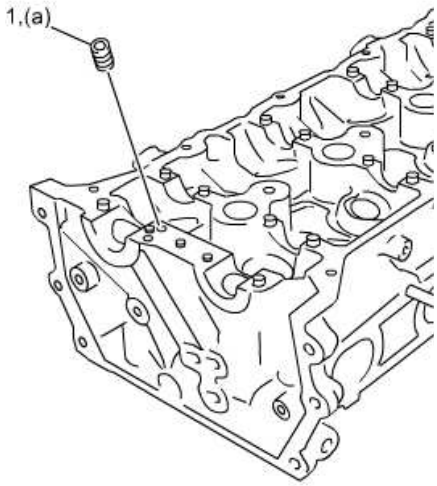
CAUTION:
When compressing the valve spring, be careful not to damage inside surface of the tappet installing hole.

Special Tool
(A): 09916–14510
(B): 09916–14522
(C): 09916–84511



9) Install venturi plug (1).

Tightening torque
Venturi plug (a): 3.5 N·m (0.36 kg-m, 2.5 lbf-ft)



1D

Valve and Valve Guide Inspection

Reference: Valve and Cylinder Head Disassembly and Reassembly

Valve Guide

Valve stem-to-guide clearance

- Take diameter readings on valve stems and guides with a micrometer and bore gauge to check system-to-guide clearance.
- Be sure to take reading at more than one place along the length of each stem and guide.
- Replace valve and valve guide if clearance exceeds limit.

Valve stem outside diameter

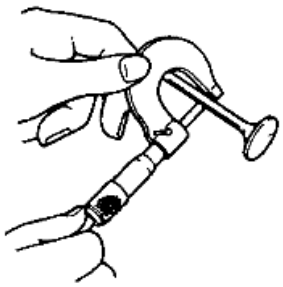
IN: 5.465 – 5.480 mm (0.2152 – 0.2157 in.)
EX: 5.440 – 5.455 mm (0.2142 – 0.2147 in.)

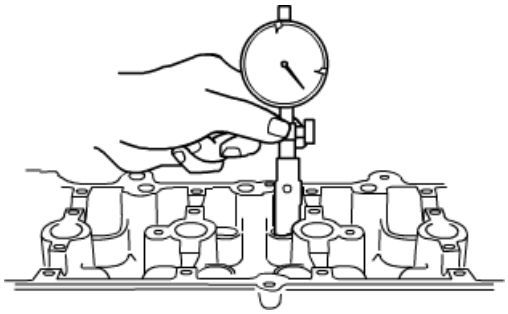
Valve guide inside diameter

IN & EX: 5.500 – 5.512 mm (0.2166 – 0.2170 in.)

Stem-to-guide clearance

Standard
IN: 0.020 – 0.047 mm (0.0007 – 0.0018 in.)
EX: 0.045 – 0.072 mm (0.0017 – 0.0028 in.)
Limit
IN: 0.070 mm (0.0027 in.)
EX: 0.090 mm (0.0035 in.)





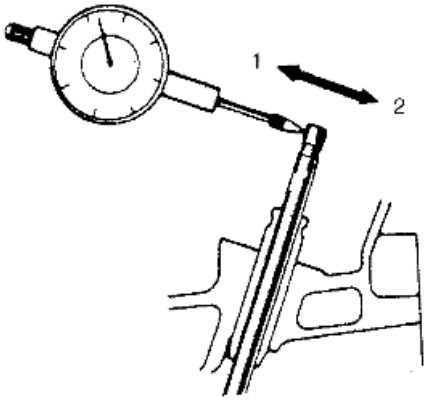
Valve stem end deflection

Check valve stem end deflection using a dial gauge.
Move stem end in directions (1) and (2) to measure end deflection.
Replace valve and valve guide if deflection exceeds the limit.

Valve stem end deflection limit

In: 0.14 mm (0.0055 in.)

Ex: 0.18 mm (0.0070 in.)



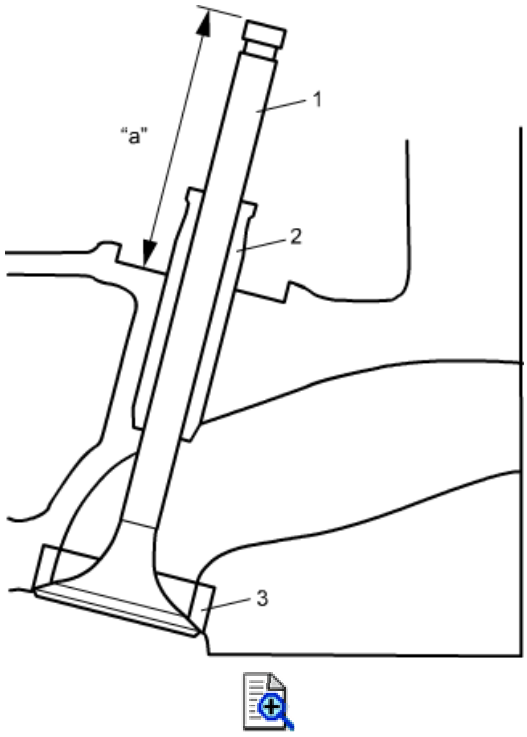
Valve

Visual inspection

- Remove all carbon deposits from each valve (1).
- Check each valve for wear, burn or distortion at its face and stem end and replace if necessary.
- Measure valve protrusion length "a".
  Replace valve and/or cylinder head if measured length is out of standard value.

Valve protrusion length "a"

Standard
IN: 44.00 – 44.60 mm (1.733 – 1.755 in.)
EX: 42.85 – 43.45 mm (1.687 – 1.710 in.)



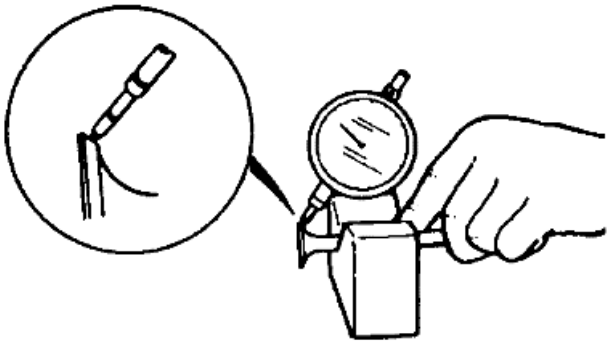
2. Valve guide	3. Valve seat

Valve head radial runout

Check each valve for radial runout using a dial gauge and "V" block.
To check runout, rotate valve slowly.
Replace valve if runout exceeds the limit.

Valve head radial runout

Standard
IN: 0.000 – 0.045 mm (0.0000 – 0.0017 in.)
EX: 0.000 – 0.030 mm (0.0000 – 0.0011 in.)
Limit
IN: 0.090 mm (0.0035 in.)
EX: 0.060 mm (0.0023 in.)

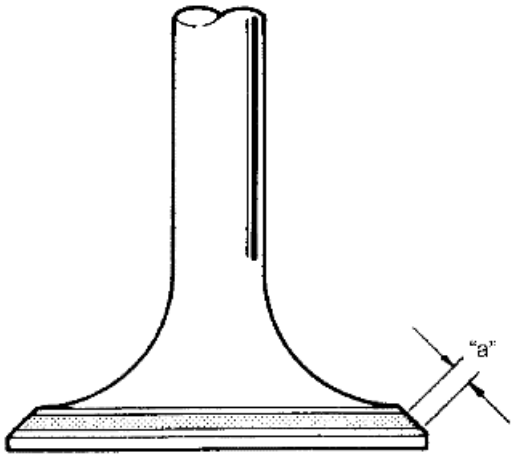


Seating contact width

Create contact pattern on each valve in the usual manner, i.e., by giving uniform coat of marking compound to valve seat and, by rotating and tapping seat with valve. Must use a valve lapper (tool use in valve lapping).
Pattern produced on seating surface of valve must be a continuous ring without any break, and the width of pattern must be within specified range.

Standard seating width "a" revealed by contact pattern on valve face

IN: 1.05 – 1.35 mm (0.0414 – 0.531 in.)
EX: 1.12 – 1.42 mm (0.0441 – 0.0559 in.)



Valve seat repair

A valve seat not producing uniform contact with its valve or showing a seating surface width that is out of specified range must be repaired by regrinding or cutting and finished by lapping.

1) Intake valve seat:

Use valve seat cutters to make three cuts as illustrated in figure. Must use three separate cutters: the 1st for making 22° angle, the 2nd for making 60° angle, and 3rd for making 45° angle. The 3rd cut (45°) must be made to produce desired seat width.

Seat width for intake valve seat

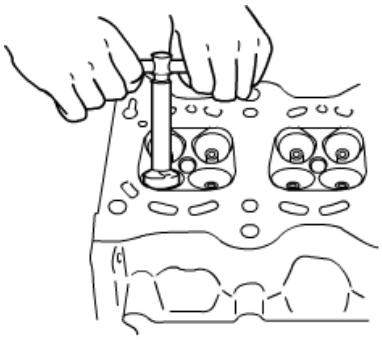
"a": 1.05 – 1.35 mm (0.0414 – 0.0531 in.)

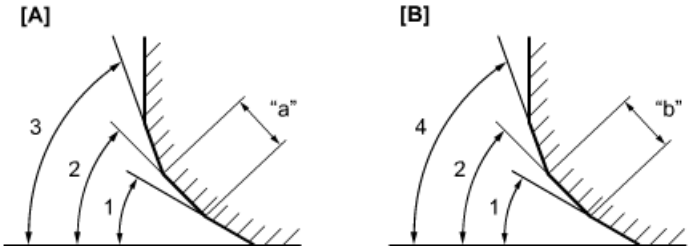
2) Exhaust valve seat:

Use valve seat cutters to make three cuts as illustrated in the figure. Three cutters must be used: the 1st for making 22° angle, the 2nd for making 65° angle, and 3rd for making 45° angle. Must make the 3rd cut (45°) to produce desired seat width.

Seat width for exhaust valve seat

"b": 1.12 – 1.42 mm (0.0441 – 0.559 in.)





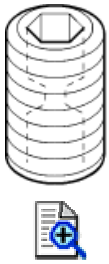
[A]: Intake	1. 22°	3. 60°
[B]: Exhaust	2. 45°	4. 65°

3) Valve lapping:

Lap valve on seat in two steps, first with coarse size lapping compound applied to face and the second with fine-size compound, each time using valve lapper according to usual lapping method.

Venturi Plug Inspection

Check that venturi plug passage is not clogged.
Clean or replace venturi plug if venturi plug passage is clogged.



1D

Cylinder Head Inspection

Reference: Valve and Cylinder Head Disassembly and Reassembly

Combustion Chamber

- Remove all carbon deposits from each combustion chamber.

NOTE:
Do not use any sharp-edged tools to scrape off carbon deposits. Be careful not to scuff or nick metal surfaces when removing carbon deposits. The same applies to valves and valve seats, too.

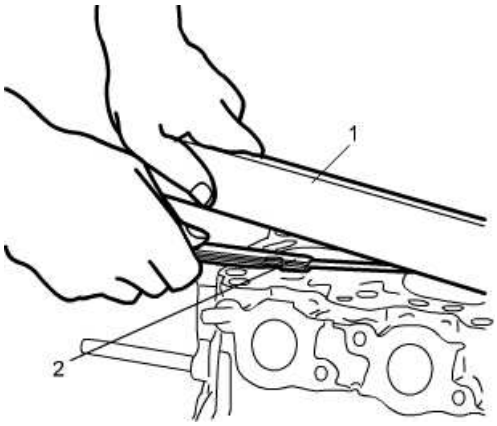
- Check cylinder head for cracks on intake and exhaust ports, combustion chambers, and head surface.

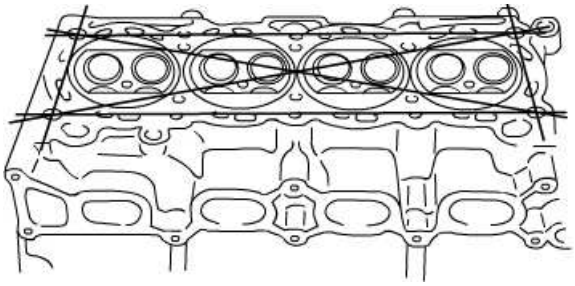
Cylinder Head Flatness

Use a straightedge (1) and feeler gauge (2) to check flatness of gasket surface at a total of 6 locations.
If any measured value exceeds its limit, correct gasket surface with a surface plate and abrasive paper #400 (Waterproof silicon carbide abrasive paper) by placing abrasive paper on and over surface plate and rubbing gasket surface against paper to grind off high spots.
Replace cylinder head if it is impossible to correct cylinder head distortion.

NOTE:
Distorted mating surface of cylinder head and cylinder head gasket causes combustion gas and/or check cooling system for leakage, overheating and reduced power output.

Distortion of mating surface of cylinder head and cylinder head gasket
Limit: 0.03 mm (0.0011 in.)



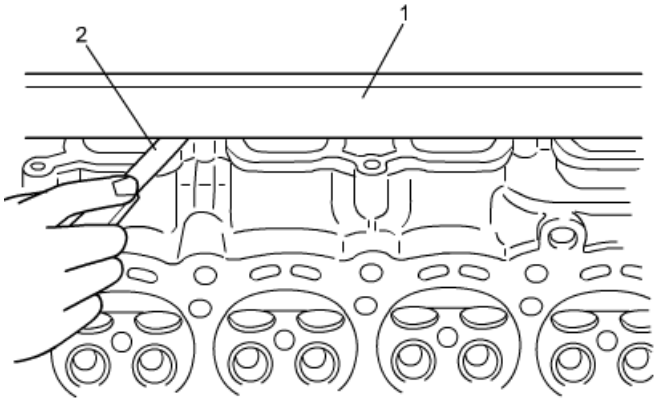


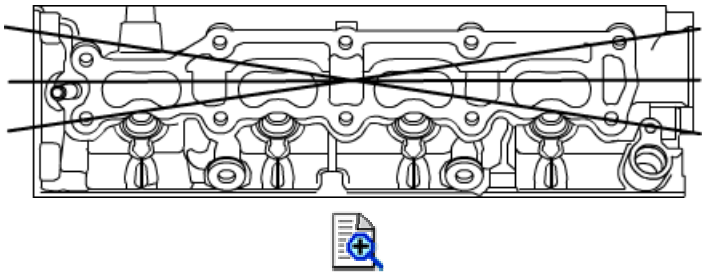
Manifold Seating Surface Flatness

Use straightedge (1) and feeler gauge (2) to check flatness of manifold seating surface. Correct seating surface or replace cylinder head if measured value exceeds its limit.

Distortion of seating face of intake manifold and exhaust manifold on cylinder head

Limit: 0.05 mm (0.0019 in.)





1D

Cylinder Head Bolt No.1 Inspection

Reference: Valve and Cylinder Head Disassembly and Reassembly

NOTE:
If cylinder head bolt No. 1 (1) is reused, check thread diameter for deformation as follows and replace it with a new one if thread diameter difference exceeds the limit:

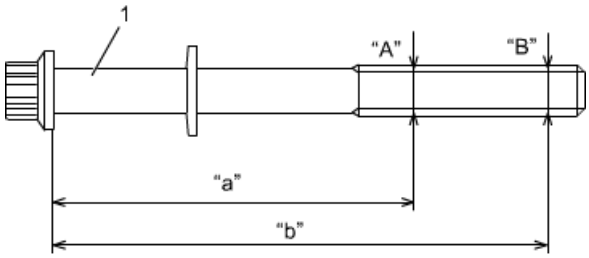
Use a micrometer (3) to measure the thread diameter of each cylinder head bolt No. 1 "A" at "a" and "B" at "b".
Then calculate difference in diameters (A – B).
Replace cylinder head bolt No.1 with new bolt if it exceeds limit.

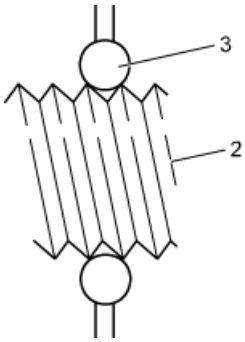
Cylinder head bolt No.1 diameter measurement points

"a": 95.0 mm (3.74 in.)
"b": 130.0 mm (5.11 in.)

Cylinder head bolt No.1 diameter difference (deformation)

Limit (A – B): 0.25 mm (0.0098 in.)





2. Thread

1D

Valve Spring Inspection

Reference: Valve and Cylinder Head Disassembly and Reassembly

Valve Spring Free Length and Preload

- Check each valve spring for breakage or weakening.
- Measure valve spring free length and preload.
  Replace valve spring if measured value is less than limit.

NOTE:
Weakened valve springs can cause chatter, not to mention possibility of reducing power output due to gas leakage caused by decreased seating pressure.

Valve spring free length "a"

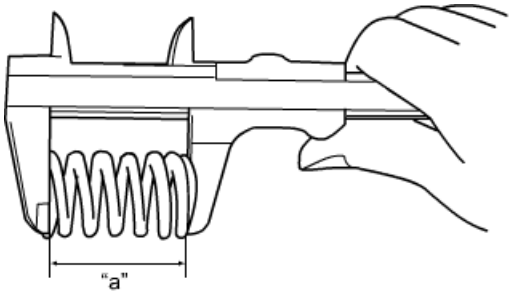
Standard: 51.34 mm (2.021 in.)
Limit: 50.34 mm (1.981 in.)

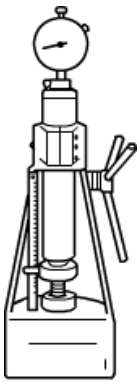
Valve spring preload when compressed to 41.0 mm (1.61 in.)

Standard: 170 – 196 N (17.4 kgf – 19.9 kgf, 125.5 lbf – 144.0 lbf)
Limit: 165 N (16.9 kgf, 37.1 lbf)

Valve spring preload when compressed to 31.2 mm (1.22 in.)

Standard: 379 – 437 N (38.7 – 44.5 kgf, 279.5 – 322.0 lbf)
Limit: 375 N (38.2 kgf, 277.0 lbf)



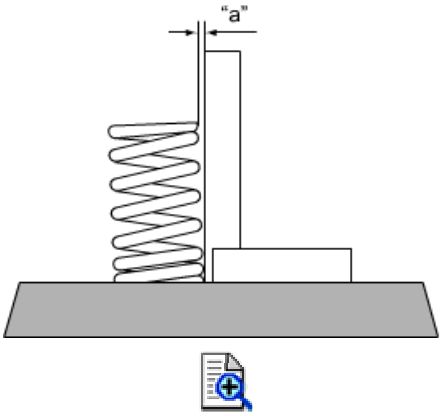


Spring Squareness

Use a square surface plate to check each spring for squareness in terms of clearance between end of valve spring and square. Valve springs found to exhibit a larger clearance than limit must be replaced.

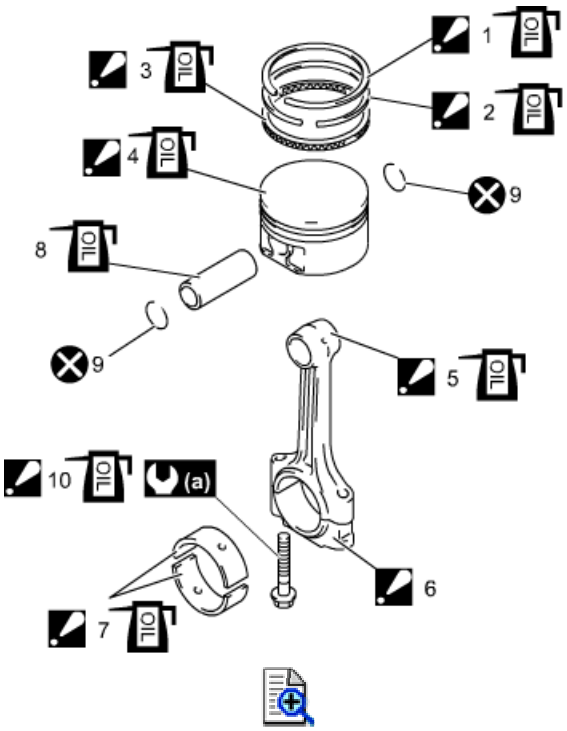
Valve spring squareness

Limit: 2.2 mm (0.086 in.)



1D

Piston, Piston Ring and Connecting Rod Components

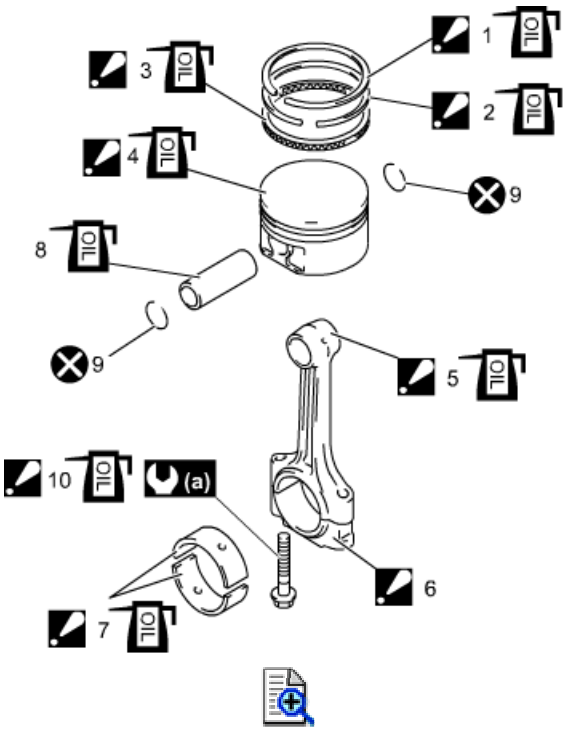


1. 1st ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	5. Connecting rod : Do not apply engine oil to mating surface between connecting rod bearing and connecting rod. : Apply engine oil to sliding surface.	9. Piston pin circlip
2. 2nd ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	6. Connecting rod bearing cap : To install connecting rod cap, direct arrow on it to crank pulley. : Do not apply engine oil to mating surface between connecting rod bearing and connecting rod cap.	10. Connecting rod bearing cap bolt : Check connecting rod bearing cap bolt for deformation to reuse. ☞ : Apply engine oil to bolt thread and seat. : For tightening order, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***.
3. Oil ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	7. Connecting rod bearing : For applying engine oil, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***.	(a) : 15 N·m → +45° → +45° (1.5 kgf-m → +45° → +45°, 11.0 lbf-ft → +45° → +45°)

 4. Piston : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***. : Apply engine oil to sliding surface.	 8. Piston pin : Apply engine oil to sliding surface.	 : Do not reuse.

1D

Piston, Piston Ring and Connecting Rod Components



1. 1st ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	5. Connecting rod : Do not apply engine oil to mating surface between connecting rod bearing and connecting rod. : Apply engine oil to sliding surface.	9. Piston pin circlip
2. 2nd ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	6. Connecting rod bearing cap : To install connecting rod cap, direct arrow on it to crank pulley. : Do not apply engine oil to mating surface between connecting rod bearing and connecting rod cap.	10. Connecting rod bearing cap bolt : Check connecting rod bearing cap bolt for deformation to reuse. ☞ : Apply engine oil to bolt thread and seat. : For tightening order, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***.
3. Oil ring : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Disassembly and Reassembly***. : Apply engine oil to sliding surface.	7. Connecting rod bearing : For applying engine oil, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***.	(a) : 15 N·m → +45° → +45° (1.5 kgf-m → +45° → +45°, 11.0 lbf-ft → +45° → +45°)

 4. Piston : For assembly, refer to ***Piston, Piston Ring and Connecting Rod Removal and Installation***. : Apply engine oil to sliding surface.	 8. Piston pin : Apply engine oil to sliding surface.	 : Do not reuse.

1D

Piston, Piston Ring and Connecting Rod Removal and Installation

CAUTION:
Parts must go back in the position where they were. Keep them in the following order:
- **Connecting rod**
- **Connecting rod bearing**
- **Connecting rod bearing cap**
- **Piston**

Removal

Reference: Piston, Piston Ring and Connecting Rod Components

1) Remove engine assembly from vehicle. ☞

2) Remove cylinder head. ☞

3) Remove oil pump. ☞

4) Mark cylinder number on all pistons, connecting rods and connecting rod bearing caps using silver pencil or quick drying paint.

5) Remove connecting rod bearing caps.

6) Remove carbon deposits from tops of cylinder bores before removing pistons from cylinder.

7) Push piston and connecting rod assembly out through the top of cylinder bore.

8) Remove connecting rod bearings from connecting rod and connecting rod bearing cap, if necessary.

Installation

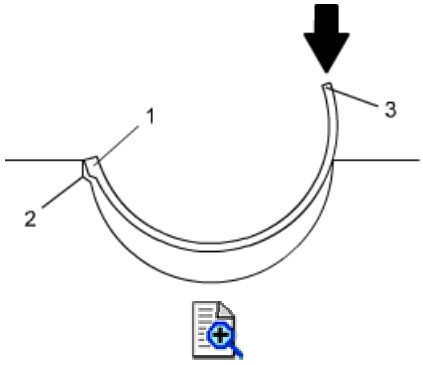
Reference: Piston, Piston Ring and Connecting Rod Disassembly and Reassembly
Reference: Crankshaft Pin and Connecting Rod Bearings Inspection

CAUTION:
- **Apply engine oil to the following parts:**
  - **Crankshaft pin**
  - **Connecting rod bearing**
  - **Piston**
  - **Piston ring**
  - **Cylinder wall**
- **Install the following parts in the position where they were:**
  - **Connecting rod**
  - **Connecting rod bearing**
  - **Connecting rod bearing cap**
  - **Piston**

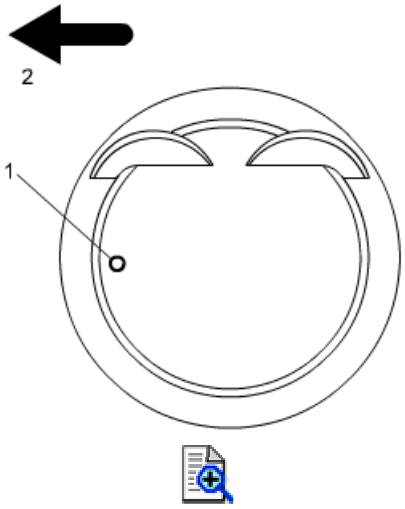
1) Apply engine oil to pistons, piston rings, cylinder walls, connecting rod bearings and crankshaft pins.

NOTE:
Do not apply engine oil between connecting rod and bearing or between connecting rod bearing cap and bearing.

2) Install connecting rod bearing to connecting rod or bearing cap as follows:
a) Fit tab (1) of connecting rod bearing to groove (2) of connecting rod or bearing cap.
b) Press bearing end (3) until it fully seats in connecting rod or bearing cap.



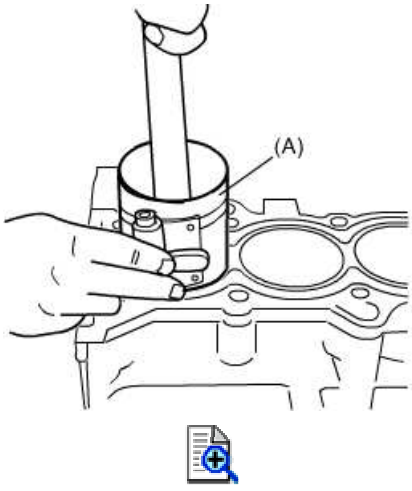
3) When installing piston and connecting rod assembly into cylinder bore, direct front mark (1) on piston head to crankshaft pulley side (2).



2:	Crankshaft pulley side

4) Install piston and connecting rod assembly into cylinder bore. Use special tool to compress rings. Guide connecting rod into place on crankshaft.
Tap piston head with a hammer handle to install piston into bore. Hold ring compressor firmly against cylinder block until all piston rings have entered in cylinder bore.

Special Tool
(A): 09916–77310



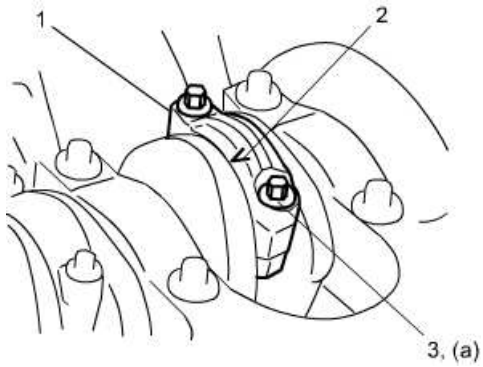
5) Install connecting rod bearing cap (1) as follows:

NOTE:
- **Before installing connecting rod bearing cap, check the cap bolts for deformation. Refer to "Connecting rod bolt deformation" under *Piston Pins and Connecting Rods Inspection*.**
- **Tighten connecting rod bearing cap bolt (3) gradually.**

a) Direct arrow mark (2) on connecting rod bearing cap (1) to crankshaft pulley side.
b) Apply engine oil to bolt thread and seat of connecting rod bearing cap bolt.
c) Tighten all connecting rod bearing cap bolts to 15 N·m (1.5 kgf-m, 11.0 lbf-ft) evenly and gradually.
d) Retighten them to 45° in the same manner as in Step c).
e) Retighten them to 45° in the same manner as in Step c).

Tightening torque

Connecting rod bolt* (a): 15 N·m → +45° → +45° (1.5 kgf-m → +45° → +45°, 11.0 lbf-ft → +45° → +45°



6) Install oil pump. ☞

7) Install cylinder head. ☞

8) Install engine assembly. ☞

1D

Piston, Piston Ring and Connecting Rod Disassembly and Reassembly

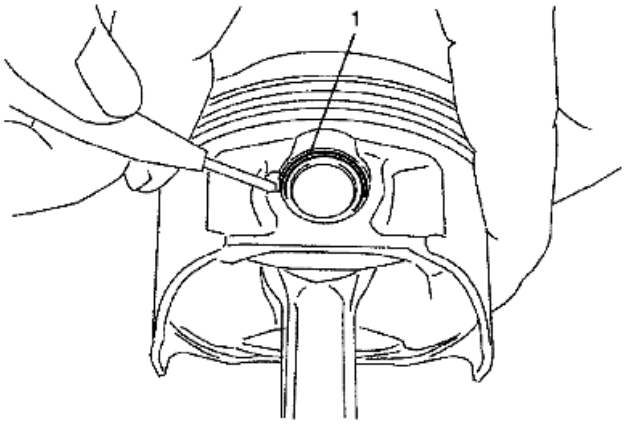
Reference: Piston, Piston Ring and Connecting Rod Removal and Installation

CAUTION:
Parts must be reassembled in the position where they were. Keep the following as a group for each cylinder:
- **Piston**
- **Piston pin**
- **Piston ring**
- **Connecting rod**
- **Connecting rod bearing**
- **Connecting rod bearing cap**

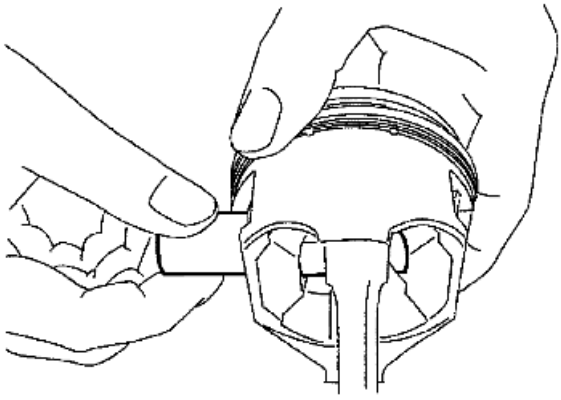
Disassembly

1) Use a piston ring expander to remove 1st and 2nd rings and oil ring from piston.

2) Remove piston pin from connecting rod as follows.
a) Remove piston pin circlips (1), as shown.



b) Remove piston pin.



Reassembly

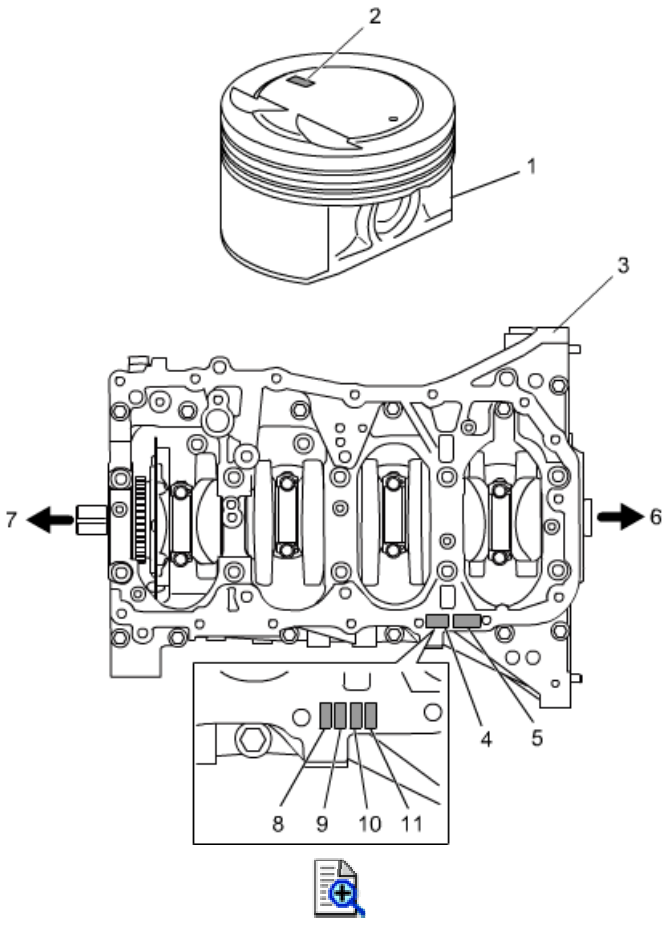
Reference: Cylinder, Piston and Piston Ring Inspection
Reference: Piston Pins and Connecting Rods Inspection

Reference: Crankshaft Pin and Connecting Rod Bearings Inspection

CAUTION:
- **Apply engine oil to the following parts:**
  - **Piston pin hole**
  - **Piston pin**
  - **Connecting rod small-end bore**
- **Reassemble the following parts in the position where they were:**
  - **Piston**
  - **Piston pin**
  - **Piston ring**
  - **Connecting rod**
  - **Connecting rod bearing**
  - **Connecting rod bearing cap**

NOTE:
Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance. When installing a standard size piston, make sure to match piston with cylinder.

1) To replace piston, select proper piston using the following procedures:
a) Check stamped number (2) on piston (1) as shown in figure.
b) Check stamped number (4) on lower crankcase (3) as shown in figure.



5. Stamped alphabet	9. Cylinder No.2
6. Transaxle side	10. Cylinder No.3
7. Crankshaft pulley side	11. Cylinder No.4

8. Cylinder No.1	

c) Stamped number on piston and stamped number on lower crankcase correspond with each other.
Select proper piston referring the following table.

Piston selection table

	Stamped number on lower crankcase	
	1	2
Stamped number on piston	1	2

2) Use a suitable tool to remove carbon deposit from piston head and ring grooves.

3) Assemble piston pin, piston (1) and connecting rod (2) as follows.

a) Apply engine oil to piston pin, piston pin hole in piston and connecting rod.

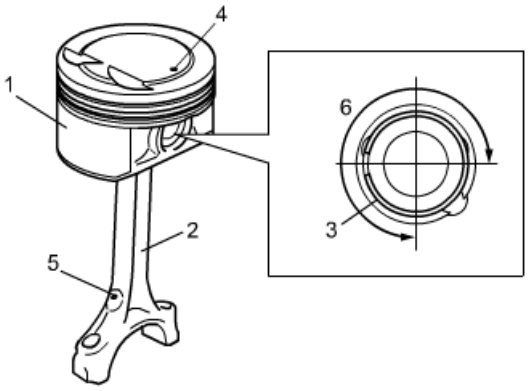
b) Fit connecting rod to piston.

NOTE:
Be sure to position front mark (4) on piston and oil hole (5) of connecting rod (2) at specified position as shown in figure.

c) Insert piston pin to piston and connecting rod.

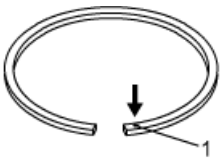
d) Install new piston pin circlips (3).

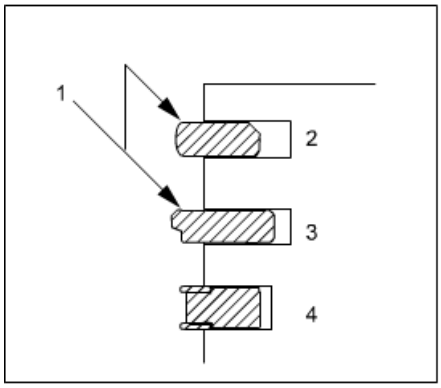
NOTE:
Install circlip so that circlip end gap comes within the range indicated by arrow (6).



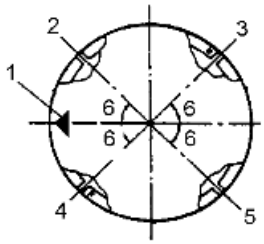
4) Install piston rings to piston noting the following points:

- As indicated in figure, 1st and 2nd rings have discrimination mark (1) respectively. When installing these piston rings to piston, direct discrimination mark side of each ring toward top of piston.
- 1st ring (2) differs from 2nd ring (3) in thickness, shape and color of surface contacting cylinder wall.
  Refer to the figure to distinguish 1st ring from 2nd ring.
- When installing oil ring (4), install spacer first, and then install two rails.





5) After installing three rings (1st, 2nd and oil rings), distribute their end gaps as shown in figure.



1. Front mark	4. 2nd ring end gap and oil ring spacer gap
2. Oil ring upper rail gap	5. Oil ring lower rail gap
3. 1st ring end gap	6. 45°

1D

Cylinder, Piston and Piston Ring Inspection

Reference: Piston, Piston Ring and Connecting Rod Disassembly and Reassembly

Cylinder

Visual inspection

Check cylinder walls for scratches, roughness or ridges which indicate excessive wear. Replace cylinder block, piston rings and/or pistons if cylinder wall is too rough, deeply scratched or ridged.

Cylinder bore diameter, taper and out-of-round

Use cylinder gauge to measure cylinder bore in thrust and axial direction.
Replace cylinder block if any of the following conditions are discovered:

- Cylinder bore exceeds limit.
- Difference of measurements at two positions ([1] and [2]) exceeds taper limit.
- Difference between thrust [4] and axial [3] measurements exceeds roundness limit.

CAUTION:
Replace cylinder block if any abnormality is found on cylinder inside wall.

NOTE:
There are two sizes for cylinder bore, to keep clearance between piston and cylinder properly.
To distinguish standard value, refer to *Piston, Piston Ring and Connecting Rod Disassembly and Reassembly*.

Cylinder bore diameter

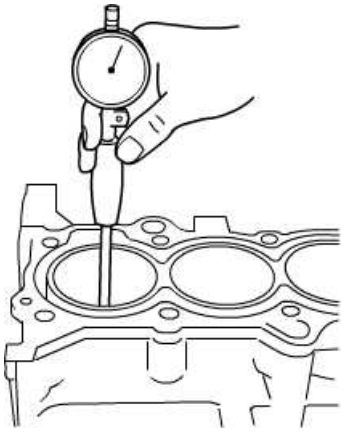
Standard

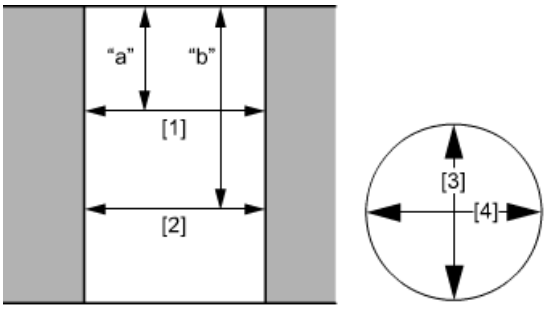
Stamped number on lower crankcase	1	92.0101 – 92.0200 mm (3.62245 – 3.62283 in.)
	2	92.0000 – 92.0100 mm (3.62205 – 3.62244 in.)

Cylinder bore diameter
Limit: 92.050 mm (3.6240 in.)

Cylinder bore roundness ([3] – [4])
Limit: 0.020 mm (0.00078 in.)

Cylinder bore taper ([1] – [2])
Limit: 0.013 mm (0.00051 in.)





"a":	50 mm (1.96 in.)
"b":	100 mm (3.93 in.)

Piston

NOTE:
Two sizes of piston are available as standard size spare part so as to ensure proper piston-to-cylinder clearance.

Visual inspection

Inspect piston for cracks or other damages.
Replace piston if any abnormalities are found.

Piston diameter

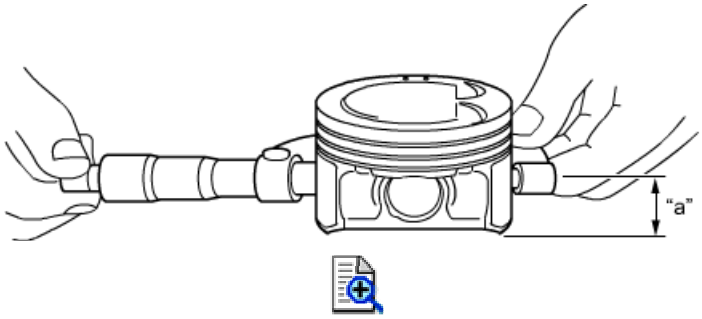
As indicated in figure, piston diameter should be measured at specified position "a" 11.4 mm (0.448 in) from piston skirt end in the direction perpendicular to piston pin.
Replace piston if measured diameter is less than its limit.

New piston diameter standard size

Stamped number on piston	**1**	**91.950 – 91.960 mm (3.6200 – 3.6204 in.)**
	2	**91.940 – 91.950 mm (3.6196 – 3.6200 in.)**

Piston diameter limit size

Stamped number on piston	1	91.940 mm (3.6196 in.)
	2	91.930 mm (3.6192 in.)



"a": 11.4 mm (0.449 in.)

Piston clearance

Measure cylinder bore diameter and piston diameter to find their difference called piston clearance. Piston clearance should be within its standard value.
Replace piston if it is out of limit.

NOTE:
Cylinder bore diameters used here are measured in thrust direction at two positions.

Piston clearance

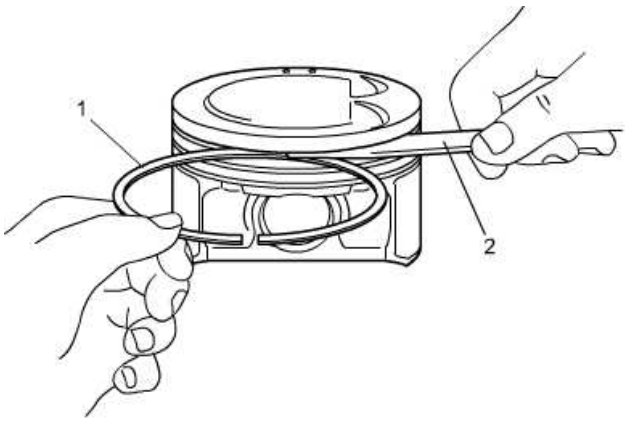
Limit: 0.12 mm (0.0047 in.)

Ring groove clearance

1) Before checking, piston grooves must be clean, dry and free from carbon deposits.
2) Fit new piston ring (1) into piston groove.
3) Use feeler gauge (2) to measure clearance between ring and ring land.
Replace piston if clearance is out of limit.

Ring groove clearance

	Standard	Limit
1st ring	0.04 – 0.08 mm (0.0015 – 0.0031 in.)	0.13 mm (0.0051 in.)
2nd ring	0.03 – 0.07 mm (0.0011 – 0.0027 in.)	0.11 mm (0.0433 in.)
Oil ring	0.035 – 0.175 mm (0.0014 – 0.0068 in.)	—



Piston Ring

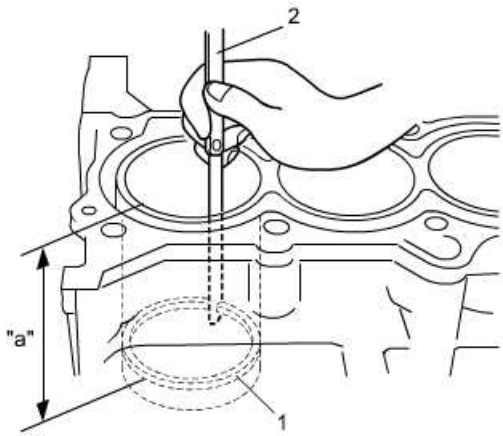
Piston ring end gap

To measure end gap, insert piston ring (1) into cylinder bore, and then measure the gap with feeler gauge (2).
Replace piston ring if measured gap exceeds limit.

NOTE:
Remove carbon deposit from top of cylinder bore before inserting piston ring.

Piston ring end gap

Item	Standard	Limit
1st ring	0.20 – 0.33 mm (0.0078 – 0.0129 in.)	0.7 mm (0.0275 in.)
2nd ring	0.32 – 0.48 mm (0.0126 – 0.0188 in.)	0.7 mm (0.0275 in.)
Oil ring	0.20 – 0.50 mm (0.0078 – 0.0196 in.)	1.8 mm (0.0708 in.)



“a”. 120 mm (4.724 in.)

1D

Piston Pins and Connecting Rods Inspection

Reference: Piston, Piston Ring and Connecting Rod Disassembly and Reassembly

Piston Pin

Visual inspection

Check piston pin, connecting rod small-end bore and piston pin hole in piston for wear or damage, paying particular attention to condition of small-end bore bushing.
Replace piston pin, connecting rod and/or piston if piston pin, connecting rod small-end bore or piston pin hole in piston is badly worn or damaged.

Piston pin clearance

Check piston pin clearance in connecting rod small-end and piston. Replace connecting rod and/or piston if its small-end is badly worn or damaged or if measured clearance exceeds limit.

Piston pin clearance in connecting rod small-end

Standard: 0.003 – 0.017 mm (0.0002 – 0.0006 in.)
Limit: 0.040 mm (0.0015 in.)

Piston pin clearance in piston

Standard: 0.010 – 0.016 mm (0.00039 – 0.00062 in.)
Limit: 0.05 mm (0.0019 in.)

Small-end bore

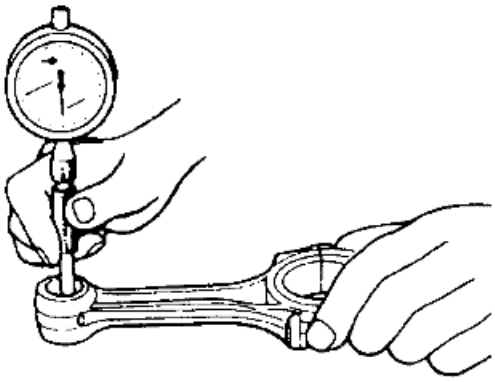
21.003 – 21.011 mm (0.82689 – 0.83720 in.)

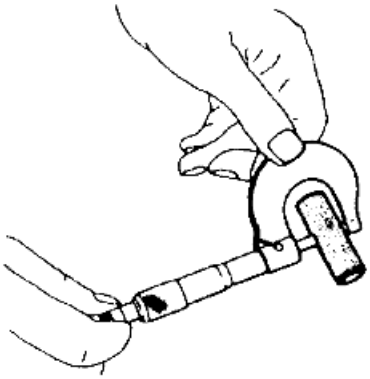
Piston pin outside diameter

20.994 – 21.000 mm (0.82654 – 0.82677 in.)

Diameter of piston pin hole in piston

21.007 – 21.013 mm (0.82705 – 0.82728 in.)





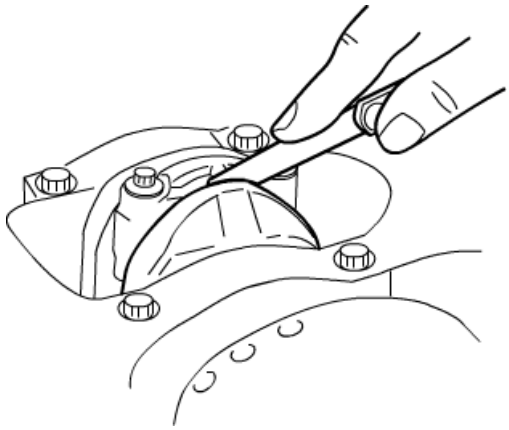
Connecting Rod

Big-end side clearance

Check big-end side clearance of connecting rod, with rod fitted and connected to its crankshaft pin in the normal manner.
Replace connecting rod if measured clearance exceeds standard value.

Big-end side clearance

Standard: 0.25 – 0.40 mm (0.0098 – 0.0157 in.)

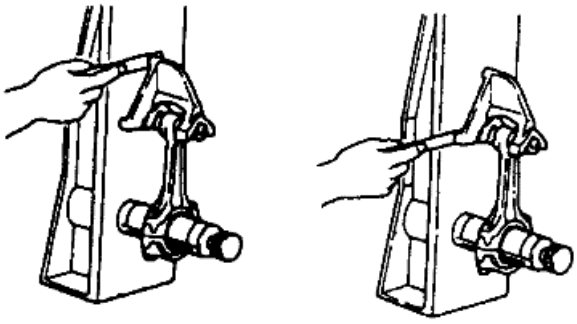


Connecting rod alignment

Mount connecting rod on aligner to check for bow and twist.
Replace it if measured value exceeds the limit.

Connecting rod alignment

Limit on bow: 0.05 mm (0.0019 in.)
Limit on twist: 0.10 mm (0.0039 in.)



Connecting rod bolt deformation

Use micrometer (3) to measure each thread, diameter of connecting rod bolt (1) "A" at "a" and "B" at "b".
Calculate difference in diameters ("A" – "B").
Replace connected rod bolt if it exceeds limit.

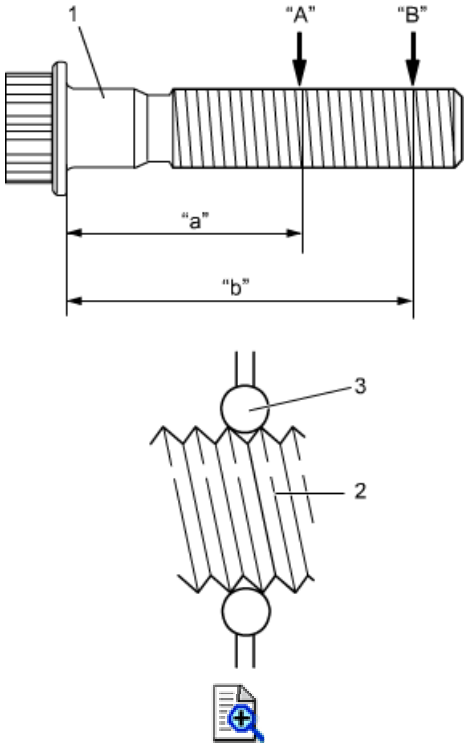
Connecting rod bolt measurement points

"a": 28.5 mm (1.12 in.)

"b": 42.0 mm (1.65 in.)

Connecting rod bolt diameter difference

Limit ("A" – "B"): 0.05 mm (0.0019 in.)



2.	Thread

1D

Crankshaft Pin and Connecting Rod Bearings Inspection

Reference: Piston, Piston Ring and Connecting Rod Disassembly and Reassembly

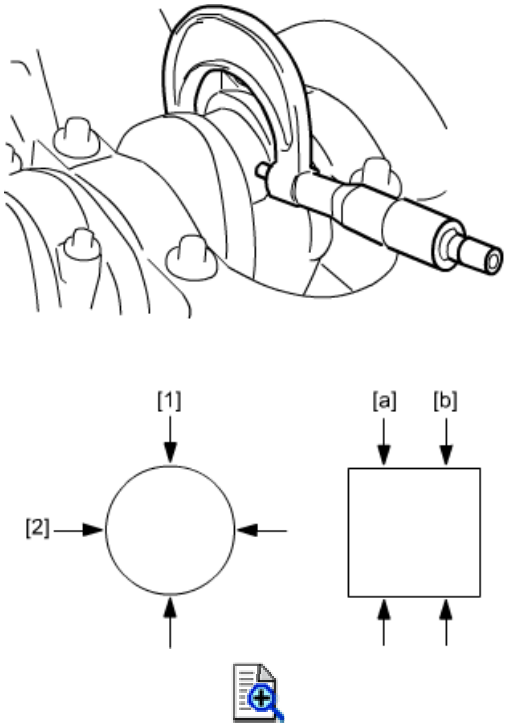
Crankshaft Pin Diameter

- Use micrometer to measure crankshaft pin diameter at several points and calculate taper and out-of-round conditions.
  Replace crankshaft or regrind crankshaft pin to undersize and use undersize bearing if calculated taper and/or out-of-round is out of their service limit.

CAUTION:
If crankshaft pin is reground, new undersize bearings must be installed and bearing clearance must be checked.

Crankshaft pin diameter
Standard: 49.982 – 50.000 mm (1.9678 – 1.9685 in.)

Crankshaft pin taper ([a] – [b]) and out-of-round ([1] –[2])
Limit: 0.01 mm (0.0003 in.)

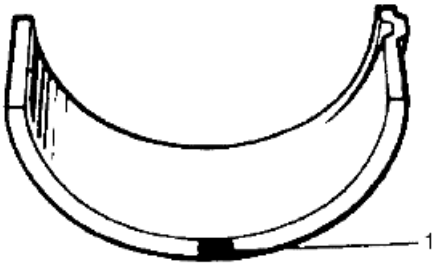


Connecting Rod Bearing General Information

- Service connecting rod bearings are available in five standard sizes and 0.25 mm (0.0098 in) undersize bearing. The difference of those sizes is thickness.
- Specified colors for identification of sizes are painted at specified location (1) as shown in figure.

	Painted color	Bearing thickness
Standard size	Blue	1.494 – 1.497 mm (0.05882 – 0.05893 in.)
	Yellow	1.491 – 1.494 mm (0.05870 – 0.05881 in.)

	Colorless	1.488 – 1.491 mm (0.05859 – 0.05870 in.)
	Black	1.485 – 1.488 mm (0.05847 – 0.05858 in.)
	Green	1.482 – 1.485 mm (0.05835 – 0.05846 in.)
0.25 mm (0.0098 in) undersize	Red	1.605 – 1.615 mm (0.06319 – 0.06358 in.)



Connecting Rod Bearing Visual Inspection

Check bearing shells for signs of fusion, pitting, burn or flaking and observe contact pattern. Replace connecting rod bearings if any abnormalities are found.

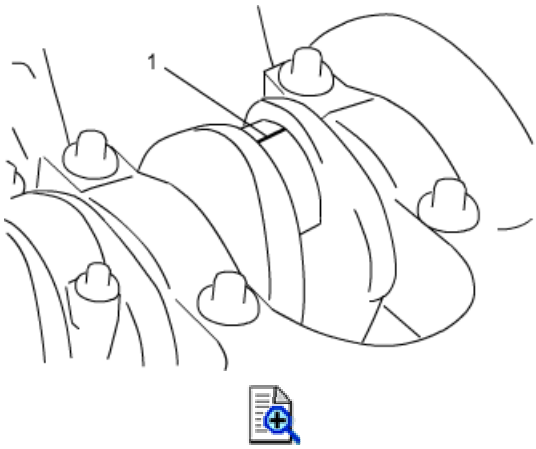
Connecting Rod Bearing Clearance

CAUTION:
Do not rotate crankshaft while gauging plastic is installed.

NOTE:
After checking connecting rod bearing clearance, check connecting rod bolt for deformation by referring to "Connecting rod bolt deformation" under *Piston Pins and Connecting Rods Inspection*.

1) Clean connecting rod bearings and crankshaft pin.

2) Place plastic gauge (1) with the same width as the crankshaft pin, so that it fits over the bearing, parallel to the crankshaft, avoiding the oil hole.

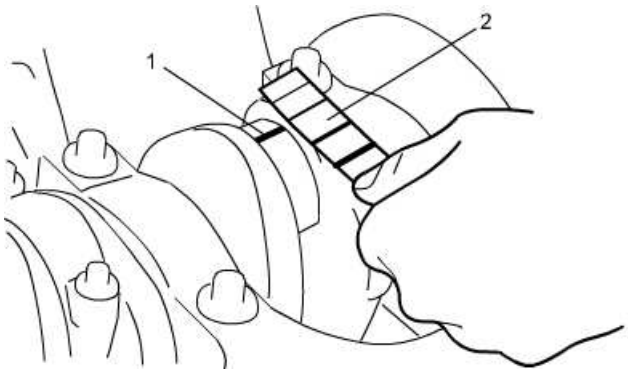


3) Install connecting rod bearings and its cap. ☞

4) After three minutes elapsed, remove cap and use a scale (2) on plastic gauge envelope to measure plastic gauge (1) width at the widest point.

Connecting rod bearing clearance

Standard: 0.045 – 0.063 mm (0.0017 – 0.0024 in.)
Limit: 0.065 mm (0.0025 in.)



If measured oil clearance is less than standard value or more than service limit, replace connecting rod bearings with new ones referring to ***Selection of Connecting Rod Bearings***, and recheck oil clearance.
Depending on measured oil clearance with new bearing, select other bearings using the following procedures and recheck oil clearance:

- More than standard:
  Replace bearings with one size thicker or regrind crankshaft pin to under size and use 0.25 mm (0.0098 in) undersize bearings.
- Less than standard:
  Replace bearings with one size thinner or regrind crankshaft pin to under size and use 0.25 mm (0.0098 in) undersize bearings.

Selection of Connecting Rod Bearings

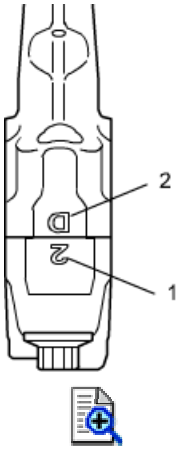
Standard size

1) Check connecting rod big-end inside diameter using the following procedures:

- There is stamped number (any of "1", "2" or "3") on each connecting rod and it cap as shown in figure.
- That number represent connecting rod big-end inside diameter as follows.

Connecting rod big-end inside diameter

Stamped number	Connecting rod big-end inside diameter
1	53.0000 – 53.0060 mm (2.08662 – 2.08685 in.)
2	53.0061 – 53.0120 mm (2.08686 – 2.08708 in.)
3	53.0121 – 53.0180 mm (2.08709 – 2.08732 in.)

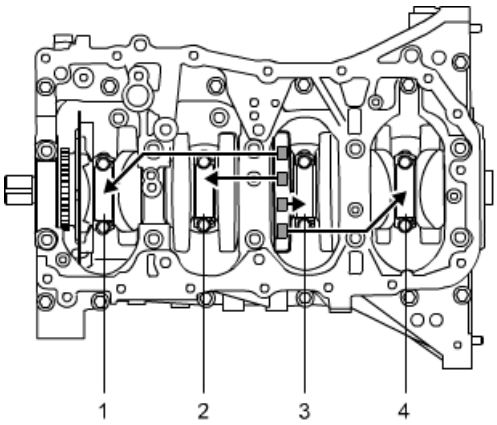


1.	Connecting rod big-end inside diameter number
2.	Weight indication mark

2) Check crankshaft pin diameter using the following procedures:
- There are four stamped alphabets (any of "A", "B" or "C") on crank web No.5 as shown in figure.
- Those alphabets represent crankshaft pin diameter as follows:

Crankshaft pin diameter

Stamped alphabet	Crankshaft pin diameter
A	49.9940 – 50.0000 mm (1.96827 – 1.96850 in.)
B	49.9880 – 49.9939 mm (1.96804 – 1.96826 in.)
C	49.9820 – 49.9879 mm (1.96780 – 1.96802 in.)



1.	Crankshaft pin No.1
2.	Crankshaft pin No.2
3.	Crankshaft pin No.3
4.	Crankshaft pin No.4

3) Determine new standard bearings to be installed to connecting rod big-end from numbers stamped on connecting rods and the caps and alphabets stamped on crank web No. 5 using the following table:

Connecting rod bearing cross-reference selection table

		Stamped number for connecting rod big-end inside diameter		
		1 or A	2 or B	3 or C
Stamped alphabet for crankshaft pin outside diameter	A	Green	Black	Colorless
	B	Black	Colorless	Yellow
	C	Colorless	Yellow	Blue

Undersize

1) Determine target diameter of crankshaft pin for regrinding according to the following procedure.

a) Assemble connecting rod, connecting rod cap and undersize bearings (0.25 mm (0.0098 in.)), referring to step 2) to 5) of "Installation" under ***Piston, Piston Ring and Connecting Rod Removal and Installation***.

b) Use a bore gauge to measure connecting rod bearing inside diameter "a".

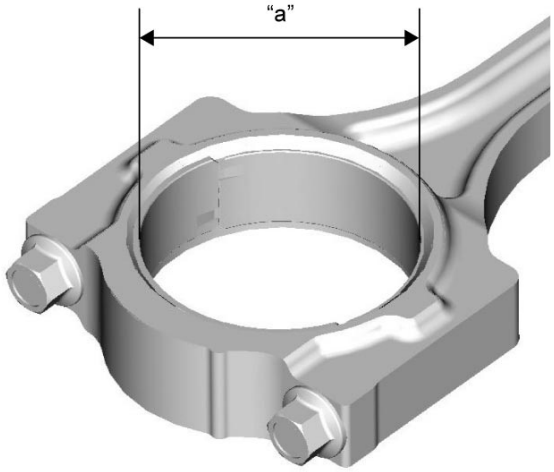
c) Calculate target diameter using the following formula:

Formula for target diameter of crankshaft pin

A = B – 0.054 mm (0.0021 in.)
A: Target diameter of crankshaft pin B: Measured connecting rod bearing inside diameter "a".

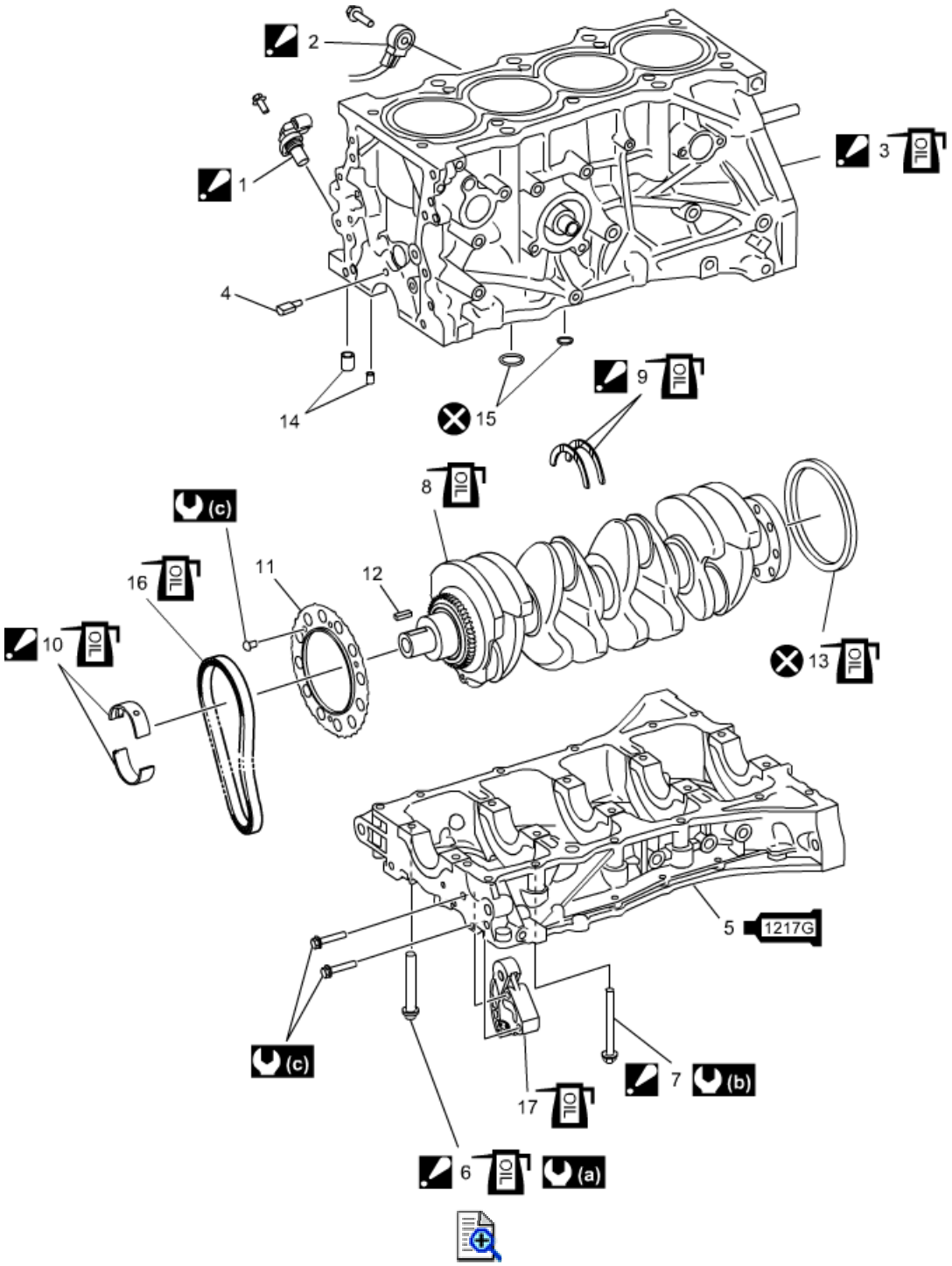
2) Grind crankshaft pin to target diameter.

3) Check connecting rod bearing oil clearance. ☞

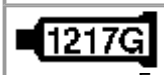

“a”

1D

Main Bearing, Crankshaft and Cylinder Block Components



1. CKP sensor : For removal and installation, refer to ***CKP Sensor Removal and Installation***.	Crankshaft : Apply engine oil to sliding surface 8.	15. O-ring

 2. Knock sensor : For removal and installation, refer to ***Knock Sensor Removal and Installation***.	 9. Thrust bearing : Install thrust bearing with oil grooves facing out.: Apply engine oil to sliding surface.	 16. Oil pump chain : Apply engine oil to sliding surface.
 3. Cylinder block : Do not apply engine oil to main bearing seating face. : Apply engine oil to sliding surface	 10. Main bearing : For applying engine oil, refer to ***Main Bearings, Crankshaft and Cylinder Block Removal and Installation***.	 17. Oil pump chain adjuster : Apply engine oil to sliding surface.
4. Timing chain oil jet	11. Sensor plate	 : 50 N·m → 0 N·m → 20 N·m → 35 N·m → +40° → +40° (5.1 kgf-m → 0 kgf-m → 2.0 kgf-m → 3.6 kgf-m → +40° → +40°, 37.0 lbf-ft → 0 lbf-ft → 15.0 lbf-ft → 26.0 lbf-ft → +40° → +40°)
 5. Lower crankcase : Apply sealant 99000-31260 referring to ***Main Bearings, Crankshaft and Cylinder Block Removal and Installation***.	12. Crankshaft timing sprocket key	 : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
 6. Crankcase bolt No.1 : Check crankcase bolt No.1 for deformation to reuse. ☞ : Apply engine oil to bolt thread and seat.: For tightening order, refer to ***Main Bearings, Crankshaft and Cylinder Block Removal and Installation***.	 13. Rear oil seal : Apply engine oil to oil seal lip.	 : 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
 7. Crankcase bolt No.2 : For tightening order, refer to ***Main Bearings, Crankshaft and Cylinder Block Removal and Installation***.	14. Dowel pin	 : Do not reuse.

1D

Main Bearings, Crankshaft and Cylinder Block Removal and Installation

Reference: Main Bearing, Crankshaft and Cylinder Block Components

CAUTION:
Parts must go back in the position where they were. Keep them in the following order:
- **Main bearing**
- **Thrust bearing**

Removal

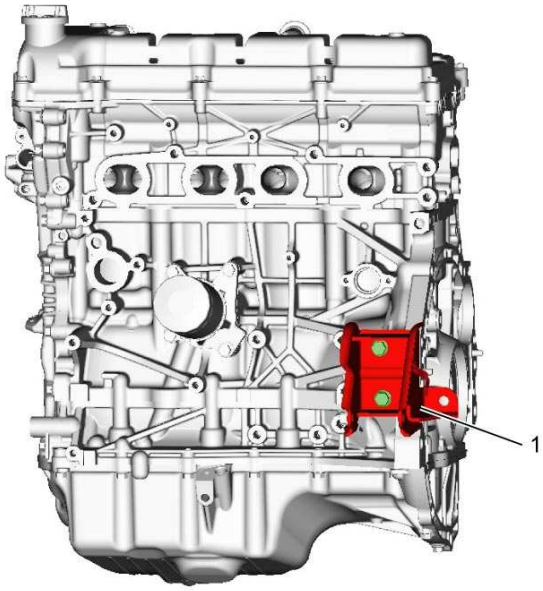
1) Remove engine assembly. ☞

2) Remove flywheel for M/T model or drive plate for CVT model. ☞

3) Remove generator. ☞

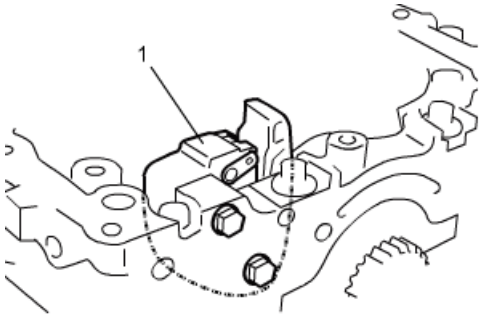
4) Remove water pump. ☞

5) Remove engine front mounting bracket (1).



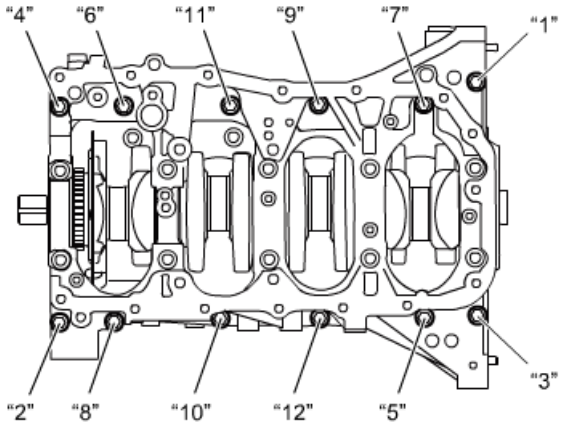
6) Remove piston and connecting rod. ☞

7) Remove oil pump chain adjuster (1) from lower crankcase.



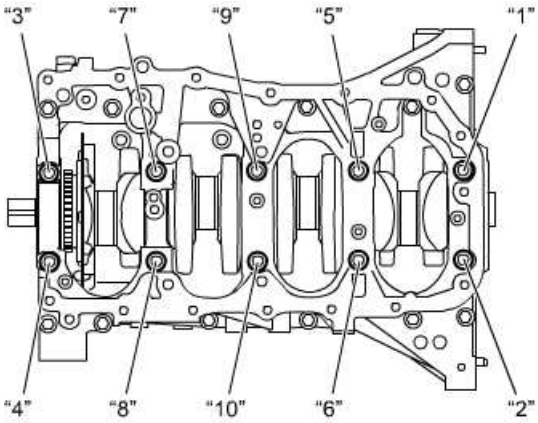
8) Remove CKP sensor. ☞

9) Loosen crankcase bolt No.2s in numerical order ("1" – "12") evenly and gradually.



10) Loosen crankcase bolt No.1s in numerical order ("1" – "10") evenly and gradually, and then remove lower crankcase and rear oil seal.

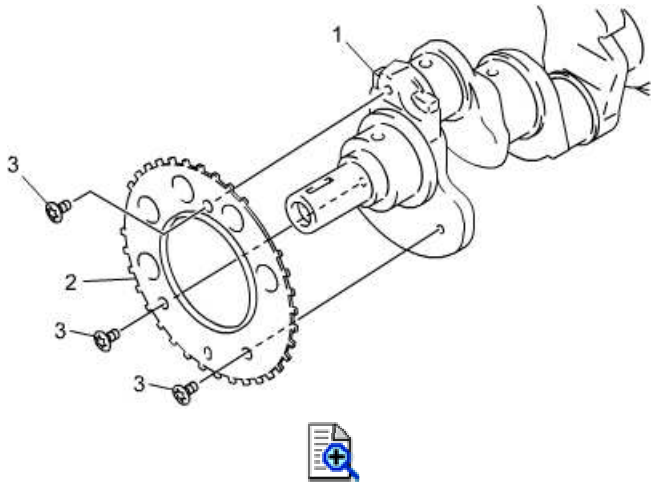
NOTE:
Use 12-point socket wrench for crankcase bolt No.1s.



11) Remove crankshaft and oil pump chain from cylinder block.

12) Remove sensor plate (2) from crankshaft (1), if necessary.

