

Body/equipment mounting directives

E-CANTER

Australia



Body/equipment mounting directives FEB

Common Section

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1 Introduction

MITSUBISHI FUSO TRUCK & BUS CORPORATION, as the manufacturer of MITSUBISHI FUSO vehicles, publishes this body/equipment mounting directive to provide body manufacturers with important technical information about the basic vehicle. This information must be observed by the body manufacturer in the production of bodies and equipment, fittings and modifications for MITSUBISHI FUSO vehicles.

Due to the large number of body manufacturers and body types, MITSUBISHI FUSO TRUCK & BUS CORPORATION cannot take into account all the possible modifications to the vehicle, e.g. performance, stability, load distribution, center of gravity and handling characteristics, that may result from the design of attachments, bodies, equipment or modifications. For this reason, MITSUBISHI FUSO TRUCK & BUS CORPORATION can accept no body manufacturer liability for accidents or injuries sustained as a result of such modifications to the vehicles if such modifications have a negative impact on the overall vehicle. Accordingly, MITSUBISHI FUSO TRUCK & BUS CORPORATION will only assume liability as vehicle manufacturer within the scope of the design, production and instruction services which it has performed itself.

The body manufacturer is bound to ensure that its bodies and equipment, fittings and modifications are themselves not defective, nor capable of causing defects or hazards to the overall vehicle. If this obligation is violated in any way, the body manufacturer shall assume full product liability. The body/equipment mounting directives enable MITSUBISHI FUSO TRUCK & BUS CORPORATION to instruct the body manufacturer about important aspects that must be observed when mounting its bodies and equipment, fittings and modifications.

These body/equipment mounting directives are primarily intended for the professional manufacturers of bodies, equipment, fittings and modifications for our vehicles. As a result, these body/equipment mounting directives assume that the body manufacturer has suitable background knowledge. If you intend to mount attachments, bodies and equipment on or carry out modifications to our vehicles, please be aware that certain types of work (e.g. welding work on load-bearing components) may only be carried out by qualified personnel. This will avoid the risk of injury while also ensuring that the degree of quality required for the attachments, bodies, equipment and modifications is given.



1.1 The aim of these directives

These directives serve as instructions for the manufacture of attachments, bodies, equipment and modification to other make bodies and major assemblies. These directives are divided into 10 interlinked chapters to help you find the information you require more quickly:

- 1 Introduction ▷ 1.1
- 2 General ▷ 2.1
- 3 Planning of bodies ▷ 3.1
- 4 Technical threshold values for planning ▷ 4.1
- 5 Damage prevention ▷ 5.1
- 6 Modifications to the basic vehicle ▷ 6.1
- 7 Construction of bodies ▷ 7.1
- 8 Electrics/electronics ▷ 8.1
- 9 Calculations ▷ 9.1
- 10 Technical data ▷ 10.1

Appendix

Index

Additional information

The index, in PDF format, is linked to help you find the information you require quickly.

Make absolutely sure that you observe the technical threshold values selected in Section 4 as planning must be based on these values.

Section 6 "Modifications to the basic vehicle" and Section 7 "Construction of bodies" represent the main source of technical information contained in these body/equipment mounting directives.

1 Introduction

1.1 The aim of these directives

Risk of accident

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the Owner's Handbook, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

The instructions listed herein must be observed in full to maintain the operational reliability and road safety of the chassis and for observance of material defect claims.

Illustrations and schematic drawings are examples only and serve to explain the texts and tables.

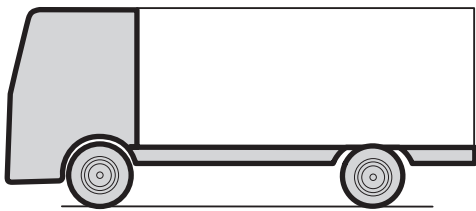
References to regulations, standards, directives etc. are given in keywords and serve for information only.

Additional information is available from an authorized MITSUBISHI FUSO dealer.

Your

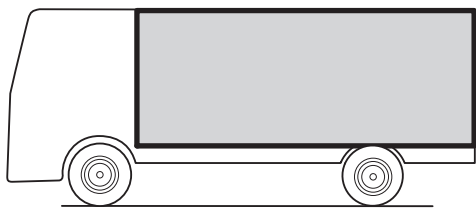
MITSUBISHI FUSO TRUCK & BUS CORPORATION

The illustrations below explain the difference between "Basic vehicle" and "Body":



N00.00-3192-00

Basic vehicle



N00.00-3193-00

Body



1.2 Symbols

The following symbols are used in these directives:



Risk of accident

A warning draws your attention to possible risks of accident and injury to yourself and others.



Environmental note

An environmental note gives you tips on the protection of the environment.



Property damage

This note draws your attention to possible damage to your vehicle.



Additional information

This note points out any additional information.



This symbol indicates the item on which you will find further information on the subject. These items are cross-linked in the PDF file.



1.3 Vehicle safety



Risk of accident and injury

The use of parts, assemblies or conversion parts and accessories which have not been approved may jeopardize the safety of the vehicle.

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the Owner's Handbook, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

Official acceptance by public testing bodies or official approval does not rule out safety hazards.

In many countries, parts that make extensive changes to the vehicle can invalidate the general operating permit. Specifically, this concerns parts which:

- change the vehicle type approved in the general operating permit
- could endanger road users
- could adversely affect noise levels



Additional information

Make absolutely sure that you comply with national registration regulations as attachments, bodies, equipment on or modifications to the vehicle will change the vehicle type approved and may invalidate the general operating permit.

Notes on vehicle safety

MITSUBISHI FUSO recommends

using appropriate parts only for each particular vehicle model.



1.4 Operational safety



Risk of accident

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the Owner's Handbook, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

Work incorrectly carried out on electronic components and their software could prevent this equipment from working correctly. Since the electronic systems are networked, this might also affect systems that have not been modified.

Malfunctions in the electronic systems could seriously jeopardize the operating safety of the vehicle.



1.5 Accident prevention

Observe the requirements and precautions set out in this manual when carrying out body-building work or modification work.

The body, the attached or installed equipment and any modifications must comply with the applicable laws and ordinances as well as work safety or accident prevention regulations, safety rules and accident insurer requirements.

All technical means shall be used to avoid operating conditions that may be unsafe or liable to cause an accident.

All national laws, directives and registration requirements must be complied with.

The manufacturer of the attachment, body, equipment or conversion or the device manufacturer is responsible for compliance with these laws and regulations.

1.6 Note on copyright

All the text, illustrations and data contained in these body/equipment mounting directives are protected by copyright.

If you have any questions, contact the department responsible ▷ 2.1.

2.1 Technical advice and contact persons

2.1 Technical advice and contact persons

Please log in from the following BODYBUILDER PORTAL URL and contact us.



2.2 Product safety

Both the vehicle manufacturer and the body manufacturer must always ensure that they introduce their scopes into the market in a safe condition and that third parties are not at risk of any safety hazard. If this is not adhered to they may be subject to civil, criminal and public law consequences. Every manufacturer is liable for the products it manufactures.

From this, it follows that the vehicle body/conversion manufacturer therefore also bears responsibility for the following:

- the operating and road safety of the body
- the operating and road safety of parts and modifications
- testing and maintaining the operating and handling safety of the vehicle after the body/equipment is mounted (the body and/or equipment must not have a negative effect on the driving, braking or steering characteristics of the vehicle)
- influences of parts on or modifications to the chassis
- consequential damage resulting from the body, attachment, equipment or modification
- consequential damage resulting from retrofitted electrical and electronic systems
- maintaining the operational reliability and freedom of movement of all moving parts of the chassis after the body/equipment is mounted (e.g. axles, springs, propeller shafts, steering, transmission linkage, etc.) even in the case of diagonal torsion between the chassis and the bodies

Be careful of the following points when carrying out body-building or modification work.

Safety design

- Securing adequate safety and reliability, and preparing safety devices (design which is fail-safe and takes account of misoperation and misuse, safety evaluation)
- Storing technical material, drawings and documents during development

Manufacturing quality

- Manufacturing according to the drawings in order to prevent errors, missing parts and defective assembly, and secure high manufacturing quality
- Implementing a quality confirmation inspection, and storing the records of the inspection
Use the post-body-building/modification inspection sheet.

Preparing an instruction manual and warning indications

- Instruction manual
Concrete indication of the effect of incorrect operation on the human body, the vehicle, and other locations (elimination of indications that are likely to cause misunderstanding, and also ambiguous expressions)
- Warning indications
To ensure that the vehicle is used as safely as possible, warning indications must use expressions that are easy to understand and letters that are large enough to read easily, include pictures, and be applied to locations that are readily visible to the driver.

2.3 Ensuring traceability

Hazards in your implement/body which become known after delivery may necessitate supplementary measures in the market (customer notification, warnings, recalls). In order to make these measures as efficient as possible, your product must be traceable after delivery.

For this purpose and to enable the Federal Office for Motor Vehicles' Central Vehicle Register (Zfzr) or comparable registers abroad to be used for determining which owners are affected, we advise you to promptly file the serial number/identification number of your equipment/add-on part linked to the vehicle identification number for the truck in your databases.

Similarly, it is also advisable to store the addresses of your customers for this purpose and to grant subsequent purchasers the opportunity to register.



2 General

2.4 Mitsubishi three diamonds and Fuso emblem

2.4 Mitsubishi three diamonds and Fuso emblem

The Mitsubishi three diamonds and Fuso emblem are owned or controlled by MITSUBISHI FUSO.

They must not be removed or affixed in another position.

Mitsubishi three diamonds and Fuso emblems supplied separately must be attached at the points specified by MITSUBISHI FUSO.

Overall appearance of the overall vehicle

If the vehicle fails to comply with the appearance and quality standards as required by MITSUBISHI FUSO TRUCK & BUS CORPORATION, the trademarks such as the Mitsubishi three diamonds and Fuso emblem must be removed.

Third-party trademarks

- may not be affixed next to MITSUBISHI FUSO trademarks

Binding ruling

The MITSUBISHI FUSO Brand Trademark Directive governs the use of trademarks by body manufacturers on integrated bodies mounted on chassis. MITSUBISHI FUSO TRUCK & BUS CORPORATION reserves the right to prohibit the body manufacturer from using MITSUBISHI FUSO trademarks in the event of any violations to this body/equipment mounting directive, including the trademark directive.

- If you have any question, contact the department responsible ▷ 2.1.



2.5 Trademarks

Labels and marks must be applied to the predetermined positions.

For details of the location and method of applying labels and marks, refer to "10.8 Other Equipment"

▷ 10.8.2.

2.6 Recycling of components



Environmental note

When planning attachments, bodies, equipment and modifications, and with regard to the legal requirements according to EU Directive 2000/53/EC and 1907/2006/EC (REACH: Registration, Evaluation, Authorisation (and Restriction) of Chemicals), the following principles for environmentally-compatible design and material selection shall be taken into account.

Materials with risk potential and restriction by REACH, such as halogen additives, heavy metals, asbestos, CFCs and CHCs, are to be avoided.

- It is preferable to use materials which permit recycling and closed material cycles.
 - Materials and production processes are to be selected such that only low quantities of waste are generated during production and that this waste can be easily recycled.
 - Plastics are to be used only where they provide advantages in terms of cost, function or weight.
 - In the case of plastics, and composite materials in particular, only compatible substances within one material family are to be used.
- For components which are relevant to recycling, the number of different types of plastics used must be kept to a minimum.
 - It must be assessed whether a component can be made from recycled material or with recycled elements.
 - It must be ensured that components can be dismantled easily for recycling, e.g. by snap connections or predetermined breaking points. These components should generally be easily accessible and should permit the use of standard tools.
 - Service products must be capable of being removed simply and in an environmentally responsible manner by means of drain plugs, etc.
 - Wherever possible, components should not be painted or coated; colored plastic parts are to be used instead.
 - Components in areas at risk from accidents must be designed in such a way that they are damage-tolerant, repairable and easy to replace.
 - All plastic parts are to be marked in accordance with VDA code of practice 260, e.g. "PPGF30R".
 - EU Directive 2000/53/EC must be complied with.

2.7 Quality system

World-wide competition, increased quality standards demanded by the customer from the product as a whole, national and international product liability laws, new organizational forms and rising cost pressures make efficient quality assurance systems a necessity in all sectors of the automotive industry.

For the reasons quoted above, MITSUBISHI FUSO TRUCK & BUS CORPORATION urgently advises body manufacturers to set up a quality management system with the following minimum requirements:

- Does the quality management system clearly define responsibility and authority?
- Is there a description of processes/workflows?
- Are the contracts checked/is the feasibility of construction checked?
- Are product checks on the basis of specified instructions carried out?
- What provisions are made for the handling of faulty products?
- Are the inspection results documented and archived?
- Do all employees concerned have currently valid proof of the qualification required?
- Is the test equipment systematically monitored?
- Is there a system for labelling materials/parts?
- Are quality assurance measures carried out at suppliers?

2.8 Issue of letter of no objection

2.8.1 Letter of no objection

MITSUBISHI FUSO TRUCK & BUS CORPORATION does not issue body/equipment approval certificates for bodies not manufactured by MITSUBISHI FUSO TRUCK & BUS CORPORATION. These directives only supply important information and technical specifications to body manufacturers explaining how to handle the product. For this reason, MITSUBISHI FUSO TRUCK & BUS CORPORATION recommends that all work on the basic vehicle and body be carried out in compliance with the MITSUBISHI FUSO body/equipment mounting directives.

MITSUBISHI FUSO TRUCK & BUS CORPORATION advises against attachments, bodies, equipment and modifications which:

- are not produced in accordance with MITSUBISHI FUSO body/equipment mounting directives
- exceed the permitted maximum gross vehicle weight
- exceed the permissible axle loads

MITSUBISHI FUSO TRUCK & BUS CORPORATION issues letter of no objection voluntarily based on the following criteria:

MITSUBISHI FUSO TRUCK & BUS CORPORATION's assessment shall be based solely on the documents submitted by the body manufacturer carrying out the modifications. The assessment and the endorsement shall only cover the expressly defined scopes and their basic compatibility with the designated chassis and its connection points or, in the case of chassis modifications, the basic feasibility of the design for the designated chassis.

The letter of no objection shall not refer to the overall design of the body, its functions or its intended field of operation. No objection shall only apply if design, production and assembly are performed by the body manufacturer carrying out the modifications in accordance with the state of the art and in compliance with the valid MITSUBISHI FUSO body / equipment mounting directives – unless deviations have been endorsed in these directives. Nevertheless, the letter of no objection shall not release the body manufacturer carrying out the modifications from his product liability or his obligation to perform his own calculations, tests and trials on the overall vehicle in order to ensure that the overall vehicle produced by the company meets the required specifications for operating and road safety and handling characteristics. Accordingly, it shall be the sole duty and responsibility of the body manufacturer to ensure the compatibility of his attachments, bodies, equipment and modifications with the basic vehicle and to guarantee the operating and road safety of the vehicle.

All national laws, directives and registration requirements must be complied with.

2.8 Issue of letter of no objection

2.8.2 Required documents

In individual cases, the body drawings may be submitted to the department responsible before the start of work ▷ 2.1. The drawings shall contain the following information:

- All deviations from MITSUBISHI FUSO body/equipment mounting directives.
- Complete data on dimensions, weights and center of gravity (weight certificates)
- Attachment of body to the chassis
- Vehicle operating conditions, e.g.
 - on poor roads
 - in very dusty conditions
 - at high altitude
 - at extremely high or low ambient temperatures
- Certificates ("e" mark, seat tensile strength test, etc.)

Submitting the required documentation in full will make queries on our part unnecessary and will speed up the approval procedure.

If complex calculations and/or vehicle tests are necessary for the no objection check, all costs incurred must be borne by the vehicle body/conversion manufacturer or its client. The extent of testing required is defined by the relevant department of Daimler and MITSUBISHI FUSO development.

2.8.3 Legal claim

- No legal claim can be made as to the issue of a letter of no objection.
- MITSUBISHI FUSO TRUCK & BUS CORPORATION reserves the right to refuse the issue of a letter of no objection due to ongoing technical development and the knowledge gained from it, even if a similar certificate was issued in the past.
- The letter of no objection may be restricted to individual vehicles.
- Subsequent issuance of a letter of no objection for vehicles already completed or delivered can be refused.

The body manufacturer alone shall be responsible for:

- The functionality and compatibility of its bodies and equipment, fittings and conversions with the basic vehicle
- Operating and road safety
- All bodies and equipment, fittings, conversions and installed parts

3.1 Selecting the chassis

Property damage

When planning attachments, bodies, equipment or modification work, the selected vehicle must be checked to verify whether it fulfils the necessary requirements.

In order to ensure safe operation of the vehicle, it is essential to choose the chassis and equipment carefully in accordance with the intended use.

Along with the selection of the correct vehicle version, the required series and special equipment such as

- Axle ratio
- Position of the center of gravity
- Legal registration requirements (e.g. Underrun protection)
- Permissible and technical gross vehicle weight

should be taken into consideration and be appropriate for the intended use.

Property damage

Observe the Model. The axle designation or the load capacity of the tires has only limited relevance to the gross weight of the vehicle.

Additional information

The non-availability of a vehicle version may be an indication that the vehicle is not suitable for the intended application.

<Vehicle with LDWS> (lane departure warning system)

LDWS may be disabled in the following cases:

- Any item which interferes with the camera's field of view exists near the camera.
- Any equipment (snowplough, etc.) is attached in front of the vehicle.

3.2 Vehicle modifications



Risk of accident

Do not carry out any modifications to major assemblies (steering, brake system etc.). Any modifications to the steering and the brake system may result in these systems malfunctioning and ultimately failing. The driver could lose control of the vehicle and cause an accident.

Alterations to the basic vehicle are permitted only within the framework of the procedures described in this body/equipment mounting directive.

If the method of handling or maintaining the vehicle changes as a result of carrying out body building or modification, prepare an instruction manual and keep a copy in the vehicle, and also apply warning labels to the vehicle.

The body or equipment manufacturer must apply an Intermediate or Final Stage Manufacturer's Label and inform the officially recognized approval authority or inspector of any modifications to the chassis when the vehicle is inspected.

Following all work on the brake system, i.e. even if merely disassembling parts, a complete check (operation, effectiveness and visibility) of the entire brake system must be performed.

The vehicles are shipped after adequate consideration has been given to safety, reliability and maintainability. Ensure that these functions remain intact after body-building or modification work.

The vehicles must still comply with the regulation of the country where the vehicles are used after modifications have been carried out.

Do not change critical safety parts because this may cause a serious accident and is also illegal.

When selecting body-building or modification parts, give consideration to strength, robustness and safety, and also strive to minimize weight.

Install body-building or modification parts in such a way that visibility in the forward direction is not impaired.

Take care not to damage or impair the function of parts on the chassis side.

Upon completion of the work, check to see if the manufacturing quality conforms to the design and also if the specified performance and functions have been secured.

Drive the vehicle and confirm that there is no unusual vibration or noise and also that the vehicle performance is stable.

3 Planning of bodies

3.3 Dimensions, weights, overall vehicle height

3.3 Dimensions, weights, overall vehicle height



Risk of accident

The vehicle tire load capacity may not be exceeded by overloading the vehicle beyond its specified gross vehicle weight. The tires could overheat and suffer damage. This could cause you to lose control of the vehicle and cause an accident with possible injury to yourself and others.

Information on the permissible axle loads can be found on the vehicle model plate.

All legal provisions governing the permissible vehicle height must be taken into account when planning bodies.

In the Federal Republic of Germany the permissible vehicle height is limited to max. 4 m. In other countries (and if the vehicle is operated on international services), comply with all the relevant national regulations.



Additional information

Information about changes in weight is available from the department responsible ▷ 2.1.

For details of maximum rear body width, refer to "4.7 Others" ▷ 4.7.

Dimensions and weight details can be found in the drawings and technical data. They are based on a vehicle that is fitted with standard equipment. Weight tolerances of $\pm 3\%$ in production must be taken into consideration (1230/2012/EC).

For the minimum mass of the vehicle, refer to "10.2 Specification" (1230/2012/EC).

The permissible axle loads and the maximum permissible gross vehicle weight specified in the technical data may not be exceeded.

The technical data can be found in the vehicle documents or on the vehicle model plate.



3 Planning of bodies

3.3 Dimensions, weights, overall vehicle height

Lamps

The maximum total width of a vehicle should be as shown below in accordance with the specifications for the headlamps and position lamps.

If the rear body prevents the visibility of the front and side turn signal indicator lamps from meeting the regulatory requirements, additional side turn signal lamps must be installed to ensure compliance with visibility regulations.

Maximum total width of vehicle
2550 mm

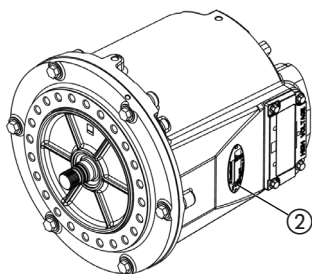
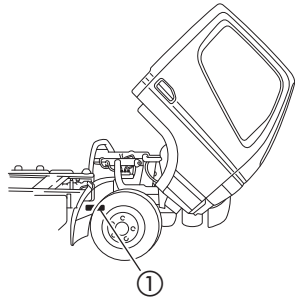


3 Planning of bodies

3.4 Vehicle type identification data

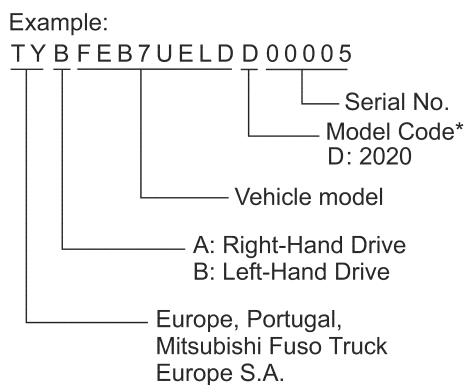
3.4 Vehicle type identification data

If presented at the time of repair or parts order, the chassis number ① and motor generator number ② will facilitate the quick and smooth processing of your requests.



3.4.1 Vehicle identification number (V.I.N.)

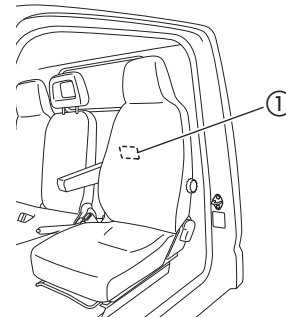
The vehicle identification number is indicated on the right frame, near the front wheel.



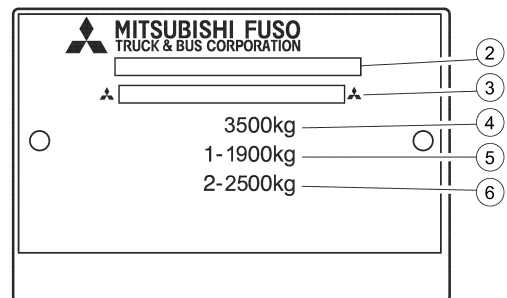
*: This code will be changed due to model change.

3.4.2 Nameplate

A nameplate ① is located inside the cab.



The nameplate shows the following.



- ② Whole vehicle type-approval number
- ③ Vehicle identification number
- ④ Maximum permitted laden mass of the vehicle
- ⑤ Maximum permitted laden mass of the combination
- ⑥ Maximum permitted load mass for 1st axle

3.5 Tires

The body manufacturer must ensure that:

- the largest permissible MITSUBISHI FUSO authorized tires can be fitted.
- the distance between the tire and the mudguard or wheel housing is sufficient even when snow or anti-skid chains are fitted, with the suspension fully compressed (including any twist) (Adherence to valid regulations).
- that the relevant information in the drawings is observed.

If the option of fitting snow and anti-skid chains cannot be guaranteed, the operator should be informed by the body manufacturer (operating instructions).



Risk of accident

Exceeding the specified tire load-bearing capacity or the permissible maximum tire speed can lead to tire damage or failure. You can lose control of the vehicle, cause an accident and injuries.

For this reason, only fit tires of a type and size approved for your vehicle and observe the tire load-bearing capacity required for your vehicle. Observe tire speed index.

Comply with national regulations governing the approval of tires. These regulations may define a specific type of tire for your vehicle or may forbid the use of certain tire types which are approved in other countries.



Property damage

If you have other wheels fitted

- the brakes or components of the suspension system could be damaged
- wheel and tire clearance can no longer be guaranteed
- the brakes or components of the suspension system can no longer function correctly.

3.6 Bolted and welded connections



Risk of accident

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions.

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition.

Welding work on the chassis/body may only be carried out by trained personnel.

The body, the attached or installed equipment and any modifications must comply with the applicable laws and ordinances as well as work safety or accident prevention regulations, safety rules and accident insurer requirements.



Additional information

Further information on bolted and welded connections can be found in Section 5 "Damage prevention" ▷ 5.2 and Section 6 "Modifications to the basic vehicle" ▷ 6.1.

3.6.1 Welded connections

Welding work on the chassis/body may only be carried out by trained personnel.

Property damage

Parts which must not be welded:

- Assemblies such as the motor generator, propeller shaft, transmission, axles, etc.
- The chassis frame (except frame modifications).

Additional information

Further information on bolted and welded connections can be found in Section 5 "Damage prevention" ▷ 5.2 and Section 6 "Modifications to the basic vehicle" ▷ 6.1.

3.7 Soundproofing

The following modifications can lead to noise problems:

- Change of motor generator model
- Change of reduction gear
- Replacement of tires with non-registered ones

Do not modify the vehicle except for those indicated in the body/equipment mounting directives.

- Noise-insulating parts fitted as standard must not be removed or modified.
- The level of interior noise must not be adversely affected.

Additional information

Comply with all national regulations and directives.

In Germany, the EC Directive 70/157/EEC or Article 49.3 of the German licensing regulations (low-noise vehicles) must be observed.

3.8 Maintenance and repairs



Risk of accident and injury

Always have maintenance work performed at a qualified specialist workshop possessing the required expertise and tools in order to perform the necessary work.

MITSUBISHI FUSO recommends an authorized MITSUBISHI FUSO dealer.

It is absolutely essential that all safety-relevant work and all work on safety-relevant systems is performed by a qualified specialist workshop.

Before performing any maintenance work, always read the technical documentation, such as the Instruction Manual and the workshop information. Always have all maintenance work performed at the correct time. If this is not done, malfunctions or failures may occur in systems that could be relevant to safety. This could make you cause an accident, which could result in injury to yourself or others.

Maintenance and repair of the vehicle should not be made unnecessarily difficult by the body.

Maintenance points and major assemblies must be easily accessible.

- The Instruction Manual must be complied with and supplemented as necessary.
- Stowage boxes must be fitted with maintenance flaps or removable rear panels.
- The battery compartment must be sufficiently ventilated, with provision for air to enter and exit.
- Check the condition and capacity of batteries and service them in accordance with the manufacturer's specifications ▷ 3.8.2 and ▷ 3.8.3.

Any additional expenses arising from the body in connection with warranty, maintenance or repair will not be borne by MITSUBISHI FUSO TRUCK & BUS CORPORATION.

3.8.1 Maintenance instructions

The following must be observed by the body manufacturer before delivery of the vehicle:

- Due date of inspection
- Be sure to set up the brake system.
- Check the condition and capacity of batteries and service them in accordance with the manufacturer's specifications.
- Check the headlamp setting or have this checked at a qualified specialist workshop.
- Retighten the wheel nuts to the specified torque.
- Instruction Manual and directives for maintenance of attachments, bodies, installations or conversions, which have been installed by the body manufacturer, must be provided with the vehicle in the language of the country of use.



3.8.2 Preparation for storing the vehicle

Property damage

For vehicle deliveries in winter (gritted roads). To prevent surface damage, please clean the vehicle at the earliest opportunity. Particular attention should be paid to the motor generator housing and light-alloy wheels.

Storage in an enclosed space:

- Clean the overall vehicle.
- Check the oil levels.
- Inflate the tires to 0.5 bar above the specified tire pressures.
- Release the handbrake and chock the wheels.
- Disconnect the battery and grease battery lugs and terminals.

Storing the vehicle in the open (< 1 month):

- Carry out the same procedure as for storing in an enclosed space.
- Close all air inlets and set the heating system to "Off".

Storing the vehicle in the open (> 1 month):

- Carry out the same procedure as for storing in an enclosed space.
- Fold the windscreen wipers away from the windscreen.
- Close all air inlets and set the heating system to "Off".
- Remove the battery and store it in accordance with the manufacturer's specifications.

Maintenance work on stored vehicles (in storage for > 1 month):

- Check the oil level once a month.
- Check the coolant once a month.
- Check the tire pressures once a month.
- Remove the battery.

Removing the vehicle from storage:

- Check the fluid levels in the vehicle.
- Correct the tire pressures to the manufacturer's specifications.
- Check the battery charge and install the battery.
- Clean the overall vehicle.

3.8.3 Battery maintenance and storage

To avoid damage to the battery, disconnect the battery if the vehicle is to be immobilized for a period of longer than 1 week.

If the vehicle is immobilized for periods of longer than 1 month, remove the battery and store it in a dry place at temperatures of between 0 °C to 30 °C.

Store the battery in an upright position.

The battery charge must be kept above 12.55 V at all times.

Property damage

If the battery voltage drops below 12.1 V, the battery is damaged and it will have to be replaced.

Leaving the vehicle parked up for long periods of time can lead to battery damage. This can be avoided by disconnecting the battery and storing it appropriately.

3.8.4 Work before handing over the modified vehicle

The manufacturer must confirm the work and modifications carried out by making an entry in the Service Booklet.

Checking the overall vehicle

Check the vehicle for perfect condition. All damage must be repaired.

If it is not known how long a vehicle equipped with a hydraulic clutch operating system has been in storage, the brake fluid must be renewed.

Checking the batteries:

Test the battery charge before handing over the vehicle.

Checking the tires

Before handing over the vehicle, check that the tires are inflated to the specified pressure and check the tires for damage. Damaged tires must be replaced.

Checking wheel alignment

When equipment, attachments and bodies have been mounted, it is recommended to have the toe setting checked by a qualified specialist workshop. MITSUBISHI FUSO recommends an authorized MITSUBISHI FUSO dealer for this work.

It is absolutely essential that all safety-relevant work and all work on safety-relevant systems is performed by a qualified specialist workshop.

Additional information

Further details are available from an Authorized MITSUBISHI FUSO dealer.

3 Planning of bodies

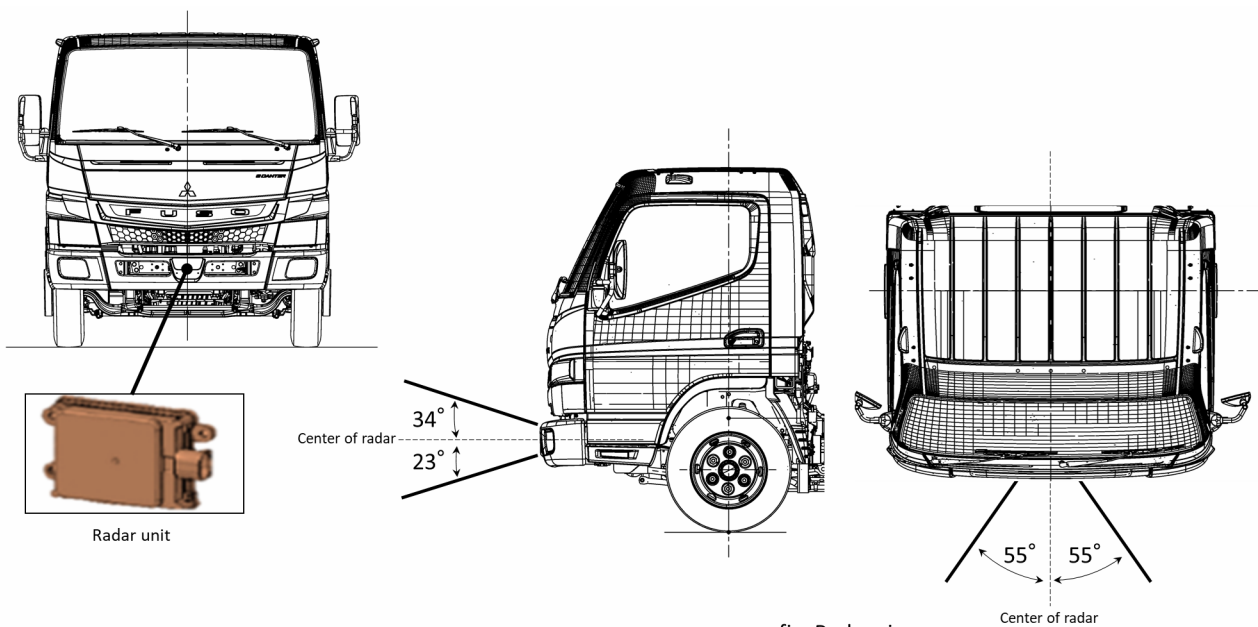
3.9 Advanced Emergency Braking System (AEBS)

3.9 Advanced Emergency Braking System (AEBS)

<Vehicle with AEBS>

Active Brake assist operates when there is a danger of collision with the vehicle, and it helps to alleviate collision damage.

- Place the starter switch in the "OFF" position before disconnecting the harness connector of the system control unit.
- For precautions when performing electric welding, refer to 5.2 "Welding work" ▷ 5.2.
- Radar unit and radar unit cover may cause trouble if repainted.
Mask these parts and components before starting painting to protect them against paint spray.
Remove radar unit if forced drying around radar unit.
- Contact a MITSUBISHI FUSO authorized Distributor to have calibration of radar if radar unit removed.
- Change to new radar unit if radar get damaged due to fallen
- Do not put any equipment in front of radar view area (fig. radar view area).



3 Planning of bodies

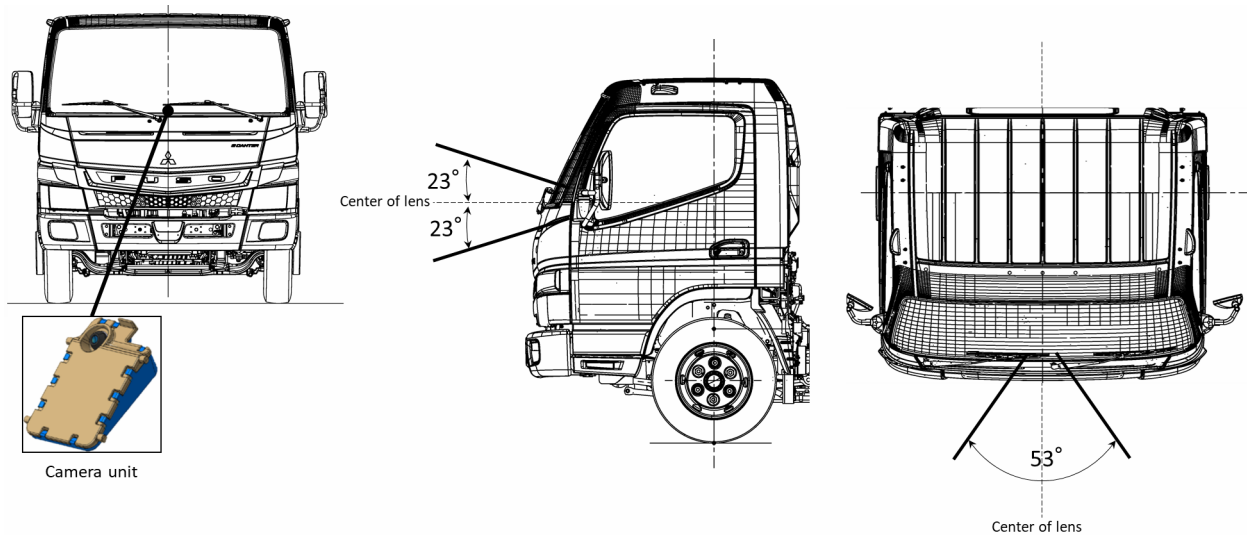
3.10 Lane Departure Warning System (LDWS)

3.10 Lane Departure Warning System (LDWS)

<Vehicle with LDWS>

The lane departure warning system alerts the driver with a warning display and buzzer if the driver has left their lane unintentionally.

- Place the starter switch in the "OFF" position before disconnecting the harness connector of the system control unit.
- For precautions when performing electric welding, refer to 5.2 "Welding work" ▷ 5.2
- Camera unit may cause trouble if repainted.
Mask camera unit before starting painting to protect them against paint spray.
- Check if lane detection is displayed to meter cluster correctly if camera unit removed.
(Clear lane marking and vehicle speed is over 60km/h).
Contact a MITSUBISHI FUSO authorized Distributor if lane cannot be detected.
- Change to new camera unit if camera get damaged due to fallen
- Do not put any equipment in front of camera view area (fig. radar view area).



3.11 Optional equipment



Risk of accident and injury

The use of parts, assemblies or conversion parts and accessories which have not been approved may jeopardize the safety of the vehicle.

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the vehicle Instruction Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

MITSUBISHI FUSO recommends using equipment available as option codes to adapt the vehicle to the body optimally.

All code-specific special equipment is available from an authorized MITSUBISHI FUSO dealer or the department responsible ▷ 2.1.

Optional equipment (e.g. , anti-roll bars, etc.) or retrofitted equipment increases the unladen weight of the vehicle.

When chassis are fitted with different springs or tire sizes, the frame height can change considerably in both the laden and unladen state.

The actual vehicle weight and axle loads must be determined by weighing before mounting.

Not all optional equipment can be installed in any vehicle without problems. This applies, in particular, for retrofitted equipment because the installation space may already be occupied by other components or the special equipment may require other components.

If the current value falls outside the specified range when body building and modification work are performed for electrical parts, a fault is detected, causing a warning lamp to go on and remain on or a function not to operate.

- If an electrical part is to be added or a lamp is to be replaced with an LED lamp, the current value of the electrical part should be ensured to fall within a specified range. This is, however, does not guarantee that the electrical part to be mounted will be fully operational when its current value falls within the specified range.
- For the specified current value, ask an authorized MITSUBISHI FUSO dealer or the department responsible ▷ 2.1.
- Some electrical parts to be mounted require that the SAM control unit parameters be changed. For the electrical parts to be mounted, see "8.1.2 Signal detection and actuation module-related parts" ▷ 8.1.2.
Ask an authorized MITSUBISHI FUSO dealer.
- When adding or replacing a lighting unit, be sure to mount one that complies with the applicable laws and regulations, and observe the regulations governing visibility.

3.12 ADR/GGVS



Risk of accident

The vehicles cannot fulfil the ADR/GGVS requirements due to the vehicle equipment.
If it is required and cannot be avoided, contact the department responsible.
See ▷ 2.1.



4 Technical threshold values for planning

4.1 Vehicle overhang and technical wheelbases

4.1 Vehicle overhang and technical wheelbases



Risk of accident

The body must be designed in such a way that a placing of excessive load weight at the rear is prevented. It is important to comply with the points listed below, otherwise the necessary steering and braking forces for safe vehicle operation cannot be transferred to the road.

- When calculating the length of the vehicle overhang, always take into account the permissible axle loads and the minimum front axle load.
- Comply with the minimum front axle load ▷ 4.3.
- Take the weight of special equipment into consideration when making calculations.



4 Technical threshold values for planning

4.1 Vehicle overhang and technical wheelbases

4.1.1 Maximum vehicle overhangs

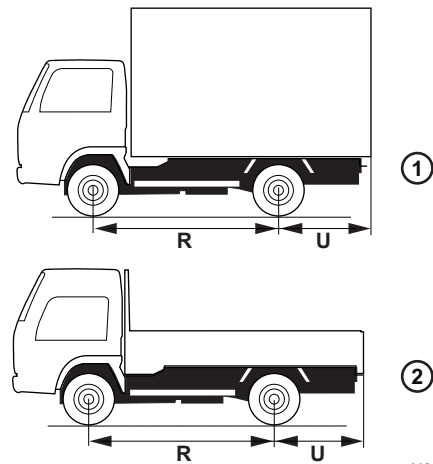
	Maximum vehicle overhang (U)
①	65% of wheelbase
②	50% of wheelbase

① Vehicle with body whereby no load extends over the rear end of the vehicle.
Example: box body

② Vehicle except ①

i Additional information

All national laws, directives and registration requirements must be complied with.



N60.10-2256-00

R=Wheel base
U=Rear overhang

4 Technical threshold values for planning

4.2 Weight distribution, CoG height, anti-roll bars

4.2 Weight distribution, CoG height, anti-roll bars



Risk of accident

The body must be designed in such a way that a placing of excessive load weight at the rear is prevented. It is important to comply with the points listed below, otherwise the necessary steering and braking forces for safe vehicle operation cannot be transferred to the road.

4.2.3 Stabilizers roll control

Make sure that the vehicle you are building is correctly equipped. MITSUBISHI FUSO provides stabilizers as factory equipment for different model series, and does not offer optional stabilizers for any model.

4.2.1 Weight distribution

Avoid one-sided weight distribution.

The wheel load (1/2 the axle load) may be exceeded by no more than 4%. Observe the tire load capacity.

Example:

- Permissible axle load 5,000 kg
- Permissible wheel load distribution 2,600 kg to 2,400 kg

4.2.2 CoG height

For approval of the vehicle with body/implements mounted, a calculation of the height of the center of gravity of the laden vehicle must be submitted in accordance with EC Brakes Directive 71/320/EEC. The calculation basis for permissible heights of center of gravity can be requested from the department responsible ▷ 2.1.

For CoG height of the kerb weight, see "10.3 Weight distribution table" ▷ 10.3.

MITSUBISHI FUSO cannot vouch for the handling, braking and steering characteristics of vehicles with attachments, installations or modifications for payloads with unfavourable centers of gravity (e.g. rear-mounted, overheight and side-mounted loads). The vehicle body/equipment manufacturer/converter is responsible for the safety of the vehicle in the case of these bodies.



4.3 Steerability



Risk of accident

The body must be designed in such a way that a placing of excessive load weight at the rear is prevented. The following points must be complied with otherwise the steering and braking forces necessary for safe driving cannot be transmitted.

To ensure sufficient vehicle steerability, the minimum front axle load (25% of gross vehicle weight) must be maintained under all load conditions. Consult the department responsible in the event of any deviations ▷ 2.1.



Property damage

The permissible front axle load must not be exceeded.

Observe the notes on product safety ▷ 2.2.



4 Technical threshold values for planning

4.4 Clearance for the basic vehicle and bodies

4.4 Clearance for the basic vehicle and bodies

Certain clearances must be maintained in order to ensure the function and operational safety of assemblies.

Dimensional data in the body/equipment mounting directives must be observed.

The minimum clearance between chassis parts and rear body parts must be kept according to the following table of minimum clearance standard.

4.4.1 Minimum clearance and notes

Section behind cab

In the section behind the cab, there are a cab tilt locking unit, etc. Ensure there is a clearance of at least 100 mm between the cab and rear body to facilitate trouble-free operation, inspection and filling works.

Provide a protector in order to prevent loads from falling from the rear body front window of the dump or other rear body.

Areas around motor generator

Vertical direction 40 mm

Lateral direction 30 mm

Longitudinal direction 25 mm

Motor generator assembly

Do not install any rear body part in the area of 100 mm of rear part, because motor generator assembly is moved backward in the same inclination line of motor generator, to pull out the spline shaft, when motor generator is removed.

Surrounding part of the propeller shaft and the rear axle

Min. 25 mm of the surrounding part.

Brake hose (which connects to the front and rear wheel)

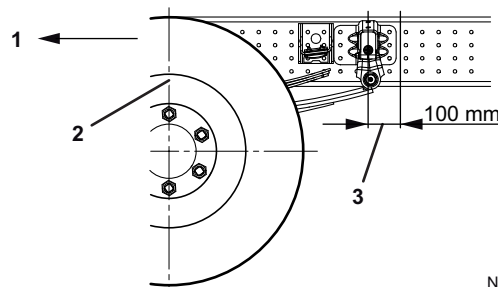
Keep min. 50 mm of clearance at worst. This brake hose is considered to move when vehicle is driven.

Other hoses

40 mm

Rear springs

The link at the rear of the main spring may move while driving. Do not fit any mounting hardware within the range indicated in the figure.



N60.00-2257-00

- 1 Front of vehicle
- 2 Rear axle center line
- 3 No components may be attached in this area

4 Technical threshold values for planning

4.4 Clearance for the basic vehicle and bodies

Space above rear axle

Air and electrical lines such as the brake hose and wiring harness are laid on top of the rear axle.

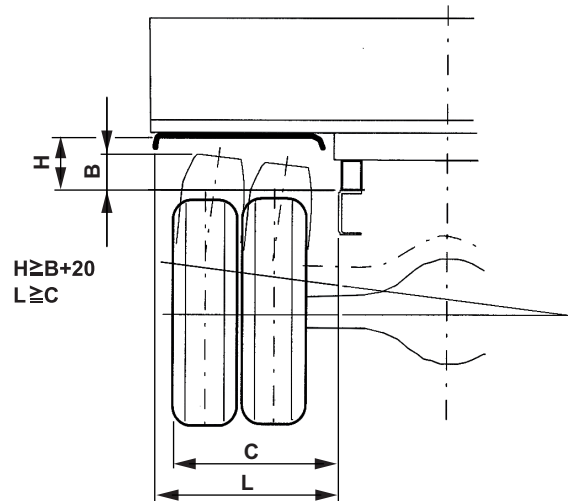
Provide enough space above the rear axle so that these lines will not come into contact with any of the mounting parts even when the axle is elevated to the highest position.

Refer to "Differential and tire bound height" ▷ 10.6.2.

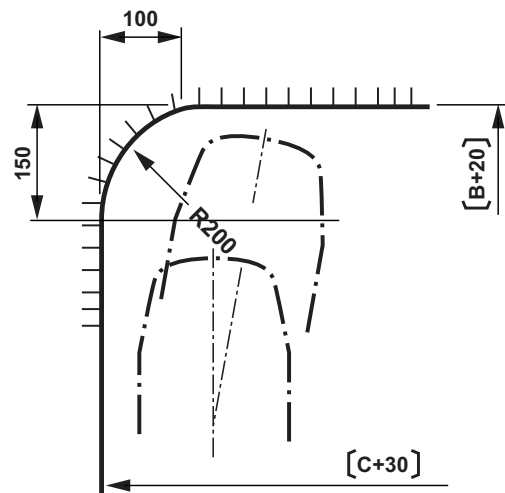
Attaching the rear fender

The clearance between the rear fender and tire must be designed to be optimum assuming that the vehicle is travelling in bad conditions.

Determine the standard clearance from the fender and top and side surfaces of the frame as follows from dimensions B and C listed in 10.6 "Differential and tire bound height" ▷ 10.6.2.



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4 Technical threshold values for planning

4.4 Clearance for the basic vehicle and bodies

Battery

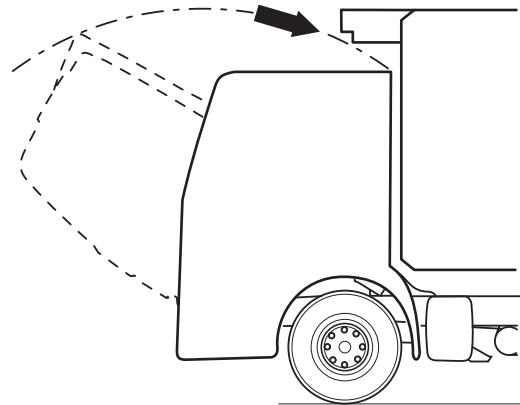
Mounting hardware must be located so that battery removal/installation and inspection as well as battery cover detaching/attaching can be done easily.

i Additional information

Read and comply with the relevant sections of the body/equipment mounting directives.

4.4.2 Attachment above cab

- Observe the permissible center of gravity location and the front axle load.
- Make sure that there is sufficient space for tilting
Refer to "10.4.3 Cab side view" ▷ 10.4.3.



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Cab tilting range clearance

4 Technical threshold values for planning

4.5 Permissible load on cab roof

4.5 Permissible load on cab roof

When attaching externally mounted parts such as roof deck or ladder onto the roof, take care to prevent the weight of these parts from exceeding 50 kg.



4 Technical threshold values for planning

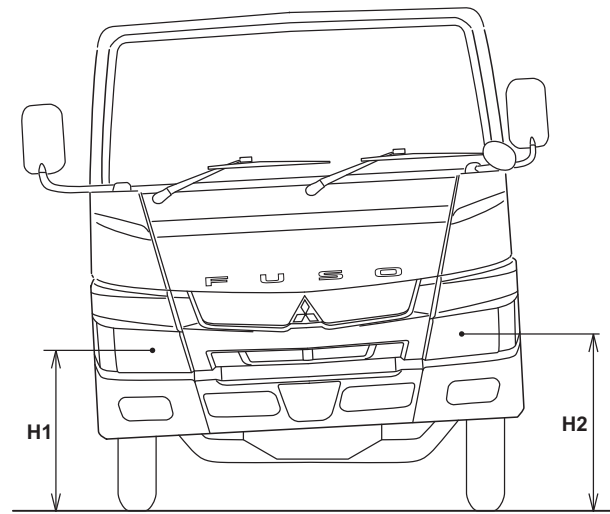
4.6 Vehicle body incline

4.6 Vehicle body incline

As far as possible, take steps to ensure that the weight of the body-building part is balanced in the left-right direction. If it is not possible to ensure left-right weight balance, carry out adjustment by adding a counterweight or adding a spacer to the mounting frame, for example.

When carrying out body-building work, be sure to observe the following items in order to ensure that the vehicle does not topple over or become twisted.

- Be sure to carry out the work on flat ground.
- As far as possible, carry out the work with both the front and rear tires on the ground.
- When installing the body, ensure that the chassis is horizontal.
- When installing the body, place it symmetrically on the chassis to prevent it from tilting.



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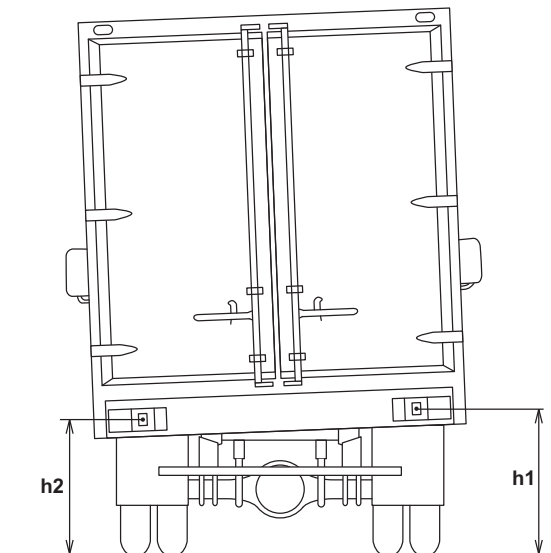
H1 Right front

H2 Left front

4.6.1 Measuring the tilt of the body

When carrying out body-building work, measure the tilt of the body shown below. If the tilt of the body of the completed vehicle when empty exceeds the target value, correct it.

- Front tilt: ΔH_f
Left-right difference at the headlamp center height
 $\Delta H_f = H1 - H2$
Target: $|\Delta H_f| \leq 10 \text{ mm}$
- Rear tilt: ΔH_r
Left-right difference at the stop lamp center height
 $\Delta H_r = h1 - h2$
Target: $|\Delta H_r| \leq 10 \text{ mm}$
- Twisting in the longitudinal direction of the vehicle:
 T_w
 $T_w = \Delta H_f - \Delta H_r = (H1 - H2) - (h1 - h2)$
Target: $|T_w| \leq 10 \text{ mm}$



N60.00-2259-00

h2 Left rear

h1 Right rear

4 Technical threshold values for planning

4.6 Vehicle body incline

4.6.2 Correction method

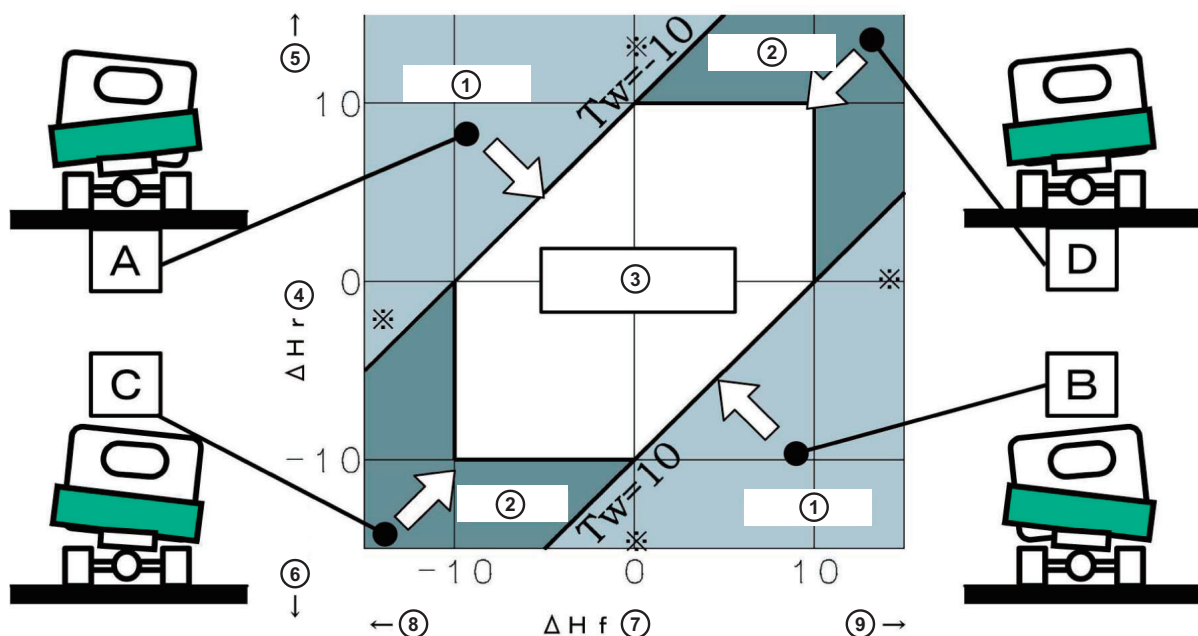
The correction method differs depending upon the posture of the actual vehicle.

Check to see which condition of **A** to **D** shown in the graph below the measurement results correspond to, and then carry out correction as follows. (Note that if you carry out a different kind of correction, the results may actually become worse.)

i Additional information

Measure the tilt of the body with the body-building part mounted.

Body posture and applicable correction method



N60.00-2260-00

- ① Twist
- ② Droop
- ③ Target range
- ④ Rear
- ⑤ Right rising

- ⑥ Right falling
- ⑦ Front
- ⑧ Right falling
- ⑨ Right rising

Twist correction (in the case of **A** and **B**: $|Tw| > 10$ mm)

4 Technical threshold values for planning

4.6 Vehicle body incline

When clamping the body-building part, the twist can be corrected by applying a twist to the chassis in the opposite direction.

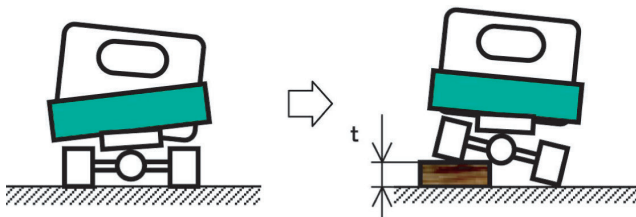
- Place chocks firmly beneath the front wheels.
- In the case of [A] ($Tw < -10$), place the left rear wheel on a plate of thickness t corresponding to the amount of twist. In the case of [B] ($Tw > 10$), place the right rear wheel on the plate.

Amount of lift-up of the wheel on one side for correcting twist

Unit: mm

Twist " Tw "	Plate thickness (lift-up) "t"
10 to 15	100
15 to 20	150

(Lift-up on one side is also permissible.)



- After clamping the body-building part, first slacken all of the clamping bolts. (Take care to ensure that it is safe.)
- Lift the tire onto the plate, and then once again tighten the clamping bolts.
- Lower the tire from the plate, and confirm that there is no looseness in the clamped part or any other part.

i Additional information

In the case of a vehicle whose initial position is close to one of the ✕ markings on the illustration "Body posture and applicable correction method" (> 4.6.2) (body both cambered and twisted), the position will sometimes become [C] or [D] after multiple applications of this correction method. In this case, continue with tilt correction.

Tilt correction ([C] and [D]: $|\Delta H_f| > 10$ mm, or $|\Delta H_r| > 10$ mm)

With the body-building part clamped to the vehicle, insert a spacer between the axle spring washer and the spring.

By inserting a spacer at either the front wheel or the rear wheel, both the front and rear of the vehicle will be corrected. First, insert a spacer at the rear wheel, and only if correction is insufficient insert a spacer at the front wheel as well.

i Additional information

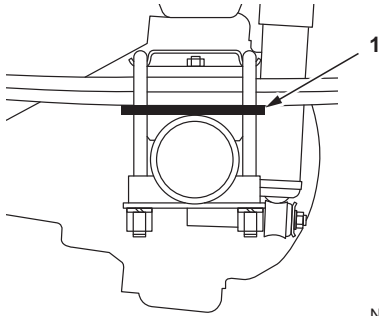
When implementing the following operations, please contact your local MITSUBISHI FUSO authorized dealer.

- Place chocks beneath the front wheels, then jack up the rear axle in order to firmly support the frame or the body-building part.
- Note that the spacer insertion position for an over-slung vehicle (spring is above the axle) is different from that for an under-slung vehicle (spring is beneath the axle).

4 Technical threshold values for planning

4.6 Vehicle body incline

Over-slung vehicle



N60.00-2262-00

1 Spacer insertion position

i Additional information

If the length of the center bolt is insufficient, replace the bolt with one which is between one and two sizes longer.

Number of spacers to be inserted in order to correct tilt

Unit: mm

Tilt Hf or Hr	Number of spacers
10 to 14	1
14 to 18	2

4 Technical threshold values for planning

4.6 Vehicle body incline

Spacer part number and insertion position

Spacer part number (All t = 4.5)	Insertion position of rear wheel spacer	
	In the case of C (Right falling)	In the case of D (Right rising)
MB161776	Below right spring	Below left spring

- Clamp the spring to the axle by tightening the U-bolt to the specified torque.

i Additional information

If the length of the U-bolt is insufficient, replace the bolt with one which is between one and two sizes longer.

i Additional information

- The center bolt for the spring does not need to be loosened.
- If the length of the center bolt is insufficient, replace the bolt with one which is between one and two sizes longer.

- Re-check the tilt, and if the amount of correction is insufficient, insert a spacer at the front wheel as well.
 - Place chocks beneath the rear wheels, then jack up the rear axle in order to firmly support the frame.
 - Insert a spacer (MC110153) between the front axle and the left or right front wheel, whichever is lower (the tilt will be corrected by approximately 5 mm).

If it is still necessary to correct the vehicle tilt even after performing the above corrective procedure, please contact the department responsible.

▷ 2.1.



4.7 Others

4.7.1 Maximum rear body width

The maximum limits on the rear body width is prescribed in the local laws and regulations. There is a limitation on rear body width for exterior mirror and Lamps.

Exterior mirror

The vehicle is shipped from the factory with the exterior mirrors installed in the "Inside set" position. Before delivery, relocate the mirrors in the necessary positions shown in type 1, 2 and Table 1 depending on the rear body width.

Dimensions for type 1

The diagram for type 1 shows two mirror configurations labeled 1 and 2. Configuration 1 is the 'Inside' position and configuration 2 is the 'Outside' position. A side view shows the mirror assembly with a stay length L indicated by a double-headed arrow between the mirror and the mounting point on the rear body.

Unit: mm	
STAY LENGTH	L
Short	170
Long	290

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- 1 Inside
- 2 Outside

Dimensions for type 2

The diagram for type 2 shows mirror configuration 1. A side view shows the mirror assembly with a stay length L indicated by a double-headed arrow between the mirror and the mounting point on the rear body.

Unit: mm	
STAY LENGTH	L
Short	205
Middle	297.5
Long	390

N88.70-2050-00

- 1 Inside

4 Technical threshold values for planning

4.7 Others

Table 1: Mirror setting positions corresponding to stay length and rear body width

Unit: mm

Stay Length	Mirror set position	Rear body width	Type
Short	Inside Set	2000 to 2150	1
	Outside Set	2150 to 2280	
Long	Inside Set	2280 to 2400	1
	Outside Set	2400 to 2550	
	Inside Set	2370 to 2550	2

* Consult an authorized MITSUBISHI FUSO dealer if the body width is not within the ranges shown above.



5 Damage prevention

5.1 Brake hoses/cables and lines

5.1 Brake hoses/cables and lines

Risk of accident

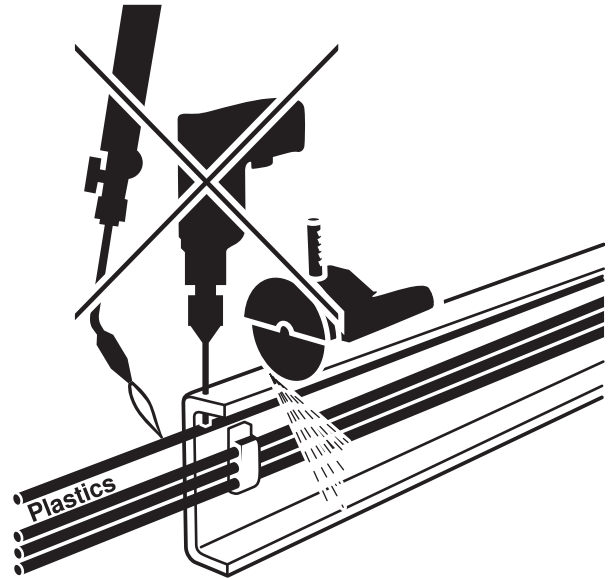
Work carried out incorrectly on the brake hoses, cables and lines may impair their function. This may lead to the failure of components or parts relevant to safety.

- Hydraulic lines and brake hoses must be covered or removed if necessary before carrying out any welding, drilling and grinding work and before working with cutting discs.
- After installing, hydraulic lines and brake hoses, the system must be tested for pressure loss and leaks.
- No other lines may be attached to brake hoses.
- Lines must be protected from heat by means of appropriate insulation.
- Line routing must be designed to prevent any increase in pressure loss.

Comply with all national regulations and laws.

Additional information

Further information on brake hoses can be found in 6.11 "Brake systems" ▷ 6.11.



N00.01-2285-00

5.2 Welding work

Risk of injury

Welding work in the vicinity of the airbags can cause the restraint system to malfunction.

Welding work near the airbags is strictly forbidden.

The airbag could be triggered or may no longer function correctly.

Property damage

Do not connect the arc welder ground clamp to assemblies such as the motor generator or axles.

Welding work is not permitted on assemblies such as the motor generator, axles, etc.

- Avoid defects such as deposited metal cracking, toe crack, blow holes, slag inclusion, under cut, poor penetration, etc.

The legal stipulations regarding the transport and storage of airbag units must be observed.

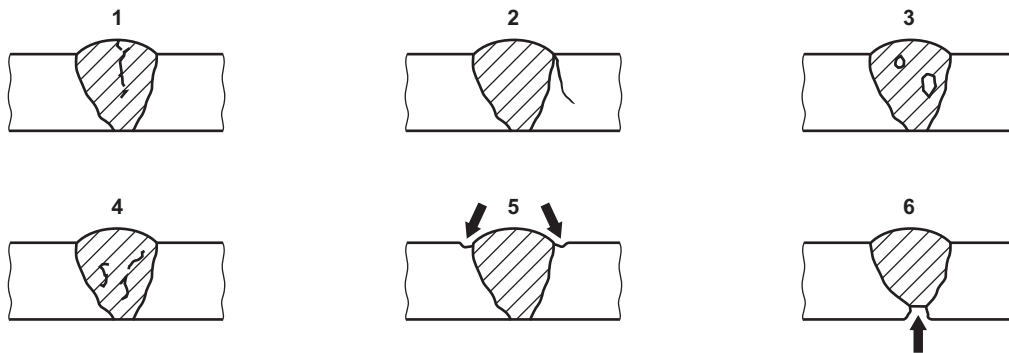
All laws governing explosive substances must be complied with.

The following safety measures must be observed to prevent damage to components caused by overvoltage during welding work:

- Disconnect the positive and negative terminals from the battery and cover them.
- Connect the welding-unit ground terminal directly to the part to be welded.
- Do not touch electronic component housings (e.g. control modules) and electric lines with the welding electrode or the ground contact clamp of the welding unit.
- Before welding, cover spring to protect them from welding spatter. Do not touch springs with welding electrodes or welding tongs.
- Avoid welding work on inaccessible cavities in the cab.
- Welds must be ground down and reinforced with angular profiles to prevent notching from welding penetration.
- Avoid welds in bends.
- The distance from a weld to the outer edge should always be at least 15 mm.

5 Damage prevention

5.2 Welding work



N60.00-2264-00

- 1 Deposited metal cracking
- 2 Toe crack
- 3 Blow hole

- 4 Slag inclusion
- 5 Under cut
- 6 Poor penetration

i Additional information

Additional information on welded connections can be found in Section 6 "Modifications to the basic vehicles" ▷ 6.1. and Section 8 "Electrics/electronics" ▷ 8.1.

The following safety measures must be observed to prevent damage to welding parts;

- Do not weld any item to the frame to hold it temporarily.
- Clean parts thoroughly with a wire brush and dry them off before welding.
- Make sure the paint is completely removed, before welding a painted part.
- Use a low hydrogen type welding electrode. The welding electrode absorbs moisture when it is used, so it is necessary to dry it thoroughly before use.
- When welding, maintain the optimum welding speed and conditions for the preservation of the welding electrode.
- Maintain the welding current at the optimum value for safety.
- Make several short welding beads rather than one long bead.
- Make symmetrical beads to limit shrinkage.
- Avoid more than 3 welds at any one point.
- Avoid welding in strain hardened zones.

- When connecting the ground cable of the arc welder, make sure to disconnect the negative terminal from the battery. The ground of the welder should be connected to the side rail near the welded part. Never connect around the transmission, propeller shaft, front and rear axles, etc.
- When performing welding work on the chassis, take proper measure to prevent the tubes, harnesses, rubber parts, springs, etc. from heat or spatter.
- Do not cool parts off with water after welding.



Risk of accident and injury

Before performing electric or arc welding as part of vehicle repair operation, disconnect the negative (-) cable from the battery. The ground cable of the welding machine should be connected to a point as close to the welding area as possible.



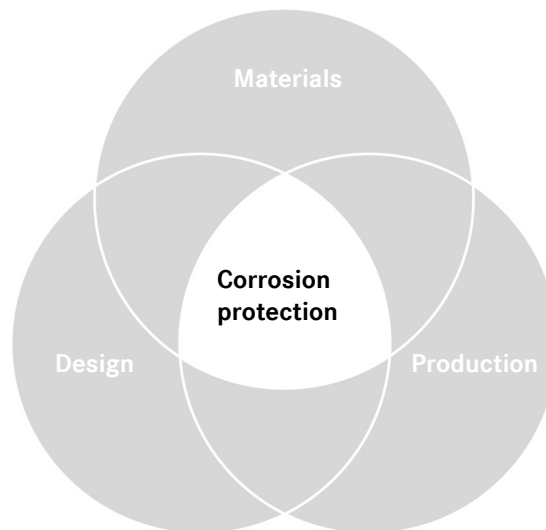
5.3 Corrosion protection measures

General

In order to preserve the durability and quality standard of the vehicle, measures must be taken to protect it against corrosion when the vehicle is modified and after installing bodies and fittings.

Information on the design, execution of work and the requirements of the materials and components to be used with regard to corrosion protection is listed below.

To achieve good corrosion protection, the areas of design (1), production (2) and materials (3) must be perfectly matched.



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Optimum corrosion protection

5 Damage prevention

5.3 Corrosion protection measures

Disassembly of components

If the body manufacturer makes structural modifications to the chassis, the corrosion protection in the affected areas must be restored to match the production standards of MITSUBISHI FUSO. The areas must also be finished with appropriate paintwork. Information on approved MITSUBISHI FUSO refinishing paint suppliers is available on request from the department responsible ▷ 2.1.

Damage to components

If components are damaged during disassembly (scratches, scuff marks), they must be professionally repaired. This applies especially for drilled holes and openings. Two-component epoxy primers are particularly suitable for repair work.

Cutting of components

When cutting and grinding work is carried out, the adjacent painted components must be protected against flying sparks and shavings. Grinding dust and shavings must be carefully removed because these contaminants can spread corrosion. Edges and drilled holes must be cleanly deburred in order to guarantee optimum corrosion protection.

Corrosion protection on reinforcements and fittings

Reinforcements and fittings must receive adequate anti-corrosion priming prior to installation. In addition to galvanising, cathodic dip-priming and zinc-rich paint in sufficient coatings have proved satisfactory for this purpose.



5 Damage prevention

5.3 Corrosion protection measures

Corrosion prevention in welding work

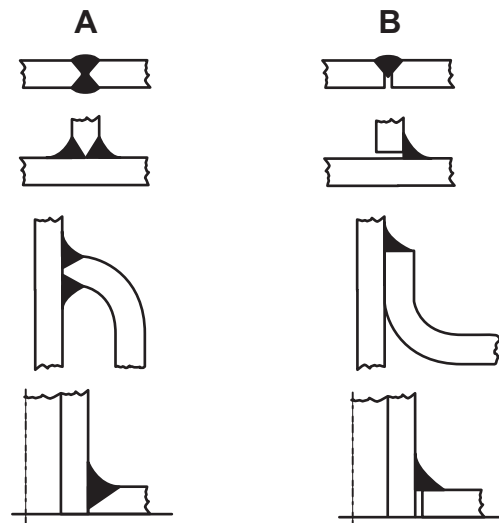
In order to avoid crevice corrosion at weld seams, the welds should be made in accordance with the examples shown.

Preparation

The welding area must be free from corrosion, grease, dirt or similar contamination. If painted surfaces are to be welded, the paint coat must first be removed by grinding or chemical stripping. If this is not done, the paint will burn and the residues can impair corrosion resistance.

After welding work

- Remove drilling shavings.
- Deburr sharp edges.
- Remove any burned paint and thoroughly prepare surfaces for painting.
- Prime and paint all unprotected parts.
- Preserve cavities with wax preservative.
- Carry out corrosion protection measures on the underbody and frame parts.



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Example: Weld seams

A - Suitable

B - Unsuitable

i Additional information

Plug and slot welds, particularly on horizontal surfaces, should be avoided due to the risk of corrosion. If they are unavoidable, these welds must receive additional preservation. Furthermore, avoid designs which allow moisture to accumulate. These must be fitted with additional drainage holes or gaps in the weld seam.

5 Damage prevention

5.4 Bolted connections

5.4 Bolted connections










Use the specified bolts and nuts. Unless otherwise specified, tighten to the torques shown in the table below.

Make sure that the thread and washer are dry when tightening.

If strength categories differ between a nut and bolt (or stud bolt), tighten the nut to the torque specified for the bolt.

- Hex bolt and stud bolt

Unit: N·m {kgf·m}







Strength category	4T		7T		8T	
Indication	  (Stud)		  (Stud)		  (Stud)	
Nominal diameter mm						
M5	2 to 3 {0.2 to 0.3}	—	4 to 6 {0.4 to 0.6}	—	5 to 7 {0.5 to 0.7}	—
M6	4 to 6 {0.4 to 0.6}	—	7 to 10 {0.7 to 1.0}	—	8 to 12 {0.8 to 1.2}	—
M8	9 to 13 {0.9 to 1.3}	—	16 to 24 {1.7 to 2.5}	—	19 to 28 {2.0 to 2.9}	—
M10	18 to 27 {1.8 to 2.7}	17 to 25 {1.8 to 2.6}	34 to 50 {3.5 to 5.1}	32 to 48 {3.3 to 4.9}	45 to 60 {4.5 to 6.0}	37 to 55 {3.8 to 5.7}
M12	34 to 50 {3.4 to 5.1}	31 to 45 {3.1 to 4.6}	70 to 90 {7.0 to 9.5}	65 to 85 {6.5 to 8.5}	80 to 105 {8.5 to 11}	75 to 95 {7.5 to 10}
M14	60 to 80 {6.0 to 8.0}	55 to 75 {5.5 to 7.5}	110 to 150 {11 to 15}	100 to 140 {11 to 14}	130 to 170 {13 to 17}	120 to 160 {12 to 16}
M16	90 to 120 {9.0 to 12}	90 to 110 {9 to 11}	170 to 220 {17 to 23}	160 to 210 {16 to 21}	200 to 260 {20 to 27}	190 to 240 {19 to 25}
M18	130 to 170 {14 to 18}	120 to 150 {12 to 16}	250 to 330 {25 to 33}	220 to 290 {22 to 30}	290 to 380 {30 to 39}	250 to 340 {26 to 35}
M20	180 to 240 {19 to 25}	170 to 220 {17 to 22}	340 to 460 {35 to 47}	310 to 410 {32 to 42}	400 to 530 {41 to 55}	360 to 480 {37 to 49}
M22	250 to 330 {25 to 33}	230 to 300 {23 to 30}	460 to 620 {47 to 63}	420 to 560 {43 to 57}	540 to 720 {55 to 73}	490 to 650 {50 to 67}
M24	320 to 430 {33 to 44}	290 to 380 {29 to 39}	600 to 810 {62 to 83}	540 to 720 {55 to 73}	700 to 940 {72 to 96}	620 to 830 {63 to 85}

5 Damage prevention

5.4 Bolted connections


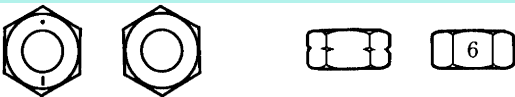
- Hex flange bolt

Unit: N·m {kgf·m}

Strength category	4T		7T		8T	
Indication						
Nominal diameter mm						
M6	4 to 6 {0.4 to 0.6}	–	8 to 12 {0.8 to 1.2}	–	10 to 14 {1.0 to 1.4}	–
M8	10 to 15 {1.0 to 1.5}	–	19 to 28 {2.0 to 2.9}	–	22 to 33 {2.3 to 3.3}	–
M10	21 to 30 {2.1 to 3.1}	20 to 29 {2.0 to 3.0}	45 to 55 {4.5 to 5.5}	37 to 54 {3.8 to 5.6}	50 to 65 {5.0 to 6.5}	50 to 60 {5.0 to 6.5}
M12	38 to 56 {3.8 to 5.5}	35 to 51 {3.5 to 5.2}	80 to 105 {8.0 to 10.5}	70 to 95 {7.0 to 9.5}	90 to 120 {9 to 12}	85 to 110 {8.5 to 11}


- Hex nut

Unit: N·m {kgf·m}

Strength category	4T		6T	
Indication				
Nominal diameter mm				
	Standard thread	Coarse thread	Standard thread	Coarse thread
M5	2 to 3 {0.2 to 0.3}	–	4 to 6 {0.4 to 0.6}	–
M6	4 to 6 {0.4 to 0.6}	–	7 to 10 {0.7 to 1.0}	–
M8	9 to 13 {0.9 to 1.3}	–	17 to 24 {1.7 to 2.5}	–
M10	18 to 27 {1.8 to 2.7}	17 to 25 {1.8 to 2.6}	34 to 50 {3.5 to 5.1}	32 to 48 {3.3 to 4.9}
M12	34 to 50 {3.4 to 5.1}	31 to 45 {3.1 to 4.6}	70 to 90 {7.0 to 9.5}	65 to 85 {6.5 to 8.5}
M14	60 to 80 {6.0 to 8.0}	55 to 75 {5.5 to 7.5}	110 to 150 {11 to 15}	100 to 140 {11 to 14}
M16	90 to 120 {9.5 to 12}	90 to 110 {9 to 11}	170 to 220 {17 to 23}	160 to 210 {16 to 21}
M18	130 to 170 {14 to 18}	120 to 150 {12 to 16}	250 to 330 {25 to 33}	220 to 290 {22 to 30}
M20	180 to 240 {19 to 25}	170 to 220 {17 to 22}	340 to 460 {35 to 47}	320 to 410 {32 to 42}
M22	250 to 330 {25 to 33}	230 to 300 {23 to 30}	460 to 620 {47 to 63}	420 to 560 {43 to 57}
M24	320 to 430 {33 to 44}	290 to 380 {29 to 39}	600 to 810 {62 to 83}	540 to 720 {55 to 73}

- Hex flange nut

Unit: N·m {kgf·m}

Strength category	4T	
Indication		
	Nominal diameter mm	
	Standard thread	Coarse thread
M6	4 to 6 {0.4 to 0.6}	—
M8	10 to 15 {1.0 to 1.5}	—
M10	21 to 31 {2.1 to 3.1}	20 to 29 {2.0 to 3.0}
M12	38 to 56 {3.8 to 5.5}	35 to 51 {3.5 to 5.2}

5 Damage prevention

5.4 Bolted connections

Preventing contact corrosion

Direct contact between materials with different electrode potentials can lead to corrosion of the less noble material when exposed to moisture and salt ions.

When selecting materials, avoid the following combinations:

- Chrome/nickel-steel with aluminium
- Chrome/nickel-steel with zinc-coated steel

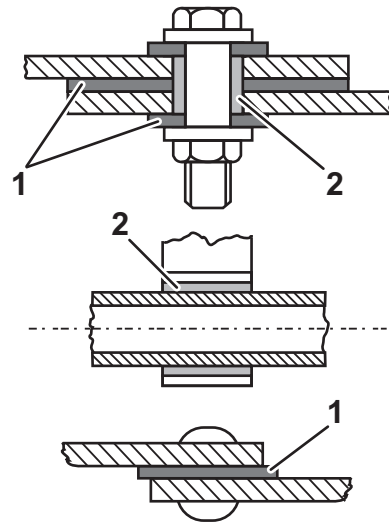
Insulation by coating

Contact corrosion can be prevented by using insulation such as washers, sleeves or bushings. Even in this case, however, the connecting points must not be persistently exposed to moisture.

Vehicle cleaning and care

When the vehicle is handed over to the body manufacturer, it must immediately be cleaned of salt and dirt. If it is to be stored for some time, the vehicle must be preserved.

During modification it must be ensured that load-bearing components are additionally protected against aggressive chemicals and environmental influences. If the vehicle comes into contact with chemicals or salts (e.g. snow-clearing operations), it must be cleaned thoroughly at regular intervals.



N31.00-2093-00

- 1 Insulating washer
- 2 Insulating sleeve

Property damage

A conductive connection occurs if two different metals are brought into contact with each other through an electrolyte (e.g. air humidity). This causes electrochemical corrosion and the less base of the two metals is damaged. The further apart the two metals are in the electrochemical potential series, the more intense electrochemical corrosion becomes.

For this reason, electrochemical corrosion must be prevented by insulation or by treating the components accordingly, or it can be minimised by selecting suitable materials.

5.5 Painting work



Environmental note

Paints and lacquers are harmful to health and to the environment if they are not handled correctly.

Dispose of paints and lacquers in an environmentally responsible manner.

General precautions

- If you removed parts, be sure to reinstall them in their original positions.
- If you removed any labels, obtain new labels and apply them to the same positions from which you removed the old labels.
- Paint compatibility should be checked when repainting. In order to avoid color variations on painted bodies, MITSUBISHI FUSO recommends that paints be used only if they have been tested and approved for the vehicle model in question. There may be paint colors and parts not available for some vehicle types. Contact an authorized MITSUBISHI FUSO dealer to confirm which colors or parts are available for the vehicle.

5.5.1 Areas which must not be repainted

If you repaint the following parts and areas, trouble may occur. For this reason, before repainting the body areas, apply masking tape or other protective material to these areas to prevent them from being exposed to paint.

If you removed parts, be sure to reinstall them in their original positions. Also, if you removed any labels, obtain new labels and apply them to the same positions from which you removed the old labels.

- Sealing surfaces
- Windows
- Contact areas between the wheels and wheel hubs, contact areas between the disc wheels of the double tires
- Contact areas for wheel nuts
- Brake hose and brake associated parts
- Various vinyl tubes and identification tape
- Breathers on axles, etc.

- Door locks
- Door retainers in the rear door hinges
- Spring mounting area
- Rubber hoses
- Cab suspension, motor generator, chassis suspension and steering system rubber or plastic parts
- Electric control unit
SAM (Body electronics control unit with integrated relay and fuse)
- Electrical wiring and connectors
- Lamps, switches, batteries and other electrical parts, high-voltage equipment and other related parts
- Drive shaft connecting flange (propeller shaft)
- Piston rods for the hydraulic and pneumatic cylinders
- Control valves for the air lines
- Various caution plates and nameplates
- Rubber or polypropylene parts for cab
 - Weatherstrips
 - Rear view mirror bodies
 - Mud guard aprons
 - Washer nozzles
 - Splash aprons
 - Mud guards
 - Steps
 - Fenders
 - Runchannels
 - Bumper corner covers
 - Packing rubbers (mirror fitting, aerial fitting, and grip fitting bases)
 - Aerial
 - Rader Cover
- The following parts should not be repainted for appearance reasons.
 - Emblems (such as FUSO)
 - Rear view mirror stays
 - Fenders
 - Wiper arms and blades
 - Aerial and its bracket
 - High-voltage battery box side cover

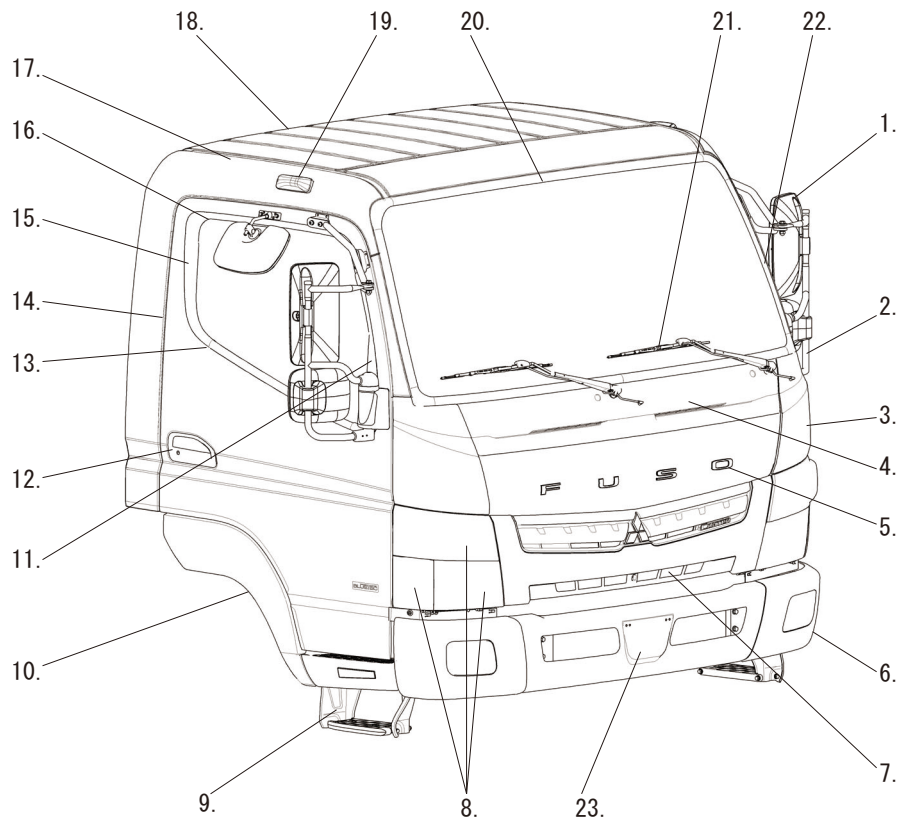


5.5.2 Precautions to be observed when drying the paint

- Forced drying
In order to protect resin and rubber parts, ensure that the temperature of the painted surface does not exceed 80°C.
If the temperature is likely to exceed 80°C, either remove the following parts or take steps to protect them from heat.

Parts to be removed or shielded from heat when repainting at temperatures exceeding 80°C

1. Exterior mirror
2. Mirror stay
3. Corner panel including caps for mounting
4. Front cover
5. Emblem
6. Bumper corner cover
7. Front grille (Including caps screws for fitting hole in cab)
8. Lamp, etc.
9. Step
10. Fender
11. Door delta garnish
12. Door outer handle
13. Door belt line molding
14. Door weatherstrip
15. Door sash garnish
16. Door runchannel
17. Screw seal washer
18. Rear window weatherstrip (cab)
19. Lamps
20. Wind shield weatherstrip
21. Wiper
22. Aerial
23. Rader Cover



Natural drying

In this case, no resin or rubber parts must be removed from the vehicle.

i Additional information

- Clear acrylic urethane can be susceptible to blistering. More information can be obtained from the paint manufacturer/supplier.
- The surfaces must be roughened before repainting, otherwise the paint layer might adhere poorly.

5 Damage prevention

5.5 Painting work

5.5.3 Painting vehicles prior to shipment

- Cab

Part name	Painting specifications		
	Body color (color name)	Color code	Paint manufacturer
Outside of cab (body color)	Natural white	AC17031	Kansai Paint
	Sonic blue	CTB10000	Nippon Paint
	Forest green	CTG10058	Nippon Paint
	Arcadia silver	CTH10090	Dai Nippon Toryo
	Light blue	AC17120	Dai Nippon Toryo
	Shannon blue	AC17089	Nippon Paint
	Jupiter green	AC17010	Kansai Paint
	Fiji green	AC17088	Kansai Paint
	Bright orange	AC17024	Kansai Paint
	Mars red	AC17023	Kansai Paint
	Warm silver	AC17130	Dai Nippon Toryo
	Active yellow	CFY10013	Kansai Paint
	Ice blue-silver	CFH10002	Dai Nippon Toryo

- Chassis

Part name	Paint specifications	
Frame	RN chassis black or Emaron MS chassis black	Dai Nippon Toryo
Axles [front and rear]	Chassis Super MZ or chassis black M	Dai Nippon Toryo
Propeller shaft	RM chassis super black	Dai Nippon Toryo
Spring	Spring black No. 1000	Dai Nippon Toryo



5.5.4 Repainting of the cab

- When a standard-color-coated cab is repainted, plastic and rubber parts on it should be removed where possible to protect them from adverse effects.

Removable parts	Parts to be masked
<ul style="list-style-type: none"> Emblems Front grille ^{*1} Corner panels ^{*1} Front cover Steps Fenders Wipers Aerial Lamps Exterior mirrors, mirror stays Bumper corner covers Heat protector (at back of cab) Sealing washers for screws Rader Cover 	<ul style="list-style-type: none"> Door outer handles Weatherstrips ^{*2} Caution labels Door delta garnish Door runchannels Door sash garnish Door beltline moldings

^{*1} The caps covering the holes in the cab for mounting the radiator grille and corner panels cannot be reused once removed. Replace them with new ones.

Part name	Part No.
Clip	MK676916 (MITSUBISHI FUSO part number)

^{*2} Before reinstalling removed door weatherstrips, check their plastic clips for deformation in claws and defects preventing smooth insertion. Any defective clips must be replaced with new ones.

Part name	Part No.
Clip	MK402586 (MITSUBISHI FUSO part number)

- Before the cab is shipped from the factory, it is coated with a non-sanding type high-adhesion natural white paint only. However, in order to completely remove oil, grease and other contaminants from the surfaces to be painted, it is recommended that you sand these surfaces. Paint other than natural white is not high-adhesion paint. When using paint of a different color, be sure to sand the surfaces to be painted before applying the paint.
(Sanding procedure: Sand the surfaces uniformly with #400 sandpaper until the gloss disappears from the surface.)

- Repainting the cab
Paint
When repainting the cab with lacquer or urethane paint, it is recommended that you use one of the following kinds of paint because it has been confirmed that they form a high-adhesion film even when applied without sanding the surfaces to be painted.

Manufacturer	Name of paint
Kansai Paint	Retan PG80 Retan PG60 Acric #1000
Rock Paint Co., Ltd.	38 Line Co-Rock 79 Line Rock Ace 73 Line Hi Rock 35 Line Rock Lacquer
Isamu Paint Co., Ltd.	AU21 Hi-Art #3000
Dai Nippon Toryo Co., Ltd.	Auto V Top Monarch Auto Squall Auto Acrose Super Auto Swift Acrytan 1000 T-300LINE
Nippon Paint Co., Ltd.	Nax Mighty Lac Nax Sperio Nax Besta Nippe Acrylic

For brands other than the above, you must confirm whether or not it is necessary to sand the surfaces to be painted, by asking the paint manufacturer, for example.

- Outline of repair-painting using arcadia silver or warm silver paint
Carry out repair-painting using arcadia silver (CTH10090) or warm silver (AC17130) paint, by means of the following procedure.

Process	Description of work
1. Preparing faulty areas for repainting	<p>Remove graining and runs by wet-rubbing with #400 sandpaper, and after the surface is smooth, finish by wet-rubbing with #600 – 800 sandpaper. If there are areas where the paint film is insufficiently thick, wet-rub them with #800 sandpaper.</p> <p>If there are areas on the outside of the above which are to be coated with clear paint, wet-rub them with #1500 sandpaper.</p>
2. Degreasing and masking	<p>Air-blow areas to be repair-painted and also the vicinity thereof, carry out degreasing with a silicone remover, and then carry out masking as necessary.</p>
3. Applying an intermediate coat	<p>If the substrate (ED) is visible through the baked paint film, apply an intermediate coat.</p> <ul style="list-style-type: none"> • Apply the intermediate coat to a thickness which is sufficient to adequately hide exposed ED areas. The film thickness should be 15 – 20 µm. • Wipe away misted areas using thinner. • Wait 3 to 5 minutes to allow the paint film to set, then force-dry it at 80°C for 15 minutes. • After force-drying, allow the paint film to cool down, then wet-rub the intermediate coat with #600 waterproof sandpaper. • Using #800 waterproof sandpaper, finish the base painting area (the outer side of the intermediate coat) by wet-sanding. <p>* If the substrate (ED) is not exposed, there is no need to apply an intermediate coat.</p> <p>Paint used:</p> <p>Primer surfacer STX-2K-HS 2-liquid type paint hardener 25 % 2-liquid type paint thinner 10 % (STX-2K-TH-0D)</p>

Process	Description of work
4. Applying the base coat	<p>First determine the color of the base repair-painting areas, and then shade the peripheral areas. Do not apply a thick coat to the base. (12 – 15 μm) Lightly apply one coat of paint to the areas which the mist of the base coat (17130 colors) reach (shaded areas). Promptly proceed to the next process within 2 to 3 minutes (before the paint becomes touch-dry). In some cases this process can be omitted.</p> <p>[Paint blending] Use the undiluted paint after filtering it. Return the unused paint to its original container and store it. If the area to be repair-painted is small, you can carry out shading more easily by adding a further 10 to 20 % of thinner to reduce the viscosity and also spraying at a lower air pressure. Wait for about 7 minutes to allow the paint to set, and then apply clear paint.</p> <p>[Mixing ratio of paint] Base coat AC-17130 (quick-drying) 100 (VOLUME) (When the room temperature is between 10 and 20°C) Base coat thinner 11070 approx. 70 (16 – 18 seconds by the use of Iwata cup^{*3}) (When the room temperature is between 20 and 25°C) Base coat thinner 11050 (Standard 20°C) (When the room temperature is between 25 and 35°C) Base coat thinner 11040</p>
5. Clear painting	<p>Lightly mist-coat all of the areas to be repair-painted, finish continuously with one wet coat of paint, and then immediately shade the mist area.</p> <p>[Mixing ratio of paint] 2-liquid type paint Clear 20 – 60 100 2-liquid type paint MS hardner 50 2-liquid type paint Thinner quick-drying Approx. 10 (18 – 20 seconds by the use of Iwata cup^{*3})</p> <p>[Mixing ratio for ombre painting] Clear paint blended according to the above 10 2-liquid type paint Thinner For shading 11031 50</p> <p>* The blended clear paint can be used for up to about 4 hours at normal temperature.</p>
6. Drying	<p>After applying clear paint, wait for 2 to 3 minutes to allow it to set, then force-dry it at 80°C for 15 minutes.</p>

*3: The Iwata cup:

is a simple paint viscometer, viscosity cup, NK-2 produced by ANEST IWATA Corporation.

For details, please address inquiries to an authorized MITSUBISHI FUSO dealer.

5.5.5 Procedure for painting plastic parts

- Do not paint, bake or dry plastic parts of the cab while they are installed. Remove plastic parts and paint them as described below. It is recommended that you use the paint and painting method indicated in the table below.

Paint manufacturer	Dai Nippon Toryo Co., Ltd.
Paint type	Acrylic and urethane type
Name of paint	Planitto #3000
Curing agent	Planitto #721 curing agent
Blending ratio	Main ingredient : Curing agent = 100 : 15
Diluting thinner	Planitto #30 thinner
Paint viscosity	12 – 14 seconds/by the use of Iwata cup ^{*1}
Dry film thickness	20 – 35 μ
Setting	Normal temperature × 5 – 10 minutes
Drying the paint film	60 – 70° × 30 – 40 minutes Touch-drying ≈ 15 – 20 minutes
Pre-treating the surface to be painted	1. Sanding white painted surfaces 2. IPA degreasing 3. Air blow
Painting method	Hand spraying with gun

Note 1. Acrylic lacquer type paint may be prone to blistering. For details, ask the paint manufacturer/supplier.

2. Be sure to sand the surfaces before repainting, otherwise the paint film may not adhere well.

*1: The Iwata cup:

is a simple paint viscometer, viscosity cup, NK-2 produced by ANEST IWATA Corporation.

- Custom vehicles and optional plated parts cannot be repainted.
- Solvent for removing contamination
Synthetic resin used for the grille, and so on, do not readily withstand organic solvents. For this reason, if you select the wrong kind of solvent for wiping such a part, cracks may occur and also marks may remain on the surface of the part.
- Organic solvents which can be used
 - Kerosene
 - Light oil
 - Anti-freeze
 - Wax spray can (Nihon Parkerizing Co., Ltd.) Neolider
 - Industrial soap
 - Unigold
 - Car Spray 99
- Solvents which must not be used
 - Paint thinner
 - Turpentine
 - Gasoline
 - Escort
 - Origin veil
 - Torepika
 - Emulsion wax
 - Commercially available wax
 - Acetone
 - Reagent alcohol (The Japanese Pharmacopoeia Grade 1)
 - Ketones
 - Esters
 - Chlorinated hydrocarbon

5.5.6 Laminated glass

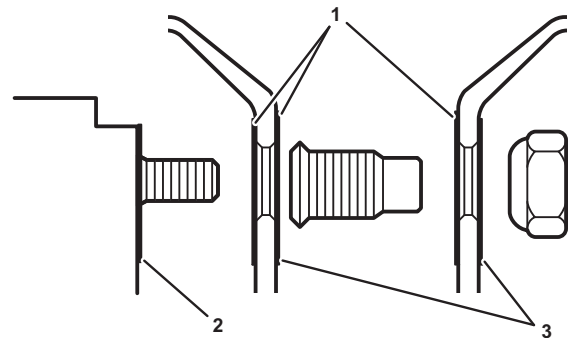
- When a repainted cab body is forced-dried, the temperature should not exceed 100 °C and the process must be completed within 60 minutes. When using a temperature above 100 °C, cover the glass surfaces with shields to prevent them from being heated beyond 100 °C or remove the glass.
- Laminated glass is marked by a double slash (//) in the lower left corner.

5.5.7 Painting the disc wheels

Disc wheels are sometimes painted in the specified color in addition to the original paint on the wheels as shipped by the wheel manufacturer. However, this could lead to loose wheel nuts depending on the thickness of the paint coating.

Prohibition of additional painting

- Do not apply additional painting to disc wheel mounting surfaces, wheel nut seating surfaces and wheel hub mounting surfaces. This makes the paint coating thicker, which could lead to loose wheel nuts. If additional painting has been applied, remove it and clean the surface with a wire brush.



N40.00-2034-00

- 1 Disc wheel mounting surface
- 2 Wheel hub mounting surface
- 3 Wheel nut seating surface

- If you removed parts, securely reinstall them in their original positions. If you peeled off labels, obtain new labels and stick them in their original locations.

Tire rotation

- If additional paint on a disc wheel mounting surface becomes the mounting surface for the mating part (wheel hub or wheel) as a result of tire rotation, remove the paint on the wheel mounting surface and wheel nut seating surface and clean the surfaces with a wire brush before installing the disc wheel. If it is installed without removing the paint, the thick paint coating could lead to loose wheel nuts.

