MITSUBISHI FORKLIFT TRUCKS

Service Manual

Chassis, Mast & Options

FD100N	**F15D-60011-up**
FD120N	**F15D-60011-up**
FD135N	**F15D-60011-up**
FD150AN	**F24B-60011-up**
FD160AN	**F39-60011-up**

For use with 6M60-TL Engine Service Manual. **99799-53100**

FOREWORD

This service manual is a guide for servicing Mitsubishi forklift trucks. For your convenience the instructions are grouped by systems as a ready reference.

The long productive life of your forklift truck(s) depends on regular and proper servicing. Servicing consistent with what you will learn by reading this service manual. Read the respective sections of this manual carefully and familiarize yourself with all of the components before attempting to start a test, repair or rebuild job.

The descriptions, illustrations and specifications contained in this manual are for trucks with serial numbers in effect at the time of printing. Mitsubishi Forklift Trucks reserves the right to change specifications or design without notice and without incurring obligation.

FD100N, FD120N, FD135N, FD150N and FD160N are powered by Mitsubishi 6M60-TL diesel engine. For engine servicing, please refer to the 6M60-TL diesel engine service manual (Publication Number 99709-61100).

Safety Related Signs

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

WARNING	Indicates a specific potential hazard resulting in serious bodily injury or death.
CAUTION	Indicates a specific potential hazard resulting in bodily injury, or damage to, or destruction of, the forklift truck.
NOTE	Indicates a condition that can cause damage to, or shorten service life of, the forklift truck.

Pub. No. 99799-53100

SAFETY

⚠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.

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

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

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.

(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. Do not mix metric fasteners with standard nuts and bolts.

(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 proce-

dure 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. Do not connect wiring to a line containing fluid.

(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.

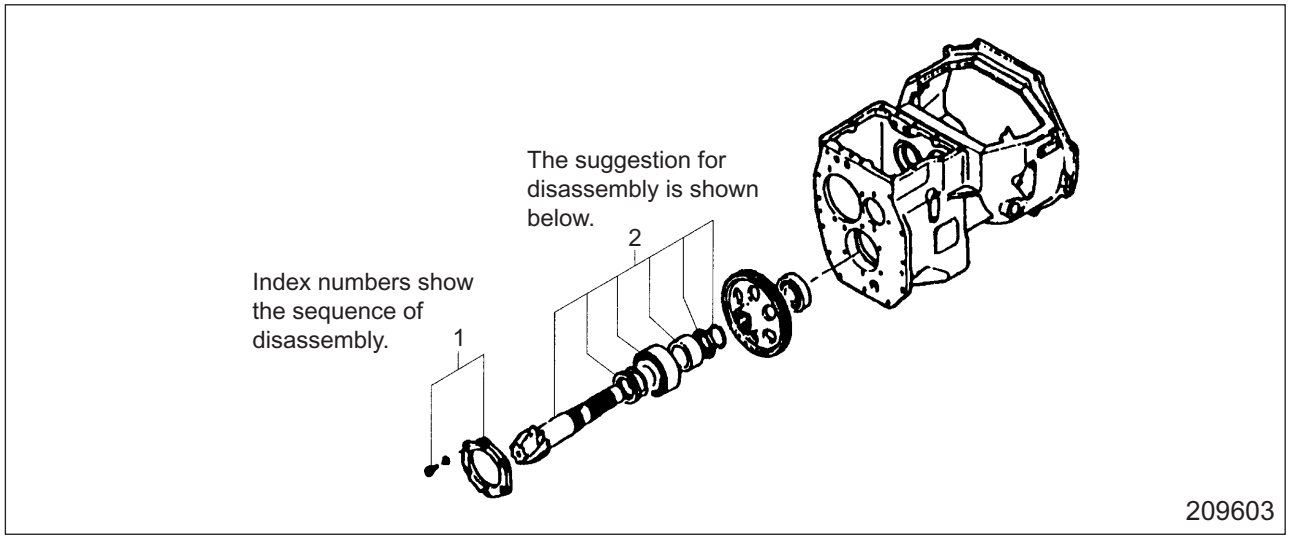
(18) Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result 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 READ THIS MANUAL
Disassembly diagram (example)

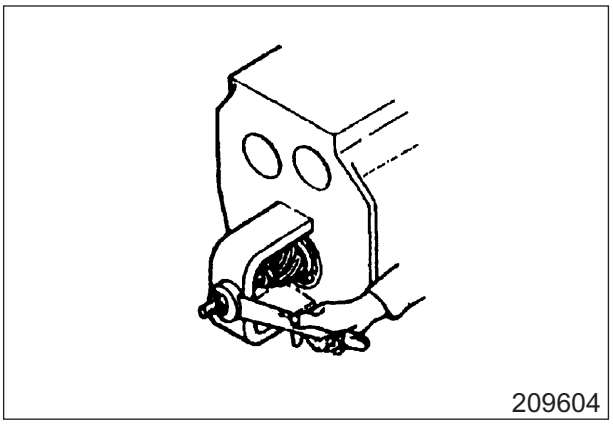


Sequence

1 Cover, Bolt, Washer (part name)
2 Output shaft (part name)

Suggestion for disassembly

(1) Output shaft removal



Symbols or abbreviations

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)

Clearance between cylinder and piston	Standard valve	0.020 to 0.105 mm (0.00079 to 0.00413 in.)
	Repair service unit	0.15 mm (0.059 in.)

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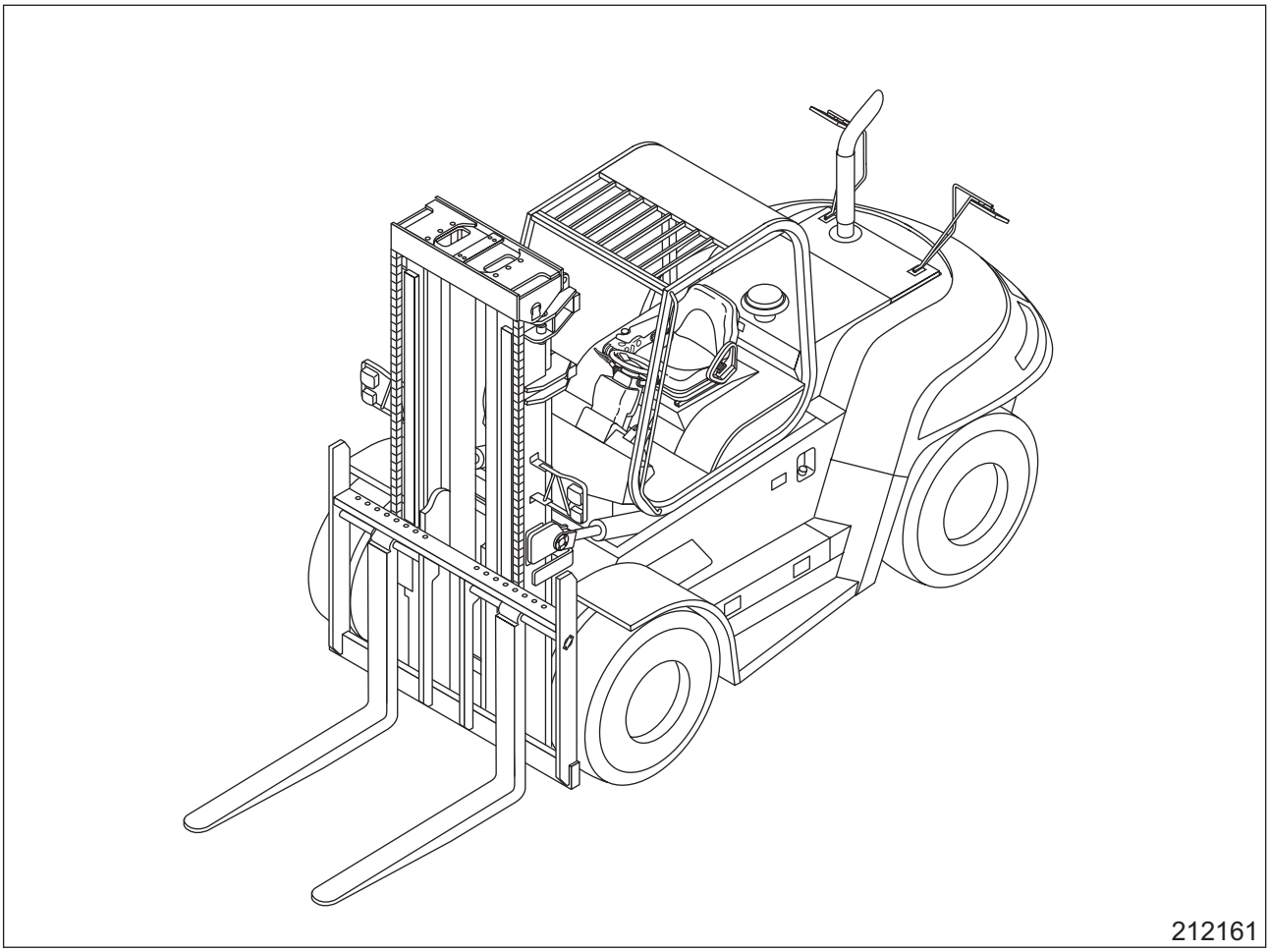
GENERAL INFORMATION