NOTE:
Use T-30 security TORX® to loosen sensor plate screws (3).



Installation

Reference: Crankshaft Inspection
Reference: Main Bearings Inspection
Reference: Sensor Plate Inspection
Reference: Flywheel/Drive Plate Inspection
Reference: Cylinder Block Inspection
Reference: Oil Pump Drive Sprocket Inspection
Reference: Oil Pump Chain and Oil Pump Chain Adjuster Inspection

CAUTION:
- **Apply engine oil to the following parts:**
  - **Crankshaft journal**
  - **Main bearing**
  - **Thrust bearing**
  - **Oil pump chain adjuster**
- **Do not apply engine oil to the following spots:**
  - **Contact surfaces between main bearing and cylinder block**
  - **Contact surfaces between main bearing and lower crankcase**
  - **Contact surfaces between connecting rod bearing and connecting rod**
  - **Contact surfaces between connecting rod bearing and connecting rod cap**
- **Install the following parts in the position where they were:**
  - **Main bearing**
  - **Thrust bearing**

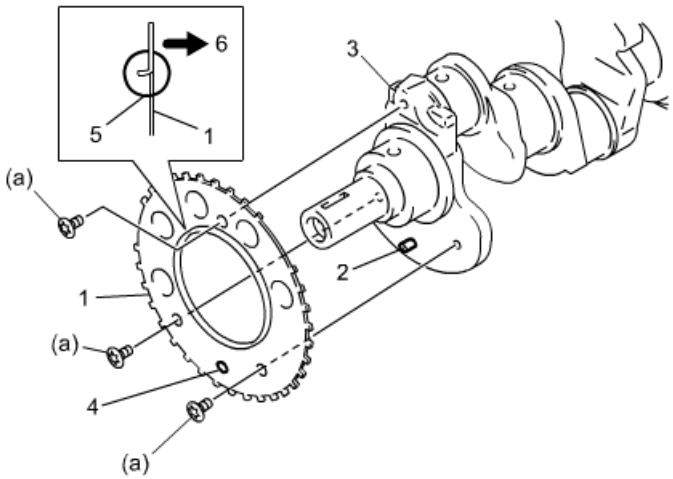
1) Install sensor plate (1) using the following procedure:
a) Attach spring pin (2) to crankshaft (3).

NOTE:
Use spring pin of genuine SUZUKI part (09205-05006).

b) Install sensor plate to crankshaft.

CAUTION:
- **Align spring pin hole (4) on sensor plate with spring pin on crankshaft.**
- **Inside edge (5) of sensor plate is bent. Install sensor plate properly.**

Tightening torque
Sensor plate screw (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



6.	Crankshaft side

c) Detach spring pin from crankshaft.

2) Install main bearings to cylinder block or lower crankcase using the following procedures:

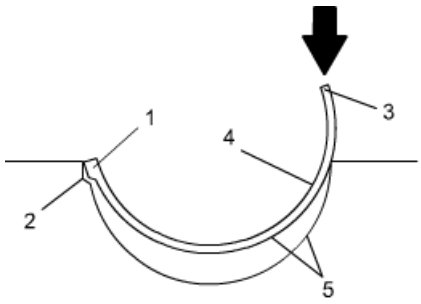
NOTE:
- **Install main bearing halves with oil groove to cylinder block.**
- **Install other main bearing halves to lower crankcase.**

a) Fit the tab (1) on each bearing into recess (2) in cylinder block or lower crankcase.

b) Press bearing end (3) until it is firmly seated on the cylinder block or lower crankcase.

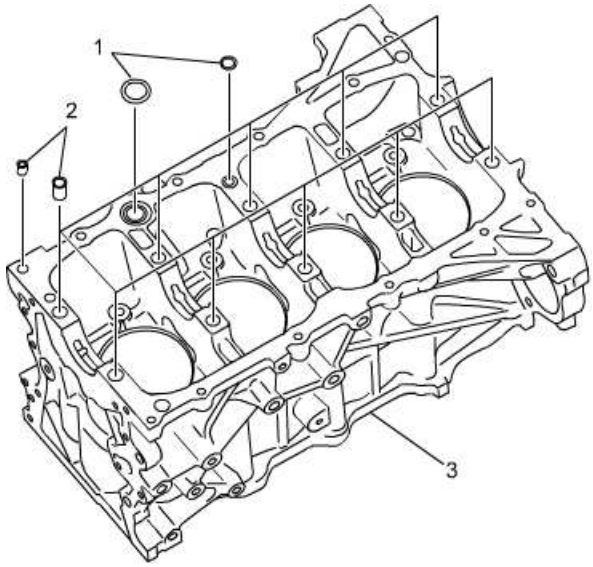
c) Apply engine oil to sliding surface (4) of main bearing halves.

CAUTION:
Do not apply engine oil between bearing halves (5) and cylinder block or lower crankcase (5).

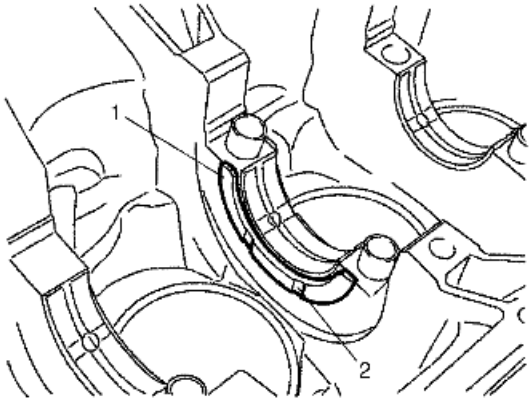


3) Install new O-rings (1) to cylinder block (3).

4) Install dowel pins (2) to cylinder block (3).



5) Apply engine oil to thrust bearings (1) and install them to cylinder block journal No.3, with oil grooves (2) facing outward.



6) Apply engine oil to sliding surface of main bearings and crankshaft.

7) Install crankshaft to cylinder block, with oil pump chain installed to oil pump drive sprocket on crankshaft.

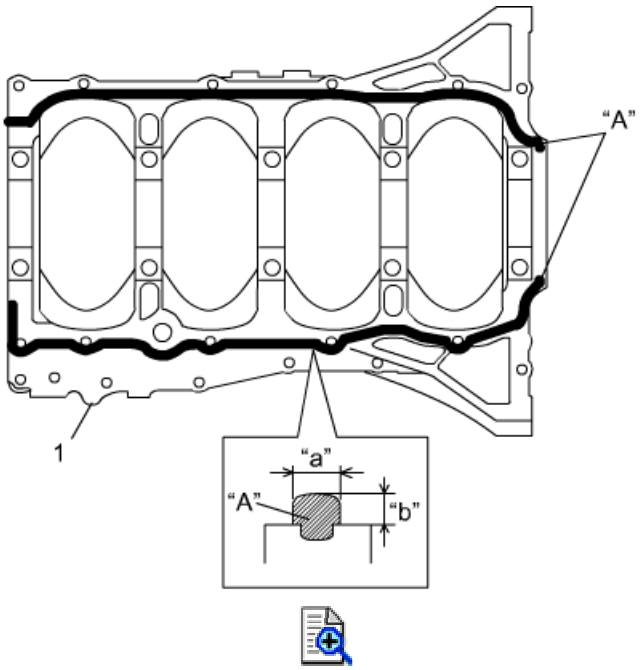
8) Apply sealant to mating surface of lower crankcase (1) as shown in figure.

NOTE:
- **Before applying sealant, make sure mating surfaces are clean and dry.**
- **Install lower crankcase within 10 minutes after applying sealant.**

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant bead size for lower crankcase

Width "a": 3 mm (0.11 in.)
Height "b": 2 mm (0.07 in.)



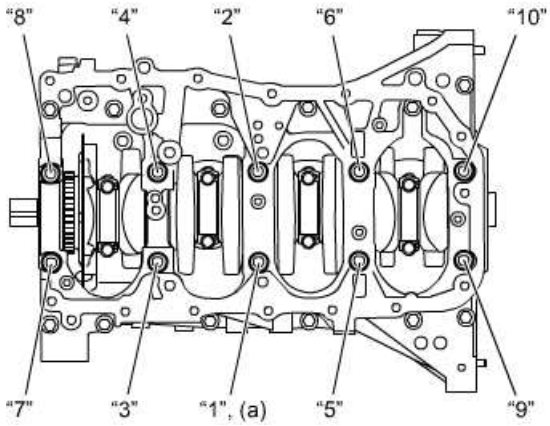
9) Install lower crankcase to cylinder block and tighten crankcase bolt No.1s using the following procedures:

NOTE:
- **If crankcase bolt No.1 are reused, check them for deformation by referring to "Crankcase Bolt No.1 Inspection" under *Main Bearings Inspection*.**
- **Use 12-point socket wrench for crankcase bolt No.1s.**

a) Apply engine oil to bolt threads and seats of crankcase bolt No.1 and tighten bolt to 50 N·m (5.1 kgf-m, 37.0 lbf-ft) in numerical order ("1" – "10") evenly and gradually.
b) Loosen all bolts in reverse numerical order until loosening torque becomes 0.
c) Retighten them to 20 N·m (2.0 kgf-m, 15.0 lbf-ft) in the same manner as in Step a).
d) Retighten them to 35 N·m (3.6 kgf-m, 26.0 lbf-ft) in the same manner as in Step a).
e) Retighten them to 40° in the same manner as in Step a).
f) Retighten them to 40° in the same manner as in Step a).

Tightening torque

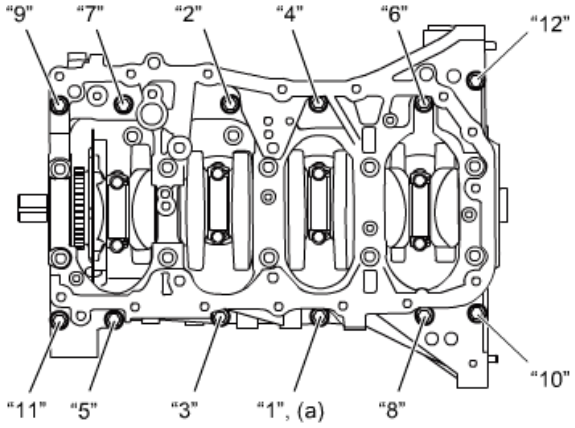
Crankcase bolt No.1* (a): 50 N·m → 0 N·m → 20 N·m → 35 N·m → 40° → 40° (5.1 kgf-m → 0 kgf-m → 2.0 kgf-m → 3.6 kgf-m → 40° → 40°, 37.0 lbf-ft → 0 lbf-ft → 15.0 lbf-ft → 26.0 lbf-ft → 40° → 40°)



10) Tighten crankcase bolt No.2s in numerical order (“1” – “12”) evenly and gradually.

Tightening torque

Crankcase bolt No.2* (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

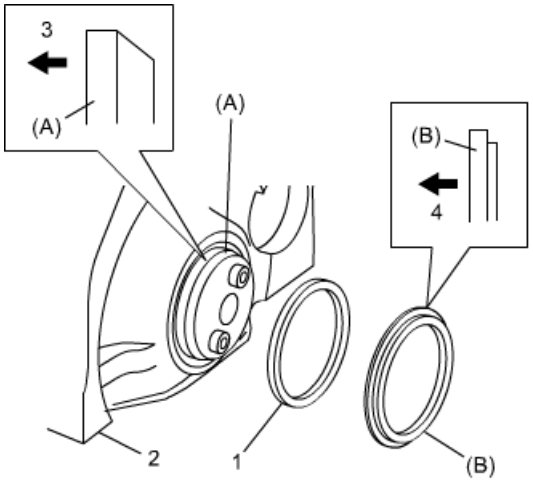


11) Check that crankshaft rotates smoothly when turning it by hand.

12) Apply engine oil to new rear oil seal (1) and install it to cylinder block (2) using special tools.

Special Tool

(A): 09911–97710
(B): 09911–97811



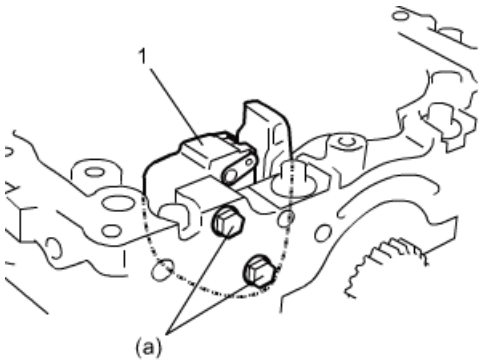
3. Crankshaft side	4. Oil seal side

13) Install pistons and connecting rods. ☞

14) Install oil pump chain adjuster (1).

Tightening torque

Oil pump chain adjuster bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



15) Install cylinder head.

16) Install timing chain cover.

17) Install cylinder head cover.

18) Install oil pan.

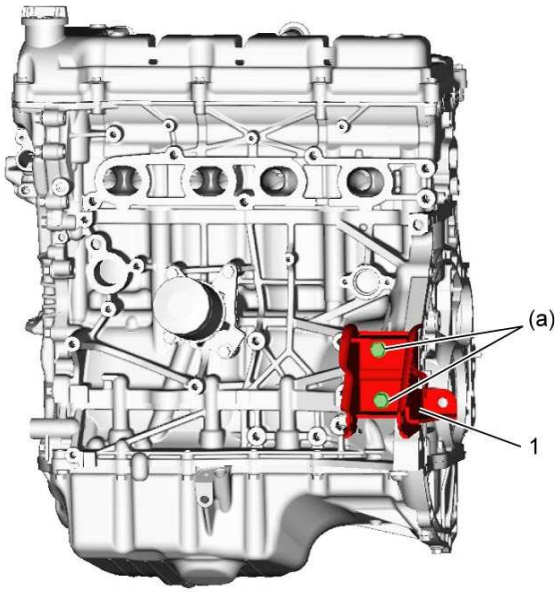
19) Install CKP sensor.

20) Install flywheel for M/T model, or drive plate for CVT model.

21) Install engine front mounting bracket (1).

Tightening torque

Engine front mounting bracket bolt (a): 55 N·m (5.6 kg-m, 40.5 lbf-ft)



22) Install water pump.

23) Install generator.

24) Install engine assembly.

1D

Crankshaft Inspection

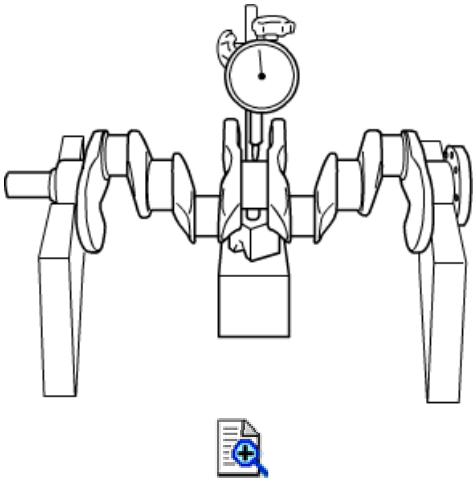
Reference: Main Bearings, Crankshaft and Cylinder Block Removal and Installation

Crankshaft Runout

Use dial gauge to measure runout at center journal. Rotate crankshaft slowly.
Replace crankshaft if runout exceeds the limit.

Crankshaft runout

Limit: 0.02 mm (0.0007 in.)



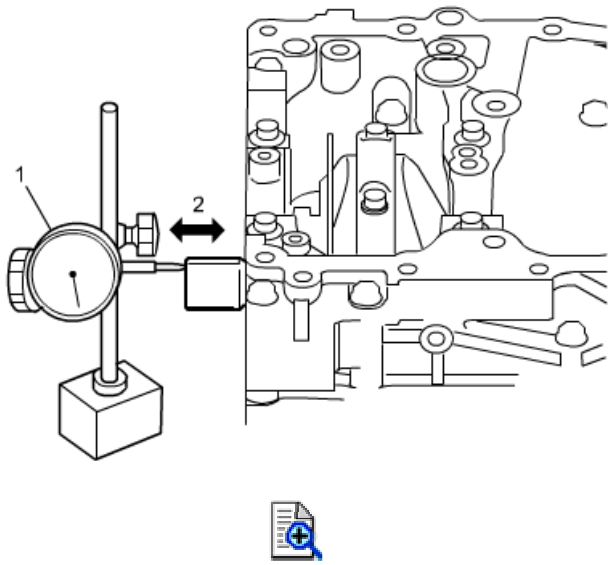
Crankshaft Thrust Play

1) Assemble crankshaft, main bearings, thrust bearings and lower crankcase without applying sealant.

2) Use dial gauge (1) to measure crankshaft thrust play (2) as shown in figure below.
Replace thrust bearing with new one (standard size or over size) to obtain standard thrust play if measured thrust play is out of standard value.
Recheck crankshaft thrust play.

Crankshaft thrust play

Standard: 0.10 – 0.35 mm (0.0039 – 0.0137 in.)



Thrust bearing thickness

Standard size: 2.470 – 2.520 mm (0.973 – 0.9921 in.)
Oversize (0.125 mm, 0.00492 in.): 2.533 – 2.583 mm (0.0998 – 0.1016 in.)

Out-of-Round and Taper (Uneven Wear) of Journals

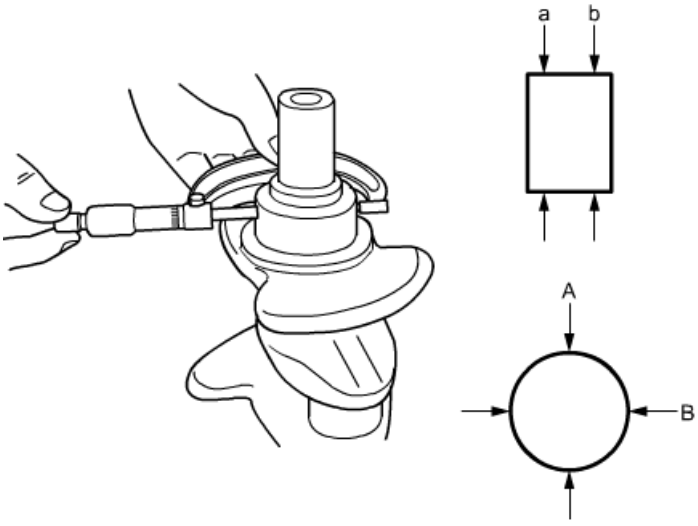
An unevenly worn crankshaft journal shows up as a difference in diameter at a cross section or along its length (or both). This difference, if any, is determined by taking micrometer readings.
Regrind or replace crankshaft if any one of journals is badly damaged or uneven wear exceeds its limit.

Crankshaft journal outside diameter

Standard: 51.982– 52.000 mm (2.0466 – 2.0472 in)
Limit: 51.972 mm (2.0461 in.)

Crankshaft out-of-round (A – B) and taper (a – b)

Limit: 0.01 mm (0.0003 in.)



1D

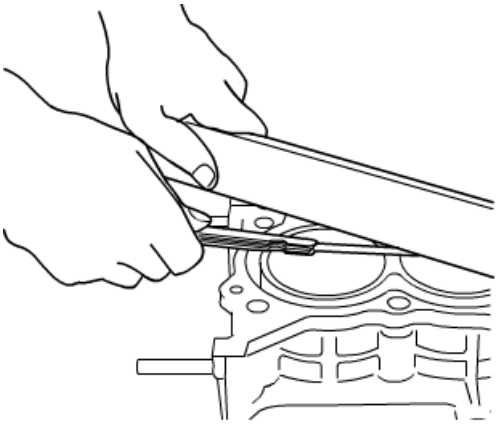
Cylinder Block Inspection

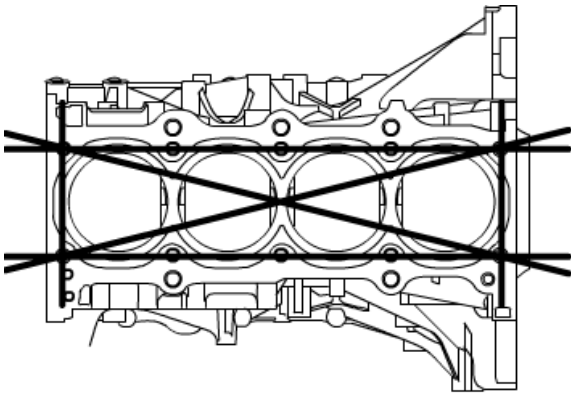
Reference: Main Bearings, Crankshaft and Cylinder Block Removal and Installation

Distortion of Gasket Surface

Use straightedge and feeler gauge to check gasket surface for distortion and repair it, if flatness exceeds the limit.
Replace cylinder block if repair is not possible.

Cylinder block flatness
Limit: 0.03 mm (0.001 in.)





1D

Main Bearings Inspection

Reference: Main Bearings, Crankshaft and Cylinder Block Removal and Installation

Visual Inspection

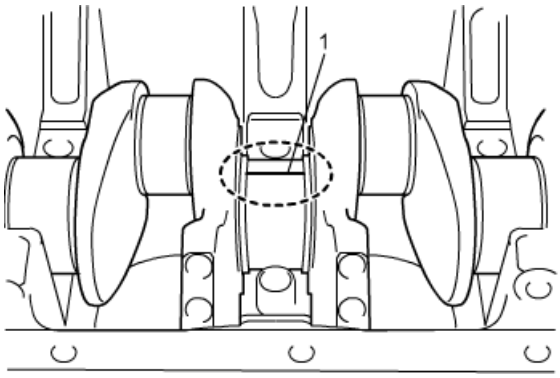
Check bearings for pitting, scratches, wear or damage.
Replace both upper and lower halves if any defective condition is found. Never replace either half without replacing the other half.

Main Bearing Clearance

CAUTION:
Do not rotate crankshaft while gauging plastic is installed.

NOTE:
After checking main bearing clearance, check crankcase bolt No.1 for deformation. ☞

1) Remove lower crankcase.
2) Clean bearings and crankshaft journals.
3) Place plastic gauge (1) with the same width as the bearing, parallel to the crankshaft, avoiding oil hole.

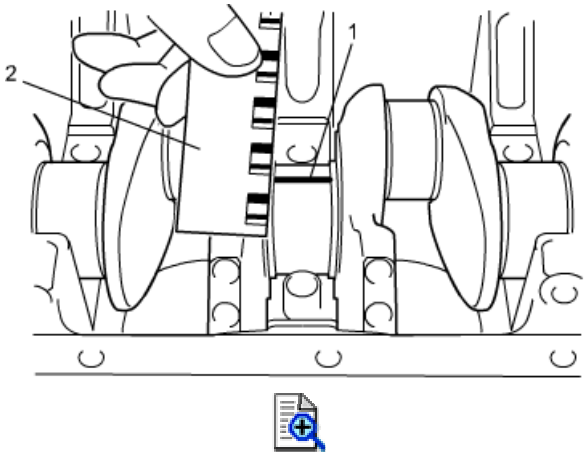


4) Without applying sealant install lower crankcase. ☞
5) After three minutes, remove lower crankcase and use scale (2) on plastic gauge envelope (1) to measure plastic gauge width at the widest point.

NOTE:
If either of the following conditions exists for the crankshaft journal and the cylinder block journal together, different standard values are applied.
- **Stamped number for crankshaft journal diameter is "4", and stamped alphabet for cylinder block journal inside diameter is "A".**
  Standard: 0.019 – 0.031 mm (0.00075 – 0.00122 in.)
- **Stamped number for crankshaft journal diameter is "9", and stamped alphabet for cylinder block journal inside diameter is "F".**
  Standard: 0.025 – 0.037 mm (0.0010 – 0.0014 in.)

For more information about stamped number and stamped alphabet. ☞

Main bearing clearance
Standard: 0.022 – 0.034 mm (0.00087 – 0.00133 in.)
Limit: 0.050 mm (0.00196 in.)



If measured clearance is less than standard or more than service limit, replace main bearings with new ones referring to ***Selection of Main Bearings*** and recheck main bearing clearance.
If measured clearance with new bearings is out of standard, select other bearing using the following procedures and recheck main bearing clearance:

- More than standard:
  Replace bearing with one size thicker or regrind crankshaft journal to undersize and use 0.25 mm undersize bearing (0.0098 in).
- Less than standard:
  Replace bearing with one size thinner or regrind crankshaft journal to undersize and use 0.25 mm undersize bearing (0.0098 in).

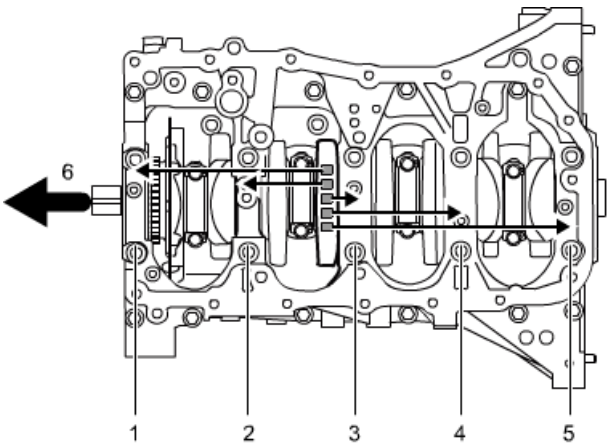
Selection of Main Bearings

Standard size bearing

If engine is under one of the following conditions, select a new standard bearings as follows, and install it.

- Bearing is in defective condition.
- Bearing clearance is out of specification.
- Crankshaft or cylinder block is replaced.

1) Check crankshaft journal diameter using the following procedures:
  - There are five stamped numbers (any of "4" through "9") on crank web No.4 as shown in figure.
  - Those numbers represent crankshaft journal diameter as follows:



1.	Crankshaft journal No.1

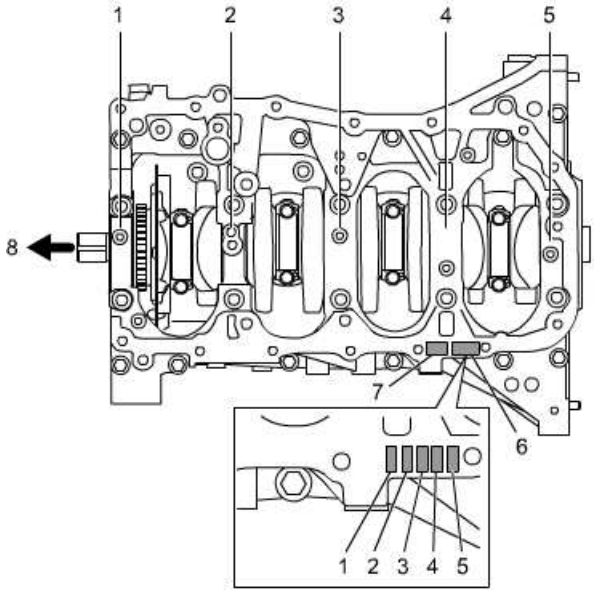
2.	Crankshaft journal No.2
3.	Crankshaft journal No.3
4.	Crankshaft journal No.4
5.	Crankshaft journal No.5
6.	Crankshaft pulley side

- Determine crankshaft journal diameter for journals No.1 through No.5 using stamped numbers and following table.

Crankshaft journal diameter

Stamped numbers	Journal diameter
4	51.997 – 52.000 mm (2.04712 – 2.04724 in.)
5	51.994 – 51.997 mm (2.04700 – 2.04712 in.)
6	51.991 – 51.994 mm (2.04688 – 2.04700 in.)
7	51.988 – 51.991 mm (2.04677 – 2.04688 in.)
8	51.985 – 51.988 mm (2.04665 – 2.04677 in.)
9	51.982 – 51.985 mm (2.04654 – 2.04665 in.)

2) Check cylinder block journal inside diameter using the following procedures:
- There are five stamped alphabets (6) (any of "A" through "F") on Lower crankcase as shown in figure.
- Those alphabets represent cylinder block journal inside diameter as follows:



1.	Cylinder block journal No.1
2.	Cylinder block journal No.2
3.	Cylinder block journal No.3
4.	Cylinder block journal No.4
5.	Cylinder block journal No.5
7.	Stamped numbers for bore
8.	Crankshaft pulley side

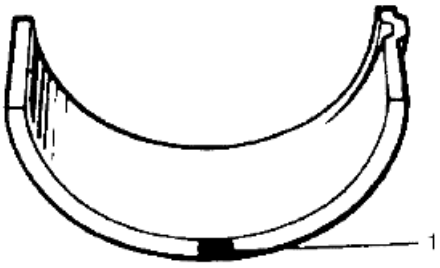
- Determine cylinder block journal inside diameter for journals No.1 through No.5 using stamped alphabets and following table.

Stamped number	Cylinder block journal inside diameter
A	56.000 – 56.003 mm (2.20473 – 2.20484 in.)
B	56.003 – 56.006 mm (2.20484 – 2.20496 in.)
C	56.006 – 56.009 mm (2.20496 – 2.20507 in.)
D	56.009 – 56.012 mm (2.20507 – 2.20519 in.)
E	56.012 – 56.015 mm (2.20519 – 2.20531 in.)
F	56.015 – 56.018 mm (2.20531 – 2.20543 in.)

3) There are 5 kinds of standard bearings differing in thickness. To distinguish them, each bearing is painted in the following colors at the position as shown in figure.
Each color represents the following thickness at the center of bearing:

Standard size crankshaft main bearing thickness

Painted color	Bearing thickness
Blue	2.011 – 2.014 mm (0.07917 – 0.07929 in)
Yellow	2.008 – 2.011 mm (0.07905 – 0.07917 in)
Colorless	2.005 – 2.008 mm (0.07893 – 0.07905 in)
Black	2.002 – 2.005 mm (0.07881 – 0.07893 in)
Green	1.999 – 2.002 mm (0.07870 – 0.07881 in)



1. Paint

4) Select new standard crankshaft bearings using stamped numbers for crankshaft journal diameter, stamped alphabets for cylinder block journal inside diameter and following table:

Main bearing cross – reference selection table (standard size)

			Stamped number on crank web No.4					
			4	5	6	7	8	9
Stamped alphabets on lower crankcase	A	Upper	Green	Green	Green	Black	Black	Colorless
		Lower	Green	Green	Black	Black	Colorless	Colorless
	B	Upper	Green	Green	Black	Black	Colorless	Colorless
		Lower	Green	Black	Black	Colorless	Colorless	Yellow
	C	Upper	Green	Black	Black	Colorless	Colorless	Yellow
		Lower	Black	Black	Colorless	Colorless	Yellow	Yellow
	D	Upper	Black	Black	Colorless	Colorless	Yellow	Yellow
		Lower	Black	Colorless	Colorless	Yellow	Yellow	Blue
	E	Upper	Black	Colorless	Colorless	Yellow	Yellow	Blue
		Lower	Colorless	Colorless	Yellow	Yellow	Blue	Blue
	F	Upper	Colorless	Colorless	Yellow	Yellow	Blue	Blue
		Lower	Colorless	Yellow	Yellow	Blue	Blue	Blue

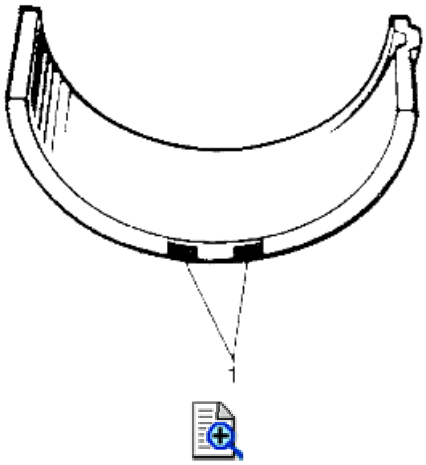
Undersize bearing (0.25 mm (0.0098 in.))

- 0.25 mm (0.0098 in.) undersize bearing is available, in five kinds varying in thickness. To distinguish them, each bearing is painted in the following colors at the position as shown in figure.
  Each color represents the following thickness at the center of bearing.

Undersize of crankshaft main bearing thickness

Painted color	Bearing thickness
Red & Blue	2.136 – 2.139 mm (0.08409 – 0.08421 in.)
Red & Yellow	2.133 – 2.136 mm (0.08397 – 0.08409 in.)
Red	2.130 – 2.133 mm (0.08385 – 0.08397 in.)

Red & Black	2.127 – 2.130 mm (0.08374 – 0.08385 in.)
Red & Green	2.124 – 2.127 mm (0.08363 – 0.08374 in.)

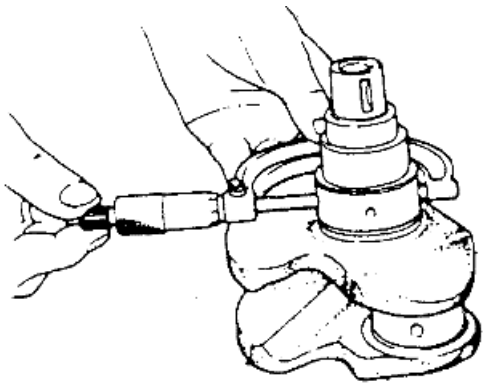


1.	Paint

- If necessary, regrind crankshaft journal and select undersize bearing to use with it as follows.
  a. Regrind crankshaft journal to the following finished diameter:

  Finished crankshaft journal diameter
  51.732 – 51.750 mm (2.0367 – 2.0374 in.)

  b. Use micrometer to measure reground journal diameter. ☞
  c. Use measured journal diameter above and alphabets on cylinder block to select an undersize bearing by referring to the following table:



Main bearing cross – reference table (under size)

	Measured journal diameter					
	51.7470 – 51.7499 mm (2.03728	51.7440 – 51.7469 mm (2.03717	51.7410 – 51.7439 mm (2.03705	51.7380 – 51.7409 mm (2.03693	51.7350 – 51.7379 mm (2.03682	51.7320 – 51.7349 mm (2.03670

			– 2.03739 in.)	– 2.03727 in.)	– 2.03716 in.)	– 2.03704 in.)	– 2.03692 in.)	– 2.03680 in.)
Stamped alphabet on lower crankcase	A	Upper	Red & Green	Red & Green	Red & Green	Red & Black	Red & Black	Red
		Lower	Red & Green	Red & Green	Red & Black	Red & Black	Red	Red
	B	Upper	Red & Green	Red & Green	Red & Black	Red & Black	Red	Red
		Lower	Red & Green	Red & Black	Red & Black	Red	Red	Red & Yellow
	C	Upper	Red & Green	Red & Black	Red & Black	Red	Red	Red & Yellow
		Lower	Red & Black	Red & Black	Red	Red	Red & Yellow	Red & Yellow
	D	Upper	Red & Black	Red & Black	Red	Red	Red & Yellow	Red & Yellow
		Lower	Red & Black	Red	Red	Red & Yellow	Red & Yellow	Red & Blue
	E	Upper	Red & Black	Red	Red	Red & Yellow	Red & Yellow	Red & Blue
		Lower	Red	Red	Red & Yellow	Red & Yellow	Red & Blue	Red & Blue
	F	Upper	Red	Red	Red & Yellow	Red & Yellow	Red & Blue	Red & Blue
		Lower	Red	Red & Yellow	Red & Yellow	Red & Blue	Red & Blue	Red & Blue

d. Install selected main bearings and measure bearing clearance. ☞
If measured clearance is more than standard, replace bearings with one size thicker and recheck bearing clearance.
If measured clearance is less than standard, replace bearings with one size thinner and recheck bearing clearance.

Crankcase Bolt No.1 Inspection

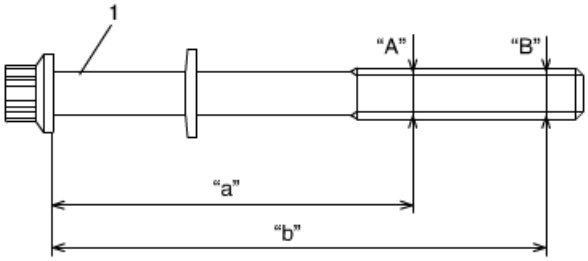
Measure each thread diameter at specified points on crankcase bolt No.1 (1) using micrometer (2).
Calculate difference in diameters ("A" – "B").
Replace with new one if it exceeds limit.

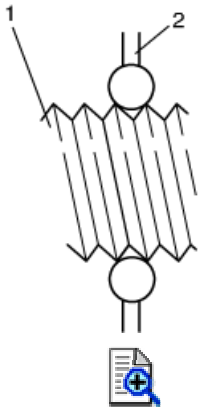
Crankcase bolt diameter measurement points

"a": 61.0 mm (2.40 in.)
"b": 98.0 mm (3.85 in.)

Crankcase cap bolt diameter difference

Limit ("A" – "B"): 0.13 mm (0.0051 in.)


1
"A"
"B"
"a"
"b"

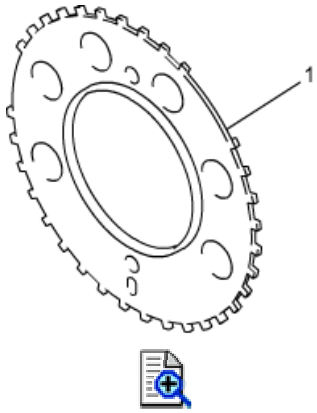

1
2

1D

Sensor Plate Inspection

Reference: Main Bearings, Crankshaft and Cylinder Block Removal and Installation

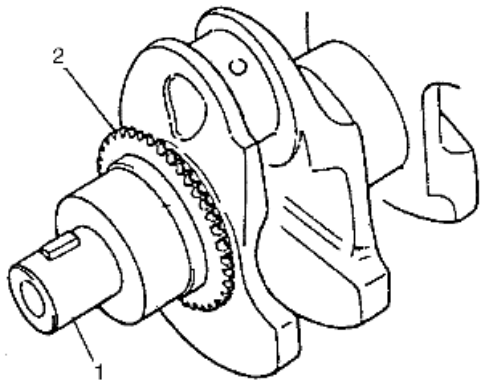
Check sensor plate (1) for cracks or damage.
Replace it if any defective conditions are found.



1D

Oil Pump Drive Sprocket Inspection

Check oil pump drive sprocket (2) for cracks or any damage.
Replace crankshaft (1) if defective conditions are found.



1D

Oil Pump Chain and Oil Pump Chain Adjuster Inspection

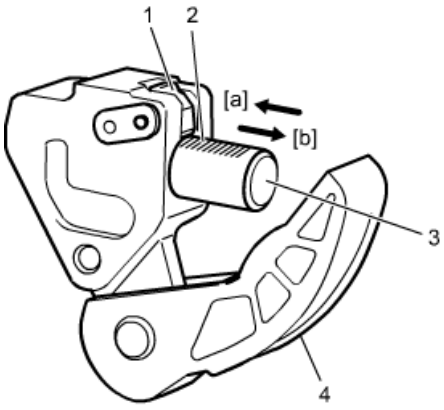
Oil Pump Chain

Check oil pump chain for wear or any damage.
Replace oil pump chain if faulty condition is found.

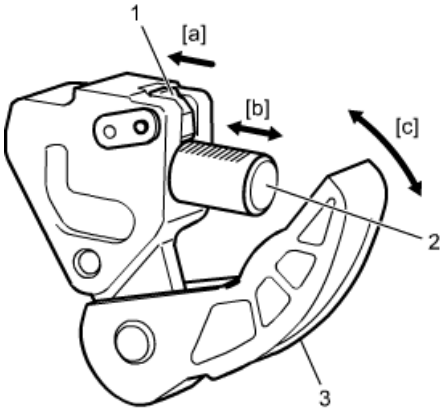
Oil Pump Chain Adjuster

Check oil pump chain adjuster according to the following procedures.

- Check latch (1), teeth (2), plunger (3) or tensioner (4) for cracks, wear or any damage.
- Check that plunger (3) moves in direction [b] and does not move in direction [a] when latch (1) engages with plunger teeth (2).



- Check that plunger (2) moves in direction [b] freely and smoothly when latch (1) is raised up in direction [a].
- Check that tensioner (3) moves in direction [c] freely and smoothly.



Replace oil pump chain adjuster if defective conditions are found.

1D

Tightening Torque Specifications

CAUTION:
For fastener with * (asterisk) below, be sure to tighten it according to specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Throttle body bolt	12	1.2	9.0	☞
Cylinder block heater bolt	11	1.1	8.5	☞
PCV valve	2.5	0.25	2.0	☞
Cylinder head cover bolt*	3.0 N·m → 5.0 N·m → 7.5 N·m (0.31 kgf-m → 0.51 kgf-m → 0.76 kgf-m, 2.5 lbf-ft → 4.0 lbf-ft → 5.5 lbf-ft)			☞
Special tool fixing bolt	8	0.82	6.0	☞
CMP actuator bolt	60	6.1	44.5	☞
Camshaft housing bolt*	11	1.1	8.5	☞
Exhaust camshaft timing sprocket bolt	60	6.1	44.5	☞
Timing chain cover plug	27	2.8	20.0	☞
Ground cable bolt	9.0	0.92	7.0	☞
P/S control module ground bolt	9.0	0.92	7.0	☞
Battery ground terminal bolts	9.0	0.92	7.0	☞
Timing chain cover bolt* (M8 bolt)	25	2.5	18.5	☞
Timing chain cover bolt* (M10 bolt)	55	5.6	40.5	☞
Crankshaft pulley bolt	150	15.3	111.0	☞
OCV bolt	11	1.1	8.5	☞
Flywheel bolt	70	7.1	52.0	☞
Drive plate bolt	70	7.1	52.0	☞
Timing chain guide bolt	9.0	0.92	7.0	☞
Timing chain tensioner bolt	25	2.5	18.5	☞
Timing chain tensioner adjuster bolt	11	1.1	8.5	☞
Cylinder head bolt No.1*	20 N·m → 40 N·m → +60° → +80° (2.0 kgf-m → 4.1 kgf-m → +60° → +80°, 15.0 lbf-ft → 29.5 lbf-ft → +60° → +80°)			☞
Cylinder head bolt No.2	25	2.5	18.5	☞
Venturi plug	3.5	0.36	2.5	☞
Connecting rod bolt*	15 N·m → +45° → +45° (1.5 kgf-m → +45° → +45°, 11.0 lbf-ft → +45° → +45°			☞
Sensor plate screw	11	1.1	8.5	☞
Crankcase bolt No.1*	50 N·m → 0 N·m → 20 N·m → 35 N·m → 40° → 40° (5.1 kgf-m → 0 kgf-m → 2.0 kgf-m → 3.6 kgf-m → 40° → 40°,			☞

	37.0 lbf-ft → 0 lbf-ft → 15.0 lbf-ft → 26.0 lbf-ft → 40° → 40°)			
Crankcase bolt No.2*	25	2.5	18.5	☞
Oil pump chain adjuster bolt	11	1.1	8.5	☞
Engine front mounting bracket bolt	55	5.6	40.5	☞

NOTE:
The specified tightening torque is described in the following.
Air Cleaner Components
Throttle Body and Intake Manifold Components
Cylinder Head Cover Components
Camshaft and Tappet Components
Engine Mountings Components
Timing Chain Cover Components
Timing Chain and Chain Tensioner Components
Valve and Cylinder Head Components
Piston, Piston Ring and Connecting Rod Components
Main Bearing, Crankshaft and Cylinder Block Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1D

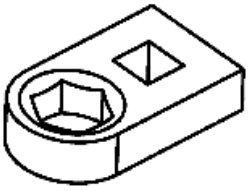
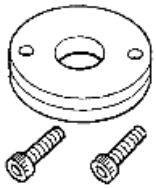
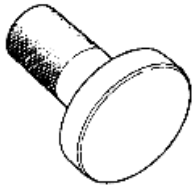
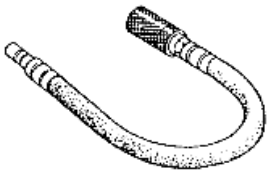
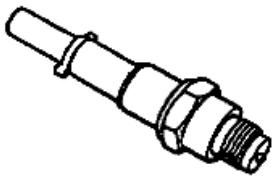
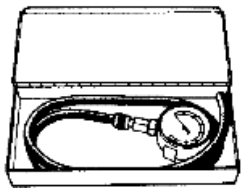
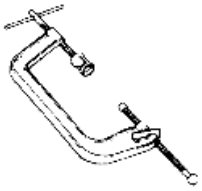
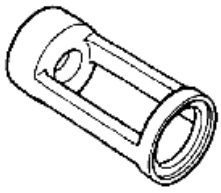
Recommended Service Material

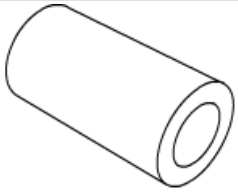
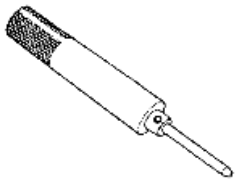
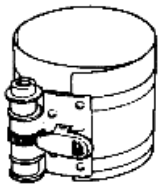
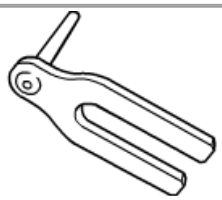
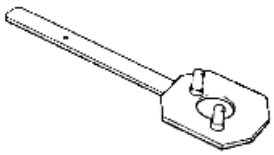
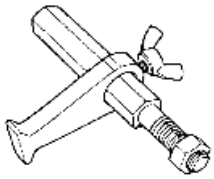
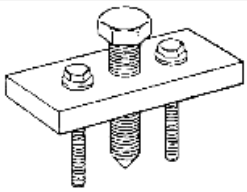
Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞ ☞ ☞

NOTE:
Required service material is also described in the following.
Cylinder Head Cover Components
Camshaft and Tappet Components
Timing Chain Cover Components
Timing Chain and Chain Tensioner Components
Valve and Cylinder Head Components
Piston, Piston Ring and Connecting Rod Components
Main Bearing, Crankshaft and Cylinder Block Components

1D

Special Tool

09911–05120 Box end wrench (14 mm)		09911–97710 Oil seal guide	
09911–97811 Oil seal installer		09913–75510 Bearing installer	
09915–64512 Compression gauge		09915–64530 Compression gauge hose	
09915–67010 Compression gauge attachment (C)		09915–67311 Vacuum gauge	
09916–14510 Valve lifter		09916–14522 Valve spring compressor attachment	
09916–34542 Reamer handle		09916–34550 Valve guide reamer (5.5 mm)	

09916–37320 Valve guide outer reamer (10.5 mm) 	09916–44910 Valve guide installer & remover 
09916–56510 Valve guide installer attachment 	09916–58210 Valve guide installer handle 
09916–77310 Piston ring compressor (50-125 mm) 	09916–84511 Forceps 
09917–16710 Timing chain tensioner holder 	09917–68221 Camshaft pulley holder 
09917–98221 Valve guide stem attachment 	09924–17811 Flywheel holder 
09926–58010 Bearing remover attachment 	09944–36011 Steering wheel remover 

Engine Lubrication Description

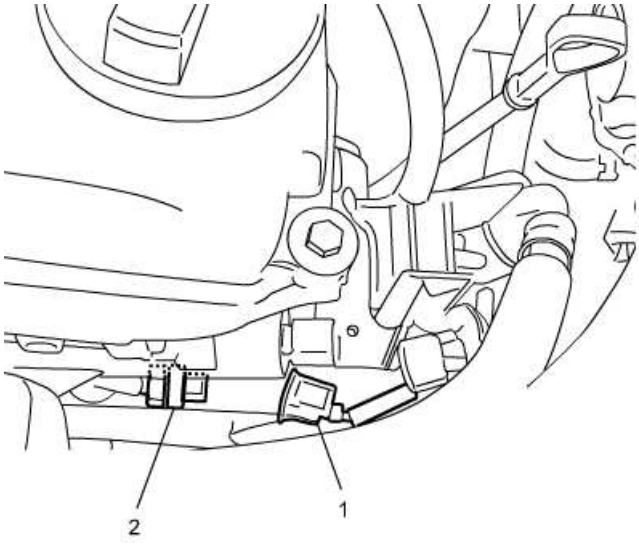
The oil pump is a trochoid rotor pump that is driven by the crankshaft via oil-pump-drive sprocket, oil pump chain, oil pump sprocket, balancer shaft No.1 and balancer shaft No.2.
The pump draws up oil from the oil pan through the oil pump strainer. The oil delivered from the pump flows through the oil filter.
The filtered oil flows through the two paths in the cylinder block.
Through the first path, the oil reaches the crankshaft main bearings. After lubricating the crankshaft main bearings, the oil is supplied to the connecting rod bearings by way of the passages formed in the crankshaft and then injected through the oil jets to lubricate the pistons, piston rings and cylinder walls.
Through the second path, the oil goes up to the cylinder head and flows in the passages formed inside the camshafts to lubricate them and the valve mechanisms.
The oil pump has an oil relief valve. The valve opens when the oil pressure exceeds the preset limit to release it.

Oil Pressure Check

NOTE:
Before checking oil pressure, check the following points:
- **Oil level in oil pan**
  If oil level is too low, add oil up to full level mark on oil level gauge. ☞
- **Oil quality**
  If oil is discolored or deteriorated, change it. ☞
- **Oil leaks**
  If leak is found, repair it.

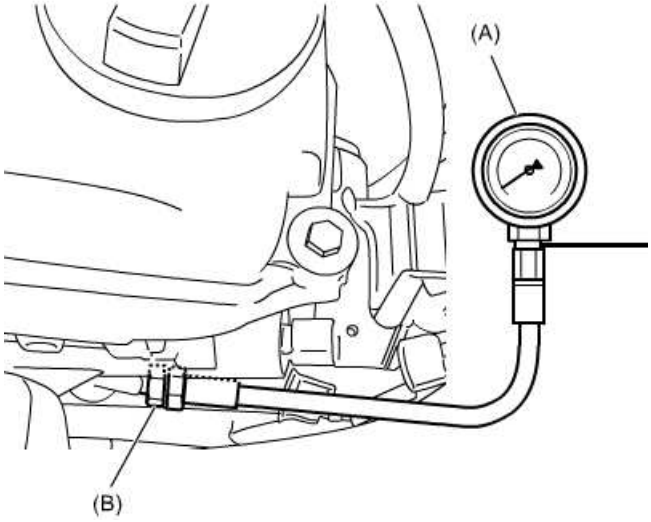
1) For M/T model, place gear shift lever in "Neutral" and apply parking brake.
For CVT model, place select lever in "P" and apply parking brake.
2) Disconnect OCV connector.
3) Remove engine cover.
4) Disconnect oil pressure switch connector (1).
5) Remove oil pressure switch (2) from timing chain cover.

CAUTION:
Cover the drive belt with shop cloth and avoid oil drops to belt while removing oil pressure switch.



6) Install special tools to threaded hole where oil pressure switch was removed.

Special Tool
(A): 09915–77311
(B): 09915–78211



7) Start engine and warm engine up to normal operating temperature.

8) After warming up, raise engine speed to 4,000 rpm and measure oil pressure.

Oil pressure specification

More than 300 – 550 kPa (3.1 – 5.6 kgf/cm², 43.5 – 79.8 psi) at 4,000 rpm.

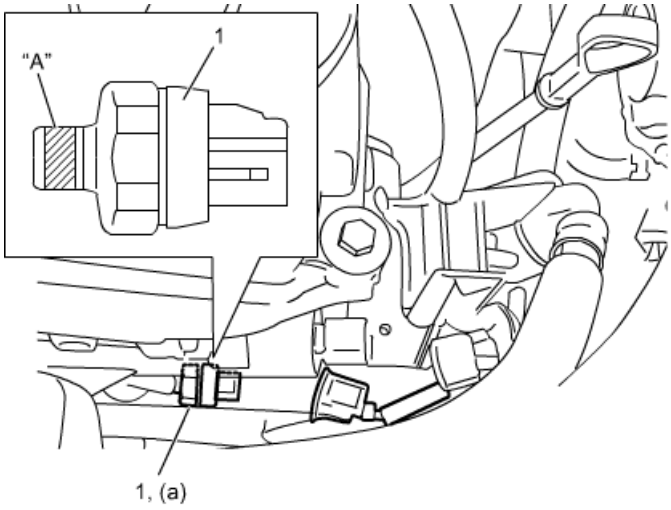
9) After checking oil pressure, stop engine and remove special tools.

10) Apply thread lock cement to thread portion of oil pressure switch (1), and then tighten switch to specified torque.

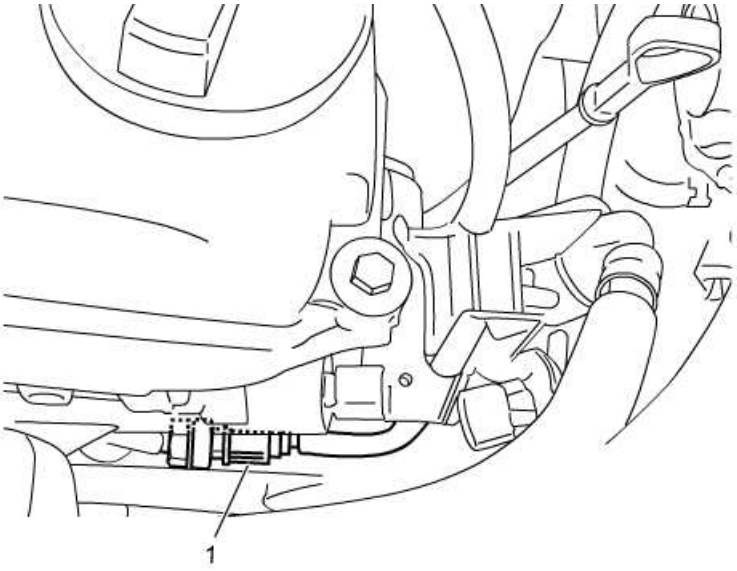
"A": Thread lock cement 99000–32110 (Thread Lock Cement Super 1322)

Tightening torque

Oil pressure switch (a): 13 N·m (1.3 kg-m, 9.5 lbf-ft)



11) Connect oil pressure switch lead wire (1).



12) Start engine and check oil pressure switch for oil leakage. If oil leakage is found, repair it.

13) Check DTC referring to ***DTC Check***. If any DTC is displayed, clear it referring to ***DTC Clearance***.

Engine Oil and Filter Change

WARNING:
- **New and used engine oil can be hazardous. Be sure to read *General Precautions*.**
- **Steps 1) – 11) must be performed with ENGINE NOT RUNNING. For Step 12), be sure to have adequate ventilation while engine is running.**
- **In order to avoid being burned, replace oil filter when the exhaust system is cool.**

Before draining engine oil, check engine for oil leakage. If any sign of leakage is found, correct defective part before proceeding to the following procedure.

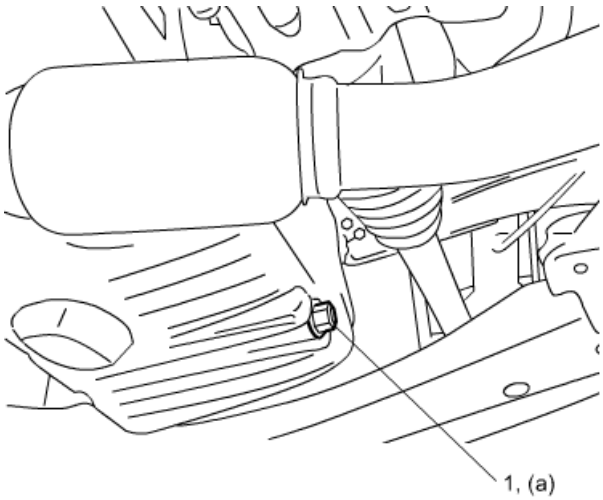
1) Remove right side engine undercover.

2) Drain engine oil by removing drain plug (1).

3) Wipe drain plug and its mounting surface clean. Reinstall drain plug with new gasket and tighten it to specified torque.

Tightening torque

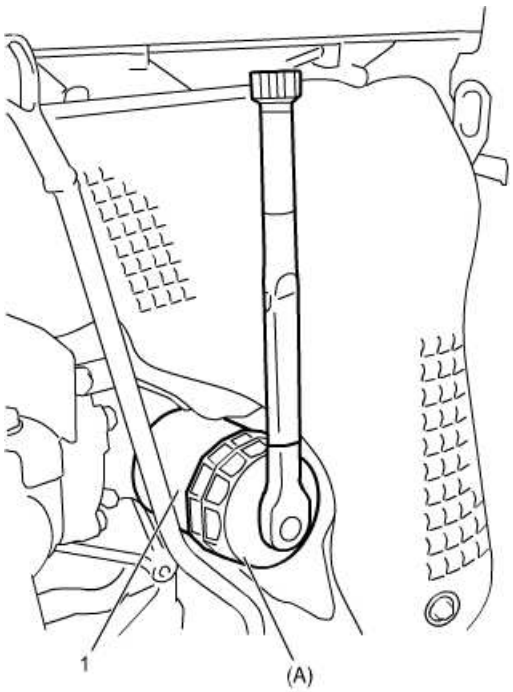
Engine oil drain plug (a): 35 N·m (3.6 kg-m, 26.0 lbf-ft)



4) Remove oil filter (1) through space between exhaust manifold and radiator cooling fan using special tool.

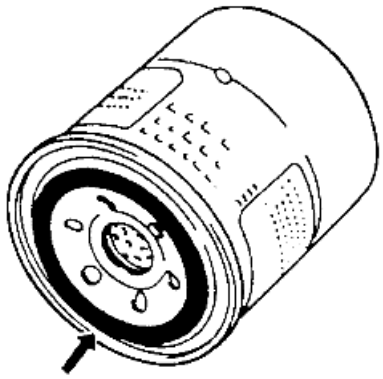
Special Tool

(A): 09915–47341



5) Wipe oil filter mounting surface of oil filter adapter case cleanly.

6) Apply engine oil to new oil filter O-ring.



7) Screw new filter on oil filter stand by hand until filter O-ring touches filter mounting surface.

CAUTION:
To tighten oil filter properly, it is important to accurately identify the position at which filter O-ring first contacts the mounting surface.

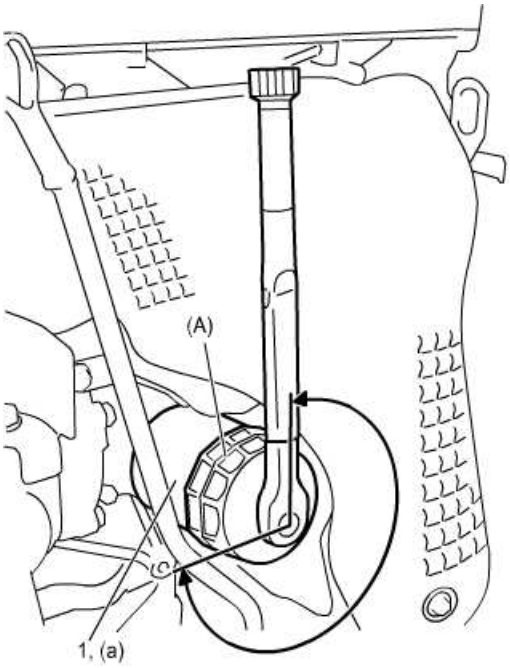
8) Tighten oil filter (1) 3/4 turn from the point of contact with filter mounting surface using special tool.

Special Tool

(A): 09915–47341

Tightening torque

Oil filter (a): 14 N·m (1.4 kg-m, 10.5 lbf-ft)



9) Refill engine oil to the specified amount.
Use only engine oil of American Petroleum Institute (API) Certified for Gasoline Engines emblem of "starburst".

It is highly recommended to use SAE 5W-30 oil.

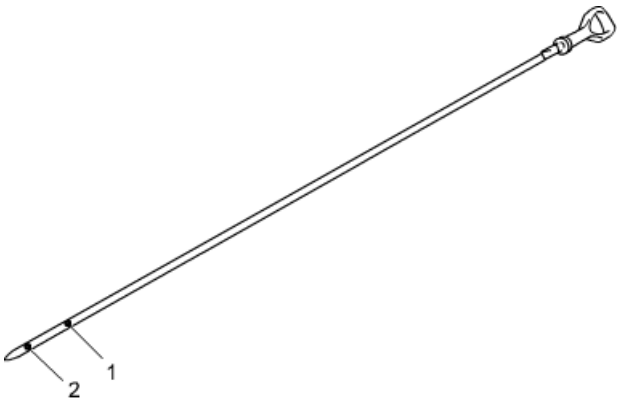
NOTE:
Engine oil capacity is specified below. However, note that the amount of oil required when actually changing oil may somewhat differ from the data depending on various conditions (temperature, viscosity, etc.)

Engine oil specifications
Oil pan capacity: About 4.3 liters (9.09 US pt. / 7.57 Imp pt.)
Oil pan plus oil filter capacity: About 4.5 liters (9.51 US pt. / 7.92 Imp pt.)
Disassembly/Reassembly: About 5.2 liters (10.99 US pt. / 9.15 Imp pt.)

10) Check oil filter and drain plug for oil leakage.

11) Install right side engine undercover.

12) Start and run engine for 3 min. After stopping the engine, wait for 5 min. Then, confirm that the specified amount of engine oil has been refilled.


1
2

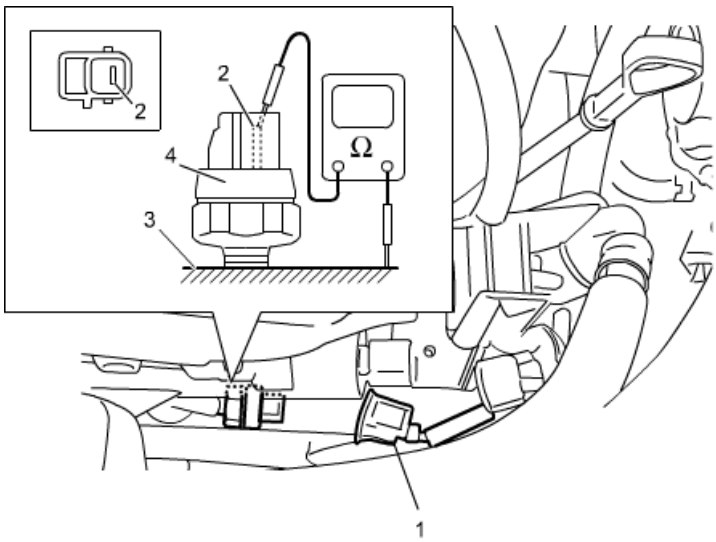
Oil Pressure Switch On-Vehicle Inspection

1) Disconnect oil pressure switch connector (1).

2) Check for continuity between oil pressure switch terminal (2) and cylinder block (3) as shown.
If check result is not as specified, replace oil pressure switch (4).

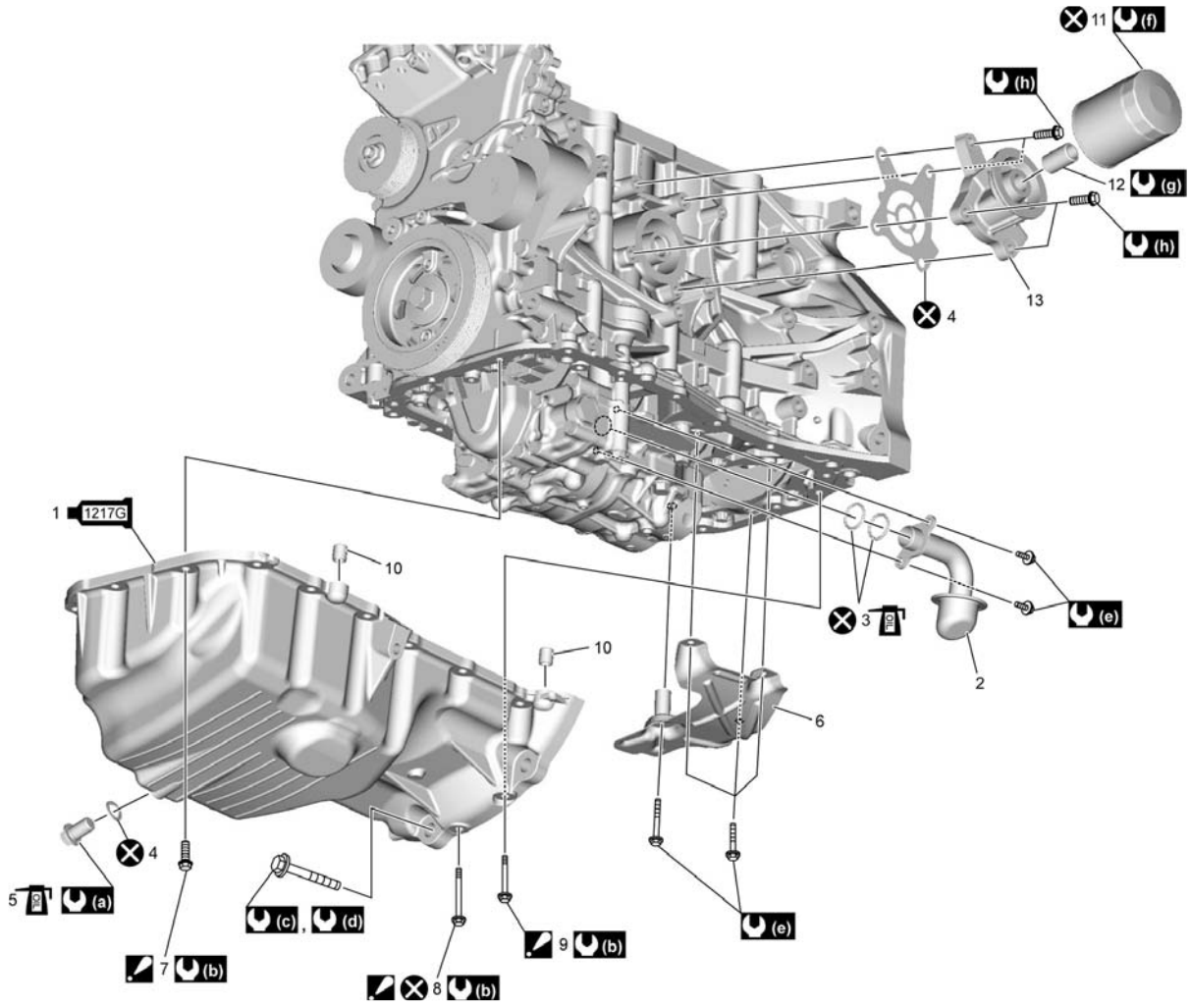
Oil pressure switch specification

During engine running: No continuity
At engine stop: Continuity



1E

Oil Pan and Oil Pump Strainer Components



1217G	1.	Oil pan : Apply sealant 99000-31260 to mating surface.	9.	Oil pan bolt No.3 : For tightening order, refer to ***Oil Pan and Oil Pump Strainer Removal and Installation***.	(d) :	85 N·m (8.7 kgf-m, 63.0 lbf-ft) (M/T model)
	2.	Oil pump strainer	10.	Dowel pin	(e) :	11 N·m (1.1 kgf-m, 8.5 lbf-ft)
OIL	3.	O-ring : Apply engine oil.	11.	Oil filter	(f) :	14 N·m (1.4 kgf-m, 10.5 lbf-ft)
	4.	Gasket	12.	Oil filter stand	(g) :	18 N·m (1.8 kgf-m, 13.5 lbf-ft)

 5. Drain plug : Apply engine oil to bolt thread.	13. Oil filter adapter	 : 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
6. Oil pan baffle plate	 : 35 N·m (3.6 kgf-m, 26.0 lbf-ft)	 : Do not reuse.
 7. Oil pan bolt No.1 : For tightening order, refer to ***Oil Pan and Oil Pump Strainer Removal and Installation***.	 : 15 N·m → 25 N·m (1.5 – 2.5 kgf-m, 11.0 – 18.5 lbf-ft)	
 8. Oil pan bolt No.2 (precoated adhesive) : For tightening order, refer to ***Oil Pan and Oil Pump Strainer Removal and Installation***.	 : 80 N·m (8.2 kgf-m, 59.0 lbf-ft) (CVT model)	

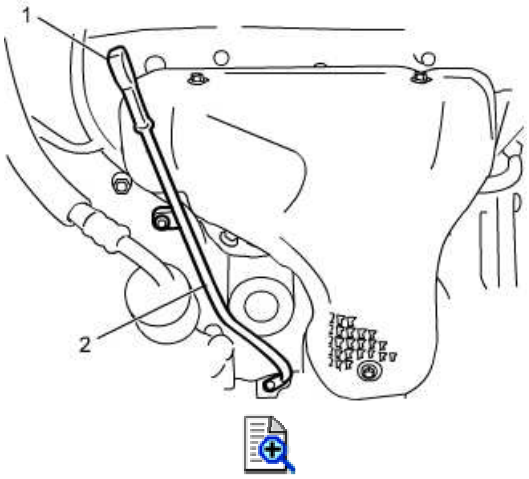
1E

Oil Pan and Oil Pump Strainer Removal and Installation

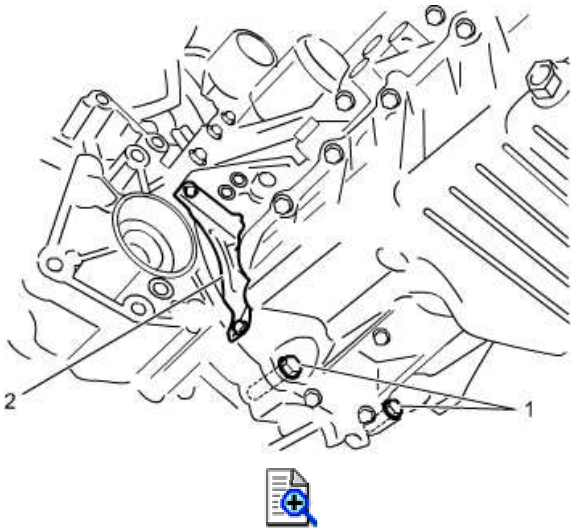
Reference: Oil Pan and Oil Pump Strainer Components

Removal

1) Remove left and right side engine under covers.
2) Drain engine oil. ☞
3) Remove exhaust pipe No.1. ☞
4) For 4WD model, remove transfer. ☞
5) Remove oil level gauge (1) and oil level gauge guide (2).

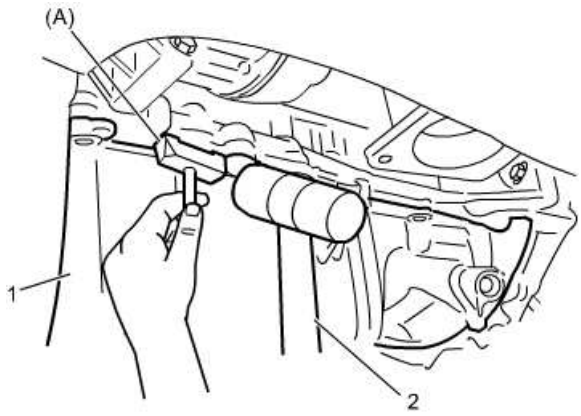


6) Remove transaxle bolts (1), then remove drive plate cover (2) for CVT model, or clutch housing lower plate (2) for M/T model.



7) Remove oil pan bolts from oil pan (1).
8) Remove oil pan (1) from lower crank case by using special tool and hammer (2).

Special Tool
(A): 09921–96510



9) Remove oil pump strainer from oil pump assembly.
10) Remove oil pan baffle plate from lower crank case.

Installation

1) Install oil pan baffle plate (1).

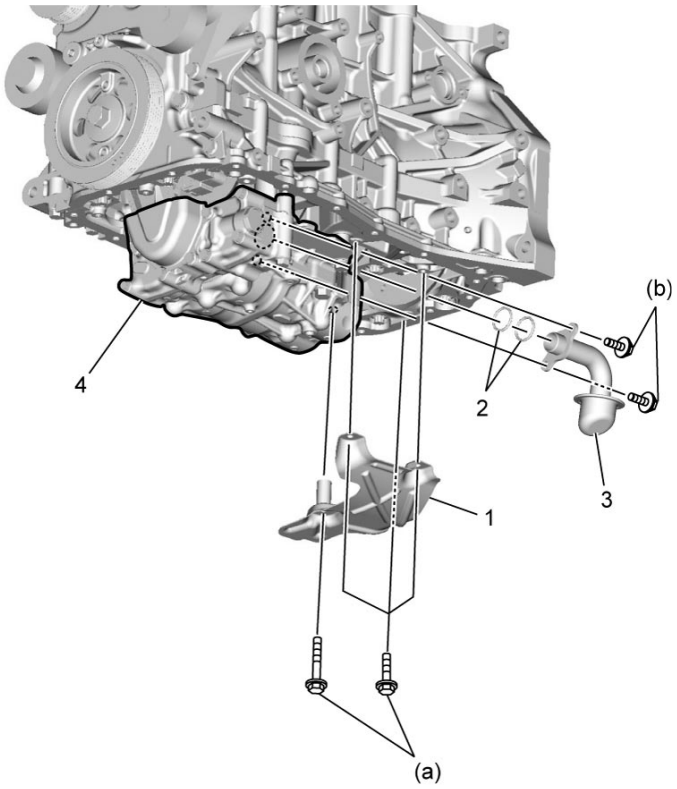
Tightening torque

Oil pan baffle plate bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)

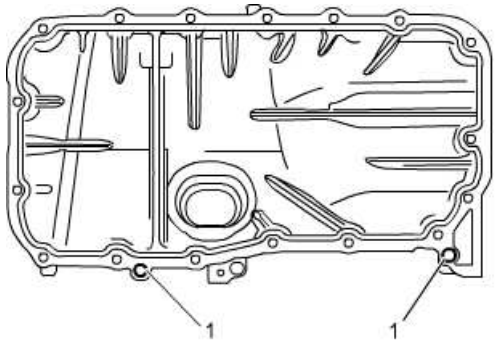
2) Apply engine oil to new O-rings (2) and install them to oil strainer (3).
3) Install oil strainer (3) to oil pump (4).

