



# Service Manual

## Chassis & Mast

## MC/FC

<b>FG15N</b>	EF34L-00011-up	<b>FD15N</b>	EF16D-00011-up
<b>FG18N</b>	EF34L-40001-up	<b>FD18N</b>	EF16D-40001-up
<b>FG20CN</b>	EF34L-60001-up	<b>FD20CN</b>	EF16D-60001-up
<b>FG20N</b>	EF17DL-00011-up	<b>FD20N</b>	EF18C-00011-up
<b>FG25N</b>	EF17DL-50001-up	<b>FD25N</b>	EF18C-50001-up
<b>FG30N</b>	EF13FL-00011-up	<b>FD30N</b>	EF14E-00011-up
<b>FG35N</b>	EF13FL-50001-up	<b>FD35N</b>	EF14E-50001-up

For use with S4Q2, S4S and K21/K25 Engine  
Service Manuals.

99719-59110

## FOREWORD

This service manual is a guide to servicing of Mitsubishi Forklift Trucks. The instructions are grouped by systems to serve the convenience of your ready reference.

Long productive life of your forklift trucks depends to a great extent on correct servicing – the servicing consistent with what you will learn from this service manual. We hope you read the respective sections of this manual carefully and know all the components you will work on before attempting to start a test, repair or rebuild job.

The descriptions, illustrations and specifications contained in this manual were of the trucks of serial numbers in effect at the time it was approved for printing. Mitsubishi forklift truck reserves the right to change specifications or design without notice and without incurring obligation.

The trucks are powered by K21/K25 gasoline engines or S4Q2/S4S diesel engines. For the engine servicing, please refer to the applicable engine service manual.

### Safety Related Signs

The following safety related signs are used in this service manual to emphasize important and critical instructions:



Indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicate a potentially hazardous situation which, if not avoided, may result in minor or moderate injury, or damage to your machine.



Indicates a condition that can cause damage to, or shorten service life of, the machine.

Pub. No. 99719-59110

## SAFETY

 **WARNING**

The proper and safe lubrication and maintenance for this forklift truck, recommended by Mitsubishi forklift truck, are outlined in the **OPERATION & MAINTENANCE MANUAL** for these trucks.

**Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the OPERATION & MAINTENANCE MANUAL before performing any lubrication or maintenance.**

The serviceman or mechanic may be unfamiliar with many of the systems on this truck. This makes it important to use caution when performing service work. A knowledge of the system and/or components is important before the removal or disassembly of any component.

Because of the size of some of the truck components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all warning plates and decals on the truck before operating, lubricating or repairing the product.
2. Always wear protective glasses and protective shoes when working around trucks. In particular, wear protective glasses when pounding on any part of the truck or its attachments with a hammer or sledge. Use welders gloves, hood/goggles, apron and other protective clothing appropriate to the welding job being performed. Do not wear loose-fitting or torn clothing. Remove all rings from fingers when working on machinery.
3. Do not work on any truck that is supported only by lift jacks or a hoist. Always use blocks or jack stands to support the truck before performing any disassembly.

 **WARNING**

**Do not operate this truck unless you have read and understand the instructions in the OPERATION & MAINTENANCE MANUAL. Improper truck operation is dangerous and could result in injury or death.**

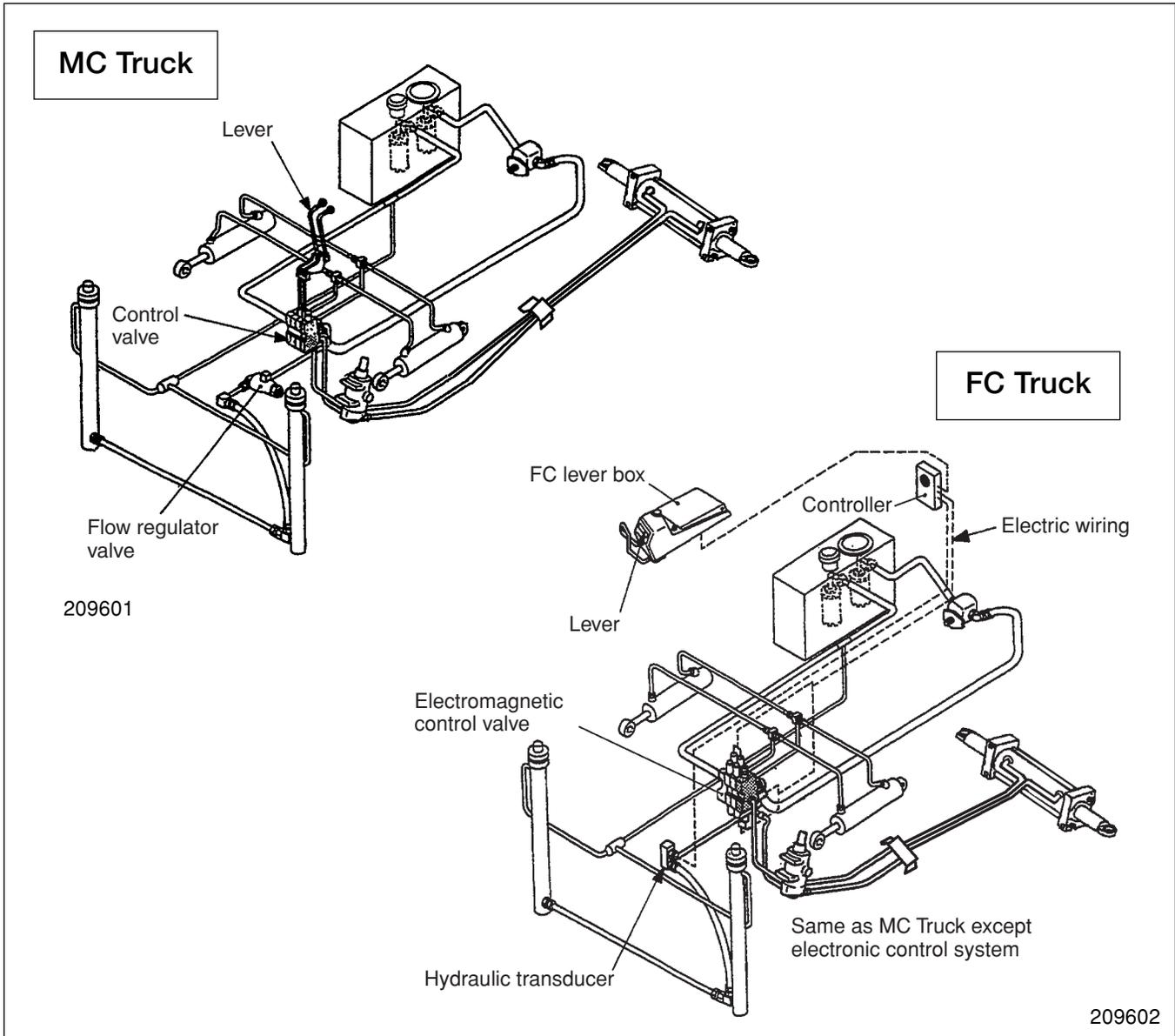
4. Lower the forks or other implements to the ground before performing any work on the truck. If this cannot be done, make sure the forks or other implements are blocked correctly to prevent them from dropping unexpectedly.
5. Use steps and grab handles (if applicable) when mounting or dismounting a truck. Clean any mud or debris from steps, walkways or work platforms before using. Always face truck when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.
6. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lb.) or more. Make sure all chains, hooks, slings, etc., are in good condition and are of the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.
7. To avoid burns, be alert for hot parts on trucks which have just been stopped and hot fluids in lines, tubes and compartments.
8. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.
9. Be careful when removing filler caps, breathers and plugs on the truck. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the truck has just been stopped because fluids can be hot.

10. Always use tools that are in good condition and be sure you understand how to use them before performing any service work.
11. Reinstall all fasteners with same part number. Do not use a lesser quality fastener if replacements are necessary.
12. If possible, make all repairs with the truck parked on a level, hard surface. Block truck so it does not roll while working on or under truck.
13. Disconnect battery and discharge any capacitors (electric trucks) before starting to work on truck. Hang "Do not Operate" tag in the Operator's Compartment.
14. Repairs, which require welding, should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of parent metal.
15. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will it be damaged in operation by contacting sharp corners, or by rubbing against some object or hot surface. Place wiring away from oil pipe.
16. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution.
17. Always support the mast and carriage to keep carriage or attachments raised when maintenance or repair work is performed, which requires the mast in the raised position.
18. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.
19. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure, must be installed correctly.
20. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.
21. Do not operate a truck if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.