5.6 Chassis springs

5.6.1 Leaf springs

- Only use spring leaves which have been tested and approved for the vehicle model in question. Reinforcement by installing additional spring leaves is not permitted.
- Do not damage the surface or the corrosion protection of the spring leaves when carrying out installation work.
- Before carrying out welding work, cover the spring leaves to protect them against welding spatter. Do not touch springs with welding electrodes or welding tongs.

5.7 Tilting the cab



Risk of injury

Before tilting the cab, please make sure that you read the "Tilting the cab" section in the detailed Instruction Manual.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

5.8 Towing and tow-starting



Risk of accident and injury

Before towing or tow-starting, please make sure that you read the "Towing" section in the detailed Instruction Manual. You could otherwise fail to recognize dangers and cause an accident, which could result in injury to yourself or others.



Property damage

Failure to observe the instructions in the Instruction Manual can result in damage to the vehicle.



5.9 Risk of fire



Risk of fire

Work on live electrical lines carries a risk of short circuit.

Before starting work on the electrical system, disconnect the on-board electrical system from the power source, e.g. battery.

With all bodies make sure that neither flammable objects nor flammable liquids can come into contact with hot assemblies (including through leakages in the hydraulic system) such as the transmission, etc.

Appropriate caps, seals and covers must be installed on the body in order to avoid the risk of fire.



5.10 Electromagnetic compatibility (EMC)

The different electrical consumers on board the vehicle cause electrical interference in the vehicle's electrical circuit. MITSUBISHI FUSO tests the electromagnetic compatibility in the vehicle of all factory-installed electrical and electronic components.

When retrofitting electric or electronic systems, they must be tested for electromagnetic compatibility and this must be documented.

The equipment must possess type approval in accordance with EC Directive 72/245/EC (in its currently valid version) and must bear the CE mark.

An alternative to this is testing and labeling as per UN-R 10 with the corresponding CE mark.

The following standards provide information on this:

- The current valid version of EC directive 72/245/EC (currently 2009/19/EC)
- UN regulation UN-R 10
- CISPR 12
- ISO 7637
- ISO 11451
- ISO 11452

When retrofitting two-way radio systems, the installation notes as per ISO/TS 21609 must be observed.

Additional information

Observe the notes on operational and vehicle safety (▷ 1.3) and (▷ 1.4).

5 Damage prevention

5.11 Storing and handing over the vehicle

5.11 Storing and handing over the vehicle

Storage

To prevent any damage while vehicles are in storage, MITSUBISHI FUSO recommends that they be serviced and stored in accordance with the manufacturer's specifications ▷ 3.8.2 and ▷ 3.8.3.

Handover

To prevent damage to the vehicle or to repair any existing damage, MITSUBISHI FUSO recommends that the vehicle be subjected to a full function check and a complete visual inspection before it is handed over ▷ 3.8.4.



6.1 General

Risk of injury

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions.

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition.

Welding work on the chassis/body may only be carried out by trained personnel.

The body, the attached or installed equipment and any modifications must comply with the applicable laws and directives as well as work safety or accident prevention regulations, safety rules and accident insurer requirements.

Additional information

Further information on bolted and welded connections can be found in Section 3 "Planning of bodies" ▷ 3.6 and Section 5 "Damage prevention" ▷ 5.1.

- Never modify (weld, padding, additional work, etc.) or heat critical safety parts such as the axle, steering, brake, suspension related components, propeller shaft. If you study the movement of critical safety parts owing to unavoidable circumstances, be sure to consult the department responsible.
▷ 2.1

Main critical safety parts

- Knuckle arm
- Knuckle arm bolt
- Tie rod assembly
- Tie rod arm
- Tie rod arm bolt
- Axle
- Steering shaft assembly
- Power steering booster
- Power steering booster bracket
- Pitman arm ball stud
- Steering drag link
- Steering ball stud
- Steering universal yoke
- Steering slip joint
- Steering spider
- Brake hose, brake pipe
- Brake booster
- Vacuum tank
- Wheel bolt
- Wheel nut
- Spring bracket
- Spring U-bolt
- Propeller shaft

6 Modifications to the basic vehicle

6.2 Chassis frame material

6.2 Chassis frame material

If the frame is extended, the material of the extension element and reinforcing bracket must have the same quality and dimensions as the standard chassis frame.

Material/part					
Side rail		Stiffener ①	Stiffener ②	Stiffener ③	Stiffener
MJSH440 (S355J2C+N)	HTP540 (S500MC)	MJSH440 (S355J2C+N)	HTP540 (S500MC)	MJSH440 (S355J2C+N)	MJSH440 (S355J2C+N)
–	×	×	×	–	–

Additional information

For the member dimensions and the position of stiffener ① or stiffener ②, ③, refer to "10.5.2 Frame section modulus" ▷ 10.5.2.
For further information of the material, refer to "7.1.1 Body mounting methods" ▷ 7.1.1.

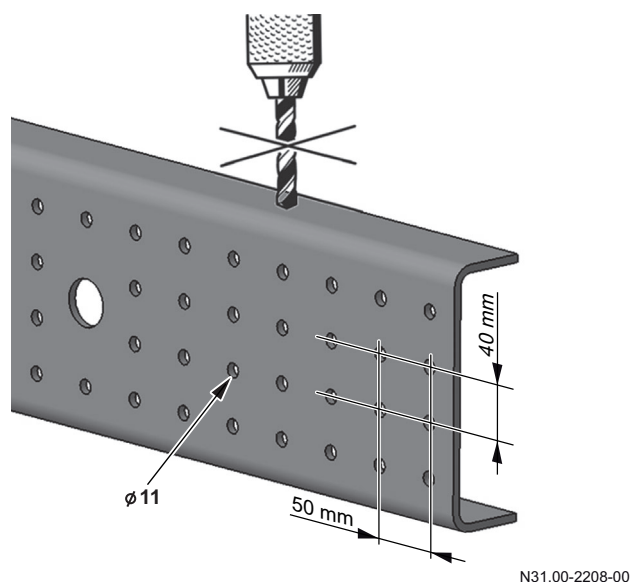
6 Modifications to the basic vehicle

6.3 Drilling work on the vehicle frame

6.3 Drilling work on the vehicle frame

Drilling holes in side rail

- Holes have been drilled in the side rail at regular intervals (longitudinal pitch 50 mm, vertical pitch 40 mm). Use the existing holes.
- The drilling of further holes is not permitted.
- Never drill holes in the upper and lower surfaces of the flange.
- As a rule, no holes may be enlarged. If it is absolutely necessary to enlarge one, keep its diameter within 13 mm.
- No load may be applied to the center of the web of the side rail (diaphragm effect). If this is unavoidable, make sure that there is a large area of support on both sides of the web.
- After drilling deburr all holes.



6 Modifications to the basic vehicle

6.3 Drilling work on the vehicle frame

Drilling work on the cross members

- The holes and distances between the holes should conform to the values specified in the chart below.

Unit: mm

Cross member type	Hole diameter	Center-to-center distance of holes
<ul style="list-style-type: none"> Alligator type (see Fig. 1) Channel type (see Fig. 2) 	9 max.	30* min.

Note*: Maintain the dimensions of previously drilled holes.

- Holes should be more than 100 mm away from the end of the side rail flange or the end of the gusset.
- Holes in the web of the channel type cross member should be 50 mm min. from the end of the cross member. (Refer to Fig. 2)
- Holes in the flange should be more than 25 mm from the end.
- Holes should be drilled more than 20 mm from the curved part of the flange.

Alligator type

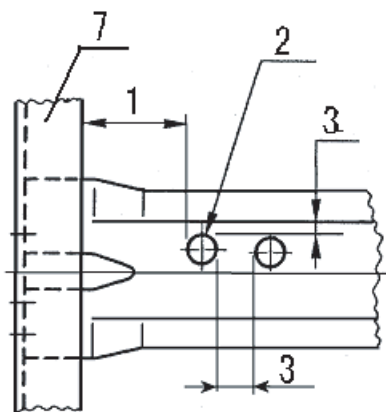


Fig. 1

- 1 100 mm min
- 2 DIA 9 mm max
- 3 25 mm min
- 4 20 mm min

Channel type

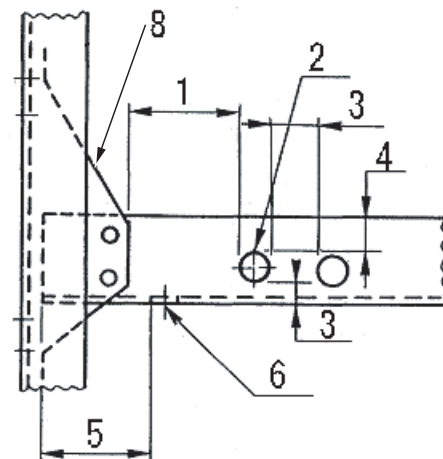


Fig. 2

- 5 50 mm min (Web surface)
- 6 DIA 13 mm max (Web surface)
- 7 Side rail
- 8 Gusset

6 Modifications to the basic vehicle

6.4 Welding work on the vehicle frame

6.4 Welding work on the vehicle frame

Welding anything onto chassis frame is prohibited in principle, as the welding increases the risk of cracks in the member. For detailed instructions about rear body mounting, see 7.2 "Mounting Frame" ▷ 7.2.

Additional information

Further information on welded connections can be found in Section 5 "Damage prevention" ▷ 5.2.

6 Modifications to the basic vehicle

6.5 Modifications to the wheelbase

6.5 Modifications to the wheelbase

The wheelbase should not be extended or shortened because considerations for the propeller shaft length, balance, position, brake piping and harness length are required.

If this is unavoidable, contact the department responsible ▷ 2.1.

6.5.1 Prohibition on modifying the propeller shaft



Risk of accident

It is strictly prohibited to modify the propeller shaft by welding or other means to change its length.

An improperly modified propeller shaft may cause vibration during operation, which in turn may cause cracks and fractures in the motor generator, separation of the propeller shaft, and other dangerous conditions, possibly resulting in a serious accident.



6.6 Frame modifications

- The maximum permissible axle loads must not be exceeded, while the minimum front axle load must be exceeded.
- Rear underride guard: fastened in the same way as on a standard vehicle.
- Extend the mounting frame to the end of the frame.

6.6.1 Precautions for modification

In the case that a rear body of special design is mounted or the vehicle is to be used in special conditions, use utmost care that neither the structure nor the strength of the frame is impaired during mounting or modification work.

When mounting a rear body of special design, pay full attention to even weight distribution on the frame.

Refer to "10.5.2 Frame section modulus" ▷ 10.5.2.

Attaching stiffeners, drilling holes or welding objects to the frame can affect the strength of the frame greatly, possibly resulting in a deformed or cracked frame. Avoid performing any unnecessary reinforcement, drilling or welding work on the frame.

6.6.2 Extending and shortening

- Frame rear overhang extending procedure
Perform the following steps to extend the frame rear overhang.

- Extension members

Extension member		Reinforcement		Electrode	
Material	Thickness	Material	Thickness	Shielded metal arc welding	CO ₂ gas shielded arc welding
MJSH440 (S355J2C+N) HTP540 (S500MC)	Same as the side rail	MJSH440 (S355J2C+N)	3.2 - 4.5 mm	Illuminite base, for 540 MPa, D4301 or equivalent as per JIS Z3211	YGW11 or equivalent as per JIS Z3312

As high tensile strength steel (540 MPa class) hardens more easily at welds than automotive structural steel (MJSH440), follow the instructions below.

- Be sure to use a low-hydrogen type electrode. Especially, where the weld must have the same strength level as the base metal, use a low hydrogen, high tensile strength type electrode.
- Short weld beads are more likely to crack due to low hardening rate, so in areas requiring many short weld beads, perform continuous welding instead.

6 Modifications to the basic vehicle

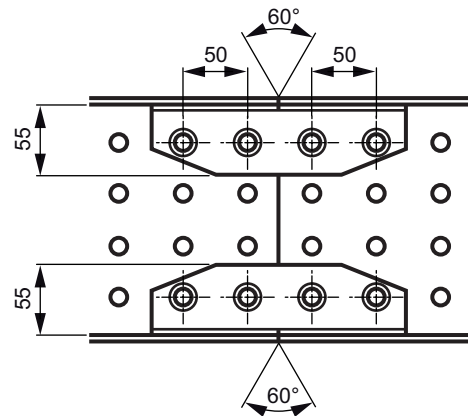
6.6 Frame modifications

- Extending and shortening procedure

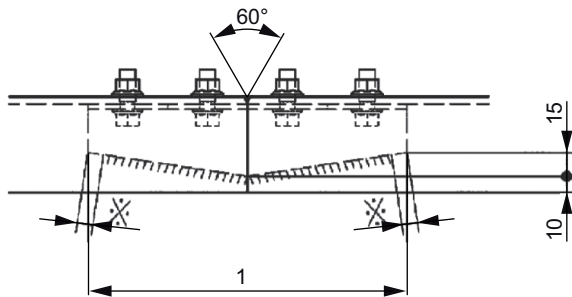
Comply with the reinforcement procedure illustrated below.

The reinforcement member should be bolted at two points each in the base metal and extension member. Use M10 bolts (8T) and nuts (6T) and a tightening torque of 60 to 80 N·m {6 to 8 kgf·m}.

Use utmost care about finishing the flange end face of the side rail butt welded joint. Carefully finish it with a grinder to ensure that the end face is free of undercut or padding protrusions. Make also sure that there is no step between the side rail and extension member. Smoothly finish any steps.



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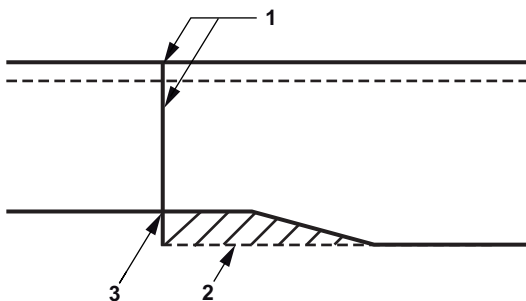


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1 More than 200 mm

i Additional information

The length of 20 mm marked with ✕ should not be welded.



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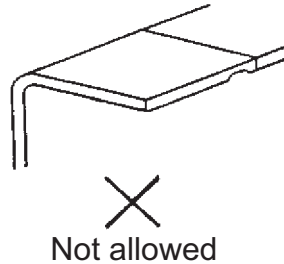
- 1 Finish surface with a grinder
- 2 Eliminate any steps
- 3 Finish end face with a grinder

6 Modifications to the basic vehicle

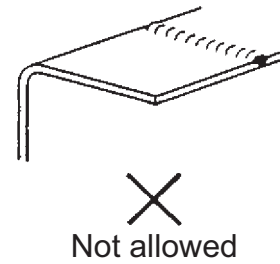
6.6 Frame modifications

- Cautions for finishing the side rails.
Be especially careful when finishing the flange end of the butt-welded side rails. Ensure a clean finish by grinding the weld so it is free of undercut, pileup or convex bead.

Under cut

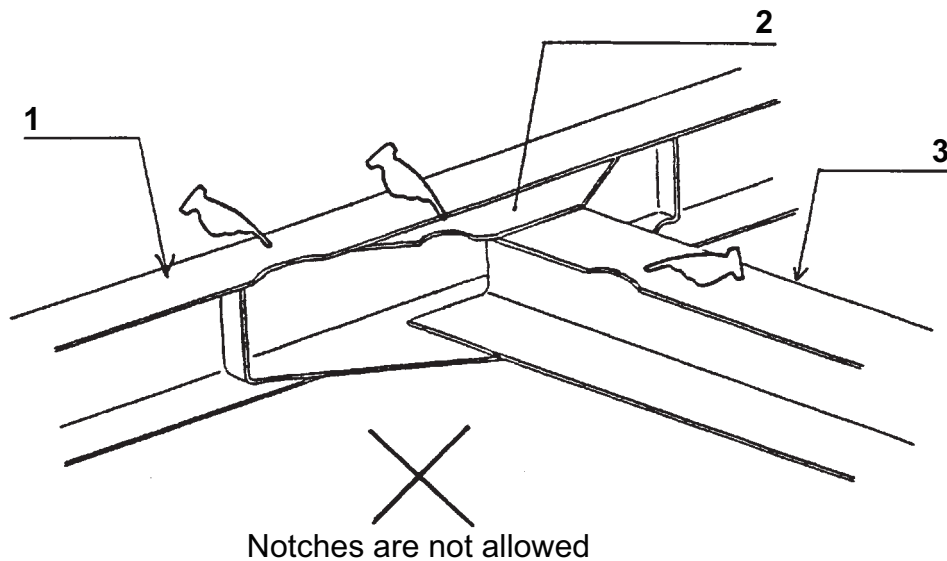


Pile up



6.6.3 Others

Never drill or grind any notches in the side rail, cross member flange, or cross member gusset.



- 1 Side rail
- 2 Cross member gusset
- 3 Cross member

6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

6.7 Mounting of implements and auxiliary components

Risk of accident

The use of parts, assemblies or conversion parts and accessories which have not been approved may jeopardize the safety of the vehicle.

Before installing any attachments, special-purpose bodies, equipment or carrying out any modifications to the basic vehicle and/or its assemblies, you must read the relevant sections of the vehicle Instruction Manual, as well as the operating and assembly instructions issued by the manufacturer of the accessories and items of optional equipment.

You could otherwise fail to recognize dangers, which could result in injury to yourself or others.

Official acceptance by public testing bodies or official approval does not rule out safety hazards.

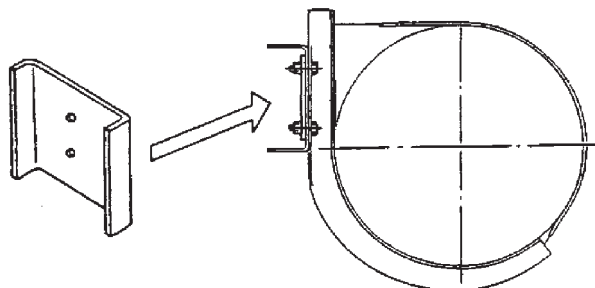
All national laws, directives and registration requirements must be complied with.

6.7.1 Mounting equipment on the side rail

- Attach a stiffener to the inside of the side rail as shown below when installing bolts to support heavy components on the side rail overhang. This will prevent cracks in the frame due to resonance of the component if the static load caused by the weight of the component exceeds 100 kg of force for each bolt.

Example:

- As a rule, avoid attaching additional equipment together with components (battery, etc.) which are already installed to the frame side. When this is absolutely necessary, increase the size of the bolts, or the number of bolt locations, to decrease the stress on each bolt.



6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

6.7.2 Wheel chocks

Mounting

- In a suitable bracket so that they cannot rattle.
- Secured to prevent loss.
- Ensure good accessibility.

6.7.3 Spare tire carrier

- Install under the frame, on the side of the frame or on the body in accordance with the chassis drawing.
- It must be easily accessible and easy to handle.
- The Spare tire - carrier

When remodelling the tire carrier, followings must be paid attention:

- (a) A single worker can easily remove or attach the tire.
- (b) Interference is not caused with parts other than the intended stopper when tightening the tire on the tire carrier.
- (c) The worker can attach even burst tires.
- (d) The tightening section is prevented from becoming loose.

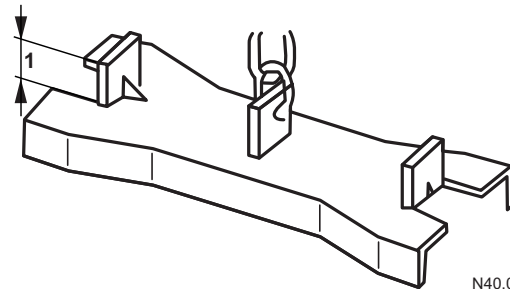
Example 1: Clamped tire-carrier

- The tightening bolt must be 30 mm or longer.
- Double nuts must be used for tightening.
- The structure having a height difference for preventing falling on the bracket.
- The structure having a stopper for preventing tightening nuts and bolts from falling.

Example 2: Hoisted tire-carrier

- The structure must have a spring inserted below the hoisting plate.
 - The structure must prevent reverse rotation of the hoisting shaft.
 - The structure must have a lock for preventing the tire from falling
- (e) The tightening bolt must be M10, 7 T strength or an equivalent product. (clamped tire-carriers)
 - (f) The tire shape must limit movement in the forward, backward, left and right directions. (clamped tire-carriers)
 - (g) Take care to prevent injury when hoisting tires. (hoisted tire-carriers)

- (h) Tightening bolts must be tightened to a torque of at least 49 Nm and by a force at least 290 N at handles. The tire-carrier must be designed to have enough contact area to support the tire securely. (hoisted tire-carriers)
- (i) The height difference on the lifter must be at least 10 mm, or the lifter must be of a shape that enables the same effect. (hoisted tire-carriers)



1 More than 10 mm

- (j) When manufacturing the carrier, apply a tensile load of 4900 N or more on the lifter. (hoisted tire-carriers)
- (k) Affix a Caution Plate indicating the recommended tightening torque 49 Nm at a position that can be easily seen during operation.

6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

- Carry out the following tests with the carrier attached to the body or in a similar state.

(a) Tensile strength test

(clamped tire-carrier)

Apply the following load face down at the center of the disc wheel with a tire attached to the carrier.

$$P = W \times \alpha \times \beta$$

P : Test load

W : tire of maximum set weight

α : Load multiple of 2.5

β : Required safety ratio of 1.3

(hoisted tire-carrier)

Apply the following load face down via the hoisting plate.

$$P = (P_o \times \gamma \pm W \times \alpha) \times \beta$$

P : Test load

P_o : Load applied on chain by tightening torque during standard tightening

W : tire of maximum set weight

α : Load multiple of 2.5

β : Required safety ratio of 1.3

γ : Load multiple of 1.5

As a result of this test, carrier components must be free from detrimental deformation.

(b) Hoisting strength test

(hoisted tire carrier)

Fix the hoisting plate, and apply the following torques on the carrier.

$$T = T_o \times \gamma \times \beta$$

T : Test torque

T_o : Standard tightening torque

β : Required safety ratio of 1.3

γ : Load multiple of 1.5

As a result of this test, carrier components must be free from detrimental deformation.

(c) Operating durability

Hoist a tire of maximum allowable weight, tighten to a torque of 49 Nm, and then winch down. Repeat this series of operations 200 times. (This test needs be carried out continuously.) As a result of this test, operation must remain uninterrupted and carrier components must be free from detrimental deformation.

(d) Looseness resistance

Increase and decrease vibrations of 1 g (9.8 m/sec²) (need not be 1 g during resonance vibrations) and 8.3 Hz to 50 Hz (500 to 3,000 times per minute) on the supporting device in the vertical direction of the carrier mount continuously for one hour taking at least 5 minutes for each reciprocal movement.

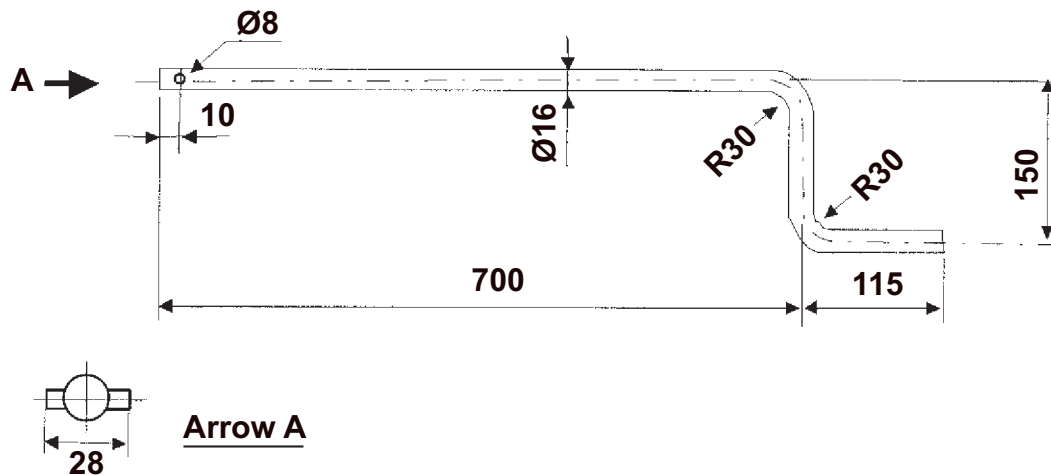
As a result of this test, the carrier device must be free from detrimental looseness.



6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

Crank handle (reference)



6.7.4 Mudguards and wheel arches

- The distance from the tire to the mudguard or wheel arch must be sufficient, even when snow chains or anti-skid chains are fitted and at full spring compression (including under torsion). The dimensional data in the tender drawings must be observed.
- On chassis with standard bore holes for mudguard brackets, use these bore holes to secure the brackets.

6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

6.7.5 Rear underrun protection

In Germany, Article § 32b of the German vehicle licensing regulations requires an underrun protection when

- the distance between the rear of the vehicle and the final rear axle is more than 1,000 mm
- the ground clearance of the chassis as well as the main body parts exceeds 700 mm for the unladen vehicle across the entire width.

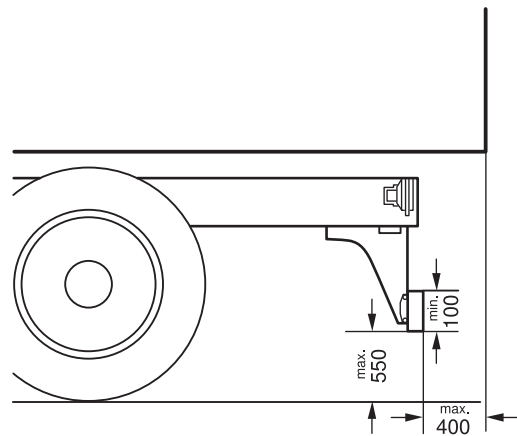
Exceptions to this regulation are semitrailer tractor vehicles, machines and vehicles whose purpose cannot be fulfilled if an underrun protection is fitted.

If an underrun protection is required, it must comply with UN regulation R58.

The underrun protection must be mounted as far back as possible.

Installation dimensions:

- maximum height of underrun protection (unladen vehicle) above road surface: 550 mm.
- maximum width = width of rear axle (outer tire edge).
- minimum width: = Width of rear axle - 100 mm on each side (widest axle is authoritative)
- cross member section height at least 100 mm.
- edge radius at least 2.5 mm.



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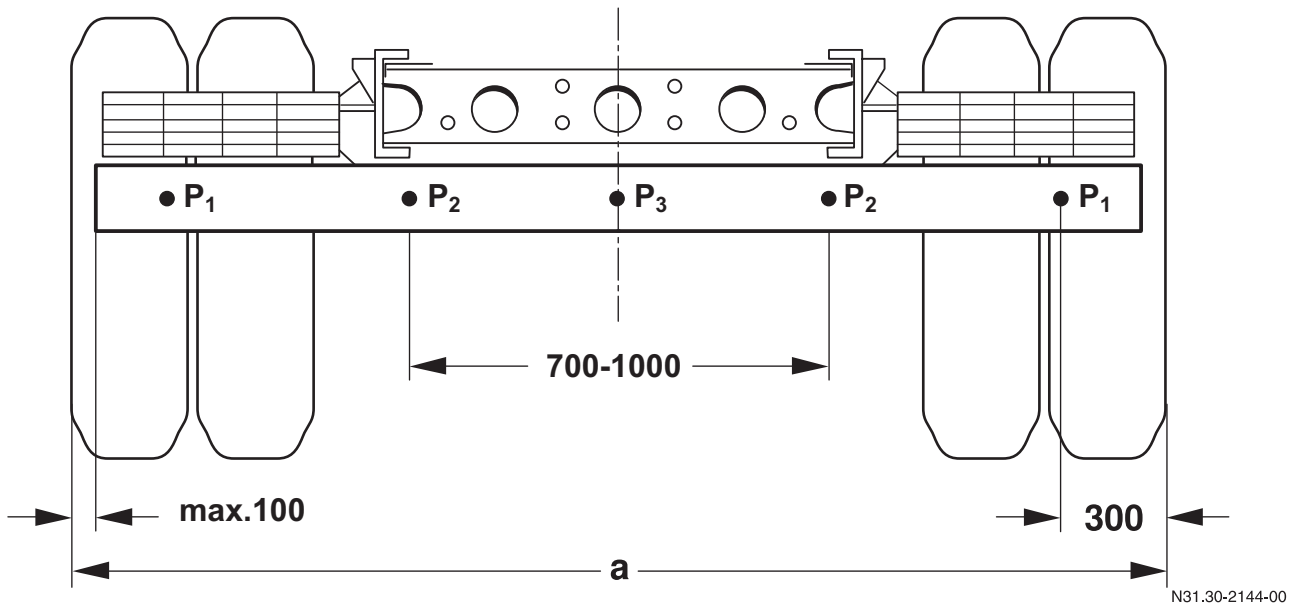
The rear underrun protection fitted at the factory complies with UN regulation R58. No modifications may be made. If modifications are unavoidable, they must be clarified in advance with the vehicle licensing agency responsible.

6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

Check strength of underrun protection and its mounting in accordance with UN regulation R58.

At maximum deformation, the distance from the end of the body to the end of the underrun protection at the load points may not exceed 400 mm.



a = Rear axle width

P₁, P₂, P₃ = Load application points

6 Modifications to the basic vehicle

6.7 Mounting of implements and auxiliary components

6.7.6 Side underrun protections

According to EC Directive 89/297/EEC, a side underrun protection is stipulated for vehicles with a permissible gross vehicle weight in excess of 3.5 t.

- Components may be mounted in the side underrun protections, e.g. battery box, lights, reflectors, spare wheel and tool box, provided that the specified clearances are maintained. Brake, hydraulic lines and other parts may not be secured to side underrun protections.
- The function and accessibility of all equipment on the vehicle must not be impaired.
- The underrun protections must extend continuously from the front to the rear wherever possible.
- Adjacent parts may overlap. The overlapping edge must point to the rear or downwards.

6.7.7 Front-mounted implements

Additional information

Airbags are not permissible if the vehicle is fitted with front-mounted implements.

If the vehicle has airbags, they must be properly removed.

The installation of front-mounted implements must be co-ordinated with the department responsible (▷ 2.1).

6.8 Cab

Modifications to the cab must not have a negative effect on the operation or strength of assemblies or control elements or on the strength of load-bearing parts.

The tilting cab must not be fixed rigidly to the bodywork. If any interventions to the cab are planned they must be co-ordinated with the department responsible ▷ 2.1.

- The content relating to Mitsubishi three diamonds and Fuso emblem must be complied with ▷ 2.4.

Attaching the roof deck

Roof

- When attaching externally mounted parts such as roof deck or drag foiler onto the roof, use the exclusive mounting holes provided on the roof. (See Figs. 1 and 2.)
- Prevent the weight of externally mounted parts attached to the roof from exceeding 50 kg. (See Figs. 1, 2 and 4.)
- Use nickel-chrome plated stainless steel bolts and washers.
- Take special care to prevent the body from becoming scratched when attaching externally mounted parts.
- Insert packing between externally mounted parts and the body to prevent rusting. Use RC710CP (EPDM) rubber or equivalent with a thickness of 2 mm or less and a hole diameter of 8 mm (for ozone crack prevention).
- After attaching externally mounted parts, coat the entire periphery of the mounting bolts with sealer.
- The top coat of paint must be applied to externally mounted parts before attaching to the roof. (See Fig. 3.)

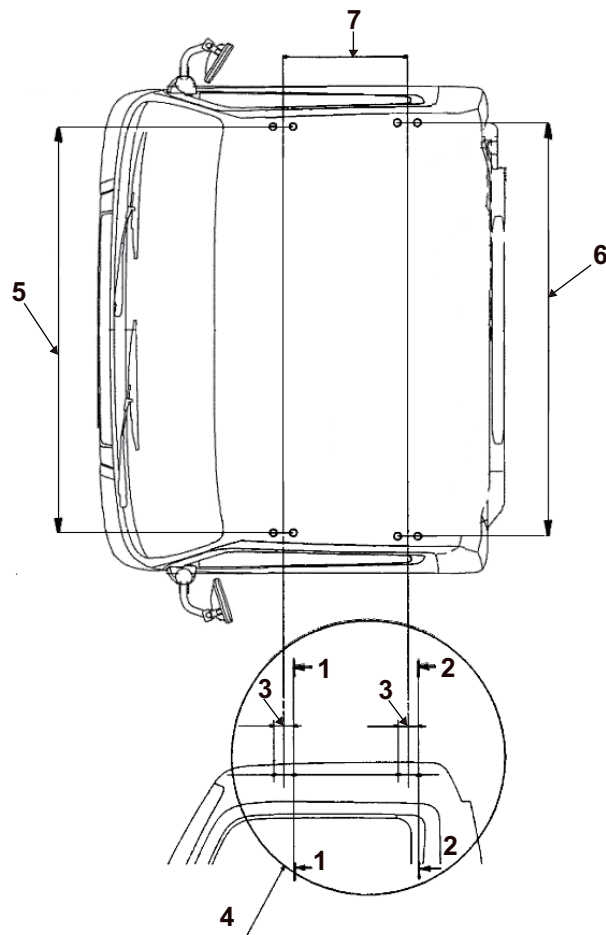
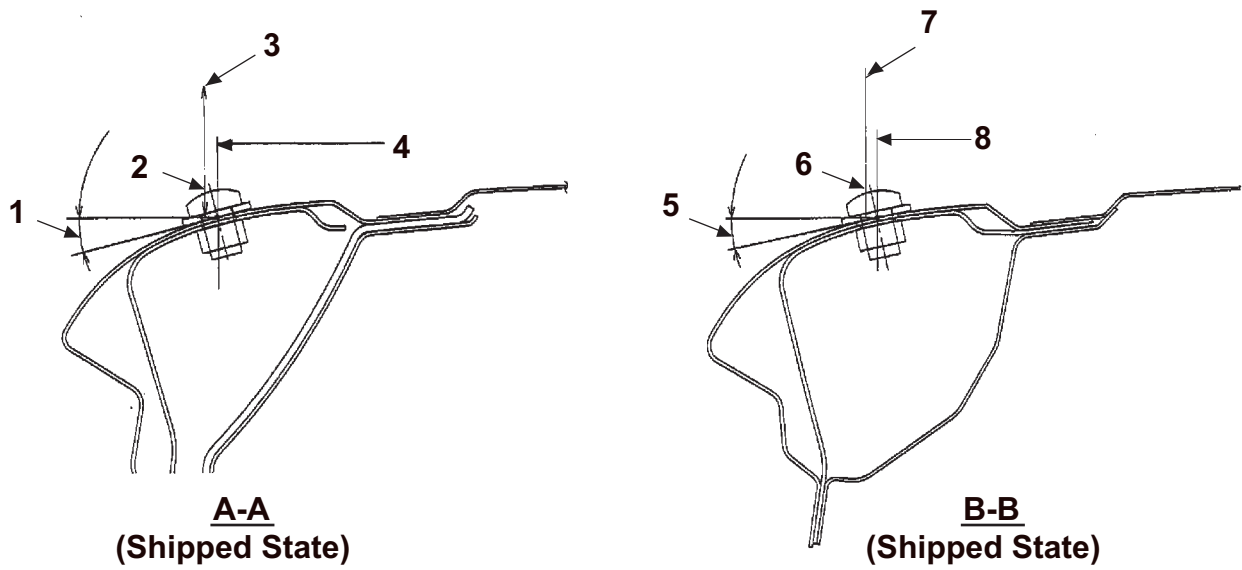


Fig. 1

1 Section A-A
2 Section B-B
3 80
4 Detail C

5 1664 (Wide cab)
1364 (Standard cab)
6 1694 (Wide cab)
1394 (Standard cab)
7 500



DETAIL C

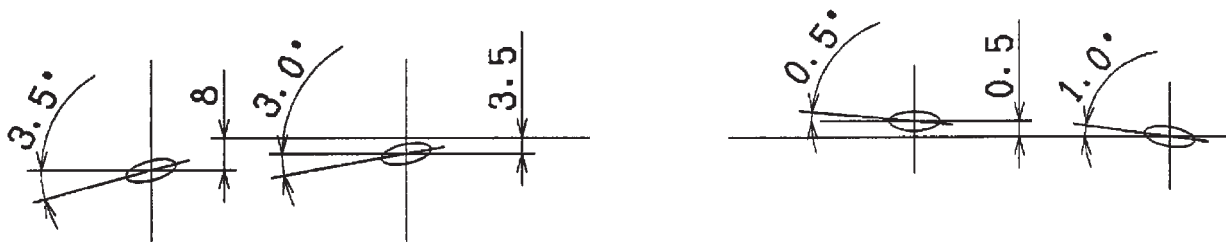


Fig. 2

- 1 16.5° (Wide cab, Standard cab)
- 2 31.0 (Wide cab)
29.0 (Standard cab)
- 3 roof top
- 4 1664 (Wide cab)
1364 (Standard cab)

- 5 14.5° (Wide cab, Standard cab)
- 6 34.5 (Wide cab)
32.5 (Standard cab)
- 7 roof top
- 8 1694 (Wide cab)
1394 (Standard cab)

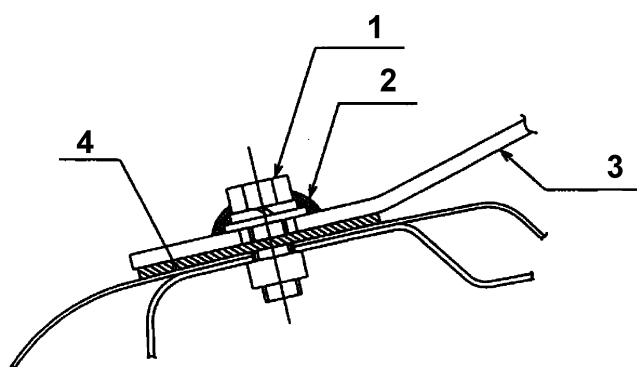


Fig. 3

- 1 Use washer and bolt with plain washer
- 2 Coat periphery with sealer
- 3 Roof deck or drag foiler
- 4 Rubber packing

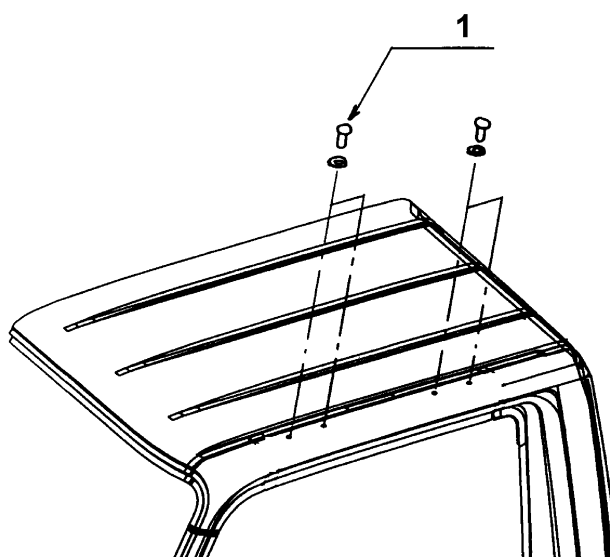


Fig. 4

- 1 Bolt and washer: Left/right total 8 places
(For roof deck or drag foiler)

6.9 Seats and bench seat



Risk of injury

Modifications to or work incorrectly carried out on a restraint system (seat belt and seat belt anchorages, belt tensioner or airbag) or its wiring, could cause the restraint systems to stop functioning correctly, e.g. the airbags or belt tensioners could be triggered inadvertently or could fail in accidents in which the deceleration force is sufficient to trigger the airbag. For this reason, never carry out modifications to the restraint systems.

Comply with all national regulations and directives.

The retrofitting of original seats and/or bench seats is only permitted and possible if the necessary preinstallations exist in the vehicle, such as suitable floor assembly, reinforced cab/cab suspension. For all other seat retrofittings, corresponding evidence (belt checks, tensile tests) is required as part of an endorsement check carried out by the department responsible ▷ 2.1.

6.10 Installation of propeller shafts

The modification of extending or shortening the wheelbase or additional installation of a gear box to the drive line requires the modification of the propeller shaft. If the propeller shaft is improperly modified such as a change in the pipe length by welding to the main unit of the propeller shaft, vibration caused by the propeller shaft can lead to a serious trouble or accident such as cracks and rupture of the motor generator and falling-off of the propeller shaft. Therefore, the modification of the propeller shaft is strictly prohibited.

If the modification of the propeller shaft is necessary due to a customer's request or body mounting layout, be sure to consult the department responsible.
(▷ 2.1)

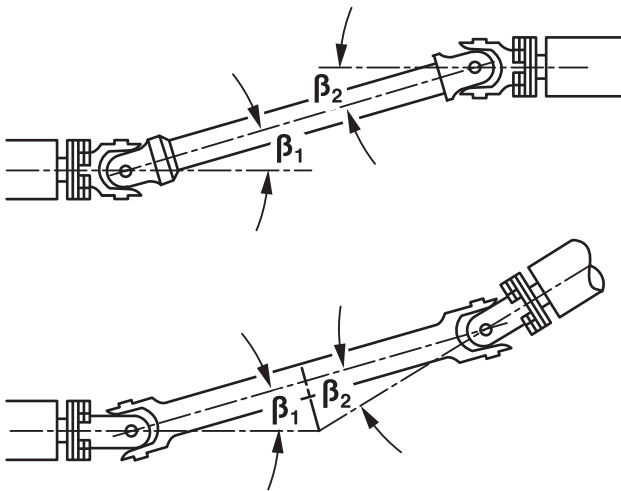
Observe the following when installing propeller shafts:

- Installation guidelines of the propeller shaft manufacturer.
- If necessary, fit several propeller shafts with intermediate bearings.
- The flanging surfaces must be completely flat.
- The angular offsets must be identical at both universal joints ($\beta_1 = \beta_2$). They must not be greater than 6° or less than 1° .
- Balancing plates must not be removed.
- Make sure that the marks are aligned on the propeller shafts during installation.
- Eliminate any vibrations, e.g. by optimizing the propeller shaft angles.

6 Modifications to the basic vehicle

6.10 Installation of propeller shafts

6.10.1 Types of angular offset



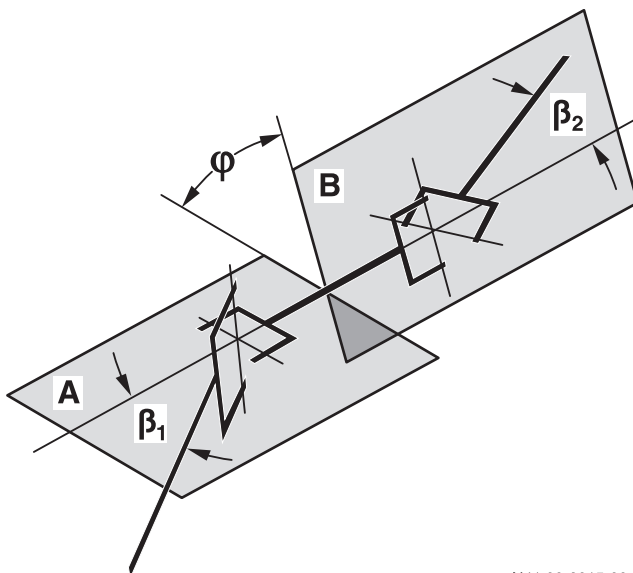
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Angle in one plane (two-dimensional offset)

$$\beta_1 = \beta_2$$

Upper = Z-type offset

Lower = W-type offset



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Angles in two planes (three-dimensional offset)

$$\beta_1 = \beta_2$$

With three-dimensional offset, the input and output shafts intersect in different planes (combined W- and Z-offset).

In order to compensate for any irregularities, the inner joint fork must be offset.

Property damage

Failure to observe these instructions could result in damage to the major assemblies.



6.11 Brake systems



Risk of accident

Work carried out incorrectly on the brake system may impair its function. This may lead to the failure of components or parts relevant to safety. This could cause you to lose control of the vehicle and cause an accident with possible injury to yourself and others.

Disc brake



Property damage

Do not impede cooling by attaching spoilers below the bumper, additional hub caps or brake disc covers, etc.

All accident prevention regulations must be complied with when working on the vehicle.

Comply with all national regulations and laws.



Additional information

After any modifications the brake system must be tested for proper operation and approved by a technical inspection authority otherwise the operating permit will be invalidated.

Further information can be found in Section 5 "Damage prevention" ▷ 5.1.

ESP (Electronic Stability Program)

<Vehicle with ESP>

- Be sure not to change the motor generator power, transmission, final ratio (except option), tire size, suspension system or wheelbase.
- Be sure not to alter ESP-associated devices, sensors, harnesses or connectors in any way.



6 Modifications to the basic vehicle

6.11 Brake systems

6.11.1 Chassis tubing form and dimension specifications

The chassis uses steel brake lines which conform to the following specifications.

(Double Flare type)

Unit: mm

Nominal diameter	A	B	t	C	S min.	Material
4.75 4.76	6.6-7.1	3.0-3.7	0.7	1.4	1.0	SPCC (JIS) (ASTM A109 or A366) Double walled steel tubes
6.35	8.6-9.1	4.5-5.2	0.7	1.4	1.0	

(ISO flare type) Material is the same as Double Flare types.

Unit: mm

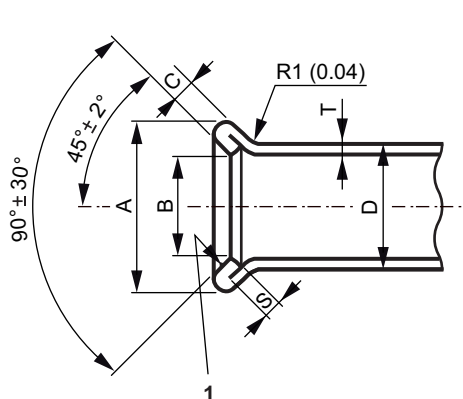
Nominal diameter	D1	D2	D3	D4 min.	T	L
4.75 4.76	4.83-4.69	7.28-6.92	3.5-3.0	4.7	0.77-0.63	2.8-2.2
6.35	6.42-6.28	8.98-8.62	5.1-4.6	6.3		

D4 is an outside diameter on the sealing surface. The surface-roughness is $\sqrt[3.2]{\lambda\tau 0.8}$

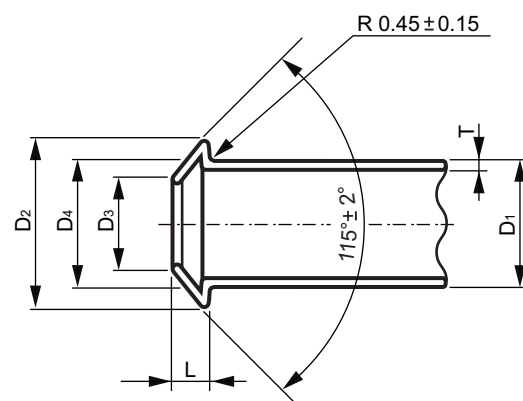
Double flare type

Unit: mm ISO flare type

Unit: mm



N42.50-2019-00



N42.50-2020-00

1 This surface must be smooth

Fig. 1

6 Modifications to the basic vehicle

6.1.1 Brake systems

The tightening torques for the flare nuts which connect the brake lines are shown below.

Nominal Diameter mm	Tightening torque N·m {kgf·cm}
4.75 4.76	13 to 17 {130 to 170}
6.35	19 to 26 {190 to 260}

6.1.1.2 Making additional tubes

- Only use brake tubes of the same material as the tubes connected to the chassis when extending the brake tubes.
- Only use steel tubes to extend the brake fluid tubes. Never use copper tubes.
- Only use metric pipe tools to form the flared end of brake lines as shown in the "Flared end shape figure" in Fig. 1. Be careful to not scratch the tubes, or damage the mating surfaces when flaring the ends.
- A brass nut used with steel tubes could cause uneven fitting between the flared surface of the tubes and the connecting surface joint, resulting in fluid leakage.
- Use the flare nuts specified in the table below.

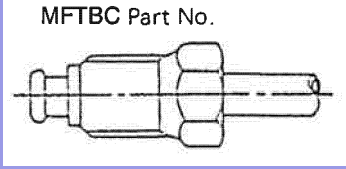
Nominal diameter of tube mm	MFTBC Part No. 
4.75 4.76	MF65 1001 (Double flare type) MK678335 (ISO flare type)
6.35	MF65 1002 (Double flare type) MK678336 (ISO flare type)

Fig. 2

- Use a tubing bending tool to bend the brake lines correctly. Do not use heat to bend the brake lines.
- The bend curvature R should strictly conform to the minimum allowable bend radius R shown in the table below.

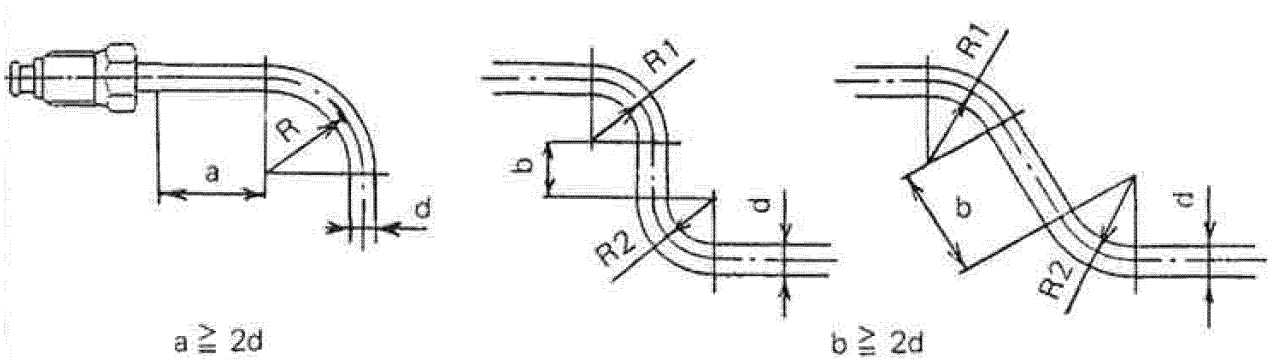
Unit: mm

Nominal diameter	Bend radius
4.75 4.76	25
6.35	30

6 Modifications to the basic vehicle

6.11 Brake systems

- The required length of the straight portion of the line end and the bent portion must conform to the dimensions specified in Fig. 3.



- Use high pressure air nozzle to clean and remove foreign matter from inside the brake lines before use. Use compressed air for cleaning. Cleaning oil is not recommended, but completely remove any residue if it is used.

6.11.3 Running additional lines

- Avoid crossing brake lines. If this is unavoidable, position each line so it clears the other by more than 15 mm. (Fig. 4)

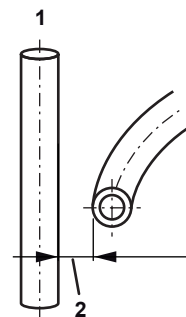


Fig. 4

- Crossed brake lines
- 15 mm min.

N42.50-2022-00

- Position the brake lines so that they are not closer than 15 mm to sharp edges of the frame or other parts. (Fig. 5)

6 Modifications to the basic vehicle

6.11 Brake systems

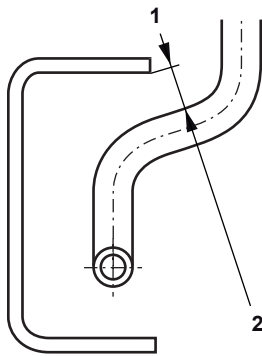


Fig. 5

N42.50-2023-00

- 1 Sharp edges
- 2 15 mm min.

- Securely clamp brake lines with PVC coated clamps or grommets to prevent vibrations when the vehicle is running.
- The standard brake line clearances are shown in the table below.

Unit: mm

	Tube dia	Clamp intervals
Straight tube	4.75-8	550 max.
Curved tube	↑	400 max.

- Brake lines should be laid along the inside web of the side rail whenever possible. When they cross over to the opposite side rail, they should be positioned along the cross members. Install the lines more than 10 mm away from bolts and rivets.
- Make sure the brake fluid lines can be bled easily.
- Never clamp or tape electrical wires to the brake lines, as this can cause corrosion of the line. Maintain the clearances described in Section 4 "Clearance for the basic vehicle and bodies" ▷ 4.4.
- The clearance between the brake lines components should conform to the specifications in Section 4 "Clearance for the basic vehicle and bodies" ▷ 4.4.
- Position the connection nut in a location where it can be completely tightened without difficulty.
- Tighten the flare nuts to torque specified in ▷ 6.11.2. Do not tighten the flare nut any further if oil leaks. Loosen the flare nut completely, adjust the mating surfaces, re-thread the nut and then tighten it completely.

- Never force or tighten any part with a wrench or other tool if problems occur while installing brake lines. Realign the brake lines so the mating surfaces are correctly positioned, and then tighten the flare nut. If possible, first gently thread the nuts by hand, and then tighten them with the designated flare nut wrench.
- Never install brake lines near the drive shaft or other moving parts.
- Never change the installation location of the brake hoses.
- When replacing the brake lines, do not use the fluid which was drained. Drain the fluid completely and replace with new fluid.
- Install the brake lines so that they are protected from damages caused by flying objects thrown up by the tires.
- When it is necessary to protect brake lines against possible damage as described above, install a protective panel as shown below.
 - (a) Fabricate a protective panel which will not be deformed by flying objects and come in contact with the brake lines.
 - (b) Position and shape the protective panel properly (for drain holes, etc.) so water will drain freely.

Example

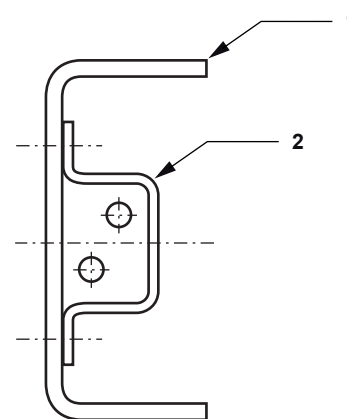


Fig. 6

N42.50-2024-00

- 1 Side rail
- 2 Protector

6.12 Handling of EV system



Risk of accident

For EV system, high-voltage of 365 V may be generated in the high-voltage circuit consisting of high-voltage equipment (motor generator, motor electronic control unit and high-voltage battery box) and high-voltage cable (orange color). Due care must be exercised. Also, the laws of the country in which the vehicle is to be used must be strictly observed.

Never use the high-voltage battery for any other application.

You cannot carry out body building for the purpose of transporting dangerous items.



Property damage

Do not wash the high-voltage battery using high-pressure washing. This may result in water getting inside the high-voltage battery, causing it to become damaged.

Do not drive the vehicle on a road that is submerged with water to a depth of 30 cm or more. This may result in water getting inside the high-voltage battery, causing it to become damaged.

Characteristics of EV system

The system is equipped with a high-voltage battery (365 V) exclusive for the EV system apart from a 12 V battery.

High-voltage is interrupted when the starter switch is turned OFF.

High-voltage is generated in the high-voltage circuit when the starter switch is turned ON.

High-voltage may be generated in the high-voltage circuit regardless of the vehicle condition when the EV system is abnormal (illumination of the EV warning lamp).

6 Modifications to the basic vehicle

6.12 Handling of EV system

6.12.1 General precautions

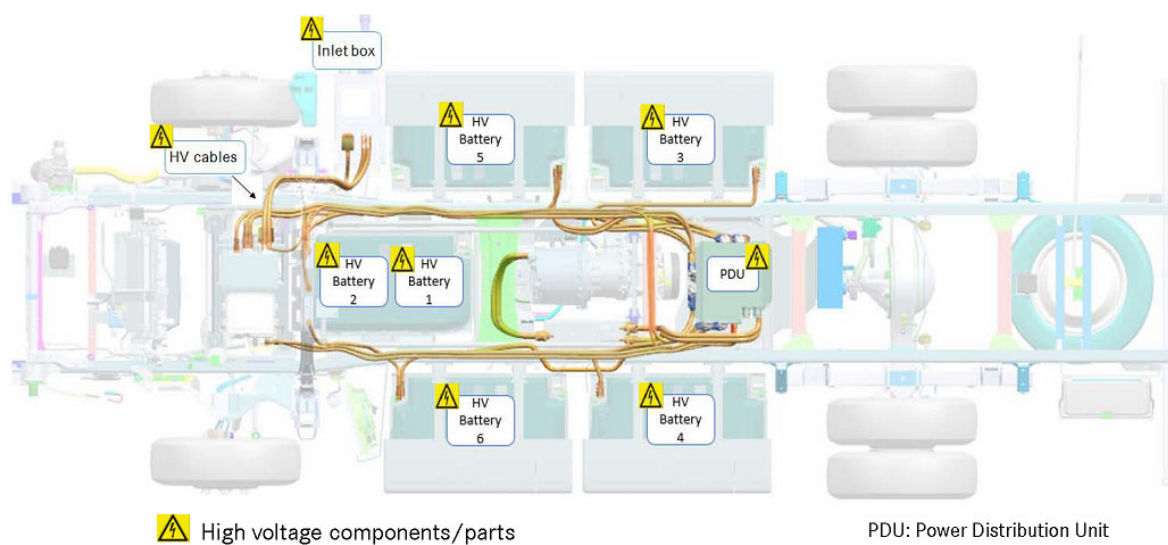


Risk of accident

The eCanter has high-voltage (approx. 365 V). Be careful that mishandling high-voltage equipment may lead to an electric shock, leakage and breakage.

(a) The eCANTER has high voltage equipment (approx. 365V).

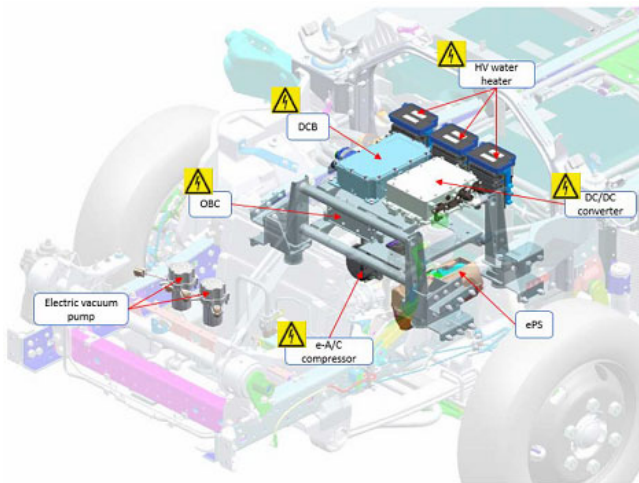
Handle it with care; otherwise, an electrical shock, leakage, or breakage may result. The high voltage equipment includes the following:




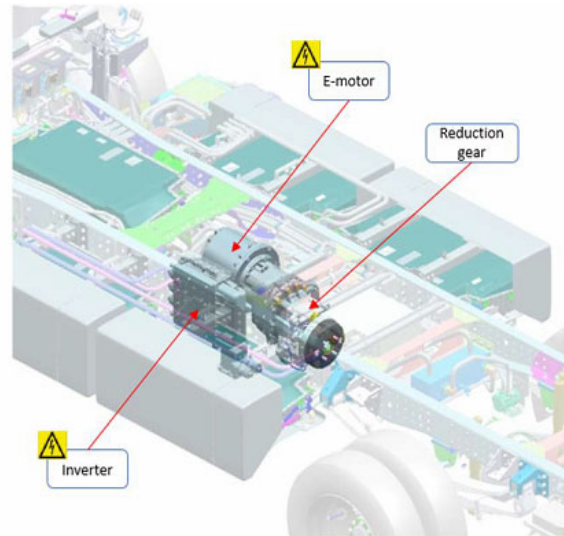
6 Modifications to the basic vehicle

6.12 Handling of EV system

- Detail drawing of high-voltage battery box



 High voltage components/parts



DCB: DC interface box

ePS: Electric power steering pump

e-A/C: Electric air conditioner

OBC: AC onboard charger

- (b) An operator who removes and installs high-voltage equipment must be careful of an electric shock. In addition, qualifications may be required depending on countries where the vehicle is used. Observe the laws and regulations of the applicable country when performing the work.
- (c) The pieces of the high-voltage equipment should not be disassembled.
(excluding high-voltage cable joint, and safety plug and air filter of the high-voltage battery box)
Never disassemble the high-voltage equipment, because doing so may cause the risk of an electric shock and failure.
Besides, never modify sensors, harnesses and connectors.
- (d) Even if it is simple work such as installing the radio, the high-voltage equipment might be damaged. Be sure to implement the following items.
- Remove the starter key from the starter switch.
 - Remove the negative (-) terminal of the 12 V battery cable and put a cover on the terminal.
 - Check that the EV system is normally activated ("READY indicator" illuminates on the instrument panel when the key is turned ON.) before and after body mounting work.
- (e) Before carrying out a vehicle wash, including a high-pressure wash, stop the EV system and wait for at least 5 minutes.
Do not apply high pressure cleaning to the EV system equipment, charge inlet box, or ECU. Do not expose the area surrounding the high voltage battery bent pipe directly to water or steam. If water or steam enters into the high voltage battery, the lithium battery may be broken.
- (f) Do not bind the high voltage cable together with wires or pipes.

6 Modifications to the basic vehicle

6.12 Handling of EV system

6.12.2 High voltage shutoff and reset

(a) Safety precautions for bodywork

Bodywork requires safety measures such as shutting off the high voltage. Performing the work without shutting off the high voltage may cause an electric shock or damage to the equipment.

Shut off the high voltage depending on the content of the bodywork as follows:

Work allowed or not	Work items		Simple shutoff *	High voltage shutoff	Caution
Yes	General	Welding	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The distance to the high voltage harness and cover shall be 500 mm or greater.
		Machining	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The distance to the high voltage harness and cover shall be 500 mm or greater.
		Painting	<input type="checkbox"/>	<input checked="" type="checkbox"/>	The high voltage parts and harnesses shall not be painted.
		Assembly of non-high voltage parts	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Equal potential bonding of the high voltage parts shall not be disassembled (into black and yellow cables).
	Electric/electronic	Soldering	<input type="checkbox"/>	<input checked="" type="checkbox"/>	–
	High voltage parts	Installation/removal	<input type="checkbox"/>	<input checked="" type="checkbox"/>	These parts shall not be accessed by any worker other than specialized in the servicing of high voltage parts.
	Body	Assembly	<input type="checkbox"/>	<input checked="" type="checkbox"/>	–
No	General work		<input type="checkbox"/>	<input checked="" type="checkbox"/>	No one is allowed to touch or move the high voltage parts (including umber cables) or to tow the vehicle (at the vehicle speed of 20 km/h or higher) with the Ready indicator in the meter panel off.

*Shut off the high voltage by pressing the high voltage shutoff switch


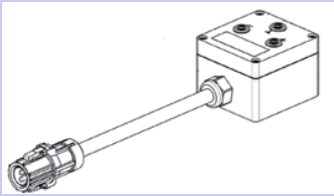
- Work that requires the shutoff of the high voltage
 - Bodywork
 - Example: Bodywork including support frames for flat bed, box, damp, etc.
 - 12 V tail gate lifter bodywork
 - Replacement of high voltage parts
- Disassembly/assembly of suspension and brake parts or work under the cab
- Vehicle demonstration at exhibitions

6 Modifications to the basic vehicle

6.12 Handling of EV system

- Work that does not require the shutoff of the high voltage
 - Light work
Example: Tire change, work inside or outside the cab, head lamp bulb replacement, 12 V or 24 V battery charging or replacement, replenishment of coolant
 - Visual inspection of high voltage parts/harnesses
- Periodical inspection items
- Towing at 20 km/h or lower
To tow the vehicle at 20 km/h or higher, turn on the EV system and set the gear to the N position.
- (b) Preparing for high voltage shutoff
To shut off and reset the high voltage, prepare the following tools:





Special tool

Symbol	Name	Shape	Part number	Purpose
	High voltage break out box	 511789	MH064920	Voltage shutoff work/restart work

6 Modifications to the basic vehicle

6.12 Handling of EV system

Other items to be prepared

Symbol	Name	Shape	Purpose
–	Voltmeter	 601977	Use a voltmeter designed to withstand high voltage rather than a normal voltmeter.
–	Insulation resistance tester	 601978	Use an equipment able to measure the resistance value of a load to which a voltage of 500 V is applied.
–	High voltage protectors	High voltage insulation gloves  601979	Use gloves that withstand up to 600V and are long enough to cover the arms
–		Protective goggles  601980	Wear goggles if necessary.

(c) High voltage shutoff procedure

- Perform the following steps. Copy the voltage shutoff report on the next page, check all the items, record the values, and store the report.
- Check the Duspol high voltage tester function and appearance for abnormalities. Record the Duspol high voltage tester inspection date.
- Be sure to wear insulation gloves for high voltage.
- Lock the wheels and apply the parking brake.
- Put a sign of "High voltage vehicle. Danger: high voltage" on the cab.
- Remove the starter key and store it in a safe place.
- The charge connector is removed.
- Press in the high voltage shutoff switch.

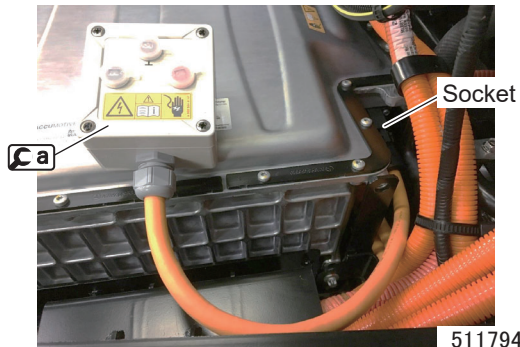
- Inspect the high voltage related parts and check the appearance of high voltage battery for damages.
- Remove the protection cover and blind plug from the high voltage battery 1.



- Securely connect  to the blind plug socket of the high voltage battery.

6 Modifications to the basic vehicle

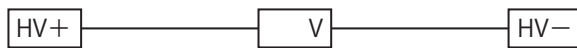
6.12 Handling of EV system



- The high voltage shutoff switch is pulled out (released).
- Set the shift lever to the "P" position. Press the START/STOP button and check that the Ready lamp of the meter cluster is lit.
- Using a voltmeter, check if the high voltage system is energised (by measuring the voltage via **Ca**).

Reference value

DC 250 V

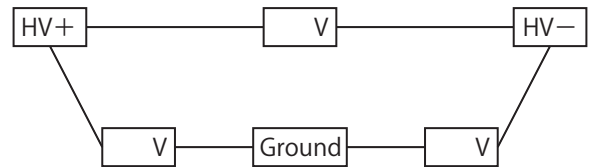


511796

- Remove the starter key and store it in a safe place.
- Press in the high voltage shutoff switch.
- Remove the negative terminal from the 12 V battery.
- Wait for 5 minutes until the electricity is discharged.
- Using a voltmeter, check that the high voltage system is not energised (by measuring the voltage via **Ca**).

Reference value

Less than DC 5V



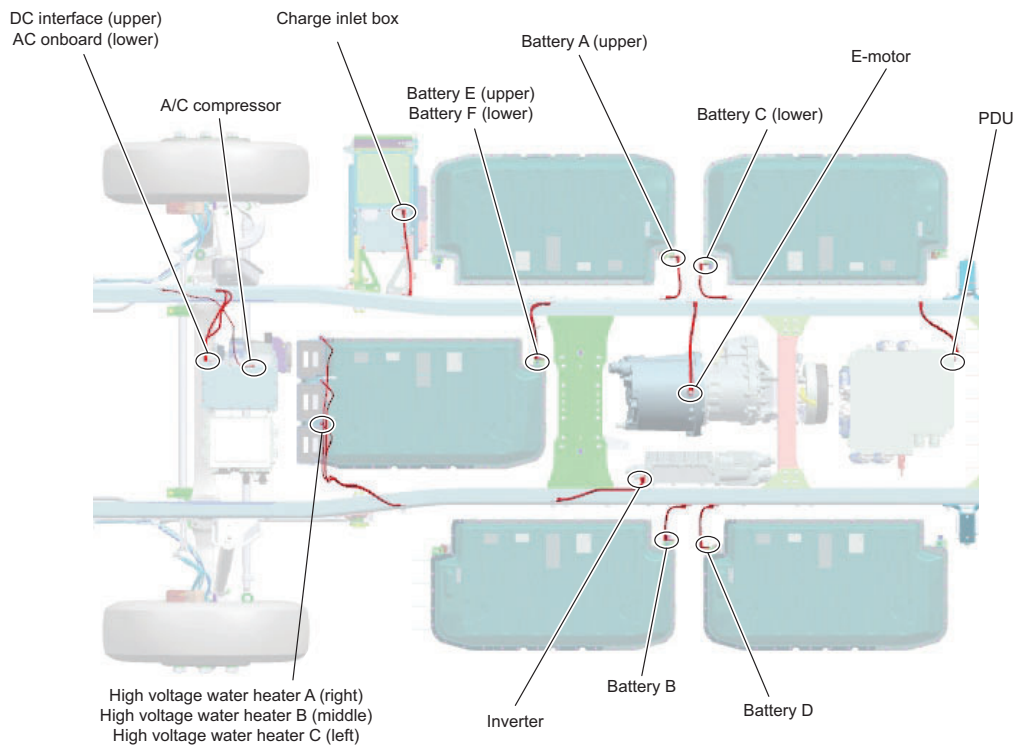
511797

- Change the sign from "High voltage vehicle. Danger: high voltage" to "High voltage vehicle. Shutting off the high voltage".
 - Check all the items and record the values in the report.
- (d) High voltage reset procedure
- Perform the following steps. Copy the Rework Report, check all the items, record the values, and store the report.
 - Document the tasks performed in the report.
 - Document any high voltage system tasks performed in the report. (* 1)
 - Check that the high voltage parts and the surrounding area are free from damages and that plugs are inserted into all the connectors with all the covers installed.
 - If you have replaced the high voltage equipment (see * 1), check that the equal potential ground cable is securely connected, as instructed below.
 - Check the ground connection tester appearance and function for abnormalities.
 - Check if the equal potential ground connector is installed exactly as instructed.

6 Modifications to the basic vehicle

6.12 Handling of EV system

Equal potential ground cable



601426

Content of the work on the high voltage equipment (1)

Resistance between the high voltage equipment and frame

Ω

Content of the work on the high voltage equipment (2)

Resistance between the high voltage equipment and frame

Ω

Content of the work on the high voltage equipment (3)

Resistance between the high voltage equipment and frame

Ω

If you worked on three or more high voltage units, add the report by signing and attaching it.

601981

6 Modifications to the basic vehicle

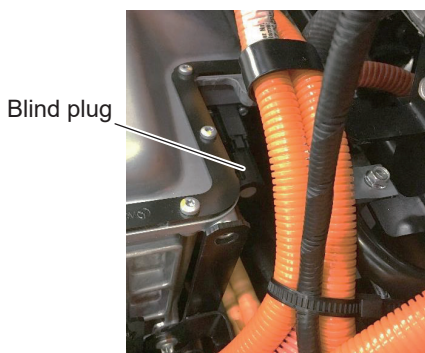
6.12 Handling of EV system

- Check if the measured resistance is within the reference value.

Reference value

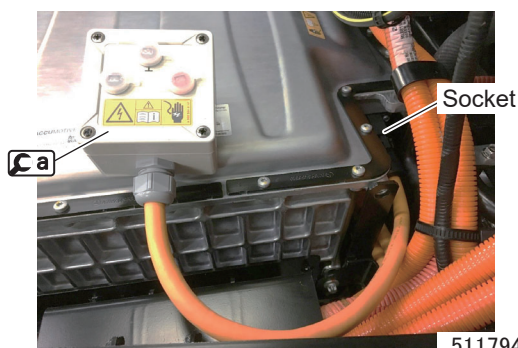
The resistance of the non-painted portion of the frame shall be less than 40 mΩ at 2 A or higher

- Be sure to wear insulation gloves for high voltage.
- Check the voltmeter and resistance tester for any problems. Record the inspection date of the Duspol high voltage tester.
- Remove the battery side cover and remove the No.3 or No.4 high voltage battery blind plug.



511793

- Check the following items based on the content of the work performed and enter the necessary values.
- Check the insulation resistance tester appearance and function for abnormalities.
- Check the inspection date of the Duspol high voltage tester.
- Connect **Ca** to the blind plug socket.



511794

- Measure the insulation resistance of the high voltage battery using a voltmeter and insulation resistance tester and check if it is within the reference value (by measuring the voltage via **Ca**).

Reference value

2.5 mΩ or higher
(at 500 V)



511795

- Check the high voltage equipment for visible damages.
- Change the sign from "High voltage vehicle. Shutting off the high voltage" to "High voltage vehicle. Danger: high voltage".
- Remove **Ca** from the high voltage battery and attach the blind plug.
- Securely install the protection cover on the high voltage battery.
- Connect the negative terminal of the 12 V battery.
- The high voltage shutoff switch is pulled out (released).
- Insert the starter key. Turn on the START/STOP button and wait for the system check.
- Remove the sign of "High voltage vehicle. Danger: high voltage".
- Perform the test run (functional check) and record the travel distances before and after the test run.
- Check all the items and record the vehicles in the report.

Voltage Shutoff Work Report: eCanter

1/2

Company/branch name		User name	
Vehicle identification number		Work code	Worker name/date
Registration number	Registration date	Model name	Travel distance

Check the following items and enter the appropriate values.

A1 Check the Duspol high voltage tester appearance and function for abnormalities.

A2 Inspection date of the Duspol high voltage tester

V1 The vehicle wheels are locked with chocks.

V2 The sign of "High voltage vehicle. Danger: high voltage" is raised.

V3 Turn off the starter switch. Remove the starter key and store it in a safe place.

V4 The charge connector is removed.

V5 The high voltage shutoff switch is pressed in.

V6 Inspection of the high voltage related parts: Check the high voltage battery appearance for abnormalities.

V6 Remove the protection cover and blind plug from the high voltage battery, and securely install the high voltage break out box on the high voltage battery. Securely install the blind plug to the high voltage break out box.

T1 The high voltage shutoff switch is released.

T2 The READY lamp is lit when the starter switch is turned on with the shift lever in the P position.

M1 Energisation of the high voltage battery (measurement via the high voltage break out box)

HV+ V **HV-**

M2 The voltage measured in M1 is DC 250V or higher.

L1 Turn off the starter key and store it in a safe place.

L2 Press in the high voltage shutoff switch.

L3 Remove the connection to the 12V battery. Time

L4 Wait for 5 minutes or longer. Time

↘ Proceed to the second page

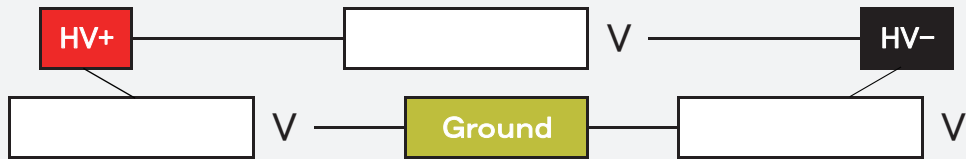


6 Modifications to the basic vehicle

6.12 Handling of EV system

2/2

M3 Non-energisation of the high voltage battery (measurement via the high voltage break out box)



M4 The voltage of M3 is always less than DC 5V.

P1 Change the sign from "High voltage vehicle. Danger: high voltage" to "High voltage vehicle. Shutting off the high voltage"

P2 Check all the items and enter the numeric values.

P3 Where the starter key is stored:

This vehicle is ready for servicing.

Comment

Date/time

Place

Sign - Electricity or high voltage specialist

Rework Report: eCanter

1/2

Company/branch name		User name	
<input type="text"/>		<input type="text"/>	
Vehicle identification number	Work code	Worker name/date	
<input type="text"/>	<input type="text"/>	<input type="text"/>	
Registration number	Registration date	Model name	Travel distance
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Check the following items and enter the appropriate values.

D1 What work was performed?

D2 Document any work related to the high voltage system:

Name of the responsible person

Sign of the responsible person

C1 Check that the high voltage equipment and the surrounding area are free from damages, that all the connectors are connected, and that all the covers are installed using the specified parts.

If you replace high voltage equipment (see D2), check if the equal potential ground cable is securely connected by checking the following:

B1 Check the ground connection tester appearance and function for abnormalities.

B2 Check if the equal potential ground cable is installed exactly as instructed.

Content of the work on the high voltage equipment (1)	Resistance between the high voltage equipment and frame
---	---

<input type="text"/>	<input type="text"/> Ω
----------------------	------------------------

Content of the work on the high voltage equipment (2)	Resistance between the high voltage equipment and frame
---	---

<input type="text"/>	<input type="text"/> Ω
----------------------	------------------------

Content of the work on the high voltage equipment (3)	Resistance between the high voltage equipment and frame
---	---

<input type="text"/>	<input type="text"/> Ω
----------------------	------------------------

If you worked on three or more high voltage units, add the report by signing and attaching it.

B3 The resistance measured is within the allowable range (the resistance of the non-painted portion of the frame shall be less than 40 mΩ at 2 A or higher).

↙ Proceed to the second page



6 Modifications to the basic vehicle

6.12 Handling of EV system

2/2

Check the following items based on the content of the work performed and enter the necessary values.

I1 Check the insulation resistance tester appearance and function for abnormalities.

I2 Inspection date of the Duspol high voltage tester

I3 Measuring status of the insulation resistance
(Measurement via the high voltage break out box connected to the high voltage battery box)



I4 The insulation resistance between the high voltage measuring point and the ground is within the specified range (250 kΩ or higher at 500 V as per the UN Regulation No.100 (ECR-R100) 5.1.3.2).

P1 Check the high voltage equipment for visible damages.

P2 Change the sign from "High voltage vehicle. Shutting off the high voltage" to "High voltage vehicle. Danger: high voltage"

P3 Remove the high voltage break out box from the high voltage battery.
Securely install a blind plug and protection cover to the high voltage battery.

P4 Connect the connection to the 12 V battery.

P5 Release the high voltage shutoff switch.

P6 Turn on the starter switch and wait for the system check.

P7 Remove the sign of "High voltage vehicle. Danger: high voltage" from the vehicle.

P8 Test run (functional check) Travel distance

P9 Complete the test run (functional check). Travel distance after test run

P10 Check all the items and enter the numeric values.

This vehicle is ready for servicing.

Comment

Date/time

Place

Sign - Electricity or high voltage specialist



6.12.3 Precautions during electric welding

Property damage

Do not leave the safety plug cover open. Be sure to install it otherwise water or foreign matter may enter the high-voltage battery box and cause the battery to break down.

- (a) Remove the starter key from the key slot.
 - (b) Turn off the high voltage shutoff switch.
 - (c) Disconnect the battery cable connected to the negative (-) side of the battery and leave for 5 minutes or longer.
 - (d) As needed, cover the surrounding area to prevent welding sparks from damaging the vehicle.
 - (e) Connect the welder negative (-) cable to the vicinity of the welding part. Do not connect the cab and frame.
 - (f) Set the welder current to the value appropriate for the metal and perform welding.
 - (g) Perform welding work, referring to "8.6 Precautions during electric welding" (▷ 8.6.).
- (c) Do not expose the ventilation valve (the internal release valve) of the high voltage battery to water, sea water, juice, or other liquid because doing so may result in damages to the internal parts of the high voltage battery, explosion, firing, heating, or expansion of the battery module.
Also, do not apply high pressure cleaning to the said valve.
 - (d) Do not pierce the high voltage battery with a nail, strike it with a hammer, or stomp on it because doing so will damage the battery internal circuit or may cause explosion, firing, heating, or expansion of the battery.
 - (e) If the battery is externally corroded, emits odour, or gets heated, immediately stop using it and contact your Mitsubishi Fuso dealer.
 - (f) You cannot perform maintenance or repair of the high voltage battery interior with the lid or external attachment removed.

6.12.4 Precautions of high-voltage battery box

The high voltage battery is a lithium ion battery
Observe the following precautions to secure the safety of the battery and make full use of the performance.
For any questions regarding handling, etc., contact your Mitsubishi Fuso dealer.

- (a) If a fault or other problem occurs during the use of the high voltage battery, immediately contact your Mitsubishi Fuso dealer for receiving appropriate support.
- (b) The high voltage battery shall not be used for any other purposes than intended.

6.12.5 Attaching a side guard

When installing a side guard around the high voltage battery box, take care to prevent interference with the high voltage battery box side cover when it is attached or removed.

Take care to prevent the side guard and mounting stay from hiding the caution label.

6.12.6 Installing the side underrun protection

- (a) When installing the side underrun protection in the vicinity of the high-voltage battery box, take care that it does not interfere with the replenishment of water in the inverter cooling water tank, the inspection of the filling port and the high-voltage battery box side cover, or the operation of the high-voltage shutoff switch.
- (b) Ensure that the side underrun protection and mounting stay do not hide the access hole for the high-voltage shutoff switch in the side cover or the caution labels.

6.12.7 Precautions during painting

- (a) High-voltage cables and connectors are in exclusive orange color so that they can be identified as high-voltage. When reapplying painting, be careful not to paint these cables so that they can be surely distinguished.
- (b) The high-voltage battery box is painted in color so that the rise in the battery temperature is kept to a minimum. Do not repaint the battery box.

6.12.8 Attaching caution label for high-voltage shutoff switch

Additional information

For attaching of the caution label, see ▷ 10.8.2.

6.12.9 Installing custom-built truck body

When adding a wire or pipe for installing custom-built body, do not clamp it together with a high-voltage cable.

6.13 Others



6.13.1 SRS air bag

Risk of injury

Observe the following precautions when carrying out body/modification work on vehicles equipped with SRS airbags and seat belts with emergency tensioning retractors.

Otherwise, the airbag may not operate properly or it may be triggered unexpectedly during the work. (SRS: Abbreviation for Supplemental Restraint System, a restraint system which supplements the seat belts)

- Precautions for body building and modifications
 - (a) Modification of a front portion of the vehicle or mounting of a built body on the front surface of the cab may result in the SRS air bag not working properly. If such a modification is made or body building is performed, explain the precaution to the purchaser of the vehicle and alter the SRS air bag so as to demount. For queries about the alteration procedure to demount the air bag and any special types of body building other than those given below, contact the department responsible. ▷ 2.1
 - Modification of the front bumper, frame or cab at the front portion of the vehicle
 - Mounting of a grille guard or winch
 - Mounting of a snowplow
 - Body building of a front-stowing, and not hook-stowing, cab back crane (type of crane traveling with a hook suspended at the front of the cab)
 - (b) Never disassemble or modify the steering wheel (including the pad), airbag modules (driver's seat and front passenger seat), airbag ECU, sub-G sensor, ELR of the seatbelts fitted with pretensioners (driver's seat and front passenger seat) or the airbag harnesses.
 - (c) Do not install electrical parts or equipment related to body-building at a location that is on and higher than the steering wheel.


- (d) The airbag ECU is installed on a bracket alongside the brake pedal on the cabin floor (in the case where a front passenger seat airbag is provided, a sub-sensor is also installed on the floor at the rear of the washer tank on the front passenger seat side), so do not modify or reinforce the airbag ECU mounting bracket. Also, do not apply a strong impact to the bracket by kicking or striking it, for example.
- Precautions during electric welding
 - (a) Turn OFF the starter switch and disconnect the negative battery cable. Then, leave the vehicle to stand for 1 minute or more. This step is performed to let electricity stored in the backup capacitor disposed inside the ECU of the SRS air bag discharged. Wrap tape around the negative battery cable terminal for proper insulation. (Be sure to perform this step particularly for work related to electrical systems and cab.)
 - (b) Make an ground connection of the welding machine near the welding portion.
 - (c) After the welding operation, restore the battery cable to the original position and turn ON the starter switch. At this time, make sure that  does not appear on the multi-display. If the multi-display shows , never fail to contact an authorized MITSUBISHI FUSO dealer.

If you carry out welding work in the vicinity of the airbag, you are likely to cause this restraint system to become defective. Never carry out welding in the vicinity of the airbag.

If you ignore this warning, the airbag is likely to deploy or fail to function correctly.

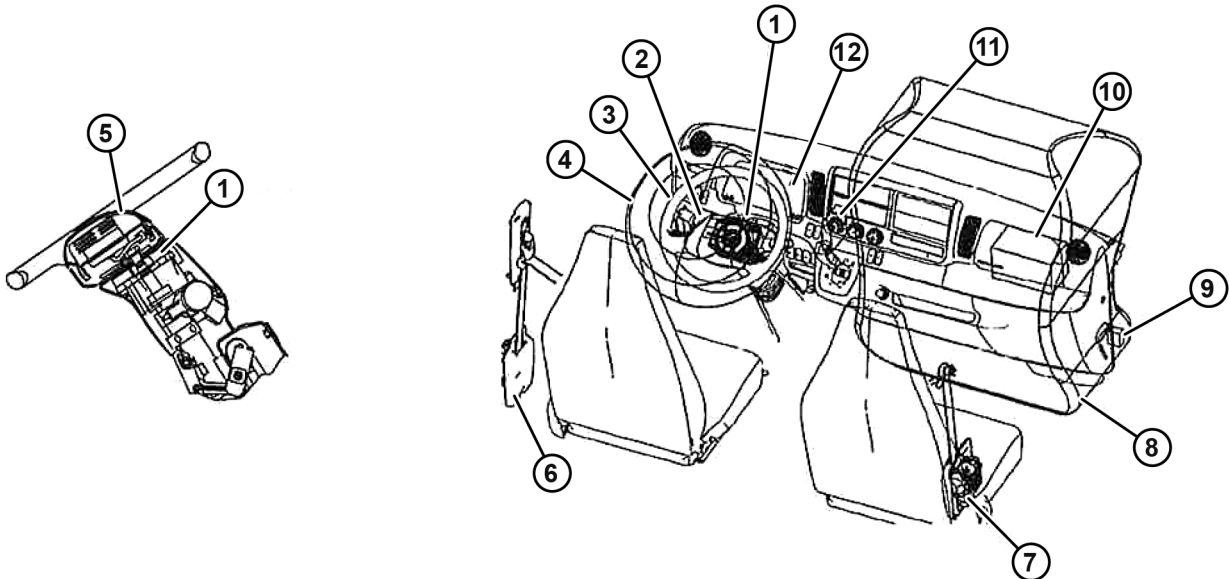
- Precautions during body building work
 - (a) The SRS air bag system parts are mounted around the steering wheel and seat belt retractor. Do not tap the areas around the SRS air bag system parts or otherwise apply impact to them.
 - (b) Do not remove any SRS air bag system parts.

- (c) Do not modify harnesses and connectors of the SRS air bag system. Do not fix other harnesses to the air bag or pretensioner harness.
- (d) Do not check the SRS air bag circuit using a multimeter or similar device.
- (e) When performing work involving heating to the cab (e.g. painting), if the temperature becomes 93°C or higher, remove the air bag ECU, sub-G sensor, air bag module, clock spring, and the ELR of the seat belt with pretensioner in advance.
If these parts are to be removed, contact the department responsible in advance. ▷ 2.1
- (f) If the air bag module is removed, place it with the horn pad upper surface facing up on a flat site. Do not place any other object on the air bag module.
- (g) Use utmost care when handling the air bag module, air bag ECU and sub-G sensor. Do not drop it or subject it to water or oil.
Never apply impact to the air bag ECU and sub-G sensor, in particular.
Should it be dropped, replace it with a new one even if it looks all right on the outside.
- (h) Do not modify the electrical circuit of the SRS air bag.
Never use a general-purpose multimeter.
- (i) Never source power from the SRS air bag fuse.
- (j) Do not turn the clock spring three turns or more from the neutral position (straight-ahead position), as a damaged internal harness could result.
- (k) Whenever removing the steering wheel or steering shaft joint, be sure to place the front tires in the straight-ahead position, remove the starter key, and lock the steering wheel.
- (l) During reinstallation of the steering wheel, make sure that the front tires are placed in the straight-ahead position and the clock spring in the neutral position.
To bring the clock spring into its neutral position, follow these steps: turn the clock spring fully clockwise; turn it counterclockwise the number of turns specified on the label; and turn it until the alignment marks are aligned with each other.
- (m) After the work has been completed, use the SRS air bag warning to check that the system functions properly.

Turn ON the starter switch and then check that the SRS air bag warning  does not appear on the meter cluster multi-display.

If the SRS air bag warning  appears, consult an authorized MITSUBISHI FUSO dealer.

- Miscellaneous
 - (a) Be sure to consult an authorized MITSUBISHI FUSO dealer whenever performing any work other than those noted above, replacing or disposing of the SRS air bag, or discarding a vehicle equipped with the SRS air bag.



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- | | | | |
|---|---|----|--|
| 1 | Clock spring | 7 | Seat belt with pretensioner on passenger's seat side |
| 2 | Air bag module on driver's seat side | 8 | Air bag on passenger's seat side |
| 3 | Steering wheel | 9 | Sub-G sensor |
| 4 | Air bag on driver's seat side | 10 | Passenger-side airbag module |
| 5 | Air bag module | 11 | Airbag control unit |
| 6 | Seat belt with pretensioner on driver's seat side | 12 | SRS warning |

6.13.2 Advanced emergency braking system (AEBS) <Vehicle with AEBS>

Advanced emergency braking system automatically applies the brakes to either prevent a collision, or reduce the speed at which impact occurs and thereby reduce the damage caused by a collision when a collision with the vehicle ahead cannot be avoided.

Preparation

Before doing any electrical welding work related to body mounting work, turn off the starter switch and disconnect the battery cable from the negative terminal.

Put the ground for the welder close to the position you are welding.

When painting work

- Mask the radar unit and radar cover so no paint gets on them.
- Remove the radar unit from the vehicle before forced drying the area around the radar unit.

If you remove the radar unit

After you have removed the radar unit from the vehicle, have the radar adjusted at MITSUBISHI FUSO TRUCK&BUS CORPORATION.

If you drop the radar unit

The radar unit is a precision component. You must replace it if it is subjected to physical shock, such as being dropped.

Built body components

Do not install built body components in front of the radar. Doing so could cause false alarms or malfunctions.

Do not install a license plate frame (number plate frame).

7.1 General



Risk of accident and injury

Do not modify any bolted connections that are relevant to safety, e.g. that are required for wheel alignment, steering or braking functions.

When unfastening bolted connections make sure that, when work is complete, the connection again corresponds with the original condition.

Welding work on the chassis/body may only be carried out by trained personnel.

The body, attached or installed equipment and any modifications must comply with the applicable laws and directives as well as workplace safety or accident prevention regulations, safety rules and accident insurer requirements.

With all bodies make sure that neither flammable objects nor flammable liquids can come into contact with hot assemblies (including through leakages in the hydraulic system) such as the transmission, etc.

Appropriate caps, seals and covers must be installed on the body in order to avoid the risk of fire.



Property damage

Bodies on which the transmission can be expected to be exposed to high levels of water, e.g. cleaning water (flushing, overflowing or similar), require an effective cover over the transmission (transmission guard) which will prevent abrupt cooling as well as water ingestion via the transmission breather.



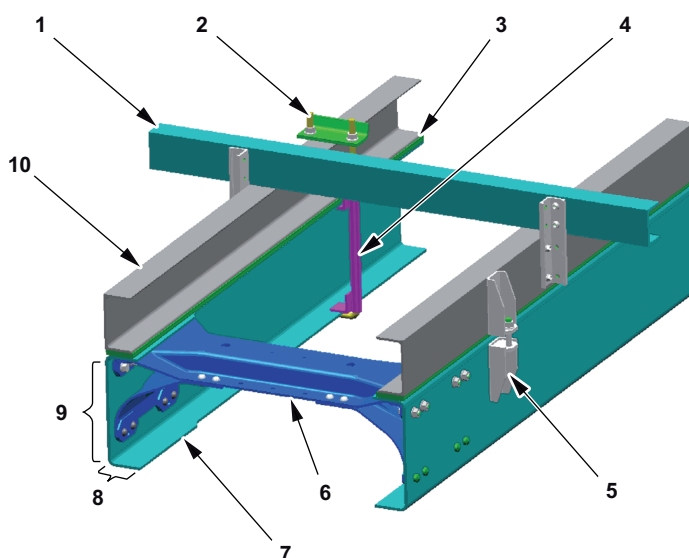
Additional information

Further information on bolted and welded connections can be found in Section 3 "Planning of bodies" ▷ 3.6 and Section 5 "Damage prevention" ▷ 5.1.



7.1.1 Body mounting methods

General



- | | | | |
|---|-------------------------------------|----|----------------|
| 1 | Cross sill | 6 | Cross member |
| 2 | U-bolt | 7 | Chassis frame |
| 3 | Spacer (liner) | 8 | Flange |
| 4 | Spacer (for preventing deformation) | 9 | Web |
| 5 | Mounting bracket | 10 | Mounting frame |

N31.00-2218-00

Correct calculation of load on the chassis frame

- If a mounting frame is used, the stress calculation of the chassis frame must be conducted for beams combined with the body to be mounted.
- The mounting frame must be fastened to the chassis frame so firmly that the rear body weight may be borne evenly by the combined chassis frame and mounting frame.

i Additional information

- For the strength calculation of the chassis frame and mounting frame, refer to "10.3 Weight distribution table" ▷ 10.3 and "10.5.2 Frame section modulus" ▷ 10.5.2.
- The frame stress should be less than the values shown in the table below.

7 Construction of bodies

7.1 General Common

Table of frame stresses (when loaded to rating)

Unit: MPa {kgf/mm²}

Condition \ Material	High tensile steel plate with tensile strength	
	SAPH440 440 {45}	HTP540 540 {55}
Vehicles mainly driven on paved roads	74 {7.5} or less	88 {9.0} or less
Vehicles mainly driven on rough roads	54 {5.5} or less	64 {6.5} or less



7.2 Mounting frame

All bodies require a mounting frame or a substructure that assumes the function of a mounting frame to ensure a reliable connection between the chassis and the body.

! Property damage

If more than one body is mounted on the same chassis (e.g. platform and loading tailgate), the larger of the specified moments of resistance must be taken to determine the mounting frame.

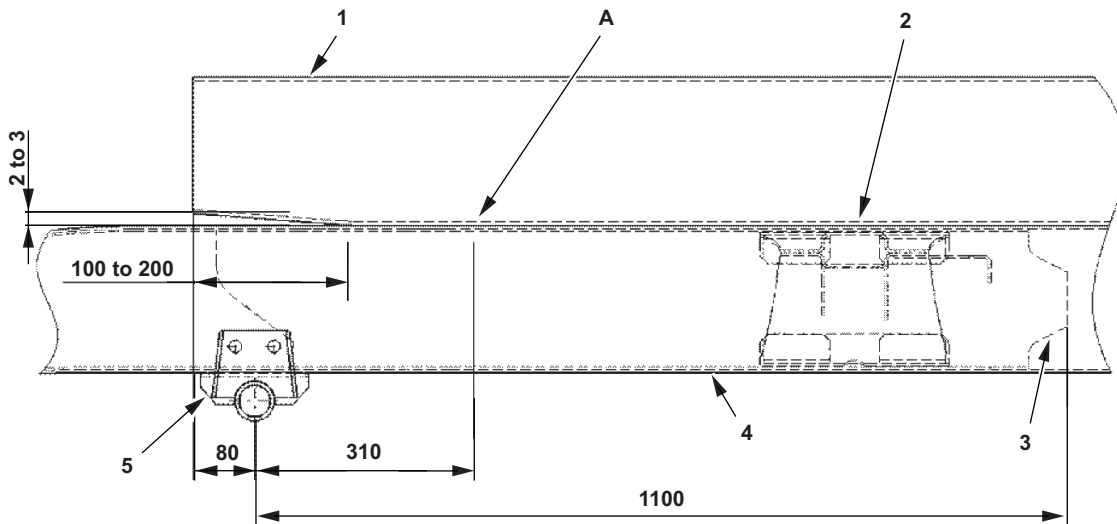
7 Construction of bodies

7.2 Mounting frame

Cargo

7.2.1 Mounting frame

- Be sure to install a mounting frame to ensure that a concentrated load is not applied to the chassis frame.



