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TOYOTA MOTOR CORPORATION
OVERSEAS C&A DIVISION

ABOUT THIS MANUAL

Purpose

This manual is provided to Body and Equipment Manufacturers, including inter-mediate and/or final stage manufacturers (hereinafter collectively referred to as Body and Equipment Manufacturers), to provide :

- (1) Technical instructions for TOYOTA DYNA truck chassis with cab for mounting of bodies and alterations of chassis.
- (2) An aid to Body and Equipment Manufacturers for producing safe vehicles under their own discretion and responsibility.
- (3) Other general advice for installation, modification or alteration.

when Body and Equipment Manufacturers install any body or other equipment or device on TOYOTA DYNA truck chassis with cab (hereinafter collectively referred to as TOYOTA Chassis), or modify or alter a TOYOTA Chassis.

Important

This manual contains the instructions commonly applicable to all TOYOTA DYNA truck models.

Peculiar instructions as chassis layout drawings, chassis mass, precautions etc. for each model, are given separately in the peculiar body mounting manuals for each vehicle model (hereinafter collectively referred to as the "Manual for each model").

Therefore, this manual should be used together with the Manual for each model series. (Details of construction of TOYOTA's Body Builder's Guide are mentioned at the last part of this chapter.)

- The Manuals for each model is available at authorized TOYOTA distributor.
- For more information on mounting bodies and equipment or on chassis modifications, refer to the appropriate service manuals, parts catalogs, owner's manual.
- The information in this manual is accurate to the best of TOYOTA's Knowledge at the time of going to press. TOYOTA reserves the right to modify any and all information without notice and without obligation.
- Should more detailed data or information be needed, please contact authorized TOYOTA distributor.

ABOUT THIS MANUAL

Warning

- It is the responsibility of the Body and Equipment Manufacturers or the Modification companies to make sure that the completed vehicle with body and equipment, or after modification, conforms to all applicable laws and regulations of the country in which the vehicle is to be used (e. g. regulations on lighting, tilt, overall size, axle load, external noise control etc.).
- This manual does not guarantee the safety of a TOYOTA chassis which has been installed, modified, or altered by Body and Equipment Manufacturers.
- This manual does not affect that the ultimate responsibility for the manufacture and mounting of the body, installation, modification or alteration on a TOYOTA Chassis devolves upon the Body and Equipment Manufacturer.
- Each individual Body and Equipment Manufacturer has the sole responsibility for the design, functions, materials and work concerning the body and equipment.
- TOYOTA MOTOR CORPORATION does not assume any liability whatsoever for any injury to persons or damage to property caused as a result of the utilization of this manual.
- Parts number as described in each page will be changed without forward notice.
Therefore, consult to TOYOTA distributor or sales dealer with regard to the exact parts number.
- Drawings as described in each page show as example for your reference.
Details of parts to be install each vehicle, see the Body Builder's Guide for the respective model series.

ABOUT THIS MANUAL

CONSTRUCTION OF TOYOTA BODY BUILDER'S GUIDE



COMMON TO TOYOTA DYNA TRUCKS BODY BUILDER'S GUIDE

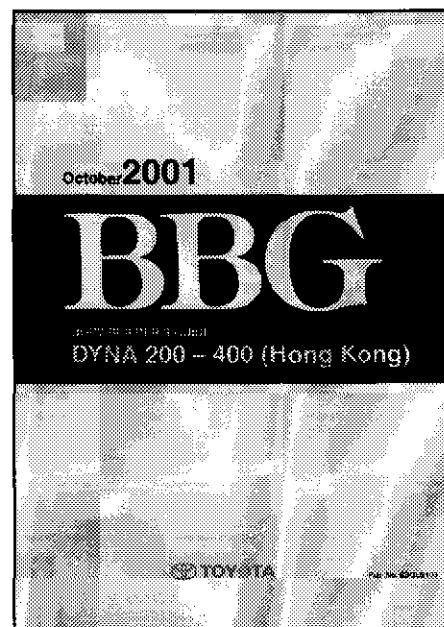
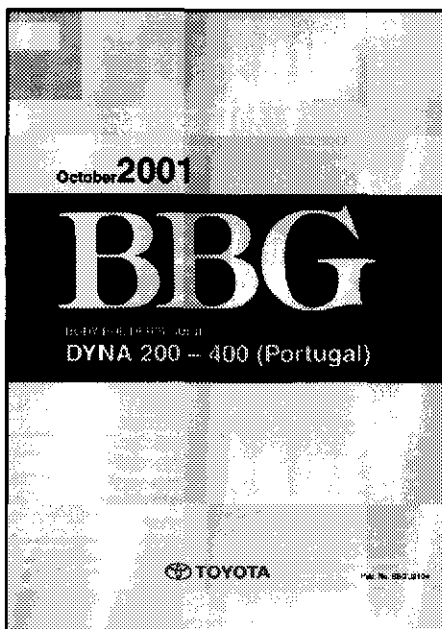


This manual contains the basical common instructions to apply to TOYOTA DYNA truck models for installation, mounting, modification or alteration.

MODEL SERIES BODY BUILDER'S GUIDE



This manual contains the peculiar TOYOTA DYNA truck chassis specifications and data for each models.



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8. EXHAUST SYSTEM
9. BATTERY
10. SUSPENSION AND TIRE
11. SPARE TIRE CARRIER
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1. GENERAL PRECAUTIONS

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- This section describes general precautions that must be taken when mounting a standard body or equipment or when making alterations to the chassis.
- Improper mounting of a body or equipment or improper alterations may cause unforeseen faults in the vehicle and lead to serious accidents.
- If you intend to mount a body or equipment, or make alterations to the chassis of a TOYOTA vehicle, be sure to observe the precautions described in this section.

1. GENERAL PRECAUTIONS**1) Before Mounting and Alterations**

- (1) The base vehicle has been proved for laws and regulations, performance, and safety, becoming a well-rounded vehicle. Pay particular attention not to impair its functions by mounting and alterations.
- (2) Thoroughly review the mounting and alteration methods and the modification to be made to the standard parts through alteration, and verify the result of the review to see if there is no technical and safety problems.
- (3) Laws and regulations related to the mounting and alterations place the minimum restrictions. In making alterations to vehicle, care should be taken to design and fabricate them in such a manner as to satisfy various related law and regulations with an ample allowance.
- (4) Be sure that the materials used for mounting or alterations sufficiently meet the legal requirements, the performance and safety standards, and that the resulting vehicle should be as light weight as possible.
- (5) No difference in weight between right and left wheels should occur due to the mounting or alterations.
- (6) The materials and parts involved in the mounting or alteration work should be designed and fabricated to facilitate the inspection and maintenance of chassis parts after they are mounted on the vehicles.
- (7) Forward field of view must not be restricted by mounting or alterations.

2) During Mounting and Alterations

- (1) Be sure that the work not to damage the chassis or impair its functions.
- (2) When removing and reinstalling chassis components, be sure to follow the procedures described in the Service Manual issued by TOYOTA Overseas Service Division.
- (3) All mounting job should be conducted in a manner avoiding local concentration of the load on the chassis frame. In order to distribute the load over the frames, all the wheels should be located on the same plane without distorting the frame.
- (4) Never make any modification (welding, padding, machining, heating, etc.) to the component parts of the important safety parts (accelerator, steering, brake, suspension, etc.) .

3) After Mounting and Alterations

- (1) Check to see whether the materials or parts used for such work are produced as designed and satisfy predetermined performance requirements and functions, and also whether they contain no defects.
- (2) If the handling, maintenance, and service methods change due to mounting and alterations, prepare the Instruction Manual and attach it to the completed vehicle.
- (3) Prepare Instruction Manuals, Service Guides, and so on about the handling and maintenance, service of the rear body or equipment as well as the inspection interval and attach them to the completed vehicle.
- (4) Pay every attention to the after-sales service system for the mounted body and alteration parts. Service Manuals of Base vehicle are optionally available from your local TOYOTA Distributor or Sales dealer.

2. MOUNTING PRECAUTIONS**1) Requests to Body and Equipment Manufacturers****(1) Pay extra attention to safety of products in the design, fabrication, and inspection phases.****a. Design ensuring safety**

All products must be proven for safety and equipped with safety devices as required. (Specifically, the parts that may come into contact with the human body must be provided with this measure.)

The "industry-standard levels and safety of other products" should also be taken into account.

b. Fabrication conforming to drawings

Quality of the fabricated products should conform to the instructions given in the drawings. (Prevention of wrong parts, missing parts, and assembly defects.)

c. Final inspection

Conduct final inspection for all products and prepare Inspection Records.

d. Storage and management of drawings, documents, and Inspection Records.

Set up the rules for storing the drawings, documents, and inspection Records concerning a. to c. and make them understood.

(2) Prepare substantial Instruction Manuals and WARNING labels**a. Instruction Manual**

Describe the effects of improper handling and usage upon the customer body and vehicle to details as Precautions.

b. Warning Labels

Describe safety notes on labels as briefly as possible and affix them at appropriate positions.

2) Precautions to Follow when Studying and designing body and Equipment

When studying and designing the installation of body and equipment, note the following ;

a. Observe the safety regulations, inspection standards, and other standards concerning the vehicle.**b. If there are self-imposed control rules set up by the Automobile Manufacturer's Association, Vehicle Body Industrial Association, and so on, follow them.****c. Pay extra attention to vehicle safety and prevention of accidents.**

- d. Body and equipment must be as lightweight as possible and their weight must be distributed evenly to the left and right wheels.
- e. When installing equipment at the lower portion of front and rear overhangs, make sure not to affect the approach angle and departure angle of the base vehicle. If it is inevitable to change the approach angle or departure angle, check it taking into account the use conditions of the customer.
- f. The area around the rear body, specifically the area around the cab lock operation section, should be free from any projection and sharp edge of a cut iron part.
- g. Equipment should not interfere with removal, reinstallation, inspection, and service of chassis components.

Examples ;

- Inspection, replenishment and drain of engine oil
 - Inspection, replenishment and drain of engine coolant
 - Inspection, replenishment and drain of transmission oil
 - Inspection, replenishment and drain of differential oil
 - Inspection, replenishment of electrolyte of battery
 - Filling of fuel
 - Inspection, removal, and reinstallation of brake-related valves
 - Inspection and replenishment of brake fluid
 - Removal, reinstallation, and inspection of spare tire
 - Etc.
- h. Do not install equipment on the chassis component mounting brackets such as a fuel tank support and battery carrier (especially, the components to which shock and external force is applied (e.g., side guard)).
 - i. Front and rear view areas and the view areas of rear view mirrors and undermirrors should not be obstructed by the installed body or equipment.

3) Body and Equipment Mounting Precautions

Mount the body and equipment with the following safety precautions given below.

- a. Stop the engine, apply the parking brake and set linchpin to tires.
- b. Place the chassis at a level place with the rear body held horizontal.

- c. Be careful not to damage the chassis components and impair its functions.

Examples;

Do not step on brake-related valves, brake pipe, fuel tank, fuel pipe, vacuum tank, battery, wiring harness, transmission control rod and cables.

- d. When riding on the cab, use the grip and step so that you do not fall or slip.
- e. When the cab is tilted, lock it with the safety device of the cab tilt stopper.
- f. Take care when a heavy equipment is installed on the cab roof or inside the cab, the tilt down speed of the cab becomes faster.
- g. Before tilt down the cab, make sure tools and waste are not left in the engine room.
- h. When starting the engine, make sure that;
- Shift the transmission control lever to the neutral position.
 - For the Vehicle with PTO, turn it OFF position.
 - Do not expose inflammable objects to exhaust gas.
 - If you are working indoors, install ventilation equipment to force exhaust gas to outdoors.
- i. When the engine is running, pay attention to the rotating parts, high-temperature parts, and exhaust gas emitted direction so that you are not injured or scalded yourself.
- Rotating parts : Cooling fan and belt, pulley, flywheel PTO, alternator and belt, and cooler compressor and belt.
 - High-temperature parts : Exhaust manifold, turbo charger, intake manifold, intercooler, oil pan, radiator, radiator cap, water hose, exhaust pipe, muffler, and brake drum (just after driving)
 - Do not work behind the exhaust pipe and in the area where exhaust gas is accumulated.
- j. When moving the vehicle ;
- Do not place any object (e.g., tool and parts) that interferes with brake operation in the cab.
 - Idle the engine until the Vacuum Warning Lamp goes out. Then, move the vehicle.
- k. Follow the instructions given on the CAUTION plate affixed on the chassis with a cab.

I. When reinstalling wheels, be sure to tighten wheel nuts to the specified tightening torque.

- Wheel nuts of wheels on right side of vehicle: Right-handed thread

Wheel nuts of wheels on left side of vehicle: Left-handed thread

- Tightening torque: 440 to 590 N•m

{ 4500 to 6000 kgf•cm }

4) About Headlamp Aiming Adjustment

The vehicle posture changes after installation of body and equipment. Carry out headlamp aiming adjustment.

(For the adjustment procedure, refer to the Owner's or Service Manual.)

5) About Fog Lamp Aiming Adjustment

The vehicle posture changes after installation of body and equipment. Carry out fog lamp aiming adjustment.

(For the adjustment procedure, refer to the Owner's or Service Manual.)

6) About LSPV Adjustment

The vehicle posture and ground clearance change after installation of body and equipment. Adjust the LSPV.

(For the adjustment procedure, refer to the Owner's or Service Manual.)

7) Precautions for Adjusting the Tire Air Pressure

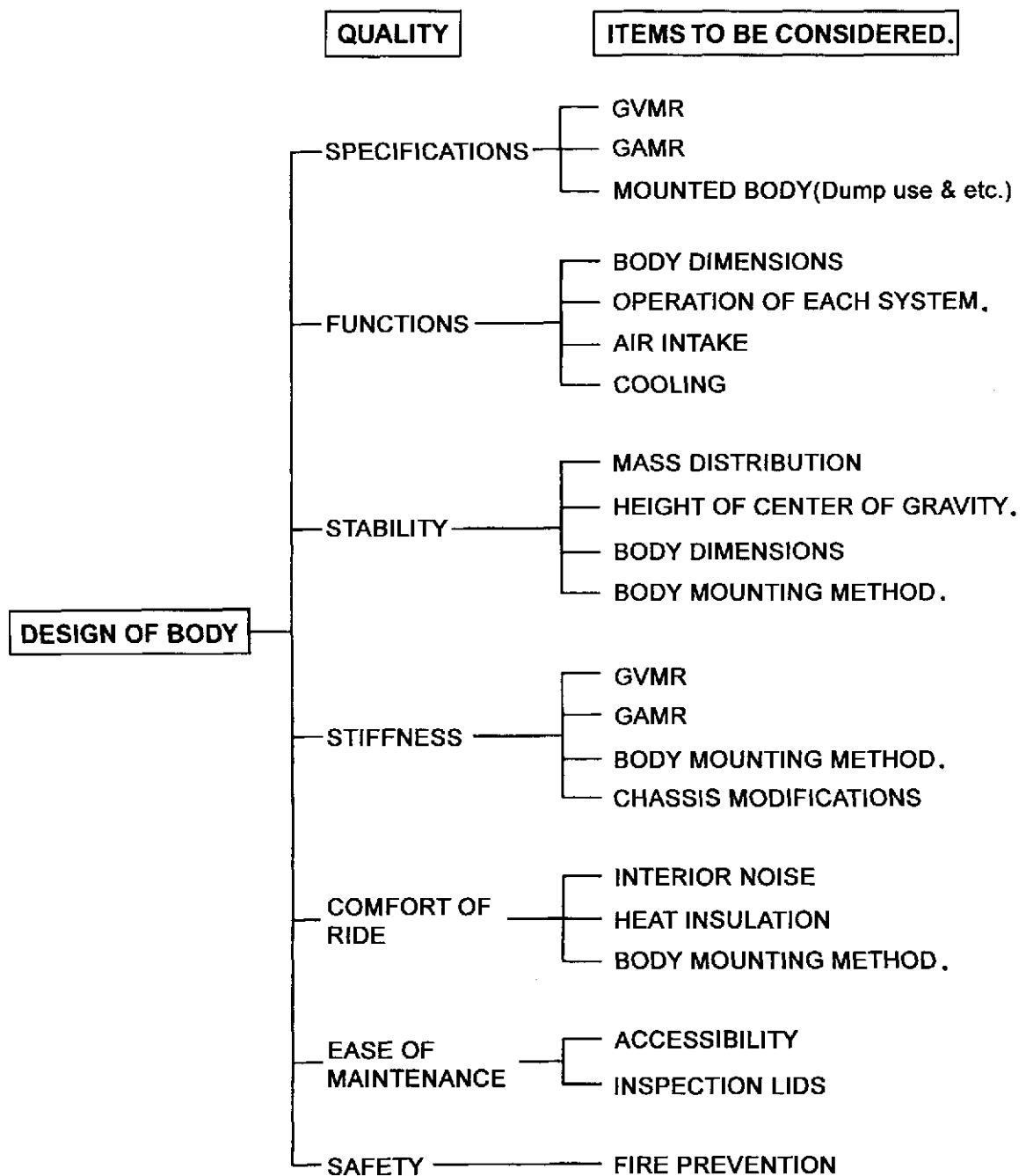
When the chassis with cab is delivered, the tire air pressure is reduced to absorb the shocks and vibrations caused during transportation by road. After completion of mounting, adjust the tire air pressure.

(Adjust the tire air pressure properly according to the air pressure label affixed on the door pillar or instruction to be described in Owner's or Service Manual.)

3. BODY DESIGN AND CONSTRUCTION

ENSURING TOTAL VEHICLE QUALITY

The final quality of a vehicle depends not only on the chassis manufacturer but also on the body manufacturer. Accordingly, body manufacturer should pay attention to the following aspects of body design and construction.



1) Mass and Dimensions

When designing or constructing a body, make sure that;

- a. the total mass of the vehicle is within the permissible axle capacity, tire capacity and gross vehicle mass (GVM).
- b. the front axle load satisfies the minimum ratio of gross vehicle mass.
- c. the height of the center of gravity from the ground after body mounting is within the specified limit.
- d. the vehicle mass is evenly distributed between left and right wheels.
- e. the overall width of the vehicle is within the specified limit.
- f. the dimensions and mass of the vehicle comply with local regulations.

The specified values for the above items are given under "1. Vehicle summary—Chassis Specifications" in the TOYOTA Body Builder's Guide for the respective model series.

For your reference, example of the chassis specifications to be given in the Body Builder's Guide for the respective model series is described in the next page.

Example : VEHICLE SUMMARY

CHASSIS SPECIFICATIONS

Item		Chassis model	XZU410 - TKFSS	
Cab width (type)		(mm)	1,995 (WIDE)	
Drive system			4 x 2	
Wheel base		(mm)	3,430	
Tread		(mm)	Front	1,655
		Rear	1,590	
MAX. GVM. Rating		(kg)	8,000	
Capacity (kg) (On std. spec.)	GAM. Rating	Front	3,100	
		Rear	6,200	
	Tire	Front	3,100	
		Rear	6,000	
Chassis weight (kg) (On std. spec. with spare tire)		Total	2,530	
		Front	1,640	
		Rear	890	
Engine	Model		J05C	
	Max. Output	JIS gross	-	
		ISO net	103kW {140PS} at 2,900 r/min	
	Max. Torque	JIS gross	-	
ISO net		360 N•m {36.7kgf•m} at 1,600 r/min		
Height of gravity from ground		(m)	0.649	
Cab to rear axle center		(m)	2.842	
Tire and disc	Tire	Front	225/80R17.5 - 14PRLT	
		Rear		
	Disc	Front	17.5 x 6.00 - 127 mm (offset)	
		Rear		
Fuel tank		(L)	108	
Battery	V - kC {A•h} - No.		12v - 216 {60} - 2	
Alternator	V - A		24 - 50	
Recommended maximum body width (mm)			2,085	

Notes:

1. The front axle load must exceed 30% of the gross vehicle mass under full loaded condition.
2. The height of center of gravity from ground on the unloaded vehicle with body mounted should be 1.08 m or less.
3. Weight distribution on the left and right wheels should be balanced.
4. Both front axle and rear axle loads must not exceed the permissible load based on the tire load capacity according to the tire standards in your country.

2) Formula for Calculation

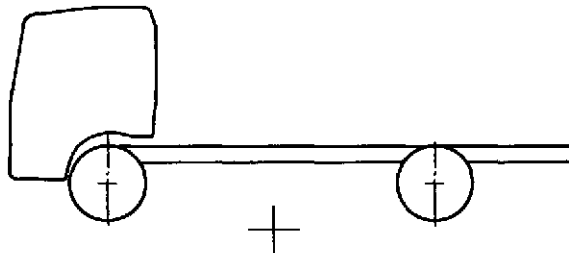
When calculating

- gross vehicle mass
- body load center (offset), and
- height of center of gravity from ground for chassis with body mounted, use the formulae described in this section.

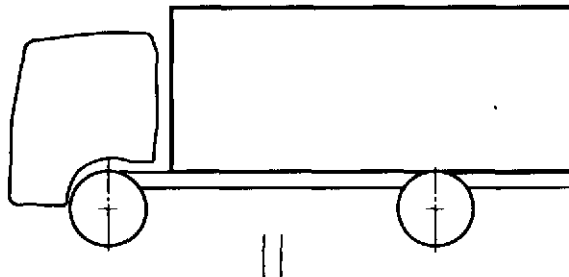
(1) Gross Vehicle Mass (GVM)

What is Gross Vehicle mass (GVM) ;

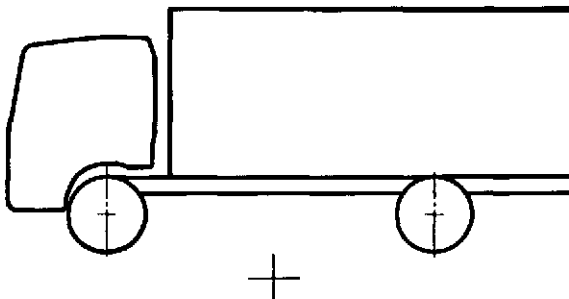
CHASSIS MASS



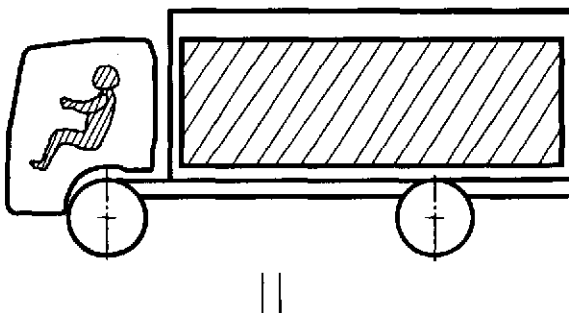
BODY MASS



VEHICLE MASS



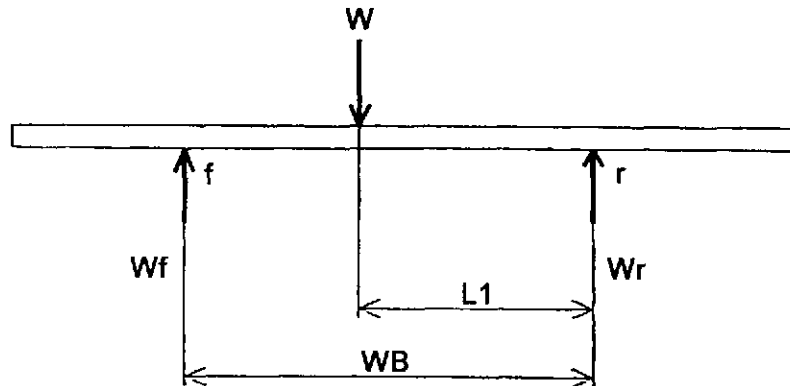
CREW and PAYLOAD



GROSS VEHICLE MASS (GVM)

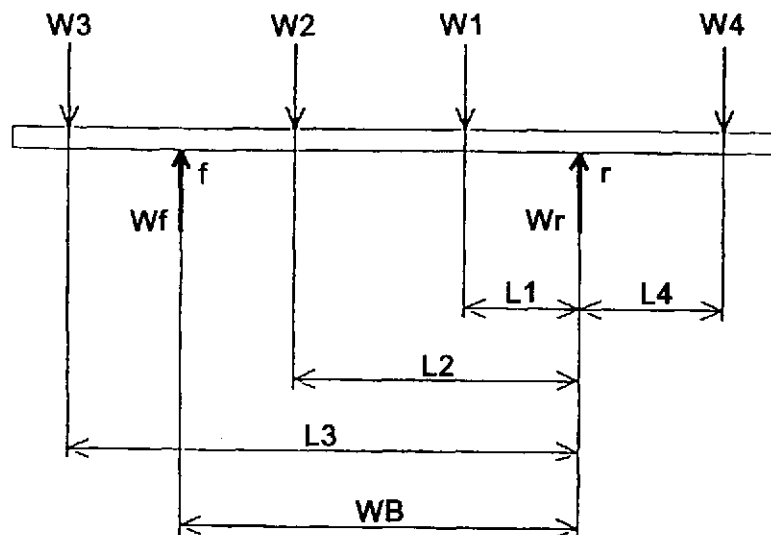
(2) Basic Formula for Mass Distribution

The distribution of mass on front and rear axles is calculated as follows;

1. For one unit of load

$$Wf = \frac{W \times L1}{WB}$$

$$Wr = W - Wf$$

2. For multiple units of load

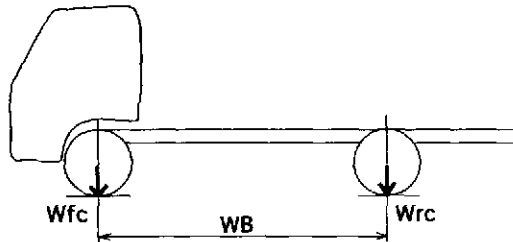
$$Wf = \frac{(W1 \times L1) + (W2 \times L2) + (W3 \times L3) - (W4 \times L4)}{WB}$$

$$Wr = (W1 + W2 + W3 + W4) - Wf$$

(3) Calculation of Gross Vehicle Mass

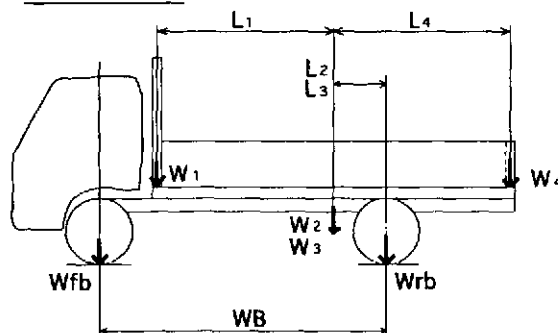
The details of each factor used in calculating GVM are as follows;

CHASSIS MASS



W_{fc} and W_{rc} are given "1 Vehicle Summary -----Chassis Specification" in the Body Builder's Guide for the respective model series.

BODY MASS

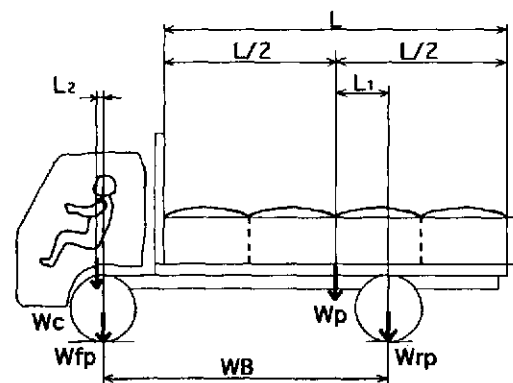


Calculate W_{fb} and W_{rb} of Body Mass using the basic formula for mass distribution.

[Example for flat cargo body]

Construction	Mass (W)	Length (L)
Guard frame	W_1	L_1
Side gates	W_2	L_2
Floor const.	W_3	L_3
Tail gate	W_4	L_4

CREW MASS and PAYLOAD



Calculate W_{fp} and W_{rp} of Crew Mass and Payload using the basic formula for mass distribution.

Load	Mass (kg)	Length (mm)
Crew	W_c	$* L_2 + WB$
Payload	W_p	L_1
Total		

Marks * :

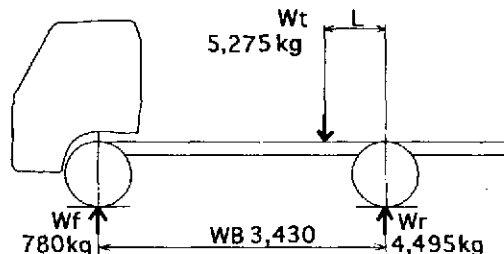
"This dimension is indicated in the Body Builder's Guide for the respective model series.

[NOTE] • Example of calculating mass distribution is described in this clause page 1 - 4 - 9 for your reference.

(4) Theoretical Calculation of Body Load Center (Load Offset)

a. Calculation of carrying capacity (CC)

$$\text{CC} = \text{GVMR} - (\text{Chassis mass} + \text{Crews mass}) \\ = \text{Body mass} + \text{Payload}$$



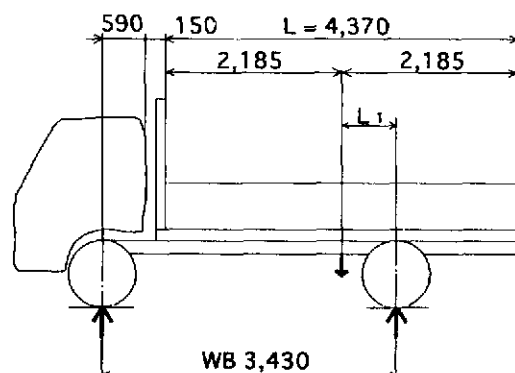
For a Model XZU410 - TKFSS Cargo Truck

(kg)

	Total	Front	Rear
GVMR (A)	8,000	2,620	5,380
Chassis mass (B)	2,530	1,640	890
Crews mass (C)	195	200	- 5
Carrying capacity (A - B - C)	Wt 5,275	Wf 780	Wr 4,495

b. Calculation of carrying capacity load center

$$\text{Carrying capacity load center } L_1 \leq \frac{W_f \times W_B}{W_t} = \frac{780 \times 3,430}{5,275} = 507 \rightarrow 505 \text{ mm}$$



c. As carrying capacity load center is fixed, mountable body length can be calculated.

$$L = 2,185 \times 2 = 4,370 \text{ mm}$$

Actual body offset is determined by the body length required by customer and maximum permissible rear-overhang length.

(5) Mass Distribution on Front Axle (When loaded)

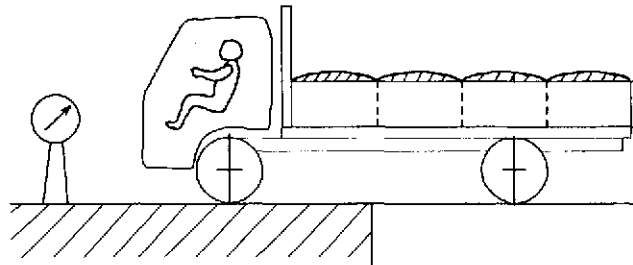
This means the percentage of vehicle total mass applied on front axle.

Limit : Front axle mass Distribution $\geq 30\%$

$$\frac{\text{Front Axle Mass}}{\text{Gross Vehicle Mass}} \times 100 \geq 30\%$$

The mass distribution on front axle has also a major impact on the steering and handling of the vehicle.

Therefore on safety during running, make sure that the minimum 30% of vehicle total mass applied on front axle.

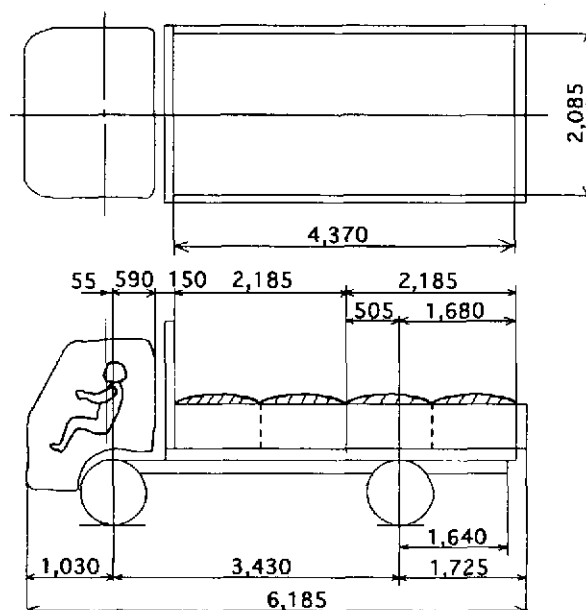


Front Axle Mass Distribution

(6) Example of Calculation of Mass Distribution

Calculating mass distribution for a Model XZU410 – TKFSS cargo truck (body length 4,370 mm).

UNIT : mm



a. Calculation of Gross Vehicle Mass and Gross Axle Mass

UNIT : kg

	Total	Front	Rear
Chassis mass	2,530	1,640	890
Body mass	530	80	450
Vehicle mass	3,060	1,720	1,340
Payload	4,745	700	4,045
Crew	195	200	- 5
GVM	8,000	2,620	5,380
Axle capacity	—	3,100	6,200
Tire capacity (225/80R-17.5)	—	3,100	6,000

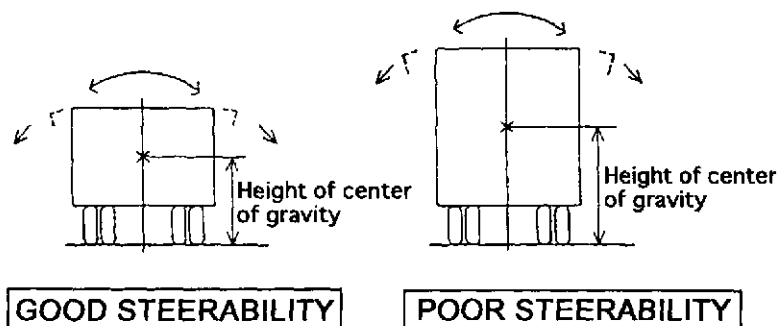
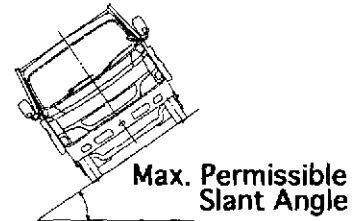
b. Mass distribution on front axle

$$\frac{Fr}{GVM} \times 100 = \frac{2,620}{8,000} \times 100 = \boxed{32.8 > 30\%}$$

3) Height of Center of Gravity from Ground

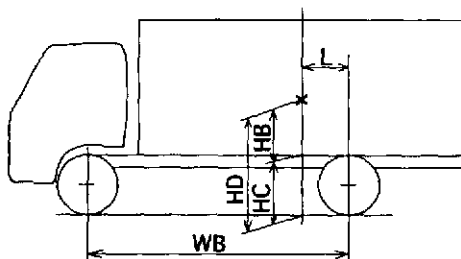
(1) A High Center of Gravity Causes POOR STEERABILITY

- The height from the ground of the vehicle's center of gravity has a major impact on the steering and handling of the vehicle. Therefore on safety during running, make sure that the height of the center of gravity does not exceed the specified limit.
- The specified limit on the height of center of gravity represents the maximum height of center of gravity that will assure a turn-over angle of 35 degrees when the vehicle is unloaded.
- For the maximum height of center of gravity from ground for each model when a body or equipment is mounted, see the Body Builder's Guide for the respective models series.



(2) Calculation

- Calculate height of center of gravity as follows;



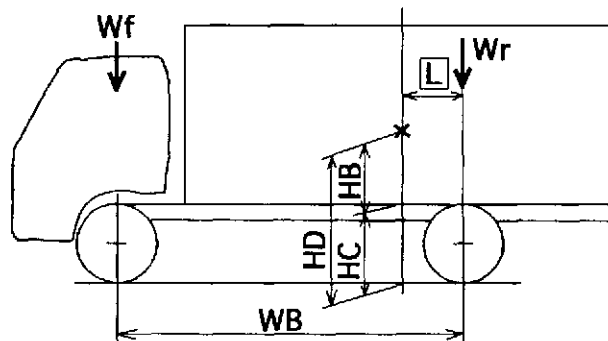
- L : Body mass offset (m)
- HB : Height of center of gravity of body from upper surface of chassis frame (m)
- HC : Ground height of upper surface of chassis frame at body mass offset point (m)
- HD : Height of center of gravity of body from ground (m)

[NOTE]

- The vehicle which is adopted the leaf spring suspension, ground height of upper surface of chassis frame, marked "HC", must be considered the deflection value of the leaf spring due to weight of the mounted body.

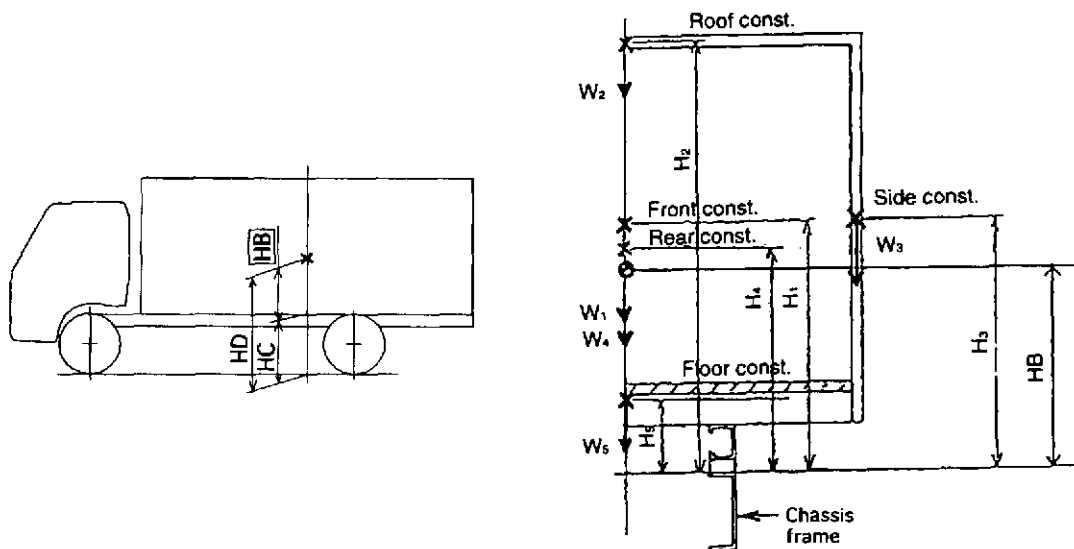
- a. Calculate body mass offset (L) in meters.

$$\frac{W_f \times WB}{\text{Total mass of body}} = L \text{ (m)}$$



- b. Calculate height of center of gravity of body from upper surface of chassis frame (HB).

Calculate HB in meters according to the following example;

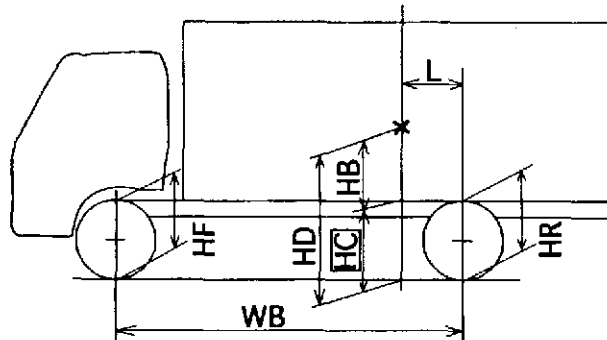


Construction	Mass=W (kg)	Height=H (m)	Moment = W x H (kg • m)
Front const.	80	1.267	101.36
Roof const.	60	2.467	148.02
Side const.	250	1.302	325.50
Rear const.	170	1.272	216.24
Floor const.	530	0.169	89.57
Total	1090 (A)	0.808	880.69 (B)

$$HB = \frac{(B)}{(A)} = \frac{880.69}{1090} = 0.808 \text{ (m)}$$

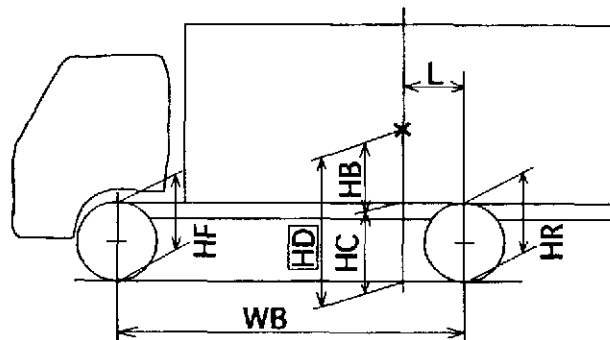
- c. Calculate ground height of upper surface of chassis frame (HC) at body mass offset point in meters.

$$HR - \left\{ (HR - HF) \times \frac{L}{WB} \right\} = HC \text{ (m)}$$



- d. Calculate height of center of gravity of body from ground (HD) in meters.

$$HB + HC = HD \text{ (m)}$$



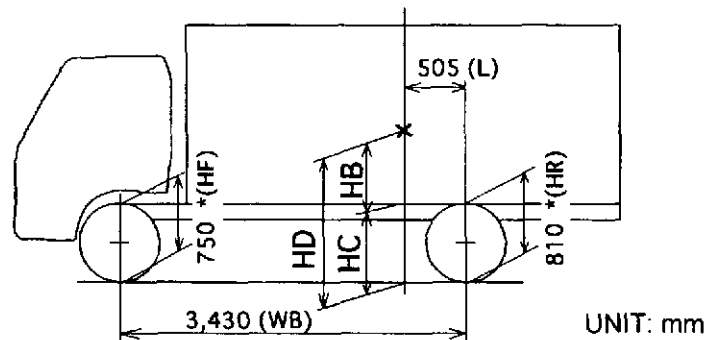
- e. Finally, make sure that the height of the center of gravity of the vehicle does not exceed the specified limit height of center of gravity from ground at the vehicle mass that is shown in the Body Builder's Guide for the respective model series.

$HD \text{ (m)} < \text{limit specified in Body Builder's Guide for the respective model series.}$

If the height exceeds the specified limit, you must take steps to reduce the height and bring it within the limits specified in the Body Builder's Guide for the respective model series by modifying body design or other means.

f. Example

Height of center of gravity on model XZU410-TKFSS truck with dry van body.



Dimensions marked "*" are indicated in the model series Body Builder's Guide.

$$HC = HR - \{(HR - HF) \times L / WB\}$$

$$HD = HB + HC$$

$$HC = 810 - \{810 - 750\} \times 505 / 3,430\}$$

$$HD = 0.808 + 0.801$$

$$= 801 \text{ (mm)} = 0.801 \text{ (m)}$$

$$= 1.609 \text{ (m)}$$

	Height of center of gravity from ground (H) (m)	Mass(W) (kg)	Moment (H x W) (kg • m)
Chassis	0.649	2,530	1,641.97
Body	(HD) 1.609	1,090	1,753.81
Total	H = 0.938	3,620 (A)	3,395.78 (B)

$$H = \frac{(B)}{(A)} = \frac{3,395.78}{3,620} = 0.938 < \underline{1.08 \text{ (m)}}$$



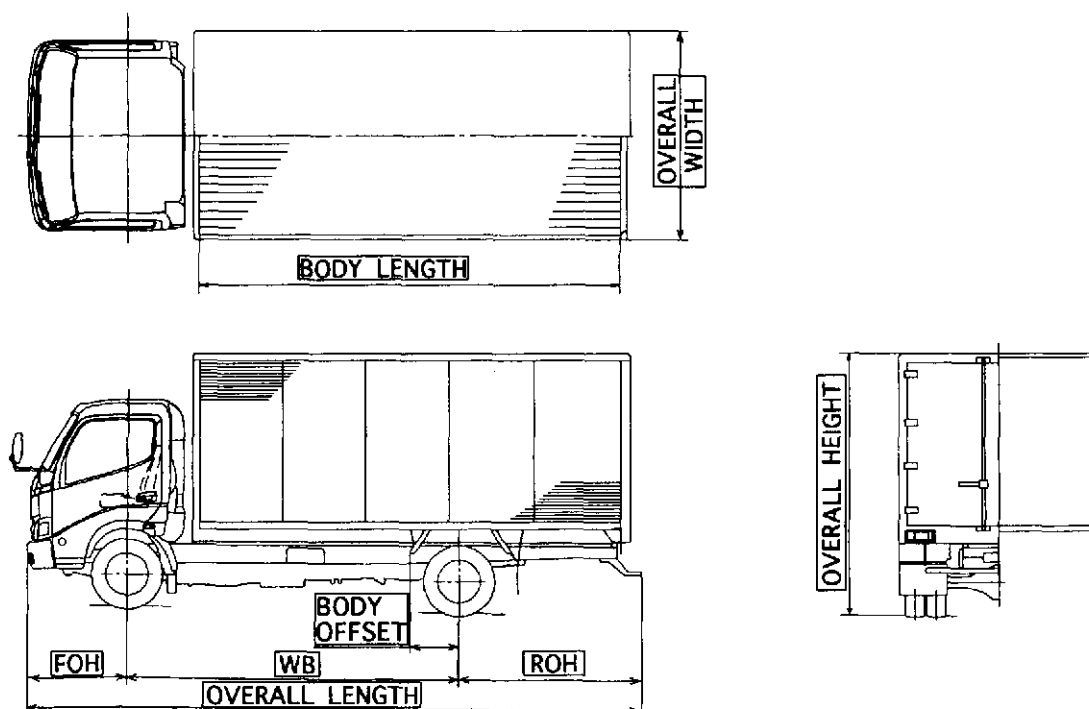
This limit is specified in the Body Builder's Guide for the respective model series.

4) Dimensions

It is the responsibility of the body and equipment manufacturer to ensure that the dimensions of the completed vehicle conform to the regulations of the country in which the vehicle is to be operated.

When designing a body or equipment, in addition to observing the maximum height for the center of gravity of the completed vehicle, you should also observe the maximum rear body or equipment width specified in the Body Builder's Guide for the respective model series.

Outline of vehicle's dimensions are described as follows;



[NOTE]

FOH : Front Overhang

ROH : Rear Overhang

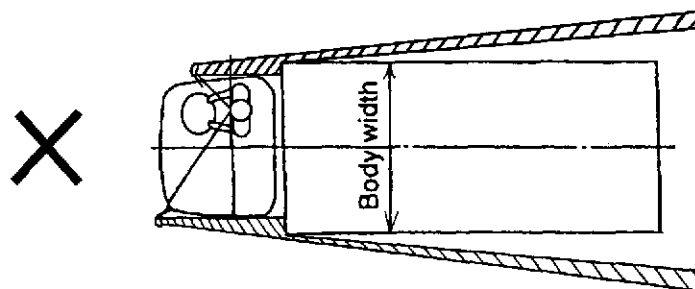
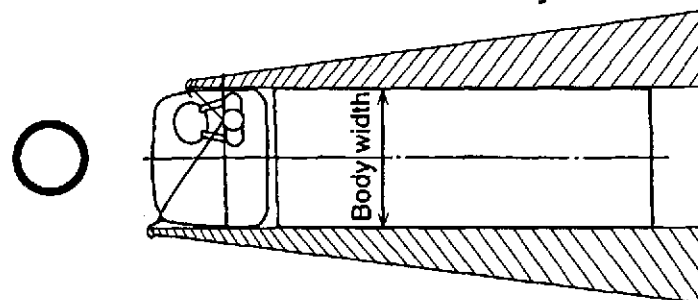
WB : Wheelbase

(1) Body Width and Rearward Visibility

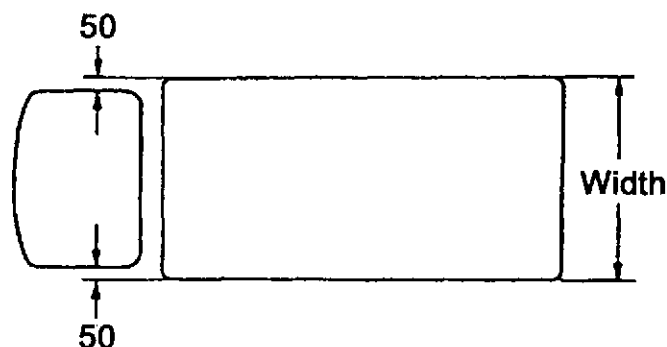
Excessive rear body width will seriously affect rearward visibility.

Make sure that you observe the specified dimensions when designing the body (see figure for details).

Visibility through the Rearview Mirror.

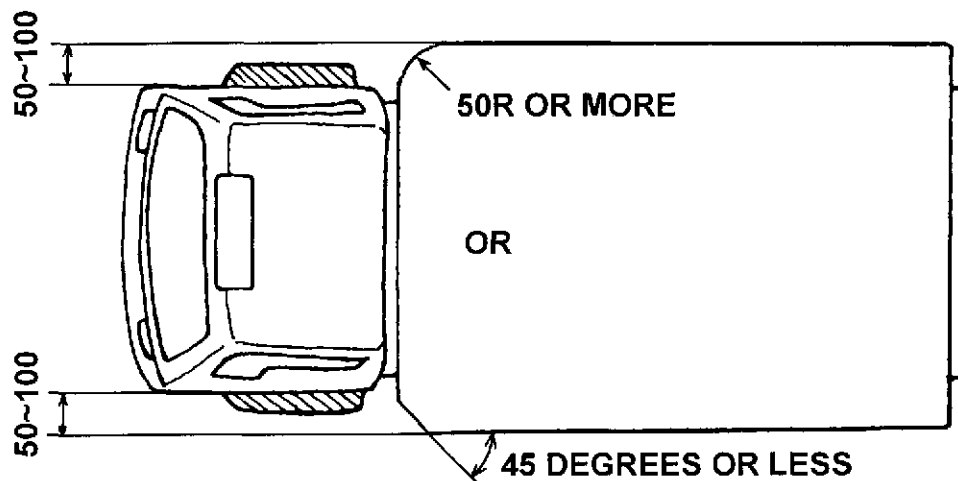
Bad visibility**Good visibility****(2) Recommended Maximum Body Width**

The width of a mounted body should basically be each 50 mm maximum as measured from the outermost point of the cab of the base chassis.



When the difference in width between the cab and body is from 50 mm up to 100 mm on one side, provide chamfering of 45 degrees or less or a corner radius of 50 mm or more at the front end of the rear body.

UNIT : mm



(3) Rear Overhang

The rear overhang means the distance from the center of rear axle to the rear end of the vehicle and it is determined by wheelbase length.

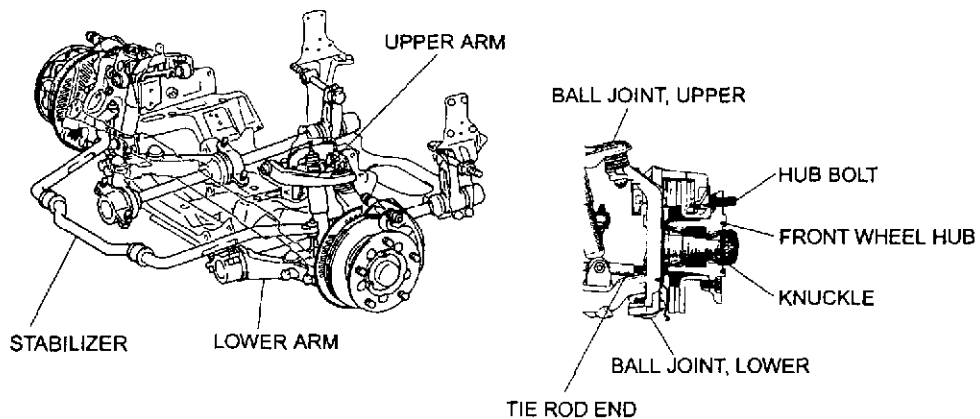
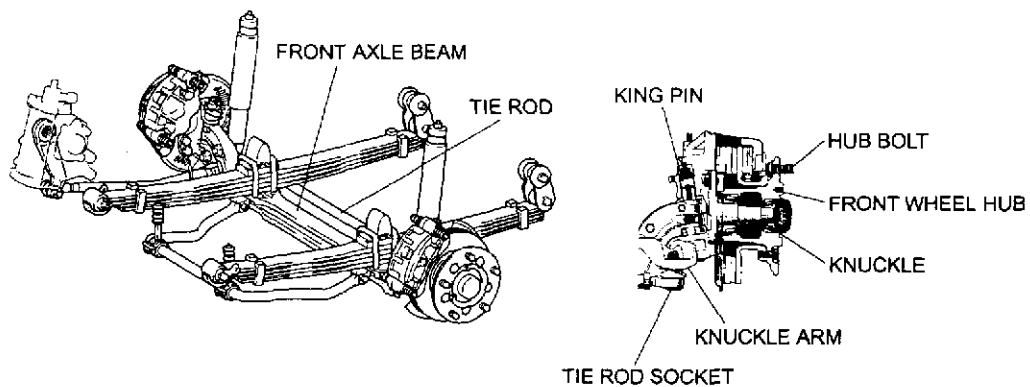
Please see the limitation of its extension length below.

REAR OVERHANG	APPLICATION VEHICLE	FIGURE
2/3 of the wheelbase or less.	Vehicles of which cargo does not Protrude. Example : Bus, Van and so Forth.	
1/2 of the wheelbase or less.	Other Vehicles.	

4. NEVER MODIFY SAFETY PARTS

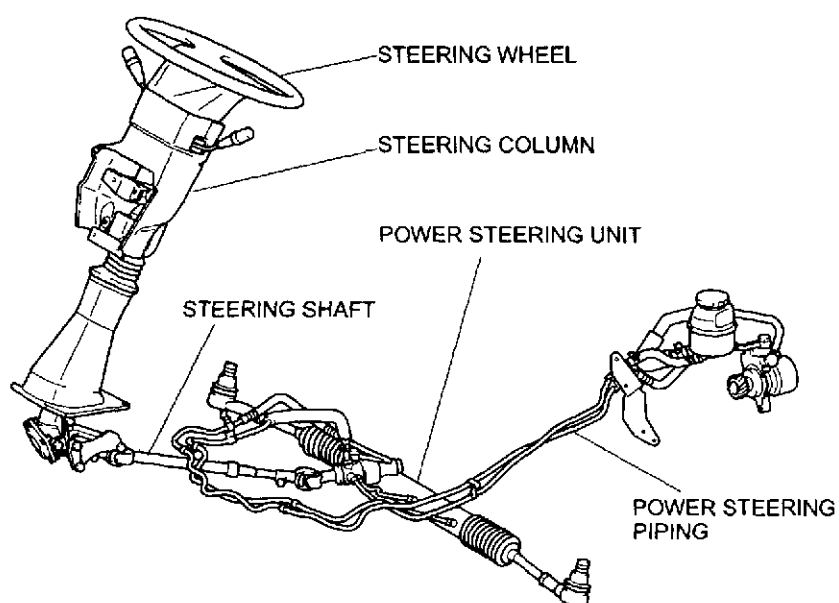
Never modify and never heat safety parts relating to the front axle, steering system or brake component, etc. Modifying or heating these parts may affect their strength and is highly dangerous.

The parts of the chassis relating to the body mounting which must not be modified are as shown in the figures below.

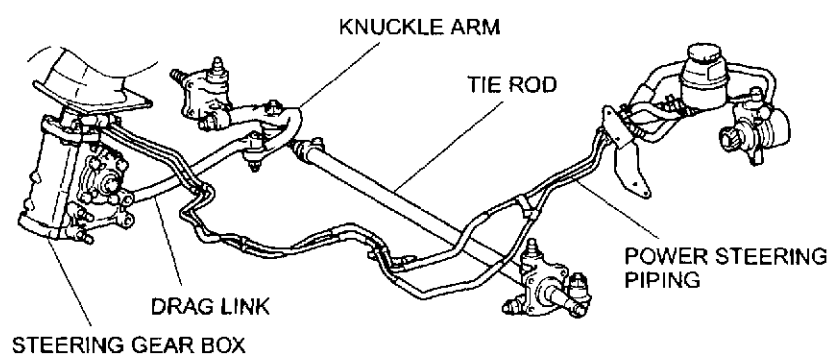
1) Front Axle**INDEPENDENT SUSPENSION****RIGID SUSPENSION**

2) Steering System

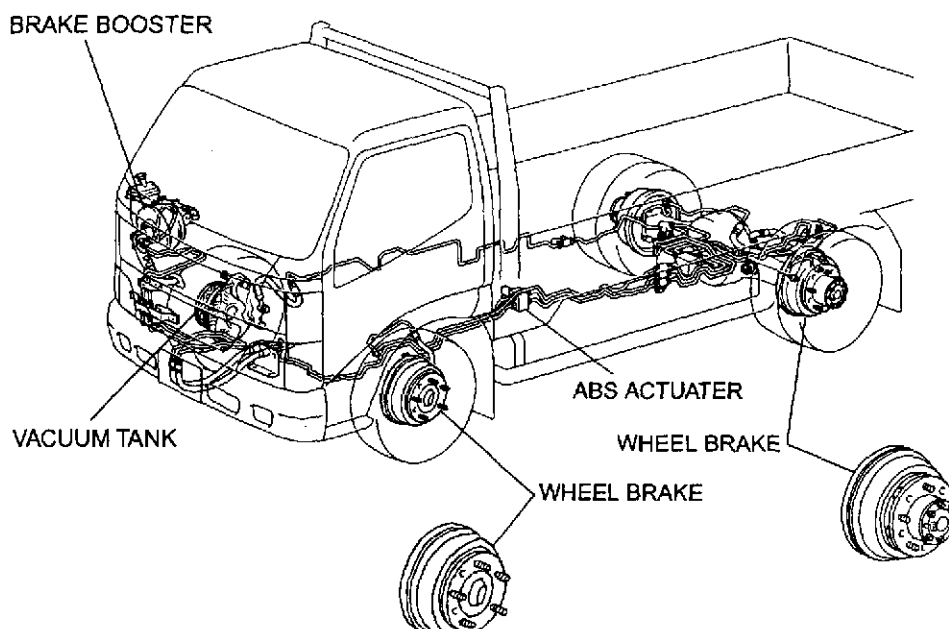
FOR INDEPENDENT SUSPENSION



FOR RIGID SUSPENSION



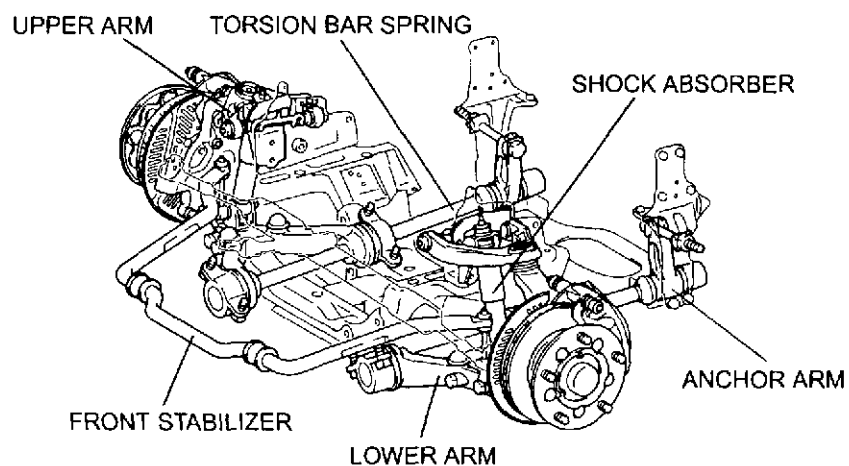
3) Brake System



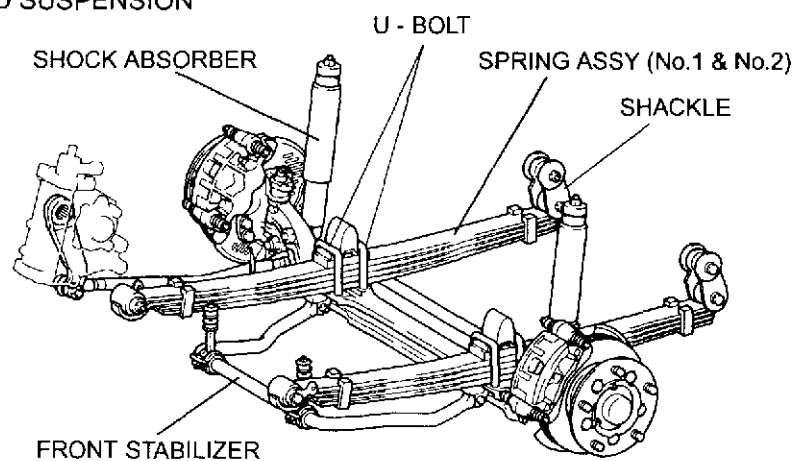
4) Springs

FRONT

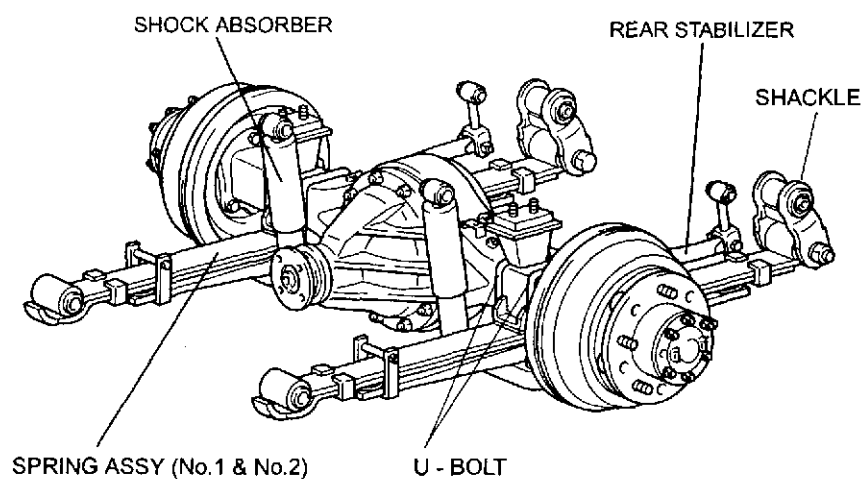
INDEPENDENT SUSPENSION



RIGID SUSPENSION

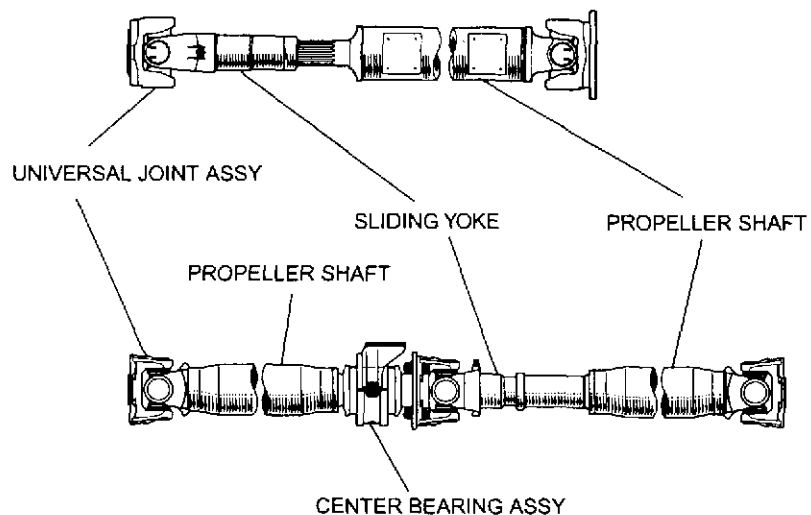


REAR



5) Propeller Shaft

To alter the length of the wheel base it is necessary to modify the propeller shaft. However, improper modification of the propeller shaft may lead to damage and unusual noises during driving or even cause serious accidents, and is therefore highly dangerous.



5. CLEARANCES**Clearance Between Chassis Parts and Body or Equipment**

To prevent contact with chassis parts that vibrate or rotate during driving, be sure to allow adequate clearance between chassis parts and the body or equipment. Also be sure to allow sufficient space to allow easy filling, maintenance and repair work.

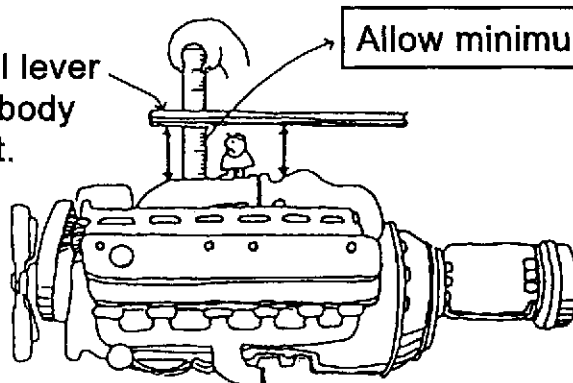
1) Engine, Clutch and Transmission**Clearance of Peripheral Parts with the Body**

Observe the following clearances between the peripheral parts of the engine, clutch and transmission, and the mounted body or equipment.

	MINIMUM CLEARANCE
Engine periphery and body or equipment.	Above and below : Min. 50mm Right and left : Min. 50mm Front and back : Min. 50mm
Transmission periphery and body or equipment.	Min. 50mm

[EX.]

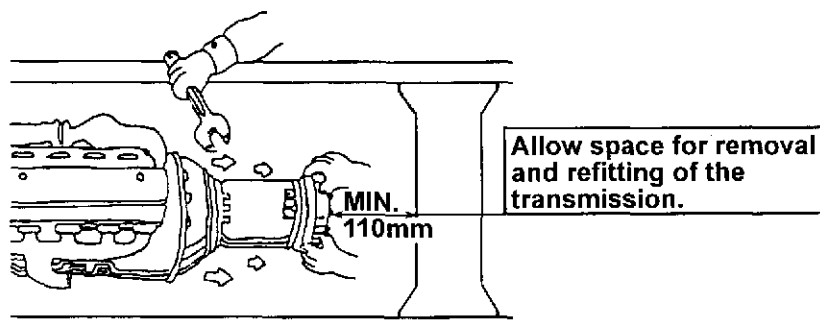
Dump control lever and parts of body or equipment.



Allow minimum clearance.

2) Space for Removal and Refitting of Transmission

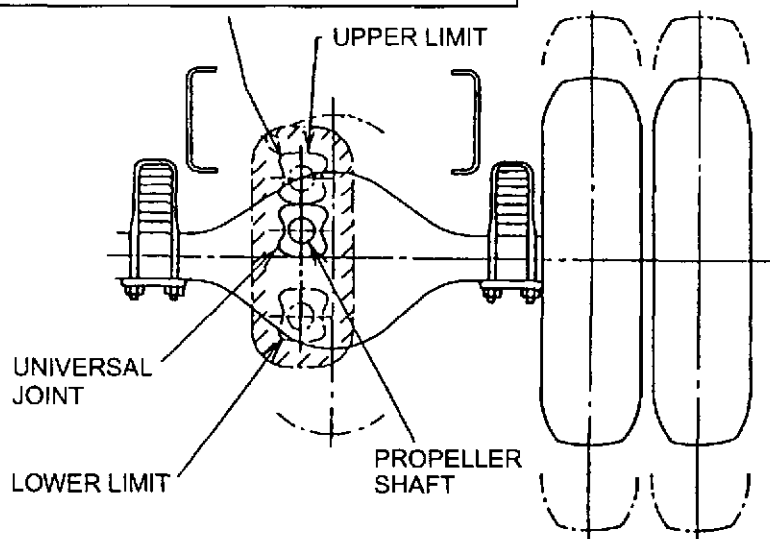
When removing the clutch and transmission, to extract the clutch spline shaft, it is necessary to pull the transmission assembly backwards approximately 110 mm in the line of the engine. Make sure you allow enough space for this work.



3) Propeller Shaft

The clearance between the propeller shaft (including joints) and the body (pump bracket for dump body, etc.) must be at least 50 mm from the limit of displacement of the propeller shaft (above, below, left, right, front or back of the axle).

Allow 50 mm clearance from limit of displacement (above, below, left, right, front, back).

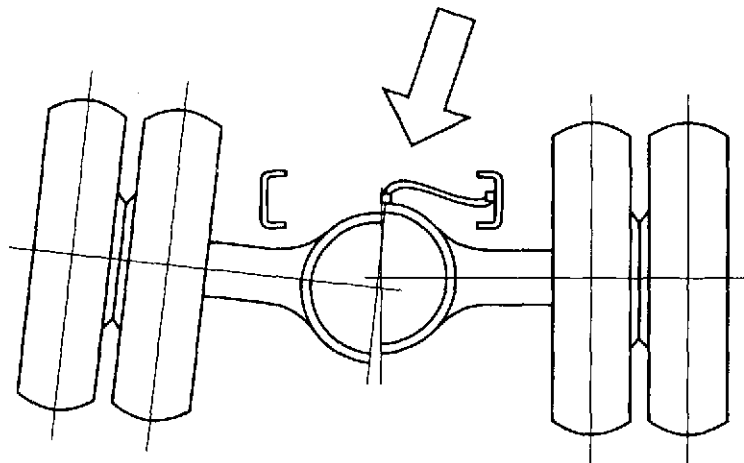


4) Rear Axle

Clearance when Rubber Bumper Contacting

The clearance between the rear axle (including the brake hose, torque rods and ABS harness, etc which is located on the rear axle) and the mounted body or equipment must be at least 50 mm from the limit of displacement of the rear axle, so that the axle does not touch the mounted body or equipment nor even contact the rubber bumper.

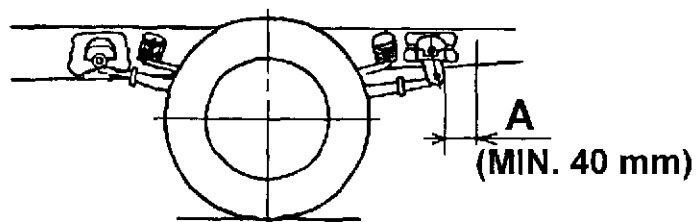
- For details of range of axle movement, see the Body Builder's Guide for the respective model series.



5) Springs

Clearance from End of Spring

During driving, the spring end (shackle) moves rearward. When mounting the body or equipment, do not position any part of the body or equipment inside the range marked "A" in the following figure.



Do not mount any part
of the body or equipment
inside this range.

6) Brake Hose and Pipe

Strictly observe the minimum clearances between the brake hose and pipe and the body or equipment. If the hoses are allowed to come into contact with the body or equipment, they will quickly become damaged and this may lead to serious accidents.

For details of minimum clearance, see clause **5. BRAKE & HYDRAULIC PIPING.**

7) Electrical Wiring

Strictly observe the minimum clearances between electrical wiring and the body or equipment. If electrical wiring is allowed to come into contact with the body or equipment, it will quickly become damaged and this may lead to serious problems such as fire.

For details of minimum clearance, see clause **7. ELECTRICAL SYSTEM.**

8) Exhaust muffler & Tail Pipe

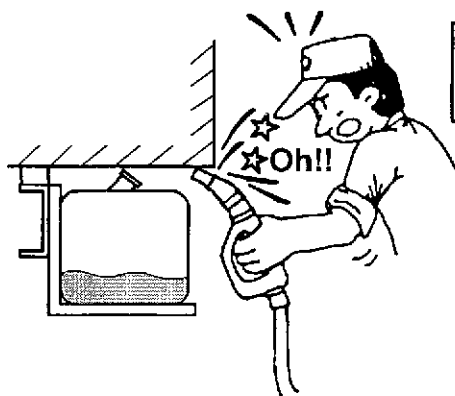
Strictly observe the minimum clearances between the exhaust muffler or tail pipe and the body or equipment. If the exhaust muffler or tail pipe are allowed to come into contact with the body or equipment, this may lead to serious problems such as fire.

For details of minimum clearance, see clause **8. EXHAUST SYSTEM.**

9) Fuel Tank Filler Cap

Space for Opening the Filler Cap and Filling

The fuel tank is mounted at the left or right side of the chassis. When mounting the body or equipment or making alterations, make sure that there is enough space to open the filler cap and fill the tank with fuel.