## HOW TO USE THIS MANUAL

Truck models covered in this manual:

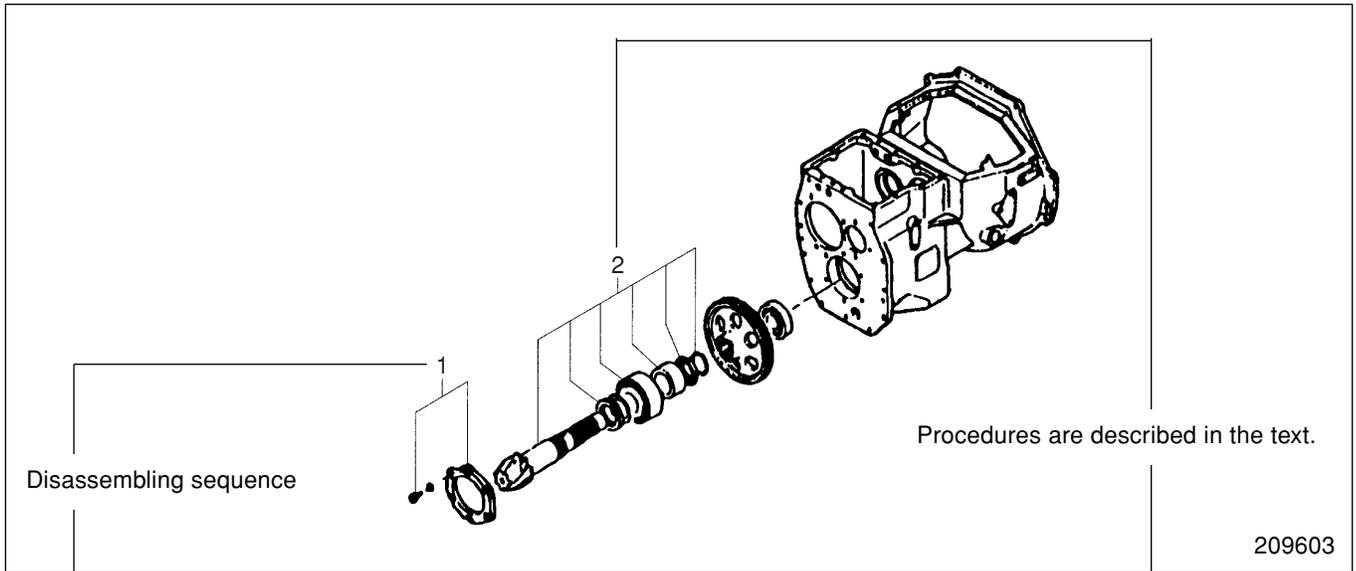
- MC Truck (Mechanical Control System)  
Mechanically controlled hydraulic system (conventional lever system)
- FC Truck (Finger-tip Control System)  
Electronically controlled hydraulic system



- Gasoline Engine Truck (FG) . . . . . Equipped with K21 or K25 Gasoline Engine
- Diesel Engine Truck (FD) . . . . . Equipped with S4Q2 or S4S Diesel Engine
- Powershift Truck . . . . . Equipped with Powershift Transmission

# HOW TO USE THIS MANUAL (continued) (Removal, Installation, Assembly and Disassembly)

Disassembly diagram (example)

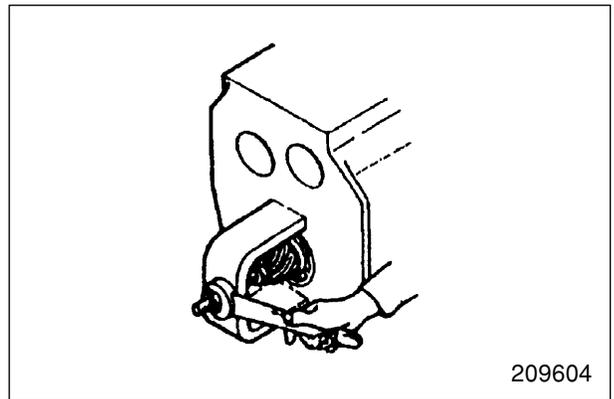


## Sequence

- 1 Cover , Bolt, Washer (part name)
- 2 Snap ring ..... (part name)

## Suggestion for disassembling

1. Output shaft, Removing  
Remove output shaft using a special tool.



## Service Data

Gear Backlash	A	0.11 to 0.28 mm (0.0043 to 0.0110 in.)
	B	0.5 mm (0.020 in.)

A: Standard Value

B: Repair or Service Limit

## Symbols or abbreviation

OP	Option
R1/4	Taper pipe thread (external) 1/4 inch (formerly PT1/4)
Rc1/8	Taper pipe thread (internal) 1/8 inch (formerly PT1/8)
G1/4A	Straight pipe thread (external) 1/4 inch (formerly PF1/4-A)
Rp1/8	Straight pipe thread (internal) 1/8 inch (formerly PS1/8)

## Units

1. SI Units are used in this manual.
2. The following table shows the conversion of SI unit and customary unit.

Item	SI unit	Customary unit
Force	1 N	0.1012 kgf
	1 lbf	0.4536 kgf
Pressure	1 kPa	0.0102 kgf/cm <sup>2</sup>
	1 psi	0.0703 kgf/cm <sup>2</sup>
Torque	1 N·m	0.1012 kgf·m
	1 lbf·ft	0.1383 kgf·m

# GROUP INDEX

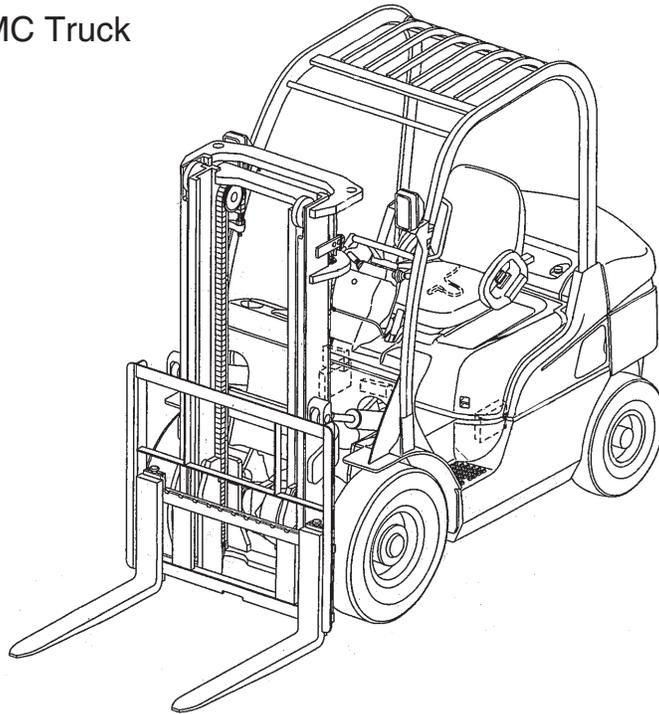
GROUP INDEX	Items	
<b>GENERAL INFORMATION</b>	Model view, Truck models covered, Serial number locations, Dimensions, Technical data	<b>1</b>
<b>COOLING SYSTEM</b>	Fan removal and installation, Fan belt inspection and adjustment	<b>2</b>
<b>ELECTRICAL SYSTEM</b>	Console box, Chassis electrical devices, Battery maintenance, Electrical system schematic	<b>3</b>
<b>CONTROLLERS</b>	Main functions, Service tool functions, Input/output monitor, Error codes and troubleshooting	<b>4</b>
<b>POWER TRAIN</b>	Removal and installation	<b>5</b>
<b>POWERSHIFT TRANSMISSION</b>	Torque converter, 1-speed transmission, Control valve, Automatic 2-speed transmission	<b>6</b>
<b>FRONT AXLE AND REDUCTION DIFFERENTIAL</b>	Front tires, Front axle, Reduction and differential	<b>7</b>
<b>REAR AXLE</b>	Rear tires, Rear axle, Toe-in, Minimum turning radius	<b>8</b>
<b>BRAKE SYSTEM</b>	Master cylinder, Wheel cylinders, Wheel brakes, Brake booster	<b>9</b>
<b>STEERING SYSTEM</b>	Steering gear, Power cylinder, Flow divider	<b>10</b>
<b>HYDRAULIC SYSTEM</b>	Hydraulic tank, Gear pump, Control valve, Lift and tilt cylinders, Flow regulator valve, Down safety valve	<b>11</b>
<b>MAST AND FORKS</b>	Simplex mast, Duplex mast, Triplex mast	<b>12</b>
<b>SERVICE DATA</b>	Maintenance standards, Periodic service chart, Periodic replacement parts, Lubrication instructions, Special tools	<b>13</b>

