



Service Manual

Chassis & Mast

MC/FC

GP15N	ET34L-00011-up
GP18N	ET34L-40001-up
GP20CN	ET34L-60001-up
GP20N	ET17DL-00011-up
GP25N	ET17DL-50001-up
GP30N	ET13FL-00011-up
GP35N	ET13FL-50001-up

DP15N	ET16D-00011-up
DP18N	ET16D-40001-up
DP20CN	ET16D-60001-up
DP20N	ET18C-00011-up
DP25N	ET18C-50001-up
DP30N	ET14E-00011-up
DP35N	ET14E-50001-up

FOREWORD

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

Long productive life of your Lift 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. Cat Lift 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

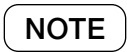
The following safety related signs are used in this service manual to emphasize important and critical instructions:



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.

SAFETY

 **WARNING**

The proper and safe lubrication and maintenance for this lift truck, recommended by Cat Lift 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.

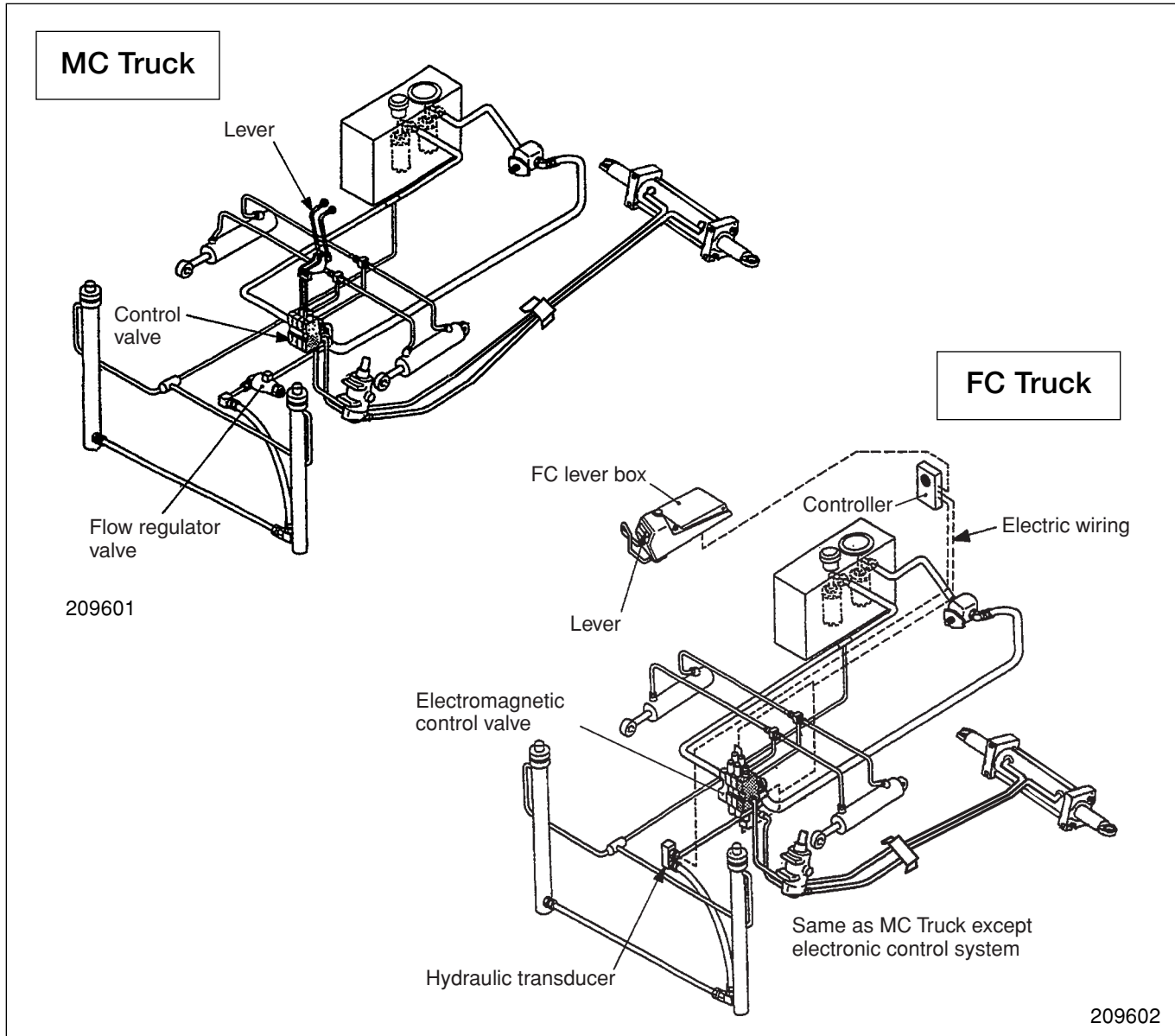
4. Lower the forks or other implements to the ground before performing any work on the truck. If this cannot be done, make sure the forks or other implements are blocked correctly to prevent them from dropping unexpectedly.
5. Use steps and grab handles (if applicable) when mounting or dismounting a 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:

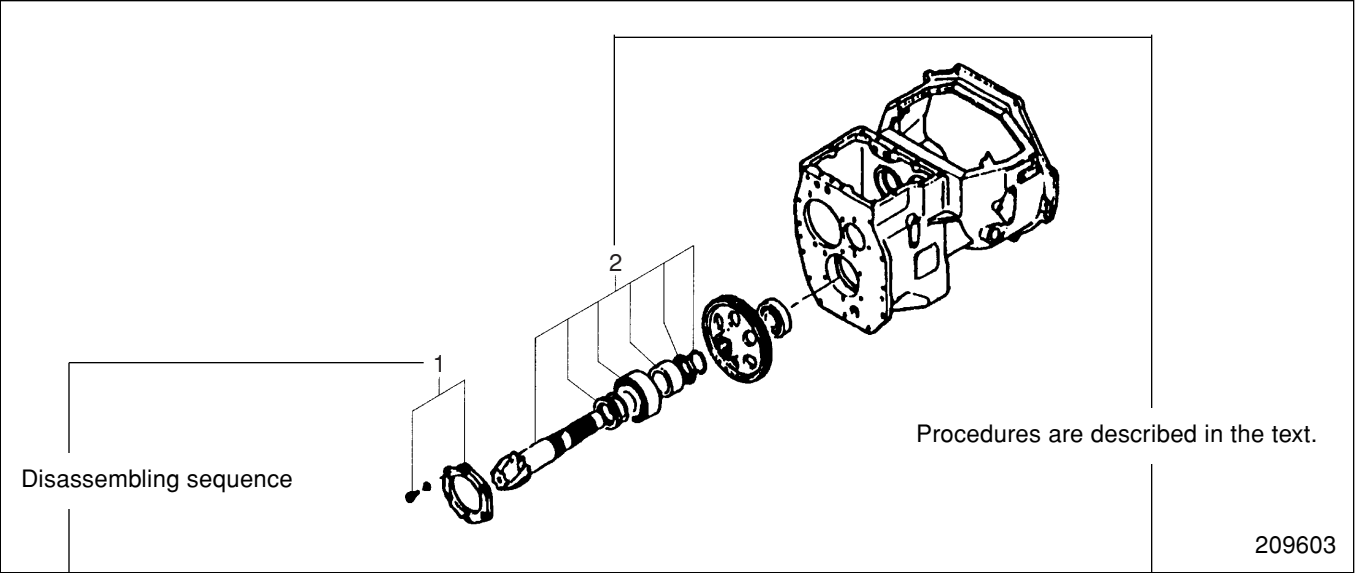
- MC Truck (Mechanical Control System)
Mechanically controlled hydraulic system (conventional lever system)
- FC Truck (Finger-tip Control System)
Electronically controlled hydraulic system



- Gasoline Engine Truck (GP) Equipped with K21 or K25 Gasoline Engine
- Diesel Engine Truck (DP) 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)

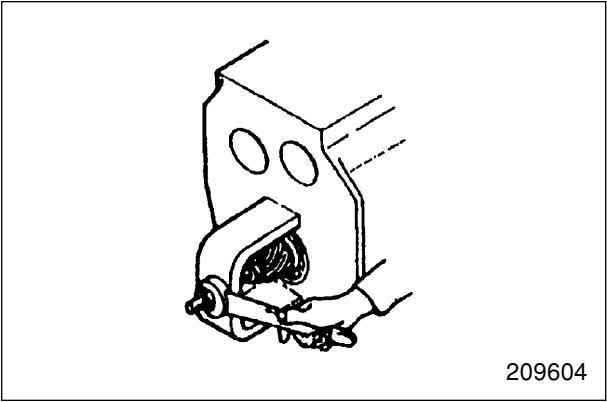


Sequence

- 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 ²
	1 psi	0.0703 kgf/cm ²
Torque	1 N·m	0.1012 kgf·m
	1 lbf·ft	0.1383 kgf·m

