

Chapter 7

ELECTRICAL SYSTEM

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9. INSTALLATION OF THE BATTERY DISCONNECT SWITCH
10. INSTALLATION OF FLASHER CUTTING
11. TRAILER ELECTRICAL CONNECTION

1. LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

Requirements of CMVSS 108

The following devices are provided, located and/or wired by Hino Motors, Ltd.

Requirements of CMVSS 108.

- Head lamps
- Daytime Running lamps
- Front side reflex reflectors
- Front side marker lamps
- Front turn signal lamps
- Front cab roof clearance & I.D. lamps
- Rear reflex reflectors (Temporary loc.)
- Tail lamps (Temporary loc.)
- Stop lamps (Temporary loc.)
- License plate lamps (Temporary loc.)
- Back up lamps (Temporary loc.)
- Rear turn signal lamps (Temporary loc.)

The following additional devices must be installed on the body and meet all the requirements of CMVSS 108.

- Rear side marker lamps
- Rear side reflex reflectors
- Rear clearance lamps
- Rear identification lamps

The following additional devices must be installed on the body and meet all the requirements of CMVSS 108 if the overall vehicle length is 30 feet or greater.

- Intermediate side marker lamps
- Intermediate side reflex reflector

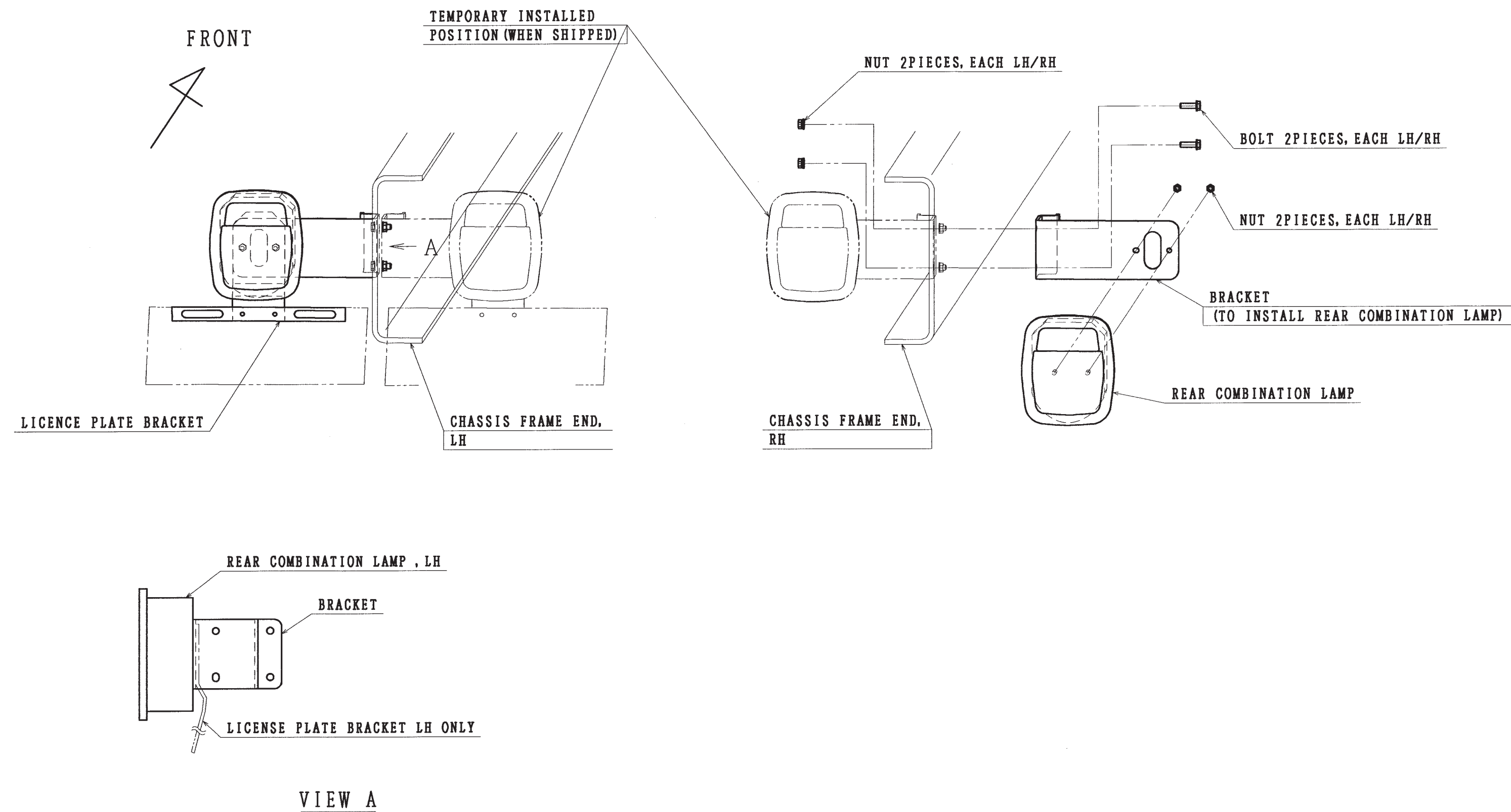
Installation of Rear Lamps

Rear combination lamps such as tail lamps, stop lamps, turn signal lamps, rear reflex reflectors, back up lamps and license plate lamps are temporary installed on the end of chassis frame at factory, they should be relocated by subsequent manufacturer to conform to CMVSS 108.

Notes for relocation of rear combination lamps:

- Tail lamps, stop lamps and turn signal lamps, back up lamps and license plate lamps are designed in one body as rear combination lamps. Do not install the rear combination lamps horizontally or up side down not to affect the performance of license plate lamps and water drain holes.
- Install the rear combination lamps to the outside of frame end at right and left using same holes, bolts and nuts of frame end as temporary fitted.
- When installing the rear combination lamps to the rear body, be sure to prevent breakage, deflection and vibration of rear combination lamp body.
- Tightening torque for rear combination lamp mounting nuts is 50 ± 20 kgf·cm (3.6 ± 1.4 lb·ft).
- Tightening torque for the stay mounting bolts is 790 ± 316 kgf·cm (57.14 ± 22.85 lb·ft).
- Do not apply rust-proofing clear lacquer to lamp lens or body.
- Bracket for rear license plate is fitted together with rear combination lamp, LH, to the chassis frame.

Installation of Rear Combination Lamps



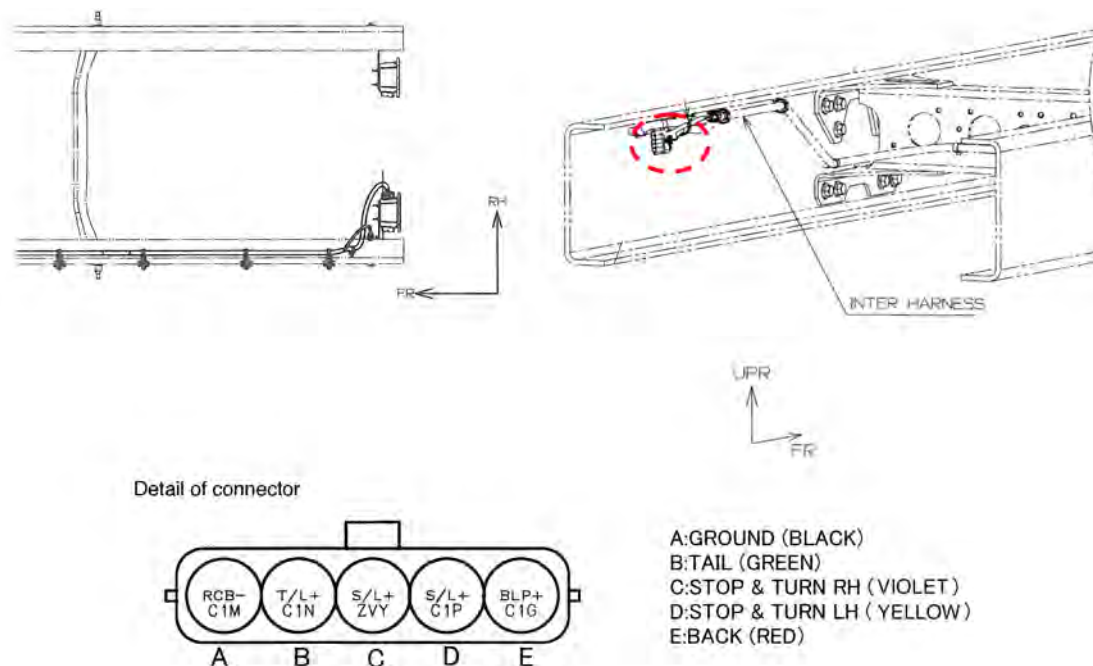
Case of rear combination lamp less option

The connector for rear combination lamp is provided at the end of LH side rail.

See the following figure.

Please prepare rear combination lamps which complied with CMVSS108 and the harness which links LH and RH side lamp.

Install them to comply with CMVSS108.



Cautions Regarding Additional Turn Signal Lamps

This is to avoid a possible failure of BCM (Body Control Module) arising from excessive electrical loading due to the mounting of additional turn signal lamps to the BCM of the vehicle.

The BCM on each vehicle is designed to accommodate the total wattage of the turn signal lamps.

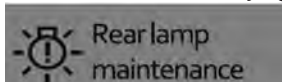
Must consider the function of the turn signal including the hazard warning for proper working when changing design of the turn signal lamps.

The turn signal lamps on each vehicle meet the CMVSS, and no additional lamp is needed in this regard so long as the vehicle is used as it was designed.

When you intend to add side turn signal lamps, install them according to the NOTE of paragraph ELECTRICAL POWER SOURCES.

Note

- 1) If operating rear stop lamp and turn signal lamp, please see the chapter 7 "INSTALLATION OF FLASHER CUTTING" and modify.
- 2) If the following warning light is displayed on the meter, some failures are occurred due to modifying. Possible failures due to modifying are case1) to case 3).



<Possible modification failures>

Case 1): BCM output for stop lamps(Stop & Turn lamps) are short circuit to GND (= failure situation)

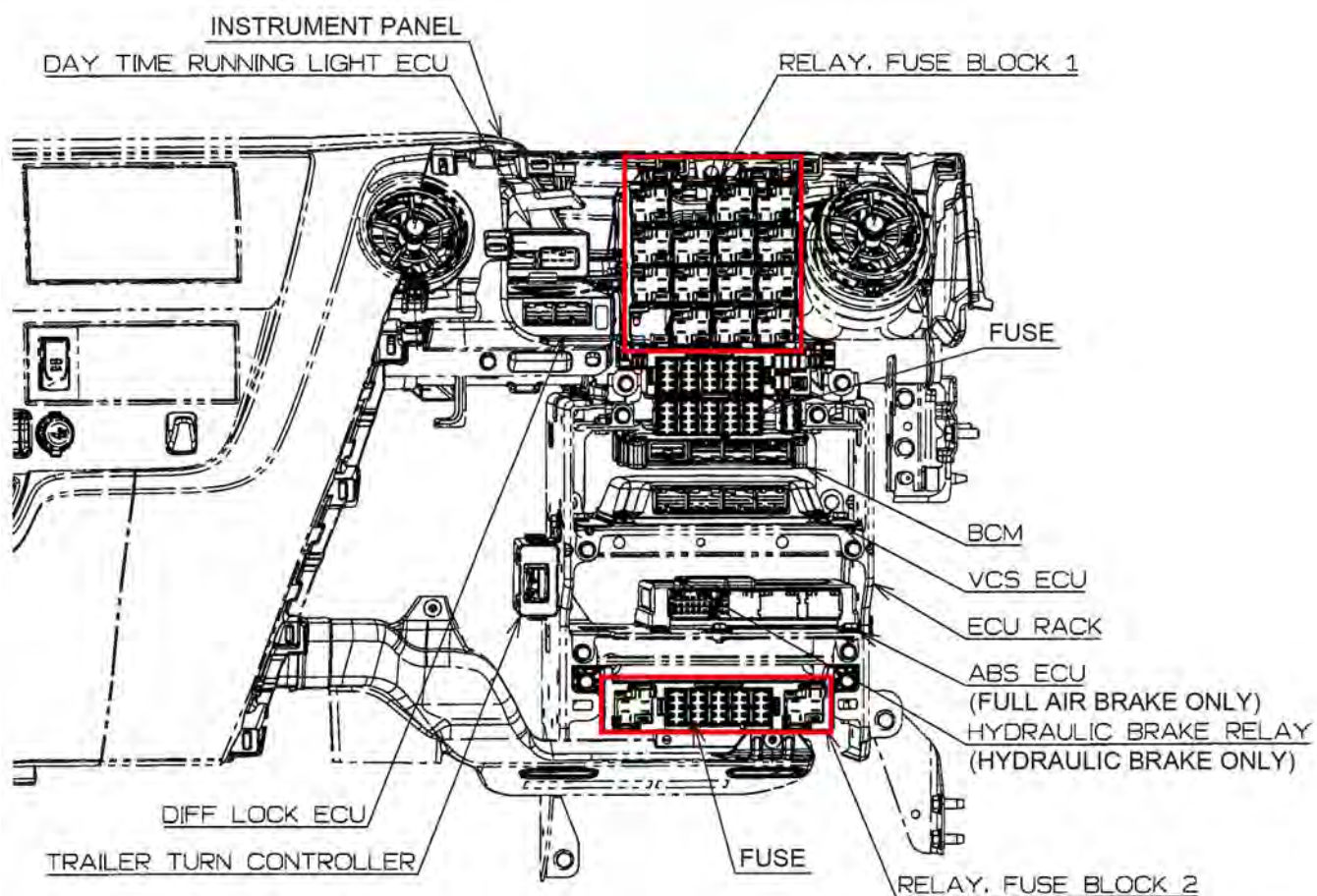
Case 2): BCM output for stop lamps(Stop & Turn lamps) are short circuit to Power supply (=failure situation)

Case 3): Stop & Turn Fuse (Fuse name: TRUN_STOP_10A) for BCM is blown or removed (=failure situation)

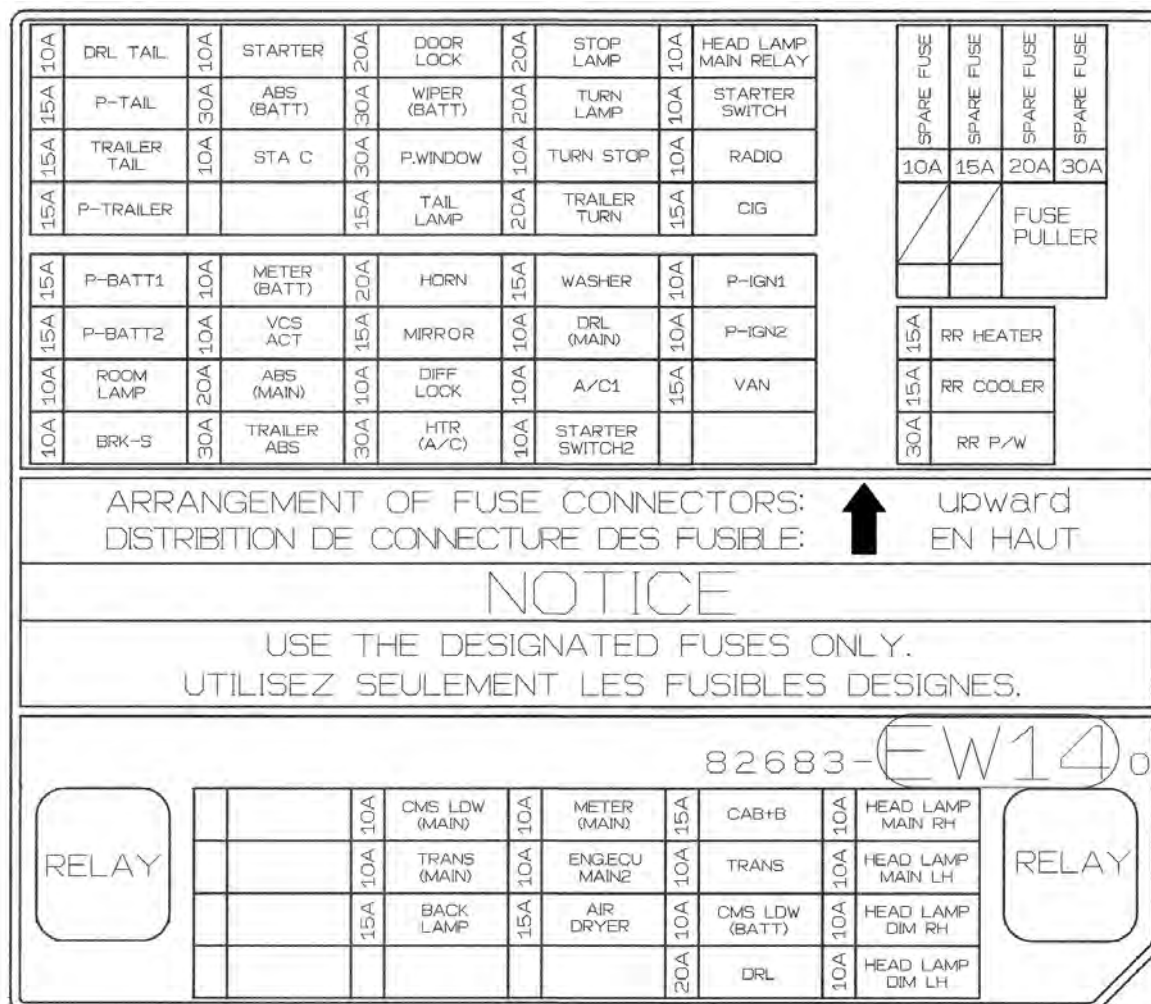
2. FUSE BLOCK, RELAY PANEL AND FUSIBLE LINK BLOCK

Location of the Cab Side

The fuse block and the relay panel are located inside the instrument panel as shown below.



FUSE BLOCK

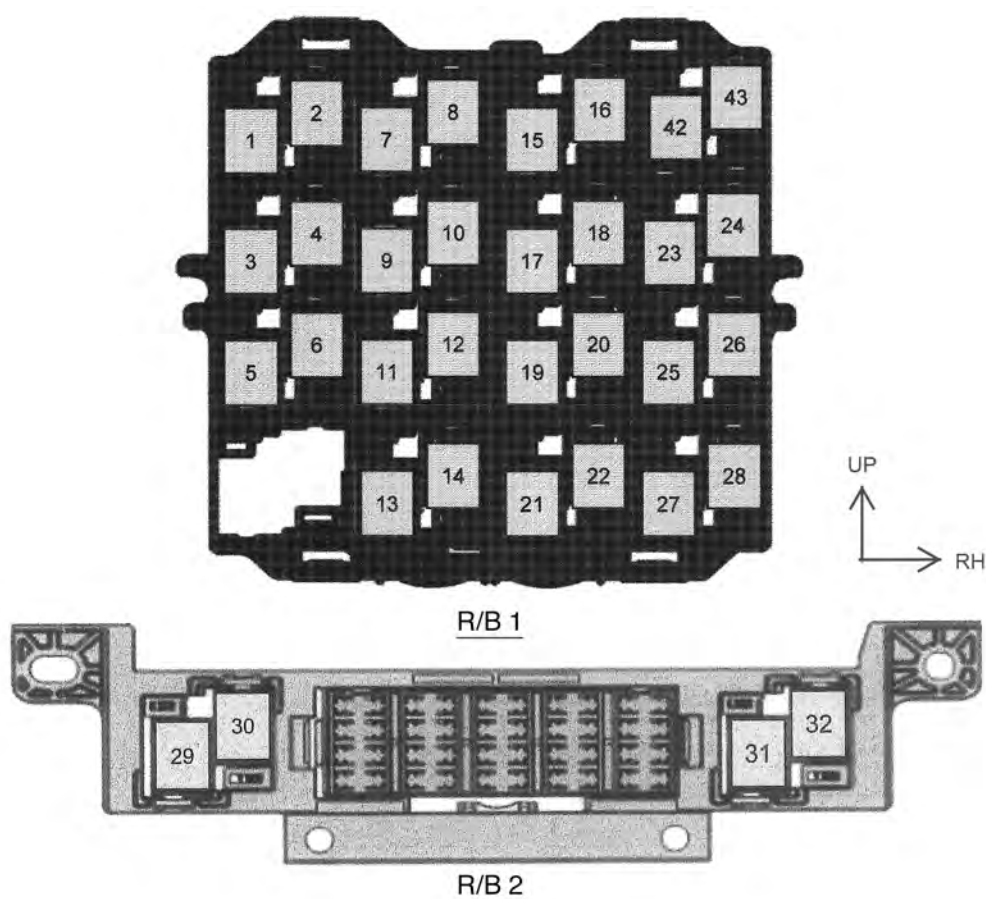


[NOTE]

Be sure to use each capacity fuse designated in the above table.