# GENERAL INFORMATION

Model View .....	1 – 1
Truck Models Covered .....	1 – 2
Serial Number Locations .....	1 – 3
Dimensions .....	1 – 4
Technical Data .....	1 – 5

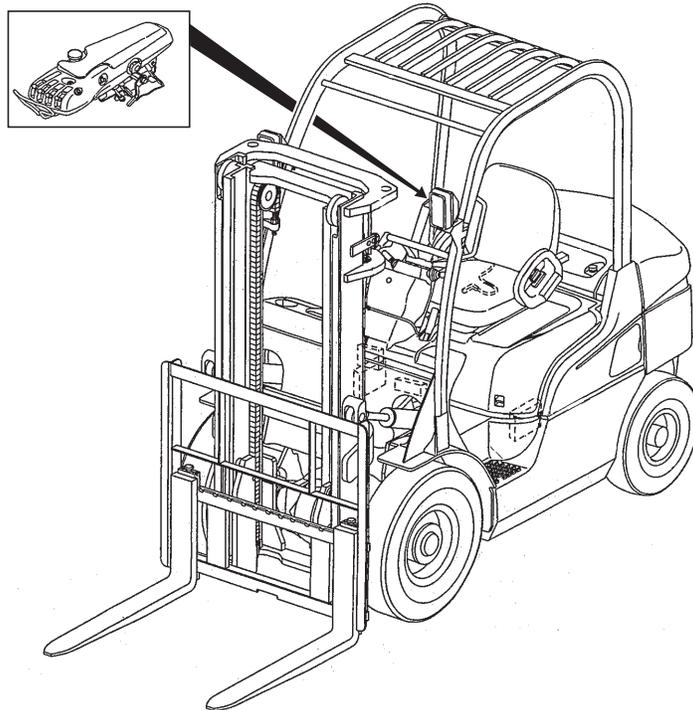
**Model View**

MC Truck



210991

FC Truck



210992

## Truck Models Covered

This Service Manual furnishes servicing and maintenance information for the following trucks:

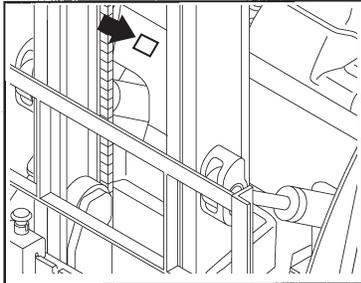
Engine control	LPG engine	Diesel engine
Standard (Non-electronic control)	—	MC/FC
Electronic control	MC/FC	—

(FC type is used in torque converter model only.)

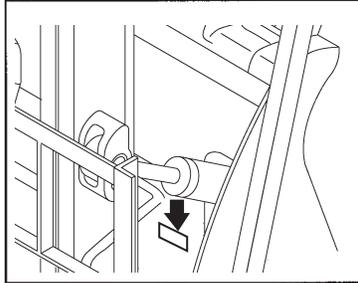
Truck class	LPG engine models			Diesel engine models		
	Truck model	Model code - serial number	Engine mounted	Truck model	Model code - serial number	Engine mounted
1 ton class	FG15N	EF34L-00011-up	K21	FD15N	EF16D-00011-up	S4Q2
	FG18N	EF34L-40001-up	K21	FD18N	EF16D-40001-up	S4Q2
	FG20CN	EF34L-60001-up	K21	FD20CN	EF16D-60001-up	S4Q2
2 ton class	FG20N	EF17DL-00011-up	K21	FD20N	EF18C-00011-up	S4S
	FG25N	EF17DL-50001-up	K21	FD25N	EF18C-50001-up	S4S
3 ton class	FG30N	EF13FL-00011-up	K25	FD30N	EF14E-00011-up	S4S
	FG35N	EF13FL-50001-up	K25	FD35N	EF14E-50001-up	S4S

# Serial Number Locations

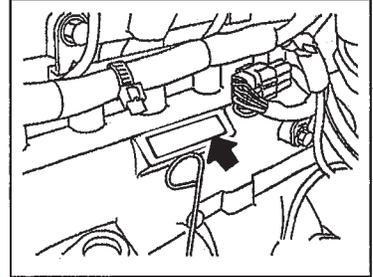
Name Plate



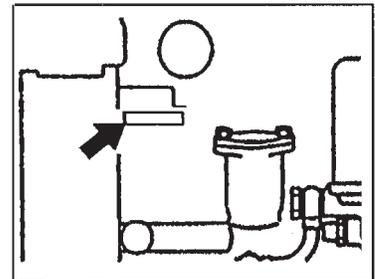
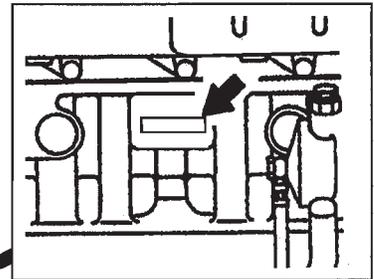
Chassis Serial Number



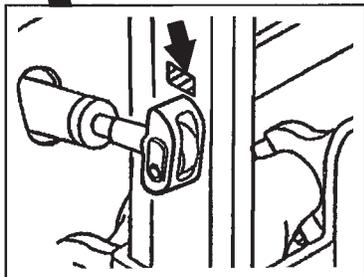
Gasoline Engine Serial Number



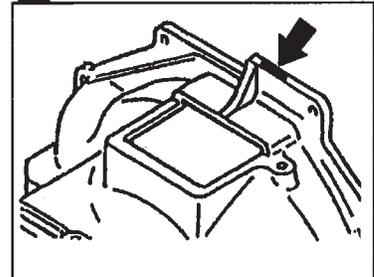
Diesel Engine Serial Number  
(2, 3 ton classes)



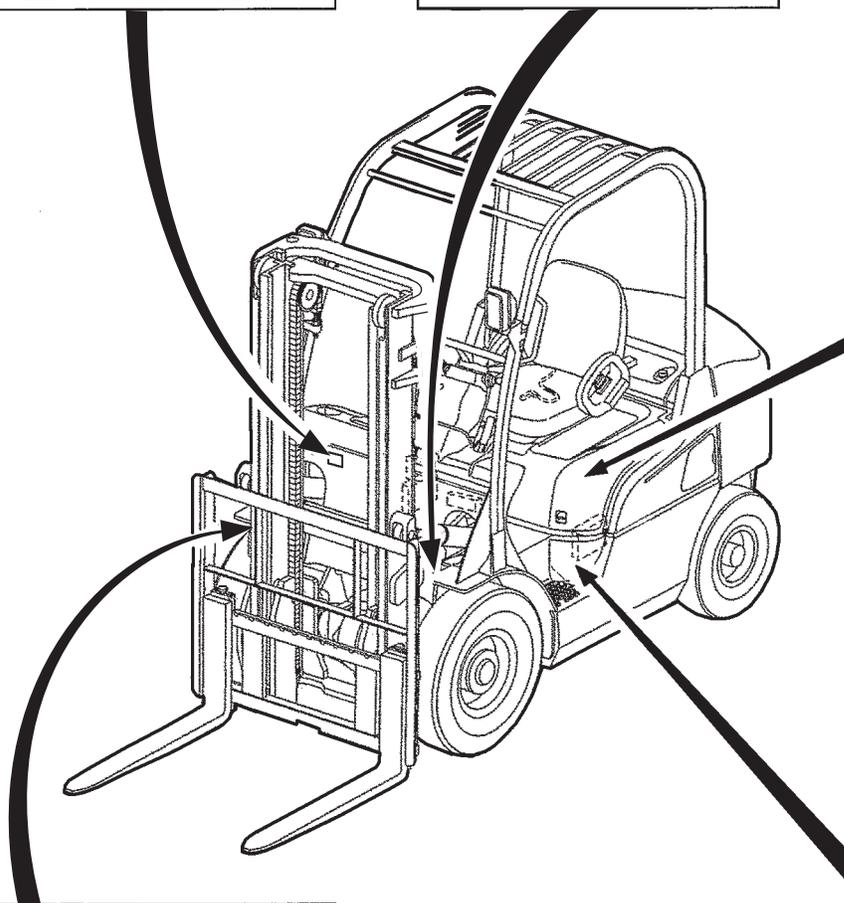
Diesel Engine Serial Number  
(1 ton class and FD20N~25N)