1. Model View

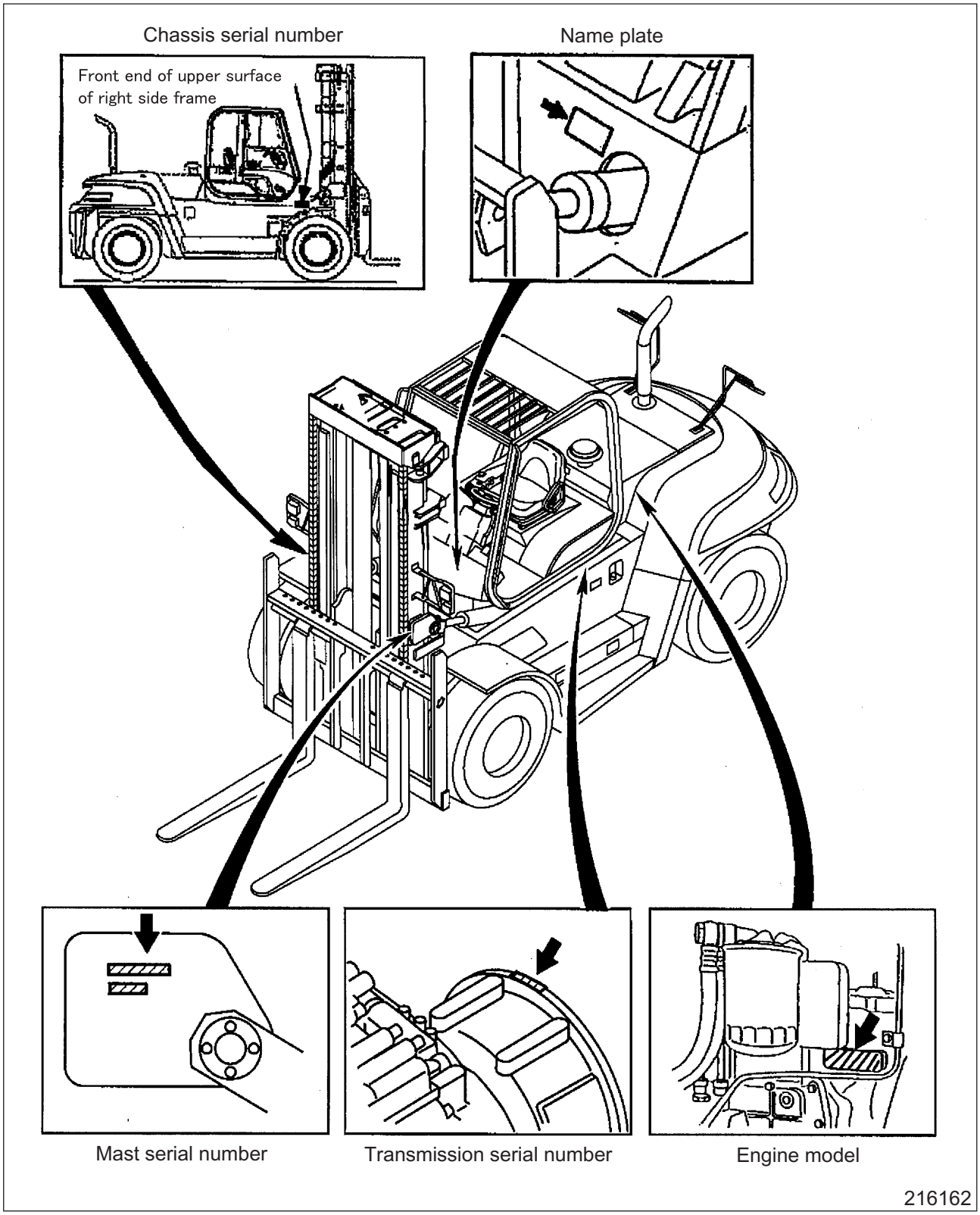


2. Truck Models Covered

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

Truck model	Transmission	Model code - Serial number	Engine mounted
FD100N	Powershift	F15D-60011-up	Mitsubishi 6M60-TL diesel engine
FD120N	Powershift	F15D-60011-up	Mitsubishi 6M60-TL diesel engine
FD135N	Powershift	F15D-60011-up	Mitsubishi 6M60-TL diesel engine
FD150N	Powershift	F24B-60011-up	Mitsubishi 6M60-TL diesel engine
FD160N	Powershift	F39-60011-up	Mitsubishi 6M60-TL diesel engine

3. Serial Number Locations

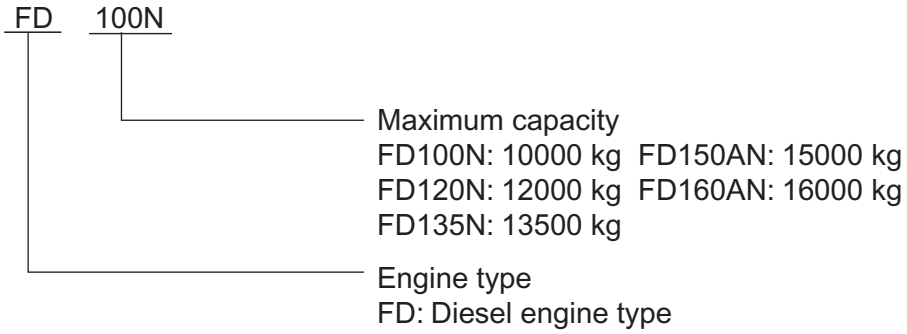


4. Main specifications

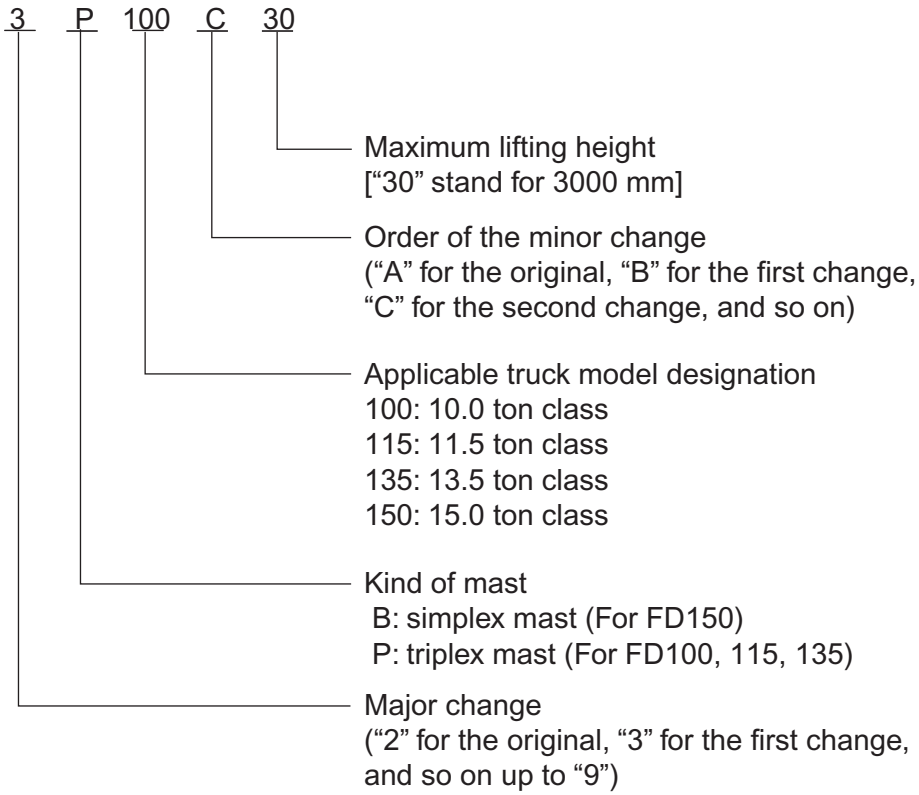
Truck model			FD100N	FD120N	FD135N	FD150N	FD160N
Designation			F15D	F15D	F15D	F24B	F39
Type			Standard (with 3-speed powershift transmission)				
General	Capacity/load center		10000/600 kgf/mm (17500/24 lbf/in.)	12000/600 kgf/mm (20000/24 lbf/in.)	13500/600 kgf/mm (17500/24 lbf/in.)	15000/600 kgf/mm (20000/24 lbf/in.)	16000/600 kgf/mm (17500/24 lbf/in.)
	Lift		3300 mm (130 in.)				
	Lift speed (unloaded/ loaded)		480/360 mm/sec (104/98 fpm)		400/310 mm/sec (79/61 fpm)		370/310 mm/sec (73/61 fpm)
	Lowering speed (unloaded/ loaded)		500/450 mm/sec (98/89 fpm)		510/380 mm/sec (100/75 fpm)		470/420 mm/sec (93/83 fpm)
	Tilt angle (forward-backward)		15˚– 12˚				
	Free lift		0				
Performance	Travel speeds (unloaded/ loaded)	Forward	29/24.5 km/h (18/15 mph)		30/22.0 km/h (19/14 mph)		
		Reverse					
	Minimum turning radius		4000 mm (157 in.)	4060 mm (160 in.)	4160 mm (164 in.)	4550 mm (179 in.)	4815 mm (190 in.)
	Turning angle	Inside	78˚27′				–
		Outside	51˚14′				–
	Minimum intersecting aisle		3550 mm (140 in.)	3590 mm (141 in.)	3680 mm (145 in.)	3830 mm (151 in.)	–
Tires	Gradeability (rated load)	At 1.6 km/h (1 mph)	30%	27%	26%	27%	29%
		At 2 km/h (1.2 mph)	21%	19%	15%	14%	
	Size of tires (front and rear)		10.00-20-14PR (I)	10.00-20-16PR (I)	12.00-20-18PR (I)		12.00-20-20PR (I)
	Inflation pressure of tires (front and rear)		700 kPa (7.0 kgf/cm^2) [101 psi]	800 kPa (8.0 kgf/cm^2) [116 psi]	800 kPa (7.7 kgf/cm^2) [94 psi]		–
Weight and axle loading (unload)	Weight		14800 kg (32630 lb)	16060 kg (28800 lb)	17700 kg (39020 lb)	18050 kg (39790 lb)	18950 kg (41780 lb)
	Front axle loading		7450 kg (16420 lb)	7340 kg (16180 lb)	7850 kg (17310 lb)	8190 kg (18050 lb)	8910 kg (19640 lb)
	Rear axle loading		7350 kg (16200 lb)	8720 kg (19250 lb)	9850 kg (21720 lb)	9860 kg (21730 lb)	10040 kg (22130 lb)

