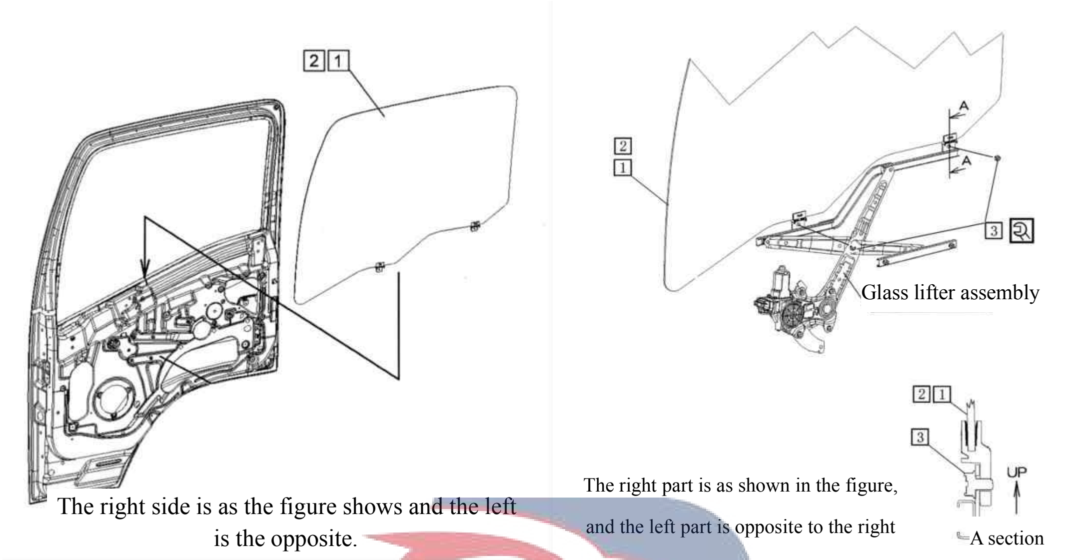
Door glass



The right side is as the figure shows and the left is the opposite.

The right part is as shown in the figure, and the left part is opposite to the right

Assembly requirements:

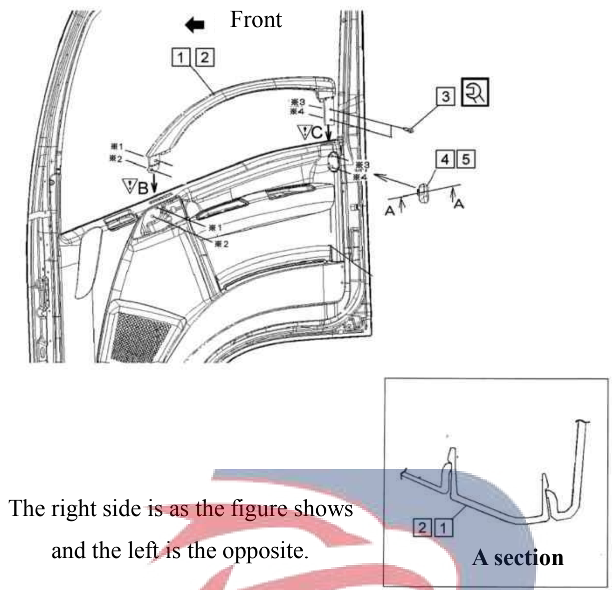
1. Insert the right front door glass assembly (1) into the door sheet metal frame;

2. Insert the right door glass lifter assembly into the right door sheet metal, align the mounting holes on the frame with the mounting holes on the glass lifter assembly bracket, tighten the bolts (3) (as shown in section A) and tighten them.

Assembly details:

1. Right front door glass assembly
2. Left front door glass assembly
3.Bolt（Q1840610）

Door upper armrest



Assembly requirements:

1. Insert the armrest - upper right front door (1) into the door trim plate (as shown), so that the mounting holes align with the corresponding assembly of the left door trim plate; screw in the combination screw - armrest (3) and tighten them with a pneumatic wrench and a spearhead;

2. Insert trim cap (4) into the specified position in place (as shown in section A).

Assembly details:

1. Armrest-upper right front door (6107521-D17YZ)

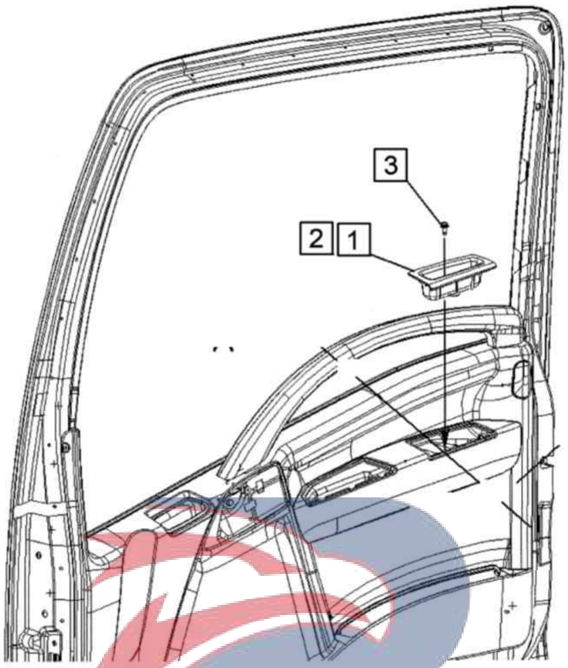
2. Armrest-upper left front door（6107511-D17YZ）

3. Bolt

4. Trip cap-right armrest（6107541-D17YZ）

5. Trip cap-left armrest (6107531-D17YZ)

Inner handle box



The right side is as the figure shows and the left is the opposite.

Assembly requirements:

1. Align the mounting holes of inner handle box - right front door (1) with the mounting holes of the inner handle box bracket, and fasten them with screws (3).

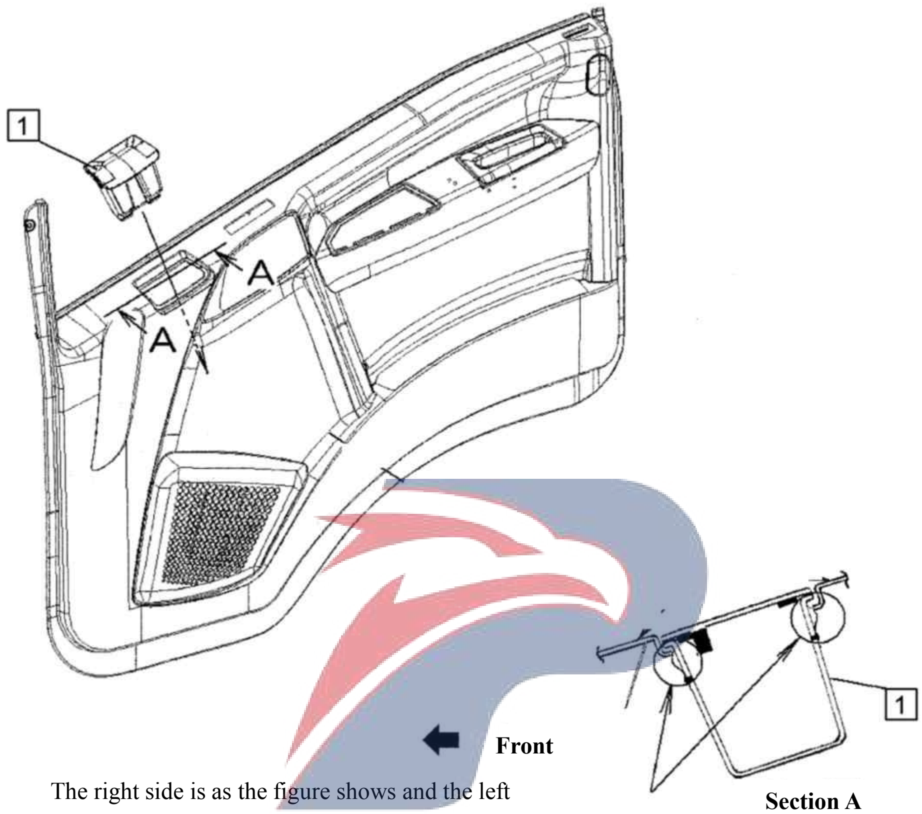
Assembly details:

1. Inner handle box - front right door

2. Inner handle box - front left door（6107551-D17YZ）

3. Bolt

Cigarette ash container



The right side is as the figure shows and the left is the opposite.

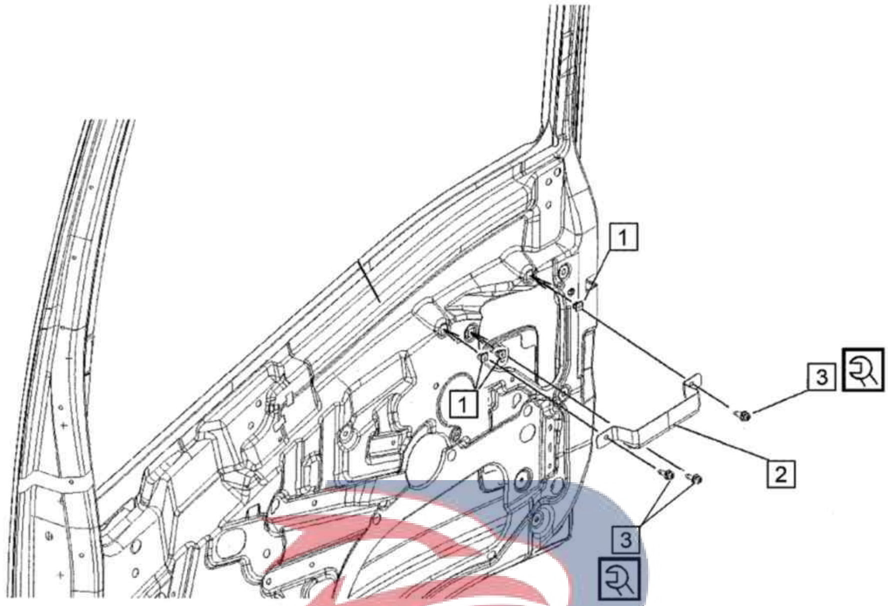
Assembly requirements:

1. Pull the ashtray assembly (1) into place on the right door trim (as shown) and press in place (as shown in section A).

Assembly details:

1. Ashtray assembly (6107571-D17YZ)

Bracket



The right side is as the figure shows and the left is the opposite.

Assembly requirements:

1. Press the gasket nut (1) into the corresponding hole on the right door sheet metal;

2. Align the mounting holes of the bracket (2) with the mounting holes of the gasket nut (1) and fasten them with screw (3).

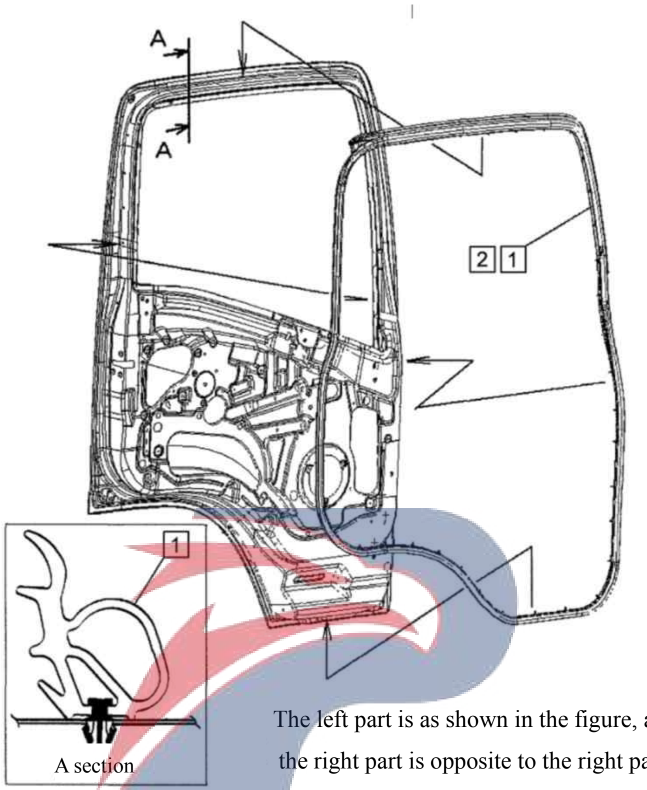
Assembly details:

1. Nut (5107223-801)

2. Bracket（6107011-P301）

3. Screw

Door sealing rubber strip



The left part is as shown in the figure, and the right part is opposite to the right part.

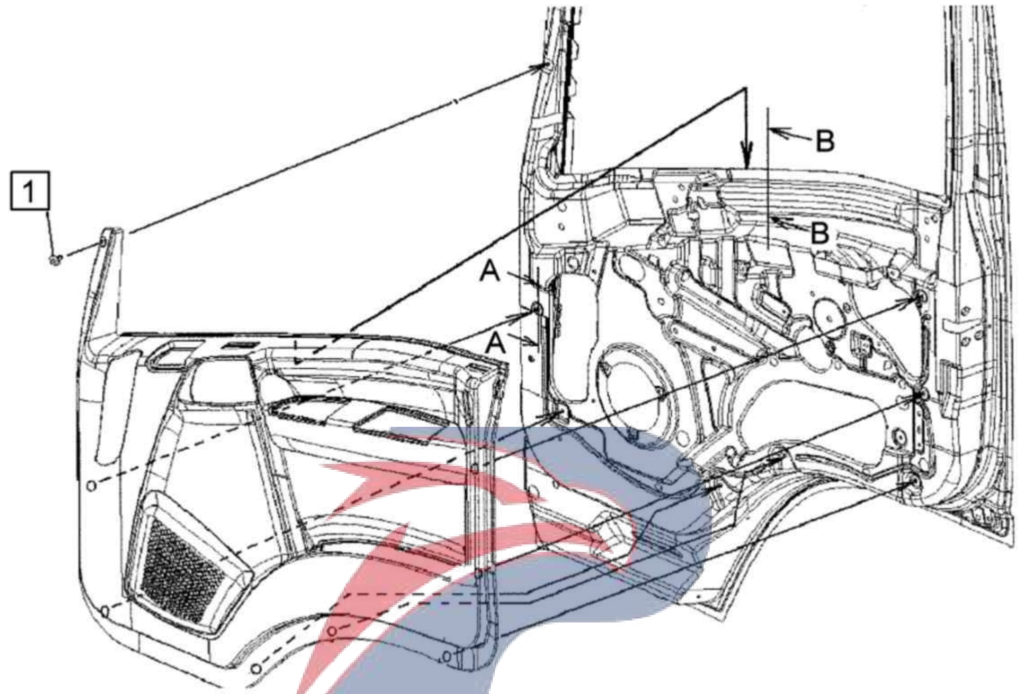
Assembly requirements:

1. Embed the upper side of door sealing strip (1) or (2) into the sheet metal at the upper part of the door, and press the fastening nail of ① into the mounting hole of door in place (as shown).

Assembly details:

1. Right trim strip (6107030-P301)
2. Left trim strip（6107020-P301）

Trim plate inside door



The right part is as shown in the figure, and the left part is opposite to the right part.

Assembly requirements:

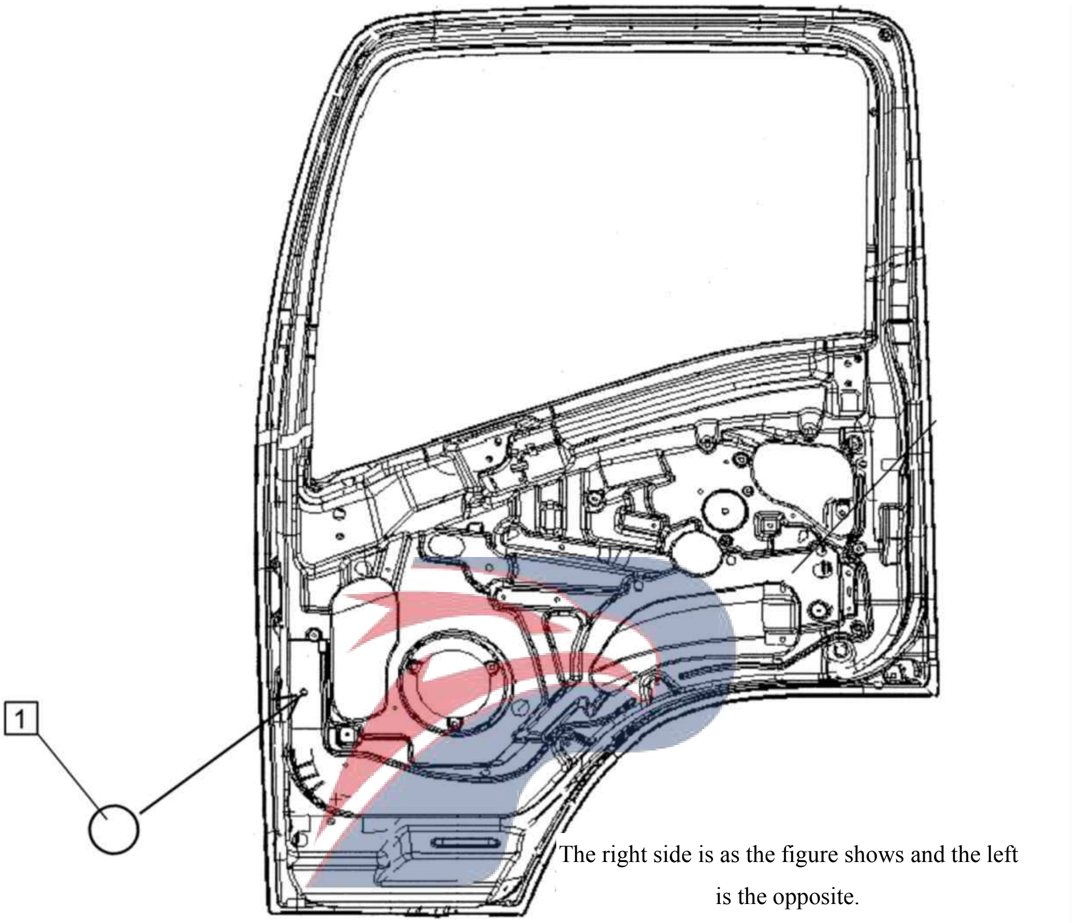
1. Press the staple bolts of trim plate inside the left door into the holes on left door inner plate;

2. Get fastening nail (1) through the hole on the trim plate inside the left door, and press it into the gasket nut of the inner plate.

Assembly details:

1. Fixing nail (8200991-D17YZ)

Sealing cover piece



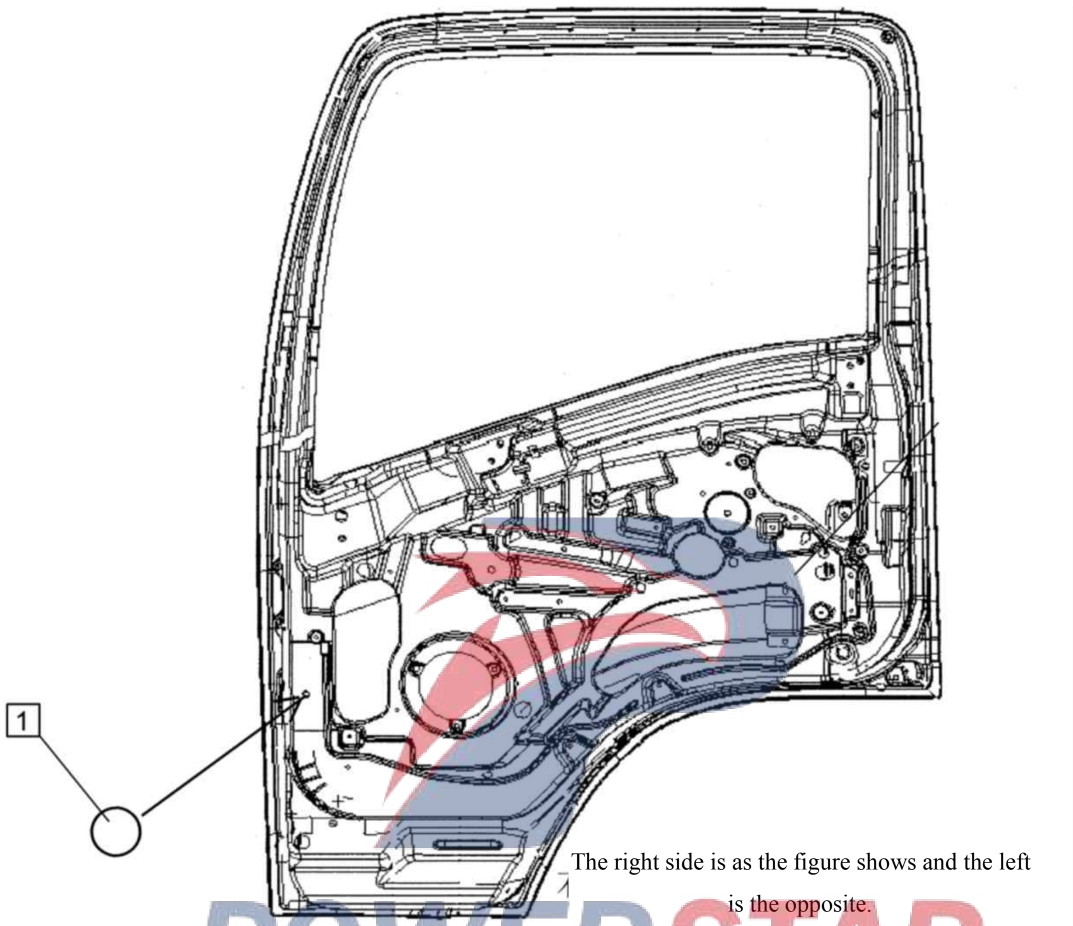
Assembly requirements:

1. Attach the sealing cover (1) to the illustrated area.

Assembly details:

1. Seal cover plate (8200143-803)

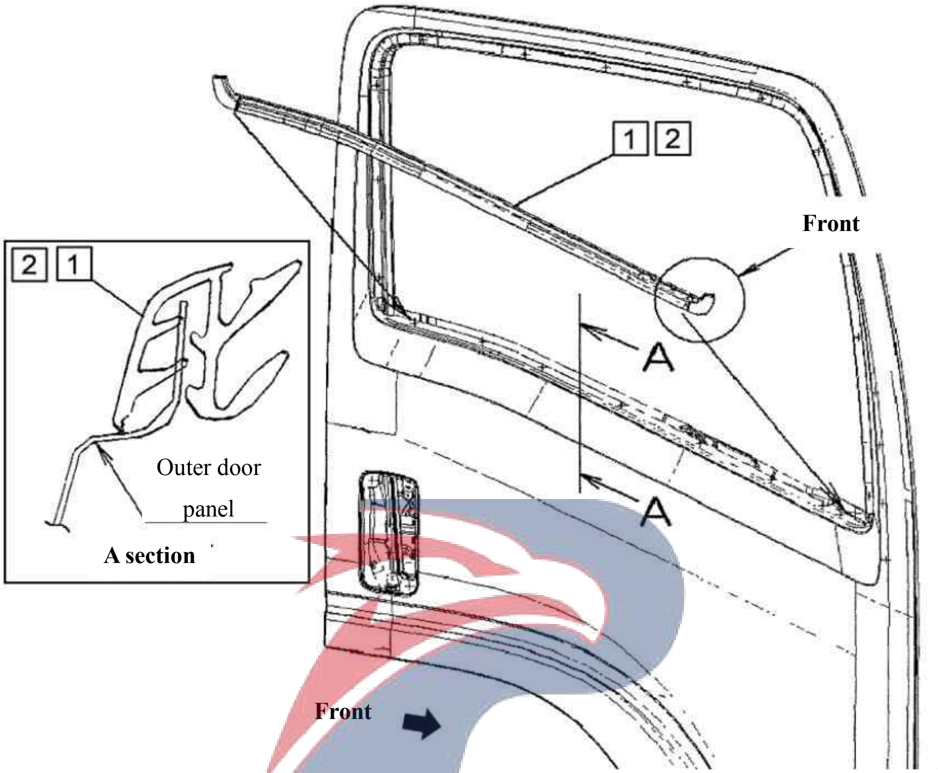
Paste the butyl rubber rope



Assembly requirements:

1. Paste the butyl rubber rope in the illustrated area.

Trim strip assembly



Assembly requirements:

1. Align the front end of right trim strip assembly (1) with the window sealing rubber strip (as shown in section A);

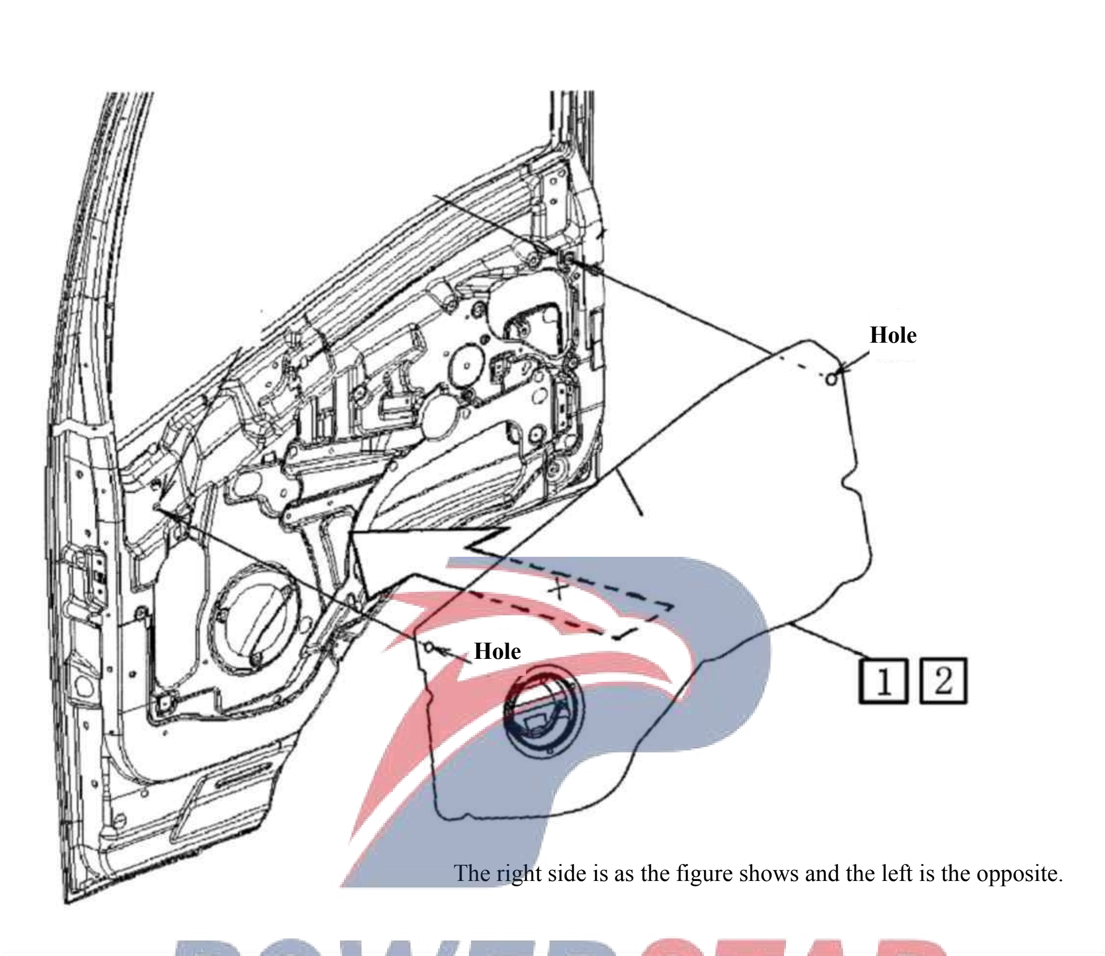
2. Tap the outside with a rubber hammer to fit it into place (as shown).

Assembly details:

1. Right trim strip assembly (6107140-P301)

2. Left trim strip assembly（6107130-P301）

Water seal



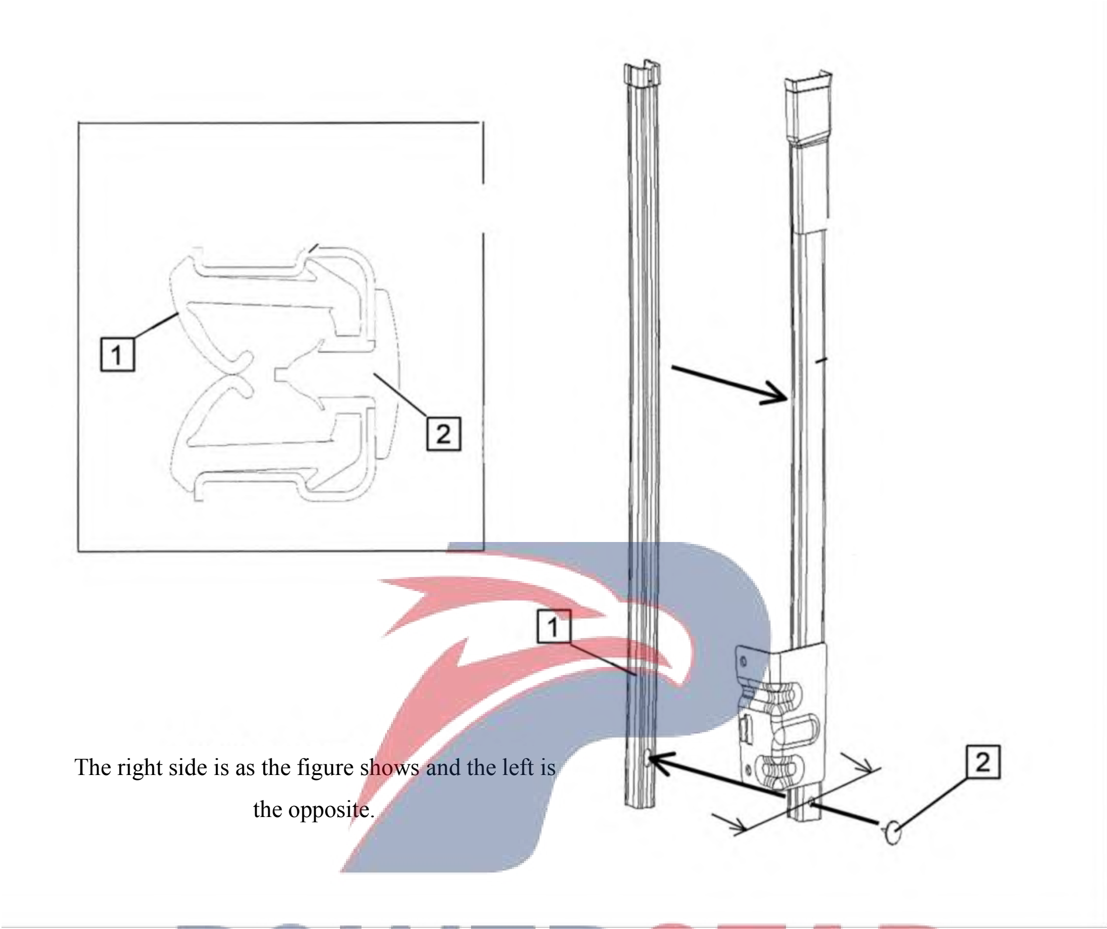
Assembly requirements:

1. Paste the water seal - front door (1) to the position shown.

Assembly details:

1. Water seal - right front door (6107621-P301)
2. Water seal - left front door（6107611-P301）

Glass chute strip



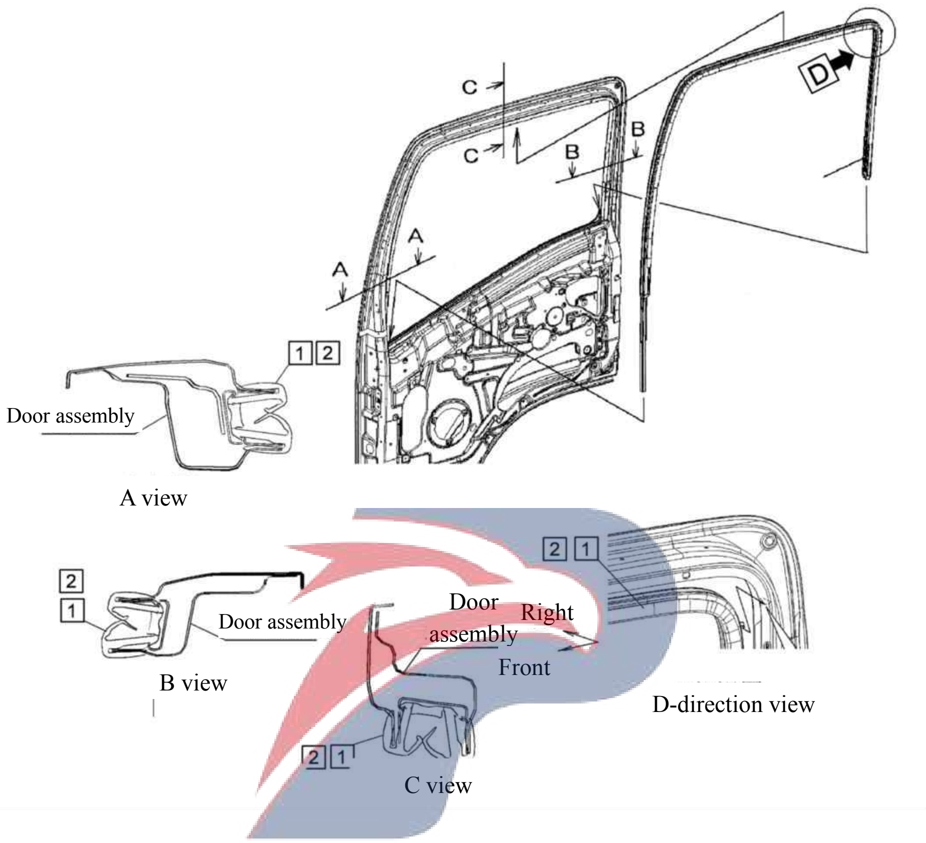
Assembly requirements:

1. Fix the glass chute strip - rear lower side of right front door (1) with fastening nails as shown on the right.

Assembly details:

1. Glass chute strip (6107261-P301)
2. Fixing nail

Glass chute strip



Assembly requirements:

1. Fetch the glass chute strip - right front door (1), and insert its rear end into the right door metal plate chute (as shown in section B).

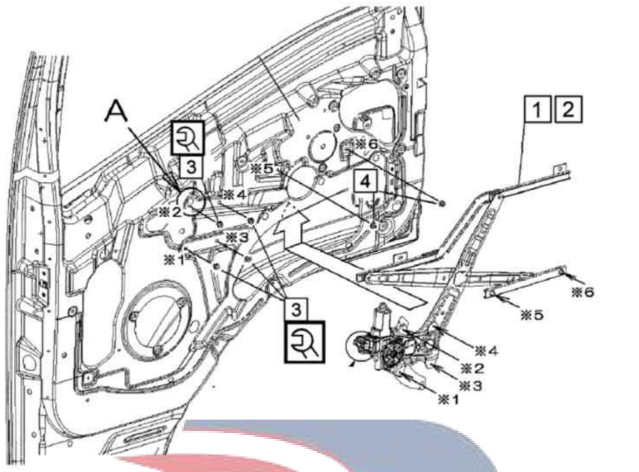
2. Fetch glass chute strip - right front door (1), and insert its rear end into the right door sheet metal chute (as shown in section B).

Assembly details:

1. Glass chute strip - right front door (6107241-P301A)

2、Glass chute strip - left front door（6107231-P301A）

Glass lifter



Assembly requirements:

1. Put the front door glass lifter assembly (1) or (2) into the right door, and insert the studs on the bracket into the corresponding mounting holes, and then fit the mounting holes on the lower part of the bracket to the mounting holes on the inner panel of the door;

2. Screw the nut (4) into the stud of the door glass lifter assembly (1) or (2);

3. Get bolt (3) through the mounting hole in the door inner panel and screw it into the mounting hole in the lower part of the front door lifter assembly (1) or (2) bracket.

Assembly details:

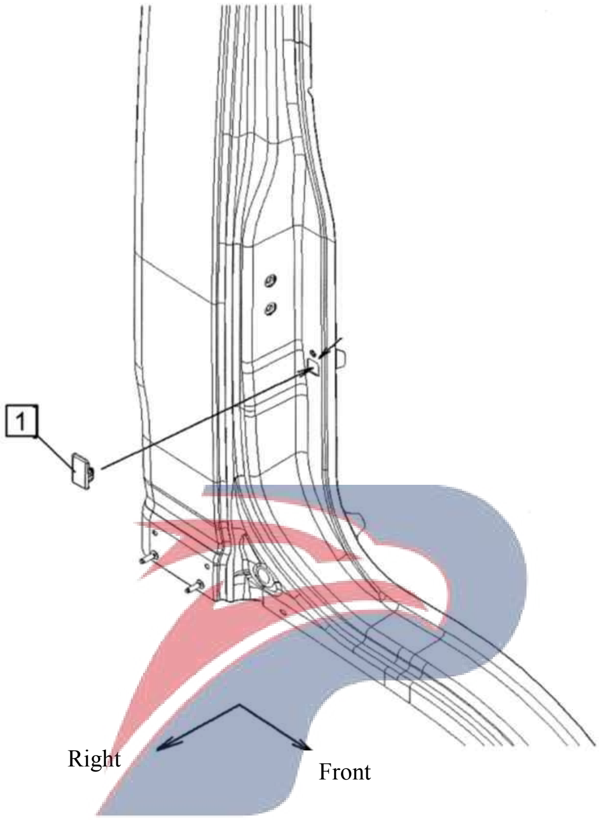
1. Right front door glass lifter assembly

2. Right front door glass lifter assembly

3. Bolt（Q1840610）

4. Nut（Q32006）

Door switch hole cover



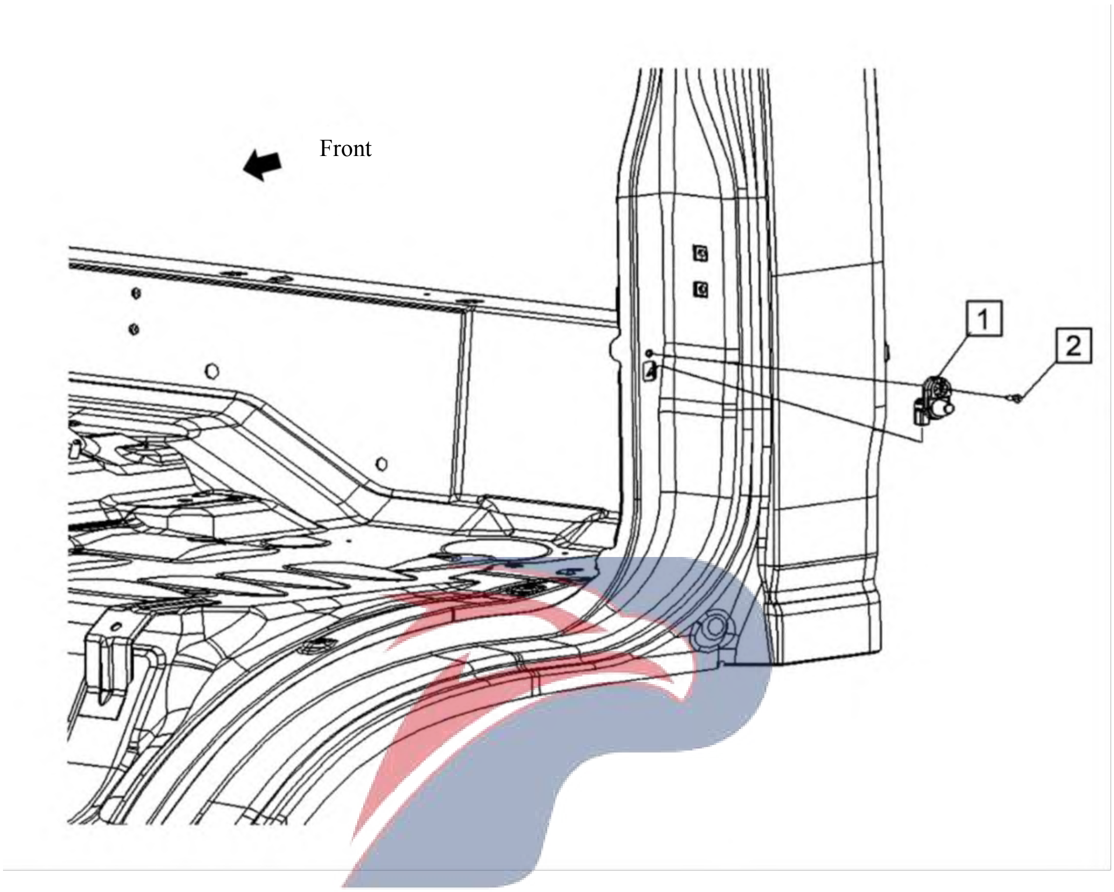
Assembly requirements:

1. Insert the hole cover - front door switch ① into the right door sheet metal mounting hole in the cab (as shown in the figure).

Assembly details:

1. Hole cover - front door switch (6107431-P301)

Door switch assembly



Assembly requirements:

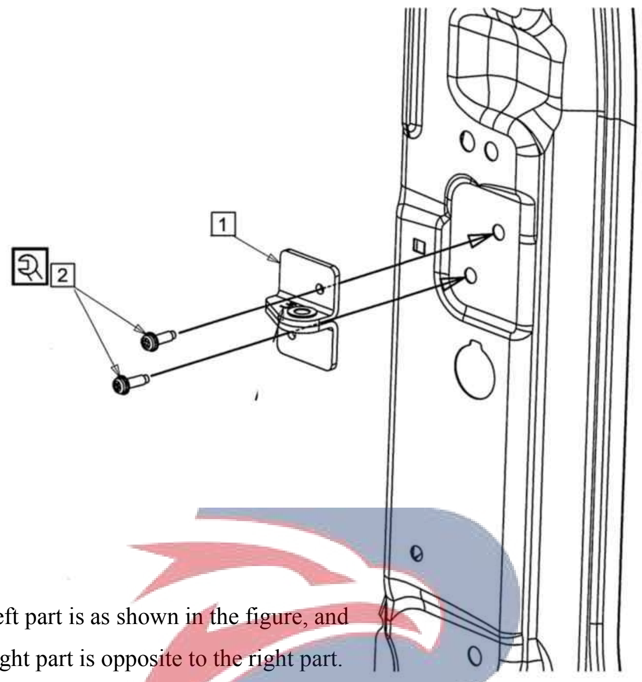
1. Place the center pillar of front door switch assembly (1), and tighten with screw (2).

Assembly details:

1. Front door switch assembly - center pillar

2. Screw

Door connecting rod



The left part is as shown in the figure, and the right part is opposite to the right part.

Assembly requirements:

1. Put the connecting rod assembly (1) to the left door, get through bolt (2) through the hole on connecting rod assembly (1) with a pneumatic wrench, and tighten the bolt slightly;

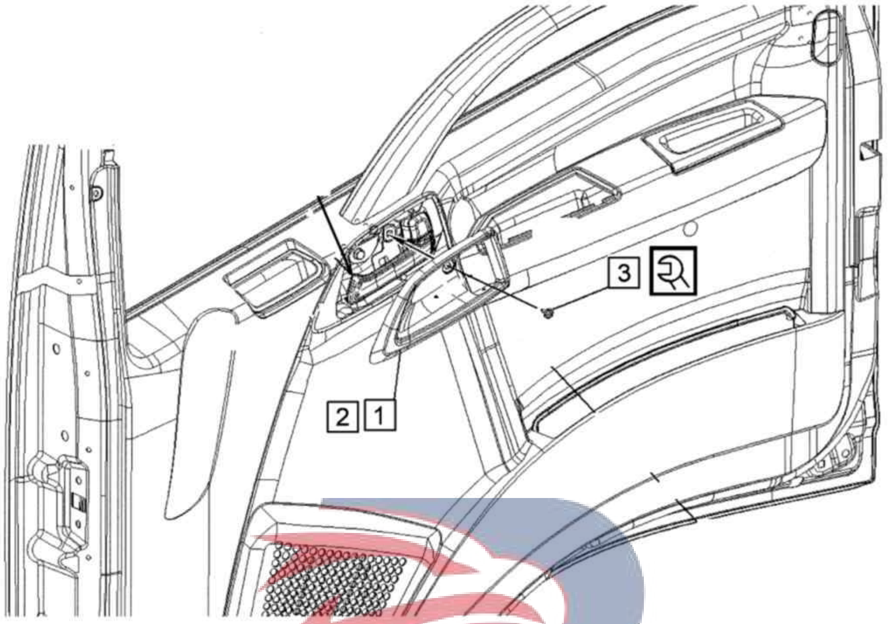
2. Use a torque wrench to tighten the screw (2) to the specified torque of 9 ± 2N • m and mark the head of the screw (2) with a marker.

Assembly details:

1. Connecting rod assembly

2. Bolt

Handle trim cover inside door



The right side is as the figure shows and the left is
the opposite.

Assembly requirements:

1. As shown, insert the trim cover - right front door handle (1) into the corresponding position on the right door trim plate;

2. Get screw (2) through the trim cover - mounting hole in the right front door handle (1), and screw it into the gasket nut of the door sheet metal.

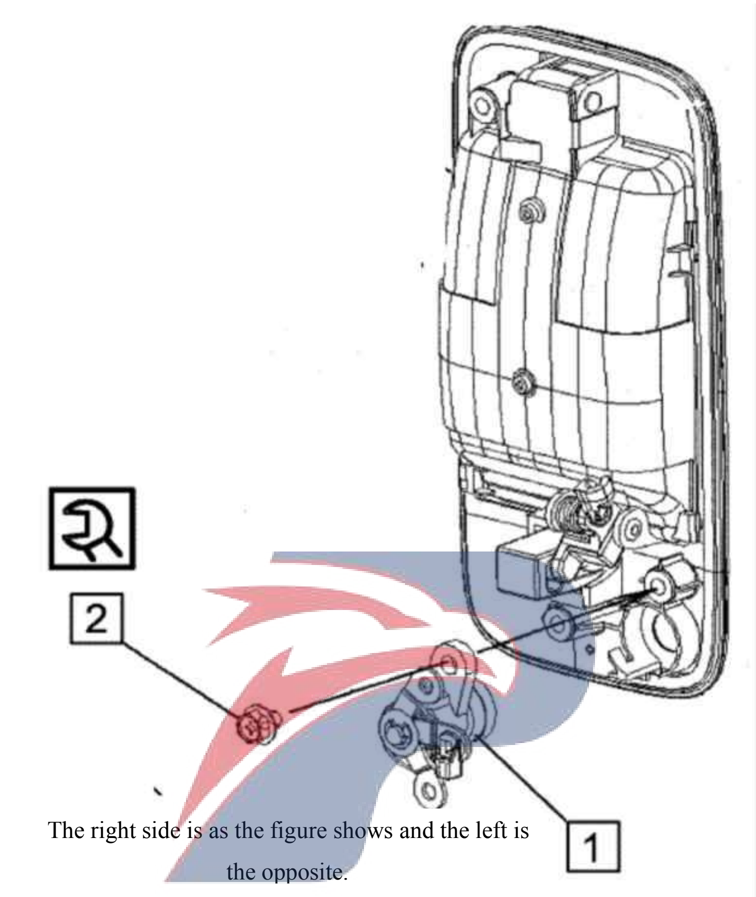
Assembly details:

1. Trim cover - right front door handle (6107591-D17YZ)

2. Trim cover - left front door handle（6107581-D17YZ）

3. Screw

Door lock



The right side is as the figure shows and the left is the opposite.

Assembly requirements:

1. Align the mounting hole of the lock assembly (1) with the corresponding mounting hole of the outer door handle, and screw in the bolt (2);

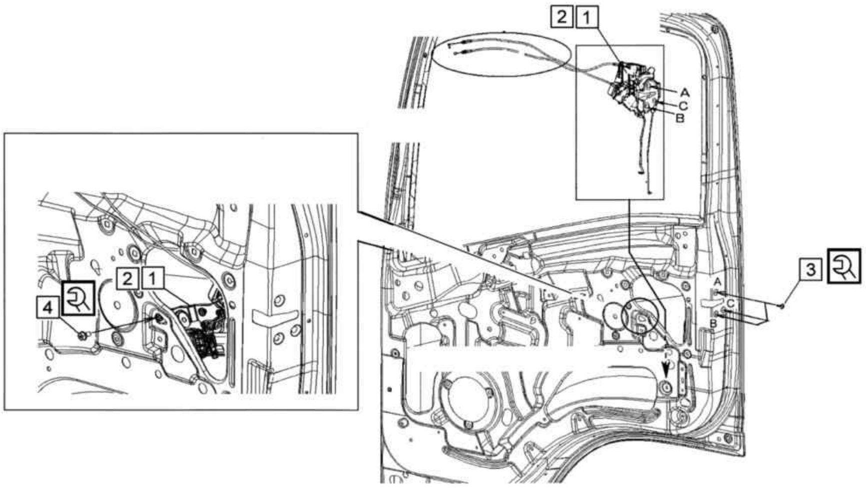
2. Tighten the bolt (2).

Assembly details:

1. Lock assembly (with key)

2. Screw

Door lock



The right side is as the figure shows and the left is the opposite.

Assembly requirements:

1. Take the right door lock assembly (1). Place it in the right door sheet metal as shown on the right, align its mounting holes A, B, C with the mounting holes in the door sheet metal, screw in the bolt (3) and preload it;

2. Align the lower mounting hole of the right door lock assembly (1) with the mounting hole of the door sheet metal, and pre-tighten them with bolt (4);

3. Tighten the bolts (3) and (4) in the order of A → B → C → (4).

Assembly details:

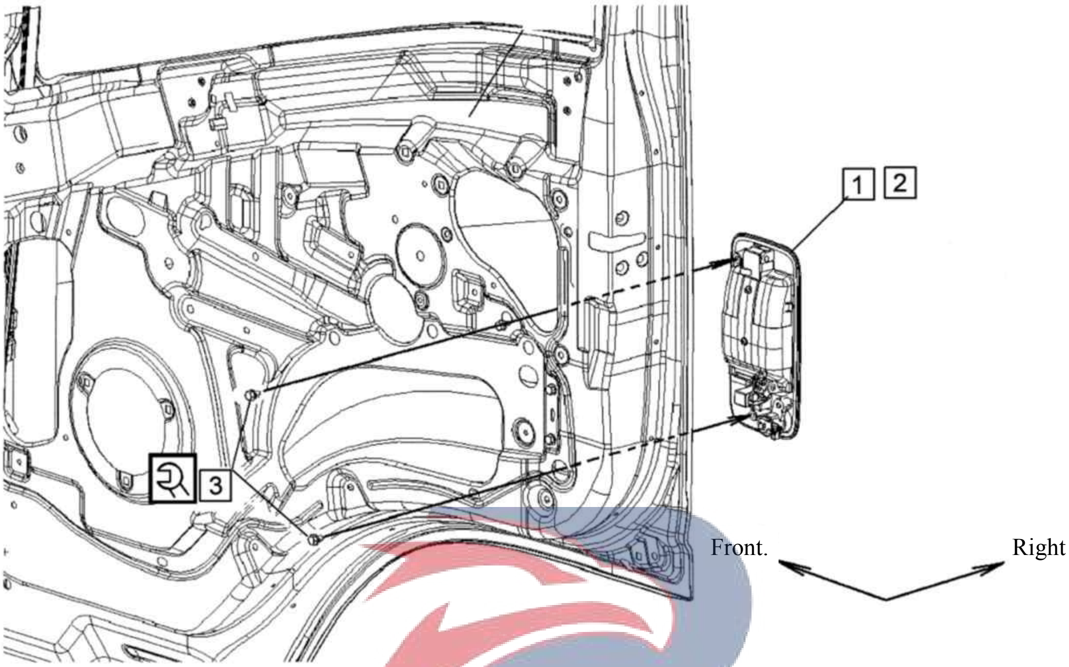
1. Door lock assembly - right front door

2. Door lock assembly - left front door

3. Screw

4. Bolt（Q1840610）

Outer door handle



The right side is as the figure shows and the left is the opposite.

Assembly requirements:

1. Insert the outer front door handle assembly (1) or (2) into the corresponding position so that the mounting holes align with the door mounting holes (as shown), screw in the bolt (3) and fasten it.

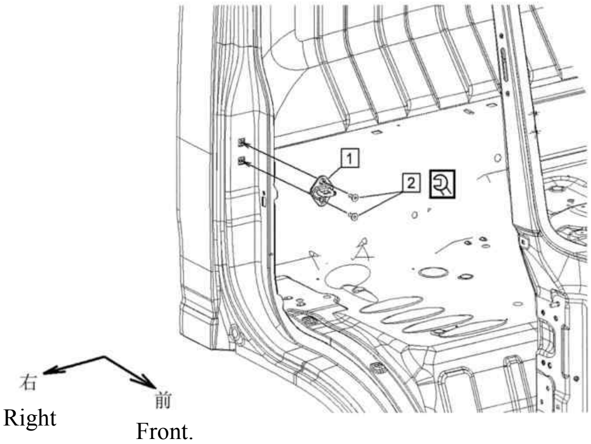
Assembly details:

1. Right front door handle assembly (6107320-P301)

2. Left front door handle assembly（6107310-P301）

3. Bolt（Q1840610）

Door stopper



The right side is as the figure shows
and the left is the opposite.

Assembly requirements:

1. Put the stopper (1) to the left door, get through screw (2) through the hole on stopper (1) with a pneumatic wrench, and tighten the bolt slightly;

2. Close the left door so that the lock mechanism abuts against the stopper (1), and visually check whether the catch of stopper (1) is aligned with the middle of the opening of the lock mechanism. If it is not aligned, gently tap the catch of stopper (1) with a rubber hammer, adjust it to the specified position;

Note: Be sure the catch of stopper (1) is in a horizontal position.

3. Close the door. Attach a steel ruler against the lock mechanism and stopper (1), visually check whether the difference between the door and the side wall of the door is within mm level; if not meeting the requirement, lightly hit the catch of stopper (1) with a rubber hammer to adjust it until the difference between the door and the side wall meets the requirement;

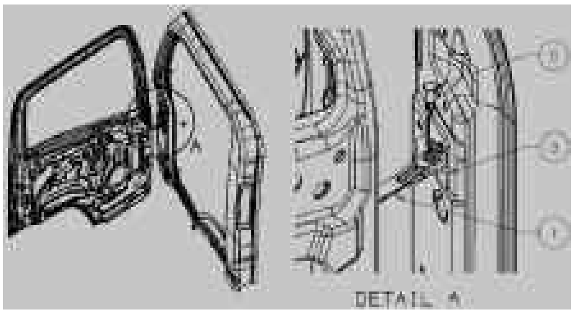
4. Use a torque wrench to tighten the screw (2) to the specified torque of 24 ± 5N • m and mark the head of the screw (2) with a marker.

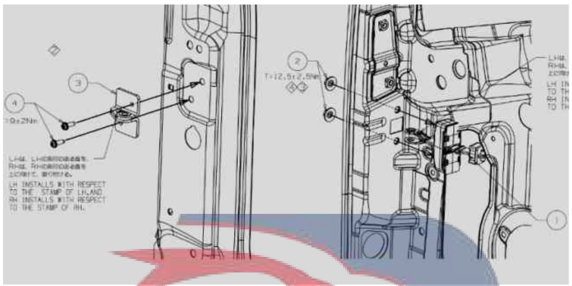
Assembly details:

1. Stopper assembly (6107210-P301)

2. Bolt

Inspection arm





Assembly requirements:

1. Take the inspection arm assembly (1) and get its bolt through the door and put in onto the position as shown in the figure and screw the nut (2);

2. Tighten the nut (2) at a torque of 12.5±2.5N.m;

3. Fix bracket 3 in the corresponding position of the cab with bolt 4;

4. Apply a small amount of grease onto the pin assembly (1) as shown on the right, and connect the door inspection arm to the cab.

Assembly details:

1. Inspection arm assembly

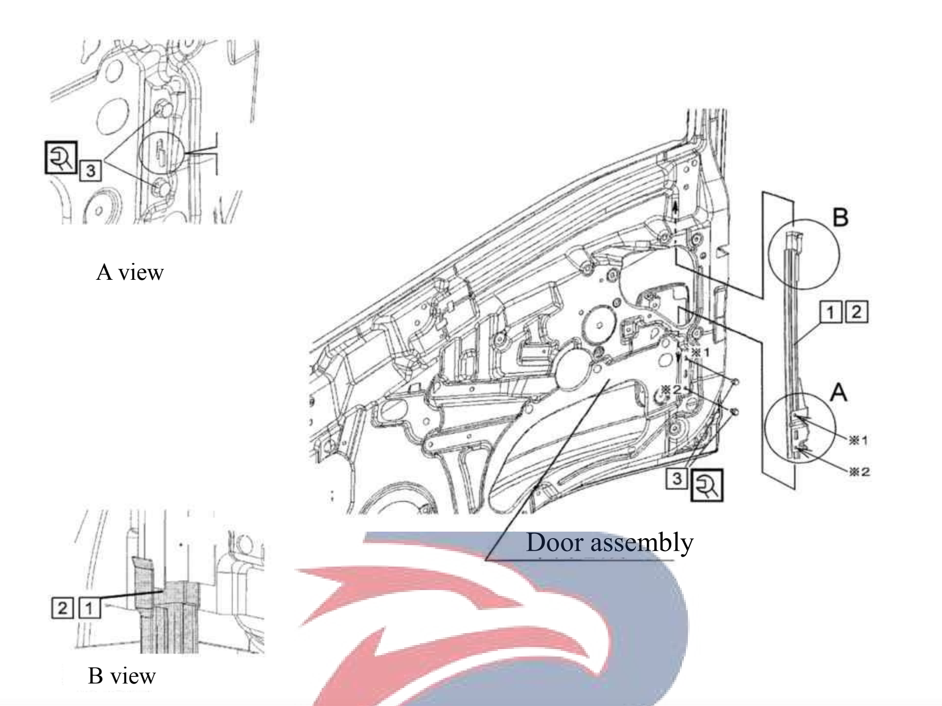
2. Nut（3404211-D17YZ）

3. Bracket assembly

4. Bolt

5. Pin

Glass chute



Assembly requirements:

1. Fix the glass chute strip - rear lower side of right front door (1) or (2) into the right door sheet metal frame, and insert its upper end into the sheet metal hole (as shown in section B);

2. Attach its lower bracket close to the right door sheet metal frame, so that the mounting holes on the bracket align with the corresponding mounting holes on the right door sheet metal frame, screw in the bolt (3) and fasten it (as shown in section A).

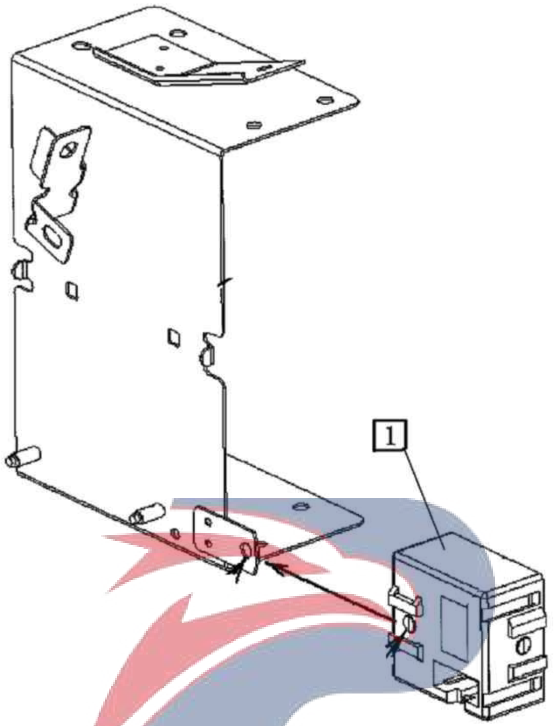
Assembly details:

1. Guideway assembly - behind the right front door glass

2. Guideway assembly - behind the left front door glass

3. Bolt（Q1840610）

Door lock relay



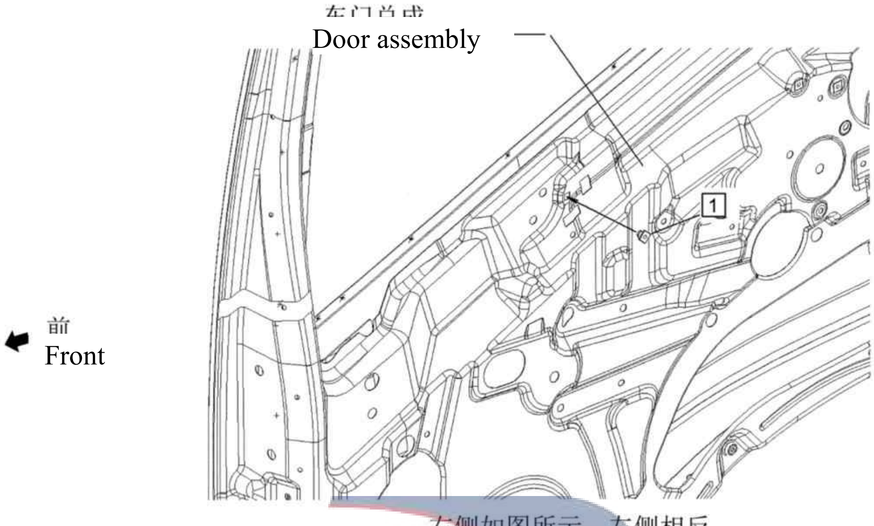
Assembly requirements:

1. Insert the relay assembly - door lock (1) into the bracket as shown on the right.

Assembly details:

1. Relay assembly - door lock

Inner handle gasket nut



The right side is as the figure shows and the left is the opposite.

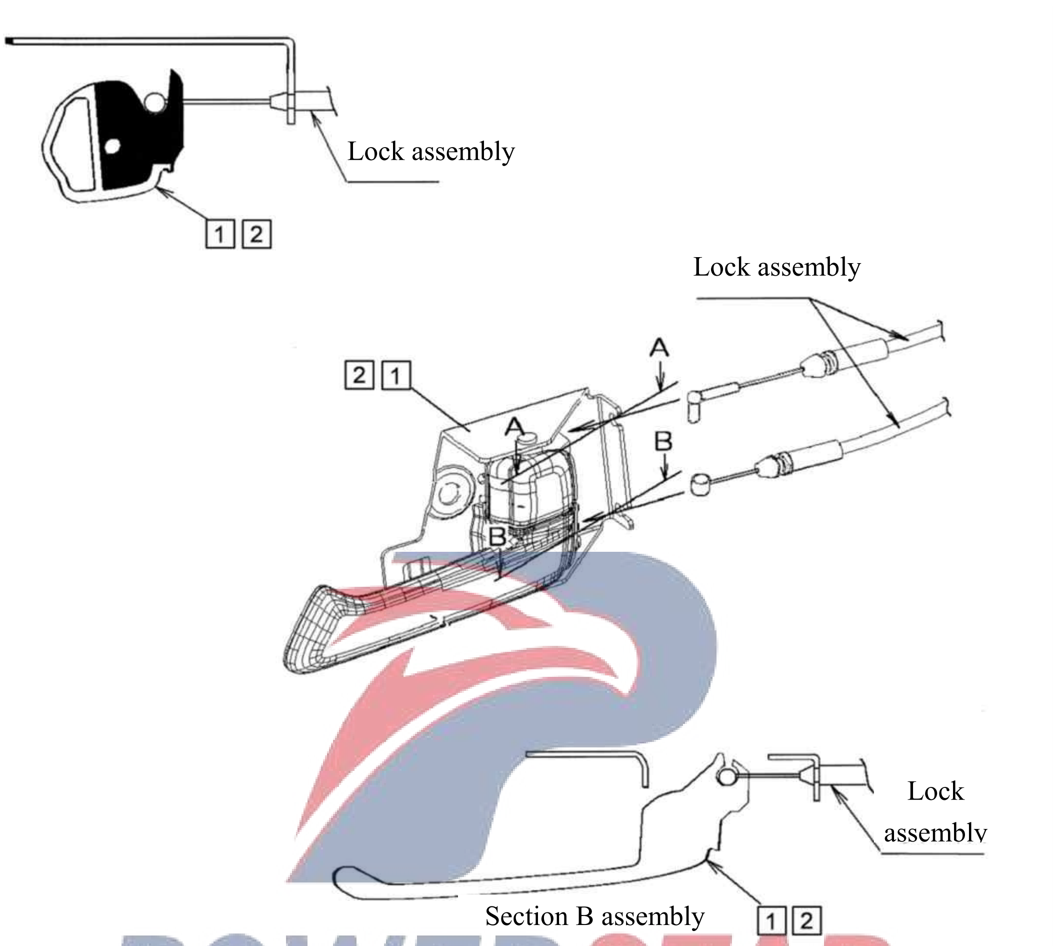
Assembly requirements:

1. Insert gasket nut (1) into the door assembly as shown on the right (can also be knocked in with a hammer).

Assembly details:

1. Gasket nut - inner handle (5107223-801)

Inner handle and connecting rod assembly



Assembly requirements:

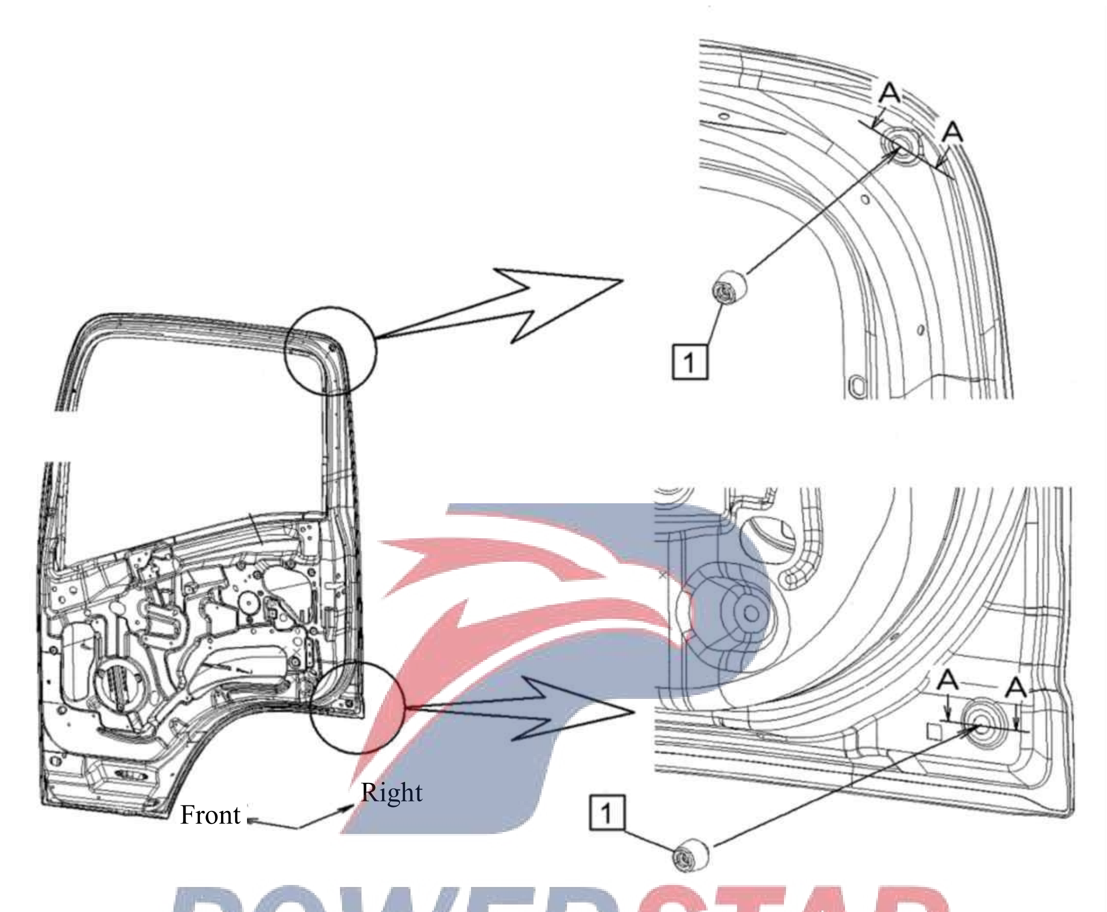
1. Insert rods A and B on the lock assembly into the corresponding positions on the right inner handle and connecting rod assembly (1) or (2), then insert them into the corresponding positions on the door as shown on the right.

Assembly details:

1、Right inner handle and connecting rod assembly（6107820-D17YZ）

2. Left inner handle and connecting rod assembly (6107810-D17YZ)

Limit rubber pad



The right side is as the figure shows and the left is the opposite.

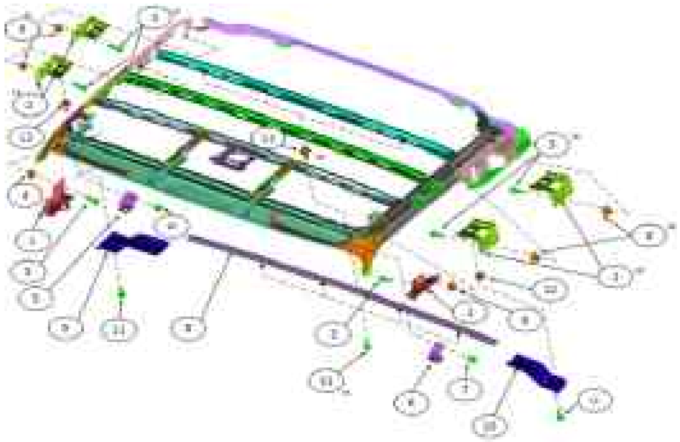
Assembly requirements:

1.Take the limit rubber pad - front door (1). Screw into the corresponding position of the door assembly as shown on the right.

Assembly details:

1. Limit rubber pad - front door

Curtain rails - low roof



Assembly requirements:

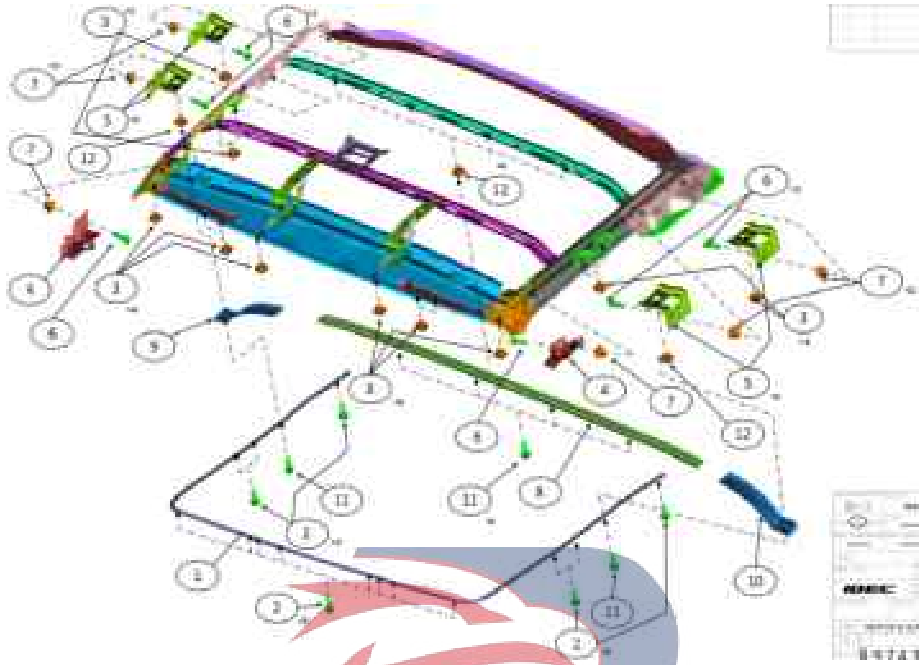
1. As shown in the figure, take the ceiling supports 1, 2, 5, and 6 and install them where appropriate in the cab;

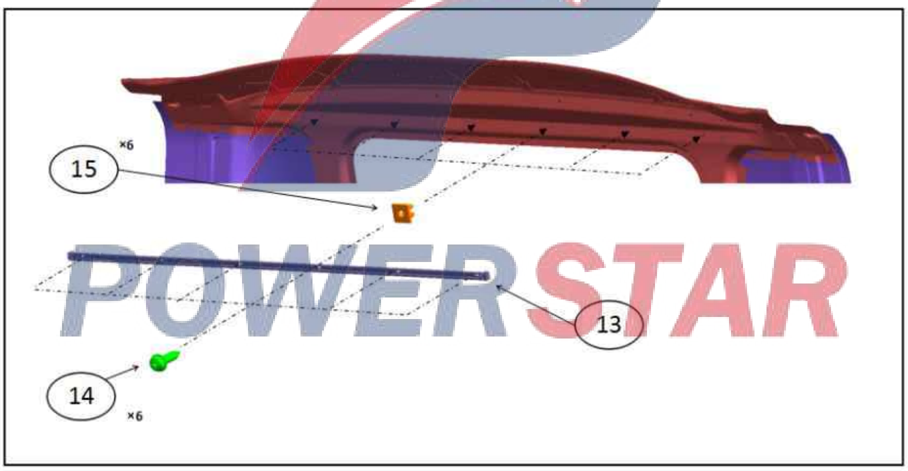
2. After the ceiling is installed, take the curtain guide rail assembly and its left and right ends and install them as shown in the figure. After the assembly is done, the guide rail and the ceiling shall fit perfectly without any gap.

Assembly details:

1. Side limit support – front ceiling segment
2. Side limit support – front ceiling segment
3. Screw(8204121-803)
4. Nut (5107223-801)
5. Left bracket - roof (8204332-D15EH)
6. Right bracket - roof
7. Bolt
8. Roof rail assembly - blinds (8204380-D15EH)
9. Left tip - roof rail (8204387-D15EH)
10. Right tip - roof rail (8204388-D15EH)
11. Screw (8204121-803)
12. Nut (5107223-801)

Curtain rail - standard roof





Assembly requirements:

1. As shown in the figure, take the ceiling supports 1, 2, 5, and 6 and install them where appropriate in the cab;

2. After the roof is installed, install the curtain rail assembly and left and right ends. After that, rail and roof should fit well without gaps.

Assembly details:

1. Curtain rail assembly (8205010-D34EZ)

2. Screw(8204121-803)

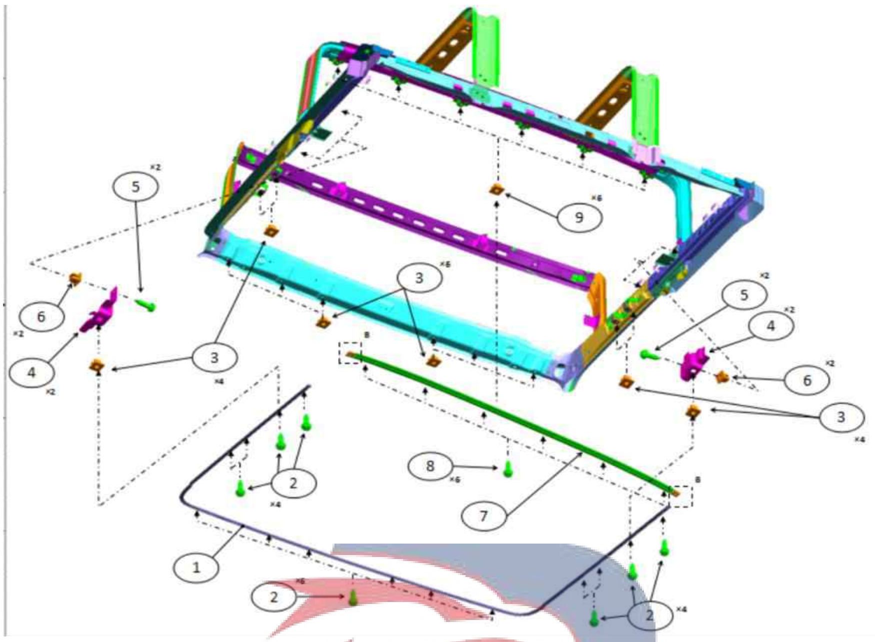
3. Nut (5107223-801)

4. Side limit support – front ceiling segment

5. Side limit support – front ceiling segment

6. Screw(8204121-803)
7. Nut (5107223-801)
8. Roof rail assembly -- blinds (8204380-D34EZ)
9. Left tip -- roof rail (8204387-D34EZ)
10. Right tip -- roof rail (8204388-D34EZ)
11. Screw(8204121-803)
12. Nut (5107223-801)
13. Rear curtain rail assembly (8205130-D34EZ)
14. Screw(8204121-803)
15. Nut (5107223-801)

Curtain rail - raised roof



Assembly requirements:

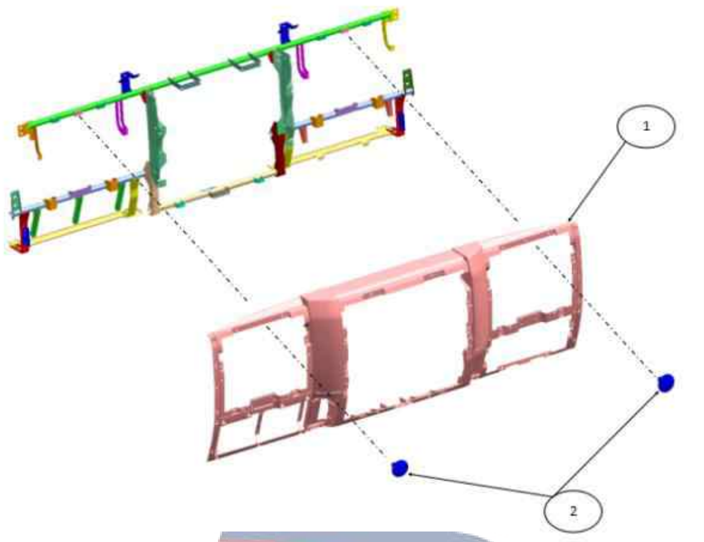
1. As shown in the figure, take the ceiling supports 1, 2, 5, and 6 and install them where appropriate in the cab;

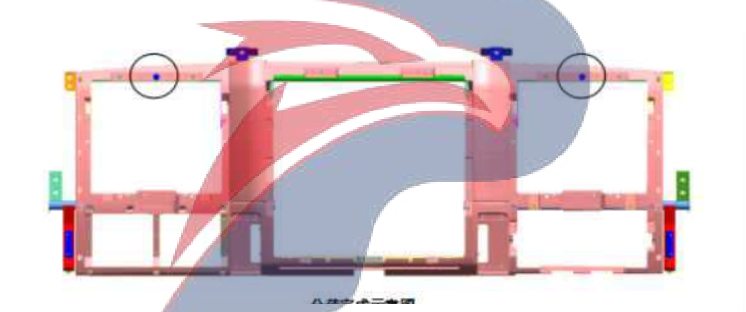
2. After the ceiling is installed, take the curtain guide rail assembly and its left and right ends and install them as shown in the figure. After the assembly is done, the guide rail and the ceiling shall fit perfectly without any gap.

Assembly details:

1. Curtain rail assembly (8205010-D17YZ)
2. Screw (8204121-803)
3. Nut (5107223-801)
4. Side limit support -- front ceiling segment (8205211-D17YZ)
5. Screw(8204121-803)
6. Nut (5107223-801)
7. Roof rail assembly -- blinds (8204380-D17YZ)
8. Screw (8204121-803)
9. Nut (5107223-801)

Roof container assembly 1





Completed schematic diagram

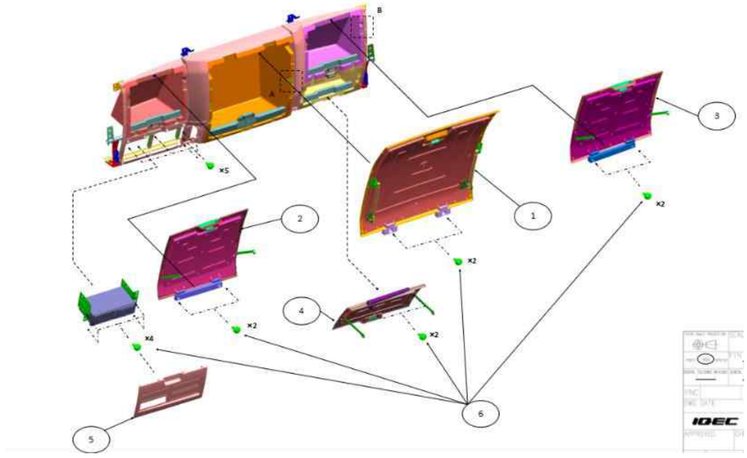
Assembly requirements:

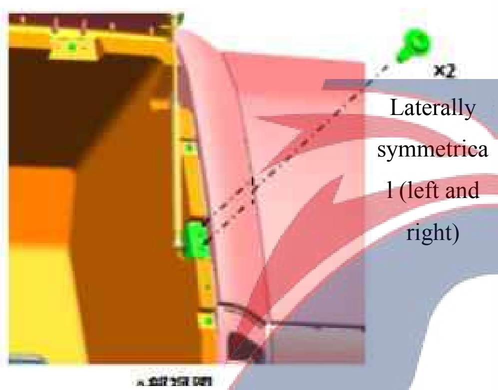
1. Fix the roof container cover assembly 1 to the frame with the fastening nail 2 as shown.

Assembly details:

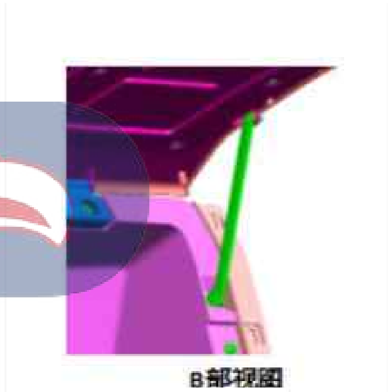
1. Roof container cover assembly (5700210-D17YZ)
2. Fixing nail (5206681-D17YZ)

Roof container assembly 2





A view



B view

Assembly requirements:

1. According to the diagram, fix the roof container cover assembly 1-5 onto the corresponding container assembly with screw 6.

Assembly details:

1. Cover plate assembly – middle glove box (5709220-D17YZ)

2. Cover plate assembly - left upper container (5709210-D17YZ)

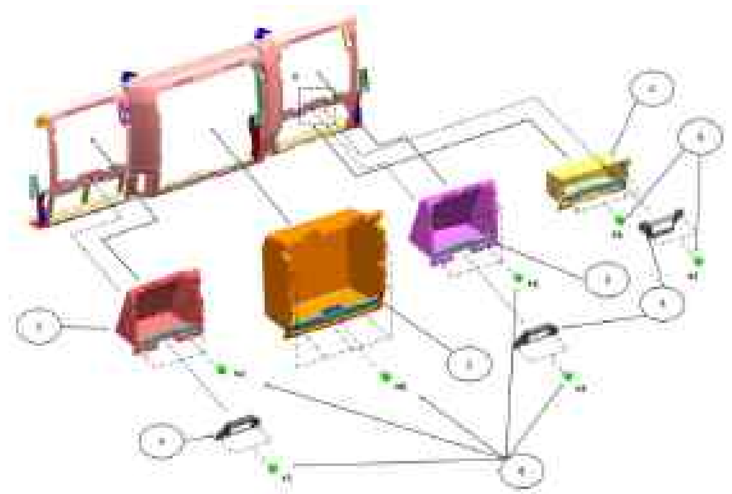
3.Cover plate assembly - right upper container（5709230-D17YZ）

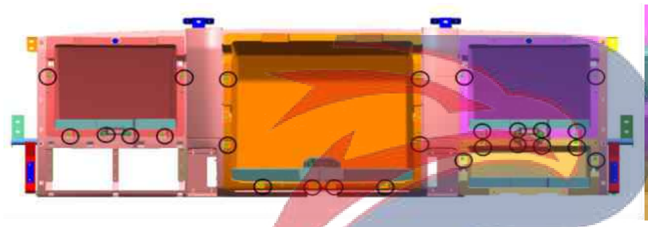
4. Cover plate assembly - right lower container（5709240-D17YZ）

5. Cover plate assembly - tachograph (5709250-D17YZ)

6. Screw

Roof container assembly





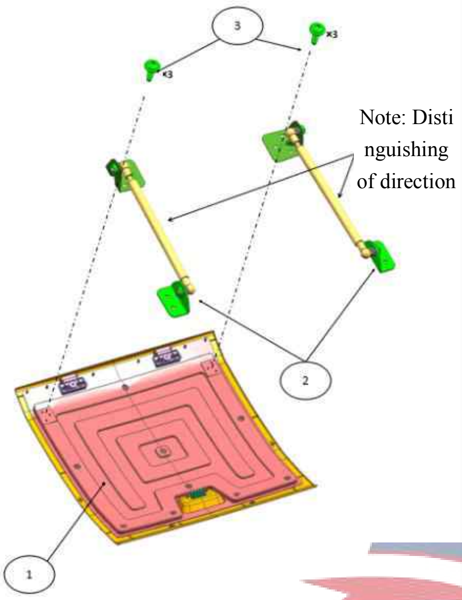
Assembly requirements:

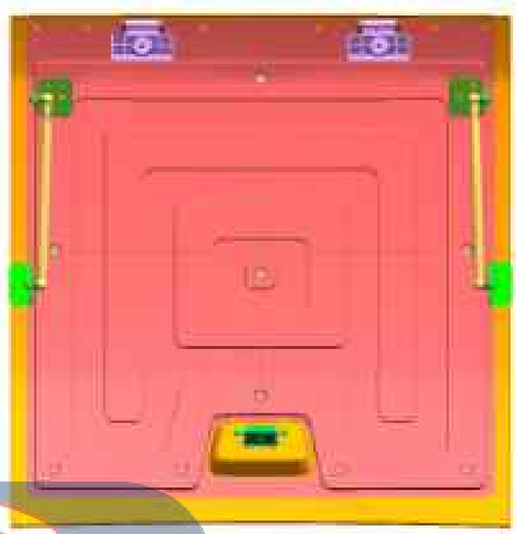
1. Fix each container assembly onto the frame as pictured.

Assembly details:

1. Roof container assembly - Central (5709120-D17YZ)
2. Roof container assembly -Upper left（5709110-D17YZ）
3. Roof container assembly - Upper right（5709130-D17YZ）
4. Roof container assembly - Lower right（5709140-D17YZ）
5. Stopper - cover plate (5709123-D17YZ)
6. Screw

Cover plate sub-assembly- central container





Assembly requirements:

1. The support rod 2 is fixed on the container cover assembly 1 with screws 3 as shown in the figure;

2. The subassembly is as shown in the right figure.

Note: Be careful of the orientation of support rod 2 during assembling.

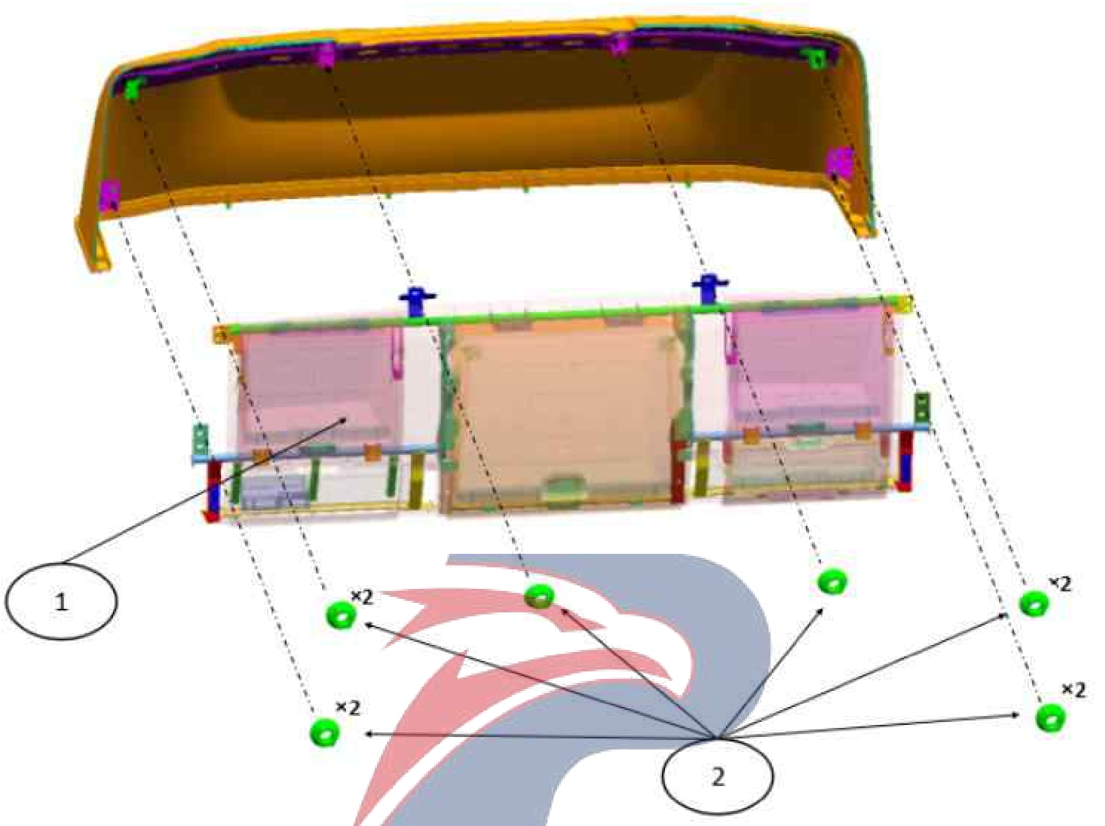
Assembly details:

1. Cover plate assembly – middle glove box (5709220-D17YZ)

2. Support rod（5709129-D17YZ）

3. Screw

Container assembly



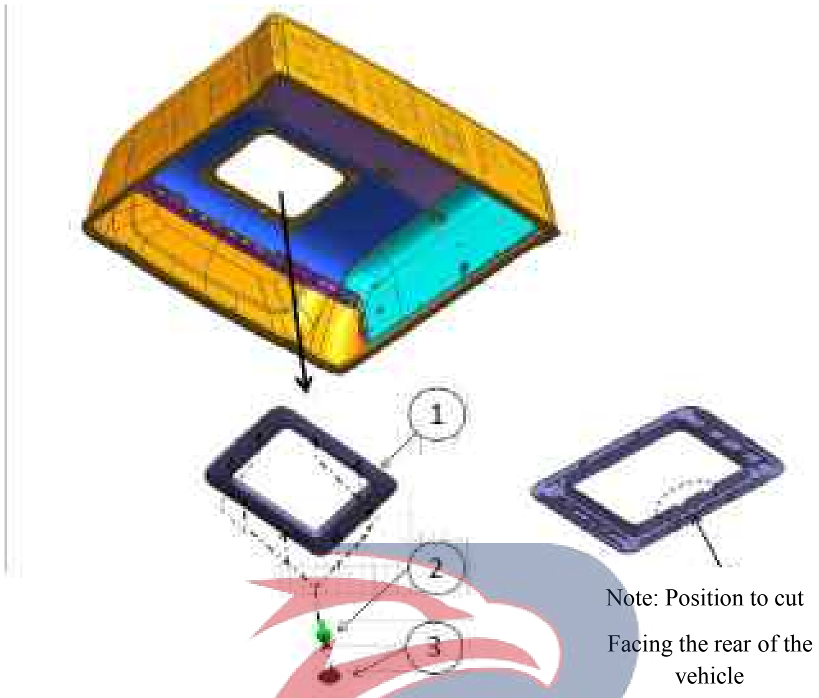
Assembly requirements:

1. Fix the container assembly 1 onto the cab as shown in the figure.

Assembly details:

1. Roof container assembly
2. Nut（Q32008）

Trim plate - skylight



Assembly requirements:

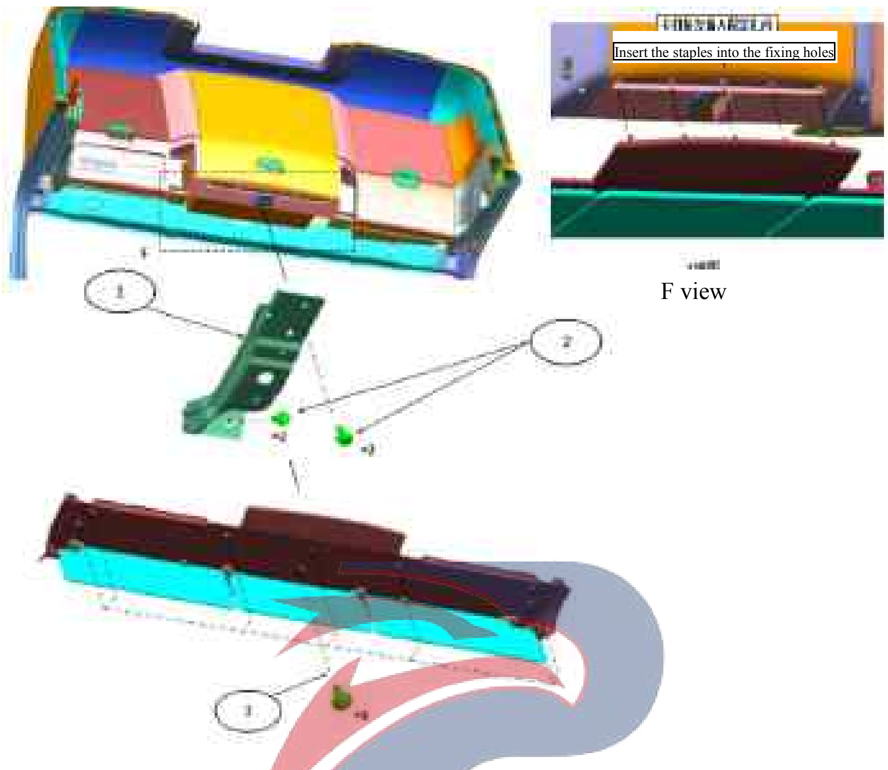
1. Fix the skylight trim plate 1 onto the roof of the cab with bolt 2.

Note: The skylight trim plate must be installed after the roof has been assembled and before the roof container is assembled.

Assembly details:

1. Skylight trim plate (5703020-D17YZ)
2. Bolt（Q1840620）
3. Seal cover

Sun visors



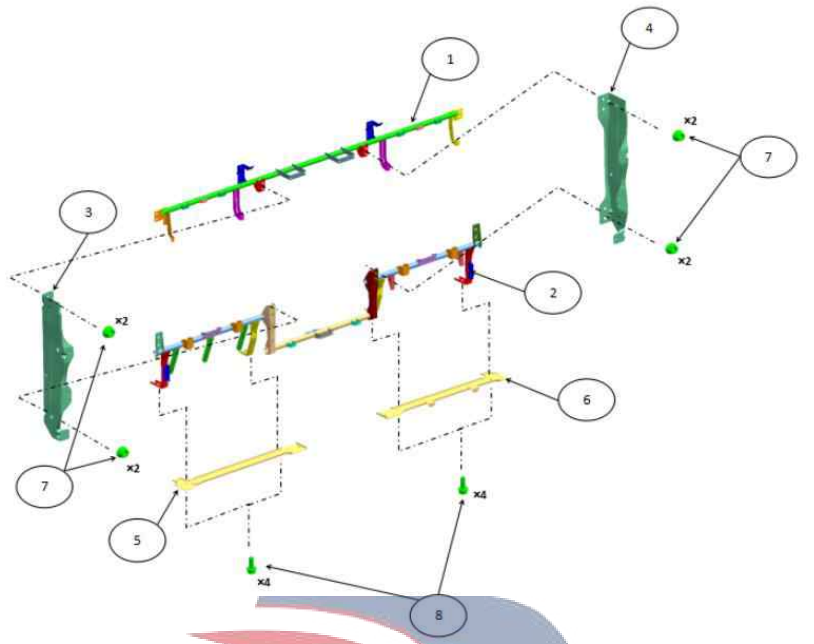
Assembly requirements:

1. Fix the sunvisor bracket 1 on the middle bracket between cab and container with bolt 2;
2. Install the sunvisor assembly onto the sunvisor bracket with screw 3.

Assembly details:

1. Bracket - sunvisor（5701222-D17YZ）
2. Bolt（Q1840616）
3. Screw

Bracket - raised roof container



Assembly requirements:

1. The containers 1, 2, 3, 4 are combined as shown in the figure and fastened with nut 7;

2. Fix the brackets 5, 6 with bolts 8 onto both sides of the lower end of the bracket 2.

Note: Pay attention to the brackets 3, 4 and 5, 6 when assembling

Assembly details:

1. Upper bracket - container (5701110-D17YZ)

2. Lower bracket - container（5701220-D17YZ）

3. Left of middle bracket - container (5701230-D17YZ)

4. Right of middle bracket - container（5701240-D17YZ）

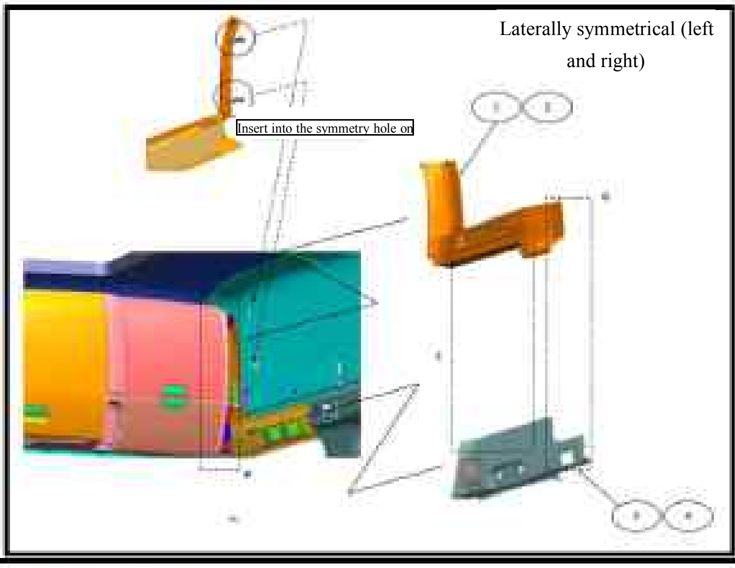
5. Right of lower bracket - container（5701224-D17YZ）

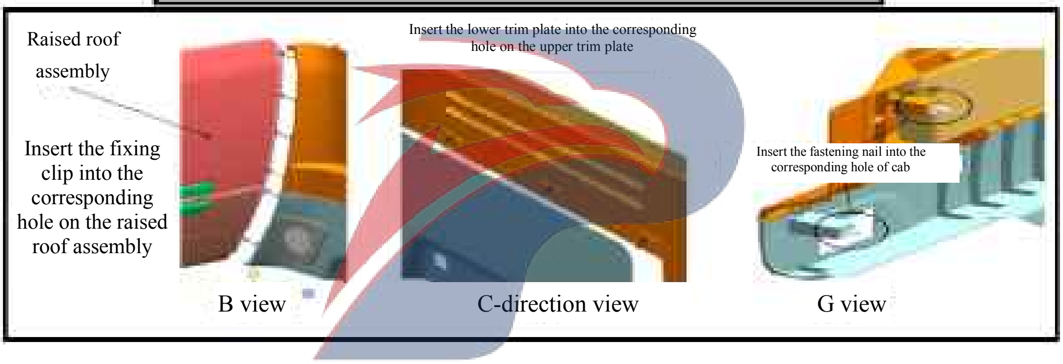
6. Left of lower bracket - container (5701225-D17YZ)

7. Nut（Q32008）

8. Bolt（Q1840616）

Side wall-high ceiling





Assembly requirements:

1. As shown in the figure, take the left and right side walls 1 and 2 and install them on the left and right sides to the ceiling using the fixing nails (3).

Assembly details:

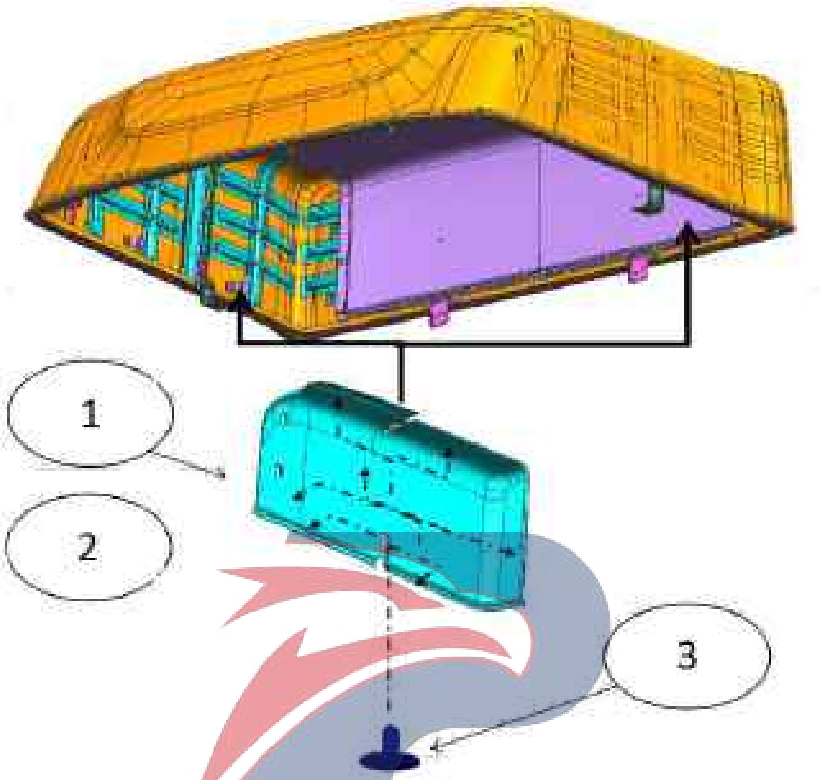
1. Upper cover of high top side part -left（5702210-D17YZ）

2. Upper cover of high top side part -right（5702220-D17YZ）

3. Speaker trim cover - left (3721140-D17YZ)

4. Speaker trim cover -right（3721240-D17YZ）

Side wall-raised roof



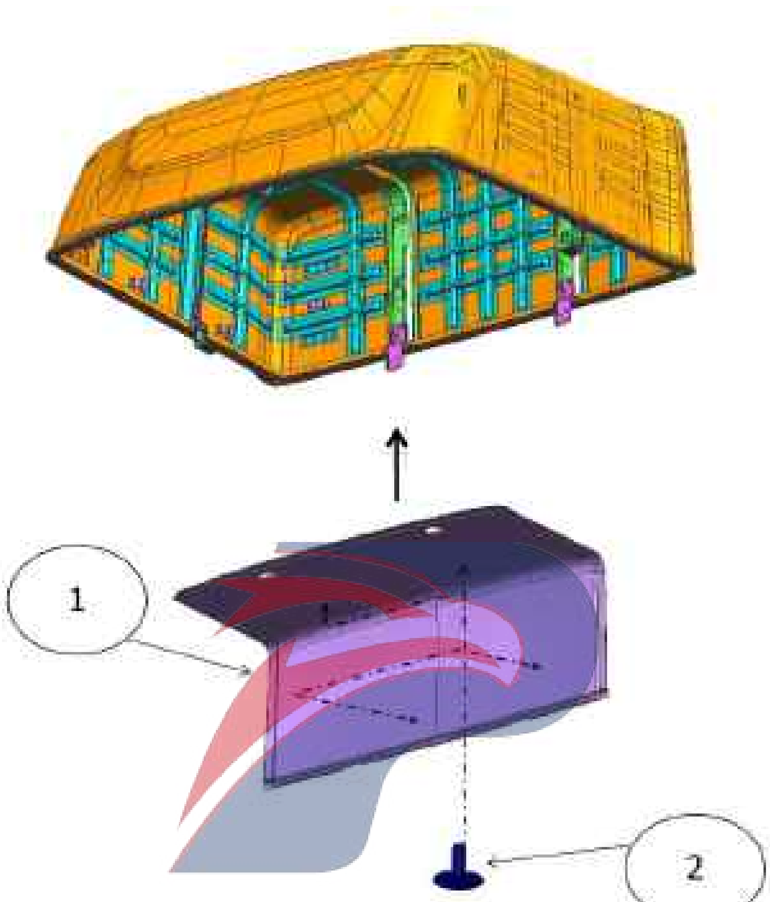
Assembly requirements:

1. As shown in the figure, take the left and right side walls 1 and 2 and install them on the left and right sides to the ceiling using the fixing nail (3).

Assembly details:

1. Raised roof side wall - left (5206090-D17YZ)
2. Raised roof side wall -right（5206100-D17YZ）
3. Fixing nail (5206681-D17YZ)

Rear wall-raised roof



Assembly requirements:

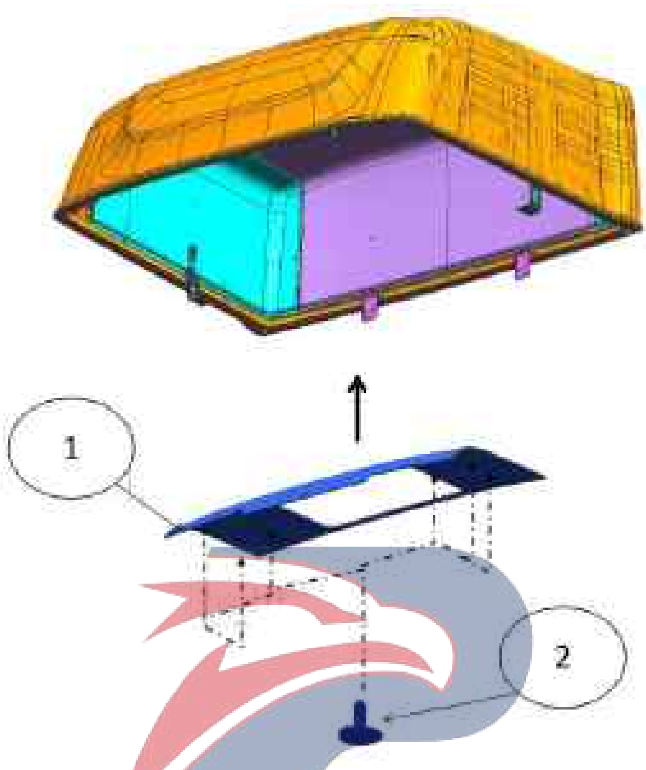
1. Install the raised roof rear wall 1 to the rear side inside the raised roof with fastening nail 2.

Assembly details:

1. Raised roof rear wall（5206082-D17YZ）

2. Fixing nail (5206681-D17YZ)

Rear wall-raised roof



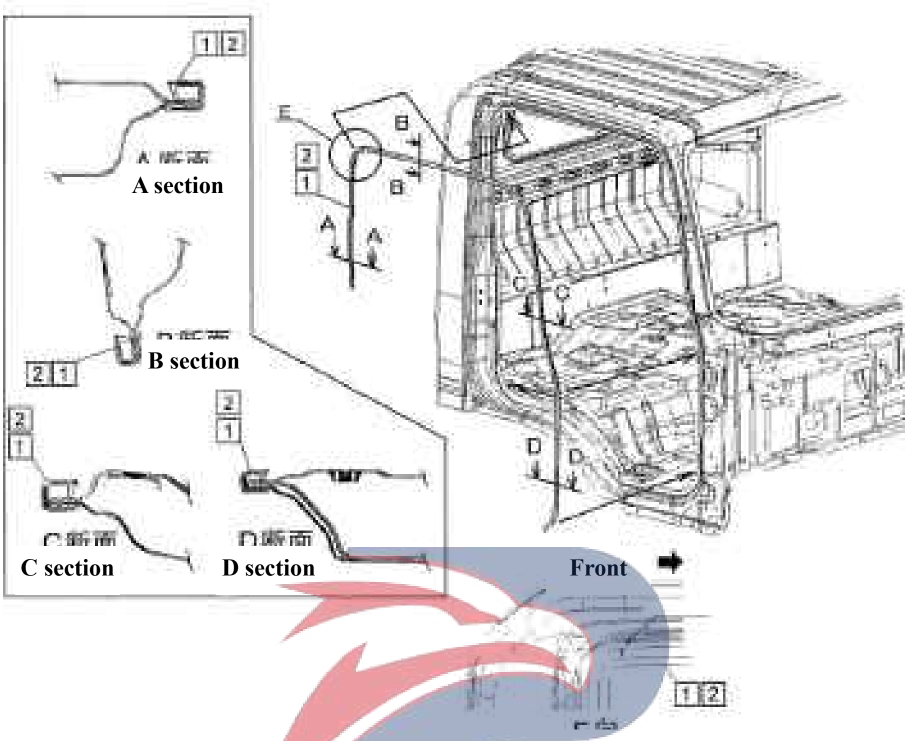
Assembly requirements:

1. Install the raised roof rear wall 1 to the rear side inside the raised roof with fastening nail 2.

Assembly details:

1. Raised roof rear wall（5206080-D17YZ）
2. Fixing nail (5206681-D17YZ)

Assembling of door sealing rubber strip



Assembly requirements:

1. Place the sealing rubber strip - right door (1) to the door, align the white mark point with the corresponding position on the sheet metal, as shown on the right.

2. Embed (1) into the door frame sheet metal, and know it in place with a rubber hammer.

Note: The soft side of sealing rubber strip should face the inside of the car, and the hard side towards the outside.

Assembly details:

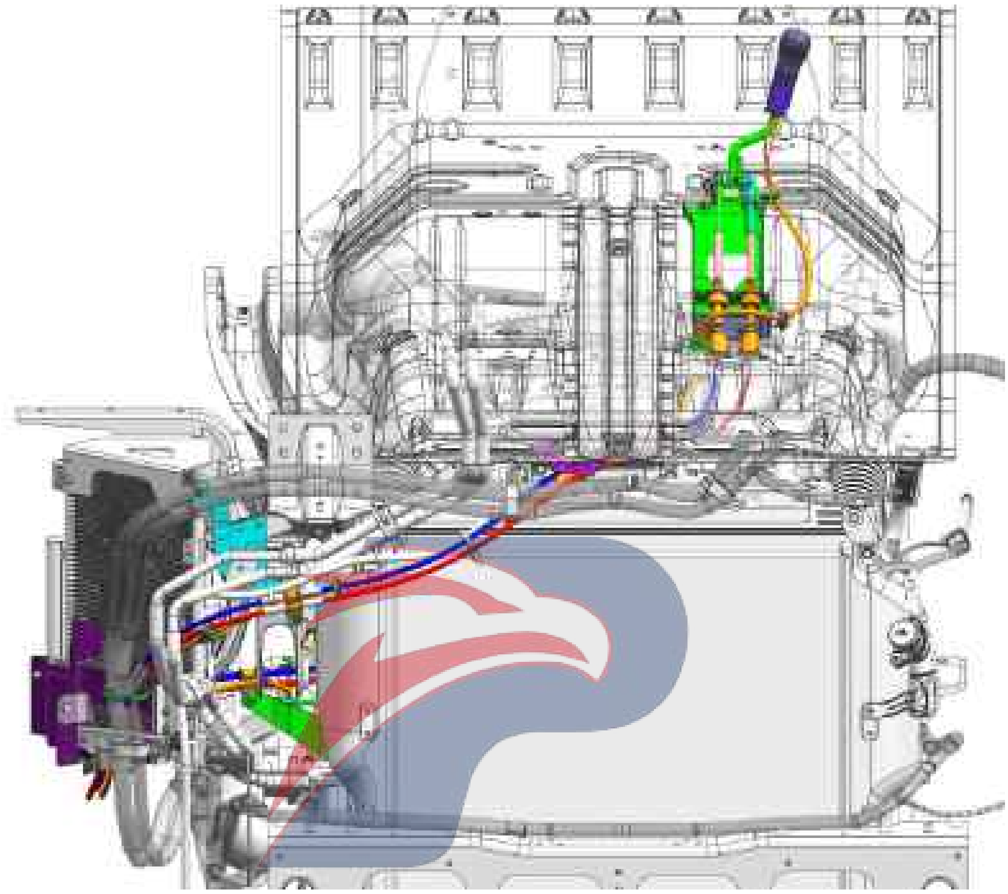
1. Sealing rubber strip-right door (6107160-D17YZ)

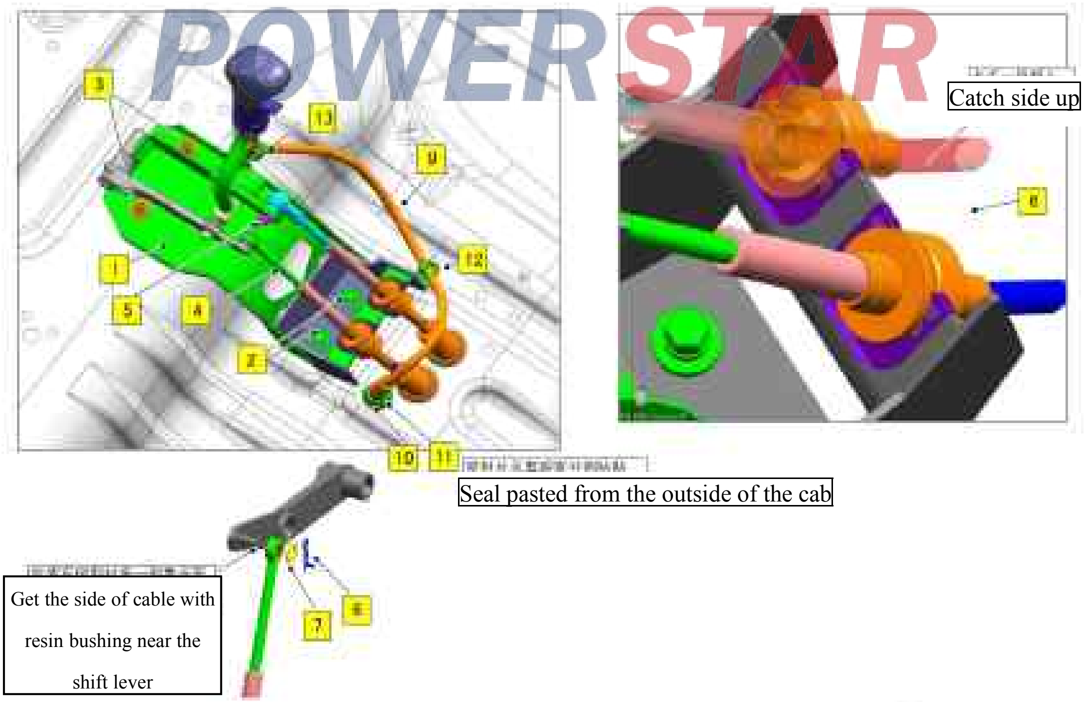
Sealing rubber strip-right door（6107160-P301）

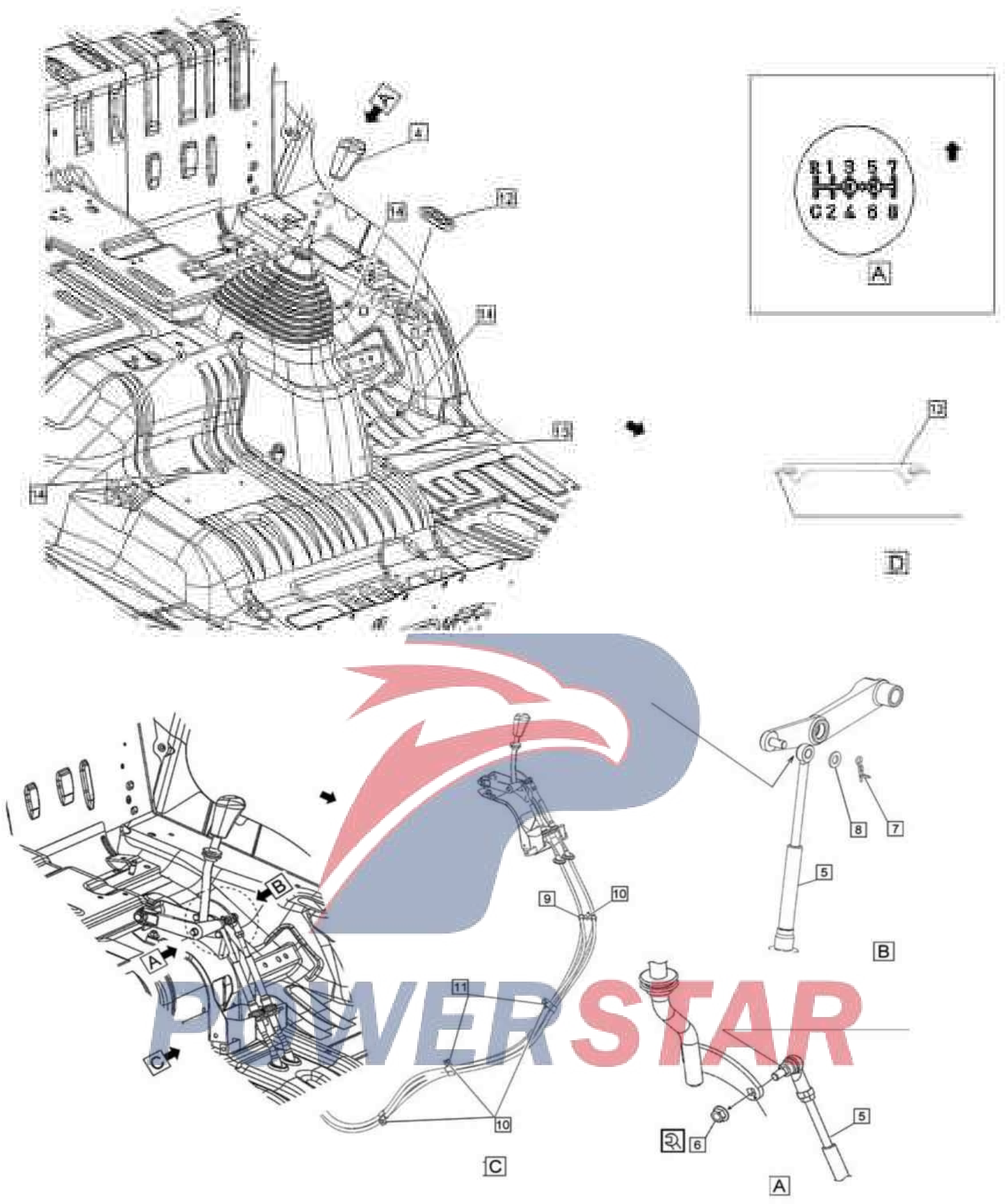
2. Sealing rubber strip -left door（6107150-D17YZ）

Sealing rubber strip-left door（6107150-P301）

Transmission lever connection







Assembly requirements:

1. Fix the transmission lever assembly onto the floor with bolt 2 and nut 2;

2. Fix the cable 5 with the nut 6. Square hole part to be inserted into the square hole. The torque of the nut 6 is: 23.1 ± 3.5N.m;

3. Fix the cable 5 with washer 8 and cotter pin 7;

4. Fix the cable 5 with clip 9, bolt 10 and nut 11;

5. Insert the rubber plug 12 into the left side of the floor;

6. Secure the transmission assembly with fastening nail 14, put the shift handle 4 to the transmission lever while paying attention to the direction.

Assembly details:

1. Transmission lever assembly

2. Bolt（1702236-P301）

3. Nut（3404211-P301）

4. Shift handle

5. Selector cable assembly

Selector cable assembly

6. Nut（1702234-P301）

7. Cotter pin - cable and selector lever

8. Washer (Q40008)

9. Clip

10. Bolt（Q1840820）

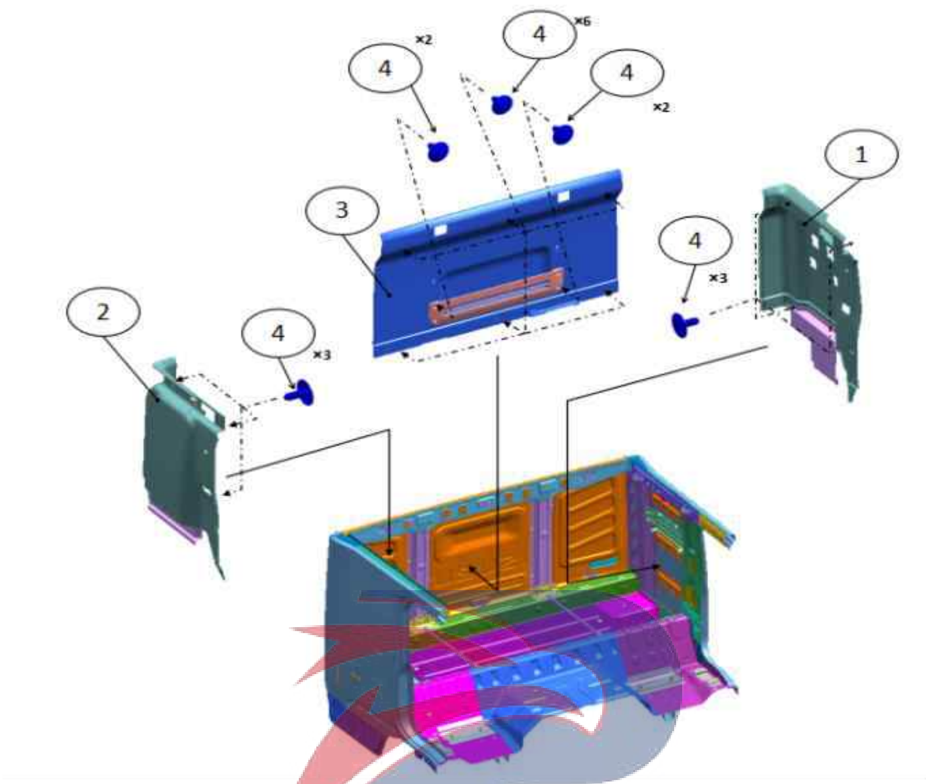
11. Nut（Q32008）

12. Rubber plug cover

13. Shift control box assembly

14. Fixing nail

Side and rear wall - raised-roof cab



Assembly requirements:

1. As shown in the figure, take the left and right side walls 1 and 2 and the rear trim panel 3, and fix them around the cab using the fixing nails (4).

Assembly details:

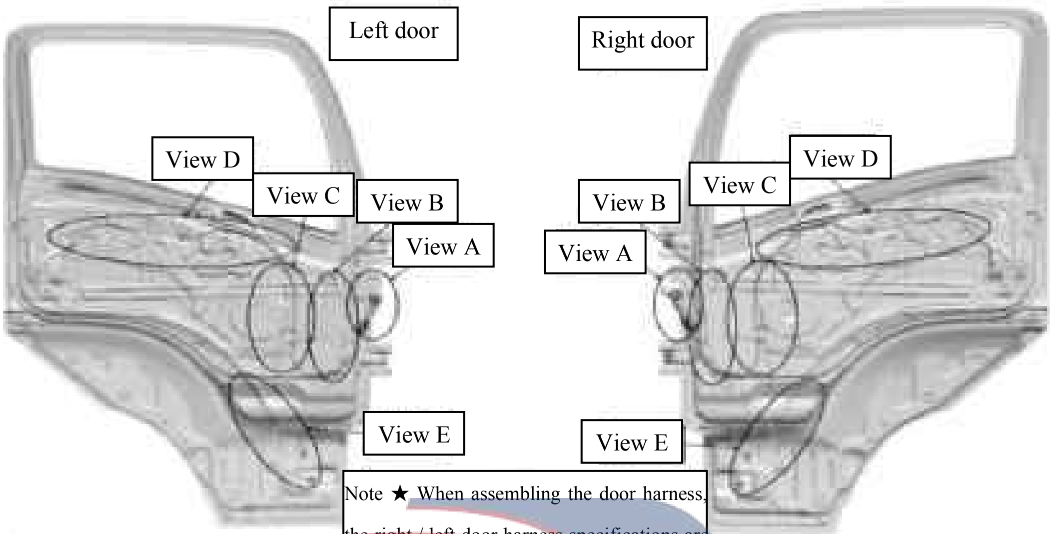
1. Upper trim plate assembly of left rear pillar (5206610-D17YZ)

2. Upper trim plate assembly of right rear pillar（5206620-D17YZ）

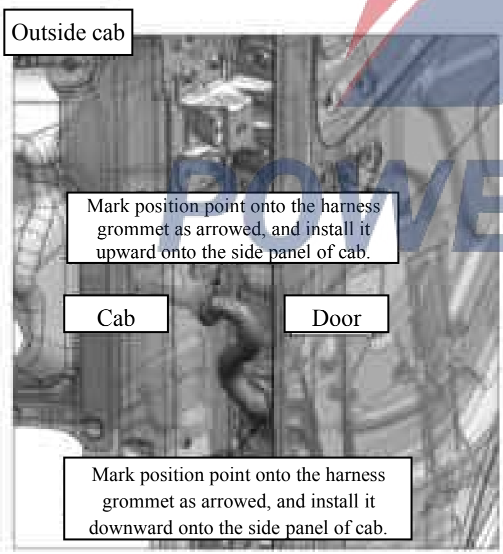
3. Rear trim plate assembly (5602010-D17YZ)

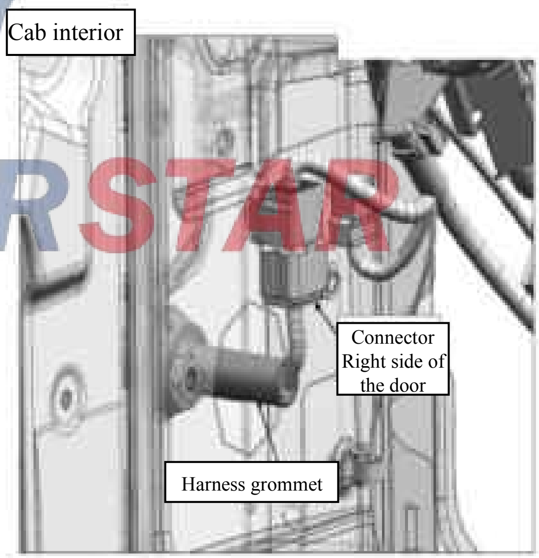
4. Fixing nail (5206681-D17YZ)

Door harness



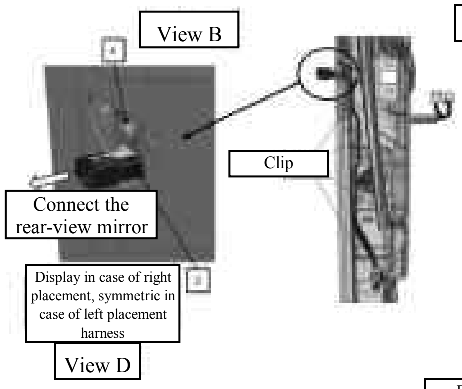
Note ★ When assembling the door harness, the right / left door harness specifications are required to be correct. Following the illustration as shown, insert the harness clips into the corresponding fixing holes.

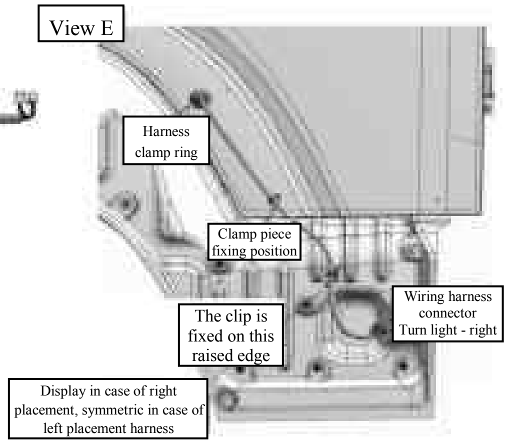


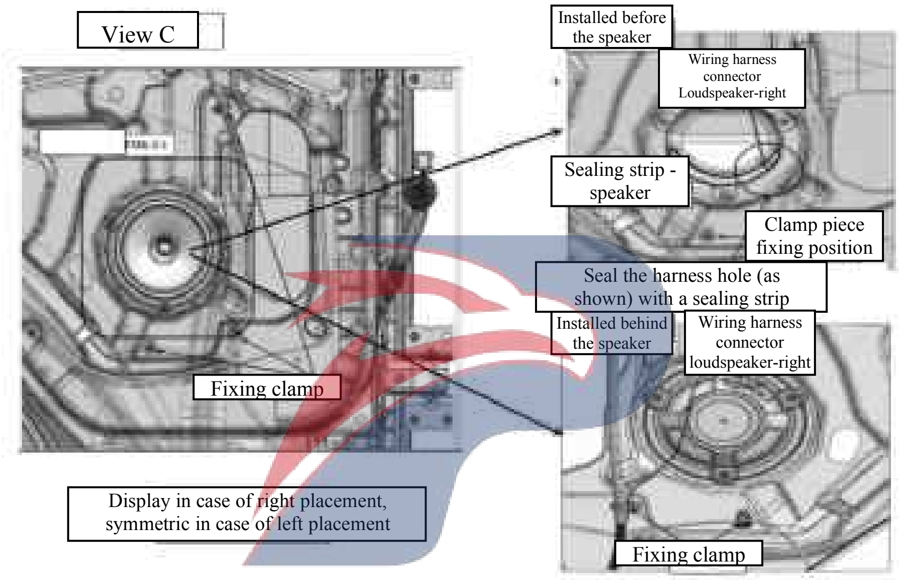


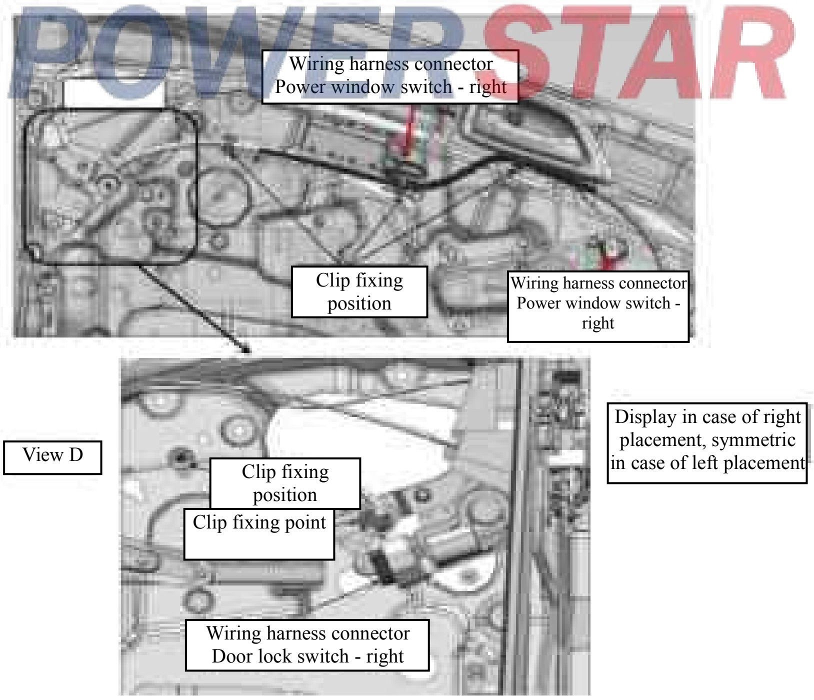
View A

Display in case of right placement, symmetric in case of left placement


View B
Clip
Connect the rear-view mirror
Display in case of right placement, symmetric in case of left placement harness
View D


View E
Harness clamp ring
Clamp piece fixing position
Wiring harness connector Turn light - right
The clip is fixed on this raised edge
Display in case of right placement, symmetric in case of left placement harness


View C
Installed before the speaker
Wiring harness connector Loudspeaker-right
Sealing strip - speaker
Clamp piece fixing position
Seal the harness hole (as shown) with a sealing strip
Installed behind the speaker
Wiring harness connector loudspeaker-right
Fixing clamp
Display in case of right placement, symmetric in case of left placement
Fixing clamp


Wiring harness connector Power window switch - right
Clip fixing position
Wiring harness connector Power window switch - right
View D
Clip fixing position
Clip fixing point
Wiring harness connector Door lock switch - right
Display in case of right placement, symmetric in case of left placement

Assembly requirements:

1. Connect the cab main harness to the door harness 1 as shown in Figure A.

2. Fix the door harness with a clip as shown in Figure B.

3. Fix the grommet of the door harness 1 as shown in Figures C and D.

4. Connect the door harness to the speaker and secure the door harness with the clip as shown in Figure E.

5. Connect the door harness to the glass lifter and the manual door lock, and fix the door harness with the clip as shown in Figure F.

6. Connect the door harness to the electric door lock and secure the door harness with the clip as shown in Figure G.

7. Connect the door harness to the side turn light and secure the door harness with the clip as shown in Figure J.

Assembly details:

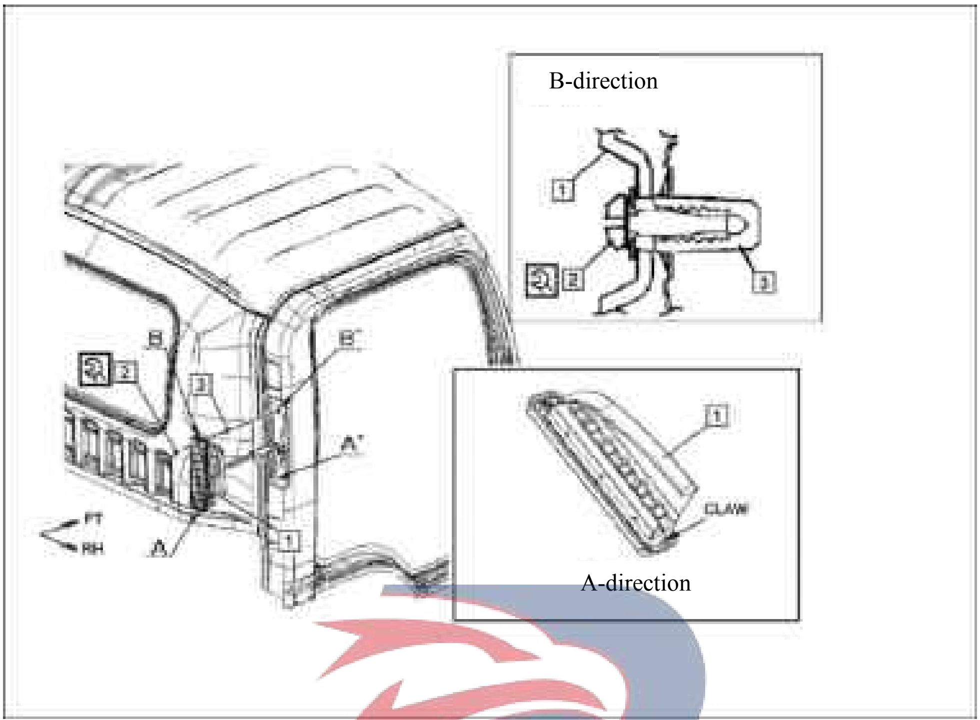
1. Door harness assembly - right (4611140-D17YZ)

Door harness assembly -left（4611130-D17YZ）

2. Bracket (5305292-D17YZ)

3. Bolt（Q1840816）

Air outlet assembly--air filter



Assembly requirements:

1. Install gasket nut ③ to the corresponding mounting hole on the body, and assemble them as shown on the right.

2. Install the air outlet assembly - air filter ① onto the corresponding body mounting hole on the body.

3. Fasten it with screw ② using a pneumatic wrench and thick gun head.

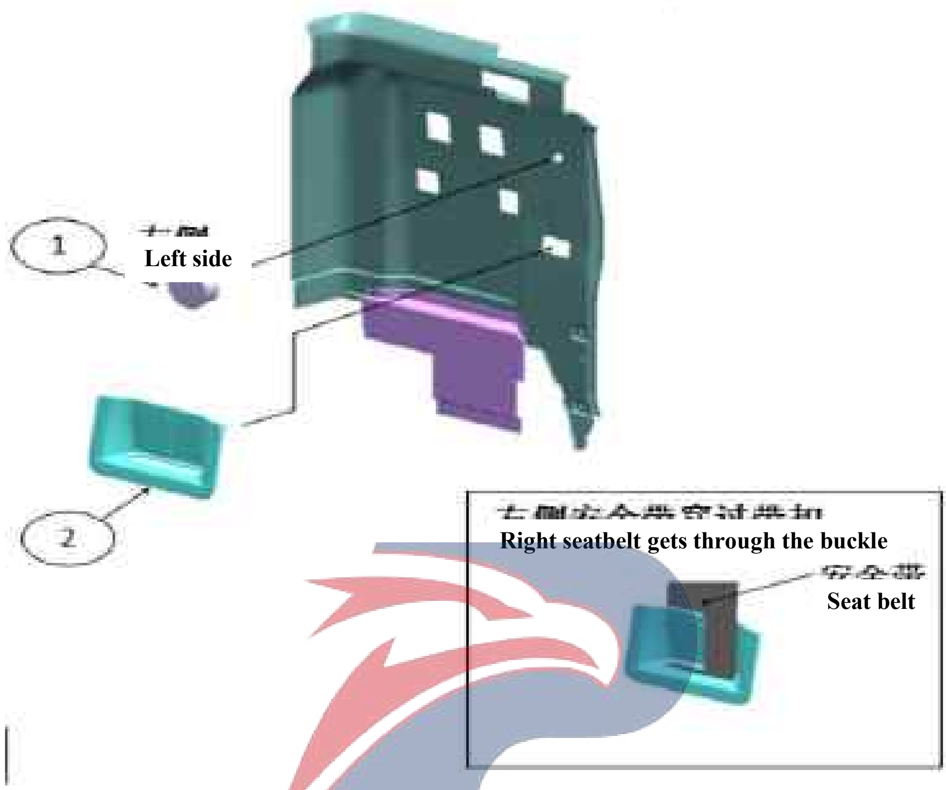
Assembly details:

1 Air outlet assembly – air filter (8101510-P301)

2. Screw

3. Washer nut (3724543-44)

Hook--jacket-high-ceiling cab



Assembly requirements:

1. As shown, the seatbelt buckle and the 1, 2 on the left of trim cover are installed to the rear trim plate of the cab.

Assembly details:

1 Air outlet assembly – air filter (8101510-P301)

2. Screw

3. Washer nut (3724543-44)

Wheel cover assembly

Figure 1
Left wheel
cover view

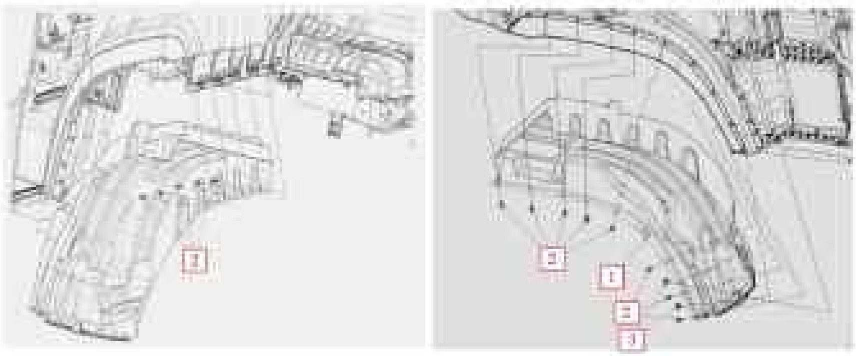
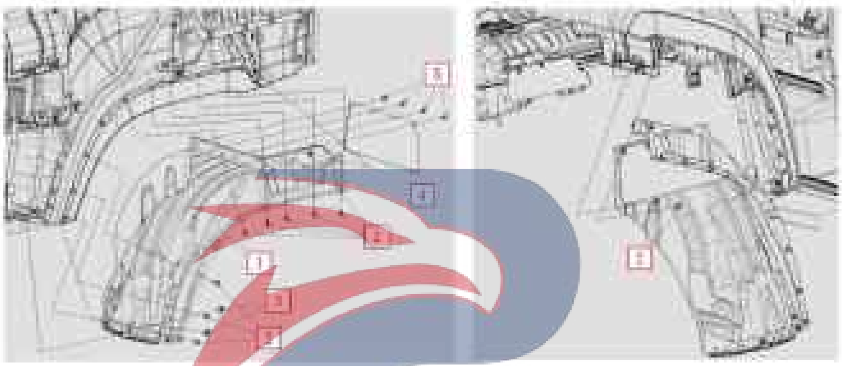


Figure 2-
Right wheel
cover



Assembly requirements:

1. Install the left and right wheel covers to the both sides of the bottom of the cab with fastening nails.

Assembly details:

1. Rear section assembly of right wheel cover (5101080-D17YZ)

Rear section assembly of left wheel cover（5101070-D17YZ）

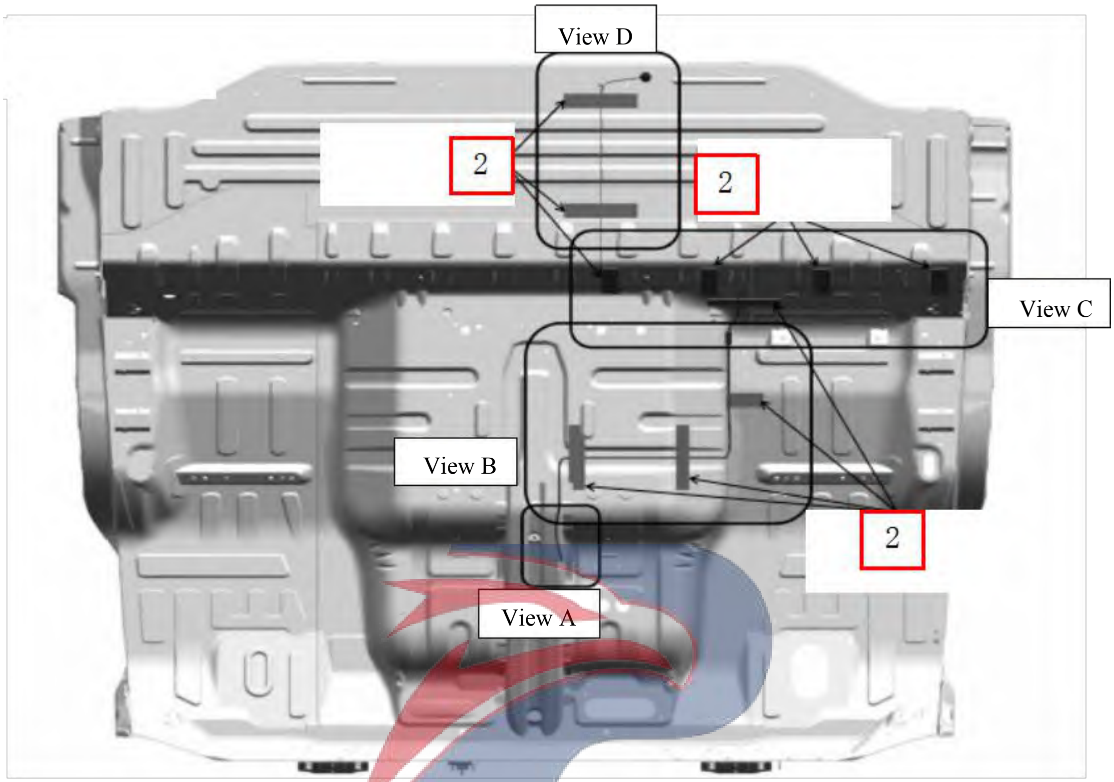
2. Fixing nail (8101314-117/C)

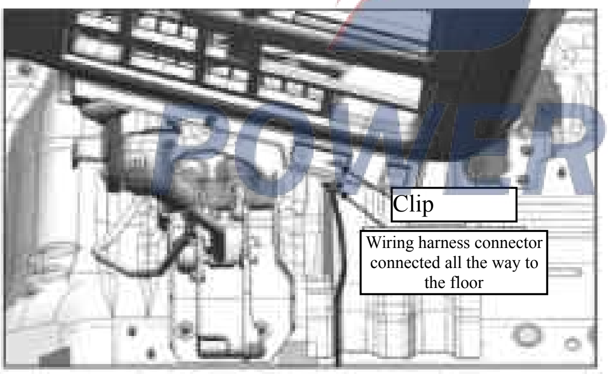
3. Bolt（8405121-117/C）

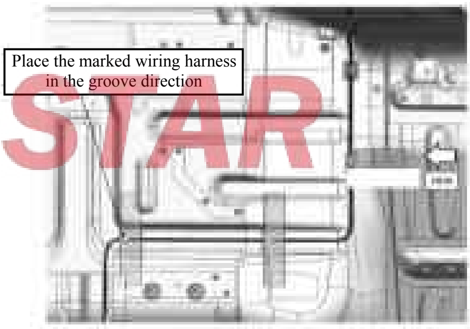
4. Right rear fender (5101084-D17YZ)

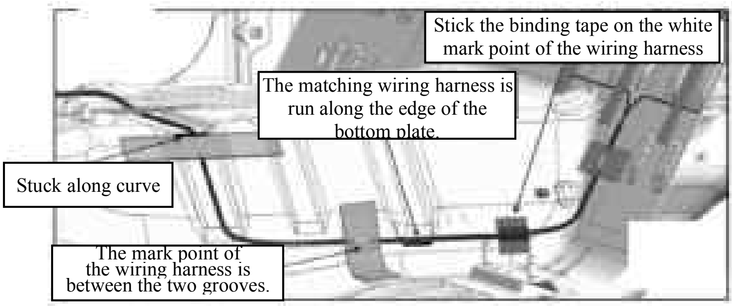
5. Fixing nail (8101314-117/C)

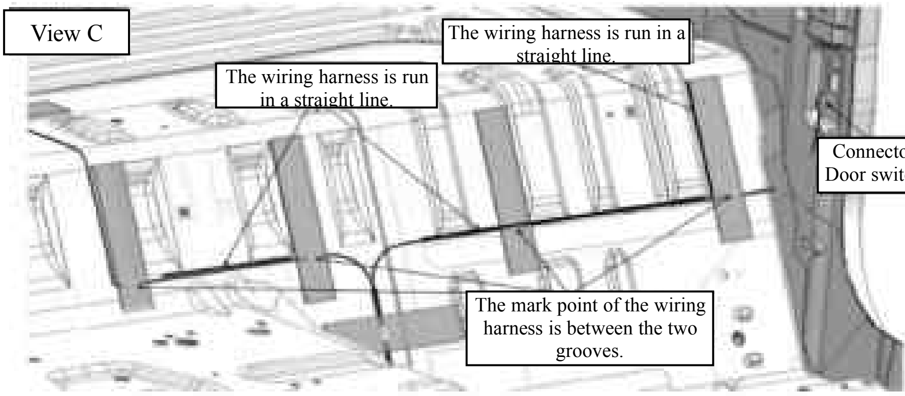
Floor harness - standard roof

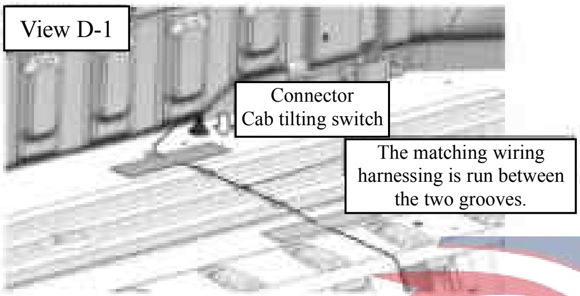


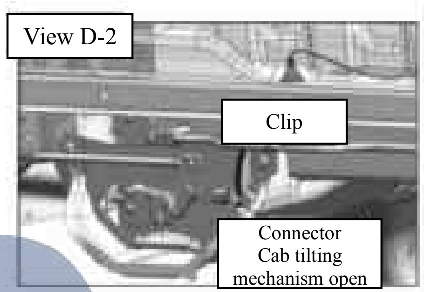












Assembly requirements:

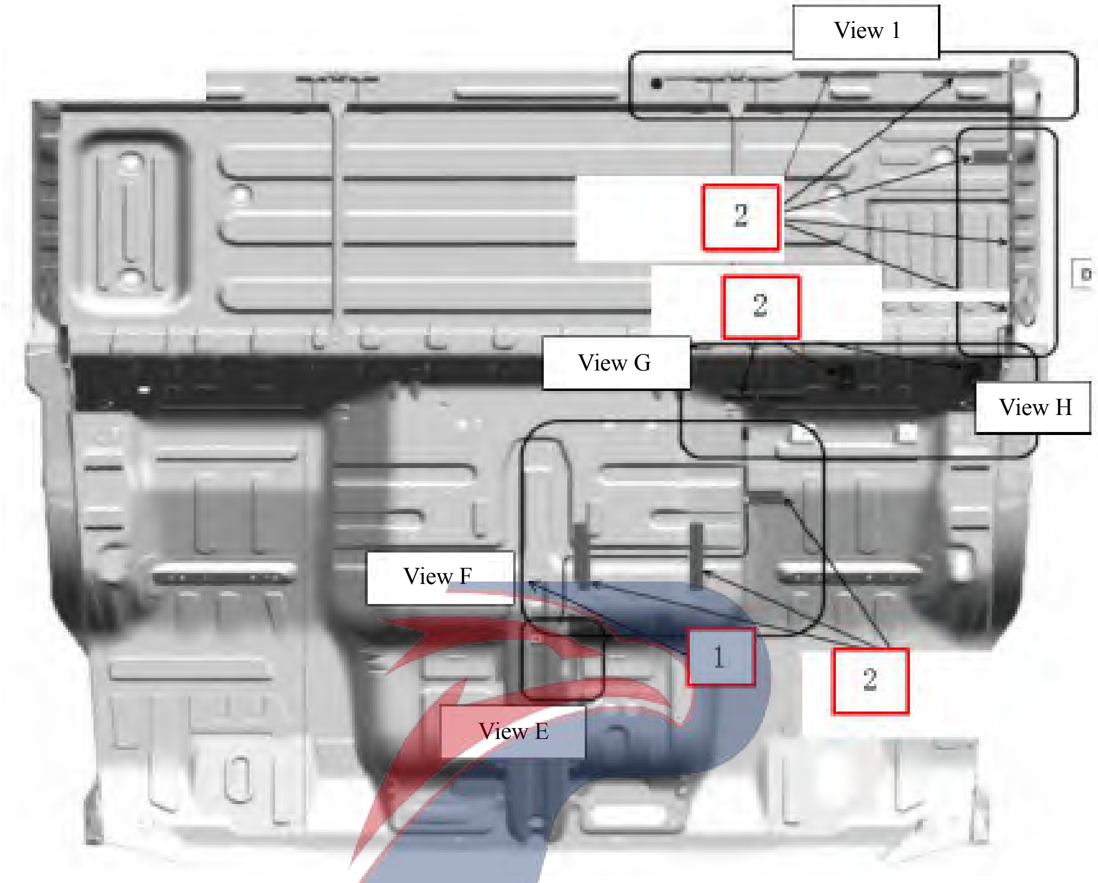
1. As shown in the figure, fix the floor wiring harness 1 with the insertion strip 2. The insertion strip shall be firmly stuck.

