CAT® Lift Trucks

Service Manual

Chassis & Mast

FC/MC

EP13PNT	ETB21-00011-up
EP15PNT	ETB21-50011-up
EP16CPNT	ETB22-00011-up
EP18CPNT	ETB22-50011-up
EP16PNT	ETB23-00011-up
EP18PNT	ETB23-50011-up
EP20PNT	ETB24-00011-up

99759-6N100

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, EP18... Order the manual at mid-west-tech.com >

Chapter 1 GENERAL INFORMATION

1. Model View 1-1
2. Truck Models Covered 1-1
3. Serial Number Locations 1-2
4. Specifications 1-3

Chapter 2 VEHICLE ELECTRICAL COMPONENTS

1. Console 2-1
1.1 MC Model 2-1
1.2 FC Model 2-2
2. Disassembling Console 2-3
2.1 Disassembling Sequence 2-3
2.2 Suggestions for Disassembly 2-4
3. Reassembling Console 2-5
4. Meter panel 2-6
4.1 Functions of Meter panel 2-6
4.2 Adjusting and Setting of Meter panel 2-10
4.3 Error Code List 2-23
5. Key Switch 2-24
6. Lighting Switch (Rear Work Lamp) 2-24
6.1 Lamps 2-25
6.2 Specification Chart 2-26
7. Horn Switch and Battery Disconnect Switch 2-27
7.1 MC Model 2-27
7.2 FC Model 2-27
8. Troubleshooting of Lighting and Horn Systems 2-28
9. Parking Brake Switch 2-29
10. Combination Switch 2-30
10.1 Direction lever 2-31
10.2 Light Switch, Turn Signal Switch (option) 2-31
11. Disassembling Accelerator Control 2-32
11.1 Disassembling Sequence 2-32
11.2 Adjusting 2-33
12. Joystick Box 2-35
13. Fuses 2-35

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >

Chapter 3 POWER TRAIN

1. Removing Batteries 3-1
2. Removing Front Wheels 3-2
3. Removing Transfer Assemblies, Traction Motors 3-3
4. Installing Transfer Assemblies, Traction Motors and Calipers 3-4
5. Service Data 3-6

Chapter 4 TRANSFER UNITS

1. Specifications 4-1
2. Structure 4-2
   2.1 External View 4-2
   2.2 Structure 4-3
3. Disassembling Transfer Units 4-4
   3.1 Preparation 4-4
   3.2 Disassembly Sequence 4-4
4. Inspecting Transfer Units 4-9
5. Reassembling Transfer Units 4-10
   5.1 Reassembly Sequence 4-10
6. Service Data 4-19

Chapter 5 REAR AXLE

1. Structure 5-1
   1.1 Rear Axle 5-1
   1.2 Rear Wheels 5-2
2. Removing Rear Wheel 5-2
3. Installing Rear Wheel 5-3
4. Removing Rear Axle 5-4
   4.1 Removal Sequence 5-4
   4.2 Suggestions for Removal 5-5
5. Installing Rear Axle 5-5
6. Disassembling Rear Axle 5-6
   6.1 Disassembly Sequence 5-6
   6.2 Suggestions for Disassembly 5-7
   6.3 Inspection during Disassembling Rear Axle 5-8
7. Reassembling Rear Axle 5-9
   7.1 Suggestions for Reassembly 5-9
8. Inspecting and Adjusting Rear Axle 5-12
   8.1 Measuring Minimum Turning Radius 5-12
9. Troubleshooting 5-13
10. Service Data 5-14
   10.1 Rear Axle 5-14

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >

Chapter 6 BRAKE SYSTEM

1. Specifications 6-1
2. Structure 6-2
2.1 Outline of Brake System 6-2
2.2 Brake Pedal Assembly 6-3
2.3 Electro-magnetic Brake Assembly 6-5
3. Removing Master Cylinder 6-6
3.1 Removal Sequence 6-6
4. Disassembling Master Cylinder 6-7
4.1 Disassembly Sequence 6-7
5. Inspecting and Adjusting Master Cylinder 6-8
6. Reassembling Master Cylinder 6-11
7. Inspecting and Adjusting Brake Pedal Assembly 6-12
8. Manually Release of Electro-Magnetic Brake 6-14
9. Troubleshooting 6-15
9.1 Brake Pedal Assembly 6-15
9.2 Parking Brake 6-16
10. Service Data 6-17
10.1 Brake Pedal 6-17
10.2 Master Cylinder 6-18

