

Service Manual

**GP40, GPL40;
DP40, DPL40, DP45, DP50
Chassis & Mast**

FOREWORD

This service manual is a guide to servicing of Caterpillar 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. Caterpillar reserves the right to change specifications or design without notice and without incurring obligation.

The gasoline models (GP40/GPL40) are powered by Caterpillar 6G72-32FD gasoline engine. The diesel models (DP40/DPL40/DP45/DP50) are powered by Caterpillar S6S diesel engine.

GROUP INDEX

Group	Items involved
General	Serial number locations, Dimensions, Technical data
Cooling system	Fan removal and installation, Fan belt adjustment
Electrical system	Console box, Chassis electrical devices, Care of the battery, Schematic
Power train	Removal and installation
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Manual transmission	Description, Suggestions for removal and installation, Disassembly, Inspection and repair, Reassembly
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 axle, Rear tires
Brake system	Master cylinder, Wheel brakes, 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
Masts and forks	Dual-stage panoramic mast
Troubleshooting	
Service data	Maintenance standards, Periodic service chart, Periodic replacement parts, Lubrication instructions, Special tools, Inspection guide

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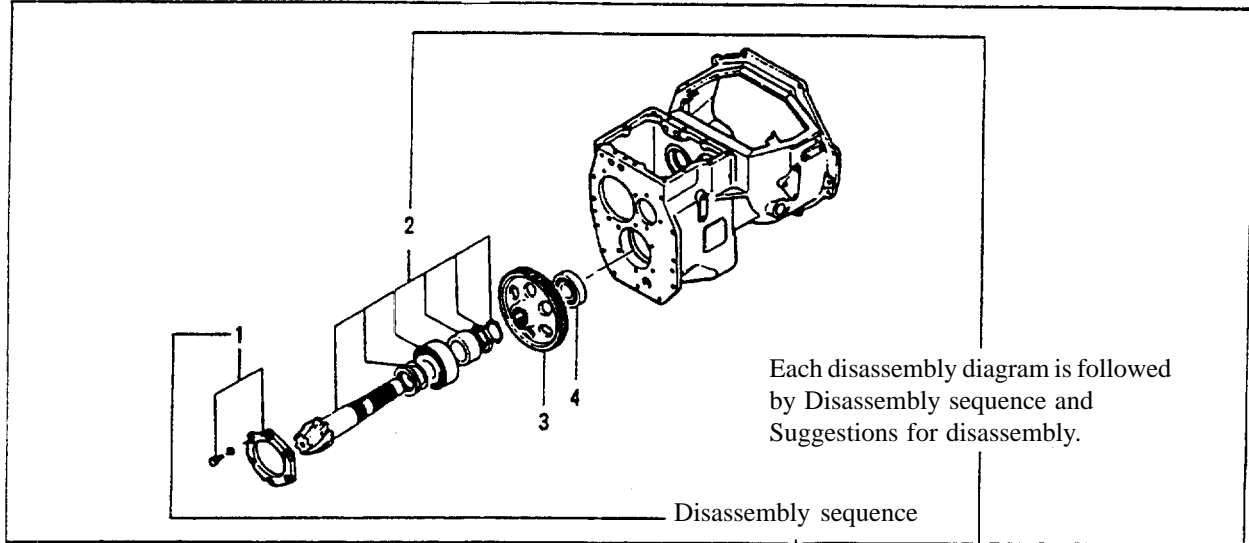
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HOW TO READ THIS MANUAL

Disassembly diagram (example)