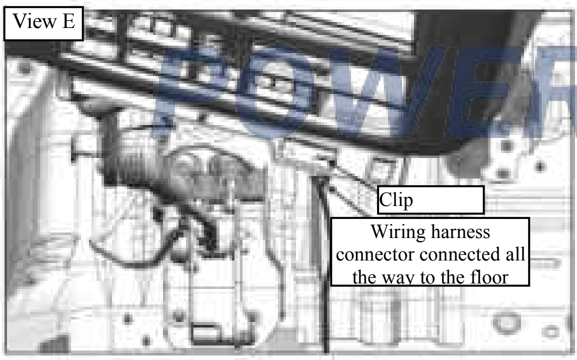
Assembly details:

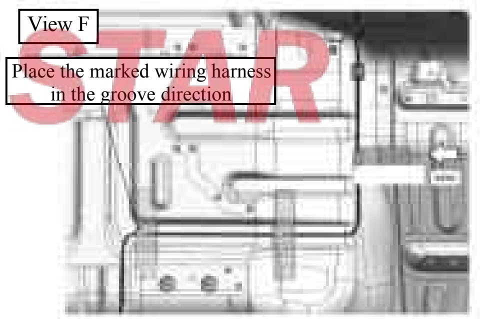
1. Floor harness assembly (4611110-D34EZ)

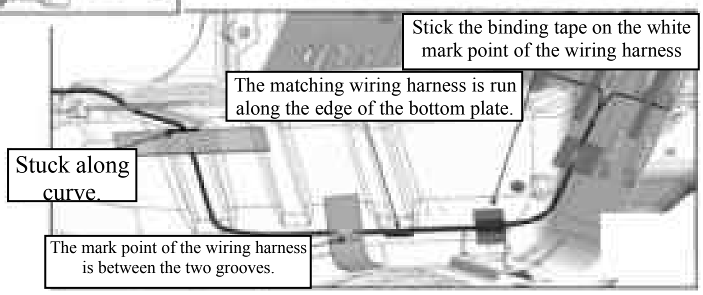
2. Insertion strip (3724427-117)

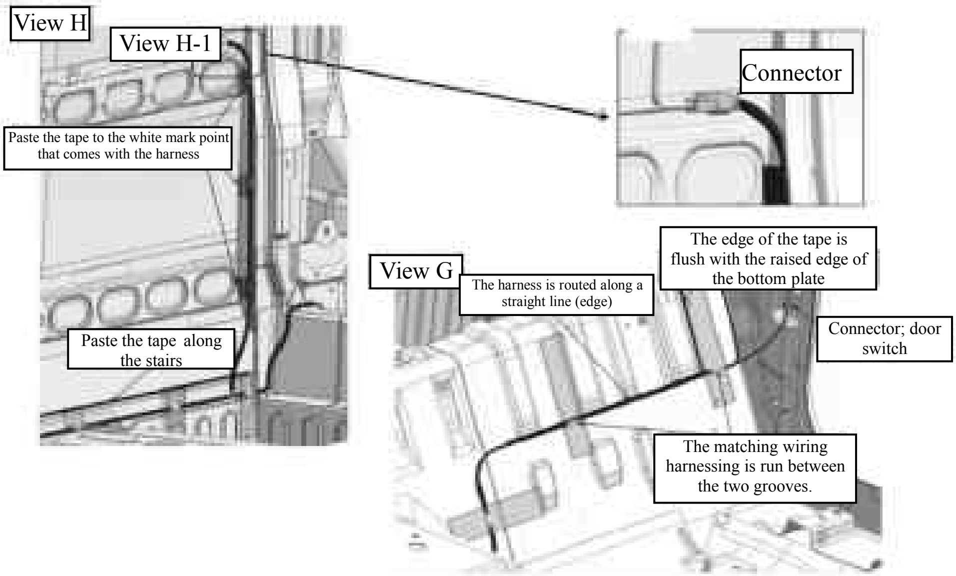
Floor wiring harness - raised roof

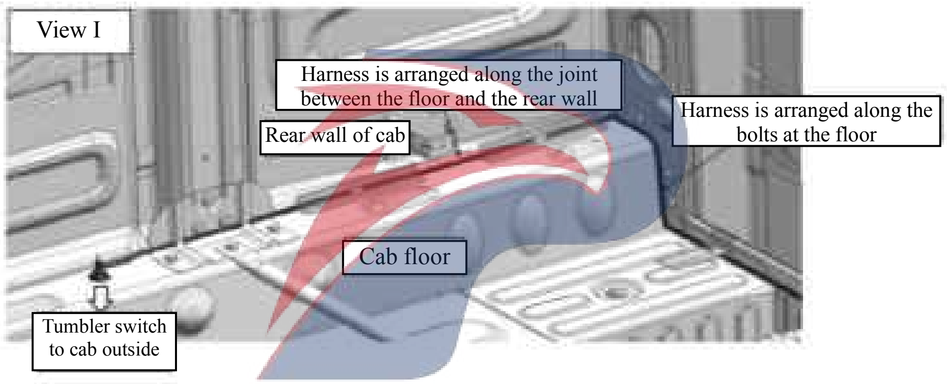


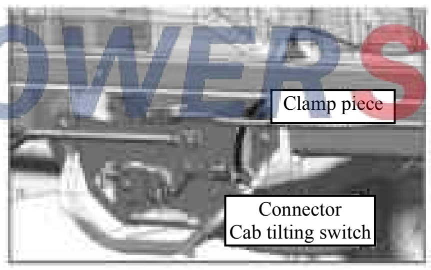












Assembly requirements:

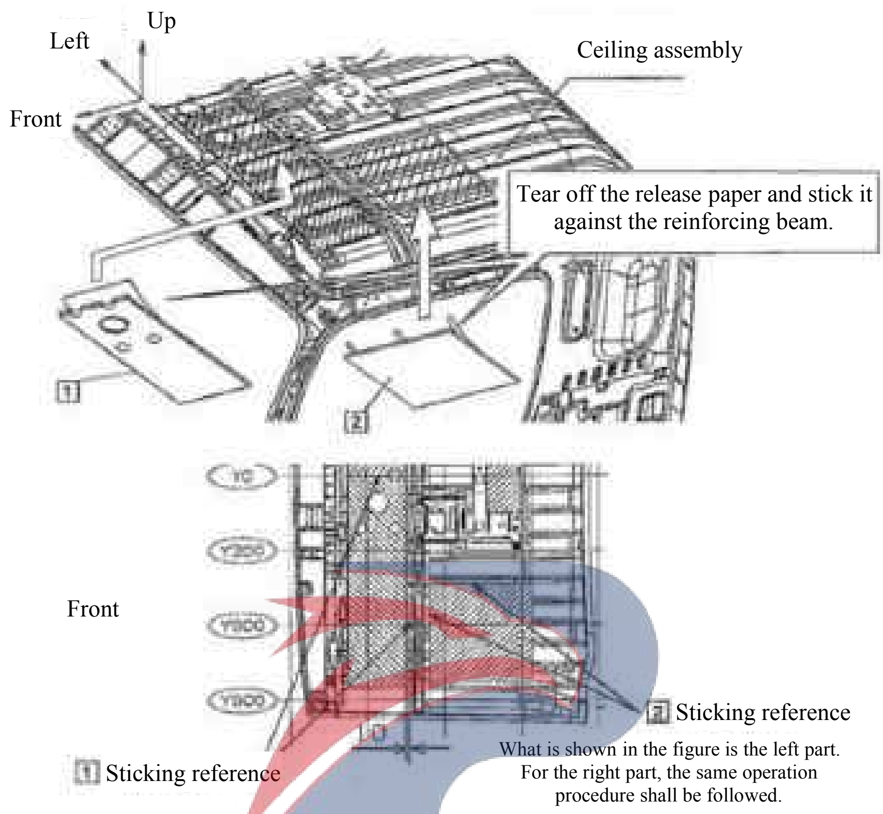
1. As shown in the figure, fix the floor wiring harness 1 with the insertion strip 2. The insertion strip shall be firmly stuck.

Assembly details:

1. Floor harness assembly（4611110-D17YZ）

2. Insertion strip (3724427-117)

Ceiling heat insulation pad assembly (standard roof)



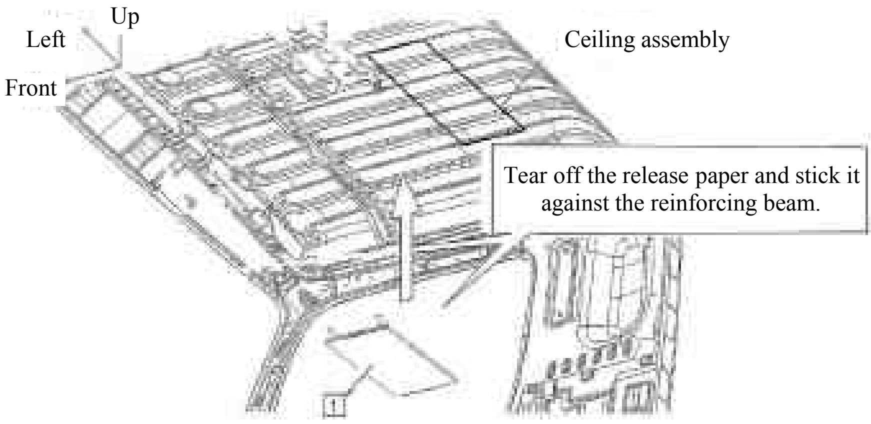
Assembly requirements:

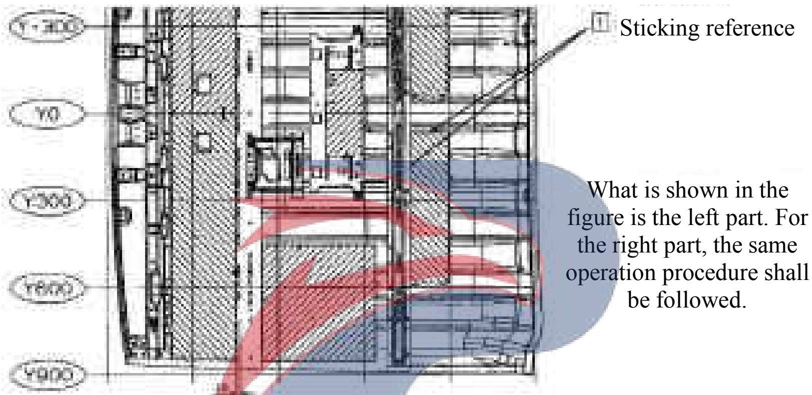
1. Tear off the release paper from parts 1 and 2.
2. Locate parts 1 and 2 according to the stiffeners, and then attach them onto the roof assembly.

Assembly details:

1. Heat insulation pad -- Front roof
2. Heat insulation pad - Central roof

Ceiling heat insulation pad assembly (standard roof)





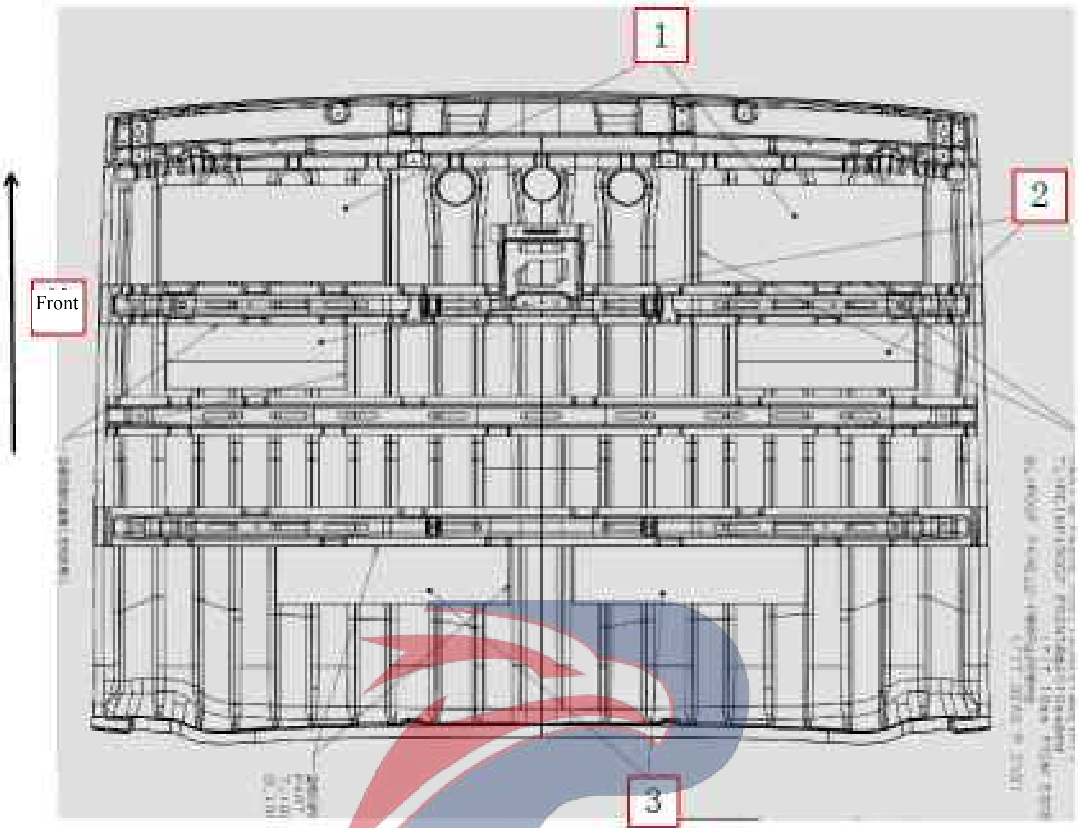
Assembly requirements:

1. Tear off the release paper from parts 1.
2. Locate parts 1 according to the stiffeners, and then attach them onto the roof assembly.

Assembly details:

1. Heat insulation pad (5206131-P301)

Roof insulation mat assembly (low roof)



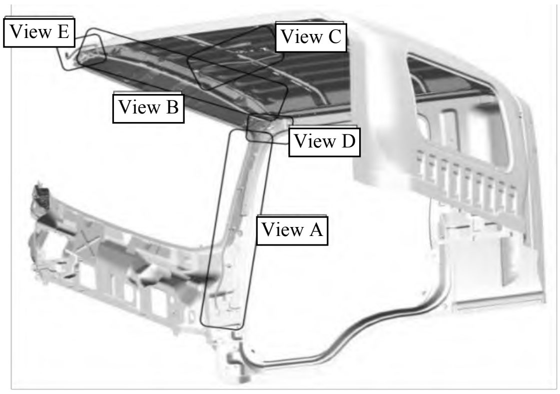
Assembly requirements:

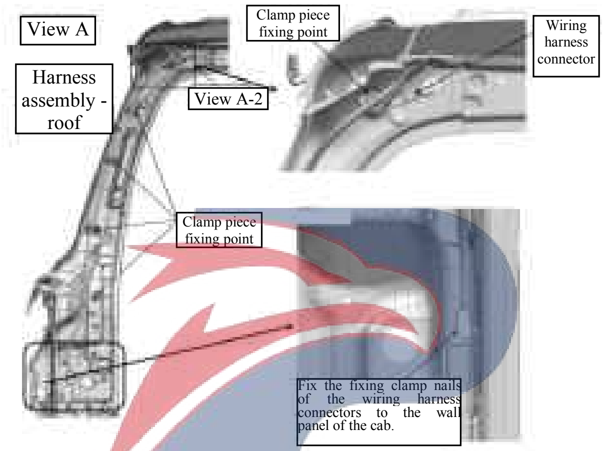
1. Attach 2 pieces of insulation pads 1, 2 and 3 to cab roof correctly, firmly and reliably.

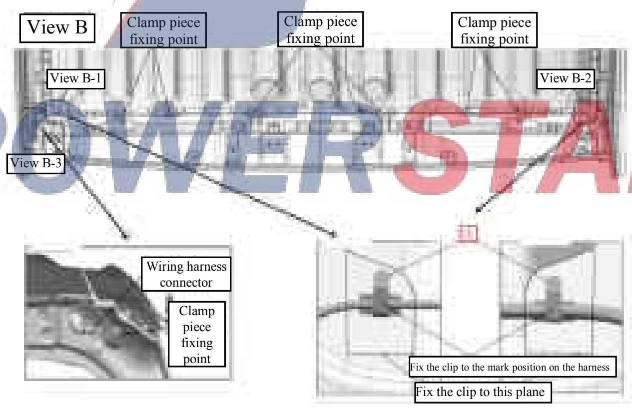
Assembly details:

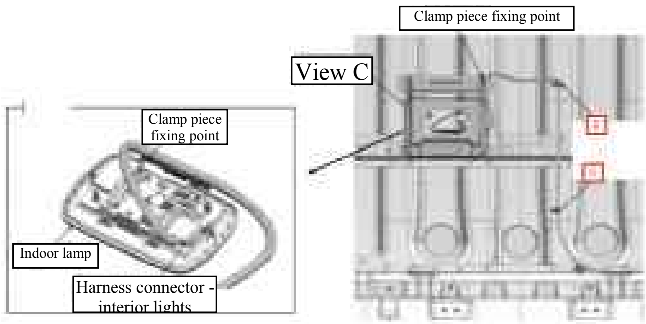
1. Heat insulation pad（5206131-D15EH）
2. Heat insulation pad - central roof (5206141-D16TH)
3. Heat insulation pad (5206131-P301)

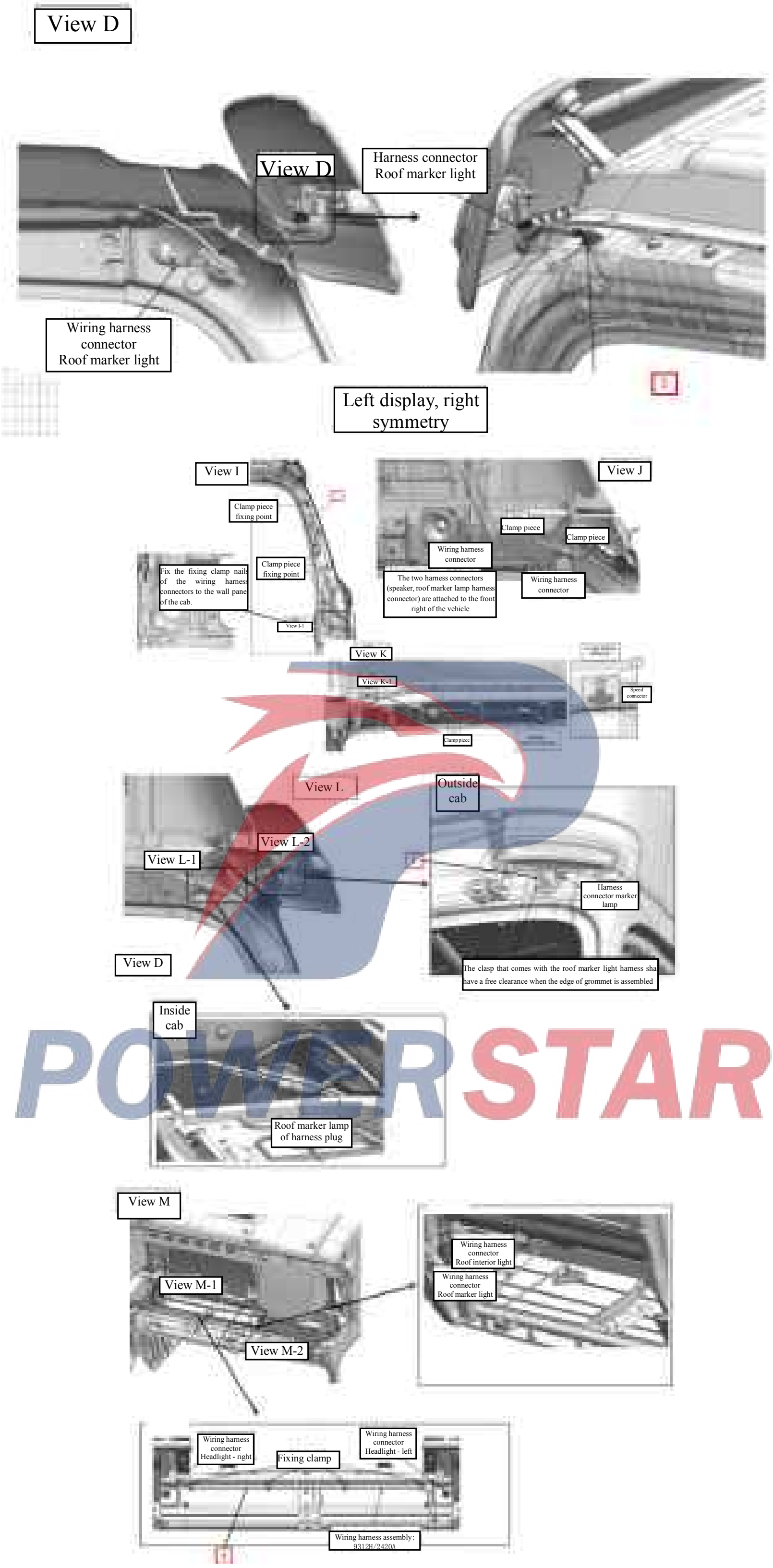
Roof harness - standard roof











Assembly requirements:

1. Take the ceiling wiring harness (1) and place it where as shown in the figure, and snap the connector of the wiring harness at one of its ends into the sheet metal hole of the front post as shown in the figure.

2. Snap the clamp nails of the ceiling wiring harness (1) into the sheet metal holes as shown in the front post diagram from top to bottom.

3. Take the ceiling wiring harness (1) and put it where as shown in the figure. Snap its clamp nails successively into the sheet metal holes from right to left as shown in the figure.

4. Remove the clamp piece (2) from the release paper, stick it where as shown in the figure, and fix the ceiling wiring harness (1) at this location.

5. After the contour lamp harness 3 is connected to the ceiling harness, fixed in the top of cab at the left and right ends of the sheet metal hole.

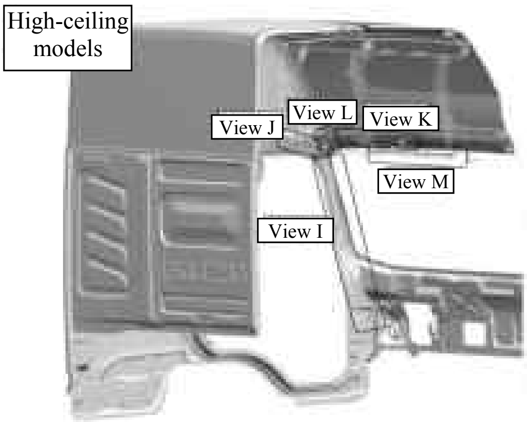
Assembly details:

1.Wiring harness assembly --roof

2. Fixing clamp (3724436-117)

3. Clearance lamp harness assembly (4611210-D34EZ)

Ceiling wiring harness--high ceiling



Assembly requirements:

1. Take the ceiling wiring harness (1) and place it where as shown in the figure, and snap the connector of the wiring harness at one of its ends into the sheet metal hole of the front post as shown in the figure.

2. Snap the clamp nails of the ceiling wiring harness (1) into the sheet metal holes as shown in the front post diagram from top to bottom.

3. Take the ceiling wiring harness (1) and put it where as shown in the figure. Snap its clamp nails successively into the sheet metal holes from right to left as shown in the figure.

4. Connect the connector of indoor light harness 3 to the left side of roof harness, and put them into the container bracket from left.

5. Remove the clamp piece (2) from the release paper, stick it where as shown in the figure, and fix the ceiling wiring harness (1) at this location.

6、After the contour lamp harness 4 is connected to the ceiling harness, fixed in the top of cab at the left and right ends of the sheet metal hole.

Assembly details:

1. Roof harness assembly - left (4611220-D17YZ)

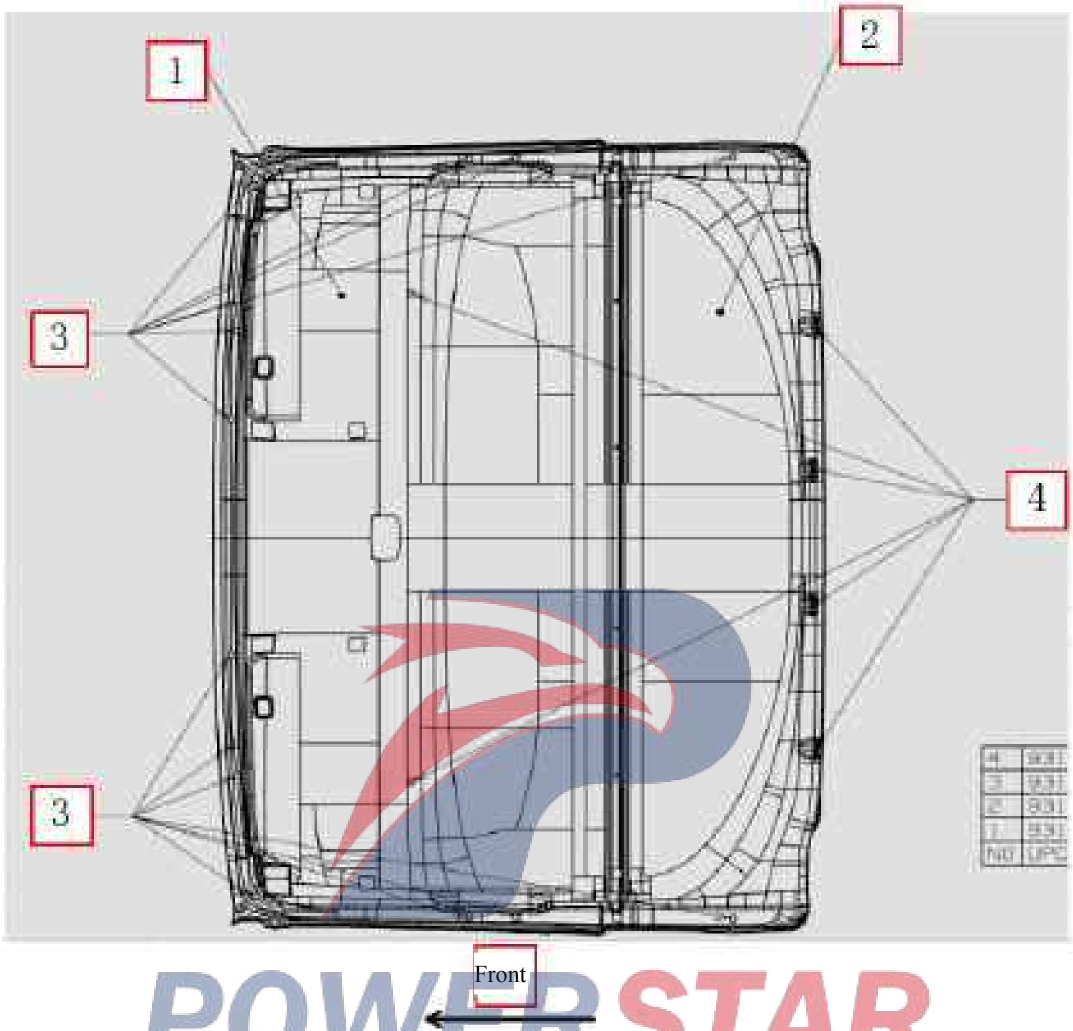
Roof harness assembly—right（4611230-D17YZ）

2. Fixing clamp (3724436-117)

3. Interior lights harness assembly - Left (4611120-D17YZ)

4. Clearance lamp harness (4611210-D17YZ)

Ceiling wiring harness--raised roof



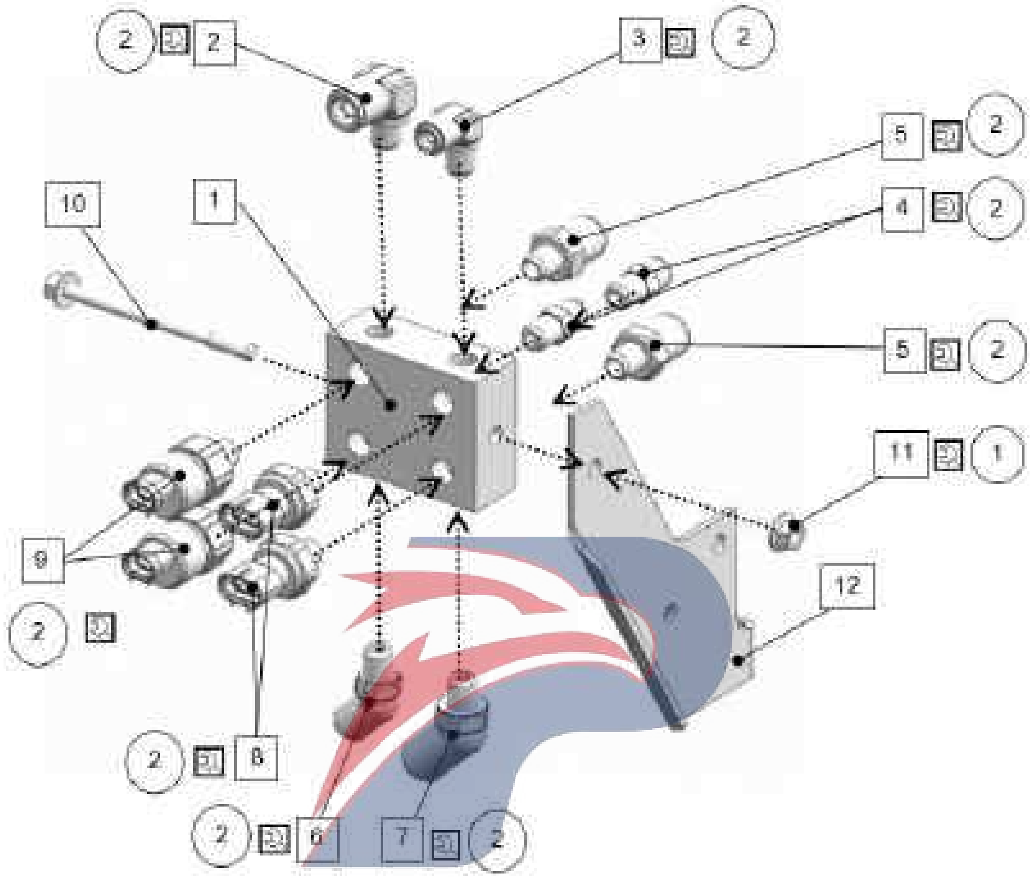
Assembly requirements:

1. Fix the rear section and front section of roof in order with fastening nails 3 and 4.

Assembly details:

1. Roof - front section (5206080-D15EH)
2. Roof-rear section (5206082-D15EH）
3. Fixing nail (5206671-P301)
4. Fixing nail (5206688-D17YZ)

Valve assembly



Assembly requirements:

1. Fix the valve body onto the bracket with bolts and nuts at the specified torque, and make a mark using a marker;

2. Apply sealant onto 2~3 threads longitudinally from the lowest thread.

3. Screw connector 2 by 2~3 turns; then loosen it back by 2~3 turns, so that the sealant can be evenly applied onto it.

4. Fasten the connectors as shown;

5. Tighten it with the required torque value and make a mark using a marker pen.

Assembly details:

1. Valve body

2. Connector (1096609580)

3. Connector (1096609560)

4. Connector (1096609630)

5. Connector (1096609670)

6. Connector (897432565A)

7. Connector (897,432,566A)

8. Sensor-air pressure

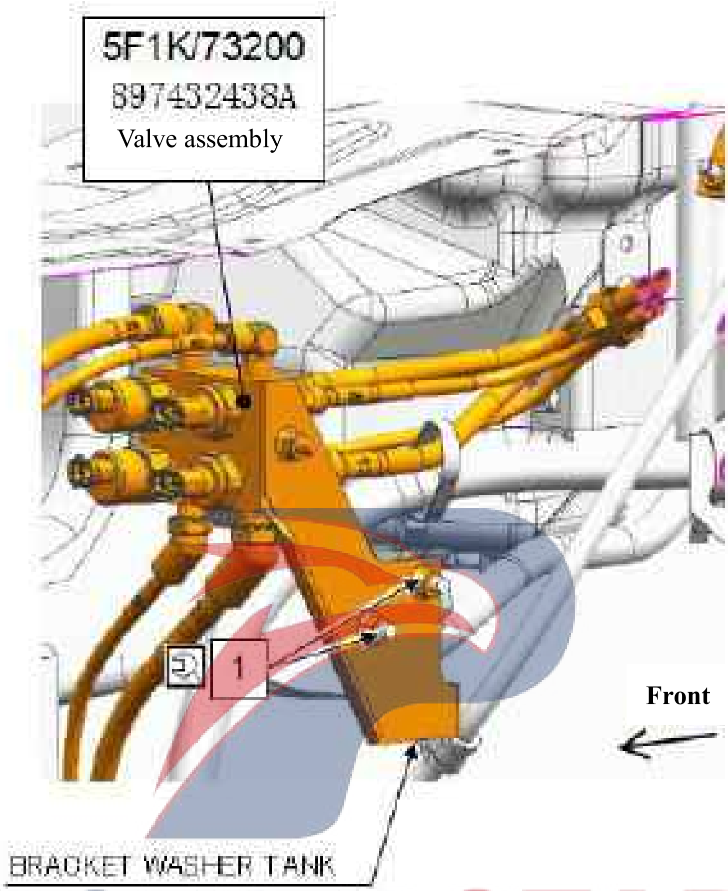
9. Sensor-air pressure

10. Bolt (Q18408100×1.2)

11. Nut (Q32008)

11. Bracket (897432439A)

Valve assembly installation



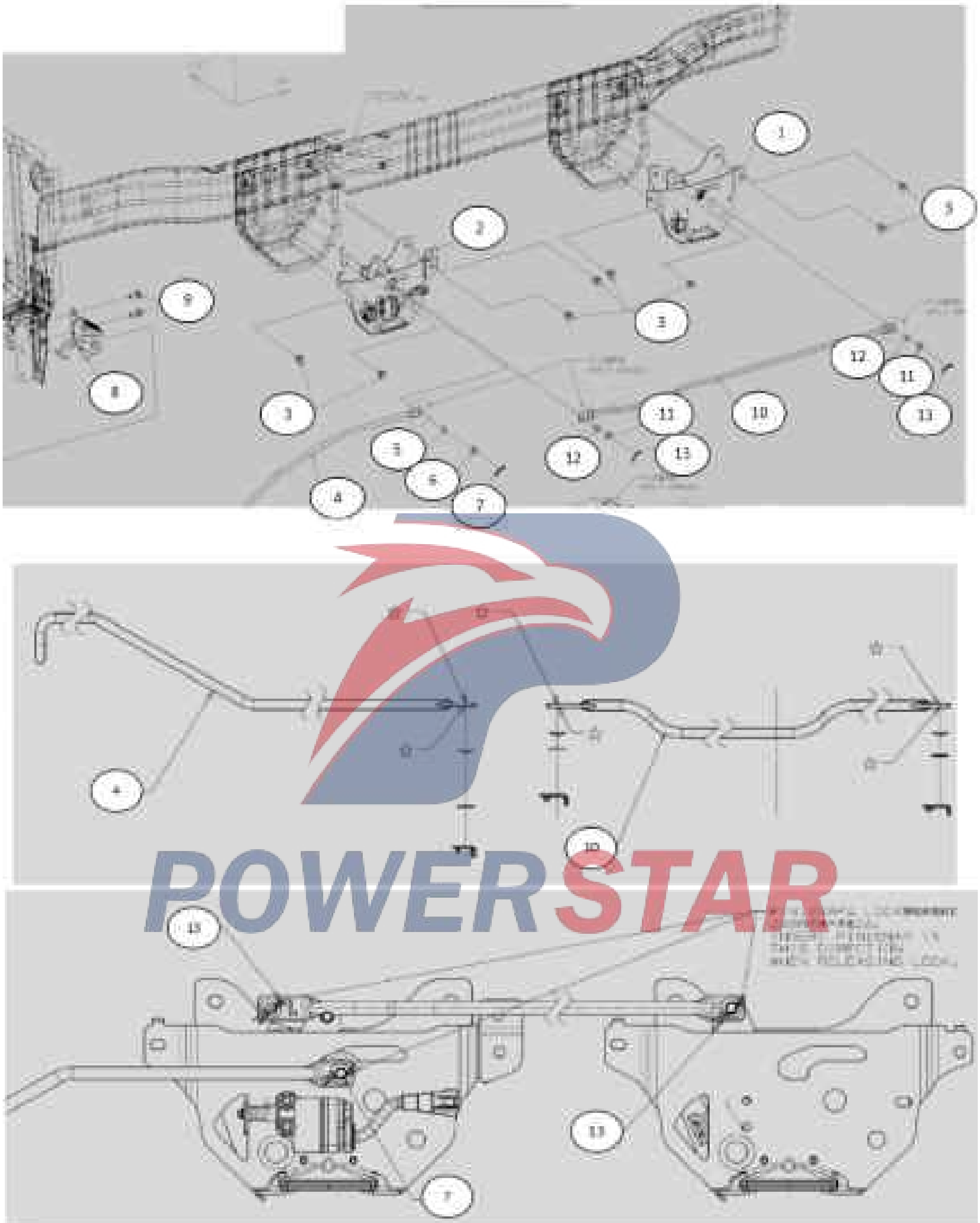
Assembly requirements:

1. Tighten it with the required torque value and make a mark using a marker pen.

Assembly details:

1. Nut (Q32008)

Torsion lock assembly



Assembly requirements:

1. Insert the torsion lock assembly's catch into the bracket hole and secure the torsion lock assembly - cab 1, 2 to the bracket with bolt 3.

2. Torque of bolt 3: 24.7±4.9 N.m.

3. The unlocking lever 4 is inserted into the bracket 8, and secure the bracket assembly 8 to the cab with bolt 9.

4. Torque of bolt 9: 24.7±4.9 N.m.

5. Apply grease to the end of the pushrod assembly 10, and connect both ends of the pushrod assembly 10 to the left and right locks with washers 11 and 12.

6. Apply grease to the right end of unlocking lever assembly 6, and connect the end to the left torsion lock assembly with washers 5, 6 and pin 7.

Assembly details:

1. Right torsion lock assembly - cab (5002020-D17YZ)

2. Left torsion lock assembly - cab(5002010-D17YZ)

3. Bolt (Q1840820)

4. Unlocking lever (8202610-D34EZ)

Unlocking lever (8202610-D17YZ)

5. Washer (5002612-D17YZ)

6. Flat washer (Q40008)

7. Snap pin (5002611-P301)

8. Bracket assembly(8202620-D17YZ)

9. Bolt (Q1840820)

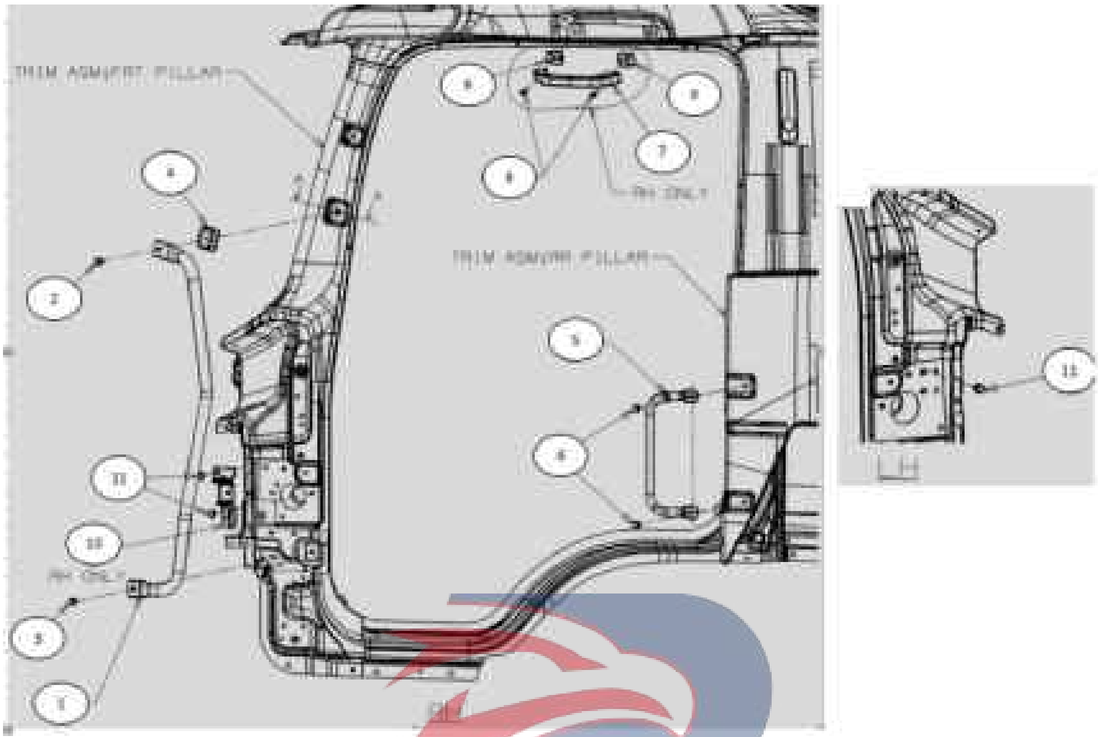
10. Connecting rod

11. Flat washer (Q40008)

12. Washer (5002612-D17YZ)

13. Snap pin (5002611-P301)

Assist handle



Assembly requirements:

1. As shown in the figure, assist handle - front seat side 7, as well as fixed seat - assist handle 9 are fixed onto the side of the roof with screw 8.

2. After fixing the bolt 2, cover the assist handle cover.

3. Use bolts 2 to secure the cover 4, left / right auxiliary handles - the upper part of the front pillar 1, 2 to the front pillar. Use bolts 3 to secure the left / right auxiliary handles - the lower part of the front pillar 1, 2 to the front pillar. The torque requirements for bolts 2 and 3 are: 19 ± 5 N.m.

4. Right bracket assembly - assist handle 10 are fixed to front pillar with bolt 11.

5. Left/right assist handle 5 is fixed to the central column in cab with bolt 6.

6. Bolt 6 torque : 19 ± 5 N.m.

Assembly details:

1. Right assist handle assembly - front pillar (8200520-D17YZ)

Left assist handle assembly -- front pillar(8200510-D17YZ)

2. Bolt (Q1840820)

3. Bolt (Q1840816)

4. Plug cover (8200448-D17YZ)

5. Handle (8200426-D17YZ)

6. Bolt (Q1840816T)

7. Assist handle - front seat side (8200152-D34EZ)

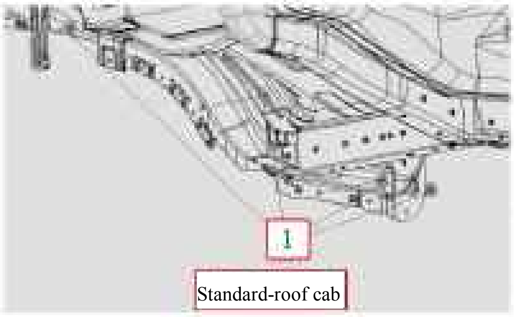
8. Screw - assist handle

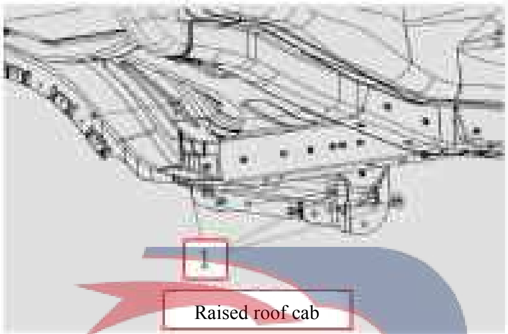
9. Fixed seat - assist handle (8200428-D17YZ)

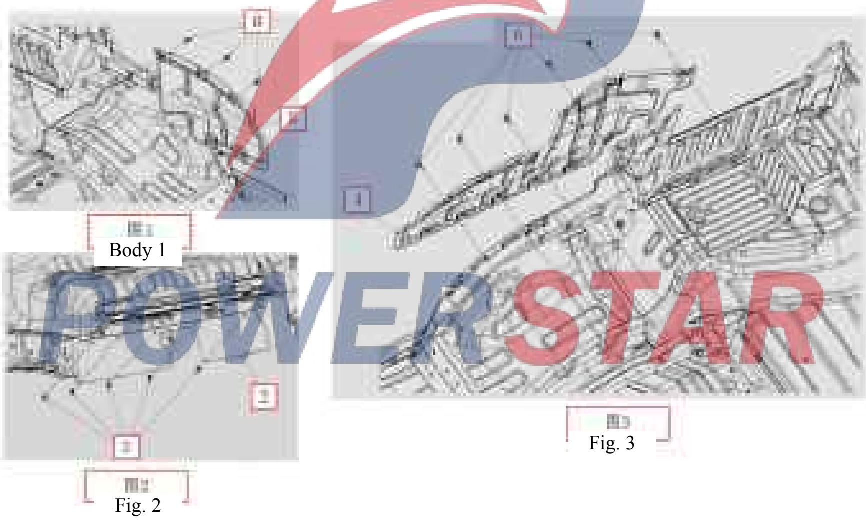
10. Right bracket assembly - assist handle

11. Bolt (Q1840816)

Sound insulation pad-raised roof







Assembly requirements:

1. Install it with seal cover 1 onto the corresponding position in cab.

2. Fix the left and right sound insulation pads onto the stringer on the bottom of cab with bolt 6 at a torque of 22.8±6.9 N.m.

3. Fix sealing strip 2 onto the position on the bottom of the cab with screw 3.

Assembly details:

1. Seal cover

2. Sealing strip (1301134-D17YZ)

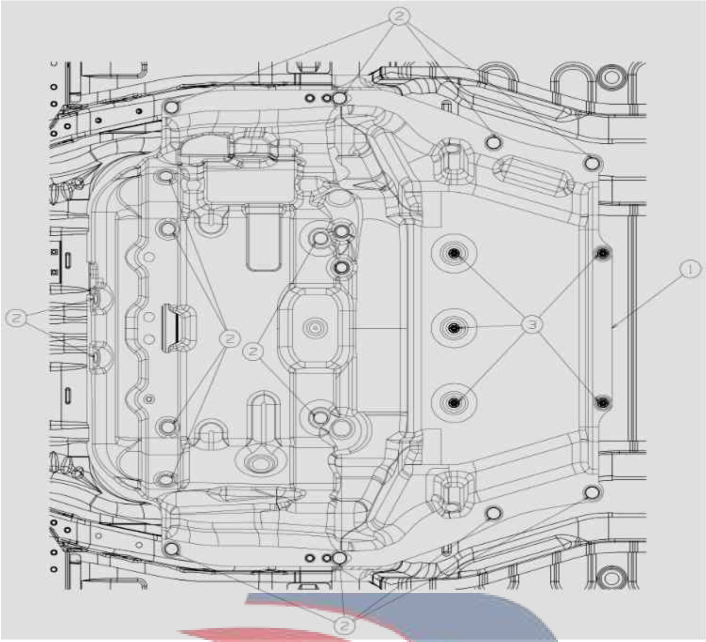
3. Screw (1301135-D17YZ)

4. Sound insulation pad assembly (left) (5101030-D17YZ)

5. Sound insulation pad (right) (5107020-D17YZ)

6. Bolt

Sound insulation pad-raised roof



Assembly requirements:

1. Fix the engine sound insulation pad assembly 1 onto the position in place and reliably with fastening nails 2 and 3.

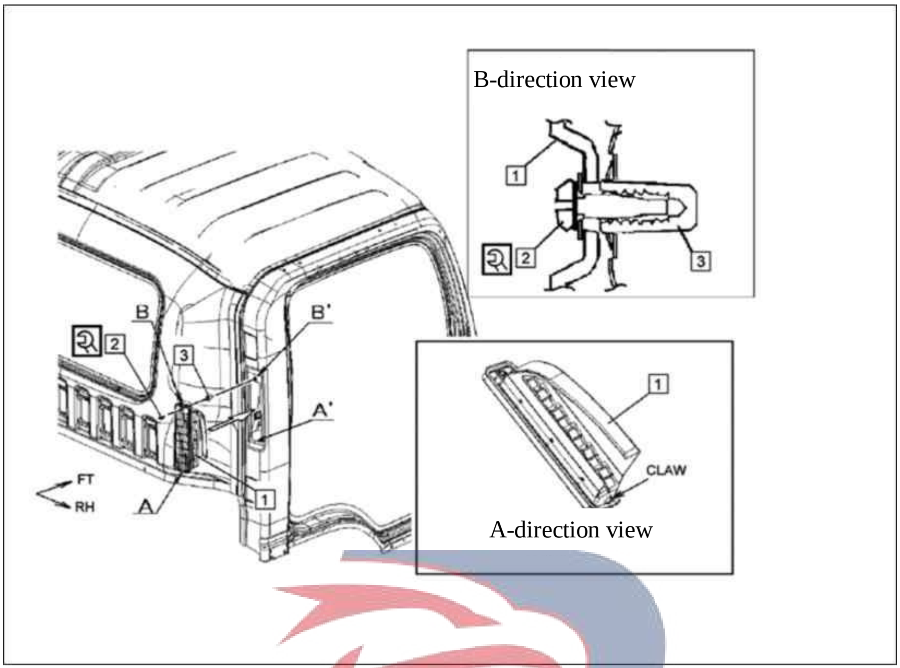
Assembly details:

1. Fixing nail

2. Plug

3. Convex cap (8200201-D17YZ)

Air outlet assembly--air filter



Assembly requirements:

1. Install gasket nut ③ to the corresponding mounting hole on the body, and assemble them as shown on the right;

2. Install the air outlet assembly - air filter ① onto the corresponding body mounting hole on the body. Fasten it with screw ② using a pneumatic wrench and thick gun head at a torque of 2.0±0.5N.m .

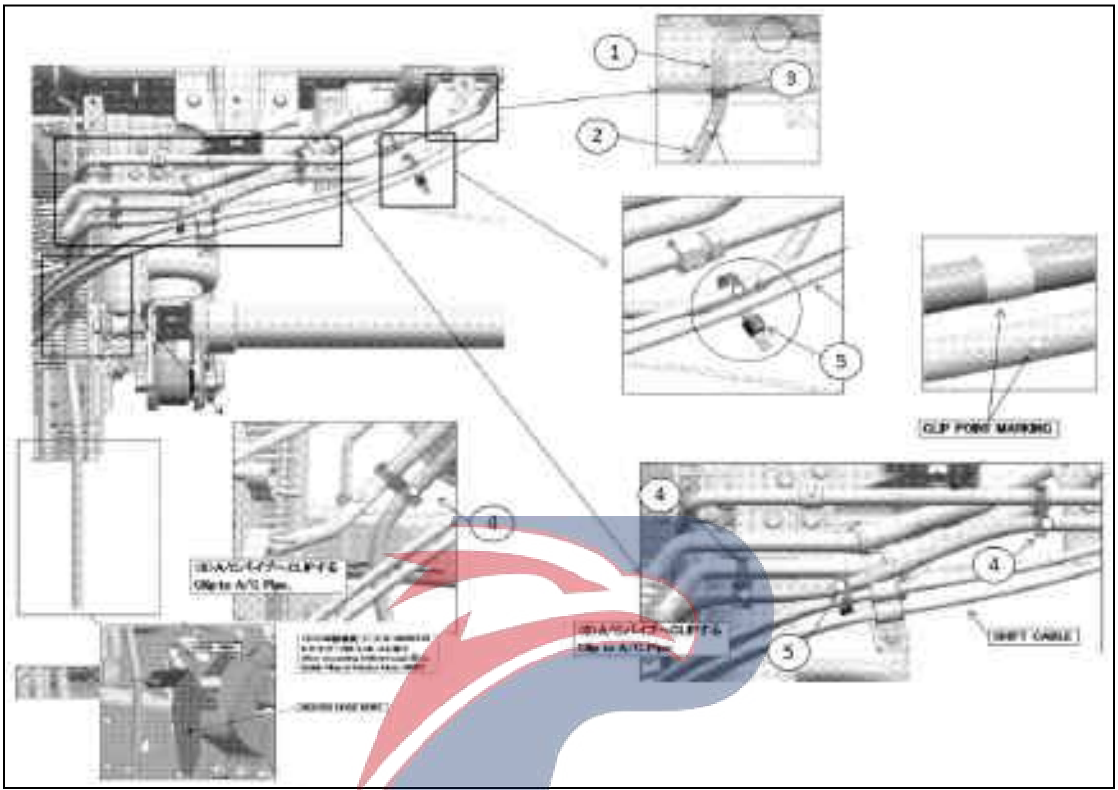
Assembly details:

1 Air outlet assembly-air filter (8101510-P301)

2. Screw

3. Washer nut (3724543-44)

Dripping pipe fixing



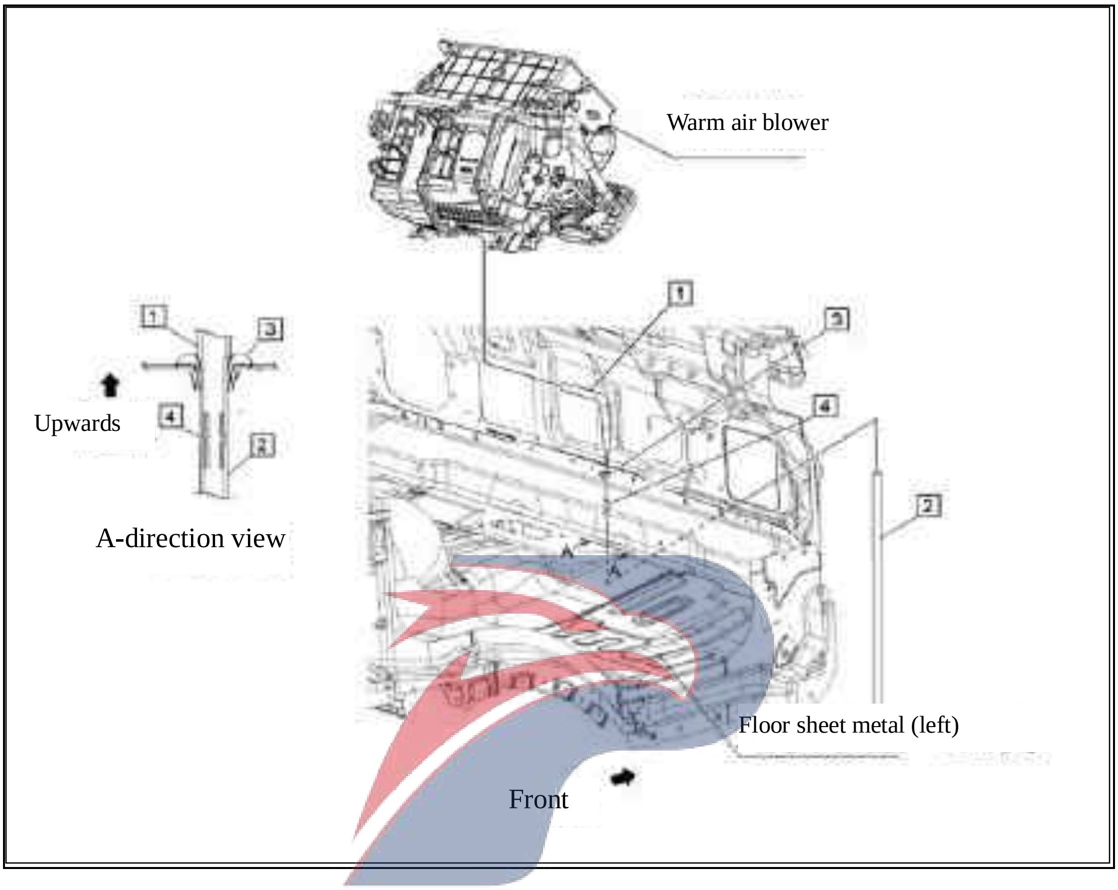
Assembly requirements:

1. Fix the lower section of weeping pipe onto the low pressure pipe and warm water pipe with pipe clamps and ties.

Assembly details:

1. Upper segment of dripping pipe – A/C
2. Lower segment of dripping pipe – A/C (8101332-D17YZ)
3. Seal cover-dripping pipe
4. Pipe clamp (3703237-117/C)
5. Binding tape (3703237-D17YZ)

Dripping pipe fixing



Assembly requirements:

1. As shown on the right, combine the upper section of weeping pipe - air conditioner ① and the lower section of weeping pipe - air conditioner ②, and insert the seal cover - weeping pipe ② into the upper section of weeping pipe - air conditioner ①, and install the sealing cover onto the corresponding mounting hole on the left side of the floor;

2. The above sub-assemblies are inserted into the weeping pipe on the bottom of the heater.

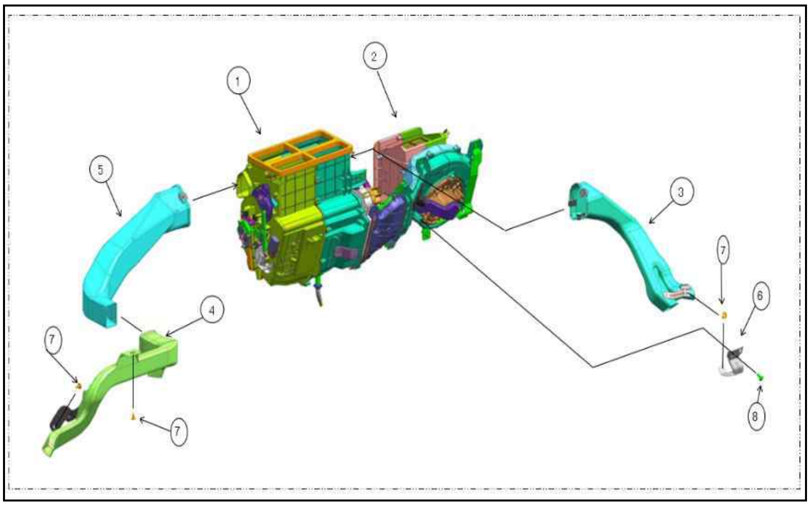
Assembly details:

1. Upper segment of dripping pipe – A/C

2. Lower segment of dripping pipe – A/C (8101332-D17YZ)

3. Seal cover-dripping pipe

Blower vent pipe



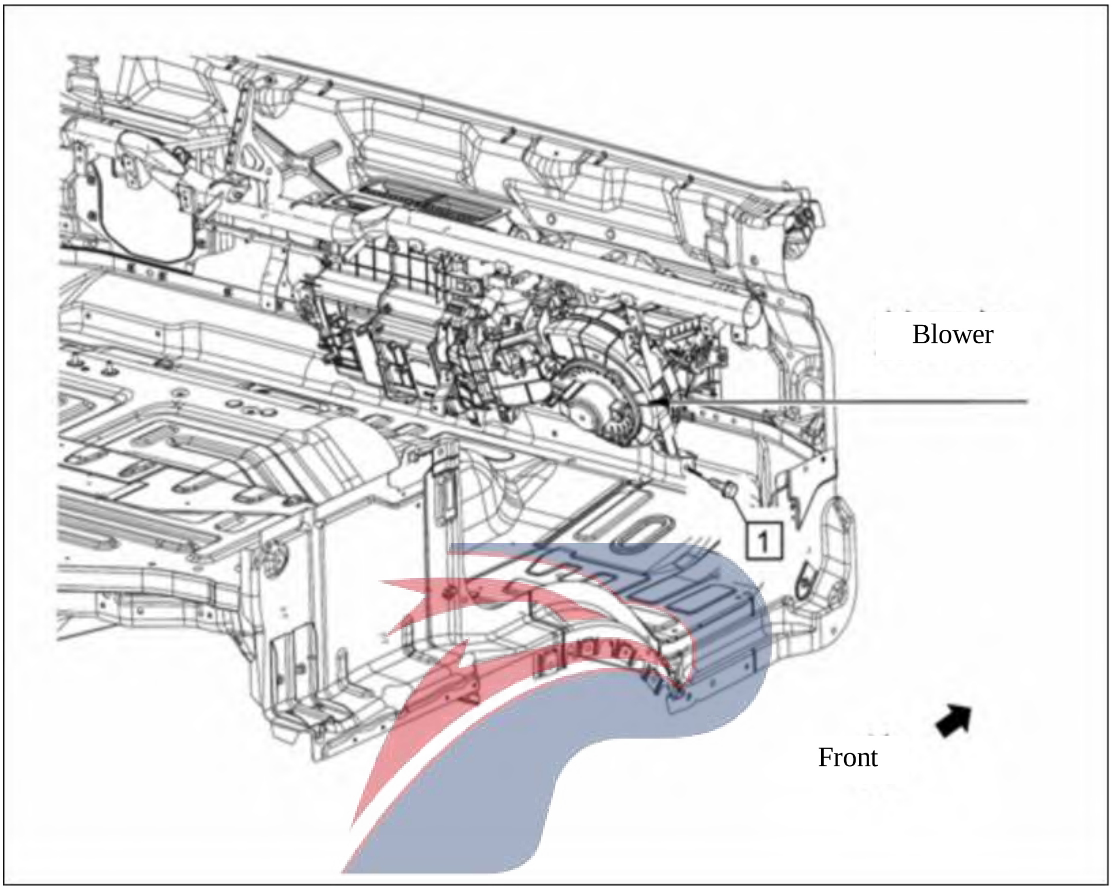
Assembly requirements:

1. As shown in the figure, install the vent pipe onto the blower tightly and reliably.

Assembly details:

1. Blower assembly
2. Heater assembly
3. Vent pipe assembly (8101370-D17YZ)
4. Connection pipeline assembly-lower ventilation
5. Vent pipe assembly
6. Bracket (8101381-D17YZ)
7. Fixing nail
8. Screw

Blower connected to cab



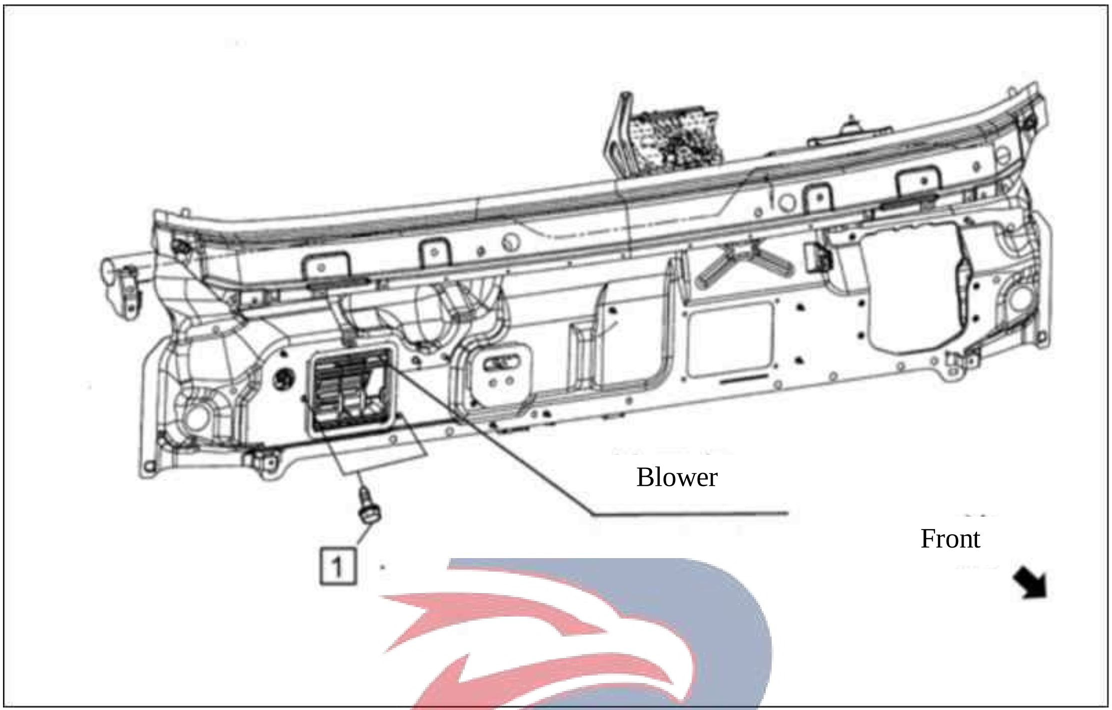
Assembly requirements:

1. As shown on the right, tighten the bolt ① onto the corresponding mounting holes of the blower and instrument support rod with a socket wrench and a pneumatic wrench. (Note: Make sure the blower is firmly connected to the bracket)

Assembly details:

1. Bolt

Blower connected to the front panel bolts of the cab



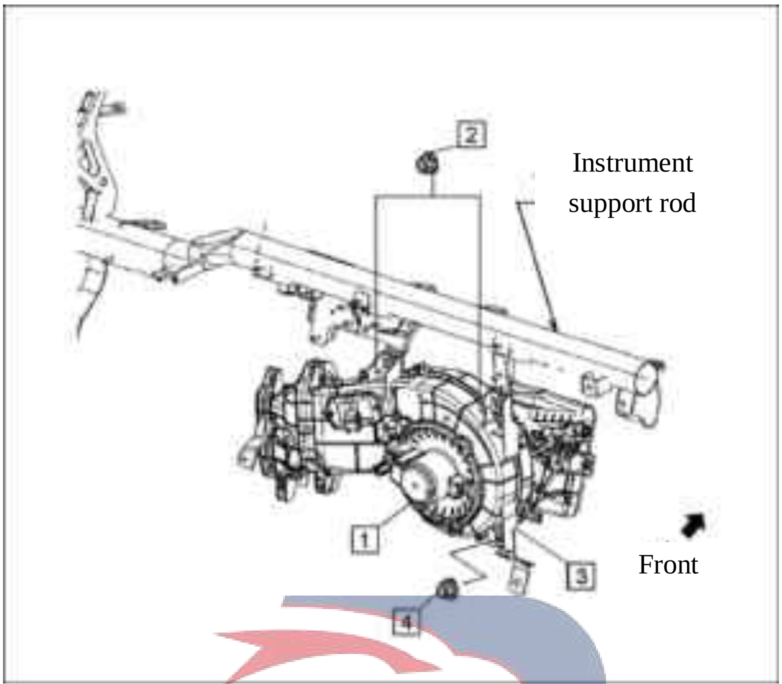
Assembly requirements:

1. As shown on the right, tighten the bolt ① onto the corresponding mounting holes of the front panel of the cab with a socket wrench and a pneumatic wrench. (Note: Ensure that the blower is firmly connected to the front panel of the cab)

Assembly details:

1. Bolt (8101312I-P301)

Sub-assembly of blower and instrument support rod



Assembly requirements:

1. As shown on the right, install the blower assembly ① to the instrument support rod through tightening nut ② by 2 to 3 threads and then fasten it with a pneumatic wrench and a socket wrench;

2. As shown on the right, fix the bracket - blower motor ③ and nut ④ to the corresponding bolts on the instrument support rod with a pneumatic wrench and a socket wrench;

Assembly details:

1. Blower assembly

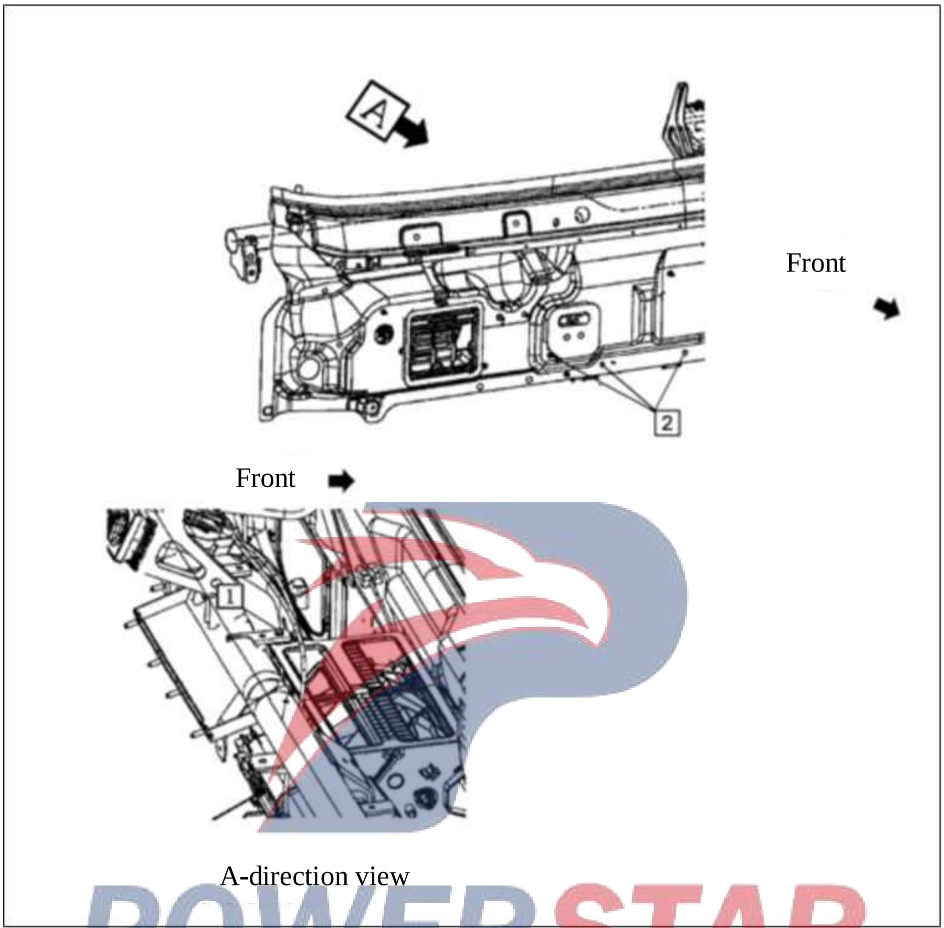
2. Nut (Q32006)

3. Bracket assembly-blower motor

4. Bracket - blower motor (8101321-D17YZ)

5. Nut (Q32006)

Bolts assembly for front panel of cab



Assembly requirements:

1. As shown on the right, tighten the bolt ② onto the corresponding mounting holes of the front panel of the cab with a socket wrench and a pneumatic wrench;

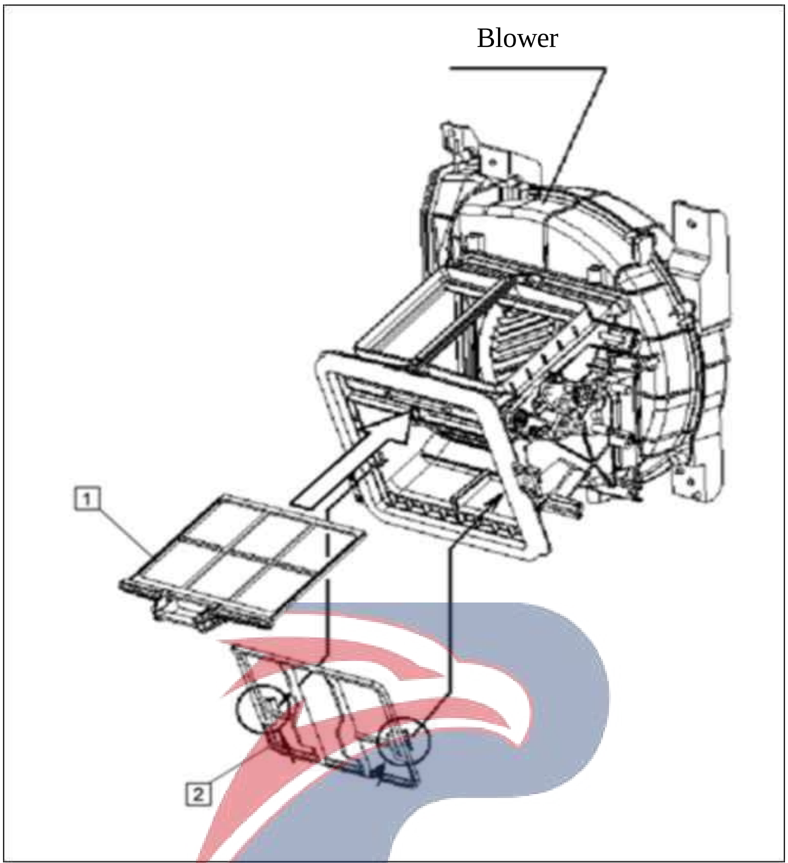
2. As shown on the picture in direction A, tighten the bolt ① onto the corresponding mounting hole above the instrument support rod with a socket wrench and a pneumatic wrench.

Assembly details:

1. Bolt (Q1840616)

2. Bolt (8101312Ⅰ-P301)

Air filter assembly



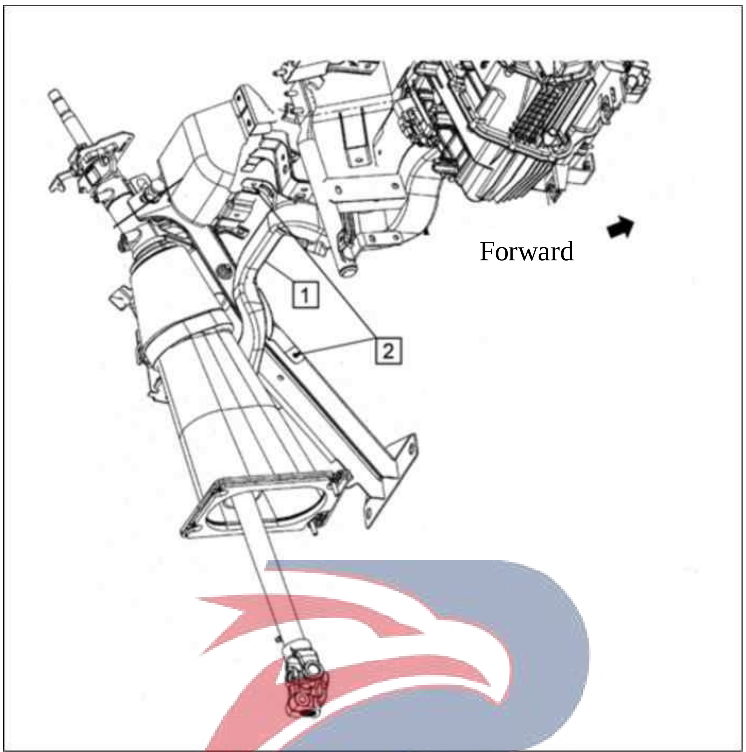
Assembly requirements:

1. Install the air filters ① and ② onto the blower as shown in the picture. There should be no clearance.

Assembly details:

1. Air filter (101490I-P301)
2. Air filter

Connection pipeline assembly-lower ventilation



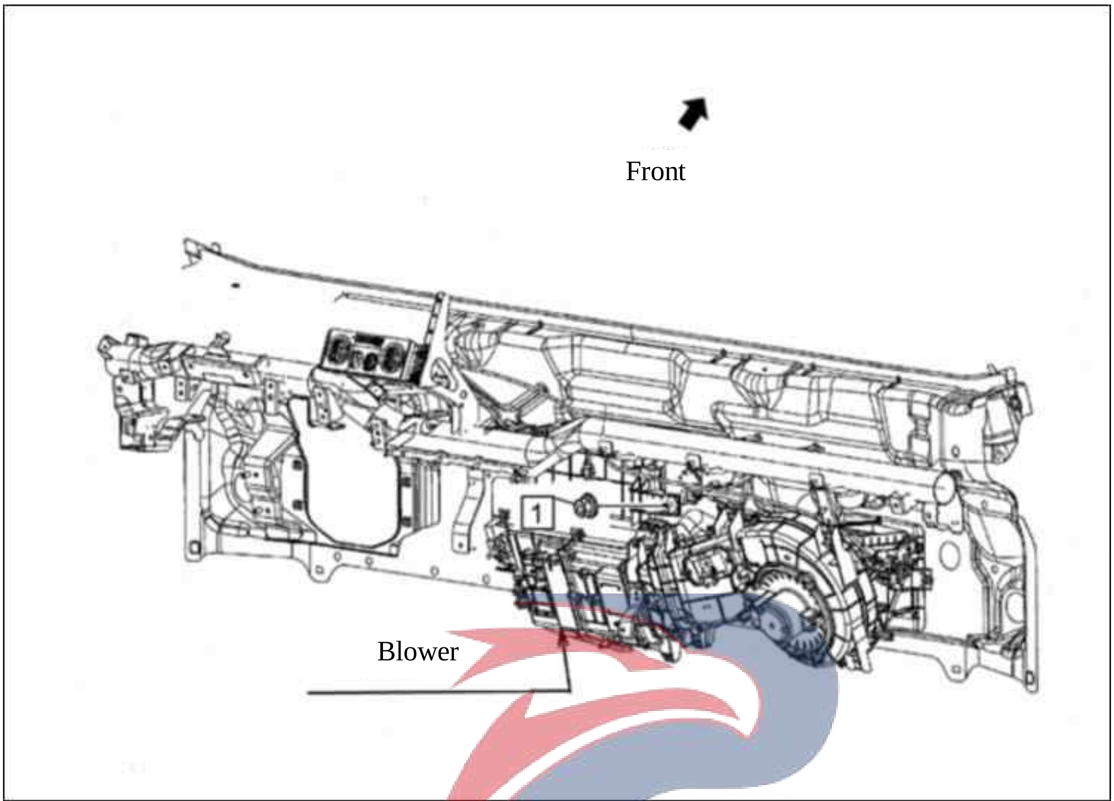
Assembly requirements:

1. Fix the connecting pipe assembly - lower vent ① with fastening nail ② as shown on the right.

Assembly details:

1. Connection pipeline assembly-lower ventilation
2. Fixing nail

Nuts assembly on upper side of heater



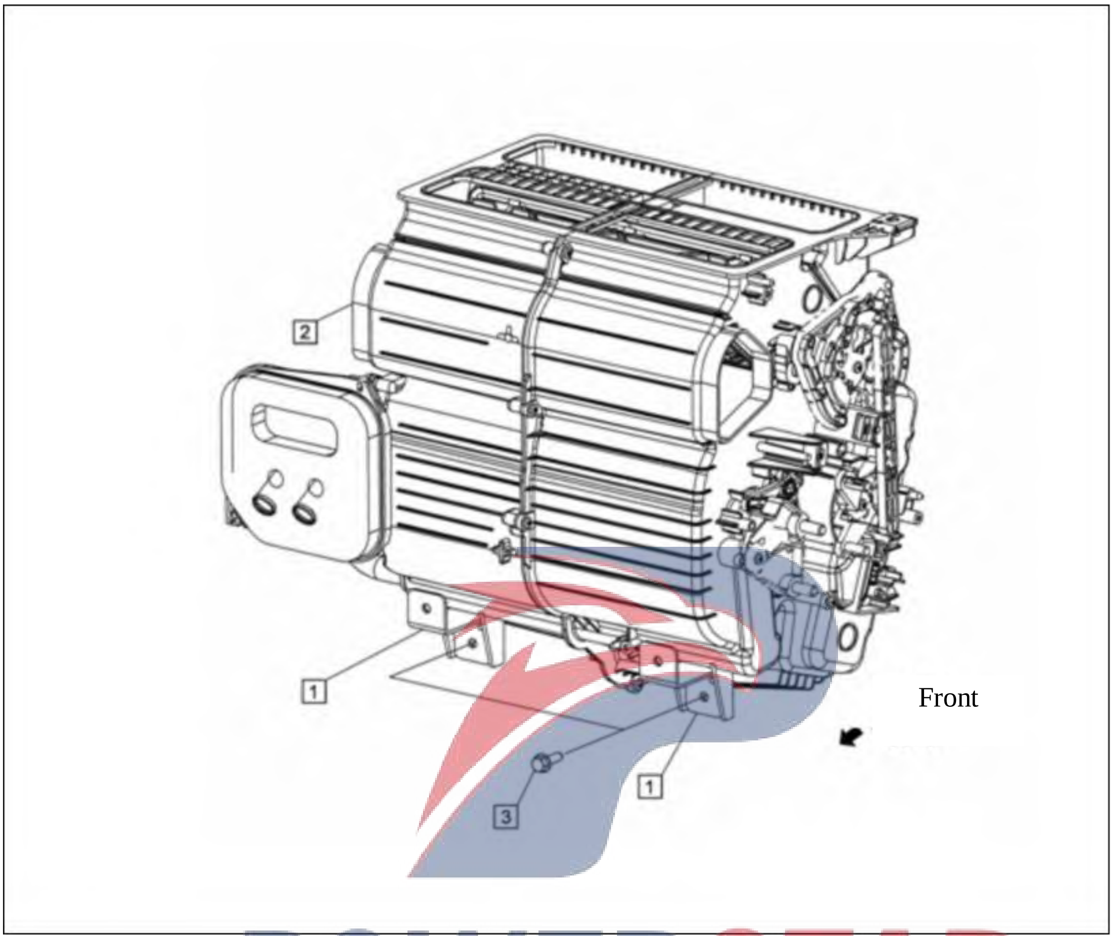
Assembly requirements:

1. As shown on the right, tighten bolt ① onto the corresponding bolts of the heater with a socket wrench and a pneumatic wrench.

Assembly details:

1. Nut (Q32006)

Bracket - heater assembly



Assembly requirements:

1. As shown on the right, place the heater assembly ② on the platform. Install bracket - heater ① and bolt ③ onto the lower side of the heater with a socket wrench and a pneumatic wrench.

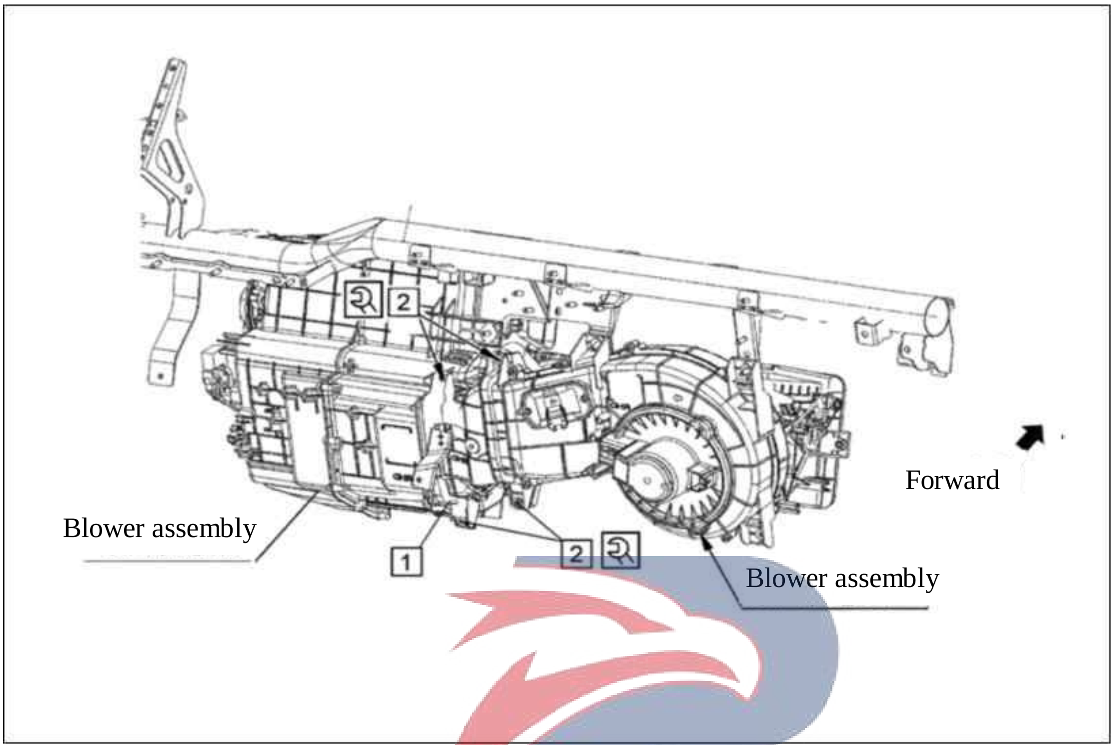
Assembly details:

1. Bracket -- heater

2. Heater assembly (8101010-D17YZ)

3. Bolt (Q1840620)

Vent pipe assembly



Assembly requirements:

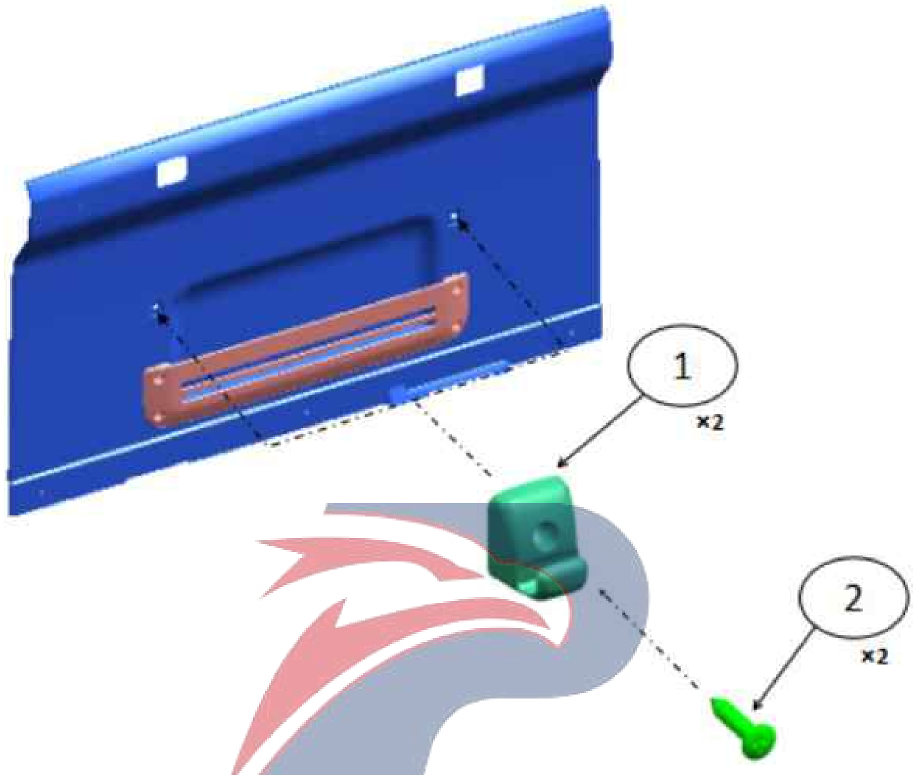
1. Assemble the vent pipe assembly ① with screw ② as shown on the right. Torque of screw: 1.4 (1.1-1.7)N.m.

Assembly details:

1. Vent pipe assembly

2. Screw

Hook--jacket-raised roof cab



Assembly requirements:

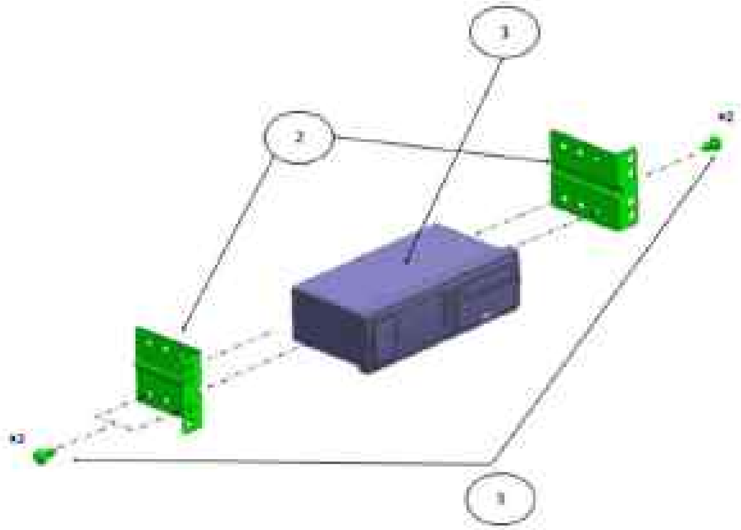
1. As shown in the figure, take the left and right side walls 1 and 2 and the rear trim panel 3, and fix them around the cab using the fixing nails (4).

Assembly details:

1. Hook – Jacket (8200153-D17YZ)

2. Screw

Tachograph



Assembly requirements:

1. The support rod 2 is fixed on the container cover assembly 1 with screws 3 as shown in the figure.

2. The subassembly is as shown in the right figure. Note: Be careful of the orientation of bracket 2 during assembling.

Assembly details:

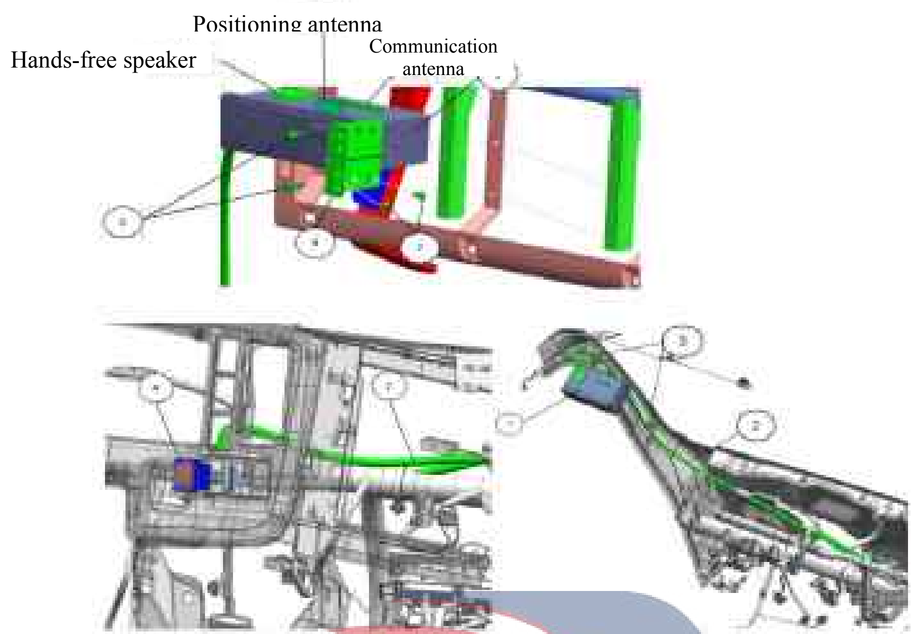
1. Tachograph (3850010-D17YZ)

(3850010-D34EZ)

2. Bracket (3725311-P301)

3. Screw

Tachograph assembly - raised roof



Assembly requirements:

1. Fix the tachograph subassembly onto the container bracket with screw 5.

2. Fix the cable 2 on the left front pillar of the cab with the clip 3.

3. Connect the emergency contact switch 4 and cable, and fix them onto corresponding position on the dashboard.

Assembly details:

1. Tachograph assembly (3850010-D17YZ)

2. Cable (3850102-D17YZ)

3. Clip (3724436-117)

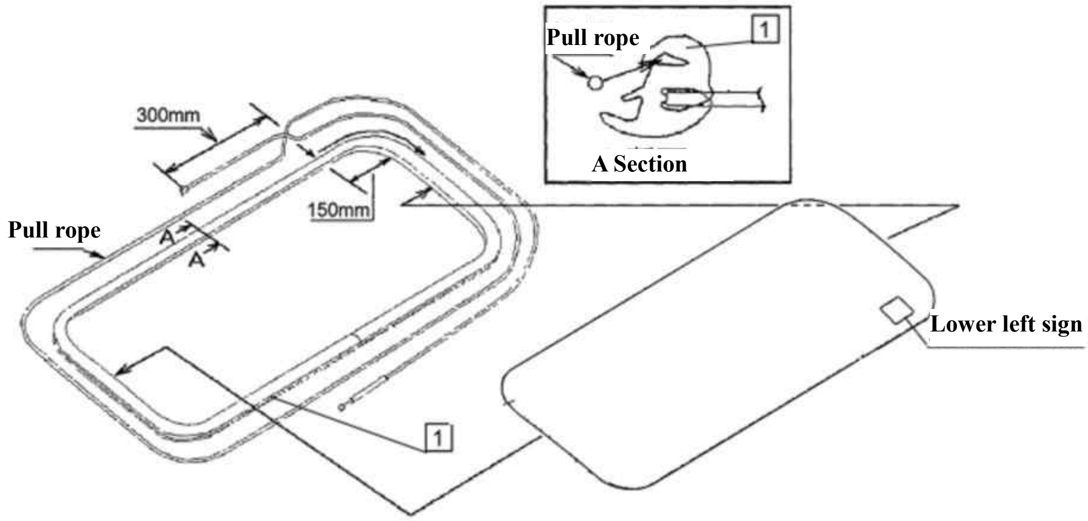
4. Emergency contact switch (3793111-D17YZ)

5. Screw

6. Bracket (8200131-P301B)

7. Screw

Rear window trim strip



Assembly requirements:

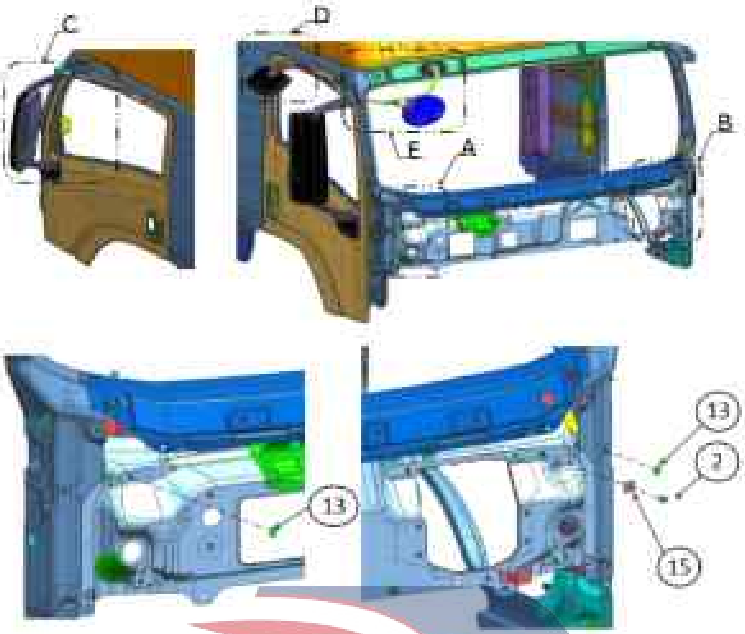
1. Place the rear window glass and sealing strip - rear window (1) to the platform. Put the left and right corners of (1) into the left and right corners of the glass, put its lower part into the rear window, and finally put the left and right and upper part into glass. Note: The seam of (1) should be in the middle of the glass.

2. Insert the cord into (1) as shown in section A.

Assembly details:

1. Sealing rubber strip - rear window (5206331-P301)

Rearview mirror assembly



Assembly requirements:

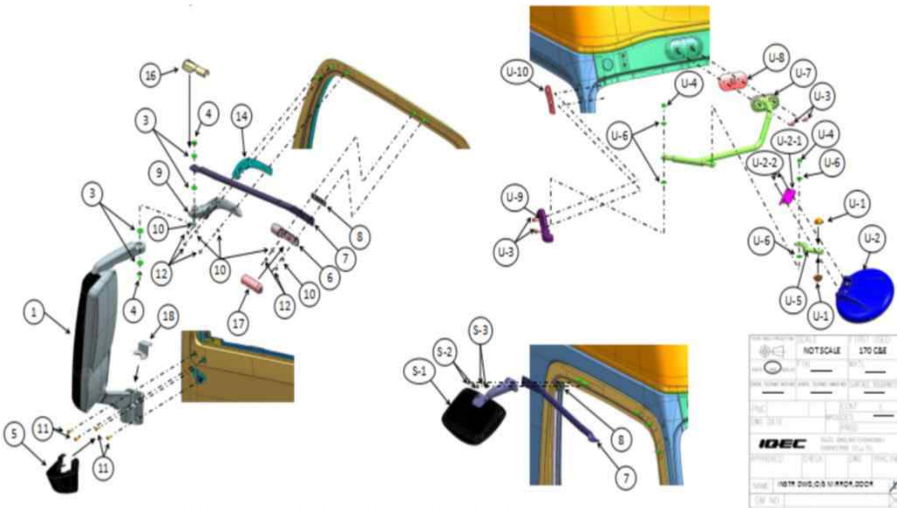
Assembly details:

1. Blind area mirror assembly (8202310-D17YZ)

2. Washer (Q40108)

3. Nut (8101162-117/C)

Rearview mirror assembly



Assembly requirements:

Assembly details:

1. Rearview mirror assembly - left (8202010-D17YZ)

Rearview mirror assembly -right(8202020-D17YZ)

2. Bolt

3. Washer

4. Nut

5. Right lower cover plate - rearview mirror arm (8202044-D17YZ)

Left lower cover plate -- rearview mirror arm (8202033-D17YZ)

6. Gasket (8202051-D17YZ)

7. Right fixed connecting rod - main rearview mirror (8202048-D17YZ)

Left fixed connecting rod -- main rearview mirror (8202037-D17YZ)

8. Gasket

9. Right mounting bracket assembly - main rearview mirror (8202060-D17YZ)

Left mounting bracket assembly -- main rearview mirror (8202050-D17YZ)

10. Washer (Q40108)

11. Bolt

12. Nut (8101162-117/C)

13. Seal cover plate (88200143-803)

14. Right Gasket - mirrors mounting bracket (8202046-D17YZ)

Left Gasket -- mirrors mounting bracket (8202035-D17YZ)

15. Seal - mirror bracket (8101195-117/C)

16. Cover plate -- Connecting rod

17. Cover plate (8202052-D17YZ)

18. Right cover plate - Lower cover plate (8202042-D17YZ)

Left cover plate -- Lower cover plate (8202031-D17YZ)

U-1. Pivot assembly - blind area mirror

U-2. Blind area mirror

U-3. Bolt assembly

U-4. Nut

U-5. Rocker arm - bottom mirrors

U-6. Washer

U-7. Bracket assembly - bottom mirrors (8219018-D15EH)

Bracket assembly -- bottom mirrors (8219018-D17YZ)

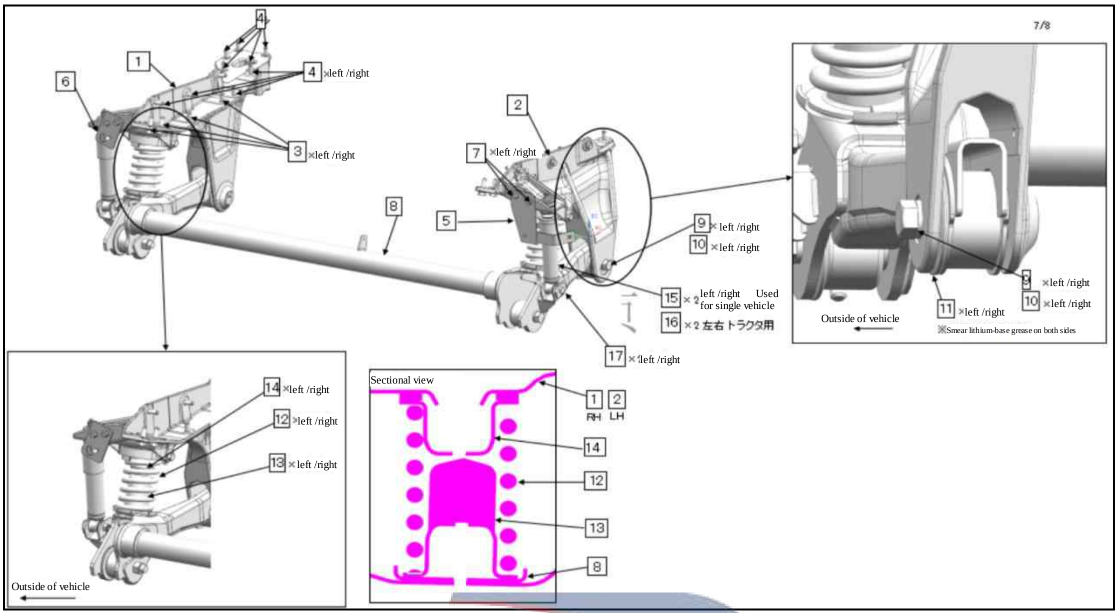
Bracket assembly -- bottom mirrors (8219018-D34EZ)

U-8. Gasket - bottom mirror bracket and top cover

U-9. Bracket - bottom mirror bracket and side wall

U-10. Gasket -- bottom mirror bracket and side wall

Rear suspension - spring suspension



Assembly requirements:

1. Take the boom assembly 8 and place it on the subassembly bench, smear grease on the two sides of the retaining ring 11, and connect the retaining ring 12, boom assembly, and cab tilter 9 to the supports 1 and 2 with the bolt 9 and the washer 10.

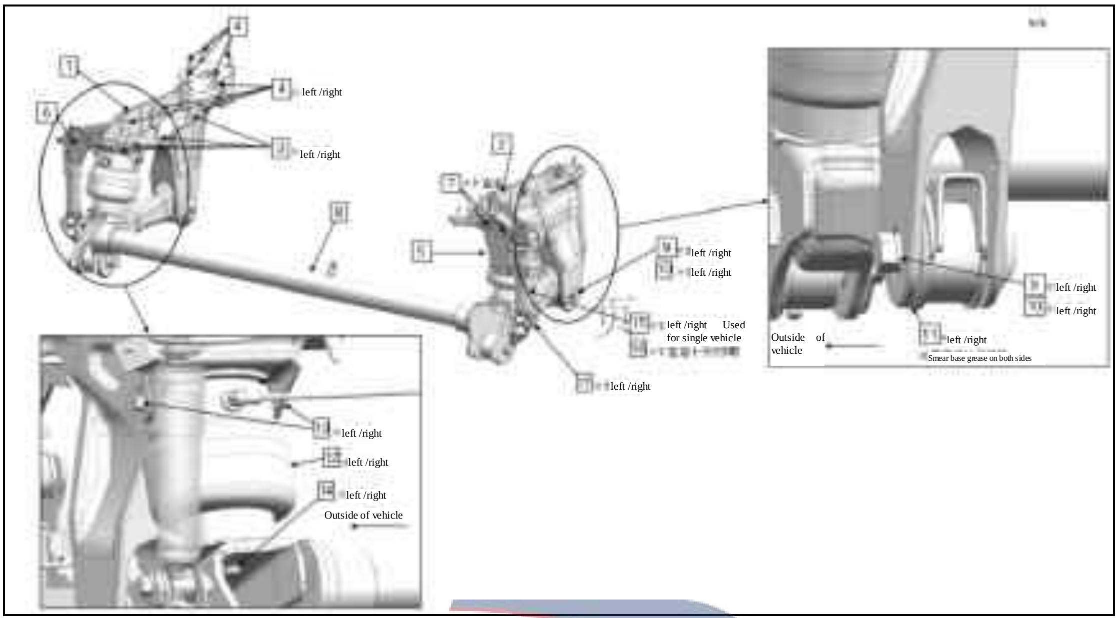
2. Install air spring assembly 12, damping rubber 13, and rubber seal 14 onto Cantilever assembly - cab tilting mechanism 8.

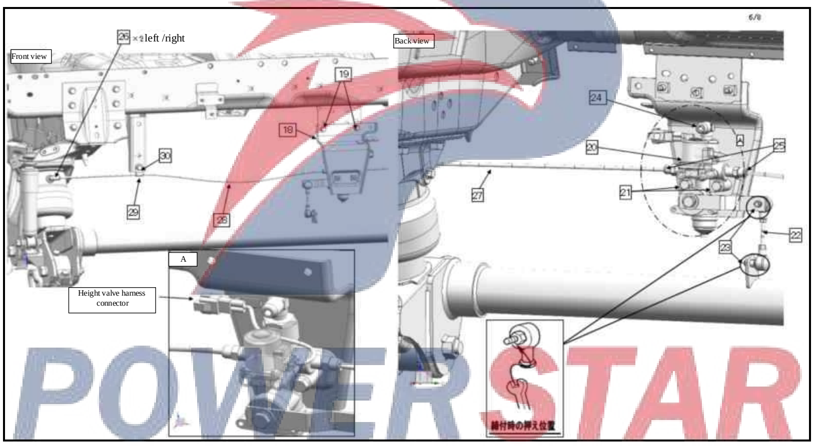
3. Torque of bolt 3: 106±11Nm; torque of bolt 3: 61±6.1Nm; torque of bolt 9:   274±20Nm.

Assembly details:

1. Right support assembly -- Cab rear suspension
2. Left support assembly -- Cab rear suspension
3. Bolt (Q1841235(P=1.25))
4. Bolt (Q1841030T(P=1.25,9.8))
5. Support assembly-cab installation
6. Bracket assembly-cab installation (8100513-D17YZ)
7. Bolt (Q1840820)
8. Boom assembly--cab tilter (5002940-D17YZ)
9. Bolt (Q151B1890)
10. Washer
11. Retainer ring
12. Coil spring assembly
13. Damping rubber
14. Rubber seal
15. Suspension damper assembly (5002080-D17YZ)
16. Suspension damper assembly (5002090-D17YZ)
17. Bolt (Q1841260 (P=1.25))

Rear suspension - air suspension





Assembly requirements:

1. Take the boom assembly 8 and place it on the subassembly bench, smear grease on the two sides of the retaining ring 11, and connect the retaining ring 12, boom assembly, and cab tilter 9 to the supports 1 and 2 with the bolt 9 and the washer 10.

2. Install air spring assembly 12, damping rubber 13, and rubber seal 14 onto Cantilever assembly - cab tilting mechanism 8.

3. Torque of bolt 3: 106±11Nm; torque of bolt 3: 61±6.1Nm; torque of bolt 9: 274±20Nm.

Assembly details:

1. Right support assembly -- Cab rear suspension

2. Left support assembly -- Cab rear suspension

3. Bolt (Q1841235(P=1.25))

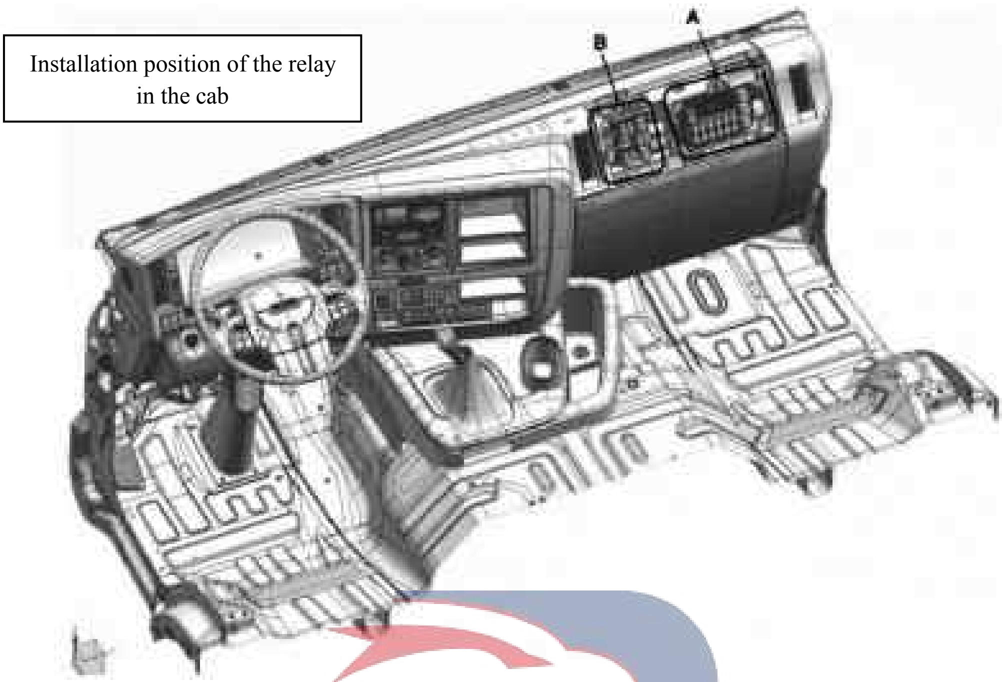
4. Bolt (Q1841030T(P=1.25,9.8))

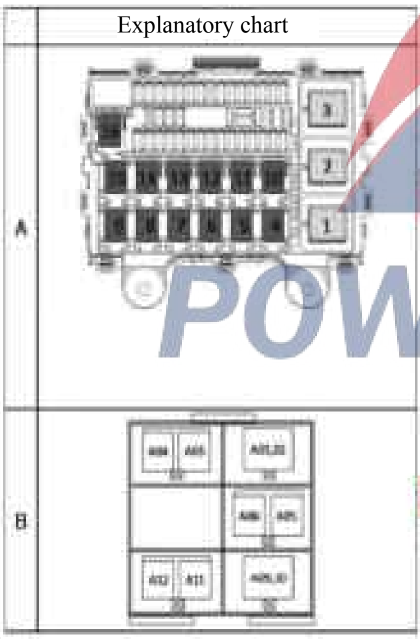
5. Support assembly-cab installation

6. Bracket assembly-cab installation (8100513-D17YZ)

7. Bolt(Q1840820)
8. Boom assembly--cab tilter (5002940-D17YZ)
9. Bolt (Q151B1890)
10. Washer
11. Retainer ring
12. Air spring assembly
13. Bolt (Q1840816)
14. Bolt (Q1840825)
15. Suspension damper assembly (5002080-D17YZ)
16. Suspension damper assembly (5002090-D17YZ)
17. Bolt (Q1841260(P=1.25))
18. Bracket - height valve (5002860-D17YZ)
19. Bolt(Q1840825)
20. Valve assembly (202930-D17YZ)
21. Bolt (Q1840840T)
22. Connecting rod assembly
23. Nut (3703211-117/C)
24. Connector
25. Connector
26. Connector
27. Nylon tube
28. Nylon tube (8202911-D17YZ)
29. Clip
30. Bolt (Q1840820)

Relay assembly





Relay wiring diagram at position A

Code	EPC	[illegible]	Part No.	Part Name	Vehicle model		Qty	Remarks
16	/	/	[illegible]	Relay tail light	C**	E**	1	[illegible]
15	/	/	[illegible]	Relay-High beam light	C**	E**	1	[illegible]
14	/	/	/	/	/	/	/	
13	/	/	[illegible]	Relay-Low beam light	C**	E**	1	[illegible]
12	[illegible]	[illegible]	[illegible]	Relay- power window	C**	E**	1	[illegible]
11	/	/	[illegible]	/	/	/	/	
10	[illegible]	[illegible]	[illegible]	Relay- condenser fan	C**	E**	1	[illegible]
9	[illegible]	[illegible]	[illegible]	Relay- fog light	C**	E**	1	[illegible]
8	/	/	[illegible]	Relay- wiper high/low conversion	C**	E**	1	[illegible]
7	/	/	[illegible]	Relay- horn	C**	E**	1	[illegible]
6	/	/	[illegible]	Relay- wiper motor	C**	E**	1	[illegible]
5	[illegible]	[illegible]	[illegible]	Relay- rear fog lights	C**	E**	1	[illegible]
4							/	
3	[illegible]	[illegible]	[illegible]	Relay- ignition switch	[illegible]	[illegible]	1	[illegible]
2	[illegible]	[illegible]	[illegible]	Relay- blower	[illegible]	E**	1	[illegible]
1	[illegible]	[illegible]	[illegible]	Relay- break light	C**	E**	1	[illegible]

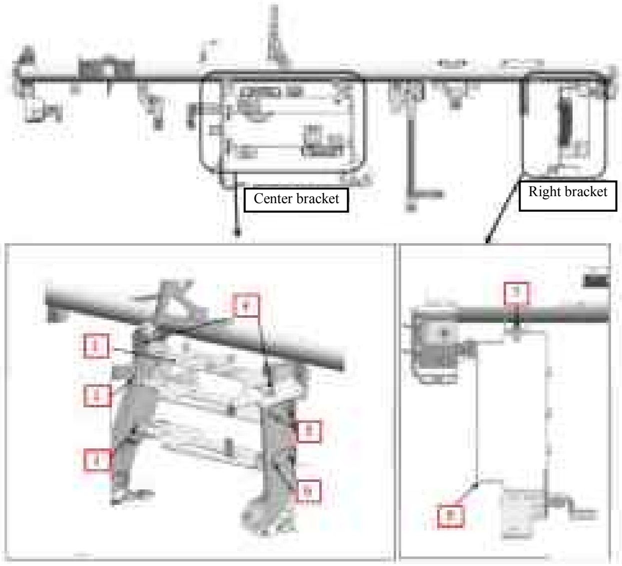
Relay wiring diagram at position B

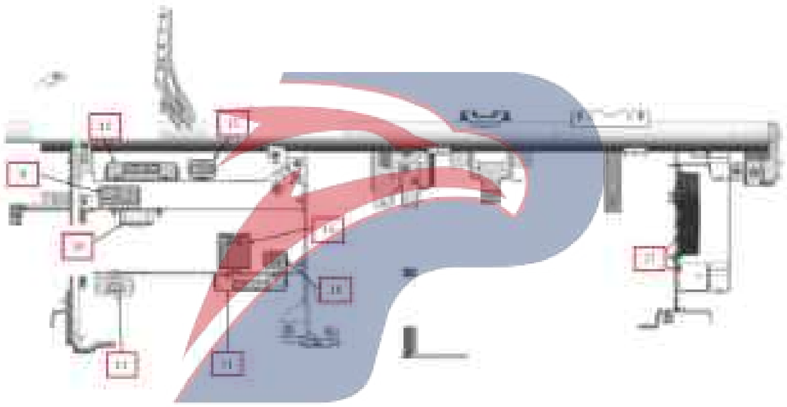
Code	EPC	[illegible]	Part No.	Part Name	Vehicle model		Qty	Remarks
A12	[illegible]	[illegible]	[illegible]	Relay- ABS failure light	/	E**	1	[illegible]
A11	[illegible]	[illegible]	[illegible]	Relay- ABS failure light	/	E**	1	[illegible]
[illegible]	[illegible]		[illegible]	Relay-	/	E**	1	[illegible]
[illegible]	[illegible]		[illegible]	Relay-	C**	E**	1	[illegible]
A05	[illegible]		[illegible]	Relay-	C**	E**	1	[illegible]
A04	[illegible]		[illegible]	Relay-tail light	/	E**	1	[illegible]
A03	[illegible]		[illegible]	Relay- turnover pump in cab	C**	E**	1	[illegible]
[illegible]	[illegible]		[illegible]	Relay- A/C	C**	E**	1	[illegible]

Assembly requirements:

1. Insert the relays into the relay boxes one by one while paying attention to the specifications and order.
2. Note: Distinguish between relays for C Series and E Series.

Relay and bracket





Assembly requirements:

1. Fix the brackets 1, 2, 3, 8 onto the instrument bracket with bolts and nuts according to the requirements of the figure.

2. Install the relays to these positions reliably. Note: When assembling the relays, select the correct specifications according to the types of cars.

Assembly details:

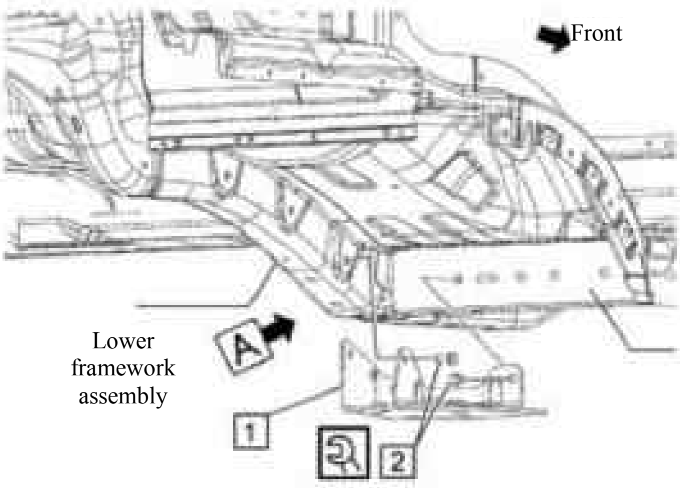
1. Bracket assembly (5305210-D17YZ)
2. Bracket assembly (5305220-D17YZ)
3. Bracket assembly (5305230-D17YZ)
4. Nut (Q32006)
5. Bolt (Q1840616)
6. Bolt (Q1840616)
7. Bolt (Q1840616)
8. Bracket assembly (5305240-D17YZ)
9. Automotive speed control module (5101032-D17YZ)
10. Controller - ABS
11. Flasher relay

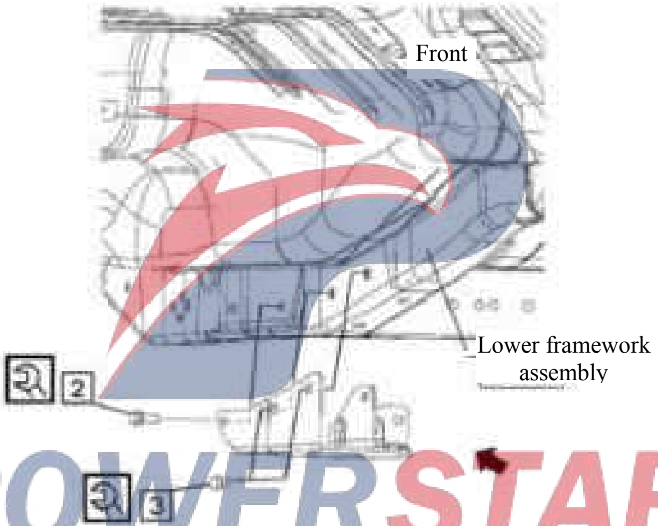
Flasher relay(3712220-CEZ14)

12. Vehicle Information Control Unit (5101031-D17YZ)
13. Relays - wiper
14. CAN Conversion Module (3601010-D17YZ)

15. Relay - door switch
16. Relays - high/low beam
17. Control module - ABS (3204100-912/C)
Control module --ABS(3204100-CEH14)
Control module --ABS(3204100-CEH15)
Control module --ABS

Stiffener assembly -- turning mechanism





Assembly requirements:

1. Fix the stiffener assembly - turnover mechanism 1 to the lower frame assembly with bolts 2 and 3.

2. Torque of bolt 2: 24.7±4.9 N.m; torque of bolt 3: 51.2±7.8 N.m.

Assembly details:

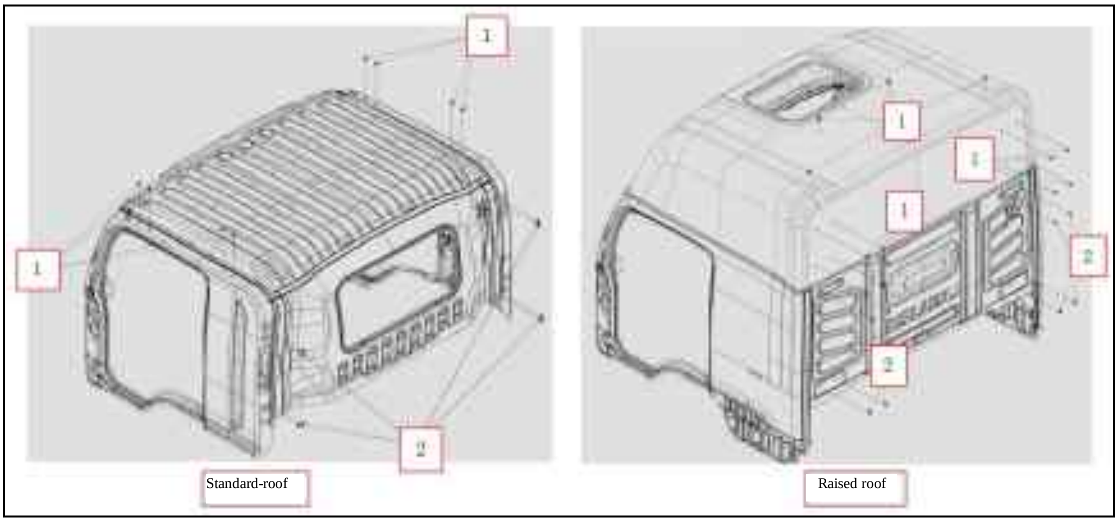
1. Stiffener assembly - turning mechanism

Stiffener assembly -- turning mechanism

2. Hex flange face bolt (Q1840820)

3. Bolt (Q1841030T(P=1.25,9.8))

Cab roof waterproof bolt assembly



Assembly requirements:

1. As shown in the figure, take the screws 1 and 2 and fix them where appropriate in the ceiling of the cab.

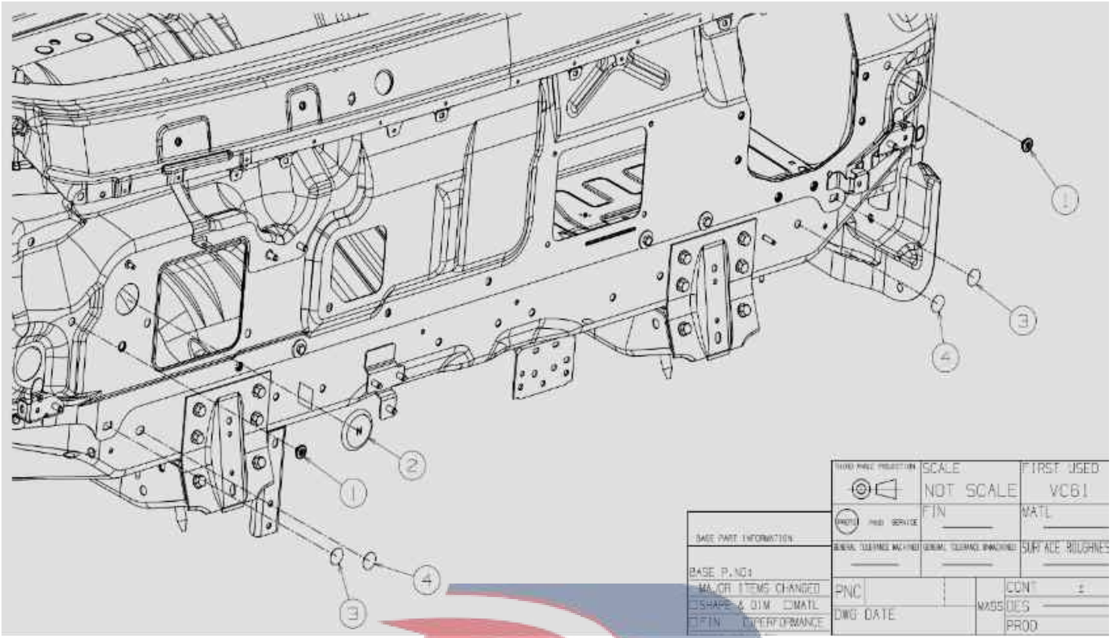
Note: The raised roof must be assembled before the cab installation is completed.

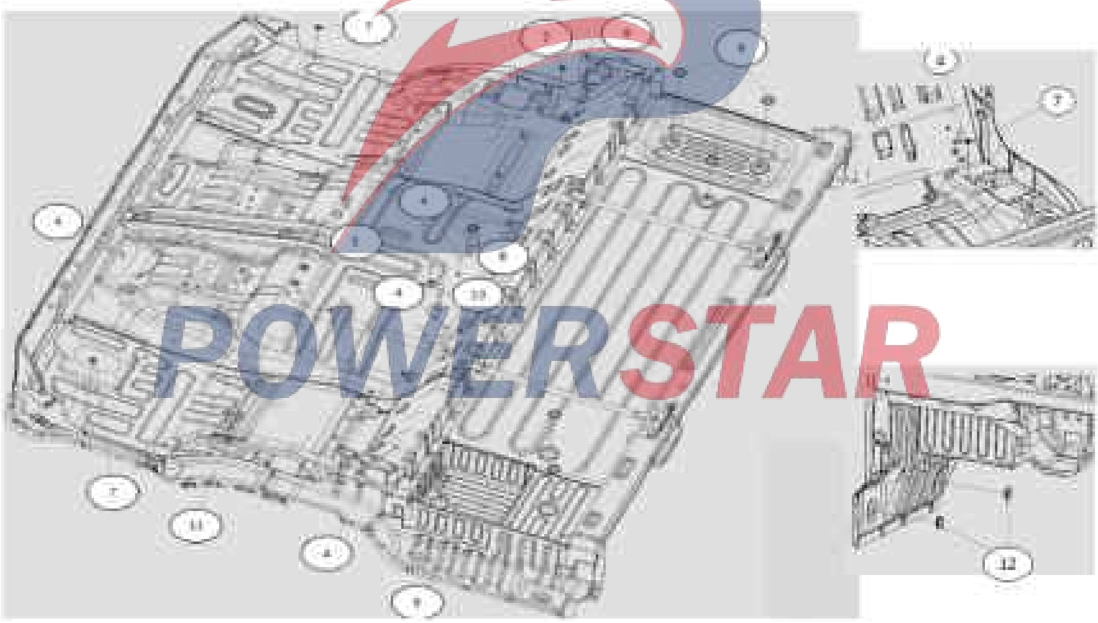
Assembly details:

1. Screw

2. Screw

Cab seal cover - raised roof





Assembly requirements:

1. As shown in the figure, take the screws 1 and 2 and fix them where appropriate in the ceiling of the cab.

Note: The raised roof must be assembled before the cab installation is completed.

Assembly details:

1. Fixing nail
2. Plug
3. Seal cover plate (8200143-803)
4. Seal cover plate (8200143-803)
5. Seal cover plate (8200143-803)
6. Hole cover - antenna cable

7. Plug cover(8101179-117/C)

8. Plug cover(5107611-26)

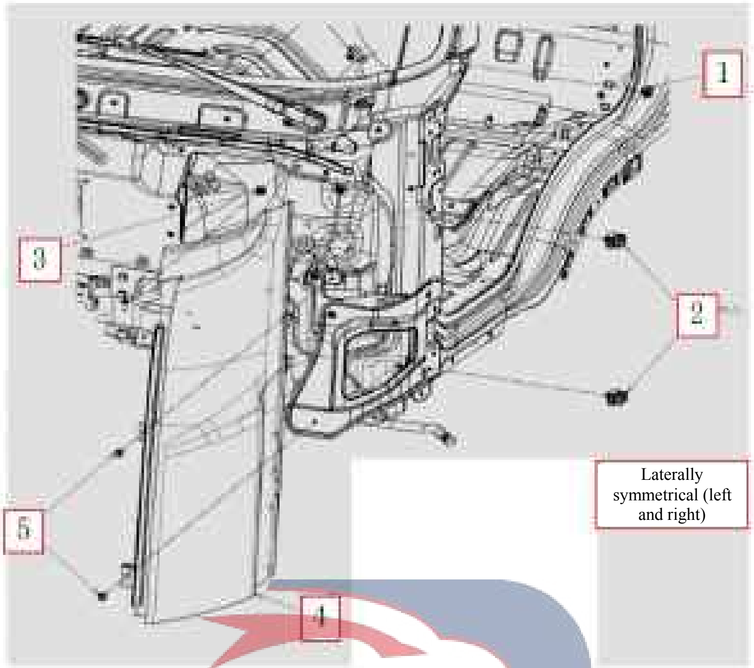
9. Sheath (5107621-D17YZ)

10. Seal cover plate (8200143-803)

11. Rubber plug cover

12. Plug cover (5107611-D17YZ)

Angle plate assembly



Assembly requirements:

1. Fix the staples 1 and 2 to the front pillar.

2. Fix the fastening nail 3 to the front panel.

3. Fix the left/right angle plate 4 to the front pillar.

4. Fix the left / right angle plates 1, 2 with bolt 5.

Assembly details:

1. Clamp nail

2. Clamp nail

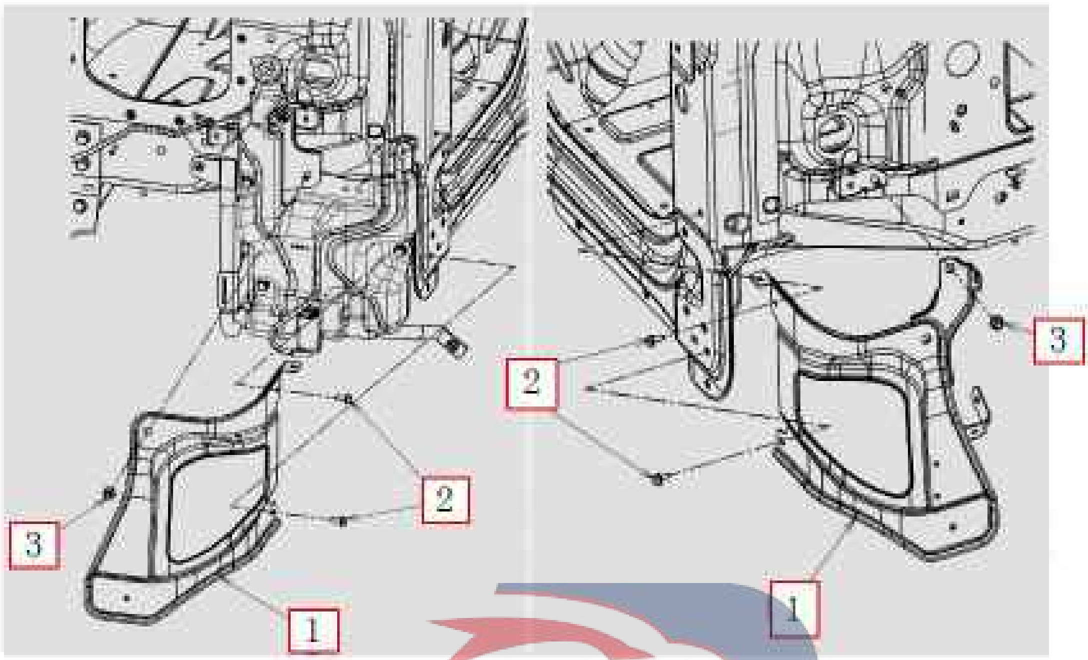
3. Fixing nail

4. Left angle plate assembly (5300110-D17YZ)

Right angle plate assembly (5300120-D17YZ)

5. Bolt

Angle plate bracket assembly



Assembly requirements:

1. Fix the left and right angle plate brackets to the cab with bolt 2 and nut 3.

Assembly details:

1. Right angle plate bracket assembly (5300420-D17YZ)

2. Left angle plate bracket assembly (5300410-D17YZ)

3. Bolt (Q1840616)

4. Nut (Q32008)

Pedal assembly

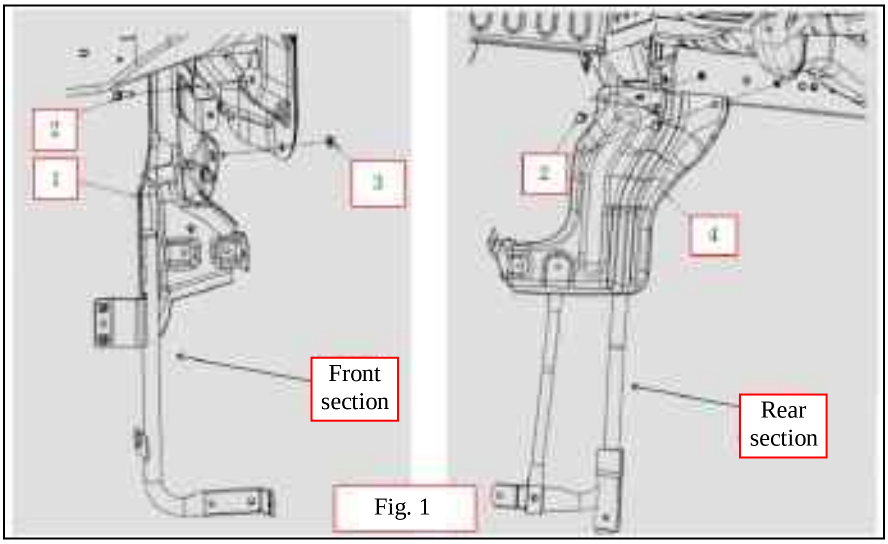


Fig. 1

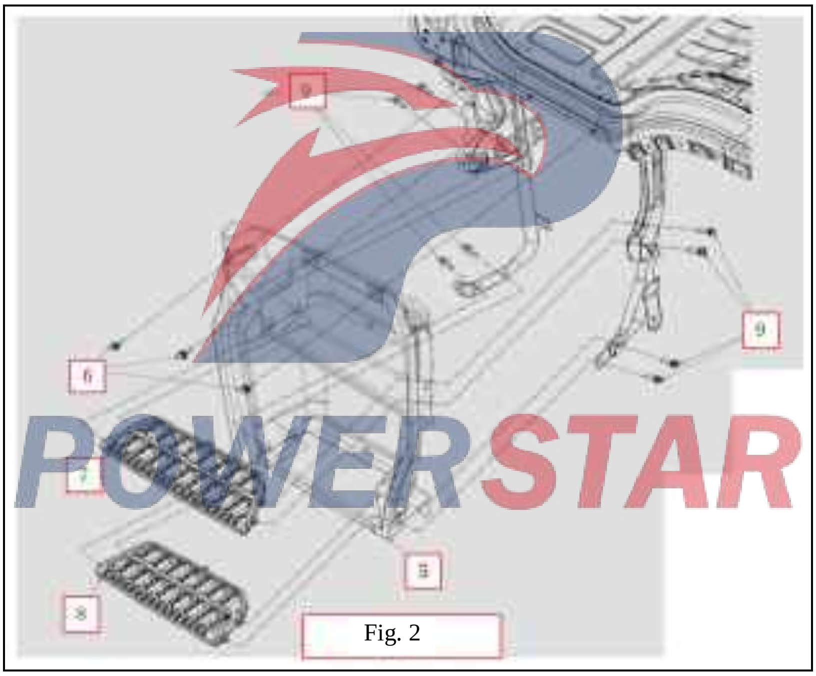


Fig. 2

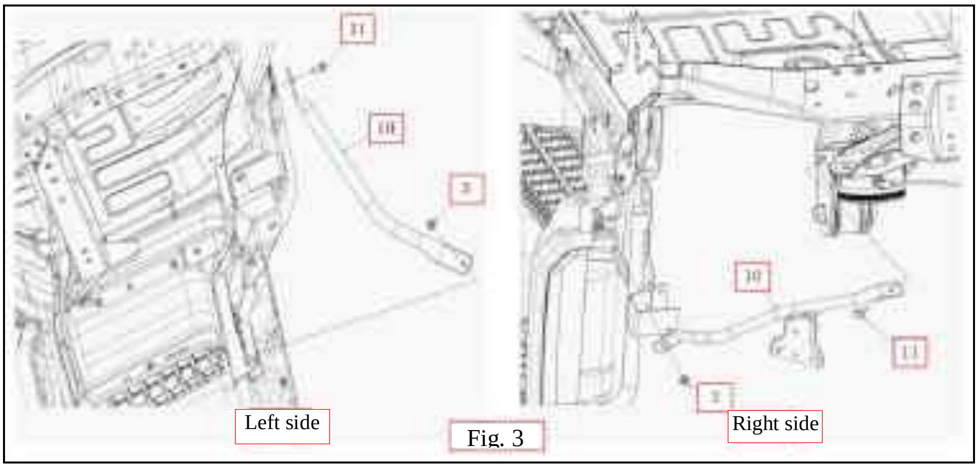


Fig. 3

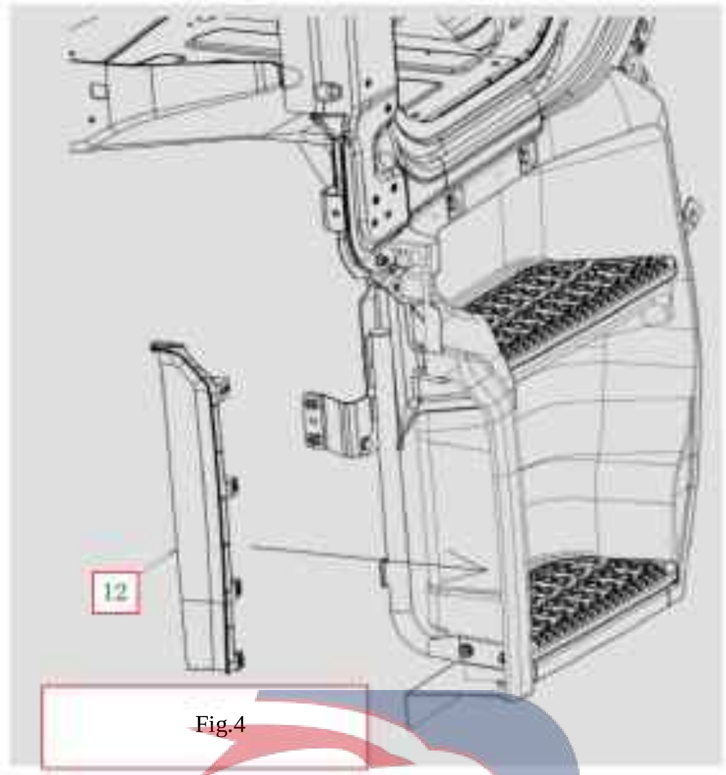


Fig.4

Assembly requirements:

1. Fix the front bracket assembly - left and right pedal 1 with bolt 2 and nut 3, and fix the rear bracket assembly - left and right pedals 4 with bolt 2, as shown in Figure 1.

2. Fix the upper part of the pedal assembly 5 on both sides with bolt 6, and fix the lower part of pedal assemblies 7,8, as shown in Figure 2.

3. Fix the bracket assembly - pedal 10 with nut 3 and hex flange bolt 11, as shown in Figure 3.

4. Install the pedal side cover assembly 12 onto the pedal assembly 5 as shown in Figure 4.

5. Torque of bolts 2, 9, 11, and nut 3: 22.8±6.9 N.m.

Assembly details:

1. Front bracket assembly - right pedal (8405040-D17YZ)

Front bracket assembly—left pedal (8405030-D17YZ)

2. Bolt (Q1840820)

3. Nut (Q32008)

4. Rear bracket assembly - right pedal (8405060-D17YZ)

Rear bracket assembly—left pedal (8405050-D17YZ)

5. Right pedal assembly (8405020-D17YZ)

Left pedal assembly(8405010-D17YZ)

6. Bolt

7. The second section of pedal-Right (8405022-D17YZ)

The second section of pedal-Left (8405012-D17YZ)

8. The second section of pedal-Right (8405021-D17YZ)

The second section of pedal-Left (8405011-D17YZ)

9. Bolt (8405013-D17YZ)

10. Bracket (8405080-D17YZ)

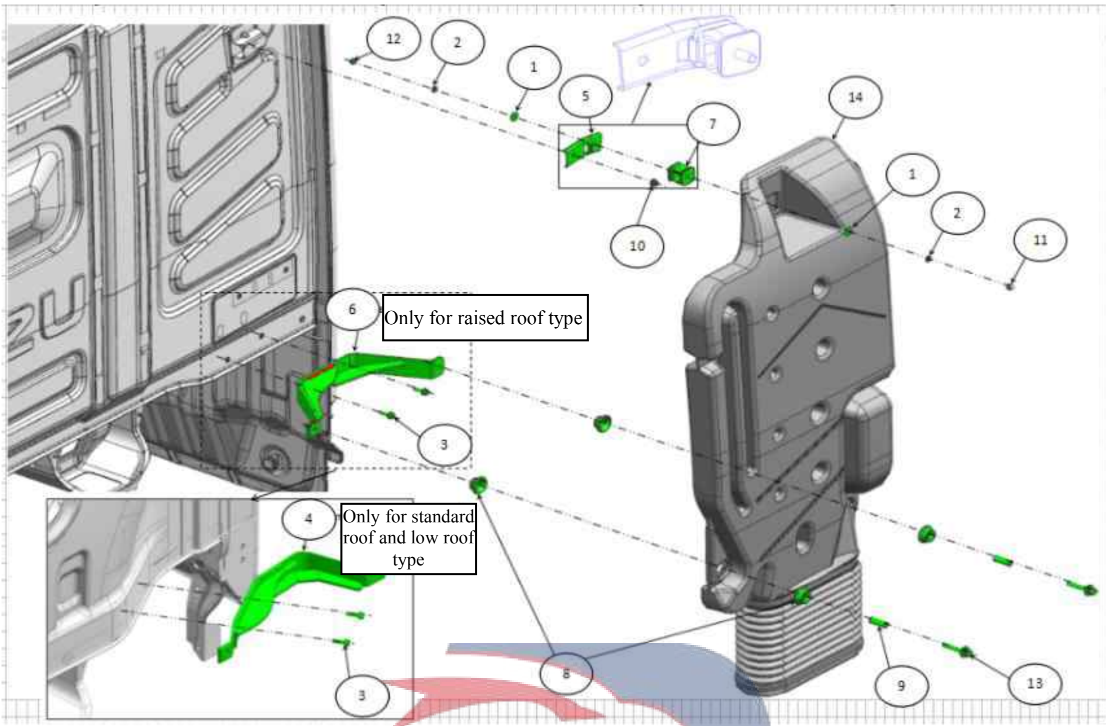
Bracket (8405070-D17YZ)

11. Bolt (Q1840820)

12. Pedal side cover plate - right (8405232-D17YZ)

Pedal side cover plate-left (8405231-D17YZ)

Air intake device fixing



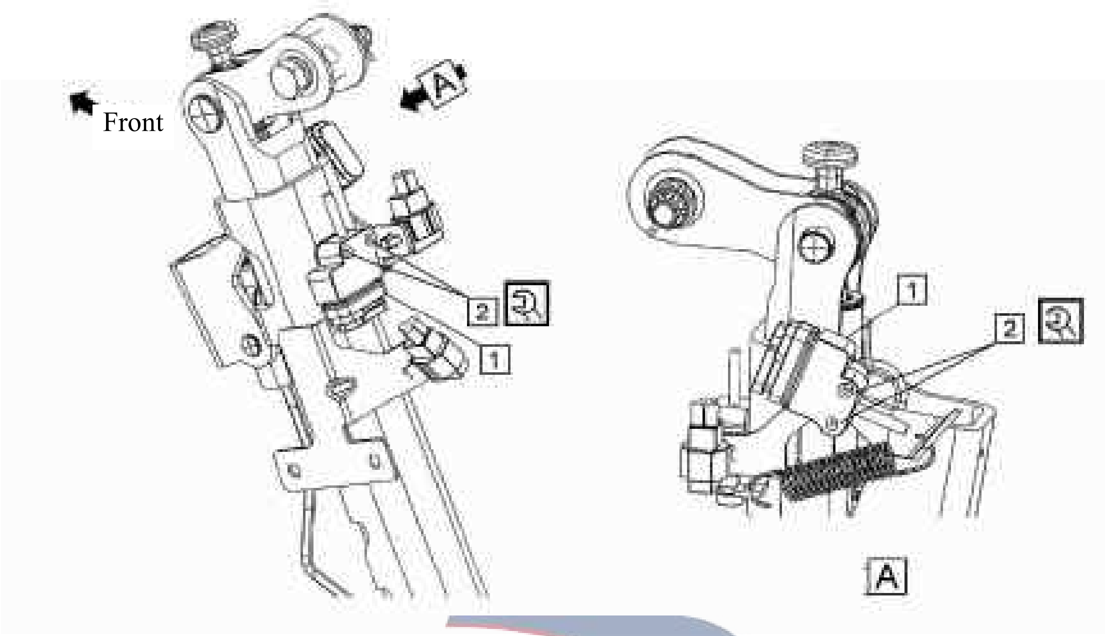
Assembly requirements:

1. Fix the bracket assemblies 9, 10 to the cab with bolt 11 and nut 5.
2. Fix the rubber mounting system 8 to the bracket 9 with nut 3, spring washer 12, and flat gasket 13.
3. Fix the air intake device with bolt 2, nuts 4 and 6, rubber support 7, spring washer 12, flat gasket 13.

Assembly details:

1. Flat washer
2. Spring washer (Q40308)
3. Bolt
4. Bracket assembly -- air filter
5. Bracket assembly -- air filter
6. Bracket assembly -- air filter (1109560-D17YZ)
7. Rubber suspension - air filter (1109530-803)
8. Rubber support
9. Nut
10. Nut (1109551-803)
11. Nut
12. Nut
13. Bolt
14. Air intake device

Switch-cab tilting



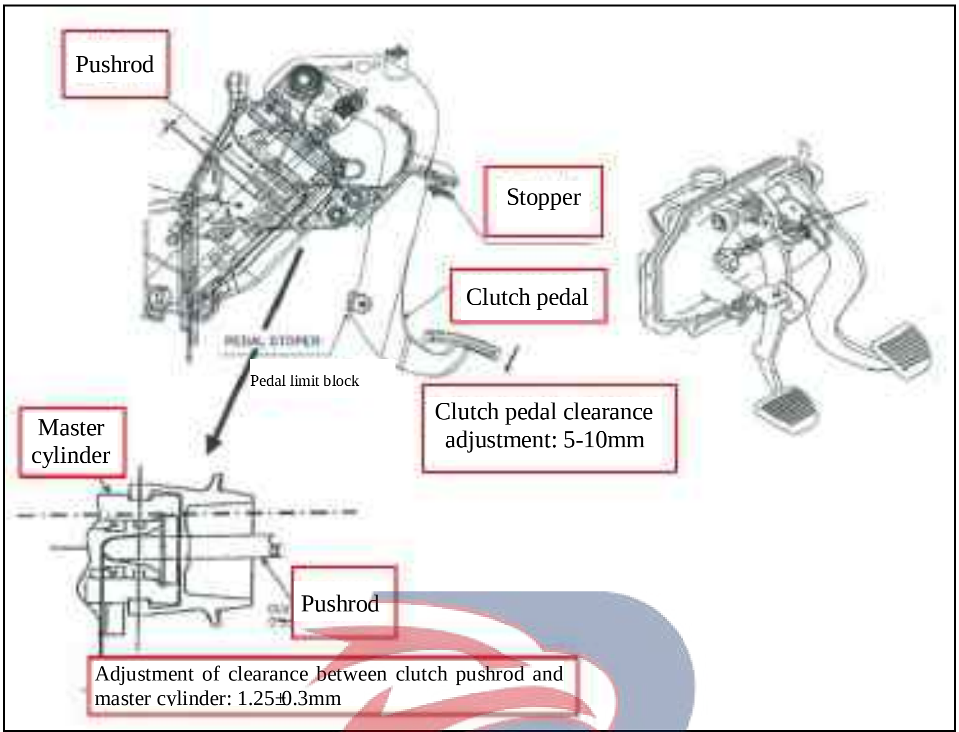
Assembly requirements:

1. Fix the switch - cab tilting mechanism 1 onto the bracket with bolt 2.

Assembly details:

1. Switch - cab tilting mechanism
2. Bolt (Q1840625)

Clutch pushrod adjustment



Assembly requirements:

1. Loosen the pushrod nut, and turn the pushrod so that the end of the pushrod is in contact with the piston;
2. Mark the putter with a white (or red) marker, and turn the pushrod back by 3/4 - 5/4 of turns (270°-450°);
3. Tighten the pushrod lock nut at a torque of 19.6±5 N.m.

Clutch assembly cover plate installation

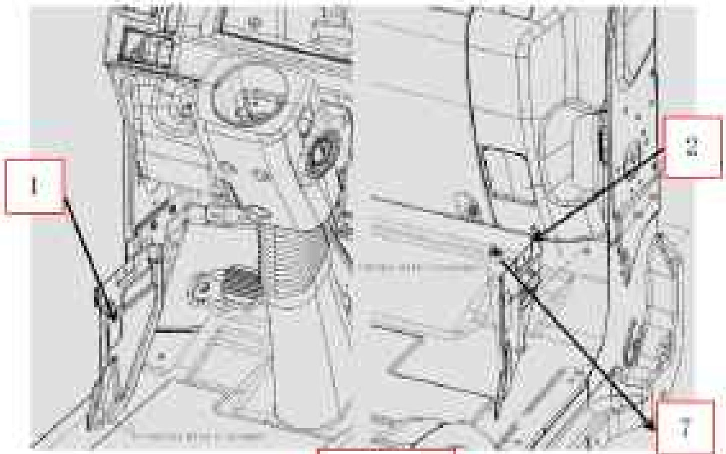


Fig. 1

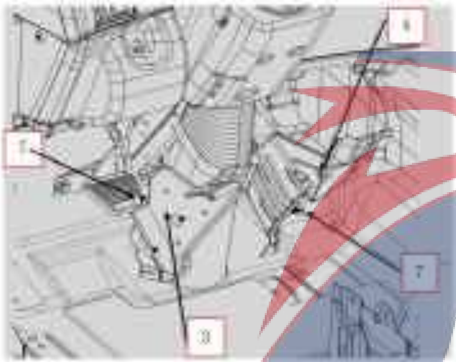


Fig. 2

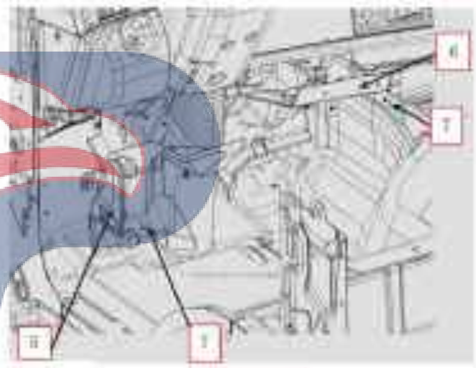


Fig. 3

Assembly requirements:

1. As shown in Figure 1, fix the lower cover plate of front pillar on both sides onto the both sides of the front inside of the cab with fastening nail 7.

2. As shown in Figure 2, fix cover plates 3,4 onto the both sides of steering column with fastening nail 7.

3. As shown in Figure 3, fix cover plates 5,6 onto the both sides of clutch pedal with fastening nail 7. Note: Assemble them in strict accordance with the order of Figures 1 to 3. Throttle and clutch pedal covers are installed in place, and the nails are fastened reliably.