5. Chassis and Mast Model Identification

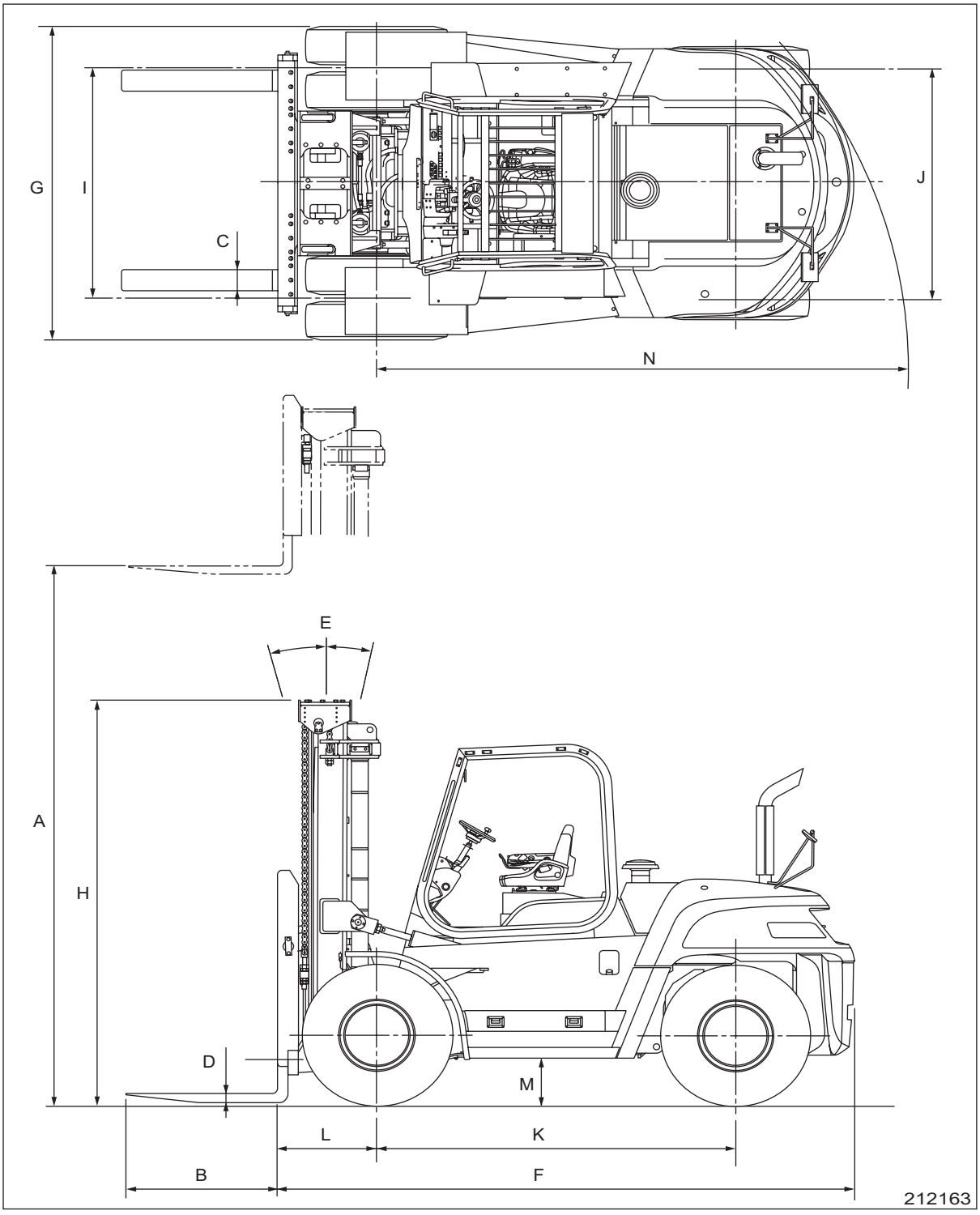
[Chassis]



[Mast]



6. Dimensions (Approximate)



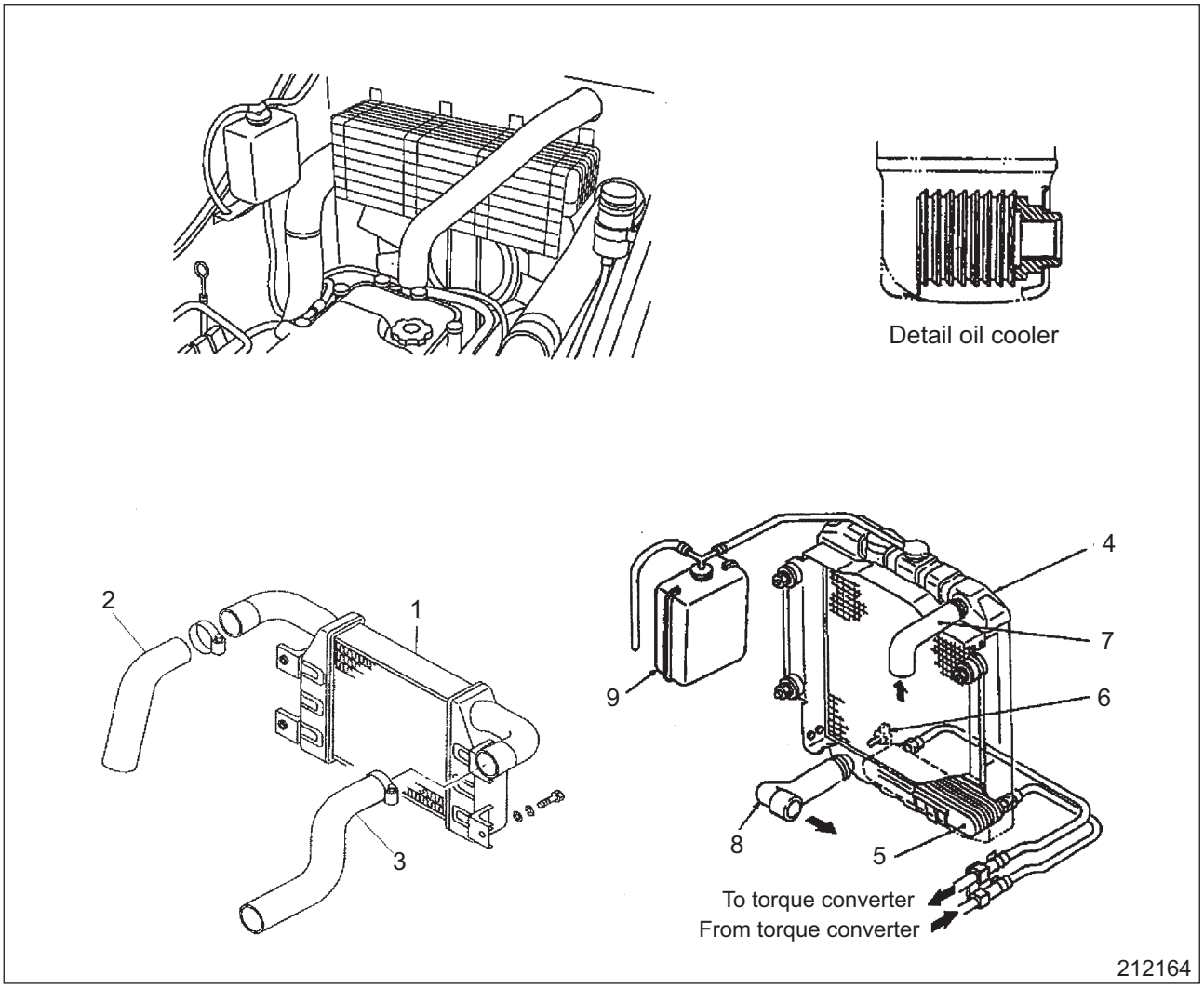
No.	Truck model	FD100N	FD120N	FD135N	FD150N	FD160N
A	Lift	3300 mm (130 in.)				
B	Fork length	1220 mm (48 in.)				
C	Fork width	180 mm (7.1 in.)				
D	Fork thickness	72 mm (2.8 in.)	79 mm (3.1 in.)	88 mm (3.5 in.)	88 mm (3.5 in.)	92 mm (3.6 in.)
E	Tilt angle (forward-backward)	15˚–12˚				
F	Overall length	4295 mm (169 in.)	4375 mm (172 in.)	4530 mm (178 in.)	4830 mm (190 in.)	5040 mm (198 in.)
G	Overall width (outside of tires)	2515 mm (99 in.)		2600 mm (102 in.)		5040 mm (198 in.)
H	Overall height (to top of mast lowered)	3235 mm (127 in.)		3480 mm (137 in.)		3680 mm (145 in.)
I	Tread (front)	1900 mm (75 in)		1905 mm (75 in)		
J	Tread (rear)	1765 mm (77 in)		1925 mm (76 in)		1890 mm (74 in)
K	Wheelbase	2800 mm (110 in)			3100 mm (122 in)	3300 mm (130 in)
L	Front overhang	755 mm (29.7 in.)	765 mm (30 in.)	795 mm (31.3 in.)	795 mm (31.3 in.)	805 mm (31.7 in.)
M	Ground clearance (at frame)	275 mm (10.8 in.)		320 mm (12.6 in.)		
N	Minimum turning radius	4000 mm (157 in.)	4060 mm (160 in.)	4160 mm (164 in.)	4550 mm (179 in.)	4815 mm (190 in.)