Chapter 7 STEERING SYSTEM

1. Specifications 7-1
2. Structure 7-2
2.1 Outline of Steering System (3W Model) 7-2
3. Removing Steering Linkage Assembly 7-3
3.1 Removal Sequence 7-3
3.2 Suggestions for Removal 7-4
4. Inspecting Steering Linkage Assembly 7-5
5. Installing Steering Linkage Assembly 7-5
6. Troubleshooting 7-5

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >

4. Specifications

This specification describes the truck with simplex 3.3 m mast.

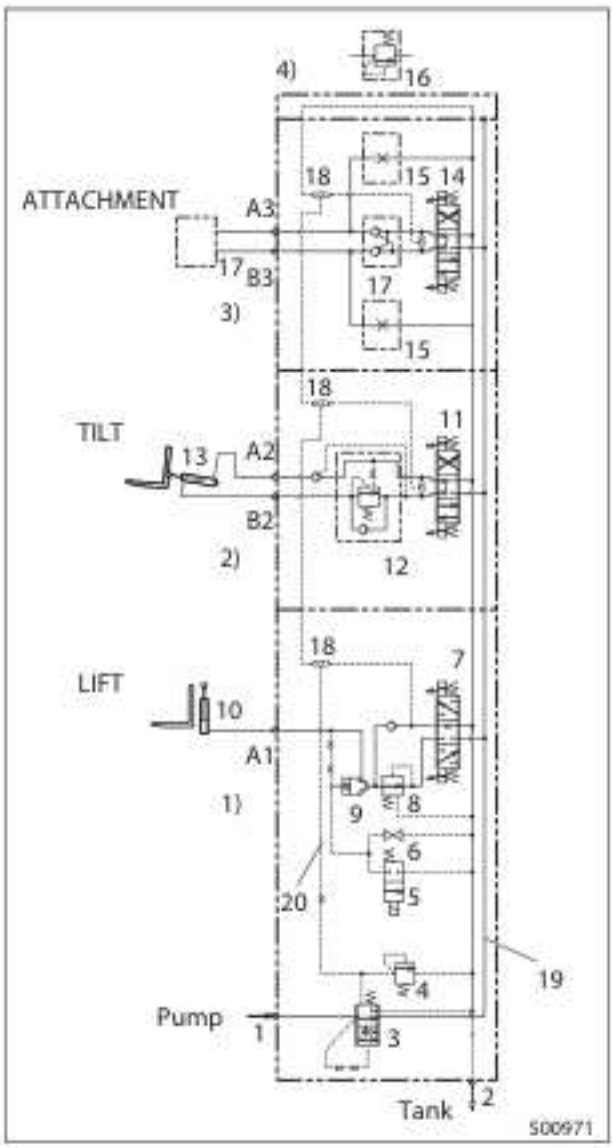
	SPECIFICATION		UNIT	EP 13PNT	EP 15PNT	EP 16CPNT	EP 18CPNT	EP 16PNT	EP 18PNT	EP 20PNT
PERFORMANCE	RATED CAPACITY, 500 mm (24 in.)		kg (lb)	1300 (2500)	1500 (2900)	1600 (3000)	1800 (3500)	1600 (3000)	1800 (3500)	2000 (4000)
	LOAD CENTER		mm (in.)	500 (24)		500 (24)		500 (24)		
	MAXIMUM FORK HEIGHT		mm (in.)	3325 (130.91)		3325 (130.91)		3325 (130.91)		
	FREE LIFT		mm (in.)	115 (4.53)		115 (4.53)		115 (4.53)		
	LIFT SPEED (UNLOADED/LOADED)		m/s (mph)	0.6/0.5 (118.11/98.43)		0.6/0.5 (118.11/98.43)	0.6/0.44 (118.11/86.61)	0.6/0.5 (118.11/98.43)	0.6/0.44 (118.11/86.61)	0.6/0.4 (118.11/78.74)
	LOWERING SPEED (UNLOADED/LOADED)		m/s (mph)	0.5/0.52 (98.43/102.36)		0.5/0.52 (98.43/102.36)		0.5/0.52 (98.43/102.36)		
	TILT ANGLE (FORWARD/BACKWARD)		deg	5/7.5		5/7.5		5/7.5		
	TRAVEL SPEED	FORWARD (UNLOADED/LOADED)	km/h (mph)	16/16 (9.94/9.94)		16/16 (9.94/9.94)		16/16 (9.94/9.94)		
		REVERSE (UNLOADED/LOADED)	km/h (mph)	16/16 (9.94/9.94)		16/16 (9.94/9.94)		16/16 (9.94/9.94)		
	MINIMUM TURNING RADIUS		mm (in.)	1475 (58.07)		1585 (62.40)		1695 (66.73)		
	WORKING AISLE WIDTH 1000 x 1200 mm (39.37 x 47.24 in.) PALLETS		mm (in.)	3173 (124.92)		3283 (129.25)		3393 (133.58)		3403 (133.98)
	WORKING AISLE WIDTH 800 x 1200 mm (31.50 x 47.24 in.) PALLETS		mm (in.)	2993 (117.83)		3103 (122.17)		3213 (126.50)		3222 (126.85)