Assembly details:

1. Lower cover plate of left front pillar (8200168-D17YZ)

2. Lower cover plate of right front pillar(8200169-D17YZ)

3. Clutch pedal cover plate - right (8200165-D17YZ)

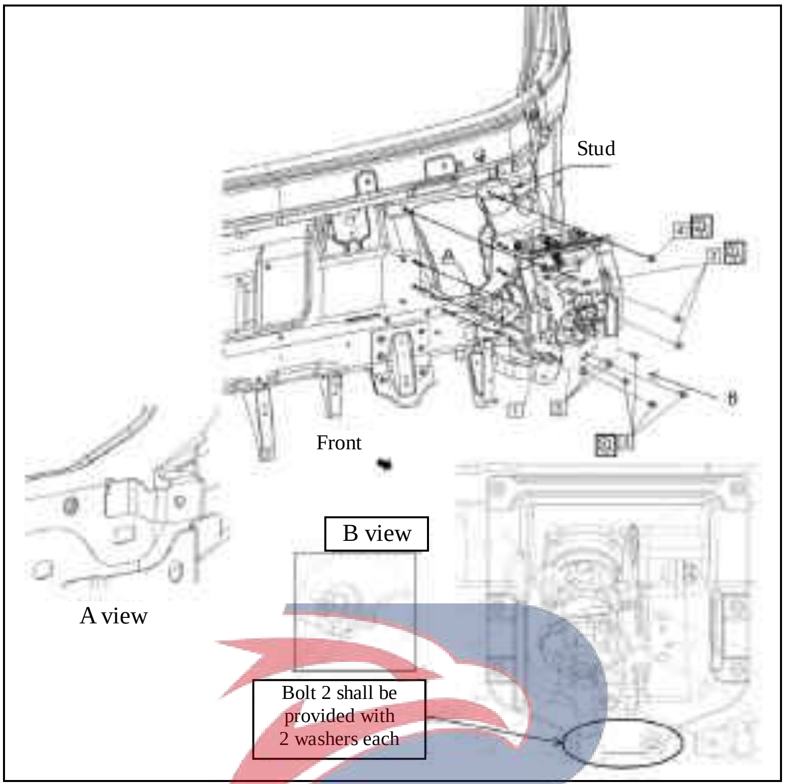
4. Accelerator pedal cover plate - left (8200166-D17YZ)

5. Clutch pedal cover plate - left(8200164-D17YZ)

6. Accelerator pedal cover plate - right(8200167-D17YZ)

7. Fixing nail (8200171-D17YZ)

Pedal and mounting bracket assembly



Assembly requirements:

1. As shown in the figure, place the upper right mounting hole on pedal and mounting bracket assembly to the left front panel studs of the cab, and put on nut (4).

2. Align the mounting hole. Insert the bolt (2) through the hole in the upper part of the pedal and mounting bracket assembly (1), and screw the bolt into the screw hole on the front panel. Make sure that they are only preloaded and not fastened.

3. Insert bolt (2) into washer (3), and get them through the lower part of the pedal and mounting bracket assembly (1), and screw the bolt into the screw hole on the front panel. Make sure that they are only preloaded and not fastened.

4. Tighten bolt (2) and nut (4) one by one at a torque of 24.2 (22.4-26.0) N·m.

Assembly details:

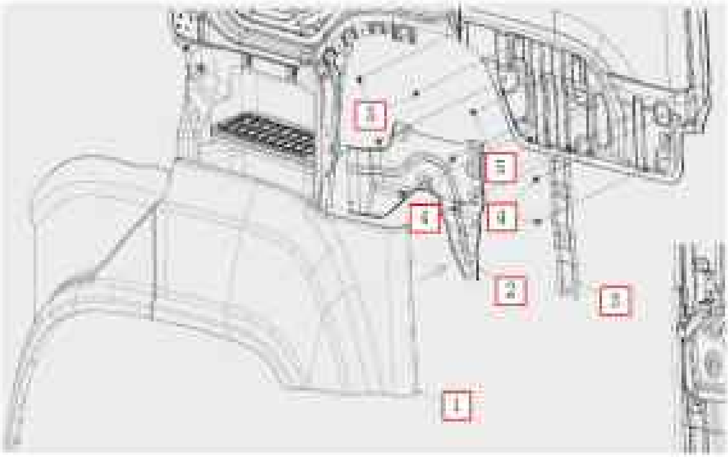
1. Pedal and mounting bracket assembly (3504010-D17YZ)

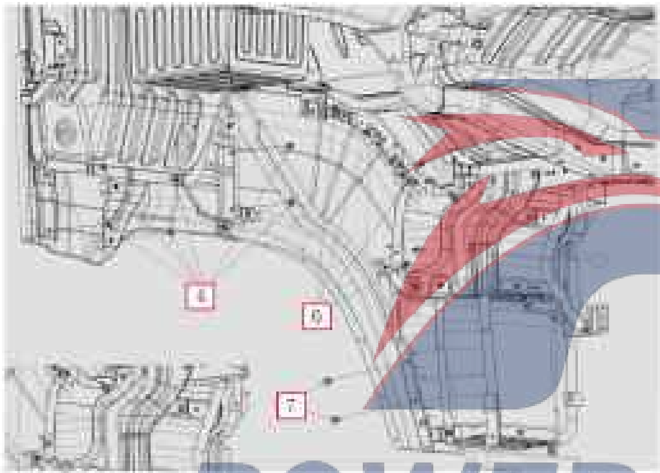
2. Bolt

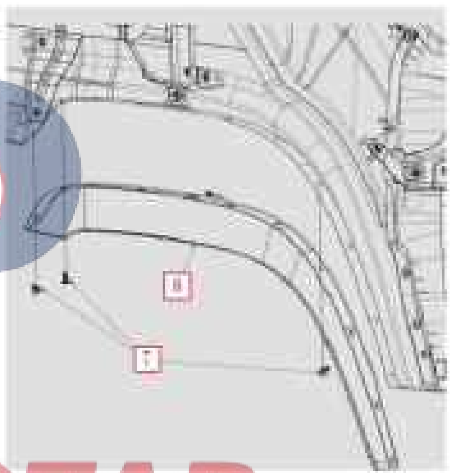
3. Washer (Q40208)

4. Nut (Q32008T13F2)

Wheel brow assembly







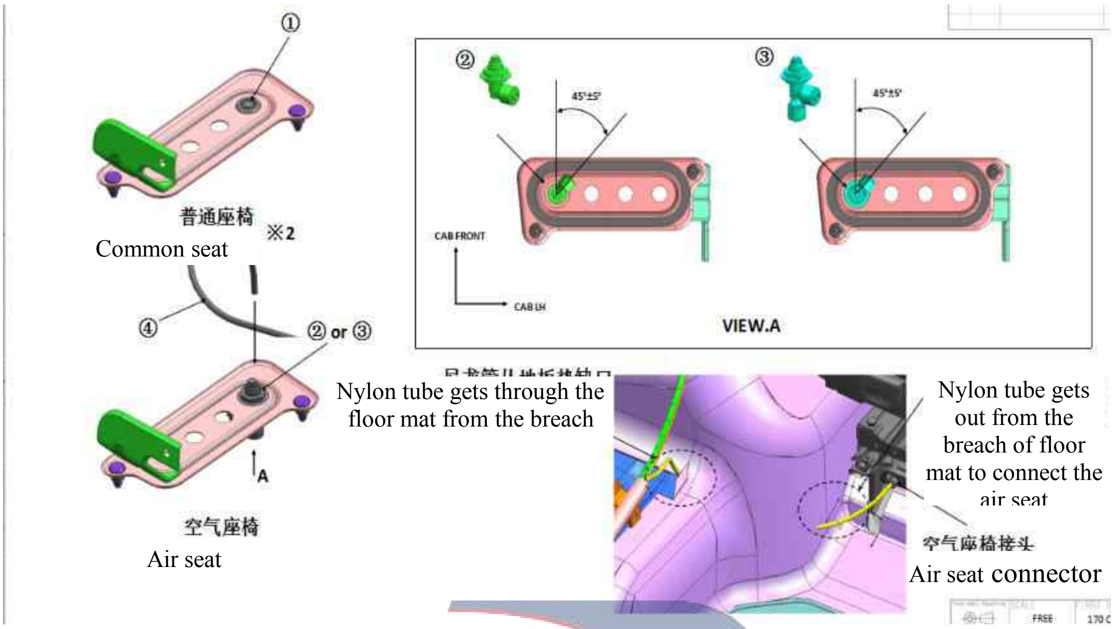
Assembly requirements:

1. As shown in the figure, fix the wheel brow on the bracket as required.

Assembly details:

1. Wheel brow assembly - left (5402010-D17YZ)
   Wheel brow assembly -right(5402200-D17YZ)
2. Right rear wheel brow bracket (8200846-D17YZ)
   Left rear wheel brow bracket(8200836-D17YZ)
3. Bracket (5109087-D17YZ)
4. Bolt (5402201-D17YZ)
5. Fixing nail (8101312-117/C)
6. Bolt (5402201-D17YZ)
7. Fixing nail (8101314-117/C)
8. Under left wheel brow (5402441-D17YZ)
   Under right wheel brow (5402421-D17YZ)

Nylon tube connector subassembly



Assembly requirements:

1. Depending on the vehicle configuration, attach connector 2 or 3 to the bracket

Assembly details:

1. Plug cover

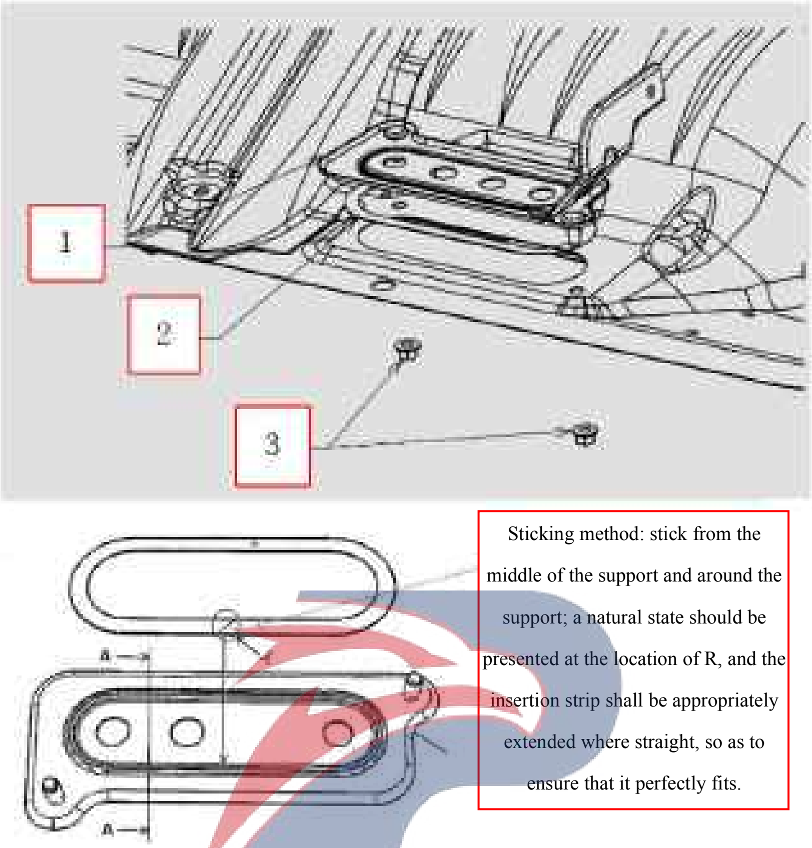
2. Connector - air seat（6800022-D17YZ）

3. Connector - air suspension (6800021-D17YZ)

4. Nylon tube assembly - common seat (8100670-D17YZ)

Nylon tube assembly - air seat (8100650-D17YZ)

Nylon tube connector subassembly



Assembly requirements:

1. Take the insertion strip 2 and put it around the nylon pipe connector support 1. Note: its sticking mode shall be reasonable.

1. Fix the support 1 where as shown in the cab figure with the nut 3.

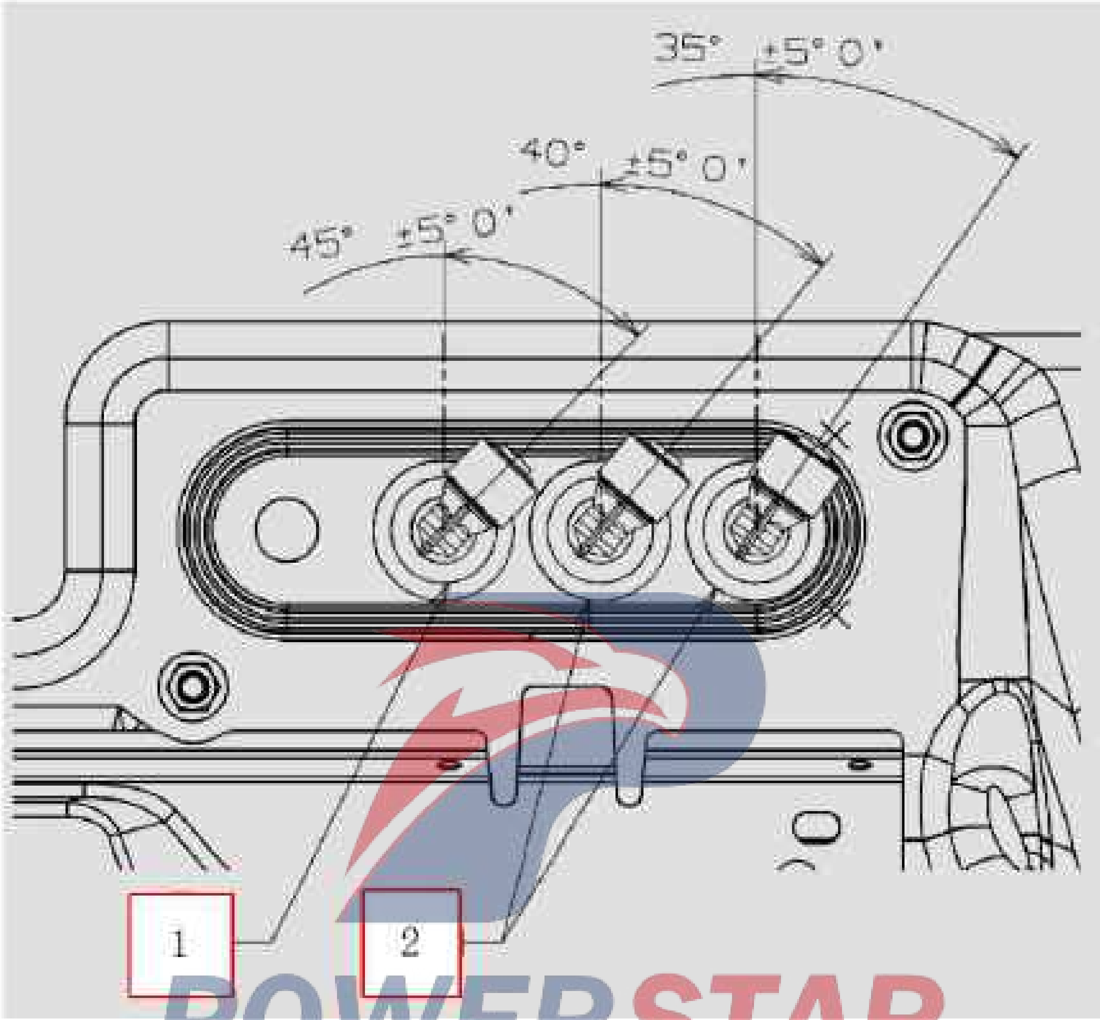
Assembly details:

1. Bracket (8100690-D17YZ)

2. Insertion strip

3. Nut（Q32008）

Nylon hose connector subassembly



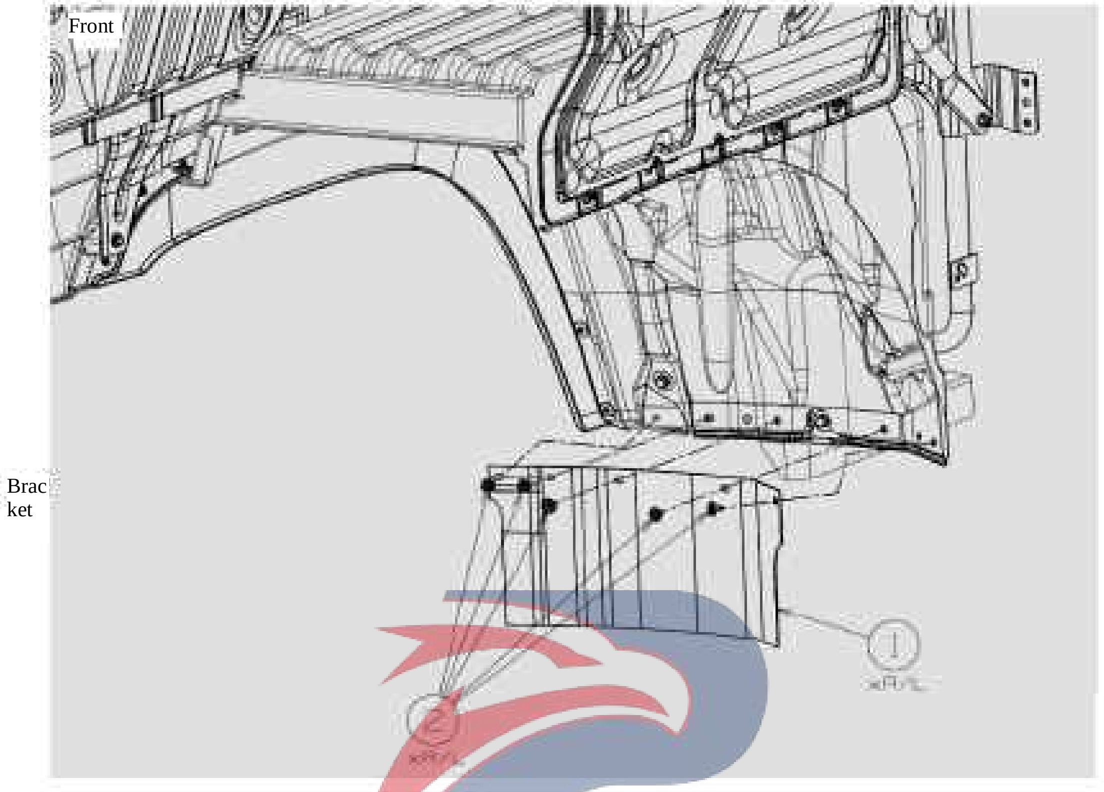
Assembly requirements:

1. Take the connectors 1 and 2 and fix them on the support. Note: their inclination angles shall be reasonable.

Assembly details:

1. Connector (8100657-D17YZ)
2. Connector (8100657-D17YZ)

Front fender assembly



Laterally symmetrical (left and right)

Assembly requirements:

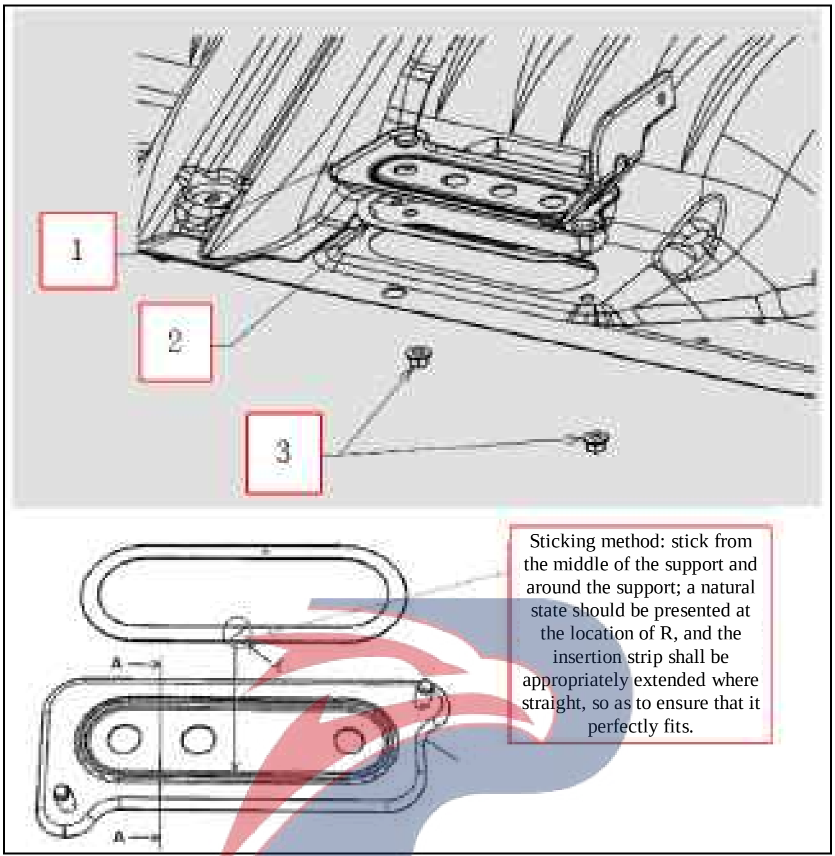
1. Fix front fender 1 onto the front side of cab wheel cover with fastening nails.

Assembly details:

1. Front fender (3102175-D17YZ)

2. Fixing nail (8405123-117/C)

Nylon tube connector subassembly



Assembly requirements:

1. Take the insertion strip 2 and put it around the nylon pipe connector support 1. Note: its sticking mode shall be reasonable.

1. Fix the support 1 where as shown in the cab figure with the nut 3.

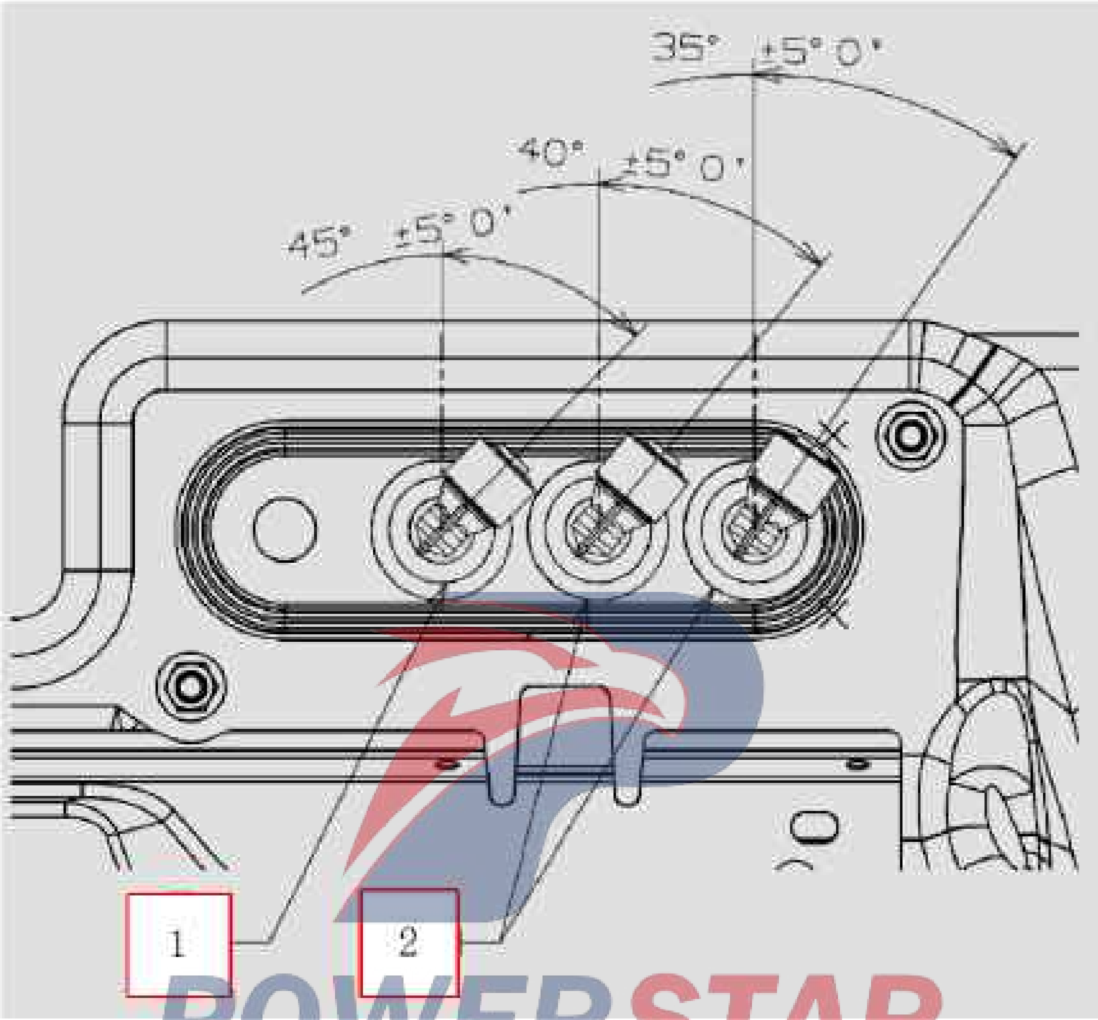
Assembly details:

1. Bracket (8100690-D17YZ)

2. Insertion strip

3. Nut (Q32008)

Nylon tube connector subassembly



Assembly requirements:

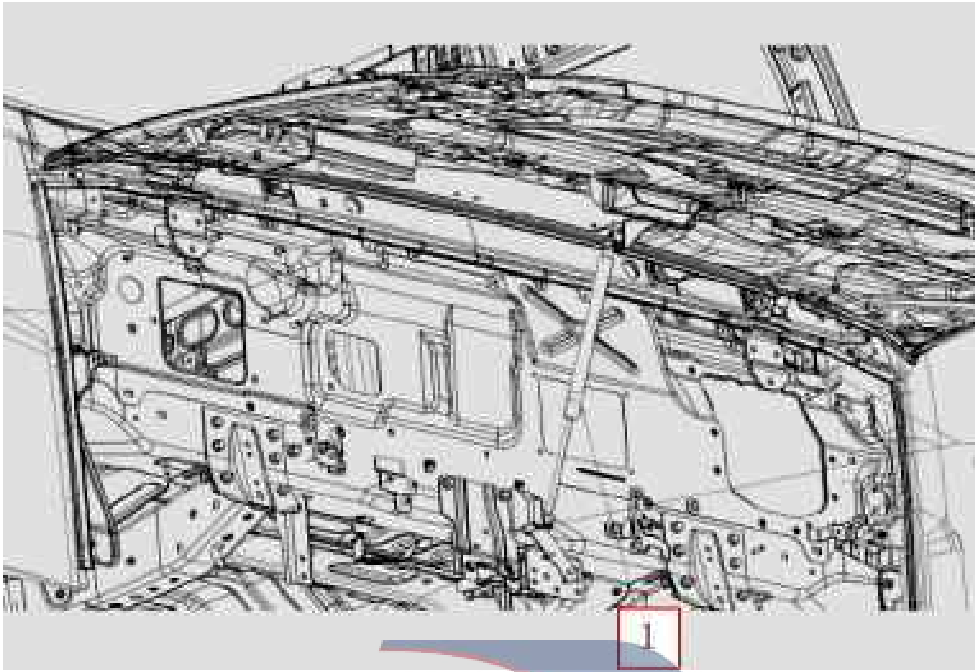
1. Take the connectors 1 and 2 and fix them on the support. Note: their inclination angles shall be reasonable.

Assembly details:

1. Connector (8100657-D17YZ)

2. Connector (8100657-D17YZ)

Strut rod-front panel



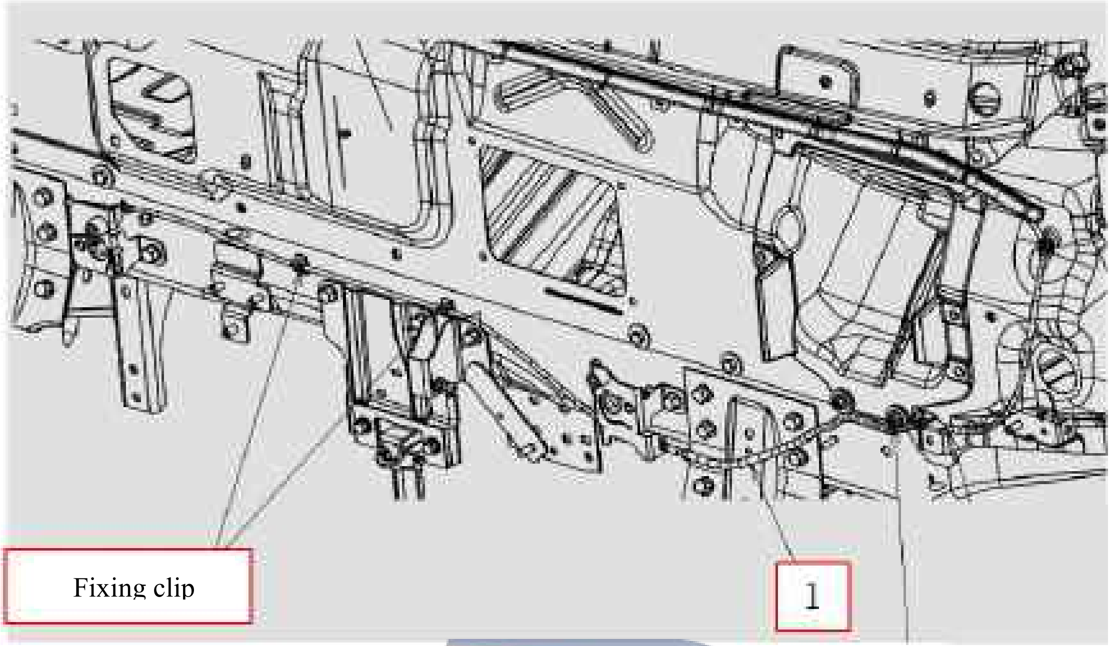
Assembly requirements:

1. Insert the strut assembly 1 into the ball head of the mounting bracket.
   Note: Pay attention to the orientation of the front panel struts during assembling

Assembly details:

1. Strut assembly - front panel (5302340-D17YZ)

Fixing nail assembly



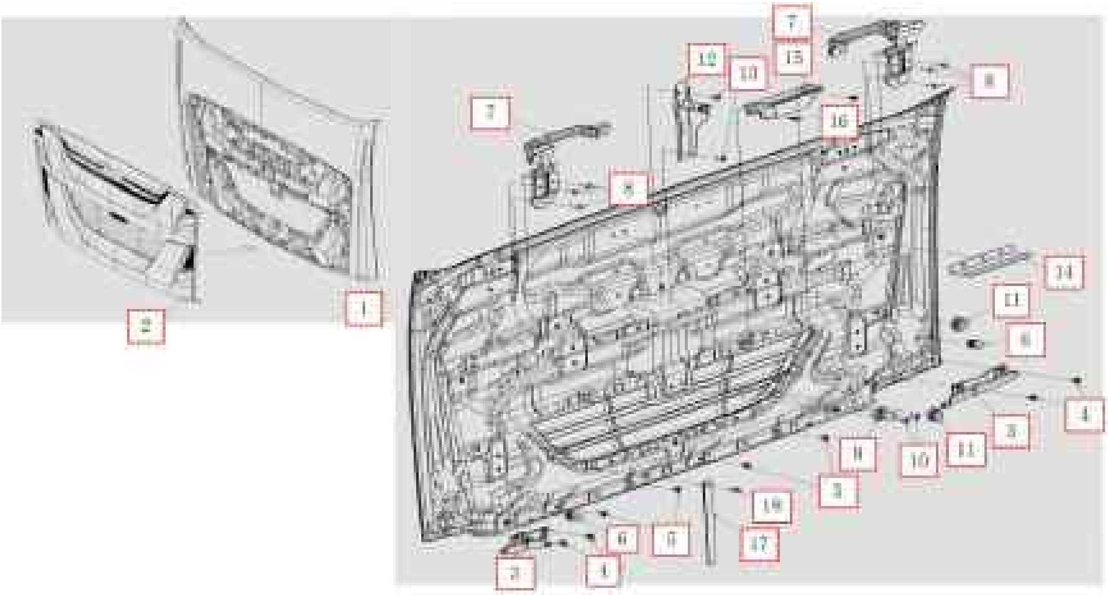
Assembly requirements:

1. Assemble the cable 1 as shown in Figure 1 and pay attention to the sequence.

Assembly details:

1. Cable assembly - front panel (5302040-D17YZ)

Front panel subassembly



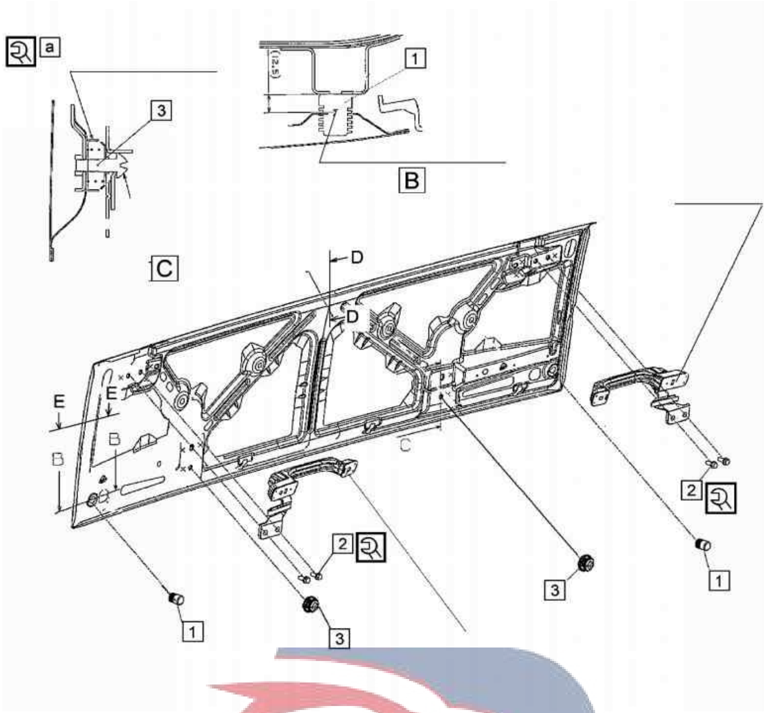
Assembly requirements:

1. Fix radiator hood assembly 2 to front panel assembly 1;
2. Install the corresponding parts to the front panel assembly as shown.

Assembly details:

1. Front panel assembly (5302010-D17YZ)
2. Hood assembly - radiator (1301110-D17YZ)
3. Cover plate (5302113-D17YZ)
Cover plate (5302112-D17YZ)
4. Fixing nail-front fender cover (8405123-117/C)
5. Fixing nail-front fender cover (8405123-117/C)
6. Rubber gasket (8101231-117/C)
7. Right assist handle assembly (5300160-D17YZ)
Left assist handle assembly (5300150-D17YZ)
8. Bolt (Q1840620)
9. Stopper (5302332-D17YZ)
10. Bolt (5302331-D17YZ)
11. Stopper assembly - front panel (5302330-D17YZ)
12. Bracket assembly (5302360-D17YZ)
13. Bolt (5302331-D17YZ)
14. Lower sealing strip assembly - front panel (5302370-D17YZ)
15. Cover plate (5302481-D17YZ)
16. Screw
17. Extension strap (5302381-D17YZ)
18. Bolt (5302382-D17YZ)

Front panel subassembly



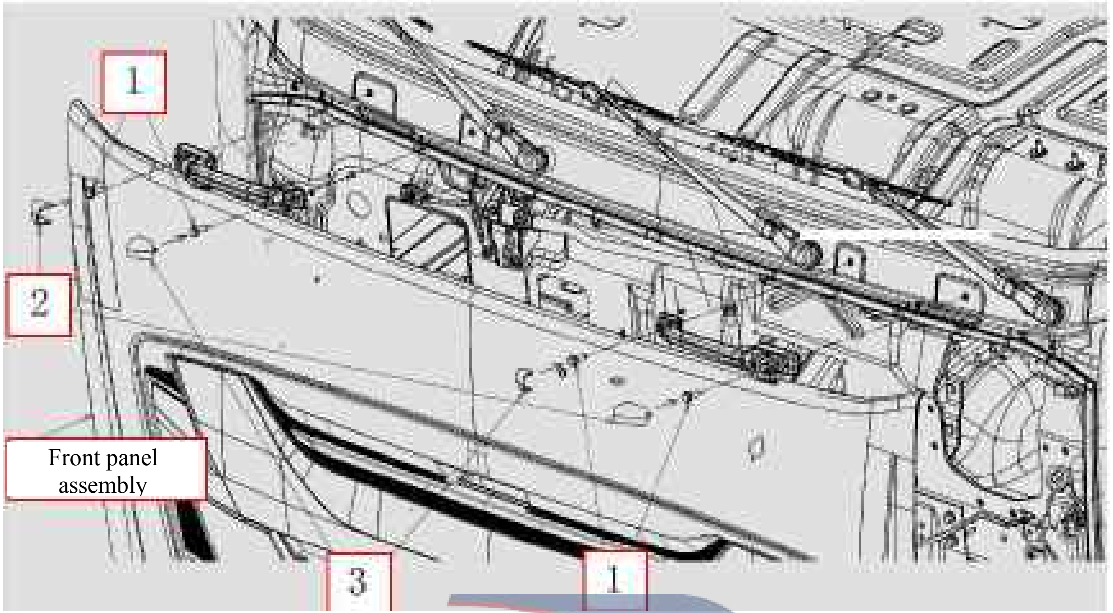
Assembly requirements:

1. The rubber pad 1 is fixed to the panel assembly, leaving a length of 12.5 mm, as shown in Figure B.
2. Fix the handle with bolt 2 at a torque of 25.8±7.8N.m.
3. The stopper assembly - front panel 3 is fixed to the panel assembly at a torque of 15.7±4.9N.m.

Assembly details:

1. Rubber gasket (8101231-117/C)
2. Hex flange face bolt (Q1840820)
3. Stopper assembly -- front panel

Front panel assembly



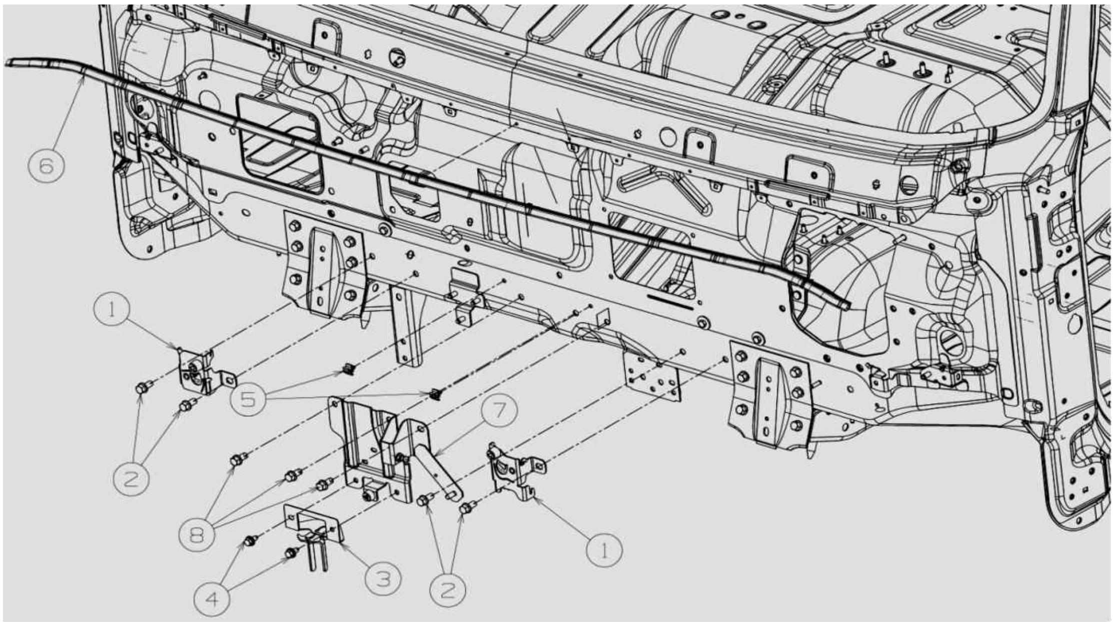
Assembly requirements:

1. Fix the front panel assembly to the front panel of the cab with bolt 1 at a torque of 25.8±7.7 N.m;
2. Install cover plates 2 and 3 on the front panel handle.

Assembly details:

1. Bolt (Q1840830T×1.25，10.9 级)
2. Cover plate (5302011-117)
3. Cover plate (5302012-117)

Front panel lock assembly



Assembly requirements:

1. Fix the lock sub-assembly - front panel 1 and bracket 7 onto the front panel of the cab with bolts 2 and 8 at a torque of 47.1±11.8 N.m.

2. Fix the switch board assembly - front panel 3 onto the bracket 7 with bolt 4 at a torque of 20.1±6.7 N.m.

3. Fix the fastening nails of front panel sealing strips onto the cab.

4. Install the front panel fastener clip 5 onto the cab.

Assembly details:

1. Lock sub-assembly - front panel (5302320-D17YZ)

Lock sub-assembly -- front panel(5302310-D17YZ)

2. Hex flange face bolt (Q1841020)

3. Lock assembly - front panel (5302300-D17YZ)

4. Bolt (1702244-P301)

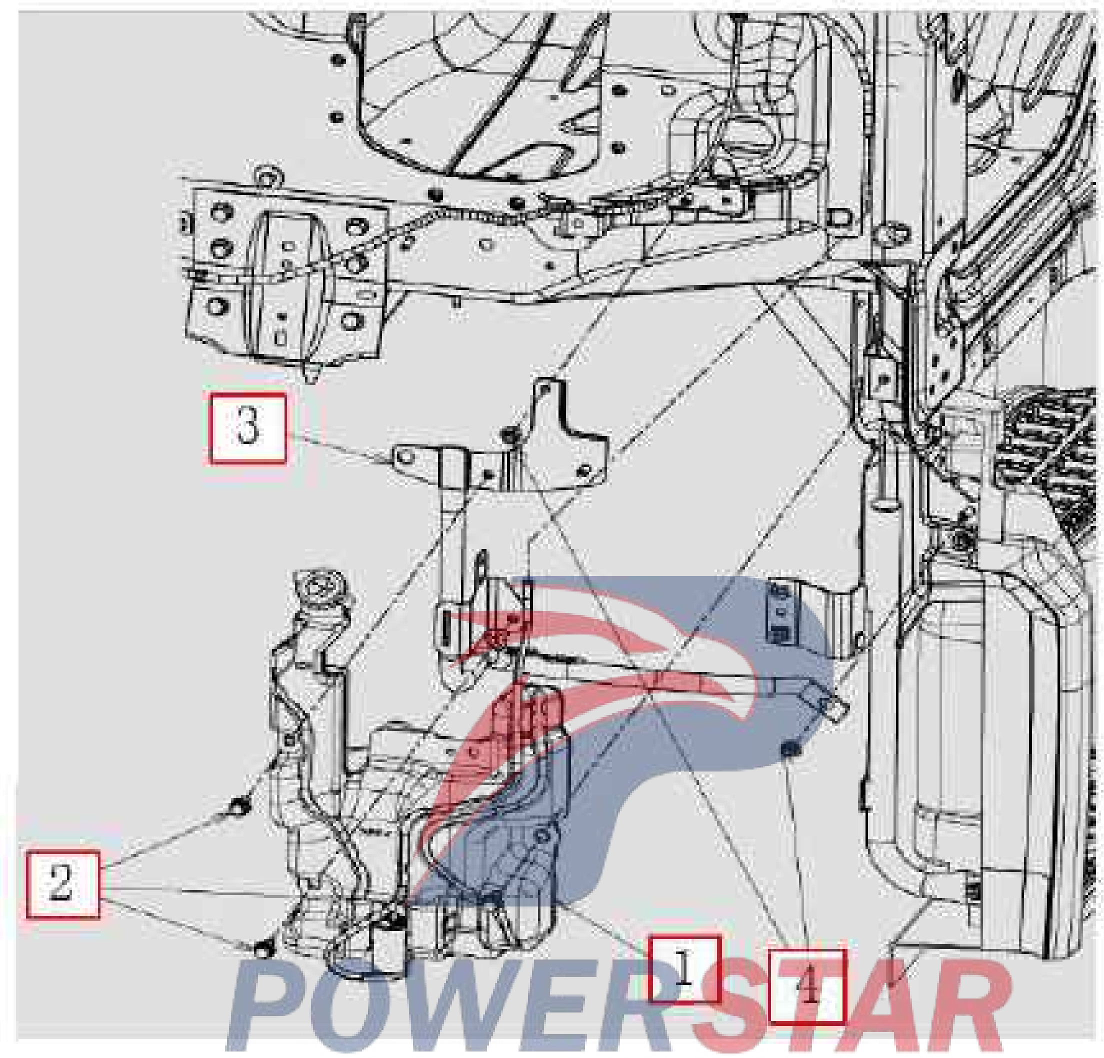
5. Clip (8402105-44)

6. Sealing strip assembly - front panel (5206051-D17YZ)

7. Bracket assembly (5302350-D17YZ)

8. Hex flange face bolt (Q1841020)

Detergent tank assembly



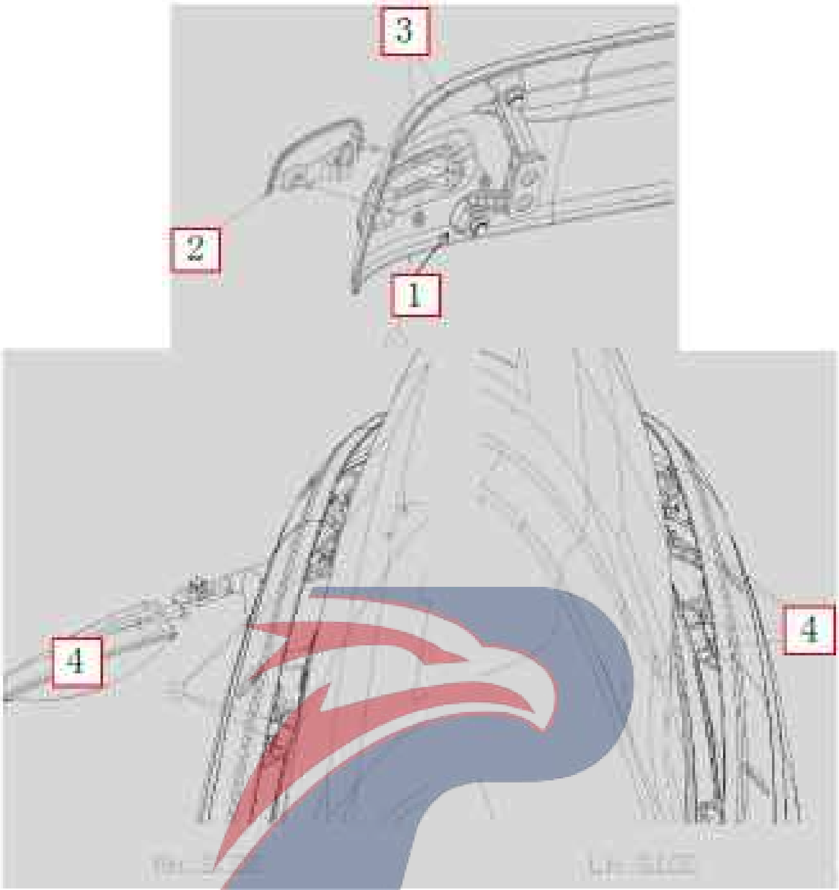
Assembly requirements:

1. Fix bracket (3) to the illustrated position with bolt 2.
2. Fix detergent tank assembly 1 to bracket 3 with nut 4.

Assembly details:

1. Detergent tank and pump assembly (5207010-D17YZ)
2. Bolt
3. Bracket assembly (5207020-D17YZ)
4. Nut (Q32008)

Vent visor assembly



Assembly requirements:

1. Fix clearance lamp 2 to the vent visor with nut 3.
2. Install the vent visor assembly 1 on the mounting bracket with bolt 4

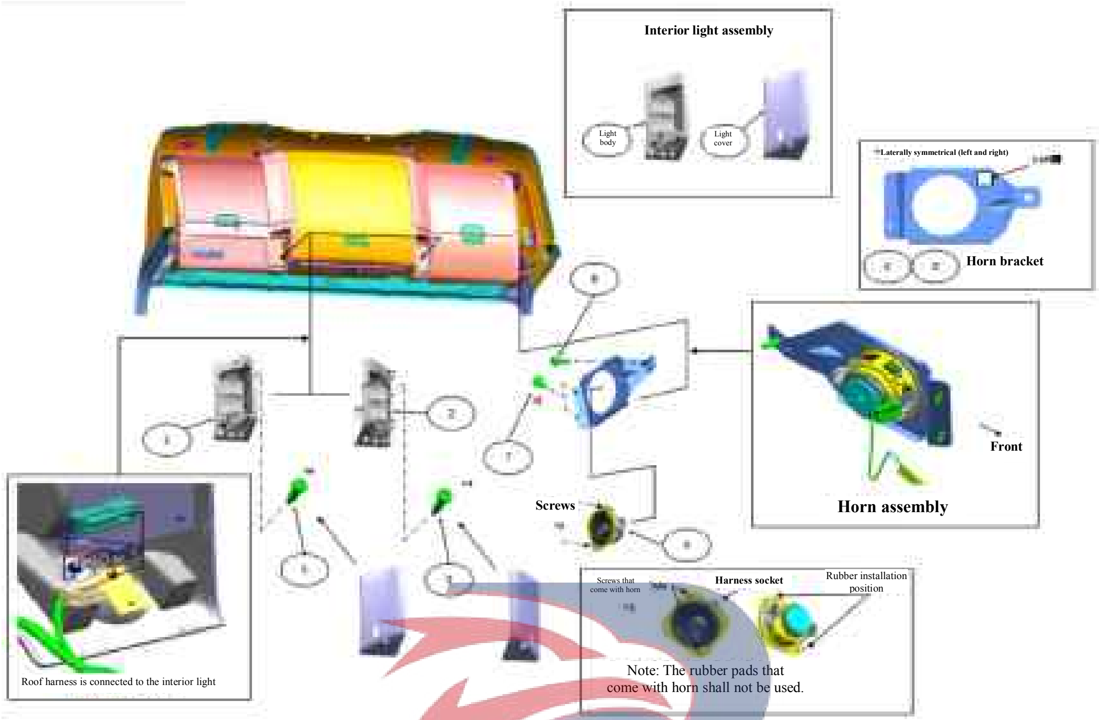
Assembly details:

1. Vent visor (raised roof) (8204110-D17YZ)
   Vent visor (standard roof)(8204110-D34EZ)
2. Right top clearance lamp (3731020-D17YZ)

Left top clearance lamp (3731010-D17YZ)

3. Nut (Q32006)
4. Bolt (Q1840845)

Interior lights, horns



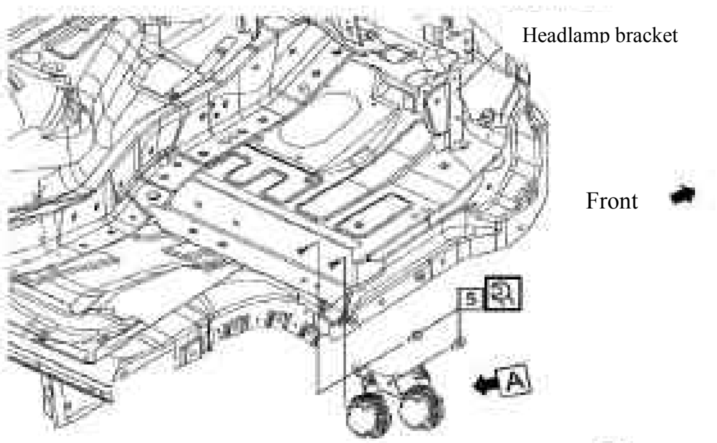
Assembly requirements:

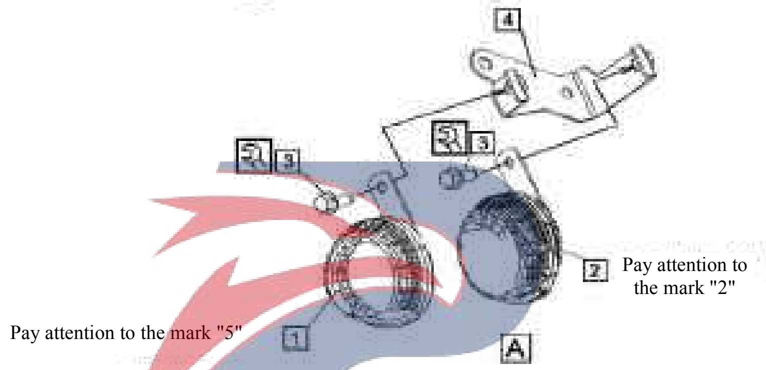
1. As shown in the figure, take the left and right side walls 1 and 2 and install them on the left and right sides to the ceiling using the fixing nails (3).

Assembly details:

1. Interior light - Left (3714030-D17YZ)
2. Interior light -Right (3714040-D17YZ)
3. Screw (Q2715519)
4. Horn bracket - left (3721131-D17YZ)
5. Horn bracket - Right (3721132-D17YZ)
6. Horn (3721030-D17YZ)
7. Screw
8. Bolt (Q1840616)

Horn





Assembly requirements:

1. Fix the compound horns 1 and 2 to the bracket 4 with hex head bolts, spring washers and flat pad assembly 3.

2. Fix the bracket 4 onto the bracket with hex head bolts, spring washers and flat pad assembly 5.

3. Torque of bolt assembly 3,5: 17.15±7.15N.m

Assembly details:

1. Loudspeaker

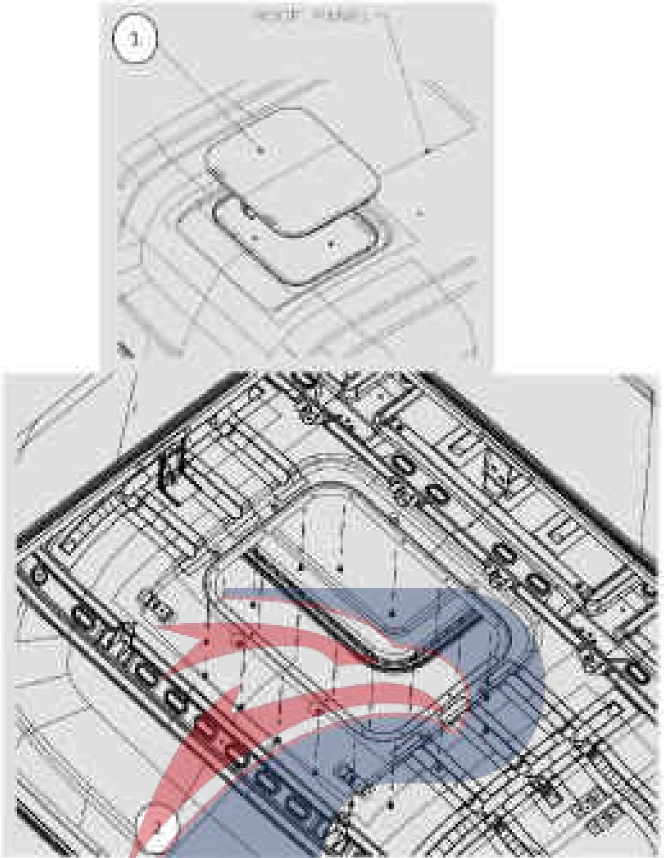
2. Bass horn

3. Assembly of hex head bolt, spring washer, and flat washer (3724333-801)

4. Bracket -- horn(3721111-D17YZ)

5. Assembly of hex head bolt, spring washer, and flat washer (3724333-801)

Skylight assembly



Assembly requirements:

1. Install locating pins on both sides of the skylight assembly 1, as shown in Figure 1 on the right.

2. Firmly attach the manual chuck to the inside of the skylight assembly, as shown in Figure 2.

3. Affix the skylight assembly 1 on top of the cab in the right direction.

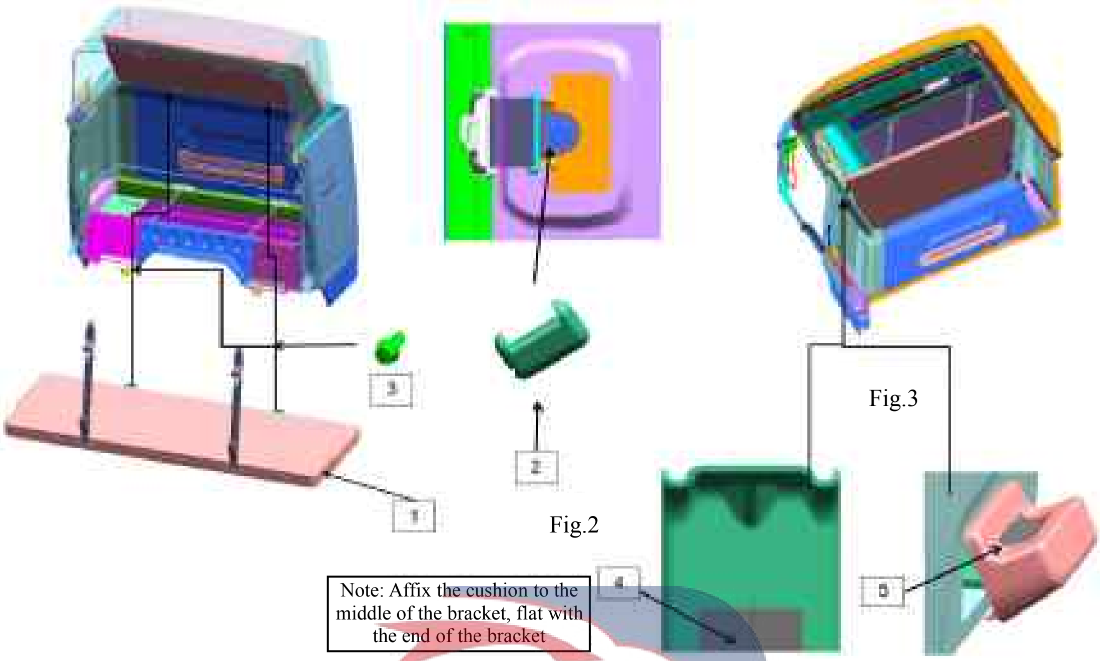
4. Use a manual star screwdriver to secure screw 2 to the top of the cab.

Assembly details:

1. Skylight assembly (5703010-D17YZ)

2. Screw

Upper berth assembly



Assembly requirements:

1. Install cushion 4 and seal cover 5 onto the corresponding positions in the cab.

2. Fix the rear end of upper berth 1 onto the corresponding position in the cab with bolt 3, as shown in Figure 1.

3. Fix the upper end of upper berth safety strap onto the corresponding position in the cab, and install the seal cover onto the end cap of the safety strap as shown in Figure 2.

4. The installation is completed as shown in Figure 3.

Assembly details:

1. Upper berth (7600210-D17YZ)

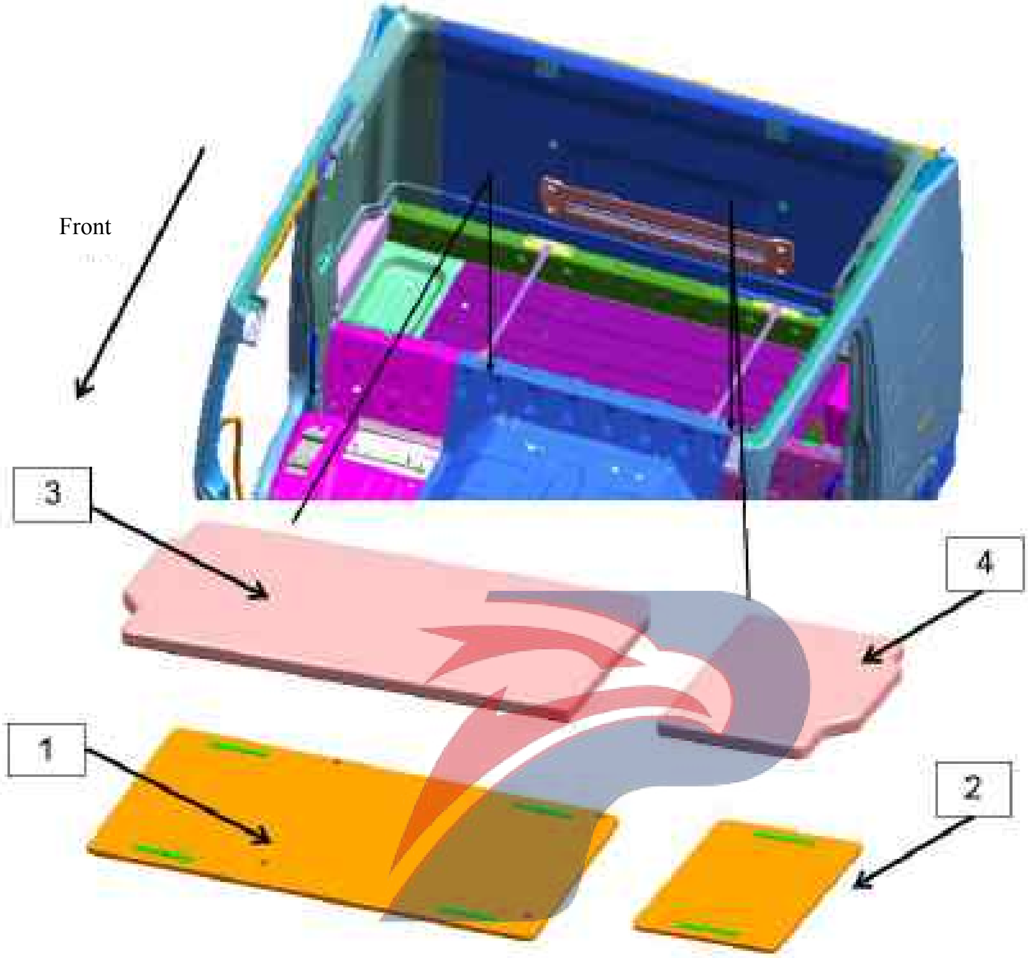
2.Seal cover (5206083-D17YZ)

3.Bolt (Q1840820)

4. Cushion pad (5402352-D17YZ)

5.Seal cover(5402351-D17YZ)

Lower berth assembly



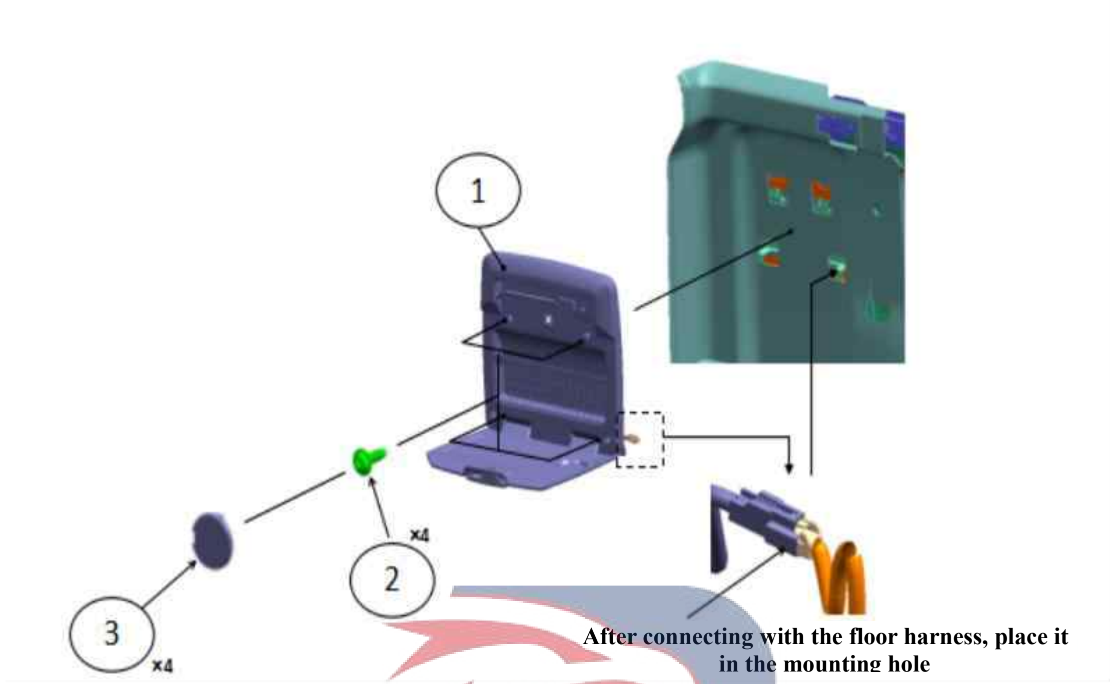
Assembly requirements:

1. As shown in the figure, cushions 1, 2 and berth assembly 3, 4 are installed in the cab.

Assembly details:

1. Lower mattress -Right(7603020-D17YZ)
2. Lower mattress – left (7603010-D17YZ)
3. Lower mattress - Right(7602120-D17YZ)
4. Lower mattress - left (7602110-D17YZ)

Small table assembly



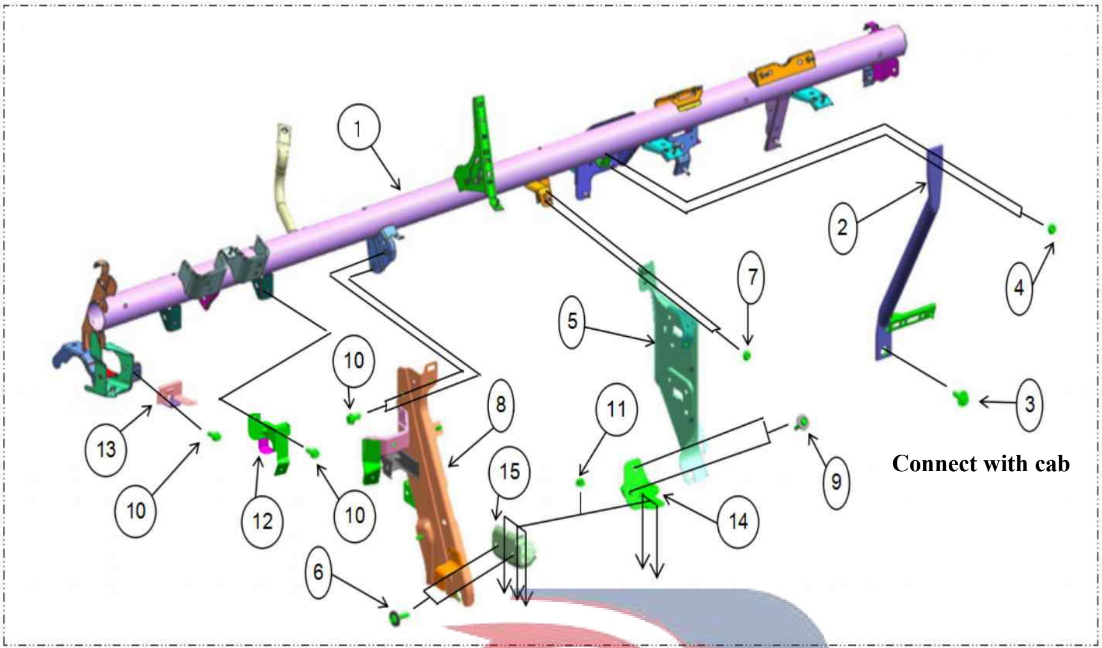
Assembly requirements:

1. As shown, the small table assembly is installed onto the left rear trim plate in the cab.

Assembly details:

1. Small table assembly (5206690-D17YZ)
2. Screw
3. Trim cover

Instrument frame bracket subassembly



Assembly requirements:

1. As shown, fix the brackets onto the frame assembly with bolts or nuts.

Assembly details:

1. Instrument frame assembly (8200060-D17YZ)

2. Support rod (8200261-D17YZ)

3.Bolt

4. Nut (Q32006)

5. Bracket (8200330-D17YZ)

6. Bolt (8200124-D17YZ)

7. Nut (Q32006)

8. Bracket (8200340-D17YZ)

9. Bolt (8200124-D17YZ)

10.Bolt (Q1840616)

11. Nut (Q32006)

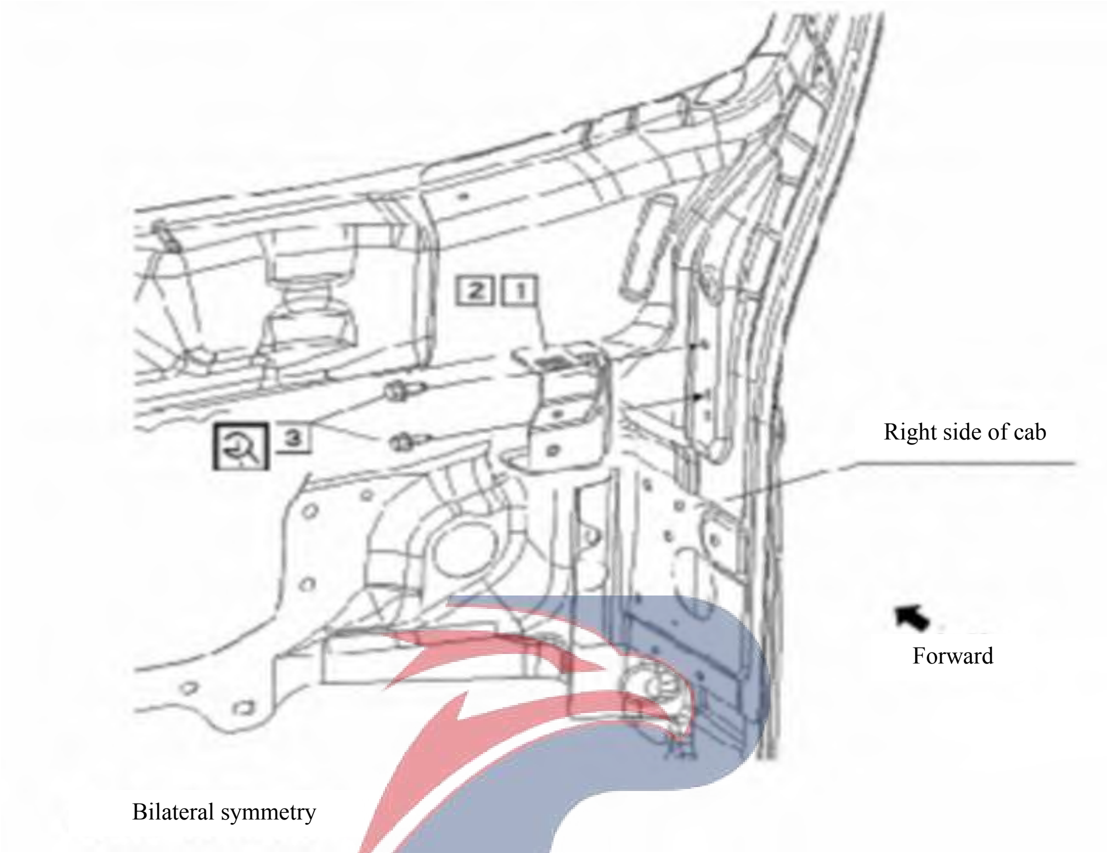
12. Bracket (8200310-D17YZ)

13. Bracket (8200320-D17YZ)

14. Bracket (8200350-D17YZ)

15. Bracket (8200360-D17YZ)

Connection between framework and cab



Assembly requirements:

1.Fix left and right bracket assembly - frame to the cab with bolt ③. Torque of bolt 3: 20, (20.0 - 26.0)N.m

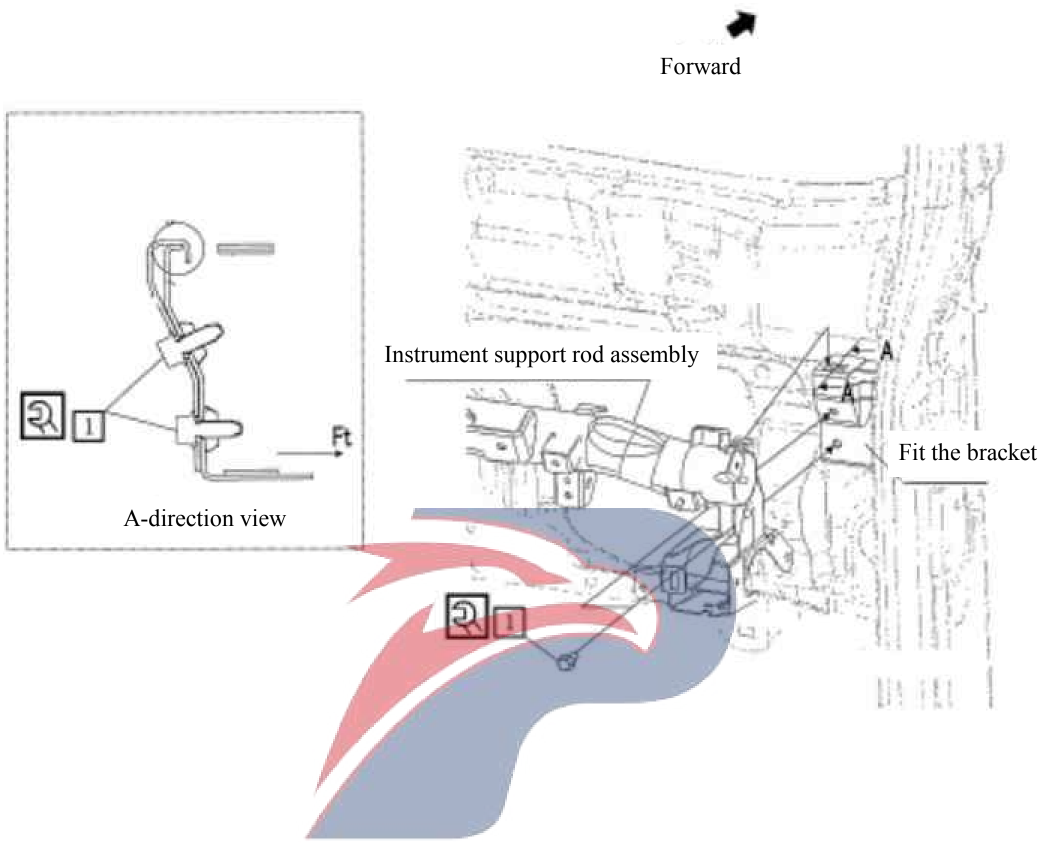
Assembly details:

1. Left bracket assembly - frame (8200370-D17YZ)

2. Right bracket assembly - frame (8200380-D17YZ)

3.Bolt (Q1840816)

Connection between framework and cab



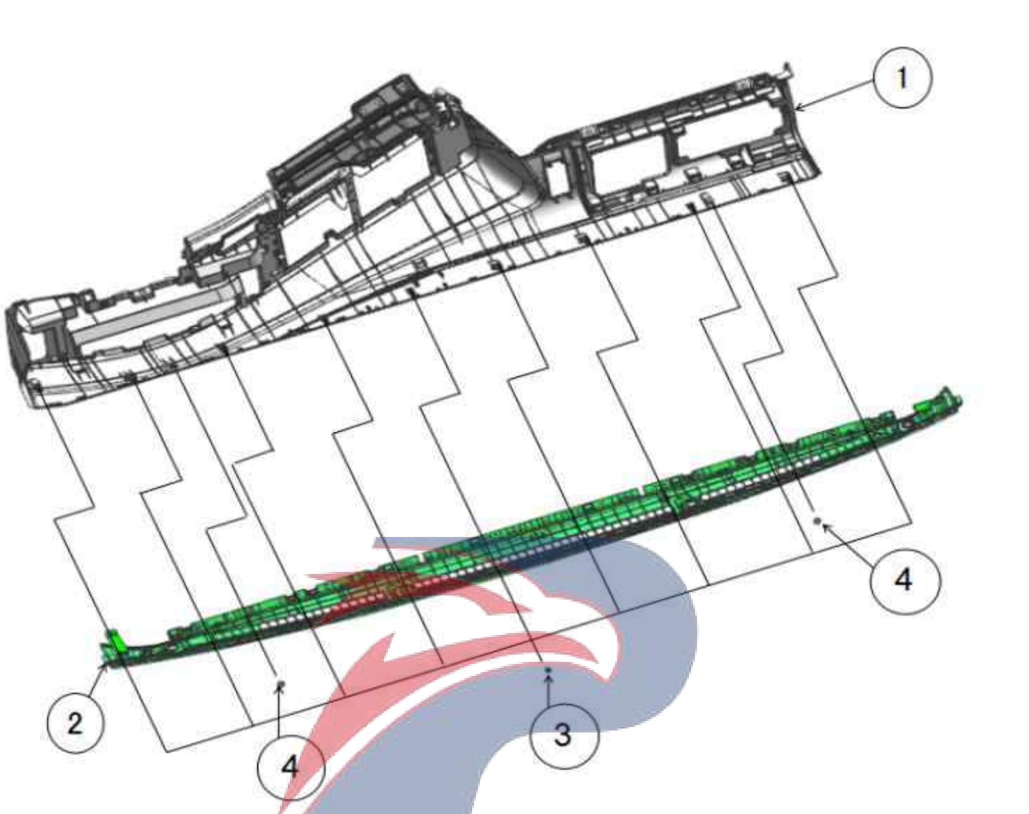
Assembly requirements:

1. Fix the frame assembly onto both sides of the cab with bolt 1 at a torque of 20 (20.0 - 26.0)N.m.

Assembly details:

1.Bolt (Q1840820)

Cover plate assembly-- dashboard front vent



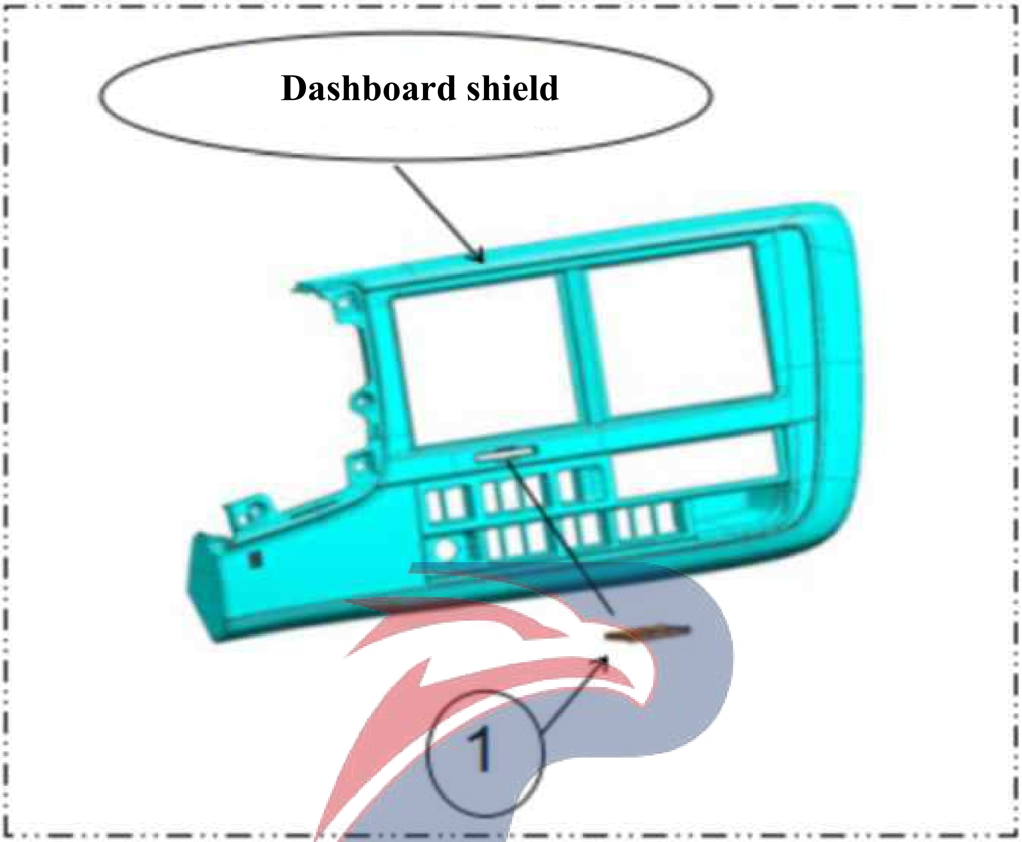
Assembly requirements:

1.Fix the cover plate assembly - dashboard front vent ① onto the mounting hole of the dashboard assembly. Tighten the fastening nails and screws.

Assembly details:

1. Dashboard assembly (8200110-D17YZ)
2. Cover assembly - dashboard front vent (8101540-D17YZ)
3. Screw
4. Fixing nail

Card box subassembly



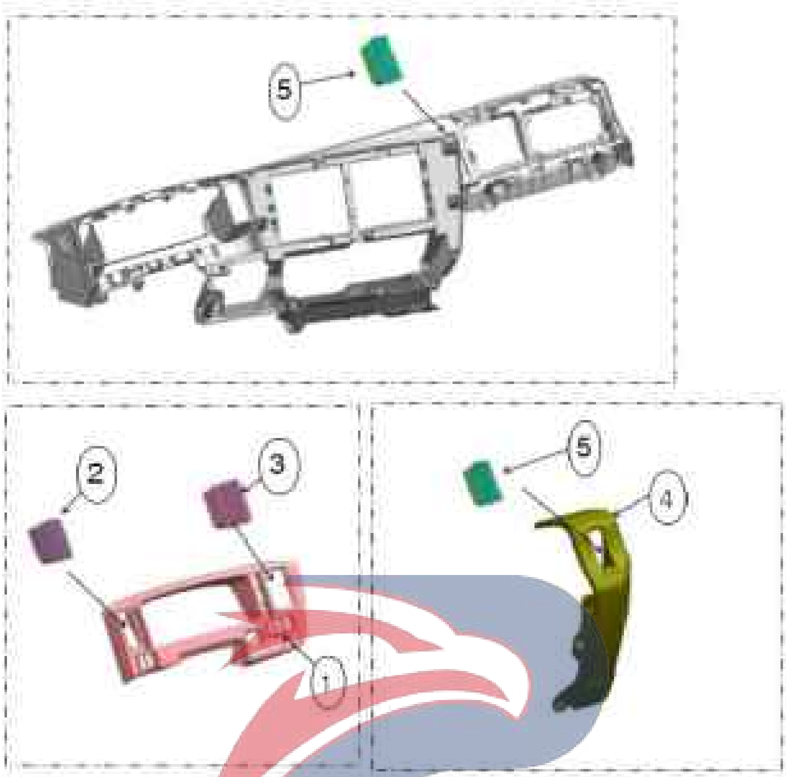
Assembly requirements:

1. As shown on the right, fix the card box ① onto the dashboard shield assembly, and ensure there is no clearance.

Assembly details:

1. Card box (8200230-P301)

Ventilator Grille



Assembly requirements:

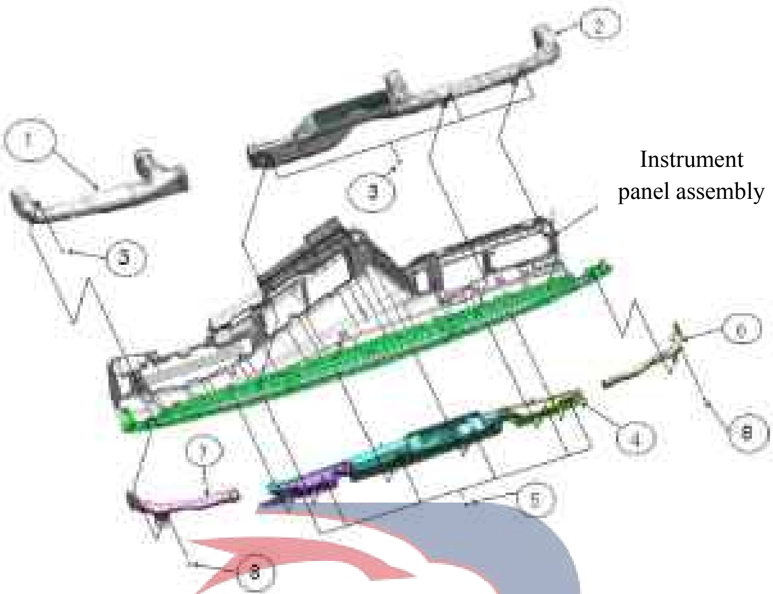
1. Ventilation grills ② and ③ are mounted on the appropriate positions on the shield as shown, and ensure there is no clearance.

2. Ventilation grill ⑤ is mounted on the dashboard cover plate and side cover plate as shown, and ensure there is no clearance.

Assembly details:

1. Dashboard shield assembly (3801460-D17YZ)
2. Ventilation grilles (8101421-P301)
3. Ventilation grilles (8101431-P301)
4. Dashboard cover plate - right (8200140-D17YZ)
5. Ventilation grilles (8101441-P301)

Ventilation pipe subassembly



Assembly requirements:

1. Connect the left air duct assembly ① with the right air duct assembly ②, and tighten screw ③ with a pneumatic wrench;

2. Fetch the defrost tube ④, and tighten screw ⑤ with a pneumatic wrench and thick gun head;

3. Connect defrost tube - left side ⑥ to the defrost tube ④, and tighten screw ⑧ with a pneumatic wrench;

4. Connect defrost tube - right side ⑦ to the defrost tube ④, and tighten screw ⑧ with a pneumatic wrench;

Assembly details:

1. Left air duct assembly(8101350-D17YZ)

2. Middle air duct assembly (8101360-D17YZ)

3. Screw

4. Defrosting pipe

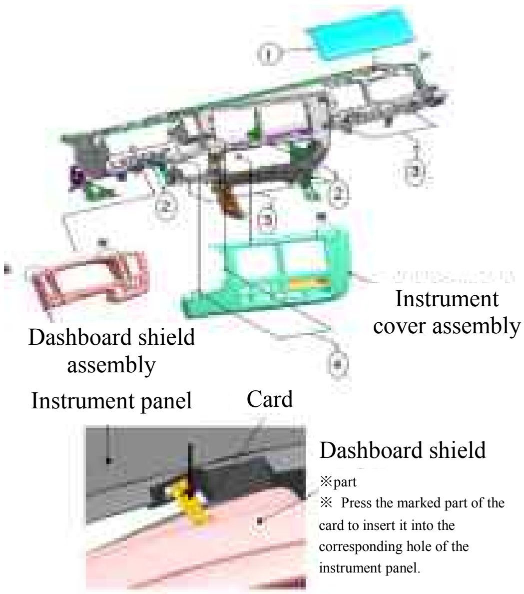
5. Screw

6. Defrost tube - left side

7. Defrosting pipe-right side

8. Screw

Dashboard cover assembly



Assembly requirements:

1. Fix the dashboard assembly onto the frame with nut 2 and bolt 3.

2. Take the cover assemblies and snap them where appropriate in the instrument panel. They shall not have any gap be loose.

Assembly details:

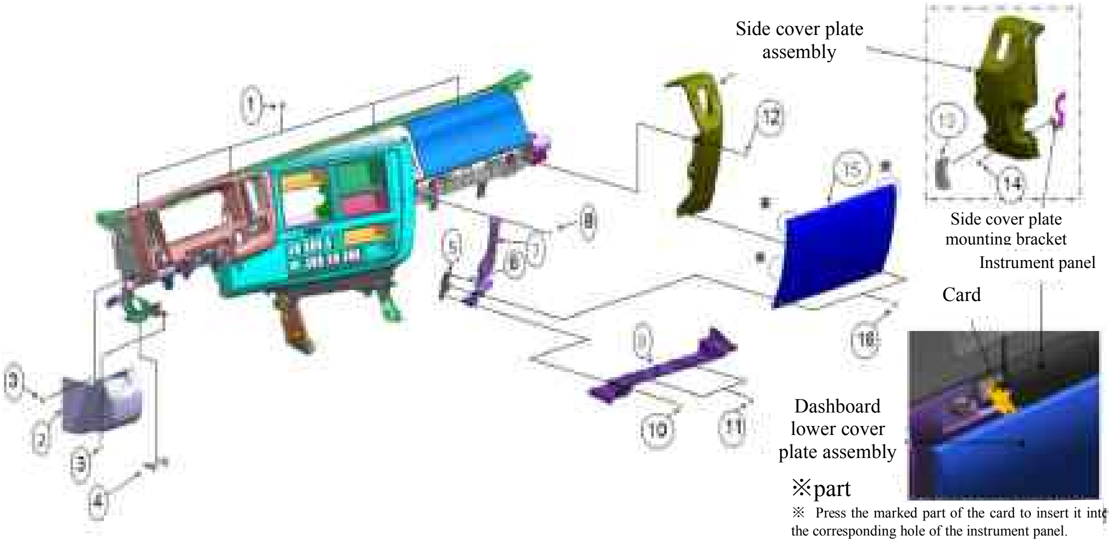
1. Relay cover plate (3724851-D17YZ)

2. Nut (Q32006)

3. Bolt (Q1840616)

4. Screw

Dashboard cover assembly



Assembly requirements:

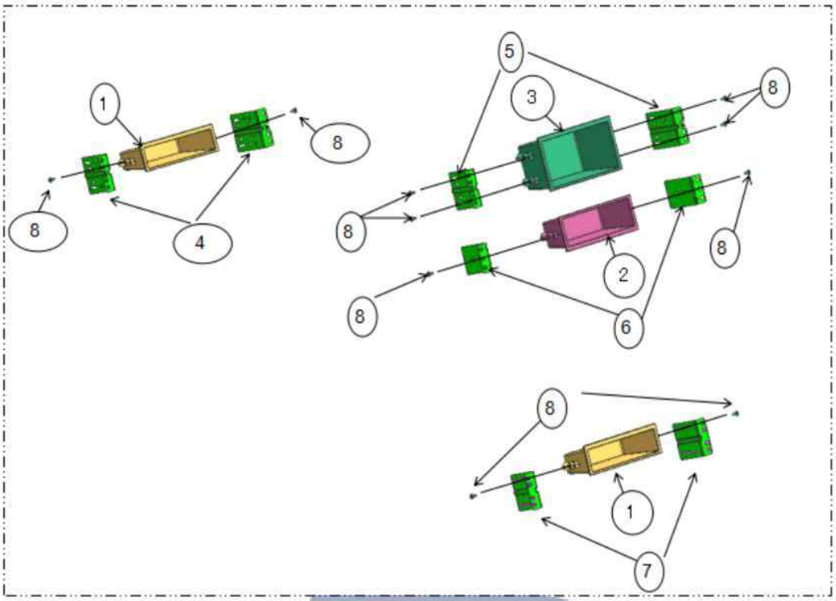
1. As shown, fix the dashboard assembly to the front panel the cab with bolt 1

2. Take the cover assemblies and snap them where appropriate in the instrument panel. They shall not have any gap be loose.

Assembly details:

1. Bolt
2. Dashboard trim cover plate assembly - driver's side (8200160-D17YZ)
3. Fixing nail (8200135-D17YZ)
4. Front panel switch
5. Bracket (8200121-D17YZ)
6. Screw
7. Dashboard middle cover plate assembly (8200223-D17YZ)
8. Screw
9. Cover plate assembly - under front passenger (8200230-D17YZ)
10. Pipe clamp (3724126-D17YZ)
11. Convex cap (8200134-D17YZ)
12. Screw
13. Cover plate (8200163-D17YZ)
14. Fixing nail (8200135-D17YZ)
15. Dashboard lower cover plate assembly (8200150-D17YZ)
16. Bolt (8200120-D17YZ)

Sundries box assembly



Assembly requirements:

1. Fix the sundries box - small ① to the brackets ④ and ⑦ as shown. 2. Fix the sundries box - middle ② to the bracket ⑥ as shown.

3. Fix the sundries box - large ③ to the bracket ⑤ as shown.

Assembly details:

1. Sundries box - small (8200181-D17YZ)

2. Sundries box-middle (8200181-P301)

3. Sundries box-large (8200211-P301)

4. Bracket (3725311-P301)

5. Bracket (8200131-P301B)

6. Bracket (8200141-P301B)

7. Bracket (8200182-D17YZ)

8. Screw

Sundries box assembly

Figure 1

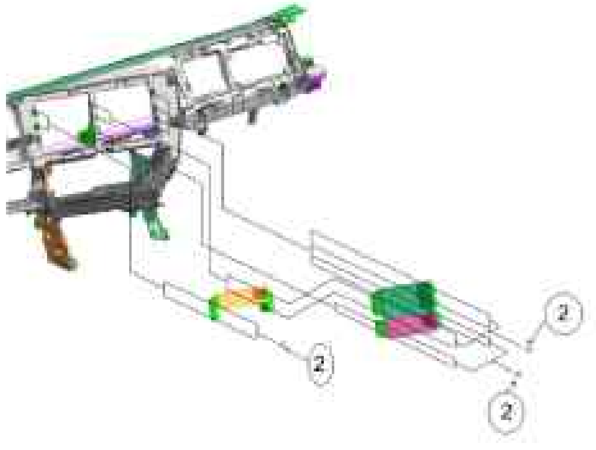


Figure 2

Figure 3

Assembly requirements:

1. According to Figure 1 and Figure 2, sundries box assemblies are fixed at the corresponding positions on the dashboard shield and instrument frame

2. The installation is completed as shown in Figure 3.

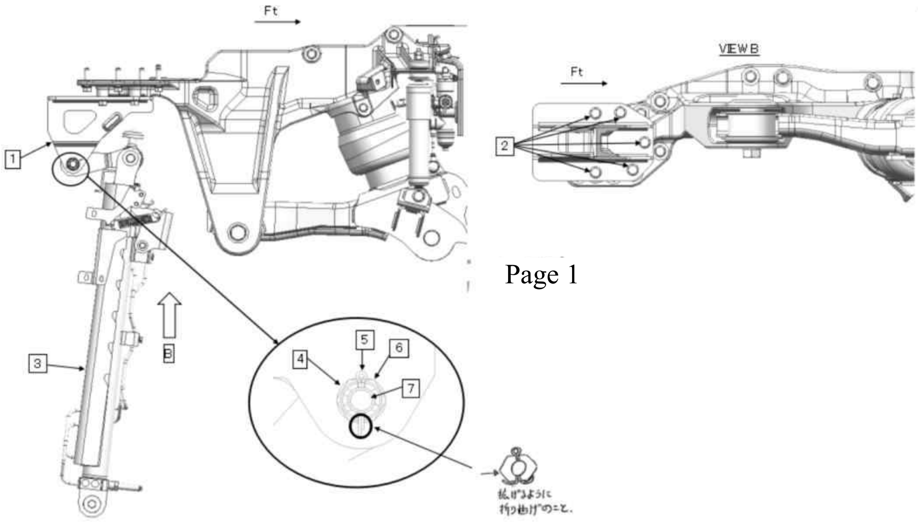
Note: When installing, pay attention to the order of these boxes.

Assembly details:

1. Screw

2. Screw

Oil cylinder--tilting mechanism



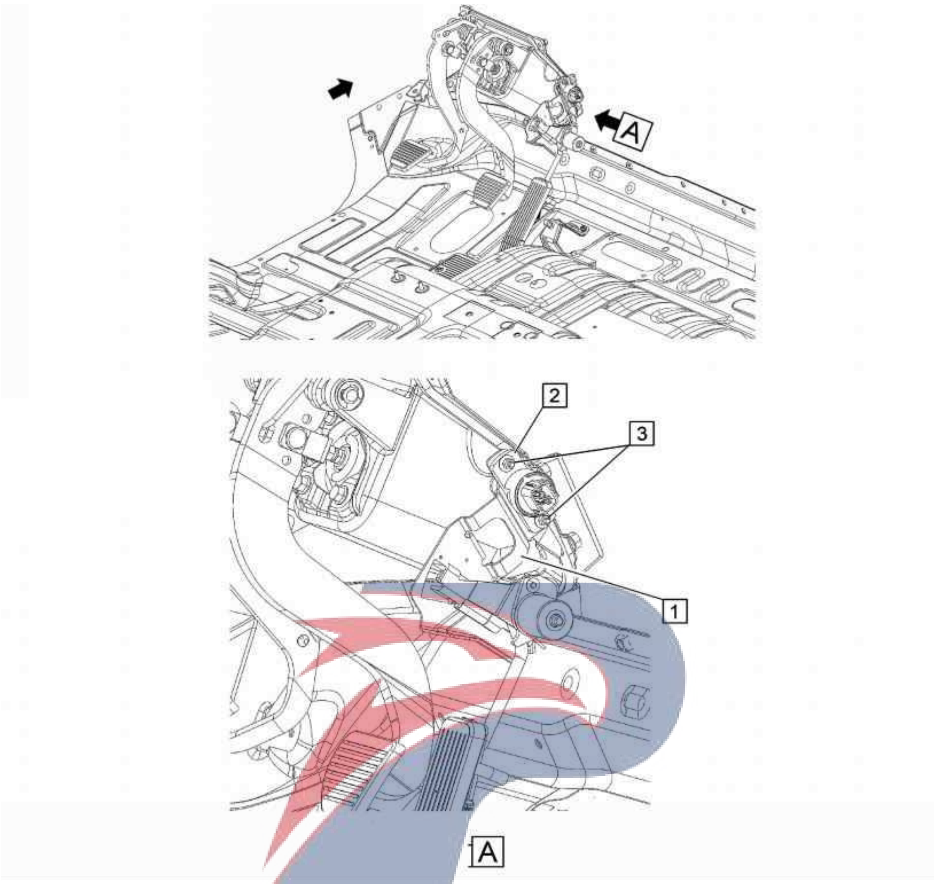
Assembly requirements:

1. Fix bracket 1 onto the turnover stiffener with bolt 2 at a torque of 51.2±5.1 N.m.
2. Get bolt 7 through bracket, oil cylinder 3, washer 4, nut 6, and fasten the nut.
3. Tighten nut 6 at a torque of 133±26 N.m.
4. Insert pin 5 and bend the pin.

Assembly details:

1. Bracket (5003920-D17YZ)
2. Bolt (Q1841035)
3. Oil cylinder - tilting mechanism (5002920-D17YZ)
4. Spring washers(Q40514)
5. Pin
6. Nut (Q381B14T13(M14×1.5))
7. Bolt

Accelerator pedal bracket assembly



Assembly requirements:

1. Fix the accelerator pedal bracket assembly 1 with nut 3.

2. Fix the throttle sensor onto bracket 1.

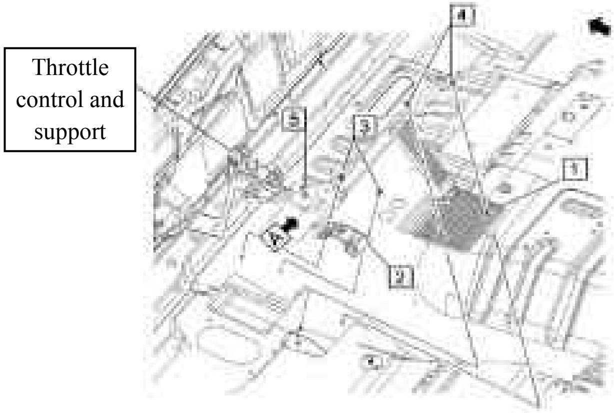
Assembly details:

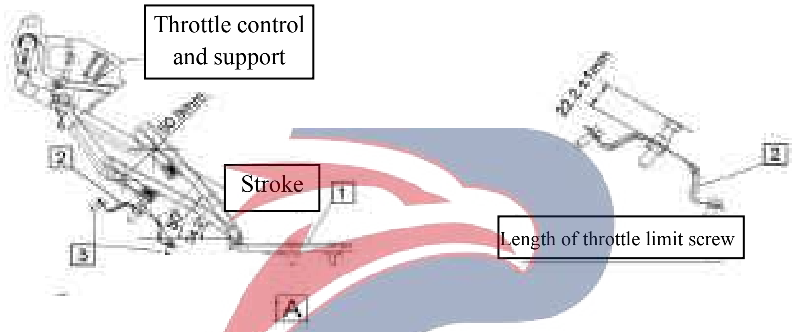
1. Accelerator pedal bracket assembly

2. Throttle sensor (8981312630)

3. Nut

Accelerator pedal assembly





Assembly requirements:

1. Secure the position limiter assembly - accelerator pedal 2 to the floor with bolt 3 and adjust the length of throttle stop bolt.

2. Fix the accelerator bracket assembly 1 to the floor with nut 4.

3. Fix the throttle control and bracket with nut 5.

Assembly details:

1. Accelerator pedal assembly

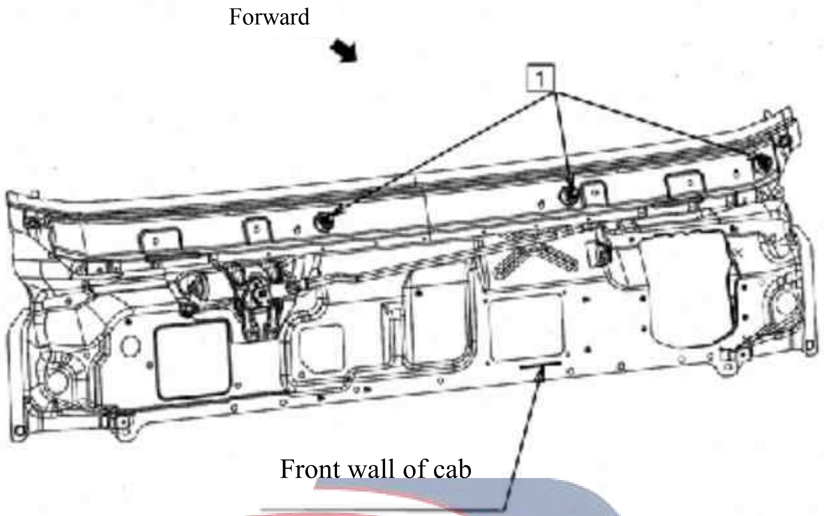
2. Position limiter assembly - accelerator pedal

3. Bolt (8101168-117/C)

4. Bolt (8101364-117/C)

5. Nut (Q32008)

Sealing cover--wiper shaft



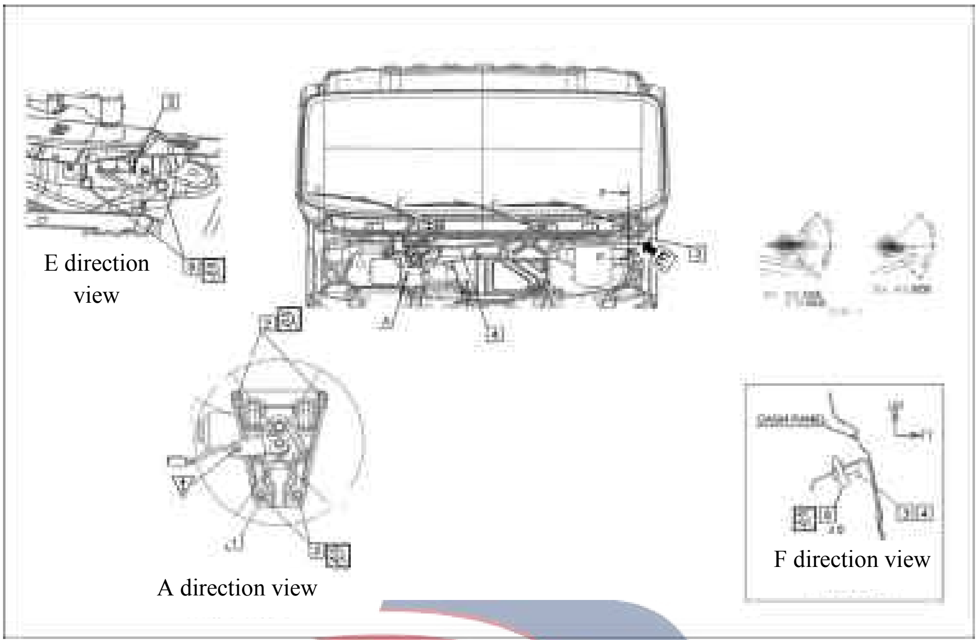
Assembly requirements:

1. As shown on the right, fix the seal cover - wiper shaft onto the wiper shaft assembly, and ensure there is no clearance.

Assembly details:

1.Seal cover -- wiper shaft

Wiper motor assembly



Assembly requirements:

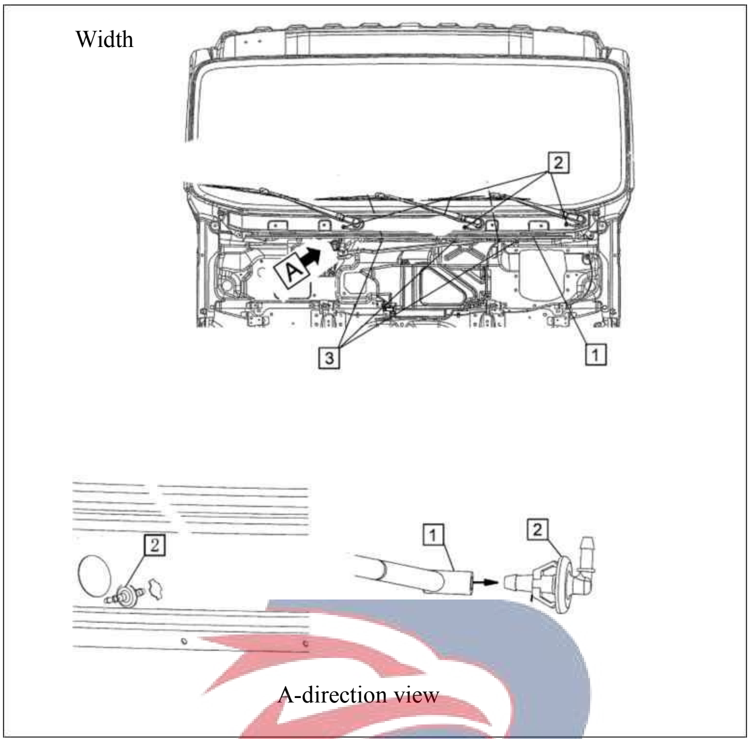
1, Take wiper motor assembly ①, according to the icon location, in the left side of the cab use a hexagonal flange nut ② to tighten according to item A on the view. The nut torque is 15.1 ± 4.5N.m.

2、Take the shaft assembly - wiper link ③ and wiper link assembly ④, according to the icon location to link, Use hexagon flange bolt ⑤ to tighten according to E, F the view.The nut torque is 15.1 ±4.5N.m。

Assembly details:

1. Wiper motor assembly
2. Hexagonal flange nut（Q32008T13F2）
3. Shaft assembly - wiper link
4. Wiper link assembly
5. Hex flange face bolt (Q1840820)

Wiper hose assembly



Assembly requirements:

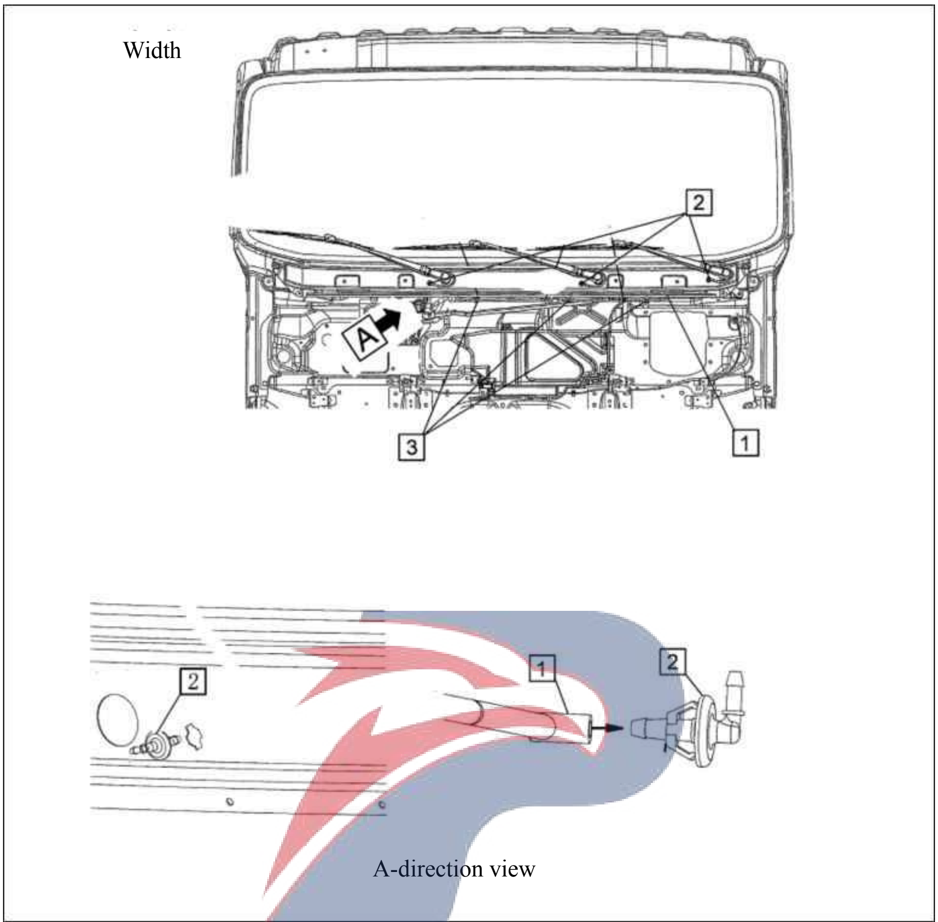
1. Take the hose assembly - wiper ①, according to the location shown, and bending joints - wiper hose ② points were linked to three locations;

2. Take the clip - wiper hose ③, according to the icon position, respectively, the hose assembly is fixed in the cab front three mounting hole position。

Assembly details:

1. Hose assembly - wiper (5207030-D17YZ)
2. Bent joints - wiper hose
3.Clip - wiper hose

Wiper assembly



Assembly requirements:

1、According to the position shown to take the wiper arm and the blade assembly - left ② , and then use the nut ① according to the direction A of view to fasten, the nut torque of 20.1 ± 3.4N.m. (Note: To ensure that distance between Wiper end and the driving edge is 47 ± 10mm);

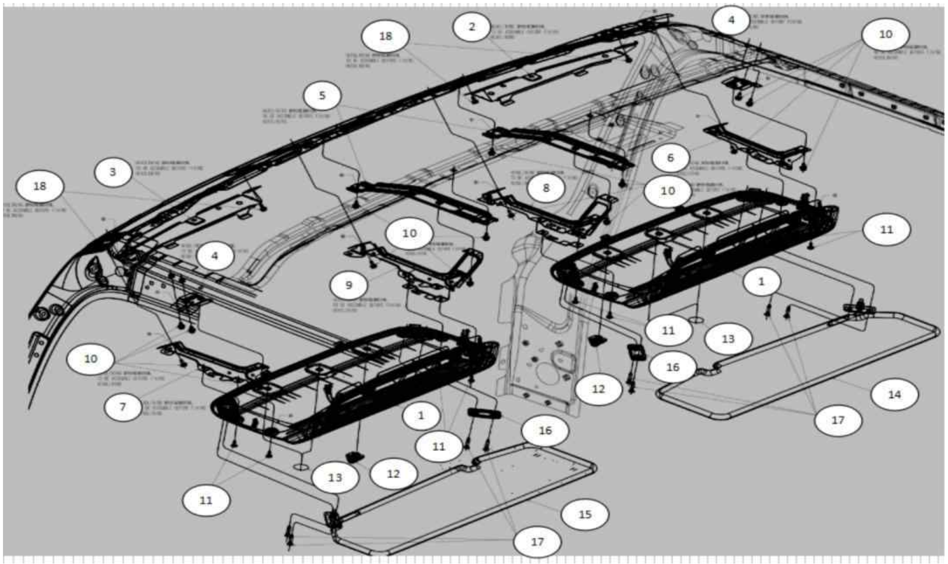
2. According to the position shown to take the wiper arm and blade assembly - the middle part ③ , and then use the nut ① according to the direction A of view to fasten, the nut torque of 20.1 ± 3.4N.m. (Note: To ensure that distance between Wiper end and the left side of the wiper blade swing is 54 ± 10 mm);

3. According to the position shown to take the wiper arm and blade assembly - right side ④ , and then use the nut ① according to the direction A of view to fasten, the nut torque of 20.1 ± 3.4N.m. (Note: To ensure that distance between Wiper end and the left side of the wiper blade swing is 54 ± 10 mm);

Assembly details:

1. Nut
2. Wiper arm and blade assembly - left side
3. Wiper arm and blade assembly - the middle part
4. Wiper arm and blade assembly - right side

Sun visor, container assembly - standard roof



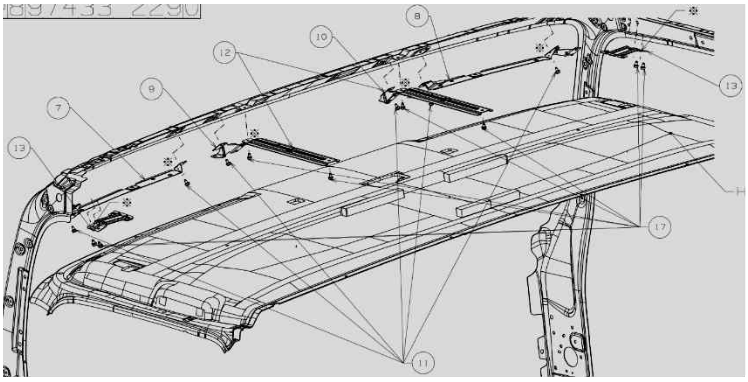
Assembly requirements:

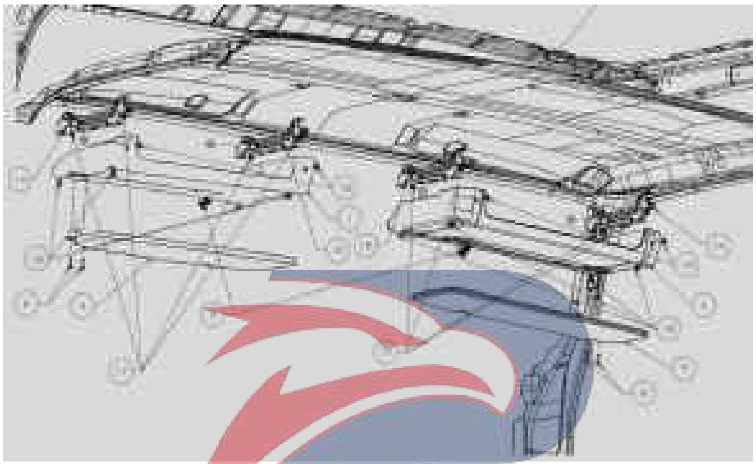
1. Take the support assemblies and fix them in the corresponding places of the cab;
2. Take the left and right glove boxes and fix them on the supports;
3. Take the left and right sun visors and fix them on the glove boxes.

Assembly details:

1. Roof container assembly (8204210-D34EZ)
2. Right bracket assembly - front of roof
3. Left bracket assembly -- front of roof
4. Left bracket (8204331-P301)
5. Left bracket
6. Bracket assembly - outside of container
7. Left bracket assembly
8. Bracket assembly -- inside of container
9. Bracket assembly (8
10. Bolt
11. Screw
12. Support-sun visor fixing (8204121-D34EZ)
13. Seal (6201421-D17YZ)
14. Left sun visor assembly (8204010-D34EZ)
15. Right sun visor assembly (8204020-D34EZ)
16. Holder (8204111-D17YZ)
17. Screw (8202721-P301)
18. Bolt

Sun visor, container assembly - low roof





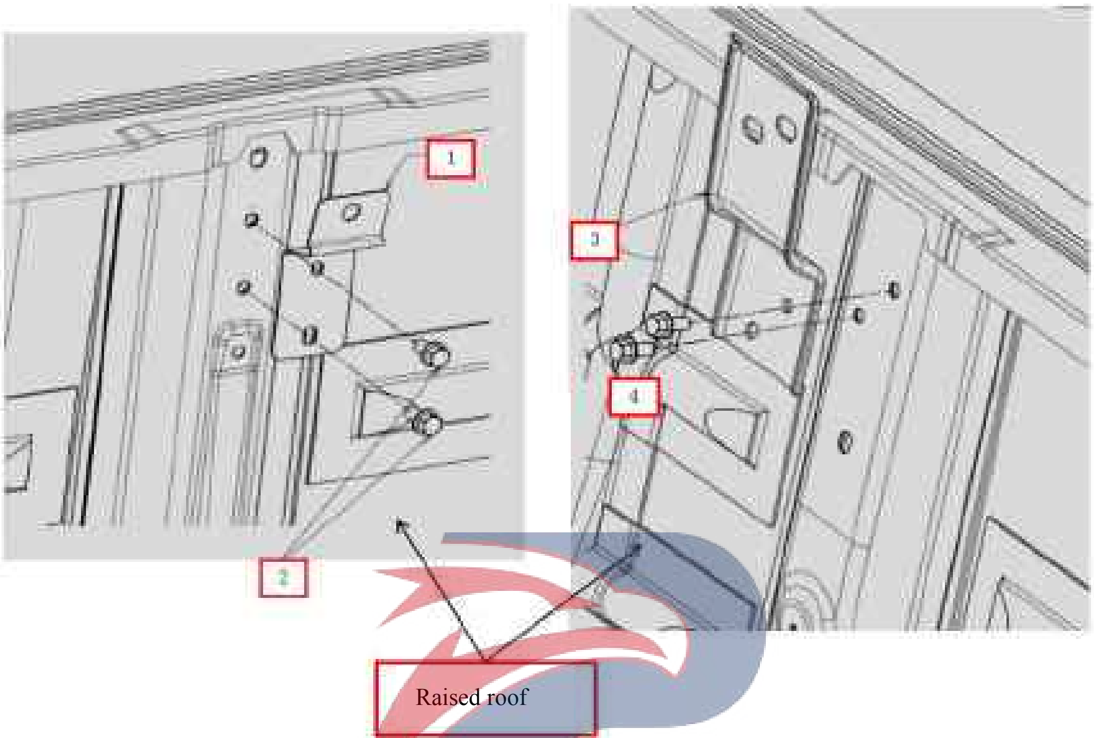
Assembly requirements:

1. Take the support assemblies and fix them in the corresponding places of the cab;
2. Take the left and right glove boxes and fix them on the supports;
3. Take the left and right sun visors and fix them on the glove boxes.

Assembly details:

1. Right container assembly (8204220-D15EH)
2. Left container assembly (8204210-D15EH)
3. Support-sun visor fixing (8204121-D34EZ)
4. Left sun visor assembly (8204010-D17YZ)
5. Right sun visor assembly (8204020-D34EZ)
6. Screw (8202721-P301)
7. Support (8204428-D15EH)
8. Support (8204429-D15EH)
9. Support (5701221-D15EH)
10. Support (5701222-D15EH)
11. Bolt
12. Support assembly (8204241-P301)
13. Container bracket on both sides (5701221-D17YZ)
14. Support (5701231-D15EH)
15. Left container bracket assembly (5701230-D15EH)
16. Right container bracket assembly (5701240-D15EH)
17. Bolt
18. Screw
19. Retainer (8204331-D15EH)

Bracket - Raised roof



Assembly requirements:

1. After the raised roof is mounted in the cab, fix the roof with brackets 1 and 2.

Assembly details:

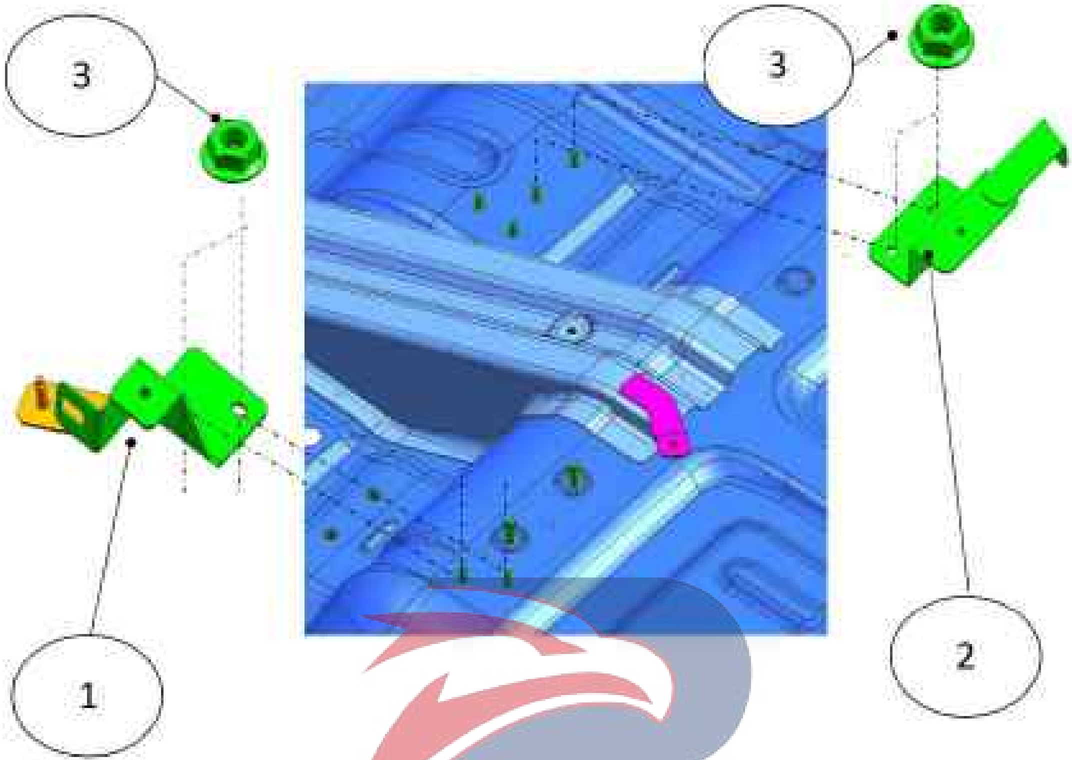
1. Bracket (5700034-D17YZ)

2. Bolt (Q1840816)

3. Bracket (5700036-D17YZ)

4. Bolt (Q1840816)

Bracket - shift trim cover



Assembly requirements:

1. As shown in the figure, the shift trim cover brackets 1 and 2 are fixed to the position in cab with nut 3.

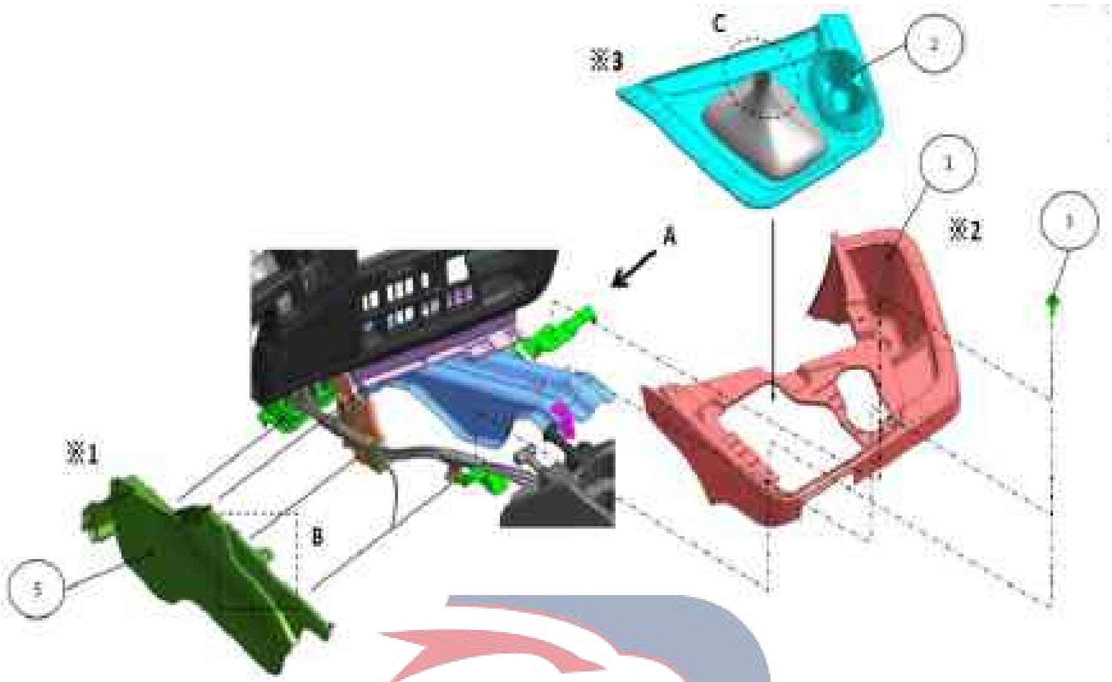
Assembly details:

1. Bracket 1(1702053-D17YZ)

2. Bracket 2 (1702054-D17YZ)

3. Nut (Q32006)

Gearshift trim cover assembly



Assembly requirements:

1. Fix the lower cover plate assembly 1 of shift lever onto corresponding bracket with bolt 3, and fix the right side of the plate to the illustrated position with fastening nail 4.

2. Fit the shift control box assembly 2 into the shift lever and fasten it to the lower cover plate assembly of shift lever. As shown in position B, there is no space or looseness between the two parts.

3. As shown in position C, fit the shift control box assembly leather sheath into the shift ball head till the groove, and lock the fastener.

4. As shown in position C, the cover plate assembly 5 on the shift lever side is fixed to the left side of the lower cover plate assembly 1 of the shift lever, and make sure there is no space or looseness between the two parts.

Assembly details:

1. Lower cover plate assembly of the shift lever (1702210-D17YZ)

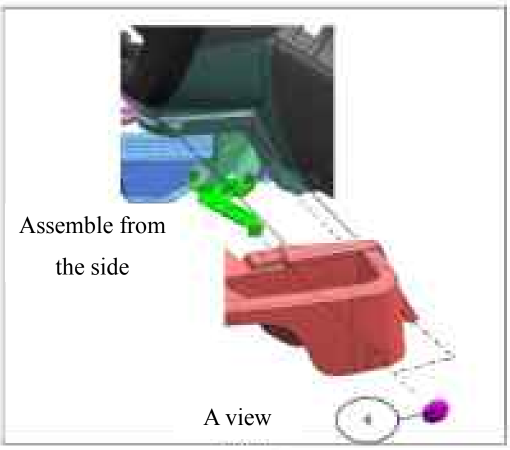
2. Shift control box assembly (1702050-D17YZ)

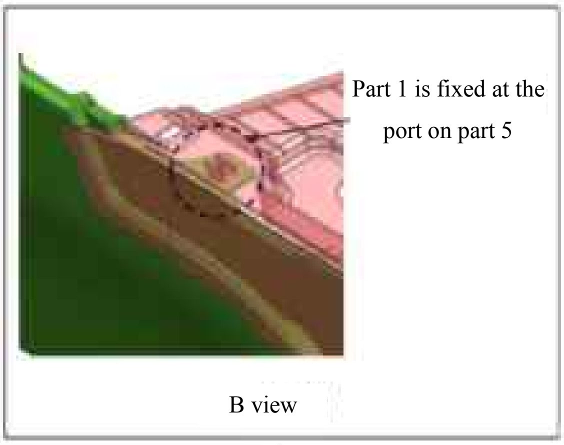
3. Bolt（1702056-D17YZ）

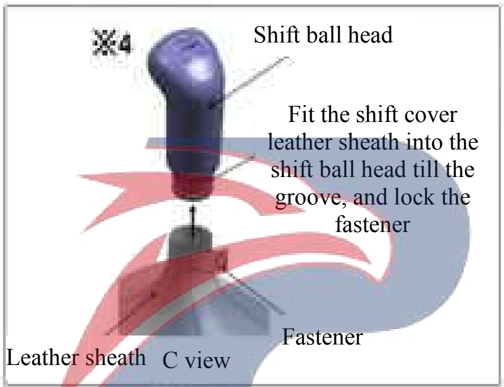
4. Fixing nail (1702059-D17YZ)

5. Side cover plate assembly of the shift lever (1702220-D17YZ)

Gearshift trim cover assembly







Brake pump subassembly

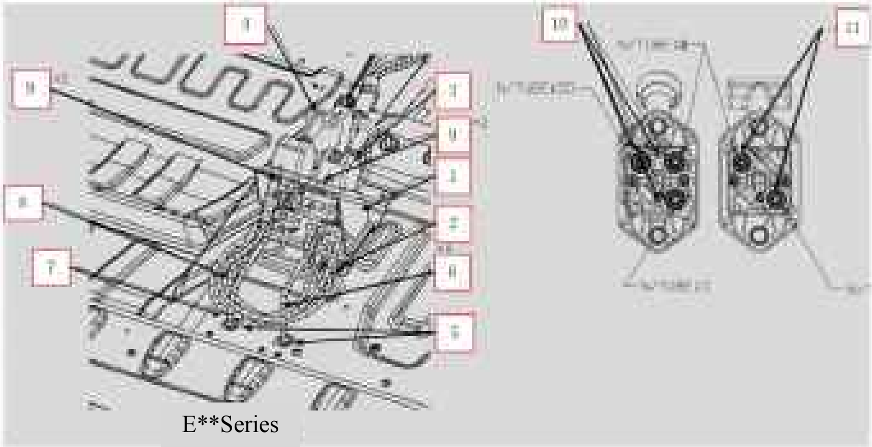
Assembly requirements:

1. Fix connectors 1-5 to the brake cylinders as pictured.
2. Connect hose 6 in place and secure it with clamp 7.
3. Plug 8 is fixed in the corresponding position of brake pump.

Assembly details:

1. Connector
2. Connector
3. Connector
4. Connector
5. Connector
6. Brake pipe (8100721-D17YZ)
7. Clip (8100722-D17YZ)
8. Plug (3513115-150)

Parking brake lever



Assembly requirements:

1. As shown, fix the cover to the corresponding position in the cab.

2. The torque of connectors 10 and 11 is 29.5±2.5 N.m.

Assembly details:

1. Bracket assembly - parking brake valve

2. Bolt (Q1460616T21）

3. Valve assembly - Parking brake

4. Valve assembly -Trailer brake

5. Plug cover

6. Exhaust brake hose (8100654-D17YZ)

7. Exhaust brake hose (8100654-D17YZ)

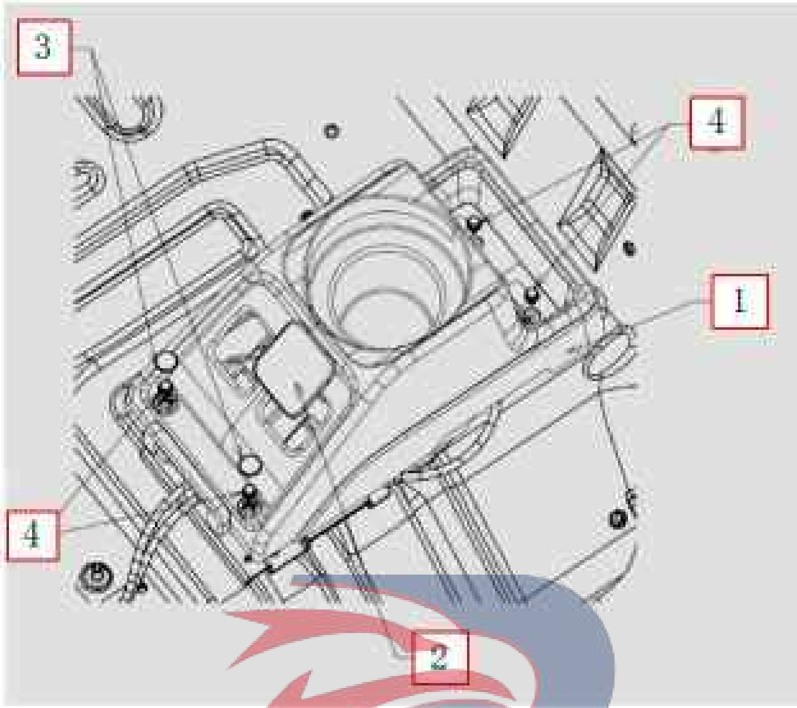
8. Nylon tube

9. Bolt (Q1460616T21)

10. Connector

11. Connector

Parking brake cover



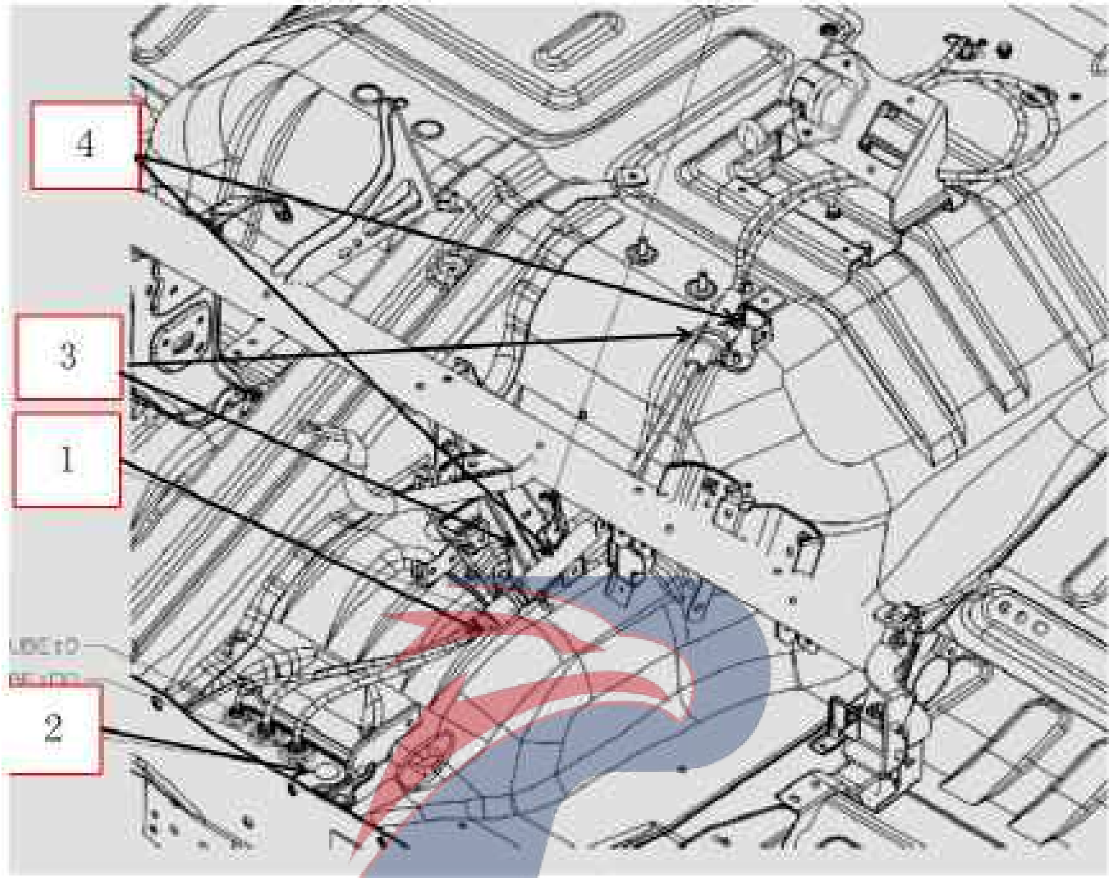
Assembly requirements:

1. As shown, fix the cover to the corresponding position in the cab.

Assembly details:

1. Cover plate - parking brake lever (8100890-D17YZ)
2. Hole cover - Trailer brake lever (8100899-D17YZ)
3. Hole cover (8100698-D17YZ)
4. Bolt (Q1460616T21)

Parking brake nylon tube assembly



Assembly requirements:

1. As shown, fit the parking brake nylon tube assembly while paying attention to the direction of nylon tube

Assembly details:

1. Nylon tube assembly (8100670-D17YZ)

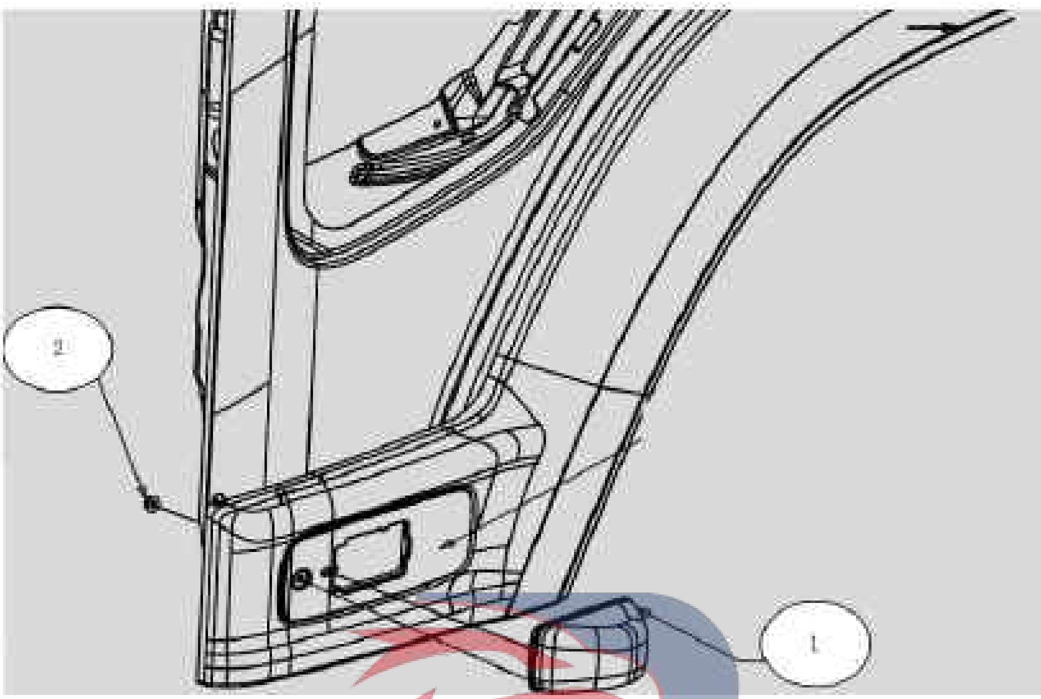
Nylon tube assembly (8100650-D17YZ)

2. Seal cover plate (8200143-803)

3. Clip

4. Nut (Q32006)

Turn light assembly



Assembly requirements:

1. Insert the bolt that comes with turn light assembly 1 into the corresponding slot on the trim plate under the door.

2. Fix the turn light onto the trim plate under the door.

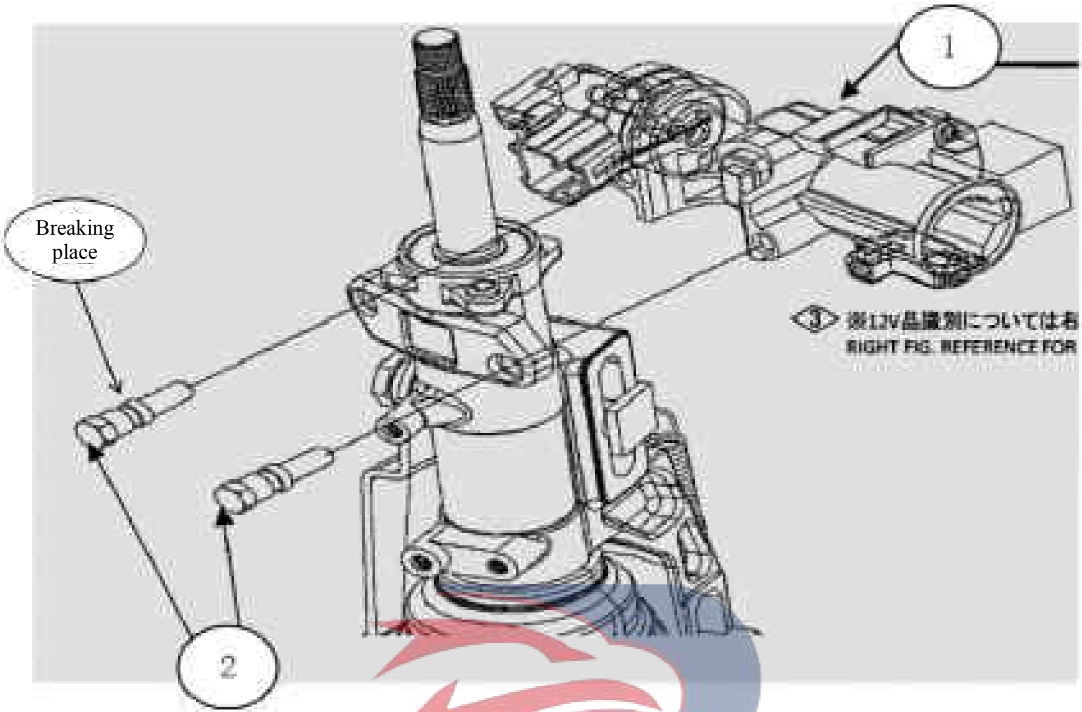
Assembly details:

1. Right turn light assembly

Left turn light assembly

2. Nut (Q32006)

Steering lock assembly



Assembly requirements:

1. Insert the steering lock assembly 1 into the steering column, and fix the steering lock 1 onto the steering column with the bolt 2.

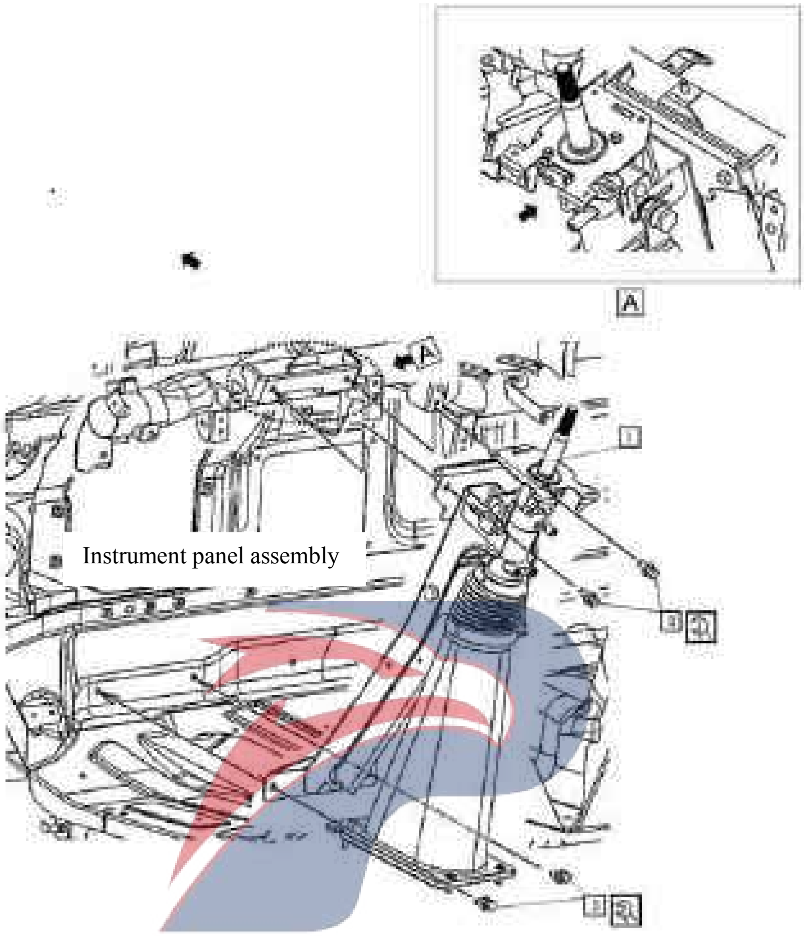
2. Tighten bolt 2 until it breaks from the position as shown.

Assembly details:

1. Steering lock assembly

2. Bolt

Steering column assembly



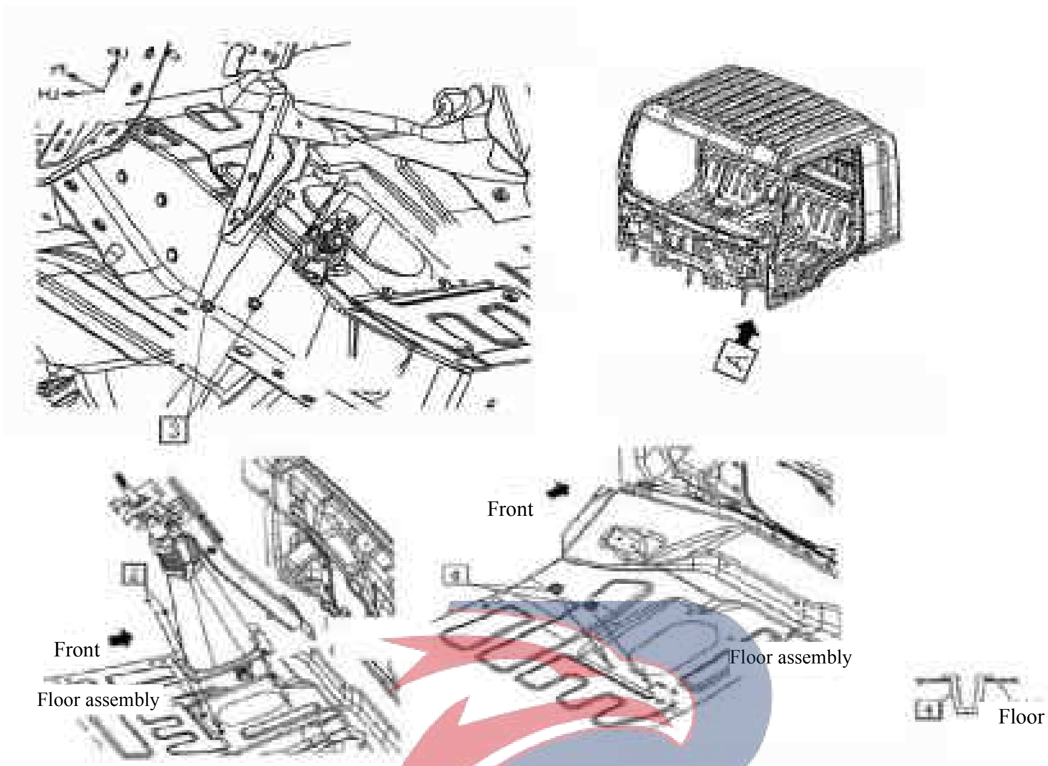
Assembly requirements:

1. Fix the steering column assembly 1 onto the instrument panel assembly with bolts 2 and 3.
2. Torque of bolts 2, 3: 17.15±5.39N.m.

Assembly details:

1. Steering column assembly (3404010-D17YZ)
2. Hex flange face bolt (Q1840820)
3. Bolt

Steering column assembly



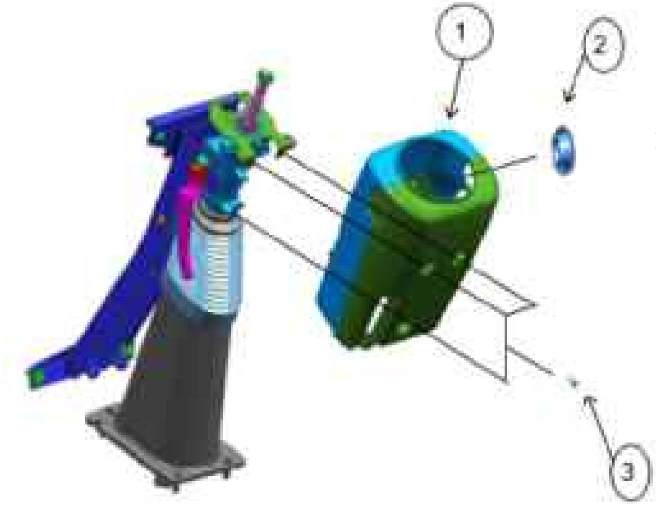
Assembly requirements:

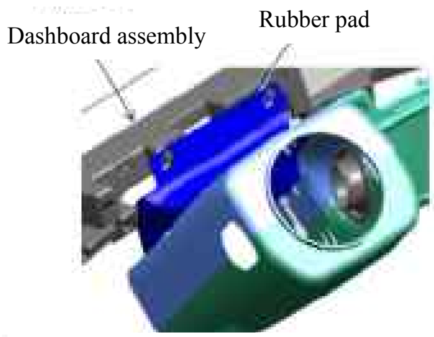
1. Insert the gasket nut 4 into the floor assembly.
2. Fix the steering column assembly to the floor assembly with screw 2 and nut 3.

Assembly details:

1. Gasket nut - trim strip (6201401-26)
2. Screw
3. Nut

Steering column housing assembly





The rubber pad of steering column housing is fixed onto the hook at position 2 of dashboard

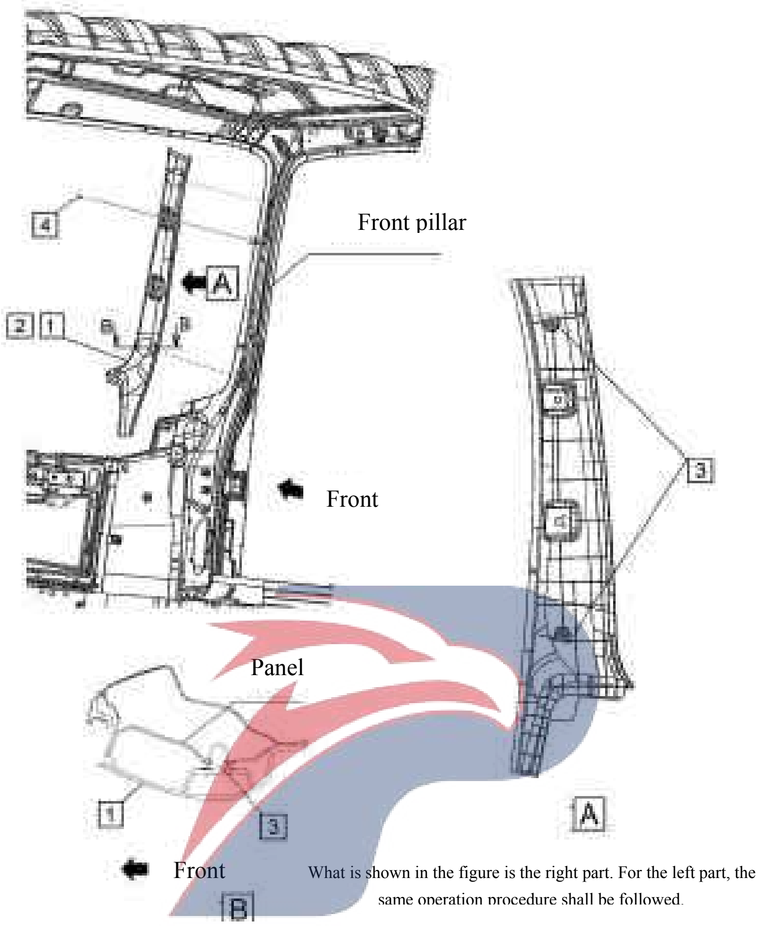
Assembly requirements:

1. Attach the steering column housing assembly 1 onto the steering column, and fix it with screw 3.
2. Install hole cover - steering column 2 onto the steering column housing assembly.