Tightening torque

Oil strainer bolt (b): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



4) Install dowel pins (1) to oil pan.

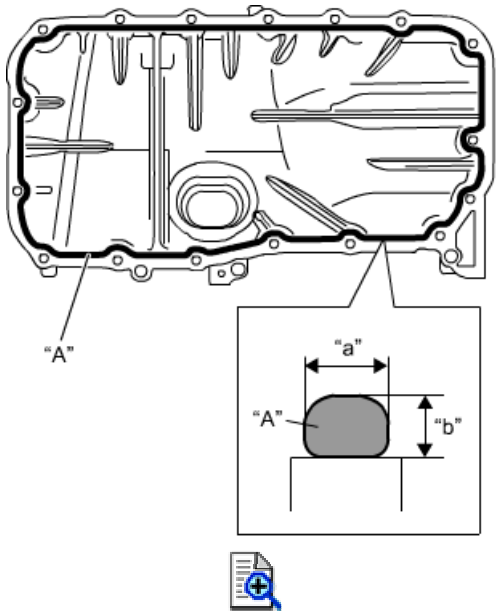


5) Apply sealant to oil pan mating surface as shown in figure.

NOTE:
- **Before applying sealant, make sure mating surfaces are clean and dry.**
- **Install oil pan within 2 minutes after applying sealant.**

"A": Sealant 99000–31260 (SUZUKI Bond No.1217G)

Sealant amount for oil pan
Width "a": 3 mm (0.12 in.)
Height "b": 2 mm (0.08 in.)



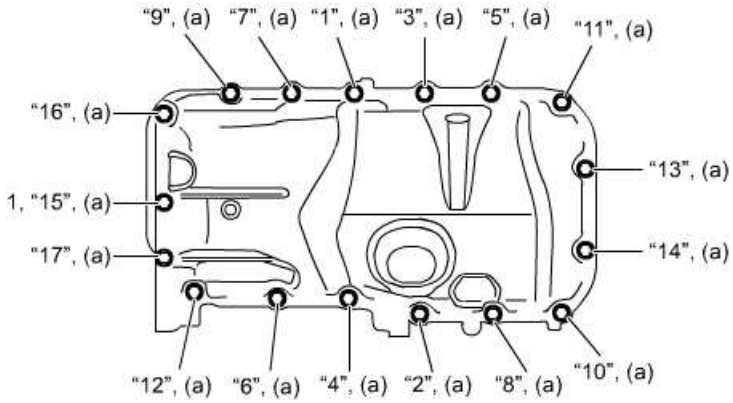
6) Install oil pan according to the following procedure.

CAUTION:
Be sure to use new oil pan bolt No.2 (1) pre-coated with adhesive.

a) Fit oil pan to lower crank case.
b) Tighten oil pan bolts to 15 N·m (1.5 kgf-m, 11.0 lbf-ft) in numerical order ("1" – "17") evenly and gradually.
c) In the same manner as Step b), retighten them to 25 N·m (2.5 kgf-m, 18.5 lbf-ft).

Tightening torque

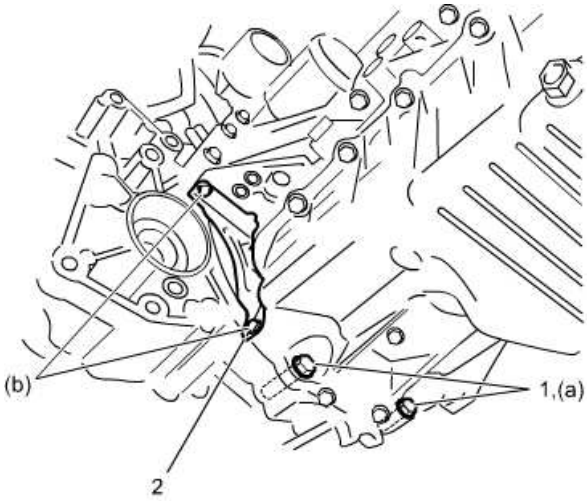
Oil pan bolt* (a): 15 N·m → 25 N·m (1.5 kgf-m → 2.5 kgf-m, 11.0 lbf-ft → 18.5 lbf-ft)



7) Install transaxle bolts (1) and then drive plate cover (2) for CVT model, or clutch housing lower plate (2) for M/T model.

Tightening torque

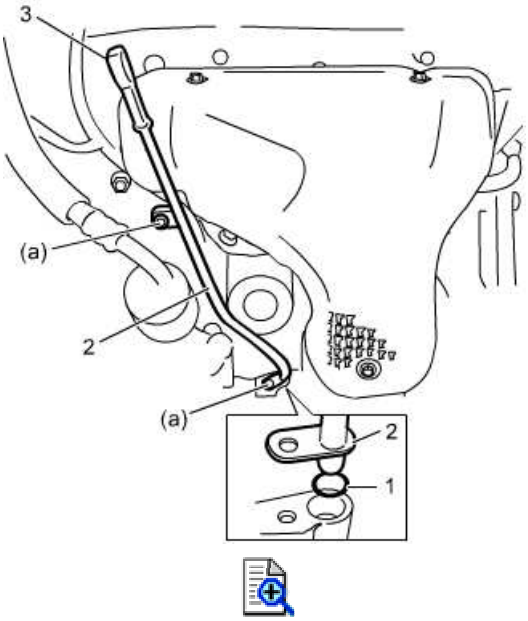
Transaxle bolt (a): 80 N·m (8.2 kg-m, 59.0 lbf-ft) ((CVT model))
Transaxle bolt (a): 85 N·m (8.7 kg-m, 63.0 lbf-ft) ((M/T model))
Drive plate cover bolt (b): 11 N·m (1.1 kg-m, 8.5 lbf-ft) ((CVT model))
Clutch housing lower plate bolt (b): 11 N·m (1.1 kg-m, 8.5 lbf-ft) ((M/T model))



8) Apply engine oil to new O-ring (1) and install it to oil pan.
9) Install oil level gauge guide (2) and oil level gauge (3).

Tightening torque

Oil level gauge guide bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



10) For 4WD model, install transfer. ☞

11) Install exhaust pipe No.1. ☞

12) Install drain plug and refill engine with engine oil. ☞

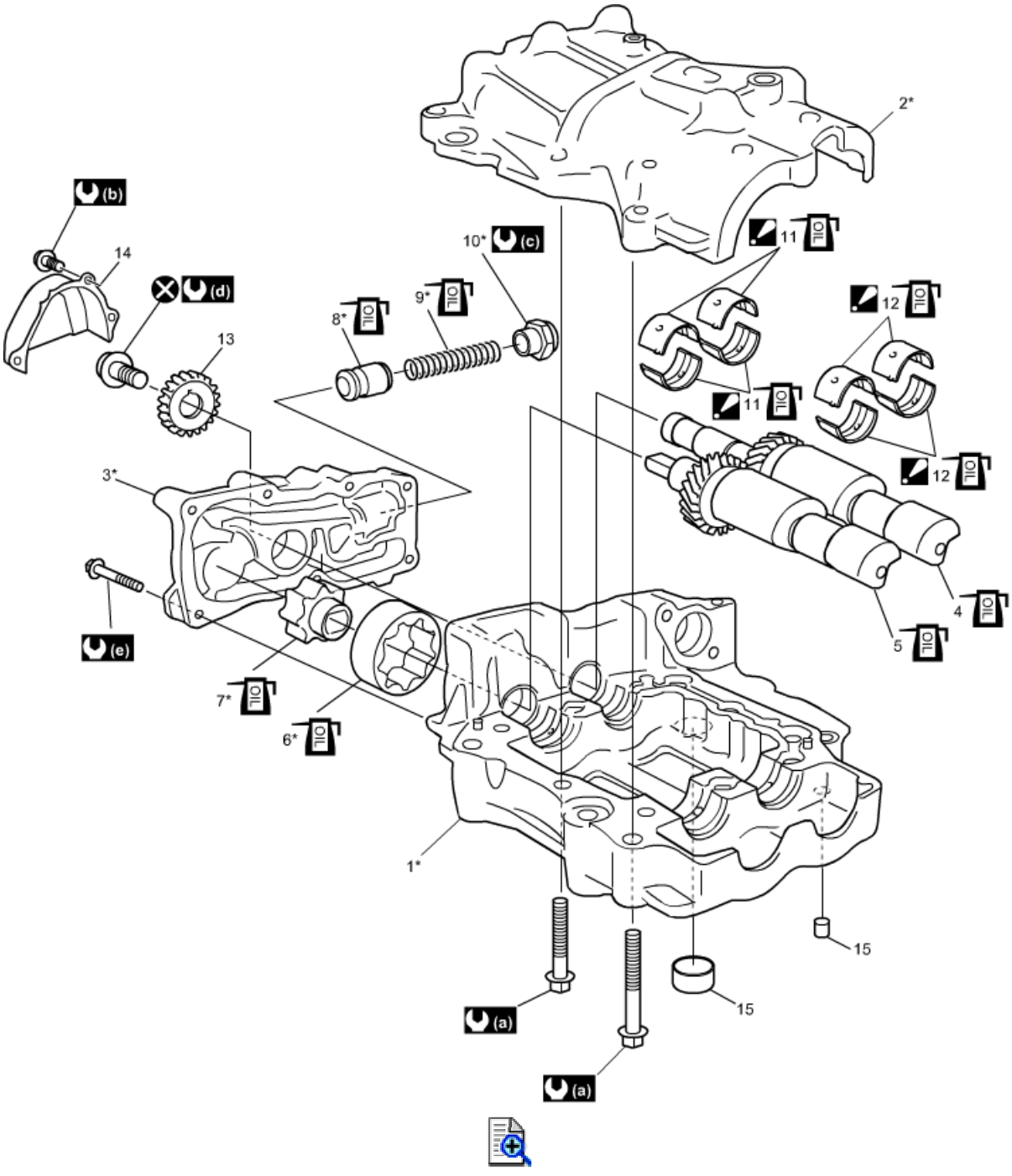
13) Run the engine and check for engine oil leaks.

14) Install left and right side engine under covers.

1E

Oil Pump Assembly Components

NOTE:
The parts with * (asterisk) are not available as replacement parts individually.
If any detect is found on those parts, replace oil pump assembly.



1. Oil pump housing	OIL Relief valve : Apply engine oil to sliding surface. 8.	15. Dowel pin
2. Balancer shaft cover	OIL Spring : Apply engine oil to sliding surface. 9.	(a) 29 N·m (3.0 kgf-m, 21.5 lbf-ft) :

3. Oil pump cover	10. Retainer	(b): 11 N·m (1.1 kgf-m, 8.5 lbf-ft)
 4. Balancer shaft No.1 : Apply engine oil to sliding surface.	 11. Balancer shaft bearing No.1 : To apply engine oil, refer to ***Balancer Shaft Removal and Installation***.	(c): 49 N·m (5.0 kgf-m, 36.5 lbf-ft)
 5. Balancer shaft No.2 : Apply engine oil to sliding surface.	 12. Balancer shaft bearing No.2 : To apply engine oil, refer to ***Balancer Shaft Removal and Installation***.	(d): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)
 6. Outer rotor : Apply engine oil to sliding surface.	13. Oil pump sprocket	(e): 12 N·m (1.2 kgf-m, 9.0 lbf-ft)
 7. Inner rotor : Apply engine oil to sliding surface.	14. Oil pump sprocket cover	: Do not reuse.

1E

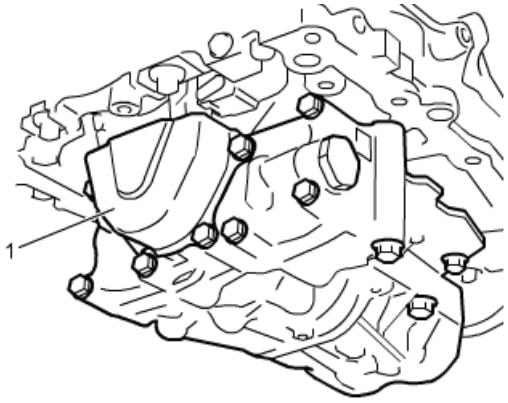
Oil Pump Assembly Removal and Installation

Reference: Oil Pump Assembly Components

Removal

1) Remove oil pan, oil strainer and oil pan baffle plate. ☞

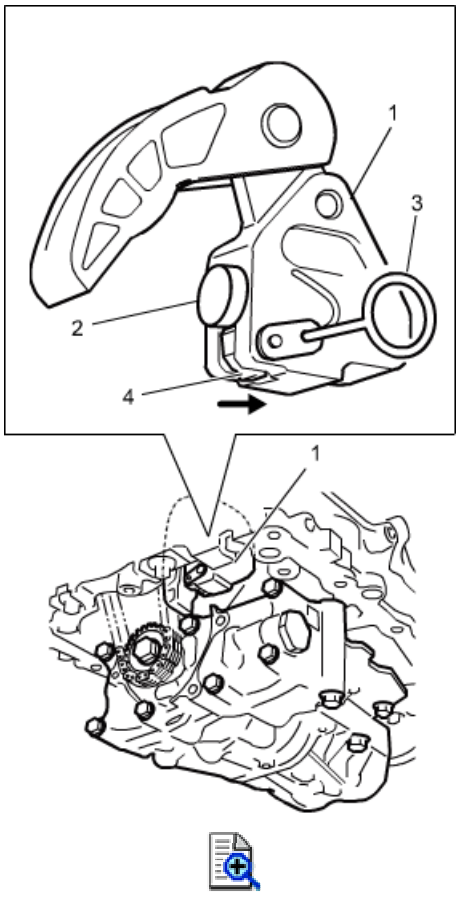
2) Remove oil pump sprocket cover (1).



3) Slacken tension of oil pump chain according to the following procedure.

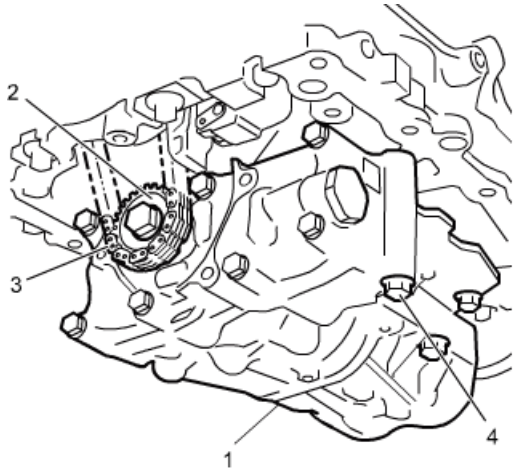
a) Raise latch (4) of oil pump chain adjuster (1) in direction of arrow to disengage latch from plunger teeth.

b) Push plunger (2) into oil pump chain adjuster (1) and install retainer (3) (3 mm wire) to hold plunger in place.



4) Remove oil pump assembly according to the following procedure.

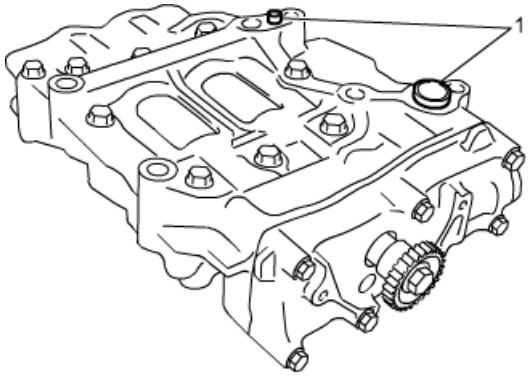
a) Remove oil pump bolts (4).
b) Remove oil pump chain (3) from oil pump sprocket (2).
c) Remove oil pump assembly (1) from lower crank case.



Installation

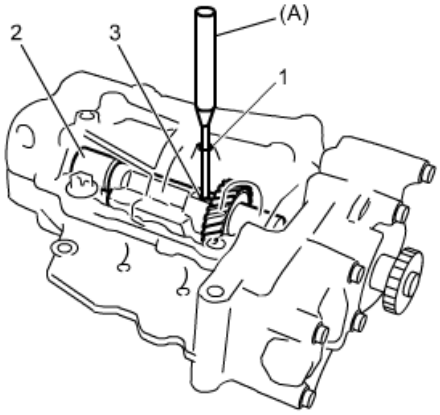
Reference: Oil Pump Inspection

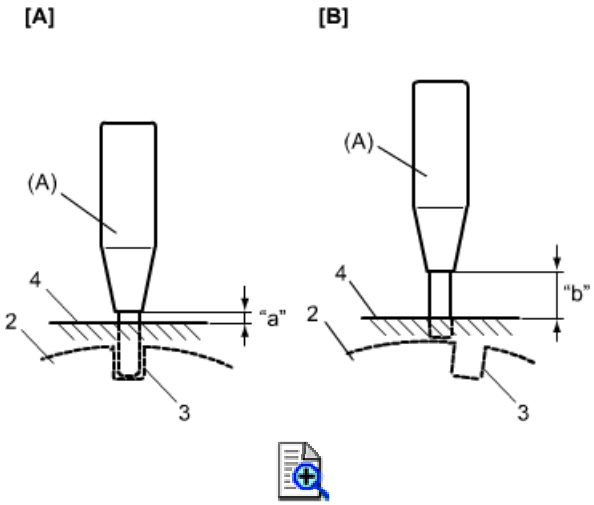
1) Make sure dowel pins (1) are installed.



2) Align balancer shaft No.1 (2) at specified position according to the following procedure.
a) Insert special tool into aligning hole (1) in oil pump housing.
b) Turn balancer shaft No.1 (2) by hand and insert special tool into aligning hole (3) in balancer shaft.

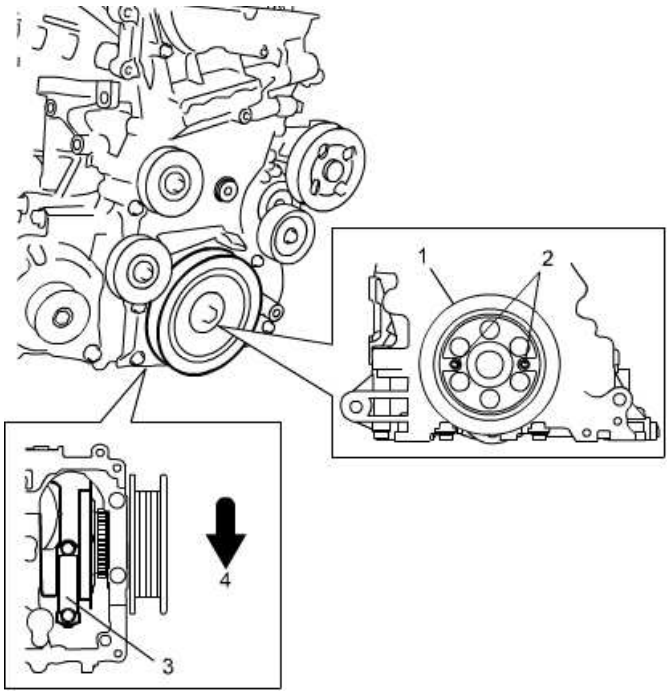
Special Tool
(A): 09922–85811





[A]: Proper condition	"a": 0 – 1 mm (0.00 – 0.03 in.)
[B]: Improper condition	"b": More than 3 mm (0.1 in.)
4. Oil pump housing	

3) Rotate crankshaft so that it is positioned as follows.
- Threaded holes line on crankshaft pulley (1) and lower crank case contact surface are set in parallel.
- Connecting rod cap (3) in cylinder No.1 is positioned close to exhaust manifold side (4).



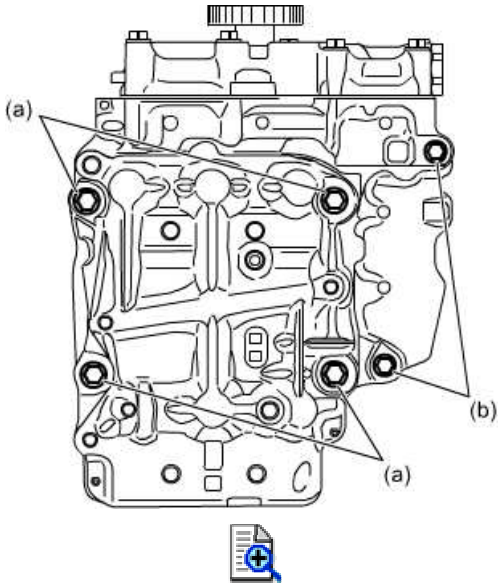
2.	Threaded hole

4) Install oil pump chain to oil pump sprocket.

5) Install oil pump assembly to lower crank case.

Tightening torque

Oil pump bolt (M10) (a): 55 N·m (5.6 kg-m, 40.5 lbf-ft)
Oil pump bolt (M8) (b): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

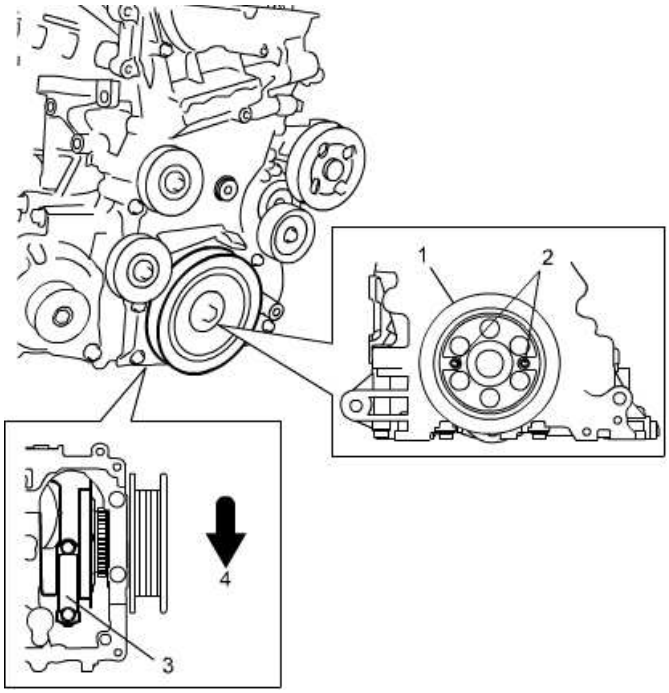


6) Remove retainer (3 mm wire) from oil pump chain adjuster.

7) Remove special tool from oil pump housing and rotate crankshaft clockwise to be positioned as follows.

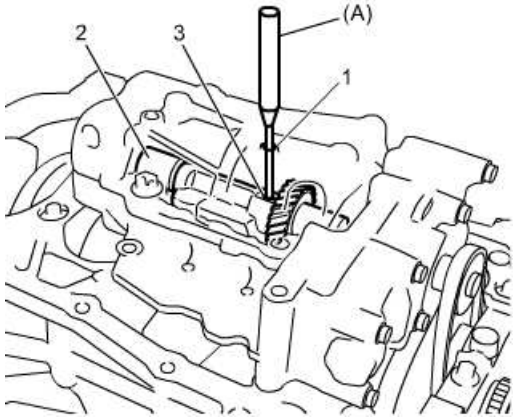
- Threaded holes (2) on crankshaft pulley (1) and lower crank case contact surface are aligned parallel.

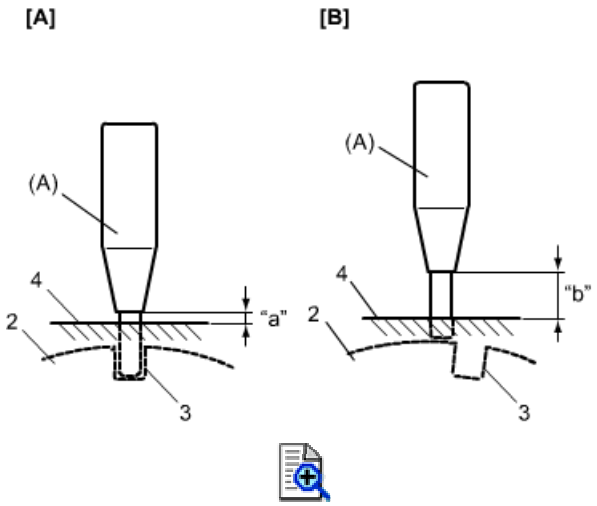
- Connecting rod cap (3) in cylinder No.1 is positioned close to exhaust manifold side (4).



8) Insert special tool to aligning hole (1) on oil pump housing and make sure the position of aligning hole (3) on balancer shaft No.1 (2) is proper.

Special Tool
(A): 09922–85811



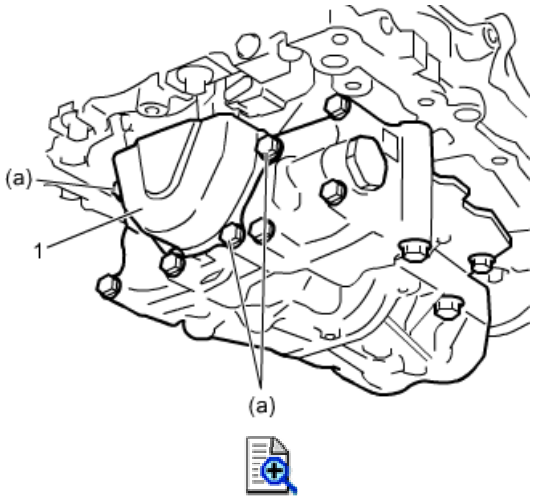


[A]: Proper condition	"a": 0 – 1 mm (0.00 – 0.03 in.)
[B]: Improper condition	"b": More than 3 mm (0.1 in.)
4. Oil pump housing	

9) Remove special tool from oil pump assembly, and then install oil pump sprocket cover (1).

Tightening torque

Oil pump sprocket cover bolt (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



10) Install oil pan, oil strainer and oil pan baffle plate.

1E

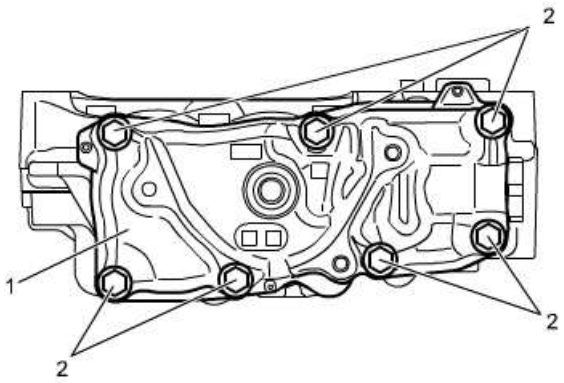
Oil Pump Assembly Disassembly and Reassembly

Reference: Oil Pump Assembly Removal and Installation

Disassembly

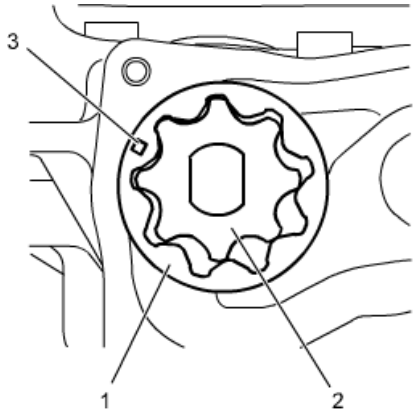
1) Remove oil pump sprocket referring to step 3) in "Removal" under ***Balancer Shaft Removal and Installation***.

2) Loosen oil pump cover bolts (2) and remove oil pump cover (1).

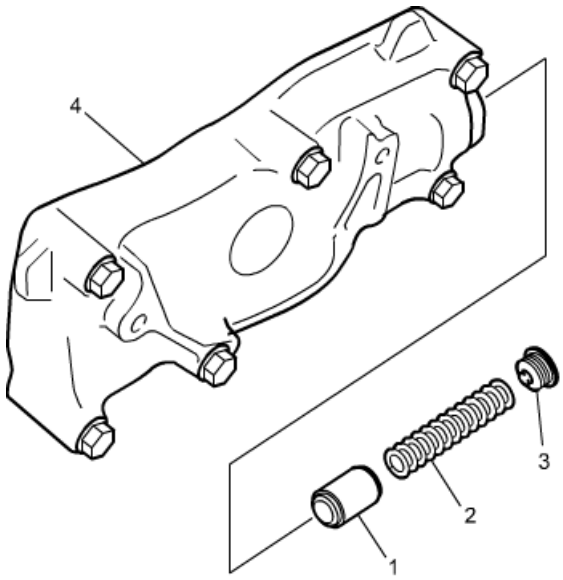


3) Remove outer rotor (1) and inner rotor (2).

CAUTION:
The outer rotor must be installed facing the same direction which it was when it was removed, so confirm the direction the matchmark (3) is facing.



4) Remove relief valve (1) and spring (2) by removing retainer (3) from oil pump cover (4).



Reassembly

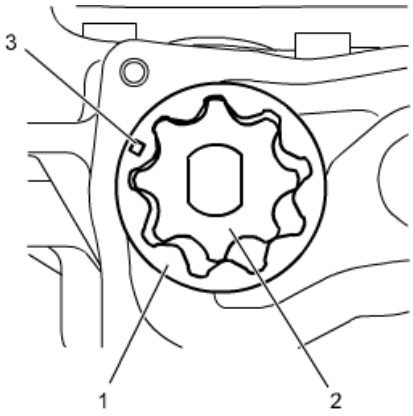
Reference: Oil Pump Inspection

1) Wash clean and then dry all disassembled parts.

2) Apply thin coat of engine oil to the following parts.
- Inner rotor
- Outer rotor
- Inside surfaces of oil pump housing and oil pump cover.

3) Install outer rotor (1) and inner rotor (2) to oil pump housing.

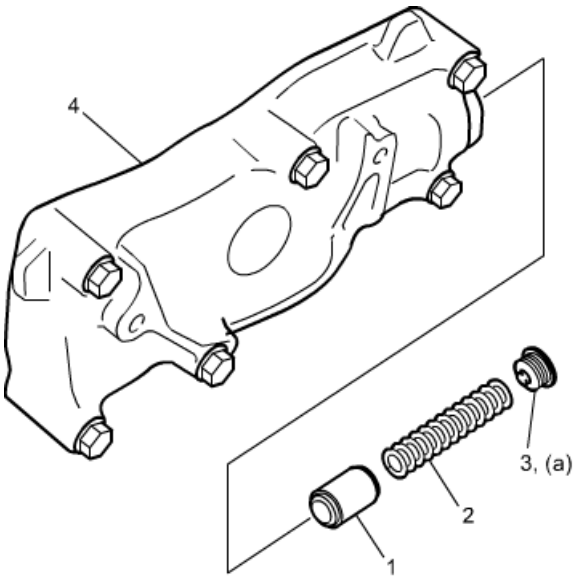
CAUTION:
Noting the matchmark (3) side, reinstall the rotors in the original position.



4) Apply engine oil to relief valve (1) and spring (2), and install them to oil pump cover (4).

5) Tighten retainer (3) to specified torque.

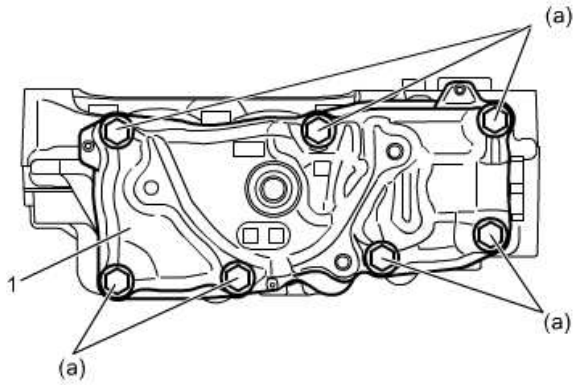
Tightening torque
Retainer (a): 49 N·m (5.0 kg-m, 36.5 lbf-ft)



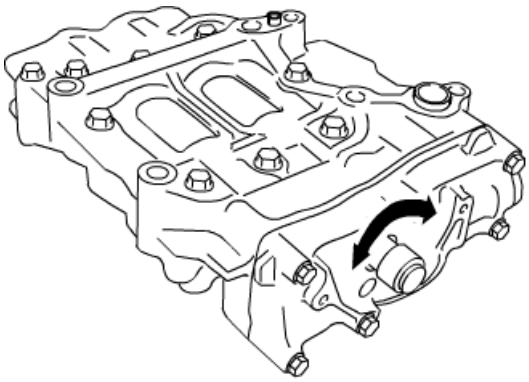
6) Install oil pump cover (1) to oil pump housing.

Tightening torque

Oil pump cover bolt (a): 12 N·m (1.2 kg-m, 9.0 lbf-ft)



7) Turn balancer shaft by hand to check for smooth rotation.



8) Install oil pump sprocket referring to step 3) in "Installation" under ***Balancer Shaft Removal and Installation***.

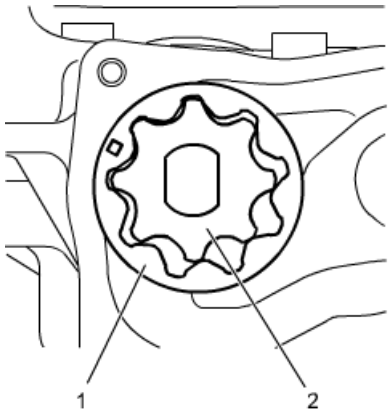
1E

Oil Pump Inspection

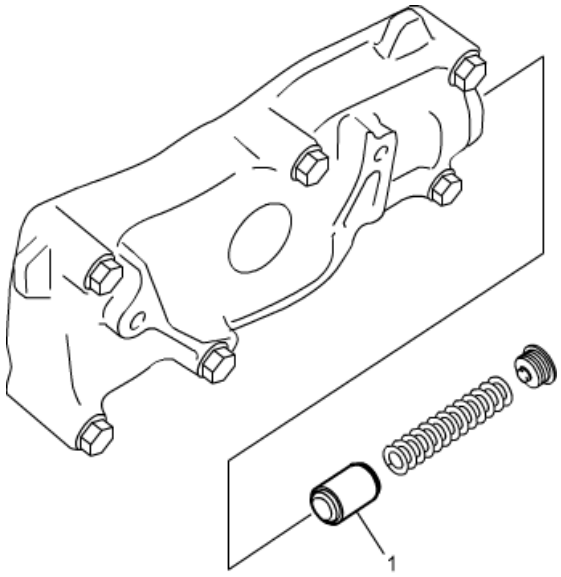
Reference: Oil Pump Assembly Disassembly and Reassembly

Oil Pump

- Check outer rotor (1), inner rotor (2), oil pump cover and oil pump housing for excessive wear or damage.



- Check relief valve (1) for smooth moving and any damage.

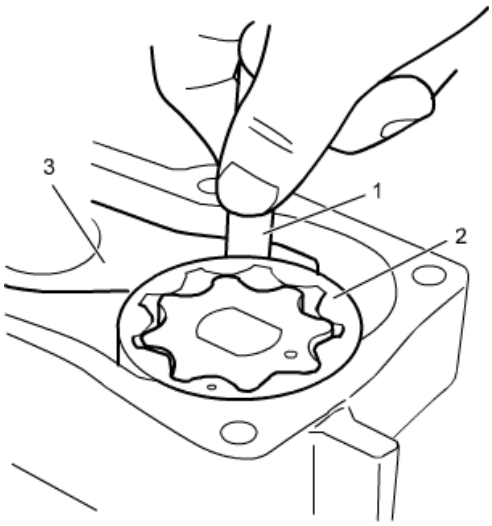


Radial clearance

Check radial clearance between outer rotor (2) and oil pump housing (3) using feeler gauge (1).
If clearance is out of specification, replace oil pimp assembly.

Oil pump radial clearance

Standard: 0.150 – 0.210 mm (0.0059 – 0.0083 in.)

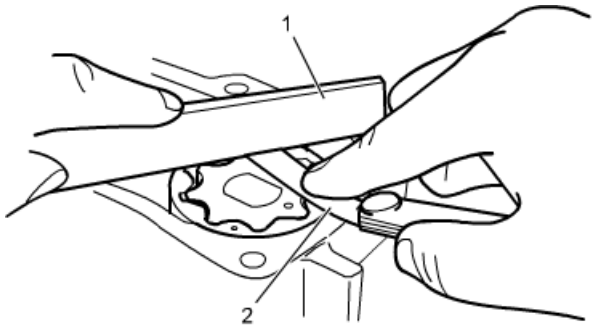


Side clearance

Using straightedge (1) and feeler gauge (2), measure side clearance of inner rotor.
If side clearance is out of specification, replace oil pump assembly.

Oil pump side clearance for oil pump inner rotor

Standard: 0.035 – 0.070 mm (0.0014 – 0.0027 in.)



Oil pump housing

Check clearance between hub of inner rotor (1) and oil pump housing (2) as follows.

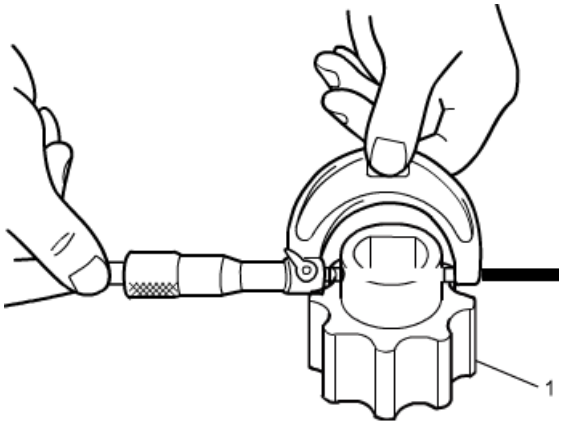
1) Measure outside diameter of hub of inner rotor (1) using micrometer.

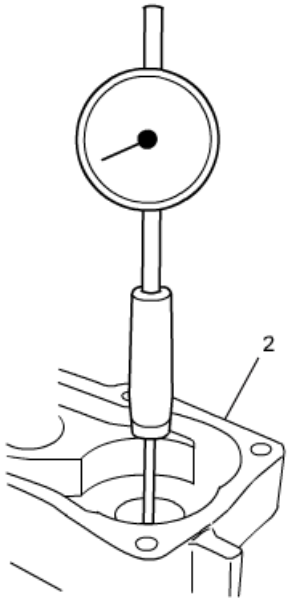
2) Measure inside diameter of oil pump housing (2) using bore gauge.

3) Calculate difference between diameters measured in Step 1) and Step 2).
If clearance is out of specification, replace oil pump assembly.

Oil pump housing clearance

	Standard
Inner rotor hub outside diameter	20.960 – 20.970 mm (0.82520 – 0.82559 in.)
Oil pump housing inside diameter	21.000 – 21.018 mm (0.82677 – 0.82748 in.)
Clearance	0.030 – 0.058 mm (0.0012 – 0.0023 in.)



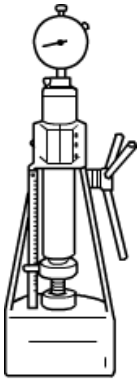


Relief valve spring tension

Check relief valve spring tension as shown in figure.
If measured tension is out of specification, replace oil pump assembly.

Relief valve tension

Loaded at spring length 48.0 mm (1.89 in)
Standard: 123 – 126 N (12.5 – 12.8 kgf, 27.7 – 28.3 lbf)



1E

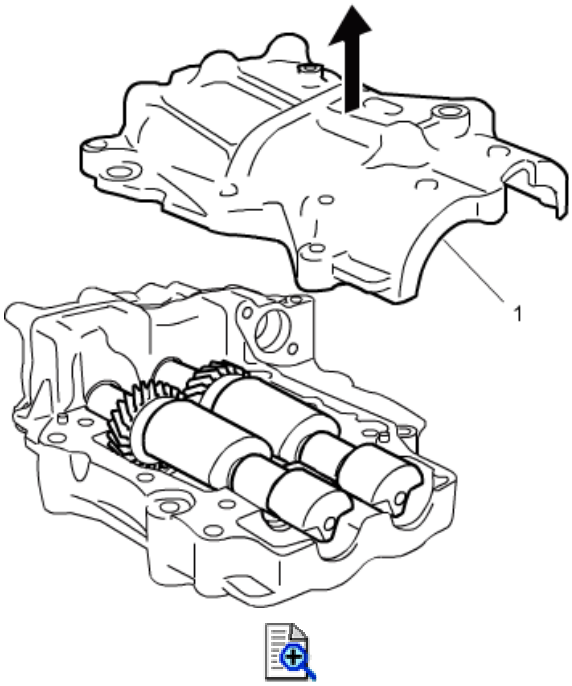
Balancer Shaft Removal and Installation

Reference: Oil Pump Assembly Components

Removal

1) Remove oil pump assembly. ☞

2) Remove balancer shaft cover (1) from oil pump assembly.



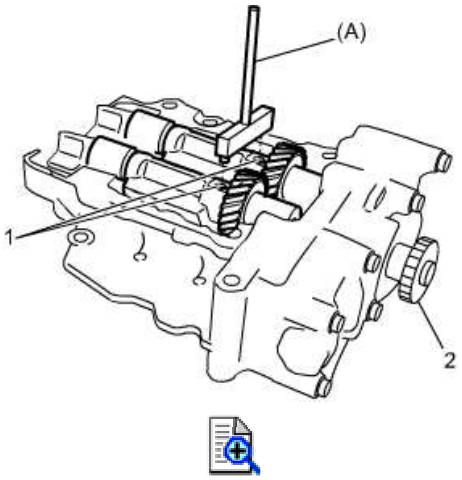
3) Remove oil pump sprocket according to the following procedure.

a) Insert special tool into aligning holes (1) in balancer shafts No.1 and No.2 to hold balancer shafts.

Special Tool

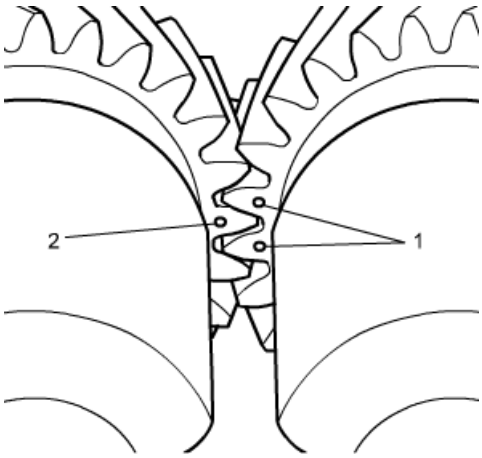
(A): 09914–67810

b) Remove oil pump sprocket (2).

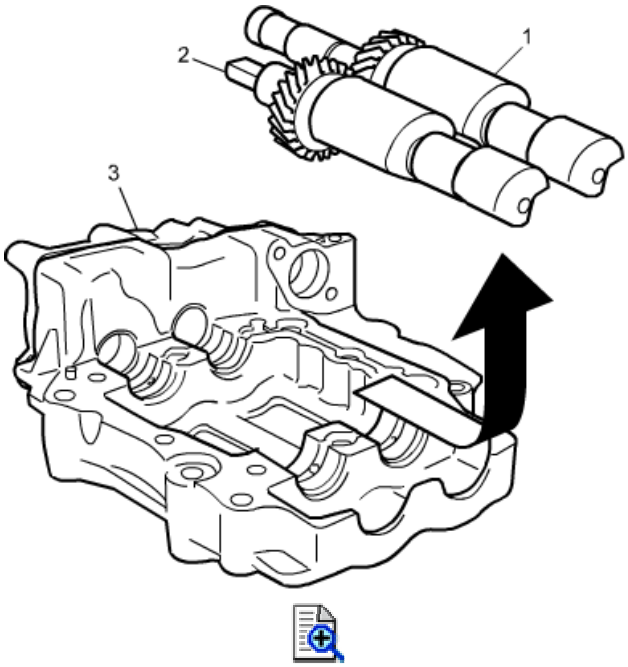


4) Remove balancer shafts No.1 and No.2 according to the following procedure.

a) Align matchmark (1) on balancer gear No.1 with matchmark (2) on balancer gear No.2 as shown in figure.



b) Remove balancer shafts No.1 (1) and No.2 (2) from oil pump housing (3) by sliding them in direction of arrow.



5) Remove balancer shaft bearings if necessary.

Installation

Reference: Balancer Shaft, Balancer Bearing Inspection

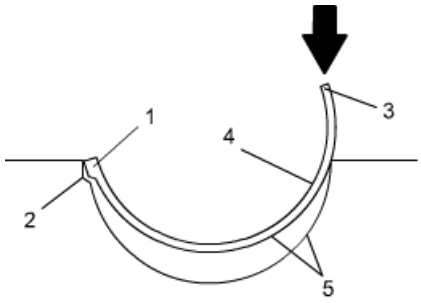
1) If removed, install shaft balancer bearings according to the following procedure.

CAUTION:
- **Balancer shaft bearing No.1 is different in shape from bearing No.2. Bearing No.1 is narrower in width than bearing No.2.**
- **Do not apply engine oil to the following surfaces.**
  - **— Both contact surfaces (5) of balancer shaft bearing and oil pump housing.**
  - **— Both contact surfaces (5) of balancer shaft bearing and balancer shaft cover.**

a) Fit tab (1) of each balancer shaft bearing to groove (2) of oil pump housing or balancer shaft cover.

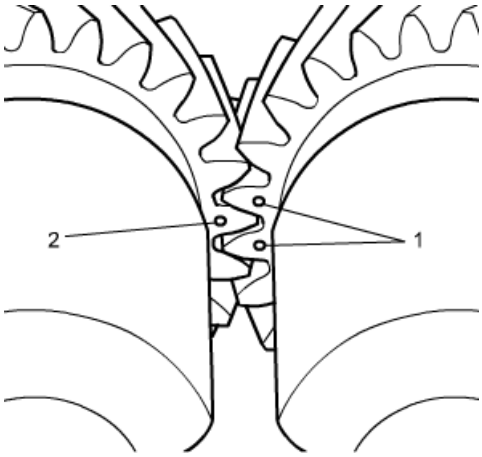
b) Press balancer shaft bearing end (3) until its outer surface comes in contact with oil pump housing or balancer shaft cover.

c) Apply engine oil to inner surface (4) of balancer shaft bearing.



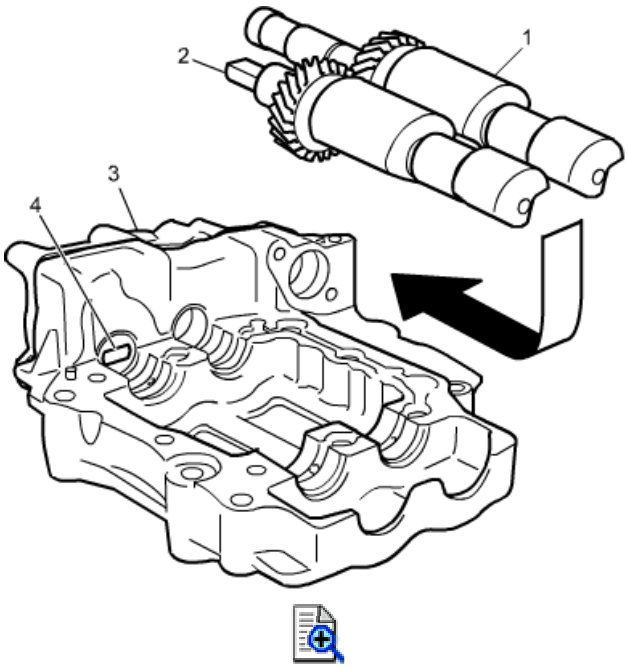
2) Install balancer shafts No.1 and No.2 to oil pump housing according to the following procedure.

a) Align matchmark (1) on balancer gear No.1 with matchmark (2) on balancer gear No.2 as shown in figure.



b) Install balancer shafts No.1 (1) and No.2 (2) to oil pump housing (3) by sliding them in direction of arrow.

NOTE:
Fit end of balancer shaft No.2 in hole in inner rotor opening (4).



3) Install oil pump sprocket according to the following procedure.

a) Insert special tool into aligning holes (1) in balancer shafts No.1 and No.2 to hold balancer shafts.

Special Tool

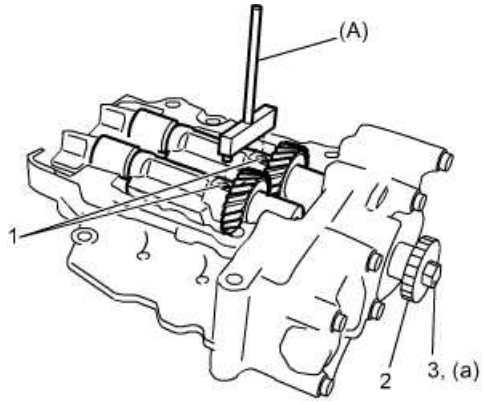
(A): 09914–67810

b) Install oil pump sprocket (2).

CAUTION:
Use new oil pump sprocket bolt (3) with pre-coated adhesive. Without this, bolts may loosen.

Tightening torque

Oil pump sprocket bolt (a): 45 N·m (4.6 kg-m, 33.5 lbf-ft)



4) Install balancer shaft cover to oil pump housing.

Tightening torque

Balancer shaft cover bolt: 29 N·m (3.0 kg-m, 21.5 lbf-ft)

5) Install oil pump assembly.

1E

Balancer Shaft, Balancer Bearing Inspection

Reference: Balancer Shaft Removal and Installation

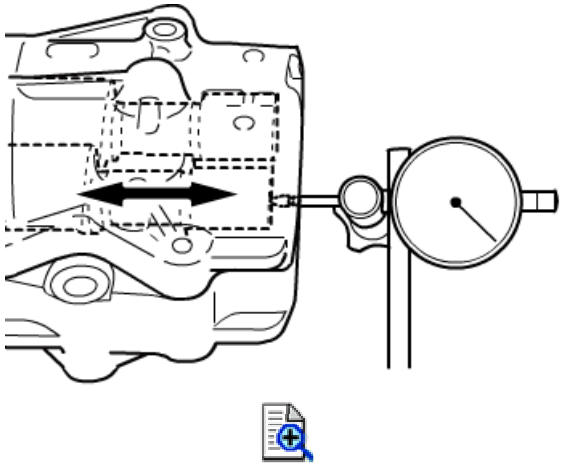
Balancer Shaft Thrust Play

1) Install balancer shafts, balancer bearings and balancer shaft cover to oil pump housing.

2) Using dial gauge, measure thrust play (axial direction) as shown in figure.
If measured thrust play is out of specification, replace oil pump assembly.

Balancer shaft thrust play

Standard: 0.150 – 0.290 mm (0.0059 – 0.0114 in.)



Journal out-of-round and taper

Using micrometer, measure balancer shaft journal diameter in the directions and at the points shown in figure, and calculate journal out-of-round and taper from measurements.
If measured values exceed their limits, replace corresponding balancer shaft with new one.

Journal outside diameter

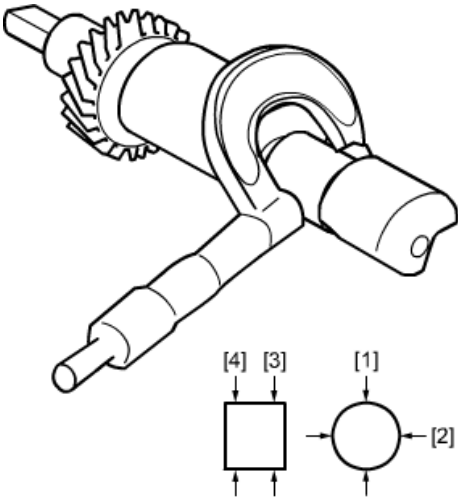
Standard: 24.940 – 24.955 mm (0.98189 – 0.98248 in.)

Journal out-of-round ([1] – [2])

Limit: 0.01 mm (0.0004 in.)

Journal taper ([3] – [4])

Limit: 0.01 mm (0.0004 in.)

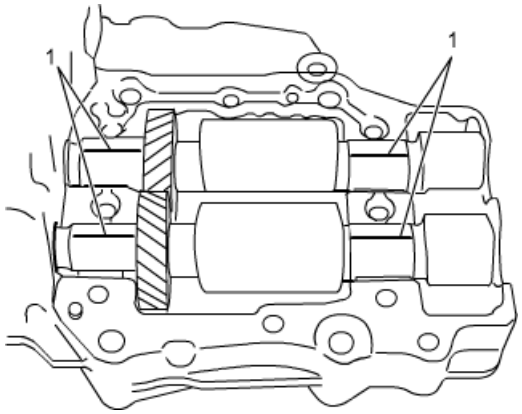


Balancer Shaft Bearing Clearance

1) Clean balancer shaft bearings, balancer shaft journals and bearing sections of both balancer shaft cover and oil pump housing.

2) Install balancer shaft bearings and balancer shafts to oil pump housing referring to steps 1) and 2) in "Installation" under ☞

3) Place a piece of gauging plastic (1) on the full width of each balancer shaft journal as shown in figure.



4) Install balancer shaft cover to oil pump housing.

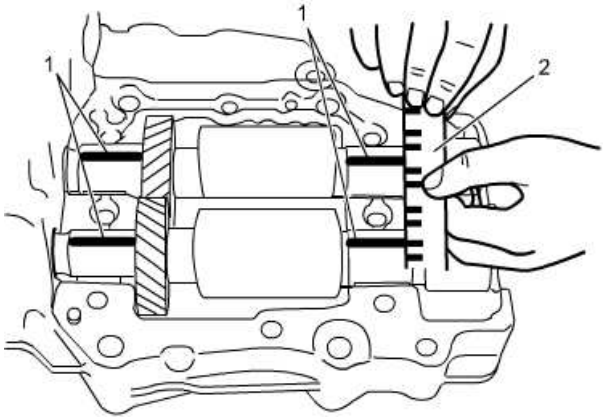
Tightening torque

Balancer shaft cover bolt: 29 N·m (3.0 kg-m, 21.5 lbf-ft)

5) Remove balancer shaft cover and measure each gauging plastic (1) width at its widest point using scale (2) on gauging plastic envelope.

Balancer shaft bearing clearance

Standard: 0.030 – 0.072 mm (0.0012 – 0.0028 in.)



6) If measured value is out of specification replace balancer shaft bearings with new ones.

7) Recheck balancer shaft clearance. If measured value with new bearings is out of specification, replace balancer shaft.

Balancer Shaft Bearing Inspection

Check bearings for pitting, scratches, excessive wear or damage. If any defective condition is found, replace balancer shaft bearings.

1E

Tightening Torque Specifications

CAUTION:
For fastener with * (asterisk) below, be sure to tighten it according to specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Oil pressure switch	13	1.3	9.5	☞
Engine oil drain plug	35	3.6	26.0	☞
Oil filter	14	1.4	10.5	☞
Oil pan baffle plate bolt	11	1.1	8.5	☞
Oil strainer bolt	11	1.1	8.5	☞
Oil pan bolt*	15 N·m → 25 N·m (1.5 kgf-m → 2.5 kgf-m, 11.0 lbf-ft → 18.5 lbf-ft)			☞
Transaxle bolt	80	8.2	59.0	(CVT model) ☞
Transaxle bolt	85	8.7	63.0	(M/T model) ☞
Drive plate cover bolt	11	1.1	8.5	(CVT model) ☞
Clutch housing lower plate bolt	11	1.1	8.5	(M/T model) ☞
Oil level gauge guide bolt	11	1.1	8.5	☞
Oil pump bolt (M10)	55	5.6	40.5	☞
Oil pump bolt (M8)	25	2.5	18.5	☞
Oil pump sprocket cover bolt	11	1.1	8.5	☞
Retainer	49	5.0	36.5	☞
Oil pump cover bolt	12	1.2	9.0	☞
Oil pump sprocket bolt	45	4.6	33.5	☞
Balancer shaft cover bolt	29	3.0	21.5	☞ ☞

NOTE:
The specified tightening torque is described in the following.
Oil Pan and Oil Pump Strainer Components
Oil Pump Assembly Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

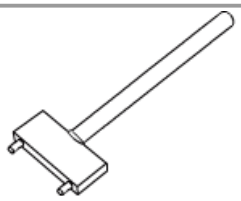
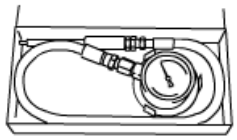
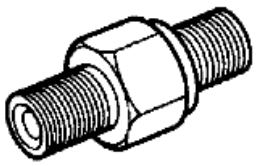
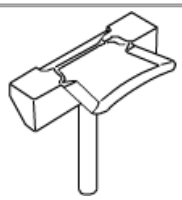
1E

Recommended Service Material

Material	SUZUKI recommended product or Specification		Note
Sealant	SUZUKI Bond No.1217G	P/No.: 99000–31260	☞
Thread lock cement	Thread Lock Cement Super 1322	P/No.: 99000–32110	☞

NOTE:
Required service material is also described in the following.
Oil Pan and Oil Pump Strainer Components
Oil Pump Assembly Components

Special Tool

09914–67810 Balancer shaft locking tool 	
09915–47341 Oil filter wrench socket 	
09915–77311 Oil pressure gauge 	
09915–78211 Oil pressure gauge attachment 	
09921–96510 Oil pan seal cutter 	
09922–85811 Spring pin remover (4.5 mm) 	

1J

Precautions for Handling Battery

WARNING:
- **Hydrogen gas is produced by battery. Never expose battery to open flame or electric spark as battery generating gas is flammable and explosive.**
- **Do not allow electrolyte to come in contact with eyes, skin, fabrics, or painted surfaces as electrolyte is a corrosive acid. Immediately and thoroughly flush any contacted area with water.**
- **Batteries should always be kept out of reach of children.**

1) The battery is a very reliable component, but needs periodic attention.
- Keep the battery carrier clean.
- Prevent rust formation on the terminal posts.
- Uniformly keep electrolyte at upper level in all cells. (If provided with cells)
- When keeping the battery in the vehicle over a long period of time, follow the instructions given below.
  — Start the engine weekly and run it until it reaches normal operating temperature with engine speed at 2000 to 3000 rpm. Make sure all electric switches are turned off before storing the vehicle.
  — Recharge the battery once a month to prevent excessive discharging. This is especially important when ambient temperature is low.
  While vehicles are stored, the battery discharges when it is not used. Battery electrolyte can freeze and battery case can crack at cold ambient conditions if the battery is not properly charged.

2) Keep the battery cable connections clean.
The cable connections, particularly at the positive (+) terminal post, tend to become corroded. Rust on the mating faces of conductors caused by corrosion hinders the flow of current.
Clean the terminals and fittings periodically to ensure good metal-to-metal contact, and grease the connections after each cleaning to protect them against rusting.

3) Always be aware of battery charge conditions. The simplest way to check conditions is through a hydrometer test. The hydrometer is an instrument for measuring the specific gravity (S.G.) of the battery electrolyte. The S.G. of the electrolyte indicates the charge conditions. ☞

1J

Battery Description

The battery has three major functions in the electrical system.

- It is a source of electrical energy for cranking the engine.
- It acts as a voltage stabilizer for the electrical system.
- It can, for a limited time, provide energy when the electrical load exceeds the output of generator.

Battery Carrier and Hold-Down Clamp

The battery carrier should be in good condition so that it will support the battery securely and keep it level. Before installing the battery, check that the battery carrier and hold-down clamp are clean and free from corrosion and that there is no foreign matter in the carrier. Tighten the hold-down clamp bolts tight enough to prevent battery from shaking in its carrier, but do not over-tighten.

Electrolyte Freezing

The freezing point of electrolyte depends on its specific gravity. Since freezing may ruin the battery, protect against freezing by keeping the battery in a fully charged condition. If a battery is frozen accidentally, it should not be charged until it is warmed.

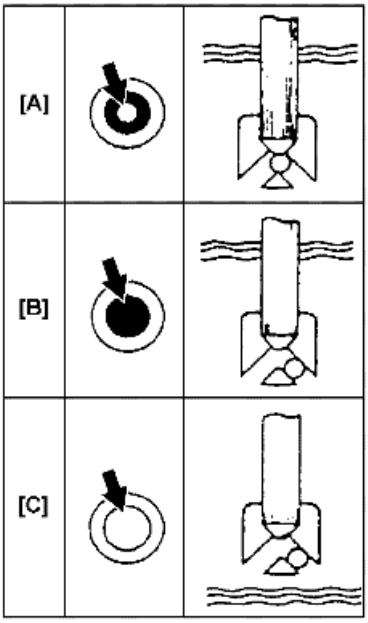
Sulfation

If the battery is allowed to sit for a long period in discharged condition, the lead sulfate changes to a hard, crystalline substance that will not easily turn back to active material during subsequent recharging. "Sulfation" refers to the result of this reaction as well as the process. Batteries in which this has occurred can be slowly charged and restored to a usable condition, but their capacity will be lower than the original capacity.

Built-In Indicator (If Provided)

The battery has a built-in temperature compensation indicator at the top. This indicator is used with the following diagnostic procedure. When checking the indicator, make sure that the top of the battery is clean. A light may be needed in poorly-lit areas.
The following three types of indication exist in normal operation.

- **Green dot [A]**
  Battery is sufficiently charged for testing.
- **Dark [B]**
  Battery must be charged before testing. If there is a cranking problem, battery should be tested as described in ***Battery Inspection***. Charging and electrical systems should also be checked at this time.
- **Clear or light yellow [C]**
  This means that fluid level is below the bottom of hydrometer. The cause may be excessive or prolonged charging, a broken case, excessive tipping, or normal battery deterioration. For barriers in this condition, a faulty charging system may be causing high charging voltage. Therefore, charging and electrical systems must be checked. If the battery is causing cranking problems, the battery should be replaced.


[A]
[B]
[C]

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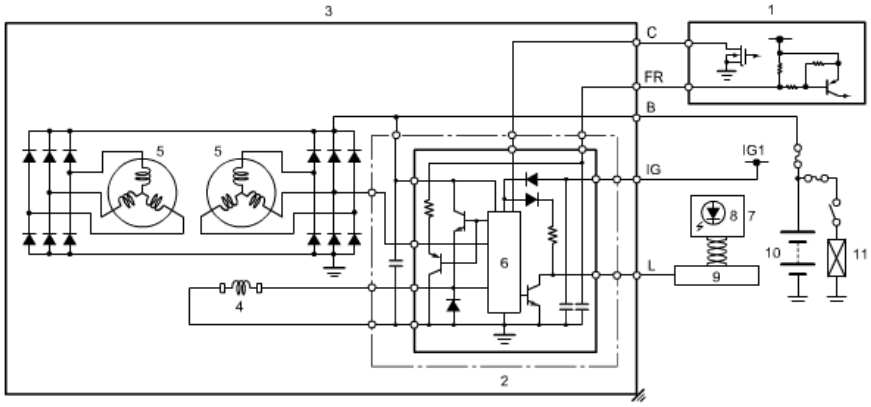
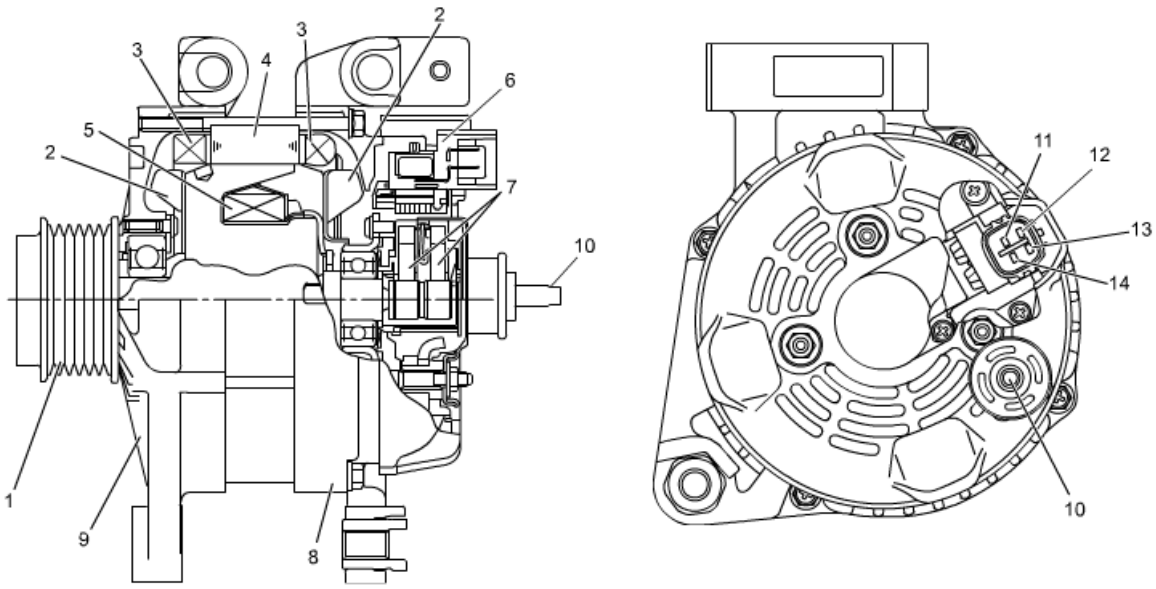
Generator Description

The generator is an IC regulator included. Internal components are connected electrically as shown in figure.
The generator features are as follows:

- The IC regulator controls the voltage produced by the generator.
  The voltage setting cannot be adjusted.
- The pulley is equipped with a one way clutch. This allows for abrasion and noise from the accessory drive belt and for damage to each device to be reduced through absorption of small changes in the engine speed.



1. ECM	4. Field coil (rotor coil)	7. Combination meter	10.	Battery
2. IC regulator	5. Stator coil	8. Charge indicator light	11.	Load
3. Generator	6. Control circuit	9. BCM		



1. Pulley	5. Field coil	9. Drive end frame	13. Generator cut terminal

2. Rotor fan	6. Regulator	10. Generator output (“B” terminal)	14. Field duty monitor terminal
3. Stator coil	7. Brush	11. Light terminal	
4. Stator core	8. Rear end frame	12. Ignition terminal	

1J

Battery Inspection

Common Causes of Failure

The following are the most common causes of battery failures.

- Accessories left on overnight or for an extended period without the generator operating.
- Driving at slow speed for short periods.
- Electrical load exceeds generator output particularly due to additional fitting of aftermarket equipment.
- Defects in charging system.
- Including failure to keep terminals clean or making hold-down clamps too loose or too tight.
- Mechanical problems in electrical system such as short-circuited or pinched wires.
- Deterioration of battery due to long-term use.
- Deterioration of battery due to long-term storage.

Visual Inspection

Check for visible damage, such as a cracked or broken case or cover, which may lead to loss of electrolyte. If visible damage is noted, replace battery. Determine cause of damage and make repairs as needed.

1J

Generator Symptom Diagnosis

Trouble in charging system will show up as one or more of the following conditions.

Charging Indicator Light Operation Failure

Condition	Possible Cause	Action
Charging indicator light does not light up with ignition ON and engine off	Blown fuse	*Replace fuse.*
	Faulty CAN communication line	*Repair or replace CAN communication line.* ☞
	Faulty combination meter	*Replace combination meter.* ☞
	Faulty BCM	*Check BCM.* ☞
	Faulty wiring	*Repair wiring.*
	Faulty IC regulator or field coil	*Repair or replace generator.* ☞
Charging indicator light does not light up with engine running (battery requires frequent recharging)	Worn or damage accessory drive belt	*Replace accessory drive belt.* ☞
	Faulty IC regulator or generator	*Replace generator.* ☞
	Faulty wiring	*Repair wiring.*

Battery Charging Failure

Condition	Possible Cause	Action
Undercharged battery	Worn or damage accessory drive belt	*Replace accessory drive belt.* ☞
	Faulty one way clutch pulley	*Replace one way clutch pulley.* ☞
	Loosen or corroded battery terminals	*Tighten battery terminals or replace battery.* ☞
	Faulty rectifier, rotor or IC regulator	*Repair or replace generator.* ☞
Overcharged battery	Faulty IC regulator	*Repair or replace generator.* ☞

Noise

Condition	Possible Cause	Action
Noisy generator	Loosen mounting bolts	*Tighten mounting bolts.* ☞
	Dirty, worn or faulty bearings	*Repair or replace generator.* ☞

Faulty rotor, diode or stator	*Repair or replace generator.* ☞
Faulty one way clutch pulley	*Replace one way clutch pulley.* ☞

1J

Generator Test

Slow engine cranking or low specific gravity of battery electrolyte may result from an undercharged battery due to failure in the generator even the charging indicator light is operating normally.
Before beginning generator test in this case, perform the following procedure.

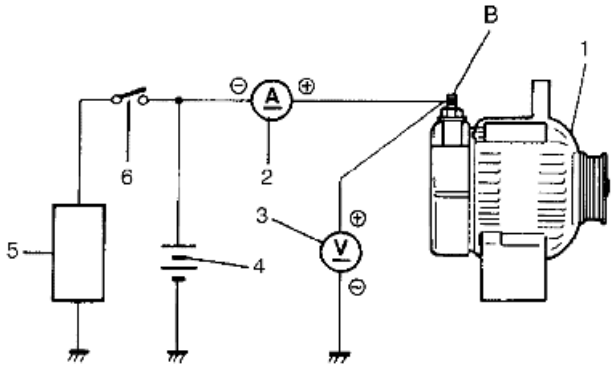
- Make sure that undercharged condition has not been caused by accessories being left on for extended period of time.
- Check drive belt for wear and tension ☞ .
- If battery defect is suspected, refer to ***Battery Description***.
- Inspect all wiring for defects and for tightness and cleanliness of connections. In particular, inspect the battery cable, starting motor leads and ignition ground cable.

No-Load Check

NOTE:
Use fully charged battery.

1) Check for DTC. ☞
If there is any DTC, perform trouble shooting for applicable DTC and then clear DTC.
- Trouble shooting: ☞
- DTC clearance: ☞

2) Turn off all electrical loads (5).
3) Connect voltmeter (3) and ammeter (2) as shown in figure.
4) Start engine and warm it up to normal operating temperature.



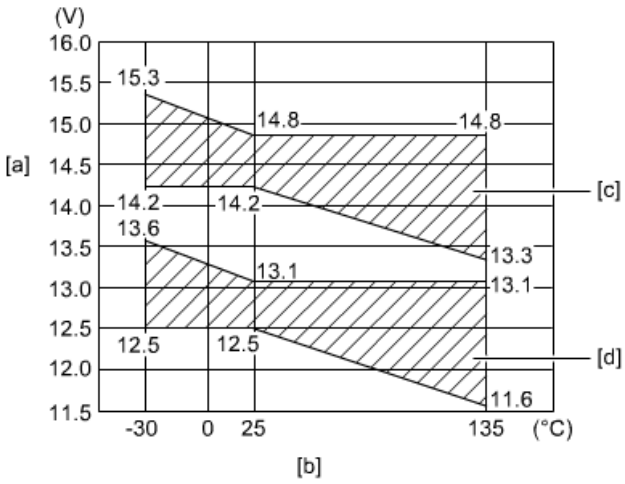
1. Generator	6. Switch
4. Battery	

5) Run engine around 2,000 rpm and read meters.
- If voltage is higher than standard value, check ground circuit of brushes. ☞
  If brushes are not grounded, replace IC regulator.
- If voltage is lower than standard value, inspect rotor, stator, rectifier, bushings and regulator. ☞

Specification for generator test (No-load check)

Current: 10 A
Regulated voltage (High): 14.2 – 14.8 V (at 25 °C, 77 °F)

Regulated voltage (Low): 12.5 – 13.1 V (at 25 °C, 77 °F)



[a]:	Reticulated voltage	[c]:	High
[b]:	Regulator case temperature	[d]:	Low

Load Check

NOTE:
Use fully charged battery.

1) Connect ammeter in the same way as ***No-Load Check***.

2) Run at engine around 2,000 rpm and turn on the following electrical accessories.
- Headlight (High beam)
- Rear window defogger
- Blower motor (Maximum speed)

3) Read ammeter.
If meter reading is less than 20 A, repair or replace generator.

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Jump Starting in Case of Emergency

With Booster Battery

CAUTION:
- **For M/T model with a catalytic converter, do not push or tow the vehicle to start it. This may cause damage to the emission control system and/or to other components.**
- **Damage to electronic components of either vehicle.**
- **Be careful not to allow metal tools or jumper cables to contact positive (+) battery terminal or other metal on vehicle, as this may cause a short circuit.**

Both booster and discharged battery should be handled carefully when using jumper cables. Follow the procedure outlined below, being careful not to cause sparks.