Never use the capacity fuse exceeding the designated one in the above, otherwise over current may damage the harness wires and fusible linkage wires.

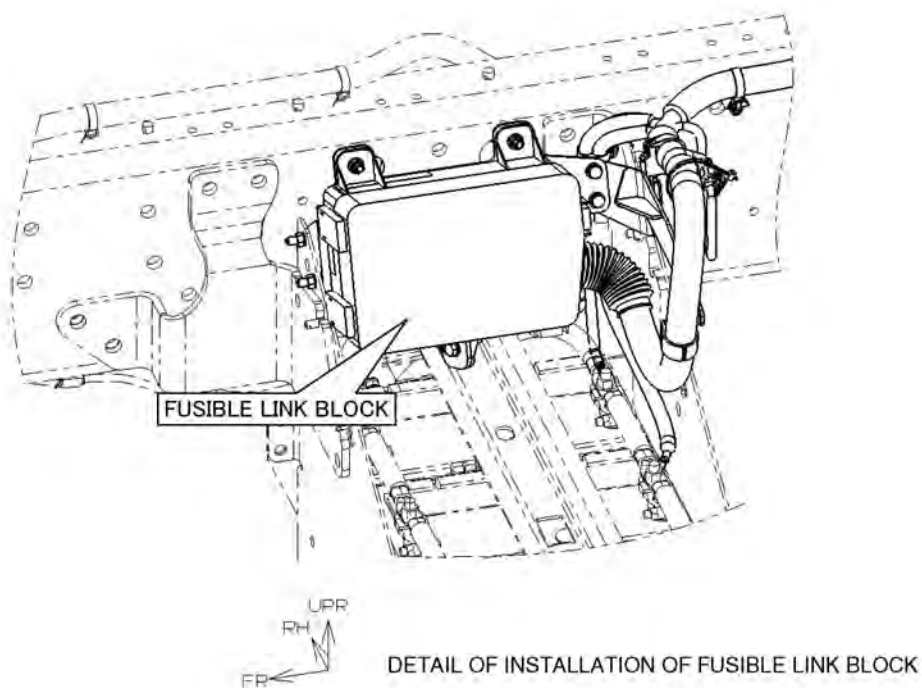
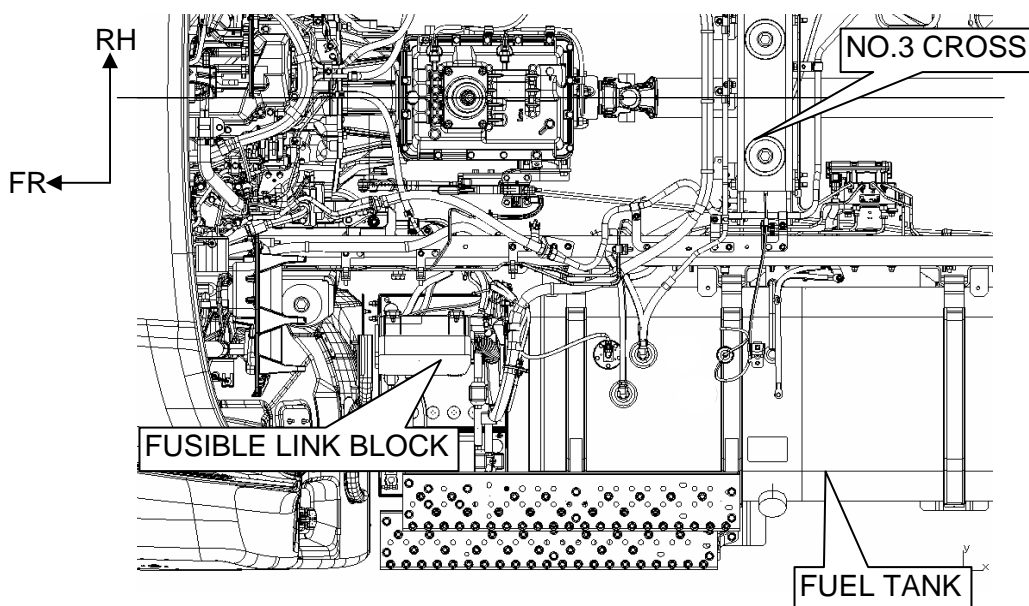
RELAY PANEL



No.	DESCRIPTION
1	TRANS STA RLY
2	TRANS BACK LAMP RLY
3	VCS ACT RLY
4	MIR HTR RLY
5	STARTER CUT RLY
6	DRL RLY 3
7	
8	
9	
10	PKB BZ OFF RLY
11	AIR HORN RLY
12	HORN RLY
13	DRL RLY 2
14	DRL RLY 1
15	AIR CON. RLY
16	HTR RLY
17	DRL TAIL RLY 2
18	AIR_SUS_DUMP_RLY
19	TAIL LP RLY 1
20	DRL TAIL RLY 1
21	
22	IDLE SHUTDOWN RLY
23	PWR RLY 1
24	PWR RLY 2
25	PWR ACC RLY
26	PWR RLY 3
27	
28	
29	
30	STARTER RLY
31	H-LP MAIN RLY
32	H-LP DIM RLY
42	RR P/W_RLY2
43	RR P/W_RLY

Location of the Chassis Side

The fusible link block is installed in left side rail as shown below.



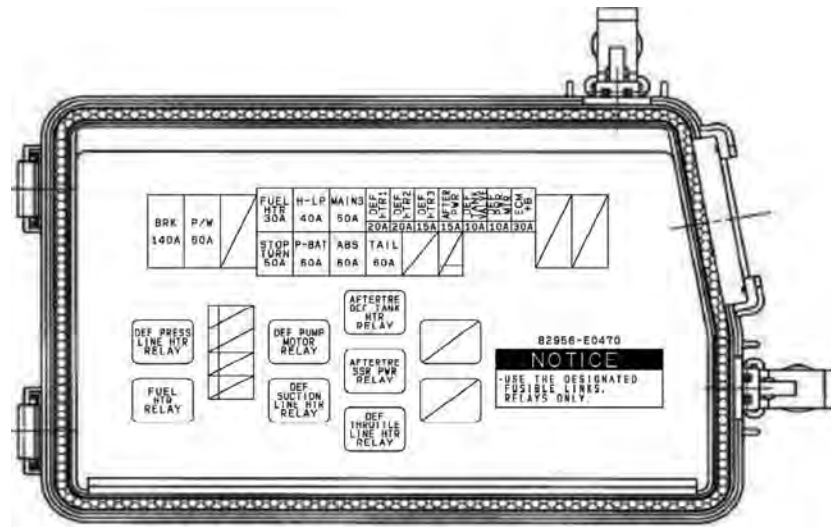
[NOTE]

Do not remove the harness connector, fusible link block, and cover except for repair and/or inspection.

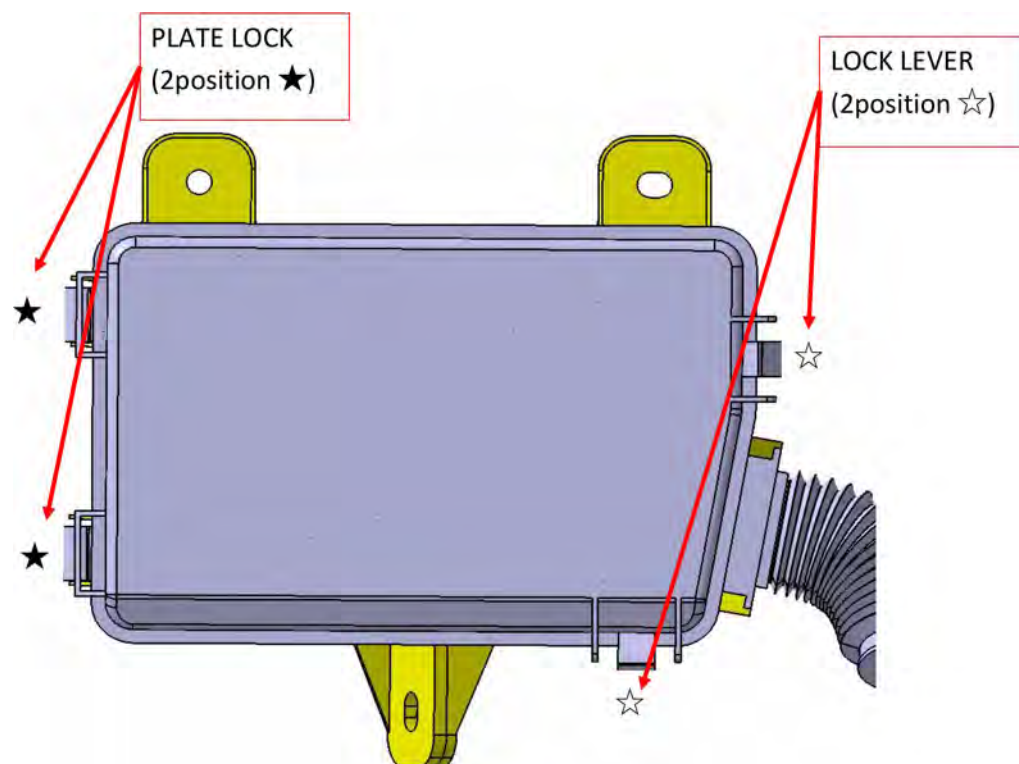
If removal is necessary, pay attention that water and/or foreign matter do not attach or enter the connector, terminals, electric component box, and cover.

If repair or replacement is required, make sure there is no attachment or entry of water and/or foreign matter. Mount properly to ensure waterproof function is not compromised.

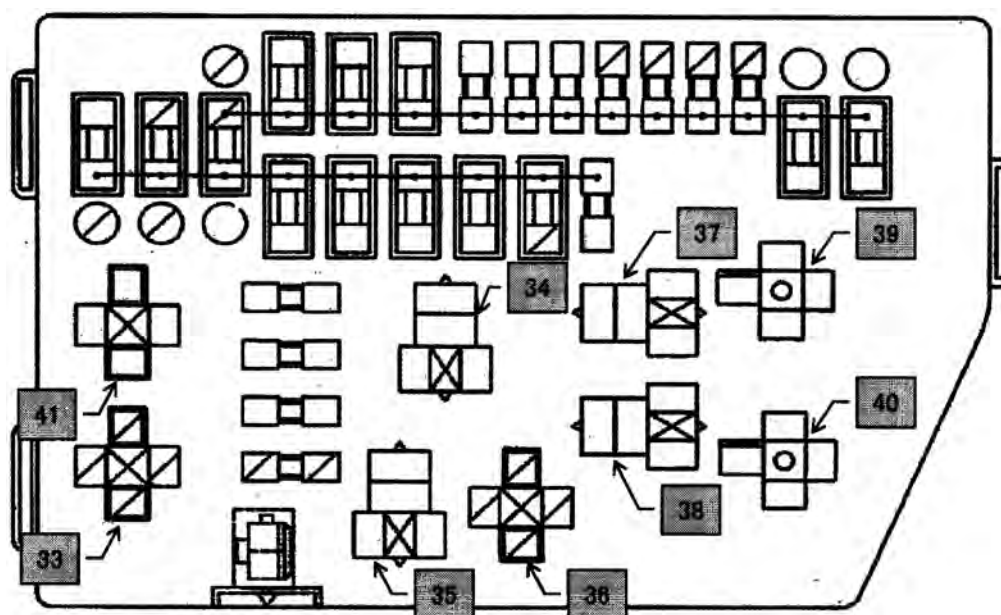
DETAIL OF FUSIBLE LINK AND RELAY POSITION



- How to remove fusible link box cover.
 1. Push lock lever and remove lock. (2 position, marked ☆)
 2. Pull-up 2 position of plate lock (marked ★) and remove cover.



RELAY PANEL



No.	DESCRIPTION
33	FUEL HEATER RLY
34	DEF PUMP MOTOR RLY
35	DEF SUCT LINE HEATER RLY
36	DEF THROTTLE LINE HEATER RLY
37	AFT DEF TANK HEATER RLY
38	AFT SENSOR POWER RLY
39	
40	
41	DEF PRESS LINE HEATER RLY

3. INSTALLATION OF ADDITIONAL SWITCHES

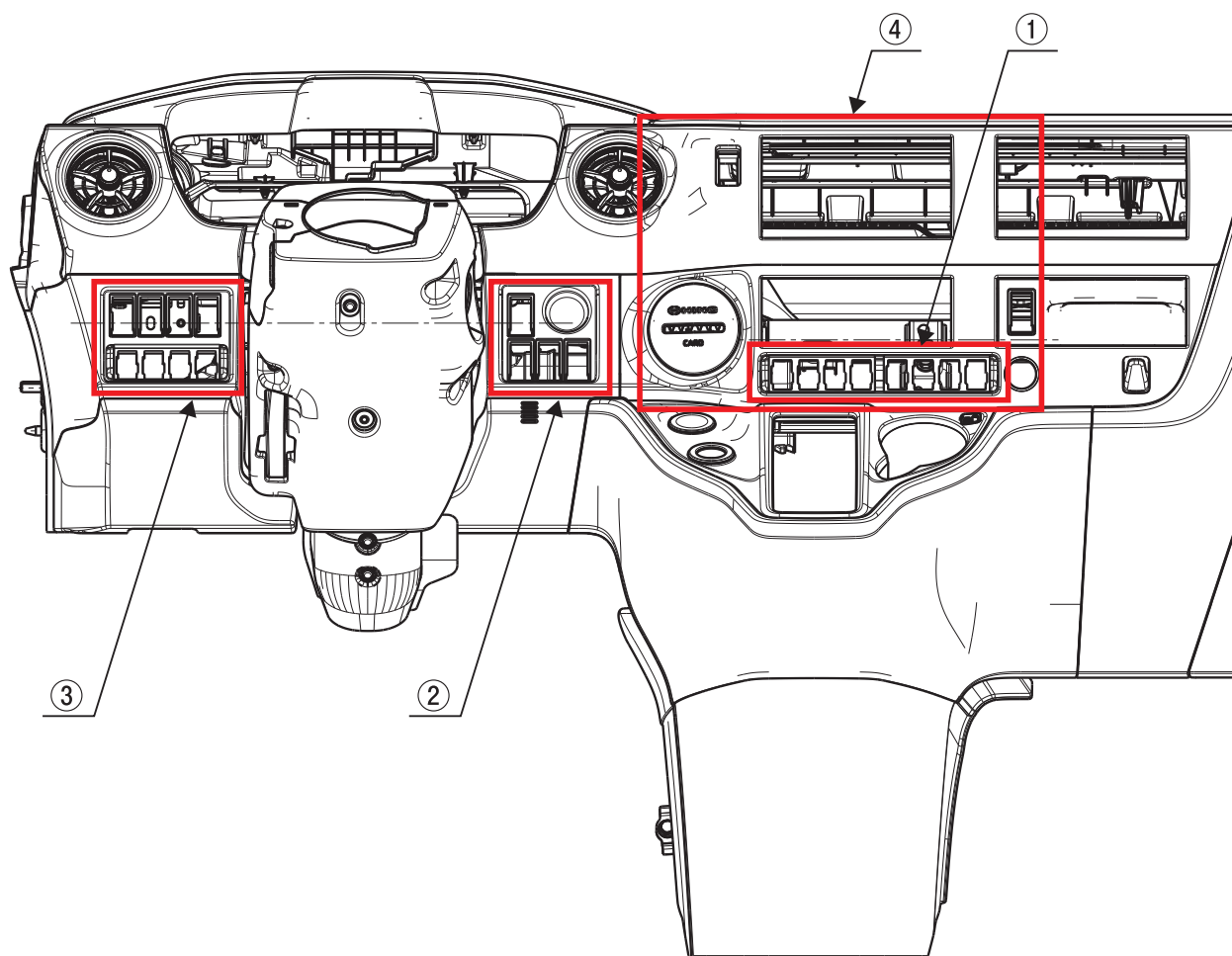
When install additional switches at instrument panel or floor console for body mounting, be sure to observe the following precautions.

- Install additional switches at available space after confirmation of original condition on the actual vehicle.

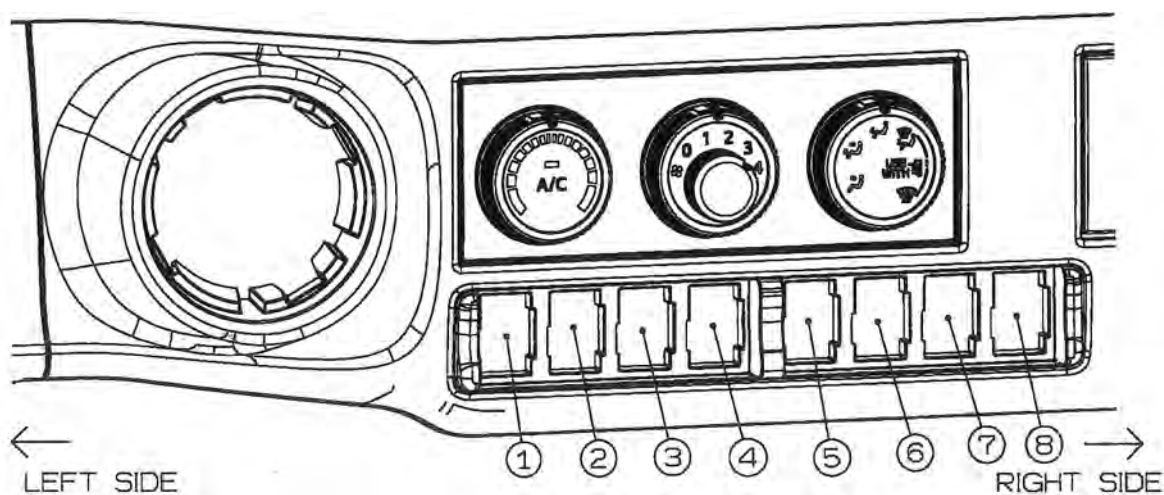
See figure below which shows all switches layout included option.

- Do not connect an electrical circuit of the body to the existing switch, otherwise over current may damage harness and switch.
- Install labels indicating the purpose of each switches to prevent wrong operation.
- Check the vehicle as the switch differs depending on the specifications.