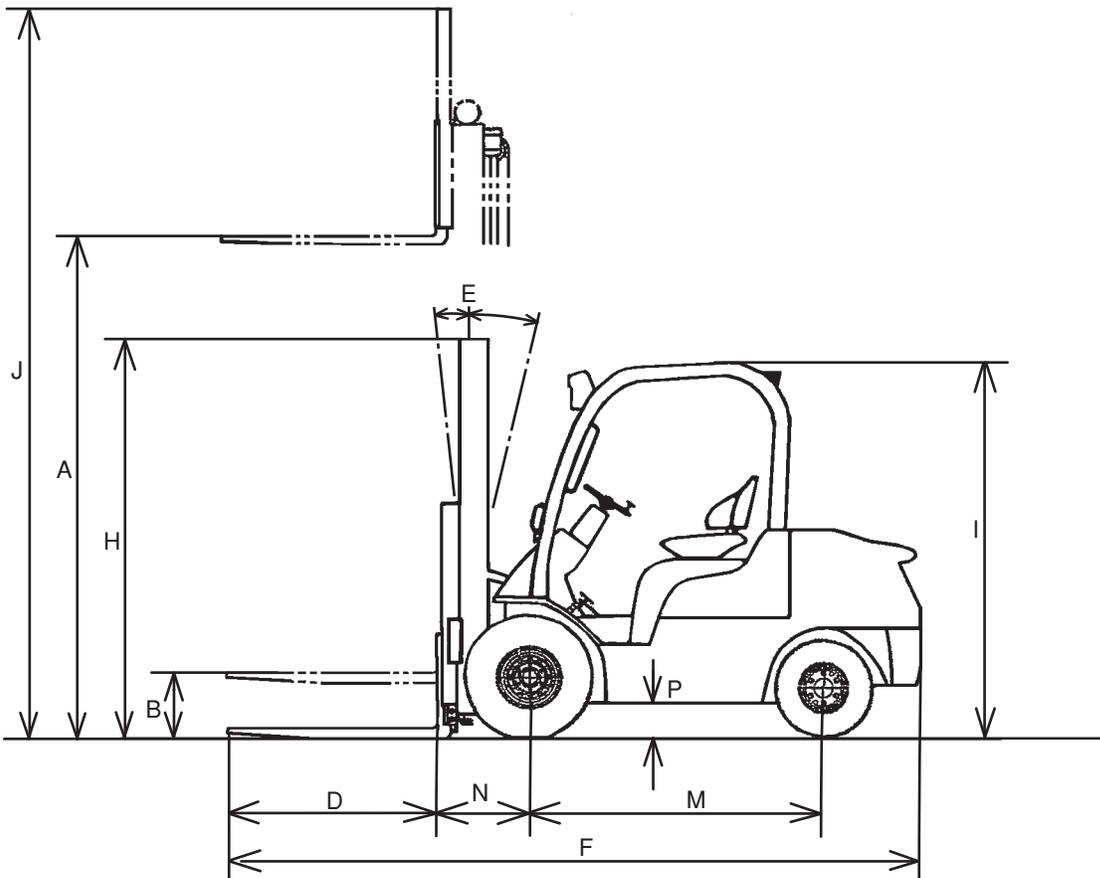
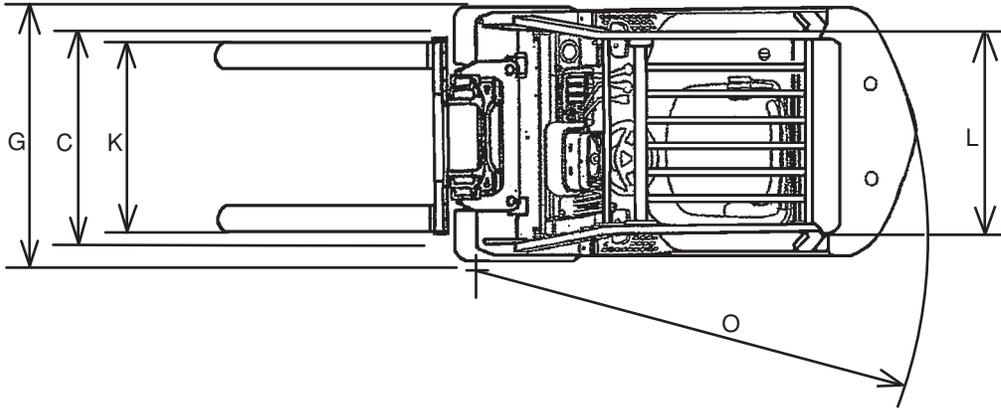
Mast Serial Number



Transmission Serial Number  
(Powershift Transmission Truck)



**Dimensions**



**Technical Data**

Unit: mm (in.)

Ref. No.	Model	Gasoline-engine Truck	FG15N	FG18N
		Diesel-engine Truck	(FD15N)	(FD18N)
Item				
A	Maximum lift	3000 (118)		
B	Free lift	115 (4.5)		
C	Fork spread (outside)	200 to 920 (7.9 to 36.2)		
D	Fork length	920 (36.2)		
E	Tilt angle (forward – backward)	6° – 12°		
F	Overall length	3180 (125.2)	3221 (126.8)	
G	Overall width (outside of tires)	Single tire	1065 (41.9)	
		Dual tire	1330 (52.4)	
H	Overall height (to top of mast lowered)	1995 (78.5)		
I	Overall height (to top of overhead guard)	2065 (81.3)		
J	Overall height (mast extended)	4055 (159.6)		
K	Tread (front)	Single tire	890 (35)	
		Dual tire	1025 (40.4)	
L	Tread (rear)	900 (35.4)		
M	Wheelbase	1400 (55.1)		
N	Front overhang	400 (15.7)		
O	Minimum turning radius	1950 (76.8)	1980 (78)	
P	Underclearance (at frame)	150 (5.9)		

GENERAL INFORMATION

Unit: mm (in.)

FG20CN	FG20N	FG25N	FG30N	FG35N
(FD20CN)	(FD20N)	(FD25N)	(FD30N)	(FD35AN)
3000 (118.1)				
115 (4.5)	140 (5.5)		150 (5.9)	
220 to 1000 (8.7 to 39.4)			250 to 1000 (9.8 to 39.4)	
920 (36.2)		1070 (42.1)		
6° – 12°				
3279 (129.1)	3408 (134.2)	3625 (142.7)	3795 (149.4)	3860 (152)
1065 (41.9)	1150 (45.3)		1275 (50.2)	1290 (50.8)
—	1480 (58.3)		1490 (58.7)	
1995 (78.5)			2045 (80.5)	2180 (85.8)
2065 (81.3)	2070 (81.5)		2095 (82.5)	2105 (82.9)
4055 (159.6)			4085 (160.8)	4055 (159.6)
890 (35)	960 (37.8)		1060 (41.7)	
—	1140 (44.9)			
900 (35.4)	980 (38.6)			
1400 (55.1)	1600 (63)		1700 (66.9)	
415 (16.3)	455 (17.9)		490 (19.3)	
2020 (79.5)	2200 (86.6)	2230 (87.8)	2380 (93.7)	2440 (96.1)
150 (5.9)	160 (6.3)		190 (7.5)	200 (7.9)

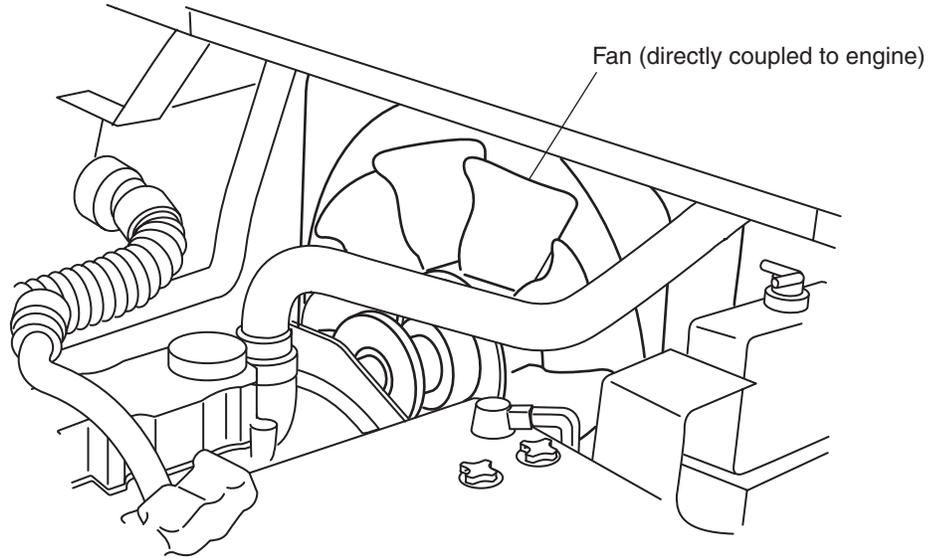
# COOLING SYSTEM

<b>Specification</b> .....	2 – 1
<b>Structure</b> .....	2 – 2
<b>Removal and Installation</b> .....	2 – 3
<b>Inspection and Adjustment</b> .....	2 – 5
Fan Belt Inspection .....	2 – 5
Fan Belt Tension .....	2 – 5
Connecting Radiator Hoses .....	2 – 5
Unit Layout .....	2 – 5
Coolant .....	2 – 6
Radiator Cap .....	2 – 6