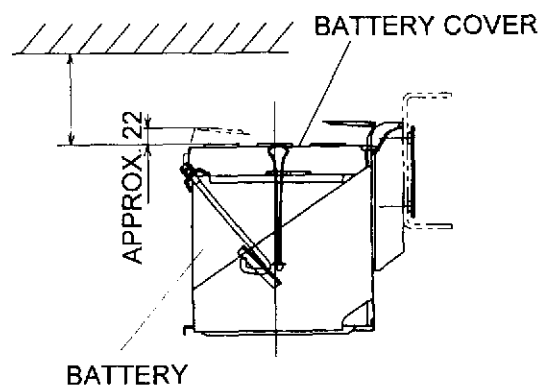


Allow space to open the filler cap and fill fuel.

10) Battery**Space for Removal and Refitting of the Cover, and Inspection and Removal and Refitting of the Battery**

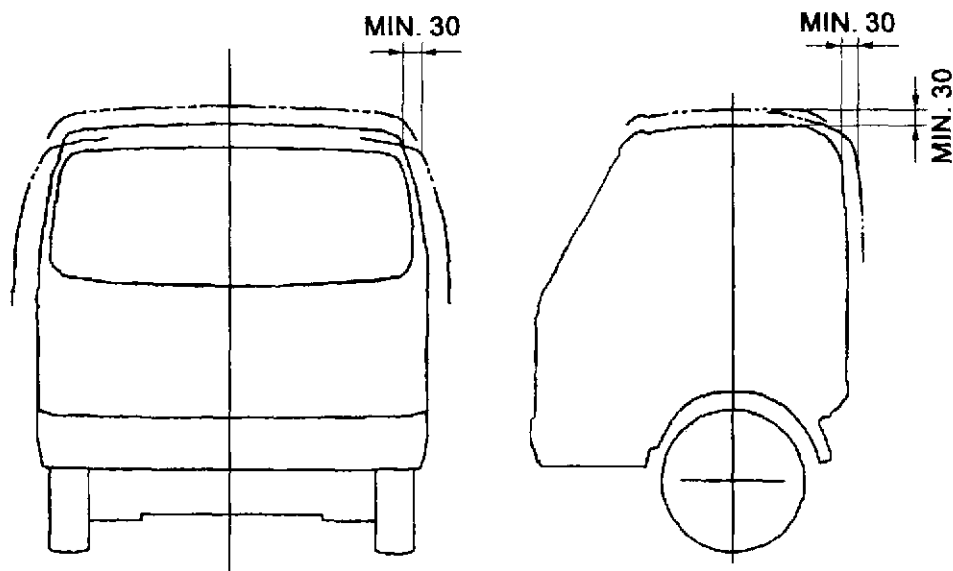
When mounting the body or equipment, make sure you allow enough space for removing and refitting the battery cover and inspection and removal and refitting of the battery itself.

Allow space for removing and refitting the cover and inspection and removal and refitting of the battery.

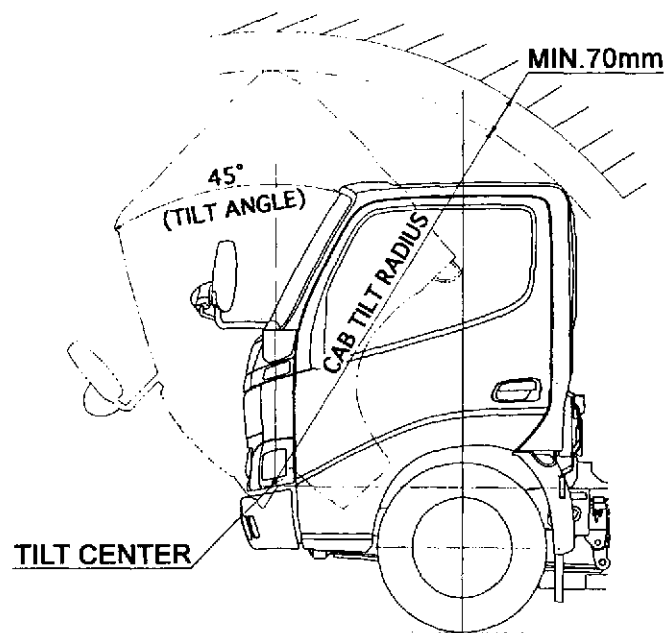


11) Cab**(1) Minimum Clearance with Cab Outer Shell**

- Even under normal driving conditions, when the cab is not tilted, it moves back and front, right and left, and up and down. The body or equipment must not interfere with cab movement.
- Allow at least 30 mm clearance between the cab and rear body or equipment.



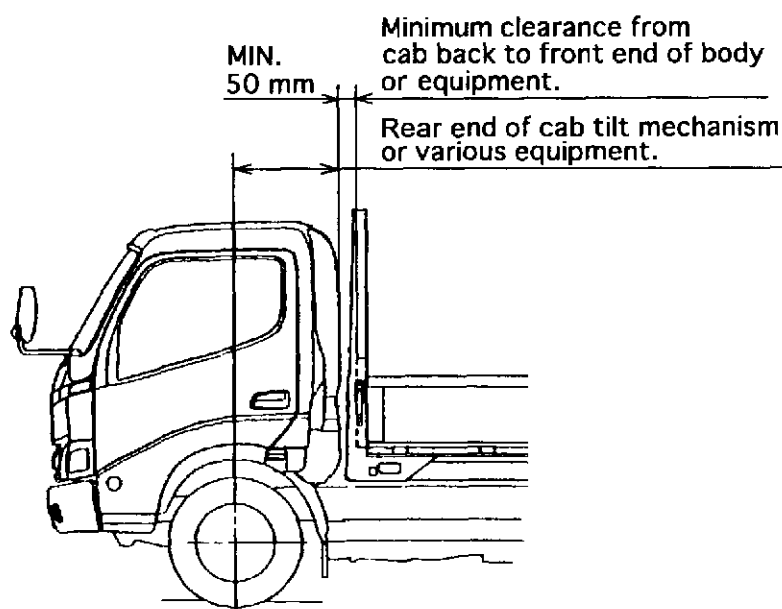
- When cab tilt, allow at least 70 mm clearance the cab and rear body or equipment. For details of cab tilt dimensions, see the Body Builder's Guide for the respective model series.



(2) Minimum Clearance with Cab Rear End

The rear part of the cab contains the cab lock mechanism and the tilt mechanism, as well as the engine cylinder block or other various equipment.

When mounting the body or equipment, allow at least the minimum clearance between the rear end of the cab and the front end of the rear body or equipment, to avoid obstructing the operation and maintenance of these mechanisms or various equipment.



For details of cab dimensions, see the Body Builder's Guide for the respective model series.

EQUIPMENT	OPERATION, MAINTENANCE, ETC.
• CAB LOCK MECHANISM AND LEVER	CAB LOCK OPERATION
• CAB LOCK SAFETY LEVER	CAB TILT OPERATION
• CAB TILT LEVER, UP AND DOWN	CAB TILT OPERATION (VEHICLE W/ELECTRICAL CAB TILT PUMP) INSPECTION OF OIL LEVEL REPLENISH THE OIL
• CAB TILT SWITCH	
• CAB STOPPER RELEASE LEVER	
• TILT PUMP HAND LEVER	INSPECTION & REPLENISH THE OIL
• POWER STEERING OIL RESERVOIR	
• COOLING WATER HEADER TANK	INSPECTION & REPLENISH THE COOLING WATER
• ENGINE OIL LEVEL GAUGE	INSPECTION OF OIL LEVEL
• ENGINE OIL FILLER	REPLENISH THE OIL
• OIL LEVEL GAUGE & FILLER OF AUTO-T/M	INSPECTION & REPLENISH THE OIL
• AIR CLEANER	INSPECTION & CLEANING OF ELEMENT
• STACK EXHAUST TAIL PIPE OR MUFFLER	FOR FIRE PREVENTION

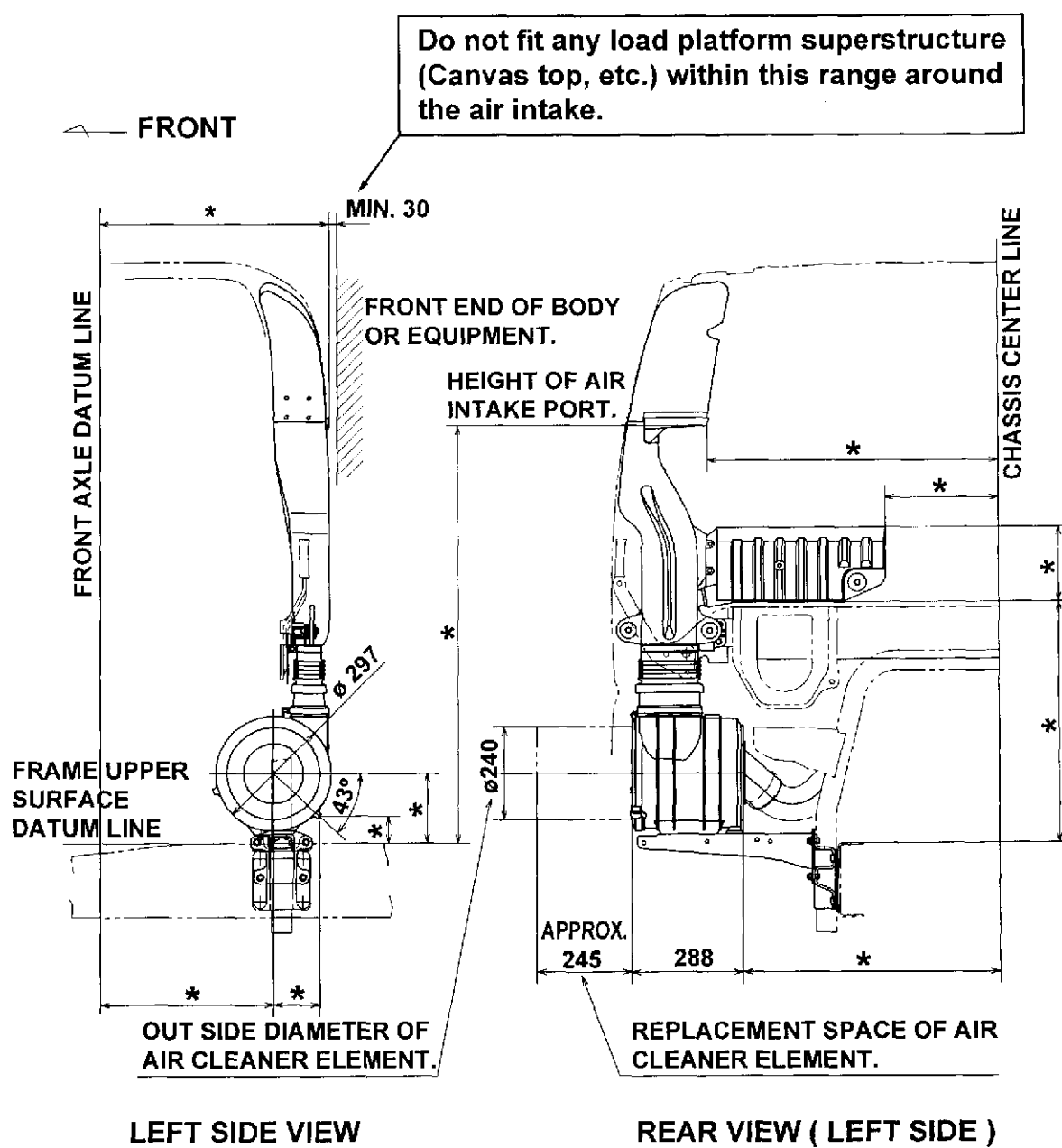
(3) Minimum Clearance with Engine Air Intake Port

The engine air intake port is located at the rear of the cab. Be sure to maintain the proper clearance so as not to obstruct the air intake.

The drawings below apply to the wide cab (1,995mm) truck series only.

For details of relevant model, see the Body Builder's Guide for the respective model series.

UNIT : mm

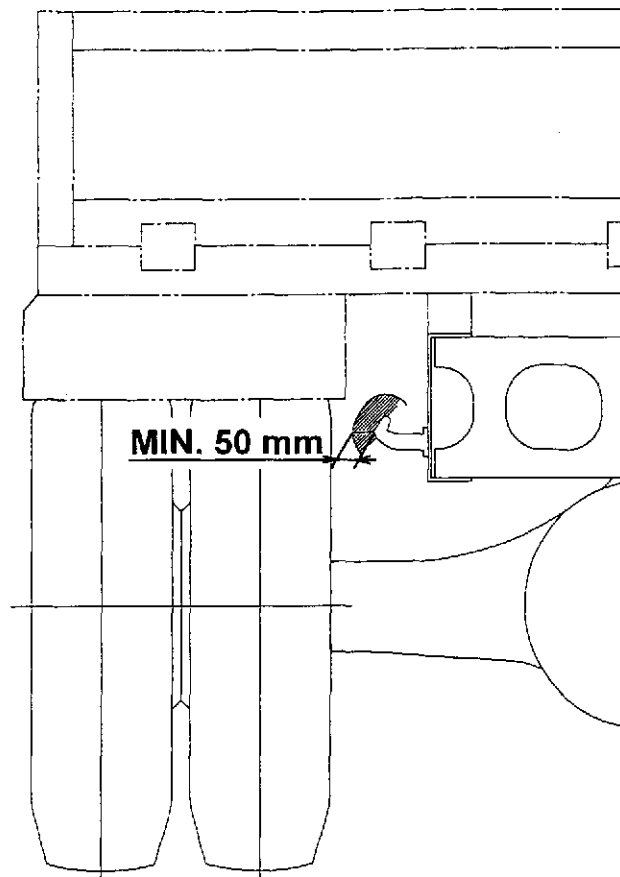


[CAUTIONS]

- 1) For details of dimensions marked "★", see the Body Builder's Guide for the respective model series.
- 2) The blocking of the smooth flow of air into the air intake pipe caused by any materials such as ropes, pieces of cloth, etc. leads to the increase of exhaust temperature if driven long intervals.
The increase in exhaust temperature is caused by the decreased efficiency in the combustion process, as the proportion of air in the combustion chamber is also decreased by the above mentioned factor.
This situation will lead to major malfunctions such as the cracking of the exhaust manifold and the breaking down of the turbocharger.
To avoid such malfunctions, please keep the air intake pipe free from any blocking materials at all times.

12) Precautions of the Rear Hook and the Rear Body for Towing

Secure the clearance as indicated on the following illustration so that a sufficient space can be available for accommodating the towing rope.



6. FIRE SHIELD

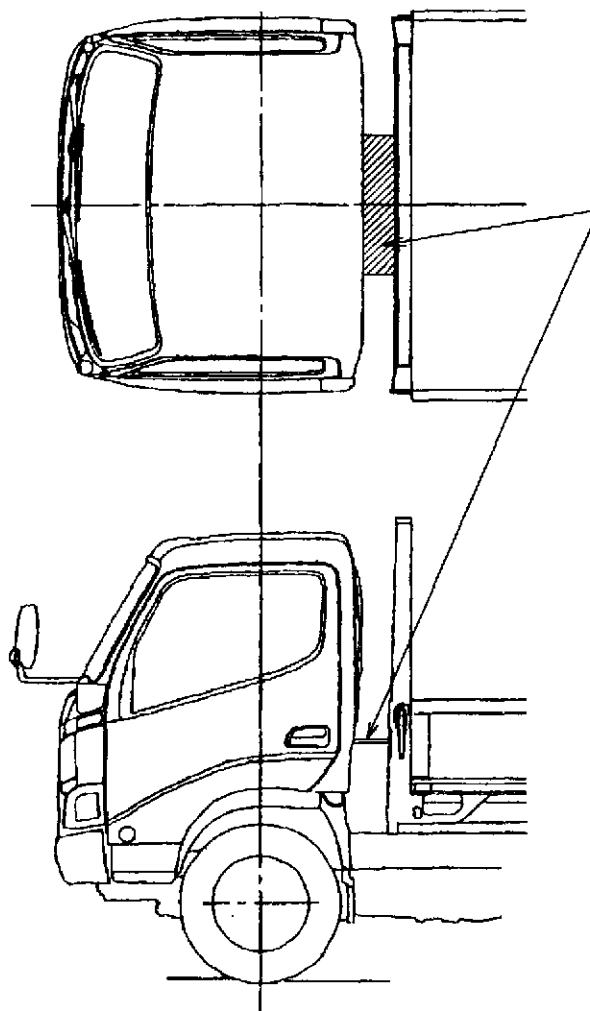
When a flat bed or similar body has been mounted, a fire shield should be fitted across the gap between the cab rear end and the front end of the load platform to prevent fires that may be caused by flammable materials falling off from the load platform onto the exhaust pipe (see figure below).

A fire shield is not necessary if the body is fitted with a sheet carrier attached directly to the top of the front guard.

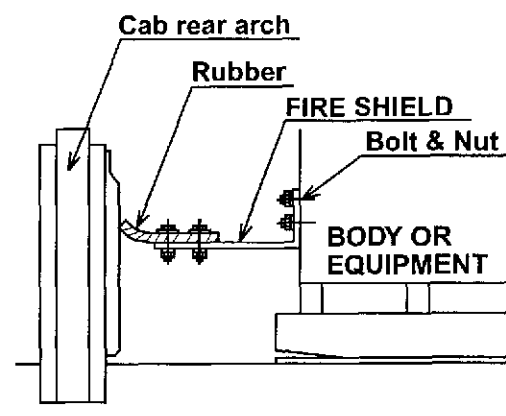
A fire shield is also not necessary for such bodies as dump trucks, mixers, tankers, and aluminum vans, where there is no danger of flammable materials falling off.

[NOTE]

- When you mount the fire shield, use bolts, etc., that can be taken out to allow for replacement of the chassis parts which are located at the rear part of cab.



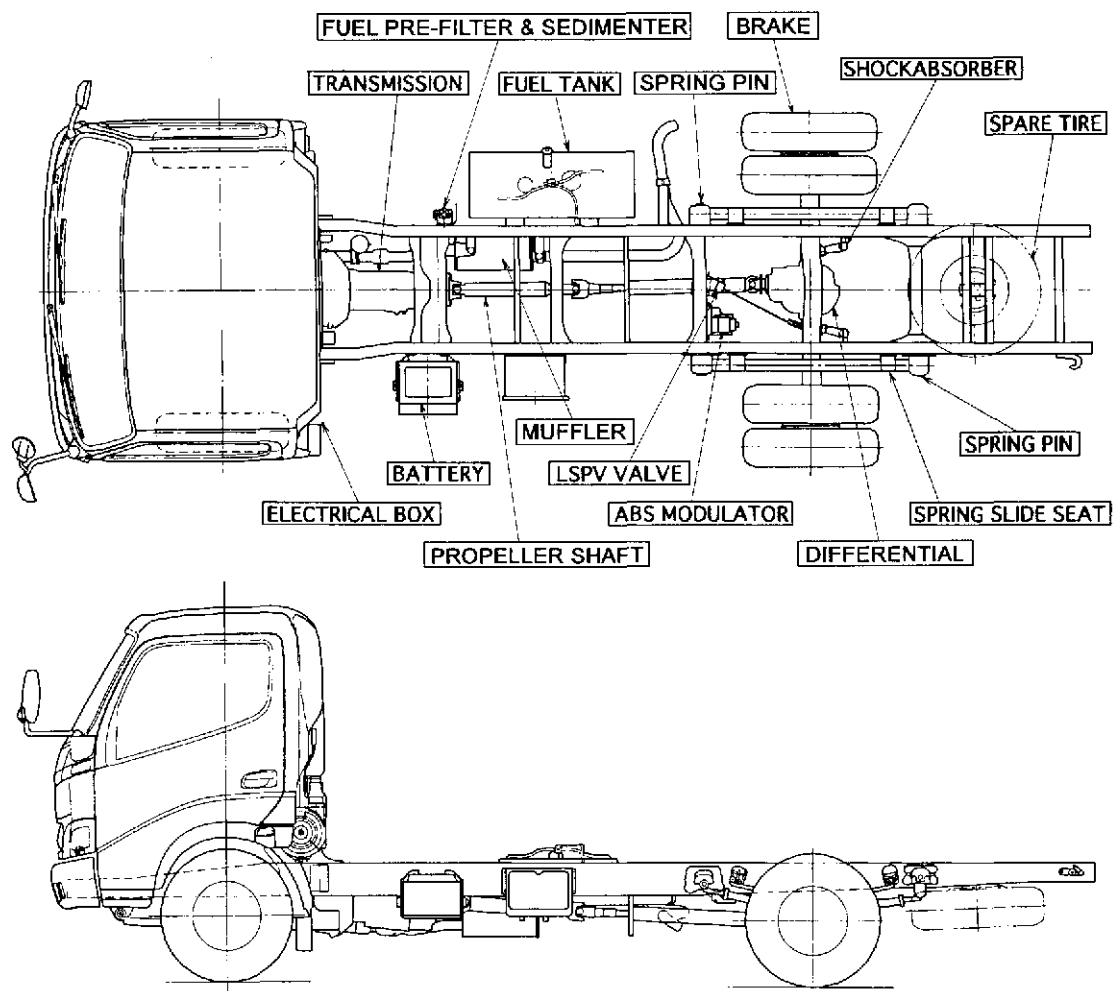
- For approximately 50mm from the front edge of fire shield (the cab side), use rubber to match the shape of the fire shield to that of the cab rear end such as rear arch cover.
- You may also install the fire shield so that it covers only the exhaust pipe.



7. ACCESSIBILITY FOR MAINTENANCE

When mounting a body or equipment, make sure you allow room for inspection and lubrication of chassis components.

Chassis Parts Requiring Inspection and Lubrication.



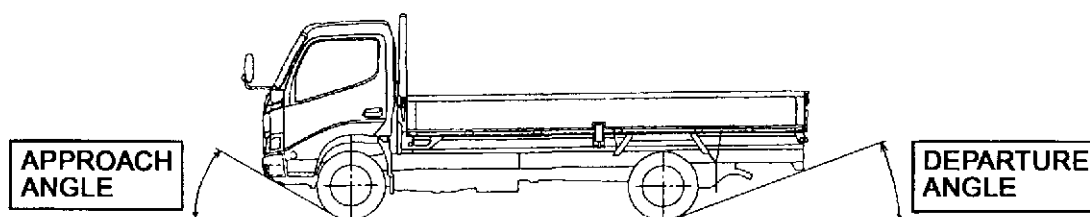
[NOTE]

- Chassis components as mentioned above figure show as example.
- For exact component installed each model, see to the Body Builder's Guide for the respective model series.

8. APPROACH AND DEPARTURE ANGLES

If you intend to mount parts of the body or equipment at a relatively low position in the front or rear overhang, make the approach angle and departure angle equal to or greater than the chassis standard angle.

If, for unavoidable reasons, you must make these angles smaller than the chassis standard, make sure to allow for operating conditions when deciding the ground height of mounted parts of the body or equipment.



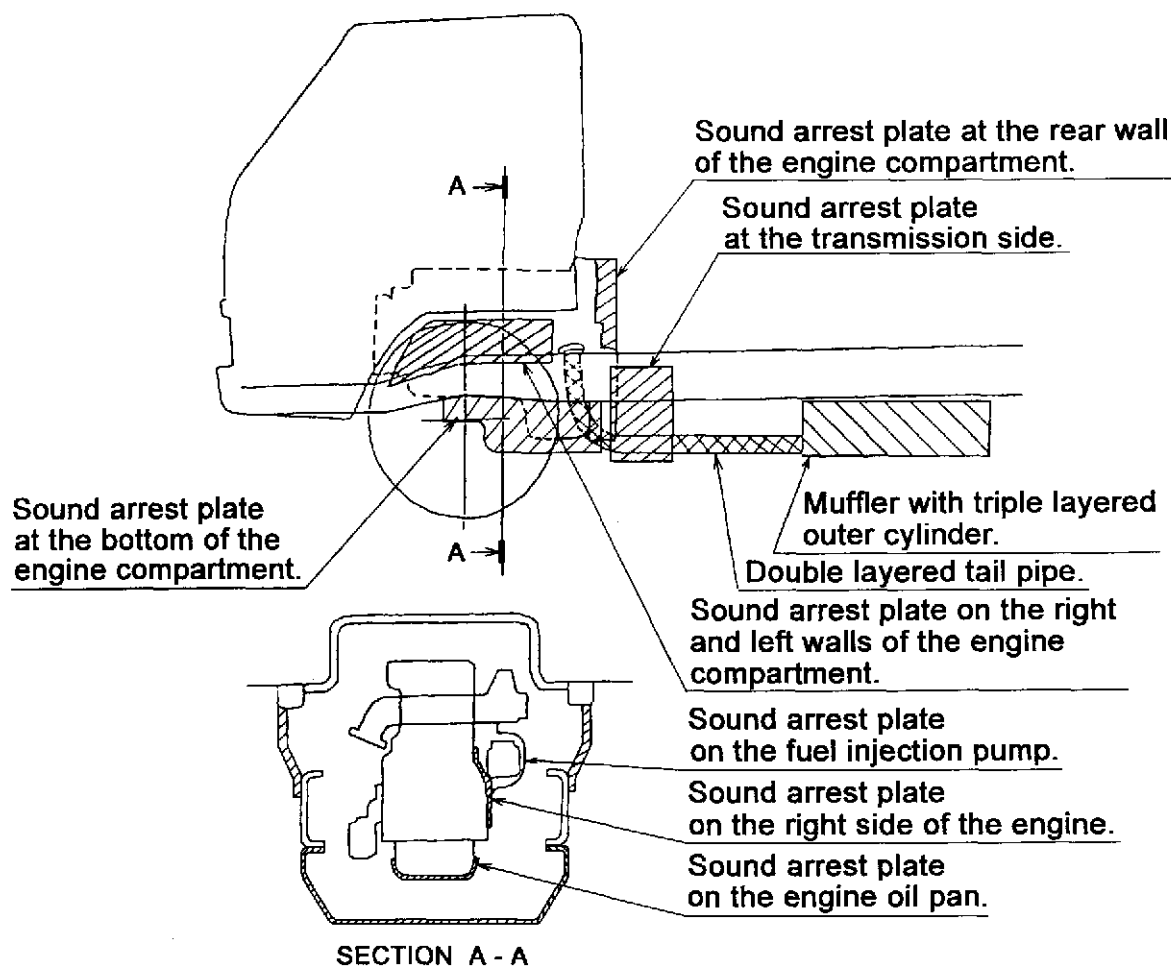
9. EXTERNAL NOISE CONTROL PARTS

Precautions for Handling Parts

External noise control parts [sound-insulating materials (covers, rubber), sound-absorbing materials, a muffler and tail pipe] are fitted to meet regulations in the country in which the vehicle is to be used. When carrying out modifications, observe the following precautions:

- The specifications of each parts are determined in accordance with external noise control regulations. Do not remove or alter the parts in any way.
- If you must temporarily detach any external noise control parts, handle it carefully in order to avoid deforming or damaging it, and make sure you refit the parts in its original position when you have finished the body mounting or alteration work. If any external noise reduction parts is distorted or damaged, replace it with a new genuine part. Never use a repaired parts.
- For details of noise control parts, see the Body Builder's Guide for the respective model series.

EXAMPLES OF NOISE CONTROL PARTS



10. AVOIDING DAMAGE TO CHASSIS

When mounting the body or equipment, be careful not to damage the chassis or interfere with its functions.

For example, do not stand on brake component (ex. ABS modulator, LSPV), brake pipes and hoses, fuel pipes and hoses, battery and wiring harness, T/M control rods or cables, and etc.

11. LEAF ADDITIONS

Leaves should not be added to leaf springs beyond the number of leaves which have been prepared as an option as this may lead to snags in the steering system at the front and unusual propeller shaft noise.

12. SHIPMENT

- After mounting the body or equipment, make sure that there is no body vibration, noise or other abnormalities before shipping the vehicle. (Perform a thorough shipping inspection.)
- Brake, steering and suspension systems are all important safety components. If any of these components have had to be temporarily removed to allow for body mounting or alterations, make sure that they are refitted exactly as before and verify their operation before shipping the vehicle. (Be sure to perform a thorough shipping inspection.)

13. TOWING VEHICLES

If you must tow a vehicle, be sure to remove the propeller shaft before towing. (This is not necessary when moving vehicles inside a factory during body mounting or alterations.)

14. COMPLYING WITH LAWS AND REGULATIONS

The completed vehicle with body or equipment fitted must comply with the vehicle laws and regulations of the country in which it is used and tolerance limits for axle capacity, weight distribution on front axle and height of the center of gravity must not be exceeded.

**15. PREPARATION OF OPERATION MANUAL AND/OR
MAINTENANCE & INSPECTION****Manual and Their Installation on Vehicles**

- In the event that the body mounting or modifications cause a change in the procedure for operation, maintenance, inspection or adjustment of the standard vehicle, an operation manual should be prepared and installed on the vehicle.
- An operation manual and/or a maintenance & inspection manual specifying the procedure for the operation, maintenance, inspection and adjustment including inspection intervals of the particular mounting or alterations should be prepared and installed in the vehicle.

16. ESTABLISHING AFTER-SALE SERVICE SYSTEM

Take adequate care to establish an after-sale service system for the parts mounted or altered.

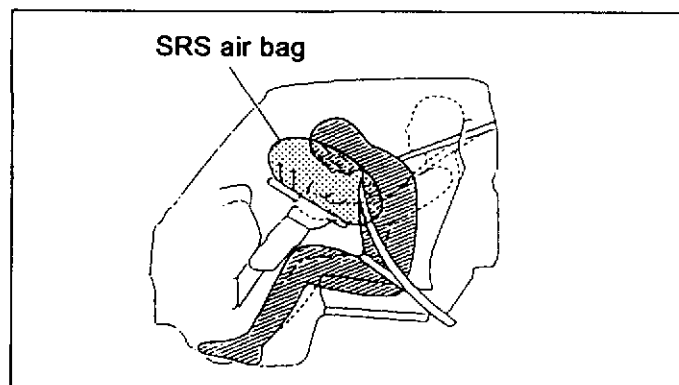
17. BODY MOUNTING FOR MODEL WITH SRS AIR BAG

In case of the vehicle equipped a SRS air bag, be sure to take the following cautions securely.

**Warning**

When body mounted, observe following cautioning points securely. Otherwise, at the collision (accident), SRS air bag does not operate correctly or inflates incorrectly, which may result in a serious injury.

- SRS stands for Supplemental Restraint System, a device to supplement the protection of the crews.

**1) Cautions for Alteration or Body Mounting**

- (1) Do not make any reinforcement not modification at a part of cab floor.
Otherwise, an impact to be conveyed to a sensor of SRS air bag will change, by which SRS air bag will not function correctly.
- (2) Do not cover over the pad of steering wheel with something like a sticker, a cover, etc.
At the same time, at an opening space for the air bag to be inflated, do not install any attachment or do not place anything thereon.
Otherwise, SRS air bag will not function correctly.
- (3) Do not make any modification of the suspension.
A change of vehicle height or a change of the suspension hardness may lead to a malfunction of SRS air bag sensor.
- (4) An electric wave of wireless device may affect badly to the sensor of SRS air bag, by which SRS air bag functions.
Take care to the following points for its installation.
 - a. Install an antenna, away possibly from SRS air bag sensor.
 - b. Install an antenna cord, 200 mm away from SRS air bag sensor.
 - c. Do not install a high power wireless device.

- d. As the installation of the said device may affect to other electronic apparatus, install it securely in accordance with a "Installation Manual" by the manufacturer of the devices.

2) Cautions when Implementing an Alteration or Body Mounting

- (1) When implementing an alteration or body mounting for an electric attachments or cab, take off battery terminal (-) beforehand and start the work after more than 90 seconds.

- (2) When heating the cab (ex. welding, painting jobs) and its temperature exceeds 85°C, remove off SRS air bag and its sensor.

Consult with your nearest TOYOTA sales dealer or distributor when needed a dismounting work.

Also, take off a fuse of SRS air bag when implementing electric welding work to the cab.

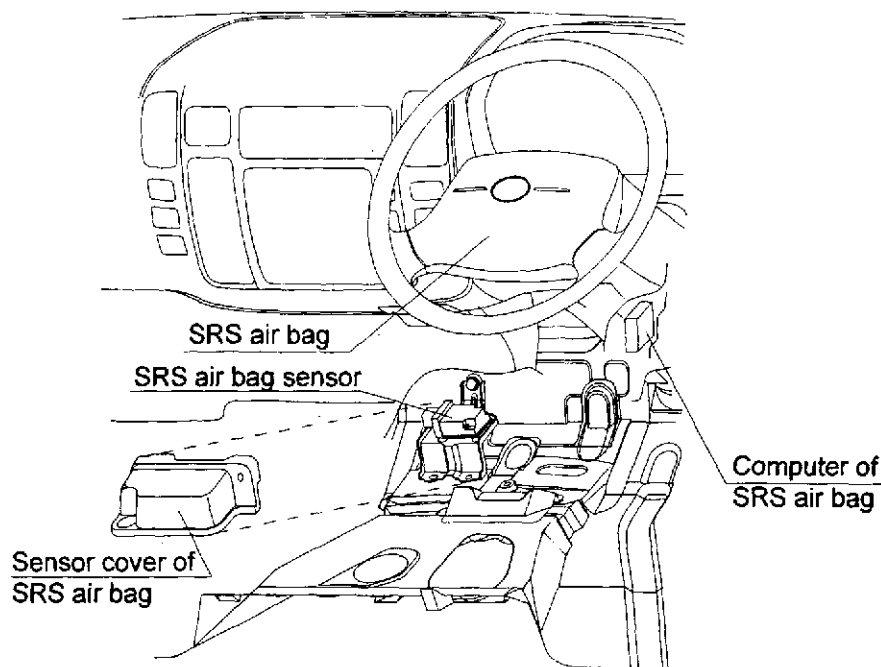
At the same time, to prevent damage from sparks during welding, cover with a heat resisting sheet the resin parts of SRS air bag and an instrument panel.

- (3) SRS air bag sensor inside of a cover at driver's feet at the cab floor, and a computer of SRS air bag at the near place of brake pedal bracket, are installed.

Take care to the following points.

Otherwise, SRS air bag will not function correctly or lead to a malfunction.

- a. Do not take off the cover.
- b. Do not kick on the cover or do not give a strong impact.
- c. Do not dash water nor oil, etc.
- d. Do not make a strong shock on the floor.



[NOTE]

- For exact installation position of related parts of SRS device, see the Body Builder's Guide for the respective model series.

- (4) Observe the following points when implementing a cab work.
If not followed correctly, it may lead to not correct operation or malfunction of SRS air bag.
 - a. Do not take off nor damage the front floor reinforcement at driver's feet at cab floor. Also, do not insert such foreign materials as bolt, nut etc., between the front floor reinforcement and the floor.
 - b. Do not take off nor damage a rubber mat underneath the floor mat at the cab floor.
 - c. SRS air bag is installed in at the pad of steering wheel.
Do not hit nor damage, nor give a strong shock to the SRS air bag.
 - d. Do not remove a stay installed in the steering post.
- (5) Do not touch electric wiring of SRS air bag.
(The connectors of SRS air bag system are unified with yellow color.)
Also, Never try to check the system by a general purpose tester, which may lead to a malfunction of SRS air bag.
- (6) Do not take out a power source of the mounting body or accessories from the fuse of SRS air bag, which may lead to malfunction of SRS air bag.
- (7) SRS air bag and chassis numbers are recorded for manufacturer's control.
When removed off the SRS air bag, install it to the original chassis without fail.
- (8) Check the warning lamp of SRS air bag after the alteration or body mounting work.
 - a. When there is not problem on the warning lamp and the engine switch is turned from "OFF" to "ON" or "ACC", the warning lamp is turned "on" and "off" after about 6 seconds.
 - b. When the warning lamp does not light up, even turning the engine switch to "ON" or "ACC", or remains light up, bring the vehicle to your nearest authorized TOYOTA sales dealer or distributor for an inspection.
 - c. Observe the caution points specified in the Service manual, when inspected at the repair shop.

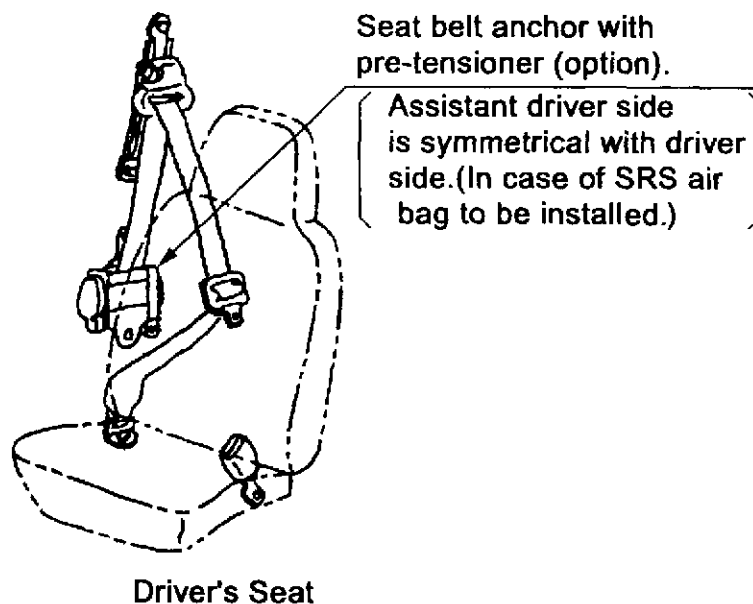
3) Others

- (1) When SRS air bag inflates at accidents, etc., it can not be usable again. Change it at your nearest TOYOTA sales dealer or distributor.
- (2) When the vehicle or SRS air bag is scrapped, consult with your nearest TOYOTA sales dealer or distributor.

- (3) SRS air bag is a device to supplement a seat belt. But it can not function instead of the seat belt. Put on correctly the seat belt. You are requested to check it by owner's manual, or to inquire it to your nearest authorized TOYOTA sales dealer or distributor, regarding the detailed handling procedure.

4) Caution Points Regarding a Seat Belt with Pre-tensioner

- (1) When doing a heating job around anchor of the seat belt at driver seat side (ex. welding, painting work, etc.), remove off the belt assy with pre-tensioner without fail. The possibility is that it may lead to incorrect explosion if heated up to high temperature (more than 80°C).
- (2) When handling the seat belt with pre-tensioner and keeping it, do not turn an exhaust outlet of the seat belt with pre-tensioner to a person. Otherwise, high pressure gas will blow up in a case, which may be very dangerous.
- (3) Do not give such strong shock as dropping down the seat belt assy with pre-tensioner. Once dropped it down, replace it with TOYOTA genuine new parts.

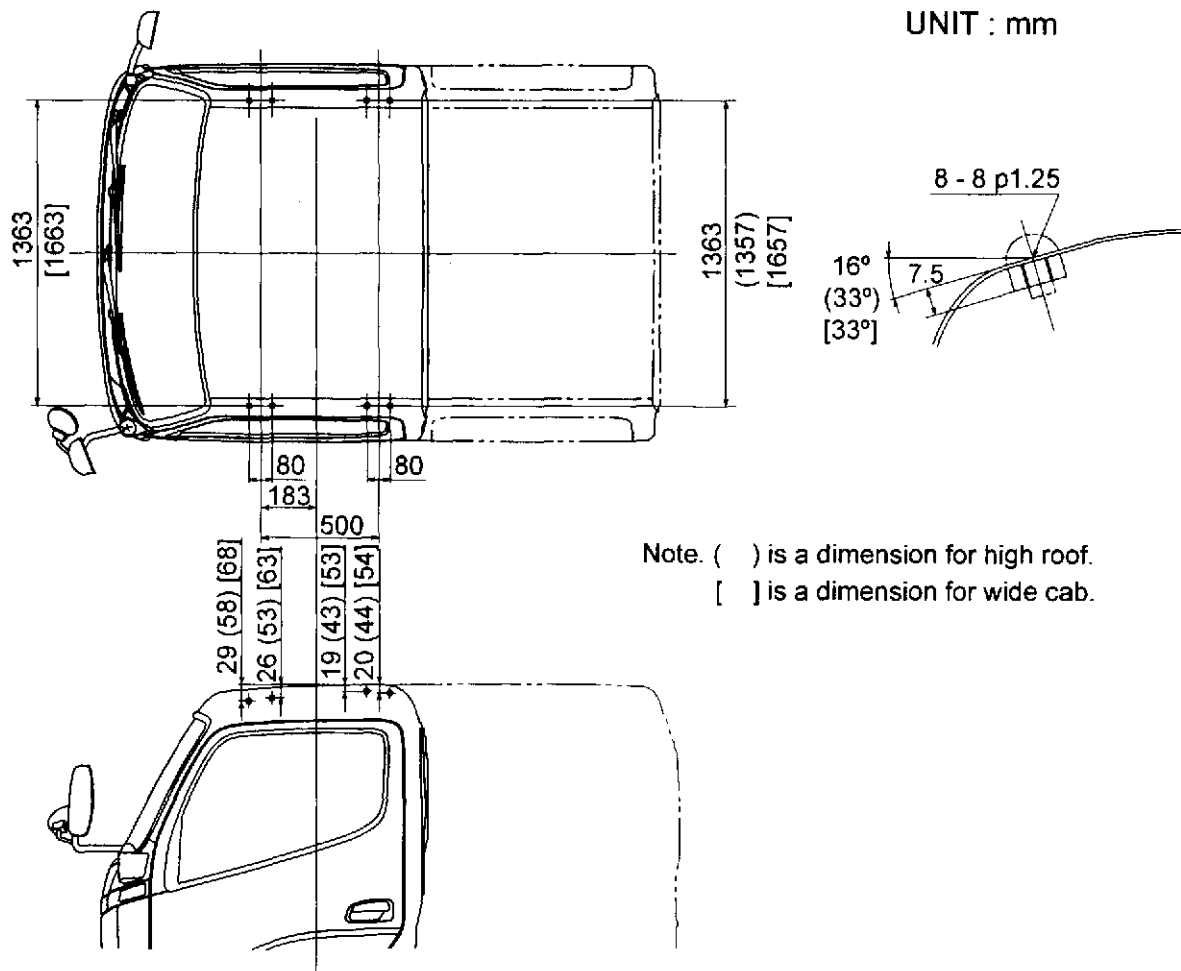


18. HOW TO MOUNT AN ATTACHMENT ON THE CAB ROOF

1) Bolt Hole Position for Mounting an Attachment

- (1) In order to facilitate mounting such attachments as roof rack, roof deflector etc. on the roof rails, nuts (M8 p.1.25) are provided in the figure below.

UNIT : mm

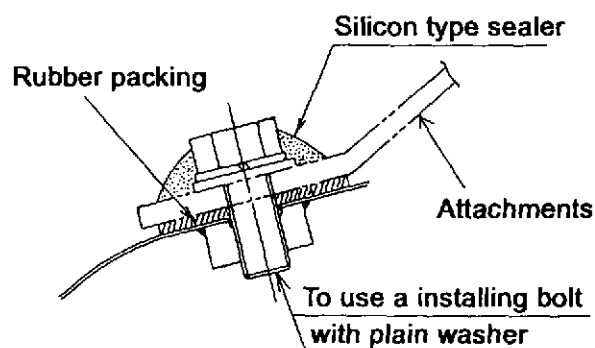


2) Cautions for Mounting Attachments on the Cab Roof

Observe the Following Points for Mounting Attachments

- (1) Blind bolts are inserted in the part of roof rails.
Accordingly, take off those bolts when mounting the attachments on the cab roof. Do not use those blind bolts for mounting the attachments.
- (2) The bolts and washers for mounting the attachments must be of nickel chrome stainless type. Chrome type stainless may get rusty possibly. Bolt size and tightening torque :
M8, $30 \pm 6 \text{ N}\cdot\text{m}$ ($300 \pm 60 \text{ kgf}\cdot\text{cm}$)
- (3) Mount the attachment on the cab roof, after painting completely.
- (4) Be careful not to scratch the painting while mounting.

- (5) Insert rubber packing securely between the attachments and the roof (Refer to the following figure) so as to avoid any scratch on the painted part of cab roof, not to get rusty and for water proof of the cab. The packing should be corresponding to RC710P (EPDM) or equivalent, and the thickness be less than 2 mm and the diameter of hole be 8 mm.



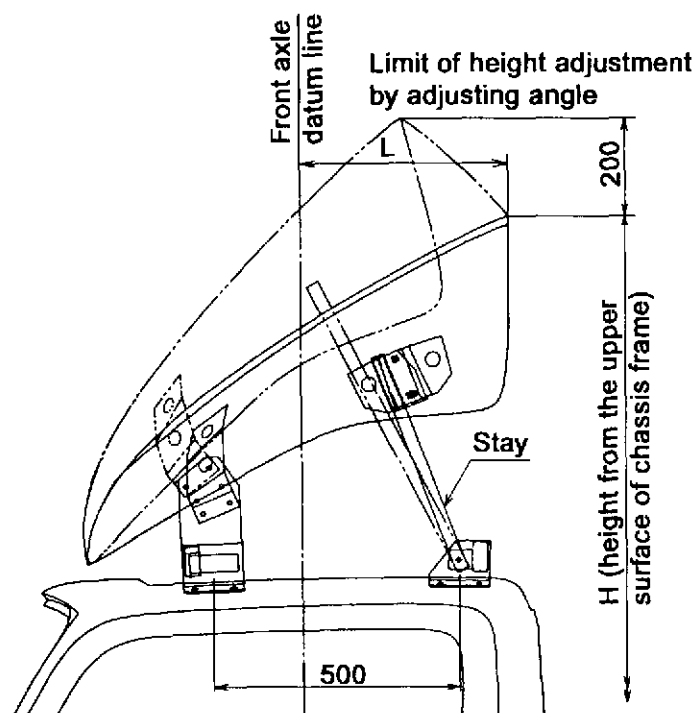
- (6) After tightening the installing bolt, apply silicon type sealer (corresponding to Three bond No. 1211 or 1212) around the tightened bolt securely in order to avoid any water leak.

[NOTE]

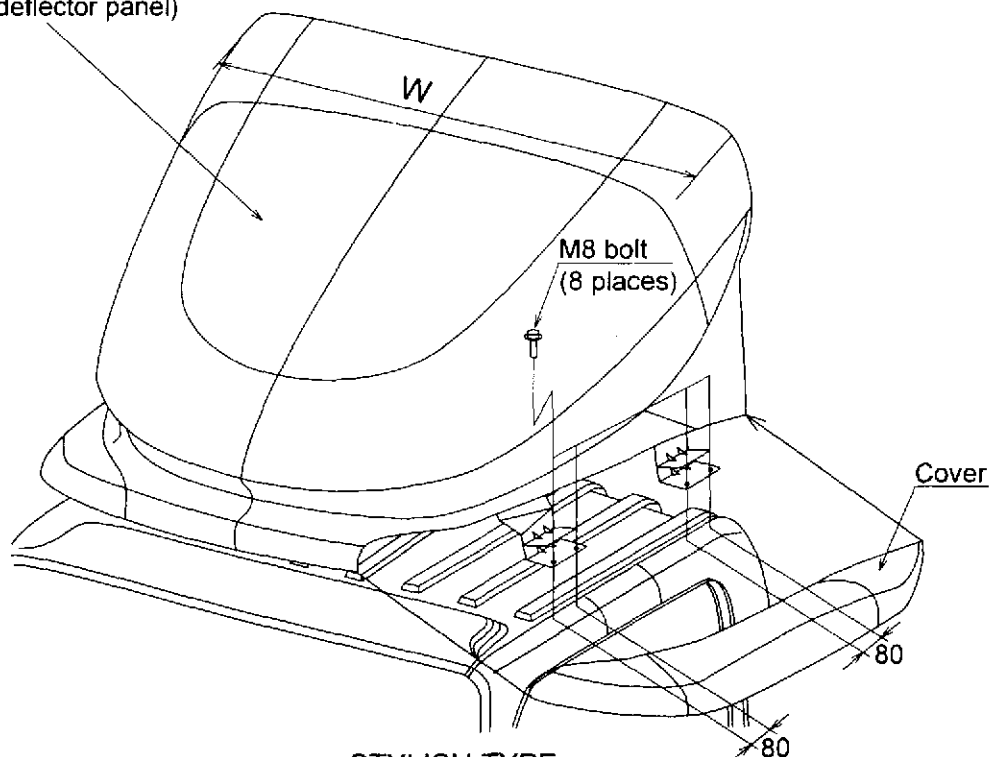
- When you install such attachment as roof rack, roof deflector etc. on the cab roof, must be contacted with TOYOTA sales dealer or distributor to get more detail instruction as maximum load and etc.

3) Shape of Window Deflector (for example)

UNIT : mm



STD TYPE

Roof air deflector
(roof air deflector panel)

STYLISH TYPE

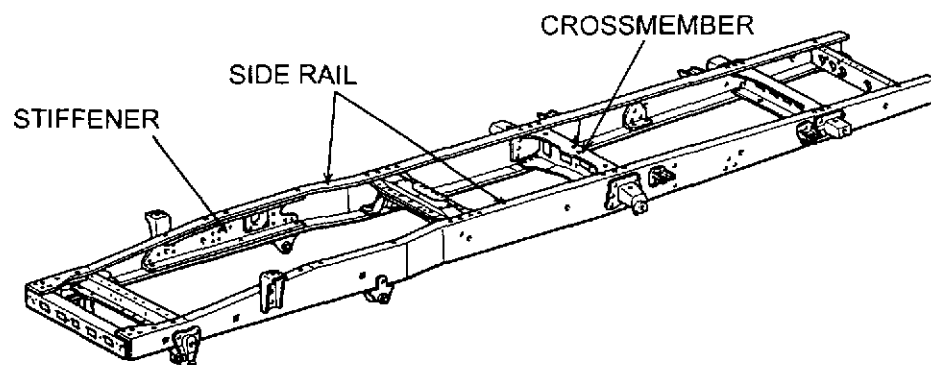
UNIT : mm

	STD type			Stylish type		
	STD roof	High roof	Wide cab	STD roof	High roof	Wide cab
L	420	420	375	470	502	555
H	2085	2150	2220	2130	2178	2290
W	1450	1450	1750	1457	1457	1764

2. CHASSIS FRAME

1. FRAME MATERIALS	2 - 2
2. DRILLING AND WELDING	2 - 3
3. PROCESSING FOR DRILLING AND WELDING WORK	2 - 4
4. SIDE MEMBER REINFORCEMENT	2 - 5
5. OTHER PRECAUTIONS FOR DRILLING	2 - 6
AND ELECTRICAL WELDING	
6. EXTENSION OF SIDE MEMBER REAR END	2 - 7
7. MOUNTING A PART ON THE SIDE MEMBER	2 - 8

- In normal operation, the chassis frame and body frame provide sufficient strength for the mounting of a standard cargo or van body.
- However, if equipment such as a small crane at the back of the cab or a mixer are fitted, the chassis frame will be subject to concentrated loads and the chassis frame alone will not give sufficient strength. To help spread the load, you must strengthen the body structure (especially strengthening members corresponding to the sub frame=longitudinal main floor member of body or equipment) or the chassis frame itself, using L-shaped stiffeners to achieve sufficient strength for the mounting of the rear body or equipment.
- The chassis frame is the “backbone” of the vehicle. This section describes precautions to be taken when drilling holes or performing welding work in fitting a normal body or equipment, or when making modifications such as fitting stiffeners, etc.



CHASSIS FRAME ASSEMBLY

1. FRAME MATERIALS

TOYOTA DYNA truck series use the following frame materials;

MATERIAL			APPLICABLE MODELS
Type of metal	Tensile strength	Yield strength	
Hot rolled steel plate	440N/mm ² { 45kgf/mm ² }	304N/mm ² { 31kgf/mm ² }	Standard cab series (XZU300 series)
Hot rolled steel plate	540N/mm ² { 55kgf/mm ² }	392N/mm ² { 40kgf/mm ² }	Wide cab series (XZU400 series)

[NOTE]

- Depending on the country in which the vehicle is to be used or type of the vehicle, some models may use different frame material of tensile strength as mentioned in above table.

For details, see the Body Builder's Guide for the respective model series.

2. DRILLING AND WELDING

1) Summary of Drilling and Welding

Drilling and Welding of the frame may bring a great influence on the frame strength. Since Improper drilling and welding may result in the frame damage, avoid frame work if at all possible. If unavoidable, make sure that there is no problem on the frame after work.

For your reference, please refer to the following basic precautions.

(1) General informations

[Drilling]

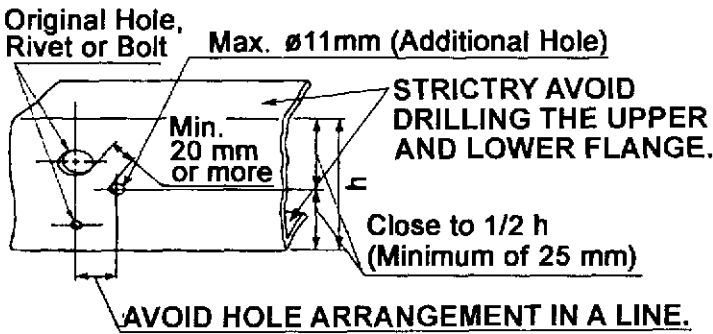
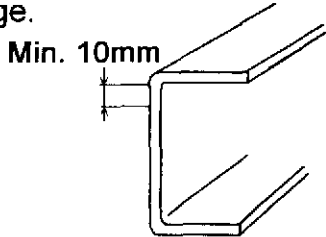
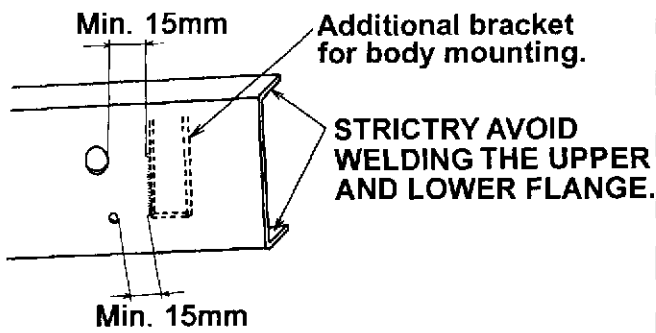
- Use an ordinary drill and never use heat such as a gas torch.
- Always chamfer after drilling.

[Welding]

Tighten with bolts or rivets instead of welding. If this cannot be done, the following precautions should be taken.

- Take off the chassis-mounted parts (brake lines, fuel lines and electrical circuitry etc.) to protect them from sparks before performing welding.
- Clean the welded area before welding and make certain that the welding rod is the one best suited for the materials to be welded.
- Keep welding speed and rod position in the optimum condition with the welding current at the optimum amperage in order to avoid defective welding work such as incomplete welding, undercut, slug fusing blowholes, cracks, pitting, etc.
- Always connect the ground wire close to the side rail area to be welded and when welding, must be remove the battery terminals.
- To reduce stress caused by welding, minimize the length of the welded area as well as the amount of welding application.
- Avoid closespacing of weld joints as much as possible.
- Avoid welding edges and bends because high welding skill is required

(2) Side rail

FRAME SHAPE NO.		 - SHAPED SECTION
DRILLING	(1)	Keep the diameter of the hole within 11mm.
	(2)	Do not drill the upper and lower area of the flange.
	(3)	When drilling the web area, keep 100mm or more away from the spring bracket.
	(4)	Arrange interval and position of holes according to the drawings shown below. 
WELDING	(1)	Do not weld the upper and lower area of the flange.
	(2)	Keep 10mm or more away from the bend of the flange. 
	(3)	Protect holes from the welding bead. (Keep 15mm or more away from the end of a hole.) 
	(4)	Keep 150mm or more away from the crossmember and the spring bracket.

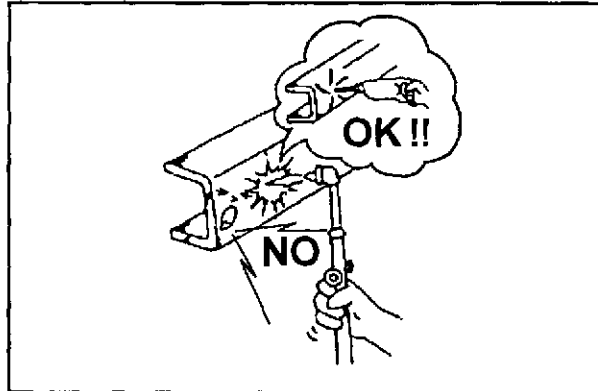
3. PROCESSING FOR DRILLING AND WELDING WORK

Use bolts or rivets for fastening and avoid welding as far as practicable.

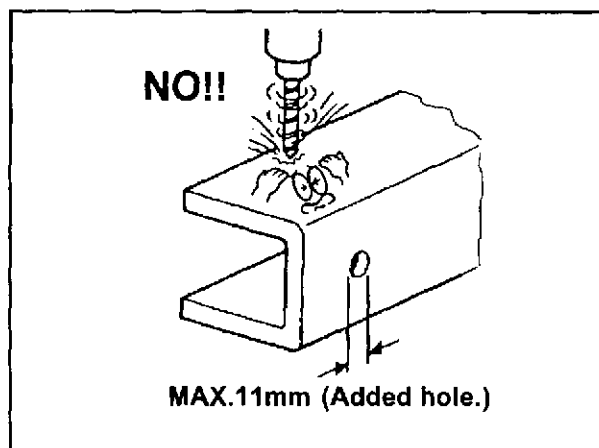
1) Drilling

Don't use gas or heat to form a hole but always use a drilling machine.

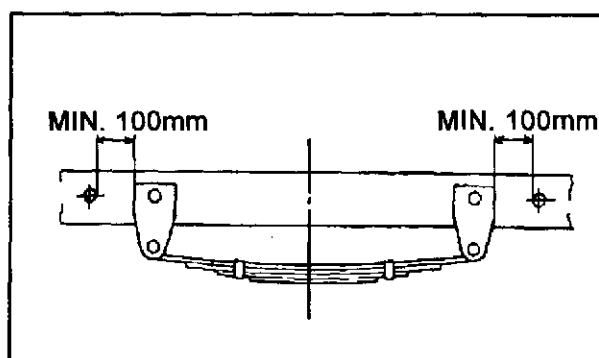
- After drilling, always finish with chamfering.

**(1) Drilling side member**

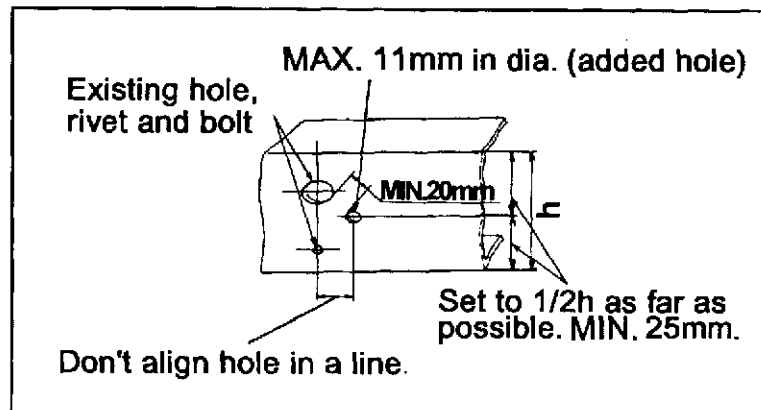
- Don't drill in the upper and lower surface of the flange.
- Make sure that the hole drilled is 11mm maximum.



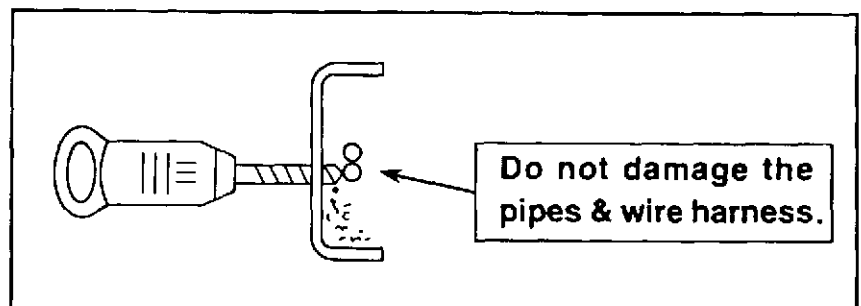
- When drilling a hole in the web surface, secure a distance of 100mm minimum from the spring bracket



- d. Set the inter-hole distance and position the holes as shown in the drawing.

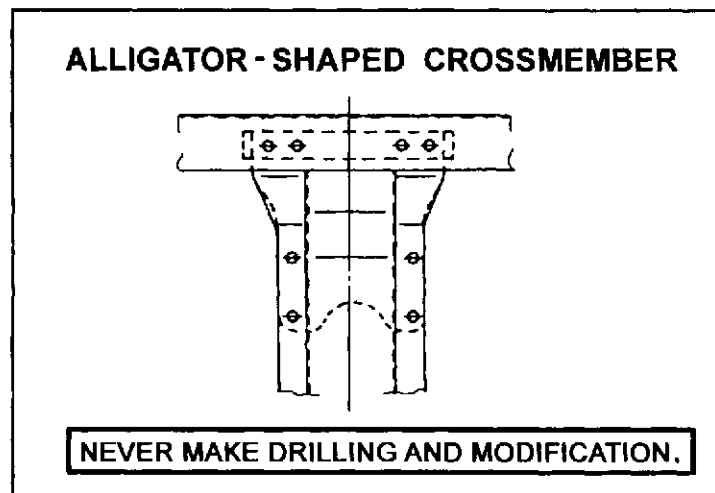


- e. Prevention of damage to pipes and harness wire, be careful not to damage the pipes and harness wires inside the side member of the frame when drilling

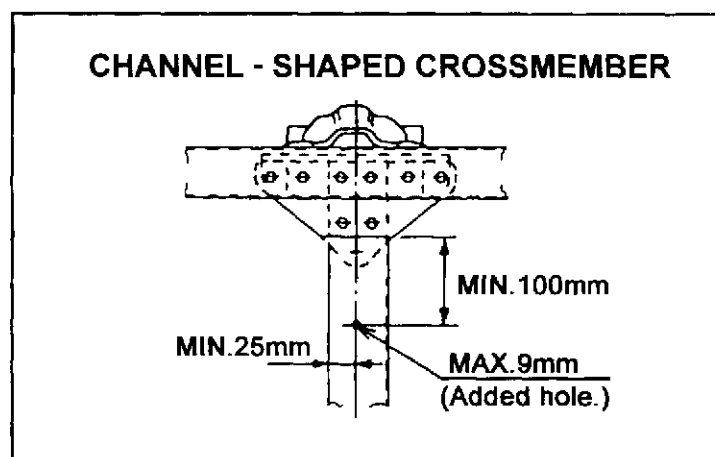


(2) Drilling cross member

- a. Don't drill a hole in or make modifications otherwise to the alligator-shaped crossmember.



- b. When making modifications to the channel-shaped crossmember by drilling or otherwise, be sure to locate the hole or the modification 25mm minimum from the crossmember edge and 100mm minimum from the bracket edge of the side member

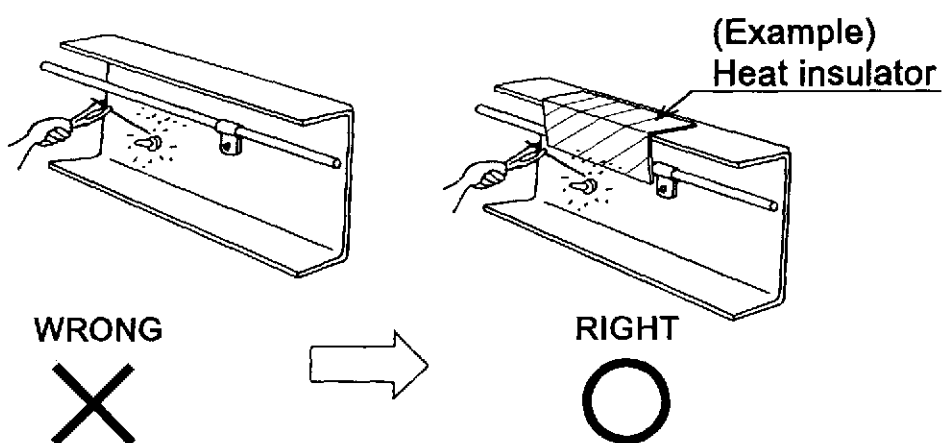


2) Welding

(1) Preparations

- a. Before carrying out the welding work, remove the brake-related parts, fuel-related parts and wirings as far as possible in order for the chassis parts not to be exposed to welding sparks.

To prevent damage to ancillary components from sparks during welding, cover the engine, meters, steering wheel, hoses, brake pipes, harness wires and tires, etc. with fire-resistant covers.



- b. Clean the welding zone sufficiently beforehand.
- c. Check to see that the welding rod is suitable for the material of the welding zone.
- Make sure that the tensile strength and the yield point of the welding rod are identical to those of the base material.

WELDING RODS

Use special welding rods for high tensile steel in places where the weld must have the same strength as the base metal.

BASE METAL (FRAME)	WELDING ROD
Hot rolled steel plate : tensile strength 45 kgf/mm ²	Same tensile strength as base metal (JIS D4301 or ISO E432)
Hot rolled steel plate : tensile strength 55 kgf/mm ²	Same tensile strength as base metal (JIS DA5001G or ISO E513)

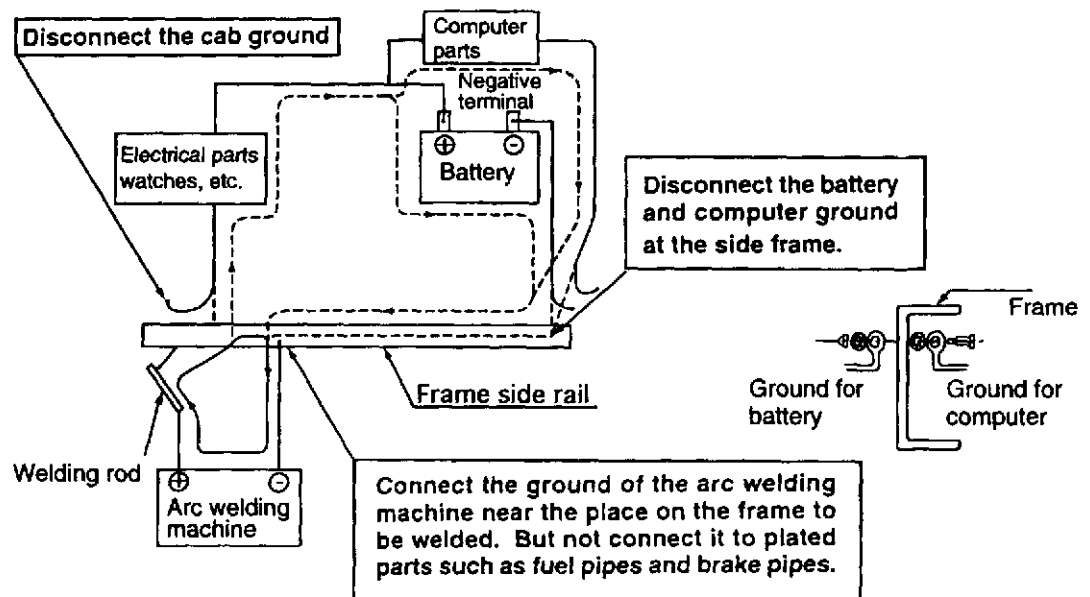
NOTE: JIS AND ISO STANDARDS ARE SHOWN BELOW.

- JIS Z - 3211-1993 AND Z 3214-1993
- ISO 2560-1972 (E)

- d. During the welding work, always be sure to ground the parts involved at a point in the vicinity of the weld zone of the side member.

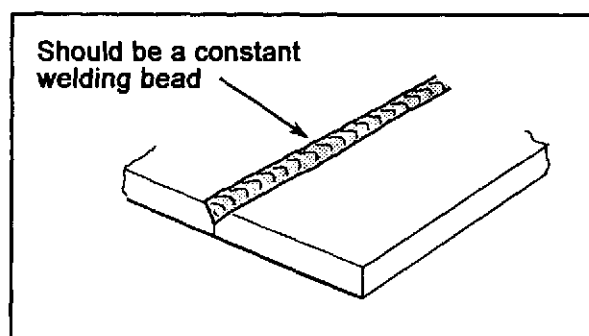
Welding processings to avoid damaging of chassis electrical parts:

- Turn the starter switch off.
- Disconnect the negative ground of the battery.
- Disconnect all electronic instruments (e.g. ABS, Engine Control Computer).
- Earth all welding equipment properly, near the area to be welded.



(2) Operation

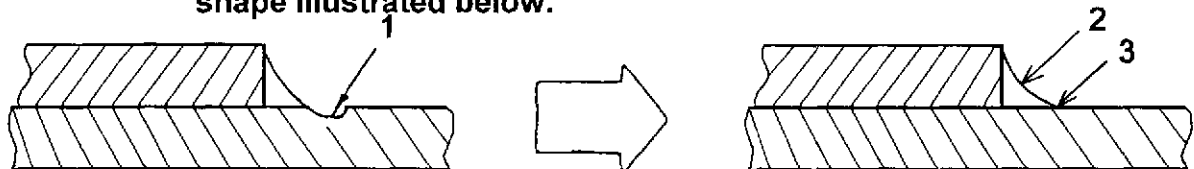
- a. Maintain a constant welding rate with an optimum current in order to avoid fusion irregularities.



- b. See to it that there is no welding defects such as incomplete welding, undercut, slug inclusion, blowhole or cracklings.

WELDING BEAD SHAPE

Make sure that the shape of the welding beads corresponds to the shape illustrated below:



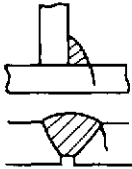
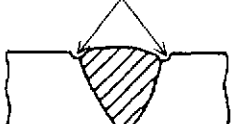
WRONG



RIGHT

1. Undercut
2. Concave welding
3. This area should be smooth and free from undercuts.

Avoid the following defects in welding beads:

Deposited Metal Cracking 	Toe Crack 	Blow Hole 
Slag Inclusion 	Under cut 	Poor Penetration 

- c. In order to reduce the stress caused by welding, the welding length should be as short as possible and the welding volume should be kept at a required minimum to secure the strength.
- d. Avoid concentration or proximity of welding joints as far as possible. Don't carry out the welding work on edges or bent portions as it demands a considerable welding skill.

2. CHASSIS FRAME

2 - 4 - 7

e. The recommended welding current is shown as following table;

Mechanical property of weld metal & rod	Rod dia. Ø Welding position	Welding current					
		3.2mm (0.126 in)		4mm (0.157 in)		5mm (0.197 in)	
		Flat	Vertical overhead	Flat	Vertical overhead	Flat	Vertical overhead
Weld Metal Hot roll plate Tensile strength ; 440 N/mm ² {45 kgf/mm ² }		(A) 80	(A) 60	(A) 120	(A) 100	(A) 170	(A) 130
Welding Rod (Tensile strength ; 420 N/mm ²) {43 kgf/mm ² }		130	110	180	150	250	200
Illuminated type Coated electrode							
Weld Metal (Hot roll plate) Tensile strength ; 540 N/mm ² {55 kgf/mm ² }		(A) 90	(A) 80	(A) 141	(A) 110	(A) 180	
Welding Rod (Tensile strength ; 490 N/mm ²) {50 kgf/mm ² }		140	130	190	160	250	
Illuminated type Coated electrode							

NOTE : • Welding Current = Amp

• Diameter of welding rod

Ø3.2 (0.126 in) or Ø4 (0.157 in)

-----plate thinner than 5mm (0.197 in)

Ø4 (0.157 in) or Ø5 (0.197 in)

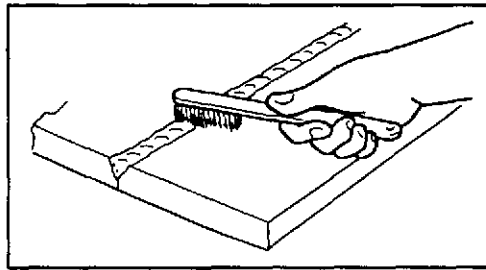
-----plate thicker than 6mm (0.24 in)

(3) After operation (anticorrosive treatment of weld zone)

Take an appropriate anticorrosive measure after welding a corrosive portion.