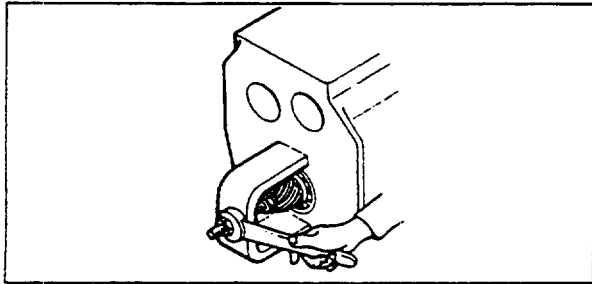


1 Cover [bolt, washer] (part name)

2 Output shaft (part name)

Suggestion for disassembly

(1) Output shaft removal

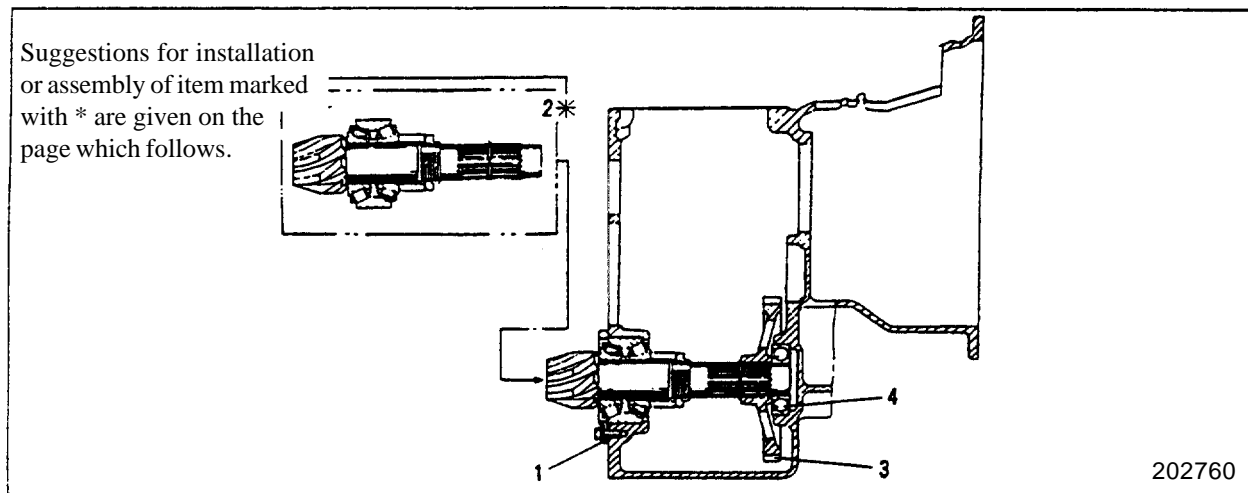


Unit: mm [in.]

Clearance between cylinder and piston	A	0.020 to 0.105 [0.000 79 to 0.004 13]
	B	0.15 [0.005 9]

A: Assembly standard
B: Repair or service limit

Reassembly diagram (example)



Reassembly sequence

4 → 2* → 3 → 1

(The same index numbering as that for disassembly is used.)

GENERAL INFORMATION

MODEL VIEW 7

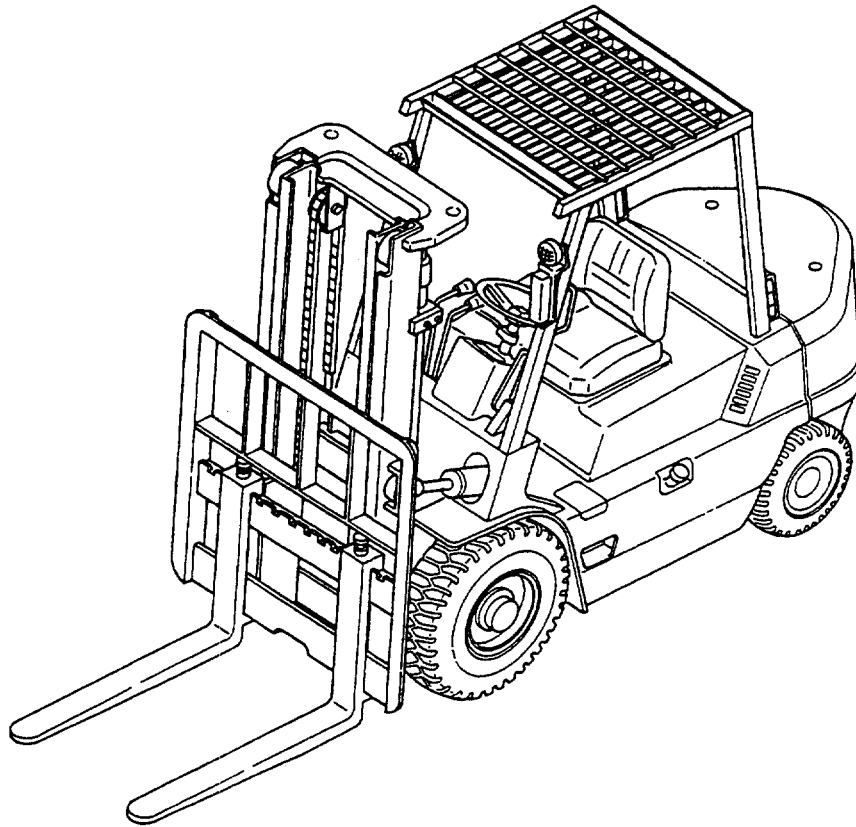
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MODEL VIEW