INSTRUMENT PANEL

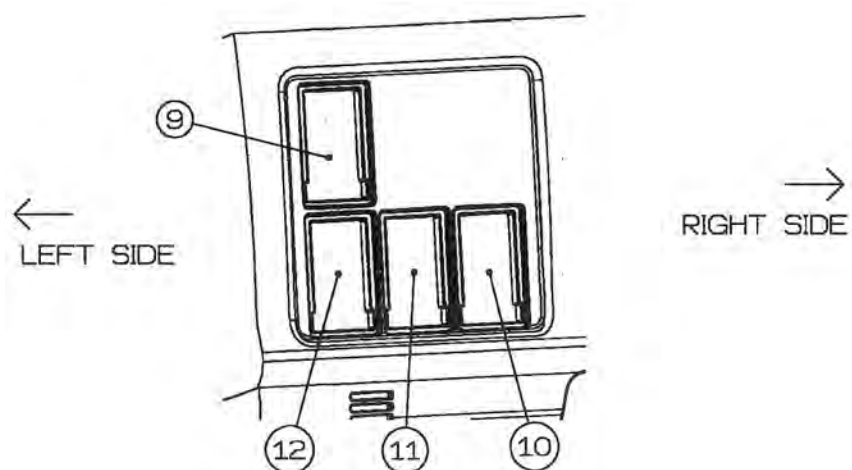


① INSTRUMENT PANEL CENTER SWITCH



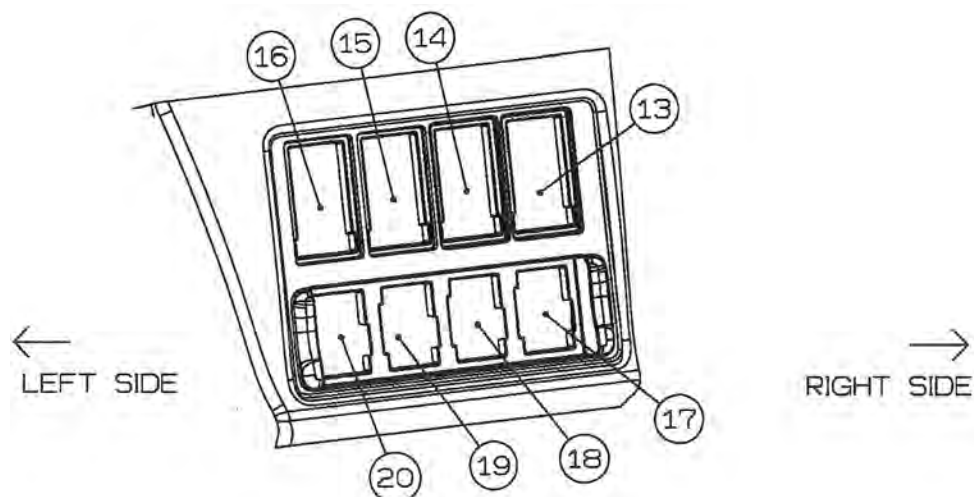
The equipped location	Popular name	Symbol
1	ATM MODE SW	
	SW LESS	—
2	SW LESS	—
3	SW LESS	—
4	DPR REFRESH SW	
5	LDWS OFF SW	
	SW LESS	—
6	ASR OFF SW	
	SW LESS	—
7	MIR HTR SW	
	SW LESS	—
8	SW LESS	—

② D LOWER RIGHT SIDE



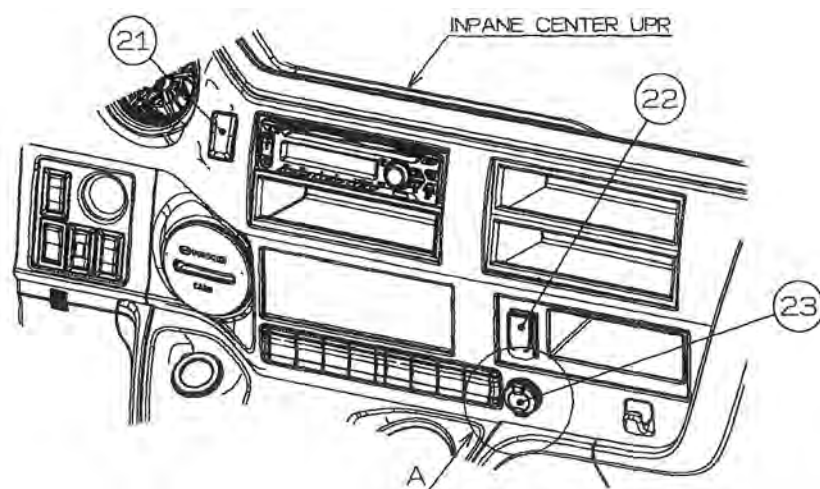
The equipped location	Popular name	Symbol
9	MANUAL DIFF LOCK SW	
	SW LESS	—
10	SW LESS	—
11	VAN LAMP SW	
	SW LESS	—
12	SW LESS	—

③ D LOWER LEFT SIDE



The equipped location	Popular name	Symbol
13	POWER WINDOW SW (RR RH)	
	SW LESS	—
14	POWER WINDOW SW (RR LH)	
	SW LESS	—
15	HEIGHT CONTROL SW	
	SW LESS	—
16	RHEOSTAT SW	
17	SW LESS	—
18	SW LESS	—
19	SW LESS	—
20	SW LESS	—

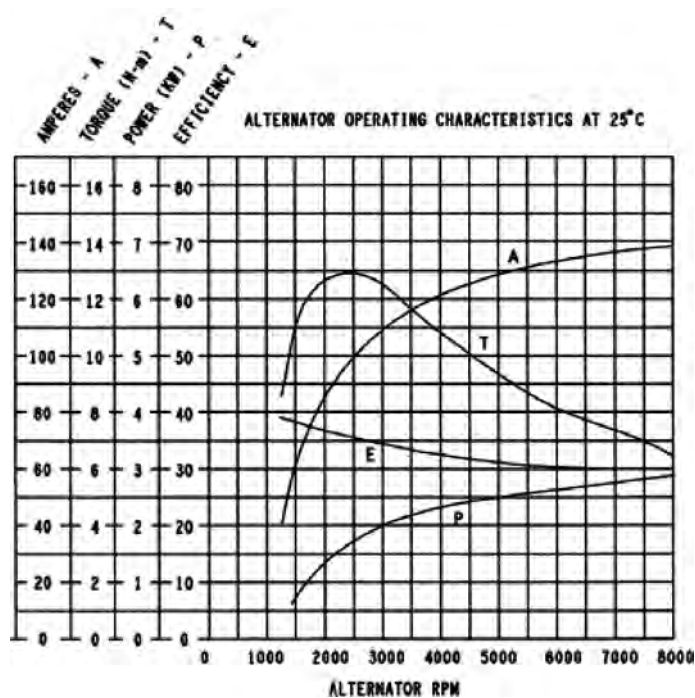
④ OTHER



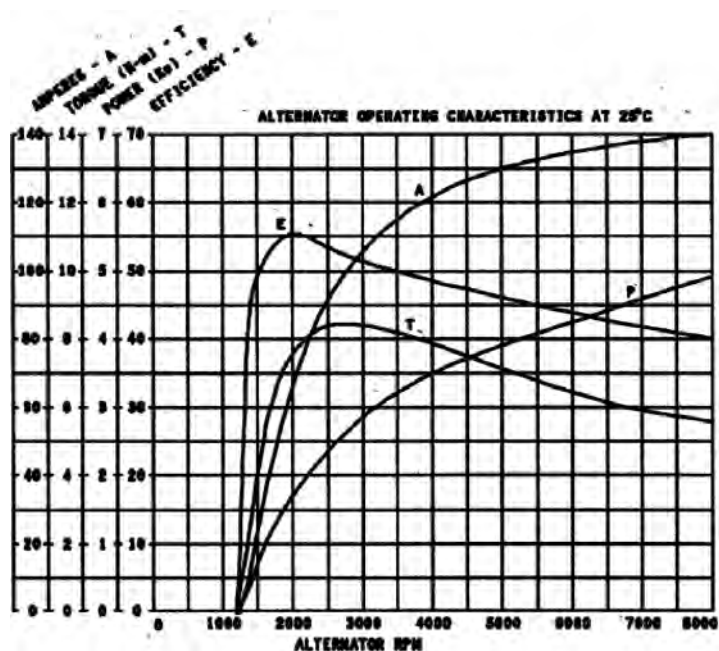
The equipped location	Popular name	Symbol
21	HAZARD SW	
22	USB SOCKET	
	SW LESS	—
23	CIGLIGHTER	
	ACC SOCKET	

4. ALTERNATOR OUTPUT CHARACTERISTIC

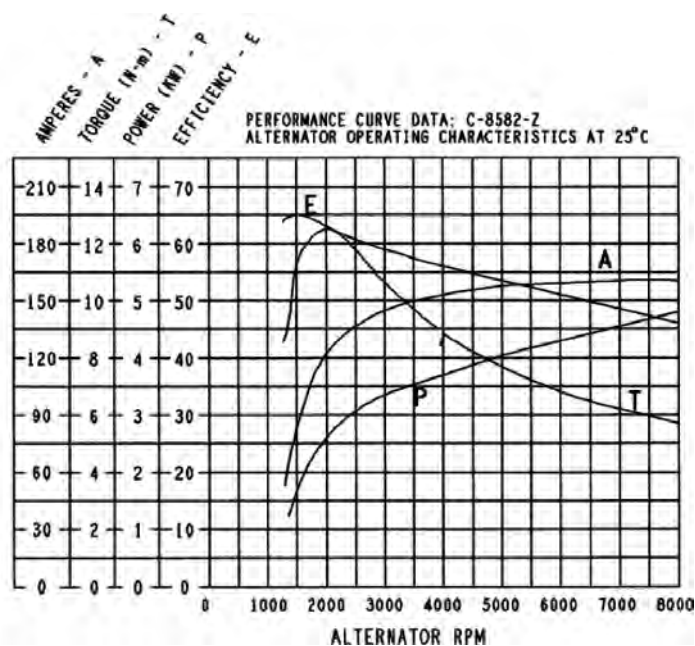
STD : 12V-130A



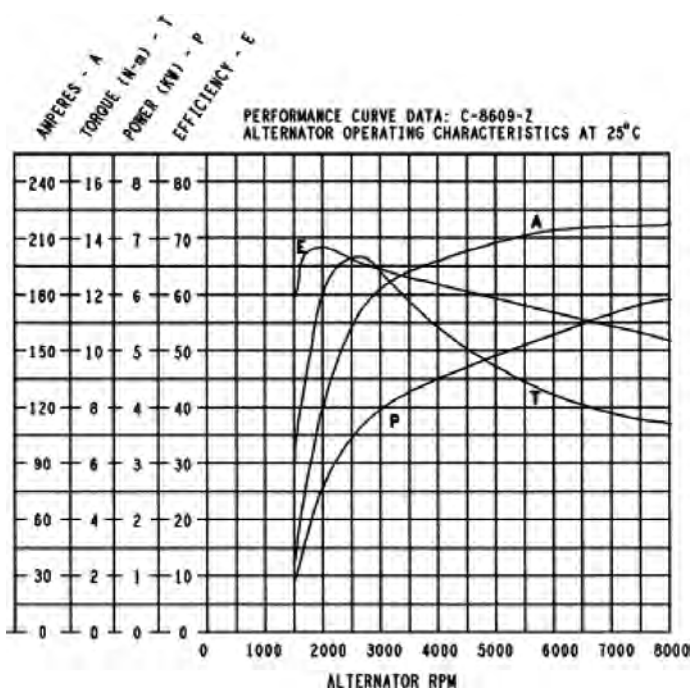
OPT : 12V-135A



OPT : 12V-160A



OPT : 12V-200A



- The maximum power available for the whole vehicle is defined by the capacity of the alternator. Therefore, the electric power that is not consumed by electrical equipments such as head lamps etc. can be available for the body side.
- Pay attention not to exceed the capacity of the alternator equipped on the vehicle.
- In the event that you are obliged to carry out the body mounting exceeding the capacity of the alternator, select the one available as an option or consult HMC or Hino authorized dealer.

5. ELECTRICAL POWER SOURCES

If you must take an electrical power supply for the body or equipment from the Hino chassis, take it from the electrical power supply connector.

Power Supply Connectors and Positions

Detail of power supply connectors as shown in the table below.

CAB SIDE							
Connector Mark	Pole Code	Circuit (Main Application)	Max Capacity [A]	Wire Size & Color	Connector Part No.	Coupling Connector Part No.	Description
A	AGK	Battery power	10 *1	0.85 W-	Delphi PART No.54241630 (HINO PART No.S8281-E0N00)	Delphi PART No.54241600	Unfused 12V Power tap, fuse and switch are required
	A6N	PTO Remote Switch	—	0.5 L-W			Input 12V positive signal for operating remote PTO *3
	A6P	Remote Accelerator On/Off Switch	—	0.5 R-W			Input 12V positive signal for *4 enabling remote accelerator sensor
	AGM	Ignition power	7 *2	0.85 L-			12V Power tap with key in "ON"
	SL5	T/M Neutral signal	—	0.5 B-R			T/M Neutral signal for enable starter
	AT6	Engine start signal	—	0.5 L-W			Input 12V positive signal for activation of starter
	T20	Engine stop signal	—	0.5 Y-			Input 12V signal for Engine stop *3 Vehicle speed must be less than 30km/h (18.64mile/h). The CAN communication line is operating normally.
	A6Q	P.T.O. enable signal	0.7	0.5 G-W			(Activation of P.T.O. mode = connected to ground Activation of running = Open circuit)
	I0M	Vehicle speed	—	0.5 Y-			8 Pulse
	SX9	Cruise Control on / off	—	0.5 G-R			In order for PTO Set/Resume to work, 12V input needs to be toggled to SX9 terminal when the engine is running. (Cruise indicator will illuminate in the gauge cluster)
	SY0	Cruise Switch1 *6	—	0.5 L-R			Output 12V signal linked with Head lamp H/L change
	SY6	Cruise Switch2 *6	—	0.5 P			
	SY7	Engine Tachometer	—	0.5 G			12V power tap for Fog lamp Total max 10.2A current together with Pole code T1Z(Connector Mark A)&SX5(Connector Mark G).
	T1Y	Head lamp output signal	—	0.5 R-G			Input 12V positive signal for engine idle up *5
	T1Z	Ignition power	9.4	0.85 G-			
	ANZ	Idle Up Signal	—	0.5 R-			

*3 : Please refer to Chapter 11 for P.T.O operation.

*4 : 1) It need to customize for idle up.
2) Please contact to HMC for customizing.

*6 : Input Pattern for Cruise Switch 1,2
SY0 SY6 Functionality
12V 0V PTO Resume/Accel
12V 12V PTO Set/Coast

Connector Mark	Pole Code	Circuit (Main Application)	Max Capacity [A]	Wire Size & Color	Connector Part No.	Coupling Connector Part No.	Description
B	V2A	Cab - Chassis Through Wire 1	7.5	0.85 G-	Delphi PART No.12064762 (HINO PART No.S8281-E0M60)	Delphi PART No.12064763	For Cab - Chassis Through Wire
	V2B	Cab - Chassis Through Wire 2		0.85 L-			
	V2C	Cab - Chassis Through Wire 3		0.85 P-			
	V2D	Cab - Chassis Through Wire 4		0.85 R-			
	V2E	Cab - Chassis Through Wire 5		0.85 V-			
	V2F	Cab - Chassis Through Wire 6		0.85 W-			
C	T21	Power Supply (BAT)	2	0.5 L-	Delphi PART No.12064769 (HINO PART No.S8281-E0M40)	Delphi PART No.12064770	For Telematics
	T22	Power Supply (ACC)	2	0.5 L-Y			
	T24	VCS CAN (Hi)	—	0.5 Y-			
	T25	Ground	—	0.5 BR-			
	T26	Power Supply (Starter switch "ON")	7 *2	0.5 L-W			
	T2Z	VCS CAN (Lo)	—	0.5 G-			
D	SY8	CAN (Hi)	—	0.5 Y-	Delphi PART No.54200200 (HINO PART No.S8281-E0M50)	Delphi PART No.54200204	
	SY9	CAN (Lo)	—	0.5 G-			
E	V2G	Cab - Chassis Through Wire 1	7.5	0.75 G-	Delphi PART No.12052848 (HINO PART No.S8281-E0D80)	Delphi PART No.12124107 (HINO PART No.S8281-E0D40)	For Cab - Chassis Through Wire
	V2H	Cab - Chassis Through Wire 2		0.75 L-			
	V2J	Cab - Chassis Through Wire 3		0.75 Y-			
	V2K	Cab - Chassis Through Wire 4		0.75 R-			
	V2L	Cab - Chassis Through Wire 5		0.75 L-R			
	V2M	Cab - Chassis Through Wire 6		0.75 BR-			

*1 Total Max 10A. current together with Pole code AGK (Connector Mark A), SX4 (Connector Mark G) & ST9 (Connector Mark G).

*2 Total Max 7A. current together with Pole code AGM (Connector Mark A) & T26 (Connector Mark C).

*5 Even if input signal for engine idle up, it does not raising of engine speed in the shipping chassis condition.

It need to customize for raising of engine speed.

Please contact to HMC for the detail.

•Activation conditions

Engine speed will raise when all of the following conditions are satisfied.

- Input engine idle up signal.
- Position of transmission gear is neutral.
- Releasing the clutch pedal (Vehicle with Manual Transmission only).

•Range of engine speed : 750 to 980 r/min.

(This range can be set optionally.)

CAUTION :

Should modify circuit on body side to avoid electrical surge voltage.

Inside circuit damage of ECU and electric noise may adversely affect the vehicle's equipment.

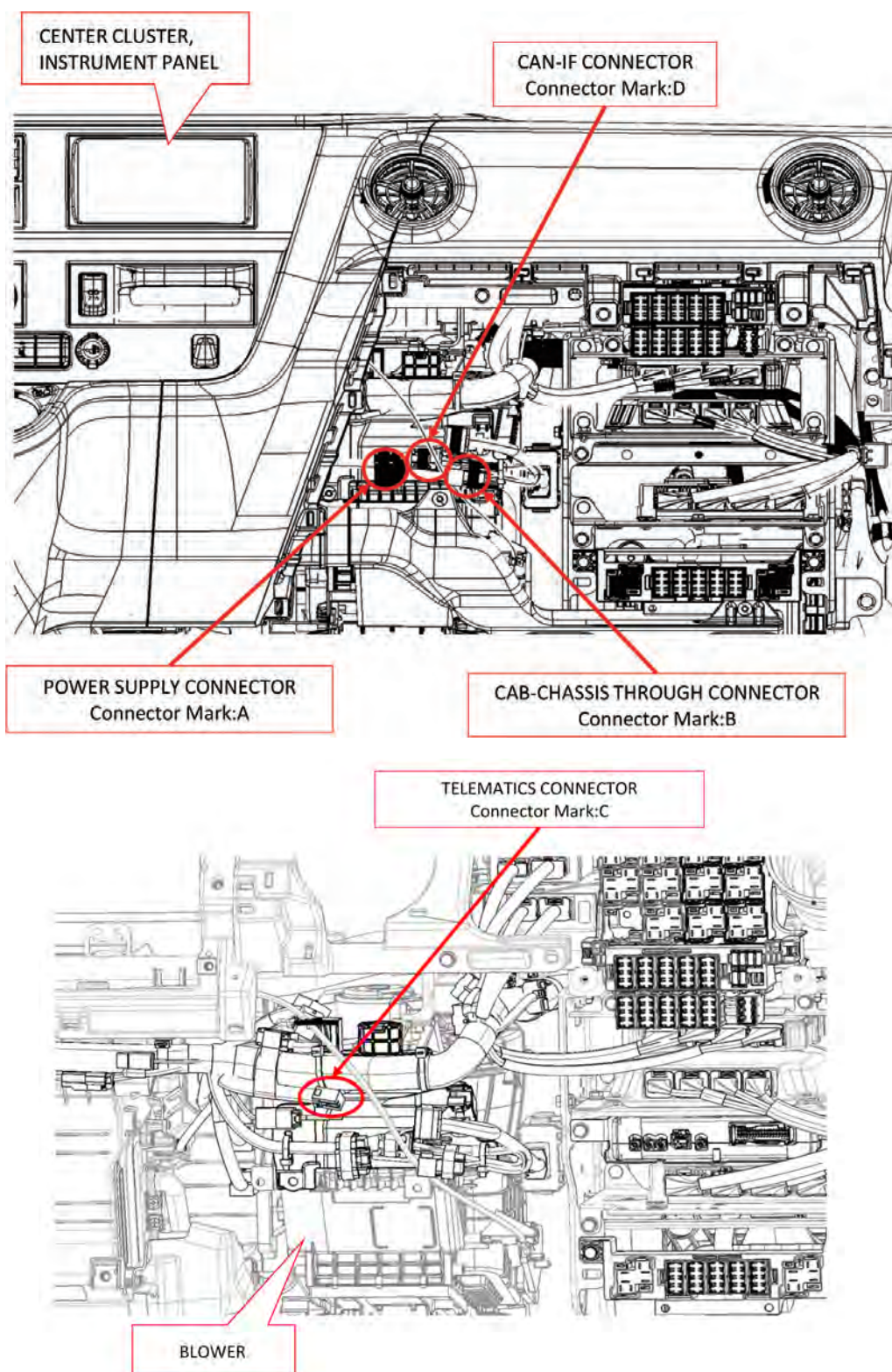
CHASSIS FRAME SIDE

Connector Mark	Pole Code	Circuit	Max Capacity [A]	Wire Size & Color	Connector Part No.	Coupling Connector Part No.	Description
F	K95	Power Supply	—	0.5 L-Y	HINO PART No.S8256-01260	HINO PART No.S8256-01250	External engine control device of Engine control for superstructure (Connect with HINO genuine parts only)
	K96	Accel sensor	—	0.5 G-Y			
	K97	Ground	—	0.5 G			
G	SQ9	Marker lamp	0.5	1.25 Y-	Delphi PART No.54201411 (HINO PART No.S8281-E0M70)	Delphi PART No.54201415 (HINO PART No.S8281-E0M80)	
	SQ8	Left turn lamp	0.5	0.5 B-R			For Side turn lamp,LH
	SM3	Right stop lamp	0.5	0.75 R-			
	SLZ	Right turn lamp	0.5	0.5 B-W			For Side turn lamp,RH
	SLY	Back up lamp	0.5	0.75 R-			
	SLX	Tail lamp	0.5	0.75 G-			12V Power tap with Head light switch in "ON"
	SX8	Ground	—	2 B-			
	SX7	Ground	—	2 B-			
	SX6	Ground	—	2 B-			
	SX5	Power Supply	7	1.25 W-			12V Power tap with starter switch "ON" and Van lamp switch "ON" Total max 10.2A current together with pole code T1Z (Connector Mark A) & SX5 (Connector Mark G) .
	SX4	Battery power	10 ※1	1.25 L-			Unfused 12V Power tap, fuse and switch are required
	ST9	Battery power	10 ※1	1.25 W-			Unfused 12V Power tap, fuse and switch are required
	ST0	Ignition power	7	1.25 Y-			12V Power tap with starter switch "ON"
H	SK9	P.T.O. DRIVE INPUT	—	0.85 L-B	Delphi PART No.54241631 (HINO PART No.S8281-E0M20)	Delphi PART No.54241601 (HINO PART No.S8281-E0M30)	
	SK8	RANGE INDICATOR	—	0.85 B-R			
	SK7	OUTPUT SPEED INDICATOR	—	0.85 B-G			
	SK6	SIGNAL RETURN	—	0.85 B-Y			
	SK5	SECONDARY MODE INDICATOR	—	0.85 G-R			
	SJ9	OPEN	—	0.85 P-			
	SL4	DIRECTION CHANGE ENABLE INPUT	—	0.85 R-G			
	SL3	NEUTRAL AT STOP	—	0.85 R-L			
	SL2	SUMP TEMPERATURE	—	0.85 V-			
	SL1	AUTO Matic NEUTRAL	—	0.85 BR-			
	SL0	RANGE INHIBIT INPUT	—	0.85 Y-			
	SL6	HOLD INPUT	—	0.85 L-			
	SKZ	P.T.O. DRIVE OUTPUT	—	0.85 B-R			