[Anticorrosive measure]

- a. Brush off dust from the weld zone.



- b. Primer surfacer (primer coating)

Apply the wash primer.

- A major portion of the wash primer is composed of vinyl butyral resin and zinc chromate (anticorrosive pigment).
- The dry film thickness is 5 to 10 microns/coat.

- c. Top coating

Use a natural dry type paint or a double coat type paint in top coating.

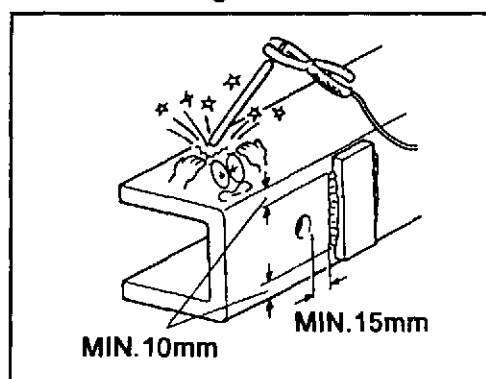
- The dry film thickness is 30 microns/coat minimum.

- d. Salt spray resistance

Conduct the salt spray test for 840 hours in succession according to ASTM B117. Make sure that no rust settles on the general surface other than the weld beads.

3) Welding Side Members

- a. Don't weld in the upper and lower surface of the flanges.
- b. Keep the welding point away from the flange bend by 10mm minimum.
- c. Be sure that the welding bead is distant by 15mm minimum from the hole edge



4. SIDE MEMBER REINFORCEMENT

The breakage or cracking of the side member is usually caused by stress concentration due to a local cut, welding or concentrated load or sudden rigidity change caused by upper parts rather than by the maximum stress which would be exerted in calculation. For this reason, the reinforcement by an outer or inner stiffener is not generally required.

- The large-scale repair of the side member should be avoided as far as possible.
- In the case where reinforcement is unavoidable due to special body or equipment mounting (e.g. a small crane mounted behind the cab), modification or operating conditions, take adequate care of the following points.

1) Material of Reinforcing Member

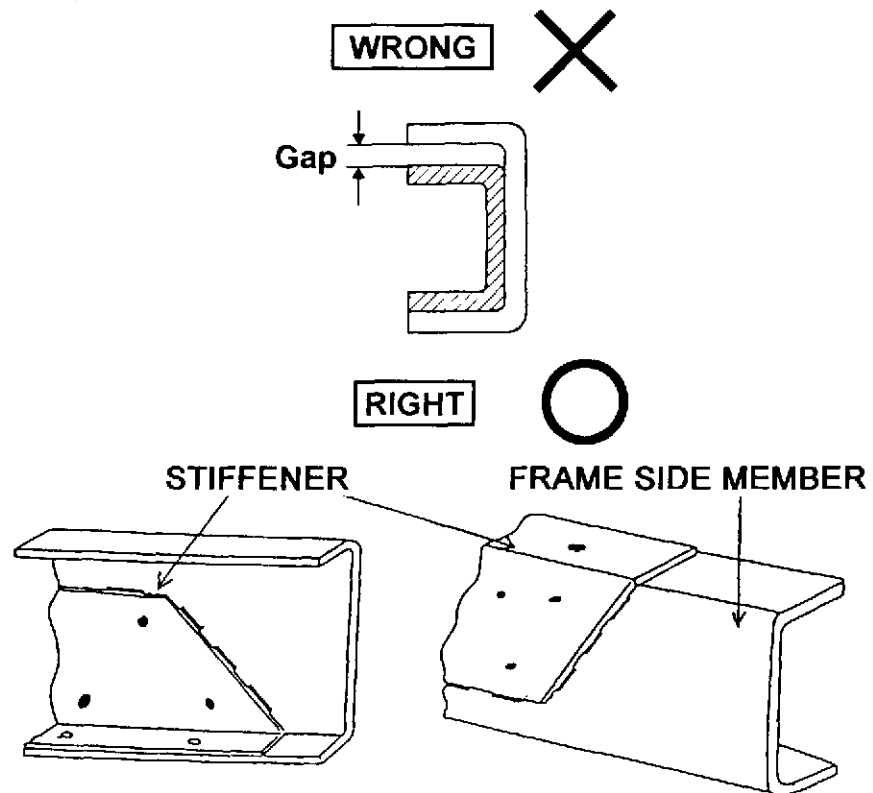
When the outer side of the side member is reinforced, use a material at least equivalent to the main and inner materials.

In applying a reinforcing plate on the inside of the side member, use a general frame steel plate TOYOTA standard SAPH440 with tensile strength of 440N/mm^2 { 45kgf/mm^2 } or an item equivalent to SS41P

2) Shape and Orientation of Reinforcing Member

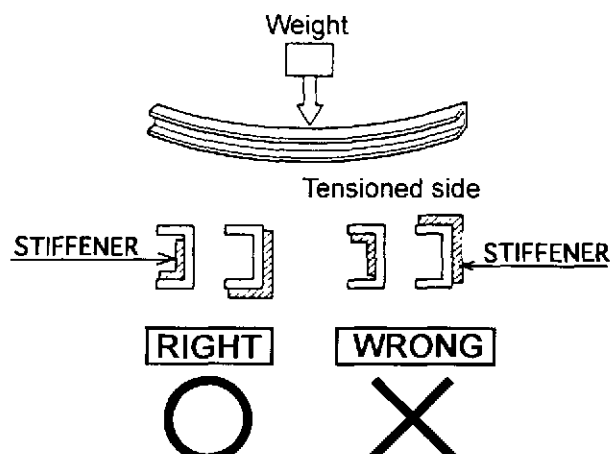
The channel-shaped reinforcing member, if low in machining precision, develops a gap with the flange and has an adverse effect when fitted in the side member.

The reinforcing member, therefore, should be L-shaped as far as possible.



- The material of the stiffeners must be equal in strength to or stronger than the side member.
- The stiffeners must be L-shaped.
- The length of the stiffener must be more than 800mm.

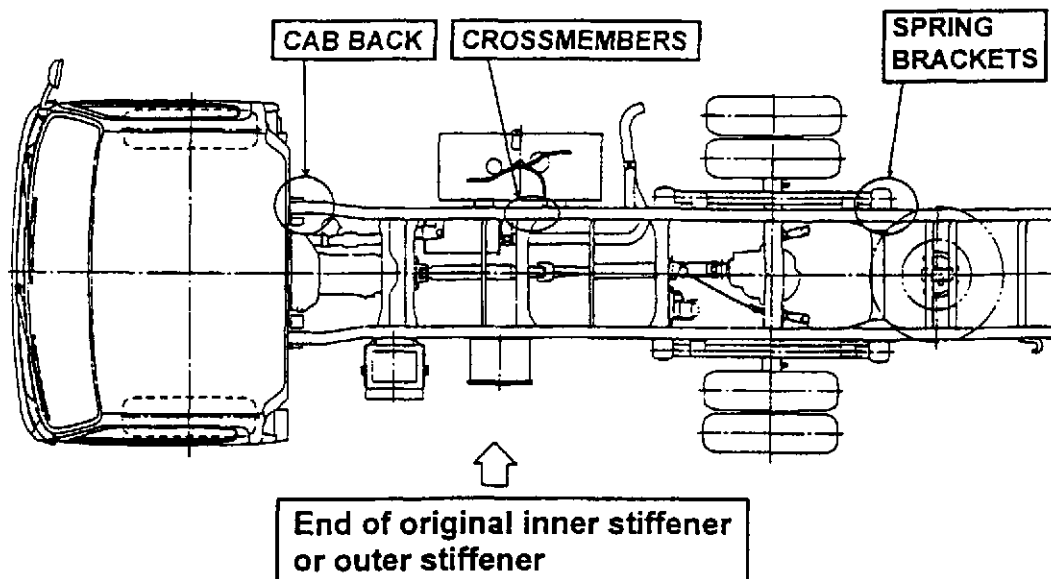
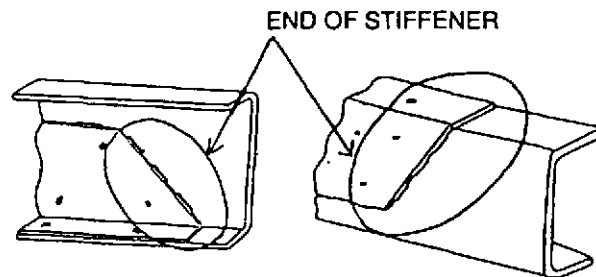
(1) The L-shaped stiffener should be set in such a position that the flange is located on the tensioned side under side member stress



- (2) If the end of the outer stiffener is registered with the end of the inner stiffener or the portion of the cross beam or spring bracket subjected to a sudden rigidity change or load concentration, a cracking is liable to occur more easily.

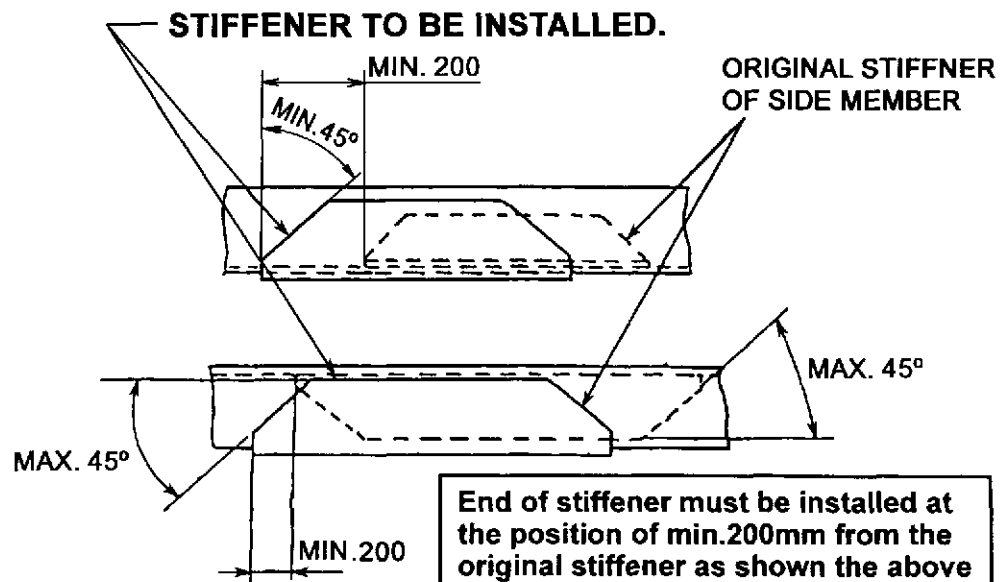
Take adequate care in determining the position of the stiffener end.

- The end of the stiffener, mentioned right side figure, must not come to following positions.

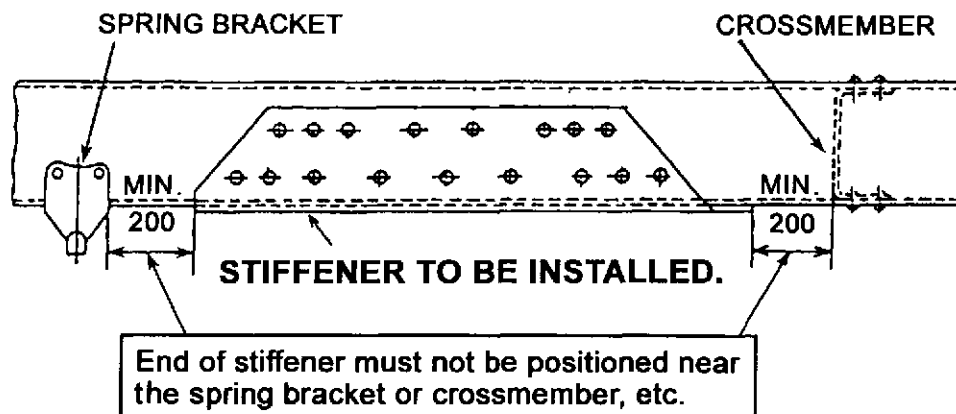


UNIT : mm

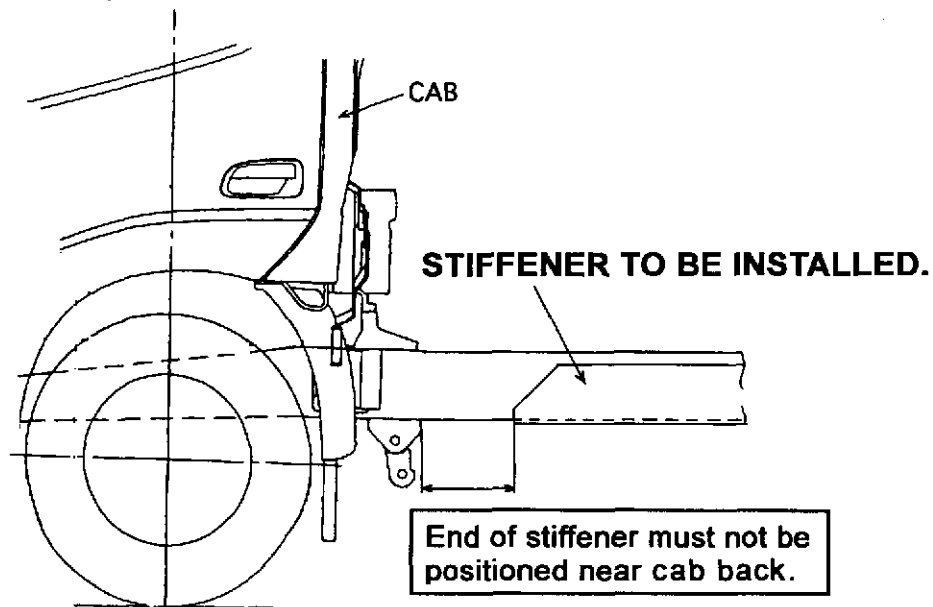
End of original inner or outer stiffener



Near crossmember or spring bracket



Near cab back



When an outer or inner stiffener is installed, the parts which are not stiffened become relatively weak.

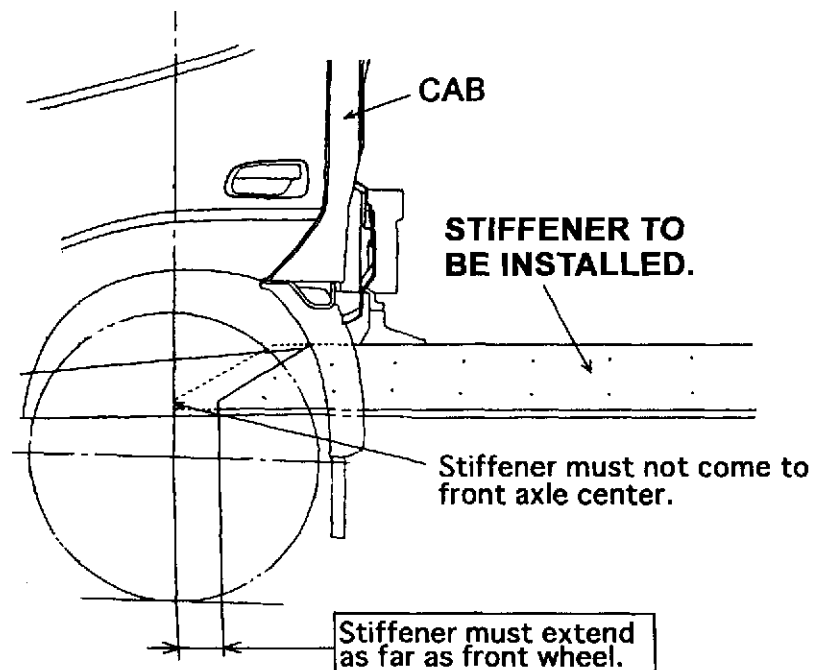
If the rigidity should become particularly weak in any area, it may cause a breakage of the side member.

You should therefore take great care when deciding where to apply stiffeners.

The side members are most vulnerable in the area between the cab and the rear body.

When a heavy concentrated load is applied immediately behind the cab, TOYOTA recommend that the stiffener is extended as far as the near front wheel as following figure.

Recommended installation at rear of cab



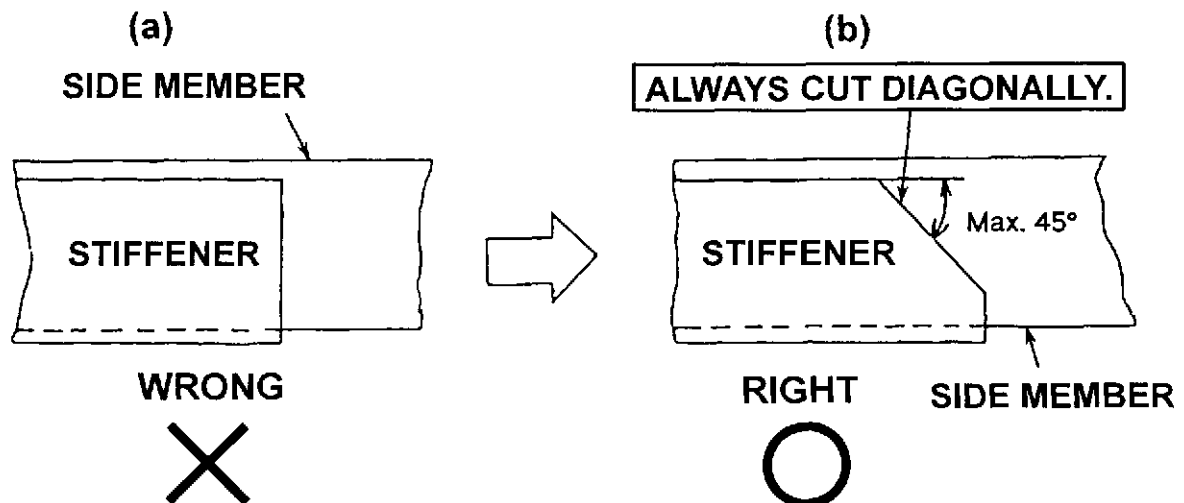
3) Avoiding Load Concentration

Reinforcement with an outer or an inner stiffener reduces the relative strength of the unreinforced portions.

The rigidity gap which may result causes breakage of the particular part.

Full study is required, therefore, on the range of reinforcement.

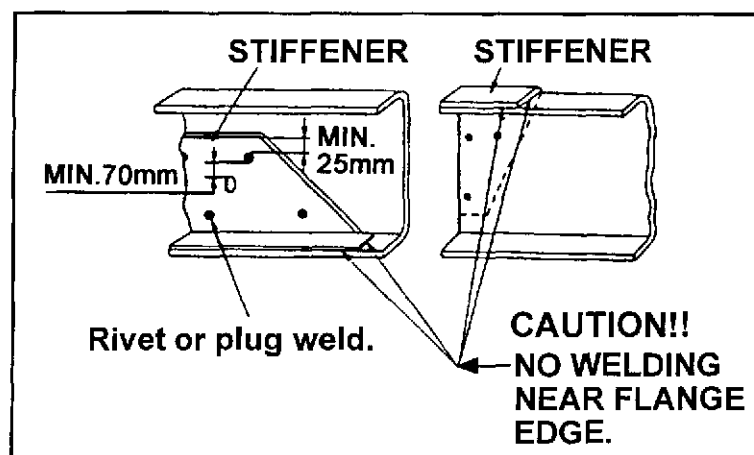
- (1) Generally, care should be taken of the clearance between the cab and the rear body for the side member of the truck. In the case where a large load is concentrated immediately after the cabin, reinforcement is required from the vicinity of the front wheel.
- (2) The end of the reinforcing member should not be raised sharply as shown in (a) .
Take care that the sectional slope is gentle with the angle of at least less than 45 degrees as shown in (b) .



4) Coupling Reinforcing Member and Side Member

Use rivets for coupling the reinforcing member and the side member.

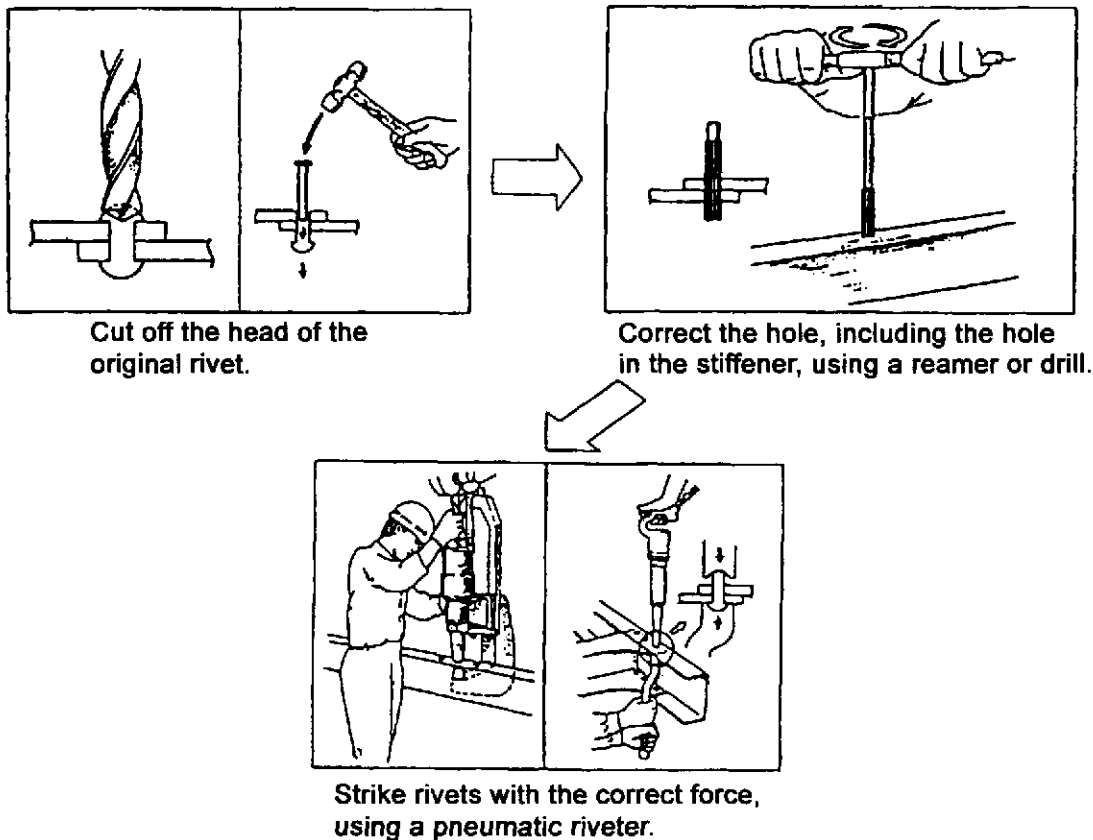
When welding is unavoidable, however don't weld to the flange but to the web. (Apply plug welding in principle.)



(1) Before repeated riveting, correct the hole by drilling and apply a sufficient pressure.

- In the case where the number of sheets fastened is increased by setting a reinforcing member, use a rivet having the next larger diameter.
- After riveting work, see that the rivet is not heated by gas flame or the like.

How to rivet, have to work as shown below.



Recommended size of rivets. UNIT : mm

Rivet	Rivet hole	Repair Limit (Rivet hole)
ø10	ø11	ø11.5
ø11	ø12	ø12.5
ø13	ø14	ø14.5

(2) In conducting the plug welding work, keep the plug-welding hole away from the end of the reinforcing member by 25mm minimum and from the bolt and the rivet hole by 70mm minimum.

- The hole diameter should be in the range of 14 to 20mm in principle

5. OTHER PRECAUTIONS FOR DRILLING AND ELECTRICAL WELDING

1) Do Not Heat the Frame Unnecessarily

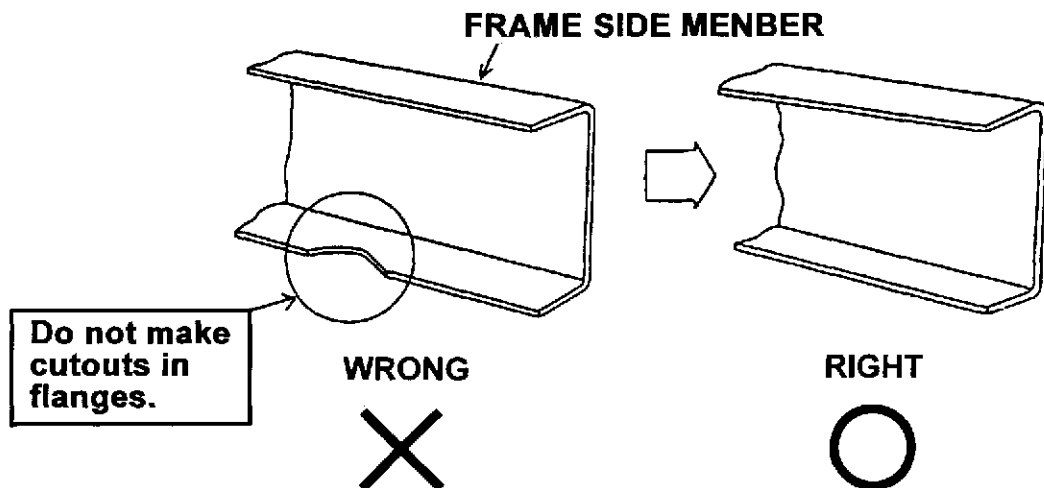
Heating greatly affects the strength of the frame.

Do not unnecessarily heat any part of the frame unless performing welding work on the web surface of the side member or gas cutting work on the rear overhang.

2) Never Make Cutouts in Flanges

Do not make cutouts in the flanges of the side members when mounting the body or making modifications.

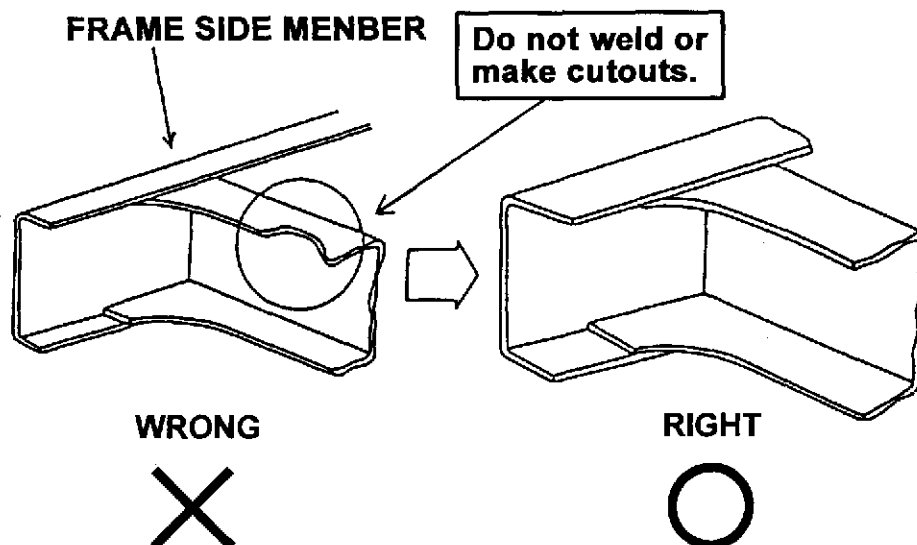
Cutouts may lead to cracks in the side members.



3) Do Not Weld or Make Cutouts in Crossmembers

The crossmembers which link the right and left side members are important strengthening parts.

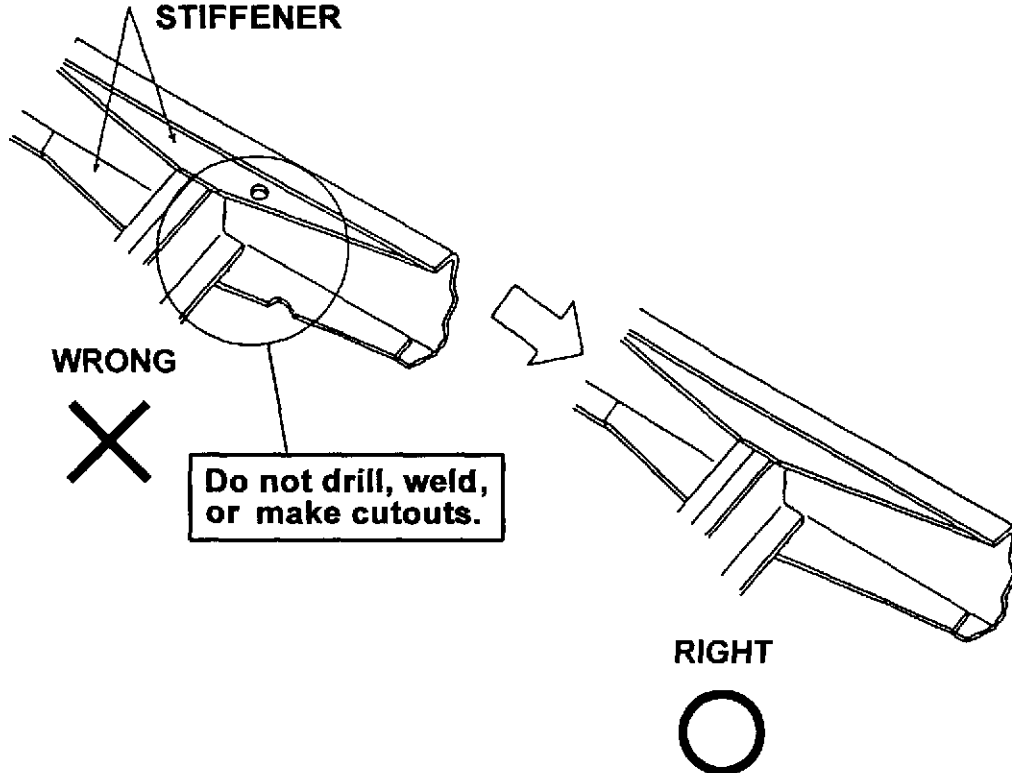
When mounting the body or equipment or making modifications, do not weld or make cutouts in the crossmembers.



4) Do Not Drill, Weld, or Make Cutouts in Stiffeners

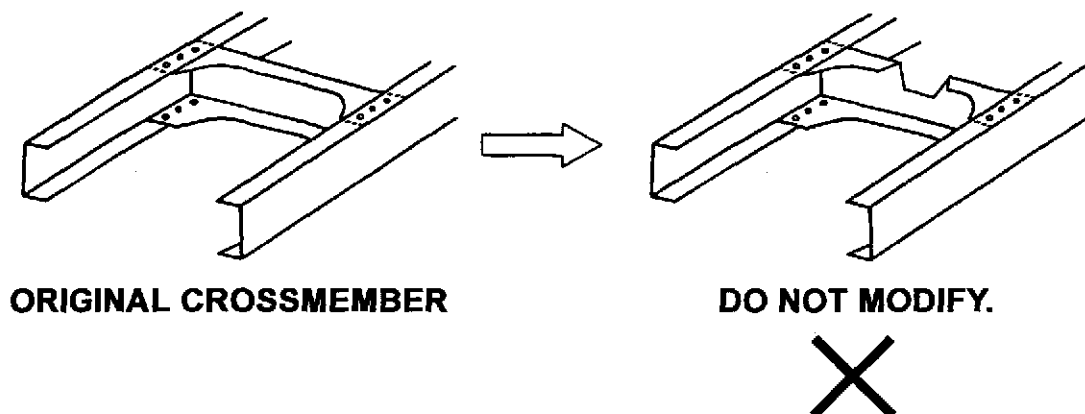
The crossmembers are important strengthening parts which are fitted to avoid concentrated loads on the side members.

When mounting the body or equipment or making modifications, do not drill, weld, or make cutouts in the stiffeners.

**CROSSMEMBER
STIFFENER****5) Do Not Modify the Crossmember**

When accommodating body side devices within the chassis frame, you should not modify crossmembers of the chassis frame.

If an equipment or a device comes across over the crossmember section or if a sufficient clearance is not available, apply an appropriate solution by moving the fitting position of the said equipment or device, etc.



6. EXTENSION OF SIDE MEMBER REAR END

The rear end of the side member should be extended according to the method shown in the figures below.

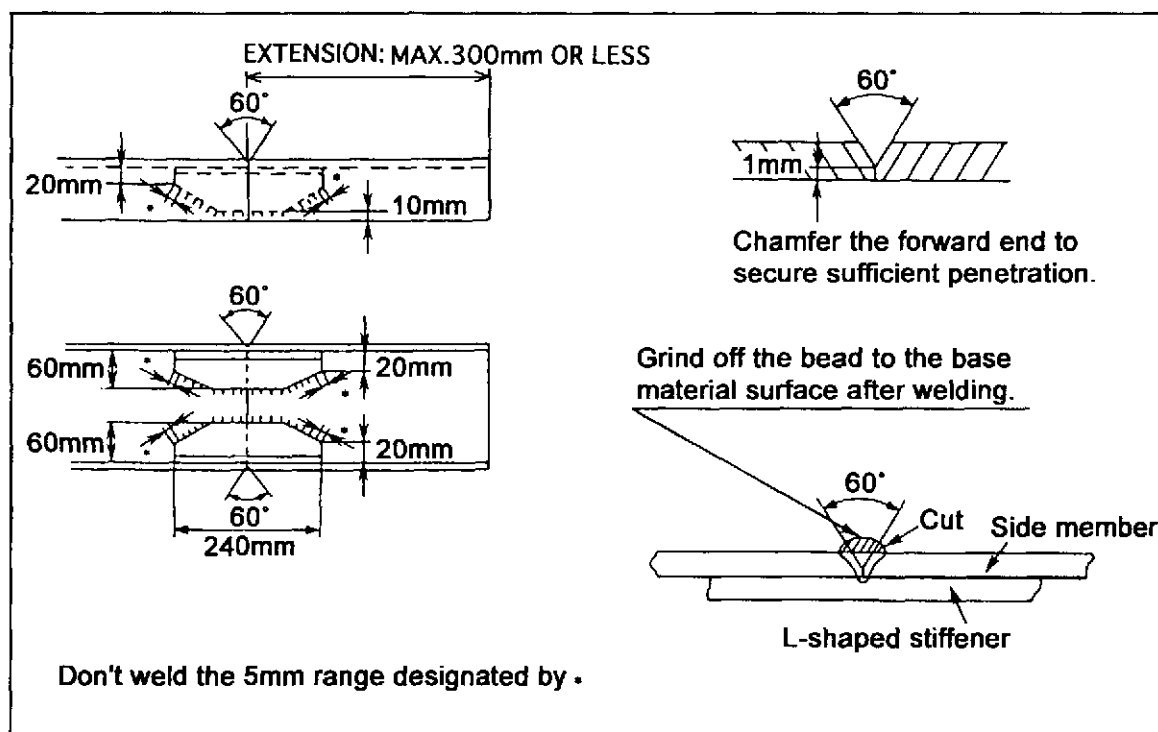
(1) Extension by Welding

Extension material

- The material of the extension must be the same as the base material of the main members and inner stiffeners.

How to make an extension

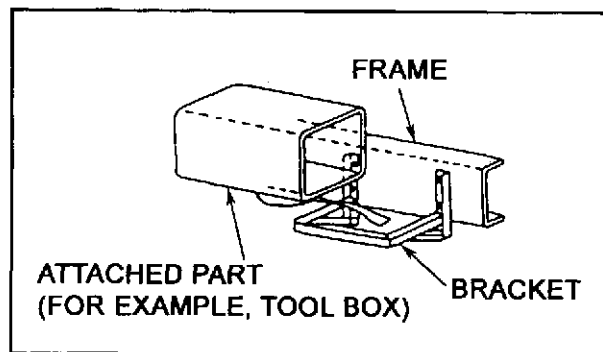
- Extension length : 300mm maximum or less.
- Use a welding rod designed for use with the base metal.
- Use a continuous butt welding for the extension material and intermittent welding for stiffeners of 35mm in circumference.

**[NOTE]**

- If demand for more than 300mm extension, please contact nearest Hino sales dealer or distributor for information on how to extend the rear end of the side member.

7. MOUNTING A PART ON THE SIDE MEMBER

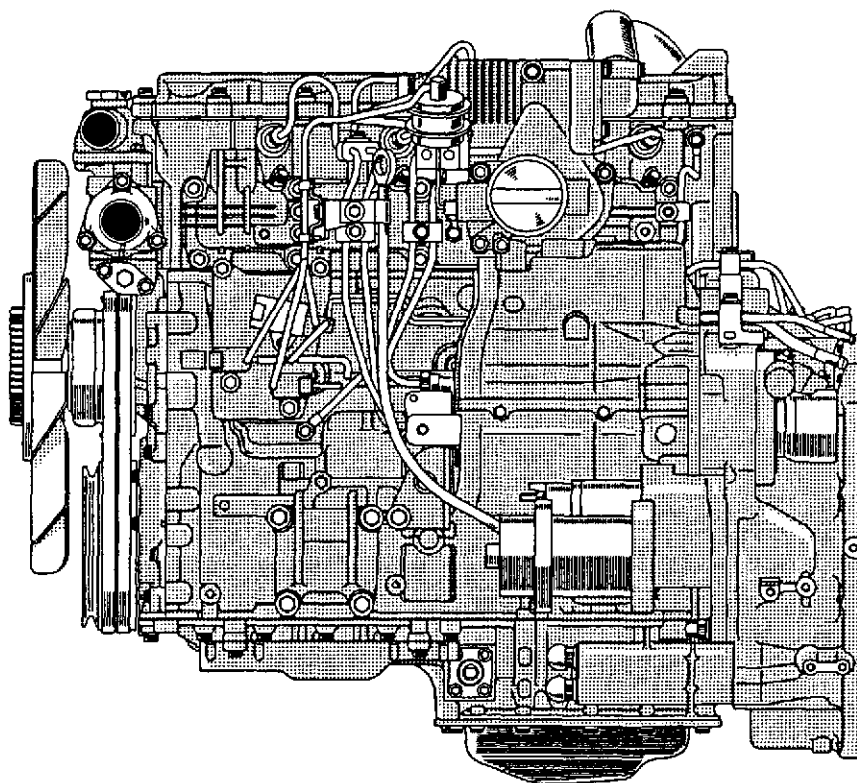
- (1) Mount a part always using a bracket.
 - The offset should be minimized.
 - Connect the bracket with bolt or rivet but not by welding as far as possible.
- (2) Tool box should be kept away from the exhaust pipe by 200mm minimum and from the muffler by 300mm minimum.
 - In the case where a sufficient clearance is not available, provide an appropriate heat-protection measure using a heat insulating plate or the like.



3. ENGINE AND ENGINE COMPARTMENT

- 1. PRECAUTIONS FOR MOUNTING OF..... 3 - 2
BODY OR EQUIPMENT**

- The engine is the most important component part of the vehicle.
To ensure that it remains in optimum condition requires regular inspection, maintenance and repair work.
- When mounting a rear body or equipment, you should therefore observe the precautions and procedures described in this section and be sure to allow for ease of regular inspection, maintenance and repair work.



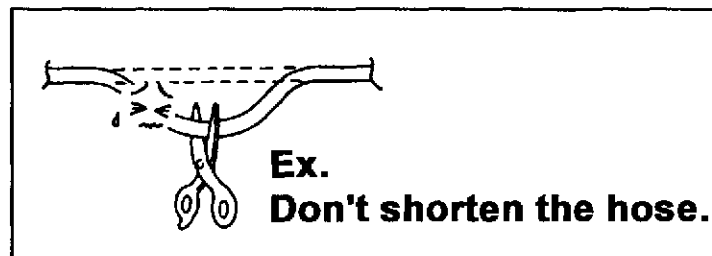
1. PRECAUTIONS FOR BODY OR EQUIPMENT MOUNTING**1) No Shared Fastening of Bolts.**

The bolts making up the engine except for those used for the cylinder head and the seals must not be fastened together with the mounted or modified parts.

Ex: Fittings of intake manifold, water outlet and inlet, parts used with seals or gaskets.

2) No Interference Resulting from Body or Equipment Mounting or Modification.**(1) Processing and arrangement change of pipes and wirings.**

The piping or wiring between the engine and the chassis has no margin allowing for the assembly variations and movement. Therefore, no modifications work should be made (for example, the hose shortened or fixed) to shorten the piping or wiring.

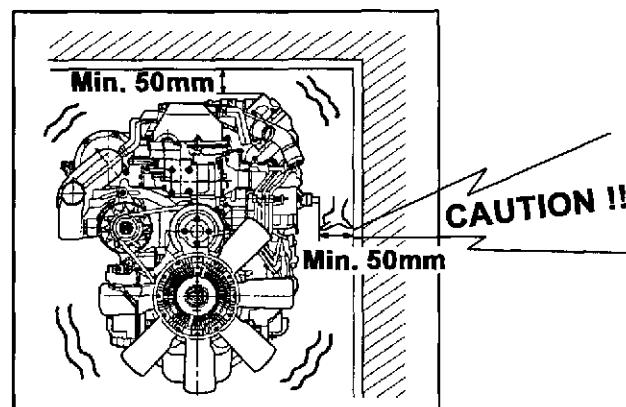
(2) Mounting or modified parts

Don't make any modifications which cause interference with the piping or wiring on any parts subjected to relative motions.

(3) Securing appropriate clearance with engine body

See to it that the clearance of 50mm minimum is secured around the engine.

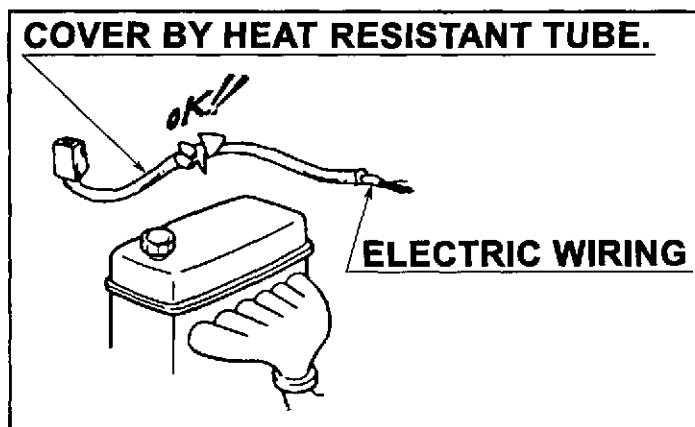
- Remember that the engine is movable in all directions including longitudinal, lateral, vertical and rotational directions.



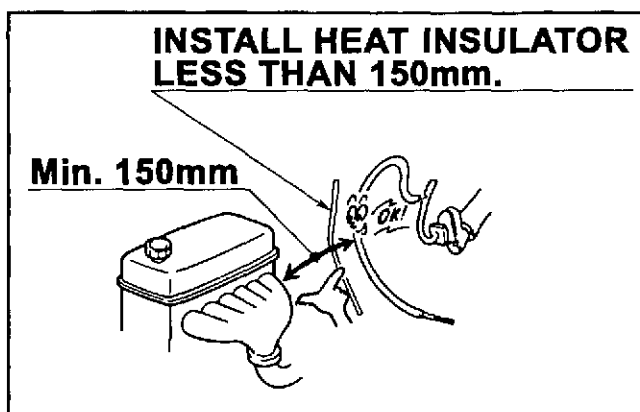
3) Heat Consideration

(piping and wiring, resin clamp, accelerator wire, fuel system, etc.)

- (1) When installing any of the above-described parts in the vicinity of the exhaust manifold, exhaust system, take adequate care of heat resistance.

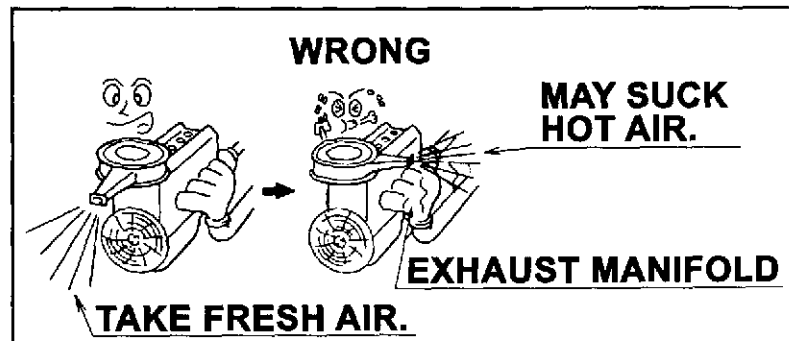


- Secure a construction free of interference in case of assembly variations or clamp dislocation.
In particular, secure a sufficient clearance for the accelerator wire from the heat source (150mm at minimum from the exhaust pipe).



- In the event that the defined clearance is unavailable, protect against heat by means of a heat insulating plate or the like.
- (2) The resin clamp may be softened by the heat from the engine compartment and may be dislocated. Take good care.

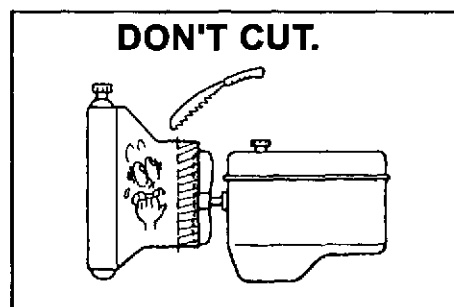
- (3) Don't make any modifications which may cause an increased temperature of intake air or fuel supplied to the injection pump.



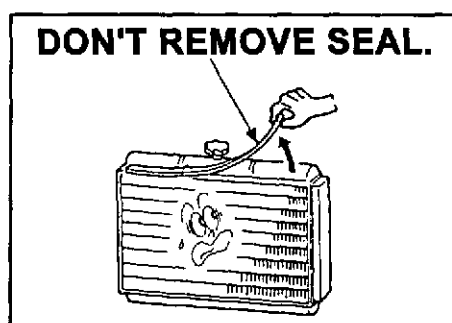
4) Cooling

Don't make any mounting or modifications which may reduce the cooling performance.

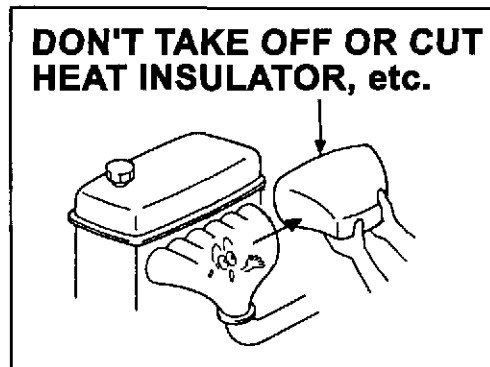
- (1) Don't mount any parts at a position where the exhaust manifold is exposed to less air.
- (2) Don't change the fan shroud coverage on the fan nor add any fan shroud cut as it would deteriorate the cooling performance.



- (3) The seals (sponge, rubber plate and the like) around the radiator are mounted for the purpose of securing the cooling performance. Don't remove them or cut a recess in them.



- (4) Don't take off or cut the protector, cover, heat insulator or the like mounted around the engine.



5) No Modifications to Increase Intake or Exhaust Air Resistance

- (1) Don't make any modifications to the air cleaner.
- (2) Don't extend or make any modifications to the arrangement of the air hose.
- (3) Don't extend or make any modifications to the arrangement of the exhaust pipe.
- (4) Don't make any modifications to the muffler.

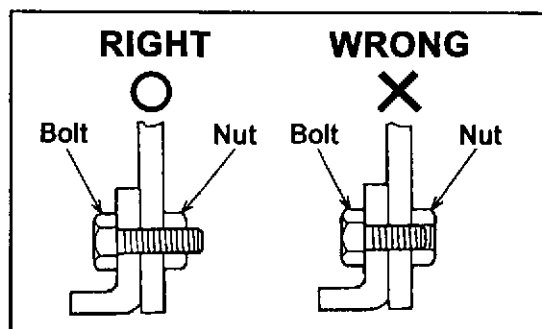
6) Mounting or Modifications of the Parts

- (1) Mounting on engine body

In mounting a part on the engine body, place it nearer to the engine (with a smaller overhang) and reduce the weight as far as possible.

- (2) Mounting bolts

Make sufficient study of the lap allowance and the bottom fitting of the bolt to be mounted.

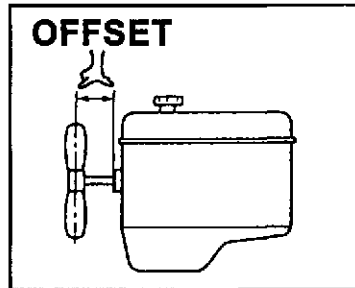


- (3) Cooling fan belt change

Don't reduce the number of existing belts and avoid the case of a belt being shared.

(4) Pulley addition

- When adding a crank pulley, minimize the offset from the mounting position and reduce the weight as far as possible.
- Don't excessively advance the fan (coupling) as a result of pulley addition as it could deteriorate the durability of the water pump.

**7) Taking Out of Auxiliary Power**

- Don't take auxiliary power out except crankshaft pulley and engine rear P. T. O.

8) Idling-Up Device

- In the case to mount the engine idling-up device, make sure that don't change for the worse of driving ability. (Ex; quick starting the vehicle, for the worse of engine brake, etc.)

9) Mounting and Dismounting Engine Parts

In reassembling an engine part, always make sure to comply with the Repair Manual issued by the oversea Service Division. (Don't reuse the gasket, strictly conform to the tightening torque requirement, etc.)

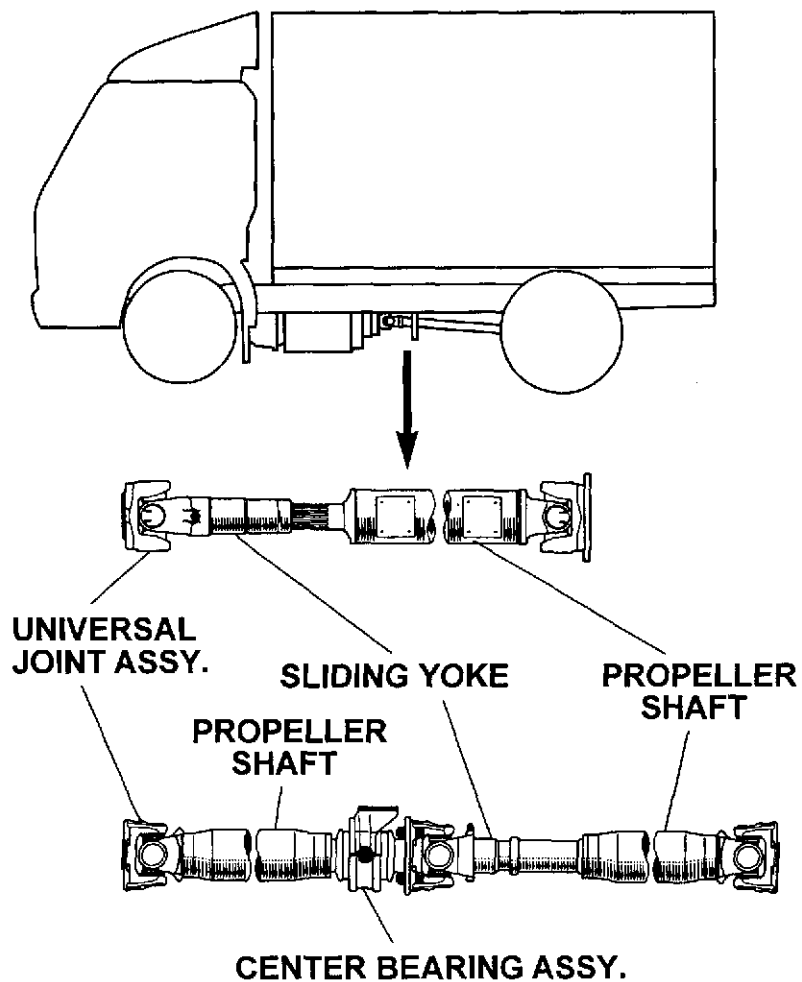
10) Serviceability

See to it that the following jobs are not adversely affected by the particular mounting or modifications.

- Oil level check
- Oil change (oil drain or filling)
- Change of oil filter
- Adjustment of fan belt tension
- Change of air cleaner element
- Change of fuel filter
- Adjustment of idle rpm, CO and HC
- Adjustment of valve clearance
- Adjustment of injection timing
- Change of injection nozzle
- Change of glow plug

4. PROPELLER SHAFT

1. PROPELLER SHAFT 4 - 1



PROPELLER SHAFT

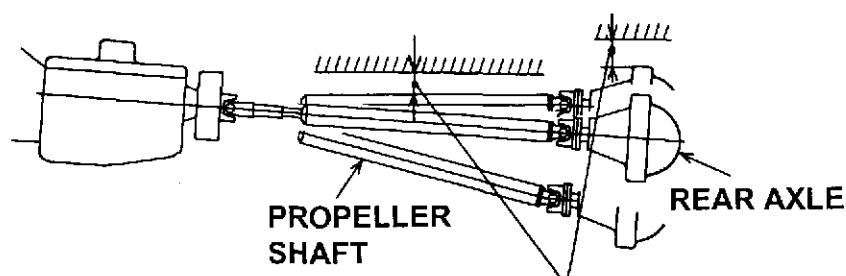
- The propeller shaft is an important component that transfers drive power generated by the engine to the rear axle. The propeller shaft rotates at high speeds while operating making it a very dangerous component.
- Accordingly, when mounting a body or equipment, be sure to observe the instructions given below.

1) Prohibited Modifications and Alterations

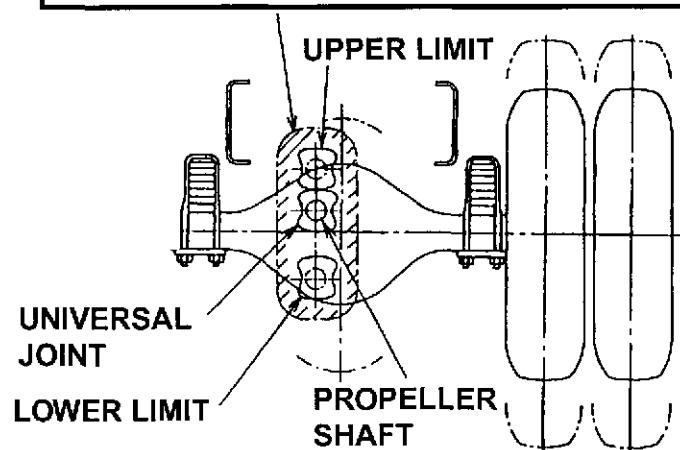
- Careless modifications will result in vibrations and unusual noises while the vehicle is driving and are very dangerous. These type of modifications must not be carried out.

2) Confirming Correct Clearance

- The propeller shaft rotates at high speeds while simultaneously vibrating up and down and right and left along the road surface.
- Accordingly, the clearance between the propeller shaft (including joints) and the body or body equipment parts must be at least 50mm from the limit of displacement of the propeller shaft (above, below, right, left and front or back of the rear axle).



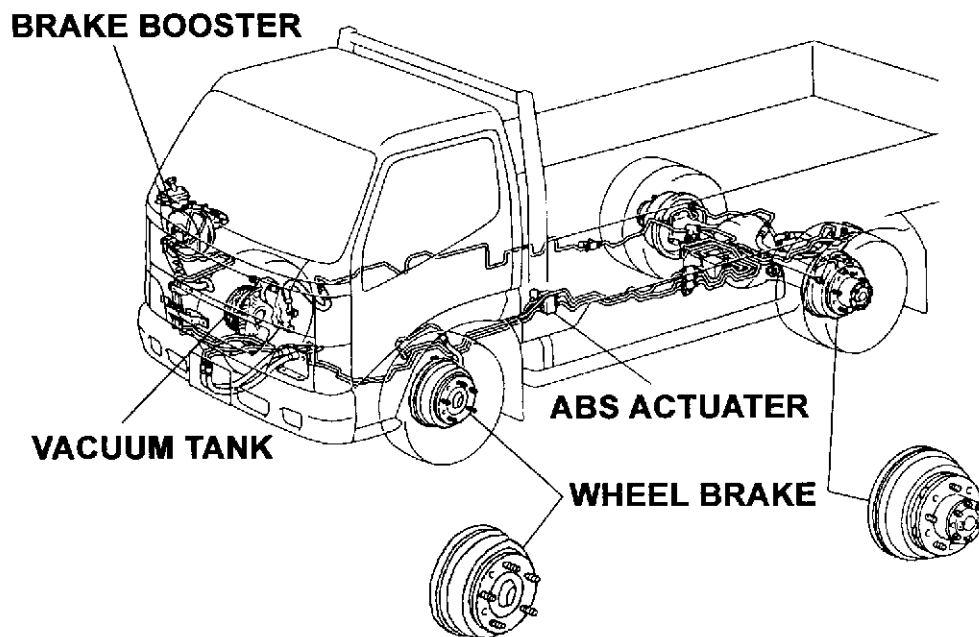
Allow 50 mm clearance from limit of displacement (above, below, left, right, front, back).



5. BRAKE & HYDRAULIC PIPING

1. GENERAL POINTS OF BRAKE SYSTEM	5 - 2
2. BRAKE PIPING USED IN THE CHASSIS.....	5 - 3
3. PRECAUTIONS WHEN MOUNTING A BODY OR EQUIPMENT	5 - 4
4. PRECAUTIONS FOR MODIFICATION (ALTERATION).....	5 - 5
5. PIPING CLEARANCES	5 - 6
6. CLIPPING OF PIPING	5 - 7

- The brake system is an extremely important safety component of the vehicle.
- Incorrect body or equipment mounting may have a major impact on the functions and performance of the brake system and may lead to serious mechanical failures or accidents.
- When mounting a body or equipment or making alterations, strictly observe the following precautions:



1. GENERAL POINTS OF BRAKE SYSTEM**1) Brake System Specifications**

- TOYOTA vehicles are equipped with an assisted brake system that is matched to the size of the vehicle to allow the driver to operate the brakes in safety and comfort.

The table below shows, in outline, how brake systems are matched to chassis models.

CHASSIS MODEL	BRAKE SYSTEM
DYNA CHASSIS	HYDRAULIC BRAKE WITH VACUUM SERVO
LIGHT MEDIUM CHASSIS	HYDRAULIC BRAKE WITH VACUUM OR AIR SERVO
MEDIUM DUTY CHASSIS	AIR OVER HYDRAULIC BRAKE OR FULL AIR BRAKE
HEAVY DUTY CHASSIS	FULL AIR BRAKE

- If body equipment design means that you need to take power from the brake system such as vacuum air pressure to control transmission PTO provided by body or equipment manufacturer, be sure to make a thoroughly study of the basic brake system before performing these modifications.

2) Do not Modify the Brake System

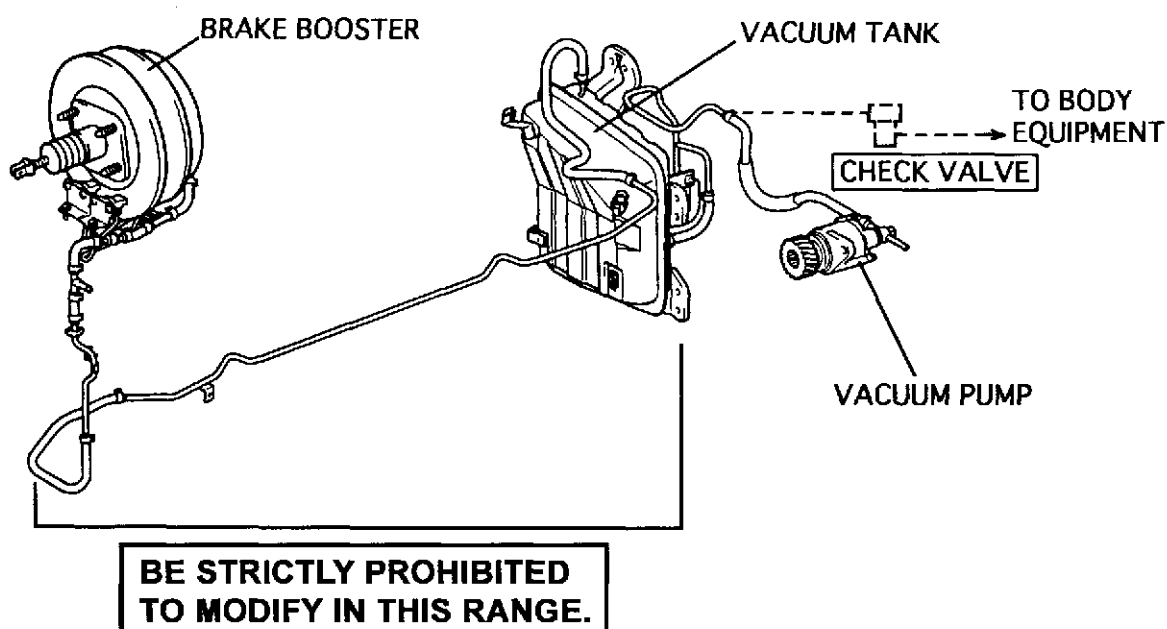
- (1) The brake system is the most important safety component of the vehicle and you must never modify it when mounting a body or equipment.
- (2) If you must modify the piping of the brake system in order to make other modifications to the chassis during body or equipment mounting (moving the fuel tank, etc.) , please contact your nearest TOYOTA sales dealer or distributor and follow the advice that the sales dealer or distributor provides.

3) Taking the Power from the Brake System

- As a general rule, the taking vacuum air to power a body or equipment from the brake system is prohibited.
- If you must take vacuum air pressure to power a body or equipment from the brake system piping, take account of the frequency of use of the equipment, the performance of the vacuum air supply and safety considerations, and consult your TOYOTA sales dealer or distributor beforehand.
- When you install vacuum air piping, make sure it will not affect brake system during operation or in the event of a breakdown and follow the rules given below;

PROCESS HOW TO TAKE VACUUM POWER

- (1) Don't take the vacuum air from the main brake vacuum piping. (between the vacuum tank to the brake booster)
- (2) Take the vacuum air from the joint of piping between the vacuum pump and the vacuum tank.
- (3) Install a protection device as check valve between the brake system and the body equipment to protect the main brake system.
- (4) Must be followed the instruction of piping precautions for installation of piping of the body equipment.

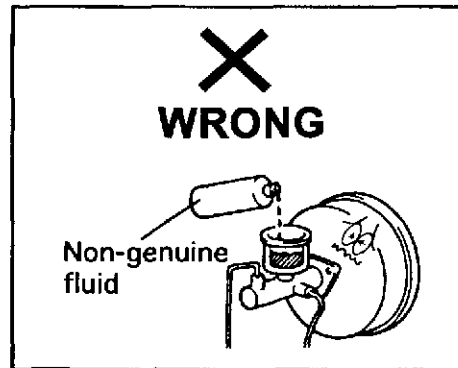


VACUUM PIPING OF BRAKE SYSTEM

4) Refilling Brake Fluid

- When changing brake and clutch fluids, use only genuine TOYOTA brake and clutch fluids. (For details of brake and clutch fluids, see the appropriate Repair or Owner's manual.)
- Never reuse old brake or clutch fluids.

Never use mineral oil or mix TOYOTA products with other brands.



5) Avoiding Effect of Exhaust Heat

- (1) Locate the brake hose and the brake pipe min. 200 mm from the exhaust system.

When the specified clearance can not be made available, protect against heat by such means as a heat insulating plate.

- (2) Locate the parking brake control cable min. 200 mm from the exhaust system.

When the specified clearance can not be provided, protect them against heat by such means as a heat insulating plate.

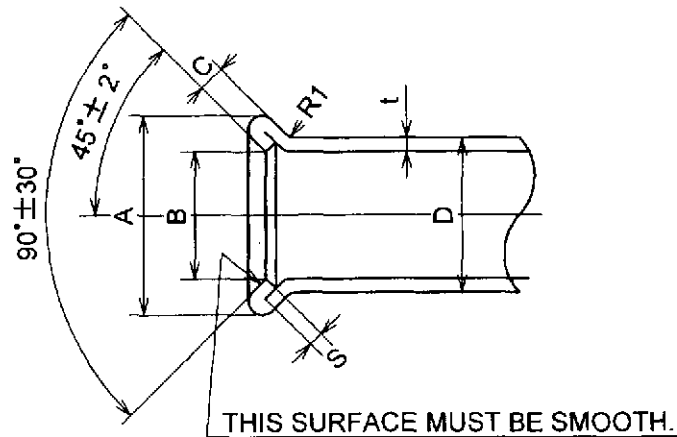
2. BRAKE PIPING USED IN THE CHASSIS

1) Steel Piping Used in the Chassis

The table below shows the steel piping used in the chassis and the configuration of the flare of each type of pipe.

UNIT : mm

Nominal diameter D	Flare configuration					Material
	A	B	t	C	S STEEL	STEEL
4.76	6.6~7.2	2.9~3.6	0.7	1.4	1.0	STDW 1
6.35	8.6~9.2	4.5~5.3	0.7	1.4	1.0	STDW 1



[DETAILS OF MATERIALS.]

Pipe dia. (mm)	Type	Pipe	Surface Treatment	
			Inside	Outside
6.76 ~ 6.35	Double-wound plated steel pipe	STDW 1	COPPER	TSH6500G-UC + TSH7902G

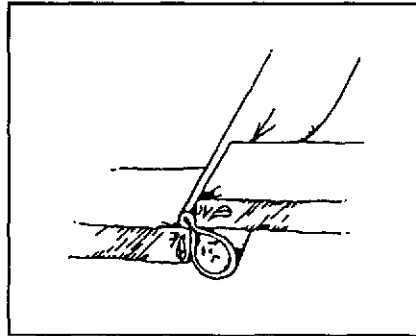
Notes:

Chemical composition and mechanical properties.

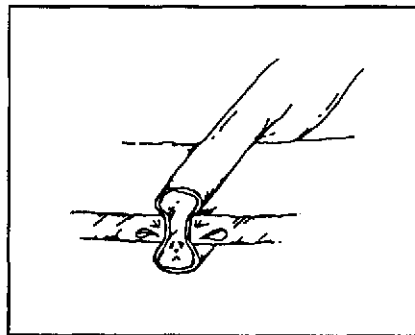
Pipe	Chemical composition (for reference) %						Mechanical properties					
							Tensile strength			Bending		
	C	Mn	P	S	Si	Cu	Tensile Strength N/mm ² {Kg/mm ² }	Yield Point N/mm ² {Kg/mm ² }	Elongation (%)	Applicable pipe dia. (mm)	Bending angle	Inside dia. (D= pipe dia.)
STDW 1	0.02	0.22	0.01	0.010	0.02	—	≥ 270 { ≥ 28 }	—	≥ 25	≤ 8	360°	1.5D

3. PRECAUTIONS WHEN MOUNTING A BODY OR EQUIPMENT**1) Avoiding Interference with Piping**

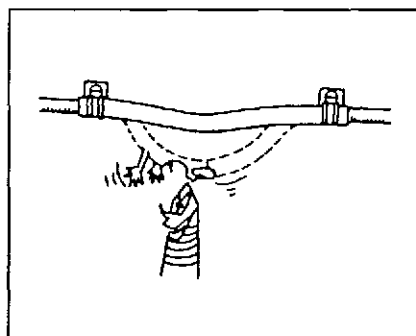
- (1) Take care that the piping is not caught by other parts.



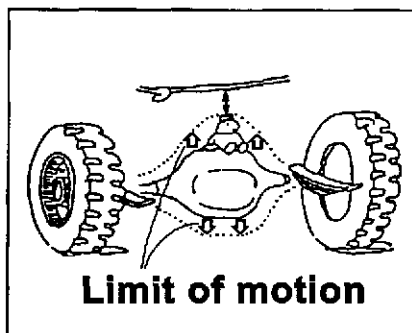
- (2) Be sure that the piping is not flattened.



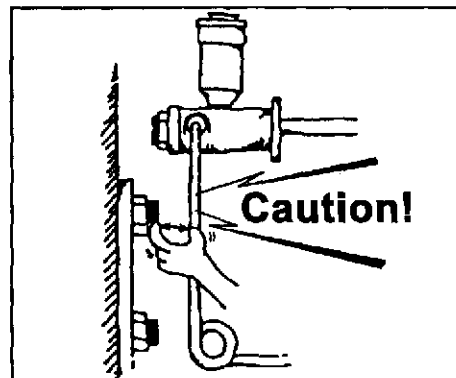
- (3) See to it that the piping is not in contact with the sharp-angle portion of other parts.



- (4) Pay attention to the displacement of the brake hose connected to the front and rear wheels while the vehicle is running.



- (5) Secure a sufficient clearance between the brake piping and installed parts.



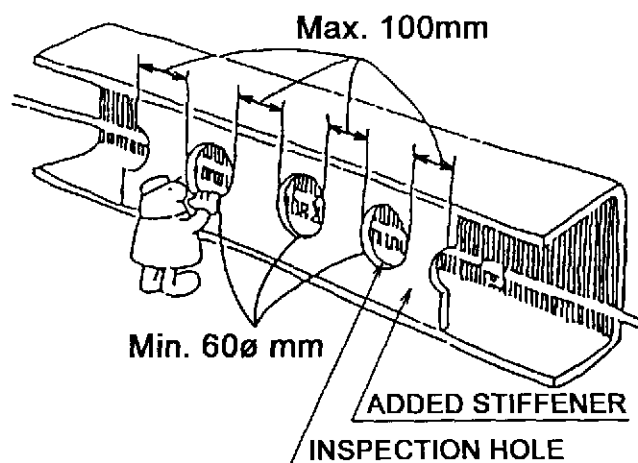
- (6) The joints of pipes and hoses must be accessible to allow tightening and so that pipes and hoses can be removed.

If you have fitted stiffeners to bridge the gap between the flanges of side members, be sure to cut inspection holes in the stiffener.

The pitch between holes must be 100 mm or less, and the diameter of the holes must be at least 60 mm.

Make sure that the holes are in front of the clips used to secure the piping to the member.

You must be able to insert or remove the clips using a box wrench.



- (7) Make sure that brake component parts are easily accessible for the serviceability.

Secure such a structure that refastening, maintenance, inspection and replacement are possible of the brake-related parts even after the particular body mounting or alteration.

Considering the position of the air bleeder of the piping, construct the brake piping to permit air bleeding.

Make sure that the air bleeders of following parts are easily accessible for air bleeding;

- BRAKE MASTER CYLINDER
- WHEEL CYLINDER



[NOTE]

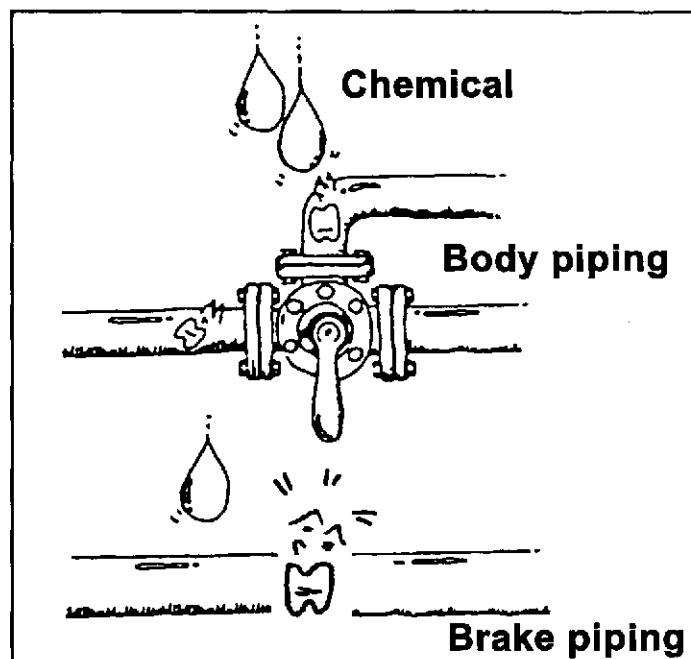
Tightening torque of air bleeding plug : $8.5 \sim 12.5 \text{ N}\cdot\text{m}$
($90 \sim 130 \text{ kgf}\cdot\text{cm}$)

- (8) Allow sufficient clearance between the brake pipes, hoses, equipment and body. When mounting the body, make sure that body and equipment do not interfere with the brake system.
- Clearance with engine
 - Clearance with brake component parts
(pipes, hoses, devices of ABS & LSPV, etc.)
 - Clearance with hoses around axles
(must be consider the maximum movement of axles)
 - Clearances with dump body parts
(moving parts such as hydraulic cylinder, dump arm etc.)
 - Clearances with rubber parts
(For more details of required clearances, see after item "5. PIPING CLEARANCES".)

