



Service Manual

Chassis & Mast

MC/FC

FD40N	EF12B-00011-up
FD45N	EF19D-50001-up
FD50CN	EF19D-80001-up
FD50N	EF28C-50001-up
FD55N	EF28C-80001-up

FG40N	EF40-00011-up
FG45N	EF29D-50001-up
FG50CN	EF29D-80001-up
FG50N	EF33C-50001-up
FG55N	EF33C-80001-up

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 lift 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 designs without notice and without incurring obligations.

The trucks listed in this manual are powered by TB45 gasoline engines or S6S diesel engines.

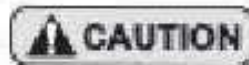
For engine servicing, please refer to the applicable engine service manual.

TB45	Gasoline engine
S6S	Diesel engine

<Safety Related Signs>



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



Indicates 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.

SAFETY



WARNING

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

Read and understand the OPERATION & MAINTENANCE MANUAL before performing any lubrication or maintenance on these trucks.

Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death.

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.
- (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.



WARNING

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

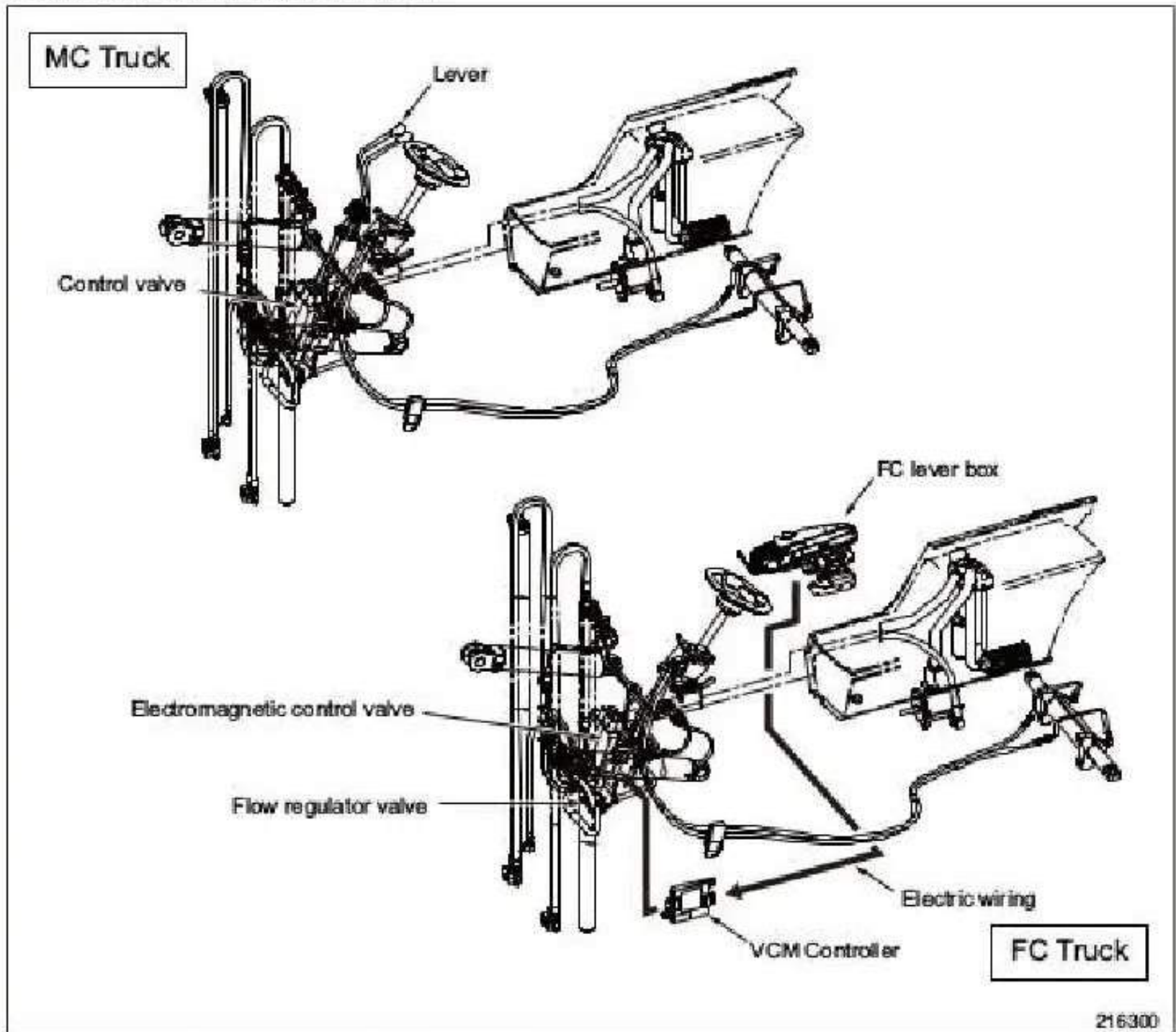
- (5) Use steps and grab handles (if applicable) when mounting or dismounting a truck. Clean any mud or debris from steps, walkways or work platforms before using. Always face truck when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.
- (6) To avoid back injury, use a hoist when lifting components which weigh 23 kg 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) 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 could 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 could result in a high velocity oil stream that will be invisible close to the hose. This oil could 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