WARNING:
- **Serious personal injury (particularly to eyes) or property damage from such causes as battery explosion, battery acid or electrical burns.**
- **Remove rings, watches and other jewelry. Be sure to wear eye protection.**

1) For CVT model, place select lever in "P".
For M/T model, place gear shift lever in "Neutral".

2) Apply parking brake.

3) Confirm that the ignition mode of keyless push start system is in "OFF".

4) Turn off lights and all other electrical loads.

5) For battery that cell caps are equipped, check electrolyte level. If it is below low level line, add distilled water.

6) Attach one of jumper cable terminals to positive (+) terminal of booster battery and other terminal of same cable to positive (+) terminal of discharged battery. (Use 12-volt battery only to jump start engine).

7) Attach one of remaining jumper cable terminals to negative (–) terminal of booster battery, and other terminal of same cable to solid engine ground (such as engine hook) at least 45 cm (18 in.) away from battery of vehicle.

8) Start engine of vehicle with booster battery and turn off electrical accessories. Then start engine with discharged battery.

9) Disconnect jumper cables in exact reverse order.

With Charging Equipment

CAUTION:
When jump starting engine with charging equipment, be sure the equipment is for 12-volt battery and negative (–) ground system. Do not use 24-volt charging equipment. Using such equipment can cause serious damage to electrical system or electronic parts.

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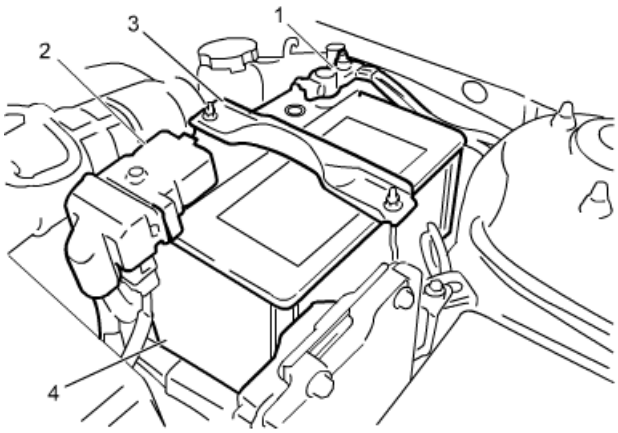
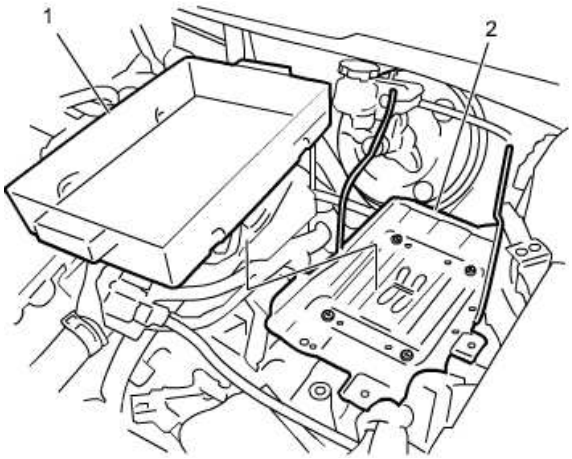
Battery Removal and Installation

Removal

1) Disconnect negative (–) cable (1) at battery (4).
2) Disconnect positive (+) cable (2) at battery.
3) Remove retainer (3).
4) Remove battery.



5) Remove battery tray (1).
6) Remove battery bracket (2) by removing air cleaner assembly ☞ and ECM ☞ if necessary.



Installation

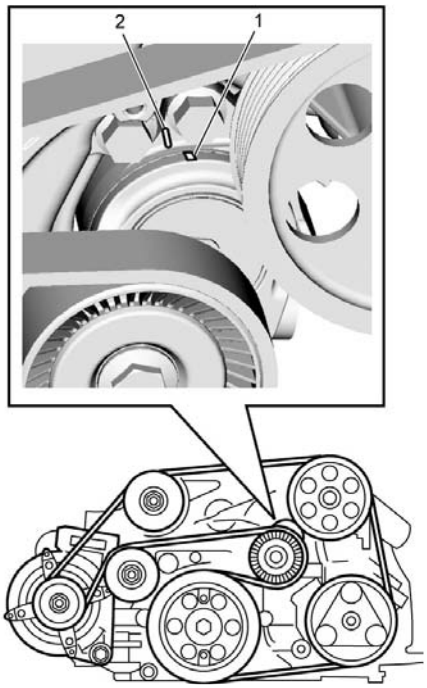
1) Reverse removal procedure.
2) Tighten battery cables securely.
3) Initialize electrical devices if necessary.

Accessory Drive Belt Tension Inspection

1) Disconnect negative (–) cable at battery.

2) Check accessory drive belt for cracks, cuts, wear and dirt.
If any abnormality is found, replace accessory drive belt. ☞

3) Check which side of indicator (2) the tension indicator (1) is on when the vehicle is viewed from the front.
If tension indicator (1) is on the left, replace accessory drive belt. ☞



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Accessory Drive Belt Removal and Installation

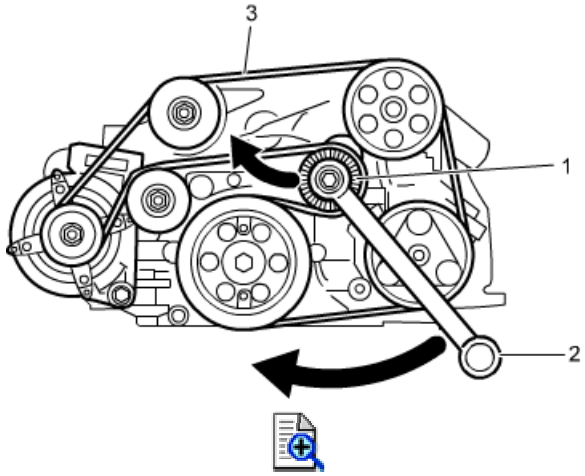
Removal

1) Disconnect negative (–) cable from battery.

2) Remove right side front fender lower lining.

3) Loosen belt tension by turning tensioner (1) in clockwise direction using wrench (2). After loosening, remove accessory drive belt (3).

CAUTION:
Do not apply torque of 59 N·m (6.0 kgf-m, 43.5 lbf-ft) or higher to the tensioner pulley.



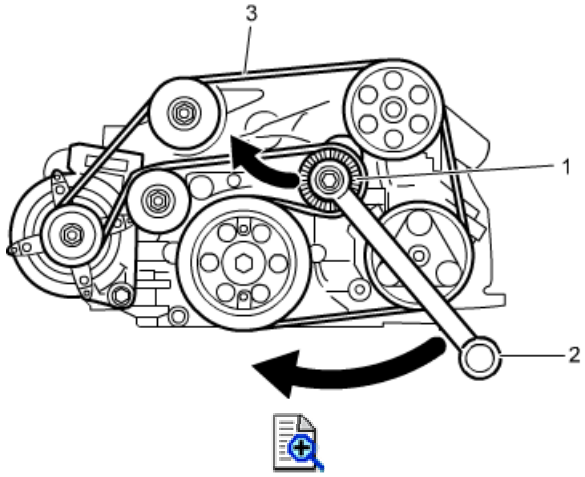
Installation

Reference: Accessory Drive Belt Tension Inspection

1) Loosen belt tension by turning tensioner (1) in clockwise direction using wrench (2). After loosening, install accessory drive belt (3).

CAUTION:
Do not apply a torque of 59 N·m (6.0 kgf-m, 43.5 lbf-ft) or higher to the tensioner pulley.

NOTE:
Make sure drive belt is installed in grooves of each pulley correctly.



2) Install right side front fender lower lining.

3) Connect negative (–) cable at battery.

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Tensioner and Idler Pulley Inspection

Reference: Tensioner and Idler Pulley Removal and Installation

Check tensioner and idler pulley for rotation, noise and play.
If any abnormality is found, replace tensioner and/or idler pulley. ☞

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Tensioner and Idler Pulley Removal and Installation

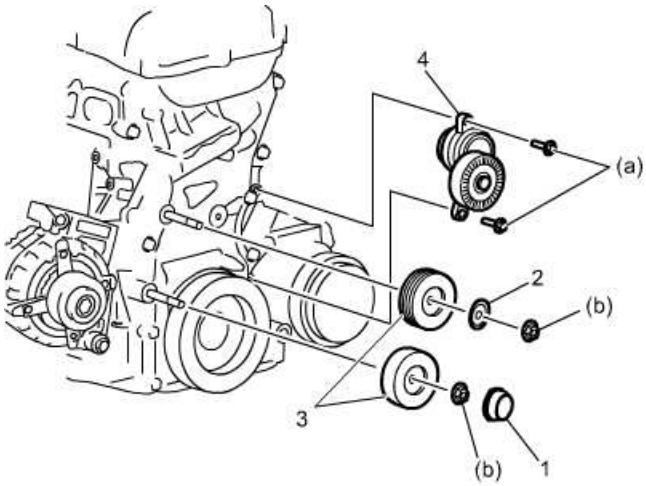
Removal

1) Remove accessory drive belt. ☞
2) Remove idler pulley cover (1).
3) Remove nuts, idler pulley shield (2) and idler pulley(s) (3).
4) Drain coolant. ☞
5) Remove water pump. ☞
6) Remove tensioner (4).

Installation

Reference: Tensioner and Idler Pulley Inspection
Reverse removal procedure, noting the following points.
- Tighten tensioner bolts and idler pulley nuts to specified torque.

Tightening torque
Tensioner bolt (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)
Idler pulley nut (b): 40 N·m (4.1 kg-m, 29.5 lbf-ft)



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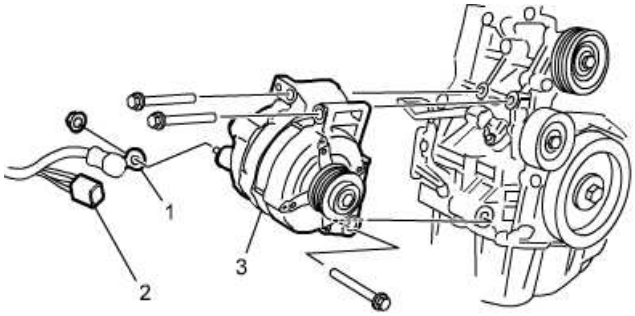
Generator Removal and Installation

Removal

1) Disconnect negative (–) cable from battery.
2) Remove engine cover.
3) Remove accessory drive belt. ☞
4) Disconnect "B" terminal wire (1) and connector (2) from generator (3).
5) Remove generator (3).



Installation

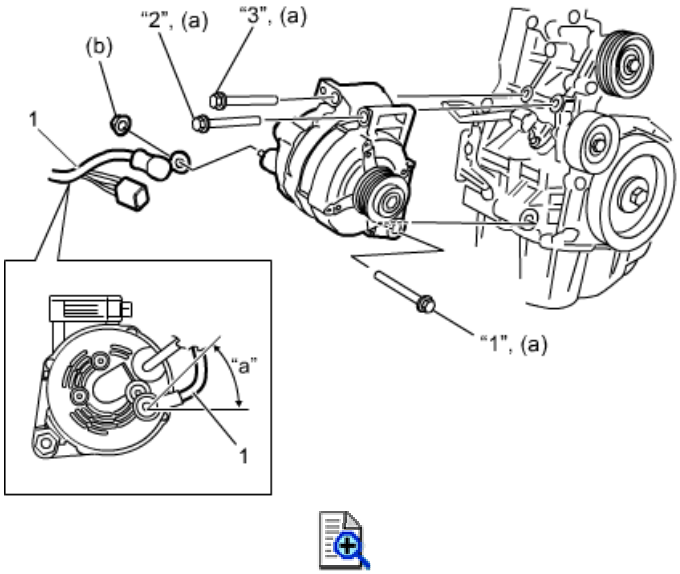
Reference: Generator Components
Reference: Generator Inspection
Reverse removal procedure, noting the following points

- Tighten generator bolts in numerical order ("1" → "2" → "3") evenly and gradually.

Tightening torque
Generator bolt* (a): 45 N·m (4.6 kg-m, 33.5 lbf-ft)

- Connect wire (1) to generator as shown in figure, and tighten "B" terminal nut to specified torque.

Tightening torque
"B" terminal nut (b): 11 N·m (1.1 kg-m, 8.5 lbf-ft)



"a": 45°

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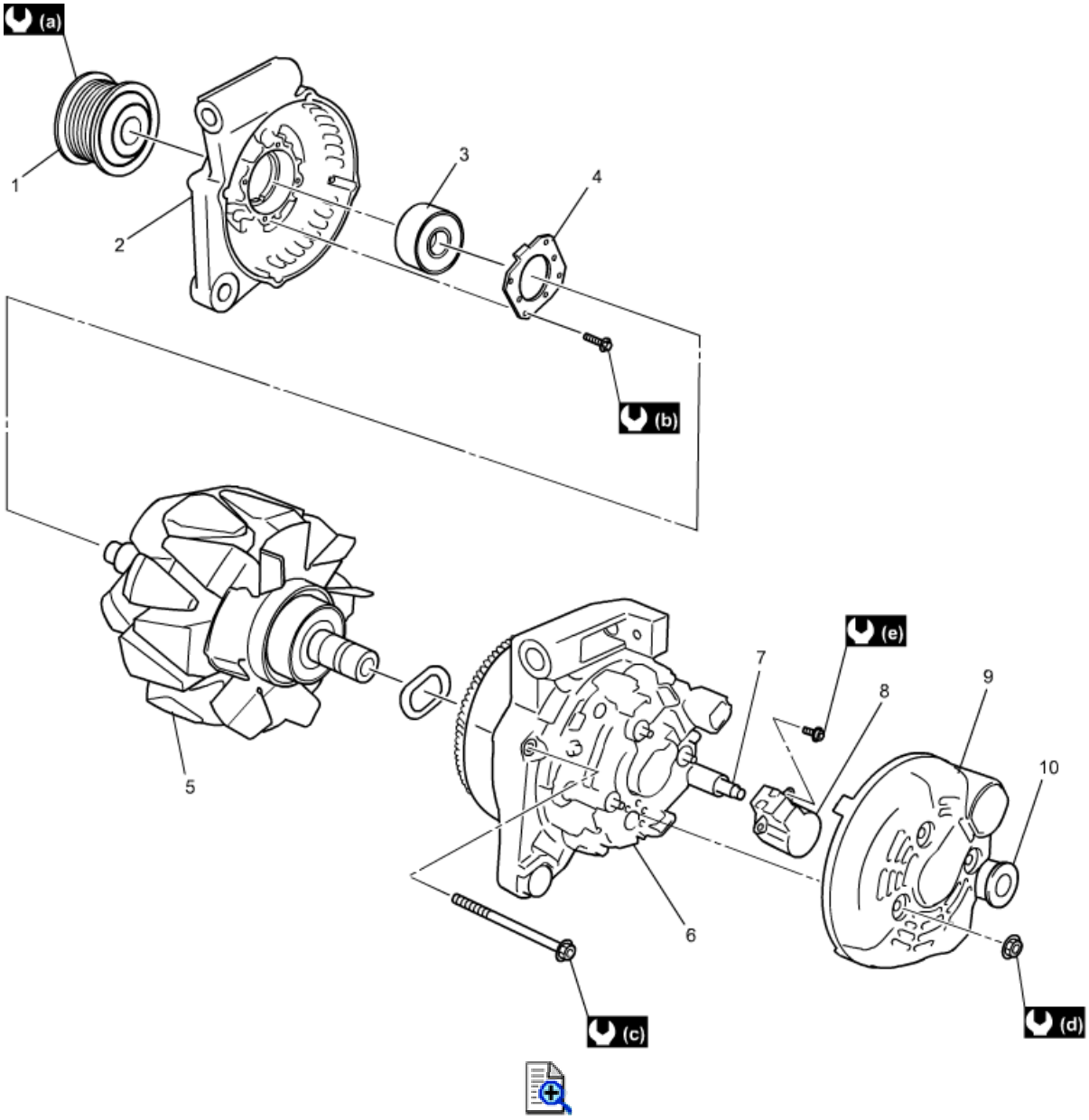
Generator Components



1. Pulley	6. Stator assembly	(a): 110 N·m (11.2 kgf-m, 81.5 lbf-ft)
2. Drive end frame	7. “B” terminal	(b): 2.3 N·m (0.23 kgf-m, 2.0 lbf-ft)
3. Drive end bearing	8. Brush holder assembly	(c): 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)
4. Bearing retainer	9. Rear end cover	(d): 4.5 N·m (0.46 kgf-m, 3.5 lbf-ft)
5. Rotor	10. Terminal bushing	(e): 2.0 N·m (0.20 kgf-m, 1.5 lbf-ft)

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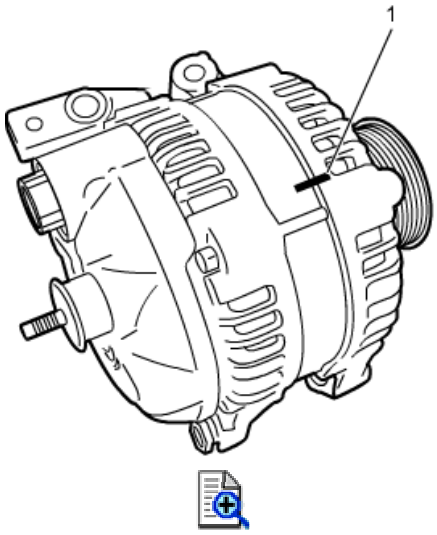
Generator Disassembly and Reassembly

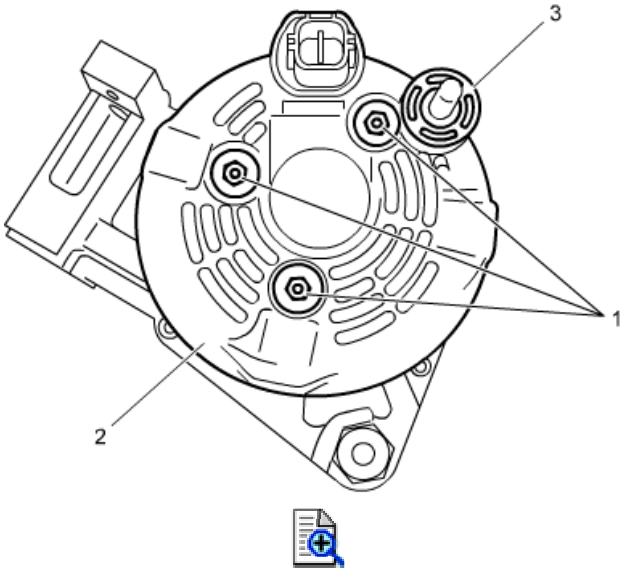
Reference: Generator Removal and Installation
Reference: Generator Components

Disassembly

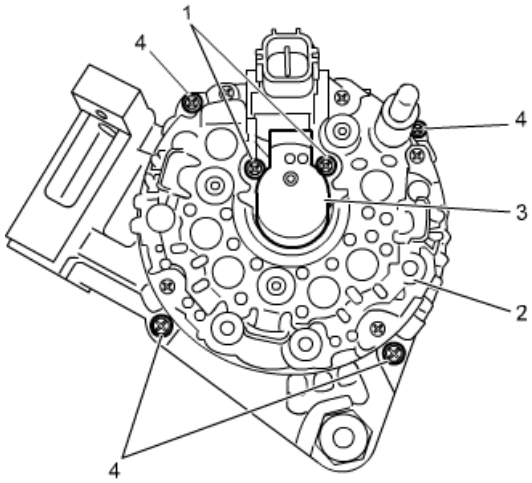
1) For easier reassembly, draw matchmark (1) on drive end frame and stator assembly as shown in figure.



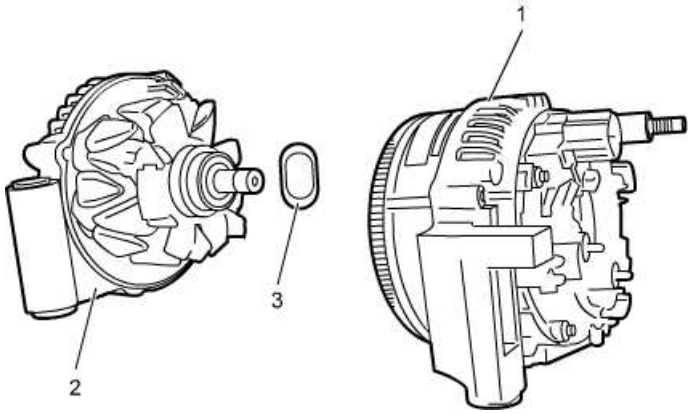
2) Loosen rear end cover nuts (1) and remove rear end cover (2) from stator assembly.
3) Remove terminal bushing (3).



4) Loosen brush holder screws (1) and remove brush holder assembly (3) from stator assembly (2).
5) Loosen stator assembly bolts (4).

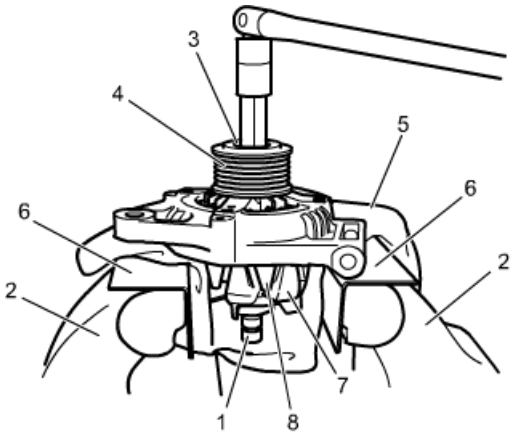


6) Remove rotor assembly (2) from stator assembly (1) and remove wave washer (3).

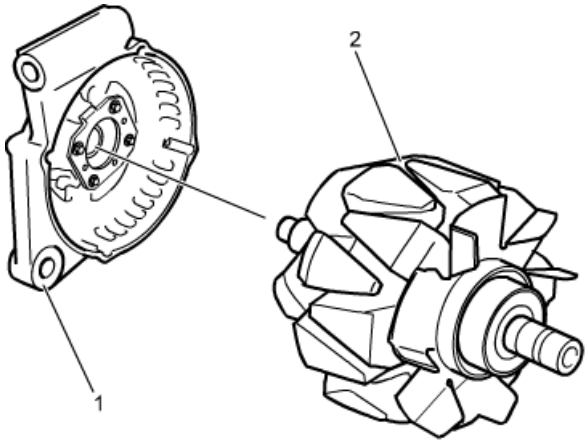


7) Hold rotor (1) by using vise (2), loosen pulley nut (3) and remove pulley (4).

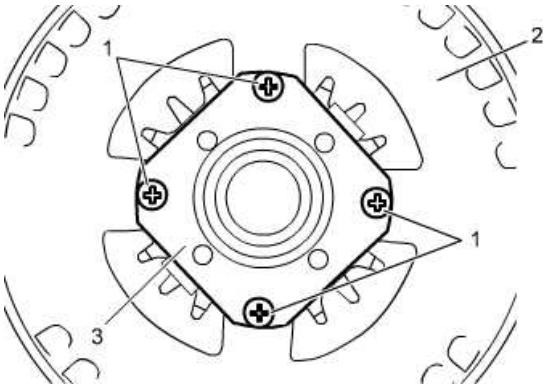
CAUTION:
- **When using vise, put clean cloth (5) and aluminium plate (6) between rotor and vise so as not to cause damage to rotor.**
- **Be sure to hold the location (7). Do not hold the location (8) as it does not have enough structural strength.**



8) Remove rotor (2) from drive end frame (1).



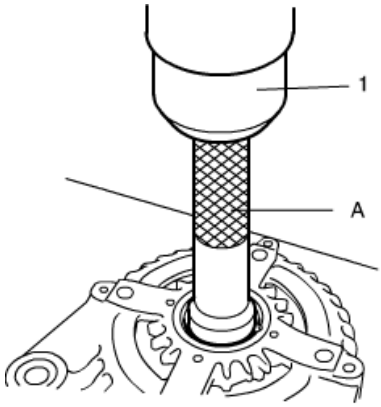
9) Loosen bearing retainer screws (1) and remove bearing retainer (3) from drive end frame (2).



10) Push out drive end bearing by using special tool and hydraulic press (1).

Special Tool

(A): 09913–75821



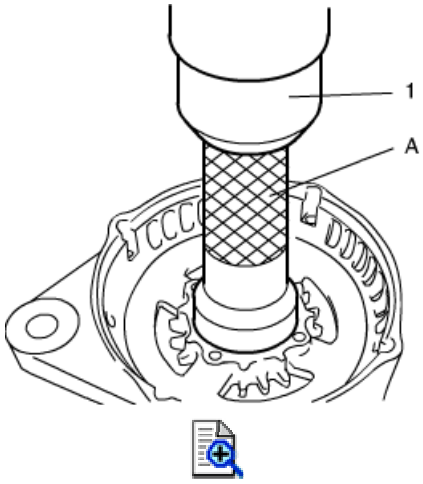
Reassembly

Reference: Generator Inspection

1) Press-fit drive end bearing by using special tool and hydraulic press (1).

Special Tool

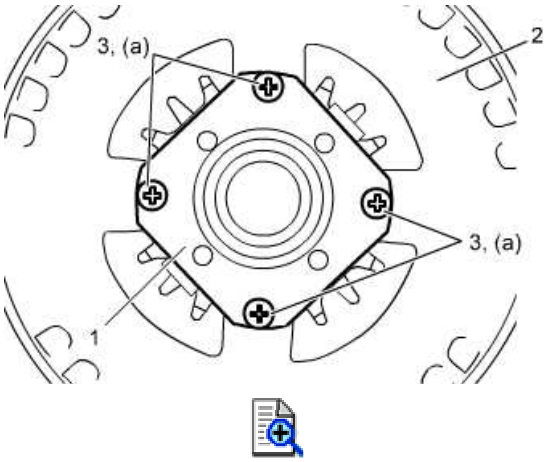
(A): 09913–76010



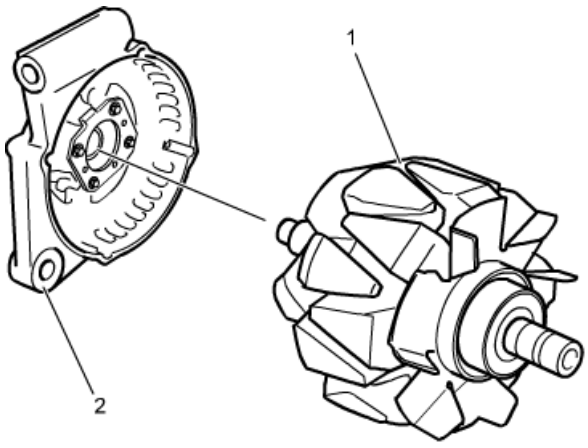
2) Install bearing retainer (1) to drive end frame (2) and tighten bearing retainer screws (3) to specified torque.

Tightening torque

Bearing retainer screw (a): 2.3 N·m (0.23 kg-m, 2.0 lbf-ft)



3) Install rotor (1) to drive end frame (2)

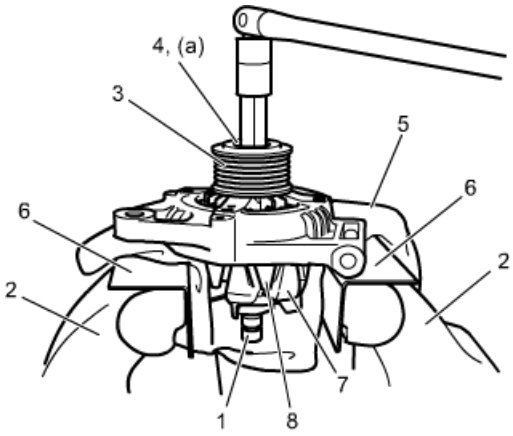


4) Hold rotor (1) by using vise (2), install pulley (3) and tighten pulley nut (4) to specified torque.

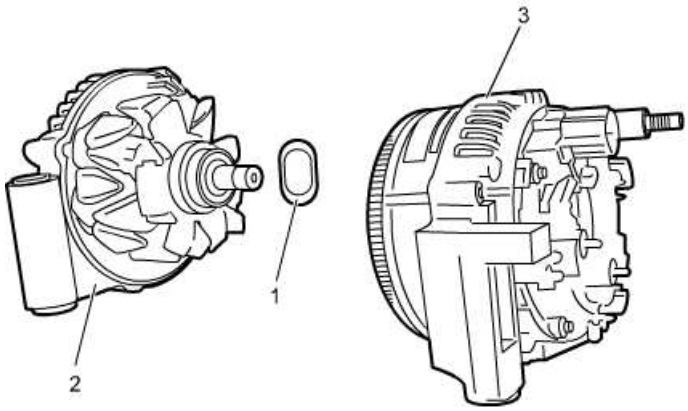
CAUTION:
- **When using vise, put clean cloth (5) and aluminium plate (6) between rotor and vise so as not to cause damage to rotor.**
- **Be sure to hold the location (7). Do not hold the location (8) as it does not have enough structural strength.**

Tightening torque

Pulley nut (a): 110 N·m (11.2 kg-m, 81.5 lbf-ft)



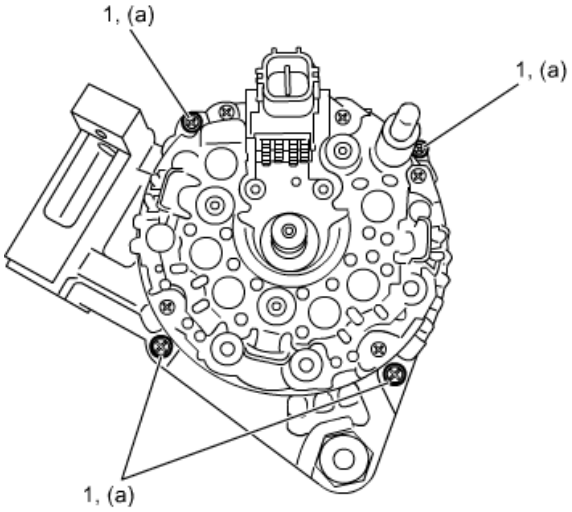
5) Install wave washer (1) and stator assembly (3) to rotor assembly (2) in alignment with matchmark drawn before disassembly.



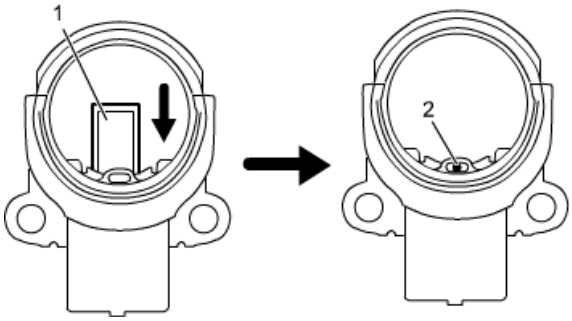
6) Tighten stator assembly bolts (1) to specified torque.

Tightening torque

Stator assembly bolt (a): 6.0 N·m (0.61 kg-m, 4.5 lbf-ft)



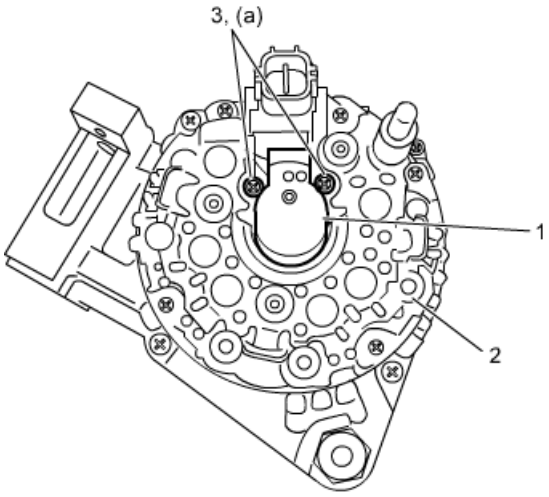
7) Install brush holder assembly to stator assembly as follows.
a) Depress brush (1) and install pin (2) while brush is depressed.



b) Install brush holder assembly (1) to stator assembly (2) and tighten brush holder screws (3) to specified torque.

Tightening torque

Brush holder screw (b): 2.0 N·m (0.20 kg-m, 1.5 lbf-ft)



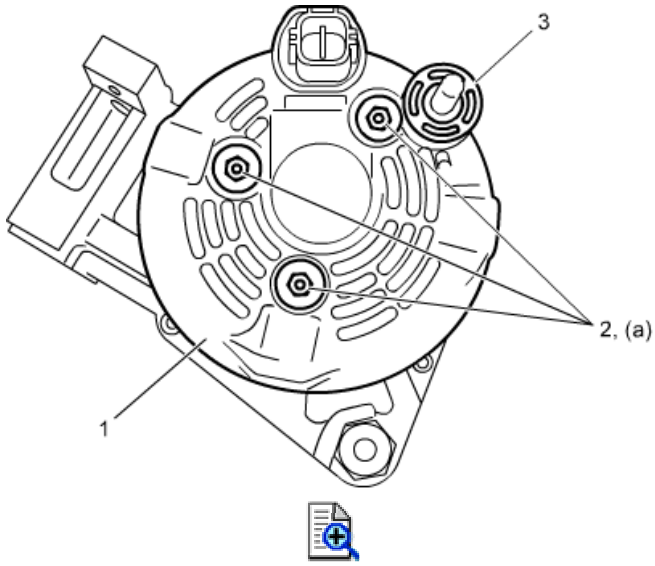
c) Remove pin from brush holder assembly.

8) Install rear end cover (1) to stator assembly and tighten rear end cover nuts (2) to specified torque.

Tightening torque

Rear end cover nut (a): 4.5 N·m (0.46 kg-m, 3.5 lbf-ft)

9) Install terminal bushing (3).



10) Check that rotor turns smoothly.

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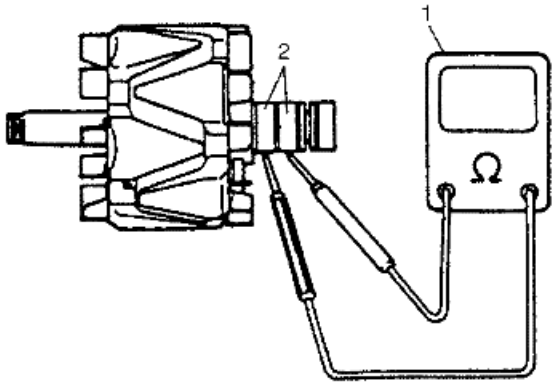
Generator Inspection

Reference: Generator Removal and Installation
Reference: Generator Components

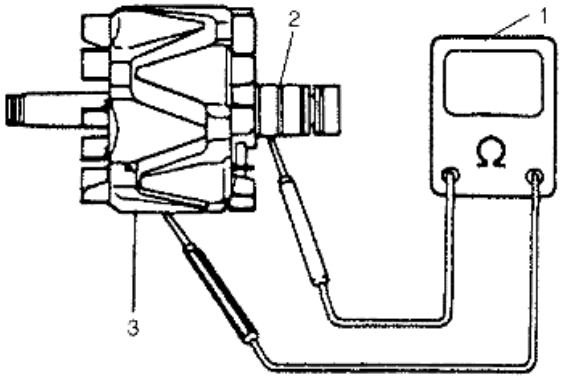
Rotor

1) Using ohmmeter (1), check for continuity between slip rings (2) of rotor. If there is no continuity, replace rotor.

Standard resistance between slip rings of rotor
1.7 – 2.1 Ω



2) Using ohmmeter (1), check that there is no continuity between slip ring (2) and rotor core (3). If there is continuity, replace rotor.



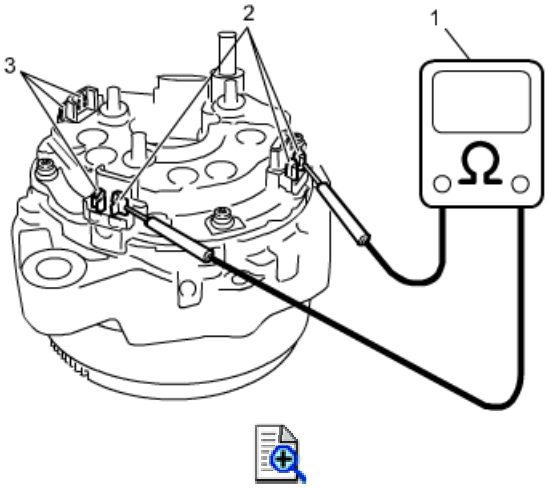
3) Check slip rings and rotor fan surface for roughness or scoring. If roughness or scoring is discovered, replace rotor.

Bearing

Check bearing for smooth rotation.
If any abnormality is found, replace bearing.

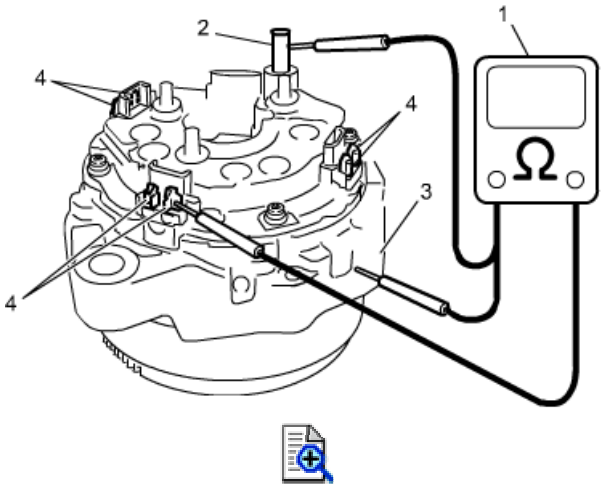
Stator and Rectifier

1) Using ohmmeter (1), check continuity between all pairs of leads (2) and (3).
If there is no continuity, replace stator.



2) Using ohmmeter (1), check continuity between the following terminals.
- "B" terminal (2) and each coil lead (4)
- Ground (3) and each coil lead (4).

Switch the positive (+) side prove and negative (−) side and measure to check continuity in both polarity directions.
If there is continuity in only one polarity direction, stator coil is normal.
If there is no continuity with either polarity or there is continuity with both polarities, replace stator.

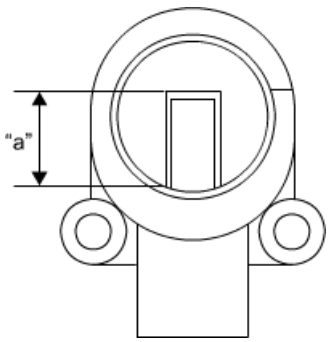


Brush and Brush Holder

Check each brush for wear by measuring them as shown in figure.
Replace brushes, if they are shorter than the limit.

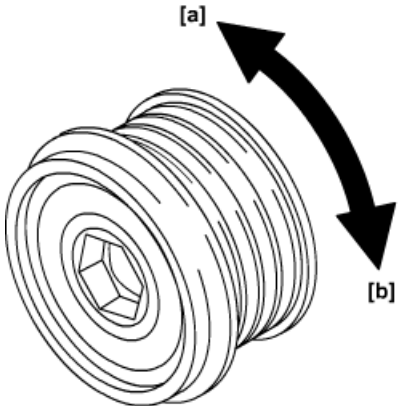
Exposed brush length "a"

Standard: 10.5 mm (0.413 in.)
Limit: 1.5 mm (0.059 in.)



Pulley

- Check pulley for wear, damage or other abnormal conditions. Replace pulley if necessary.
- Check pulley according to the following procedure.
  a. Hold center of pulley.
  b. Check that pulley locks up when turned in clockwise [b] and rotates smoothly in counterclockwise [a].
  If any faulty condition is found, replace pulley.



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Charging System Specifications

Battery

Battery specification

Battery type: 24R – 700 (55 AH / 5HR) 12 V

Generator

Rated voltage	12 V
Nominal output	130 A
Max. permissible speed	18,000 rpm
No-load speed	1,500 rpm
Regulated voltage	14.2 – 14.8 V
Permissible ambient temperature range	–30 to 90 °C (–22 to 194 °F)
Polarity	Negative (–) ground
Rotation	Clockwise viewed from pulley side

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Tightening Torque Specifications

CAUTION:
For fastener with * (asterisk) below, be sure to tighten it according to specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Tensioner bolt	25	2.5	18.5	☞
Idler pulley nut	40	4.1	29.5	☞
Generator bolt*	45	4.6	33.5	☞
"B" terminal nut	11	1.1	8.5	☞
Bearing retainer screw	2.3	0.23	2.0	☞
Pulley nut	110	11.2	81.5	☞
Stator assembly bolt	6.0	0.61	4.5	☞
Brush holder screw	2.0	0.20	1.5	☞
Rear end cover nut	4.5	0.46	3.5	☞

NOTE:
The specified tightening torque is described in the following.
Generator Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

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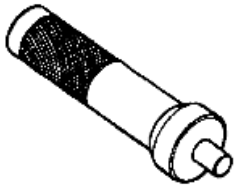
Special Tool

09913–75821 Bearing installer attachment 	 
09913–76010 Bearing installer 	 

Precautions for Cooling System

WARNING:

- **Be sure to check coolant level only on coolant reservoir (a translucent container) and add coolant only into the reservoir when replenishment is needed. Never remove radiator cap to check coolant level or add coolant, as doing so is very dangerous for the following reasons:**
  - **— Coolant in cooling system may be extremely high in temperature, even exceeding the boiling point as it is under pressure. If radiator cap is removed in this condition, high-temperature and high-pressure coolant will instantaneously boil up and gush out; you could then be seriously scalded by hot coolant and steam. Furthermore, as coolant contains flammable anti-freeze material, coolant splashing over engine and fenders can start fire.**
- **Be sure to check that engine coolant is cold before removing any part of cooling system.**
- **Be sure to disconnect negative (−) cable from battery before removing any part of cooling system.**

Cooling System Description

The cooling system consists of a radiator, coolant reservoir, water pump, cooling fan and thermostat. The radiator is of a tube-and-fin type.

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Coolant Description

The coolant recovery system is a standard system, which allows part of coolant to flow from the radiator into the coolant reservoir when it is expanded by heat. When the cooling system cools down, the coolant in the coolant reservoir is drawn back into the radiator.
The cooling system has been filled with a SUZUKI super long life coolant (coolant color: Blue) that is a 50/50 mixture of ethylene glycol antifreeze and deionized water. This coolant solution provides freezing protection to −36 °C (−33 °F).

- Freeze protection down to −36 °C (−33 °F) is also important to ensure protection against corrosion and loss of coolant from boiling. This level of protection should be maintained even if freezing temperatures are not expected.

CAUTION:

- **Ethanol or methanol base coolant or water alone should not be used in cooling system at any time as damage to cooling system could occur.**
- **Cooling system of this model is originally filled with SUZUKI super long life coolant (coolant color: Blue) diluted to the 50 percentage with deionized water.**
- **SUZUKI super long life coolant (coolant color: Blue) as supply part is already diluted to the 50 percentage with deionized water. Use it as it is without diluting.**
- **Any treatment on SUZUKI super long life coolant (coolant color: Blue) shown below reduces its durability (maintenance interval) and should be avoided. However, if any of the following cases applies, follow the maintenance schedule of SUZUKI long life coolant (coolant color: Green):** ☞
  - **— When the SUZUKI super long life coolant (coolant color: Blue) is diluted with water other than deionized water.**
  - **— When the SUZUKI super long life coolant (coolant color: Blue) is mixed with a SUZUKI long life coolant (coolant color: Green).**
- **Do not flush the cooling system. Doing so may cause new coolant to become diluted by the water remaining in the system. (The cooling system filled with the SUZUKI super long life coolant (coolant color: Blue) needs no flushing.)**

Antifreeze concentration table

Freeze protection temperature	°C	−36
	°F	−33
Concentration	%	50

Coolant capacity

Engine, radiator and heater: 5.8 liters (12.26/10.21 US/Imp pt.)
Reservoir: 0.8 liters (1.69/1.41 US/Imp pt.)
Total: 6.6 liters (13.95/11.61 US/Imp pt.)

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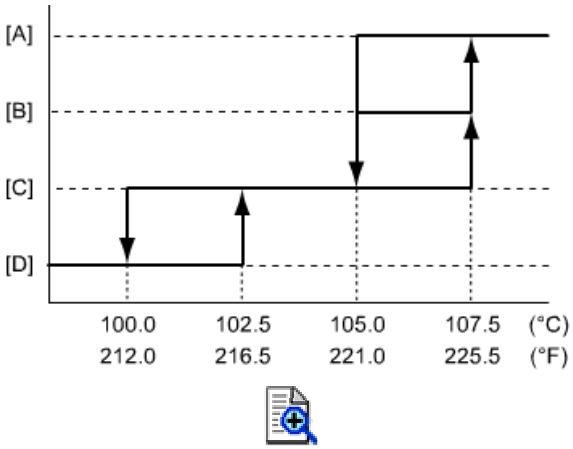
Cooling Fan Operation Description

Radiator cooling fan motors are controlled by ECM in the following conditions:

Cooling fan operation mode	OFF	Low	Mid	High
Main fan motor	OFF	Low speed	OFF	High speed
Sub fan motor	OFF	Low speed	High speed	High speed

A/C switch: OFF

NOTE:
The following table indicates cooling fan operation while engine is running at 1,250 rpm.
The number of engine revolutions determines the temperature at which the cooling fan motor speed changes.



[A]: High	[C]: Low
[B]: Mid	[D]: OFF

A/C switch: ON

Low speed

Cooling fan operates at low speed when A/C refrigerant pressure is more than 0.34 MPa (3.5 kgf/cm², 49.3 psi).

Middle speed

Cooling fan operates at middle speed for a given time (0.5 sec.) when fan speed changes high from low.

High speed

Cooling fan operates at high speed when A/C refrigerant pressure is more than 1.6 MPa (16.3 kgf/cm², 232 psi).

Fail-safe

Cooling fan operates at high speed when malfunction is detected by ECT sensor.

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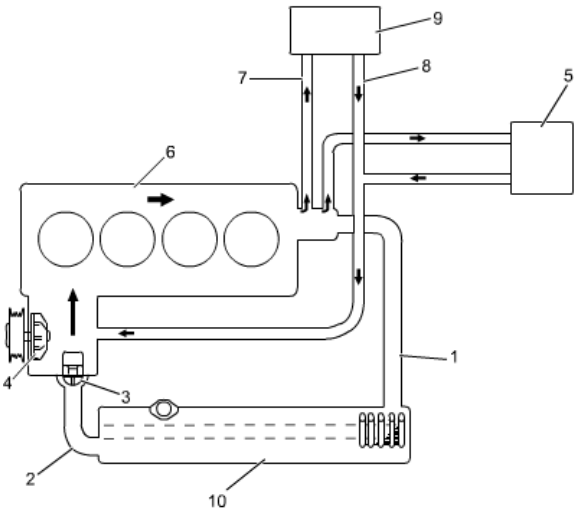
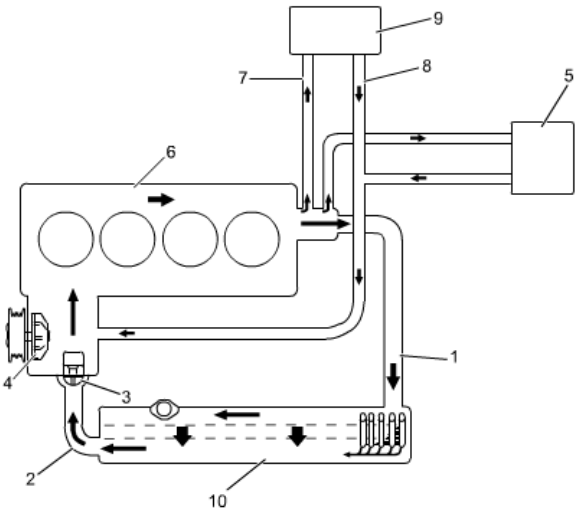
Coolant Circulation

[A]



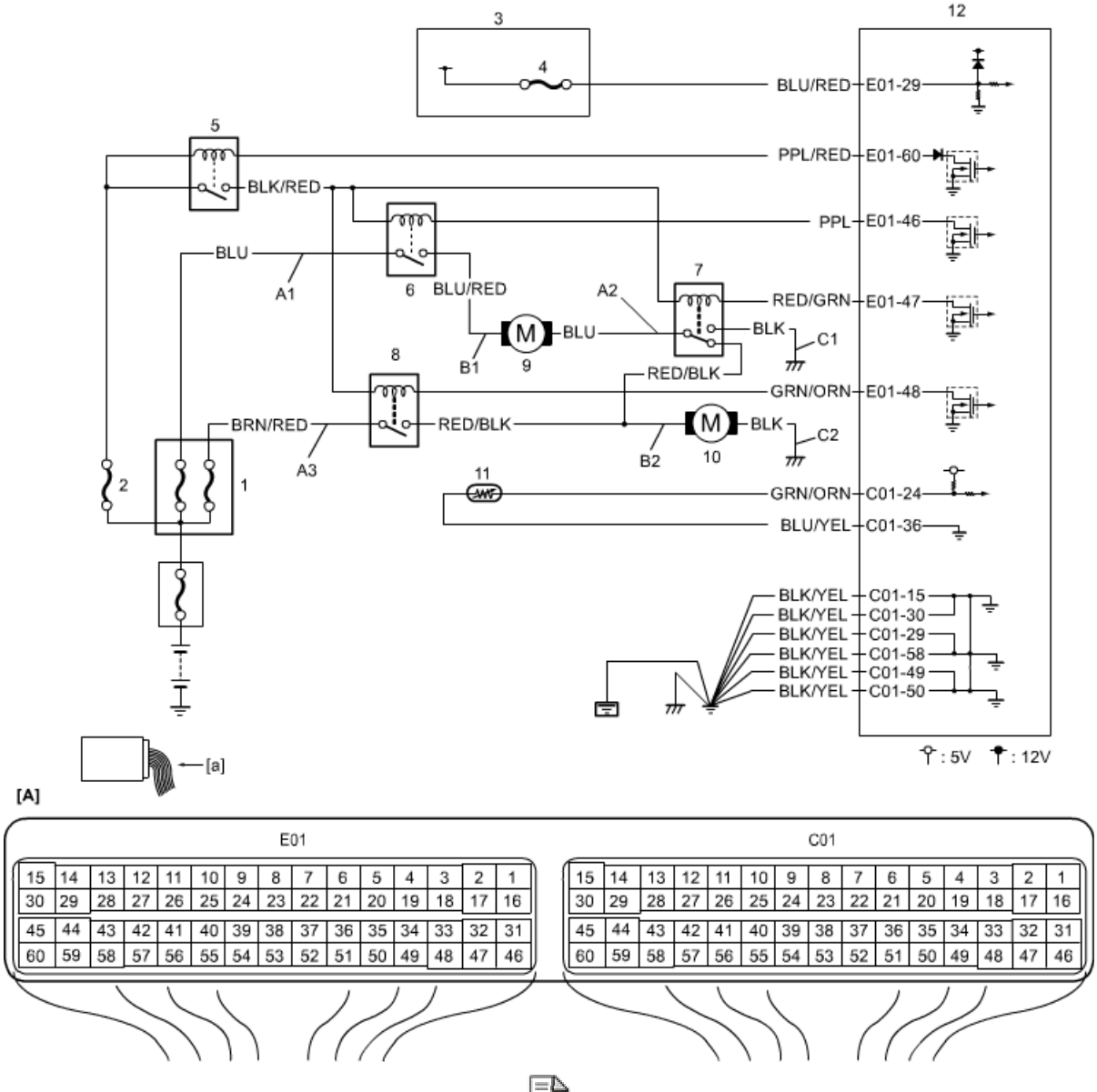
[B]



[A]: Engine is cool (thermostat closed)	3. Thermostat	7. Heater core inlet hose
[B]: Engine is normal operating temperature (thermostat open)	4. Water pump	8. Heater core outlet hose
1. Radiator inlet hose	5. Throttle body	9. Heater core
2. Radiator outlet hose	6. Engine	10. Radiator

1F

Radiator Cooling Fan Control System Circuit Diagram



[A]: ECM connector (View: [a])	C2: Radiator main fan motor ground circuit	7. Radiator cooling fan relay No.2
A1: Radiator cooling fan relay No.1 power supply circuit (switch side)	1. Main fuse box	8. Radiator cooling fan relay No.3
A2: Radiator cooling fan relay No.2 power supply circuit (switch side)	2. "FI" fuse	9. Radiator cooling sub fan motor
A3: Radiator cooling fan relay No.3 power supply circuit (switch side)	3. J/B	10. Radiator cooling main fan motor
B1: Radiator cooling sub fan motor drive circuit	4. "IG COIL" fuse	11. ECT sensor
B2: Radiator cooling main fan motor drive circuit	5. Main relay	12. ECM
C1: Radiator cooling fan relay No.2 ground circuit	6. Radiator cooling fan relay No.1	

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Engine Cooling System Symptom Diagnosis

Condition	Possible Cause	Action
Engine overheats (Radiator fan operates)	Loose or broken accessory drive belt	*Check accessory drive belt.* ☞
	Not enough coolant	*Check coolant level and add if necessary.* ☞
	Faulty thermostat	*Check thermostat.* ☞
	Faulty water pump	*Check water pump.* ☞
	Dirty or bent radiator fins	*Clean or remedy.* ☞
	Check cooling system for leakage on cooling system	*Check cooling system for leakage.* ☞
	Clogged radiator	*Replace radiator.* ☞
	Faulty radiator cap	*Check radiator cap.* ☞
	Dragging brakes	*Check brake.* ☞
	Slipping clutch	*Check clutch.* ☞
	Poor charged battery	*Check battery.* ☞
	Poor electricity generated by generator	*Check generator.* ☞
	Faulty ECT sensor	*Check ECT sensor.* ☞
	Faulty radiator cooling fan motor	*Check radiator cooling fan motor.* ☞
	Faulty ECM	*Check ECM and its circuit.* ☞
	Faulty radiator cooling fan relay	*Check radiator cooling fan relay.* ☞
	Faulty wiring or grounding	*Repair wiring.*
	Equipped with too many additional electrical part(s)	*Remove electrical parts.*
Engine overheats (Radiator fan does not operate)	Fuse blown	*Check fuse.*
	Faulty radiator cooling fan relay	*Check radiator cooling fan relay.* ☞
	Faulty ECT sensor	*Check ECT sensor.* ☞
	Faulty radiator cooling fan motor	*Check radiator cooling fan motor.* ☞
	Faulty wiring or grounding	*Repair wiring.*
	Faulty ECM	*Check ECM and its circuit.* ☞

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Radiator Cooling Fan Control System Check

Refer to ***Radiator Cooling Fan Control System Circuit Diagram*** about circuit diagram.

WARNING:
Keep hands, tools, and clothing away from radiator cooling fan to prevent personal injury. This fan is driven by electric motor that can turn on whether or not the engine is running. There is a risk that fan motor may start automatically in response to ECT sensor signal if ignition mode of keyless push start system is at "ON".

Step	Action	YES	NO
1	**DTC Check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Connect SUZUKI scan tool to data link connector (DLC). 3) Push engine switch to change ignition mode to "ON" and check DTC. ***Is there DTC(s)?***	Go to applicable DTC flow and recheck DTC.	Go to Step 2.
2	**Radiator cooling fan low mode control check** 1) Check radiator cooling fan control for low mode. ☞ ***Is it in good condition?***	Go to Step 3.	Go to Step 6.
3	**Radiator cooling fan mid and high mode control check** 1) Check radiator cooling fan control for mid and high mode. ☞ ***Is it in good condition?***	Radiator cooling fan control system is in good condition.	Go to Step 4.
4	**Radiator cooling fan relay No.3 power supply circuit (switch side) check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Remove radiator cooling fan relay No.3 from main fuse box. 3) Check for proper connection to radiator cooling fan relay No.3 at each terminal. 4) If OK, measure voltage between radiator cooling fan relay No.3 power supply circuit (switch side) (A3) and ground. ☞	Go to Step 5.	Repair or replace radiator cooling fan relay No.3 power supply circuit (switch side).

	Is it 10 – 14 V?		
5	**Radiator cooling fan relay No.2 ground circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Remove radiator cooling fan relay No.2 from main fuse box. 3) Check for proper connection to radiator cooling fan relay No.2 at each terminal. 4) If OK, measure resistance between radiator cooling fan relay No.2 ground circuit (C1) and ground. ☞ ***Is resistance 3 Ω or less?***	Go to Step 6.	Repair or replace radiator cooling fan relay No.2 ground circuit.
6	**Radiator cooling fan relay No.1 power supply circuit (switch side) check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Remove radiator cooling fan relay No.1 from main fuse box. 3) Check for proper connection to radiator cooling fan relay No.1 at each terminal. 4) If OK, measure voltage between radiator cooling fan relay No.1 power supply circuit (switch side) (A1) and ground. ***Is it 10 – 14 V?***	Go to Step 7.	Repair or replace radiator cooling fan relay No.1 power supply circuit (switch side).
7	**Radiator cooling fan relay No.1, No.2 and No.3 check** 1) Check radiator cooling fan relay No.1, No.2 and No.3. ☞ ***Is it in good condition?***	Go to Step 8.	Replace faulty radiator cooling fan relay.
8	**Sub fan motor drive circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect sub fan motor connector. 3) Check for proper connection to sub fan motor at each terminal. 4) If OK, check the following points. • Resistance of sub fan motor drive circuit (B1): less than 3	Go to Step 9.	Repair or replace sub fan motor drive circuit.

	Ω • Resistance between sub fan motor drive circuit and ground: infinity • Voltage of sub fan motor drive circuit: 0 – 1 V (with the ignition mode of keyless push start system in "ON") ***Are they in good condition?***		
9	**Radiator cooling fan relay No.2 power supply circuit (switch side) check** 1) Check the following points. • Resistance of radiator cooling fan relay No.2 power supply circuit (switch side) (A2): less than 3 Ω • Resistance between radiator cooling fan relay No.2 power supply circuit (switch side) and ground: infinity • Voltage of radiator cooling fan relay No.2 power supply circuit (switch side): 0 – 1 V (with the ignition mode keyless push start system in "ON") ***Is it in good condition?***	Go to Step 10.	Repair or replace radiator cooling fan relay No.2 power supply circuit (switch side).
10	**Main fan motor drive circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect main fan motor connector. 3) Check for proper connection to main fan motor at each terminal. 4) If OK, check the following points. • Resistance of main fan motor drive circuit (B2): less than 3 Ω • Resistance between main fan motor drive circuit and ground: infinity • Voltage of main fan motor drive circuit: 0 – 1 V (with the ignition mode of keyless start push system in "ON") ***Is it in good condition?***	Go to Step 11.	Repair or replace main fan motor drive circuit.
11	**Main fan motor ground circuit check**	Go to Step 12.	Repair or replace main fan motor ground circuit.

	1) Measure resistance between main fan motor ground circuit (C2) and ground. ***Is resistance 3 Ω or less?***		
12	**Main fan motor and sub fan motor check** 1) Check main fan motor and sub fan motor. ☞ ***Is it in good condition?***	Replace ECM and recheck DTC. ☞	Replace main fan motor or sub fan motor. ☞

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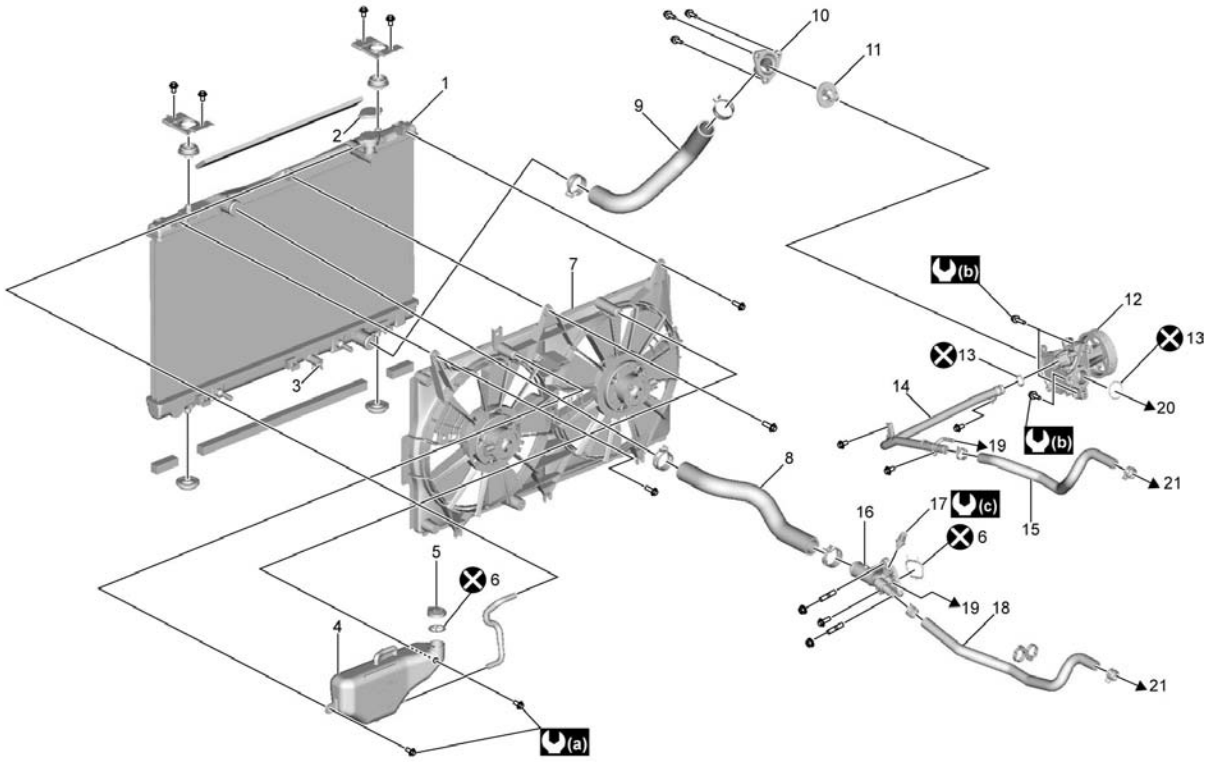
Cooling System Components



1. Radiator	8. Radiator inlet hose	15. Heater outlet hose	(a): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
2. Radiator cap	9. Radiator outlet hose	16. Water outlet cap	(b): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
3. Drain plug	10. Thermostat cap	17. ECT sensor	(c): 13 N·m (1.3 kgf-m, 9.5 lbf-ft)
4. Reservoir	11. Thermostat	18. Heater inlet hose	: Do not reuse.
5. Reservoir cap	12. Water pump	19. To throttle body	
6. Gasket	13. O-ring	20. To cylinder block	
7. Radiator cooling fan assembly	14. Heater outlet pipe	21. To heater core	

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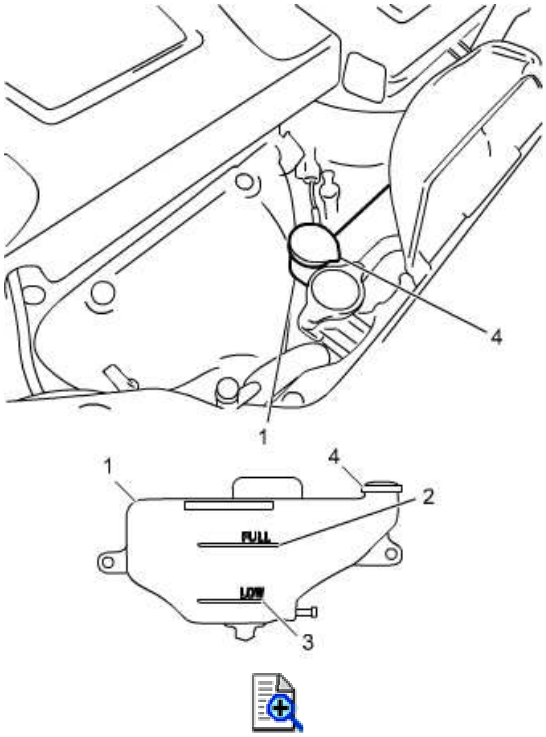
Coolant Level Check

WARNING:
To avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

When engine is cool, check coolant level in reservoir (1).
Normal coolant level should be between FULL mark (2) and LOW mark (3) on reservoir (1).
If coolant level is below LOW mark (3), remove reservoir cap (4) and add proper coolant to reservoir to bring coolant level up to FULL mark (2).
It is not necessary to remove radiator cap to check coolant level.



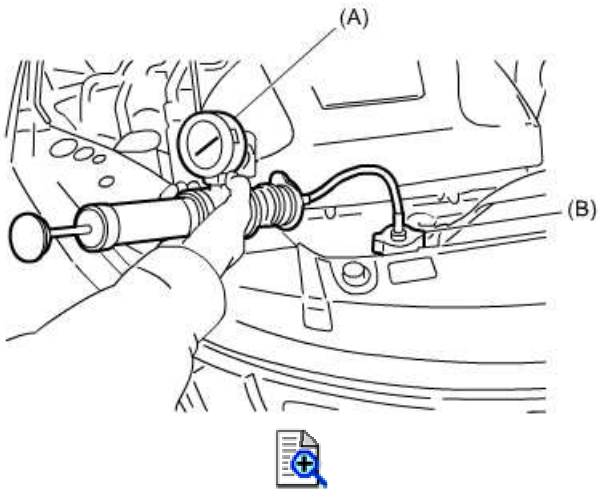
Engine Cooling System Inspection

WARNING:
In order to help avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

1) Check cooling system for leakage or damage.
2) Remove radiator cap.
3) Check coolant for proper level and freeze protection.
4) Check for check cooling system for leakage from cooling system using the following procedures:
a) Attach special tool to water filler, and then apply specified pressure to cooling system.

Special Tool
(A): 09918–78211
(B): 09918–78220

Cooling system holding pressure
123 kPa (1.3 kgf/cm², 17.3 psi)



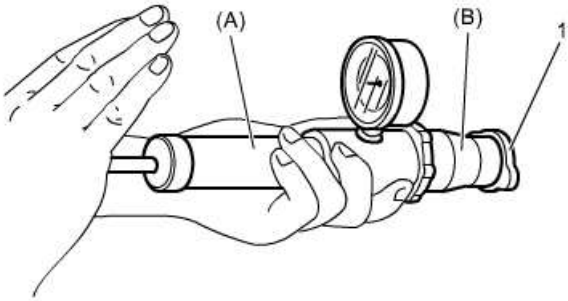
b) Check that cooling system holds the pressure.
If cooling system does not hold applied pressure, check cooling system for leakage.

5) Check radiator cap according to the following procedure.
a) Attach special tool to radiator cap (1), and then apply specified pressure.

NOTE:
Apply water or coolant to rubber seals before attaching special tool to radiator cap.

Special Tool
(A): 09918–78211
(B): 09918–78220

Radiator cap valve opening pressure
93 – 123 kPa (0.9 – 1.3 kgf/cm², 13.4 – 17.3 psi)



b) If radiator cap valve opening pressure is out of specification, replace radiator cap.

6) Detach special tool and rinse off spilled coolant.

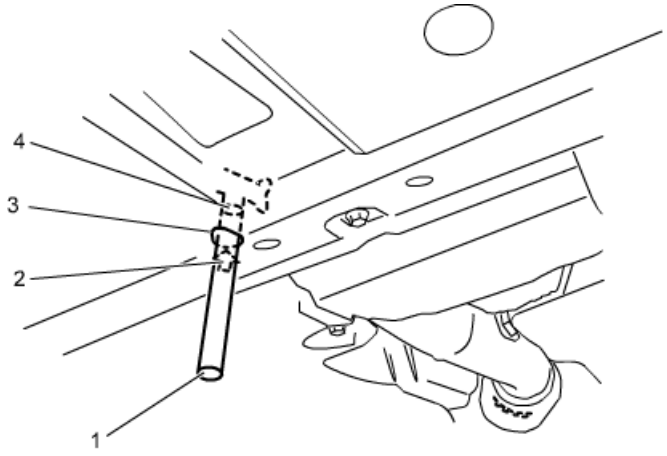
7) Install radiator cap on water filler.

Cooling System Draining

WARNING:
In order to help avoid getting burned, do not remove radiator cap while engine and radiator are still hot. Scalding fluid and steam can be blown out under pressure if cap is taken off too soon.

1) Insert hose (1) through service hole (3) and connect it to drain pipe (4) as shown in figure.

NOTE:
Use internal diameter about 8 mm, length at least 200 mm hose.

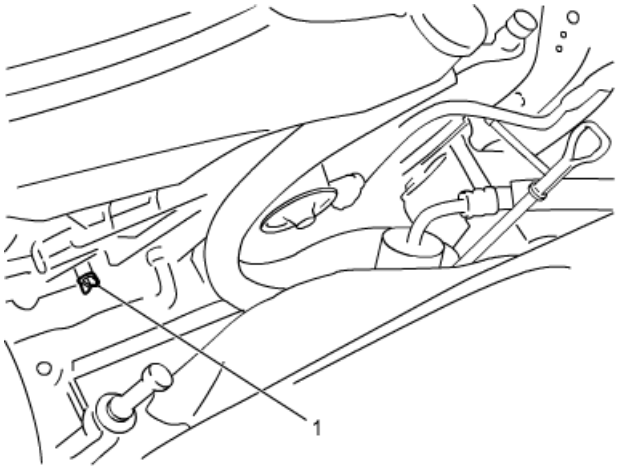


2) Remove radiator cap.

3) Drain coolant loosening radiator drain plug (1).

NOTE:
Over loosening of drain plug may cause coolant to leak from drain plug side.

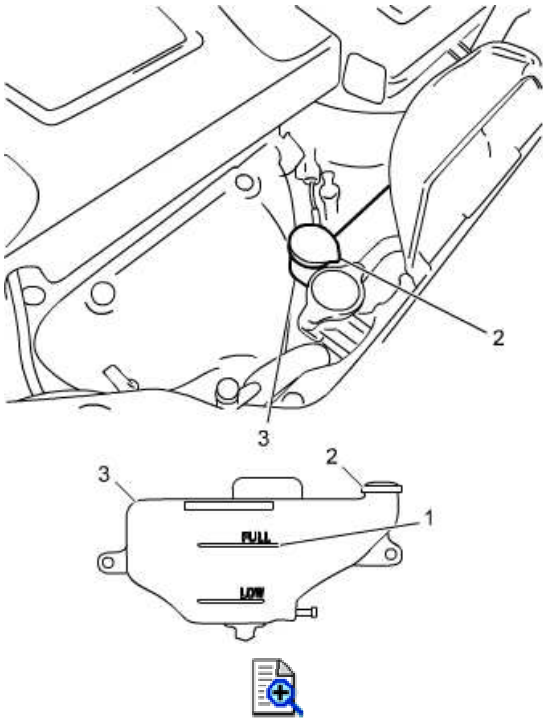
4) After draining coolant, be sure to tighten drain plug (1) securely.



Cooling System Refilling

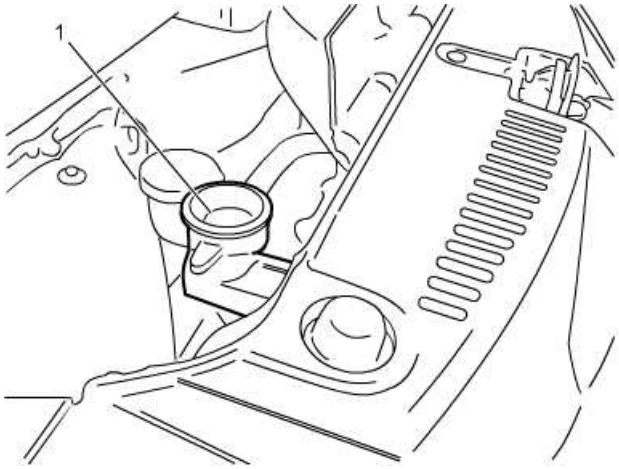
WARNING:
To avoid getting burned, do not remove cap while engine and radiator are still hot. Scalding fluid and steam can gush out under pressure if cap is taken off too soon.

1) Fill reservoir (3) with coolant up to "FULL" level mark (1).
2) Install reservoir cap (2) on reservoir (3).



3) Fill radiator with coolant up to bottom of radiator filler neck (1) and install radiator cap.

Recommended coolant
SUZUKI super long life coolant (coolant color: Blue):
Coolant specification
Freezing temperature: –36 °C (–33 °F)
Antifreeze / anti-corrosion coolant concentration: 50%
Coolant capacity
Engine, radiator and heater: 5.8 liters (12.26/10.21 US/Imp pt.)
Reservoir: 0.8 liters (1.69/1.41 US/Imp pt.)
Total: 6.6 liters (13.95/11.61 US/Imp pt.)



4) Run engine at idle speed.
5) Run engine until radiator fan motor is operated.
6) Stop engine and wait until engine comes cooled down fully.
7) Add coolant to radiator up to bottom of radiator filler neck, and install radiator cap.
8) Repeat Step 4) through 7).
9) Confirm that coolant level in reservoir is at "FULL" level mark. If coolant is insufficient, add coolant.
10) Check for check cooling system for leakage. ☞

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Cooling Water Pipes or Hoses Removal and Installation

Reference: Cooling System Components

Removal

1) Drain coolant. ☞

2) To remove cooling water pipes or hoses, loosen clamp on each hose and pull hose end to disconnect it.