(9) Antidewing and anticorrosion of piping

Corrosion of the brake piping for the special rear bodies of the liquid oxygen truck, the vacuum tank truck or fresh fish truck is promoted by the dew or water at low-temperature portions (such as the liquid oxygen inlet/outlet).

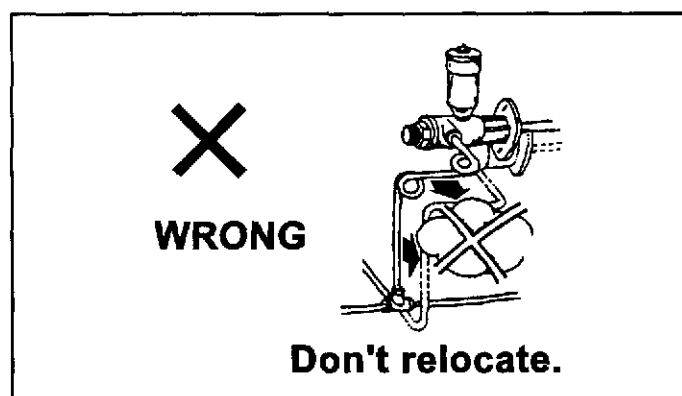
Keep the brake piping away from or cover it with a protective plate at portions where dew forms or water drops easily.



- (10) When remove the LSPV during body mounting or alteration, it must be readjusted. (For the adjustment procedure, refer to the Repair or Owner's manual.)

(11) Relocation of brake-related parts

Don't relocate the brake-related parts or change the pipe shape.



4. PRECAUTIONS FOR MODIFICATION (ALTERATION)

As far as possible avoid modifying any piping.

If you modify piping, be sure to observe the following precautions.

PIPING

- (1) When extending a pipe, do not join two pipes directly.
- (2) When joining pipes, use the flare joint method and avoid twisting the pipes too much.

[NOTE]

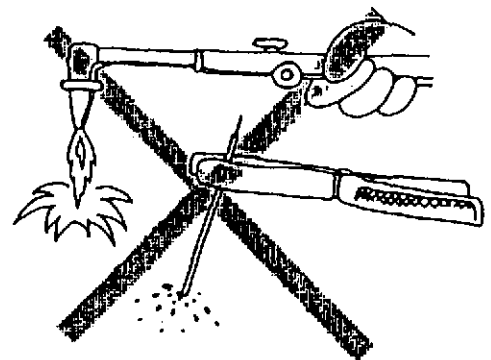
Tightening torque of flare nut

SIZE OF NUT.	INSIDE DIAMETER OF FLARE NUT OR OUTSIDE DIAMETER OF PIPE. [mm]	TIGHTENING TORQUE [N·m(kgf·cm)]
M10	4.76	12.5 ~ 17.5 (130 ~ 180)
M12	6.35	19.5 ~ 28.0 (200 ~ 290)

- (3) Most pipes are made of steel but have anti-corrosive plating on the inside.

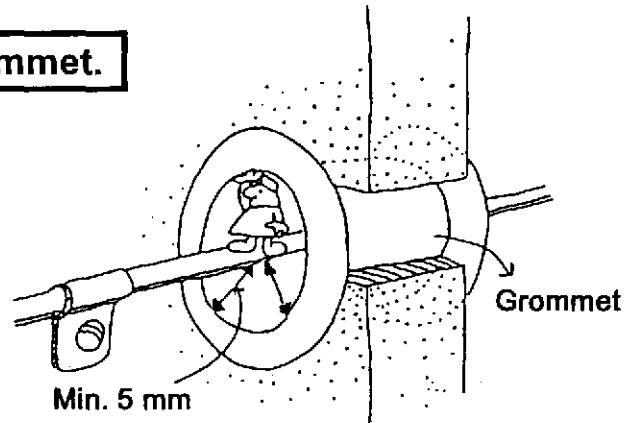
Never braze these pipes and never heat them to high temperatures.

Do not weld or braze brake piping and do not heat to high temperatures.



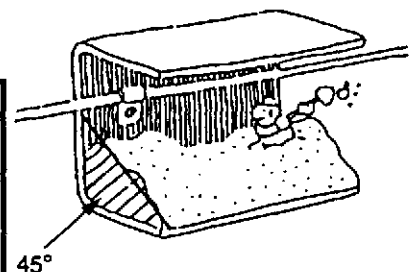
- (4) Do not use copper pipes for high-pressure hydraulic brake piping and for piping in areas below unsprung parts as on axles.

- (5) Where pipes pass through the chassis frame material, fit a grommet in the hole and secure the pipe with clips close to the hole so that the pipe does not touch the hole or the grommet.

Use of Grommet.

- (6) To remove the transmission, it is necessary to pull the transmission assembly backwards in the line of the crankshaft. Do not install piping in areas around the transmission (areas between transmission and No.3 crossmember).
- (7) Where piping may be affected by the failure of other equipment, install the pipes inside the side members or crossmembers, and do not allow them to protrude below the bottom flange surface of the chassis frame.
- (8) To prevent fires caused by oil leaks, do not install joints in hydraulic piping near to or over any part of the exhaust system.
- (9) Do not install piping between the spring brackets of the front and rear suspensions (outside the lower flange surface of the frame) or within the range of movement of the spring shackle.
- (10) The piping located on the axle below the springs is carefully designed to prevent damage from the complex vibrations which arise in this area. Do not modify this piping.
- (11) Do not install piping near to the moving parts of the chassis side propeller shaft or PTO drive shaft.
- (12) Avoid making  shape bends in hydraulic brake piping as this makes air bleeding difficult.
- (13) Do not install piping in places where earth, sand, or water accumulate. Avoid covering pipes with rubber or vinyl tubes as this tends to trap water.

Install pipes high enough so that they are not covered by any earth or sand that may accumulate on the lower flange.



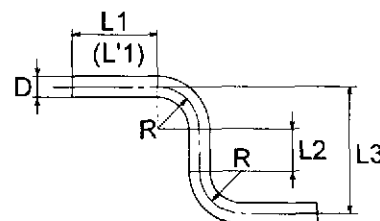
(14) To prevent from water, stone splashed by tire, locate the piping inside of frame or behind crossmember.

(must be away the piping min. 5mm from those parts)

(15) Don't locate the piping behind the end of the exhaust tail pipe.

(16) When bending pipes, observe the following precautions:

- Use a bender and do not heat the pipes in order to bend them.
- Observe the standard bending radiuses shown in the table below.



UNIT:mm

	L1	L'1	L2	L3	R
	PIPE WITH FLARE NUT.	PIPE WITHOUT FLARE NUT.	IN THE CASE OF THREE-DIMENSIONAL RADIUS.	MIN. OFFSET	———
STANDARD BENDING R. NOMINAL DIAMETER OF PIPE.	MIN. +2D	MIN. 3D	MIN. 2D	IN THE CASE, BENDING ANGLE IS AN OBTUSE ANGLE.	RADIUS R MUST BE SAME IN A PIECE OF PIPE.
4.76	30	30	MIN. 2D	MIN. 5D	30
6.35	30	30	MIN. 2D	MIN. 5D	30

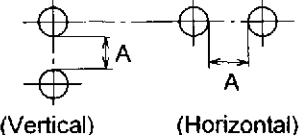
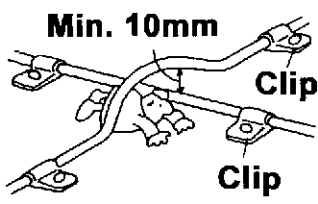
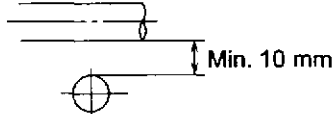
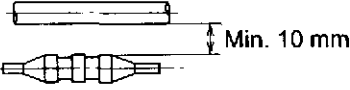
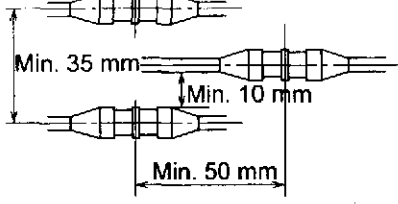
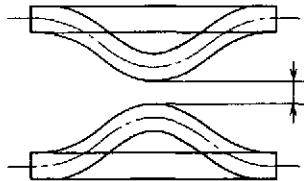
- Make sure that the flat rate of deflection of the bending portion must be min. 80% of the pipe diameter.
- Flush the inside of the pipe and remove any foreign matter before use. Use compressed air to flush the pipe.
- For details of pipe machining at the flare nut, see item 2 of this section, "Brake Piping Used in the Chassis". After machining, remove any foreign matter by flushing the pipe with compressed air.

(17) Make sure that there are not to much slack and giving tension to the piping.

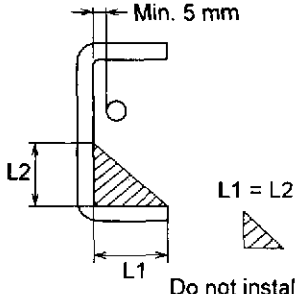
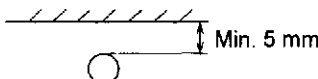
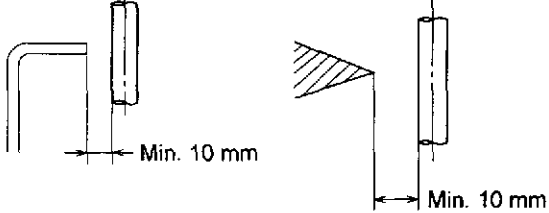
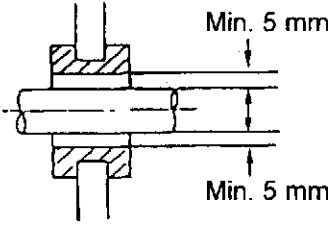
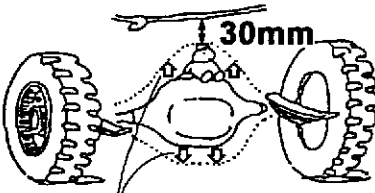
5. PIPING CLEARANCES

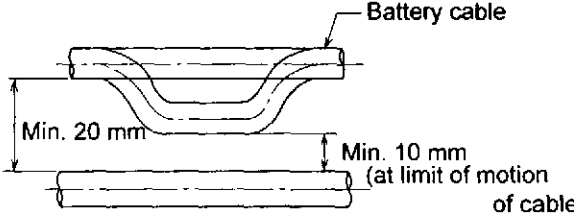
To prevent rust and damage from contact with other parts.
When modifying piping, observe the following precautions.

1) Clearances Between Two Pipes

No.	Position	Clearances
1	Between two pipes.	 A Min. 10 mm (Horizontal) 0 (Vertical)
2	Pipe crossing points. 	 Min. 10 mm Use clips to secure pipes near crossing points.
3	Between a pipe and a joint.	 Min. 10 mm
4	Between two joints.	 Min. 35 mm Min. 10 mm Min. 50 mm
5	Between two hoses.	 At maximum displacement min. 20 mm

2) Clearances Between Pipes and Other Parts

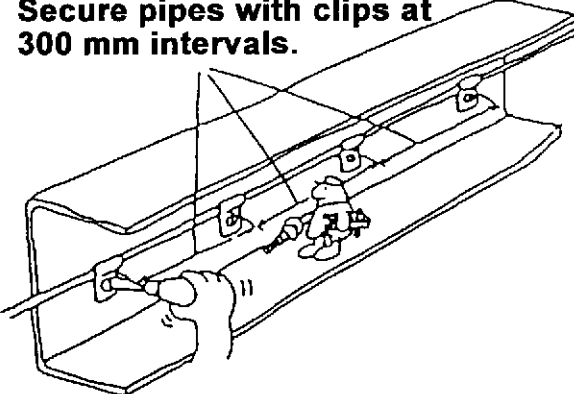
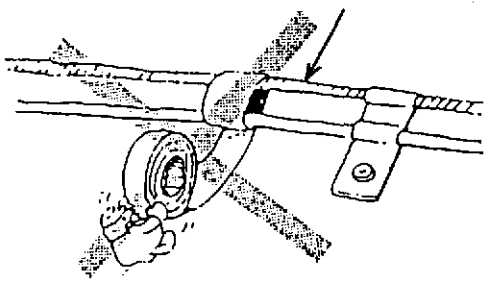
No.	Position	Clearances
1	Between pipes and chassis frame.	 Min. 5 mm $L_1 = L_2$ Do not install pipes in shaded area.
2	Between a pipe and a flat metal surface.	 Min. 5 mm
3	Between a pipe and a metal corner or edge.	 Min. 10 mm Min. 10 mm
4	Between a grommet and a pipe.	 Min. 5 mm Min. 5 mm
5	Between pipes and metal structural parts. Between a pipe and a moving part.  30mm Limit of motion	Min. 10 mm But min. 30 mm clearance from limit of motion of moving part.

No.	Position	Clearances
6	Between a hose and a structural part.	Make sure that clearances of brake and air hoses linked to wheels are at least 50 mm during driving. Take account of vibrations (e. g. when steering is at full lock). Clearances for other hoses at the limit of motion must be: • at least 10 mm from flat surfaces • at least 30 mm from corners and edges 
7	Between hoses or pipes and heated parts (exhaust system etc.). • Vacuum pipe • Hydraulic pipe • Brake hoses	Min. 100 mm Min. 200 mm at limit of motion. If this is not possible, protect the hose with heat absorbing plates.
8	Between hoses or pipes and electrical parts. • Between a pipe and a battery cable. • Between pipes and electric terminals. • Between pipes and harness wires.	 Min. 20 mm Min. 10 mm (at limit of motion of cable) Min. 30 mm Between parallel pipes/wires at limit of sag : Min. 10 mm At crossing points : Min. 20 mm

6. CLIPPING OF PIPING

Pipes must be secured with clips to prevent them from swinging due to the motion of the vehicle.

Use vinyl-coated or rubber-coated clips and follow the rules given in the table below.

No.	Item	Notes
1	Clip spacing Secure pipes with clips at 300 mm intervals. 	However, at bends, crossing points, joints, and where pipes and wires, etc. are installed in parallel, and are subject to movement, and where two copper pipes are installed, reduce the spacing of clips to prevent any vibration.
2	Clipping two items with one clip. Never bind two pipes together with tape. Never clip a pipe with a harness wire or a fuel pipe. 	Never clip a pipe and a harness wire together with one clip. Fuel pipes may only be clipped together with copper pipes. Never clip fuel pipes together with vinyl hoses or rubber hoses.
3	Maximum number of pipes clipped together.	A maximum three pipes.

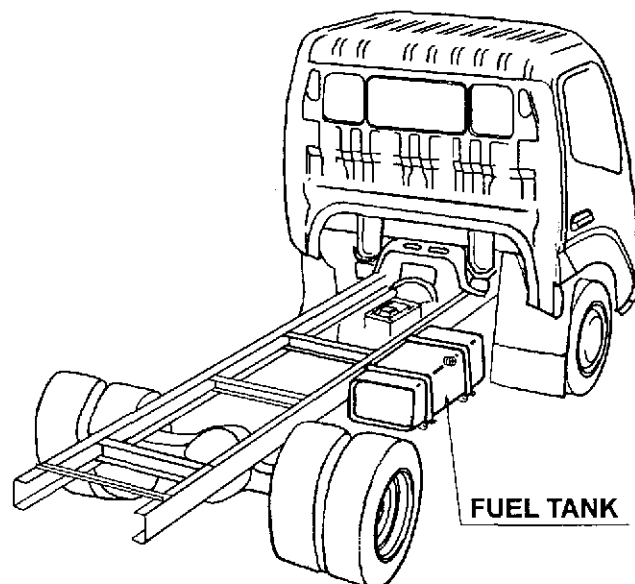
6. FUEL TANK

- 1. PRECAUTIONS FOR RELOCATING THE FUEL TANK 6 - 2**
- 2. MODIFICATION OR ADDITION OF FUEL TANK..... 6 - 3**
- 3. OTHER NOTES ON RELOCATING 6 - 4**
OR ADDING THE FUEL TANK

- For the purposes of mounting a body or equipment, or in order to adapt a vehicle for long-distance driving, you may need to move the fuel tank or mount an additional fuel tank.
- If you intend to move or add a fuel tank, be sure to observe the following procedures.

WARNING

Incorrect modifications may lead to vehicle fires.



1. PRECAUTIONS FOR RELOCATING THE FUEL TANK

When relocating the fuel tank, be sure to observe the following procedures:

- 1) If you intend to relocate making longer or shorter the fuel lines, be sure to use the specified fuel hose or steel pipe that came with base vehicle.

- (1) Vinyl chloride hose

Do not use vinyl chloride hose for the feed and fuel line.

- (2) Rubber hose

Use rubber hose for the fuel feed and return line.

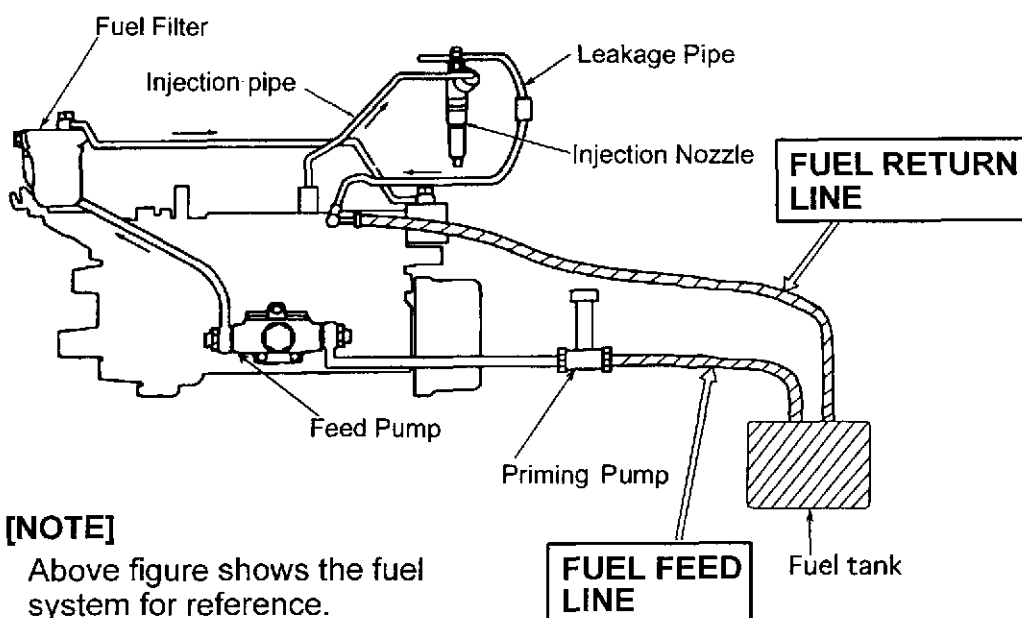
WARNING

- Never use hose of vinyl chloride instead of rubber hose.
- Connected with rubber hose and vinyl chloride hose is prohibited.
- Never use vinyl chloride hose for the fuel return line.
- Using defective polyvinyl chloride or rubber hoses can lead to vehicle fires. Always use genuine TOYOTA parts.

PIPE DIAMETERS	HOSE TYPE	NOTES
Internal: 7.6mm External: 14mm	Rubber hose (TSE 7151 G - 2 or equivalent)	Use for fuel return line
Internal: 11.5mm External: 19.5mm	Rubber hose (TSE 7151 G - 2 or equivalent)	Use for fuel feed line

Note: Hose length is discretionary.

[EXAMPLE]



[NOTE]

Above figure shows the fuel system for reference.

(3) Steel pipe

Steel pipe must be rustproofed inside and outside, and the pipe ends must be CURL spool shaped as in the drawing below:

Rustproofing:

- Internal: copper plating, min. 8. micron
- External: zinc plating, min. 13. micron(TSH6500G-SC)
+fluorocarbon resin coating

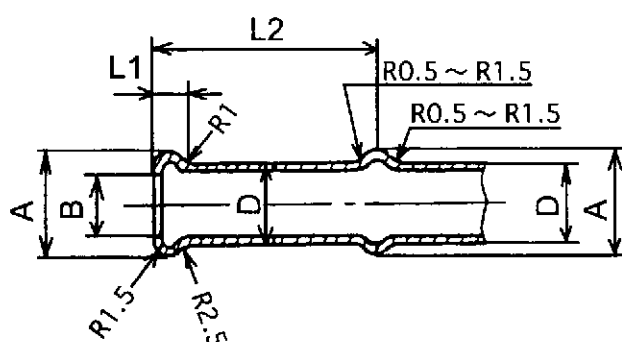
Pipe dimensions:

- External diameter: 8mm Thickness: 0.7mm
- External diameter: 12mm Thickness: 0.9mm

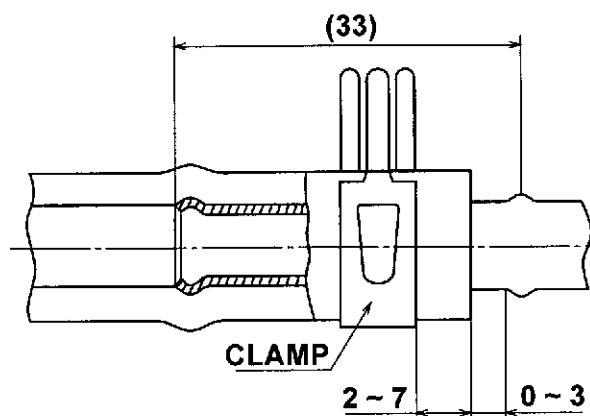
UNIT : mm

Nominal diameter	D	A	B	L1	L2	Internal diameter of rubber hose (TS715G - 2) to be connected.
	Standard diameter					
8	8	9.3	6.1	3.0	33	TSE 7151 G - 2 8
12	12	13.5	8.0	3.0	33	TSE 7151 G - 2 12

TSB5030G
CURL SPOOL SHAPE

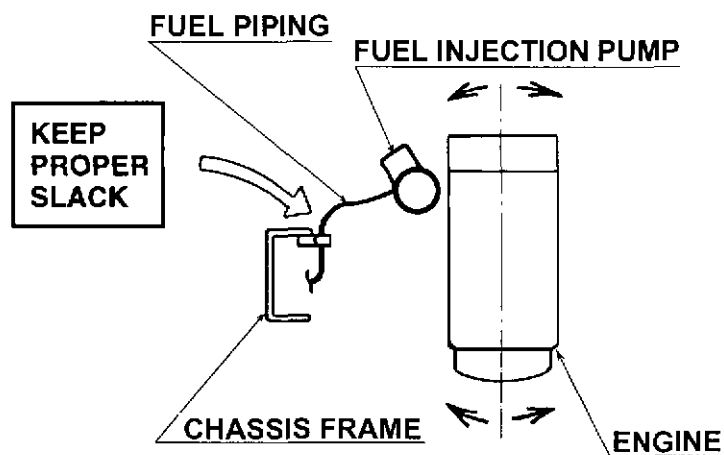


UNIT : mm



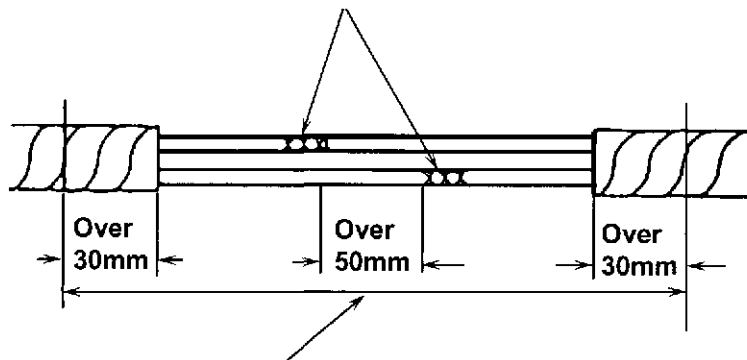
← ASSEMBLY DRAWING
(FOR REFERENCE)

- 2) Never extend fuel hoses.
- 3) As a rule, steel pipes should be used for fuel lines within the engine room.
- 4) As a rule, you should not change the clipping method or positions of clamps for fuel lines subject to movement due to the relative movement of the engine and the frame. If you must change either clipping method or clamp positions, be sure to allow sufficient slack to absorb the movement of the engine.



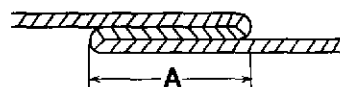
- 5) When extending the harness wires of the fuel gauge, use wires of the same color and size as the existing ones. The connections must be secured by soldering or force-fitting. Remove the burrs of soldered connections or joints and wrap them with adhesive vinyl tape or the like to insulate and prevent short circuits.

Insulate the connections with adhesive vinyl tape.

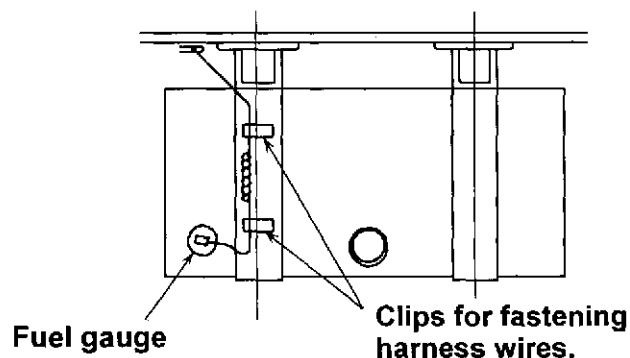


This area must be half-wrapped with adhesive vinyl tape.

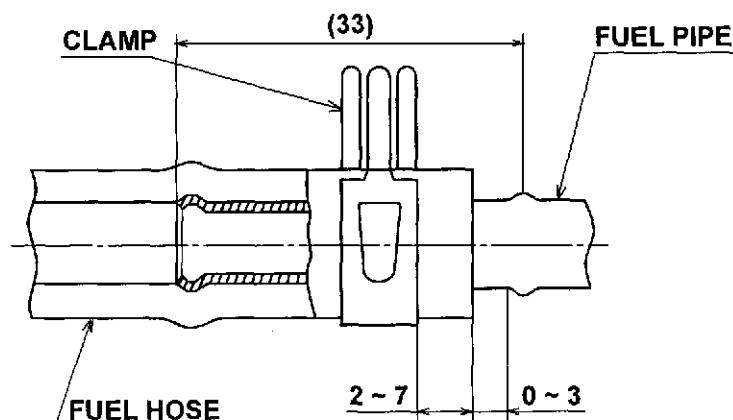
- 6) If you shorten the harness wires, bundle up the excess length, half-wrap it with adhesive vinyl tape and fasten it securely using clips fitted to the fuel tank mounting band.



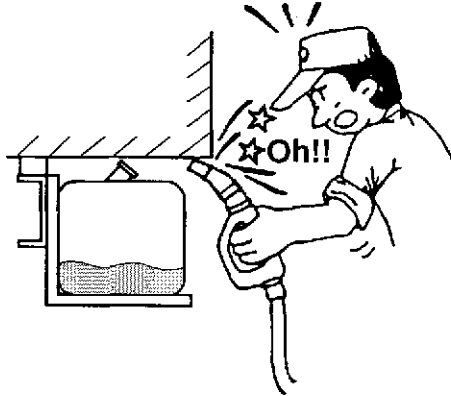
This area must be half-wrapped with adhesive vinyl tape.



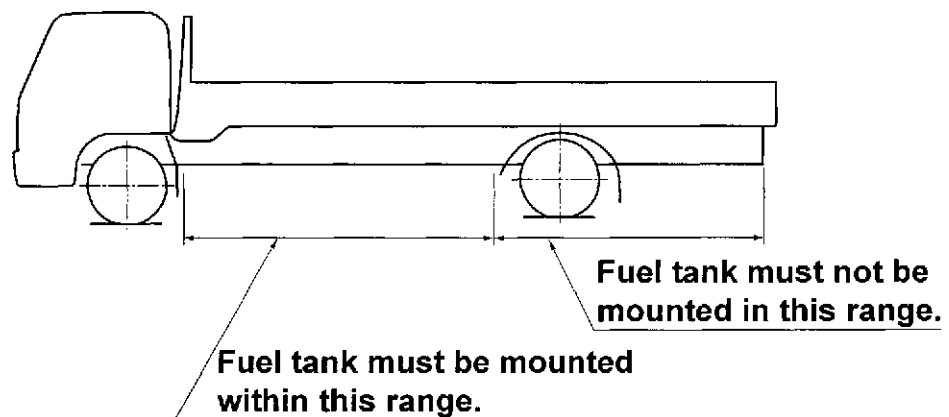
- 7) For clearances between the exhaust system, fuel tank, and fuel hoses, must be kept 200mm or more away.
- If it is impossible to allow a 200mm or larger clearance between them, install a thermal insulation plate to protect the fuel tank and hoses.
 - The hose near the high-temperature component swells and is deteriorated so much as to may slip out. Never connect the hose in such an area.
 - Details of clearances with the exhaust system, see clause "EXHAUST SYSTEM".
- 8) Make sure that even in the event of a fuel leak, fuel will not drip onto any part of the exhaust system. Joints must not be positioned above any part of the exhaust system.
- 9) Joints in the fuel hoses must be inserted by at least 30mm and gripped securely in the center by a clamp.



- 10) Make sure that the filling port of the fuel tank is positioned at least 300mm away from the mouth of the exhaust tail pipe, and at least 200mm away from any exposed electrical terminals.
- 11) Make sure that the filling port of the fuel tank is positioned to allow easy filling and easy removal and fitting of the filler cap.



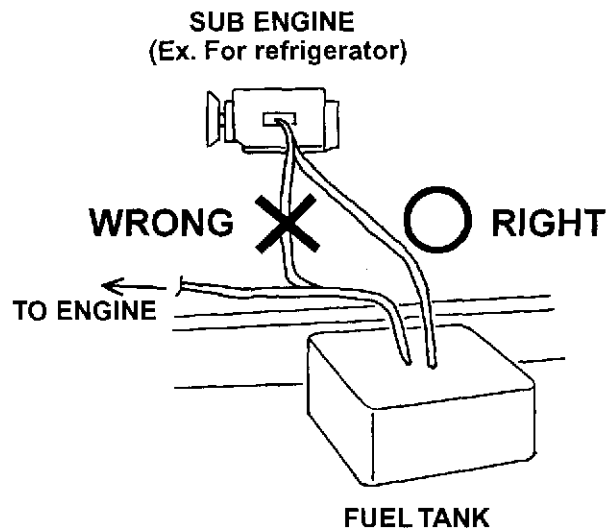
- 12) As a rule, the fuel tank must be mounted within the wheel base.



- 13) Secure the fuel hoses using clamps at 300-400mm intervals.
Fuel hoses must not run next to electrical wiring and battery cables.
Make sure that fuel hoses are positioned at least 30mm away from harness wires and battery cables.
- 14) Make sure that fuel hoses are positioned at least 10mm away from the corners of other parts, and at least 10mm away from the maximum range of movement of any parts subject to relative movement.
Secure the hoses with clamps.

- 15) When using the vehicle's main fuel tank to supply fuel to the engine of a refrigerator or other equipment, be sure that the fuel for this engine is taken directly from the main fuel tank.

Never take a line from the main fuel feed system as this will interfere with the main engine fuel supply.

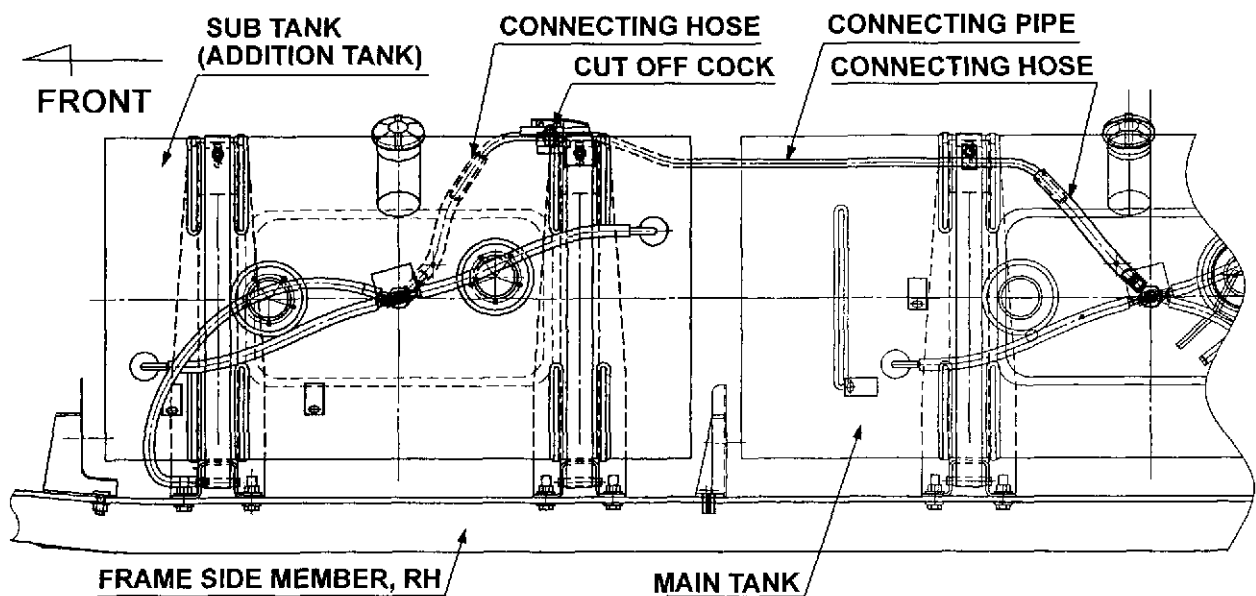


- 16) Install the relocated tank securely so that its bands do not become loose or the tank itself does not move due to vibrations caused while the vehicle is running.
- 17) When fabricating a new mounting bracket for the relocated or additional fuel tank, it must have a shape that can resist the vibrations and movements caused while the vehicle is running.
- 18) Make sure that the fuel tank must be relocated to the place where do not interfere with tire chain.

2. MODIFICATION OR ADDITION OF FUEL TANK

- 1) Never modify the fuel tank itself.
- 2) When a sub-tank is necessary, use the appropriate one of the options offered by TOYOTA for specific vehicle model.
- 3) When mounting an additional fuel tank, use the fuel tank of TOYOTA genuine parts.
- 4) When mounting an additional fuel tank, observe the precautions described in Item "1. PRECAUTIONS FOR RELOCATING THE FUEL TANK" and follow the procedure described below, and be sure to secure the tank firmly to prevent loosening of the mounting bands or slipping of the tank due to vibrations during driving.

- (1) Fit a cut-off cock to the connecting pipe between the main tank and the additional sub-tank.



- (2) The main tank and the sub-tank must be mounted at the same height.
- (3) When welding the joint of the connecting pipe to the head plate of the tank, empty all fuel from the tank and fill the tank with water. Use the gas welding method.
- (4) Total capacity of the fuel tank must be less than 200 liters for vehicle safety purpose.

[NOTE] Should more detailed data or information regarding the addition fuel tank be needed, please contact authorized TOYOTA distributor or sales dealer.

3. OTHER NOTES ON RELOCATING OR ADDING THE FUEL TANKS

- 1) The original clearance between the fuel tank and the frame allows space for U-bolts used in body mounting.

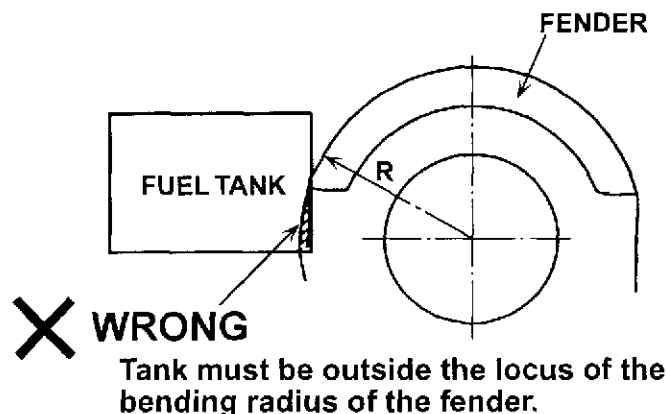
When moving the fuel tank or mounting an additional fuel tank, make sure that you allow space for these U-bolts.

- 2) When moving the fuel tank or mounting an additional fuel tank, make sure that it does not protrude beyond the overall width of the vehicle.

- 3) In vehicles for export from Japan, a pre-fuel filter and sedimentor are fitted to the frame along with the fuel tank to suit conditions of use.

When moving the fuel tank or mounting an additional fuel tank, make sure that you arrange the piping of these parts correctly

- 4) Fuel tanks must be mounted outside the locus of the bending radius of the fender to prevent them from interfering with the tire.



- 5) The original bracket for the fuel tank is designed to support the weight of the tank.

Never mount body parts or side guard parts on the fuel tank bracket.

- 6) When moving the fuel tank or mounting an additional fuel tank, mount the bracket on the frame using bolts.

Never use welding.

(When making holes in the frame for mounting the bracket, see "Drilling the frame" under clause "2. CHASSIS FRAME")

- 7) Fit protectors to ensure that the carrying load does not come into contact with the fuel tank or any part of the piping.

7. ELECTRICAL SYSTEM

1. REAR LAMPS.....	7 - 2
2. BACK-UP BUZZER	7 - 3
3. SIDE REFLECTOR.....	7 - 4
4. ALTERNATOR OUTPUT CHARACTERISTIC	7 - 5
5. SPARE POWER TERMINALS	7 - 6
6. INSTALLATION OF ADDITIONAL EQUIPMENT	7 - 7
AND SWITCHES	
7. ADDITIONAL LAMPS	7 - 8
8. DRAWING IN THE WIRE HARNESS INTO THE CAB	7 - 9
9. POINTS TO NOTE ON ELECTRICAL WELDING	7 - 10
10. POINTS TO NOTE FOR ELECTRONIC MACHINES	7 - 11
11. HARNESS WIRING	7 - 12
12. ELECTRIC WIRE SIZE AND PERMISSIBLE CURRENTS	7 - 13
13. ELECTRICAL WIRING DIAGRAM	7 - 14

The chassis is usually shipped from the factory with brackets for the rear combination lamps and rear license plate temporarily fitted.

At the time of mounting a body or equipment, make sure you observe the following precautions to fit these electrical parts or other electrical component to the body or equipment.

Warning

- Mounting an excessive number of lamps or taking-out electrical power for a body or equipment can damage the electrical systems and may lead to burnouts of the harness wires.

In the event that you are obliged to carry out the body mounting exceeding the capacity of the alternator, consult to TOYOTA distributor or sales dealer.

- The parts number described in each page will be changed without forward notice.

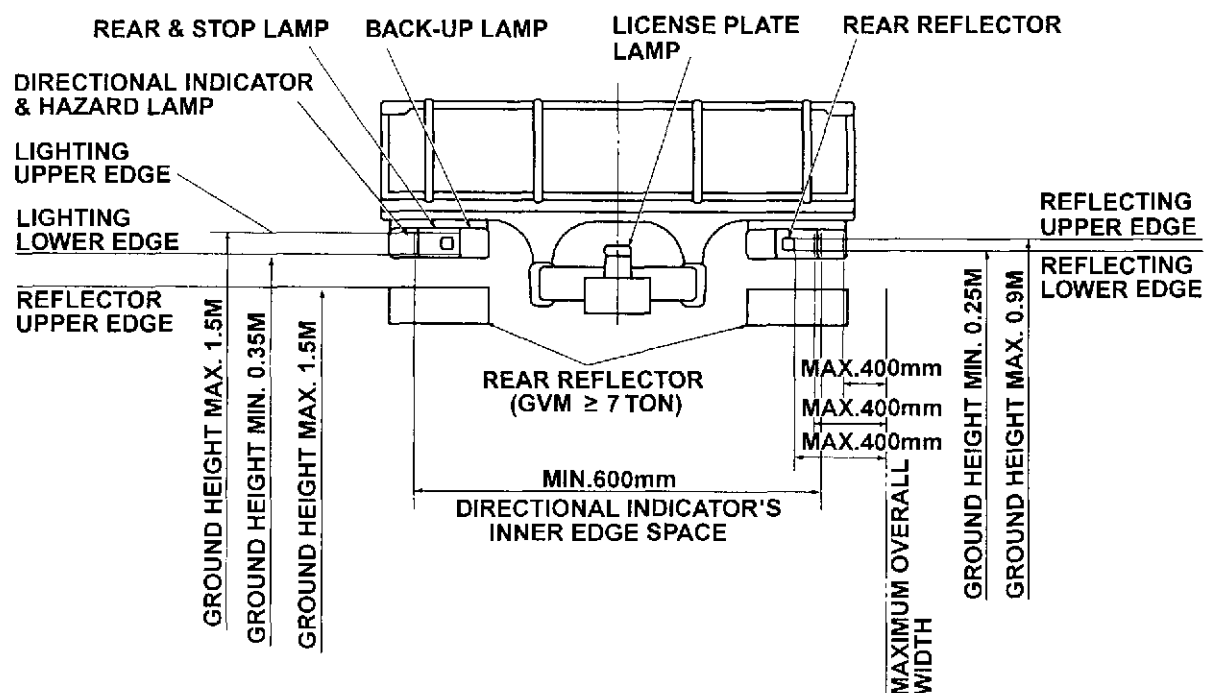
Therefore, consult to TOYOTA distributor or sales dealer with regard to the exact parts number.

1. REAR LAMPS

The rear combination lamps, license plate lamp and reversing lamp are temporarily mounted on the chassis for shipment.

At the time of mounting a body or equipment, use these parts as supplied and fit them in the positions shown in the drawing below.

For details of fitting procedures for each lamp, see following pages.

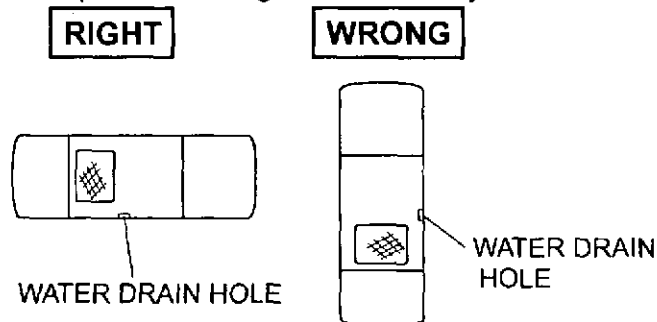


NOTE: All distances from ground and protrusions beyond maximum width are the values prescribed by Japanese laws and regulations.

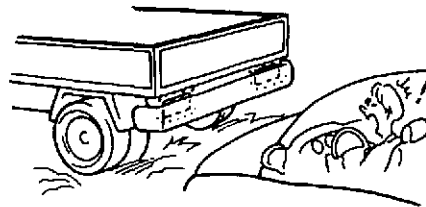
When positioning lamps, make sure that you observe the laws and regulations of the country in which the vehicle is to be used.

1) Rear Combination Lamp

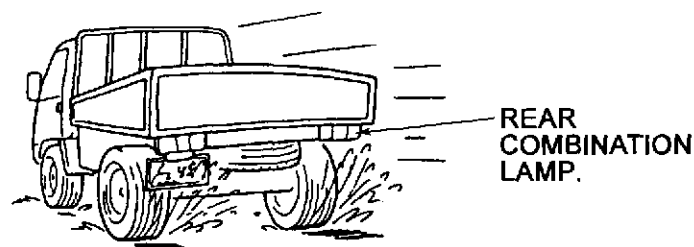
- (1) Install the lamps symmetry on right and left except license plate lamp.
- (2) There are two types of rear combination lamp such as standard and large size, be sure to install the same size of lamp on right and left.
- (3) Install the lamp that drainage hole is always to be bottom side.



- (4) The drainage hole in the bottom of the lamp is covered with tape for shipment. After installing the lamps, be sure to remove the tape.
- (5) Don't install any parts of body to rearward of the rear combination lamp to insure the visibility of lamp.



- (6) Install the water guard plate in order to prevent direct exposure to water splashed up from rear wheels.

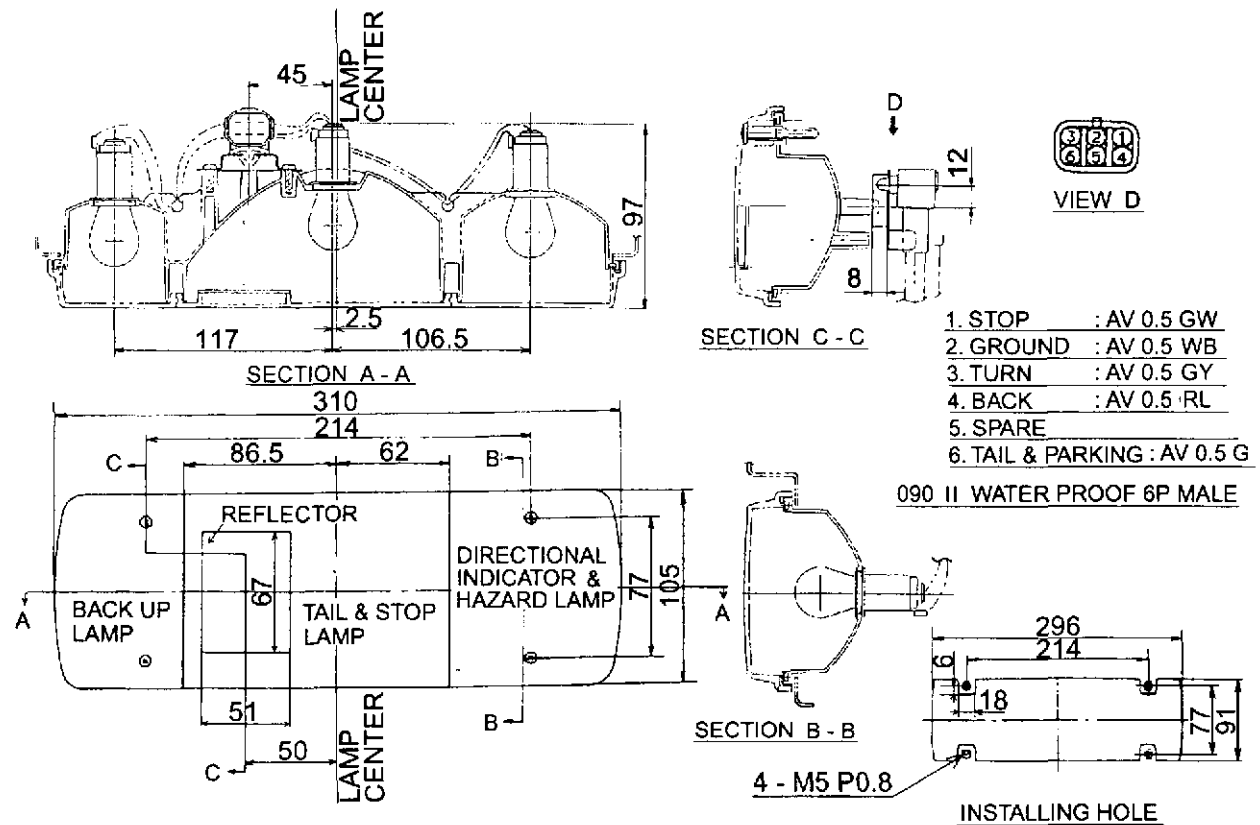


- (7) Back-up lamp is built-in rear combination lamp. Make sure that the lighting distance of the back-up lamp must be complied with vehicle laws and regulations.
- (8) Make sure that the lamp lenses and bodies do not come into contact with clear anti-rust coating.
- (9) To prevent the lamp from shaking, always use a strengthening stay such as dump truck in which lamps couldn't be installed direct to the body (vessel).

EXTERNAL ASPECT OF REAR COMBINATION LAMP

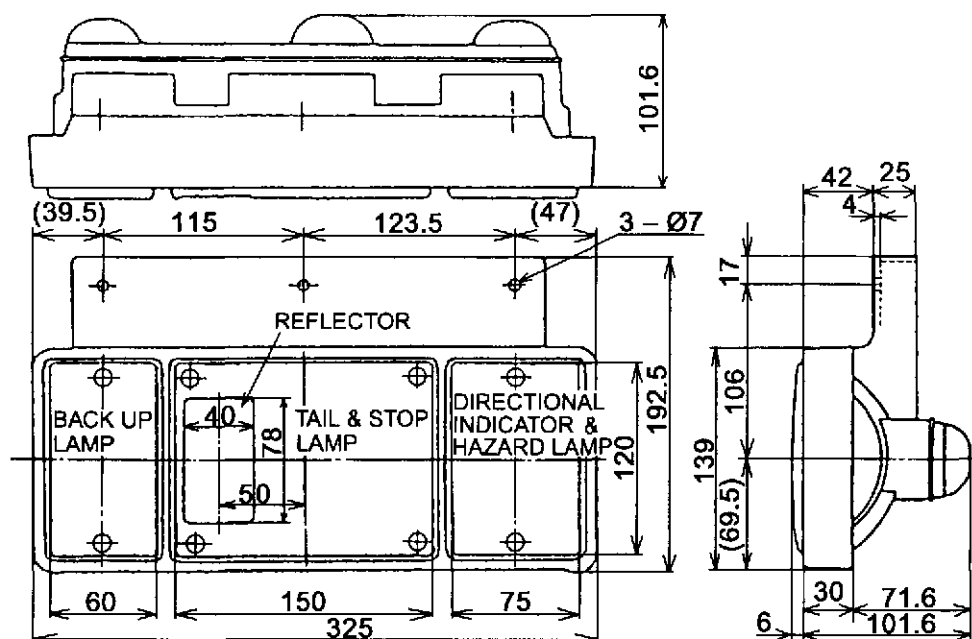
[STANDARD TYPE]

(Drawing shows right-hand lamp only. Positions reversed for left side.)



[LARGE TYPE]

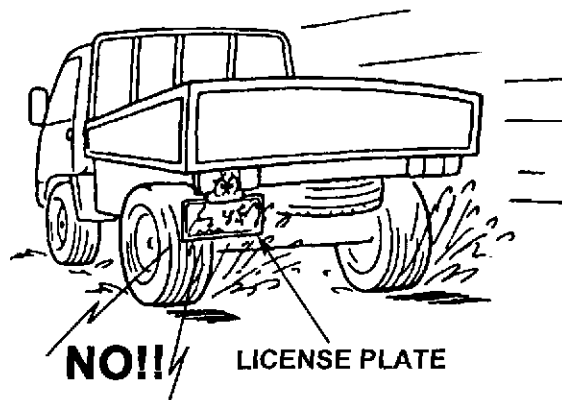
(Drawing shows right-hand lamp only. Positions reversed for left side.)



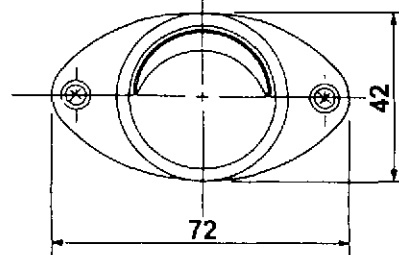
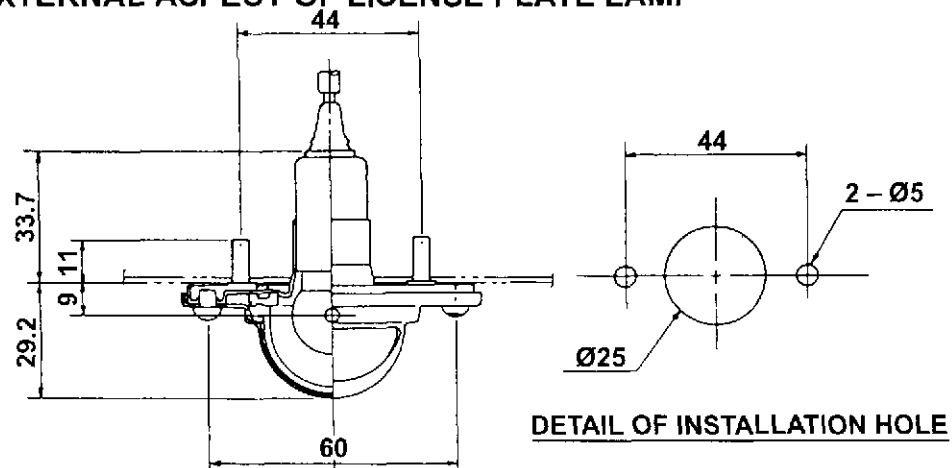
[NOTE] For the exact rear combination lamp to be installed to the each vehicle, refer to Body Builder's Guide for the respective model series.

2) License Plate Bracket and License Plate Lamp

- (1) Use the bracket supplied with the chassis to install the license plate and license plate lamp.
- (2) The license plate must be installed so as to be clearly visible from the rear of the vehicle.
Make sure that it is not hidden by the rear bumper, lamps, or by the rear body or mounted equipment.
- (3) The license plate bracket must be securely installed by rivets or bolts so as to be complied with vehicle laws and regulations.
- (4) To prevent the license plate bracket from shaking, always use a strengthening stay when it is installed.
- (5) Make sure that light of the license lamp do not directly come through toward the rear of the vehicle.
- (6) Mount the license lamp at such a position where it is not exposed directly to the water splashed by the rear wheels.

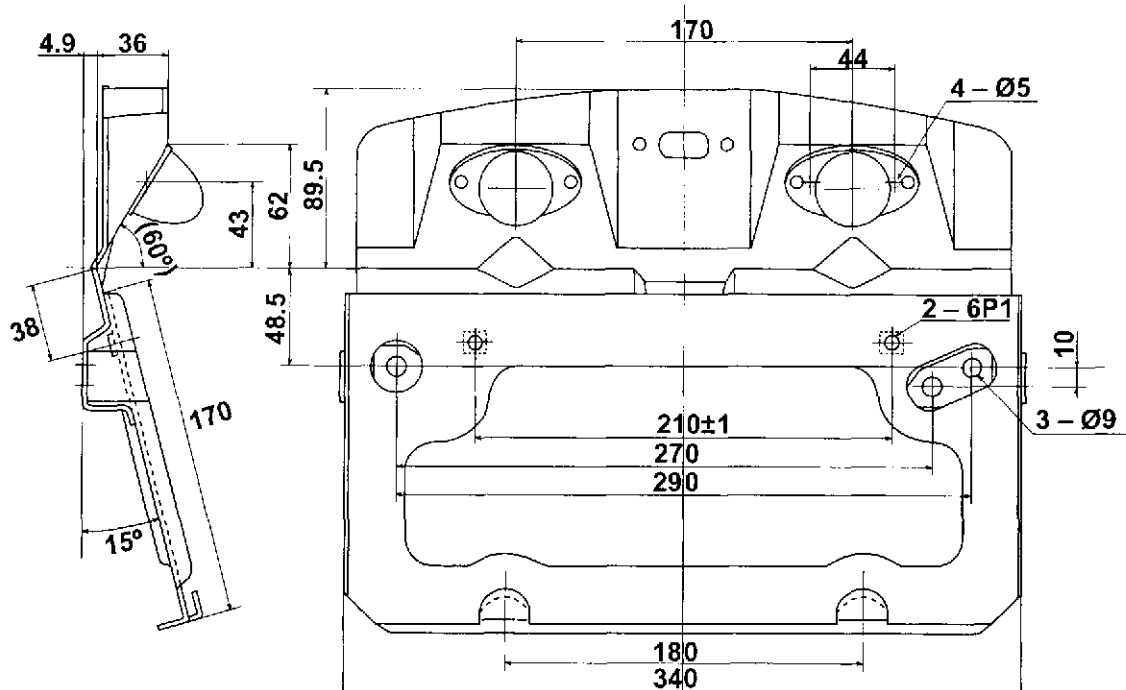


EXTERNAL ASPECT OF LICENSE PLATE LAMP



3/4 SHADE

EXTERNAL ASPECT OF LICENSE PLATE BRACKET



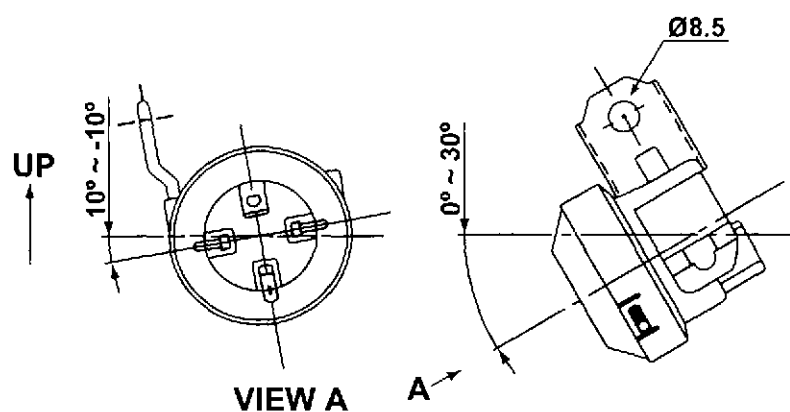
[NOTE] For the exact license plate bracket with license lamp to be installed to the each vehicle, refer to Body Builder's Guide for the respective model series.

2. BACK-UP BUZZER

- If you move or install (as an option equipment) the back-up buzzer or modify the surrounding parts of the chassis, observe the precautions as followings.

1) Installation angle

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



2) Position

- If you move the buzzer to make room for mounting a body, reinstall it in a position where it is not exposed to splashing with muddy water, stone or water.

3) Precaution for painting

- Make sure that the buzzer should be covered during painting to protect the paint coming into buzzer from sound emitting hole for avoiding failure of no sound.

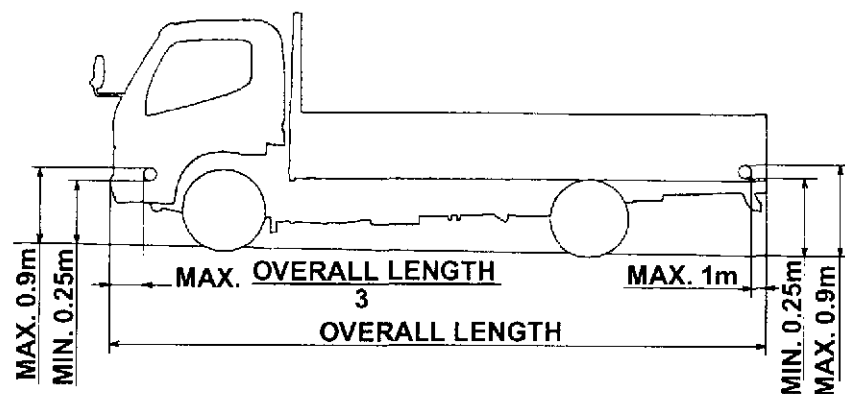
[NOTE] • The back-up buzzer is basically as an option equipment.

- Therefore, confirm that the back-up buzzer is equipped or an option equipment with the Body Builder's Guide for the respective model series.

3. SIDE REFLECTOR

- The vehicles in which overall length is over certain value as 6m or etc., be required to install the side reflector according to the vehicle laws and regulations.
- Install the side reflectors after observing the laws and regulations of the country in which the vehicle is to be used.

[EXAMPLE OF POSITIONING THE REFLECTOR]



[NOTE] ; All distances from ground and side position beyond maximum length are the values prescribed by Japanese to laws and regulations.

4. ALTERNATOR OUTPUT CHARACTERISTIC

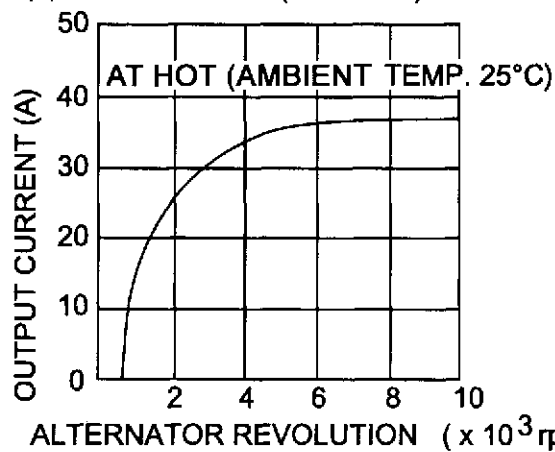
- The maximum power available for the whole vehicle is defined by the capacity of the alternator.

Therefore, the electric power that is not consumed by electrical equipments such as head lamps etc. can be available for the body side.

- Pay attention not to exceed the capacity of the alternator equipped on the vehicle.
- In the event that you are obliged to carry out the body mounting exceeding the capacity of the alternator, select the one available as an option or consult your nearest TOYOTA sales dealer or distributor.
- Alternator output characteristic of each engine model are described as follows for your reference.

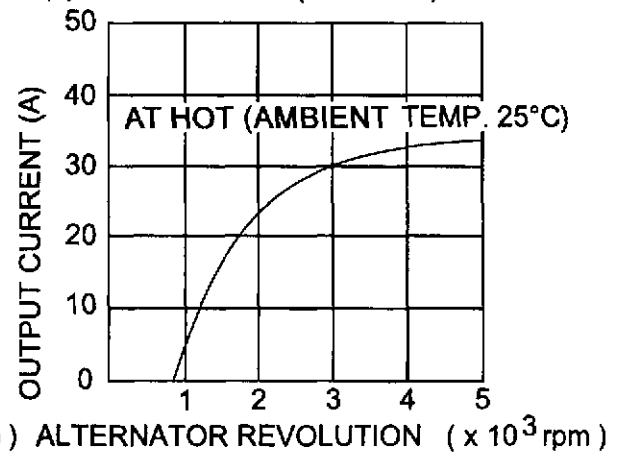
The details of the performance (output characteristic) of alternator to be installed each vehicle, see the Body Builder's Guide for the respective model.

(1) ALTERNATOR (24V - 30A)



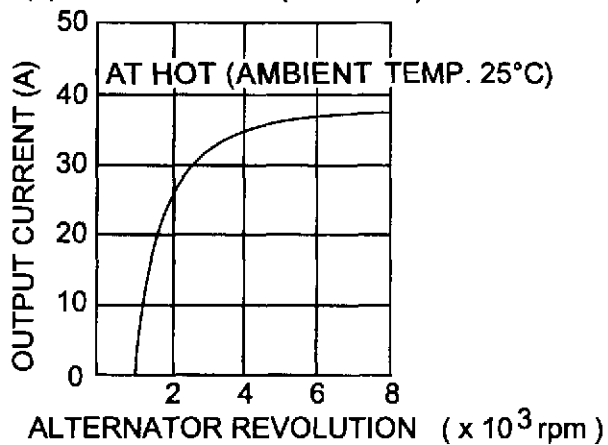
ENGINE MODEL	PULLEY RATIO
14B	2.32

(2) ALTERNATOR (24V - 30A)



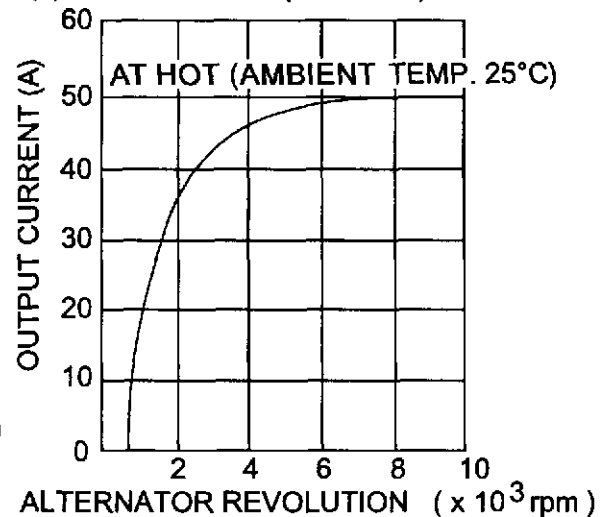
ENGINE MODEL	PULLEY RATIO
W04D	2.07

(3) ALTERNATOR (24V - 30A)



ENGINE MODEL	PULLEY RATIO
S05C-B	2.36

(4) ALTERNATOR (24V - 50A)



ENGINE MODEL	PULLEY RATIO
S05C-TA S05C-TB S05C-B (OPT)	1.99

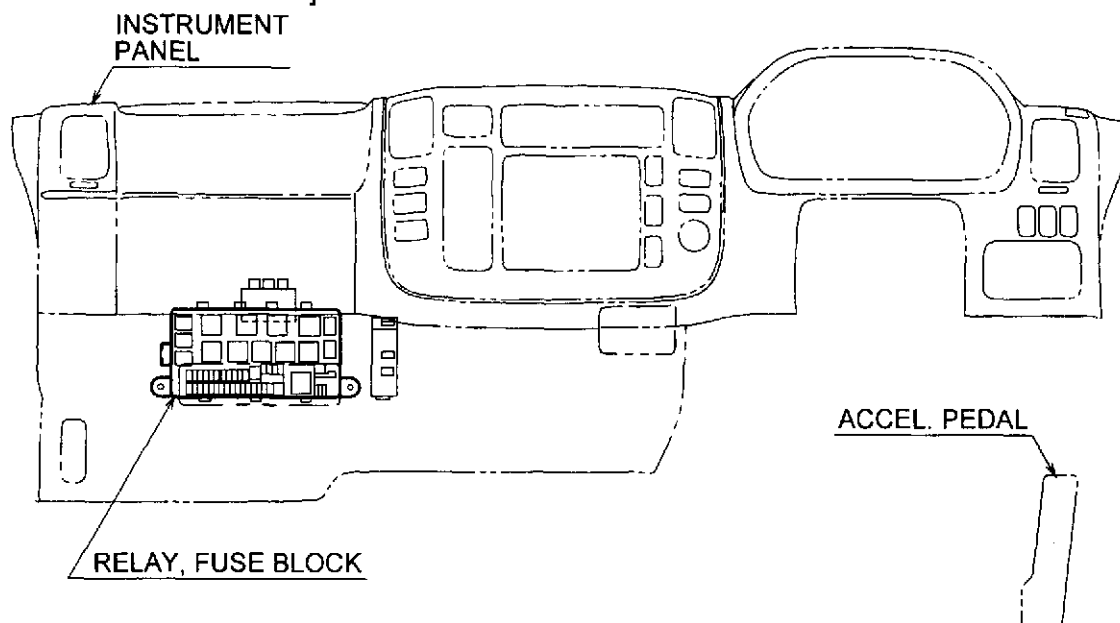
5. SPARE POWER CONNECTORS

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

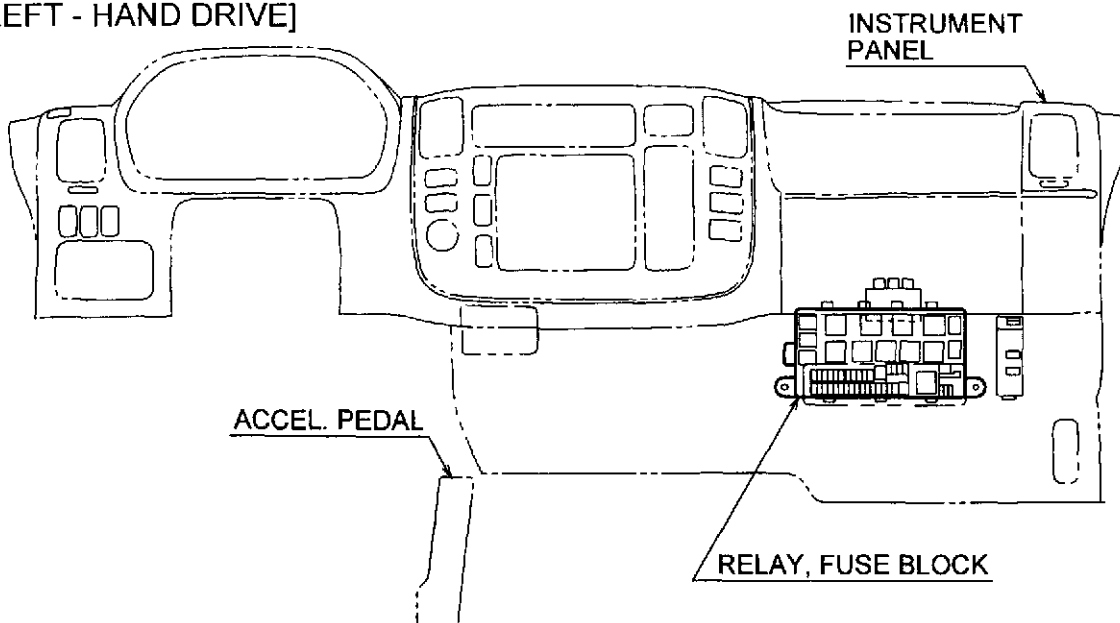
1) Install Position of Relay and Fuse

The relay and fuse are installed as following position in the cab.

[RIGHT - HAND DRIVE]



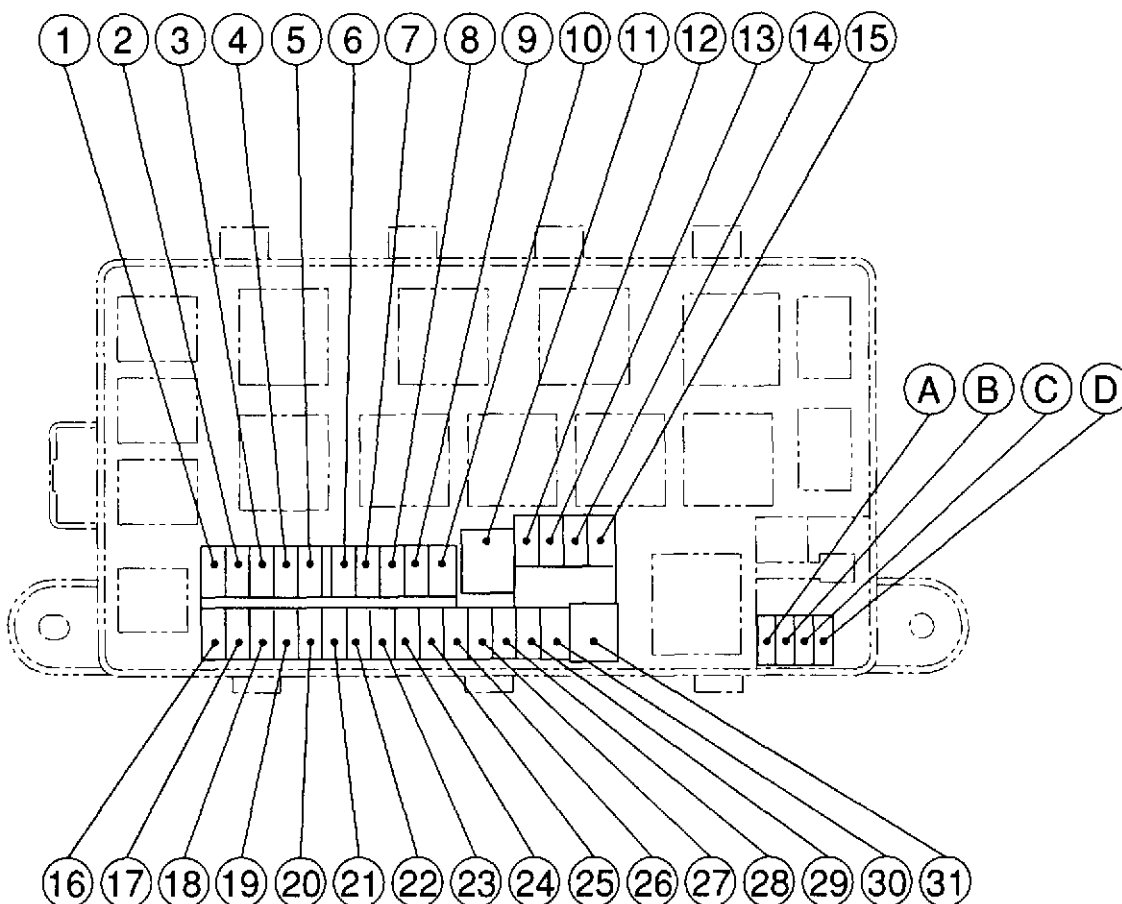
[LEFT - HAND DRIVE]



[NOTE] • Drawing shows of the standard cab specification vehicle as example.