A Part of the frame assembly that has been enlarged
wide cab: 750 mm assembly width

1 Mounting frame

2 No. 2 cross member

3 Sub-side rail <750 mm assembly width>

4 Side rail

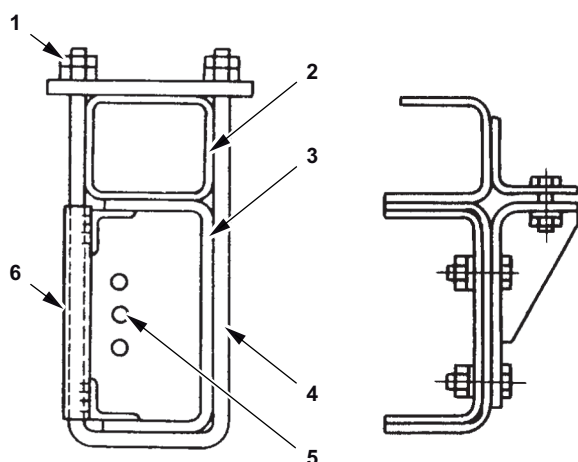
5 Front shackle hanger

i Additional information

(A) indicates the part of the frame assembly that has been enlarged (wide cab: 750 mm assembly width).

- Carry out the following in order to prevent stress concentrating at the front end of the mounting frame. Make the length of the tapered part of the bottom end of the mounting frame between 100 and 200 mm, and end the taper at a point that is not past (A). If a taper cannot be secured, form the end to a radius of at least 10, and extend the end part to the front (vicinity of the shackle).
- To connect the mounting frame to the chassis frame, either use U-bolts, or in the case of a heavy body building part fix the mounting frame with opposing brackets and ensure that the load imposed by the body building part plus the freight is borne by both the mounting frame and the chassis frame.

Ensure that the front end connecting part is frontward of the No.2 cross member (transmission suspension part). A large number of hoses and wires pass through this area, so take care not to damage them when installing the U-bolts.

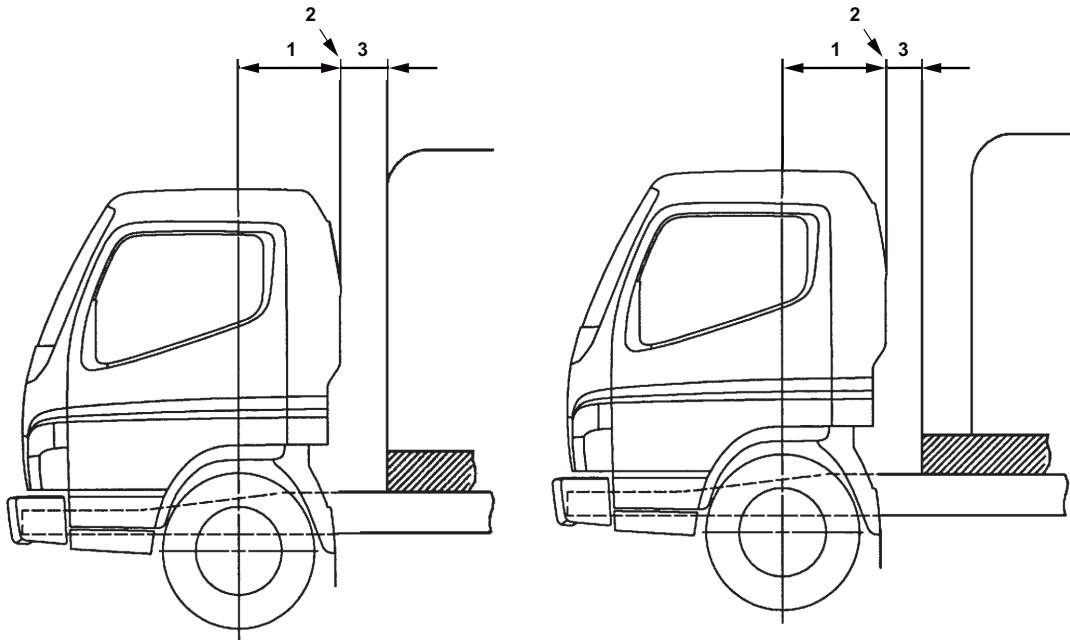


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- 1 Use double nuts
- 2 Mounting frame
- 3 Chassis frame
- 4 U-bolt
- 5 Pipings
- 6 Misalignment stopper

Position of mounting frame

- Install the mounting frame as shown in Fig. 1 to gradually reduce the stress concentrations in the front end. The front end of the mounting frame should be installed as close to the rear of the cab as possible. Extend the mounting frame as far toward the cab as possible when the rear body is installed far from the cab.



N31.20-2119-00

Fig. 1

- 1 525 mm
- 2 CAB BACK
- 3 Extend the front end of the mounting frame as far forward as possible; less than 300 mm

Mounting Bracket

When U-bolts cannot be used with a particular body, use mounting brackets in those positions to attach it to the mounting frame. Use the following bracket locations and installation procedures.

- Attach the mounting brackets to the chassis frame with bolts whenever possible. Be especially careful not to damage any pipes, hoses, and wiring harnesses attached to or around the frame.
- Do not attach brackets close to the ends of cross members, gussets or stiffeners. Brackets should be installed at least 200 mm away from the end of these parts.

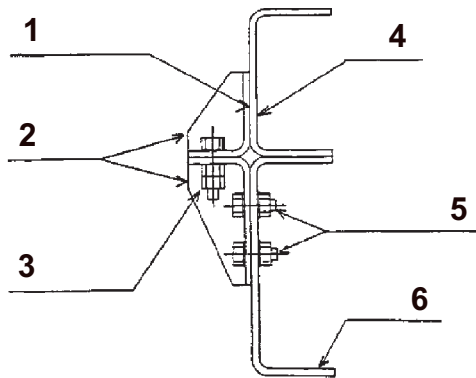


Fig. 1

- 1 Attached by welding
- 2 Mounting bracket
- 3 Use double nuts
- 4 Mounting frame
- 5 Tighten the bolts and nuts in more than two locations.
- 6 Chassis frame

- As a maker option, the genuine rear body brackets are available as shown below.

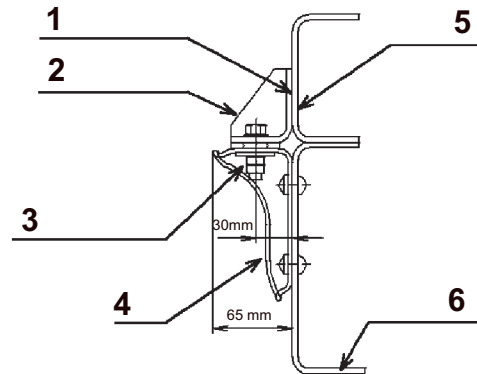
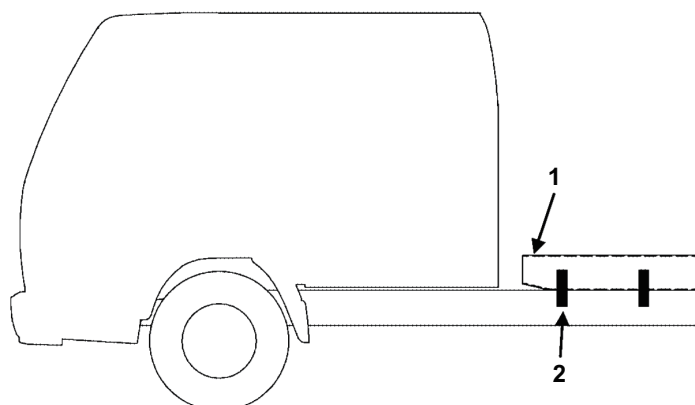


Fig. 2

- 1 Attached by welding
- 2 Mounting bracket
- 3 Use double nuts With washer (more than $\text{Ø}32 \text{ mm}$)
- 4 Genuine mounting bracket
- 5 Mounting frame
- 6 Chassis frame

- Use the following procedure as a guide for mounting the mounting frame on a crew cab vehicle.



- Extend the mounting frame forwardly as much as possible.
- Dispose the frontmost fastening member forwardly as much as possible in the mounting frame.

- Examples of front-end shape of mounting frames

(a) Install the mounting frame having the shape as shown in Fig. 1 to gradually reduce the stress concentrations in the front end.

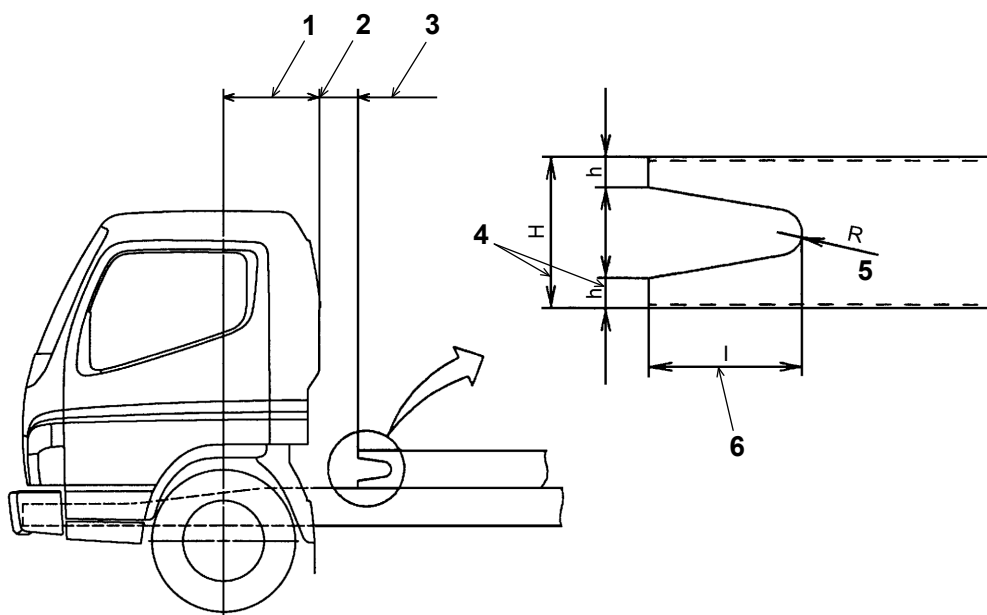


Fig. 1

- | | | | |
|---|---|---|--|
| 1 | 525 mm | 4 | "h" should be between a fourth and a fifth of "H" |
| 2 | CAB BACK | 5 | DRILLING |
| 3 | Extend the front end of the mounting frame as far forward as possible; less than 115 mm | 6 | "l" must not be less than $2/3H$ (two thirds of "H") |

7 Construction of bodies

7.2 Mounting frame

Cargo

(b) The shape of the mounting frame front end as shown in Fig. 1 is highly desirable. However, if there is enough room behind the cab, the shape as shown in Fig. 2 is also acceptable.

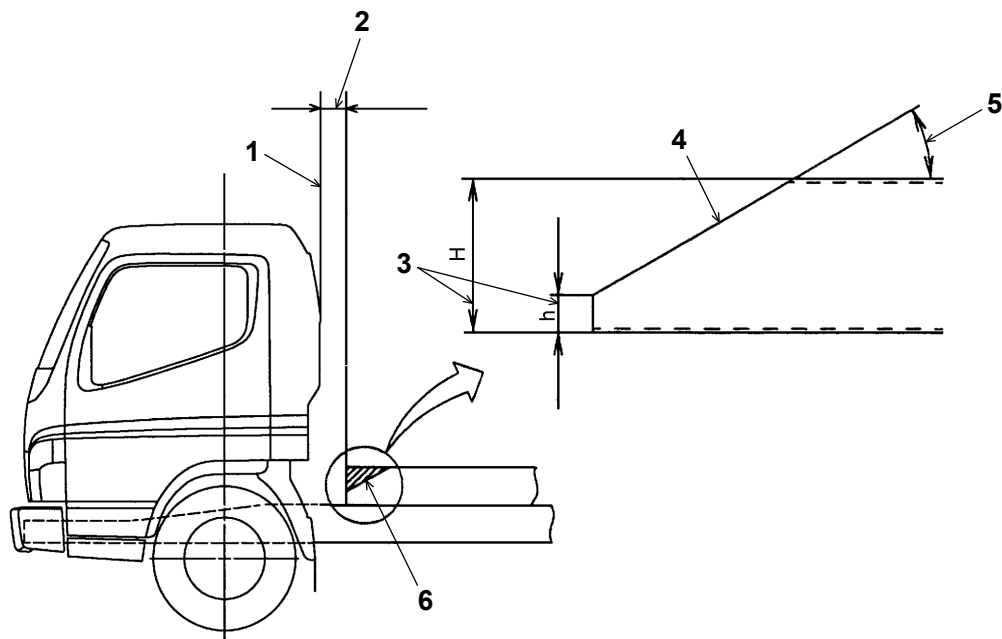


Fig. 2

- | | | | |
|---|---|---|-------------------|
| 1 | CAB BACK | 5 | Less than 30° |
| 2 | Less than 300 mm | 6 | Cut off Obliquely |
| 3 | "h" should be between a fourth and a fifth of "H" | | |
| 4 | Left open | | |

7 Construction of bodies

7.2 Mounting frame

Cargo

(c) If it is difficult to shape the front end of the mounting frame as described in Fig. 1 and Fig. 2, cut it to the shape as shown in Fig. 3 before installation.

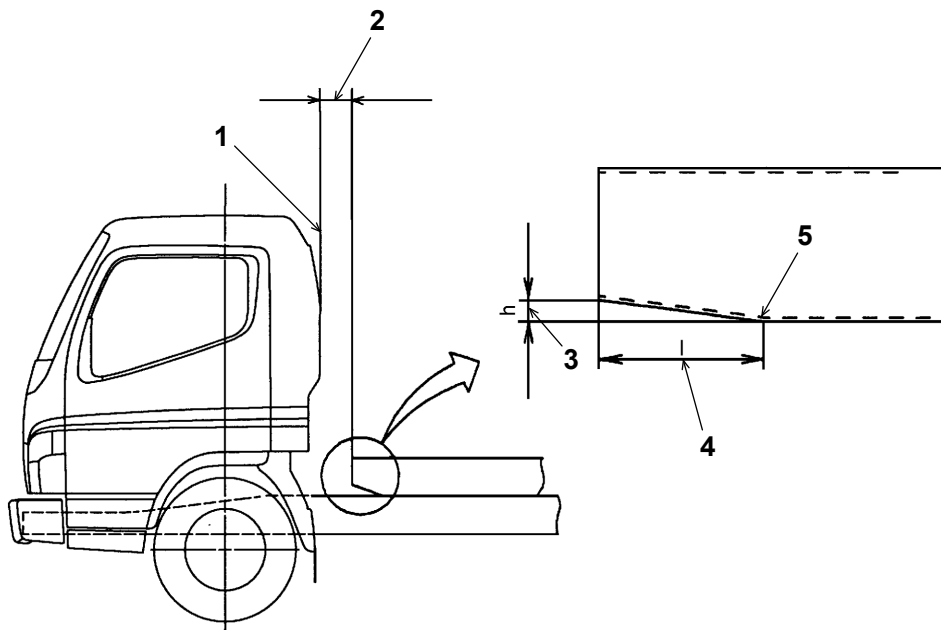


Fig. 3

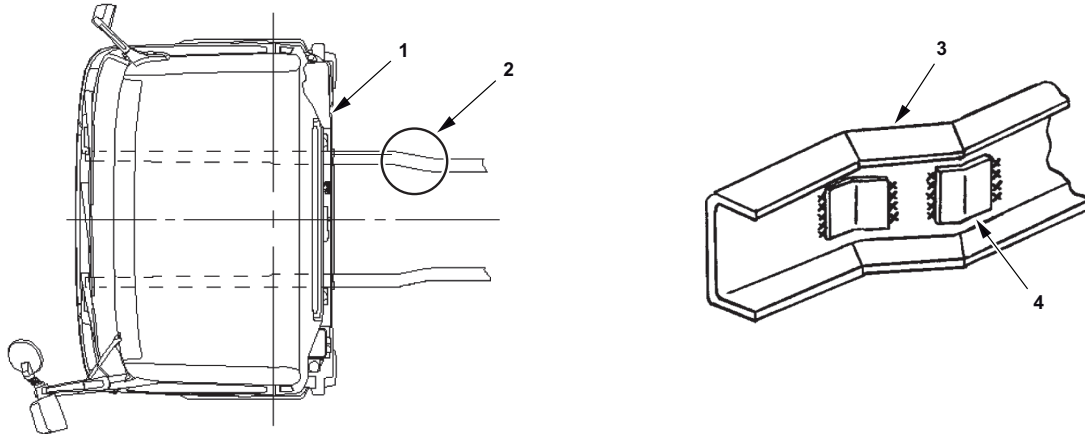
- 1 CAB BACK
- 2 Less than 300 mm
- 3 "h" should be 2 to 3 mm
- 4 "l" should be 50 to 70 mm
- 5 This corner should be ground smoothly

7 Construction of bodies

7.2 Mounting frame

Cargo

- If the chassis frame changes its width behind the cab back as shown in the picture below and the mounting frame should extend forward beyond the width-changed portion, the mounting frame must also change its width along the chassis frame. The portion of the mounting frame where the width changed must have the internal surface reinforced with stiffeners as shown in the figure.

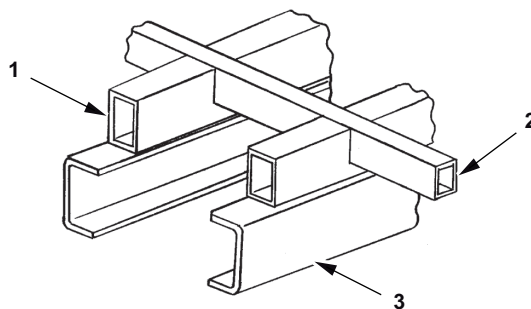


N31.20-2126-00

- 1 Cab back
- 2 Width-changed portion
- 3 Mounting frame
- 4 Stiffener

Other notes

- If, for the sake of a low deck design, the mounting frame and the cross sill must be arranged on the same plane, pass the cross sill member through the mounting frame.



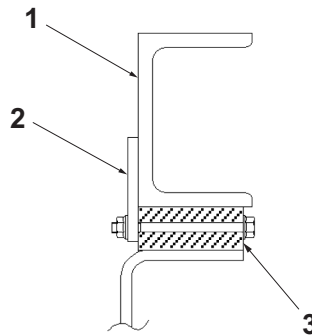
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- 1 Mounting frame
- 2 Cross sill
- 3 Chassis frame

7.3 Mounting frame attachment

7.3.1 Spacer (liner)

- Placing a spacer (liner) between the chassis frame and the mounting frame is not recommended because the combining force between both frames may be lowered.
- In an unavoidable case, hold the spacer (liner) in position with an additional retainer.



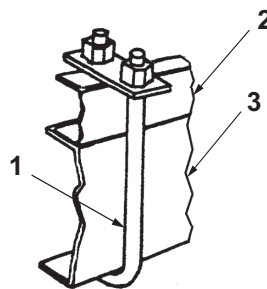
Installation of out-of-position preventive retainer

- 1 Mounting frame
- 2 Retainer
- 3 Spacer (liner)

7.3.2 Fastening mounting frame to chassis frame (securing mounted body)

Frame fasteners and their features

- U-bolt
The U-bolt is a fastener widely used for combining two or more members. This offers a considerable fastening force and is effective for preventing lateral movement of members. However, it is not so effective for suppressing the longitudinal movement. Therefore, it is required that a retainer be used together for that purpose.



- 1 U-bolt
- 2 Mounting frame
- 3 Chassis frame

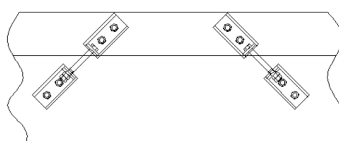
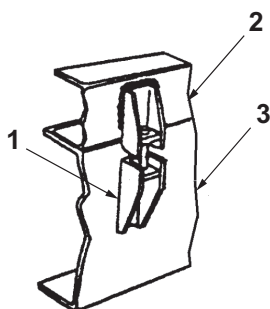
7 Construction of bodies

7.3 Mounting frame attachment

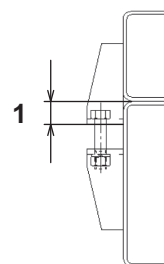
Cargo

- Opposed bracket

This is a fastener composed of two brackets opposed to each other (one on chassis frame, one on mounting frame) and one bolt connecting these brackets. This offers a larger fastening force in a vertical direction as compared to a U-bolt. However, it is inferior in the longitudinal and lateral holding forces. To increase the longitudinal holding force of this fastener, arrange two pairs of brackets diagonally as shown below. To increase the lateral holding force, overhang the bracket on the mounting frame side toward the chassis frame side.



For increasing longitudinal holding force



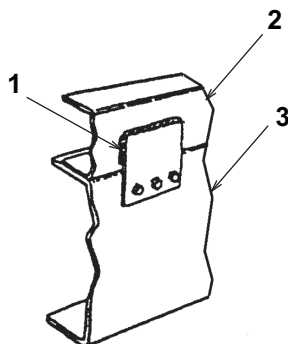
For increasing lateral holding force

- 1 *Opposed bracket*
- 2 *Mounting frame*
- 3 *Chassis frame*

- 1 *Overhang*

- Mounting flange

This is a retainer composed of a set plate fastening the chassis frame and mounting frame to each other. This offers a strong holding force in the longitudinal direction but is inferior to a U-bolt or opposed bracket in vertical and lateral holding forces.



- 1 *Set plate*
- 2 *Mounting frame*
- 3 *Chassis frame*

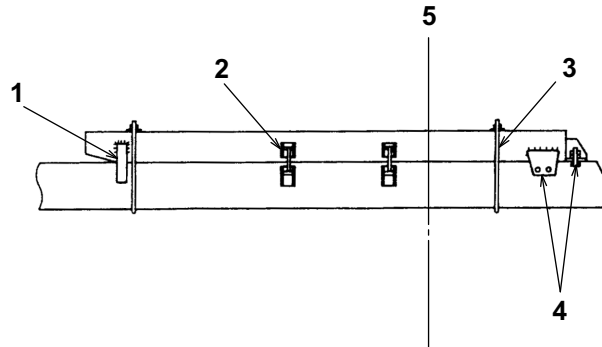
7 Construction of bodies

7.3 Mounting frame attachment

Cargo

Precautions for fastening frames

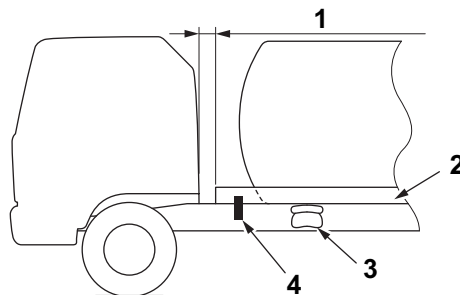
- When fastening the mounting frame to the chassis frame using U-bolts and opposed brackets, use retainers for preventing longitudinal and lateral movements together.



- 1 Retainer for suppressing lateral movements
- 2 Opposed bracket
- 3 U-bolt

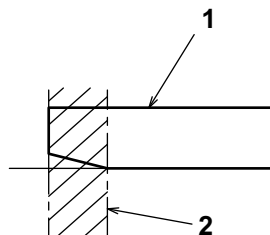
- 4 Retainer for suppressing longitudinal movements (web or flange surface)
- 5 Trunnion center

- Even if the distance between the cab back and body front end is larger, extend the mounting frame to near the cab back and secure it at a position before a No.2 cross member with a fastener.



- 1 Within 300 mm
- 2 Mounting frame
- 3 No.2 cross member
- 4 Fastener (U-bolt)

- When fastening with a U-bolt, ensure that ample spaces are left for running pipes, hoses, wires and harnesses.
- Do not attach any fastener in the mounting frame front end section where the sectional shape is different from the remaining part.



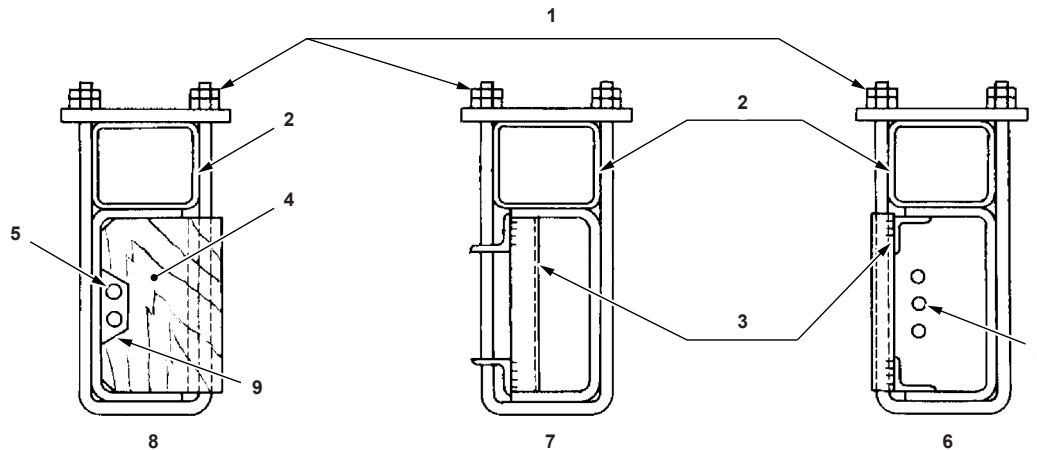
- 1 Mounting frame
- 2 Do not attach a fastener in this section.

7 Construction of bodies

7.3 Mounting frame attachment

Cargo

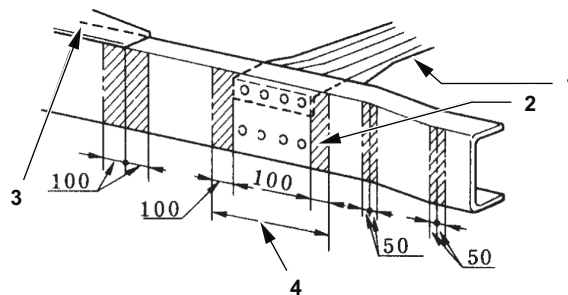
- When the mounting frame and chassis frame are combined with a U-bolt, insert a spacer in the chassis frame at the combined position to prevent the side rail flanges from deforming. When attaching the U-bolt near a hot component such as a muffler, use a metallic spacer, not a wooden spacer which can catch fire. Avoid welding a metallic spacer to the chassis frame to hold it in position.



N31.20-2138-00

- | | |
|-------------------------------------|--|
| 1 Use double nuts | 6 In case that pipings run near a flange end |
| 2 Mounting frames | 7 When a metallic spacer is used |
| 3 Spacer (metallic channel or pipe) | 8 When a wooden spacer is used |
| 4 Spacer (wood) | 9 Provide a notch for running pipings |
| 5 Pipings | |

- Attaching opposed brackets to a chassis frame should be done with bolts. For the procedure, refer to "6. Modifications to the basic vehicle" ▷ 6.1.
- Do not use U-bolts or opposed brackets for cross member, stiffener and gusset attaching sections or near the curved section of the chassis frame because these sections are likely to be subjected to stress concentration.



N31.20-2139-00

- | |
|---------------------------------------|
| 1 Cross member |
| 2 Gusset |
| 3 Stiffener |
| 4 Do not attach fastener in this area |

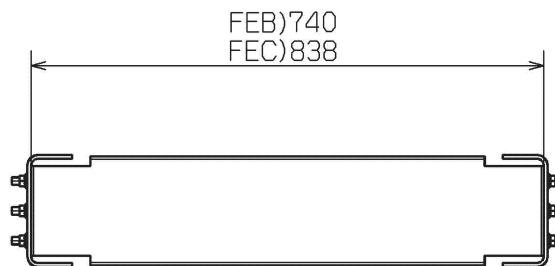
7.4 Others

7.4.1 Rear end of chassis frame

As a result of Product Tolerance for vehicles without RUP, the width dimension of the assembly at the Rear End of the Chassis Frame, may sometimes differ greatly from the dimension indicated in "10.4 Chassis cab drawings". Refer to ▷ 10.4.

If this constitutes an obstacle to body building, devise countermeasures to facilitate body building, such as the installation of a cross member at the rear end of the chassis frame.

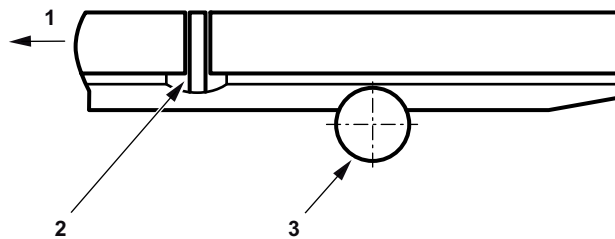
An example of a cross member is shown in the figure below.



View seen from the rear of the vehicle

7.4.2 Intermediate post

- On chassis mounted with a 5-way openable rear body, heavy object container or low rigidity body, install an intermediate post at a position just before the rear front axle to prevent the body from drooping rearward or to facilitate sideways swinging of a gate to open or close it during loading.



N31.20-2147-00

- 1 Vehicle forward
- 2 Intermediate post
- 3 Rear axle

- When installing an intermediate post on a truck with a long wheelbase, taking the chassis frame deflection during loading into consideration, provide an ample space between the post and the side gate so that trouble-free side gate opening/closing operations may be assured.

8.1 Electrical system



Risk of fire

Work carried out incorrectly on the electrical system may impair its function. This may lead to the failure of components or parts relevant to safety.

Work on live electrical lines carries a risk of short circuit.

Before starting work on the electrical system, disconnect the onboard electrical system from the power source, e.g. battery.

All accident prevention regulations must be complied with when working on the vehicle.

Comply with all national regulations and laws.



Additional information

Observe the notes on operating safety and vehicle safety in Section 1 "Introduction" ▷ 1.3 and ▷ 1.4.





8.1.1 Specification Check Prior to Building the Body

Power supply voltage

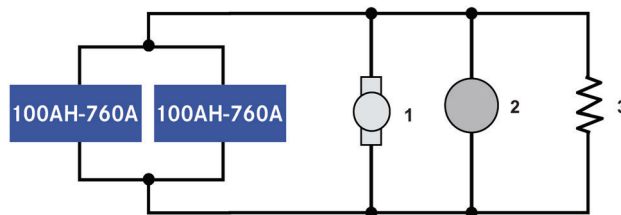
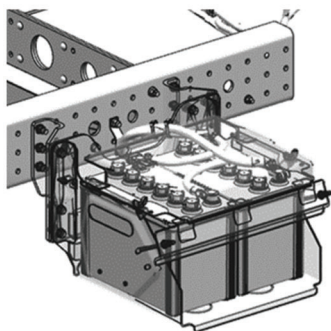
The configuration of the power supply voltage differs according to the particular vehicle.

Check the specifications of the battery mounted on the vehicle. When installing parts related to the power supply voltage, be sure to observe the following precautions.

(1) Configuration of the vehicle power supply

(a) When there is one battery (100AH-760A)

The vehicle uses 12 V power supply system. You cannot install 24 V electrical components for building body.



N54.10-2332-00

- 1 12 V starter motor
- 2 12 V alternator

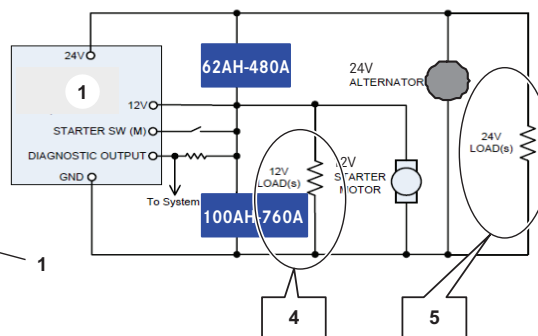
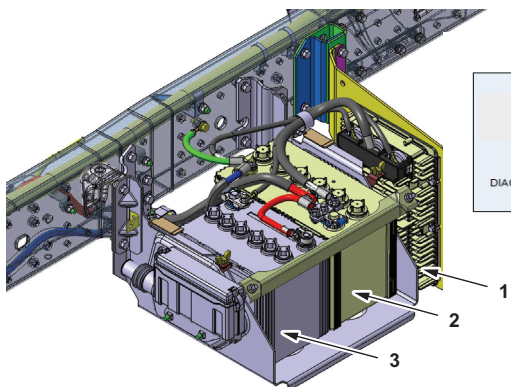
- 3 12 V load (s)

(b) When there are two batteries (100AH-760A/62AH-480A)

In this case 12 V and 24 V power supply systems coexist in the one vehicle, so be very careful.

All of the existing electrical components use 12 V system, but the take-off power supply for the option connectors uses 24 V system. Refer to ▷ 8.4.1 and ▷ 8.4.2.

You cannot use 12 V electrical components for building body.



N54.10-2333-00

- 1 Battery equalizer
- 2 Battery 12 V
- 3 Battery 24 V

- 4 Vehicle electrical system
- 5 Option output



Additional information

Some vehicles optionally use two 100AH-760A batteries without equalizer.



(2) Precautions concerning a 12 V/24 V mixed power supply voltage vehicle

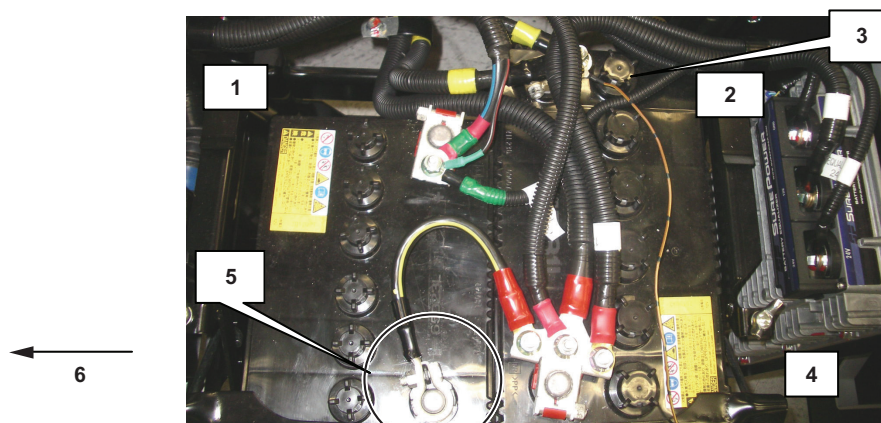
An error in the connected power supply or a wiring error such as a battery connected in the reverse polarity will have an adverse effect on the vehicle electrical components, and may lead to a vehicle fire. For this reason, be very careful of the following points.

<Before building the body>

- Turn OFF the starter switch, and pull out the starter key. Also, disconnect all testers and external communication devices.
- After carrying out the above work, close the doors and wait for at least 30 seconds before carrying out body-building work.

<When building the body>

- Disconnect the battery cables from the negative terminals of both 12 V and 24 V batteries.



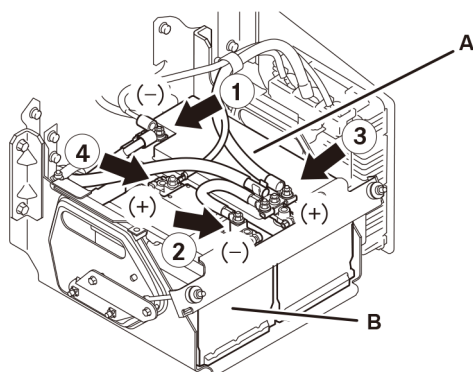
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- 1 Battery 24 V
- 2 Battery 12 V
- 3 12 V negative terminal

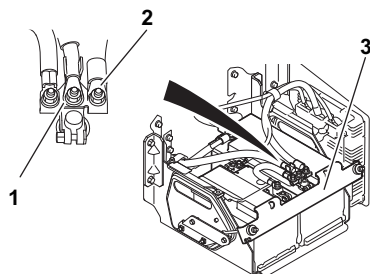
- 4 Equalizer
- 5 24 V negative terminal
- 6 Front of vehicle

- Even after you have disconnected the cable from the negative terminal of the 12 V battery, be careful not to accidentally short-circuit the negative terminal of the 24 V battery to the frame or the battery box with a spanner or other similar tools.
- When taking off power, use the body-building connector (24 V). It is forbidden to directly take off power from both batteries as a general rule. If this is unavoidable, check ▷ 8.4.1 and ▷ 8.4.2.
- It is forbidden to cut, strip or splice wires or modify connectors or fuses in the existing harness instead of using the connectors intended for building the body. Refer to ▷ 8.4.1 and ▷ 8.4.2.

- Procedure for disconnecting the harness cables
 - ① Disconnect the cable from the negative terminal of the 12 V battery.
 - ② Disconnect the cable from the negative terminal of the 24 V battery.
 - ③ Disconnect the cable from the positive terminal of the 12 V battery.
 - ④ Disconnect the cable from the positive terminal of the 24 V battery.

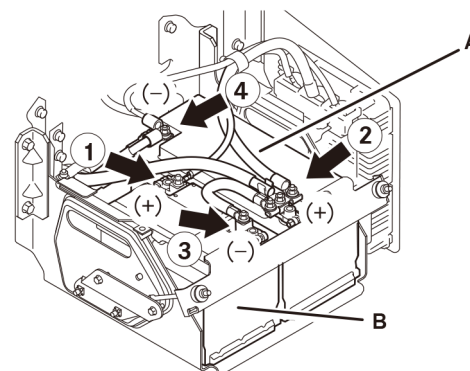


(A) Battery 12 V
(B) Battery 24 V



1 Connector
2 Cable
3 Battery

- Procedure for connecting the harness cables
 - ① Connect the cable to the positive terminal of the 24 V battery.
 - ② Connect the cable to the positive terminal of the 12 V battery.
 - ③ Connect the cable to the negative terminal of the 24 V battery.
 - ④ Connect the cable to the negative terminal of the 12 V battery.



(A) Battery 12 V
(B) Battery 24 V

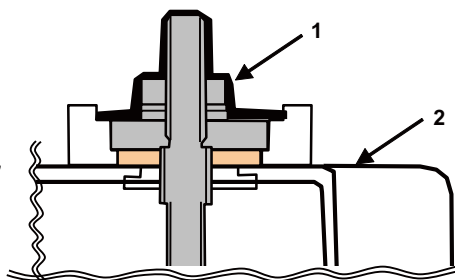
(3) Relocating the batteries and battery equalizer

- Be sure to relocate the batteries and the battery equalizer as a set.

(4) Precautions concerning the battery equalizer

- Do not disconnect the cables from the 12 V and 24 V terminals of the battery equalizer unless it is absolutely necessary. If the cables must be disconnected from the terminals for some reason, note the following precautions.
- After disconnecting the battery cables, wait for 10 minutes, and then disconnect the battery equalizer cables.
- When reinstalling the battery equalizer, ensure that the terminal side is uppermost, and also that the height of the terminals of the battery equalizer is the same as the height of the battery terminals.
- When connecting the cables to the battery equalizer terminals, apply silicone sealant as described below to ensure that the terminals are fully waterproofed with sealant. If the sealing is inadequate, the terminals will corrode, which may lead to an electric fire, fusing of terminals, or other serious accident and damage.
- How to apply silicone sealant
 - ① Place the battery equalizer in a horizontal position with the terminals facing upwards.
 - ② Connect the 12 V, 24 V, and negative battery cables to the battery equalizer after disconnecting the cables from the 12 V, 24 V and negative terminals of the battery.

- ③ Apply silicone sealant to the illustrated areas of the 12 V and 24 V terminals on the battery equalizer and battery so that the metal parts are completely covered. Remove any air bubbles in the sealant, since they will adversely affect the waterproofing effect.
- ④ After completing the application, leave it in the horizontal position to dry (approx. 8 hours at 10°C and 50% humidity).



- 1 Silicon sealant
- 2 Battery equalizer

Name	Part No.	Remarks
SEALANT	MS996198	Bond type

8.1.2 Signal detection and actuation module-related parts

Cautions on Signal detection and Actuation Module (SAM) (relay and fuse-integrated control unit for body equipment)

The signal detection and actuation module is an integrated unit with the control and power distribution functions for electric parts of the cab and body equipment.

- (a) Before disconnecting the connected cables of the signal detection and actuation module control unit, set the starter switch of the vehicle to OFF.
- (b) Before performing welding to the chassis and body, be sure to disconnect the signal detection and actuation module control unit cables and connectors. Use extreme care of spattering (sparks, etc.) thrown on the harnesses during the welding work.
Ground the welder near the weld.

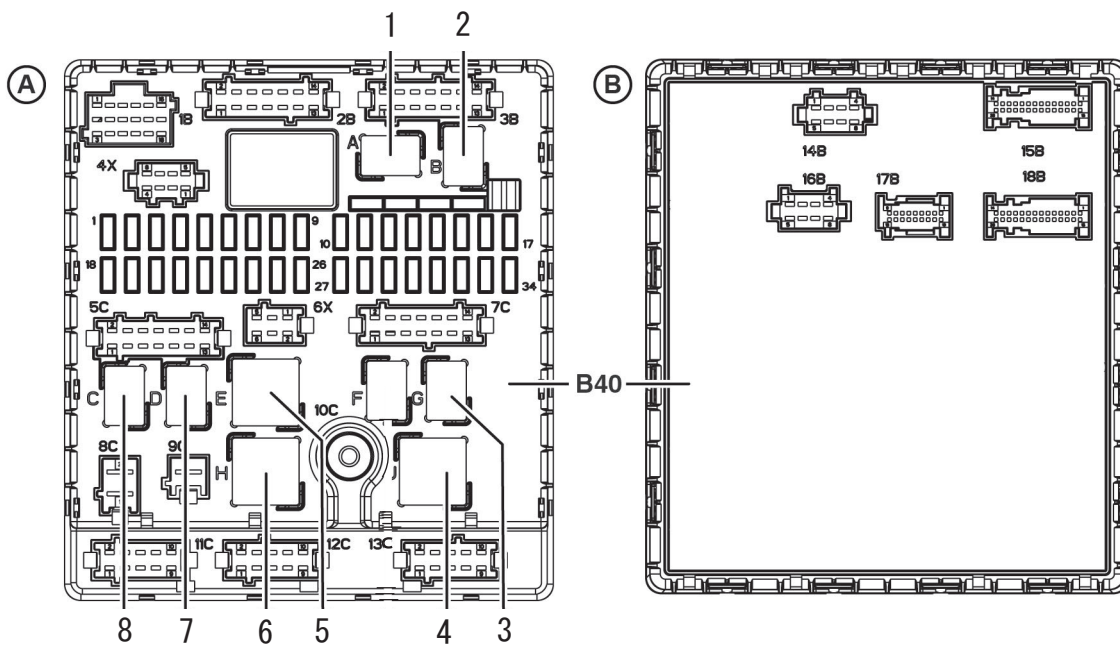
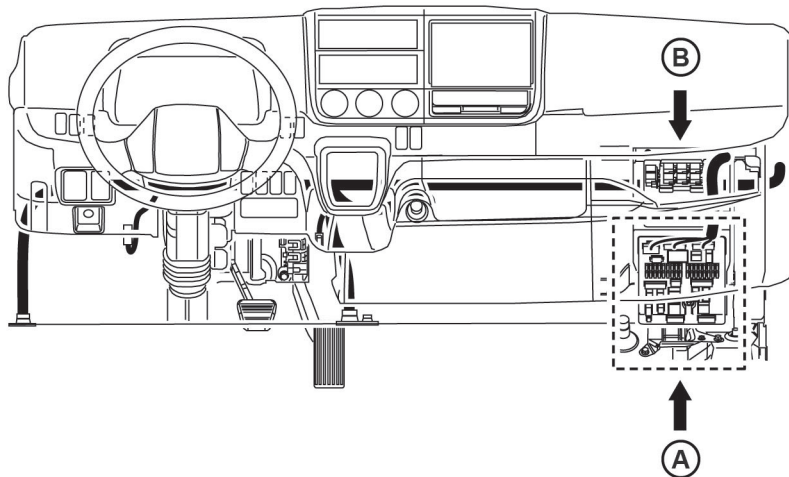
- (c) When cleaning inside the cab, take utmost care not to splash the signal detection and actuation module control unit (including relays, fuses and connectors) with water.
- (d) When removing the signal detection and actuation module control unit from the vehicle, set the starter switch of the vehicle to OFF, then disconnect the harness from the battery terminals and remove the connectors/nuts in the following order. (To reinstall, reverse the sequence of removal.)
 - Disconnect the power line (connector No. 9C, nut No. 10C) first.
 - Disconnect the control unit connectors.
 - Disconnect the ground line (connector No. 8C) last.
 - Bracket nuts (back of signal detection and actuation module, M6 x 4)]

When installing the signal detection and actuation module control unit to the vehicle, tighten its nuts to the torques specified below.

Unit: N·m

Nut type	Torque	Use
M6	4 to 6 (nominal value: 5.45)	To mount the control unit to be bracket
M8	10 to 15 (nominal value: 12.7)	To mount the power line 10C

- (e) Relays and fuses should be carefully installed or removed in/from the signal detection and actuation module control unit one by one.



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- A: Front side
- B: Back side
- 1 A/C Blower relay
- 2 Horn relay
- 3 A/C Comp. cond. relay
- 4 Acc relay
- 5 Ignition relay

- 6 Engine relay
- 7 12 V / 24 V ignition relay*
- 8 12 V / 24 V Acc relay*

* The voltage is different depending on the specification of the vehicle
 Vehicle with battery equalizer: 24 V
 Vehicle without battery equalizer: 12 V

Cautions to be taken when handling signal detection and actuation module related parts

To protect the functions of the signal detection and actuation module, DO NOT:

- (a) Alter electrical routing by extending or cutting a power cable or connector to/from other parts than the connector used for body equipment or other similar methods.
- (b) Alter the signal detection and actuation module control unit in any way.
- (c) Remove or paint the cover of the signal detection and actuation module control unit.

Output terminals for additional wiring

The signal detection and actuation module control unit has circuit output terminals for additional wiring as listed below. Connect power or signal cables to the connectors used for body equipment to add the wiring as required.

Unit: A

Circuit name	Allowable current
Power supply (Batt)	7
Power supply (ACC)	7
Power supply (key-on)	7
ILL power supply*	2.5 (chassis harness side) 2.5 (body harness side)
Neutral signal*	0.2
Parking brake signal*	0.2

(a) Cautions when using output terminals for additional wiring

- Allowable current values are specified for the output terminals. Make sure that the rated current for any additional electric part to be used is lower than the specified allowable current.
- When any diagnostic function of the output terminals marked* is used, it is necessary to change data for the signal detection and actuation module. For details, ask the department responsible. ▷ 2.1
- When a signal output terminal is used to operate any body equipment-side apparatus, use it as the activating side for operation relay. The relay used must be the noise-absorbing element-incorporated type.
- The output voltage differs according to the vehicle. Refer to "Power supply voltage" ▷ 8.1.1.
- For necessary output lead-out connectors, see "8.4.3 Mounting location of optional terminal" ▷ 8.4.3.
- When trailer is connected with coupling device, it is necessary to change data for the signal detection and actuation module to activate diagnosis function for the lamps. For details, ask the department responsible. ▷ 2.1

(b) Precautions for body building and modifying electrical parts

SAM control unit will detect an error if an electrical part is added or replaced improperly. A warning lamp then goes on and remains on or the power is shut down, resulting in vehicle failure.

- If an electrical part is to be added or a lamp is to be replaced with an LED lamp, the current value of the electrical part should be ensured to fall within a specified range. This is, however, does not guarantee that the electrical part to be mounted will be fully operational when its current value falls within the specified range.
- For the specified current value, consult an authorized MITSUBISHI FUSO dealer or the department responsible ▷ 2.1.
- Body building or modification of any of the following electrical parts requires that the SAM control unit parameters be changed. Consult an authorized MITSUBISHI FUSO dealer. Some parts to be mounted may not be fully operational depending on their specifications or the vehicle specifications.

Major body building and modification examples:

- Mounting a centralized door lock and keyless entry system
- Mounting a heated mirror
- Mounting fog lamps
- Mounting the step lamp
- Modifying the rear combination lamp [incorporating LED]
- Adding a turn signal
- Modifying the license plate lamp

8.1.3 Starter switch

- The starter switch uses weak current contacts. Do not add any wiring to the line connected to the starter switch.
- In case the use of a power source linked to the starter switch is unavoidable, be sure to connect to the appropriate output terminal for additional wiring provided on the signal detection and actuation module control unit via the connector for body equipment.

Regarding the output terminals for additional wiring provided on the signal detection and actuation module control unit, see "8.1.2 Signal detection and actuation module-related parts"

▷ 8.1.2.

8.2 Electric wiring

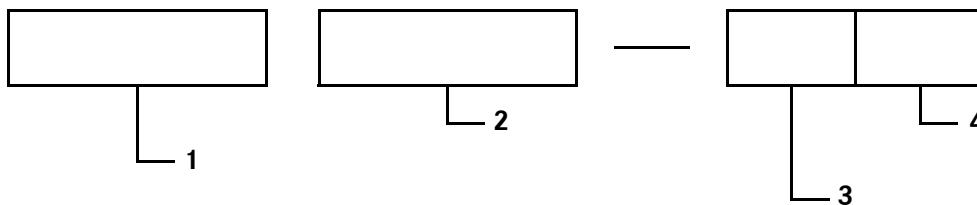
8.2.1 General precautions

The vehicle is delivered after electric wiring and fuses on the chassis side are checked with respect to load capacity, frequency of use, etc. to make sure of fire prevention and running safety. Do not alter the wiring unless it is absolutely necessary. Should it become unavoidable to extend or modify the wiring, be sure to follow the instructions given in "8.2 Electric Wiring".

8.2.2 Cable Identification

Cable size and cable color

Coding system



- 1 Type of cable
(this may not be omitted in case of AV line)
- 2 Cable size (nominal sectional area)

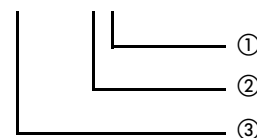
- 3 Cable color (base color)
- 4 Cable color (stripe color)

Alphabetical symbols of cable colors

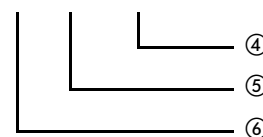
Symbol	color	Symbol	color
W	WHITE	L	BLUE
B	BLACK	Br	BROWN
R	RED	Lg	LIGHT GREEN
Y	YELLOW	O	ORANGE
G	GREEN		

Typical examples of cable identification codes

- 0.85 – GW



- AVX1.25 – L



- ① Stripe color: White
- ② Base color: Green
- ③ Cable size: 0.85 mm²
- ④ Base color: Blue (no stripe color)
- ⑤ Cable size: 1.25 mm²
- ⑥ Type of cable: AVX line

Select types of cables

Related standards

(JIS C 3406: Low voltage cables for automotive use)

(JASO D 608: Heat-resistive low voltage cables for automotive use)

(JASO D 609: Current capacity of low voltage cables for automotive use)

Type of cable

Select necessary types of cables from the list below.

Type of cable	Location of use
AV line Vinyl-insulated low voltage cable for automotive use	Used for ordinary wiring
AVX line Cross-linked vinyl heat-resistive low voltage cable for automotive use	Used for wiring in areas where ambient temperature is high, such as around motor generator and EV battery
AEX line Cross-linked polyethylene heat-resistive low voltage cable for automotive use	

Cable size

Select necessary cable sizes from the list below.

Nominal sectional area	Number of strands /Strand diameter (mm)	Allowable current (A)		
		AV line	AVX line	AEX line
0.5f	20/0.18	8	7	7
0.5	7/0.32	9	8	8
0.75f	30/0.18	10	9	9
0.85	11/0.32	11	10	10
1.25f	50/0.18	14	13	13
1.25	16/0.32	14	14	13
2	26/0.32	20	18	18
3	41/0.32	27	25	25
5	65/0.32	36	34	33
8	50/0.45	47	44	43

"f" suffixed to nominal sectional area stands for "flexible."

Use flexible cables in vibrating and crooked areas, such as at the cab to chassis and transmission.

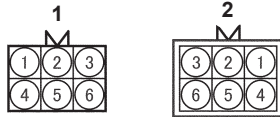
8.2.3 Connector code

Connector pin numbers

Numbering of terminals

Female terminals: Numbering started from upper left

Male terminal: Numbering started from upper right



N54.10-2338-00

1 Female connector

2 Male connector

8.2.4 Existing wiring and custom-built truck body on chassis side

- Make sure that wiring is not caught in by custom-built truck body.
- Make sure that wiring clear of sharp edges.
- When handling, do not pull wiring with excessive force.
- Remove harness connector by the connector body. Do not pull the harness.
- Make sure that wiring has a sufficient distance from heating parts.
- After installing custom-built truck body, make sure that associated wiring and parts can be inspected and serviced without hindrance.
- When a buzzer is provided for custom-built truck body, avoid shared use of chassis-side buzzer or use of a buzzer that is the same in tone as the chassis-side one.

8.2.5 Change and extension of wiring

Cables to be used

Use cables conforming to JIS C 3406 (low voltage cables for automotive use), JASO D 608 (heat-resistive low voltage cables for automotive use) or equivalent. As to vinyl tape, use products conforming to JIS C 2336 (vinyl adhesive tapes for electric insulation) or equivalent. See "Type of cable" in "8.2.2 Cable Identification" ▷ 8.2.2.

- When selecting a cable size, make sure that its allowable current conforms to the system rating. Especially in a system where a motor, etc. is used as a load, allow for the current in case the motor locks (restricted). See "Cable size" in "8.2.2 Cable Identification" ▷ 8.2.2.

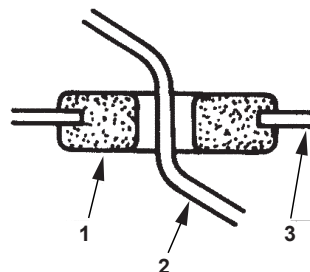
Wiring procedure

- When custom-built truck body-side wiring is extended, do not relocate existing cables and wires installed at the time of delivery from the manufacturer. If relocation is unavoidable, make sure that there is sufficient space from neighbouring parts and there is no interference with them.
- For wiring, install cables along rear body members, frame, etc. Do not stretch them in the air.
- Install cables clear of chassis and custom-built truck body rotary parts, vibrating parts and sharp edged parts. Firmly clamp cables. Secure the following clearances.

Unit: mm

Location	Minimum clearance
Between moving part and wiring	10
Between sharp edge and wiring	10

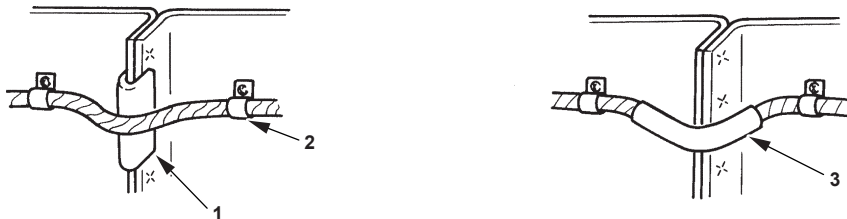
- Be sure to use a grommet in every cable through hole in the steel plate to prevent the cable from being damaged in the sheathing and short-circuited.



- 1 Grommet
- 2 Cable
- 3 Steel plate

N54.18-2109-00

- Use additional clips as required where the cable may contact the edges of metal parts to prevent damage to sheathing due to vibration-induced contact. Alternatively, cover the metal edges with a protector or wrap corrugate tube around the part of the cable that contacts the metal edges.



- 1 Protector
- 2 Fasten cable with clip
- 3 Corrugated tube

N54.18-2110-00

- If a harness exists nearby, tape the cable along to the harness. It is positively prohibitive to lay cables along the brake piping (including brake hose). Maintain clearances between cable and existing harness.

Unit: mm

Wiring method	Minimum clearance
Parallel	10
Crossover	20

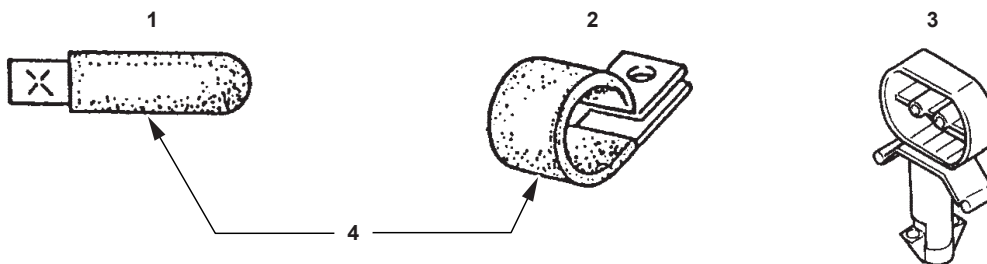
- For clearance between cable and chassies part, see "4.4 Clearance for the basic vehicle and bodies" ▷ 4.4.
- Install harnesses or battery cables where they will not be covered with accumulated dirt, snow, etc., iced nor damaged by flying stones. In an unavoidable case, provide a metal shield to protect the harness or cable.
- Do not connect cables with sheathing broken and wires drawn out.
- When equipment is wired, water may run down the cable into the equipment. Seal the through hole firmly with a grommet or the like and install the cable with its terminal upward.
- Route cables through places where they are not splashed with water or covered with dust.
- Do not install cables onto the top and outer sides of the frame. They may be damaged by feet put on the frame or stones flying to the frame during running.

- Install cables to motor generator and transmission-mounted parts routing along existing harnesses so that their relative movements can be absorbed. Also, give cables a proper amount of slack so that they do not contact with other parts.
- Relocation of batteries is prohibited.
- When cables are shortened, do not cut them short but bind excess length of cable to existing harness or the like bundled with vinyl type.
- Hold MWP water-proof connectors for rear combination lamp, license lamp, side turn lamp, etc. in place by fastening the connector body with hook type plastic clips (MH056347 to MH056350) or band clips.

- When cable bands are cut off for convenience of work, obtain necessary parts in accordance with the list below and restore the cable bands to their original state.

Part name	Part No.	Geometry	Remarks
BAND, CLIP	MK665242		Fixing tie: Hellermann Tyton, BHT375M or equivalent
BAND, CLIP	MK665243		Stud bolt tie: Hellermann Tyton, T50SOSSBD-M10-HSW or equivalent
BAND, CLIP	MK665244		Fir tree mounting tie: Hellermann Tyton, CM170-FT11J or equivalent

- For clipping, use coating tape, protective rubber or plastic clip. Limit sticking and clasping clips to auxiliary use.



- Flat clip
- Roll clip
- Plastic clip
- Vinyl tube or vinyl coating

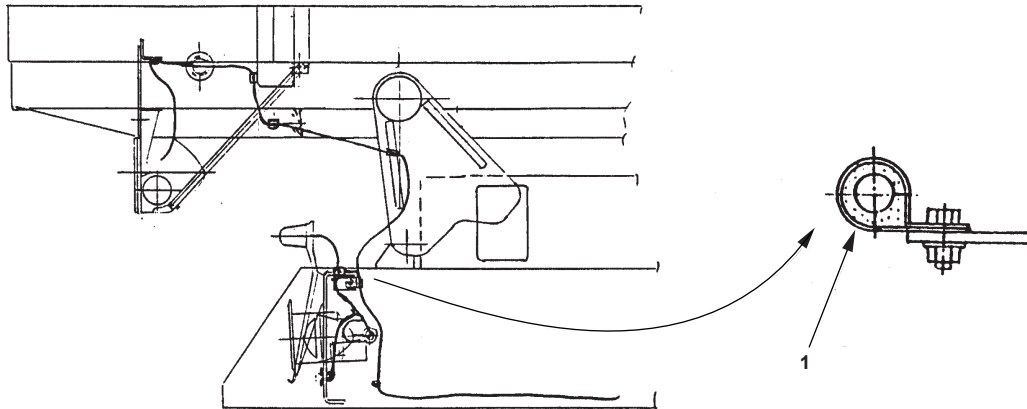
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Given below are the standard limits of spacing for cable clamps.

Unit: mm

Harness diameter	Limit of spacing
Up to 5	Up to 300
5 to 10	400
10 to 20	500

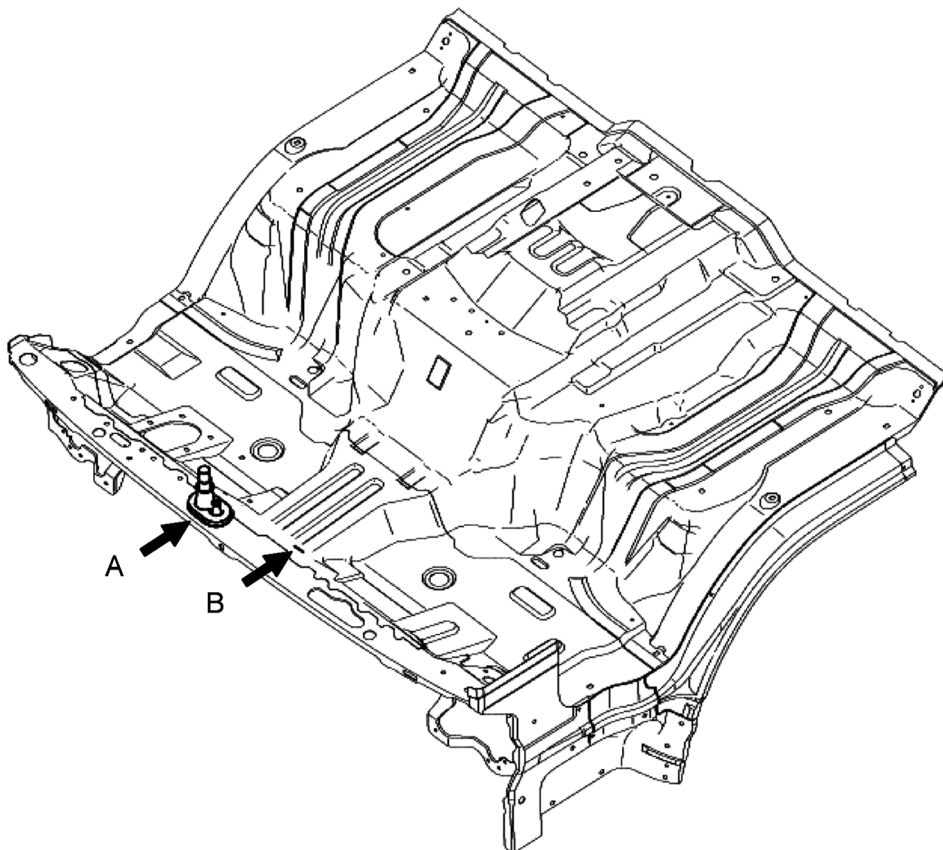
For cables to rotary portions of dump hinge and other custom-built truck body parts and vibrating bodies of transmission, etc., use solid rubber clips.



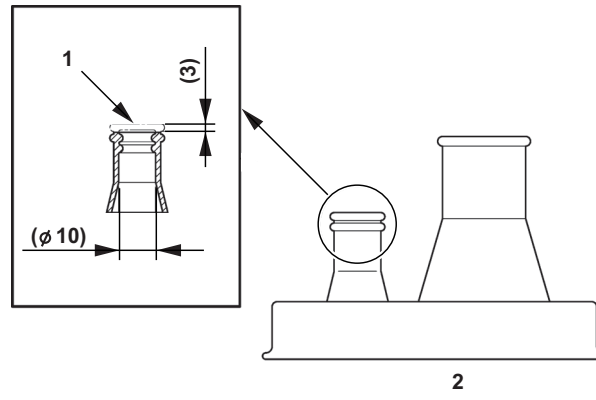
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- 1 Mitsubishi part number
MC021037 (ϕ 25 mm)
MH022804 (ϕ 12 mm) etc.

- When passing electrical wiring through the cab floor, use the grommets in the area A and B shown below.



Let harness pass through the grommet cut as shown below and then tape them.



- 1 Cut off
- 2 Grommet

N54.18-2114-00

Procedure for wire connection

- In the case of wire connection using plug and plug receptacle, use the plug receptacle on the power supply side, so that if the plug and plug receptacle should be separated, the disconnected wire is not short-circuited even if it touches the vehicle body.
- When cable is extended, the extension cable should be identical in sectional area and hue. Connect the cable ends firmly by soldering or using crimp type terminal and provide the joint with solid insulating covering. Be sure not to connect cables by twisting together. When soldering, do not use hydrochloric acid. Especially, when wires of chassis harnesses (all harnesses outside of the cab) are extended, properly protect joints against water and insulate them.

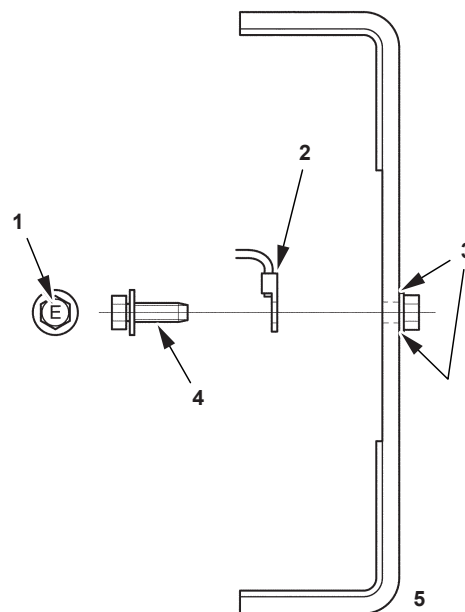
8.2.6 Grounding

Ground extended power cable to the circuit connecting to the minus (-) terminal of battery. In the case of grounding to the frame, establish the grounding point on unmasked or uncoated surface.

Use eyelet terminal for grounding.

Dedicated bolt for grounding is used for tightening ground terminal. In the case where dedicated grounding bolt is removed during custom-built truck body installation, do the following.

- If grounding point is not relocated
Reinstall the removed dedicated grounding bolt by tightening to the specified torque.
- If grounding point is relocated
Use designated dedicated grounding bolt shown below. Spot weld nut to the frame and tighten bolt to the specified torque. Provide the weld with touch-up coating.



N54.10-2339-00

- 1 Identification mark
- 2 Ground terminal
- 3 Weld nut MF434105

- 4 Dedicated grounding bolt
Part no.: MK416036 (M10x30 P1.25)
Part no.: MK560984 (M10x35 P1.25)
Tightening torque: 39 - 40 Nm
- 5 Chassis frame

When wiring from the custom-built truck body side is grounded to the frame, do the same as described in [If grounding point is relocated] above.

8.2.7 Fuse

- (a) Do not route power wiring from any fuse for unintended use. The existing fuse on the chassis side is of the optimum capacity for the service load, frequency of use, etc. When installing an additional electrical device associated with body equipment, do not connect parts or harnesses which may provide an error signal to the chassis power line or ground line.

Be sure to lead out power☆ for body equipment-related apparatus and lamps via designated appropriate connectors. For further details, see "8.4.3 Mounting location of optional terminal" ▷ 8.4.3.

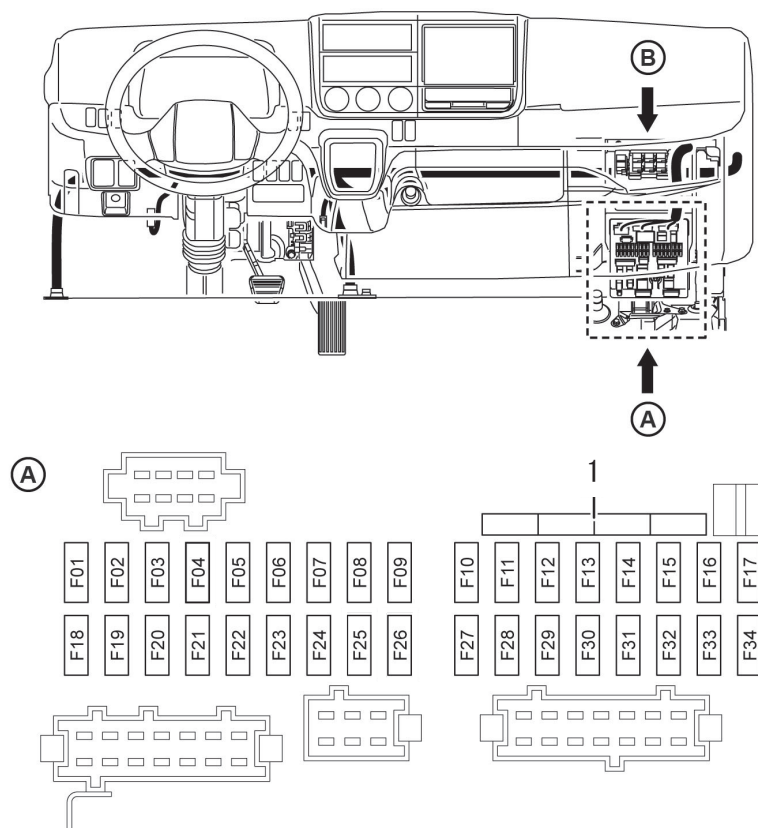
Fuses in the cab are provided on the signal

detection and actuation module control unit. When removing and reinstalling them, do so securely one by one. For other precautions on the signal detection and actuation module, see "8.1.2 Signal detection and actuation module-related parts" (▷ 8.1.2).

- (b) Mid-point extension of existing wiring or the use of a larger capacity fuse could cause an excessive current to flow in the power fuse box, resulting in a fire.

The power supply voltage may differ depending upon the fuse. Verify the power supply voltage by referring to "Power supply voltage" ▷ 8.1.1.

- (c) Arrangement of power fuses, relay in the instrument panel, sensors and ECU



A Inside of SAM

1 Spare fuse

12 V Power supply fuse

24 V When the vehicle uses two batteries, a 24 V power supply fuse is installed.
When the vehicle uses one battery, a 12 V power supply fuse is installed.

Fuse No.	Main load	Capacity
F01	VCU	10A
F02	–	10A
F03	SRS airbag	10A
F04*	Opt (IGN)	10A
F05	Power window (driver's seat side)	30A
F06	Hill start assist system	10A
F07	Power window (assistant driver's seat side)	30A
F08	–	20A
F09	Meter cluster, diagnosis connector, combination switch	10A
F10	DC/DC converter	30A
F11	Blower motor	30A
F12	Second display, Cab and spot lamp	15A
F13	EIS Relay, DC/DC converter	10A
F14	Horn	10A
F15	Second display	10A
F16	Cigarette lighter	20A
F17	High voltage battery	20A
F18	ABS ECU	10A
F19	Oil pump for motor	15A
F20	Hill start assist system ECU, electric vacuum pump, AEBS ECU	10A
F21	–	10A
F22	Motor	15A
F23	–	10A
F24	G sensor, shift lever unit	10A
F25*	Opt (ACC)	10A
F26*	Opt (B+)	10A
F27	–	20A
F28	Charging inlet box	15A
F29	Water pump (HVB 1)	20A
F30	Water pump (HVB 2)	20A
F31	VCU	20A
F32	Air-conditioner	10A
F33	–	10A
F34	–	15A

ABS : Anti-lock brake system

AEBS : Advanced emergency brake system

ECU : Electronic control Unit

VCU : Vehicle control unit

SRS : Supplemental restraint system

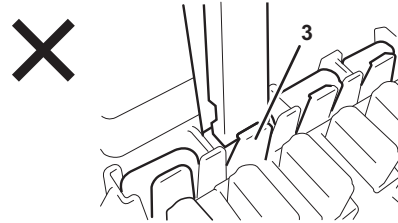
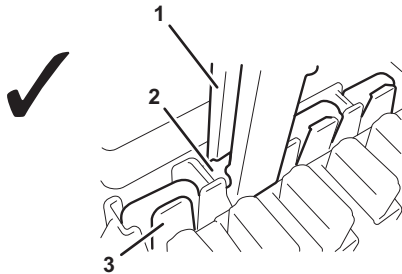
*: The power supply voltage differs depending upon the vehicle power supply specifications. Refer to "Power supply voltage" ▷ 8.1.1.

8 Electrics/electronics

8.2 Electric wiring

- Removal of spare fuse
To remove the spare fuse, insert a fuse puller from outside the wall holding the spare fuse.

Do not insert the puller from inside the wall, as doing so could damage the apparatus and cause erroneous operation or a fire.



- 1 Fuse puller
2 Fuse
3 Wall

N54.15-2222-00

8.3 Handling of electric/electronic equipment

8.3.1 Available types of electronic control systems (typical examples)

- Anti-lock brake system (ABS)
- SRS air bag
- Signal detection and Actuation Module (SAM)
- Emergency locking retractor (ELR)
- Keyless entry
- Immobilizer

8.3.2 Handling of electronic parts

In the electronic control systems-equipped vehicle, multi-way connectors suited for weak current of such electronic parts and circuits as sensors, control units and actuators are used. When handling these connectors, use particular care in the following respects.

- Do not disjoin and rejoin connectors unless necessary. Connector pins could be deformed or damaged, resulting in poor contact.
- Disjoin connectors holding their housings. Pulling by cable or by force may deform connector pins.
- When disjoining connectors, do not let water, oil or dust adhere to their pin, or poor contact or unsteady continuity could result.
- Join connectors firmly after completion of work. When a harness is removed for servicing, restore it firmly to the original place after work.
- Use of electronic equipment, such as relays, solenoid valves and motors, for installation on the vehicle body is limited to those incorporating diode or varister noise absorbing elements.

8.3.3 Handling of battery

To prevent damage or fire of battery-related parts, observe the following precautions when handling the battery.

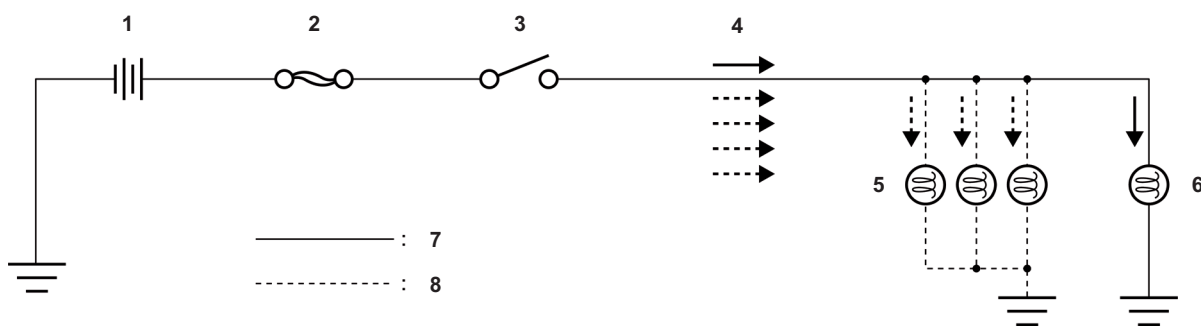
- When performing a quick charge of the battery, be sure first to disconnect the battery cables from (+) and (-) terminals.

8.4 Power supply

8.4.1 Taking power from the existing wiring

- (a) Source the power for the lamps and devices of the built body from the specified connector. If an electrical device related to the built body is to be added, do not install a part or route a harness that can give a false signal to the power line and ground line of the electrical devices on the vehicle side.

(b) Typical faulty wiring



N54.15-2223-00

- | | |
|--|---|
| <p>1 Battery
 2 High-current fuse
 3 Switch
 4 The amount of current is increased by the additional lamps, which applies load on the switch, fuse, and wires, resulting in a fire.</p> | <p>5 Additional lamps
 6 Existing lamp
 7 Existing wire
 8 Additional wires</p> |
|--|---|

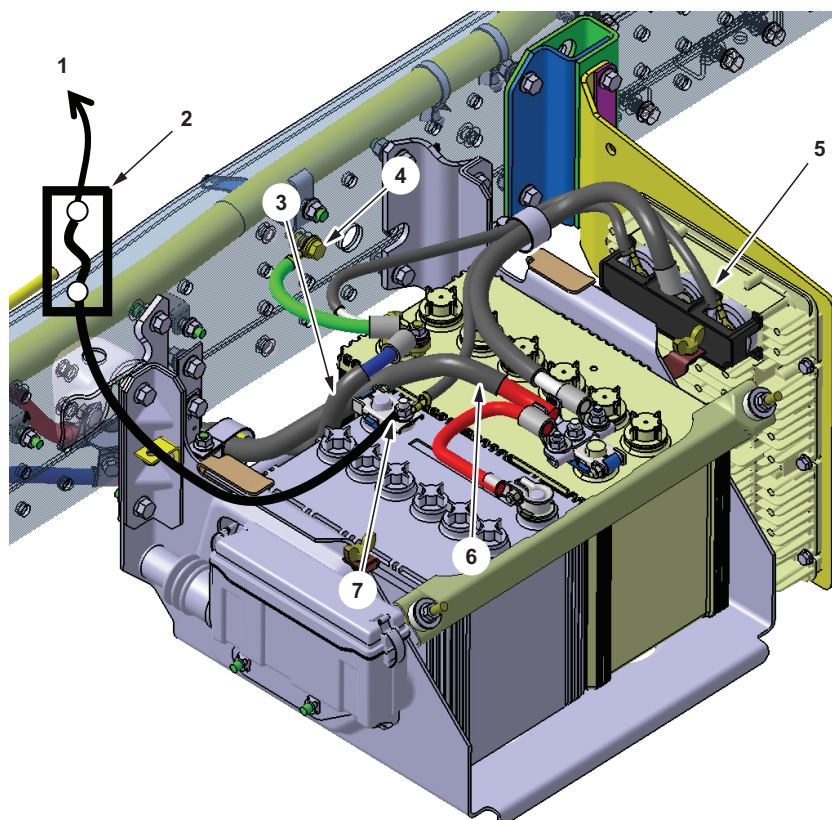
8.4.2 Taking power via the onboard battery terminal

Take power by way of the onboard battery terminal only when doing that is absolutely necessary to achieve body building. If it is done unavoidably, observe the following precautions.

- (a) Add a fuse of a correct type to any additional wire to thereby protect the circuit.
- (b) Use a wire of 5.0 mm² or more for the additional wire ("between battery terminal and fuse" of the next figure (▷ 8.4.2)). Set the wire as short as possible and make sure that its jacket is not damaged to result in a short.
- (c) For the combination of the capacity of the additional fuse and the wire size between the fuse and the additional load, study those marked with ○ in "List of recommended combinations of fuse capacity and wire size" (▷ 8.4.2).
- (d) Install the additional fuse in a waterproof cover (e.g. electric cover) or take an equivalent waterproofing measure for the additional fuse. Do not add wires or fuses to the existing high-current fuse box.
- (e) Use of a directly connected power supply causes the onboard battery to tend to run down quickly. Make sure that the customer understands and observes the following handling precautions:
 - Do not use the onboard battery as a service power supply (for the clock, memory, etc.).

Between battery terminal and fuse

24 V

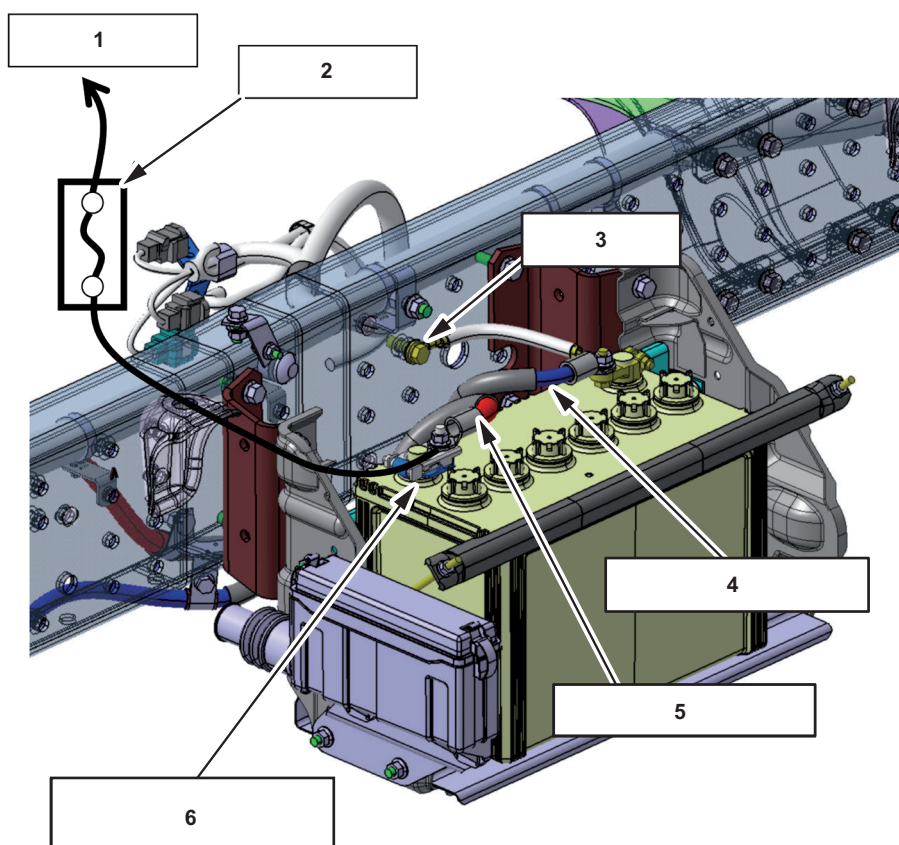


N54.15-2224-00

- 1 Addition on the built body
- 2 Additional fuse etc.
- 3 Battery cable (-)
- 4 Ground point

- 5 Battery equalizer
- 6 Battery cable (+)
- 7 Terminal for taking power on built body side, M8 screw

12 V



N54.15-2225-00

- | | | | |
|---|----------------------------|---|--|
| 1 | Addition on the built body | 4 | Battery cable (-) |
| 2 | Additional fuse etc. | 5 | Battery cable (+) |
| 3 | Ground point | 6 | Terminal for taking power on built body side, M8 screw |

(f) Use a round flat terminal for the power supply terminal and jointly fasten it by using the fixing nut for attaching the battery cable terminal.

Only one power supply terminal may be used.

Two or more additional terminals can be loosened, resulting in heat being generated or a short.

List of recommended combinations of fuse capacity and wire size

○ : Usable × : Not usable

Fuse Type	Specifications	Wire size (mm ²) [upper] and wire permissible current (A) [lower]							
		0.3	0.5	0.85	1.25	2.0	3.0	5.0	(mm ²) (A)
Blade and glass tube	5 A	○	○	○	○	○	○	○	
	7.5 A	○	○	○	○	○	○	○	
	10 A	×	○	○	○	○	○	○	
	15 A	×	×	○	○	○	○	○	

Note: Keep the continuous permissible current within 70 % of the fuse specifications value.

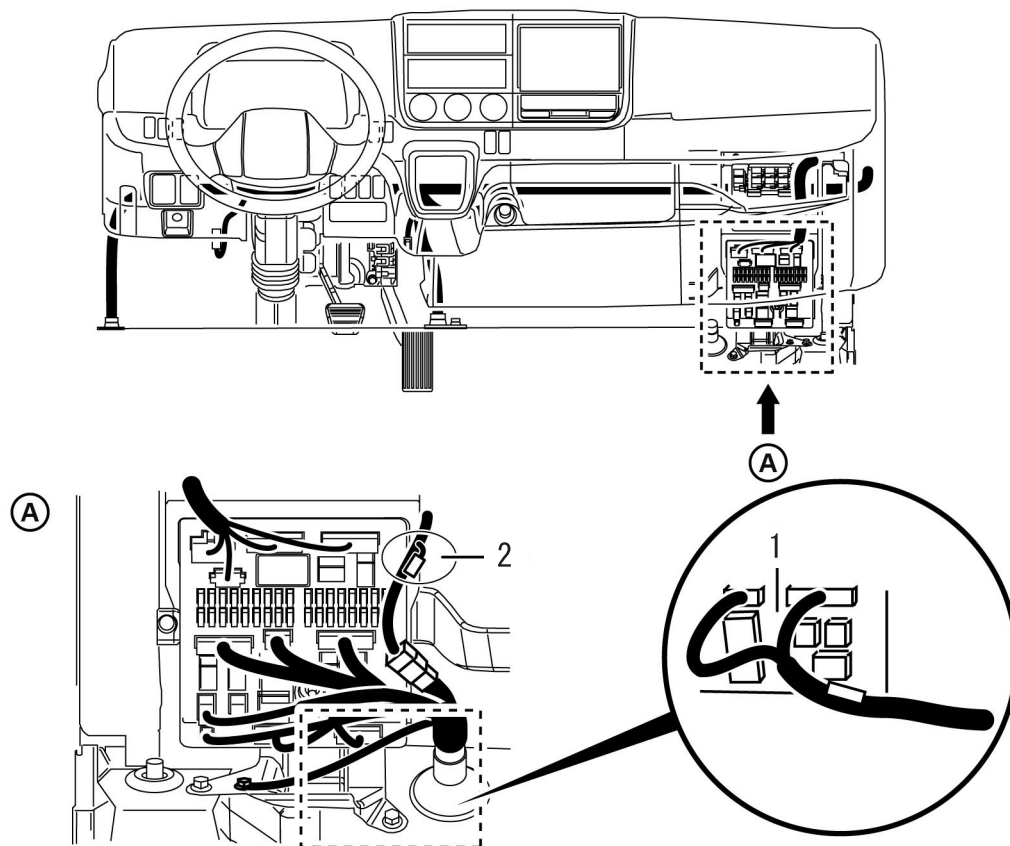
(E.g.) If the fuse used is 10 A:

$$10 \times 0.7 = 7 \text{ (A)}$$

→ A load of up to 7 A can be used.

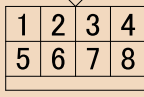
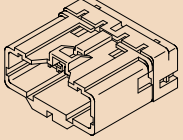

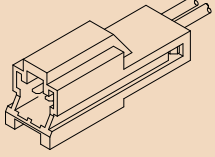
8.4.3 Mounting location of optional terminal

- Inside Cab



N54.15-2251-00

- A Internal view
1 SAM
2 B, C

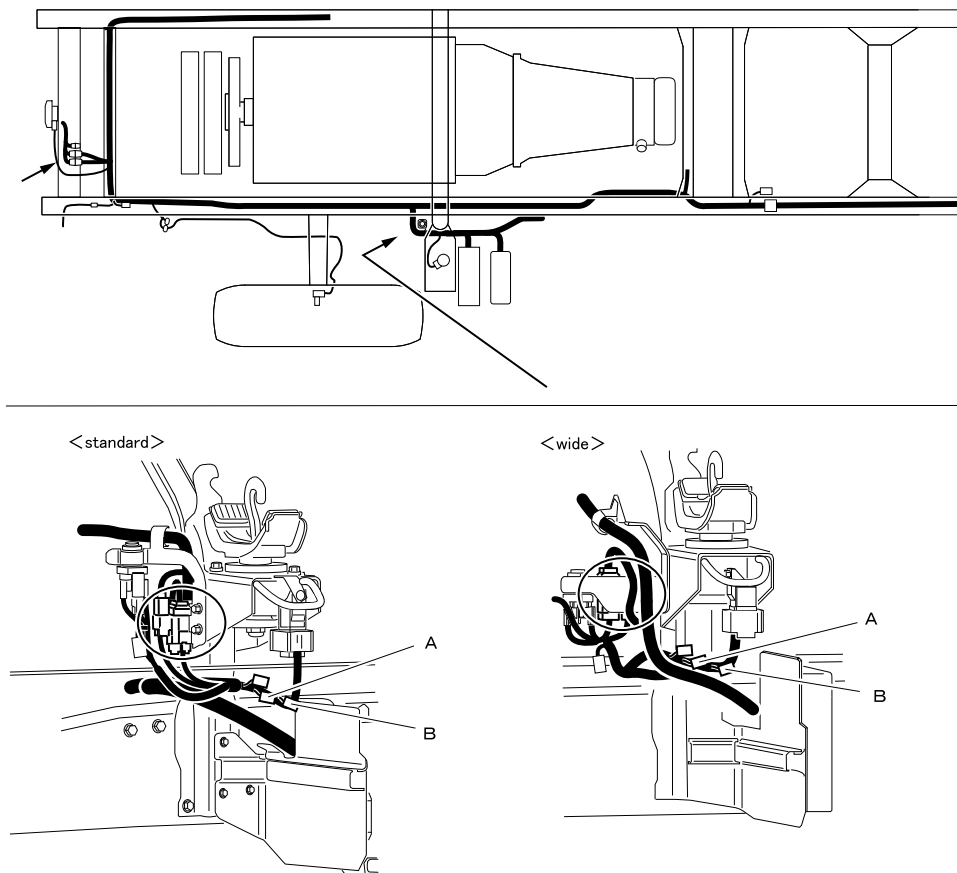
No.	Part Name	Connector No.	Circuit Description				Mating Connector
			No.	Circuit	Line color	Load	
B	OPTION CONNECTOR (Only When sub harness (MK649751) is arranged)		01	PARKING ON (24 V/12 V)	Br	*1	MH052805 
			02	NEUTRAL (24 V/12 V)	R-G	*1	
			03	PTO (24 V/12 V)	Lg-R	*1	
			04	ILL (24 V/12 V)	O-B	*1	
			05	MAIN (24 V/12 V)	L-R	*1	
			06	GND	B	10A	
			07	BATT (24 V/12 V)	G-R	*1	
			08	ACC (24 V/12 V)	W-R	*1	
C	OPTION CONNECTOR		01	IDLE UP (SWtoGND)	R-B	-	MH056800 
			02				

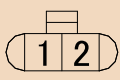
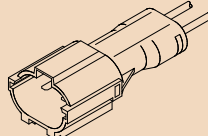
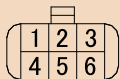
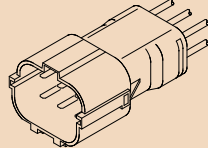
-: The connector marked with - is used for signal cabling only, not used to connect the loads.

*1: Loads to be connected to the connector marked with *1 should be arranged so that the total value of the connector output in each of the cab and chassis side shall not exceed the permissible current.



- Outside Cab



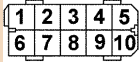
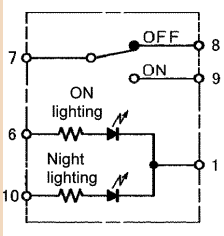

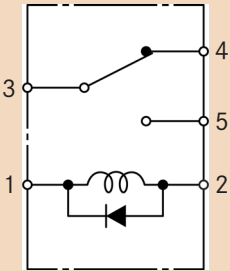
No.	Part Name	Connector No.	Circuit Description				Mating Connector
			No.	Circuit	Line color	Load	
A	OPTION CONNECTOR (side turn)	MH056451 	01	TURN LH (12 V)	Gr-L	*1	MH056401 
			02	TURN RH (12 V)	Gr-R	*1	
B	OPTION CONNECTOR (chassis)	MH056457 	01	BATT (24 V/12 V)	G-R	*2	MH050090 
			02	ACC (24 V/12 V)	W-R	*2	
			03	MAIN (24 V/12 V)	L-R	*2	
			04	-	-	-	
			05	ILL (24 V/12 V)	O-B	-	
			06	GND	B	-	

-: The connector marked with - is used for signal cabling only, not used to connect the loads.

*1: In a vehicle with a connector marked with *1, one lamp as shown in the following can be additionally mounted for one side of the vehicle at manufacturer's option: voltage:12 V, lamp type: 21 W.

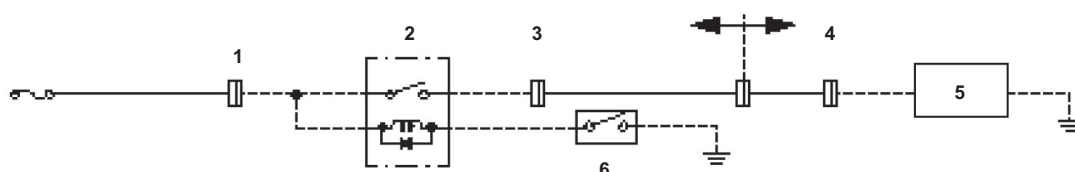
*2: Loads to be connected to the connector marked with *2 should be arranged so that the total value of the connector output in each of the cab and chassis side shall not exceed the permissible current.

8.4.4 Installation of switches and relays for equipment

Part Name	Mitsubishi Part No.	Allowable Current	Connector (Harness side)	Circuit
Rocker switch	MK645424	3.0 A or less	 <p>MCP2.8 type connector Housing: A0145450026 Terminal: A0145451126KZ (wire diameter: 0.3 mm²) A0135457626KZ (wire diameter: 0.5 to 0.85 mm²)</p>	
Relay	MK420479 24 V type	Between ③ & ⑤ (normally open side): 10 A max Between ③ & ④ (normally closed side): 5 A max	 <p>Connector type EQ5A (MH059820)</p>	 <p>1: Power supply side 2: Ground side</p>
	MK420480 12 V type	Between ③ & ⑤ (normally open side): 20 A max Between ③ & ④ (normally closed side): 10 A max		

Notes:

- If the total load current to the equipment connected to the switch for equipment exceeds 3.0 A, a relay must be added to prevent the flow of any load current exceeding 3.0 A through the switch. Night lighting and ON lighting are available for the switch for equipment. Use them as required.
- For the vehicle voltage, refer to "Power supply voltage" ▷ 8.1.1. There are two relays: One intended exclusively for 24 V and the other exclusively for 12 V. The allowable current for the output line for equipment is specified separately from that for the relay above. Select the connected load that will not exceed either allowable current.
- Typical example of use



N54.15-2229-00

- 1 Lead-out point provided on vehicle
- 2 Genuine relay (20 A or less)
- 3 Cab harness
- 4 Chassis harness

- 5 Load
- 6 Genuine switch (3 A or less)
- Additional wiring

8.4.5 Electrical power for rear body

The approximate amperages available when the vehicle operating is as shown below.

Note that these are the rough values and may vary depending on the environment conditions, vehicle model, condition of vehicle, etc.

Unit: A

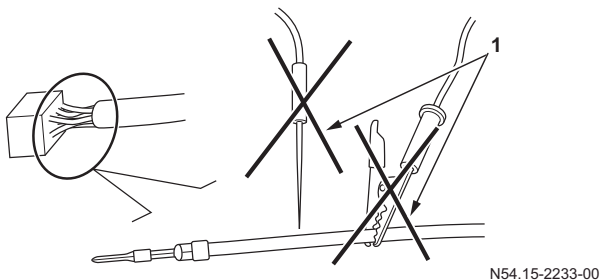
Alternator type	Available amperage
All type	< 5 (@1 hr)
	< 300 (@30 s)

8.5 Electric circuit continuity check

Property damage

Needling check is prohibitive.

Damage to cable insulation by test bar or electric circuit check lamp needle can result in premature corrosion of chassis harness.



1 Sticking of test bar or electric circuit check lamp needle into cable insulation is prohibitive.

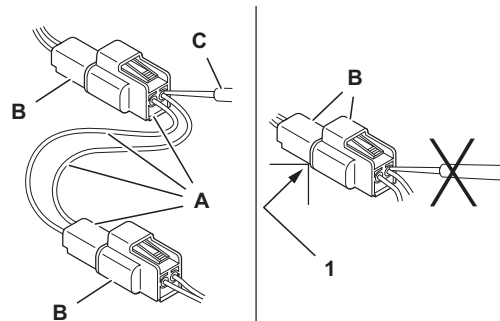
N54.15-2233-00

8.5.1 Check procedures

Continuity check with mating connectors joined (with continuity established in circuit)

Waterproof connector

- Connect check harness A between joined circuit connectors B.
- Perform the check with the test bar applied to the check harness A connector
- Do not put in the test bar from connector B-side harness. The connector would lose waterproofing performance to result in harness corrosion.

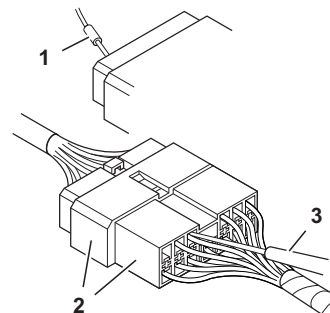


1 Connect A between B here.

N54.15-2234-00

Non-waterproof connector

- Insert the test bar from the harness side.
- If joined connectors are so small that test bar cannot be inserted, such as control unit connectors, do not push in the test bar by force but use a superfine pointed test bar.



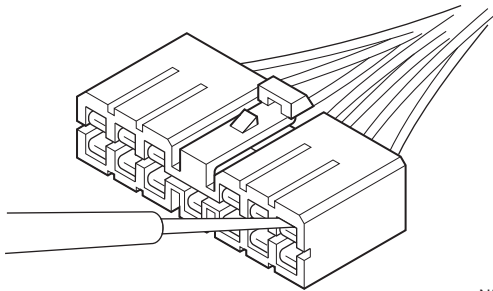
- 1 Test bar
- 2 Connector
- 3 Test bar

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Continuity check with connectors disjoined

Check with female connector pins

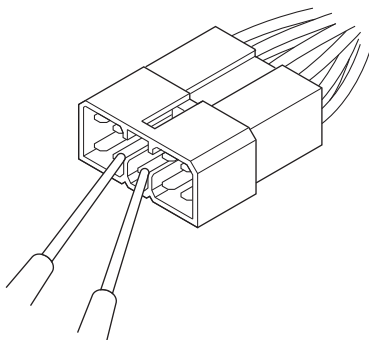
- Perform the check with the test bar inserted in the pins.
- Forced bar insertion could result in poor contact.