Installation

Reverse removal procedure noting the following points:

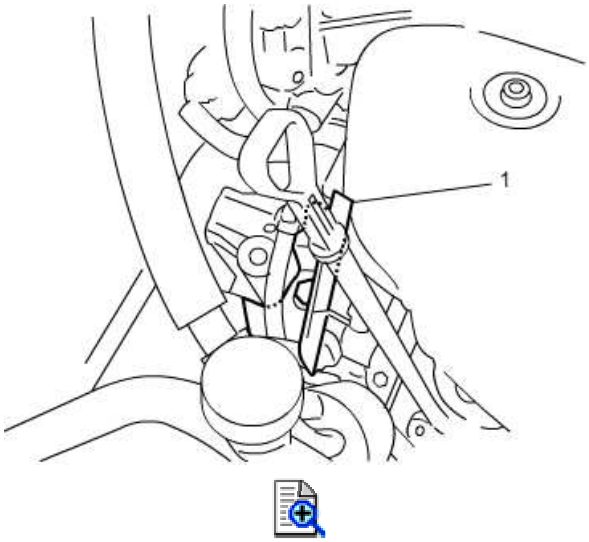
- Tighten each clamp securely with its fastener in proper direction. ☞
- Refill cooling system. ☞
- Check for check cooling system for leakage. ☞

Thermostat Removal and Installation

Removal

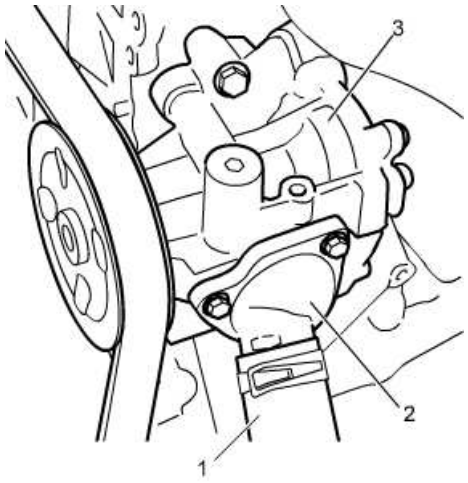
1) Drain coolant. ☞

2) Remove engine wire harness bracket (1).

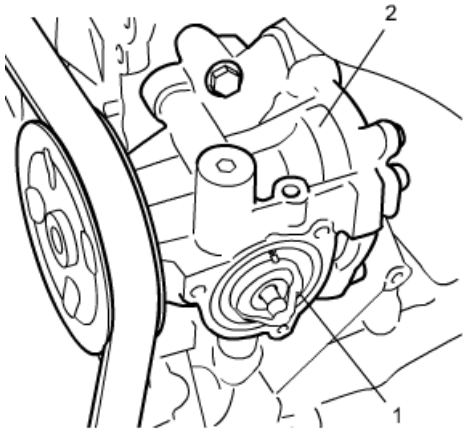


3) Disconnect radiator outlet hose (1) from thermostat cap (2).

4) Remove thermostat cap (2) from water pump (3).



5) Remove thermostat (1) from water pump (2).

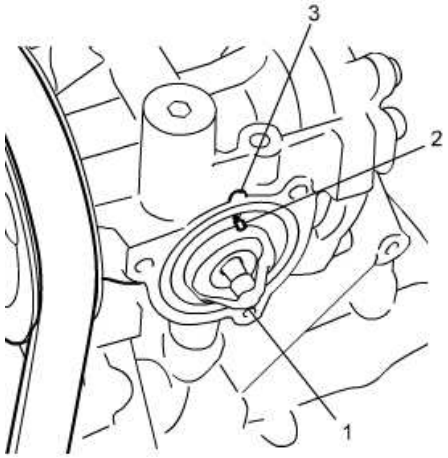


Installation

Reference: Thermostat Inspection

Reverse removal procedure noting the following points:

- When installing thermostat (1) on water pump case, be sure to position it so that air bleed valve (2) is aligned with matchmark (3).



- Refill cooling system. ☞
- Check cooling system for leakage.

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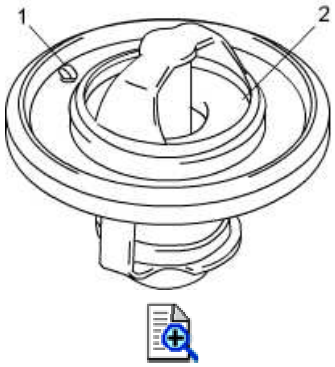
Thermostat Inspection

Reference: Thermostat Removal and Installation

- Check that air bleed valve (1) of thermostat is clean.
- Check that valve seat (2) is free from foreign matters.



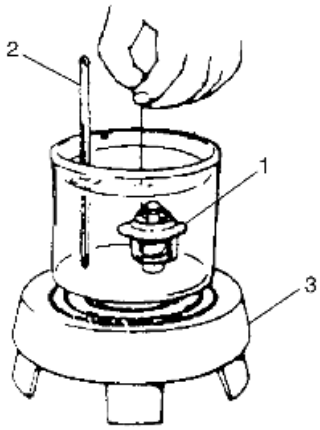
- Check thermostat valve operation using the following procedures:
  a. Immerse thermostat (1) in water, and heat water gradually.
  b. Check that valve is operating with the following specifications:

Temperature at which valve starts opening
80 – 84 °C (176 – 183 °F)

Temperature at which valve becomes fully open
95 °C (203 °F)

Thermostat valve lift
More than 8 mm (0.3 in) at 95 °C (203 °F)

If thermostat valve does not open as specified above, or sticks in any position, replace it.



2. Thermometer	3. Heater

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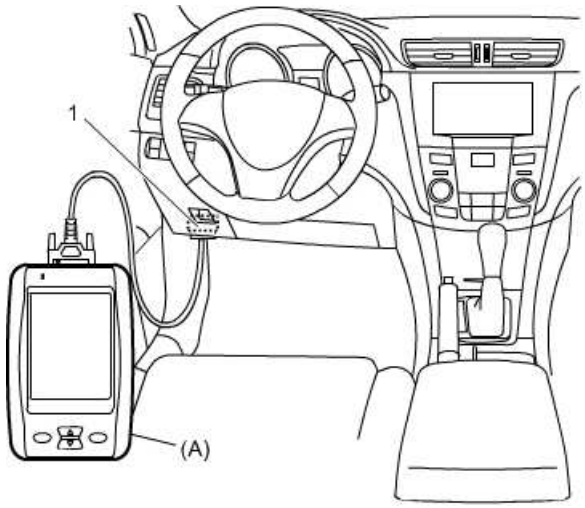
Radiator Cooling Fan Assembly On-Vehicle Inspection

Radiator Cooling Fan Operation

1) Connect scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



2) Push engine switch to change ignition mode to "ON" and clear DTC. ☞

3) Select the "Radiator Fan" function in "Active Test".

4) Check radiator cooling fan operation at low, mid and high modes.
If any abnormality is found, check cooling fan control system referring to ***Radiator Cooling Fan Control System Check***.

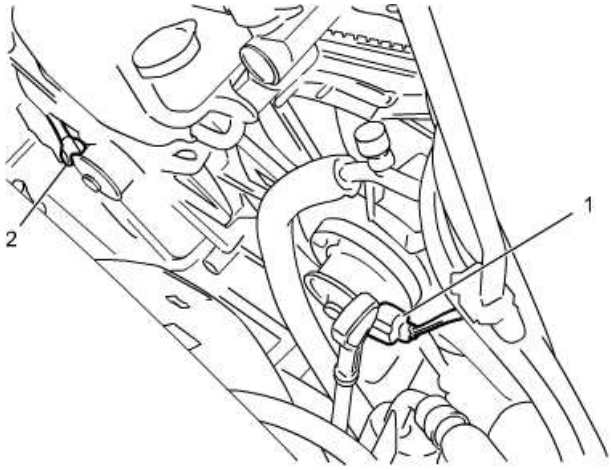
Radiator cooling fan operation

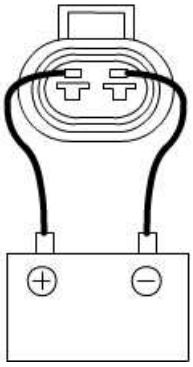
	Main fan motor	Sub fan motor
OFF	OFF	OFF
Low mode	Low speed	Low speed
Mid mode	OFF	High speed
High mode	High speed	High speed

Radiator Cooling Fan Motor

1) Disconnect main fan motor connector (2) and sub fan motor connector (1).

2) Connect each fan motor connector and battery as shown in figure respectively.





3) Check each radiator cooling fan motor for smooth rotation.
If any abnormality is found, replace corresponding radiator cooling fan motor

Radiator Cooling Fan Assembly Removal and Installation

Reference: Radiator Cooling Fan Assembly On-Vehicle Inspection

Removal

1) Remove radiator assembly. ☞

2) Remove radiator cooling fan assembly from radiator. ☞

Installation

Reverse removal procedure noting the following points:

- Refill cooling system. ☞ .
- Check for check cooling system for leakage.

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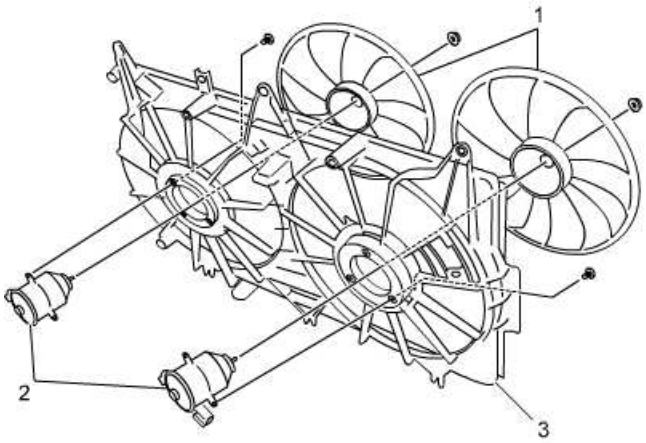
Radiator Cooling Fan Disassembly and Reassembly

Reference: Radiator Cooling Fan Assembly Removal and Installation

Disassembly

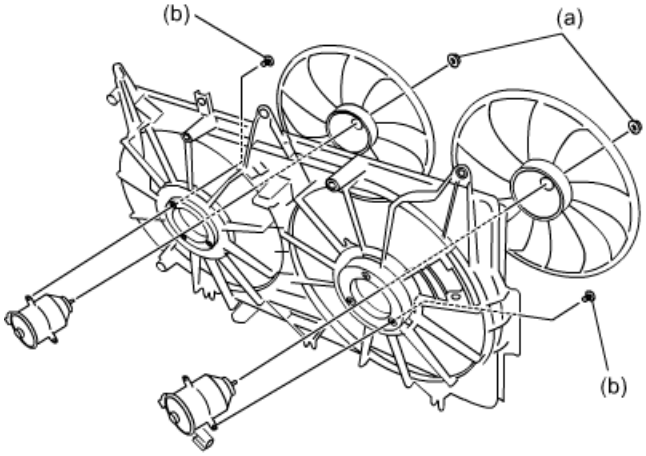
1) Remove fan (1) from cooling fan motor (2).
2) Remove fan motor (2) from cooling fan shroud (3).



Reassembly

Reverse disassembly procedure noting the following points:
- Tighten fan nuts and radiator cooling fan motor bolts to specified torque.

Tightening torque
Fan nut (a): 6.0 N·m (0.61 kg-m, 4.5 lbf-ft)
Radiator cooling fan motor bolt (b): 3.0 N·m (0.31 kg-m, 2.5 lbf-ft)



Radiator On-Vehicle Inspection and Cleaning

Inspection

Check radiator for leakage or damage. Straighten bent fins, if any.

Cleaning

Clean front area of radiator cores.

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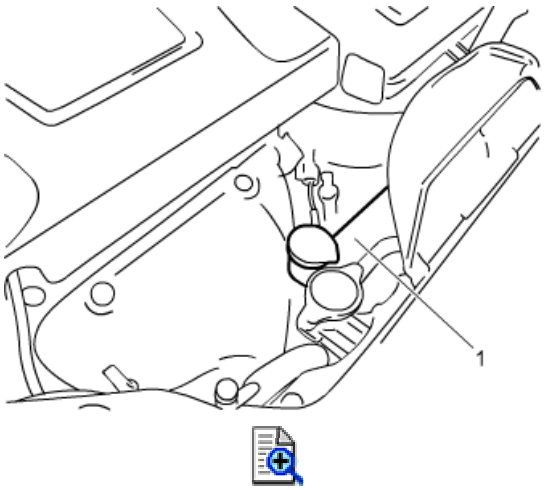
Radiator Removal and Installation

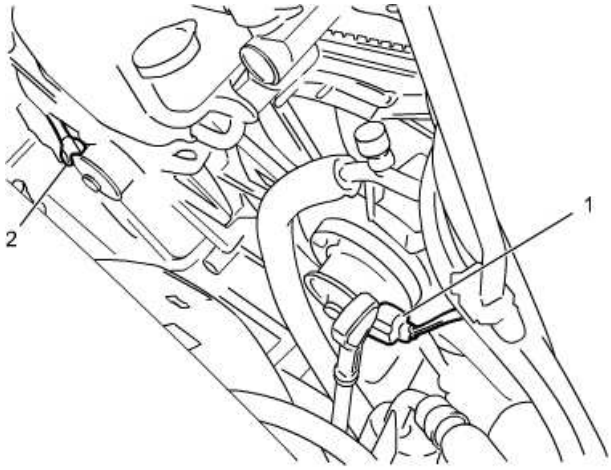
Reference: Radiator On-Vehicle Inspection and Cleaning

Removal

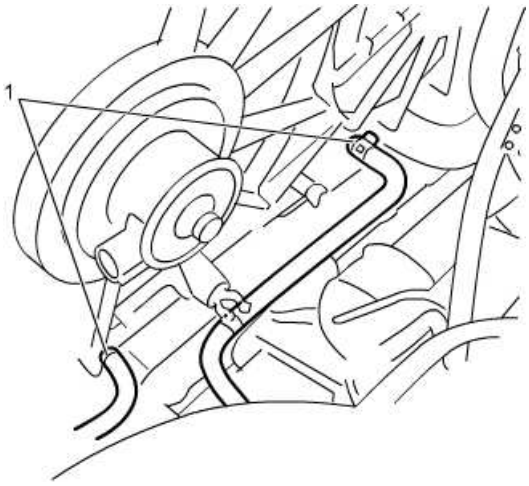
1) Disconnect negative (–) cable from battery.
2) Drain CVT fluid (CVT model). ☞
3) Drain coolant. ☞
4) Remove reservoir (1).



5) Disconnect main fan motor connector (2) and sub fan motor connector (1).



6) Remove front bumper and front bumper lower cover. ☞
7) Remove air cleaner suction pipe. ☞
8) Disconnect CVT fluid cooler hoses (1) from radiator (CVT model).

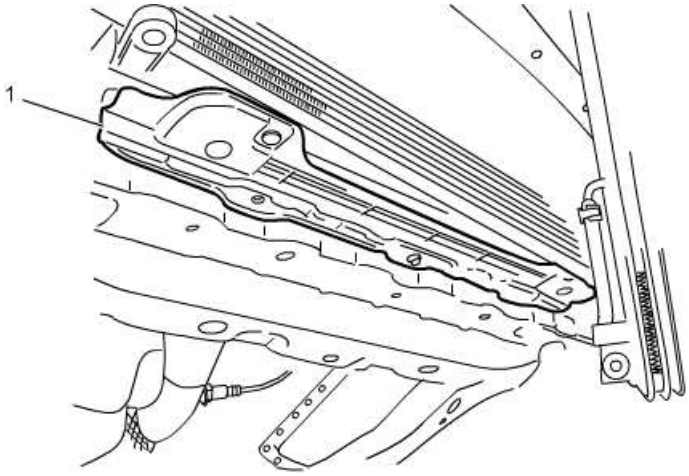


9) Remove radiator inlet hose and outlet hose from radiator. ☞

10) Remove CVT fluid cooler bracket (CVT model). ☞

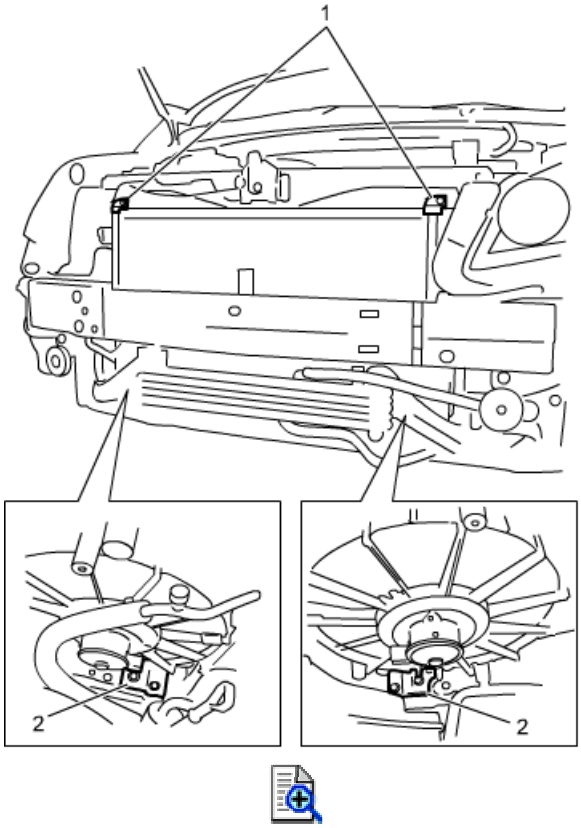
NOTE:
In order to help avoid distortion or deformation of CVT fluid cooler hoses, use a rope to suspend or hold removed CVT fluid cooler.

11) Remove radiator lower shroud (1).



12) Remove condenser upper brackets (1) and radiator brackets (2) from radiator.

NOTE:
In order to help avoid distortion or deformation of discharge hose and liquid pipe, use a rope to suspend or hold removed condenser assembly.



13) Remove radiator assembly from vehicle.

Installation

Reverse removal procedures noting the following points:

- Refill cooling system. ☞
- Check for check cooling system for leakage.
- Refill CVT fluid (CVT model). ☞
- Tighten reservoir bolts to specified torque.

Tightening torque

Reservoir bolt: 10 N·m (1.0 kg-m, 7.5 lbf-ft)

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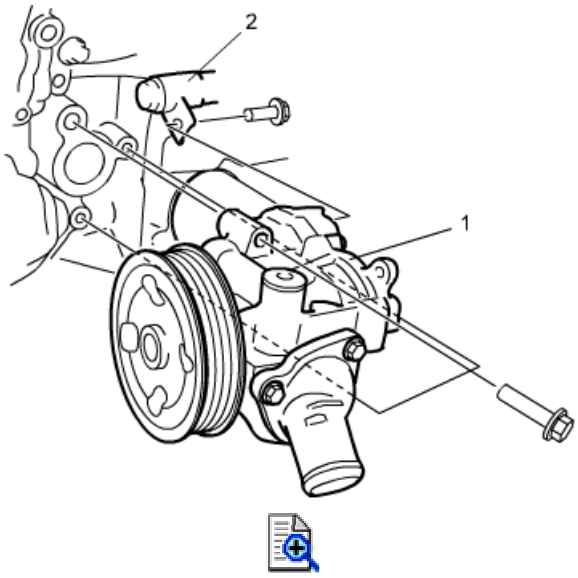
Water Pump Removal and Installation

Removal

1) Disconnect negative (–) cable from battery.
2) Drain coolant. ☞
3) Remove accessory drive belt. ☞
4) Remove engine wire harness bracket referring to Step 2) in "Removal" under ***Thermostat Removal and Installation***
5) Remove exhaust manifold. ☞
6) Remove oil level gauge and oil level gauge guide referring to Step 5) in "Removal" under ***Oil Pan and Oil Pump Strainer Removal and Installation***
7) Disconnect radiator outlet hose from thermostat cap.
8) Remove heater outlet pipe (2) from water pump (1).
9) Remove water pump (1) from cylinder block.



10) Remove thermostat if necessary. ☞

Installation

Reference: Water Pump Inspection

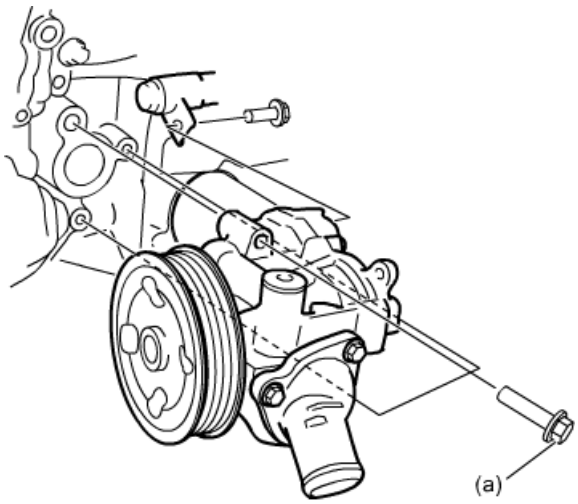
Reverse removal procedure noting the following points:

- Use new gasket and O-ring.
- Tighten water pump bolts to specified torque.

Tightening torque

Water pump bolt (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

- Refill cooling system. ☞
- Check for check cooling system for leakage.


(a)

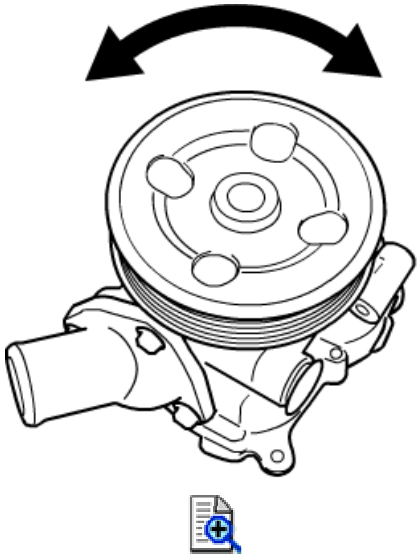
1F

Water Pump Inspection

Reference: Water Pump Removal and Installation

CAUTION:
Do not disassemble water pump.
If pump has any part requiring repair, replace pump with assembly.

Rotate water pump by hand and check for smooth rotation. If pump does not rotate smoothly or makes abnormal noise, replace it.



1F

Tightening Torque Specifications

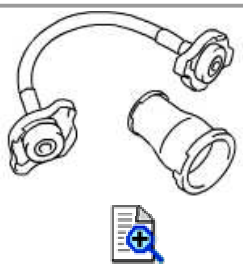
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fan nut	6.0	0.61	4.5	☞
Radiator cooling fan motor bolt	3.0	0.31	2.5	☞
Reservoir bolt	10	1.0	7.5	☞
Water pump bolt	25	2.5	18.5	☞

NOTE:
The specified tightening torque is described in the following.
Cooling System Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1F

Special Tool

09918–78211 Radiator cap tester kit ☞ ☞ 	09918–78220 Radiator cap tester adapter ☞ ☞ 
SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case☞ 	

1K

Exhaust System Description

The exhaust system consists of a exhaust manifold with a Warm Up Three-Way Catalytic converter (WU-TWC), exhaust No.1 pipe with a Three-Way Catalytic converter (TWC), exhaust No.2 pipe, a muffler, a gasket, etc. The WU-TWC and TWC are emission control devices which are added to the exhaust to lower the levels of Hydrocarbon (HC), Carbon Monoxide (CO), and Oxides of Nitrogen (NOx) pollutants in the exhaust gas. A large capacity sub-muffler is combined with the exhaust pipe No.2 for reducing booming noises at low-mid engine speeds. The adoption of a dual muffler produces low exhaust resistance and low back pressure, improves engine power and keeps exhaust noise low.

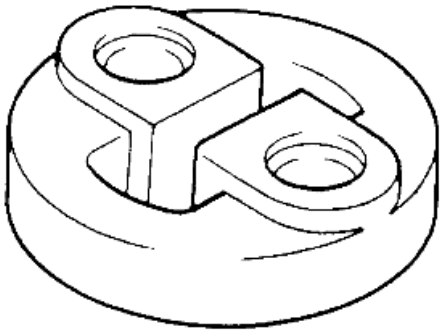
1K

Exhaust System Check

WARNING:
In order to help avoid getting burned, do not work on exhaust system when it is hot. Exhaust system must be sufficiently cool before beginning any service on it.

Check the exhaust system at every periodic vehicle inspection and when the vehicle is hoisted for other service noting the following points:

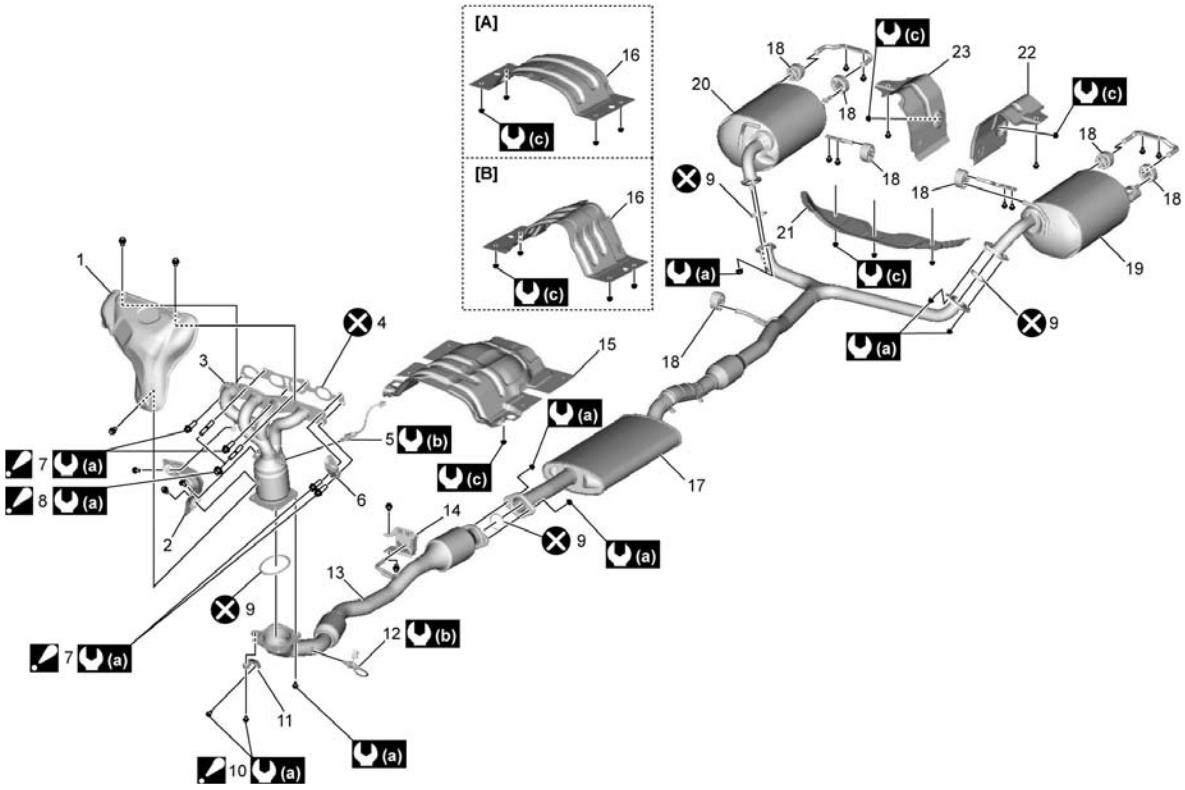
- Check rubber mountings for damage deterioration and incorrect position.



- Check mating surface of cylinder head with exhaust manifold for distortion.
- Check exhaust system for exhaust gas leakage, loose connection, dent and damage.
- Check if bolts or nuts are loosened, and then tighten them to specified torque.
- Check any damages, holes or cracks which may permit exhaust gas to enter the vehicle.
- Check to make sure that exhaust system components have enough clearance from other underbody components to avoid overheating and possible damage to these components.
- Check for any defects and fix them whenever found.

1K

Exhaust System Components



[A]: 2WD model	9. Gasket	19. Muffler L
[B]: 4WD model	10. Exhaust manifold stiffener bolt : For tightening order, refer to ***Exhaust Manifold Removal and Installation***	20. Muffler R
1. Exhaust manifold cover	11. Exhaust manifold stiffener	21. Heat protector panel No. 3
2. Exhaust manifold lower cover	12. HO2S	22. Heat protector rear panel L
3. Exhaust manifold	13. Exhaust pipe No.1	23. Heat protector rear panel R
4. Exhaust manifold gasket	14. Mounting No.1	(a): 50 N·m (5.1 kgf-m, 37.0 lbf-ft)
5. A/F sensor	15. Heat protector panel No.1	(b): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)
6. Engine hook	16. Heat protector panel No.2	(c): 2 N·m (0.2 kgf-m, 1.5 lbf-ft)

7. Exhaust manifold bolt : For tightening order, refer to ***Exhaust Manifold Removal and Installation***	17. Exhaust pipe No.2	: Do not reuse.
8. Exhaust manifold nut : For tightening order, refer to ***Exhaust Manifold Removal and Installation***	18. Mounting No.2	

1K

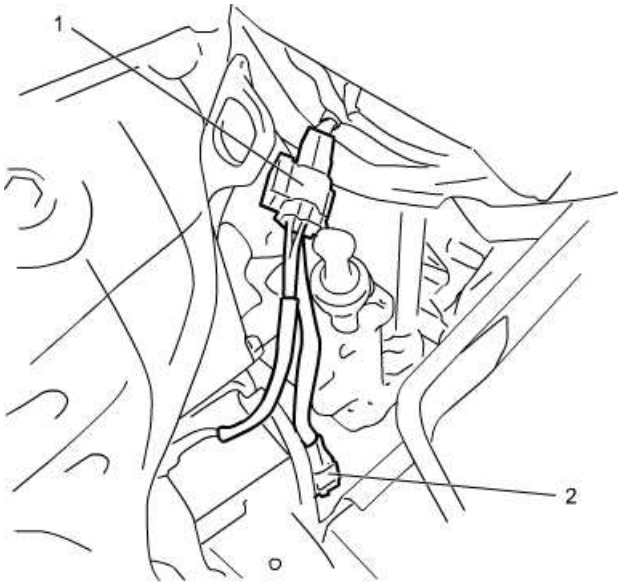
Exhaust Manifold Removal and Installation

Reference: Exhaust System Components

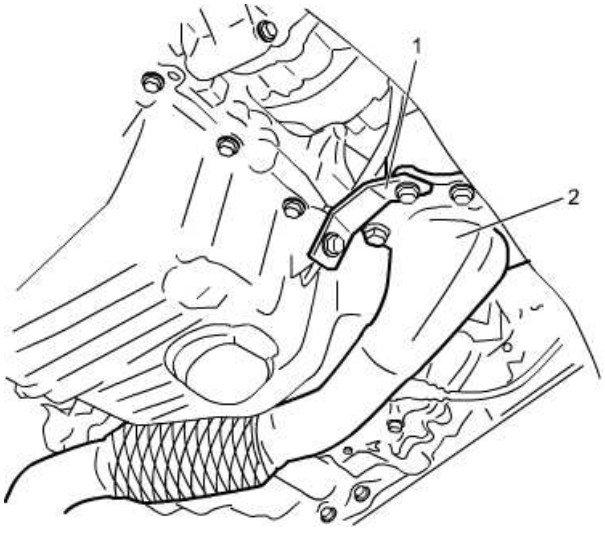
Removal

CAUTION:
Be careful not to drop exhaust manifold. If it is dropped, inside catalytic converter may be damaged on impact.

1) Disconnect negative (–) cable from battery.
2) Remove exhaust manifold cover.
3) Disconnect A/F sensor connector (1) and HO2S connector (2), and then detach them from their brackets.



4) Remove right side engine undercover.
5) Remove exhaust manifold stiffener (1).
6) Remove exhaust pipe No.1 (2).



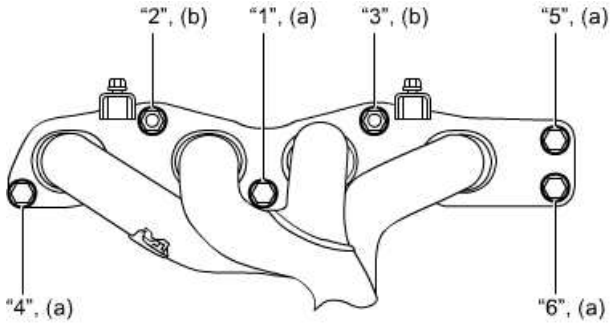
7) Remove exhaust manifold and its gasket from cylinder head.
8) Remove A/F sensor and HO2S if necessary. ☞

Installation

Reverse removal procedure noting the following points.

- Use new gaskets.
- Install A/F sensor and HO2S if removed. ☞
- Tighten exhaust manifold bolts and nuts in numerical order evenly and gradually to specified torque.

Tightening torque
Exhaust manifold bolt* (a): 50 N·m (5.1 kg-m, 37.0 lbf-ft)
Exhaust manifold nut* (b): 50 N·m (5.1 kg-m, 37.0 lbf-ft)

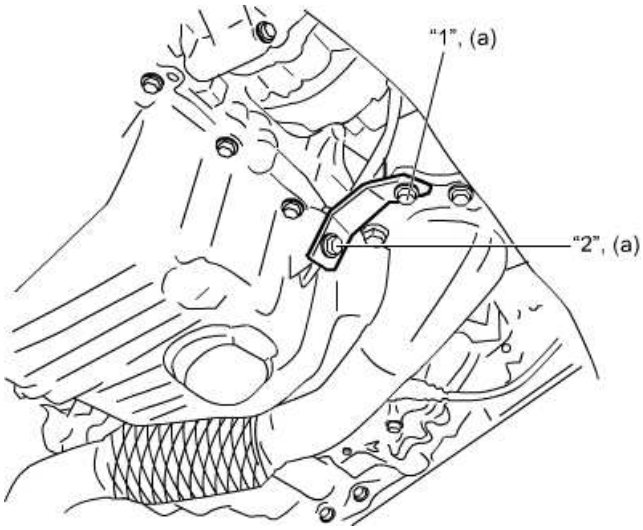


- Tighten exhaust pipe No.1 bolts to specified torque.

Tightening torque
Exhaust pipe No.1 bolt (a): 50 N·m (5.1 kg-m, 37.0 lbf-ft)

- Tighten exhaust manifold stiffener bolts in numerical order.

Tightening torque
Exhaust manifold stiffener bolt* (a): 50 N·m (5.1 kg-m, 37.0 lbf-ft)



- Run engine and check for exhaust gas leakage.

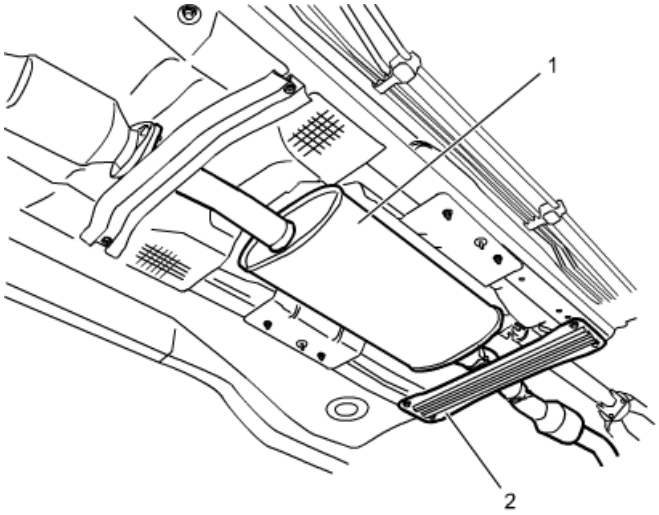
1K

Exhaust Pipe and Muffler Removal and Installation

Reference: Exhaust System Components

To remove and install exhaust pipes and muffler, refer to ***Exhaust System Components*** and noting the following points:

- Before removal of exhaust pipe No.2 (1), remove right and left main floor under covers and floor tunnel bar (2).



- Tighten bolts and nuts to specified torques when reassembling exhaust pipes and muffler.
- Run engine and check for exhaust gas leakage.

1K

Tightening Torque Specifications

CAUTION:
For fastener with * (asterisk) below, be sure to tighten it according to specified procedure in "Repair Instructions".

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Exhaust manifold bolt*	50	5.1	37.0	☞
Exhaust manifold nut*	50	5.1	37.0	☞
Exhaust pipe No.1 bolt	50	5.1	37.0	☞
Exhaust manifold stiffener bolt*	50	5.1	37.0	☞

NOTE:
The specified tightening torque is described in the following.
Exhaust System Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1G

Precautions for Fuel System Service

WARNING:
Before servicing on fuel system, the following points should be always observed in order to reduce the risk of fire and personal injury.

- **Disconnect negative (−) cable at battery.**
- **Do not smoke, and place no smoking signs near working area.**
- **Be sure to have CO2 fire extinguisher handy.**
- **Be sure to perform work in a well-ventilated area and away from any open flames (such as gas hot heater).**
- **Wear safety glasses.**
- **To relieve fuel vapor pressure in fuel tank, remove fuel filler cap from fuel filler neck and then reinstall it.**
- **As fuel feed line is still under high fuel pressure even after stopping engine, loosening or disconnecting fuel feed line directly may cause dangerous spout of fuel. Before loosening or disconnecting fuel feed line, make sure to relieve fuel pressure.** ☞
- **A small amount of fuel may be released when the fuel line is disconnected. In order to reduce the risk of personal injury, cover the fitting to be disconnected with shop cloth.**
- **Never perform service work when engine and exhaust system are hot.**

CAUTION:
Use the unleaded fuel only.
The leaded or low lead fuel can result in engine damage and reduce the effectiveness of the emission control system.

1G

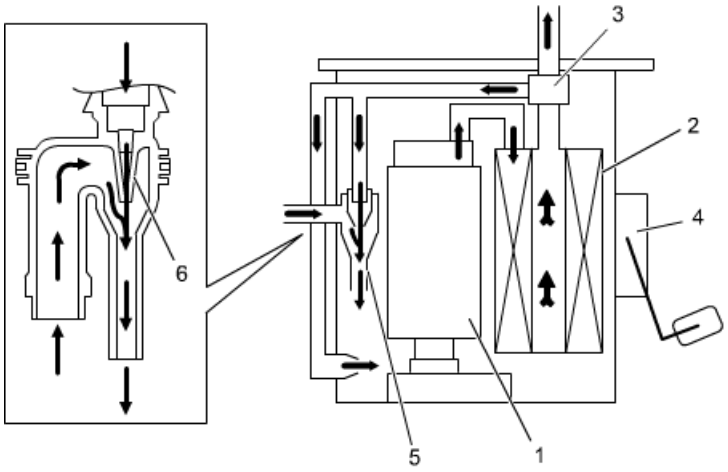
Fuel System Description

The fuel delivery system consists of the fuel tank, fuel pump assembly (with built-in fuel filter and fuel pressure regulator), delivery pipe, injectors and fuel feed line.
The fuel in the fuel tank is pumped up by the fuel pump, sent into delivery pipe and injected by the injectors.
As the fuel pump assembly is equipped with built-in fuel filter and fuel pressure regulator, the fuel is filtered and its pressure is regulated before being sent to the feed pipe.
The excess fuel at fuel pressure regulation process is returned back into the fuel tank.
Also, fuel vapor generated in the fuel tank is led through the fuel vapor line into the EVAP canister.
For system diagram, refer to ***Fuel Delivery System Diagram***.

1G

Fuel Pump Description

The fuel pump (1) is an in-tank type electric pump. Incorporated in the pump assembly are; a fuel filter (2), a fuel pressure regulator (3), a fuel level sensor (4) and a jet pump (4WD model) (5).
For 4WD model, the jet pump (5) installed in the fuel pump sucks up fuel from the sub fuel level sensor side to the fuel level sensor side through the fuel suction pipe by using negative pressure produced when pressurized fuel in the fuel pump passes the venturi (6).



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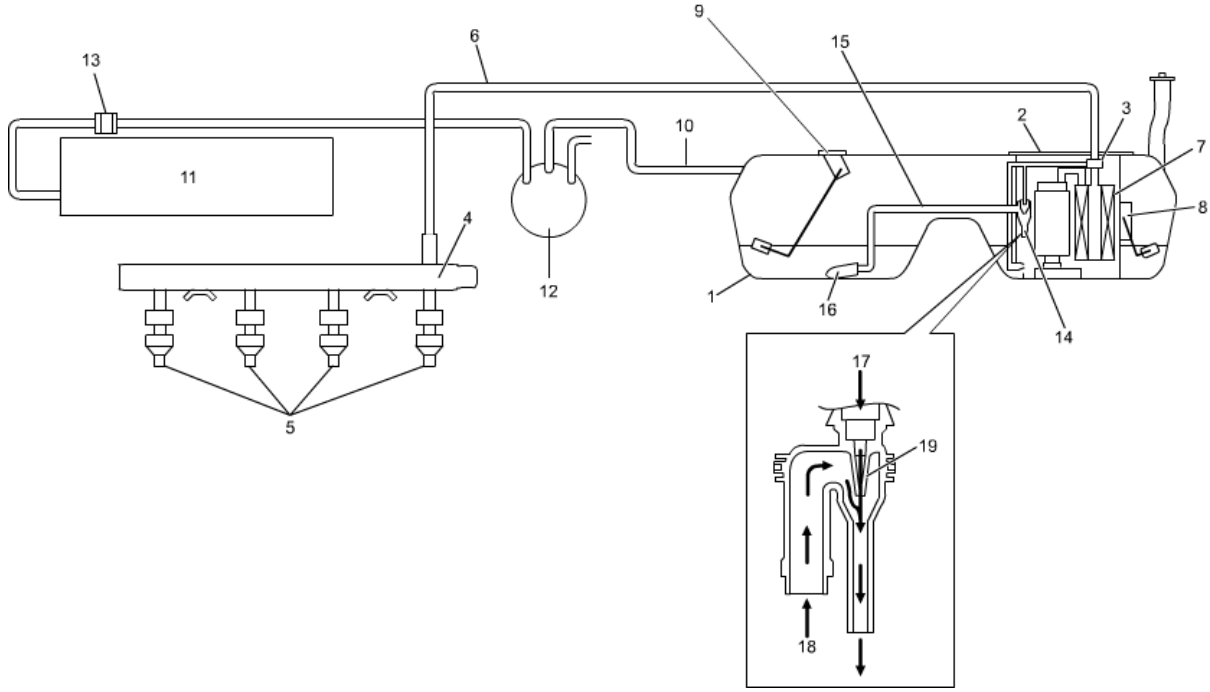
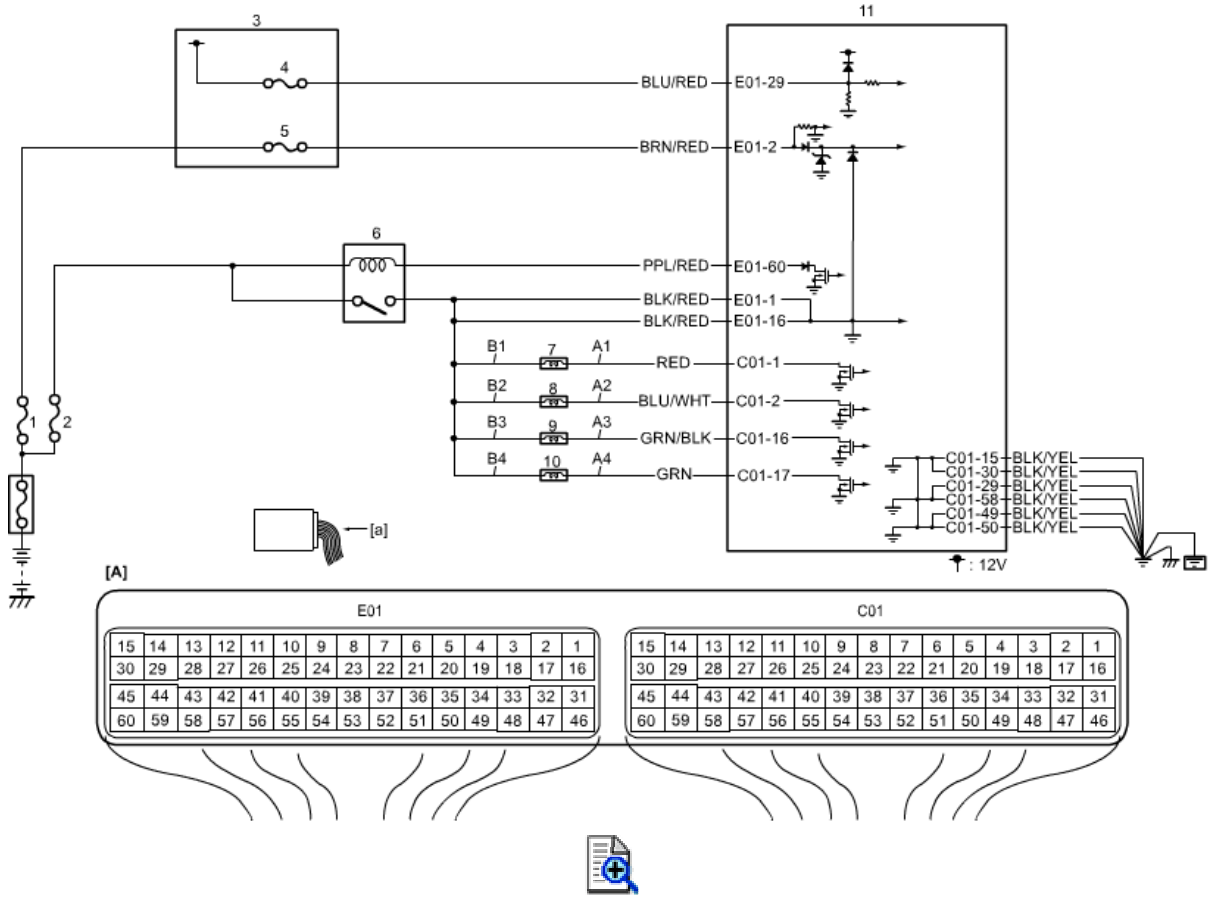
Fuel Delivery System Diagram



1. Fuel tank	8. Fuel level sensor	15. Fuel suction pipe (4WD model)
2. Fuel pump assembly	9. Sub fuel level sensor (4WD model)	16. Fuel suction filter (4WD model)
3. Fuel pressure regulator	10. Fuel vapor line	17. Pressurized fuel from fuel pump
4. Fuel delivery pipe	11. Intake manifold	18. Fuel fed from fuel suction pipe
5. Fuel injector	12. EVAP canister	19. Venturi
6. Fuel feed line	13. EVAP canister purge valve	
7. Fuel filter	14. Jet pump (4WD model)	

1G

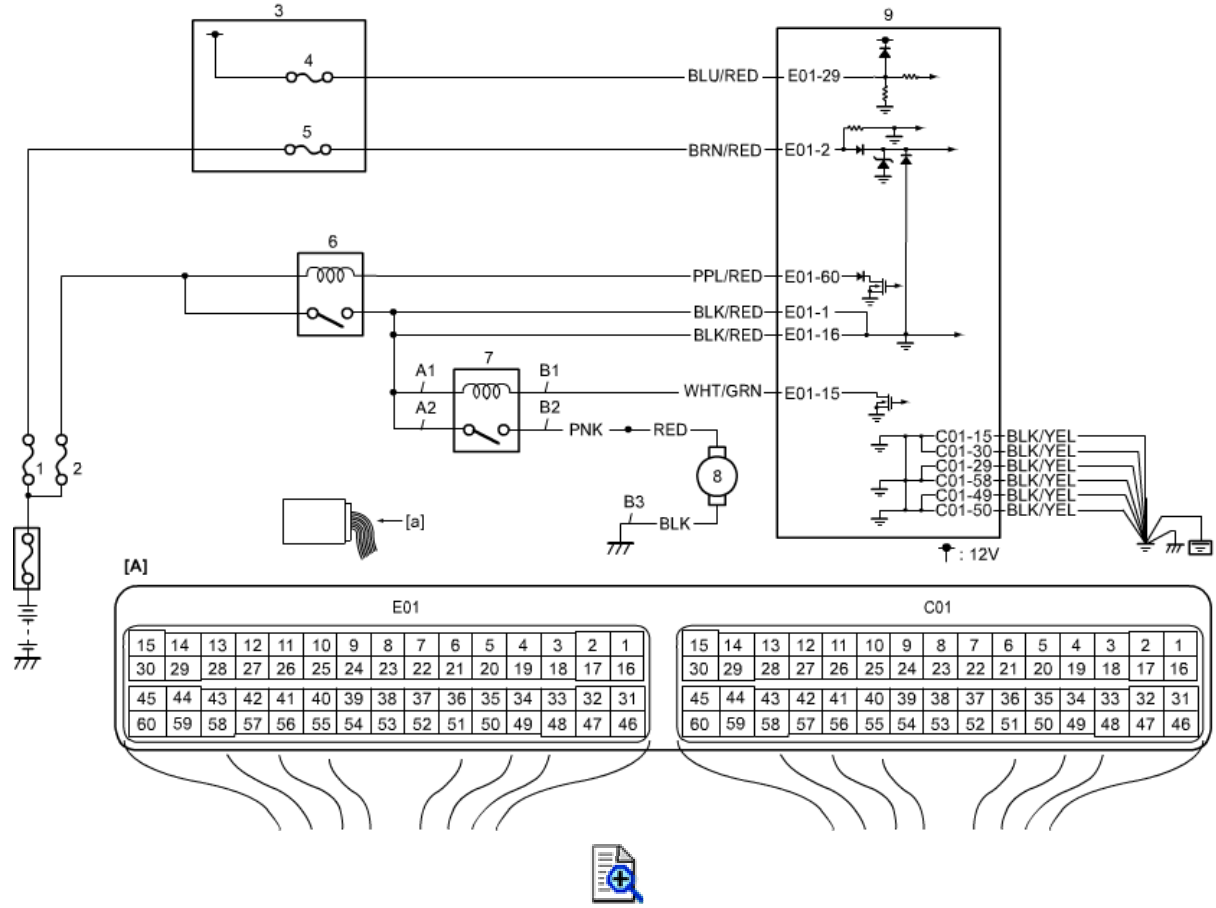
Fuel Injector Control System Circuit Diagram



[A]: ECM connector (View: [a])	B3: Fuel injector No.3 power supply circuit	6. Main relay
A1: Fuel injector No.1 drive circuit	B4: Fuel injector No.4 power supply circuit	7. Fuel injector No.1
A2: Fuel injector No.2 drive circuit	1. "B/U" fuse	8. Fuel injector No.2
A3: Fuel injector No.3 drive circuit	2. "FI" fuse	9. Fuel injector No.3
A4: Fuel injector No.4 drive circuit	3. J/B	10. Fuel injector No.4
B1: Fuel injector No.1 power supply circuit	4. "IG COIL" fuse	11. ECM
B2: Fuel injector No.2 power supply circuit	5. "DOME" fuse	

1G

Fuel Pump Control System Circuit Diagram



[A]:	ECM connector (View: [a])	B3:	Fuel pump ground circuit	5.	"DOME" fuse
A1:	Fuel pump relay power supply circuit (coil side)	1.	"B/U" fuse	6.	Main relay
A2:	Fuel pump relay power supply circuit (switch side)	2.	"FI" fuse	7.	Fuel pump relay
B1:	Fuel pump relay drive circuit	3.	J/B	8.	Fuel pump
B2:	Fuel pump power supply circuit	4.	"IG COIL" fuse	9.	ECM

1G

Fuel System Inspection

Step	Action	YES	NO
1	**Fuel pump inspection** 1) Remove fuel filler cap and push engine switch to change ignition mode to "ON". 2) Confirm that fuel pump operating sound can be heard from fuel filler port for about 2 seconds before stopping. ***Is it in good condition?***	Go to Step 2.	Check fuel pump circuit. ☞
2	**Fuel pressure check** 1) Check fuel pressure. ☞ ***Is it in good condition?***	Go to Step 3.	Repair defective part.
3	**Power balance test** 1) Check power balance. ☞ ***Is it in good condition?***	Fuel system is in good condition.	Go to Step 4.
4	**Fuel injector circuit check** 1) Check fuel injector circuit. ☞ ***Is it in good condition?***	Go to Step 5	Repair defective part.
5	**Fuel injector check** 1) Check fuel injector. ☞ ***Is it in good condition?***	Replace ECM and recheck DTC. ☞	Replace fuel injector.

1G

Power Balance Test

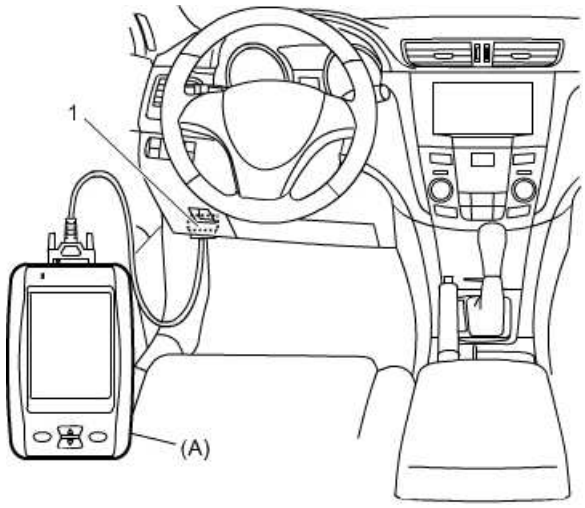
CAUTION:
When performing power balance test, do not increase engine speed higher than set idling speed. Doing so may damage engine.

1) For CVT model, place select lever in "P" and apply parking brake.
For M/T model, place gear shift lever in "Neutral" and apply parking brake.

2) Connect scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

Special Tool

(A): SUZUKI scan tool (SUZUKI-SDT)



3) Clear DTC. ☞

4) Warm up engine to normal operating temperature.

5) Using SUZUKI scan tool, select "Fuel Injector" in "Active Test" and turn off each fuel injector.

6) With each fuel injector turned off, confirm that engine speed falls lower than specified idle speed.

7) If rates of engine speed decrease are not in scale, check following items.

- Fuel injector circuit ☞
- Fuel injector ☞
- Spark plug ☞
- Ignition coil circuit ☞
- Ignition coil ☞
- Engine compression ☞

1G

Fuel Injector Circuit Check

Circuit Diagram

Refer to ***Fuel Injector Control System Circuit Diagram***.

Troubleshooting

Step	Action	YES	NO
1	**Fuel injector check for operating sound** 1) Using sound scope, check each injector for operating sound with engine cranking. ***Do all injectors make operating sound?***	Fuel injector circuit is in good condition.	Go to Step 2.
2	**Fuel injector resistance check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect connectors from fuel injectors. 3) Check for proper connection to fuel injector at each terminals. 4) If OK, check all fuel injectors for resistance. ☞ ***Are all injectors at specified resistance?***	Go to Step 3.	Replace fuel injector. ☞
3	**Fuel injector insulation resistance check** 1) Check that resistance between each fuel injector terminal and engine ground is infinity. ***Are they in good condition?***	Go to Step 4.	Replace fuel injector. ☞
4	**Fuel injector power supply circuit check** 1) Push engine switch to change ignition mode to "ON". 2) Check that voltage between each fuel injector power supply circuit (B1, B2, B3, B4) and engine ground is battery voltage. ☞ ***Is it in good condition?***	Go to Step 5.	Repair fuel injector power supply circuit. If it is in good condition, go to ***ECM Power and Ground Circuit Check***.
5	**Fuel injector drive circuit check**	Go to Step 6.	Repair fuel injector drive circuit.

	1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect connectors from ECM. 3) Check the following points. ☞ • Resistance of each fuel injector drive circuit (A1, A2, A3, A4): less than 3 Ω • Resistance between each fuel injector drive circuit and ground: infinity • Voltage of each fuel injector drive circuit: 0 – 1 V (with the ignition mode of keyless push start system in "ON") ***Are they in good condition?***		
6	**Fuel injector check** 1) Check fuel injector. ☞ ***Is it in good condition?***	Replace ECM and recheck DTC. ☞	Replace fuel injector. ☞

1G

Fuel Pump and Its Circuit Check

Circuit Diagram

Refer to ***Fuel Pump Control System Circuit Diagram***.

Troubleshooting

Step	Action	YES	NO
1	**Fuel pump control system check for operation** 1) Remove fuel filler cap. 2) Push engine switch to change ignition mode of keyless push start system to "ON". 3) Confirm that fuel pump operating sound in heard from fuel filler for about 2 seconds and then it stops. ***Is it in good condition?***	Fuel pump circuit is in good condition. Reinstall fuel filler cap.	Go to Step 2.
2	**Fuel pump relay power supply check** 1) Reinstall fuel filler cap. 2) Confirm that ignition mode of keyless push start system is "OFF". 3) Remove fuel pump relay from main fuse box. 4) Check for proper connection to fuel pump relay at each terminal. 5) If OK, push engine switch to change ignition mode to "ON". 6) Check that voltage between each fuel pump relay power supply circuit (A1, A2) and engine ground is battery voltage. ☞ ***Are they in good condition?***	Go to Step 3.	Repair fuel pump relay power supply circuit.
3	**Fuel pump relay check** 1) Check fuel pump relay. ☞ ***Is relay in good condition?***	Go to Step 4.	Replace fuel pump relay.
4	**Fuel pump relay drive circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Disconnect connectors from ECM.	Go to Step 5.	Repair fuel pump relay drive circuit.

	3) Check for proper terminal connection to ECM connectors. 4) Check the following points. ☞ • Resistance of fuel pump relay drive circuit (B1): less than 3 Ω • Resistance between fuel pump relay drive circuit and ground: infinity • Voltage of fuel pump relay drive circuit: 0 – 1 V (with the ignition mode of keyless push start system in "ON") ***Are they in good condition?***		
5	**Fuel pump relay drive signal check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Connect connectors to ECM. 3) Check that voltage between fuel pump relay drive circuit (B1) and ground is 0 – 1 V for 2 sec. after the ignition mode of keyless push start system in "ON". ☞ ***Is it in good condition?***	Go to Step 6.	Replace ECM and recheck DTC. ☞
6	**Fuel pump power supply circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Remove fuel tank. 3) Disconnect connector from fuel pump. 4) Check that resistance between fuel pump power supply circuit (B2) and ground is infinity. ☞ ***Is it in good condition?***	Go to Step 7.	Repair fuel pump power supply circuit.
7	**Fuel pump power supply circuit check** 1) Connect service wire between fuel pump circuit (B1) and ground. ☞ 2) Push engine switch to change ignition mode to "ON". 3) Check that voltage between fuel pump power supply circuit (B2) and ground is battery voltage. ***Is it in good condition?***	Go to Step 8.	Repair fuel pump power supply circuit.

8	**Fuel pump ground circuit check** 1) Confirm that ignition mode of keyless push start system is "OFF". 2) Check that resistance between fuel pump ground circuit (B3) and ground is less than 3 Ω. ☞ ***Is it in good condition?***	Replace fuel pump. ☞	Repair fuel pump ground circuit.

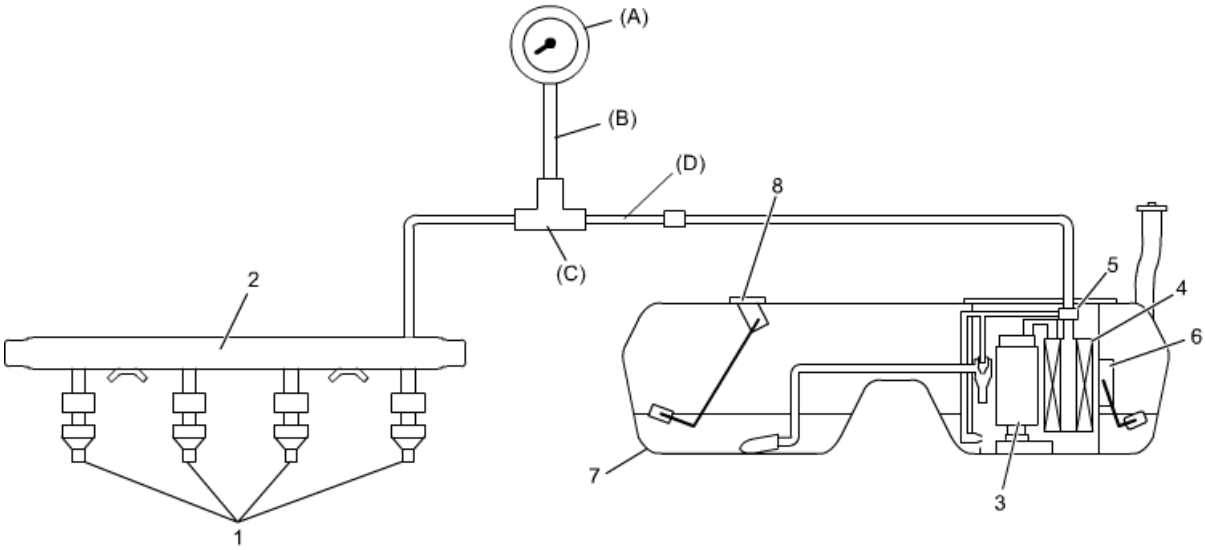
1G

Fuel Pressure Check

System Diagram

Special Tool

(A): 09912–58442
(B): 09912–58432
(C): 09912–58490
(D): 09919–45710



1. Fuel injector	4. Fuel filter	7. Fuel tank
2. Fuel delivery pipe	5. Fuel pressure regulator	8. Sub fuel level sensor (4WD model)
3. Fuel pump	6. Fuel level sensor	

Troubleshooting

NOTE:
Before using the following flow chart, check that battery voltage is higher than 11 V. If it is lower, fuel pressure becomes lower than specification even if fuel pump and line are in good condition.

Step	Action	YES	NO
1	***Was "Fuel Pump and Its Circuit Check" performed?***	Go to Step 2.	Go to ***Fuel Pump and Its Circuit Check***.
2	**Fuel pressure check 1** 1) Check fuel pressure. ☞ ***Is check result satisfactory?***	Go to Step 3.	Go to Step 6.

3	**Fuel pressure check 2** 1) Start engine and warm up to normal operating temperature. 2) Keep engine speed at 4,000 rpm. ***Does fuel pressure show about same value as Step 2?***	Go to Step 4.	Go to Step 6.
4	**Fuel line check** 1) Check fuel pipe and joint for fuel leakage, damage or deformation. ***Are they in good condition?***	Fuel system is in good condition.	Repair defective part.
5	***Was check result higher than specification in Step 2?***	Replace fuel pump assembly. ☞	Go to Step 6.
6	**Fuel line check** 1) Check fuel pipe and joint for damage or deformation. ***Are they in good condition?***	Clogged fuel filter, faulty fuel pump, faulty fuel pressure regulator or fuel leakage from pipe connection in fuel tank.	Repair defective part.

1G

Fuel Pressure Basic Check

WARNING:
When performing the following procedure, be sure to observe *Precautions for Fuel System Service* to reduce the risk of fire and personal injury.

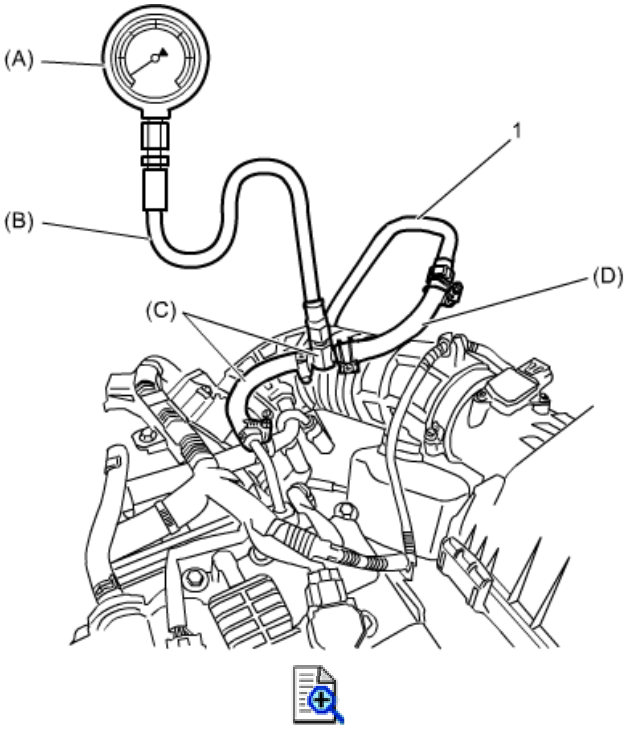
1) Relieve fuel pressure in fuel feed line. ☞

2) Remove fuel pipe stopper and disconnect fuel feed pipe from fuel delivery pipe. ☞

3) Connect special tools between fuel feed pipe (1) and fuel delivery pipe as shown in figure.

Special Tool

(A): 09912–58442
(B): 09912–58432
(C): 09912–58490
(D): 09919–45710



4) Check that battery voltage is 11 V or more.

5) Check fuel pressure using the following procedure.
If check result is out of specification, repair defective part.
a) Push engine switch to change ignition mode to "ON" and to operate fuel pump.
b) After 2 sec., push engine switch to change the ignition mode to "OFF".
c) Repeat Step a) and b) three or four times, and then check fuel pressure.

Fuel pressure specification

Standard: 375 – 385 kPa (3.8 – 3.9 kgf/cm², 54.4 – 55.8 psi)
(With fuel pump operating and engine stopped)

6) Relieve fuel pressure. ☞

7) Remove special tools from fuel delivery pipe and fuel feed pipe.

8) Connect fuel feed pipe to fuel delivery pipe and install fuel pipe stopper.

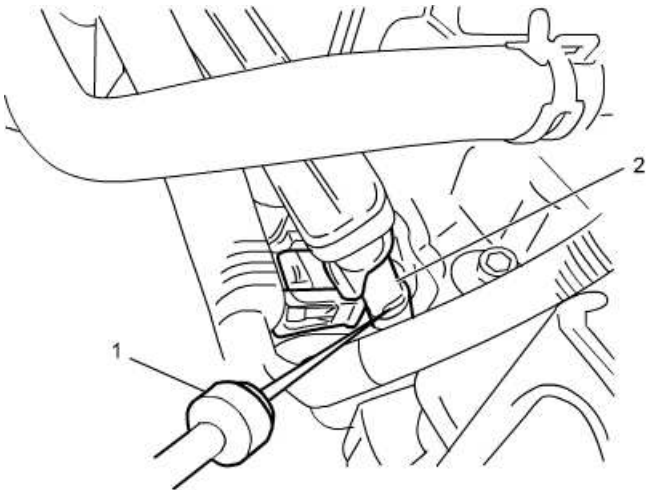
9) With engine stopped and ignition mode in "ON", check for fuel leaks. ☞

Fuel Cut Operation Check

1) For CVT model, place select lever in "P" and apply parking brake.
For M/T model, place gear shift lever in "Neutral" and apply parking brake.

2) Warm up engine to normal operating temperature.

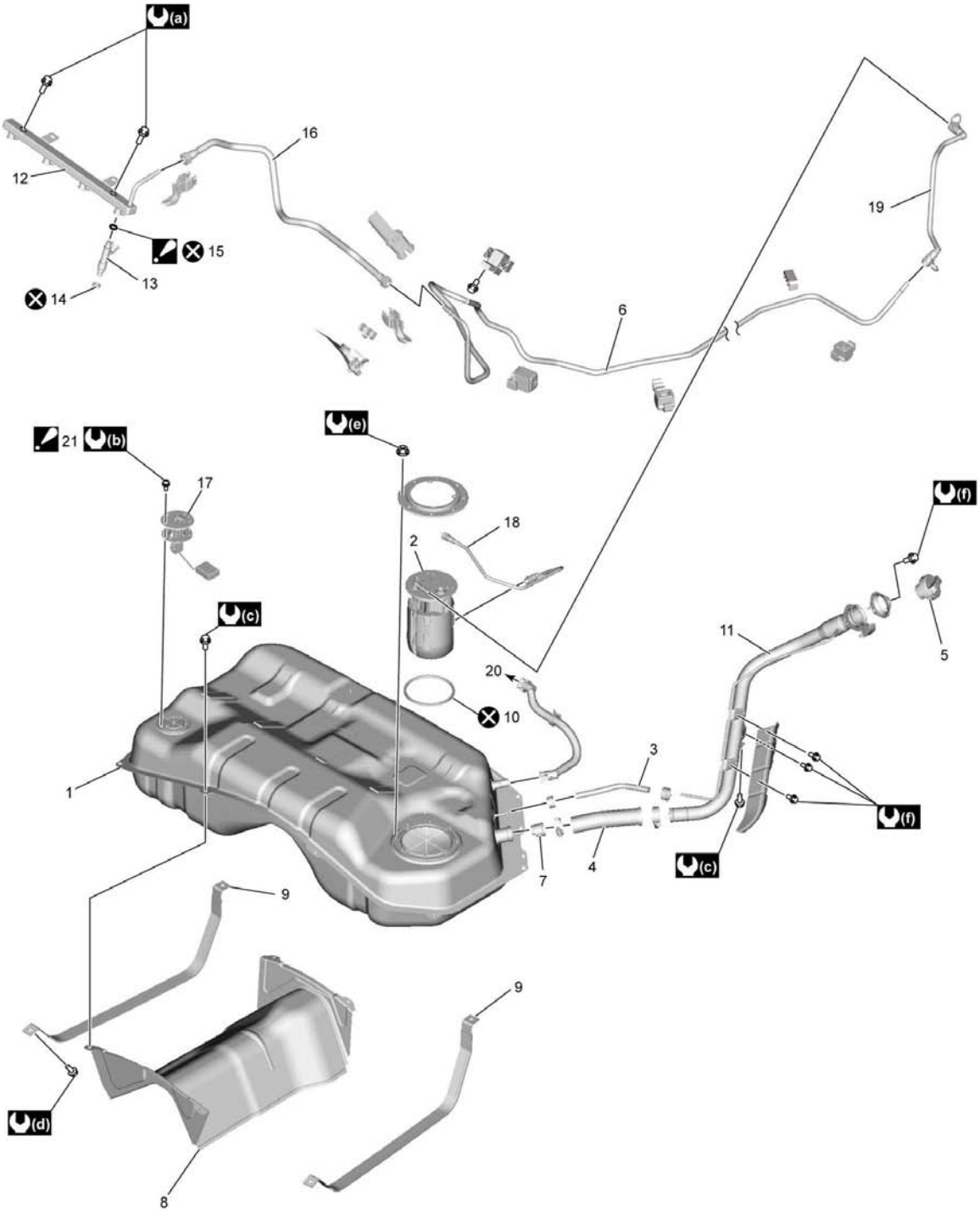
3) While listening to sound of injector (2) by using sound scope (1) or the like, increase engine speed to higher than 3,000 rpm.



4) Check that injector operation sound stops when throttle valve is closed instantly and it is heard again when engine speed is reduced to 1,500 rpm.

1G

Fuel System Components



1. Fuel tank	11. Fuel filler neck	21. Sub fuel level sensor screw (4WD model) : For tightening, refer to ***Sub Fuel Level Sensor Removal and Installation (4WD Model)***.