Lift truck model 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

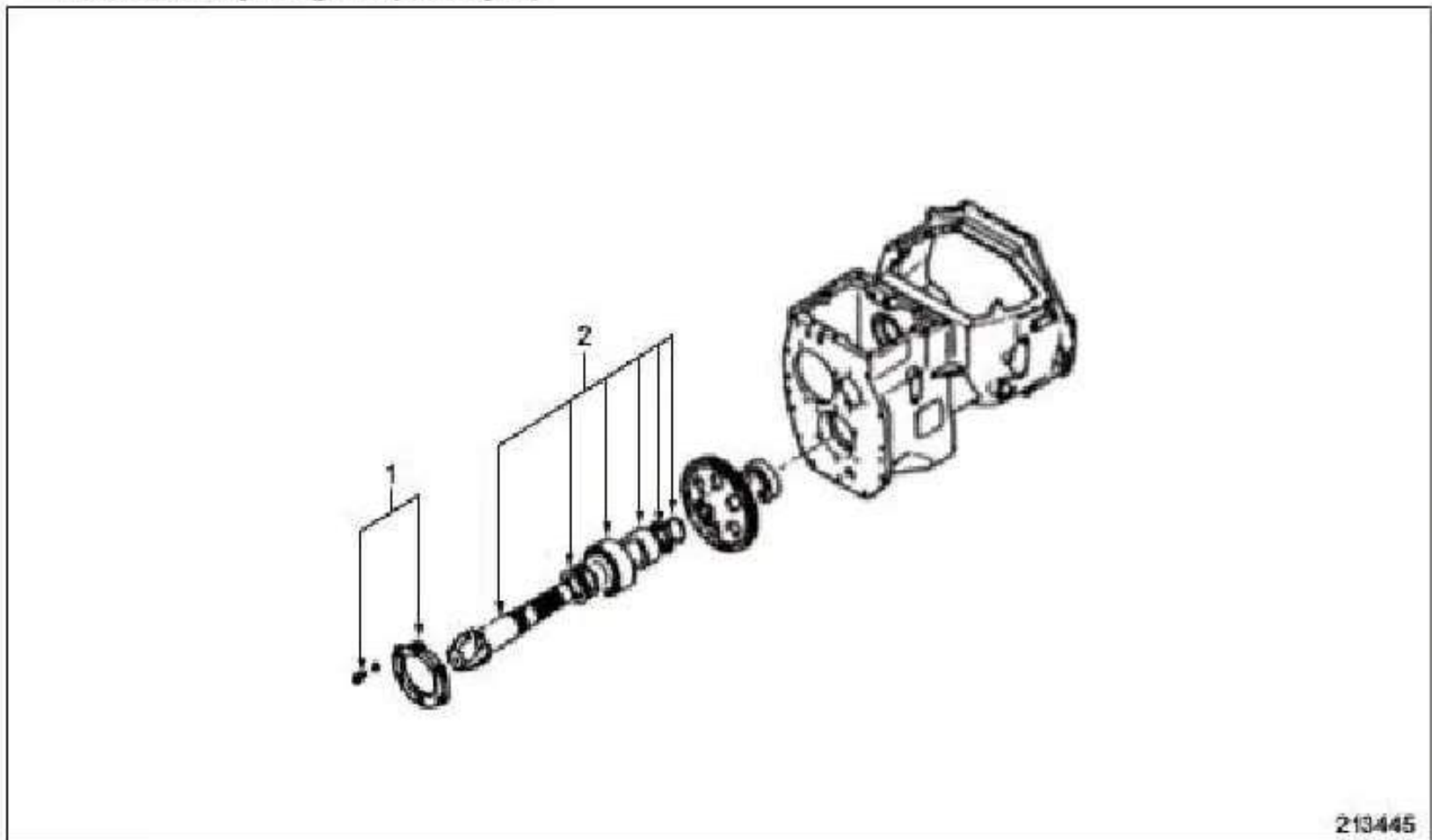


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- Gasoline-Engine Trucks (FG)..... Trucks Equipped with TB45 Gasoline Engine
- Diesel-Engine Trucks (FD) Trucks Equipped with S6S Diesel Engine
- Powershift Trucks..... Trucks Equipped with Powershift Transmission

HOW TO USE THIS MANUAL(continued)

Disassembly diagram(example)



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Sequence

- 1 Cover, Bolt, Washer (part name)
- 2 Out put shaft assembly (part name)

Suggestions for Disassembly Output shaft, Removing

Remove output shaft using a special tool.



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Service Data

Unit:mm(in.)

Gear Backlash	A	0.11 to 0.28 (0.004 to 0.011)
	B	0.5 (0.012)

A: Standard value B: Repair or Service Limit

Symbols and abbreviations

OP	Option
R1/4	Taper pipe thread (external) 1/4 inch (formerly PT1/4)
RC1/8	Taper pipe thread (external) 1/4 inch (formerly PT1/8)
G1/4A	Straight pipe thread (external) 1/4 inch (formerly PF 1/4-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	0.102 kgf
	1 lbf	0.4536 kgf
Pressure	1 kPa	0.0102 kgf/cm ²
	1 psi	0.0703 kgf/cm ²
Torque	1 N·m	0.102 kgf·m
	1 lbf·ft	0.1383 kgf·m

CHAPTER INDEX

CHAPTER INDEX	Items
GENERAL INFORMATION	Truck Models Covered, Serial Number Locations, Dimensions, Technical Data
COOLING SYSTEM	Fan Belt Removal and Installation, Fan Belt Tension
ELECTRICAL SYSTEM	Console Box, Chassis Electrical Devices, Battery Maintenance, Electrical Schematic
CONTROLLERS	Main Functions of Controller, Input/Output Monitor, Error Codes and Troubleshooting
POWER TRAIN	Removal and Installation of Power Line
POWERSHIFT TRANSMISSION	Torque Converter, Single Speed Powershift Transmission Control Valve, Automatic Two-Speed Transmission
FRONT AXLE AND REDUCTION DIFFERENTIAL	Front Tire, Front Axle, Reduction, Differential
REAR AXLE	Rear Axle, Rear Tire
BRAKE SYSTEM	Master Cylinder, Wheel Brake, Brake Booster
STEERING SYSTEM	Steering Gear, Power Cylinder, Flow Divider
HYDRAULIC SYSTEM	Tank, Pump, Control Valve, Lift and Tilt Cylinders, Flow Regulator Valve, Down Safety Valve
MAST AND FORKS	Simplex and Duplex Masts, Triplex Mast
SERVICE DATA	Maintenance Standard, Maintenance Schedule, Periodic Replacement Parts, Lubrication Instruction, Special Tool Needed

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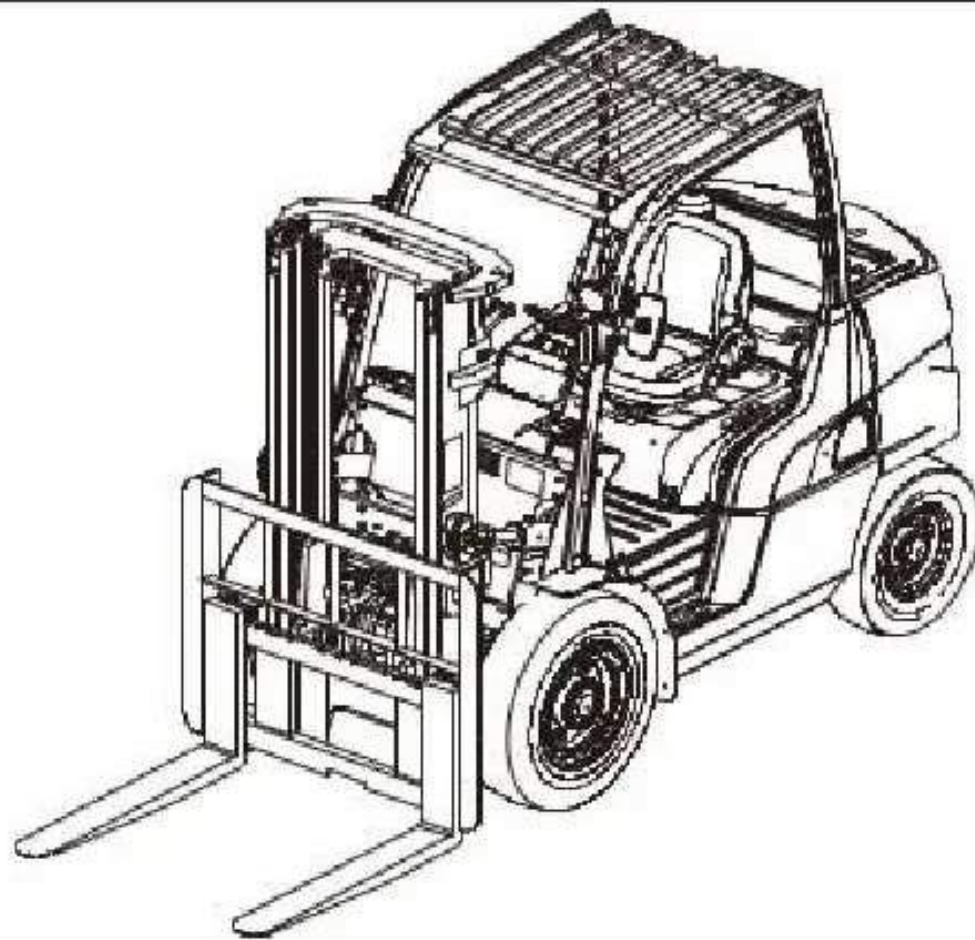
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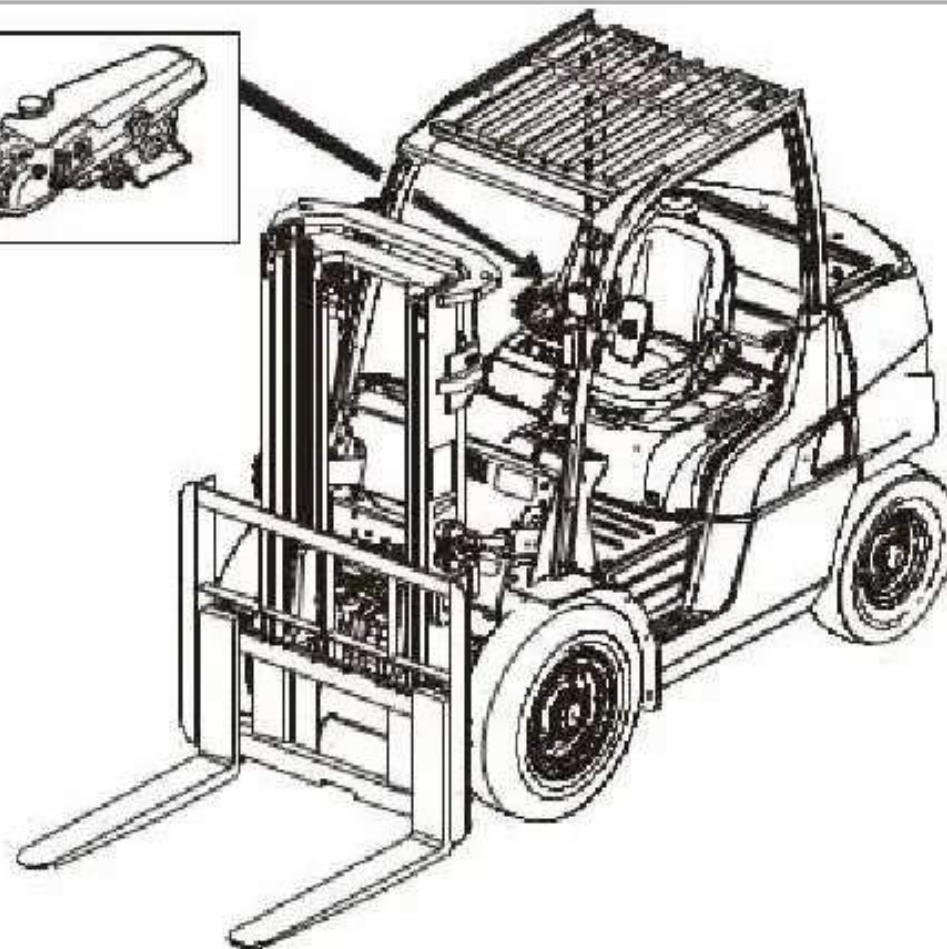
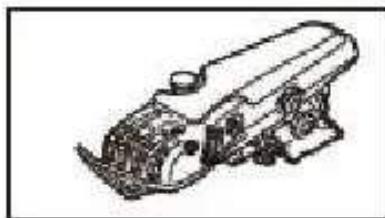
1. Model View