Assembly details:

1. Steering column housing assembly (3404230-D17YZ)
2. Cover - steering column (3404231-D17YZ)
3. Screw

Trim panel assembly - front pillar



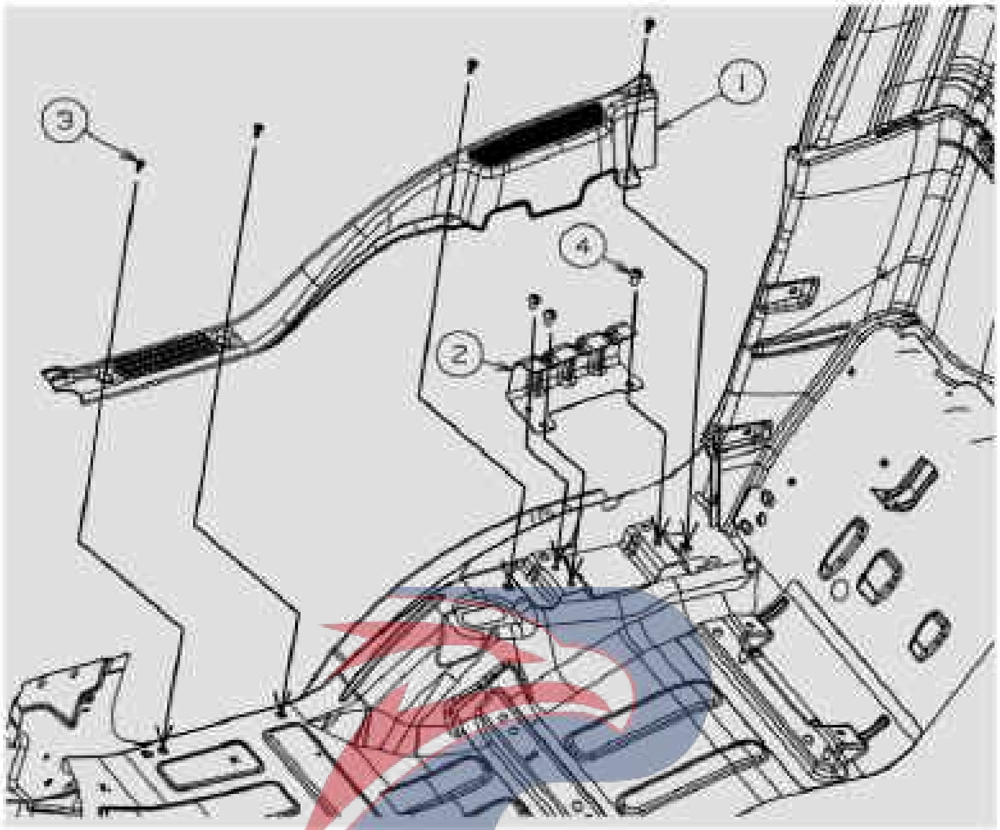
Assembly requirements:

1. Fix the trim panel - front pillars 1, 2 onto the front pillar of the cab with fastening nails 3, 4 as shown in the figure.

Assembly details:

1. Trim plate - left front pillar (8200811-D17YZ)
2. Trim plate-right front pillar（8200821-D17YZ）
3. Fastening nail - door trim plate (8200831-P301)
4. Fixing nail (5206671-D17YZ)

Trim strip



What is shown in the figure is the right part. For the left part, the same operation procedure shall be followed.

Assembly requirements:

1. Fix the left / right stiffener - sill trim strip 2 with screw 4.
2. Fix the trim strips (left/right) - front door sill 1 with screw 3.

Assembly details:

1. Trim strip (left) - front door sill (8200281-D17YZ)

Trim strip (right)-- front door sill 8200271-D17YZ）

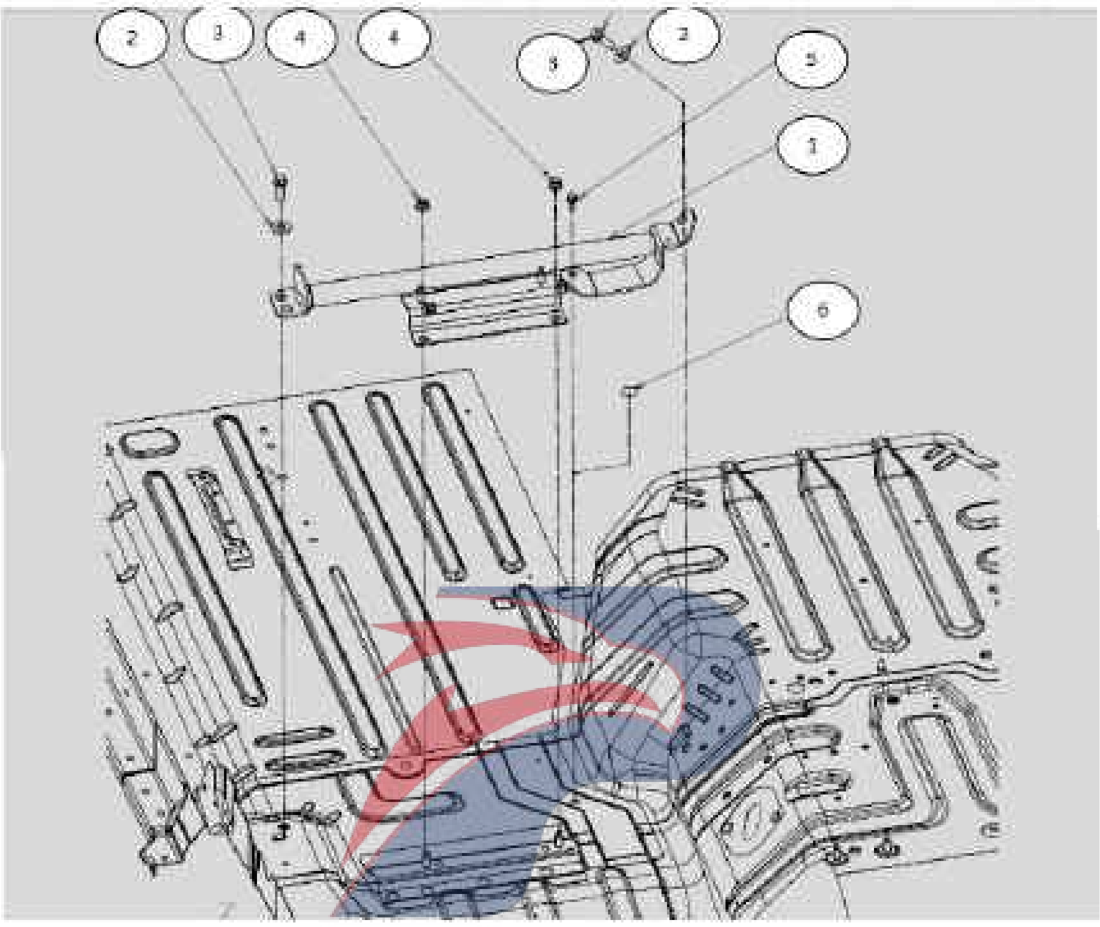
2. Left stiffener - Sill trim strip

Right stiffener -- Sill trim strip

3. Screw

4. Screw

Seat bracket assembly



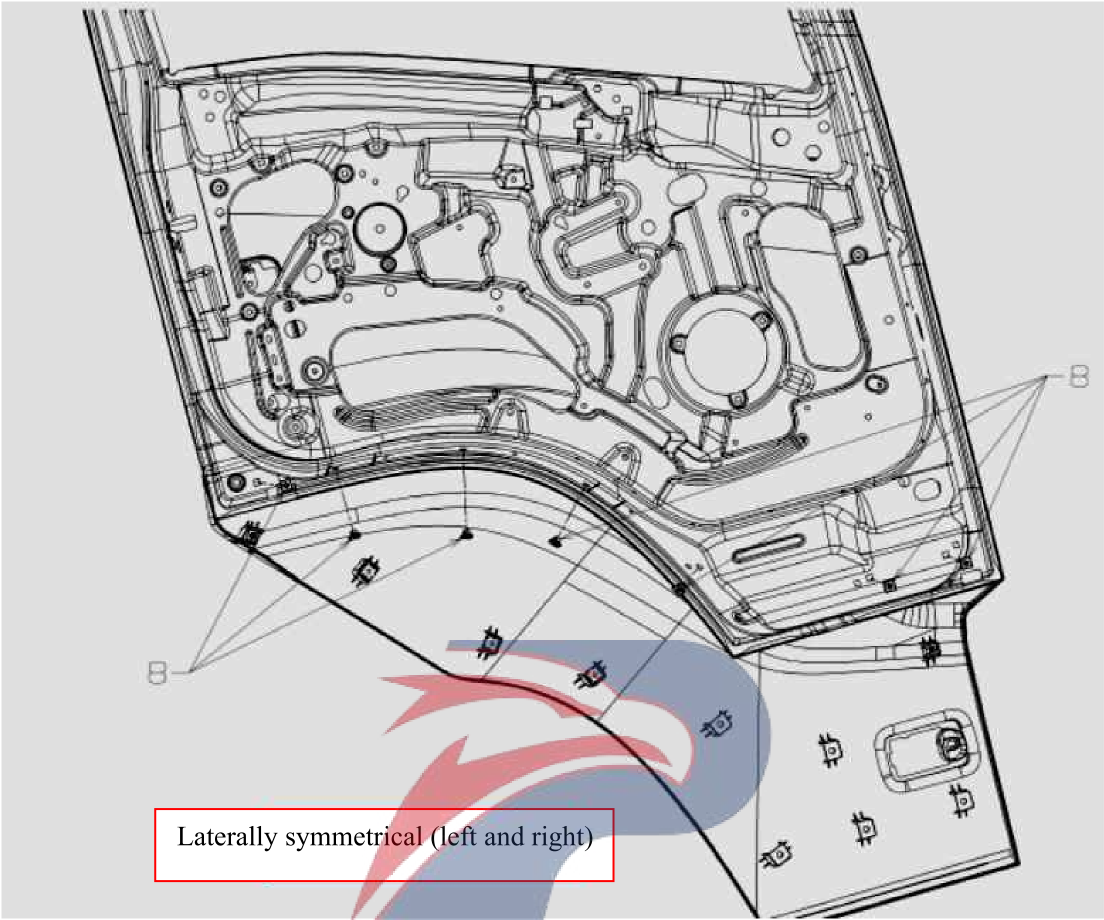
Assembly requirements:

1. Fix the mounting bracket (1) of the driver's seat to the cab as shown in the figure.
2. Bolt③: 61.3±9.2N.m；Nut ④: 51.2±7.7N.m。

Assembly details:

1. Seat mounting bracket assembly (6800020-D17YZ)
2. Washer (6800012-D17YZ)
3. Bolt (6800011-D17YZ)
4. Nut (Q32010(P=1.25)
5. Bolt (Q1840820)
6. Seal cover plate (8200143-803)

Gasket nut assembly



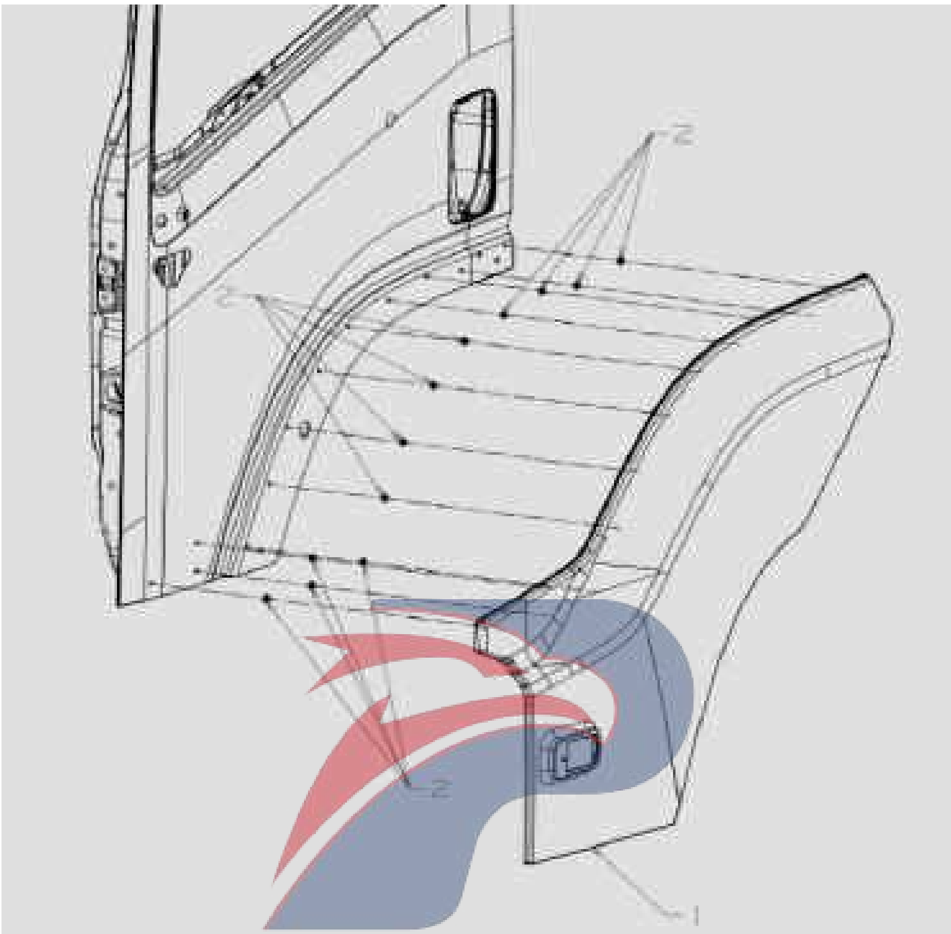
Assembly requirements:

1. As shown, insert the nut (1) into the corresponding mounting hole under the cab door.

Assembly details:

1.Washer nut (6102215-D17YZ)

Fixing nail assembly



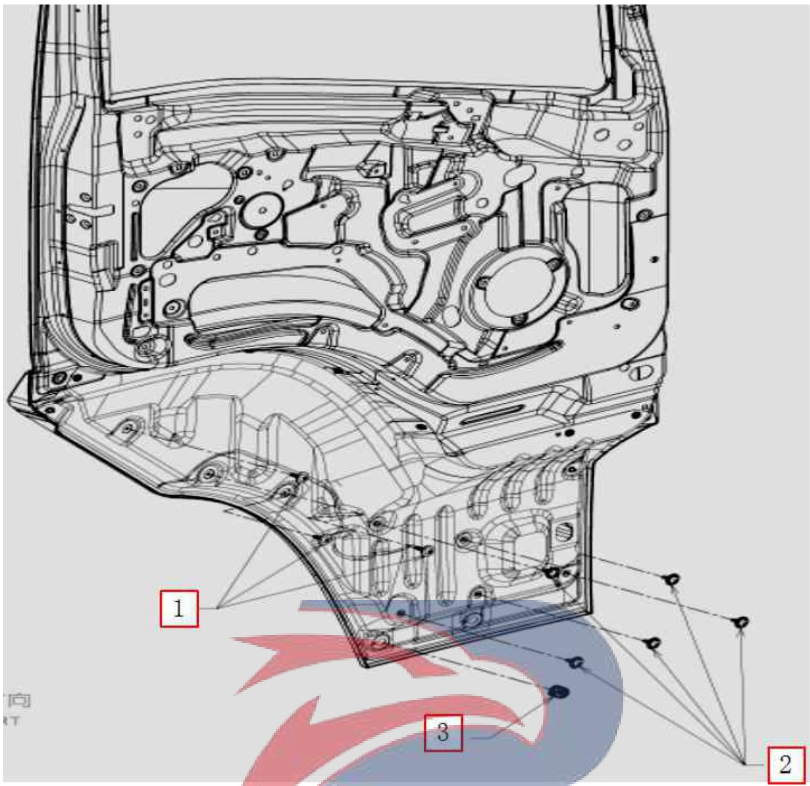
Assembly requirements:

1. Take the fixed nail (1) as shown in the right followed by embedded, difficult to use wood hammer percussion.
2. Insert part 1 into corresponding nail holes.

Assembly details:

1. Right wheel brow outer plate assembly - front door (6102210-D17YZ)
Left wheel brow outer plate assembly -- front door(6102110-D17YZ)
2. Fixing nail (8101312-117/C)

Fastening nail assembly at the lower part of the inner panel



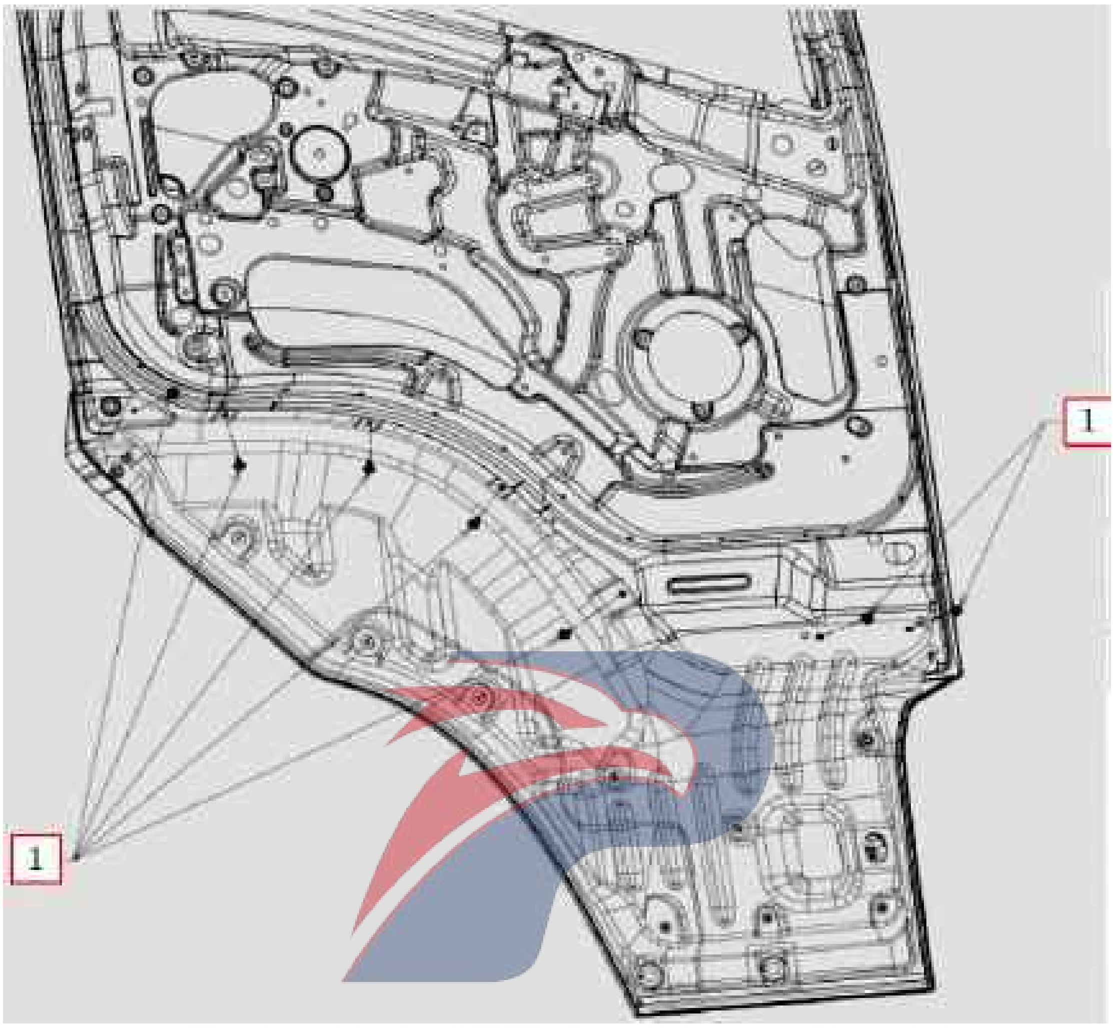
Assembly requirements:

1. Fix the inner panel onto the trim panel below the door with screw (1) as shown on the right.
2. Take the fixed nail (1) as shown in the right followed by embedded, difficult to use wood hammer percussion.
3. Install the cushion in the illustrated position, and pay attention to the screw-in direction.

Assembly details:

1. Screw(6102218-D17YZ)
2. Fixing nail (6102214-D17YZ)
3. Cushion pad(6102213-D17YZ)

Left/right wheel brow inner guard plate assembly



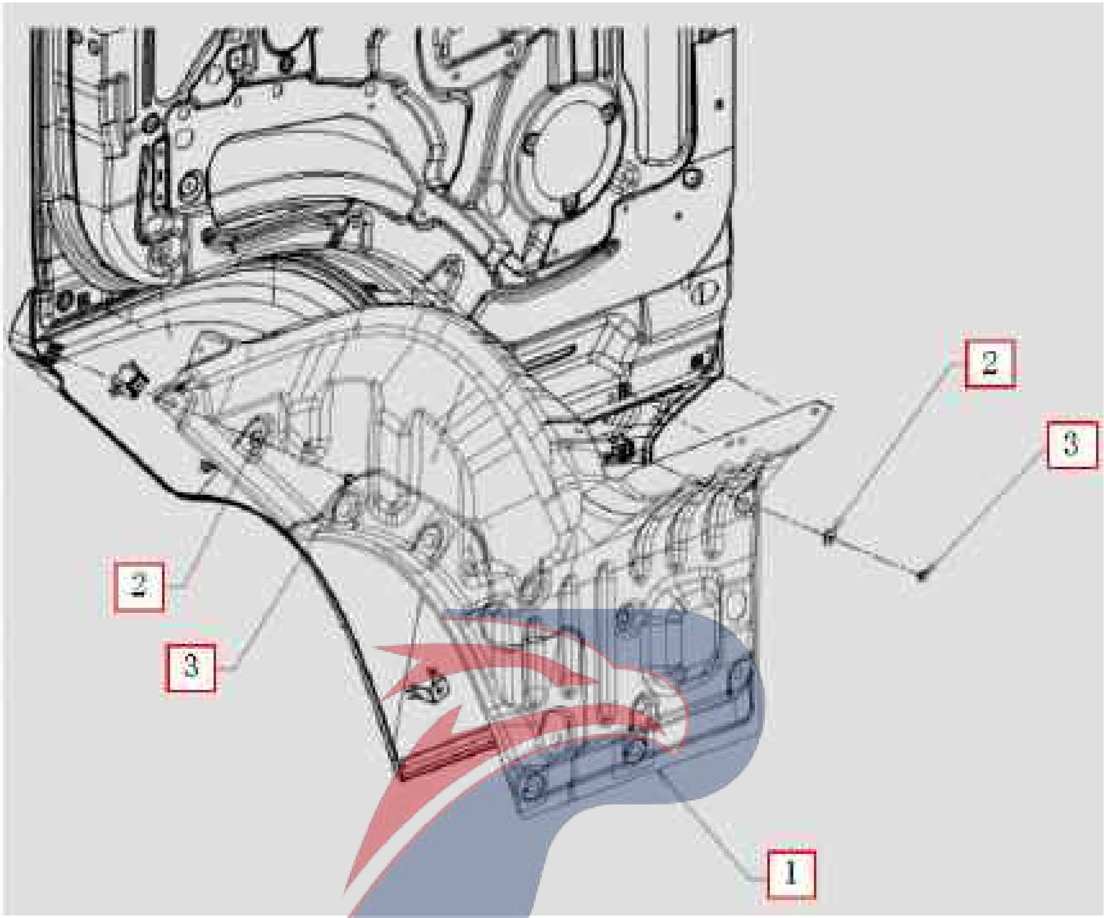
Assembly requirements:

1. As shown in the figure, fix the wheel brow plate under the door with screw (1).

Assembly details:

1、Screw(6102219-D17YZ)

Left/right wheel brow inner guard plate assembly



Assembly requirements:

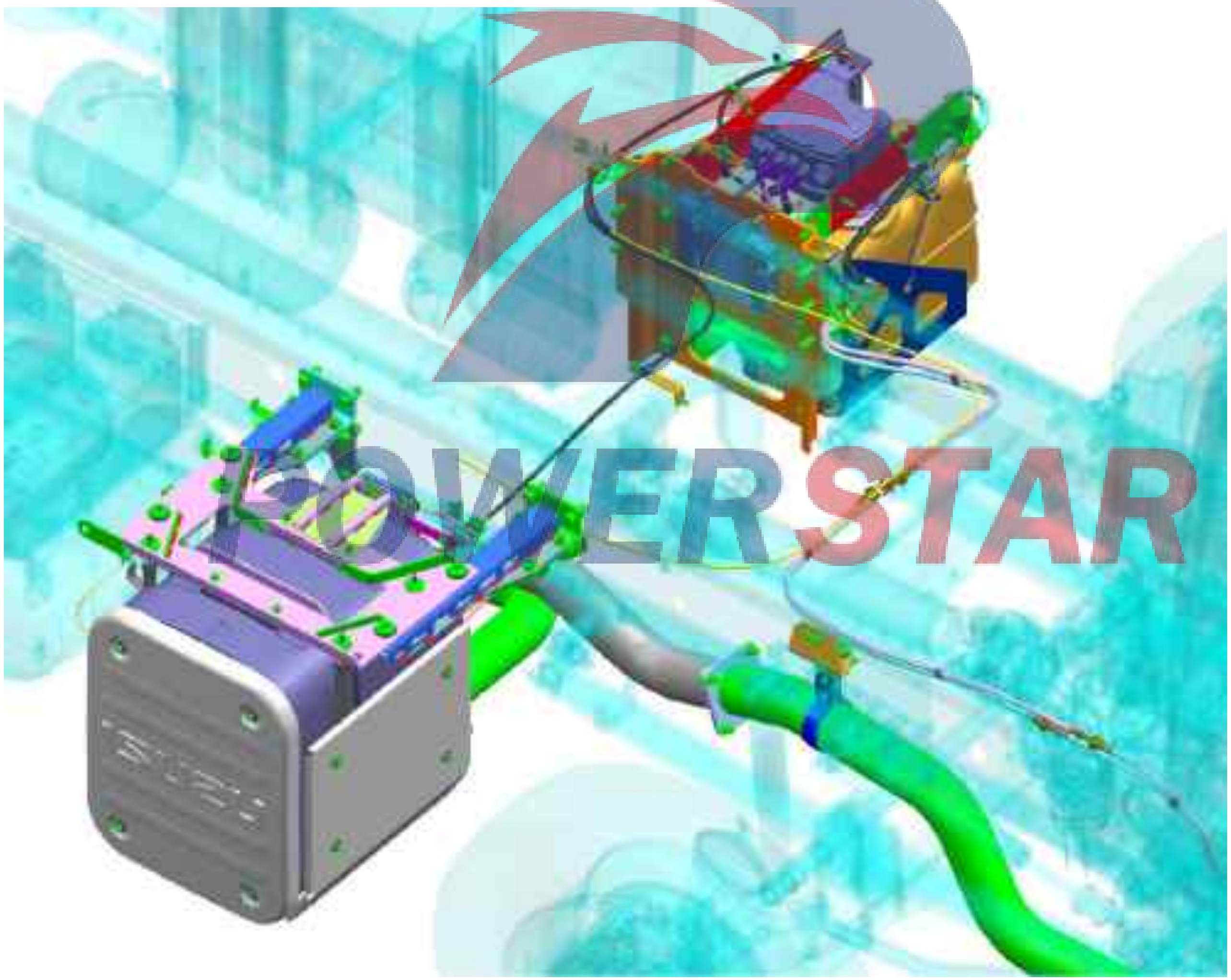
1. As shown on the right, fix the left inner panel - front door wheel brow (2) onto the corresponding positions under the left door assembly.

Assembly details:

1. Inner plate assembly of right wheel brow (6102410-D17YZ)
2. Inner plate assembly of left wheel brow (6102310-D17YZ)
3. Washer (6102217-D17YZ)
4. Nut(6102216-D17YZ)

Selective catalytic reduction system of urea

-Cummins emission system-



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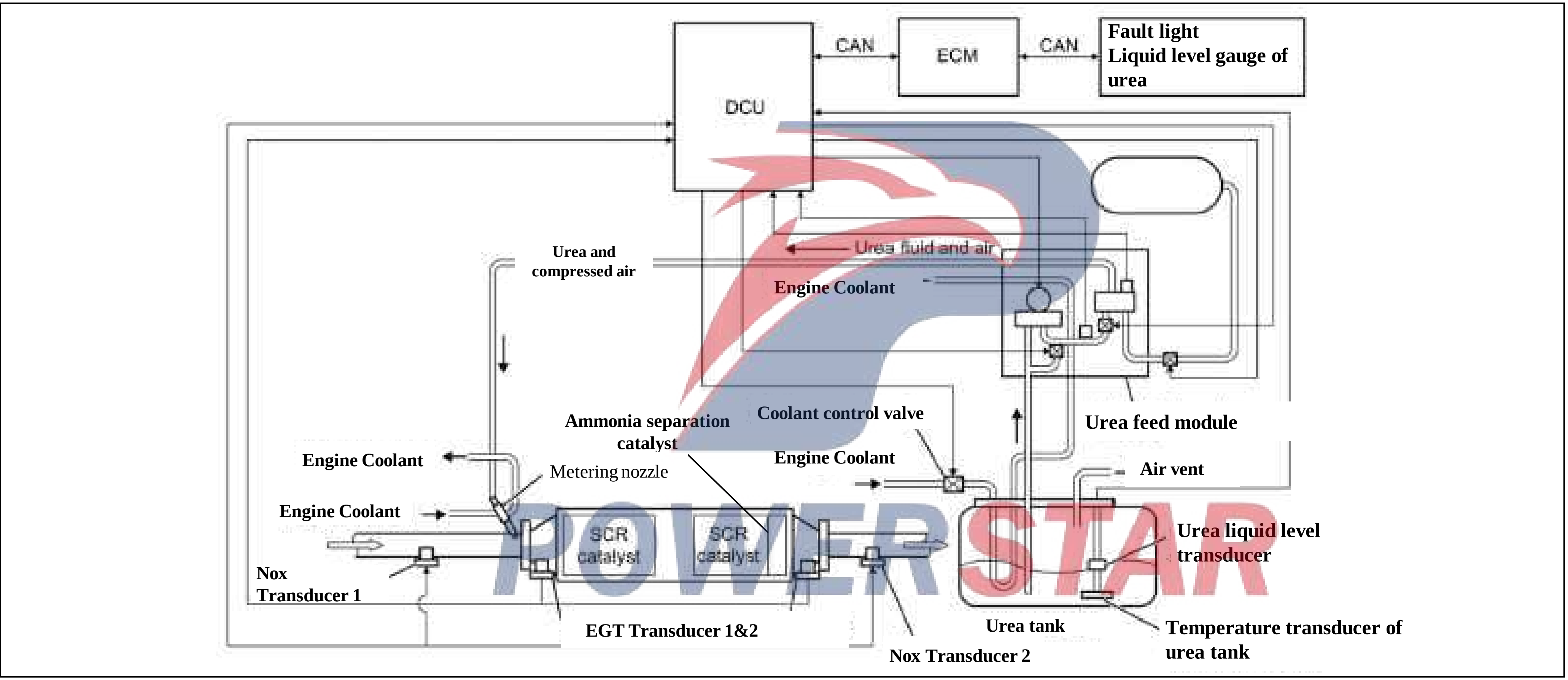
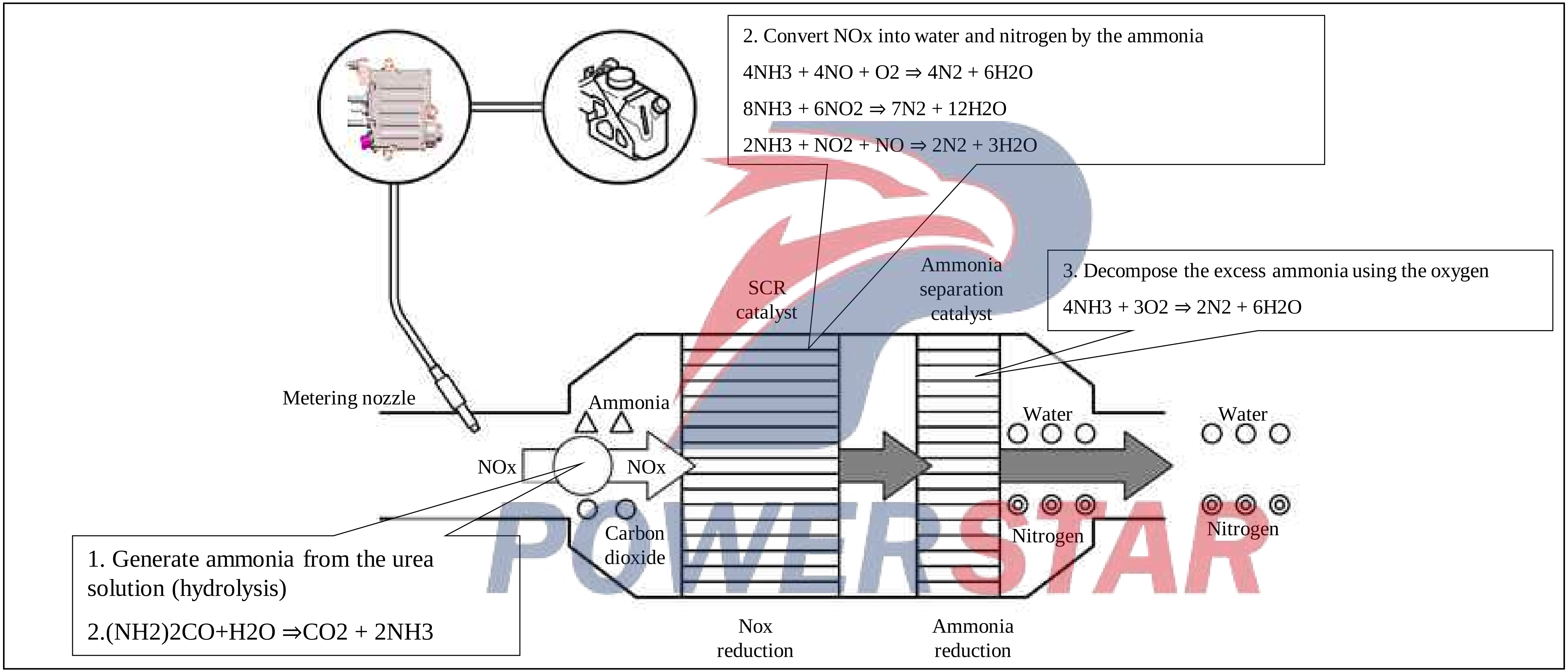
SCR system diagram



- SCR (Selective Catalytic Reduction System) waste gas treatment equipment is adopted to satisfy National Ⅴ emission requirements .
- Through the reduction reaction, the urea SCR system changes the nitrogen oxide in the exhaust gas of the diesel engine into harmless nitrogen and water by using the urea.
- DCU calculates the desired injected volume of urea solution, based on Nox transducer information, and then the urea feed module injects a mixture of urea solution and air into the exhaust pipe from a metering nozzle mounted on the exhaust pipe. Through the reduction reaction, ammonia nitrogen oxide is decomposed into water and nitrogen, and the amount of nitrogen oxide is reduced.

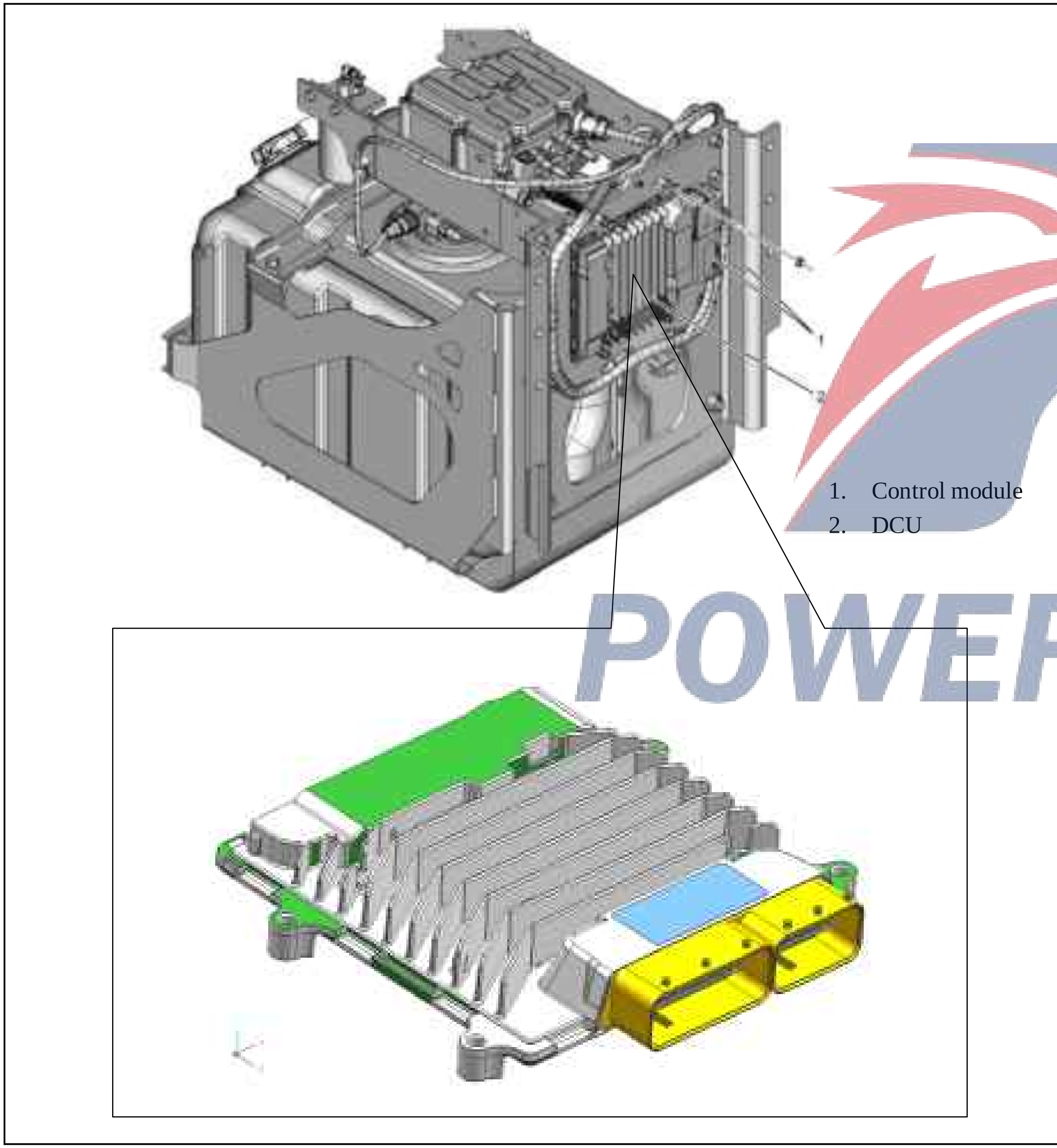
Emission reduction principle of nitrogen oxide (NOx)



AdBlue ($(NH_2)_2CO + H_2O$) discharged from the metering nozzle is decomposed by the hot gas in the exhaust gas into ammonia (NH_3). Ammonia (NH_3) and nitrogen oxides (NOx) generate a combination reaction, decomposing NOx into nitrogen (N_2) and water (H_2O).

1. The urea solution ($(NH_2)_2CO + H_2O$) is decomposed into ammonia (NH_3) by the hot gas in the exhaust gas.
2. Ammonia (NH_3) and nitrogen oxides (NOx) in the exhaust gas are decomposed into nitrogen (N_2) and water (H_2O) as they pass through SCR catalyst.
3. Excessive ammonia ($4NH_3$) is decomposed into nitrogen ($2N_2$) and water ($6H_2O$) by the oxidation catalyst (ammonia escape catalysis).

Dose control unit



DCU (dose control unit) is mounted on the back of the metering feed module. It monitors SCR system-related transducers and drives the actuator to control the urea SCR system. DCU also provides the diagnostic function of system. If the function detects any problems with the urea SCR system, it warns the driver by lighting the SCR warning lamp and MIL on the dashboard and sets up DTC at the same time.

DCU supplier is Continental.

Caution:

The following information must be input into the new DCU when an old DCU is replaced.

•V is in (chassis number)

DCU input & output

Transducer input

- Urea temperature transducer
- Urea liquid level transducer
- Temperature transducer for urea feed pump
- Pressure transducer for urea feed pump
- Air hybrid pressure transducer for urea solution
- Exhaust gas pressure transducer (EGT) 1 & 2
- NOx Transducer 1 & 2 (via J1939 250K CAN)

Switching input

- Ignition switch

DCU

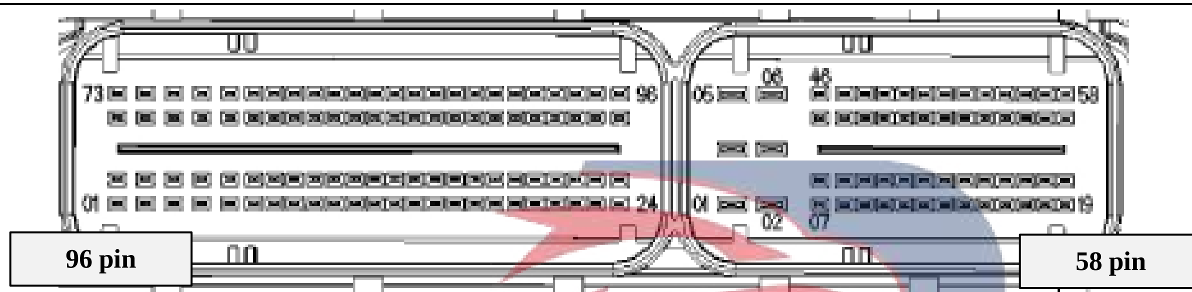
Actuator control

- Urea feed pump
- Metering valve for urea flow
- Urea exhaust valve
- Air stop valve (ASOV)
- Coolant control valve
- Heating of Nox transducer

Intelligence sharing (ISO 500K CAN)

- ECM
- Decoder

DCU Definition of DCU pin (1/3)

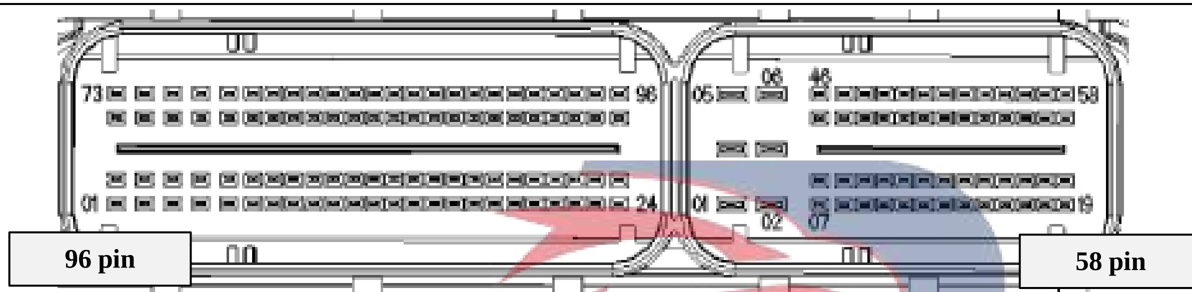


No	P in function (96 pin)
1	-
2	-
3	-
4	-
5	Urea supply pump motor power
6	-
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	-
15	ISO CAN high signal
16	ISO CAN low signal
17	• Air hybrid pressure transducer for urea solution GND
18	-
19	-
20	-

No	P in function (96 pin)
21	-
22	Signal of urea level transducer
23	-
24	Signal of urea temperature transducer
25	-
26	-
27	-
28	-
29	Urea supply pump motor control (PWM)
30	-
31	-
32	-
33	-
34	-
35	-
36	-
37	-
38	-
39	-
40	Lo-reference signal for temperature transducer of exhaust gas, urea level transducer and temperature transducer of urea tank

No	P in function (96 pin)
41	-
42	-
43	-
44	-
45	-
46	-
47	-
48	-
49	-
50	-
51	-
52	-
53	Control over low-pressure side of urea metering valve
54	-
55	Control over low-pressure side of coolant control valve
56	Control over urea blow-down valve
57	-
58	-
59	-
60	-

DCU Definition of DCU pin (2/3)

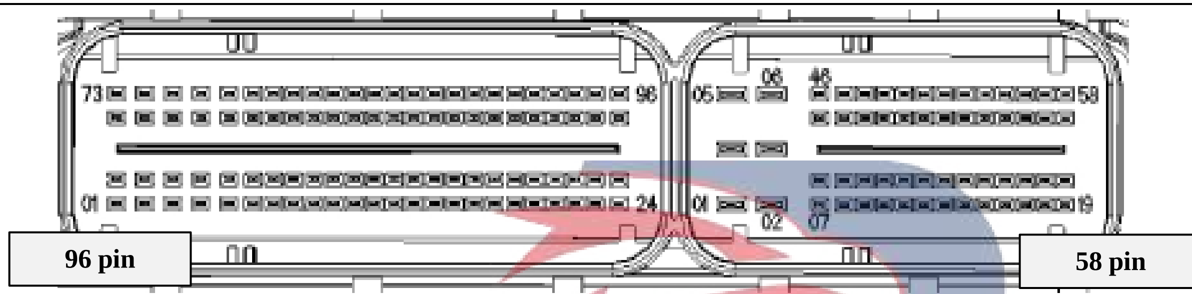


No	P in function (96 pin)
61	-
62	-
63	-
64	-
65	Urea supply pump motor power
66	-
67	-
68	-
69	-
70	-
71	Signal of air hybrid pressure transducer for urea solution
72	-
73	-
74	-
75	-
76	-
77	Control over the high-pressure side of urea metering valve
78	-
79	Control over high-pressure side of air stop valve
80	Control over low-pressure side of air stop valve

No	P in function (96 pin)
81	-
82	-
83	-
84	-
85	-
86	-
87	-
88	-
89	-
90	-
91	-
92	-
93	-
94	-
95	-
96	-

No	P in function (58 pin)
1	Battery voltage
2	Connected to the grounding line
3	Battery voltage
4	Connected to the grounding line
5	Battery voltage
6	Connected to the grounding line
7	-
8	-
9	-
10	-
11	-
12	-
13	-
14	CAN high signal (NOx transducer)
15	CAN low signal (NOx transducer)
16	-
17	Signal of exhaust temperature transducer 1
18	Signal of exhaust temperature transducer 2
19	-
20	-

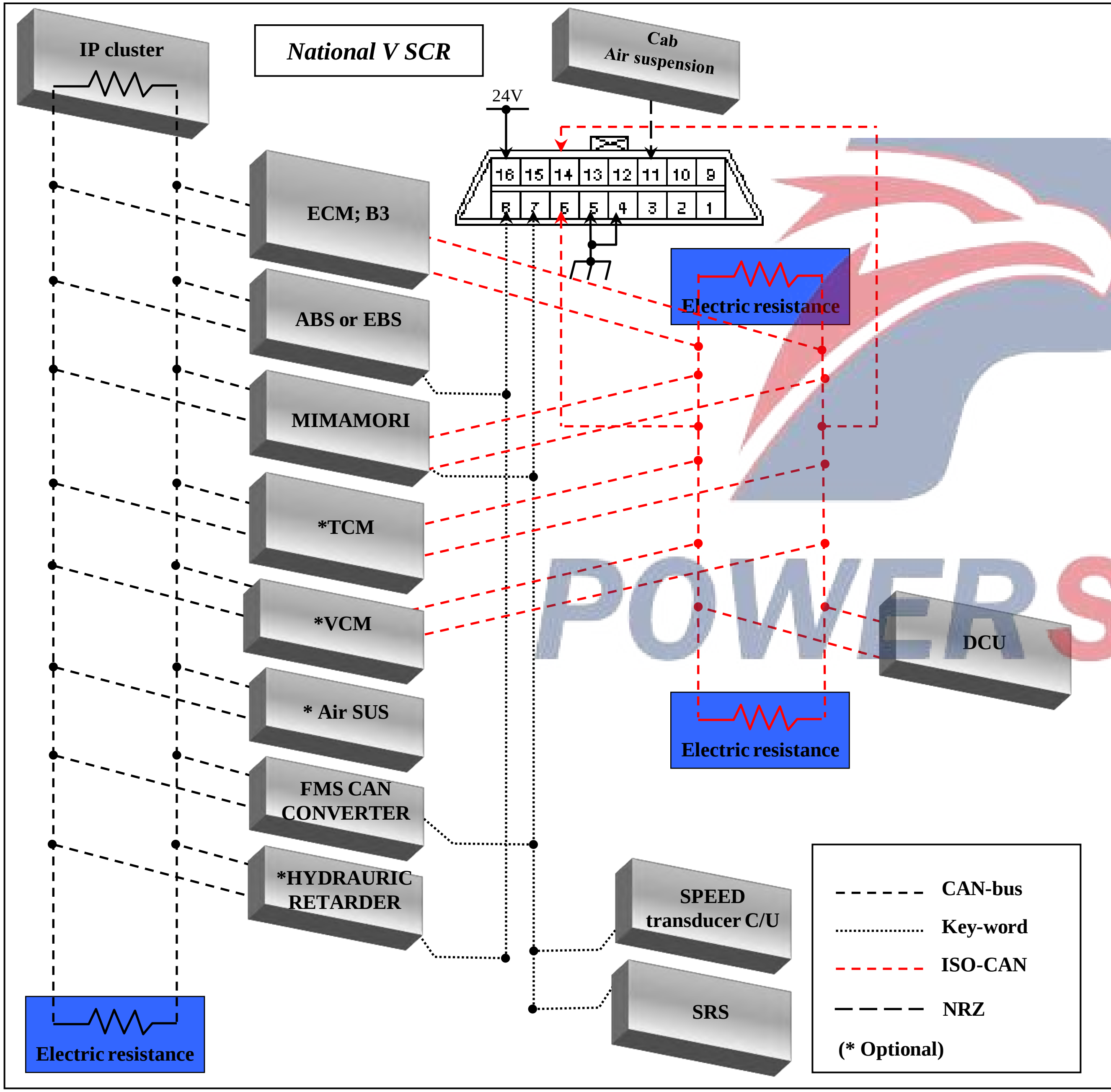
DCU Definition of DCU pin (3/3)



No	P in function (58 pin)
21	-
22	-
23	-
24	-
25	-
26	-
27	-
28	-
29	-
30	-
31	Signal of urea tank temperature transducer
32	-
33	-
34	-
35	-
36	-
37	Ignition switch voltage
38	-
39	-

No	P in function (58 pin)
40	-
41	Ignition switch voltage
42	-
43	-
44	-
45	Signal of pressure transducer for urea feed pump
46	-
47	Control over the high-pressure side of coolant control valve
48	AdBlue supply pump control (PWM)
49	-
50	Signal of urea tank temperature transducer
51	-
52	-
53	-
54	-
55	-
56	-
57	5V reference for transducer of urea feed pump
58	-

Communication of Control Module (1/2)



Communication between control modules (National V)

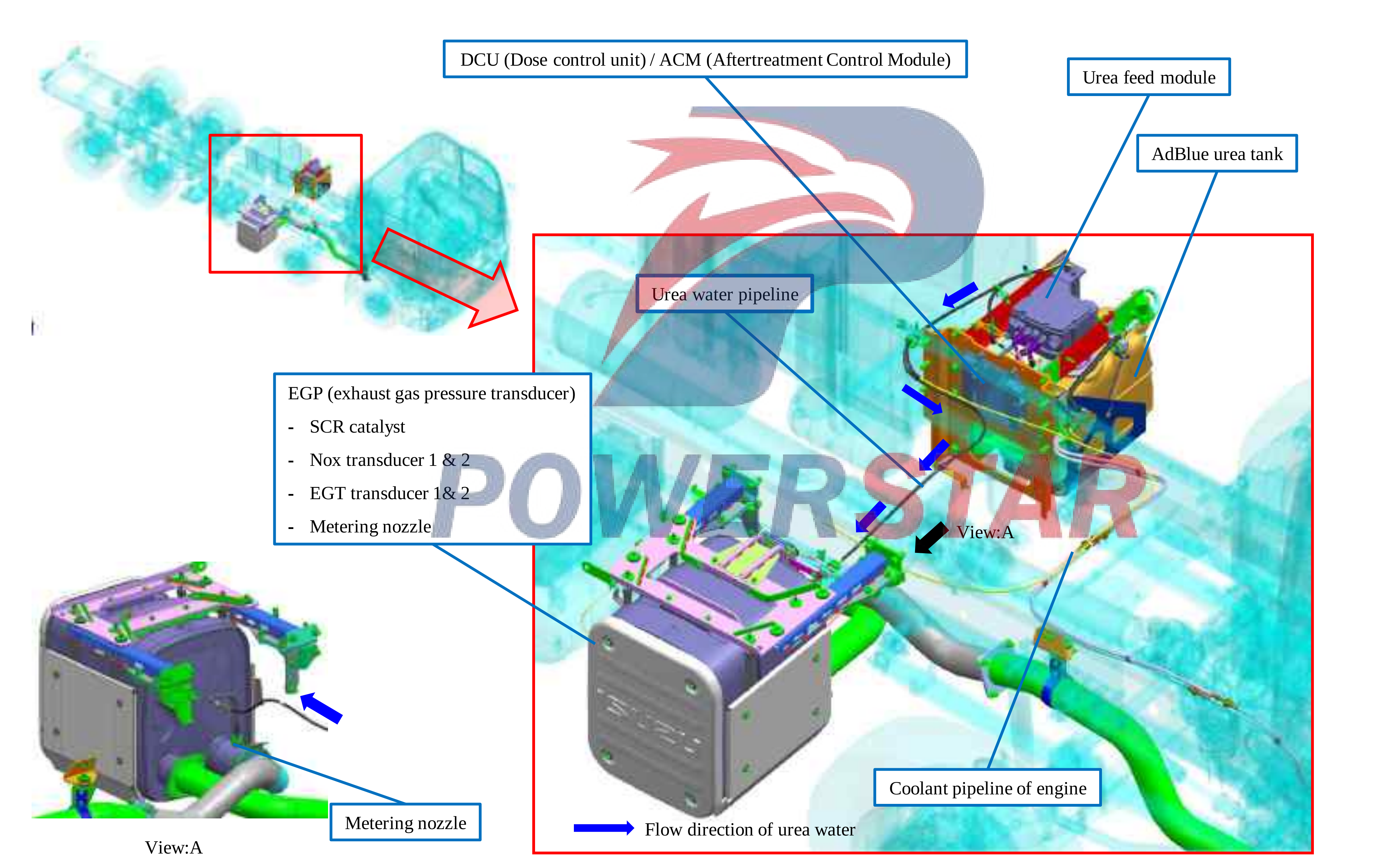
ISO CAN loop is used for communication between DCU and other control modules. CAN communication uses two communication lines to connect multiple control modules for data sharing and communication.

Different control modules can exchange multiple data at the same time. Besides, different control modules share signals for various kinds of control.

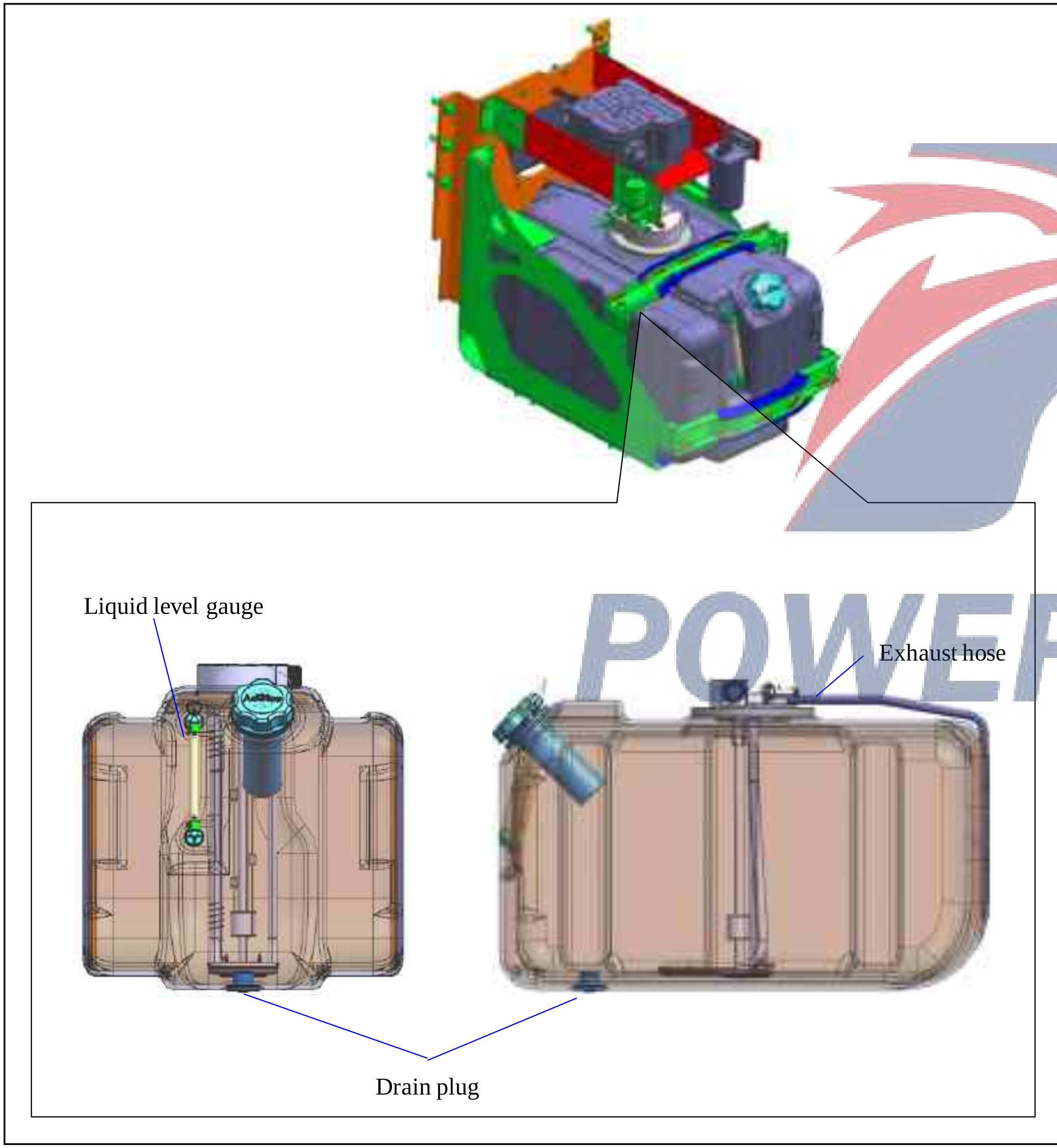
Communication between the fault diagnostic instrument and DCU

The fault diagnostic instrument communicates with ECM via the ISO CAN loop.

Control module list



Urea tank



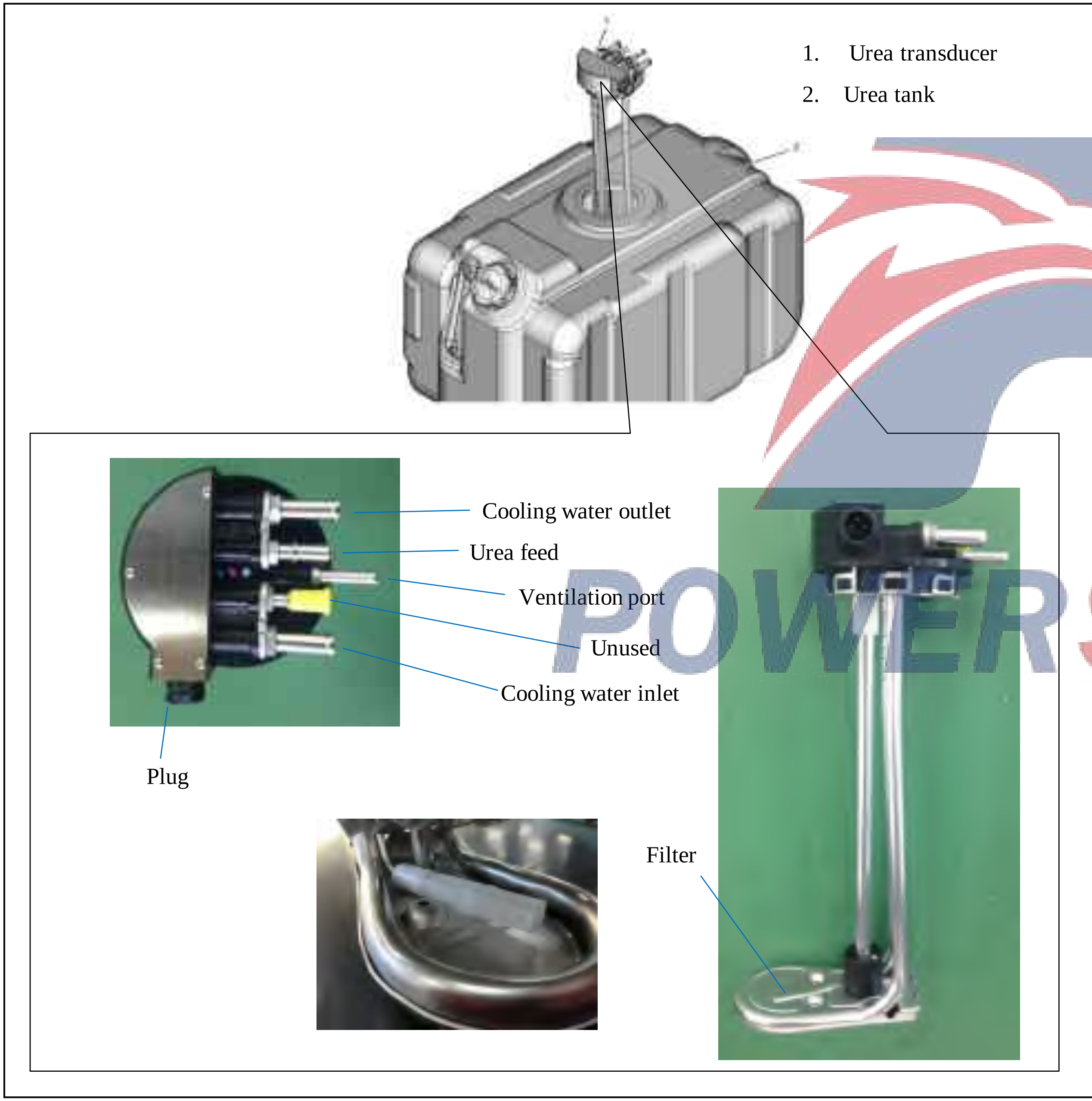
The urea tank is made of special resins and mounted on the left side of the vehicle. The urea level transducer and urea temperature transducer are installed in the tank body. In addition, the engine coolant used to defrost and hold (heating) controls is circulated in the urea tank.

The liquid level gauge to check the liquid level is installed outside the urea fluid tank.

Caution:

The capacity of urea fluid tank is 75L, and the available capacity is 60L.

Urea transducer (1/2)

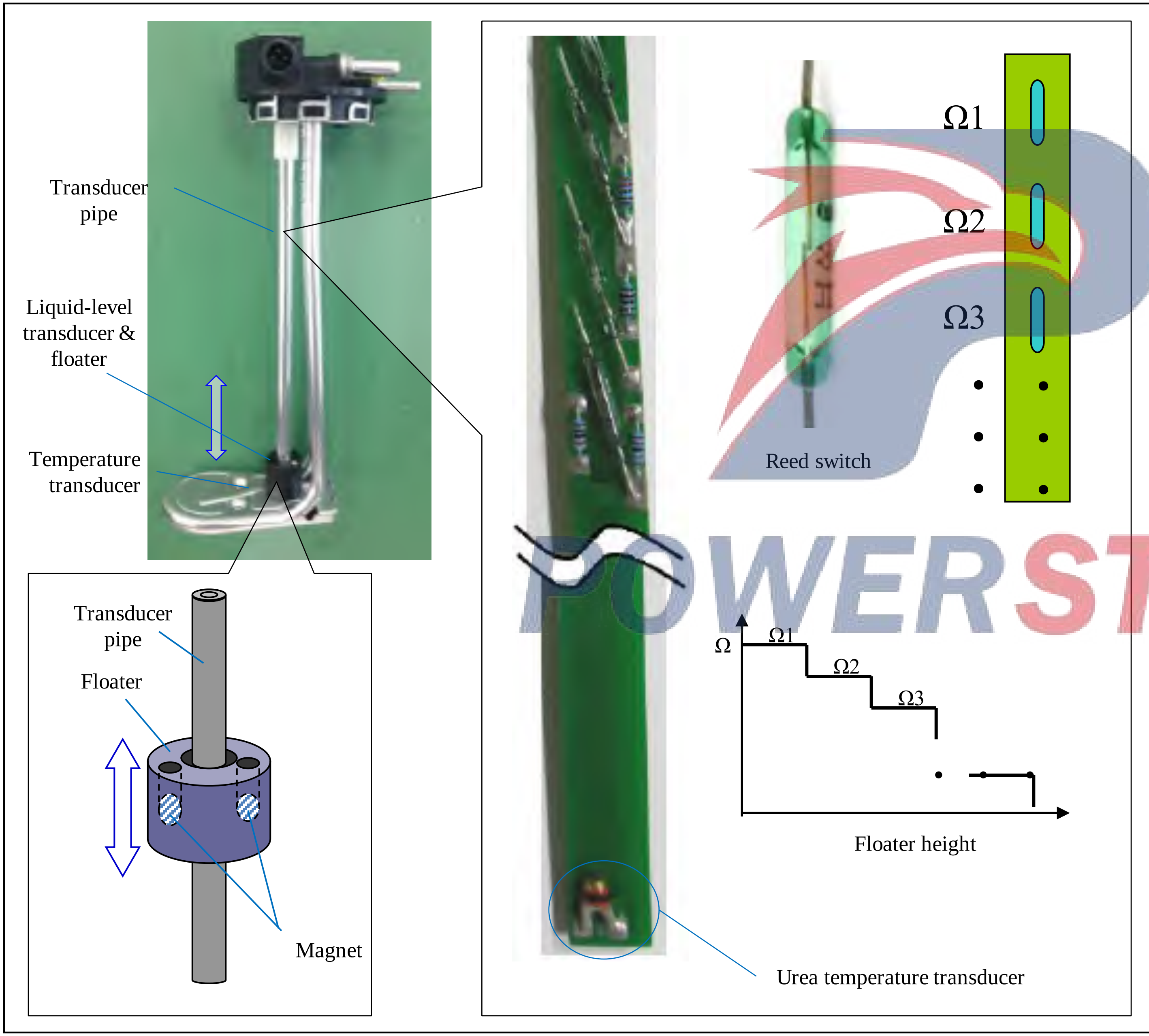


The urea transducer is installed in the urea tank and is made up of a urea temperature transducer and a urea level transducer. The urea temperature and liquid-level information in the urea tank is sent to DCU.

Caution:

The filter installed on the urea transducer has the function to filter foreign matters in the urea. However, this catalyst does not need to be replaced regularly. (without separate accessories)

Urea transducer (2/2)



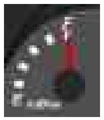
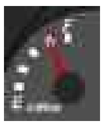
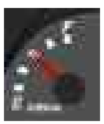
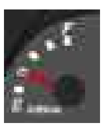
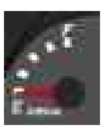
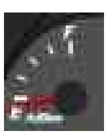
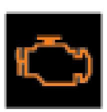
Urea liquid level transducer

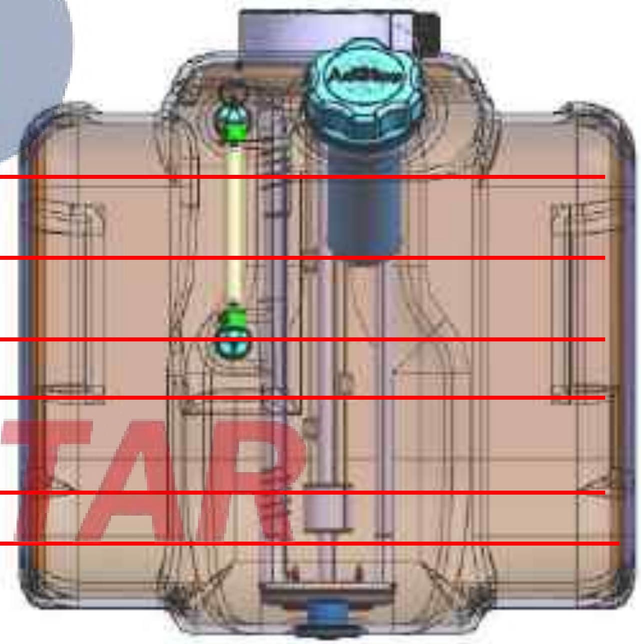
The urea level transducer consists of a floater and a transducer tube. The floater with a magnet is installed in the transducer tube. The transducer tube is equipped with a circuit board with reed switches constructed with different resistances. The combined resistance value is determined by the magnetic force in the floater to control the reed switch constructed on the circuit board.

Urea temperature transducer

The urea temperature transducer is inside the liquid-level transducer module to measure the temperature of the urea solution in the tank. The temperature transducer is a thermistor-type transducer and is on the same circuit board as the liquid-level transducer.

Urea liquid level

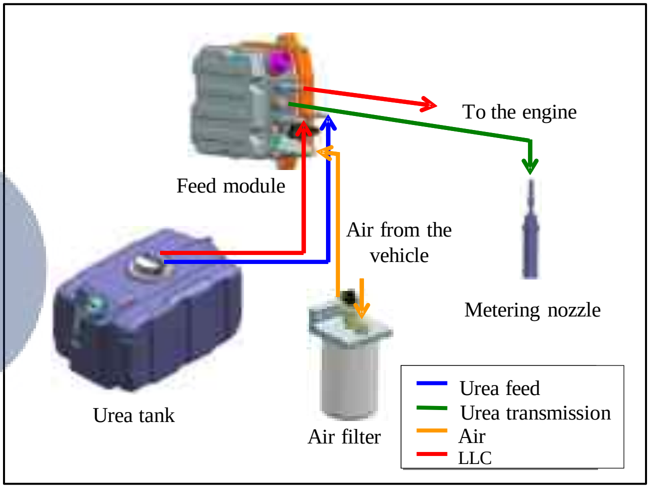
Position of transducer	Instrument	Warning lamp	Resistance (Ω)	Liquid level (L)	Liquid level (%)
0			68	Over 60	100
1			136	60	98.8
2			336	50.1	82.5
3			486	46.7	76.9
4			686	43.4	71.5
5			836	40.2	66.2
6			1036	33.6	55.4
7			1236	30.1	49.6
8			1476	26.7	44
9			2226	20.3	33.4
10			3046	10.1	16.6
11			4046	7.1	11.7
12			5846	3.4	5.6
13		 	15046	0	0

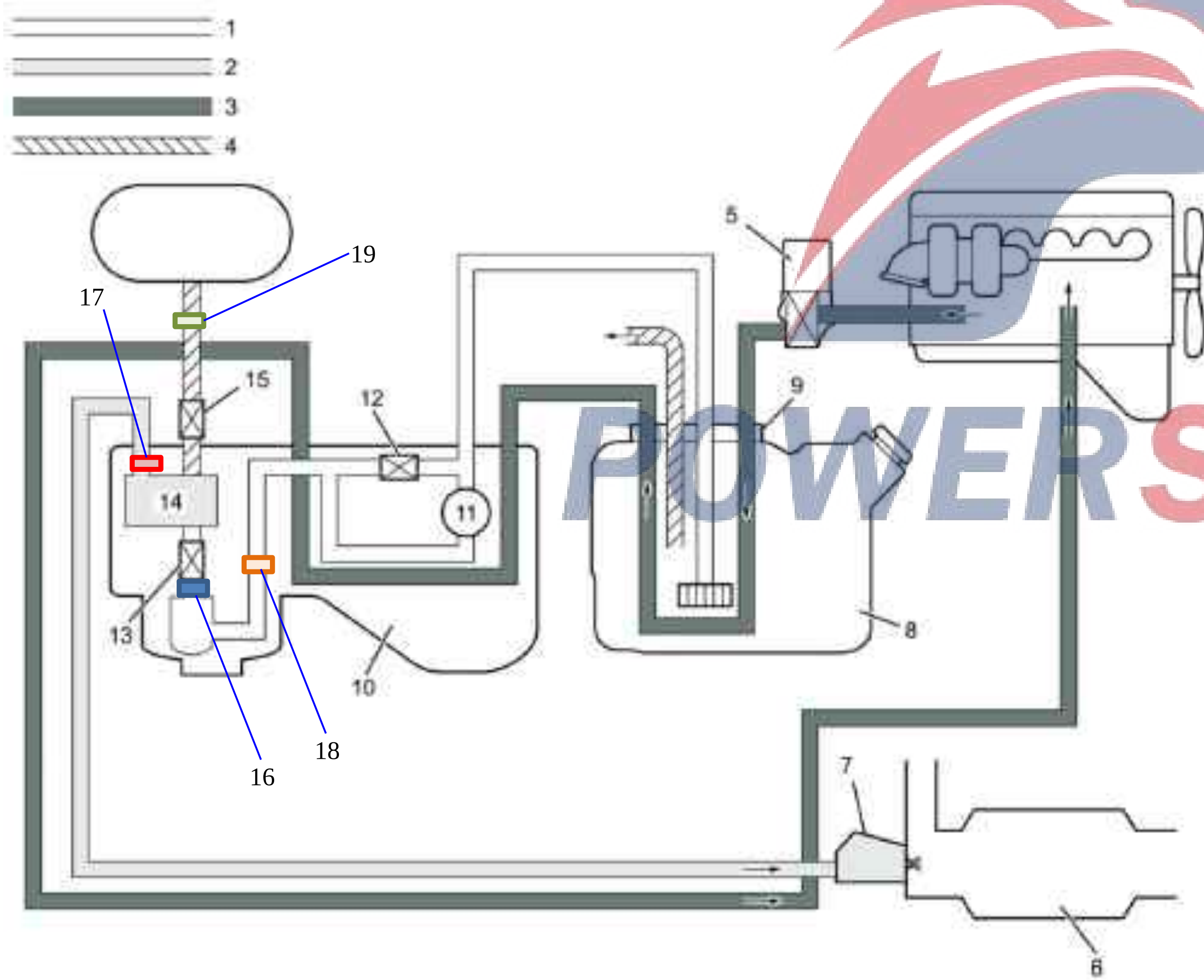


Caution:

After the low-level warning light is on, fill the urea solution immediately, add more than 3L of urea solutions to turn off the warning light. If the engine warning light is on, add more than 6.7L of urea solutions.

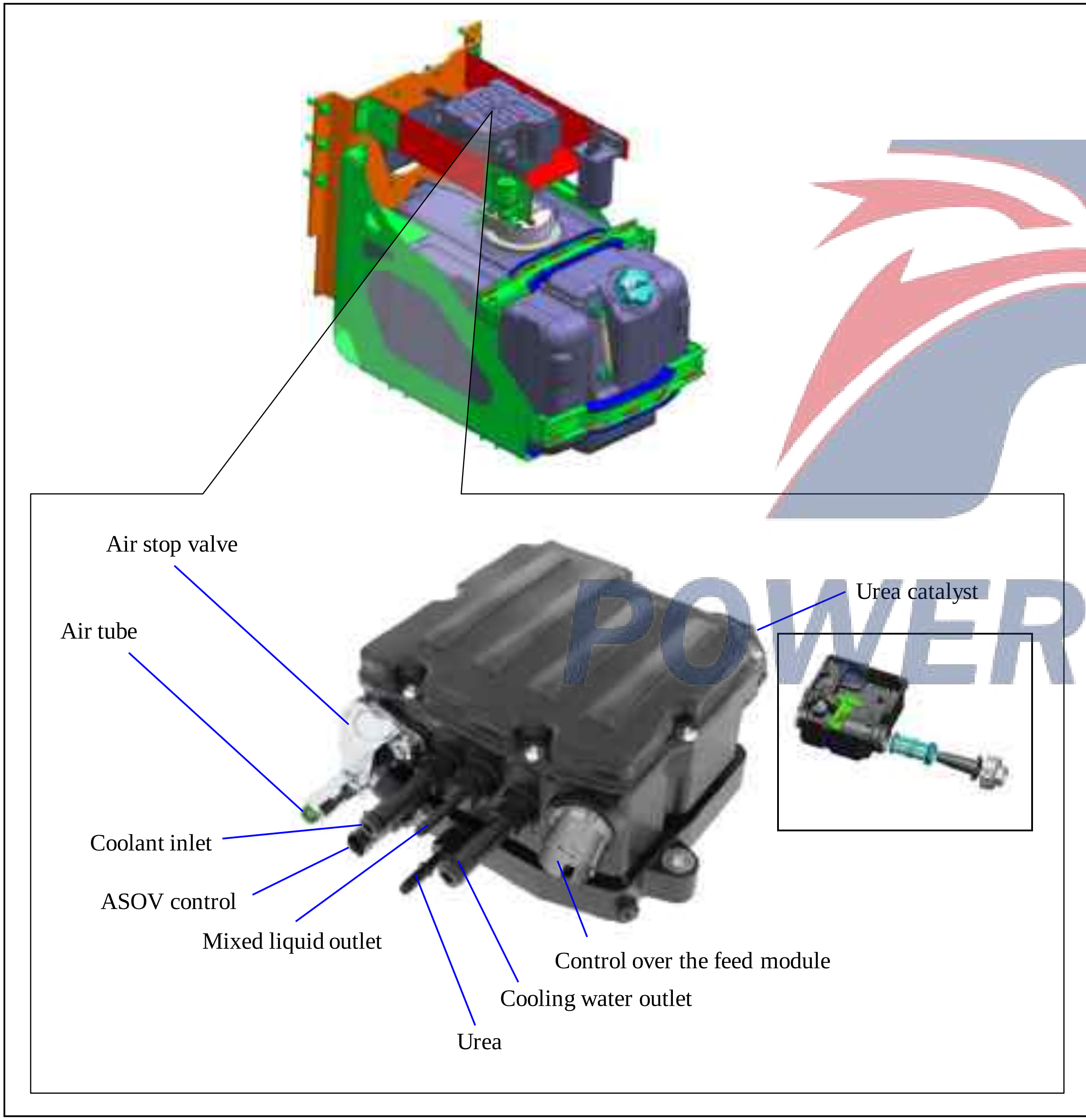
List of related measurement accessories





1. Urea
2. Air mixing
3. Engine coolant
4. Ventilation duct
5. Coolant control valve
6. SCR filter
7. Metering nozzle
8. Urea tank
9. Urea transducer
10. Urea feed module
11. Urea pump motor
12. Urea discharge valve
13. Urea metering valve
14. Mixer
15. Air stop valve (ASOV)
16. Urea feed pressure transducer
17. Hybrid pressure transducer
18. Temperature transducer for urea feed pump
19. Air filter

Urea feed module



The urea feed module is installed above the urea tank. The urea fluid feed module consists of the following components.

Urea pump motor

- The urea is pressurized to a prescribed pressure and supplied to the metering nozzle.

Urea exhaust valve

- Control and release the excess urea filtered and pressurized into the urea tank.

Urea metering valve

- Control the amount of urea into the mixer.

Mixer

The urea and air are mixed here.

ASOV (Air stop valve)

- Control the air amount into the mixer.

Temperature transducer of urea feed pump

- Monitor the urea temperature at the position of urea feed pump.

Urea feed pressure transducer

- Monitor the pressure of the feed urea.

Air mixing pressure transducer

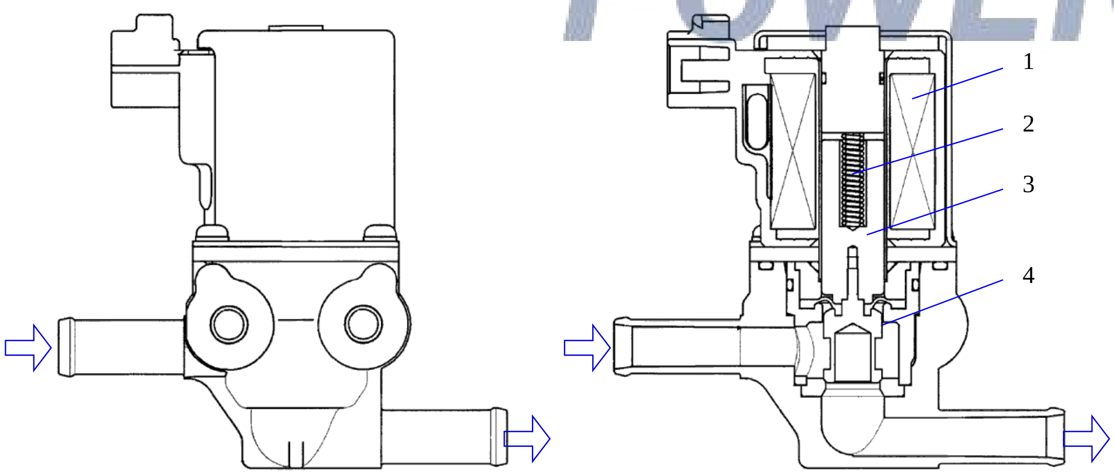
- Monitor the pressure of mixed urea & air.

Urea catalyst

- Filter the urea, and replace it every 120,000km or every 2 years as required.

Cooling water control valve

1. Coil
2. Return spring
3. Plunger
4. Valve

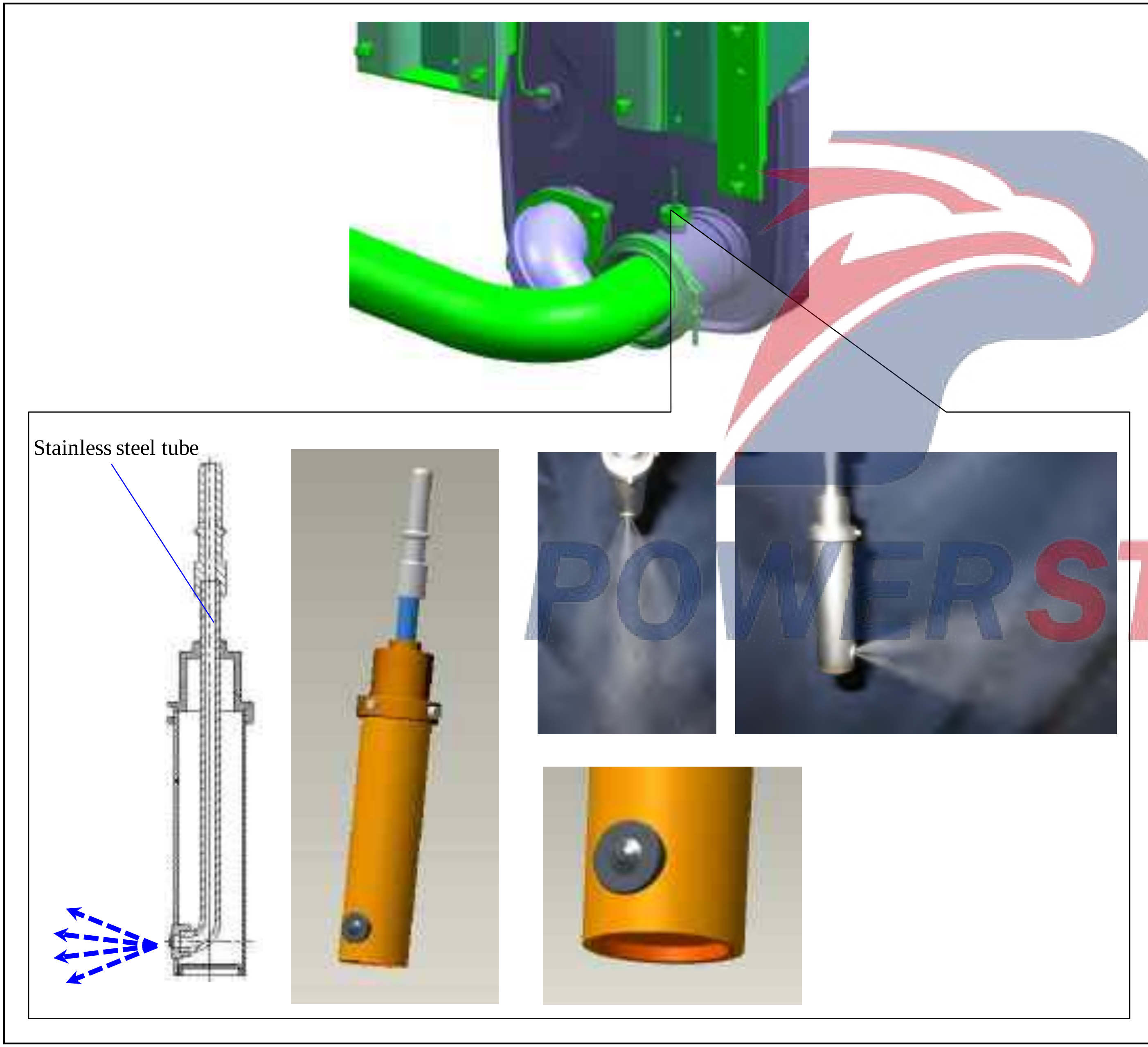


The coolant control valve (the heater control valve) is installed near the feed module. When it is lower than the specified temperature, the coolant control valve (the heater control valve) opens the inner valve and circulates the engine coolant into the urea tank and the feed module so as to defrost or maintain the urea fluid temperature.

Air filter

The air filter is mounted on the air supply pipeline in front of the urea feed module to ensure the metrological operation. Every 60,000 km must be replaced as required.

Metering nozzle



The metering nozzle is installed at the inlet of the SCR catalyst and Nox reduction is performed by injecting a mixture of urea fluid and air pressurized by the urea feed module into the exhaust pipe.

The nozzle is provided with four orifices to increase the Nox reaction. The nozzle consists of a nickel-brazed stainless steel tube to increase the heating effect.

Caution:

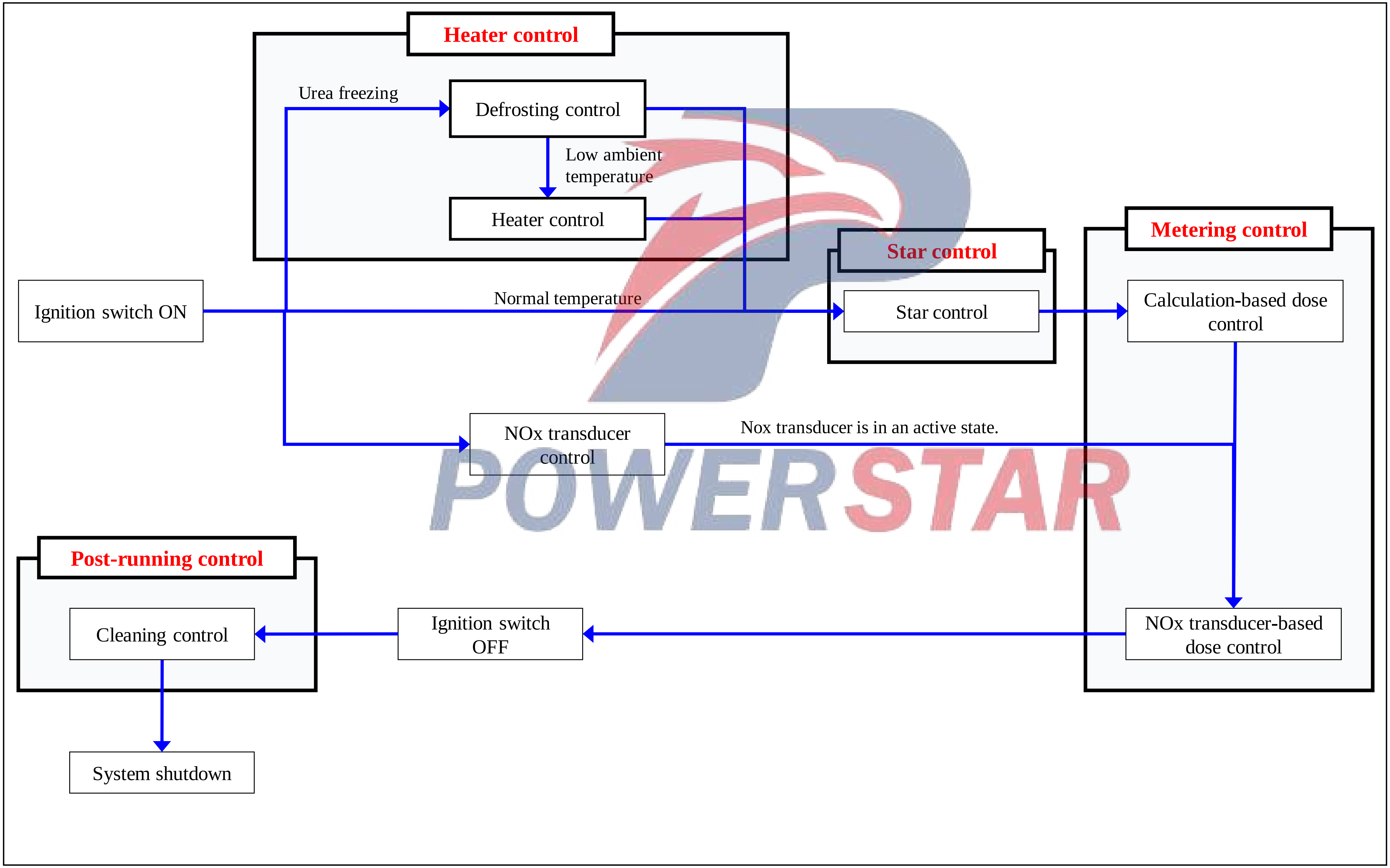
The nozzle needn't be replaced regularly. (without separate accessories)

SCR catalyst

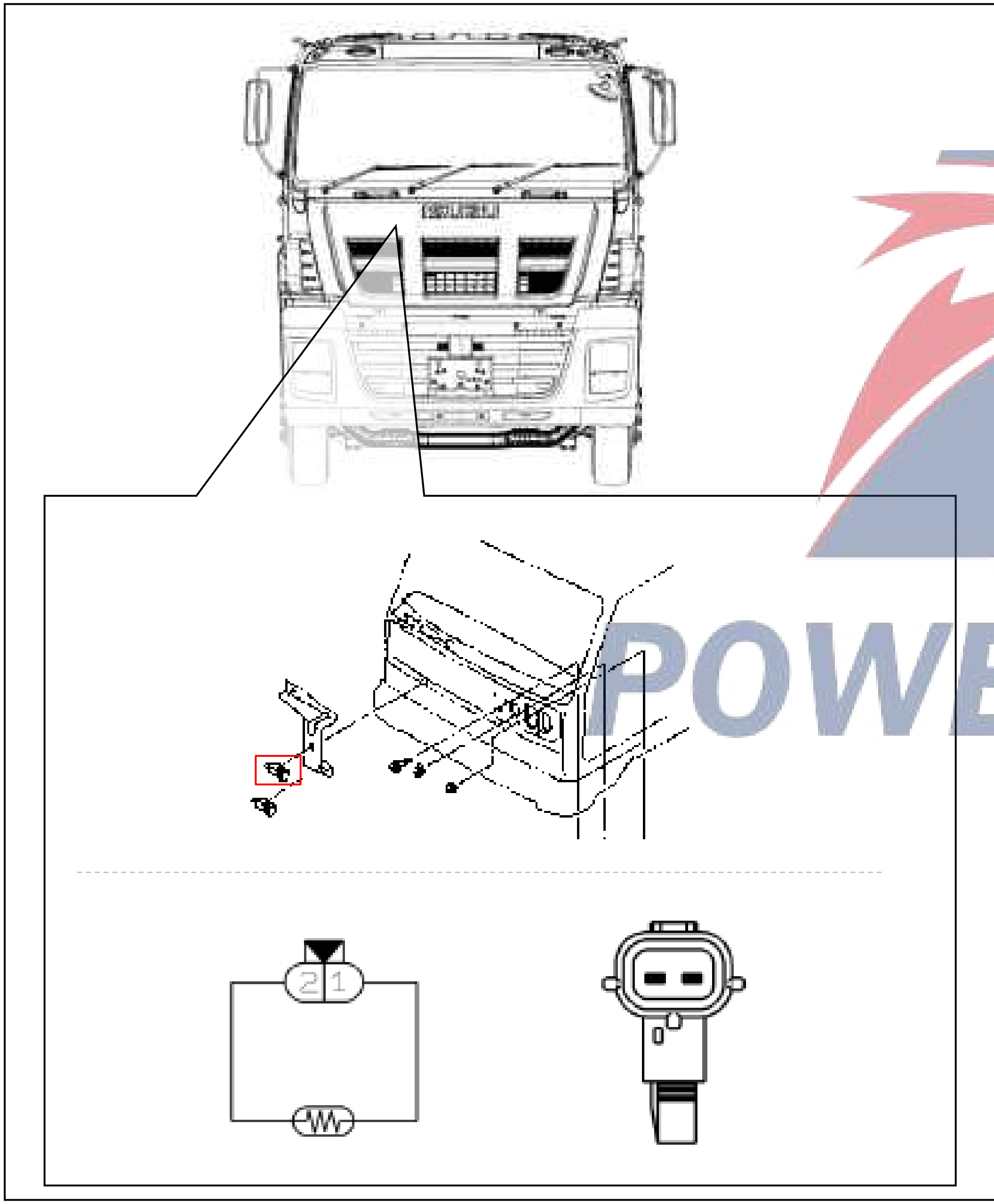
The SCR catalyst is installed inside the exhaust silencer. There are two SCR catalyst groups . One of the SCR catalysts contains an ammonia escape catalyst to meet National V emission.

The catalyst size is Φ13 inches, with a thickness of 7 inches.

Metering control system



Ambient temperature transducer



The ambient air temperature transducer is installed inside the front cover. The transducer is a variable resistance (thermistor) type, measuring the ambient air temperature. When the temperature is low, the transducer has a high resistance. When the temperature is high, the transducer has a low resistance. In the case of high resistance, ECM detects a high voltage on the signal circuit. In the case of low resistance, ECM detects a low voltage on the signal circuit. DCU and ECM share the voltage of this signal on the CAN bus to control the SCR system.

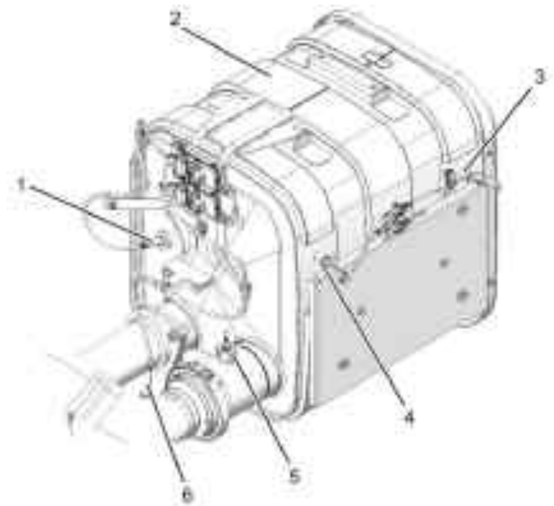
Decoder:

- The data of ambient temperature transducer can be observed on the decoder.

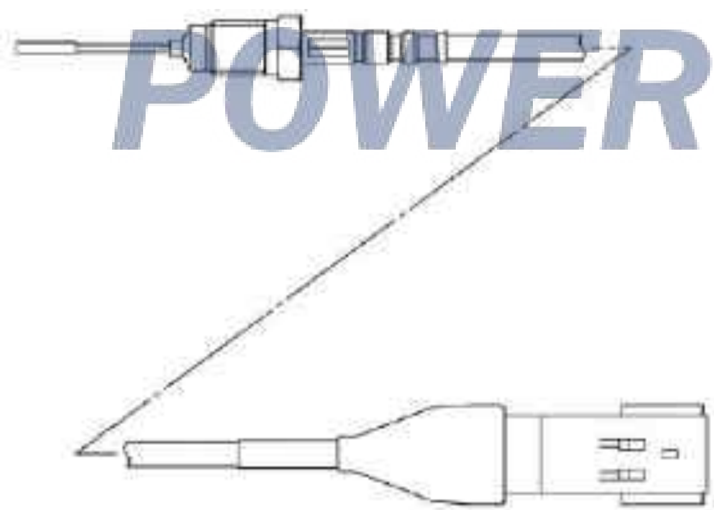
Caution:

- An ambient temperature transducer used by air conditioners of the same structure is also installed on the mounting bracket of the ambient temperature transducer.

Exhaust temperature transducer 1 (inlet) / 2 (outlet)



1. NOx transducer 2
2. SCR catalyst
3. Exhaust temperature transducer 1 (inlet)
4. Exhaust temperature transducer 2 (outlet)
5. Metering nozzle
6. NOx transducer 1



EGT (exhaust gas temperature transducer)

EGT transducer is installed on the front and back of SCR catalyst.

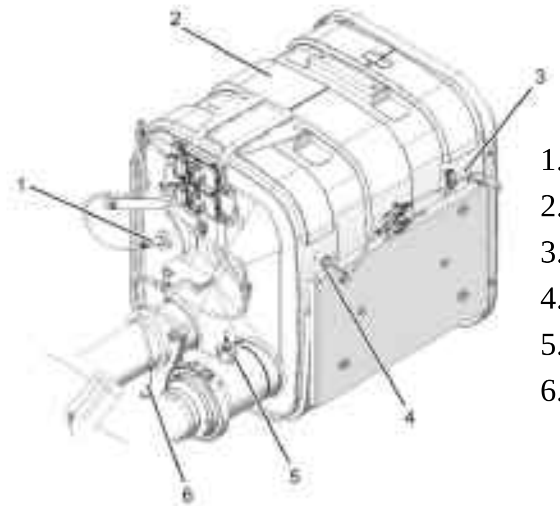
EGT Transducer 1 is installed at the inlet of the SCR catalyst to measure the upstream exhaust gas temperature of SCR catalyst. EGT Transducer 2 is installed at the outlet of SCR catalyst to measure the downstream exhaust gas temperature of SCR catalyst.

Based on the signal of exhaust gas temperature transducer, DCU controls the urea SCR system.

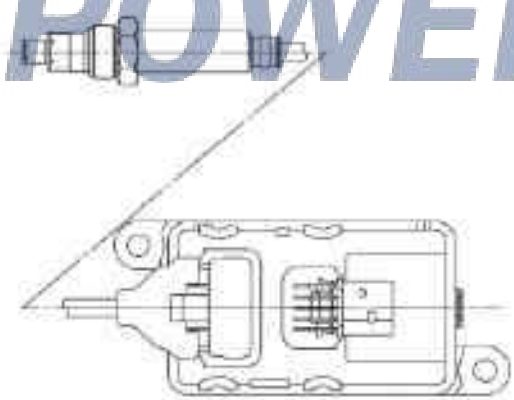
Decoder:

- The data of EGT transducer 1 & 2 can be observed on the decoder.

NOX transducer 1 (inlet) / 2 (outlet) (1/2)



1. NOx transducer 2
2. SCR catalyst
3. Exhaust temperature transducer 1 (inlet)
4. Exhaust temperature transducer 2 (outlet)
5. Metering nozzle
6. NOx transducer 1



NOx transducer 1 is installed on the upstream of the SCR catalyst to detect the concentration of NOx flowing out of the engine.

NOx transducer 2 is installed on the downstream of the SCR catalyst to detect the concentration of NOx converted by the catalyst.

The DCU monitors the NOx conversion rate through two NOx transducers.

The signal of NOx transducer is sent to DCU through the CAN communication circuit (J1939 data link). DCU calculates the required urea injection quantity based on the signal from NOx transducer 1 (inlet). Furthermore, DCU determines the conversion rate of SCR system, based on the signal from Nox transducer 2 (outlet).

Decoder:

The data related to Nox amount can be observed on the decoder.

Caution:

If Nox transducer 2 (outlet) determines that the catalytic conversion efficiency is not up to the standard, the SCR system will enter a limping energy-limited mode.

NOX transducer 1 (inlet) / 2 (outlet) (2/2)

Caution:

- Since the reacting part of transducer is made of brittle ceramic materials and the operating temperature exceeds 600 ℃, do not clean the transducer head with liquid or a wire brush.

- Nox transducer is sensitive to water, so attention shall be paid to water proofing.

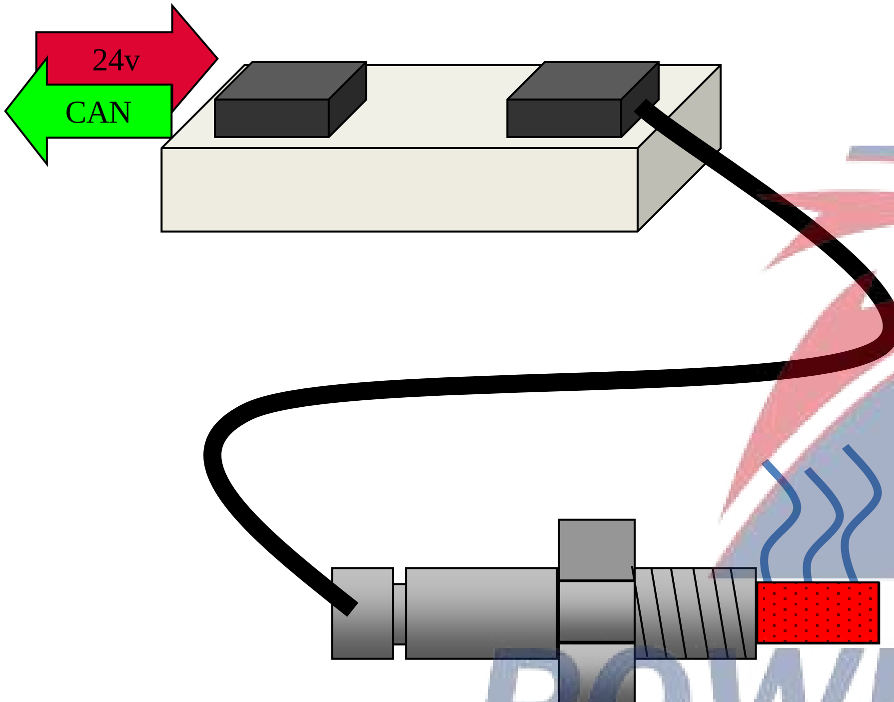
Caution:

- NOx transducer is equipped with a cortical vent, allowing fresh air to be transmitted to the transducer as a reference gas.

What's important is that the vent will not be painted or blocked by the coating after the transducer is installed. If the spraying or coating is required, isolate and protect the vent during the technological process.

Cortex

NOX Transducer action

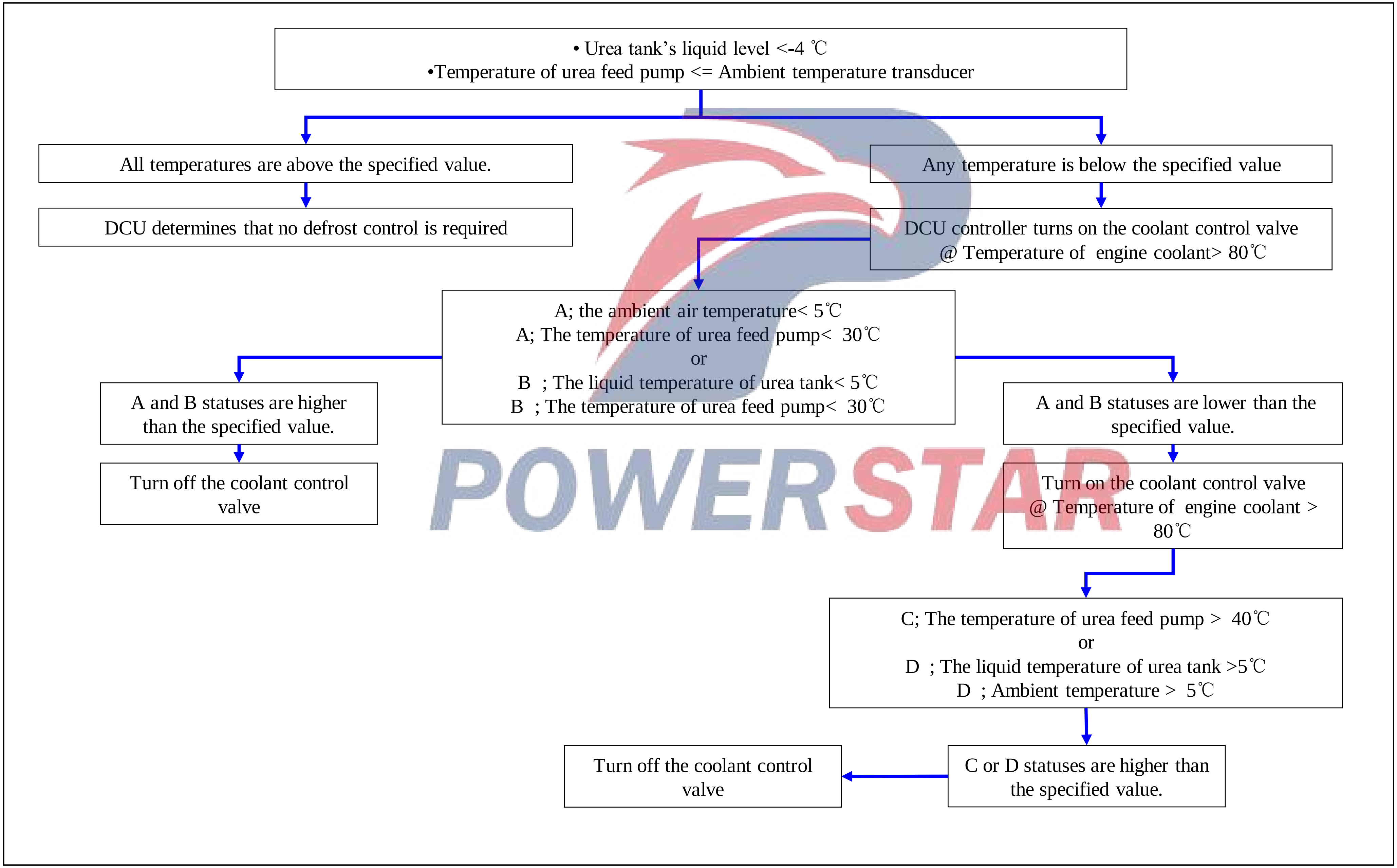


No-power reactive mode	Live - reactive mode	Live -acting mode
When the vehicle is powered off, no power is supplied to the transducer, so the transducer has no output.	Power the transducer through the vehicle's ignition switch. The transducer enters the pre-heating period to remove any moisture that may exist. This pre-heating period lasts about 60 seconds.	After receiving the signal of DCU "dew point" , the transducer element is heated to be about 800 ° C. After the transducer reaches the necessary temperature, it begins to measure NOx and the oxygen concentration.

Control over the dew-point

The "dew point" means that there is no moisture or condensate point that leads to the transducer failure in the exhaust gas. Afterwards, the temperature of dew point is set to be above 100 ° C now. This measurement is taken from the outlet EGT transducer and transmitted to DCU.

Heater control (1/4)



Heater control (2/4)

Defrosting control

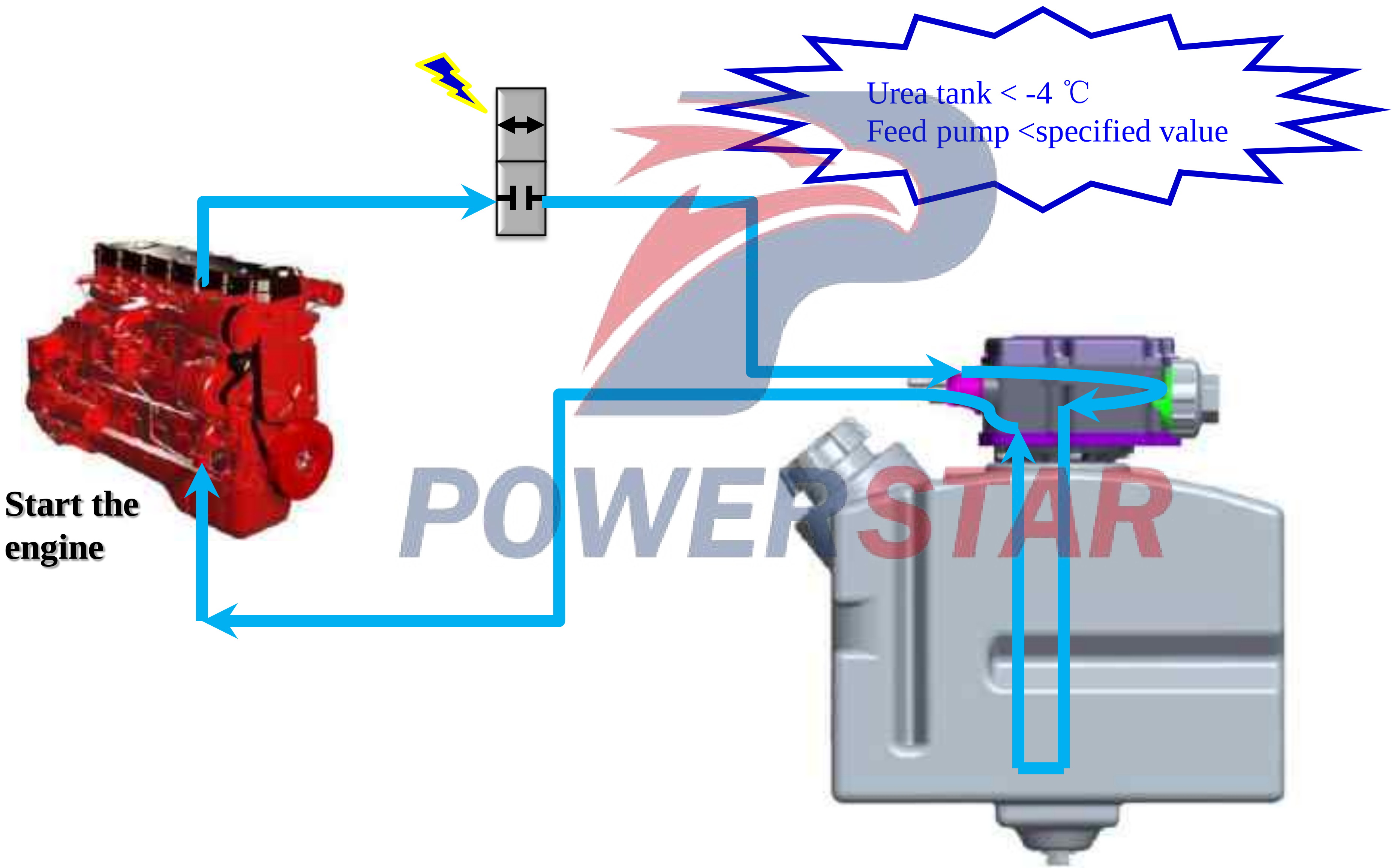
After starting the engine, DCU starts the defrost control when the urea tank temperature and the temperature of urea feed pump are below a certain temperature. Turn on the coolant control valve to circulate the engine coolant into the tank and the feed module.

Ambient Air Temperature (deg C)	Defrost Threshold (deg C)[1]
-20	30.0
-10.0	27.0
-2.0	27.0
0.0	20.0
10.0	12.5
15.0	7.0

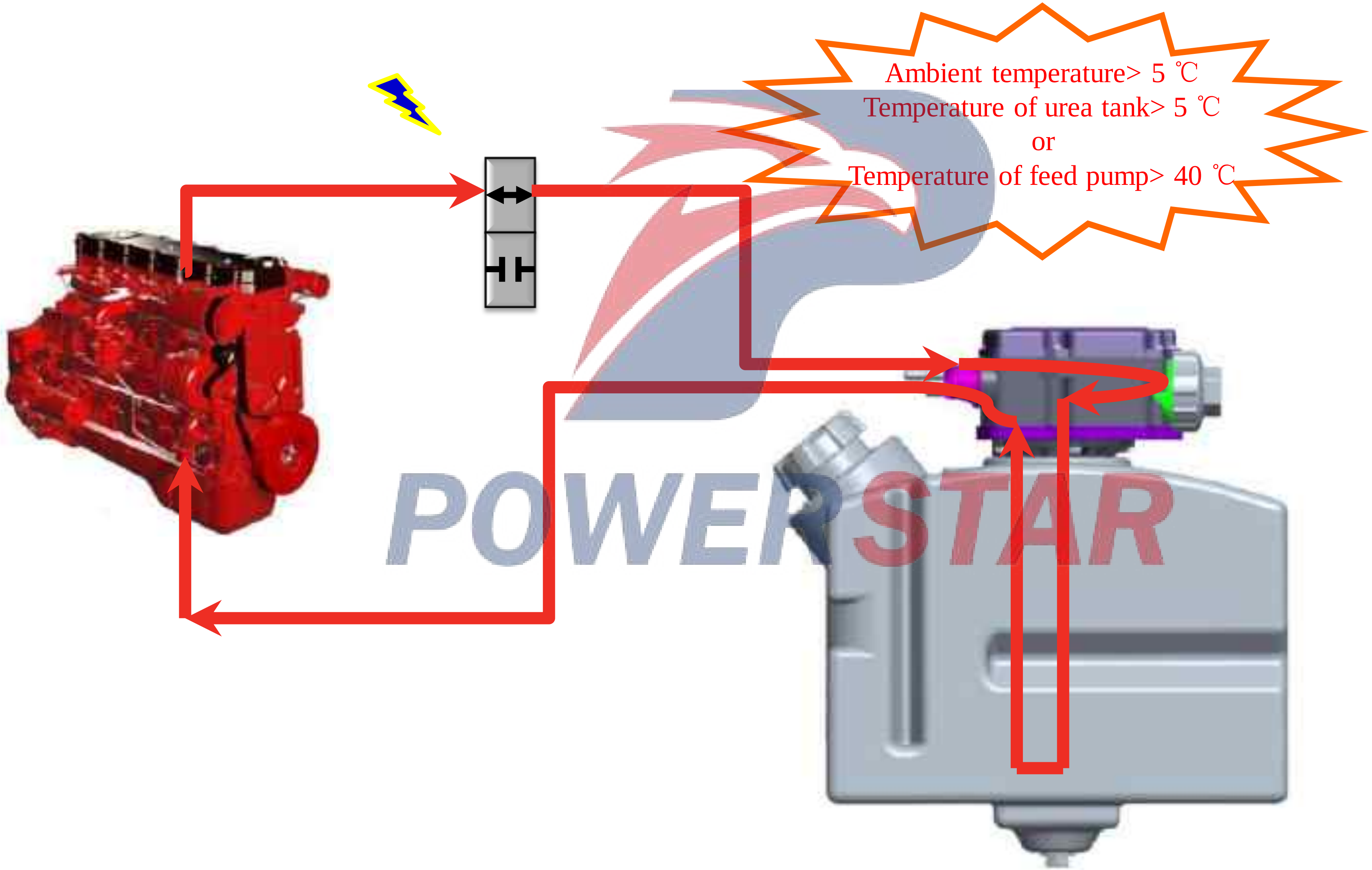
Heater control

After the defrost control has been completed, DCU monitors the temperature of urea tank , the temperature of urea feed pump and the current status of ambient air temperature. If all transducer values are below a specified value, DCU keeps the coolant control valve open until any condition has met the specified value.

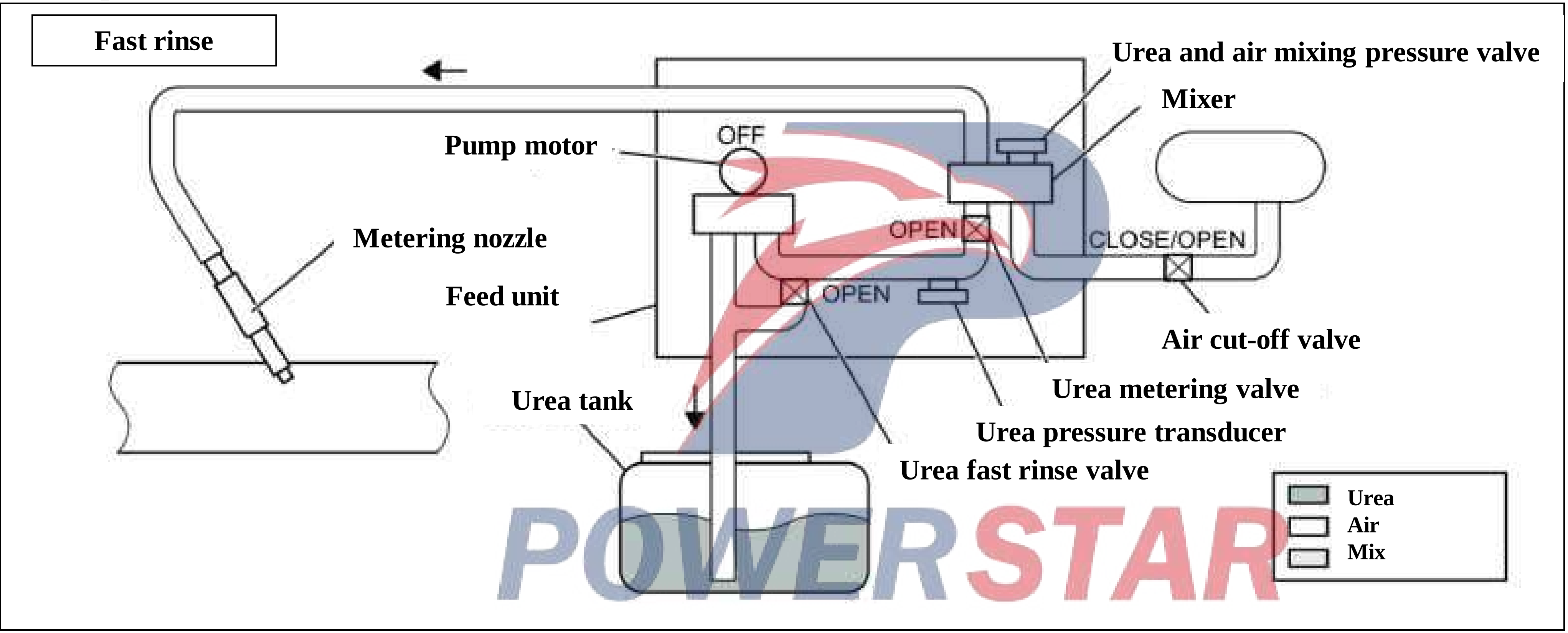
Heater control (3/4)



Heater control (4/4)



Pump control(1/4)



Pump control (start control)

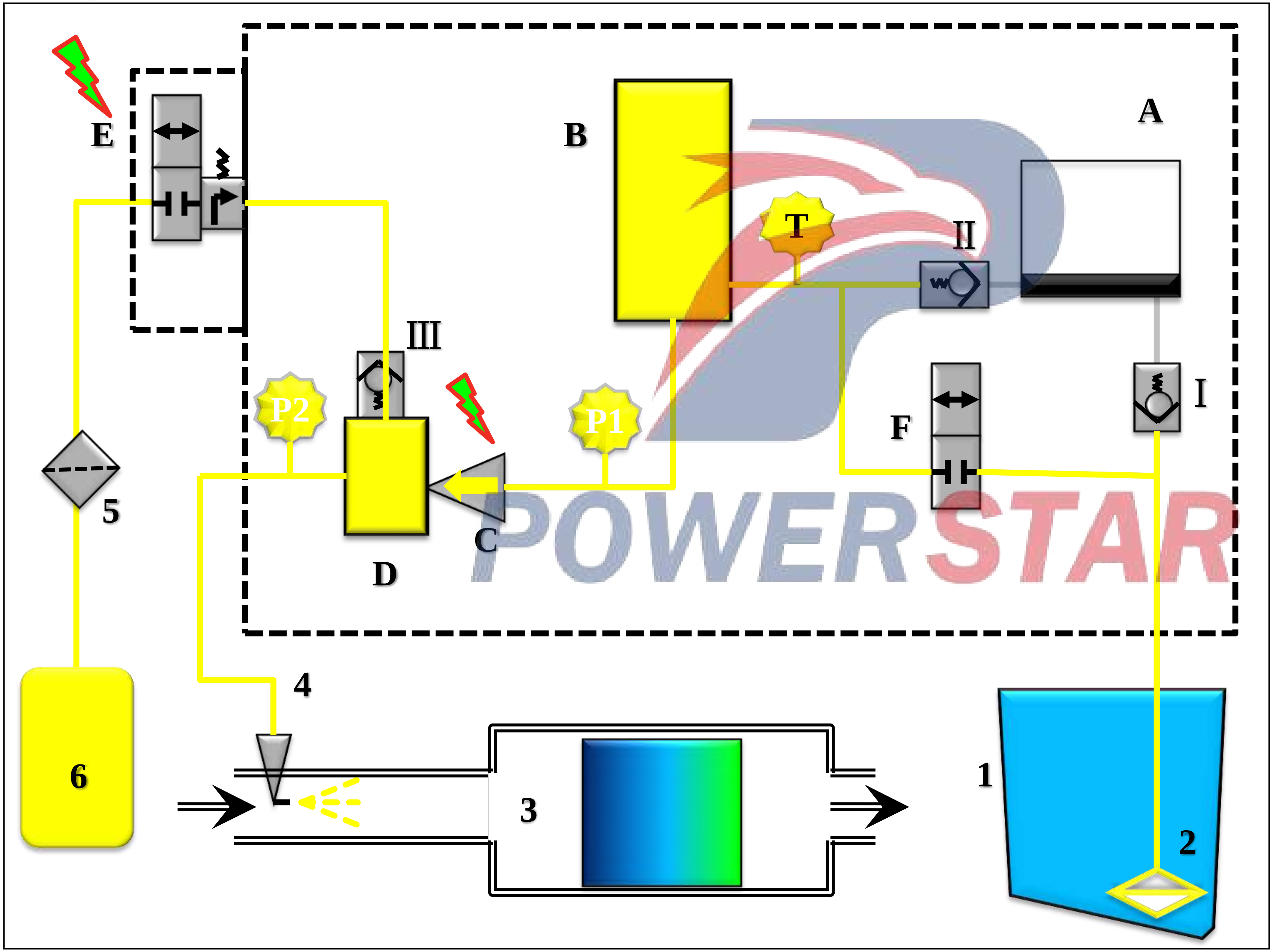
After the ignition switch is turned on, if the defrost control has been completed (DCU determines that the defrost control is not required), DCU starts the start control. The start control has two phases: Fast rinse and pressure creation.

Fast rinse

After the defrost control, DCU monitors the following values. If the following values are satisfied, DCU begins to achieve the fast rinse control by releasing the residual pressure and residual urea in the pump tube .

- “The engine starts ＞= 300s” or “EGT temperature> = 40℃"

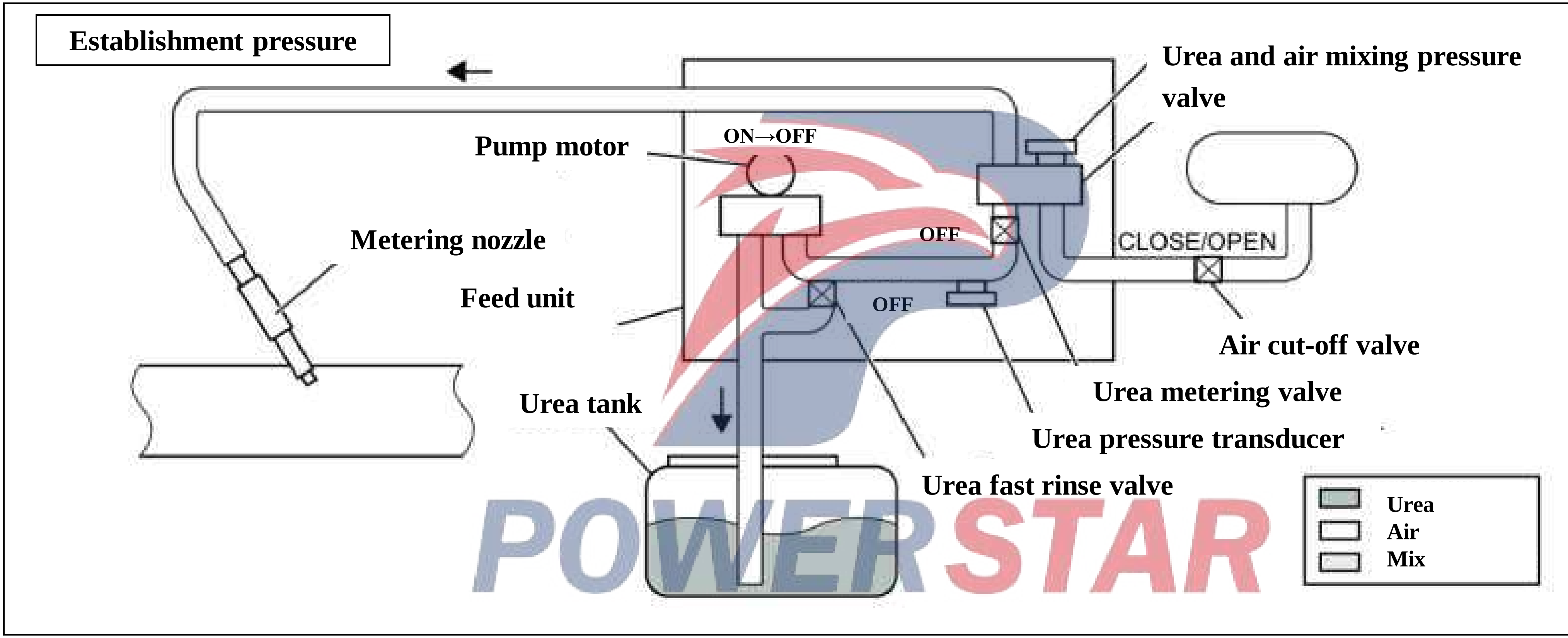
Pump control (2/4)



A) Feed pump
B) Accumulation chamber
C) Metering valve
D) Mixer
E) ASOV
F) Rinse valve

1. Urea tank
2. Urea filter
3. EGP
4. Metering nozzle
5. Air filter
6. Air tank

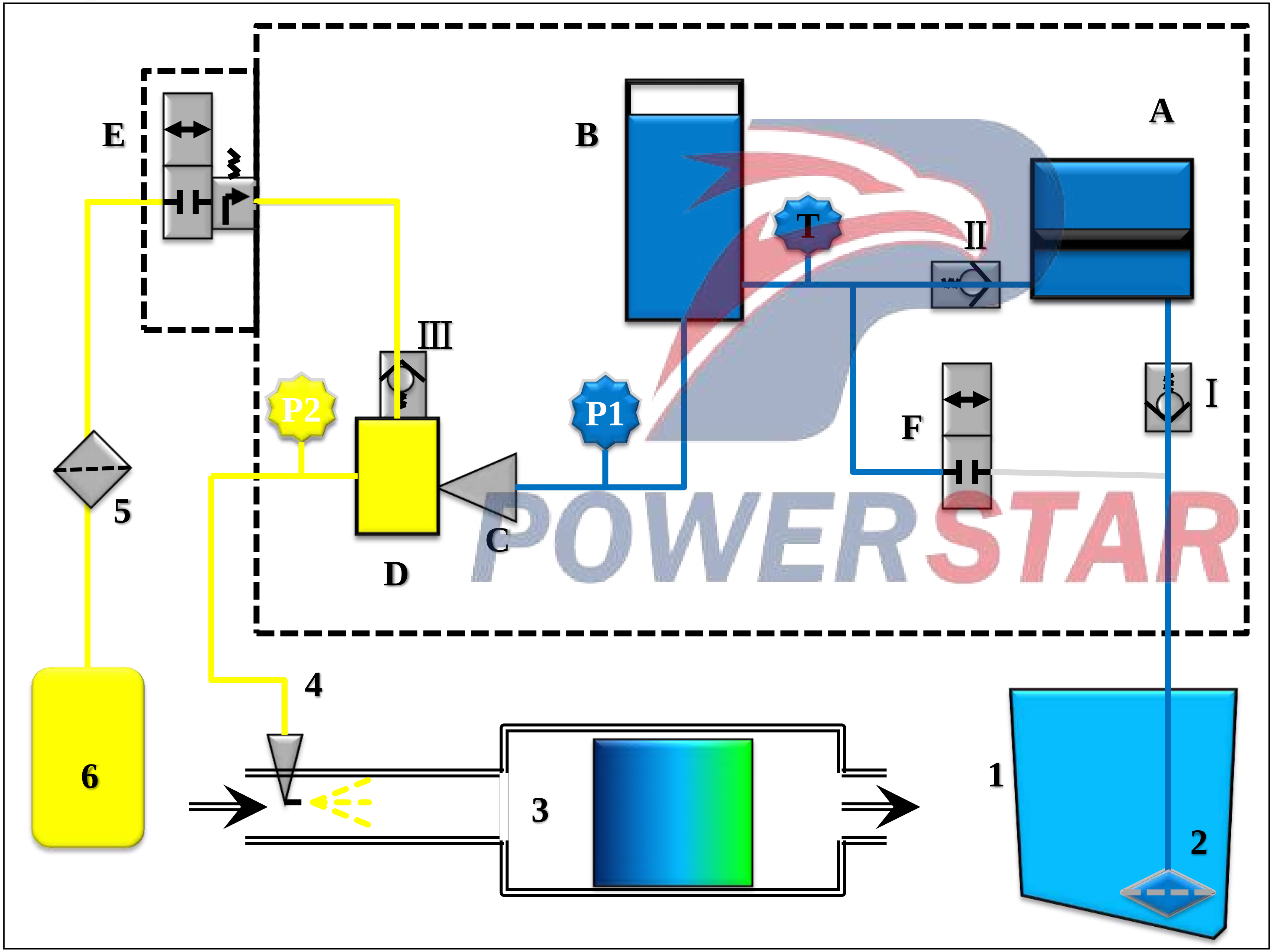
Pump control (3/4)



Establishment pressure

After the fast rinse control, turn off the air stop valve and urea metering valve so that the urea pipe in front of the urea metering valve is filled with urea fluid and the urea fluid is pressurized to the value between 500 and 600 kPa {73 and 87 psi} (pressurized). After the pressurization ends, turn on the air stop valve so that the air can enter the mixer, thus, the air pressure in the mixing chamber reaches and exceeds 300 kPa (44 psi).

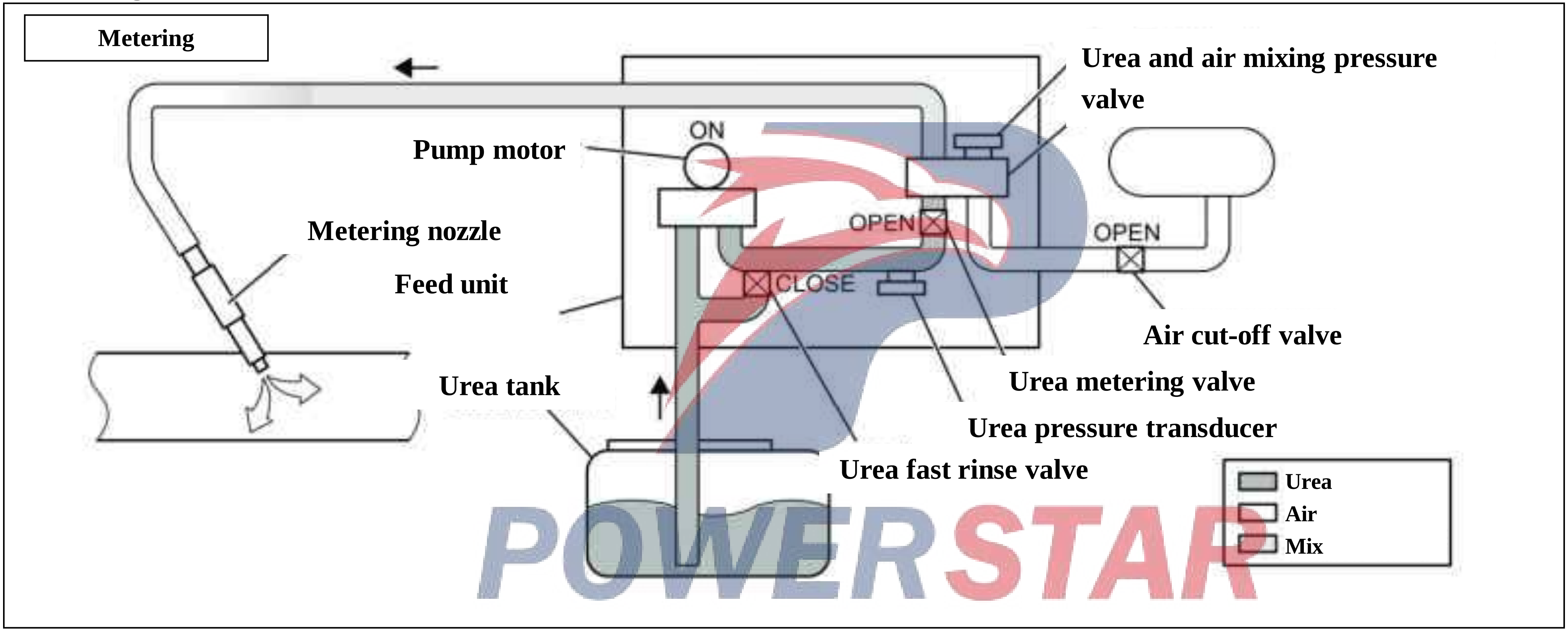
Pump control (4/4)



A) Feed pump
B) Accumulation chamber
C) Metering valve
D) Mixer
E) ASOV
F) Rinse valve

1. Urea tank
2. Urea filter
3. EGP
4. Metering nozzle
5. Air filter
6. Air tank

Metering control (1/2)



Metering control

Once the metering start condition is reached, DCU calculates the optimum urea injection dose and sends a signal to the feed pump that maintains the urea pressure between 500 and 600 kPa (73 and 87 psi). Depending on the vehicle condition, there are two ways to calculate the urea injection dose:

1. Make calculation based on NOx Transducer 1 (air inlet) or the measured value of the engine operating condition.

2. Make judgment of Nox concentration satisfying a specific range through Nox Transducer 2 (outlet).

Metering control (2/3)

Metering conditions	- Exhaust gas temperature transducer> approx. 200 °C - SCR-free system DTC - Liquid level of urea tank> about 1% - The metering system starts (air pressure> about 300 kPa / fluid pressure> about 500 kPa) - Ambient temperature transducer> about -7 ° C

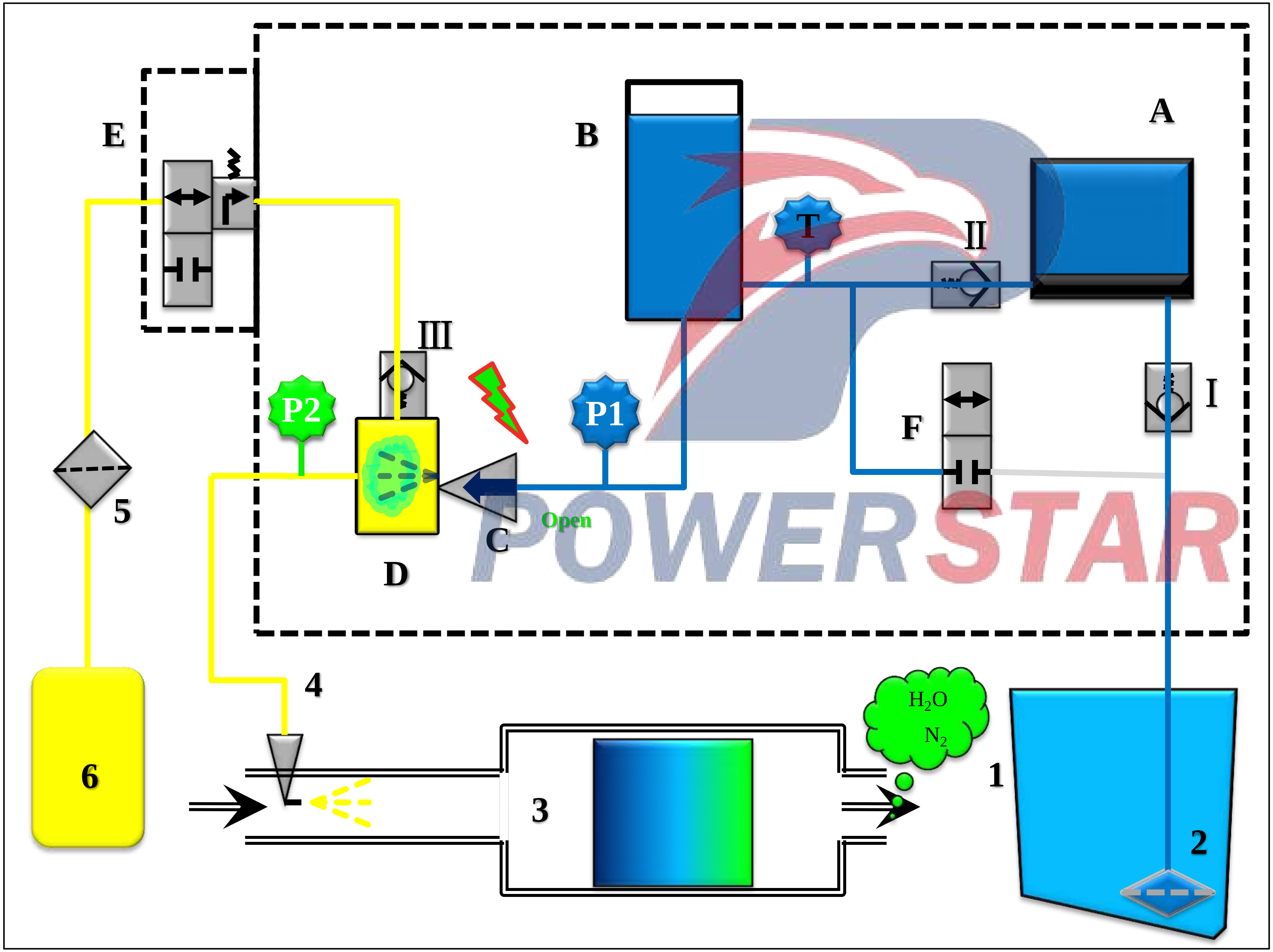
Control the calculation by calculation

No signal from the NOx transducer is available until NOx transducer control is completed. Therefore, the DCU calculates and determines the urea injection dose based on the information sent by ECM (engine speed, fuel injection dose, engine coolant temperature, exhaust gas flow).

Conduct a metering control meeting a specific range through Nox Transducer 2 (outlet)

After calculating the urea injection dose based on the NOx transducer measured value, DCU compensates and determines the urea injection dose based on the temperature prior to the SCR catalyst, ECM information, etc..

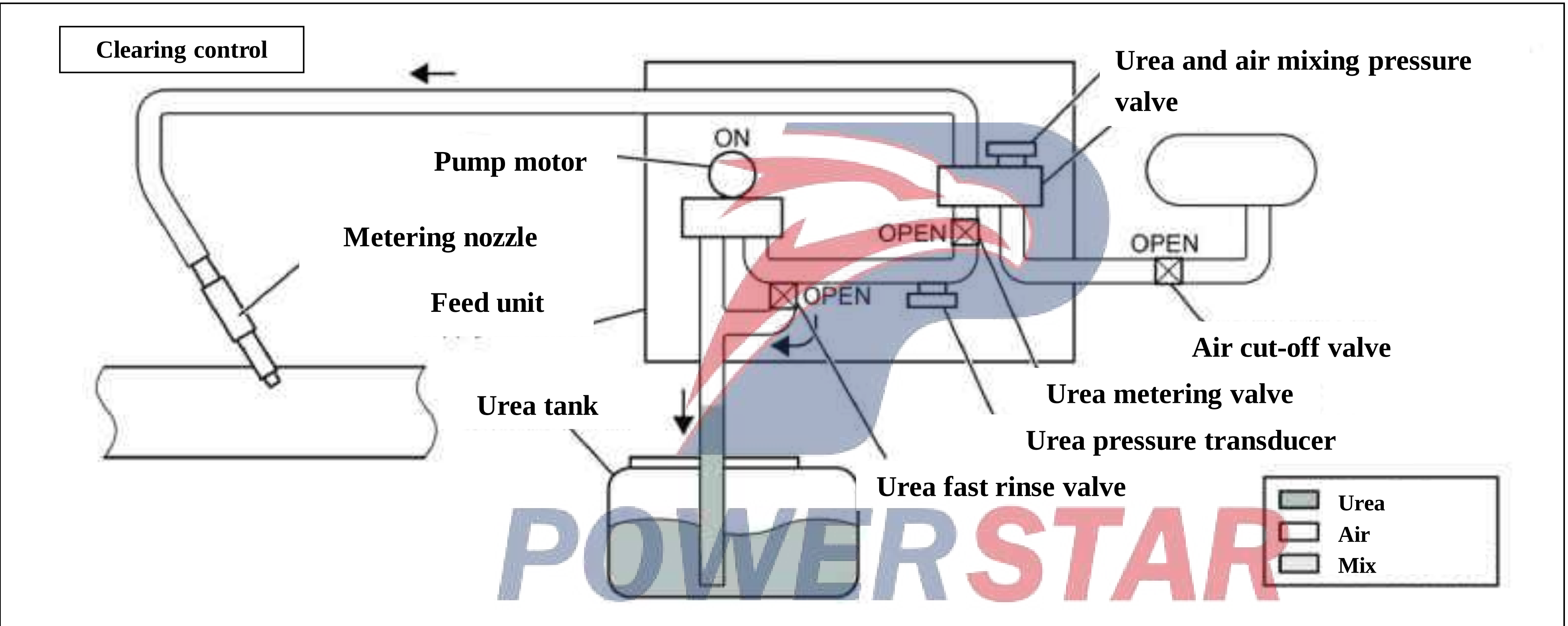
Metering control (3/3)



A) Feed pump
B) Accumulation chamber
C) Metering valve
D) Mixer
E) ASOV
F) Rinse valve

1. Urea tank
2. Urea filter
3. EGP
4. Metering nozzle
5. Air filter
6. Air tank

Post-running control (1/3)



Post-running control (clearing control)

1, When the engine is stopped, DCU stops pressurizing the urea pump,

2, DCU turns on the fast rinse valve of urea and sends the urea filled in the urea feed module and the pipe back to the urea tank.

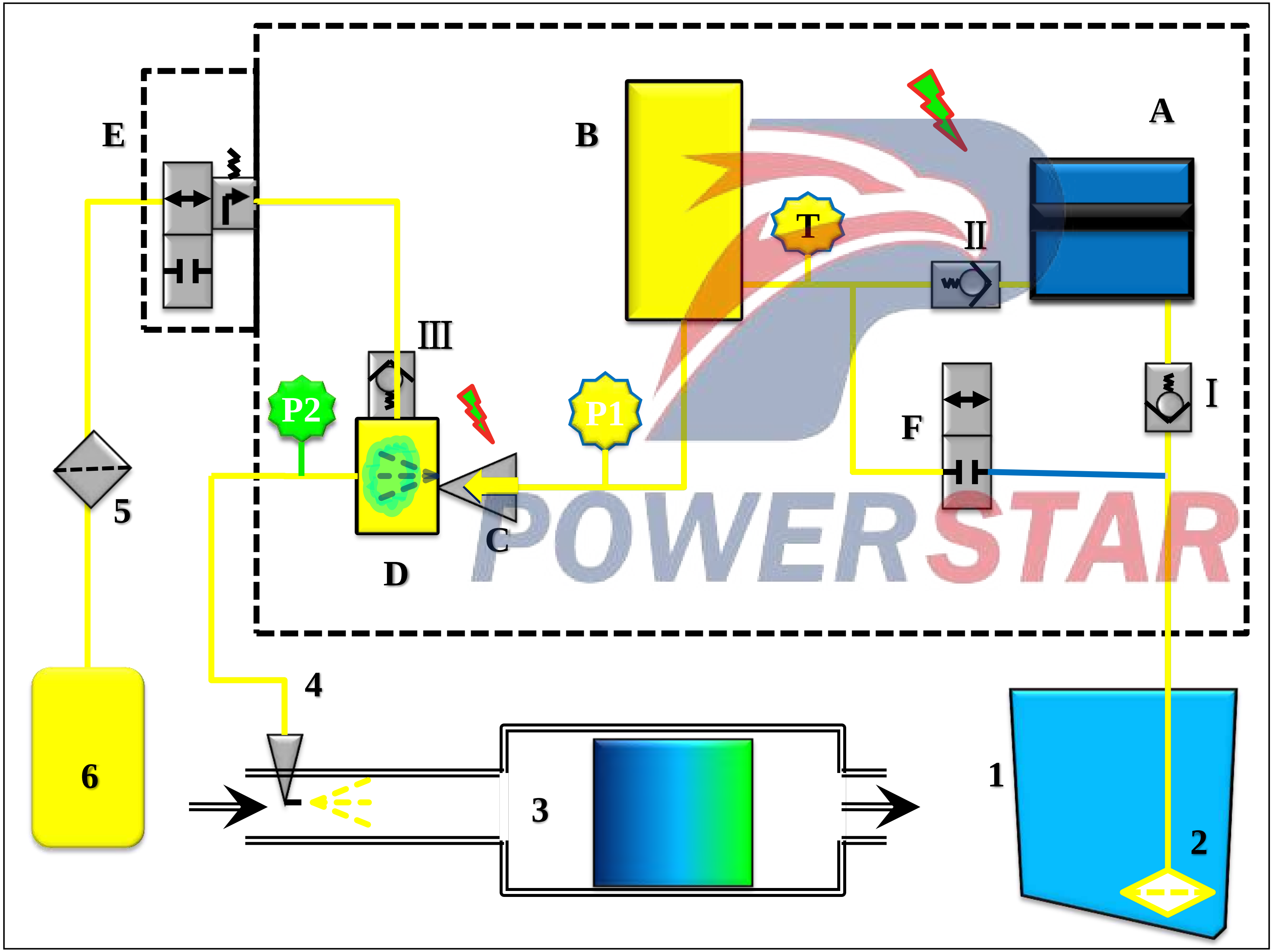
3, The urea metering valve switches to ON to send the air into the urea fluid feed module. The air is blown into the urea tank from the mixing chamber through the urea metering valve and the urea fast rinse valve.

4, The urea pump operates, and the remaining urea in the urea pump is drained to the urea tank.

Caution: After the engine is stopped, the noise can be heard from the urea tank or the urea feed module, and the noise stops after all the urea is returned to the urea tank (about 30 seconds).

5, Finally, the switch of the air stop valve, the urea metering valve and the urea fast rinse valve is closed , and so is DCU.