• For details, refer to Body Builder's Guide for the respective model series.

2) Fuse block layout



No.	DESCRIPTION	CAPACITY
1	CIGARETTE LIGHTER	10A
2	AUDIO	7.5A
3	SPARE, ACC	15A
4	AIR BAG	15A
5	ECU, GENERAL	15A
6	WIPER	20A
7	ES START	7.5A
8	4WD HEATING MIRROR	15A
9	----	----
10	A/C	10A
11	POWER WINDOW	30A
12	SPARE, BATT.	15A
13	FOG LAMP	15A
14	ECU, GENERAL	7.5A
15	DOVE LAMP	7.5A
16	STARTER	7.5A
17	HORN	10A
18	SPARE, LIGHTING	10A

No.	DESCRIPTION	CAPACITY
19	LIGHTING INSTRUMENT	7.5A
20	TAIL LAMP	7.5A
21	CHECK CONNECTOR(OBD2)	7.5A
22	SPARE	7.5A
23	----	----
24	----	----
25	HEAD LAMP (LH)	15A
26	HEAD LAMP (RH)	15A
27	ECU, GENERAL	10A
28	GAUGE	10A
29	SPARE,KEY SWITCH ON	15A
30	----	----
31	----	----
----	----	----
A	SPARE FUSE	20A
B		15A
C		10A
D		7.5A

[NOTE] • Fuse block layout as mentioned above shows as example.

- For details, refer to the Body Builder's Guide for the respective model series.

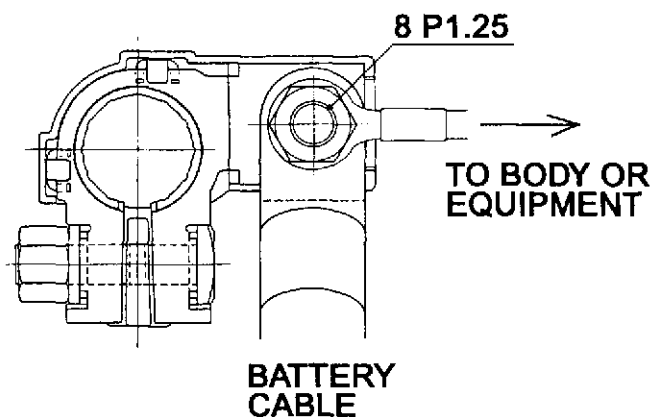
3) Method of Taking Electrical Power

(1) Taking power directly from the battery

If you intend to take electrical power for the body or equipment directly from the battery, secure the battery cable and the body power supply connector together with the same nut.
(For details, see the following figure.)

In this case, you must install a fuse at a suitable point in the circuit and take precautions to prevent short circuits as these may lead vehicle fires. When securing the cable and power terminal, make sure you tighten the nut properly.

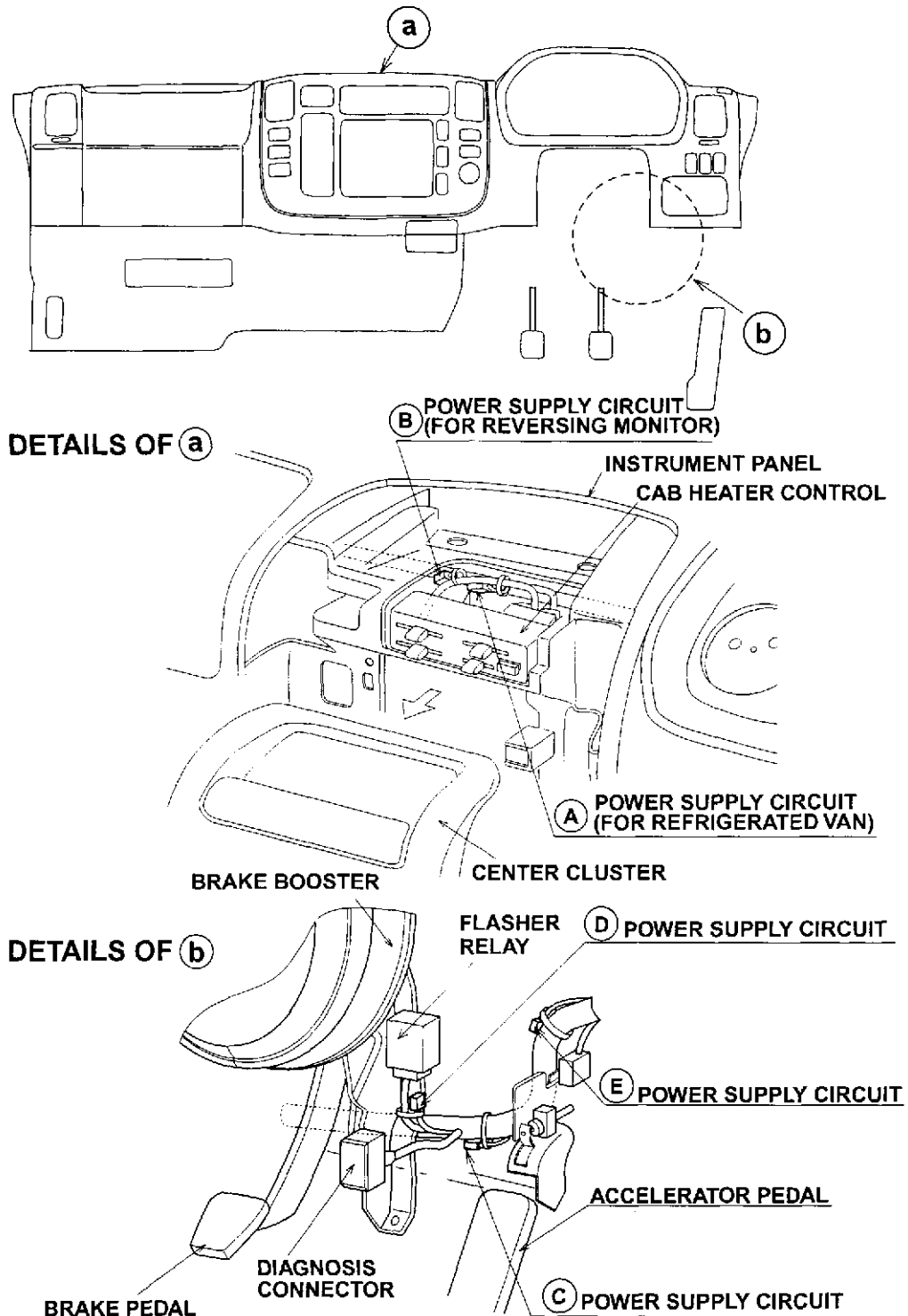
TIGHTENING TORQUE OF NUT :
9.8 ~ 15.7 N·m {100 ~ 160 kgf·cm}



(2) Spare power supply connectors and positions

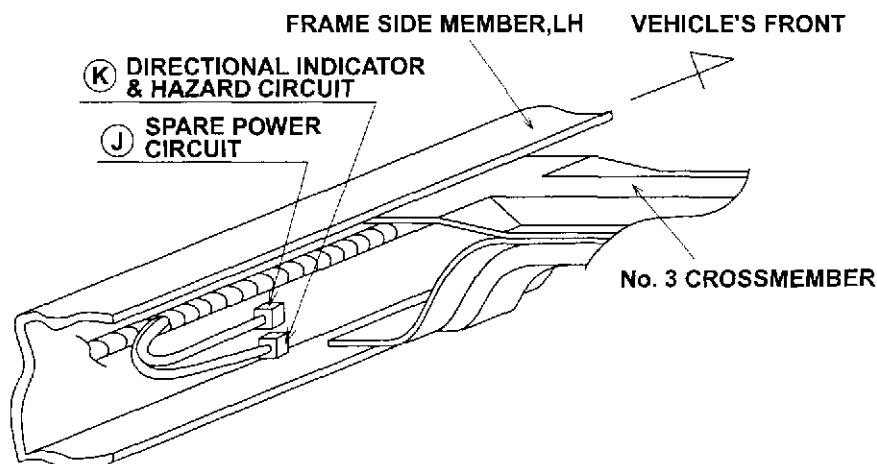
- If you intend to take the electrical power for the body or equipment from chassis harness and spare power supply connectors, use the following connectors.

OUTLET POSITIONS INSIDE THE CAB



[NOTE] • Outlet positions inside the cab as mentioned above shows as example.
 • For details, refer to the Body Builder's Guide for the respective model series.

OUTLET POSITIONS ON CHASSIS

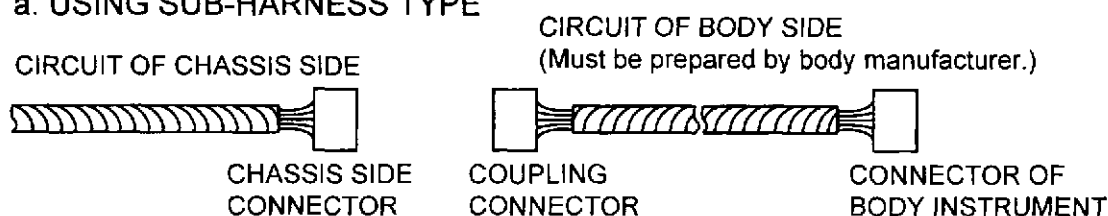


[NOTE] • Outlet positions inside the cab as mentioned above shows as example.

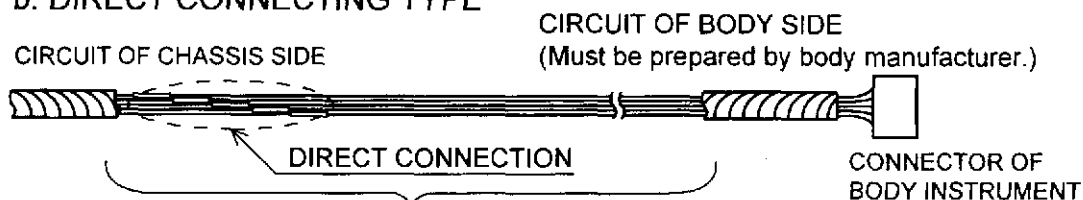
- For details, refer to the Body Builder's Guide for the respective model series.

HOW TO TAKE ELECTRICITY FROM POWER SUPPLY CIRCUIT

a. USING SUB-HARNESS TYPE



b. DIRECT CONNECTING TYPE



Extending parts must be prepared by body manufacturer.

- [NOTE]** • As far as possible take power using sub-harness type.
- If you must take power using direct connecting type, be sure to observe the precautions in described item "11. HARNESS WIRING".

DETAIL OF CONNECTOR (PARTS No. & POLE ARRANGEMENT)

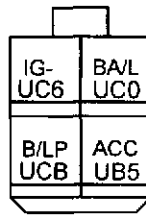
• INSIDE THE CAB

(A)



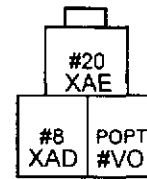
(82989-37010)

(B)



(82989-37020)

(C)



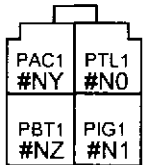
(82989-37030)

(D)



(82989-37040)

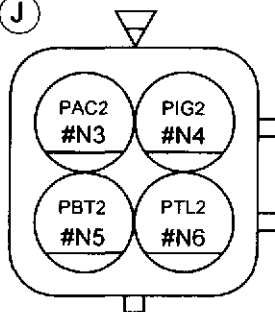
(E)



(82989-37050)

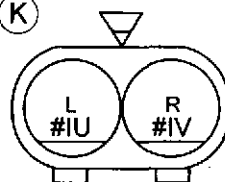
• SHASSIS SIDE

(J)



(82989-37090)

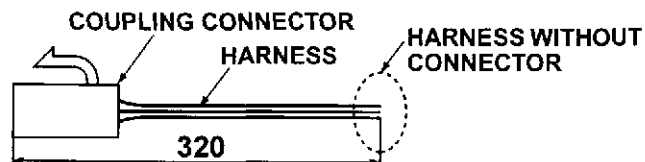
(K)



(82989-37100)

[NOTE] • FOR COUPLING CONNECTOR PROVIDED AS AN OPTIONAL PARTS.

- Parts number of coupling connector is shown in parenthesis.
- Details of coupling connector are as follows.



- Each connector of the chassis side has individual color. Make sure that do not connect wrong coupling with spare power connector.

7. ELECTRICAL SYSTEM

7-6-7

SPECIFICATIONS OF SPARE POWER CIRCUIT AND APPLICABLE CAPACITY

CONNECTOR POLE MARK		CIRCUIT (MAIN APPLICATION)	MAX. CAPACITY(A)	WIRE SIZE & COLOR	USING LENGTH(m)	COUPLING CONNECTOR PARTS No.(SPARE PARTS)		APPLICABLE MODEL	REMARKS
CAB SIDE	A	#VK Idle-up signal, refrigerated van	*	0.5 G	1.6	82989-37010		All model	
	B	UC6 Ground, reversing monitor	*	0.5 W-B	1.6	82989-37020		All model	
		UC0 Reverse signal, reversing monitor	*	0.5 R-B	6.0			All model	
		UB5 Power supply, ACC	7.5	0.5 G-R	1.7			All model	Permissible current : 7.5 A {Total current = Connector E (#NY) + J (#N3)}
		UCB Power supply, lighting	5.2	0.5 Y-B	2.8			All model	Permissible current : 5.2 A {Total current = Connector E (#N0) + J (#N6) + M (#RR)}
CAB SIDE	C	XAE Signal, parking position	*	0.5 V-Y	4.7	82989-37030		Auto transmission vehicle	
		XAE Signal, neutral position	*	0.5 B-W	4.9			Manual transmission vehicle	
		#VO Signal, PTO	*	0.5 R-W	4.9			All model	
		XAD Signal, parking brake	*	0.5 B-L	4.4			All model	
	D	#N2 Power supply	5	0.5 O	1.8	82989-37040		All model	
CHASSIS SIDE	E	#NY Power supply, ACC	7.5	0.85 G	1.7	82989-37050		All model	Permissible current : 7.5 A {Total current = Connector B (UB6) + J (#N3)}
		#N0 Power supply, lighting	5.2	0.85 P-G	2.8			All model	Permissible current : 5.2 A {Total current = Connector B (UCB) + J (#N6) + M (#RR)}
		#N1 Power supply, starter switch ON	10	0.85 V	1.9			All model	Permissible current : 10 A {Total current = Connector J (#N4)}
		#N2 Power supply	10.5	0.85 Y	2.0			All model	Permissible current : 10.5 A {Total current = Connector J (#N5)}
	J	#N6 Power supply, lighting	5.2	0.85 P-G	6.3	82989-37090		All model	Permissible current : 5.2 A {Total current = Connector B (UCB) + E (#N0) + M (#RR)}
		#N4 Power supply, starter switch ON	10	0.85 V	5.1			All model	Permissible current : 10 A {Total current = Connector E (#N1)}
		#N5 Power supply	10.5	0.85 Y	4.9			All model	Permissible current : 10.5 A {Total current = Connector E (#N2)}
		#N3 Power supply, ACC	7.5	0.85 G	4.9			All model	Permissible current : 7.5 A {Total current = Connector B (UB5) + E (#NY)}
CHASSIS SIDE	K	#IU Power supply, directional & hazard, LH	0.5	0.85 G-B	5.6	82989-37100		All model	
		#IV Power supply, directional & hazard, RH	0.5	0.85 G-Y	5.6			All model	

NOTE : (1) The permissible current to be taken from spare power connector is determined from the capacity of the fuse and wire size.

Make sure that the maximum load (current) of the installed equipment must be kept lower current than the permissible capacity to be able to take from spare power connector.

- (2) Be sure to keep the lower current value than the alternator generated capacity when switched on the original and additional equipment same time to avoid over discharging electricity of the battery.

- (3) Maximum capacity (current) of the each poles marked * is 0.1~0.2A for taking signal circuit of the instrument.

Be sure to use the this circuit to operate the relay for additional equipment of the body.

Relay must be use the built-in surge absorbing diode type as TOYOTA spare parts No.90987-02017 or equivalent.

- (4) Using length show the wire length from fuse to each connector (pole) of the spare outlet.

Be sure to make circuit using the appropriate kind, size and length of the wire followed by the table described in item "13. ELECTRIC WIRE SIZE AND PERMISSIBLE CURRENTS".

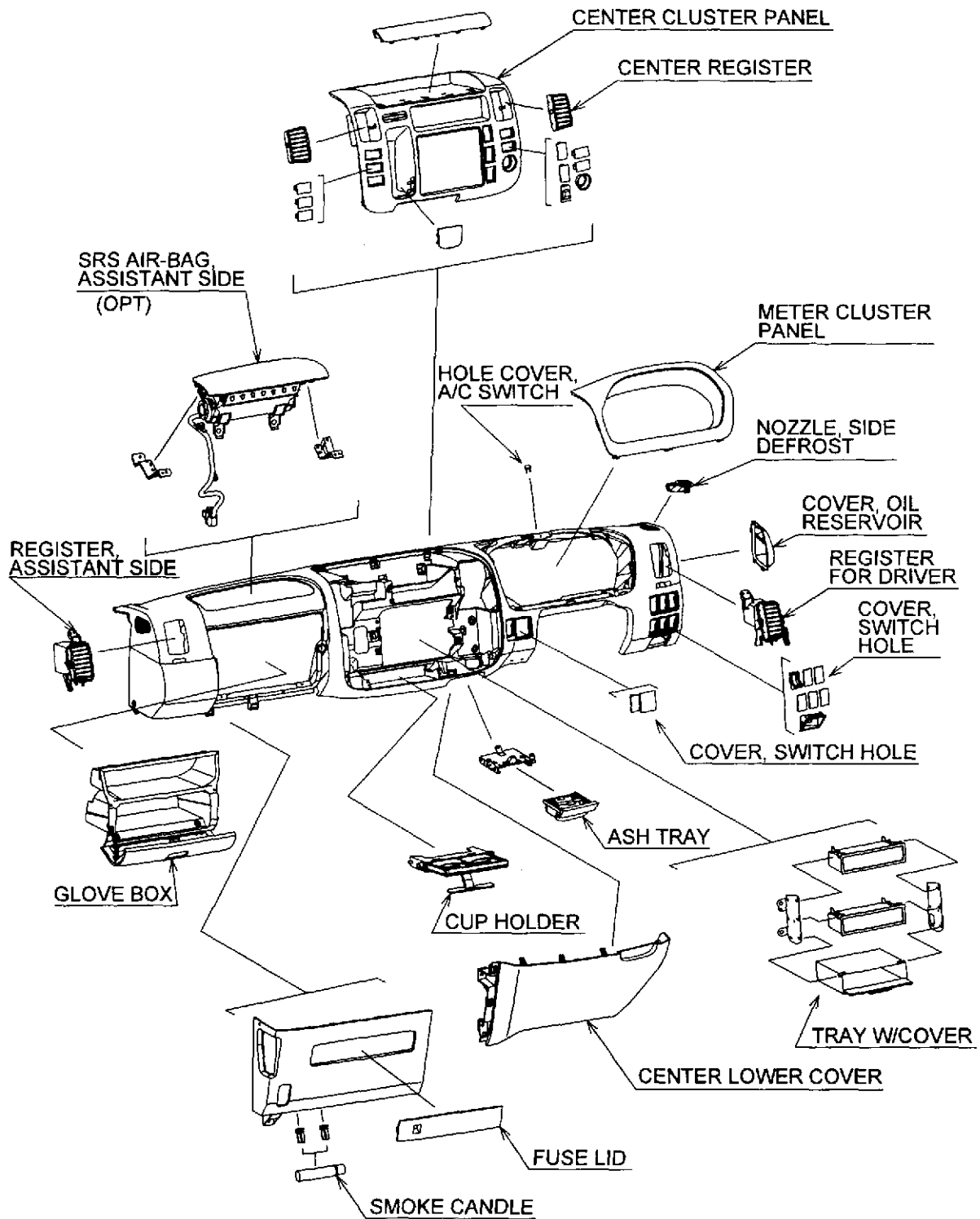
- (5) Parts number described in the connector drawing and the table will be changed without prior notice and obligation.

Therefore, you should order the spare parts of coupling connector after confirming the correct parts number with authorized TOYOTA distributor or sales dealer.

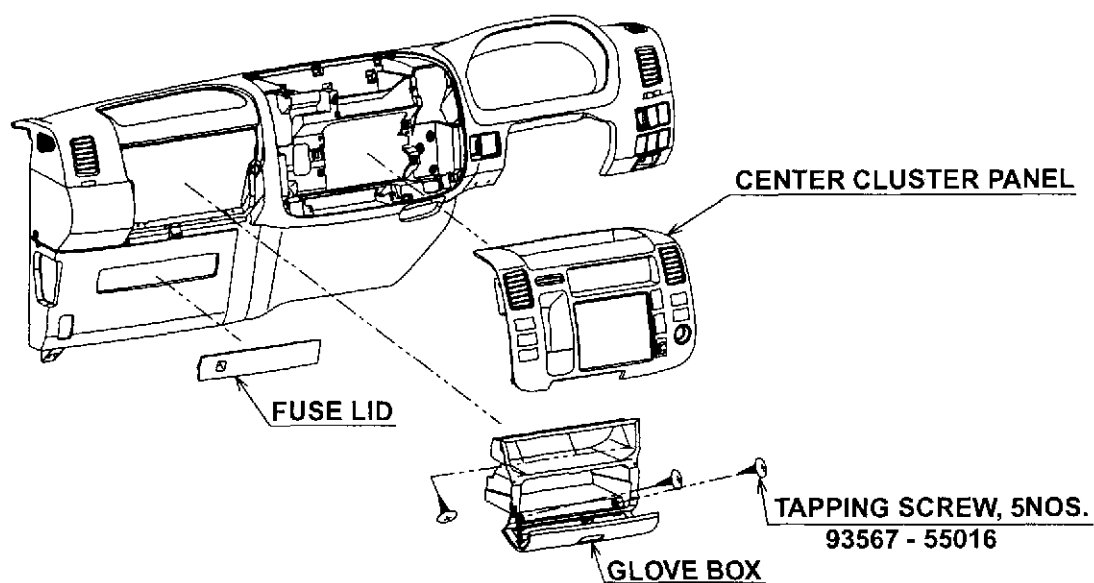
(3) Instrument panel construction

(EXAMPLE DRAWING OF DISMOUNTING)

- a. When dismount the instrument panel in order to install a relay, fuse or taking out the power from spare power connector for the body mounting, carry out as following procedure.



- b. The center cluster panel and fuse lid can be dismounting to pull this side. When dismounting the glove box, pull this side after removing the tapping screws of upper 3 nos. and lower 2 nos.



[NOTE] • Should more detailed data or information with regard to dismounting the instrument panel be needed, please contact authorized TOYOTA distributor or sales dealer.

6. INSTALLATION OF ADDITIONAL EQUIPMENT AND SWITCHES

1) Layout of Equipment and Switches

(1) Installing space of additional equipment

- Have been provided the installing space (H:150mm x W:180 mm) at the center cluster which can be installed three kind of additional equipment as a wireless radio, electrical equipment and etc.

(2) Layout of switches and lamps

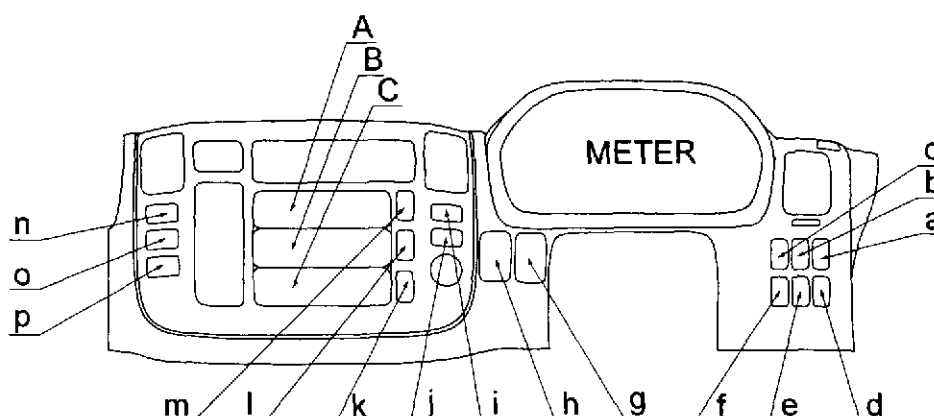
- Standard layout of switches and lamps are as following figure. (Layout details of each model, see the Body Builder's Guide for the respective model series.)
- If you intend to install additional switches or lamps at instrument panel for the convenience of body mounting, be sure to install it at empty space after confirmation of original condition of the actual vehicle.

Avoid using additional switches and lamps with existing switches and lamps.

- If you install additional switches and lamps, fit a caution plate showing the purpose of each switch, etc., to prevent accidental operation or confirmation.

7. ELECTRICAL SYSTEM

7-7-2

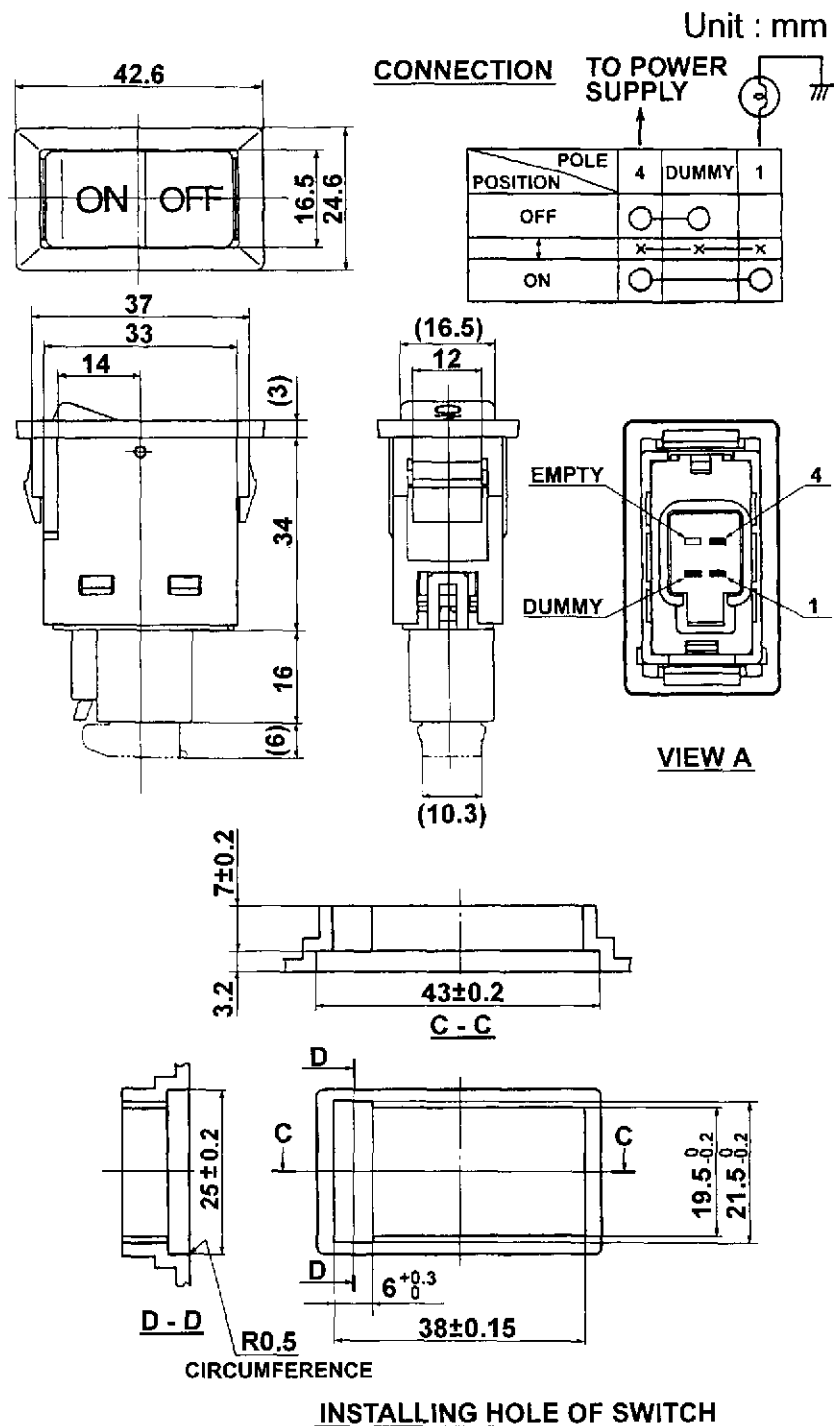


No.	DESCRIPTION	APPLICATION
A	AUDIO : TACHOGRAPH (OPT)	OPT (1DIN SPACE)
B	TRAY : AUDIO (WHEN TACHOGRAPH IS OPT.)	OPT (1DIN SPACE)
C	TRAY WITH LID : AUDIO (OPT)	(1DIN SPACE)
a	SWITCH, PTO	OPT (WITH VACUUM CONTROL PTO MODEL)
	KEY LESS ENTRY	OPT
b	SWITCH, REAR FOG LAMP	ALL MODEL
b	REMOTE CONTROL SWITCH, FLUORESCENT LIGHT	OPT
c	COIN HOLDER	ALL MODEL
d	SWITCH, HEATER MIRROR	OPT
e	TIMING ADJUSTING SWITCH, ES START	MANUAL TRANSMISSION MODEL
f	MAIN SWITCH, ES START	MANUAL TRANSMISSION MODEL
	AUTO LEVELING SWITCH, HEAD LAMP	ALL MODEL
g	SWITCH, REMOTE CONTROL MIRROR	OPT
h	SWITCH, ELECTRICAL FOLDING MIRROR	ALL MODEL
i	SWITCH, 4WD CONTROL	4WD MODEL
j	WARM-UP SWITCH	OPT
k	HAZARD SWITCH	ALL MODEL
l	CONTROL SWITCH, AUTO-TRANSMISSION P/E MODE	AUTO-TRANSMISSION MODEL
m	BRAKE LOCK SWITCH	OPT
n	WARNING LAMP, ASSISTANT SEAT BELT	OPT
o	SWITCH, UNDER-RUN LAMP	OPT
p	SPARE	

2) Additional Switches

- If you intend to install the switch to the instrument panel, use the switch mentioned hereinafter which is provided as a spare parts.

PARTS NO.	DESCRIPTION	SPECIFICATION
84270-37020	SWITCH ASSY, GENERAL USE	PERMISSIBLE LOAD: 24V - 50W



7. ADDITIONAL LAMPS

- The lamps properly installed to the vehicle has already been complied with the laws or regulations. Alteration and modification are therefore strictly prohibited.
- If you must install additional lamps, be sure to observe the following precautions.
- Moreover, installation of the additional lamps must be complied with the laws or regulations and install the harness to be observed the precautions of item "11. HARNESS WIRING".
- More detailed instructions of each model with regard to add the lamps, see the Body Builder's Guide for the respective model series.

1) Addition the Tail Lamps

- (1) Take the power from spare power connector for additional lamp as following figure. (See next page.)
- (2) Spare power connector is located at the left side No.3 crossmember (Pole code: J).
- (3) Additional lamp must be kept maximum 10 W per side.
- (4) After installation, make sure that the lamps operate properly or not.

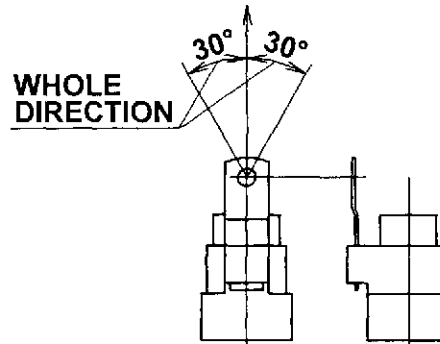
2) Addition the Stop Lamps

- (1) Make the circuit to be added additional relay as following figure. (See next page.)
- (2) Additional stop lamps must be kept maximum 25 W and one piece per side.
- (3) After installation, make sure that the lamps operate properly or not.

(4) Be sure to install the additional relay as follows;

- Install where water do not flash.
- Installation angle must be maximum 30° or less under whole direction.

UPPER SIDE OF VEHICLE

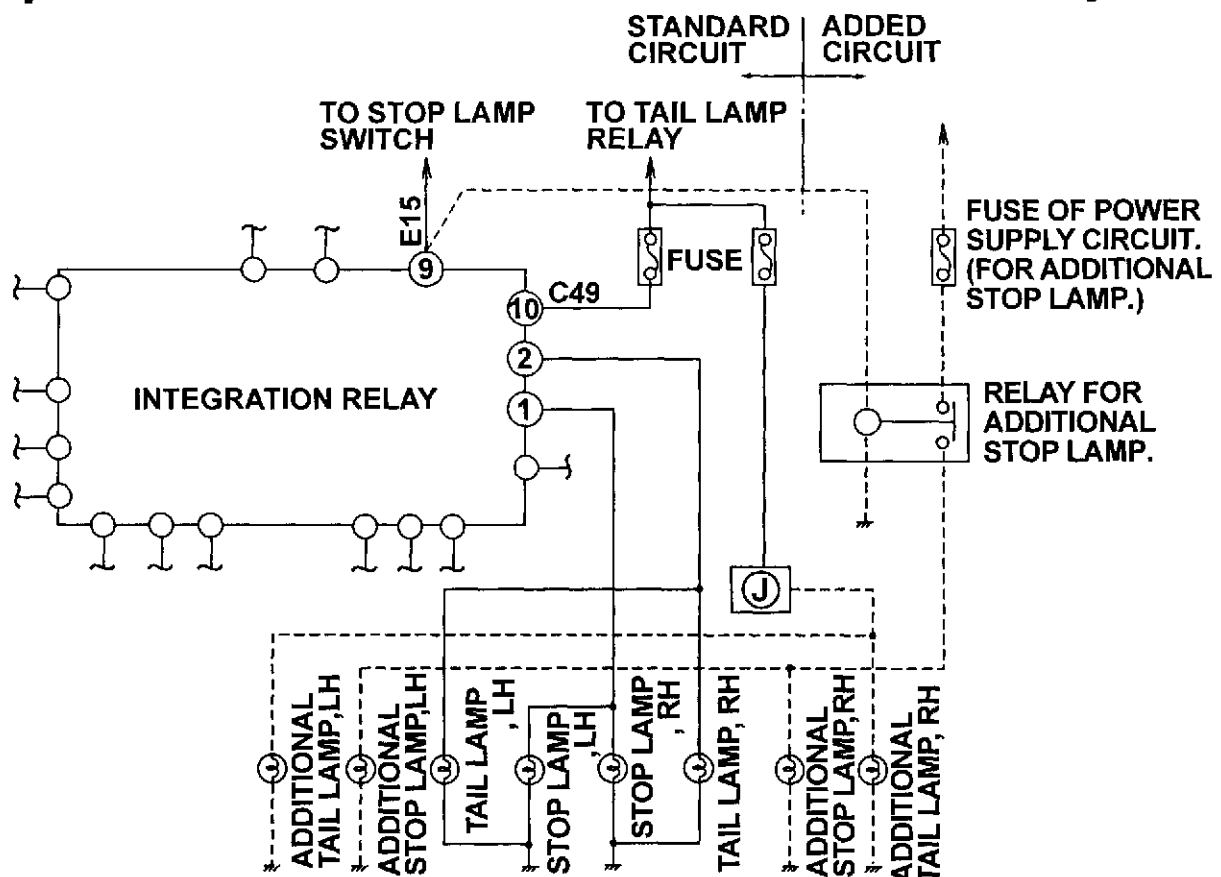


INSTALLATION ANGLE OF ADDITIONAL RELAY.

(5) Spare parts of additional relay is as follows;

DESCRIPTION	PARTS NO.	Q'TY / VEHICLE	REMARKS
RELAY, STOP LAMP	28490-58010	1	MAX. 25W x 2 PER VEHICLE

[WIRING CIRCUIT DIAGRAM FOR ADDITIONAL TAIL AND STOP LAMP]

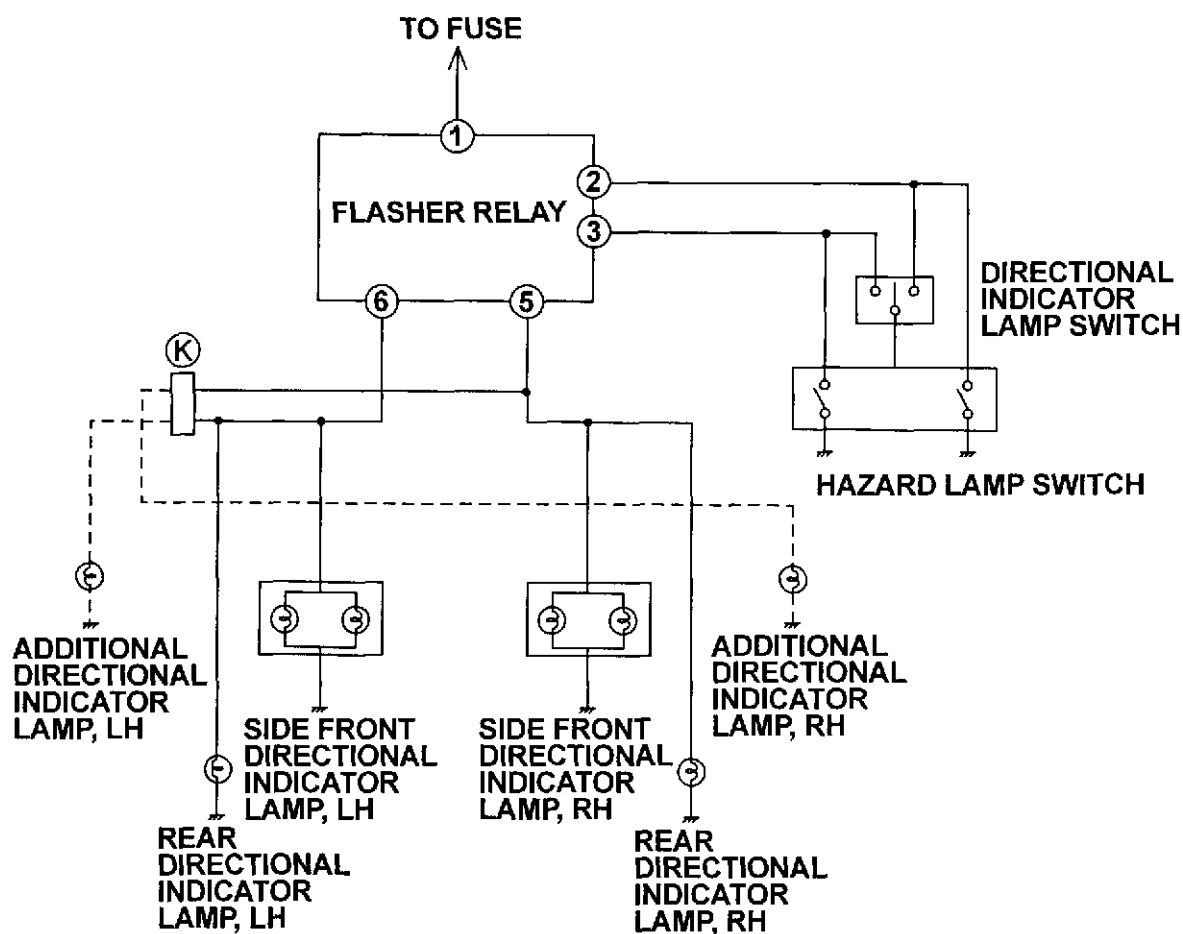


[NOTE] • Break line marked - - - is the additional circuit for tail and stop lamps.
• No. in circle mark shows the pole number of the integration relay.

3) Addition the Directional Indicator Lamps (Hazard Warning Lamps)

- (1) Take power from power supply connector which is provided existing directional indicator circuit as following figure.
- (2) Power supply terminal is provided at the left behind No.3 crossmember (Pole No. K).
- (3) Additional directional indicator lamp must be kept maximum 25W and one piece per side.
- (4) After installation, make sure that the lamps operate properly or not.

Moreover, if additional directional indicator lamps have been installed, open circuit detector system of the it's circuit may become not to operate properly.



[NOTE] • Break line marked - - - is the additional circuit for directional indicator lamps.

8. DRAWING IN THE WIRE HARNESS INTO THE CAB**1) Penetration Hole of Wire Harness**

- The penetration hole to draw the wire harness into the cab is provided at the floor of cab as following figure.
- When draw the wire harness, replace the grommet and draw it into the cab.

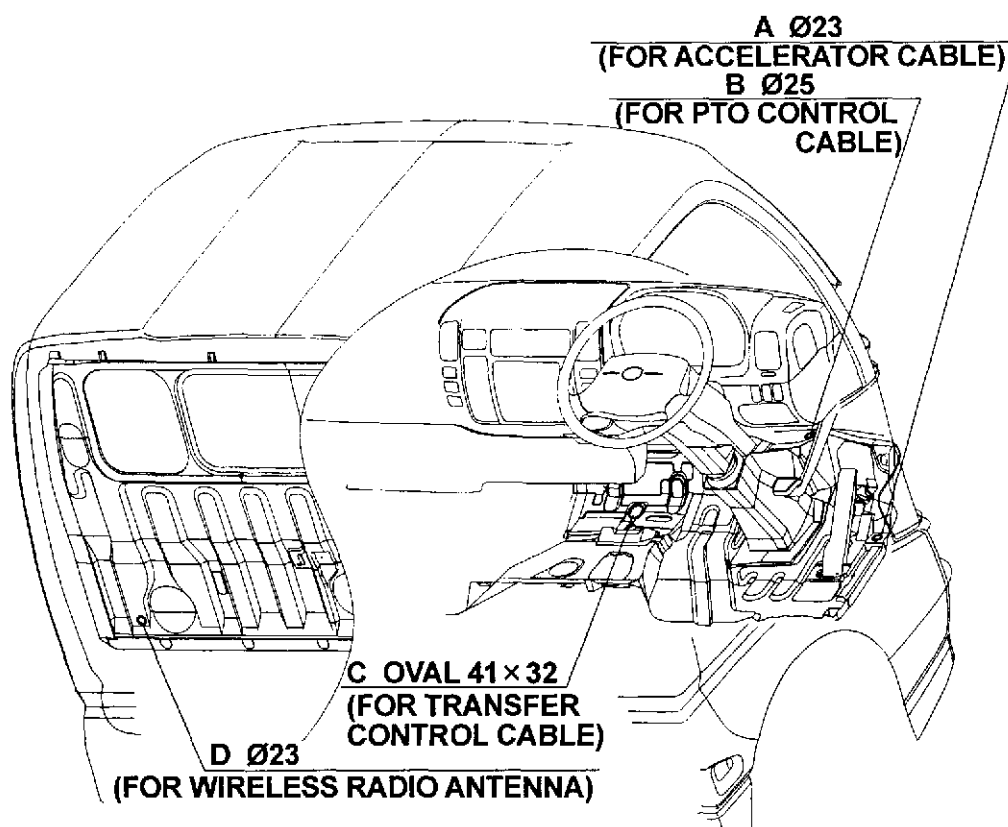
NOTE : (1) Make sure that the management should be taken such as disposing the sharp edge of the penetration hole and fixing the corrugated tube on the harness to prevent damage to the wire and potential short circuit.

(2) Make sure that the clearance between wire and penetration hole should be properly sealed by sealant to prevent water coming in and abnormal noise.

(3) The penetration holes of wire marked A, B, C may be not able to use according to the vehicle's specification.

Be sure to confirm the actual vehicle before drawing the harness (wire) and using empty hole.

(4) Using the chassis harness grommet together for drawing the additional wire is strictly prohibited to prevent damage of chassis harness when processing the grommet.



(5) Drawing as mentioned above shows as example.

More details of penetration hole and how to draw the wire harness of the each vehicle see the Body Builder's Guide for the respective model series.

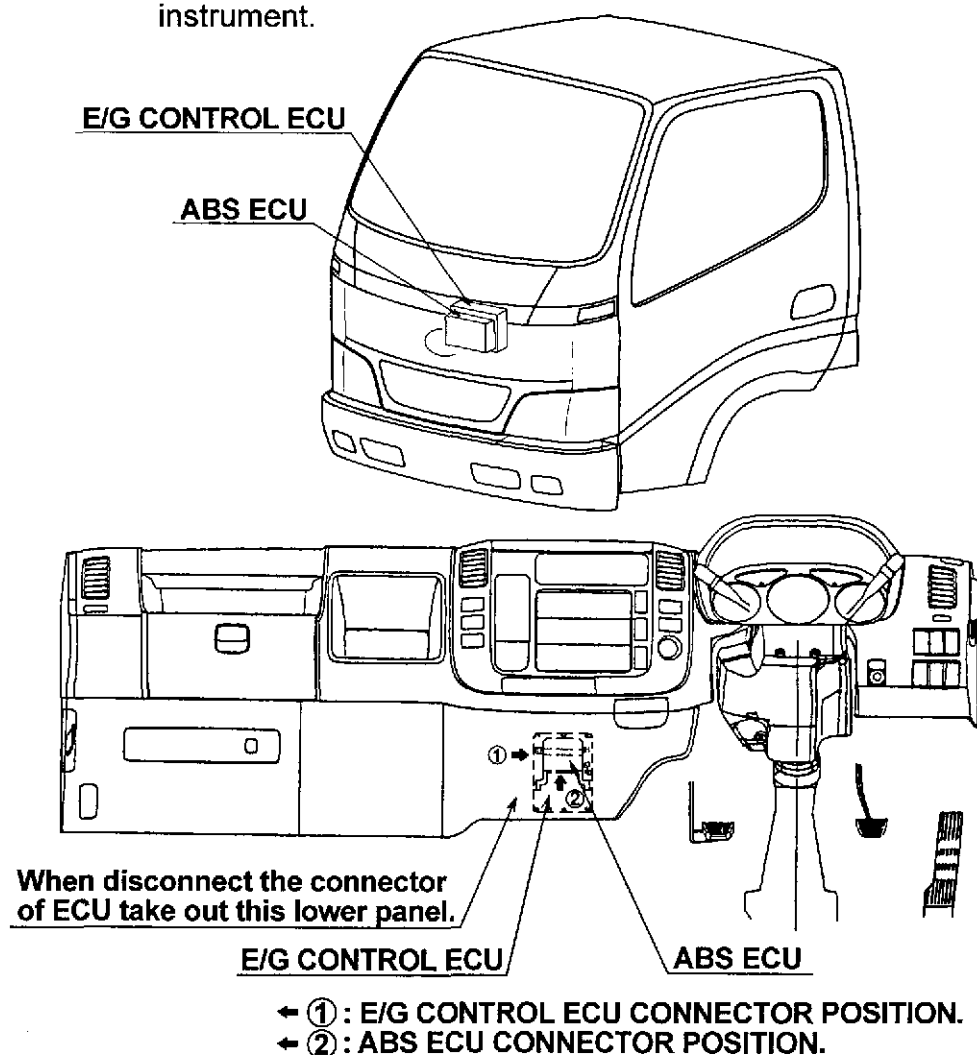
9. POINTS TO NOTE ON ELECTRICAL WELDING

Electrical components such as the alternator and tachograph are directly connected to the battery and one end is grounded to the chassis frame. Under these conditions, welding current will flow back along the ground circuit if electric welding is carried out and damage may be caused to the alternator, tachograph, electrical components, etc.

Always take the following precautions during welding.

1) Procedure before Welding

- (1) Turn the starter switch off.
- (2) Disconnect the battery's negative terminal.
- (3) Disconnect the connector of ECU of the each electronic instrument.



DETAILS, INSTALLATION POSITION OF ECU

[NOTE] • Drawing as mentioned above shows as example.

- For details of installation position of ECU of the each vehicle, see the Body Builder's Guide for the respective model series.

2) Ground of the Welding Equipment

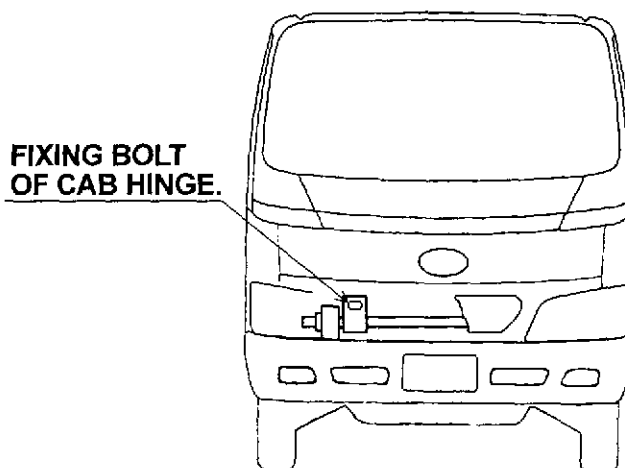
- Connect the ground of the welding equipment near the place where to be welded.

(1) Welding to the chassis frame

- Connect the ground to the bolt (plating bolt) or chassis frame near the place where to be welded.
- Peel off the paint where to be welded.
- Connecting the ground to the chassis spring is strictly prohibited to prevent damage of the spring.

(2) Welding to the cab body

- Connect the ground to the fixing bolt of cab hinge after dismounting the front grille or to the cab body.



3) Other Precautions

- To protect ancillary equipment from sparks during welding, place fire-resistant covers over the rubber hoses, wire harness, pipes, chassis spring and tires, etc.
- Perform to weld under most suitable conditions of the welding, and minimize the heat influence to the circumference where to be welded, and as far as possible to keep the welding quality.

4) After Welding

- Make sure to connect the negative terminal of the battery.
- Make sure to connect the connector of ECU of the each electronic instrument.
- Re-paint the place where to be peeled off the paint for grounding the welding equipment by same color.

5) Final Inspection after Welding

- Inspect the operation and function of each electronic instrument and equipment after restored to its original site.
- Consult to each sales dealer or distributor for the details of inspection's procedure.

10. POINTS TO NOTE FOR ELECTRONIC MACHINES

- Due to recent improvements in vehicle performance and to comply with laws and regulations, vehicles are also being equipped with electronic computers.
- If this electronic equipment is subject to heat, shocks, or other factors such as high voltage electrical welding, internal damage will occur and the equipment will stop functioning
- Accordingly, be sure to carefully observe the following precautions when mounting a body or equipment on a chassis in which electronic equipment is installed.

1) Kinds of Electronic Equipment

- The electronic equipment used in TOYOTA DYNA chassis are shown below.
 - a. TOYOTA TE-system
 - Electronic control governor
 - Electronic control timer
 - Pre-lift control fuel injection pump
 - b. A.B.S. (anti-lock brake system)
 - c. A.S.R. (anti-slip regulation system)
 - d. FSV controller
 - e. Vehicle speed control limiter
 - f. Auto-transmission control computer
 - g. Exhaust retarder control computer, etc.

2) Handling Precautions

- Circuits related to electronic control (control unit, actuator, sensor, etc.) use a special multi-terminal connector because they use a very small current.

Therefore, take note of the following points when handling them while mounting the body.

- a. Unnecessary removal or insertion of connectors should not be done.

Deformation or damage to connectors will result in decreases in the insertion force and poor connections.

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

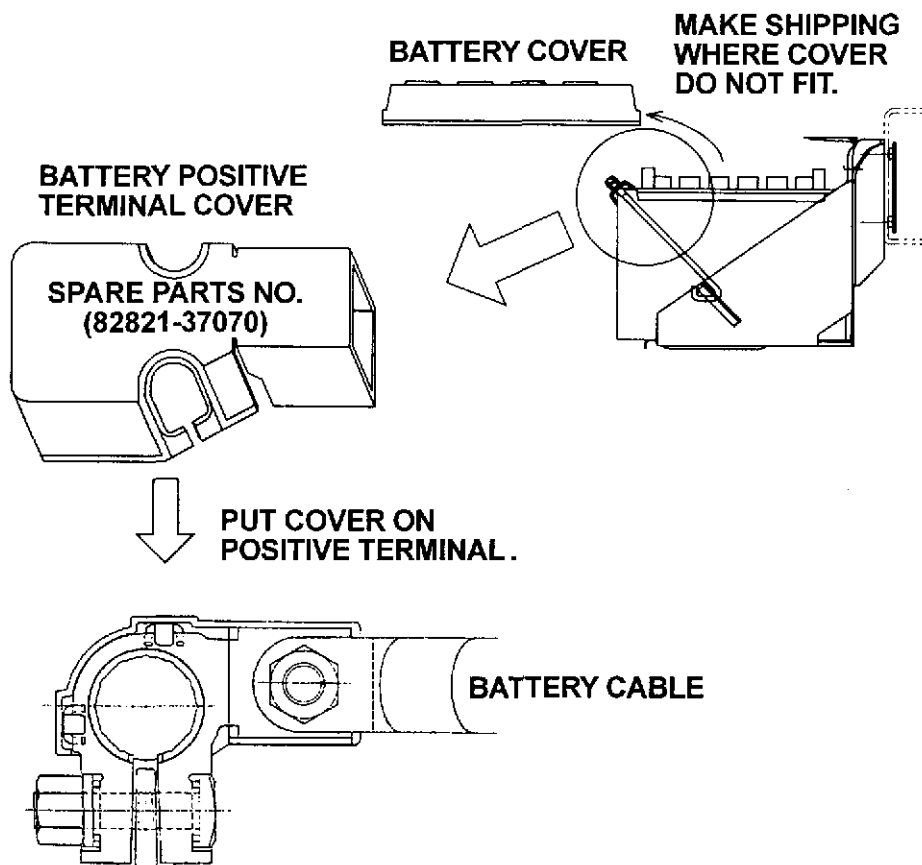
Removing the connector by holding the harness wire and pulling or twisting will cause damage to the harness wire and deformation of the terminal. Do not remove the connector in this way.

- c. Be sure water, oil, or dust do not adhere to the removed connector. Poor connections or unstable continuity will result.
- d. When connecting the connector, be sure to securely connect it until the lock engages.
- e. Observe the following precautions for electronic equipment installed on the body side.

- The electronic equipment may malfunction due to large amounts of noise generated by the equipment itself.

Accordingly, a component with a noise eliminator such as a diode or bakusuta attached should be used for the relay, solenoid, or motors installed to the body.

- f. Be sure to fix it back at existing position when harness clamps, etc. to be removed.
- g. If shipping the vehicle must be done without battery cover because of body mounting, be sure to confirm the fitting of the positive terminal's cover of battery.
Fit the cover where it is not.



DETAILS, PUTTING COVER ON.

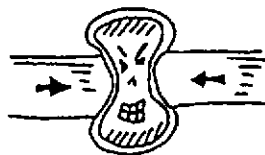
11. HARNESS WIRING

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

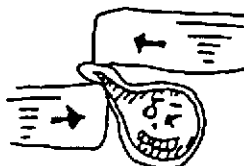
1) Precautions when Mounting Body or Equipment

- a. When installing U-bolts or body mounting brackets, observe the following precautions.

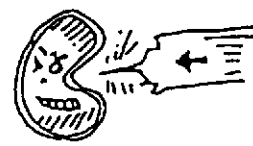
- Make sure that harness wires and battery cables are not squeezed or pinched, and do not come into contact with sharp edges or corners.



Squeezed



Pinched



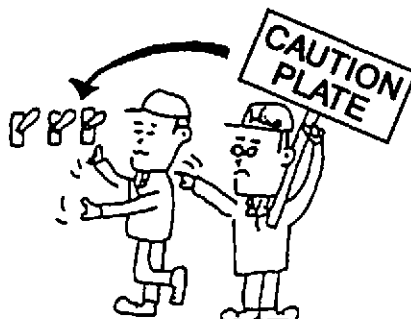
Sharp edge

- Make sure that harness wires, battery cables and other electric equipment (switches, battery, etc.) are easily accessible for maintenance.



- b. If you fit additional switches or lamps for a body or equipment, observe the following precautions.

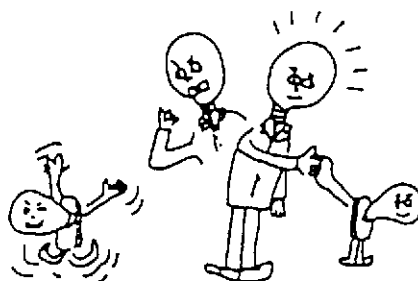
- To prevent accidental operation or confirmation, install a caution plate showing the purpose of each switch, etc.



- Common use of switches which are already installed on the chassis side for control of lamps installed on the body side or other electrical equipment is prohibited.

An overload will occur resulting in burning of the switch contacts or harness.

The control of the electrical equipment on the body side should be done using a separately installed switch.



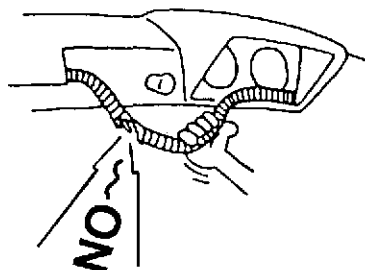
ADDITIONAL SWITCH [RIGHT] **EXISTING SWITCH [WRONG]**

- c. If you intended to fit a buzzer for a body or equipment, make sure that its sound is clearly different from that of the existing buzzer around the driver's seat of chassis.

[SPECIFICATION OF EXISTING BUZZER AROUND DRIVER'S SEAT]

BUZZER TYPE	SPECIFICATIONS
• Low brake pressure warning buzzer	Sound pressure : 90 to 105 dB (A) (At a distance of 1m)
• Engine overrun buzzer	Frequency : 400 to 600 Hz

- d. Do not force to pull the harness wiring when handle it.

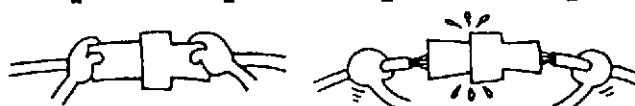


- e. When removing the connector, be sure to hold the male and female parts of the connector by housing.

Do not remove the connector by holding harness wire.

[RIGHT]

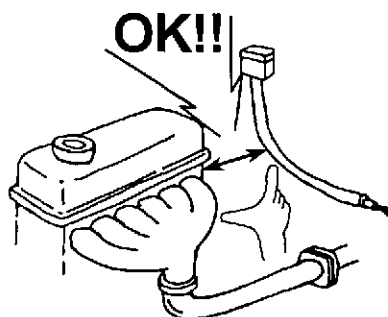
[WRONG]



- f. Secure an adequate clearance with the high-temperature parts.

Measure the temperature whenever required to eliminate the safety problems.

- Don't lay the wiring in the vicinity of the exhaust pipe or muffler or where the wiring is exposed directly to the exhaust gas.
(Clearance between exhaust system and harness wiring;
Minimum 200mm)



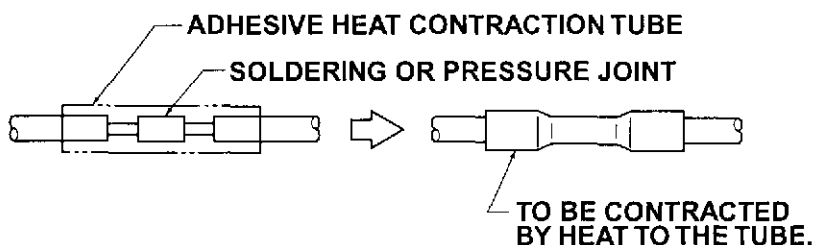
2) Addition or Modification of wiring

- (1) If you intend to extend wiring, make sure that you use the same size and color of wire as the original.
- (2) Make all connections secure by soldering or pressure joints. After connecting, remove burrs and cover fully with insulation material.

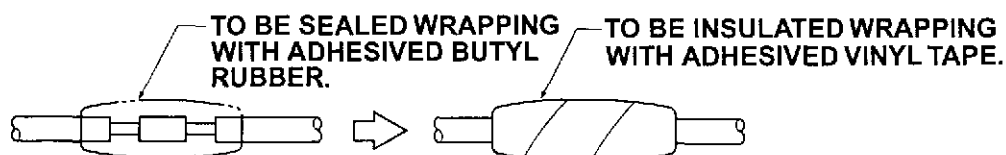
When making connections in chassis side wiring, cover connections with waterproof sealant, then cover fully with insulating material.

[EXAMPLE FOR WATERPROOFING AND INSULATION]

- Cover connections with adhesive heat contraction tube.



- Cover connections with butyl rubber.



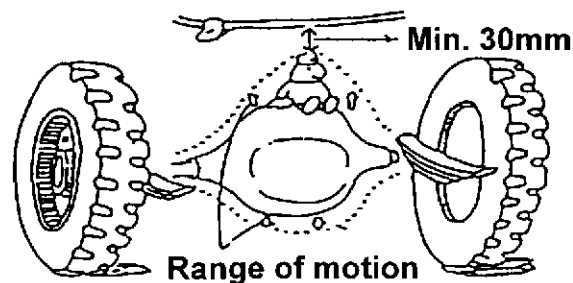
- (3) When soldering, do not use chlorine.
- (4) If you intend to move the battery or modify the battery cable layout, do not extend or shorten the battery cable.

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

- (5) Clamp electric wiring firmly to prevent it from contacting the moving or vibrating parts of the chassis or body, and any sharp edges or corners.

[CLEARANCES FOR WIRE]

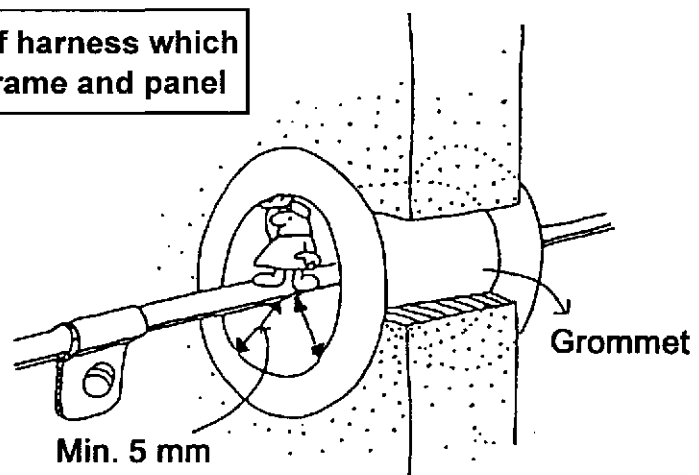
POSITION	CLEARANCES
Between moving parts and wiring. Between sharp edges or corners and wiring	At the close point : min. 30mm Minimum clearance : min. 10mm



- (6) Where wiring passes through the frame or a panel, always use a grommet to prevent damage to the wire and potential short circuits.

EXAMPLE OF USING GROMMET

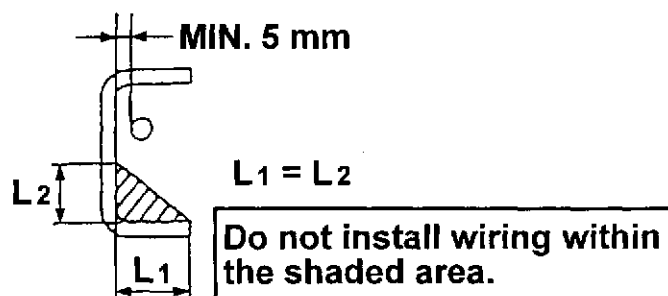
Protection of harness which penetrates frame and panel



- (7) Do not install wiring where it may be damaged by accumulation of mud or snow, by freezing, or by flying stones.

If you must install wiring in such positions, protect it with metal plates.

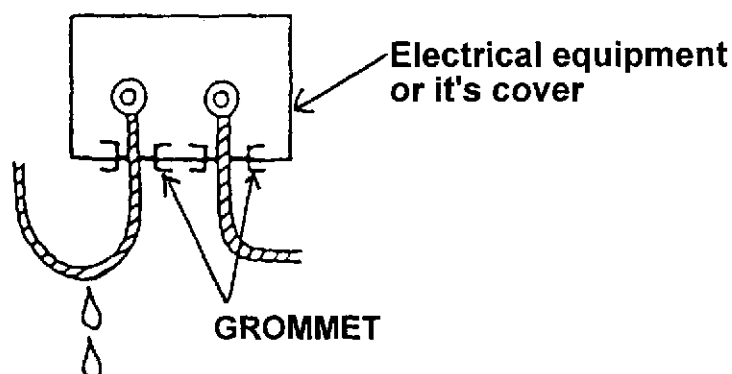
Harness wires should be installed where there is no danger of damage from accumulation of mud, sand, or snow.



- (8) When wiring of the harness wire is done inside the chassis frame, place the wiring along already installed wiring and do not wire independently along empty spaces.

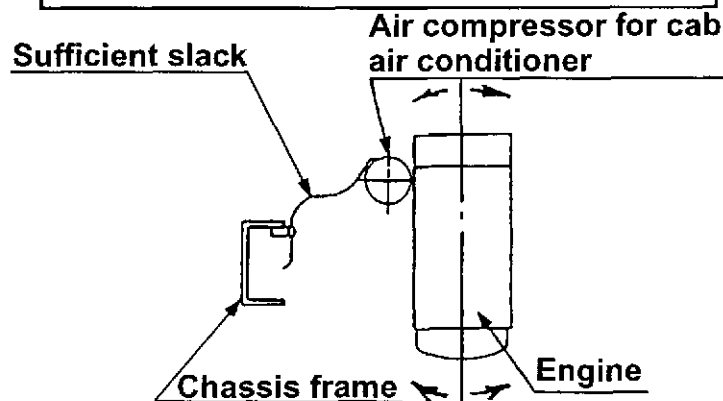
Also, when wiring under the floor of the body or inside the roof construction, be sure to place the wiring along the structure frame, use a clip following the indicated interval, carry out water proofing measures and observe the harness wiring rules.

- (9) Do not make connections by cutting open the coating of a wire and pulling out the bare wire. This procedure is very dangerous and may damage other wires.
- (10) To prevent water from running along wires and penetrating electrical equipment, always seal holes through which wires pass using grommets and make connections so that the terminal is higher than the wire.



- (11) Install wires where they are not exposed to dust or water.
- (12) Do not install the harness wire on the top or outer side of the chassis frame.
In such positions, they may be damaged by being stepped on during body mounting, or by flying stones during vehicle operation.
- (13) If there is a harness for the chassis already installed close to the wiring area when wiring is done inside the chassis frame, the wiring and taping should be done along this harness.
- (14) When installing wiring for parts of the engine, transmission, etc., install the wiring in parallel to existing wires, and be sure to allow sufficient slack to adsorb any relative movement. Make sure that the wiring does not touch any other part.

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

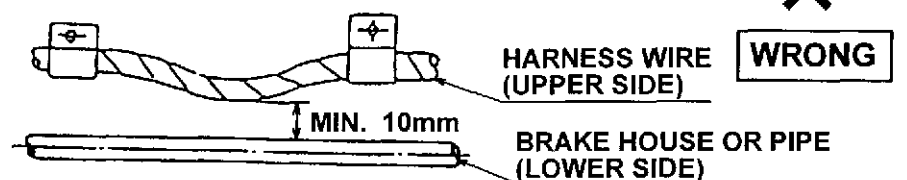


- (15) Where electrical wiring runs parallel to pipes (including rubber hoses, vinyl hoses, and steel pipes) or brake system pipes (including brake hoses and brake pipes), never clamp the wiring together with these pipes.

[CLEARANCES BETWEEN HARNESS WIRES AND PIPES]

WIRING METHOD	CLEARANCE
Pipe and parallel wire	min. 10mm
Crossing point of wire and pipe	min. 20mm

Never secure harness wires together with pipes or link rods.



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

When refitting the battery cables, observe the specified torque to avoid damaging the battery terminal:

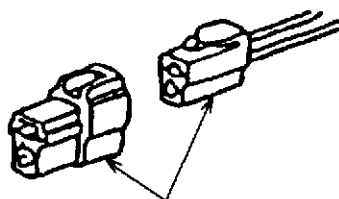
Tightening torque : 9.8~15.7 N·m {100~160 kgf·cm}

(If a terminal is damaged, replace it with a new part.)

- (17) If you move the battery, make sure it is positioned at least 200 mm away from the exhaust system (muffler, tail pipe, etc.).

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

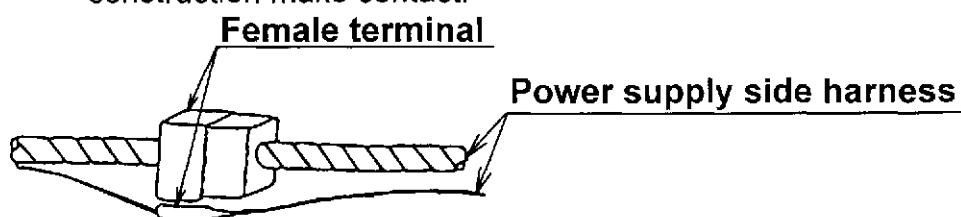
- (18) Always use a connector with lock.



Connector with lock

If you use a plug-type connecting terminal, fit the female terminal into the power supply side.

This is due to the connecting terminal detaching which does not allow a short-circuit to occur even if the chassis or body construction make contact.

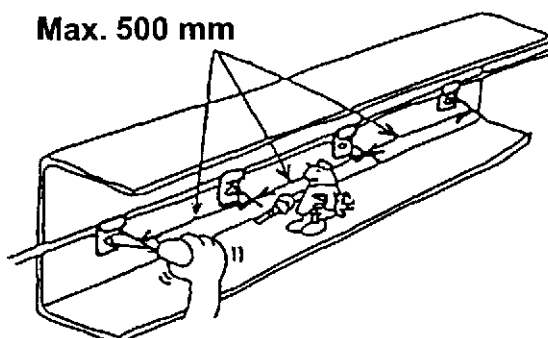


- (19) To prevent sagging, contact with other parts or contact with sharp edges or corners, secure all wiring with clips.

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

Clipping interval

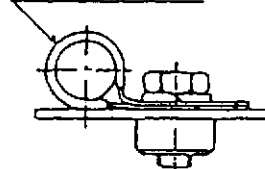
Max. 500 mm



(21) All clips should use resin coating or attached grommets.

[RECOMMENDED CLIP TYPES]

VINYL COATED

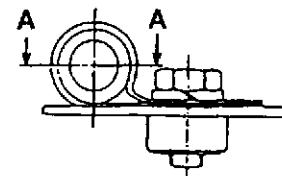


**Clip coated with more than
0.6 mm thick vinyl**

RUBBER GROMMET

SECTION A - A

R SHAPED FLANGE

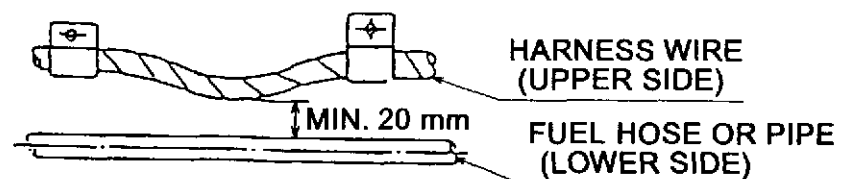


**Clip with rubber grommet
(in case of relative movement)**

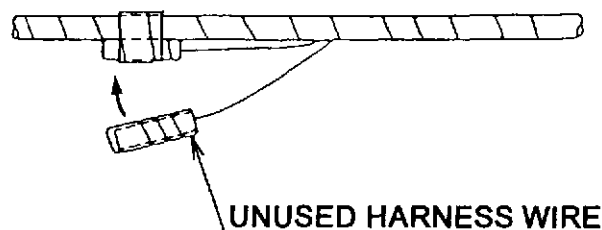
(22) Crocodile clips and adhesive clips should only be used for temporary installation.

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

Keep a clearance of at least 20 mm between the harness wire and fuel hose.

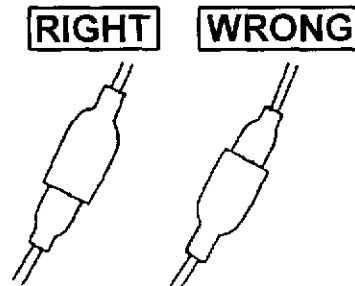


(24) Bundle unused harness wires and their terminals should be bundled with other harness wires and covered with vinyl tape to prevent water from penetrating the terminal.