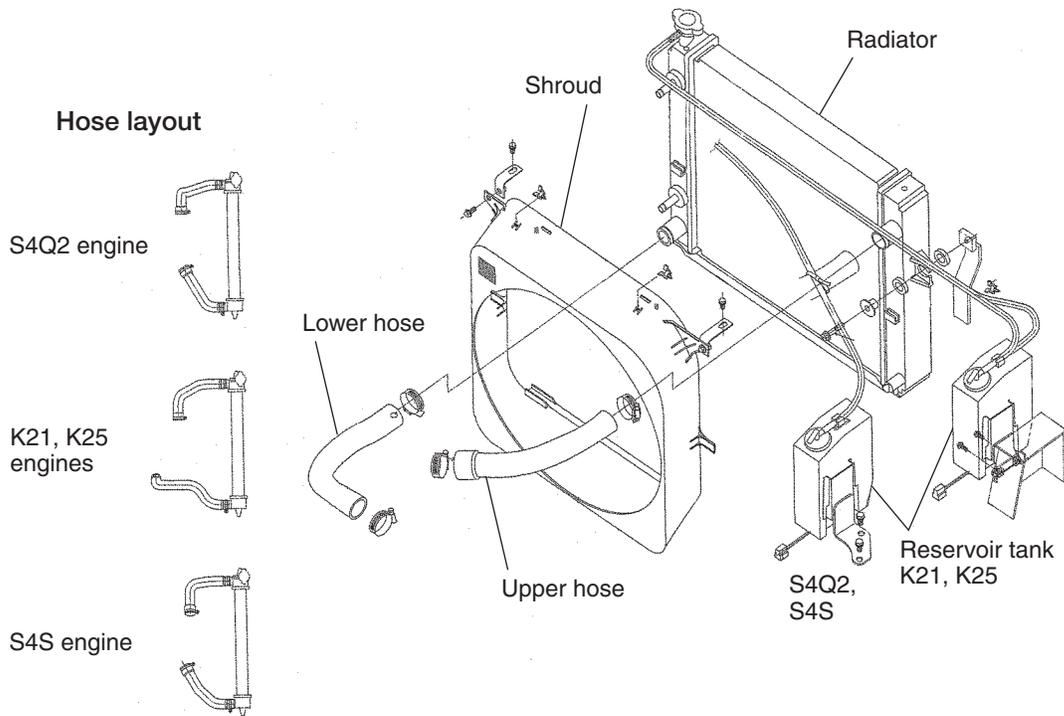
**Specification**

Items		Truck Models	1 ton class	2 ton class	3 ton class
Cooling System	Type		Water-cooled, forced circulation		
	Radiator		Corrugated fin (pressure) type		
	Water pump		Centrifugal type		
	Thermostat		Wax Pellet Type		

Structure



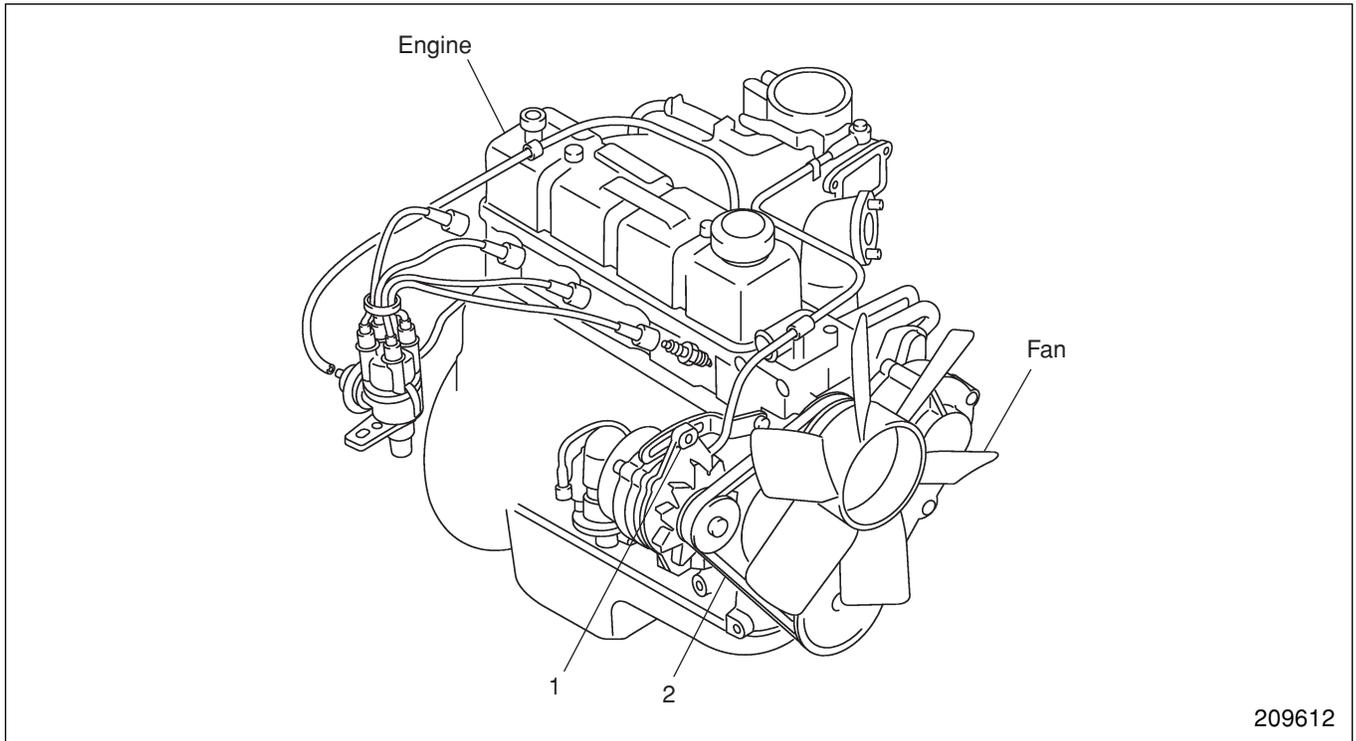
209610



209611

## Removal and Installation

### Fan Belt Removal



#### Sequence

- 1 Tension pulley assembly, Bolt
- 2 Fan belt

#### Start by:

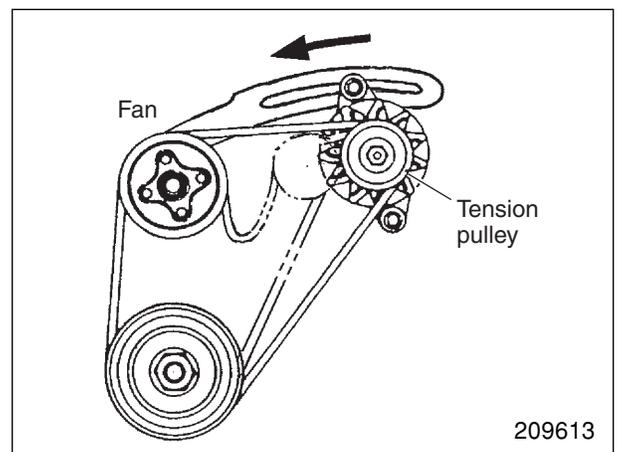
Remove the radiator cover.

#### Suggestion for Removal

- (1) Loosen the tension pulley lock bolt by three or four turns. If the bolt is loosened insufficiently, the tension pulley will not be moved.

Note: Do not loosen the lock bolt to such an extent that the bolt would be removed.

- (2) Move the tension pulley fully toward the fan, then remove the belt.



### Installation

To install, follow the removal sequence in reverse. Also follow the instructions given below.

- (1) Before installing the belt, turn the fan to check for smooth rotation. Replace the bearing if it generates abnormal sound.
- (2) After installing the belt, push it to make sure that the tension pulley moves, then tighten the pulley lock bolt firmly.