COOLING SYSTEM

1. Specifications

Truck model		FD100N	FD120N	FD135N	FD150N	FD160N
Cooling system	Cooling method	Forced circulation of coolant				
	Radiator type	Corrugated fins with pressure cap (oil cooler integral type)				
	Oil cooler type	Plate fin type				
	Coolant capacity	23 Liters (4.7 U.S. gal.)				

2. Structure



1 Intercooler
2 Intake hose
3 Outlet hose
4 Radiator
5 Oil cooler
6 Drain cock
7 Upper hose
8 Lower hose
9 Reserve tank

The cooling system has corrugated fins for the radiator and a cooling fan with eight blades which enhances the cooling efficiency.

The oil cooler for the torque converter, equipped in the lower tank of radiator, is a water-cooled type which utilizes the engine cooling water to enhance the cooling efficiency of torque converter fluid.

3. Suggestions for Removal and Installation

3.1 Removing radiator and intercooler

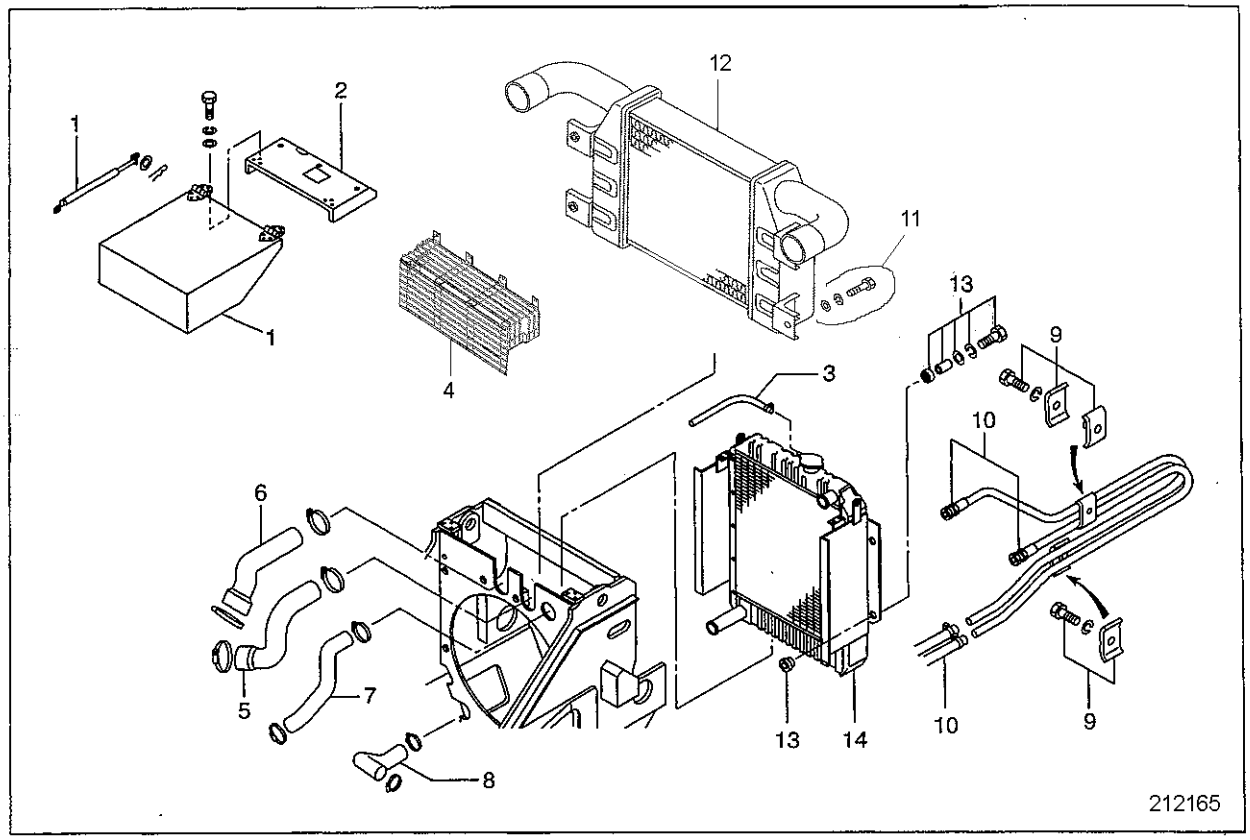
3.1.1 Preparation

Open the drain cock to drain coolant from radiator.

⚠WARNING

Make sure the coolant temperature is not hot and the radiator cap is removed before opening the drain cock.

3.1.2 Removal sequence



1 Engine cover, Gas spring
2 Radiator cover
3 Reservoir tank hose
4 Fan guard
5 Intake hose of intercooler
6 Outlet hose of intercooler
7 Radiator hose (upper)
8 Radiator hose (lower)
9 Clamp
10 Oil cooler pipe
11 Intercooler mount, Grommet, Collar, Washer
12 Intercooler
13 Radiator mount, Grommet, Collar, Washer
14 Radiator

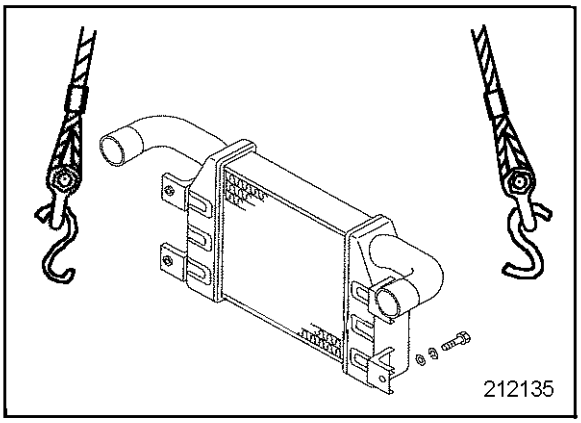
3.1.3 Suggestions for Removal and Installation

(1) Intercooler

(a) Attach a lifting hook through the top mounting bolt holes on the left hand and right hand brackets of the intercooler.

(b) Hitch a rope to the hook and lift with a crane.

Weight of intercooler	9 kg (20 lb.)

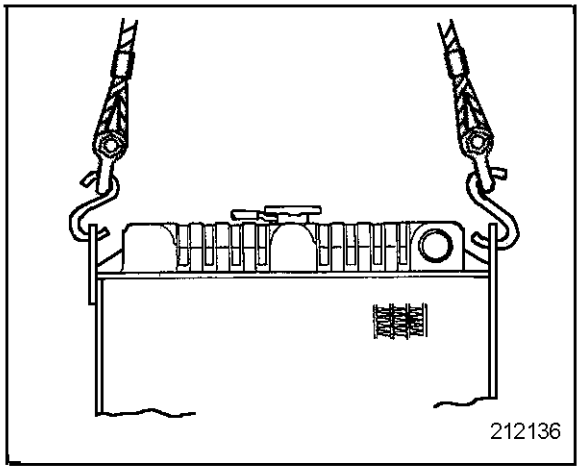


(2) Radiator

(a) Support the radiator with crane.

(b) Remove the radiator mount (four places) and lift the radiator.

Weight of radiator	30 kg (66 lb.)



3.1.4 Inspection and Repair

(1) Intercooler

(a) Replace any rubber mount which is inelastic or hardened.

(b) When foreign matters, such as insects and dust, have been adhered to the fins of the core, blow them out with compressed air from the opposite side and remove them, taking care not to damage the fins.
Wear goggles for the sake of safety.

(c) Replace the intercooler, if the corrosion and rusting are remarkable or the fin is not repairable.

(d) Check the intercooler hoses (upper, lower) for bulge, damage to the hose clamp sections. Replace them if any abnormality is found.

(2) Radiator

(a) Replace any rubber mount which is inelastic or hardened.

(b) When foreign matters, such as insects and dust, have been adhered to the fin of the core, wash them out with pressurized water from the opposite side and remove remaining foreign matters carefully so as not to damage the water pipes.

(c) Replace the radiator, if the corrosion and rusting are remarkable or the fin is not repairable.

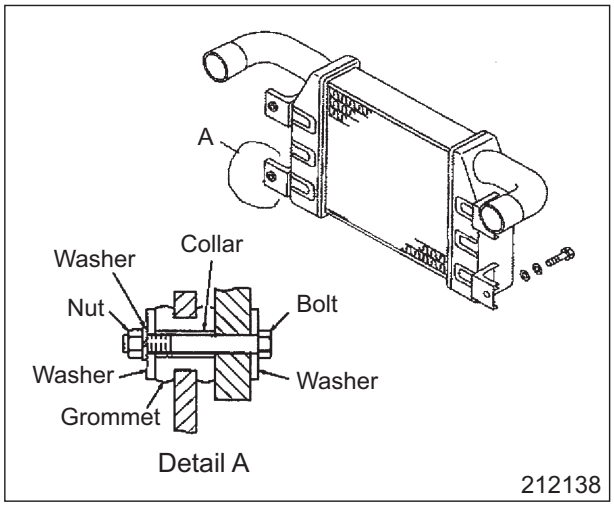
(d) Check the radiator hoses (upper, lower) for bulge, damage to the hose clamp sections. Replace them if any abnormality is found.

3.1.5 Installation

Follow the removal procedure in reverse while noting the following instructions.

(1) Intercooler

(a) Lower and align the bottom bolt holes with the mounting pin of the frame mount.