MC model



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FC model



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GENERAL INFORMATION

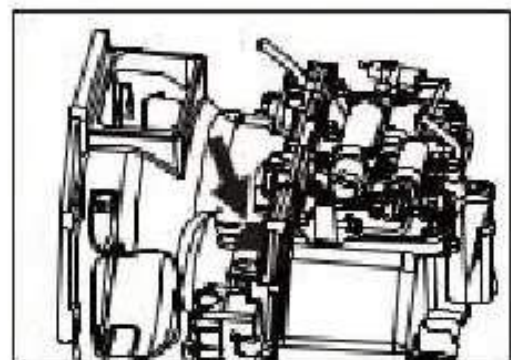
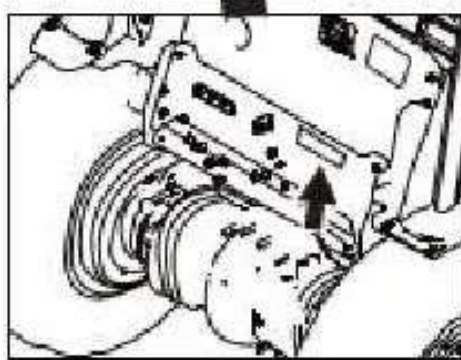
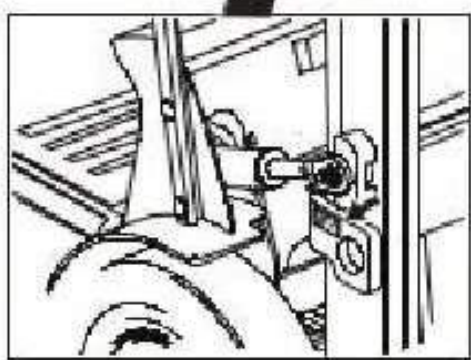
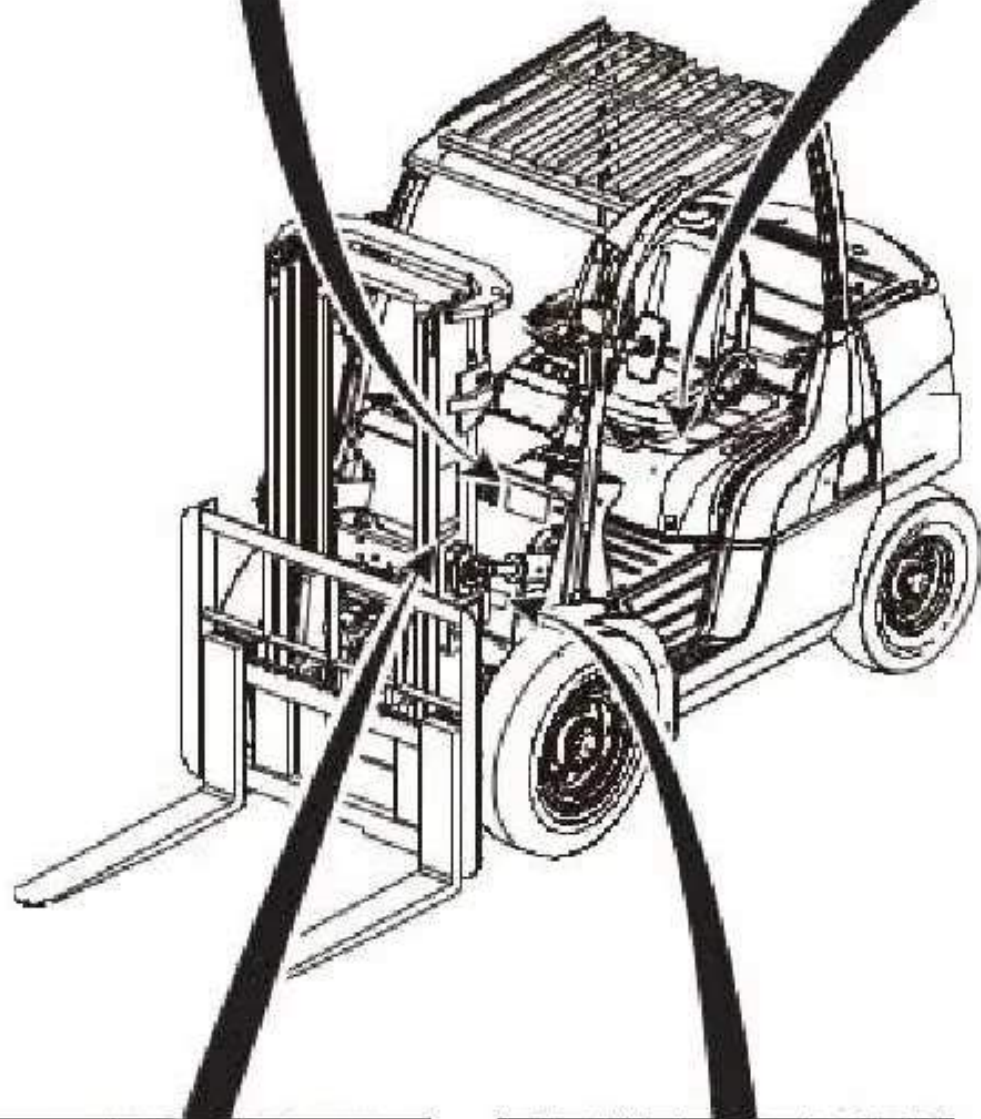
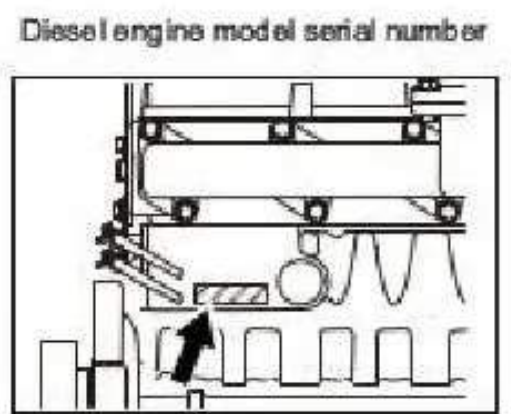
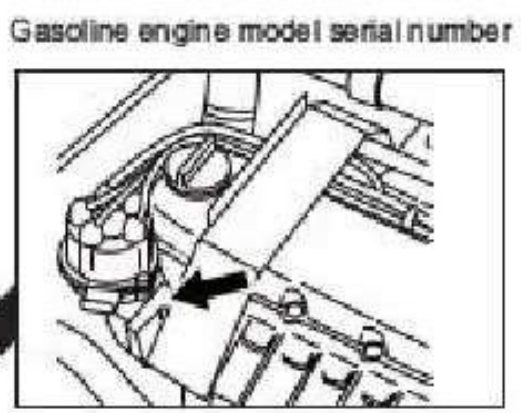
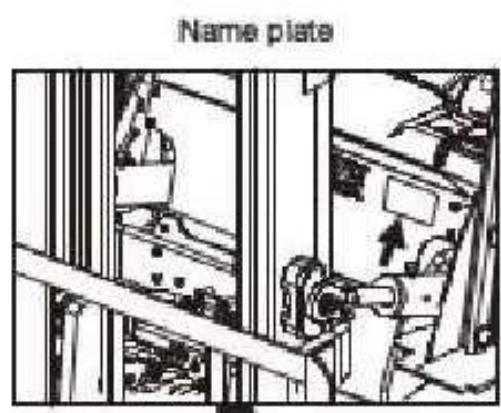
2. Lift Truck Models Covered