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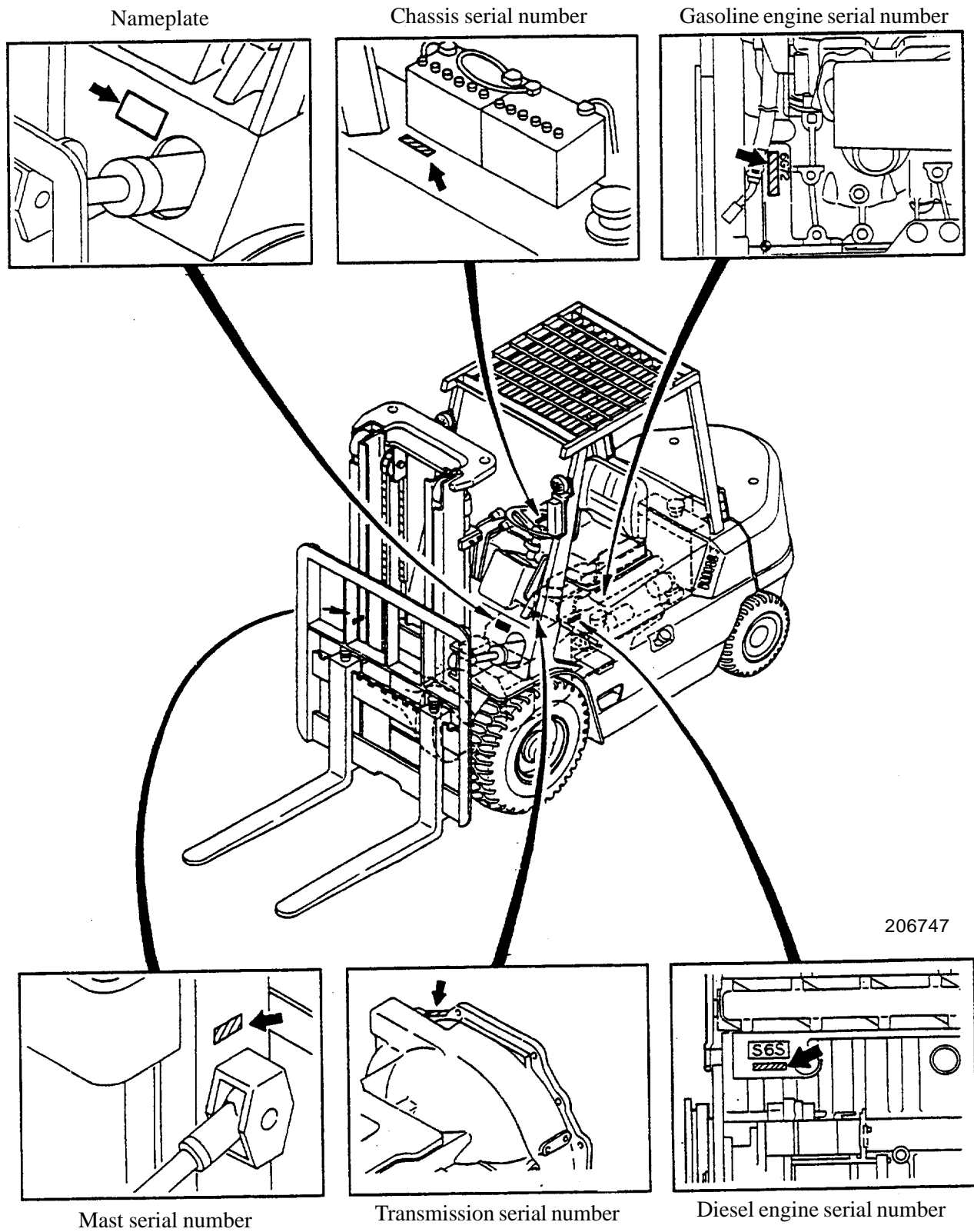
TRUCK MODELS COVERED

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

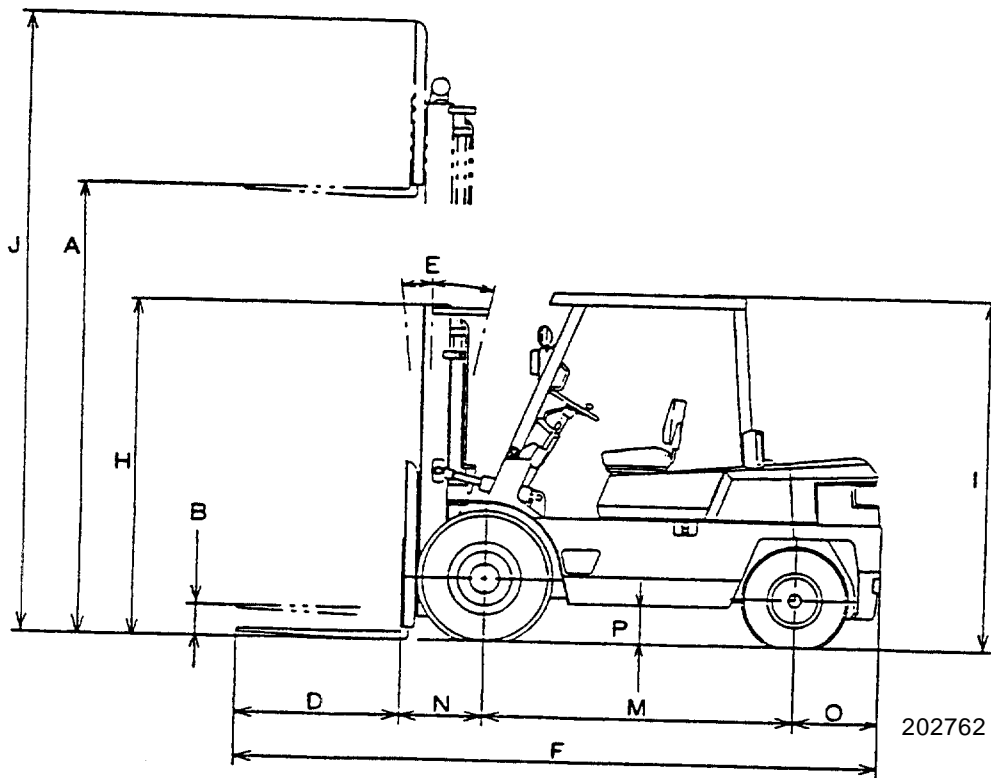
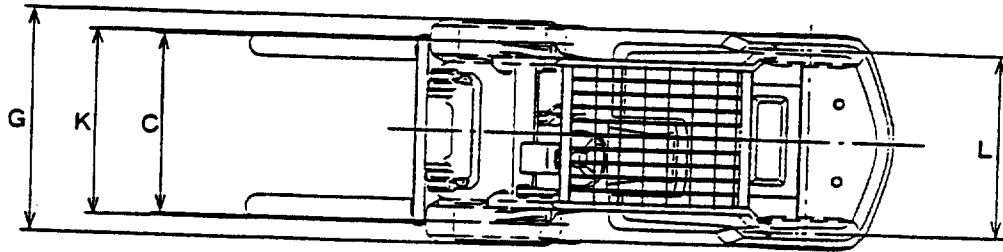
Truck model	Transmission	Model code – Serial number	Engine mounted
GP40	Powershift	1CP – 00011-up	Caterpillar 6G72 gasoline engine
GPL40	Powershift	2CP – 00011-up	Caterpillar 6G72 gasoline engine
DP40	Manual	3CP – 10001-up	Caterpillar S6S diesel engine
	Powershift		
DPL40	Manual	4CP – 10001-up	Caterpillar S6S diesel engine
	Powershift		
DP45	Manual	5CP – 10001-up	Caterpillar S6S diesel engine
	Powershift		
DP50	Powershift	6CP – 10001-up	Caterpillar S6S diesel engine