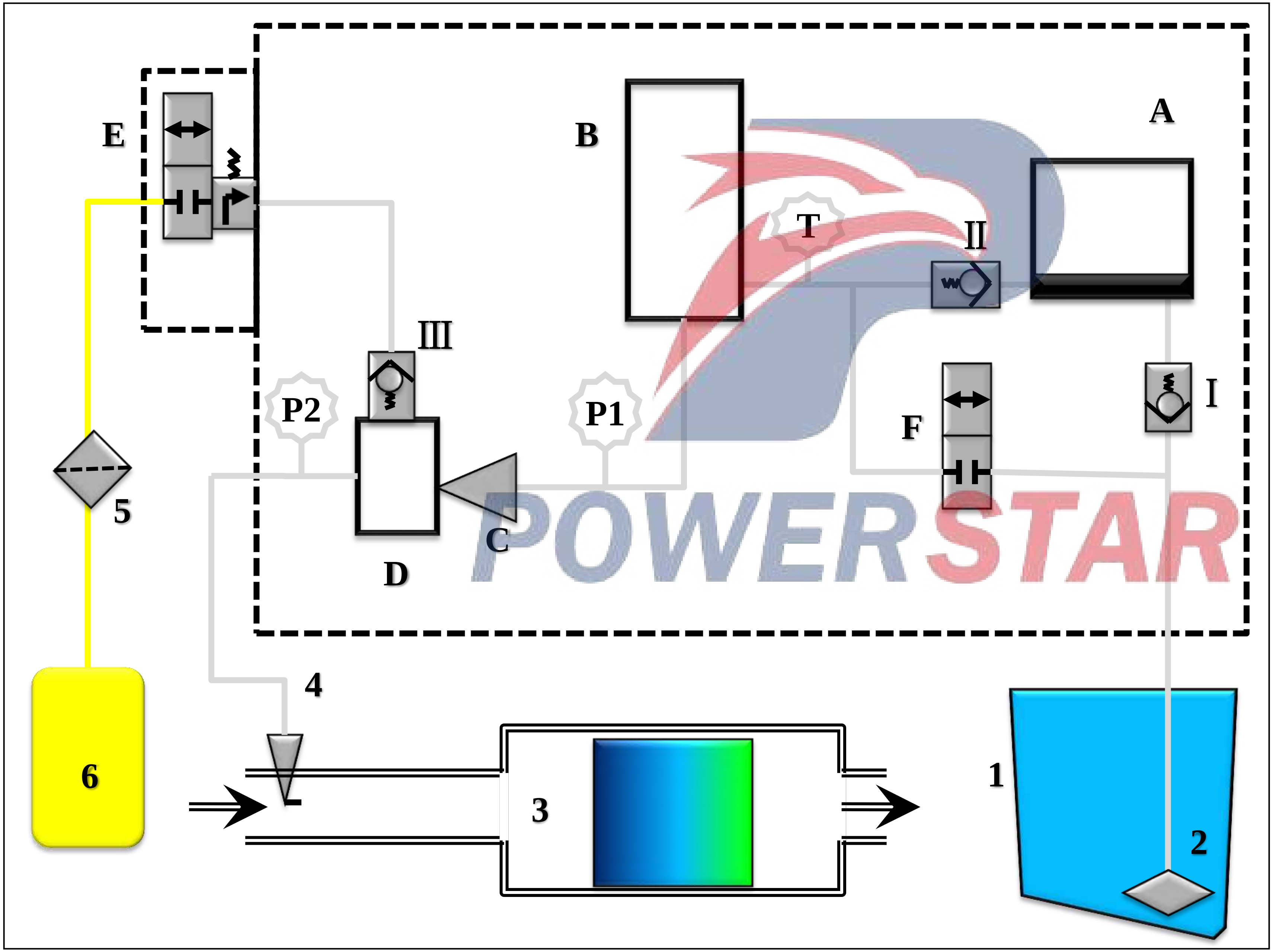
Post-running control (2/3)



A) Feed pump
B) Accumulation chamber
C) Metering valve
D) Mixer
E) ASOV
F) Rinse valve

1. Urea tank
2. Urea filter
3. EGP
4. Metering nozzle
5. Air filter
6. Air tank

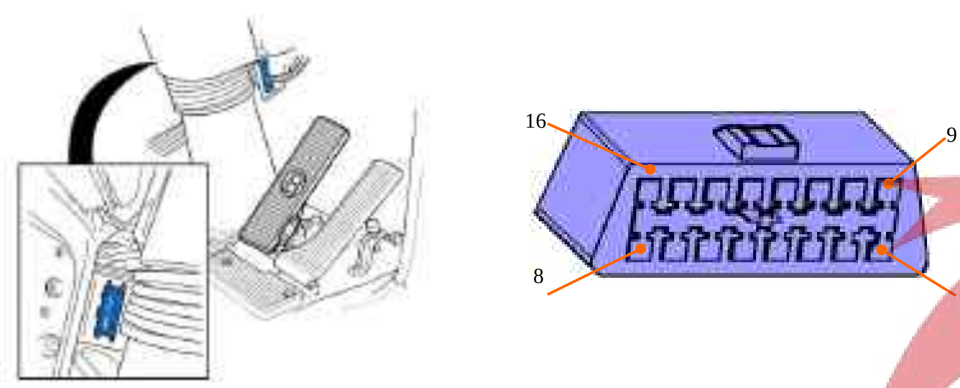
Post-running control (3/3)



A) Feed pump
B) Accumulation chamber
C) Metering valve
D) Mixer
E) ASOV
F) Rinse valve

1. Urea tank
2. Urea filter
3. EGP
4. Metering nozzle
5. Air filter
6. Air tank

Data line connection



No.	National V SCR system
1	Useless
2	Useless
3	Useless
4	Ground wire
5	Ground wire
6	ISO-CAN high signal (ECM, TCM, VCM, MIMAMORI, DCU)
7	Keyword signal (SRS, ECM, SPEED transducer C/U, MIMAMORI, air SUS, FMS)
8	Keyword signal (ABS, EBS, H/RETARDER)
9	Useless
10	Useless
11	NRZ signal (CAB SUS)
12	The switch required by the fault diagnosis (CAB SUS, air SUS, ECM, TCM, METER C/U)
13	The switch required by the fault diagnosis (ABS, EBS)
14	ISO-CAN low signal (ECM, TCM, VCM, MIMAMORI, DCU)
15	Useless
16	Battery voltage

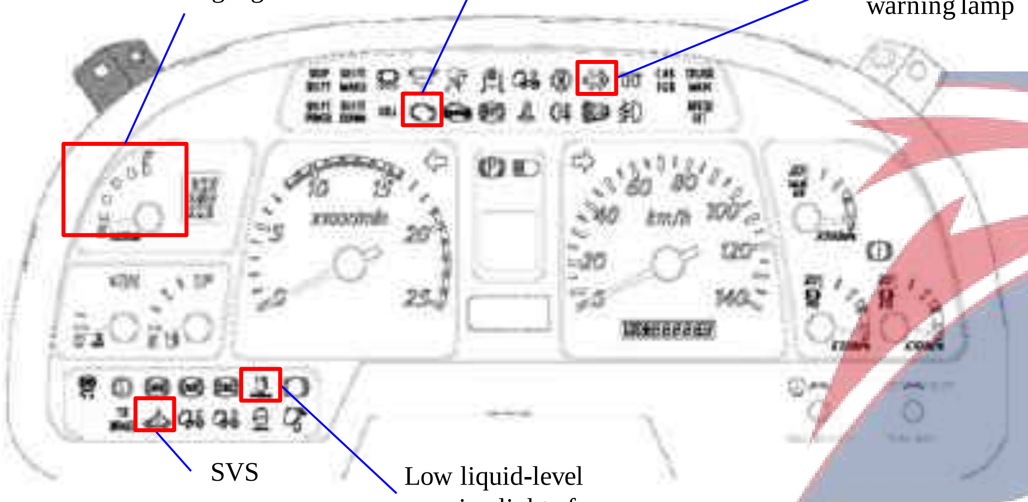
DLC port is installed in the direction operating mechanism.

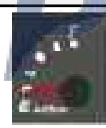
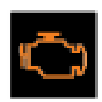
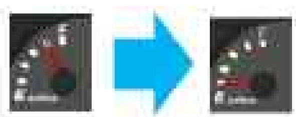
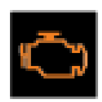
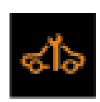
CAN is used for communication between ECM and the decoder

Caution:

- DCU and decoder of the SCR system also use CAN communication directly

SCR system warning lamp



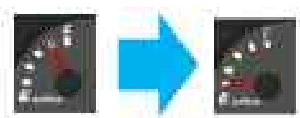
	Urea level gauge	Warning lamp
The urea needs to be supplied.		
The urea is not enough		 
Urea SCR system fault (Relevant emission trouble)		 
Urea SCR system fault (There is no trouble related to the emission)		 

The SCR system has 4 warning lights to alert the fault of SCR system. If the system fails, DCU will light the urea warning light or ask ECM to light up the engine warning light.

- Low liquid-level warning light of urea
- Fault indicating lamp
- SVS indicating lamp
- SCR system warning lamp

Caution:

- After the fault of SCR system is corrected, the fault light will not go out immediately. It will be off after the urea level gauge runs 3 times in a low liquid-level state.
- "Non-current" DTC can not be canceled. It can not be eliminated before the system runs for 9600 hours.
- If the SCR system fails, the urea level gauge will indicate the lowest point even if the urea tank is full.



Decoder

The computer with G-IDSS software

Converter

Communication line

G-IDSS is a very effective tool used to perform electrical troubleshooting and perform the system check on electronic control systems.
DLC is connected to the vehicle by using a converter and a communication line, G-IDSS can communicate with each control module.

Decoder

DTC information

This mode is aimed to display and clear the stored fault codes.

Data flow

This mode is designed to monitor the data parameters continuously. The current actual values of all important transducers and signals and the commands in the system are displayed by this mode.

Actuator test

This mode is aimed to check the practice condition of the actuator in the electronic control system. Using the actuator test menu, we can test the status of each actuator and the related transducer. Especially when DTC can not be detected, the faulty circuit can be diagnosed by the test. Using the circuit test of these menus can help distinguish between mechanical fault and electrical faults, even though DTC is detected.

Programming

This mode is aimed to program VIN into DCU when DCU is replaced.

Module information

This model is designed to display the information of control unit.

Fault code list (1/2)

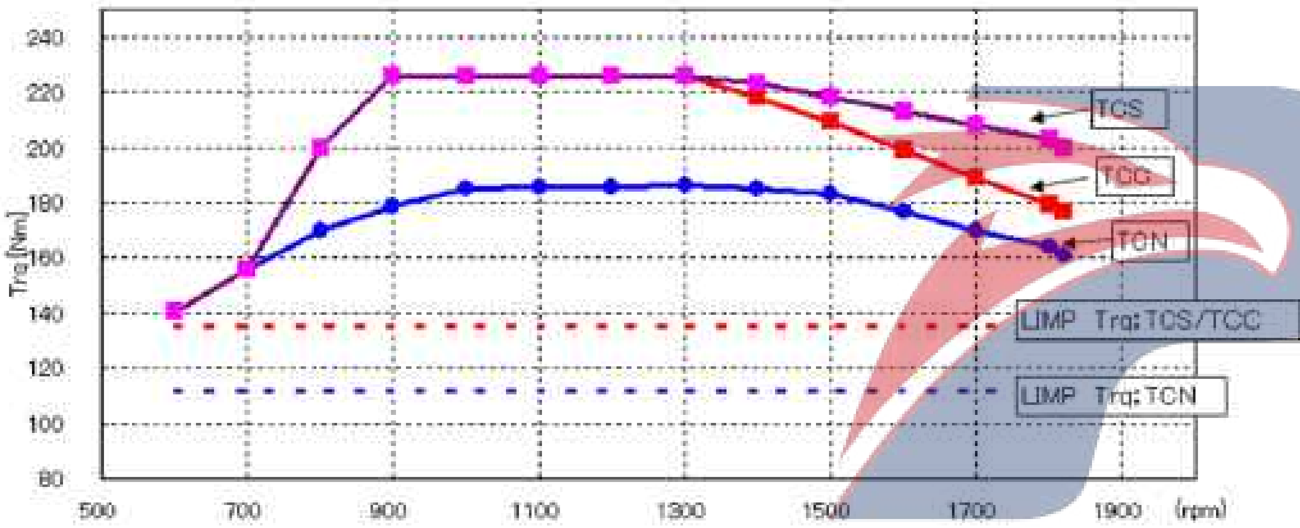
DTC	DTC type	DTC name
P0545	A	SCR inlet temperature sensor circuit - high voltage
P0546	A	SCR inlet temperature sensor circuit - low voltage
P0562	C	Battery voltage - low voltage
P0563	C	Battery voltage - high voltage
P0606	A	ECM memory module - error
P0607	C	Control module performance
P0642	A	Sensor power supply 1 - low voltage
P0643	A	Sensor power supply 1 - high voltage
P06B8	A	ECM - internal error
P2032	A	SCR outlet temperature sensor circuit - high voltage
P2033	A	SCR outlet temperature sensor circuit - low voltage
P2039	A	Urea and air mixing pressure sensor circuit - low voltage
P203C	A	Urea tank level sensor - low voltage
P203D	A	Urea tank level sensor - high voltage
P203F	D	Urea tank level – low level
P2040	A	Urea and air mixing pressure sensor circuit - high voltage
P2044	A	Urea temperature sensor - low voltage
P2045	A	Urea temperature sensor - high voltage
P2047	A	Urea nozzle circuit - error
P204C	A	Urea pressure sensor circuit - low voltage
P204D	A	Urea pressure sensor circuit - high voltage
P204F	A	Measurement feedback - error
P205C	A	SCR inlet temperature sensor circuit - high voltage

DTC	DTC type	DTC name
P205D	A	Urea tank temperature sensor - high voltage
P2080	A	SCR filter temperature sensor - tampered
P208C	A	Urea pump control circuit - low voltage
P208D	A	Urea pump control circuit - high voltage
P208E	A	Urea nozzle performance - error
P209F	A	Urea tank - thawing error
P20A1	C	Urea cleaning valve - performance error
P20A2	C	Urea purge valve circuit - low voltage
P20A3	A	Urea purge valve circuit - high voltage
P20A7	A	Urea air cut-off valve - performance error
P20A8	A	Urea air cut-off valve - low voltage
P20A9	C	Urea air cut-off valve - high voltage
P20B2	B	Urea heating rod - error
P20B3	C	Urea tank heating and cooling water control valve circuit - low voltage
P20B4	C	Urea tank heating and cooling water control valve circuit - high voltage
P20E6	A	Urea air cut-off valve pressure - too low
P20E7	A	Urea and air mixing system pressure - too low
P20E8	A	Urea pressure - lower than the specified pressure
P20E9	A	Urea pressure - higher than the specified pressure
P20EC	A	SCR temperature - too high
P20EE	B	SCR Nox content - too high, resulting in torque reduce
P2200	A	SCR inlet NOx sensor circuit - error
P2201	A	SCR inlet NOx sensor determination scope - error

Fault code list (2/2)

DTC	DTC type	DTC name
P220A	A	SCR inlet NOx sensor power supply - error
P220B	A	SCR outlet NOx sensor power supply - error
P220E	A	SCR inlet NOx sensor heating performance - error
P220F	A	SCR outlet NOx sensor heating performance - error
P229E	A	SCR outlet NOx sensor circuit - error
P229F	A	SCR outlet NOx sensor determination scope - error
P241E	A	Urea tank heating performance - error
P2509	A	Loss of power supply when ignition switch is turned on
P2BA7	A	Urea tank level – too low
P2BAE	B	SCR Nox content - too high, resulting in torque reduce
U0002	A	Communication with ECM - lost
U029D	A	SCR inlet NOx sensor – loss of communication
U029E	A	SCR outlet NOx sensor – loss of communication

Limb home (energy-limited mode)



When ECM (DCU) detects an emission-related fault, a torque limit control (limp home) will be implemented to protect the engine. In the case of SCR, ECM will limit the engine torque to 60% (a maximum limit) when ECM (DCU) detects a fault related to the metering control.

Caution:

- Cummins SCR system does not inhibit the restarting procedure of engine under the limp-home control.

Data flow list (1/4)

Urea water data		
No.	**Data name**	**Unit**
1	Engine cooling water temperature	° C/ ° F
2	Ambient temperature transducer	° C/ ° F
3	Temperature of urea feed pump	° C/ ° F
4	Temperature of urea tank	° C/ ° F
5	Liquid level of urea tank	%
6	Urea heating/ cooling water control	On / Off
7	Urea tank heater state	Defrosting /Heating / Heating Off / without heating
8	SCR system heater state	Defrosting / Heating / Heating Off / without heating
9	Supply pressure for urea water	hPa / psi
10	Urea and air mixing pressure sensor	KPa / psi
11	Pump motor output	%
12	Battery voltage	V

NOx transducer data		
No.	**Data name**	**Unit**
1	Ambient temperature	° C/ ° F
2	SCR inlet temperature	° C/ ° F
3	SCR outlet temperature	° C/ ° F
4	Maximum life temperature of SCR inlet	° C/ ° F

NOx transducer data		
No.	**Data name**	**Unit**
5	Maximum life temperature of SCR outlet	° C/ ° F
6	Detecting times for SCR high temperature	Counts
7	Final time for SCR high temperature	s
8	NOx concentration of NOx transducer at SCR inlet	ppm
9	NOx concentration of NOx transducer at SCR outlet	ppm
10	O2 concentration of NOx transducer at SCR inlet	%
11	SCR inlet NOx sensor operating range status	Outside the scope Within the scope / Error / Initial value
12	Heating, operation status and temperature status of NOx transducer at SCR inlet	Without the operating temperature. / Within the operating temperature. / Error / Initial value
13	SCR inlet NOx sensor NOx detection status	No detection/ Detection / Error / Initial value
14	SCR intle NOx sensor O2 detection status	No detection/ Detection / Error / Initial value
15	O2 concentration of NOx transducer at SCR outlet	%
16	SCR outlet NOx sensor operating range status	No detection/ Detection / Error / Initial value

Data flow list (2/4)

Nox transducer data		
No.	**Data name**	**Unit**
17	Heating, operation status and temperature status of NOx transducer at SCR outlet	Without the operating temperature. / Within the operating temperature. / Error / Initial value
18	SCR outlet NOx sensor NOx detection status	No detection/ Detection / Error / Initial value
19	SCR outlet NOx sensor O2 detection status	No detection/ Detection / Error / Initial value
20	SCR inlet frosting point signal	On / Off
21	SCR outlet frosting point signal	On / Off
22	Battery voltage	V
23	Engine speed	RPM
24	Fuel injection required	L/h / gal/h
25	MAF (Metering air)	kg/min
26	The heating loop for NOx transducer at SCR inlet is incorrect.	Short circuit/ Open circuit/ No
27	Heating control status of NOx transducer at SCR inlet	Automatic / Heating 3 or 4 / Heating 1 or 2 / Close or preheat
28	NOx detection loop of NOx transducer at SCR inlet is incorrect.	Short circuit/ Open circuit/ No

Nox transducer data		
No.	**Data name**	**Unit**
29	The O2detection loop for NOx transducer at SCR inlet is incorrect.	Short circuit/ Open circuit/ No
30	The heating loop for NOx transducer at SCR outlet is incorrect.	Short circuit/ Open circuit/ No
31	Heating control status for NOx transducer at SCR outlet	Automatic / Heating 3 or 4 / Heating 1 or 2 / Close or preheat
32	The NOX detection loop for NOx transducer at system outlet is incorrect.	Short circuit/ Open circuit/ No
33	The O2 detection loop for NOx transducer at SCR outlet is incorrect.	Short circuit/ Open circuit/ No

Control data		
No.	**Data name**	**Unit**
1	Ambient temperature	° C/ ° F
2	SCR inlet temperature	° C/ ° F
3	SCR outlet temperature	° C/ ° F
4	Pneumatic pressure	° C/ ° F
5	Urea feed pressure	hPa / psi
6	Urea and air mixing pressure sensor	KPa / psi
7	NOx concentration of NOx transducer at SCR inlet	rpm

ISUZU

Data flow list (3/4)

Control data		
No.	**Data name**	**Unit**
8	NOx concentration of NOx transducer at SCR outlet	ppm
9	SCR inlet NOx sensor operating range status	Out of the range/ Within the range/ Error / Not available (initial value)
10	Heating, operation status and temperature status of NOx transducer at SCR inlet	Out of the range/ Within the range/ Error / Not available (initial value)
11	SCR inlet NOx sensor NOx detection status	Valid / Invalid / Error / Not available (initial value)
12	SCR inlet NOx sensor O2 detection status	Valid / Invalid / Error / Not available (initial value)
13	SCR outlet NOx sensor operating range status	Valid / Invalid / Error / Not available (initial value)
14	The heating and operating temperature status forNOx transducer at SCR outlet	Outside the temperature range / at operating temperature / Error / Not available (initial value)

Control data		
No.	**Data name**	**Unit**
15	SCR outlet NOx sensor NOx detection status	Valid / Invalid / Error / Not available (initial value)
16	SCR outlet NOx sensor O2 detection status	Valid / Invalid / Error / Not available (initial value)
17	Battery voltage	V
18	Engine speed	RPM
19	Fuel injection required	L/h / gal/h
20	MAF (metering air)	kg/min
21	Actual urea injection dose	mg/s
22	Control Status 1 of SCR system	Injection / OFF / Start / Meter / False / Sweep
23	Urea tank heater state	Defrosting / Heating / Heating OFF / Without heating
24	SCR system heater state	Defrosting / Heating / Heating OFF / Without heating
25	SCR inlet frosting point signal	On / Off
26	SCR outlet frosting point signal	On / Off
27	Pump motor output	%

Data flow list (4/4)

Control data		
No.	**Data name**	**Unit**
28	Urea exhaust valve	-
29	Air stop valve output	-
30	Speed	km/h / mph

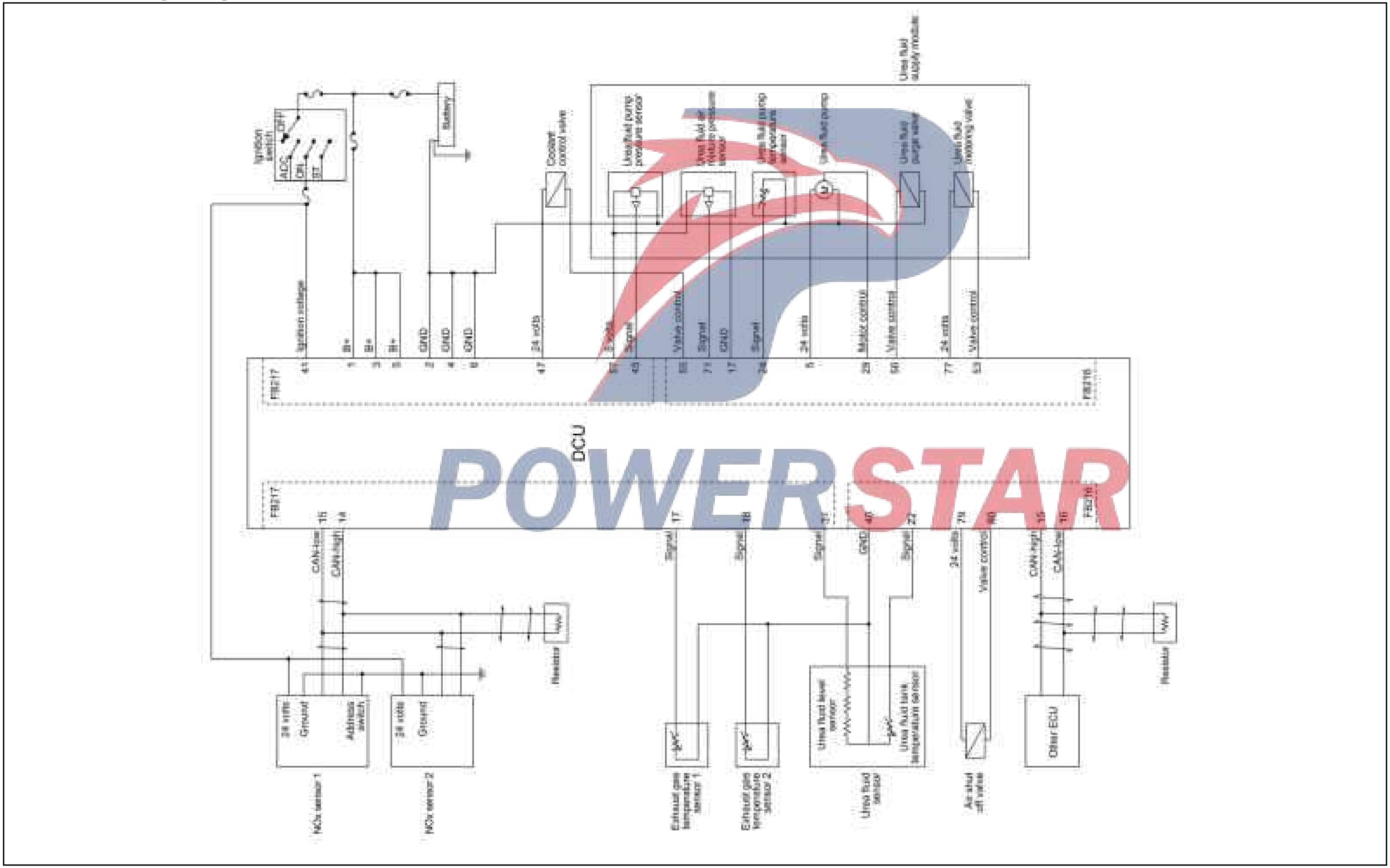
Motion test of actuator

	Test item for actuator	Required engine status	Abstract
Engine control	Urea pump motion	Operation	The test is designed to test whether the urea water is discharged at 0.27778 ml / s. The supply quantity of urea pump is tested by checking the emission volume of nozzle.
	Cooling water valve	Stop	Performing this test is aimed to confirm the status of the cooling water for heating by the movement of the coolant valve.
	ASOV	Stop	The test is intended to confirm the injection pressure by verifying the motion of the air stop valve.
	Leakage	Stop	The test is aimed to check if the system leaks urea by spraying.

Programming list

Programming items	Abstract
VIN programming	Program VIN into DCU when replacing DCU

DCU wiring diagram



Thanks

GIGA

- ***Smart instrument***
- ***Cruise control***
- ***Adjustable speed limit***

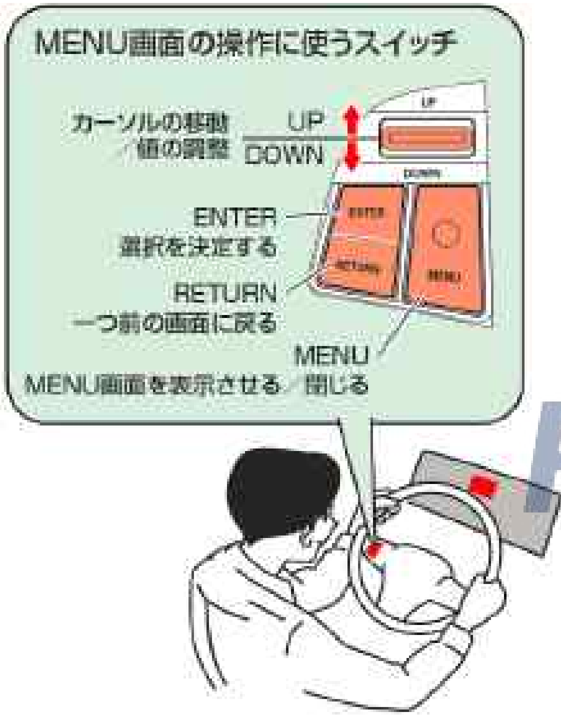
Smart instrument panel

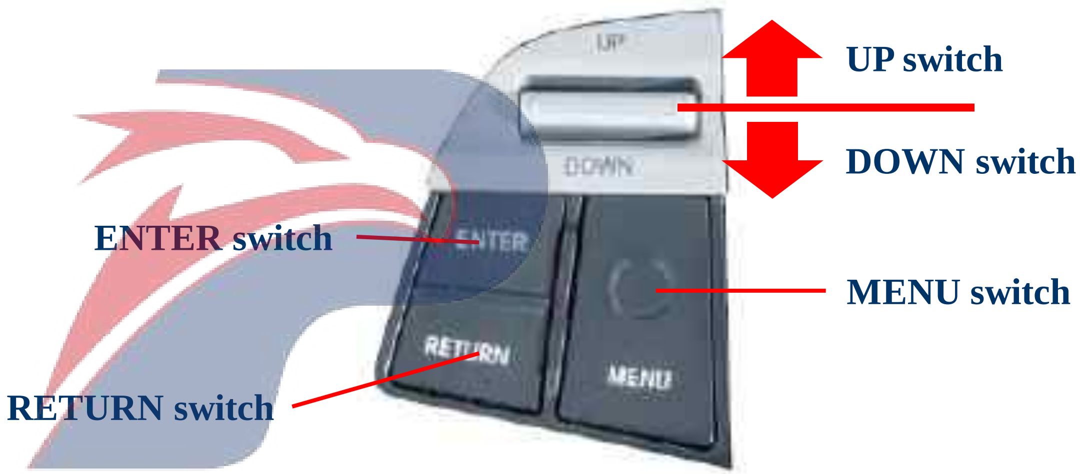
No.	Device name
1	●Tachometer (Engine tachometer)
2	●Multifunctional display screen
3	●Speedometer
4	●Water-thermometer
5	●Brake barometer (front)

No.	Device name
6	●Brake barometer (rear)
7	●Urea solution scale
8	●Fuel gauge
9	●Odometer, journey schedule

Smart instrument panel switch

There are 4 switches used to control the smart dashboard.





Smart instrument panel switch

Switch	Function
MENU	Presentation menu
ENTER	Decide the chosen items.
RETURN	Return to the previous item.
UP/DOWN	Select the arrow movement and the numerical adjustment.

■ **The picture where the smart dashboard key is ON.**

When the starting switch is in the "ON" position, the systems of all devices will be checked.

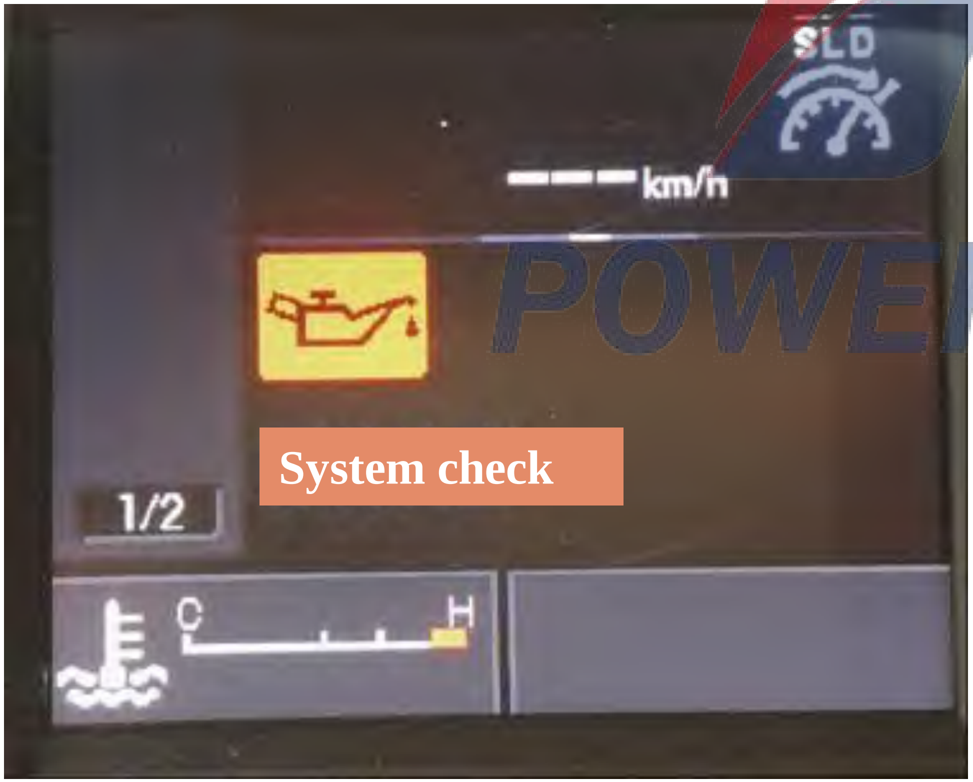
The smart dashboard will display the check picture of system.

The on-off operation of smart dashboard is invalid when the system is being checked.

After the system check is over, press "RETURN", press the "Menu" button and then switch to the menu screen.

Press "Menu" after the engine starts to switch the menu screen.

When there is a fault, the fault content shall be displayed first (insufficient urea, insufficient fuel)



Inspection items of system
Oil pressure
Voltage
Urea system
Amount of urea

Smart dashboard normal screen transition image

In a normal state, the contents indicated after the engine starts is the same as that before (Key On) the engine starts.

However, when each system is abnormal and the device is acting, the warning screen of system and the action screen of device take precedence.

When a warning or action is being shown, press the "Menu" of the smart dashboard switch, the screen will move to the menu screen.

If there is no on-off operation for 1 minute and a new warning occurs, the screen will move to the warning screen.

Operate the up and down buttons, and you can change the motion screen of device.

ISUZU

Average fuel consumption・ Average speed presentation

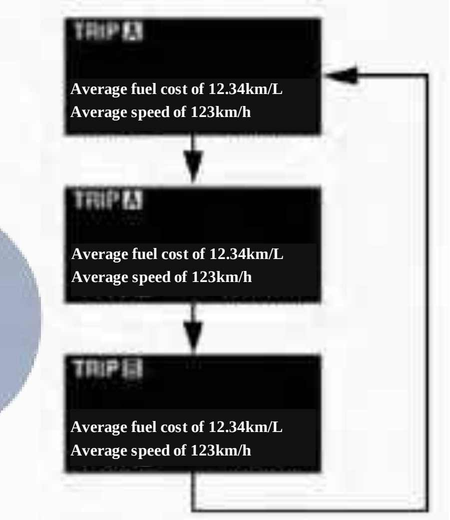
During driving, the average fuel consumption and the average speed will display.

Press "UP" or "DOWN" on the smart dashboard switch to indicate the average fuel consumption.

・Average vehicle speed.

And linked presentation along with the mileage switch button of the side interval under the speedometer.

Caution: The smart dashboard does not indicate the accumulated mileages.



Interval mileage switch button

Smart instrument presentation	Presentation content
TRIP A Average fuel cost of 12.34km/L Average speed of 123km/h	●Average fuel consumption and average speed of interval distance meter A
TRIP B Average fuel cost of 12.34km/L Average speed of 123km/h	●Average fuel consumption and average speed of interval distance meter B

Average fuel consumption・ Average speed return-to-zero

The reset linkage with the interval distance A or interval distance B.

Various settings of the menu mode

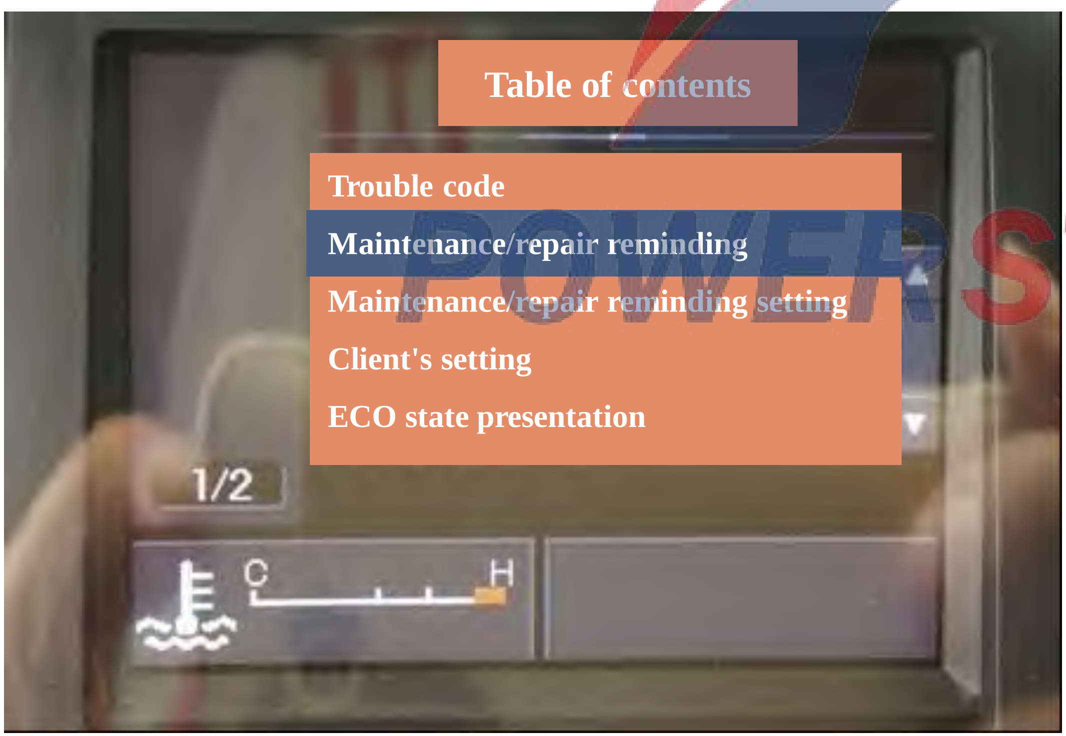
The menu of the smart dashboard switch can change the setting value.

Presentation method

Press the menu button by the menu button of smart dashboard switch.

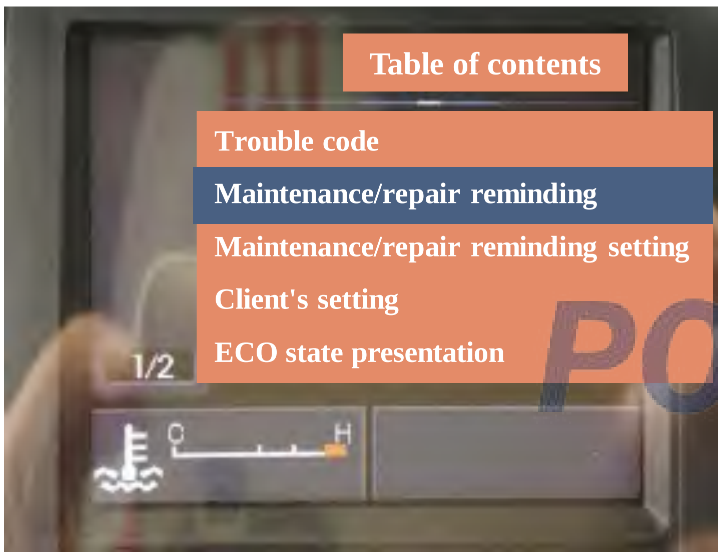
Choose various functions by UP or DOWN, press ENTER key for decision.

Menu



Trouble code

Press the ENTER button to indicate the current fault code.



ENTER

Maintenance Notice

By selecting "UP" "DOMN", confirm maintenance items, "ENTER" decision indicates details.

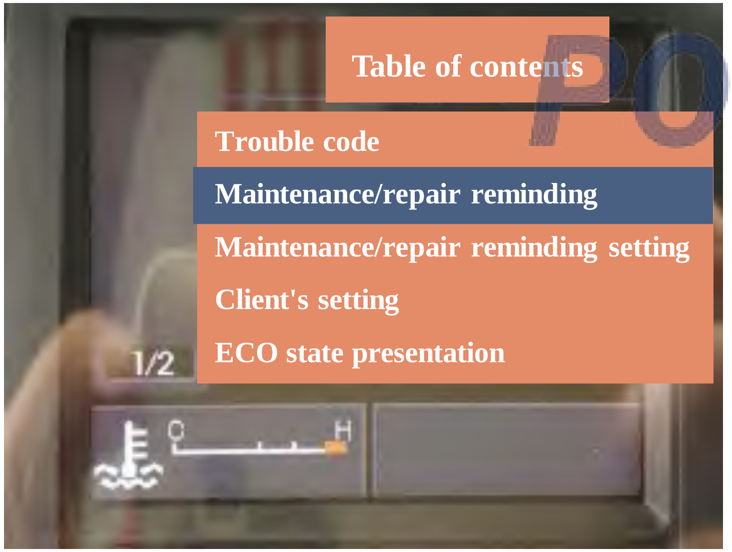
Caution:

"Setting of Maintenance Notice" does not indicate the items set when there is no maintenance period.

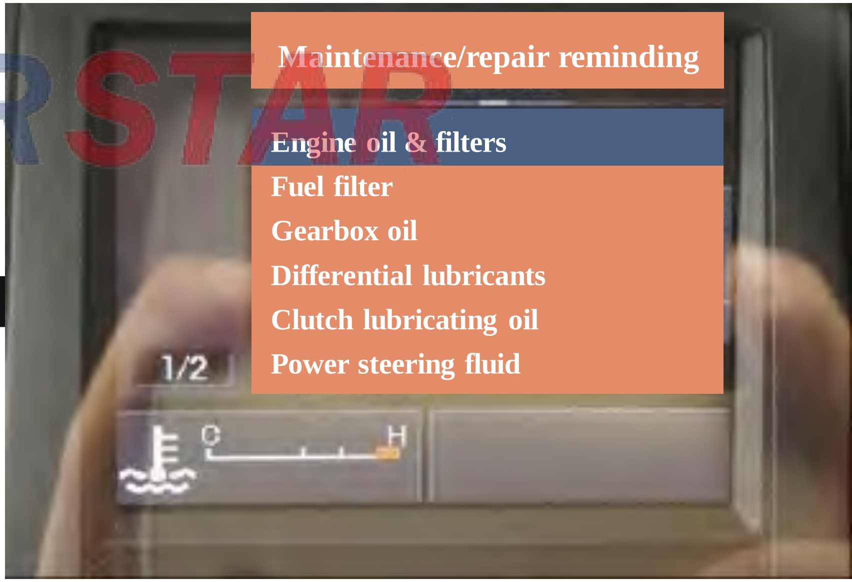
The zeroing method during the exchange period

Press "ENTER" in the selected item for a long time, and "Return to Zero or not?" will pop up. Press "ENTER" button again, it will return to zero.

When return-to-zero is cleared, "return to zero or not? is displayed, it can be canceled by pressing "RETURN" button.



ENTER



■Setting of maintenance notice

The maintenance period of maintenance notice can be set autonomously.

Select the maintenance item to be set using "UP" and "DOMN", and make a decision by "ENTER".

Once selecting the project, set the maintenance period at will.

Caution:

The initial setting value is the replacement period designated by the manufacturer.

The initial setting value in the tire maintenance period is "No Setting".

■Setting method of maintenance

Once selecting the project, change the current maintenance period picture via "UP" and "DOWN".

The cycles of the engine oil and oil filter are as follows.

Maintenance setting range

The possible setting range for maintenance period can be set like this.

The range of "UP" "DOWN" can change 5,000km each time.

Caution:

The fuel filter can only be set as "No Setting" or "100,000km".

Compressed air dryer can only be set as "No Setting" or "100,000km".

Tires can only be set to 10,000km.

Description	Initial set value	Setting range of replacement period
Engine oil & filter	45,000Km	No setting, 5000-45,000Km
Fuel filter	100， 000Km	No setting, 100,000Km
Gearbox gear oil	50,000Km	No setting, 5000-50,000Km
Differential gear oil	50,000Km	No setting, 5000-50,000Km
Compressed air dryer	100,000Km	No setting, 100,000Km
Power assisting oil for steering wheel	100,000Km	No setting, 5000-100,000Km
Tire	No setting	No setting, 10,000-120,000Km
Start the motor	Setting	No setting. Please give a setting.

Customer setting

The setting values of the item in the customer setting menu can be changed voluntarily.

When the setting item is needed to change, press "ENTER" for decision via selecting "UP" and "DOMN".

Date setting

Press "ENTER" to decide after "Date Setting" is selected.

After the decision, change the settings in an order of "year, month, day".

Clock setting

Press "ENTER" to decide after "Clock" is selected.

After the decision, change the settings in an order of "hour and minute".

Presentation setting

The small box on the right side indicates the clock in the zone, and the calendar can be changed.

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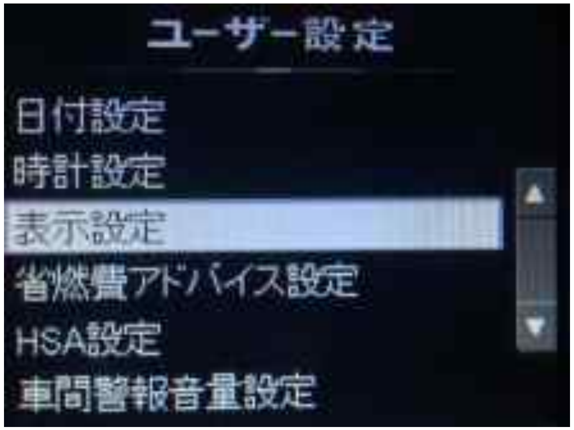
Clock & calendar represents the change setting.

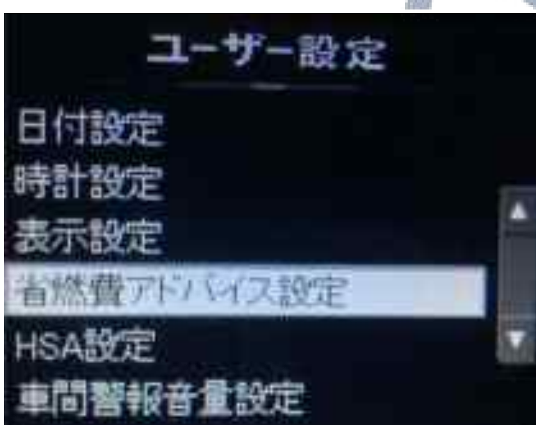
Select "Presentation Setting" and then press "ENTER" for decision.
After the decision, the small box on the right side indicates the clock and the calendar presentation is set according to "UP" and "DOWN" .



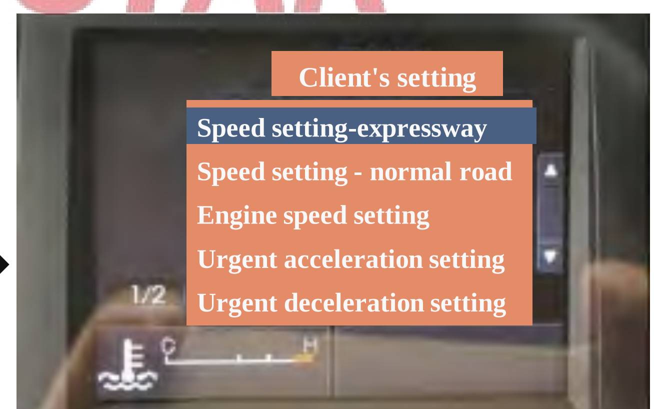
ENTER

Fuel-saving helper setting

The valid / invalid settings and the reference value indicated by each fuel-saving helper can be set.
When no setting is selected, the fuel-saving helper of selected item indicates that the item is invalid.



ENTER

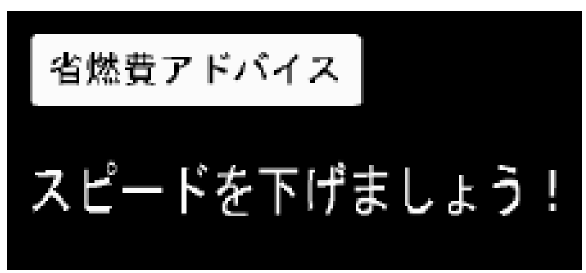


Setting range of fuel-saving helper

Description	Initial set value	Set the range
Speed setting-expressway	100Km/h	No setting, 20-110Km/h
Speed setting - ordinary road	100Km/h	No setting, 20-110Km/h
Engine speed setting	3000r/min	No setting, 50-9,99r/min
Urgent acceleration setting	9.9m/s^2	No setting, 0.5-9.9m/s^2
Urgent deceleration setting	9.9m/s^2	No setting, 0.5-9.9m/s^2
Long-time idle setting	No setting	No setting. Please give a setting.
Setting of auxiliary brake	No setting	No setting. Please give a setting.

Speed setting expressway /ordinary road

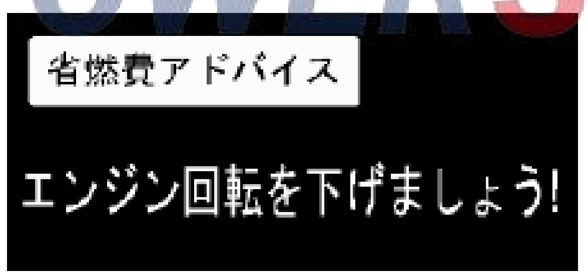
If there is a setting, the smart dashboard will prompt when the speed exceeds the set value.
"No Setting" and the vehicle speed of 20km / h ~ 110km / h can be set per 1km / h.



If the setting value is exceeded, there will be a hint.

Setting of engine speed

If there is a setting, the smart dashboard will prompt when the engine speed exceeds the set value. "No Setting" and 500r / min ~ 9,900r / min can be set per 100r / min.



Prompt in case of set value exceeded.

Rapid acceleration / deceleration setting

If acceleration /deceleration setting exists, the smart dashboard will prompt you when acceleration / deceleration above the set value occurs.

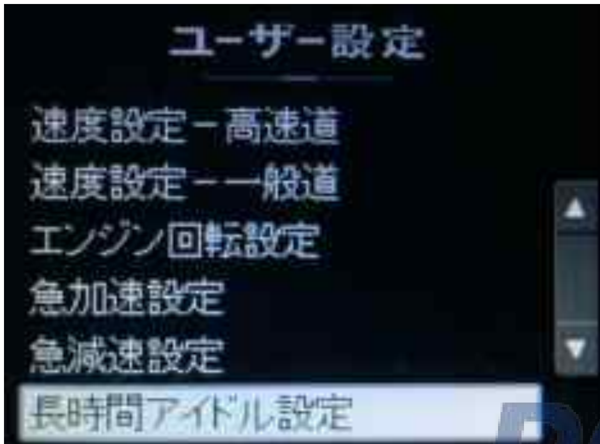
Conduct setting every 0.1m / s2 between "No Setting" and 0.5m / s2 ~ 9.9m / s^2.

Prompt in case of set value exceeded.

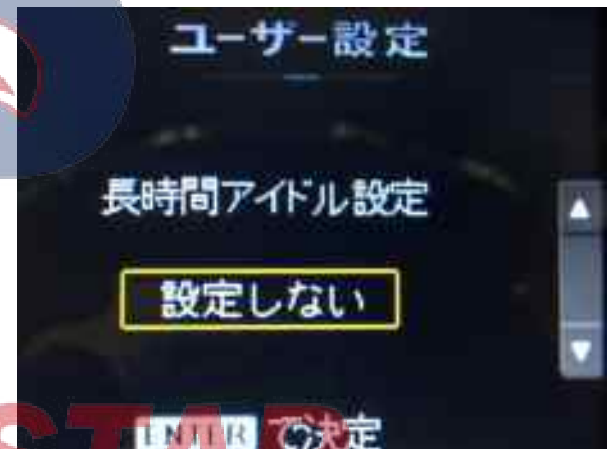
Long-time idle setting

When choosing the setting or idling continuously for more than 5 minutes, there will be relevant hints on the smart dashboard.

You can choose "Setting" and "No Setting".



ENTER



There will be a hint when idling for more than 5 minutes.

Name	Display interface	
	When parking	When driving
Energy saving advice (speed)	-	Energy saving advice Please slow down!
Energy-saving advice (engine speed)	-	Energy saving advice Please reduce the engine speed!
Energy-saving advice (rapid acceleration)	-	Energy saving advice Rapid acceleration!
Energy-saving advice (Rapid increase speed)	-	Energy saving advice Rapid increase speed!
Energy-saving advice (long idle idling)	Energy saving advice Long idle idling	-
Energy-saving advice (auxiliary brake)	-	Energy saving advice Please disengage the auxiliary brake

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■Switching method of dealer mode ①

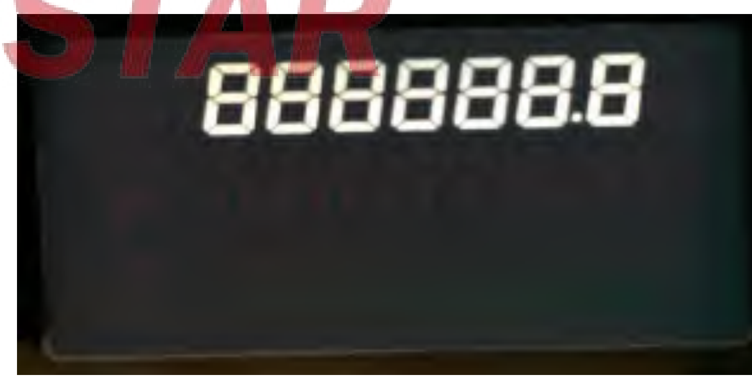
(1) Ignition switch OFF

(2) Then press[interval switch button]to turn the ignition switch on.

(3)The interval distance presentation is changed as 888888.8.

(4) Within 0.8 seconds to 7 seconds, press the [interval switch button] 3 times

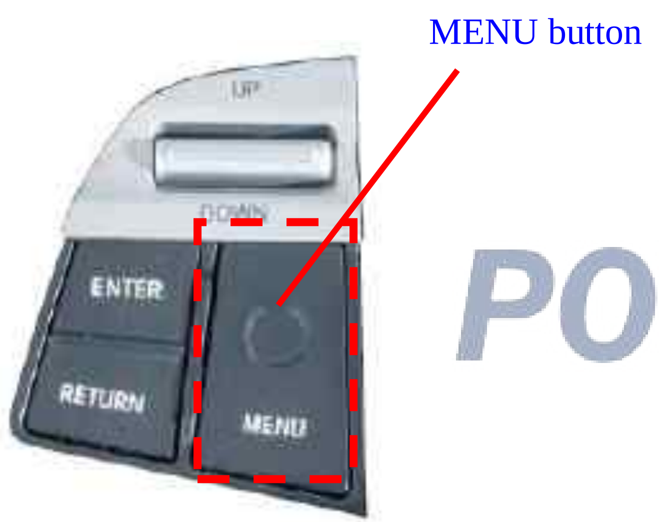
Interval switch button



Switching method of dealer mode ②

(5) Press the [MENU button] after the screen turns black.

(6) Display the dealer mode



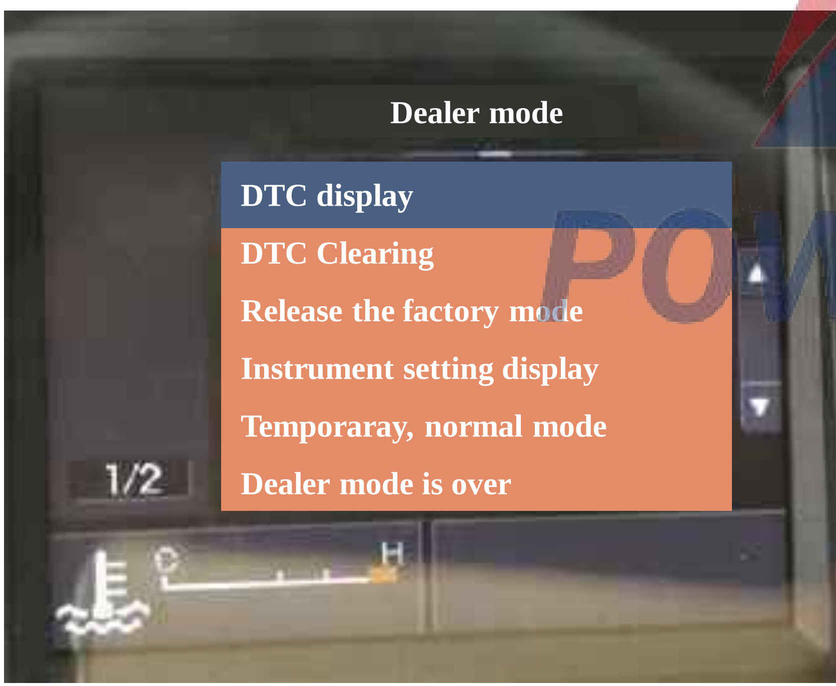
■DTC display can show current DTC.

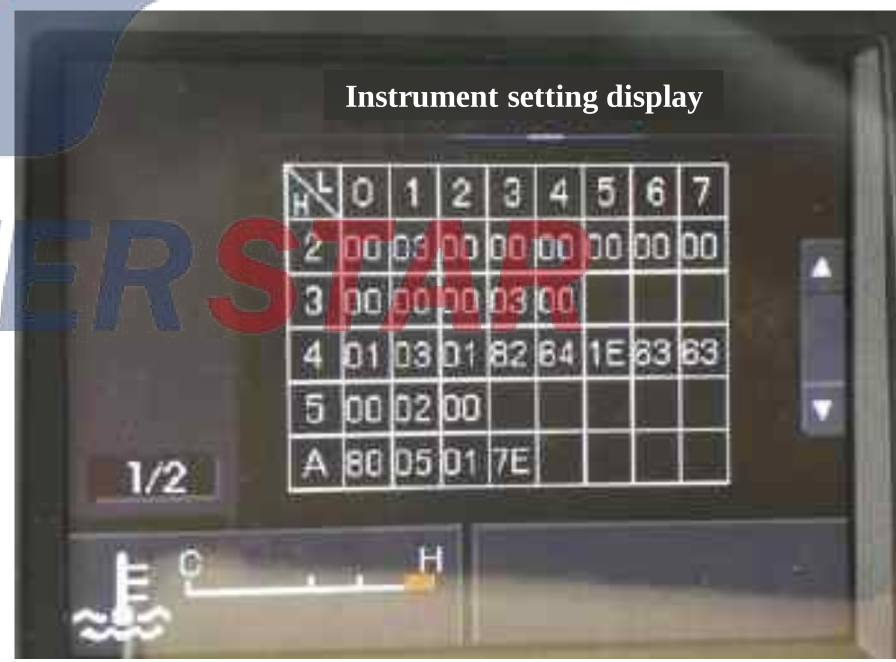
■DTC Clearing: After the fault is corrected, clear current DTC.

■Release the factory mode: All the instrument data set when leaving the factory will be cleared (maintenance tips, speed assistance, etc.)
Used only when dashboards of different vehicle are interchanged.

■Instrument Setting Display: Display the instrument set value (Make a confirmation when replacing the dashboard)

■ Temporary, normal mode





Fixed-speed cruise & speed limit adjustable

■Service conditions: the speed above 40Km / H.

■Use: A, press the master switch, switch to the automatic cruise mode. The display screen will show the “Auto Cruise Mode” prompt and last for several seconds.。

B, Step on the accelerator pedal to adjust the preset vehicle speed. If the set vehicle speed is within the allowable range, the display screen will show "STANDBY".

C, Press the setting switch, the multimedia display unit will prompt “SET” “ Vehicle Speed Setting”, at the same time, the key tone will ring. After the speed setting is completed, you can start to use automatic cruise driving.

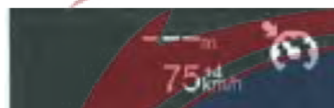
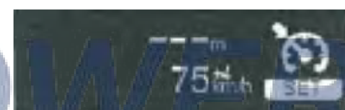
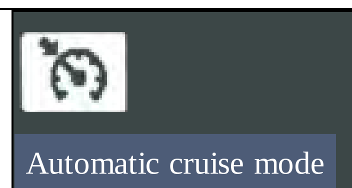
D, Press the master control switch again, get rid of it. At this point “Auto Cruise Main Menu” mark disappears. Automatic cruise will be automatically released in the following cases.

When stepping on the brake pedal / when stepping on the clutch pedal / when the vehicle speed drops below 40 km/h / when the engine control system fails / when pressing the cancellation switch

■Cancel the cruise system standby: Press the CANCEL button.

Auto cruise display content

Depending on the situation, the cruise control system will display the following on the multimedia display.

Name		Display picture	Meaning
Standby	Speed is less than 40km/h		Auto cruise system is in standby mode
	Speed is higher than 40km/h		
Automatic cruise system is in working			Automatic cruise system is in working condition
Automatic cruise system temporarily canceled			Depressing the accelerator pedal while the cruise control is in operation temporarily cancels the cruise ("SET" flashes)
Automatic cruise mode			Press the main switch, switch to automatic cruise mode

Fixed-speed cruise & speed limit adjustable

Temporarily accelerated

In the process of automatic cruising, such as overtaking need temporary acceleration, you can depress the accelerator pedal. The speed will decrease to the preset speed automatically after the accelerator pedal is released.

Change the default speed

Increase the preset speed

Use the reset switch to increase the speed, and the cruise preset speed displayed on the multimedia display will also increase.

Keep pressing the reset switch, the preset speed will gradually increase, improving by 5km/h each time.

When the preset speed is reached a suitable value, release the switch to complete the operation.

Increase the preset speed slightly

Press the reset switch and release immediately, each time the preset speed can be increase by 1km / h.

Reduce the preset speed

Use the reset switch to decrease the speed, and the cruise preset speed displayed on the multimedia display will also decrease.

Hold down the reset switch, the preset speed will be gradually reduced, each reduced by 5km / h. When the preset speed is reached a suitable value, release the switch to complete the operation.

Slightly lower the default speed

Press the reset switch and release immediately, each time the preset speed can be reduced by 1km / h.

Release automatic cruise

Press the master switch again to release. At this point "Auto Cruise Main Menu" mark disappears.

Automatic cruise will be automatically released in the following cases.

- When the brake pedal is depressed
- When the clutch pedal is depressed
- When the speed drops below 40km / h
- When the engine control system fails.
- When pressing down the cancel switch

Restore the automatic cruise

If releasing the automatic cruise for the following reasons, simply press the RES button to resume the driving state of automatic cruise. The multimedia display unit will show "SET" while the switch is released.

- When the brake pedal is depressed
- When the clutch pedal is depressed
- When pressing down the cancel switch

Adjustable speed limit

It is possible to set the maximum speed of the vehicle (about 40km / h ~ the speed set by the speed limiter). The speed limiter will automatically limit the speed below the preset speed when working.

Caution:

- Adjustable speed limiter is free of the effect from any surrounding and road environment. Please pay attention to the speed of the vehicle at any time during driving and maintain a sufficient distance from the preceding vehicle.
- When "SET" is displayed on the multimedia display unit, confirm the set max speed before starting.
- When a setting is conducted in a state of parking or a state where the vehicle speed is less than 40km/h, the system will automatically set the maximum speed to be 40km / h.
- Make sure to turn off the adjustable speed limiter when the vehicle is driving by others. Driving without the governor activated may cause an accident.
- Do not adjust the maximum speed to be below the minimum standard when driving on a highway or motorway.

  Failure to select a suitable vehicle speed based on the road conditions can cause accidents.

Fixed-speed cruise & speed limit adjustable

The speed limiter does not work.
Cause: A fault exists or the system is not turned on.

STANDBY: Standby

SET is always on: working condition

SET flashes: release state (the full throttle can release the speed limit temporarily)

Set the upper speed limit (when traveling)

① Press the master switch to switch to adjustable governor mode. At this time, the screen still display “Adjustable SLD I Mode” or “Adjustable SLD II Mode” and the factory setting speed, lasting for a few seconds.

② Increase or decrease the preset speed through the accelerator pedal, when achieving an appropriate speed (40km / h or more), press the SET switch to complete the setting. At the same time, "SET" and "Setting the Vehicle Speed " will be displayed. Afterwards, no matter how to step on the accelerator pedal, the vehicle speed will be automatically limited below the preset maximum speed..

Caution: When the vehicle is parked for speed setting, Step ② will make adjustment using the RES / SET key (press 5Km / h for a long time, press 1Km / h for a short while, and the change will occur.)

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Programming and learning

Learning・programming in case of device change

ECM replacement	Programming of vehicle identification number Uploading/downloading of Q-modulation correction Uploading/downloading of ID code of fuel injector Uploading/downloading of MAF learning value
CAN converter C/U replacement	Uploading/downloading of vehicle setting valve Programming of vehicle identification number
Driving recorder C/U replacement	Uploading/downloading of control module of driving recorder Programming of vehicle identification number ECU locking
Replacement of dashboard	Uploading/downloading of vehicle setting data Uploading/downloading of correction code of the car speed signal integrator
Replacement of the car speed signal integrator	Data uploading /downloading of the car speed signal integrator
Replacement of fuel injector	Oil injector ID programming
MAF sensor	MAF learning

■ECM setting

When ECM is replaced, vehicle information shall be programmed to a new ECM.

The same decoder must be used in the entire process from change commencing to ending. If the same decoder is not used, the vehicle information may involve one or more programming errors.

■ECM data uploading

Do not upload ECM data if ECM can not communicate prior to the replacement.

1) Upload the following data in the ECM before replacement by use of the decoder.

- Q-modulation correction
- Oil injector's ID
- MAF's learned value

■Uploading of Q-modulation correction

1) Select Item in the decoder.

Engine ＞6WG1 ＞ programming＞Q-modulation correction ＞uploading of Q-modulation correction

2) Upload the Q-modulation correction to the decoder according to the on-screen instructions of the decoder.

3) After the end of uploading, enter the uploading of ID code of the fuel injector.

■Uploading of ID code of fuel injector

1) Select Item in the decoder.。

Engine ＞6WG1 programming＞ID code of fuel injector ＞uploading of ID code of fuel injector

2) Upload the ID code of the fuel injector to the decoder according to the on-screen instructions of the decoder.

3) After the end of uploading, enter the uploading of MAF learning value.

■MAF learning value download

1) Select Item in the decoder.。

Engine >6WG1 ＞ programming ＞MAF learning value ＞ uploading of MAF learning value

2) Upload the MAF learning value to the decoder according to the on-screen instructions of the decoder.

3) After the uploading is complete, shut down the power supply of the decoder.

4) Turn off the ignition switch.

■ECM data downloading

●Do not download ECM data if ECM can not communicate prior to the replacement.

Before downloading of ECM data, confirm the vehicle information (VIN/engine model).

1) Download the following data in the ECM before replacement to the ECM after replacement.

・Q-modulation correction

・Oil injector's ID

・MAF's learned value

■Downloading of Q-modulation correction

1) Select Item in the decoder.。

Engine ＞6WG1 ＞ programming＞Q-modulation correction ＞downloading of Q-modulation correction

2) Download the Q-modulation correction to ECM according to the on-screen instructions.

3) After the end of downloading, enter the downloading of ID code of the fuel injector.

Downloading of ID code of fuel injector

1)Select Item in the decoder.。

Engine ＞ 6WG1 ＞ programming ＞ ID code of fuel injector ＞ downloading of ID code of fuel injector

2) Download the ID code of the fuel injector to ECM according to the on-screen instructions.

3) After the end of downloading, enter the downloading of MAF learning value.

MAF learning value download

1)Select Item in the decoder.

Engine ＞ 6WG1 ＞ programming ＞MAF learning value ＞ downloading of MAF learning value

2) Download the MAF learning value to ECM according to the on-screen instructions.

3) After the downloading is complete, turn off the ignition switch.

Oil injector ID programming

If ID code of fuel injector is downloaded, there is no need to program.

This operation is done only when the fuel injector is replaced.

1) Select Item in the decoder.

Engine ＞ 6WG1 ＞ programming ＞ ID code of fuel injector ＞ programming of ID code of fuel injector

2) Program the ID code of the fuel injector to ECM according to the on-screen instructions.

3) After the end of programming, turn off the ignition switch.

Programming of vehicle identification number

1)Select Item in the decoder.。

Engine ＞WG1 ＞ programming ＞ programming of vehicle identification number

2) Program the vehicle identification number to ECM according to the on-screen instructions.

3) After the end of programming, turn off the ignition switch 30s.

Control module of CAN converter

When control module of CAN converter is replaced, vehicle information shall be programmed to a new module.

The same decoder must be used in the entire process from change commencing to ending. If the same decoder is not used, the vehicle information may involve one or more programming errors.

Uploading of vehicle setting value

If the control module of CAN converter prior to the replacement can not communicate with the decoder, the data need not be uploaded.

1) 1) Select Programming in the decoder.

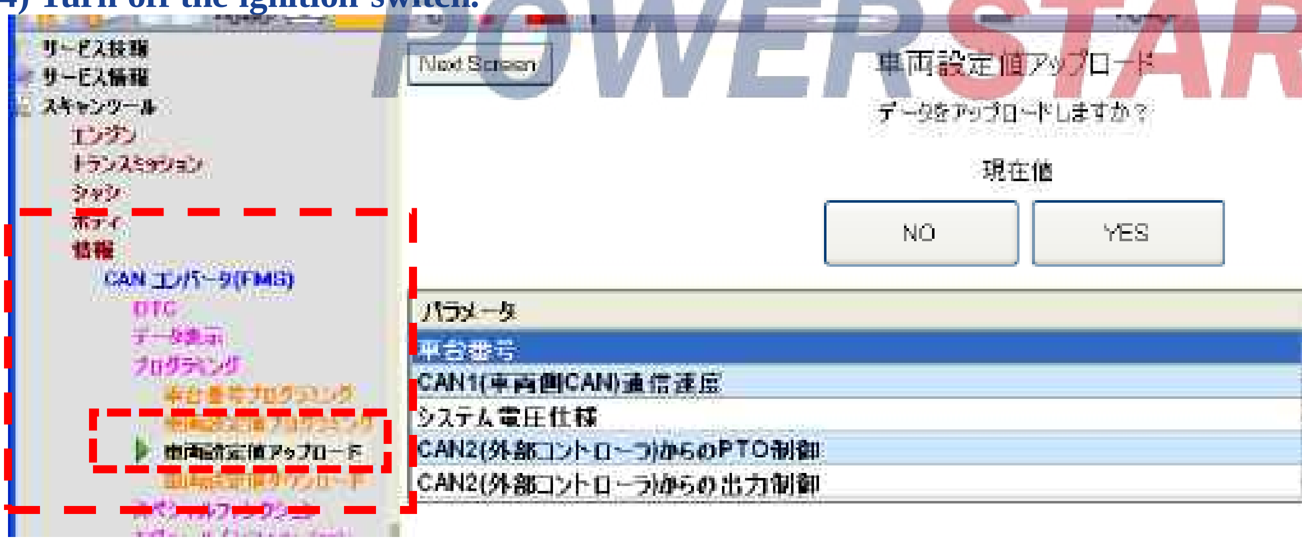
Information > CAN converter (FMS) > programming

2) Select the uploading of vehicle setting value and upload the vehicle information to the decoder according to the on-screen instructions.

Caution: 上載を実施する前に、表示した车辆情報を記録する。

3) After the uploading is complete, shut down the power supply of the decoder.

4) Turn off the ignition switch.



■Downloading of vehicle setting value

When control module of CAN converter before replacement can not communicate with the decoder, do not download.

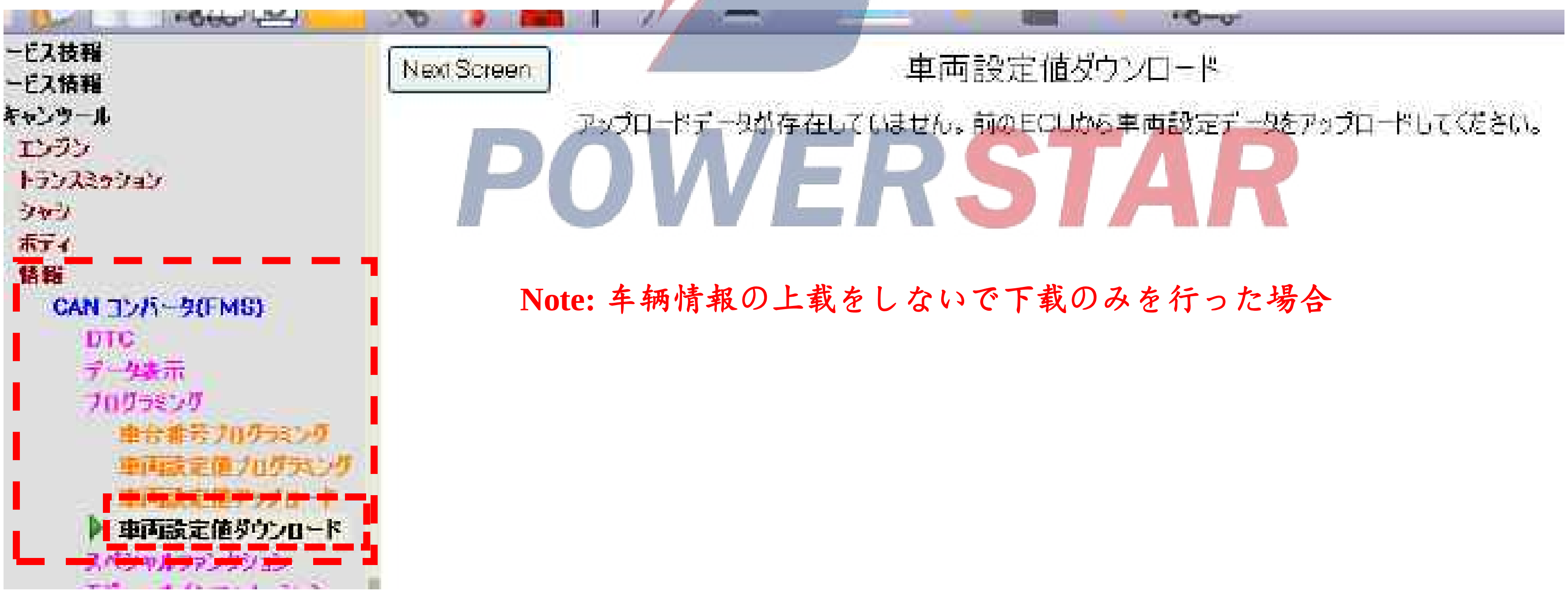
Before downloading, please confirm the vehicle information.

1) Select Programming in the decoder.

Information > CAN converter (FMS) > programming

2) Select the downloading of vehicle setting value and download the vehicle information to the control module of CAN converter according to the on-screen instructions.

3) After the end of downloading, enter the programming of vehicle identification number.



Note: 车辆情报の上载をしないで下载のみを行った場合

Programming of vehicle identification number

1) Select Programming in the decoder.

Information > CAN converter (FMS) > programming

2) Select the programming of vehicle identification number and program the vehicle identification number to the control module of CAN converter according to the on-screen instructions.

3) After the end of programming, enter the programming of vehicle setting value.

■Programming of vehicle setting value

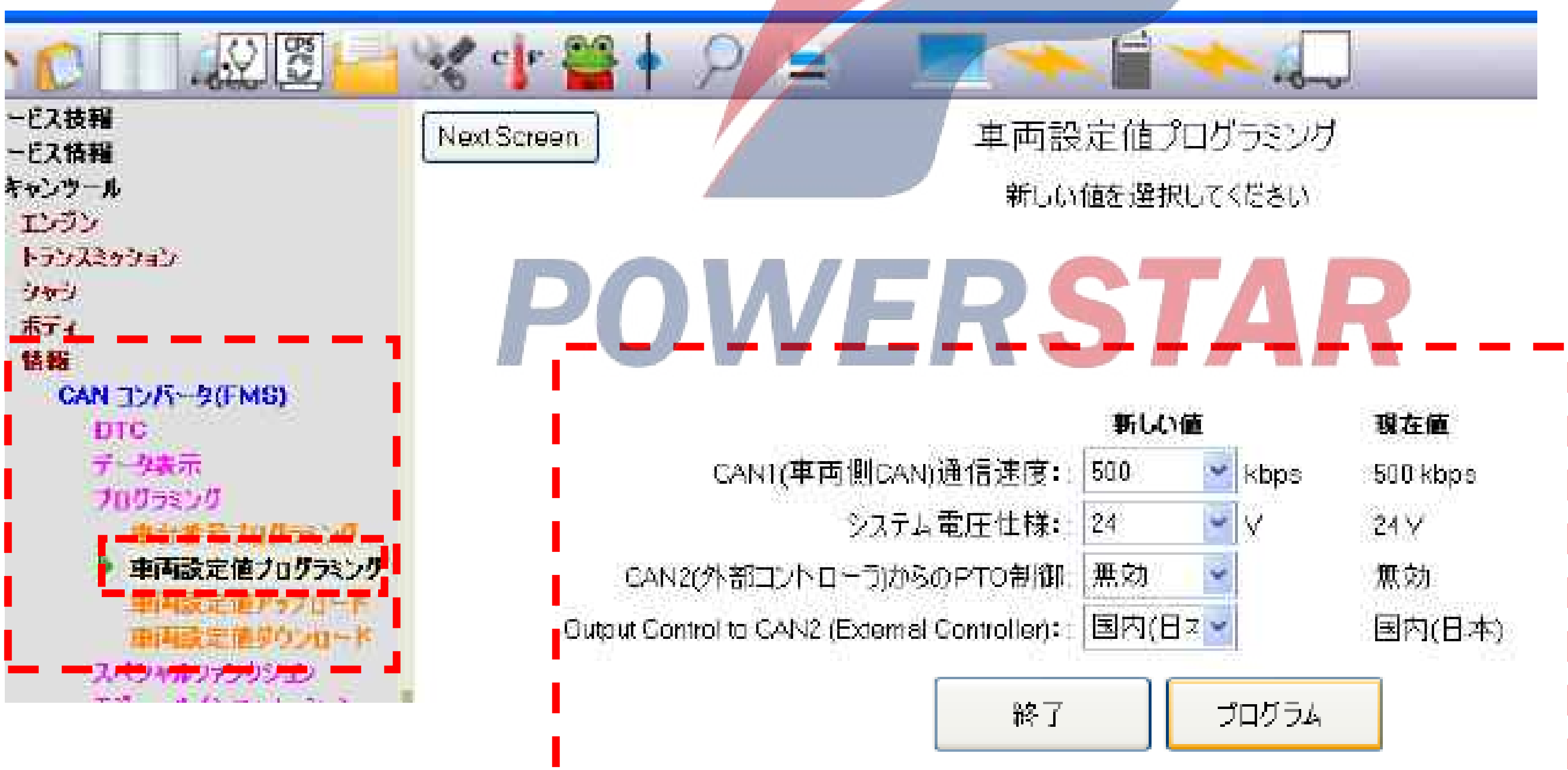
It is implemented when control module of CAN converter before replacement can not communicate with the decoder or individual set value changes.

1) Select Programming in the decoder.

Information > CAN converter (FMS) > programming

2) Select the programming of vehicle setting value and program the vehicle information to the control module of CAN converter according to the on-screen instructions.

3) After programming, turn off the ignition switch.



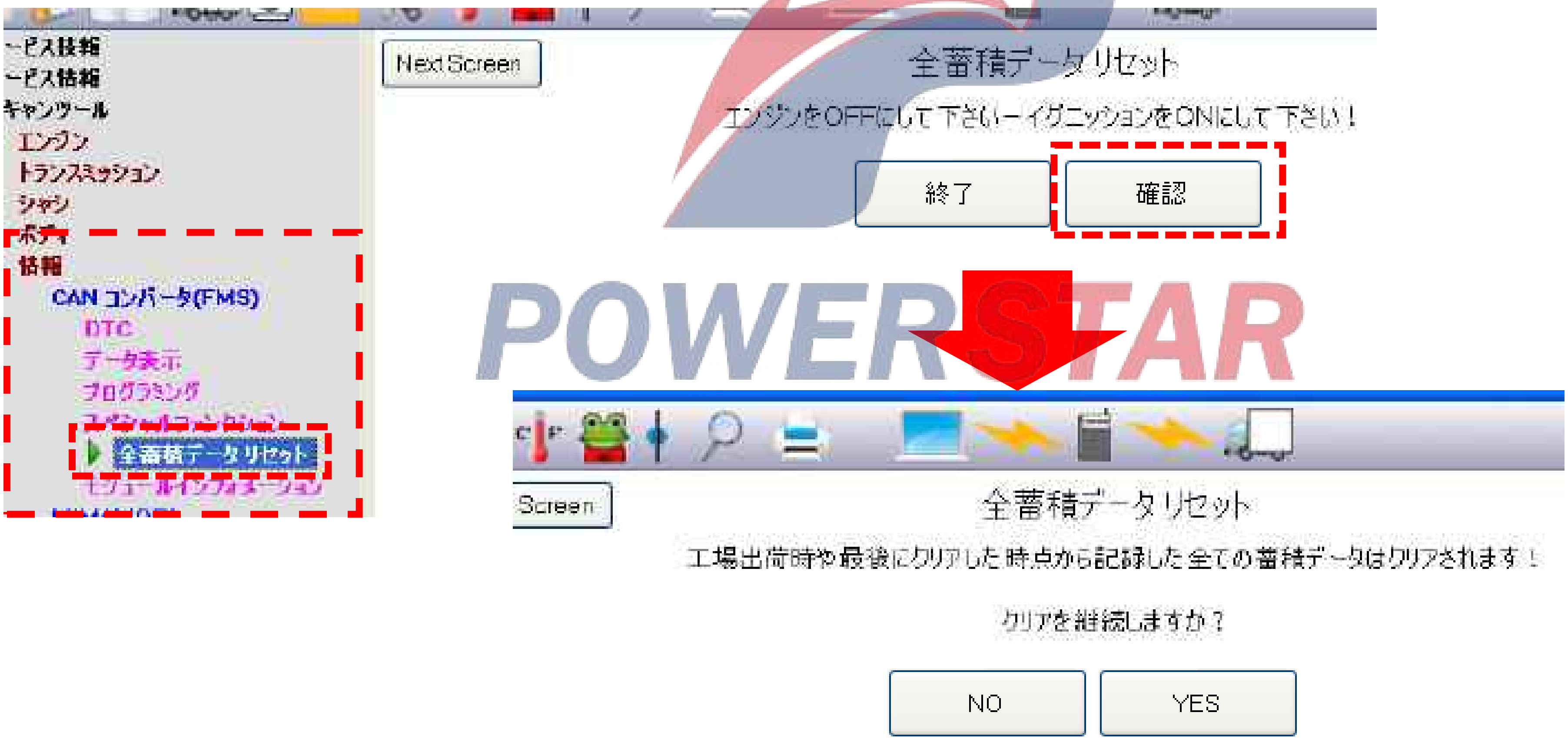
All the stored data return to zero

It is implemented when replaced accessories are reused products or car models are different.

1) Select the「special function」of the decoder.

   Information> CAN converter (FMS)> special function

2) Select the return-to-zero of all stored data and make the data return to zero according to the on-screen instructions.



Control module of driving recorder

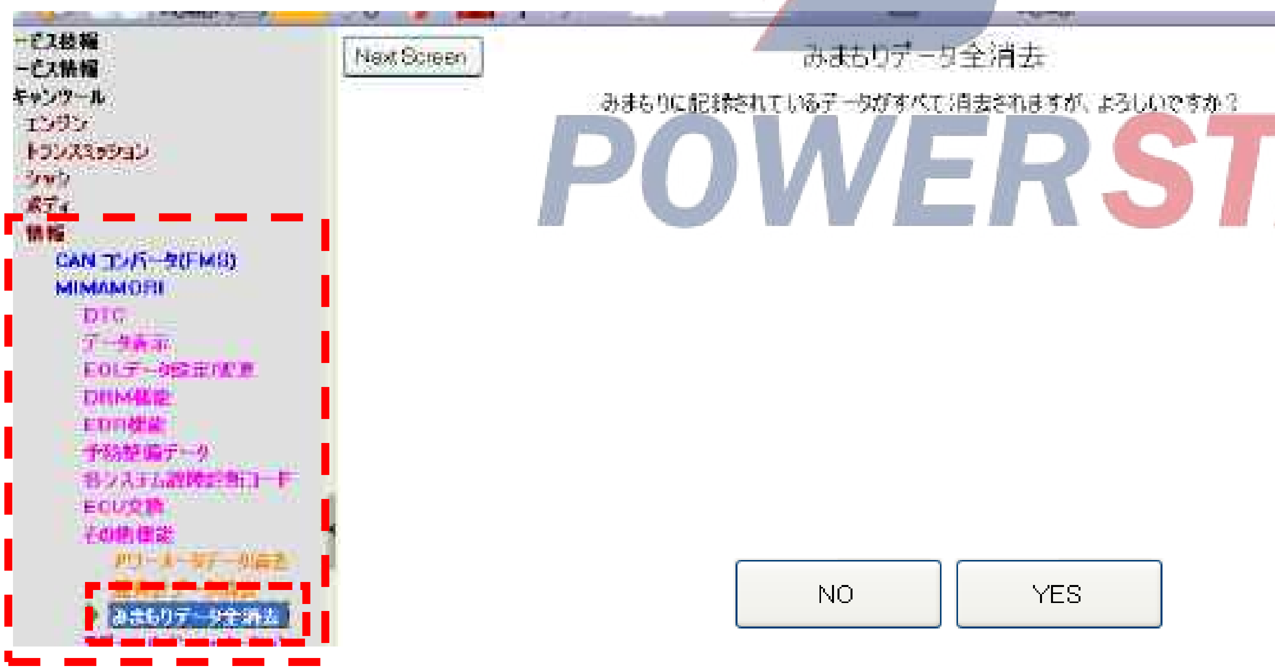
When control module of the driving recorder is replaced, vehicle information shall be programmed to the new control module of the driving recorder.

The same decoder must be used in the entire process from change commencing to ending. If the same decoder is not used, the vehicle information may involve one or more programming errors.

All the data disappear.

Caution: It is implemented when replaced accessories are reused products or car models are different.

1) Use the decoder to eliminate DTC.
2) The decoder selects other functions.
   Information>driving recorder> other functions> all the driving recorder data disappear
3) After elimination, enter the data uploading of control module of the driving recorder.



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■Data uploading of control module of driving recorder

Caution: Do not download the control module data of driving recorder when the control module of driving recorder before replacement can not communicate.

1) Select ECU Change in the decoder.

Information > DVR > ECU change

2) Select the data uploading (driving recorder →PC) and upload the data from the control module of the driving recorder according to the on-screen instructions.

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Data downloading of control module of driving recorder

Caution: Do not download the control module data of driving recorder when the control module of driving recorder before replacement can not communicate.

Before the data of control module of driving recorder is downloaded, vehicle information must be confirmed.

1) Select ECU Change in the decoder.

Information > DVR > ECU change

2) Select the data downloading (PC → (driving recorder) and download the data to the control module of the driving recorder according to the on-screen instructions.

3) After the end of downloading, enter the programming of vehicle identification number.

Programming of vehicle identification number

1) Select ECU Change in the decoder.

Information > DVR > ECU change

2) Select the programming of vehicle identification number and program the vehicle identification number according to the on-screen instructions.

3)After the end of programming of vehicle identification number, enter the EOL data setting/ECU change.

EOL data setting/change

Caution: when the control module data of driving recorder is downloaded, there is no need to set or change EOL data.

1) Select the「EOL data setting/change」of the decoder.

Information>driving recorder> EOL data setting /change

2) Program the following items according to the on-screen instructions.

・Loading ECU information ・ Engine mode l ・ T/M model ・ Tire radius

・Differential speed ratio ・ Correction coefficient of car speed ・ EOL data transmission

3) After the end, confirm that presentation data is consistent with programming data.

4) After the end of EOL data setting/change, enter the threshold value change.

■ECU locking

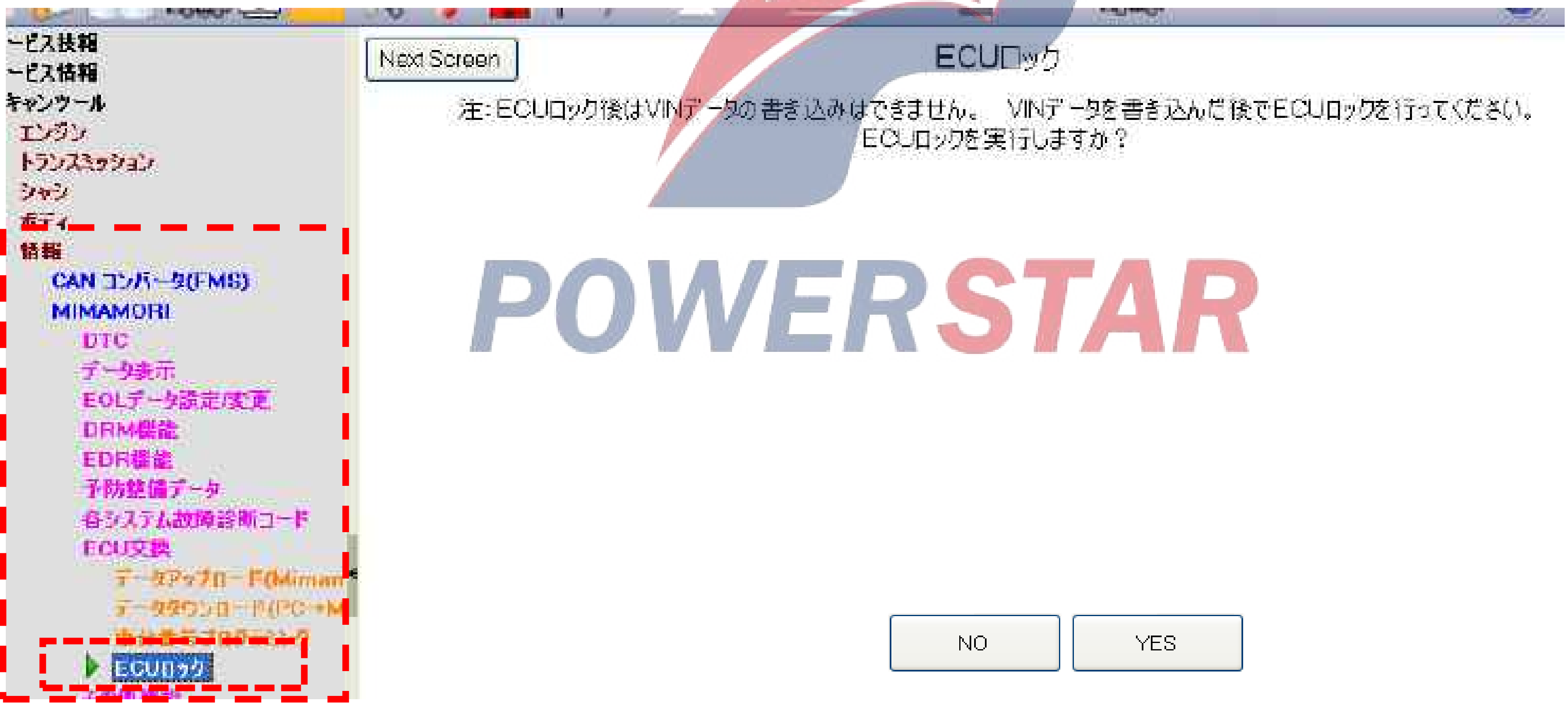
Caution: It is only performed when a new control module of driving recorder is replaced.

1) Select ECU Change in the decoder.

Information > DVR > ECU change

2) Select ECU locking and implement ECU locking according to the on-screen instructions.

3) After the end of ECU locking, turn off the ignition switch.



Vehicle speed signal integrator

When the car speed signal integrator is replaced, the correction code of the new car speed signal integrator shall be set.

The same decoder must be used in the entire process from change commencing to ending. If the same decoder is not used, the vehicle information may involve one or more programming errors.

Data uploading of the car speed signal integrator

Do not upload the data on vehicle speed signal integrator when the communication with the data on vehicle speed signal integrator before replacement can not be carried out.

1) Select Item in the decoder.

Information > vehicle speed signal integrator (single) > programming

2) Select the uploading of vehicle setting value and upload the data to the decoder according to the on-screen instructions.

3) After the uploading is complete, shut down the power supply of the decoder.

4) Switch off the ignition switch.

Data downloading of the car speed signal integrator

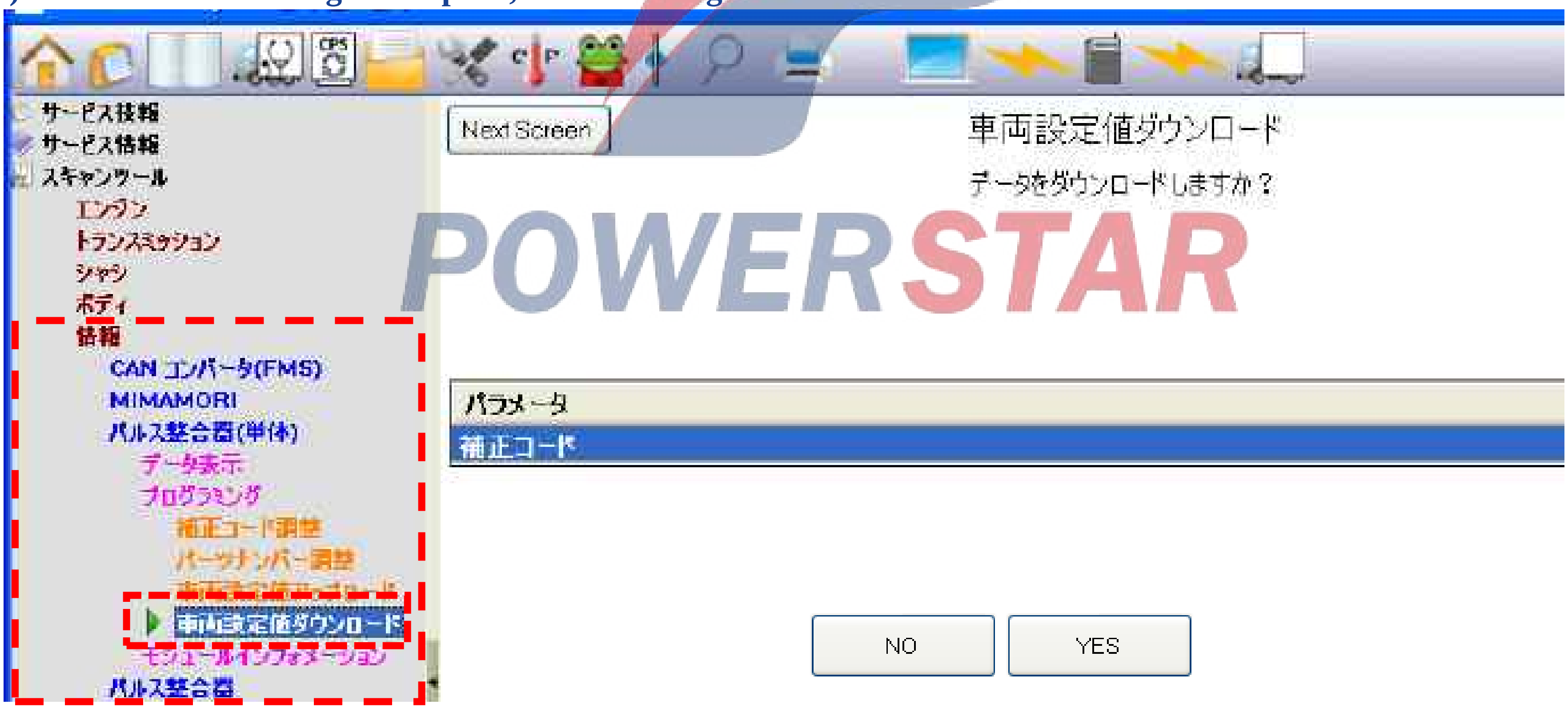
This operation can be implemented only when the car speed signal integrator before replacement can communicate with the channel decoder normally.

1) Select Item in the decoder.

Information > vehicle speed signal integrator (single) > programming

2) Select the downloading of vehicle setting value and download the data from the decoder according to the on-screen instructions.

3) After the downloading is complete, turn off the ignition switch.



Setting of correction code of the car speed signal integrator

Programming of correction code of the car speed signal integrator requires a password.

The following occasions require this operation.

- **The car speed signal integrator before replacement can not communicate with the decoder.**
- **The correction code is corrected.**

Caution: when the correction code is changed, it is necessary to change the correction code setting of speed signal integrator as well as the correction code setting of TCM.

1) Select Item in the decoder.

Information > vehicle speed signal integrator (single) > programming

2) Select the correction code setting and program the correction code according to the on-screen instructions.

3) After the end of programming, turn off the ignition switch.

Dashboard

When replacing the dashboard, program the vehicle data and a correction code for a new dashboard.
Before replacing the dashboard, upload the data of dashboard to be replaced to the decoder.
When the dashboard before replacement can not communicate with the decoder, it is needless to upload.

The same decoder must be used in the entire process from change commencing to ending. If the same decoder is not used, the vehicle information may involve one or more programming errors.

Uploading of vehicle setting data

1) Select Item in the decoder.

Vehicle body > instrument panel > programming

2) Select the uploading of vehicle setting value and upload the data to the decoder according to the on-screen instructions.

3) After the end of uploading of vehicle setting value, enter the data uploading of the car speed signal integrator.

Downloading of vehicle setting data

It is implemented only when the dashboard before replacement is possible to communicate with the decoder.

1) Select Item in the decoder.

Vehicle body > instrument panel > programming

2) Select the vehicle setting value and download the vehicle data according to the on-screen instructions.

Caution: Confirm the vehicle information before downloading.

3) After the end of downloading of vehicle setting value, enter the data downloading of the car speed signal integrator.

■Programming of vehicle setting data

When vehicle setting data is downloaded, this operation is not required.

When the dashboard before replacement can not communicate with the decoder, vehicle data must be programmed to the dashboard.

Programming of vehicle setting data requires a password.

1) Select Item in the decoder.

Vehicle body > instrument panel > programming

2) Select the vehicle setting value and download the vehicle data to the dashboard according to the on-screen instructions.

Caution: Confirm the vehicle information before downloading.

3) After the end of uploading of vehicle setting value, enter the data uploading of the car speed signal integrator

Setting of correction code for TCM

・When there is no change in the correction code, this operation is not required.。

・When the correction code changes, the correction code of the car speed signal integrator and the correction code for TCM shall be set.

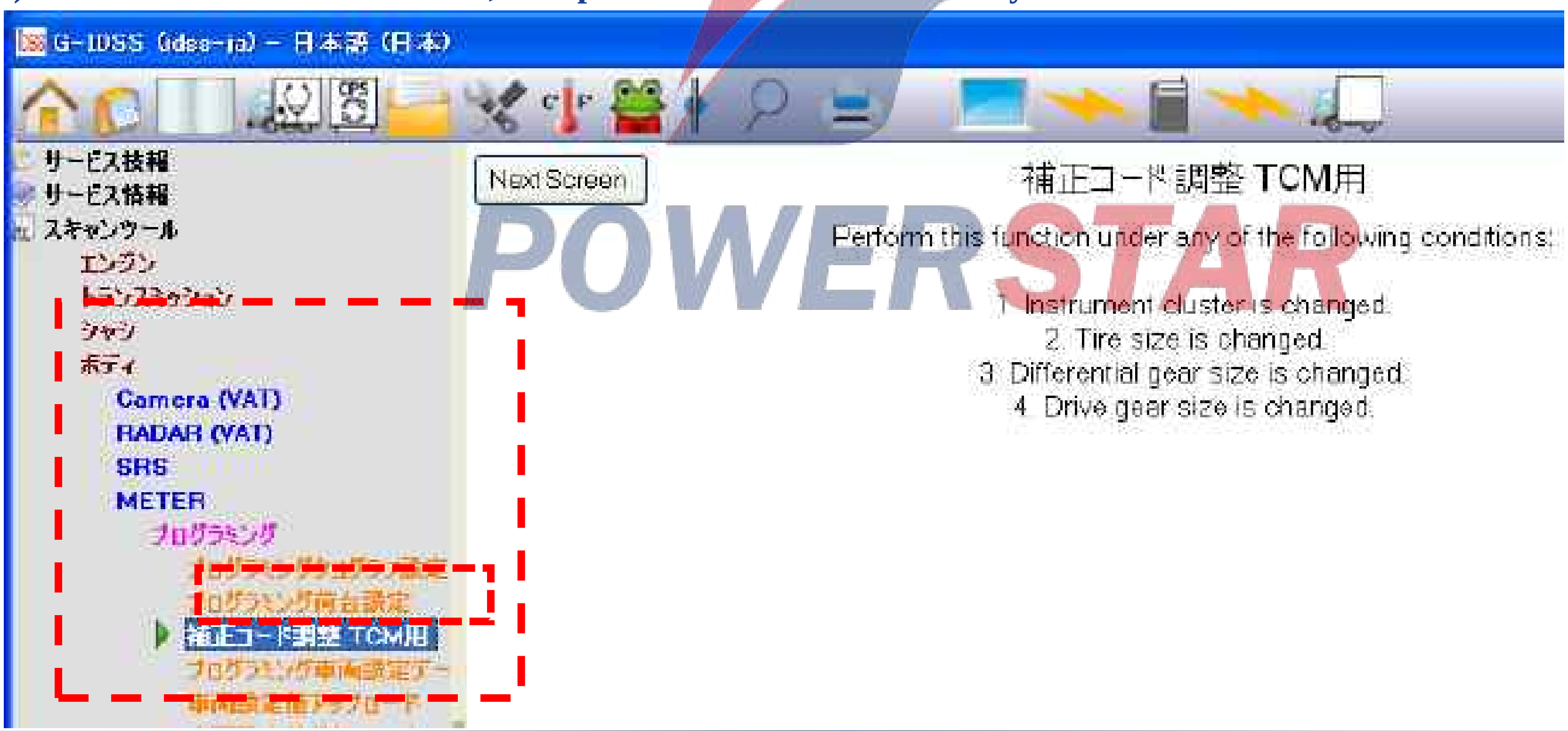
・A change of the correction code requires the password.

1) Select Item in the decoder.

Vehicle body > instrument panel > programming

2) Select the correction code adjustment for TCM and program the correction code according to the on-screen instructions.

3) After the correction code is set, car speed shall be checked actually.



■MAF learning summary

Assembly state of the MAF sensor and associated accessories will affect the accuracy of air suction amount determination.

Therefore, MAF study is needed.

Caution: before learning MAF, clean or replace the air filter.

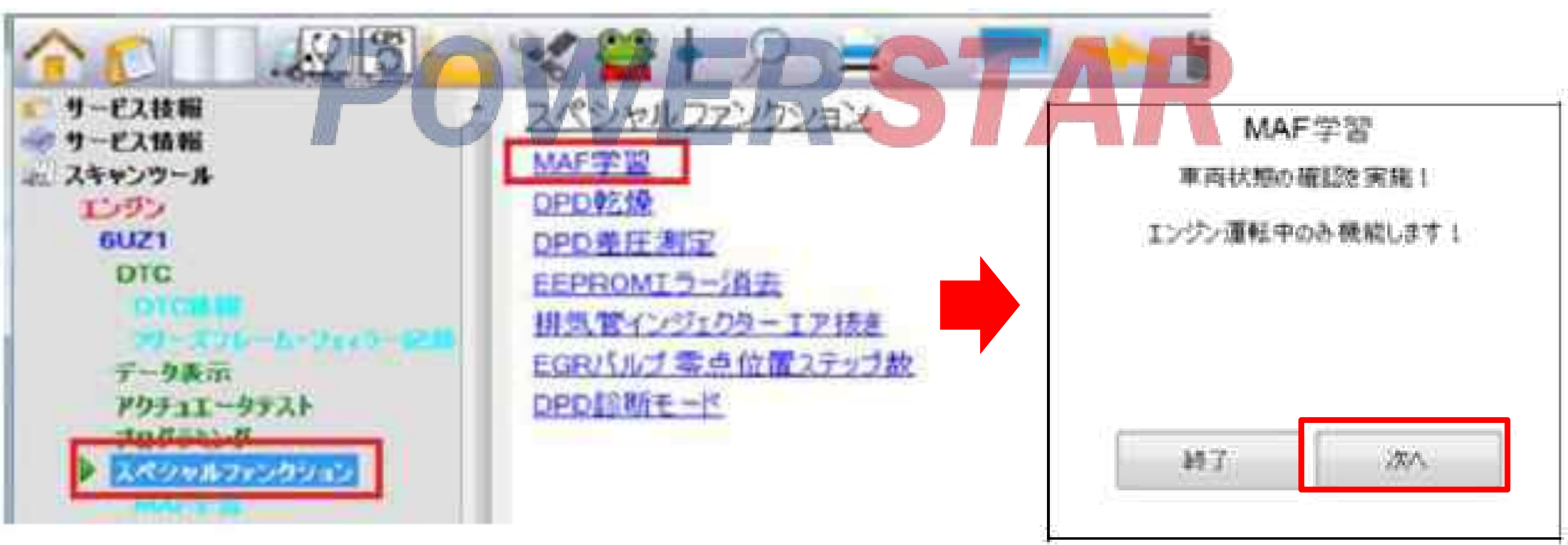
■MAF learning essentials ①

1) Select Item in the decoder.。

Engine > 6WG1> special key

2) Select MAF learning and implement MAF learning according to the on-screen instructions.

3) After the end of learning, turn off the ignition switch.



ISUZU

■MAF learning essentials ②

MAF学習

スタンバイ モード

パラメータ	値	単位
MAF学習データ	0.964	-
MAF学習モード	0	-

終了 開始

Full throttle

MAF learning

学習中(アクセルペダルを全開にして下さい。)

パラメータ	値	単位
MAF学習データ	0.964	-
MAF学習モード	3	-

中断

Throttle return, over.

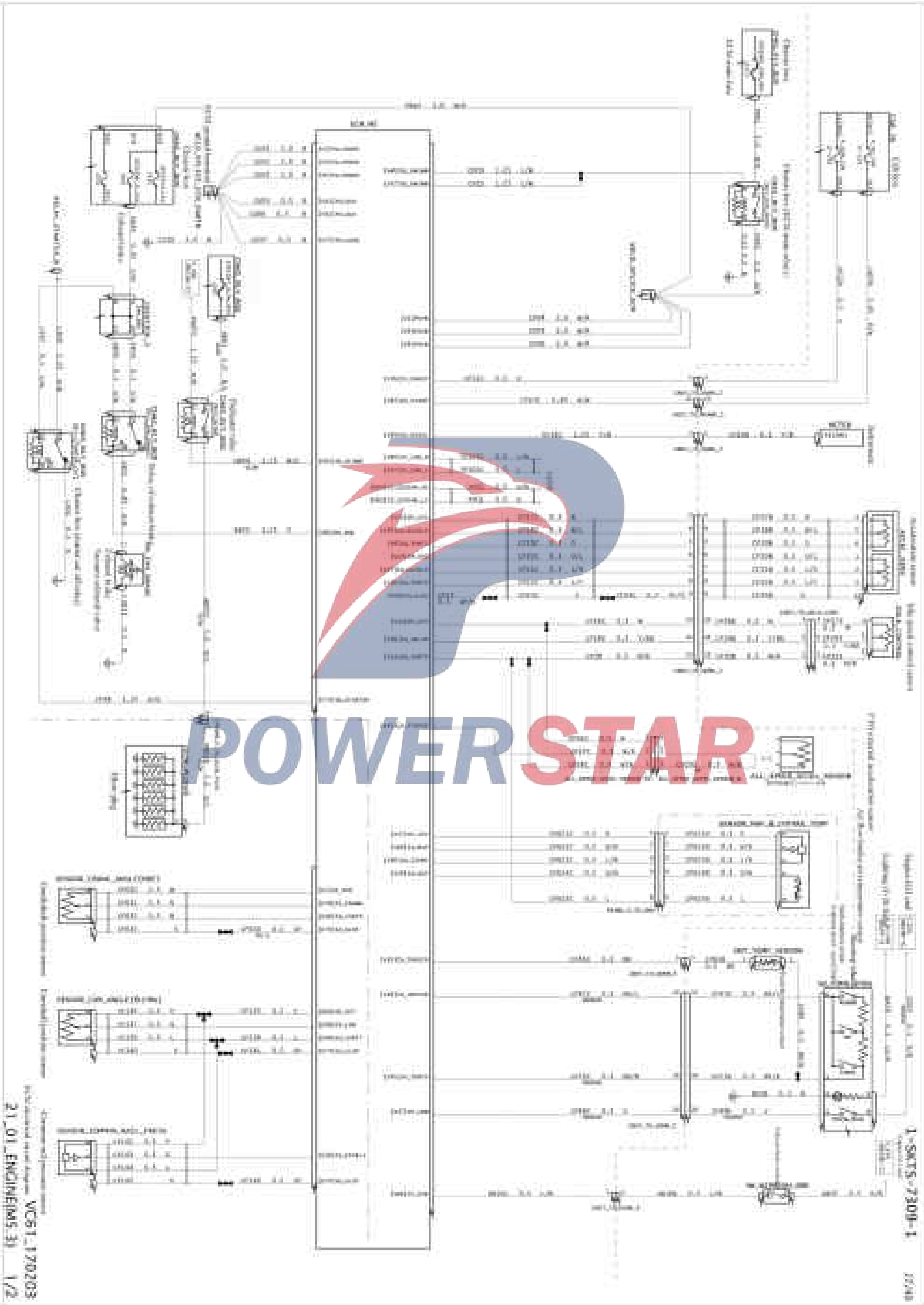
MAF learning

学習完了(アクセルペダルを戻して下さい。)

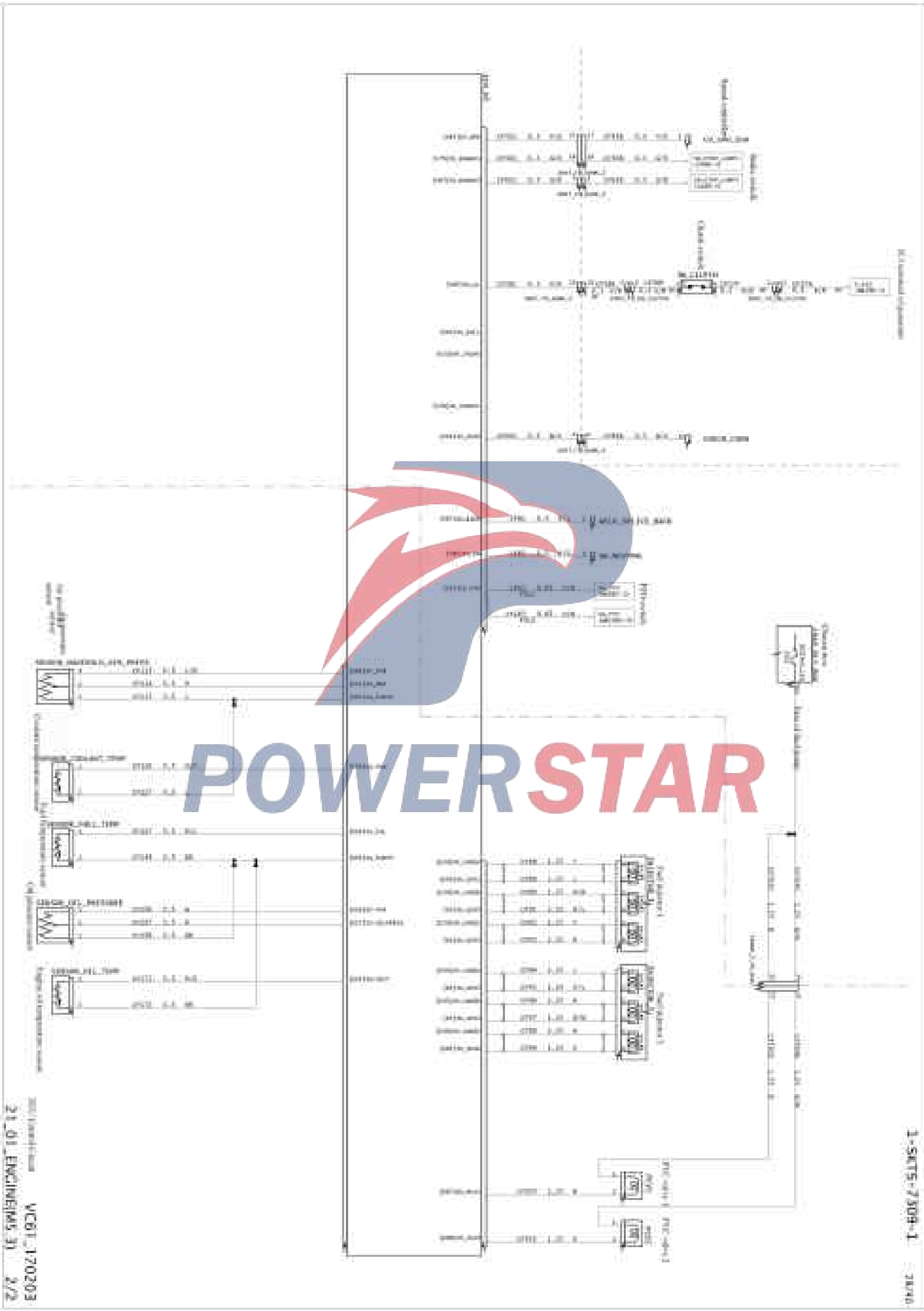
パラメータ	値	単位
MAF学習データ	0.924	-
MAF学習モード	4	-

終了

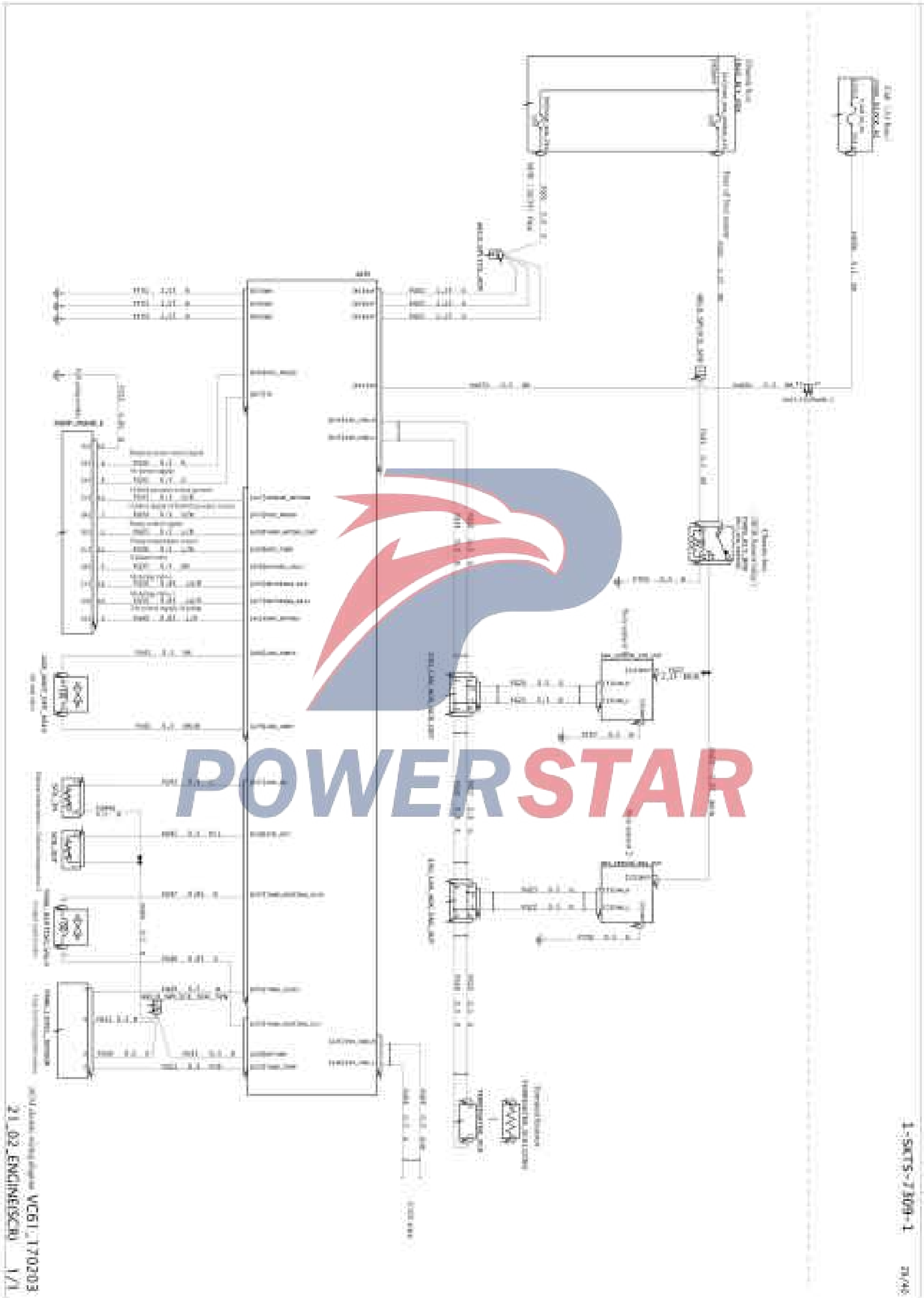
Engine ECU Control Circuit (1)



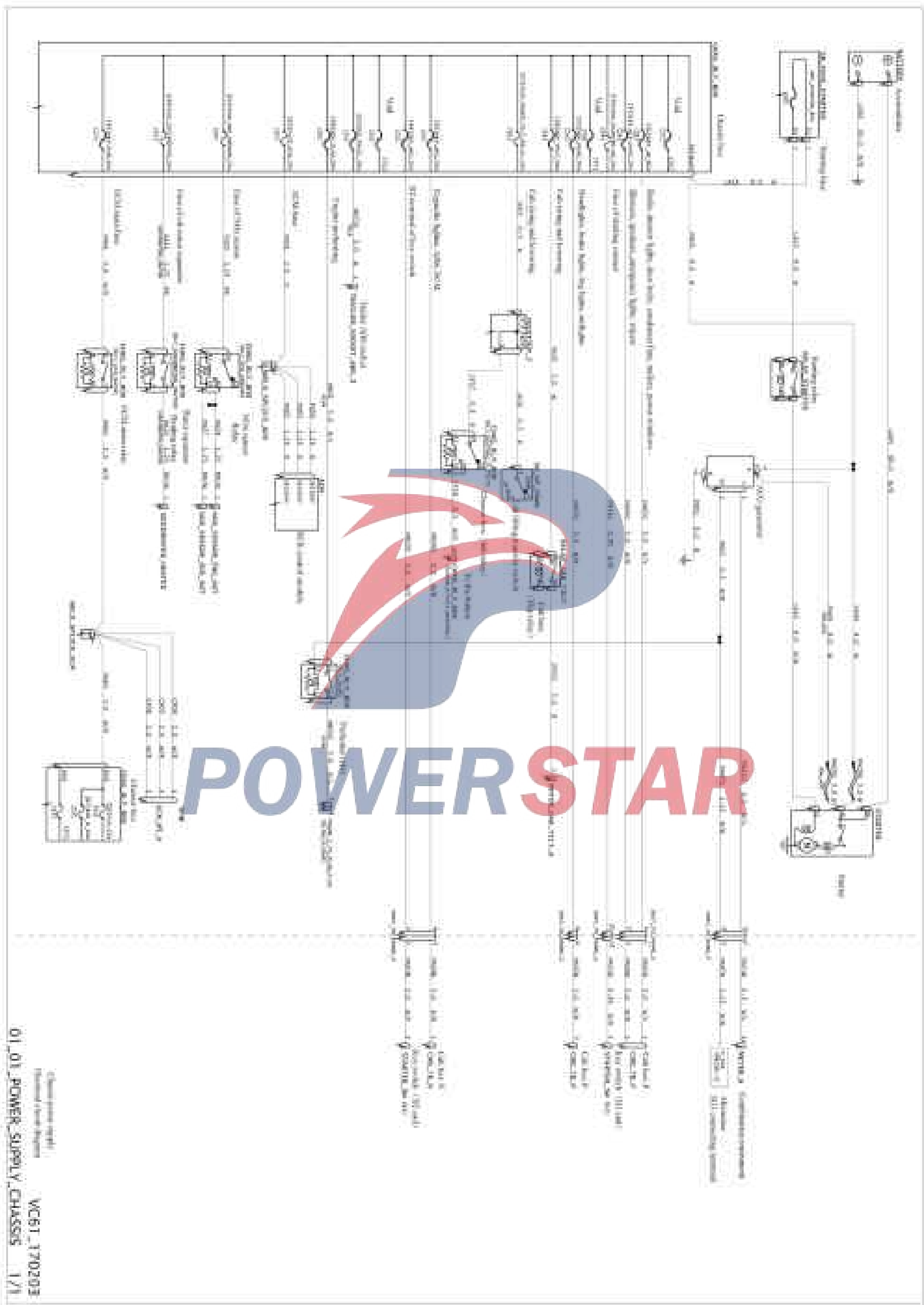
Engine ECU Control Circuit (2)



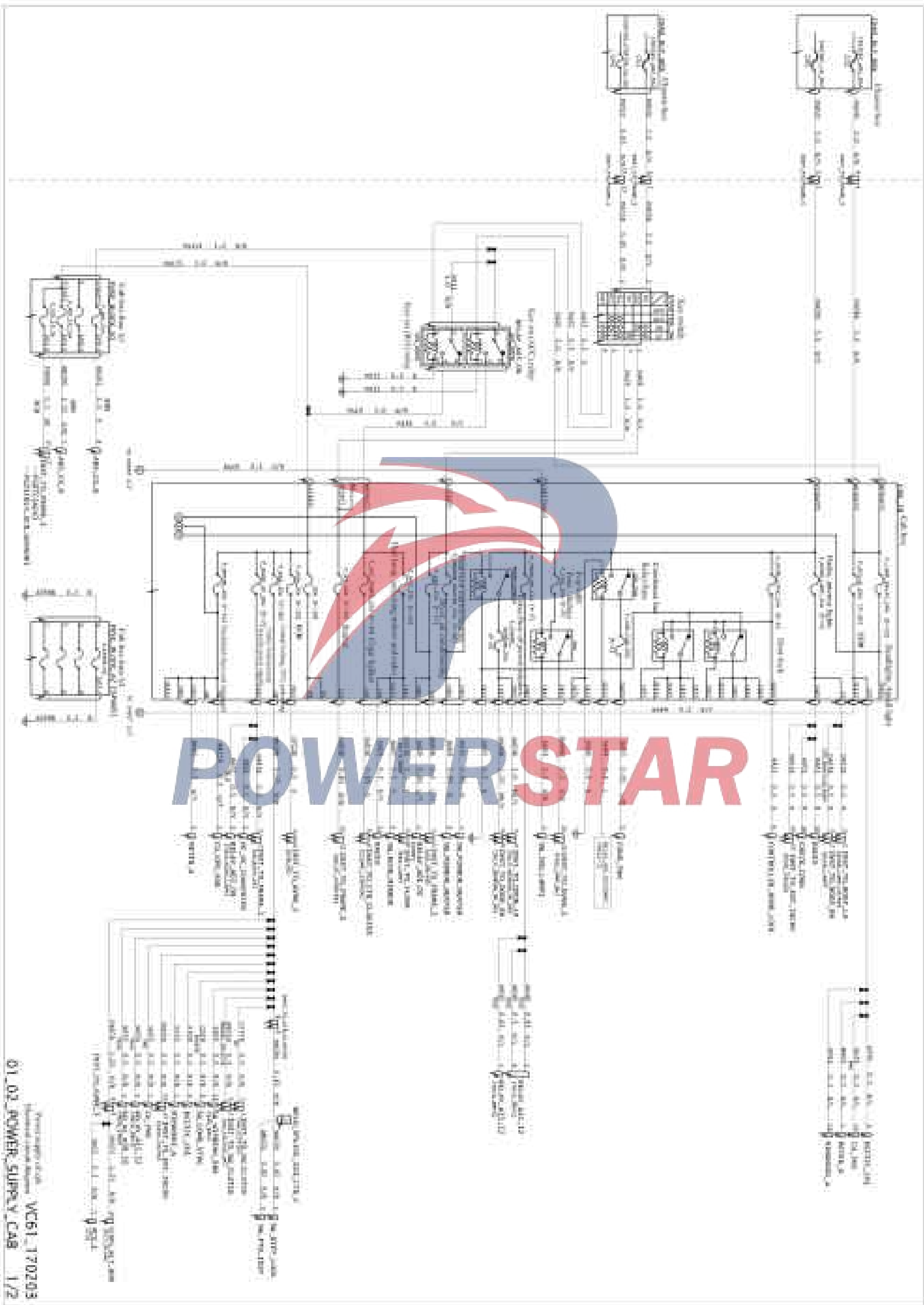
ACM control wiring diagram of SCR system



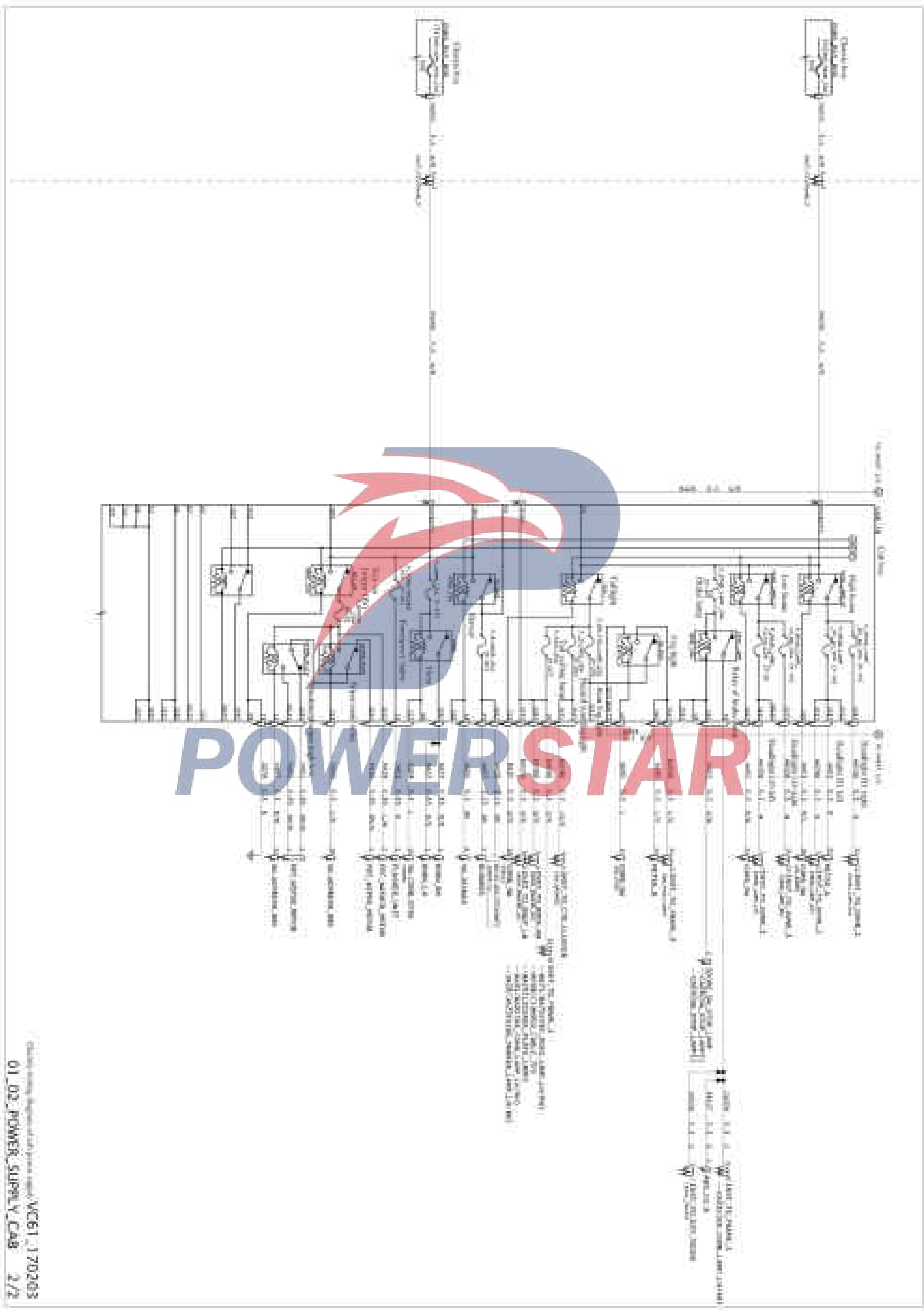
Control wiring diagram of chassis power supply



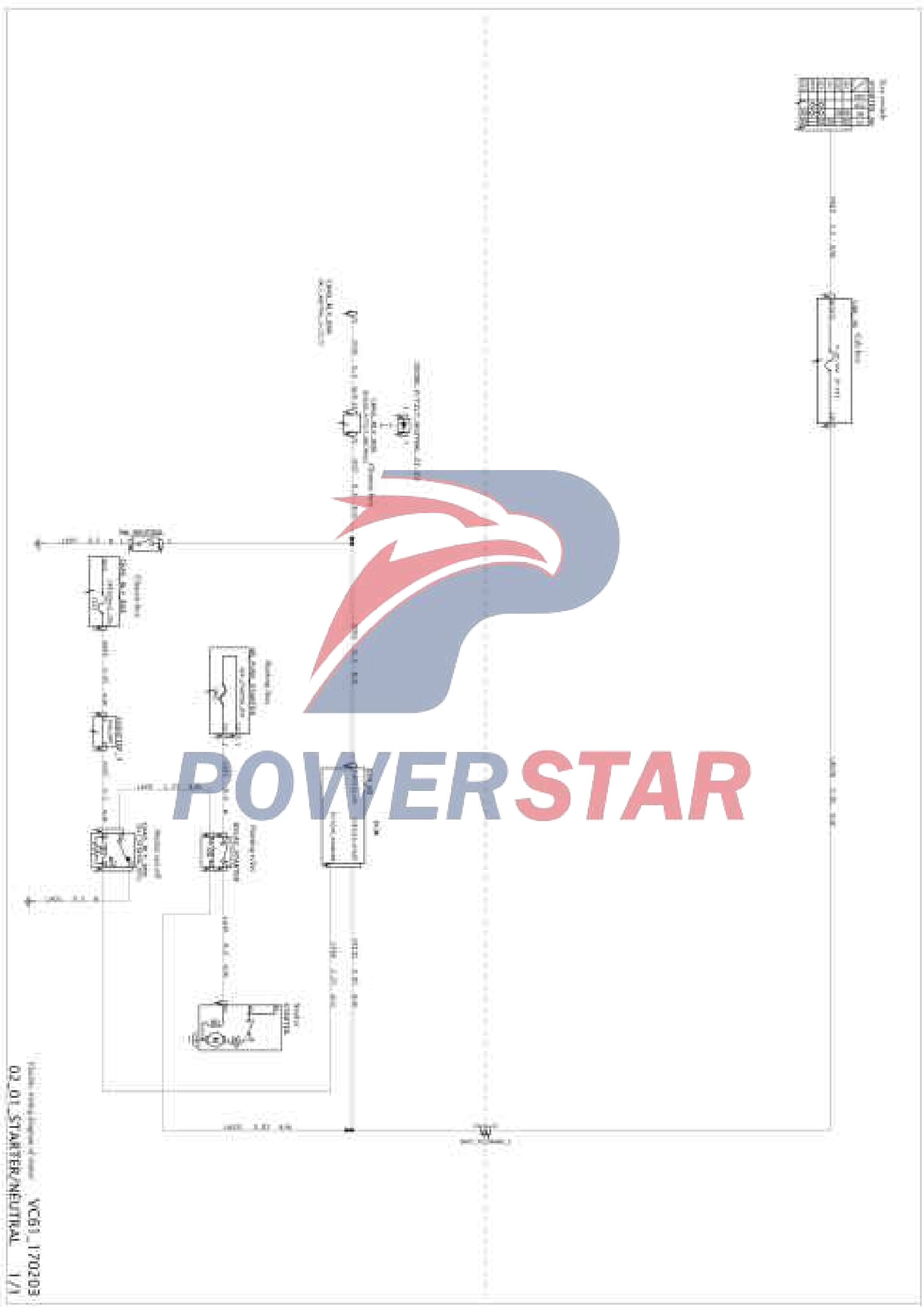
Cab power supply control circuit diagram



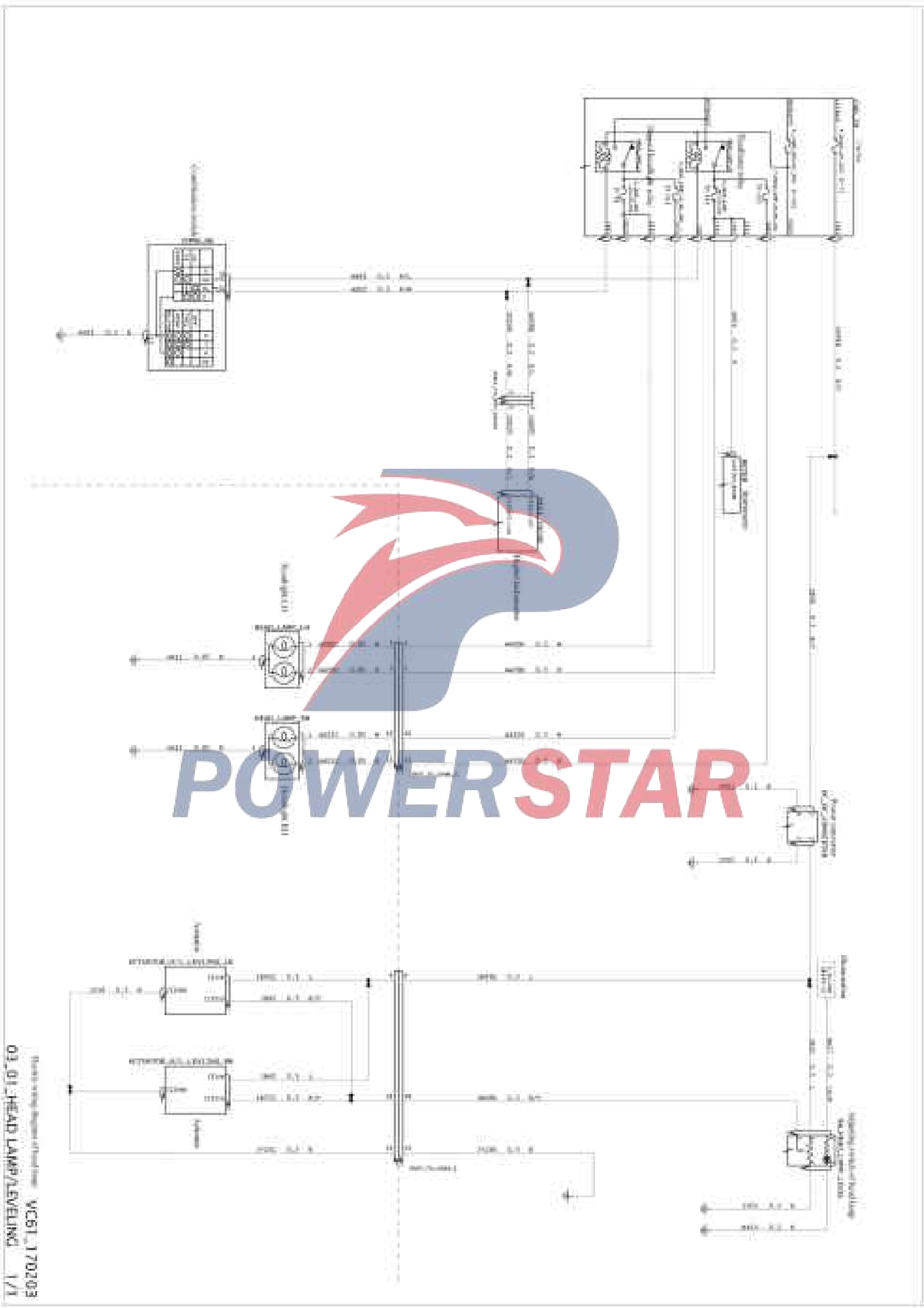
Cab power supply control circuit diagram



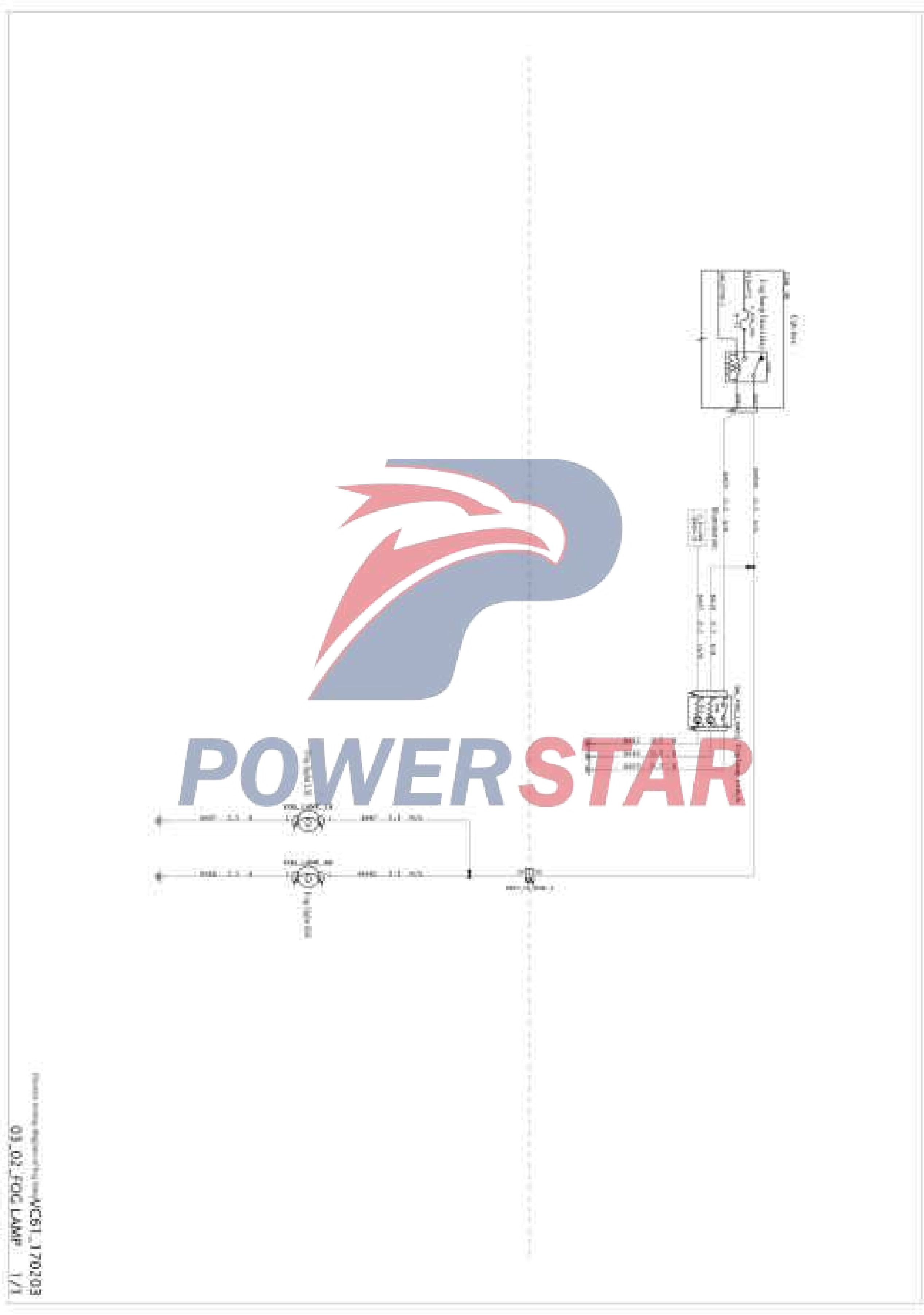
Control wiring diagram of starter



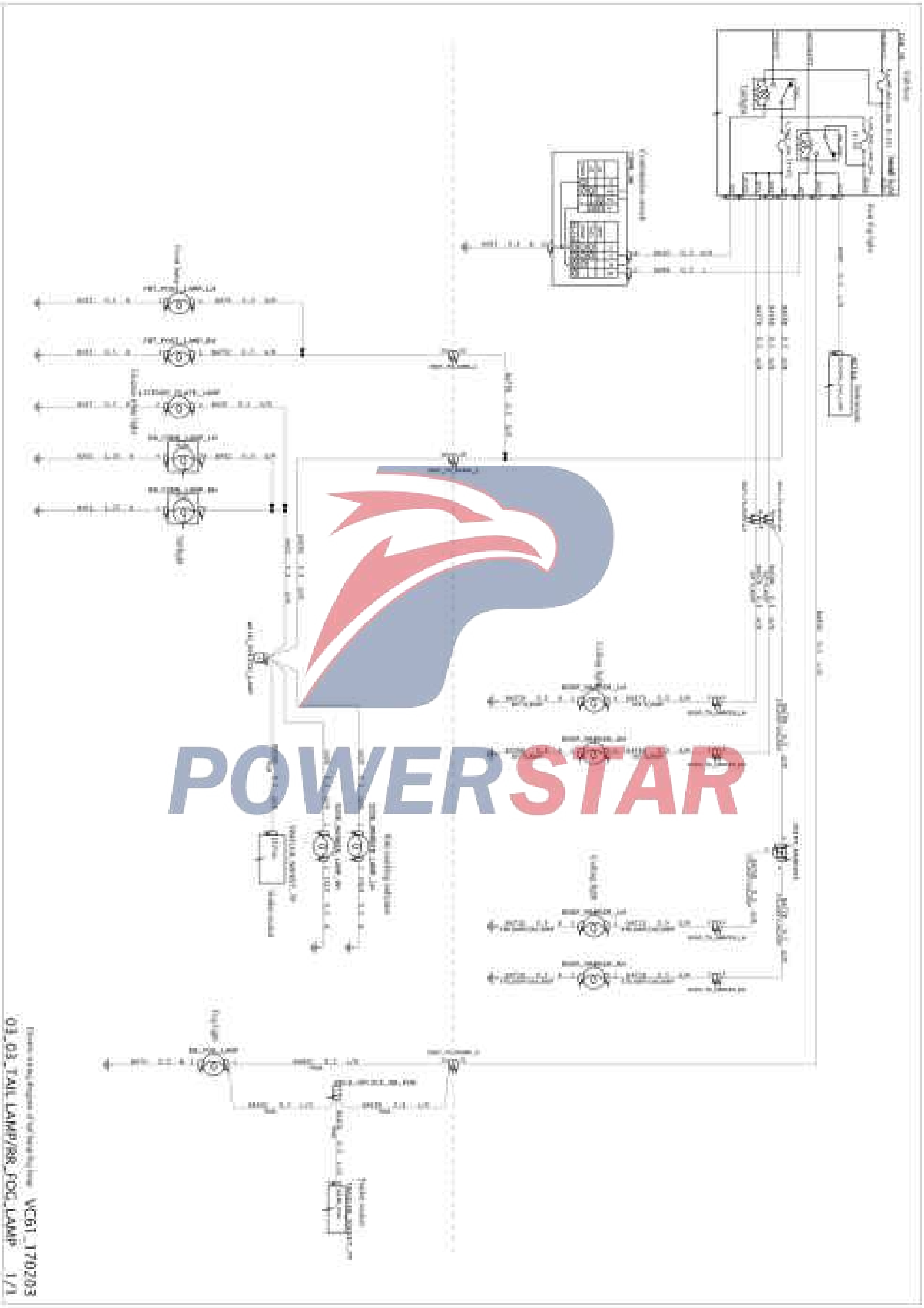
Control wiring diagram of head lamp



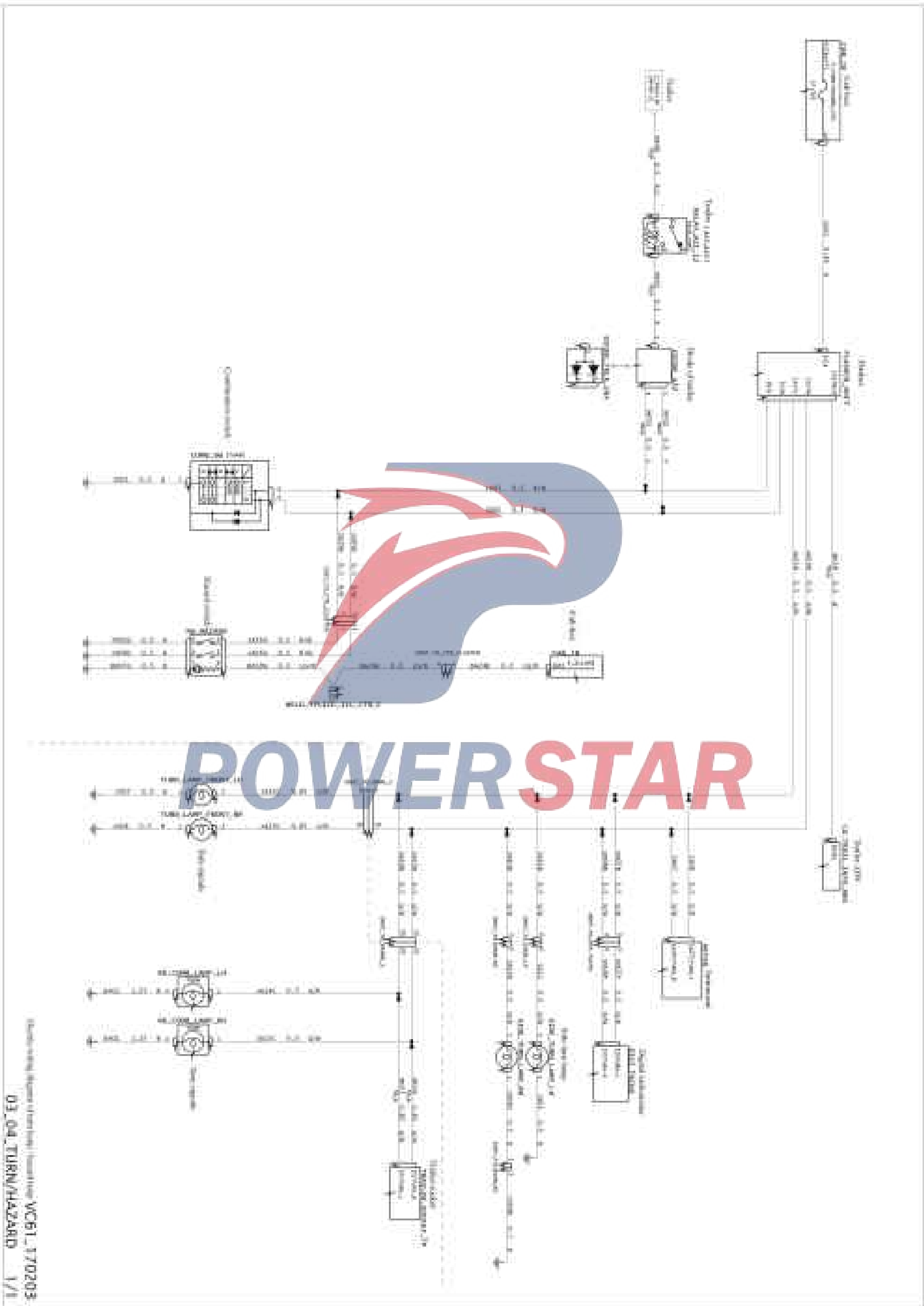
Control wiring diagram of fog lamp



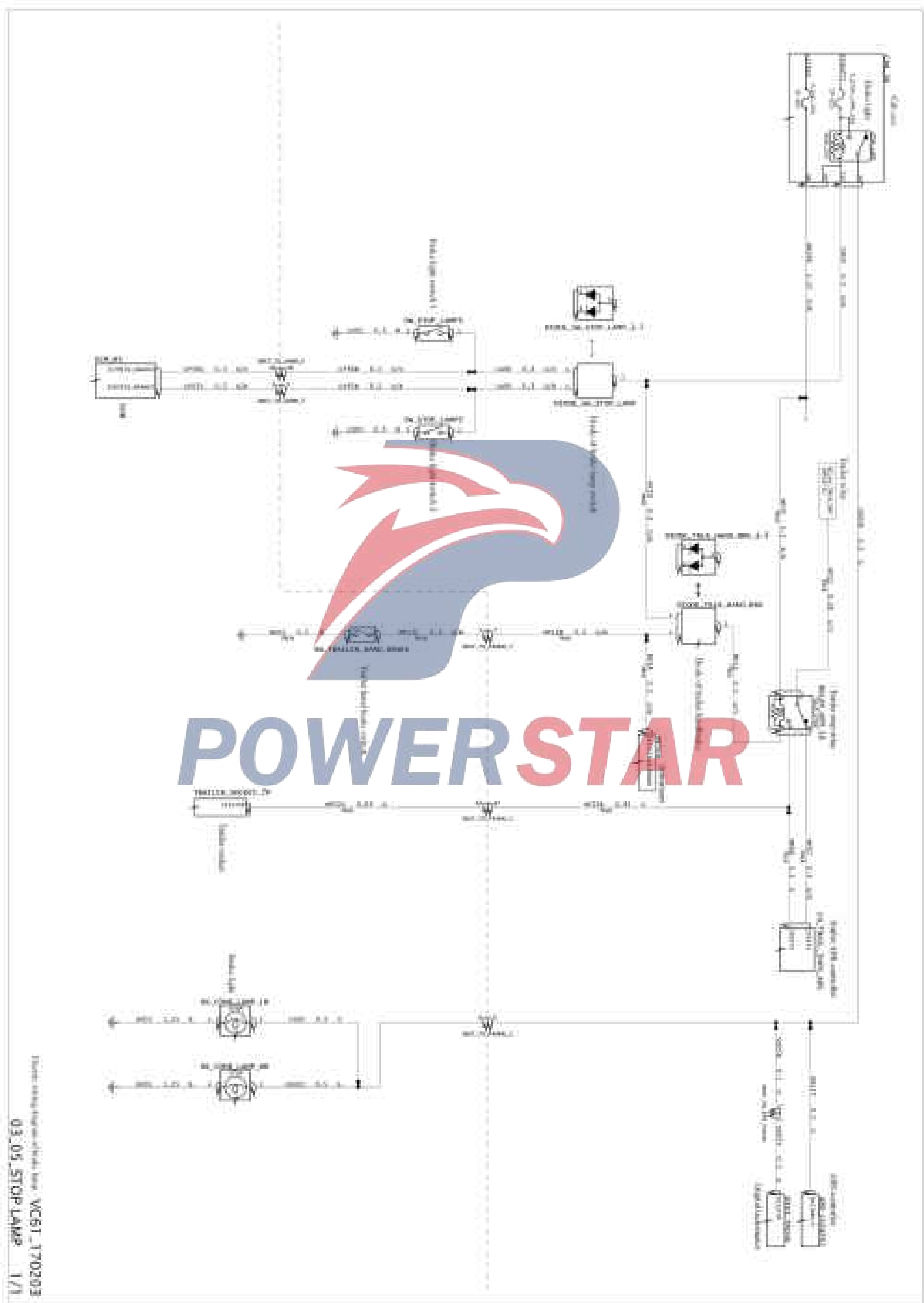
Control wiring diagram of tail lamp/fog lamp



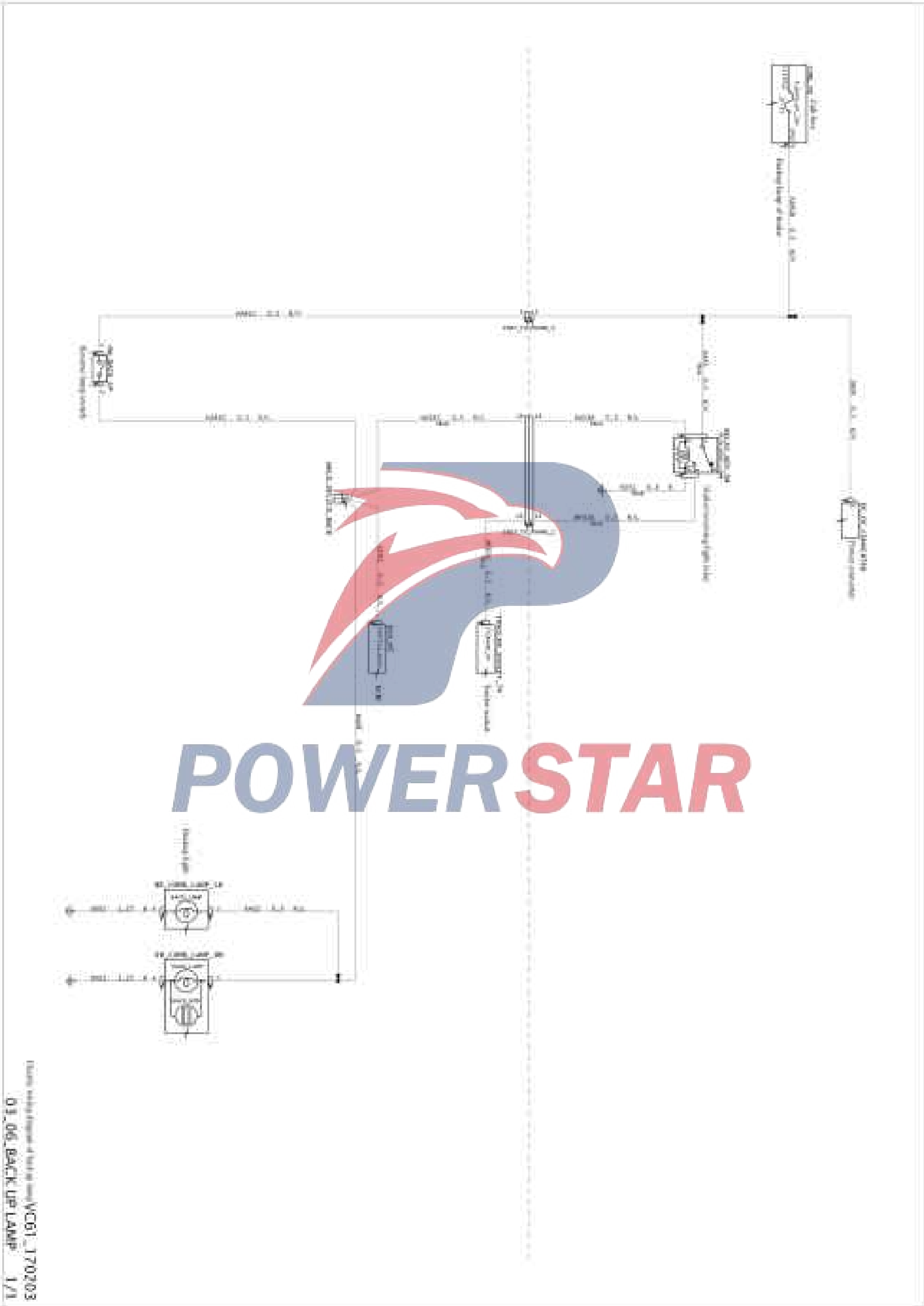
Control wiring diagram of turn lamp/hazard lamp