2. Fuel pump assembly	12. Fuel delivery pipe	(a): 25 N·m (2.5 kgf-m, 18.5 lbf-ft)
3. Breather hose	13. Fuel injector	(b): 1.6 N·m (0.16 kgf-m, 1.5 lbf-ft)
4. Fuel tank filler hose	14. Injector cushion	(c): 5.5 N·m (0.56 kgf-m, 4.0 lbf-ft)
5. Fuel filler cap	15. O-ring : Apply a bit of gasoline to install.	(d): 45 N·m (4.6 kgf-m, 33.5 lbf-ft)
6. Fuel feed pipe (body side)	16. Fuel feed pipe (fuel delivery pipe side)	(e): 10 N·m (1.0 kgf-m, 7.5 lbf-ft)
7. Fuel tank inlet valve	17. Sub fuel level sensor (4WD model)	(f): 3 N·m (0.31 kgf-m, 2.5 lbf-ft)
8. Fuel tank protector	18. Fuel suction pipe (4WD model)	: Do not reuse.
9. Fuel tank belt	19. Fuel feed pipe (fuel pump side)	
10. Fuel pump gasket	20. To EVAP canister	

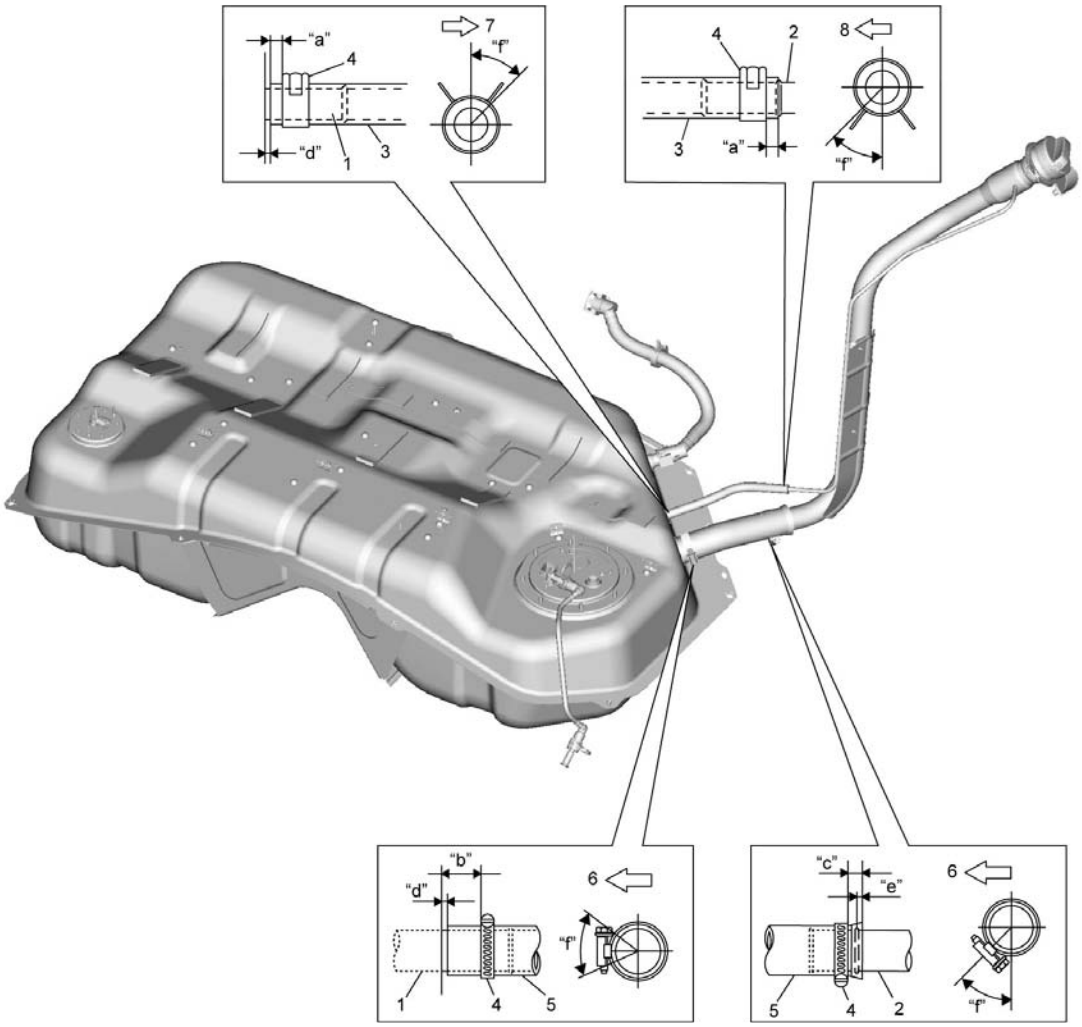
1G

Fuel Hose Disconnecting and Reconnecting

Connection Other than Quick Joint

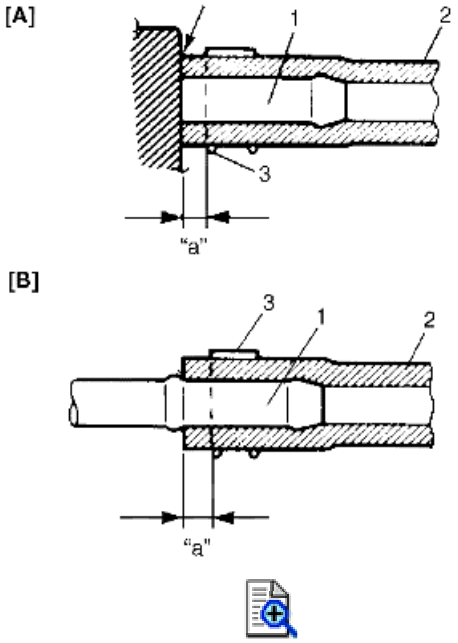
NOTE:
Be sure fuel hose end makes contact with bulge on fuel pipe or pipe joint end when inserting fuel hose to pipe.

Clamp around fuel tank



1. Fuel tank	6. Vehicle leftward	"c": 9 – 16 mm (0.36 – 0.62 in.)
2. Fuel filler neck	7. Vehicle rightward	"d": 0 – 2 mm (0.00 – 0.08 in.)
3. Breather hose	8. Vehicle backward	"e": 4 mm (0.16 in.)
4. Clamp	"a": 3 – 7 mm (0.12 – 0.27 in.)	"f": 45°
5. Fuel tank filler hose	"b": 7 – 14 mm (0.27 – 0.55 in.)	

Clamp other than around fuel tank



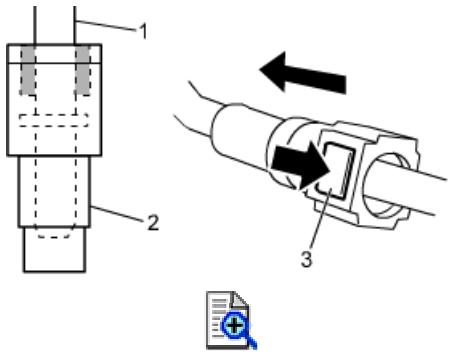
1.	Pipe
2.	Hose
3.	Clamp
[A]:	On short pipe, fit hose as far as it reaches the end of pipe joint as shown.
[B]:	On the following type pipe, fit hose as far as it reaches bulge on fuel pipe.
"a":	3 – 7 mm (0.12 – 0.27 in.)

Quick Joint (Fuel Delivery Pipe Side)

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.

2) Disconnect quick joint from fuel pipe while joint lock is unlocked by pushing lock button (3) of joint.



Reconnecting

Insert quick joint to fuel pipe until they lock securely (a click is heard), and pull quick joint by hand and make sure it does not become disconnected.

Quick Joint (Fuel Pump Side)

Disconnecting

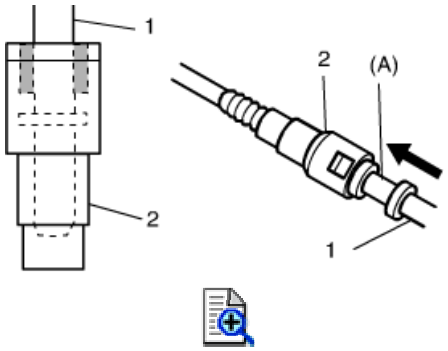
1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.

2) Unlock joint lock by inserting special tool between pipe and quick joint.

Special Tool

(A): 09919–47020

3) Disconnect quick joint from pipe.



Reconnecting

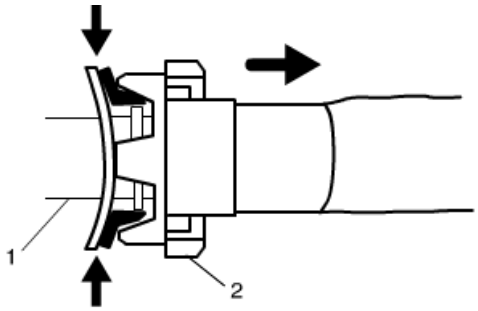
Insert quick joint to fuel pipe until they lock securely (a click is heard), and confirm that quick joint is not disconnected by hand.

Quick Joint (Fuel Vapor Line)

Disconnecting

1) Remove mud, dust and/or foreign material between pipe (1) and quick joint (2) by blowing compressed air.

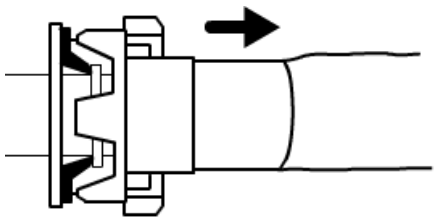
2) Disconnect hose joint while joint lock is unlocked by pushing both sides of joint.



Reconnecting

1) Insert quick joint to fuel pipe until they lock securely (a click is heard).

2) Check that quick joint does not pull out by pulling quick joint in arrow direction.



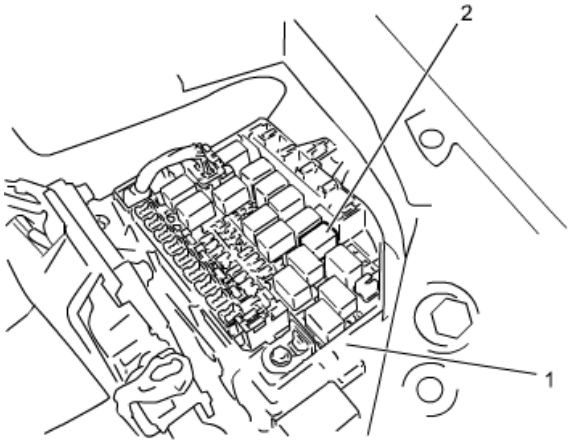
1G

Fuel Pressure Relief Procedure

CAUTION:
Never perform this work when engine is hot. Doing so may damage catalyst.

NOTE:
If ECM detects DTC(s) after servicing, clear DTC(s) referring to *DTC Clearance*.

1) Make sure that engine is cold.
2) For CVT model, place select lever in "P" position.
For M/T model, place gear shift lever in "Neutral" position.
3) Apply parking brake and block drive wheels.
4) Disconnect fuel pump relay (2) from main fuse box (1).
5) Remove fuel filler cap in order to release fuel vapor pressure in fuel tank, and then reinstall it.
6) Start engine and run it until engine stops for lack of fuel. Repeat cranking engine 2 – 3 times for about 3 seconds each time to dissipate fuel pressure in lines. Fuel connections are now safe for servicing.
7) After servicing, connect fuel pump relay (2) to main fuse box and install main fuse box cover.



Fuel Leakage Check Procedure

After performing any service on fuel system, check that there is no fuel leakage as follows.

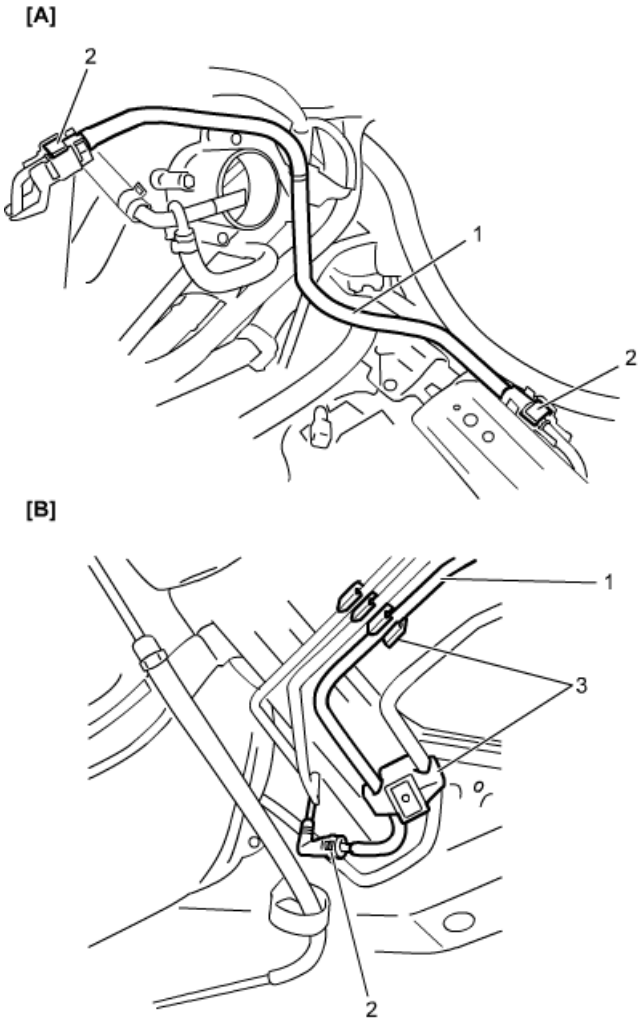
1) Apply fuel pressure to fuel feed line according to the following procedure.
   a) Push engine switch to change ignition mode to "ON" and to operate fuel pump.
   b) After 2 sec., push engine switch to change ignition mode to "OFF".
   c) Repeat Step a) and b) three or four times.

2) Check that there is no fuel leakage from any part of fuel system.

1G

Fuel Line On-Vehicle Inspection

Visually inspect fuel lines for evidence of fuel leakage, pipe (1) crack, deterioration and damage.
Check that quick joint (2) is connected securely.
Make sure all clamps (3) are secure.
Replace parts as needed.



[A]:	Engine side
[B]:	Fuel tank side

1G

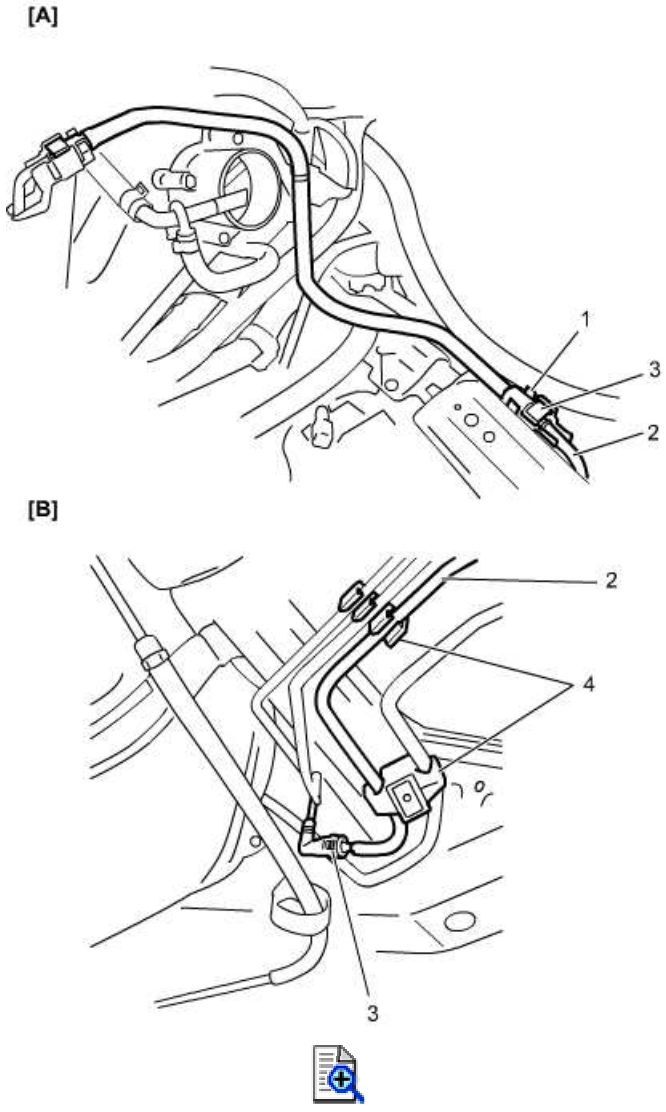
Fuel Pipe Removal and Installation

Removal

1) Relieve fuel pressure in fuel feed line. ☞
2) Remove battery, battery tray and battery bracket. ☞
3) Remove left side main floor undercover.
4) Remove fuel pipe stopper (1) and disconnect quick joint (3) of fuel feed pipe. ☞
5) Mark location of clamps (4) on fuel feed pipe (body side) (2), so that clamps can be reinstalled to where they were.
6) Remove clamps (4) from vehicle body, fuel feed pipe (body side) (2) and brake pipes.

CAUTION:
Be careful not to bend and damage fuel feed pipe and brake pipes when removing clamp.

7) Remove fuel feed pipe (body side) (2).

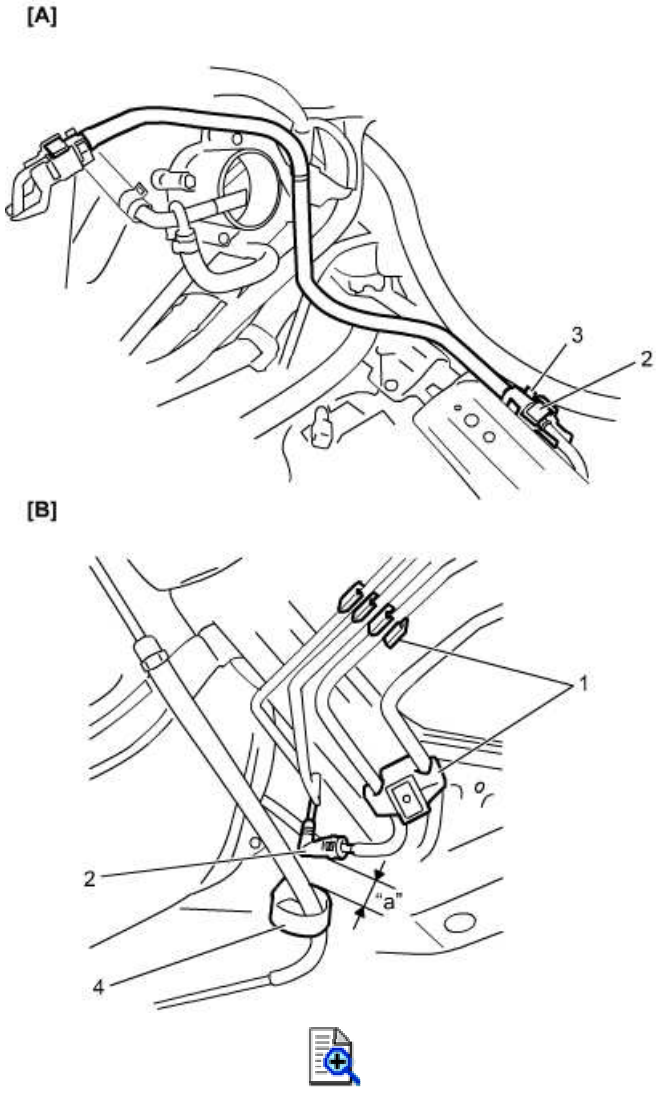


[A]:	Engine side
[B]:	Fuel tank side

Installation

1) Install clamps (1) to marked location on pipe. If clamp is deformed or broken, replace it with new one.
2) Install fuel feed pipe with pipe clamps (1) to vehicle.
3) Connect quick joint (2) of fuel feed pipe and install fuel pipe stopper (3). ☞

NOTE:
Clearance "a" between quick joint and parking cable clamp (4) should be more than 15 mm.



[A]:	Engine side
[B]:	Fuel tank side

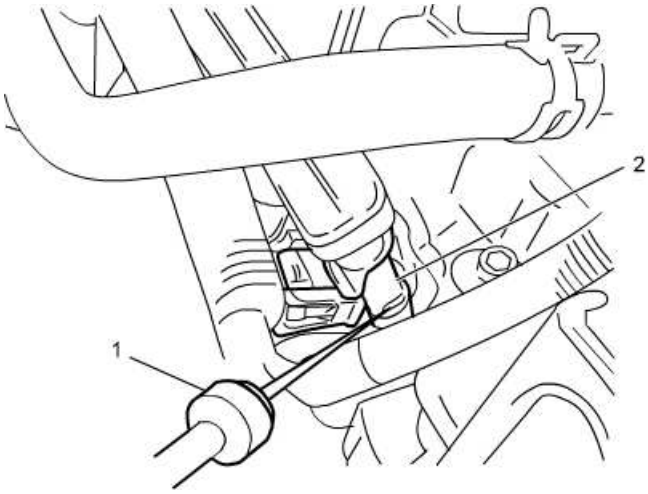
4) Install left side main floor undercover.
5) Install battery bracket and battery tray. ☞
6) Install ECM and bracket. ☞
7) Install air cleaner assembly. ☞
8) Install battery. ☞

9) With engine stopped, ignition mode of keyless push start system in "ON" and check for fuel leaks. ☞

1G

Fuel Injector On-Vehicle Inspection

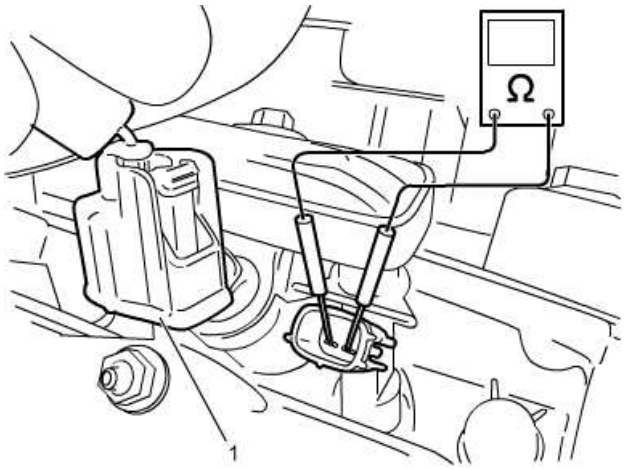
1) Using sound scope (1) or the like, check operating sound of injector (2) when engine is running or cranking.
Cycle of operating sound should vary according to engine speed.
If no sound or unusual sound is heard, check injector circuit (wire or connector) or injector.



2) Disconnect connector (1) from injector.

3) Check resistance between terminals of injector.
If resistance is out of reference value greatly, replace.

Reference resistance of fuel injector
11.6 – 12.4 Ω at 20 °C, 68 °F



4) Connect connector to injector securely.

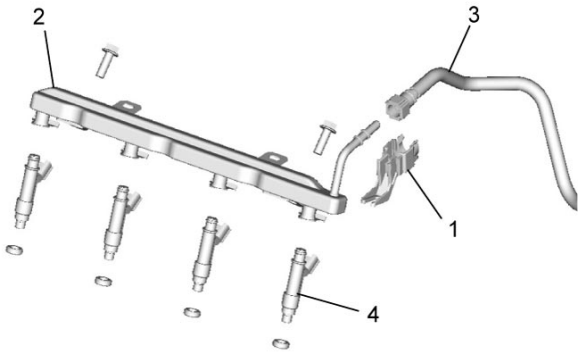
1G

Fuel Injector Removal and Installation

Reference: Fuel Injector On-Vehicle Inspection

Removal

1) Relieve fuel pressure. ☞
2) Disconnect negative (–) cable from battery.
3) Remove engine cover.
4) Disconnect PCV valve hose. ☞
5) Disconnect ignition coil connectors and fuel injector connectors.
6) Remove clamp of engine harness from fuel delivery pipe.
7) Remove fuel pipe stopper (1) and disconnect fuel feed pipe (3) from fuel delivery pipe (2). ☞
8) Remove fuel delivery pipe (2).
9) Remove fuel injector(s) (4).



Installation

Reference: Fuel Injector Inspection

Reverse removal procedure, noting the following points.

- Replace injector O-ring (1) and cushion (2) with new one.
- Apply thin coat of fuel to O-rings (1), and then install injectors (3) into delivery pipe (4) and cylinder head.
- Tighten delivery pipe bolts (5) to specified torque.

Tightening torque

Fuel delivery pipe bolt (a): 25 N·m (2.5 kg-m, 18.5 lbf-ft)

1G

Fuel Injector Inspection

Reference: Fuel Injector Removal and Installation

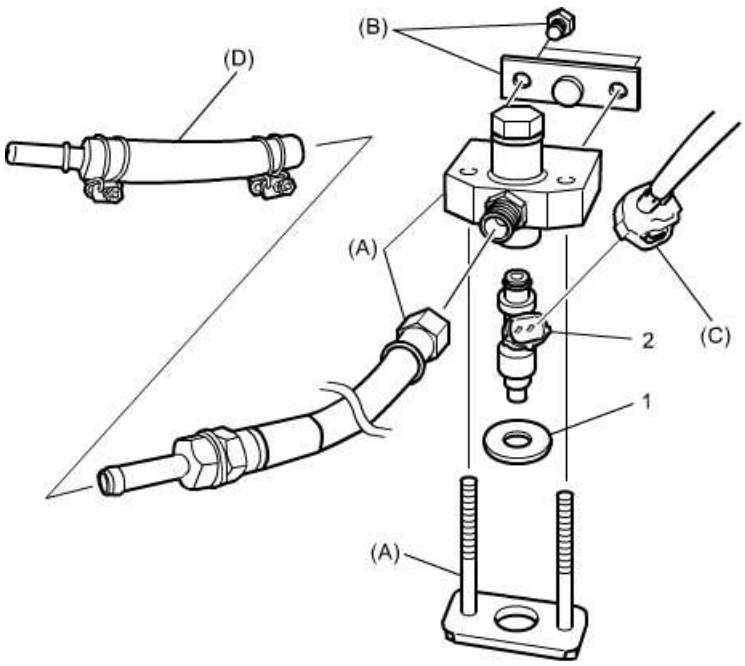
WARNING:
Put injector and battery as far away as possible to reduce risk of fire and personal injury when connecting/disconnecting test harness to/from battery.

1) Remove fuel injector (5). ☞

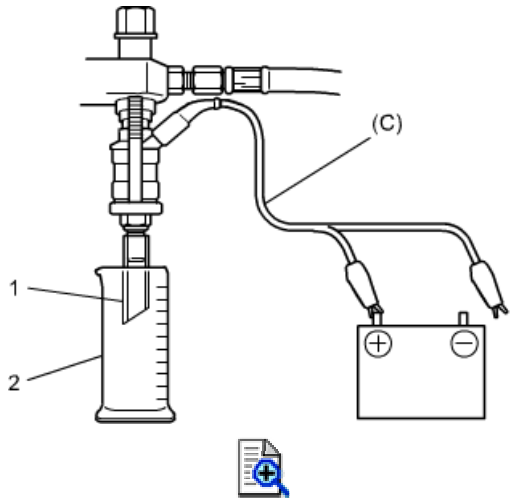
2) Set special tools to injector as follows.

Special Tool
(A): 09912–58421
(B): 09912–57610
(C): 09930–86310
(D): 09919–45710

a) Fit washer (1) (inside diameter 13.5 – 14.5 mm (0.531 – 0.570 in.)) to injector (2), and then install injector to special tool (A).
b) Connect special tool (C) to injector.
c) Install special tool (B) and special tool (D) to special tool (A).
d) Connect fuel feed pipe to special tool (D).

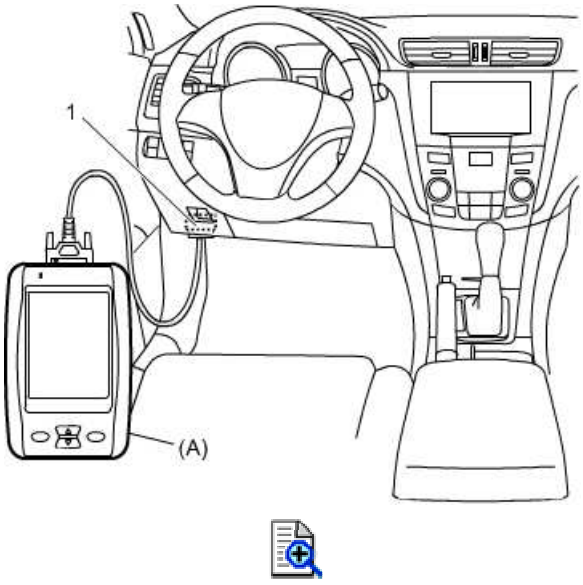


3) Install suitable vinyl tube (1) onto injector nozzle to prevent spout of fuel when performing test.
4) Put graduated cylinder (2) under injector.
5) Connect one of terminal of special tool (C) to battery positive (+) terminal.



6) Operate fuel pump and apply fuel pressure to injector as follows:
When using scan tool:
a) Connect scan tool to DLC (1) with ignition mode of keyless push start system in "OFF".

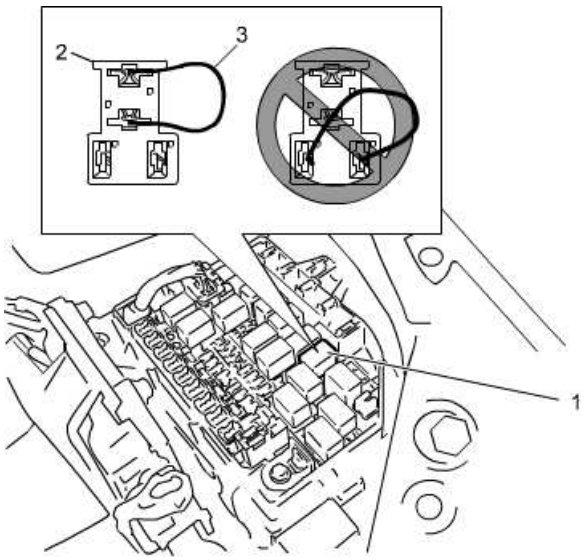
Special Tool
(A): SUZUKI scan tool (SUZUKI-SDT)



b) Push engine switch to change ignition mode to "ON", clear DTC and select "ACTIVE TEST" mode on scan tool. ☞
c) Turn ON fuel pump using scan tool.

When not using scan tool:
a) Remove fuel pump relay (1) from connector.
b) Connect two terminals of relay connector (2) using service wire (3) as shown in figure.

CAUTION:
Be sure to connect to correct terminals. Connecting to an incorrect terminal could cause damage to ECM, wire harness, etc.



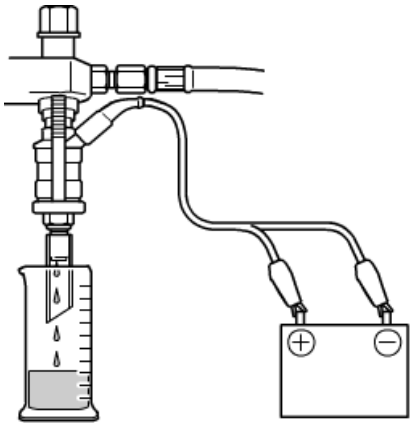
c) Push engine switch to change ignition mode to "ON".

7) Apply battery voltage to injector for 15 seconds and measure injected fuel volume with graduated cylinder.

8) Test each injector two or three times. If injected volume is out of reference value range to a large degree, replace injector.

Reference injected fuel volume

90 – 92 cm³/15 sec. (0.19/0.158 – 0.194/0.162 US/Imp pt/15 sec.)

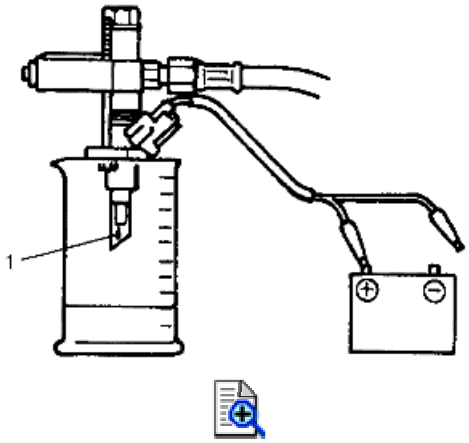


9) Check fuel leakage from injector nozzle. If fuel leaks (1) more than the following specifications, replace.

NOTE:
Do not operate injector for this check (but fuel pump should be at work).

Fuel leakage

Less than 1 drop/min.



10) Remove injector from special tool (A) and disconnect special tool (C) from injector.

WARNING:
As fuel feed line is still under high fuel pressure even after inspection, removing injector directly may cause hazardous spout of fuel. Before removing injector, make sure to relieve fuel pressure as follows.
1. Stop operation of fuel pump.
2. Put graduated cylinder under injector.
3. Apply battery voltage to injector until no fuel is injected from injector.

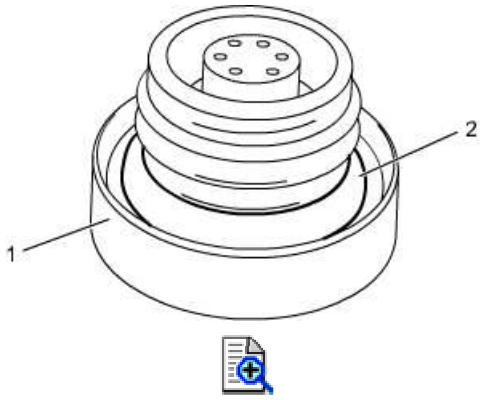
11) Carry out Steps 2) through 10) on each injector to obtain four readings.
12) After checking, remove special tools from fuel injector and fuel feed pipe.
13) Install fuel injector to cylinder head. ☞
14) Connect fuel feed pipe to fuel delivery pipe. ☞
15) Check for fuel leaks. ☞

1G

Fuel Filler Cap Inspection

WARNING:
If cap requires replacement, only a cap with the same features should be used. Failure to use correct cap can result in fire and personal injury.

Remove cap (1), and check gasket (2) for deterioration or any damage. If gasket is defective, replace cap.



1G

Fuel Tank Inlet Valve Removal and Installation

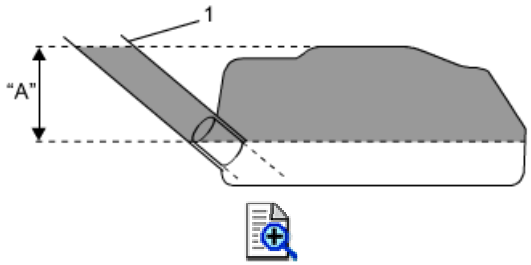
Removal

1) Remove fuel filler cap.

2) Insert hose of a hand operated pump into fuel filler hose (1) and drain fuel in space "A" shown in figure.

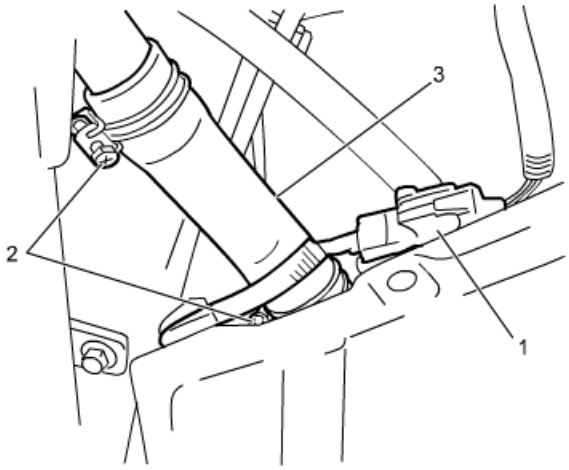
WARNING:
Store drained fuel in an airtight metal container and prevent ignition by static electricity, etc.

CAUTION:
Do not force pump hose into fuel tank.



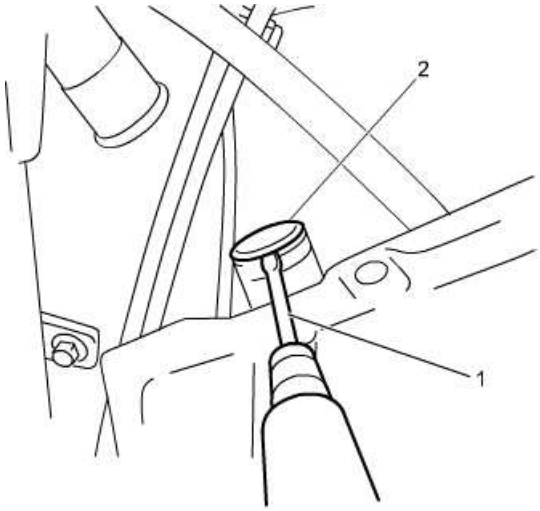
3) Hoist vehicle, and disconnect fuel tank harness connector (1).

4) Remove clamps (2) and fuel filler hose (3) from fuel tank.



5) Remove fuel tank inlet valve (2) using flat-end screwdriver (1) or the like.

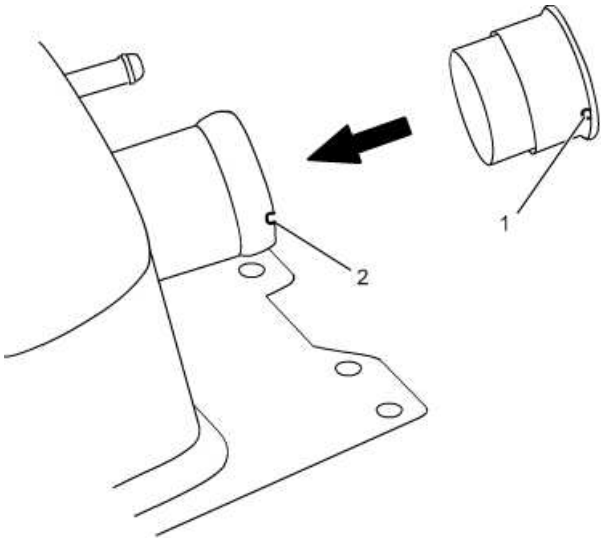
CAUTION:
Be careful not to damage fuel tank inlet valve (2) with tool.



Installation

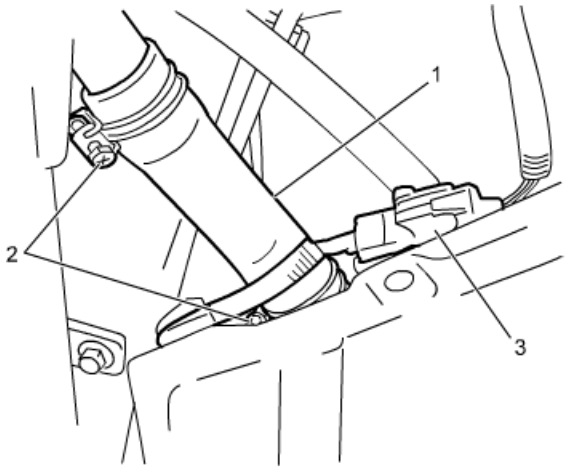
Reference: Fuel Tank Inlet Valve Inspection

1) Align protrusion (1) of fuel tank inlet valve with slot (2) of fuel tank and install it.



2) Install fuel filler hose (1) to fuel tank and secure it with clamps (2) referring to ***Fuel Hose Disconnecting and Reconnecting***.

3) Connect fuel tank harness connector (3).



4) Lower vehicle and install fuel filler cap.

1G

Fuel Tank Inlet Valve Inspection

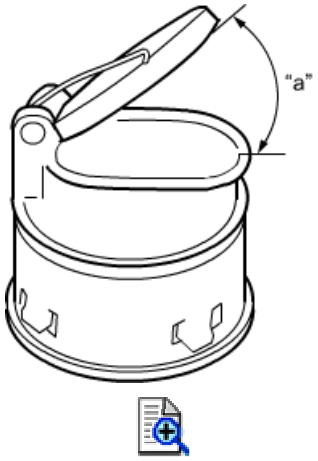
Reference: Fuel Tank Inlet Valve Removal and Installation

CAUTION:
If valve is opened more than 80 degrees "a", replace with new one.

Check fuel tank inlet valve for the following points.
If any damage or malfunction is found, replace.

- Check for damage
- Make sure opening and closing is smooth
- Make sure that value is not open by more than 80 degrees "a".

If there is a problem relating to any of the points above, replace with new one.



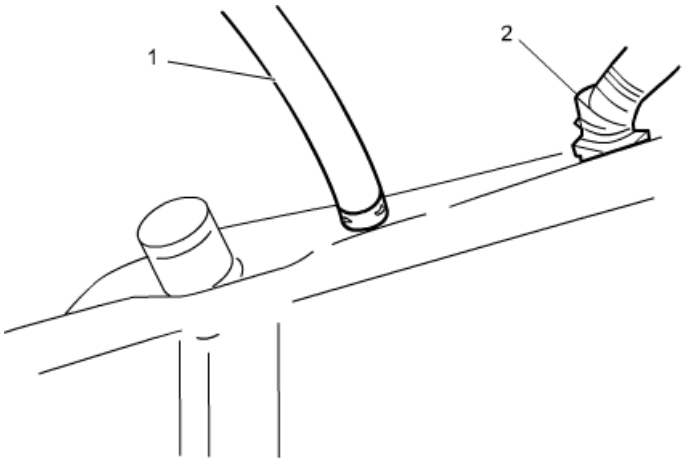
1G

Fuel Tank Removal and Installation

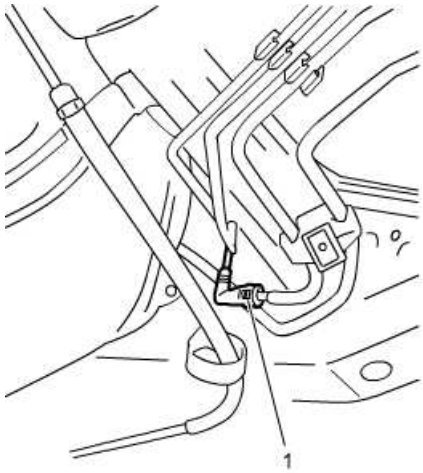
CAUTION:
When servicing fuel tank, it should be treated carefully. Pay attention not to contact with sharp edges or hot surfaces. In addition, fuel tank should not be dropped since fuel tank, fuel pump and other components can be damaged by impact. If dropped, all components should be replaced because there is a risk of damage.

Removal

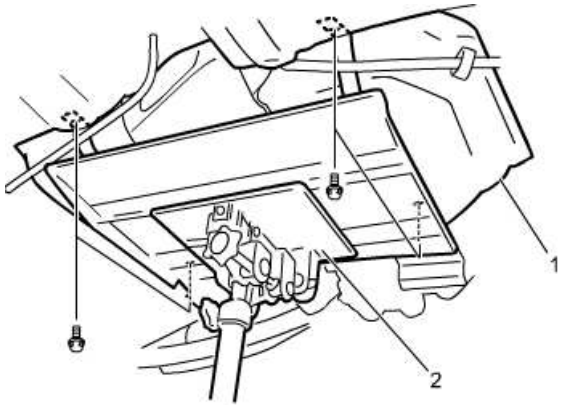
1) Relieve fuel pressure in fuel feed line. ☞
2) Disconnect negative (–) cable from battery.
3) Hoist vehicle.
4) Remove exhaust pipe No.2. ☞
5) For 4WD model, remove propeller shaft. ☞
6) With cable connected, detach parking brake cable clamp from body. ☞
7) Remove fuel filler hose from fuel tank referring to Step 1) to Step 4) of "Removal" under ***Fuel Tank Inlet Valve Removal and Installation***.
8) Disconnect breather hose (1) and EVAP canister hose (2).



9) Disconnect fuel feed pipe (1). ☞



10) Support fuel tank (1) with jack (2) and remove fuel tank.



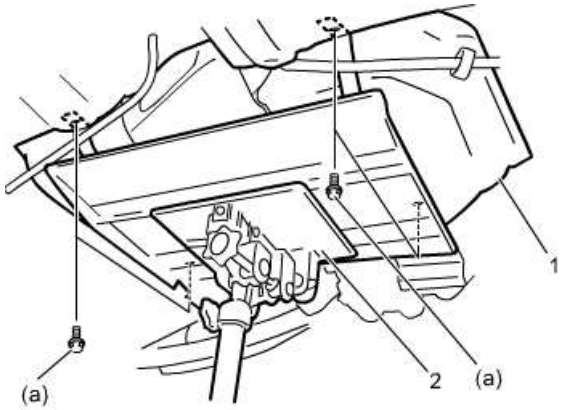
Installation

Reference: Fuel Tank Inspection
Reference: Fuel Tank Flushing Procedure

NOTE:
If parts have been removed from fuel tank, install them before installing fuel tank to vehicle.

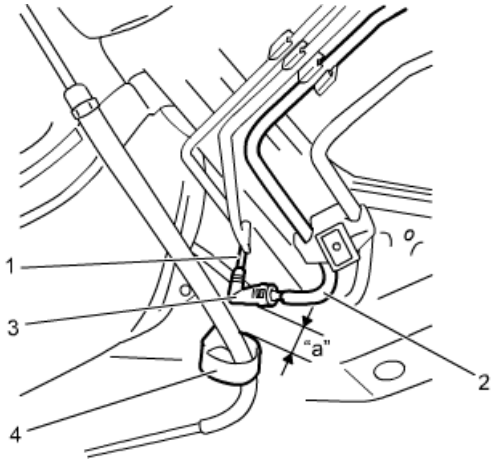
1) Raise fuel tank (1) with jack (2) and then install fuel tank to vehicle.

Tightening torque
Fuel tank bolt (a): 45 N·m (4.6 kg-m, 33.5 lbf-ft)

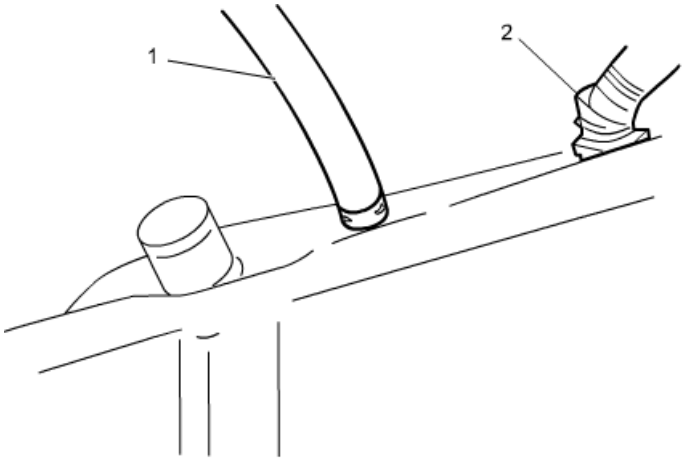


2) Connect fuel feed pipe (fuel pump side) (1) to fuel feed pipe (body side) (2), and clamp them securely. ☞

NOTE:
Clearance "a" between quick joint (3) and parking cable clamp (4) should be more than 15 mm.

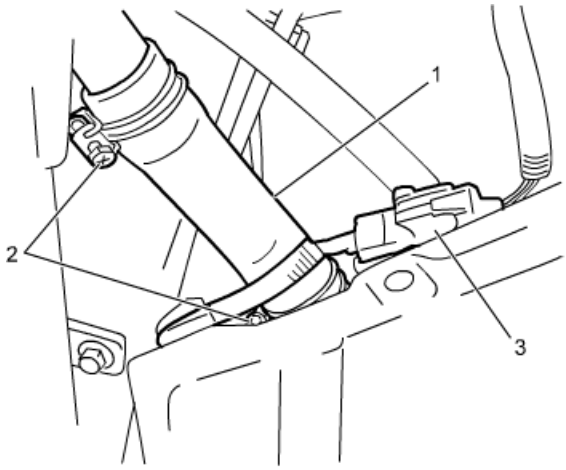


3) Connect breather hose (1) and EVAP canister hose (2).



4) Install fuel filler hose (1) to fuel tank and secure it with clamps (2) referring to ***Fuel Hose Disconnecting and Reconnecting***.

5) Connect fuel tank harness connector (3).



6) Install parking brake cable clamp to vehicle body. ☞

7) For 4WD model, install propeller shaft. ☞

8) Install exhaust pipe No.2. ☞

9) Connect negative (–) cable to battery.

10) With engine stationary, ignition mode of keyless push start system in "ON" and check for fuel leaks. ☞

1G

Fuel Tank Inspection

Reference: Fuel Tank Removal and Installation

WARNING:
Do not attempt any repair on tank using heat of flame as an explosion resulting in personal injury could occur.

- Check fuel tank for cracks, deformation or damage.
  If any abnormality is found, replace fuel tank.
- Check fuel pump gasket and sub fuel level sensor gasket for fuel leaks.
  If any abnormality is found, replace corresponding gasket.

1G

Fuel Tank Flushing Procedure

Reference: Fuel Tank Removal and Installation

1) After removing fuel tank, remove all hoses, pipes and fuel pump assembly from fuel tank.
2) Drain all remaining fuel from tank.
3) Place fuel tank to flushing area.
4) Fill tank with warm water or tap water, and agitate vigorously and drain. Repeat this washing until inside of tank is clean.
5) Completely flush out remaining water after washing.
6) Be sure to dry fuel tank assembly thoroughly out of direct sunlight after washing.

CAUTION:
Never leave water in fuel tank after washing, otherwise fuel tank inside will get corrosion.

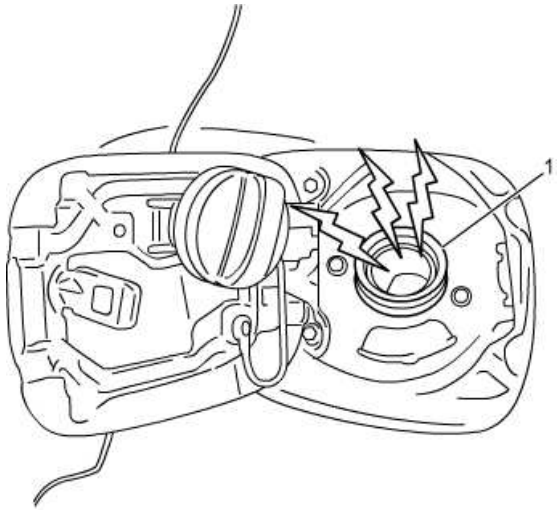
1G

Fuel Pump On-Vehicle Inspection

1) Remove fuel filler cap and push engine switch to change ignition mode to "ON".

2) Check fuel pump operating sound should be heard from fuel filler (1) for about 2 seconds.
If check result is not satisfactory, go to ***Fuel Pump and Its Circuit Check***.

NOTE:
Be sure to reinstall fuel filler cap after checking.



1G

Fuel Pump Assembly Removal and Installation

Reference: Fuel Pump On-Vehicle Inspection

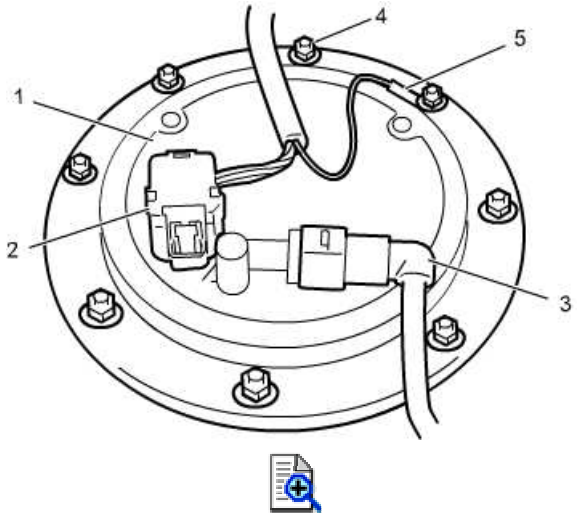
Removal

1) Remove fuel tank from vehicle. ☞

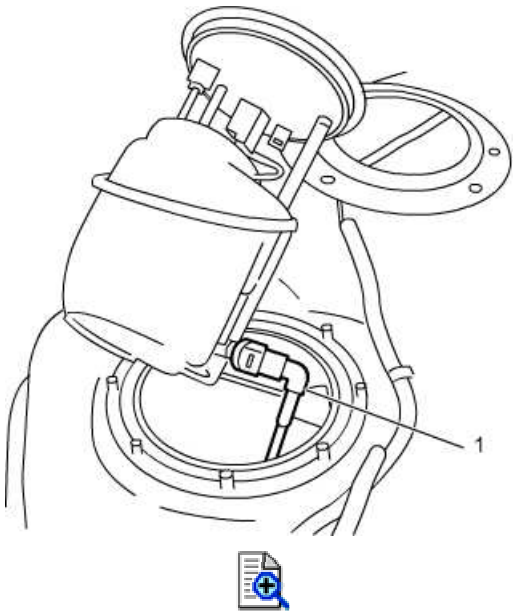
2) Disconnect fuel pump/fuel level sensor connector (2) from fuel pump assembly (1).

3) Disconnect fuel feed pipe (3) from fuel pump assembly. ☞

4) Remove fuel pump nuts (4) and ground terminal (5).



5) For 4WD model, lift fuel pump and disconnect fuel suction pipe (1) from fuel pump assembly. ☞



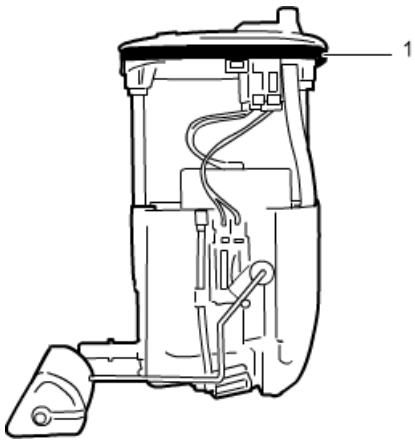
6) Remove fuel pump assembly from fuel tank.

Installation

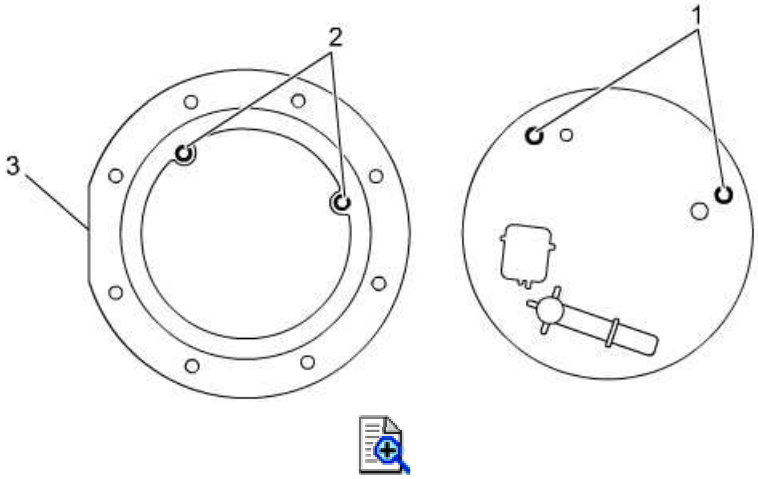
Reference: Fuel Pump Inspection

Reverse removal procedure, noting the following points.

- Check that mating surface of fuel pump is clean.
- Use new fuel pump gasket (1).



- Align protrusions (1) on fuel pump with aligning hole (2) on fuel pump plate.
- Align straight portion (3) on fuel pump plate with specified position on fuel tank.



- Tighten fuel pump nuts to specified torque.

Tightening torque

Fuel pump nut: 10 N·m (1.0 kg-m, 7.5 lbf-ft)

1G

Fuel Pump Inspection

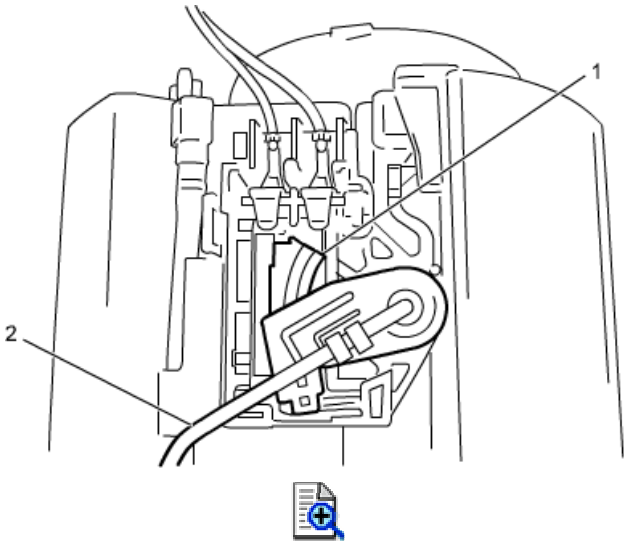
Reference: Fuel Tank Removal and Installation

- Check fuel pump assembly for damage.
- Check fuel suction filter for evidence of dirt and contamination.
  If filter is faulty, replace or clean and check for presence of dirt in fuel tank.

1G

Fuel Level Sensor Removal and Installation

CAUTION:
Do not touch resister plate (1) and cause deformation of arm (2). It may cause fuel level sensor to fail.

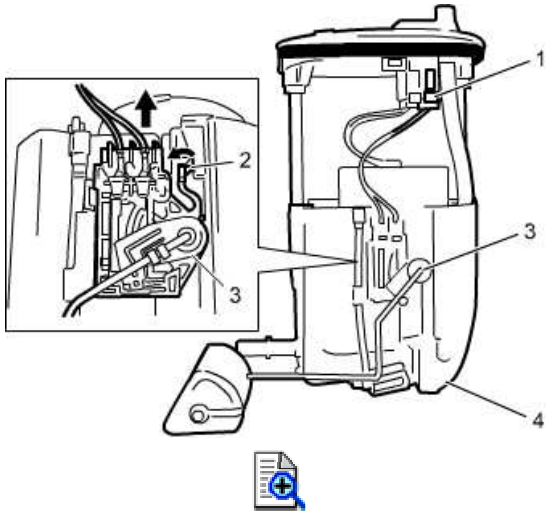


Removal

1) Remove fuel pump assembly from fuel tank. ☞

2) Disconnect fuel level sensor connector (1).

3) Release lock (2), remove fuel level sensor (3) from fuel pump (4) by sliding it in arrow direction as shown in figure.



Installation

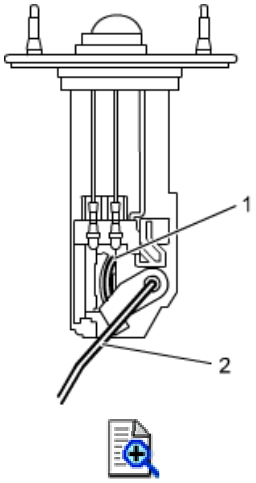
Reference: Fuel Level Sensor Inspection

Reverse removal procedure for installation.

1G

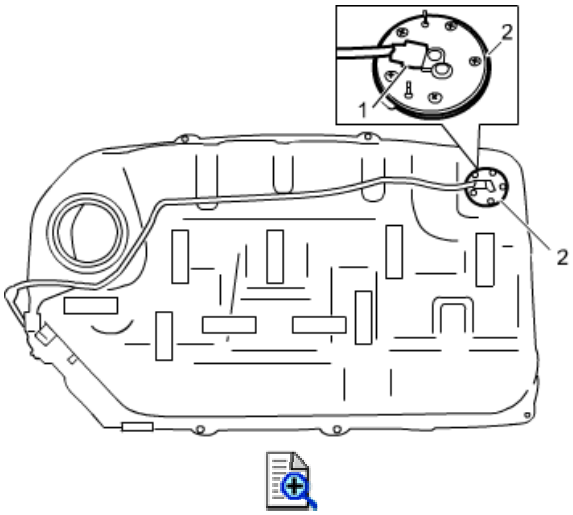
Sub Fuel Level Sensor Removal and Installation (4WD Model)

CAUTION:
Do not touch resister plate (1) and cause deformation of arm (2). It may cause sub fuel level sensor to fail.



Removal

1) Remove fuel tank from vehicle. ☞
2) Disconnect sub fuel level sensor connector (1).
3) Remove sub fuel level sensor (2) from fuel tank.



Installation

Reference: Fuel Level Sensor Inspection
Reverse removal procedure, noting the following points.
- Check that mating surface of sub fuel level sensor is clean.
- Replace gasket with new one.
- Tighten sub fuel level sensor screws to specified torque.

Tightening torque
Sub fuel level sensor screw: 1.6 N·m (0.16 kg-m, 1.5 lbf-ft) ((Reference))

- After tightening screws, check for fuel leaks.

1G

Fuel Level Sensor Inspection

Main Fuel Level Sensor

Reference: Fuel Level Sensor Removal and Installation

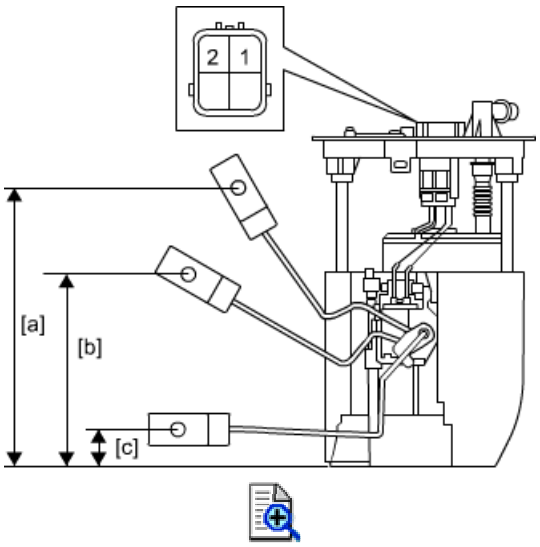
Check resistance between terminals (1) and (2) at each float position [a], [b] and [c].
If measured resistance is out of specification, replace fuel level sensor.

Fuel level sensor resistance

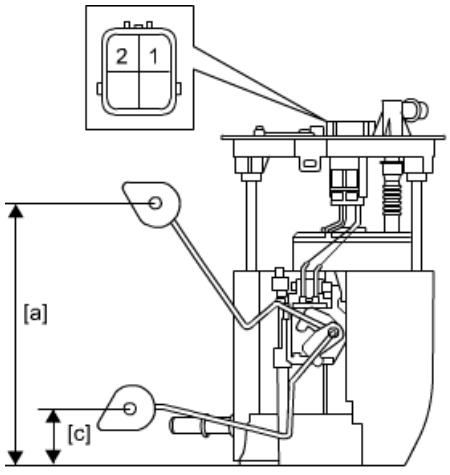
Standard

Float position		Resistance
[a]	2WD: 147.7 mm (5.815 in.)	38.0 – 42.0 Ω
	4WD: 145.6 mm (5.732 in.)	19.0 – 21.0 Ω
[b]	2WD: 98.3 mm (3.87 in.)	150.0 – 170.0 Ω
[c]	2WD: 16.5 mm (0.650 in.)	276.7 – 283.3 Ω
	4WD: 26.7 mm (1.05 in.)	114.6 – 117.2 Ω

2WD model



4WD model



Sub Fuel Level Sensor (4WD model)

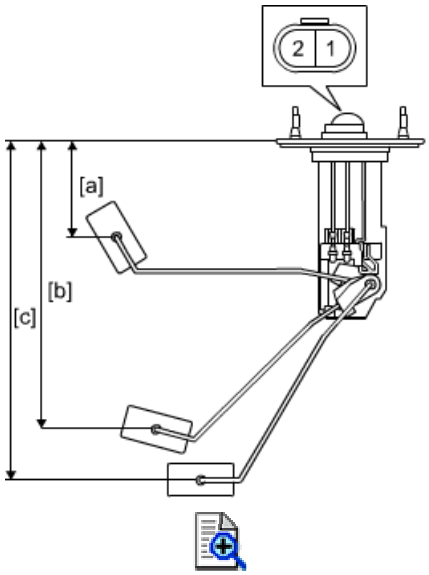
Reference: Sub Fuel Level Sensor Removal and Installation (4WD Model)

Check resistance between terminals (1) and (2) at each float position [a], [b] and [c].
If measured resistance is out of specification, replace sub fuel level sensor.

Sub fuel level sensor resistance

Standard

Float position		Resistance
[a]	53.6 mm (2.11 in.)	19.0 – 21.0 Ω
[b]	161.8 mm (6.370 in)	136.5 – 143.5 Ω
[c]	190.4 mm (7.496 in)	162.1 – 166.1 Ω



1G

Tightening Torque Specifications

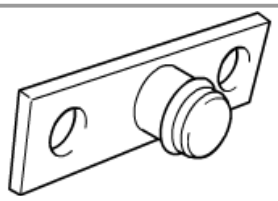
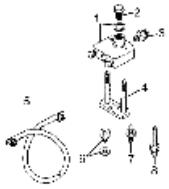
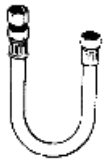
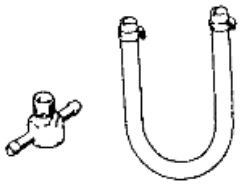
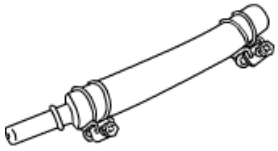
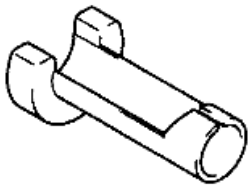
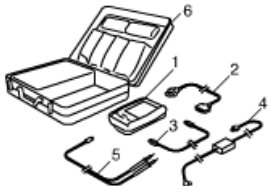
Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Fuel delivery pipe bolt	25	2.5	18.5	☞
Fuel tank bolt	45	4.6	33.5	☞
Fuel pump nut	10	1.0	7.5	☞
Sub fuel level sensor screw	1.6	0.16	1.5	(Reference) ☞

NOTE:
The specified tightening torque is described in the following.
Fuel System Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1G

Special Tool

09912–57610 Injector checking tool plate 	09912–58421 Checking tool set This kit includes the following items. 1. Tool body and washer, 2. Body plug, 3. Body attachment-1, 4. Holder, 5. Return hose and clamp, 6. Body attachment-2 and washer, 7. Hose attachment-1, 8. Hose attachment-2 
09912–58432 Fuel pressure gauge hose This tool is included in fuel pressure gauge set (09912-58413). 	09912–58442 Fuel pressure gauge This tool is included in fuel pressure gauge set (09912-58413). 
09912–58490 3-way joint & hose 	09919–45710 Fuel pipe quick joint connector 
09919–47020 Quick joint remover 	09930–86310 Injector test harness 
SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case 	

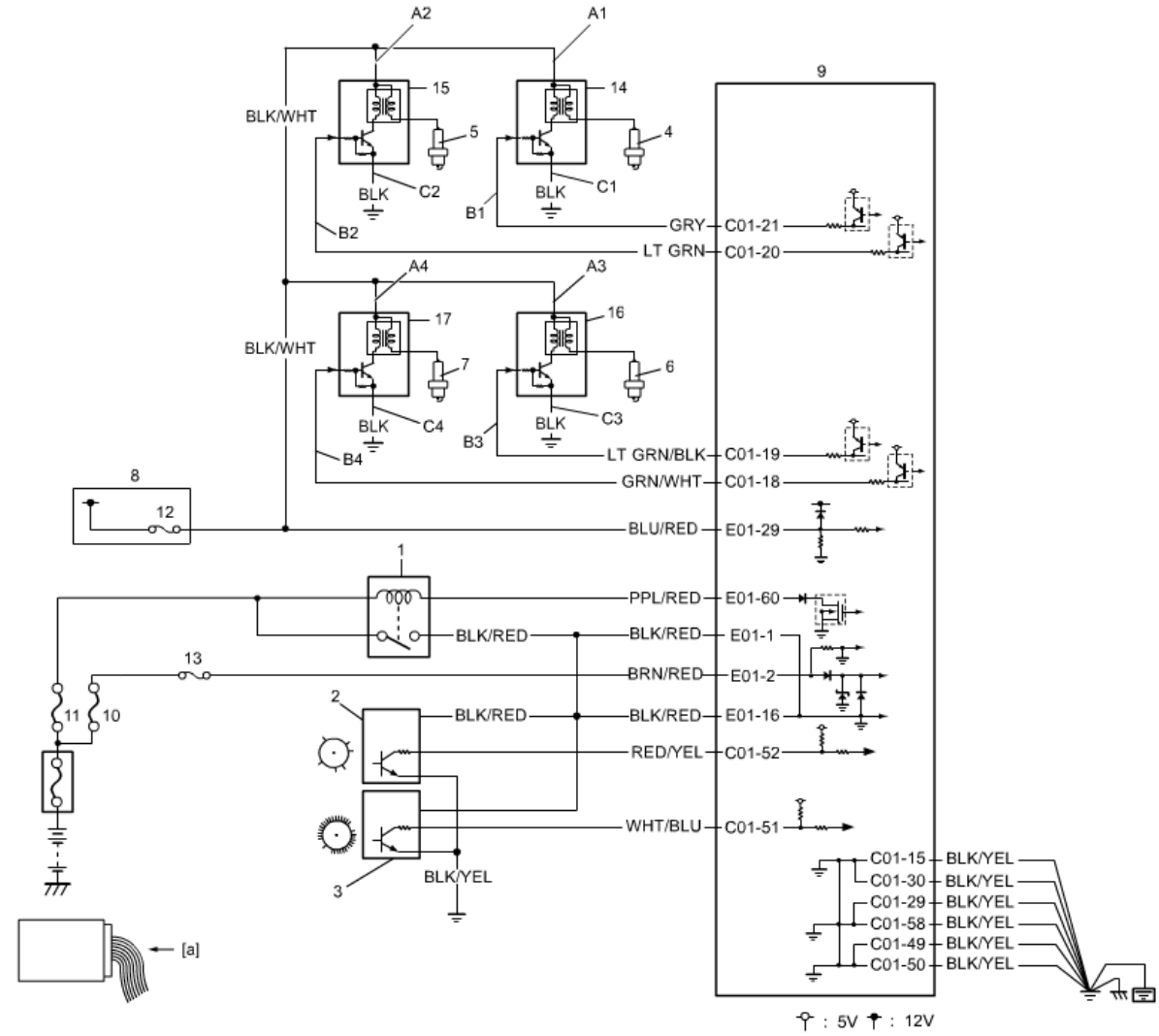
Ignition System Description

The ignition system is electronic ignition type that has neither distributor nor high-tension cords. It consists of the following parts:

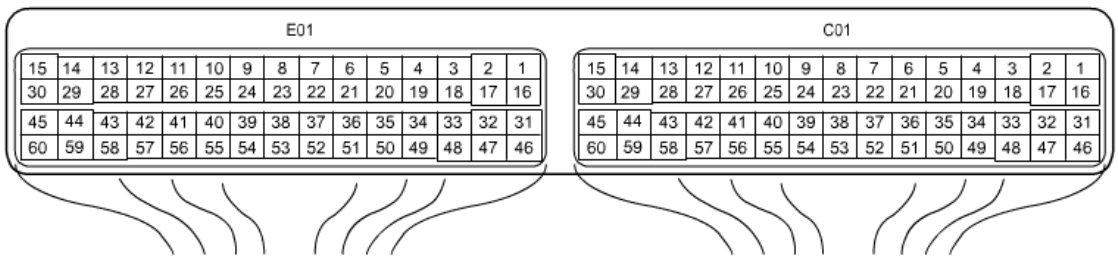
- ECM
  ECM monitors engine and vehicle conditions through the signals from the relevant sensors, determines the most suitable ignition timing and sends control signals to ignition coil assemblies.
- Ignition coil assembly
  The ignition coil assembly is a combination of an ignitor and ignition coils. It is provided for each cylinder and the ignition coils fit directly over each spark plug. The primary coil current is turned on and off according to the signal from the ECM. When the primary coil current is cut off, a high voltage is induced in the secondary coil. The high voltage is applied directly to the spark plug of each cylinder.
- Spark plug
- CMP (camshaft position) sensor and CKP (crankshaft position) sensor
  Using signals from these sensors, the ECM detects cylinders in which the piston is in the compression stroke and detects the crank angle, and sets the initial ignition timing.
- TP (throttle position) sensor, ECT (engine coolant temperature) sensor, MAF (mass air flow) sensor, IAT (intake air temperature) sensor, knock sensor and other sensors/switches
  Using signals from these sensors/switches, the ECM corrects the initial ignition timing and sets the optimum timing according to the engine conditions.