(25) Mount a cover or a protector to prevent water entry along the wiring.

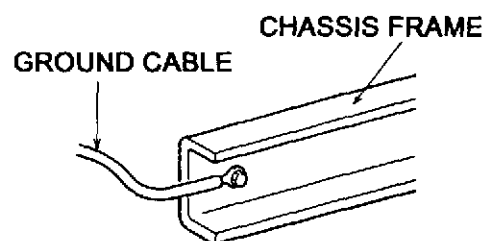
- A water-proof boot should be installed facing down.



(26) A connector, if used at a position exposed to water, should always be of water-proof type.

(27) The circuit must be so designed that the ground cable of the additional power supply is connected to the negative “-” terminal of the battery.

(28) Install the ground for an additional power supply always on the engine or frame.



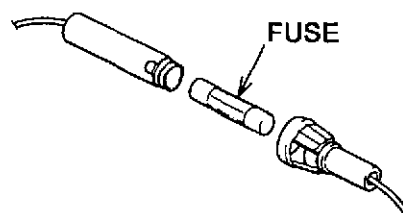
(29) Mount the ground terminal securely in the form of a circular plate terminal.

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

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

(31) Always be sure to insert a fuse in an added wiring circuit.

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



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

Ex : For the load current of 3A,

$$3 \times 1.4 = 4.2 \text{ A}$$

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

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

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

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

- (32) When installing additional electronic machine, the circuit must be wired through the fusible link and to grounded direct to the frame.

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

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

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

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

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

12.ELECTRIC WIRE SIZE AND PERMISSIBLE CURRENTS

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

CONNECTING FUSE CAPACITY (A)	WIRE TYPE		WIRE SIZE AND LENGTH						
		AMBIENT TEMPERATURE	0.5mm ²	0.85mm ²	1.25mm ²	2mm ²	3mm ²	5mm ²	8mm ²
5	AV	MAX. 80°C							
	AVX	MAX. 100°C	MAX. 30m	—	—	—	—	—	—
	AEX	MAX. 120°C							
10	AV	MAX. 80°C							
	AVX	MAX. 100°C	MAX. 15m	MAX. 20m	MAX. 30m	—	—	—	—
	AEX	MAX. 120°C							
15	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	MAX. 15m	MAX. 20m	MAX. 35m	—	—	—
	AEX	MAX. 120°C							
20	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	MAX. 15m	MAX. 25m	MAX. 40m	—	—
	AEX	MAX. 120°C							
30	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	X	MAX. 5m	MAX. 10m	MAX. 15m	MAX. 25m
	AEX	MAX. 120°C							
40	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	X	MAX. 5m	MAX. 9m	MAX. 20m	MAX. 20m
	AEX	MAX. 120°C							
50	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	X	X	MAX. 7m	MAX. 10m	MAX. 15m
	AEX	MAX. 120°C							
60	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	X	X	X	MAX. 5m	MAX. 10m
	AEX	MAX. 120°C							
80	AV	MAX. 80°C							
	AVX	MAX. 100°C	X	X	X	X	X	X	MAX. 10m
	AEX	MAX. 120°C							
	WIRE TYPE		WIRE SIZE AND PERMISSIBLE CURRENT						
		AMBIENT TEMPERATURE	0.5mm ²	0.85mm ²	1.25mm ²	2mm ²	3mm ²	5mm ²	8mm ²
	AV	MAX. 80°C	9A	11A	14A	20A	27A	36A	47A
	AVX	MAX. 100°C	8A	10A	13A	17A	24A	33A	43A
	AEX	MAX. 120°C	7A	9A	12A	17A	23A	32A	42A

- [NOTE]** a. Select wires size to suit the power consumption current.
- b. If you intend to use AEX wire, make sure that you also use heat resistant protective tubing, tape, and clips.
- c. Where the wire is subject to movement caused by relative motion, use wire of 0.85 mm² cross section or larger.
- d. Characteristic of wire.

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

- e. Marked "x" can not be used.
Marked "-----" shows the wire length maximum 50 m.

13. ELECTRICAL WIRING DIAGRAM

The diagrams as mentioned herein after are for examples.

Therefore, you are kindly requested to refer to the Repair or Owner's manual, etc. for the electrical wiring diagram.

How to use and read the electrical wiring diagram is described as follows.

1) Configuration of Electrical Wiring Diagram

Electrical wiring diagrams are described in the following classifications.

- How to read the wiring diagram for individual system.

Several kinds of circuits are described as individual groups and are explained for connectors of related parts, wire sizes, colors of the wires, etc.

- Wiring diagram for individual system.

Mainly those circuits that are connected with the body mounting are described as individual groups and are explained for connectors of related parts, wire sizes, colors of the wires, etc.

- Block configuration diagram.

Shows configuration such as FL(fusible link), F/B(fuse box), etc.

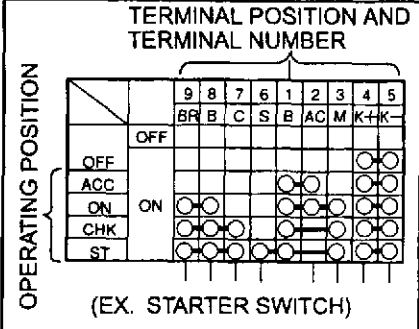
2) How to Read the Wiring Diagram for Individual System.

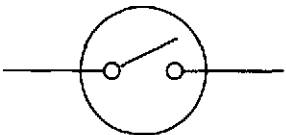
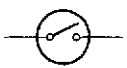
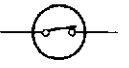
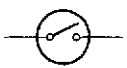
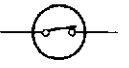
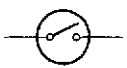
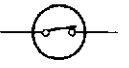
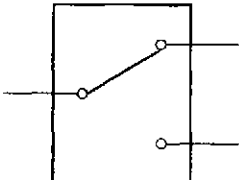
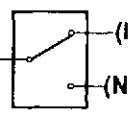
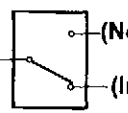
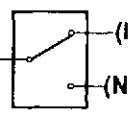
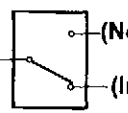
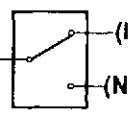
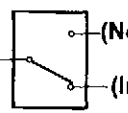
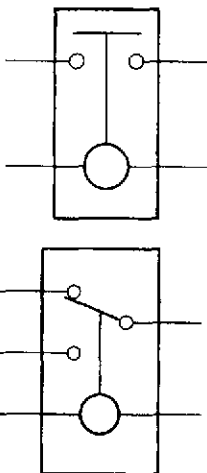
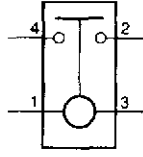
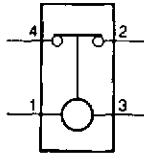
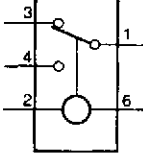
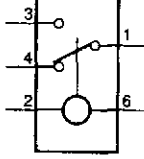
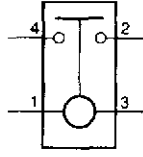
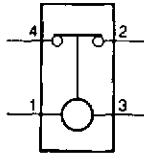
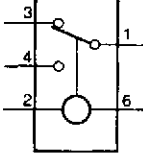
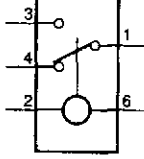
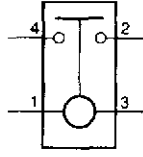
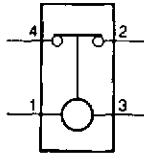
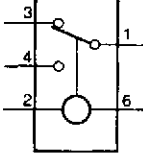
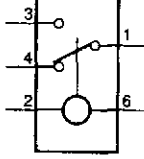
- (1) As circuit diagram mentioned on this wiring diagram includes special specifications, some of them are not applicable depending upon vehicle model and specification.

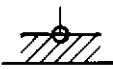
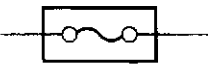
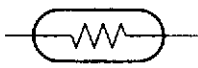
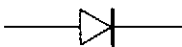
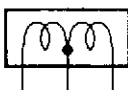
For detailed specifications of the individual model, contact with your nearest TOYOTA sales dealer or distributor.

- (2) Symbols, terms and abbreviations.

- a. Explanation of symbols

SYMBOL	MEANING
 (EX. STARTER SWITCH)	Shows connecting condition of the internal circuit of the switch like starter switch. For the items whose connection are changed by operating the switch, the connection (conduction) is shown by a connection line. For example, on the left diagram, when the starter switch is placed at "ACC" position, the terminal B and the terminal AC as well as the terminal K+ and the terminal K- are in connected condition.

SYMBOL	MEANING									
	Lock type switch There are 2 kinds of lock type switches, Normal Open switch (NO switch) and Normal Close switch (NC switch). <table><tr><th></th><th>Normal condition</th><th>When the switch is operated</th></tr><tr><td>Normal open type</td><td> No conduction</td><td> In conduction</td></tr><tr><td>Normal close type</td><td> In conduction</td><td> No conduction</td></tr></table>		Normal condition	When the switch is operated	Normal open type	 No conduction	 In conduction	Normal close type	 In conduction	 No conduction
	Normal condition	When the switch is operated								
Normal open type	 No conduction	 In conduction								
Normal close type	 In conduction	 No conduction								
	Transfer type switch The circuit is changed when the switch is operated. <table><tr><th>Normal condition</th><th>When the switch is operated</th></tr><tr><td> (In conduction) (No conduction)</td><td> (No conduction) (In conduction)</td></tr></table>	Normal condition	When the switch is operated	 (In conduction) (No conduction)	 (No conduction) (In conduction)					
Normal condition	When the switch is operated									
 (In conduction) (No conduction)	 (No conduction) (In conduction)									
	Relay By exciting the coil, the contactors directly or indirectly open or close the contact points and obtain conduction or closing of the circuit. There are 3 types of relays depending upon the types of contact points, Normal open type (NO type), Normal close type (NC type) and transfer type. <table><tr><th></th><th>Normal condition</th><th>When the switch is operated</th></tr><tr><td>Normal open type</td><td> Between 2~4 : Open Between 1~3 : No conduction</td><td> Between 2~4 : Close Between 1~3 : In conduction</td></tr><tr><td>Transfer type</td><td> Between 1~3 : Close Between 1~4 : Open Between 2~6 : No conduction</td><td> Between 1~3 : Open Between 1~4 : Close Between 2~6 : In conduction</td></tr></table>		Normal condition	When the switch is operated	Normal open type	 Between 2~4 : Open Between 1~3 : No conduction	 Between 2~4 : Close Between 1~3 : In conduction	Transfer type	 Between 1~3 : Close Between 1~4 : Open Between 2~6 : No conduction	 Between 1~3 : Open Between 1~4 : Close Between 2~6 : In conduction
	Normal condition	When the switch is operated								
Normal open type	 Between 2~4 : Open Between 1~3 : No conduction	 Between 2~4 : Close Between 1~3 : In conduction								
Transfer type	 Between 1~3 : Close Between 1~4 : Open Between 2~6 : No conduction	 Between 1~3 : Open Between 1~4 : Close Between 2~6 : In conduction								

SYMBOL	MEANING
	Ground (Earth)
	Fuse and fusible link Interrupt a circuit to protect an electric cable against an excessive current when the power circuit becomes short-circuit.
	Buzzer
	Sensor
	Diode
	Clock
	Lamp (single filament type)
	Lamp (double filament type)
	Cigarette lighter
	Magnetic valve
	Motor
	Antenna
	Shield wire
	Battery
	Twist wire

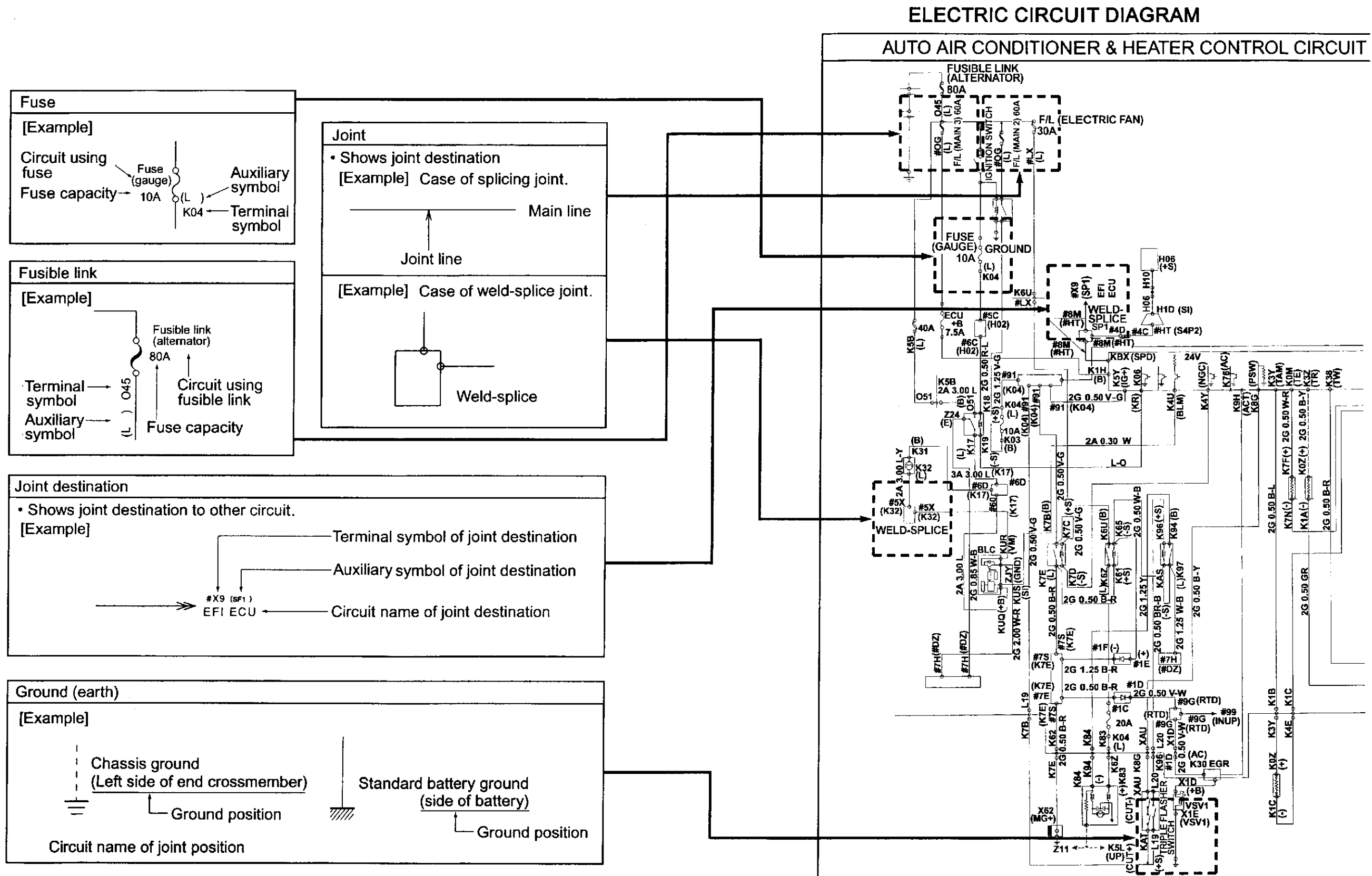
b. Explanation of terms

TERMS	MEANING
Connector	Connector consists usually of a terminal as conductor and of an isolating housing. The connector is used for such circuit as 1. power circuit, 2. general circuit, 3. electronic circuit, etc., and its connecting method consists of electric cable to electric cable, electric cable to electrical equipment (electronic parts), electric cable to electronic control equipment, connection within the electronic control equipment, etc.
Diode	Has the simplest theory and configuration among semiconductors. It is used for rectification of an alternator or for absorption of surge of a inductive load such as relay, actuator, etc.
Rheostat	Device allowing to change illuminance of meter lighting, room inside lighting at night, etc. There are 2 kinds of rheostats, resistance type and electronic type.
Junction block	Junction block includes a concentrated connecting function of electric circuits inside the block and contains such component parts as relays, fuses, circuit breakers, etc. There is also a derived type which has only jointing function by means of weld-splice of electric cables.
Combination switch	Combined switch. Compound switch integrating multiple switches with different functions. It is a lever type switch usually fitted on the steering column.
Weld-splice	Hot weld-spliced joint in which unsheathed electric cables are welded and spliced by putting them in order along the longitudinal direction and then covered by a cap. (disassembly prohibited)
Junction connector	Special connector having connecting function of electric circuit (buzz-bar) inside the connector.

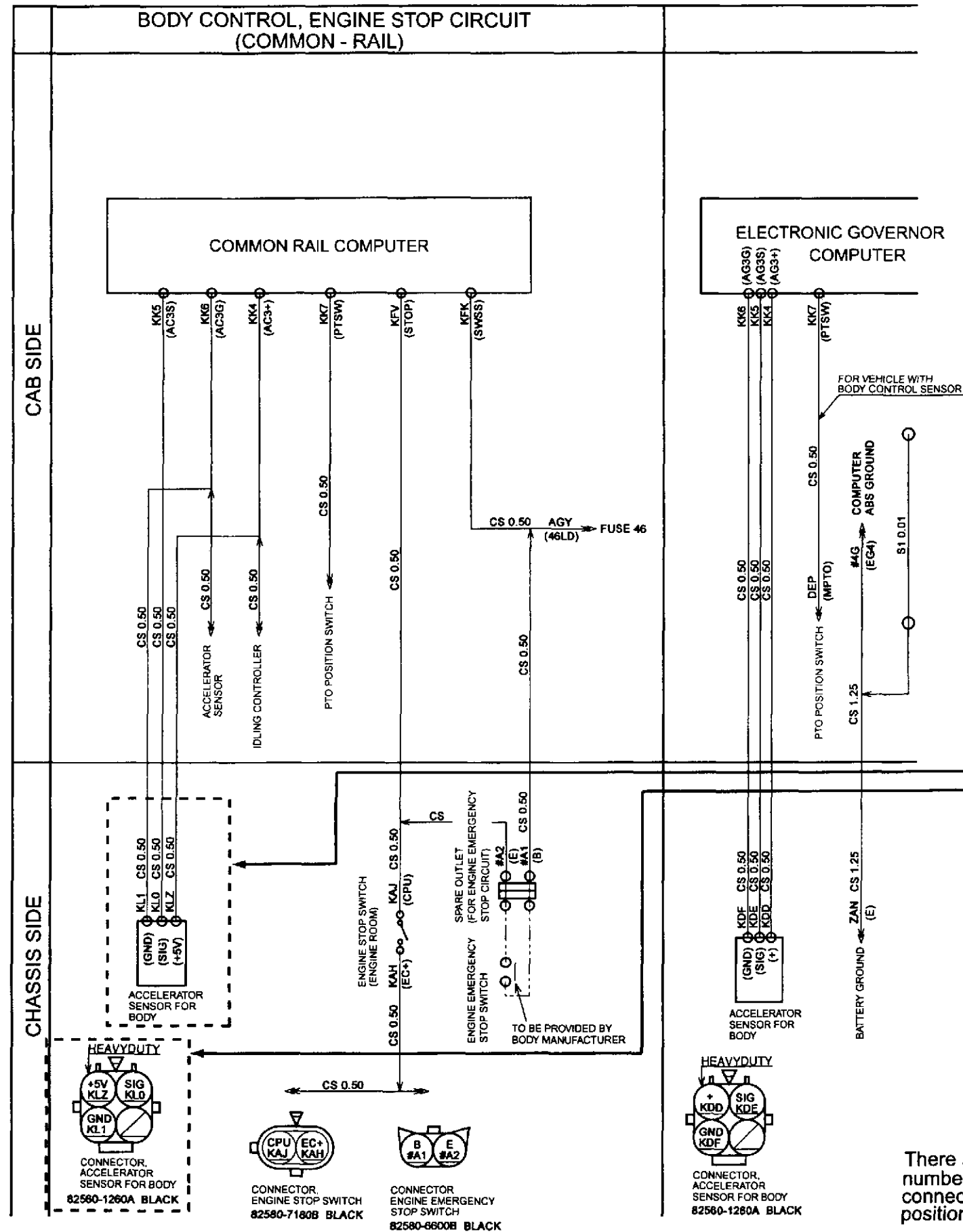
c. Explanation of abbreviations

ABBREVIATION	MEANING
FL	Abbreviation of Fusible Link
M / V	Magnetic valve
ABS	Abbreviation of Anti-lock Brake System
F / B	Fuse block
LP	Lamp
ECU	Abbreviation of Electronic Control Unit
BATT	Battery
PATM	Powerful automatic transmission
EX. BRAKE	Exhaust brake
Dr	Driver's seat side
As	Assistant's seat side
SW	Switch
ASR	Abbreviation of Anti-Slip Regulator
FSV	Abbreviation of Fuel Saving Valve

(3) How to read circuit diagram



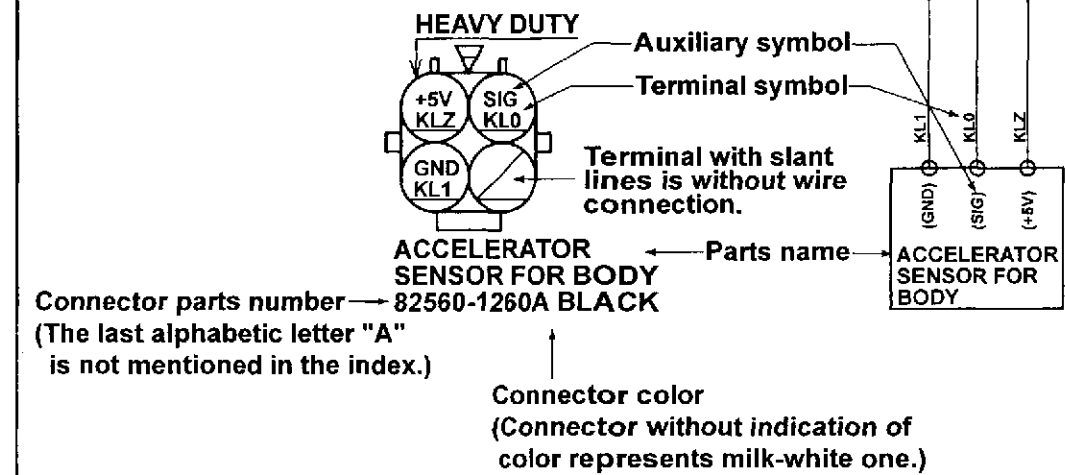
(4) How to read connector for each parts



PARTS NAME AND CONNECTOR FOR EACH PARTS

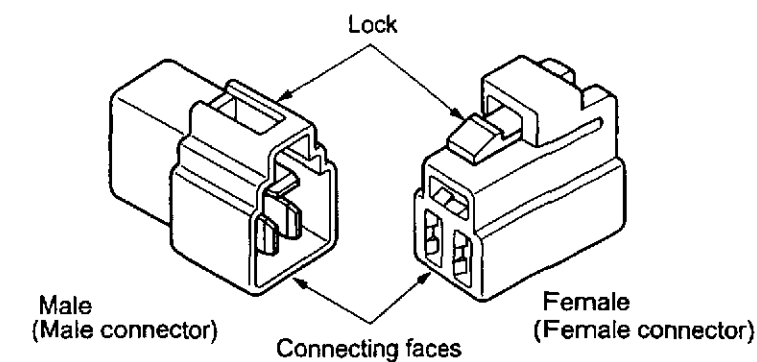
[Example] Connector connected to "accelerator sensor for body control" is searched from the connector within the wiring diagram.

Shows kind, size, color, etc., of cable.
(For detail, refer to "Size of cable and color identification".)



[NOTE]
For fitting position of each fuse and relay, refer to "Common connector".

• Indication of connector



There are various kinds of connectors of electric wiring diagram with such differences as number of poles, male (male connector), female (female connector), etc. In this manual, connectors are shown in such condition where connecting faces are visible with lock positions upward.

(5)Size of electric cable and color identification.

- Kind, size and color identification are shown here.

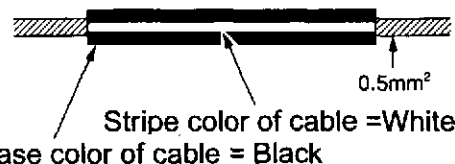
Example:

VS 0.50 Black-White

Color identification of electric cable
Size of electric cable
Kind of electric cable (symbol showing kind of electric cable)

Example:

1st letter----Base color of cable
2nd letter----Stripe color of cable



Cable	Symbol	Size and color identification of electric cable								
		0.3	0.5	0.85	1.25	2	3	5	8	15
AV	AV	—	○	○	○	○	○	○	○	○
AVS	VS	○	○	○	○	○	○	—	—	—
AVSS C-AVS	CS	○	○	○	○	—	—	—	—	—
AEX	EX	(0.2,0.3)○	○	(0.7)○	○	○	○	○	○	○
AVX	VX	○	○	○	○	○	○	○	○	(15,20,30)○

(Marks ○ ----Color to be used.)

Size of electric cable represents nominal section area (mm²).

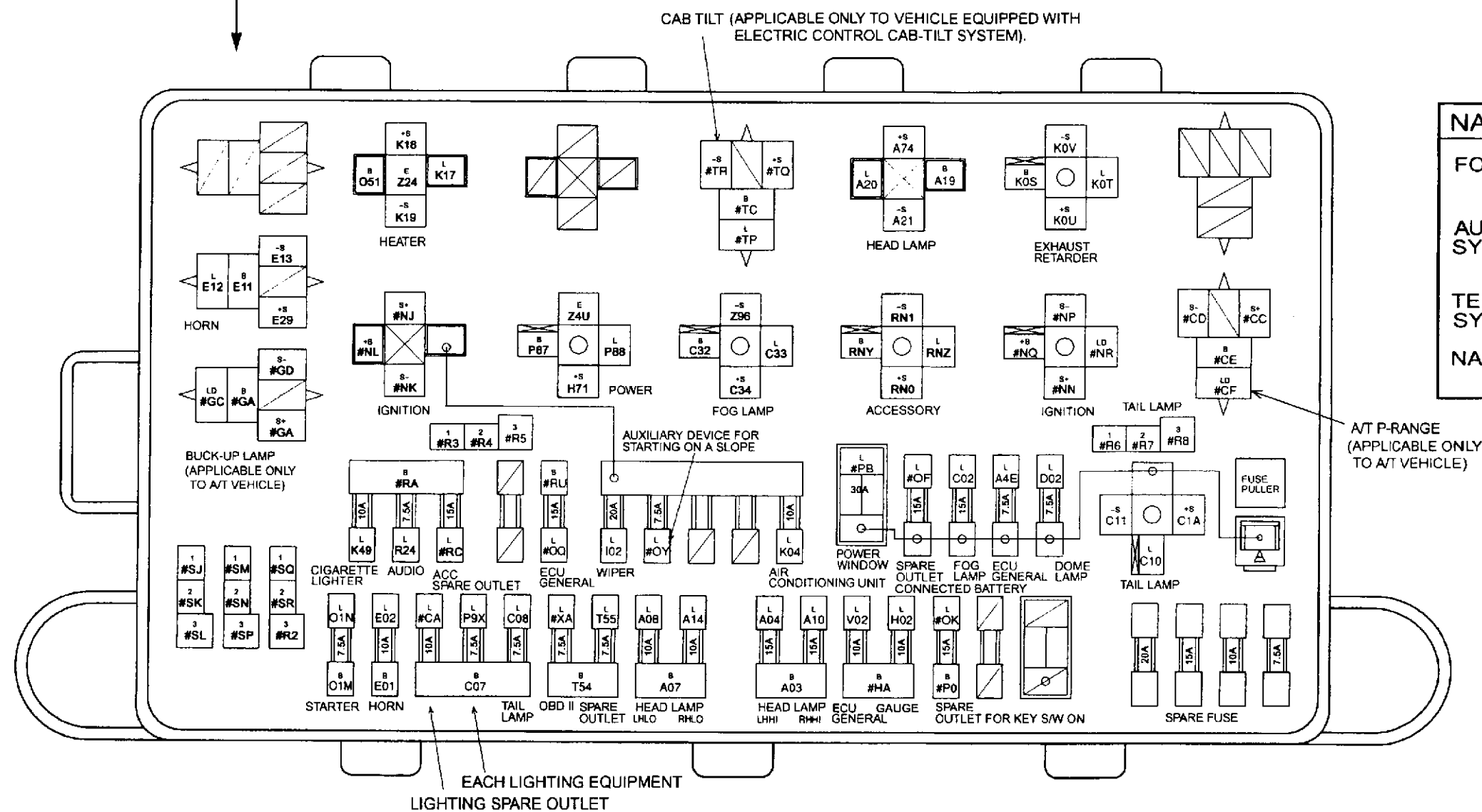
Wiring cable without particular indication of size shows of 0.5 mm².

Electric cable	Symbol	Size and color identification of electric cable					
		0.01	0.3	0.5	0.85	1.25	2
Shield wire (heat resistant type)	S1	Meshed cable	—	●	—	—	—
	S2		—	●	—	—	—
	S3		—	●	—	—	—
Shield wire(general)	S4		●	—	—	—	—
Tubed wire (TDW)	T1	—	—	●	—	—	—
	T2	—	—	●	—	●	—
	T3	—	—	●	●	●	—
	T4	—	—	●	●	●	—
	T5	—	—	●	●	—	—
Multi-core cable	M1	—	—	●	—	—	—
	M2	—	—	—	—	—	●
	M3	—	—	●	—	—	—
	M4	—	—	●	—	—	—
	M5	—	—	●	—	—	—
	M6	—	—	●	—	●	●
	M7	—	—	●	—	—	—
	M8	—	—	●	—	●	—
	M9	—	—	●	—	●	●
	MA	—	—	●	●	●	●
ABS cable	W1	—	—	—	●	—	—
	W2	—	—	—	—	●	—
	W3	—	—	—	—	●	●
Flat cable	F2	—	—	●	—	—	—
	F3	—	—	●	—	—	—
	F4	—	—	●	—	—	—
	F5	—	—	●	—	—	—
	F6	—	—	●	—	—	—
	F7	—	—	●	—	—	—
	F8	—	—	●	—	—	—
	F9	—	—	●	—	—	—
	FA	—	—	—	—	—	—

(● ----Designated color exists. However, color are limited.)

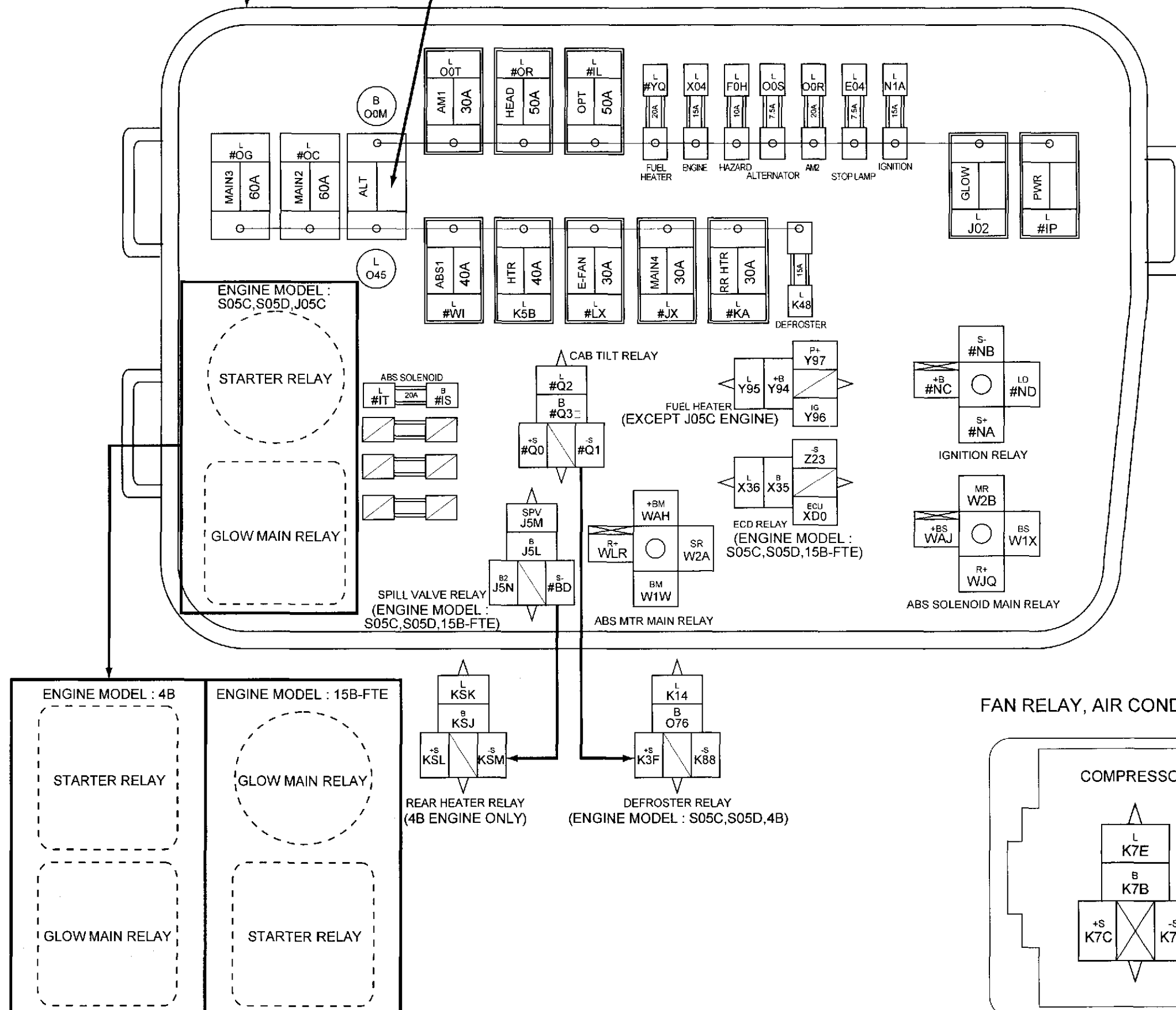
(6) How to read common connectors

FORM OF RELAY BLOCK, CAB SIDE

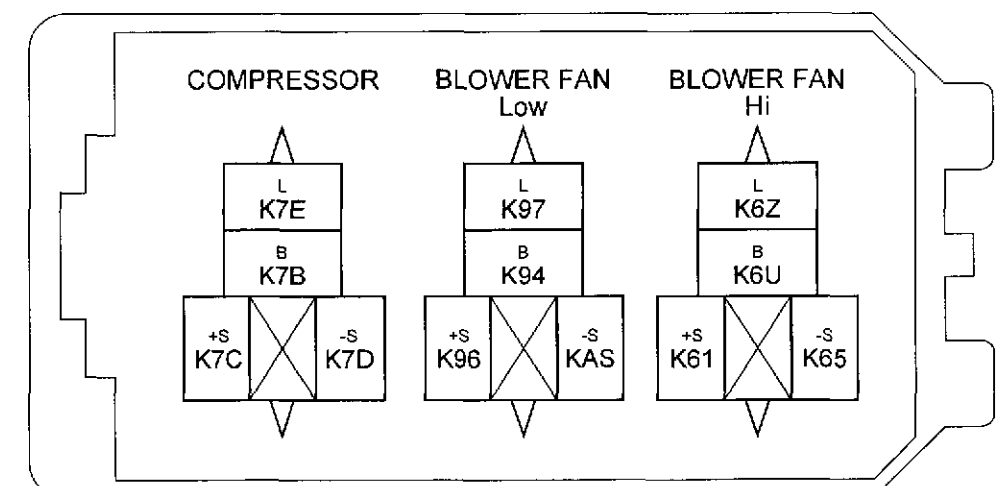


FORM OF RELAY BLOCK, CHASSIS SIDE

80A (FOR 30A AND 50A ALTERNATOR)



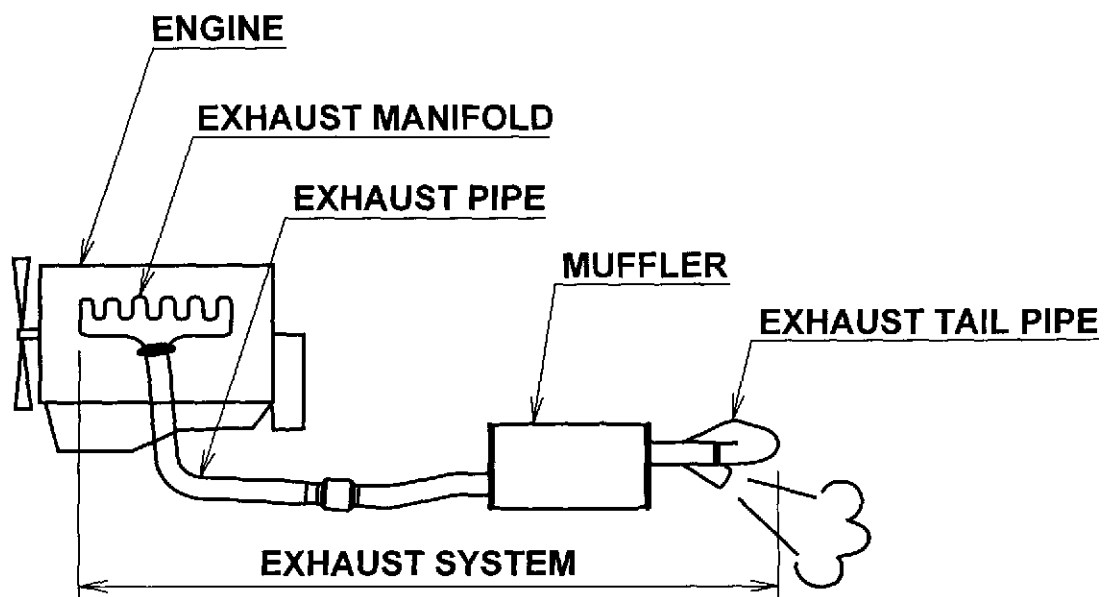
FAN RELAY, AIR CONDITIONER



8. EXHAUST SYSTEM

- 1. PRECAUTIONS FOR MOUNTING A BODY OR EQUIPMENT..... 8 - 2**
- 2. MODIFYING THE EXHAUST SYSTEM..... 8 - 3**

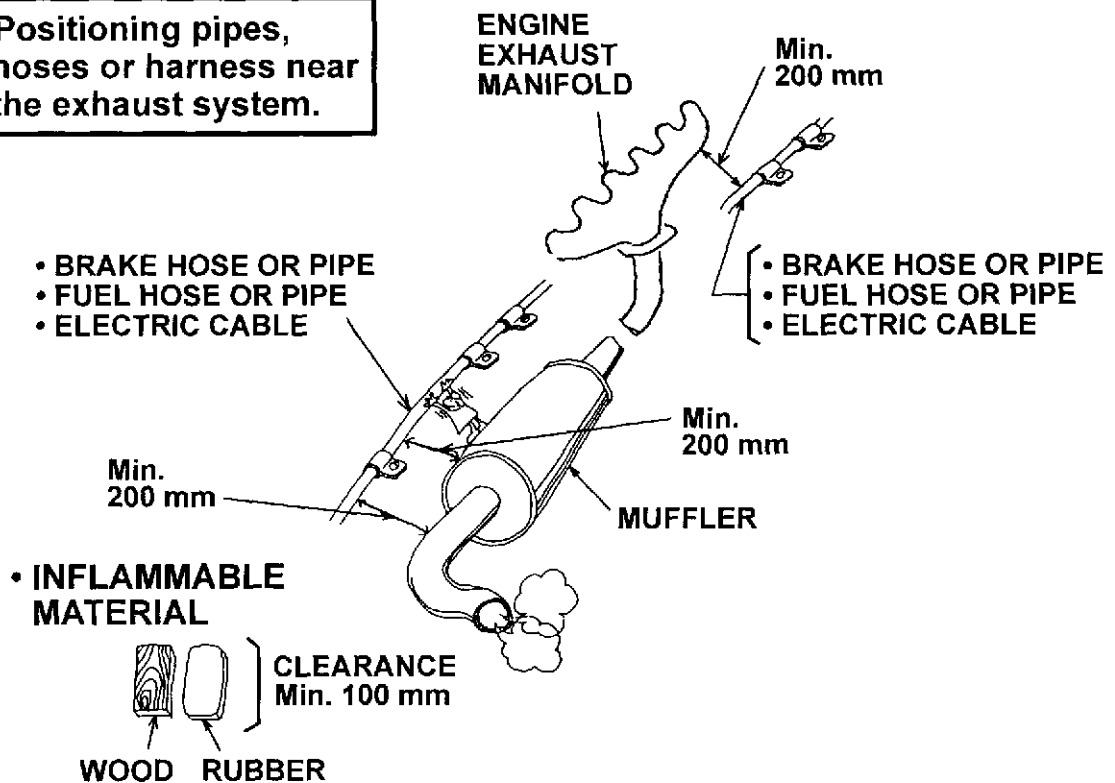
- The exhaust system becomes very hot during driving.
When mounting a body or equipment, observe the following procedures to prevent vehicle fires.
- Modifying the exhaust system has a major effect on vehicle performance and external noise.
As a rule, the exhaust system must not be modified.
- In some countries, external noise control regulations prohibit any modification of the exhaust system.



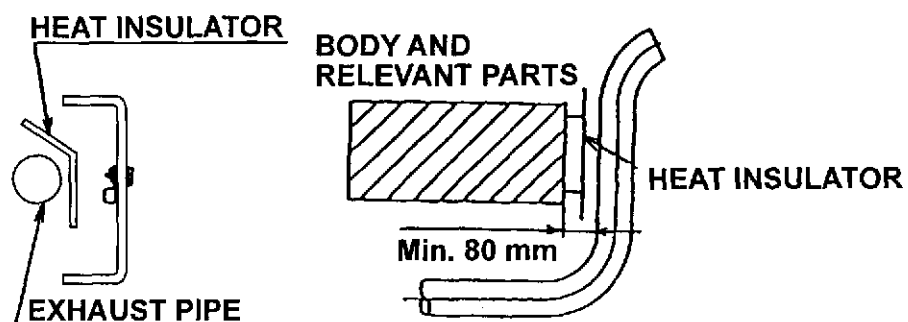
1. PRECAUTIONS FOR MOUNTING A BODY OR EQUIPMENT

- 1) When mounting a body or equipment, maintain the following clearances from the exhaust system.
 - a) For wood, rubber, cloth and resin parts, maintain a clearance of at least 100mm.
 - b) For brake hoses and electrical harness, maintain a clearance of at least 200mm.
 - c) For any other equipment that may be affected by heat, maintain a clearance of at least 80mm.
 - d) If it is impossible to maintain the above clearances, fit heat insulators between the relevant parts.

• Positioning pipes, hoses or harness near the exhaust system.

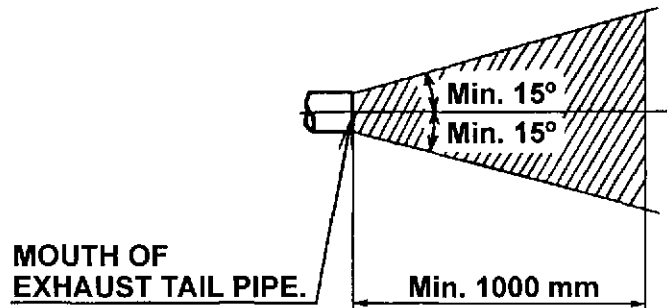


• Fitting heat insulators.



- 2) When installing a equipment (tool box, etc.) or inflammable object behind the outlet of the tail pipe, avoid the hatched area shown below.

• Do not mount any part near the mouth of the tail pipe.



Note : Applies to area above,
below, right and left of tail pipe.



Make sure that no inflammable parts (brake hoses, tubes, electrical wires) are behind the outlet of the exhaust pipe.

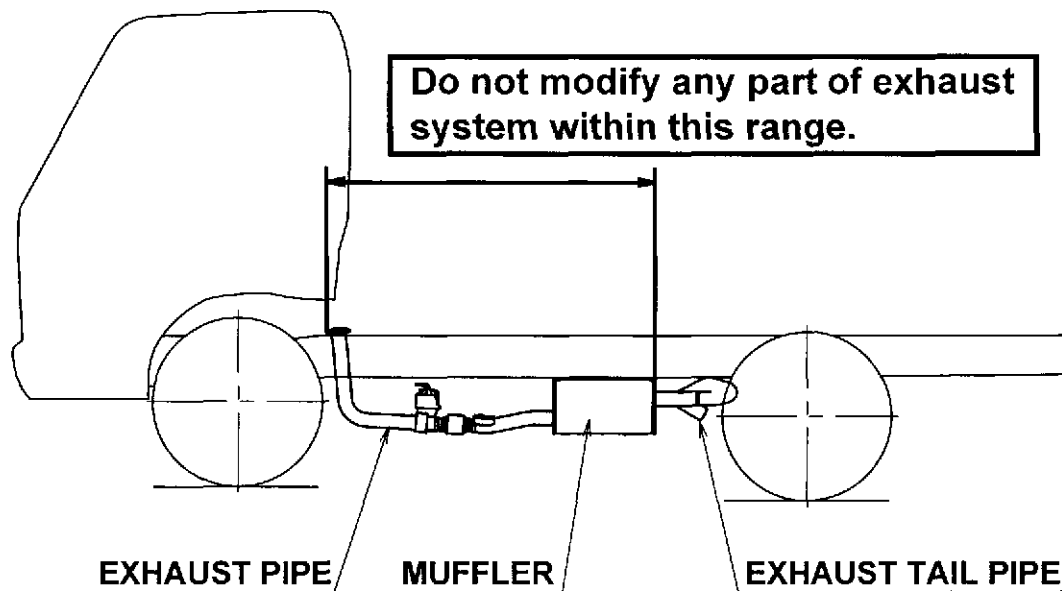
- 3) Do not install the rope hook near the high-temperature area, or the rope or canvas could droop or touch the exhaust system. Install an insulation plate as necessary.
- 4) Install equipment in such a manner that the exhaust system is not exposed to the hydraulic fluid that may leak from the equipment.

2. MODIFYING THE EXHAUST SYSTEM

- 1) Modifying the exhaust system has a major effect on vehicle performance and external noise. As a rule, the exhaust system must not be modified.

In some countries, external noise control regulations prohibit any modification of the exhaust system.

- 2) Do not modify any part within the range shown in the drawing below.



- 3) If you must modify the tail pipe in order to install a fire arrester, observe the following procedure:

- (1) The diameter and material of the pipe must be the same as those of the vehicle's original pipe. The material used differ as follows;

•Aluminum-plated steel pipe Color: Silver

The plating of aluminum-plated pipe will peel if the pipe is welded, and the rust-resistance of the pipe will deteriorate. After welding, paint the pipe in a similar color.

- (2) Extending or bending the tail pipe raises the exhaust resistance and will lead to a decline in engine output, an increase in fuel consumption, and an increase in exhaust gas density. Study the likely effects with care before making any modification of this kind. As a rule, the bending radius of the tail pipe should be at least 1.5 times the diameter of the pipe.

(3) Observe the following procedures with regard to supporting the tail pipe:

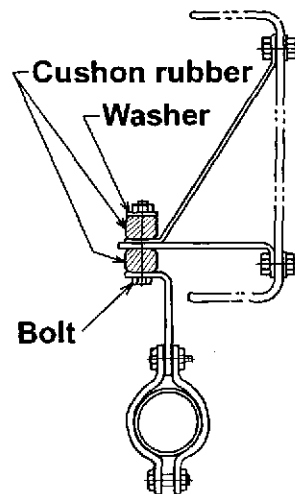
a. For vehicles with flexible pipe between the engine and the muffler

- Secure the pipe rigidly to the chassis frame without cushion rubbers.

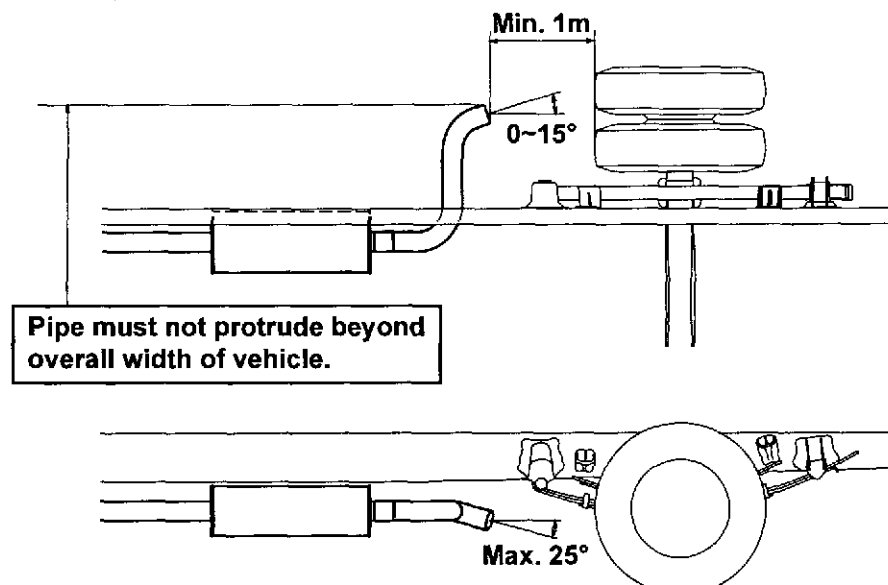
b. For vehicles not using flexible pipe between engine and muffler

- Secure the pipe to the chassis frame using cushion rubbers.

Be sure to use cushion rubbers, washers, and bolts of the same type as those used on the base vehicle.



(4) Position the mouth of the tail pipe as shown in the drawing below.



4) Clearances between exhaust parts and other parts

The exhaust system becomes very hot during driving.
Observe the following procedures to prevent vehicle fires.

(1) Clearances from body parts

When mounting a body or equipment, observe the precautions given in this section.

(2) Clearances from fuel system parts

- a. Maintain a clearance of at least 200mm between the fuel tank, fuel pipes, etc. and the hot parts of the exhaust system.

If you cannot maintain a clearance of 200mm, fit heat insulators to protect the fuel tank and fuel pipes.

When arranging fuel piping, make sure that even if a fuel line ruptures and fuel leaks out, no fuel will come into contact with the hot parts of the exhaust system.

- b. Never make joints in the fuel pipes above the hot parts of the exhaust system, etc.

- c. When moving the fuel tank or installing an additional tank, make sure that the filling port is at least 300mm away from the mouth of the tail pipe and at least 200mm away from exposed electrical terminals.

(3) Clearances from other chassis parts

Maintain the clearances shown in the table below. If you cannot maintain these clearances, fit heat insulators.

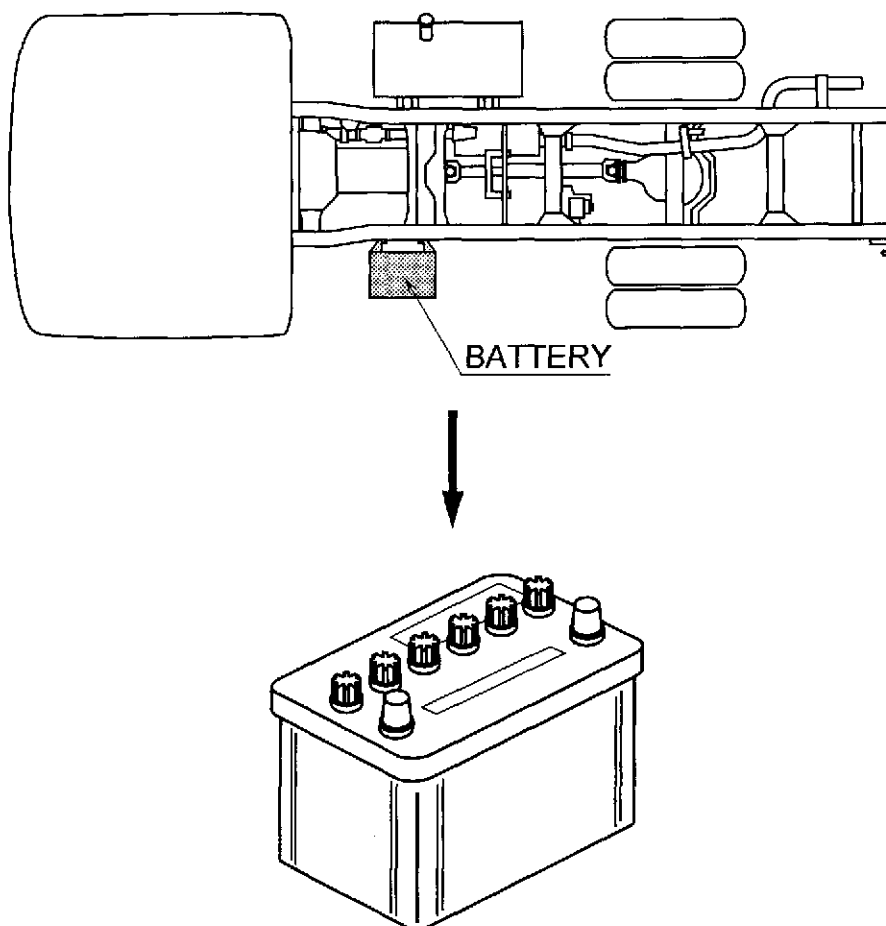
CLEARANCE(mm)	CHASSIS PART
Min. 100	Vacuum pipes, oil pipes
Min. 150	Components and parts for brake system
Min. 200	Electrical wires, battery, battery cables, rubber parts (hoses, etc.) resin parts.

9. BATTERY

- 1. WIRING PRECAUTIONS 9 - 2
- 2. CHANGE OF BATTERY MOUNTING POSITION 9 - 3
- 3. NO OVERLAID CONNECTION OF BATTERY CABLE 9 - 3
- 4. REPLACEMENT BATTERY CABLE 9 - 3
- 5. SERVICEABILITY 9 - 4

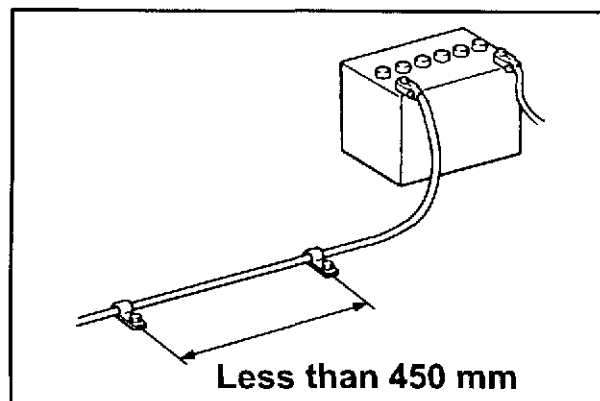
- The battery is an item which, if handled inappropriately, may cause a malfunction of the electrical components of the vehicle or an engine trouble or a fire.

Strictly observe the instructions on the battery and battery cable.



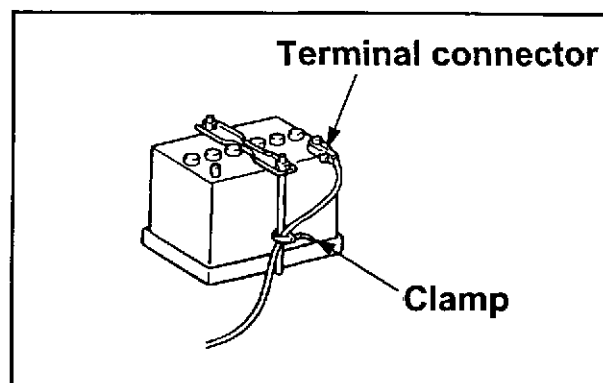
1. Wiring precautions

- (1) In order to prevent damage from water or other objects, protect the battery appropriately.
- (2) The battery cable, whether in or out of position, should not be in contact with a sharp edge of other portions.
- (3) Clip the battery cable at intervals of less than 450mm. (Always use a clip lined with rubber.)
 - Be sure that the clip is not freely movable.
 - Keep the clips away from other portions.
- (4) Don't bend the battery cable to a radius smaller than ten times of the cable diameter.



- (5) If the terminal connector is moved under the mounting tension of the battery cable, the terminal connector would become loose or normal engine start would become impossible, often leading to a battery failure.

Always securely fix the battery cable on the battery tray.



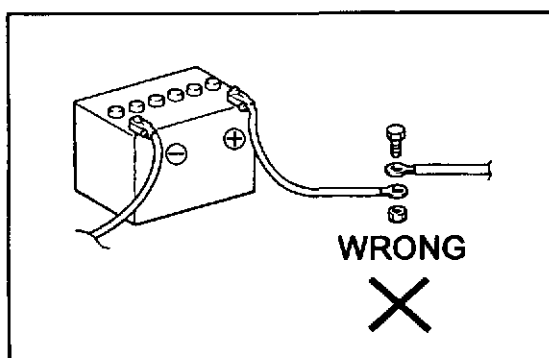
- (6) Set the route of the battery cable downward so that no leverage action is exerted to loosen the terminal connector.

2. CHANGE OF BATTERY MOUNTING POSITION

- (1) Install the battery at a position where the air flow is sufficient to release into the atmosphere the gas generated during the temperature increase or the charging operation.
- (2) Keep the battery away from a heat source by 200mm minimum. When this distance is not available, protect the battery from heat using a heat insulating plate or the like.
- (3) Determine the battery position using the existing battery cable

3. NO OVERLAID CONNECTION OF BATTERY CABLES

- Never connect battery cables by overlaying them one on another.



4. REPLACEMENT BATTERY CABLE

Replacing the battery cable may cause an engine start problem and causes the loss of other key systems.

Comply with the following instructions strictly.

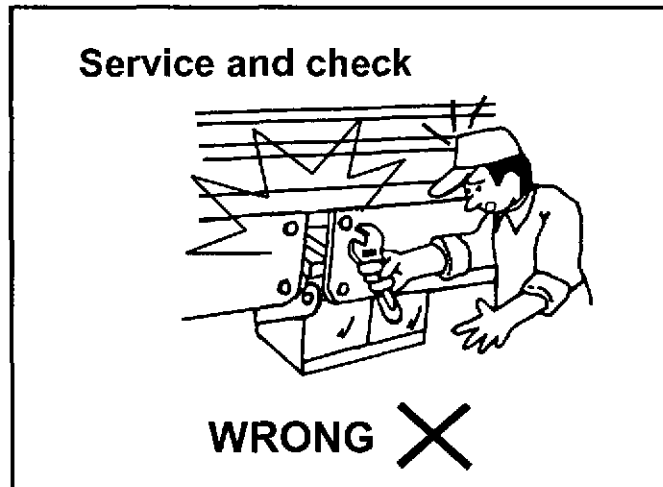
- (1) In order to secure the appropriate functions of the battery cable, use a cable with the following specifications.

THICKNESS (GAGE)	LENGTH (mm)	MATERIAL
4	1,600	Copper
2	2,600	Copper
0	4,200	Copper

- (2) When a minus cable is installed on the frame as a result of battery relocation, connect a cable of substantially the same size as the plus cable between the frame and the engine to cope with a large electric load of the starting circuit.

5. SERVICEABILITY

- (1) During the service or check work, secure a sufficient space or insulation in order not to cause any accident such as short circuit.



- (2) Attach a terminal polarity marking, a caution label and an gravity meter (mark) at an easily visible position.

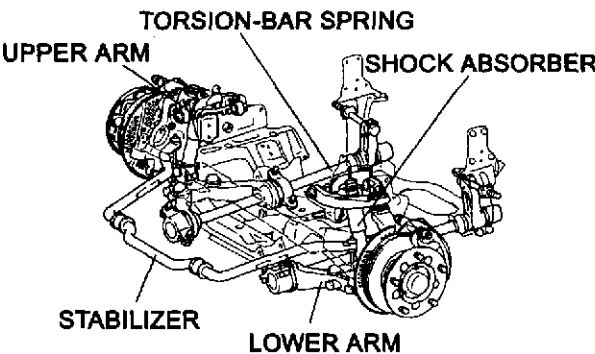
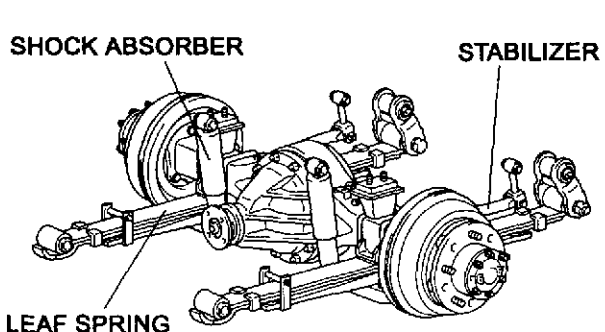
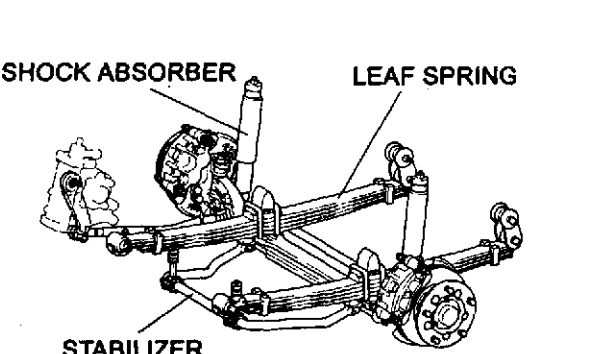
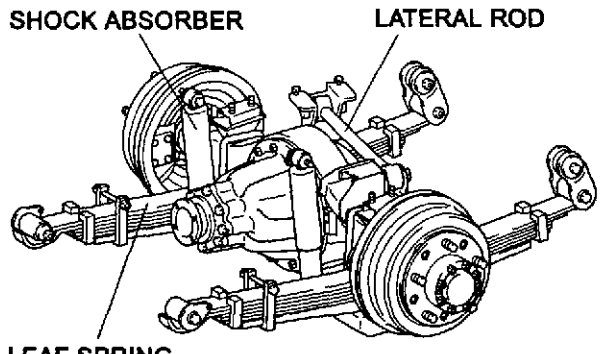
10. SUSPENSION AND TIRE

1. SUSPENSIONS USED IN THE CHASSIS.....	10 - 1
2. PROHIBITED MODIFICATION OR ALTERATION.....	10 - 2
3. SERVICEABILITY	10 - 3
4. OTHER PRECAUTIONS WHEN MOUNTING	10 - 4
OR MODIFICATION	
5. TIRE	10 - 5

1. SUSPENSIONS USED IN THE CHASSIS

- (1) Vehicle manufactured by TOYOTA normally use a multi-leaf spring or independent type suspension (for front only). (To confirm which type of suspension is being used, see the Body Builder's Guide for the respective model series.)
- (2) In addition to cushioning shocks from the road surface received while driving, the suspension couples the front and rear axles to the chassis frame playing the role of an important stabilizing component while the vehicle is accelerating and braking.
- (3) Accordingly, when mounting a body or making modification (or alteration), be sure to observe the instructions given below.

Description of suspension

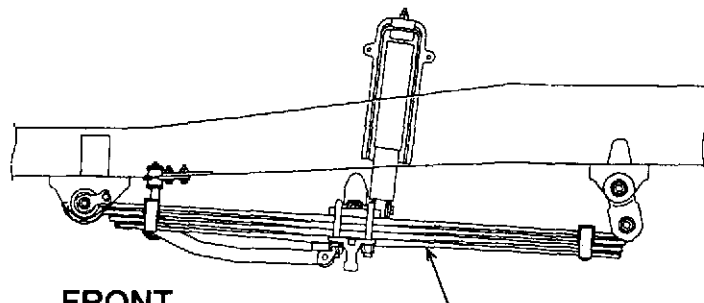
FRONT SUSPENSION	REAR SUSPENSION
 TORSION-BAR SPRING UPPER ARM SHOCK ABSORBER STABILIZER LOWER ARM INDEPENDENT AXLE	 SHOCK ABSORBER STABILIZER LEAF SPRING WITH STABILIZER
 SHOCK ABSORBER LEAF SPRING STABILIZER RIGID AXLE	 SHOCK ABSORBER LATERAL ROD LEAF SPRING WITH LATERAL ROD

2. PROHIBITED MODIFICATION OR ALTERATIONS

- (1) Careless modifications will greatly influence driving stability of the vehicle (in particular driving in a straight forward direction) and riding comfort and may cause an accident.
These type of modifications must not be carried out.
- (2) Depending on the usage condition, when using an additional leaf, it will be provided as option equipment.
Be sure to use equipment manufactured by TOYOTA. (contact the nearest TOYOTA sales dealer or distributor for information on how to install an additional leaf.)

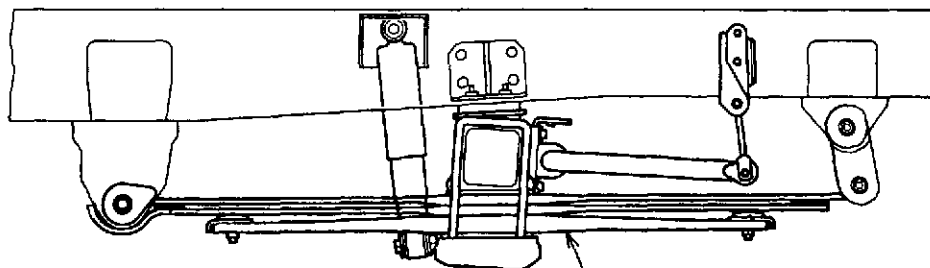
If the additional leaf is not manufactured by TOYOTA or excessive number of additional leaf are used, the mounting angle of the propeller shaft will change and result in vibration and unusual noises while the vehicle is driving.

This is very dangerous and should never be carried out.



FRONT

The addition of the multi-leaf suspension is an option. Be sure to use equipment manufactured by TOYOTA.

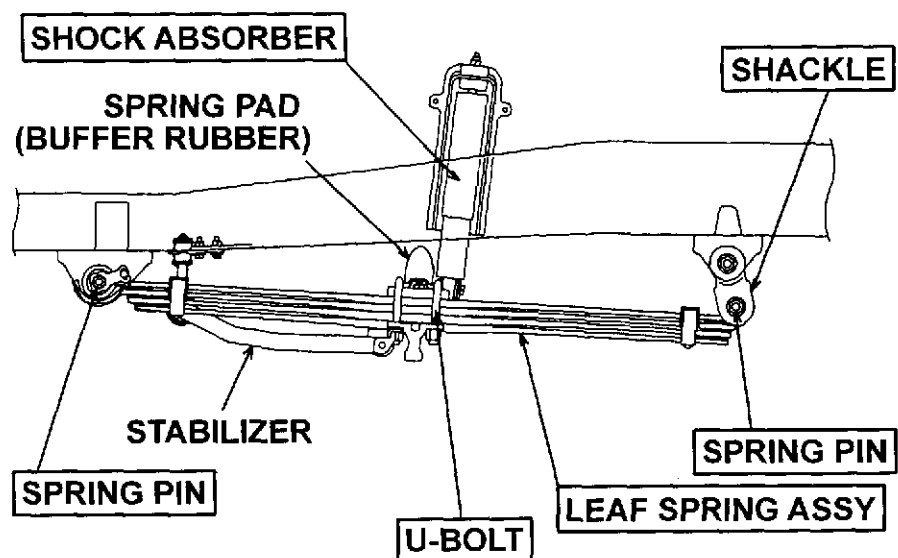


REAR

The addition of the multi-leaf suspension is an option. Be sure to use equipment manufactured by TOYOTA.

3. SERVICEABILITY

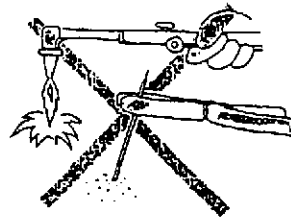
- (1) The suspension is a component which is always moving while the vehicle is driving and as such requires periodic greasing and parts replacement in addition to daily maintenance and inspection.
- (2) Accordingly, to make these operations easier, consider a construction which allows simple removal of the body parts of the peripheral assemblies as well as installing an inspection cover.

**[NOTE]**

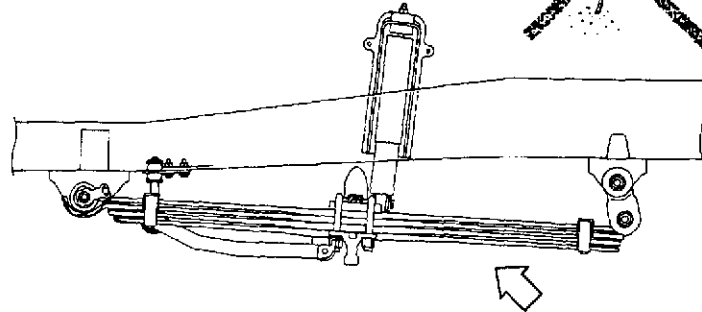
- To make it possible to carry out inspections, maintenance and repair or replace the parts inside the □ , an inspection cover should be installed or the construction should be such to allow the body parts to be removed.
- The figure above shows a multi-leaf front suspension. The same procedures should be followed for the rear suspension.

4. OTHER PRECAUTIONS WHEN MOUNTING OR MODIFICATION

**WELDING SUSPENSION PARTS
AND BRACKETS IS STRICTLY
PROHIBITED.**



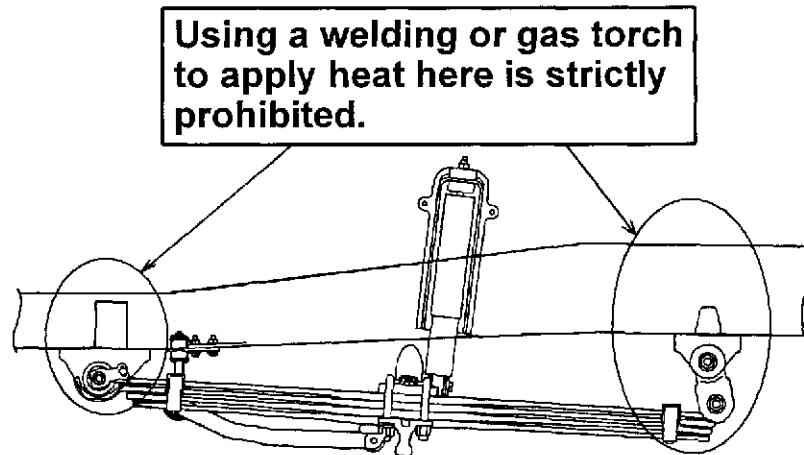
WRONG



- **Grounding the welding machine is strictly prohibited.**
- **Protect using a cover when welding peripheral parts.**

- (1) Suspension parts absorb shocks from the road surface received while driving and are always changing shape. Accordingly, the parts are manufactured from very special metal materials or other materials.
- (2) Accordingly, if subjected to the effects of heat or other environmental factors, this is danger that the material hardness may easily drop or suffer damage.
Therefore, do not use electrical welding of the suspension parts or a gas torch to apply heat.
- (3) The ground used during electrical welding must not make connect with the suspension parts.
- (4) During welding operations around the periphery of suspension parts, be sure to protect the suspension parts using a cover or similar item so the parts are not subjected to welding sparks.

- (5) Because in the peripheral portion of the bracket where the suspension parts are installed constantly a large amount of stress is generated while the vehicle is driving, heat must not be applied to this portion by electrical welding or a gas torch.



[NOTE]

- The figure above only shows a multi-leaf suspension. The same precautions also apply to independent type front suspension as well.
- Make alterations taking into consideration the upper bound limit of the differential carrier and the tire so that the tire does not interfere with the body, etc. when the vehicle bounds on rough roads.

For vehicles destined for districts where installation of the tire chain is required, add the tire chain clearance to the upper limit consideration. (For more details, refer to the Body Builder's Guide for the respective model series.)

- In the case where the vehicle is equipped with a rear axle breather and a hose, take care not to bend, distort or enclose them or otherwise interfere with normal "breathing" of the rear axle.
- The leaf spring should be installed at a point distant from the exhaust pipe by 50mm minimum and from the muffler by 150mm minimum.

In the case where these distances cannot be secured, protect the spring against heat using a heat insulating plate or the like.