[NOTE]

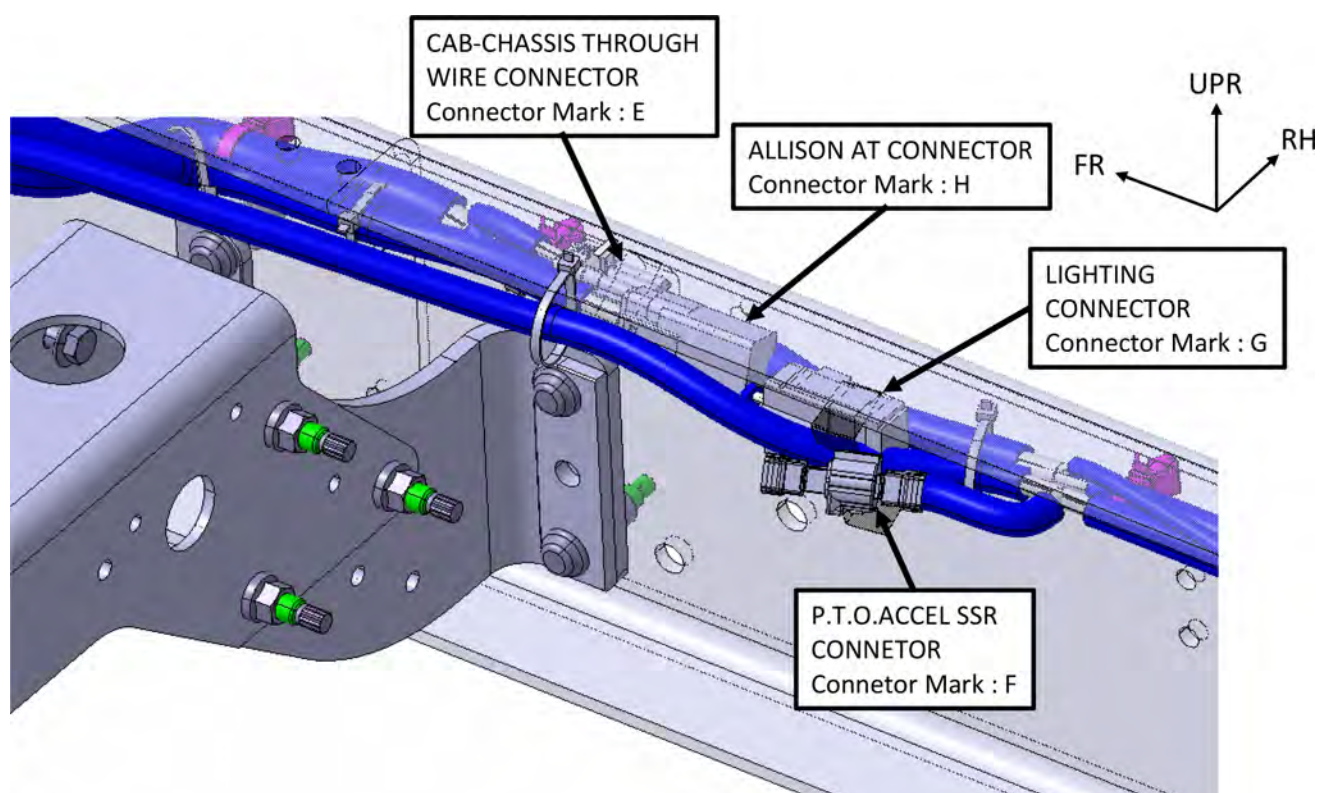
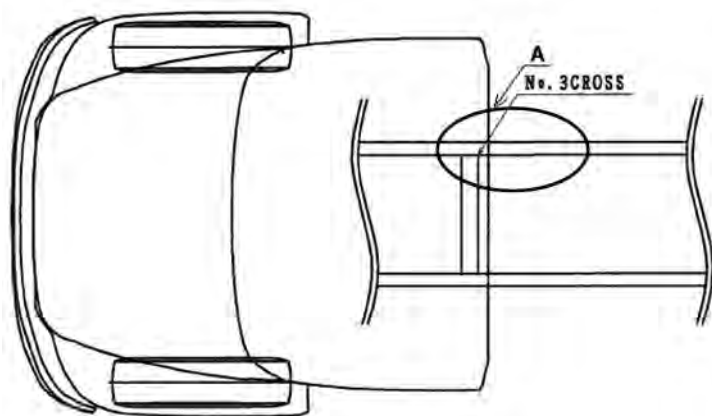
- The permissible current be taken from spare power connector is determined from the capacity of the fuse and wire size. Make sure that the maximum load (current) of the installed equipment must be kept lower current than the permissible capacity to be able to take from spare power connector.
- Be sure to keep the lower current value than the alternator generated capacity when switched on the original and additional equipment same time to avoid over discharging electricity of the battery.
- When use pole code "SQ9", "SQ8", "SM3", "SLZ", "SLY" and "SLX" (Connector Mark G), it should be on the following condition.
Turn and hazard lamp should be LED type.
If circuit current flow will exceed 0.5A, use them for operating circuit of the relay unit which to be operated turn and hazard lamp circuit.
- A connector mark H for P.T.O. control is for Allison Auto transmission only. For details, refer to Chapter 11.

PROVIDED POSITION OF CAB SIDE



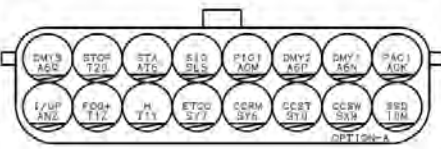
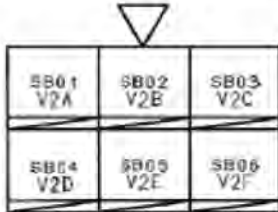
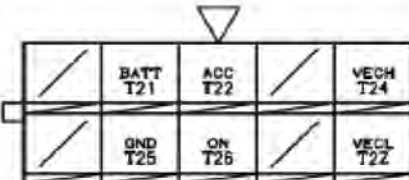
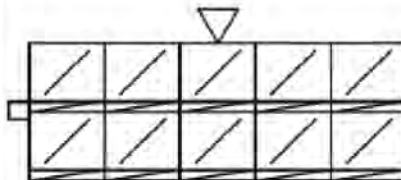
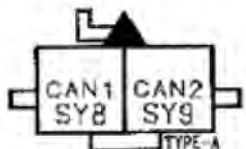
- See the previous page for wire color.

PROVIDED POSITION OF CHASSIS SIDE

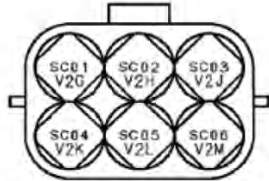
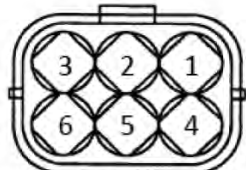
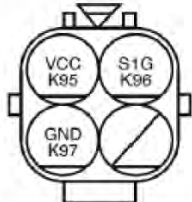
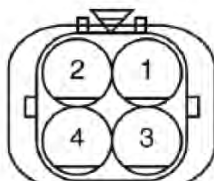
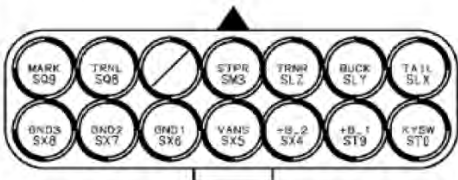
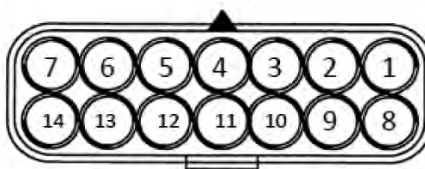
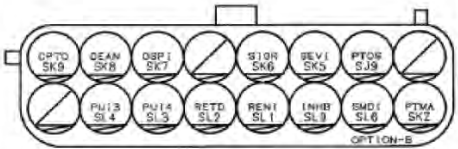
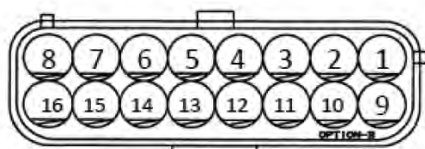


DETAIL OF POWER SUPPLY CONNECTORS

• CAB SIDE

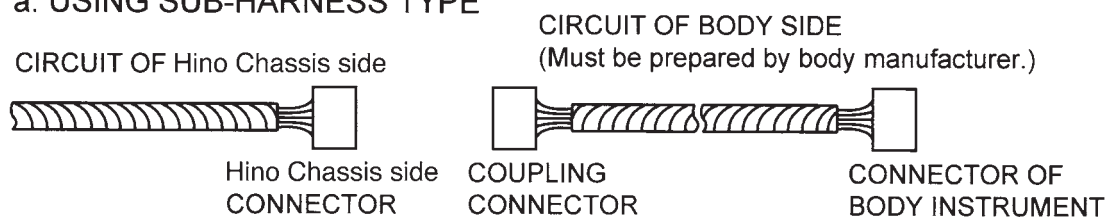
MARK	CONNECTOR	
	VEHICLE SIDE	COMPANION SIDE
A		
	Delphi PART No.54241630 (HINO PART No.S8281-E0N00)	Delphi PART No.54241600
B		
	Delphi PART No.12064762 (HINO PART No.S8281-E0M60)	Delphi PART No.12064763
C		
	Delphi PART No.12064769 (HINO PART No.S8281-E0M40)	Delphi PART No.12064770
D		
	Delphi PART No.54200200 (HINO PART No.S8281-E0M50)	Delphi PART No.54200204

• CHASSIS FRAME SIDE

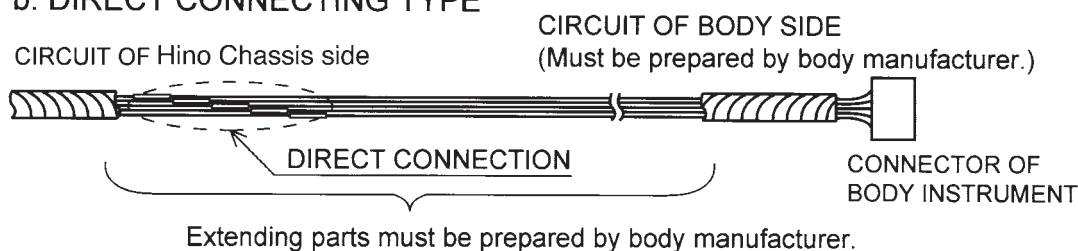
MARK	CONNECTOR	
	VEHICLE SIDE	COMPANION SIDE
E	 <p>* CPA mounting recommended</p>	
	Delphi PART No.12020833 (HINO PART No.S8284-E0280)	Delphi PART No.12124107 (HINO PART No.S8281-E0D40)
F		
	HINO PART No.S8256-01260	HINO PART No.S8256-01250
G		
	Delphi PART No.54201411 (HINO PART No.S8281-E0M70)	Delphi Part No.54201415 (HINO Part No.S8281-E0M80)
H		
	Delphi PART No.54241631 (HINO PART No.S8281-E0M20)	Delphi PART No.54241601 (HINO PART No.S8281-E0M30)

HOW TO TAKE ELECTRICITY FROM POWER SUPPLY CONNECTOR

a. USING SUB-HARNESS TYPE



b. DIRECT CONNECTING TYPE



[NOTE]

- We recommend sub-harness type.
- If you must take power using direct connecting type, be sure to observe the precautions described here in after section "HARNESS WIRING".

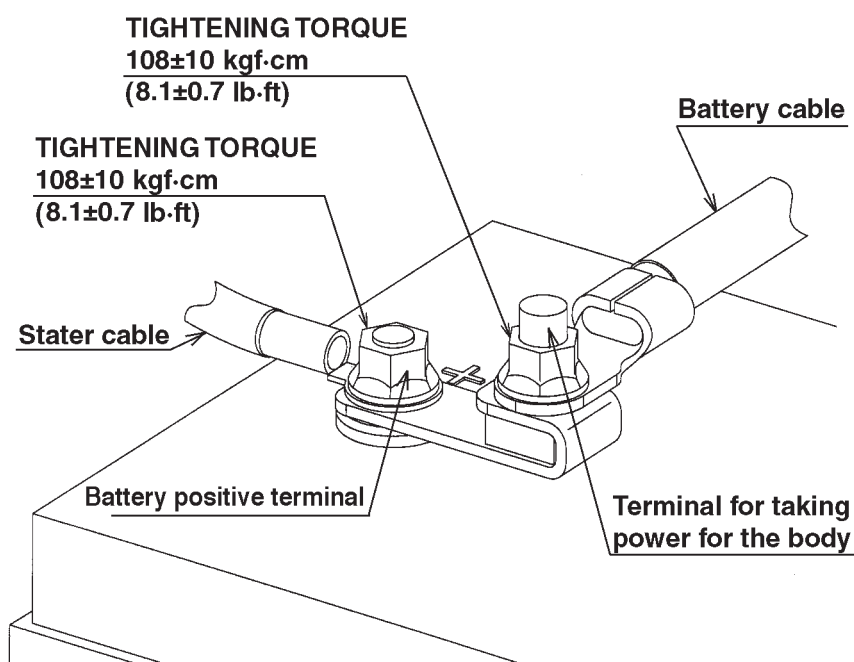
Taking Power Directly from the Battery

If you intend to take power for the body directly from the battery, secure the battery cable and the body power supply terminal together with the same nut.
For details, see the following figure.

In this case, you must install a fuse at a suitable point in the circuit and take precautions to prevent short circuits as these may lead vehicle fires.

When securing the cable and power terminal, make sure you tighten the nut properly.

- Battery model : GR31

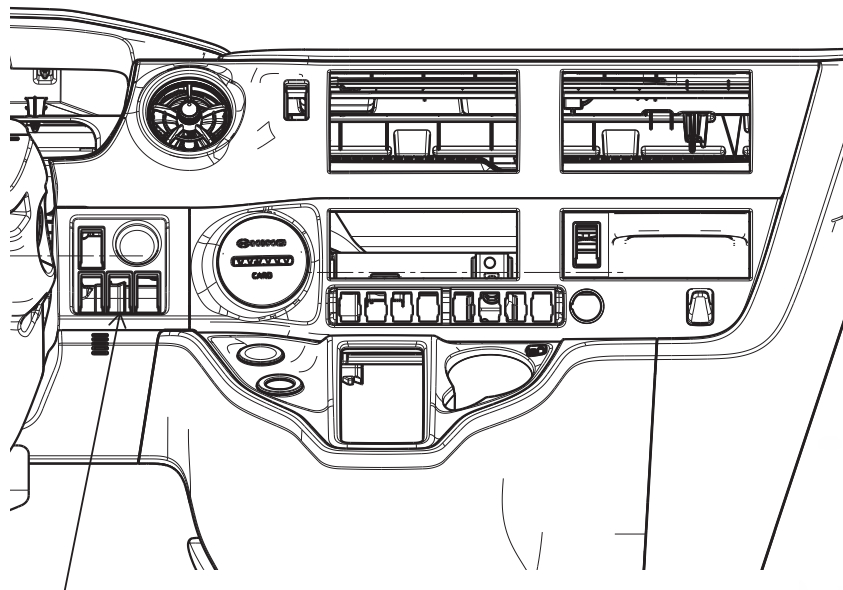


Room Lamp Switch for Van Body

Room lamp switch is provided as an optional equipment.
Be sure to follow the manner described in following figures when install the switch.

INSTALLATION POSITION OF SWITCH

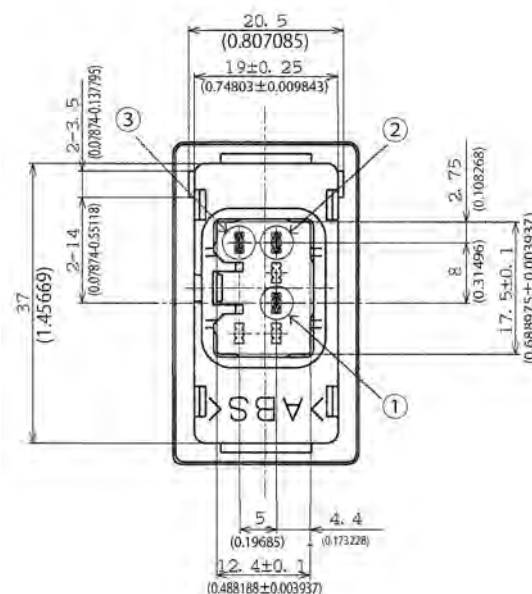
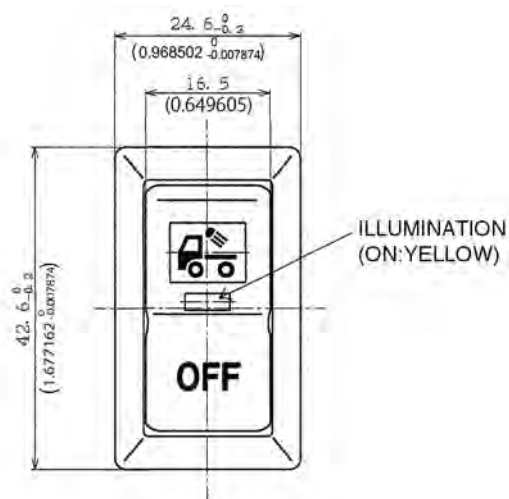
Unit: mm (in.)



INSTALLED POSITION OF SWITCH

[NOTE]

- Install the switch after removed cover plate.