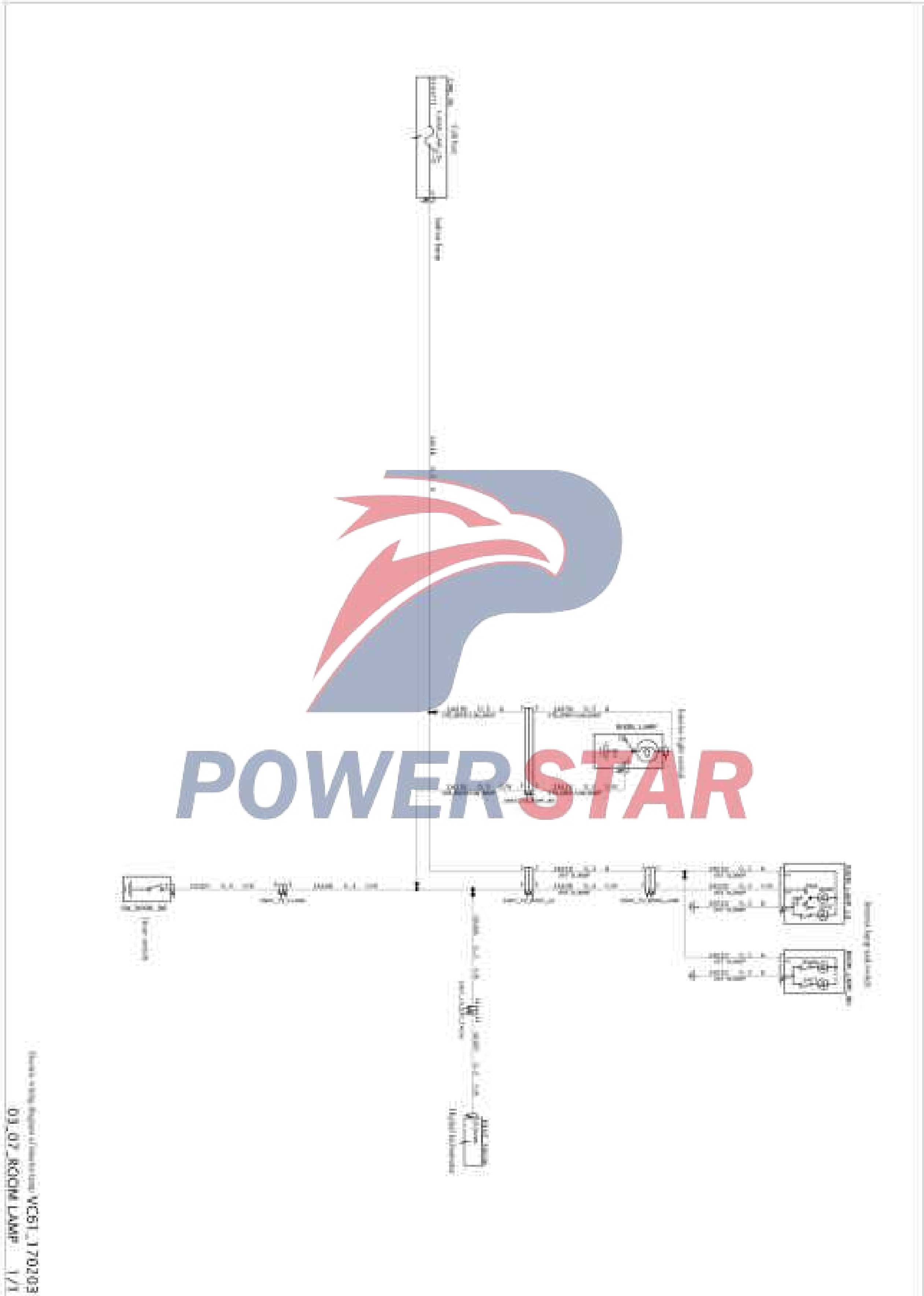
Control wiring diagram of brake lamp



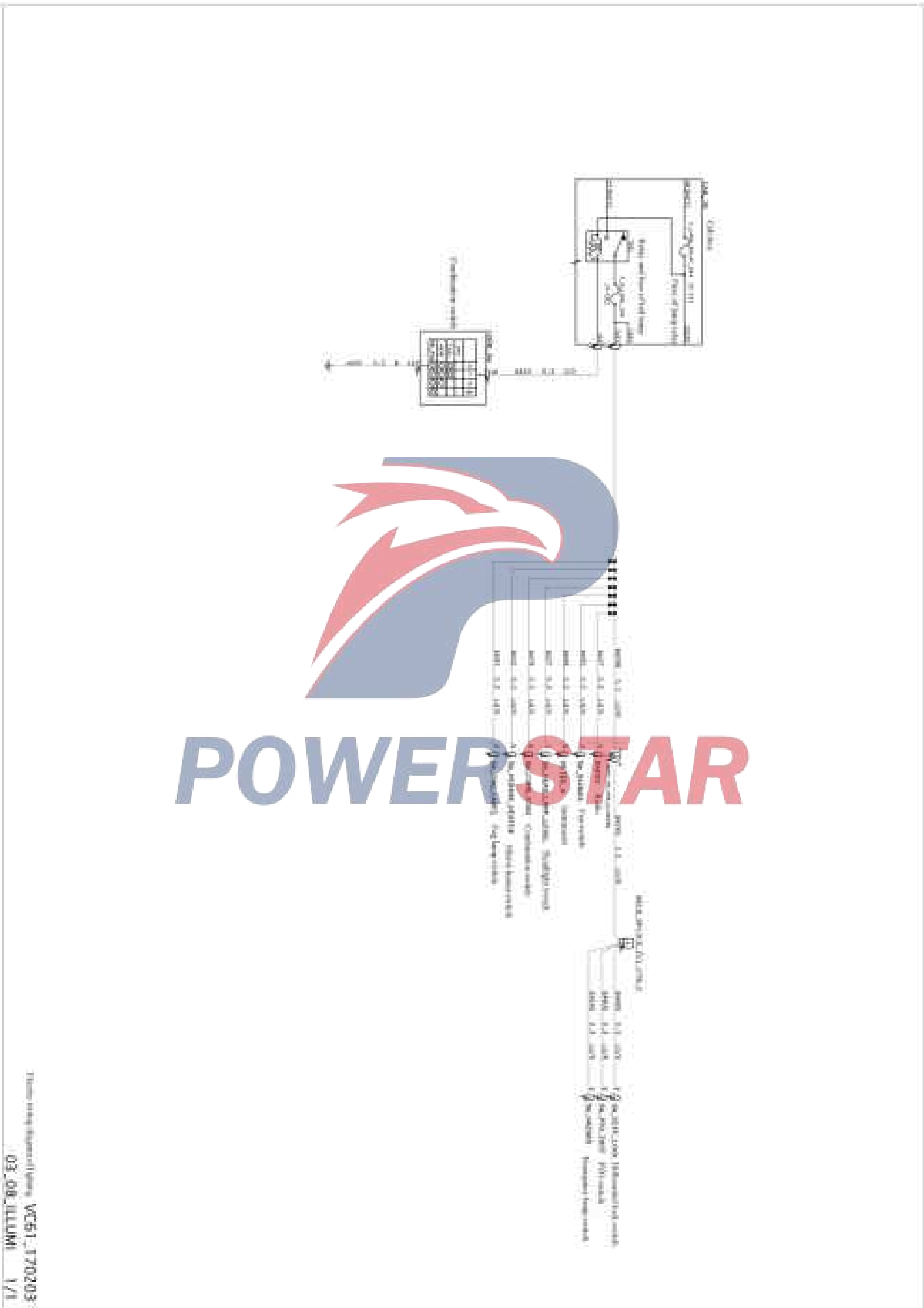
Control wiring diagram of backup lamp



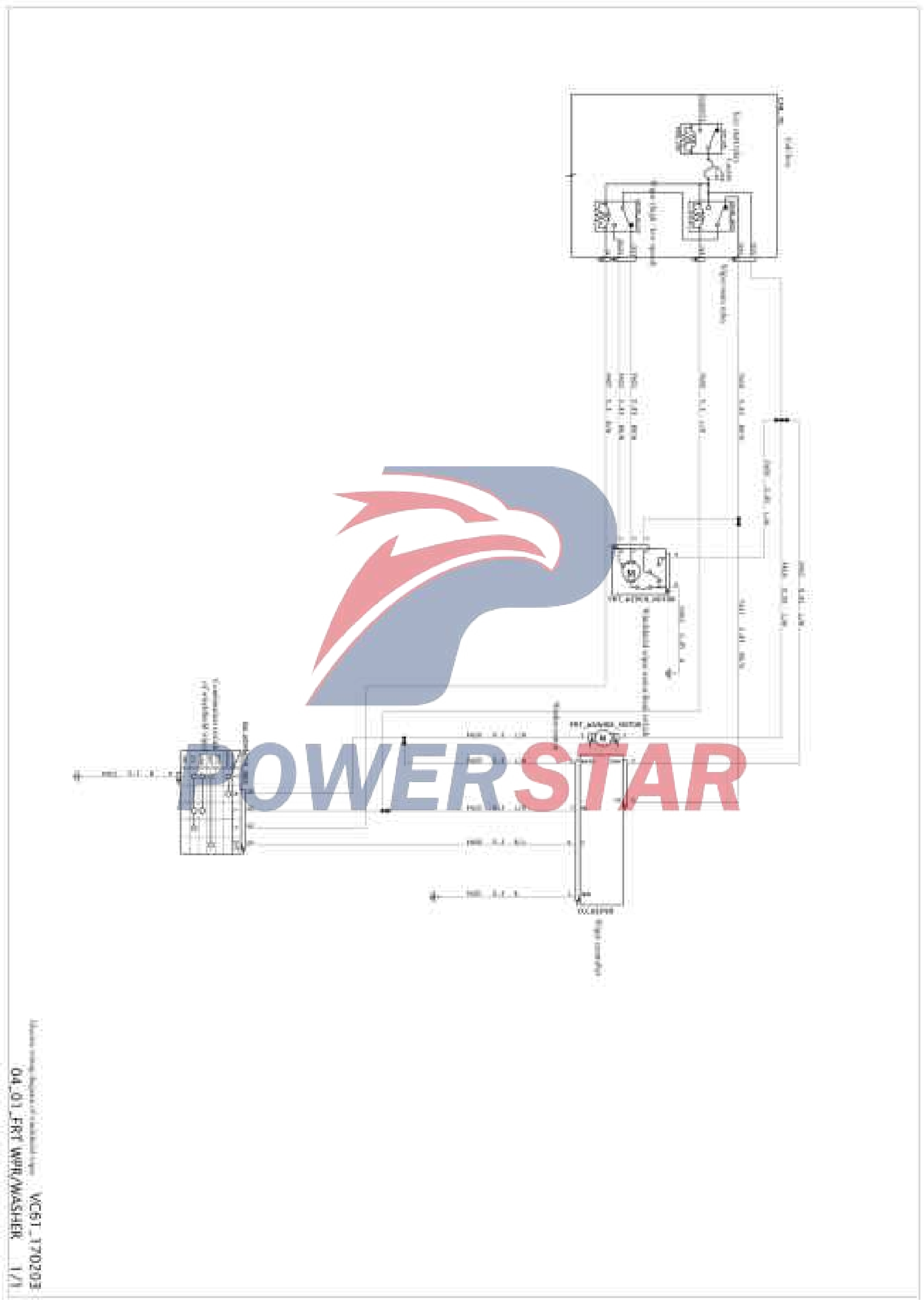
Control wiring diagram of interior lamp



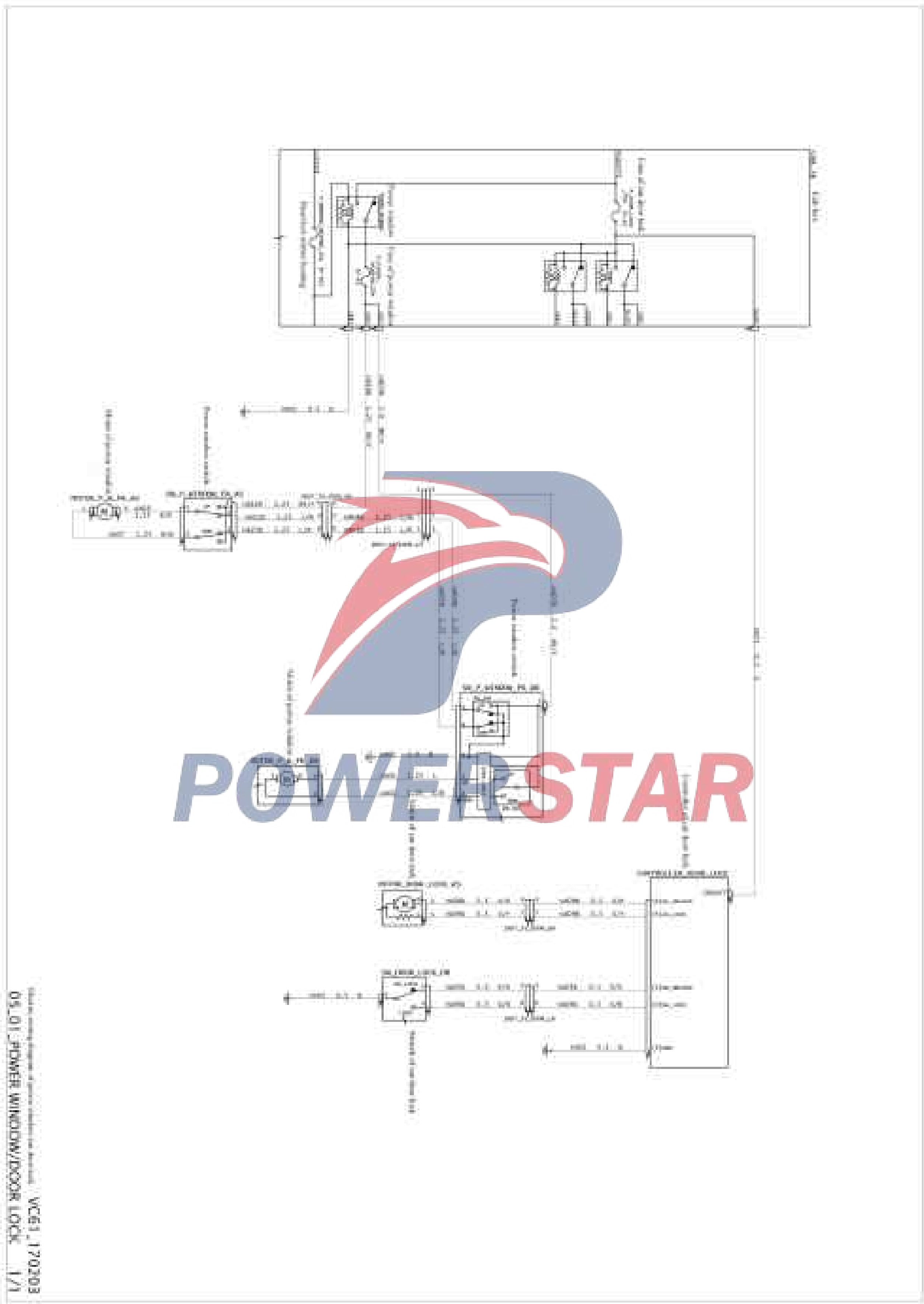
Control wiring diagram of lighting



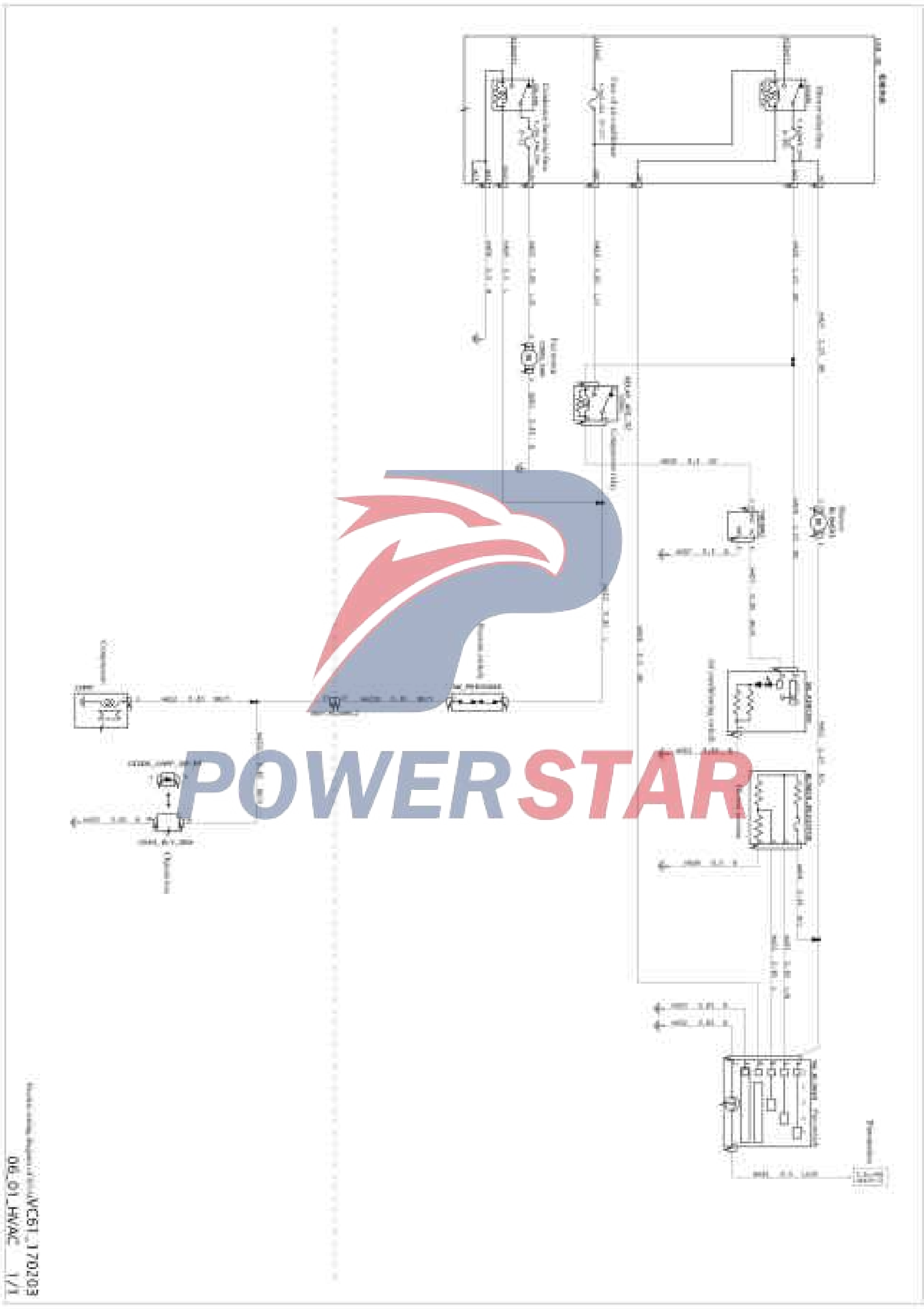
Control wiring diagram of windshield wiper



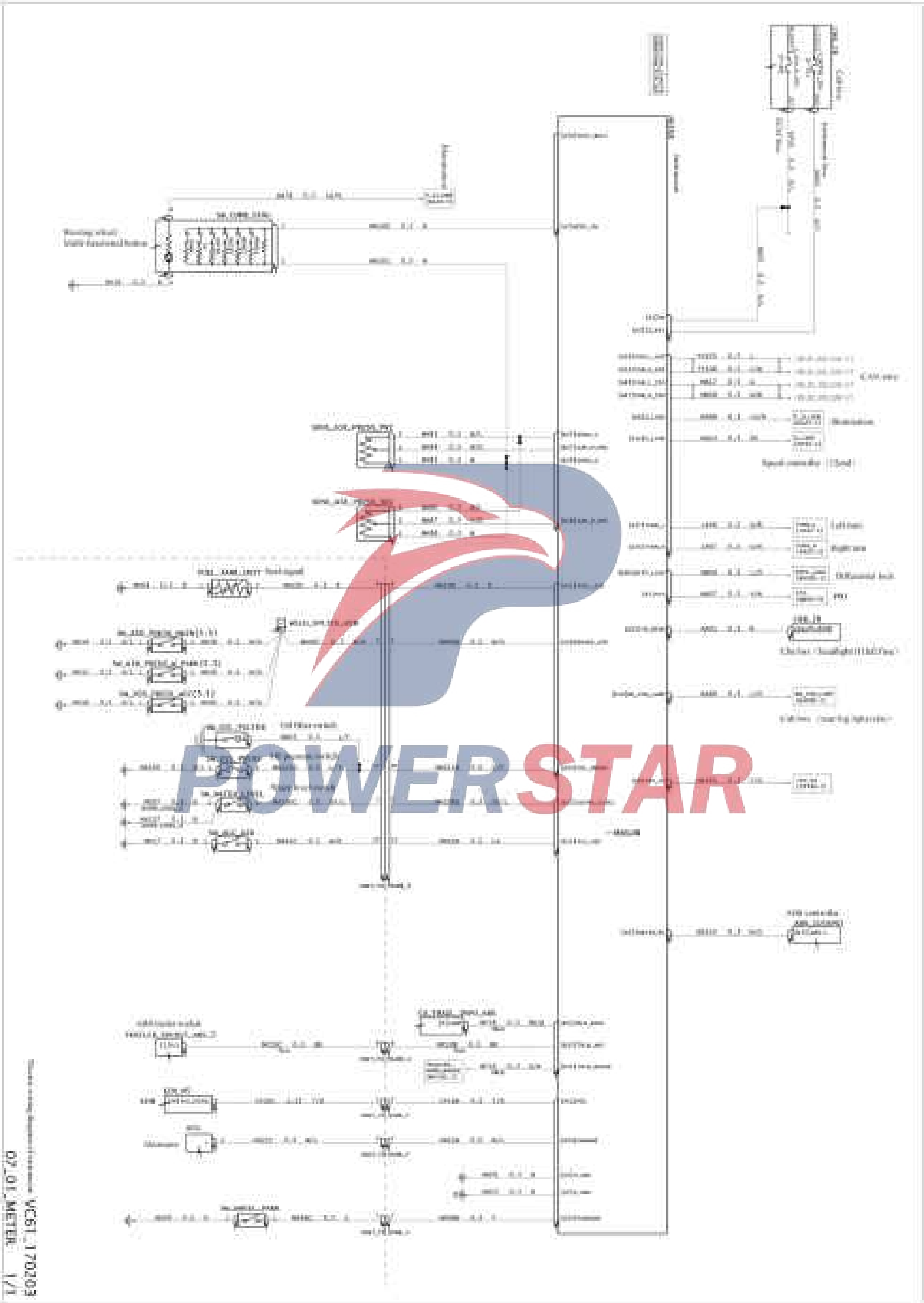
Control wiring diagram of power window/car door lock



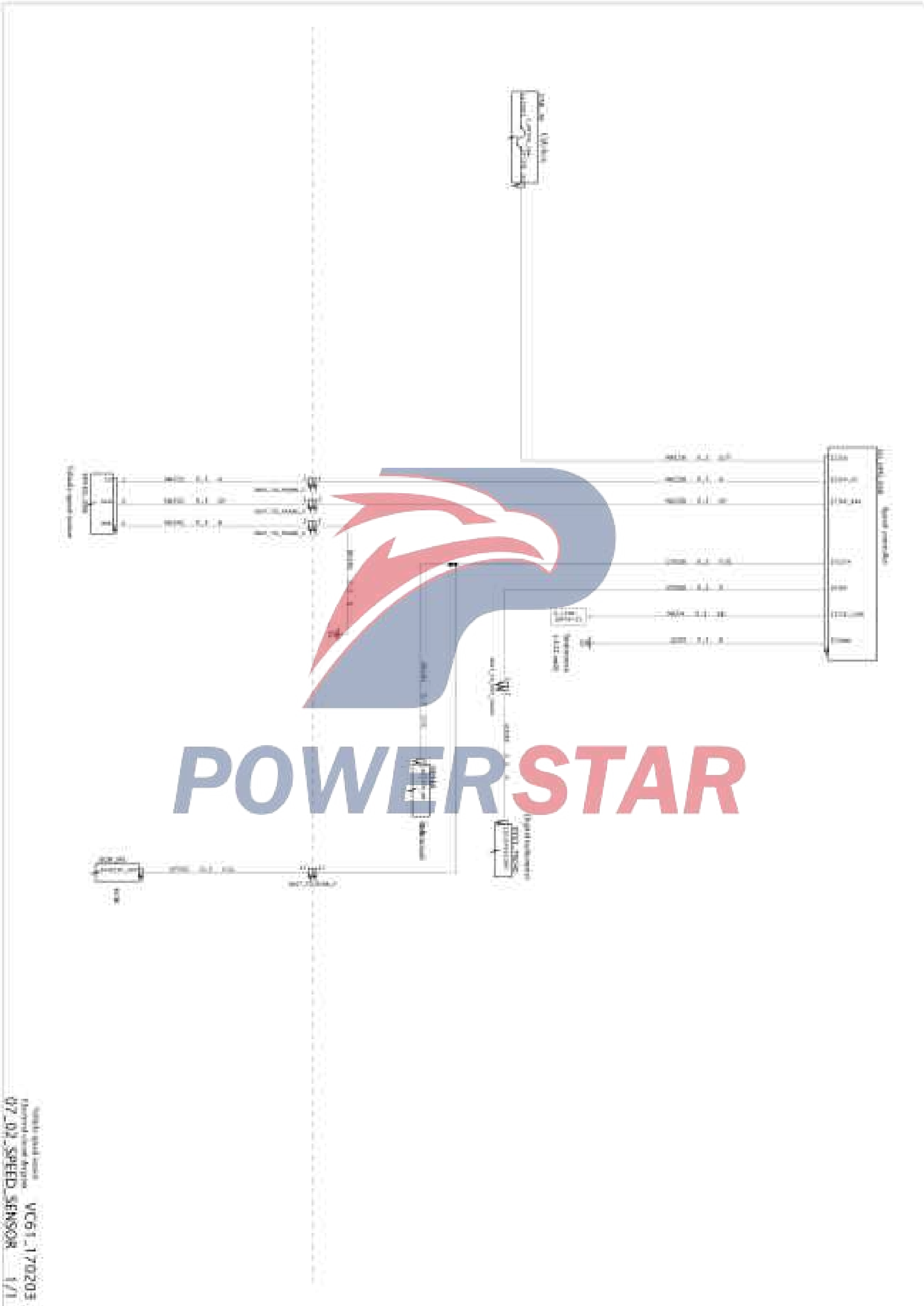
Control wiring diagram of HVAC



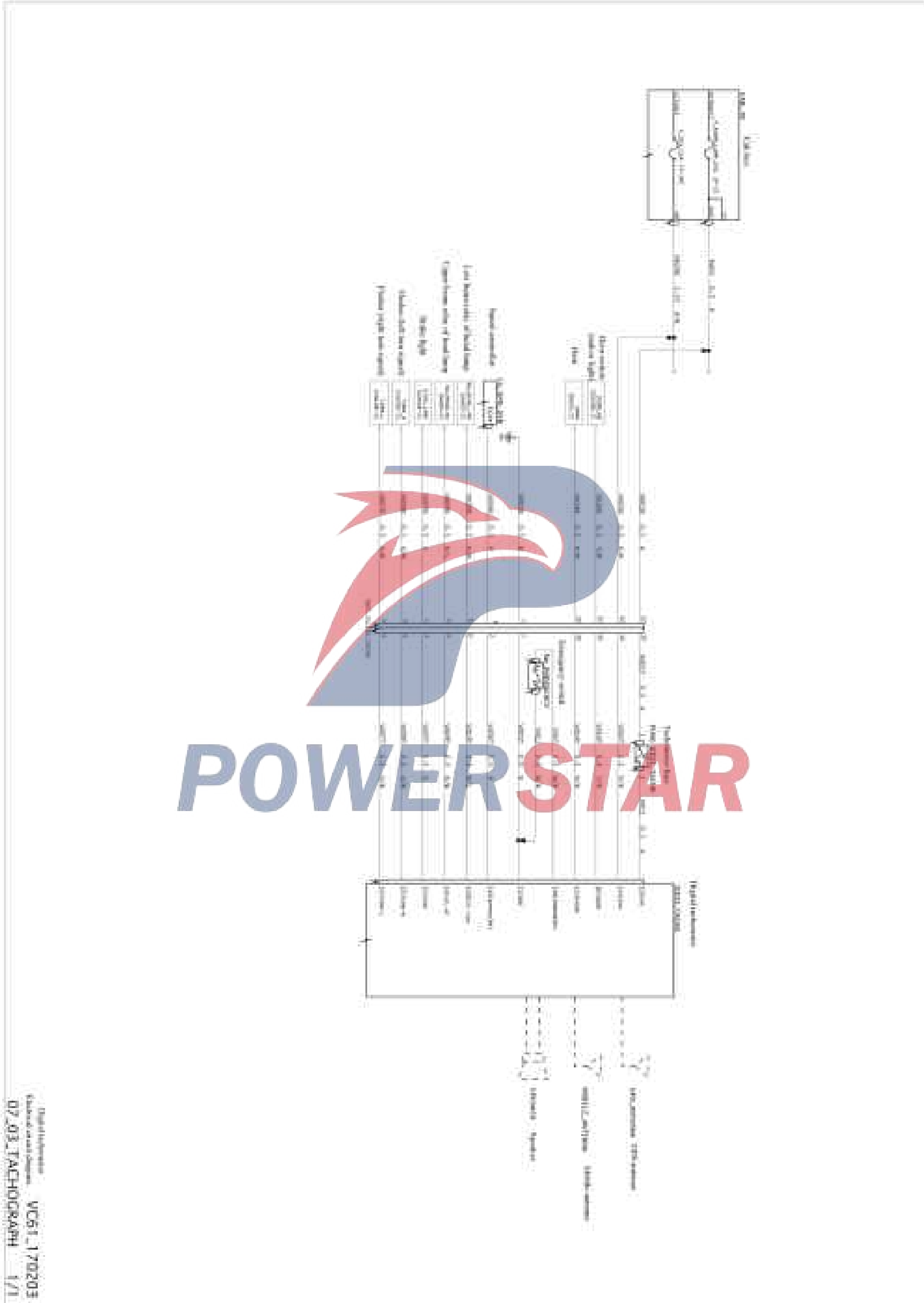
Control wiring diagram of instrument



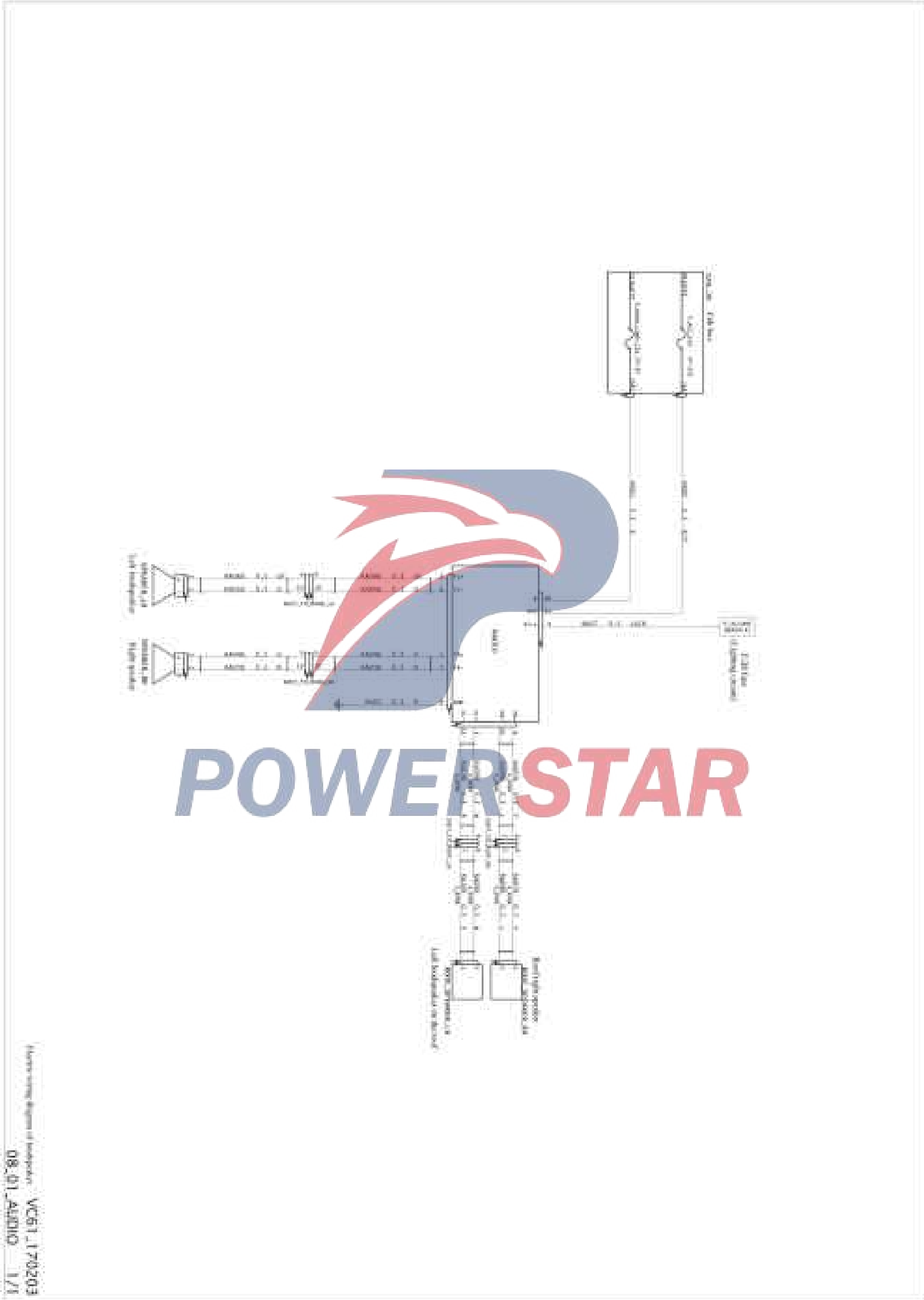
Control wiring diagram of car speed sensor



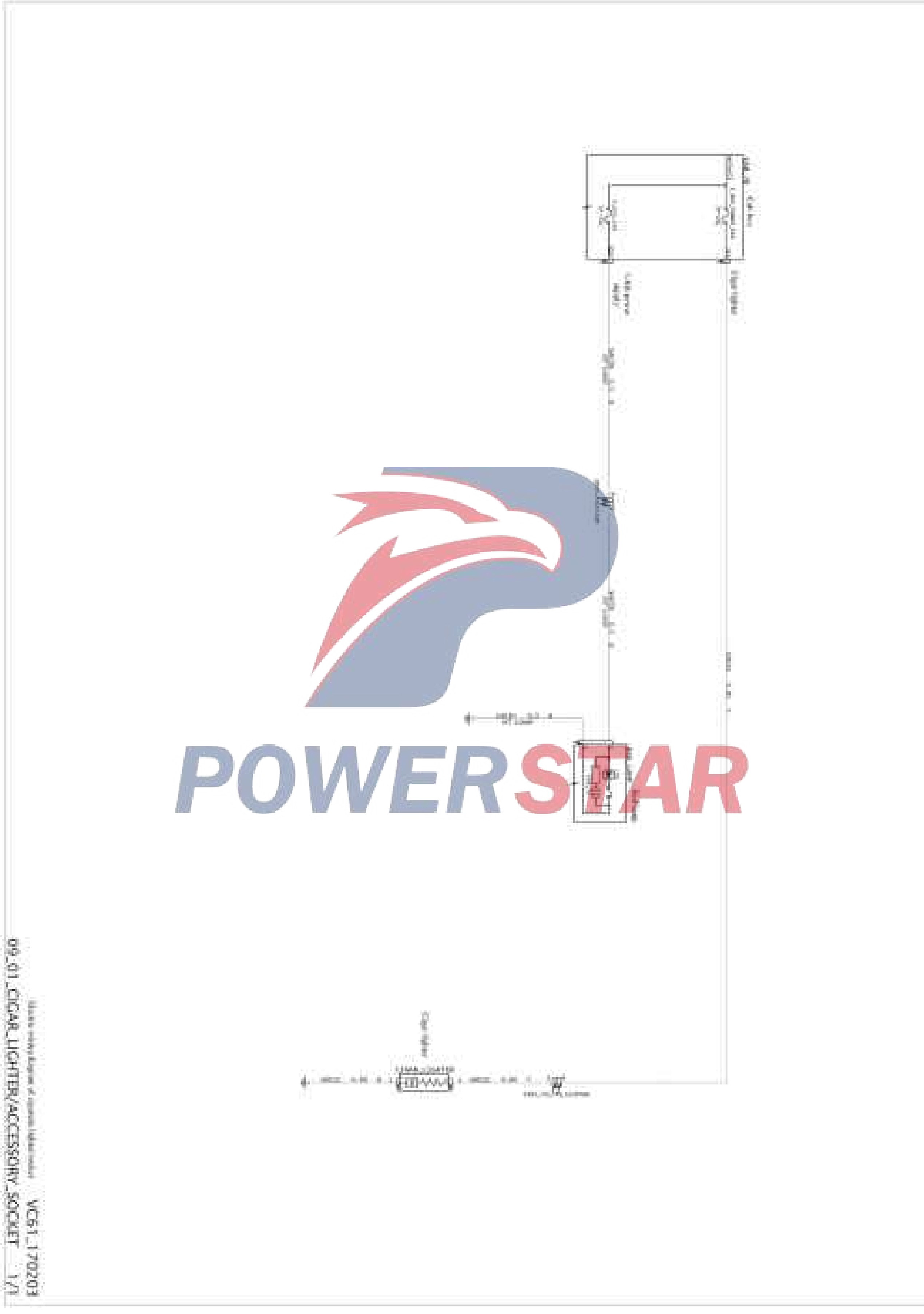
Control wiring diagram of digital tachometer



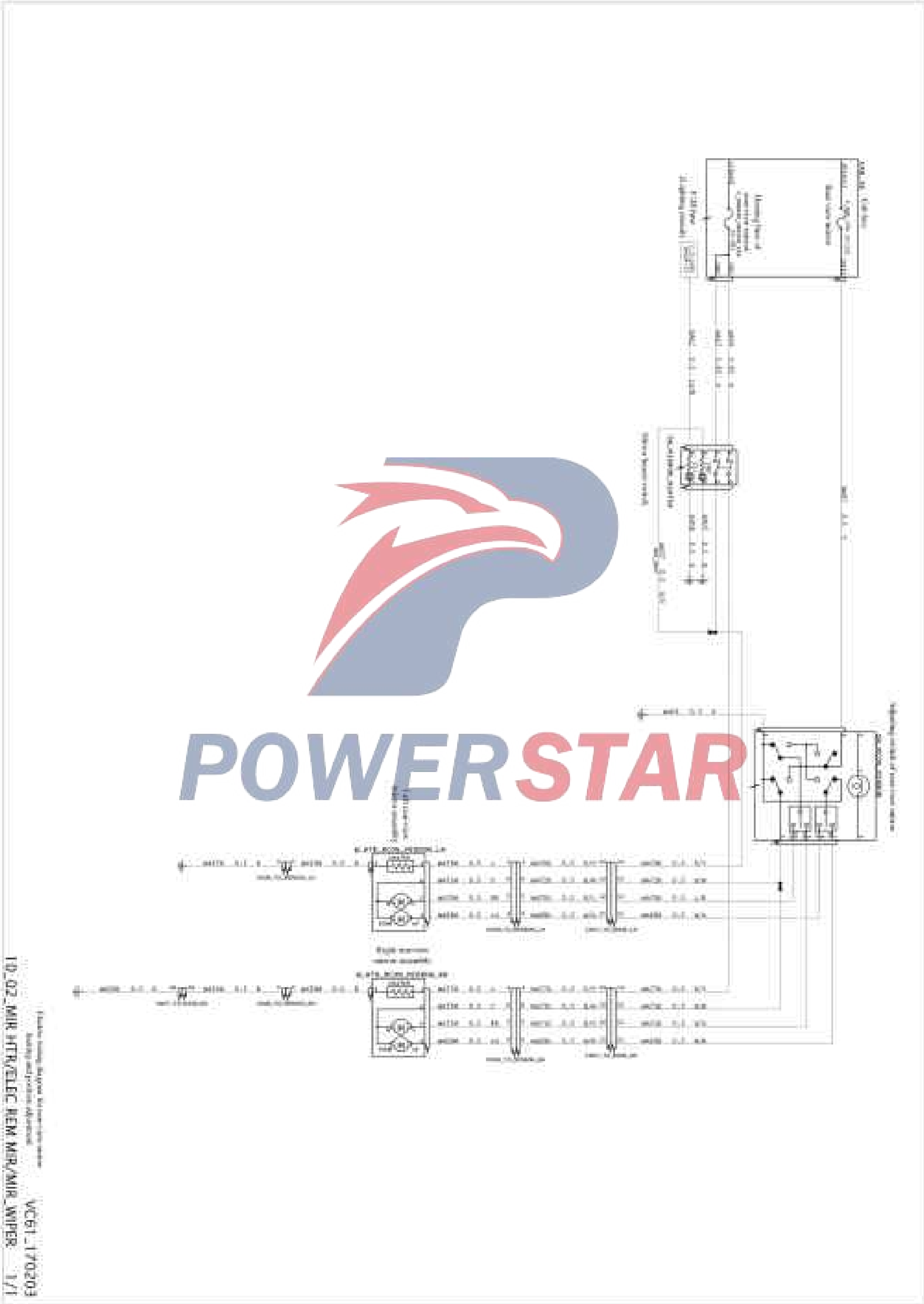
Control wiring diagram of loudspeaker



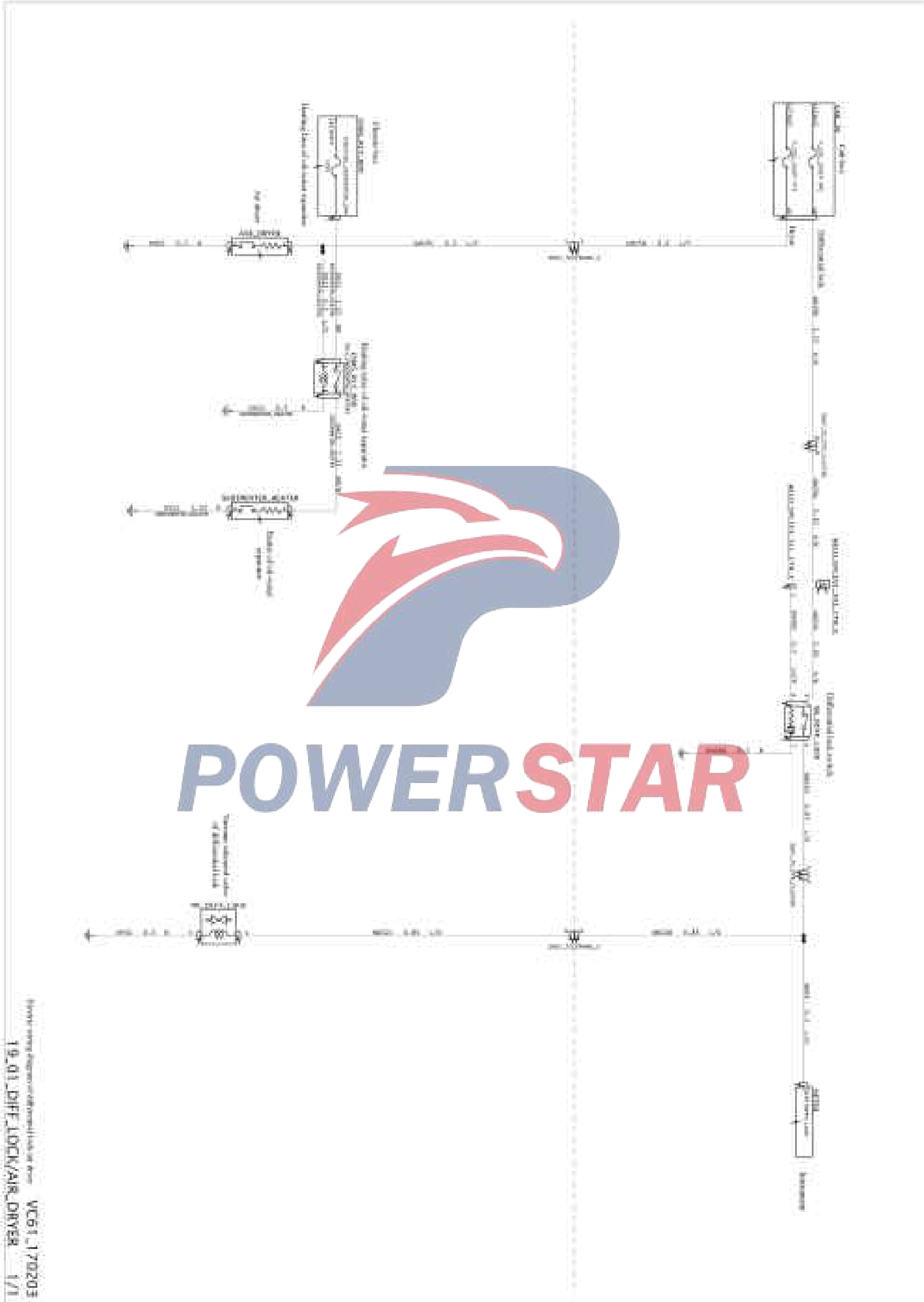
Control wiring diagram of cigarette lighter/socket



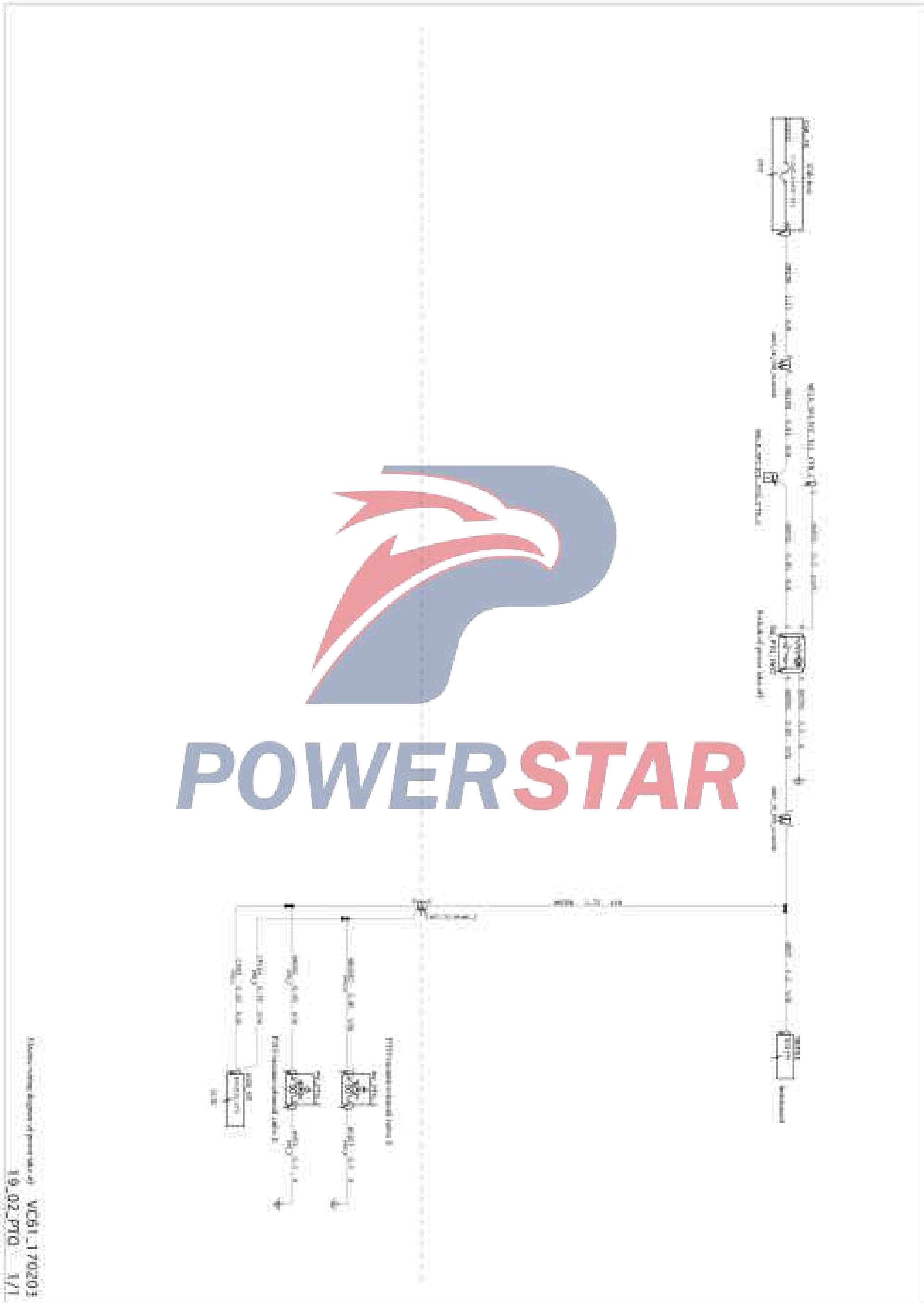
Control wiring diagram for rear-view mirror heating and position adjustment



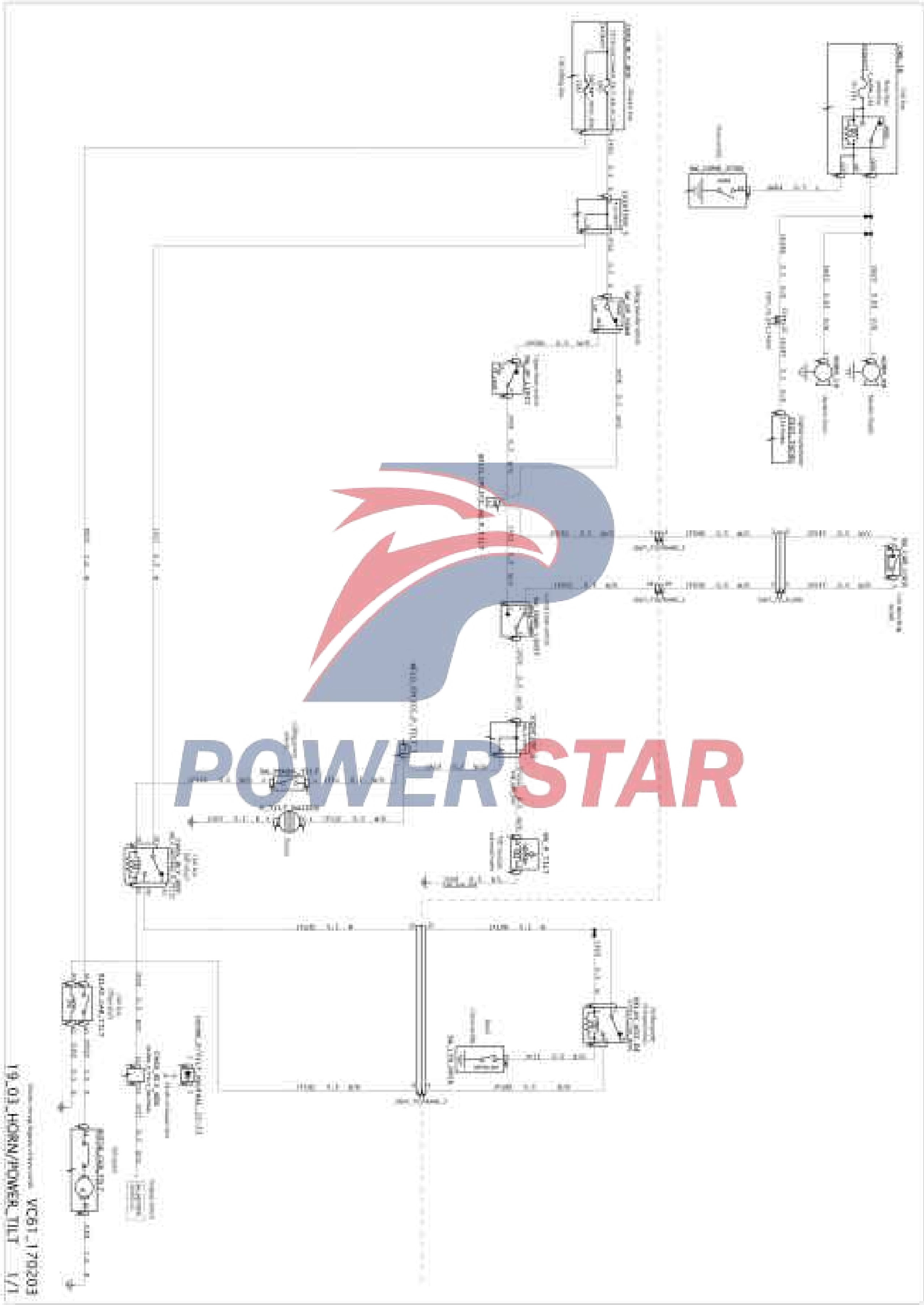
Control wiring diagram of differential lock/dryer



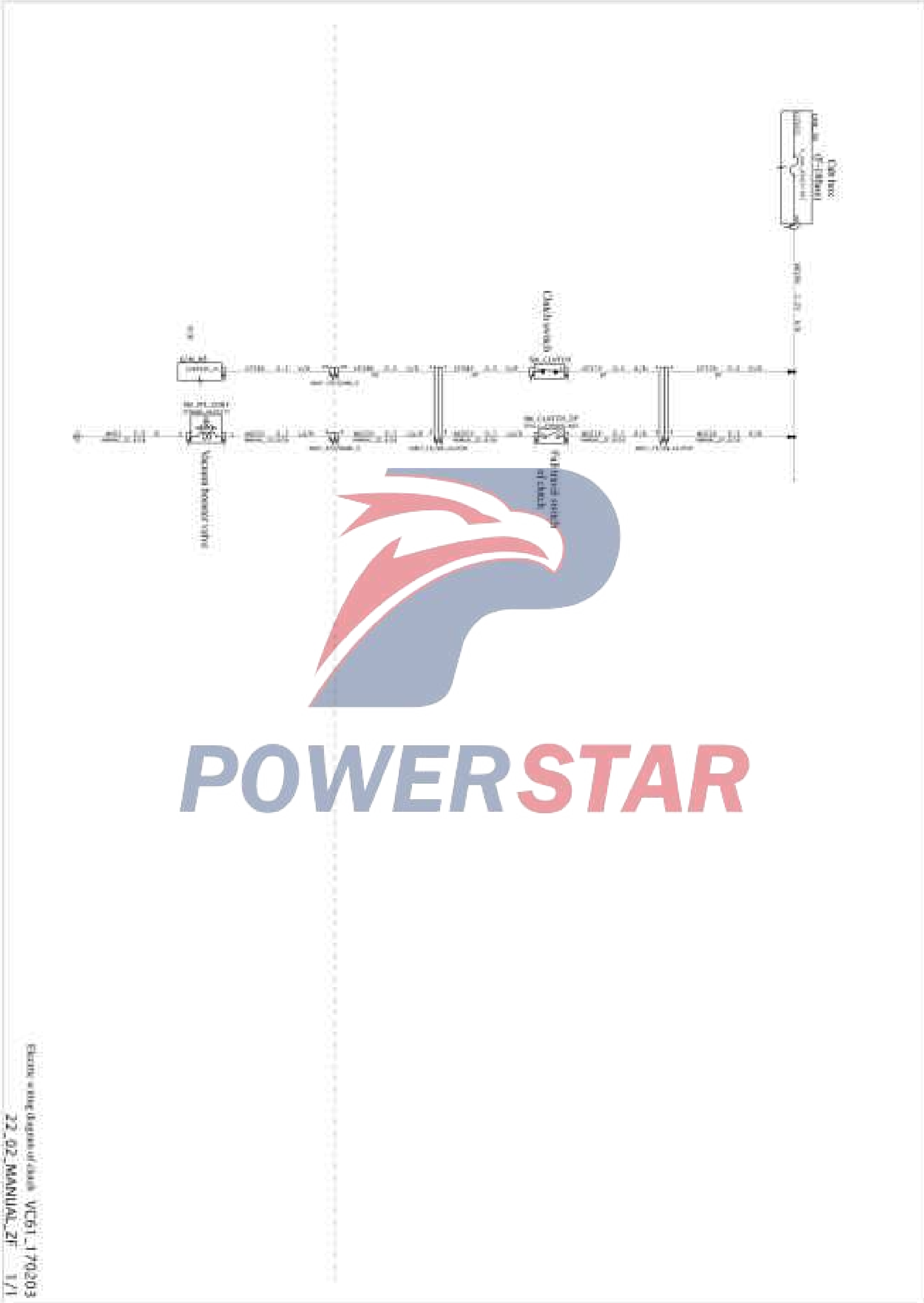
Control wiring diagram of power take off



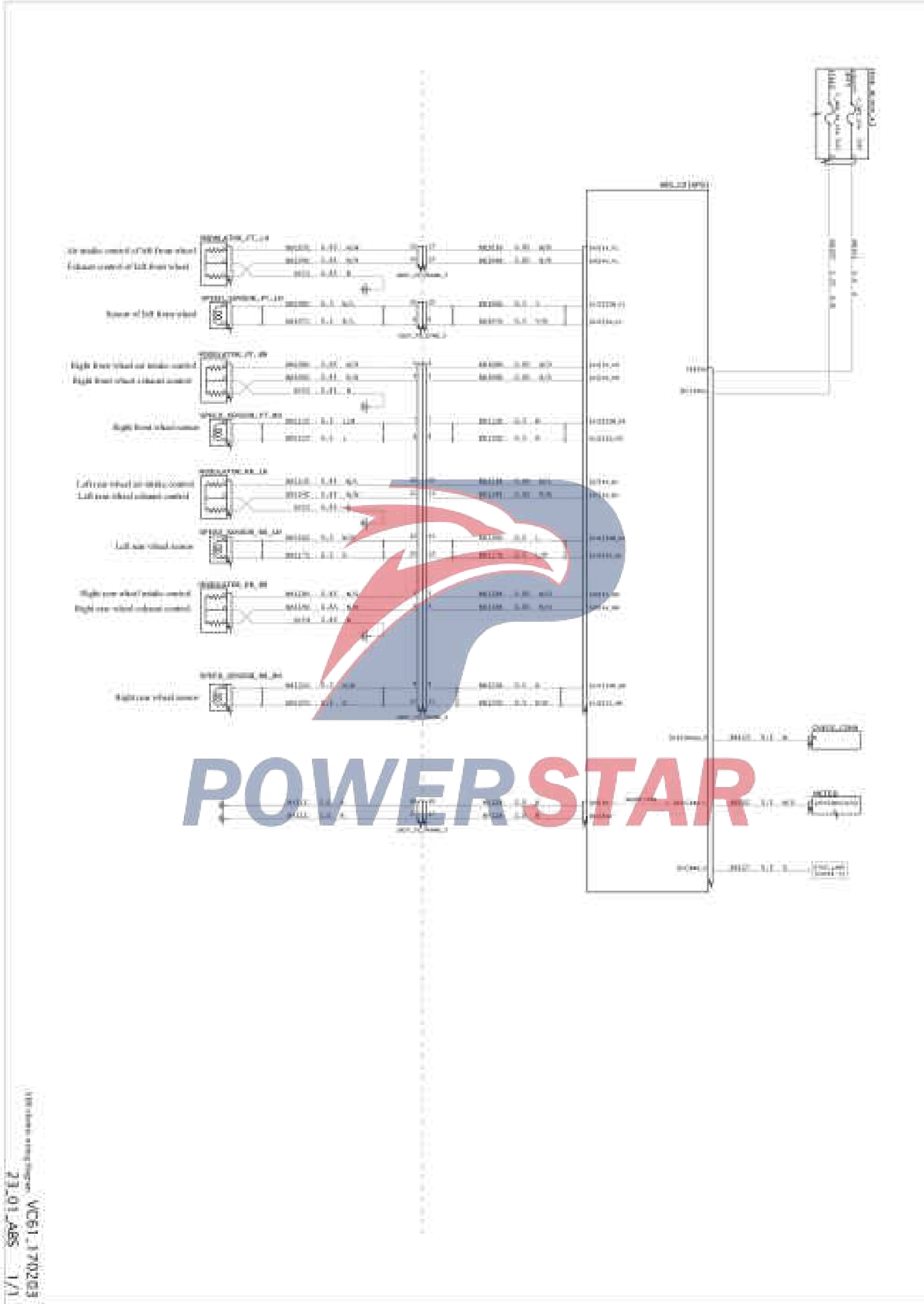
Control wiring diagram of horn/cab tilt



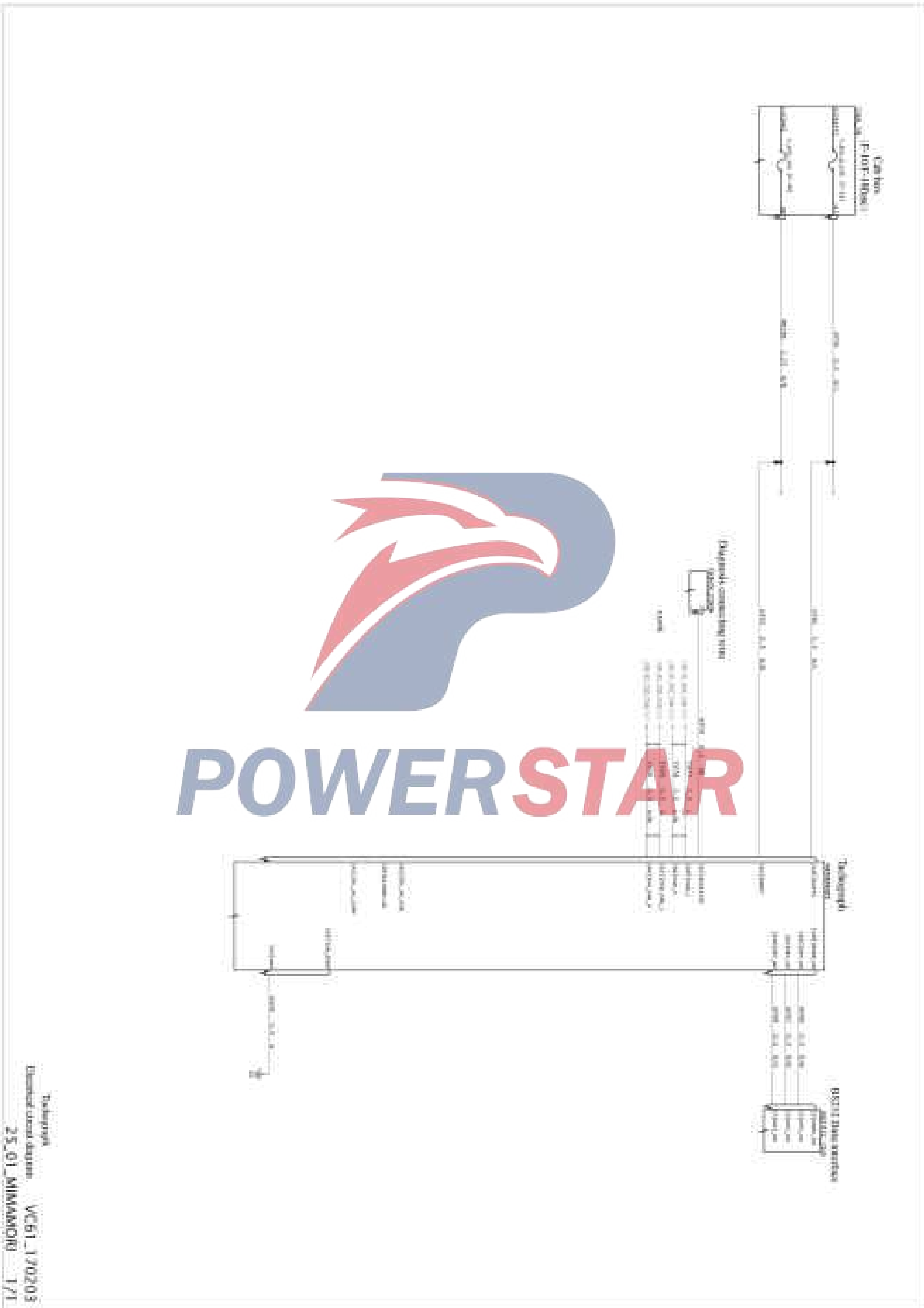
Control wiring diagram of clutch



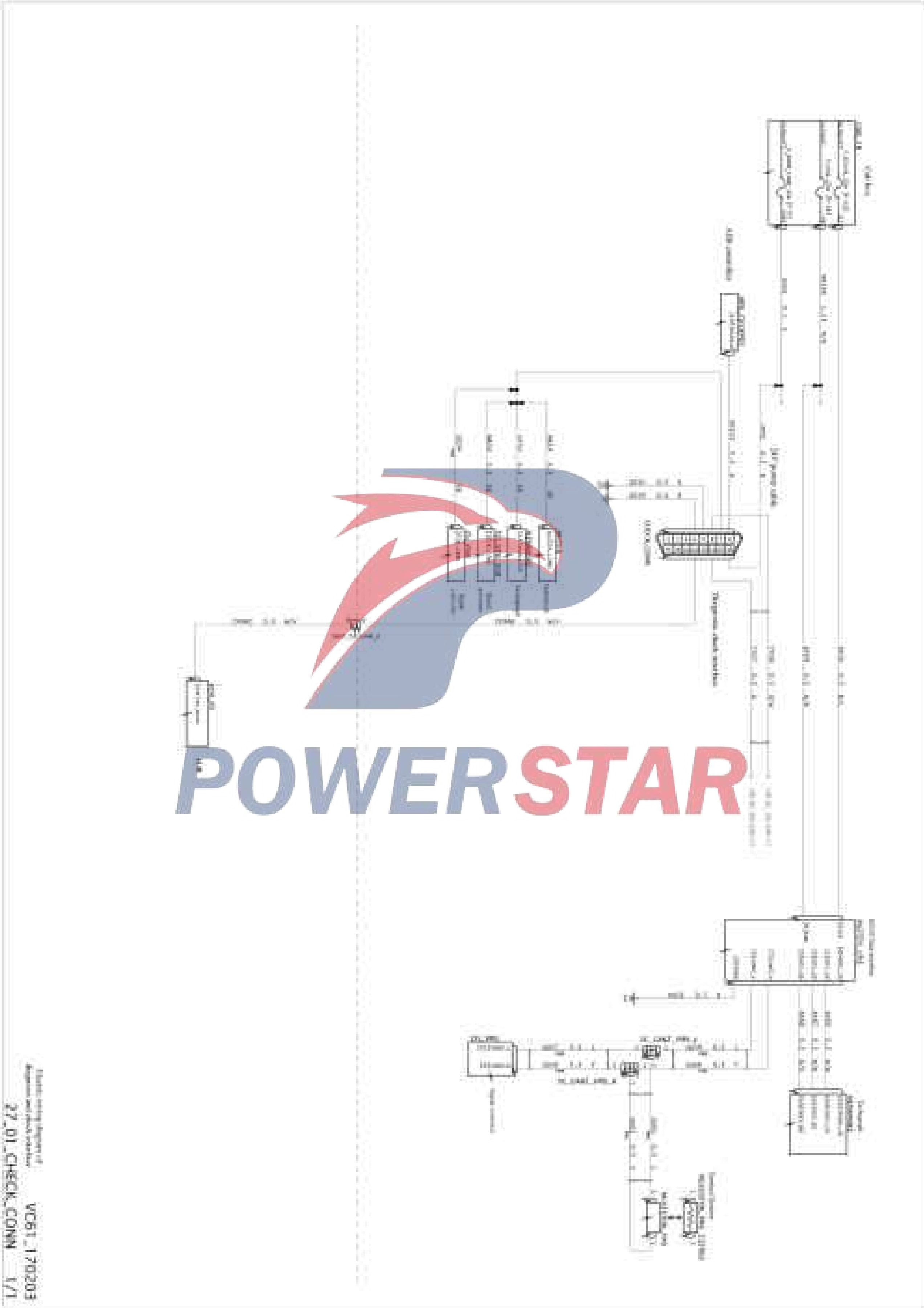
ABS control wiring diagram



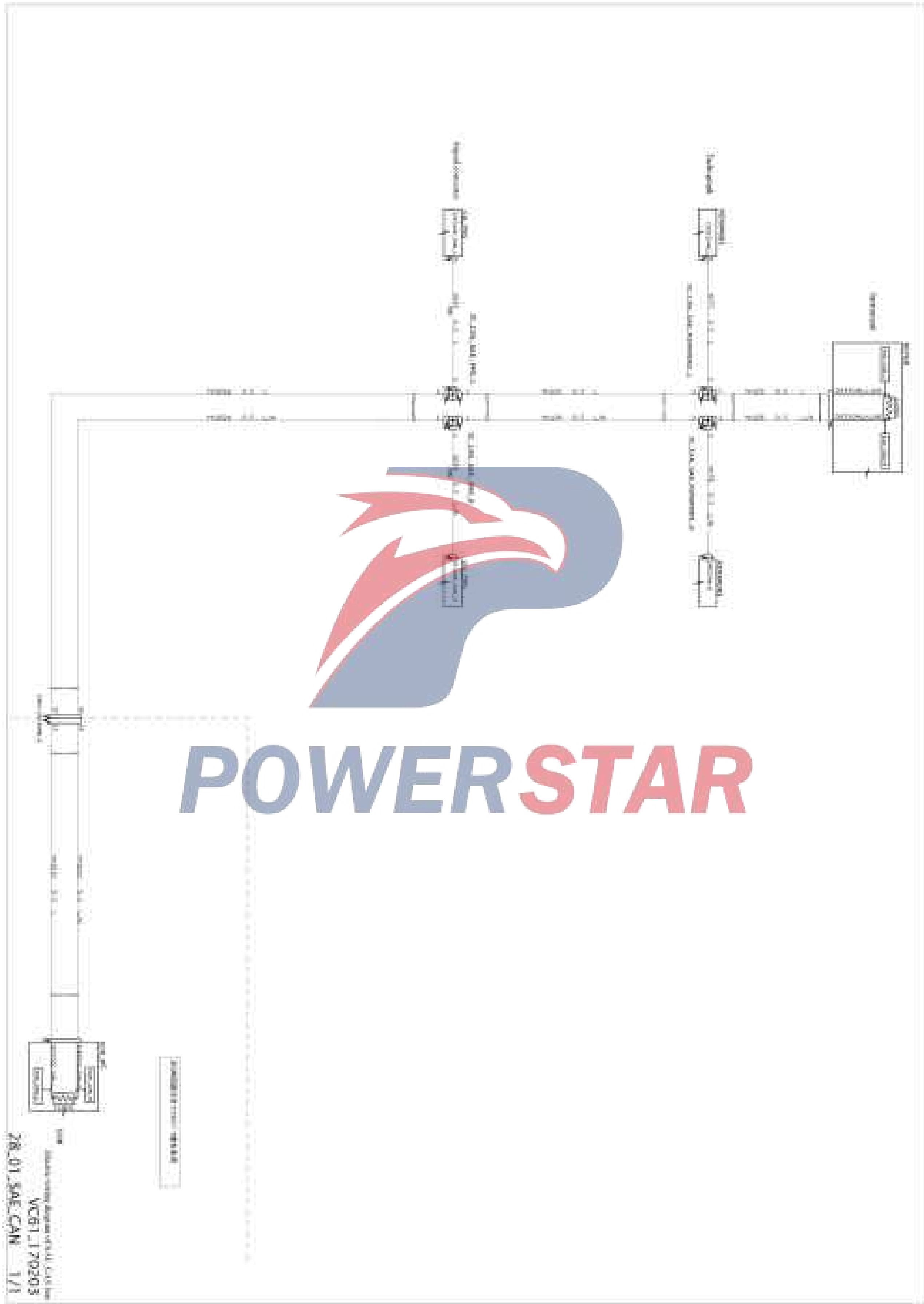
Control wiring diagram of recorder



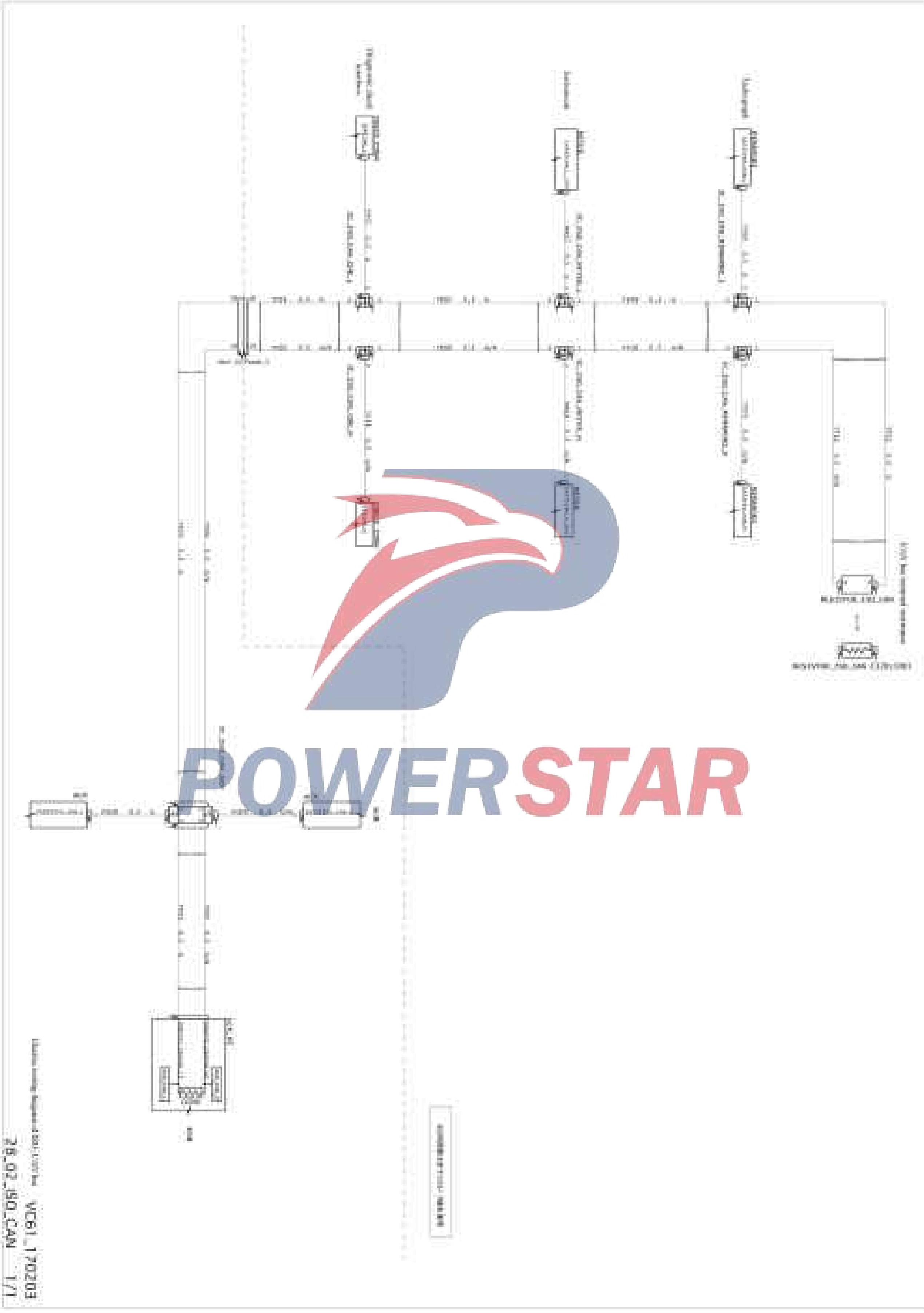
Control wiring diagram of diagnosis and check interface



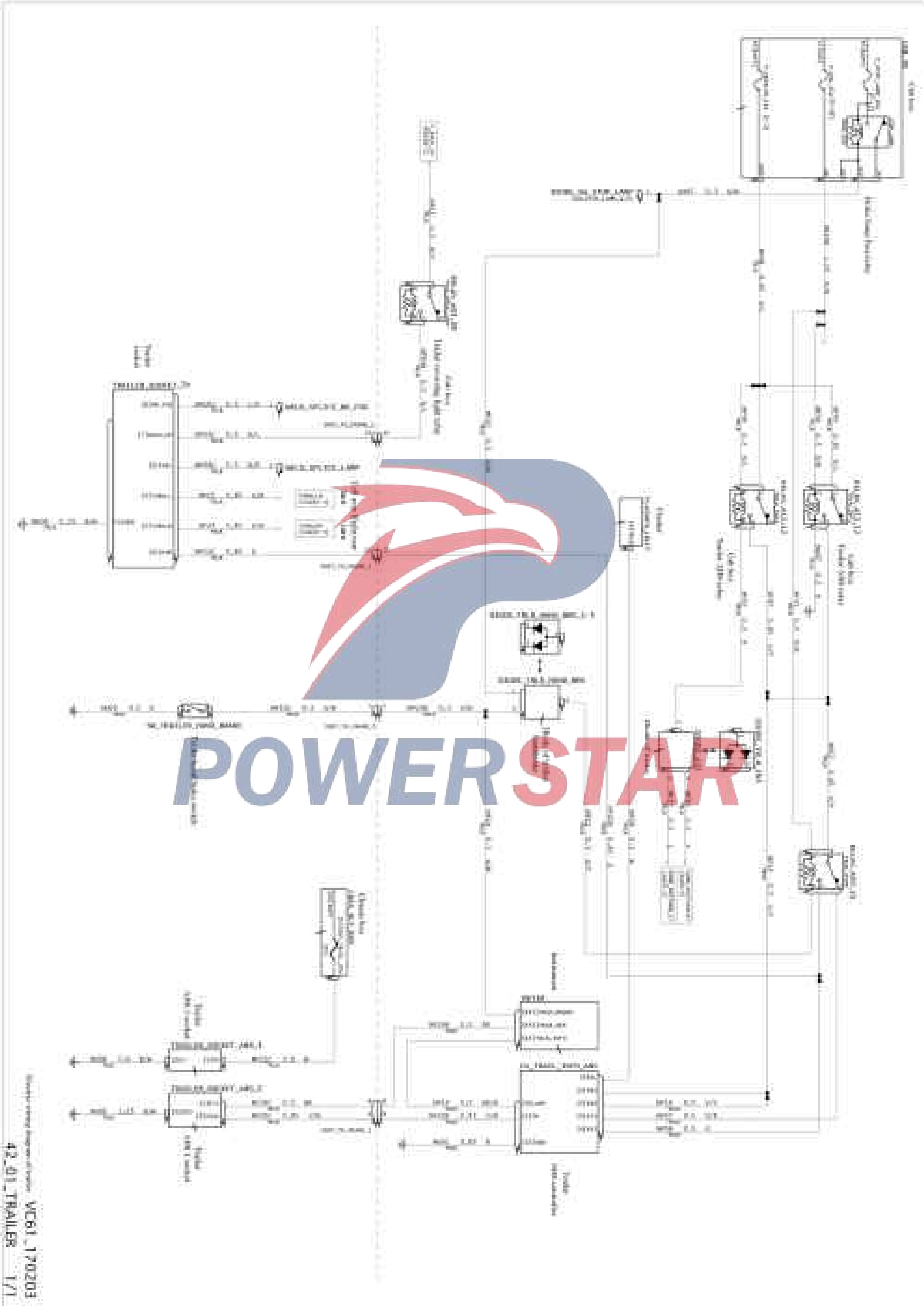
Control wiring diagram of SAE_CAN bus



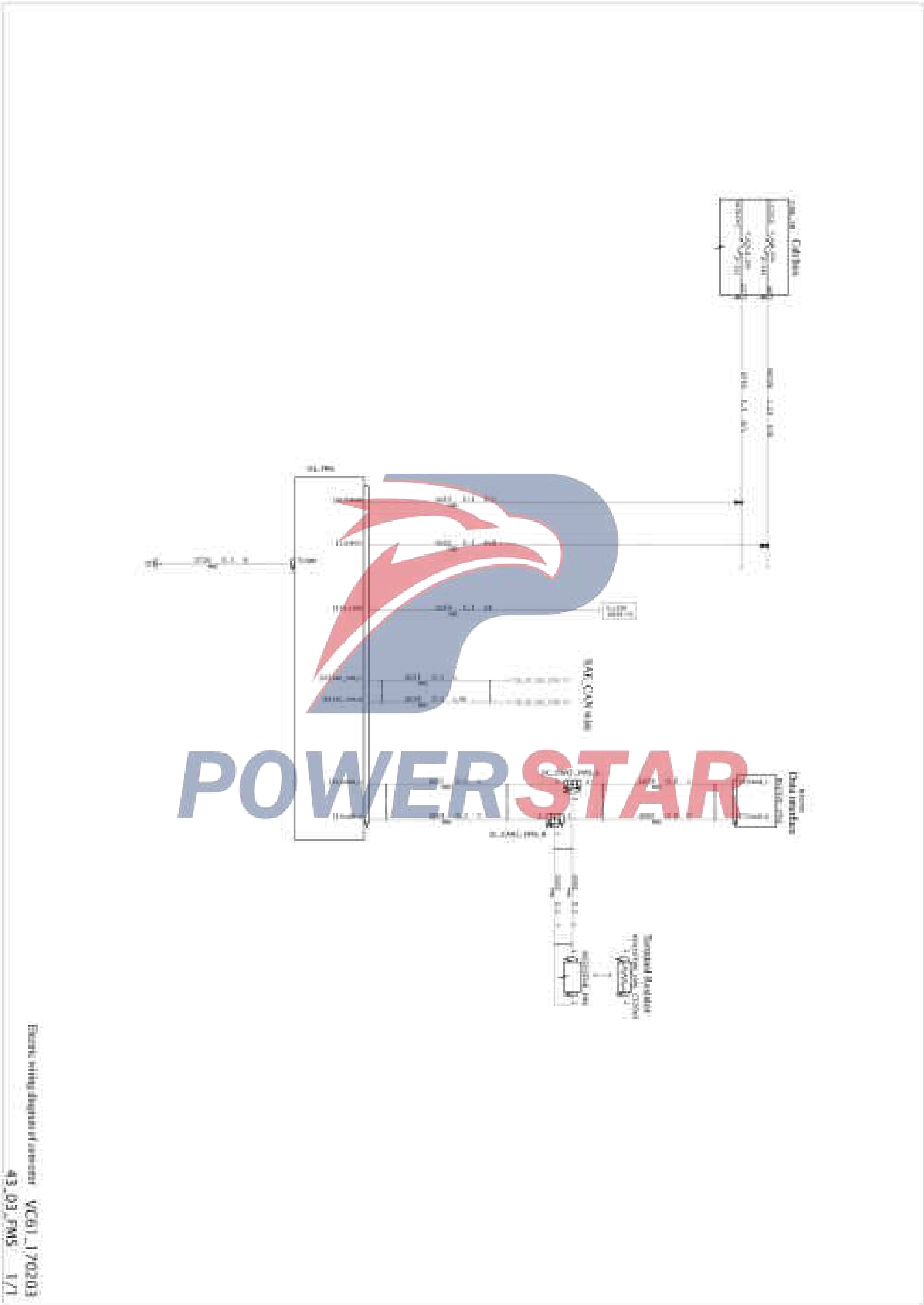
Control wiring diagram of ISO-CAN bus



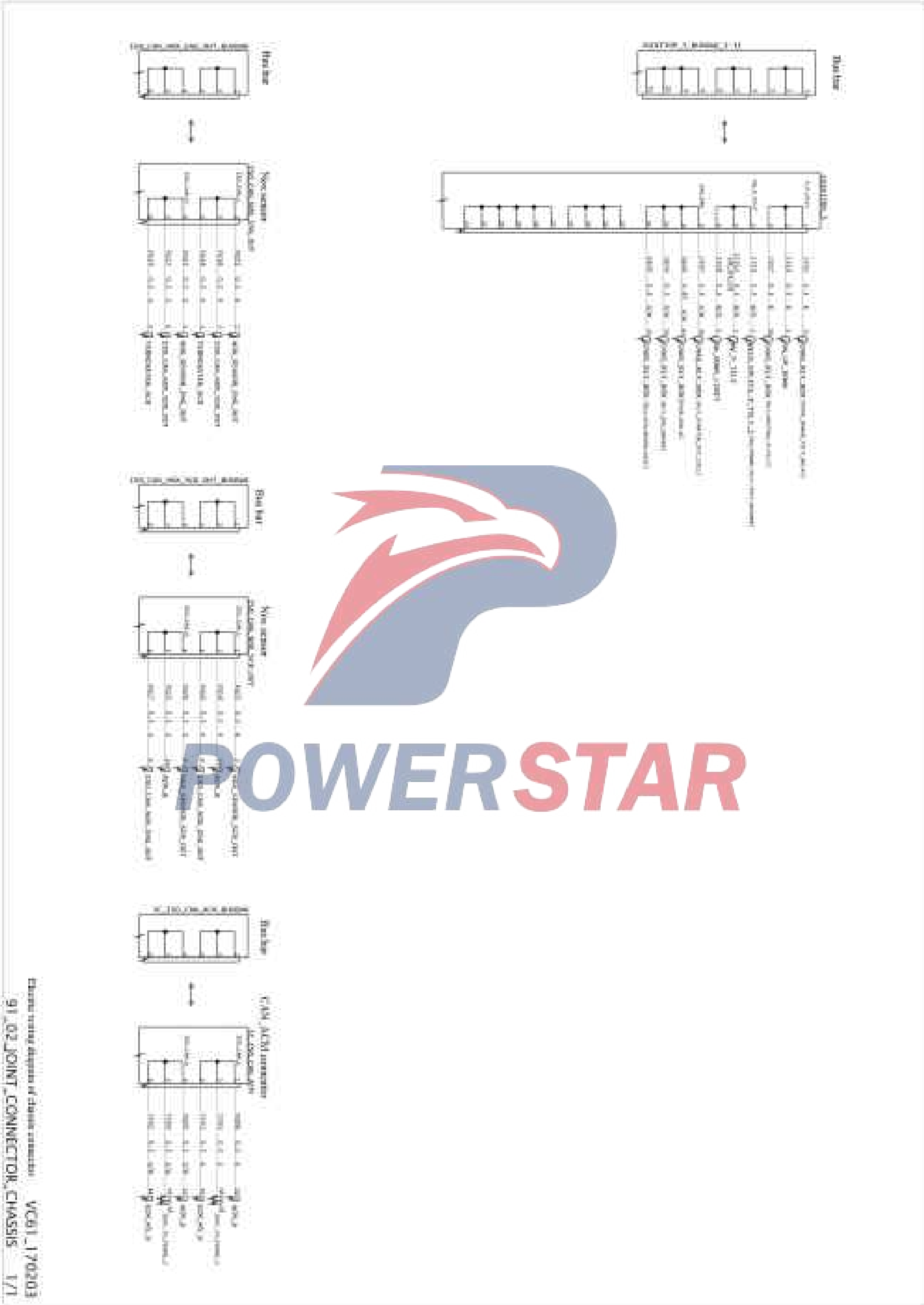
Control wiring diagram of trailer



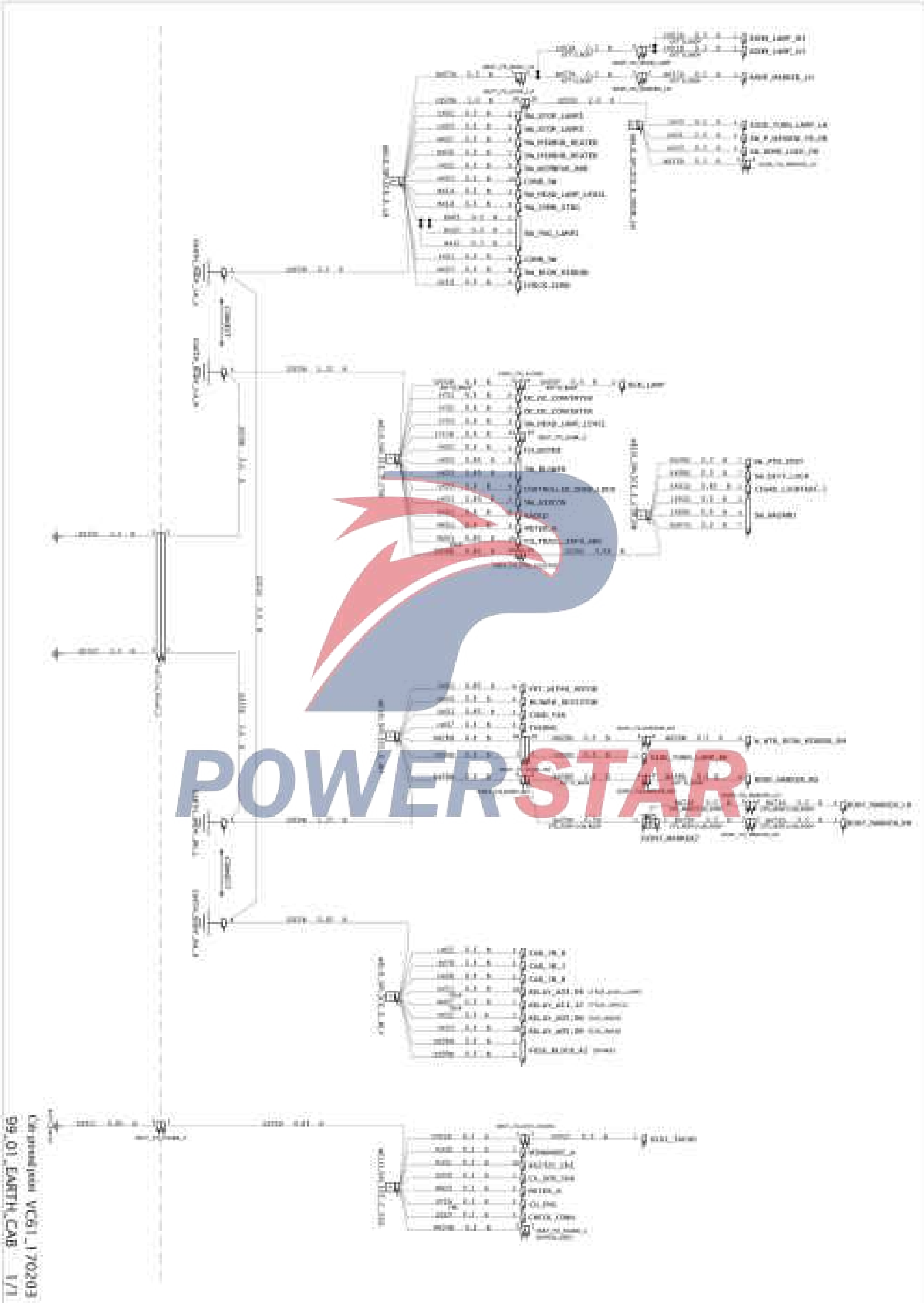
Control wiring diagram of converter



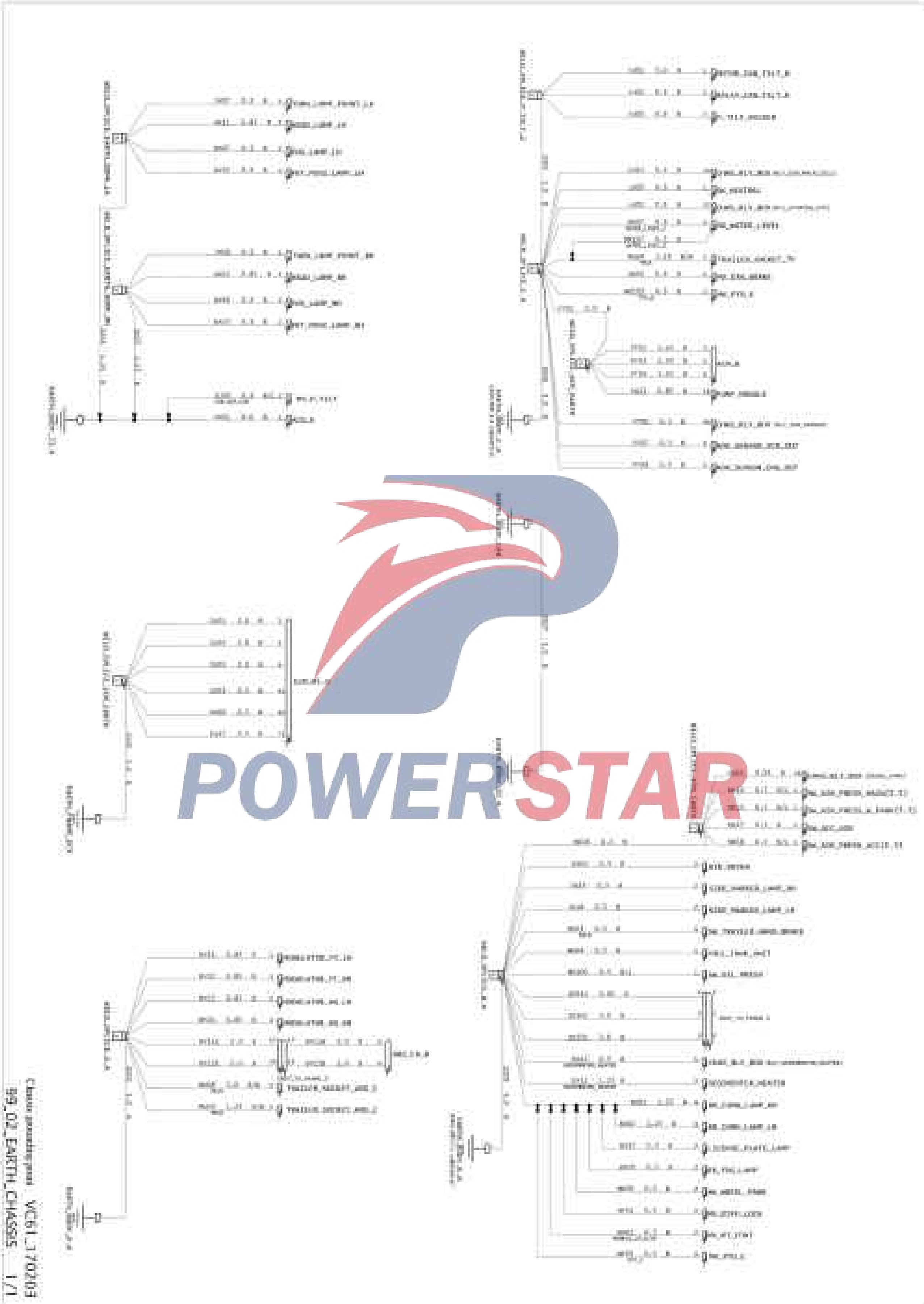
Control wiring diagram of chassis connector



Cab line ground point

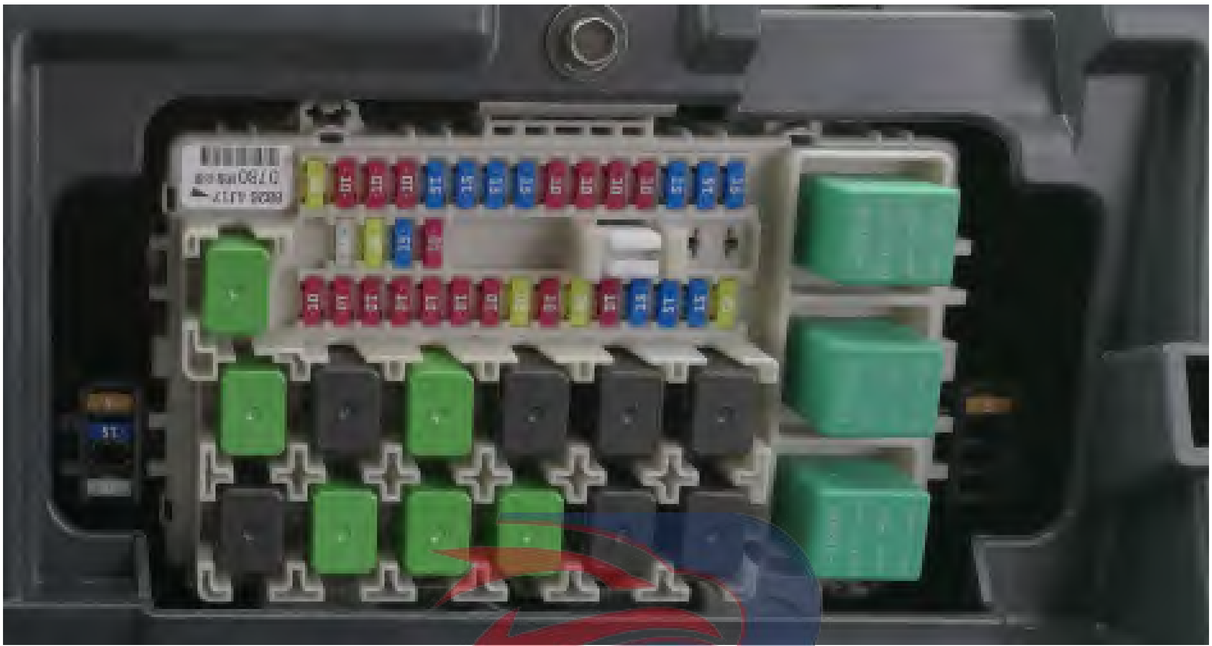


Chassis grounding point



Name of junction box fuse in the cab

Location drawing A



No.	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
Name	Blower	Rear fog light	Hazard warning light	Small light, fore fog light	Turn light and emergency light	Horn	Cigar lighter	Radio, reflector, full beam headlight and USB power supply.	Big/small light	Windscreen wiper and instrument	ECM		Central locking, PTO, preheating	Dryer, air conditioning	Rearview mirror heating and electrical window
Rating	20A	10A	10A	10A	15A	15A	15A	15A	10A	10A	10A	10A	15A	15A	15A

25A	Back-up
20A	Back-up
15A	Back-up
10A	Back-up

A1	5A	UreaSCR
A2	15A	ABS
A3		
A4	25A	ABS

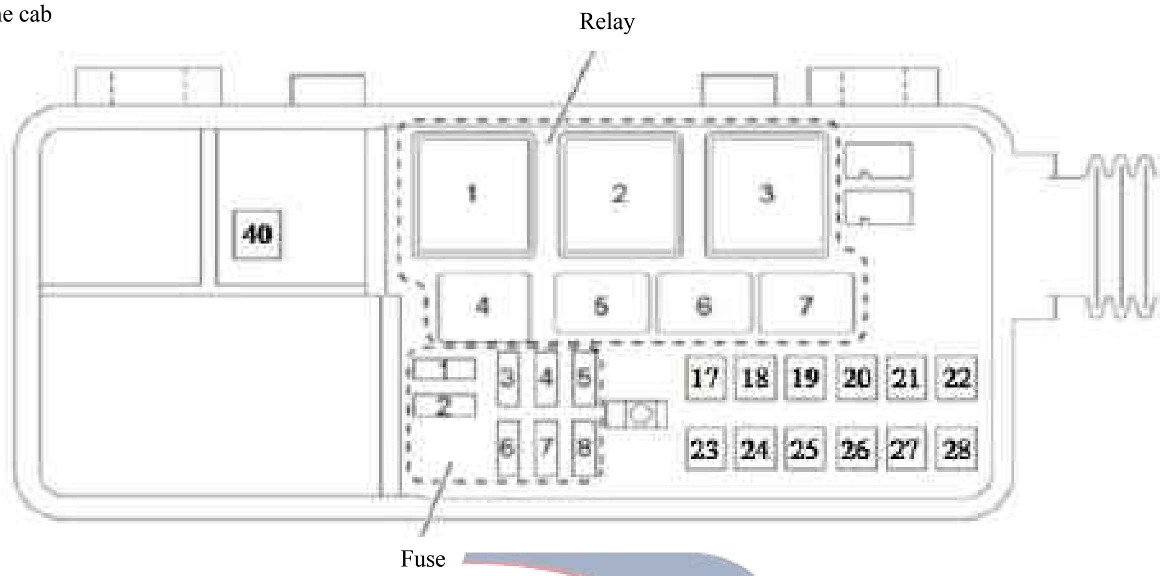
No.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Name	Headlight HI right	Headlight HI left	Starter	Brake light	Headlight LO right	ECM	Headlight LO left	windshield wiper	Trailer reversing light and converter power supply	Power window	Fog light	Door lock	Radio and interior light	Trailer	Condenser fan
Rating	10A	10A	10A	10A	10A	10A	10A	20A	10A	20A	10A	15A	15A	15A	20A

A5	5A	Back-up

Position and name of main part (VC61)

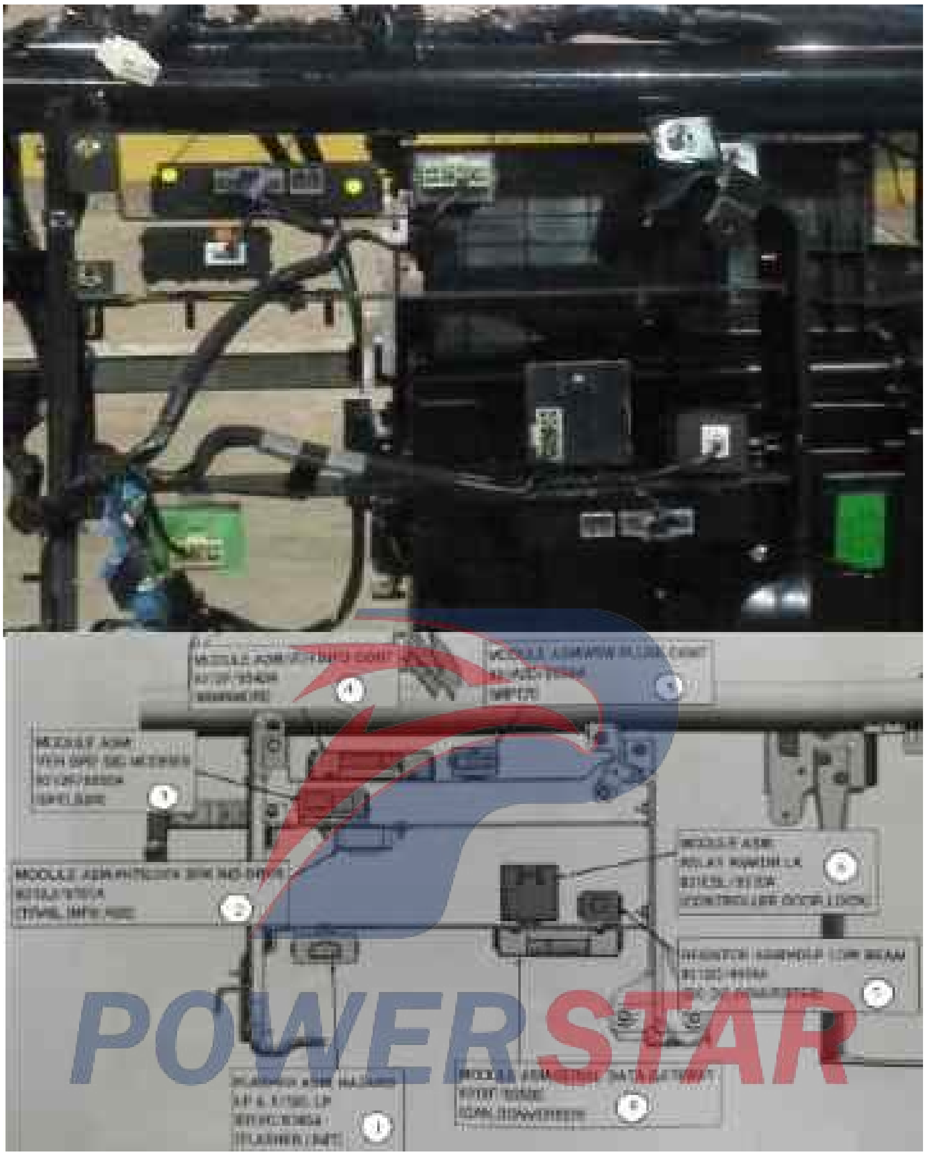
Name of chassis junction box part

Position of fuse protector box and relay outside the cab



	Relay name	No.	Fuse name	Power	No.	Fuse name	Power
1	Oil water separator heating	29	NOx sensor	15A	17	ECM main power	40A
2	ECM main	30	SCR(ACM)	25A	18	Cab rising and lowering	40A
3	Engine preheating	31	Fuel Pump	15A	19	Void	
4	Exhaust brake	32	Exhaust brake	10A	20	Engine preheating	60A
5	Cab rising and lowering	33	Void		21	Key switch (B2 end)	30A
6	Starter cut off	34	Key switch (B1 end)	10A	22	Cigarette lighter、ABS、ECM	50A
7	SCR sensor	35	Oil water separator heating	20A	23	Void	
		36	Cab rising and lowering	10A	24	Headlights, brake lights, fog lights, taillights	50A
					25	Null (trailer ABS)	30A
					26	Blowers, speakers, emergency lights, wipers	50A
					27	Void	
					28	Radio, interior lights, door locks, condenser fans, trailers, power windows	60A
					40	Starter	80A

Position and name of controller



No.	Module name	Remarks
1	Flash relay	
2	(null) ABS controller	Move to the downside of panel of co-driver seat
3	Speed governor	
4	Tachograph	
5	Wiper controller	
6	Door lock controller	
7	Power converter	
8	Signal converter	

DTC	Trouble code type or flash code	DTC Name
P0016	16	Crankshaft position-camshaft position correlation
P0087	225	Fuel rail/system pressure is excessively low.
P0088	118	Fuel rail/system pressure is excessively high
P0089	151	Performance of fuel pressure regulator
P0091	247	The control circuit voltage of the fuel pressure regulator is low.
P0092	217	The control circuit voltage of the fuel pressure regulator is high.
P0101	92	Range/performance of the circuit of the air flow sensor
P0102	91	The circuit input voltage of the air flow sensor is low.
P0103	91	The circuit input voltage of the air flow sensor is high.
P0112	22	The circuit voltage of the intake air temperature sensor is low.
P0113	22	The circuit voltage of the intake air temperature sensor is high.
P0116	23	Engine coolant temperature sensor circuit – range/performance
P0117	23	Engine coolant temperature sensor voltage is low
P0118	23	Engine coolant temperature sensor circuit – high
P0182	211	The circuit voltage of the fuel temperature sensor is low.
P0183	211	The circuit voltage of the fuel temperature sensor is high
P0192	245	The circuit voltage of the fuel rail pressure sensor is low.
P0193	245	The circuit voltage of the fuel rail pressure sensor is high
P0201	271	Fuel injector circuit open circuit——Cylinder 1
P0202	272	Fuel injector circuit open circuit——Cylinder 2
P0203	273	Fuel injector circuit open circuit——Cylinder 3
P0204	274	Fuel injector circuit open circuit——Cylinder 4
P0205	275	Fuel injector circuit open circuit——Cylinder 5
P0206	276	Fuel injector circuit open circuit——Cylinder 6
P0217	542	Engine coolant temperature - overhigh
P0219	543	Overhigh engine speed

DTC	Trouble code type or flash code	DTC Name
P0234	42	Supercharging by the turbocharger is excessively high.
P0237	32	Turbocharger boost sensor voltage is low
P0238	32	The circuit voltage of supercharging sensor of the turbocharger is high.
P0299	65	The turbocharger is deficient in supercharging.
P0335	15	Circuit of crankshaft position sensor
P0336	15	Range/performance of the circuit of crankshaft position sensor
P0340	14	Circuit of camshaft position sensor
P0341	14	Range/performance of the circuit of camshaft position sensor
P0401	93	Insufficient EGR flow detected
P0404	45	Exhaust gas circulation control circuit – range/performance
P0409	44	Exhaust gas circulation sensor circuit
P0477	46	Exhaust pressure control valve is low
P0478	46	The pressure of the exhaust pressure control valve is excessively high.
P0500	25	Speed sensor
P0502	25	Low input of VSS circuit
P0503	25	Speed sensor circuit high input
P0545	A	SCRinlet temperature sensor loop is low voltage
P0546	A	SCRinlet temperature sensor loop is high voltage
P0560	155	System voltage
P0562	C	Battery voltage is low
P0563	35	System voltage is too high
P0563	C	Battery voltage is high
P0571	26	Brake switch circuit
P0601	53	Check and error of the memory of internal control module
P0602	154	Control module programming error
P0604	153	RAM error of internal control module

DTC	Trouble code type or flash code	DTC Name
P0606	51	Engine control module processor
P0606	A	ECM memory module error
P0607	C	Control module performance
P060B	36	A/D processing performance of internal control module
P0610		Abnormal input of extra information of EEPROM vehicle
P0641	55	Sensor Reference Circuit 1 Circuit
P0642	A	Sensor power supply 1 low voltage
P0643	A	Sensor power supply 1 high voltage
P0650	77	Fault indicator (MIL) control circuit
P0651	56	Sensor Reference Circuit 2 Circuit
P0685	416	Engine control module - power relay control circuit - open
P0687	416	Engine control module - power relay control circuit - high
P0697	57	Sensor Reference Circuit 3 Circuit
P06AF		IC system of fuel injector is abnormal.
P06B8	A	ECM internal error
P1062	257	Fuel pressure regulator 1 Electromagnetic control circuit
P1063	258	Fuel pressure regulator 2 Electromagnetic control circuit
P1093	226	Fuel rail pressure is too low
P1247	411	Turbocharger boost control solenoid circuit1
P1248	412	Turbocharger boost control solenoid circuit2
P1249	413	Turbocharger boost control solenoid circuit3..
P124A	415	Circuit of the electromagnetic relay for supercharging control of the turbocharger
P1261	34	The injector positive voltage control circuit group 1
P1262	34	The injector positive voltage control circuit group 2
P1621	54	Performance of long-term memory of control module
P1644	76	Control circuit of “Please repair the vehicle as soon as possible.” indicator light

DTC	Trouble code type or flash code	DTC Name
P2032	A	SCR outlet temperature sensor loop is high voltage
P2033	A	SCR outlet temperature sensor loop is low voltage
P2039	A	Urea mixed air pressure sensor loop is low voltage
P203C	A	Urea tank level sensor is low voltage
P203D	A	Urea tank level sensor is high voltage
P203F	D	Urea tank level is low
P2040	A	Urea mixed air pressure sensor loop is high voltage
P2044	A	Urea temperature sensor is low voltage
P2045	A	Urea temperature sensor is high voltage
P2047	A	Urea nozzle loop is wrong
P204C	A	Urea pressure sensor loop is low voltage
P204D	A	Urea pressure sensor loop is low voltage
P204F	A	Metering feedback error
P205C	A	Urea tank temperature sensor is low voltage
P205D	A	Urea tank temperature sensor is high voltage
P2080	A	SCR filter temperature sensor tampering
P208C	A	Urea pump control loop is low voltage
P208D	A	Urea pump control loop is low voltage
P208E	A	Urea nozzle performance error
P209F	A	Urea tank thaw abnormalities
P20A1	C	Urea cleaning valve performance error
P20A2	C	Urea purge valve circuit is low voltage
P20A3	A	Urea purge valve circuit is high voltage
P20A7	A	Urea air cut-off valve performance error
P20A8	A	Urea air cut-off valve is low voltage
P20A9	C	Urea air cut-off valve is high voltage

DTC	Trouble code type or flash code	DTC Name
P20B2	B	Urea heating rod is abnormal
P20B3	C	Urea tank heating cooling water control valve circuit low voltage
P20B4	C	Urea tank heating cooling water control valve circuit high voltage
P20E6	A	Urea air cut-off valve pressure is too low
P20E7	A	Urea system mixed air pressure is too low
P20E8	A	Urea pressure is lower than the specified pressure
P20E9	A	Urea pressure is higher than the specified pressure
P20EC	A	SCR temperature is too high
P20EE	B	The amount of SCR Nox is too high causing torque to drop
P2122	121	Pedal position sensor 1 circuit low input
P2123	121	Pedal position sensor 1 circuit high input
P2127	122	Pedal position sensor 2 circuit low input
P2128	122	Pedal position sensor 2 circuit high input
P2138	124	Correlation of pedal position sensors 1-2
P2146	158	Fuel injector group 1 supply voltage circuit
P2149	159	Fuel injector group 2 supply voltage circuit
P2200	A	SCR inlet NOx sensor loop error
P2201	A	SCR inlet NOx sensor determining scope is error
P220A	A	SCR inlet NOx sensor power supply error
P220B	A	SCR outlet NOx sensor power supply error
P220E	A	SCR inlet NOx sensor heating performance error
P220F	A	SCR outlet NOx sensor heating performance error
P2227	71	Atmospheric pressure sensor circuit -range/performance
P2228	71	Atmospheric pressure sensor circuit -low
P2229	71	Atmospheric pressure sensor circuit -high
P2295	248	The control circuit voltage of fuel pressure regulator 2 is low.

DTC	Trouble code type or flash code	DTC Name
P2296	218	The control circuit voltage of fuel pressure regulator 2 is high.
P229E	A	SCR outlet NOx sensor loop is error
P229F	A	SCR outlet NOx sensor determining scope is wrong
P241E	A	Urea tank heating performance is error
P244A	142	Diesel oxidation catalyst
P244B	141	Diesel oxidation catalyst
P2454	47	The circuit voltage of the exhaust pressure sensor is low.
P2455	47	Exhaust pressure sensor voltage is high
P2509	A	Lost power supply when ignition switch is on
P253A	28	Power output sensor circuit
P256A	31	Engine idling selector sensor
P2BA7	A	Urea tank level is not enough
P2BAE	B	The SCR NOx is too high causing the torque to drop
U0002	A	Lost communication with ECM
U0073	84	Communication bus of control module is disconnected.
U029D	A	CR inlet NOx sensor loses communication
U029E	A	CR outlet NOx sensor loses communication

Engine Control

Troubleshooting (6W)

Table of Contents

Diagnostic system check-engine controls

1. Diagnostic system check-engine controls description of function

The engine control system inspection is a systematic method for checking problems caused by malfunctions in the engine control system. This system check is the starting point of drivability complaint diagnosis. Move from the system check to the next logical step to diagnose problems. Understanding and correctly using the diagnostic table reduces diagnostic time and prevents the replacement of good parts.

2. Diagnostic system check-engine controls

● If there are no complaints on drivability, do not perform these diagnostic steps unless otherwise instructed in other sections.

● Check for related Service Bulletins before starting the diagnosis.

● Do not clear the DTC unless instructed to do so in a diagnostic step.

● If a malfunction is found in the engine starting system, check the starting system.

● The battery should be fully charged.

● The battery cable should be normal and securely connected.

● The ground of the ECM should be securely connected to the correct position.

● Verify that the ECM harness connector is clean and correctly connected. Do not attempt to crank the engine with the ECM harness connectors disconnected.

● Verify that the ECM terminals are clean and correctly connected.

● Check if the injector ID Code is programmed correctly.

● If fuel system DTC P0087, P0088, P0089, P1093 or other DTCs are set, diagnose sensor DTCs, solenoid DTCs, actuator DTCs, and relay DTCs first.

1. Scan tool power-up check

1) Connect the scan tool. Does the scan tool power up?

Yes

=> Proceed to 2. Scan tool communication verification

No

Go to Scan tool does not power up.

Refer to "Scan tool does not power up" in this section.

2. Scan tool communication verification

1) Turn ON the ignition switch.

2) Check the communication status with the ECM with a scan tool. Does the scan tool communicate with the ECM?

Yes

=> Proceed to 3. Engine start check

No

Go to Lost communication with the ECM.

Refer to "Lost communication with the ECM" in this section.

3. Engine start check

1) Start the engine. Does the engine start?

Yes

=> Proceed to 4. MIL illumination check

No

Go to Starting system check.

Refer to "Starting system check" in this section.

4. MIL illumination check

1) Turn ON the ignition switch.

2) Check the MIL. Does the MIL illuminate?

Yes

=> Proceed to 5. MIL flash check

No

Go to MIL lighting circuit system check.

Refer to "MIL lighting circuit system check" in this section.

5. MIL flash check

1) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*DLC*".

2) Check the MIL. Does the MIL flash?

Yes

=> Proceed to 6. Control module DTC check

No

Go to MIL flashing control system check.

Refer to "MIL flashing control system check" in this section.

6. Control module DTC check

1) Observe the ECM DTC information with a scan tool. Is a DTC set?

Yes

=> Proceed to 7. Communication-related DTC check

No

=> Proceed to 11. Symptom check

7. Communication-related DTC check

1) Observe the DTC information with a scan tool. Is DTC U0073 set?

Yes

Go to DTC U0073 diagnosis.

Refer to "*DTC U0073 (Flash Code 84) Control Module Communication Bus Off" in this section*.

No

=> Proceed to 8. Control module internal-related DTC check

8. Control module internal-related DTC check

1) Observe the DTC information with a scan tool. Is DTC P0601, P0602, P0604, P0606, P060B, or P1621 set?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0601 (Flash Code 53) Internal Control Module Memory Check Sum Error" in this section*.

Refer to "*DTC P0602 (Flash Code 154) Control Module Programming Error" in this section*.

Refer to "*DTC P0604 (Flash Code 153) Internal Control Module RAM Error" in this section*.

Refer to "*DTC P0606 (Flash Code 51) ECM Processor" in this section*.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance" in this section*.

Refer to "*DTC P1621 (Flash Code 54) Control Module Long Term Memory Performance" in this section*.

No

=> Proceed to 9. Main relay system-related DTC check

9. Main relay system-related DTC check

1) Observe the DTC information with a scan tool. Is DTC P0685 or P0687 set?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0685 (Flash Code 416) ECM Power Relay Control Circuit Open*" in this section.

Refer to "*DTC P0687 (Flash Code 416) ECM Power Relay Control Circuit High*" in this section.

No

=> Proceed to 10. Check for other DTCs

10. Check for other DTCs

1) Observe the DTC information with a scan tool. Are other DTCs set?

Yes

Go to the applicable DTC diagnosis.

No

=> Proceed to 11. Symptom check

11. Symptom check

1) Check if the following symptoms are present.

● Hard start

● Rough, unstable

● High idle speed

● Cuts out

● Surges

● Lack of power, sluggishness, or sponginess

● Hesitation, sag, or stumble

● Abnormal combustion noise

● Poor fuel economy

- Black smoke
- White smoke

Yes

Repair the applicable symptom.

No

Go to Intermittent conditions.

Scan tool does not power up

1. Scan tool does not power up

description of function

The DLC is a standardized 16-pole connector. Connector design and location are dictated by an industry-wide standard and are required to provide the following.

● The battery voltage of the scan tool power supply is terminal 16.

● The scan tool power supply ground is terminal 4.

● The common signal ground is terminal 5.

The scan tool powers up when the ignition switch is OFF. If the ignition switch is turned ON, the ECM starts communicating with the scan tool.

2. Scan tool does not power up

Note:

Verify that the scan tool operates properly on another vehicle.

1. Fuse inspection

1) Turn OFF the ignition switch.

2) Inspect for a blown out ROOM LAMP, AUDIO 15 A fuse. Is the result normal?

Yes

=> Proceed to 2. DLC inspection

No

Replace the fuse. If the fuse blows out again, repair the short to ground in the circuits relating to the ROOM LAMP, AUDIO 15 A fuse.

=> Proceed to 5. Vehicle repair check

2. DLC inspection

1) Inspect for poor connections at the DLC (FU23). Is the connection status normal?

Refer to "*DLC*".

Yes

=> Proceed to 3. Inspection for open circuit in DLC battery power supply circuit

No

Repair the terminal as necessary.

=> Proceed to 5. Vehicle repair check

3. Inspection for open circuit in DLC battery power supply circuit

1) Connect a test lamp between the DLC battery power supply circuit (pin 16 of FU23) and the frame ground. Does the test lamp illuminate?

Refer to "DLC".

Yes

=> Proceed to 4. Inspection for open circuit in ground circuit

No

Repair the open circuit in the DLC battery power supply circuit.

=> Proceed to 5. Vehicle repair check

4. Inspection for open circuit in ground circuit

1) Inspect the ground circuit between the DLC and the frame ground (pins 4 and 5 of FU23) for an open circuit or high resistance. Is the result normal?

Refer to "DLC".

Yes

Go to Intermittent conditions.

No

Repair the circuit and clean or tighten the ground terminal as necessary.

=> Proceed to 5. Vehicle repair check

5. Vehicle repair check

1) Connect a scan tool to the DLC.

2) Power up the scan tool. Does the scan tool power up?

Yes

The system is normal.

No

=> Proceed to 1. Fuse inspection

Lost communication with the ECM

1. Lost communication with the ECM Description of function

The ECM communicates with the scan tool via the ISO CAN communication circuit. Reciprocal communication between the ECM, IP cluster, and DRM is done via the J1939 CAN communication circuit.

The following conditions cause poor CAN communication.

● Open circuit in CAN communication circuit

● Short together between the CAN Low circuit and CAN High circuit

● Short to ground or short to the power supply in the CAN communication circuit

● Failure inside the module, which causes a short to ground or a short to the power supply circuit in the CAN communication circuit

2. Lost communication with the ECM

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Scan tool communication verification

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Check the communication status with the ECM with a scan tool. Does the scan tool communicate with the ECM?

Yes

Go to Intermittent conditions.

No

=> Proceed to 3. DLC inspection

3. DLC inspection

1) Inspect for poor connections at the DLC (pins 4 and 6 of FU23). Is the connection status normal?

Yes

=> Proceed to 4. ECM harness connector inspection

No

Repair the connection as necessary.

=> Proceed to 17. Vehicle repair check

4. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 155 and 156 of F44). Is the connection status normal?

Yes

=> Proceed to 5. Fuse inspection

No

Repair the connection as necessary.

=> Proceed to 17. Vehicle repair check

5. Fuse inspection

1) Inspect for a blown out ECM 10A fuse. Is the result normal?

Yes

=> Proceed to 6. Inspection for open circuit in ECM power supply circuit

No

Replace the fuse. If the fuse blows out again, repair the short to ground in the circuits relating to the ECM 10A fuse.

=> Proceed to 17. Vehicle repair check

6. Inspection for open circuit in ECM power supply circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F42).

3) Turn ON the ignition switch.

4) Connect a test lamp between the ECM power supply circuit (pins 67 and 68 of F42) and frame ground. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

=> Proceed to 7. CAN circuit resistance check

No

Repair the open circuit in the ECM power supply circuit (pins 67 and 68 of F42).

=> Proceed to 17. Vehicle repair check

7. CAN circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the scan tool from the DLC if connected.

3) Measure the resistance between the CAN High circuit and the CAN Low circuit (pins 6 and 14 of FU23) with a DMM. Is the resistance within the specified range?

Value: 50 to 70 Ω

Yes

=> Proceed to 9. Inspection for short circuit in CAN circuit

No

=> Proceed to 8. Inspection for open circuit and short circuit in CAN circuit

8. Inspection for open circuit and short circuit in CAN circuit

1) Inspect for poor connections at the ECM harness connector (pins 155 and 156 of F44). Is the connection status normal?

2) Inspect the CAN High circuit and the CAN Low circuit between the ECM (pins 155 and 156 of F44) and the DLC (pins 6 and 14 of FU23) for the following conditions. Is the result normal?

● Open circuit

● Short together between the CAN High circuit and the CAN Low circuit

● High resistance

3) Are all of the results normal?

Yes

⇒ Proceed to 16. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 17. Vehicle repair check

9. Inspection for short circuit in CAN circuit

1) Inspect the CAN High circuit and the CAN Low circuit between the ECM (pins 155 and 156 of F44) and the DLC (pins 6 and 14 of FU23) for the following. Is the result normal?

● Short to ground

● Short to the power supply circuit

Yes

⇒ Proceed to 10. ECM ground circuit inspection

No

Repair the circuit as necessary.

⇒ Proceed to 17. Vehicle repair check

10. ECM ground circuit inspection

1) Inspect the ground circuit of the ECM for corrosion or improper installation. Is the result normal?

Yes

⇒ Proceed to 11. ECM main relay inspection

No

Clean or reinstall the ground circuit as necessary.

⇒ Proceed to 17. Vehicle repair check

11. ECM main relay inspection

1) Turn OFF the ignition switch.

2) Connect the ECM harness connector (F44).

Refer to "*Engine Control*".

3) Replace the ECM main relay with a glow relay or a known good relay.

4) Turn ON the ignition switch.

5) Check the communication status with the ECM with a scan tool. Does the scan tool communicate with the ECM?

Yes

Replace the ECM main relay.

⇒ Proceed to 17. Vehicle repair check

No

⇒ Proceed to 12. Inspection for open circuit in ECM main relay power supply circuit

12. Inspection for open circuit in ECM main relay power supply circuit

1) Turn OFF the ignition switch.

2) Remove the ECM main relay.

3) Turn ON the ignition switch.

4) Connect a test lamp to the ECM main relay power supply circuit (pins 1 and 2 of OR2). Does the test lamp illuminate?

Refer to "Engine Control".

Yes

⇒ Proceed to 14. ECM main relay operation check

No

⇒ Proceed to 13. Check for open circuit in ECM main relay power supply circuit

13. Check for open circuit in ECM main relay power supply circuit

1) Connect a test lamp between the ECM main relay power supply circuit (pin 1 of OR2) and the frame ground. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

Repair the open circuit in the power supply circuit between the ECM main relay power supply circuit (pin 2 of OR2) and the ECM (pins 1 and 2 of F42).

⇒ Proceed to 17. Vehicle repair check

No

Repair the open circuit in the power supply circuit between the ECM 40A slow blow fuse and the ECM main relay (pins 1 of OR2).

⇒ Proceed to 17. Vehicle repair check

14. ECM main relay operation check

1) Turn OFF the ignition switch.

2) Install the ECM main relay.

3) While checking the operation sounds of the ECM main relay, turn the ignition switch ON/OFF. When turning the ignition switch ON/OFF, does the ECM main relay make any operation sounds?

Yes

⇒ Proceed to 15. Inspection for open circuit in ECM main relay control circuit

No

Repair the open circuit or high resistance between the ECM main relay (pin 5 of OR2) and the frame ground.

⇒ Proceed to 17. Vehicle repair check

15. Inspection for open circuit in ECM main relay control circuit

1) Inspect the ECM main relay control circuit between the ECM (pins 72 and 73 of F42) and the ECM main relay (pin 3 of OR2) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 16. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 17. Vehicle repair check

16. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 17. Vehicle repair check

17. Vehicle repair check

1) Turn OFF the ignition switch.

2) Reconnect all of the disconnected fuses, relays, or harness connectors.

3) Turn ON the ignition switch.

4) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*Engine Control*".

5) Verify communication with the ECM is established with a scan tool.

Yes

The system is normal.

No

⇒ Proceed to 3. DLC inspection

MIL lighting circuit system check

1. MIL lighting circuit system check Description of function

The malfunction indicator light (MIL) is supplied power via the ignition switch, and the light illuminates based on signals from the ECM. The ECM illuminates the MIL during the light check when the ignition switch is turned ON, and when the DTC is detected. Also, if pins No. 4 and No. 12 are short-circuited, the MIL is flashed in accordance with the DTC set. A monitor circuit is incorporated inside the ECM, and this circuit monitors the operation of the MIL.

2. MIL lighting circuit system check

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is DTC P0650 set?

Yes

Go to DTC P0650 diagnosis.

Refer to "*DTC P0650 (Flash Code 77) Malfunction Indicator Lamp (MIL) Control Circuit*" in this section.

No

⇒ Proceed to 3. MIL illumination check

3. MIL illumination check

1) Turn OFF the ignition switch for at least 30 seconds.

2) Turn ON the ignition switch.

3) Check the MIL. Does the MIL illuminate?

Yes

Go to Intermittent conditions.

No

⇒ Proceed to 4. ECM replacement

4. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 5. Vehicle repair check

5. Vehicle repair check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Turn ON the ignition switch.

5) Check the MIL. Does the check engine warning light illuminate?

Yes

The system is normal.

No

⇒ Proceed to 2. Prioritized DTC

MIL flashing control system check

1. MIL flashing control system check Description of function

The malfunction indicator light (MIL) is supplied power via the ignition switch, and the light illuminates based on signals from the ECM. The ECM illuminates the MIL during the light check when the ignition switch is turned ON, and when the DTC is detected. Also, if pins No. 4 and No. 12 are short-circuited, the MIL is flashed in accordance with the DTC set. A monitor circuit is incorporated inside the ECM, and this circuit monitors the operation of the MIL.

2. MIL flashing control system check

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is DTC P0650 set?

Yes

Go to DTC P0650 diagnosis.

Refer to "*DTC P0650 (Flash Code 77) Malfunction Indicator Lamp (MIL) Control Circuit*" in this section.

No

⇒ Proceed to 3. Diagnostic switch circuit voltage check

3. Diagnostic switch circuit voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the DLC (pin 12 of FU23) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "Engine Control".

Value: 18 V

Yes

⇒ Proceed to 6. Inspection for open circuit in DLC ground circuit

No

⇒ Proceed to 4. ECM harness connector inspection

4. ECM harness connector inspection

1) Turn OFF the ignition switch.

2) Inspect for poor connections at the ECM harness connector (pin 136 of F44). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Inspection for open circuit in diagnostic switch circuit

No

Repair the connection as necessary.

⇒ Proceed to 9. Vehicle repair check

5. Inspection for open circuit in diagnostic switch circuit

1) Inspect the circuit between the ECM (pin 136 of F44) and the DLC (pin 12 of FU23) for the following conditions. Is the result normal?

● Open circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. MIL flash check

No

Repair the circuit as necessary.

⇒ Proceed to 9. Vehicle repair check

6. Inspection for open circuit in DLC ground circuit

1) Inspect for an open circuit or high resistance between the DLC (pin 4 of FU23) and the ground terminal (FU47). Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. MIL flash check

No

Repair the circuit as necessary.

⇒ Proceed to 9. Vehicle repair check

7. MIL flash check

1) Turn ON the ignition switch.

2) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*Engine Control*".

3) Check the MIL. Does the MIL flash?

Yes

Go to Intermittent conditions.

No

⇒ Proceed to 8. ECM replacement

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Vehicle repair check

9. Vehicle repair check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Turn ON the ignition switch.

5) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*Engine Control*".

6) Check the MIL. Does the MIL flash?

Yes

The system is normal.

No

⇒ Proceed to 2. Prioritized DTC check

SVS Lamp Flashing Control System Check

1. SVS Lamp Flashing Control System Check Description of function

The SVS lamp is supplied with power via the ignition switch, and the light illuminates based on signals from the ECM. The SVS lamp illuminates when the ignition switch is turned ON, and turns OFF after engine start-up is complete. Also, the SVS lamp illuminates if the DTC type C is set.

2. SVS Lamp Flashing Control System Check

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is DTC P1664 set?

Yes

Go to DTC P1664 diagnosis.

Refer to "*DTC P1664 (Flash Code 76) Service Vehicle Soon Lamp Control Circuit*" in this section.

No

⇒ Proceed to 3. Diagnostic switch circuit voltage check

3. Diagnostic switch circuit voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the DLC (pin 12 of FU23) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 18 V

Yes

⇒ Proceed to 6. Inspection for open circuit in DLC ground circuit

No

⇒ Proceed to 4. ECM harness connector inspection

4. ECM harness connector inspection

1) Turn OFF the ignition switch.

2) Inspect for poor connections at the ECM harness connector (pin 136 of F44). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Inspection for open circuit in diagnostic switch circuit

No

Repair the connections as necessary.

⇒ Proceed to 9. Vehicle repair check

5. Inspection for open circuit in diagnostic switch circuit

1) Inspect the circuit between the ECM (pin 136 of F44) and the DLC (pin 12 of FU23) for the following conditions. Is the result normal?

● Open circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. SVS lamp flash check

No

Repair the circuit as necessary.

⇒ Proceed to 9. Vehicle repair check

6. Inspection for open circuit in DLC ground circuit

1) Inspect for an open circuit or high resistance between the DLC (pin 4 of FU23) and the ground terminal (FU47). Is the result normal?

Refer to "Engine Control".

Yes

⇒ Proceed to 7. SVS lamp flash check

No

Repair the circuit as necessary.

⇒ Proceed to 9. Vehicle repair check

7. SVS lamp flash check

1) Turn ON the ignition switch.

2) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*Engine Control*".

3) Check the SVS lamp. Does the SVS lamp flash?

Yes

Go to Intermittent conditions.

No

⇒ Proceed to 8. ECM replacement

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Vehicle repair check

9. Vehicle repair check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Turn ON the ignition switch.

5) Connect a fused jumper wire to the DLC (pins 4 and 12 of FU23).

Refer to "*Engine Control*".

6) Check the SVS lamp. Does the SVS lamp flash?

Yes

The system is normal.

No

⇒ Proceed to 2. Prioritized DTC check

Starting system check

1. Starting system check　Description of function

The starting system inspection is used to find the cause of engine deactivation. The following items are the conditions for performing this diagnosis.

● The battery is fully charged and the battery cable is securely connected.

● The rotation speed when cranking is normal.

● The fuel is sufficiently supplied.

● There is no fuel leakage.

● No air in the fuel

● No abnormal conditions in the air cleaner elements and the fuel filters

2. Starting system check

1. Prioritized DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is a DTC set?

Yes

Go to the applicable DTC diagnosis.

No

⇒ Proceed to 2. Fuel system inspection

2. Fuel system inspection

1) Inspect while referring to Fuel system check. Is the result normal?

Refer to "*Fuel system check*" in this section.

Yes

⇒ Proceed to 3. Engine mechanical inspection

No

Repair or replace as necessary.

⇒ Proceed to 7. Starter system check

3. Engine mechanical inspection

1) Inspect for the following abnormal conditions. Is the result normal?

● Engine mechanical timing shift

● Improper installation position of the flywheel

● Excessive clogging in the air intake system

● Excessive clogging in the exhaust system

Yes

⇒ Proceed to 4. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 7. Starter system check

4. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply and ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 7. Starter system check

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Engine start check

6. Engine start check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Start the engine. Does the engine start?

Yes

⇒ Proceed to 7. Starter system check

No

⇒ Proceed to 1. Prioritized DTC check

7. Starter system check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is a DTC set?

Yes

Go to the applicable DTC diagnosis.

No

⇒ Proceed to 8. Vehicle repair check

8. Vehicle repair check

1) Restore the vehicle to its normal operating condition, bleed the air from the fuel piping again, and verify the repair.

Procedure completion

The system is normal.

Fuel system check

1. Fuel system check Description of function

The fuel system is composed of 2 fuel pressure sections. A suction side between the fuel tank and the fuel supply pump, and a high pressure side between the fuel supply pump and the injectors. Also, several filters are installed on the fuel system. Fuel is drawn from the fuel tank and then supplied to the fuel rail by the 2 plungers located inside the supply pump. The fuel rail pressure is controlled by the ECM, which controls the FRP regulator based on signals from the fuel rail pressure sensor. If the fuel rail pressure becomes excessively high, the fuel rail pressure limiter valve opens to release the excessive pressure and returns the fuel to the fuel tank.

2. Fuel system check

1. Fuel amount inspection

1) Inspect the fuel amount. Is the fuel amount adequate?

Yes

⇒ Proceed to 2. Fuel quality inspection

No

Refill with the fuel.

⇒ Proceed to 2. Fuel quality inspection

2. Fuel quality inspection

1) Drain the fuel from the fuel tank.

2) Refill with the specified fuel.

3) Bleed the air from the fuel piping.

4) Start the engine. Does the engine start?

Yes

⇒ Proceed to 7. Vehicle repair check

No

⇒ Proceed to 3. Fuel piping check

3. Fuel piping check

1) Bleed the air from the fuel piping between the fuel tank, the feed pump, the fuel filter, and the supply pump.

2) If fuel does not reach the fuel filter, inspect the supply pump overflow valve and replace if a malfunction is found.

3) If there is no malfunction in the overflow valve, reversely connect the IN side fuel hose above the fuel tank and the OUT side fuel hose to bleed the air. Inspect the fuel tank if fuel comes.

Procedure completion

⇒ Proceed to 4. Fuel filter inspection

4. Fuel filter inspection

1) Inspect the fuel filter.

2) If there is clogging because of dirt, etc., in the fuel filter, clean or replace.

Procedure completion

⇒ Proceed to 5. Fuel piping inspection

5. Fuel piping inspection

5. Fuel piping inspection

1) Inspect for fuel leakage.

2) Inspect the fuel piping for collapsing, bending, cracks, or looseness, and inspect the injector or the filter in the piping of the pump section for abnormal conditions such as the adherence of dirt.

3) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 6. Fuel tank inspection

6. Fuel tank inspection

1) Inspect the fuel tank for the following conditions.

● Intrusion of foreign material

● Clogging in the fuel suction inlet

● Bending or cracks in the fuel suction pipe

● Deformation of the fuel tank

● Correct installation of the fuel tank

● Water intrusion in the fuel tank

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 7. Vehicle repair check

7. Vehicle repair check

1) Restore the vehicle to its normal operating condition, bleed the air from the fuel piping again, and verify the repair.

Procedure completion

The system is normal.

Air intake system check

1. Air intake system check Description of function

In the air intake system, air intake starts from the air cleaner, and the air is then supplied to the engine through the turbocharger and intercooler. Because the air is highly pressurized by the turbocharger, if an air leakage exists in the piping, it will have an adverse effect on engine performance.

2. Air intake system check

1. Air cleaner inspection

1) Inspect the air cleaner for excessive contamination or clogging.

2) If there is excessive contamination or clogging in the air cleaner, clean or replace.

Procedure completion

⇒ Proceed to 2. Air cleaner case inspection

2. Air cleaner case inspection

1) Inspect the air cleaner case for accumulation of water or dirt.

2) Inspect the water drain valve for abnormal conditions such as clogging.

3) If there is an abnormal condition in the air cleaner case, clean it. Also, if abnormal conditions such as clogging are found after inspecting the water drain valve, repair or replace.

Procedure completion

⇒ Proceed to 3. Air intake piping inspection

3. Air intake piping inspection

1) Inspect the intercooler and the intake pipe for collapsing, looseness, damage, or improper installation.

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 4. Vehicle repair check

4. Vehicle repair check

1) Restore the vehicle to its normal operating condition, and verify the repair.

Procedure completion

The system is normal.

Exhaust system check

1. Exhaust system check Description of function

When the exhaust brake switch is turned ON, the signal is sent to the ECM. When the exhaust brake operating conditions are met, the ECM turns the exhaust brake solenoid valve ON. The exhaust brake solenoid valve controls the air pressure and operate the exhaust brake valve.

2. Exhaust system check

1. Prioritized DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is a DTC set?

Yes

Go to the applicable DTC diagnosis.

No

⇒ Proceed to 2. Exhaust brake switch check

2. Exhaust brake switch check

1) Turn ON the ignition switch.

2) Observe the parameters on the scan tool.

3) Operate the exhaust brake switch.

4) Observe the Exhaust Brake Switch parameter on the scan tool. Do ON/OFF in the parameter switch when operating the exhaust brake switch?

Yes

⇒ Proceed to 4. Exhaust piping inspection

No

⇒ Proceed to 3. Exhaust system inspection

3. Exhaust system inspection

1) Inspect the exhaust system for the following conditions.

● Exhaust brake switch malfunction

● Exhaust brake switch power supply system malfunction

● Open circuit in exhaust brake signal circuit

● Excessive clogging in the exhaust system

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 4. Exhaust piping inspection

4. Exhaust piping inspection

1) Inspect the exhaust piping for collapsing, looseness, damage, or improper installation.

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 5. Exhaust brake operation check

5. Exhaust brake operation check

1) Turn ON the ignition switch.

2) Connect the scan tool.

3) Perform the Exhaust Brake with a scan tool. Does the exhaust brake operate?

Yes

⇒ Proceed to 12. Vehicle repair check

No

⇒ Proceed to 6. Exhaust brake solenoid valve inspection

6. Exhaust brake solenoid valve inspection

1) Turn OFF the ignition switch.

2) Disconnect the exhaust brake solenoid valve harness connector (J8).

3) Measure the resistance of the exhaust brake solenoid valve (pin 1 and 2 of J8) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 34 to 40 Ω

Yes

⇒ Proceed to 7. Exhaust brake solenoid valve operation check

No

Replace the exhaust brake solenoid valve.

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake solenoid valve removal*".

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake solenoid valve installation*".

⇒ Proceed to 7. Exhaust brake solenoid valve operation check

7. Exhaust brake solenoid valve operation check

1) Turn ON the ignition switch.

2) Connect the scan tool.

3) Perform the Exhaust Brake with a scan tool. Does the exhaust brake operate?

Yes

⇒ Proceed to 12. Vehicle repair check

No

⇒ Proceed to 8. Exhaust brake inspection

8. Exhaust brake inspection

1) Inspect the exhaust brake for the following conditions.

● Exhaust brake solenoid valve malfunction

● Exhaust brake malfunction

● Abnormal conditions in the exhaust brake air and air piping

● Open circuit in the exhaust brake solenoid valve

● Malfunction in the exhaust brake solenoid valve circuit and the relay

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 9. Follow-up exhaust brake solenoid valve operation check

9. Follow-up exhaust brake solenoid valve operation check

1) Turn ON the ignition switch.

2) Connect the scan tool.

3) Perform the Exhaust Brake with a scan tool. Does the exhaust brake operate?

Yes

⇒ Proceed to 12. Vehicle repair check

No

⇒ Proceed to 10. ECM power supply and ground circuit inspection

10. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 11. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 12. Vehicle repair check

11. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 12. Vehicle repair check

12. Vehicle repair check

1) Restore the vehicle to its normal operating condition, and verify the repair.

Procedure completion

The system is normal.

EGR control system check

1. EGR control system check Description of function

The EGR system recirculates a part of exhaust gas back into the intake manifold, which results in reducing NOx emissions. Emission reduction is achieved by controlling the EGR system. A control current from the ECM operates a motor to control the lift amount of the EGR valve. In addition, the EGR position sensor is used for detection of the actual valve lift amount and for precision control of the EGR amount.

The EGR is activated when the specified conditions of engine speed, engine coolant temperature, intake air temperature, and barometric pressure are met. Then, the valve opening position is calculated based on engine speed and the desired fuel injection quantity. The motor drive duty is determined from this valve opening position, and the valve is driven according to the motor drive duty.

2. EGR control system check

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

Go to the applicable DTC diagnosis.

No

⇒ Proceed to 3. EGR components inspection

3. EGR components inspection

1) Inspect for the following conditions. Is the result normal?

● Missing or damaged EGR valve gasket

● Stuck EGR valve, or air cylinder malfunction

● EGR gas leakage from the EGR passage between the exhaust manifold and the intake manifold

● Collapsed or restricted flow in the EGR passage between the exhaust manifold and the EGR valve

● Conditions that restrict exhaust system flow

● Clogged air cleaner element, collapsing of the duct between the air cleaner and the intake manifold, or a state where flow is restricted

● Leakage in the air intake system

● Water in the air intake system

● Contamination or foreign material blocking the inlet of MAF sensor

● Misdetection or delayed response of the MAF sensor

● Engine coolant temperature sensor malfunction

● Barometric pressure sensor malfunction

Yes

⇒ Proceed to 4. EGR operation check

No

Repair as necessary.

⇒ Proceed to 8. Vehicle repair check

4. EGR operation check

1) Place the shift lever in the neutral position and apply the parking brake.

2) Start the engine.

3) Warm up the engine until the coolant temperature reaches 80℃ (176℉) or more.

4) While observing the Exhaust Gas Recirculation (EGR) Valve Position and Exhaust Gas Recirculation (EGR) Brushless DC Motor Position 2 parameters on the scan tool, repeatedly depress the accelerator pedal to increase the engine speed. Are the Exhaust Gas Recirculation (EGR) Valve Position and Exhaust Gas Recirculation (EGR) Brushless DC Motor Position 2 positions within the specified range?

Value: -5 to 5 %

Yes

⇒ Proceed to 5. EGR operation check using scan tool

No

⇒ Proceed to 6. EGR valve inspection

5. EGR operation check using scan tool

1) Perform the EGR a few times with a scan tool.

2) While observing the Exhaust Gas Recirculation (EGR) Valve Position value, command the Desired EGR Position UP and DOWN. Does the Exhaust Gas Recirculation (EGR) Valve Position parameter follow the Desired EGR Position within the specified range?

Value: -5 to 5 %

Yes

The system is normal.

No

⇒ Proceed to 6. EGR valve inspection

6. EGR valve inspection

1) Inspect the EGR valve for the following conditions. Is the result normal?

● The flow in the EGR valve is restricted by foreign material.

● Excessive deposits in the valve

● Bent valve shaft

Yes

⇒ Proceed to 7. EGR circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Vehicle repair check

7. EGR circuit inspection

1) Inspect for poor connections at the EGR valve 1 harness connector (pins 1, 2, 3, 4, 5, 6, 7, and 8 of E98). Is the connection status normal?

2) Inspect for poor connections at the EGR valve 2 harness connector (pins 1, 2, 3, 4, 5, 6, 7, and 8 of E99). Is the connection status normal?

3) Inspect for poor connections at the ECM harness connector (pins 32, 33, 34, 35, 38, 39, 40, 41, 42, 43, 44, 45, 50, 51, 60, and 61 of F41). Is the connection status normal?

4) Inspect for high resistance between the ECM (pins 32, 33, 38, 39, 40, 41, 60, and 61 of F41) and EGR valve 1 (pins 1, 2, 3, 4, 5, 6, 7, and 8 of E98). Is the result normal?

5) Inspect for high resistance between the ECM (pins 34, 35, 42, 43, 44, 45, 50, and 51 of F41) and EGR valve 2 (pins 1, 2, 3, 4, 5, 6, 7, and 8 of E99). Is the result normal?

Refer to "Engine Control".

6) Are all of the results normal?

Yes

Replace EGR valve 1 or 2.

⇒ Proceed to 8. Vehicle repair check

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 8. Vehicle repair check

8. Vehicle repair check

1) Reconnect all of the disconnected harness connectors and components.

Procedure completion

⇒ Proceed to 4. EGR operation check

ECM power supply and ground circuit check

1. ECM power supply and ground circuit check Description of function

1. ECM power supply and ground circuit check description of function

The ECM power supply is applied via the battery, slow blow fuse, ignition switch, and fuse. When the ignition switch is in the ON or in the START position, power is applied to the ECM, the ECM turns the main relay ON, and the main power is supplied to the ECM.

2. ECM power supply and ground circuit check

1. Battery inspection

1) Inspect the battery voltage and density.

2) Charge or replace as necessary.

Procedure completion

⇒ Proceed to 2. Fuse and harness inspection

2. Fuse and harness inspection

1) Inspect the fuses and the harnesses.

2) Replace as necessary.

Procedure completion

⇒ Proceed to 3. Ignition power supply voltage check

3. Ignition power supply voltage check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F42 and F44).

3) Turn ON the ignition switch.

4) Measure the voltage between the ignition switch ON signal circuit (pin 69 of F42) and the frame ground with a DMM.

Is the voltage within the specified range?

Refer to "*Engine Control*".

Value: 20 to 32 V

5) Turn the ignition switch to the START position.

6) Measure the voltage between the ignition switch START signal circuit (pin 135 of F44) and the frame ground with a DMM. Is the voltage within the specified range?

Refer to "*Engine Control*".

Value: 20 to 32 V

7) Are all of the values normal?

Yes

⇒ Proceed to 5. Inspection for open circuit and short circuit in ECM ground circuit

No

⇒ Proceed to 4. Ignition switch inspection

4. Ignition switch inspection

1) Inspect for the following abnormal conditions.

● Ignition switch malfunction

● Open circuit in the ignition switch circuit

● Ignition switch circuit and relay malfunction

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 5. Inspection for open circuit and short circuit in ECM ground circuit

5. Inspection for open circuit and short circuit in ECM ground circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40, F41, and F42).

3) Inspect the low reference circuit between the ECM (pin 7 of F40; pins 36 and 37 of F41; pins 70 and 71 of F42) and the frame ground for an open circuit or a short circuit.

Refer to "*Engine Control*".

4) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 6. Main relay system power supply circuit inspection

6. Main relay system power supply circuit inspection

1) Refer to DTC P0685 or P0687, and inspect the power supply circuit in the main relay system.

Refer to "*DTC P0685 (Flash Code 416) ECM Power Relay Control Circuit Open*" in this section.

Refer to "*DTC P0687 (Flash Code 416) ECM Power Relay Control Circuit High*" in this section.

2) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 7. Battery voltage check

7. Battery voltage check

1) Connect the ECM harness connector.

2) Connect the scan tool.

3) Turn ON the ignition switch.

4) Observe the Battery Voltage parameter on the scan tool.

5) Measure the battery voltage with a DMM.

6) Compare the voltage displayed on the scan tool and the voltage measured using a tester. Are the compared voltages almost the same?

Yes

⇒ Proceed to 9. Vehicle repair check

No

⇒ Proceed to 8. ECM replacement

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Vehicle repair check

9. Vehicle repair check

1) Restore the vehicle to its normal operating condition, and verify the repair.

Procedure completion

The system is normal.

PTO System Check

1. PTO System Check Description of function

The PTO control switches the engine mode and the external accelerator or accelerator pedal depending on the usage conditions of the power-driven unit. The ECM switches the accelerator and engine mode depending on the signal input of the accelerator, PTO switch, engine speed, parking switch, etc.