N54.15-2236-00

Check with male connector pins

- Perform the check applying the test bar directly to connector pins.
- Take care that the test bar does not short-circuit between connector pins. In the case of electronic control units, short-circuiting could break down their internal circuit.



N54.15-2237-00

8.6 Precautions for electric welding

When a worker carries out arc welding, the electrical harness of the vehicle and also the electronic devices sometimes become damaged. To prevent this, observe the following precautions.

- Preparations for arc welding
On the vehicle are mounted electronic devices and an electronic control unit (ECU) which are connected directly to the battery. If you carry out arc welding with these devices connected, current from the welding machine may flow in the reverse direction through the ground circuit and damage the devices.

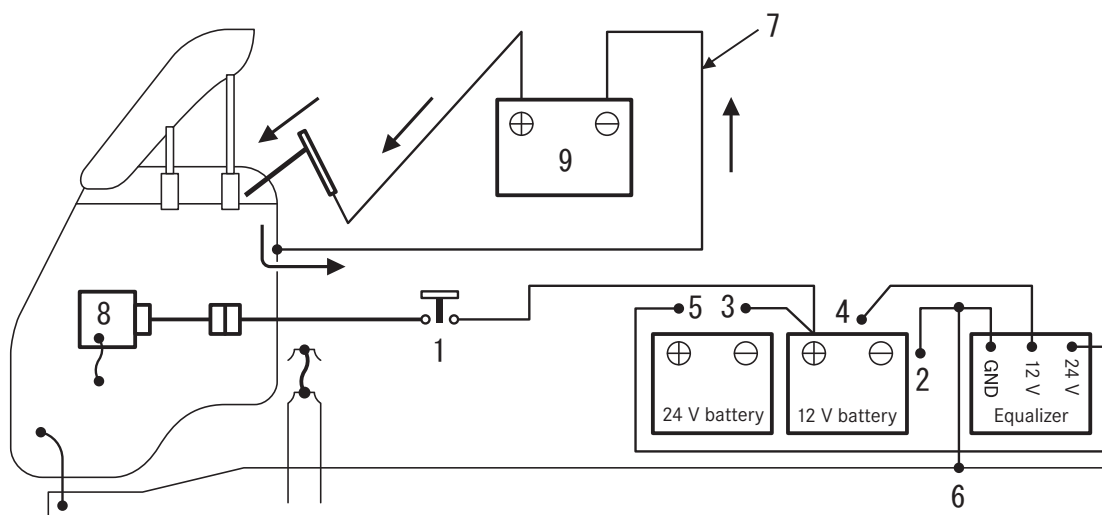
If you do not observe the precautions for welding, welding current will flow through the following circuit: ▷ 8.6

Before carrying out welding, carry out the following work.

- Turn OFF the starter switch
- Disconnect the battery cables from negative terminals of the batteries, and cover the ends of the cables.

Disconnect the harness connectors connected to the 12 V and 24 V terminals of the battery equalizer from the positive terminals of the batteries, and cover the ends of the cables.

- Wait for at least one minute. (because SRS airbags are installed)
- Be sure to ground the welding machine at a point near the welding area.
 - When welding to the cabin
Ground the cabin using a nearby plated bolt or a metallic part of the cabin. When grounding the cabin itself, remove the paint from the grounding point.
 - When welding to the frame
Ground the frame using a nearby plated bolt or the frame. When grounding the frame itself, remove the paint from the grounding point. Do not obtain an ground using a chassis spring because this may result in damage to the spring.



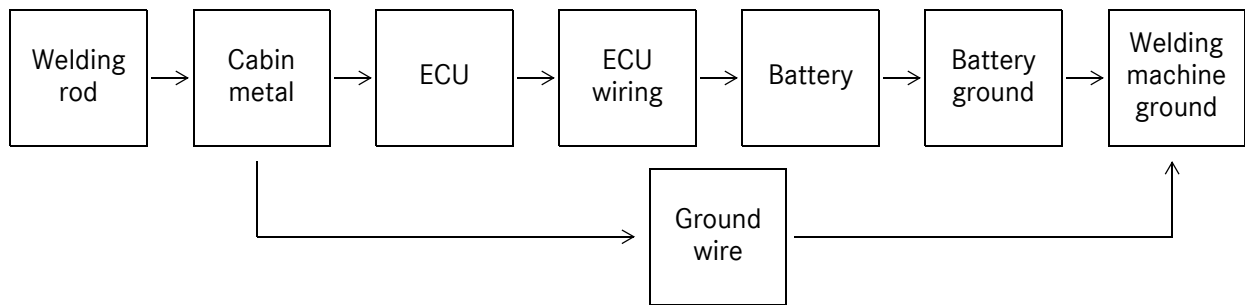
N54.10-2340-00

- Turn OFF the starter switch.
- Disconnect the cable from the negative terminal of the 12 V battery, and cover the end of the cable.
- Disconnect this cable from the negative terminal of the 24 V battery, and cover the end of the cable.
- Disconnect the cable from the positive terminal of the 12 V battery, and cover the end of the cable.
- Disconnect the cable from the positive terminal of the 24 V battery, and cover the end of the cable.
- Frame
- Ground the welding machine at a point near the welding area.
- ECU
- Welding machine

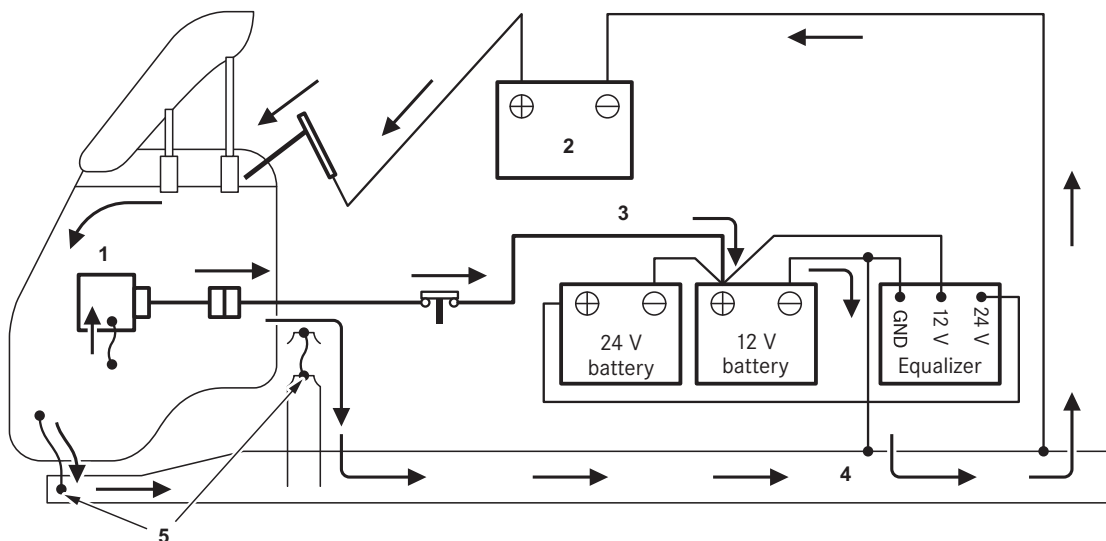
- Other precautions
 - (a) Before carrying out welding, place a cover over electronic devices, rubber hoses, wire harnesses, pipes, tubes, chassis spring, tires and other items in the vicinity of the welding area in order to protect them from sparks (spatter) generated during welding.
Please note that you cannot protect the ECU from damage caused by a short circuit if you accidentally touch the ECU case with the welding rod.
 - (b) Carry out welding under appropriate conditions, take steps to minimize the effect of heat on the vicinity, and also strive to secure high welding quality.
- Checks to be performed after the end of welding work
 - (a) Reconnect the battery cables that you disconnected from the positive and negative terminals, so as to restore the power.
If you removed the paint from the frame or the cabin, apply rustproofing paint of the same color.
 - (b) Confirm that the starter switch is OFF.
 - (c) If you wait for at least 30 seconds before reconnecting the battery cables that you disconnected from the positive and negative terminals in step (a), the needle of each meter in the meter cluster will move. Note, however, that this is due to the operation the self-diagnostic function, and is not indicative of a fault.
 - (d) After restoring the power, check the electronic devices to see if they function correctly.
For the checking method, consult an authorized MITSUBISHI FUSO dealer.
 - (e) For the precautions to observe concerning the SRS airbag when carrying out welding work, refer to ▷ 6.13.1.

8.6 Precautions for electric welding

- If you do not observe the precautions for welding, welding current will flow through the following circuit:



As a result, other wiring including the ECU and the ground wire will be damaged.



N54.10-2341-00

- 1 Damaged ECU
- 2 Welding machine
- 3 To starter switch
- 4 Frame
- 5 Damaged ground wire

8.7 Lighting

8.7.1 Installation of Additional lamps and equipment

- Turn signal lamps

One lamp (*1) may be added on one side (*1: voltage 12 V, lamp specifications 21 W). The addition of the lamp may result in the open circuit detection function being inoperative. Use the specified additional lamp.

After modification, be sure to perform the functional check.

When you install additional turn lamp, ask an authorized MITSUBISHI FUSO dealer to change the parameters of the SAM control unit.

Additional information

Failure to change the parameters will result in the turn signal not operating properly.

- Installing rear lamps

(1) The vehicle is shipped with the rear combination lamp, backup lamp, and license plate lamp temporarily mounted on the chassis. Use those parts.

(2) Be sure to install the lamps on each side of the vehicle symmetrically. Fix lamp wires aesthetically nicely along the rear surfaces of the frame, cross member, and rear body by using adequate clamps.

- Rear combination lamp

(1) Installation

On the chassis with a cab, the rear combination lamp has been temporarily mounted upside down and the water drain hole in the lamp has been taped. Be sure to peel off the tape after the lamp is installed in the correct position. Do not array the lamp vertically.

- (2) Harness extension

The extension harness for the rear combination lamp is available now. please use it.

Unit: mm

Application	Length	Part No.
Extension harness for rear combination lamp	400	MC115366
	900	MC115367

- License plate holder

(1) For the license plate lamp, use the lamp provided with the chassis as far as possible.

(2) The law stipulates that the license plate bracket must be of a construction such that it cannot be easily removed from the rear body. For this reason, install the bracket with rivets, or bolt the bracket by tightening the nuts and then be sure to either crimp the threaded part of each bolt or weld the nut to the bolt.

(3) When installing the license plate brackets to the wooden part of the rear body, use bolts that are of sufficient length to pass completely through the wood, and after tightening the nuts be sure to crimp the threaded part of each bolt.

(4) Select the mounting position of the license plate in such a way that the license plate is not in the shadow of the rear bumper or any of the lamps.

- Installation of side reflectors

Remove side reflectors from the frame during body building for later use. For additional requirements, use MITSUBISHI FUSO genuine parts.

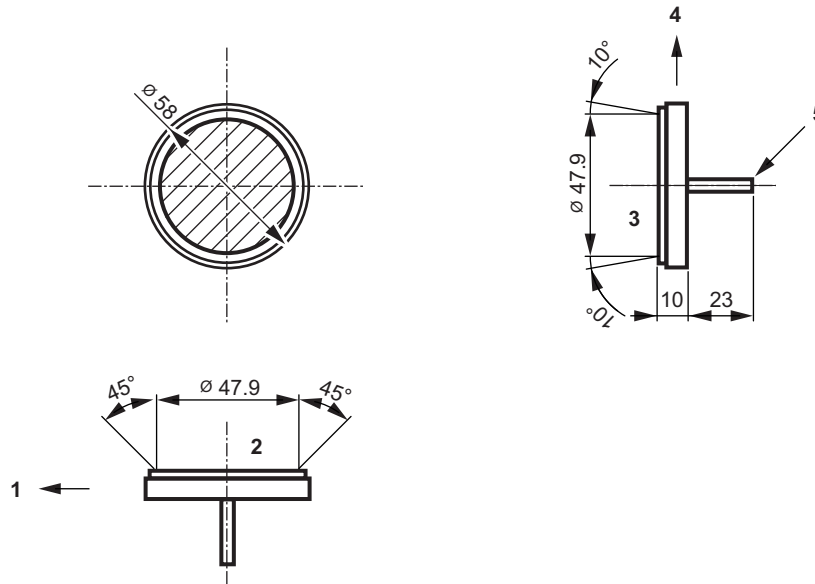
The front side reflector, removed from the frame, can no longer be reused. Use a new part if replacement is necessary for a damage one.

8.7.2 Side reflector

The side reflectors must be removed before starting the body mounting work.

If any additional side reflectors are to be installed, be sure to use MITSUBISHI FUSO genuine reflectors.

Side reflector

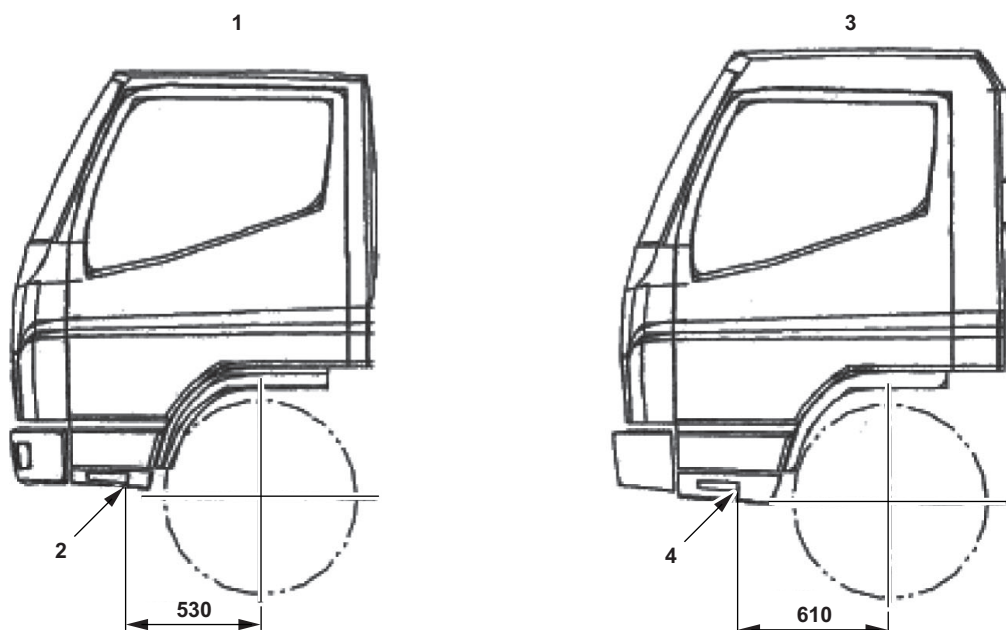


- 1 Front
- 2 Reflecting section
- 3 Reflecting section

- 4 Upward
 - 5 Bolt M5 × 0.8
- Tightening torque: 2 - 3 Nm

N82.10-2821-00

Front side reflector



- 1 Cab with standard width
- 2 Trailing edge of reflective section of reflector

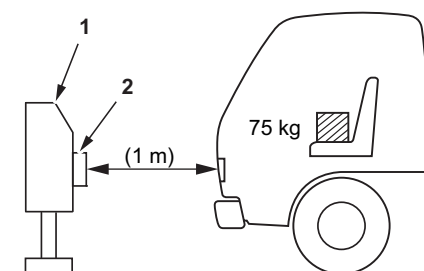
- 3 Wide cab
- 4 Trailing edge of reflective section of reflector

N82.10-2822-00

8.7.3 Headlamp aiming

Preparation before Adjustment

- Park the vehicle on a level place.
- Be sure to put tire chocks securely in place.
- Unload the vehicle and make sure no one is in it.
- Inflate the tires to the specified pressure.
- Seat one person of an equivalent mass (75 kg) in the vehicle.
- Start the vehicle system and check that the battery is being charged.
- Place convergent lamp tester and the vehicle facing each other as shown in the drawing.
- Align the center of headlamp bulb and the center of convergent lens of convergent lamp tester.
- (The drawing shows the left-hand headlamp.)
- When adjusting one headlamp, mask the other to avoid light leakage.



N82.10-2818-00

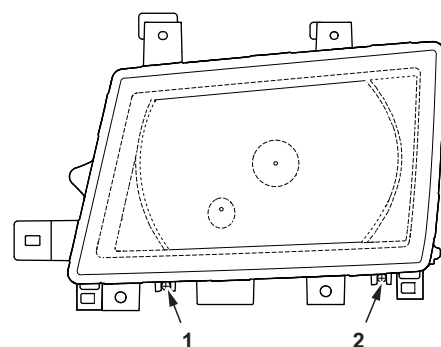
- 1 Lamp tester
- 2 Convergence lens

Adjustment

- Do not mask a lit headlamp for more than 2 minutes or the heat generated might cause a fire.

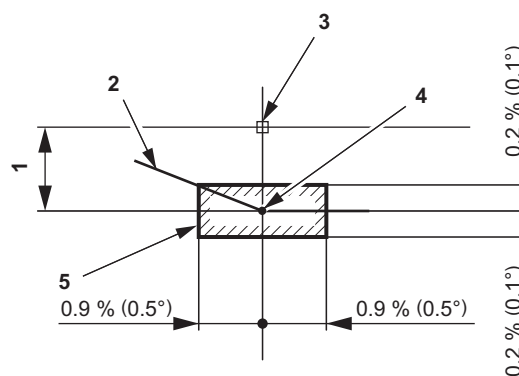
Adjustment of dipped beam

- Turn on dipped beam.
- Make adjustment by the following procedure so that the elbow point of dipped beam cut-off line is in the illustrated position.
- Vertical adjustment: Adjust by turning screws A and B in this order by the same amount.
- Horizontal adjustment: Turn screw B.
- Adjust the optical axes of the dipped beams so that the cut-off line position can conform to the standard value.



N82.10-2819-00

- 1 Screw A
- 2 Screw B



- 1 Cut-off line position
- 2 Cut-off line
- 3 Center of lamp
- 4 Elbow point of cut-off line
- 5 Tolerance of adjustment

Initial optical axis label	Optical axis adjustment angle
1.0%	0.57°
1.5%	0.86°

Vertical adjustment: Turn screws A and B in that sequence by equal amounts at a time.

Horizontal adjustment: Perform adjustment by turning screw B.

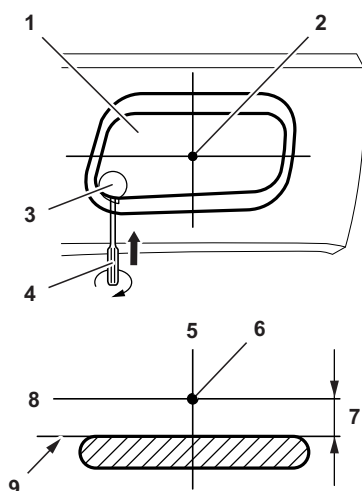
	Optical axis adjustment direction							
	Right headlamp				Left headlamp			
	Up	Down	Left	Right	Up	Down	Left	Right
Screw A	Counter-clockwise	Clockwise			Counter-clockwise	Clockwise		
Screw B	Counter-clockwise	Clockwise	Counter-clockwise	Clockwise	Counter-clockwise	Clockwise	Clockwise	Counter-clockwise

8.7.4 Fog lamp

After carrying out body-building, perform re-adjustment of aiming.

Using the aiming adjustment gear, adjust the left and right fog lamps to the correct optical axis.

Adjust the angle of the optical axis of the fog lamp so that the light-dark boundary line is in the location shown in the figure below.



N82.10-2823-00

- 1 Fog lamp
- 2 Center of lamp
- 3 Aiming gear
- 4 Screwdriver
- 5 Vertical
- 6 Lamp center
- 7 Cut-off position
- 8 Horizontal
- 9 Cut-off line

Location of light-dark boundary line	Adjustment value

	Optical axis adjustment direction	
	Up	Down
Driver rotation direction	Clockwise	Counter-clockwise

9.1 Axle load calculation

An axle load calculation is required to optimize the overall vehicle (vehicle and body). It is only possible to match the body to the truck if the vehicle is weighed before any work on the body is carried out. The weights measured by weighing form the basis of the axle load calculation.

The moment theorem is used to distribute the weight of the equipment on the front and rear axles. All distances relate to the center front axle (theoretical center). Mark the weight with mathematically correct signs and enter them in the table. The result will assist you in choosing the optimum positioning of the body.

It has proved useful to make the following calculations:

Weight

- + (plus) is everything when the vehicle is laden
- (minus) is everything that the vehicle can unload (weights)

Axle distance

- + (plus) is everything behind the center of the front axle
- (minus) is everything in front of the center of the front axle

Calculate the weight distribution on the front and rear axle using the formula:

$$\Delta G_{HA} = \frac{G_{\text{component}} \cdot a}{R} \text{ [kg]}$$

ΔG_{HA} = Change in weight on rear axle in [kg]

$G_{\text{component}}$ = Component weight in [kg]

a = Axle distance to theoretical center of front axle in [mm]

R = Theoretical wheelbase [mm]

$$\Delta G_{VA} = G_{\text{component}} - G_{HA} \text{ [kg]}$$

ΔG_{VA} = Change in weight on front axle in [kg]

$G_{\text{component}}$ = Component weight in [kg]

ΔG_{HA} = Change in weight on rear axle in [kg]

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Revision record

E		
D		
C		
B		
A	18. November. 2021	Correction
-	20. October. 2020	Newly issued
Rev. code	Date issued	Remarks

Body/equipment mounting directives

<Common section>



E-CANTER

MITSUBISHI FUSO TRUCK & BUS CORPORATION

November. 2021 TL302

Body/equipment mounting directives
Technical data section
Australia

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10.1 Model line-up

Model	Type	Drive system	Crew	Motor			G.V.W. (kg)	G.C.W. (kg)	Tire
				Model	output (kW)	torque (Nm)			
FEB7UERBSFA2	Forward control tilt cab	4 × 2	3	S30	135	390	7490	-	205/75R17.5



10.2 Specifications



10.2.1 Specifications

Model		FEB7UERBSFA2
Wheelbase (mm)		3400
Tread (mm)	Front	1665
	Rear	1560
Curb weight (kg)		3280
	Front	1900
	Rear	1380
Max. GVW		7490
	Front	3100
	Rear	5990
Motor model		S30
Max. output (EEC)		135 kW / 10000 rpm
Max. torque (EEC)		390 Nm / 0 to 3100 rpm
Reduction gear		EZ-12
	Gear ratio	2.68
Propeller shaft		P3
Transfer		-
Rear axle		R035T
Final reduction gear		D035H
	Ratio	6.666
Front axle		F350T
Tire		205/75R17.5 124/122 M
Wheel		17.5 x 6.00 - 127
Steering angle (in/out)		45° / 34°
Service brake		hydraulic vacuum assisted 2 circuit split system
Parking brake		Mechanical, internal expanding type mounted on the rear end of the transmission case
Front suspension		Semi-elliptic laminated leaf spring with shock absorbers and stabilizer
Rear suspension		Semi-elliptic laminated leaf spring with shock absorbers and stabilizer
Electrical	DC/DC convertor	12 V-210A
	Batteries	12 Volts (100AH-760A (EN)x2)
Cab		Wide, Single
Crew		3





10.2.2 Axle and tire load carrying capacity

Max. GVW (kg)	Vehicle Model	Max. Output (kW)	Tire Size	Axle Capacity (kg)	
			205/75R17.5	Front	Rear
7490	FEB7UERBSFA2	135	X	3100	5990
Tire Capacity (kg) * 1		Front	1600 X 2 = 3200		
		Rear	1500 X 4 = 6000		

* 1: At maximum information pressure (kPa, cold: Fr/Re)
205/75R17.5 124/122 ... 750/750



10.3 Weight distribution table

10.3.1 Weight distribution table

Model: FEB7UERBSFA2(135kW)

Wheelbase (m) : 3.400

Parts name	Weight (Kg)	Front axle load (Kg)	Rear axle load (Kg)
Chassis Cab weight * 1	3280	1900	1380

* 1: Chassis cab weight: Include oil, coolant but exclude spare tire & disc, tools and persons.



10.3 Weight distribution table

10.3.2 Option equipment

Group	Option	Mass Variation	Mass Center Position (distance from FrAxle center)* 1	Remark
			4x2	
			Wide cab	
			Single	
Exterior	Short stay mirror	+0 kg	-	

Note

- *1 Distance from Fr. Axle Center ; +: backward, -: forward
- Some items are applied as standard or inapplicable



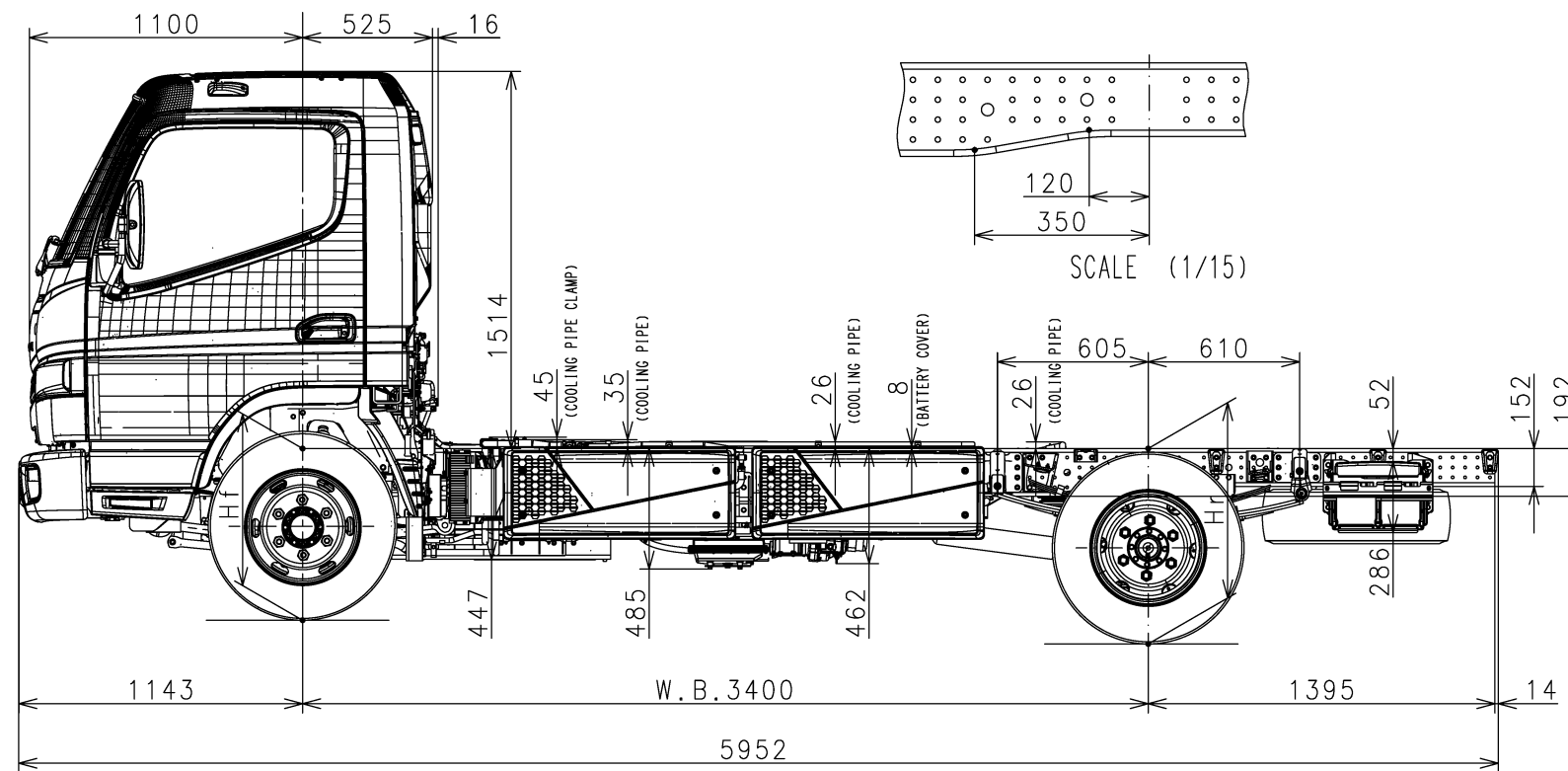
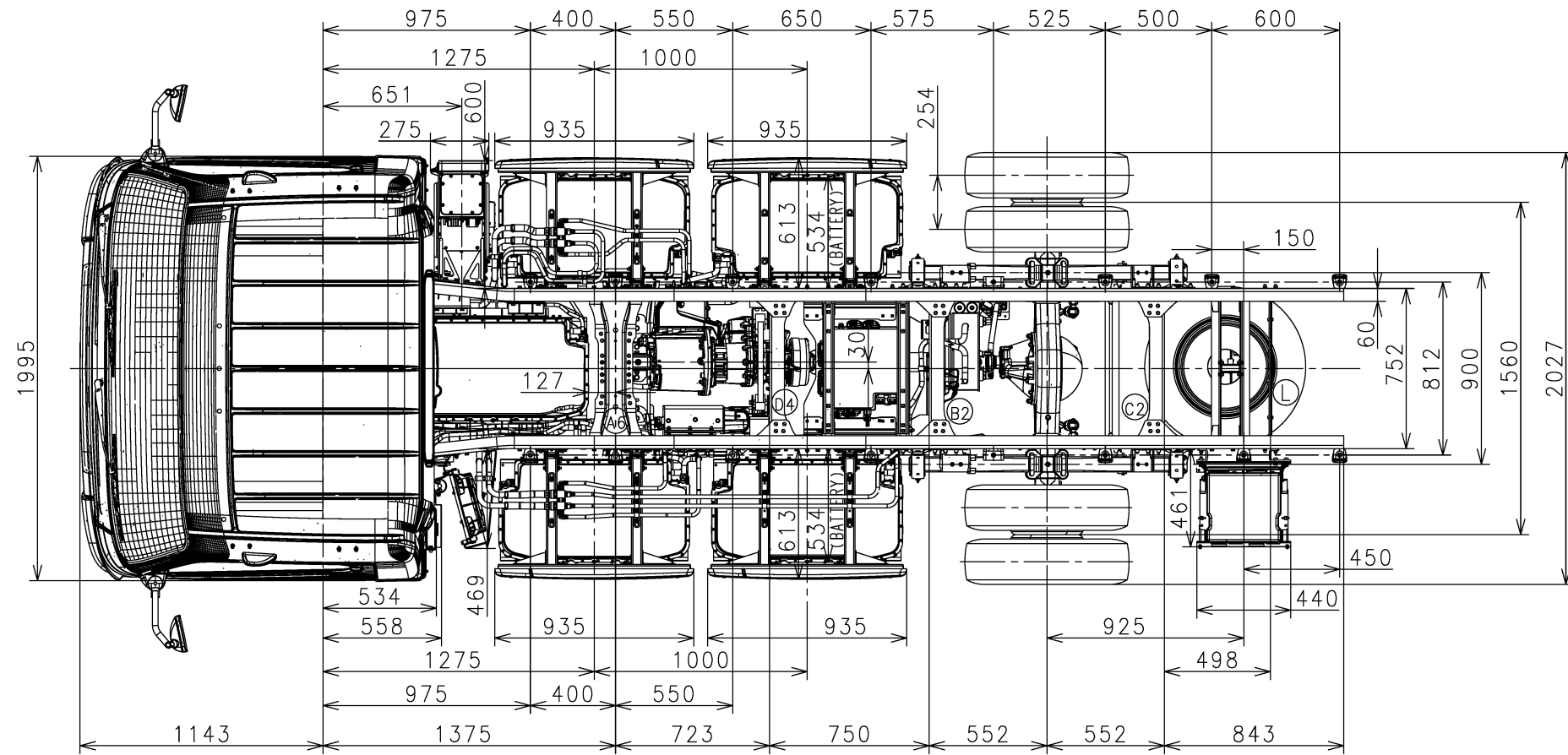
10.4 Chassis cab drawings

10.4.1 Chassis cab drawings

Division	Model	Page
2WD	FEB7UERBSFA2	8



10.4 Chassis cab drawings



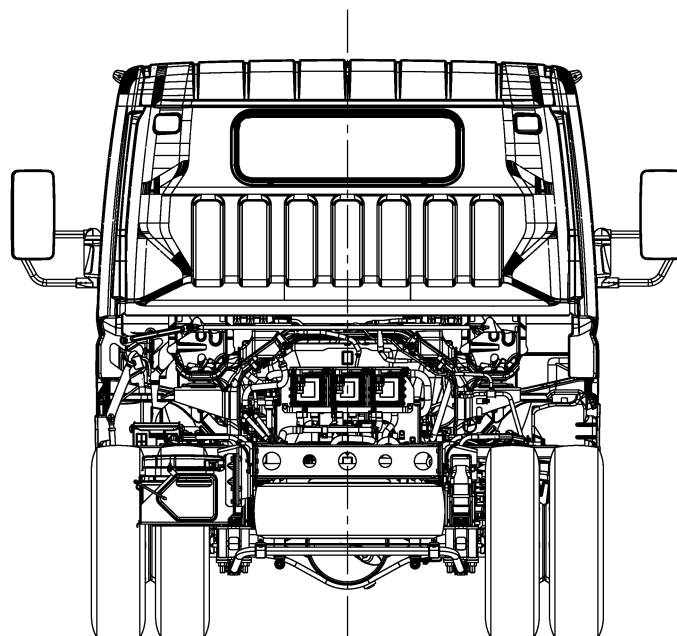
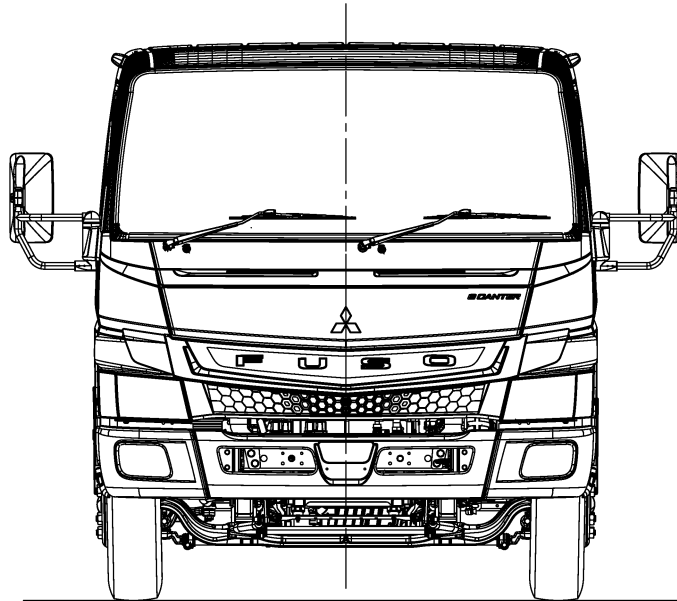
	FEB7UERB
TIRE SIZE	205/75R17.5



10.4.2 Cab drawings

Division	Model	Page
2WD	FEB7UERBSFA2	10

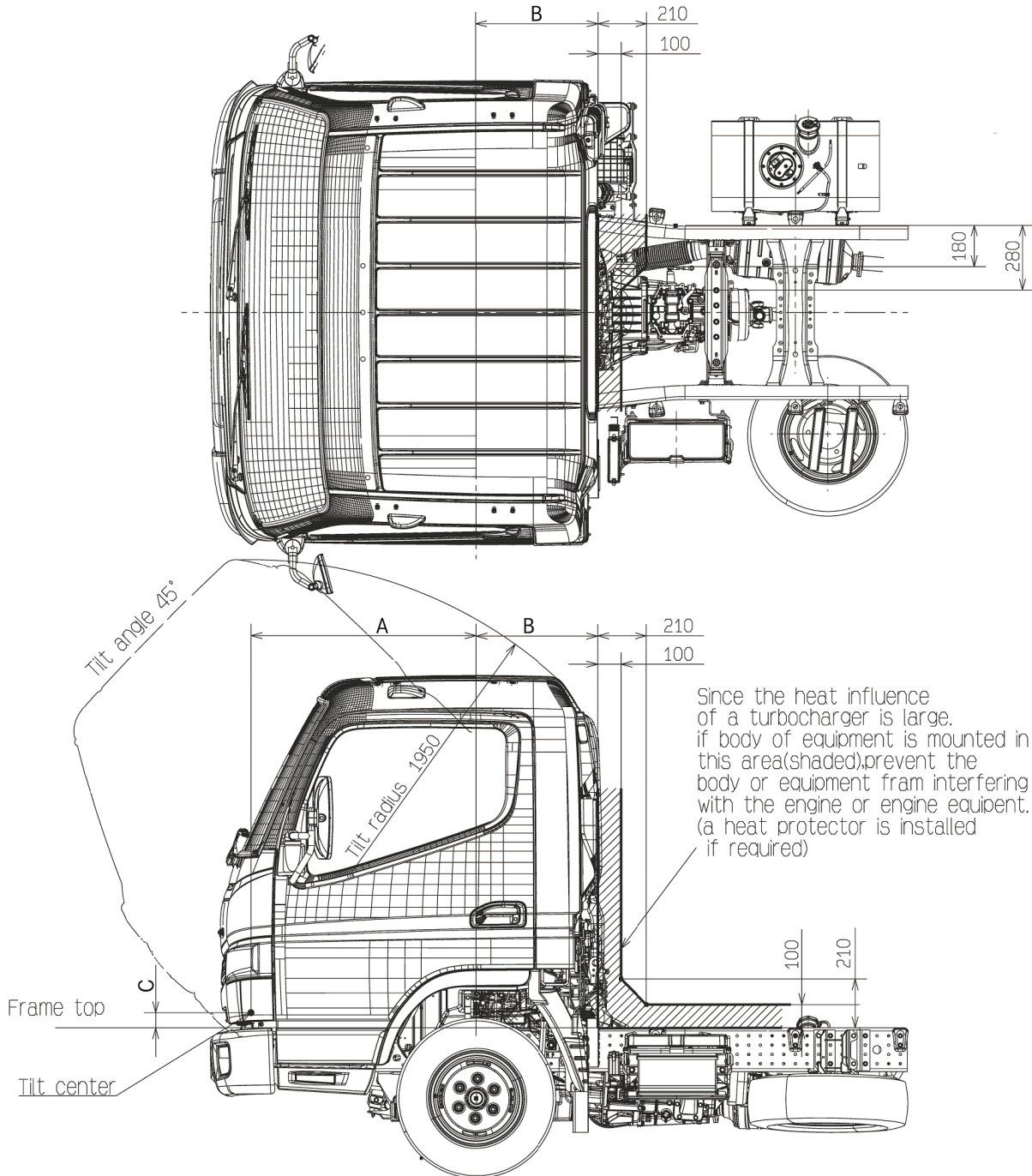




eCANTER S/CAB FEB7UERBS

SCALE=1:30

10.4.3 Cab side view



unit(mm)

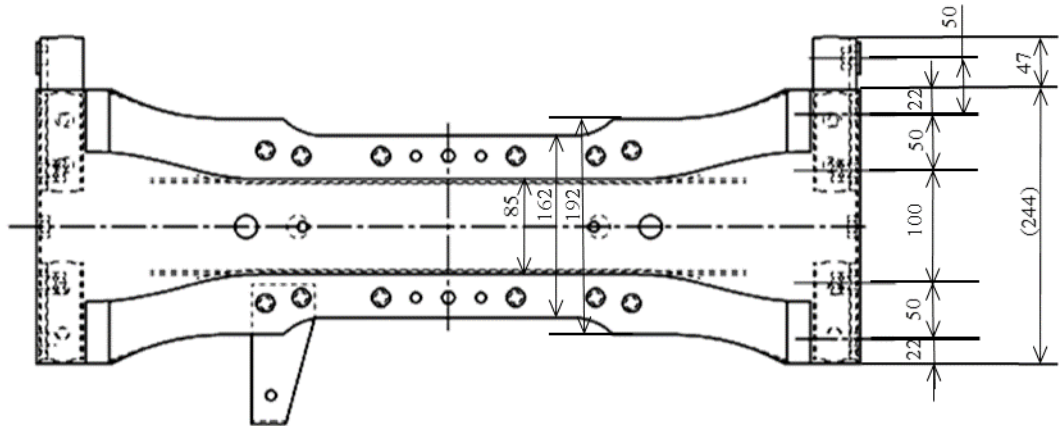
	A :Front axle center to cab tilt center	B :Front axle center to cab end	C :Top surface of frame to cab tilt center
FEB	965	525	65

10.5 Frame structure

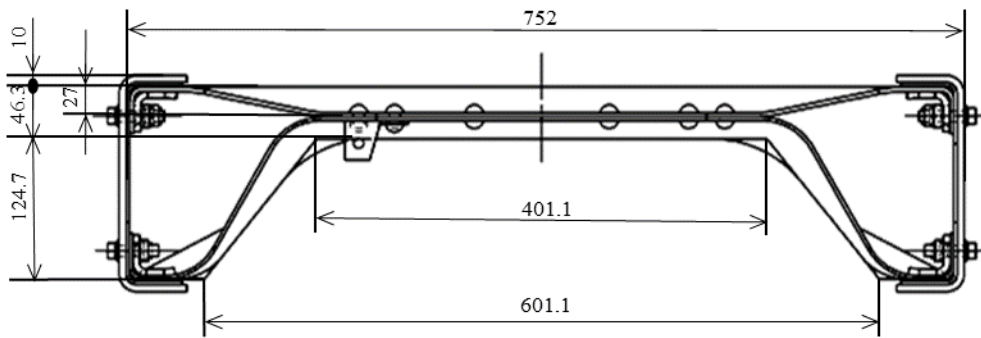
10.5.1 Details of cross member

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	B2	14
	C2	15
	D4	16
	L	17

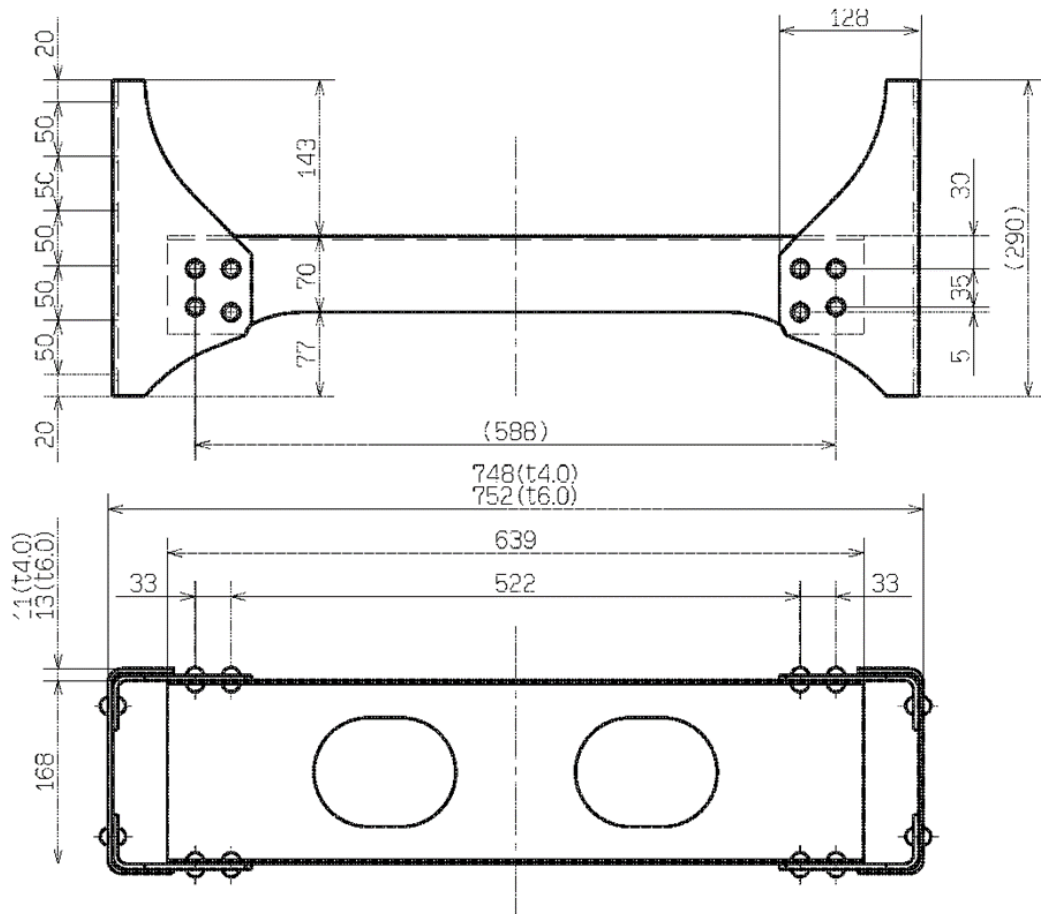




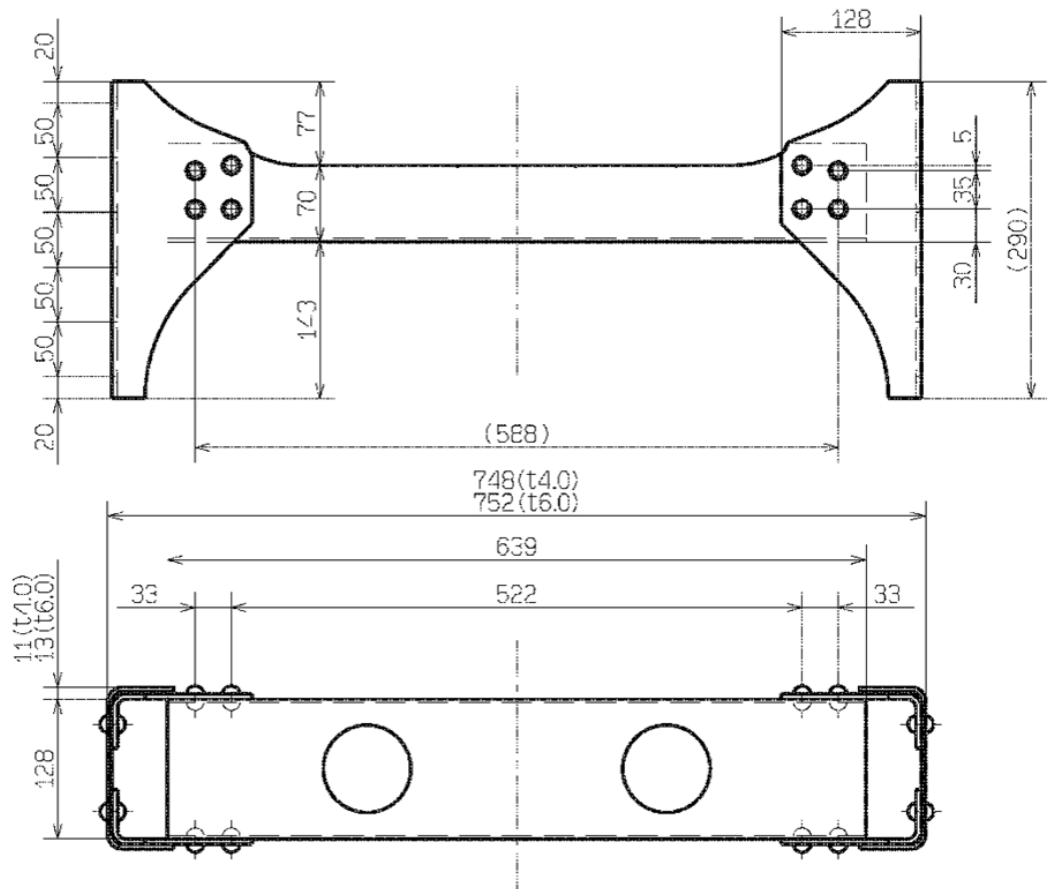
A6



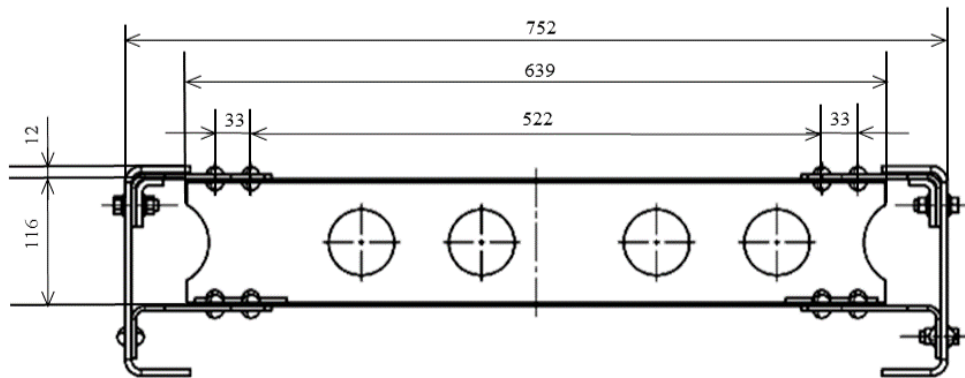
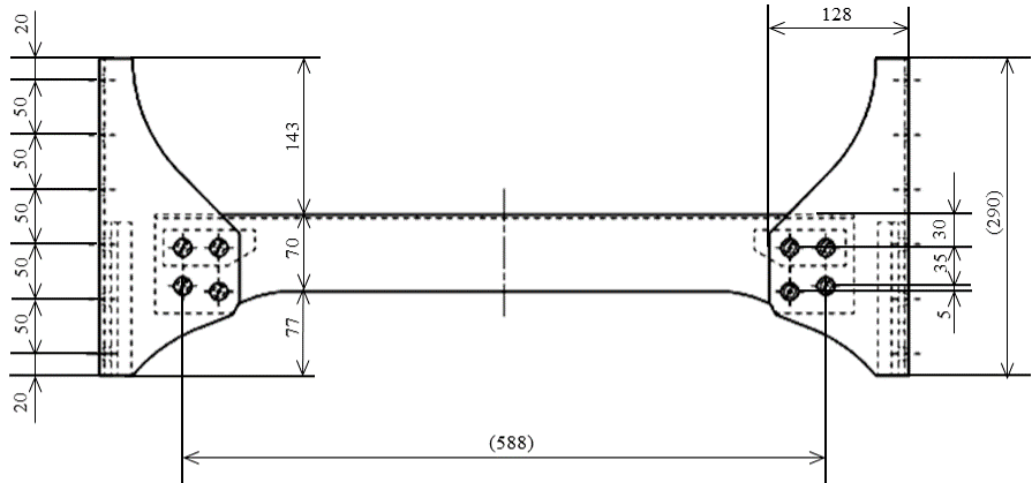
B₂

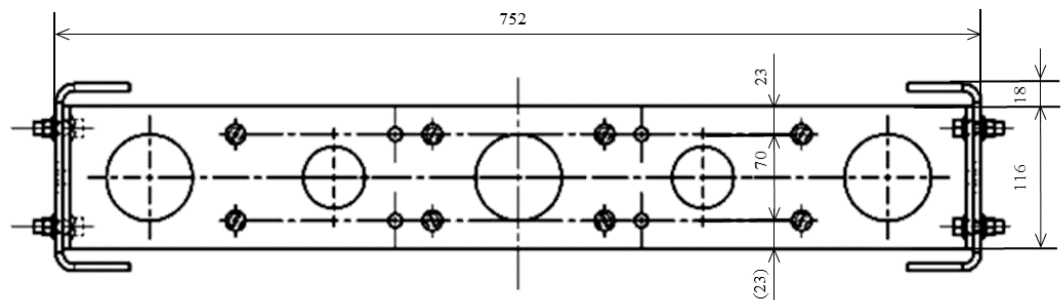
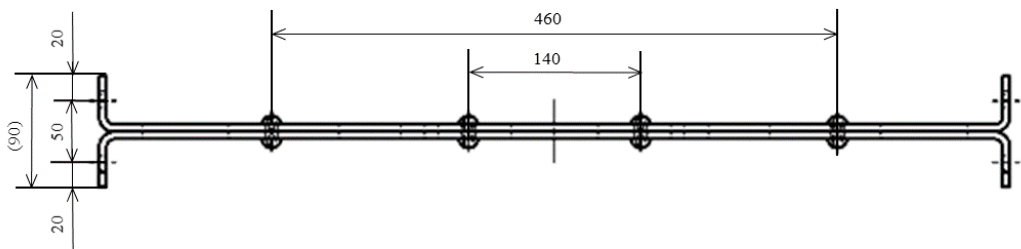


C₂



D₄





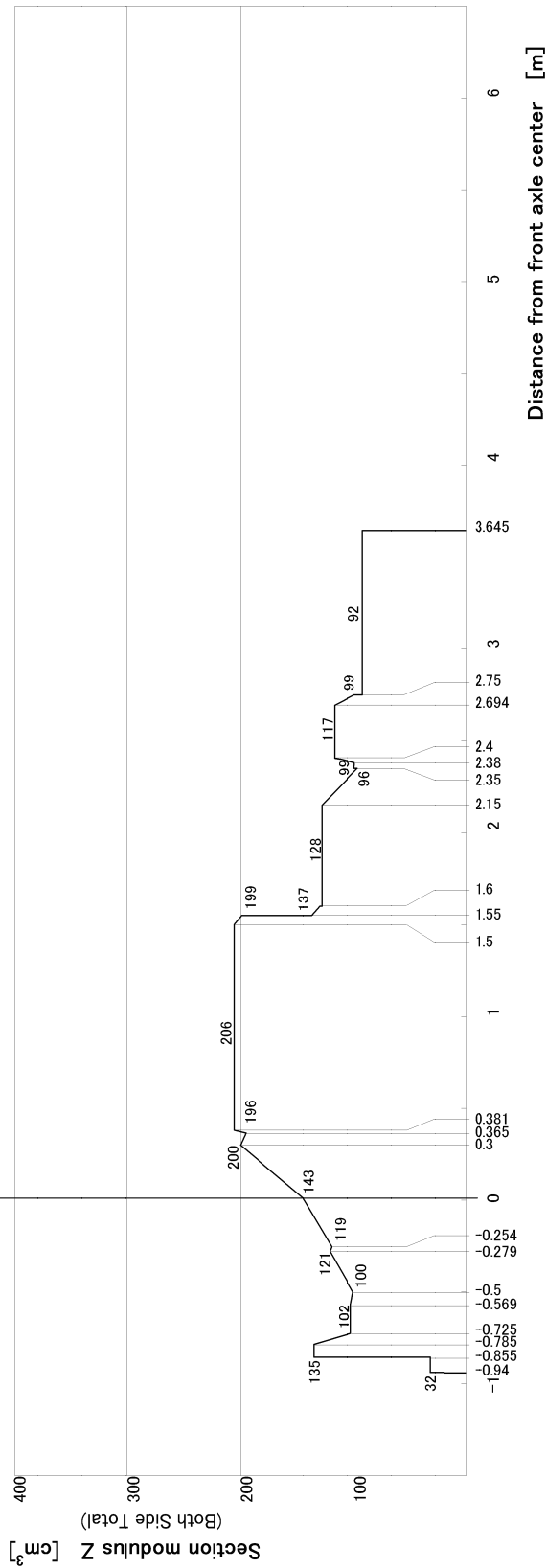
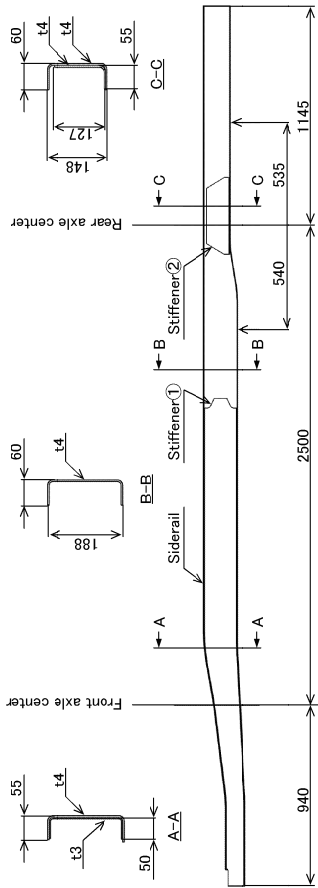
10.5.2 Frame section modulus

Model	Page
FEB7UERBSFA2	19



Model FEB7UE Chassis frame section modulus

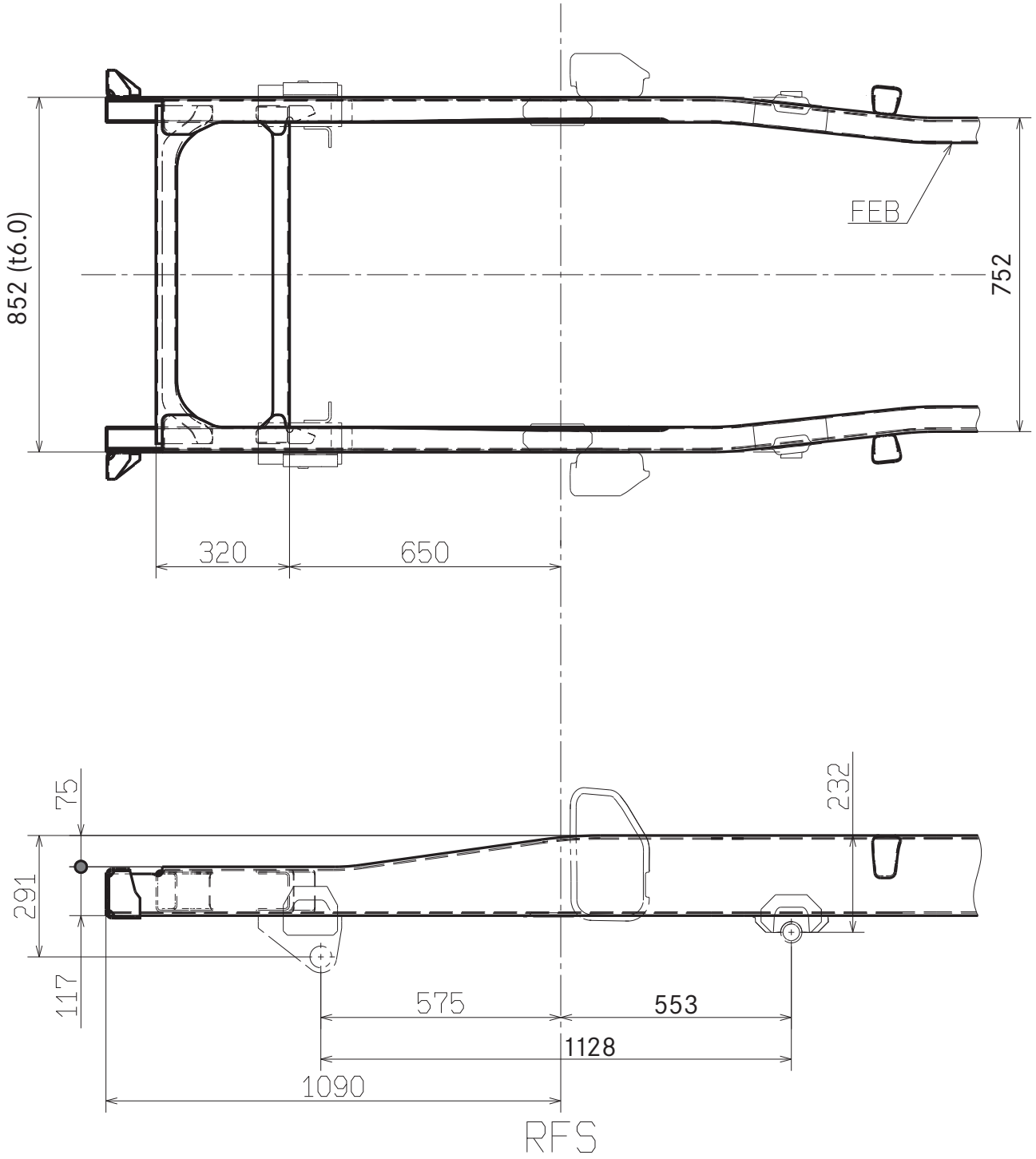
Siderail, Stiffener①	MISH440
Material	
Tensile strength	440MPa
Yield point	305MPa
Stiffener②	HTP540
Material	
Tensile strength	540MPa
Yield point	390MPa



10.5.3 Frame front drawings

Front suspension type	Model	Frame width (Nominal value)	Page
Rigid	FEB7	750	21





10.6 Spring characteristic

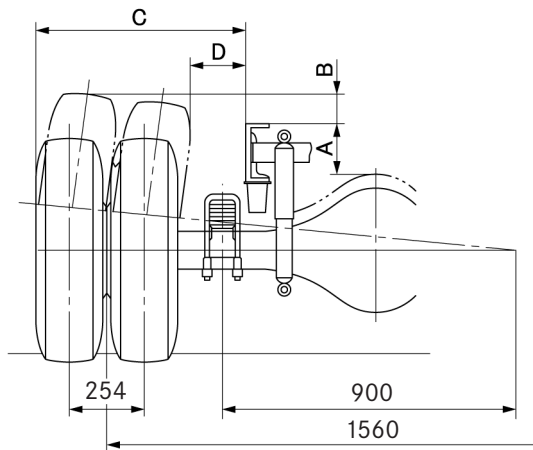
10.6.1 Distance from frame top surface to ground

MODEL	CAB CHASSIS WEIGHT kg			UNDER-SPRING WEIGHT kg		DISTANCE FROM FRAME TOP SURFACE TO GROUND mm	
	Front Wf	Rear Wr	Total W	Front	Rear	Front ±10 Hf	Rear ±25 Hr
FEB7UERBSFA2	1900	1380	3280	309	558	679	770



10.6.2 Differential and tire bound height

Model	Tire size	A mm	B mm	C mm	D mm
FEB7UERBSFA2	205/75R17.5C	105	146	638	148

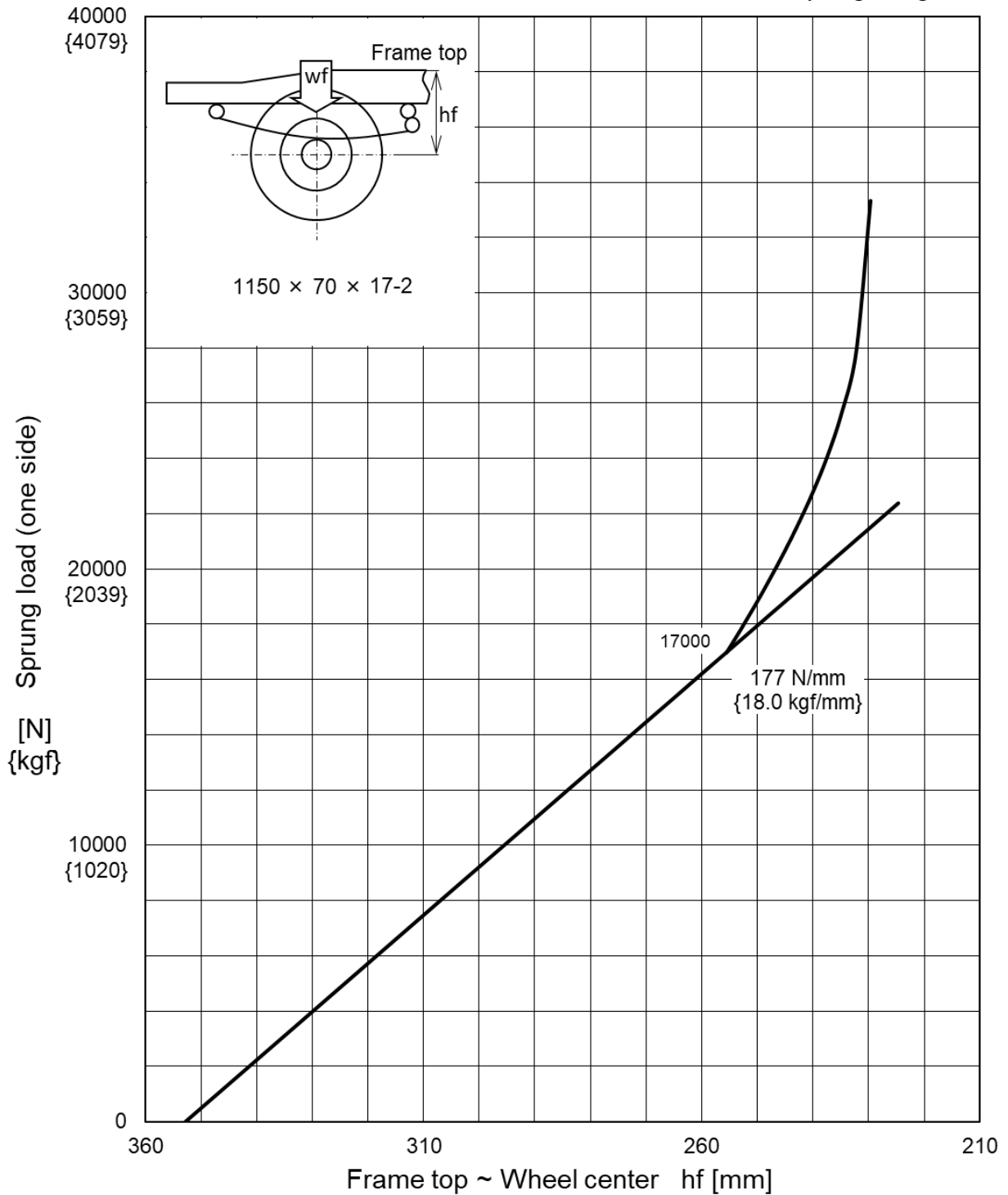


FEB7

10.6.3 Front spring diagram

MODEL: FEB7

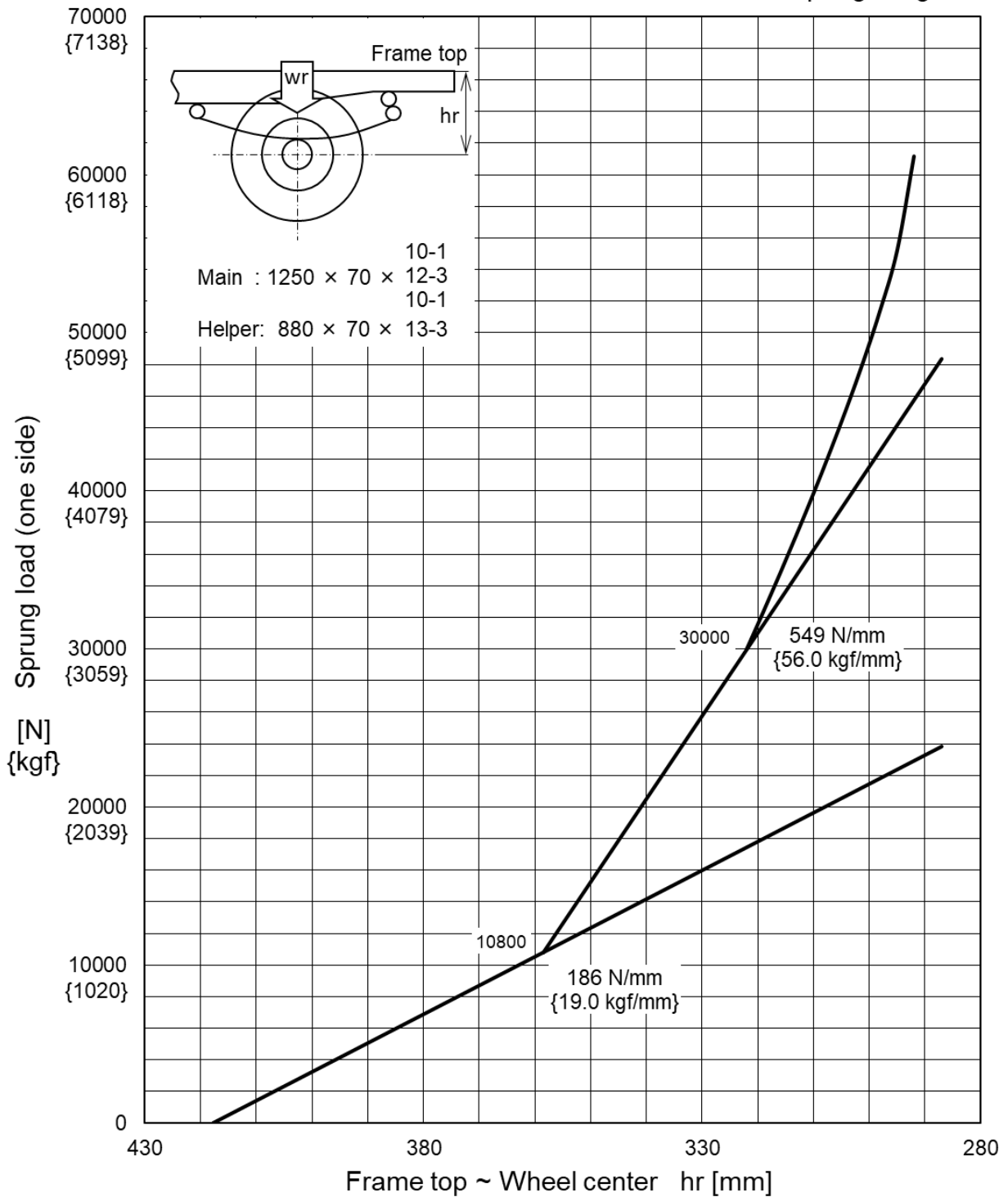
Front Spring Diagram



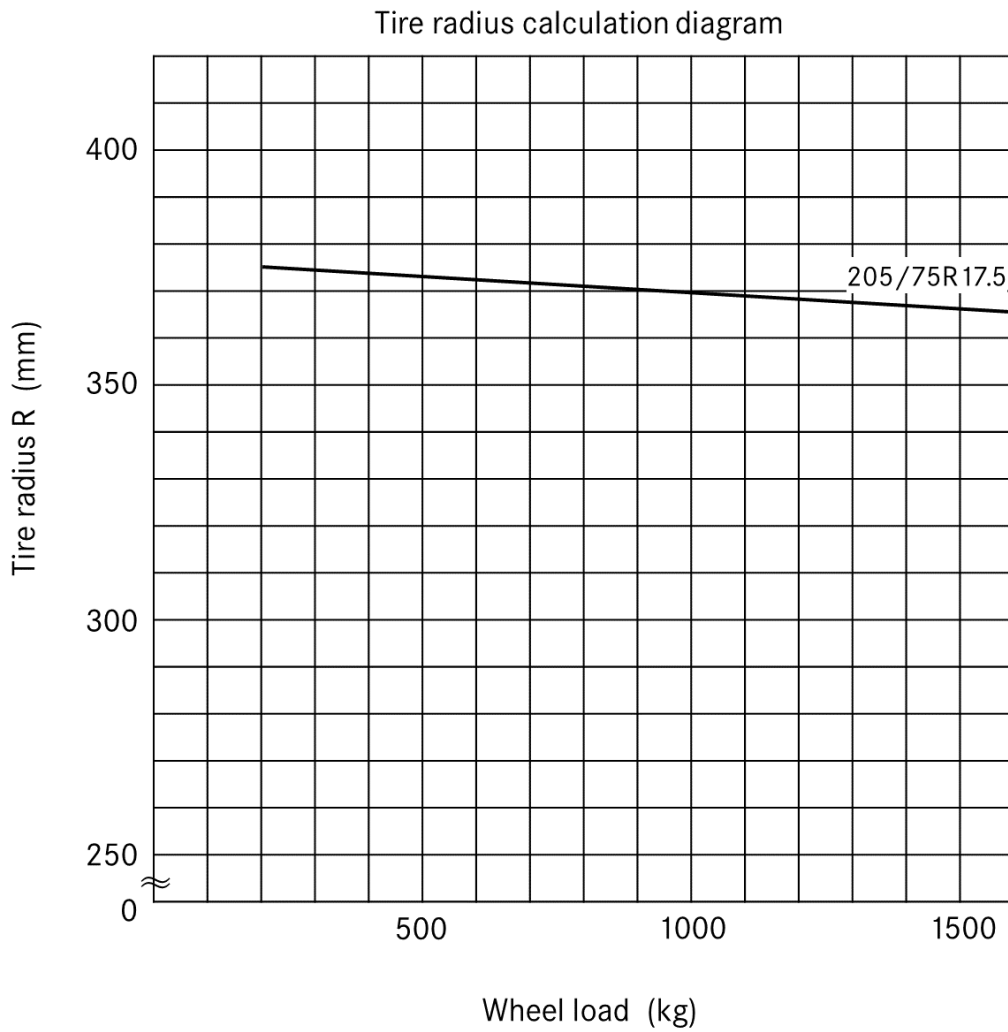
10.6.4 Rear spring diagram

MODEL: FEB7

Rear Spring Diagram



10.6.5 Tire radius calculating diagram



Single tire : Front-rear tire distributed load/2
 Double tire : Rear-tire distributed load/4



10.7 Electrical systems

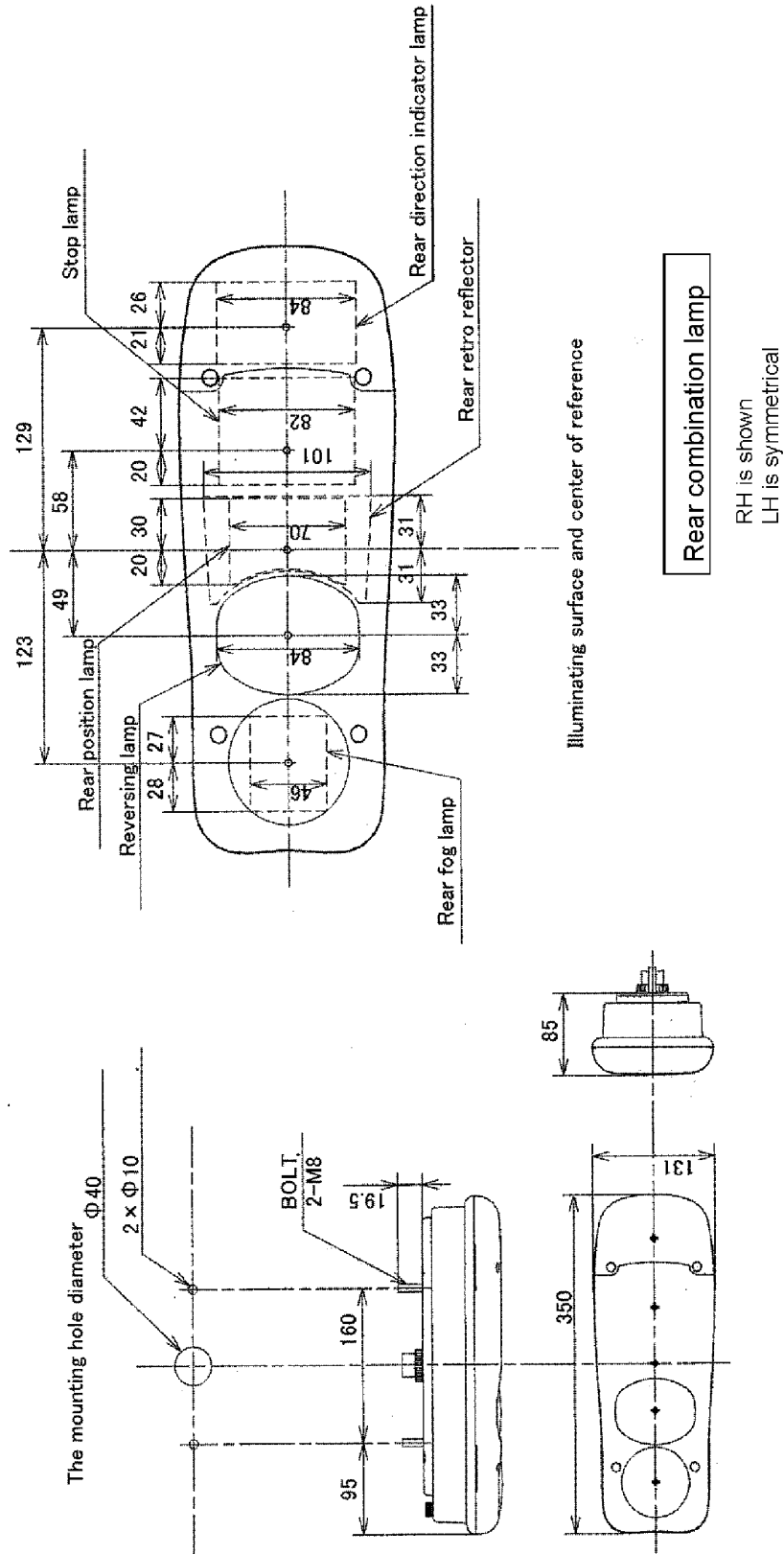
See the electrical wiring diagram section.



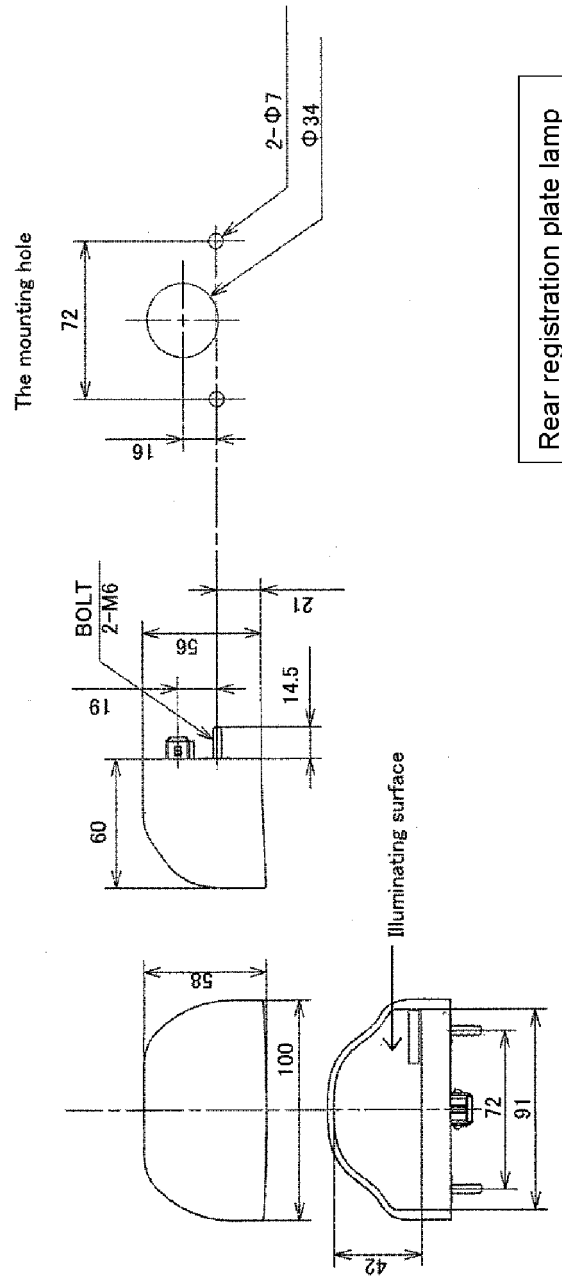
10.8 Other equipment

10.8.1 Installing rear lamps

(1) Rear combination lamp



(2) Rear registration plate lamp

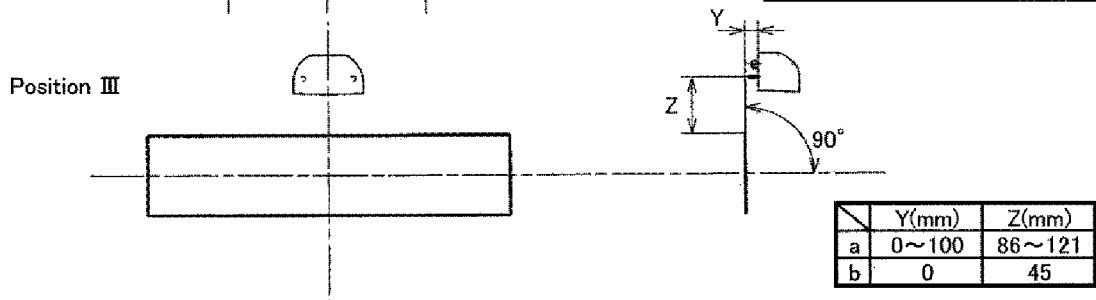
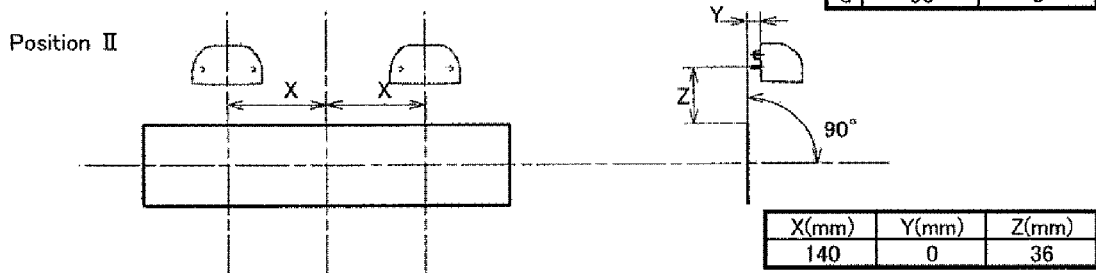
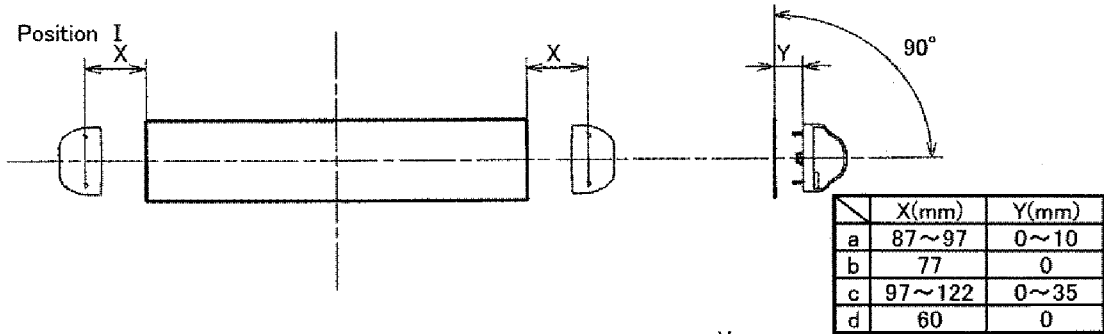


Rear registration plate lamp

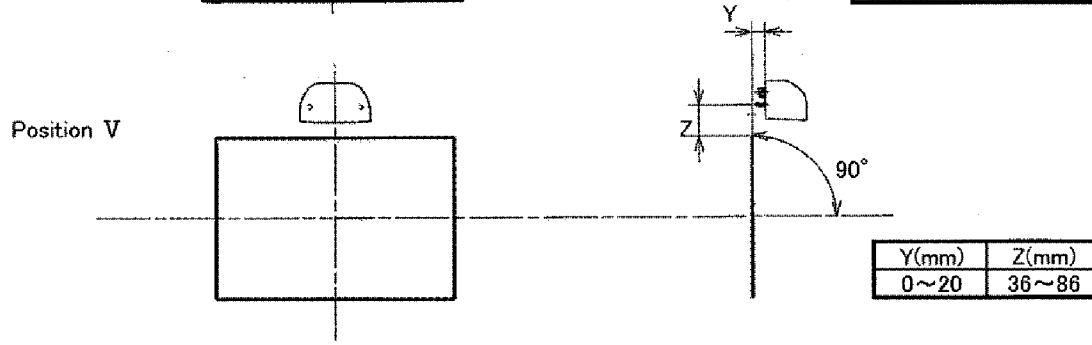
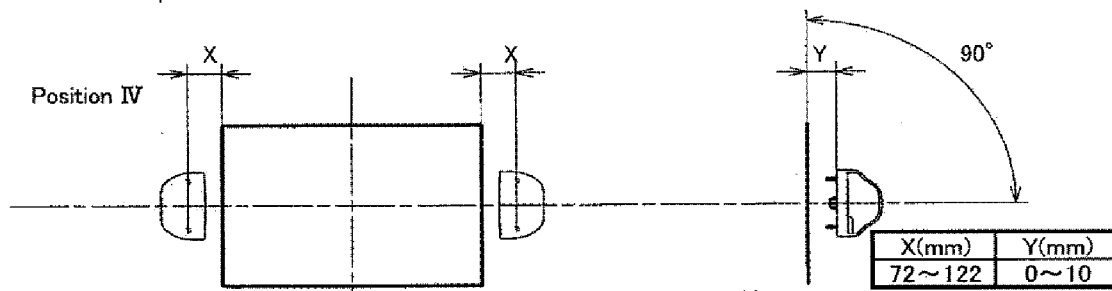


The relative position of registration plate lamp and registration plate should be the following scheme. (Position I - V)

In case of wide plate.



In case of tall plate.



10.8.2 Labels and markings

- When peeling off a label or emblem, order the part number from the responsible division and attach the label or emblem while referring to ▷ T32.

(1) List of the attaching locations of labels and emblems

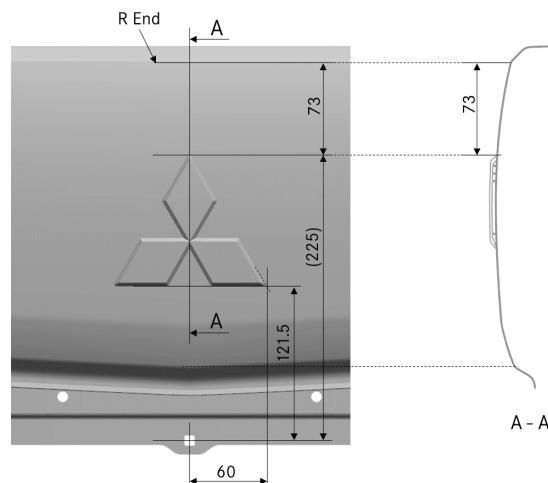
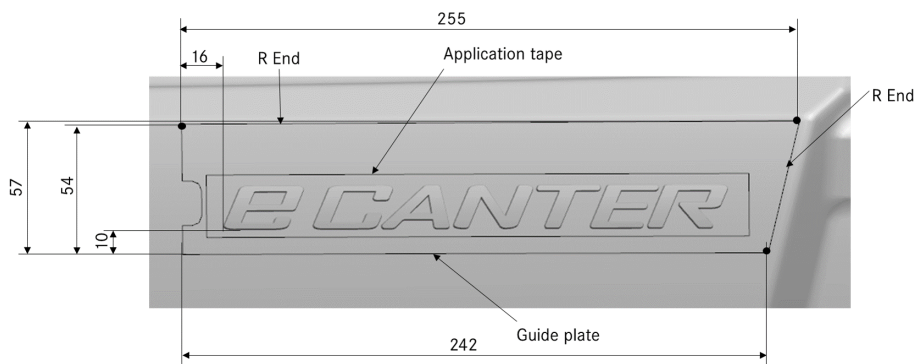
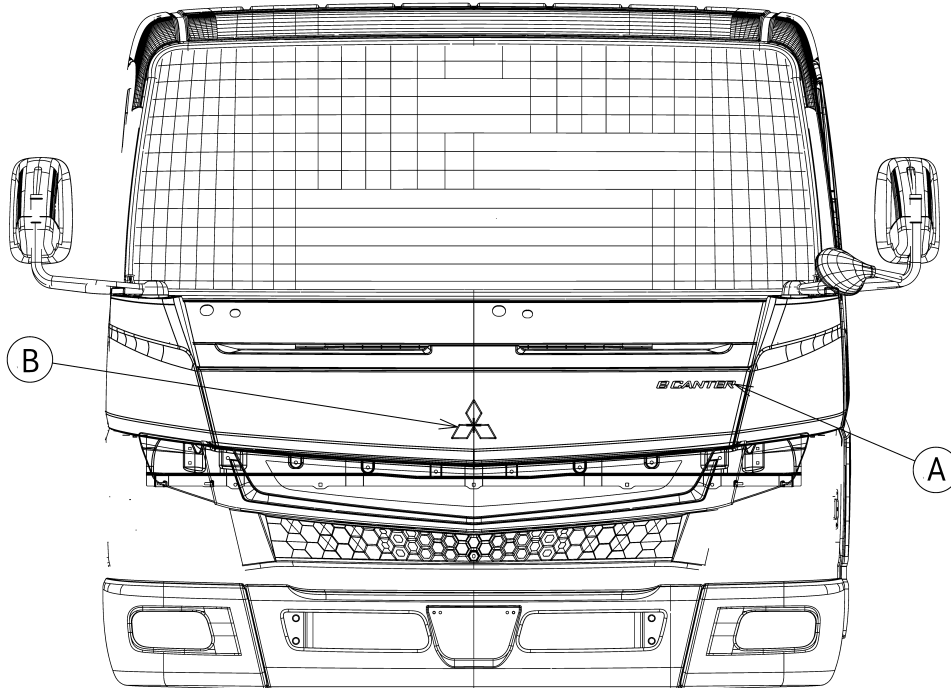
Description \ Locations	Front face of cab
FUSO	○
e-CANTER	○

NOTE: Types of the label and emblem attaching on a vehicle differ depending on the vehicle types.



(2) Installation of marks

High-voltage shutoff switch caution label are to be stuck, peel off the backing paper from each sticker, and affix it in position according to the illustration.



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Revision record <Technical data section>

	30. November. 2020	Change of GVW and Rear Axle Capacity
-	20. October. 2020	Newly issued
Rev. code	Date issued	Remarks

NOTE:

- 1, Chapter 1-9 is Common Section for all markets and to be revised without any special notification. Therefore, please note that this version is not necessarily the latest one.
- 2, Chapter 10 is for specific market(s). MFTBC will distribute the latest version whenever it will be revised.

Body/equipment mounting directives <Technical data section>



Australia

MITSUBISHI FUSO TRUCK & BUS CORPORATION

November. 2020 TL3FA

Body/equipment mounting directives
Electrical systems section
Australia

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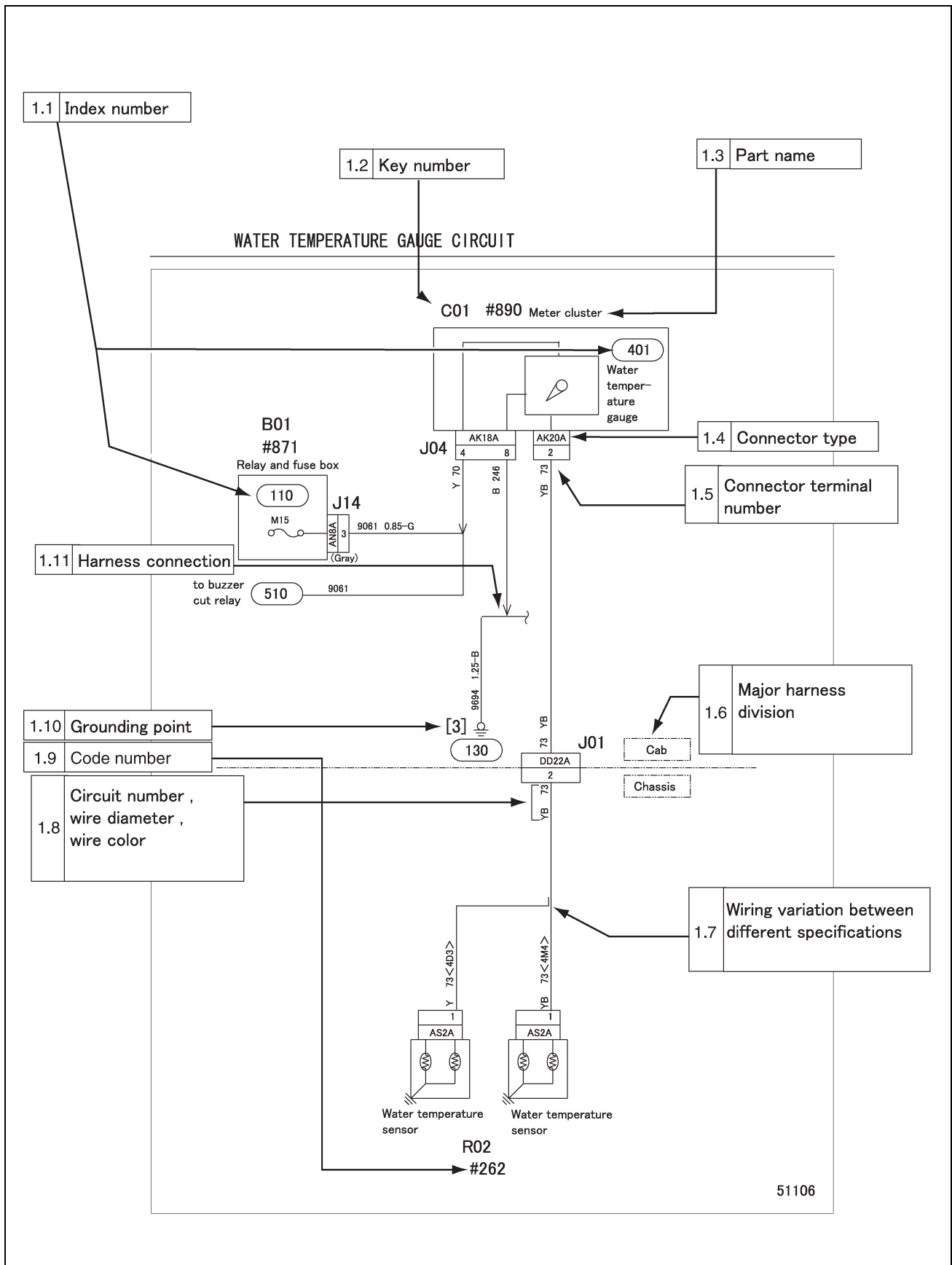
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10.7 Electrical systems

HOW TO READ CIRCUITS



1.1 Index number: (100) - (999)

- Index numbers are used as reference numbers for electrical circuits. Each electrical circuit has been assigned its own index number.

1.2 Key number: A01 - Z99

- Key numbers indicate parts installation locations. The installation location of an electrical equipment can be easily found using its key number shown in a circuit diagram.

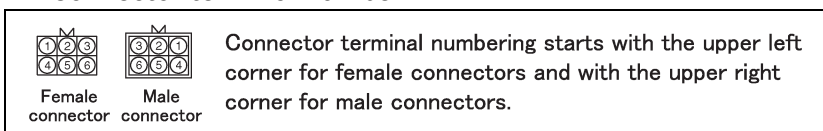
All of the electrical equipment installation locations are listed in Gr54-10. (Group Number Service Manual)

1.3 Part name

1.4 Connector type (type indication)

- A list of the connectors used is included in Gr54-10. (Group Number Service Manual)

1.5 Connector terminal number



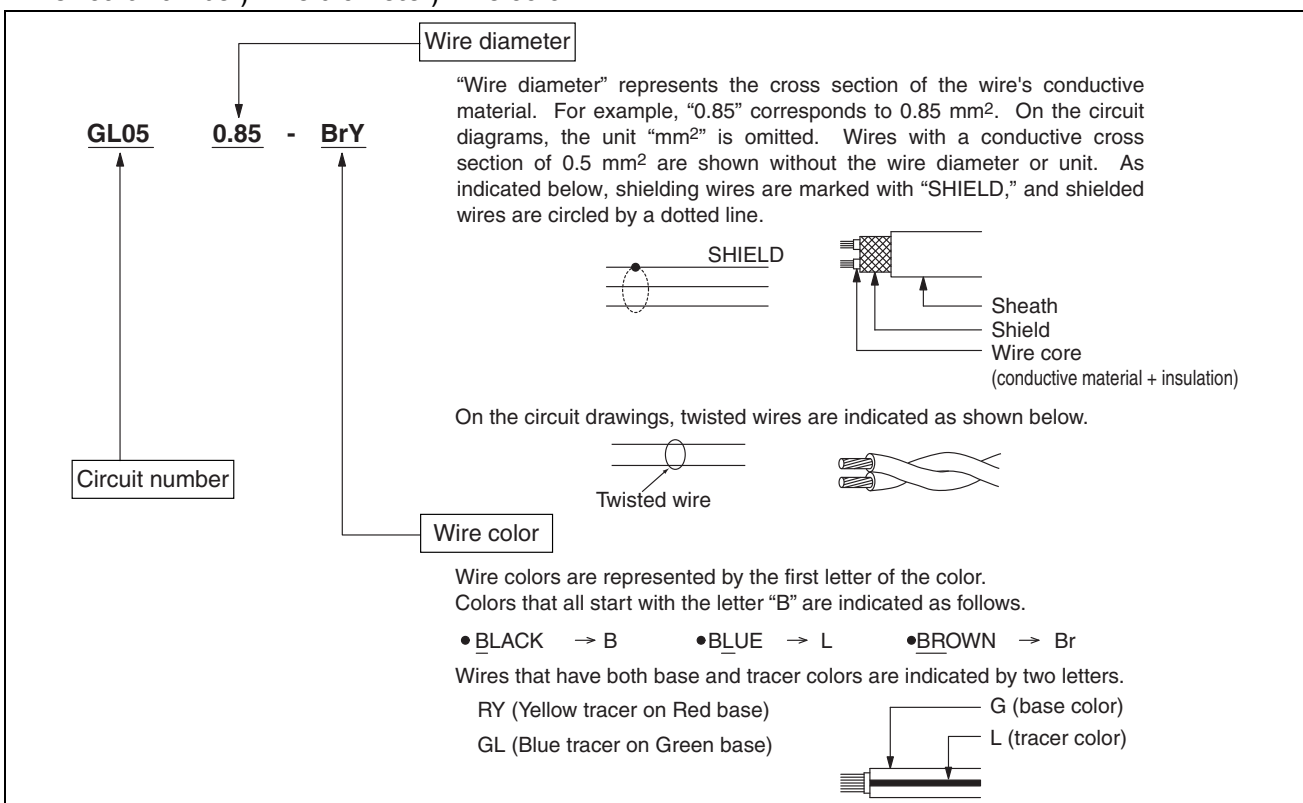
1.6 Major harness division

- Major harness divisions are shown

1.7 Wiring variations between different specifications

- Variations in wiring/circuit between different vehicle specifications are clearly indicated as shown.