1H

Ignition System Wiring Circuit Diagram



[A]

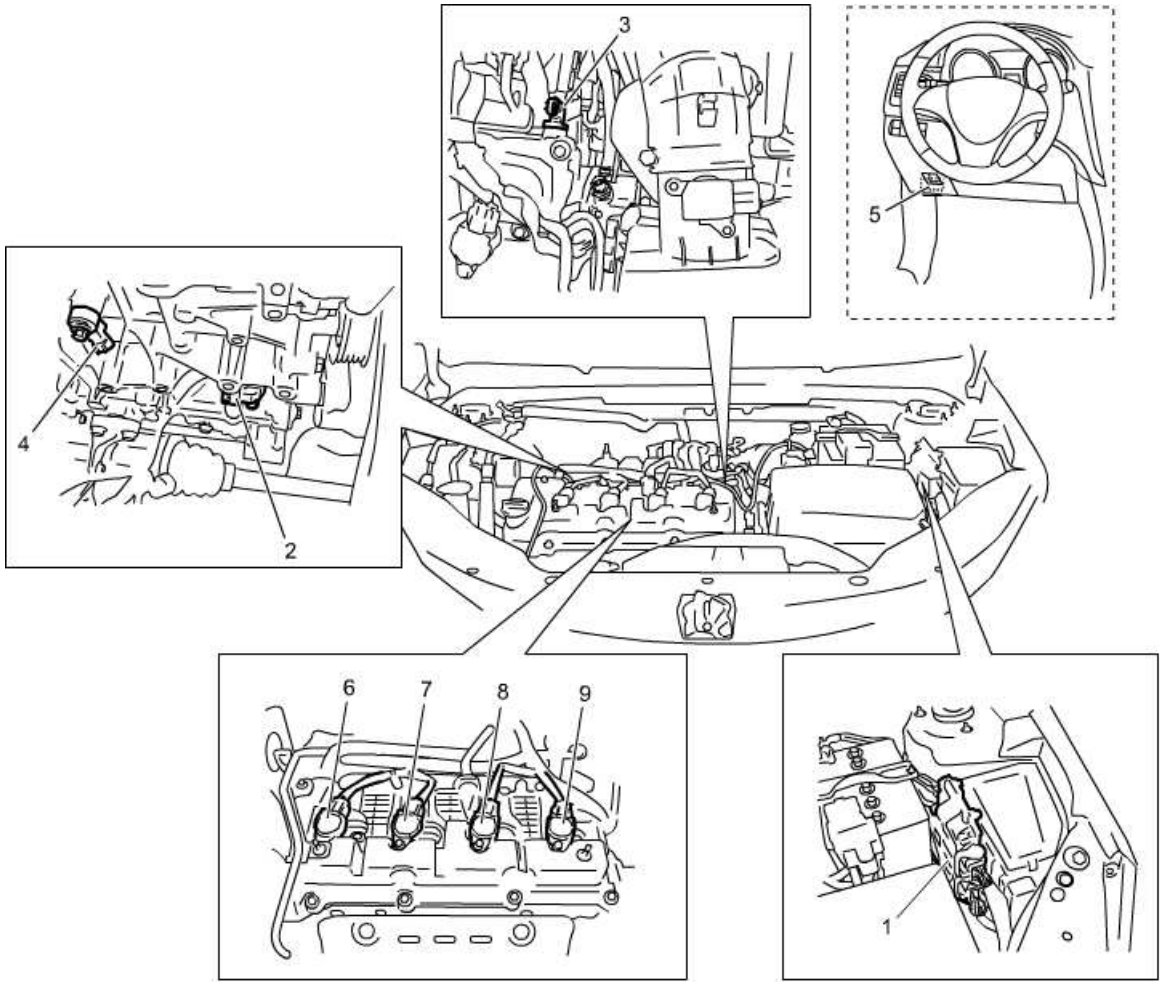


[A]:	ECM connector (View: [a])	4.	Spark plug No.1	11.	"FI" fuse
A1 – A4:	Ignition coil assembly power supply circuits	5.	Spark plug No.2	12.	"IG COIL" fuse
B1 – B4:	Ignition coil assembly drive circuits	6.	Spark plug No.3	13.	"DOME" fuse
C1 – C4:	Ignition coil assembly ground circuits	7.	Spark plug No.4	14.	Ignition coil assembly No.1

1. Main relay	8. J/B	15. Ignition coil assembly No.2
2. CMP sensor	9. ECM	16. Ignition coil assembly No.3
3. CKP sensor	10. "B/U" fuse	17. Ignition coil assembly No.4

1H

Ignition System Component Location



1: ECM	4. Knock sensor	7. Ignition coil assembly No.2
2: CKP sensor	5. DLC	8. Ignition coil assembly No.3
3. CMP sensor	6. Ignition coil assembly No.1	9. Ignition coil assembly No.4

1H

Ignition System Check

Step	Action	YES	NO
1	***Was "Engine and Emission Control System Check" performed?***	Go to Step 2.	Go to ***Engine and Emission Control System Check***.
2	**Ignition spark test 1** 1) Perform ignition spark test. ☞ ***Is test result satisfactory?***	Go to Step 3.	Go to Step 4.
3	**Ignition timing check** 1) Check ignition timing. ☞ ***Is check result satisfactory?***	Ignition system is in good condition.	Repair or replace malfunctioning part.
4	**Confirmation of cylinders with malfunction detected** 1) Confirm whether there are any cylinders with a malfunction detected in ignition spark test. ***Are there malfunctions in any cylinders?***	Go to Step 8.	Go to Step 5.
5	**Ignition spark test 2** 1) Replace spark plug in cylinder with malfunction detected with spark plug of normal cylinder. 2) Perform ignition spark test on spark plug newly installed in cylinder with malfunction detected. ☞ ***Is test result satisfactory?***	Replace spark plug in malfunction-detected cylinder. ☞	Go to Step 6.
6	**Ignition spark test 3** 1) Replace ignition coil assembly in cylinder with malfunction detected with ignition coil assembly of normal cylinder. 2) Perform ignition spark test on spark plug in cylinder with malfunction detected. ☞ ***Is test result satisfactory?***	Replace ignition coil assembly in cylinder with malfunction detected. ☞	Go to Step 7.
7	**Ignition coil assembly drive circuit check** 1) Check drive circuits (B1, B2, B3 and B4) of each ignition coil	Go to Step 8.	Repair malfunctioning part.

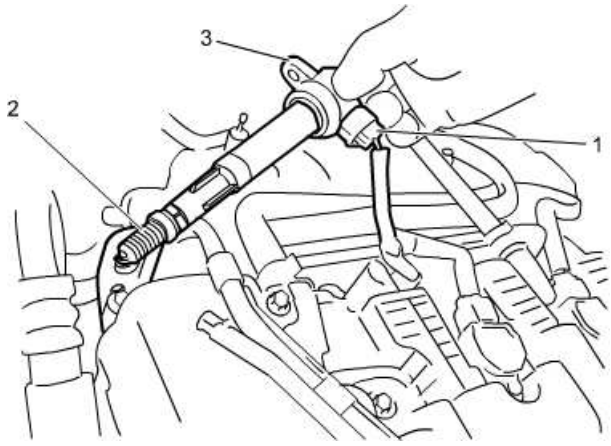
	assembly for open, short and poor connection. ☞ ***Are circuits in good condition?***		
8	**Ignition coil assembly power supply and ground circuit check** 1) Check power supply (A1, A2, A3 and A4) and ground (C1, C2, C3 and C4) circuits of each ignition coil assembly for open, short and poor connection. ☞ ***Are circuits in good condition?***	Replace ECM and recheck DTC. ☞	Repair malfunctioning part.

1H

Ignition Spark Test

WARNING:
Be sure to disconnect injector connectors. Without disconnection of injector connectors, combustible gas may come out from spark plug holes during this test and may get ignited in engine compartment.

1) Remove spark plug. ☞
2) Inspect spark plug. ☞
3) Disconnect all injector connector.
4) Connect ignition coil connector (1) to ignition coil assembly (3).
5) Connect spark plug (2) to ignition coil assembly, and ground spark plug.



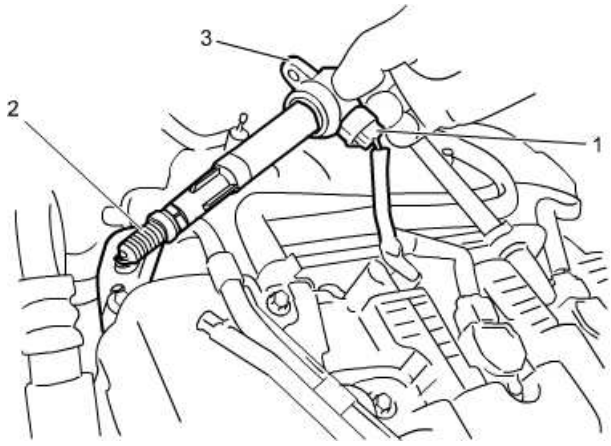
6) Crank engine and check whether spark plug sparks.
7) Check all spark plugs in the same manner. If any spark plug does not spark, check ignition system. ☞

1H

Ignition Spark Test

WARNING:
Be sure to disconnect injector connectors. Without disconnection of injector connectors, combustible gas may come out from spark plug holes during this test and may get ignited in engine compartment.

1) Remove spark plug. ☞
2) Inspect spark plug. ☞
3) Disconnect all injector connector.
4) Connect ignition coil connector (1) to ignition coil assembly (3).
5) Connect spark plug (2) to ignition coil assembly, and ground spark plug.



6) Crank engine and check whether spark plug sparks.
7) Check all spark plugs in the same manner. If any spark plug does not spark, check ignition system. ☞

1H

Spark Plug Removal and Installation

Removal

1) Remove ignition coil assembly. ☞

2) Remove spark plug from cylinder head.

Installation

Reference: Spark Plug Inspection

Reverse removal procedure noting the following.

- Tighten spark plug to specified torque.

Tightening torque

Spark plug: 25 N·m (2.5 kg-m, 18.5 lbf-ft)

1H

Spark Plug Inspection

Reference: Spark Plug Removal and Installation

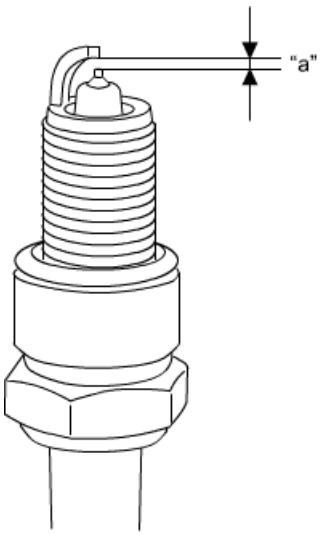
CAUTION:
- **For iridium type spark plug, do not touch the center electrode. The center electrode can be damaged if a mechanical force is applied.**
- **For iridium type spark plug, do not clean nor adjust gap.**

Check spark plug for the following points:
- Air gap
- Electrode wear
- Carbon deposits
- Insulator damage

If any abnormality is found for iridium spark plug, replace with new spark plug.
If any abnormality is found for nickel spark plug, adjust air gap, clean with spark plug cleaner or replace with new spark plug.

Spark plug air gap "a"
Standard: 1.0 – 1.1 mm (0.039 – 0.043 in.)

Spark plug specification
Iridium type: NGK SILFR6A11
Nickel type: DENSO K16HPR-U11

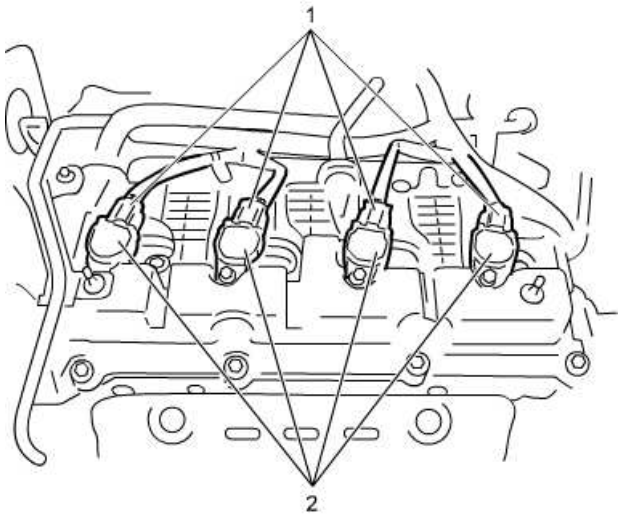


1H

Ignition Coil Assembly Removal and Installation

Removal

1) Disconnect negative (–) cable from battery.
2) Remove engine cover.
3) Disconnect ignition coil connector (1).
4) Remove ignition coil assembly (2).



Installation

Reference: Ignition Coil Assembly Inspection

Reverse removal procedure noting the following.

- Tighten ignition coil bolt to specified torque.

Tightening torque

Ignition coil bolt: 11 N·m (1.1 kg-m, 8.5 lbf-ft)

1H

Ignition Coil Assembly Inspection

Reference: Ignition Coil Assembly Removal and Installation

Check ignition coil assembly for the following points:

- Damage
- Deterioration
- Corrosion of terminal

If any abnormality is found, replace ignition coil assembly. ☞

1H

Ignition Timing Inspection

Reference: Spark Plug Removal and Installation

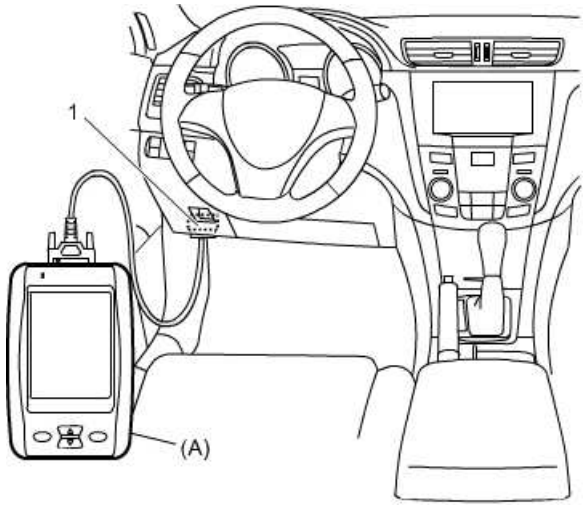
NOTE:
Ignition timing is not adjustable. If ignition timing is out of specification, check ignition system related parts.

1) For CVT model, place select lever in "P" position.
For M/T model, place gear shift lever in "Neutral" position.

2) Apply parking brake.

3) Confirm that ignition mode of keyless push start system is "OFF" and connect SUZUKI scan tool to DLC (1).

Special Tool
(A): SUZUKI scan tool (SUZUKI-SDT)



4) Start engine and warm it up to normal operating temperature.

5) Make sure that all electrical loads except ignition are in OFF position.

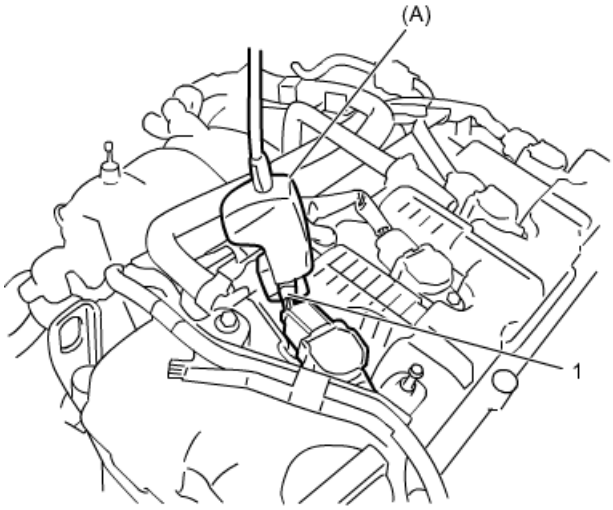
6) Make sure accelerator pedal is not depressed.

7) Make sure that idle speed is at specified speed. ☞

8) Fix ignition timing using "Fixed Spark" in "Active Test" mode on SUZUKI scan tool.

9) Set timing light (A) according to the following procedure.
a) Point arrow on sensor of timing light (A) to ignition coil assembly of cylinder No.1.
b) Clip ignition coil harness (1) of cylinder No.1 with special tool (A).

Special Tool
(A): 09930–76420



10) Check that the ignition timing is at the specified value using the timing chain cover mark (1) and crankshaft pulley notch mark (2).

Initial ignition timing

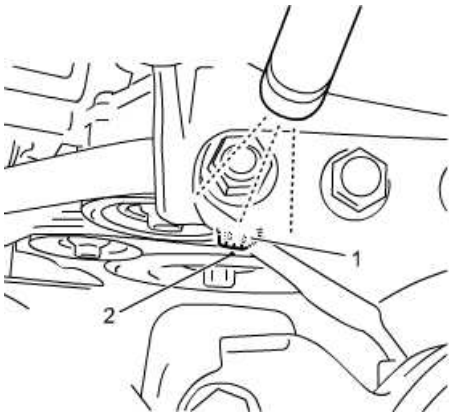
Fixed with SUZUKI scan tool: 5 ± 3° BTDC (at specified idle speed)

Ignition order

1 – 3 – 4 – 2

If ignition timing is out of specification, check the following points.

- CKP sensor ☞
- CKP sensor plate ☞
- CMP sensor ☞
- CMP sensor rotor tooth of intake camshaft



11) Release ignition timing fixation by using SUZUKI scan tool.

12) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 6° ± 3° BTDC by using timing light. When the engine speed is increased, check that ignition timing advances.
If even just one of the check results is not satisfactory, check the following points.

- ECM and its circuit ☞
- TP sensor ☞
- APP sensor ☞

1H

Ignition Timing Inspection

Reference: Spark Plug Removal and Installation

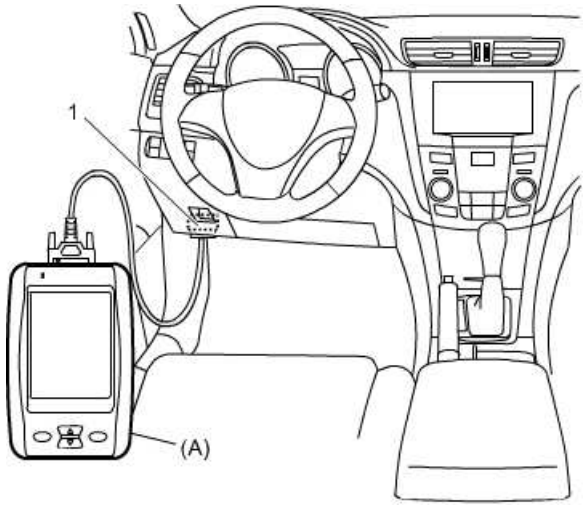
NOTE:
Ignition timing is not adjustable. If ignition timing is out of specification, check ignition system related parts.

1) For CVT model, place select lever in "P" position.
For M/T model, place gear shift lever in "Neutral" position.

2) Apply parking brake.

3) Confirm that ignition mode of keyless push start system is "OFF" and connect SUZUKI scan tool to DLC (1).

Special Tool
(A): SUZUKI scan tool (SUZUKI-SDT)



4) Start engine and warm it up to normal operating temperature.

5) Make sure that all electrical loads except ignition are in OFF position.

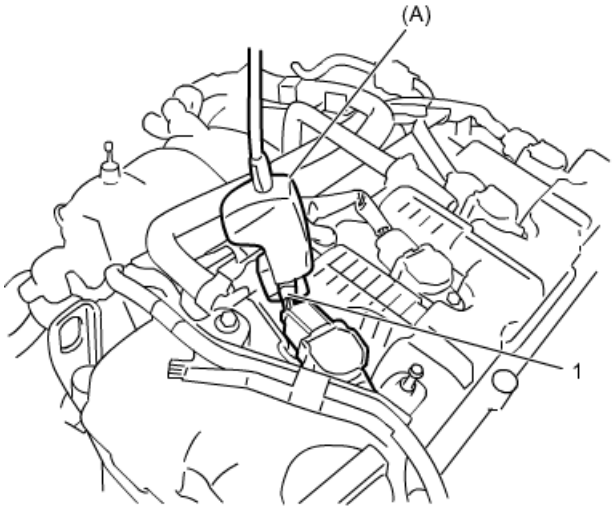
6) Make sure accelerator pedal is not depressed.

7) Make sure that idle speed is at specified speed. ☞

8) Fix ignition timing using "Fixed Spark" in "Active Test" mode on SUZUKI scan tool.

9) Set timing light (A) according to the following procedure.
a) Point arrow on sensor of timing light (A) to ignition coil assembly of cylinder No.1.
b) Clip ignition coil harness (1) of cylinder No.1 with special tool (A).

Special Tool
(A): 09930–76420



10) Check that the ignition timing is at the specified value using the timing chain cover mark (1) and crankshaft pulley notch mark (2).

Initial ignition timing

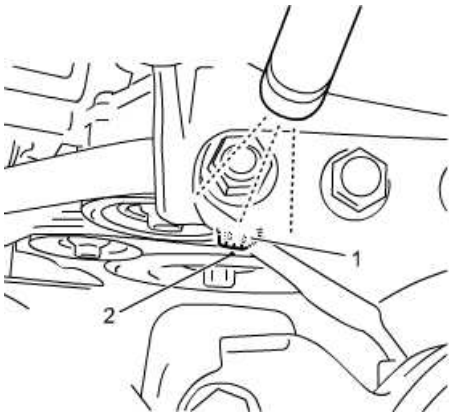
Fixed with SUZUKI scan tool: 5 ± 3° BTDC (at specified idle speed)

Ignition order

1 – 3 – 4 – 2

If ignition timing is out of specification, check the following points.

- CKP sensor ☞
- CKP sensor plate ☞
- CMP sensor ☞
- CMP sensor rotor tooth of intake camshaft



11) Release ignition timing fixation by using SUZUKI scan tool.

12) With engine idling (throttle opening at closed position and vehicle stopped), check that ignition timing is about 6° ± 3° BTDC by using timing light. When the engine speed is increased, check that ignition timing advances.
If even just one of the check results is not satisfactory, check the following points.

- ECM and its circuit ☞
- TP sensor ☞
- APP sensor ☞

1H

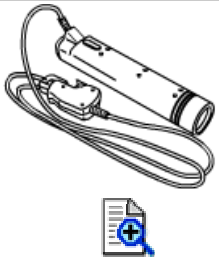
Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Spark plug	25	2.5	18.5	☞
Ignition coil bolt	11	1.1	8.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1H

Special Tool

09930–76420 Timing-light (dry cell type) ☞		SUZUKI scan tool (SUZUKI-SDT) — This kit includes following items. 1. SUZUKI-SDT 2. DLC cable 3. USB cable 4. AC/DC power supply 5. Voltage meter probe 6. Storage case☞	

1I

Cranking System Description

Cranking Circuit

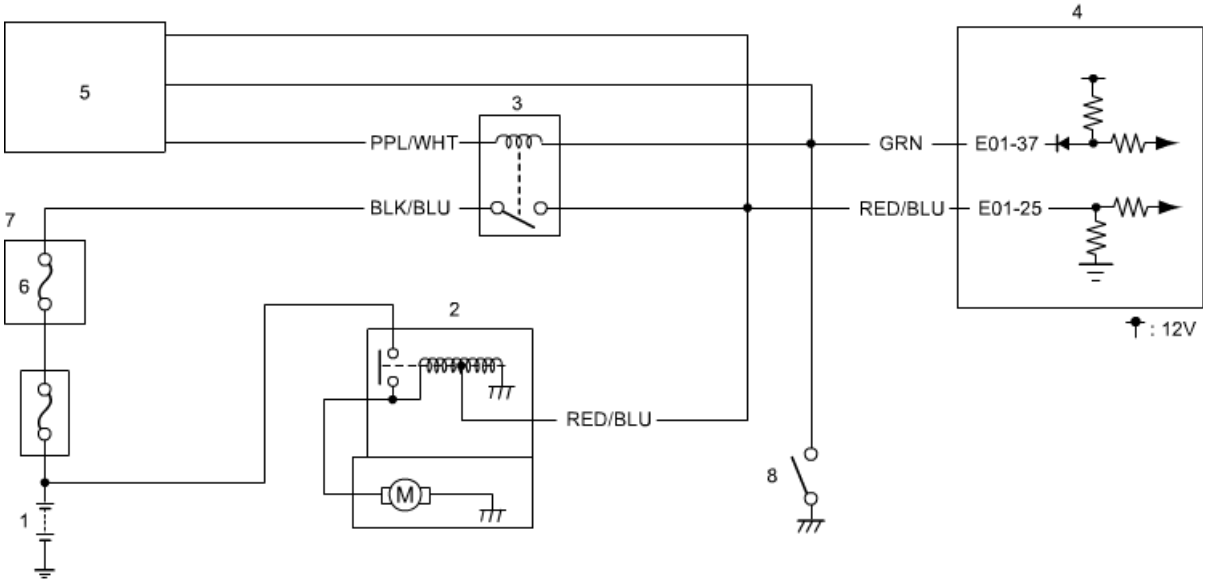
The cranking circuit consists of the battery, starting motor, starting motor control relay, engine switch, P position switch (CVT model), clutch switch (M/T model), and related electrical wiring.

Starting Motor Circuit

In the circuit shown in ***Cranking System Circuit Diagram***, the coil of the magnetic switch in starting motor is energized when the engine starts. The resulting movement of the plunger and pinion drive lever causes the pinion to engage the drive plate (CVT model) or engine flywheel (M/T model) gear, contact with the magnetic switch ends, and cranking takes place. When the engine starts, the pinion overrunning clutch protects the armature from excessive speed until the switch is opened, at which time the return spring causes the pinion to disengage.

1I

Cranking System Circuit Diagram



1. Battery	4. ECM	7. Main fuse box
2. Starting motor	5. Keyless start control module	8. P position switch (CVT model) or clutch pedal position switch (M/T model)
3. Starting motor control relay	6. "ST" fuse	

1I

Cranking System Symptom Diagnosis

Possible symptoms of starting system trouble would be as follows:

- Starting motor does not run (or runs slowly).
- Starting motor runs but fails to crank engine.
- Abnormal noise is heard.

Proper diagnosis must be made to determine exactly where the cause of each trouble lies in battery, wiring harness, starting motor (including magnetic switch) or engine.
Before removing the starting motor to perform inspection, check the following items to narrow down the possible causes of trouble.

- Tightness of battery terminals (including ground cable connection on engine) and starting motor terminals
- Discharge of battery
- Mounting of starting motor

Condition	Possible Cause	Action
Starting motor not running (No operating sound of magnetic switch)	Malfunction of P position switch (CVT model)	*Check P position switch.* ☞
	Malfunction of clutch pedal position switch (M/T model)	*Check clutch pedal position switch.* ☞
	Battery voltage is too low	*Check battery.* ☞
	Charging faulty due to deteriorated battery	*Replace battery.* ☞
	Poor battery terminal connection	*Check terminal connection or replace battery.* ☞
	Poor ground cable connection	*Tighten ground cable.*
	Blown fuse	*Replace fuse.*
	Faulty magnetic switch	*Check magnetic switch.* ☞
	Poor magnetic switch lead wire connector connection	*Check connector connection.* ☞
	Open-circuit between battery and magnetic switch	*Repair circuit.*
	Open-circuit in pull-in coil	*Check pull-in coil circuit.* ☞
	Faulty brushes and/or brush springs	*Check brushes and brush springs.* ☞
	Poor sliding of plunger and/or pinion	*Check plunger and pinion.* ☞
	Faulty starting motor control relay	*Check starting motor control relay.* ☞
	Faulty ECM and its circuit	*Check ECM and its circuit.* ☞
	Faulty keyless start system	*Check keyless start system.* ☞
Starting motor not running (Operating sound of magnetic switch heard)	Battery voltage is too low	*Check battery.* ☞
	Charging faulty due to deteriorated battery	*Replace battery.* ☞
	Poor battery terminal connection	*Check terminal connection or replace battery.* ☞

	Poor ground terminal connection	*Tighten ground cable.*
	Faulty magnetic switch	*Check magnetic switch.* ☞
	Faulty brushes and/or brush springs	*Check brushes and brush springs.* ☞
	Faulty brush holder	*Check brush holder.* ☞
	Burnt commutator	*Check commutator.* ☞
	Short-circuit between commutator and armature	*Check commutator.* ☞
	Poor starting motor cable connection	*Check starting motor cable connection.* ☞
	Open circuit between battery and magnetic switch	*Repair circuit.*
	Obstructed crankshaft rotation	*Repair engine assembly.*
Starting motor running but too slowly (small torque) (If battery and wiring are satisfactory, inspect starting motor)	Faulty magnetic switch	*Check magnetic switch.* ☞
	Low battery voltage	*Check battery.* ☞
	Charging faulty due to deteriorated battery	*Replace battery.* ☞
	Poor battery terminal connection	*Check terminal connection or replace battery.* ☞
	Short-circuit between commutator and armature	*Check commutator.* ☞
	Burnt commutator	*Check commutator.* ☞
	Faulty brushes and/or brush springs	*Check brushes and brush springs.* ☞
	Faulty brush holder	*Check brush holder.* ☞
	Faulty rear bracket bushing	*Check rear bracket bushing.* ☞
Starting motor running, but not cranking engine	Worn pinion tip	*Replace overrunning clutch.* ☞
	Poor sliding of overrunning clutch	*Check overrunning clutch.* ☞
	Slipping overrunning clutch	*Replace overrunning clutch.* ☞
	Worn teeth of ring gear	*Replace flywheel (M/T model) or drive plate (CVT model).* ☞
Noise	Abnormally worn bushing	*Replace bushing.* ☞
	Worn teeth of pinion	*Replace overrunning clutch.* ☞
	Worn teeth of ring gear	*Replace flywheel (M/T model) or drive plate (CVT model).* ☞

1I

Starting Motor Control Relay Inspection

Refer to ***Control Relay Inspection***.

1I

Starting Motor Removal and Installation

Removal

1) Disconnect negative (–) cable at battery.
2) Remove engine cover.
3) Remove air cleaner outlet hose. ☞
4) Disconnect magnetic switch lead wire (1) and starting motor cable (2) from starting motor.
5) Remove starting motor mounting bolts (3).
6) Remove starting motor (4).

Installation

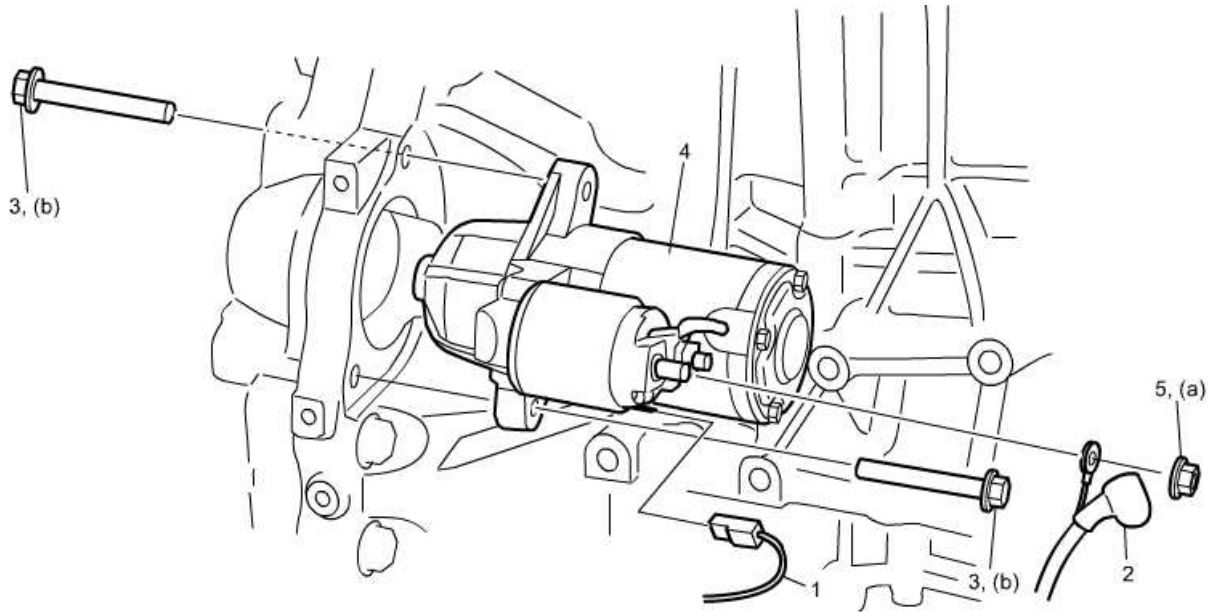
Reference: Starting Motor Inspection

Reverse removal procedure, noting the following points.

- Tighten starting motor mounting bolts (3) and starting motor cable nut (5) to specified torques.

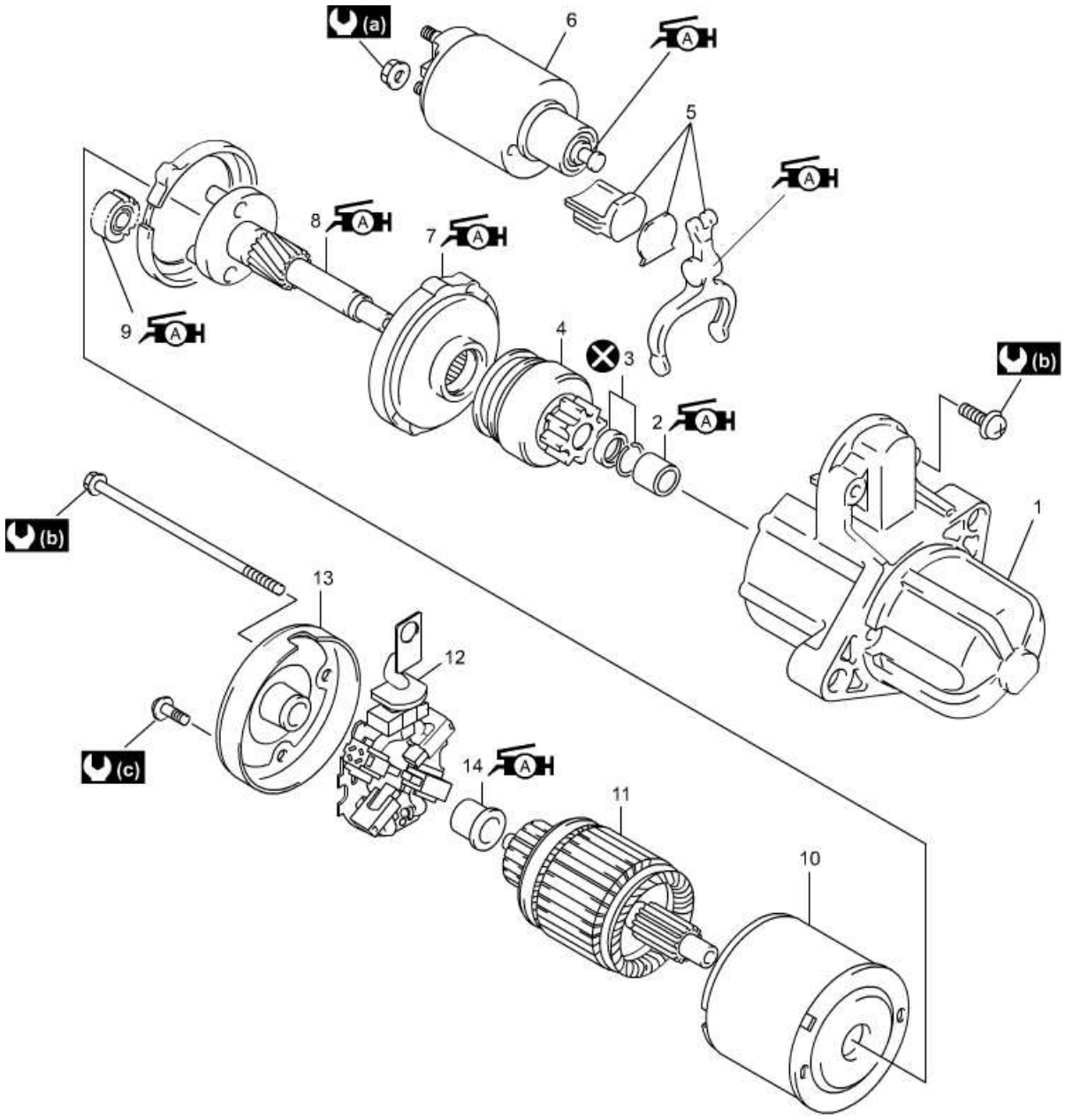
Tightening torque

Starting motor cable nut (a): 11 N·m (1.1 kg-m, 8.5 lbf-ft)
Starting motor mounting bolt (b): 45 N·m (4.6 kg-m, 33.5 lbf-ft)



1I

Starting Motor Components



1. Armature housing	6. Magnetic switch	11. Armature	(b): 6.0 N·m (0.61 kgf-m, 4.5 lbf-ft)
2. Bushing	7. Internal gear	12. Brush assembly	(c): 3.5 N·m (0.36 kgf-m, 3.0 lbf-ft)
3. Pinion stop ring	8. Planetary carrier shaft	13. End housing	: Do not reuse.
4. Overrunning clutch	9. Planetary gear	14. Bushing	: Apply grease to sliding surface of each part.

5. Drive lever assembly	10. Yoke	(a):	10 N·m (1.0 kgf-m, 7.5 lbf-ft)

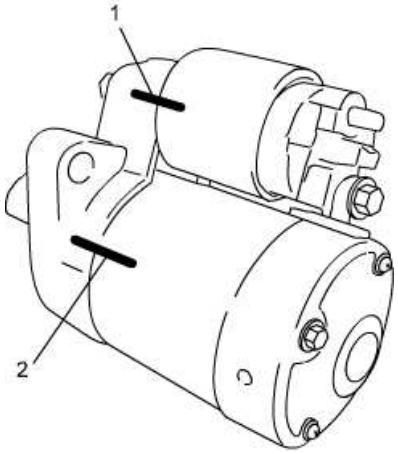
1I

Starting Motor Disassembly and Reassembly

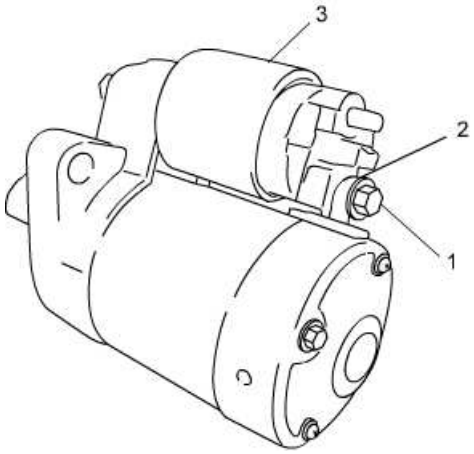
Disassembly

Reference: Starting Motor Removal and Installation
Reference: Starting Motor Components

1) Before disassembly, draw matchmark (1) and (2) shown in figure make it easier to reassemble components in the correct position.

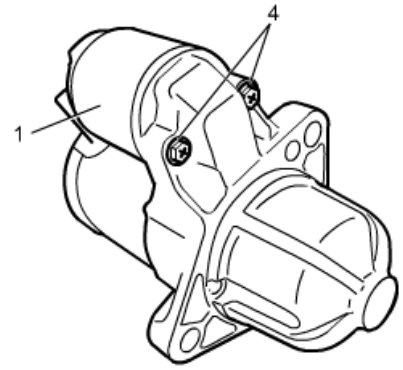


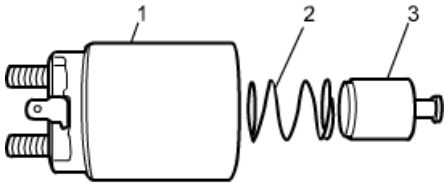
2) Remove nut (1) and disconnect lead wire (2) from magnetic switch (3).



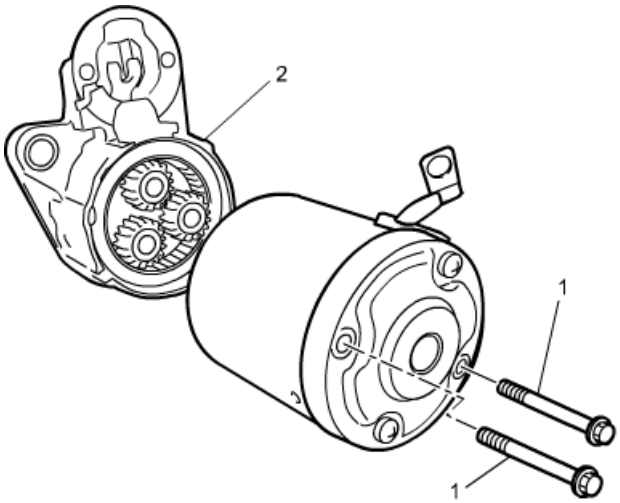
3) Remove screws (4) and pull out magnetic switch (1) from starting motor assembly.
4) Disassemble spring (2) and plunger (3) from magnetic switch body

CAUTION:
Do not disassemble magnetic switch body.
Replace it as assembly, if required.

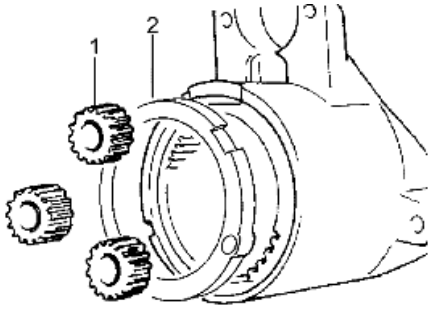




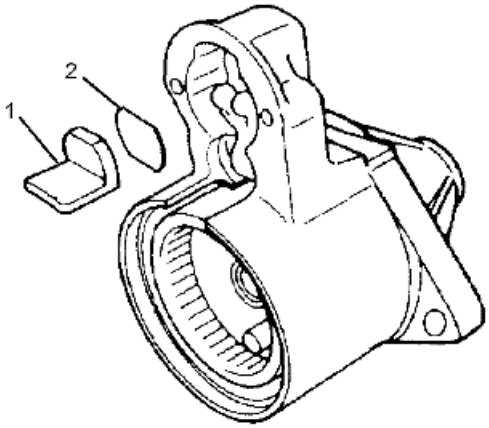
5) Remove bolts (1) and separate yoke from armature housing (2).



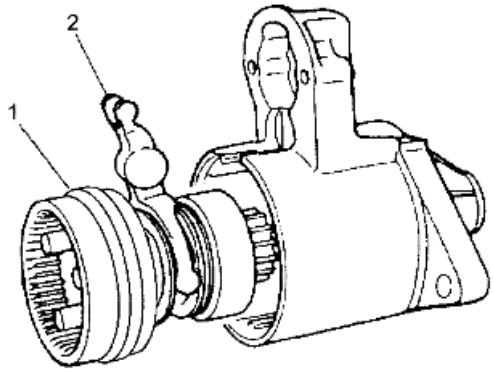
6) Remove grommet (2) and planetary gears (1).



7) Remove seal rubber (1) and plate (2).

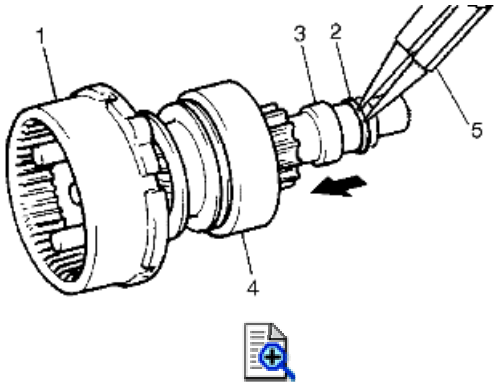


8) Remove shaft assembly (1) with drive lever (2).

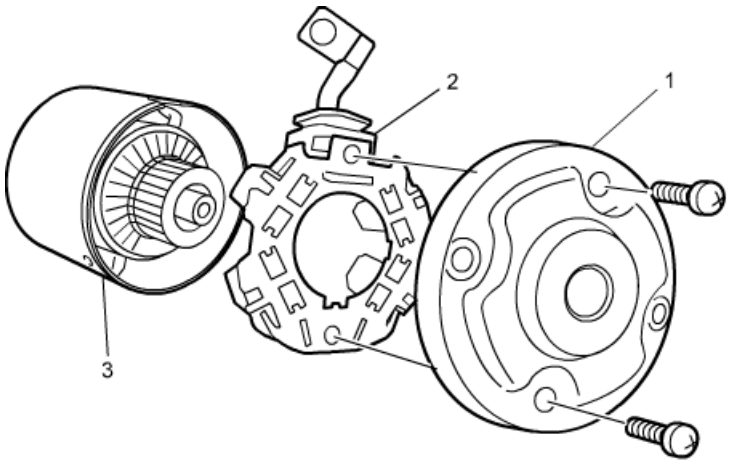


9) With pinion stop ring (3) moved to overrunning clutch (4) side (arrow side), remove snap ring (2) by using snap ring pliers (5).

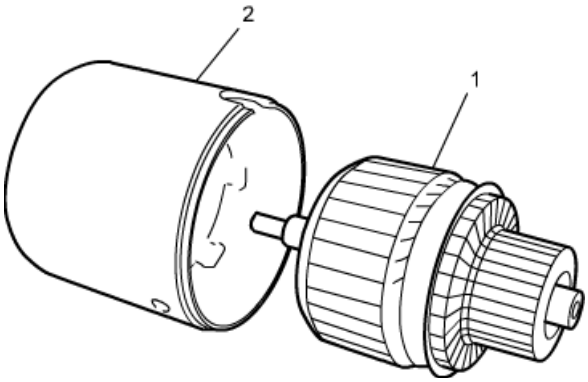
10) Remove pinion stop ring (3), overrunning clutch (4) and internal gear (1) from gear shaft.



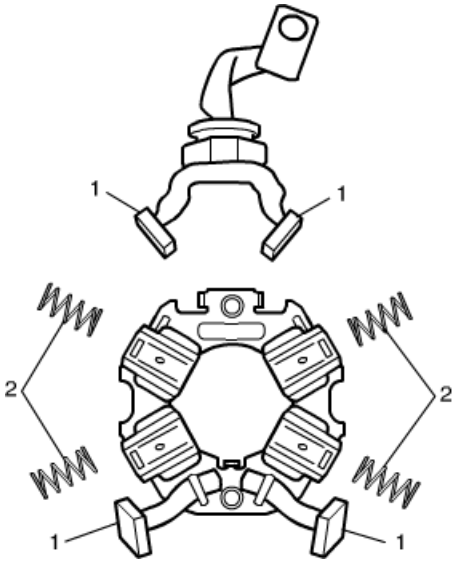
11) Remove end housing (1) and remove brush assembly (2) from yoke (3).



12) Remove armature (1) from yoke (2).



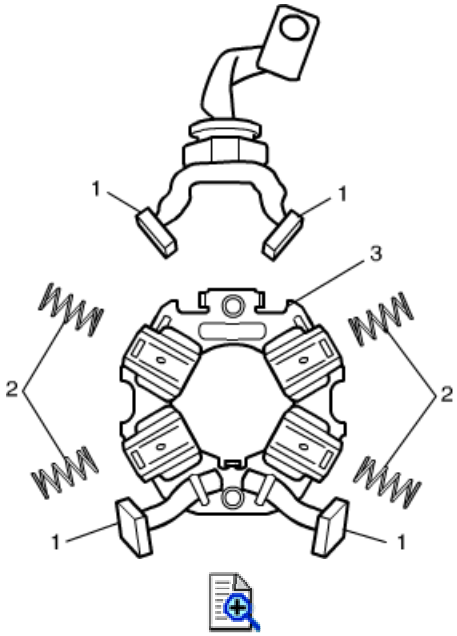
13) Remove brushes (1) and brush springs (2).



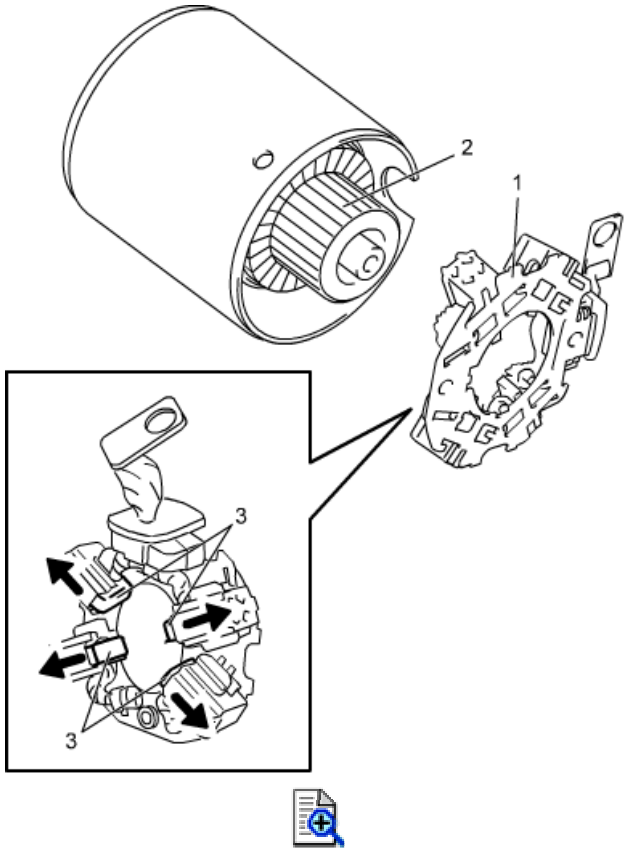
Reassembly

Reference: Starting Motor Inspection

1) Install brush springs (2) and brushes (1) to brush holder (3).



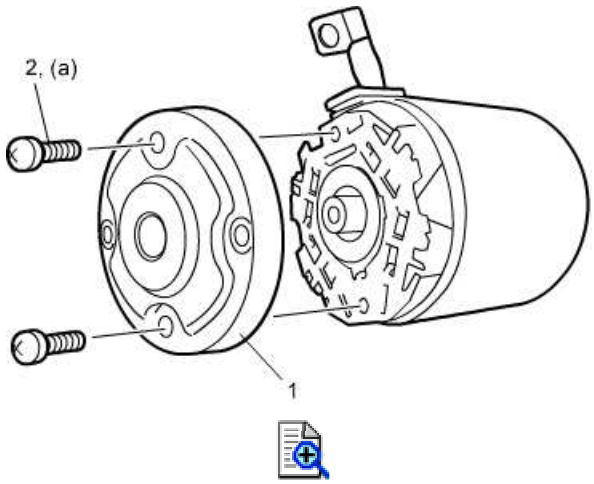
2) Install armature (2) to yoke.
3) Install brush assembly (1) to armature (2) while pushing 4 brushes (3) outward.



4) Install end housing (1) to brush holder and tighten brush holder screws (2) to specified torque.

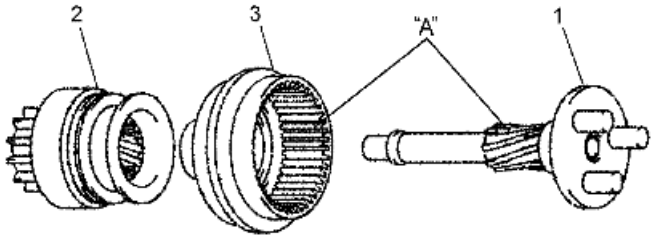
Tightening torque

Brush holder screw (a): 3.5 N·m (0.36 kg-m, 3.0 lbf-ft)



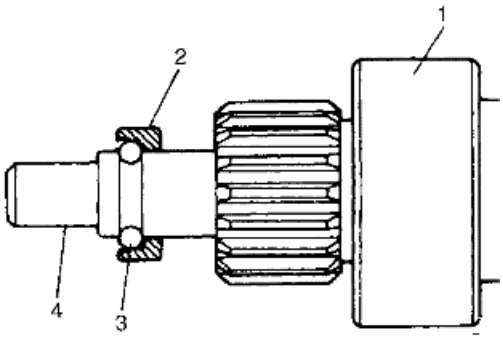
5) Before installing overrunning clutch (2) and internal gear (3) to gear shaft (1), apply grease to shaft spline.

"A": Grease 99000–25011 (SUZUKI Super Grease A)



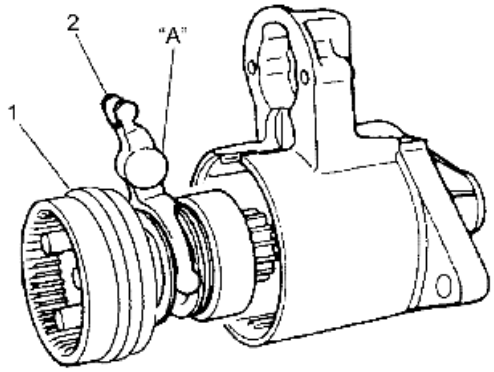
6) Install internal gear and overrunning clutch (1) to gear shaft (4) with new snap ring (3) and pinion stop ring (2).

NOTE:
Install pinion stop ring in the direction and position as shown in figure.



7) Apply grease to drive lever (2) and insert shaft assembly (1) into armature housing with drive lever positioned as shown in the figure.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

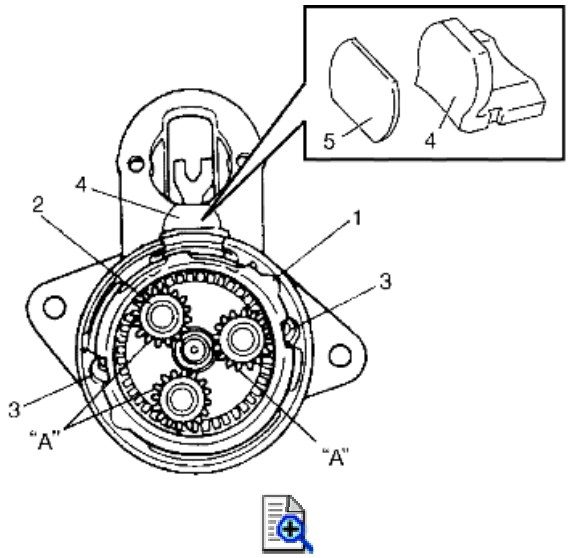


8) With armature housing bolt holes (3) and grommet cutting positions aligned, install grommet (1) in armature housing.

9) Install plate (5) and seal rubber (4) to armature housing.

10) Apply grease to planetary gears (2) and Install planetary gears to gear shaft.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

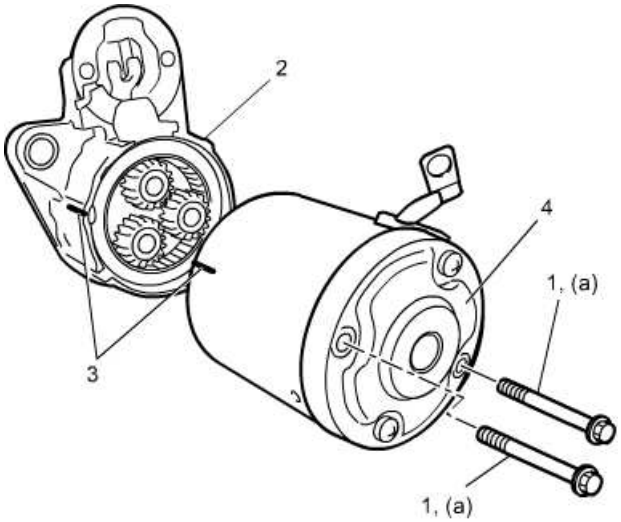


11) Install yoke, armature, brush assembly and end housing (4) to armature housing (2) in alignment with matchmark (3) drawn before disassembly.

12) Tighten end housing bolts (1) to specified torque.

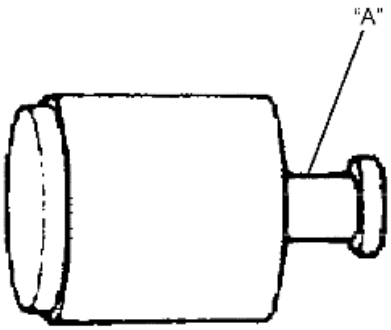
Tightening torque

End housing bolt (a): 6.0 N·m (0.61 kg-m, 4.5 lbf-ft)



13) Apply grease to plunger.

"A": Grease 99000–25011 (SUZUKI Super Grease A)

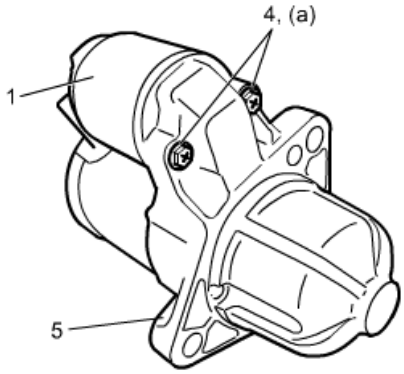


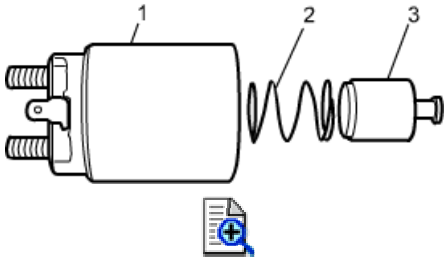
14) Install magnetic switch (1), spring (2) and plunger (3) to armature housing (5) in alignment with matchmark drawn before removal.

15) Tighten screws (4) to specified torque.

Tightening torque

Magnetic switch screw (a): 6.0 N·m (0.61 kg-m, 4.5 lbf-ft)

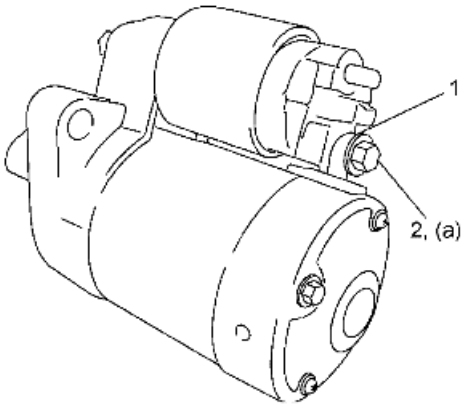




16) Connect lead wire (1) to terminal "M" (2) and tighten lead wire nut to specified torque.

Tightening torque

Lead wire nut (a): 10 N·m (1.0 kg-m, 7.5 lbf-ft)



17) Check magnetic switch for operation. ☞

1I

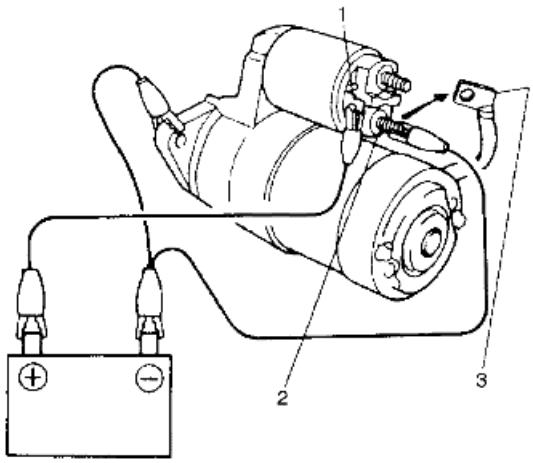
Starting Motor Inspection

Reference: Starting Motor Removal and Installation
Reference: Starting Motor Components

Starting Motor Operation Check

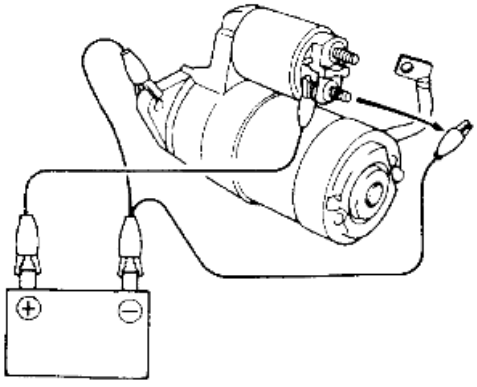
CAUTION:
- **When connecting cables to battery for the operation check, give enough care not to make an accidental short.**
- **Each test must be performed within 3 to 5 seconds to avoid burning of coil.**

1) Perform pull-in test as follows.
a) Disconnect lead wire (3) from terminal "M" (2).
b) Connect battery to magnetic switch as shown in figure.
c) Check that plunger and pinion move outward.
If plunger and pinion do not move, replace magnetic switch.



1. Terminal "S"

2) Perform hold-in test as follows.
a) From the state of step 1) with plunger and pinion in "out" position, disconnect negative (–) lead from terminal "M".
b) Check that plunger and pinion remain in "out" position.
If plunger and pinion return inward, replace magnetic switch.



1I

Cranking System Specifications

Voltage		12 V			
Output		1.4 kW			
Rating		30 seconds			
Direction of rotation		Clockwise as viewed from pinion side			
Number of pinion teeth		8 teeth			
Performance		Voltage	Current	Torque	Revolution speed
Around at 20 °C (68 °F)	No-load characteristic	11.0 V	90 A MAX	—	2000 rpm MIN
	Loaded characteristic	7.5 V	300 A	11.0 N·m (1.1 kgf-m, 8.5 lbf-ft) minimum	840 rpm MIN
	Locked characteristic	3.0 V	860 A MAX	20.0 N·m (2.0 kgf-m, 15.0 lbf-ft) minimum	—
	Magnetic switch operating voltage	8 V or less			

1I

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Starting motor cable nut	11	1.1	8.5	☞
Starting motor mounting bolt	45	4.6	33.5	☞
Brush holder screw	3.5	0.36	3.0	☞
End housing bolt	6.0	0.61	4.5	☞
Magnetic switch screw	6.0	0.61	4.5	☞
Lead wire nut	10	1.0	7.5	☞

NOTE:
The specified tightening torque is described in the following.
Starting Motor Components

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.

1I

Recommended Service Material

Material	SUZUKI recommended product or Specification		Note
Grease	SUZUKI Super Grease A	P/No.: 99000–25011	☞ ☞ ☞ ☞

NOTE:
Required service material is also described in the following.
Starting Motor Components

Abbreviations

A

A/B	Air Bag
ABDC	After Bottom Dead Center
ABS	Anti-lock Brake System
AC	Alternating Current
A/C	Air Conditioning
A-ELR	Automatic-Emergency Locking Retractor
A/F	Air Fuel Ratio
ALR	Automatic Locking Retractor
API	American Petroleum Institute
APP	Accelerator Pedal Position
A/T	Automatic Transmission, Automatic Transaxle
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid, Automatic Transaxle Fluid
AWD	All Wheel Drive

B

BARO	Barometric Pressure
BBDC	Before Bottom Dead Center
BCM	Body electrical Control Module
BTDC	Before Top Dead Center
B+	Battery Positive Voltage
BB+	Battery Positive Voltage for Backup

C

CAN	Controller Area Network
CKP	Crankshaft Position
CMP	Camshaft Position
CO	Carbon Monoxide
CO2	Carbon Dioxide
CPP	Clutch Pedal Position
CPU	Central Processing Unit
CRS	Child Restraint System
CVT	Continuously Variable Transmission, Continuously Variable Transaxle

D

DC	Direct Current
D/C	Driving Cycle
DLC	Data Link Connector
DOHC	Double Over Head Camshaft
DOJ	Double Offset Joint

DOT	Department of Transportation
DRL	Daytime Running Light
DTC	Diagnostic Trouble Code (Diagnostic Code)
D/C	Driving Cycle

E

EBD	Electronic Brake Force Distribution
ECM	Engine Control Module
ECT	Engine Coolant Temperature
ECU	Electronic Control Unit
EEPROM	Electrically Erasable Programmable Read Only Memory
EFE Heater	Early Fuel Evaporation Heater
EGR	Exhaust Gas Recirculation
ELR	Emergency Locking Retractor
EPS	Electronic Power Steering
ESP®	Electronic Stability Program
EVAP	Evaporative Emission

G

GND	Ground
GPS	Global Positioning System

H

HVAC	Heating, Ventilating and Air Conditioning
HC	Hydrocarbons
HFC	Hydro Fluorocarbon
HI	High
HO2S	Heated Oxygen Sensor

I

IAC	Idle Air Control
IAT	Intake Air Temperature
IMT	Intake Manifold Tuning
ISC	Idle Speed Control
ISO	International Organization for Standardization

J

JIS	Japanese Industrial Standards
J/B	Junction Block
J/C	Junction Connector

L

L	Left
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LHD	Left Hand Drive vehicle

LIN	Local Interconnect Network
LO	Low
LSPV	Load Sensing Proportioning Valve

M

MAF	Mass Air Flow
MAP	Manifold Absolute Pressure
Max	Maximum
MFI	Multiport Fuel Injection
Min	Minimum
MIL	Malfunction Indicator Lamp (“CHECK ENGINE” Light or “SERVICE ENGINE SOON” Light)
M/T	Manual Transmission, Manual Transaxle

N

NOx	Nitrogen Oxides

O

OBD	On-Board Diagnostic system
OCM	Occupant Classification Module
OCV	Oil Control Valve
O/D	Overdrive
OHC	Over Head Camshaft
O2S	Oxygen Sensor

P

PCM	Powertrain Control Module
PCV	Positive Crankcase Ventilation
PNP	Park / Neutral Position
P/S	Power Steering
PSP	Power Steering Pressure

R

R	Right
RAM	Random Access Memory
ROM	Read Only Memory
RPM	Engine Speed

S

SAE	Society of Automotive Engineers
SDM	Sensing and Diagnostic Module (Air Bag Controller, Air bag Control Module)
SDT	Smart Diagnostic Tester
SFI	Sequential Multiport Fuel Injection
SI	System International
SOHC	Single Over Head Camshaft
SRS	Supplemental Restraint System

T

TCC	Torque Converter Clutch
TCM	Transmission Control Module
TCSS	Traction Control Support System
TDC	Top Dead Center
TP	Throttle Position
TPMS	Tire Pressure Monitoring System
TWC	Three-Way Catalytic converter

U

UART	Universal Asynchronous Receiver / Transmitter
USB	Universal Serial Bus

V

VFD	Vacuum Fluorescent Display
VIN	Vehicle Identification Number
VSS	Vehicle Speed Sensor
VVT	Variable Valve Timing

W

WU-OC	Warm Up Oxidation Catalytic converter
WU-TWC	Warm Up Three-Way Catalytic converter

Other

2WD	2-Wheel Drive
4WD	4-Wheel Drive

NOTE:
ESP® is a registered trademark of Daimler AG.

SAE Terms VS. Former SUZUKI Terms

This table lists SAE (Society of Automotive Engineers) J1930 terms and abbreviations which may be used in this manual in compliance with SAE recommendations, as well as the corresponding former SUZUKI terms.

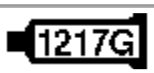
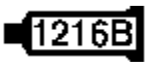
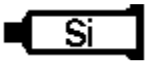
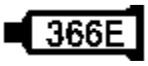
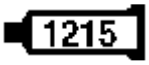
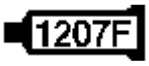
SAE Term		Former SUZUKI Term
Full Term	**Abbreviation**	
A		
Accelerator Pedal	AP	Accelerator Pedal
Air Cleaner	ACL	Air Cleaner
Air Conditioning	A/C	Air Conditioner (A/C, AC)
B		
Barometric Pressure	BARO	Barometric Pressure
Battery Positive Voltage	B+	Battery Voltage, +B
C		
Camshaft Position	CMP	—
Carbon Dioxide	CO2	←
Carbon Monoxide	CO	←
Carburetor	CARB	Carburetor
Charge Air Cooler	CAC	Intercooler
Closed-Loop	CL	—
Clutch Pedal Position	CPP	—
Closed Throttle Position	CTP	—
Continuous Fuel Injection	CFI	—
Continuously Variable Transmission, Continuously Variable Transaxle	CVT	←
Crankshaft Position	CKP	Crank Angle
D		
Data Link Connector	DLC	Assembly Line Diag. Link (ALDL), Serial Data Link (SDL)
Diagnostic Test Mode	DTM	—
Diagnostic Trouble Code	DTC	Diagnostic Code
Distributor Ignition	DI	—
E		
Early Fuel Evaporation	EFE	←
Electrically Erasable Programmable Read Only Memory	EEPROM	—
Electronic Ignition	EI	—
Engine Control Module	ECM	Electronic Control Module (ECM), Engine Control Unit (ECU)
Engine Coolant Level	ECL	Coolant Level
Engine Coolant Temperature	ECT	Coolant Temperature, Water Temperature
Engine Modification	EM	—
Engine Speed	RPM	Engine Speed
Erasable Programmable Read Only Memory	EPROM	—
Evaporative Emission	EVAP	Evaporative Emission

Evaporative Emission Canister Purge Valve	EVAP Canister Purge Valve	EVAP Solenoid Purge Valve (SP Valve)
Exhaust Gas Recirculation	EGR	←
Exhaust Gas Recirculation Pressure Transducer	EGR Pressure Transducer	EGR Modulator
F		
Fan Control	FC	—
Flash Electrically Erasable Programmable Read Only Memory	FEEPROM	—
Flash Erasable Programmable Read Only Memory	FEPROM	—
Four Wheel Drive	4WD	←
Fourth Gear	4GR	Fourth Gear, 4th Gear
Front Wheel Drive	FWD	—
Fuel Pump	FP	Fuel Pump
Fuel Tank Pressure	FTP	←
Fuel Tank Temperature	FTT	—
G		
Generator	GEN	Generator, Alternator
Ground	GND	Ground (GND, GRD), Earth
H		
Heated Oxygen Sensor	HO2S	Heated Oxygen Sensor, Oxygen Sensor with Heater
Hydrocarbon	HC	←
I		
Idle Air Control	IAC	Idle Speed Control (ISC)
Idle Speed Control	ISC	←
Ignition Control	IC	Electronic Spark Advance (ESA)
Ignition Control Module	ICM	—
Intake Air Temperature	IAT	Intake Air Temperature (IAT), Air Temperature
Intake Manifold Tuning	IMT	←
K		
Knock Sensor	KS	Knock Sensor
M		
Malfunction Indicator Lamp	MIL	“CHECK ENGINE” light, Malfunction Indicator Lamp
Manifold Absolute Pressure	MAP	Intake Manifold Pressure, Intake Vacuum
Manifold Differential Pressure	MDP	—
Manifold Surface Temperature	MST	—
Manifold Vacuum Zone	MVZ	—
Mass Air Flow	MAF	Air Flow
Multiport Fuel Injection	MFI	Multipoint Fuel Injection (MPI)
N		
Nitrogen Oxides	NOX	←
Nonvolatile Random Access Memory	NVRAM	—
O		
On-Board Diagnostic	OBD	Self-Diagnosis Function, On-Board Diagnostic (OBD)

Open Loop	OL	—
Oxidation Catalytic Converter	OC	Catalytic Converter
Oxygen Sensor	O2S	Oxygen Sensor
P		
Park / Neutral Position	PNP	—
Power Steering Control	PSC	—
Power Steering Pressure	PSP	Power Steering Pressure (P/S Pressure)
Powertrain Control Module	PCM	—
Programmable Read Only Memory	PROM	—
Pulsed Secondary Air Injection	PAIR	Pulse Air Control
R		
Random Access Memory	RAM	←
Read Only Memory	ROM	←
S		
Scan Tool	ST	—
Secondary Air Injection	AIR	—
Sequential Multiport Fuel Injection	SFI	←
Service Reminder Indicator	SRI	—
Supercharger	SC	—
Supercharger Bypass	SCB	—
System Readiness Test	SRT	—
T		
Thermal Vacuum Valve	TVV	Thermal Vacuum Switching Valve (TVSV), Bimetal Vacuum Switching Valve (BVSV)
Third Gear	3GR	Third Gear, 3rd Gear
Three Way + Oxidation Catalytic Converter	TWC + OC	—
Three Way Catalytic Converter	TWC	Three Way Catalyst
Throttle Body	TB	Throttle Body
Throttle Body Fuel Injection	TBI	Single-point Fuel Injection (SPI), Throttle Body Fuel Injection (TBI)
Torque Converter Clutch	TCC	Torque Converter Clutch (T.C.C.)
Traction Control System	TCS	Traction Control System
Transmission Control Module	TCM	Transmission Control Module, Automatic Transmission (A/T) Control Module, A/T Controller
Transmission Range	TR	—
Transmission Range Switch	TR Switch	Shift Switch, Shift Lever Switch
Turbocharger	TC	Turbocharger
V		
Vehicle Speed Sensor	VSS	Vehicle Speed Sensor (VSS), Speed Sensor
Voltage Regulator	VR	Voltage Regulator
Volume Air Flow	VAF	Air Flow
W		
Warm Up Oxidation Catalytic Converter	WU-OC	—

Warm Up Three Way Catalytic Converter	WU-TWC	—
Wide open Throttle	WOT	—

Symbols

Symbol	Definition	Symbol	Definition
	Tightening torque		Apply SUZUKI BOND NO. 1217G 99000-31260
	Apply oil (engine, transmission, transfer, differential)		Apply SUZUKI BOND NO. 1216B 99000-31230
	Apply fluid (brake, power steering or automatic transmission fluid)		Apply SILICONE SEALANT 99000-31120
	Apply SUZUKI SUPER GREASE A 99000-25011		Apply SEALING COMPOUND 366E 99000-31090
	Apply SUZUKI SUPER GREASE C 99000-25030		Apply THREAD LOCK 1322 99000-32110
	Apply SUZUKI SUPER GREASE E 99000-25051		Apply THREAD LOCK 1333B 99000-32020
	Apply SUZUKI SUPER GREASE H 99000-25121		Apply THREAD LOCK 1342 99000-32050
	Apply SUZUKI SUPER GREASE I 99000-25210		Do not reuse
	Apply SUZUKI BOND NO. 1215 99000-31110		Note on reassembly
	Apply SUZUKI BOND NO. 1207F 99000-31250		

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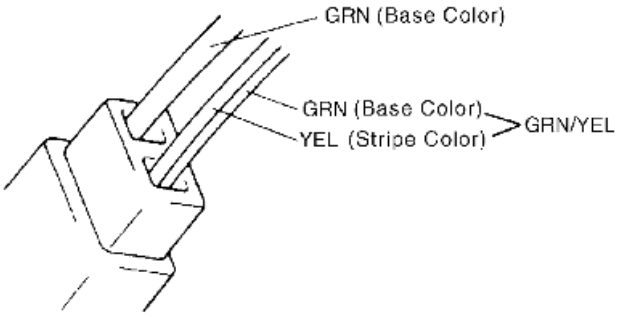
Wire Color Symbols

Symbol		Wire Color	Symbol		Wire Color
B	BLK	Black	O, Or	ORN	Orange
Bl	BLU	Blue	R	RED	Red
Br	BRN	Brown	W	WHT	White
G	GRN	Green	Y	YEL	Yellow
Gr	GRY	Gray	P	PNK	Pink
Lbl	LT BLU	Light blue	V	PPL	Violet
Lg	LT GRN	Light green			

There are two types of colored wire used in this vehicle. One is single-colored type and the other is dual-colored (striped) type.
The single-colored type of wire uses only one color symbol (i.e. “GRN”).
The dual-colored type of wire uses two color symbols (i.e. “GRN/YEL”). The first symbol represents the base color of the wire (“GRN” in the figure) and the second symbol represents the color of the stripe (“YEL” in the figure).