2. PTO System Check

1. PTO operation check

1) In order to switch to the operational mode, operate the PTO switch when all the following conditions are met.

● The parking brake is in operation.

● The gear is in the neutral position.

● When idling

● Depress the clutch pedal.

2) In order to switch to the running mode, follow the procedure described below to operate the PTO switch.

● When idling

● The gear is in the neutral position.

● Release the parking brake.

3) Check whether the operation is normal. Is the operation normal?

Yes

⇒ Proceed to 3. Accelerator pedal and external accelerator position check

No

⇒ Proceed to 2. PTO operation follow-up check

2. PTO operation follow-up check

1) Check if the PTO operates under normal procedures. Does the PTO operate under normal procedures?

Yes

⇒ Proceed to 3. Accelerator pedal and external accelerator position check

No

⇒ Proceed to 1. PTO operation check

3. Accelerator pedal and external accelerator position check

1) Check if the accelerator pedal and the external accelerator return. Do the accelerator pedal and external accelerator return?

Yes

⇒ Proceed to 4. Fuel injection characteristic switching verification

No

Return the accelerator pedal and external accelerator to the normal position.

⇒ Proceed to 4. Fuel injection characteristic switching verification

4. Fuel injection characteristic switching verification

1) Operate the PTO to check if the driving mode and the operational mode in the fuel injection characteristic switching are switched normally.

2) If the idling speed does not change, inspect the idling control switch, circuit, etc., and repair as necessary.

● An external accelerator can be used in the operational mode.

● In the running mode, operation of the idling control switch will change the idle speed.

Procedure completion

⇒ Proceed to 5. PTO switch operation check

5. PTO switch operation check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Place the gear in the neutral position.

4) Operate the PTO switch.

5) Verify that ON/OFF on the scan tool data display switch according to the operation of the switch.

6) If the switch input display does not change to ON/OFF, inspect the PTO switch, circuit, etc., and repair as necessary.

Procedure completion

⇒ Proceed to 6. External accelerator output voltage check

6. External accelerator output voltage check

1) Turn ON the ignition switch.

2) Operate the external accelerator and change the output voltage.

3) Check the output voltage of the external accelerator with a DMM.

Value: 0.3 to 0.5 V While idling

Value: 4.2 to 4.6 V Full throttle

4) If the output voltage is abnormal at this time, refer to DTC P253A and inspect the external accelerator, circuit, etc., and repair as necessary.

Refer to "*DTC P253A (Flash Code 28) PTO Sensor Circuit*" in this section.

Procedure completion

⇒ Proceed to 7. Neutral switch operation check

7. Neutral switch operation check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Place the gear in the neutral position.

4) Verify the Neutral Switch parameter shows ON/OFF on the scan tool according to the gear operations.

5) If the display does not show ON/OFF, inspect the neutral switch, circuit, etc., and repair as necessary.

Procedure completion

⇒ Proceed to 8. Accelerator switch check

8. Accelerator switch check

1) Operate the PTO to check if the driving accelerator and the external accelerator in the accelerator switching status are switched normally. Does the engine speed change normally using the driving accelerator or the external accelerator when the PTO is used?

Yes

⇒ Proceed to 10. Vehicle repair check

No

⇒ Proceed to 9. ECM replacement

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Vehicle repair check

10. Vehicle repair check

1) Restore the vehicle to its normal operating condition, and verify the repair.

Procedure completion

The system is normal.

DTC List

1. DTC List

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0016	A	DTC P0016 (Flash code 16) Crankshaft Position - Camshaft Position Correlation	● The CMP sensor signal pulses are detected. ● The CKP sensor signal pulses are detected. ● The battery voltage is 18 V or more. ● DTCs P0335, P0336, P0340, and P0341 are not set.	● The ECM detects that the CKP sensor signal and the CMP sensor signal are not synchronized while the engine is running.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P0087	B	DTC P0087 (Flash code 225) Fuel Rail/ System Pressure - Too Low DTC P0088 (Flash code 118) Fuel Rail/ System Pressure - Too High	● The ignition switch is ON. ● The engine is running. ● DTCs P0192, P0193, P060B, and P0641 are not set.	● The ECM detects that the fuel rail pressure is 170 MPa {24,600 psi} or more and the pressure limiter valve is activated.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B. ● The ECM limits the fuel injection quantity. ● The ECM stops the EGR control.
P0088	A	DTC P0088 (Flash code 118) Fuel Rail/ System Pressure - Too High	● The battery voltage is 16 V or more. ● The engine is running. ● DTCs P0192, P0193, P060B, and P0641 are not set.	● The ECM detects that the fuel rail pressure is 198 MPa {28,710 psi} or more for 5 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the upper limit of the fuel rail pressure. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0089	B	DTC P0089 (Flash code 151) Fuel Pressure Regulator Performance	● The battery voltage is 18 V or more. ● The engine is running. ● The engine coolant temperature is 60℃ {140℉} or more. ● DTCs P0192, P0193, P0335, P0336, P060B, and P0641 are not set.	● The ECM detects that the difference between the fuel rail pressure and the desired fuel rail pressure is more than a predetermined level during engine start-up.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B. ● The ECM limits the upper limit of the fuel rail pressure. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0091	A	DTC P0091 (Flash code 247) Fuel Pressure Regulator Control Circuit Low	● The battery voltage is 18 V or more. ● The engine is running. ● The CKP sensor signal pulses are detected. ● The CMP sensor signal pulses are detected.	● The ECM detects that the PCV 1 signal circuit voltage is excessively low for approximately 4 seconds or more when PCV 1 is OFF.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0092	A	DTC P0092 (Flash code 217) Fuel Pressure Regulator Control Circuit High	● The battery voltage is 18 V or more. ● The engine is running. ● The CKP sensor signal pulses are detected. ● The CMP sensor signal pulses are detected. ● DTC P0091 is not set.	● The ECM detects that the PCV 1 signal circuit voltage is excessively high for approximately 4 seconds or more when PCV 1 is ON.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0101	B	DTC P0101 (Flash code 92) Mass Air Flow Sensor Circuit Range/Performance	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P0102, P0103, P0112, P0113, P0116, P0117, P0118, P0234, P0404, P0409, P0560, P060B, P0641, P0651, P0697, P1247, P1248, P1249, P124A, P1404, P140A, P140B, P140C, P2227, P2228, and P2229 are not set. Also, the following conditions are met for 3 seconds or more. ● The engine speed is 1000 to 2000 rpm. ● The EGR control is commanded OFF. ● The engine run time is 5 seconds or more.	The ECM detects that the MAF sensor signal voltage is not within the predetermined range of the calculated MAF predicted value for 10 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B. ● The ECM inhibits the EGR control.
P0102	A	DTC P0102 (Flash code 91) Mass Air Flow Sensor Circuit Low Input	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P0560 and P060B are not set.	● The ECM detects that the MAF sensor signal voltage is 0.1 V or less for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity.
P0103	A	DTC P0103 (Flash code 91) Mass Air Flow Sensor Circuit High Input	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P0560 and P060B are not set.	● The ECM detects that the MAF sensor signal voltage is 4.9 V or more for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0112	A	DTC P0112 (Flash code 22) Intake Air Temperature Sensor Circuit Low	● The battery voltage is 18 V or more. ● DTCs P060B and P0651 are not set.	● The ECM detects that the IAT sensor signal voltage is 0.1 V or less for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default IAT value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.
P0113	A	DTC P0113 (Flash code 22) Intake Air Temperature Sensor Circuit High	● The battery voltage is 18 V or more. ● The engine run time is 3 minutes or more. ● DTCs P060B and P0651 are not set.	● The ECM detects that the IAT sensor signal voltage is 4.9 V or more for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default IAT value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.
P0116	B	DTC P0116 (Flash code 23) Engine Coolant Temperature Sensor Circuit Range/ Performance	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● The vehicle run time is more than 5 minutes with a vehicle speed of 4 km/h or more. ● The engine speed is 1000 rpm or more and the engine run time is more than 5 minutes. ● The accumulated fuel injection quantity since engine start-up is more than the threshold. ● DTCs P0117, P0118, P0201, P0202, P0203, P0204, P0205, P0206, P0500, P0502, P0503, P060B, P0697, P1261, P1262, P2146, and P2149 are not set.	● The ECM detects that the difference between the maximum and minimum engine coolant temperatures is less than 0.2 to 12℃ {1.8 to 22℉}.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B.
P0117	A	DTC P0117 (Flash code 23) Engine Coolant Temperature Sensor Circuit Low	● The battery voltage is 18 V or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the engine coolant temperature sensor signal voltage is 0.1 V or less for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default coolant temperature value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0118	A	DTC P0118 (Flash code 23) Engine Coolant Temperature Sensor Circuit High	● The battery voltage is 18 V or more. ● The engine run time is 5 seconds or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the engine coolant temperature sensor signal voltage is 4.8 V or more for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default coolant temperature value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.
P0182	A	DTC P0182 (Flash code 211) Fuel Temperature Sensor Circuit Low	● The battery voltage is 18 V or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the fuel temperature sensor signal voltage is 0.1 V or less for approximately 4 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default fuel temperature value.
P0183	A	DTC P0183 (Flash code 211) Fuel Temperature Sensor Circuit High	● The battery voltage is 18 V or more. ● The engine run time is 3 minutes or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the fuel temperature sensor signal voltage is 4.8 V or more for approximately 4 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default fuel temperature value.
P0192	A	DTC P0192 (Flash code 245) Fuel Rail Pressure Sensor Circuit Low	● The battery voltage is 18 V or more. ● DTCs P060B and P0641 are not set.	● The ECM detects that the fuel rail pressure sensor signal voltage is 0.7 V or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default fuel rail pressure value. ● The ECM limits the fuel injection quantity. ● The ECM limits the upper limit of the fuel rail pressure. ● The ECM inhibits the EGR control.
P0193	A	DTC P0193 (Flash code 245) Fuel Rail Pressure Sensor Circuit High	● The battery voltage is 18 V or more. ● DTCs P060B and P0641 are not set.	● The ECM detects that the fuel rail pressure sensor signal voltage is 4.75 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default fuel rail pressure value. ● The ECM limits the fuel injection quantity. ● The ECM limits the upper limit of the fuel rail pressure. ● The ECM inhibits the EGR control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0201	A	DTC P0201 (Flash code 271) Injector Circuit Open - Cylinder 1	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1261 and P2146 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0202	A	DTC P0202 (Flash code 272) Injector Circuit Open - Cylinder 2	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1261 and P2146 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0203	A	DTC P0203 (Flash code 273) Injector Circuit Open - Cylinder 3	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1261 and P2146 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0204	A	DTC P0204 (Flash code 274) Injector Circuit Open - Cylinder 4	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1262 and P2149 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0205	A	DTC P0205 (Flash code 275) Injector Circuit Open - Cylinder 5	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1262 and P2149 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0206	A	DTC P0206 (Flash code 276) Injector Circuit Open - Cylinder 6	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P1262 and P2149 are not set.	● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0217	D	DTC P0217 (Flash code 542) Engine Coolant Over Temperature Condition	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P0117, P0118, P060B, and P0697 are not set.	● The ECM detects that the engine coolant temperature is 108℃ {226 ℉} or more for 7.3 seconds.	● The ECM does not illuminate the MIL or SVS lamp. Refer to Action taken when DTC sets - Type D.
P0219	D	DTC P0219 (Flash code 543) Engine Overspeed Condition	● The battery voltage is 18 V or more.	● The ECM detects that the engine speed is 2700 rpm or more.	● The ECM does not illuminate the MIL or SVS lamp. Refer to Action taken when DTC sets - Type D.
P0234	A	DTC P0234 (Flash code 42) Turbocharger Overboost Condition	● The battery voltage is 18 V or more. ● The engine is running. ● DTCs P060B, P0697, P1247, P1248, P1249, and P124A are not set.	● The ECM detects an excessive boost pressure.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the VGS control. ● The ECM inhibits the EGR control.
P0237	A	DTC P0237 (Flash code 32) Turbocharger Boost Sensor Circuit Low	● The battery voltage is 18 V or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the boost pressure sensor signal voltage is 0.1 V or less for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default boost pressure value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.
P0238	A	DTC P0238 (Flash code 32) Turbocharger Boost Sensor Circuit High	● The battery voltage is 18 V or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the boost pressure sensor signal voltage is 4.9 V or more for approximately 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default boost pressure value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0299	B	DTC P0299 (Flash code 65) Turbocharger Underboost	● The ignition switch is ON. ● The engine speed is 1300 to 2000 rpm. ● The fuel injection quantity is more than or equal to the predetermined value. ● DTCs P0087, P0088, P0089, P0091, P0092, P0102, P0103, P0116, P0117, P0118, P0192, P0193, P0201, P0202, P0203, P0204, P0205, P0206, P0401, P0404, P0409, P0560, P060B, P0641, P0651, P0697, P1062, P1063, P1093, P1247, P1248, P1249, P124A, P1261, P1262, P1404, P140B, P140C, P2146, P2149, P2227, P2228, P2229, P2295, P2296, and P244A are not set.	● The ECM detects that the boost pressure is lower than a predetermined value for 5 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B.
P0335	A	DTC P0335 (Flash code 15) Crankshaft Position Sensor Circuit	● The battery voltage is 18 V or more. ● The engine is running. ● The CMP sensor signal pulses are detected. ● DTCs P0016, P0336, P0340, and P0341 are not set.	● The ECM detects that no CKP sensor signal pulse is generated while the engine is running.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default boost pressure value. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0336	A	DTC P0336 (Flash code 15) Crankshaft Position Sensor Circuit Range/Performance	● The battery voltage is 18 V or more. ● The engine is running. ● The CMP sensor signal pulses are detected. ● DTCs P0016, P0336, P0340, and P0341 are not set.	● The ECM detects that the CKP sensor signal pulse is not normal while the engine is running.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default boost pressure value. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0340	A	DTC P0340 (Flash code 14) Camshaft Position Sensor Circuit	● The battery voltage is 18 V or more. ● The engine is running. ● The CKP sensor signal pulses are detected. ● DTCs P0016, P0335, P0336, and P0341 are not set.	● The ECM detects that no CMP sensor signal pulse is generated while the engine is running.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0341	A	DTC P0341 (Flash code 14) Camshaft Position Sensor Circuit Range/Performance	● The engine is running. ● The CKP sensor signal pulses are detected. ● DTCs P0016, P0335, P0336, and P0340 are not set.	● The ECM detects that the CMP sensor signal pulse is not normal while the engine is running.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P0401	A	DTC P0401 (Flash code 93) EGR Flow Insufficient Detected	● The battery voltage is 16 V or more. ● The engine is idling. ● DTCs P0102, P0103, P0112, P0113, P0116, P0117, P0118, P0404, P0409, P0500, P0502, P0503, P0560, P060B, P0641, P0651, P0697, P1404, P140A, P140B, P2227, P2228, and P2229 are not set.	● The ECM detects that the difference between the EGR flow when the valve is open and the EGR flow when the valve is closed is less than the specified value.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity.
P0404	A	DTC P0404 (Flash code 45) EGR Control Circuit Range/ Performance	● The battery voltage is 16 V or more. ● The desired EGR position is stable. ● DTCs P0409, P060B, P0641, P0697, and P140B are not set.	● The ECM detects that when the EGR motor output is 90% or more, the difference between the desired EGR position and the EGR 1 opening angle is excessive for 10 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM inhibits the EGR control.
P0409	A	DTC P0409 (Flash code 44) EGR Sensor Circuit	● The battery voltage is 18 V or more. ● DTCs P060B and P0641 are not set.	● The ECM detects that the signals input from EGR position sensor 1 signals 1, 2, and 3 are all ON or all OFF for approximately 3 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM inhibits the EGR control.
P0477	A	DTC P0477 (Flash code 46) Exhaust Pressure Control Valve Low	● The battery voltage is 18 V or more. ● The ECM is commanding the exhaust brake ON.	● The ECM detects a low voltage condition in the exhaust brake solenoid valve control circuit for 3.2 seconds or more when the exhaust brake is commanded OFF.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the exhaust brake control.
P0478	A	DTC P0478 (Flash code 46) Exhaust Pressure Control Valve High	● The battery voltage is 18 V or more. ● The ECM is commanding the exhaust brake OFF.	● The ECM detects a high voltage condition in the exhaust brake solenoid valve control circuit for 3.2 seconds or more when the exhaust brake is commanded ON.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P0500	A	DTC P0500 (Flash code 25) Vehicle Speed Sensor	● The battery voltage is 18 V or more. ● The engine speed is 1000 rpm or more. ● The accelerator pedal is released when the engine speed is high. ● DTC P0219 is not set.	● The ECM detects that no vehicle speed signal has been generated for 7 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The vehicle speed is controlled to 10 km/h. ● The ECM limits the fuel injection quantity. ● The ECM stops the PTO control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0502	A	DTC P0502 (Flash code 25) Vehicle Speed Sensor Circuit Low Input	● The battery voltage is 21 V or more. ● DTC P060B is not set.	● The ECM detects that the vehicle speed signal voltage is 0.5 V or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The vehicle speed is controlled to 10 km/h. ● The ECM limits the fuel injection quantity. ● The ECM stops the PTO control.
P0503	A	DTC P0503 (Flash code 25) Vehicle Speed Sensor Circuit High Input	● The battery voltage is 21 V or more. ● DTC P060B is not set.	● The ECM detects that the vehicle speed signal voltage is 20 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The vehicle speed is controlled to 10 km/h. ● The ECM limits the fuel injection quantity. ● The ECM stops the PTO control.
P0560	A	DTC P0560 (Flash code 155) System Voltage	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTC P060B is not set.	Any of the following are met: ● The ECM detects a dropping resistor malfunction. ● The ECM detects a malfunction in the 12 V reference circuit between the MAF sensor and the ECM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P0563	C	DTC P0563 (Flash code 35) System Voltage High	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTC P060B is not set.	● The ECM detects that the voltage of the ignition power supply circuit is 32 V or more for 30 minutes.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.
P0571	C	DTC P0571 (Flash code 26) Brake Switch Circuit	● The battery voltage is 18 V or more.	● The ECM detects a correlation error between the stoplight switch 1 signal and the stoplight switch 2 signal 32 times.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.
P0601	A	DTC P0601 (Flash code 53) Internal Control Module Memory Check Sum Error	● The battery voltage is 16 V or more. ● The ignition switch is ON.	● The ECM detects that the calculated checksum does not match the checksum stored in the ROM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM limits the upper limit of the fuel rail pressure.
P0602	C	DTC P0602 (Flash code 154) Control Module Programming Error	● The battery voltage is 16 V or more.	Any of the following are met: ● The ECM detects that the fuel delivery rate and the Injector ID Code are not programmed. ● The ECM detects an error in the programmed Injector ID Code.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0604	A	DTC P0604 (Flash code 153) Internal Control Module RAM Error	-	● The ECM detects a malfunction inside the RAM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits pre-injection. ● The ECM stops the engine. (The engine is ready to start after the ignition switch is turned OFF for 10 seconds or more.)
P0606	A	DTC P0606 (Flash code 51) ECM Processor	● The battery voltage is 16 V or more. ● The ignition switch is ON.	● The ECM detects a malfunction inside the main CPU or the sub integrated circuit.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The engine does not start when the main CPU malfunctions.
P060B	A	DTC P060B (Flash code 36) Internal Control Module A/D Processing Performance	● The battery voltage is 18 V or more.	● The ECM detects a malfunction inside the A/D converter.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM limits the upper limit of the fuel rail pressure. ● The ECM inhibits the VGS control. ● The ECM inhibits the EGR control.
P0641	A	DTC P0641 (Flash code 55) Sensor Reference Voltage 1 Circuit	● The battery voltage is 16 V or more.	● The ECM detects that the voltage of 5 V reference circuit 1 or 6 is 4.5 V or less, or 5.5 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM limits the upper limit of the fuel rail pressure.
P0650	A	DTC P0650 (Flash code 77) Malfunction Indicator Light (MIL) Control Circuit	● The battery voltage is 18 V or more. ● The ignition switch is ON.	Any of the following are met: ● The ECM detects a low voltage condition in the MIL control circuit when the light is commanded OFF. ● The ECM detects a high voltage condition in the MIL control circuit when the light is commanded ON.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P0651	A	DTC P0651 (Flash code 56) Sensor Reference Voltage 2 Circuit	● The battery voltage is 16 V or more. ● DTC P060B is not set.	● The ECM detects that the voltage of 5 V reference circuit 2 or 5 is 4.5 V or less, or 5.5 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the VGS control. ● The ECM inhibits the EGR control.
P0685	C	DTC P0685 (Flash code 416) ECM Power Relay Control Circuit Open	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTC P060B is not set.	● The ECM detects a low voltage condition in the relay voltage supply circuit for approximately 3 seconds when the ECM main relay is commanded ON.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.
P0687	C	DTC P0687 (Flash code 416) ECM Power Relay Control Circuit High	● The battery voltage is 18 V or more. ● 5 seconds have passed since the ignition switch was turned OFF. ● DTC P0606 is not set.	● When the ECM main relay is commanded OFF, the ECM detects that the ECM main relay is still ON.	● The ECM illuminates the SVS lamp the next time the ignition switch is turned ON. Refer to Action taken when DTC sets - Type C.
P0697	A	DTC P0697 (Flash code 57) Sensor Reference Voltage 3 Circuit	● The battery voltage is 16 V or more. ● DTC P060B is not set.	● The ECM detects that the voltage of 5 V reference circuit 3 or 4 is 4.5 V or less, or 5.5 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the VGS control. ● The ECM inhibits the EGR control.
P1062	A	DTC P1062 (Flash code 257) Fuel Pressure Regulator 1 Solenoid Control Circuit	● The battery voltage is 18 V or more.	● The ECM detects a failure in the PCV 1 drive circuit.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P1063	A	DTC P1063 (Flash code 258) Fuel Pressure Regulator 2 Solenoid Control Circuit	● The battery voltage is 18 V or more.	● The ECM detects a failure in the PCV 2 drive circuit.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P1093	B	DTC P1093 (Flash code 227) Fuel Rail Pressure Too Low	● The battery voltage is 18 V or more. ● The engine is running. ● The coolant temperature is 60℃ {132℉} or more. ● DTCs P0087, P0091, P0092, P0192, P0193, P0335, P0336, P060B, P0641, P1062, P1063, P2295, and P2296 are not set.	● The ECM detects that the actual fuel rail pressure is less than the desired fuel rail pressure by 50 MPa {7,250 psi} or more for 5 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P1247	A	DTC P1247 (Flash code 411) Turbocharger Boost Control Solenoid Circuit 1	● The battery voltage is 18 V or more. ● DTC P124A is not set.	Any of the following are met: ● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 1 for 3 seconds. ● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 1 for 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM stops the EGR control.
P1248	A	DTC P1248 (Flash code 412) Turbocharger Boost Control Solenoid Circuit 2	● The battery voltage is 18 V or more. ● DTC P124A is not set.	Any of the following are met: ● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 2 for 3 seconds. ● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 2 for 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM stops the EGR control.
P1249	A	DTC P1249 (Flash code 413) Turbocharger Boost Control Solenoid Circuit 3	● The battery voltage is 18 V or more. ● DTC P124A is not set.	Any of the following are met: ● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 3 for 3 seconds. ● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 3 for 3 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM stops the EGR control.
P124A	A	DTC P124A (Flash code 415) Turbocharger Boost Control Solenoid Relay Circuit	● The battery voltage is 18 V or more.	● The ECM detects an abnormal VGS relay operation voltage.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the EGR control. ● The ECM stops the VGS control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P1261	A	DTC P1261 (Flash code 34) Injector Positive Voltage Control Circuit Group 1	● The battery voltage is 18 V or more. ● The ignition switch is ON.	● The ECM detects an open circuit in the injector charge-up circuit of common power supply 1 in the ECM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P1262	A	DTC P1262 (Flash code 34) Injector Positive Voltage Control Circuit Group 2	● The battery voltage is 18 V or more. ● The ignition switch is ON.	● The ECM detects an open circuit in the injector charge-up circuit of common power supply 2 in the ECM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P1404	A	DTC P1404 (Flash code 45) EGR Position Fault	● The ignition switch is OFF. ● DTCs P0404, P0409, P0500, P0502, P0503, P060B, P0641, P0697, P140A, and P140B are not set.	● The ECM detects that the EGR zero position counter is 31 or more or 5 or less when the ignition switch is OFF.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P140A	A	DTC P140A (Flash code 345) EGR 2 Performance	● The battery voltage is 18 V or more. ● The desired EGR position is stable. ● DTCs P0409, P060B, P0641, P0697, and P140B are not set.	● The ECM detects that when the EGR motor output is 90% or more, the difference between the desired EGR position and the EGR 2 opening angle is excessive for 10 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM inhibits the EGR control.
P140B	A	DTC P140B (Flash code 344) EGR 2 Position Sensor Performance	● The battery voltage is 18 V or more. ● DTCs P060B and P0697 are not set.	● The ECM detects that the signals input from EGR position sensor 2 signals 1, 2, and 3 are all ON or all OFF for approximately 3 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM inhibits the EGR control.
P140C	A	DTC P140C (Flash code 345) EGR 2 Closed Position Performance	● The battery voltage is 18 V or more. ● The ignition switch is OFF. ● DTCs P0404, P0409, P0500, P0502, P0503, P060B, P0641, P0697, P140A, and P140B are not set.	● The ECM detects that the EGR zero position counter is 31 or more or 5 or less when the ignition switch is OFF.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P1621	A	DTC P1621 (Flash code 54) Control Module Long Term Memory Performance	● The battery voltage is 18 V or more.	● The ECM detects that the calculated checksum does not match the checksum stored in the EEPROM.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P1664	C	DTC P1664 (Flash code 76) Service Vehicle Soon Lamp Control Circuit	● The battery voltage is 18 V or more. ● The ignition switch is ON.	Any of the following are met: ● The ECM detects a low voltage condition in the SVS lamp control circuit when the SVS lamp is commanded OFF. ● The ECM detects a high voltage condition in the SVS lamp control circuit when the SVS lamp is commanded ON.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.
P2122	A	DTC P2122 (Flash code 121) Pedal Position Sensor 1 Circuit Low Input	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0641 are not set.	● The ECM detects that the accelerator pedal position sensor 1 signal voltage is 0.2 V or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the exhaust brake control.
P2123	A	DTC P2123 (Flash code 121) Pedal Position Sensor 1 Circuit High Input	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0641 are not set.	● The ECM detects that accelerator pedal position sensor 1 signal voltage is 4.9 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the exhaust brake control.
P2127	A	DTC P2127 (Flash code 122) Pedal Position Sensor 2 Circuit Low Input	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0651 are not set.	● The ECM detects that the accelerator pedal position sensor 2 signal voltage is 0.2 V or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the exhaust brake control.
P2128	A	DTC P2128 (Flash code 122) Pedal Position Sensor 2 Circuit High Input	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0651 are not set.	● The ECM detects that accelerator pedal position sensor 2 signal voltage is 4.9 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the exhaust brake control.
P2138	A	DTC P2138 (Flash code 124) Pedal Position Sensor 1 - 2 Voltage Correlation	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B, P0641, P0651, P2122, P2123, P2127, and P2128 are not set.	● The ECM detects that accelerator pedal position sensors 1 and 2 deviate from the range by 45% or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM stops the PTO control. ● The ECM stops the exhaust brake control.
P2146	A	DTC P2146 (Flash code 158) Fuel Injector Group 1 Supply Voltage Circuit	● The battery voltage is 18 V or more. ● The engine is running. ● DTC P0201, P0202, or P0203 is not set.	● The ECM detects that there is an open circuit, a short to ground or a short to the power supply circuit in the injector charge voltage circuit of common power supply 1, or that there is a short to ground in the injector solenoid coil control circuit of cylinder No. 1, 2, or 3 for 3 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P2149	A	DTC P2149 (Flash code 159) Fuel Injector Group 2 Supply Voltage Circuit	● The battery voltage is 18 V or more. ● The engine is running. ● DTC P0204, P0205, or P0206 is not set.	● The ECM detects that there is an open circuit, a short to ground or a short to the power supply circuit in the injector charge voltage circuit of common power supply 2, or that there is a short to ground in the injector solenoid coil control circuit of cylinder No. 4, 5, or 6 for 3 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P2227	B	DTC P2227 (Flash code 71) Barometric Pressure Sensor Circuit Range/Performance	● The battery voltage is 18 V or more. ● The engine speed is 400 to 500 rpm. ● The fuel injection quantity is less than or equal to the predetermined value. ● The accelerator pedal is not depressed. ● The vehicle speed is 0 km/h. ● DTCs P0102, P0103, P0116, P0117, P0118, P0500, P0502, P0503, P0560, P060B, P0651, P0697, P2227, P2228, and P2229 are not set.	● The ECM detects that the difference between the barometric pressure and the boost pressure is 19 kPa {2.8 psi} or more, or 12 kPa {1.7 psi} or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B.
P2228	A	DTC P2228 (Flash code 71) Barometric Pressure Sensor Circuit Low	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0651 are not set.	● The ECM detects that the barometric pressure sensor signal voltage is 0.5 V or less for approximately 5 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default barometric pressure value. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.
P2229	A	DTC P2229 (Flash code 71) Barometric Pressure Sensor Circuit High	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0651 are not set.	● The ECM detects that the barometric pressure sensor signal voltage is 4.0 V or less for approximately 5 seconds.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM assumes a default barometric pressure value. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control. ● The ECM inhibits the VGS control.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P2295	A	DTC P2295 (Flash code 248) Fuel Pressure Regulator 2 Control Circuit Low	● The battery voltage is 18 V or more. ● The engine is running. ● The CKP sensor signal pulses are detected. ● The CMP sensor signal pulses are detected.	● The ECM detects that the PCV 2 signal circuit voltage is excessively low for approximately 4 seconds or more when PCV 2 is OFF.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P2296	A	DTC P2296 (Flash code 218) Fuel Pressure Regulator 2 Control Circuit High	● The battery voltage is 18 V or more. ● The engine is running. ● The CKP sensor signal pulses are detected. ● The CMP sensor signal pulses are detected. ● DTC P2295 is not set.	● The ECM detects that the PCV 2 signal circuit voltage is excessively high for approximately 4 seconds or more when PCV 2 is ON.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A. ● The ECM limits the fuel injection quantity. ● The ECM inhibits the EGR control.
P244A	B	DTC P244A (Flash code 142) Diesel Oxidation Catalyst (DOC) Exhaust Pressure Too Low	● The battery voltage is 18 V or more. ● The fuel injection quantity is more than or equal to the predetermined value. ● DTCs P0102, P0103, P0112, P0113, P0560, P060B, P0651, P0697, P2454, and P2455 are not set.	● The ECM detects that the exhaust differential pressure is less than the predetermined value for 30 seconds or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B.
P244B	A	DTC P244B (Flash code 141) Diesel Oxidation Catalyst (DOC) Exhaust Pressure Too High	● Condition for running the DTC ● The battery voltage is 18 V or more. ● The engine speed is 2000 rpm or more. ● DTCs P060B, P0697, P2454, and P2455 are not set.	● The ECM detects that the exhaust differential pressure is 60 kPa {8.7 psi} or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P2454	A	DTC P2454 (Flash code 47) Exhaust Pressure Sensor Circuit Low	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0697 are not set.	● The ECM detects that the exhaust differential pressure sensor signal voltage is 0.2 V or less.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.
P2455	A	DTC P2455 (Flash code 47) Exhaust Pressure Sensor Circuit High	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0697 are not set.	● The ECM detects that the exhaust differential pressure sensor signal voltage is 4.9 V or more.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

DTC	DTC Type	DTC title	Condition for running the DTC	Condition for setting the DTC	Action taken when DTC sets
P253A	C	DTC P253A (Flash code 28) PTO Sensor Circuit	● The battery voltage is 18 V or more. ● The ignition switch is ON. ● DTCs P060B and P0641 are not set.	● The ECM detects that the PTO accelerator sensor signal voltage is 4.8 V or more.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C. ● The ECM disables the PTO accelerator sensor control.
P256A	C	DTC P256A (Flash code 31) Engine Idle Speed Selector Sensor	● The battery voltage is 18 V or more. ● The ignition switch is ON.	● The ECM detects that the signal input on both the Up side and Down side of the idling control switch is ON at the same time.	● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.
U0073	A	DTC U0073 (Flash code 84) Control Module Communication Bus Off	● The battery voltage is 18 V or more.	● The ECM detects a malfunction in the J1939 CAN communication circuit.	● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

DTC type definitions

1. DTC type definitions

There are 4 DTC types: Type A, B, C, and D. Among these DTCs, type A and B DTCs are related to emission whereas type C and D DTCs are related to items other than emission.

1. Action taken when DTC sets - Type A

● The ECM illuminates the malfunction indicator light (MIL).

● The ECM records the operating conditions when the diagnostic runs and fails. The ECM stores this information in the Freeze Frame/Failure Records.

2. Action taken when DTC sets - Type B

● The ECM illuminates the MIL on the second consecutive driving cycle.

● The ECM records the operating conditions when the diagnostic runs and fails. The first time the diagnostic runs and fails, the ECM stores this information in the Failure Records. If the diagnostic reports a failure on the second consecutive driving cycle, the ECM records the operating conditions at the time of failure and stores this information in the Freeze Frame and updates the Failure Records.

3. Condition for clearing the MIL/DTC - Type A or Type B

● The ECM turns OFF the MIL after 3 consecutive driving cycles that the diagnostic runs and does not fail.

● A current DTC is cleared when the diagnostic runs and passes.

● A history DTC clears after 40 consecutive warm-up cycles if no failures are reported.

● Clear the MIL and the DTC with a scan tool.

4. Action taken when DTC sets - Type C

● The ECM illuminates the service vehicle soon (SVS) lamp when the diagnostic runs and fails.

● The ECM records the operating conditions when the diagnostic runs and fails. The ECM stores this information in the Failure Records.

5. Condition for clearing the SVS lamp/DTC - Type C

● The ECM turns OFF the SVS lamp after 1 driving cycle that the diagnostic runs and does not fail.

● A current DTC is cleared when the diagnostic runs and passes.

● A history DTC clears after 40 consecutive warm-up cycles if no failures are reported.

● Clear the SVS lamp and the DTC with a scan tool.

6. Action taken when DTC sets - Type D

● The ECM does not illuminate the MIL or SVS lamp.

● The ECM records the operating conditions when the diagnostic runs and fails. The ECM stores this information in the Failure Records.

7. Condition for clearing the DTC - Type D

● A current DTC is cleared when the diagnostic runs and passes.

● A history DTC clears after 40 consecutive warm-up cycles if no failures are reported.

● Clear the DTC with a scan tool.

DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation

1. DTC P0016 DTC information

1. DTC P0016 description

The CKP sensor is installed to the flywheel housing. The sensor rotor is fixed on the flywheel. There are 56 notches spaced 6° apart and a 30° opening. Top dead center (TDC) of cylinder No. 1 can be detected through this opening. The CMP sensor is installed to the supply pump. The CMP sensor detects the camshaft rotation in the supply pump. The ECM determines compression top dead center of cylinder No. 1 by detecting the opening of the sensor rotor with the CKP sensor and one reference projection with the CMP sensor. If the ECM detects that both signals are out of synchronization, the DTC is set.

2. Condition for setting DTC P0016

Condition for running the DTC

● CMP sensor signal pulses are detected.

● CKP sensor signal pulses are detected

● The battery voltage is 18V or more.

● DTCs P0335, P0336, P0340, and P0341 are not set.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the CKP sensor signal and the CMP sensor signal are not synchronized while the engine is running.

3. Action taken when DTC P0016 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "DTC type definitions" in this section.

4. Condition for clearing DTC P0016

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0016 diagnostics

Note:

● This DTC is set resulting from a mechanical system malfunction, such as an improperly installed timing gear.

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine. If the engine does not start, crank the engine for 10 seconds.

4) Observe the DTC information with a scan tool. Is DTC P0335, P0336, P0340, or P0341 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

No

⇒ Proceed to 3. CKP sensor and CMP sensor inspection

3. CKP sensor and CMP sensor inspection

1) Inspect the CKP sensor and the CMP sensor for the following conditions.

● Damage to the sensor

● Loose or improperly installed sensor

● Excessive gap

● Foreign material passes through the gap between the sensor and the sensor rotor or between the sensor and the camshaft gear.

● Damage to the sensor rotor or camshaft gear

● Loose or improperly installed sensor rotor or camshaft gear

2) Inspect the installation status of the timing gear and the supply pump.

3) Repair or replace as necessary.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine. If the engine does not start, crank the engine for 10 seconds.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0087 (Flash Code 225) Fuel Rail/System Pressure - Too Low

1. DTC P0087 DTC information

1. DTC P0087 description

The fuel rail system is composed of 2 fuel pressure sections. A suction side between the fuel tank and the fuel supply pump, and a high pressure side between the fuel supply pump and the injectors. Fuel is drawn from the fuel tank and then supplied to the fuel rail by the 2 plungers located inside the supply pump. The fuel rail pressure is controlled by the ECM, which controls the FRP regulator based on signals from the fuel rail pressure sensor. If the fuel rail pressure becomes excessively high, the fuel rail pressure limiter valve opens to release the excessive pressure and returns the fuel to the fuel tank. The ECM sets this DTC if the fuel rail pressure sharply decreases after the pressure goes excessively high. This DTC detects activation of the pressure limiter valve.

2. Condition for setting DTC P0087

Condition for running the DTC

● The ignition switch is ON.

● The engine is running.

● DTCs P0192, P0193, P060B, and P0641 are not set.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel rail pressure is 170 MPa {24,600 psi} or more and the pressure limiter valve is activated.

3. Action taken when DTC P0087 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM stops the EGR control.

4. Condition for clearing DTC P0087

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P0087 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0088, P0089, P0091, P0092, P0192, P0193, P0201, P0202, P0203, P0204, P0205, P0206, P2146, or P2149 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0088 (Flash Code 118) Fuel Rail/System Pressure - Too High*" in this section.

Refer to "*DTC P0089 (Flash Code 151) Fuel Pressure Regulator Performance*" in this section.

Refer to "*DTC P0091 (Flash Code 247) Fuel Pressure Regulator Control Circuit Low*" in this section.

Refer to "*DTC P0092 (Flash Code 217) Fuel Pressure Regulator Control Circuit High*" in this section.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P0201 (Flash Code 271) Injector Circuit Open - Cylinder 1*" in this section.

Refer to "*DTC P0202 (Flash Code 272) Injector Circuit Open - Cylinder 2*" in this section.

Refer to "*DTC P0203 (Flash Code 273) Injector Circuit Open - Cylinder 3*" in this section.

Refer to "*DTC P0204 (Flash Code 274) Injector Circuit Open - Cylinder 4*" in this section.

Refer to "*DTC P0205 (Flash Code 275) Injector Circuit Open - Cylinder 5*" in this section.

Refer to "*DTC P0206 (Flash Code 276) Injector Circuit Open - Cylinder 6*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

No

⇒ Proceed to 3. DTC check when revving engine

3. DTC check when revving engine

1) Turn OFF the ignition switch.

2) Place the shift lever in the neutral position and apply the parking brake.

3) Start the engine.

4) While observing the DTC information with a scan tool, repeatedly depress the accelerator pedal from idle to full throttle to rev the engine. Is a DTC set?

Yes

⇒ Proceed to 4. Fuel rail pressure sensor signal voltage check

No

An intermittent problem due to foreign object in the fuel can be suspected.

Replace the fuel filter element.

⇒ Proceed to 13. Repair verification

4. Fuel rail pressure sensor signal voltage check

1) Turn OFF the ignition switch.

2) Wait for 2 minute to reduce the fuel pressure of the fuel rail.

3) Turn ON the ignition switch.

4) Observe the Fuel Rail Pressure Sensor parameter on the scan tool. Is the Fuel Rail Pressure Sensor parameter within the

specified range?

Value: 0.9 to 1.0 V

Yes

⇒ Proceed to 5. Injector inspection using scan tool

No

⇒ Proceed to 12. Fuel rail pressure sensor circuit inspection

5. Injector inspection using scan tool

1) Start the engine.

2) Perform the Cylinder Balance Test with a scan tool.

3) Command each injector OFF and verify the engine speed changes for each injector. Are there any injectors that do not change the engine speed when commanded OFF?

Yes

Replace the injectors that do not change.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 13. Repair verification

No

⇒ Proceed to 6. High-pressure side fuel piping inspection

6. High-pressure side fuel piping inspection

1) Inspect that the fuel piping between the fuel tank and the fuel supply pump is properly connected, there are no cuts or cracks in the fuel hoses, and proper clamps are used. Is the result normal?

Note:

● The fuel piping between the fuel tank and the fuel supply pump is slightly vacuumed when the engine is running. Therefore, if the piping is not connected securely, air can get inside. If the engine speed or the engine load increases while air has entered the fuel system, fluctuation in the fuel rail pressure occurs, and this DTC may be set.

2) Operate the priming pump until the force required for pressing increases.

Note:

● When a leak exists in the fuel system between the primping pump and fuel supply pump, the pushing weight of the priming pump does not get heavy.

3) Start the engine.

4) Inspect the high-pressure side of the fuel system and check for any fuel leakage between the fuel supply pump and the fuel rail. Is the result normal?

Note:

● Check for fuel leakage from the high pressure piping inlet to the bottom of the cylinder head cover. If a fuel leakage exists, the engine oil level will rise. Inspect the engine oil for fuel contamination.

Yes

⇒ Proceed to 7. DTC check during fuel supply

No

Repair as necessary.

⇒ Proceed to 13. Repair verification

7. DTC check during fuel supply

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch.

3) Perform a test run while supplying fuel with other piping connected to the fuel supply pump inlet. Replace the fuel hoses with transparent hoses at this time and visually inspect whether air is contained.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 8. Fuel pressure verification

No

⇒ Proceed to 9. Suction side return fuel piping inspection

8. Fuel pressure verification

1) Turn ON the ignition switch.

2) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool.

3) Start the engine.

4) While observing the Fuel Rail Pressure (FRP) parameter on the scan tool, repeatedly depress the accelerator pedal from idle to full throttle to rev the engine. Are the Fuel Rail Pressure (FRP) parameters for when the engine is stopped, when the engine is idling, and when revving the engine equal to the specified values?

Value: -30 MPa { -4,350 psi } When the engine is stopped

Value: -5 to 5 MPa { -725 to 725 psi } When idling the engine, when revving the engine

Yes

⇒ Proceed to 10. Suction side feed fuel piping inspection

No

⇒ Proceed to 11. PCV circuit inspection

9. Suction side return fuel piping inspection

1) Inspect for damage or twisting in the fuel system between the fuel supply pump and the fuel tank. Is the result normal?

2) If possible, inspect for foreign material in the fuel tank or for foreign material that may cause clogging of the fuel. Is the result normal?

3) Are all of the results normal?

Yes

Replace the fuel filter.

⇒ Proceed to 13. Repair verification

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

10. Suction side feed fuel piping inspection

1) Inspect for clogging in the fuel system between the fuel tank and the fuel supply pump, for a cut or a crack in the fuel hoses, and if proper clamps are used. Is the result normal?

Yes

⇒ Proceed to 11. PCV circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

11. PCV circuit inspection

1) Inspect for poor connections at the PCV harness connector (pins 1 and 2 of E44 and E43). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 17, 25, 30, and 31 of F40). Is the connection status normal?

3) Inspect for high resistance between the ECM (pins 17, 25, 30, and 31 of F40) and the PCV (pins 1 and 2 of E44 and E43). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the fuel supply pump and the fuel filter.

Note:

● If the fuel supply pump is replaced, the fuel filter must be replaced at the same time.

⇒ Proceed to 13. Repair verification

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 13. Repair verification

12. Fuel rail pressure sensor circuit inspection

1) Inspect for poor connections at the fuel rail pressure sensor harness connector (pins 1, 2, and 3 of E42). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 46, 57, 60, and 61 of F41). Is the connection status normal?

3) Inspect for high resistance in the circuit between the ECM (pins 46, 57, 60, and 61 of F41) and the fuel rail pressure sensor (pins 1, 2, and 3 of E42). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the fuel rail pressure sensor.

⇒ Proceed to 13. Repair verification

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 13. Repair verification

13. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0088 (Flash Code 118)Fuel Rail/System Pressure - Too High

1. DTC P0088 DTC information

1. DTC P0088 description

The fuel rail pressure sensor is installed to the fuel rail and detects the fuel rail pressure. If the fuel rail pressure changes according to the engine condition, the output voltage of the fuel rail pressure sensor changes. If the fuel rail pressure is low, the output voltage becomes low, and if the pressure is high, the output voltage becomes high. The ECM interprets this output voltage as an actual fuel rail pressure and uses it for control. The sensor 5 V reference, signal, and low reference circuits of the fuel rail pressure sensor are dedicated circuits and are connected to the ECM. Also, the sensor circuit is shielded to prevent intrusion of electronic noise, etc.

2. Condition for setting DTC P0088

Condition for running the DTC

● The battery voltage is 16 V or more.

● The engine is running.

● DTCs P0192, P0193, P060B, and P0641 are not set.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel rail pressure is 198 MPa {28,710 psi} or more for 5 seconds or more.

3. Action taken when DTC P0088 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the upper limit of the fuel rail pressure.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0088

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0088 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Bleed the air.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0088 set?

Yes

⇒ Proceed to 4. Fuel rail pressure sensor harness connector inspection

No

⇒ Proceed to 3. ECM harness connector inspection

3. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 46, 57, 60, and 61 of F41). Is the connection status normal?

Refer to "Engine Control".

Yes

Go to Intermittent conditions.

No

Repair the connection as necessary.

⇒ Proceed to 21. Repair verification

4. Fuel rail pressure sensor harness connector inspection

1) Inspect for poor connections at the fuel rail pressure sensor harness connector (pins 1, 2, and 3 of E42). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Fuel supply pump inspection

No

Repair the connection as necessary.

⇒ Proceed to 21. Repair verification

5. Fuel supply pump inspection

1) Inspect the installation status of the fuel supply pump. Is the installation status normal?

Yes

⇒ Proceed to 6. Fuel pipe and fuel filter inspection

No

Repair as necessary.

⇒ Proceed to 21. Repair verification

6. Fuel pipe and fuel filter inspection

1) Inspect for any abnormal conditions such as collapsing or clogging in all fuel pipes, and for any abnormal conditions in the fuel filters, etc. Is the result normal?

Yes

⇒ Proceed to 7. Cylinder injection correction amount check

No

Repair or replace as necessary.

⇒ Proceed to 21. Repair verification

7. Cylinder injection correction amount check

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the Fuel Compensation parameter for each cylinder on the scan tool. Is the Fuel Compensation parameter within the normal range?

Specified value: -4 - 4 mm3/st

Yes

⇒ Proceed to 8. Fuel rail pressure check

No

Inspect and clean the injectors of the applicable cylinders, and replace as necessary.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 21. Repair verification

8. Fuel rail pressure check

1) Turn OFF the ignition switch for at least 30 seconds.

2) Turn ON the ignition switch.

3) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool. Is the Fuel Rail Pressure (FRP) parameter equal to the specified value?

Value: about 0 MPa { about 0 psi }

Yes

⇒ Proceed to 12. Fuel rail pressure check when idling

No

⇒ Proceed to 9. Fuel rail pressure sensor 5 V reference voltage check

9. Fuel rail pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel rail pressure sensor harness connector (E42).

3) Turn ON the ignition switch.

4) Measure the voltage between the fuel rail pressure sensor 5 V reference circuit (pin 61 of F41) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "Engine Control".

Value: 5 V

Yes

⇒ Proceed to 12. Fuel rail pressure check when idling

No

⇒ Proceed to 10. Inspection for open circuit and short circuit in fuel rail pressure sensor circuit

10. Inspection for open circuit and short circuit in fuel rail pressure sensor circuit

1) Inspect between the fuel rail pressure sensor (pins 1, 2, and 3 of E42) and the ECM (pins 46, 57, 60, and 61 of F41) for an open circuit or a short circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. Follow-up fuel rail pressure check

No

Repair or replace as necessary.

⇒ Proceed to 21. Repair verification

11. Follow-up fuel rail pressure check

1) Turn ON the ignition switch.

2) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool. Is the Fuel Rail Pressure (FRP) parameter equal to the specified value?

Value: about 0 MPa { about 0 psi }

Yes

⇒ Proceed to 12. Fuel rail pressure check when idling

No

⇒ Proceed to 14. Fuel rail pressure sensor inspection

12. Fuel rail pressure check when idling

1) Start the engine.

2) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool. Is the Fuel Rail Pressure (FRP) parameter more than or equal to the specified value?

Value: 0 MPa { 0 psi }

Yes

⇒ Proceed to 13. Fuel rail pressure check during accelerator pedal operation

No

⇒ Proceed to 14. Fuel rail pressure sensor inspection

13. Fuel rail pressure check during accelerator pedal operation

1) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool while operating the accelerator pedal. Does the Fuel Rail Pressure (FRP) parameter change?

● When the accelerator pedal is depressed, it changes to the positive side.

● When the accelerator pedal is released, it changes to the negative side.

Yes

Go to Intermittent conditions.

No

⇒ Proceed to 14. Fuel rail pressure sensor inspection

14. Fuel rail pressure sensor inspection

1) Inspect for dirt, etc., attached to the fuel rail pressure sensor. Is the result normal?

Yes

⇒ Proceed to 15. Fuel pipe and fuel filter follow-up inspection

No

Replace the fuel rail pressure sensor.

⇒ Proceed to 21. Repair verification

15. Fuel pipe and fuel filter follow-up inspection

1) Inspect for any abnormal conditions such as collapsing or clogging in all fuel pipes, and for any abnormal conditions in the fuel filters, etc. Is the result normal?

Yes

⇒ Proceed to 16. Fuel supply pump operation check

No

Repair or replace as necessary.

⇒ Proceed to 21. Repair verification

16. Fuel supply pump operation check

1) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool while operating the accelerator pedal. Does the Fuel Rail Pressure (FRP) parameter change?

● When the accelerator pedal is depressed, it changes to the positive side.

● When the accelerator pedal is released, it changes to the negative side.

Yes

⇒ Proceed to 17. Pressure limiter operation check

No

Replace the fuel supply pump.

⇒ Proceed to 21. Repair verification

17. Pressure limiter operation check

1) Bleed the air.

2) Reconnect all of the disconnected harness connectors.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is DTC P0088 set?

Yes

Replace the pressure limiter.

⇒ Proceed to 18. Pressure limiter signal input check

No

⇒ Proceed to 21. Repair verification

18. Pressure limiter signal input check

1) Bleed the air.

2) Reconnect all of the disconnected harness connectors.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is DTC P0088 set?

Yes

⇒ Proceed to 19. ECM power supply and ground circuit inspection

No

⇒ Proceed to 21. Repair verification

19. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 20. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 2. Current DTC check

20. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 21. Repair verification

21. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0089 (Flash Code 151) Fuel Pressure Regulator Performance

1. DTC P0089 DTC information

1. DTC P0089 description

The fuel rail pressure sensor is installed to the fuel rail and detects the fuel rail pressure. If the fuel rail pressure changes according to the engine condition, the output voltage of the fuel rail pressure sensor changes. If the fuel rail pressure is low, the output voltage becomes low, and if the pressure is high, the output voltage becomes high. The ECM interprets this output voltage as an actual fuel rail pressure and uses it for control. The sensor 5 V reference, signal, and low reference circuits of the fuel rail pressure sensor are dedicated circuits and are connected to the ECM. Also, the sensor circuit is shielded to prevent intrusion of electronic noise, etc.

2. Condition for setting DTC P0089

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● The engine coolant temperature is 60℃ {140℉} or more.

● DTCs P0192, P0193, P0335, P0336, P060B, and P0641 are not set.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the difference between the fuel rail pressure and the desired fuel rail pressure is excessively large during engine start-up.

3. Action taken when DTC P0089 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the upper limit of the fuel rail pressure.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0089

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "DTC type definitions" in this section.

2. DTC P0089 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Bleed the air.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is DTC P0089 set?

Yes

⇒ Proceed to 3. Fuel rail pressure sensor harness connector inspection

No

Go to Intermittent conditions.

3. Fuel rail pressure sensor harness connector inspection

1) Inspect for poor connections at the fuel rail pressure sensor harness connector (pins 1, 2, and 3 of E42). Is the connection status normal?

Refer to "Engine Control".

Yes

⇒ Proceed to 4. Fuel supply pump inspection

No

Repair the connection as necessary.

⇒ Proceed to 16. Repair verification

4. Fuel supply pump inspection

1) Inspect the installation status of the fuel supply pump. Is the installation status normal?

Yes

⇒ Proceed to 5. Fuel pipe and fuel filter inspection

No

Repair as necessary.

⇒ Proceed to 16. Repair verification

5. Fuel pipe and fuel filter inspection

1) Inspect for any abnormal conditions such as collapsing or clogging in all fuel pipes, and for any abnormal conditions in the fuel filters, etc. Is the result normal?

Yes

⇒ Proceed to 6. Cylinder injection correction amount check

No

Repair or replace as necessary.

⇒ Proceed to 16. Repair verification

6. Cylinder injection correction amount check

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the Fuel Compensation parameter for each cylinder on the scan tool. Is the Fuel Compensation parameter within the normal range?

Specified value: -4 - 4 mm^3/st

Yes

⇒ Proceed to 7. Fuel rail pressure check during accelerator pedal operation

No

Inspect and clean the injectors of the applicable cylinders, and replace as necessary.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 16. Repair verification

7. Fuel rail pressure check during accelerator pedal operation

1) Turn OFF the ignition switch for at least 30 seconds.

2) Turn ON the ignition switch.

3) While observing the Fuel Rail Pressure (FRP) parameter on the scan tool, depress the accelerator pedal from idle to full throttle several times. Does the Fuel Rail Pressure (FRP) parameter show a value within the specified range quickly enough?

Value: -2 to 2 MPa { -290 to 290 psi }

Yes

⇒ Proceed to 9. Inspection for open circuit and short circuit in fuel rail pressure sensor circuit

No

⇒ Proceed to 8. Fuel rail pressure sensor 5 V reference voltage check

8. Fuel rail pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel rail pressure sensor harness connector (E42).

3) Turn ON the ignition switch.

4) Measure the voltage between the fuel rail pressure sensor 5 V reference circuit (pin 61 of F41) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 5 V

Yes

⇒ Proceed to 10. Fuel rail pressure sensor inspection

No

⇒ Proceed to 9. Inspection for open circuit and short circuit in fuel rail pressure sensor circuit

9. Inspection for open circuit and short circuit in fuel rail pressure sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and fuel rail pressure sensor harness connector (E42).

3) Inspect between the fuel rail pressure sensor (pins 1, 2, and 3 of E42) and the ECM (pins 46, 57, 60, and 61 of F41) for an open circuit or a short circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. Fuel rail pressure sensor inspection

No

Repair or replace as necessary.

⇒ Proceed to 16. Repair verification

10. Fuel rail pressure sensor inspection

1) Inspect for dirt, etc., attached to the fuel rail pressure sensor. Is the result normal?

Yes

⇒ Proceed to 11. Fuel supply pump operation check

No

Replace the fuel rail pressure sensor.

⇒ Proceed to 16. Repair verification

11. Fuel supply pump operation check

1) Observe the Fuel Rail Pressure (FRP) parameter on the scan tool while operating the accelerator pedal. Does the Fuel Rail Pressure (FRP) parameter change?

● When the accelerator pedal is depressed, it changes to the positive side.

● When the accelerator pedal is released, it changes to the negative side.

Yes

⇒ Proceed to 16. Repair verification

No

Replace the fuel supply pump.

⇒ Proceed to 12. Pressure limiter operation check

12. Pressure limiter operation check

1) Bleed the air.

2) Reconnect all of the disconnected harness connectors.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 15 seconds.

5) Start the engine.

6) Observe the DTC information with a scan tool. Is DTC P0089 set?

Yes

Replace the pressure limiter.

⇒ Proceed to 13. Pressure limiter signal input check

No

⇒ Proceed to 16. Repair verification

13. Pressure limiter signal input check

1) Bleed the air.

2) Reconnect all of the disconnected harness connectors.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Start the engine.

6) Observe the DTC information with a scan tool. Is DTC P0089 set?

Yes

⇒ Proceed to 14. ECM power supply and ground circuit inspection

No

⇒ Proceed to 16. Repair verification

14. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 15. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 2. Current DTC check

15. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 16. Repair verification

16. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0091 (Flash Code 247) Fuel Pressure Regulator Control Circuit Low

1. DTC P0091 DTC information

1. DTC P0091 description

The PCV controls the amount of fuel force-fed to the fuel rail. The PCV closes the valve after the signal voltage is sent to the PCV installed to the supply pump, and then the fuel is force-fed from the supply pump to the fuel rail. The ECM activates the PCV by controlling the valve opening timing. The earlier the valve opening time of the PCV is, the larger the amount of fuel force-fed to the fuel rail is, and the fuel rail pressure rises.

Two PCVs are installed to the supply pump and only a normal PCV can be activated even if one side fails. Because the PCV corresponds to each fuel injection cylinder, the DTC is not set but the engine is stopped if the harness is connected reversely.

2. Condition for setting DTC P0091

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● CKP sensor signal pulses are detected.

● CMP sensor signal pulses are detected.

Condition for setting the DTC

● The ECM detects that the PCV 1 signal circuit voltage is excessively low for approximately 4 seconds or more when PCV 1 is OFF.

3. Action taken when DTC P0091 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0091

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0091 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Check whether DTC P0091 is a current failure with a scan tool. Is DTC P0091 a current failure?

Yes

⇒ Proceed to 3. Inspection of each harness connector and PCV1 installation

No

Go to Intermittent conditions.

3. Inspection of each harness connector and PCV1 installation

1) Inspect for poor connections at the PCV1 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

2) Inspect the installation status of the PCV1 body. Is the result normal?

3) Are all of the results normal?

Yes

⇒ Proceed to 4. PCV1 inspection

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

4. PCV1 inspection

1) Turn OFF the ignition switch.

2) Disconnect the PCV1 harness connector (E43).

Refer to "*Engine Control*".

3) Measure the resistance of PCV1 with a DMM. Is the resistance equal to the specified value?

Value: about 3.2 Ω At room temperature

Yes

⇒ Proceed to 5. PCV1 power supply voltage check

No

Replace the fuel supply pump.

⇒ Proceed to 10. Repair verification

5. PCV1 power supply voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the PCV1 power supply circuit (pin 1 of E43) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 20 V

Yes

⇒ Proceed to 7. Inspection for open circuit or short circuit in PCV1 control circuit

No

⇒ Proceed to 6. Fuse inspection

6. Fuse inspection

1) Inspect for a blown out ECM MAIN 15 A fuse. Is the result normal?

Yes

Repair or replace the power supply circuit between the ECM MAIN 15 A fuse (pin 20 of FB10) and PCV1 (pin 1 of E43).

⇒ Proceed to 10. Repair verification

No

Replace the fuse. Also, inspect for a short circuit which could cause a fuse blowout in the circuits related to the fuse, and repair or replace the harness as necessary.

⇒ Proceed to 10. Repair verification

7. Inspection for open circuit or short circuit in PCV1 control circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Connect a fused jumper wire between the PCV1 control circuit (pin 2 of E43) and the frame ground.

4) Measure the resistance between the PCV 1 control circuit (pins 17 and 25 of F40) and the frame ground with a DMM (Check for open circuit in PCV 1 control circuit). Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: 0 Ω

5) Disconnect the fused jumper wire from between the PCV1 control circuit (pin 2 of E43) and frame ground.

6) Measure the resistance between the PCV1 control circuit (pins 17 and 25 of F40) and frame ground with a DMM (Check for short circuit in PCV1 control circuit). Is the resistance more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 10 MΩ

7) Are all of the values normal?

Yes

⇒ Proceed to 8. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

8. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 9. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0092 (Flash Code 217) Fuel Pressure Regulator Control Circuit High

1. DTC P0092 DTC information

1. DTC P0092 description

The PCV controls the amount of fuel force-fed to the fuel rail. The PCV closes the valve after the signal voltage is sent to the PCV installed to the supply pump, and then the fuel is force-fed from the supply pump to the fuel rail. The ECM activates the PCV by controlling the valve opening timing. The earlier the valve opening time of the PCV is, the larger the amount of fuel force-fed to the fuel rail is, and the fuel rail pressure rises.

Two PCVs are installed to the supply pump and only a normal PCV can be activated even if one side fails. Because the PCV corresponds to each fuel injection cylinder, the DTC is not set but the engine is stopped if the harness is connected reversely.

2. Condition for setting DTC P0092

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● CKP sensor signal pulses are detected.

● CMP sensor signal pulses are detected.

● DTC P0091 is not set.

Refer to "*DTC P0091 (Flash Code 247) Fuel Pressure Regulator Control Circuit Low*" in this section.

Condition for setting the DTC

● The ECM detects that the PCV 1 signal circuit voltage is excessively high for approximately 4 seconds or more when PCV 1 is ON.

3. Action taken when DTC P0092 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "DTC type definitions" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0092

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0092 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Check whether DTC P0092 is a current failure with a scan tool. Is DTC P0092 a current failure?

Yes

⇒ Proceed to 3. Inspection of each harness connector and PCV1 installation

No

Go to Intermittent conditions.

3. Inspection of each harness connector and PCV1 installation

1) Inspect for poor connections at the PCV1 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

2) Inspect the installation status of the PCV1 body. Is the result normal?

3) Are all of the results normal?

Yes

⇒ Proceed to 4. PCV1 inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

4. PCV1 inspection

1) Turn OFF the ignition switch.

2) Disconnect the PCV1 harness connector (E43).

3) Measure the resistance of PCV 1 with a DMM. Is the resistance equal to the specified value?

Refer to "Engine Control".

Value: 3.2 Ω At room temperature

Yes

⇒ Proceed to 5. PCV 1 control circuit voltage check

No

Replace the fuel supply pump.

⇒ Proceed to 8. Repair verification

5. PCV 1 control circuit voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the PCV 1 control circuit (pin 2 of E43) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0 V

Yes

⇒ Proceed to 6. ECM power supply and ground circuit inspection

No

Repair the short to the power supply circuit in the control circuit between PCV 1 (pin 2 of E43) and the ECM (pins 17 and 25 of F40).

⇒ Proceed to 8. Repair verification

6. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0101 (Flash Code 92) Mass Air Flow Sensor Circuit Range/Performance

1. DTC P0101 DTC information

1. DTC P0101 description

The MAF sensor is an air flow meter that measures the amount of air that enters the engine. It is installed between the air cleaner and the turbocharger. When the amount of air entering the engine is small, it indicates deceleration or idling speed. When the amount of air entering the engine is large, it indicates acceleration or a high load state. The ECM calculates a predicted MAF value and compares the actual MAF sensor voltage signal to the predicted MAF value. This comparison determines if the signal is stuck, or is too low or too high for a particular operating condition. If the ECM detects that the actual MAF sensor signal voltage is not within the predetermined range of the calculated MAF predicted value, the DTC is set.

2. Condition for setting DTC P0101

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P0102, P0103, P0112, P0113, P0116, P0117, P0118, P0234, P0404, P0409, P0560, P060B, P0641, P0651, P0697, P1247, P1248, P1249, P124A, P1404, P140A, P140B, P140C, P2227, P2228, and P2229 are not set.

Refer to "*DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input*" in this section.

Refer to "*DTC P0112 (Flash Code 22) Intake Air Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0113 (Flash Code 22) Intake Air Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0116 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0234 (Flash Code 42) Turbocharger Overboost Condition*" in this section.

Refer to "*DTC P0404 (Flash Code 45) EGR Control Circuit Range/Performance*" in this section.

Refer to "*DTC P0409 (Flash Code 44) EGR Sensor Circuit*" in this section.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P1247 (Flash Code 411) Turbocharger Boost Control Solenoid Circuit 1*" in this section.

Refer to "*DTC P1248 (Flash Code 412) Turbocharger Boost Control Solenoid Circuit 2*" in this section.

Refer to "*DTC P1249 (Flash Code 413) Turbocharger Boost Control Solenoid Circuit 3*" in this section.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

Refer to "*DTC P1404 (Flash Code 45) EGR Position Fault*" in this section.

Refer to "*DTC P140A (Flash Code 345) EGR 2 Performance*" in this section.

Refer to "*DTC P140B (Flash Code 344) EGR 2 Position Sensor Performance*" in this section.

Refer to "*DTC P140C (Flash Code 345) EGR 2 Closed Position Performance*" in this section.

Refer to "*DTC P2227 (Flash Code 71) Barometric Pressure Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

Also, the following conditions are met for 3 seconds or more.

● The engine speed is 1000 - 2000 rpm.

● The EGR control is commanded OFF.

● The engine run time is 5 seconds or more.

Condition for setting the DTC

● The ECM detects that the MAF sensor signal voltage is not within the predetermined range of the calculated MAF predicted value for 10 seconds or more.

3. Action taken when DTC P0101 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0101

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P0101 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Air intake/exhaust system inspection

1) Inspect for the following conditions. Is the result normal?

● Clogged air cleaner element, collapsing of the air piping between the air cleaner and the intake manifold, or a state where flow is restricted or damage is present

● Leakage in the air intake system

● Contamination or foreign material blocking the inlet of MAF sensor

● Misdetection or delayed response of the MAF sensor

● Water intrusion in the air intake system

● Any kind of restriction that happens in the exhaust system

● Stuck EGR valve

● Stuck exhaust brake valve

Yes

⇒ Proceed to 3. Individual harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

3. Individual harness connector inspection

1) Inspect for poor connections at the MAF sensor harness connector (pins 1, 2, and 3 of E107). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 81 and 82 of F42; pin 107 of F43). Is the connection status normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 4. MAF sensor circuit inspection

No

Repair the connection as necessary.

⇒ Proceed to 5. Repair verification

4. MAF sensor circuit inspection

1) Inspect for high resistance between the ECM (pins 81 and 82 of F42; pin 107 of F43) and the MAF sensor (pins 1, 2, and 3 of E107). Is the result normal?

Refer to "*Engine Control*".

Yes

Replace the MAF sensor.

⇒ Proceed to 5. Repair verification

No

Repair the circuit as necessary.

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input

1. DTC P0102 DTC information

1. DTC P0102 description

The MAF sensor is an air flow meter that measures the amount of air that enters the engine. It is installed between the air cleaner and the turbocharger. When the amount of air entering the engine is small, it indicates deceleration or idling speed. When the amount of air entering the engine is large, it indicates acceleration or a high load state. The sensor has the following circuits.

● 12 V reference circuit

● Low reference circuit

● MAF sensor signal circuit

The ECM monitors the MAF sensor signal voltage. The scan tool displays this output voltage in voltage and grams per cylinder (g/cyl). If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0102

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P0560 and P060B are not set.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the MAF sensor signal voltage is 0.1 V or less for approximately 3 seconds.

3. Action taken when DTC P0102 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

4. Condition for clearing DTC P0102

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0102 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0560 set at the same time?

Yes

Go to DTC P0560 diagnosis.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

No

⇒ Proceed to 3. MAF sensor signal voltage check

3. MAF sensor signal voltage check

1) Observe the MAF Sensor (Mass Air Flow) parameter on the scan tool. Is the MAF Sensor (Mass Air Flow) parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 4. MAF sensor 12 V reference voltage check

No

Go to Intermittent conditions.

4. MAF sensor 12 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the MAF/IAT sensor harness connector (E107).

3) Connect a test lamp between the MAF sensor 12 V reference circuit (pin 1 of E107) and the frame ground.

Refer to "*Engine Control*".

4) Turn ON the ignition switch. Does the test lamp illuminate?

Yes

⇒ Proceed to 5. MAF sensor signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in MAF sensor 12 V reference circuit

5. MAF sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the MAF sensor 12 V reference circuit and the signal circuit (pins 1 and 3 of E107).

Refer to "*Engine Control*".

2) Observe the MAF Sensor (Mass Air Flow) parameter on the scan tool. Is the MAF Sensor (Mass Air Flow) parameter more than or equal to the specified value?

Value: 4.9 V

Yes

⇒ Proceed to 8. MAF sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in MAF sensor signal circuit

6. Inspection for open circuit in MAF sensor 12 V reference circuit

1) Inspect the 12 V reference circuit between the ECM (pin 81 of F42) and the MAF sensor (pin 1 of E107) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in MAF sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 107 of F43) and the MAF sensor (pin 3 of E107) for the following conditions. Is the result normal?

Refer to "Engine Control".

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. MAF sensor harness connector inspection

1) Inspect for poor connections at the MAF sensor harness connector (pins 1 and 3 of E107). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the MAF sensor.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 81 of F42, pin 107 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input

1. DTC P0103 DTC information

1. DTC P0103 description

The MAF sensor is an air flow meter that measures the amount of air that enters the engine. It is installed between the air cleaner and the turbocharger. When the amount of air entering the engine is small, it indicates deceleration or idling speed. When the amount of air entering the engine is large, it indicates acceleration or a high load state. The sensor has the following circuits.

● 12 V reference circuit

● Low reference circuit

● MAF sensor signal circuit

The ECM monitors the MAF sensor signal voltage. The scan tool displays this output voltage in voltage and grams per cylinder (g/cyl). If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0103

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P0560 and P060B are not set.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the MAF sensor signal voltage is 4.9 V or more for approximately 3 seconds.

3. Action taken when DTC P0103 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

4. Condition for clearing DTC P0103

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0103 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. MAF sensor signal voltage check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the MAF Sensor (Mass Air Flow) parameter on the scan tool. Is the MAF Sensor (Mass Air Flow) parameter more than or equal to the specified value?

Value: 4.9 V

Yes

⇒ Proceed to 3. MAF sensor 12 V reference voltage and signal voltage check

No

Go to Intermittent conditions.

3. MAF sensor 12 V reference voltage and signal voltage check

1) Observe the DTC information with a scan tool for DTC P0560 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the MAF/IAT sensor harness connector (E107).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the MAF Sensor (Mass Air Flow) parameter on the scan tool.

Value: 0.1 V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in MAF sensor signal circuit

The reading is less than or equal to the specified value and DTC P0560 is set.

Go to DTC P0560 diagnosis.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

The reading is less than or equal to the specified value and DTC P0560 is not set.

⇒ Proceed to 4. MAF sensor low reference circuit inspection using test lamp

4. MAF sensor low reference circuit inspection using test lamp

1) Connect a test lamp between the MAF sensor low reference circuit (pin 2 of E107) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. MAF sensor harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in MAF sensor low reference circuit

5. Inspection for short to power supply in MAF sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 107 of F43) and the MAF sensor (pin 3 of E107) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 12 V reference circuit

● Short to the 5 V reference circuit

Note:

● The MAF sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in MAF sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 82 of F42) and the MAF sensor (pin 2 of E107) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. MAF sensor harness connector inspection

1) Inspect for poor connections at the MAF sensor harness connector (pin 2 of E107). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the MAF sensor.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 82 of F42). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0112 (Flash Code 22) Intake Air Temperature Sensor Circuit Low

1. DTC P0112 DTC information

1. DTC P0112 description

The IAT sensor is installed between the air cleaner and the turbocharger and is integrated with the MAF sensor. The IAT sensor is a variable resistor and measures the temperature of the air flowing into the engine. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit and grounds to the low reference circuit. The IAT sensor resistance is high at a low temperature. As the air temperature rises, the sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0112

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the IAT sensor signal voltage is 0.1 V or less for approximately 3 seconds.

3. Action taken when DTC P0112 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default IAT value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0112

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0112 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. IAT sensor signal voltage check

3. IAT sensor signal voltage check

1) Observe the Intake Air Temperature Sensor parameter on the scan tool. Is the Intake Air Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 4. IAT sensor signal output voltage check

No

Go to Intermittent conditions.

4. IAT sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the MAF/IAT sensor harness connector (E107).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the Intake Air Temperature Sensor parameter on the scan tool. Is the Intake Air Temperature Sensor parameter more than or equal to the specified value?

Value: 4.9 V

Yes

Replace the MAF sensor.

⇒ Proceed to 8. Repair verification

No

⇒ Proceed to 5. Inspection for short to ground in IAT sensor signal circuit

5. Inspection for short to ground in IAT sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 109 of F43) and the IAT sensor (pin 4 of E107) for the following conditions. Is the result normal?

● Short to ground

● Short to the low reference circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 8. Repair verification

6. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 109 and 110 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0113 (Flash Code 22) Intake Air Temperature Sensor Circuit High

1. DTC P0113 DTC information

1. DTC P0113 description

The IAT sensor is installed between the air cleaner and the turbocharger and is integrated with the MAF sensor. The IAT sensor is a variable resistor and measures the temperature of the air flowing into the engine. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit and grounds to the low reference circuit. The IAT sensor resistance is high at a low temperature. As the air temperature rises, the sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0113

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine run time is 3 minutes or more.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the IAT sensor signal voltage is 4.9 V or more for approximately 3 seconds.

3. Action taken when DTC P0113 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default IAT value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0113

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0113 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. IAT sensor signal voltage check

3. IAT sensor signal voltage check

1) Observe the Intake Air Temperature Sensor parameter on the scan tool. Is the Intake Air Temperature Sensor parameter more than or equal to the specified value?

Value: 4.9 V

Yes

⇒ Proceed to 4. IAT sensor signal output voltage check

No

Go to Intermittent conditions.

4. IAT sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the MAF/IAT sensor harness connector (E107).

3) Turn ON the ignition switch.

4) Measure the voltage between the IAT sensor signal circuit (pin 4 of E107) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.9 V

Yes

⇒ Proceed to 5. Inspection for short to power supply in IAT sensor signal circuit

No

⇒ Proceed to 6. IAT sensor low reference circuit inspection using fused jumper wire

5. Inspection for short to power supply in IAT sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 109 of F43) and the IAT sensor (pin 4 of E107) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 12 V reference circuit

Note:

● The IAT sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

6. IAT sensor low reference circuit inspection using fused jumper wire

1) Connect a fused jumper wire between the IAT sensor signal circuit and the low reference circuit (pins 4 and 5 of E107).

Refer to "*Engine Control*".

2) Observe the Intake Air Temperature Sensor parameter on the scan tool. Is the Intake Air Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 10. Inspection for short to 5 V reference in IAT sensor signal circuit

No

⇒ Proceed to 7. IAT sensor signal output voltage check using fused jumper wire

7. IAT sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the IAT sensor signal circuit (pin 4 of E107) and the frame ground.

Refer to "*Engine Control*".

2) Observe the Intake Air Temperature Sensor parameter on the scan tool. Is the Intake Air Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 9. Inspection for open circuit in IAT sensor low reference circuit

No

⇒ Proceed to 8. Inspection for open circuit in IAT sensor signal circuit

8. Inspection for open circuit in IAT sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 109 of F43) and the IAT sensor (pin 4 of E107) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

9. Inspection for open circuit in IAT sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 110 of F43) and the IAT sensor (pin 5 of E107) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The IAT sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

10. Inspection for short to 5 V reference in IAT sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 109 of F43) and the IAT sensor (pin 4 of E107) for a short to the 5 V reference circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. IAT sensor harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

11. IAT sensor harness connector inspection

1) Inspect for poor connections at the IAT sensor harness connector (pins 4 and 5 of E107). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the MAF/IAT sensor.

⇒ Proceed to 14. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

12. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 109 and 110 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0116 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Range/Performance

1. DTC P0116 DTC information

1. DTC P0116 description

The engine coolant temperature sensor is installed in the thermostat housing. The engine coolant temperature sensor is a variable resistor and measures the temperature of the engine coolant. If the ECM detects that the difference of the engine coolant temperature is less than the calculated range under the predetermined conditions, the DTC is set. The ECM diagnoses this DTC 1 time only per 1 ignition cycle.

2. Condition for setting DTC P0116

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● The vehicle run time is more than 5 minutes with a vehicle speed of 4 km/h or more.

● The engine speed is 1000 rpm or more and the engine run time is more than 5 minutes.

● The accumulated fuel injection quantity since engine start-up is more than the threshold.

● DTCs P0117, P0118, P0201, P0202, P0203, P0204, P0205, P0206, P0500, P0502, P0503, P060B, P0697, P1261, P1262, P2146, and P2149 are not set.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0201 (Flash Code 271) Injector Circuit Open - Cylinder 1*" in this section.

Refer to "*DTC P0202 (Flash Code 272) Injector Circuit Open - Cylinder 2*" in this section.

Refer to "*DTC P0203 (Flash Code 273) Injector Circuit Open - Cylinder 3*" in this section.

Refer to "*DTC P0204 (Flash Code 274) Injector Circuit Open - Cylinder 4*" in this section.

Refer to "*DTC P0205 (Flash Code 275) Injector Circuit Open - Cylinder 5*" in this section.

Refer to "*DTC P0206 (Flash Code 276) Injector Circuit Open - Cylinder 6*" in this section.

Refer to "*DTC P0500 (Flash Code 25) Vehicle Speed Sensor*" in this section.

Refer to "*DTC P0502 (Flash Code 25) Vehicle Speed Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0503 (Flash Code 25) Vehicle Speed Sensor Circuit High Input*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1*" in this section.

Refer to "*DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the difference between the maximum and minimum engine coolant temperatures is less than 0.2 to 12 ℃ {1.8 to 22℉}.

3. Action taken when DTC P0116 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0116

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P0116 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Engine coolant system inspection

1) Inspect the engine cooling system for the following conditions. Is the result normal?

● Improper engine coolant level

● Engine coolant leakage

Yes

⇒ Proceed to 3. Individual harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

3. Individual harness connector inspection

1) Inspect for poor connections at the engine coolant temperature sensor harness connector (pins 1 and 3 of E102). Is the connection status normal?

2) Inspect for poor connections at the TCM harness connector (pins 51 and 64 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 4. Engine coolant temperature sensor circuit inspection

No

Repair the connection as necessary.

⇒ Proceed to 5. Repair verification

4. Engine coolant temperature sensor circuit inspection

1) Inspect for high resistance in the circuit between the ECM (pins 51 and 64 of F41) and the engine coolant temperature sensor (pins 1 and 2 of E102). Is the result normal?

Refer to "*Engine Control*".

Yes

Replace the engine coolant temperature sensor.

⇒ Proceed to 5. Repair verification

No

Repair the circuit as necessary.

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for 30 seconds.

3) While observing the Coolant Temperature parameter on the scan tool, start the engine and wait until it is completely warmed up. Is the Coolant Temperature parameter within the specified range?

Value: 50 to 80 ℃ { 122 to 80 ℃ }

Yes

Observe the DTC information with a scan tool.

No

⇒ Proceed to 2. Engine coolant system inspection

DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low

1. DTC P0117 DTC information

1. DTC P0117 description

The engine coolant temperature sensor is installed in the thermostat housing. The engine coolant temperature sensor is a variable resistor and measures the temperature of the engine coolant. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit, and the low reference circuit connects to ground. The engine coolant temperature sensor resistance is high at a low temperature. As the engine coolant temperature increases, the sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0117

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the engine coolant temperature sensor signal voltage is 0.1 V or less for approximately 3 seconds.

3. Action taken when DTC P0117 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default coolant temperature value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0117

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0117 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Engine coolant temperature sensor signal voltage check

3. Engine coolant temperature sensor signal voltage check

1) Observe the Engine Coolant Temperature Sensor parameter on the scan tool. Is the Engine Coolant Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 4. Engine coolant temperature sensor signal output voltage check

No

Go to Intermittent conditions.

4. Engine coolant temperature sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the engine coolant temperature sensor harness connector (E102).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the Engine Coolant Temperature Sensor parameter on the scan tool. Is the Engine Coolant Temperature Sensor parameter more than or equal to the specified value?

Value: 4.8 V

Yes

Replace the engine coolant temperature sensor.

⇒ Proceed to 8. Repair verification

No

⇒ Proceed to 5. Inspection for short to ground in engine coolant temperature sensor signal circuit

5. Inspection for short to ground in engine coolant temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 64 of F41) and the engine coolant temperature sensor (pin 1 of E102) for the following conditions. Is the result normal?

● Short to ground

● Short to the low reference circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 8. Repair verification

6. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 51 and 64 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High

1. DTC P0118 DTC information

1. DTC P0118 description

The engine coolant temperature sensor is installed in the thermostat housing. The engine coolant temperature sensor is a variable resistor and measures the temperature of the engine coolant. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit, and the low reference circuit connects to ground. The engine coolant temperature sensor resistance is high at a low temperature. As the engine coolant temperature increases, the sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0118

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine runtime is 5 seconds or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the engine coolant temperature sensor signal voltage is 4.8 V or more for approximately 3 seconds.

3. Action taken when DTC P0118 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default coolant temperature value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0118

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0118 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Engine coolant temperature sensor signal voltage check

3. Engine coolant temperature sensor signal voltage check

1) Observe the Engine Coolant Temperature Sensor parameter on the scan tool. Is the Engine Coolant Temperature Sensor parameter more than or equal to the specified value?

Value: 4.8 V

Yes

⇒ Proceed to 4. Engine coolant temperature sensor signal output voltage check

No

Go to Intermittent conditions.

4. Engine coolant temperature sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the engine coolant temperature sensor harness connector (E102).

3) Turn ON the ignition switch.

4) Measure the voltage between the engine coolant temperature sensor signal circuit (pin 1 of E102) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 5.5 V

Yes

⇒ Proceed to 5. Inspection for short to power supply in engine coolant temperature sensor signal circuit

No

⇒ Proceed to 6. Engine coolant temperature sensor low reference circuit inspection using fused jumper wire

5. Inspection for short to power supply in engine coolant temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 64 of F41) and the engine coolant temperature sensor (pin 1 of E102) for a short to the power supply circuit. Is the result normal?

Note:

● The engine coolant temperature sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

6. Engine coolant temperature sensor low reference circuit inspection using fused jumper wire

1) Connect a fused jumper wire between the engine coolant temperature sensor signal circuit and the low reference circuit (pins 1 and 3 of E102).

Refer to "*Engine Control*".

2) Observe the Engine Coolant Temperature Sensor parameter on the scan tool. Is the Engine Coolant Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 10. Inspection for short to 5 V reference in engine coolant temperature sensor signal circuit

No

⇒ Proceed to 7. Engine coolant temperature sensor signal output voltage check using fused jumper wire

7. Engine coolant temperature sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the engine coolant temperature sensor signal circuit (pin 1 of E102) and the frame ground.

Refer to "*Engine Control*".

2) Observe the Engine Coolant Temperature Sensor parameter on the scan tool. Is the Engine Coolant Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 9. Inspection for open circuit in engine coolant temperature sensor low reference circuit

No

⇒ Proceed to 8. Inspection for open circuit in engine coolant temperature sensor signal circuit

8. Inspection for open circuit in engine coolant temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 64 of F41) and the engine coolant temperature sensor (pin 1 of E102) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

9. Inspection for open circuit in engine coolant temperature sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 51 of F41) and the engine coolant temperature sensor (pin 3 of E102) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The engine coolant temperature sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

10. Inspection for short to 5 V reference in engine coolant temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 64 of F41) and the engine coolant temperature sensor (pin 1 of E102) for a short to the 5 V reference circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. Engine coolant temperature sensor harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

11. Engine coolant temperature sensor harness connector inspection

1) Inspect for poor connections at the engine coolant temperature sensor harness connector (pins 1 and 3 of E102). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the engine coolant temperature sensor.

⇒ Proceed to 14. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

12. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 51 and 64 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0182 (Flash Code 211) Fuel Temperature Sensor Circuit Low

1. DTC P0182 DTC information

1. DTC P0182 description

The fuel temperature sensor is installed to the fuel filter. The fuel temperature sensor is a variable resistor that measures the temperature of the fuel entering the supply pump. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit, and the low reference circuit connects to ground. When the fuel temperature sensor is at low temperature, the resistance of the sensor is high. When the fuel temperature increases, sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0182

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel temperature sensor signal voltage is 0.1 V or less for approximately 4 seconds.

3. Action taken when DTC P0182 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default fuel temperature value.

4. Condition for clearing DTC P0182

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0182 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Fuel temperature sensor signal voltage check

3. Fuel temperature sensor signal voltage check

1) Observe the Fuel Temperature Sensor parameter on the scan tool. Is the Fuel Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 4. Fuel temperature sensor signal output voltage check

No

Go to Intermittent conditions.

4. Fuel temperature sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel temperature sensor harness connector (E97).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the Fuel Temperature Sensor parameter on the scan tool. Is the Fuel Temperature Sensor parameter more than or equal to the specified value?

Value: 4.8 V

Yes

Replace the fuel temperature sensor.

⇒ Proceed to 8. Repair verification

No

⇒ Proceed to 5. Inspection for short to ground in fuel temperature sensor signal circuit

5. Inspection for short to ground in fuel temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 65 of (F41) and the fuel temperature sensor (pin 1 of E97) for the following conditions. Is the result normal?

● Short to ground

● Short to the low reference circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 8. Repair verification

6. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 51 and 65 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0183 (Flash Code 211) Fuel Temperature Sensor Circuit High

1. DTC P0183 DTC information

1. DTC P0183 description

The fuel temperature sensor is installed to the fuel filter. The fuel temperature sensor is a variable resistor that measures the temperature of the fuel entering the supply pump. This sensor has a signal circuit and a low reference circuit. The ECM supplies 5 V to the signal circuit, and the low reference circuit connects to ground. When the fuel temperature sensor is at low temperature, the resistance of the sensor is high. When the fuel temperature increases, sensor resistance decreases. The ECM detects a high voltage when the sensor resistance is high. The ECM detects a low voltage when the sensor resistance is low. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0183

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine run time is 3 minutes or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel temperature sensor signal voltage is 4.8 V or more for approximately 4 seconds.

3. Action taken when DTC P0183 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default fuel temperature value.

4. Condition for clearing DTC P0183

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0183 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Fuel temperature sensor signal voltage check

3. Fuel temperature sensor signal voltage check

1) Observe the Fuel Temperature Sensor parameter on the scan tool. Is the Fuel Temperature Sensor parameter more than or equal to the specified value?

Value: 4.8 V

Yes

⇒ Proceed to 4. Fuel temperature sensor signal output voltage check

No

Go to Intermittent conditions.

4. Fuel temperature sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel temperature sensor harness connector (E97).

3) Turn ON the ignition switch.

4) Measure the voltage between the fuel temperature sensor signal circuit (pin 1 of E97) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.8 V

Yes

⇒ Proceed to 5. Inspection for short to power supply in fuel temperature sensor signal circuit

No

⇒ Proceed to 6. Fuel rail pressure sensor low reference circuit inspection using fused jumper wire

5. Inspection for short to power supply in fuel temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 65 of F41) and the fuel temperature sensor (pin 1 of E97) for a short to the power supply circuit. Is the result normal?

Note:

● The fuel temperature sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

6. Fuel rail pressure sensor low reference circuit inspection using fused jumper wire

1) Connect a fused jumper wire between the fuel temperature sensor signal circuit and the low reference circuit (pins 1 and 2 of E97).

Refer to "*Engine Control*".

2) Observe the Fuel Temperature Sensor parameter on the scan tool. Is the Fuel Temperature Sensor parameter

less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 10. Inspection for short to 5 V reference in fuel temperature sensor signal circuit

No

⇒ Proceed to 7. Fuel temperature sensor signal output voltage check using fused jumper wire

7. Fuel temperature sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the fuel temperature sensor signal circuit (pin 1 of E97) and the frame ground.

Refer to "*Engine Control*".

2) Observe the Fuel Temperature Sensor parameter on the scan tool. Is the Fuel Temperature Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 9. Inspection for open circuit in fuel temperature sensor low reference circuit

No

⇒ Proceed to 8. Inspection for open circuit in fuel temperature sensor signal circuit

8. Inspection for open circuit in fuel temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 65 of F41) and the fuel temperature sensor (pin 1 of E97) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

9. Inspection for open circuit in fuel temperature sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 51 of F41) and the fuel temperature sensor (pin 2 of E97) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The fuel temperature sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

10. Inspection for short to 5 V reference in fuel temperature sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 65 of F41) and the fuel temperature sensor (pin 1 of E97) for a short to the 5 V reference circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. Fuel temperature sensor harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

11. Fuel temperature sensor harness connector inspection

1) Inspect for poor connections at the fuel temperature sensor harness connector (pins 1 and 2 of E97). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the fuel temperature sensor.

⇒ Proceed to 14. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

12. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 51 and 65 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low

1. DTC P0192 DTC information

1. DTC P0192 description

The fuel rail pressure sensor is installed to the fuel rail. The sensor detects the fuel rail pressure and converts the pressure to a voltage signal. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Fuel rail pressure sensor signal circuit

The ECM monitors the fuel rail pressure sensor signal voltage. The signal voltage increases as the fuel rail pressure rises, and it decreases as the pressure declines. The ECM calculates the actual fuel rail pressure from the voltage signals and uses the result in fuel injection control and other control tasks. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0192

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel rail pressure sensor signal voltage is 0.7 V or less.

3. Action taken when DTC P0192 sets

● The ECM detects that the fuel rail pressure sensor signal voltage is 0.7 V or less.

3. Action taken when DTC P0192 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default fuel rail pressure.

● The ECM limits the fuel injection quantity.

● The ECM limits the upper limit of the fuel rail pressure.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0192

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0192 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. Fuel rail pressure sensor signal voltage check

3. Fuel rail pressure sensor signal voltage check

1) Observe the Fuel Rail Pressure Sensor parameter on the scan tool. Is the Fuel Rail Pressure Sensor parameter less than or equal to the specified value?

Value: 0.7 V

Yes

⇒ Proceed to 4. Fuel rail pressure sensor signal output voltage check

No

Go to Intermittent conditions.

4. Fuel rail pressure sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel rail pressure sensor harness connector (E42).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the Fuel Rail Pressure Sensor parameter on the scan tool. Is the Fuel Rail Pressure Sensor parameter more than or equal to the specified value?

Value: 4.5 V

Yes

⇒ Proceed to 5. Fuel rail pressure sensor 5 V reference voltage check

No

⇒ Proceed to 5. Fuel rail pressure sensor 5 V reference voltage check

No

⇒ Proceed to 6. Inspection for short to ground in fuel rail pressure sensor signal circuit

5. Fuel rail pressure sensor 5 V reference voltage check

1) Measure the voltage between the fuel rail pressure sensor 5 V reference circuit (pin 3 of E42) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

⇒ Proceed to 8. Fuel rail pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit in fuel rail pressure sensor 5 V reference circuit

6. Inspection for short to ground in fuel rail pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pins 46 and 57 of F41) and the fuel rail pressure sensor (pin 2 of E42) for the following conditions. Is the result normal?

● Short to ground

● Short to the low reference circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit in fuel rail pressure sensor 5 V reference circuit

1) Inspect the 5 V reference circuit between the ECM (pins 46 and 61 of F41) and the fuel rail pressure sensor (pin 3 of E42) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The fuel rail pressure sensor shares the 5 V reference circuit with other sensors. A malfunction in the 5V reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Fuel rail pressure sensor harness connector inspection

1) Inspect for poor connections at the fuel rail pressure sensor harness connector (pin 3 of E42). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the fuel rail pressure sensor.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 61 of F41). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High

1. DTC P0193 DTC information

1. DTC P0193 description

The fuel rail pressure sensor is installed to the fuel rail. The sensor detects the fuel rail pressure and converts the pressure to a voltage signal. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Fuel rail pressure sensor signal circuit

The ECM monitors the fuel rail pressure sensor signal voltage. The signal voltage increases as the fuel rail pressure rises, and it decreases as the pressure declines. The ECM calculates the actual fuel rail pressure from the voltage signals and uses the result in fuel injection control and other control tasks. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0193

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the fuel rail pressure sensor signal voltage is 4.75 V or more.

3. Action taken when DTC P0193 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default fuel rail pressure.

● The ECM limits the fuel injection quantity.

● The ECM limits the upper limit of the fuel rail pressure.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0193

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0193 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. Fuel rail pressure sensor signal voltage check

3. Fuel rail pressure sensor signal voltage check

1) Observe the Fuel Rail Pressure Sensor parameter on the scan tool. Is the Fuel Rail Pressure Sensor parameter more than or equal to the specified value?

Value: 4.75 V

Yes

⇒ Proceed to 4. Fuel rail pressure sensor signal output voltage check

No

Go to Intermittent conditions.

4. Fuel rail pressure sensor signal output voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel rail pressure sensor harness connector (E42).

3) Turn ON the ignition switch.

4) Measure the voltage between the fuel rail pressure sensor signal circuit (pin 2 of E42) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 5.5 V

Yes

⇒ Proceed to 10. Inspection for short to power supply in fuel rail pressure sensor signal circuit

No

⇒ Proceed to 5. Fuel rail pressure sensor signal output voltage check using test lamp

5. Fuel rail pressure sensor signal output voltage check using test lamp

1) Connect a test lamp between the fuel rail pressure sensor signal circuit (pin 2 of E42) and the frame ground.

2) Measure the voltage between the fuel rail pressure sensor signal circuit (pin 2 of E42) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.75 V

Yes

⇒ Proceed to 9. Inspection for short to 5 V reference in fuel rail pressure sensor signal circuit

No

⇒ Proceed to 6. Fuel rail pressure sensor low reference circuit inspection using fused jumper wire

6. Fuel rail pressure sensor low reference circuit inspection using fused jumper wire

1) Connect a fused jumper wire between the fuel rail pressure sensor signal circuit and the low reference circuit (pins 1 and 2 of E42).

Refer to "*Engine Control*".

2) Observe the Fuel Rail Pressure Sensor parameter on the scan tool. Is the Fuel Rail Pressure Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 11. Fuel rail pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit in fuel rail pressure sensor low reference circuit

7. Inspection for open circuit in fuel rail pressure sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 60 of F41) and the fuel rail pressure sensor (pin 1 of E42) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The fuel rail pressure sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 8. Inspection for open circuit in fuel rail pressure sensor signal circuit

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

8. Inspection for open circuit in fuel rail pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pins 46 and 57 of F41) and the fuel rail pressure sensor (pin 2 of E42) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 12. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

9. Inspection for short to 5 V reference in fuel rail pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pins 46 and 57 of F41) and the fuel rail pressure sensor (pin 2 of E42) for a short to the 5 V reference circuit. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

10. Inspection for short to power supply in fuel rail pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pins 46 and 57 of F41) and the fuel rail pressure sensor (pin 2 of E42) for a short to the power supply circuit. Is the result normal?

Note:

● The fuel rail pressure sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 14. Repair verification

11. Fuel rail pressure sensor harness connector inspection

1) Inspect for poor connections at the fuel rail pressure sensor harness connector (pins 1 and 2 of E42). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the fuel rail pressure sensor.

⇒ Proceed to 14. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

12. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 46, 57, and 60 of F41). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0201 (Flash Code 271) Injector Circuit Open - Cylinder 1

1. DTC P0201 DTC information

1. DTC P0201 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0201

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1261 and P2146 are not set.

Refer to "*DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0201 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0201

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0201 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 1 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 1 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 1 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 1 injector control circuit (pin 3 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 1 injector control circuit (pin 3 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 1 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 1 injector inspection

3. Cylinder No. 1 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 2, 3, and 4 of H116), and repair as necessary.

2) Disconnect the cylinder No. 1 injector harness (E71).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E71) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E71) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 1 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 1 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 1 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 1 injector harness (E71).

4) Connect a fused jumper wire to the cylinder No. 1 injector harness (pins 1 and 2 of E71).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 1 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 1 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 1 injector control circuit (pin 3 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

● Between the cylinder No. 1 injector control circuit (pin 3 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Refer to "*Engine Control*".

8) Are all of the values normal?

Value: ∞ Ω

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0202 (Flash Code 272) Injector Circuit Open - Cylinder 2

1. DTC P0202 DTC information

1. DTC P0202 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0202

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1261 and P2146 are not set.

Refer to "*DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0202 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0202

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0202 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 2 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 2 injector internal resistance check). Is it within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 2 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 2 injector control circuit (pin 1 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 2 injector control circuit (pin 1 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 2 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 2 injector inspection

3. Cylinder No. 2 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 3, 4, and 7 of H116), and repair as necessary.

2) Disconnect the cylinder No. 2 injector harness (E72).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E72) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E72) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 2 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 2 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 2 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 2 injector harness (E72).

4) Connect a fused jumper wire to the cylinder No. 2 injector harness (pins 1 and 2 of E72).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 2 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 2 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 2 injector control circuit (pin 1 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

● Between the cylinder No. 2 injector control circuit (pin 1 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Refer to "*Engine Control*".

Value: ∞ Ω

8) Are all of the values normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0203 (Flash Code 273) Injector Circuit Open - Cylinder 3

1. DTC P0203 DTC information

1. DTC P0203 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0203

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1261 and P2146 are not set.

Refer to "*DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0203 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0203

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0203 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 3 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 3 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 3 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 3 injector control circuit (pin 2 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 3 injector control circuit (pin 2 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 3 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 3 injector inspection

3. Cylinder No. 3 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 3, 4, and 6 of H116), and repair as necessary.

2) Disconnect the cylinder No. 3 injector harness (E73).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E73) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E73) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 3 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 3 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 3 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 3 injector harness (E73).

4) Connect a fused jumper wire to the cylinder No. 3 injector harnesses (pins 1 and 2 of E73).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 3 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 26 of F40)

Refer to "Engine Control".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 3 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 3 injector control circuit (pin 2 of F40) and the frame ground

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

● Between the cylinder No. 3 injector control circuit (pin 2 of F40) and the injector body

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the injector body

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the injector body

Refer to "*Engine Control*".

Value: ∞ Ω

8) Are all of the values normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0204 (Flash Code 274) Injector Circuit Open - Cylinder 4

1. DTC P0204 DTC information

1. DTC P0204 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0204

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1262 and P2149 are not set.

Refer to "*DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0204 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0204

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0204 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 4 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 4 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 4 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 4 injector control circuit (pin 6 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 4 injector control circuit (pin 6 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 4 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 4 injector inspection

3. Cylinder No. 4 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 2, 3, and 4 of H117), and repair as necessary.

2) Disconnect the cylinder No. 4 injector harness (E74).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E74) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E74) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 4 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 4 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 4 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 4 injector harness (E74).

4) Connect a fused jumper wire to the cylinder No. 4 injector harness (pins 1 and 2 of E74).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 4 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 4 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 4 injector control circuit (pin 6 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

● Between the cylinder No. 4 injector control circuit (pin 6 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Refer to "*Engine Control*".

Value: ∞ Ω

8) Are all of the values normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0205 (Flash Code 275) Injector Circuit Open - Cylinder 5

1. DTC P0205 DTC information

1. DTC P0205 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0205

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1262 and P2149 are not set.

Refer to "*DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0205 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0205

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0205 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 5 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 5 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 5 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 5 injector control circuit (pin 4 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 5 injector control circuit (pin 4 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 5 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 5 injector inspection

3. Cylinder No. 5 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 3, 4, and 7 of H117), and repair as necessary.

2) Disconnect the cylinder No. 5 injector harness (E75).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E75) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E75) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 5 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 5 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 5 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 5 injector harness (E75).

4) Connect a fused jumper wire to the cylinder No. 5 injector harness (pins 1 and 2 of E75).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 5 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 5 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 5 injector control circuit (pin 4 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

● Between the cylinder No. 5 injector control circuit (pin 4 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Refer to "*Engine Control*".

Value: ∞ Ω

8) Are all of the values normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0206 (Flash Code 276) Injector Circuit Open - Cylinder 6

1. DTC P0206 DTC information

1. DTC P0206 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P0206

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P1262 and P2149 are not set.

Refer to "*DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit in the injector solenoid circuit for 2.6 seconds or more.

3. Action taken when DTC P0206 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0206

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0206 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Cylinder No. 6 injector circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

4) Measure the resistance between each injector circuit (F40) with a DMM (No. 6 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

5) Measure the resistance between each injector circuit (F40) with a DMM (No. 6 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 6 injector control circuit (pin 5 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

Value: ∞ Ω

● Between the cylinder No. 6 injector control circuit (pin 5 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Value: ∞ Ω Room temperature

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 6 injector circuit resistance check using fused jumper wire

No

⇒ Proceed to 3. Cylinder No. 6 injector inspection

3. Cylinder No. 6 injector inspection

1) Inspect the connection status of the harness connector in the cylinder block (pins 3, 4, and 6 of H117), and repair as necessary.

2) Disconnect the cylinder No. 6 injector harness (E76).

3) Measure the resistance of the injector terminal (pins 1 and 2 of E76) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

4) Measure the resistance between the injector terminal (pins 1 and 2 of E76) and the injector body with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: ∞ Ω

5) Are all of the values normal?

Yes

⇒ Proceed to 4. Cylinder No. 6 injector circuit resistance check using fused jumper wire

No

Replace the cylinder No. 5 injector.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 6. Repair verification

4. Cylinder No. 6 injector circuit resistance check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 6 injector harness (E76).

4) Connect a fused jumper wire to the cylinder No. 6 injector harness (pins 1 and 2 of E76).

5) Measure the resistance between each injector circuit (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

6) Measure the resistance between each injector circuit (F40) with a DMM (No. 6 injector internal resistance check). Is the resistance within the specified range?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.3 to 1.3 Ω

7) Measure the resistance between each injector circuit (F40) with a DMM (No. 6 injector body insulation check). Is the resistance equal to the specified value?

● Between the cylinder No. 6 injector control circuit (pin 5 of F40) and the frame ground

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

● Between the cylinder No. 6 injector control circuit (pin 5 of F40) and the injector body

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the injector body

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the injector body

Refer to "*Engine Control*".

Value: ∞ Ω

8) Are all of the values normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0217 (Flash Code 542) Engine Coolant Over Temperature Condition

1. DTC P0217 DTC information

1. DTC P0217 description

The engine coolant temperature sensor is a variable resistor and measures the temperature of the engine coolant. If the ECM detects an excessively high coolant temperature, the DTC is set.

2. Condition for setting DTC P0217

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P0117, P0118, P060B, and P0697 are not set.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the engine coolant temperature is 108℃ {226℉} or more for 7.3 seconds.

3. Action taken when DTC P0217 sets

● The ECM does not illuminate the MIL or SVS lamp. Refer to Action taken when DTC sets - Type D.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0217

● Condition for clearing the DTC - Refer to Type D.

Refer to "*DTC type definitions*" in this section.

2. DTC P0217 diagnostics

Note:

● After starting the engine, the engine coolant temperature rises to 80 - 85℃ {176 - 185℉} then stabilizes when the thermostat opens.

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0117 set at the same time?

Yes

Go to DTC P0117 diagnosis.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

No

⇒ Proceed to 3. Engine cooling system inspection

3. Engine cooling system inspection

1) Inspect the engine cooling system for the following conditions. Is the result normal?

● Insufficient coolant level

● Coolant leakage

● Cooling fan belt slip

● Cooling fan clutch malfunction

● Thermostat malfunction

● Water pump malfunction

● Radiator clogging

Yes

⇒ Proceed to 4. Coolant temperature check

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

4. Coolant temperature check

1) While observing the Coolant Temperature parameter on the scan tool, start the engine and wait until it is completely warmed up. Is the Coolant Temperature parameter on the scan tool more than or equal to the specified value?

Value: 108 ℃ { 107.78 ℃ }

Yes

⇒ Proceed to 5. Engine coolant temperature sensor inspection

No

Ask the driver if the overheat occurred due to low engine coolant level, etc.

If an engine overheat has occurred in the past, make sure to inspect the engine, and repair as necessary.

⇒ Proceed to 6. Repair verification

5. Engine coolant temperature sensor inspection

1) Test the engine coolant temperature sensor at various temperatures, and evaluate the possibility of sensor malfunction. Is the result normal?

Yes

Go to Intermittent conditions.

No

Replace the engine coolant temperature sensor.

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) While observing the Coolant Temperature parameter on the scan tool, start the engine and wait until it is

completely warmed up. Is the Coolant Temperature parameter on the scan tool more than or equal to the specified value?

Value: 108 ℃ { 107.78 ℃ }

Yes

⇒ Proceed to 2. Prioritized DTC check

No

Observe the DTC information with a scan tool.

DTC P0219 (Flash Code 543) Engine Overspeed Condition

1. DTC P0219 DTC information

1. DTC P0219 description

The CKP sensor is installed to the flywheel housing. The ECM calculates the engine speed and accurate crankshaft position based on the signal pulse from the CKP sensor. If the ECM detects that the engine is in a state of overrun, the DTC is set.

2. Condition for setting DTC P0219

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects that the engine speed is 2700 rpm or more.

3. Action taken when DTC P0219 sets

● The ECM does not illuminate the MIL or SVS lamp. Refer to Action taken when DTC sets - Type D.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0219

● Condition for clearing the DTC - Refer to Type D.

Refer to "*DTC type definitions*" in this section.

2. DTC P0219 diagnostics

Note:

● If there is electromagnetic interference in the CKP sensor circuit, this DTC may be set.

Caution：

● This DTC is set by an engine overrun condition due to driver error, for example, downshifting of a manual transmission on a steep downhill slope.

Engine overrun may damage internal engine components.

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0335, P0336, or P0340 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

No

⇒ Proceed to 3. Engine speed verification

3. Engine speed verification

1) Connect the scan tool.

2) Start the engine.

3) While raising the engine speed as necessary, observe the Engine Speed parameter on the scan tool. Is the Engine Speed parameter more than or equal to the specified value?

Value: 2,700 rpm

Yes

⇒ Proceed to 4. CKP sensor inspection

No

Ask the driver if the overrun was caused by gear slip-out, shift error, down-slope driving, etc. If an engine overrun has occurred in the past, be sure to inspect the engine, and repair as necessary.

⇒ Proceed to 5. Repair verification

4. CKP sensor inspection

1) Inspect the CKP sensor and the sensor rotor for the following conditions. Is the result normal?

● Damage to the sensor

● Loose or improperly installed sensor

● Excessive gap

● Foreign material passes through the gap between the sensor and the sensor rotor.

● Damage to the sensor rotor

● Loose or improperly installed sensor rotor

Yes

Replace the CKP sensor.

⇒ Proceed to 5. Repair verification

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) While observing the Engine Speed parameter on the scan tool, repeatedly depress the accelerator pedal from idle to full throttle to increase the engine speed. Is the Engine Speed parameter more than or equal to the specified value?

Value: 2,700 rpm

Yes

⇒ Proceed to 2. Prioritized DTC check

No

Observe the DTC information with a scan tool.

DTC P0234 (Flash Code 42) Turbocharger Overboost Condition

1. DTC P0234 DTC information

1. DTC P0234 description

The boost pressure sensor is installed on the intake duct and detects the pressure in the intake manifold. If the pressure in the intake manifold changes according to the turbocharger conditions, the boost pressure sensor output voltage changes. If the pressure in the intake manifold is low, the output voltage becomes low, and if the pressure is high, the output voltage becomes high. The ECM reads this change in output voltage, converts it to boost pressure, and uses it for control. The boost pressure sensor 5 V reference circuit is shared with the engine coolant temperature sensor, fuel temperature sensor, and EGR position sensor 2.

2. Condition for setting DTC P0234

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTCs P060B, P0697, P1247, P1248, P1249, and P124A are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P1247 (Flash Code 411) Turbocharger Boost Control Solenoid Circuit 1*" in this section.

Refer to "*DTC P1248 (Flash Code 412) Turbocharger Boost Control Solenoid Circuit 2*" in this section.

Refer to "*DTC P1249 (Flash Code 413) Turbocharger Boost Control Solenoid Circuit 3*" in this section.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

Condition for setting the DTC

● The ECM detects an excessive boost pressure.

3. Action taken when DTC P0234 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the VGS control.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0234

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0234 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is DTC P0237, P0238, P0641, P0651, P0697, P2228, or P2229 set at the same time?

Yes

Go to the applicable DTC diagnosis. Refer to "*DTC P0237 (Flash Code 32) Turbocharger Boost Sensor Circuit Low*" in this section.

Refer to "*DTC P0238 (Flash Code 32) Turbocharger Boost Sensor Circuit High*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

No

⇒ Proceed to 3. Boost pressure sensor connector inspection

3. Boost pressure sensor connector inspection

1) Inspect for poor connections at the boost pressure sensor connector (pins 1, 2, and 3 of E101). Is the connection status normal?

Refer to "*Engine Control*".

2) Visually inspect to ensure that the rubber hose is correctly installed and that there are no cracks or clogging. Is the result normal?

3) Are all of the results normal?

Yes

⇒ Proceed to 4. Current DTC check

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

4. Current DTC check

1) Observe the DTC information with a scan tool. Is DTC P0234 set?

Yes

⇒ Proceed to 5. Boost pressure sensor harness connector inspection

No

Go to Intermittent conditions.

5. Boost pressure sensor harness connector inspection

1) Inspect for poor connections at the boost pressure sensor harness connector (pins 1, 2, and 3 of E101). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. Boost pressure sensor signal voltage check

No

Repair the connection as necessary.

⇒ Proceed to 13. Repair verification

6. Boost pressure sensor signal voltage check

1) Turn ON the ignition switch.

2) Observe the Boost Pressure Sensor parameter on the scan tool. Is the Boost Pressure Sensor parameter within the specified range?

Value: 0.1 to 4.9 V

Yes

⇒ Proceed to 9. Turbocharger inspection

No

⇒ Proceed to 7. Boost pressure sensor 5 V reference voltage check

7. Boost pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the boost pressure sensor harness connector (E101).

3) Turn ON the ignition switch.

4) Measure the voltage between the boost pressure sensor 5 V reference circuit (pin 3 of E101) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 5 V

Yes

⇒ Proceed to 9. Turbocharger inspection

No

⇒ Proceed to 8. Inspection for open circuit and short circuit in boost pressure sensor circuit

8. Inspection for open circuit and short circuit in boost pressure sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and boost pressure sensor harness connector (E101).

3) Connect a fused jumper wire between each circuit of the boost pressure sensor harness connector (E101), and measure the resistance between each circuit of the ECM harness connector (F41) with a DMM. Is the resistance equal to the specified value?

● Jumper: Between the signal circuit and the 5 V reference circuit (pins 1 and 3 of E101)

● Measure: Between the signal circuit and the 5 V reference circuit (pins 50 and 62 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

● Jumper: Between the signal circuit and the low reference circuit (pins 1 and 2 of E101)

● Measure: Between the signal circuit and the low reference circuit (pins 51 and 62 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

● Jumper: Between the 5 V reference circuit and the low reference circuit (pins 2 and 3 of E101)

● Measure: Between the 5 V reference circuit and the low reference circuit (pins 50 and 51 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

Refer to "*Engine Control*".

Yes

Replace the boost pressure sensor.

⇒ Proceed to 13. Repair verification

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

9. Turbocharger inspection

1) Inspect the turbocharger. Is the result normal?

Yes

⇒ Proceed to 10. Air intake system inspection

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

10. Air intake system inspection

1) Inspect the air intake system. Is the result normal?

Refer to "*Air intake system check*" in this section.

Yes

⇒ Proceed to 13. Repair verification

No

⇒ Proceed to 11. ECM power supply and ground circuit inspection

11. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Note:

● If DTC P0237 or P0238 is set, first address the DTCs that are set.

Refer to "*DTC P0237 (Flash Code 32) Turbocharger Boost Sensor Circuit Low*" in this section.

Refer to "*DTC P0238 (Flash Code 32) Turbocharger Boost Sensor Circuit High*" in this section.

Yes

⇒ Proceed to 12. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

12. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 13. Repair verification

13. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0237 (Flash Code 32) Turbocharger Boost Sensor Circuit Low

1. DTC P0237 DTC information

1. DTC P0237 description

The boost pressure sensor is installed to the intake duct. The boost pressure sensor changes the signal voltage in accordance with changes in air pressure in the air intake pipe. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Boost pressure sensor signal circuit

The boost pressure sensor transmits the signals related to air pressure changes within the air intake pipe to the ECM. The ECM detects a low signal voltage in low boost pressure, such as when the engine is under low load. The ECM detects a high signal voltage in high boost pressure, such as when the engine is under high load. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P0237

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the boost pressure sensor signal voltage is 0.1 V or less for approximately 3 seconds.

3. Action taken when DTC P0237 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default boost pressure value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0237

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0237 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Boost pressure sensor signal voltage check

3. Boost pressure sensor signal voltage check

1) Observe the Boost Pressure Sensor parameter on the scan tool. Is the Boost Pressure Sensor parameter less than or equal to the specified value?

Value: 0.1 V

Yes

⇒ Proceed to 4. Boost pressure sensor 5 V reference voltage check

No

Go to Intermittent conditions.

4. Boost pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the boost pressure sensor harness connector (E101).

3) Turn ON the ignition switch.

4) Measure the voltage between the boost pressure sensor 5 V reference circuit (pin 3 of E101) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.9 V

Yes

⇒ Proceed to 5. Boost pressure sensor signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in boost pressure sensor 5 V reference circuit

5. Boost pressure sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the boost pressure sensor 5 V reference circuit and the signal circuit (pins 1 and 3 of E101).

Refer to "*Engine Control*".

2) Observe the Boost Pressure Sensor parameter on the scan tool. Is the Boost Pressure Sensor parameter more than or equal to the specified value?

Value: 4.5 V

Yes

⇒ Proceed to 8. Boost pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in boost pressure sensor signal circuit

6. Inspection for open circuit in boost pressure sensor 5 V reference circuit

1) Inspect the 5 V reference circuit between the ECM (pin 50 of F41) and the boost pressure sensor (pin 3 of E101) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution:

● The boost pressure sensor shares the 5 V reference circuit with other sensors. A malfunction in the 5 V reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in boost pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 62 of F41) and the boost pressure sensor (pin 1 of E101) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Boost pressure sensor harness connector inspection

1) Inspect for poor connections at the boost pressure sensor harness connector (pins 1 and 3 of E101). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the boost pressure sensor.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 50 and 62 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0238 (Flash Code 32) Turbocharger Boost Sensor Circuit High

1. DTC P0238 DTC information

1. DTC P0238 description

The boost pressure sensor is installed to the intake duct. The boost pressure sensor changes the signal voltage in accordance with changes in air pressure in the air intake pipe. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Boost pressure sensor signal circuit

The boost pressure sensor transmits the signals related to air pressure changes within the air intake pipe to the ECM. The ECM detects a low signal voltage in low boost pressure, such as when the engine is under low load. The ECM detects a high signal voltage in high boost pressure, such as when the engine is under high load. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P0238

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the boost pressure sensor signal voltage is 4.9 V or more for approximately 3 seconds.

3. Action taken when DTC P0238 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default boost pressure value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P0238

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0238 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Boost pressure sensor signal voltage check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the Boost Pressure Sensor parameter on the scan tool. Is the Boost Pressure Sensor parameter more than or equal to the specified value?

Value: 4.9 V

Yes

⇒ Proceed to 3. Boost pressure sensor 5 V reference voltage and signal voltage check

No

Go to Intermittent conditions.

3. Boost pressure sensor 5 V reference voltage and signal voltage check

1) Observe the DTC information with a scan tool for DTC P0697 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the boost pressure sensor harness connector (E101).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the Boost Pressure Sensor parameter on the scan tool.

Value: 0.1 V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in boost pressure sensor signal circuit

The reading is less than or equal to the specified value and DTC P0697 is set.

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

The reading is less than or equal to the specified value and DTC P0697 is not set.

⇒ Proceed to 4. Boost pressure sensor low reference circuit inspection using test lamp

4. Boost pressure sensor low reference circuit inspection using test lamp

1) Connect a test lamp between the boost pressure sensor low reference circuit (pin 2 of E101) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. Boost pressure sensor harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in boost pressure sensor low reference circuit

5. Inspection for short to power supply in boost pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 62 of F41) and the boost pressure sensor (pin 1 of E101) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● The boost pressure sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in boost pressure sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 51 of F41) and the boost pressure sensor (pin 2 of E101) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The boost pressure sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. Boost pressure sensor harness connector inspection

1) Inspect for poor connections at the boost pressure sensor harness connector (pin 2 of E101). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the boost pressure sensor.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 51 of F41). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0299 (Flash Code 65) Turbocharger Underboost

DTC P0299 DTC information

1. DTC P0299 description

The boost pressure sensor is located in the air intake pipe. This sensor changes the signal voltage in accordance with changes in air pressure in the air intake pipe. The ECM monitors the boost pressure sensor signal. If the ECM detects an excessively low sensor signal, the DTC is set. This indicates that the boost pressure is excessively low.

2. Condition for setting DTC P0299

Condition for running the DTC

● The ignition switch is ON.

● The engine speed is 1300 - 2000 rpm.

● The fuel injection quantity is more than or equal to the predetermined value.

● DTCs P0087, P0088, P0089, P0091, P0092, P0102, P0103, P0116, P0117, P0118, P0192, P0193, P0201, P0202, P0203, P0204, P0205, P0206, P0401, P0404, P0409, P0560, P060B, P0641, P0651, P0697, P1062, P1063, P1093, P1247, P1248, P1249, P124A, P1261, P1262, P1404, P140B, P140C, P2146, P2149, P2227, P2228, P2229, P2295, P2296, and P244A are not set.

Refer to "*DTC P0087 (Flash Code 225) Fuel Rail/System Pressure - Too Low*" in this section.

Refer to "*DTC P0088 (Flash Code 118) Fuel Rail/System Pressure - Too High*" in this section.

Refer to "*DTC P0089 (Flash Code 151) Fuel Pressure Regulator Performance*" in this section.

Refer to "*DTC P0091 (Flash Code 247) Fuel Pressure Regulator Control Circuit Low*" in this section.

Refer to "*DTC P0092 (Flash Code 217) Fuel Pressure Regulator Control Circuit High*" in this section.

Refer to "*DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input*" in this section.

Refer to "*DTC P0116 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P0201 (Flash Code 271) Injector Circuit Open - Cylinder 1*" in this section.

Refer to "*DTC P0202 (Flash Code 272) Injector Circuit Open - Cylinder 2*" in this section.

Refer to "*DTC P0203 (Flash Code 273) Injector Circuit Open - Cylinder 3*" in this section.

Refer to "*DTC P0204 (Flash Code 274) Injector Circuit Open - Cylinder 4*" in this section.

Refer to "*DTC P0205 (Flash Code 275) Injector Circuit Open - Cylinder 5*" in this section.

Refer to "*DTC P0206 (Flash Code 276) Injector Circuit Open - Cylinder 6*" in this section.

Refer to "*DTC P0401 (Flash Code 93) EGR Flow Insufficient Detected*" in this section.

Refer to "*DTC P0404 (Flash Code 45) EGR Control Circuit Range/Performance*" in this section.

Refer to "*DTC P0409 (Flash Code 44) EGR Sensor Circuit*" in this section.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P1062 (Flash Code 257) Fuel Pressure Regulator 1 Solenoid Control Circuit*" in this section.

Refer to "*DTC P1063 (Flash Code 258) Fuel Pressure Regulator 2 Solenoid Control Circuit*" in this section.

Refer to "*DTC P1093 (Flash Code 226) Fuel Rail Pressure Too Low*" in this section.

Refer to "*DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1*" in this section.

Refer to "*DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2*" in this section.

Refer to "*DTC P1404 (Flash Code 45) EGR Position Fault*" in this section.

Refer to "*DTC P140B (Flash Code 344) EGR 2 Position Sensor Performance*" in this section.

Refer to "*DTC P140C (Flash Code 345) EGR 2 Closed Position Performance*" in this section.

Refer to "*DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit*" in this section.

Refer to "*DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit*" in this section.

Refer to "*DTC P2227 (Flash Code 71) Barometric Pressure Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P2295 (Flash Code 248) Fuel Pressure Regulator 2 Control Circuit Low*" in this section.

Refer to "*DTC P2296 (Flash Code 218) Fuel Pressure Regulator 2 Control Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the boost pressure is lower than a predetermined value for 5 seconds or more.

3. Action taken when DTC P0299 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0299

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P0299 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0237, P0238, P2227, P2228, or P2229 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0237 (Flash Code 32) Turbocharger Boost Sensor Circuit Low*" in this section.

Refer to "*DTC P0238 (Flash Code 32) Turbocharger Boost Sensor Circuit High*" in this section.

Refer to "*DTC P2227 (Flash Code 71) Barometric Pressure Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.。

No

⇒ Proceed to 3. Boost pressure control components inspection

3. Boost pressure control components inspection

1) Inspect for the following conditions that cause a low boost pressure. Is the result normal?

● Air leakage around the boost pressure sensor or foreign material covering the sensor hole

● Air leakage around the air intake pipe between the turbocharger and the intake manifold. Damaged components and loose clamps

● Biting of the turbine shaft, which causes a decrease in the rotation speed of the turbocharger shaft

● Clogged air cleaner element, collapsing of the intake pipe between the air cleaner and the boost pressure sensor, or a state where flow is restricted

● Oil in the air intake pipe that may cause a boost pressure sensor signal error. If the oil is attached to inside the piping, intercooler, or turbocharger, it is necessary to wipe it off.

Yes

⇒ Proceed to 4. Boost pressure and barometric pressure difference check

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

4. Boost pressure and barometric pressure difference check

1) Turn ON the ignition switch.

2) Observe the difference between the Boost Pressure parameter and the Barometric Pressure parameter on the scan tool.

Is the difference between the Boost Pressure parameter and the Barometric Pressure parameter more than or equal to the specified value?

Value: 10 kPa { 1.5 psi }

Yes

⇒ Proceed to 5. Barometric pressure check

No

Go to Intermittent conditions.

5. Barometric pressure check

1) Refer to the table and compare the Barometric Pressure parameter on the scan tool with the surrounding barometric pressure. Is the Barometric Pressure parameter within the specified range?

Altitude measured in meters (m)	Altitude measured in feet (ft)	Barometric pressure measured in kilopascals (kPa)
4267	14000	56-64
3962	13000	58-66
3658	12000	61-69
3353	11000	64-72
3048	10000	66-74
2743	9000	69-77
2438	8000	71-79
2134	7000	74-82
1829	6000	77-85
1524	5000	80-88
1219	4000	83-91
914	3000	87-95
610	2000	90-98
305	1000	94-102
0	0 (Sea level)	96-104
-305	-1000	101-105

Yes

⇒ Proceed to 6. Boost pressure sensor circuit inspection

No

⇒ Proceed to 7. Barometric pressure sensor circuit inspection

6. Boost pressure sensor circuit inspection

1) Inspect for poor connections at the boost pressure sensor harness connector (pins 1 and 3 of E101). Is the connection status normal?

2) Inspect for poor connections at the TCM harness connector (pins 50 and 62 of FU163). Is the connection status normal?

3) Inspect for high resistance in the circuit between the ECM (pins 50 and 62 of F41) and the boost pressure sensor (pins 1 and 3 of E101). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the boost pressure sensor.

⇒ Proceed to 8. Repair verification

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 8. Repair verification

7. Barometric pressure sensor circuit inspection

1) Inspect for poor connections at the barometric pressure sensor harness connector (pin 1 of FL52). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pin 110 of F43). Is the connection status normal?

3) Inspect the low reference circuit between the ECM (pin 110 of F43) and the barometric pressure sensor (pin 1 of FL52) for high resistance. Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the barometric pressure sensor.

⇒ Proceed to 8. Repair verification

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit

1. DTC P0335 DTC information

1. DTC P0335 description

The CKP sensor detects the engine speed. When the sensing holes installed in the flywheel housing pass the tip of the CKP sensor, this emits voltage, which generates a pulse signal. The ECM reads this pulse signal and determines the engine speed, the injection cylinder, and the injection timing based on the signal.

2. Condition for setting DTC P0335

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● CMP sensor signal pulses are detected.

● DTCs P0016, P0336, P0340, and P0341 are not set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0341 (Flash Code 14) Camshaft Position Sensor Circuit Range/Performance*" in this section.

Condition for setting the DTC

● The ECM detects that no CKP sensor signal pulse is generated while the engine is running.

3. Action taken when DTC P0335 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default boost pressure value.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0335

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0335 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. CKP sensor installation inspection

1) Inspect the installation status of the CKP sensor. Is the result normal?

Yes

⇒ Proceed to 3. Current DTC check

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

3. Current DTC check

1) Check whether the DTC is a past failure with a scan tool. Is DTC P0335 a past failure?

Yes

⇒ Proceed to 4. ECM harness connector inspection

No

⇒ Proceed to 5. CKP sensor harness connector inspection

4. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 47 and 58 of FU163). Is the connection status normal?

Note:

● In the case of a past failure, poor connections or intermittent conditions are suspected in the ECM harness connector.

Refer to "*Engine Control*".

2) Repair the connection as necessary.

Procedure completion

⇒ Proceed to 14. Repair verification

5. CKP sensor harness connector inspection

1) Inspect for poor connections at the CKP harness connector (pins 1 and 2 of E92). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. CKP sensor signal circuit resistance check

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

6. CKP sensor signal circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41).

3) Measure the resistance of the CKP sensor signal circuit (pins 47 and 58 of F41) with a DMM (Signal circuit internal resistance check). Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 109 to 143 Ω

Yes

⇒ Proceed to 8. Inspection for open circuit and short circuit in CKP sensor circuit

No

⇒ Proceed to 7. CKP sensor inspection

7. CKP sensor inspection

1) Disconnect the CKP sensor harness connector (E92).

2) Measure the resistance of the CKP sensor connector (E92) (Internal resistance check). Is the resistance within the specified range?

● In the CKP sensor signal circuit (pins 1 and 2 of E92)

Refer to "*Engine Control*".

Value: 109 to 143 Ω

3) Measure the resistance of the CKP sensor connector (E92) (Insulation check). Is the resistance equal to the specified value?

● Between the CKP sensor signal circuit (pin 1 of E92) and the frame ground

● Between the CKP sensor signal circuit (pin 2 of E92) and the frame ground

Refer to "*Engine Control*".

Value: ∞ Ω

4) Are all of the values normal?

Yes

⇒ Proceed to 8. Inspection for open circuit and short circuit in CKP sensor circuit

No

Replace the CKP sensor.

⇒ Proceed to 14. Repair verification

8. Inspection for open circuit and short circuit in CKP sensor circuit

1) Inspect for an open circuit or a short circuit between the ECM (pins 47, 54, and 58 of F41) and the CKP sensor (pins 1 and 2 of E92). Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. Engine speed verification using scan tool

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

9. Engine speed verification using scan tool

1) Reconnect all of the disconnected harness connectors.

2) Connect the scan tool.

3) Start and idle the engine.

4) Observe the Desired Idle Speed parameter and the Engine Speed parameter on the scan tool. Are both parameters same?

Yes

⇒ Proceed to 10. Engine speed verification during operation

No

⇒ Proceed to 12. ECM power supply and ground circuit inspection

10. Engine speed verification during operation

1) Check whether the engine speed changes. Is the engine speed stable?

Yes

⇒ Proceed to 14. Repair verification

No

⇒ Proceed to 11. CKP sensor and flywheel inspection

11. CKP sensor and flywheel inspection

1) Visually inspect the CKP sensor and the flywheel for scratches or dirt. Is the result normal?

Yes

⇒ Proceed to 12. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

12. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Note:

● If DTC P0016, P0340, or P0341 is set, first address the DTCs that are set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0341 (Flash Code 14) Camshaft Position Sensor Circuit Range/Performance*" in this section.

Yes

⇒ Proceed to 13. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 3. Current DTC check

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance

1. DTC P0336 DTC information

1. DTC P0336 description

The CKP sensor detects the engine speed. When the sensing holes installed in the flywheel housing pass the tip of the CKP sensor, this emits voltage, which generates a pulse signal. The ECM reads this pulse signal and determines the engine speed, the injection cylinder, and the injection timing based on the signal.

2. Condition for setting DTC P0336

Condition for running the DTC

● The battery voltage is 18 V or more.

● The engine is running.

● CMP sensor signal pulses are detected.

● DTCs P0016, P0336, P0340, and P0341 are not set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0341 (Flash Code 14) Camshaft Position Sensor Circuit Range/Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the CKP sensor signal pulse is not normal while the engine is running.

3. Action taken when DTC P0336 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default boost pressure value.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0336

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0336 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. CKP sensor installation inspection

1) Inspect the installation status of the CKP sensor. Is the result normal?

Yes

⇒ Proceed to 3. Current DTC check

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

3. Current DTC check

1) Check whether the DTC is a past failure with a scan tool. Is DTC P0336 a past failure?

Yes

⇒ Proceed to 4. ECM harness connector inspection

No

⇒ Proceed to 5. CKP sensor harness connector inspection

4. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 47 and 58 of FU163). Is the connection status normal?

Note:

● In the case of a past failure, poor connections or intermittent conditions are suspected in the ECM harness connector.

Refer to "*Engine Control*".

2) Repair the connection as necessary.

Procedure completion

⇒ Proceed to 14. Repair verification

5. CKP sensor harness connector inspection

1) Inspect for poor connections at the CKP harness connector (pins 1 and 2 of E92). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. CKP sensor signal circuit resistance check

No

Repair the connection as necessary.

⇒ Proceed to 14. Repair verification

6. CKP sensor signal circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41).

3) Measure the resistance of the CKP sensor signal circuit (pins 47 and 58 of F41) with a DMM (Signal circuit internal resistance check). Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 109 to 143 Ω

Yes

⇒ Proceed to 8. Inspection for open circuit and short circuit in CKP sensor circuit

No

⇒ Proceed to 7. CKP sensor inspection

7. CKP sensor inspection

1) Disconnect the CKP sensor harness connector (E92).

2) Measure the resistance of the CKP sensor connector (E92) (Internal resistance check). Is the resistance within the specified range?

● In the CKP sensor signal circuit (pins 1 and 2 of E92)

Refer to "*Engine Control*".

Value: 109 to 143 Ω

3) Measure the resistance of the CKP sensor connector (E92) (Insulation check). Is the resistance equal to the specified value?

● Between the CKP sensor signal circuit (pin 1 of E92) and the frame ground

● Between the CKP sensor signal circuit (pin 2 of E92) and the frame ground

Refer to "*Engine Control*".

Value: ∞ Ω

4) Are all of the values normal?

Yes

⇒ Proceed to 8. Inspection for open circuit and short circuit in CKP sensor circuit

No

Replace the CKP sensor.

⇒ Proceed to 14. Repair verification

8. Inspection for open circuit and short circuit in CKP sensor circuit

1) Inspect for an open circuit or a short circuit between the ECM (pins 47, 54, and 58 of F41) and the CKP sensor (pins 1 and 2 of E92). Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. Engine speed verification using scan tool

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

9. Engine speed verification using scan tool

1) Reconnect all of the disconnected harness connectors.

2) Connect the scan tool.

3) Start and idle the engine.

4) Observe the Desired Idle Speed parameter and the Engine Speed parameter on the scan tool. Are both parameters same?

Yes

⇒ Proceed to 10. Engine speed verification during operation

No

⇒ Proceed to 12. ECM power supply and ground circuit inspection

10. Engine speed verification during operation

1) Check whether the engine speed changes. Is the engine speed stable?

Yes

⇒ Proceed to 14. Repair verification

No

⇒ Proceed to 11. CKP sensor and flywheel inspection

11. CKP sensor and flywheel inspection

1) Visually inspect the CKP sensor and the flywheel for scratches or dirt. Is the result normal?

Yes

⇒ Proceed to 12. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

12. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Note:

● If DTC P0016 or P0340 is set, first address the DTCs that are set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Yes

⇒ Proceed to 13. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 14. Repair verification

13. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 14. Repair verification

14. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit

1. DTC P0340 DTC information

1. DTC P0340 description

The CMP sensor detects the camshaft rotation in the supply pump and identifies the cylinder. When the pulsar installed in the camshaft passes the tip of the CMP sensor, this emits voltage, which generates a pulse signal. The ECM reads this pulse signal and identifies the cylinder based on the signal.

2. Condition for setting DTC P0340

Condition for running the DTC

● The battery voltage is 18 V or more.

● The engine is running.

● CKP sensor signal pulses are detected

● DTCs P0016, P0335, P0336, and P0341 are not set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0341 (Flash Code 14) Camshaft Position Sensor Circuit Range/Performance*" in this section.

Condition for setting the DTC

● The ECM detects that no CMP sensor signal pulse is generated while the engine is running.

3. Action taken when DTC P0340 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0340

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0340 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Turn ON the ignition switch.

2) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Prioritized DTC check

No

Go to Intermittent conditions.

3. Prioritized DTC check

1) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 4. CMP sensor installation inspection

4. CMP sensor installation inspection

1) Inspect the installation status of the CMP sensor. Is the result normal?

Yes

⇒ Proceed to 5. CMP sensor harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

5. CMP sensor harness connector inspection

1) Inspect for poor connections at the CMP sensor harness connector (pins 1, 2, and 3 of E91). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. CMP sensor 5 V reference voltage check

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

6. CMP sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the CMP sensor harness connector (E91).

3) Turn ON the ignition switch.

4) Measure the voltage between the CMP sensor 5 V reference circuit (pin 3 of E91) and the frame ground with a DMM.

Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 5 V

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

⇒ Proceed to 7. Individual harness connector inspection

7. Individual harness connector inspection

1) Inspect for poor connections at the CMP sensor harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

Repair or replace as necessary.

⇒ Proceed to 8. CMP sensor signal input check

8. CMP sensor signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0340 set?

Yes

⇒ Proceed to 9. CMP sensor inspection

No

⇒ Proceed to 15. Repair verification

9. CMP sensor inspection

1) Remove the CMP sensor, and inspect the sensor tip for scratches or damage. Is the result normal?

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

Replace the CMP sensor.

⇒ Proceed to 15. Repair verification

10. Inspection for open circuit and short circuit in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and the CMP sensor harness connector (E91).

3) Connect a fused jumper wire between each circuit of the CMP sensor harness connector (E91), and measure the resistance between each circuit of the ECM harness connector (F41) with a DMM. Is the resistance equal to the specified value?

● Jumper: Between the signal circuit and the 5 V reference circuit (pins 1 and 3 of E91)

● Measure: Between the signal circuit and the 5 V reference circuit (pins 52 and 66 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

● Jumper: Between the signal circuit and the low reference circuit (pins 1 and 2 of E91)

● Measure: Between the signal circuit and the low reference circuit (pins 53 and 66 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

● Jumper: Between the low reference circuit and the 5 V reference circuit (pins 2 and 3 of E91)

● Measure: Between the 5 V reference circuit and the low reference circuit (pins 52 and 53 of F41)

Value: 0.5 Ω (With a jumper wire)

Value: ∞ Ω (Without a jumper wire)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. Inspection for short to ground in CMP sensor circuit

No

Repair or replace the malfunctioning circuit.

⇒ Proceed to 15. Repair verification

11. Inspection for short to ground in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and the CMP sensor harness connector (E91).

3) Measure the resistance between each circuit of the ECM harness connector (F41) and the frame ground with a DMM (Check for short circuit). Is the resistance equal to the specified value?

● Between the CMP sensor signal circuit (pin 66 of F41) and the frame ground

● Between the CMP sensor 5 V reference circuit (pin 52 of F41) and the frame ground

Refer to "*Engine Control*".

Value: ∞ Ω

Yes

⇒ Proceed to 12. Inspection for short to power supply in CMP sensor circuit

No

Repair the short to ground in the CMP sensor circuit.

⇒ Proceed to 15. Repair verification

12. Inspection for short to power supply in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the CMP sensor harness connector (E91).

3) Turn ON the ignition switch.

4) Measure the voltage between each circuit on the CMP sensor harness connector side (E91) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 0 V

Yes

⇒ Proceed to 13. ECM power supply and ground circuit inspection

No

Repair the short to the power supply in the CMP sensor circuit.

⇒ Proceed to 15. Repair verification

13. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Note:

● If DTC P0016, P0335, or P0336 is set, first address the DTCs that are set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Yes

⇒ Proceed to 14. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

14. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 15. Repair verification

15. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0341 (Flash Code 14) Camshaft Position Sensor Circuit Range/Performance

1. DTC P0341 DTC information

1. DTC P0341 description

The CMP sensor detects the camshaft rotation in the supply pump and identifies the cylinder. When the pulsar installed in the camshaft passes the tip of the CMP sensor, this emits voltage, which generates a pulse signal. The ECM reads this pulse signal and identifies the cylinder based on the signal.

2. Condition for setting DTC P0341

Condition for running the DTC

● The engine is running.

● CKP sensor signal pulses are detected

● DTCs P0016, P0335, P0336, and P0340 are not set.

Refer to "*DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0340 (Flash Code 14) Camshaft Position Sensor Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the CMP sensor signal pulse is not normal while the engine is running.

3. Action taken when DTC P0341 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

4. Condition for clearing DTC P0341

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0341 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Turn ON the ignition switch.

2) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Prioritized DTC check

No

Go to Intermittent conditions.

3. Prioritized DTC check

1) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 4. CMP sensor installation inspection

4. CMP sensor installation inspection

1) Inspect the installation status of the CMP sensor. Is the result normal?

Yes

⇒ Proceed to 5. CMP sensor harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

5. CMP sensor harness connector inspection

1) Inspect for poor connections at the CMP sensor harness connector (pins 1, 2, and 3 of E91). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. CMP sensor 5 V reference voltage check

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

6. CMP sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the CMP sensor harness connector (E91).

3) Turn ON the ignition switch.

4) Measure the voltage between the CMP sensor 5 V reference circuit (pin 3 of E91) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 5V

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

⇒ Proceed to 7. Individual harness connector inspection

7. Individual harness connector inspection

1) Inspect for poor connections at the CMP sensor harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

Repair or replace as necessary.

⇒ Proceed to 8. CMP sensor signal input check

8. CMP sensor signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0341 set?

Yes

⇒ Proceed to 9. CMP sensor inspection

No

⇒ Proceed to 15. Repair verification

9. CMP sensor inspection

1) Remove the CMP sensor, and inspect the sensor tip for scratches or damage. Is the result normal?

Yes

⇒ Proceed to 10. Inspection for open circuit and short circuit in CMP sensor circuit

No

Replace the CMP sensor.

⇒ Proceed to 15. Repair verification

10. Inspection for open circuit and short circuit in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and the CMP sensor harness connector (E91).

3) Connect a fused jumper wire to each circuit of the CMP sensor harness connector (E91).

● Between the CMP sensor signal circuit and the 5 V reference circuit (pins 1 and 3 of E91)

● Between the CMP sensor signal circuit and the low reference circuit (pins 1 and 2 of E91)

● Between the CMP sensor 5 V reference circuit and the low reference circuit (pins 2 and 3 of E91)

● Between the CMP sensor shield wire and the low reference circuit (pin 2 of E91)

4) Measure the resistance between each circuit of the ECM harness connector (F41) with a DMM (Check for open circuit).

Is the resistance equal to the specified value?

● Between the CMP sensor signal circuit and the 5 V reference circuit (pins 52 and 66 of F41)

● Between the CMP sensor signal circuit and the low reference circuit (pins 53 and 66 of F41)

● Between the CMP sensor 5 V reference circuit and the low reference circuit (pins 52 and 53 of F41)

Refer to "*Engine Control*".

Value: 0.5 Ω

5) Disconnect the fused jumper wire from between each circuit of the CMP sensor harness connector (E91).

6) Measure the resistance between each circuit of the ECM (F41) and the CMP sensor (E91) with a DMM (Check for short circuit). Is the resistance equal to the specified value?

● 5 V reference circuit between the ECM (pin 52 of F41) and the CMP sensor (pin 3 of E91)

● Signal circuit between the ECM (pin 66 of F41) and the CMP sensor (pin 1 of E91)

● Low reference circuit between the ECM (pin 53 of F41) and the CMP sensor (pin 2 of E91)

Refer to "*Engine Control*".

Value: ∞ Ω

7) Are all of the values normal?

Yes

⇒ Proceed to 11. Inspection for short to ground in CMP sensor circuit

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

11. Inspection for short to ground in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and the CMP sensor harness connector (E91).

3) Measure the resistance between each circuit of the ECM harness connector (F41) and the frame ground with a DMM (Check for short circuit). Is the resistance equal to the specified value?

● Between the CMP sensor signal circuit (pin 66 of F41) and the frame ground

● Between the CMP sensor 5 V reference circuit (pin 52 of F41) and the frame ground

Refer to "*Engine Control*".

Value: ∞ Ω

Yes

⇒ Proceed to 12. Inspection for short to power supply in CMP sensor circuit

No

Repair the short to ground in the CMP sensor circuit.

⇒ Proceed to 15. Repair verification

12. Inspection for short to power supply in CMP sensor circuit

1) Turn OFF the ignition switch.

2) Disconnect the CMP sensor harness connector (E91).

3) Turn ON the ignition switch.

4) Measure the voltage between each circuit of the CMP sensor harness connector (E91) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 0V

Yes

⇒ Proceed to 13. ECM power supply and ground circuit inspection

No

Repair the short to the power supply in the CMP sensor circuit.

⇒ Proceed to 15. Repair verification

13. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "ECM power supply and ground circuit check" in this section.

Note:

● If DTC P0016, P0335, or P0336 is set, first address the DTCs that are set.

Refer to "DTC P0016 (Flash Code 16) Crankshaft Position - Camshaft Position Correlation" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Yes

⇒ Proceed to 14. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

14. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 15. Repair verification

15. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0401 (Flash Code 93) EGR Flow Insufficient Detected

1. DTC P0401 DTC information

1. DTC P0401 description

The ECM controls the opening and closing of the EGR valve based on the driving condition of the engine by controlling the EGR motor. The EGR valve position is detected by the position sensor and is sent to the ECM. When the proper clearance requirements are met, the ECM opens the EGR valve while monitoring the MAF signal. An expected MAF difference should be detected between the closed and open positions of the valve. If the ECM detects an MAF difference that is less than expected, this DTC is set. The ECM diagnoses this DTC 1 time only per 1 ignition cycle.

2. Condition for setting DTC P0401

Condition for running the DTC

● The battery voltage is 16 V or more.

● The engine is idling.

● DTCs P0102, P0103, P0112, P0113, P0116, P0117, P0118, P0404, P0409, P0500, P0502, P0503, P0560, P060B, P0641, P0651, P0697, P1404, P140A, P140B, P2227, P2228, and P2229 are not set.

Refer to "*DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input*" in this section.

Refer to "*DTC P0112 (Flash Code 22) Intake Air Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0113 (Flash Code 22) Intake Air Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0116 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0404 (Flash Code 45) EGR Control Circuit Range/Performance*" in this section.

Refer to "*DTC P0409 (Flash Code 44) EGR Sensor Circuit*" in this section.

Refer to "*DTC P0500 (Flash Code 25) Vehicle Speed Sensor*" in this section.

Refer to "*DTC P0502 (Flash Code 25) Vehicle Speed Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0503 (Flash Code 25) Vehicle Speed Sensor Circuit High Input*" in this section.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P1404 (Flash Code 45) EGR Position Fault*" in this section.

Refer to "*DTC P140A (Flash Code 345) EGR 2 Performance*" in this section.

Refer to "*DTC P140B (Flash Code 344) EGR 2 Position Sensor Performance*" in this section.

Refer to "*DTC P2227 (Flash Code 71) Barometric Pressure Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the difference between the EGR flow when the valve is open and the EGR flow when the valve is closed is less than the specified value.

3. Action taken when DTC P0401 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

4. Condition for clearing DTC P0401

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0401 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0101, P0102, P0103, or P0560 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0101 (Flash Code 92) Mass Air Flow Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input*" in this section.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

No

⇒ Proceed to 3. Current DTC check

3. Current DTC check

1) Start and completely warm up the engine until the engine coolant temperature reaches 80℃ {176℉} or more.

2) Idle the engine for at least 3 minutes while observing the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. EGR components inspection

No

Go to Intermittent conditions.

4. EGR components inspection

1) Inspect the air intake/exhaust system for the following conditions. Is the result normal?

● Missing or broken EGR valve gasket

● Stuck EGR valve

● EGR gas leakage from the EGR passage between the exhaust manifold and the intake manifold

● Restricted or broken EGR passage between the exhaust manifold and the EGR valve

● Any kind of restriction that happens in the exhaust system

● Clogged air cleaner element, collapsing of the air piping between the air cleaner and intake manifold, or a state where flow is restricted or breakage is present

● Leakage in the air intake system

● Water intrusion in the air intake system

● Contamination or foreign material blocking the inlet of MAF sensor

● Misdetection or delayed response of the MAF sensor

● The ventilation duct is connected to the exhaust tail pipe. Remove the duct and retest if it is connected.

Yes

⇒ Proceed to 5. EGR operation check using scan tool

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

5. EGR operation check using scan tool

1) Perform EGR a few times with the scan tool.

2) While observing the Exhaust Gas Recirculation (EGR) Valve Position value, command the Desired EGR Position UP and DOWN. Does the Exhaust Gas Recirculation (EGR) Valve Position parameter follow the Desired EGR Position?

Value: -5 to 5 %

Yes

Go to Intermittent conditions.

No

Replace the EGR valve.

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0404 (Flash Code 45) EGR Control Circuit Range/Performance

1. DTC P0404 DTC information

1. DTC P0404 description

The EGR motor is installed inside the EGR valve. The EGR motor used on this vehicle is a brushless DC motor and is driven by the three-phase motor. EGR motor 1 has the following circuits.

● EGR motor 1 drive circuit 1

● EGR motor 1 drive circuit 2

● EGR motor 1 drive circuit 3

The ECM drives the EGR motor via EGR motor 1 drive circuits 1, 2, and 3. The ECM outputs the drive signal by switching inside the ECM, and the motor rotates according to the combination of the three-phase signal. Also, the valve opening angle is controlled by the duty. If the EGR motor drive duty is large and the difference between the desired EGR opening angle and the EGR 1 opening angle is excessive, the ECM sets the DTC.

2. Condition for setting DTC P0404

Condition for running the DTC

● The battery voltage is 16 V or more.

● The desired EGR position is stable.

● DTCs P0409, P060B, P0641, P0697, and P140B are not set.

Refer to "*DTC P0409 (Flash Code 44) EGR Sensor Circuit*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P140B (Flash Code 344) EGR 2 Position Sensor Performance*" in this section.

Condition for setting the DTC

● The ECM detects that when the EGR motor output is 90% or more, the difference between the desired EGR position and the EGR 1 opening angle is excessive for 10 seconds or more.

3. Action taken when DTC P0404 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0404

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0404 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. EGR operation check using scan tool

1) Clear the DTC with a scan tool.

2) Perform EGR a few times with the scan tool.

3) While observing the Exhaust Gas Recirculation (EGR) Valve Position value, command the Desired EGR Position UP and DOWN. Does the Exhaust Gas Recirculation (EGR) Valve Position parameter follow the Desired EGR Position within the specified range?

Yes

⇒ Proceed to 3. Current DTC check

No

⇒ Proceed to 4. Inspection for open circuit and short circuit in EGR motor 1 drive circuit

3. Current DTC check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0404 set?

Yes

⇒ Proceed to 6. ECM power supply and ground circuit inspection

No

Go to Intermittent conditions.

4. Inspection for open circuit and short circuit in EGR motor 1 drive circuit

1) Inspect the drive circuit between the ECM (pins 32, 33, and 38 of F41) and EGR motor 1 (pins 6, 7, and 8 of E98) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the power supply circuit

● High resistance

Refer to "Engine Control".

Yes

Replace EGR valve 1.

⇒ Proceed to 5. EGR valve operation signal input check

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

5. EGR valve operation signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0404 set?

Yes

⇒ Proceed to 6. ECM power supply and ground circuit inspection

No

⇒ Proceed to 8. Repair verification

6. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0409 (Flash Code 44) EGR Sensor Circuit

1. DTC P0409 DTC information

1. DTC P0409 description

The EGR position sensor is installed inside the EGR valve. The EGR position sensor is a Hall IC type sensor installed in a total of 3 locations, and the motor phase is set by the polarity output ON/OFF of each sensor. EGR position sensor 1 has the following circuits.

● 5 V reference circuit

● Low reference circuit

● EGR position sensor 1 signal circuit 1

● EGR position sensor 1 signal circuit 2

● EGR position sensor 1 signal circuit 3

The ECM supplies 5 V to EGR position sensor 1 signals 1, 2, and 3 via the 5 V reference circuit and grounds to the ECM via the low reference circuit. Also, the EGR position sensor, via each signal circuit, outputs the polarity of either EGR position sensor 1 signals 1, 2, or 3 as ON/OFF to the ECM. The ECM detects the EGR valve position by counting the number of times the polarity changes. If all the polarity signal inputs of EGR position sensor 1 signals 1, 2, and 3 turn ON or OFF at the same time, the ECM sets a DTC.

2. Condition for setting DTC P0409

Condition for running the DTC

● The battery voltage is 18V or more.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the signals input from EGR position sensor 1 signals 1, 2, and 3 are all ON or all OFF for approximately 3 seconds or more.

3. Action taken when DTC P0409 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0409

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0409 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Individual harness connector inspection

1) Inspect for poor connections at the EGR valve 1 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in 5 V reference circuit of EGR position sensor 1

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

3. Inspection for open circuit and short circuit in 5V reference circuit of EGR position sensor 1

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F41) and the EGR valve 1 harness connector (E98).

3) Inspect the 5 V reference circuit between the ECM (pin 61 of F41) and EGR position sensor 1 (pin 1 of E98) for the following conditions. Is the result normal?

● Open circuit

● High resistance

● Short to ground

● Short to the EGR position sensor 1 circuit (pins 39, 40, 41, and 60 of F41) or short to the ECM power supply circuit (pins 67 and 68 of F42)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 4. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 1

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

4. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 1

1) Inspect signal circuit 1 between the ECM (pin 39 of F41) and EGR position sensor 1 (pin 4 of E98) for the following conditions. Is the result normal?

● Open circuit

● High resistance

● Short to ground

● Short to the power supply circuit

● Short to the EGR position sensor 1 circuit (pins 40, 41, 60, and 61 of F41) or short to the ECM power supply circuit (pins 67 and 68 of F42)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 2

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

5. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 2

1) Inspect signal circuit 2 between the ECM (pin 40 of F41) and EGR position sensor 1 (pin 3 of E98) for the following conditions. Is the result normal?