1.8 Circuit number, wire diameter, wire color



1.9 Code number: #001 - #999

- Code numbers are reference numbers to find individual electrical equipment inspection procedures. The inspection procedure for an electrical equipment can be found using its code number shown in a circuit diagram.

1.10 Grounding point: [1] - [99]

- Locations where wires are grounded to the vehicle. All of the grounding points are listed in (130). (Index number Service Manual)

1.11 Harness connection

- The arrow in the wiring diagram indicates where harnesses are connected, and NOT the flow of electricity.

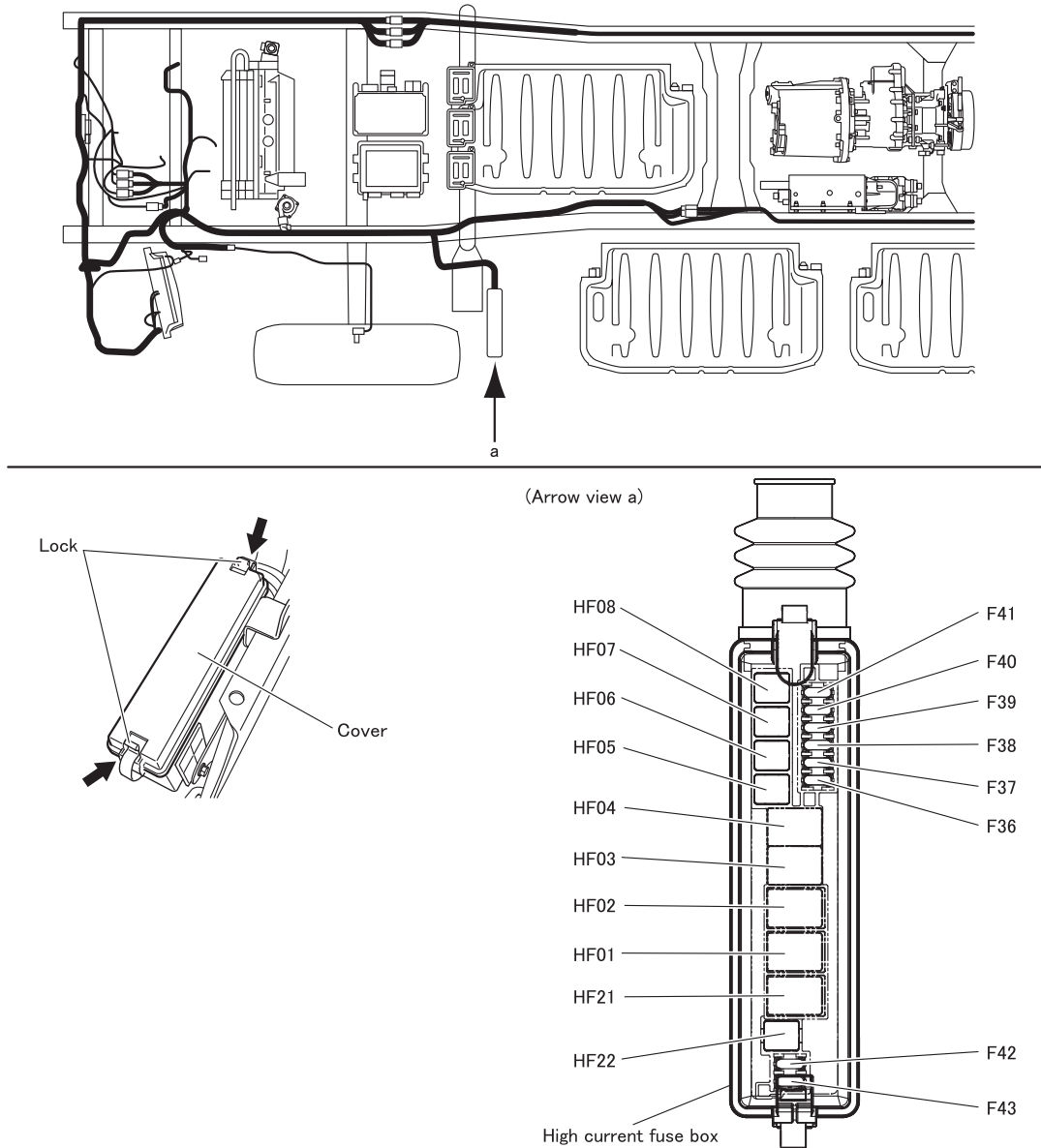
Wire color

Wire color		Base color / Tracer color											
B	Black	BW	Black/white	BY	Black/yellow	BR	Black/red	BG	Black/green	BL	Black/blue	BO	Black/orange
		BP	Black/pink	BV	Black/violet	B Br	Black/brown						
Br	Brown	BrW	Brown/white	BrB	Brown/black	BrY	Brown/yellow	BrR	Brown/red	BrG	Brown/green	BrL	Brown/blue
		BrGr	Brown/gray	BrV	Brown/violet								
G	Green	GW	Green/white	GR	Green/red	GY	Green/yellow	GB	Green/black	GL	Green/blue	GO	Green/orange
		GGr	Green/gray	GBr	Green/brown	GV	Green/violet						
Gr Gy	Gray	GrL	Gray/blue	GrR	Gray/red	GrB	Gray/black	GrG	Gray/green	GrW	Gray/white	GrY	Gray/yellow
		GyL	Gray/blue	GyR	Gray/red	GyB	Gray/black	GyG	Gray/green	GyW	Gray/white		
		GrG	Gray/green	GrBr	Gray/brown								
L	Blue	LW	Blue/white	LR	Blue/red	LY	Blue/yellow	LB	Blue/black	LO	Blue/orange	LG	Blue/green
		LGr	Blue/gray	LBr	Blue/brown								
Lg	Light green	LgR	Light green/red	LgY	Light green/yellow	LgB	Light green/black	LgW	Light green/white				
O	Orange	OL	Orange/blue	OB	Orange/black	OG	Orange/green						
P	Pink	PB	Pink/black	PG	Pink/green	PL	Pink/blue	PW	Pink/white	PGr	Pink/gray	PV	Pink/violet
Pu	Purple												
R	Red	RW	Red/white	RB	Red/black	RY	Red/yellow	RG	Red/green	RL	Red/blue	RO	Red/orange
		RBr	Red/brown	RGr	Red/Gray								
Sb	Sky blue												
V	Violet	VY	Violet/yellow	VW	Violet/white	VR	Violet/red	VG	Violet/green	VGr	Violet/gray	VB	Violet/black
W	White	WR	White/red	WB	White/black	WL	White/blue	WG	White/green	WO	White/orange	WV	White/violet
		WBr	White/brown	WY	White/yellow								
Y	Yellow	YR	Yellow/red	YB	Yellow/black	YG	Yellow/green	YL	Yellow/blue	YW	Yellow/white	YO	Yellow/orange
		YP	Yellow/pink	YV	Yellow/violet	YGr	Yellow/gray	YBr	Yellow/brown				



10.7.1 Electrical wiring diagram

HIGH-CURRENT FUSE BOX (1)



⚠ WARNING

- To prevent possible injury, be sure to disconnect the negative (-) cable of the battery and insulate it with tape before removing high-current fuses. (Refer to Gr00.)

⚠ CAUTION

- With the negative (-) cable of the battery connected, some high-current fuses are always under battery voltage. An arc will be generated when any of these high-current fuses is replaced without disconnecting the battery negative cable, and this could cause the related electric devices to be damaged.
- If replace the fuse, remove the high-current fuse box from the vehicle.
- If a fuse blows out, identify and remedy the cause, then replace the fuse.
- Be sure to use the fuse with the specified ampere.

54-300623HF-1

HIGH-CURRENT FUSE BOX (2)

High current fuse box

Fuse No.	Main load	Capacity
HF01	SAM	140A
HF02	Electric power steering oil pump	120A
HF03	SAM	80A
HF04	Cooling fan	80A
HF05	Electric vacuum pump 1	40A
HF06	Electric vacuum pump 2	40A
HF07	Water pump relay (MOTOR)	20A
HF08	Hydraulic unit	50A
HF21	-	-
HF22	SAM	40A
F36	VCU	10A
F37	-	-
F38	Rear condenser fan	15A
F39	High voltage water heater (HVAC)	20A
F40	Condenser fan	20A
F41	Hydraulic unit	30A
F42	-	-
F43	Water pump (PE)	20A

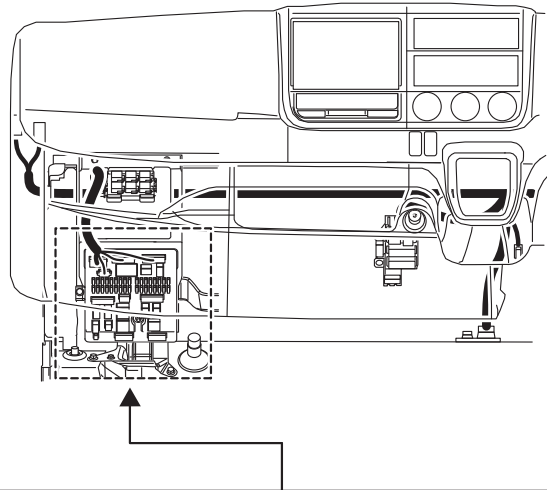
SAM : Signal detect and actuation module

VCU : Vehicle control unit

54-300623HF-2

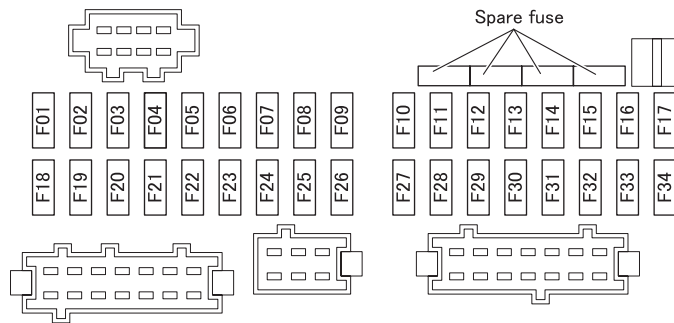


FUSE BOX (1)

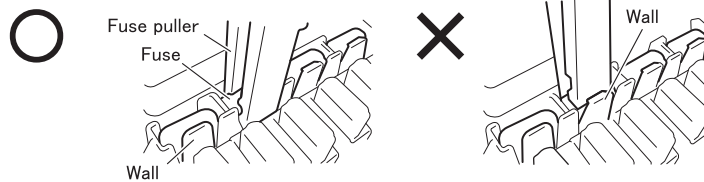


<Inside of SAM>

SAM : Signal detect and actuation module



Removal of spare fuse



⚠ WARNING

- To prevent possible injury, be sure to disconnect the negative (-) cable of the battery and insulate it with tape before removing fuses. (Refer to Gr00.)

⚠ CAUTION

- If a fuse blows out, identify and remedy the cause, then replace the fuse.
- Be sure to use the fuse with the specified ampere.
- Insert the fuse puller into the gap on the outer side of the fuse holder wall to remove the spare fuse. Do not force the puller into the gap on the inner side of the fuse holder wall. Doing so will break the SAM and cause malfunctions or a fire.

54-300623FUSE-1

FUSE BOX (2)

Fuse box

Fuse No.	Main load	Capacity
F01	VCU	10A
F02	-	10A
F03	SRS airbag	10A
F04	Opt (IGN)	10A
F05	Power window (driver's seat side)	30A
F06	Hill start assist system	10A
F07	Power window (assistant driver's seat side)	30A
F08	-	20A
F09	Meter cluster, diagnosis connector, combination switch	10A
F10	DC/DC converter	30A
F11	Blower motor	30A
F12	Cab and spot lamp	15A
F13	EIS Relay, DC/DC converter	10A
F14	Horn	10A
F15	-	10A
F16	Cigarette lighter	20A
F17	High voltage battery	20A
F18	ABS ECU	10A
F19	Oil pump for motor	15A
F20	Hill start assist system ECU, electric vacuum pump, AEBS ECU	10A
F21	-	10A
F22	Motor	15A
F23	-	10A
F24	G sensor, shift lever unit	10A
F25	Opt (ACC)	10A
F26	Opt (B+)	10A
F27	-	20A
F28	Charging inlet box	15A
F29	Water pump (HVB 1)	20A
F30	Water pump (HVB 2)	20A
F31	VCU	20A
F32	Air-conditioner	10A
F33	-	10A
F34	-	15A

● Since the main load is described here, connection of other loads is described in (110)

ABS : Anti-lock brake system
 AEBS : Advanced emergency brake system
 ECU : Electronic control Unit
 VCU : Vehicle control unit
 SRS : Supplemental restraint system

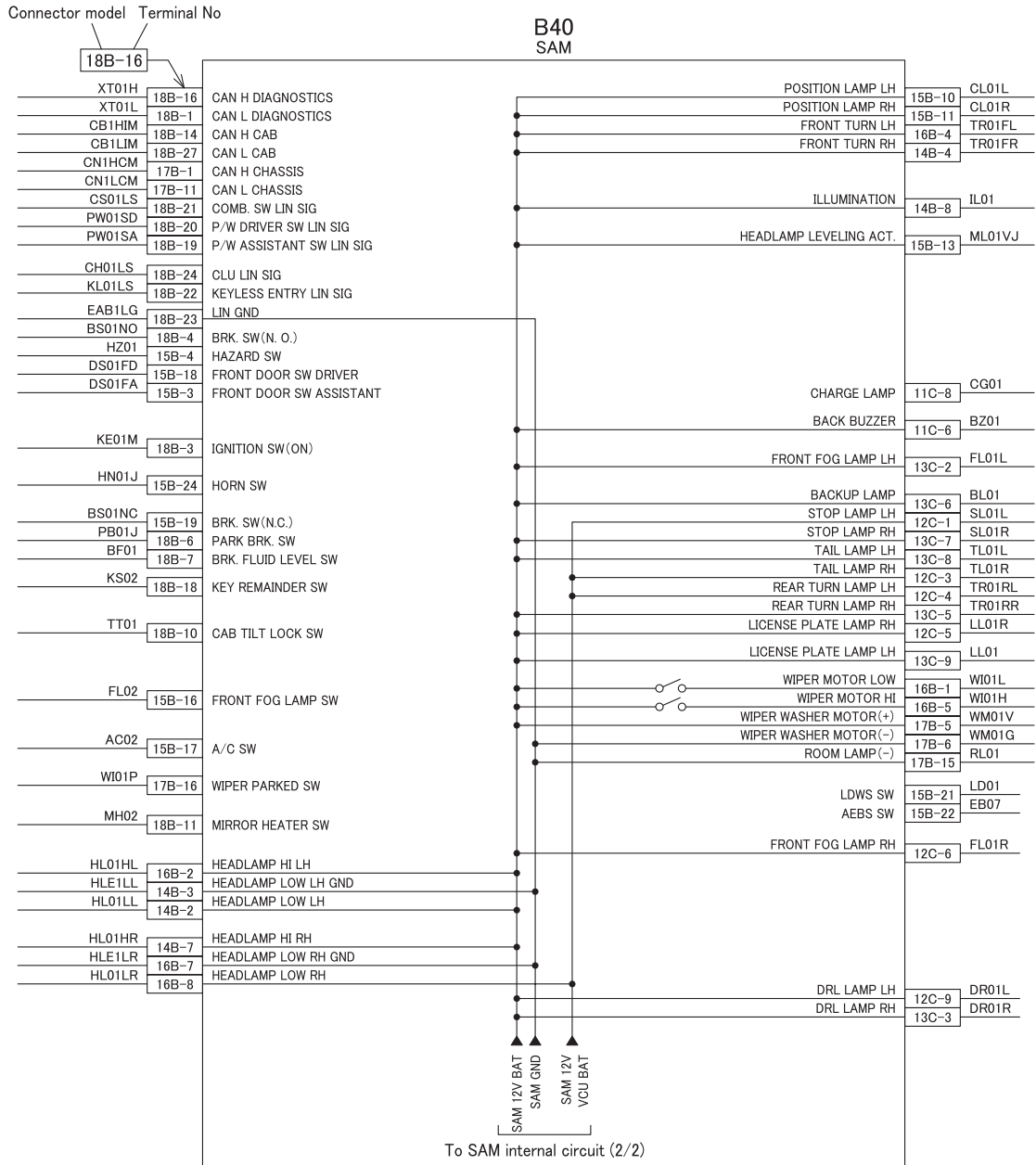
54-300623FUSE-2



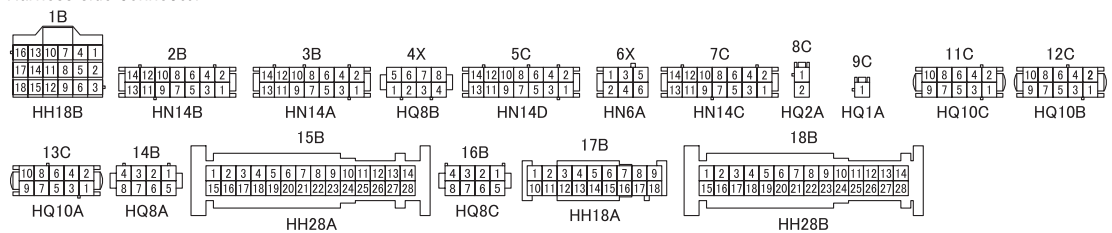
SAM INTERNAL CIRCUIT (1)

(1/2)

A part of this circuit is omitted.



Harness side connector



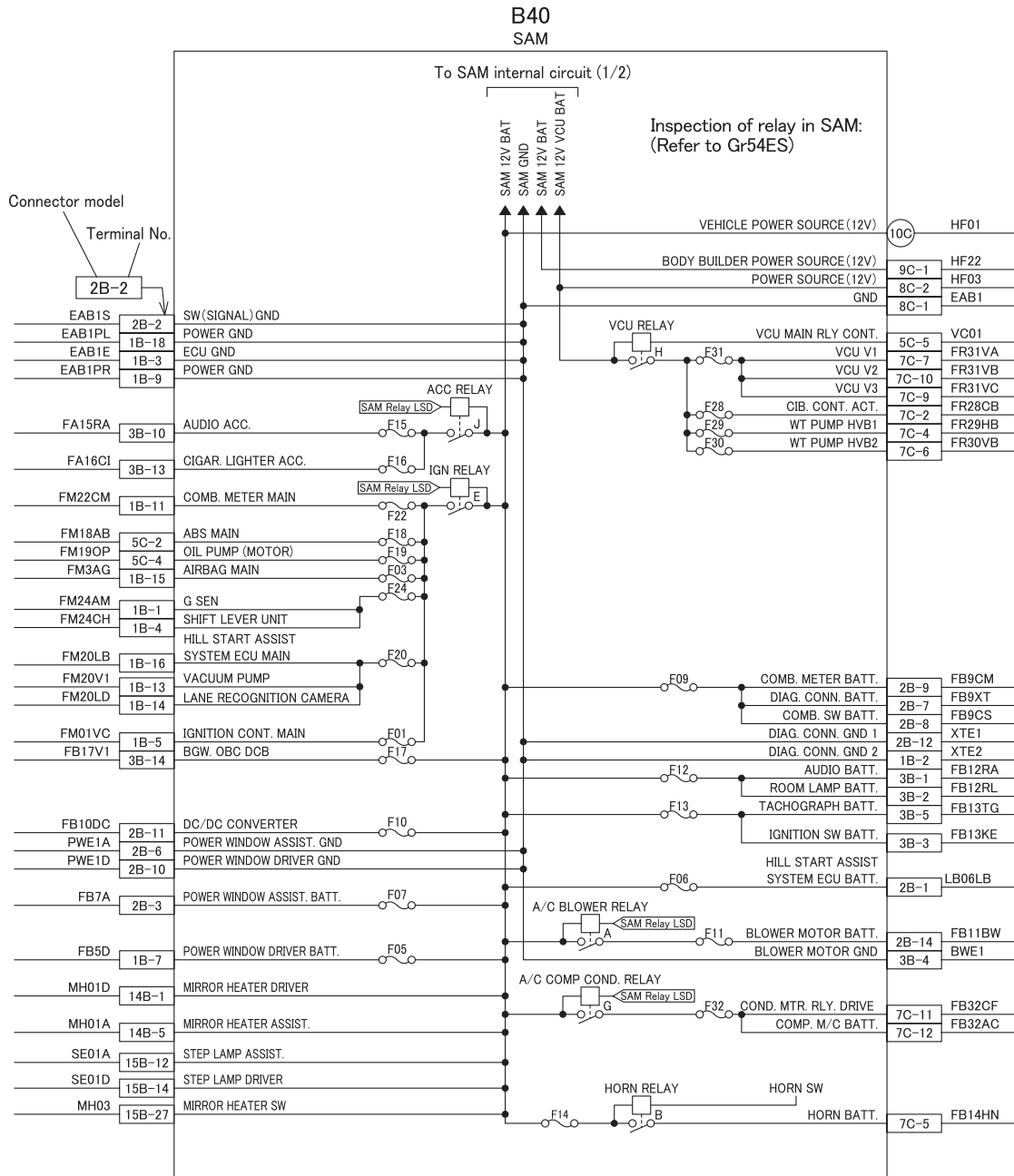
105-300622SAM-1



SAM INTERNAL CIRCUIT (2)

(2/2)

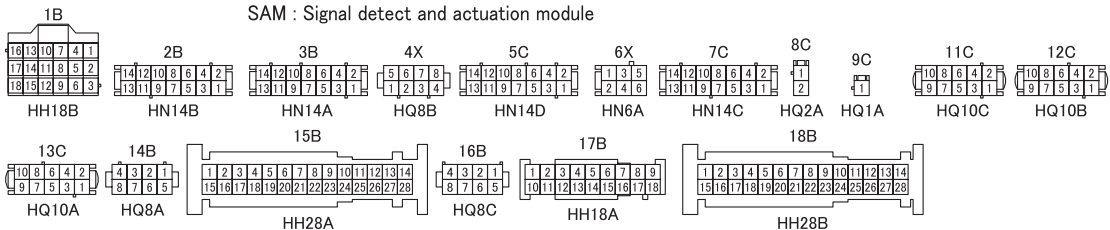
A part of this circuit is omitted.



Harness side connector

ECU : Electronic control unit

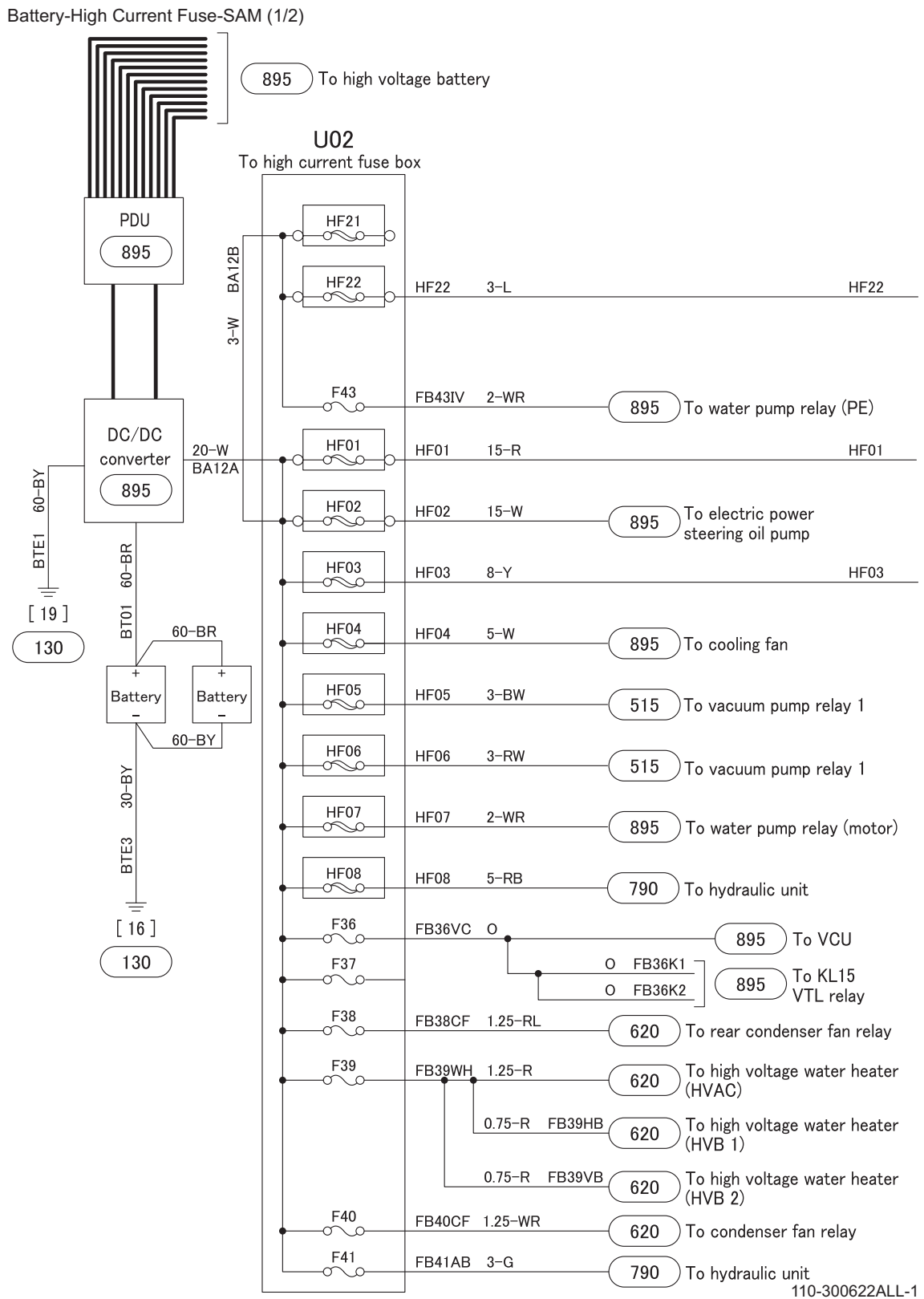
SAM : Signal detect and actuation module



105-300622SAM-2

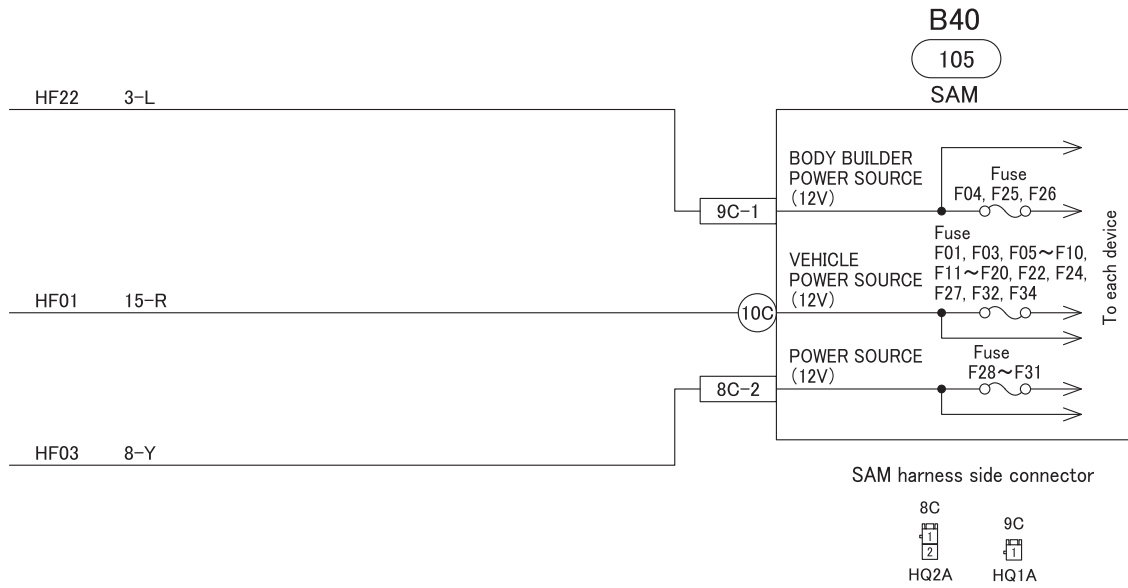


POWER CIRCUIT (1)



POWER CIRCUIT (2)

Battery-High Current Fuse-SAM (2/2)

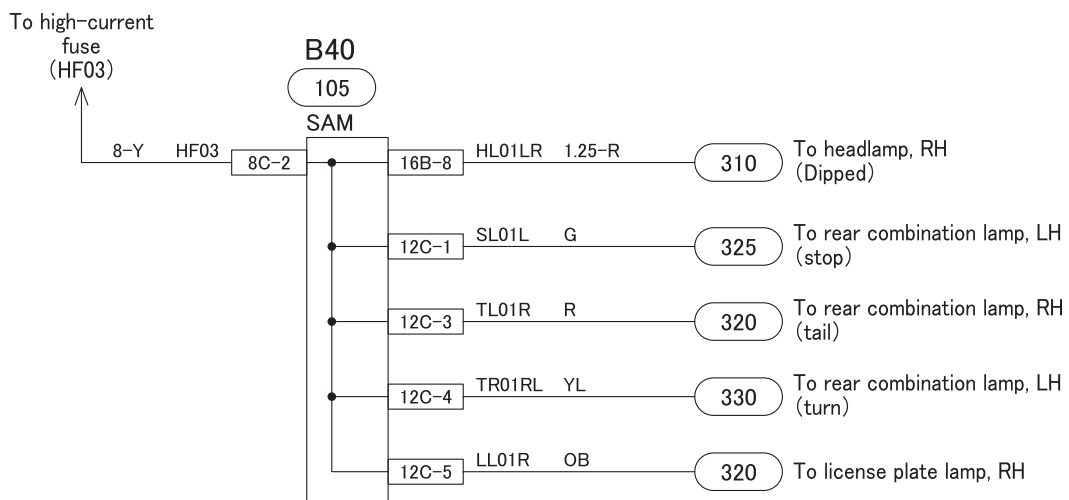


110-300622ALL-2

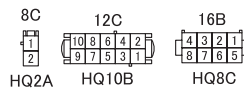


POWER CIRCUIT (3)

SAM (12V BAT)



SAM connector (harness side)

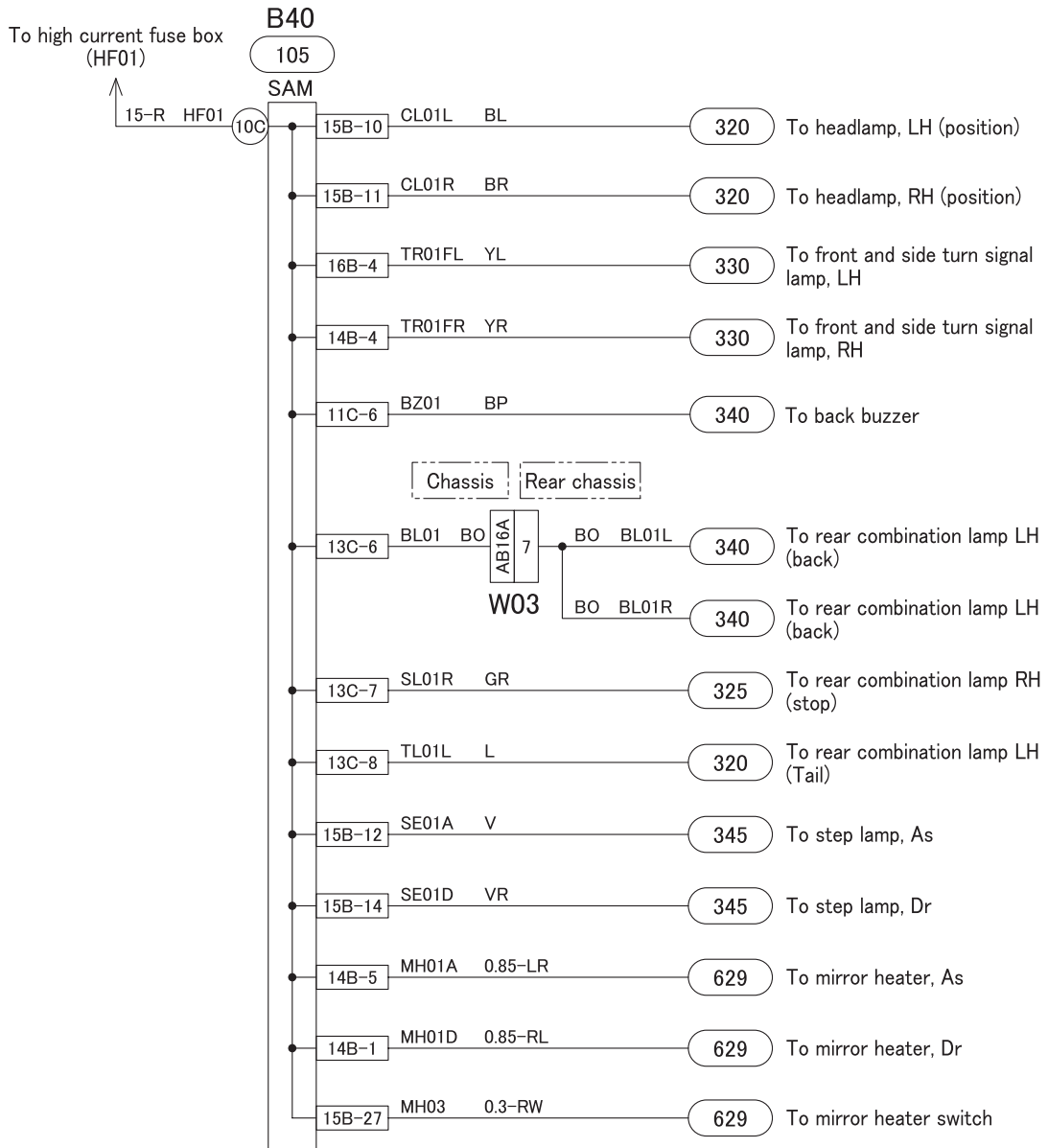


110-300622-12V

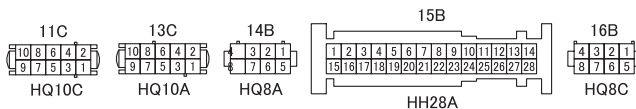


POWER CIRCUIT (4)

SAM (12V BAT)(1/4)



SAM connector (harness side)



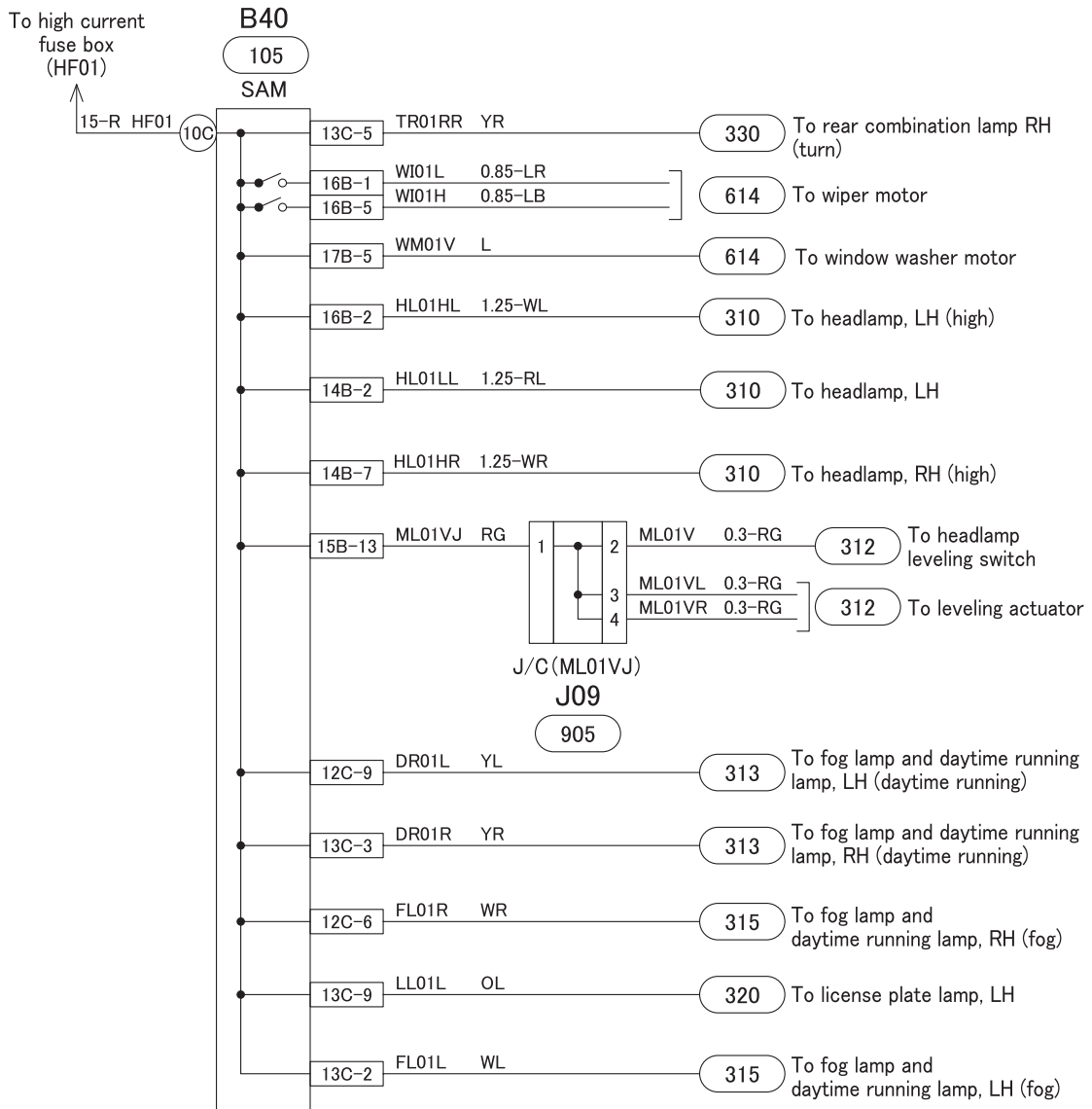
Dr : Driver's seat side
As : Assistant driver's seat side

110-300622-12-1

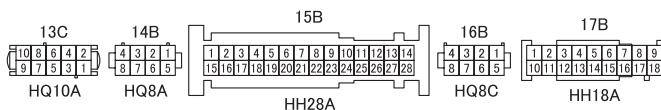


POWER CIRCUIT (5)

SAM (12V BAT)(2/4)



SAM connector (harness side)

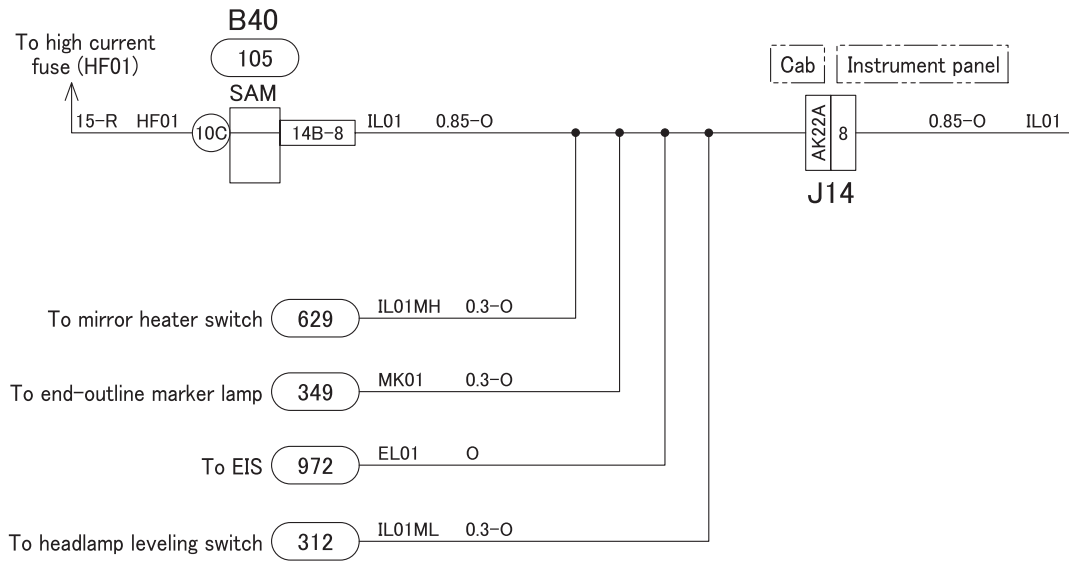


110-300622-12-2



POWER CIRCUIT (6)

SAM (12V BAT)(3/4)



SAM connector (harness side)

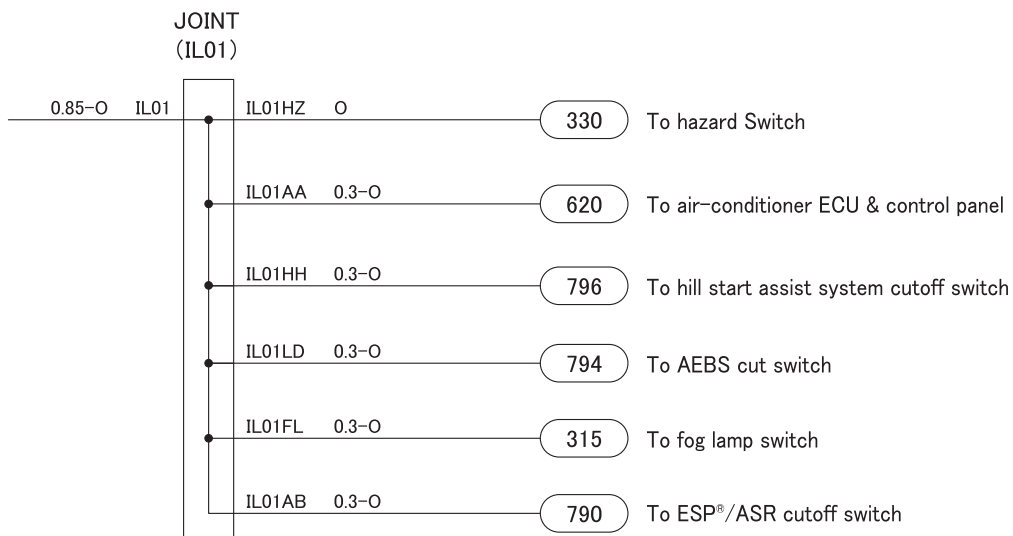


110-300622-12-3



POWER CIRCUIT (7)

SAM (12V BAT)(4/4)



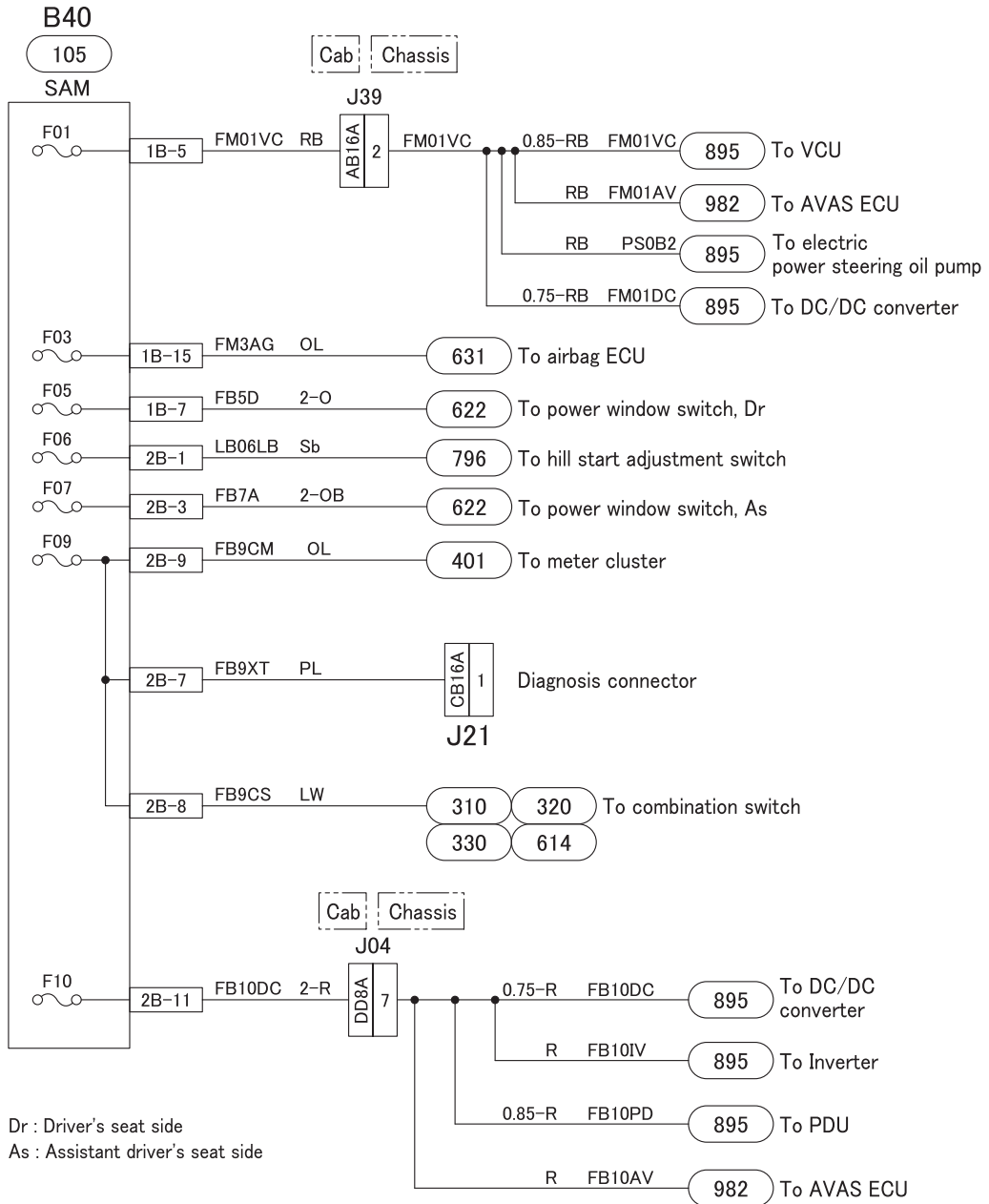
ECU: Electronic control unit

110-300622-12-4

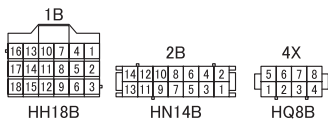


POWER CIRCUIT (8)

SAM (Fuse F01~F10)



SAM connector (harness side)

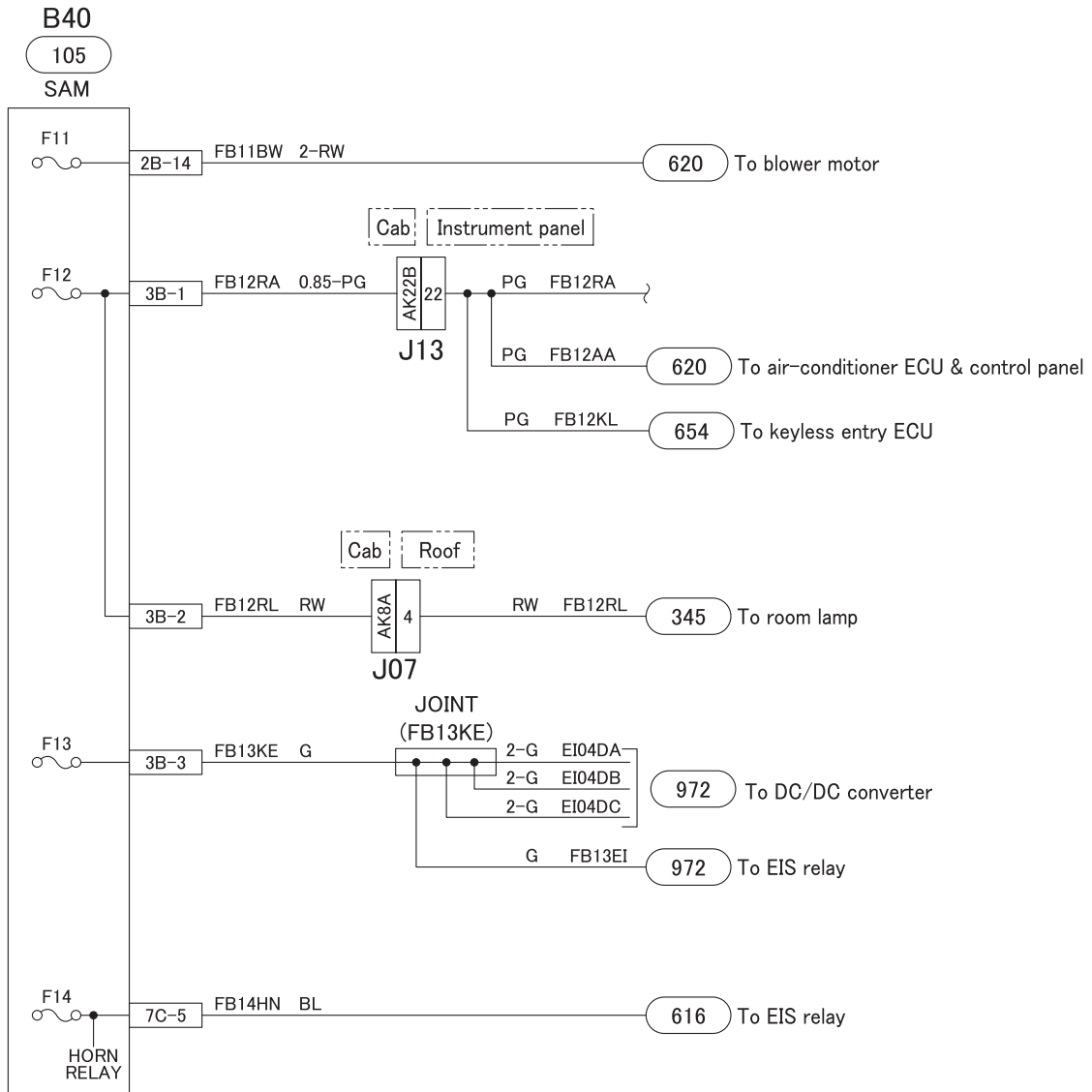


110-300622F01



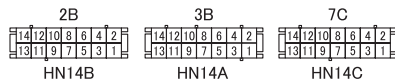
POWER CIRCUIT (9)

SAM (Fuse F11~F14)



ECU: Electronic control unit

SAM connector (harness side)

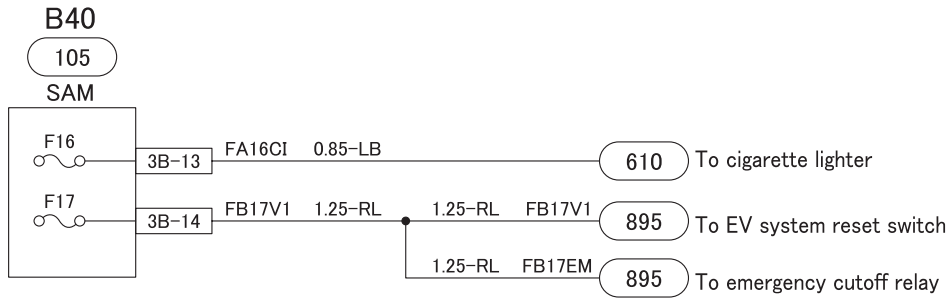


110-300622F11

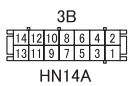


POWER CIRCUIT (10)

SAM (Fuse F16~F17)



SAM connector (harness side)

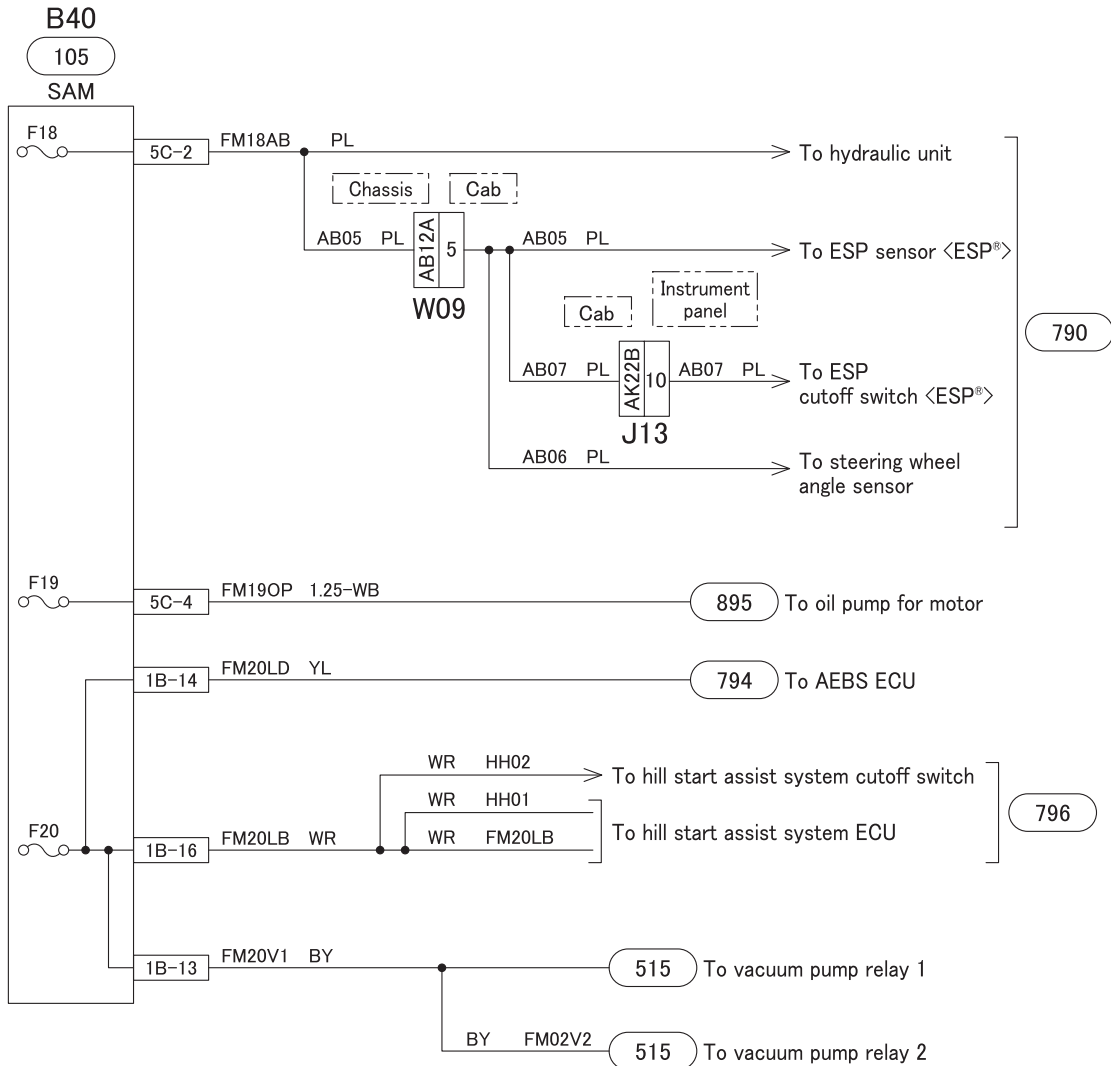


110-300622F15

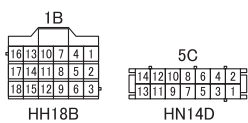


POWER CIRCUIT (11)

SAM (Fuse F18~F20)



SAM connector (harness side)

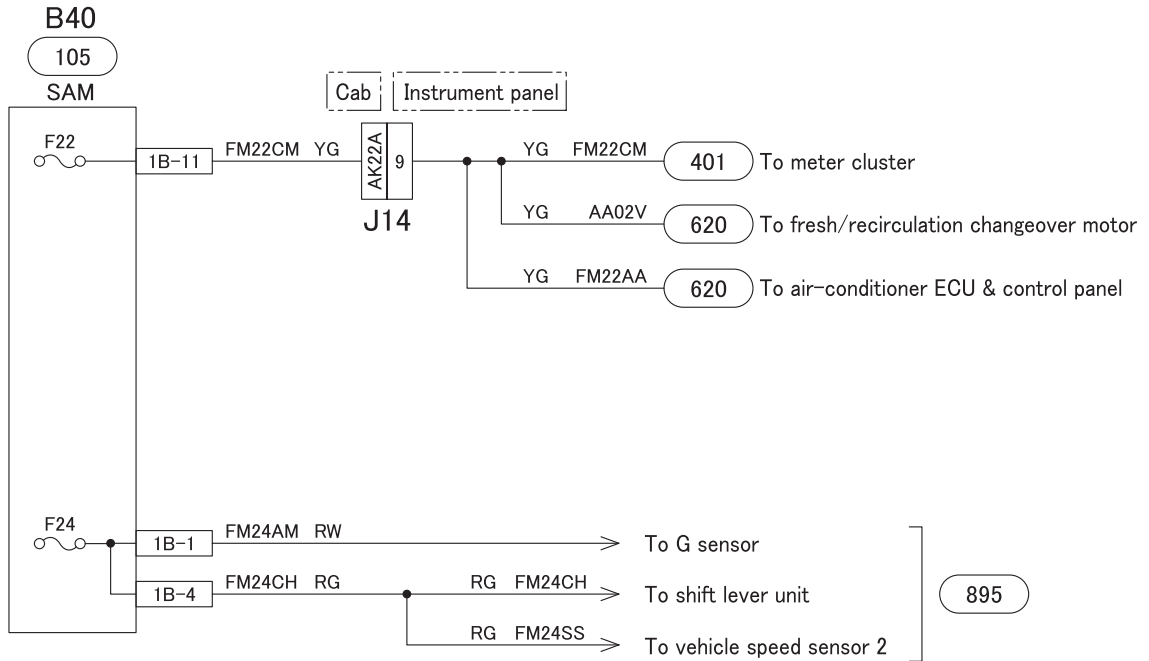


110-300622F18

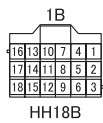


POWER CIRCUIT (12)

SAM (Fuse F22~F24)



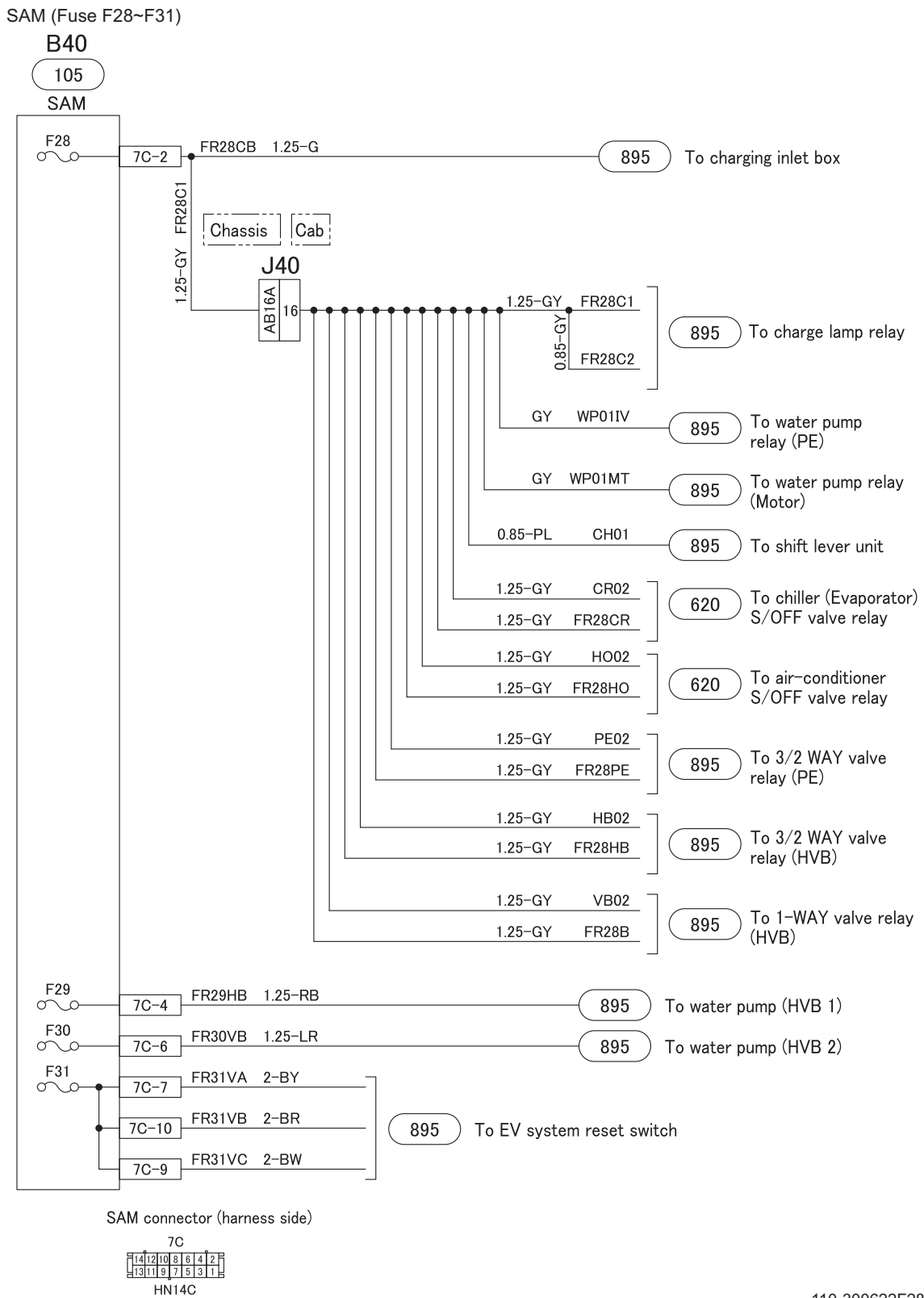
SAM connector (harness side)



110-300622F22

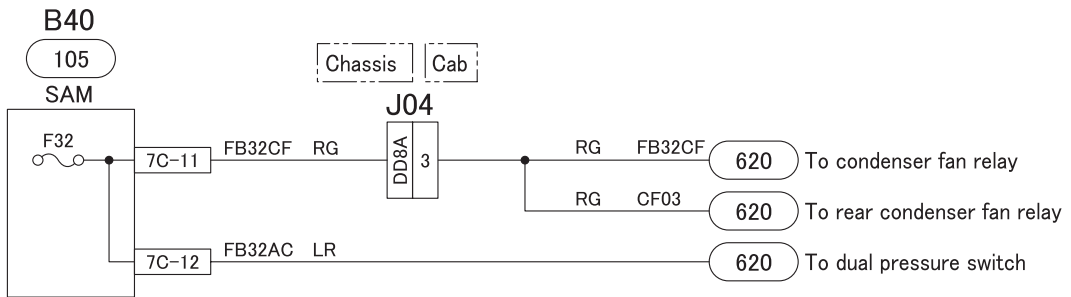


POWER CIRCUIT (13)

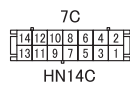


POWER CIRCUIT (14)

SAM (Fuse F32)



SAM connector (harness side)

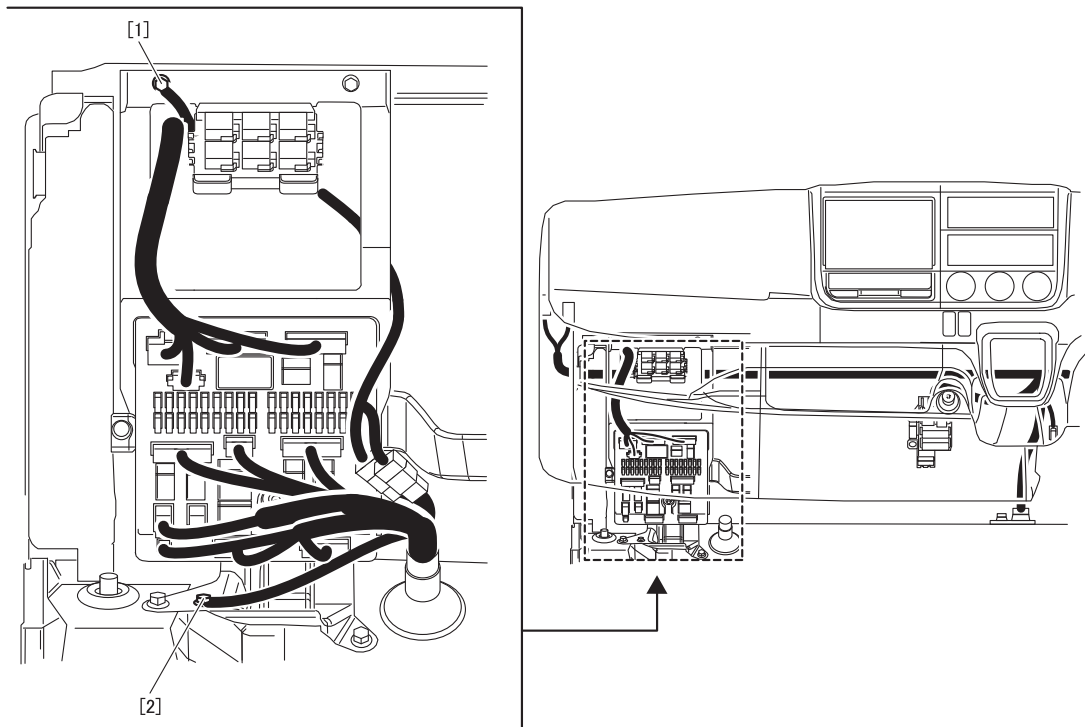


110-300622F32



GROUND (1)

[1]-[2]Cab ground

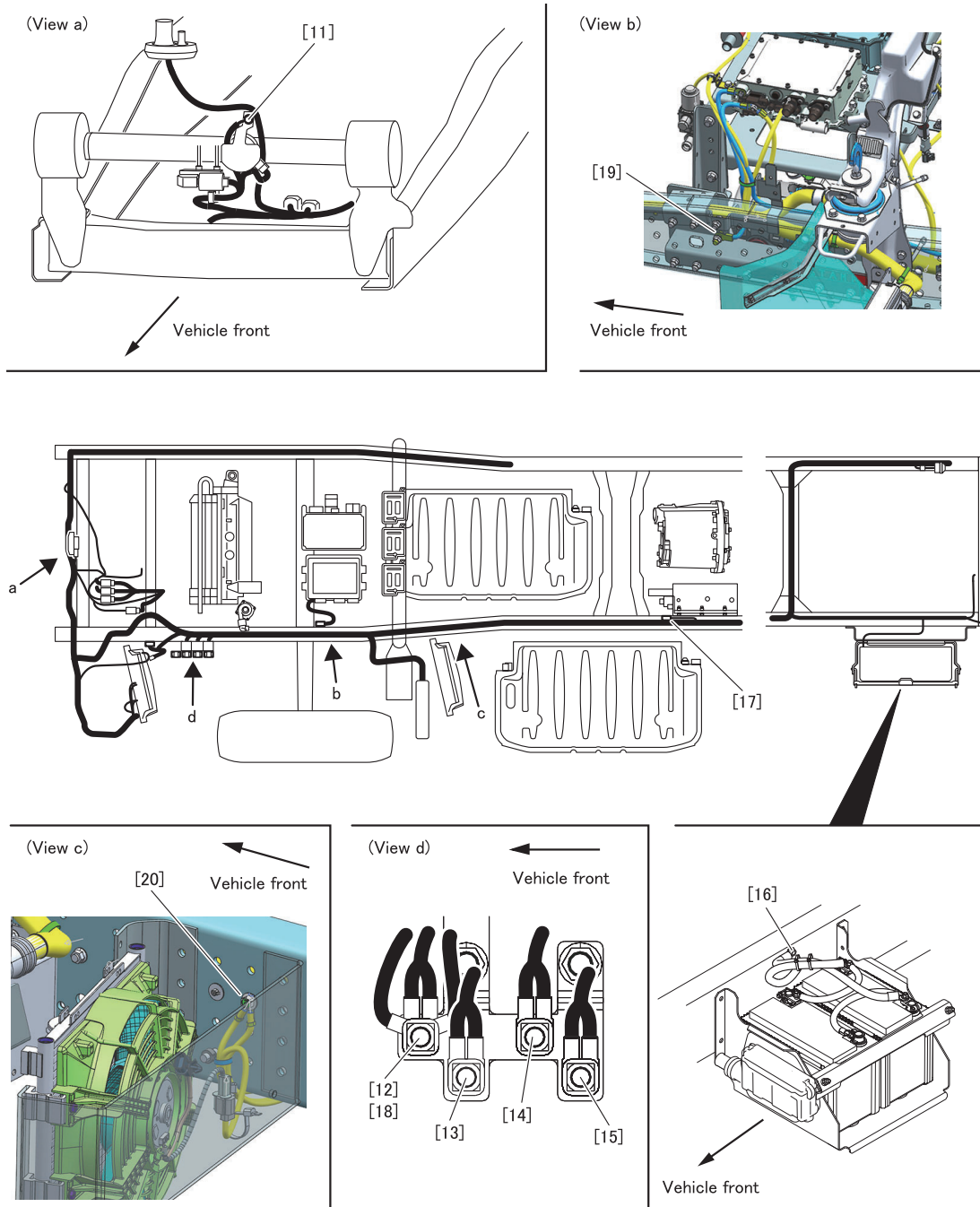


Location	Circuit No.	Wire diameter – wire colour	Destination	Remarks
[1]	EAB2	1.25-B	JOINT (EAB2)	
[2]	EAB3	1.25-B	Frame ground ([12])	

54-300623GND-1

GROUND (2)

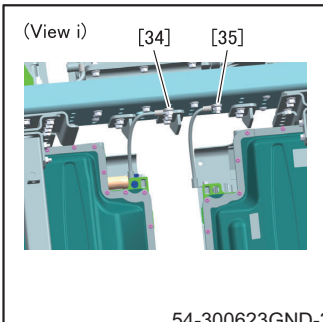
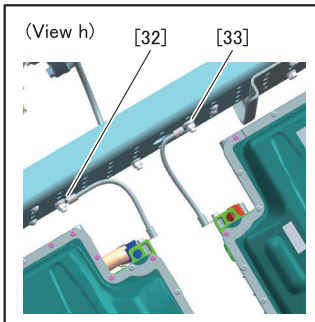
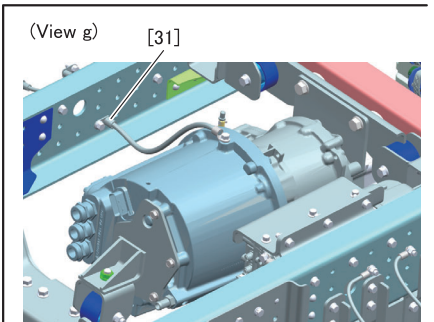
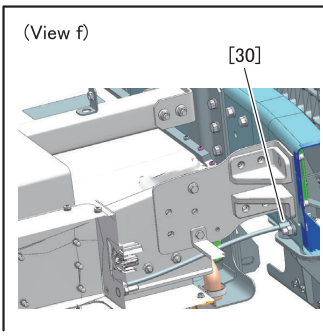
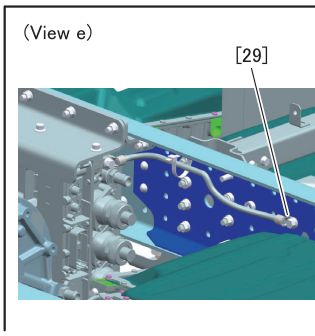
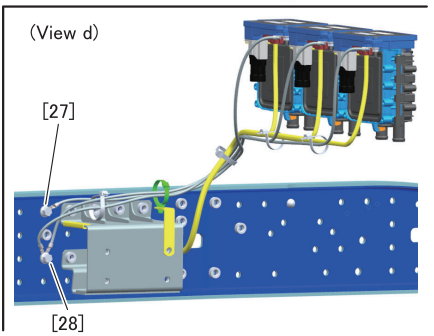
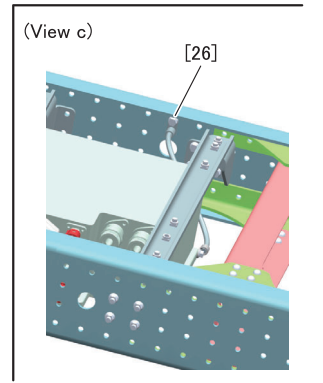
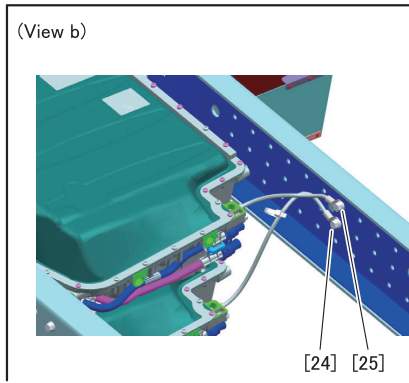
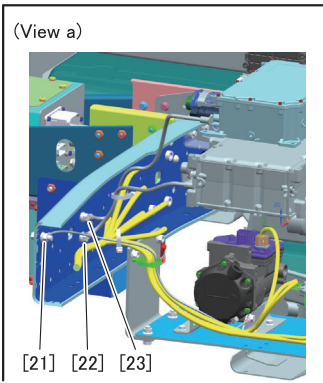
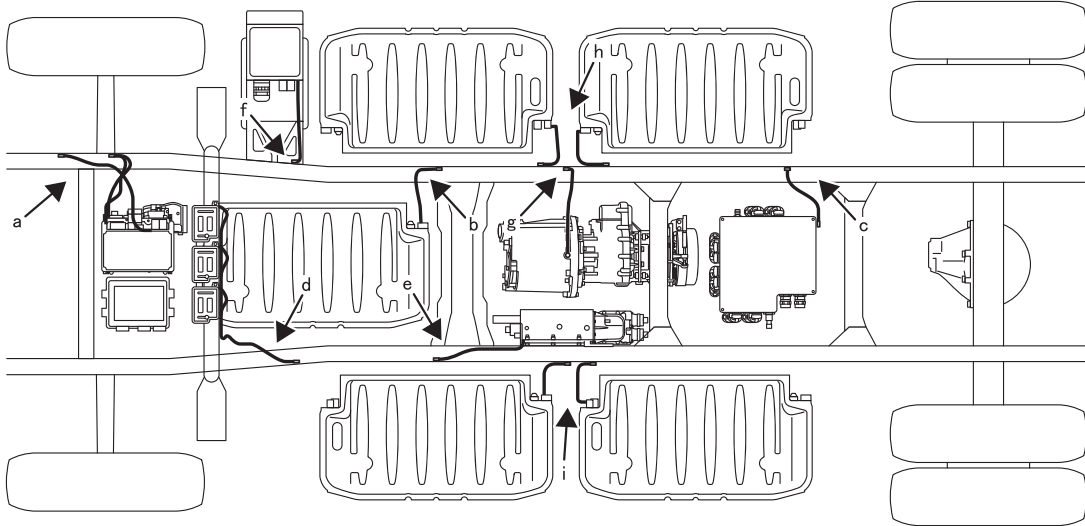
[11]-[20]Chassis ground



54-300623GND-2

GROUND (3)

[21]-[35]Chassis ground



54-300623GND-3

GROUND (4)

Location	Circuit No	Wire diameter- wire color	Destination	Remarks
[11]	HNE1	1.25-B	Frame ground ([12])	Horn
[12]	EAB3	1.25-B	Frame ground ([2])	
	HNE1	1.25-B	Horn ([11])	
	WPE1	2-B	Water pump (MOTOR)	
	FLE1L	B	To fog lamp and daytime running lamp	
[13]	EAB1	8-B	SAM	
[14]	ABE1	3-B	Hydraulic unit	ABS
	ABE2	3-B		
	VPE1	3-B	Electric vacuum pump 1	
	VPE2	3-B	Electric vacuum pump 2	
	EAC1L	2-B	-	
	EAC1R	2-B	-	
	[15]	FNE1	5-B	
PEE2		2-B	Water pump (PE)	
HBE3		2-B	Water pump (HVB 1)	
VBE3		2-B	Water pump (HVB 2)	
[16]	BTE3	30-BY	Battery	
[17]	EAR1	1.25-B	JOINT (EAR1)	
[18]	CFE1	1.25-B	Condenser fan motor 1	
	CFE3	1.25-B	Condenser fan motor 2	
	CFE4	B	Rear Condenser fan relay	
[19]	BTE1	60-BY	DC/DC converter	
[20]	DCE1S	1.25-BY		
[20]	EPE1	15-B	Electric power steering oil pump	
	OPE3	1.25-G	To motor for Oil pump	
[21]	-	5-BY	High voltage air-conditioner compressor	
[22]	-	20-BY	OBC	
[23]	-	20-BY	DCB	
[24]	-	20-BY	High voltage battery 2	
[25]	-	20-BY	High voltage battery 1	
[26]	-	40-BY	PDU	
[27]	-	9-BY	High voltage water heater (HVB 2)	
[28]	-	9-BY	High voltage water heater (HVB 1)	
	-	9-BY	High voltage water heater (HVAC)	
[29]	-	40-BY	Inverter	
[30]	-	20-BY	Charging inlet box	
[31]	-	40-BY	Motor generator	
[32]	-	20-BY	High voltage battery 3	
[33]	-	20-BY	High voltage battery 5	
[34]	-	20-BY	High voltage battery 6	
[35]	-	20-BY	High voltage battery 4	

ABS : Anti-lock brake system

SAM : Signal detect and actuation module

ECU : Electronic control unit

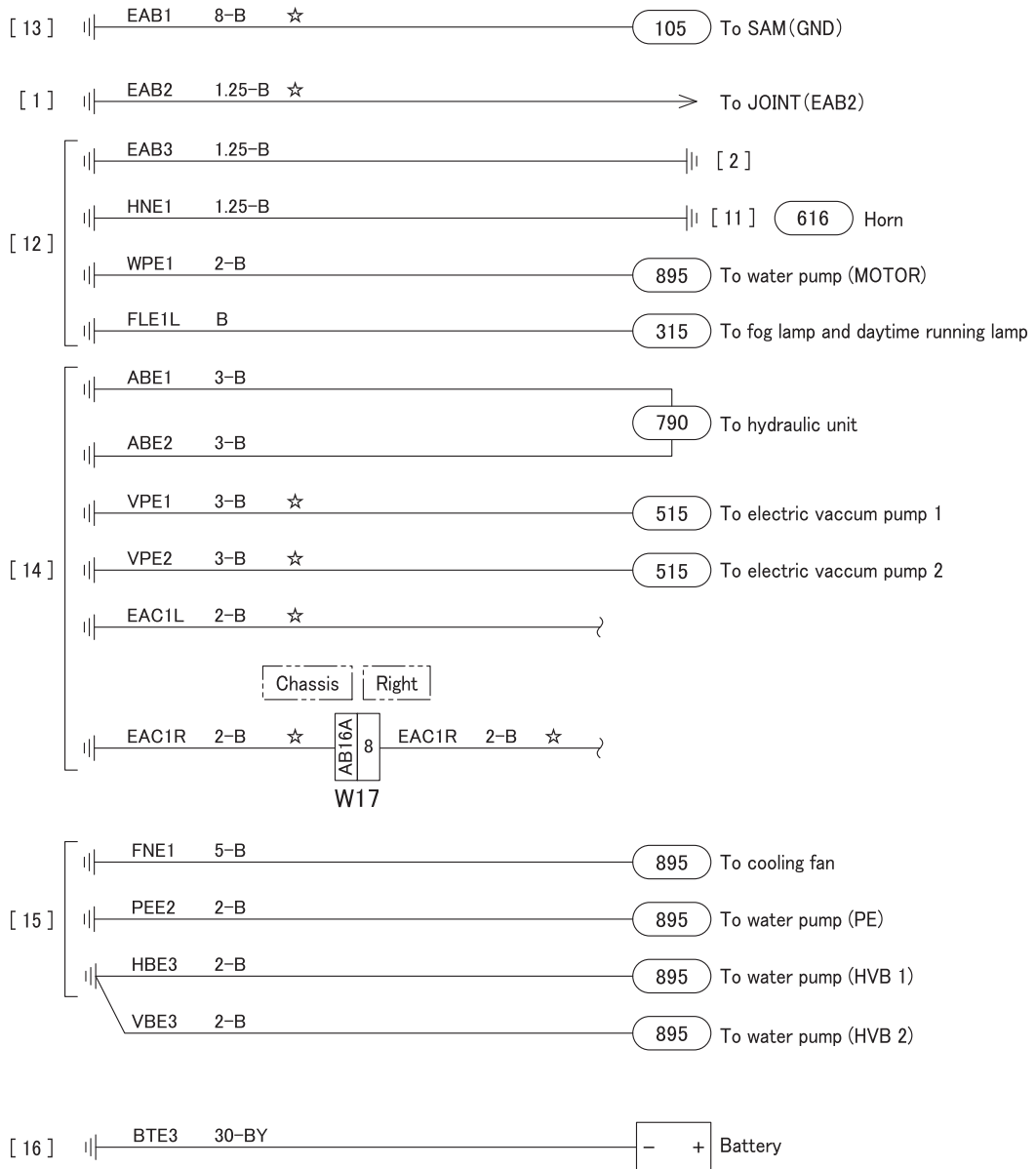
54-300623GND-4



GROUND (5)

Overall view of ground

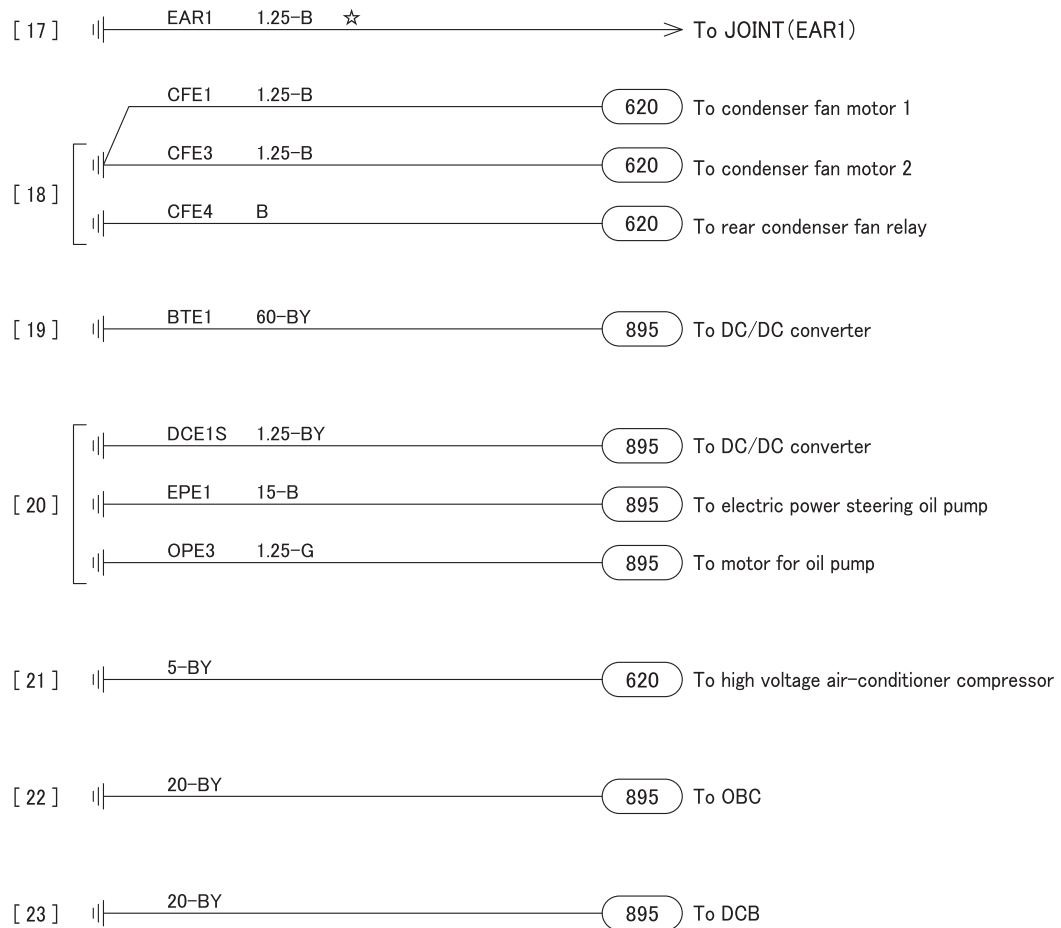
- This diagram indicates grounding points.
- See the following pages for branching of grounding (writing for).
(in circuit No.order)



130-300622ALL-1



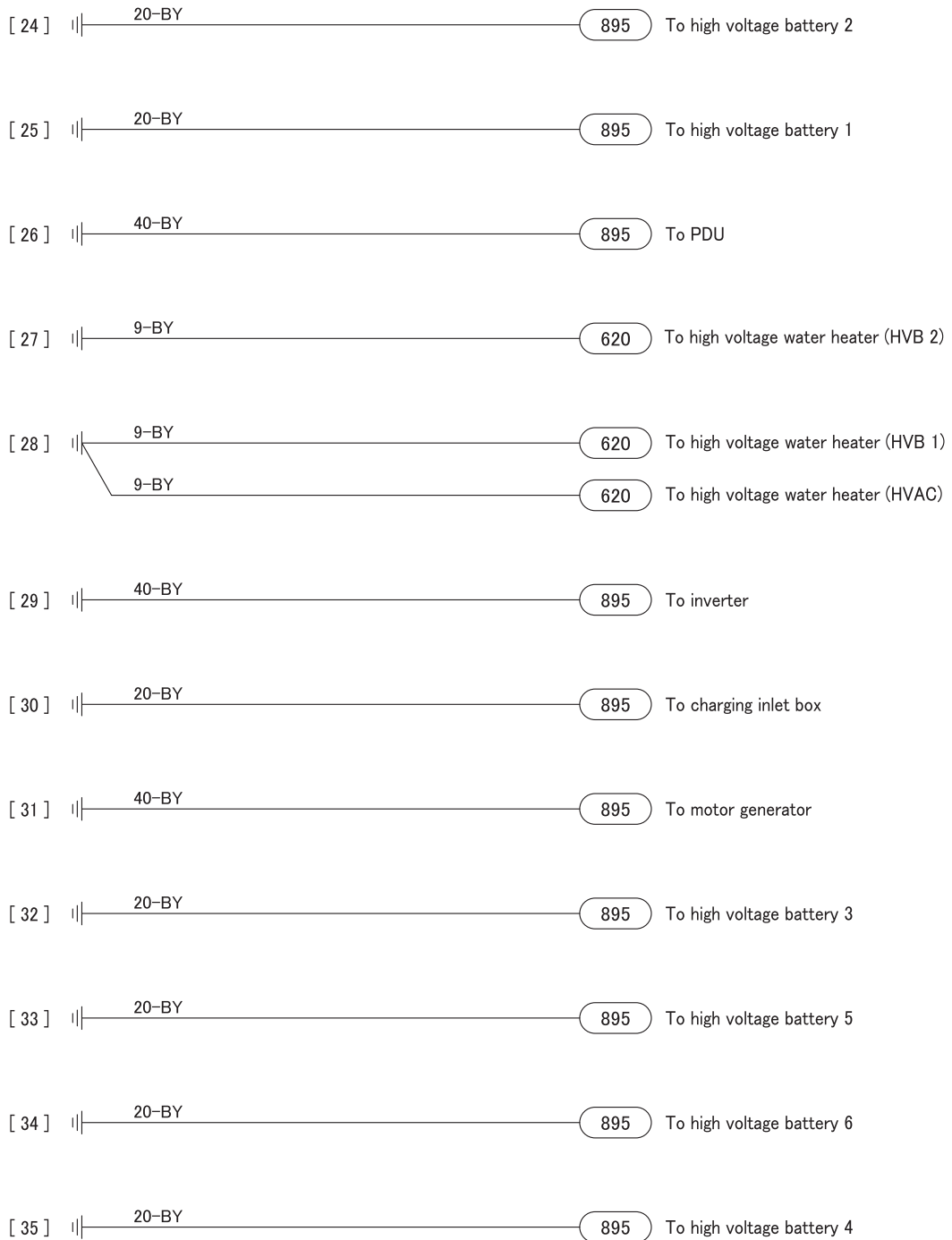
GROUND (6)



130-300622ALL-2



GROUND (7)

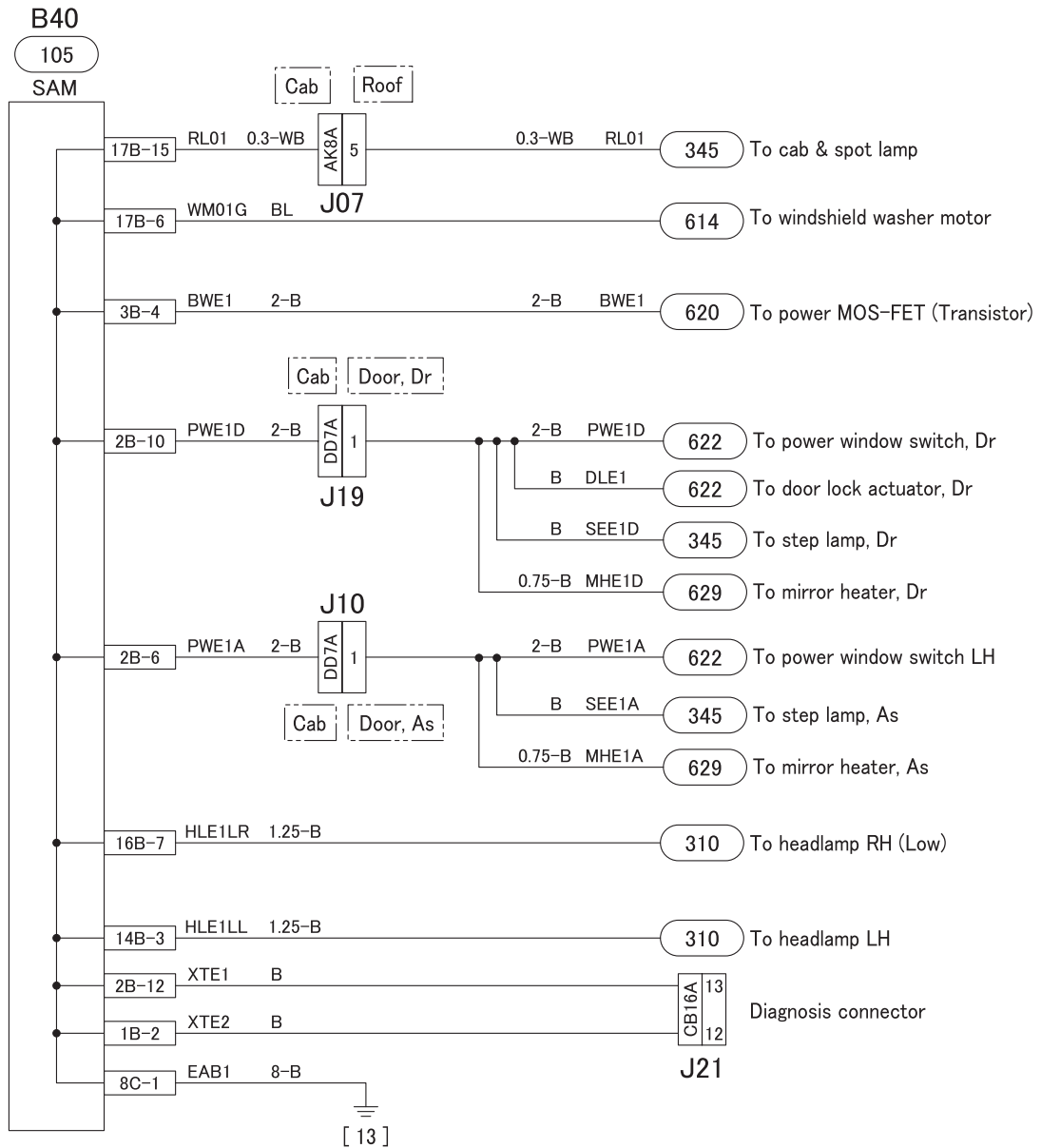


130-300622ALL-3



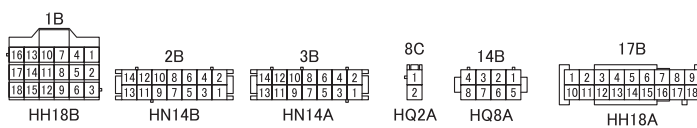
GROUND (8)

Circuit No.EAB1 ground (1/6)



Dr : Driver's seat side
As : Assistant driver's seat side

SAM connector (harness side)

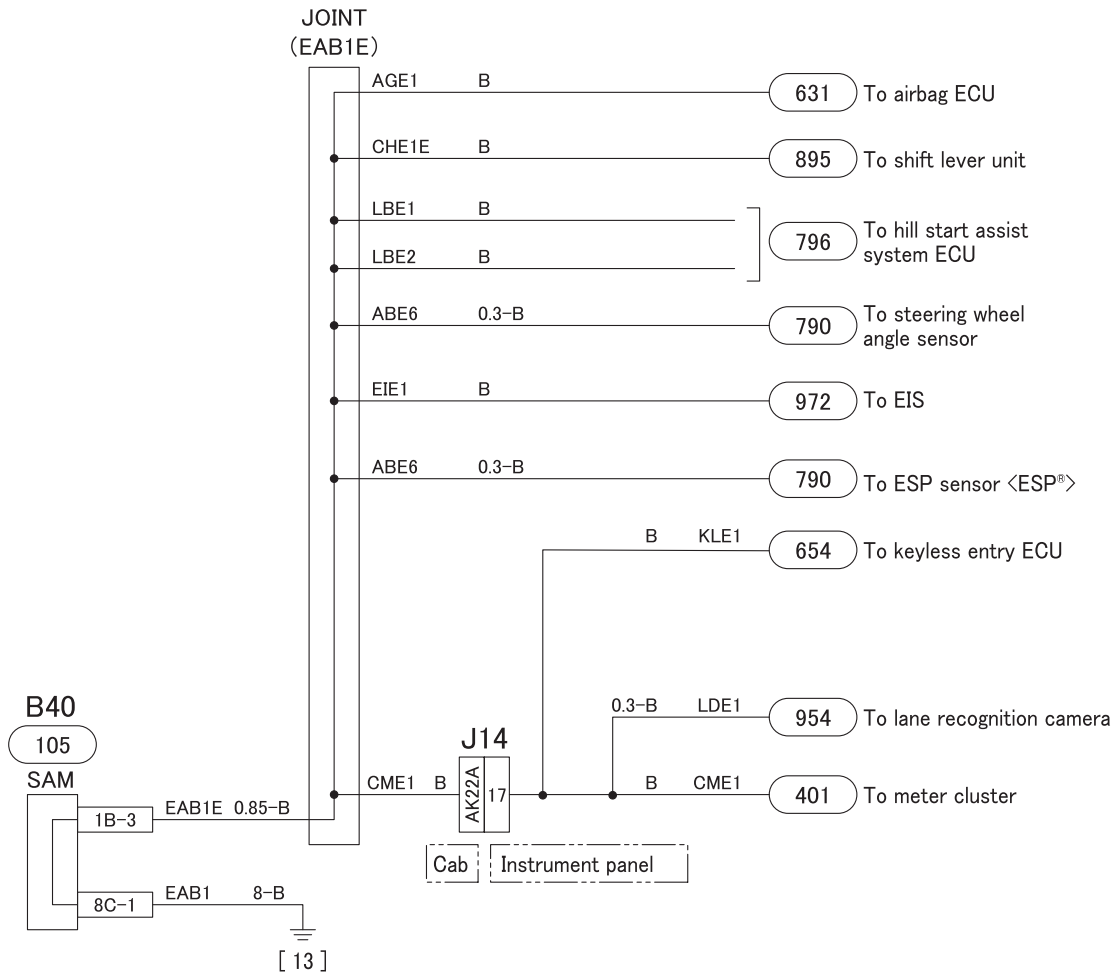


130-300622EAB1-1



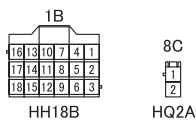
GROUND (9)