GROUP INDEX

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

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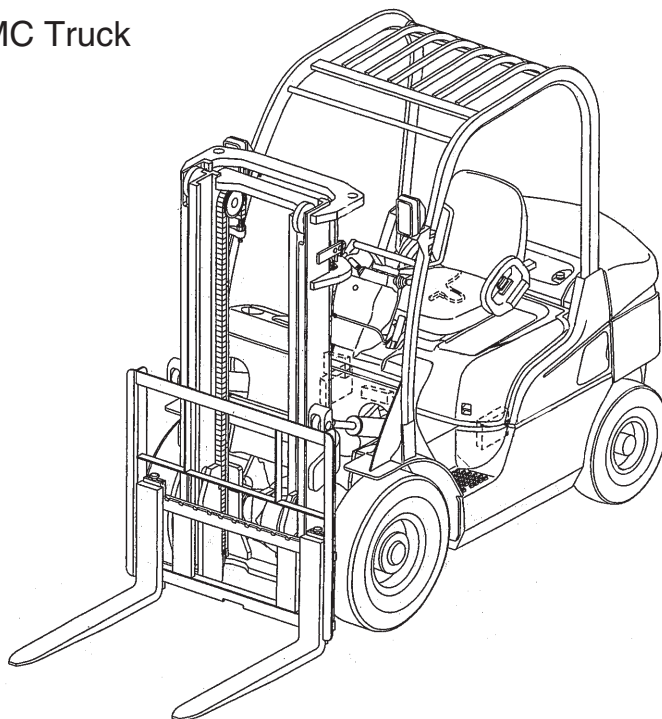
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GENERAL INFORMATION

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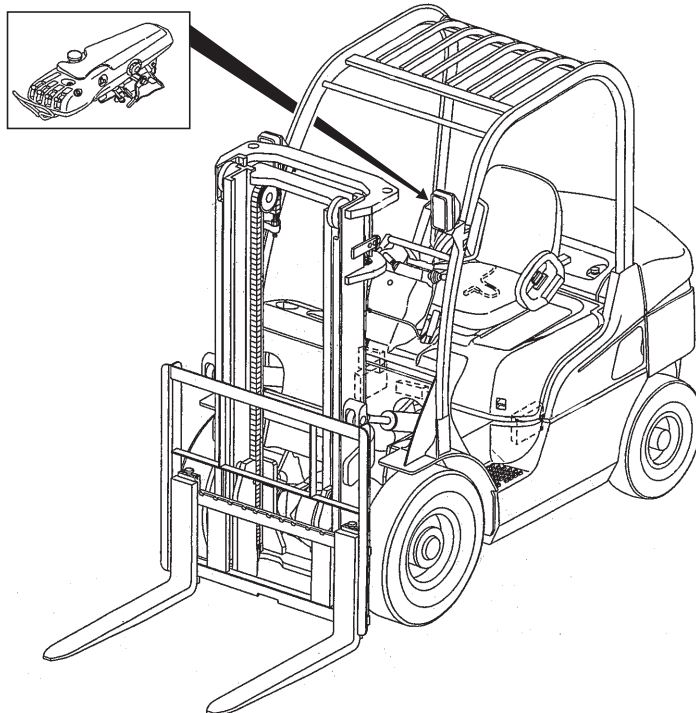
Model View