(2) Hose

(a) Connect each hose to intercooler or radiator making sure the end of the hose reaches the base of the fitting. Tighten the clamp and make sure the hose end is stopped at the flare of the fitting and can not come off of the fitting.

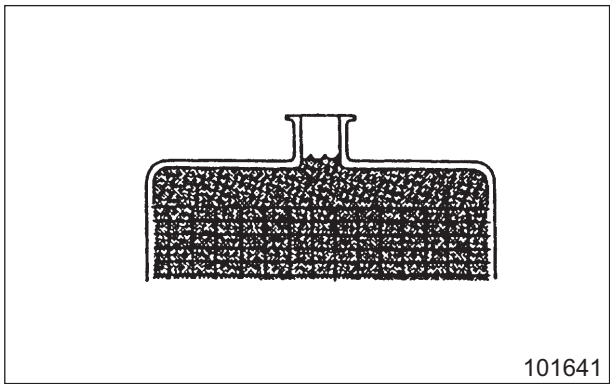
(3) Antifreeze and coolant

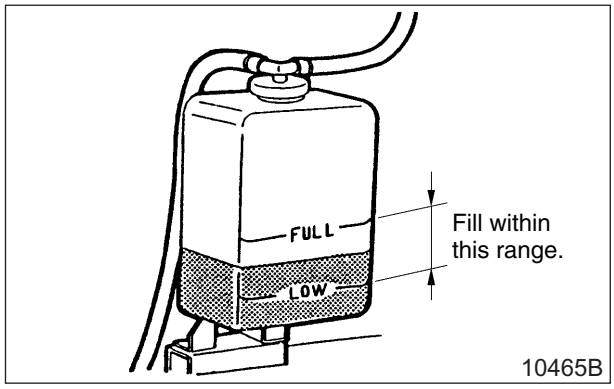
(a) Mix the coolant with antifreeze to specified concentration, and fill the radiator with it until the fluid level comes to the top of the inlet.

(b) In addition, fill the reserve tank with the mixed solution to the specified level.

(c) Start and warm up the engine while checking for abnormal sound.

(d) If coolant in reserve tank decreases, supply the mixed solution to the specified range.





4. Troubleshooting

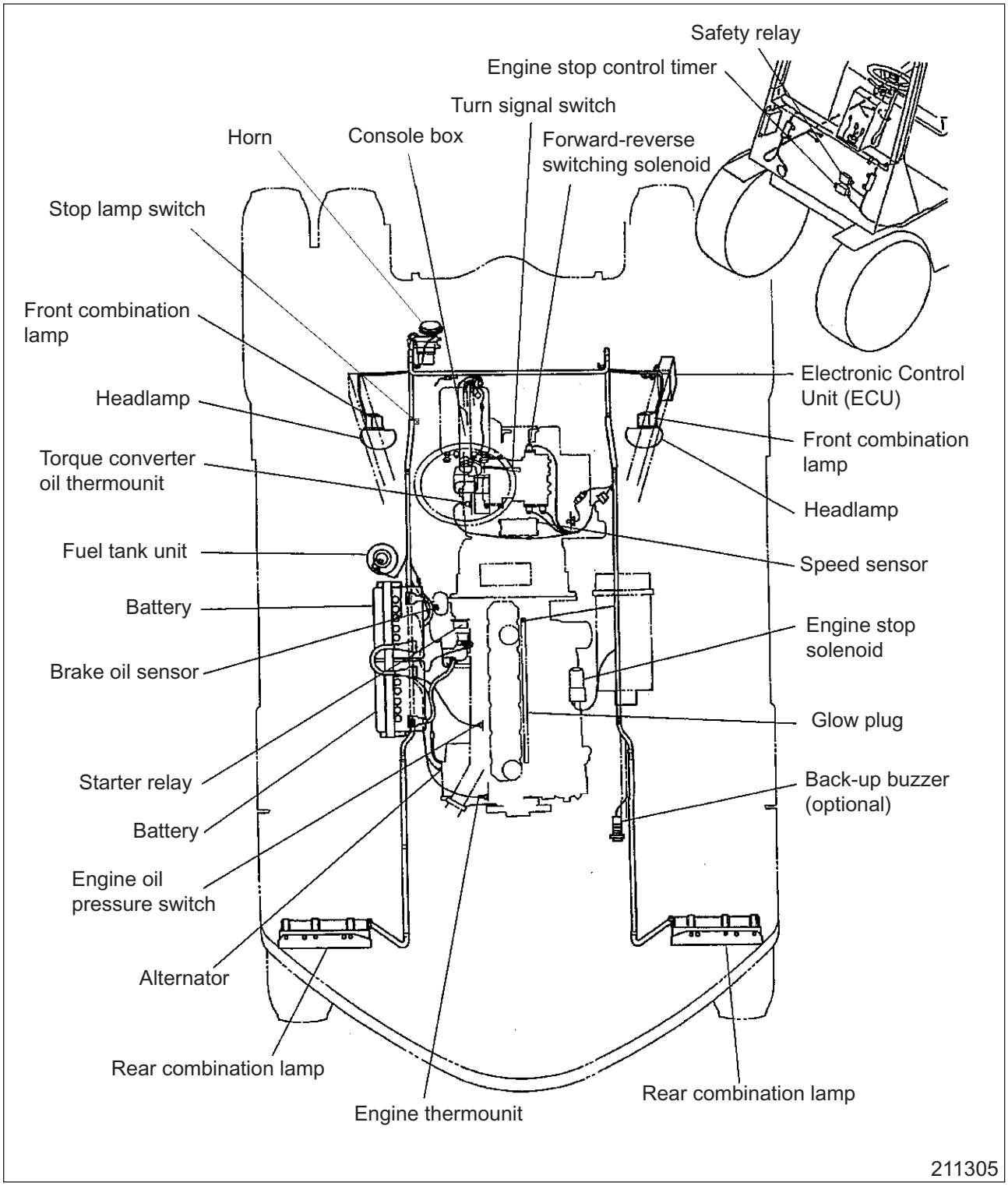
Water leaks from radiator	Radiator has been corroded due to prolonged activity or others	Repair corroded part or replace if there is remarkable corrosion.
	Deterioration of upper or lower hose	Replace.
	Poor tightening of hose clamp	Retighten or replace.
	Faulty drain cock	Replace drain cock.
	Cracks occurred in engine cooling system, over-heating	Inspect and repair engine cooling system.
Engine overheat	Clogging of radiator fins	Clean tubes with copper or steel wire so as not to damage them.
	Extreme deformation of fin	Repair or replace the fin.
	Loosened fan belt and water pump belt	Check belts for tension, elongation and crack due to ageing, and replace if there is any defect.
	Defective thermostat	Inspect and repair, or replace.
	Insufficient coolant	Refill.
Oil leaks from oil cooler hose	Poor tightening of hose clamp	Retighten or replace.
	Oil cooler has been corroded due to prolonged activity or others	Repair corroded part or replace if there is remarkable corrosion.

ELECTRICAL SYSTEM

1. Specifications

Truck model		FD100N	FD120N	FD135N	FD150N	FD160N
Battery	Model number and quantity	65D23R × 2				
	Voltage (V)	12				
	Capacity (Ah)	52				
Direction lever		Electric				
Console box		With OK monitor				
3-speed automatic transmission controller		ECU (Electronic Control Unit)				
Starter switch		Anti-restart type (with the built-in mechanical lockout for preventing duplicated starting)				
Lamps		24V, Refer to “Lamp Bulb Specifications”.				

2. Location of Components



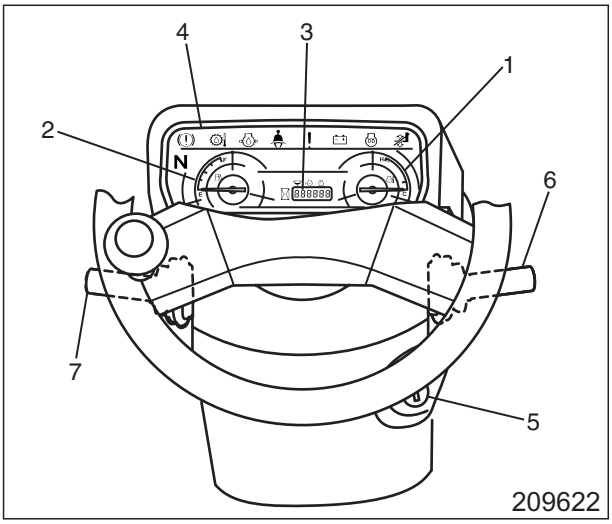
NOTE

Every harness should be properly retained to avoid it from being interfered or rubbed by other parts. Repair a damaged harnesses with vinyl tape.