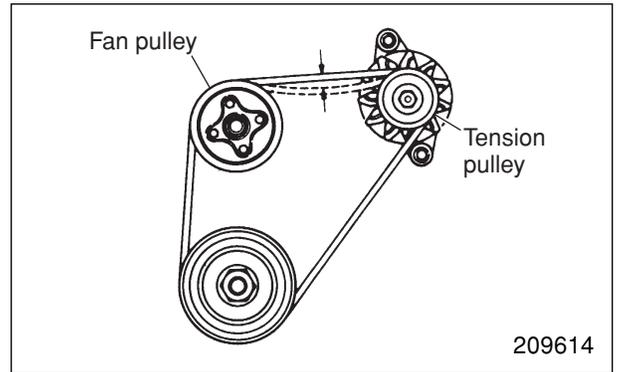
## Inspection and Adjustment

### Fan Belt Inspection

- (1) Check the belt for contamination with oil, grease and dust. Replace the belt if required. When the contamination is slight, remove it clean with rag or wiping paper. Do not use gasoline, oil or any other solvent to clean the belt.
- (2) During engine overhaul or belt tension adjustment, closely check the belt for condition. Replace the belt with a new one if it has any sort of damage.

### Fan Belt Tension

Apply a force of 98 N (10 kgf) [22 lbf] perpendicularly to the belt at a point midway between the fan pulley and tension pulley. Adjust the tension so that belt deflection becomes between 11 to 13 mm (0.43 to 0.51 in.).

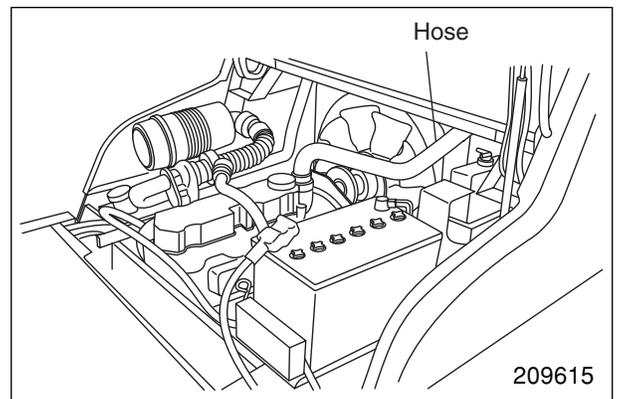


### Connecting Radiator Hoses

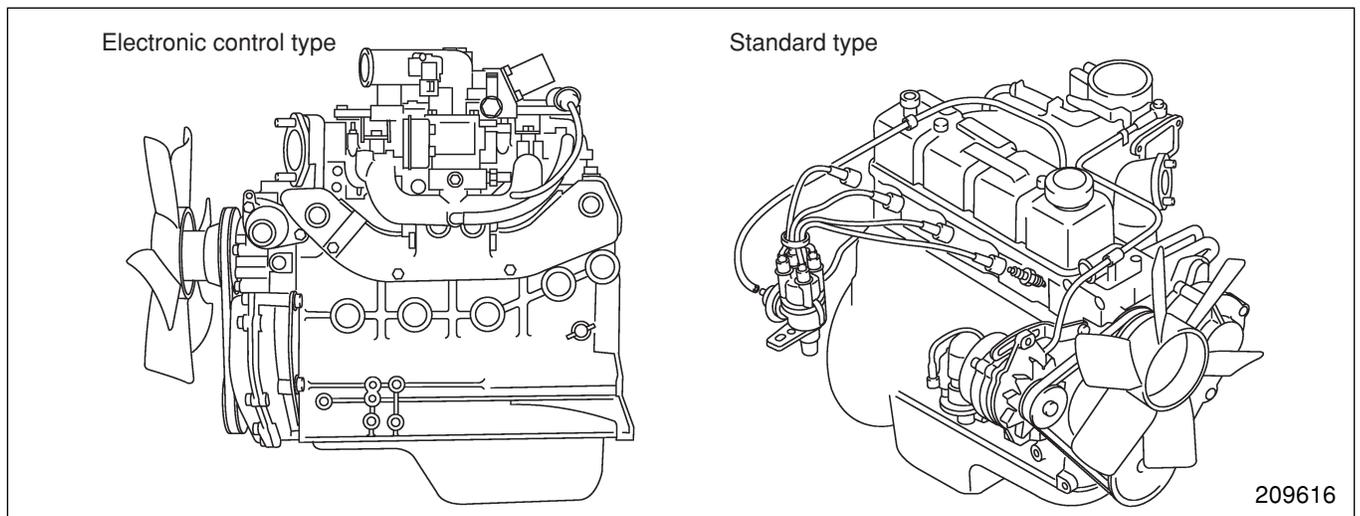
When connecting the hoses to the radiator, fit their ends fully on the fittings and secure them with clamps. Tighten the clamp bolts to the torques indicated below. Make sure that each hose is correctly connected and prevented from disconnection by the flare of the fitting.

#### Clamp bolt tightening torques

Upper and lower hoses	3.92 to 5.88 N·m (0.4 to 0.59 kgf·m) [2.9 to 4.3 lbf·ft]
Cooler hose	2.94 to 4.9 N·m (0.3 to 0.5 kgf·m) [2.2 to 3.6 lbf·ft]



### Unit Layout



## COOLING SYSTEM

---

### Coolant

Fill the radiator with coolant containing antifreeze. Start and operate the engine to let it warm up while checking for abnormal noise. Make sure that the quantity of coolant is as specified by checking the level in the reserve tank.

#### Quantity of coolant

Unit: liter (U.S. gal.)

Items \ Truck Models	1 ton class	2 ton class	3 ton class
Engine	3.95 (1.04)	—	—
Radiator	2.2 (0.58)	—	—
Reserve tank (FULL level)	0.65 (0.17)	0.65 (0.17)	0.65 (0.17)
Total quantity of coolant (including coolant in hoses)	6.8 (1.80)	7.4 (1.96)	8.7 (2.30)
Oil cooler	0.094 (0.02)	—	—

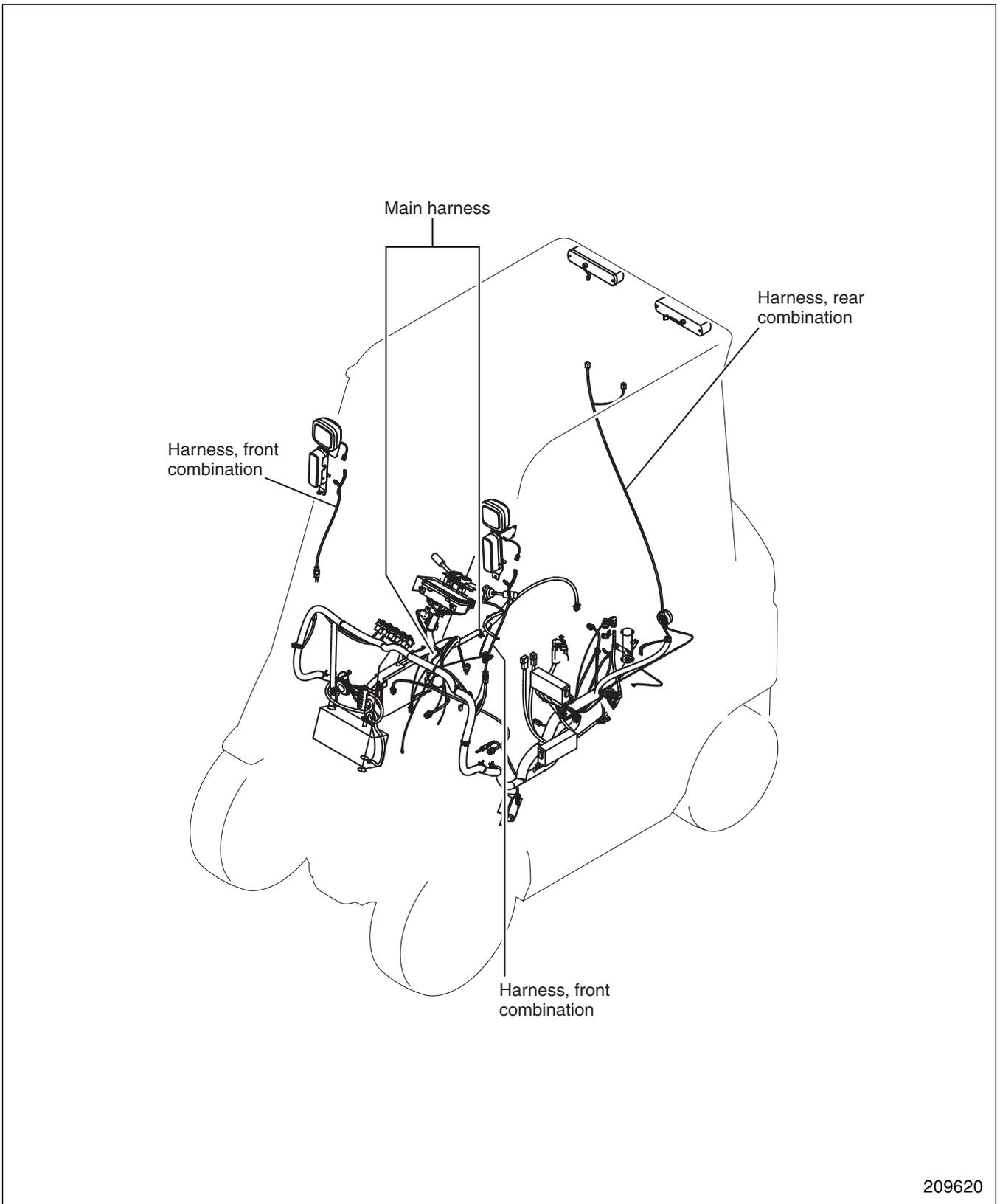
### Radiator Cap

Opening pressure	90 ± 15 kPa (0.92 ± 0.15 kgf/cm <sup>2</sup> ) [13.1 ± 2.2 psi]
Vacuum valve	0 to 5 kPa (0 to 0.05 kgf/cm <sup>2</sup> ) [0 to 0.73 psi]