This Service Manual provides service and maintenance information for the following lift trucks:

Mounted engine	Gasoline model	Diesel model
Non-electronic control	-	MC / FC
Electronic control	MC / FC	-

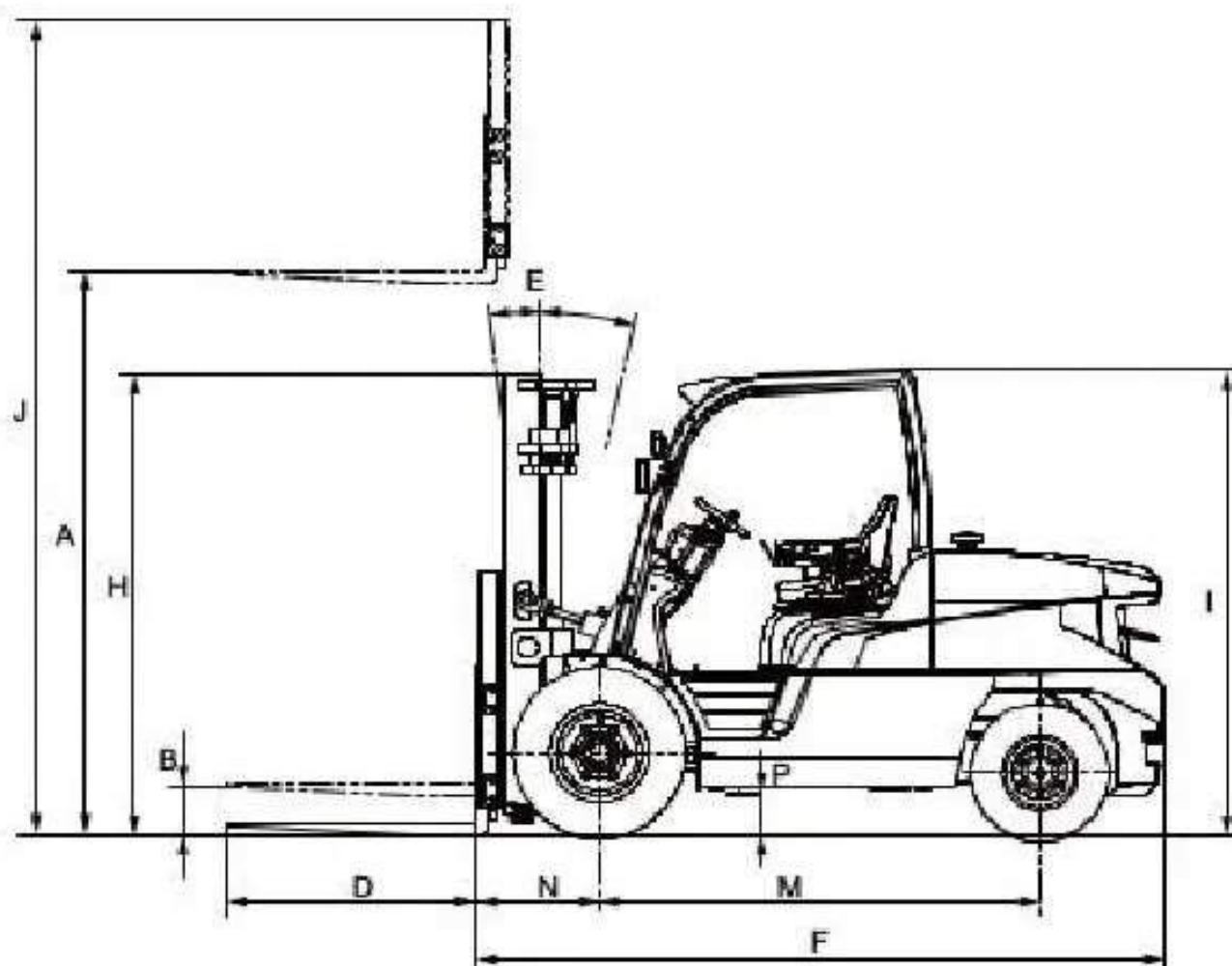
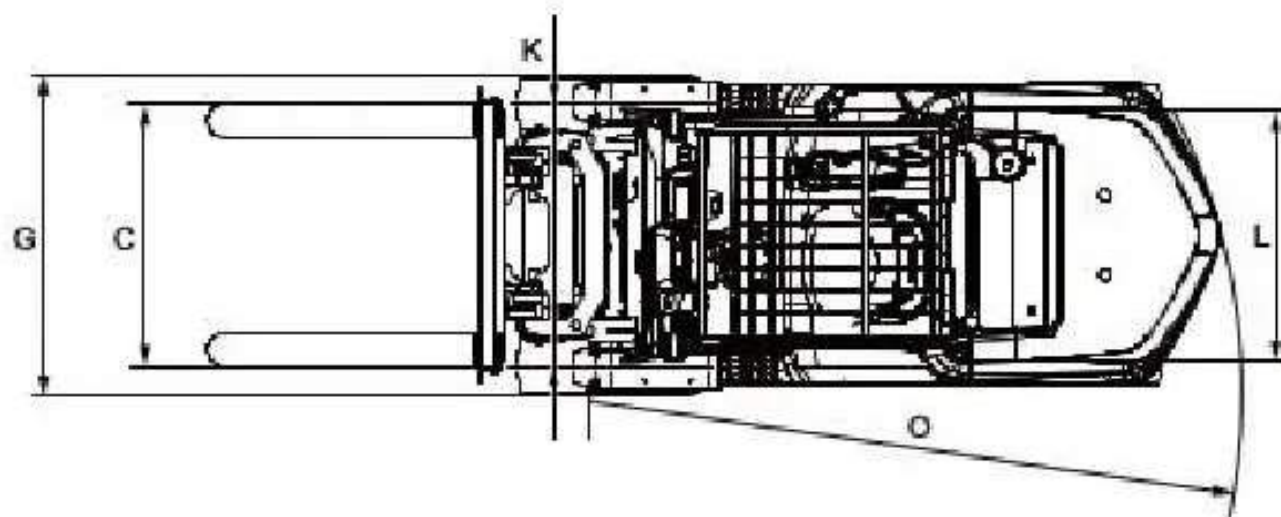
Electronic Gasoline engine models			Non-electronic diesel engine models		
Truck model	Serial number	Mounted engine	Truck model	Serial number	Mounted engine
FG40N	EF40-00011-up	TB45	FD40N	EF12B-00011-up	S6S
FG45N	EF29D-50001-up	TB45	FD45N	EF19D-50001-up	S6S
FG50CN	EF29D-80001-up	TB45	FD50CN	EF19D-80001-up	S6S
FG50N	EF33C-50001-up	TB45	FD50N	EF28C-50001-up	S6S
FG55N	EF33C-80001-up	TB45	FD55N	EF28C-80001-up	S6S

3. Serial Number Locations



GENERAL INFORMATION

4. Dimensions



5. Technical Data

Unit:mm (in.)