[NOTE]

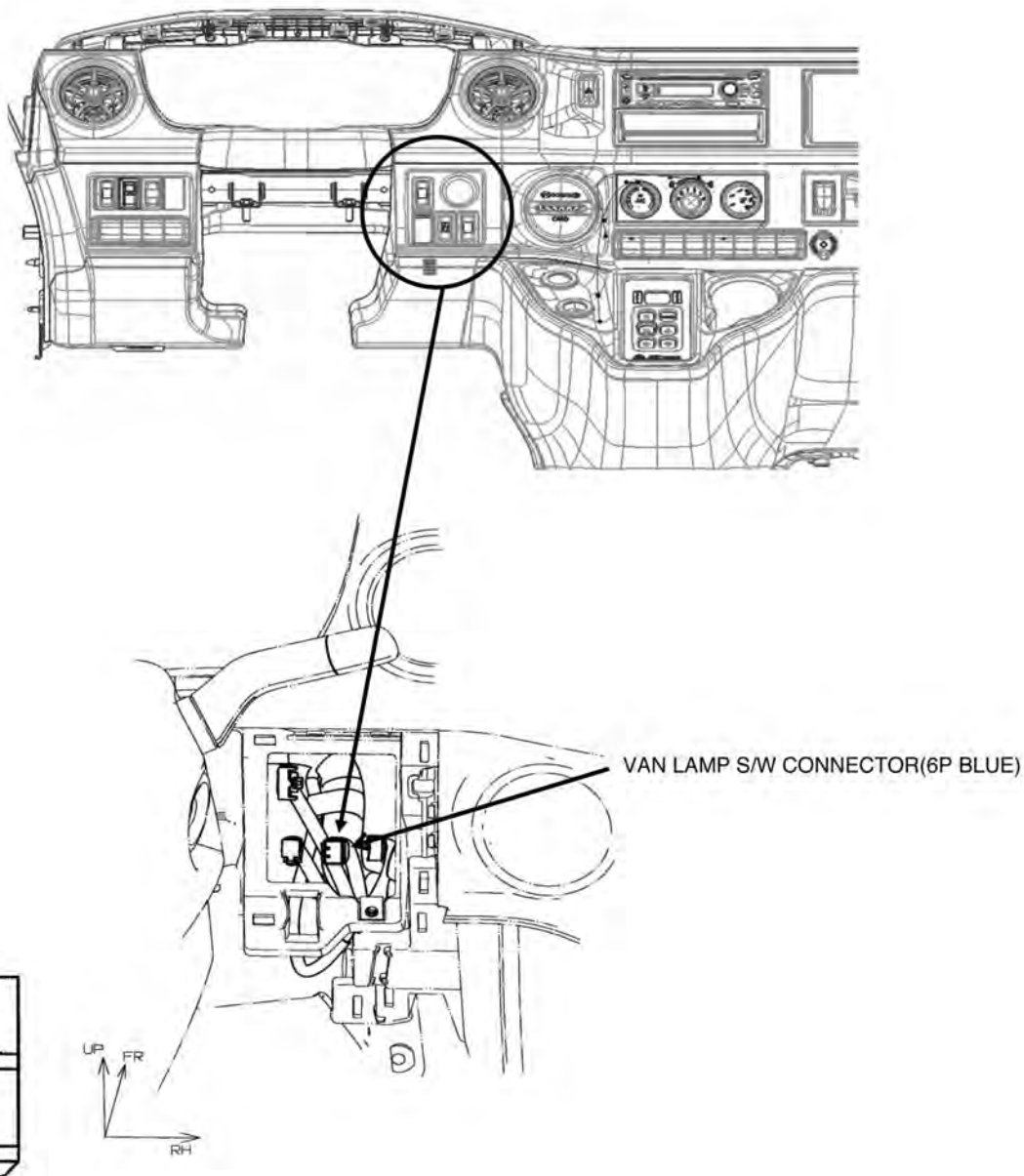
- VIEW FROM SWITCH SIDE
- POLE POSITION
- ① BATTERY CIRCUIT
- ② GROUND CIRCUIT
- ③ CONNECTED TO THE ROOM LAMP CONNECTOR FOR VAN BODY TO BE PROVIDED BEHIND CAB.

DETAIL OF SWITCH

Part Number : S8428-03780

Detail of Provision of Connector

- Connector which is connected with room lamp switch for van body is provided center of dash board panel described in following figure.
- Make sure to connect the power supply connector with switch.



VLP-			
1.25			
W			
VL I-		VLP+	
0.5		1.25	
B		G	

82824 - E0U10

[NOTE]

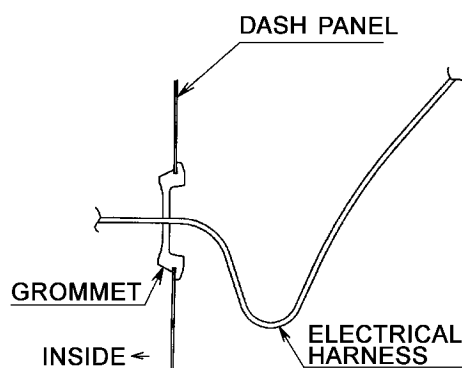
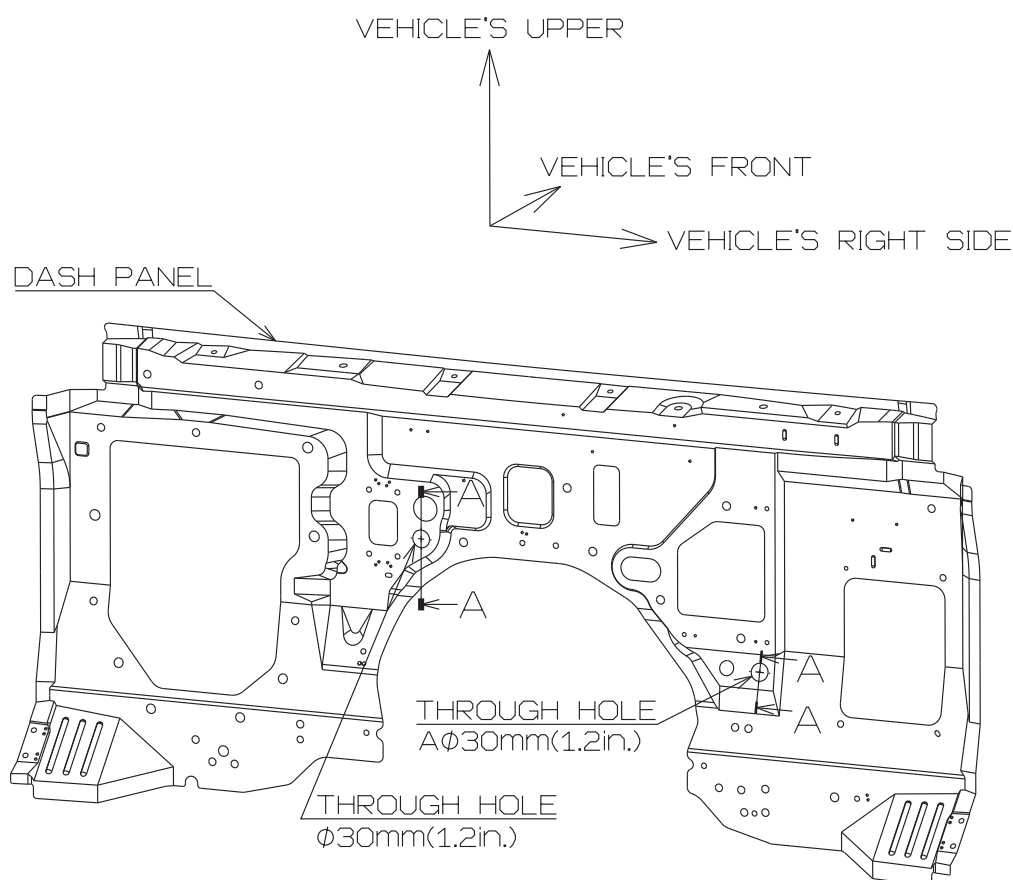
* COLOR OF HARNESS

- G : GREEN (BATTERY CIRCUIT, MAX. 7A)
- B : BLACK (GROUND CIRCUIT)
- W : WHITE (CONNECTED TO THE POWER SUPPLY CONNECTOR "E" FOR ROOM LAMP OF VAN BODY TO BE PROVIDED BEHIND CAB.)

Precaution for Installing Wires, etc., to Cab

When installing a harness etc. through the hole of front dash panel, to secure the rust prevention and water proof before the said taken-in, carry out fitting and wiring according to the following instructions.

- Through hole $\phi 30$ mm (1.2 in.) is provided on the front dash panel but it is closed with a grommet. Make a slit on this grommet and, after the wiring, sufficiently seal its periphery with a sealing agent.
- In order to inhibit water intrusion, lower the wiring as shown on "Section A - A" to drain the water and after that bring the wiring into the cab.
- It is prohibited to fix the wiring with a tapping screw etc., because this can be a cause of penetration of dust.



SECTION A - A

6. BACK-UP ALARM (OPT)

Back-up alarm is optional equipment.

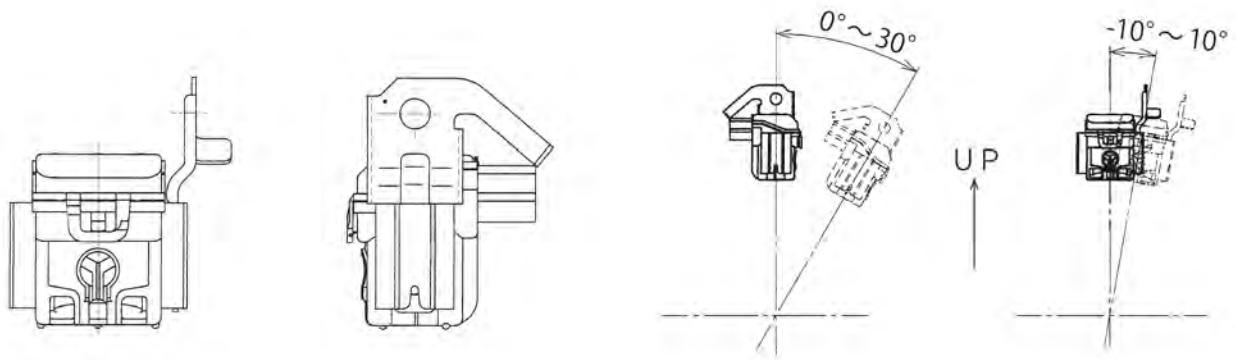
At chassis delivery, back-up alarm is temporary installed onto the rear combination lamp bracket (LH side).

Install the back-up alarm in proper position when mounting body.

Observe precautions as followings.

Installation angle

- Must be kept the permissible range of installing angles shown in the figure below.
- If the installing angle is not within range, water will accumulate inside the alarm and may lead to failure.



Position

Install the back-up alarm in a position where it is not exposed to splashing with muddy water, stone or water.

Precaution for painting

Make sure that the alarm is covered during painting to protect the paint coming into alarm from sound emitting hole for avoiding failure of no sound.

Sound Pressure Level	87±6dB (A) at 1m (3.28ft)
----------------------	---------------------------

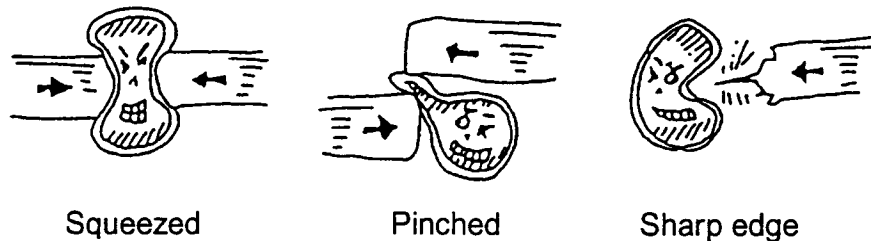
7. HARNESS WIRING

- If a mistake is made in the harness wiring while mounting a body or equipment, the harness wire may be damaged by vehicle vibration while the vehicle is driving, or water, dust, or mud entering into the harness wire. If these occur, a short-circuit or fire may result causing a serious accident.
- Accordingly, be sure to observe the procedures given below for modifications or alterations of the harness wire involved with the body mounting or other actions.

Important Points in Installing Electrical Equipment and Harness Wire

Cautions needed when mounting the body or equipment

When installing U-bolts or related parts of body to chassis frame, be careful that the harness wires are not squeezed, pinched or forced into contact with sharp edges.



Harness wires, battery cables, terminals and electrical equipments (switches, joints) must be easily inspected and serviced after mounting a body.



Junction block

Modifying of the junction block is prohibited because it may be cause of problem such as entering water into the junction block.

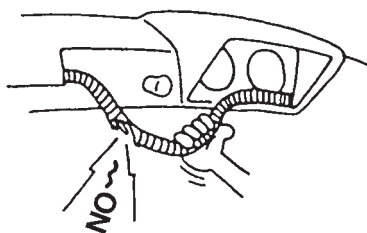
Therefore, please consult HMC if need to handle it.

When installing to fit a alarm for the body, make sure that its sound is clearly different from that of the existing alarm around the driver's seat.

[SPECIFICATION OF EXISTING ALARM AROUND DRIVER'S SEAT]

ALARM TYPE	SPECIFICATIONS
•Low Brake Pressure warning alarm	•Sound pressure:80dB •Frequency:1397Hz 1660Hz 1895Hz 2351Hz
•HYDRAULIC brake motor emergency warning alarm	

Do not pull forcibly the harness wiring when handling it.



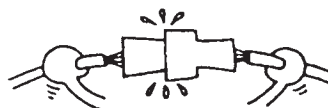
When removing the connector, be sure to hold the male and female parts of the connector by housing.

Do not remove the connector by holding harness wire.

CORRECT

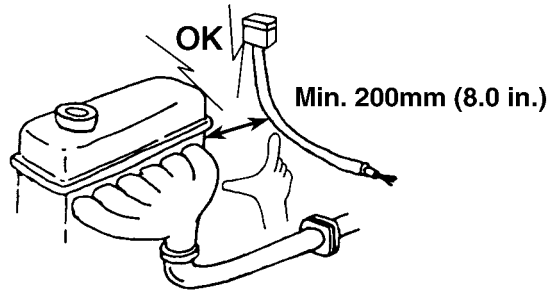


INCORRECT



Secure sufficient clearance with the high-temperature parts.
Measure the temperature whenever required to prevent the problem of heat.

- Don't install a harness wire in the vicinity of the exhaust pipe or muffler or where the harness wire is exposed directly to the exhaust gas.
- Clearance against heat-generating parts; Minimum 200mm (8.0 in.).



- When the clearance is less than 200mm (8.0 in.) with heat-generating parts, provide an insulator to protect harness wire from heat.

NOTE: The allowable temperature of vinyl coating harness wire is 20°C (48°F) to 60°C (140°F).

Addition or Modification of harness wire

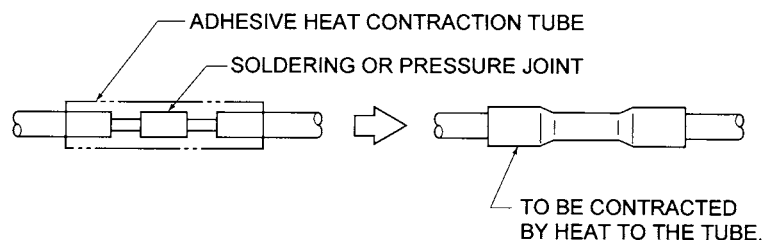
If you intend to extend harness wire, make sure that you use the same size and color of wire as the original.

Make all joint secure by soldering or pressure joints. After connecting, remove burrs and cover completely with insulation material.

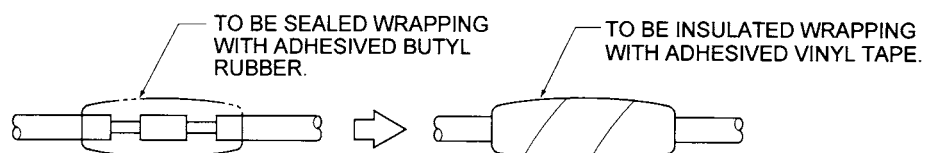
When making joint parts in chassis side wiring, cover joint parts with waterproof sealant, then cover fully with insulating material.

[EXAMPLE FOR WATERPROOFING AND INSULATION]

- Cover joint parts with adhesive heat contraction tube.



- Cover joint parts with butyl rubber.



When soldering, do not use chlorine.

If you intend to move the battery or modify the battery cable layout, do not extend or shorten the battery cable.

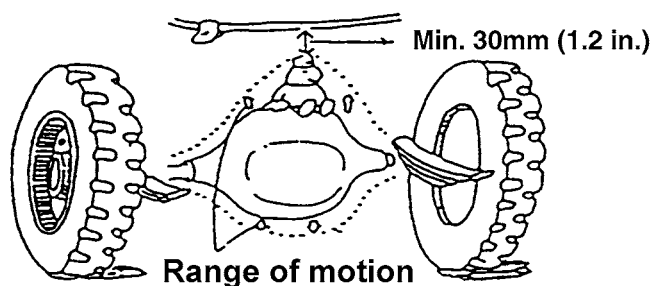
If you move the battery, resistance of the extended harness wire should be below 45milli-Ohms. Otherwise critical burner failure can be brought.

In areas where the battery cables are subject to movement due to relative motion of the starter and the side rail, do not modify the clamping method, positions of clamps, or the amount of slack in the cables.

Clamp harness wire firmly to prevent it from contacting the moving or vibrating parts of the chassis or rear body, and any sharp edges or corners.

[CLEARANCES FOR WIRE]

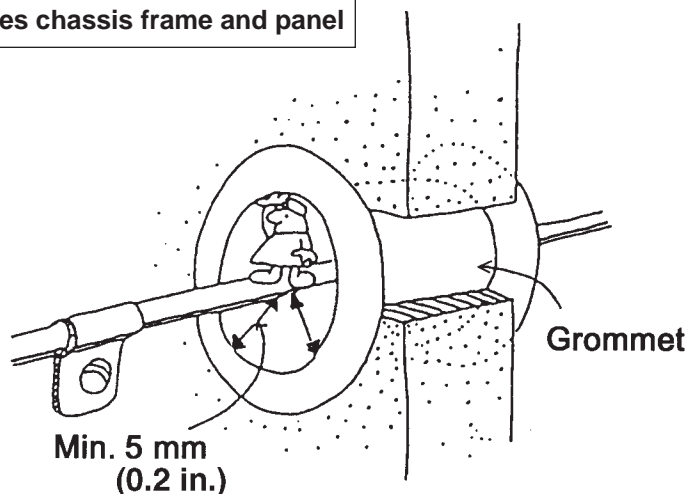
POSITION	CLEARANCES
• Between moving parts and wiring.	At the close point : min. 30mm (1.2 in.)
• Between sharp edges or comers and wiring.	Minimum clearance : min. 10mm (0.4 in.)



Where harness wire passes through the chassis frame or a panel, always use a grommet to prevent damage to the harness wire and potential short circuits.

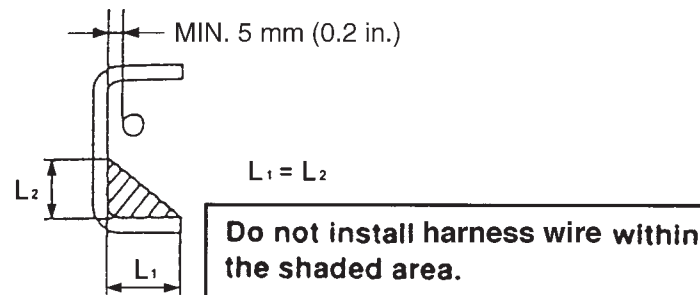
EXAMPLE OF USING GROMMET

Protection of harness wire which penetrates chassis frame and panel



Do not install harness wire where it may be damaged by accumulation of mud or snow, by freezing, or by road debris.
If you must install harness wire in such positions, protect it with metal plates.

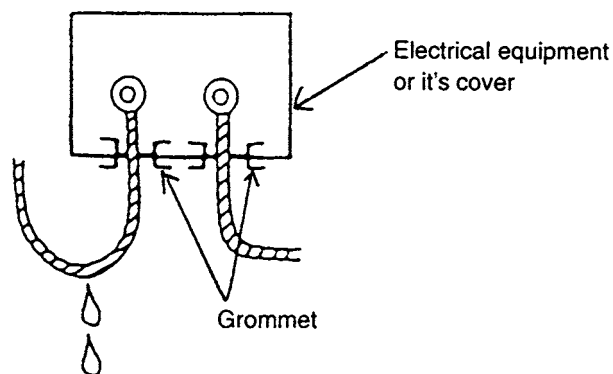
Harness wires should be installed where there is no danger of damage from accumulation of mud, sand, or snow.



When installing a harness wire inside the side rail, place the harness wire along already installed harness wire and do not wire independently along empty spaces.
Also, when wiring under the floor of the body or inside the roof construction, be sure to place the harness wire along the structure frame, use a clip following the indicated interval, carry out water proofing measures and observe the harness wiring rules.