GENERAL INFORMATION

SERIAL NUMBER LOCATIONS



DIMENSIONS



GENERAL INFORMATION

Unit mm [in.]

Ref. No.	Truck model	GP40 DP40	GPL40 DPL40	DP45	DP50 (single tire)	DP50 (dual tire)	
A	Maximum lift	3 000 [118]					
B	Free lift	150 [5.9]		160 [6.5]	170 [6.7]		
C	Fork spread (outside)	300 to 1 190 [12 to 47]				300 to 1 500 [12 to 59]	
D	Fork length	1 070 [42]			1 220 [48]		
E	Tilt angle (forward – backward)	6° – 12°					
F	Overall length	4 155 [163.6]	4 205 [165.6]	4 335 [170.7]	4 540 [178.7]	4 545 [178.9]	
G	Overall width (outside of tires)	Single tire	1 415 [55.7]	1 460 [57.5]		/	
		Dual tire	1 780 [70.1]				1 965 [77.4]
H	Overall height (to top of mast lowered)	2 150 [84.6]			2 350 [92.5]		
I	Overall height (to top of overhead guard)	2 250 [88.6]					
J	Overall height (mast extended)	4 135 [162.8]			4 285 [168.7]		
K	Tread (front)	Single tire	1 160 [45.7]				/
		Dual tire	1 310 [51.6]			1 445 [56.9]	
L	Tread (rear)	1 180 [46.5]					
M	Wheelbase	2 000 [78.7]			2 150 [84.6]		
N	Front overhang	535 [21.1]		555 [21.9]	560 [22]	565 [22.2]	
O	Rear overhang	550 [21.7]	600 [23.6]	560 [22]	610 [24]		
P	Underclearance (at frame)	250 [9.8]					

TECHNICAL DATA

Item		Truck model	GP40 (DP40)	GPL40 (DPL40)	DP45	DP50 (single tire)	DP50 (dual tire)			
Model code			1CP {3CP}	2CP {4CP}	5CP	6CP				
Type		Standard								
General	Capacity/load center, kgf/mm [lbf/in.]		4 000/500 [8 000/24]	4 000/600 [9 000/24]	4 500/600 [10 000/24]	5 000/600 [11 000/24]	5 000/600 [11 000/24]			
	Maximum lift, mm [in.]		3 000 [118]							
	Lift speed (rate load), mm/sec [fpm]		450 [89] {480 [94]}		480 [94]	420 [83]				
	Lowering speed (rate load), mm/sec [fpm]		500 [98]							
	Tilt angle (forward – backward)		6° – 12°							
	Free lift, mm [in.]		150 [5.9]		165 [6.5]	170 [6.7]				
Performance	Travel speeds, km/h [mph]	Manual transmission models (DP40 thru DP45)	Forward L to H	9.5 to 19.5 [5.9 to 12.1]			/			
			Reverse L to H							
		Powershift transmission models	Forward	20 [12.4]					14 to 24.5 [8.7 to 15.2]	
			Reverse							
	Minimum turning radius, mm [in.]		2 740 [107.9]	2 790 [109.8]	2 920 [115]	2 970 [116.9]				
	Steering angle	Inside	83°							
		Outside	56°33'							
	Minimum intersecting aisle, mm [in.]	Single tire	2 360 [92.9]	2 400 [94.5]	2 450 [96.5]	2 510 [98.8]	/			
		Dual tire	2 490 [98]	2 520 [99.2]	2 570 [101.2]				2 740 [107.9]	
	Gradeability (rated load)	Manual transmission models, tan %	{20}	{17}	20	/				
Powershift transmission models, tan % at 2 km/h [1.2 mph]		25	32 [22]	25	31				30	
Tires (size and inflation pressure)	Front, kPa (kgf/cm ²) [psi]	Single tire	8.25-15-12PR(I) 686 (7) [100]	300-15-18PR(I) 686 (7) [100]			/			
		Dual tire	7.50-16-12PR(I) 686 (7) [100]			8.25-15-12PR(I) 686 (7) [100]				
	Rear, kPa (kgf/cm ²) [psi]	7.00-12-12PR(I) 686 (7) [100]			7.00-12-12PR(I) 834 (8.5) [121]					