# ELECTRICAL SYSTEM

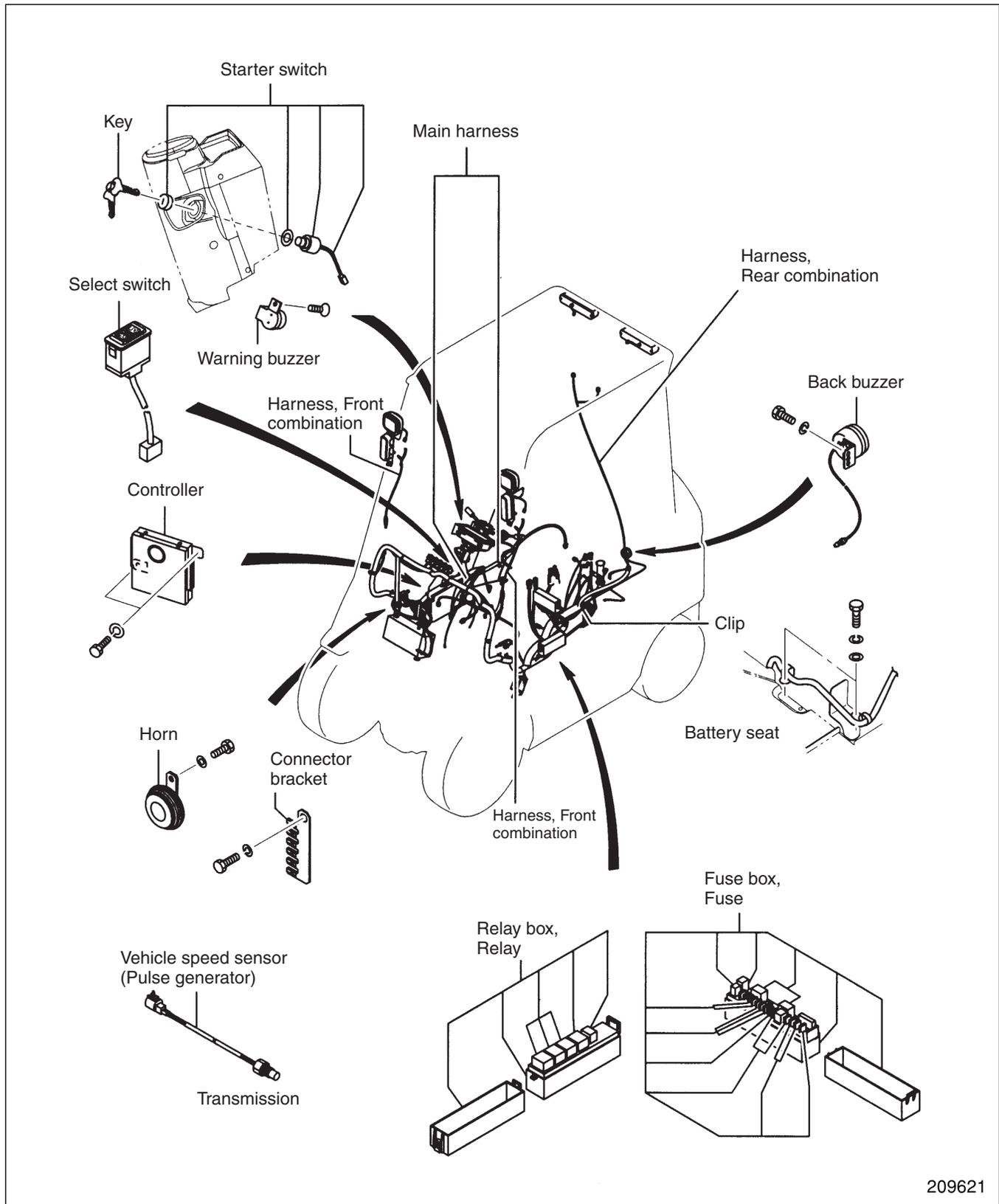
<b>Chassis Electrical Devices Wiring Outline</b> .....	3 – 1
<b>Structure</b> .....	3 – 3
Console box .....	3 – 3
Major Electrical Components .....	3 – 5
Lamp Bulb Specifications .....	3 – 17
<b>Console Box</b> .....	3 – 18
Disassembly .....	3 – 18
Instrument Panel .....	3 – 19
<b>Battery Maintenance</b> .....	3 – 20
<b>Wire Color</b> .....	3 – 21
<b>Troubleshooting</b> .....	3 – 22
<b>Electrical Schematic</b> .....	3 – 27

### Chassis Electrical Devices Wiring Outline (No. 1)



209620

### Chassis Electrical Devices Wiring Outline (No. 2)

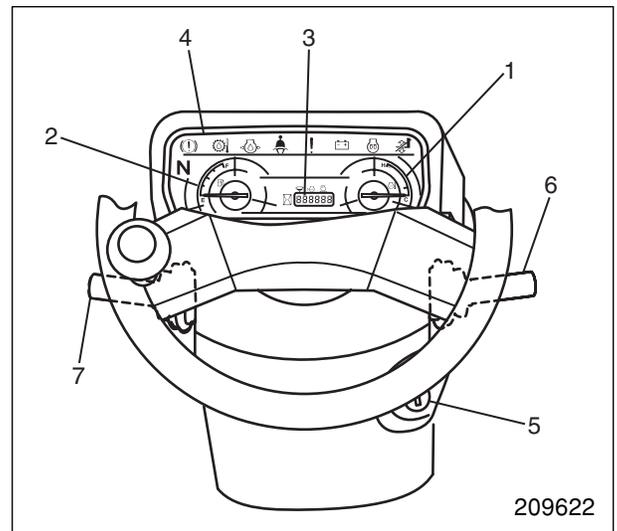


209621

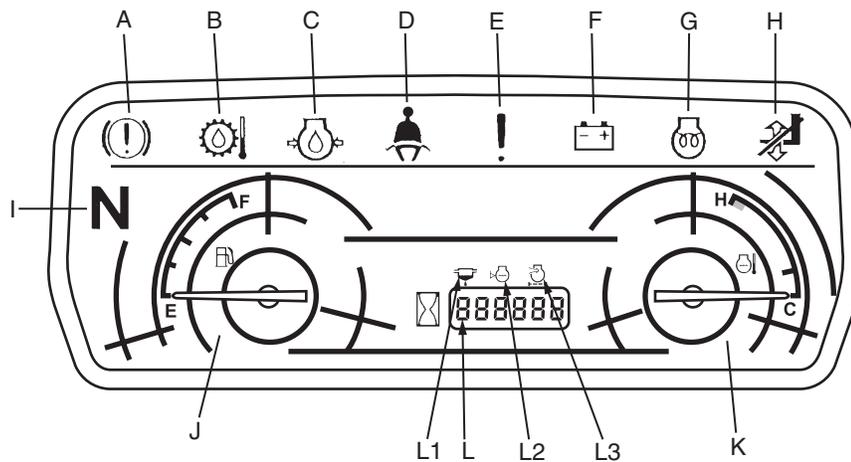
## Structure

### Console box

- 1 Water temperature gauge
- 2 Fuel gauge
- 3 Various warning lights
- 4 Instrument panel
- 5 Starter switch
- 6 Lighting switch, turn signal switch
- 7 Forward-reverse lever



Function of Instrument Panel



209623

Description of function

Code	Name of monitor	When not illuminated	When illuminated or flashing	Remarks	
A	Brake fluid level warning lamp	Normal level	Low level	—	
B	ATM: Torque converter fluid temperature warning lamp	Normal temperature	Overheat	ATM truck	
	MTM: Clutch wear lamp	Normal	Clutch worn	MTM truck	
C	Engine oil pressure warning lamp	Normal oil pressure	Low oil pressure	—	
D	Seat belt reminder warning lamp	Fastened	Not fastened	—	
E	Multi-purpose warning lamp (illuminates when warnings indicated by printed symbols occur or minor failures occur)	Normal	Malfunction	Printed symbol	
F	Charge warning lamp	Normal charging	Abnormal charging system	—	
G	Glow pilot lamp	Preheating completed	Engine being preheated	Diesel-engine truck	
H	Load/unload interlock lamp	Free	Locked	—	
	Fr, Re interlock lamp	Free	Locked (flashing)	—	
I	Neutral lamp	F or R	Neutral	—	
J	Fuel gauge	Indicate remaining fuel amount with key in "ON."			
K	Water temperature gauge	Overheat if pointer enters the red zone.			
L	Liquid crystal (normally acting as hour meter)	Indicate operating hours with key in "ON."			
Position and content of printed symbols	L1	Fuel filter warning lamp	Normal	Water drain required	Diesel-engine truck
	L2	Coolant level warning lamp	Normal level	Low level	Option
	L3	Clogged air cleaner element warning lamp	Normal element	Clogged	Option
When major failures occur, bulbs A, C, D, E, and H simultaneously flash.					