Do not make connections by cutting open the coating of a wire and pulling out the bare wire. This procedure is very dangerous and may damage to other wires.

Plug up the passage hole of a harness wire with a grommet so that water dose not pour in electrical equipment along with a harness wire.
Make a terminal parts higher than the entrance of a harness wire.



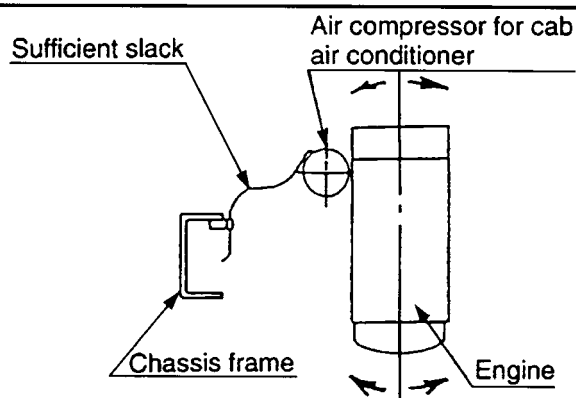
Install harness wire where they are not exposed to dust or water.

Do not install the harness wire on the top or outer side of the chassis frame. In such positions, they may be damaged by being stepped on during body mounting, or by road debris during vehicle operation.

If there is a harness for the chassis already installed close to the wiring area when wiring is done inside the chassis frame, the wiring and taping should be done along this harness.

When installing harness wire for parts of the engine, transmission, etc., install the harness wire in parallel to existing harness wire, and be sure to allow sufficient slack to adsorb any relative movement. Make sure that the harness wire does not touch any other parts.

When installing the harness wire to connect to the power unit, make sure that harness wire has sufficient slack to absorb relative movement.

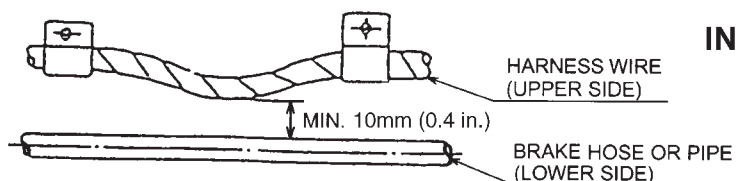
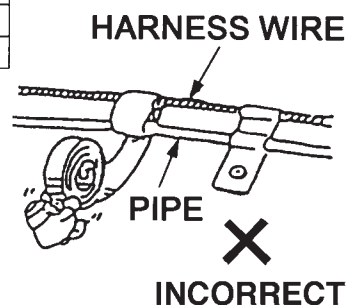


Where harness wire runs parallel to pipes (including rubber hoses, vinyl hoses, and steel pipes) or brake system pipes (including brake hoses and brake pipes), never clamp the harness wire together with these pipes.

[CLEARANCES BETWEEN HARNESS WIRES AND PIPES]

WIRING METHOD	CLEARANCE
Pipe and parallel wire	min. 10mm (0.4 in.)
Crossing point of wire and pipe	min. 20mm (0.8 in.)

Never secure harness wires together with pipes or link rods.



If you move the battery, you may have to temporarily remove the battery cables from the terminals of the battery.

When reinstalling the battery cables, observe the specified torque to avoid damaging the battery terminal.

Unit: kgf-cm (lb-ft)

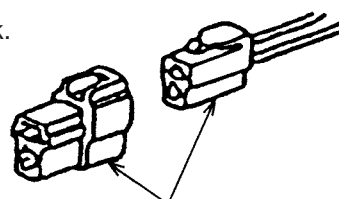
SIZE OF BOLT & NUT	TIGHTENING TORQUE
M8	77±19 (5.8±1.4)
M10	108±10 (8.1±0.7)

If a terminal is damaged, replace it with a new parts.

If you move the battery, make sure it is positioned at least 200 mm (8.0 in.) away from the exhaust system such as muffler and tail pipe.

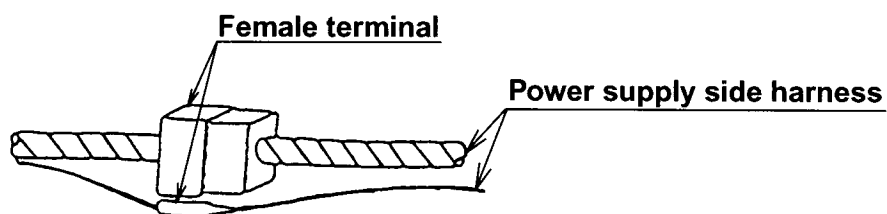
If you must install the battery within 200 mm (8.0 in.) of the exhaust system, protect it with insulating panels.

Always use a connector with lock.



Connector with lock

If you use a plug-type connecting terminal, fit the female terminal into the power supply side. This is due to the connecting terminal detaching which does not allow a short-circuit to occur even if the chassis frame or body construction make contact.

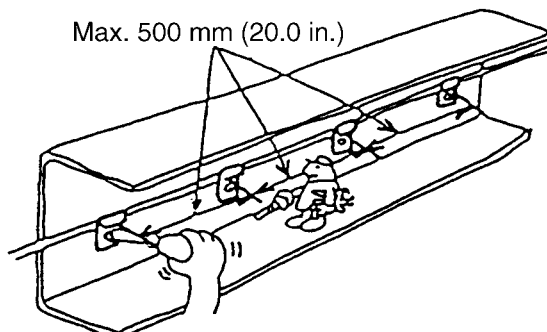


To prevent sagging, contact with other parts or contact with sharp edges or corners, secure all harness wire with clips.

The clips should be spaced at a standard interval of 300~500 mm (12.0~20.0 in.). This interval should be shorter where conditions dictate.

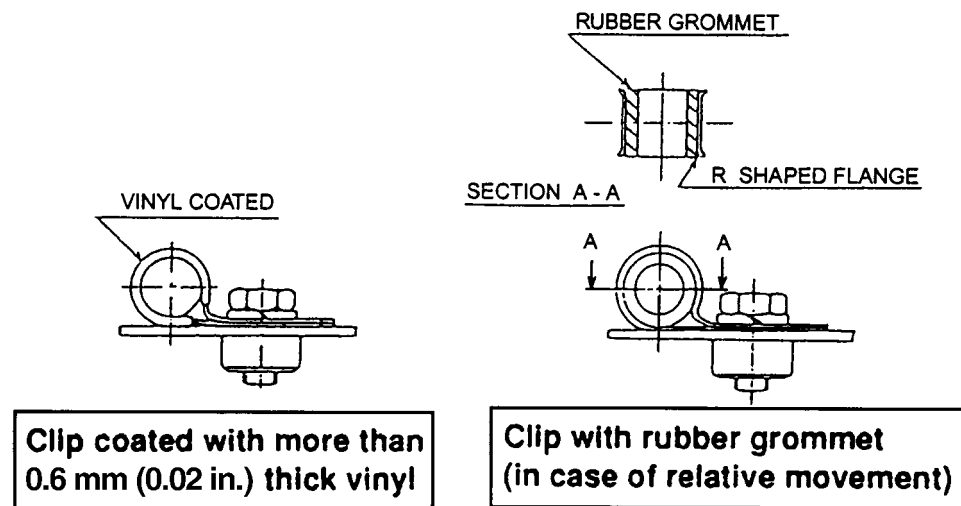
Clipping interval

Max. 500 mm (20.0 in.)



All clips should use resin coating or attached grommets.

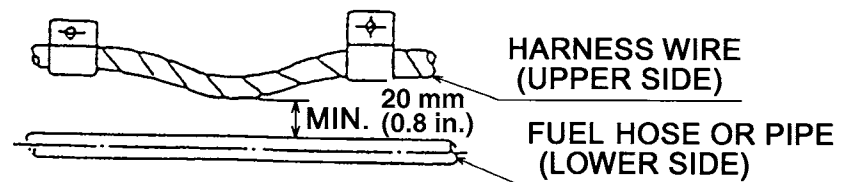
[RECOMMENDED CLIP TYPES]



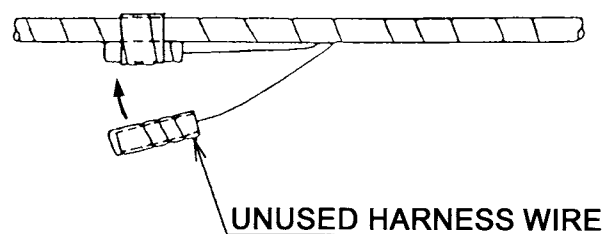
Crocodile clips and adhesive clips should only be used for temporary installation.

Harness wires should be installed above fuel hoses or pipes to avoid fuel dripping onto the harness wire in the event that a fuel leak occurs.

Keep a clearance at least 20 mm (0.8 in.) between the harness wire and fuel hose.

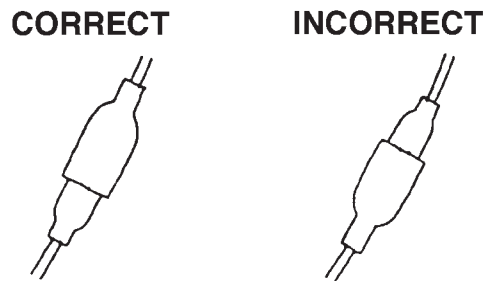


Bundle unused harness wires and their terminals should be bundled with other harness wires and covered with vinyl tape to prevent water from penetrating the terminal.



Mount a cover or a protector to prevent water entry along the harness wire.

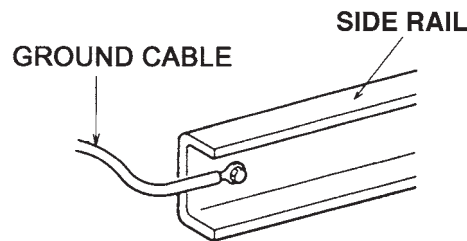
- A water-proof boot should be installed facing down.



A connector, if used at a position exposed to water, should always use water-proof type.

The circuit must be designed that the ground cable of the additional power supply is connected to the negative terminal of the battery.

Install the ground for an additional power supply always on the engine or side rail.



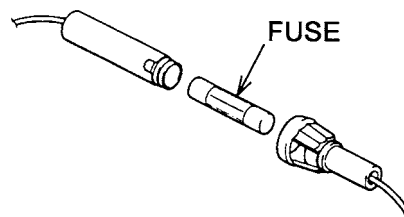
Mount the ground terminal securely in the front of a circular plate terminal.

Fuses of optimum capacity must be used for vehicles considering the operating load and the operating frequency.

Don't add any load from accessories to the existing fuses.

Be sure to insert a fuse in an added harness wire all the time.

Use a vinyl-coated clamp, taking adequate care against short circuit.



- The fuse capacity should be about 1.4 times the load current.

Ex : For the load current of 3A,
 $3 \times 1.4 = 4.2 \text{ A}$

Therefore, the standard fuse capacity of 5A is the best choice.

FUSE RATED CURRENT AGAINST LOAD (Automobile Standard JASO D610-75)

LOAD CURRENT, A	BELOW 7	7 MIN. AND BELOW 11	11 MIN. AND BELOW 14	14 MIN. AND BELOW 21
Fuse rated current, A	10	15	20	30

Ex : 5A fuse can be used for the load current of 3.5A maximum.

When installing additional electronic machine, the circuit must be wired through the fusible link and to be grounded direct to the side rail.

- Be sure to not flow the dormant current in the circuit.

Make sure that the clamp of the harness wire should be added to install as occasion demands to prevent the resonance oscillation of the harness wire due to engine vibration and vehicle's running.

- Take special attention for the clamping that the case to be used harness wire with fusible link.

When installing electric motor consumed bigger load, be sure to use the appropriate size of harness wire.

- If over capacity of spare power circuit, take the power direct from the battery.

Electric Wire Size and Permissible Currents

Wire Size and Currents

When wiring the harness wire together with the body mounting operations, select an appropriate type of harness wire taking into consideration the power consumption capacity (A) of the electrical equipment such will be mounted and the condition of the installation location referring as following table.

CONNECTING FUSE CAPACITY (A)	WIRE TYPE		WIRE SIZE AND LENGTH						
		AMBIENT TEMPERATURE	0.5mm ² (0.0008 in. ²)	0.85mm ² (0.0013 in. ²)	1.25mm ² (0.002 in. ²)	2mm ² (0.0031 in. ²)	3mm ² (0.005 in. ²)	5mm ² (0.008 in. ²)	8mm ² (0.012 in. ²)
5	AV	80°C (176°F)	MAX. 30m (MAX. 98 ft)	—	—	—	—	—	—
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
10	AV	80°C (176°F)	MAX. 15m (MAX. 49 ft)	MAX. 20m (MAX. 66 ft)	MAX. 30m (MAX. 98 ft)	—	—	—	—
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
15	AV	80°C (176°F)	X	MAX. 15m (MAX. 49 ft)	MAX. 20m (MAX. 66 ft)	MAX. 35m (MAX. 115 ft)	—	—	—
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
20	AV	80°C (176°F)	X	X	MAX. 15m (MAX. 49 ft)	MAX. 25m (MAX. 82 ft)	MAX. 40m (MAX. 131 ft)	—	—
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
30	AV	80°C (176°F)	X	X	X	MAX. 5m (MAX. 16 ft)	MAX. 10m (MAX. 33 ft)	MAX. 15m (MAX. 49 ft)	MAX. 25m (MAX. 82 ft)
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
40	AV	80°C (176°F)	X	X	X	MAX. 5m (MAX. 16 ft)	MAX. 9m (MAX. 30 ft)	MAX. 20m (MAX. 66 ft)	MAX. 20m (MAX. 66 ft)
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
50	AV	80°C (176°F)	X	X	X	X	MAX. 7m (MAX. 23 ft)	MAX. 10m (MAX. 33 ft)	MAX. 15m (MAX. 49 ft)
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
60	AV	80°C (176°F)	X	X	X	X	X	MAX. 5m (MAX. 16 ft)	MAX. 10m (MAX. 33 ft)
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
80	AV	80°C (176°F)	X	X	X	X	X	X	MAX. 10m (MAX. 33 ft)
	AVX	100°C (212°F)							
	AEX	120°C (248°F)							
	WIRE TYPE		WIRE SIZE AND PERMISSIBLE CURRENT						
		AMBIENT TEMPERATURE	0.5mm ² (0.0008 in. ²)	0.85mm ² (0.0013 in. ²)	1.25mm ² (0.002 in. ²)	2mm ² (0.0031 in. ²)	3mm ² (0.005 in. ²)	5mm ² (0.008 in. ²)	8mm ² (0.012 in. ²)
	AV	80°C (176°F)	9A	11A	14A	20A	27A	36A	47A
	AVX	100°C (212°F)	8A	10A	13A	17A	24A	33A	43A
	AEX	120°C (248°F)	7A	9A	12A	17A	23A	32A	42A

[NOTE]

- Marked “X” can not be used.
- Marked “—” shows the wire length maximum 50 m (164 ft).

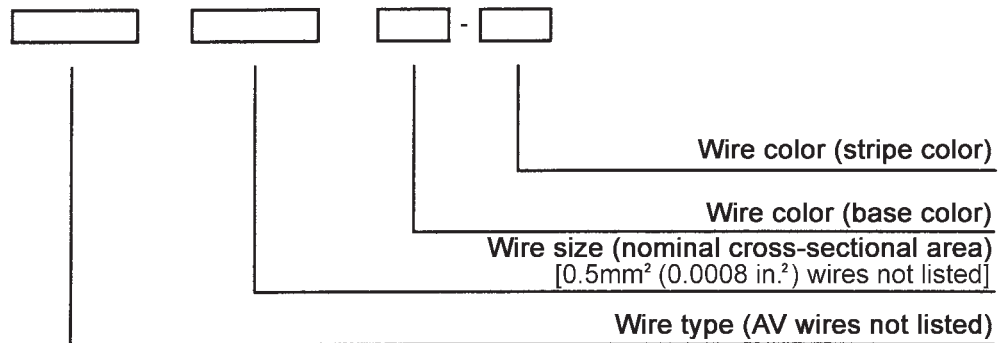
[NOTE]

- Select wires size to suit the power consumption current.
- If you intend to use AEX wire, make sure that you also use heat resistant protective tubing, tape, and clips.
- Where the wire is subject to movement caused by relative motion, use wire of 0.85 mm² (0.0013 in.²) cross section or larger.
- Characteristic of wire.

Wire type	Permissible ambient temperature	Notes
AV wire (low-voltage wire for vehicles.)	max. 80°C (176°F)	Use for normal wiring.
AVX wire (cross-lined vinyl) (heat-resistant low-voltage wire for vehicles.)	max. 100°C (212°F)	Use for wiring in engine room and other areas with high ambient temperature.
AEX wire (cross-lined polyethylene) (heat-resistant low-voltage wire for vehicles.)	max. 120°C (248°F)	

Coding for Electrical Wires

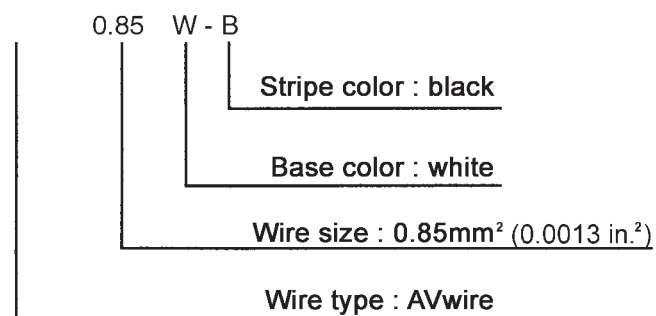
Wire codes represent size and color



Code

Wire color code	Wire color
B	BLACK
BR	BROWN
DG	DARK GRAY
G	GREEN
GR	GRAY
L	BLUE
LG	LIGHT GREEN
O	ORANGE
P	PINK
R	RED
V	VIOLET
W	WHITE
Y	YELLOW

For example



8. BODY BUILDER CAN

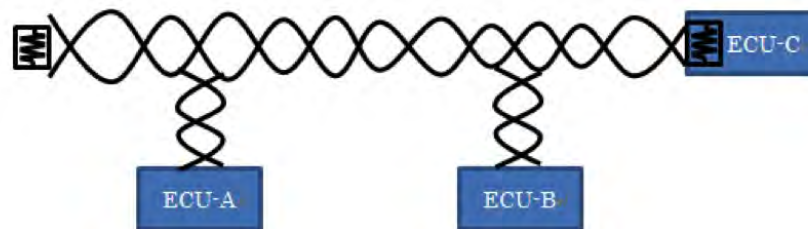
■ Basic configuration of CAN (Controller Area Network)

The CAN communication line consists of two communication lines (CAN - H and CAN - L) twisted in pairs.

It is necessary to have a resistance value of $60\ \Omega$ between CAN - H / L, and in general, a $120\ \Omega$ resistor is connected to both ends of the communication line.

The section between the terminating resistors is called the back bone, and the section branching from this section is called the branch (Stub).

The ECU is connected to the Stub or to the end of the Back Bone in the case of an ECU with a built-in terminating resistor



■ CAN communication method

Since CAN is digital communication, it carries information at 0 and 1, but 0 and 1 are represented by the voltage difference between CAN - H / L lines.

•1(Recessive State)

“CAN - H / L is normally held at a potential of 2.5 V. In case There is no potential difference between H / L lines by this.”

•0(Dominant State)

The CAN - H line is boosted to around 3.5 V, and conversely, the CAN - L line is stepped down to around 1.5 V.

This creates a potential difference between the H / L lines.



At the time of reception, the controller connected to the CAN line detects the voltage difference between the H / L lines, judges 0 and 1, When transmitting, generate voltage difference between H / L lines and express 0, 1,.