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)
Weight, kg [lb]	Single tire (without load)		5 170 [11 400] {5 280 [11 642]}	5 590 [12 326] {5 700 [12 569]}	6 170 [13 605]	6 700 [14 774]	
	Dual tire (without load)		5 280 [11 642] {5 390 [11 885]}	5 630 [12 414] {5 740 [12 657]}	6 210 [13 693]		6 910 [15 237]
Engine	Engine model		6G72-32FD {S6S}		S6S		
	Manufacturer		6G72-32FD: Mitsubishi Motors Corporation S6S: Mitsubishi Heavy Industries, Ltd.				
	Type		Water-cooled, 4-stroke cycle				
	No. of cylinders – arrangement		6G72-32FD: 6 – 60° S6S: 6 – inline				
	Type of combustion chambers		6G72-32FD: Semi-spherical S6S: Swirl				
	Valve arrangement		6G72-32FD: Overhead with overhead cam S6S: Overhead				
	Type of cylinder liners		6G72-32FD: Integral S6S: Dry				
	Bore × stroke, mm [in.]		6G72-32FD: 9.11 × 76 [3.59 × 2.99] S6S: 94 × 120 [3.70 × 4.72]		94 × 120 [3.70 × 4.72]		
	Displacement, liter [cu in.]		6G72-32FD: 2.972 [181] S6S: 4.996 [305]		4.996 [305]		
	Compression ratio		6G72-32FD: 8.9 : 1 S6S: 22 : 1		22 : 1		
	Rated output, PS/rpm		6G72-32FD: 64/2 450 S6S: 82/2 450		82/2 450		
	Maximum torque, N·m (kgf·m) [lbf·ft]/rpm		6G72-32FD: 179 (18.3) [132]/1 800 S6S: 250 (25.5) [184]/1 600		250 (25.5) [184]		
	Dimensions (length × width × height), mm [in.]		6G72-32FD: 586 × 637 × 765 [23.1 × 25.1 × 30.1] S6S: 908 × 650 × 801 [35.7 × 25.6 × 31.5]		908 × 650 × 801 [35.7 × 25.6 × 31.5]		
	Weight (service), kg [lb]		6G72-32FD: 175 [386] S6S: 350 [772]		350 [772]		
	Installation position		Rear				
	Intake valves	Open, BTDC	6G72-32FD: 19° S6S: 30°				
		Close, ABDC	6G72-32FD: 57° S6S: 50°				
Exhaust valves	Open, BBDC	6G72-32FD: 57° S6S: 74°					
	Close, ATDC	6G72-32FD: 19° S6S: 30°					

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)
Engine	Valve clearance	Intake valves, mm [in.]	6G72-32FD: 0.25 [0.009 8] (hot)				
		Exhaust valves, mm [in.]	S6S: 0.25 [0.009 8] (cold)				
	Ignition	6G72-32FD: Spark S6S: Compression					
	Firing order	6G72-32FD: 1 - 2 - 3 - 4 - 5 - 6 S6S: 1 - 5 - 3 - 6 - 2 - 4					
	Ignition or injection timing, BTDC	6G72-32FD: 5° S6S: 22°					
	Fuel tank capacity, liter [U.S. gal]	105 [27.7]		125 [33]			
	No-load minimum speed, rpm	6G72-32FD: 600 to 650 S6S: 650 to 700					
No-load maximum speed, rpm	6G72-32FD: 2 600 to 2 700 S6S: 2 600 to 2 650						
Ignition system (6G72-32FD)	Ignition coil	Type	Mold				
		Manufacturer	Diamond Electric				
	Distributor	Type	Pointless				
		Manufacturer	Mitsubishi Electric Corporation				
		Type of spark advance mechanism	Centrifugal-vacuum				
	Spark plug	Model	W16EX-U/BP5ES				
		Manufacturer	Nippon Denso and NGK				
Size, mm [in.]		14 [0.55]					
Gap, mm [in.]		0.7 to 0.8 [0.028 to 0.031]					
Fuel system (6G72-32FD)	Carburetor	Type	Downdraft				
		Manufacturer	Aisan Kogyo				
	Governor	Type	Pneumatic				
		Manufacturer	Mikuni Kogyo				
	Fuel pump	Type	Electromagnetic plunger				
		Manufacturer	Jidosha Kiki				
	Air cleaner	Type × number	Cyclone with paper element × 1				
Manufacturer		Nippon Rokaki					
Fuel system (S6S)	Fuel injection pump	Type	Bosch				
		Manufacturer	Nippon Denso				
		Plunger diam., mm [in.]	6.5 [0.256]				
		Cam lift (one side), mm [in.]	8 [0.31]				
	Fuel injection nozzles	Type	Throttle				
		Spray holes, diam., mm [in.]	1.0 [0.04]				
Injection pressure, MPa (kgf/cm ²) [psi]		13.7 (140) [1 991]					