Truck model	class		4 ton class		5 ton class		
	Gasoline model		FG40N	FG45N	FG50CN	FG50N	FG55N
	Diesel model		FD40N	FD45N	FD50CN	FD50N	FD55N
A	Maximum lift		3350 (132)		3360 (132.5)		
B	Free lift height		150 (5.9)		160 (6.3)		
C	Fork spread <min - max>		320 - 1184 (12.6 - 46.6)				
D	Fork length		1220 (48.0)				
E	Tilt angle <forward - backward> Deg		6 - 10				
F	Overall length		3000 (118)	3130 (123)	3170 (125)	3310 (130)	3360 (132)
G	Overall width <outside-to-outside of tires>	Single	1415 (55.5)	1460 (57.5)			
		Double	1780 (70.0)				
		Special double	1965 (77.5)				
H	Overall height <with mast lowered>		2320 (91.5)		2400 (94.5)		
I	Height of the overhead guard		2280 (89.5)				
J	Overall height <with mast extended>	With backrest	4570 (180)		4590 (181)		
		Without backrest	4230 (167)	4190 (165)	4330 (170)		
K	Tread <front wheel>	Single	1175 (46.5)				
		Double	1310 (51.5)				
		Special double	1445 (57.0)				
L	Tread <rear wheel>		1180 (46.5)				
M	Wheelbase		1850 (73.0)	2000 (78.5)		2150 (84.5)	
N	Front overhang		577 (22.7)		582 (22.9)	602 (23.7)	
O	Minimum turning radius		2580 (101)	2730 (107)	2760 (109)	2890 (114)	2940 (116)
P	Under clearance <at frame>		227 (8.9)				

GENERAL INFORMATION

6. Performance

Truck model	Class		4 ton class		5 ton class		
Gasoline model	Truck model		FG40N	FG45N	FG50CN	FG50N	FG55N
Capacity	kg (lb)		3500 (8000)	4000 (9000)	4500 (10000)	5000 (11000)	5500 (12000)
Load center	mm (in.)		600 (24)				
Lift speed	Loaded	2SP mast	570 (110)		490 (96)		
		2FF mast	530 (105)		430 (85)		
		3FF mast	530 (105)		450 (89)		
	Unloaded	2SP mast	600 (120)		520 (100)		
		2FF mast	560 (110)		460 (90)		
		3FF mast	560 (110)		480 (94)		
Travel speed	Forward	Loaded	1st speed	13.5 (8.5)			
			2nd speed	22.0 (14.0)			21.5 (13.5)
		Unloaded	1st speed	13.5 (8.5)			
			2nd speed	22.5 (14.0)			
	Reverse	Loaded	1st speed	18.5 (11.5)			
		Unloaded	1st speed	19.0 (12.0)			18.5 (11.5)

Truck model	Class		4 ton class		5 ton class		
Diesel model	Truck model		FD40N	FD45N	FD50CN	FD50N	FD55N
Capacity	kg (lb)		3500 (8000)	4000 (9000)	4500 (10000)	5000 (11000)	5500 (12000)
Load center	mm (in.)		600 (24)				
Lift speed	Loaded	2SP mast	550 (110)		470 (93)		
		2FF mast	510 (100)		420 (83)		
		3FF mast	520 (102)		440 (86)		
	Unloaded	2SP mast	610 (120)		530 (105)		
		2FF mast	570 (112)		470 (92)		
		3FF mast	570 (112)		490 (96)		
Travel speed	Forward	Loaded	1st speed	13.5 (8.5)			
			2nd speed	21.5 (13.5)	21.0 (13.0)		
		Unloaded	1st speed	13.5 (8.5)			
			2nd speed	22.0 (13.5)			
	Reverse	Loaded	1st speed	18.0 (11.0)			17.5 (11.0)
		Unloaded	1st speed	18.5 (11.5)			

Chapter 2 COOLING SYSTEM

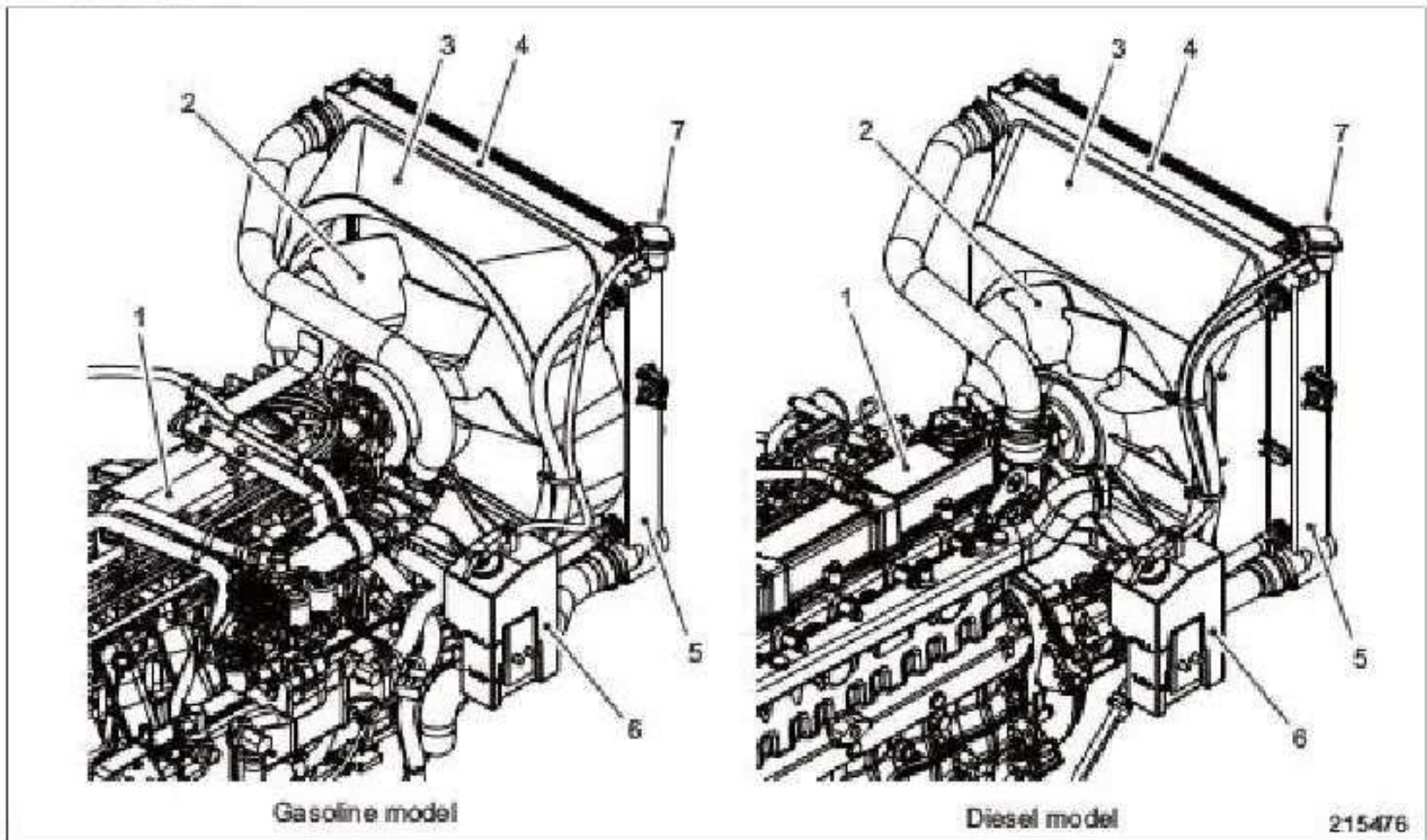
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1. Specifications