5. TIRE

- A chassis on which genuine tires are mounted ship to the body or equipment manufacturer.
- Don't use any tire or disc other than specified for the particular vehicle.
- While mounting the body or equipment, there is a danger that scratches, paint adhesion, or other damage may occur during welding and other operations.

Be sure to observe the instructions for the mounting operation given below.

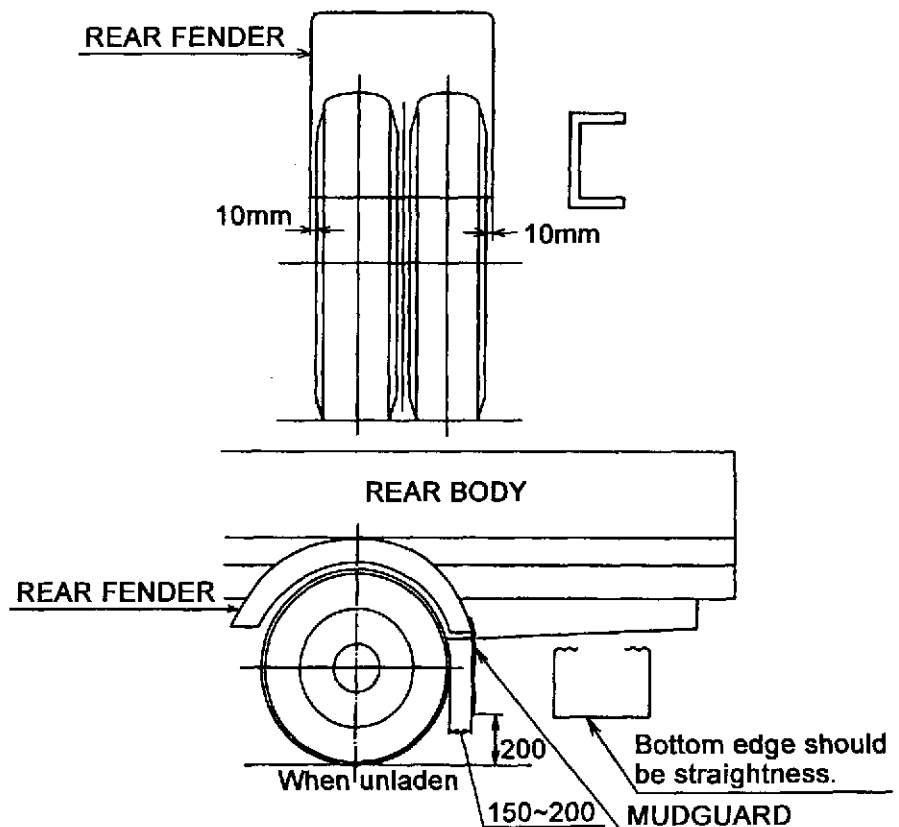
1) Precautions Before Start Body Mounting or Alteration Work

- While mounting a body or equipment, attach covers to tires to prevent paint deposit and damages to tires.
Or begin body or equipment mounting after changing tires to dummy tires.

2) Body Mounting or Modification

MOUNTING A REAR FENDER & MUDGUARD

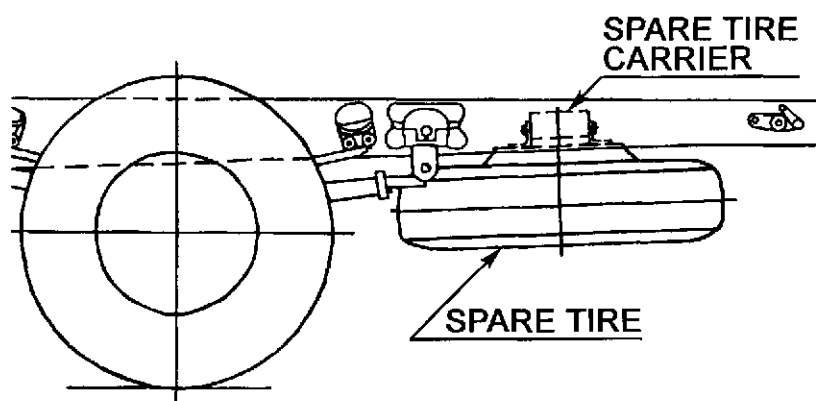
- Install a rear fender & mudguard to protect the chassis parts from dust, water, or mud thrown up by the tires while the vehicle is driving.
(For details on installing the rear fender & splash guard, see the Body Builder's Guide for the respective model series.)



11. SPARE TIRE CARRIER

1. RECOMMENDED SPARE TIRE CARRIER	11 - 2
2. GENERAL PREVENTIVE MEASURES	11 - 2
3. PREVENTIVE MEASURE FOR ADDITION OR ALTERATION TO SPARE TIRE CARRIER OF WIND-UP TYPE	11 - 4
4. SPARE TIRE CARRIER HANDLE	11 - 5
5. SPARE TIRE CARRIER HANDLE GUIDE	11 - 6
6. CAUTION PLATE FOR CARRIER TIGHTENING TORQUE.....	11 - 6

- A spare tire carrier is fitted as standard equipment to all chassis except dump chassis. It is fitted either in the chassis frame rear overhang or within the wheel base.
- Incorrect modification of the spare tire carrier can result in the spare tire falling out and may cause accidents.
- If you must move or modify the spare tire carrier in order to allow mounting of a body or equipment, observe the following procedures.



1. RECOMMENDED SPARE TIRE CARRIER

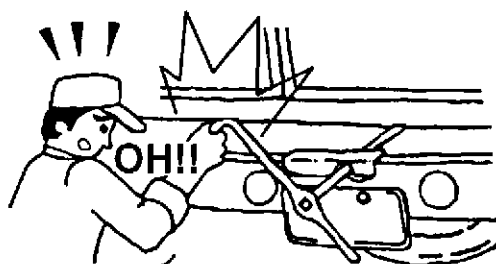
The spare tire carrier must have sufficient strength and wear resistance to prevent the spare tire from falling out during driving.

Use only genuine TOYOTA parts.

2. GENERAL PREVENTIVE MEASURES

When mounting a spare tire carrier, make sure that it has sufficient strength and wear resistance to carry the tire, and also that

- construct the vehicle in such a way as to facilitate the mounting and demounting of the spare tire by a single person.
- construct the vehicle with the spare tire not in contact with the parts other than the stopper when mounted.
- be sure that the chain or the like is not caught up when the tire is wound up.
- don't install the body or equipment parts within the operating range of the spare tire carrier handle.



- construct the spare tire carrier in such a way that even a punctured tire can be fixed securely.
- the construction should be such that the tire is stored within the outermost side of the vehicle and be sure to keep the enough height from ground to avoid contact with ground during driving.
- construct the spare tire carrier in such a manner that the tire is fixed at a position 100mm minimum away from the exhaust pipe and 200mm minimum away from the muffler.
In the case where no sufficient clearance is available, take an appropriate measure to protect the spare tire against heat by a heat insulating plate or the like.

- construct the spare tire carrier to be kept the enough clearance with movable or rotating parts of mounted body or equipment and chassis when mounting or demounting of the spare tire.
- be strictly prohibited a slope construction of the spare tire carrier excluding the slope due to vehicle inclination or chassis frame structure.
- attach the caution plate for the spare tire at a position easily visible from the operating point.

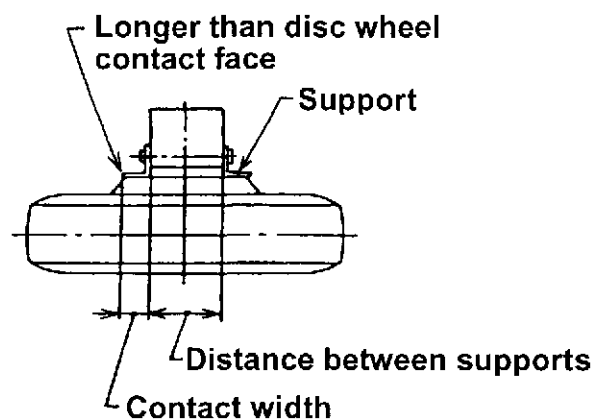
[NOTE]

Confirm the chassis drawing where spare tire carrier is installed in Body Builder's Guide for the respective model series.

3. PREVENTIVE MEASURE FOR ADDITION OR MODIFICATION TO SPARE TIRE CARRIER OF WIND-UP TYPE

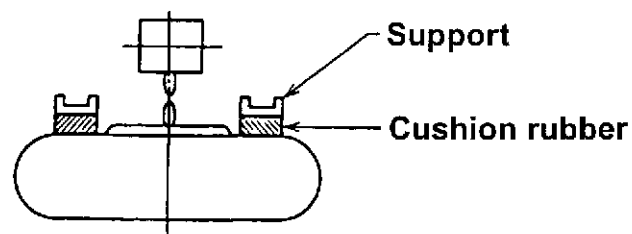
1) Disc Wheel Support

- The support should be so constructed as not to be deformed with a sufficient contact area with the disc wheel.
- Even if the tire to be carried is punctured, the structure gives adequate tightening resistance.



2) Tire Rubber Support

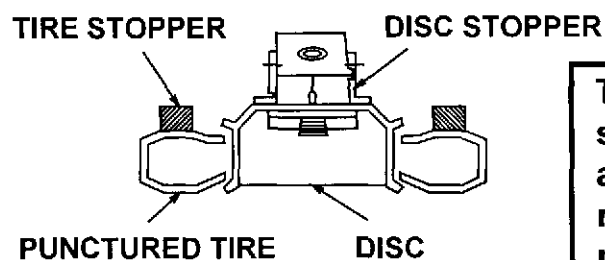
- If the tire is supported by the tire rubber itself, the distance between the supports is close to the maximum width of the tire and the supports are covered by cushion rubbers which are firmly fixed to the supports.
- If the tire to be carried is punctured, the structure gives adequate tightening resistance.



[NOTE]

- In the case of spare tire carrier with tire rubber support type, it is difficult to get adequate tightening resistance when the tire to be carried is punctured.

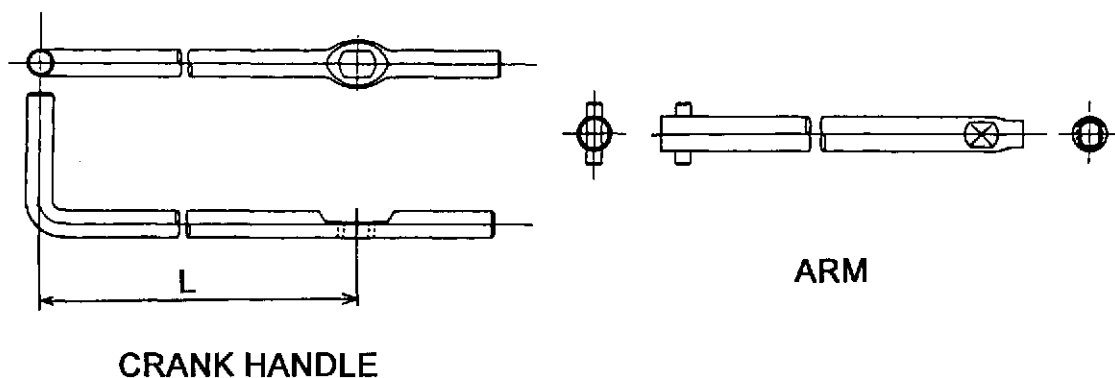
It is therefore advised to install the disc stopper to the carrier itself or construct a such that tire disc is contacted with installation bracket as following figure.



The carrier must have a stopper that will give adequate tightening resistance even with a punctured tire.

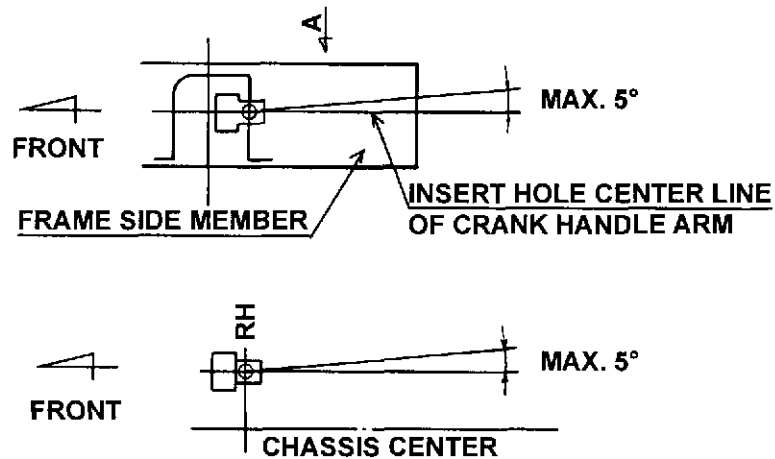
4. SPARE TIRE CARRIER HANDLE

- The size of the arm of the crank handle (L) must be the length to be able to achieve the carrier maker's recommended tightening torque.
- The length of the arm, make sure that the operation of the crank handle is not obstructed with other parts.



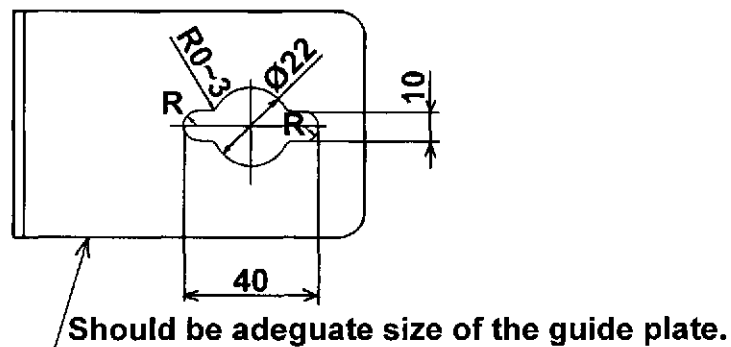
5. SPARE TIRE CARRIER HANDLE GUIDE

1) Install the Handle Guide as Following Figure;



VIEW A

2) Details of Handle Guide Hole



6. CAUTION PLATE FOR CARRIER TIGHTENING TORQUE

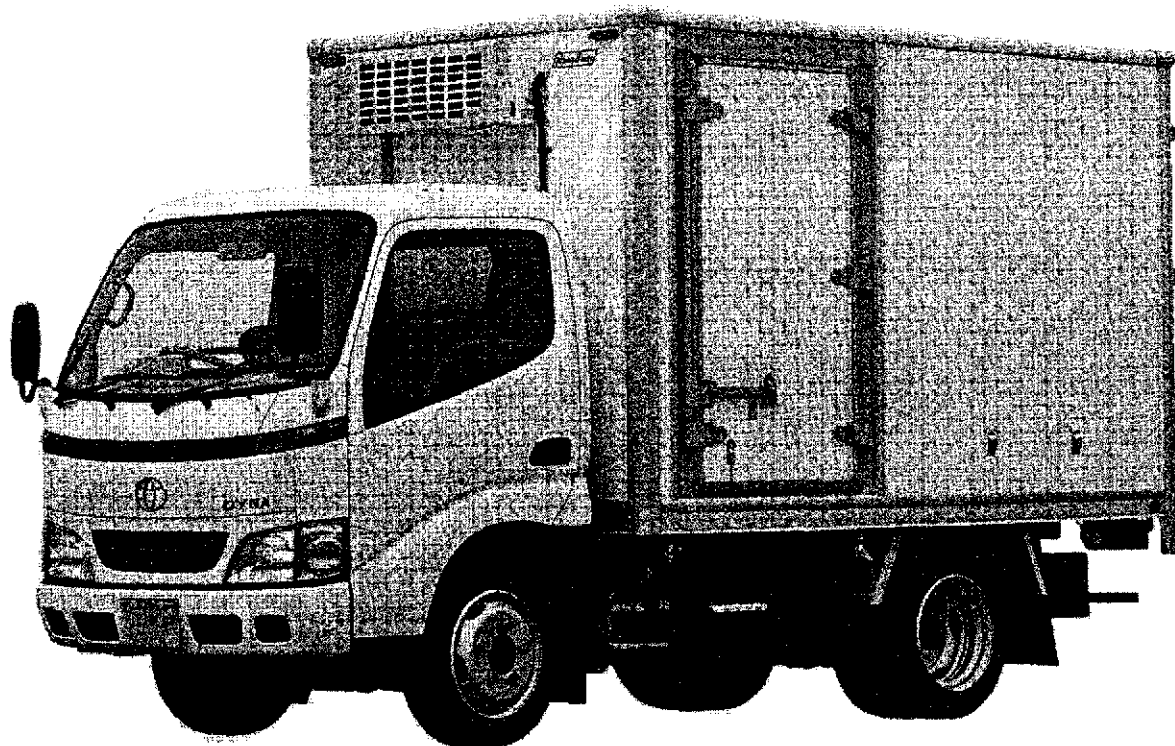
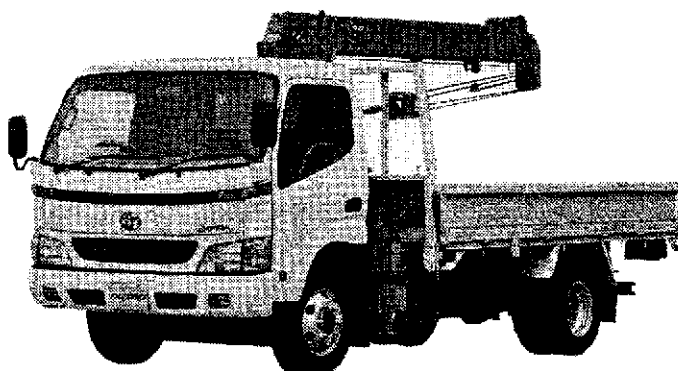
- Fit a caution plate showing the proper tightening torque for the carrier in a visible location as close as possible to the carrier.
- The style of the caution plate should be similar to that of a genuine TOYOTA caution plate.

12. BODY & EQUIPMENT MOUNTING

1. DESIGN OF BODY OR EQUIPMENT MOUNTING	12 - 2
2. SPACER	12 - 3
3. MOUNTING METHOD OF BODY OR EQUIPMENT	12 - 4
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FOR BODY MOUNTING	
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- Improper mounting of a body or equipment may cause cracks in the chassis frame or cause serious problems such as poor steerability.
- You should take particular care when designing and fitting a main sill (subframe).

If you intend to mount a body or equipment, be sure to observe the instructions given in this section.



1. DESIGN OF BODY OR EQUIPMENT MOUNTING

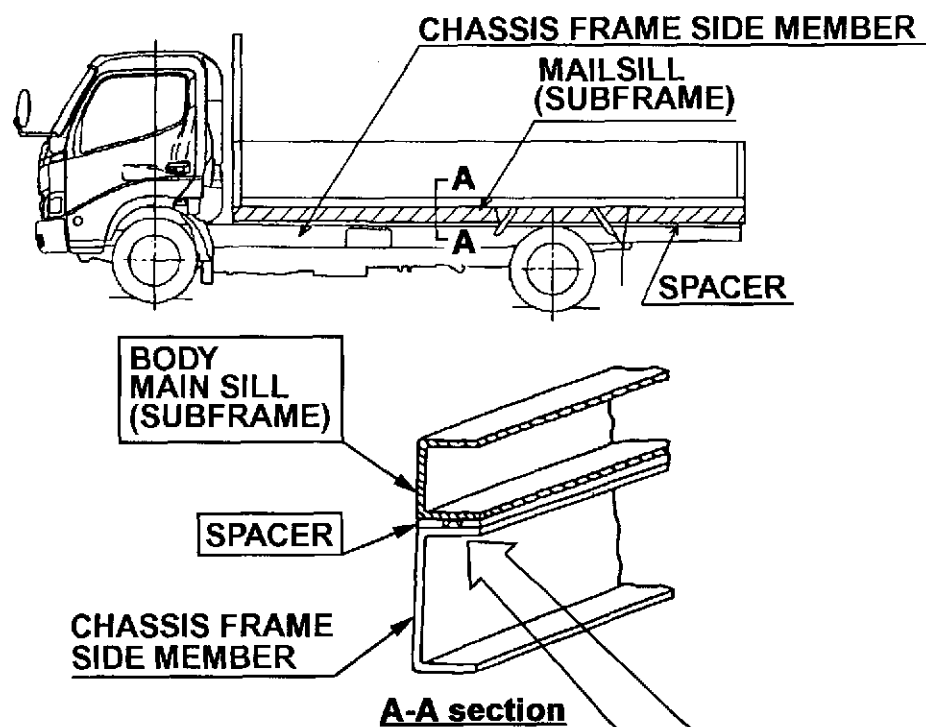
1) Main Sill (Subframe)

When mounting a body or equipment, always fit a main sill (subframe) on the top surface of the side member of the chassis frame.

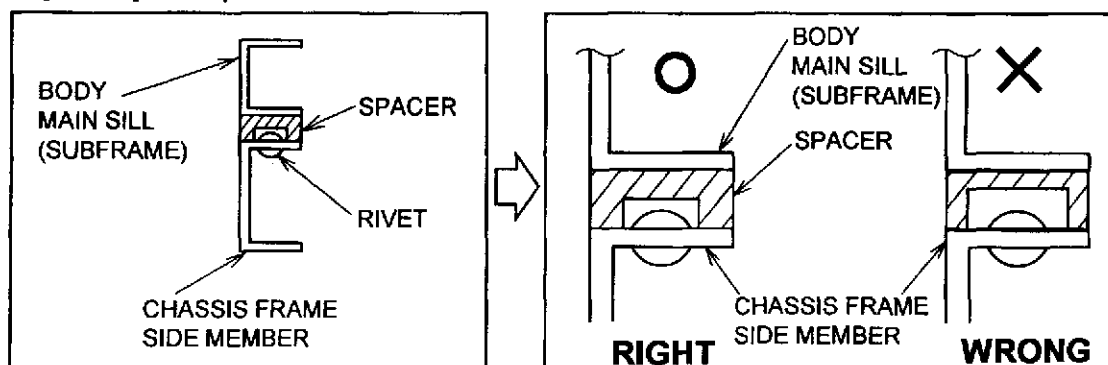
- (1) When mounting the main sill on top of the side member, be sure that you position it so as to disperse the stress placed on the frame by loading.

Also be sure to secure all mechanisms of the body equipment unit to the main sill, except for the combination parts between the main sill and the chassis frame.

Fit a spacer between the main sill and the side member to lift the main sill off the rivet heads of the frame side member.



[NOTE] The spacer should be structured to avoid deformation.



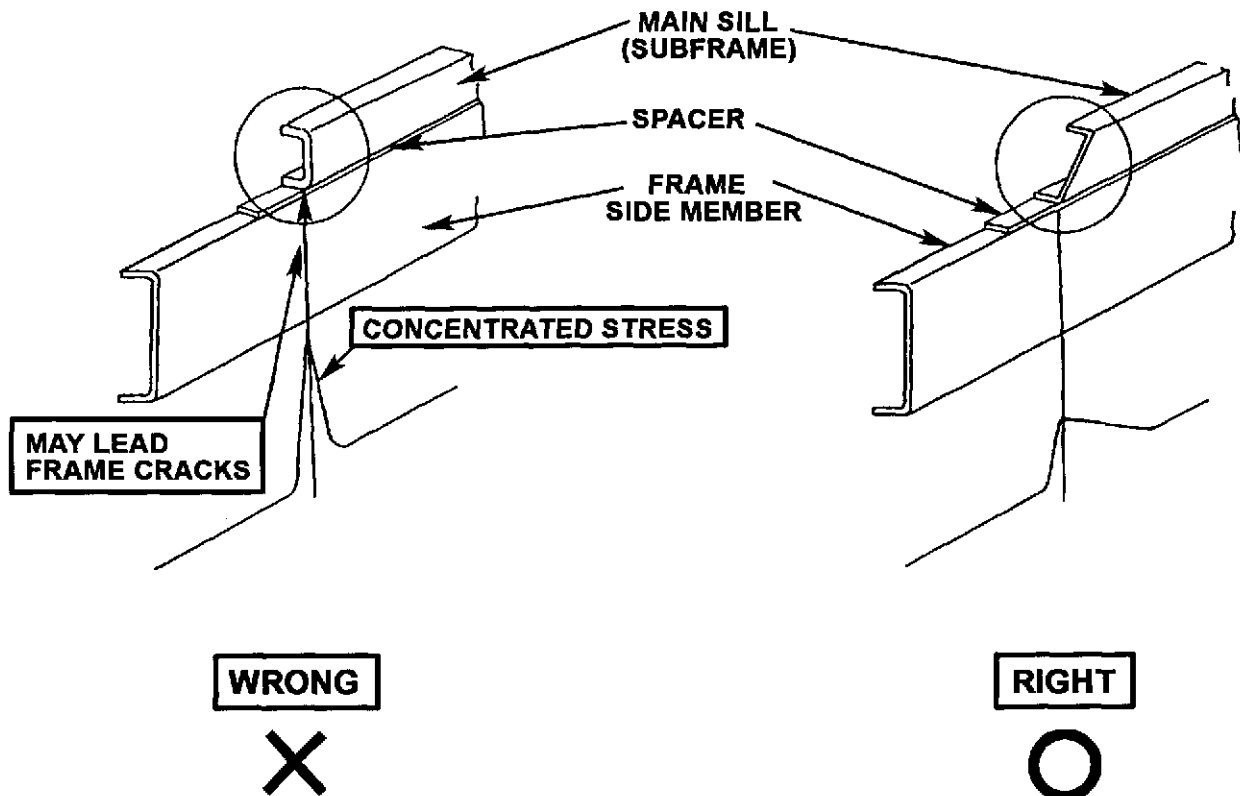
INSTALLATION DETAILS OF SPACER

- (2) Relation of concentrated stress to forward end shape of main sill.

Preventing concentrated stress around the forward end of the main sill (subframe).

If the section modulus at the forward end of the main sill (subframe) changes suddenly, this will place concentrated stress on the chassis frame and may lead to cracks in the side members.

When mounting a body or equipment, make sure that the section modulus at the forward end of the main sill (subframe) does not change suddenly.



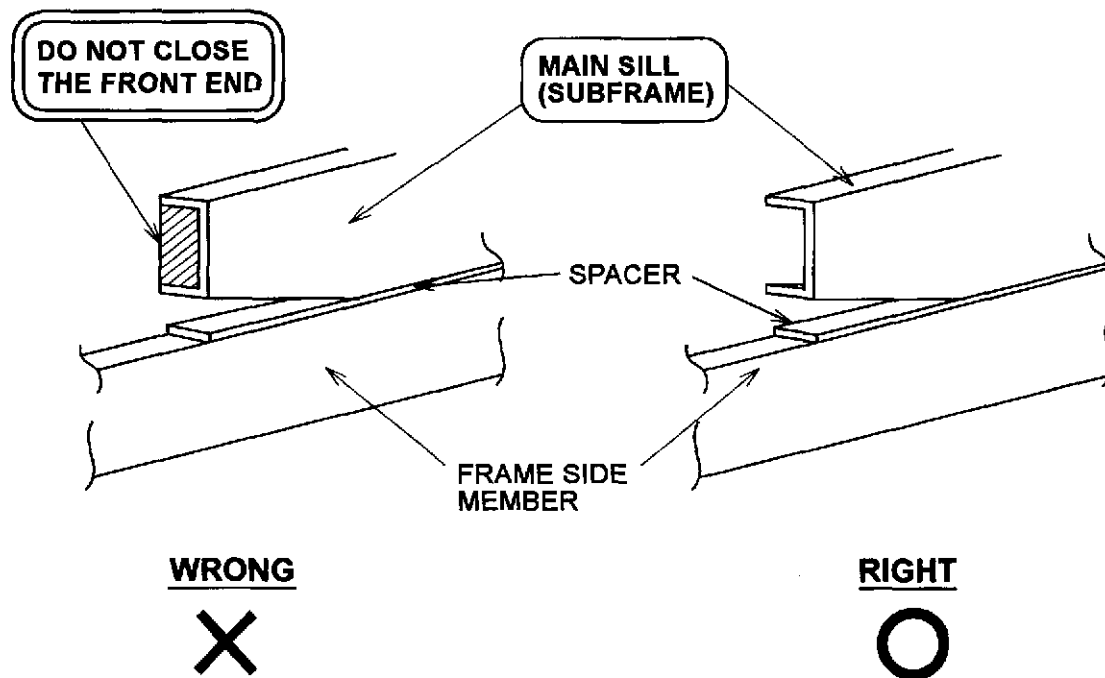
2) Forward End of Main Sill (Subframe)

- (1) The front end of the main sill, where it contacts the side member, must be shaped as shown in the drawings below.

UNIT:mm

MAIN SILL (SUBFRAME)	
MATERIAL	RECOMMENDED SHAPE OF FORWARD END
WOOD	Diagram illustrating the recommended shape of the forward end of a wooden main sill. The cross-section shows a tapered shape with a height H and a length $L = \frac{H}{2} \sim H$. A vertical dimension of APPROX. 5 is indicated.
PRESSED OR SHAPED STEEL	Diagram illustrating the recommended shape of the forward end of a pressed or shaped steel main sill. The cross-section shows a tapered shape with a height H and a length $L = \frac{3}{2}H \sim 2H$. A vertical dimension of APPROX. 5 is indicated.
PRESSED OR SHAPED STEEL	Diagram illustrating the recommended shape of the forward end of a pressed or shaped steel main sill. The cross-section shows a rectangular shape with a height of APPROX. $\frac{H}{3}$, a length of APPROX. $2H$, and a 45° chamfer on the top right corner. The total height is H.

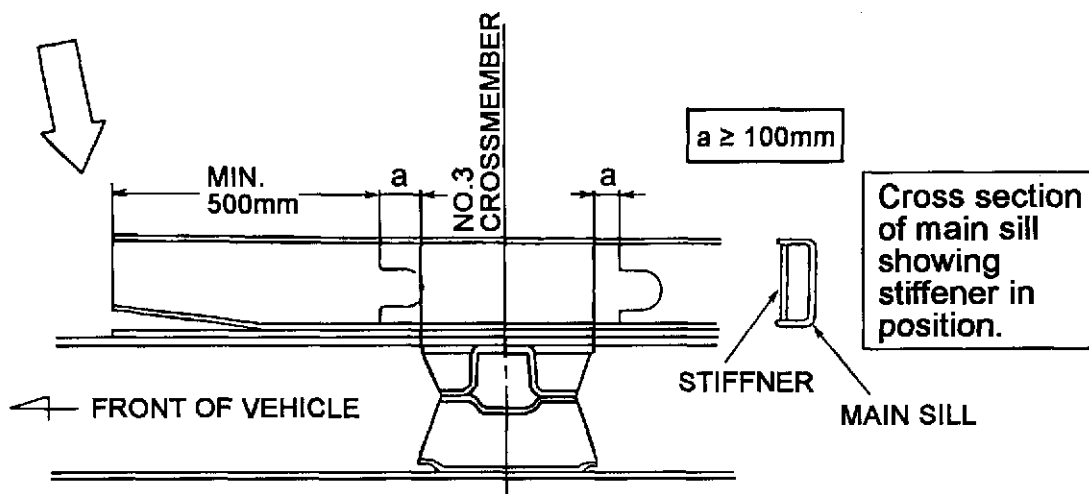
- (2) The front end of the main sill (subframe), which used pressed or shaped steel material, must not be closed as shown in the drawing below to avoid stress concentration.



3) Stiffening of Main Sill (Subframe)

When the main sill is to be strengthened using a stiffener, some distance must be kept between the stiffeners and the crossmembers of the chassis frame as shown below.

Never fit a crossmember at the forward end of the main sill.

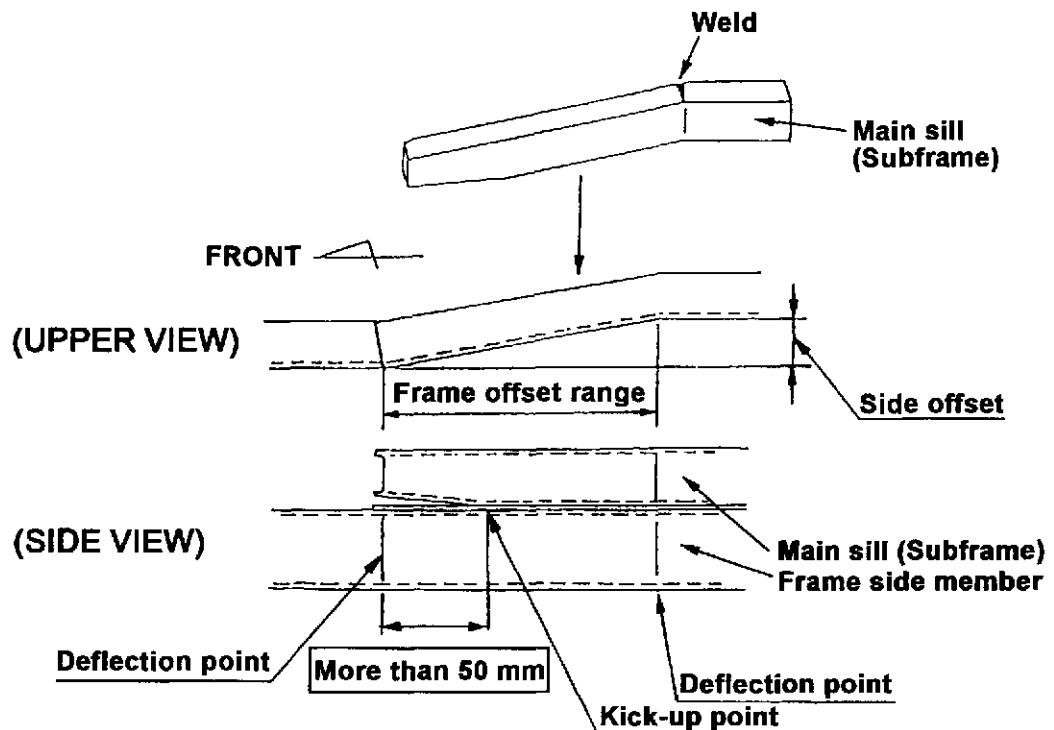


4) Main Sill Shape for Side Member with Side Offset

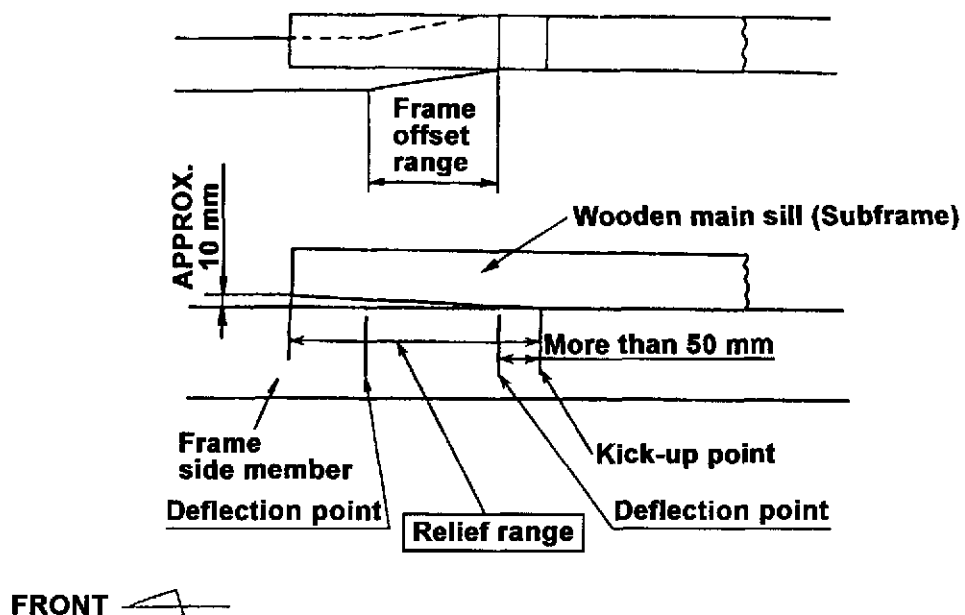
If the side member of the chassis frame has a side offset, the main sill must follow the contour of the side member.

The kick-up point of the main sill must be at least 50 mm from the deflection point of the side member in order to disperse stress.

• PRESSED OR SHAPED STEEL MAIN SILL

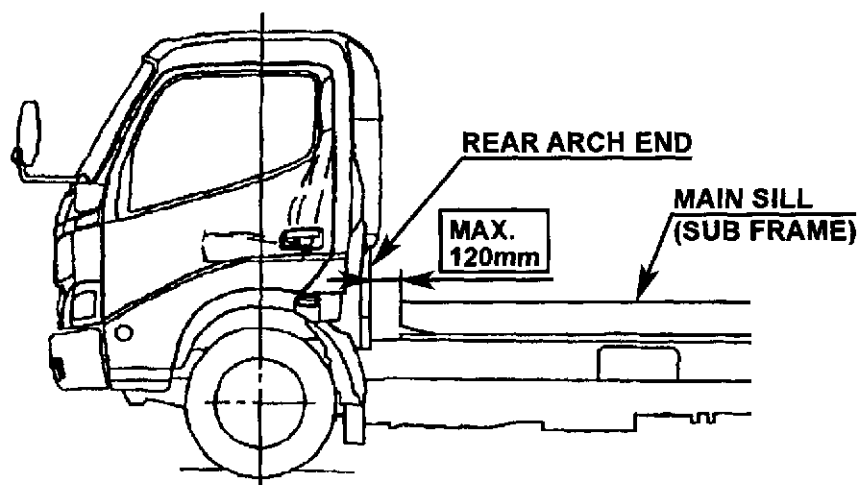


• WOODEN MAIN SILL



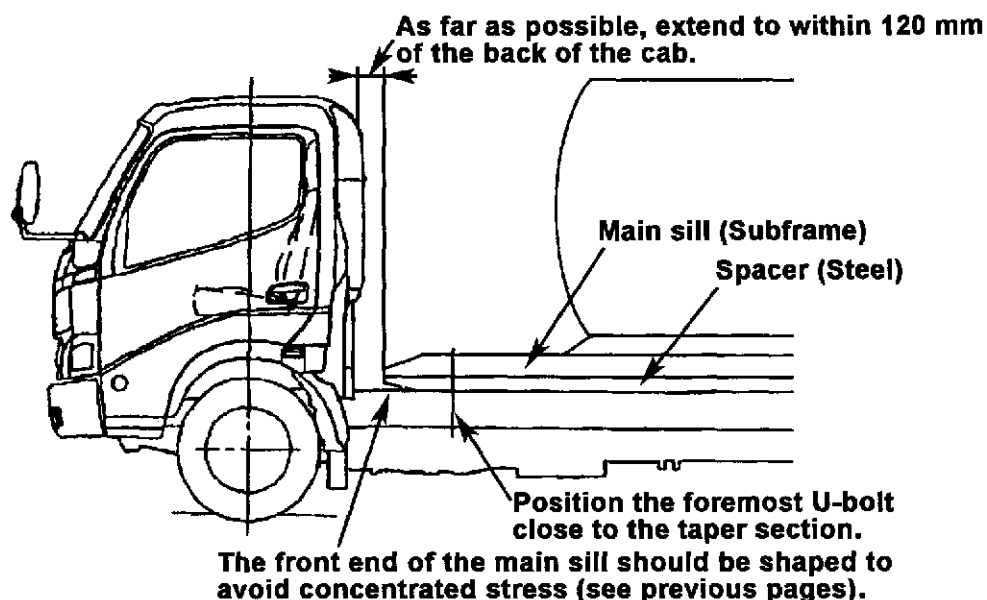
5) Extension of Main Sill (Subframe)

The main sill should extend as far as possible towards the back of the cab to minimize car-shake (vibration) and prevent the creation of weak areas in the frame side member.



6) Positioning Forward End of Main Sill for Rigidity of Body or Equipment

- For trucks with highly rigid bodies such as tank lorries, LPG lorries, and van body trucks (especially refrigerator trucks), etc., be sure to select the chassis model and design the body so that the main sill extends as far as possible toward the back of the cab.
- If for unavoidable reasons, such as axle mass distribution, you must leave a large gap between the body or equipment and the back of the cab, extend the main sill as far as possible toward the back of the cab and secure it firmly to the chassis frame.



7) Required High Rigidity of Main Sill (Subframe)

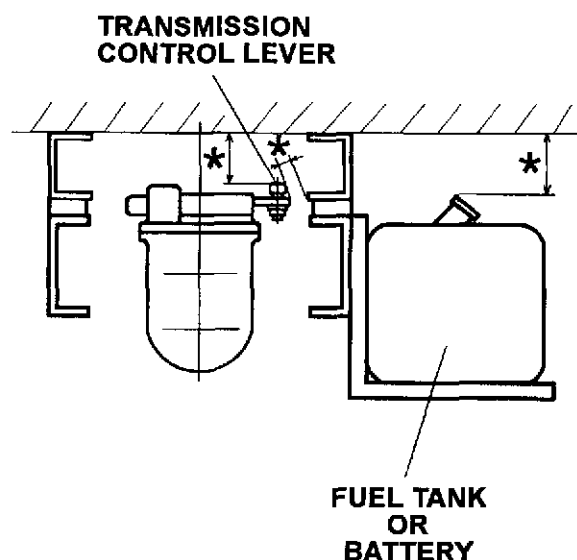
- For the vehicle mounting a heavy body or carrying a heavy load goods, determine the main sill (subframe) having enough rigidity to support the loading goods and evenly dispersing the load to the frame side member after carefully studying the strength of the chassis frame and main sill (subframe).

8) Avoiding Sudden Change of Rigidity around No.3 Crossmember

- The part around No.3 crossmember is easy to occur stress concentration due to constantly receiving the high bending and torsional force under operation of the vehicle.
- Be sure to avoid such structure around No.3 crossmember of the main sill (subframe) and body or equipment as sudden change of section modulus or rigidity.

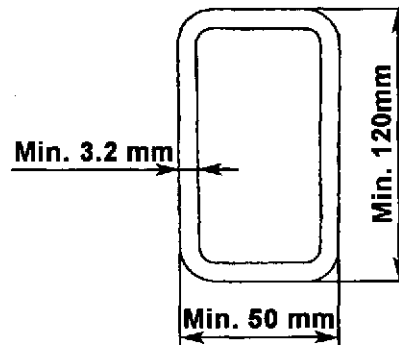
9) To Keep Enough Clearance with Chassis Component Parts

- Construct the main sill (subframe) to keep enough clearance with chassis component parts taking account of the full bound or control stroke movement of the transmission control lever, fuel tank and battery which are projected from upper surface of the frame side member and other parts of chassis even moving during operation.



10) Rear Body Length and Dimensions of Main Sill (Subframe)

- For the vehicles having a long rear body, the sectional area of the main sill (subframe) of the rear body should be set to a value greater than shown in the drawing.

**11) Main Sill (Subframe) of Long Wheelbase Vehicles**

- A steel main sill (subframe) should be used for the long wheelbase vehicles.
- The use of a wooden or aluminum main sill (subframe) may bend the frame side members, often making the rear deck gate inoperable.
- With regard to vehicles with a concentrated load having a long wheelbase, use the standard pressure-rolled structural steel material SS41 (Min. 120 mm high by 50 mm wide by 3.2 mm thick) or the like.

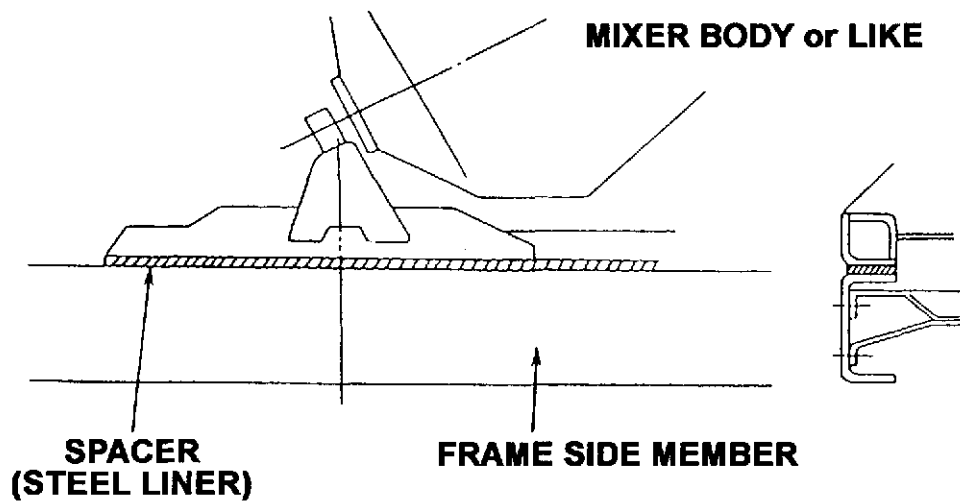
12) Provision Water Drain Hole of Main Sill(Subframe)

- In the case of using a lip-formed steel ( channel-shaped) or  closed section steel for the main sill (subframe) and cross sill, water may deposit in the formed or closed steel often causing rust.
- Be sure to provide a drain hole at a place where no strength problem is occurred.

2. SPACER

When installing a main sill, insert a spacer between the side member of the chassis frame and the main sill to lift the main sill clear of the rivets in the upper surface of the frame.

If the body to be mounted will apply a concentrated load to the chassis frame as concrete mixer body or like, the spacer should be made of a high strength material such as steel liner.

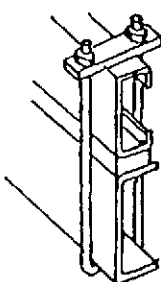
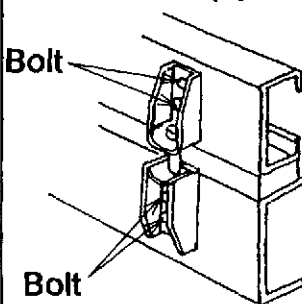
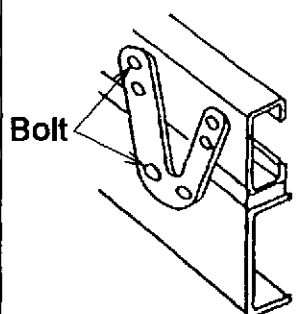


3. MOUNTING METHOD OF BODY OR EQUIPMENT

1) How to Install the Main Sill (Subframe)

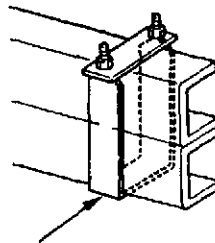
- (1) Install the main sill (subframe) of the body or equipment on the chassis using U-bolts or brackets.

The details of mounting methods are shown in the drawings below.

MOUNTING METHOD	DISCRIPTION
U-bolt 	This mounting method is most commonly used because there is no need to modify the chassis and it gives suitable flexibility.
Bracket (1) 	This mounting method is used where U-bolts cannot be fitted owing to the shape of the body to be mounted, e.g. with tanker bodies.
Bracket (2) 	This type of mounting bracket must only be used together with U-bolts and bolt-type mounting brackets. It gives additional rigidity by preventing the main sill from shifting longitudinally (forward and backward).

- (2) If the main sill (subframe) even if made of steel to be secured to the chassis, should not be fixed on the frame by welding or bolting on the frame upper flange.

- (3) If it is difficult to allow a clearance to the chassis parts, use U-bolts made from steel sheet.



U-bolt (made by steel sheet)

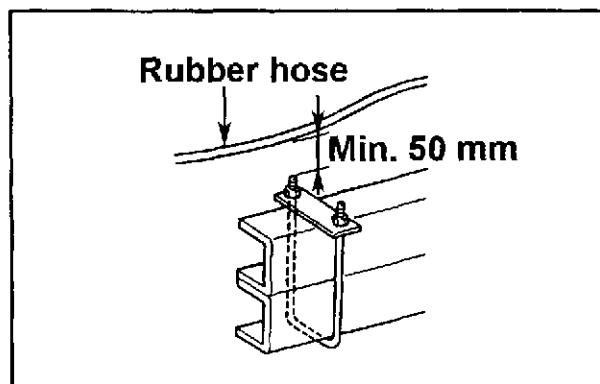
- (4) For the locations of the U-bolts used when mounting ordinary body or equipment, see the U-bolt Mounting Position Drawing in the Body Builder's Guide for the respective model series.
- (5) For the chassis frame with a -shaped cross section, install a appropriate props at the U-bolt tightening section to prevent deformation of the flange on the frame side member.

Refer to Installation Method of U-bolts for more details of the props.

- (6) Install main sill (subframe) tightening U-bolts and a appropriate props in such a manner that they do not touch harness wires, brake pipes, and hoses and that these parts can be inspected, serviced, removed, and reinstalled later.

Allow sufficient clearances around rubber hoses because they will move while the vehicle in running.

The gap to the rubber hose must be 50 mm or more and the gaps to the brake pipe and valve must be 15 mm or more.

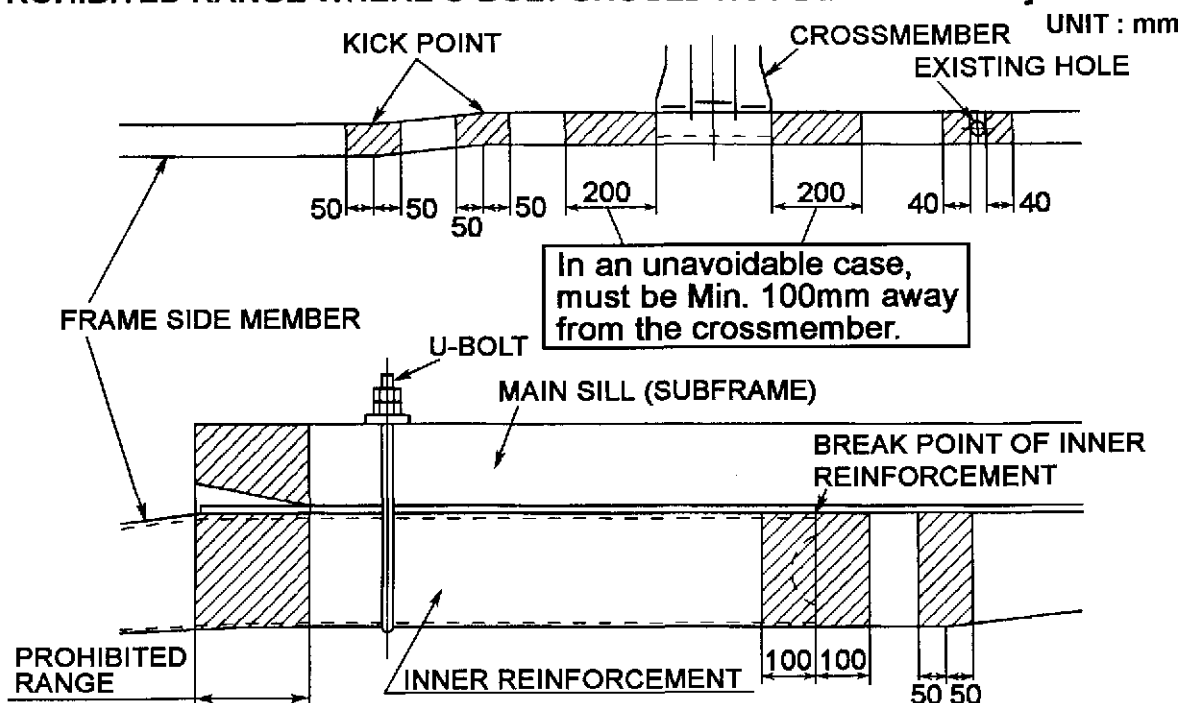


- (7) When a prop is required around the exhaust pipe and muffler, use a steel prop.

(8) It is desirable to install the U-bolts at the U-bolt mounting positions (standard positions) shown on the below. Installing U-bolts at other positions will impair the frame strength. As a rule, do not install U-bolts at the positions listed below. If it is unavoidable to install U-bolts at prohibited positions, carefully verify the frame strength.

- a. Point where there is a difference in level on the chassis frame (frame kick point) and the side offset point (side kick point)
→ The U-bolt mounting position must be 50 mm or more away from the frame kick point.
- b. Existing hole in the flange of the frame side rail
→ The U-bolt mounting position must be 40 mm or more away from the existing hole.
- c. Break point of the frame's inner or outer reinforcement (the section modulus change greatly)
→ The U-bolt mounting position must be 100 mm or more away from the break point of the inner or outer reinforcement.
- d. Near the crossmember
→ As a rule, the U-bolt mounting position must be 200 mm or more away from the crossmember. If impossible, the U-bolt must be at least 100 mm away from the crossmember.
- e. Stress release point at front end of main sill (subframe).
- f. The details where U-bolt should be installed, see the Body Mounting Manual for the respective model series.

[PROHIBITED RANGE WHERE U-BOLT SHOULD NOT BE INSTALLED]



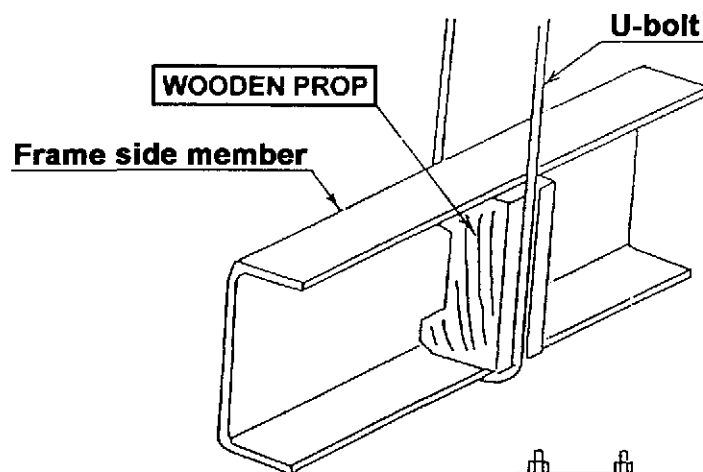
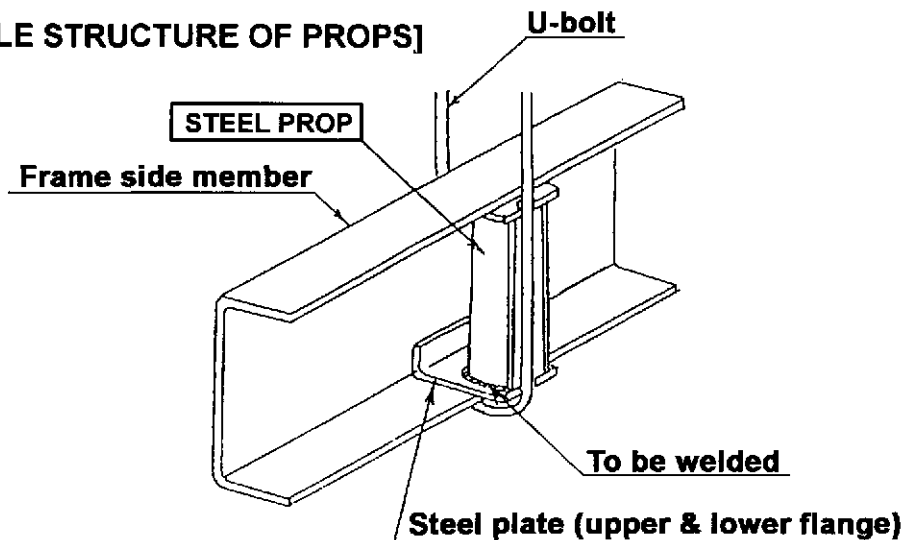
2) Installation Method of U-bolts

For the frame side member which is fastened with a U-bolt, use appropriate props to support the frame side member so that the lower flange may not be deformed.

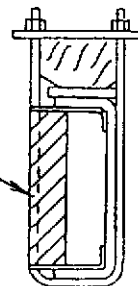
Sufficient clearance should be allowed to prevent the props from contacting brake pipes, hoses, cables, harness wires etc.

In an area close to the muffler, use a steel prop to prevent burning.

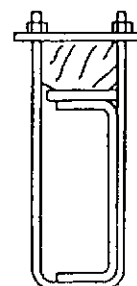
[EXAMPLE STRUCTURE OF PROPS]



INSTALL PROP

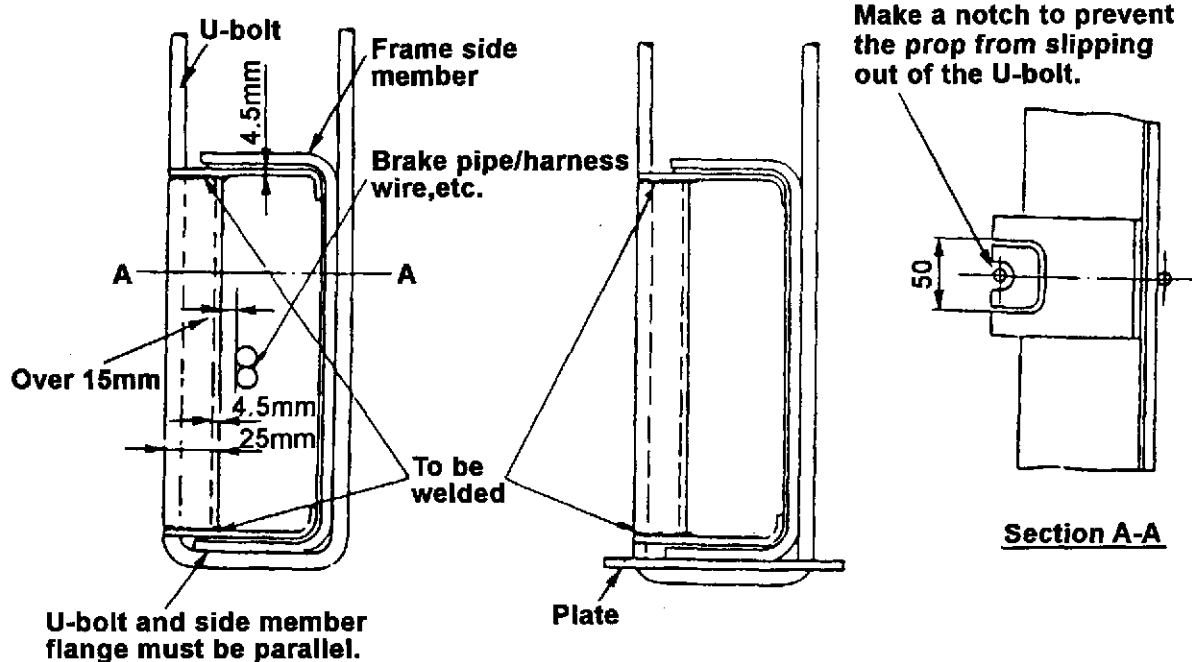
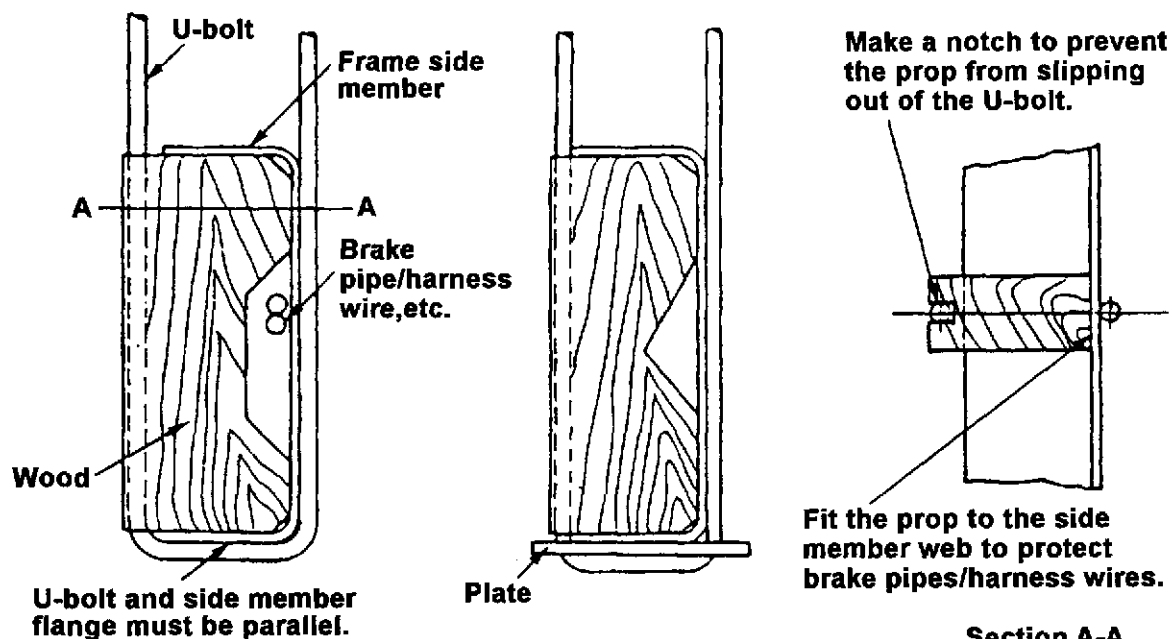


RIGHT



WRONG

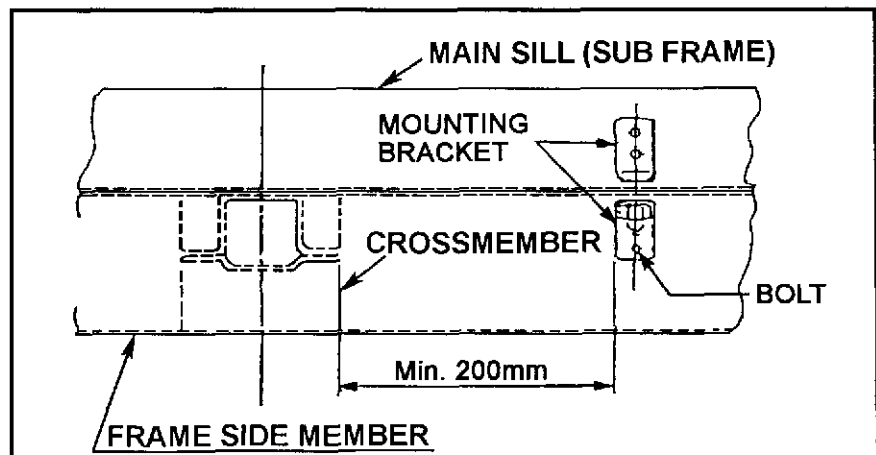


[DETAILS OF INSTALLATION]**DETAIL OF INSTALLATION OF STEEL PROP****DETAIL OF INSTALLATION OF WOODEN PROP**

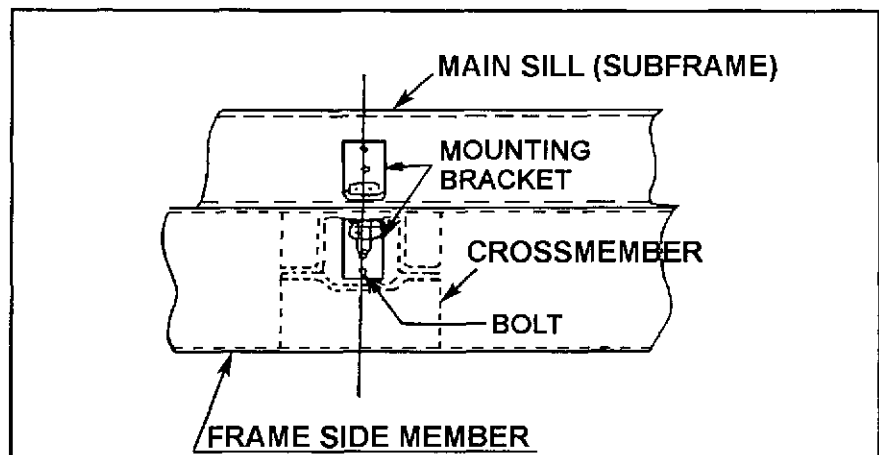
3) Use of Mounting Brackets

Follow the cautions below in the case where it is unavoidable to use mounting brackets because of the inability of installing a U-bolt due to the mounted body or equipment structure.

- (1) Installing mounting brackets near crossmembers may place high stress on the side member. Mounting brackets must therefore be positioned at least 200 mm away from the any crossmembers.



- (2) If the mounting brackets must be mounted within 200 mm of the end of crossmember, they should be positioned at the center of crossmember.



- (3) Secure mounting brackets to the chassis frame side member with bolts.

Be sure not to damage brake pipes or harness wires when drilling holes in the chassis frame.

For a general description of how to drill holes in the chassis frame, see clause "2. CHASSIS FRAME".

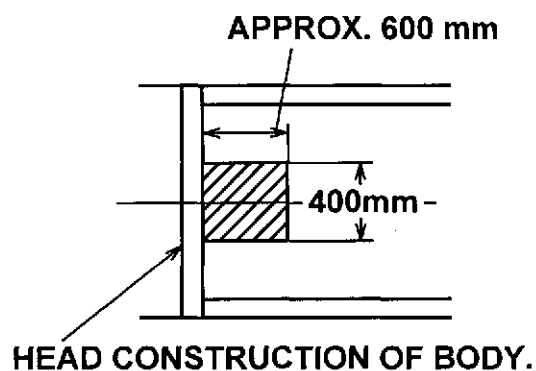
4. INSPECTION LIDS

To facilitate inspection and maintenance of the transmission and rear axle, wherever possible, install inspection lids in the floor of the body or equipment.

1) Transmission Inspection Lid

In forward control vehicles, the transmission is located behind the cab.

An inspection lid should be positioned as shown in the drawing below to facilitate inspection and maintenance.



5. REAR FENDER

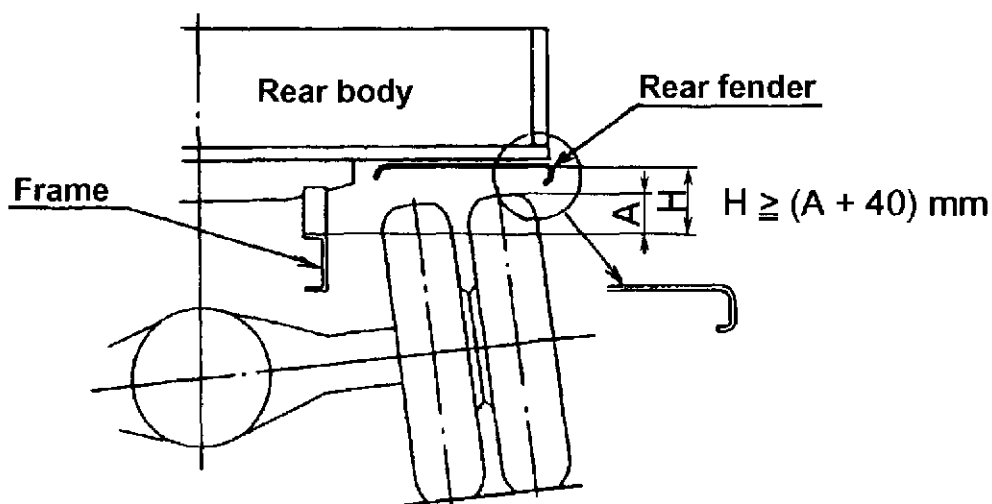
1) Precautions for Installing Rear Fenders

- (1) Install the rear fenders conforming to vehicle safety regulations, and allow sufficient clearance between the tires and the floor of the body or equipment so that the tires do not contact the fenders.

For details of clearances, see Maximum Vertical Deflection of Rear Wheels in the Body Builder's Guide for the respective model series.

If there is a possibility that tire chains may have to be fitted, you should allow an extra clearance of 50 mm.

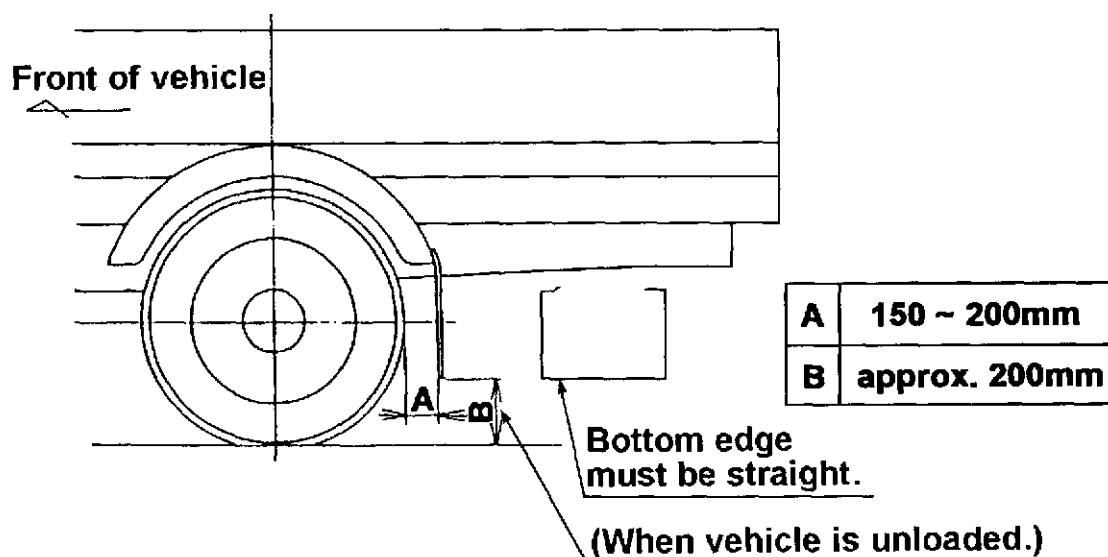
- (2) For safety and extra rigidity, the outer edge of the rear fender should turn inward as shown in the drawing below. The inside edge should also be turned inward of rigidity.



- (3) The outer edge of the fender should project at least 10 mm beyond the side of the tire and provided the overall width of the fender does not exceed overall width of the vehicle.

2) Mud Flaps on Rear Fenders

- (1) Install the mud flaps on rear fenders in consideration of protection effectiveness of splashing mud, water, etc., prevention to be caught by the tire and clearance with exhaust tail pipe, etc.
- (2) When fitting mud flaps, be sure to observe the clearances shown in the drawing below.
Be sure that the mud flaps comply with local regulations.

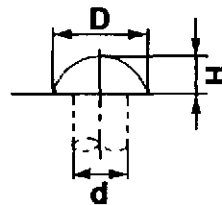


6. CHASSIS FRAME

1) Rivet Dimensions

The drawing below shows the dimensions of the rivets used in the chassis frame.

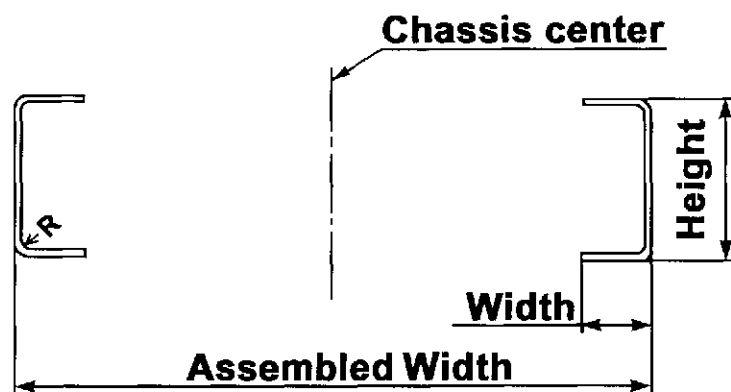
When mounting a main sill (subframe) you will need to allow holes to accommodate the rivet heads either in the main sill itself or in a spacer.



UNIT:mm

d	D	H	Locations Used
ø10	ø16	7	Crossmembers (top and bottom faces of side member)
ø11	ø18	8	Crossmembers (top and bottom faces of side member)

2) Tolerances of Chassis Frame Assembly Width and Height



UNIT : mm

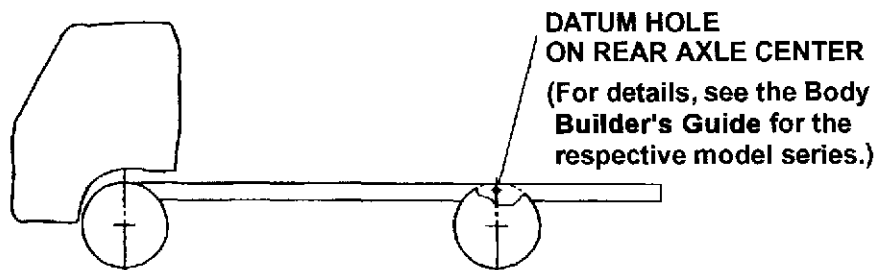
CAB TYPE	Assembled width	Height	Width
STANDARD	±2	+1 0	+3 0
WIDE		+1 0	+3 0

7. BODY OFFSET

For mounting the dump or concrete mixer body, determine the body offset as small as possible in order to get enough load on the rear tires getting good driving ability on unpaved road.