CAN configuration

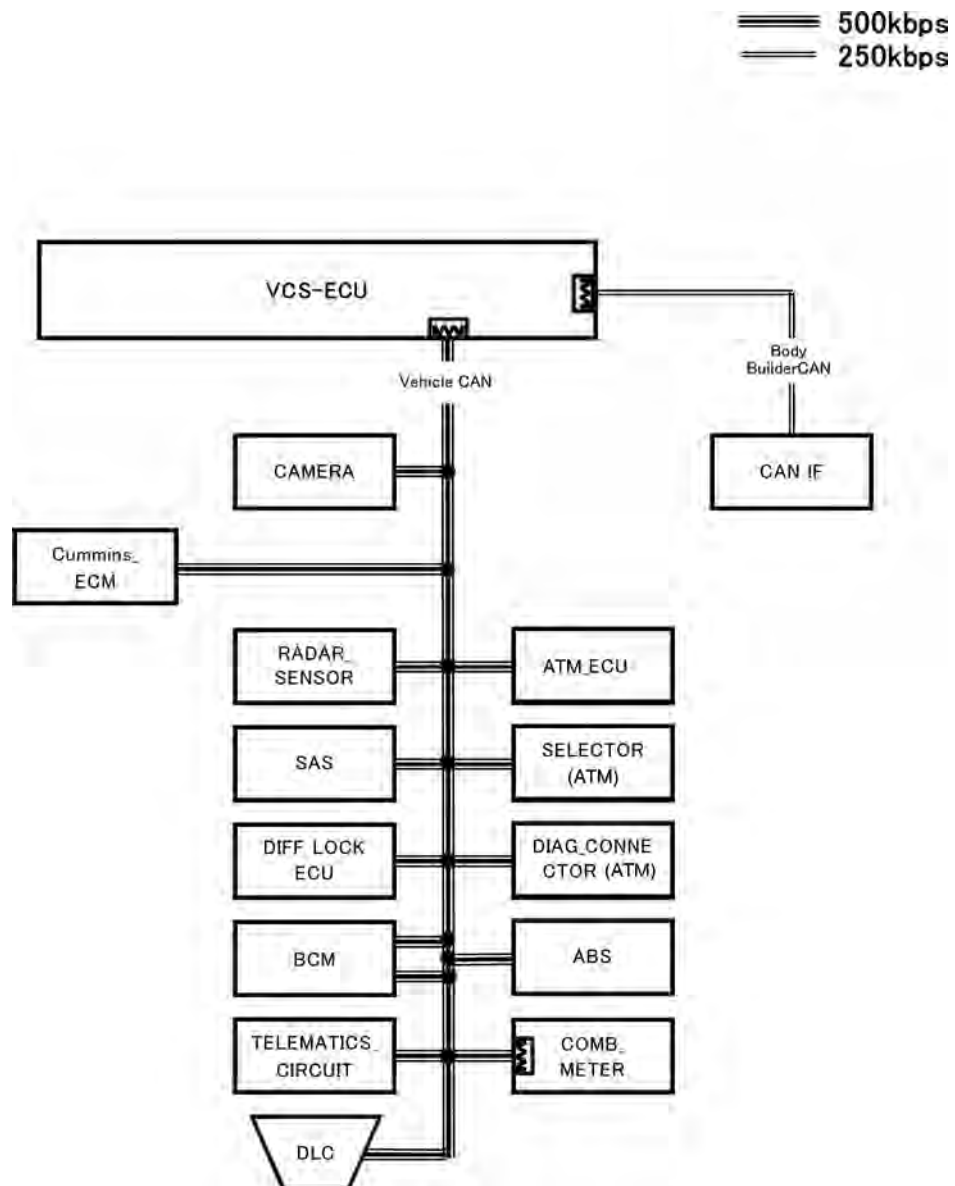
The CAN configuration is as follows

Configuration of CAN

The CAN configuration is as follows

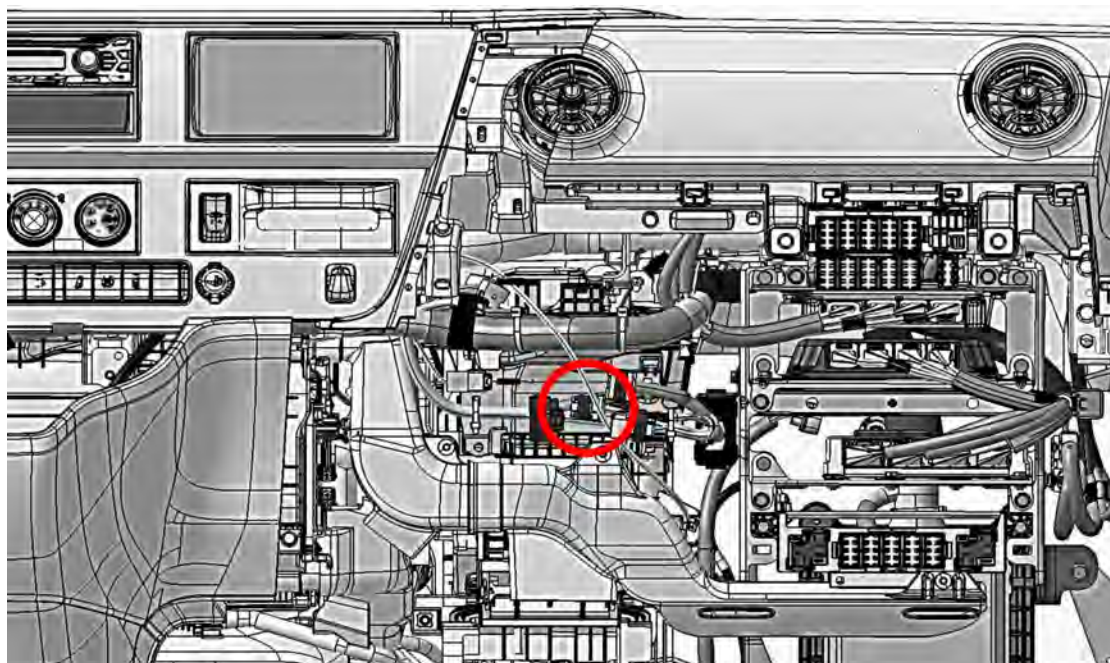
The contents of ENGINE - DIAG and VEHICLE CAN are transferred to Body Builder CAN by VCU.

Also, engine control requests from Body Builders CAN are transferred to VEHICLE-CAN and engine control is implemented.



Mounting Position of the Body builder CAN Connector

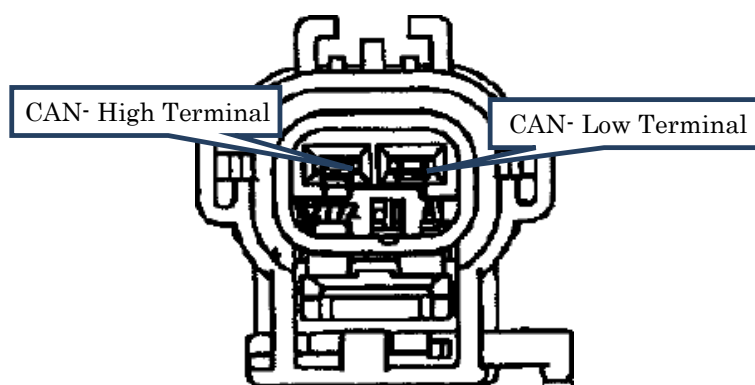
Access to the Body builder CAN line is possible from the connector in the instrument panel rack.



Body builder CAN Connector Type

Part No. S8281-EM050

DELPHI-Part No. : 54200200



Requirements for the Body builder CAN Wiring

In order to secure the CAN communication, please follow the SAE standard (J1939-15: Physical Layer) when wiring the Body builder CAN.

■ The termination resistor

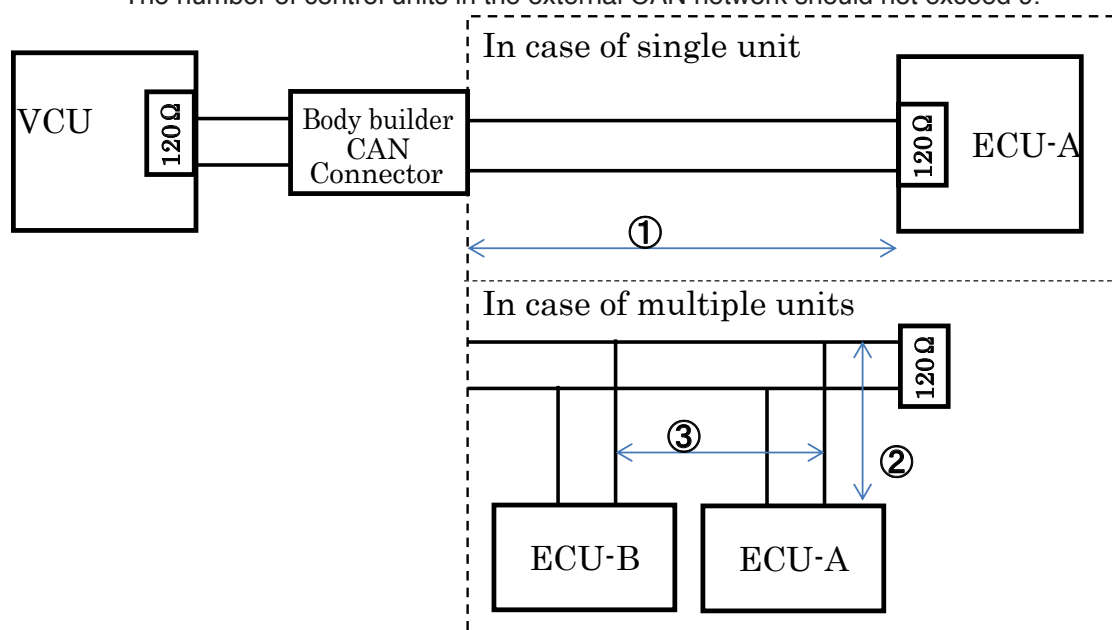
The Body builder CAN line must be connected by using a 120 Ohm termination resistor at each end.

Because one is built in the VCU, please connect another one, or connect an ECU with built-in terminating resistor.

■ Wiring length

In order to minimize the influence of noise, please keep the wiring at the minimum length.

- Wire length from terminating the Body builder CAN connector to terminating resistor / terminating resistor built-in ECU please keep the length within 30 m (98.4252ft) - ①
- When branching off from the Body builder CAN line and connecting the ECU, please keep the line length within 3 m (9.84252ft). - ②
- When connecting multiple branch lines to the Body builder CAN line, please leave a space of 0.1 m (0.328084ft) or more. - ③
- The number of control units in the external CAN network should not exceed 9.



Body builder CAN Communication Specification

The signals that can be obtained from the Body builder CAN are as follows.

Please refer to the SAE standard (J1939-71 Vehicle Application Layer) for details of the signal.

Note:

- The baud rate of the Body builder CAN is 250 k.
- Since communication contents are not guaranteed in the following states, please avoid communication on the Body builder CAN.
- When the key switch position is other than ON.
- At the start of the engine (when the starter motor is operated)

Data Name	Identifier(Hex)	Transmission Cycle (msec)	Byte	Bit	Signal Name	Set Value
ETC1	0CF00203	10	Electric transmission control #1			
			1	6-5	Transmission Shift In Process	00b:Shift is not in process 01b:Shift in process 11b:Not available
				4-3	Transmission Torque Converter Lockup Engaged	00:Transition is not in process 01:Transition is in process 11:Not available
				2-1	Transmission Driveline Engaged	00b:Driveline disengaged 01b:Driveline engaged 11b:Not available
			2-3	Transmission Output Shaft Speed	0. 125rpm/bit (0~8031. 875rpm)	
			6-7	Transmission Input Shaft Speed	0. 125rpm/bit (0~8031. 875rpm)	
EEC2	0CF00300	50	Electric engine control # 2			
			1	2-1	Accelerator Pedal 1 Low Idle Switch	00:Accelerator pedal 1 not in low idle condition 01:Accelerator pedal 1 in low idle condition 10:Error 11:Not available
			2		Accelerator Pedal Position	0.4%/bit (0~100%)
			3		Engine Percent Load At Current Speed	1%/bit (0~125%)
EEC1	0CF00400	20	Electric engine control # 1			
			1	4-1	Engine Torque Mode	0000:No request
						0001:starter active, gear not engaged
						0010:Cruise Control Active
						0011:P.T.O. Governor Active
						0100:Speed limiter Active
						0101:ASR control Active
						0110:T/M control Active
						0111:ABS control Active
						1000:Torque limit State
						1001:High speed governor Active
						1010:Brake system Active
			1011:Remote engie accelerator operation Active			
1110:Other						
1111:Not available						
2		Driver's Demand Engine - Percent Torque	1%/bit(-125%~125%)			
4-5		Engine Speed	0. 125rpm/bit(0~8031. 875rpm)			
6		Source Address of Controlling Device for Engine Control	Device (Souce Address) status controlling engine			
7	4-1	Engine Starter Mode	0000:start not requested			
			0100:starter inhibited due to engine already running			
			1000:starter inhibited due to starter over-temp			
			1100:starter inhibited - reason unknown			
EBC1	18F0010B	100	Electric brake control # 1			
			1	6, 5	Anti-Lock Braking (ABS) Active	00b:ABS passive but installed 01b:ABS active 11b:Not available
ETC2	18F00503	100	Electric transmission control #2			
			1		Transmission Current Gear	1 gear / bit (-125~+125)
			2, 3		Transmission Actual Gear Ratio	0. 001/bit (0~64. 255)
			4		Transmission Selected Gear	1 gear / bit (-125~+125)
			5, 6		Transmission Requested Range	ASCII code(P,R,D1,D2...etc)
VDHR	18FEC100	1000	High Resolution Vehicle Distance			
			1-4		High Resolution Total Vehicle Distance Total Vehicle Distance (High Resolution)	Accumulated distance traveled by the vehicle during its operation. (5 m/bit)
HOURS	18FEE500	2000	Engine Hours, Revolutions			
			1-4		Total Engine Hours Total ECU Run Time	Accumulated time of operation of engine. (0.05 h/bit)

Data Name	Identifier(Hex)	Transmission Cycle (msec)	Byte	Bit	Signal Name	Set Value
TD	18FEE617	1000	Time / Date			
			1		Seconds	00h~EFh [0.25 sec / bit] (display range: 0 to 59 seconds)
			2		Minutes	00h~3Bh [1 minute / bit] (0 to 59 minutes)
			3		Hours	00h~17h [1 hour / bit] (0 to 23 o'clock)
			4		Month	01h~0Ch [Month / bit] (display range: January to December)
			5		Day	01h~7E7Ch [0.25 days / bit] (display range: 1 to 31 days)
			6		Year	00h~FAh [1 year / bit] (1985 to 2235)
LFC	18FEE900	2000	Fuel Consumption (Liquid) 1			
			5-8		Engine Total Diesel Fuel Demand	Accumulated amount of fuel used during vehicle operation. See SPN 5054 for alternate resolution. (0.5 l/bit)
ET1	0x18FEEE00	1000	Engine Temperature 1			
			1		Engine Coolant Temperature	1°C/bit (-40~210°C) OFFSET: -40°C
CCVS	18FEF100	100	Cruise control / vehicle speed			
			1	4, 3	Parking Brake Switch	00b: Parking brake not set 01b: Parking brake set 11b: Not available
			2, 3		Wheel-Based Vehicle Speed	1/256Km/h/bit (0~250.996Km/h)
			8, 7		Clutch Switch	00b: Clutch pedal released 01b: Clutch pedal depressed 11b: Not available
			6, 5		Brake Switch	00b: Brake pedal released 01b: Brake pedal depressed 10b: Error 11b: Not available
			4, 3		Cruise Control Enable Switch	00b: Cruise control disabled 01b: Cruise control enabled 11b: Not available
			2, 1		Cruise Control Active	00b: Cruise control switched off 01b: Cruise control switched on 11b: Not available
			8, 7		Cruise Control Accelerate Switch	00b: Cruise control activator not in the position "accelerate" 01b: Cruise control activator in position "accelerate" 11b: Not available
			6, 5		Cruise Control Resume Switch	00b: Cruise control activator not in the position "resume" 01b: Cruise control activator in position "resume" 11b: Not available
			4, 3		Cruise Control Coast (Decelerate) Switch	00b: Cruise control activator not in the position "coast" 01b: Cruise control activator in position "coast" 11b: Not available
			2, 1		Cruise Control Set Switch	00b: Cruise control activator not in the position "set" 01b: Cruise control activator in position "set" 11b: Not available
			8-6		Cruise Control States	000b: Off/Disabled 001b: Hold 010b: Accelerate 011b: Decelerate 100b: Resume 110b: Accelerator Override
			5-1		P.T.O. Governor State	00000b: Off/Disabled 00001b: Hold
TRF1	18FEF803	1000	Transmission Fluids 1			
			5-6		Transmission Oil Temperature1	0.03125 deg C/bit, -273deg C offset
ETC5	1CFEC327	100	Electronic Transmission Controller 5			
			2	4-3	Transmission Neutral Switch	00: Off 01: On 10, 11: Not available

Engine Control from Body builder CAN

Similar to the old Power Take Off (P.T.O.) accelerator signal, you can control the engine from the Body builder CAN.

Note:

- If you need to customize the RPM control, please consult with HMC or Hino authorized dealer for any appropriate advice.
- When the engine control request from vehicle driveline component such as ASR or CMS (Collision Mitigation system) and CAN message from body equipment are overlapped, the request from vehicle driveline component may be given priority over the message from body equipment. In that case, take measures to suspend the request from vehicle side only the condition above mentioned for controlling Engine properly from body equipment.
- Since communication contents are not guaranteed in the following states, please avoid communication on the Body builder CAN.

When the key switch position is other than ON.

At the start of the engine (when the starter motor is operating)

- When carrying out engine control from the Body builder CAN, please send it to the Body builder CAN in the following form.

Data Name	Identifier(Hex)	Transmission Cycle	Note
TSC1	0C000007	10ms	

Byte	Bit	Signal Name	Set Value
1	8-7	Not Used	b11
	6-5	Override Control Mode Priority	b11
	4-3	Engine Requested Speed Control Conditions	b00 Transient Optimized for driveline disengaged and non-lockup conditions b01 Stability Optimized for driveline disengaged and non-lockup conditions b10 Stability Optimized for driveline engaged and/or in lockup condition 1 b11 Stability Optimized for driveline engaged and/or in lockup condition 2
	2-1	Engine Override Control Mode	b00 -Torque control b00 -Override disabled b01 -Speed control b11 -Torque limit control
2-3		Engine Requested Speed/Speed Limit	0.125 rpm per bit (0~8031.875rpm)
4		Engine Requested Torque/Torque Limit	1 %/bit, 125% Offset
5-7		Not Used	
8	8-5	Message Checksum	If used, the message checksum is calculated using the first 7 data bytes, the message counter and the bytes of the message identifier. It is calculated as follows: Checksum = (Byte1 + Byte2 + Byte3 + Byte4 + Byte5 + Byte6 + Byte7 + (message counter & 0x0F) + message ID low byte + message ID mid low byte + message ID mid high byte + message ID high byte) Message Checksum = (((Checksum >> 6) & 0x03) + (Checksum >>3) + Checksum) & 0x07 Should be set to 0xF if not used.
	4-1	Message Counter	If used, the message counter will count from 0 to 7 and then wrap every transmission. Should be set to 0xF if not used.

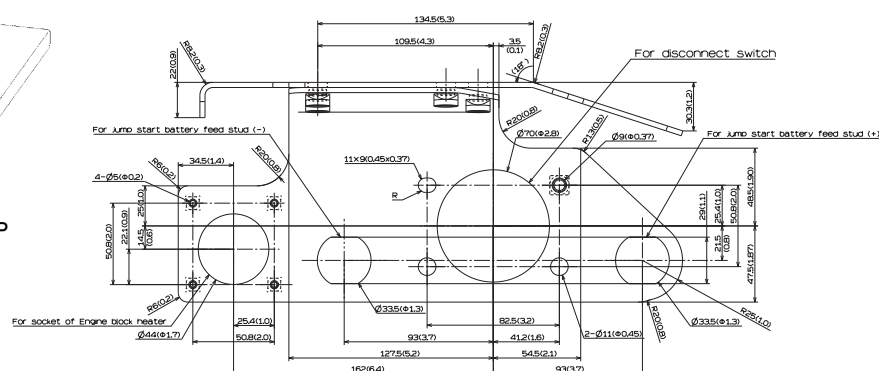
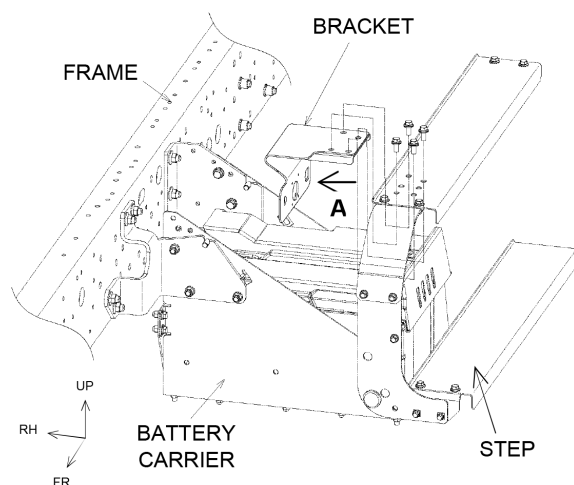
Note: Using either the message checksum or the message counter is not allowed. When using the message checksum and message counter, they shall be used together and both shall be set-up with valid values.