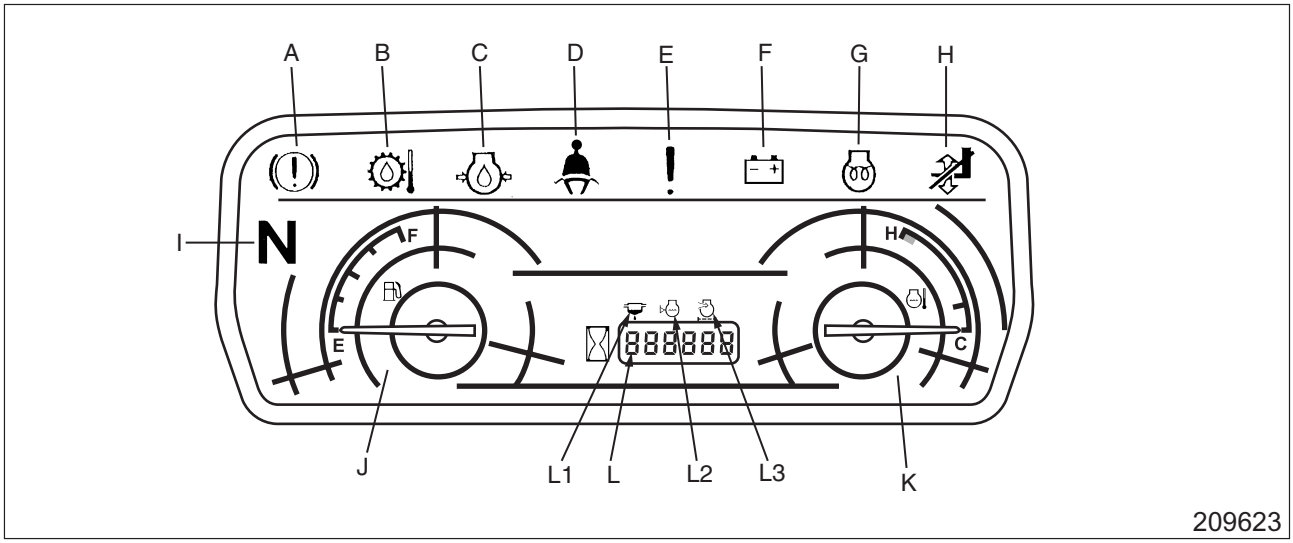
3. Structure

3.1 Console box

1 Engine coolant temperature gauge
2 Fuel gauge
3 Hourmeter, Indicator lamp
4 Meter panel
5 Starter switch
6 Lighting switch, Turn signal
7 Direction lever



3.2 OK Monitor



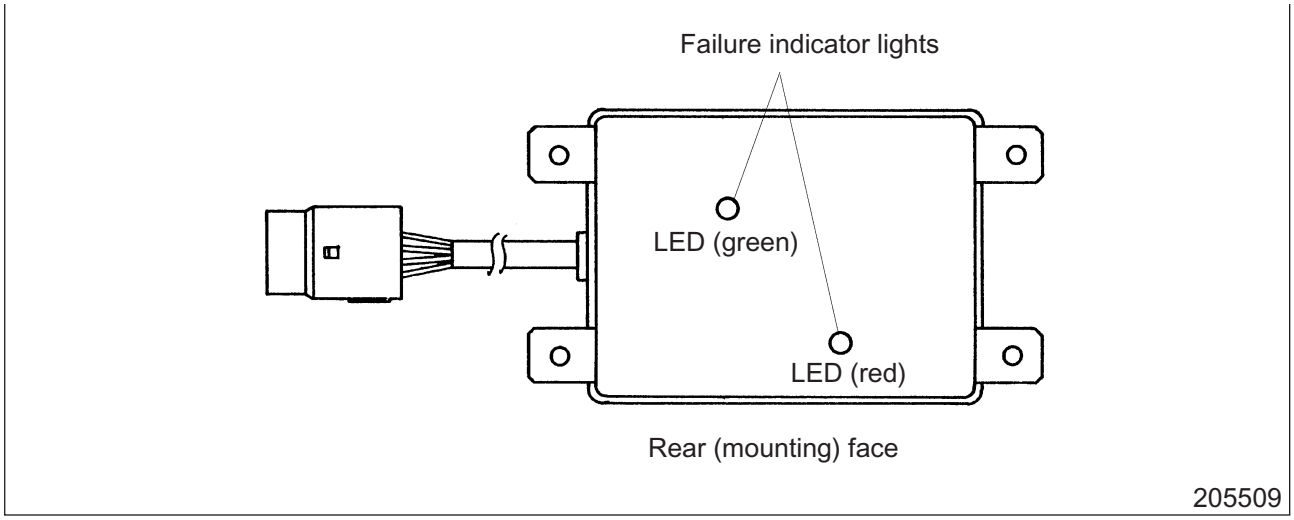
No.		Indicator lamp	OFF	ON or Flashing	Remark
A		Brake fluid level indicator lamp	Normal fluid level	Low fluid level	–
B		ATM: Transmission oil temperature indicator lamp	Normal temperature	Overheating	Automatic transmission model
		MTM: Clutch wearing	Normal	Wearing	Manual transmission model
C		Engine oil pressure indicator lamp	Normal oil pressure	Insufficient oil pressure	–
D		Seatbelt reminder lamp	Properly attached	Unattached	–
E		Multi-purpose warning lamp (This turns on when any alarm regarding the printed symbols is issued or at a minor trouble.)	Normal	Failure	Printed symbol part
F		Charging indicator lamp	Normally charged	Charging system abnormal	–
G		Glow plug indicator lamp	Heating completed	Heating	Diesel engine truck
H		Mast interlock indicator	Blinks under interlocked condition		
I		Fr, Re interlock indicator lamp	Blinks under interlocked condition		
		Neutral indicator lamp	Blinks when the gear is in neutral		
J		Fuel gauge	Shows the remaining fuel quantity when the key is turned ON.		
K		Engine coolant temperature gauge	Means overheat if the hand falls in the red zone.		
L		LCD (typically used as an hour meter)	Shows the operation hours when the key is turned ON.		
Location and meaning of printed symbols	L1	Fuel filter water drain warning lamp	Normal	Water drain	Diesel engine truck
	L2	Radiator coolant level warning lamp	Normal level	Low level	Option
	L3	Air cleaner element indicator lamp	Normal element condition	Clogged	Option
When major failures occur: Bulbs A, C, D, E, and H simultaneously flash.					

How to check indicator lamp bulbs

Each bulb is normal if the indicator lamp check switch comes ON with the starter switch key turned to (ON) position. However, the charge condition indicator lamp and engine oil pressure indicator lamp will not be illuminated.

3.3 Major Components

3.3.1 ECU (Electronic Control Unit)



The Electronic Control Unit (ECU) has a built-in 1-chip microcomputer to process signals from the travel speed sensor for activating the 3-speed automatic transmission.
This ECU has "self-diagnostic" failure indicator lamps which allow the operator to understand the failure in the electrical system.
It is also provided with the fail-safe systems (that allow for a unit to be switched to the safer side should any malfunction occur on it) as shown in the table below.

NOTE

The failure indicator lamps are located on the rear (mounting) face of the ECU box. This makes it necessary to remove the ECU from the truck to observe these lamps.

Fail-safe Systems

Failure	Function
Solenoid output signal circuit open	Turns OFF the power line and indicates the trouble content with the failure indicator lamp, if any open circuit is detected in the solenoid output signal circuit.
Travel speed sensor circuit open	Allows the truck to run at the present travel speed but cause an indicator light to come on.

Failure indicator lamp

Failure	Failure indicator lamp flashing pattern
Travel speed sensor circuit open	
3-speed automatic transmission solenoid circuit open	

NOTE

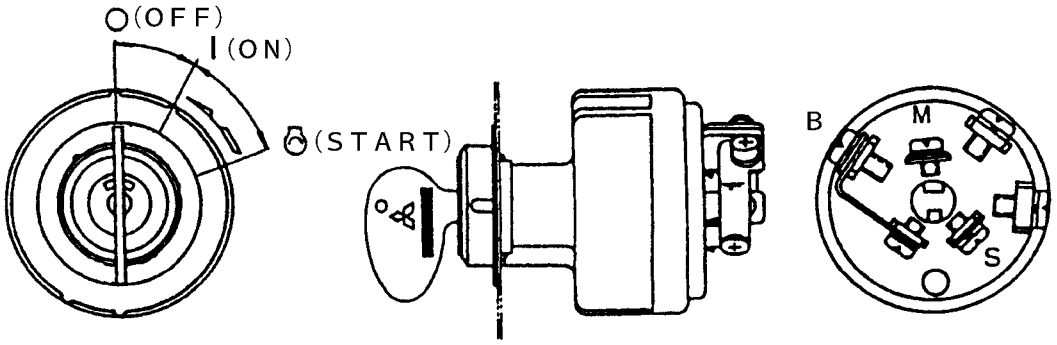
Each failure indicator lamp turns ON or turns OFF as shown below.

3.3.2 Starter Switch (Anti-restart Type)

This switch has a built-in mechanical lockout to prevent restarting.

Since this lockout mechanism restraints the starter switch (key) from moving from | (ON) position to (START) position while the engine is running, it serves as to prevent engine troubles or starter damages possibly caused by any operation mistake.

The starter switch is wired in such a way to energize the glow plugs. The | (ON) position of the switch is for energizing the glow plugs.