Item		Truck model				
		FG40N FD40N	FG45N FD45N	FG50CN FD50CN	FG50N FD50N	FG55N FD55N
Cooling system	Cooling method	Water-cooled, forced circulation				
	Radiator	Corrugated fin (pressure) type				
	Water pump	Centrifugal type				
	Thermostat	Wax pellet type				

COOLING SYSTEM

2. Structure

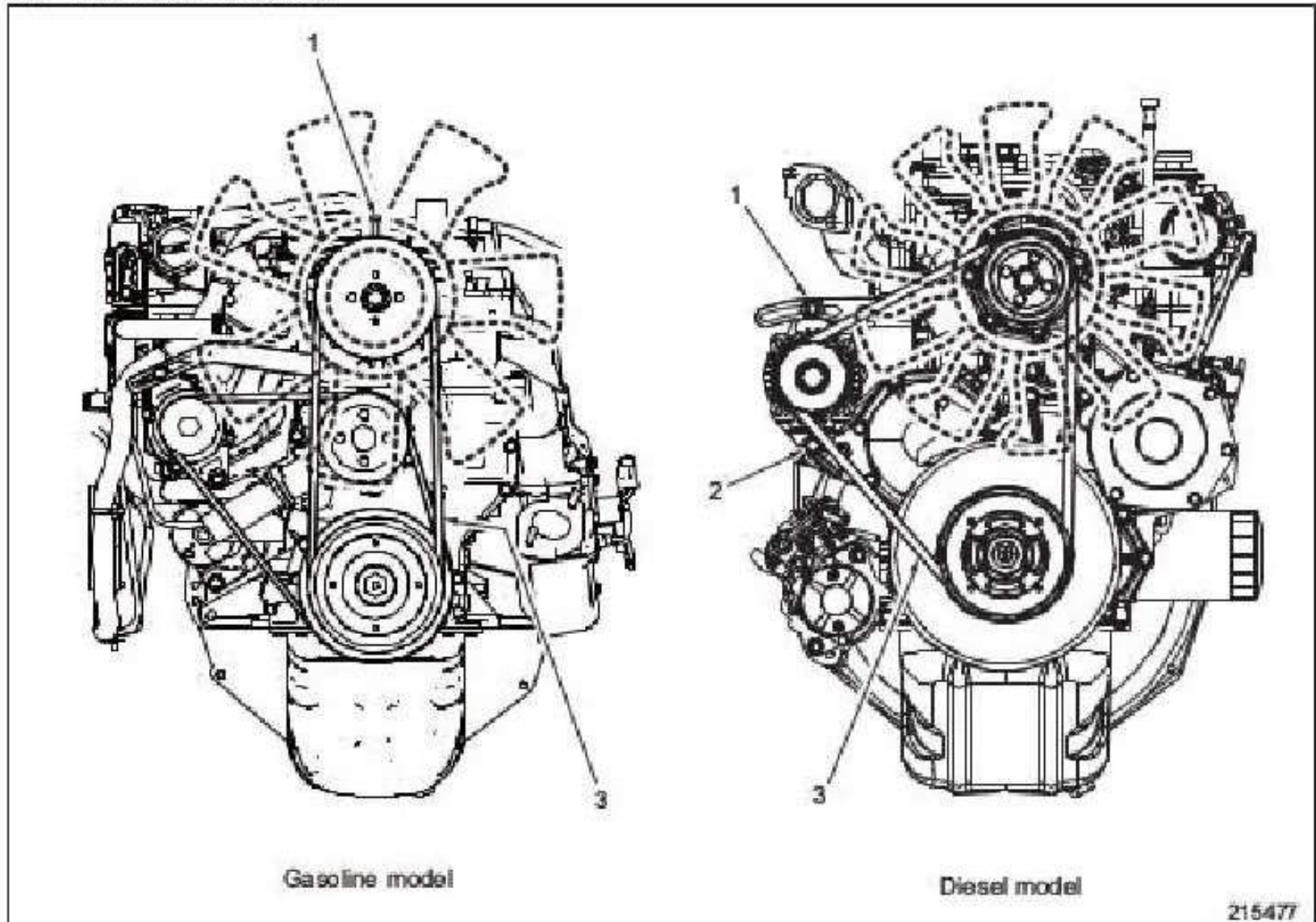


- 1 Engine
- 2 Fan (coupled directly to the engine crankshaft)
- 3 Shroud
- 4 Radiator

- 5 Oil cooler for torque converter
- 6 Reserve tank
- 7 Radiator cap

3. Removal and Installation

3.1 Fan Belt Removal



- 1 Tension assembly (pulley lock bolt)
- 2 Alternator lock bolt

- 3 Fan belt

3.1.1 Start by

Remove the radiator cover.

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COOLING SYSTEM

3.1.2 Removal

Gasoline model

- (1) Loosen the pulley lock bolts by rotating 3 to 4 turns.

If the pulley lock bolts are not loosened adequately, the fan pulley will not move.

Note: Do not remove the pulley lock bolts by loosening them too much.

- (2) Loosen the lock nut.
- (3) Loosen the adjusting screw and push the fan pulley against the crankshaft pulley side to remove the belt.

Diesel model

- (1) Loosen the pulley lock bolts and the alternator lock bolts by rotating 3 to 4 turns.

If the lock bolts are not loosened adequately, the alternator will not move.

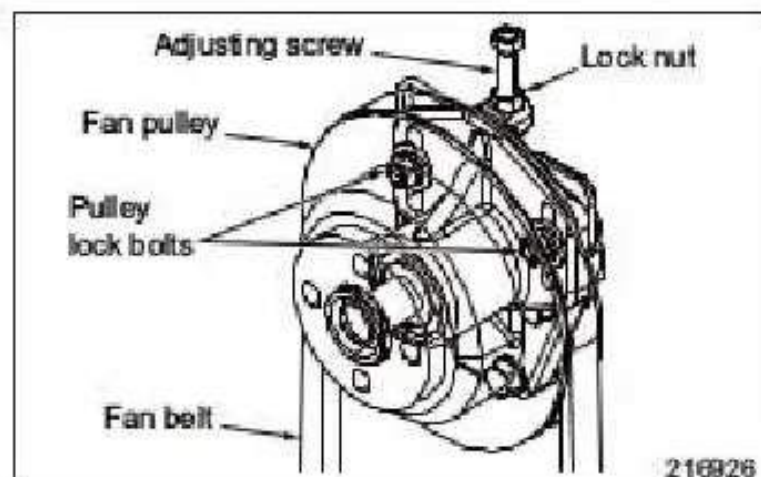
Note: Do not remove the lock bolts by loosening them too much.

- (2) Push the alternator pulley against the fan side to remove the belt.

3.1.3 Installation

For installation, follow the removal sequence in reverse. Also follow the instructions below.

- (1) Before installing the belt, turn the fan to check for smooth rotation. Replace the bearing if it generates unusual noises.
- (2) After installing the belt, check that the pulley moves when pushing the tension belt.
- (3) Tighten the lock bolts and lock nut firmly.