Circuit No.EAB1 ground <JOINT(EAB1E)> (2/6)



ECU : Electronic control unit
 ESP®: Electronic stability program

SAM connector (harness side)

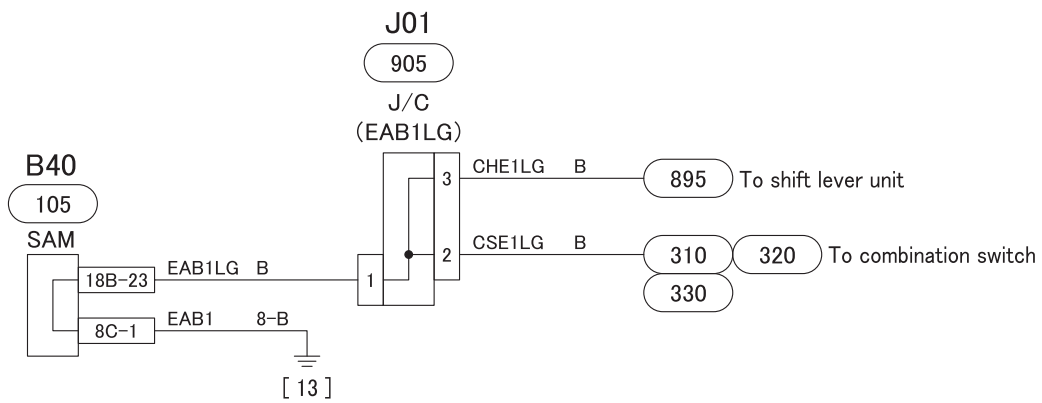


130-300622EAB1-2

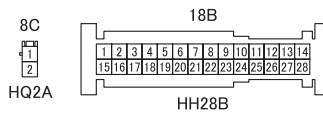


GROUND (10)

Circuit No.EAB1 ground<J/C(EAB1LG)> (3/6)



SAM connector (harness side)



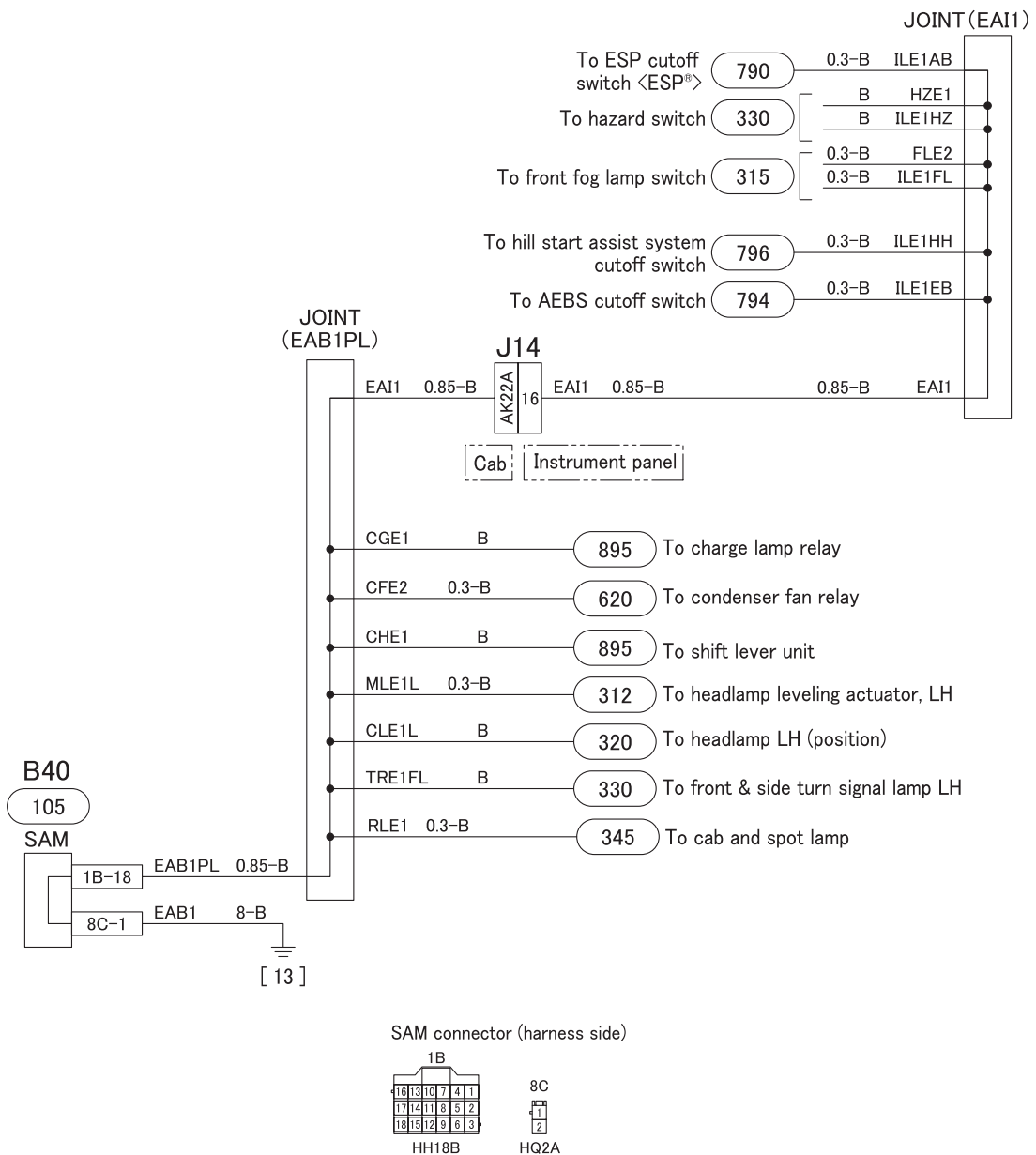
130-300622EAB1-3



GROUND (11)

Circuit No.EAB1 ground <JOINT(EAB1PL), JOINT(EAI1)> (4/6)

ESP® : Electronic stability program
ECU : Electronic control unit

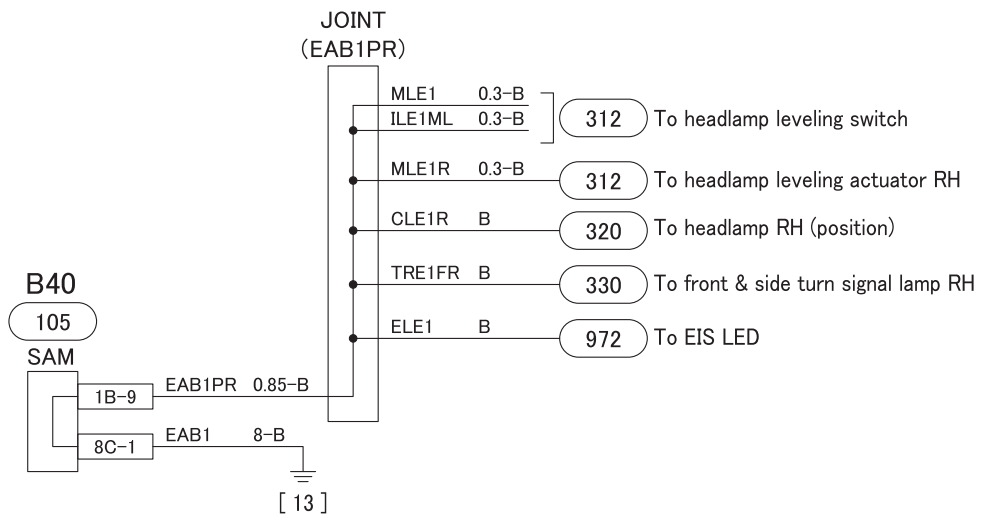


130-300622EAB1-4

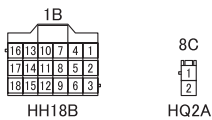
GROUND (12)

Circuit No.EAB1 ground <JOINT(EAB1PR)> (5/6)

ESP® : Electronic stability program



SAM connector (harness side)

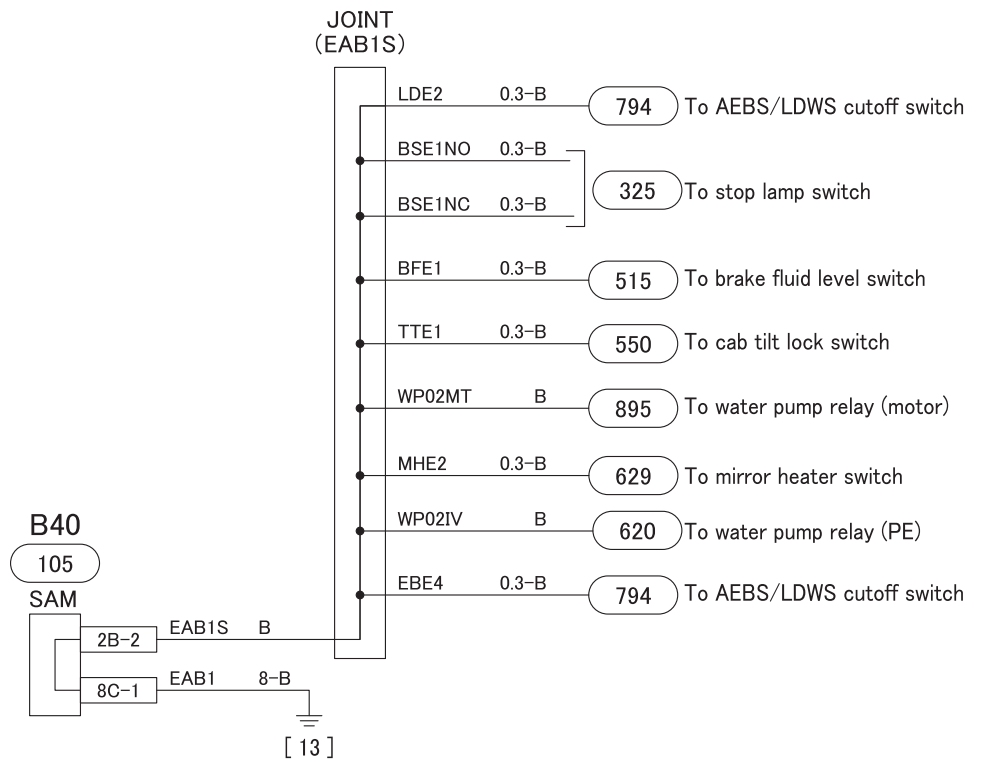


130-300622EAB1-5



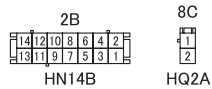
GROUND (13)

Circuit No.EAB1 ground <JOINT(EAB1S)> (6/6)



LDWS : Lane departure warning system
 AEBS : Advanced emergency brake system

SAM connector (harness side)

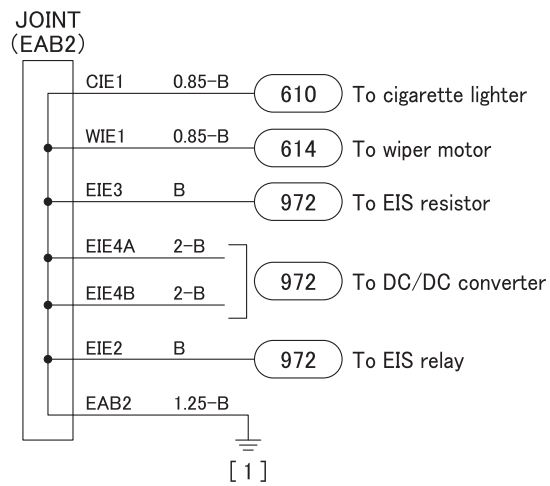


130-300622EAB1-6



GROUND (14)

Circuit No.EAB2 ground

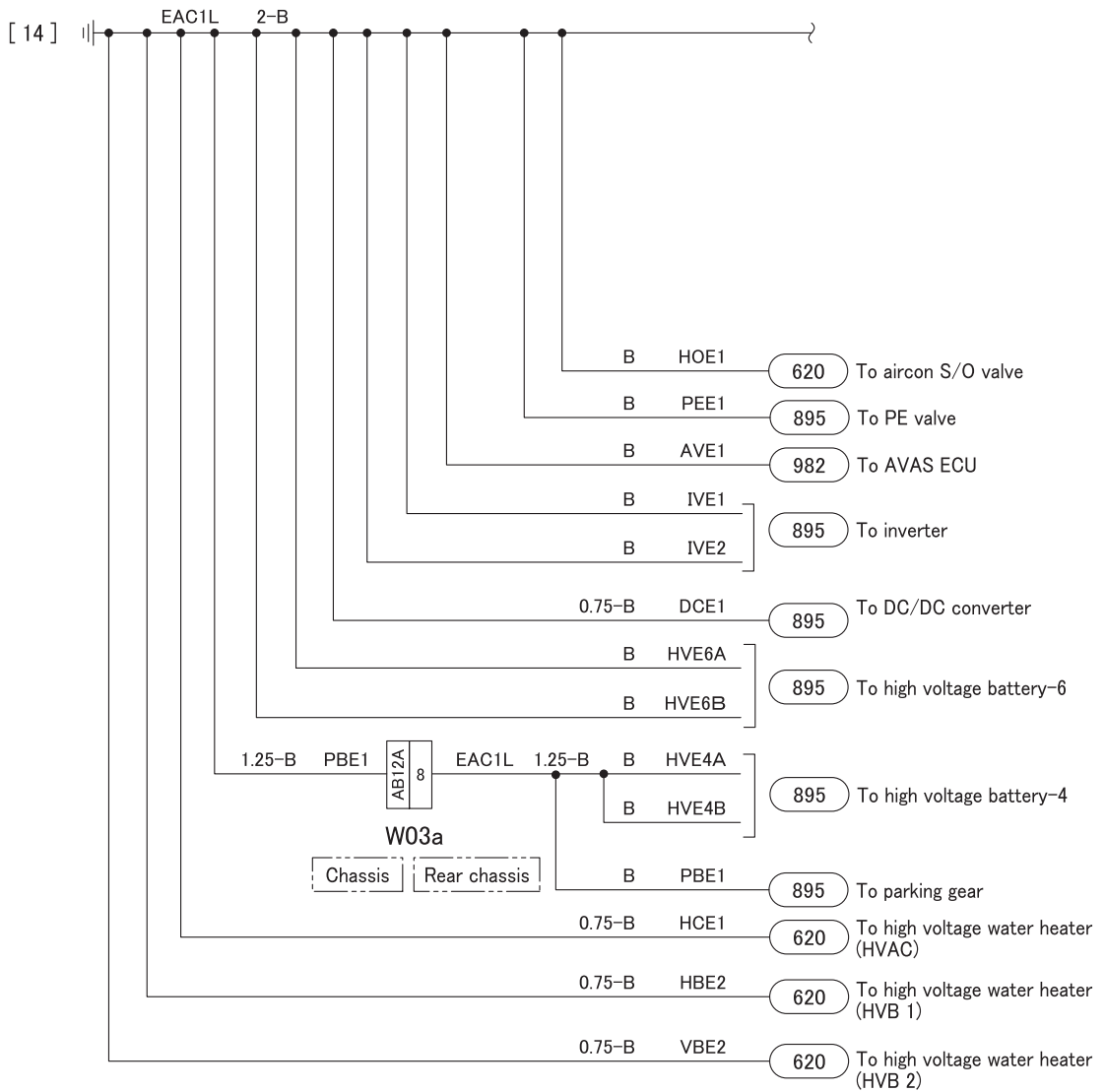


130-300622EAB2



GROUND (15)

Circuit No.EAC1L ground



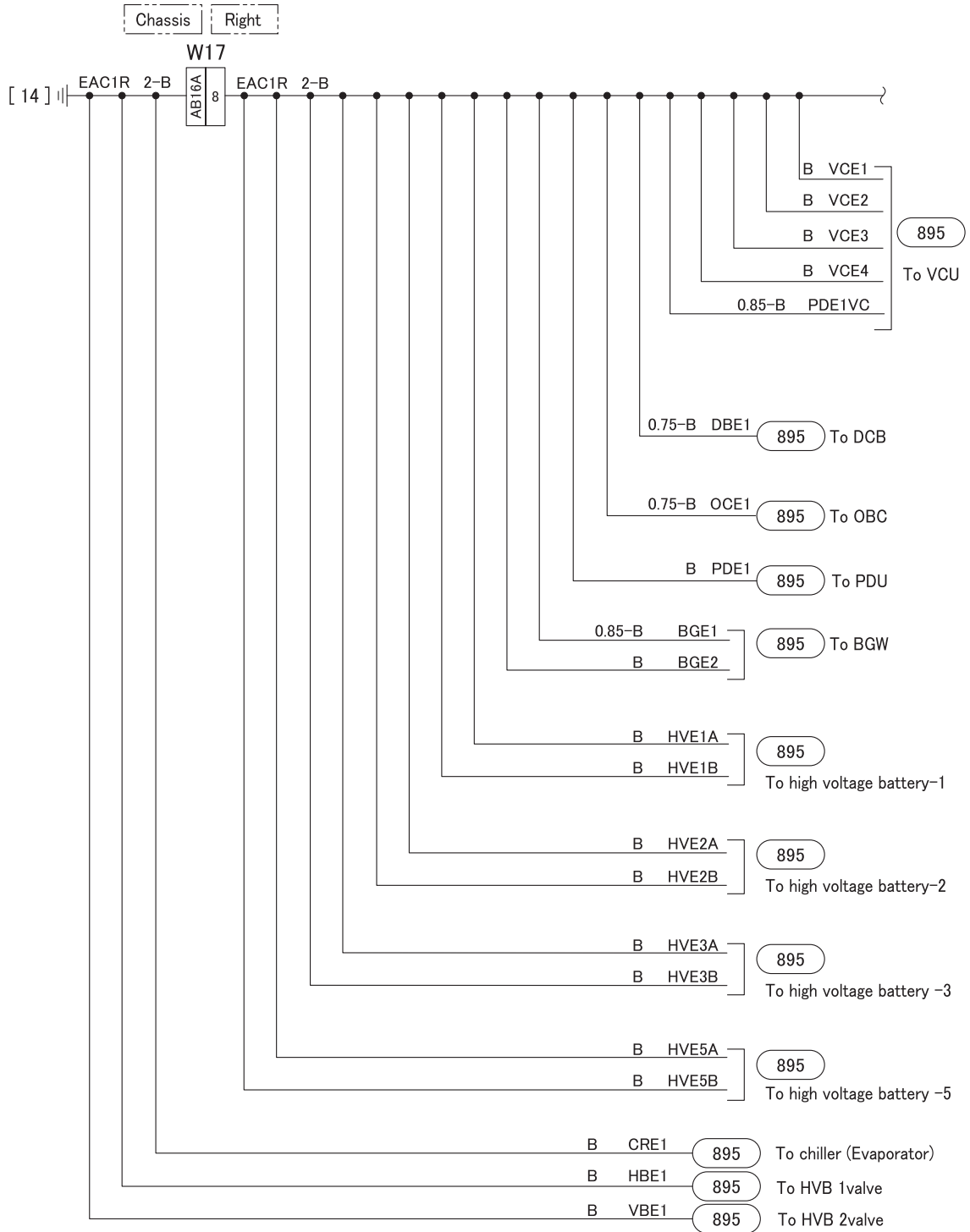
ECU : Electronic control unit

130-300622EAC1L



GROUND (16)

Circuit No.EAC1R ground



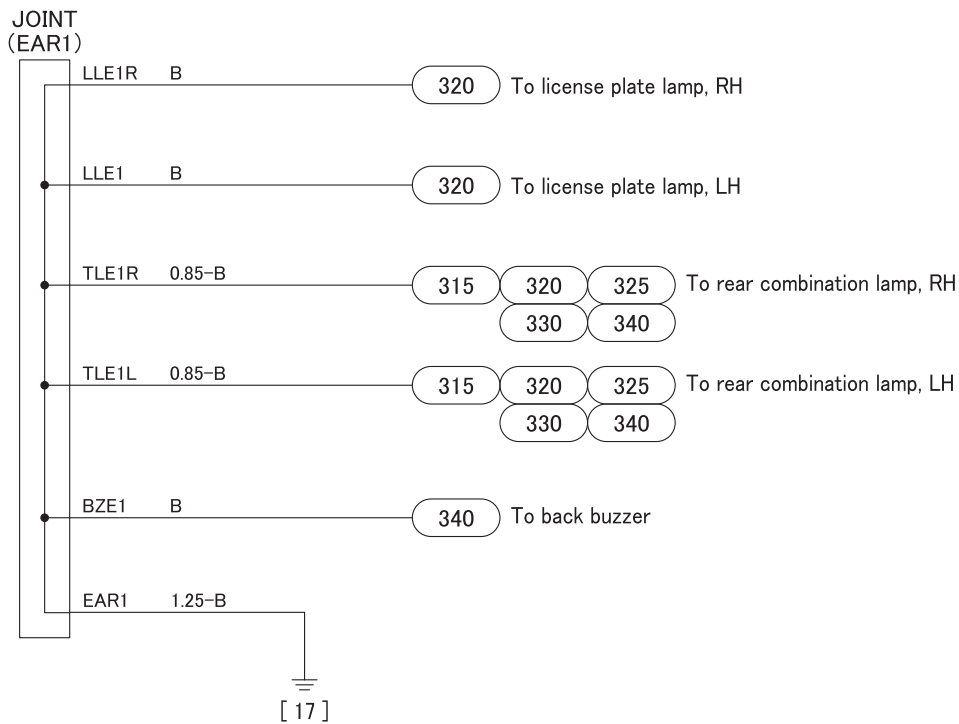
VCU: Vehicle control unit

130-300622EAC1R



GROUND (17)

Circuit No.EAR1 ground

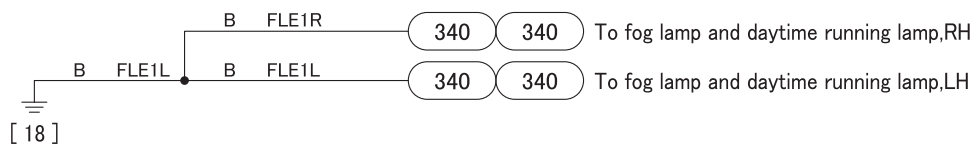


130-300622EAR1



GROUND (18)

Circuit No.FLE1 ground

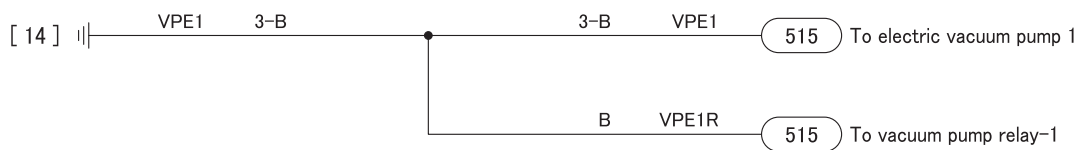


130-300622FLE1



GROUND (19)

Circuit No.VPE1 ground

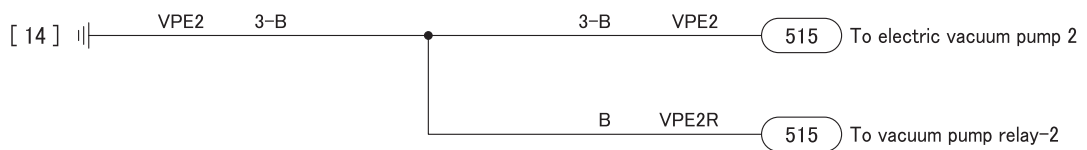


130-300622VPE1



GROUND (20)

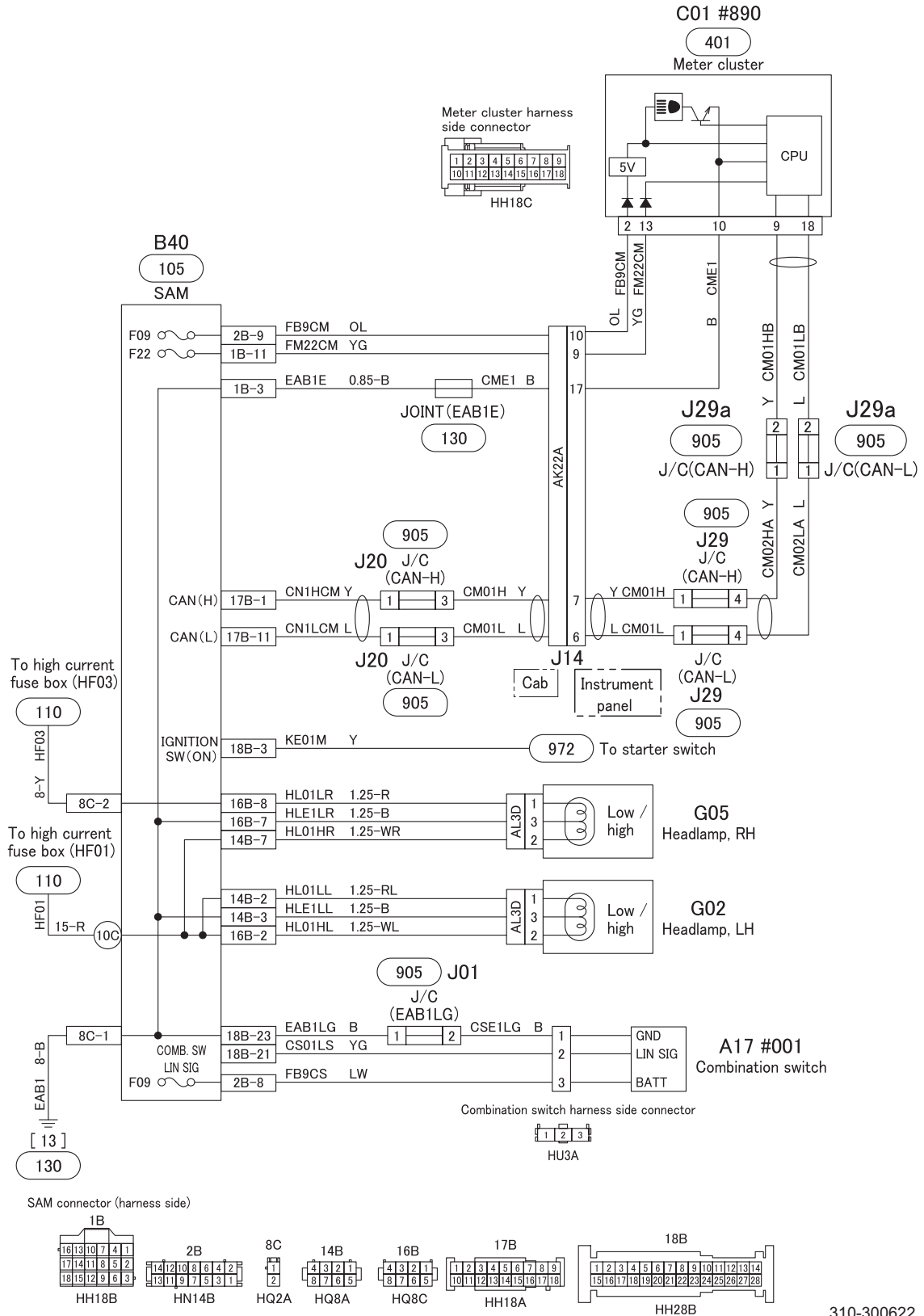
Circuit No.VPE2 ground



130-300622VPE2



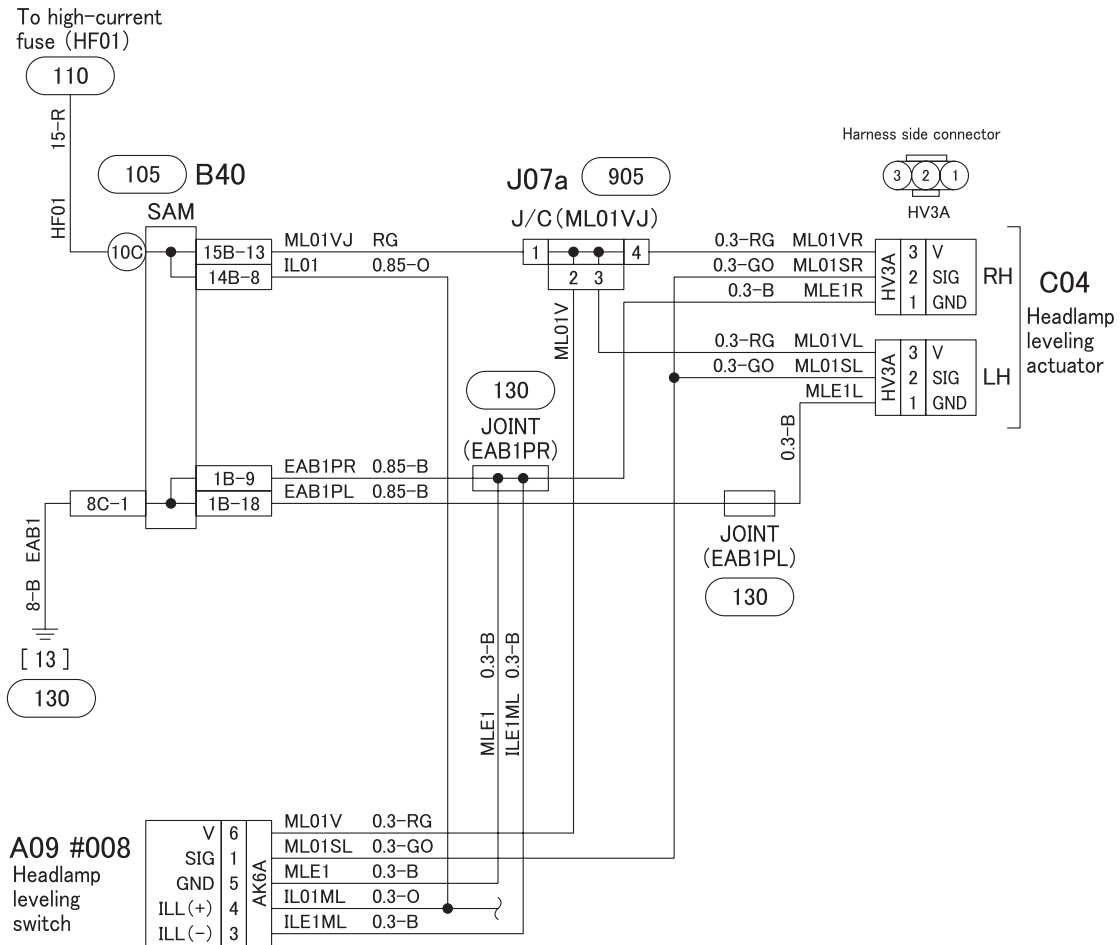
HEADLAMP CIRCUIT



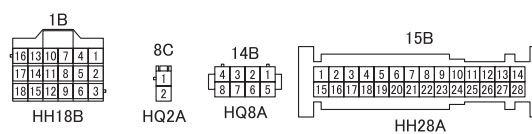
310-300622



HEADLAMP LEVELING CIRCUIT



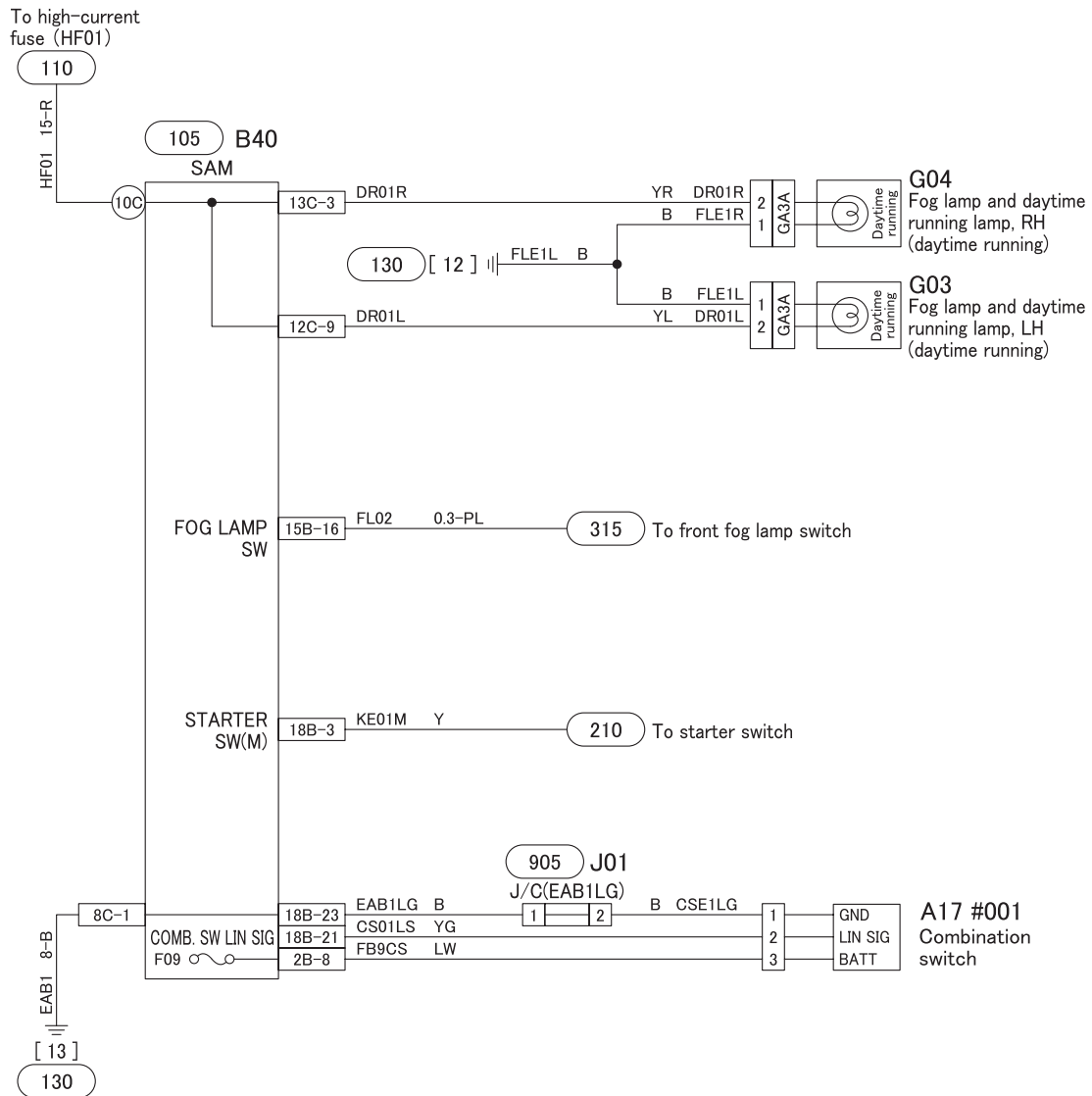
SAM connector (harness side)



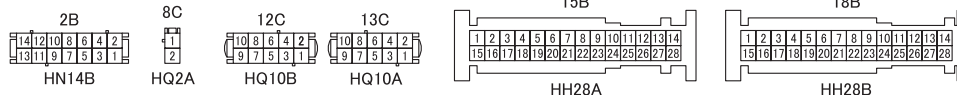
312-300622



DAYTIME RUNNING LAMP CIRCUIT



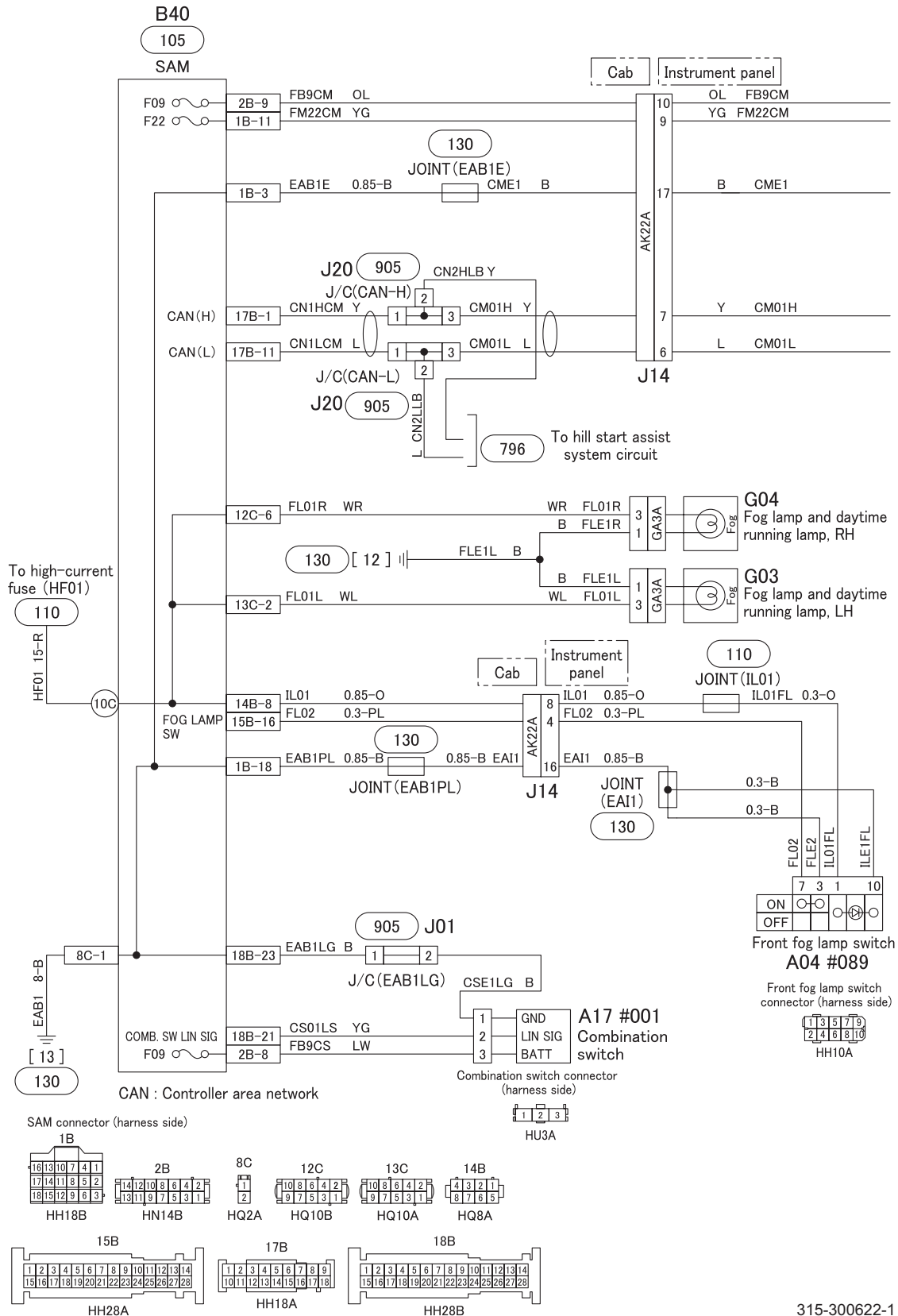
SAM connector (harness side)



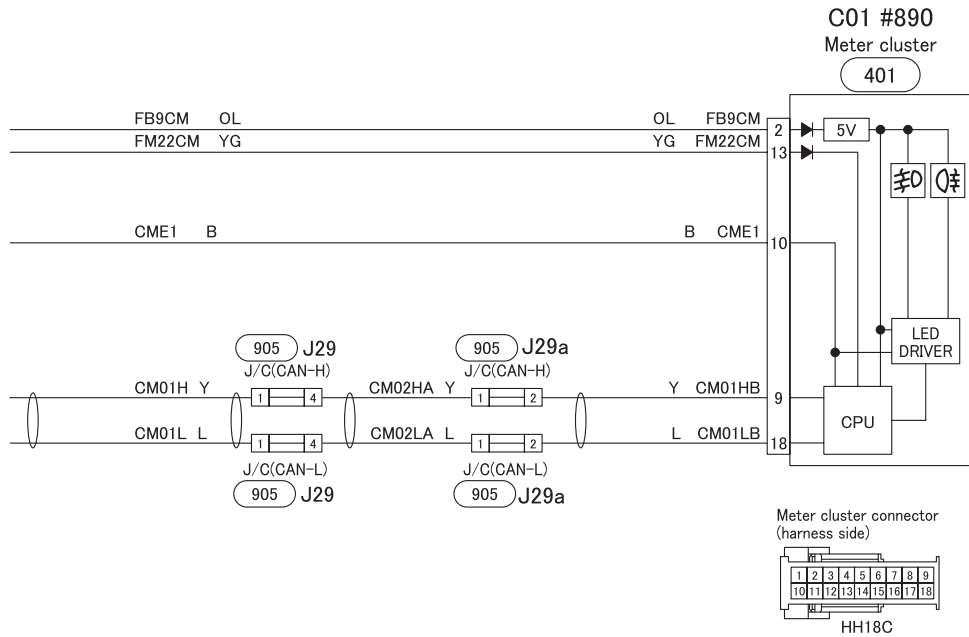
313-300622



FOG LAMP CIRCUIT (1)



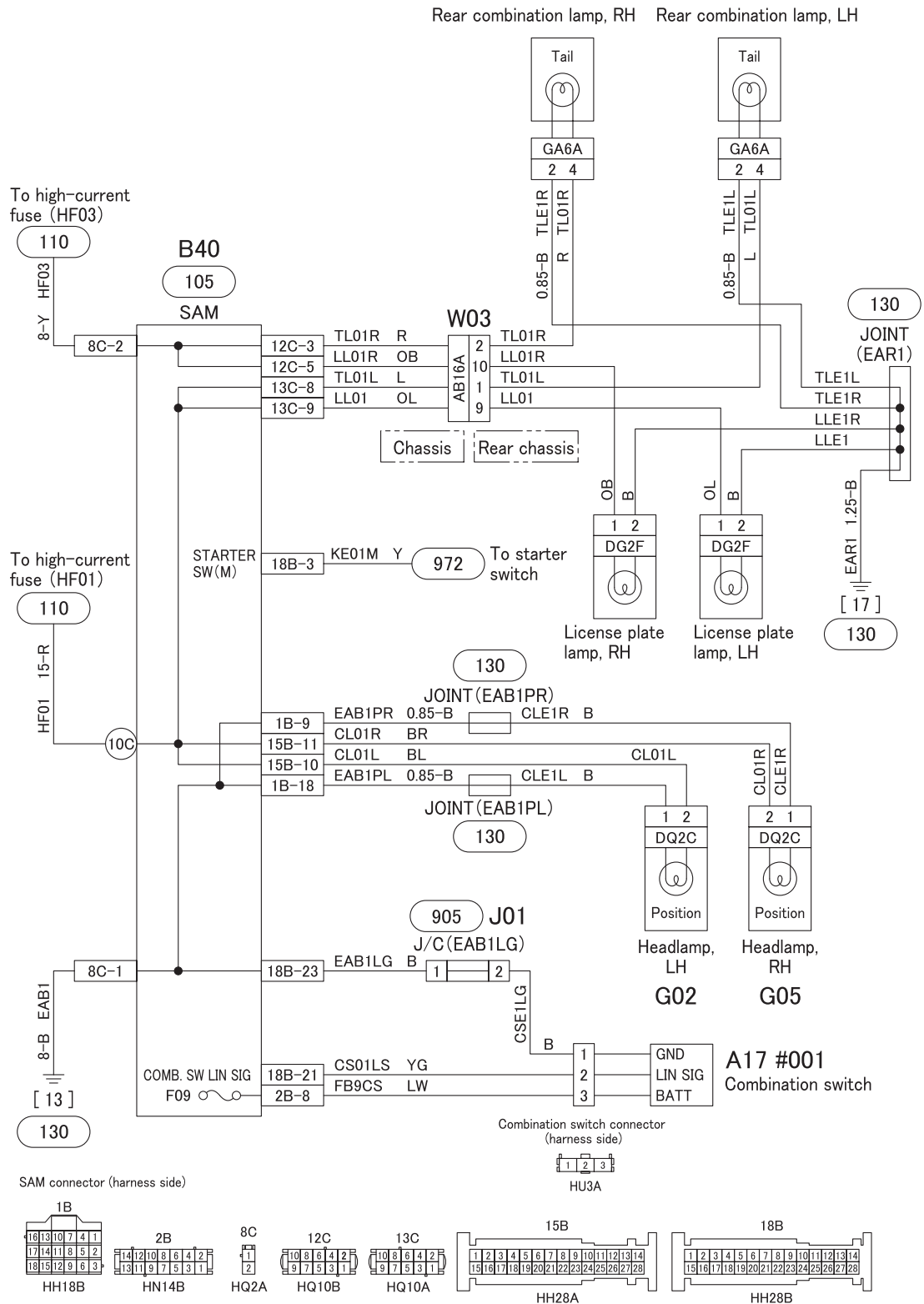
FOG LAMP CIRCUIT (2)



315-300622-2



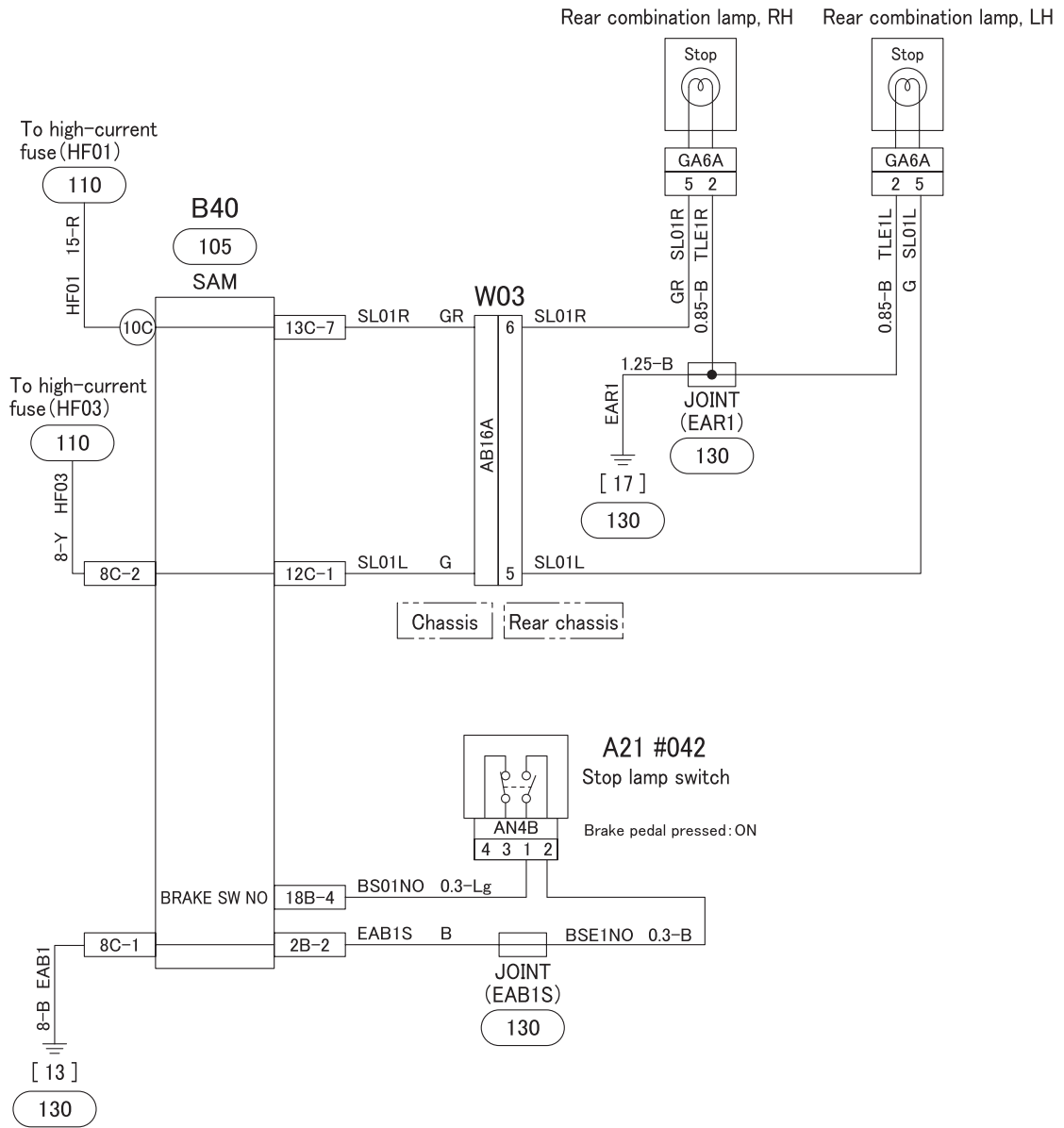
TAIL, POSITION AND LICENSE PLATE LAMPS CIRCUIT



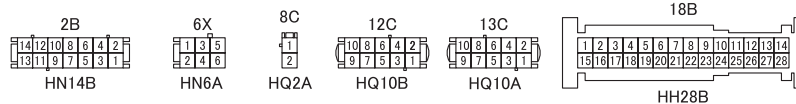
320-300622



STOP LAMP CIRCUIT



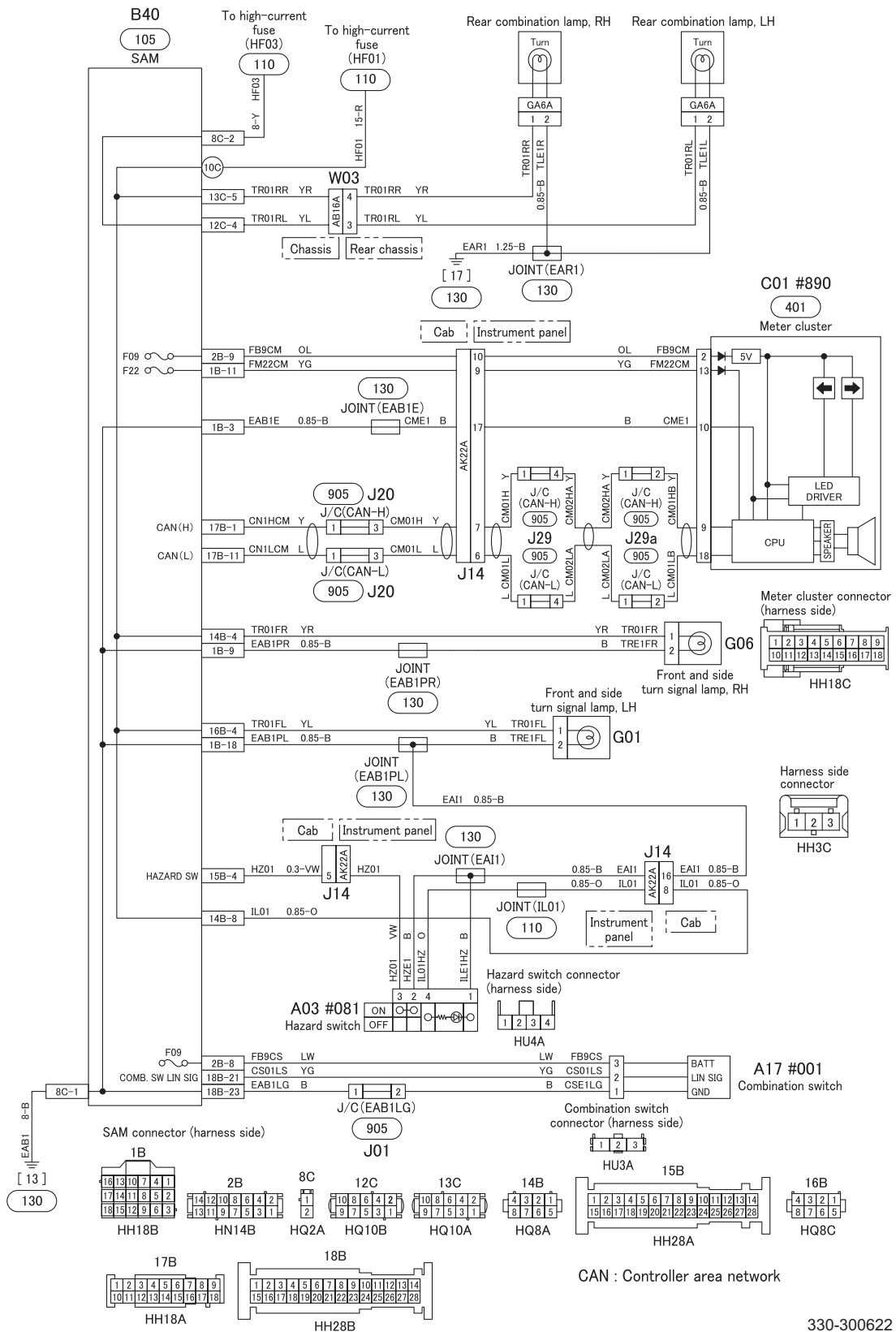
SAM connector (harness side)



325-300622



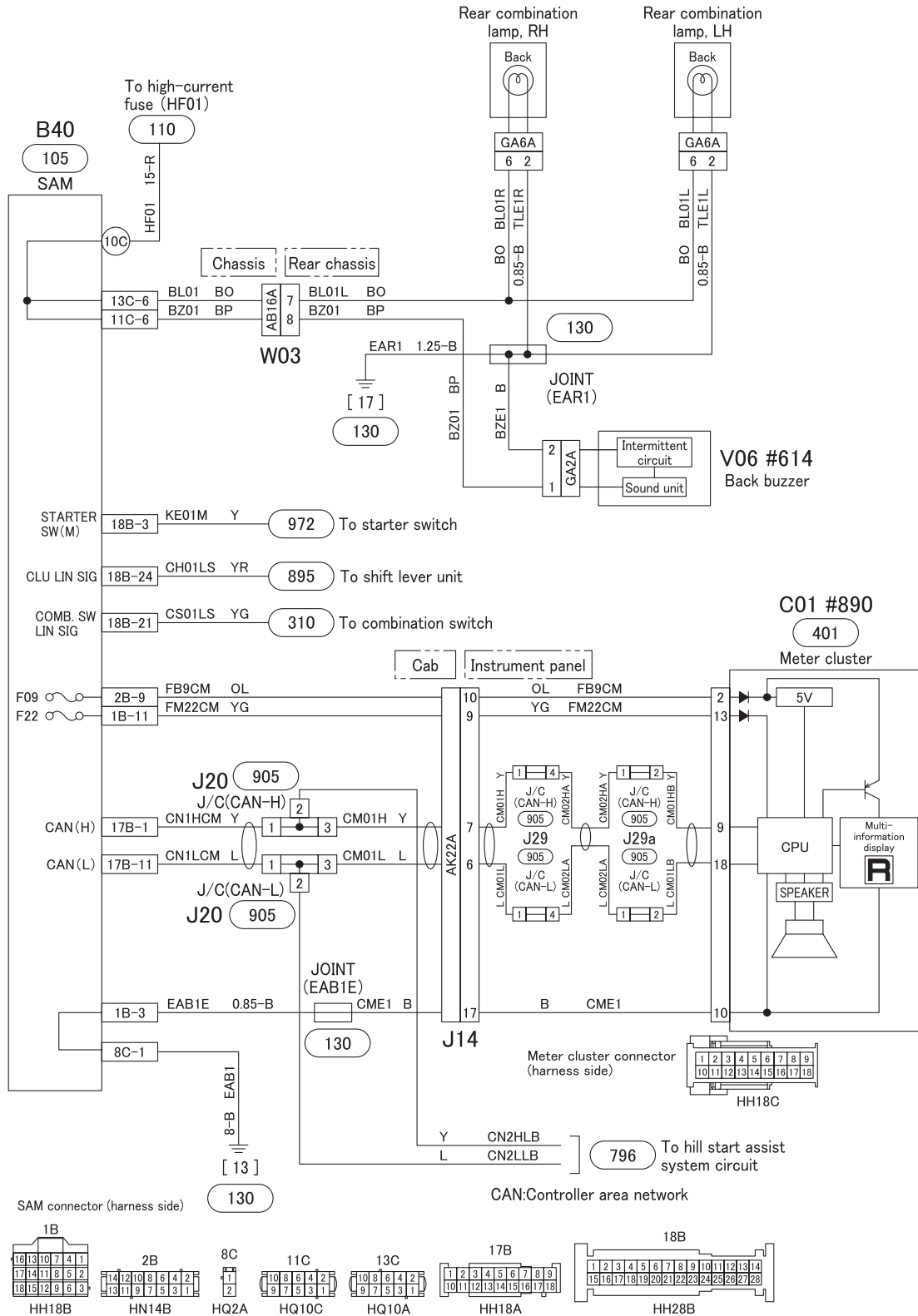
TURN SIGNAL AND HAZARD WARNING LAMP CIRCUIT



330-300622



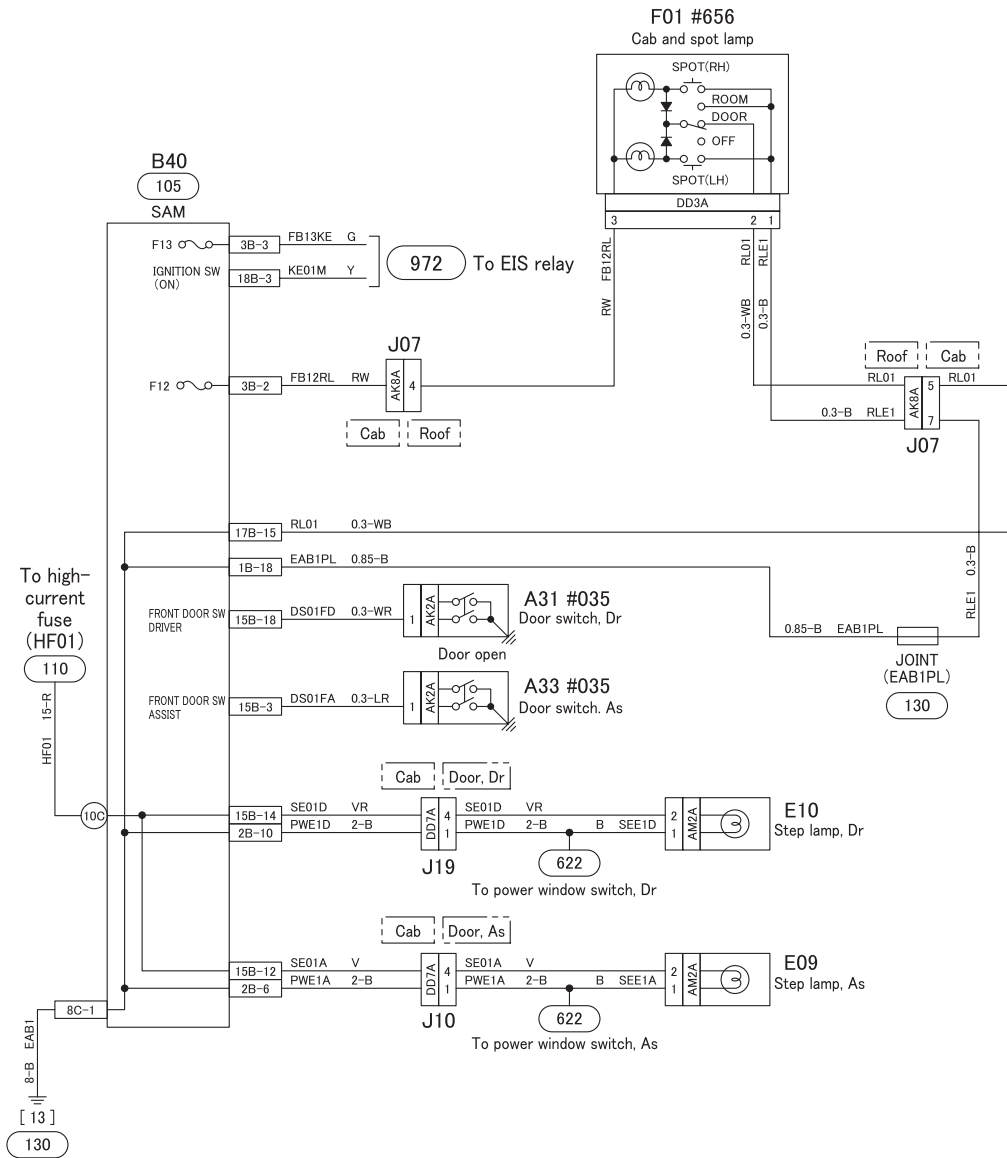
BACKUP LAMP CIRCUIT



340-300622

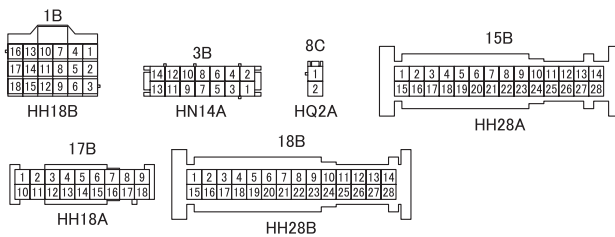


CAB LAMP CIRCUIT



Dr : Driver's seat side
As : Assistant driver's seat side

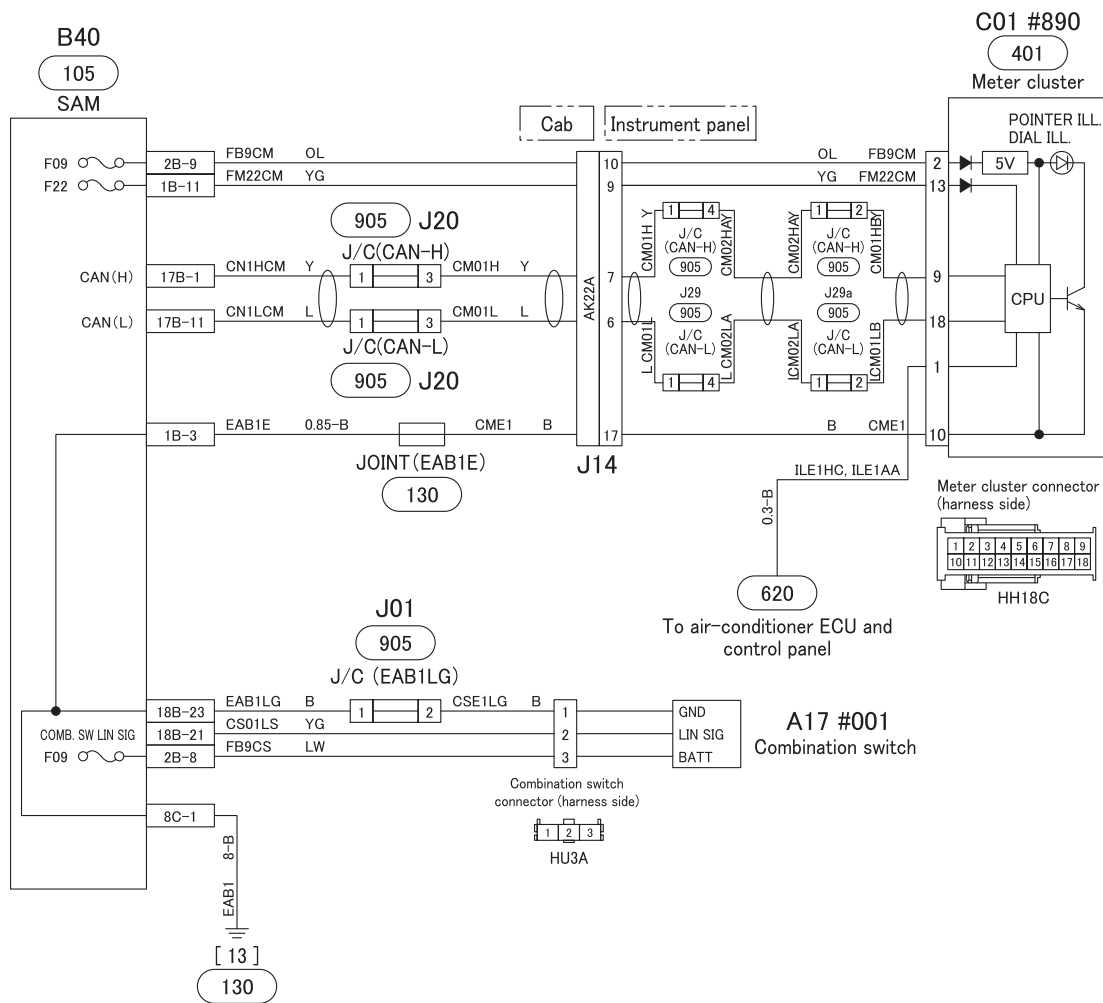
SAM connector (harness side)



345-300622

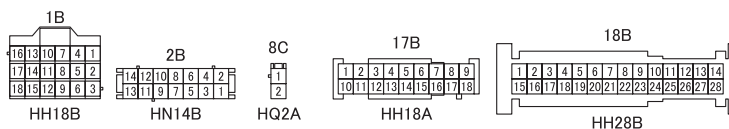


ILLUMINATION LAMP CIRCUIT



ECU : Electronic control unit
CAN : Controller area network

SAM connector (harness side)

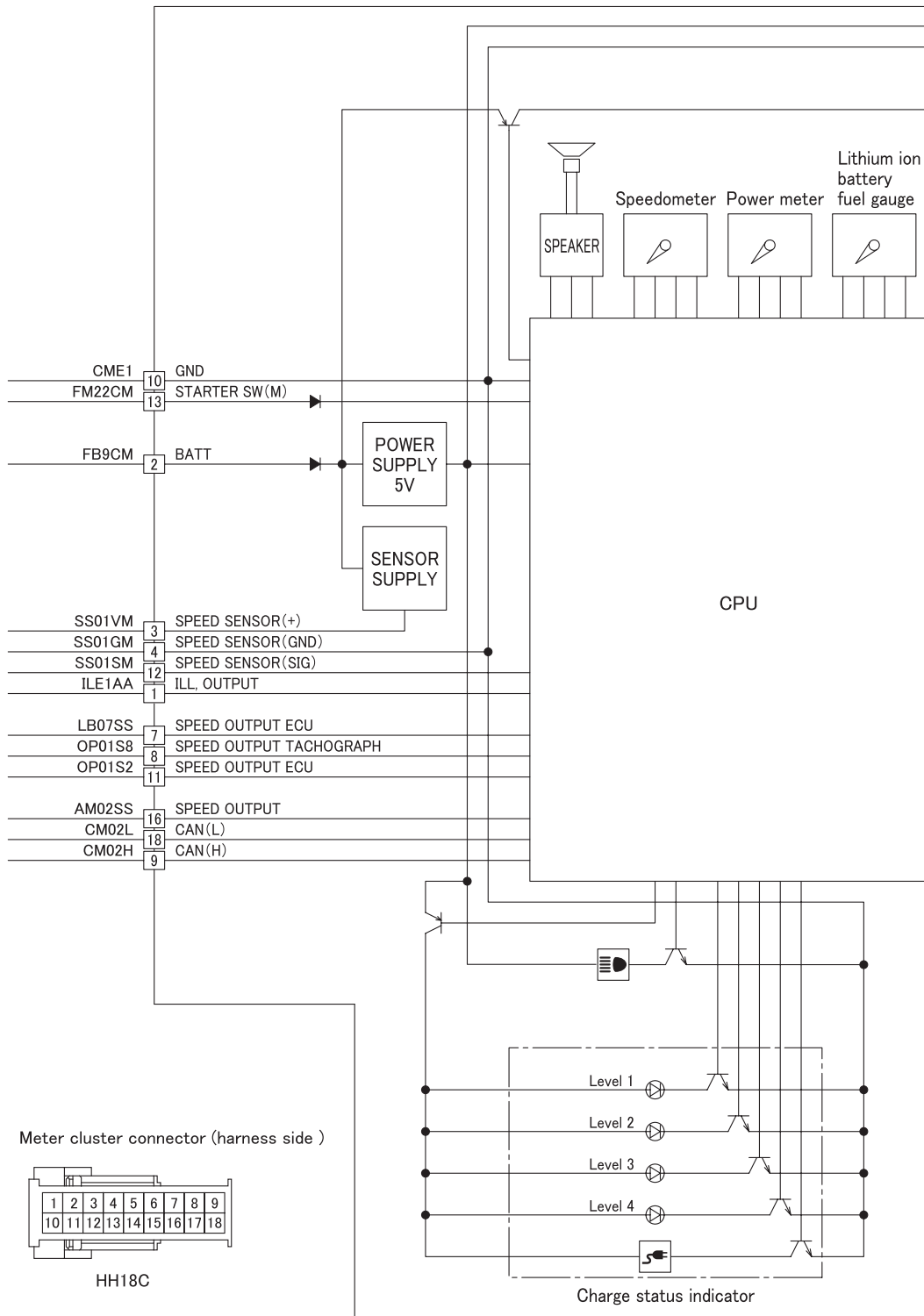


348-300622



METER CLUSTER INTERNAL CIRCUIT (1)

(1/2)

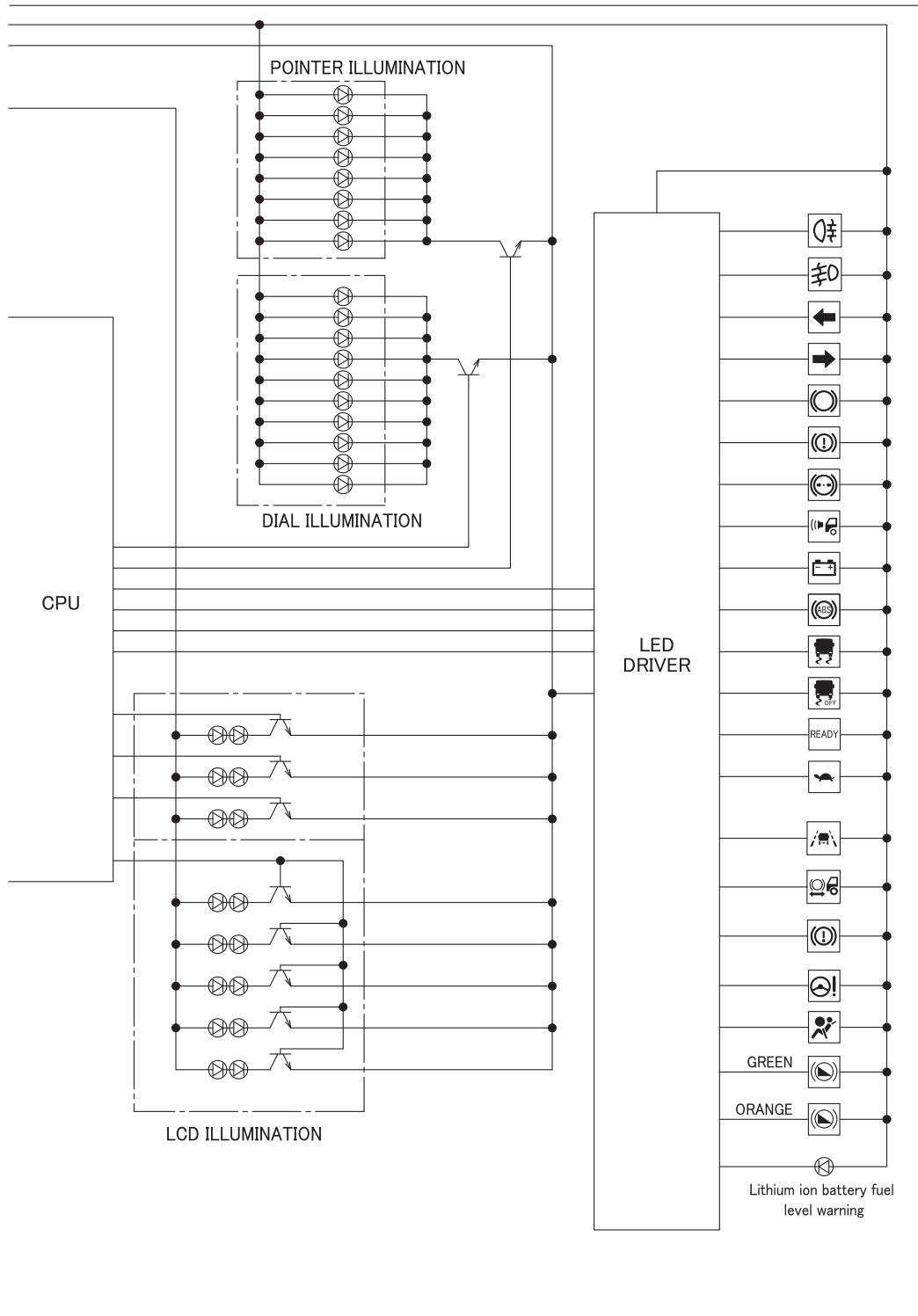


401-300622-1



METER CLUSTER INTERNAL CIRCUIT (2)

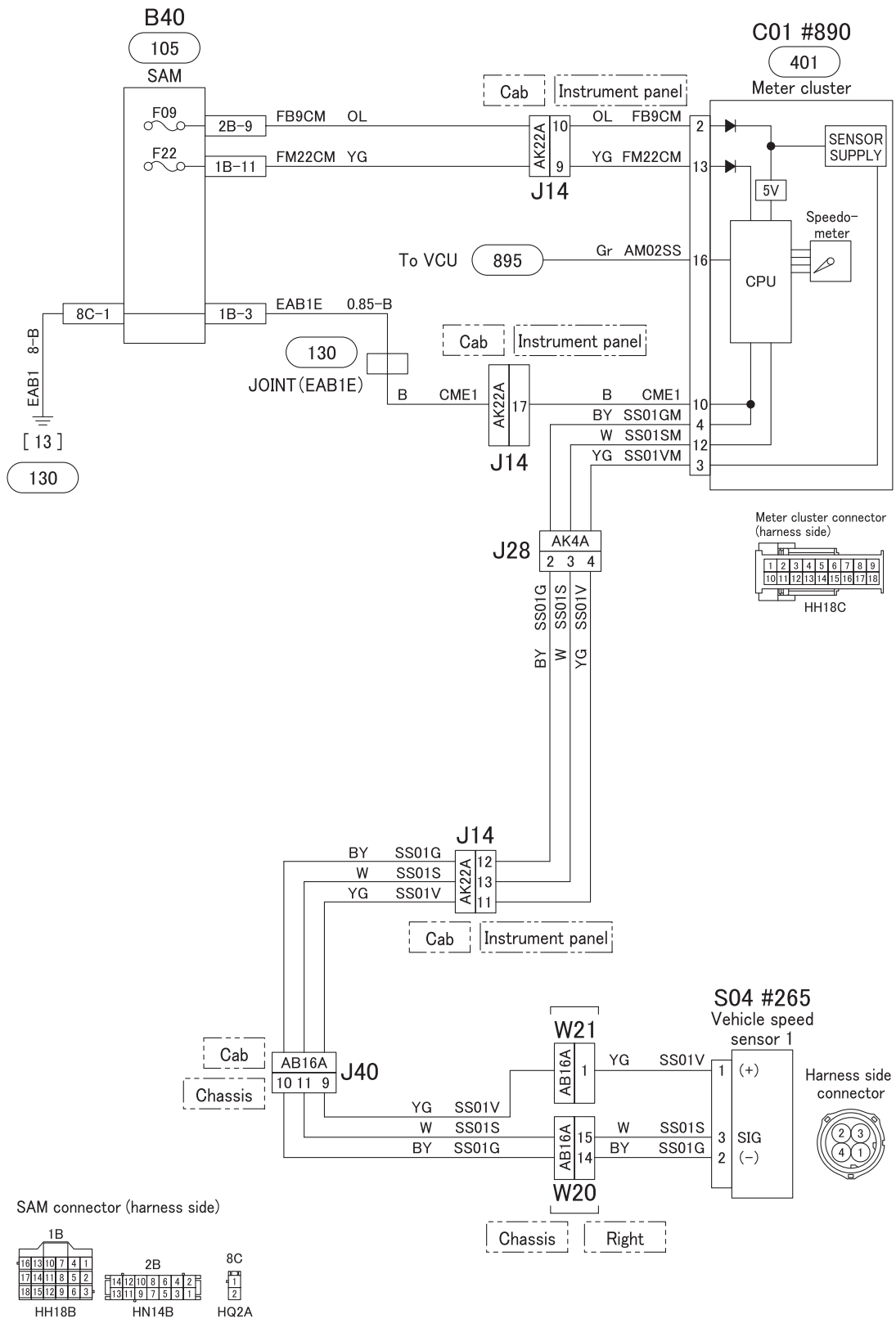
(2/2)



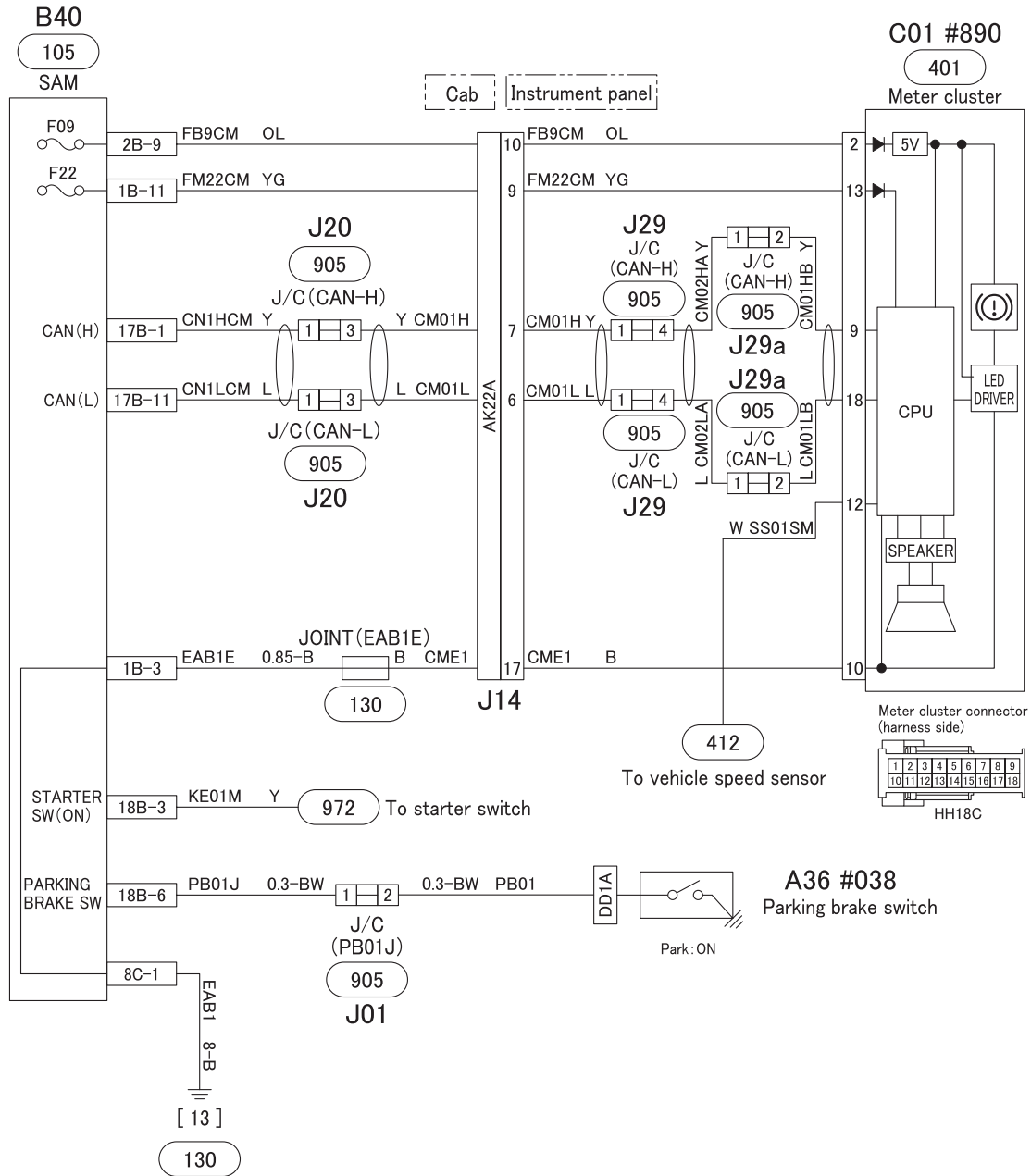
401-300622-2



SPEEDOMETER CIRCUIT

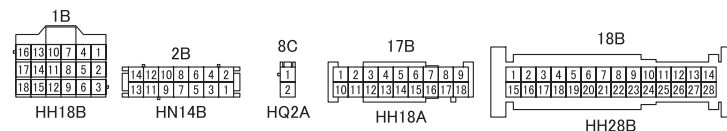


PARKING BRAKE INDICATOR CIRCUIT



CAN : Controller area network

SAM connector (harness side)

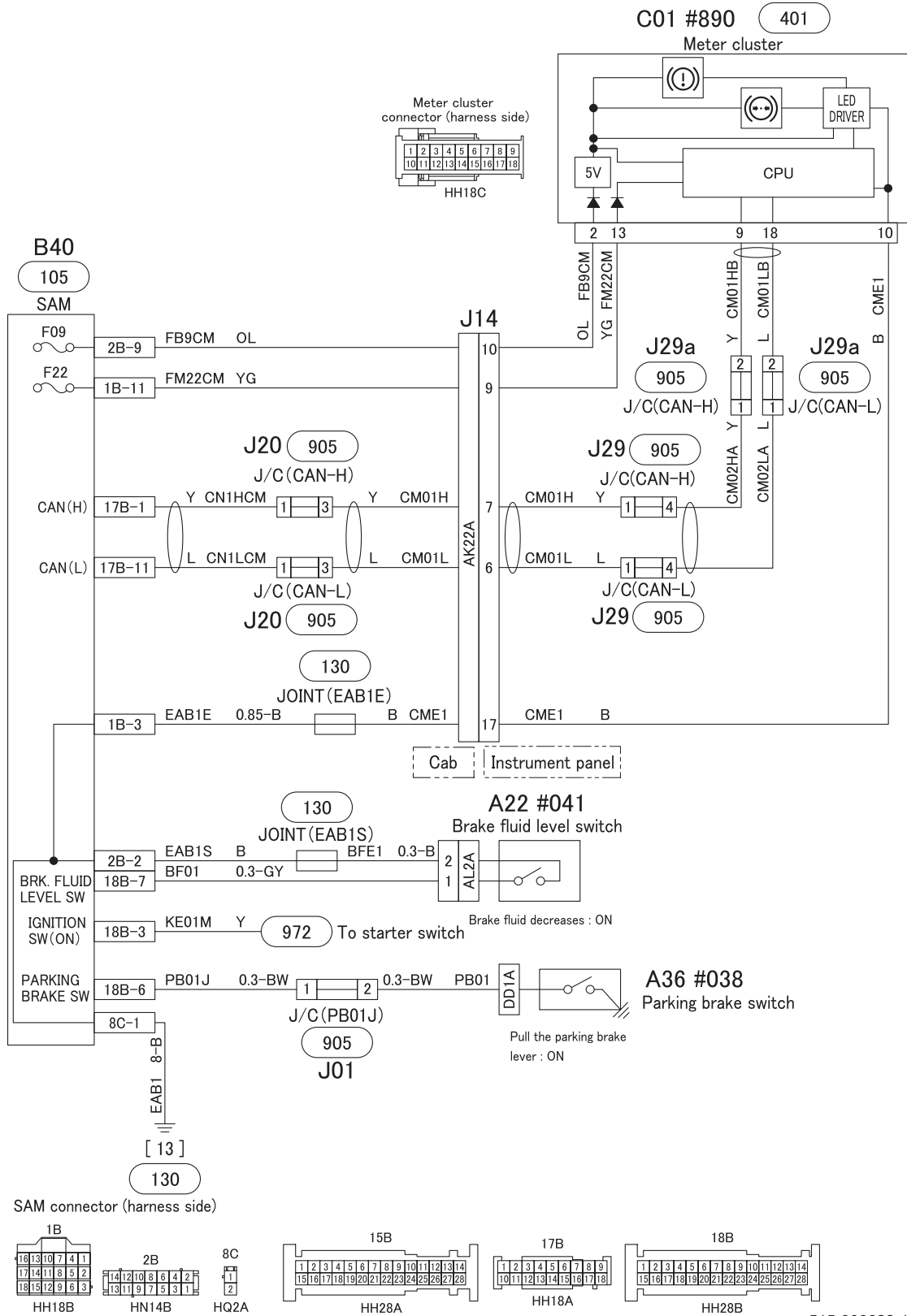


510-300622



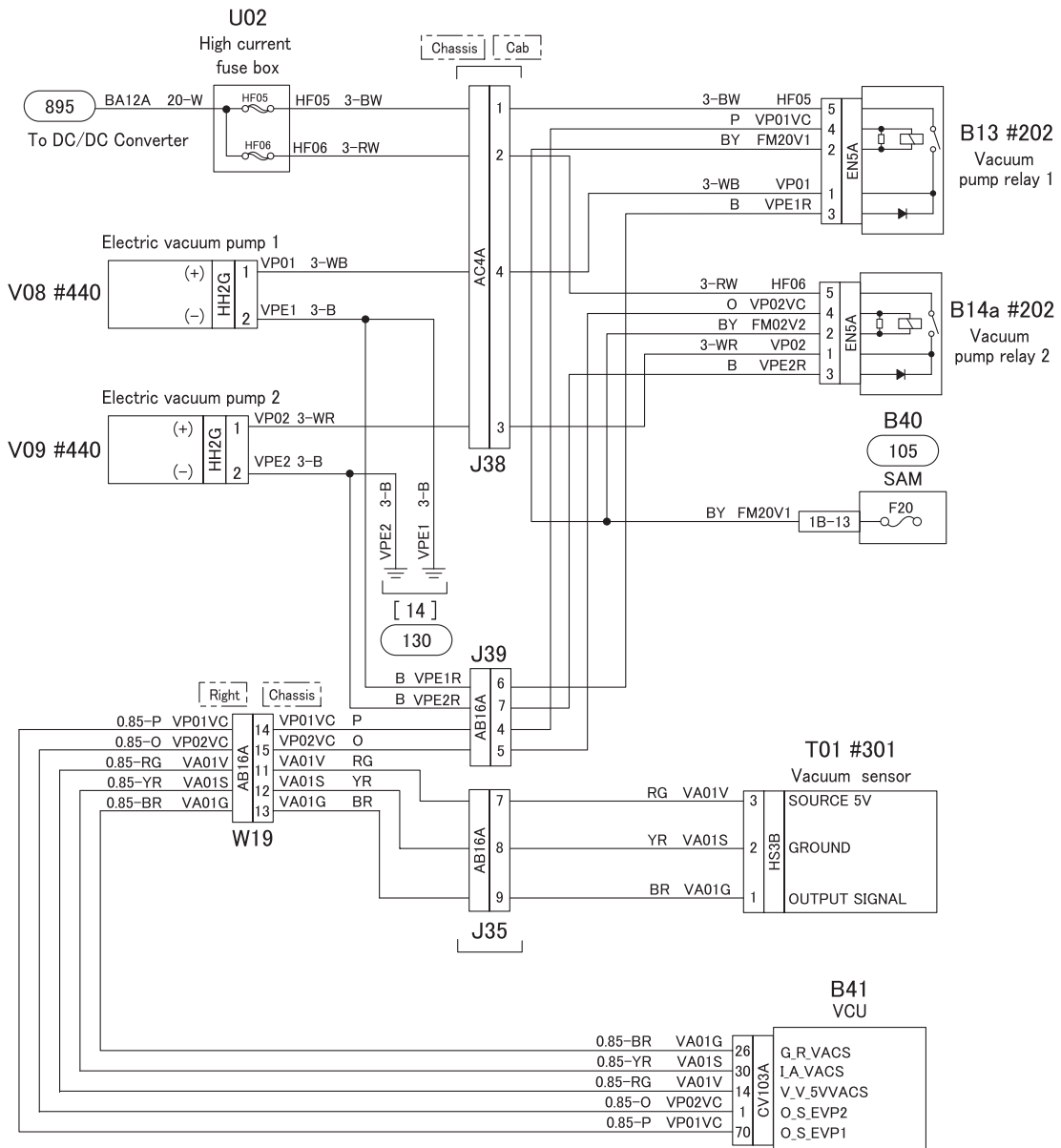
BRAKE WARNING CIRCUIT (1)

(1/2)

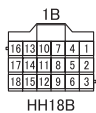


BRAKE WARNING CIRCUIT (2)

(2/2)

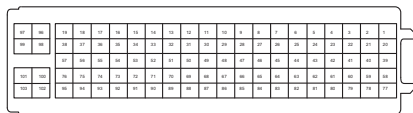


SAM connector (harness side)



HH18B

VCU connector (harness side)

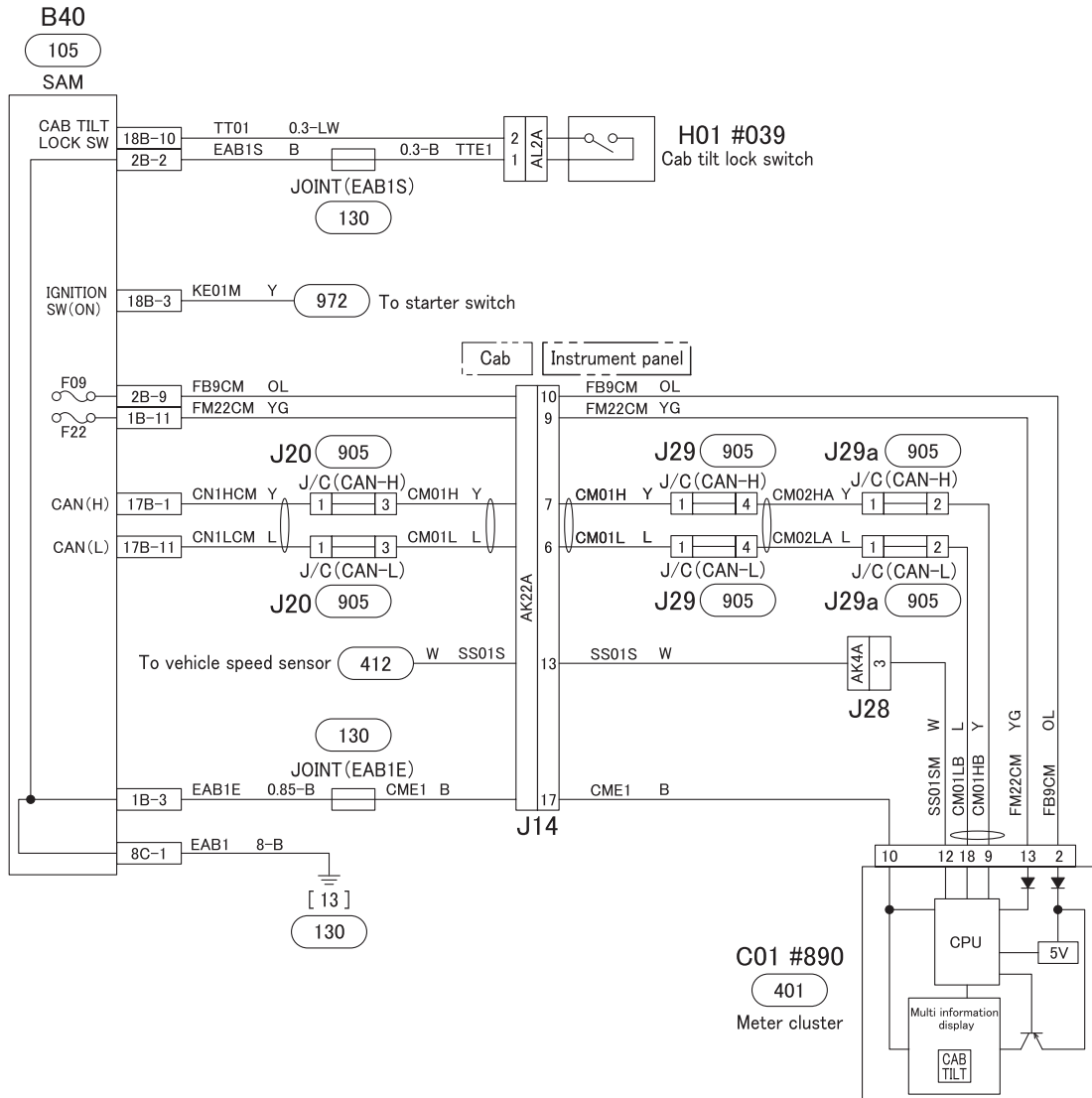


CV103A

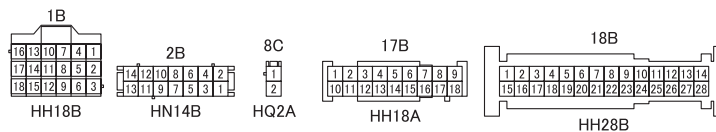
515-300622-2



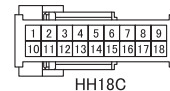
CAB TILT WARNING CIRCUIT



SAM connector (harness side)