9. INSTALLATION OF THE BATTERY DISCONNECT SWITCH

When installing the battery disconnect switch, be sure to observe the following procedures by own responsibility of Body and Equipment manufacturers.

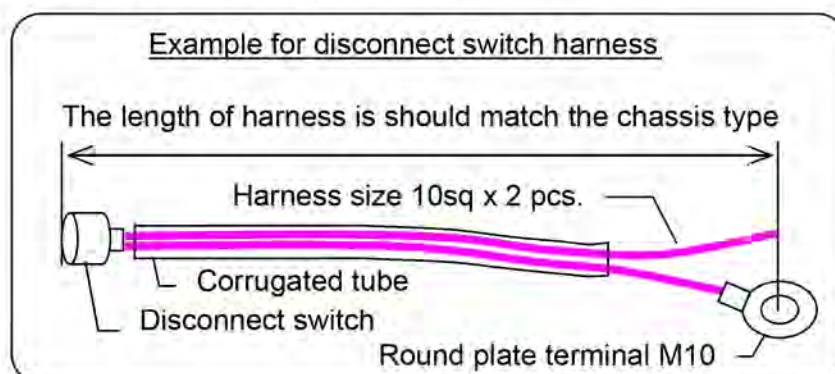
- Body and Equipment Manufacturers should prepare the battery disconnect switch, harness and other necessary parts for installing battery disconnect switch.
- The bracket for installing disconnect switch is installed on chassis.
See the figure below for detail of installation position.

Unit : mm(in.)

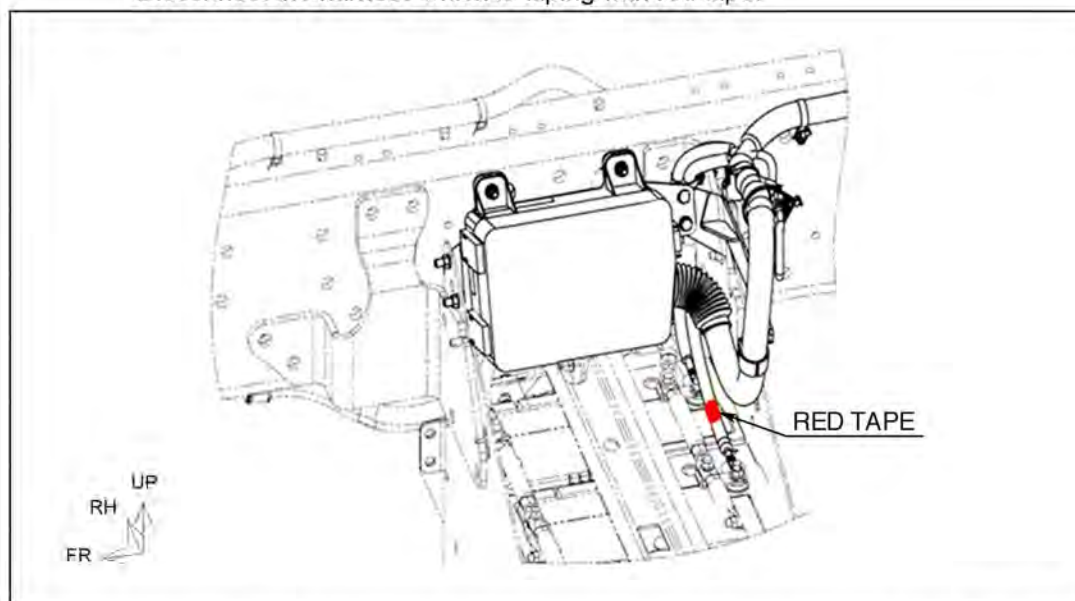


VIEW A

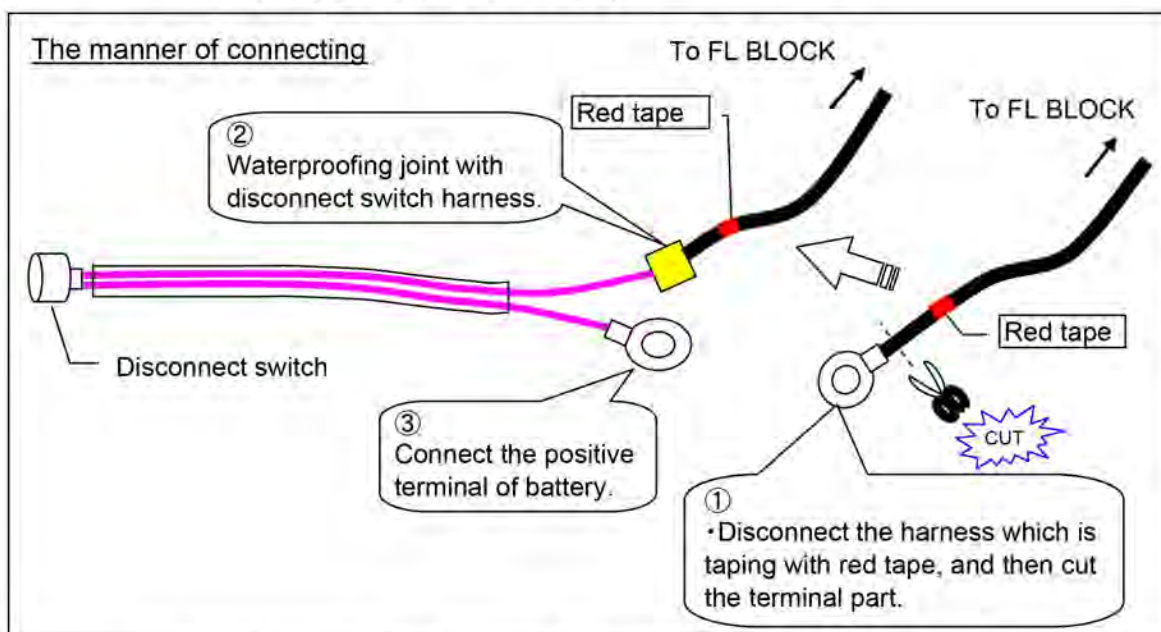
- Should make a harness as figure below.



- Turn the starter switch to "LOCK" position, and should wait at least 10 minutes, then disconnect the negative terminal of battery.
- Disconnect the harness which is taping with red tape.



- Install the disconnect switch harness between the positive terminal of battery and harness which is taping with red tape. See below the manner of connecting.
Tightening torque of terminal nut : $108 \pm 10 \text{ kgf} \cdot \text{cm}$ ($8.1 \pm 0.7 \text{ lb} \cdot \text{ft}$)
Should use 10 sq or more for harness.
The joint parts needs waterproofing.



- Should tighten the earth cable with negative terminal of battery.

[Note]

- The power circuit is cut off by this alteration but after-run circuit of Engine ECU is worked for keeping function of Engine ECU.
- Refer to "WELDING WORK" and "DEF- SCR SYSTEM" in Chapter 4 when welding operation, etc.

10. INSTALLATION OF FLASHER CUTTING

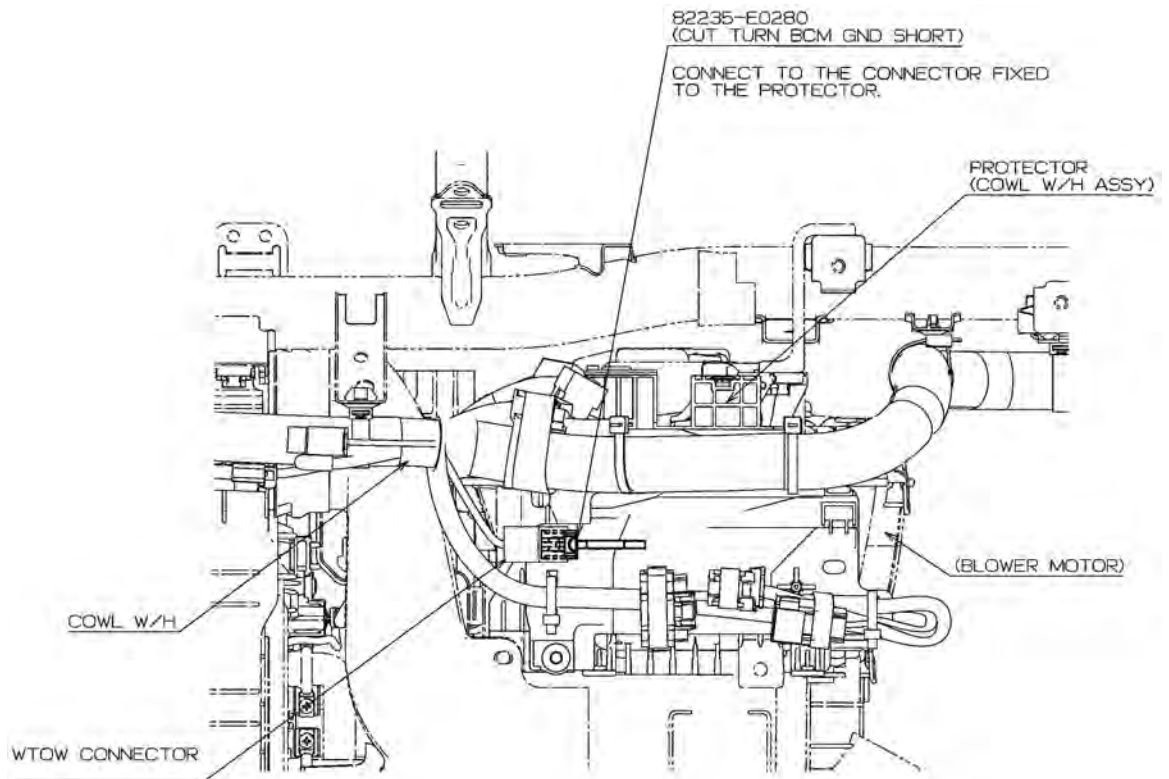
Be sure to observe the following instructions when separating rear stop lamp and turn signal lamp.

Add a short pin connector for flasher cutting

- Prepare the short pin below which is available as a spare parts.
Part No. :82235-E0280
- Turn the starter switch to “LOCK” position, wait at least 10 minutes, and disconnect the negative terminal of battery before start work.
- The short pin connector connect to the connector which fixed to the protector.
(See the figure below.) ①
- The turn stop dual output line of the BCM switches to the stop single output line of the BCM by connecting short pin connector to the connector. ②

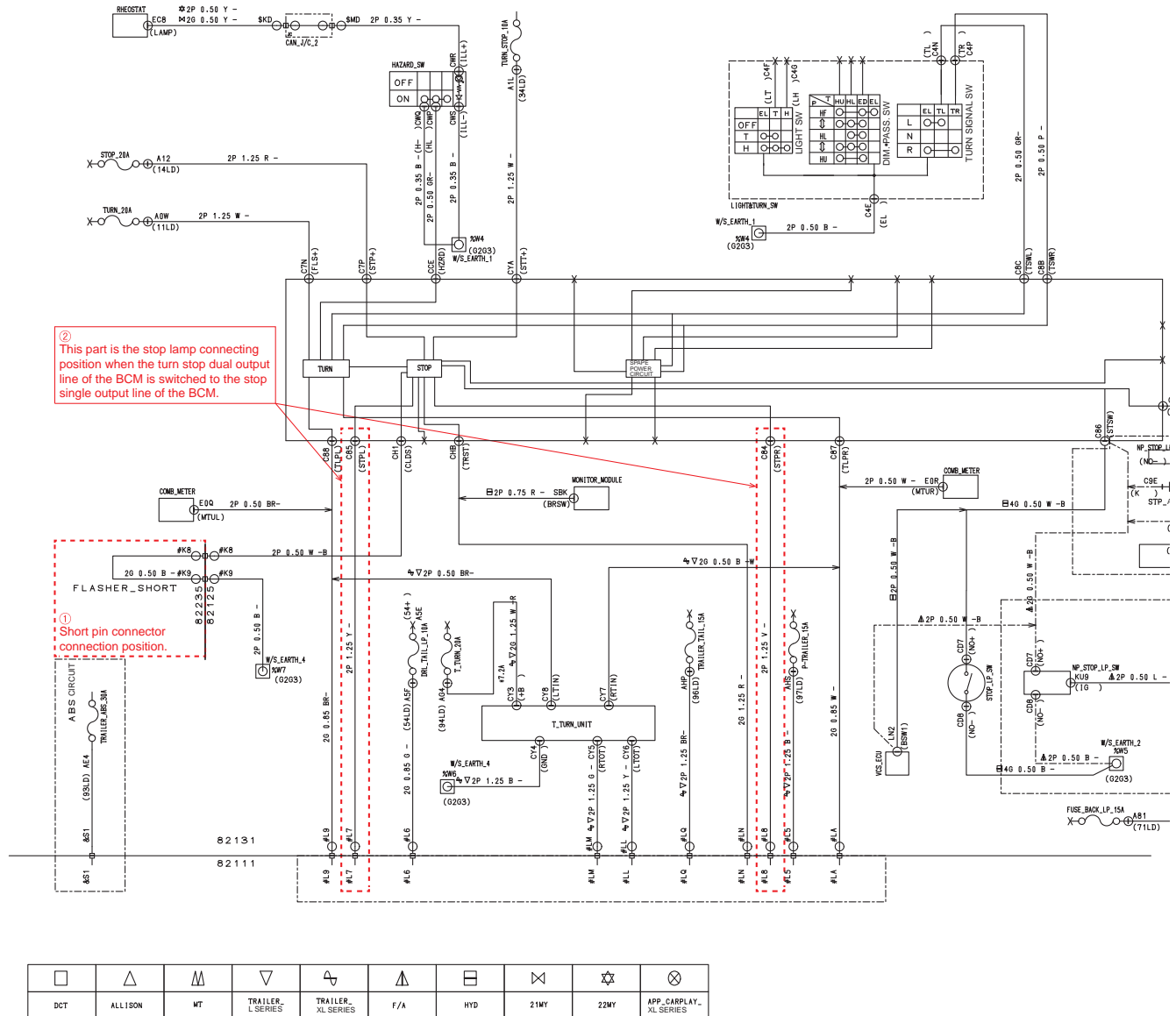
[NOTE]

- Make sure that the short pin connector is connected to the connector.
If the connector is not connected sufficiently, a circuit will return to the original condition.



<Summary Circuit>

BODY CONTROL CIRCUIT_CAB



[CAUTION]

The rear turn lamp connection will be cut out after this modifying, therefore, the following additional modifying is required.

Method of Taking Out The Rear Turn Lamp Circuit.

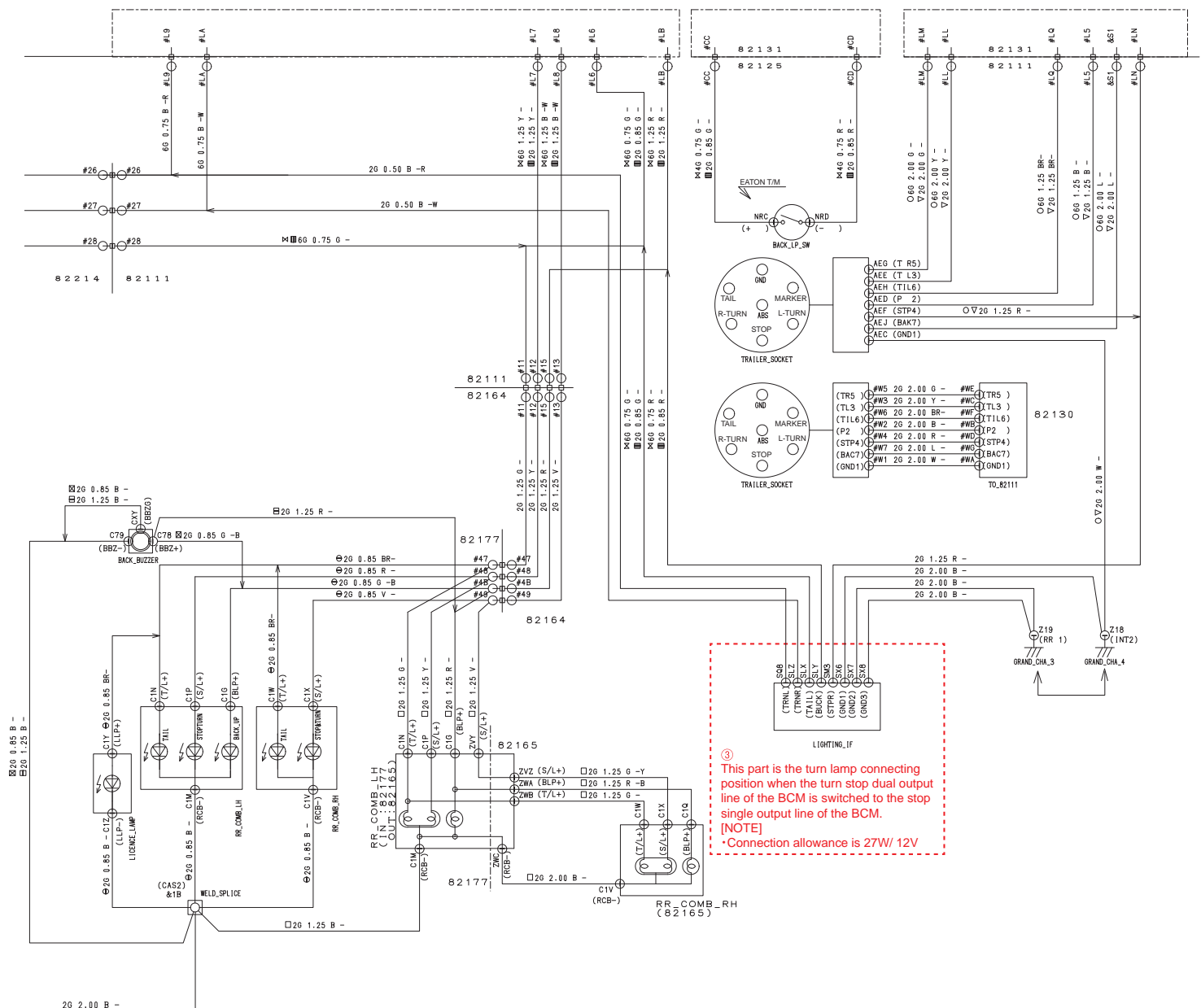
- When usage electric current value of each terminal of right and left is 27W/12V or less, connect to the turn signal switch circuit of spare chassis connector. ③
See “Connector Mark G”, in Chapter 7 for details connector.
(In this case, it can be connected directly to the circuit.)

[NOTE]

- Turn the starter switch to “LOCK” position, wait at least 10 minutes, and disconnect the negative terminal of battery before start work.
- Confirm that the stop lamp and the turn lamp work properly after work.
- Need to start the engine after the work when change the BCM control.

<Summary Circuit>

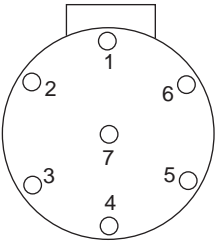
BODY CONTROL CIRCUIT_CHASSIS



11. TRAILER ELECTRICAL CONNECTION

CONNECTOR TYPE : SAE TYPE, 7- CONDUCTOR ELECTRICAL CONNECTION

• JUMPER CABLE

Form for plug of jumper cable	Number of conductor	Lamps and Signal circuits	Max. capacity
 <p><u>FRONT VIEW</u></p>	1	Earth	-
	2	CLEARANCE, SIDE MARKER	10.5A
	3	Turn signal lamp (LH) Hazard lamp (LH)	4.5A
	4	Stop lamp	5A
	5	Turn signal lamp (RH) Hazard lamp (RH)	4.5A
	6	Tail lamp License plate lamp	10.5A
	7	ABS POWER	15A

EXAMPLE : TRAILER SOCKET BRACKET HOLE AND AIR FITTING HOLE

Unit: mm (in.)