4. Inspection and Adjustment

4.1 Fan Belt

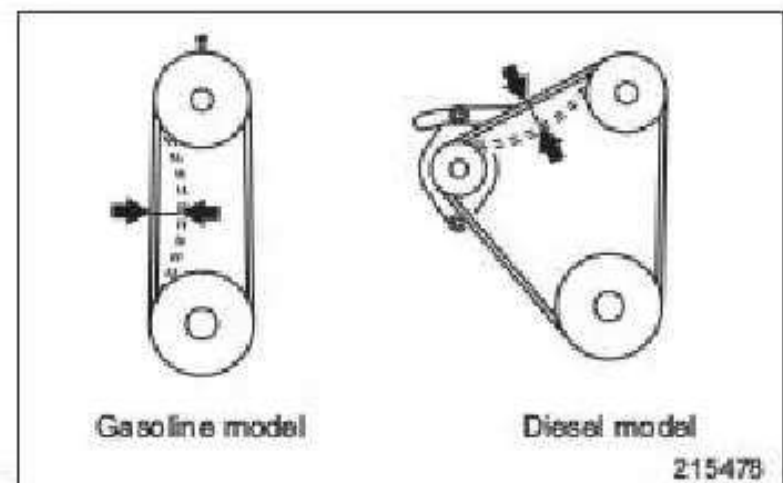
4.1.1 Fan Belt Inspection

- (1) Check the belt for contamination from oil, grease or dust. Replace the belt if needed when the contamination is found. When the belt is slightly contaminated, clean it with a rag or paper towel. Do not use gasoline, oil or any other solvent for cleaning.
- (2) During the engine overhaul or belt tension adjustment, check the condition of the belt. Replace the belt if it has any damage.

4.1.2 Fan Belt Tension

Apply force, as specified below, perpendicularly to the belt midway between the fan pulley and tension pulley (or crank shaft pulley), and make sure the belt tension is within the specified range.

Force	96 N (9.99 kgf) [22.03 lbf]
Belt tension	11 to 13 mm (0.43 to 0.51 in.)



COOLING SYSTEM

4.2 Radiator

4.2.1 Radiator unit

Check the core for foreign substances such as dust. If foreign substances are adhered to the core surface, remove them by blowing compressed water from the opposite direction.

CAUTION

Be careful not to damage the water pipe while cleaning.

4.2.2 Radiator rubber mount

Replace radiator rubber mount if it is hardened and has no elasticity.

4.2.3 Radiator cap

Unit: Kpa (kgf/cm²) [psi]

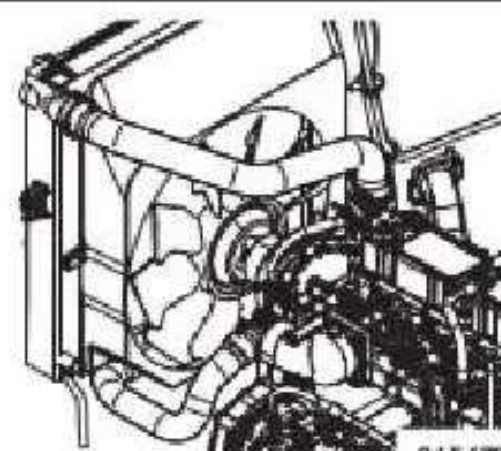
Opening pressure	88 ± 14.7 (0.9 ± 0.15) [12.77 ± 2.13]
Vacuum valve	0 to 4.9 (0 to 0.05) [0 to 0.71]

4.3 Upper Hose, Lower Hose

4.3.1 Connecting Hoses

- (1) Check the hoses and replace them if they are swollen or damaged.
- (2) When connecting the hoses to the radiator, make sure that their ends are fully inserted into the fittings and secure them with clamps.

Diesel model



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4.4 Coolant

4.4.1 Draining coolant

- (1) Drain the coolant from the radiator by loosening the drain cock.
- (2) Drain the coolant from the reservoir tank.

Coolant quantity Unit: liter (cu. in.)

Item	Gasoline	Diesel
Total quantity of coolant (including coolant in hoses)	15.95 (973.3)	12.94 (789.6)
Reservoir tank (FULL level)	0.65 (39.7)	0.65 (39.7)

CAUTION

Be sure to store antifreeze/coolant mixture carefully because it is hazardous waste. Ask your local dealer for information pertaining to the proper disposal of the coolant.

4.4.2 Refilling coolant

Mix antifreeze with soft water (tap water) at the proper concentration as shown below and fill the radiator and reserve tank up to the specified level.

Example: MHI Long Life Coolant

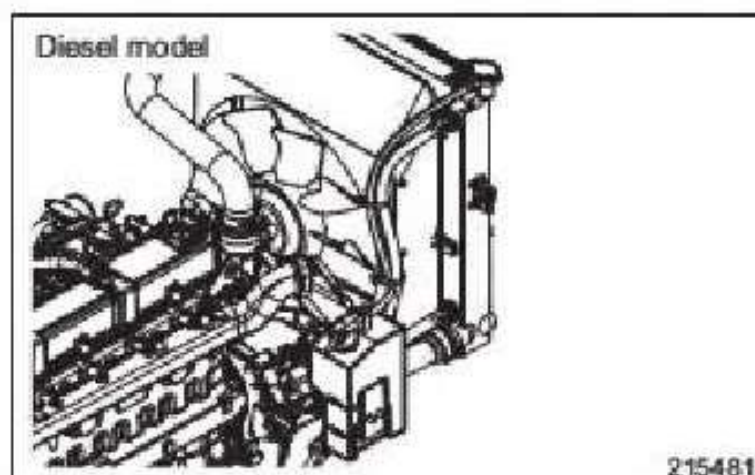
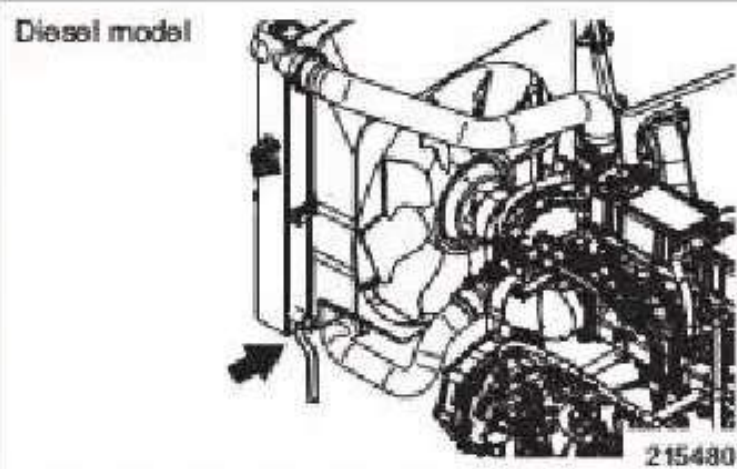
Temperature °C (°F)	-39 (-38)	-30 (-22)	-25 (-13)	-20 (-4)	-15 (5)	-10 (14)
Concentration (%)	55	50	45	40	35	30

CAUTION

Antifreeze concentration ratio varies depending on brands. Be sure to mix the coolant according to a manufacture's recommended mix ratio.

4.4.3 Coolant level check

- (1) Warm up the engine while paying attention to any unusual noises.
- (2) Stop the engine and check the reserve tank for coolant level, then refill if needed.