Terminal / Component / Key position	B	M	S
	Fuse box, batteries, alternator, glow plugs	Fuse box, engine stop control timer, glow plug timer and relay	Transmission shift lever, glow plug timer
(OFF)	○		
(ON)	○	○	
(START)	○	○	○

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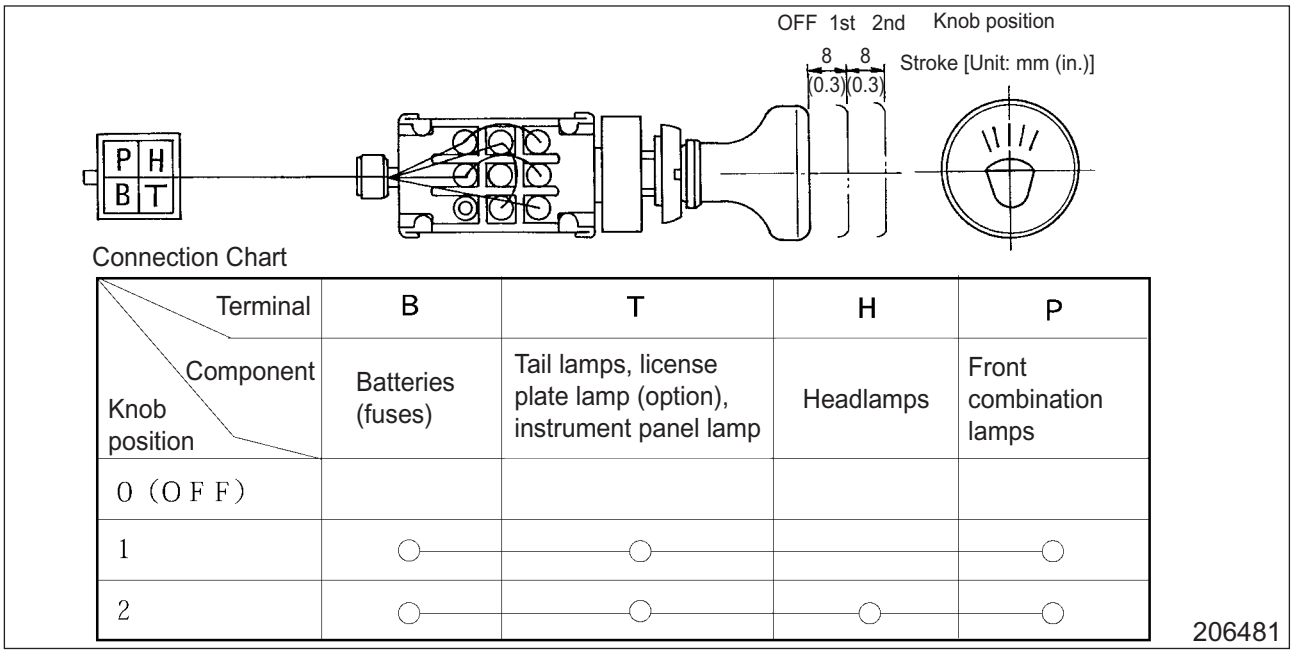
3.3.3 Lighting switch

Connection Chart



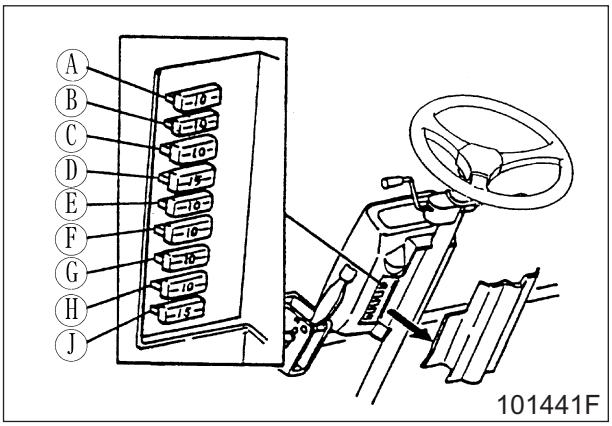
Connection Chart

Terminal / Component / Knob position	B	T	H	P
Batteries (fuses)		Tail lamps, license plate lamp (option), instrument panel lamp	Headlamps	Front combination lamps
0 (OFF)				
1	○	○		○
2	○	○	○	○

3.3.4 Fuse box

Connection Chart

Symbol	Capacity	Major components to be connected
A	10A	F – N – R lever
B	10A	Instrument panel lamp, turn signal lamp
C	10A	Spare terminal
D	15A	Lamps
E	10A	Horn
F	10A	Spare fuse
G	10A	Transmission controller, vacuum buzzer, stop lamps
H	10A	Back-up lamps
J	15A	Spare fuse

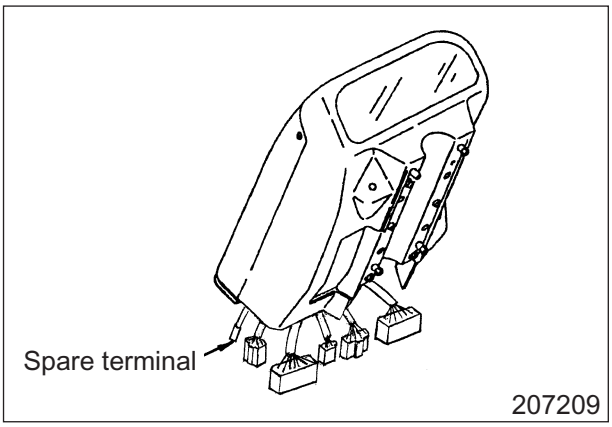


3.3.5 Spare terminal

The spare supply cord extends from the fuse box in the console box. (Another spare terminal is in the chassis-side main harness.)

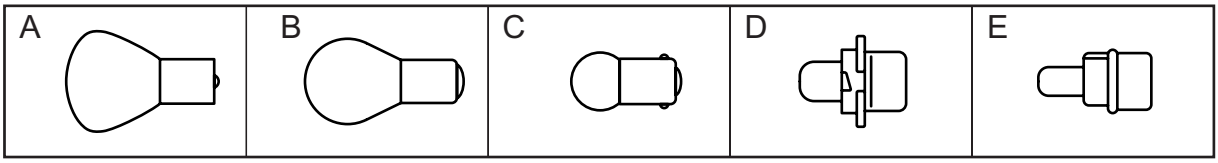
Color code	Lg (light green)

Removing the console box rear panel will permit you to gain access to this spare terminal, which is taped onto the harness protector with vinyl tape.



3.3.6 Lamp Bulb Specifications

Item		Qty	Color of lens	Bulb		Remark
				For 24V system	Schematic diagram	
Head lamps		2	Frosted	60W	A	60/60W, option
Combination lamps (front)	Turn signal lamps	2	Amber	25W	B	Standard (mounted on the overhead guard)
	Clearance lamps	2	Frosted	12W	C	
Combination lamps (rear)	Tail and stop lamps	2	Red	10/25W	B	
	Turn signal lamps	2	Amber	25W	B	
	Back-up lamps	2	Frosted	12W	B	
Working lamps (front)		2	Frosted	60/60W	A	Option
Working lamps (rear)		2	Frosted	60/60W	A	Option
License plate lamp		1	Frosted	12W	C	Option
Instrument panel lamps		2	Frosted	3W	D	For combination meter
OK monitor indicator lamps		5	Frosted	3W	E	For combination meter



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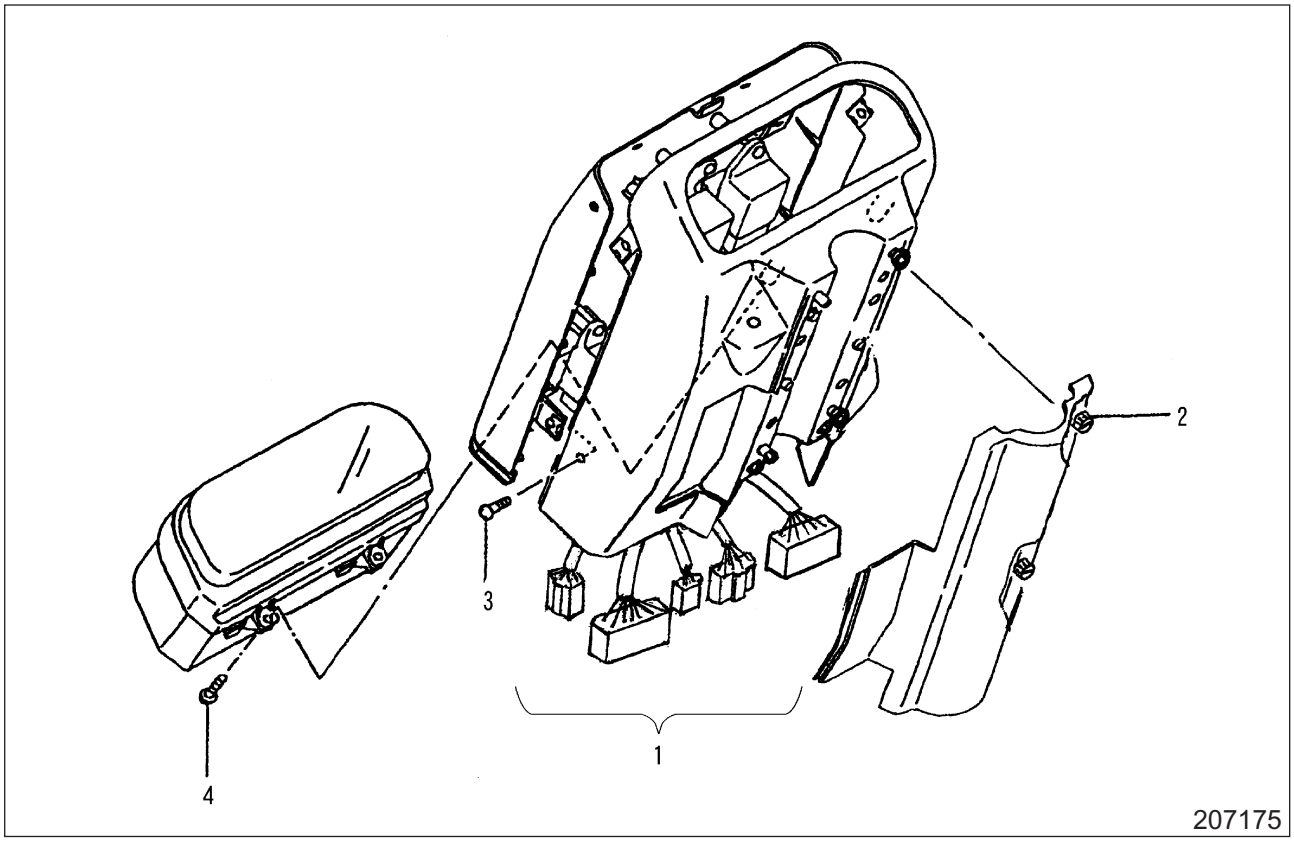
4. Disassembly and Reassembly

4.1 Disassembly of Console Box



4.1.1 Disassembly sequence

(1)Disconnect the electrical wires at connectors 1.