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)
Fuel system (S6S)	Heater plugs	Type	Sheathed				
		Voltage – current, V – A	22 – 4.4				
	Fuel pump	Type	Piston (Bosch)				
		Manufacturer	Nippon Denso				
	Air cleaner	Type × number	Cyclone with paper element × 1				
Manufacturer		Nippon Rokaki					
Lubrication system	Type		Pressure feed				
	Oil pump		Trochoid type				
	Oil filter		Paper element type				
	Refill capacities, liter [U.S. gal]	Oil pan	6G72-32FD: 4.0 [1.1]	S6S: 11 [2.9]			
		Oil filter	0.4 [0.1]	1 [0.3]			
Total		4.4 [1.2]	12 [3.2]				
Cooling system	Type		Forced circulation				
	Radiator		Corrugated fin with pressure cap				
	Refill capacity, liter [U.S. gal]		6G72-32FD: 11.85 [3.1]	S6S: 11.85 [3.1]			
	Water pump		Centrifugal type driven by V-belt				
	Thermostat		Wax type				
Battery	Type × number (Battery supplied by MCFA or MCFE)		48D26R × 1 {48D26R × 2}	48D26R × 2			
	Voltage, V		12 {24}	24			
	Capacity, Ah		40				
Alternator and regulator	Alternator type		3-phase AC				
	Manufacturer		Mitsubishi Electric Corporation				
	Capacity, V – A		12 – 40 {24 – 30}	24 – 30			
	Voltage/current regulator		Built-in IC type				
Stator	Type		Electromagnetic				
	Manufacturer		Mitsubishi Electric Corporation				
	Voltage – output, V – kW		12 – 1.2 {24 – 5}	24 – 5			
Engine stop device	Control timer (DP40 thru DP50)	Setting, sec	5 to 7				
		Operating voltage, V	16 to 30				
	Stop solenoid (DP40 thru DP50)	Rated current (at 24 V), A	11.3				
		Manufacturer					Mitsubishi Electric Corporation
	Detector (magnetic pickup)	Output, mA					180 minimum
		Gap mm [in.]					0.7 ± 0.2 [0.028 ± 0.008]

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)		
Power train	Clutch (DP40 thru DP45)	Type	Dry, single disc (OP: wet type)						
		Facing (OD × ID), mm [in.]	325 × 210 [12.8 × 8.3] (wet: 325 × 225 [12.8 × 8.9])						
		Material	DR-8 (wet: cork)						
	Torque converter	Type	3-element, 1-stage, 2-phase						
		Manufacturer's model	Okamura M15						
		Stall torque ratio	3.2						
	Transmission	Power-shift	Control and shift		Hydraulic and column shift				
			Ratios	Forward	4.004			F1: 5.735, F2: 3.239	
				Reverse	4.057			R1: 5.735, R2: 3.239	
		Manual (DP40 thru DP45)	Type	Synchro-mesh					
			Shift	Floor-shift					
			Forward ratio	1st	8.462				
				2nd	4.145				
	Reverse ratio	1st	8.489						
		2nd	4.159						
Reduction gear	Type of gear	Spiral bevel							
	Gear ratio	4.857							
Differential	Housing	Banjo							
	Type of gear and pinion - number	Gear	Straight bevel - 2						
		Pinion	Straight bevel - 4						
Steering system	Type		Recirculating ball-and-nut						
	Gear ratio		20.0						
	Steering wheel diameter, mm [in.]		380 [15]						
	Power steering	Type		Semi-integral					
		Power cylinder ID × rod diam., mm [in.]		55 × 25 [2.17 × 0.98]					
		Effective stroke, mm [in.]		275 [10.8]					
		Relief pressure, kPa (kgf/cm ²) [psi]		8 336 ⁺⁴⁹⁰ ₀ (85 ⁺⁵ ₀) [1 209 ⁺⁷¹ ₀]					
Flow rate, liter [U.S. gal]/min		17.5 ± 0.5 [4.6 ± 0.13]							
Traveling system	Front axle		Full-floating tubular type						
	Rear axle		Elliott type						
	Suspension system	Front	Fixed type						
		Rear	Center-pivot type						
	Wheel alignment	Toe-in, mm [in.]		0					
		Camber		1.0°					
Caster		0°							
Kingpin inclination		5.0°							

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)	
Brake system	Service brakes	Type	Self-adjusting, duo-servo					
		Drum diameter, mm [in.]	317.5 [12.50]					
		Lining (length × width × thick × number), mm [in.]	351 × 60 × 6 × 2 [13.8 × 2.4 × 0.2 × 2]			332 × 63 × 10 × 2 [13.1 × 2.5 × 0.4 × 2]		
		Master cylinder ID, mm [in.]	22.22 [0.874 8]			25.4 [1.000]		
	Wheel cylinder ID, mm [in.]	28.58 [1.125 2]			31.75 [1.250 0]			
Parking brake	Type	Mechanical, mounted on wheels						
Brake booster		Mastervac (vacuum suspended)						
Body		Assembled-frame type						
Hydraulic system	Hydraulic pump	Type	Gear					
		Manufacturer	Kayaba {Simazu}		Simazu			
		Manufacturer's type	KFD3245 {SPG2-48}		SPG2-48			
		Rated discharge, liter [U.S. gal]/rpm	110 [29.0]/2 450 {116 [30.6]/2 450}		116 [30.6]/2 450			
		Drive line	Universal joint					
	Control valve	Type	KVS					
		Manufacturer	Kayaba					
	Flow regulator valve	Relief pressure, kPa (kgf/cm ²) [psi]	19 123 ⁺⁴⁹⁰ ₀ (195 ⁺⁵ ₀) [2 773 ⁺⁷¹ ₀]					
		Type	Variable (Adjustable)					
	Lift cylinders	Regulated flow rate, liter [U.S. gal]/min	100 [26.4]			115 [30.4]		
		ID, mm [in.]	65 ^{+0.1} ₀ [2.56 ^{+0.004} ₀]			70 ^{+0.1} ₀ [2.76 ^{+0.004} ₀]		
	Tilt cylinders	Stroke, mm [in.]	1 500 [59.06]					
		ID, mm [in.]	80 ^{+0.1} ₀ [3.15 ^{+0.004} ₀]		90 ^{+0.1} ₀ [3.54 ^{+0.004} ₀]			
Hydraulic tank capacity, liter [U.S. gal]	Stroke, mm [in.]	185 [7.28]						
		58.5 [15.4]			69.3 [18.3]			