COOLING SYSTEM

5. Troubleshooting

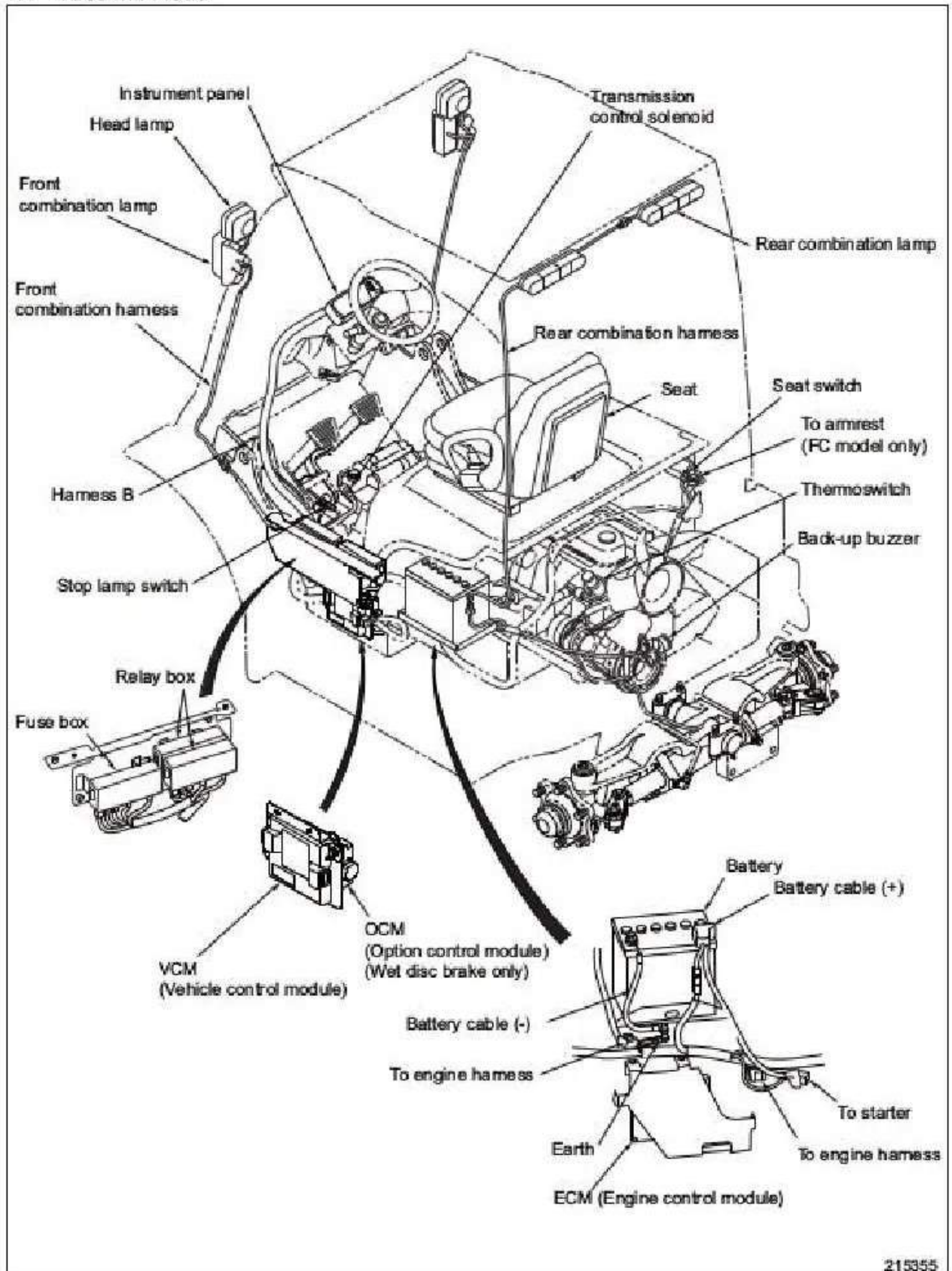
Condition	Possible cause	Action
Leaking coolant from radiator	Damaged radiator core or tank	Replace
	Damaged radiator hoses	Replace
	Hose clamp is defective.	Replace
	Drain cock is defective.	Replace
Engine overheated	Radiator fins are clogged.	Clean
	Fins are excessively distorted.	Replace
	Loose belt	Check the belt for tension, elongation, and cracks. Replace the belt if such defect is found.
	Not enough coolant	Refill
Leaking oil from oil cooler hose	Insufficient tightening torque of hose clamp	Tighten or replace

Chapter 3 ELECTRIC SYSTEM

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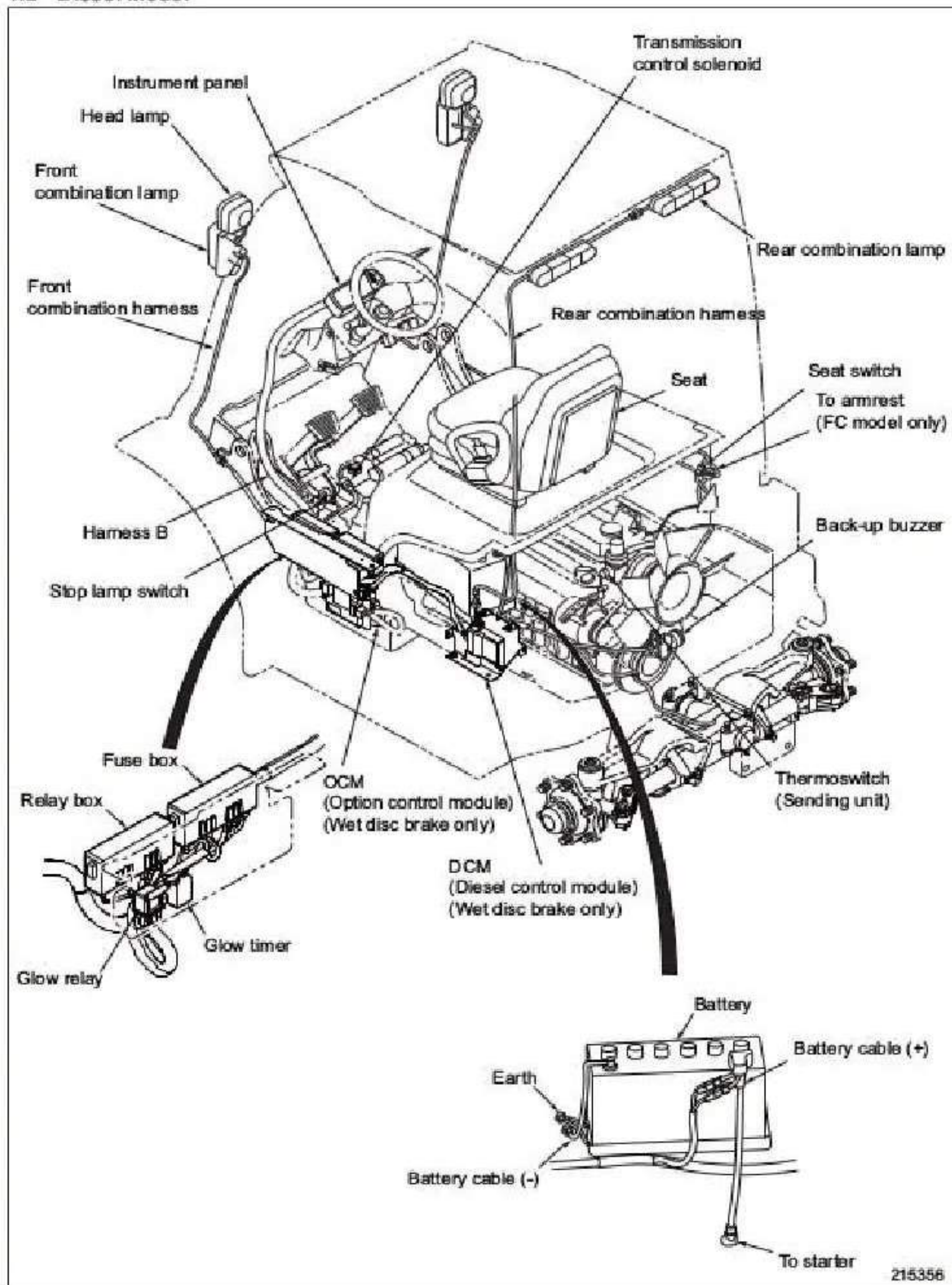
1. Chassis Electrical Devices Wiring Outline

1.1 Gasoline Model



ELECTRIC SYSTEM

1.2 Diesel Model



1.3 Gasoline and Diesel Models