8. DATUM HOLE ON REAR AXLE CENTER FOR BODY MOUNTING

When body offset position on the chassis frame is to be determined, make use of rear axle datum line holes (ø9) on the frame side member.



9. INSTALLATION OF UNDER RUN PROTECTION

In the case of installing the under run protection parts as side guard and rear bumper, etc. to comply with local vehicle regulation, install it after carefully studying the following points;

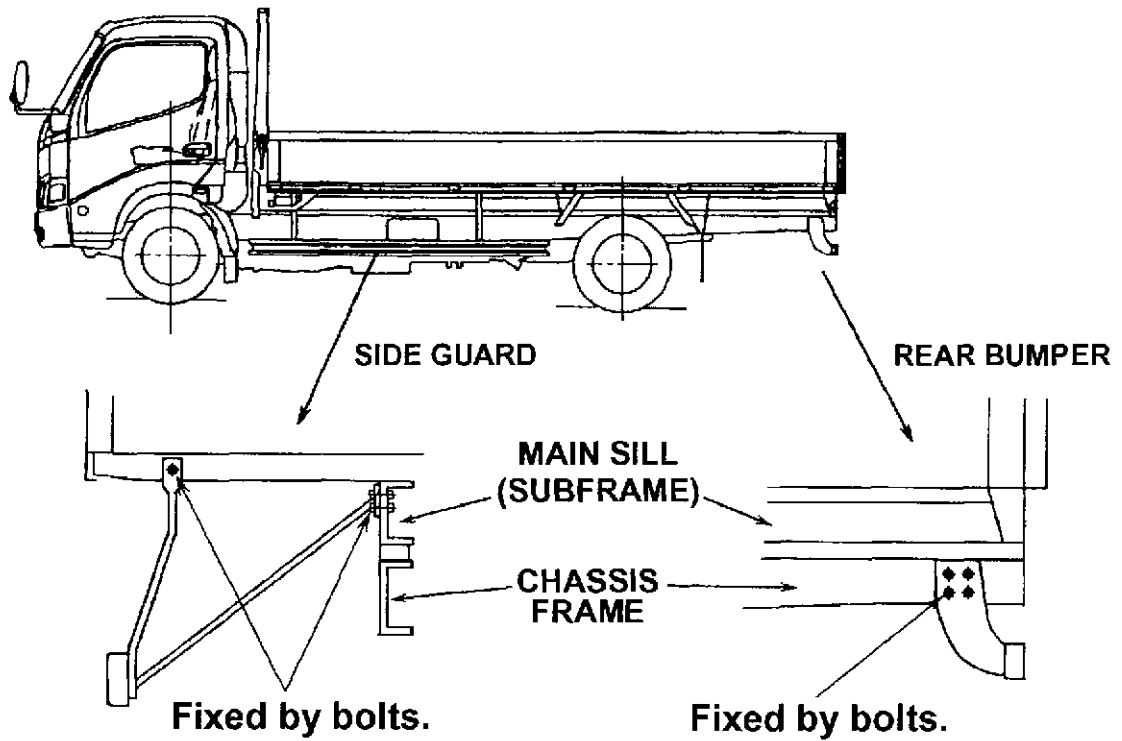
- (1) Dimensions and shape must be complied with regulation.
(ground height, size and shape of parts)
- (2) Strength of installation and parts it's self must also be complied with regulation.
- (3) Installation must be by bolts to the cross sill or main sill (subframe) of body and should be detachable construction.

Be sure not to install it to the chassis frame side member, fuel tank or battery support.

- (4) Be sure not to obstruct the service and maintenance ability for chassis component parts.

- Easy inspection of electrolyte level and easy removal of the battery.
- Easy filling and easy removal and replacement of filler cap of the fuel tank.
- Easy removal and easy installation of the spare tire.
- Opening and closing of the tool box cover.

- (5) Be sure to avoid near the mouth of exhaust tail pipe for preventing dirty by the exhaust gas and abnormal exhaust noise.



10. REAR BODY

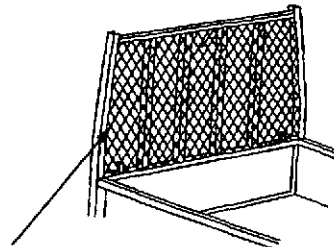
- In order to prevent intrusion of dust and exhaust gas into the rear body, securely seal all the holes and apertures in the body floor (deck) except water drain hole as dump body.
- Don't remove the insulator from base vehicle.
- When mounting a rear body, must be taken the following precautions;

1) Prevention of Cargo Drop

Each customer (driver) is responsible for preventing his/her cargo from falling.

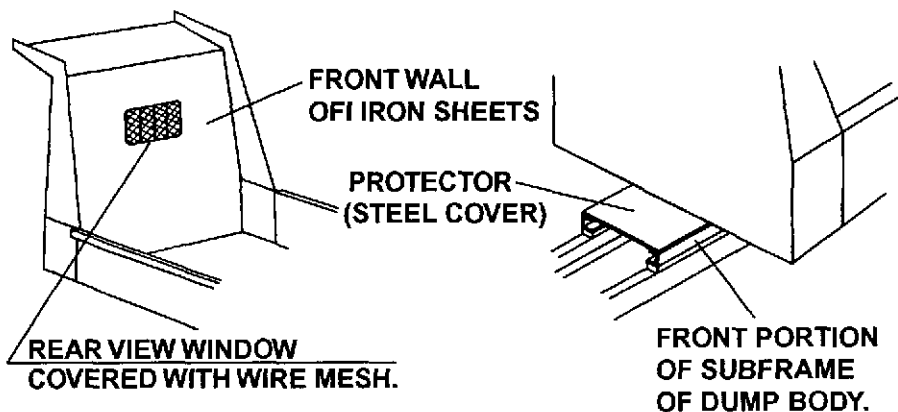
The body-builder therefore is required to take a measure for cargo-fall prevention most suitable for the normal cargo of the particular customer.

- (1) Since the general cargo can be bound only laterally, the front portion of the deck is effectively covered with a wire mesh or iron sheets.

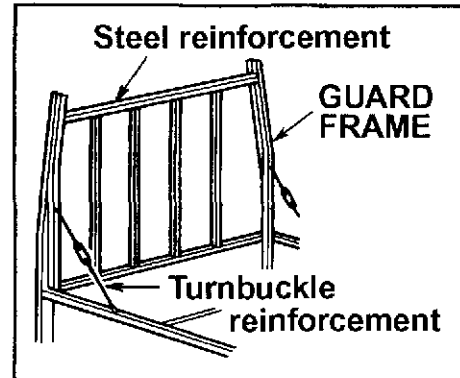


**COVERED WITH WIRE MESH
OR IRON SHEETS.**

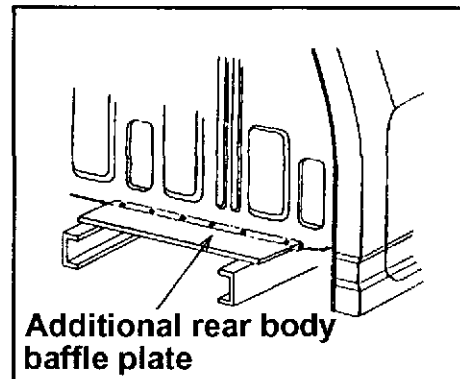
- (2) In the case of dump body, a rear view window on the front wall of the vessel is effectively covered with a wire mesh and a protector (steel cover) must be also installed on front portion on the subframe.



- (3) In the case of vehicles for carrying long or heavy objects, take adequate care in reinforcing the guard frame and the connection between the guard frame and the floor.

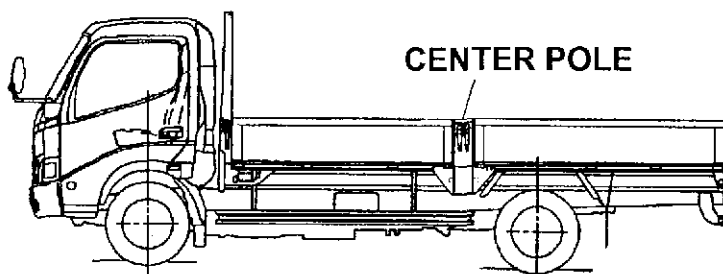


- (4) In case that the clearance between cab and rear body (special equipment) increases (60 mm or more) due to special equipment mounting, take such a construction to prevent from loading goods falling by the addition of a plate and so on.

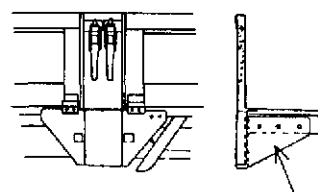


2) Building Side Gate of Separate Type

- For the side gate of the rear body which is open deck cargo body, recommend a three-way open gate type (rigid piece side gate) keeping bending rigidity of rear body to avoid deformation of the chassis frame rear overhang.
- In change the side gate of rear body from rigid piece to separate type, provide the center pole at forward position of rear axle between wheelbase.
- And be sure to reinforce the center pole to keep the bending rigidity same with rigid piece of side gate.



**CENTER POLE
MUST BE PROVIDED
AT FORWARD POSITION
OF REAR AXLE.**



Reinforcing member

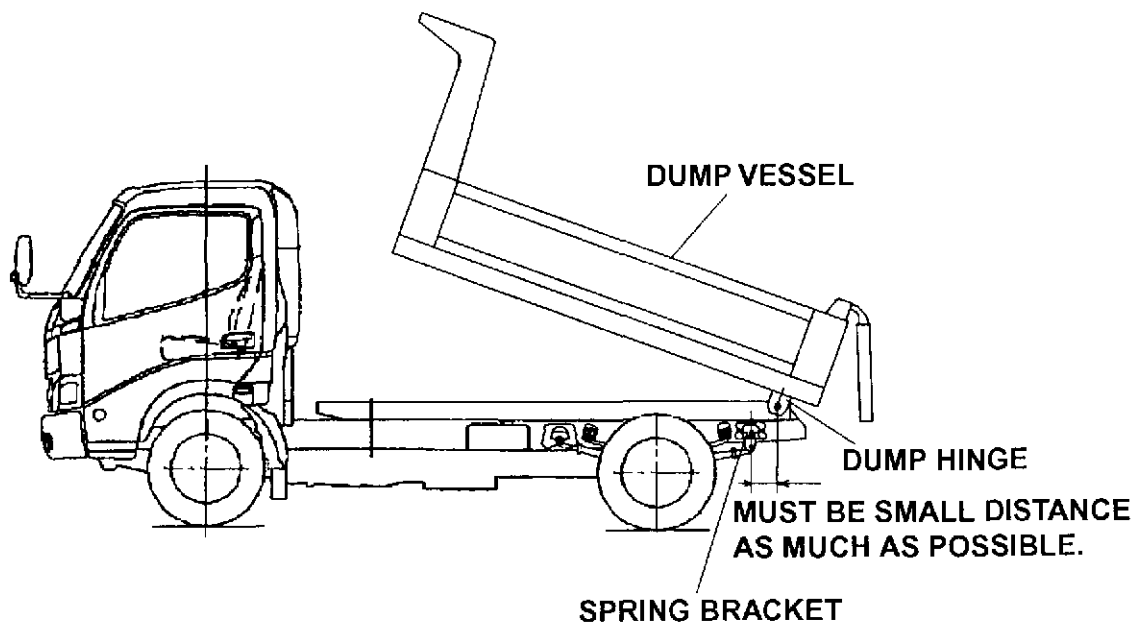
REINFORCING DETAILS OF CENTER POLE

11. MOUNTING OF SPECIAL REAR BODY

1) Precautions for Mounting the Dump Body

(1) Dump hinge position

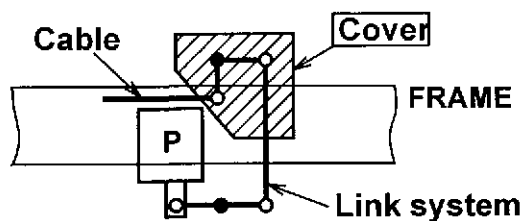
- To ensure stability of the vehicle when the rear body (dump vessel) is raised, the dump hinge must be installed as close to the rear spring bracket as possible.



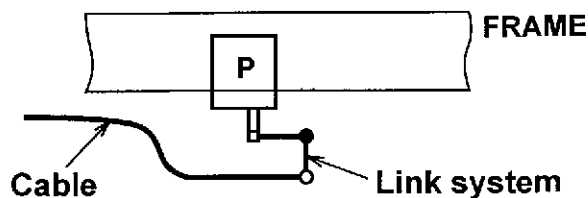
(2) Measures directed toward the dump control system

- To prevent accidental operation of the dump body during vehicle inspection or maintenance, you should observe the following precautions and fit a protector to the control system.
 - a. Make sure that the control link system cannot be reached from the upper side of the frame.

Example 1 : Mount a large cover over the link system.

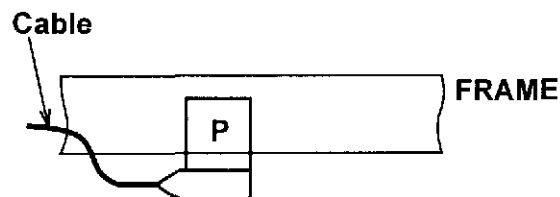


Example 2 : Install the link system on the underside of the frame.



Example 3:

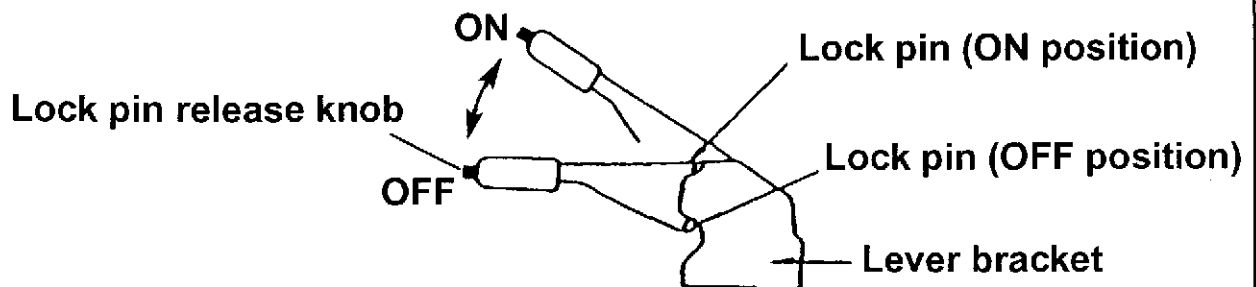
Connect the control cable directly to the hydraulic pump to eliminate the need for intermediate link levers, etc.



- b. Make sure that the link levers are easily accessible for lubrication or if possible use oilless link levers.

Examples :

- Fit the lubrication port on the side of the frame
 - Mount the link levers so that they can be lubricated from the underside of the chassis frame, without raising the load platform.
 - Use an oilless link system.
- c. Make sure that any operating levers inside the cab lock automatically in both ON and OFF positions.



- d. Precaution for routing the dump control cable

The dump control lever was installed as optional equipment when the chassis was assembled.

Design and install the control cable while mounting the rear body.

Route the cable in such a manner that it does not touch the edges of the frame and brackets and the movable portions such as various control links and engine.

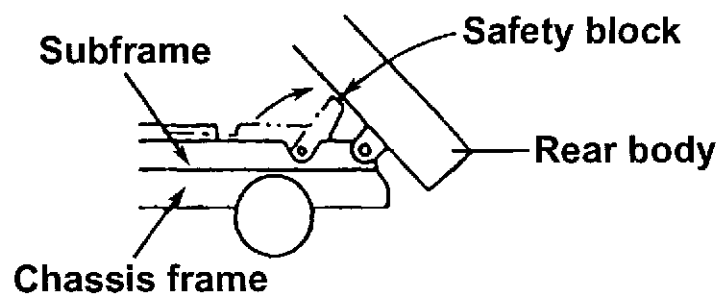
After routing the dump control cable, check that it does not touch the above edges and movable portions. Do not forget to check that the dump control lever does not touch the shift lever by operating the shift lever.

(3) About the safety block

- a. The structure of the safety block (or safety rod) must be designed so that it can be locked and released easily.

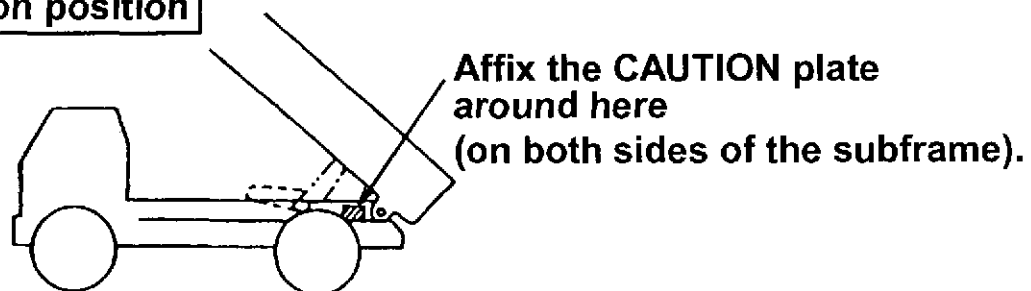
Example of structure:

The safety block (or safety rod) is installed on the subframe and it is turned up or down (manually).



- b. Inside the cab and also the both sides of the subframe, affix a CAUTION plate explaining the cautions about the handling of the safety block, near the safety block (or safety rod).

Inside the cab and also the both sides of the subframe, affix the CAUTION plate explaining the precautions to be followed when the rear body is raised.

Affixation position**(4) About the instruction manual**

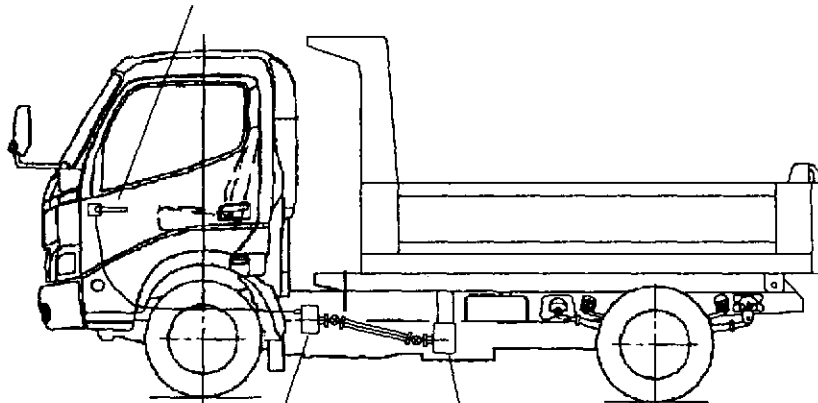
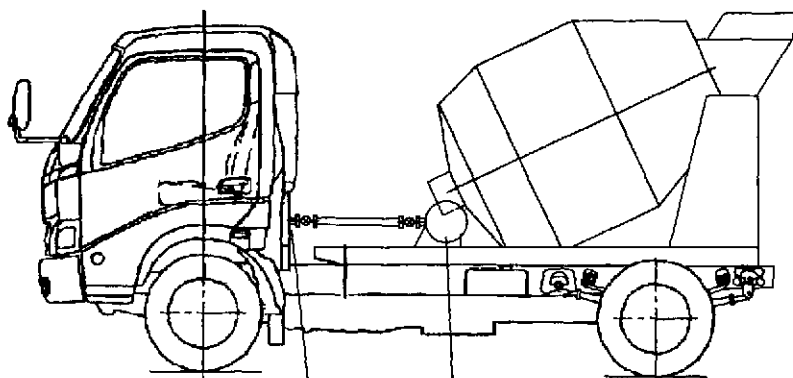
In the Instruction Manual, explain the following topics in an easy style:

- How to operate the dump system
- How to operate the safety block and dump lever lock

13. BODY & EQUIPMENT CONTROLS

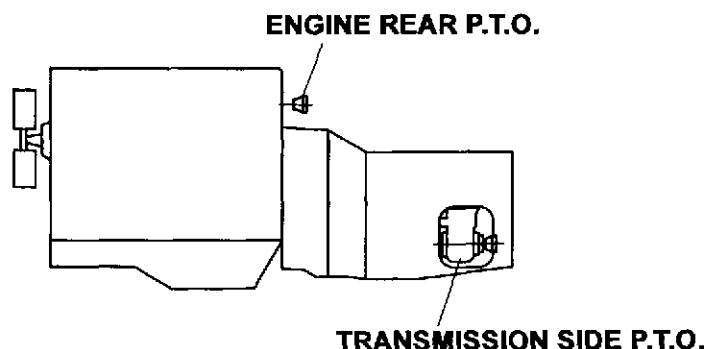
- 1. POWER TAKE OFF (P.T.O.) 13 - 2**
- 2. P.T.O. (POWER TAKE OFF) DRIVE SHAFT 13 - 3**
- 3. ENGINE CONTROLS FOR BODY OR EQUIPMENT 13 - 4**
- 4. ENGINE CONTROLS FOR MECHANICAL GOVERNOR 13 - 5**
- 5. P.T.O. CONTROL (TRANSMISSION SIDE P.T.O.)..... 13 - 6**

- After mounting a body or equipment, you may need to take a power supply from the chassis and fit controls for the body or equipment.
- When making these modifications, be sure to observe the following precautions.

BODY CONTROL LEVER**TRANSMISSION P.T.O. DEVICE
(POWER TAKE OFF) (EX. OIL PUMP FOR BODY OR EQUIPMENT.)****ENGINE REAR P.T.O. DEVICE
(EX. OIL PUMP FOR BODY OR EQUIPMENT.)**

1. POWER TAKE OFF (P.T.O.)

- DYNA series may be provided the Power Take Off (P.T.O.) in described following figure as an option equipment.



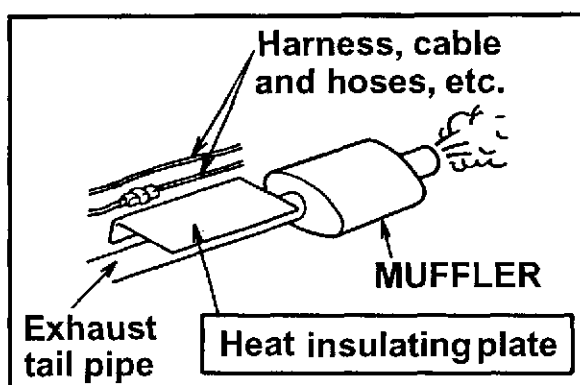
1) General Precautions of P.T.O.

- (1) For the P.T.O. fixed to transmission or engine, never permit the unit to exceed the torque and r.p.m. recommended by TOYOTA.

[EXAMPLE FOR TRANSMISSION SIDE P.T.O.]

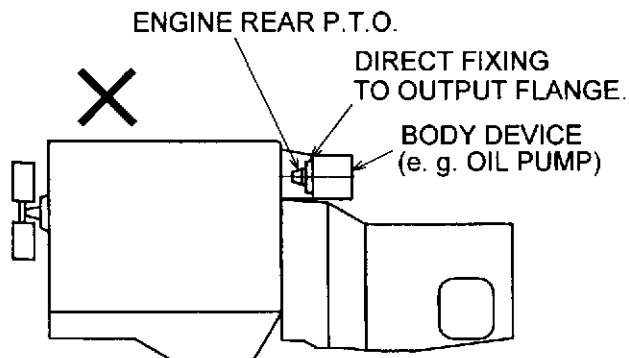
TRANSMISSION SERIES	PERMISSIBLE TORQUE (N·m{kgf·m})	RECOMMENDED r.p.m.
H260	Max. 245 {25}	Max. 1,000 r.p.m.
H350	Max. 245 {25}	Max. 1,000 r.p.m.
A443E	Max. 245 {25}	Max. 1,000 r.p.m.

- For details of permissible torque and recommended r.p.m., see the Body Builder's Guide for the respective model series.
- (2) When the P.T.O. is operated for a long time in the ordinary condition, a heat protection fixture such as a heat insulator should be provided in order to prevent fuel vaporization and protect cables, hoses, tubes and wirings from high heat emitted from exhaust manifolds and exhaust pipes.

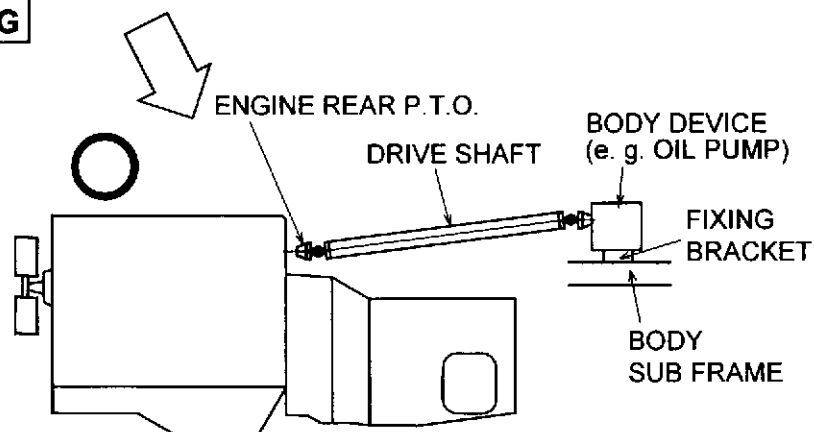


- (3) The devices of the body or equipment (e.g. an oil pump) which will be intended to drive by P.T.O., must be securely fixed at same installation angle of engine to the body or equipment side via bracket, etc.

THE DIRECT FIXING THE DEVICES TO THE P.T.O. OUTPUT FLANGE IS STRICTLY PROHIBITED.

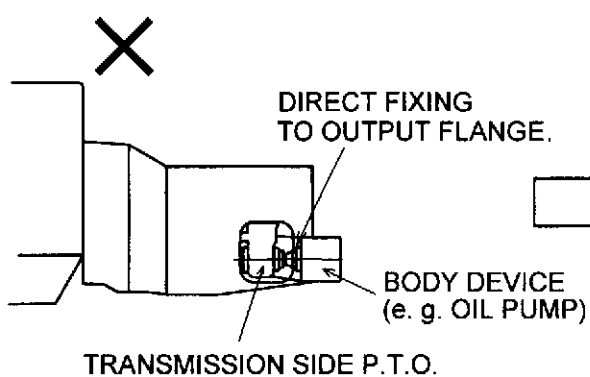


WRONG

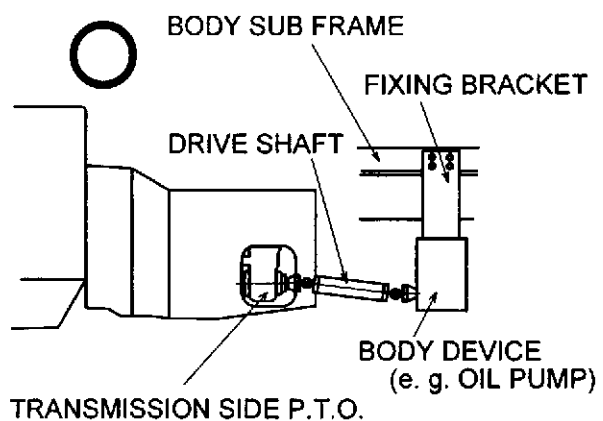


ENGINE REAR P.T.O.

RIGHT



WRONG



RIGHT

TRANSMISSION SIDE P.T.O.

2. P.T.O. (POWER TAKE OFF) DRIVE SHAFT

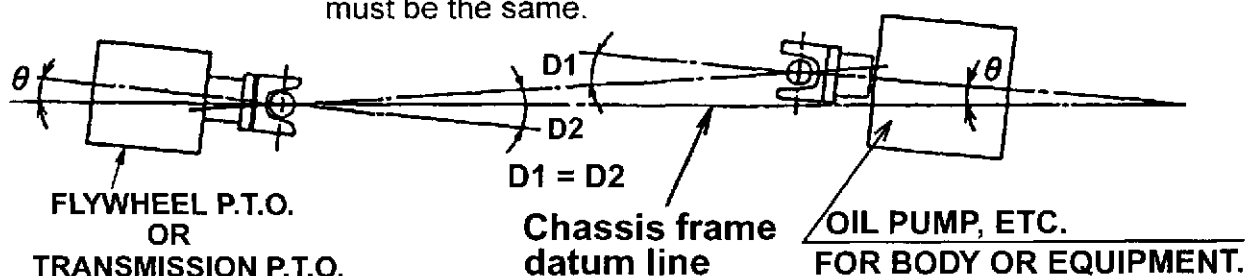
You may decide to fit a drive shaft to the engine rear P.T.O. or the transmission side P.T.O.

If the installing angle of this drive shaft is too large, it will cause noise and vibration, and may cause damage.

When fitting the drive shaft be sure to observe the following precautions.

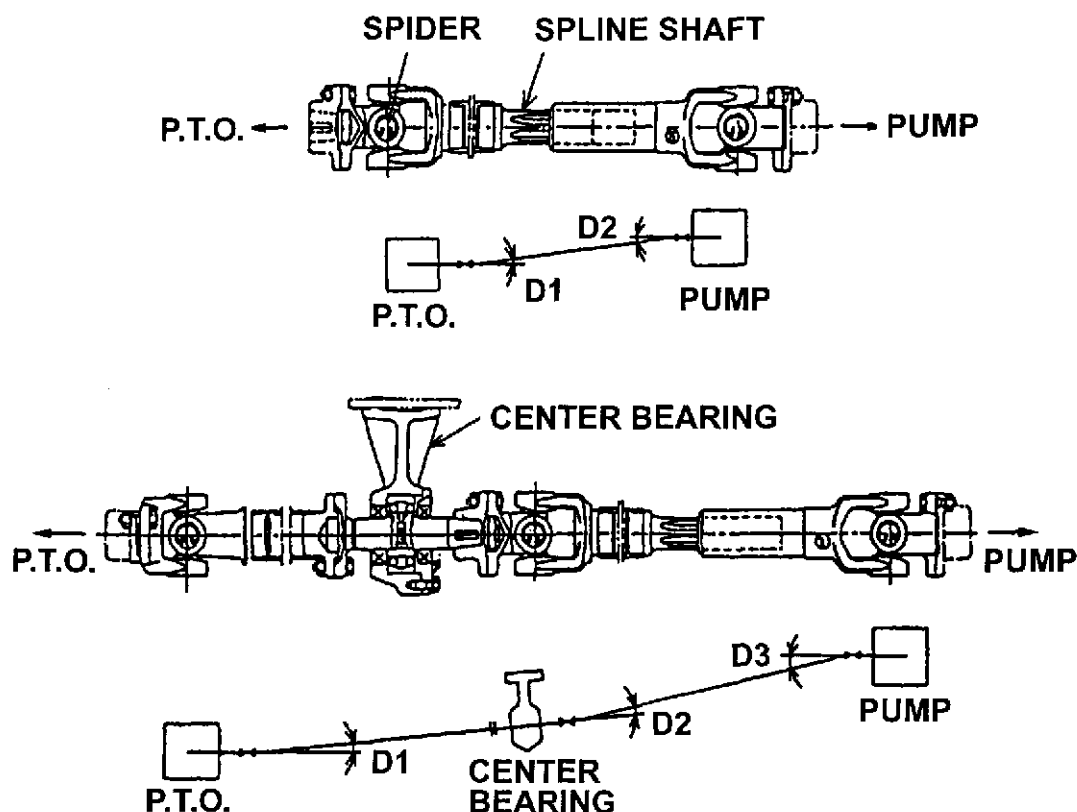
1) Mounting Angles for Devices of Body and Equipment

The devices on the body or equipment side (e.g. oil pump) must be installed at the same angle as the engine (θ), and the angles of the universal joint of the drive shaft (D1 and D2) must be the same.



2) Drive Shaft Angle

As a rule, the three-dimensional angle of the universal joint of the drive shaft (D1, D2 and D3) should be a MIN. 1° to MAX. 6° .

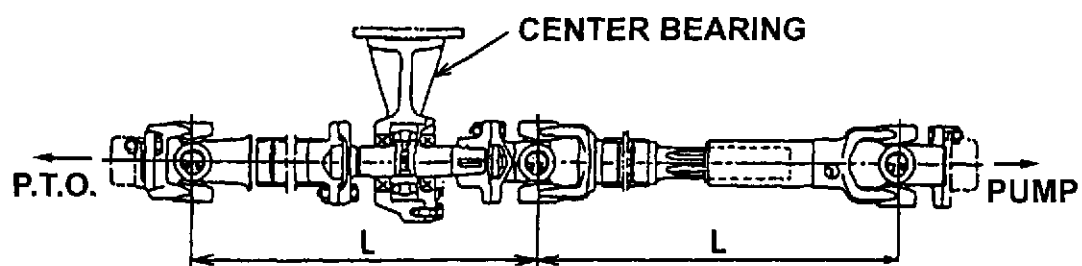
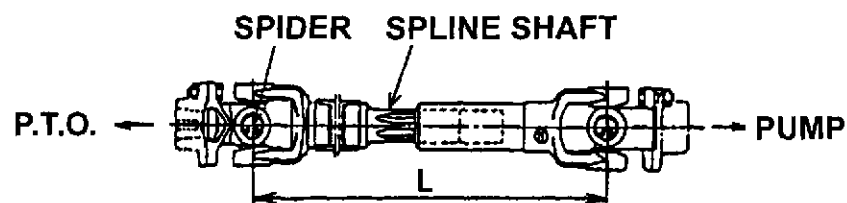


3) Length of Drive Shaft

To keep vibration during driving to a minimum, TOYOTA recommend that the drive shaft should be no longer than the values shown in the table below.

If you must make the shaft longer than the values shown in the table, fit a central bearing to avoid excessive vibration.

	SPECIFICATION
EXTERNAL DIAMETER	MAX.Ø45mm
WEIGHT	MAX.7kg
LENGTH(L)	MAX.1,100mm
THREE DIMENSIONAL ANGLE	MAX.6°



3. ENGINE CONTROLS FOR BODY OR EQUIPMENT**1) Fuel Injection Pump Governor**

- DYNA vehicles use the following fuel injection pump governor.

ENGINE MODEL	GOVERNOR TYPE		MANUFACTURER
	PUMP	GOVERNOR	
14B	V4 TYPE	ELECTRONIC CONTROL TYPE	DENSO
15B-FTE	V4 TYPE	ELECTRONIC CONTROL TYPE	DENSO
W04D	IN - LINE	MECHANICAL CONTROL TYPE	DENSO
W04D-TI	IN - LINE	MECHANICAL CONTROL TYPE	DENSO
S05C-B	IN - LINE	MECHANICAL CONTROL TYPE	DENSO
S05C-TA	IN - LINE	MECHANICAL CONTROL TYPE	DENSO
S05C-TB	COMMONRAIL TYPE	ELECTRONIC CONTROL TYPE	DENSO
J05C	IN - LINE	MECHANICAL CONTROL TYPE	DENSO

2) Installation of Engine Accelerator

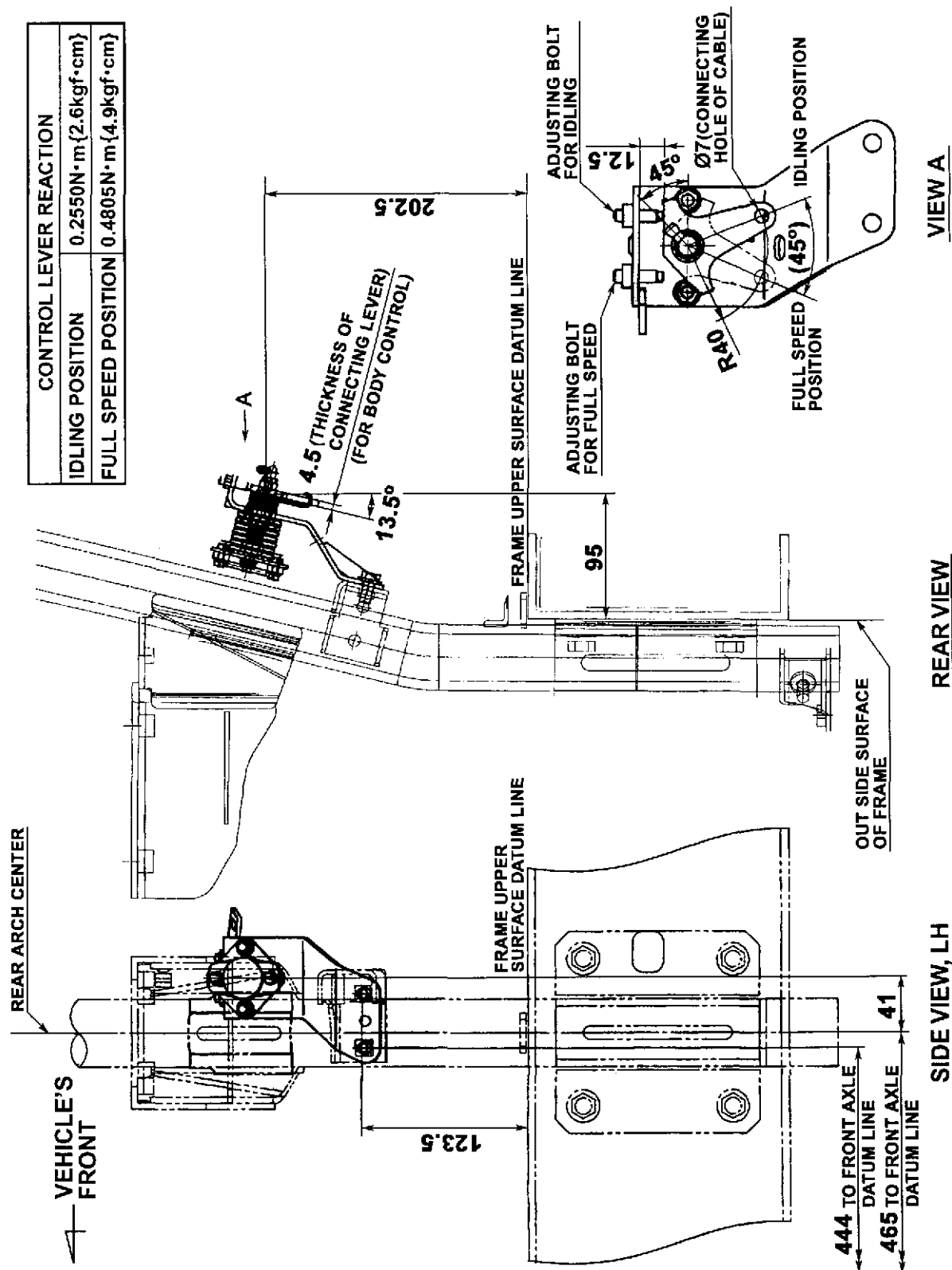
- Engine accelerator for body control may be provided at left side of the cab rear arch as an optional equipment.
- Should more detailed date or information with regard to engine accelerator for body control be needed, consult authorized TOYOTA sales dealer or distributor.
- For your reference, engine accelerator of engine model S05C-TB which will be equipped as an option equipment of cargo and mixer, etc. are described in next pages.

Exact details of engine accelerator, see the Body Builder's Guide for the respective model series.

EXAMPLE**[ENGINE ACCELERATOR FOR ELECTRONIC GOVERNOR]**

- Engine Model : S05C-TB
- Cab Type : Wide
- Application of Body : General cargo

UNIT : mm



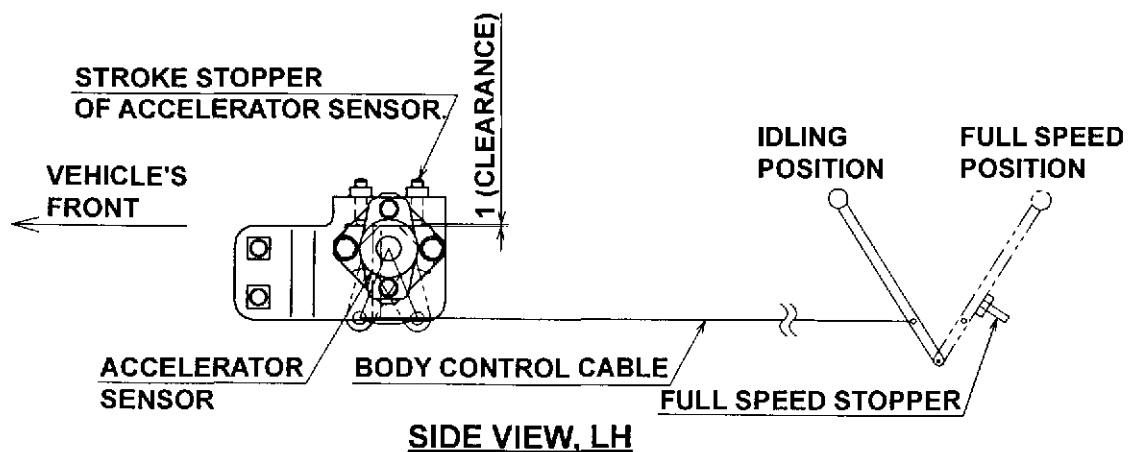
EXAMPLE**[HOW TO INSTALL ENGINE ACCELERATOR FOR BODY OR EQUIPMENT]****(ELECTRONIC GOVERNOR ONLY)**

- (1) Be sure to provide the body controller with the full speed stopper for controlling the stroke of the sensor.

In that case, adjust the body side stroke stopper in such a way that the body side stopper comes in contact earlier than the sensor side stopper.

The standard for adjustment is 1 mm clearance between the sensor side lever and stopper under the condition that the body side lever touches the stopper. (See the following illustration.)

- Be sure to set the sensor lever that sensor lever should be contacted with idling stopper by adjusting body control lever while body or equipment do not operate (while vehicle is driving).

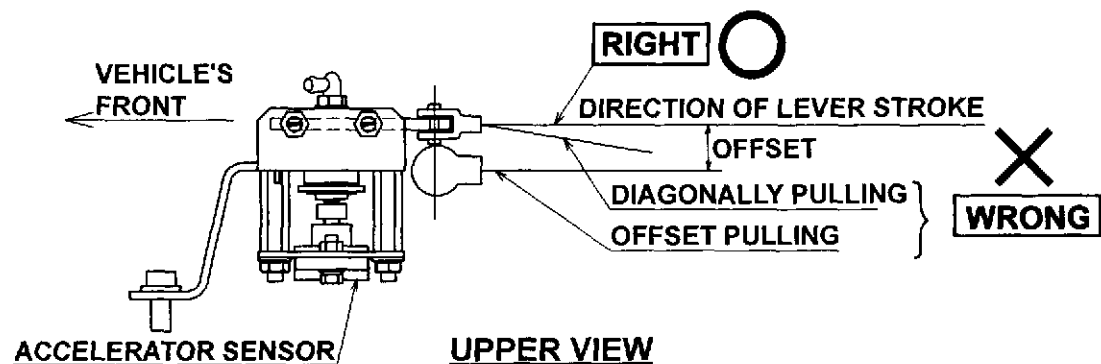


- The clearance indicated for the stroke stopper of accelerator stopper is just for reference.

If the sensor side stopper comes into contact earlier, a forcible stress will be imposed on the sensor shaft and it may result in the damage of the part in cause.

Moreover, if sensor lever do not came into contact with idling stopper, may result in a bad condition of the engine while vehicle to be driving.

- (2) When fitting the cable on the sensor lever, define the direction by pulling the cable parallelly to the direction of lever stroke so that an imbalanced load may not be imposed on the sensor shaft. (See the following illustration.)



- (3) The accelerator sensor is not of integral water proof type. Therefore, when transplanting it, pay attention to avoid the direct projection of vehicle washing water, tire splash, etc.

4. ENGINE CONTROLS FOR MECHANICAL GOVERNOR (WITHOUT OPTIONAL ENGINE ACCELERATOR)

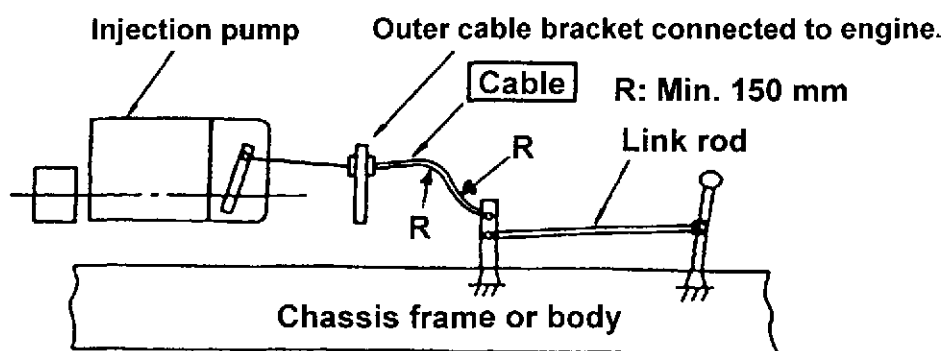
1) Engine Control for Body

If you intend to fit a device to control engine revolutions when working with a body or equipment, make sure that the device is able to absorb the relative movement between the engine and the chassis (installing of control lever for body or equipment, etc.).

If the mechanism cannot absorb the relative motion, the control lever of the injection pump may be moved by the normal vibration of the engine (displacement) and abnormal vibrations may arise while operating a body or equipment.

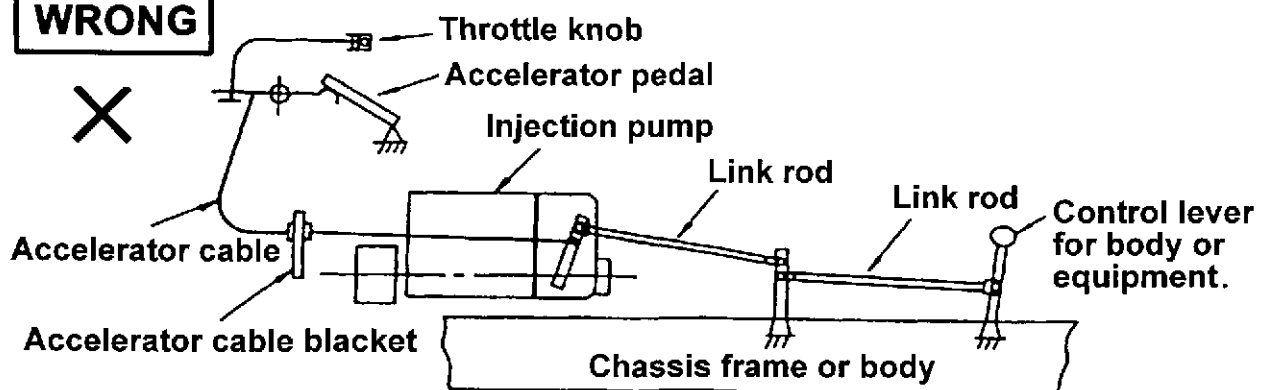
Relative movement of engine and chassis absorbed.

RIGHT



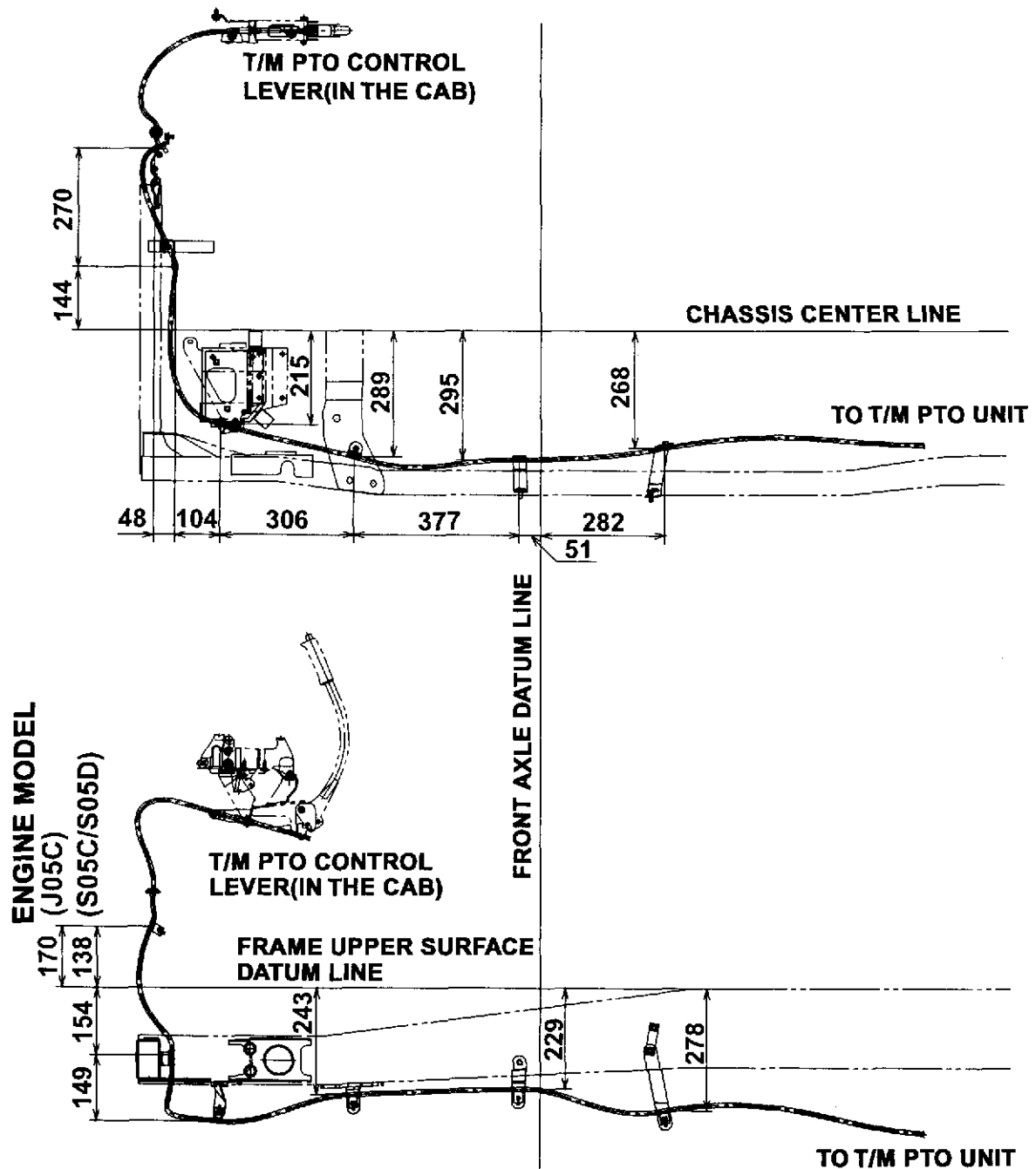
Relative movement of engine and chassis not absorbed.

WRONG



**2) RECOMMENDED INSTALLATION LAYOUT OF
P.T.O. CONTROL CABLE
[EXAMPLE FOR STANDARD CAB]**

UNIT : mm



- Details of each model, see the Body Builder's Guide for the respective model series.

14. PAINTING

- 1. TOP COAT PAINTING 14 - 1**
- 2. PRECAUTION OF TOP COAT PAINTING FOR CAB..... 14 - 2**
- 3. HANDLING OF LAMINATED WINDSHIELD 14 - 3**
- 4. HOW TO REMOVE THE RADIATOR GRILLE 14 - 4**
- 5. THE KIND AND THE ATTACHING POSITION 14 - 5**
OF MARK AND ORNAMENT
- 6. PRECAUTIONS FOR FITTING AND STORING 14 - 6**
THE CAUTION PLATE

1. TOP COAT PAINTING

Take a care to the following points, when required to repaint it by a customer.

1) Sanding

When repainting, perform to sand the original coat carefully not to be left any part no-sanded, in order to improve the adhesion of top coat paint. And, never remove off sealant, adhesive agent at connecting parts of the metal sheet.

[Sanding surface]



(Bad sanding)

Uneven sanding



Coated film



(Good sanding)

Even sanding



Coated film

2) How to Choose Top Coat Paint

(1) When painting on the metal parts

TOYOTA recommends urethane-type, natural air drying paint to be used, which have superior characteristics as in painting finish quality, color fade-out, comparing with lacquer-type paint. The top coat should be at least 30 μ thick.

Recommendation brand	Nihon paint NAX-M-G2
	Kansai paint RETAN PG-60
	Dainihon paint V-Top

(2) When painting on the resin parts

- TOYOTA recommends paint for the resin parts to be used, which is best matched to the characteristics of the resin parts (step rubber, front-grill, front garnish, etc.) and also, can prevent to lowering the shock resistant force at low temperature.

Recommendation brand	Nihon B chemical (NBC)	R240 A
		R225 Hardener B
	Kansai paint	RETAN PG60 base A
		RETAN PG plastic hardener ... B
[Caution] Above listed 2 brands respectively, mix A and B by a rate of 4 : 1.		

- Then, Avoid to paint backside of the resin parts as its shock resistant force lowers further down with the both side to be painted, of the resin parts.
- Cab step, made of polypropylene material, can not be painted.

2. PRECAUTION OF TOP COAT PAINTING FOR CAB**1) Cautions for Cab Painting**

When painting the cab, take a caution to the following points, other than above.

(1) The place and parts to be omitted from painting for cab and mounting body as well as adhesion of all kinds of oil:

- Various kinds of the ornaments, marks.
- Various kinds of caution plates, labels.
- Relating equipments and parts to the brake as well as a brake hose.
- Various types of rubber hoses.
- Electrical wiring, connectors, electrical lamps, electrical switch, relating equipments and parts.
- Back-up buzzer, noise emitting hole of electric horn.
- Rubber and plastic parts of cab, engine, chassis suspension and steering system.
- Rubber hose for cab-tilt, piston rod of the cylinder for cab-tilt. (The vehicle with a hydraulic cab-tilt, driven by an electrical motor)
- Batteries
- Wiper blade, washer nozzle.
- Installing surface of disc to the disc wheel. (Including the hub to be contacted and contacting surface of drum, disc wheel as well as contacting surface of hub nuts.)
Then, when stained paint to the inner part of the cab, cleaning it with a neutral detergent, do not use gasoline or thinner.

2) Caution when Drying

- When you use forced drying, a temperature on the surface of any parts to be painted must be 80°C as an upper limit.

Removing off any plastic parts, rubber parts from the vehicle, paint them when you use a forced drying at over 80°C. (Refer to the figure as shown below.)

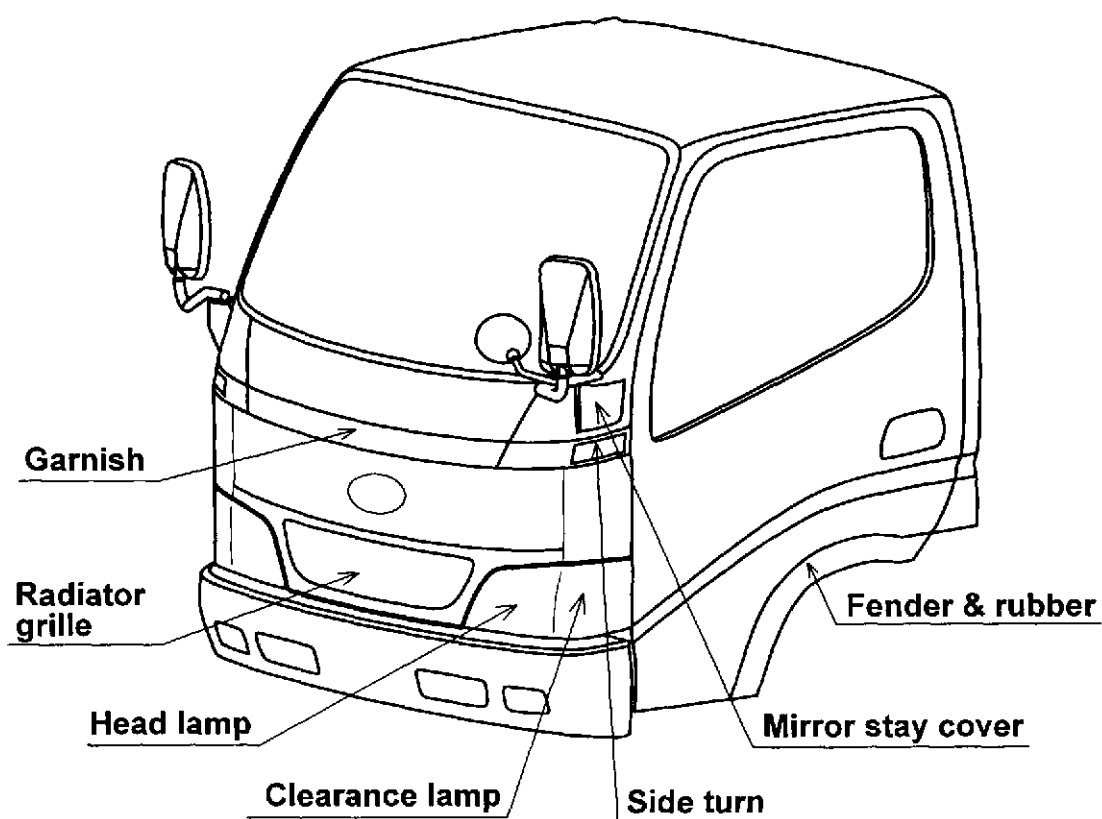
Take care to those as plastic parts like fender, air cleaner, etc. are much used.

- When a vehicle with air-conditioning whose all piping and hosing are heated at abnormal temperature (more than 100°C), a pressure safety valve may function and come out refrigerant gas.

- When removing off a air-cleaner assy, seal completely the inlet port side of engine to prevent any penetration of dirt, paint or etc.

Also, install hoses securely and clamp them firmly when mounting them.

- Remove off the parts shown below when painting at over 80°C.



[NOTE] Remove off the radiator grille in accordance with item 4.

3. HANDLING OF LAMINATED WINDSHIELD

A laminated glass is produced in such order that polyvinyl butyral film is inserted between 2 glasses and pressed with heat.

Under driving general condition, there is no problem.

But under a hot temperature and a high moisture when painting, intermediate film is fallen off or such defective occur as foaming may be caused.

Therefore, a special caution needs to be taken.

1) Caution when Painting

There is no problem when you use a natural drying.

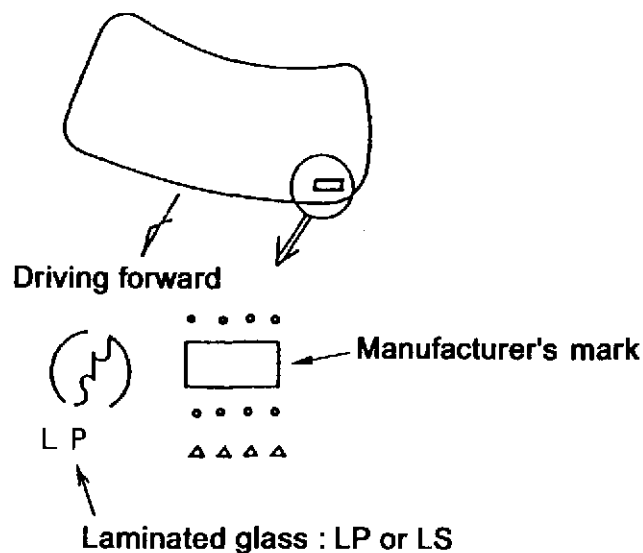
But when a forced drying is used with infrared ray lamp, etc., be sure that the drying should be implemented within 30 minutes at less than 120°C.

When drying at the temperature of more than 120°C, remove off the windshield glass or cover over the glass with something so that the temperature on the glass surface should not go up more than 120°C.

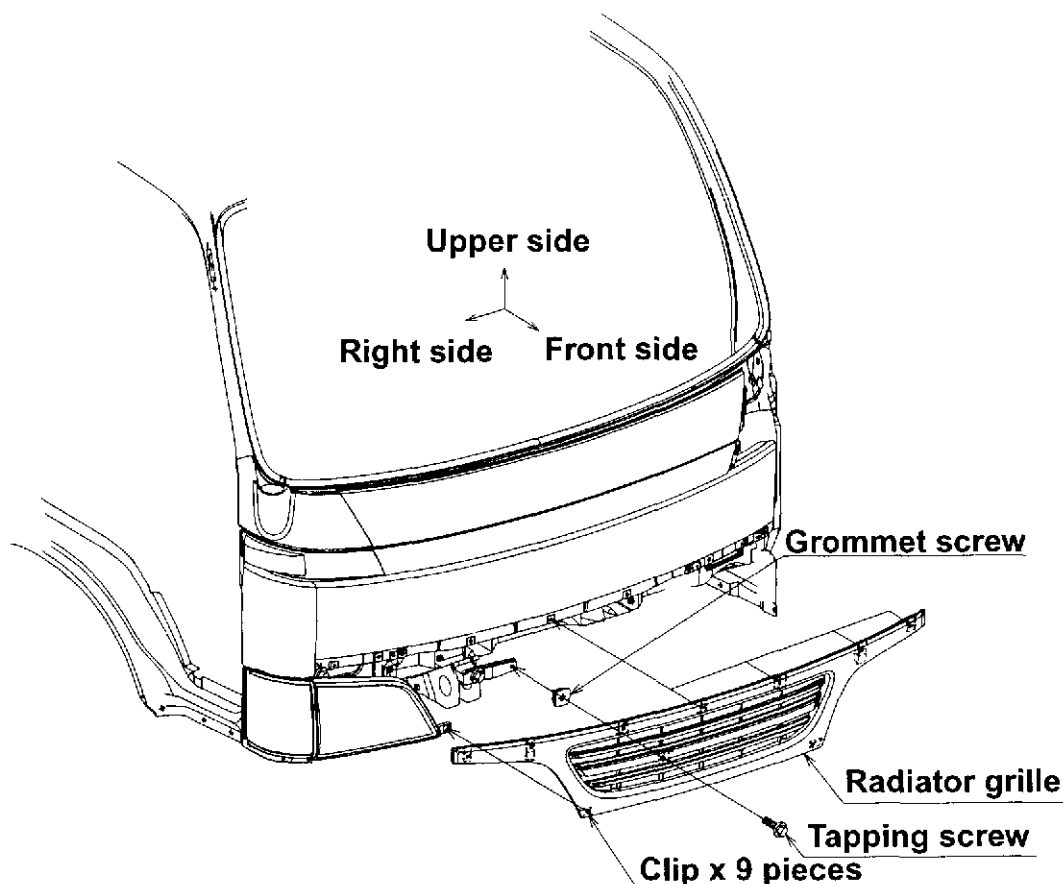
2) How to Identify the Laminated Glass.

JIS and Manufacturer Marks are specified at the left bottom of the windshield as shown in the following figure.

You can identify it with the specified mark as the mark LP or LS is specified at the underneath of JIS mark in case of the laminated glass. (Partial tempered glass is specified by Z.)



4. HOW TO REMOVE THE RADIATOR GRILLE



1) How to Remove Off the Radiator Grille

- Loosen the tapping screw, in the central part.
- Inserting your fingers into the clips underneath to pull them toward you, remove the clips.
- Remove the clips in the same manner at the side.
 - * Remove the clips from right side of the vehicle (left side when viewed in front of the vehicle).

2) How to Install the Radiator Grille

- Install the clips on the radiator grille.
- Install the radiator grille on the cab body by matching the clips holes and pushing it in the order from the bottom to the upper side.
- Install the tapping screw at the central part.

3) Caution

- After confirming that there are no damages at nail part, etc., of the clips, install them.

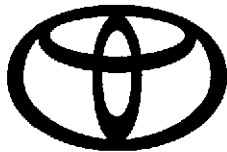
[NOTE] Details of the how to remove the radiator grille, see the Body Builder's Guide for the respective model series.

5. THE KIND AND THE ATTACHING POSITION OF MARK AND ORNAMENT

The kind and the position to be attached of marks and ornaments on the cab as well as the chassis are specified in the chart below.

Implement masking them completely when repainting the cab or the body.

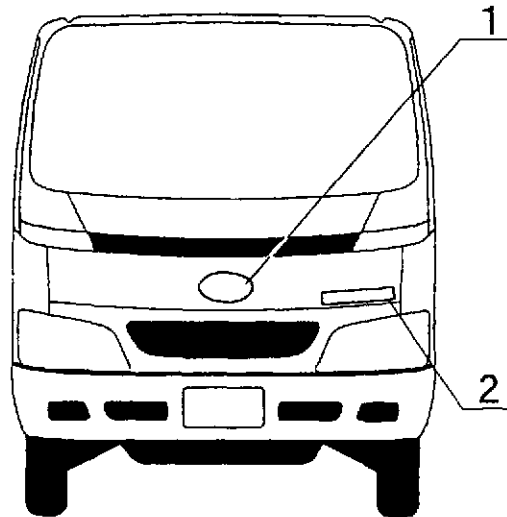
When the marks and the ornaments to be attached on cab are packed separately and shipped out together with the vehicle, or when attaching them after complete painting, attach them at the specified places in accordance with the attaching position chart and the attaching procedure.

ATTACHING PLACE		KIND OF MARK	No.	NAME OF MARK	PART No.
Cab	Front	Symbol mark	1		75315-37010
		Model mark	2	DYNA	75311-37050
Rear body	Back	4 - ABS mark	3	4-ABS	75475-37010
		Manufacturer name, Model mark	4	DYNA	75471-37050

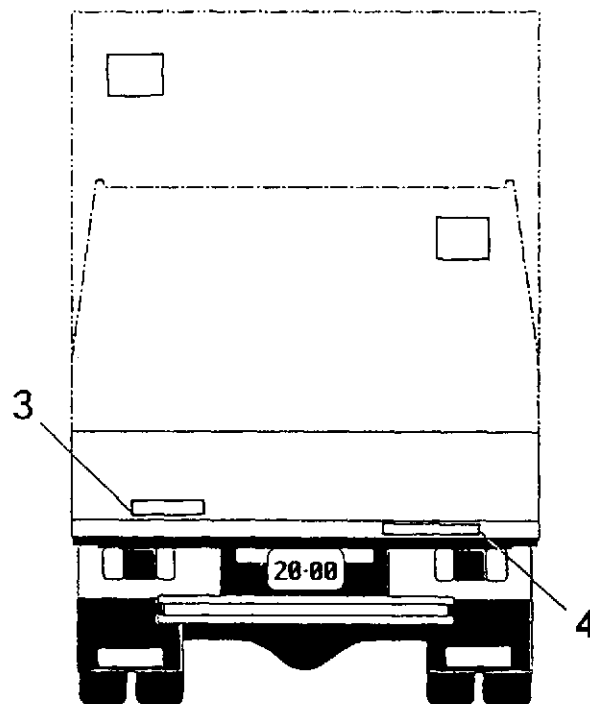
- [NOTE]** • Parts numbers are changeable always. Accordingly, for confirmation, get in contact with nearest TOYOTA sales dealer or distributor when you place an order for necessary parts.
- Detail of marks, see the Body Builder's Guide for the respective model series.

1) Attaching Place and Procedure for Each Mark and Ornament

Refer to the detailed figure of the attaching position for 1 to 5 of the attachments on the cab.



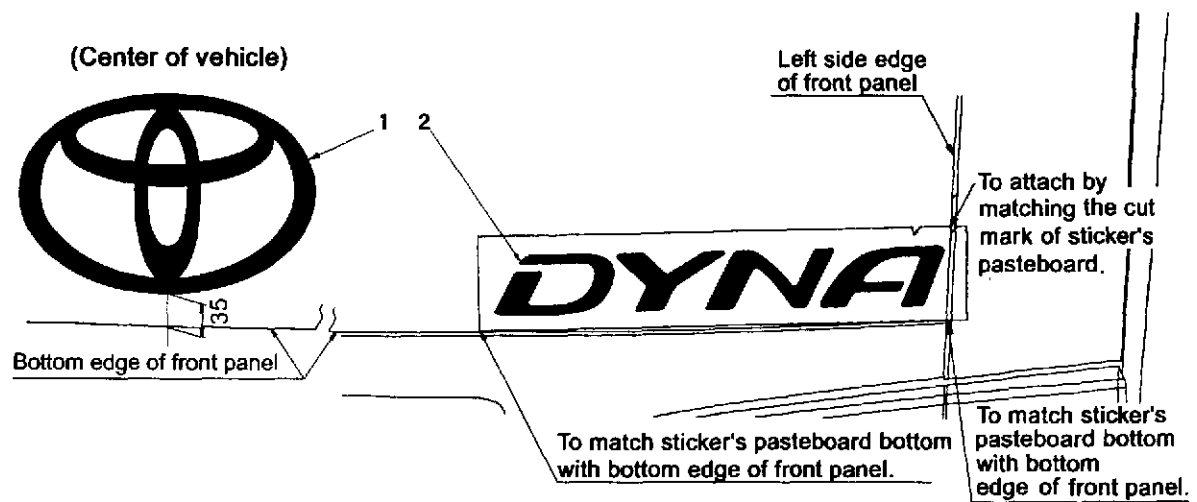
(FRONT VIEW OF CAB)



(REAR VIEW OF VEHICLE)

2) Attachment of Each Mark and Ornament

(1) The detail of attaching position



(CAB FRONT VIEW)

6. PRECAUTIONS FOR FITTING AND STORING THE CAUTION PLATE

1) How to Stick It

- a. Stick the caution plate to a dry place which is free from dust and dirt after the paint has completely dried up.
- b. Clean your hand and don't use cotton work gloves, etc..
- c. Completely remove water, oil, dust, etc. from the surface to stick (surface of cab) with ethyl alcohol if they are found remaining there.
- d. When the temperature is less than 10°C, warm up the surface to stick as well as the caution plate with warm wind of more than 20°C before sticking the caution plate.
- e. After sticking the caution plate, press it with a roller, etc., with a force of approximately 49 N/cm² {5 kgf/cm²}.
- f. Remove liner paper (backing paper) just before using it.
- g. When air remains inside, make a tiny hole with a needle or a cutter knife and press it out with your fingers from the bubble area.

2) How to Store It

When storing the caution plate, select a dry place with an ambient temperature (of 20 to 25°C) and without dust, dirt and stain.

Also, store the caution plate at a flat place such as a shelf, etc., and do not place anything on it.

3) Other Precautions for the Caution Plate

- a. As the caution plate is made from vinyl chloride, it is thin, soft and easily extendible.

Therefore, take utmost care for handling it.

- b. When removing the caution plate, etc., be careful not to damage the painted surface with a sharp knife, etc.

On the other hand, removal of the caution plate can be done more easily by pulling the caution plate in perpendicular direction to the sticking surface while heating it with a hair dryer.

- c. Do not throw the caution plates away but keep them together to compare with new caution plates and to prevent mixing up with the new ones.

Request

The following application form has been prepared to enable quicker responses to inquiries concerning attachment installation. Please use it effectively.

- ☐ Inquiry on technical information related to attachment installation
- ☐ Request on issuance of manufacturer's certificate (Always enter the information concerning the asterisked (*) items.)

1. Objective and background (importance, urgency, competing model state, etc.)

2. Contents of request

3. Description of attachment*

Attach a drawing or photograph showing the dimensions, weight, weight distribution to front and rear axles, structure, etc. of the attachment.

4. Restrictive conditions*

- ① Base vehicle model and model year
- ② Frame No.
- ③ Produced quantity and period
- ④ Name of attachment manufacturer
- ⑤ Working conditions
 - Road surface status (paved road: % of total, unpaved road: % of total)
 - Traveling speed (normally km/h, high speed: km/h)
 - Traveling distance (km/month)
 - Loading weight (kg)

5. Desired closing date for answer

6. Answering party

- Country
- Address
- Company name
- Department
- Name of person in charge
- Telephone
- Fax

SALES PROMOTION DEPT.
OVERSEAS C&A DIVISION.

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