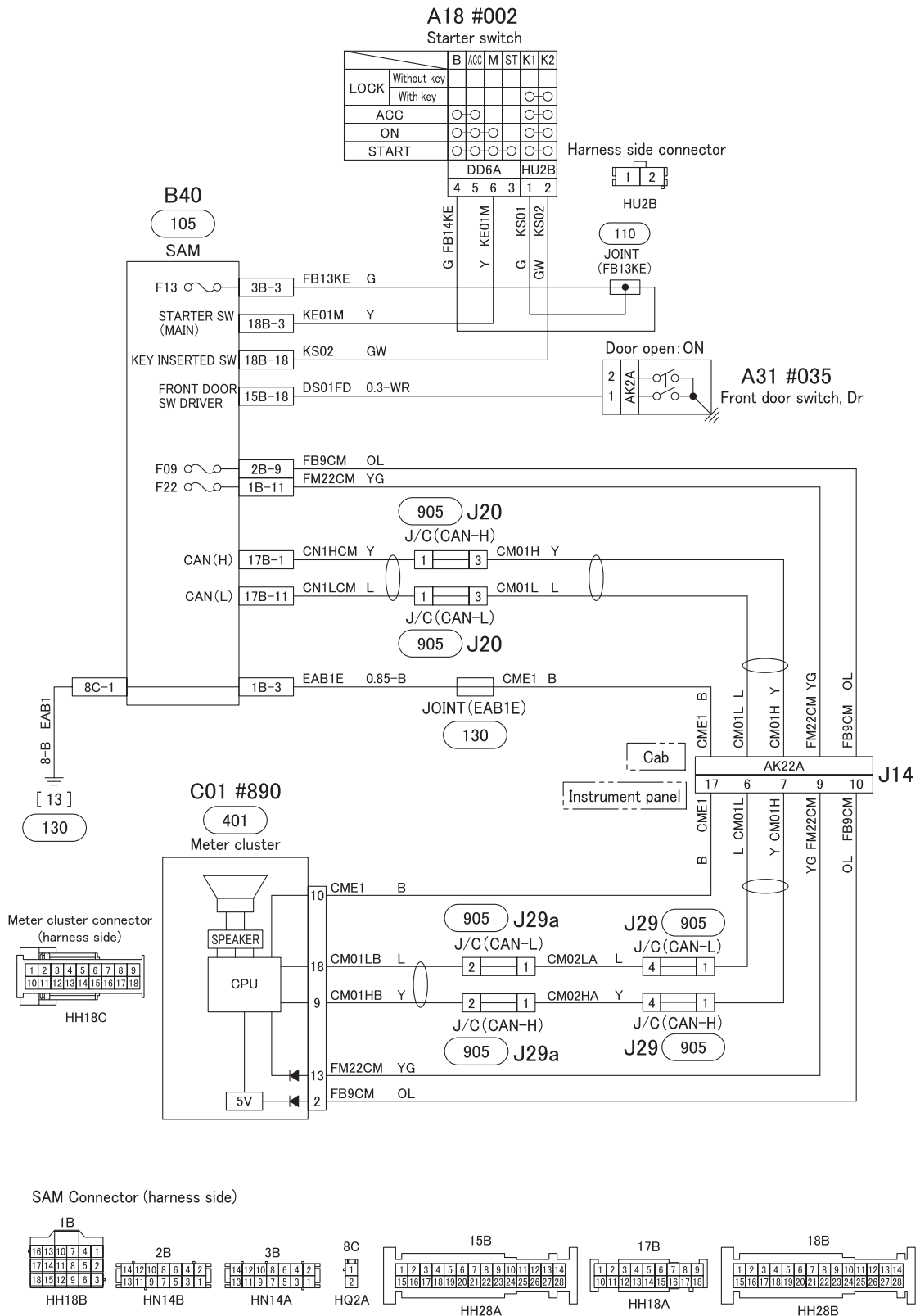
Meter cluster harness side connector



550-300622



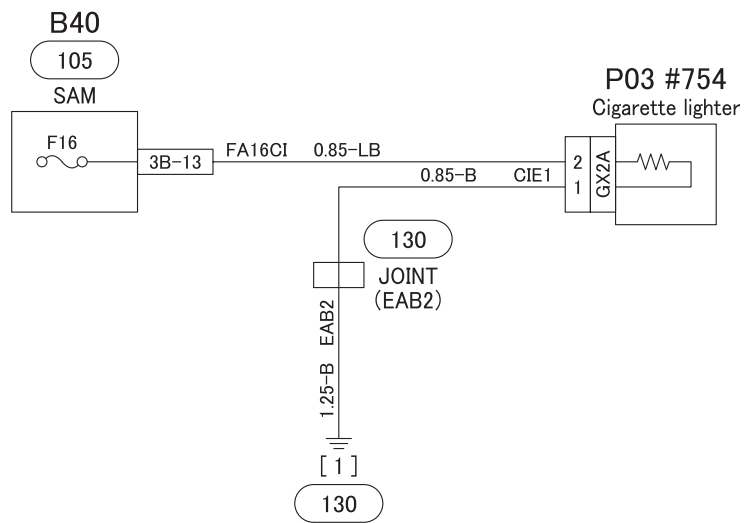
STARTER KEY REMOVAL REMINDER ALARM CIRCUIT



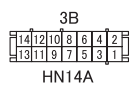
554-300622



CIGARETTE LIGHTER CIRCUIT



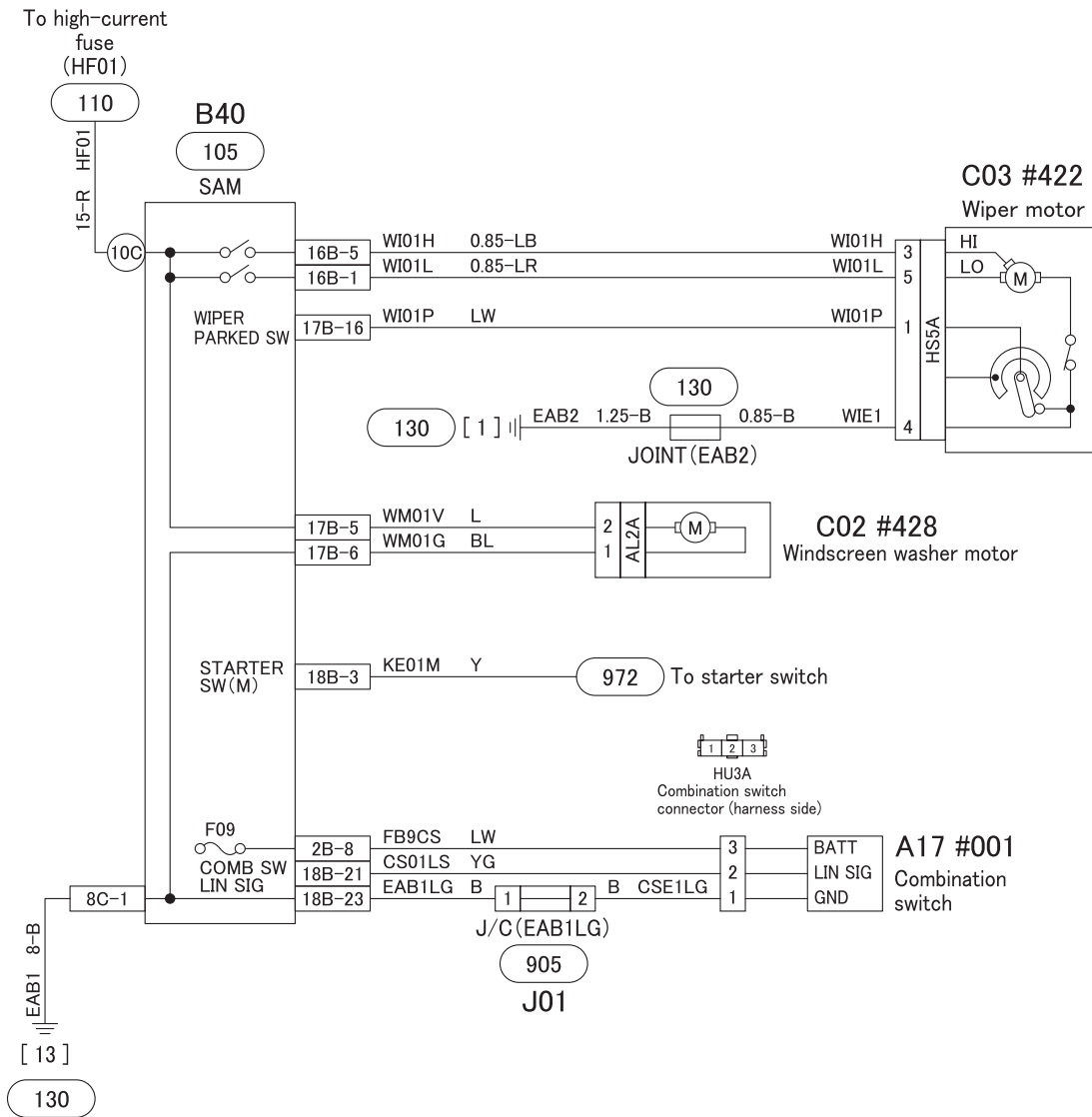
SAM connector (harness side)



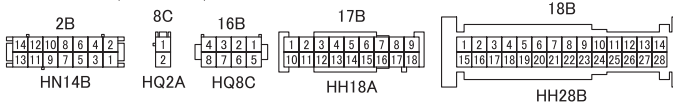
610-300622



WIPER AND WASHER CIRCUIT



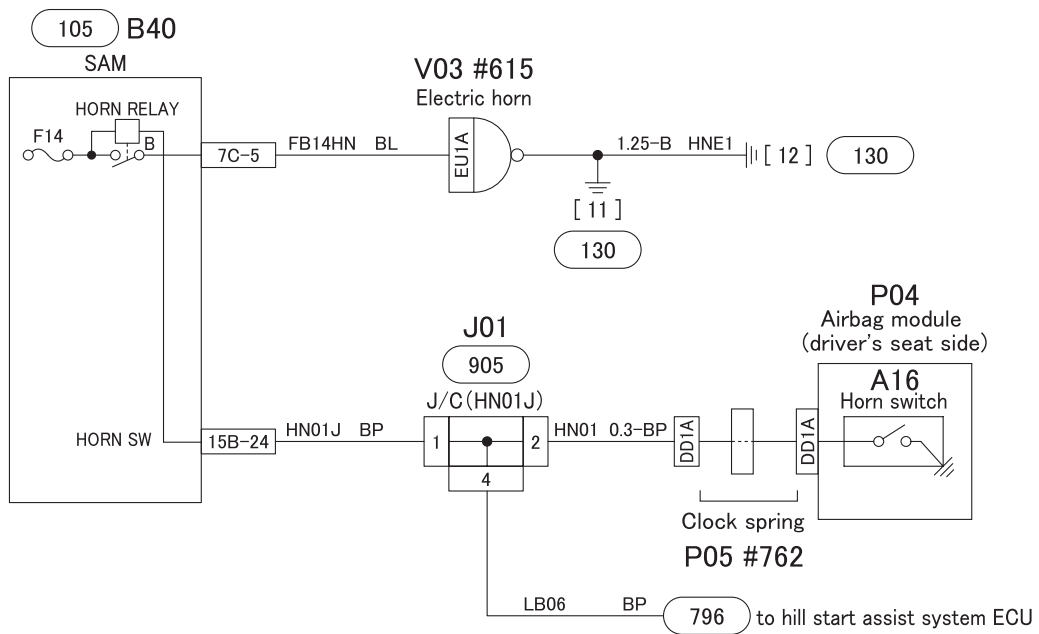
SAM connector (harness side)



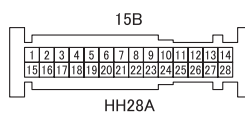
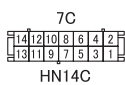
614-300622



HORN CIRCUIT



SAM connector (harness side)



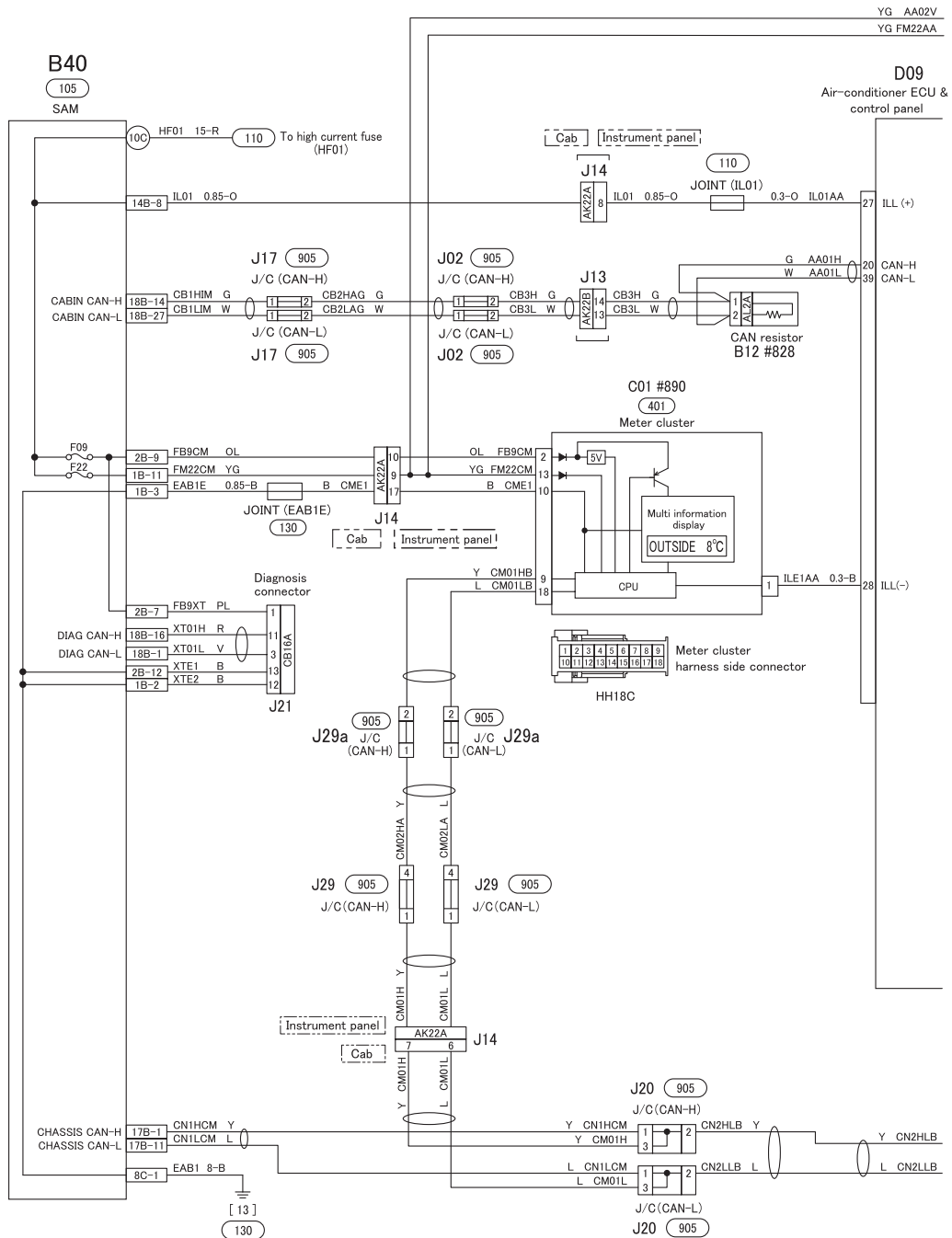
SRS : Supplemental restraint system
ECU : Electronic control unit

616-300622

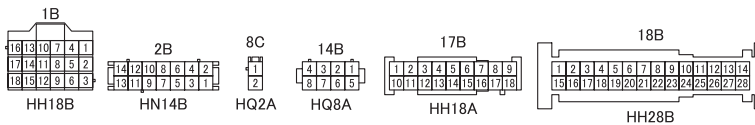


AIR-CONDITIONER CIRCUIT (1)

(1/9)



SAM connector (harness side)



Air conditioner ECU & control panel harness side connector

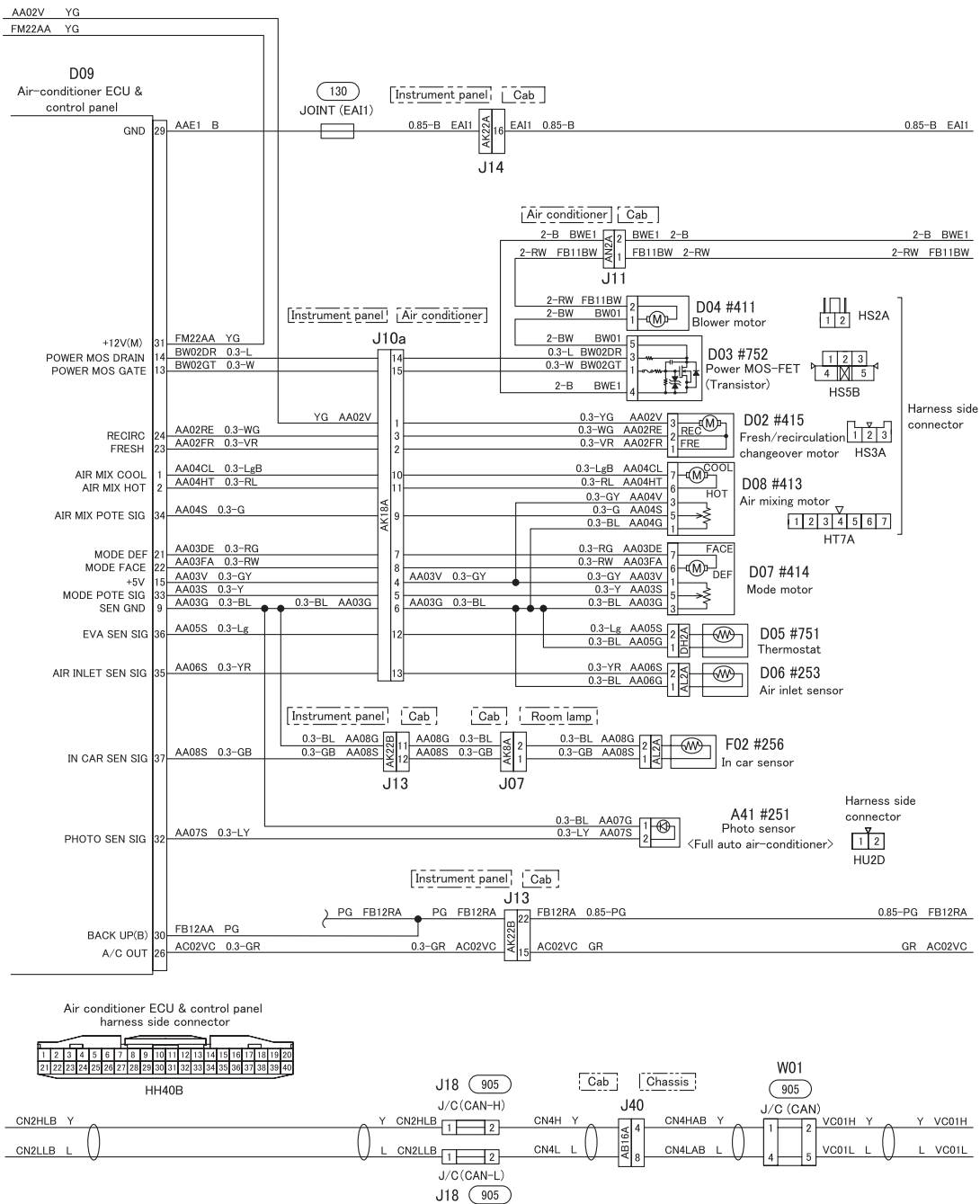


620-300622F-1



AIR-CONDITIONER CIRCUIT (2)

(2/9)

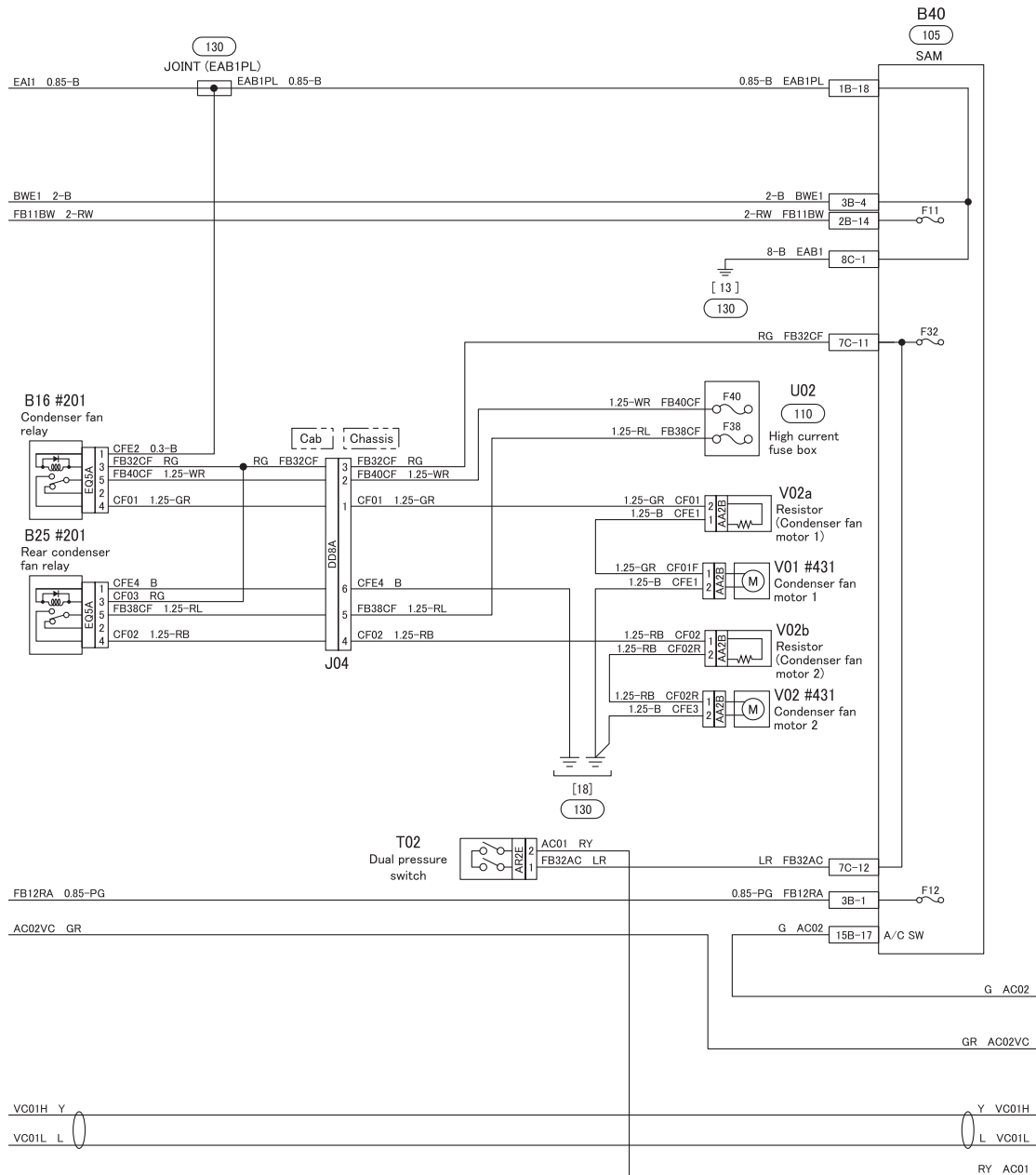


620-300622F-2

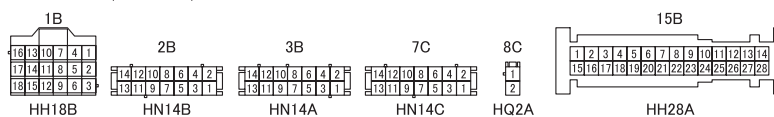


AIR-CONDITIONER CIRCUIT (3)

(3/9)



SAM connector (harness side)

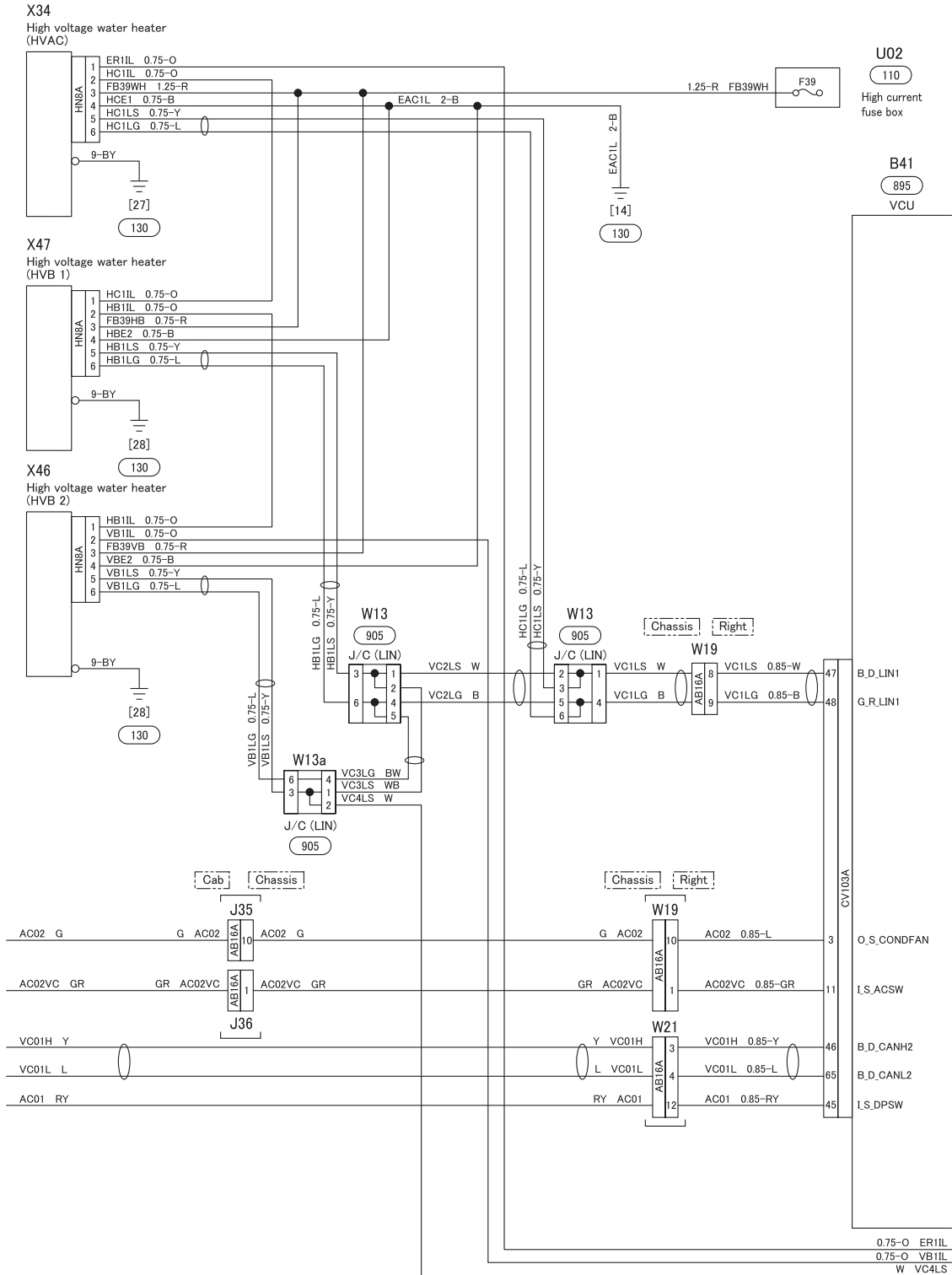


620-300622F-3



AIR-CONDITIONER CIRCUIT (4)

(4/9)

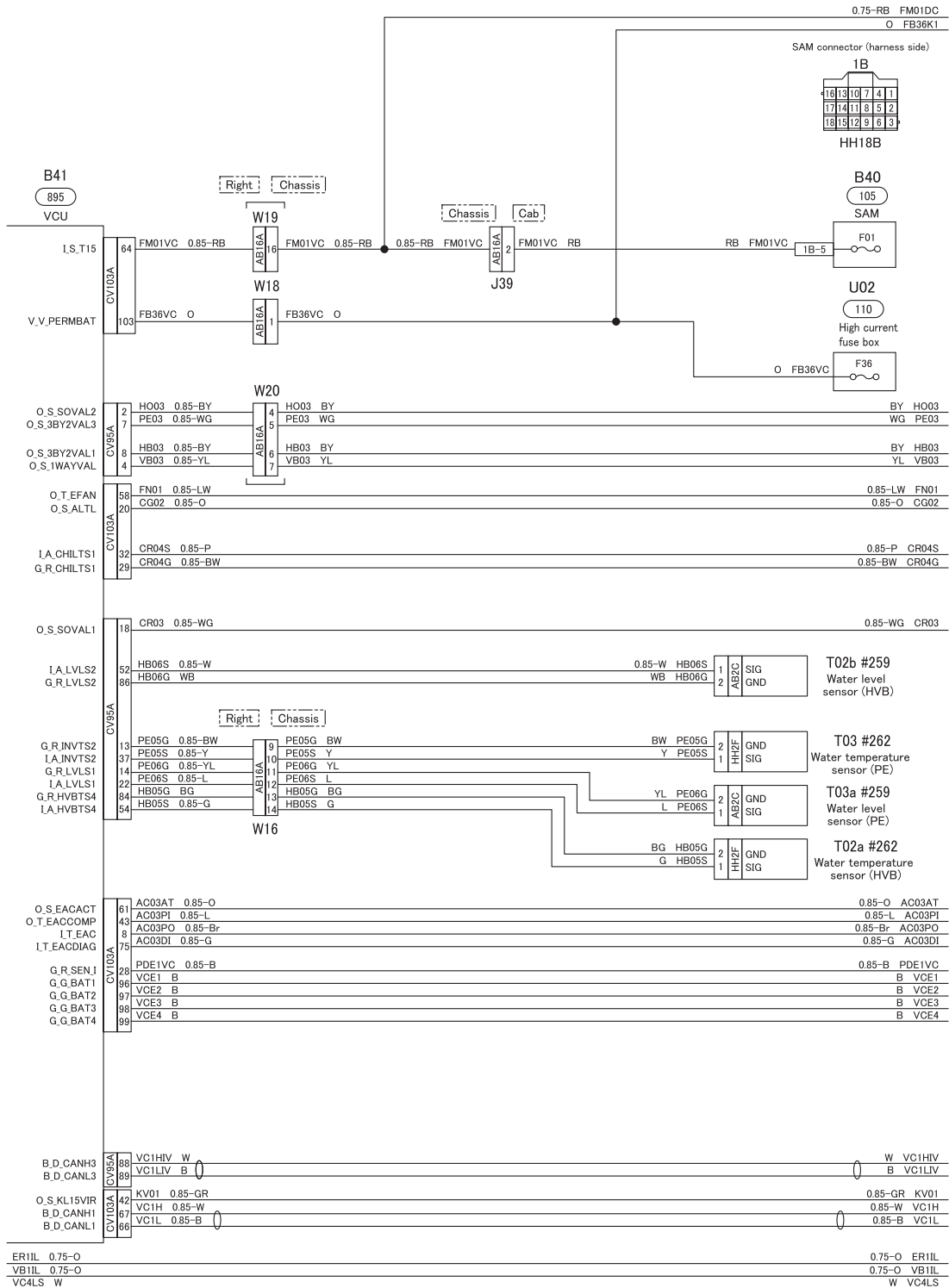


620-300622F-4



AIR-CONDITIONER CIRCUIT (5)

(5/9)

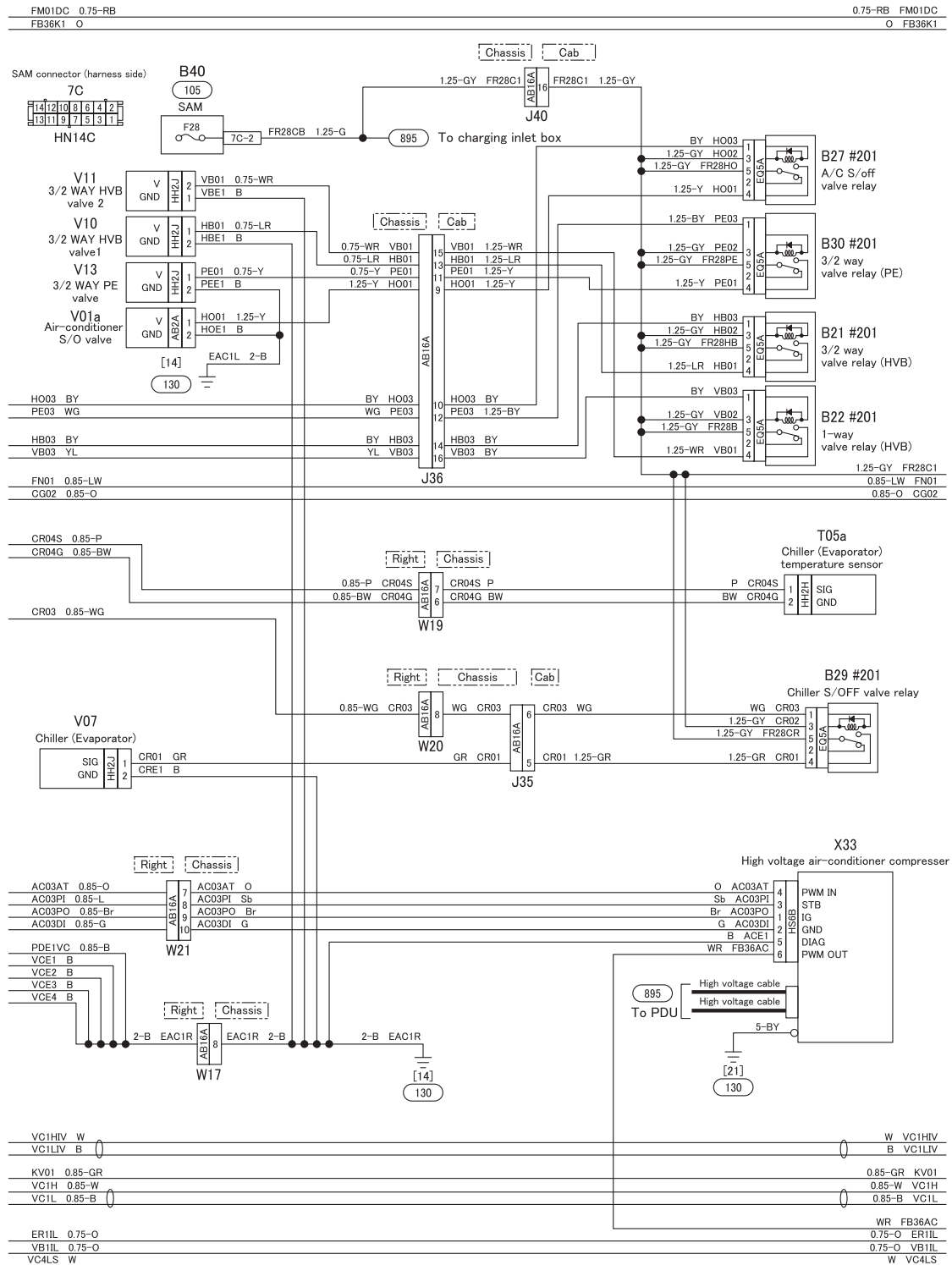


620-300622F-5



AIR-CONDITIONER CIRCUIT (6)

(6/9)

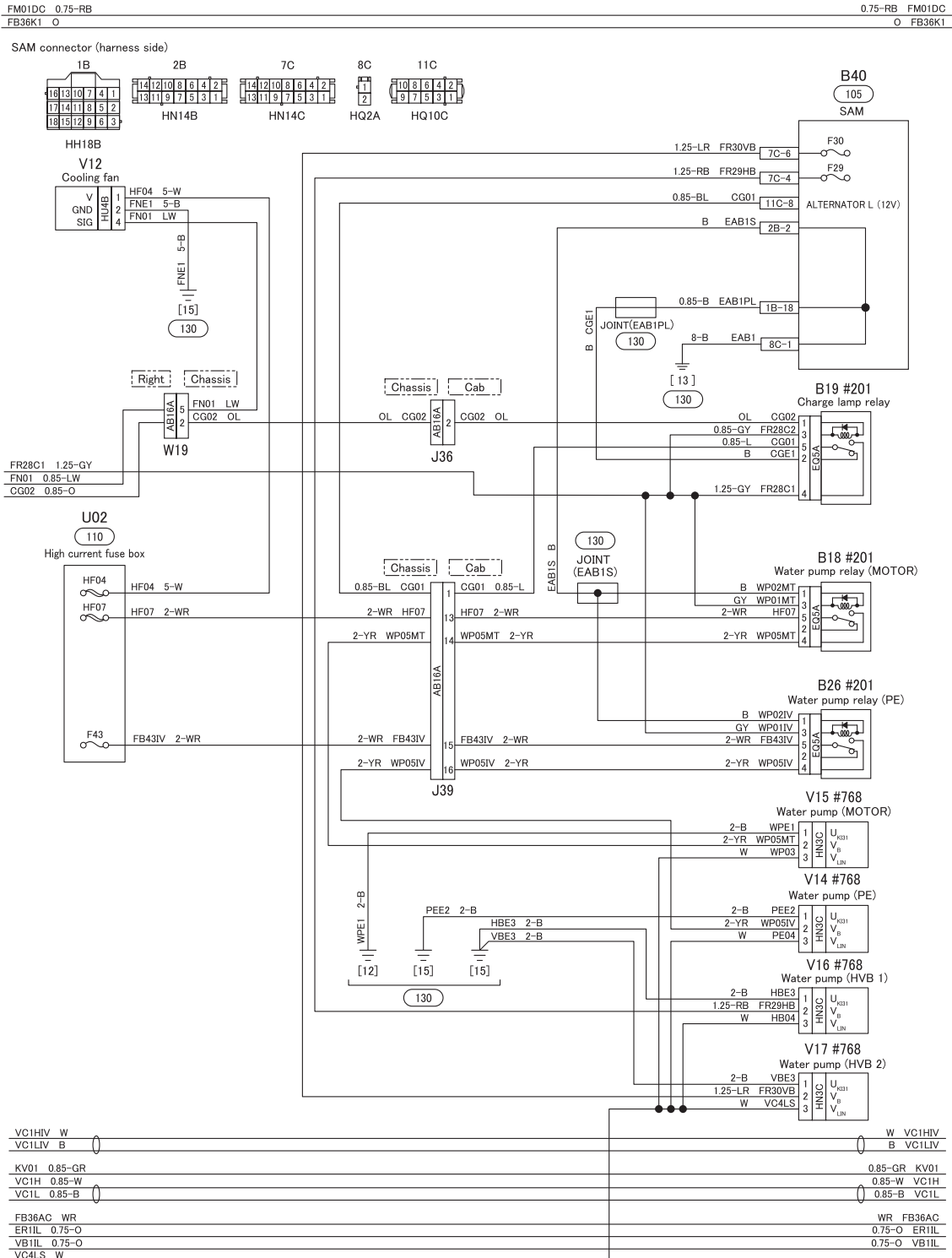


620-300622F-6



AIR-CONDITIONER CIRCUIT (7)

(7/9)

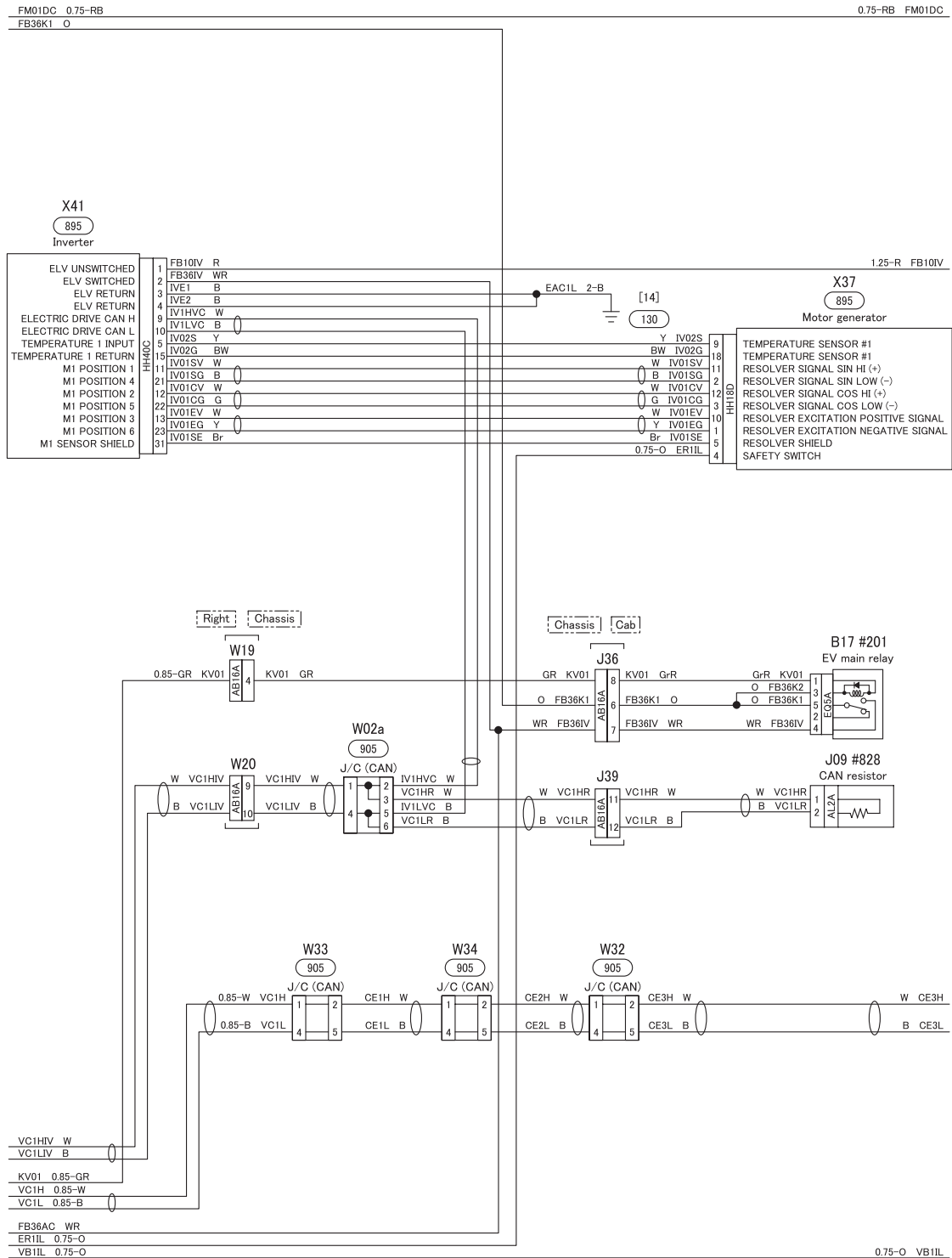


620-300622F-7



AIR-CONDITIONER CIRCUIT (8)

(8/9)

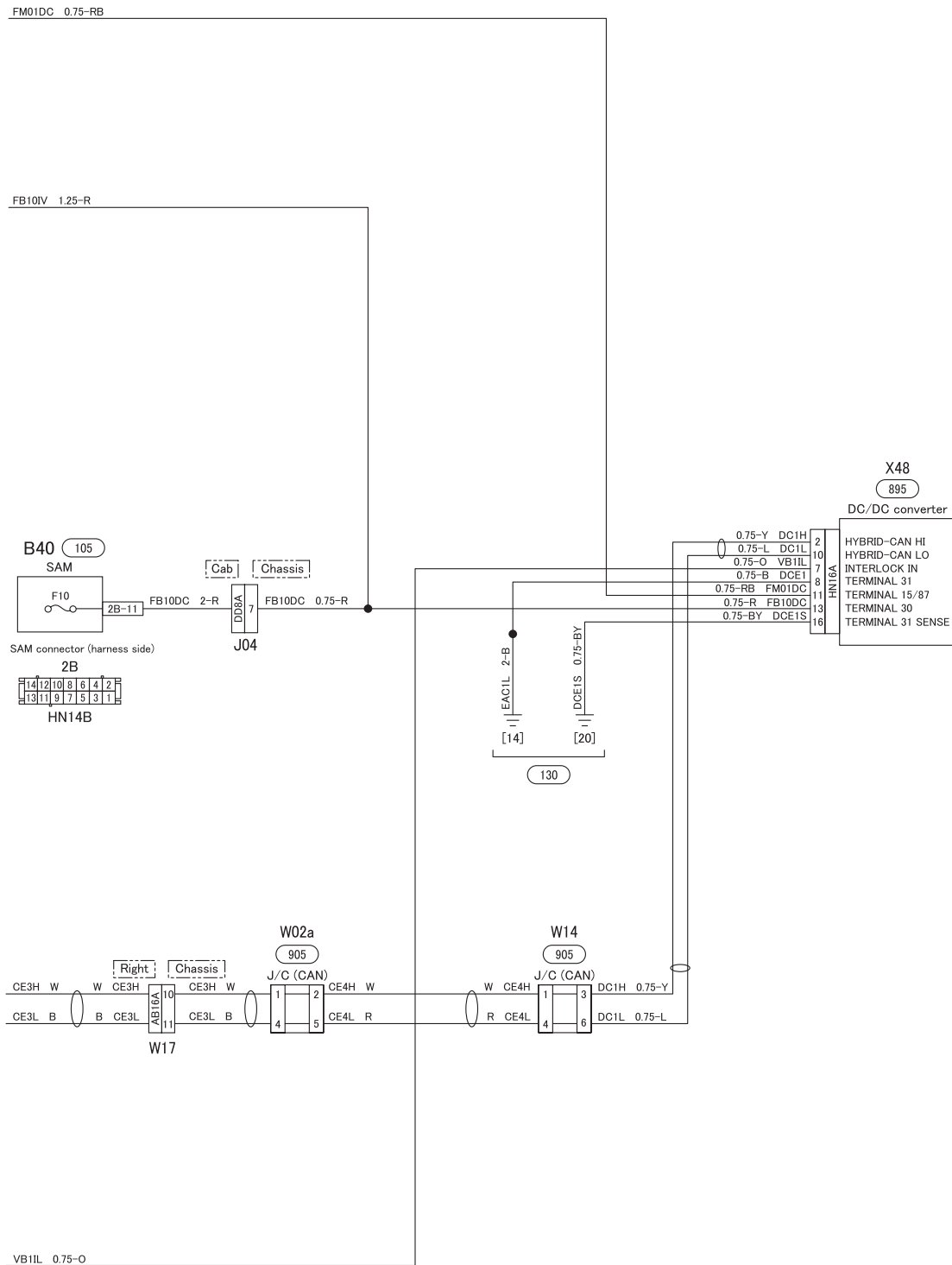


620-300622F-8



AIR-CONDITIONER CIRCUIT (9)

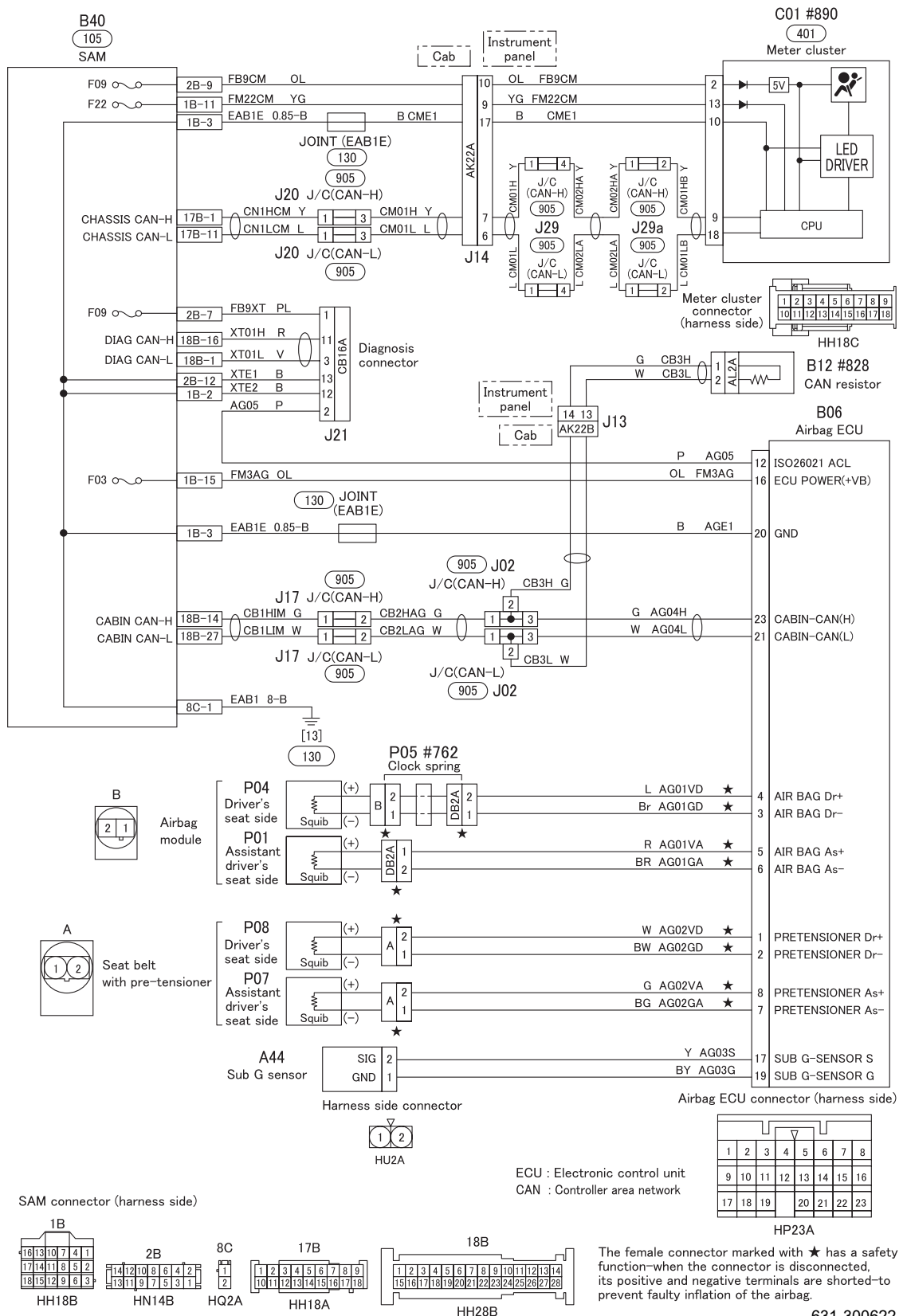
(9/9)



620-300622F-9

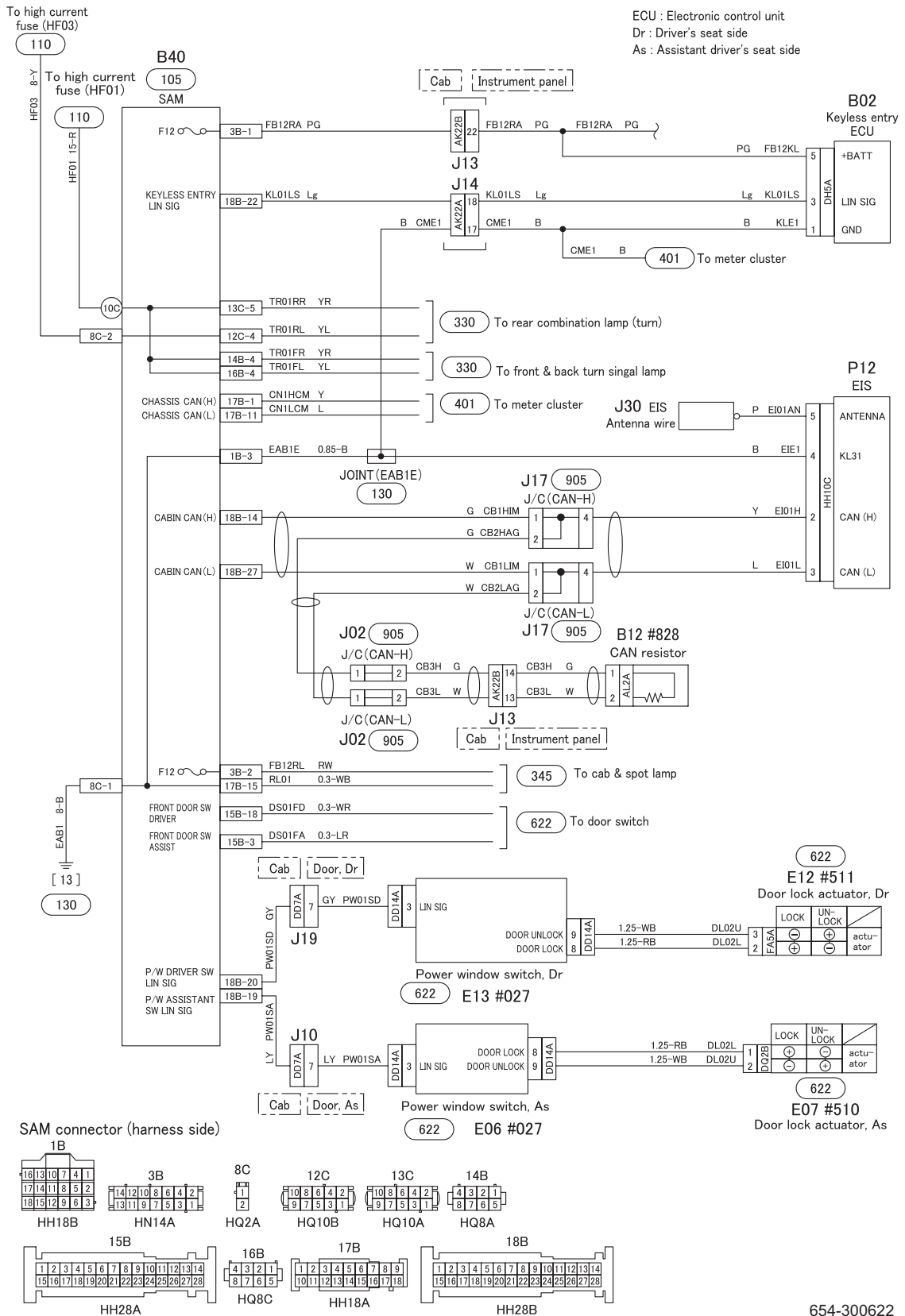


SRS AIRBAG CIRCUIT



631-300622

KEYLESS ENTRY CIRCUIT

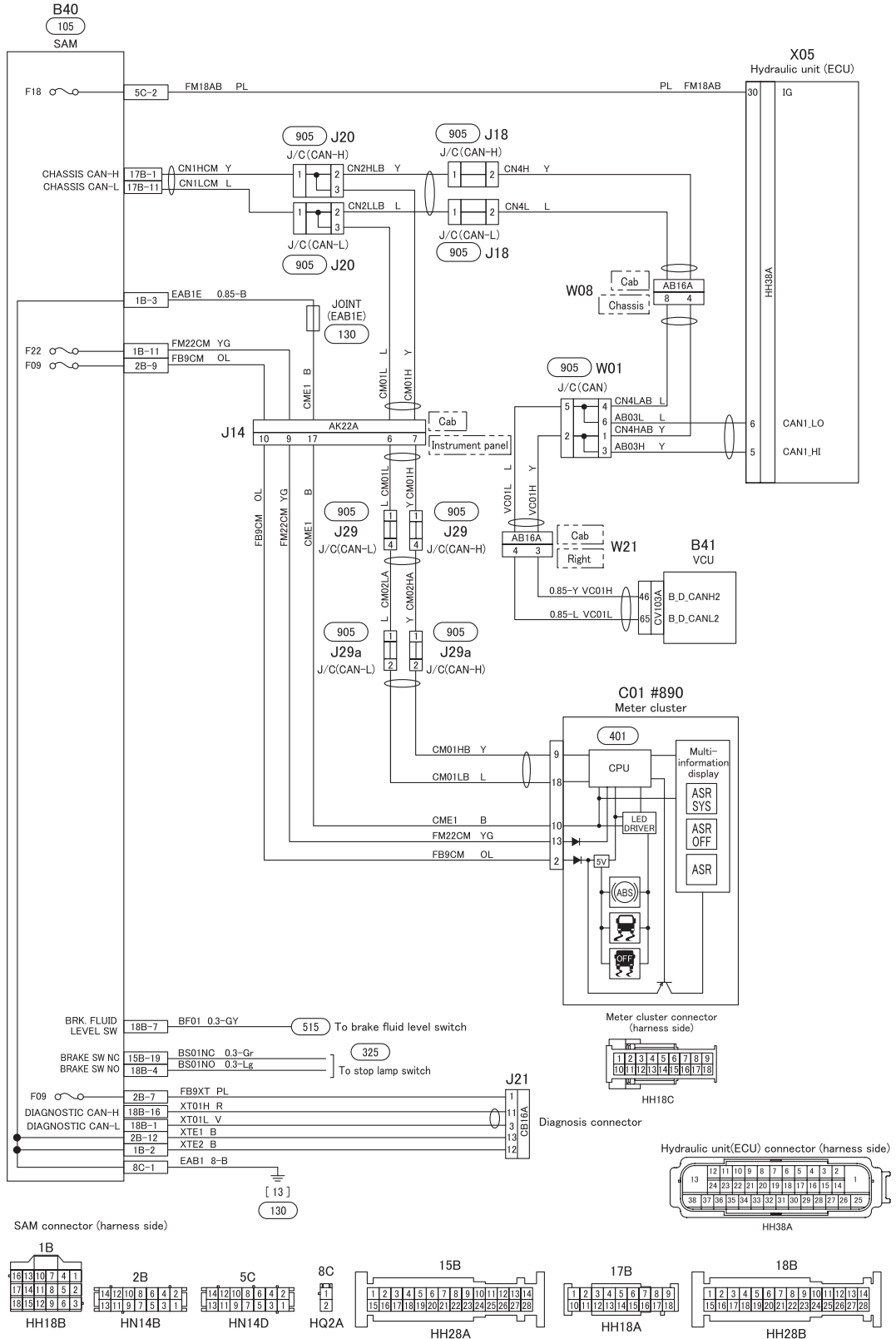


654-300622



ABS CIRCUIT (1)

(1/2)

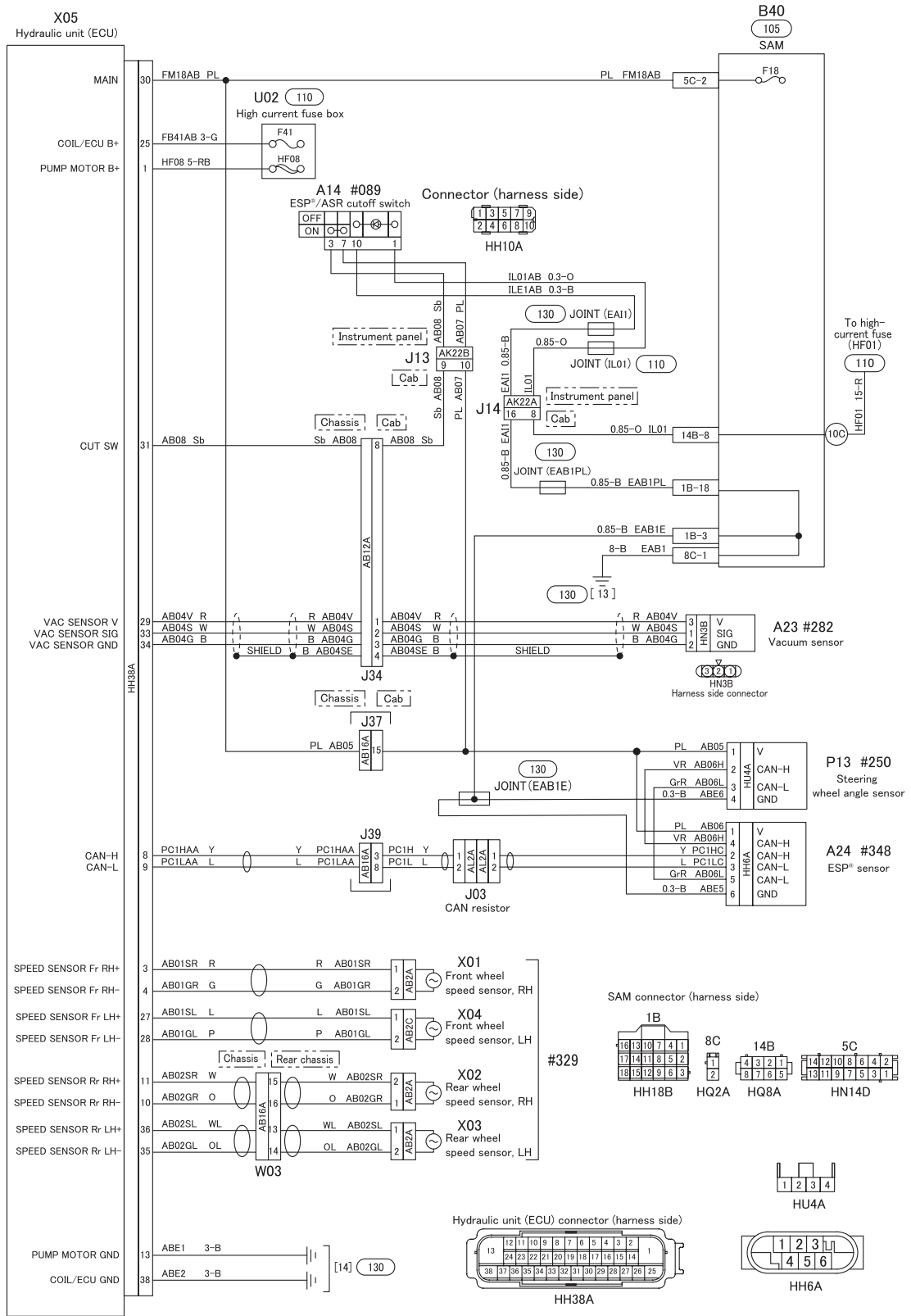


790-300622-1



ABS CIRCUIT (2)

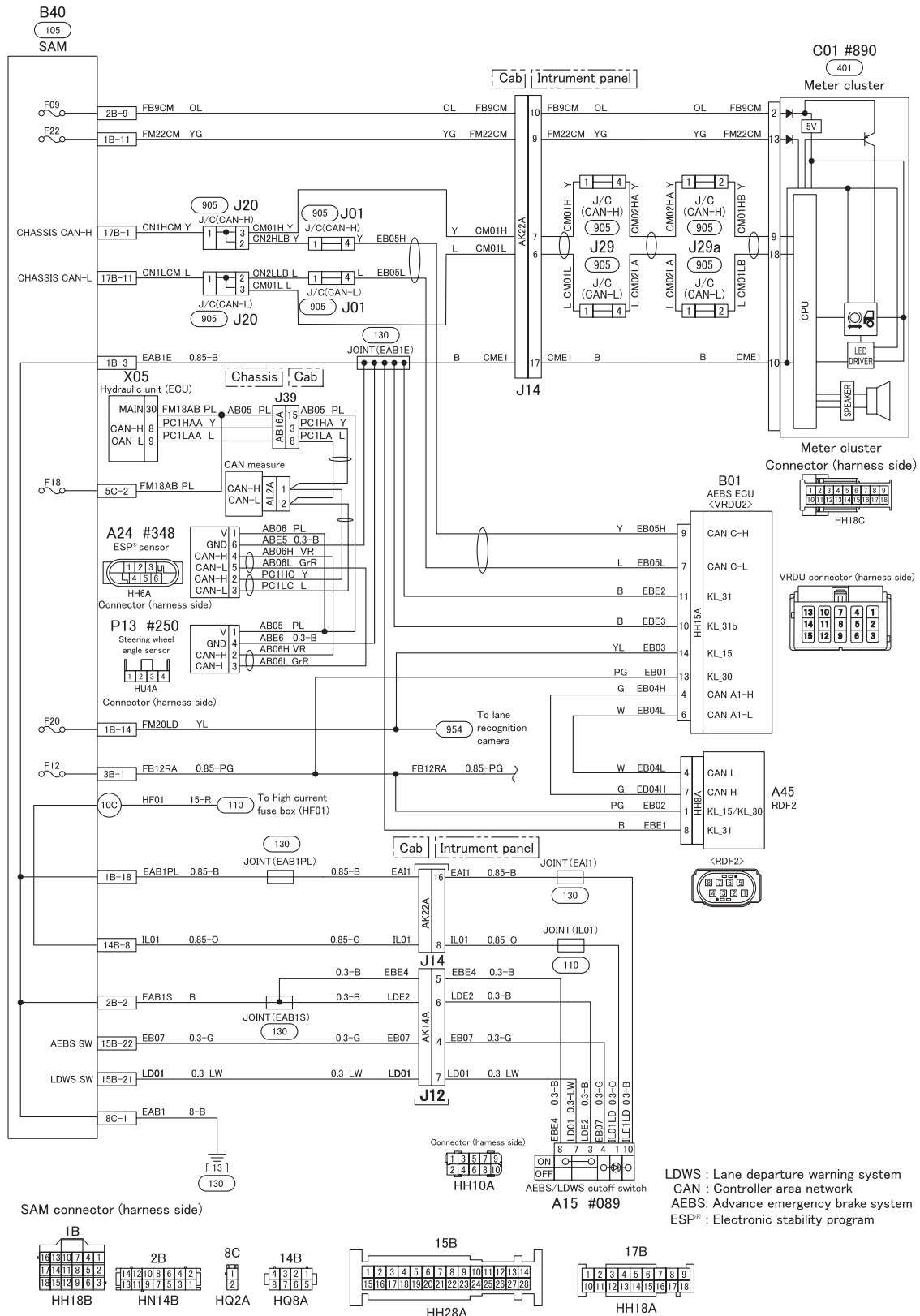
(2/2)



790-300622-2



AEBS CIRCUIT

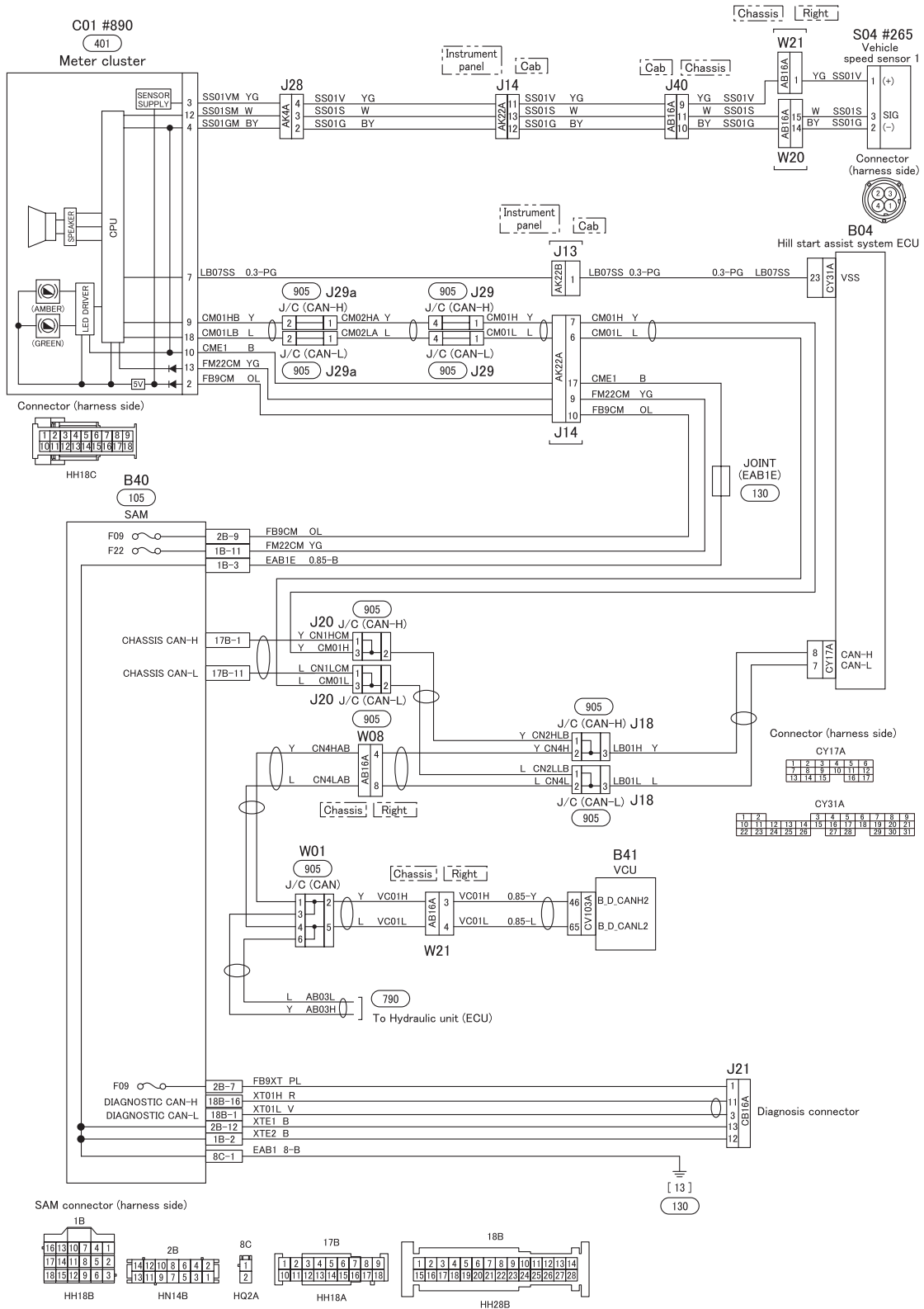


794-300622



HILL START ASSIST SYSTEM CIRCUIT (1)

(1/2)

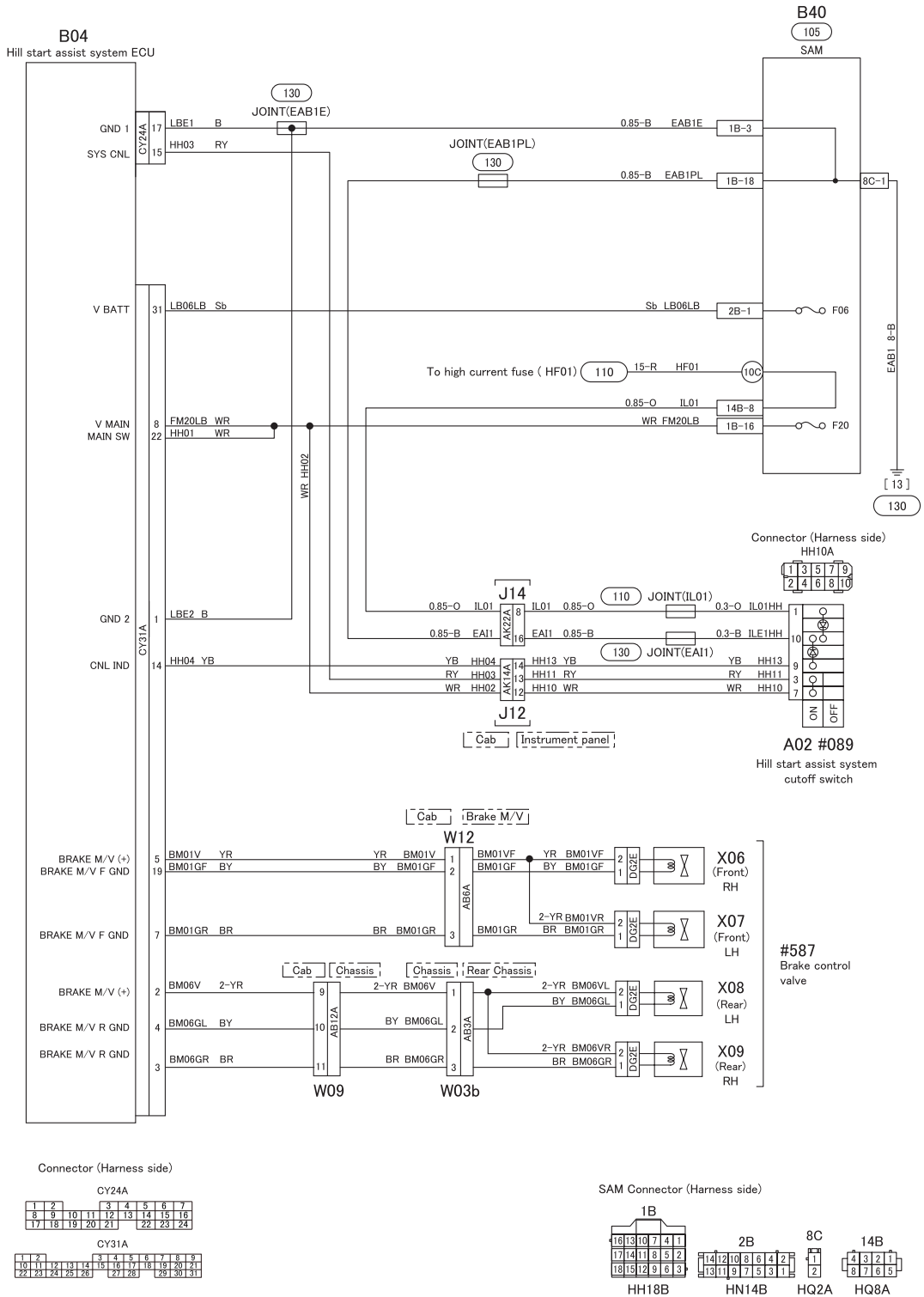


796-300622-1



HILL START ASSIST SYSTEM CIRCUIT (2)

(2/2)

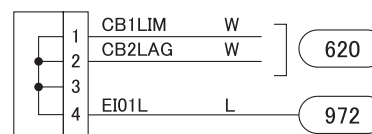
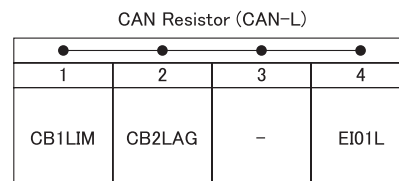
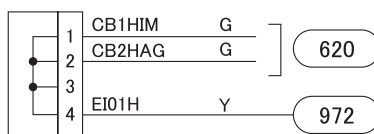
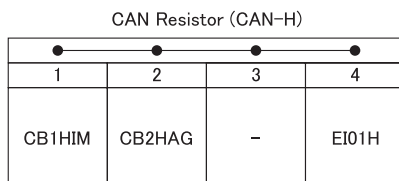
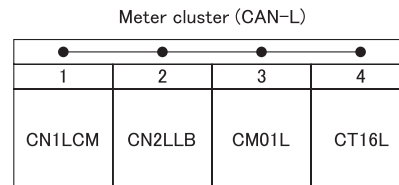
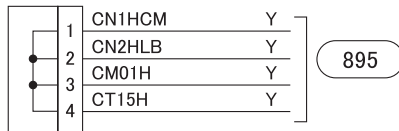
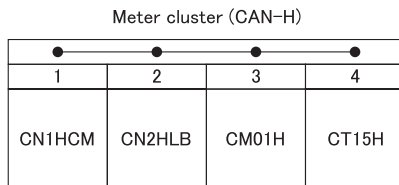
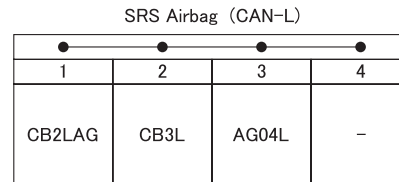
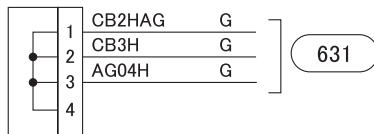
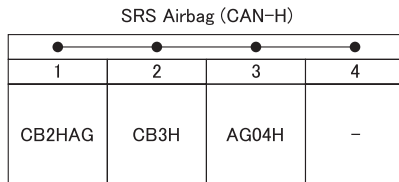


796-300622-2



JOINT CONNECTOR (1)

(1/9)



SRS : Supplemental Restraint System
CAN : Controller Area Network

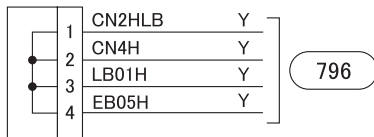
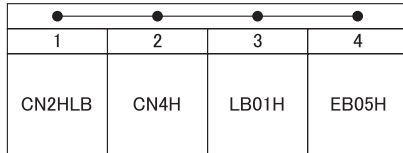
905-300622-1



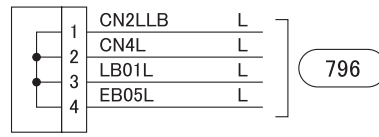
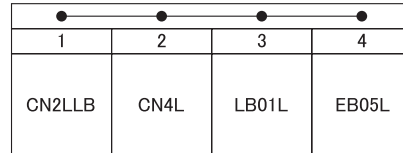
JOINT CONNECTOR (2)

(2/9)

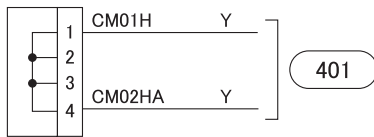
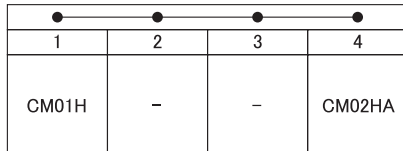
Hill start assist system (CAN -H)



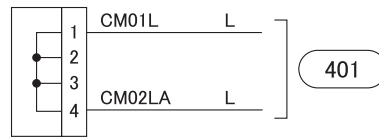
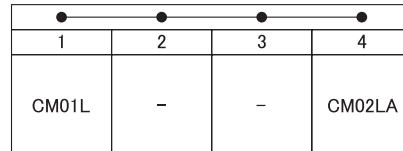
Hill start assist system (CAN -L)



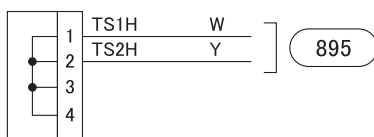
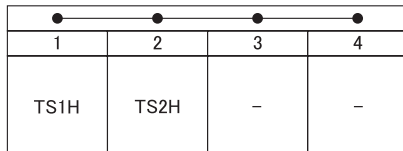
Meter cluster (CAN -H)



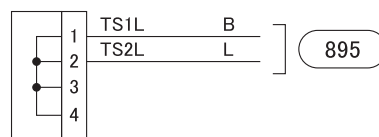
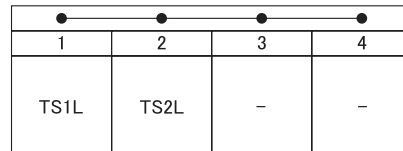
Meter cluster (CAN -L)



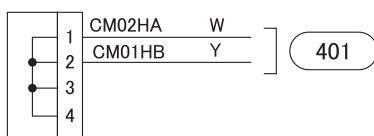
EV CAN (CAN -H)



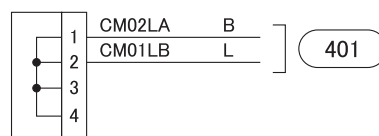
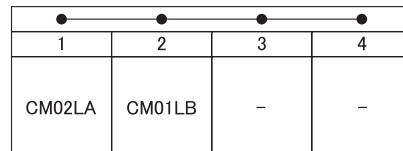
EV CAN (CAN -L)



Meter cluster (CAN -H)



Meter cluster (CAN -L)



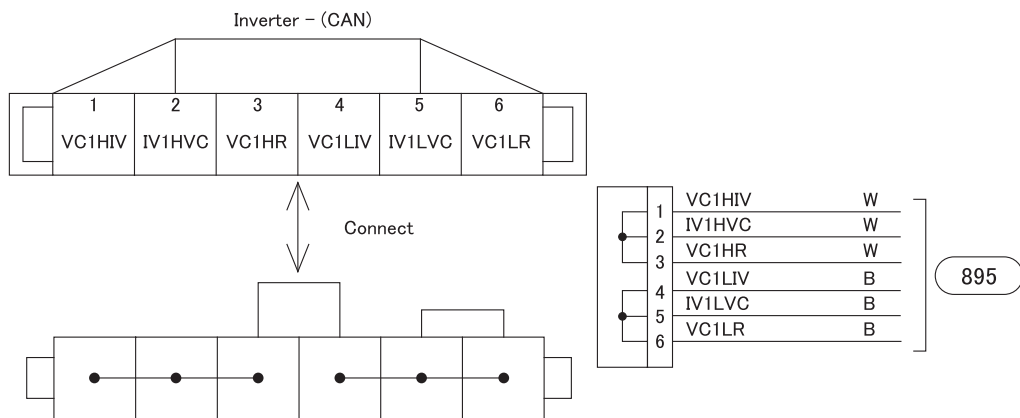
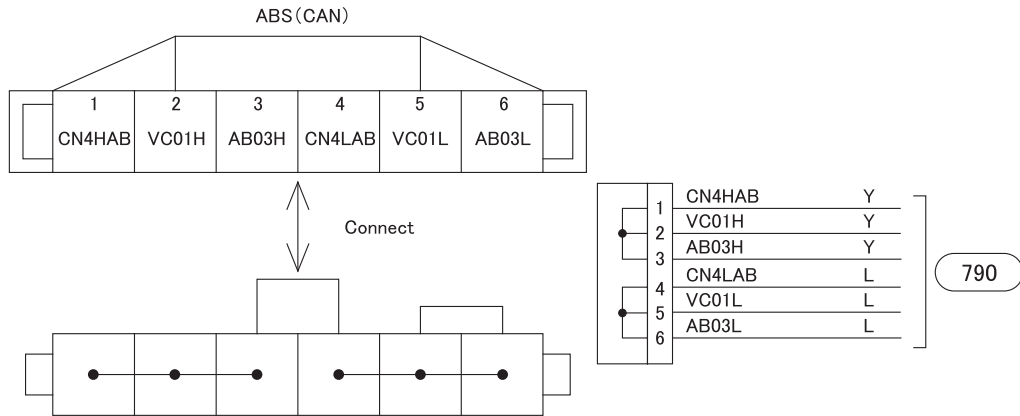
CAN : Controller Area Network

905-300622-2



JOINT CONNECTOR (3)

(3/9)



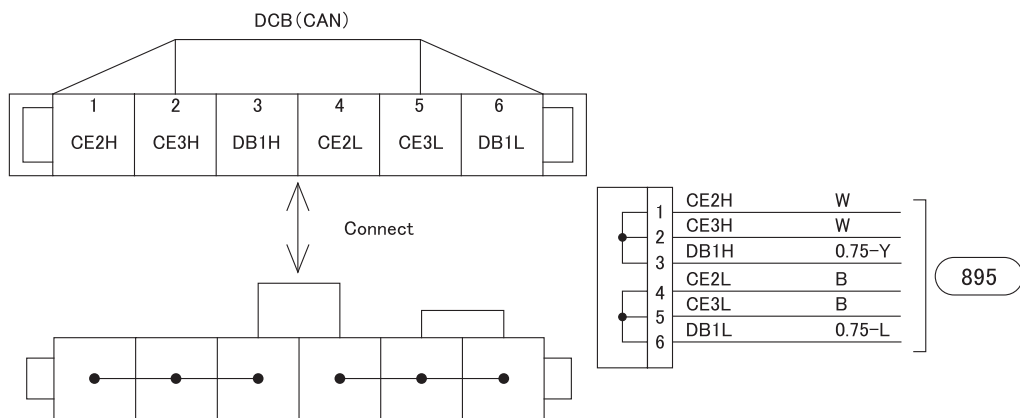
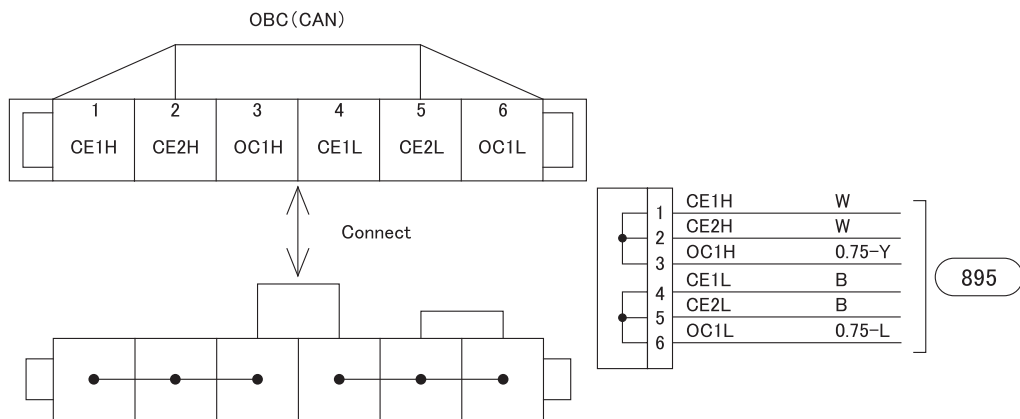
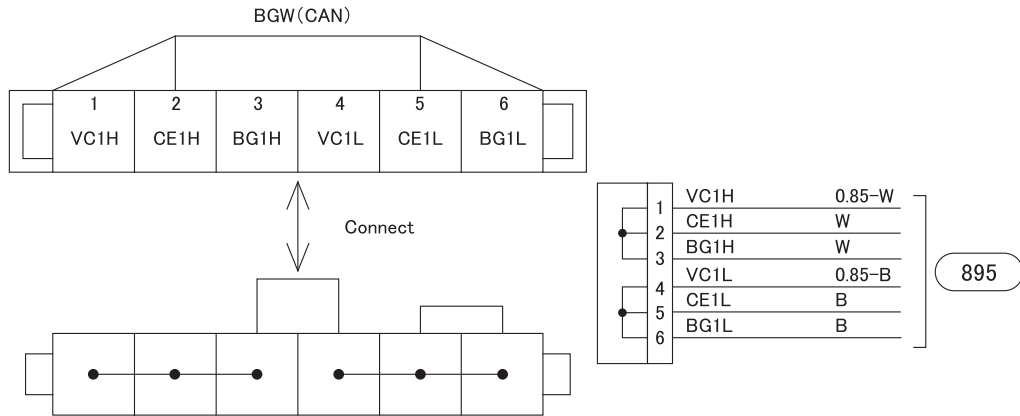
ABS : Anti-lock brake system
 CAN : Controller Area Network

905-300622-3



JOINT CONNECTOR (4)

(4/9)



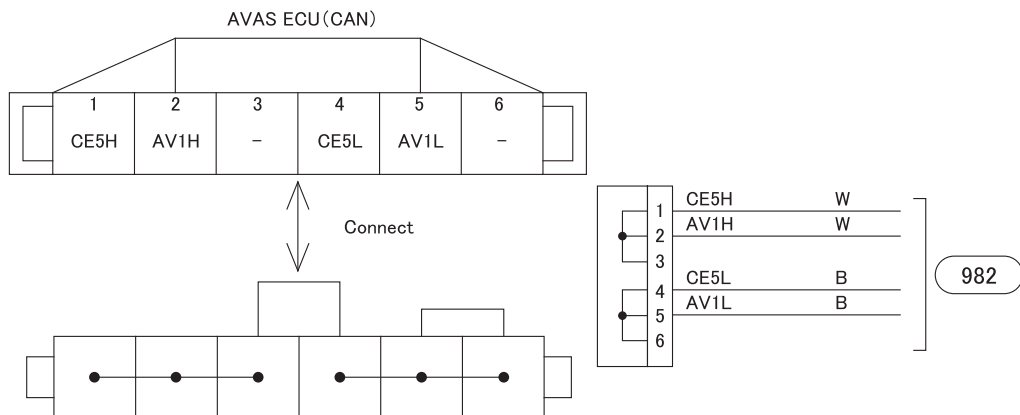
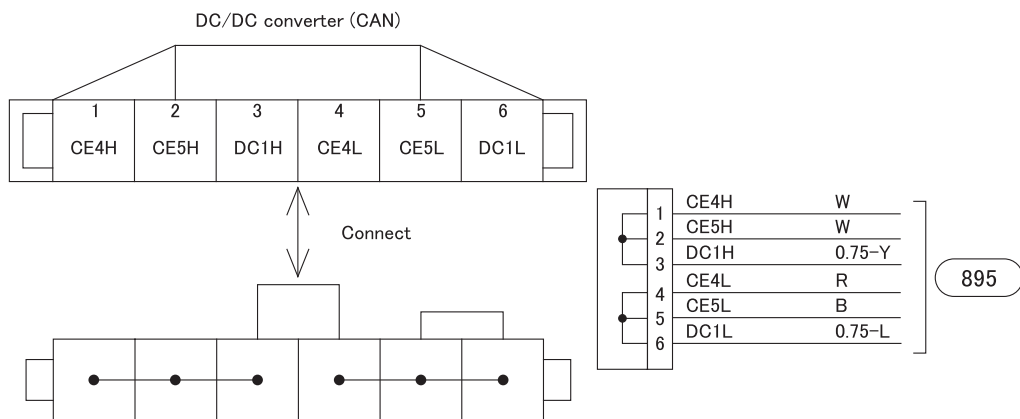
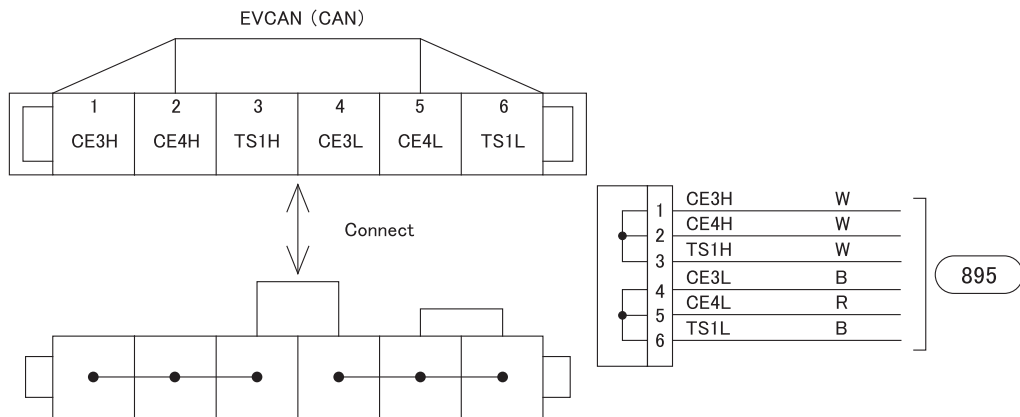
CAN : Controller Area Network

905-300622-4



JOINT CONNECTOR (5)

(5/9)



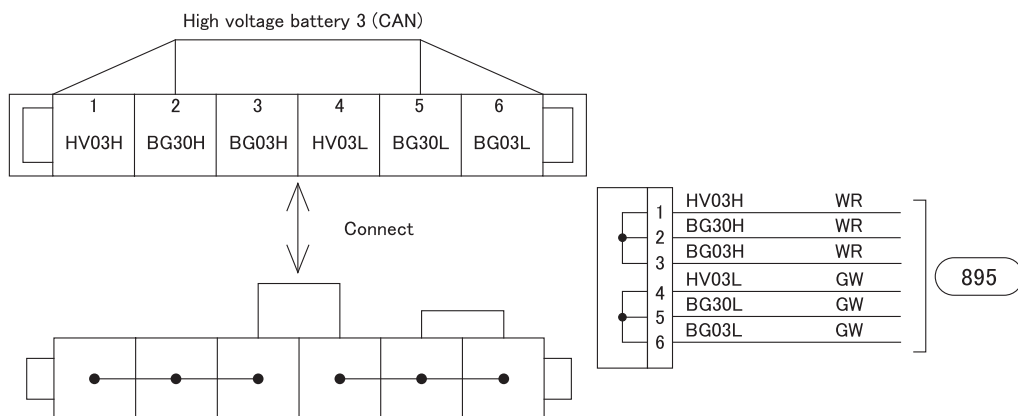
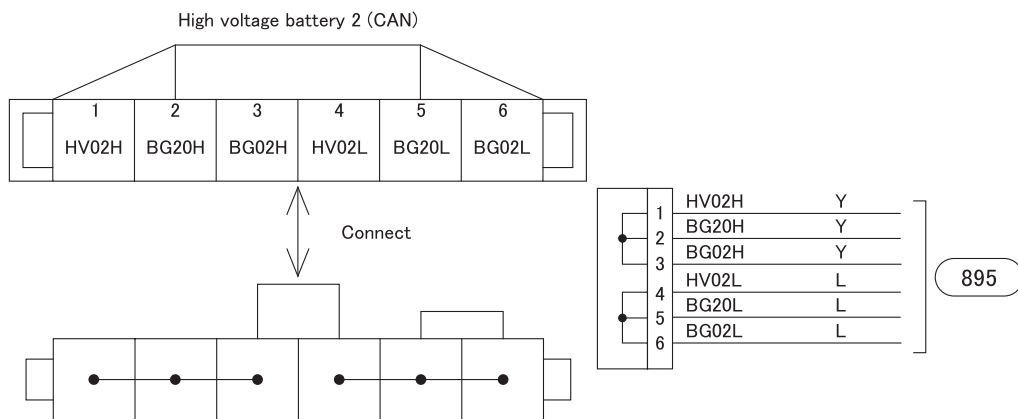
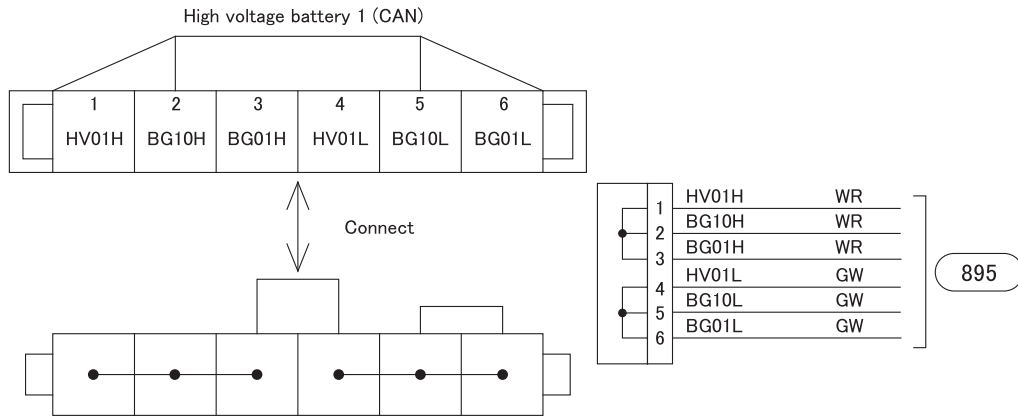
CAN : Controller Area Network

905-300622-5



JOINT CONNECTOR (6)

(6/9)



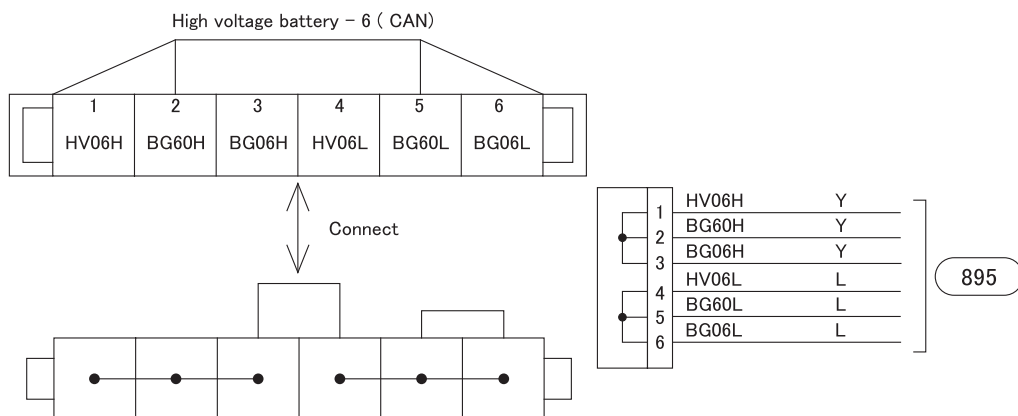
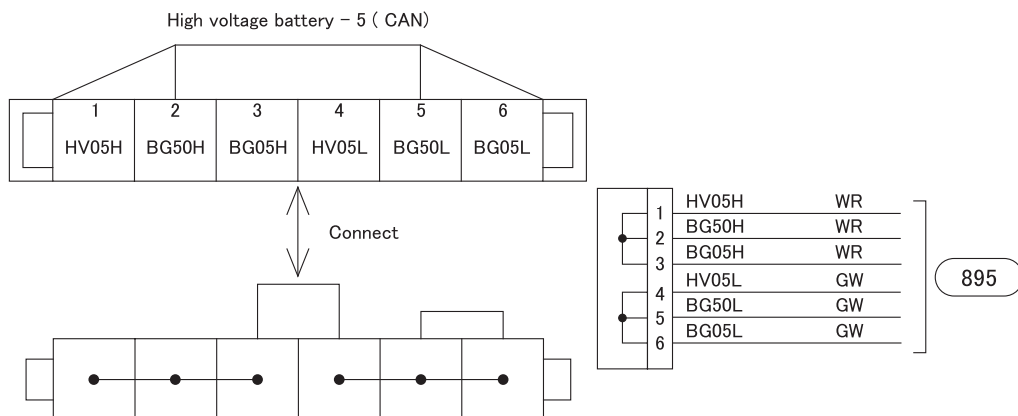
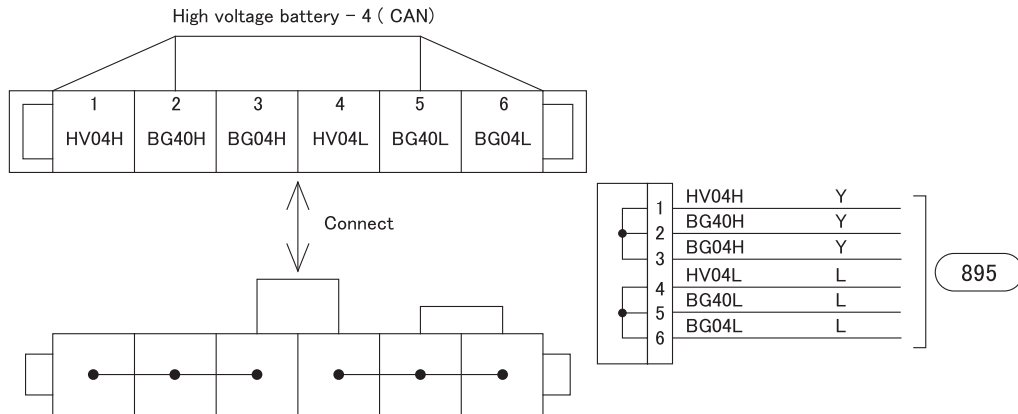
CAN : Controller Area Network

905-300622-6



JOINT CONNECTOR (7)

(7/9)