MC Truck



210991

FC Truck



210992

Truck Models Covered

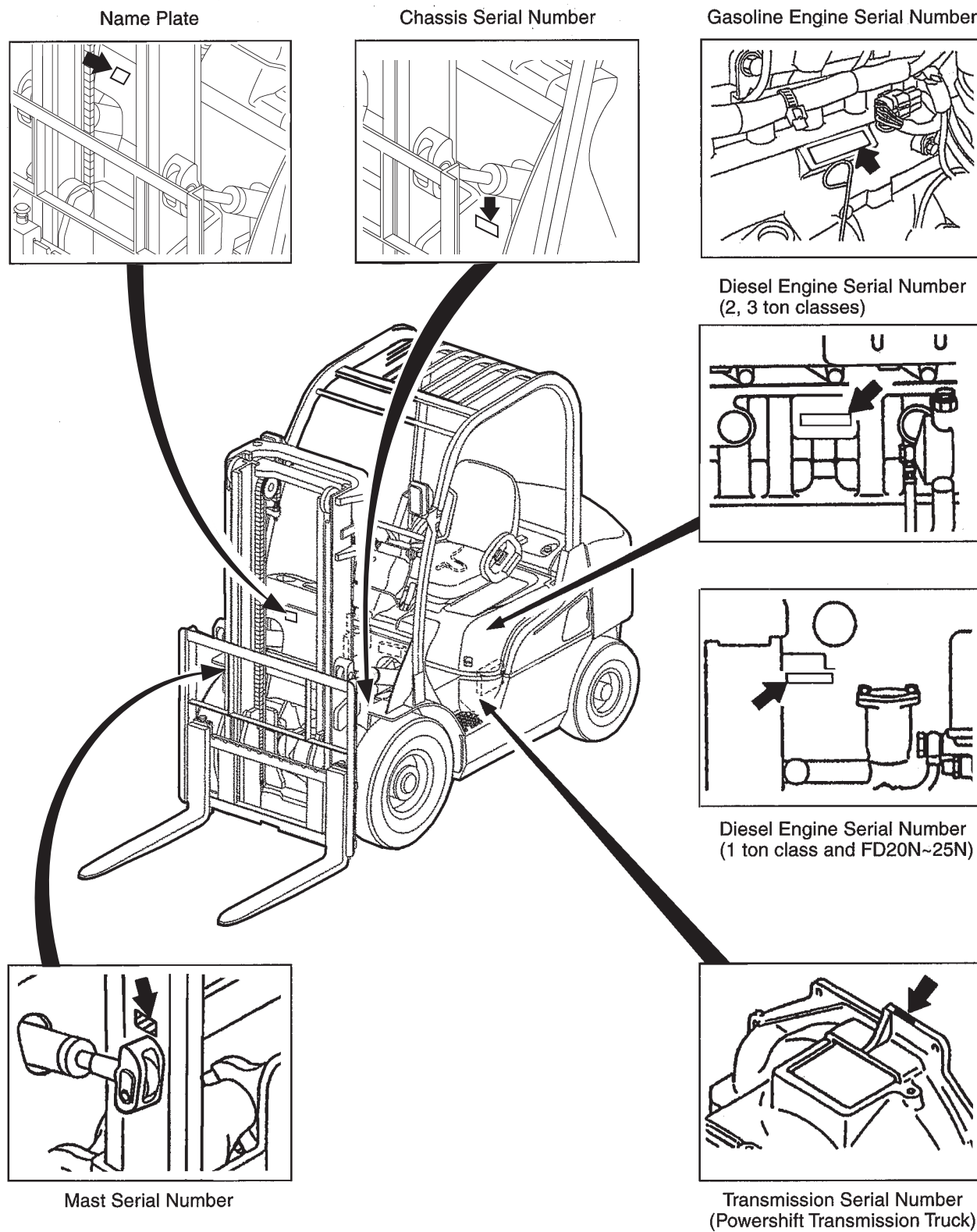
This Service Manual furnishes servicing and maintenance information for the following trucks:

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

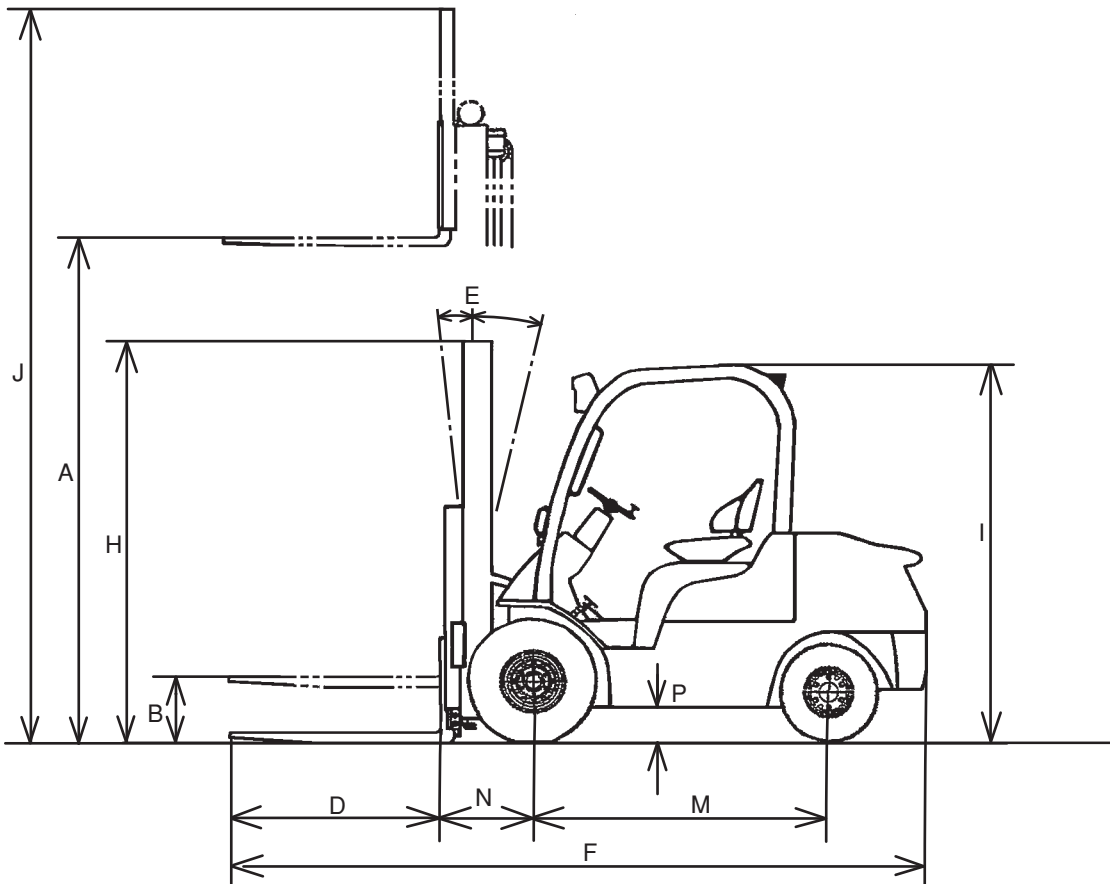
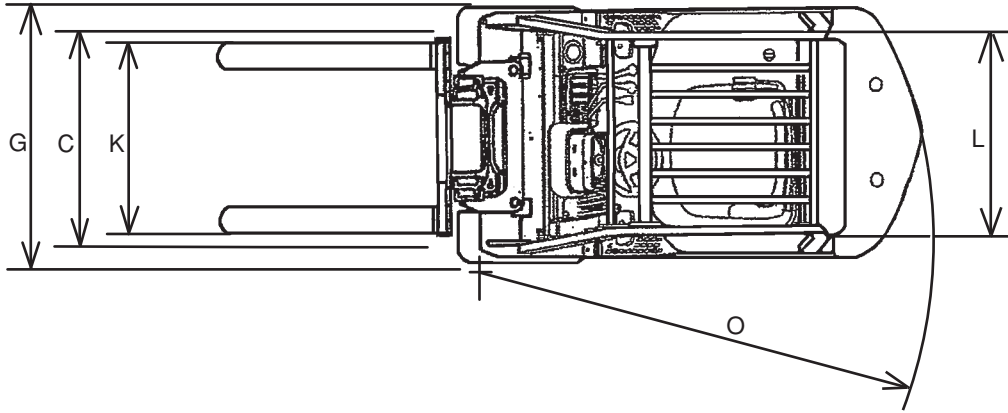
(FC type is used in torque converter model only.)

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	GP15N	ET34L-00011-up	K21	DP15N	ET16D-00011-up	S4Q2
	GP18N	ET34L-40001-up	K21	DP18N	ET16D-40001-up	S4Q2
	GP20CN	ET34L-60001-up	K21	DP20CN	ET16D-60001-up	S4Q2
2 ton class	GP20N	ET17DL-00011-up	K21	DP20N	ET18C-00011-up	S4S
	GP25N	ET17DL-50001-up	K21	DP25N	ET18C-50001-up	S4S
3 ton class	GP30N	ET13FL-00011-up	K25	DP30N	ET14E-00011-up	S4S
	GP35N	ET13FL-50001-up	K25	DP35N	ET14E-50001-up	S4S

Serial Number Locations



Dimensions



Technical Data

Unit: mm (in.)

Ref. No.	Model	Gasoline-engine Truck	GP15N	GP18N
		Diesel-engine Truck	(DP15N)	(DP18N)
	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)	

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