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Fasteners Information

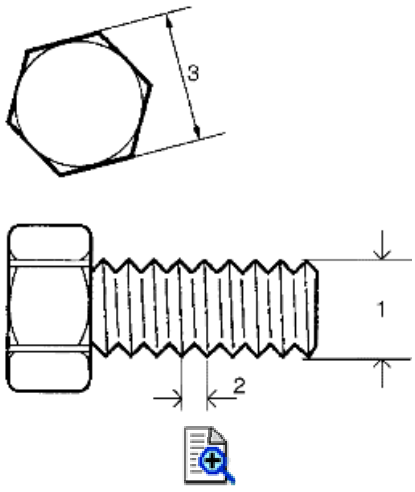
Metric Fasteners

Most of the fasteners used for this vehicle are JIS-defined and ISO-defined metric fasteners. When replacing any fasteners, it is most important that replacement fasteners are of the correct diameter, thread pitch and strength.

CAUTION:
The thread pitch (2) or the width across flats (3) may vary between ISO-defined and JIS-defined fasteners even when the nominal diameter (1) of thread is the same. Refer to JIS-TO-ISO Main Fasteners Comparison Table below for the difference.
Installing a mismatched bolt or nut will cause damage to the threads. Before installing a fastener, check the thread pitch for correct matching and then tighten it by hand temporarily. If it is tight, recheck the thread pitch.

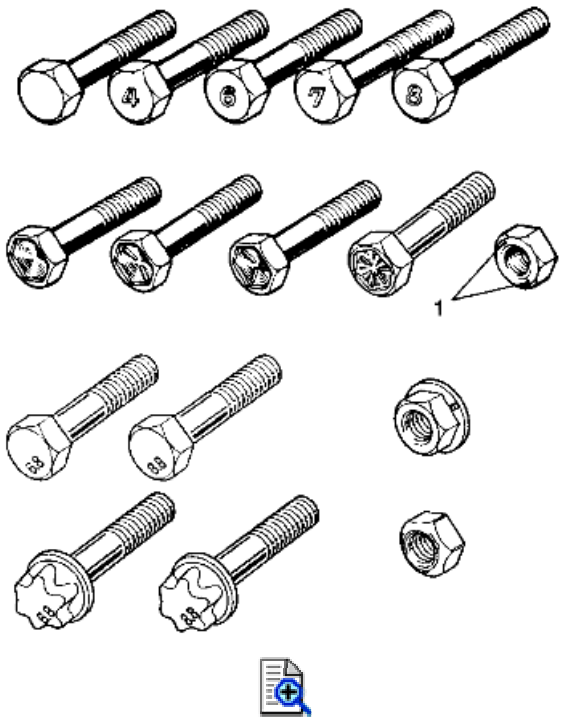
JIS-TO-ISO Main Fasteners Comparison Table

		Nominal diameter				
		M6	**M8**	**M10**	**M12**	**M14**
JIS	Thread pitch	1.0	1.25	1.25	1.25	1.5
	Width across flats	10	12	14	17	19
ISO	Thread pitch	1.0	1.25	1.5	1.5	1.5
	Width across flats	10	13	16	18	21



Fastener Strength Identification

Most commonly used strength classes of metric fasteners are 4T, 6.8, 7T and 8.8. Strength class is indicated by a number or radial line(s) embossed on the head of each bolt. Some metric nuts have a punched number, 6 or 8 on their end surfaces. Figure shows different strength markings.
When replacing metric fasteners, be sure to use bolts and nuts of the same strength class as or higher class than the original bolts and nuts. It is also important to select replacement fasteners of the correct diameter and thread pitch. Correct replacement bolts and nuts are available as SUZUKI spare parts.
Metric bolts and nuts: Strength class numbers or marks (The larger the number, the greater the strength).



1.	Nut strength identification

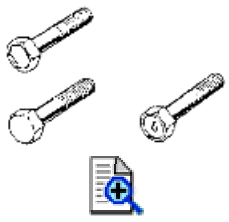
Standard Tightening Torques

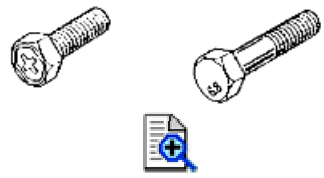
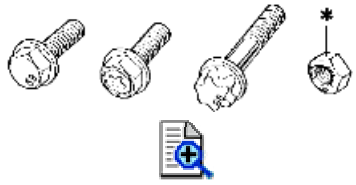
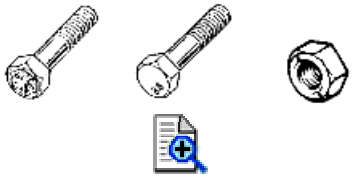
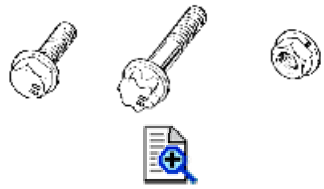
Each fastener should be tightened to the torque specified in each section. If no torque description or specification is provided in the relevant section, refer to the following tightening torque chart for the applicable torque for each fastener. When a fastener of greater strength than the original one is used, use the torque specified for the original fastener.

NOTE:

- **For flanged bolts, flanged nuts and self-locking nuts of the 4T and 7T strength classes, add 10% to the applicable tightening torques given in the following chart.**
- **The following chart is applicable only where the fastened parts are made of steel or light alloy.**

Tightening torque chart

Strength	Unit	Thread diameter (Nominal diameter) (mm)								
		4	5	6	8	10	12	14	16	18
Fastener of strength class equivalent to 4T	N·m	1.5	3.0	5.5	13	29	45	65	105	160
	kgf-m	0.15	0.30	0.55	1.3	2.9	4.5	6.5	10.5	16
	lbf-ft	1.0	2.5	4.0	9.5	21.0	32.5	47.0	76.0	116.0
	N·m	2.4	4.7	8.4	20	42	80	125	193	280

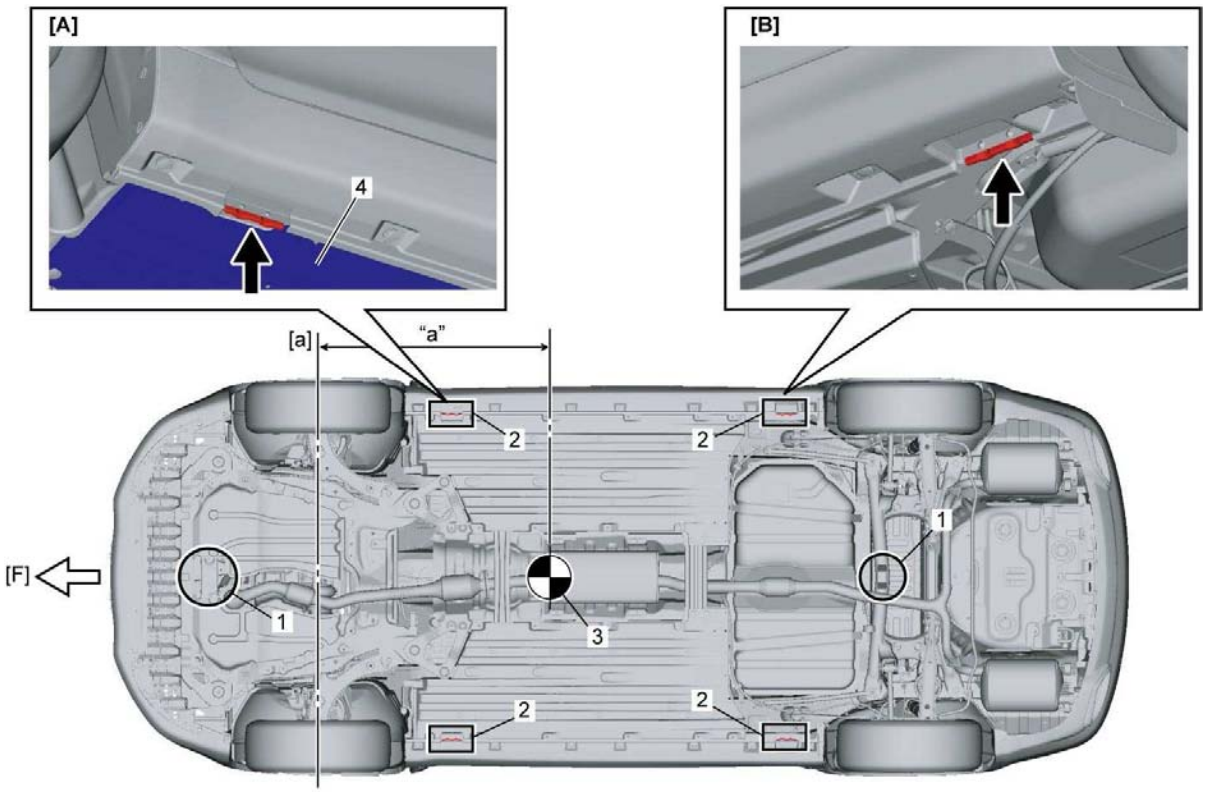
Fastener of strength class equivalent to 6.8	kgf-m	0.24	0.47	0.84	2.0	4.2	8.0	12.5	19.3	28
	lbf-ft	2.0	3.5	6.0	14.5	30.5	58.0	90.5	139.5	202.5
Flanged fastener of strength class equivalent to 6.8 *: Self-locking nut (6 strength)	N·m	2.4	4.9	8.8	21	44	84	133	203	298
	kgf-m	0.24	0.49	0.88	2.1	4.4	8.4	13.3	20.3	29.8
	lbf-ft	2.0	3.5	6.5	15.5	32.0	61.0	96.5	147.0	215.5
Fastener of strength class equivalent to 7T	N·m	2.3	4.5	10	23	50	85	135	210	240
	kgf-m	0.23	0.45	1.0	2.3	5.0	8.5	13.5	21	24
	lbf-ft	2.0	3.5	7.5	17.0	36.5	61.5	98.0	152.0	174.0
Fastener of strength class equivalent to 8.8 (bolt) or 8 (nut)	N·m	3.1	6.3	11	27	56	105	168	258	373
	kgf-m	0.31	0.63	1.1	2.7	5.6	10.5	16.8	25.8	37.3
	lbf-ft	2.5	4.5	8.0	19.5	40.5	76.0	121.5	187.0	270.0
Flanged fastener of strength class equivalent to 8.8 (bolt) or 8 (nut)	N·m	3.2	6.5	12	29	59	113	175	270	395
	kgf-m	0.32	0.65	1.2	2.9	5.9	11.3	17.5	27	39.5
	lbf-ft	2.5	5.0	9.0	21.0	43.0	82.0	126.5	195.5	286.0

*: Self-locking nut

Vehicle Lifting Points

WARNING:
- **Before applying the hoist arms to the underbody, take in mind the balance of the vehicle on the hoist that should change depending on the parts going to be removed.**
- **Before lifting up the vehicle on the hoist, make sure that the hoist arm is not in contact with such components as the brake pipes, fuel pipes and brackets.**
- **When using a frame contact hoist, apply the right and left arms to the symmetrically located points shown in the figure. Lift up the vehicle till 4 tires are a little off the ground and make sure that the vehicle will not fall off by rocking the vehicle body. Work can be started only after this confirmation.**
- **Make absolutely sure to lock the hoist after vehicle is hoisted up.**

When Using Frame Contact Hoist



[A]: Front side	[a]: Wheel center	2. Support position for frame contact hoist and safety stand
[B]: Rear side	"a": Approx 1060 mm (Approx 41.73 in.)	3. Gravity center position without load in vehicle

[F]: Vehicle front	1. Floor jack position	4. Main floor undercover

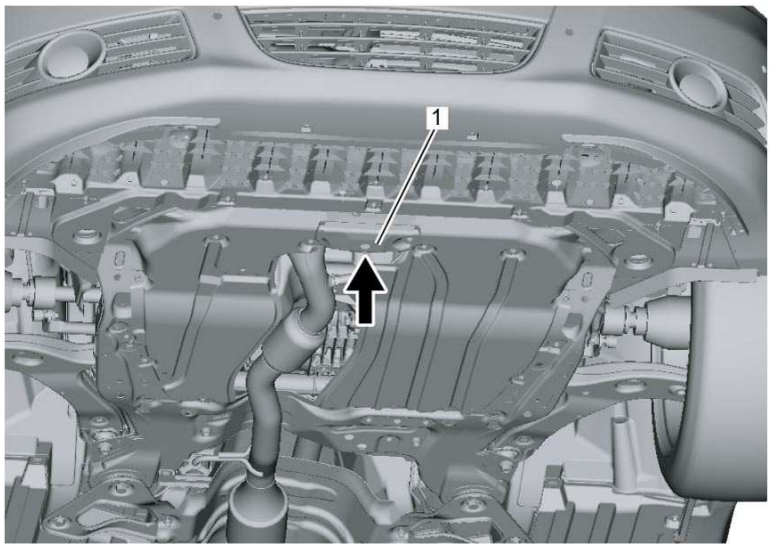
NOTE:
When necessary work involves removal and installation of main floor undercover (4) carefully select position of hoist arm pad before hoisting the vehicle. Otherwise, the pad may interfere with main floor undercover, to disabling removal or installation of main floor undercover.

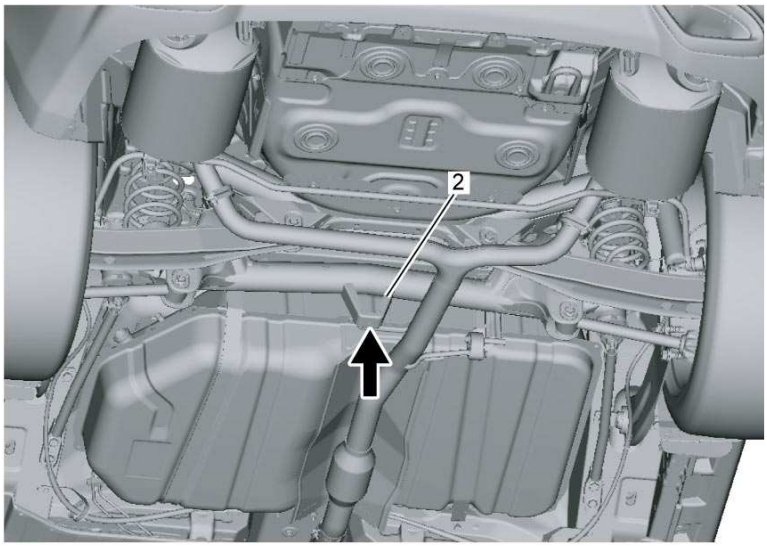
When Using Floor Jack

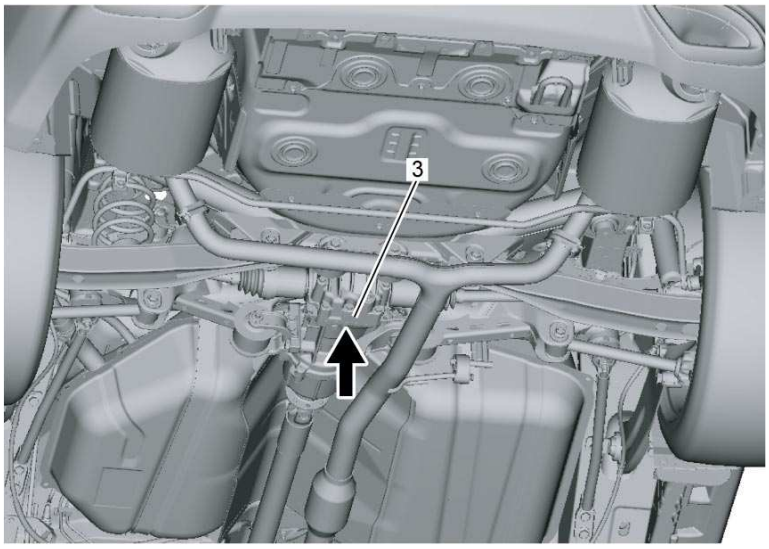
WARNING:
- **When the vehicle is jacked up only at the front or rear end, be sure to block all the wheels on the ground.**
- **After the vehicle is jacked up, be sure to support it on safety stands. It is extremely dangerous to do any work on the vehicle supported by a jack alone.**

CAUTION:
Never apply jack against rear suspension parts (i.e., stabilizer, etc.), vehicle floor or exhaust pipe No. 2 or it may get deformed.

In raising front or rear vehicle end off the floor by jacking, be sure to put the jack against front suspension frame (1), rear suspension frame (2) (2WD model) or rear differential case (3) (4WD model).

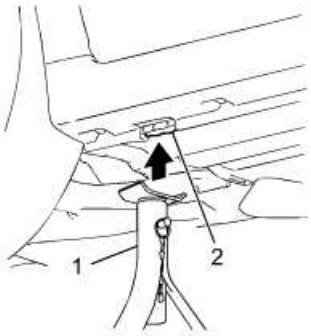




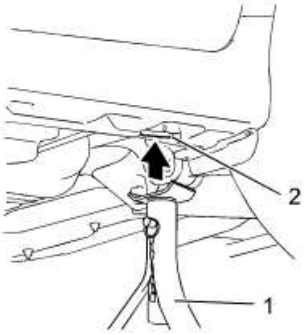


To perform service with either front or rear vehicle end jacked up, be sure to place safety stands (1) under body mounting stays (2) so that vehicle body is securely supported. Then check to ensure that vehicle body does not slide on safety stands (1) and the vehicle is held stable for safety's sake.

[A]



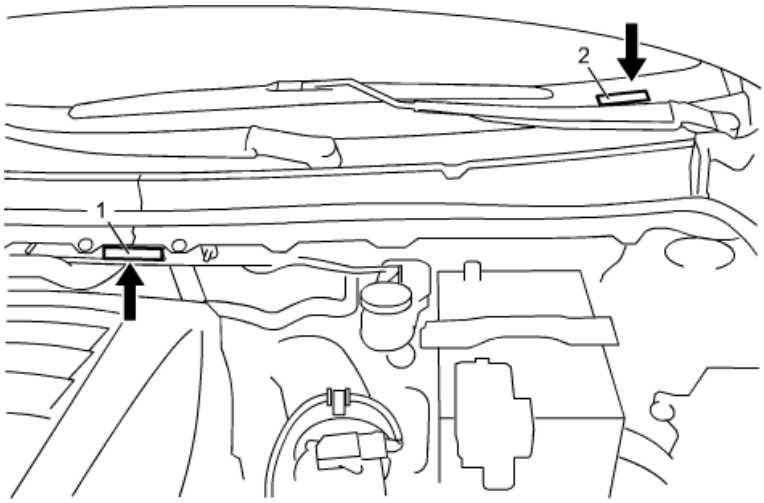
[B]



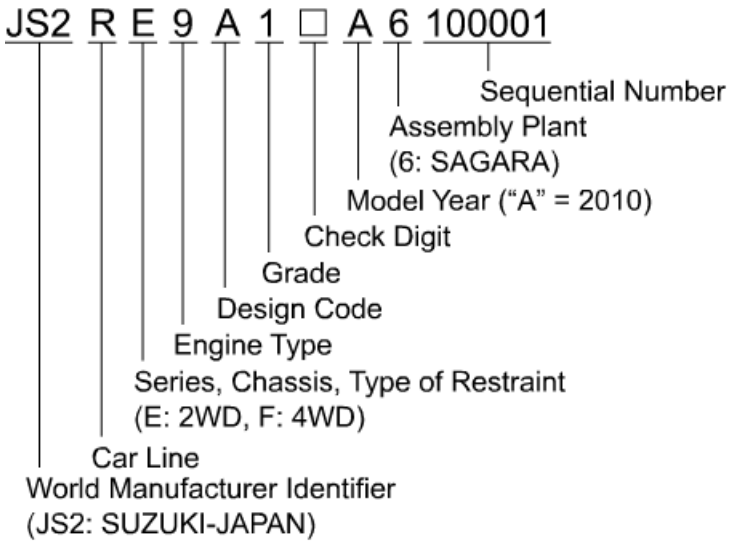
[A]: Front	[B]: Rear

Vehicle Identification Number

The vehicle identification number is punched on the cowl top panel (1). The vehicle identification number is also indicated on the left side of instrument panel (2) depending on the vehicle specification.

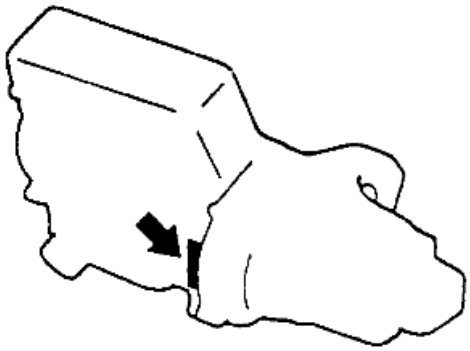


Vehicle identification number specifications

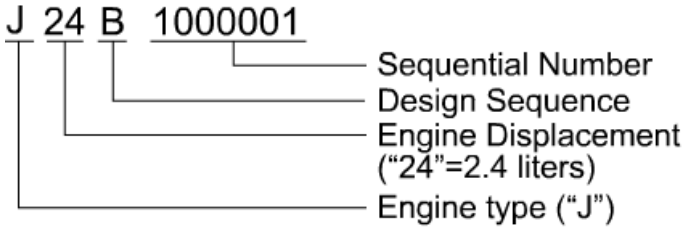


Engine Identification Number

The engine identification number is punched on cylinder block.



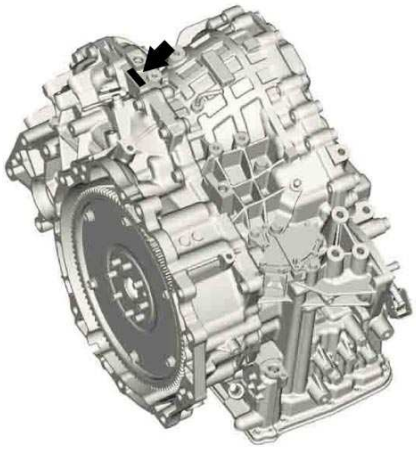
Engine identification number specifications



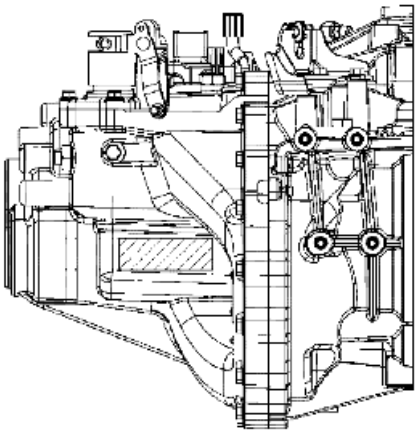
Transaxle Identification Number

The CVT identification number is punched on transaxle case.

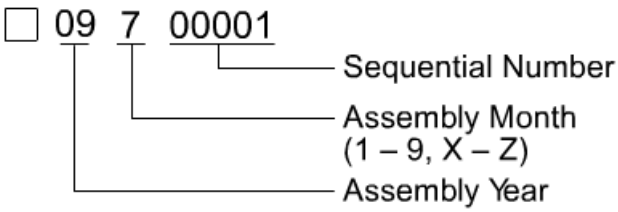
CVT



M/T



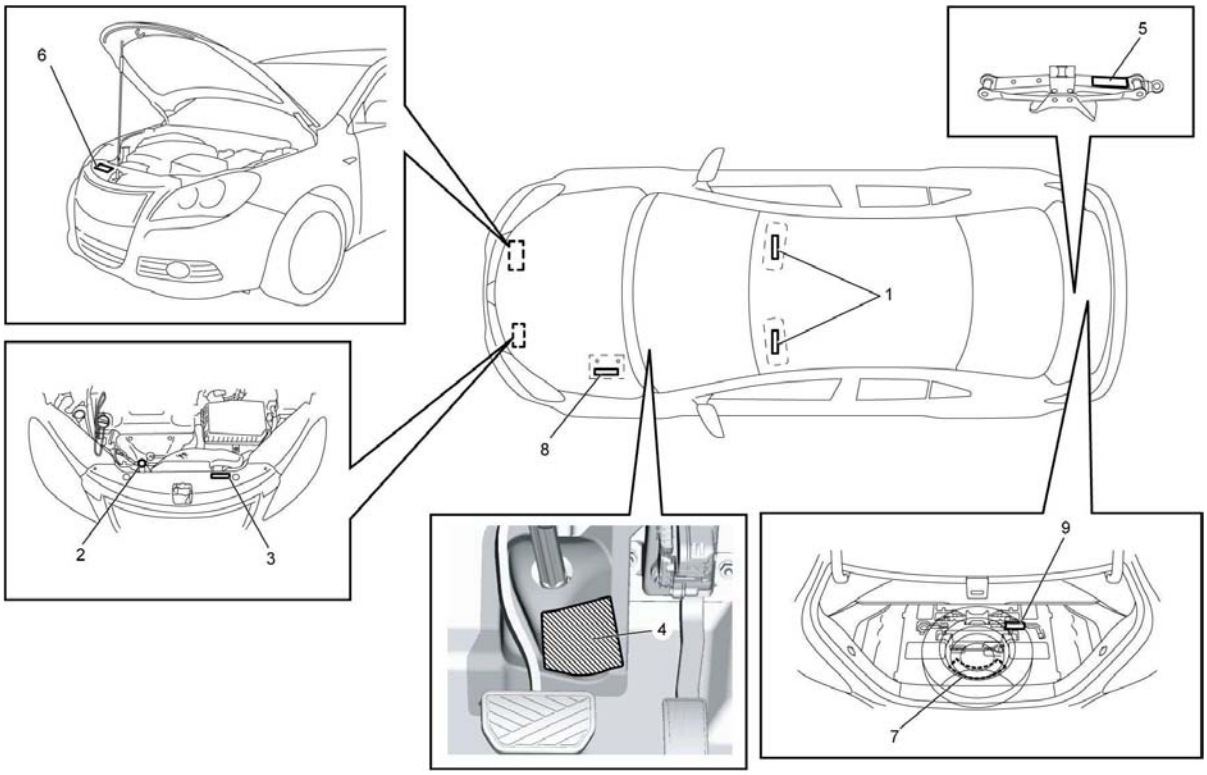
Transaxle identification number specifications



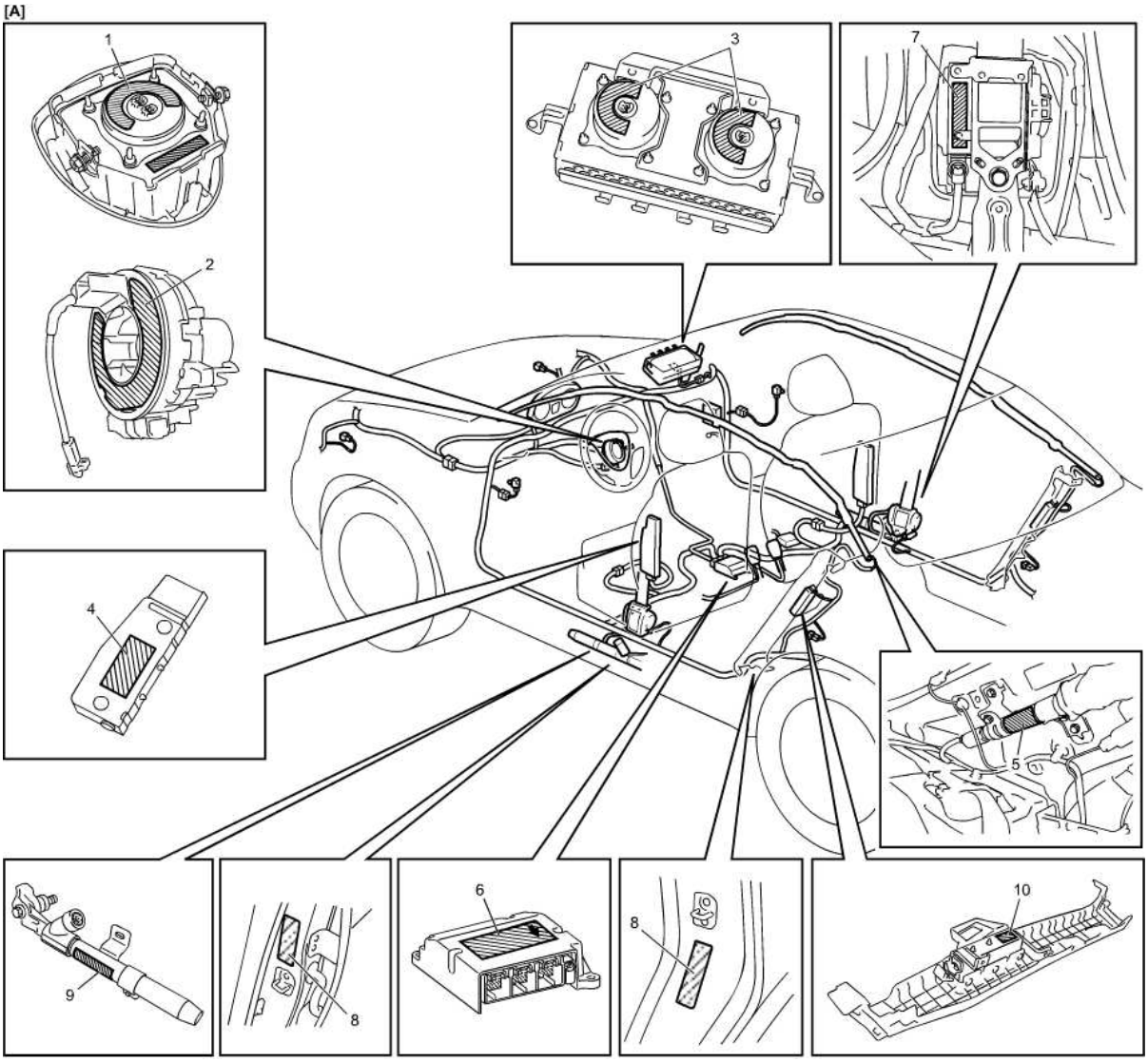
0A

Warning, Caution and Information Labels Location

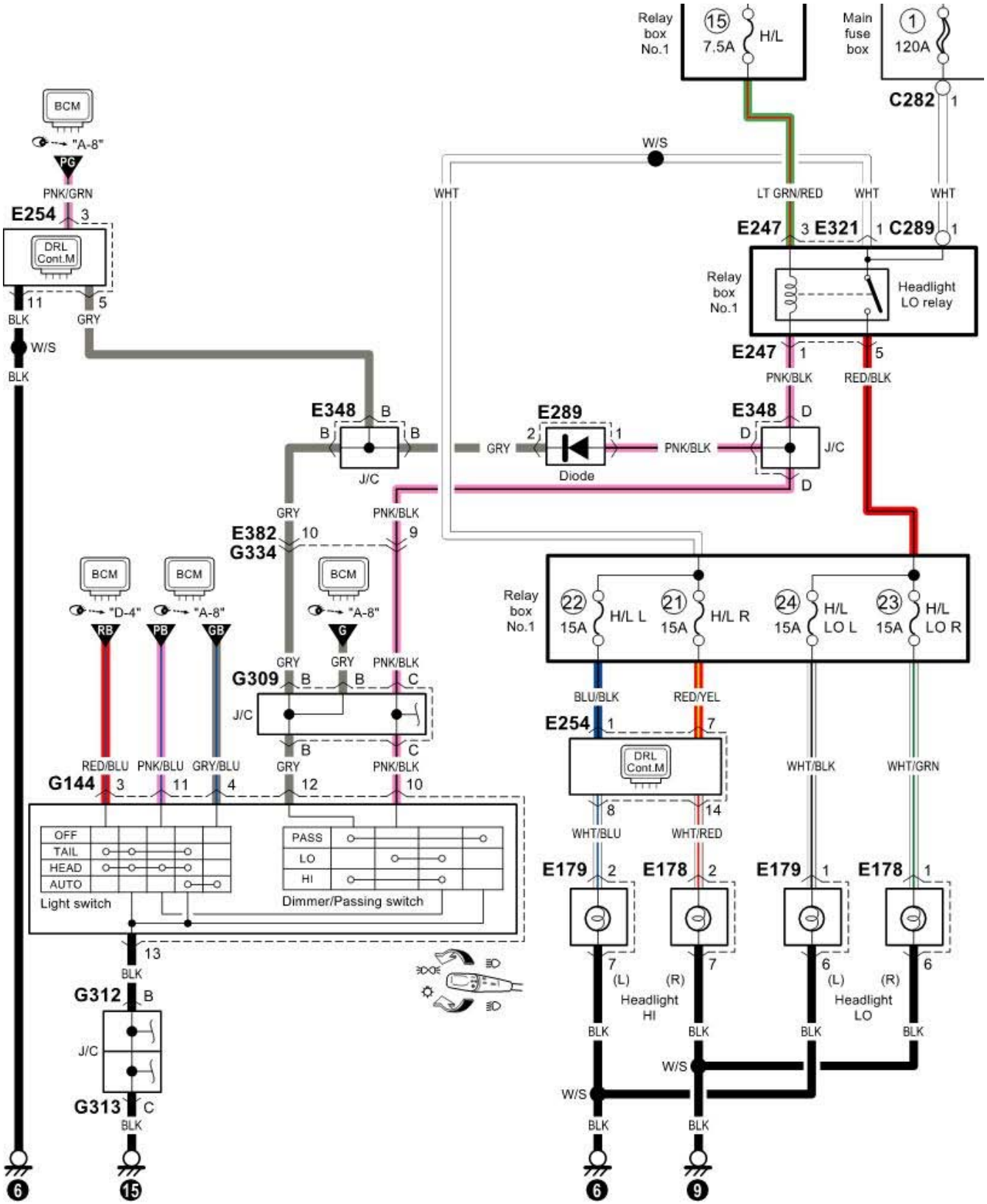
The figure shows main labels among others that are attached to vehicle components.
When servicing and handling components, refer to WARNING / CAUTION instructions printed on labels.
If any WARNING / CAUTION label is found stained or damaged, clean or replace it if necessary.



1. Air bag label on sun visor	4. Steering shaft joint cover label	7. Compact spare tire label
2. Radiator cap label	5. Jack label	8. Battery label
3. Engine cooling fan label	6. Air conditioner label	9. Jacking instruction label



[A]: These labels are attached on vehicle equipped with air bag system only.	6. Air bag label on SDM
1. Air bag label on driver air bag (inflator) module	7. Pretensioner label on seat belt retractor
2. Air bag label on contact coil assembly	8. Side/Curtain air bag label on pillar (both right and left sides)
3. Air bag label on passenger air bag (inflator) module	9. Pretensioner label on lap pretensioner
4. Air bag label on side air bag (inflator) module	10. Air bag label on rear side air bag (inflator) module
5. Air bag label on curtain air bag (inflator) module	


Relay box No.1
15
7.5A
H/L
Main fuse box
1
120A
C282
1
BCM
"A-8"
PG
PNK/GRN
E254
3
DRL Cont.M
11
5
BLK
GRY
W/S
BLK
W/S
WHT
LT GRN/RED
WHT
WHT
E247
3
E321
1
C289
1
Relay box No.1
Headlight LO relay
E247
1
5
PNK/BLK
RED/BLK
E348
B
B
B
J/C
GRY
E289
2
1
Diode
PNK/BLK
E348
D
D
J/C
D
GRY
PNK/BLK
E382
10
9
G334
BCM
"D-4"
RB
BCM
"A-8"
PB
BCM
"A-8"
G
GB
GRY
GRY
PNK/BLK
G309
B
B
C
J/C
B
C
RED/BLU
PNK/BLU
GRY/BLU
GRY
PNK/BLK
G144
3
11
4
12
10
OFF
TAIL
HEAD
AUTO
Light switch
PASS
LO
HI
Dimmer/Passing switch
13
BLK
G312
B
J/C
G313
C
BLK
6
15
Relay box No.1
22
15A
H/L L
21
15A
H/L R
24
15A
H/L LO L
23
15A
H/L LO R
BLU/BLK
RED/YEL
E254
1
7
DRL Cont.M
8
14
WHT/BLU
WHT/RED
WHT/BLK
WHT/GRN
E179
2
E178
2
E179
1
E178
1
7
(L)
(R)
7
Headlight HI
6
(L)
(R)
6
Headlight LO
BLK
BLK
BLK
BLK
W/S
W/S
BLK
BLK
6
9

9B

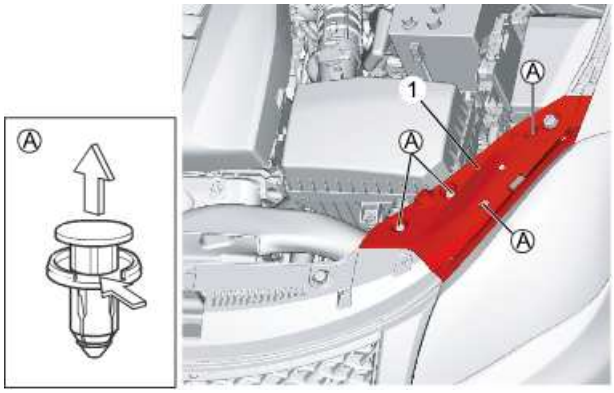
Headlight Unit Removal and Installation

WARNING:
Headlight bulbs may be extremely hot. There is risk of burn if you touch them carelessly.

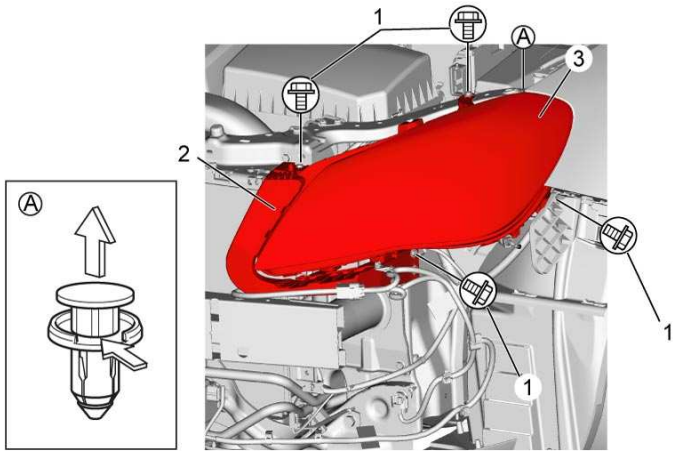
CAUTION:
Do not touch glass surface of bulb with bare hands. Bulb surface with dirt deteriorates and becomes unclear when bulb lights up.

Removal

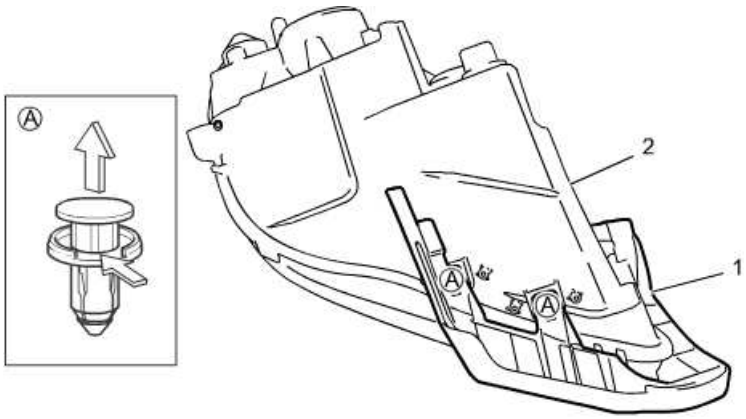
1) Disconnect negative (–) cable at battery.
2) Remove headlight cover (1).



3) Remove front bumper. ☞
4) Disconnect headlight unit connectors.
5) Remove headlight unit bolt (1) and clip.
6) Remove headlight holder (2) and headlight unit (3).

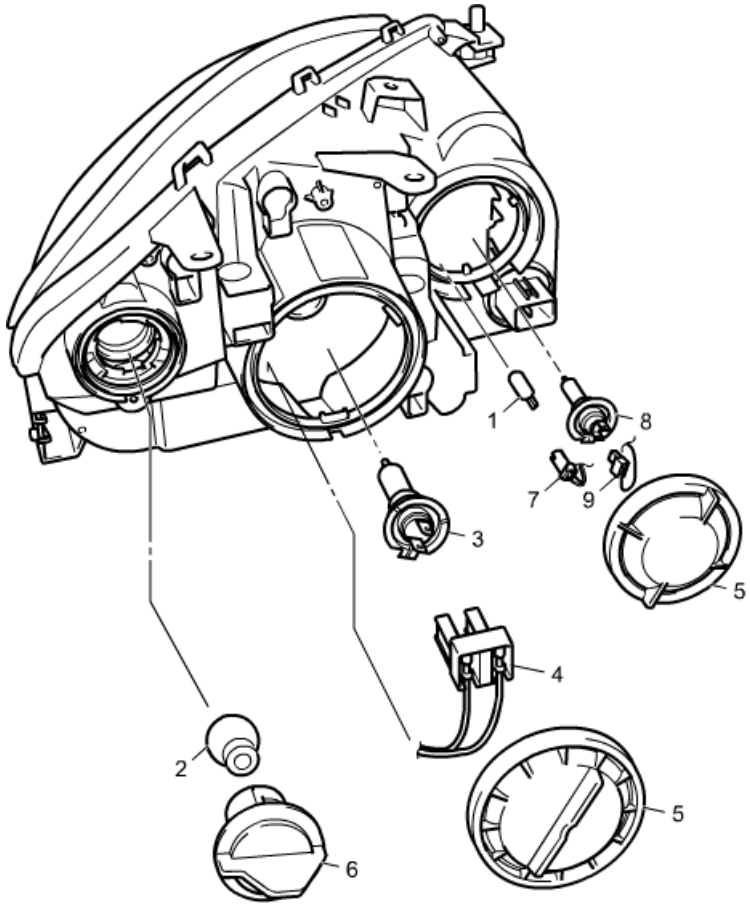


7) Remove clips and remove headlight holder (1) from headlight unit (2).



8) Remove bulbs, if necessary.

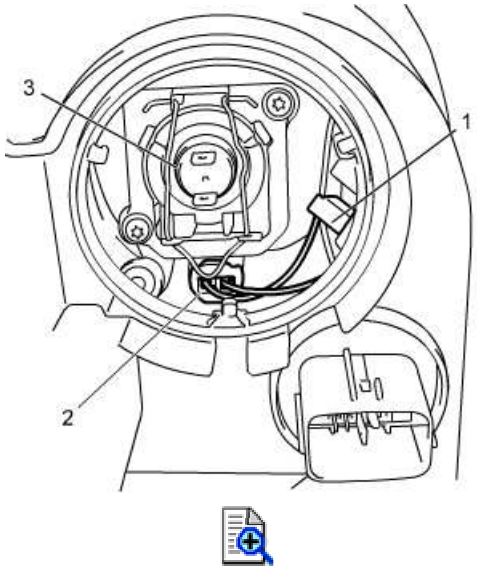
NOTE:
Bulbs in headlight unit except bulb for left low-beam light can be replaced from rear side with headlight unit installed.



1. Clearance light bulb	6. Turn signal light bulb socket
2. Turn signal light bulb	7. Clearance light bulb socket

3.	Headlight bulb (LO)	8.	Headlight bulb (HI)
4.	Headlight bulb connector (LO)	9.	Headlight bulb connector (HI)
5.	Back cover		

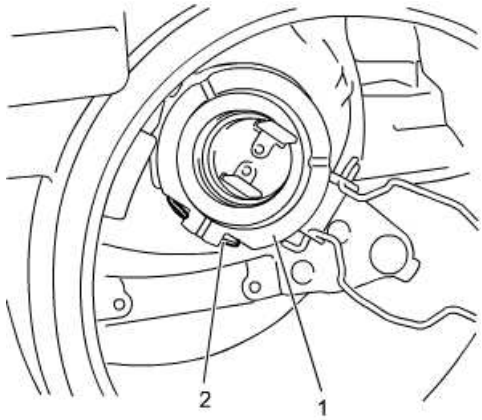
9) Turn back cover counterclockwise to remove.
10) Disconnect headlight bulb connector (HI) (1).
11) Pull out clearance bulb socket (2) and remove clearance bulb.
12) Release bulb spring and remove headlight bulb (HI) (3).



Installation

Reverse removal procedure, noting the following points.

- Aim headlights after installing. ☞
- Align headlight bulb (LO) (1) with claw (2).



9B

Headlight Aiming and Light Intensity Check

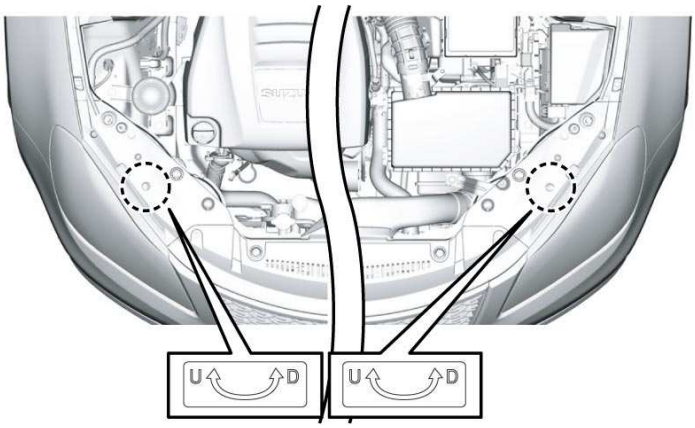
NOTE:
- **Unless otherwise required by local regulations, perform headlight aiming using either of the procedures described below.**
- **After any of the following services, be sure to aim headlights.**
  - **— Headlight unit replacement**
  - **— Headlight unit removal and installation**

Preparation

1) Adjust air pressure of all tires to specified value.
2) Remove any load from vehicle.
3) Have one person of 68 kg (150 lb) sit on driver seat.
4) Start engine to fully charge battery.

Aiming Adjustment Screws

Use aiming adjustment screws as shown in figure.

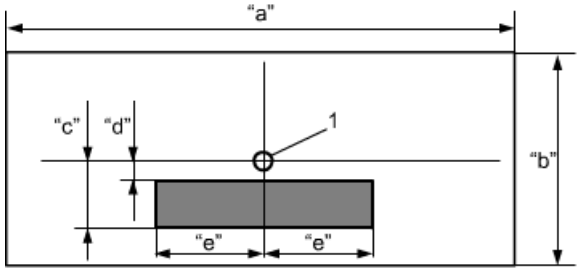


Procedure Using Tester

Follow tester manufacturer's instructions.

Procedure Using Adjustment Screen

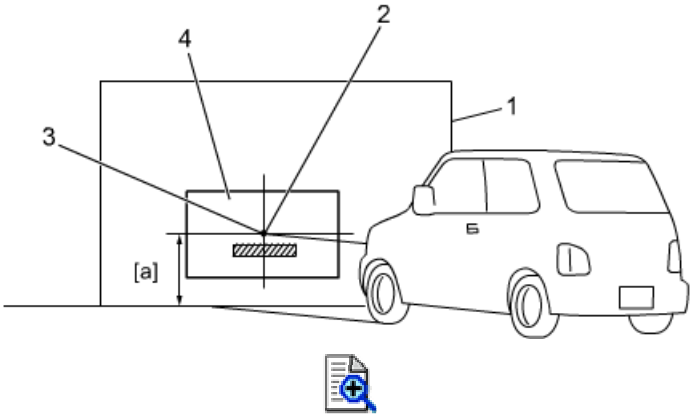
1) Prepare aiming screen as shown in figure.



: [a]

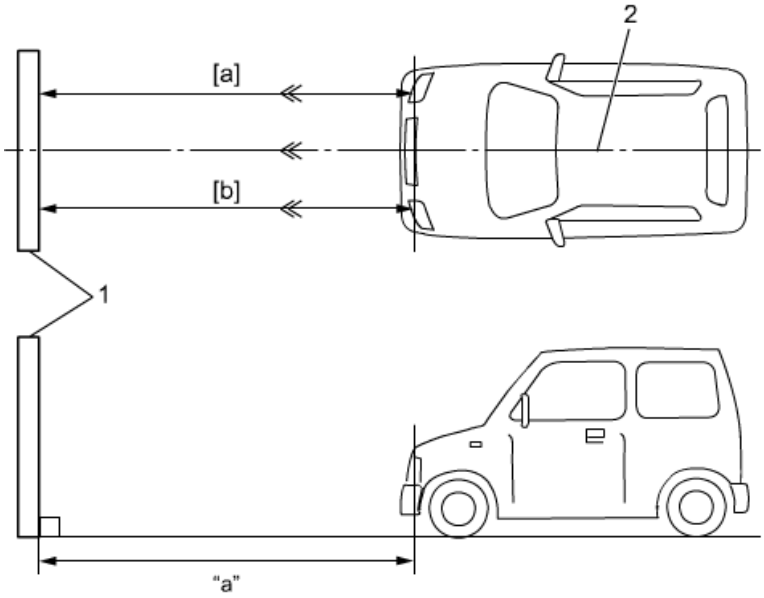
[a]: Elbow point adjustment range	"d": 20 mm (0.8 in.)
"a": About 420 mm (16.5 in.)	"e": 270 mm (10.6 in.)
"b": About 350 mm (13.8 in.)	1. Light center (Make a ø 10 mm (ø 0.4 in.) hole.)
"c": 150 mm (5.91 in.)	

2) Park vehicle on a level floor with front facing vertical wall (1).
3) Put a mark (3) on wall at same height as headlight center position (2).
4) Align light center hole made in screen (4) with mark on wall and fix screen with its horizontal edges parallel with floor surface.



[a]:	Headlight center height

5) Locate vehicle 10 m (33 ft) away from screen (1) with its front directly against screen ([a]=[b]).

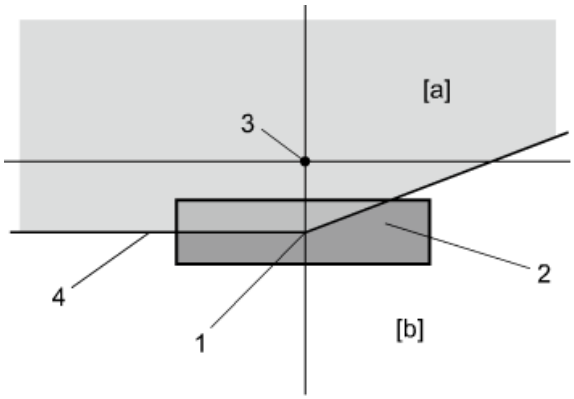


"a": 10 m (33 ft.)	2. Vehicle center

6) Block light from headlight not being adjusted by placing light shield in front of the light.

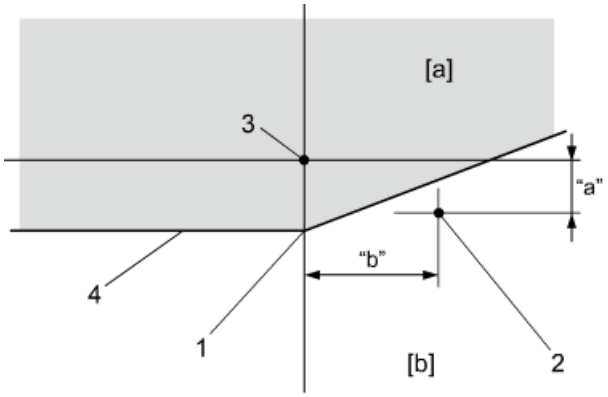
7) Turn on headlights (low beams).

8) Adjust aiming screw so that elbow point (1) of low beam on screen is within adjustment range (2) as shown in figure.



[a]: Dark portion	3. Headlight center
[b]: Bright portion	4. Bright / dark boundary

9) Check that light intensity measured on screen at a point 110 mm (4.33 in) below and 230 mm (9.05 in) to right of light center is at or higher than specified value.

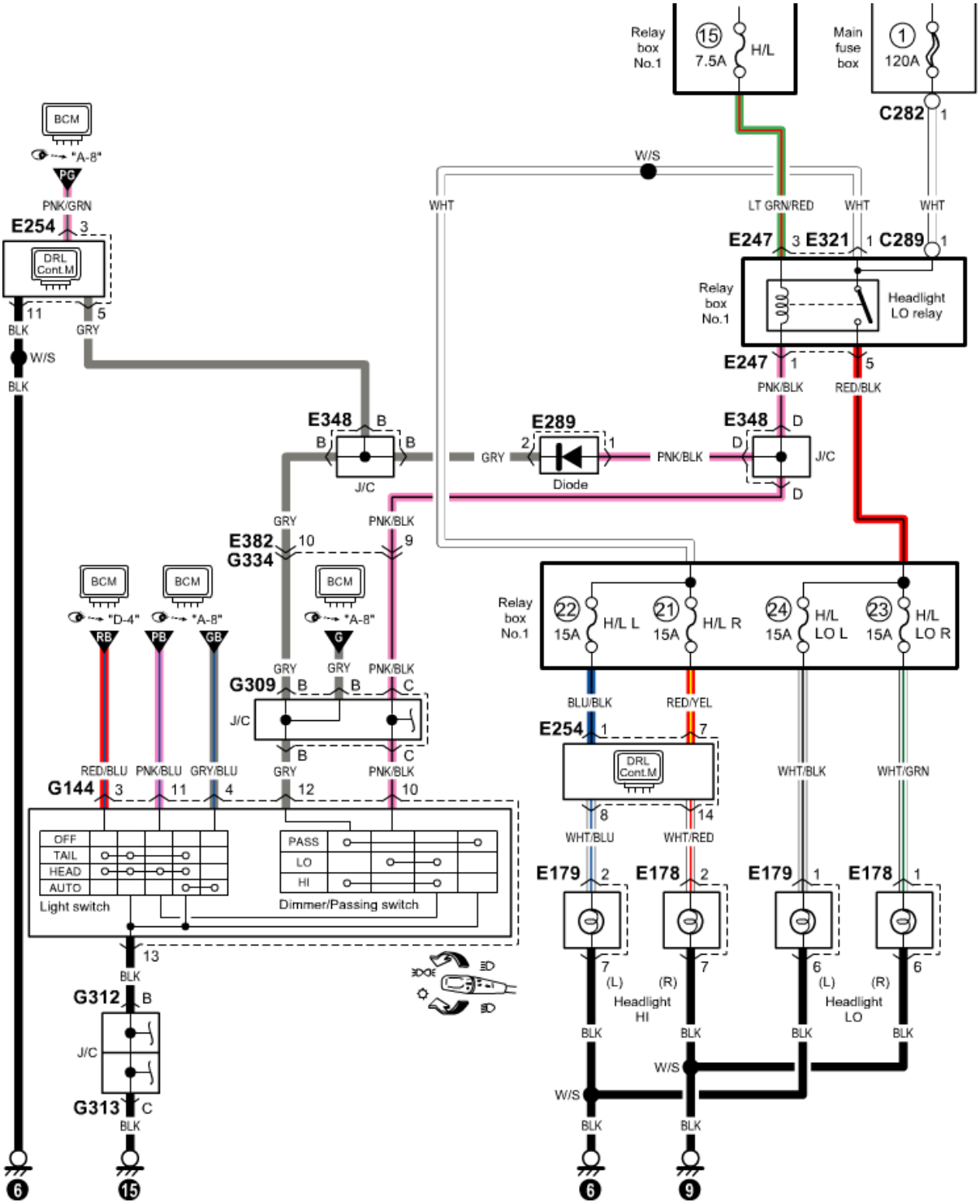


[a]: Dark portion	1. Elbow point
[b]: Bright portion	2. Brightness measurement point

"a": 110 mm (4.33 in.)	3. Headlight center
"b": 230 mm (9.05 in.)	4. Bright / dark boundary
"c": 130 mm (5.12 in.)	

9A

D-1 Headlight System Circuit Diagram

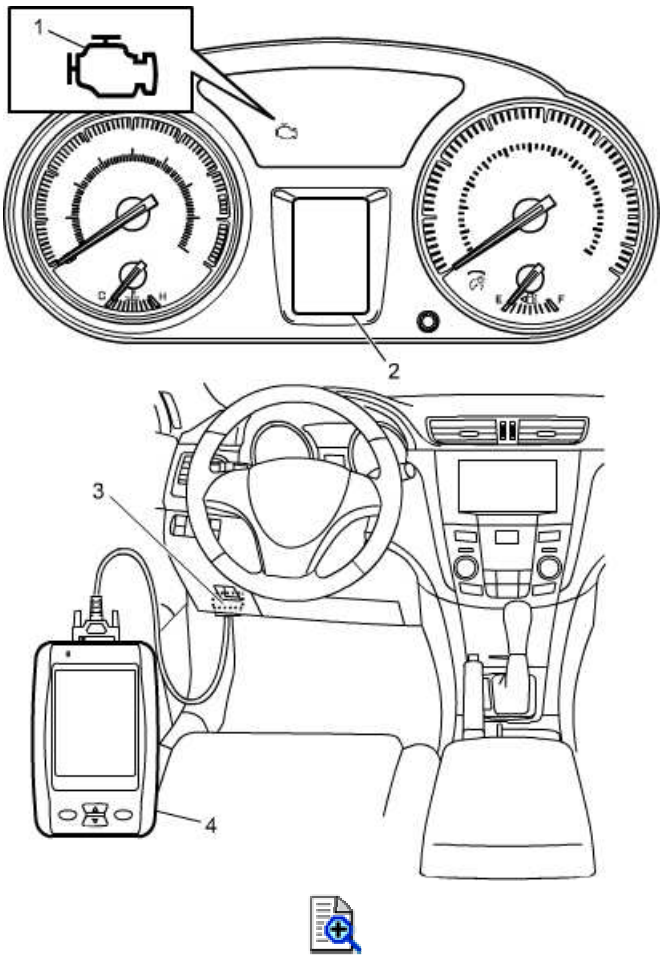


1A

OBD System Description

ECM in this vehicle has the following functions in compliance with OBD-II regulations.

- When the ignition mode of the keyless push start system in turned "ON" while the engine stopped, MIL (1) turns ON to check the MIL (1) and its circuit.
- When ECM detects a malfunction which adversely effects vehicle emission more than specified D/C, it displays message in information display (2) and turns on or flashes MIL in the combination meter (flashing only when detecting a misfire which can cause damage to the catalyst) and stores the DTC in its memory. If it detects normal conditions continuously for three driving cycles after detecting a malfunction, it turns off MIL after engine start in next D/C although DTC stored in its memory is retained as history DTC.
- For some malfunctions, ECM adopts the 2 D/C detecting logic to prevent erroneous detection. With this logic, MIL is turned on when the malfunction is detected in 2 consecutive D/Cs.
- Malfunctions detected by ECM are stored in its memory as pending DTC, confirmed DTC (current and history) and permanent DTC. The permanent DTC, among others, will be stored in the memory that cannot be manually erased. For the details, refer to description on ***Permanent DTC***.
- When a malfunction is detected, engine and driving conditions at the moment the malfunction was detected are stored in ECM memory as freeze frame data. For the details, refer to description on ***Freeze Frame Data***.
- It is possible to communicate ECM via DLC (3) by using with SUZUKI scan tool (SUZUKI-SDT) (4) or CAN communication OBD-II generic scan tool.



Warm-Up Cycle

Warm-up cycle means that the coolant temperature has risen by at least 22 °C (39.6 °F) from engine starting and reaches a minimum temperature of at least 71 °C (159.8 °F).

Driving Cycle (D/C)

A "Driving Cycle" is a duration from an engine startup to the following engine shutoff.

2 Driving Cycle Detection Logic

The malfunction detected in the 1st driving cycle is stored in ECM memory (in the form of pending DTC and freeze frame data) but the MIL does not turn on at this time. It turns on at the 2nd detection of the same malfunction in the next driving cycle.

Pending DTC

Pending DTC means a DTC detected and stored temporarily at the 1st driving cycle of the 2 D/C detection logic.

Permanent DTC

In accordance with SAE J 1979, ECM stores DTCs that adversely affect vehicle emission (i.e. DTCs with MIL turning on) in non-volatile RAM (NVRAM) separately from that for pending and confirmed DTCs. This DTC is called a permanent DTC.
Unlike pending and confirmed DTCs, the permanent DTC will not be cleared even when executing the clear command of scan tool or when shutting off the power to ECM. The permanent DTC is cleared only when the ECM detects no malfunction in the trouble area of the permanent DTC. (For permanent DTC clearance, refer to ***DTC Clearance***.)
Up to four of the most recent permanent DTCs will be stored in memory. The DTCs are cleared once a full determination has been made that they are normal.

Freeze Frame Data

ECM stores the engine and driving conditions at the moment of the detection of a malfunction in its memory. This data is called "Freeze frame data".
Therefore, it is possible to know engine and driving conditions (e.g., whether the engine was warm or not, where the vehicle was running or stopped, where air/fuel mixture was lean or rich) when a malfunction was detected by checking the freeze frame data. Also, ECM has a function to store each freeze frame data for 3 different malfunctions in the order of their detection. Utilizing this function, it is possible to know the order of detection of these malfunctions. This is helpful when rechecking or diagnosing a problem.
For details of freeze frame data that can be read from ECM, refer to table below.

DTC
Fuel System
Calculated Load
ECT
Short Term Fuel Trim
Long Term Fuel Trim
Engine Speed
Vehicle Speed
Ignition Advance
Intake Air Temperature
MAF
Absolute TP 1*
Evap Canist Prg Duty
Fuel Tank Level
Barometric Pres
Battery Voltage
Relative TP**
Absolute TP 2*
Absolute APP 1*
Absolute APP 2*

Target Throt Pos

NOTE:

- **For freeze flame data with asterisk (*), it indicates the ratio between power supply voltage and output voltage of related sensor.**
  When power supply voltage is 5.0 V and output voltage is 4.0 V, freeze frame data is displayed as follows.
  - **— For systems where the output is proportional to the input voltage, it displays 80% (= the percent of maximum input reference voltage).**
  - **— For systems where the output is inversely proportional to the input voltage, it displays 20% (=100% minus the percent of maximum input reference voltage).**
- **For relative TP with asterisks (**) in above table, it indicates by formula ((output voltage – output voltage at closed throttle position) / power supply voltage).**
  When power supply voltage is 5.0 V and output voltage at closed throttle position is 1.0 V, freeze frame data is displayed as follows.
  - **— At closed throttle position (output voltage = 1.0 V), it displays 0%.**
  - **— At wide open throttle position (output voltage = 4.0 V), it displays 60%. However, for systems where the output is inversely proportional to the input voltage, it displays 100% minus above-mentioned formula.**

Freeze flame data (for example)

Function View System Bar Help

Sub System / Freeze Frame Data

P0118	Engine coolant temperature circuit high

Parameter	Value	Units
DTC	P0118	
Fuel System	OL	
Calk Load	29.4	%
Coolant Temp	−40	°C
Short FT B1	0.0	%
Long FT B1	0.0	%
Engine Speed	1824	rpm
Vehicle Speed	0	Km/h
Ignition Advance	21.0	°BTDC

Exit

DTC | Data List | View | Active Test | Utility

Priority of freeze frame data

ECM has 4 frames where the freeze frame data can be stored. The first frame stores the freeze frame data of the malfunction which was detected first. However, the freeze frame data stored in this frame is updated according to the priority described below. (If malfunction as described in the upper square "1" below is detected while the freeze frame data in the lower square "2" has been stored, the freeze frame data "2" will be updated by the freeze frame data "1".)

Priority	Freeze frame data in frame 1
1	Freeze frame data at initial detection of malfunction among "misfire detected" (P0300 – P0304), "fuel system too lean" (P0171, P2096) and "fuel system too rich" (P0172, P2097)

2	Freeze frame data when a malfunction other than those in "1" above is detected.

In the 2nd through the 4th frames, the freeze frame data of each malfunction is stored in the order of detection. These data are not updated.
Shown in the table below are examples of how freeze frame data are stored when two or more DTCs are detected.

			Frame 1	Frame 2	Frame 3	Frame 4
			Freeze frame data	1st freeze frame data	2nd freeze frame data	3rd freeze frame data
DTC detection order	1	No DTC	—	—	—	—
	2	P0443	P0443 data	P0443 data	—	—
	3	P0112	P0443 data	P0443 data	P0112 data	—
	4	P0117	P0443 data	P0443 data	P0112 data	P0117 data
	5	P0480	P0443 data	P0443 data	P0112 data	P0117 data
	6	P0171	P0171 data	P0443 data	P0112 data	P0117 data

—: No freeze frame data

Freeze frame data clearance

The freeze frame data is cleared at the same time as clearance of DTC.

System Readiness Test

The system readiness test is to check if the on-board diagnosis of each system related to exhaust emission has been completed or not with a scan tool (SUZUKI SDT or CAN communication OBD-II generic scan tool). When the conditions established for each system are met, ECM performs an on-board diagnosis of corresponding system and changes the status of system readiness test from "Incomplete" to "Complete".
When "Complete" status is displayed, it is maintained until the "DTC clearance" is performed with scan tool.

NOTE:
- **The status of system readiness test may be changed as "incomplete" when performing the following services.**
  - **— Disconnection of battery negative cable**
  - **— Disconnection of ECM connectors**
  - **— Removal of ground cable for ECM**
  - **— Disconnection of "B/U" fuse and/or "DOME" fuse**
- **By utilizing this system readiness test, it is possible to confirm that all DTC confirmation procedures for each system have been completed or are incomplete. For all DTCs related to each system, refer to the table below.**
- **The system readiness test does not determine whether result of the on-board diagnosis is "Normal" or "Abnormal", rather it displays whether the result is "Complete" or "Incomplete".**

Monitoring Item of System Readiness Test Table

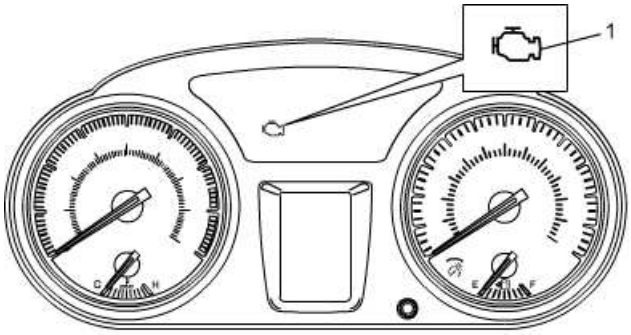
Monitoring item	DTC related to monitoring item						
Catalyst	P0420	—	—		—	—	—
Evaporative System	P0441	P0456	—		—	—	—
O2 Sensor	P0133	P0134	P0139	P013E	P2195	P2196	P2A01
O2 Sensor Heater	P0037	—	—	—	—	—	—
EGR and/or VVT System Monitoring	P0011	P0012	—	—	—	—	—

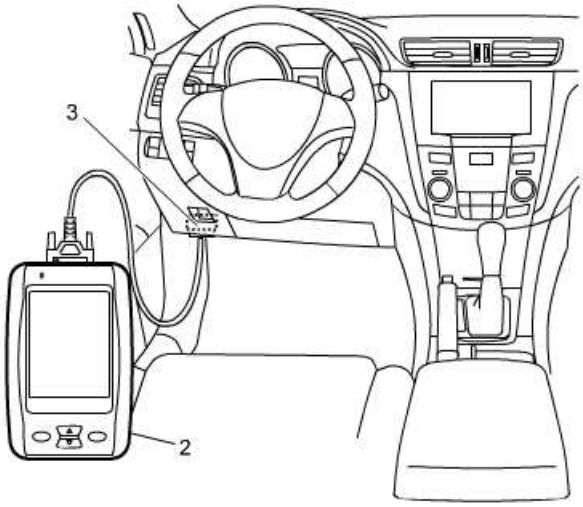
5E

OBD System Description

For CVT control system, TCM has the following functions.

- When ignition mode of keyless push start system in "ON", MIL (1) turns ON to check the MIL and its circuit.
- When TCM detects a malfunction in CVT control system (and/or a malfunction which gives an adverse effect to vehicle emission) while the engine is running, TCM requires ECM to make the MIL in the combination meter of the instrument panel turn ON. TCM stores the malfunction area (DTC according to SAE J2012) in TCM memory.
  (If it detects that continuously 3 driving cycles are normal after detecting a malfunction, however, it makes MIL turn OFF although DTC stored in its memory will remain.)
- Malfunctions detected by TCM are stored in its memory as pending DTC, confirmed DTC (current and history) and permanent DTC. The permanent DTC, among others, will be stored in the memory that cannot be manually erased. (For the details, refer to description on ***Permanent DTC***)
- It is possible to communicate through DLC (3) by using not only SUZUKI scan tool (2) but also CAN communication OBD generic scan tool which are in compliance with SAE J1978. (Diagnostic information can be accessed by using a scan tool.)





- For information about the following items, refer to ***OBD System Description***.
  - — Warm-up cycle
  - — Driving cycle
  - — 2 driving cycle detection logic
  - — Pending DTC
  - — Freeze frame data

Permanent DTC

In accordance with SAE J1979, TCM stores DTCs that adversely affect vehicle emission (i.e. DTCs with MIL turning on) in a non-volatile RAM (NVRAM) separately from that for pending and confirmed DTCs. This DTC is called a permanent DTC.
Unlike pending and confirmed DTCs, the permanent DTC will not be cleared even when executing the clear command of scan tool or when shutting off the power to TCM. Only when does TCM detect no malfunction in the trouble area of the stored permanent DTC with the condition determined normal the permanent DTC will be cleared. (For permanent DTC clearance, refer to ***DTC Clearance***)
The maximum of four earliest detections of the permanent DTCs will be stored in memory. The DTCs are cleared in the order of completing determination as normal.

1A

OBD System Description - Cold Start Performance Monitor

System Description / Monitoring Procedure

The ECM retards the ignition timing and increases the idle air to quickly increase the catalyst temperature at cold start to reduce emissions. The ECM monitors the ignition timing and the idle air for cold starts. If the idle air or the ignition timing is out of specification, the ECM will set DTC.

DTC Description / Detecting Condition / Confirmation Procedure

P050A, P050B

Refer to ***DTC P050A / P050B***.

Cold Start Idle Air Control System Performance Monitor

Operation

DTCs	P050A, P050B
Monitor execution	Not applicable
Monitoring duration	10 sec.

Enabled conditions

Parameter	Min.	Max.
P050A		
Time after engine start	1 sec.	30 sec.
ECT at engine start	–10 °C (14 °F)	40 °C (104 °F)
ECT	–10 °C (14 °F)	40 °C (104 °F)
IAT	–10 °C (14 °F)	40 °C (104 °F)
Throttle position	—	60 °
P050B		
Time after engine start	1 sec.	30 sec.
ECT at engine start	–10 °C (14 °F)	40 °C (104 °F)
ECT	–10 °C (14 °F)	40 °C (104 °F)
IAT	–10 °C (14 °F)	40 °C (104 °F)
Throttle position	—	60 °
Vehicle speed	0 km/h (0 mile/h)	

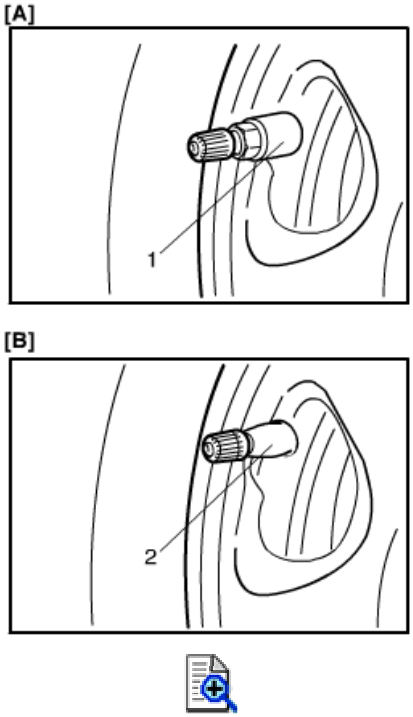
Typical malfunction thresholds

P050A:	
Phase 1:	Commanded final idle air duty – Predetermined idle air duty < –20%
Phase 2:	Commanded final idle air duty – Predetermined idle air duty > 43%
Phase 3:	Commanded final idle air duty < = 1%
Phase 4:	Commanded final idle air duty > = 99%
P050B:	
Phase 1:	Commanded final ignition timing – Predetermined timing < –20° (CVT), –10° (M/T)
Phase 2:	Commanded final ignition timing – Predetermined timing > 5° (CVT), 10° (M/T)

2D

Identification of TPMS-Equipped Vehicles

TPMS-equipped vehicles can be identified by checking the shape of an air valve as shown below.



[A]: Vehicle with TPMS	1. Tire air valve (silver)
[B]: Vehicle without TPMS	2. Tire air valve (black)

2D

Tightening Torque Specifications

Fastening part	Tightening torque			Note
	N·m	kgf-m	lbf-ft	
Wheel nut	140	14.3	103.5	☞
Tire pressure sensor mounting nut	8.5	0.85	6.5	☞

Reference:
For the tightening torque of fastener not specified in this section, refer to ***Fasteners Information***.