(2)Remove screws 2 (four) securing the cover.

(3)Remove screws 3 (six) and separate the front panel and rear panel.

(4)Remove screws 4 (four) securing the combination meter panel.

NOTE

Remove screws 3 and 4 to replace any bulb in the console box.

4.1.2 Reassembly

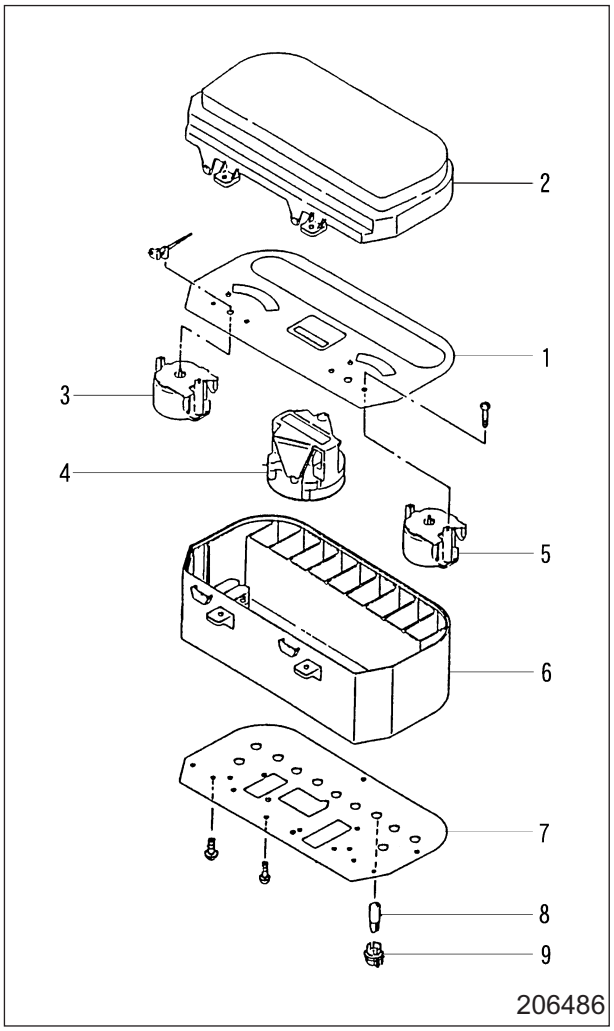
Reassemble in the reverse order of disassembly sequence.

4.2 Combination Meter

4.2.1 Disassembly

(1) Disassembly sequence

1 Meter panel
2 Meter cover
3 Engine coolant temperature gauge
4 Service hourmeter
5 Fuel gauge
6 Meter case
7 Printed circuit plate
8 Valve
9 Socket



NOTE

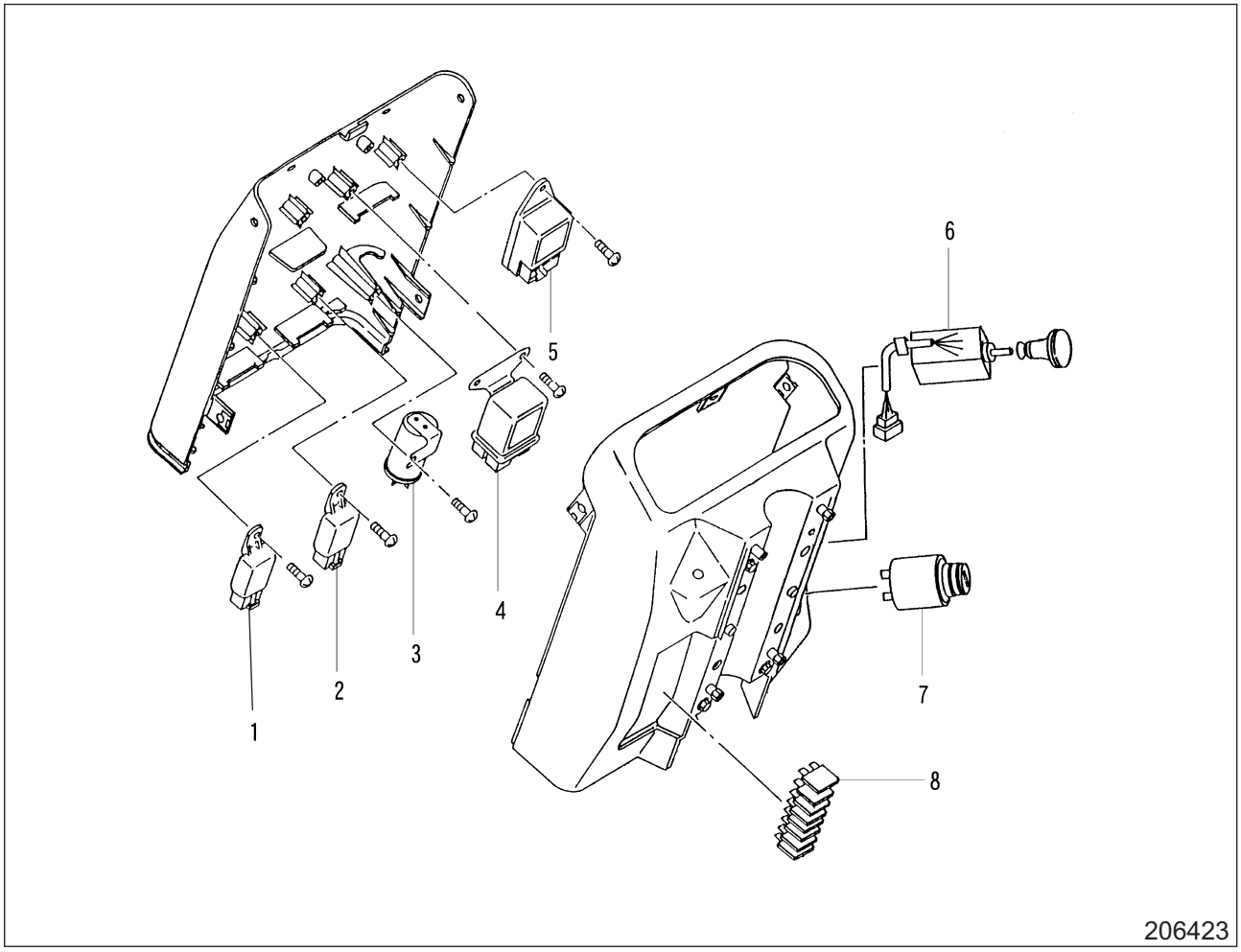
Be careful not to damage the printed circuit plate.

(2) Indicator Bulb Replacement
Turn the socket to the left to remove it from the printed circuit plate.
Then, remove the bulb from the socket.
For the location of each bulb, refer to “OK Monitor.”

4.2.2 Reassembly

Reassemble in the reverse order of disassembly sequence.

4.3 Electrical Components in the Console Box



1 Power relay
2 Power relay
3 Turn signal relay
4 Glow plug relay
5 Glow plug timer
6 Lighting switch
7 Starter switch
8 Fuse

5. Batteries and Charging

5.1 Battery Conditions and Adjustment Method Based on the Electrolyte Specific Gravity (S.G.)

Electrolyte S.G. reading at 20˚C (68˚F)	Battery condition	Adjustment
1.280 to 1.265	Battery is fully or well charged.	If difference in S.G. between any two cells is less than 0.04, continue to use the battery without additional charging. Where the difference in S.G. is greater than 0.04, discharge the battery with an efficiency-based manner. If the condition is improved, recharge the battery while adjusting the electrolyte specific gravity.
1.260 to 1.225	Battery is half charged.	Recharge the battery. Check for any short-circuited cord or corroded connection in the electrical system.
1.220 or less	battery is discharged, requiring cares.	Recharge the battery. If difference in S.G. among the cell is large, adjust the S.G. during recharging.
When the difference in S.G. is greater than 0.040	A cell with a low S.G. is in shorted condition. Some electrolyte has been lost. Too much electrolyte, or water in electrolyte.	Recharge until voltage and S.G. of each cell stabilize and are maintained constant for at least 2 hours. During recharging, adjust the S.G. to anywhere between 1.280 and 1.265. If difference in S.G. among the cells is more than 0.040 and a low S.G. is found in certain cells only, replace the battery. After leaving it for 12 to 96 hours, give it a high current discharge test.

5.2 Relationship between Electrolyte S.G. and Charging Capacity

Whether the battery is fully charged can be checked from the electrolyte S.G. (between 1.280 and 1.625) read with a hydrometer. However, it can also be judged theoretically from the reduction rate of the electrolyte quantity. If refilling is necessary every month or so, the system is tending to over-charge the battery. If refilling is not required for over 3 months, it is likely that the system is inadequately charging.

5.3 Precautions for Battery Charging

(1) The charging current should be about 1/10 the capacity of the battery to be charged.
(2) For quick charging, the battery capacity in ampere should not be exceeded.
(3) During charging, adjust the charging current to prevent the electrolyte temperature from rising beyond 45˚C (113˚F).
(4) When connecting cables to the battery terminal, begin with the cable for the positive (+) terminal. When disconnecting them from the battery, begin with a cable for the negative (-) terminal.

⚠ CAUTION

Be sure to turn off the starter switch and light switch before disconnecting or connecting the battery cables.
(IC regulator may be damaged.)