● Open circuit

● High resistance

● Short to ground

● Short to the power supply circuit

● Short to the EGR position sensor 1 circuit (pins 39, 41, 60, and 61 of F41) or short to the ECM power supply circuit (pins 67 and 68 of F42)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 6. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 3

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

6. Inspection for open circuit and short circuit in EGR position sensor 1 signal circuit 3

1) Inspect signal circuit 3 between the ECM (pin 41 of F41) and EGR position sensor 1 (pin 2 of E98) for the following conditions. Is the result normal?

● Open circuit

● High resistance

● Short to ground

● Short to the power supply circuit

● Short to the EGR position sensor 1 circuit (pins 39, 40, 60, and 61 of F41) or short to the ECM power supply circuit (pins 67 and 68 of F42)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. Inspection for open circuit in EGR position sensor 1 low reference circuit

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

7. Inspection for open circuit in EGR position sensor 1 low reference circuit

1) Inspect the low reference circuit between the ECM (pin 60 of F41) and EGR position sensor 1 (pin 5 of E98) for the following conditions. Is the result normal?

● Open circuit

● High resistance

● Short to ground

● Short to the EGR position sensor 1 circuit (pins 39, 40, 41, and 61 of F41) or short to the ECM power supply circuit (pins 67 and 68 of F42)

Refer to "*Engine Control*".

Yes

⇒ Proceed to 8. EGR position check

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

8. EGR position check

1) Turn OFF the ignition switch.

2) Reconnect all of the disconnected harness connectors.

3) Connect the scan tool.

4) Turn ON the ignition switch.

5) Observe the EGR Position parameter on the scan tool. Do the EGR Position 1, 2, and 3 parameters all show OFF?

Yes

⇒ Proceed to 9. EGR valve 1 operation check

No

⇒ Proceed to 10. EGR position sensor 1 signal input check

9. EGR valve 1 operation check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0409 set?

Yes

Replace EGR valve 1.

⇒ Proceed to 10. EGR position sensor 1 signal input check

No

Go to Intermittent conditions.

10. EGR position sensor 1 signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0409 set?

Yes

⇒ Proceed to 11. ECM power supply and ground circuit inspection

No

⇒ Proceed to 13. Repair verification

11. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 12. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

12. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 13. Repair verification

13. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0477 (Flash Code 46) Exhaust Pressure Control Valve Low

1. DTC P0477 DTC information

1. DTC P0477 description

The exhaust brake solenoid valve is installed on the right side of the cab rear side member. The exhaust brake solenoid valve controls the supply of air to the exhaust brake valve. If the exhaust brake switch is turned ON and the exhaust brake operating conditions are established, the ECM supplies power to the exhaust brake relay. The ECM controls the exhaust brake solenoid valve and operates the exhaust brake.

2. Condition for setting DTC P0477

Condition for running the DTC

● The battery voltage is 18V or more.

● The ECM commands the exhaust brake ON.

Condition for setting the DTC

● The ECM detects a low voltage condition in the exhaust brake solenoid valve control circuit for 3.2 seconds or more when the exhaust brake is commanded OFF.

3. Action taken when DTC P0477 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P0477

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0477 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Individual harness connector inspection

1) Inspect for poor connections at the exhaust brake solenoid valve, the exhaust brake relay, each exhaust brake cut relay, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Exhaust brake relay operation check using scan tool

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

3. Exhaust brake relay operation check using scan tool

1) Turn OFF the ignition switch.

2) Remove the exhaust brake relay.

3) Connect the scan tool.

4) Turn ON the ignition switch.

5) Select Exhaust Brake under Actuator Test on the scan tool, and turn ON the exhaust brake relay.

6) Measure the voltage of the circuit on the coil side of the exhaust brake relay installation section (pins 8 and 10 of FU119) with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 20 V

Yes

Replace the exhaust brake relay.

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 4. Exhaust brake relay power supply voltage check

4. Exhaust brake relay power supply voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the power supply circuit on the coil side of the exhaust brake relay installation section (pin 8 of FU119) and frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 20 V

Yes

⇒ Proceed to 6. Inspection for open circuit and short circuit in exhaust brake relay control circuit

No

⇒ Proceed to 5. Fuse inspection

5. Fuse inspection

1) Inspect for a blown out Exhaust Brake 10A fuse. Is the result normal?

Yes

Repair or replace the circuit between the ECM main relay and the exhaust brake relay.

⇒ Proceed to 9. Repair verification

No

Replace the fuse. Also, inspect for a short circuit which could cause a fuse blowout in the circuits related to the fuse, and repair or replace the harness as necessary.

⇒ Proceed to 9. Repair verification

6. Inspection for open circuit and short circuit in exhaust brake relay control circuit

1) Turn OFF the ignition switch.

2) Install the exhaust brake relay.

3) Disconnect the ECM harness connector (F43).

4) Turn ON the ignition switch.

5) Measure the voltage between the exhaust brake relay control circuit (pin 102 of F43) and frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 20 V

Yes

⇒ Proceed to 7. ECM power supply and ground circuit inspection

No

Repair or replace the exhaust brake relay control circuit between the exhaust brake relay (pin 8 of FU119) and the ECM (pin 102 of F43).

⇒ Proceed to 9. Repair verification

7. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 8. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0478 (Flash Code 46) Exhaust Pressure Control Valve High

1. DTC P0478 DTC information

1. DTC P0478 description

The exhaust brake solenoid valve is installed on the right side of the cab rear side member. The exhaust brake solenoid valve controls the supply of air to the exhaust brake valve. If the exhaust brake switch is turned ON and the exhaust brake operating conditions are established, the ECM supplies power to the exhaust brake relay. The ECM controls the exhaust brake solenoid valve and operates the exhaust brake.

2. Condition for setting DTC P0478

Condition for running the DTC

● The battery voltage is 18V or more.

● The ECM commands the exhaust brake OFF.

Condition for setting the DTC

● The ECM detects a high voltage condition in the exhaust brake solenoid valve control circuit for 3.2 seconds or more when the exhaust brake is commanded ON.

3. Action taken when DTC P0478 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0478

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0478 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Individual harness connector inspection

1) Inspect for poor connections at the exhaust brake solenoid valve, exhaust brake relay, ECM harness connector, and intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Exhaust brake relay circuit voltage check using the scan tool

No

Repair or replace as necessary.

⇒ Proceed to 7. Repair verification

3. Exhaust brake relay circuit voltage check using the scan tool

1) Turn OFF the ignition switch.

2) Remove the exhaust brake relay.

3) Connect the scan tool.

4) Turn ON the ignition switch.

5) Select Exhaust Brake under Actuator Test on the scan tool, and turn OFF the exhaust brake relay.

6) Measure the voltage of the circuit on the coil side of the exhaust brake relay installation section (pins 8 and 10 of FU119) with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: about 0 V

Yes

Replace the exhaust brake relay.

⇒ Proceed to 7. Repair verification

No

⇒ Proceed to 4. Inspection for short to power supply in exhaust brake relay control circuit

4. Inspection for short to power supply in exhaust brake relay control circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F43).

3) Turn ON the ignition switch.

4) Measure the voltage between the circuit on the coil side of the exhaust brake relay installation section (pins 8 and 10 of FU119) and frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: about 0 V

Yes

⇒ Proceed to 5. ECM power supply and ground circuit inspection

No

Repair or replace the exhaust brake relay control circuit between the exhaust brake relay (pin 8 of FU119) and the ECM (pin 102 of F43).

⇒ Proceed to 7. Repair verification

5. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 6. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 7. Repair verification

6. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 7. Repair verification

7. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0500 (Flash Code 25) Vehicle Speed Sensor

1. DTC P0500 DTC information

1. DTC P0500 description

The vehicle speed sensor detects the vehicle speed. The vehicle speed sensor is installed on the transmission output section. The vehicle speed sensor is driven via the drive gear, and the sensor shaft section rotates. When the shaft rotates, the magnet installed on the sensor generates a voltage and outputs it as a pulse signal. For the sensor output signals, the time period between the pulse signals change according to the vehicle speed. When the sensor shaft speed is low, a low frequency pulse is outputted, and when the sensor shaft speed is high, a high frequency pulse is outputted. The ECM converts the vehicle speed sensor signal to the vehicle speed and uses it for the vehicle speed suppression control, etc. The speed sensor control unit is installed in order to correct changes in pulse signals from the vehicle speed sensor that vary due to different transmission and differential gear ratios or different tire radiuses, and to allow the instrument panel cluster or the various controls to use accurate vehicle speed information. A vehicle speed of 60 km/h is equivalent to a vehicle speed sensor shaft speed of 637 rpm. The pulse signal changes the voltage between a High level of approximately 14 V and a Low level of approximately 2 V.

2. Condition for setting DTC P0500

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine speed is 1000 rpm or more.

● Release the accelerator pedal when the engine speed is high.

● DTC P0219 is not set.

Refer to "*DTC P0219 (Flash Code 543) Engine Overspeed Condition*" in this section.

Condition for setting the DTC

● The ECM detects that no vehicle speed signal has been generated for 7 seconds.

3. Action taken when DTC P0500 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The vehicle speed is controlled to 10 km/h.

● The ECM limits the fuel injection quantity.

● The ECM stops the PTO control.

4. Condition for clearing DTC P0500

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0500 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Vehicle speed sensor connector inspection

1) Inspect for poor connections at the vehicle speed sensor connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in VSS signal circuit

No

Repair the connection as necessary.

⇒ Proceed to 9. Repair verification

3. Inspection for open circuit and short circuit in VSS signal circuit

1) Turn OFF the ignition switch.

2) Disconnect the harness connector from the ECM (F42), the speed sensor control unit, and the vehicle speed sensor.

3) Inspect for an open circuit or a short circuit between the ECM (pin 74 of F42) and the speed sensor control unit. Is the result normal?

Refer to "*Engine Control*".

4) Inspect for an open circuit or a short circuit between the speed sensor control unit and the vehicle speed sensor. Is the result normal?

5) Are all of the results normal?

Yes

⇒ Proceed to 4. Vehicle speed check

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

4. Vehicle speed check

1) Start the engine and drive the vehicle.

2) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 5. Vehicle speed sensor inspection

5. Vehicle speed sensor inspection

1) Turn OFF the ignition switch.

2) Remove the vehicle speed sensor.

3) Inspect the vehicle speed sensor shaft and gear for abnormal conditions. Also inspect the gear section of the transmission as necessary, and perform repairs if any abnormal condition is found.

4) Connect the vehicle speed sensor harness connector.

5) Turn ON the ignition switch.

6) Rotate the shaft of the vehicle speed sensor slowly and check whether the voltage changes. Does the voltage change within the specified range below?

Value: 1.0 to 3.0 V

Value: 12.0 to 15.0 V

Yes

⇒ Proceed to 6. Speed sensor control unit check

No

Replace the vehicle speed sensor.

⇒ Proceed to 9. Repair verification

6. Speed sensor control unit check

1) Turn OFF the ignition switch.

2) Connect the vehicle speed sensor harness connector.

3) Start the engine and drive the vehicle.

4) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 7. Switch check

No

Replace the speed sensor control unit.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit setting*".

⇒ Proceed to 9. Repair verification

7. Switch check

1) Operate the following switches, and observe whether input is normal with a scan tool. Is each switch input normal?

● Neutral Switch

● Clutch Pedal Switch

● Park Brake Switch

Yes

⇒ Proceed to 8. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0502 (Flash Code 25) Vehicle Speed Sensor Circuit Low Input

1. DTC P0502 DTC information

1. DTC P0502 description

The vehicle speed sensor detects the vehicle speed. The vehicle speed sensor is installed on the transmission output section. The vehicle speed sensor is driven via the drive gear, and the sensor shaft section rotates. When the shaft rotates, the magnet installed on the sensor generates a voltage and outputs it as a pulse signal. For the sensor output signals, the time period between the pulse signals change according to the vehicle speed. When the sensor shaft speed is low, a low frequency pulse is outputted, and when the sensor shaft speed is high, a high frequency pulse is outputted. The ECM converts the vehicle speed sensor signal to the vehicle speed and uses it for the vehicle speed suppression control, etc. The speed sensor control unit is installed in order to correct changes in pulse signals from the vehicle speed sensor that vary due to different transmission and differential gear ratios or different tire radiuses, and to allow the instrument panel cluster or the various controls to use accurate vehicle speed information. A vehicle speed of 60 km/h is equivalent to a vehicle speed sensor shaft speed of 637 rpm. The pulse signal changes the voltage between a High level of approximately 14 V and a Low level of approximately 2 V.

2. Condition for setting DTC P0502

Condition for running the DTC

● The battery voltage is 21V or more.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the vehicle speed signal voltage is 0.5V or less.

3. Action taken when DTC P0502 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The vehicle speed is controlled to 10 km/h.

● The ECM limits the fuel injection quantity.

● The ECM stops the PTO control.

4. Condition for clearing DTC P0502

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0502 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Vehicle speed sensor connector inspection

1) Inspect for poor connections at the vehicle speed sensor connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in VSS signal circuit

No

Repair the connection as necessary.

⇒ Proceed to 9. Repair verification

3. Inspection for open circuit and short circuit in VSS signal circuit

1) Turn OFF the ignition switch.

2) Disconnect the harness connector from the ECM (F42), the speed sensor control unit, and the vehicle speed sensor.

3) Inspect for an open circuit or a short circuit between the ECM (pin 74 of F42) and the speed sensor control unit. Is the result normal?

Refer to "*Engine Control*".

4) Inspect for an open circuit or a short circuit between the speed sensor control unit and the vehicle speed sensor. Is the result normal?

5) Are all of the results normal?

Yes

⇒ Proceed to 4. Vehicle speed check

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

4. Vehicle speed check

1) Start the engine and drive the vehicle.

2) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 5. Vehicle speed sensor inspection

5. Vehicle speed sensor inspection

1) Turn OFF the ignition switch.

2) Remove the vehicle speed sensor.

3) Inspect the vehicle speed sensor shaft and gear for abnormal conditions. Also inspect the gear section of the transmission as necessary, and perform repairs if any abnormal condition is found.

4) Connect the vehicle speed sensor harness connector.

5) Turn ON the ignition switch.

6) Rotate the shaft of the vehicle speed sensor slowly and check whether the voltage changes. Does the voltage change within the specified range below?

Value: 1.0 to 3.0 V

Value: 12.0 to 15.0 V

Yes

⇒ Proceed to 6. Speed sensor control unit check

No

Replace the vehicle speed sensor.

⇒ Proceed to 9. Repair verification

6. Speed sensor control unit check

1) Turn OFF the ignition switch.

2) Connect the vehicle speed sensor harness connector.

3) Start the engine and drive the vehicle.

4) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 7. Switch check

No

Replace the speed sensor control unit.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit setting*".

⇒ Proceed to 9. Repair verification

7. Switch check

1) Operate the following switches, and observe whether input is normal with a scan tool. Is each switch input normal?

● Neutral Switch

● Clutch Pedal Switch

● Park Brake Switch

Yes

⇒ Proceed to 8. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0503 (Flash Code 25) Vehicle Speed Sensor Circuit High Input

1. DTC P0503 DTC information

1. DTC P0503 description

The vehicle speed sensor detects the vehicle speed. The vehicle speed sensor is installed on the transmission output section. The vehicle speed sensor is driven via the drive gear, and the sensor shaft section rotates. When the shaft rotates, the magnet installed on the sensor generates a voltage and outputs it as a pulse signal. For the sensor output signals, the time period between the pulse signals change according to the vehicle speed. When the sensor shaft speed is low, a low frequency pulse is outputted, and when the sensor shaft speed is high, a high frequency pulse is outputted. The ECM converts the vehicle speed sensor signal to the vehicle speed and uses it for the vehicle speed suppression control, etc.

The speed sensor control unit is installed in order to correct changes in pulse signals from the vehicle speed sensor that vary due to different transmission and differential gear ratios or different tire radiuses, and to allow the instrument panel cluster or the various controls to use accurate vehicle speed information. A vehicle speed of 60 km/h is equivalent to a vehicle speed sensor shaft speed of 637 rpm. The pulse signal changes the voltage between a High level of approximately 14 V and a Low level of approximately 2 V.

2. Condition for setting DTC P0503

Condition for running the DTC

● The battery voltage is 21V or more.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the vehicle speed signal voltage is 20 V or more.

3. Action taken when DTC P0503 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The vehicle speed is controlled to 10 km/h.

● The ECM limits the fuel injection quantity.

● The ECM stops the PTO control.

4. Condition for clearing DTC P0503

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0503 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Vehicle speed sensor connector inspection

1) Inspect for poor connections at the vehicle speed sensor connector. Is the connection status normal?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in VSS signal circuit

No

Repair the connection as necessary.

⇒ Proceed to 9. Repair verification

3. Inspection for open circuit and short circuit in VSS signal circuit

1) Turn OFF the ignition switch.

2) Disconnect the harness connector from the ECM (F42), the speed sensor control unit, and the vehicle speed sensor.

3) Inspect for an open circuit or a short circuit between the ECM (pin 74 of F42) and the speed sensor control unit. Is the result normal?

Refer to "*Engine Control*".

4) Inspect for an open circuit or a short circuit between the speed sensor control unit and the vehicle speed sensor. Is the result normal?

5) Are all of the results normal?

Yes

⇒ Proceed to 4. Vehicle speed check

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

4. Vehicle speed check

1) Start the engine and drive the vehicle.

2) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 5. Vehicle speed sensor inspection

5. Vehicle speed sensor inspection

1) Turn OFF the ignition switch.

2) Remove the vehicle speed sensor.

3) Inspect the vehicle speed sensor shaft and gear for abnormal conditions. Also inspect the gear section of the transmission as necessary, and perform repairs if any abnormal condition is found.

4) Connect the vehicle speed sensor harness connector.

5) Turn ON the ignition switch.

6) Rotate the shaft of the vehicle speed sensor slowly and check whether the voltage changes. Does the voltage change within the specified range below?

Value: 1.0 to 3.0 V

Value: 12.0 to 15.0 V

Yes

⇒ Proceed to 6. Speed sensor control unit check

No

Replace the vehicle speed sensor.

⇒ Proceed to 9. Repair verification

6. Speed sensor control unit check

1) Turn OFF the ignition switch.

2) Connect the vehicle speed sensor harness connector.

3) Start the engine and drive the vehicle.

4) Check whether the Vehicle Speed parameter is normal on the scan tool. Is the value normal?

Yes

⇒ Proceed to 7. Switch check

No

Replace the speed sensor control unit.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Speed sensor control unit setting*".

⇒ Proceed to 9. Repair verification

7. Switch check

1) Operate the following switches, and observe whether input is normal with a scan tool. Is each switch input normal?

● Neutral Switch

● Clutch Pedal Switch

● Park Brake Switch

Yes

⇒ Proceed to 8. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0560 (Flash Code 155) System Voltage

1. DTC P0560 DTC information

1. DTC P0560 description

The ECM supplies 12 V reference to the MAF sensor. Battery power is supplied to the ECM via the dropping resistor, and it is converted into 12 V. The ECM monitors the voltage of the 12 V reference circuit. If the ECM detects an excessively low or high voltage, the DTC is set.

2. Condition for setting DTC P0560

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

Any of the following conditions are met.

● The ECM detects a dropping resistor malfunction.

● The ECM detects a malfunction in the 12 V reference circuit between the MAF sensor and the ECM.

3. Action taken when DTC P0560 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0560

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0560 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. MAF sensor circuit check

No

Go to Intermittent conditions.

3. MAF sensor circuit check

1) Turn OFF the ignition switch for at least 30 seconds.

2) Disconnect the MAF/IAT sensor harness connector (E107).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. Dropping resistor circuit check

No

⇒ Proceed to 12. MAF sensor harness connector inspection

4. Dropping resistor circuit check

1) Turn OFF the ignition switch for at least 30 seconds.

2) Keep the MAF/IAT sensor harness connector (E107) disconnected.

3) Disconnect the dropping resistor harness connector (FB53).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 9. Inspection for short circuit in dropping resistor voltage supply circuit

No

⇒ Proceed to 5. Dropping resistor inspection

5. Dropping resistor inspection

1) Measure the resistance of the dropping resistor (pins 1 and 2 of FB53) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 45 to 55 Ω

Yes

⇒ Proceed to 6. Ignition voltage feed voltage check

No

Replace the dropping resistor.

⇒ Proceed to 15. Repair verification

6. Ignition voltage feed voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the ignition voltage feed circuit (pin 1 of FB53) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 16 V

Yes

⇒ Proceed to 7. Dropping resistor voltage supply voltage check

No

Inspect the fuse first and repair the open circuit or high resistance in the power supply circuit between the VGS 10 A fuse and the dropping resistor.

⇒ Proceed to 15. Repair verification

7. Dropping resistor voltage supply voltage check

1) Measure the voltage between the dropping resistor voltage supply circuit (pin 2 of FB53) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 13 V

Yes

⇒ Proceed to 11. Dropping resistor harness connector inspection

No

⇒ Proceed to 8. Inspection for open circuit in ignition voltage feed circuit

8. Inspection for open circuit in ignition voltage feed circuit

1) Inspect the ignition voltage feed circuit between the VGS 10 A fuse and the dropping resistor (pin 1 of FB53) for an open circuit or high resistance. Inspect the VGS 10 A fuse first. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 13. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 15. Repair verification

9. Inspection for short circuit in dropping resistor voltage supply circuit

1) Inspect the voltage supply circuit between the ECM (pin 49 of F41) and the dropping resistor (pin 2 of FB53) for the following conditions. Is the result normal?

● Short to ground

● Short to the power supply circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. Inspection for short circuit in MAF sensor 12 V reference circuit

No

Repair the circuit as necessary.

⇒ Proceed to 15. Repair verification

10. Inspection for short circuit in MAF sensor 12 V reference circuit

1) Inspect the 12 V reference circuit between the ECM (pin 81 of F42) and the MAF sensor (pin 1 of E107) for the following conditions. Is the result normal?

● Short to ground

● Short to the power supply circuit

Refer to "*Engine Control*".

Yes

⇒ Proceed to 14. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 15. Repair verification

11. Dropping resistor harness connector inspection

1) Inspect for poor connections at the dropping resistor harness connector (pins 1 and 2 of FB53). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Go to Intermittent conditions.

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

12. MAF sensor harness connector inspection

1) Inspect for poor connections at the MAF sensor harness connector (pin 1 of E107). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the MAF sensor.

⇒ Proceed to 15. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

13. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 49 of F41). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 14. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

14. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 15. Repair verification

15. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0563 (Flash Code 35) System Voltage High

1. DTC P0563 DTC information

1. DTC P0563 description

The ECM monitors the ignition voltage to verify that the voltage stays within the appropriate range. When the ECM detects that the ignition voltage is excessively high, this DTC is set.

2. Condition for setting DTC P0563

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.
Condition for setting the DTC

● The ECM detects that the voltage of the ignition power supply circuit is 32 V or more for 30 minutes.

3. Action taken when DTC P0563 sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0563

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P0563 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Vehicle maintenance check

1) Check if the battery charger has been recently connected to the battery.

Yes

⇒ Proceed to 6. Repair verification

No

⇒ Proceed to 3. Ignition voltage check

3. Ignition voltage check

1) Connect the scan tool.

2) Start the engine.

3) Observe the Ignition Voltage parameter on the scan tool. Is the Ignition Voltage parameter less than or equal to the specified value?

Value: 32.0 V

Yes

⇒ Proceed to 4. Charging system inspection

No

Go to Intermittent conditions.

4. Charging system inspection

1) Inspect the charging system. Is the result normal?

Yes

⇒ Proceed to 5. ECM replacement

No

Repair the charging system.

⇒ Proceed to 6. Repair verification

5. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the Ignition Voltage parameter on the scan tool. Is the Ignition Voltage parameter less than or equal to the specified value?

Value: 32.0 V

Yes

⇒ Proceed to 4. Charging system inspection

No

Observe the DTC information with a scan tool.

DTC P0571 (Flash Code 26) Brake Switch Circuit

1. DTC P0571 DTC information

1. DTC P0571 description

The stoplight switch is installed to the brake pedal bracket. There are two stoplight switches, and the two switches are turned ON together when the brake pedal is depressed. Power supply voltage is provided to the stoplight switch via the stoplight relay, the stoplight relay diode, and the stoplight switch diode. When the stoplight switch is turned ON, the ground circuit is established, and the signal is input to the ECM. The ECM sets the DTC if the stoplight switch 1 and 2 signal input counts do not match.

2. Condition for setting DTC P0571

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects a correlation error between the stoplight switch 1 signal and the stoplight switch 2 signal 32 times.

3. Action taken when DTC P0571 sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0571

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P0571 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Brake Switch 1 parameter check

1) Turn ON the ignition switch.

2) Press and release the brake switch.

3) Observe the Brake Switch 1 parameter on the scan tool. Does the Brake Switch 1 parameter show ON/OFF?

Yes

⇒ Proceed to 9. Brake Switch 2 parameter check

No

⇒ Proceed to 3. Inspection of each harness connector related to stoplight switch 1

3. Inspection of each harness connector related to stoplight switch 1

1) Inspect for poor connections at the stoplight switch 1 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 4. Stoplight switch 1 circuit check using fused jumper wire

No

Repair or replace as necessary.

⇒ Proceed to 8. Brake pedal switch 1 signal input check

4. Stoplight switch 1 circuit check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the stoplight switch 1 harness connector (FU159).

3) Connect a fused jumper wire to the stoplight switch 1 circuit (pins 1 and 2 of FU159).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) While observing the Brake Switch 1 parameter on the scan tool, disconnect the jumper wire. Does the Brake Switch 1 parameter show ON/OFF?

Yes

Replace stoplight switch 1.

Refer to "*9.Body, Cab, Accessories 9A.Lighting Systems Stoplight switch removal*".

Refer to "*9.Body, Cab, Accessories 9A.Lighting Systems Stoplight switch installation*".

⇒ Proceed to 8. Brake pedal switch 1 signal input check

No (Does not turn ON)

⇒ Proceed to 5. Inspection for open circuit in stoplight switch 1 circuit

No (Does not turn OFF)

⇒ Proceed to 6. Stoplight switch 1 circuit voltage check

5. Inspection for open circuit in stoplight switch 1 circuit

1) Inspect for an open circuit or high resistance between the ECM (pin 138 of F44) and stoplight switch 1 (pin 1 of FU159). Is the result normal?

2) Inspect for an open circuit or high resistance between stoplight switch 1 (pin 2 of FU159) and the frame ground. Is the result normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 16. Stoplight switch diode harness connector voltage check

No

Repair or replace as necessary.

⇒ Proceed to 8. Brake pedal switch 1 signal input check

6. Stoplight switch 1 circuit voltage check

1) Turn OFF the ignition switch.

2) Disconnect the stoplight switch 1 harness connector (FU159).

3) Turn ON the ignition switch.

4) Measure the voltage between the stoplight switch 1 circuit (pin 1 of FU159) and frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 18 V

Yes

⇒ Proceed to 7. Inspection for short to ground in stoplight switch 1 circuit

No

⇒ Proceed to 16. Stoplight switch diode harness connector voltage check

7. Inspection for short to ground in stoplight switch 1 circuit

1) Inspect for a short to ground between the ECM (pin 138 of F44) and stoplight switch 1 (pin 1 of FU159). Is the result normal?

2) Inspect for a short to ground between stoplight switch 1 (pin 1 of FU159) and the stoplight switch diode (pin A of FL103). Is the result normal?

Refer to "*Engine Control*".

Refer to "*Taillight*".

3) Are all of the results normal?

Yes

⇒ Proceed to 15. Inspection for open diode across stoplight switch

No

Repair or replace as necessary.

⇒ Proceed to 8. Brake pedal switch 1 signal input check

8. Brake pedal switch 1 signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Operate the vehicle under the conditions for running the DTC.

6) Observe the DTC information with a scan tool. Is DTC P0571 set?

Yes

⇒ Proceed to 9. Brake Switch 2 parameter check

No

⇒ Proceed to 24. Repair verification

9. Brake Switch 2 parameter check

1) Turn ON the ignition switch.

2) Press and release the brake switch.

3) Observe the Brake Switch 2 parameter on the scan tool. Does the Brake Switch 2 parameter show ON/OFF?

Yes

⇒ Proceed to 24. Repair verification

No

⇒ Proceed to 10. Inspection of each harness connector related to stoplight switch 2

10. Inspection of each harness connector related to stoplight switch 2

1) Inspect for poor connections at the stoplight switch 2 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 11. Stoplight switch 2 circuit check using fused jumper wire

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

11. Stoplight switch 2 circuit check using fused jumper wire

1) Turn OFF the ignition switch.

2) Disconnect the stoplight switch 2 harness connector (FB5).

3) Connect a fused jumper wire to the stoplight switch 2 circuit (pins 1 and 2 of FB5).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) While observing the Brake Switch 2 parameter on the scan tool, disconnect the jumper wire. Does the Brake Switch 2 parameter show ON/OFF?

Yes

Replace stoplight switch 2.

Refer to "*9.Body, Cab, Accessories 9A.Lighting Systems Stoplight switch removal*".

Refer to "*9.Body, Cab, Accessories 9A.Lighting Systems Stoplight switch installation*".

⇒ Proceed to 24. Repair verification

No (Does not turn ON)

⇒ Proceed to 12. Inspection for open circuit in stoplight switch 2 circuit

No (Does not turn OFF)

⇒ Proceed to 13. Stoplight switch 2 circuit voltage check

12. Inspection for open circuit in stoplight switch 2 circuit

1) Inspect for an open circuit or high resistance between the ECM (pin 138 of F44) and stoplight switch 2 (pin 1 of FB5). Is the result normal?

2) Inspect for an open circuit or high resistance between stoplight switch 2 (pin 2 of FB5) and the frame ground. Is the result normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 22. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

13. Stoplight switch 2 circuit voltage check

1) Turn OFF the ignition switch.

2) Disconnect the stoplight switch 2 harness connector (FB5).

3) Turn ON the ignition switch.

4) Measure the voltage between the stoplight switch 2 circuit (pin 1 of FB5) and frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 18 V

Yes

⇒ Proceed to 14. Inspection for short to ground in stoplight switch 2 circuit

No

⇒ Proceed to 15. Inspection for open diode across stoplight switch

14. Inspection for short to ground in stoplight switch 2 circuit

1) Inspect for a short to ground between the ECM (pin 138 of F44) and stoplight switch 2 (pin 1 of FB5). Is the result normal?

2) Inspect for a short to ground between stoplight switch 2 (pin 1 of FB5) and the stoplight switch diode (pin B of FL103). Is the result normal?

Refer to "*Engine Control*".

Refer to "*Taillight*".

3) Are all of the results normal?

Yes

⇒ Proceed to 22. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

15. Inspection for open diode across stoplight switch

1) Inspect for an open circuit or high resistance between the stoplight switch diode (pin A of FL103) and stoplight switch 1 (pin 1 of FU159). Is the result normal?

2) Inspect for an open circuit or high resistance between the stoplight switch diode (pin B of FL103) and stoplight switch 2 (pin 1 of FB5). Is the result normal?

Refer to "*Taillight*".

3) Are all of the results normal?

Yes

⇒ Proceed to 16. Stoplight switch diode harness connector voltage check

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

16. Stoplight switch diode harness connector voltage check

1) Turn OFF the ignition switch.

2) Disconnect the stoplight switch diode harness connector (FL103).

3) Turn ON the ignition switch.

4) Measure the voltage between the stoplight switch diode harness connector (FL103) and frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Taillight*".

Value: 18V

Yes

Replace the stoplight switch diode.

⇒ Proceed to 24. Repair verification

No

⇒ Proceed to 17. Fuse inspection

17. Fuse inspection

1) Inspect for a blown out STOP LAMP 10 A fuse. Is the result normal?

Yes

⇒ Proceed to 18. Stoplight relay inspection

No

Replace the fuse. If the fuse blows out again, repair the short to ground in the circuits relating to the STOP LAMP 10 A fuse.

⇒ Proceed to 24. Repair verification

18. Stoplight relay inspection

1) Inspect the stoplight relay. Is the result normal?

Yes

⇒ Proceed to 19. Inspection for open circuit between fuse and stoplight relay

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

19. Inspection for open circuit between fuse and stoplight relay

1) Inspect for an open circuit or high resistance between the STOP LAMP 10A fuse and the stoplight relay (pin 3 of IR1). Is the result normal?

Refer to "*Taillight*".

Yes

⇒ Proceed to 20. Inspection for open circuit between stoplight relay and stoplight relay diode

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

20. Inspection for open circuit between stoplight relay and stoplight relay diode

1) Inspect for an open circuit or high resistance between the stoplight relay (pin 5 of IR1) and the stoplight relay diode (pin C of FL103). Is the result normal?

Refer to "*Taillight*".

Yes

⇒ Proceed to 21. Inspection for open circuit between stoplight relay diode and stoplight switch diode

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

21. Inspection for open circuit between stoplight relay diode and stoplight switch diode

1) Inspect the circuit between the stoplight relay diode (pin C of FL103) and the stoplight switch diode (pins A and B of FL103) for an open circuit or high resistance. Is the result normal?

Refer to "*Taillight*".

Yes

Replace the stoplight relay diode.

⇒ Proceed to 24. Repair verification

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

22. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 23. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 24. Repair verification

23. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 24. Repair verification

24. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0601 (Flash Code 53) Internal Control Module Memory Check Sum Error

1. DTC P0601 DTC information

1. DTC P0601 description

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P0601

Condition for running the DTC

● The battery voltage is 16V or more.

● The ignition switch is ON.

Condition for setting the DTC

● The ECM detects that the calculated checksum does not match the checksum stored in the ROM.

3. Action taken when DTC P0601 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM limits the upper limit of the fuel rail pressure.

4. Condition for clearing DTC P0601

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0601 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0602 (Flash Code 154) Control Module Programming Error

1. DTC P0602 DTC information

1. DTC P0602 description

The injector ID code information is stored in EEPROM within the ECM. If no injector ID code is programmed in the ECM or the ECM detects an error in the programmed injector ID code, the DTC is set.

2. Condition for setting DTC P0602

Condition for running the DTC

● The battery voltage is 16 V or more.

Condition for setting the DTC

Any of the following conditions are met.

● The ECM detects that the fuel delivery rate and the injector ID code are not programmed.

● The ECM detects an error in the programmed injector ID Code.

3. Action taken when DTC P0602 sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0602

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P0602 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Verify that all the tool connections are securely connected.

2) Verify that the programming device operates properly.

3) Connect the scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Turn ON the ignition switch.

6) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Injector ID code and fuel delivery rate verification

No

⇒ Proceed to 5. Repair verification

3. Injector ID code and fuel delivery rate verification

1) Verify that the correct injector ID code and fuel delivery rate are input to the ECM with a scan tool.

2) If the injector ID code and the fuel delivery rate are correctly input, clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Turn ON the ignition switch.

5) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. ECM replacement

No

⇒ Proceed to 5. Repair verification

4. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0604 (Flash Code 153) Internal Control Module RAM Error

1. DTC P0604 DTC information

1. DTC P0604 description

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P0604

Condition for setting the DTC

● A malfunction is detected inside the RAM.

3. Action taken when DTC P0604 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits pre-injection.

● The ECM stops the engine. (The engine is ready to start after the ignition switch is turned OFF for 10 seconds or more.)

4. Condition for clearing DTC P0604

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0604 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0606 (Flash Code 51) ECM Processor

1. DTC P0606 DTC information

1. DTC P0606 description

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P0606

Condition for running the DTC

● The battery voltage is 16V or more.

● The ignition switch is ON.

Condition for setting the DTC

● The ECM detects a malfunction inside the main CPU or sub integrated circuit.

3. Action taken when DTC P0606 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The engine does not start when the main CPU malfunctions.

4. Condition for clearing DTC P0606

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0606 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance

1. DTC P060B DTC information

1. DTC P060B description

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P060B

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects a malfunction inside the A/D converter.

3. Action taken when DTC P060B sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM limits the upper limit of the fuel rail pressure.

● The ECM inhibits the VGS control.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P060B

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P060B diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

Trouble Code P0610 EEPROM_ Vehicle Additional Information Input error

1. DTC P0610 DTC information

1. DTC P0610 DTC description

The EEPROM in the ECM stores the vehicle information. DTC will be set if no vehicle information is programmed in the ECM, or if a fault with a programmed vehicle condition has been detected by the ECM.

2. DTC P0610 setting conditions

Precondition for DTC setting

● Start switch ON

● No DTC P1621 detected

Please refer to "*DTC P1621 Control Module EEPROM Error*"

DTC setting conditions

● Vehicle information is set by the ECM without program setting

3. DTC P0610 set when the treatment measures

● Engine warning light is on

● The ECM limits the fuel injection quantity

2. Engine control

"*Engine Engine Control Engine Control Circuit*"

3. Sketchy circuit diagram

"*Engine Functions, Structure, Motion, Schematic Circuit*"

4. DTC P0610 diagnosis

1. Engine control system check

Refer to the book "Inspection of Engine Control Systems"

2. Now DTC confirmed

1) Confirm the connection of all the components

2) Confirm that the programming machine is operating normally

3) Connect the decoder components

4) Start the switch for more than 1 minute OFF

5) Start switch ON

6) Check the DTC with the decoder

Yes

⇒ 3. Vehicle condition confirmation

No

⇒ 5. Confirmation of symptom cancellation

3. Vehicle information confirmed

1) Confirm that the vehicle information is correctly entered in the ECM by the decoder

2) When the vehicle information is entered correctly, use the decoder to eliminate the DTC

3) Start the switch for more than 1 minute OFF

4) Start switch ON.

5) Check the DTC with the decoder. Is there a DTC checkout?

Yes

⇒ 4. Replace the ECM.

No

⇒ 5. Confirmation of symptom cancellation.

4. ECM exchange

Make up:

● ECM replacement programming.

Complete the replacement job

⇒ 5. Confirmation of symptom cancellation.

5. Confirm the cancellation of symptoms

1) Eliminate the DTC with the decoder unit.

2) Start the switch for more than 1 minute OFF.

3) Start the engine.

4) Check the DTC with the decoder.

DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit

1. DTC P0641 DTC information

1. DTC P0641 description

The ECM supplies 5 V reference to the following sensors through 5 V reference circuit 1.

● Accelerator pedal position sensor 1

● PTO throttle sensor

Also, the ECM supplies 5 V reference to the following sensors through 5 V reference circuit 6.

● Fuel rail pressure sensor

● EGR position sensor 1

5 V reference circuits 1 and 6 are independent of each other outside the ECM but share the bus inside the ECM. Therefore, all of 5 V reference circuits 1 and 6 may be affected by a short circuit in one of the sensor 5 V reference circuits. The ECM monitors the voltage of 5 V reference circuits 1 and 6, and if it detects that the voltage is excessively low or high, the DTC is set.

2. Condition for setting DTC P0641

Condition for running the DTC

● The battery voltage is 16 V or more.

● DTC P060B is not set.

Condition for setting the DTC

● The ECM detects that the voltage of 5 V reference circuit 1 or 6 is 4.5 V or less, or 5.5 V or more.

3. Action taken when DTC P0641 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM limits the upper limit of the fuel rail pressure.

4. Condition for clearing DTC P0641

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0641 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. 5 V reference voltage check for EGR position sensor 1

No

Go to Intermittent conditions.

3. 5 V reference voltage check for EGR position sensor 1

1) Turn OFF the ignition switch.

2) Disconnect the EGR valve 1 harness connector (E98).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of EGR position sensor 1 (pin 1 of E98) and the frame ground with a DMM.

Refer to "*Engine Control*".

Value: 4.5 to 5.5 V

The reading is more than the specified value.

⇒ Proceed to 8. Inspection for short to power supply circuit in 5 V reference circuit

The reading is within the specified range.

Replace the EGR valve.

⇒ Proceed to 10. Repair verification

The reading is less than the specified value.

⇒ Proceed to 4. Fuel rail pressure sensor 5 V reference voltage check

4. Fuel rail pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the fuel rail pressure sensor harness connector (E42).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of EGR position sensor 1 (pin 1 of E98) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

Replace the fuel rail pressure sensor.

⇒ Proceed to 10. Repair verification

No

⇒ Proceed to 5. 5 V reference voltage check for accelerator pedal position sensor 1

5. 5V reference voltage check for accelerator pedal position sensor 1

1) Turn OFF the ignition switch.

2) Disconnect the accelerator pedal position sensor harness connector (FL1).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of EGR position sensor 1 (pin 1 of E98) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

Replace the accelerator pedal position sensor.

⇒ Proceed to 10. Repair verification

No (Models equipped with PTO throttle sensor)

⇒ Proceed to 6. PTO throttle sensor 5 V reference voltage check

No (Except models equipped with PTO throttle sensor)

⇒ Proceed to 7. Inspection for short to ground in 5 V reference circuit

6. PTO throttle sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the PTO throttle sensor harness connector (FB176).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of EGR position sensor 1 (pin 1 of E98) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "Engine Control".

Value: 4.5 V

Yes

Replace the PTO throttle sensor.

⇒ Proceed to 10. Repair verification

No

⇒ Proceed to 7. Inspection for short to ground in 5 V reference circuit

7. Inspection for short to ground in 5 V reference circuit

1) Inspect 5 V reference circuit 1 between the ECM (pin 83 of F42) and the following components for a short to ground or a short to the low reference circuit. Is the result normal?

● Accelerator pedal position sensor 1 (pin 4 of FL1)

● PTO throttle sensor (pin 2 of FB176)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 6 between the ECM (pin 61 of F41) and the following components for a short to ground or a short to the low reference circuit. Is the result normal?

● Fuel rail pressure sensor (pin 3 of E42)

● EGR position sensor 1 (pin 1 of E98)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

8. Inspection for short to power supply circuit in 5 V reference circuit

1) Inspect 5 V reference circuit 1 between the ECM (pin 83 of F42) and the following components for a short to the power supply circuit. Is the result normal?

● Accelerator pedal position sensor 1 (pin 4 of FL1)

● PTO throttle sensor (pin 2 of FB176)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 6 between the ECM (pin 61 of F41) and the following components for a short to the power supply circuit. Is the result normal?

● Fuel rail pressure sensor (pin 3 of E42)

● EGR position sensor 1 (pin 1 of E98)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0650 (Flash Code 77) Malfunction Indicator Lamp (MIL) Control Circuit

1. DTC P0650 DTC information

1. DTC P0650 description

The MIL is in the instrument panel cluster. The MIL informs the driver that a malfunction has occurred in the engine control system and that it is necessary to repair the vehicle. The ECM monitors for any status that is different from the MIL command status in the MIL control circuit. The circuit is defective if the ECM detects a low voltage when the MIL is commanded OFF, or if the ECM detects a high voltage when the MIL is commanded ON. If the ECM detects any abnormal value in the control circuit voltage, the DTC is set.

2. Condition for setting DTC P0650

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

Condition for setting the DTC

Any of the following conditions are met.

● The ECM detects a low voltage condition in the MIL control circuit when the light is commanded OFF.

● The ECM detects a high voltage condition in the MIL control circuit when the light is commanded ON.

3. Action taken when DTC P0650 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0650

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0650 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch for at least 10 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Fuse inspection

No

Go to Intermittent conditions.

3. Fuse inspection

1) Inspect for a blown out METER 10 A fuse. Is the result normal?

Yes

⇒ Proceed to 4. Inspection for short to ground in MIL control circuit

No

Replace the fuse. If the fuse blows out again, repair the short to ground in the circuits relating to the METER 10 A fuse.

⇒ Proceed to 12. Repair verification

4. Inspection for short to ground in MIL control circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F43).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Check the MIL. Does the MIL turn OFF?

Yes

⇒ Proceed to 5. Inspection for short to power supply in MIL control circuit

No

Repair the short to ground in the MIL control circuit between the ECM (pin 105 of F43) and the instrument panel cluster (pin 31 of FU97).

⇒ Proceed to 12. Repair verification

5. Inspection for short to power supply in MIL control circuit

1) Remove the Meter 10 A fuse.

2) Turn ON the ignition switch.

3) Measure the voltage between the MIL control circuit (pin 105 of F43) and the frame ground with a DMM. Is the voltage less than or equal to the specified value?

Refer to "*Engine Control*".

Value: 1V

Yes

⇒ Proceed to 6. MIL illumination check using fused jumper wire

No

Repair the short to the power supply circuit in the MIL control circuit between the ECM (pin 105 of F43) and the instrument panel cluster (pin 31 of FU97).

⇒ Proceed to 12. Repair verification

6. MIL illumination check using fused jumper wire

1) Turn OFF the ignition switch.

2) Install the METER 10 A fuse.

3) Turn ON the ignition switch.

4) Connect a fused jumper wire between the MIL control circuit (pin 105 of F43) and the frame ground.

Refer to "*Engine Control*".

5) Check the MIL. Does the MIL illuminate?

Yes

⇒ Proceed to 10. ECM harness connector inspection

No

⇒ Proceed to 7. Instrument panel cluster power supply voltage check

7. Instrument panel cluster power supply voltage check

1) Connect a test lamp between the ignition power supply circuit (pin 2 of FU97) and the frame ground.

Refer to "*Engine Control*".

2) Turn ON the ignition switch. Does the test lamp illuminate?

Yes

⇒ Proceed to 8. Inspection for open circuit in MIL control circuit

No

Repair the open circuit or high resistance in the ignition power supply circuit between the METER 10 A fuse and the instrument panel cluster (pin 2 of FU97).

⇒ Proceed to 12. Repair verification

8. Inspection for open circuit in MIL control circuit

1) Inspect the MIL control circuit between the ECM (pin 105 of F43) and the instrument panel cluster (pin 31 of FU97) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. Instrument panel cluster harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 12. Repair verification

9. Instrument panel cluster harness connector inspection

1) Inspect for poor connections at the instrument panel cluster harness connector (pins 2 and 31 of FU97). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Repair or replace the instrument panel cluster.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster setting*".

⇒ Proceed to 12. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 12. Repair verification

10. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 105 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 12. Repair verification

11. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 12. Repair verification

12. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch for at least 10 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool.

DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit

1. DTC P0651 DTC information

1. DTC P0651 description

The ECM supplies 5 V reference to the following sensors through 5 V reference circuit 2.

● Accelerator pedal position sensor 2

● Barometric pressure sensor

In addition, the ECM also supplies 5 V reference to the following sensors through 5 V reference circuit 5.

● CMP sensor

5 V reference circuits 2 and 5 are independent of each other outside the ECM but share the bus inside the ECM. Therefore, all of 5 V reference circuits 2 and 5 may be affected by a short circuit in one of the sensor 5 V reference circuits. The ECM monitors the voltage of 5 V reference circuits 2 and 5, and if it detects that the voltage is excessively low or high, the DTC is set.

2. Condition for setting DTC P0651

Condition for running the DTC

● The battery voltage is 16V or more.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the voltage of 5 V reference circuit 2 or 5 is 4.5 V or less, or 5.5 V or more.

3. Action taken when DTC P0651 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the VGS control.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0651

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0651 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. CMP sensor 5 V reference voltage check

No

Go to Intermittent conditions.

3. CMP sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the CMP sensor harness connector (E91).

3) Turn ON the ignition switch.

4) Measure the voltage between the CMP sensor 5 V reference circuit (pin 3 of E91) and the frame ground with a DMM.

Refer to "*Engine Control*".

Value: 4.5 to 5.5 V

The reading is more than the specified value.

⇒ Proceed to 7. Inspection for short to power supply circuit in 5 V reference circuit

The reading is within the specified range.

Replace the CMP sensor.

⇒ Proceed to 9. Repair verification

The reading is less than the specified value.

⇒ Proceed to 4. Barometric pressure sensor 5 V reference voltage check

4. Barometric pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the barometric pressure sensor harness connector (FL52).

3) Turn ON the ignition switch.

4) Measure the voltage between the CMP sensor 5 V reference circuit (pin 3 of E91) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

Replace the barometric pressure sensor.

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 5. 5 V reference voltage check for accelerator pedal position sensor 2

5. 5V reference voltage check for accelerator pedal position sensor 2

1) Turn OFF the ignition switch.

2) Disconnect the accelerator pedal position sensor 2 harness connector (FL1).

3) Turn ON the ignition switch.

4) Measure the voltage between the CMP sensor 5 V reference circuit (pin 3 of E91) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5V

Yes

Replace the accelerator pedal position sensor.

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 6. Inspection for short to ground in 5 V reference circuit

6. Inspection for short to ground in 5 V reference circuit

1) Inspect 5 V reference circuit 2 between the ECM (pin 106 of F43) and the following components for a short to ground or a short to the low reference circuit. Is the result normal?

● Accelerator pedal position sensor 2 (pin 1 of FL1)

● Barometric pressure sensor (pin 3 of FL52)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 5 between the ECM (pin 52 of F41) and the following components for a short to ground or a short to the low reference circuit. Is the result normal?

● CMP sensor (pin 3 of E91)

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 8. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

7. Inspection for short to power supply circuit in 5 V reference circuit

1) Inspect 5 V reference circuit 2 between the ECM (pin 106 of F43) and the following components for a short to the power supply circuit. Is the result normal?

● Accelerator pedal position sensor 2 (pin 1 of FL1)

● Barometric pressure sensor (pin 3 of FL52)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 5 between the ECM (pin 52 of F41) and the following components for a short to the power supply circuit. Is the result normal?

● CMP sensor (pin 3 of E91)

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 8. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P0685 (Flash Code 416) ECM Power Relay Control Circuit Open

1. DTC P0685 DTC information

1. DTC P0685 description

The ECM main relay is energized in order to supply battery power to the ECM through the relay switch side when the ECM receives an ignition switch ON signal. When the ignition switch turns OFF, voltage application to the ECM main relay is stopped after a predetermined period of length of time has passed. If the ECM detects a low voltage status in the ECM main relay voltage supply circuit when 3 seconds have passed after tuning the ignition switch ON, the DTC is set.

2. Condition for setting DTC P0685

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects a low voltage condition in the relay voltage supply circuit for approximately 3 seconds when the ECM main relay is commanded ON.

3. Action taken when DTC P0685 sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0685

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P0685 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM main relay inspection

No

Go to Intermittent conditions.

3. ECM main relay inspection

1) Turn OFF the ignition switch for at least 30 seconds.

2) Replace the ECM main relay with a glow relay or a known good relay.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. Fuse inspection

No

Replace the ECM main relay.

⇒ Proceed to 7. Repair verification

4. Fuse inspection

1) Inspect for poor connections at the frame ground, and retighten or clean the corroded area as necessary.

2) Inspect for a blown out ECM 40 A slow blow fuse. Is the result normal?

Yes

⇒ Proceed to 5. ECM main relay circuit inspection

No

Replace the slow blow fuse. If the slow blow fuse blows out again, repair the short to ground in the circuits relating to the ECM 40 A slow blow fuse.

⇒ Proceed to 7. Repair verification

5. ECM main relay circuit inspection

1) Inspect for poor connections at the ECM harness connector (pins 67, 68, 72, and 73 of F42). Is the connection status normal?

2) Inspect each relay circuit for an open circuit or high resistance. Is the result normal?

● Between the ECM (pins 67 and 68 of F42) and the ECM main relay (pin 2 of OR2)

● Between the ECM (pins 72 and 73 of F42) and the ECM main relay (pin 3 of OR2)

● Between the ECM 40 A slow blow fuse and the ECM main relay (pin 1 of OR2)

● Between the ECM main relay (pin 5 of OR2) and the frame ground

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 6. ECM replacement

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 7. Repair verification

6. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 7. Repair verification

7. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool.

DTC P0687 (Flash Code 416) ECM Power Relay Control Circuit High

1. DTC P0687 DTC information

1. DTC P0687 description

The ECM main relay is energized in order to supply battery power to the ECM through the relay switch side when the ECM receives an ignition switch ON signal. When the ignition switch turns OFF, voltage application to the ECM main relay is stopped after a predetermined period of length of time has passed. If the ECM detects that the ECM is ON when 5 seconds have passed after tuning the ignition switch OFF, the DTC is set.

2. Condition for setting DTC P0687

Condition for running the DTC

● The battery voltage is 18V or more.

● 5 seconds have passed since the ignition switch was turned OFF.

● DTC P0606 is not set.

Refer to "*DTC P0606 (Flash Code 51) ECM Processor*" in this section.

Condition for setting the DTC

● The ECM detects that the ECM is ON when the ECM main relay is commanded OFF.

3. Action taken when DTC P0687 sets

● The ECM illuminates the SVS lamp the next time the ignition switch is turned ON. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P0687

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P0687 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Inspection for short to power supply in battery voltage feed circuit

No

Go to Intermittent conditions.

3. Inspection for short to power supply in battery voltage feed circuit

1) Turn OFF the ignition switch for at least 30 seconds.

2) Remove the ECM main relay.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is DTC P0685 set?

Yes

⇒ Proceed to 4. ECM main relay inspection

No

Repair the short to the power supply circuit in the battery voltage feed circuit between the ECM (pins 67 and 68 of F42) and the ECM main relay (pin 2 of OR2).

⇒ Proceed to 5. Repair verification

4. ECM main relay inspection

1) Turn OFF the ignition switch for at least 30 seconds.

2) Replace the ECM main relay with a glow relay or a known good relay.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

Repair the short to the power supply circuit between the ECM (pins 72 and 73 of F42) and the ECM main relay (pin 3 of OR2).

⇒ Proceed to 5. Repair verification

No

Replace the ECM main relay.

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool.

DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit

1. DTC P0697 DTC information

1. DTC P0697 description

The ECM supplies 5 V reference to the exhaust differential pressure sensor through 5 V reference circuit 3.

Also, the ECM supplies 5 V reference to the following sensors through 5 V reference circuit 4.

● Boost pressure sensor

● EGR position sensor 2

● Engine coolant temperature sensor

● Fuel temperature sensor

5 V reference circuits 3 and 4 are independent of each other outside the ECM but share the bus inside the ECM. Therefore, all of 5 V reference circuits 3 and 4 may be affected by a short circuit in one of the sensor 5 V reference circuits. The ECM monitors the voltage of 5 V reference circuits 3 and 4, and if it detects that the voltage is excessively low or high, the DTC is set.

2. Condition for setting DTC P0697

Condition for running the DTC

● The battery voltage is 16 V or more.

● DTC P060B is not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Condition for setting the DTC

● The ECM detects that the voltage of 5 V reference circuit 3 or 4 is 4.5 V or less, or 5.5 V or more.

3. Action taken when DTC P0697 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the VGS control.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P0697

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P0697 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Boost pressure sensor 5 V reference voltage check

No

Go to Intermittent conditions.

3. Boost pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the boost pressure sensor harness connector (E101).

3) Turn ON the ignition switch.

4) Measure the voltage between the boost pressure sensor 5 V reference circuit (pin 3 of E101) and the frame ground with a DMM.

Refer to "*Engine Control*".

Value: 4.5 to 5.5 V

The reading is more than the specified value.

⇒ Proceed to 7. Inspection for short to power supply circuit in 5 V reference circuit

The reading is within the specified range.

Replace the boost pressure sensor.

⇒ Proceed to 9. Repair verification

The reading is less than the specified value.

⇒ Proceed to 4. 5 V reference circuit inspection for EGR position sensor 2

4. 5 V reference circuit inspection for EGR position sensor 2

1) Turn OFF the ignition switch.

2) Disconnect the EGR valve 2 harness connector (E99).

3) Turn ON the ignition switch.

4) Measure the voltage between the boost pressure sensor 5 V reference circuit (pin 3 of E101) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

Replace the EGR valve.

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 5. Exhaust differential pressure sensor 5 V reference circuit inspection

5. Exhaust differential pressure sensor 5 V reference circuit inspection

1) Turn OFF the ignition switch.

2) Disconnect the exhaust differential pressure sensor harness connector (FB66).

3) Turn ON the ignition switch.

4) Measure the voltage between the boost pressure sensor 5 V reference circuit (pin 3 of E101) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

Replace the exhaust differential pressure sensor.

⇒ Proceed to 9. Repair verification

No

⇒ Proceed to 6. Inspection for short to ground in 5 V reference circuit

6. Inspection for short to ground in 5 V reference circuit

1) Inspect 5 V reference circuit 3 between the ECM (pin 20 of F43) and the exhaust differential pressure sensor (pin 3 of FB66) for a short to ground or a short to the low reference circuit. Is the result normal?

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 4 between the ECM (pin 50 of F41) and the following components for a short to ground or a short to the low reference circuit. Is the result normal?

● Boost pressure sensor (pin 3 of E101)

● EGR position sensor 2 (pin 1 of E99)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 8. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

7. Inspection for short to power supply circuit in 5 V reference circuit

1) Inspect 5 V reference circuit 3 between the ECM (pin 20 of F43) and the exhaust differential pressure sensor (pin 3 of FB66) for a short to the power supply circuit. Is the result normal?

Refer to "*Engine Control*".

2) Inspect 5 V reference circuit 4 between the ECM (pin 50 of F41) and the following components for a short to the power supply circuit. Is the result normal?

● Boost pressure sensor (pin 3 of E101)

● EGR position sensor 2 (pin 1 of E99)

Refer to "*Engine Control*".

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 8. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

8. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

Trouble Code P06AF Injector IC system error

1. DTC P06AF DTC information

1. DTC P06AF DTC description

ECM internal processing unit is abnormal

2. DTC P06AF setting conditions

Precondition for DTC setting

● Battery is 18-32V

● Engine running

DTC setting conditions

● ECM detects injector control (IC) dysfunction

3. Disposal of DTC P06AF setting

● Engine warning light turns on

● The ECM limits the fuel injection quantity

2. Engine control

Refer to "*Engine Engine Control*"

3. Sketchy circuit diagram

Refer to "*Engine Function, Construction, Operation Sketch Map*"

4. DTC P06AF diagnosis

1. Engine control system check

Refer to the book "Inspection of Engine Control Systems"

2. Now DTC confirmed

1) Connect the decoder

2) Start the switch for more than 1 minute OFF

3) Start the engine

4) Check the DTC with the decoder. Is there any DTC detected?

Yes

⇒ 3. ECM replacement.

No

⇒ 4. Confirmation of symptom cancellation.

3. ECM replacement completed

⇒ 4. Confirmation of symptom cancellation.

4. Confirm the cancellation of symptoms

1) Eliminate the DTC with the decoder unit.

2) Start the switch for more than 1 minute OFF.

3) Start the engine.

4) Check the DTC with the decoder.

DTC P1062 (Flash Code 257) Fuel Pressure Regulator 1 Solenoid Control Circuit

1. DTC P1062 DTC information

1. DTC P1062 description

The PCV flyback circuit in the ECM controls the PCV drive voltage through 2 systems, PCV1 and PCV2.

2. Condition for setting DTC P1062

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects a failure in the PCV 1 drive circuit.

3. Action taken when DTC P1062 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P1062

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1062 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 3. ECM harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

3. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 17 and 25 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 4. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 5. Repair verification

4. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1063 (Flash Code 258) Fuel Pressure Regulator 2 Solenoid Control Circuit

1. DTC P1063 DTC information

1. DTC P1063 description

The PCV flyback circuit in the ECM controls the PCV drive voltage through 2 systems, PCV1 and PCV2.

2. Condition for setting DTC P1063

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects a failure in the PCV 2 drive circuit.

3. Action taken when DTC P1063 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P1063

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1063 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 3. ECM harness connector inspection

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

3. ECM harness connector inspection

1) Inspect for poor connections at the TCM harness connector (pins 30 and 31 of FU163). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 4. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 5. Repair verification

4. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1093 (Flash Code 226) Fuel Rail Pressure Too Low

1. DTC P1093 DTC information

1. DTC P1093 description

The ECM monitors the fuel rail pressure based on the fuel rail pressure sensor signals. If the pressure is low, the ECM adjusts the operation of the supply pump PCV, and increases the fuel rail pressure. If a failure in the fuel supply to the supply pump or a malfunction in the supply pump occurs, raising the fuel rail pressure will become impossible. If the fuel rail pressure becomes higher than a predetermined level, the pressure limiter in the fuel rail is activated, which lowers the fuel rail pressure and prevents engine mechanical failure.

2. Condition for setting DTC P1093

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● The water temperature is 60℃ (132℉) or more.

● DTCs P0087, P0091, P0092, P0192, P0193, P0335, P0336, P060B, P0641, P1062, P1063, P2295, and P2296 are not set.

Refer to "*DTC P0087 (Flash Code 225) Fuel Rail/System Pressure - Too Low*" in this section.

Refer to "*DTC P0091 (Flash Code 247) Fuel Pressure Regulator Control Circuit Low*" in this section.

Refer to "*DTC P0092 (Flash Code 217) Fuel Pressure Regulator Control Circuit High*" in this section.

Refer to "*DTC P0192 (Flash Code 245) Fuel Rail Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P0193 (Flash Code 245) Fuel Rail Pressure Sensor Circuit High*" in this section.

Refer to "*DTC P0335 (Flash Code 15) Crankshaft Position Sensor Circuit*" in this section.

Refer to "*DTC P0336 (Flash Code 15) Crankshaft Position Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit" in this section.

Refer to "*DTC P1062 (Flash Code 257) Fuel Pressure Regulator 1 Solenoid Control Circuit*" in this section.

Refer to "*DTC P1063 (Flash Code 258) Fuel Pressure Regulator 2 Solenoid Control Circuit*" in this section.

Refer to "*DTC P2295 (Flash Code 248) Fuel Pressure Regulator 2 Control Circuit Low*" in this section.

Refer to "*DTC P2296 (Flash Code 218) Fuel Pressure Regulator 2 Control Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the actual fuel rail pressure is less than the desired fuel rail pressure by 50 MPa {7,250 psi} or more for 5 seconds or more.

3. Action taken when DTC P1093 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P1093

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P1093 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Fuel system inspection

1) Inspect the fuel amount. Refill if the level is low.

2) Bleed the air in the fuel.

Refer to "*Fuel system check*" in this section.

Procedure completion

⇒ Proceed to 3. Current DTC check

3. Current DTC check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. Inspection for leakage, collapsing, or clogging of the fuel pipe and fuel filter inspection

No

⇒ Proceed to 13. Repair verification

4. Inspection for leakage, collapsing, or clogging of the fuel pipe and fuel filter inspection

1) Turn OFF the ignition switch.

2) Check for any abnormal conditions such as fuel leakage, collapsing, or clogging in all fuel pipes. And, inspect for any abnormal conditions in the fuel filters, etc. Is the result normal?

Yes

⇒ Proceed to 5. Fuel high pressure piping inspection

No

Repair or replace as necessary.

⇒ Proceed to 13. Repair verification

5. Fuel high pressure piping inspection

1) Start the engine.

2) Depress the accelerator pedal.

3) Inspect for fuel leakage from the fuel high pressure piping. Is the result normal?

Yes

⇒ Proceed to 6. Cylinder injection correction amount check

No

Repair or replace the parts leaking fuel.

⇒ Proceed to 13. Repair verification

6. Cylinder injection correction amount check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Start the engine.

4) Observe the Fuel Compensation parameter for each cylinder on the scan tool. Is the Fuel Compensation parameter within the normal range?

Specified value: -4 - 4 mm3/st

Yes

⇒ Proceed to 7. PCV1 inspection

No

Replace the cylinder injector that is outside the specified value.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 7. PCV1 inspection

7. PCV1 inspection

1) Start the engine.

2) Disconnect the PCV1 harness connector (E43) while the engine is idling.

Refer to "*Engine Control*".

3) Check the engine condition. Does the engine stall?

Caution：

● DTC P0091 is set if the PCV 1 harness connector (E43) is disconnected. Clear the DTC after inspection.

Yes

⇒ Proceed to 9. Fuel supply pump replacement

No

⇒ Proceed to 8. PCV2 inspection

8. PCV2 inspection

1) Connect the PCV1 harness connector (E43).

2) Start the engine.

3) Disconnect the PCV2 harness connector (E44) while the engine is idling.

Refer to "*Engine Control*".

4) Check the engine condition. Does the engine stall?

Caution：

● DTC P2295 is set if the PCV 2 harness connector (E44) is disconnected. Clear the DTC after inspection.

Yes

⇒ Proceed to 9. Fuel supply pump replacement

No

⇒ Proceed to 10. Pressure limiter inspection

9. Fuel supply pump replacement

Procedure completion

⇒ Proceed to 13. Repair verification

10. Pressure limiter inspection

1) Remove the fuel pipe from the pressure limiter.

2) Install a hose, etc., to the fuel pipe to prepare the fuel leakage check.

3) Perform a test-run. Does fuel leak from the pressure limiter?

Yes

Replace the pressure limiter.

⇒ Proceed to 13. Repair verification

No

⇒ Proceed to 11. Pressure limiter operation check

11. Pressure limiter operation check

1) Reconnect all of the disconnected harness connectors.

2) Bleed the air from the fuel.

Refer to "*Fuel system check*" in this section.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Start the engine.

6) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 12. ECM replacement

No

⇒ Proceed to 13. Repair verification

12. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 13. Repair verification

13. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1247 (Flash Code 411) Turbocharger Boost Control Solenoid Circuit 1

1. DTC P1247 DTC information

1. DTC P1247 description

The VGS solenoid valve is used to supply air to the air cylinder. Controlling the air supply to the air cylinder appropriately controls the VGS air cylinder. The solenoid valve power supply is supplied via the VGS relay, and is also connected to the ECM via the VGS solenoid valve. The ECM controls each solenoid valve, and if a malfunction is detected, it stops the power supply to the VGS solenoid valve by controlling the VGS relay and stops each control.

2. Condition for setting DTC P1247

Condition for running the DTC

● The battery voltage is 18V or more.

● DTC P124A is not set.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

Condition for setting the DTC

Any of the following conditions are met:

● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 1 for 3 seconds.

● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 1 for 3 seconds.

3. Action taken when DTC P1247 sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM stops the EGR control.

4. Condition for clearing DTC P1247

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1247 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Observe the DTC information with a scan tool. Is DTC P124A set at the same time?

Yes

Go to DTC P124A diagnosis.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

No

⇒ Proceed to 3. Individual harness connector inspection

3. Individual harness connector inspection

1) Inspect for poor connections at the VGS solenoid valve 1 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 4. VGS solenoid valve 1 inspection

No

Repair the connections as necessary.

⇒ Proceed to 10. Repair verification

4. VGS solenoid valve 1 inspection

1) Turn OFF the ignition switch.

2) Disconnect the VGS solenoid valve 1 harness connector (FB180).

3) Measure the resistance of the VGS solenoid valve 1 connector (pins 1 and 2 of FB180) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 34 to 40 Ω

Yes

⇒ Proceed to 5. Inspection for open circuit and short circuit in VGS relay circuit

No

Replace VGS solenoid valve 1.

⇒ Proceed to 10. Repair verification

5. Inspection for open circuit and short circuit in VGS relay circuit

1) Inspect the circuit between VGS solenoid valve 1 (pin 2 of FB180) and the VGS relay (pin 1 of OR7) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

2) Inspect the circuit between the VGS relay (pin 1 of OR7) and the ECM main relay (pin 2 of OR2) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 6. Inspection for open circuit and short circuit in VGS solenoid valve 1 circuit

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit and short circuit in VGS solenoid valve 1 circuit

1) Inspect the circuit between VGS solenoid valve 1 (pin 1 of FB180) and the ECM (pin 28 of F40) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. VGS solenoid valve 1 operation check

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

7. VGS solenoid valve 1 operation check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Clear the DTC with a scan tool.

4) Remove the air piping from the VGS air cylinder.

5) Perform the VGS Control with a scan tool. Does VGS solenoid valve 1 operate normally?

Yes

⇒ Proceed to 10. Repair verification

No

⇒ Proceed to 8. ECM power supply and ground circuit inspection

8. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 9. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1248 (Flash Code 412) Turbocharger Boost Control Solenoid Circuit 2

1. DTC P1248 DTC information

1. DTC P1248 description

The VGS solenoid valve is used to supply air to the air cylinder. Controlling the air supply to the air cylinder appropriately controls the VGS air cylinder. The solenoid valve power supply is supplied via the VGS relay, and is also connected to the ECM via the VGS solenoid valve. The ECM controls each solenoid valve, and if a malfunction is detected, it stops the power supply to the VGS solenoid valve by controlling the VGS relay and stops each control.

2. Condition for setting DTC P1248

Condition for running the DTC

● The battery voltage is 18V or more.

● DTC P124A is not set.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

Condition for setting the DTC

Any of the following conditions are met:

● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 2 for 3 seconds.

● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 2 for 3 seconds.

3. Action taken when DTC P1248 sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM stops the EGR control.

4. Condition for clearing DTC P1248

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1248 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. DTC verification

1) Observe the DTC information with a scan tool for DTC P124A being set at the same time.

Yes

Go to DTC P124A diagnosis.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

No

⇒ Proceed to 3. Individual harness connector inspection

3. Individual harness connector inspection

1) Inspect for poor connections at the VGS solenoid valve 2 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 4. VGS solenoid valve 2 inspection

No

Repair the connections as necessary.

⇒ Proceed to 10. Repair verification

4. VGS solenoid valve 2 inspection

1) Turn OFF the ignition switch.

2) Disconnect the VGS solenoid valve 2 harness connector (FB181).

3) Measure the resistance of the VGS solenoid valve 2 connector (pins 1 and 2 of FB181) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 30 to 40 Ω

Yes

⇒ Proceed to 5. Inspection for open circuit and short circuit in VGS relay circuit

No

Replace VGS solenoid valve 2.

⇒ Proceed to 10. Repair verification

5. Inspection for open circuit and short circuit in VGS relay circuit

1) Inspect the circuit between VGS solenoid valve 2 (pin 2 of FB181) and the VGS relay (pin 4 of OR7) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

2) Inspect the circuit between the VGS relay (pin 1 of OR7) and the ECM main relay (pin 2 of OR2) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 6. Inspection for open circuit and short circuit between VGS solenoid valve 2 and ECM

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit and short circuit between VGS solenoid valve 2 and ECM

1) Inspect the circuit between VGS solenoid valve 2 (pin 1 of FB181) and the ECM (pin 21 of F40) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. VGS solenoid valve 2 operation check

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

7. VGS solenoid valve 2 operation check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Clear the DTC with a scan tool.

4) Remove the air piping from the VGS air cylinder.

5) Perform the VGS Control with a scan tool. Does VGS solenoid valve 2 operate normally?

Yes

⇒ Proceed to 10. Repair verification

No

⇒ Proceed to 8. ECM power supply and ground circuit inspection

8. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 9. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1249 (Flash Code 413) Turbocharger Boost Control Solenoid Circuit 3

1. DTC P1249 DTC information

1. DTC P1249 description

The VGS solenoid valve is used to supply air to the air cylinder. Controlling the air supply to the air cylinder appropriately controls the VGS air cylinder. The solenoid valve power supply is supplied via the VGS relay, and is also connected to the ECM via the VGS solenoid valve. The ECM controls each solenoid valve, and if a malfunction is detected, it stops the power supply to the VGS solenoid valve by controlling the VGS relay and stops each control.

2. Condition for setting DTC P1249

Condition for running the DTC

● The battery voltage is 18V or more.

● DTC P124A is not set.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

Condition for setting the DTC

Any of the following conditions are met:

● When the solenoid valve is commanded OFF, the ECM detects a low voltage condition in VGS solenoid valve 3 for 3 seconds.

● When the solenoid valve is commanded ON, the ECM detects a high voltage condition in VGS solenoid valve 3 for 3 seconds.

3. Action taken when DTC P1249 sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM stops the EGR control.

4. Condition for clearing DTC P1249

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1249 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. DTC verification

1) Observe the DTC information with a scan tool for DTC P124A being set at the same time.

Yes

Go to DTC P124A diagnosis.

Refer to "*DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit*" in this section.

No

⇒ Proceed to 3. Individual harness connector inspection

3. Individual harness connector inspection

1) Inspect for poor connections at the VGS solenoid valve 3 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

Yes

⇒ Proceed to 4. VGS solenoid valve 3 inspection

No

Repair the connections as necessary.

⇒ Proceed to 10. Repair verification

4. VGS solenoid valve 3 inspection

1) Turn OFF the ignition switch.

2) Disconnect the VGS solenoid valve 3 harness connector (FB182).

3) Measure the resistance of the VGS solenoid valve 3 connector (pins 1 and 2 of FB182) with a DMM. Is the resistance within the specified range?

Refer to "*Engine Control*".

Value: 30 to 40 Ω

Yes

⇒ Proceed to 5. Inspection for open circuit and short circuit in VGS relay circuit

No

Replace VGS solenoid valve 3.

⇒ Proceed to 10. Repair verification

5. Inspection for open circuit and short circuit in VGS relay circuit

1) Inspect the circuit between VGS solenoid valve 3 (pin 2 of FB182) and the VGS relay (pin 4 of OR7) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

2) Inspect the circuit between the VGS relay (pin 1 of OR7) and the ECM main relay (pin 2 of OR2) for the following conditions. Is the result normal?

● Open circuit

● Short to the power supply circuit

● Short to the signal circuit

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 6. Inspection for open circuit and short circuit in VGS solenoid valve 3 circuit

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit and short circuit in VGS solenoid valve 3 circuit

1) Inspect the circuit between VGS solenoid valve 3 (pin 1 of FB182) and the ECM (pin 20 of F40) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. VGS solenoid valve 3 operation check

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

7. VGS solenoid valve 3 operation check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Clear the DTC with a scan tool.

4) Remove the air piping from the VGS air cylinder.

5) Perform the VGS Control with a scan tool. Does VGS solenoid valve 3 operate normally?

Yes

⇒ Proceed to 10. Repair verification

No

⇒ Proceed to 8. ECM power supply and ground circuit inspection

8. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 9. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P124A (Flash Code 415) Turbocharger Boost Control Solenoid Relay Circuit

1. DTC P124A DTC information

1. DTC P124A description

The VGS solenoid valve power supply is supplied via the VGS relay, and is also connected to the ECM via the VGS solenoid valve. The ECM controls each solenoid valve, and if a malfunction is detected, it stops the power supply to the VGS solenoid valve by controlling the VGS relay and stops each control.

2. Condition for setting DTC P124A

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects an abnormal VGS relay operation voltage.

3. Action taken when DTC P124A sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the EGR control.

● The ECM stops the VGS control.

4. Condition for clearing DTC P124A

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P124A diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Individual harness connector inspection

1) Inspect for poor connections at the VGS relay, the ECM harness connector, and the intermediate connector. Is the connection status normal?

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

Yes

⇒ Proceed to 3. VGS relay voltage check

3. VGS relay voltage check

1) Turn OFF the ignition switch.

2) Remove the VGS relay.

3) Turn ON the ignition switch.

4) Measure the voltage between the VGS relay circuit (pin 29 of F40) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 0V

Yes

⇒ Proceed to 5. VGS relay inspection

No

⇒ Proceed to 4. Inspection for open circuit in VGS relay

4. Inspection for open circuit in VGS relay

1) Inspect for an open circuit between the coil side of the VGS relay (pin 5 of OR7) and the ECM (pin 29 of F40). Is the result normal?

2) Inspect for an open circuit between the coil side and the power supply side of the VGS relay (pins 3 and 4 of OR7) and the main relay (pin 2 of OR2). Is the result normal?

Refer to "*Engine Control*".

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 5. VGS relay inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

5. VGS relay inspection

1) Turn OFF the ignition switch.

2) Install the VGS relay.

3) Measure the voltage between the VGS relay circuit (pin 29 of F40) and the frame ground with a DMM. Is the voltage equal to the specified value?

Value: 0V

4) Turn ON the ignition switch.

5) Measure the voltage between the VGS relay circuit (pin 29 of F40) and the frame ground with a DMM. Is the voltage equal to battery voltage?

Refer to "*Engine Control*".

6) Are all of the values normal?

Yes

⇒ Proceed to 6. ECM power supply and ground circuit inspection

No

Repair or replace the VGS relay or the VGS relay power supply side circuit.

⇒ Proceed to 8. Repair verification

6. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1261 (Flash Code 34) Injector Positive Voltage Control Circuit Group 1

1. DTC P1261 DTC information

1. DTC P1261 description

The charge-up circuit within the ECM increases the voltage applied to the injector. The charge-up circuit is divided into 2 banks: common power supply 1 and common power supply 2. Common power supply 1 serves the injectors of cylinders No. 1, 2, and 3, and common power supply 2 serves the injectors of cylinders No. 4, 5, and 6. If an open circuit occurs in the injector charge-up circuit of common power supply 1 in the ECM, the DTC is set.

2. Condition for setting DTC P1261

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

Condition for setting the DTC

● The ECM detects an open circuit in the injector charge-up circuit of common power supply 1 in the ECM.

3. Action taken when DTC P1261 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "DTC type definitions" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P1261

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "DTC type definitions" in this section.

2. DTC P1261 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1262 (Flash Code 34) Injector Positive Voltage Control Circuit Group 2

1. DTC P1262 DTC information

1. DTC P1262 description

The charge-up circuit within the ECM increases the voltage applied to the injector. The charge-up circuit is divided into 2 banks: common power supply 1 and common power supply 2. Common power supply 1 serves the injectors of cylinders No. 1, 2, and 3, and common power supply 2 serves the injectors of cylinders No. 4, 5, and 6. If an open circuit occurs in the injector charge-up circuit of common power supply 2 in the ECM, the DTC is set.

2. Condition for setting DTC P1262

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

Condition for setting the DTC

● The ECM detects an open circuit in the injector charge-up circuit of common power supply 2 in the ECM.

3. Action taken when DTC P1262 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P1262

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1262 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. ECM replacement

No

⇒ Proceed to 4. Repair verification

3. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 4. Repair verification

4. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1621 (Flash Code 54) Control Module Long Term Memory Performance

1. DTC P1621 DTC information

1. DTC P1621 description

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P1621

This diagnosis applies to the microprocessor inside the ECM.

2. Condition for setting DTC P1621

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects that the calculated checksum does not match the checksum stored in the EEPROM.

3. Action taken when DTC P1621 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P1621

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P1621 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Device connection check

1) Verify that all the tool connections are securely connected.

2) Verify that the programming device operates properly.

3) Connect the scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Turn ON the ignition switch.

6) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Current DTC check

No

⇒ Proceed to 5. Repair verification

3. Current DTC check

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. ECM replacement

No

⇒ Proceed to 5. Repair verification

4. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P1664 (Flash Code 76) Service Vehicle Soon Lamp Control Circuit

1. DTC P1664 DTC information

1. DTC P1664 description

The SVS lamp is in the instrument panel cluster. The SVS lamp informs the driver that a non-emission related malfunction has occurred and repair must be performed.

The ECM monitors for any status that is different from the SVS lamp command status in the SVS lamp control circuit. The circuit is defective if the ECM detects a low voltage when the SVS lamp is commanded OFF, or if the ECM detects a high voltage when the MIL is commanded ON. If the ECM detects any abnormal value in the control circuit voltage, the DTC is set.

2. Condition for setting DTC P1664

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

Condition for setting the DTC

Any of the following conditions are met.

● When the SVS lamp is commanded OFF, the ECM detects a low voltage condition in the SVS lamp control circuit.

● When the SVS lamp is commanded ON, the ECM detects a high voltage condition in the SVS lamp control circuit.

3. Action taken when DTC P1664 sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P1664

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P1664 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch for 10 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Fuse inspection

No

Go to Intermittent conditions.

3. Fuse inspection

1) Inspect for a blown out METER 10 A fuse. Is the result normal?

Yes

⇒ Proceed to 4. Inspection for short to ground in SVS lamp control circuit

No

Replace the fuse. If the fuse blows out again, repair the short to ground in the circuits relating to the METER 10 A fuse.

⇒ Proceed to 12. Repair verification

4. Inspection for short to ground in SVS lamp control circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F43).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Check the SVS lamp. Does the SVS lamp turn OFF?

Yes

⇒ Proceed to 5. Inspection for short to power supply in SVS lamp control circuit

No

Repair the short to ground in the SVS lamp control circuit between the ECM (pin 117 of F43) and the instrument panel cluster (pin 4 of FU98).

⇒ Proceed to 12. Repair verification

5. Inspection for short to power supply in SVS lamp control circuit

1) Remove the Meter 10 A fuse.

2) Turn ON the ignition switch.

3) Measure the voltage between the SVS lamp control circuit (pin 117 of F43) and the frame ground with a DMM. Is the voltage less than or equal to the specified value?

Refer to "*Engine Control*".

Value: 1V

Yes

⇒ Proceed to 6. SVS lamp illumination check using fused jumper wire

No

Repair the short to the power supply circuit in the SVS lamp control circuit between the ECM (pin 117 of F43) and the instrument panel cluster (pin 4 of FU98).

⇒ Proceed to 12. Repair verification

6. SVS lamp illumination check using fused jumper wire

1) Turn OFF the ignition switch.

2) Install the METER 10 A fuse.

3) Turn ON the ignition switch.

4) Connect a fused jumper wire between the SVS lamp control circuit (pin 117 of F43) and the frame ground.

Refer to "*Engine Control*".

5) Check the SVS lamp. Does the SVS lamp illuminate?

Yes

⇒ Proceed to 10. ECM harness connector inspection

No

⇒ Proceed to 7. Instrument panel cluster power supply voltage check

7. Instrument panel cluster power supply voltage check

1) Connect a test lamp between the ignition power supply circuit (pin 40 of FU98) and the frame ground.

Refer to "*Engine Control*".

2) Turn ON the ignition switch. Does the test lamp illuminate?

Yes

⇒ Proceed to 8. Inspection for open circuit in SVS lamp control circuit

No

Repair the open circuit or high resistance in the ignition power supply circuit between the METER 10 A fuse and the instrument panel cluster (pin 40 of FU98).

⇒ Proceed to 12. Repair verification

8. Inspection for open circuit in SVS lamp control circuit

1) Inspect the SVS lamp control circuit between the ECM (pin 117 of F43) and the instrument panel cluster (pin 4 of FU98) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. Instrument panel cluster harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 12. Repair verification

9. Instrument panel cluster harness connector inspection

1) Inspect for poor connections at the instrument panel cluster harness connector (pins 4 and 40 of FU98). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Repair or replace the instrument panel cluster.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster setting*".

⇒ Proceed to 12. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 12. Repair verification

10. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 117 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 11. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 12. Repair verification

11. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 12. Repair verification

12. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Turn ON the ignition switch for at least 10 seconds.

4) Start the engine.

5) Observe the DTC information with a scan tool.

DTC P2122 (Flash Code 121) Pedal Position Sensor 1 Circuit Low Input

1. DTC P2122 DTC information

1. DTC P2122 description

The accelerator pedal position sensor is installed to the accelerator pedal bracket. The sensor consists of 2 sensors in 1 housing. The ECM uses the accelerator pedal position sensor to calculate target acceleration and deceleration. Accelerator pedal position sensor 1 has the following circuits.

● 5V reference circuit

● Low reference circuit

● Accelerator pedal position sensor 1 signal circuit

The accelerator pedal position sensor 1 sends signals related to accelerator pedal angle changes to the ECM via the signal circuit. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P2122

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the accelerator pedal position sensor 1 signal voltage is 0.2 V or less.

3. Action taken when DTC P2122 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P2122

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2122 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0641 set at the same time?

Yes

Go to DTC P0641 diagnosis.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

No

⇒ Proceed to 3. Signal voltage check for accelerator pedal position sensor 1

3. Signal voltage check for accelerator pedal position sensor 1

1) Fully depress and release the accelerator pedal while observing the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value less than or equal to the specified value while depressing and releasing the pedal?

Value: 0.2V

Yes

⇒ Proceed to 4.5V reference voltage check for accelerator pedal position sensor 1

No

Go to Intermittent conditions.

4. 5 V reference voltage check for accelerator pedal position sensor 1

1) Turn OFF the ignition switch.

2) Disconnect the accelerator pedal position sensor 1 harness connector (FL1).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of accelerator pedal position sensor 1 (pin 4 of FL1) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.9 V

Yes

⇒ Proceed to 5. Accelerator pedal position sensor 1 signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in 5 V reference circuit of accelerator pedal position sensor 1

5. Accelerator pedal position sensor 1 signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the 5 V reference circuit of accelerator pedal position sensor 1 and the signal circuit (pins 4 and 5 of FL1).

Refer to "*Engine Control*".

2) Observe the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool. Is the APP Sensor 1 (Accelerator Pedal Position) parameter more than or equal to the specified value?

Value: 4.9 V

Yes

⇒ Proceed to 8. Accelerator pedal position sensor 1 harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in accelerator pedal position sensor 1 signal circuit

6. Inspection for open circuit in 5 V reference circuit of accelerator pedal position sensor 1

1) Inspect the 5 V reference circuit between the ECM (pin 83 of F42) and accelerator pedal position sensor 1 (pin 4 of FL1) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● Accelerator pedal position sensor 1 shares the 5 V reference circuit with other sensors. A malfunction in the 5 V reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in accelerator pedal position sensor 1 signal circuit

1) Inspect the signal circuit between the ECM (pin 99 of F43) and accelerator pedal position sensor 1 (pin 5 of FL1) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Accelerator pedal position sensor 1 harness connector inspection

1) Inspect for poor connections at the accelerator pedal position sensor 1 harness connector (pins 4 and 5 of FL1). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace accelerator pedal position sensor 1.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 83 of F42, pin 99 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value less than or equal to the specified value while depressing and releasing the pedal?

Value: 0.2 V

Yes

⇒ Proceed to 3. Signal voltage check for accelerator pedal position sensor 1

No

Observe the DTC information with a scan tool.

DTC P2123 (Flash Code 121) Pedal Position Sensor 1 Circuit High Input

1. DTC P2123 DTC information

1. DTC P2123 description

The accelerator pedal position sensor is installed to the accelerator pedal bracket. The sensor consists of 2 sensors in 1 housing. The ECM uses the accelerator pedal position sensor to calculate target acceleration and deceleration. Accelerator pedal position sensor 1 has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Accelerator pedal position sensor 1 signal circuit

The accelerator pedal position sensor 1 sends signals related to accelerator pedal angle changes to the ECM via the signal circuit. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P2123

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that accelerator pedal position sensor 1 signal voltage is 4.9 V or more.

3. Action taken when DTC P2123 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P2123

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2123 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Signal voltage check for accelerator pedal position sensor 1

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value more than or equal to the specified value while depressing and releasing the pedal?

Value: 4.9V

Yes

⇒ Proceed to 3. 5 V reference voltage and signal voltage check for accelerator pedal position sensor 1

No

Go to Intermittent conditions.

3. 5V reference voltage and signal voltage check for accelerator pedal position sensor 1

1) Observe the DTC information with a scan tool for DTC P0641 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the accelerator pedal position sensor 1 harness connector (FL1).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool.

Value: 0.2 V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in accelerator pedal position sensor 1 signal circuit

The reading is less than or equal to the specified value and DTC P0641 is set.

Go to DTC P0641 diagnosis.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

The reading is less than or equal to the specified value and DTC P0641 is not set.

⇒ Proceed to 4. Accelerator pedal position sensor 1 low reference circuit inspection using test lamp

4. Accelerator pedal position sensor 1 low reference circuit inspection using test lamp

1) Connect a test lamp between the accelerator pedal position sensor 1 low reference circuit (pin 6 of FL1) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. Accelerator pedal position sensor 1 harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in accelerator pedal position sensor 1 low reference circuit

5. Inspection for short to power supply in accelerator pedal position sensor 1 signal circuit

1) Inspect the signal circuit between the ECM (pin 99 of F43) and accelerator pedal position sensor 1 (pin 5 of FL1) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● Accelerator pedal position sensor 1 may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in accelerator pedal position sensor 1 low reference circuit

1) Inspect the low reference circuit between the ECM (pin 76 of F42) and accelerator pedal position sensor 1 (pin 6 of EL1) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● Accelerator pedal position sensor 1 shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. Accelerator pedal position sensor 1 harness connector inspection

1) Inspect for poor connections at the accelerator pedal position sensor 1 harness connector (pin 6 of FL1). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace accelerator pedal position sensor 1.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 76 of F42). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 1 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value more than or equal to the specified value while depressing and releasing the pedal?

Value: 4.9 V

Yes

⇒ Proceed to 2. Signal voltage check for accelerator pedal position sensor 1

No

Observe the DTC information with a scan tool.

DTC P2127 (Flash Code 122) Pedal Position Sensor 2 Circuit Low Input

1. DTC P2127 DTC information

1. DTC P2127 description

The accelerator pedal position sensor is installed to the accelerator pedal bracket. The sensor consists of 2 sensors in 1 housing. The ECM uses the accelerator pedal position sensor to calculate target acceleration and deceleration. Accelerator pedal position sensor 2 has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Accelerator pedal position sensor 2 signal circuit

The accelerator pedal position sensor 2 sends signals related to accelerator pedal angle changes to the ECM via the signal circuit. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P2127

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the accelerator pedal position sensor 2 signal voltage is 0.2 V or less.

3. Action taken when DTC P2127 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P2127

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2127 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. Signal voltage check for accelerator pedal position sensor 2

3. Signal voltage check for accelerator pedal position sensor 2

1) Fully depress and release the accelerator pedal while observing the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value less than or equal to the specified value while depressing and releasing the pedal?

Value: 0.2V

Yes

⇒ Proceed to 4. 5 V reference voltage check for accelerator pedal position sensor 2

No

Go to Intermittent conditions.

4. 5V reference voltage check for accelerator pedal position sensor 2

1) Turn OFF the ignition switch.

2) Disconnect the accelerator pedal position sensor 2 harness connector (FL1).

3) Turn ON the ignition switch.

4) Measure the voltage between the 5 V reference circuit of accelerator pedal position sensor 2 (pin 1 of FL1) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: less than 5V

Yes

⇒ Proceed to 5. Accelerator pedal position sensor 2 signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in 5V reference circuit of accelerator pedal position sensor 2

5. Accelerator pedal position sensor 2 signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the 5V reference circuit of accelerator pedal position sensor 2 and the signal circuit (pins 1 and 2 of FL1).

Refer to "*Engine Control*".

2) Observe the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool. Is the APP Sensor 2 (Accelerator Pedal Position) parameter more than or equal to the specified value?

Value: 4.9V

Yes

⇒ Proceed to 8. Accelerator pedal position sensor 2 harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in accelerator pedal position sensor 2 signal circuit

6. Inspection for open circuit in 5 V reference circuit of accelerator pedal position sensor 2

1) Inspect the 5 V reference circuit between the ECM (pin 106 of F43) and accelerator pedal position sensor 2 (pin 1 of FL1) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● Accelerator pedal position sensor 2 shares the 5 V reference circuit with other sensors. A malfunction in the 5V reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in accelerator pedal position sensor 2 signal circuit

1) Inspect the signal circuit between the ECM (pin 127 of F43) and accelerator pedal position sensor 2 (pin 2 of FL1) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Accelerator pedal position sensor 2 harness connector inspection

1) Inspect for poor connections at the accelerator pedal position sensor 2 harness connector (pins 1 and 2 of FL1). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace accelerator pedal position sensor 2.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 106 and 127 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value less than or equal to the specified value while depressing and releasing the pedal?

Value: 0.2 V

Yes

⇒ Proceed to 3. Signal voltage check for accelerator pedal position sensor 2

No

Observe the DTC information with a scan tool.

DTC P2128 (Flash Code 122) Pedal Position Sensor 2 Circuit High Input

1. DTC P2128 DTC information

1. DTC P2128 description

The accelerator pedal position sensor is installed to the accelerator pedal bracket. The sensor consists of 2 sensors in 1 housing. The ECM uses the accelerator pedal position sensor to calculate target acceleration and deceleration. Accelerator pedal position sensor 2 has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Accelerator pedal position sensor 2 signal circuit

The accelerator pedal position sensor 2 sends signals related to accelerator pedal angle changes to the ECM via the signal circuit. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P2128

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the accelerator pedal position sensor 2 signal voltage is 4.9 V or more.

3. Action taken when DTC P2128 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P2128

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2128 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Signal voltage check for accelerator pedal position sensor 2

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display the specified value while depressing and releasing the pedal?

Value: 4.9V

Yes

⇒ Proceed to 3. 5V reference voltage and signal voltage check for accelerator pedal position sensor 2

No

Go to Intermittent conditions.

3. 5 V reference voltage and signal voltage check for accelerator pedal position sensor 2

1) Observe the DTC information with a scan tool for DTC P0651 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the accelerator pedal position sensor 2 harness connector (FL1).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool.

Value: 0.2V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in accelerator pedal position sensor 2 signal circuit

The reading is less than or equal to the specified value and DTC P0651 is set.

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

The reading is less than or equal to the specified value and DTC P0651 is not set.

⇒ Proceed to 4. Accelerator pedal position sensor 2 low reference circuit inspection using test lamp

4. Accelerator pedal position sensor 2 low reference circuit inspection using test lamp

1) Connect a test lamp between the accelerator pedal position sensor 2 low reference circuit (pin 3 of FL1) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. Accelerator pedal position sensor 2 harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in accelerator pedal position sensor 2 low reference circuit

5. Inspection for short to power supply in accelerator pedal position sensor 2 signal circuit

1) Inspect the signal circuit between the ECM (pin 127 of F43) and accelerator pedal position sensor 2 (pin 2 of FL1) for the following conditions.

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● Accelerator pedal position sensor 2 may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in accelerator pedal position sensor 2 low reference circuit

1) Inspect the low reference circuit between the ECM (pin 110 of F43) and accelerator pedal position sensor 2 (pin 3 of FL1) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● Accelerator pedal position sensor 2 shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. Accelerator pedal position sensor 2 harness connector inspection

1) Inspect for poor connections at the accelerator pedal position sensor 2 harness connector (pin 3 of FL1). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace accelerator pedal position sensor 2.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 110 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the APP Sensor 2 (Accelerator Pedal Position) parameter on the scan tool. Does the scan tool display a value more than or equal to the specified value while depressing and releasing the pedal?

Value: 4.9 V

Yes

⇒ Proceed to 2. Signal voltage check for accelerator pedal position sensor 2

No

Observe the DTC information with a scan tool.

DTC P2138 (Flash Code 124) Pedal Position Sensor 1 - 2 Voltage Correlation

1. DTC P2138 DTC information

1. DTC P2138 description

The accelerator pedal position sensor is installed to the accelerator pedal bracket. The sensor consists of 2 sensors in 1 housing. Accelerator pedal position sensor 1 and accelerator pedal position sensor 2 are hall IC type sensors with the following circuits.

● 5 V reference circuit

● Low reference circuit

● Signal circuit

The ECM supplies 5 V to the accelerator pedal position sensors via the 5 V reference circuit, and the low reference circuit connects to ground. The accelerator pedal position sensor sends signals related to accelerator pedal angle changes to the ECM via the signal circuit. The signal voltage of accelerator pedal position sensor 1 is kept low at first and increases as the pedal is depressed. The signal voltage of accelerator pedal position sensor 2 is kept high at first and decreases as the pedal is depressed. If the ECM detects that the voltages of both the accelerator pedal position sensor 1 signal and the accelerator pedal position sensor 2 signal do not correlate, the DTC is set.

2. Condition for setting DTC P2138

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B, P0641, P0651, P2122, P2123, P2127, and P2128 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P2122 (Flash Code 121) Pedal Position Sensor 1 Circuit Low Input*" in this section.

Refer to "*DTC P2123 (Flash Code 121) Pedal Position Sensor 1 Circuit High Input*" in this section.

Refer to "*DTC P2127 (Flash Code 122) Pedal Position Sensor 2 Circuit Low Input*" in this section.

Refer to "*DTC P2128 (Flash Code 122) Pedal Position Sensor 2 Circuit High Input*" in this section.

Condition for setting the DTC

● The ECM detects that accelerator pedal position sensors 1 and 2 deviate from the range by 45% or more.

3. Action taken when DTC P2138 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM stops the PTO control.

● The ECM stops the exhaust brake control.

4. Condition for clearing DTC P2138

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2138 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0641, P0651, P2122, P2123, P2127, or P2128 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P2122 (Flash Code 121) Pedal Position Sensor 1 Circuit Low Input*" in this section.

Refer to "*DTC P2123 (Flash Code 121) Pedal Position Sensor 1 Circuit High Input*" in this section.

Refer to "*DTC P2127 (Flash Code 122) Pedal Position Sensor 2 Circuit Low Input*" in this section.

Refer to "*DTC P2128 (Flash Code 122) Pedal Position Sensor 2 Circuit High Input*" in this section.

No

⇒ Proceed to 3. DTC check during accelerator pedal operation

3. DTC check during accelerator pedal operation

1) Fully depress and release the accelerator pedal while observing the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 4. Accelerator pedal position sensor circuit inspection

No

Go to Intermittent conditions.

4. Accelerator pedal position sensor circuit inspection

1) Inspect for poor connections at the accelerator pedal position sensor harness connector (pins 1, 2, 3, 4, 5, and 6 of FL1). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 76 and 83 of F42; pins 99, 106, 110, and 127 of F43). Is the connection status normal?

3) Inspect for high resistance between the ECM (pins 76 and 83 of F42; pins 99, 106, 110, and 127 of F43) and the accelerator pedal position sensor (pins 1, 2, 3, 4, 5, and 6 of FL1). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

⇒ Proceed to 5. Inspection for short circuit in accelerator pedal position sensor signal circuit

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 8. Repair verification

5. Inspection for short circuit in accelerator pedal position sensor signal circuit

1) Inspect the signal circuit between the ECM (pins 99 and 127 of F43) and the accelerator pedal position sensor (pins 2 and 5 of FL1) for a short circuit. Is the result normal?

Yes

Replace the accelerator pedal position sensor.

⇒ Proceed to 6. Accelerator pedal position sensor signal input check

No

Repair the circuit as necessary.

⇒ Proceed to 8. Repair verification

6. Accelerator pedal position sensor signal input check

1) Reconnect all of the disconnected harness connectors.

2) Clear the DTC with a scan tool.

3) Turn OFF the ignition switch for at least 30 seconds.

4) Start the engine.

5) Fully depress and release the accelerator pedal while observing the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 7. ECM replacement

No

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Fully depress and release the accelerator pedal while observing the DTC information with a scan tool.

5) Observe the DTC information with a scan tool.

DTC P2146 (Flash Code 158) Fuel Injector Group 1 Supply Voltage Circuit

1. DTC P2146 DTC information

1. DTC P2146 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P2146

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTC P0201, P0202, or P0203 is not set.

Refer to "*DTC P0201 (Flash Code 271) Injector Circuit Open - Cylinder 1*" in this section.

Refer to "*DTC P0202 (Flash Code 272) Injector Circuit Open - Cylinder 2*" in this section.

Refer to "*DTC P0203 (Flash Code 273) Injector Circuit Open - Cylinder 3*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit, a short to ground or a short to the power supply circuit in the injector charge voltage circuit of common power supply 1, or that there is a short to ground in the injector solenoid coil control circuit of cylinder No. 1, 2, or 3 for 3 seconds or more.

3. Action taken when DTC P2146 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P2146

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2146 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in injector

No

Go to Intermittent conditions.

3. Inspection for open circuit and short circuit in injector

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 1, 3, and 5 injector harnesses (E71, E73, and E75) from the injectors.

4) Measure the resistance between each circuit of the ECM harness connector (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the common power supply 1-2 charge voltage circuit (pins 18 and 26 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

5) Measure the resistance between each circuit of the ECM harness connector (F40) with a DMM (Check for short circuit). Is the resistance equal to the specified value?

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 18 of F40)

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 18 of F40)

● Between the common power supply 1-1 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 18 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 26 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 26 of F40)

● Between the common power supply 1-2 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 26 of F40)

● Between the common power supply 1-1 charge voltage circuit (pin 18 of F40) and the frame ground

● Between the common power supply 1-2 charge voltage circuit (pin 26 of F40) and the frame ground

Refer to "*Engine Control*".

Value: ∞ Ω

6) Are all of the values normal?

Yes

⇒ Proceed to 4. Inspection for open circuit in injector circuit using fused jumper wire

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

4. Inspection for open circuit in injector circuit using fused jumper wire

1) Turn OFF the ignition switch.

2) Connect a fused jumper wire between each terminal of the cylinder No. 1, 2, and 3 injectors (E71, E72, and E73) and measure the resistance between each circuit on the ECM harness connector (F40) with a DMM. Is the resistance less than or equal to the specified value?

● Jumper: Between the cylinder No. 1 injector terminals (pins 1 and 2 of E71)

● Measure: Between the common power supply 1-1 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 18 of F40)

● Measure: Between the common power supply 1-2 charge voltage circuit and the cylinder No. 1 injector control circuit (pins 3 and 26 of F40)

Value: 0.5 Ω

● Jumper: Between the cylinder No. 2 injector terminals (pins 1 and 2 of E72)

● Measure: Between the common power supply 1-1 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 18 of F40)

● Measure: Between the common power supply 1-2 charge voltage circuit and the cylinder No. 2 injector control circuit (pins 1 and 26 of F40)

Value: 0.5 Ω

● Jumper: Between the cylinder No. 3 injector terminals (pins 1 and 2 of E73)

● Measure: Between the common power supply 1-1 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 18 of F40)

● Measure: Between the common power supply 1-2 charge voltage circuit and the cylinder No. 3 injector control circuit (pins 2 and 26 of F40)

Value: 0.5 Ω

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Inspection for short to power supply in injector circuit

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

5. Inspection for short to power supply in injector circuit

1) Measure the voltage between the charge voltage circuit of common power supply 1 (pins 18 and 26 of F40) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0V

Yes

⇒ Proceed to 6. Injector inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

6. Injector inspection

1) Disconnect the cylinder No. 1, 3, and 5 injector harnesses (E71, E73, and E75) from the injectors.

Refer to "*Engine Control*".

2) Measure the resistance of the injector terminal with a DMM (Injector internal resistance check). Is the resistance within the specified range?

Value: 0.3 to 1.3 Ω

3) Measure the resistance between the injector terminal and the injector body with a DMM (Injector insulation check). Is the resistance equal to the specified value?

Value: ∞ Ω

4) Are all of the values normal?

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2149 (Flash Code 159) Fuel Injector Group 2 Supply Voltage Circuit

1. DTC P2149 DTC information

1. DTC P2149 description

An injector is a device that performs fuel injection. The injectors are installed on the engine head, and the ECM controls the fuel injection quantity and timing by regulating the injector energization time. Also, 100 V or more for operating the injectors is created inside the ECM, and the boosted voltage of 100 V or more is applied to the injectors.

2. Condition for setting DTC P2149

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● DTC P0204, P0205, or P0206 is not set.

Refer to "*DTC P0204 (Flash Code 274) Injector Circuit Open - Cylinder 4*" in this section.

Refer to "*DTC P0205 (Flash Code 275) Injector Circuit Open - Cylinder 5*" in this section.

Refer to "*DTC P0206 (Flash Code 276) Injector Circuit Open - Cylinder 6*" in this section.

Condition for setting the DTC

● The ECM detects that there is an open circuit, a short to ground or a short to the power supply circuit in the injector charge voltage circuit of common power supply 2, or that there is a short to ground in the injector solenoid coil control circuit of cylinder No. 4, 5, or 6 for 3 seconds or more.

3. Action taken when DTC P2149 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P2149

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2149 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn ON the ignition switch.

3) Observe the DTC information with a scan tool. Is a DTC set?

Yes

⇒ Proceed to 3. Inspection for open circuit and short circuit in injector

No

Go to Intermittent conditions.

3. Inspection for open circuit and short circuit in injector

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Disconnect the cylinder No. 2, 4, and 6 injector harnesses (E72, E74 and E76) from the injectors.

4) Measure the resistance between each circuit of the ECM harness connector (F40) with a DMM (Check for open circuit in charge voltage circuit). Is the resistance less than or equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the common power supply 2-2 charge voltage circuit (pins 8 and 9 of F40)

Refer to "*Engine Control*".

Value: 0.5 Ω

5) Measure the resistance between each circuit of the ECM harness connector (F40) with a DMM (Check for short circuit). Is the resistance equal to the specified value?

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 8 of F40)

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 8 of F40)

● Between the common power supply 2-1 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 8 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 9 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 9 of F40)

● Between the common power supply 2-2 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 9 of F40)

● Between the common power supply 2-1 charge voltage circuit (pin 8 of F40) and the frame ground

● Between the common power supply 2-2 charge voltage circuit (pin 9 of F40) and the frame ground

Refer to "*Engine Control*".

6) Are all of the values normal?

Value: ∞ Ω

Yes

⇒ Proceed to 4. Inspection for open circuit in injector circuit using fused jumper wire

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

4. Inspection for open circuit in injector circuit using fused jumper wire

1) Turn OFF the ignition switch.

2) Connect a fused jumper wire between each terminal of the cylinder No. 4, 5, and 6 injectors (E74, E75, and E76) and measure the resistance between each circuit on the ECM harness connector (F40) with a DMM. Is the resistance less than or equal to the specified value?

● Jumper: Between the cylinder No. 4 injector terminals (pins 1 and 2 of E74)

● Measure: Between the common power supply 2-1 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 8 of F40)

● Measure: Between the common power supply 2-2 charge voltage circuit and the cylinder No. 4 injector control circuit (pins 6 and 9 of F40)

Value: 0.5Ω

● Jumper: Between the cylinder No. 5 injector terminals (pins 1 and 2 of E75)

● Measure: Between the common power supply 2-1 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 8 of F40)

● Measure: Between the common power supply 2-2 charge voltage circuit and the cylinder No. 5 injector control circuit (pins 4 and 9 of F40)

Value: 0.5Ω

● Jumper: Between the cylinder No. 6 injector terminals (pins 1 and 2 of E76)

● Measure: Between the common power supply 2-1 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 8 of F40)

● Measure: Between the common power supply 2-2 charge voltage circuit and the cylinder No. 6 injector control circuit (pins 5 and 9 of F40)

Value: 0.5Ω

Refer to "*Engine Control*".

Yes

⇒ Proceed to 5. Inspection for short to power supply in injector circuit

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

5. Inspection for short to power supply in injector circuit

1) Measure the voltage between the charge voltage circuit of common power supply 2 (pins 8 and 9 of F40) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0V

Yes

⇒ Proceed to 6. Injector inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

6. Injector inspection

1) Disconnect the cylinder No. 2, 4, and 6 injector harnesses (E72, E74 and E76) from the injectors.

Refer to "*Engine Control*".

2) Measure the resistance of the injector terminal with a DMM (Injector internal resistance check). Is the resistance within the specified range?

Value: 0.3 to 1.3 Ω

3) Measure the resistance between the injector terminal and the injector body with a DMM (Injector insulation check). Is the resistance equal to the specified value?

Value: ∞ Ω

4) Are all of the values normal?

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

Note:

● If an injector has been replaced, be sure to set the injector ID code on the ECM.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2227 (Flash Code 71) Barometric Pressure Sensor Circuit Range/Performance

1. DTC P2227 DTC information

1. DTC P2227 description

The barometric pressure sensor is installed within the instrument panel on the passenger side. The barometric pressure sensor changes voltage according to changes in air pressure. Diagnosis is performed inside the ECM by comparing the barometric pressure sensor input with the boost pressure sensor input. If the ECM detects that those inputs are not within each specified range, the DTC is set.

2. Condition for setting DTC P2227

Condition for running the DTC

● The battery voltage is 18 V or more.

● The engine speed is 400 to 500 rpm.

● The fuel injection quantity is less than or equal to the predetermined value.

● The accelerator pedal is not depressed.

● Vehicle speed is 0 km/h.

● DTCs P0102, P0103, P0116, P0117, P0118, P0500, P0502, P0503, P0560, P060B, P0651, P0697, P2227, P2228, and P2229 are not set.

Refer to "*DTC P0102 (Flash Code 91) Mass Air Flow Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0103 (Flash Code 91) Mass Air Flow Sensor Circuit High Input*" in this section.

Refer to "*DTC P0116 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Range/Performance*" in this section.

Refer to "*DTC P0117 (Flash Code 23) Engine Coolant Temperature Sensor Circuit Low*" in this section.

Refer to "*DTC P0118 (Flash Code 23) Engine Coolant Temperature Sensor Circuit High*" in this section.

Refer to "*DTC P0500 (Flash Code 25) Vehicle Speed Sensor*" in this section.

Refer to "*DTC P0502 (Flash Code 25) Vehicle Speed Sensor Circuit Low Input*" in this section.

Refer to "*DTC P0503 (Flash Code 25) Vehicle Speed Sensor Circuit High Input*" in this section.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the difference between the barometric pressure and the boost pressure is 19 kPa {2.8 psi} or more, or 12 kPa {1.7 psi} or less.

3. Action taken when DTC P2227 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P2227

● Condition for clearing the MIL/DTC - Refer to Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P2227 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0237, P0238, P2228, or P2229 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0237 (Flash Code 32) Turbocharger Boost Sensor Circuit Low*" in this section.

Refer to "*DTC P0238 (Flash Code 32) Turbocharger Boost Sensor Circuit High*" in this section.

Refer to "*DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High*" in this section.

No

⇒ Proceed to 3. Boost pressure and barometric pressure difference check

3. Boost pressure and barometric pressure difference check

1) Turn ON the ignition switch.

2) Compare the Boost Pressure parameter to the Barometric Pressure (BARO) parameter on the scan tool.

3) Check whether both parameters are within each specified range. Is the parameter within the specified range?

Yes

Go to Intermittent conditions.

No

⇒ Proceed to 4. Barometric pressure check

4. Barometric pressure check

1) Refer to the table and compare the Barometric Pressure (BARO) parameter on the scan tool with the surrounding barometric pressure.

2) Observe the Barometric Pressure (BARO) parameter on the scan tool. Is the Barometric Pressure (BARO) parameter within the specified range?

Altitude measured in meters (m)	Altitude measured in feet (ft)	Barometric pressure measured in kilopascals (kPa)
4267	14000	56-64
3962	13000	58-66
3658	12000	61-69
3353	11000	64-72
3048	10000	66-74
2743	9000	69-77
2438	8000	71-79
2134	7000	74-82
1829	6000	77-85
1524	5000	80-88
1219	4000	83-91
914	3000	87-95
610	2000	90-98
305	1000	94-102
0	0 (Sea level)	96-104
-305	-1000	101-105

Yes

⇒ Proceed to 6. Inspection for high resistance in boost pressure sensor circuit

No

⇒ Proceed to 7. Barometric pressure sensor circuit inspection

5. Individual harness connector inspection

1) Inspect for poor connections at the boost pressure sensor harness connector (pins 1, 2, and 3 of E101). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 50, 51, and 62 of F41). Is the connection status normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 6. Inspection for high resistance in boost pressure sensor circuit

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 9. Repair verification

6. Inspection for high resistance in boost pressure sensor circuit

1) Inspect for high resistance in the circuit between the ECM (pins 50, 51, and 62 of F41) and the boost pressure sensor (pins 1, 2, and 3 of E101). Is the result normal?

Refer to "*Engine Control*".

Yes

Replace the boost pressure sensor.

⇒ Proceed to 9. Repair verification

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

7. Barometric pressure sensor circuit inspection

1) Inspect for poor connections at the barometric pressure sensor harness connector (pins 1, 2, and 3 of FL52). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 106, 108, and 110 of F43). Is the connection status normal?

Refer to "*Engine Control*".

3) Are all of the results normal?

Yes

⇒ Proceed to 8. Inspection for high resistance in barometric pressure sensor circuit

No

Repair the circuit or the connection as necessary.

⇒ Proceed to 9. Repair verification

8. Inspection for high resistance in barometric pressure sensor circuit

1) Inspect for high resistance in the circuit between the ECM (pins 106, 108, and 110 of F43) and the barometric pressure sensor (pins 1, 2, and 3 of FL52). Is the result normal?

Refer to "*Engine Control*".

Yes

Replace the barometric pressure sensor.

⇒ Proceed to 9. Repair verification

No

Repair the circuit as necessary.

⇒ Proceed to 9. Repair verification

9. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2228 (Flash Code 71) Barometric Pressure Sensor Circuit Low

1. DTC P2228 DTC information

1. DTC P2228 description

The barometric pressure sensor is installed within the instrument panel on the passenger side. The barometric pressure sensor changes voltage according to changes in air pressure. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Barometric pressure sensor signal circuit

The barometric pressure sensor activates according to changes in air pressure, sending signals to the ECM. The ECM detects a low voltage when air pressure is low, such as in high altitude locations. The ECM detects a high voltage when the air pressure is high. The ECM uses this signal voltage to calibrate the fuel injection quantity and injection timing for altitude compensation. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P2228

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the barometric pressure sensor signal voltage is 0.5 V or less for approximately 5 seconds.

3. Action taken when DTC P2228 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default barometric pressure value.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P2228

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2228 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0651 set at the same time?

Yes

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

No

⇒ Proceed to 3. Barometric pressure sensor signal voltage check

3. Barometric pressure sensor signal voltage check

1) Observe the Barometric Pressure Sensor parameter on the scan tool. Is the Barometric Pressure Sensor parameter less than or equal to the specified value?

Value: 0.5V

Yes

⇒ Proceed to 4. Barometric pressure sensor 5 V reference voltage check

No

Go to Intermittent conditions.

4. Barometric pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the barometric pressure sensor harness connector (FL52).

3) Turn ON the ignition switch.

4) Measure the voltage between the barometric pressure sensor 5 V reference circuit (pin 3 of FL52) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.0 V

Yes

⇒ Proceed to 5. Barometric pressure sensor signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in barometric pressure sensor 5 V reference circuit

5. Barometric pressure sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the barometric pressure sensor 5 V reference circuit and the signal circuit (pins 2 and 3 of FL52).

Refer to "*Engine Control*".

2) Observe the Barometric Pressure Sensor parameter on the scan tool. Is the Barometric Pressure Sensor parameter more than or equal to the specified value?

Value: 4.0 V

Yes

⇒ Proceed to 8. Barometric pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in barometric pressure sensor signal circuit

6. Inspection for open circuit in barometric pressure sensor 5 V reference circuit

1) Inspect the 5 V reference circuit between the ECM (pin 106 of F43) and the barometric pressure sensor (pin 3 of FL52) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The barometric pressure sensor shares the 5 V reference circuit with other sensors. A malfunction in the 5 V reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in barometric pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 108 of F43) and the barometric pressure sensor (pin 2 of FL52) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Barometric pressure sensor harness connector inspection

1) Inspect for poor connections at the barometric pressure sensor harness connector (pins 2 and 3 of FL52). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the barometric pressure sensor.

⇒ Proceed to 11. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 106 and 108 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2229 (Flash Code 71) Barometric Pressure Sensor Circuit High

1. DTC P2229 DTC information

1. DTC P2229 description

The barometric pressure sensor is installed within the instrument panel on the passenger side. The barometric pressure sensor changes voltage according to changes in air pressure. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Barometric pressure sensor signal circuit

The barometric pressure sensor activates according to changes in air pressure, sending signals to the ECM. The ECM detects a low voltage when air pressure is low, such as in high altitude locations. The ECM detects a high voltage when the air pressure is high. The ECM uses this signal voltage to calibrate the fuel injection quantity and injection timing for altitude compensation. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P2229

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0651 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the barometric pressure sensor signal voltage is 4.0V or less for approximately 5 seconds.

3. Action taken when DTC P2229 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM assumes a default barometric pressure value.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

● The ECM inhibits the VGS control.

4. Condition for clearing DTC P2229

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2229 diagnosti

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Barometric pressure sensor signal voltage check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the Barometric Pressure Sensor parameter on the scan tool. Is the Barometric Pressure Sensor parameter more than or equal to the specified value?

Value: 4.0 V

Yes

⇒ Proceed to 3. Barometric pressure sensor 5 V reference voltage and signal voltage check

No

Go to Intermittent conditions.

3. Barometric pressure sensor 5 V reference voltage and signal voltage check

1) Observe the DTC information with a scan tool for DTC P0651 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the barometric pressure sensor harness connector (FL52).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the Barometric Pressure Sensor parameter on the scan tool.

Value: 0.5 V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in barometric pressure sensor signal circuit

The reading is less than or equal to the specified value and DTC P0651 is set.

Go to DTC P0651 diagnosis.

Refer to "*DTC P0651 (Flash Code 56) Sensor Reference Voltage 2 Circuit*" in this section.

The reading is less than or equal to the specified value and DTC P0651 is not set.

⇒ Proceed to 4. Barometric pressure sensor low reference circuit inspection using test lamp

4. Barometric pressure sensor low reference circuit inspection using test lamp

1) Connect a test lamp between the barometric pressure sensor low reference circuit (pin 1 of FL52) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. Barometric pressure sensor harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in barometric pressure sensor low reference circuit

5. Inspection for short to power supply in barometric pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 108 of F43) and the barometric pressure sensor (pin 2 of FL52) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● The barometric pressure sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in barometric pressure sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 110 of F43) and the barometric pressure sensor (pin 1 of FL52) for an open circuit or high resistance. Is the result normal?

Caution:

● The barometric pressure sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. Barometric pressure sensor harness connector inspection

1) Inspect for poor connections at the barometric pressure sensor harness connector (pin 1 of FL52). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the barometric pressure sensor.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 110 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2295 (Flash Code 248) Fuel Pressure Regulator 2 Control Circuit Low

1. DTC P2295 DTC information

1. DTC P2295 description

The PCV controls the amount of fuel force-fed to the fuel rail. The PCV closes the valve after the signal voltage is sent to the PCV installed to the supply pump, and then the fuel is force-fed from the supply pump to the fuel rail. The ECM activates the PCV by controlling the valve opening timing. The earlier the valve opening time of the PCV is, the larger the amount of fuel force-fed to the fuel rail is, and the fuel rail pressure rises.

Two PCVs are installed to the supply pump and only a normal PCV can be activated even if one side fails. Because the PCV corresponds to each fuel injection cylinder, the DTC is not set but the engine is stopped if the harness is connected reversely.

2. Condition for setting DTC P2295

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● CKP sensor signal pulses are detected.

● CMP sensor signal pulses are detected.

Condition for setting the DTC

● The ECM detects that the PCV 2 signal circuit voltage is excessively low for approximately 4 seconds or more when PCV 2 is OFF.

3. Action taken when DTC P2295 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P2295

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2295 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Check whether DTC P2295 is a current failure with a scan tool. Is DTC P2295 a current failure?

Yes

⇒ Proceed to 3. Inspection of each harness connector and PCV2 installation

No

Go to Intermittent conditions.

3. Inspection of each harness connector and PCV2 installation

1) Inspect for poor connections at the PCV2 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

2) Inspect the installation status of the PCV2 body. Is the result normal?

3) Are all of the results normal?

Yes

⇒ Proceed to 4. PCV2 inspection

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

4. PCV2 inspection

1) Turn OFF the ignition switch.

2) Disconnect the PCV2 harness connector (E44).

3) Measure the resistance of the PCV2 connector (pins 1 and 2 of E44) with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: about 3.2 Ω At room temperature

Yes

⇒ Proceed to 5. PCV2 power supply voltage check

No

Replace the fuel supply pump.

⇒ Proceed to 10. Repair verification

5. PCV2 power supply voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the PCV2 power supply circuit (pin 1 of E44) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: 20 V

Yes

⇒ Proceed to 7. Inspection for open circuit and short circuit in PCV2 control circuit

No

⇒ Proceed to 6. Fuse inspection

6. Fuse inspection

1) Inspect for a blown out ECM MAIN 15 A fuse. Is the result normal?

Yes

Repair or replace the power supply circuit between the ECM MAIN 15A fuse and PCV 2 (pin 1 of E44).

⇒ Proceed to 10. Repair verification

No

Replace the fuse. Also, inspect for a short circuit which could cause a fuse blowout in the circuits related to the fuse, and repair or replace the harness as necessary.

⇒ Proceed to 10. Repair verification

7. Inspection for open circuit and short circuit in PCV2 control circuit

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F40).

3) Connect a fused jumper wire between the PCV control circuit (pin 2 of E44) and the frame ground.

4) Measure the resistance between the PCV2 control circuit (pins 30 and 31 of F40) and frame ground with a DMM (Check for open circuit in PCV2 control circuit). Is the resistance less than or equal to the specified value?

Refer to "*Engine Control*".

Value: 0 Ω

5) Disconnect the fused jumper wire from between the PCV control circuit (pin 2 of E44) and frame ground.

6) Measure the resistance between the PCV2 control circuit (pins 30 and 31 of F40) and frame ground with a DMM (Check for short circuit in PCV2 control circuit). Is the resistance more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 10 MΩ

7) Are all of the values normal?

Yes

⇒ Proceed to 8. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

8. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 9. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2296 (Flash Code 218) Fuel Pressure Regulator 2 Control Circuit High

1. DTC P2296 DTC information

1. DTC P2296 description

The PCV controls the amount of fuel force-fed to the fuel rail. The PCV closes the valve after the signal voltage is sent to the PCV installed to the supply pump, and then the fuel is force-fed from the supply pump to the fuel rail. The ECM activates the PCV by controlling the valve opening timing. The earlier the valve opening time of the PCV is, the larger the amount of fuel force-fed to the fuel rail is, and the fuel rail pressure rises.

Two PCVs are installed to the supply pump and only a normal PCV can be activated even if one side fails. Because the PCV corresponds to each fuel injection cylinder, the DTC is not set but the engine is stopped if the harness is connected reversely.

2. Condition for setting DTC P2296

Condition for running the DTC

● The battery voltage is 18V or more.

● The engine is running.

● CKP sensor signal pulses are detected.

● CMP sensor signal pulses are detected.

● DTC P2295 is not set.

Refer to "*DTC P2295 (Flash Code 248) Fuel Pressure Regulator 2 Control Circuit Low*" in this section.

Condition for setting the DTC

● The ECM detects that the PCV 2 signal circuit voltage is excessively high for approximately 4 seconds or more when PCV 2 is ON.

3. Action taken when DTC P2296 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

● The ECM limits the fuel injection quantity.

● The ECM inhibits the EGR control.

4. Condition for clearing DTC P2296

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC P2296 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Check whether DTC P2296 is a current failure with a scan tool. Is DTC P2296 a current failure?

Yes

⇒ Proceed to 3. Inspection of each harness connector and PCV2 installation

No

Go to Intermittent conditions.

3. Inspection of each harness connector and PCV2 installation

1) Inspect for poor connections at the PCV2 harness connector, the ECM harness connector, and the intermediate connector. Is the connection status normal?

2) Inspect the installation status of the PCV2 body. Is the result normal?

3) Are all of the results normal?

Yes

⇒ Proceed to 4. PCV2 inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

4. PCV2 inspection

1) Turn OFF the ignition switch.

2) Disconnect the PCV2 harness connector (E44).

3) Measure the resistance of PCV 2 with a DMM. Is the resistance equal to the specified value?

Refer to "*Engine Control*".

Value: about 3.2 Ω At room temperature

Yes

⇒ Proceed to 5. PCV 2 control circuit voltage check

No

Replace the fuel supply pump.

⇒ Proceed to 8. Repair verification

5. PCV 2 control circuit voltage check

1) Turn ON the ignition switch.

2) Measure the voltage between the PCV 2 control circuit (pin 2 of E44) and the frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0 V

Yes

⇒ Proceed to 6. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

6. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 7. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 8. Repair verification

7. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 8. Repair verification

8. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P244A (Flash Code 142) Diesel Oxidation Catalyst (DOC) Exhaust Pressure Too Low

1. DTC P244A DTC information

1. DTC P244A description

The exhaust differential pressure sensor is installed to the chassis frame located near the exhaust silencer. The exhaust differential pressure sensor changes signal voltage in accordance with changes in the exhaust gas pressure in front of and behind the exhaust silencer. If the exhaust differential pressure is detected to be too low under predetermined conditions, this DTC is set.

2. Condition for setting DTC P244A

Condition for running the DTC

● The battery voltage is 18V or more.

● The fuel injection quantity is more than or equal to the predetermined value.

● DTCs P0102, P0103, P0112, P0113, P0560, P060B, P0651, P0697, P2454, and P2455 are not set.

Refer to "*DTC P0560 (Flash Code 155) System Voltage*" in this section.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P2454 (Flash Code 47) Exhaust Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2455 (Flash Code 47) Exhaust Pressure Sensor Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the exhaust differential pressure is less than the predetermined value for 30 seconds or more.

3. Action taken when DTC P244A sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type B.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P244A

● Refer to Condition for clearing the MIL/DTC - Type A or Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P244A diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Exhaust differential pressure sensor functional inspection

1) Inspect the exhaust differential pressure sensor for the following conditions.

● Incorrect piping or disconnection of the exhaust differential pressure hose or pipe.

● Clogging, collapsing, or twisting of the exhaust differential pressure hose or pipe

● Incorrect installation of the exhaust differential pressure sensor

● Damage to the exhaust differential pressure sensor

● Contamination or foreign material blocking the exhaust differential pressure sensor port.

● Misdetection or delayed response of the exhaust differential pressure sensor

Note:

● Installation direction of the exhaust differential pressure sensor hose is specified.

2) Repair or replace as necessary.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

Procedure completion

⇒ Proceed to 3. Exhaust system inspection

3. Exhaust system inspection

1) Inspect the air intake/exhaust system for the following conditions. Is the result normal?

● Missing or damaged exhaust pipe gasket

● Exhaust gas leakage from the exhaust pipe, gasket, exhaust silencer, or the exhaust differential pressure sensor hose or pipe.

● Exhaust system modification

● Stuck exhaust brake valve

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake valve inspection*".

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake solenoid valve inspection*".

Yes

⇒ Proceed to 4. Exhaust silencer inspection

No

Repair or replace as necessary.

⇒ Proceed to 6. Repair verification

4. Exhaust silencer inspection

1) Remove the exhaust silencer.

2) Inspect the exhaust silencer for damage, cracking, or burnouts. Is the result normal?

Yes

⇒ Proceed to 5. Exhaust differential pressure sensor circuit inspection

No

Replace the exhaust silencer as necessary.

⇒ Proceed to 6. Repair verification

5. Exhaust differential pressure sensor circuit inspection

1) Inspect for poor connections at the exhaust differential pressure sensor harness connector (pins 1, 2, and 3 of J93). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 2, 20, 22, and 23 of FL558). Is the connection status normal?

3) Inspect for high resistance in the circuit between the ECM (pins 2, 20, 22, and 23 of FL558) and the exhaust differential pressure sensor (pins 1, 2, and 3 of J93). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the exhaust differential pressure sensor.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

⇒ Proceed to 6. Repair verification

No

Repair the circuit or connection as necessary.

⇒ Proceed to 6. Repair verification

6. Repair verification

1) Reconnect all of the disconnected harness connectors.

2) Turn ON the ignition switch for 30 seconds.

Note:

● This is to have the exhaust differential pressure sensor relearn.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Start the engine.

6) Operate the vehicle under the conditions for running the DTC.

7) Observe the DTC information with a scan tool.

DTC P244B (Flash Code 141) Diesel Oxidation Catalyst (DOC) Exhaust Pressure Too High

1. DTC P244B DTC information

1. DTC P244B description

The exhaust differential pressure sensor is installed to the chassis frame located near the exhaust silencer. The exhaust differential pressure sensor changes signal voltage in accordance with changes in the exhaust gas pressure in front of and behind the exhaust silencer. If the ECM detects that the exhaust differential pressure is excessively high, this DTC is set.

2. Condition for setting DTC P244B

● Condition for running the DTC

● The battery voltage is 18V or more.

● The engine speed is 2000 rpm or more.

● DTCs P060B, P0697, P2454, and P2455 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Refer to "*DTC P2454 (Flash Code 47) Exhaust Pressure Sensor Circuit Low*" in this section.

Refer to "*DTC P2455 (Flash Code 47) Exhaust Pressure Sensor Circuit High*" in this section.

Condition for setting the DTC

● The ECM detects that the exhaust differential pressure is 60 kPa {8.7 psi} or more.

3. Action taken when DTC P244B sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P244B

● Refer to Condition for clearing the MIL/DTC - Type A or Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P244B diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Exhaust differential pressure sensor functional inspection

1) Inspect the exhaust differential pressure sensor for the following conditions.

● Incorrect piping or disconnection of the exhaust differential pressure hose or pipe.

● Clogging, collapsing, or twisting of the exhaust differential pressure hose or pipe

● Incorrect installation of the exhaust differential pressure sensor

● Damage to the exhaust differential pressure sensor

● Contamination or foreign material blocking the exhaust differential pressure sensor port.

● Misdetection or delayed response of the exhaust differential pressure sensor

Note:

● Installation direction of the exhaust differential pressure sensor hose is specified.

2) Repair or replace as necessary.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

Procedure completion

⇒ Proceed to 3. Exhaust system inspection

3. Exhaust system inspection

1) Inspect the air intake/exhaust system for the following conditions. Is the result normal?

● Missing or damaged exhaust pipe gasket

● Exhaust gas leakage from the exhaust pipe, gasket, exhaust silencer, or the exhaust differential pressure sensor hose or pipe.

● Exhaust system modification

● Stuck exhaust throttle valve or exhaust brake valve

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake valve inspection*".

Refer to "*4.Brakes 4E.Speed Retarder System Exhaust brake solenoid valve inspection*".

Yes

⇒ Proceed to 4. Exhaust differential pressure sensor circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 5. Repair verification

4. Exhaust differential pressure sensor circuit inspection

1) Inspect for poor connections at the exhaust differential pressure sensor harness connector (pins 1, 2, and 3 of J93). Is the connection status normal?

2) Inspect for poor connections at the ECM harness connector (pins 2, 20, 22, and 23 of FL558). Is the connection status normal?

3) Inspect for high resistance in the circuit between the ECM (pins 2, 20, 22, and 23 of FL558) and the exhaust differential pressure sensor (pins 1, 2, and 3 of J93). Is the result normal?

Refer to "*Engine Control*".

4) Are all of the results normal?

Yes

Replace the exhaust differential pressure sensor.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

⇒ Proceed to 5. Repair verification

No

Repair the circuit or connection as necessary.

⇒ Proceed to 5. Repair verification

5. Repair verification

1) Reconnect all of the disconnected harness connectors.

2) Turn ON the ignition switch for 30 seconds.

Note:

● This is to have the exhaust differential pressure sensor relearn.

3) Clear the DTC with a scan tool.

4) Turn OFF the ignition switch for at least 30 seconds.

5) Start the engine.

6) Operate the vehicle under the conditions for running the DTC.

7) Observe the DTC information with a scan tool.

DTC P2454 (Flash Code 47) Exhaust Pressure Sensor Circuit Low

1. DTC P2454 DTC information

1. DTC P2454 description

The exhaust differential pressure sensor is installed to the chassis frame located near the exhaust silencer. The exhaust differential pressure sensor changes signal voltage in accordance with changes in the exhaust gas pressure in front of and behind the exhaust silencer. The sensor has the following circuits.

● 5V reference circuit

● Low reference circuit

● Exhaust differential pressure sensor signal circuit

The exhaust differential pressure sensor sends signals related to exhaust differential pressure changes to the ECM via the signal circuit. The ECM detects a low signal voltage when the differential pressure is low. The ECM detects a high signal voltage when the differential pressure is high. If the ECM detects an excessively low signal voltage, the DTC is set.

2. Condition for setting DTC P2454

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the exhaust differential pressure sensor signal voltage is 0.2 V or less.

3. Action taken when DTC P2454 sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P2454

● Refer to Condition for clearing the MIL/DTC - Type A or Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P2454 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 3. Current DTC check

3. Current DTC check

1) Observe the DTC information with a scan tool. Is DTC P2454 set?

Yes

⇒ Proceed to 4. Exhaust differential pressure sensor 5 V reference voltage check

No

Go to Intermittent conditions of engine.

4. Exhaust differential pressure sensor 5 V reference voltage check

1) Turn OFF the ignition switch.

2) Disconnect the exhaust differential pressure sensor harness connector (J93).

3) Turn ON the ignition switch.

4) Measure the voltage between the exhaust differential pressure sensor 5 V reference circuit (pin 3 of J93) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 4.5 V

Yes

⇒ Proceed to 5. Exhaust differential pressure sensor signal output voltage check using fused jumper wire

No

⇒ Proceed to 6. Inspection for open circuit in exhaust differential pressure sensor 5 V reference circuit

5. Exhaust differential pressure sensor signal output voltage check using fused jumper wire

1) Connect a fused jumper wire between the exhaust differential pressure sensor 5 V reference circuit and the signal circuit (pins 2 and 3 of J93).

Refer to "*Engine Control*".

2) Observe the Exhaust differential pressure sensor parameter on the scan tool. Is the Exhaust differential pressure sensor parameter more than or equal to the specified value?

Value: 4.5 V

Yes

⇒ Proceed to 8. Exhaust differential pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit and short circuit in exhaust differential pressure sensor signal circuit

6. Inspection for open circuit in exhaust differential pressure sensor 5 V reference circuit

1) Inspect the 5 V reference circuit between the ECM (pin 20 of FL558) and the exhaust differential pressure sensor (pin 3 of J93) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit and short circuit in exhaust differential pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 2 of FL558) and the exhaust differential pressure sensor (pin 2 of J93) for the following conditions. Is the result normal?

● Open circuit

● Short to ground

● Short to the low reference circuit

● High resistance

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Exhaust differential pressure sensor harness connector inspection

1) Inspect for poor connections at the exhaust differential pressure sensor harness connector (pins 2 and 3 of J93). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the exhaust differential pressure sensor.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

⇒ Proceed to 11. Repair verification

No

Repair the connections as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pins 2 and 20 of FL558). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connections as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P2455 (Flash Code 47) Exhaust Pressure Sensor Circuit High

1. DTC P2455 DTC information

1. DTC P2455 description

The exhaust differential pressure sensor is installed to the chassis frame located near the exhaust silencer. The exhaust differential pressure sensor changes signal voltage in accordance with changes in the exhaust gas pressure in front of and behind the exhaust silencer. The sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● Exhaust differential pressure sensor signal circuit

The exhaust differential pressure sensor sends signals related to exhaust differential pressure changes to the ECM via the signal circuit. The ECM detects a low signal voltage when the differential pressure is low. The ECM detects a high signal voltage when the differential pressure is high. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P2455

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0697 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the exhaust differential pressure sensor signal voltage is 4.9 V or more.

3. Action taken when DTC P2455 sets

● The ECM illuminates the MIL. Refer to Action taken when DTC sets - Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P2455

● Refer to Condition for clearing the MIL/DTC - Type A or Type B.

Refer to "*DTC type definitions*" in this section.

2. DTC P2455 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Current DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P2455 set?

Yes

⇒ Proceed to 3. Prioritized DTC check

No

Go to Intermittent conditions of engine.

3. Prioritized DTC check

1) Observe the DTC information with a scan tool. Is DTC P0697 set at the same time?

Yes

Go to DTC P0697 diagnosis.

Refer to "*DTC P0697 (Flash Code 57) Sensor Reference Voltage 3 Circuit*" in this section.

No

⇒ Proceed to 4. Exhaust differential pressure sensor signal voltage check

4. Exhaust differential pressure sensor signal voltage check

1) Turn OFF the ignition switch.

2) Disconnect the exhaust differential pressure sensor harness connector (J93).

3) Turn ON the ignition switch.

4) Measure the voltage between the exhaust differential pressure sensor signal circuit (pin 2 of J93) and the frame ground with a DMM. Is the voltage more than or equal to the specified value?

Refer to "*Engine Control*".

Value: 0.1 V

Yes

⇒ Proceed to 6. Inspection for short to power supply in exhaust differential pressure sensor signal circuit

No

⇒ Proceed to 5. Exhaust differential pressure sensor low reference circuit inspection using test lamp

5. Exhaust differential pressure sensor low reference circuit inspection using test lamp

1) Connect a test lamp between the exhaust differential pressure sensor low reference circuit (pin 1 of J93) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 8. Exhaust differential pressure sensor harness connector inspection

No

⇒ Proceed to 7. Inspection for open circuit in exhaust differential pressure sensor low reference circuit

6. Inspection for short to power supply in exhaust differential pressure sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 2 of FL558) and the exhaust differential pressure sensor (pin 2 of J93) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● The exhaust differential pressure sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

7. Inspection for open circuit in exhaust differential pressure sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 23 of FL558) and the exhaust differential pressure sensor (pin 1 of J93) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The exhaust differential pressure sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 9. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 11. Repair verification

8. Exhaust differential pressure sensor harness connector inspection

1) Inspect for poor connections at the exhaust differential pressure sensor harness connector (pin 1 of J93). Is the result normal?

Refer to "*Engine Control*".

Yes

Replace the exhaust differential pressure sensor.

Note:

● If the exhaust differential pressure sensor is replaced, learning must be performed.

⇒ Proceed to 11. Repair verification

No

Repair the connections as necessary.

⇒ Proceed to 11. Repair verification

9. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 23 of FL558). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 10. ECM replacement

No

Repair the connections as necessary.

⇒ Proceed to 11. Repair verification

10. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 11. Repair verification

11. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC P253A (Flash Code 28) PTO Sensor Circuit

1. DTC P253A DTC information

1. DTC P253A description

The PTO throttle sensor detects the PTO throttle opening degree. The ECM receives the PTO throttle opening degree from the PTO throttle sensor and controls the fuel injection quantity (engine speed) during PTO usage. The PTO throttle sensor has the following circuits.

● 5 V reference circuit

● Low reference circuit

● PTO throttle sensor signal circuit

The PTO throttle sensor transmits signals related to PTO throttle position changes to the ECM by way of a signal circuit. If the ECM detects an excessively high signal voltage, the DTC is set.

2. Condition for setting DTC P253A

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

● DTCs P060B and P0641 are not set.

Refer to "*DTC P060B (Flash Code 36) Internal Control Module A/D Processing Performance*" in this section.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

Condition for setting the DTC

● The ECM detects that the PTO throttle sensor signal voltage is 4.8 V or more.

3. Action taken when DTC P253A sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

● The ECM disables the PTO throttle sensor control.

4. Condition for clearing DTC P253A

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P253A diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. PTO throttle sensor signal voltage check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

Caution：

● If a PTO throttle sensor is not equipped, go to PTO throttle sensor 5 V reference voltage and signal voltage check.

4) Observe the PTO Remote Throttle Sensor parameter on the scan tool while operating the PTO throttle. Does the PTO Remote Throttle Sensor parameter show the specified value or more?

Value: 4.8 V

Yes

⇒ Proceed to 3. PTO throttle sensor 5 V reference voltage and signal voltage check

No

Go to Intermittent conditions.

3. PTO throttle sensor 5 V reference voltage and signal voltage check

1) Observe the DTC information with a scan tool for DTC P0641 being set at the same time.

2) Turn OFF the ignition switch.

3) Disconnect the PTO throttle sensor harness connector (FB176).

Refer to "*Engine Control*".

4) Turn ON the ignition switch.

5) Observe the PTO Remote Throttle Sensor parameter on the scan tool.

Value: 0.1 V

The reading is more than the specified value.

⇒ Proceed to 5. Inspection for short to power supply in PTO throttle sensor signal circuit

The reading is less than or equal to the specified value and DTC P0641 is set.

Go to DTC P1655 diagnosis.

Refer to "*DTC P0641 (Flash Code 55) Sensor Reference Voltage 1 Circuit*" in this section.

The reading is less than or equal to the specified value and DTC P0641 is not set.

⇒ Proceed to 4. PTO throttle sensor low reference circuit inspection using test lamp

4. PTO throttle sensor low reference circuit inspection using test lamp

1) Connect a test lamp between the PTO throttle sensor low reference circuit (pin 3 of FB176) and the battery power supply. Does the test lamp illuminate?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 7. PTO throttle sensor harness connector inspection

No

⇒ Proceed to 6. Inspection for open circuit in PTO throttle sensor low reference circuit

5. Inspection for short to power supply in PTO throttle sensor signal circuit

1) Inspect the signal circuit between the ECM (pin 128 of F43) and the PTO throttle sensor (pin 1 of FB176) for the following conditions. Is the result normal?

● Short to the power supply circuit

● Short to the 5 V reference circuit

Note:

● The PTO throttle sensor may be damaged if the sensor signal circuit is shorted to the power supply.

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

6. Inspection for open circuit in PTO throttle sensor low reference circuit

1) Inspect the low reference circuit between the ECM (pin 76 of F42) and the PTO throttle sensor (pin 3 of FB176) for an open circuit or high resistance. Is the result normal?

Refer to "*Engine Control*".

Caution：

● The PTO throttle sensor shares the low reference circuit with other sensors. A malfunction in the low reference circuit may set DTCs on sensors that share this circuit.

Yes

⇒ Proceed to 8. ECM harness connector inspection

No

Repair the circuit as necessary.

⇒ Proceed to 10. Repair verification

7. PTO throttle sensor harness connector inspection

1) Inspect for poor connections at the PTO throttle sensor harness connector (pin 3 of FB176). Is the connection status normal?

Refer to "*Engine Control*".

Yes

Replace the PTO throttle sensor.

⇒ Proceed to 10. Repair verification

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

8. ECM harness connector inspection

1) Inspect for poor connections at the ECM harness connector (pin 128 of F43). Is the connection status normal?

Refer to "*Engine Control*".

Yes

⇒ Proceed to 9. ECM replacement

No

Repair the connection as necessary.

⇒ Proceed to 10. Repair verification

9. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 10. Repair verification

10. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the PTO Remote Throttle Sensor parameter on the scan tool while operating the PTO throttle. Does the PTO Remote Throttle Sensor parameter show the specified value or more?

Value: 4.8 V

5) Observe the DTC information with a scan tool.

Yes

⇒ Proceed to 2. PTO throttle sensor signal voltage check

No

Observe the DTC information with a scan tool.

DTC P256A (Flash Code 31) Engine Idle Speed Selector Sensor

1. DTC P256A DTC information

1. DTC P256A description

The idling control switch is a switch to adjust the idle speed during warm-up. If the Up or Down buttons on the idling control switch are pressed, the signal is input to the ECM. The ECM sets the DTC if the signal input on both the Up side and the Down side of the idling control switch are ON at the same time.

2. Condition for setting DTC P256A

Condition for running the DTC

● The battery voltage is 18V or more.

● The ignition switch is ON.

Condition for setting the DTC

● The ECM detects that the signal input on both the Up side and Down side of the idling control switch is ON at the same time.

3. Action taken when DTC P256A sets

● The ECM illuminates the SVS lamp. Refer to Action taken when DTC sets - Type C.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC P256A

● Refer to Condition for clearing the SVS lamp/DTC - Type C.

Refer to "*DTC type definitions*" in this section.

2. DTC P256A diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Idling control switch check

1) Turn OFF the ignition switch.

2) Disconnect the idling control switch harness connector (FU211).

Refer to "*Engine Control*".

3) Turn ON the ignition switch.

4) Observe the Idle Up Switch parameter and the Idle Down Switch parameter on the scan tool. Do the Idle Up Switch parameter and the Idle Down Switch parameter show OFF?

Yes

Replace the idling control switch.

⇒ Proceed to 7. Repair verification

No

⇒ Proceed to 3. Idle-up signal voltage check

3. Idle-up signal voltage check

1) Measure the voltage between the idle-up signal circuit (pin 3 of FU211) and frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0V

Yes

⇒ Proceed to 4. Idle-down signal voltage check

No

Repair or replace as necessary.

⇒ Proceed to 7. Repair verification

4. Idle-down signal voltage check

1) Measure the voltage between the idle-down signal circuit (pin 1 of FU211) and frame ground with a DMM. Is the voltage equal to the specified value?

Refer to "*Engine Control*".

Value: about 0V

Yes

⇒ Proceed to 5. ECM power supply and ground circuit inspection

No

Repair or replace as necessary.

⇒ Proceed to 7. Repair verification

5. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 6. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 7. Repair verification

6. ECM replacement

Note:

● Perform programming after replacing the ECM.

Procedure completion

⇒ Proceed to 7. Repair verification

7. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.

DTC U0073 (Flash Code 84) Control Module Communication Bus Off

1. DTC U0073 DTC information

1. DTC U0073 description

The ECM communicates with the IP cluster and DRM via the J1939 CAN communication circuit. If the ECM detects any malfunction in the J1939 CAN communication circuit, the DTC is set.

2. Condition for setting DTC U0073

Condition for running the DTC

● The battery voltage is 18V or more.

Condition for setting the DTC

● The ECM detects a malfunction in the J1939 CAN communication circuit.

3. Action taken when DTC U0073 sets

● The ECM illuminates the MIL. Action taken when DTC sets - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

4. Condition for clearing DTC U0073

● Condition for clearing the MIL/DTC - Refer to Type A.

Refer to "*DTC type definitions*" in this section.

2. DTC U0073 diagnostics

1. Engine control system check

Refer to "*Diagnostic system check-engine controls*" in this section.

2. Prioritized DTC check

1) Connect the scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Observe the DTC information with a scan tool. Is DTC P0601, P0606, or P1621 set at the same time?

Yes

Go to the applicable DTC diagnosis.

Refer to "*DTC P0601 (Flash Code 53) Internal Control Module Memory Check Sum Error*" in this section.

Refer to "*DTC P0606 (Flash Code 51) ECM Processor*" in this section.

Refer to "*DTC P1621 (Flash Code 54) Control Module Long Term Memory Performance*" in this section.

No

⇒ Proceed to 3. Current DTC check

3. Current DTC check

1) Observe the DTC information with a scan tool. Is DTC U0073 set?

Yes

⇒ Proceed to 4. Individual harness connector inspection

No

Go to Intermittent conditions.

4. Individual harness connector inspection

1) Inspect for poor connections at all harness connectors and intermediate connectors related to the J1939 CAN communication circuit. Is the connection status normal?

Refer to "*CAN communication*".

Yes

⇒ Proceed to 5. DRM inspection

No

Repair the connection as necessary.

⇒ Proceed to 15. Repair verification

5. DRM inspection

1) Turn OFF the ignition switch.

2) Disconnect the DRM harness connector (FL101).

3) Turn ON the ignition switch.

4) Observe the DTC information with a scan tool. Is DTC U0073 set?

Yes

⇒ Proceed to 6. CAN communication circuit resistance check

No

Replace the DRM.

Refer to "*9.Body, Cab, Accessories 9Z.Body, Cab, Accessories Electrical Control DRM removal*".

Refer to "*9.Body, Cab, Accessories 9Z.Body, Cab, Accessories Electrical Control DRM installation*".

⇒ Proceed to 15. Repair verification

6. CAN communication circuit resistance check

1) Turn OFF the ignition switch.

2) Disconnect the ECM harness connector (F44).

3) Measure the resistance between the CAN High circuit and the CAN Low circuit of the ECM harness connector (pins 28 and 30 of F44) with a DMM. Is the resistance equal to the specified value?

Refer to "*CAN communication*".

Value: 50 to 70 Ω

Yes

⇒ Proceed to 9. Inspection for short circuit in CAN High circuit

No

⇒ Proceed to 7. CAN resistor inspection

7. CAN resistor inspection

1) Remove the CAN resistor.

2) Measure the resistance of the CAN resistor with a DMM. Is the resistance equal to the specified value?

Value: 110 to 130 Ω

Yes

⇒ Proceed to 8. IP cluster inspection

No

Replace the CAN resistor.

⇒ Proceed to 15. Repair verification

8. IP cluster inspection

1) Remove the IP cluster.

2) Measure the CAN resistance (pins 13 and 14) of the IP cluster with a DMM. Is the resistance equal to the specified value?

Value: 110 to 130 Ω

Yes

⇒ Proceed to 11. Inspection for open circuit in CAN High circuit

No

Replace the IP cluster.

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster removal*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster installation*".

Refer to "*9.Body, Cab, Accessories 9E.Instrumentation, Driver Info. Instrument panel cluster setting*".

⇒ Proceed to 15. Repair verification

9. Inspection for short circuit in CAN High circuit

1) Measure the resistance between the CAN High circuit of the ECM harness connector (pin 28 of F44) and the frame ground with a DMM. Is the resistance more than or equal to the specified value?

Refer to "*CAN communication*".

Value: 10 MΩ

Yes

⇒ Proceed to 10. Inspection for short circuit in CAN Low circuit

No

Repair the short to ground in the CAN High circuit.

⇒ Proceed to 15. Repair verification

10. Inspection for short circuit in CAN Low circuit

1) Measure the resistance between the CAN Low circuit of the ECM harness connector (pin 30 of F44) and the frame ground with a DMM. Is the resistance more than or equal to the specified value?

Refer to "*CAN communication*".

Value: 10 MΩ

Yes

⇒ Proceed to 13. ECM power supply and ground circuit inspection

No

Repair the short to ground in the CAN Low circuit.

⇒ Proceed to 15. Repair verification

11. Inspection for open circuit in CAN High circuit

1) Measure the resistance of the CAN High circuit between the IP cluster (pin 13 of FU97) and the ECM (pin 28 of F44) with a DMM. Is the resistance equal to the specified value?

Refer to "*CAN communication*".

Value: 0 Ω

Yes

⇒ Proceed to 12. Inspection for open circuit in CAN Low circuit

No

Repair the open circuit in the CAN High circuit.

⇒ Proceed to 15. Repair verification

12. Inspection for open circuit in CAN Low circuit

1) Measure the resistance of the CAN Low circuit between the IP cluster (pin 14 of FU97) and the ECM (pin 30 of F44) with a DMM. Is the resistance equal to the specified value?

Refer to "*CAN communication*".

Value: 0 Ω

Yes

⇒ Proceed to 13. ECM power supply and ground circuit inspection

No

Repair the open circuit in the CAN Low circuit.

⇒ Proceed to 15. Repair verification

13. ECM power supply and ground circuit inspection

1) Inspect the ECM power supply or the ground circuit. Is the result normal?

Refer to "*ECM power supply and ground circuit check*" in this section.

Yes

⇒ Proceed to 14. ECM replacement

No

Repair or replace as necessary.

⇒ Proceed to 15. Repair verification

14. ECM replacement

Note:

● The replaced ECM requires programming and learning.

Procedure completion

⇒ Proceed to 15. Repair verification

15. Repair verification

1) Clear the DTC with a scan tool.

2) Turn OFF the ignition switch for at least 30 seconds.

3) Start the engine.

4) Operate the vehicle under the conditions for running the DTC.

5) Observe the DTC information with a scan tool.