GENERAL INFORMATION

Item		Truck model	GP40 {DP40}	GPL40 {DPL40}	DP45	DP50 (single tire)	DP50 (dual tire)	
Mast and forks	Mast		Roller type CL					
	Mast dimensions (flange ID × thick × web thick), mm [in.]		Outer	118 × 23 × 14 [4.65 × 0.91 × 0.55]		130 × 25 × 16 [5.12 × 0.98 × 0.63]		
			Inner	118 × 25 × 14 [4.65 × 0.98 × 0.55]				
	Main rollers	Bearing		#6309 ball bearing		#6310 ball bearing		
		Diam × width, mm [in.]		118 × 40 [4.65 × 1.57]		130 × 40 [5.12 × 1.57]		
	Side rollers	Bearing		Lubricated type needle roller bearing				
		Diam × width, mm [in.]		52 × 36 [2.05 × 1.42]				
	Lift chains		BL834			BL1023		
	Fork (length × width × thick), mm [in.]		1 070 × 150 × 50 [42 × 5.9 × 2.0]			1 220 × 150 × 60 [48 × 5.9 × 2.4]		
	Fork spread (outer width), mm [in.]		300 to 1 190 [12 to 47]				300 to 1 500 [12 to 59]	

COOLING SYSTEM

DESCRIPTION 21

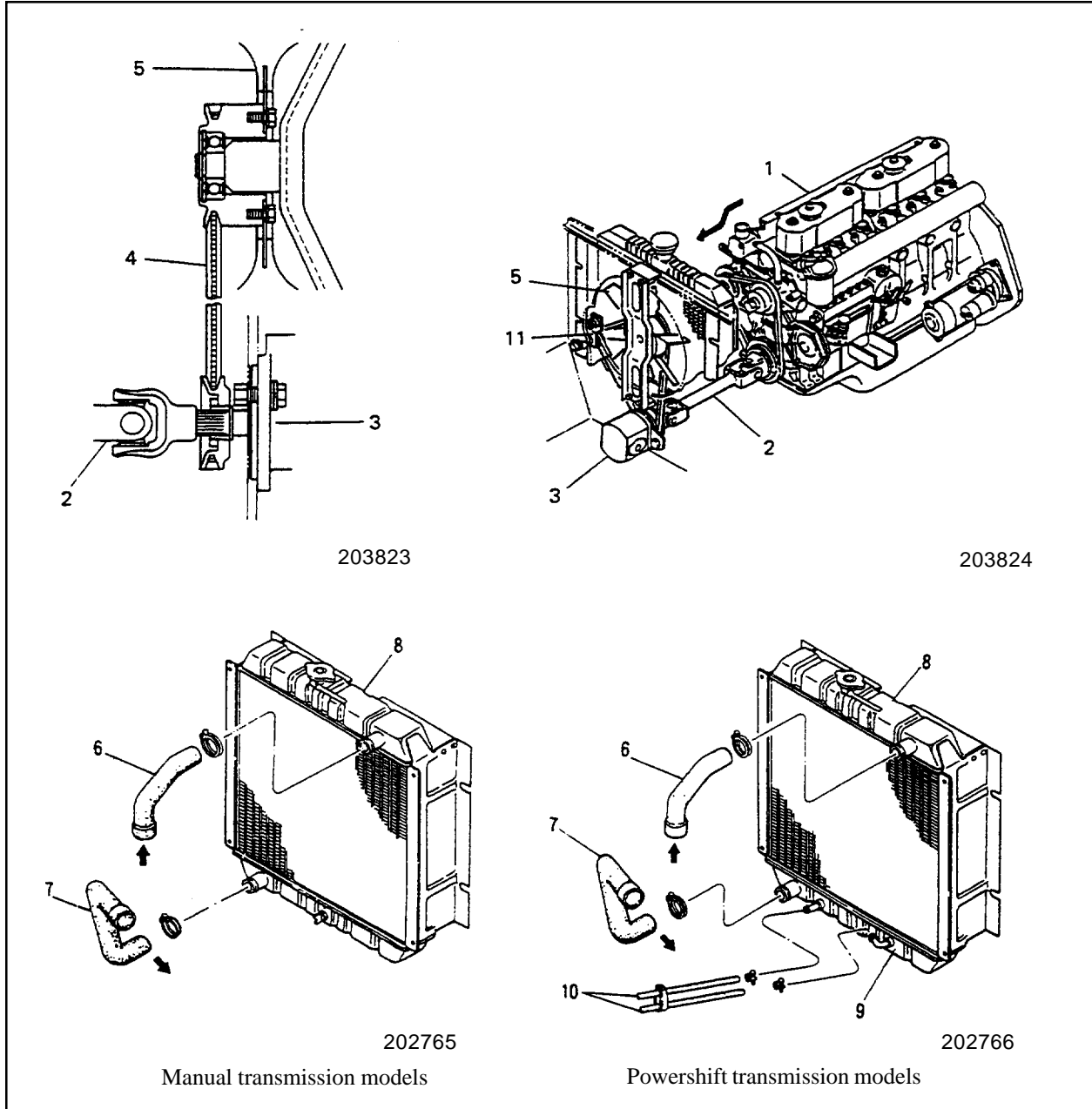
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INSPECTION AND ADJUSTMENT