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >

22.2 FC Hydraulic System Circuit

Overview of Hydraulic System with Circuit Diagram

For the construction of each valve, refer to the operational description of the relevant valve.



Note: Hydraulic circuit for lift and valve (3-10)
Hydraulic circuit for tilt and valve (11-13)
Hydraulic circuit for attachment and valve (14-18)

1. From hydraulic pump
2. To hydraulic tank
3. Bleed-off valve (BO valve)
4. Relief valve (Pilot valve)
5. Lift lock solenoid valve
6. Shut-off valve
7. Lift spool
8. Flow control valve
9. Lift lock valve
10. Lift cylinder
11. Tilt spool
12. Tilt lock valve (counter-balance valve)
13. Tilt cylinder
14. Attachment spool
15. Port for relief valve
16. Port relief valve (OP)
17. Double pilot check valve
18. Shuttle valve
19. Supply oil gallery to the circuit
20. Load pressure (Load sensing)
1) Inlet section
2) Tilt section
3) Attachment section
4) End plate

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >

13. Troubleshooting

Situation	Possible causes	Action
Lift bracket, inner mast or middle mast does not rise or lower smoothly.	Faulty rotation of rollers	Apply grease or replace rollers.
	Improper mast strip clearance	Adjust with shims.
	Improper main roller or side roller clearance	Adjust longitudinal and lateral clearances.
Lift bracket or inner mast is lopsided.	Uneven chain tension between right and left chains	Adjust chain tension.
	Excessive side roller clearance	Adjust by adding shims.
	Uneven adjustment of shims between right and left lift cylinders (at maximum lift position)	Adjust by removing shims.
	Lift bracket retaining stopper in contact	Adjust chain tension.
Mast generate abnormal noise	Faulty rotation of rollers	Apply grease or replace rollers.
	Defective hose pulley bearing (for triplex mast system only)	Replace.
Lift cylinders descent due to leaks.	Damaged gaskets in lift cylinders	Replace.
	Internal leak of control valve	Replace.
Entire masts shake	Worn mast support bushings and caps	Re-tighten, or replace bushings and caps.
Masts are deformed in shape.	Uneven cargo load or overload	Replace assembly.
Uneven fork end heights	Bent finger bars	Repair or replace.
	Bent forks	Replace.
	Mast deformation due to uneven cargo load	Repair or replace.
Second lift cylinders move when first lift cylinder operates. (Duplex and Triplex mast systems)	Low oil temperature	Increase oil temperature by raising and lowering lift bracket.
	No clearance for lift bracket roller surfaces	Readjust rollers.
	Clogged pipes	Inspect and clean hydraulic lines.
	Improper air bleeding	Bleed hydraulic system.
Spongy operation of fall-prevention function when lifting operation is stopped.	Improper air bleeding	Bleed hydraulic system.

MidWestTech | Caterpillar EP13PNT, EP15PNT, EP16CPNT, EP18CPNT, EP16PNT, E... Order the manual at mid-west-tech.com >