Inspection method of blown bulbs for Instrument panel

Each warning lamp and indicator lamp are normal if they illuminate with the starter switch turned ON, and no bulbs are blown.

## Major Electrical Components

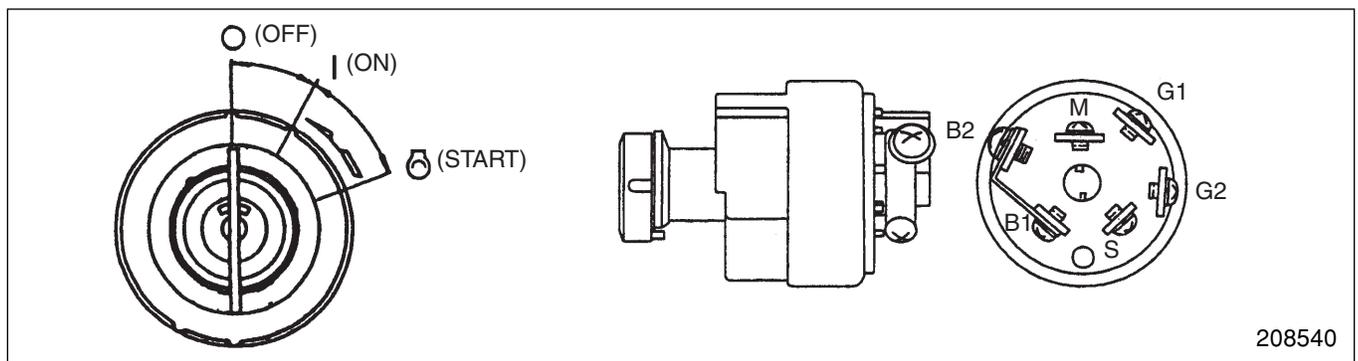
### Starter switch

The diesel-engine truck, which uses a distributor type injection pump, is provided with an engine automatic stop mechanism of the fuel cut system by the starter switch.

The gasoline-engine truck is also provided with an engine automatic stop mechanism of the fuel cut system.

### Starter switch (with Anti-Restart Lock)

This switch has a built-in anti-restart lock, so the key cannot be turned from **I** (ON) to **⊗** (START) position while the engine is running. This prevents the engine from troubles on starting or starter breakage caused by casual re-starting while the engine is running. The gasoline- and diesel-engine models use the same starter switch. In the diesel-engine models, **I** (ON) position of the switch is for energizing the glow plugs.



### Connection Table

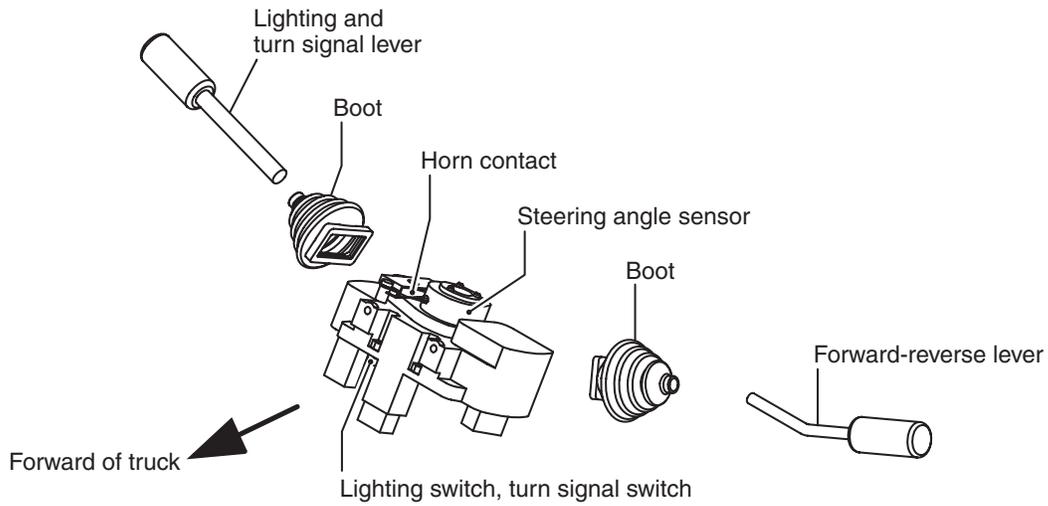
#### Gasoline-engine truck (12 V)

Terminal	B1, B2	G1	G2	M	S
Connected to	Battery, alternator, fuse box			Fuse box	FNR lever
Key position					
OFF					
ON (when driving)	○	—————	—————	○	
START (when starting engine)	○	—————	○	○	○

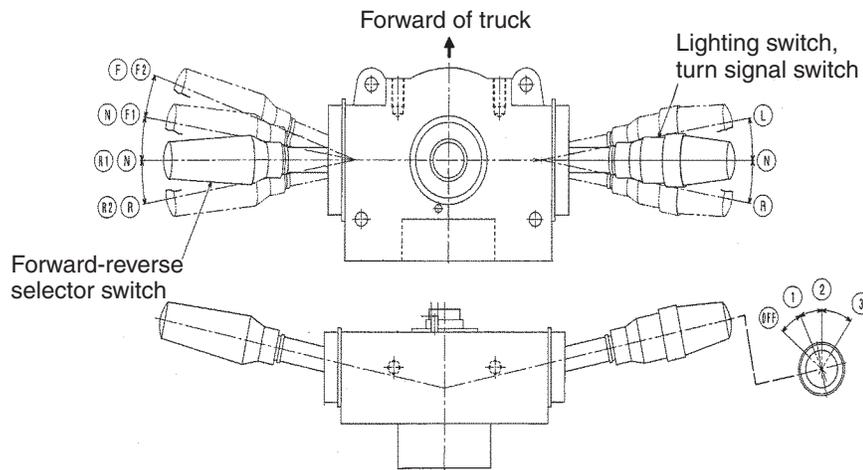
#### Diesel-engine truck (24 V)

Terminal	B1, B2	G1	G2	M	S
Connected to	Battery, alternator, fuse box relay (glow plug)			Fuse box, engine stop, control timer	Neutral switch (starter), glow timer
Key position					
OFF					
ON (when preheating) (when driving)	○	—————	—————	○	
START (when starting engine)	○	—————	○	○	○

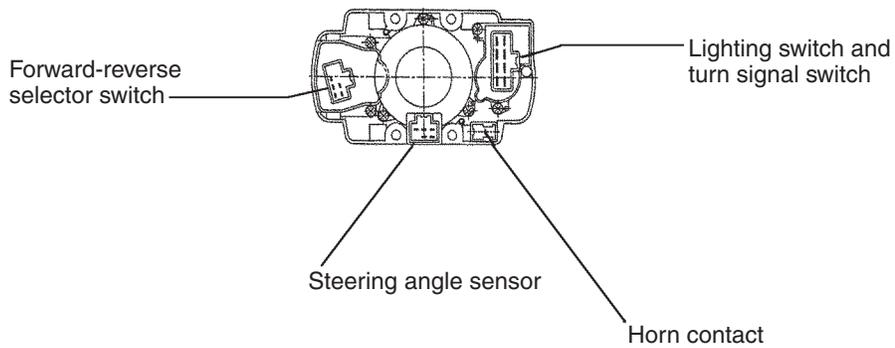
Lighting switch and turn signal switch



209625



209626



209627

**BUY NOW**

**Then Instant Download  
the Complete Manual  
Thank you very much!**