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 Fan belt adjustment 26

DESCRIPTION



- 1 Engine
- 2 Universal joint
- 3 Gear pump
- 4 Fan belt
- 5 Cooling fan
- 6 Upper hose

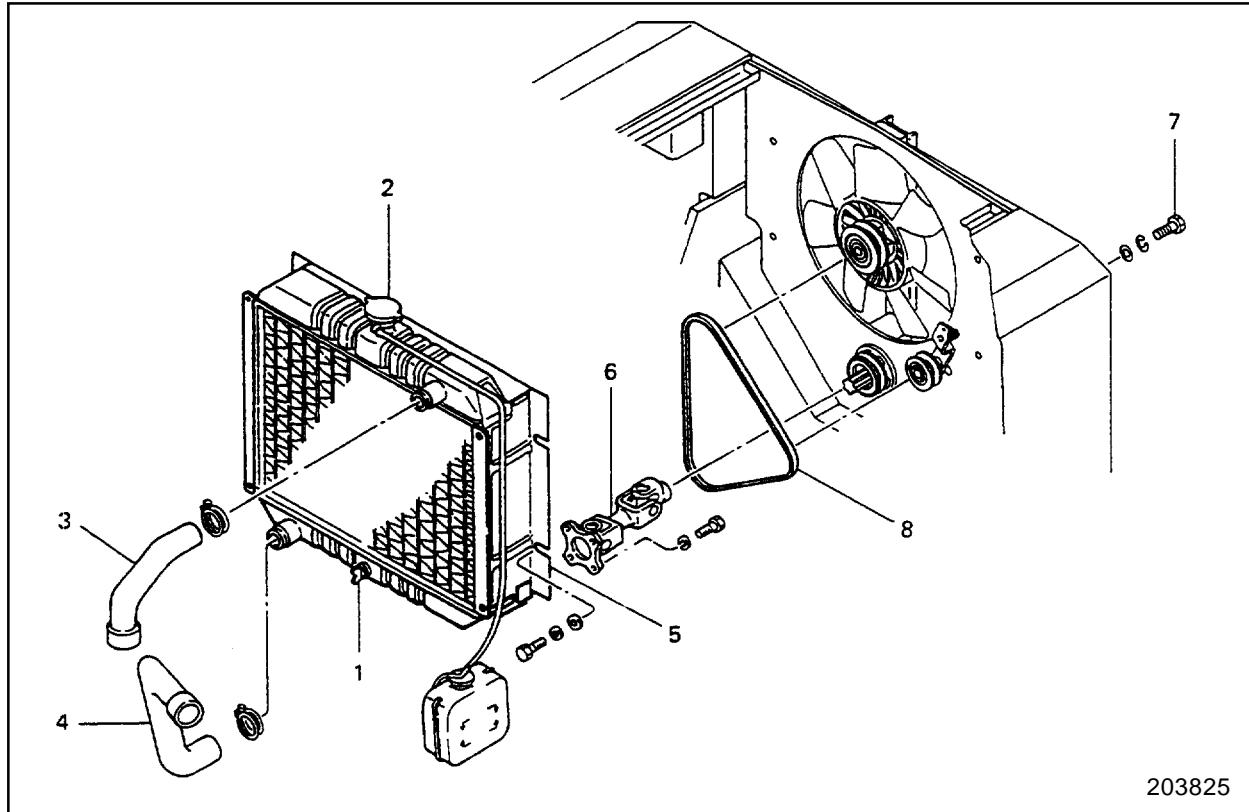
- 7 Lower hose
- 8 Radiator
- 9 Oil cooler
- 10 Cooler hoses
- 11 Tension pulley

COOLING SYSTEM

REMOVAL AND INSTALLATION

Fan Belt Removal

1. Method by removing radiator



Removal sequence

- | | |
|--------------|-----------------------|
| 1 Drain cock | 5 Radiator |
| 2 Cap | 6 Universal joint |
| 3 Hose | 7 Tension pulley bolt |
| 4 Hose | 8 Belt |

Start by:

- (1) remove the radiator cover.
- (2) remove the engine cover and gas springs.

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