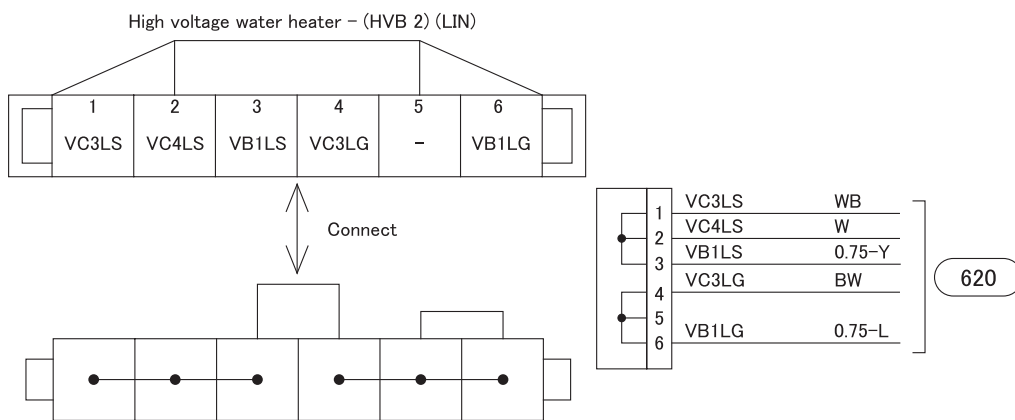
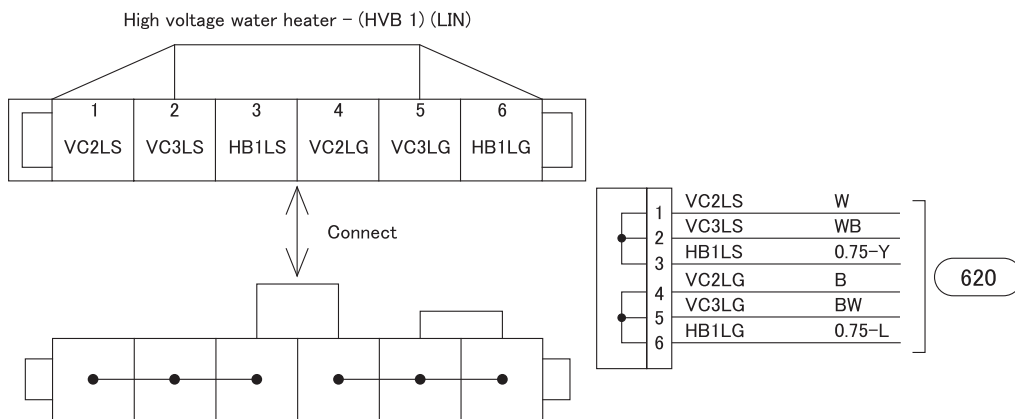
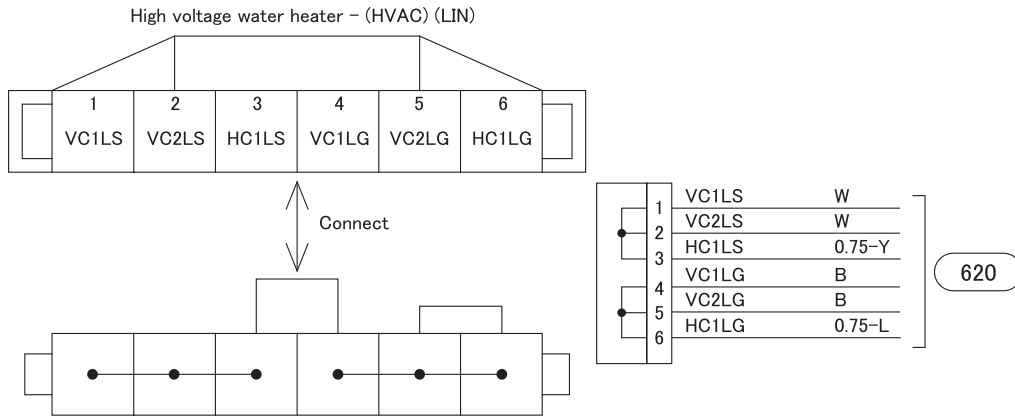
CAN : Controller Area Network

905-300622-7



JOINT CONNECTOR (8)

(8/9)



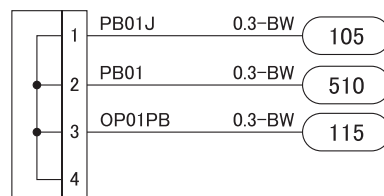
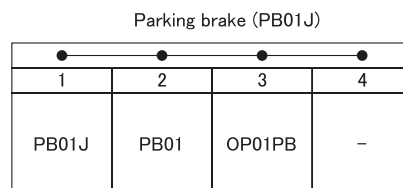
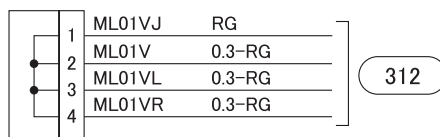
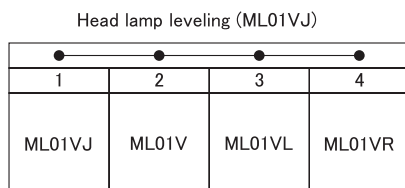
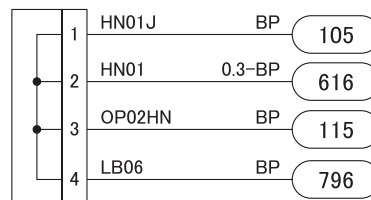
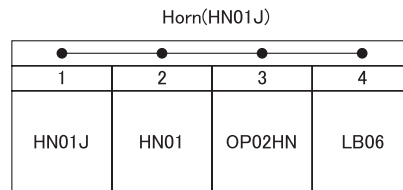
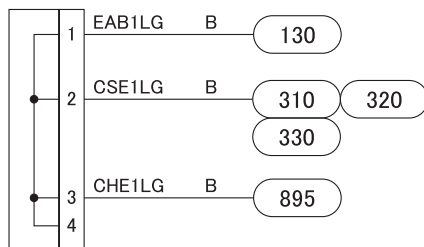
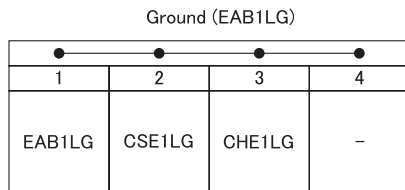
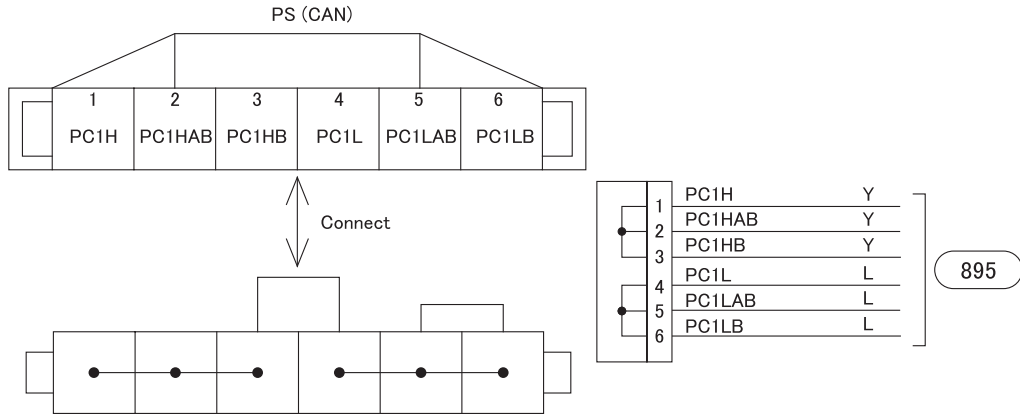
CAN : Controller Area Network

905-300622-8



JOINT CONNECTOR (9)

(9/9)

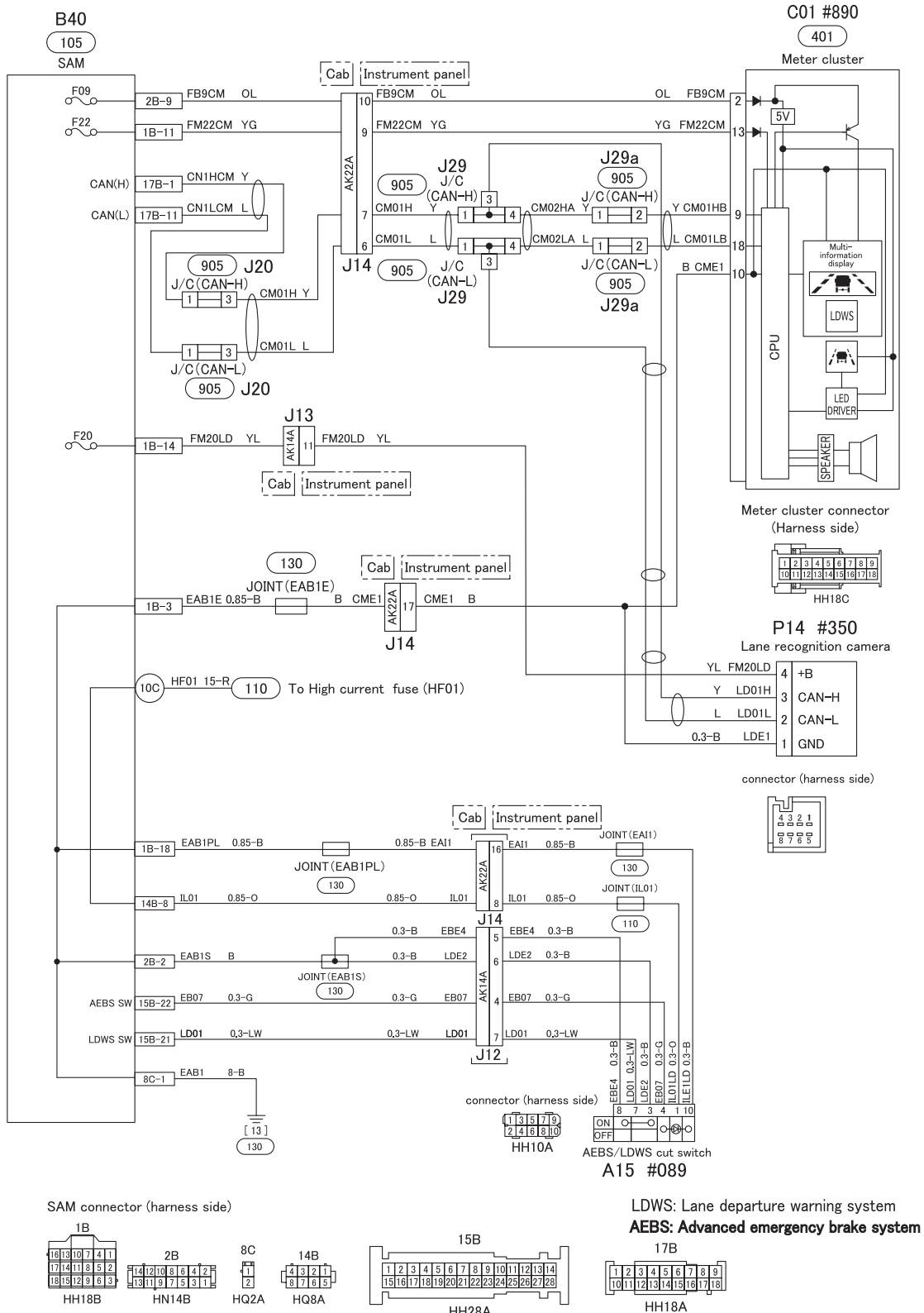


CAN : Controller Area Network

905-300622-9



LDWS CIRCUIT



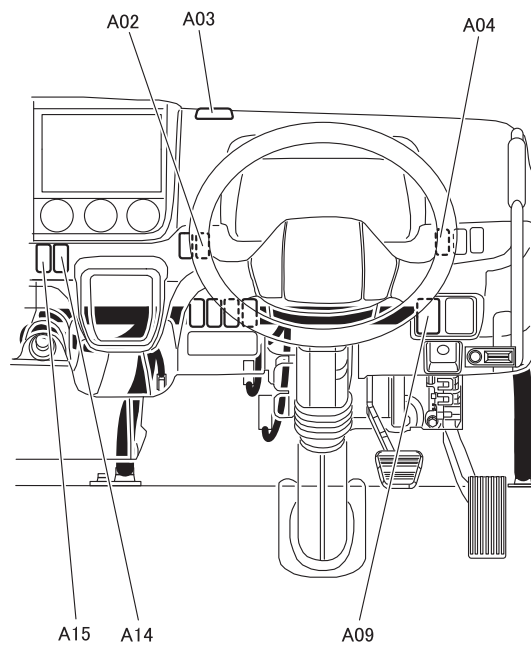
954-300622



INSIDE CAB LAYOUT

SWITCH AND SENSOR (1)

A02-15(Switch)



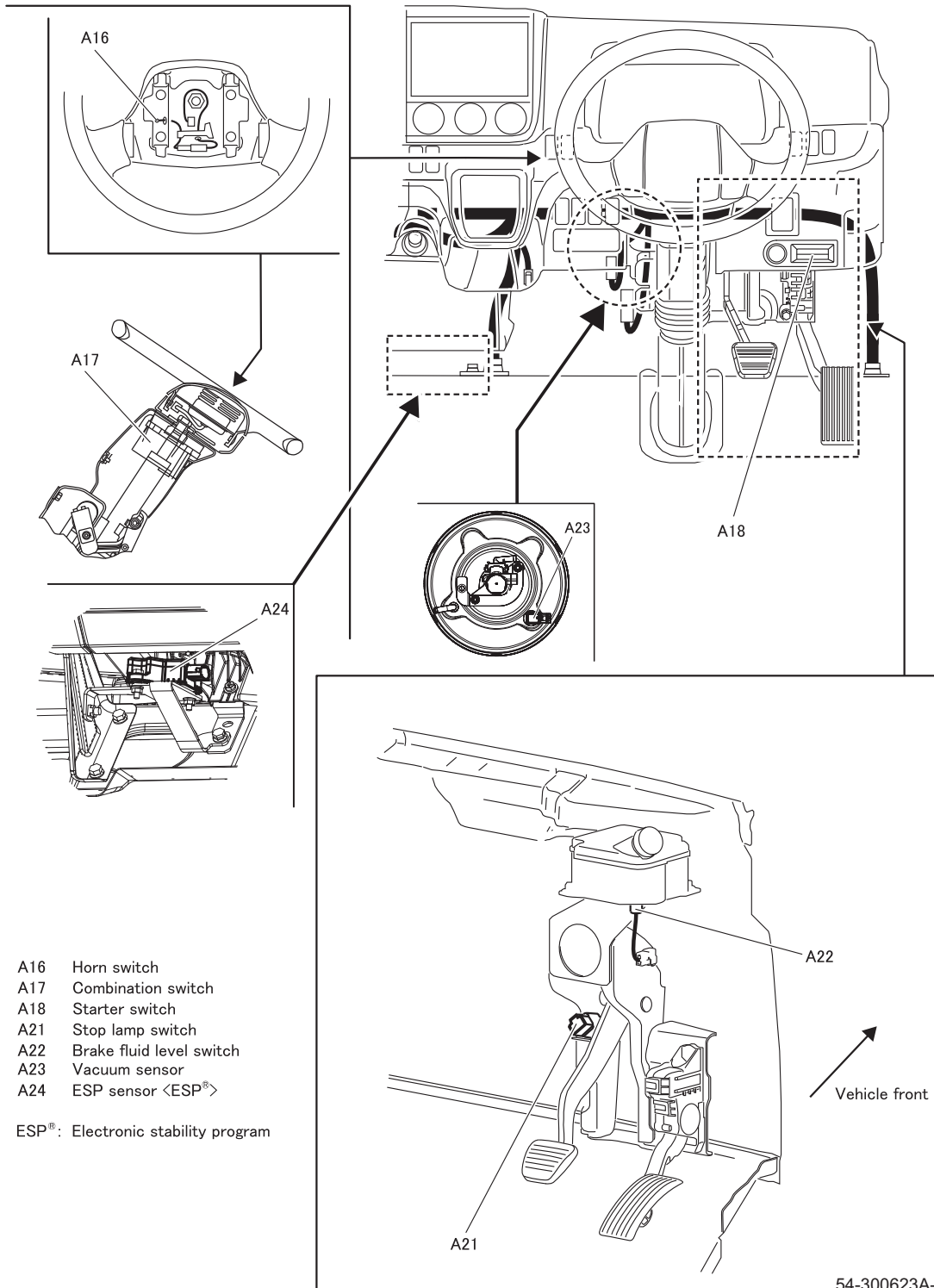
- A02 Hill start assist system cutoff switch
- A03 Hazard switch
- A04 Front fog lamp switch
- A09 Headlamp leveling switch
- A14 ESP®/ASR cutoff switch
- A15 AEBS/LDWS cutoff switch

ASR : Anti-spin regulator
ESP® : Electronic stability program
LDWS : Lane departure warning system
AEBS : Advanced emergency brake system

54-300623A-1

SWITCH AND SENSOR (2)

A16-24(Switch)

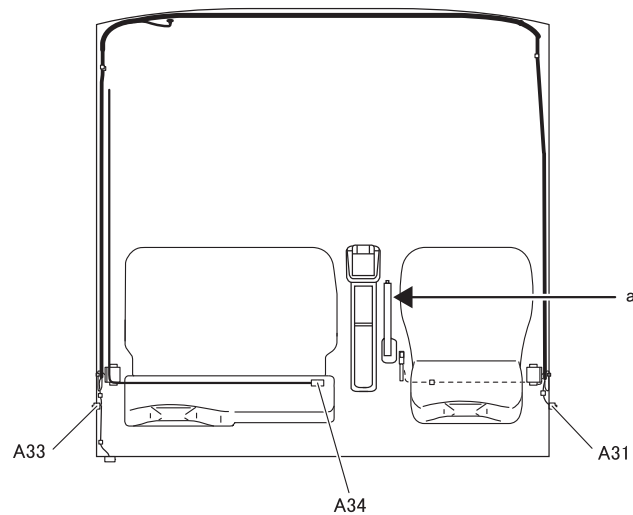


54-300623A-2



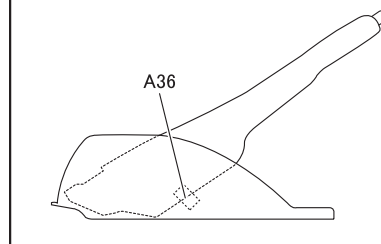
SWITCH AND SENSOR (3)

A31-36(Switch)



(View a)

<Parking brake lever>



- A31 Door switch, Dr
- A33 Door switch, As
- A34 EV system reset switch (Normal close)
- A36 Parking brake switch

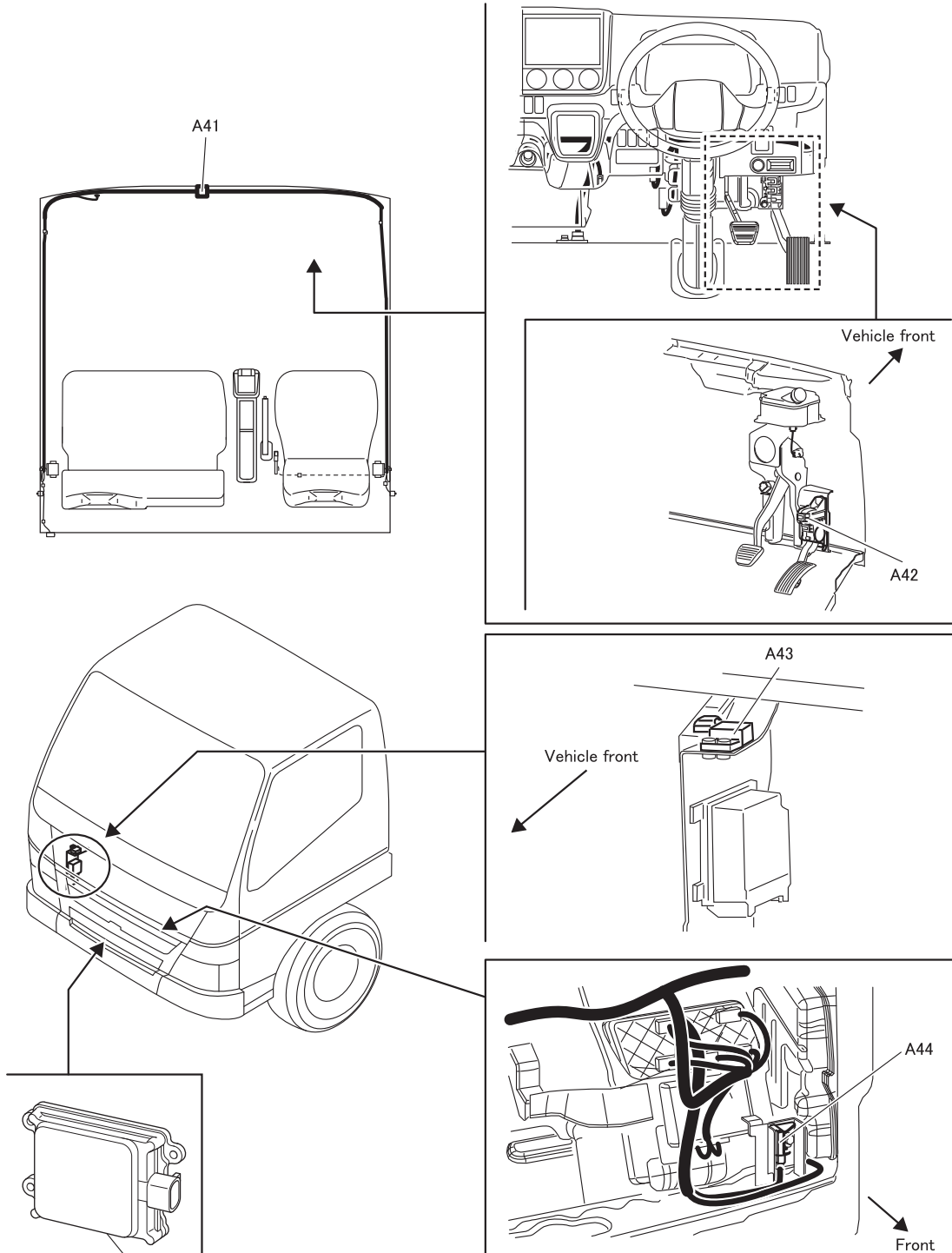
Dr : Driver's seat side

As : Assistant driver's seat side

54-300623A-3

SWITCH AND SENSOR (4)

A41-45(Sensor)

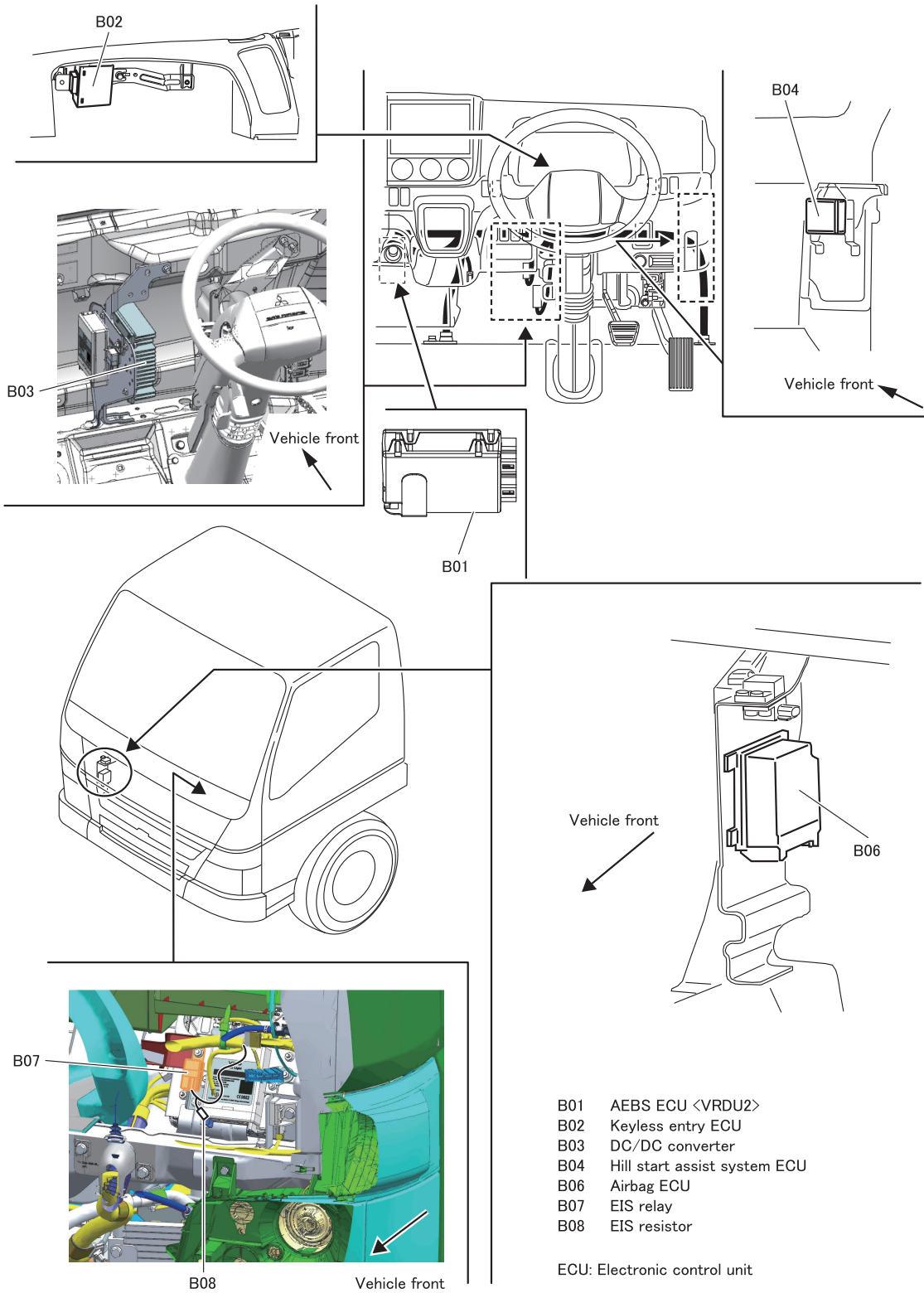


- A41 Photo sensor <Full auto air-conditioner>
- A42 Accelerator position sensor
- A43 G (sensor)
- A44 Sub G sensor
- A45 RDF2

54-300623A-4

RELAY AND ELECTRONIC CONTROL UNIT (1)

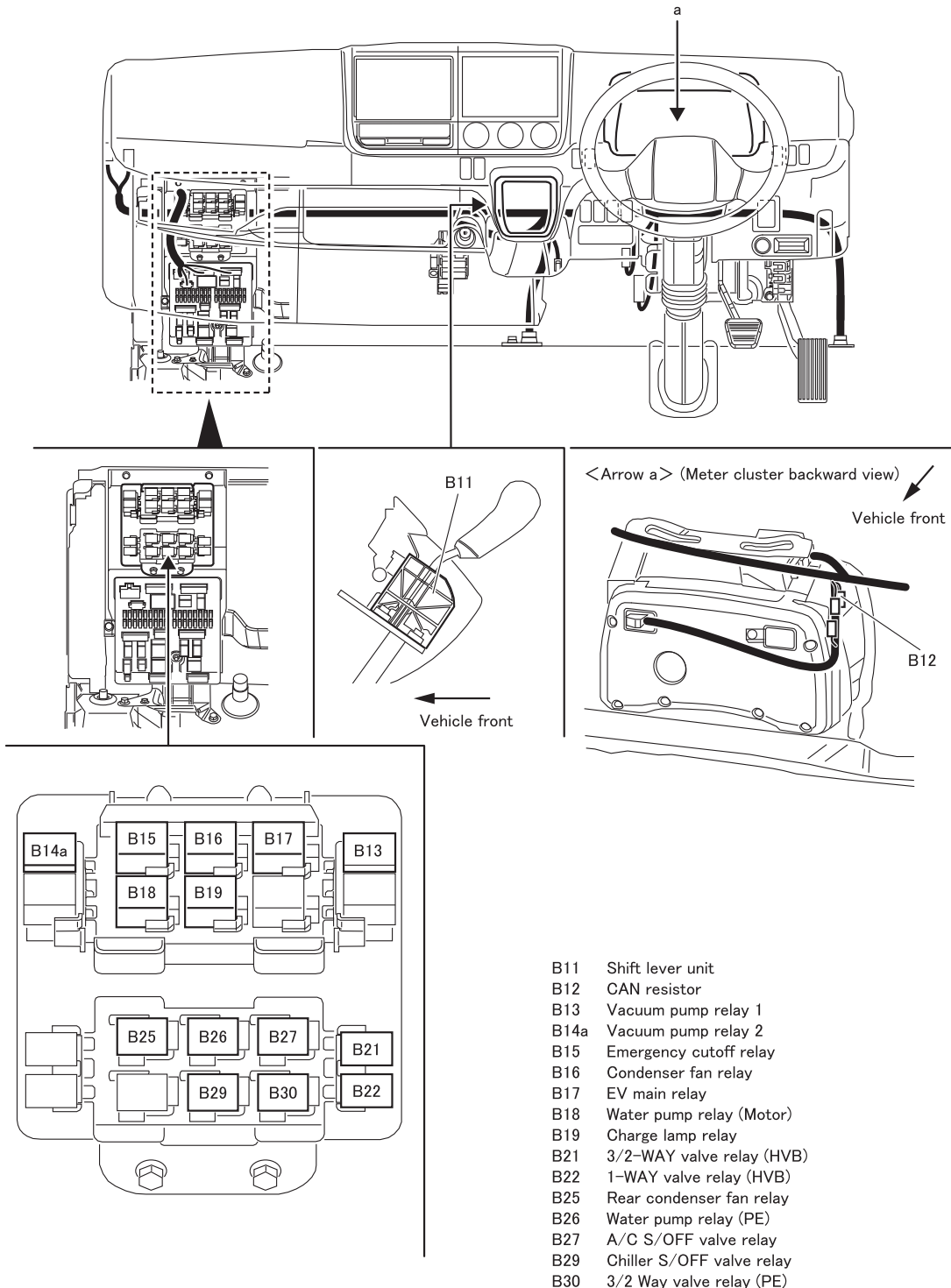
B01-08



54-300623B-1

RELAY AND ELECTRONIC CONTROL UNIT (2)

B11-30

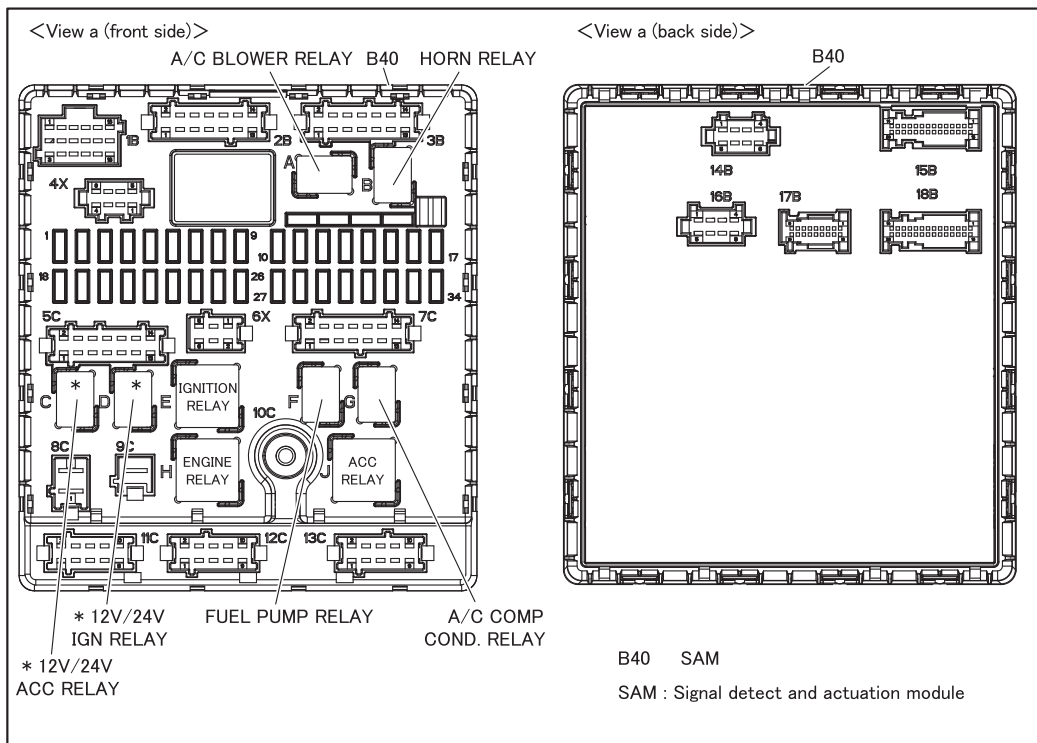
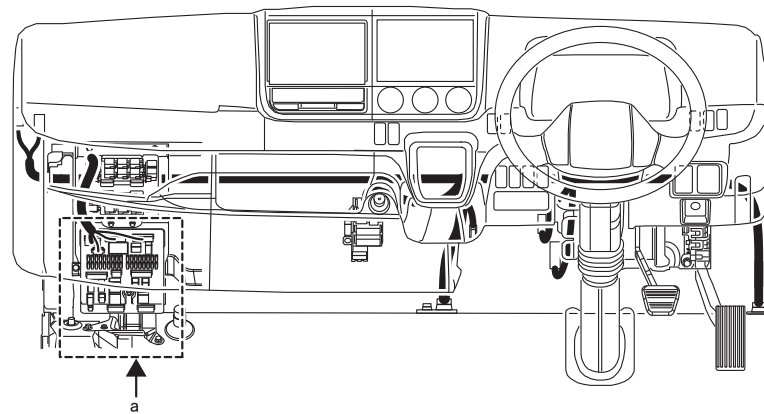


54-300623B-2



RELAY AND ELECTRONIC CONTROL UNIT (3)

B40

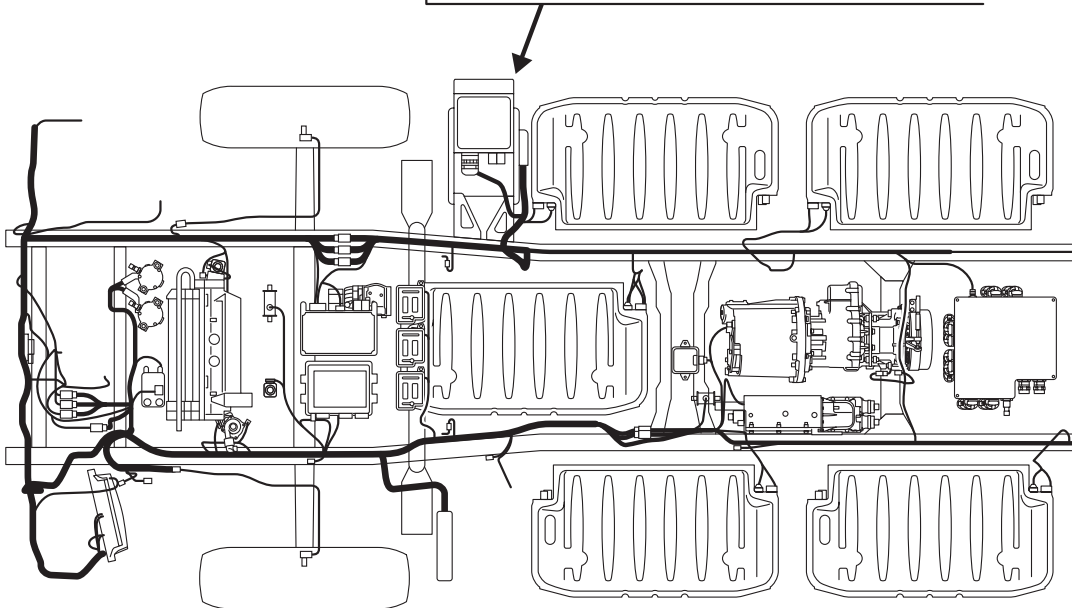
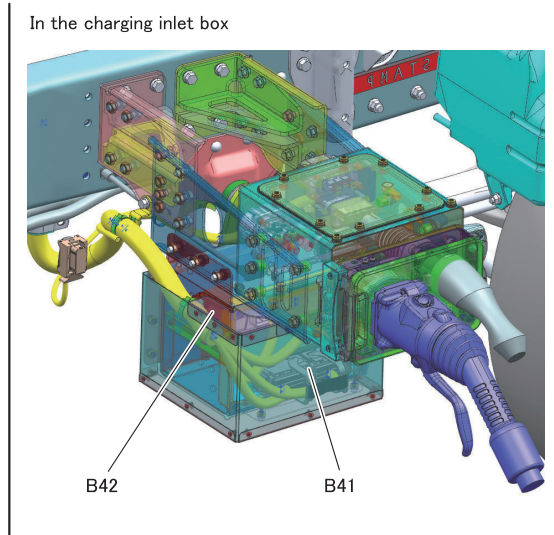


54-300623B-3



RELAY AND ELECTRONIC CONTROL UNIT (4)

B41-B42



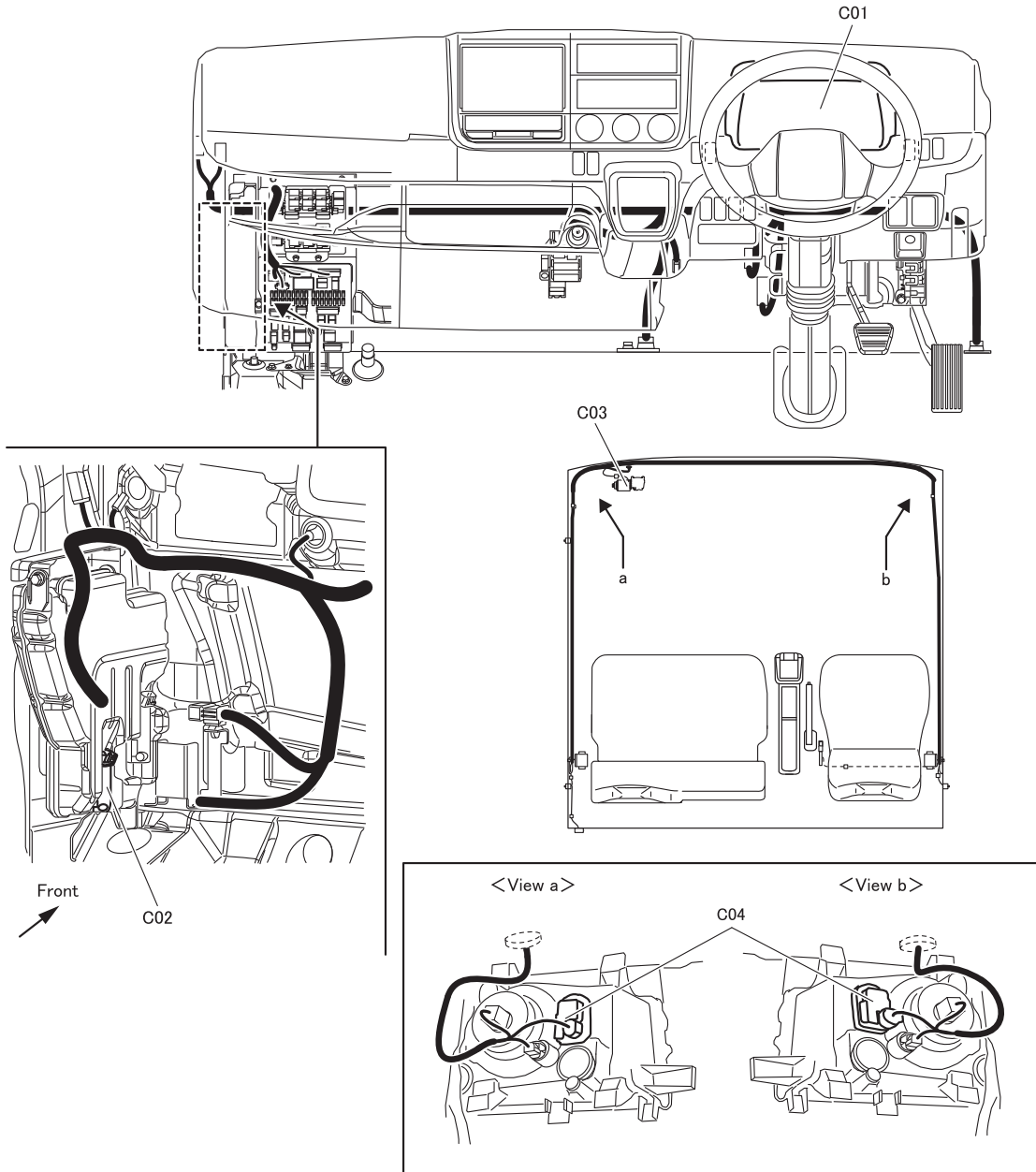
B41 VCU
B42 BGW

54-300623B-4



METER AND MOTOR

C01-C04



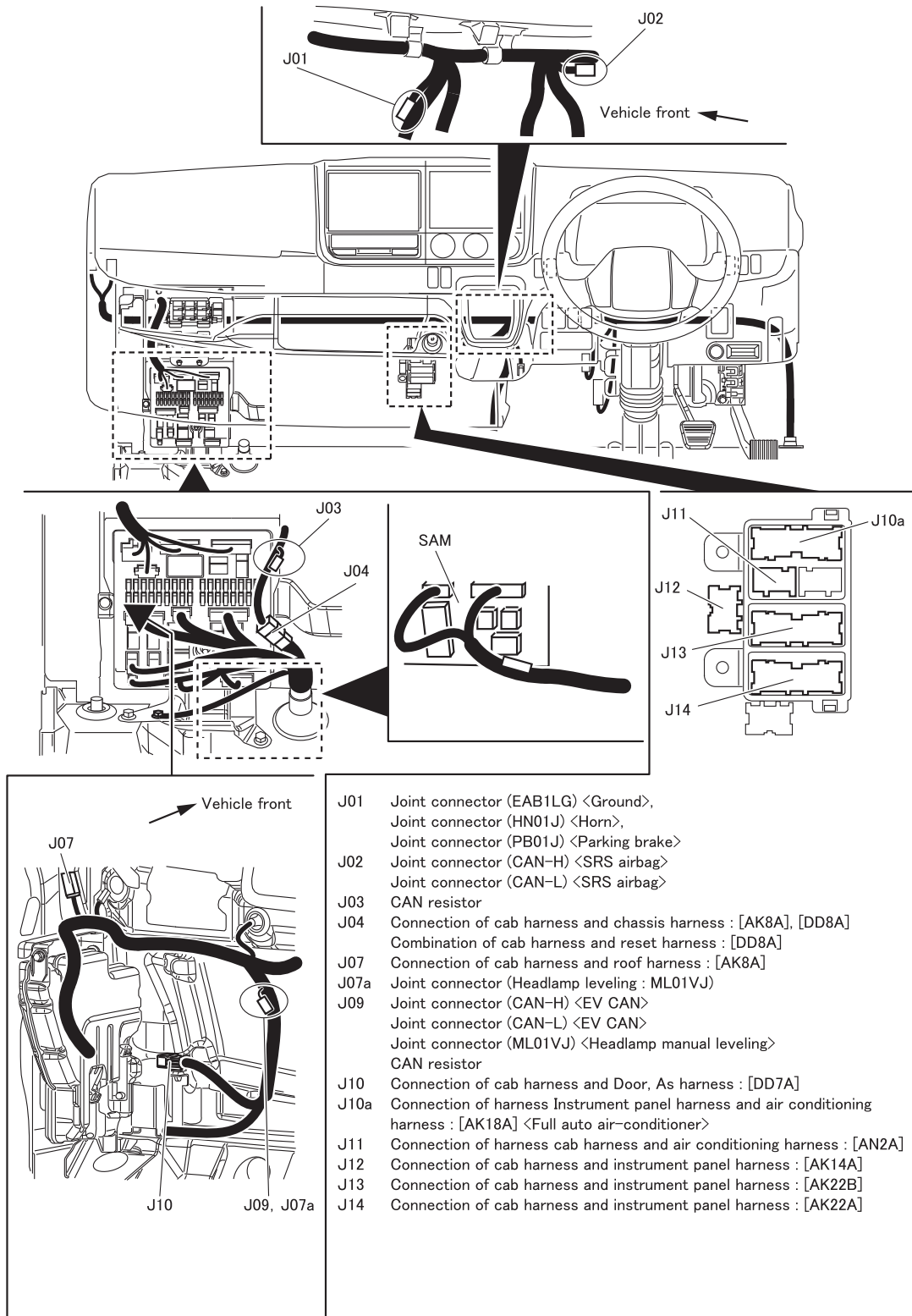
- C01 Meter cluster
- C02 Windscreen washer motor
- C03 Wiper motor
- C04 Headlamp leveling actuator

54-300623C



JOINTS OF MAIN HARNESS CONNECTORS (1)

J01-14



The inside of [] indicates the connector type

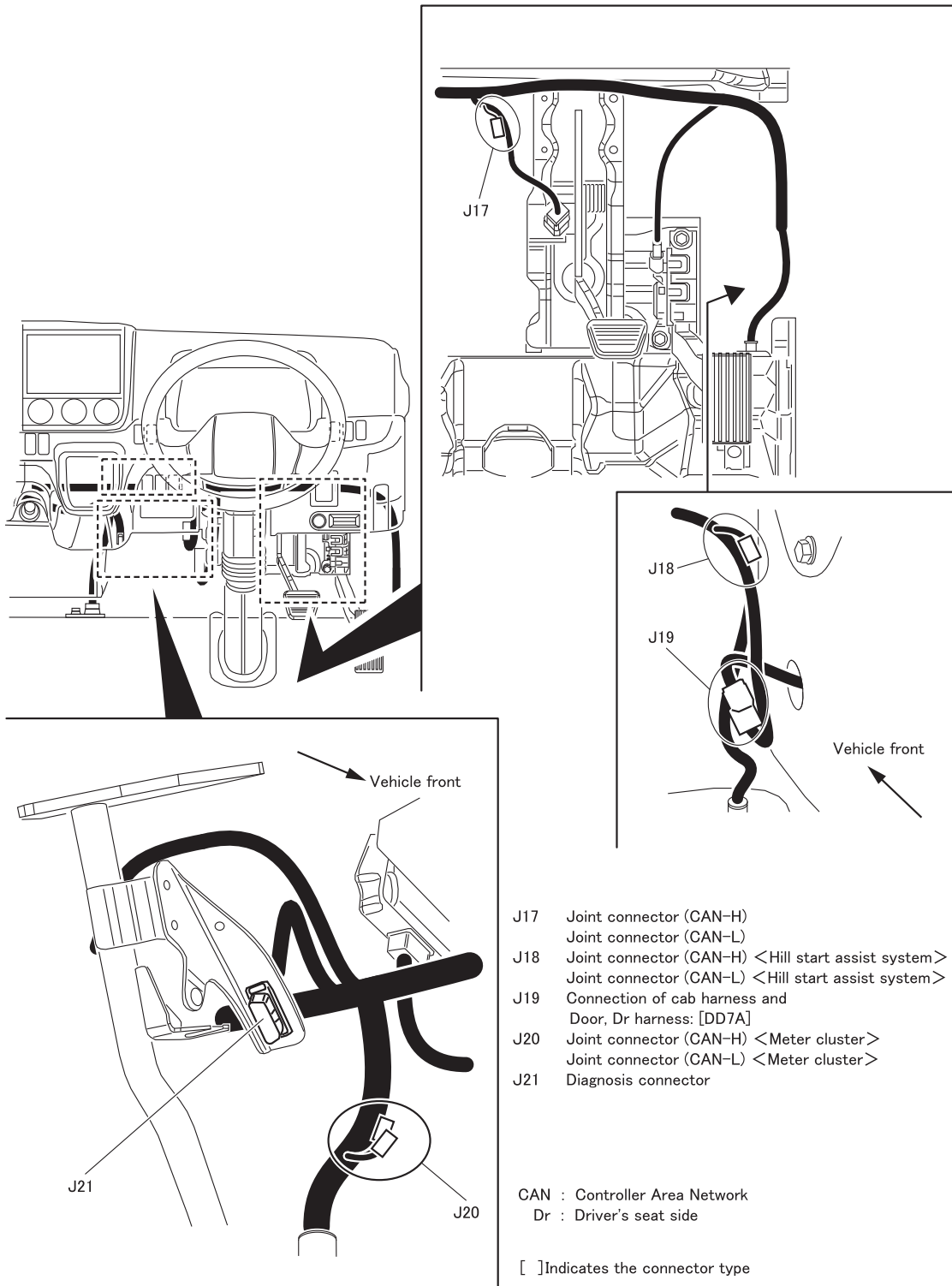
CAN : Controller area network

As : Assistant driver's seat side

54-300623J-1

JOINTS OF MAIN HARNESS CONNECTORS (2)

J17-21

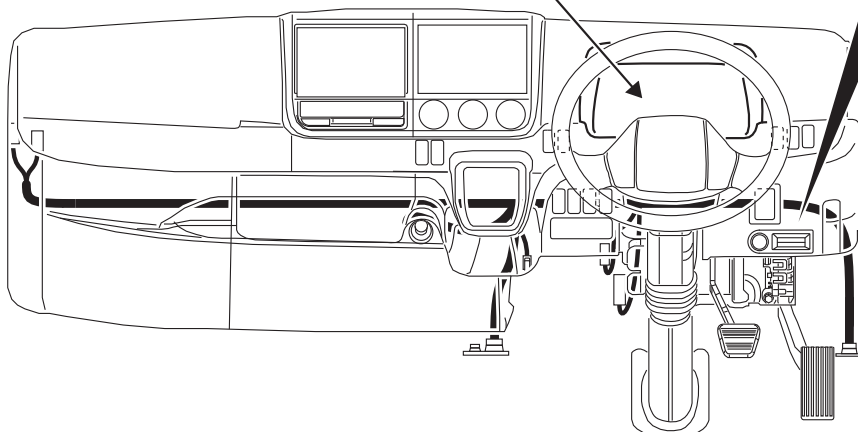
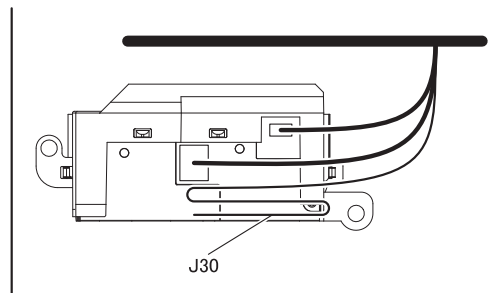
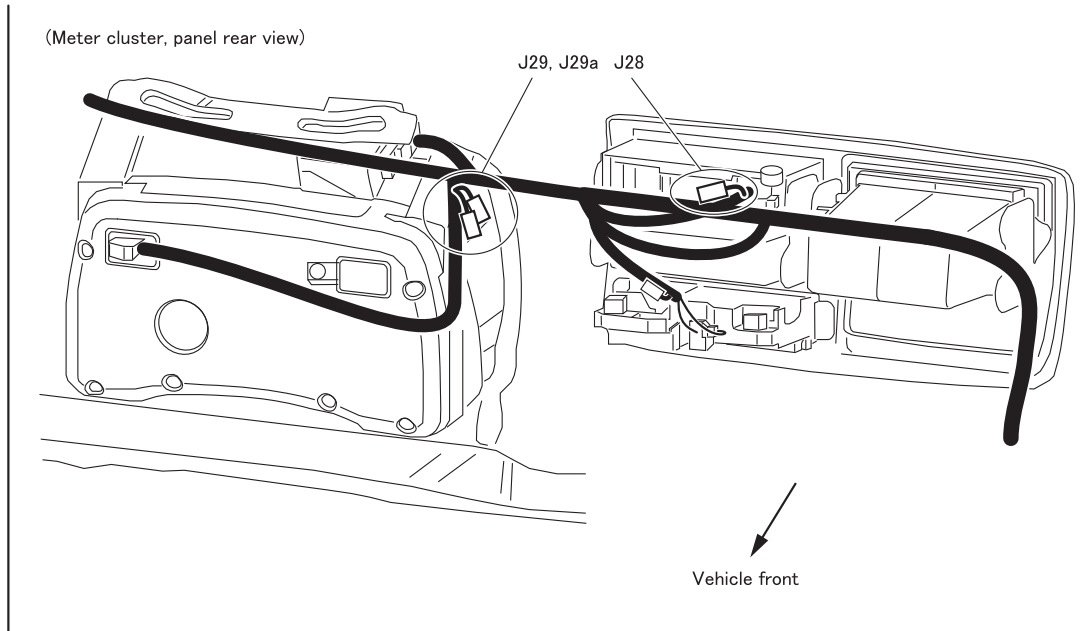


54-300623J-2



JOINTS OF MAIN HARNESS CONNECTORS (3)

J28-30



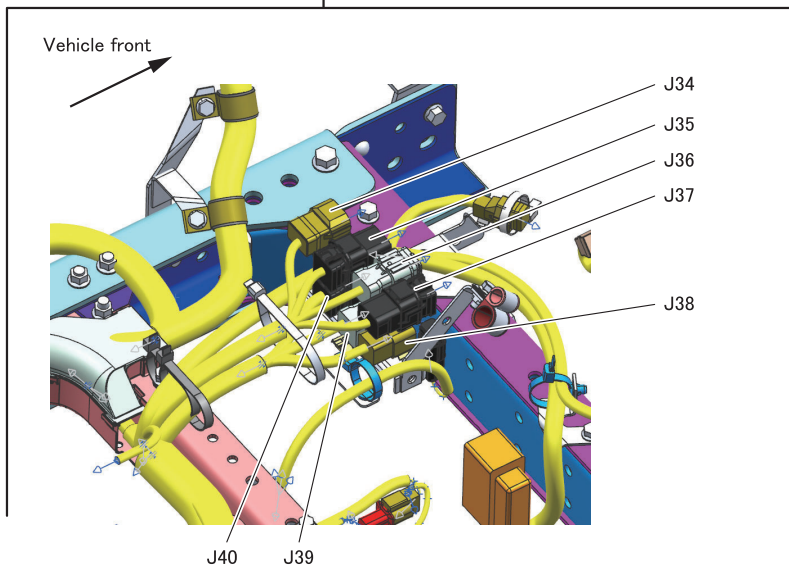
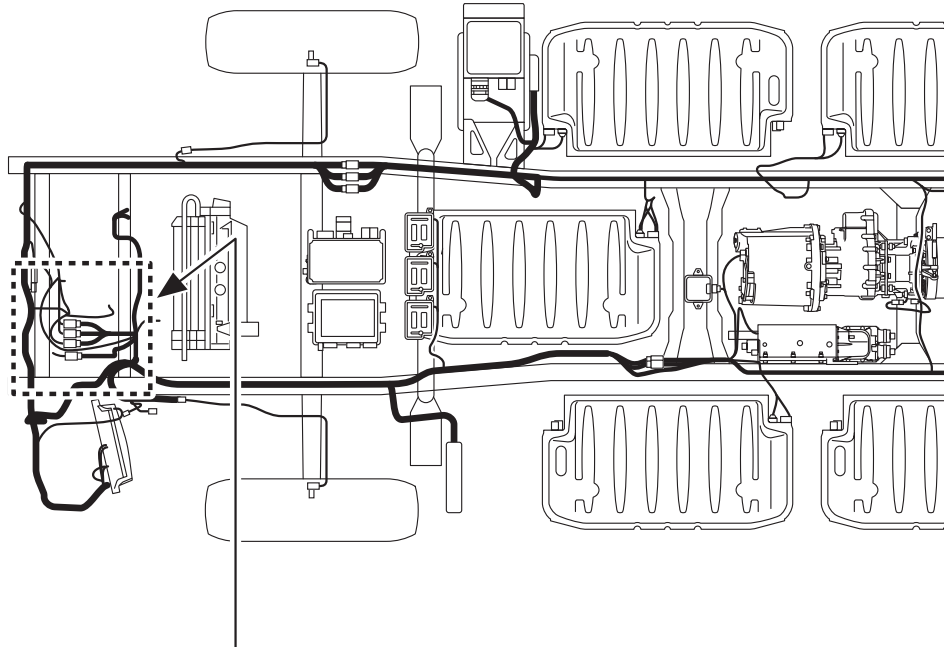
- J28 Connector (for vehicle speed sensor) : [AK4A]
- J29 Joint connector (CAN - H) <Meter cluster>
Joint connector (CAN - L) <Meter cluster>
- J29a Joint connector (CAN - H) <Meter cluster>
Joint connector (CAN - L) <Meter cluster>
- J30 EIS antenna wire

CAN : Controller Area Network

54-300623J-3

JOINTS OF MAIN HARNESS CONNECTORS (4)

J34-40



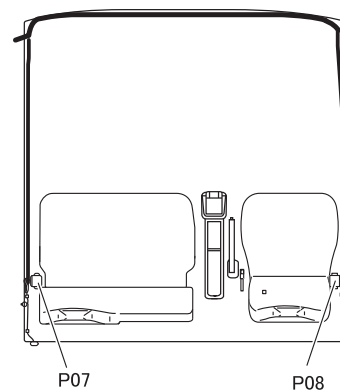
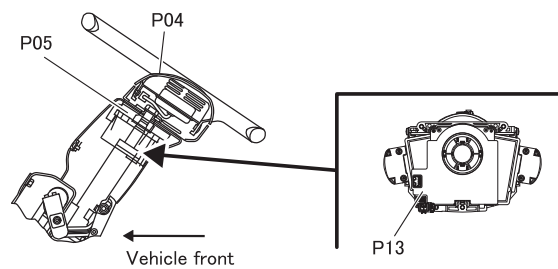
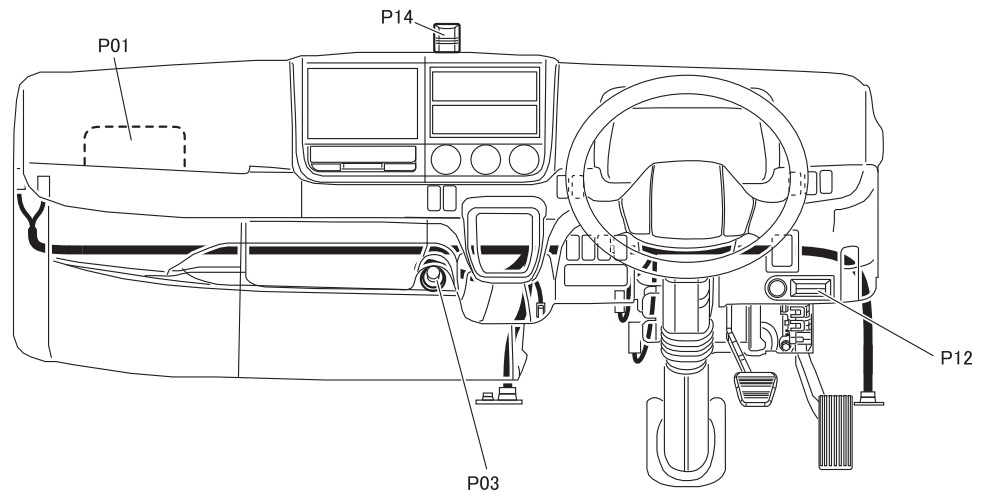
- J34 Connection of chassis harness and cab harness : [AB12A]
- J35 Connection of chassis harness and cab harness : [AB16A]
- J36 Connection of chassis harness and cab harness : [AB16A]
- J37 Connection of chassis harness and cab harness : [AB16A]
- J38 Connection of chassis harness and cab harness : [AC4A]
- J39 Connection of chassis harness and cab harness : [AB16A]
- J40 Connection of chassis harness and cab harness : [AB16A]

[] Indicates the connector type

54-300623J-4

OTHERS

P01-14

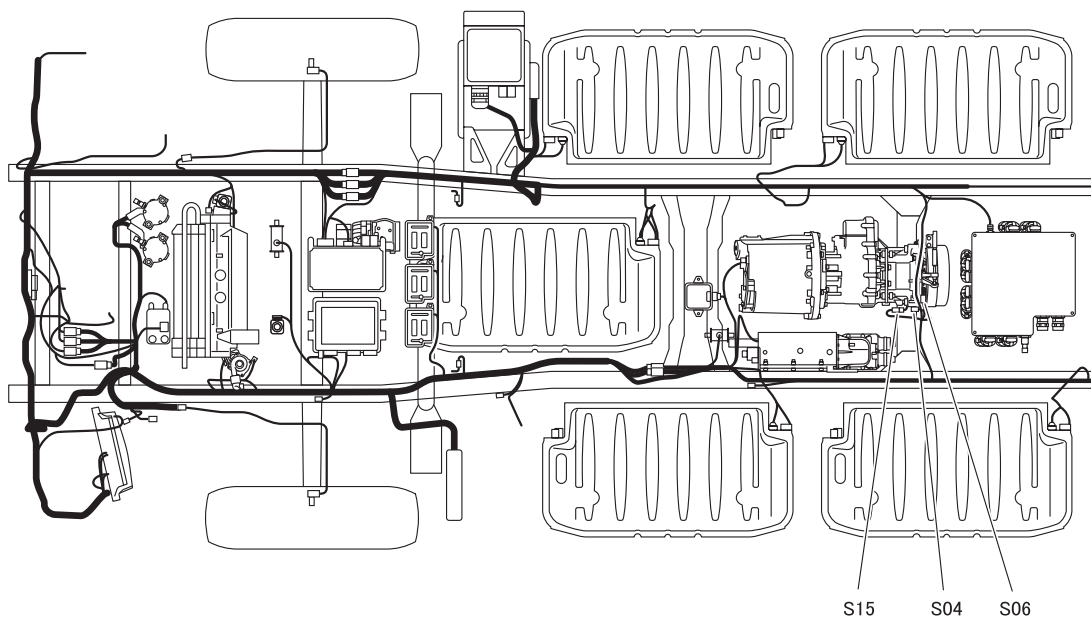


- P01 Airbag module (Assistant driver's seat side)
- P03 Cigarette lighter
- P04 Airbag module (Driver's seat)
- P05 Clock spring
- P07 Seat belt with pretensioner (Assistant driver's seat)
- P08 Seat belt with pretensioner (Driver's seat)
- P12 EIS
- P13 Steering wheel angle sensor
- P14 Lane recognition camera

54-300623P

TRANSMISSION

S04-15



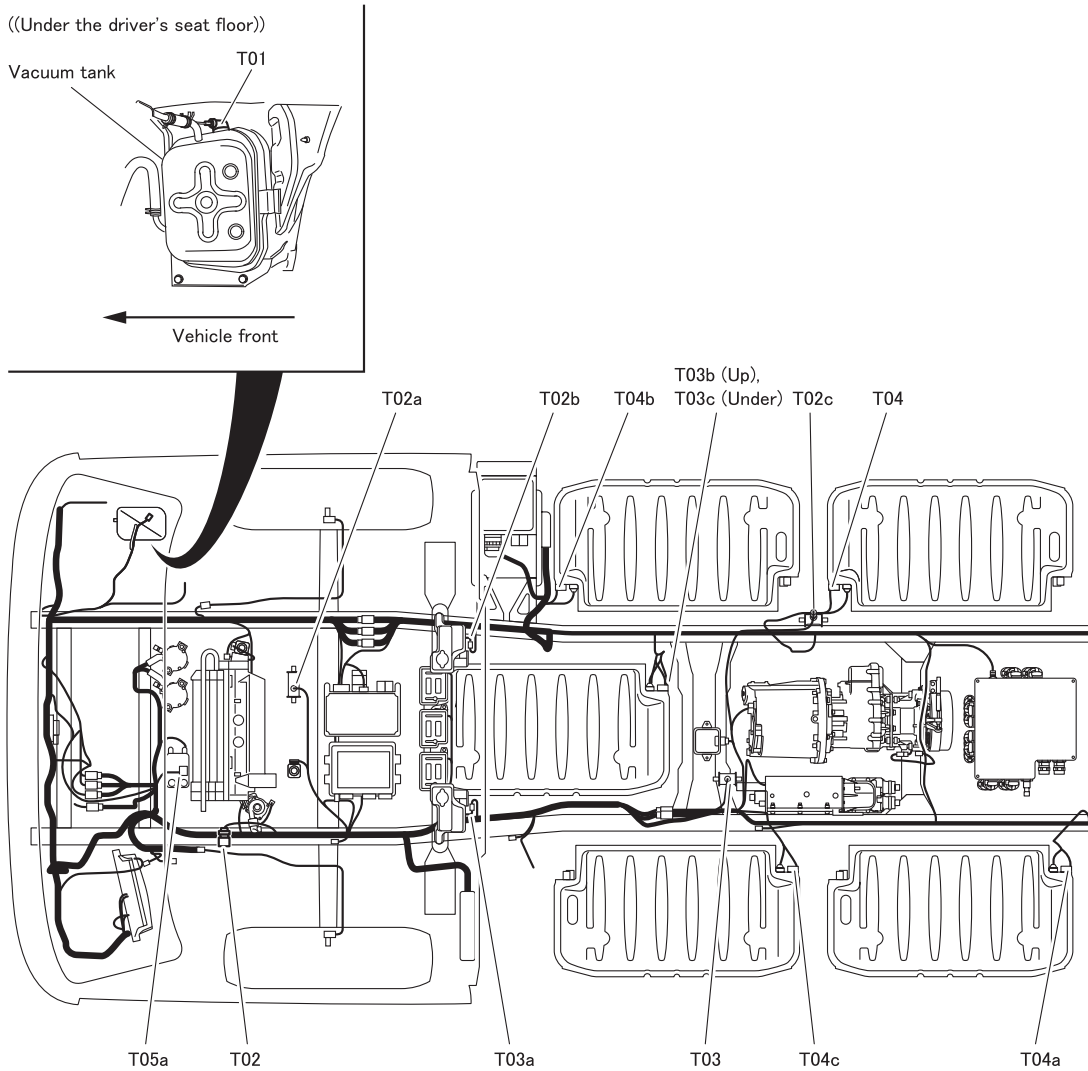
- S04 Vehicle speed sensor 1
- S06 Vehicle speed sensor 2
- S15 Parking gear switch

54-300623S

CHASSIS SIDE

SWITCH AND SENSOR (1)

T01-05a(Switch,sensor)

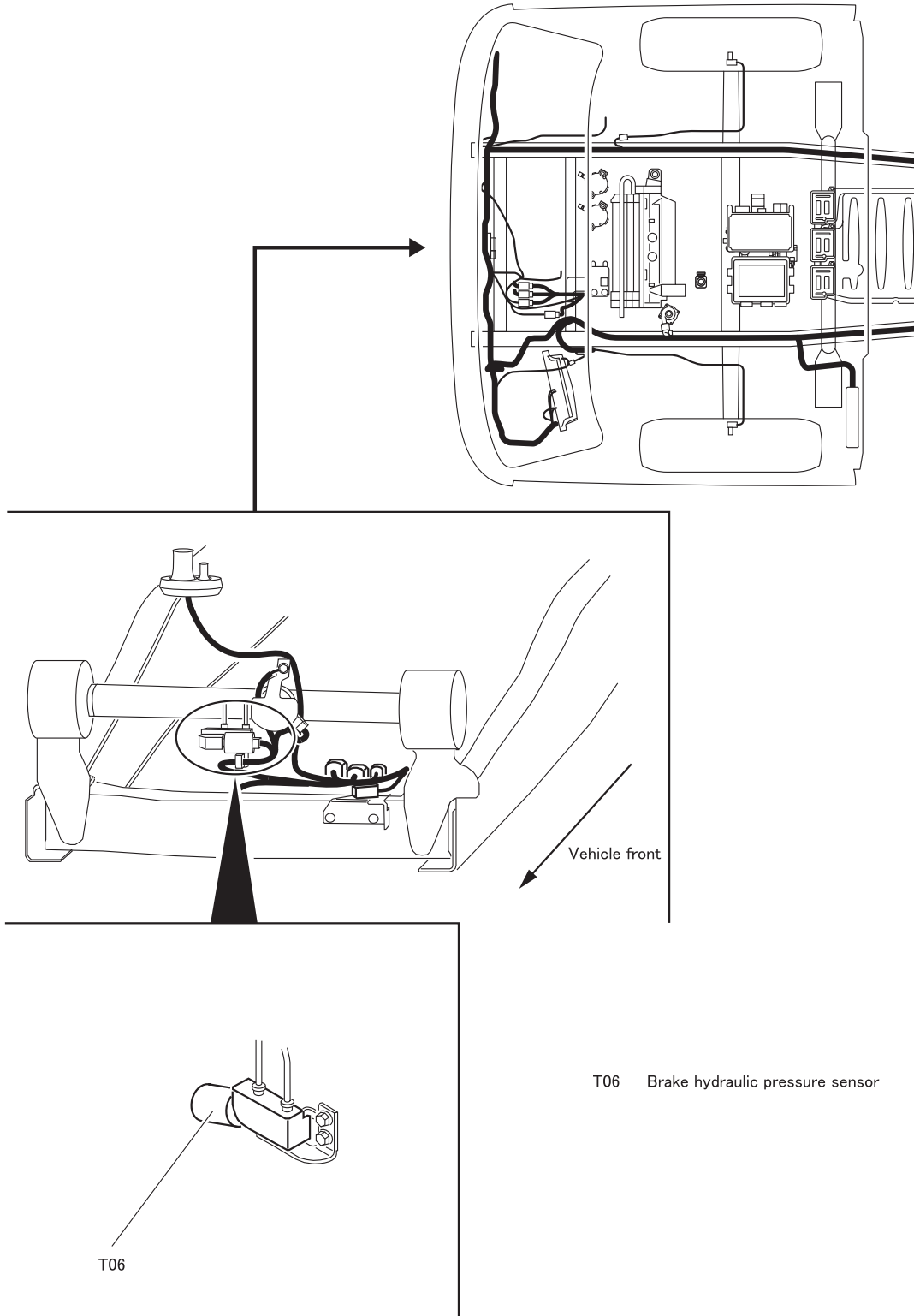


- T01 Vacuum sensor
- T02 Dual pressure switch
- T02a Water temperature sensor (HVB)
- T02b Water level sensor (HVB)
- T02c Oil temperature sensor
- T03 Water temperature sensor (PE)
- T03a Water level sensor (PE)
- T03b Cooling temperature sensor 1
- T03c Cooling temperature sensor 2
- T04 Cooling temperature sensor 3
- T04a Cooling temperature sensor 4
- T04b Cooling temperature sensor 5
- T04c Cooling temperature sensor 6
- T05a Chiller (evaporator) temperature sensor

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SWITCH AND SENSOR (2)

T06(Sensor)

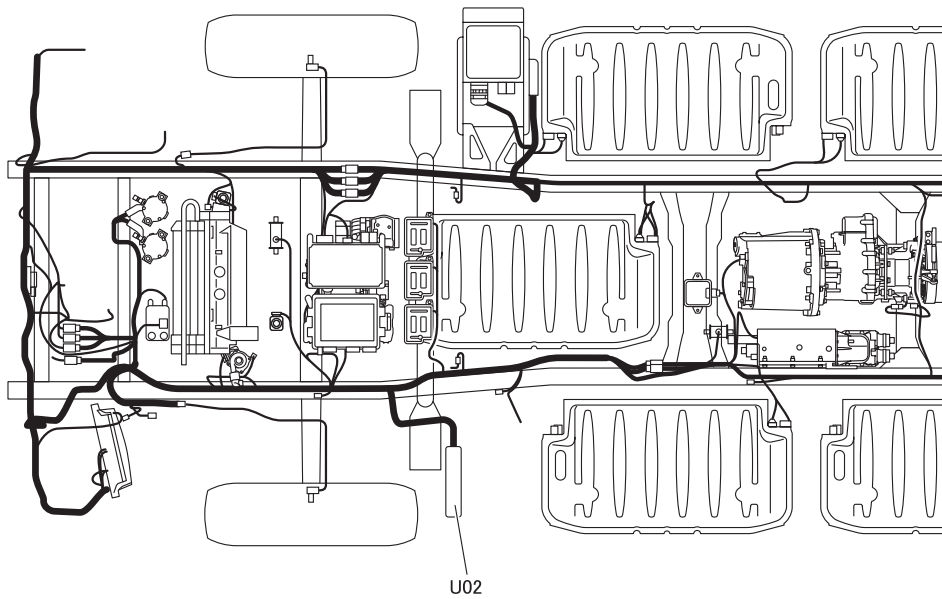


54-300623T-2



FUSE, RELAY AND ELECTRONIC CONTROL UNIT

U02



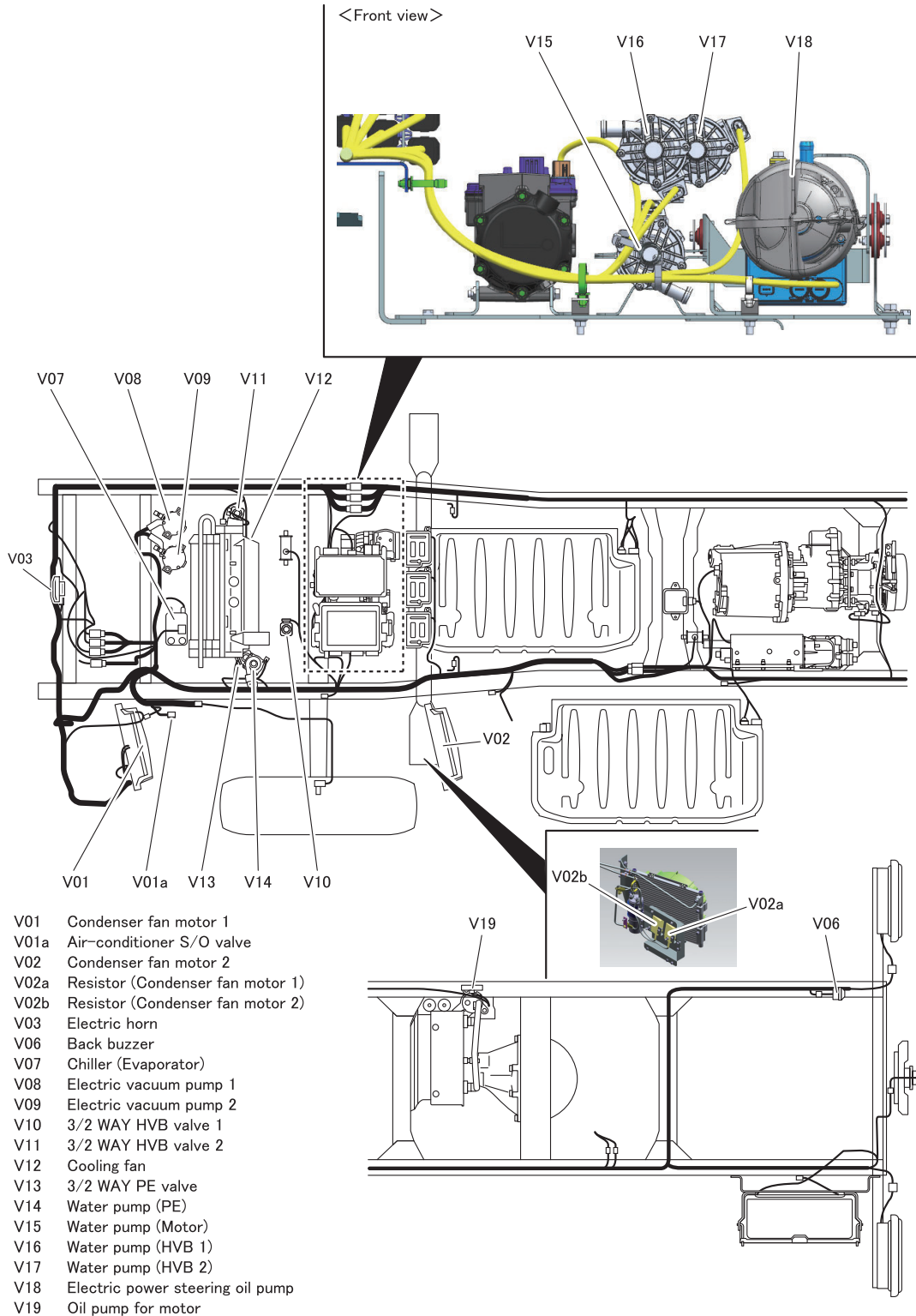
U02 High current fuse box

54-300623U



MAGNETIC VALVE, MOTOR AND BUZZER

V01-19

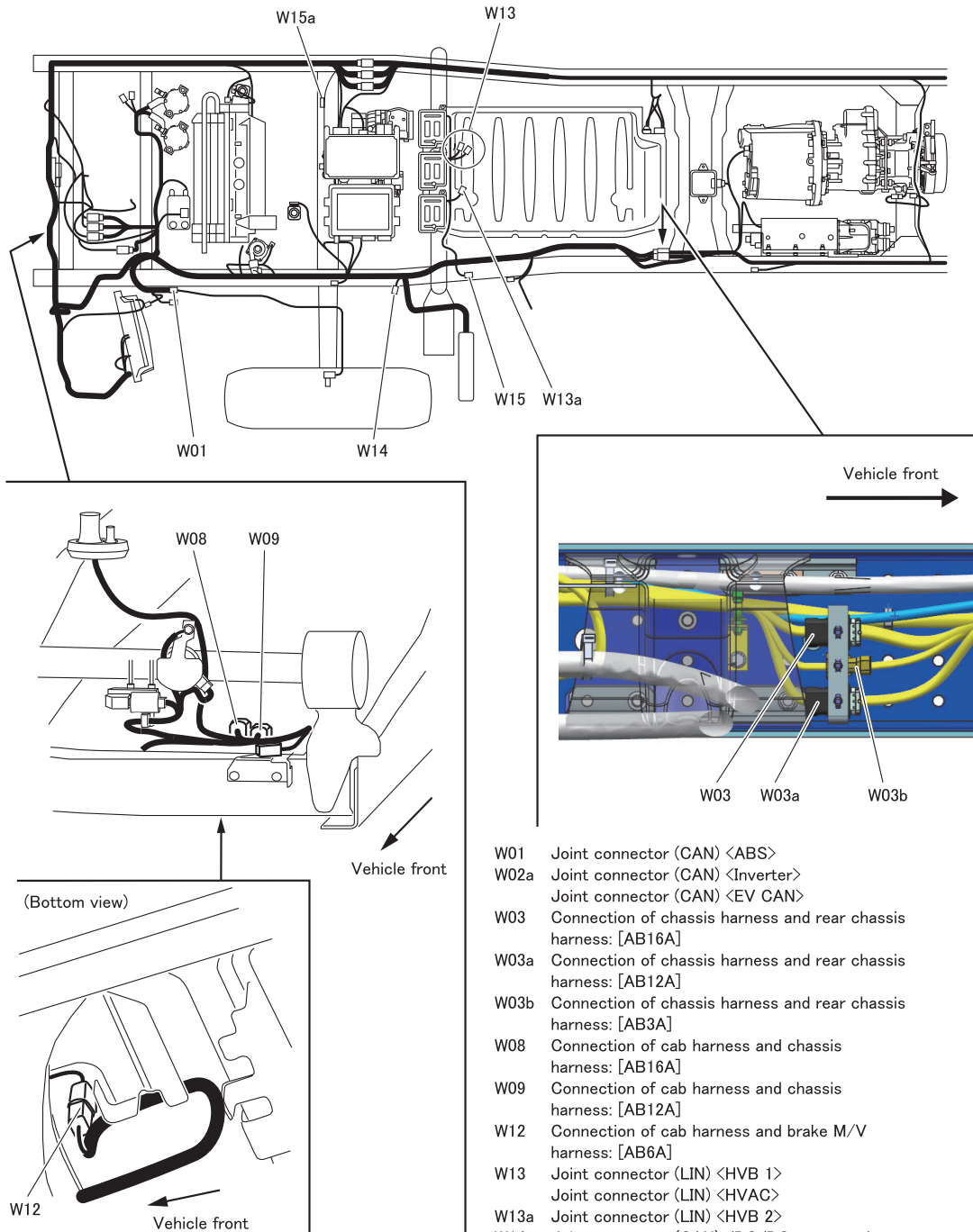


54-300623V



JOINTS OF MAIN HARNESS CONNECTORS (1)

W01-15a



- W01 Joint connector (CAN) <ABS>
- W02a Joint connector (CAN) <Inverter>
- W02a Joint connector (CAN) <EV CAN>
- W03 Connection of chassis harness and rear chassis harness: [AB16A]
- W03a Connection of chassis harness and rear chassis harness: [AB12A]
- W03b Connection of chassis harness and rear chassis harness: [AB3A]
- W08 Connection of cab harness and chassis harness: [AB16A]
- W09 Connection of cab harness and chassis harness: [AB12A]
- W12 Connection of cab harness and brake M/V harness: [AB6A]
- W13 Joint connector (LIN) <HVB 1>
- W13 Joint connector (LIN) <HVAC>
- W13a Joint connector (LIN) <HVB 2>
- W14 Joint connector (CAN) <DC/DC converter>
- W15 Joint connector (CAN) <AVAS>
- W15a Joint connector (CAN) <VCU>

[] Indicates the connector type

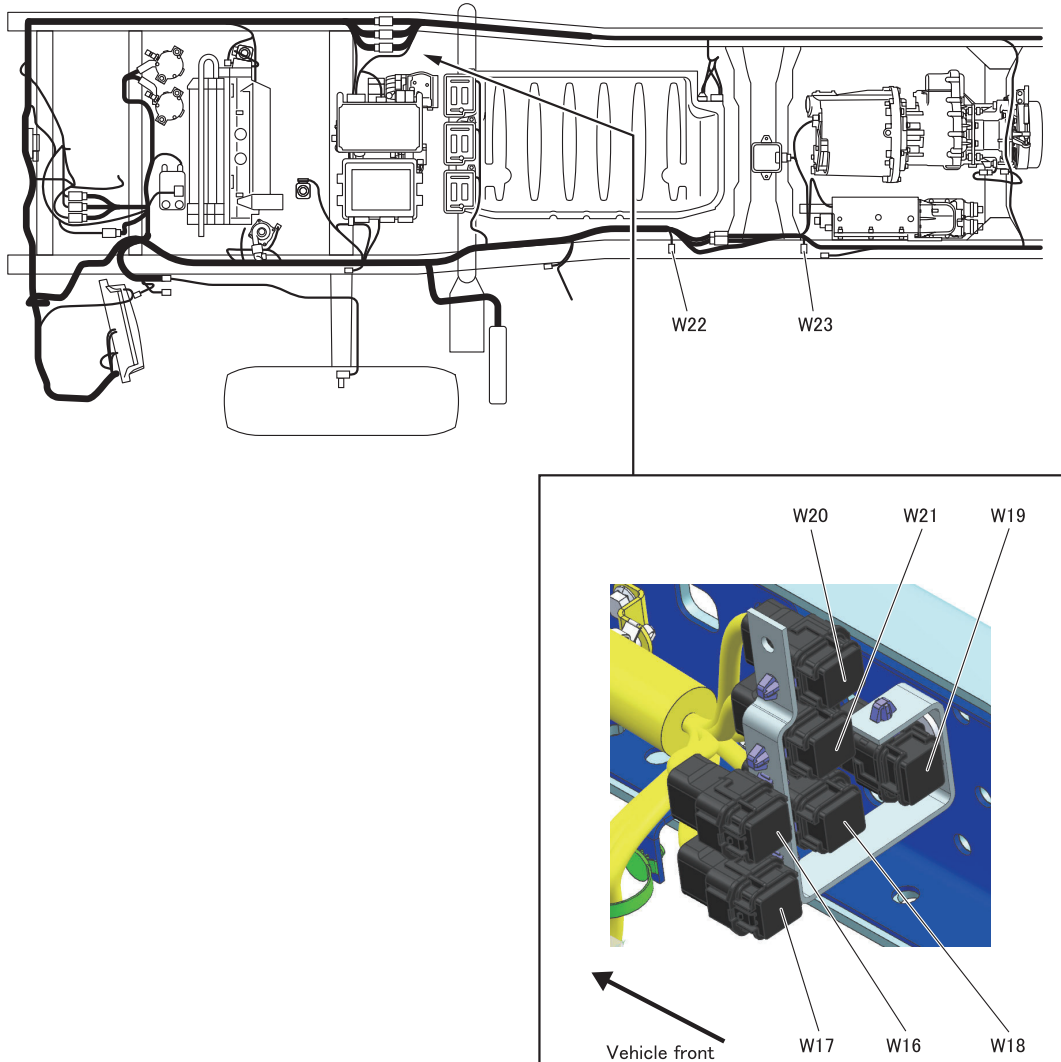
CAN : Controller area network

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JOINTS OF MAIN HARNESS CONNECTORS (2)

W16-23



- W16 Connection of chassis harness and right harness : [AB16A]
- W17 Connection of chassis harness and right harness : [AB16A]
- W18 Connection of chassis harness and right harness : [AB16A]
- W19 Connection of chassis harness and right harness : [AB16A]
- W20 Connection of chassis harness and right harness : [AB16A]
- W21 Connection of chassis harness and right harness : [AB16A]
- W22 Joint connector (CAN) <High voltage battery 4>
- W23 Joint connector (CAN) <High voltage battery 6>

CAN : Controller Area Network

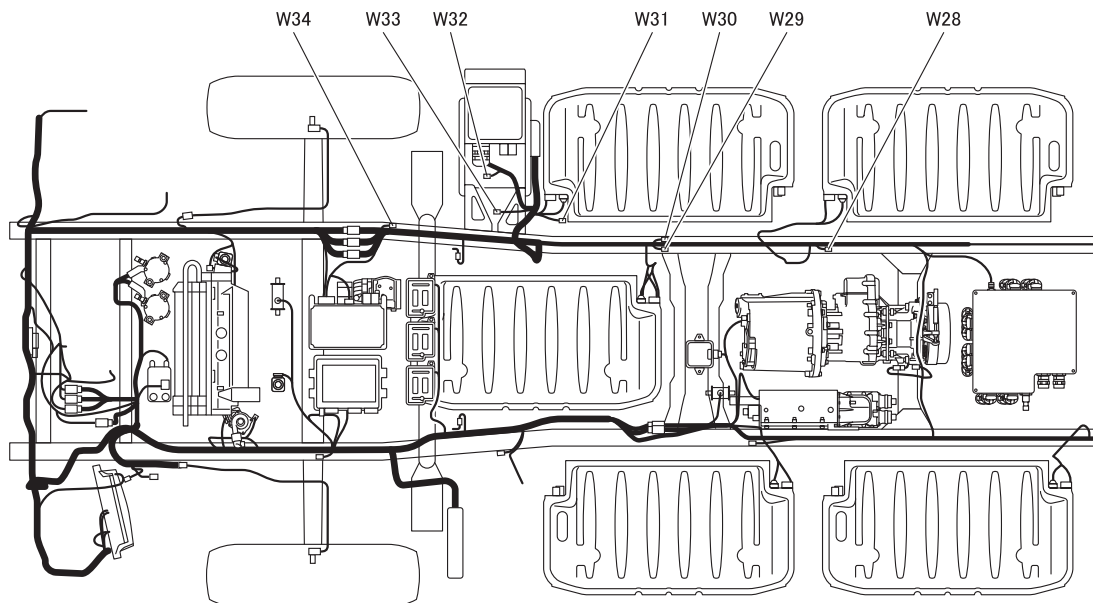
[] Indicates the connector type

54-300623W-2



JOINTS OF MAIN HARNESS CONNECTORS (3)

W28-34



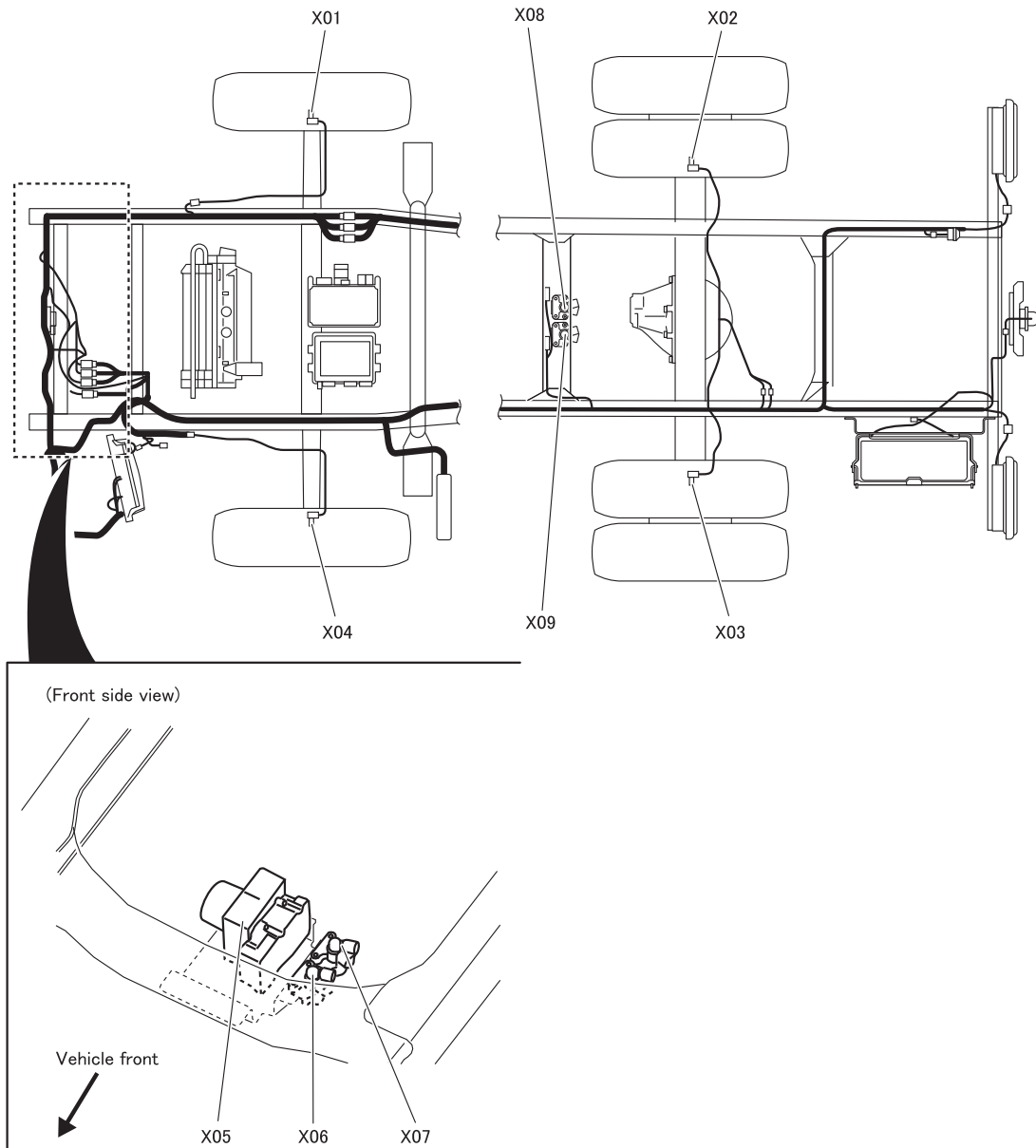
- W28 Joint connector (CAN) <High voltage battery 3>
- W29 Joint connector (CAN) <High voltage battery 1>
- W30 Joint connector (CAN) <High voltage battery 2>
- W31 Joint connector (CAN) <High voltage battery 5>
- W32 Joint connector (CAN) <DCB>
- W33 Joint connector (CAN) <BGW>
- W34 Joint connector (CAN) <OBC>

CAN : Controller Area Network

54-300623W-3

OTHERS (1)

X01-09

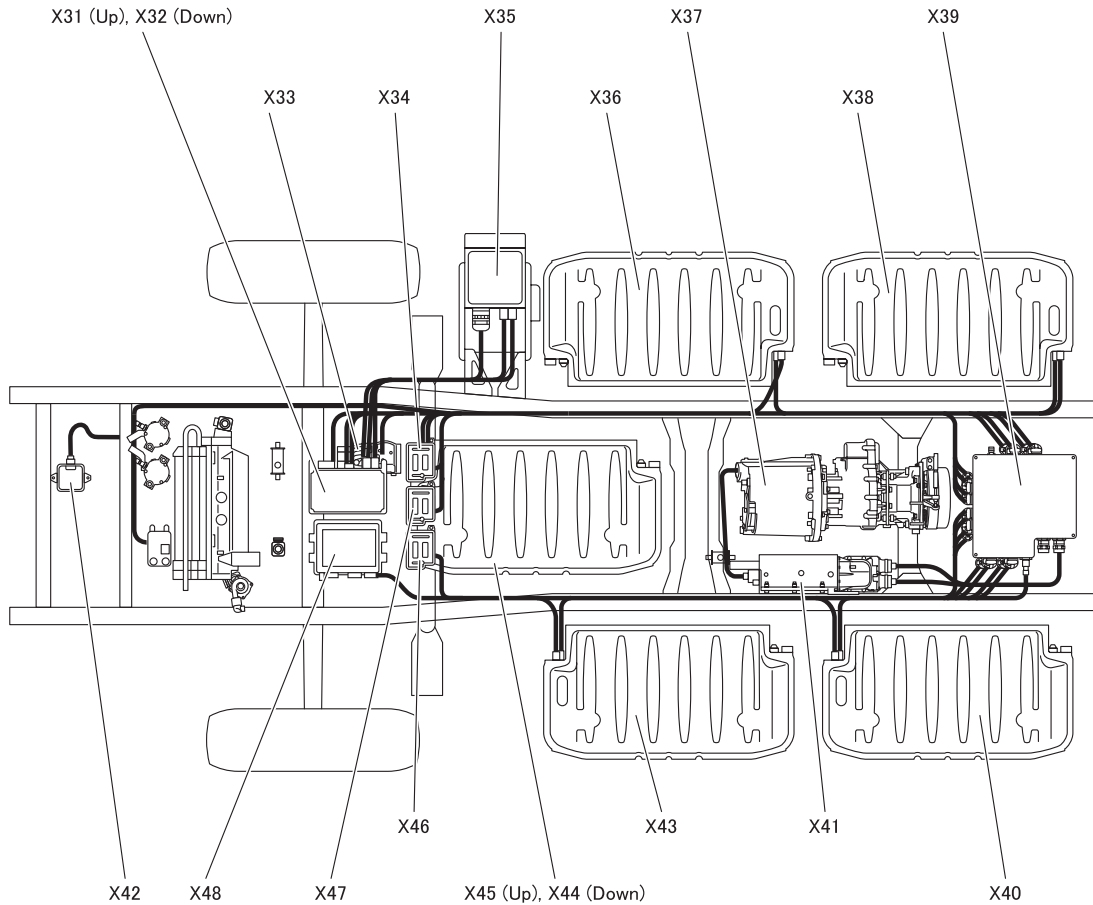


- X01 Front wheel speed sensor, RH
- X02 Rear wheel speed sensor, RH
- X03 Rear wheel speed sensor, LH
- X04 Front wheel speed sensor, LH
- X05 Hydraulic unit (ECU)
- X06 Brake control valve, RH (front)
- X07 Brake control valve, LH (front)
- X08 Brake control valve, RH (rear)
- X09 Brake control valve, LH (rear)

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OTHERS (2)

X31-48



X31	DCB	X40	High voltage battery 4
X32	OBC	X41	Inverter
X33	High voltage air-conditioner compressor	X42	AVAS ECU
X34	High voltage water heater (HVAC)	X43	High voltage battery 6
X35	Charging inlet box	X44	High voltage battery 2
X36	High voltage battery 5	X45	High voltage battery 1
X37	Motor generator	X46	High voltage water heater (HVB 2)
X38	High voltage battery 3	X47	High voltage water heater (HVB 1)
X39	PDU	X48	DC/DC converter

ECU : Electronic control unit

54-300623X-2

Revision record <Electrical systems section>

-	20. October. 2020	Newly issued
Rev. code	Date issued	Remarks

NOTE:

- 1, Chapter 1-9 is Common Section for all markets and to be revised without any special notification. Therefore, please note that this version is not necessarily the latest one.
- 2, Chapter 10 is for specific market(s). MFTBC will distribute the latest version whenever it will be revised.

Body/equipment mounting directives <Electrical systems section>

E-CANTER

Australia

MITSUBISHI FUSO TRUCK & BUS CORPORATION

October. 2020 TL3FA
