CAT® Lift Trucks

Service Manual

Chassis & Mast

LC/FC

DP100NM1	AT15E-20011-39999
DP120NM1	AT15E-20011-39999
DP135NM1	AT15E-20011-39999
DP150NM1	AT24C-20011-39999

For use with 6D16-TL Diesel Engine Service Manual

99799-87100

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Service... Order the manual at mid-west-tech.com >

Chapter 1 GENERAL INFORMATION

1. Model View 1-1
2. Applicable Lift Truck Models 1-2
3. Serial Number Locations 1-3
4. Specifications 1-4
4.1 Dimensions 1-5
4.2 Performance 1-6

Chapter 2 COOLING SYSTEM

1. Specifications 2-1
2. Structure 2-2
3. Removing Radiator and Intercooler 2-3
3.1 Preparation 2-3
3.2 Removal Sequence of Radiator and Intercooler 2-3
3.3 Suggestions for Removal 2-4
4. Inspecting and Adjusting Radiator and Intercooler 2-5
4.1 Intercooler 2-5
4.2 Inspecting Fan Belt 2-5
4.3 Radiator 2-5
4.4 Antifreeze and Cooling Water 2-6
5. Installing Cooling System 2-7
5.1 Suggestions for Installation 2-7
6. Troubleshooting 2-10
7. Service Data 2-11
7.1 Fan Belt 2-11
7.2 Radiator 2-11
7.3 Intercooler 2-12
7.4 Oil Cooler 2-13

Chapter 3 ELECTRICAL SYSTEM

1. Chassis Electrical Components and Wiring Outline 3-1
1.1 Electrical Components and Wiring Diagram of Each System 3-2
2. Console Box 3-12
2.1 Outline of Console Box 3-12
2.2 Removing Meter Panel 3-12
2.3 Installing Meter Panel 3-13
3. Main Electrical Components 3-14
3.1 Meter Panel 3-14
3.2 Select Switch 3-15
3.3 Brake Warning Icon 3-16
3.4 Key Switch (Anti-Restart Switch) 3-17
3.5 Light Switch and Turn Signal Switch 3-18
3.6 Direction (FNR) Switch 3-20
3.7 Horn 3-21

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >

3.8 Fuel Tank Unit 3-22
3.9 Stop Light Switch 3-22
3.10 Thermo Switch (T/C Oil) 3-23
3.11 Speed Sensor 3-24
3.12 Fuse Box 3-25
3.13 Relay Box 3-26
3.14 Glow Relay 3-28
3.15 Engine Stop Timer 3-28
3.16 Low Air Pressure Switch 3-29
3.17 List of Lights 3-30
4. Battery and Maintenance 3-31
4.1 Battery Specific Gravity Condition and Adjustment 3-31
4.2 Relationship Between Electrolyte Specific Gravity and State of Charge 3-32
4.3 Precautions for Battery Charging 3-32
5. Meter panel 3-33
5.1 Meter Panel Layout 3-33
5.2 Basic Display 3-35
5.3 Basic Operation 3-40
5.4 When a Warning Occurs 3-48
5.5 When Several Warnings Occur Simultaneously 3-50
5.6 Warning Symbols 3-51
5.7 Warning Icons 3-52
5.8 Optional Features 3-53
5.9 Hour Meter 3-56
5.10 Troubleshooting 3-57
6. Wire Color 3-58
6.1 List of Wire Color Codes 3-58
7. Troubleshooting 3-59
7.1 Engine Startup Problem 3-59
7.2 Gauge-Related Problems 3-59
7.3 Light-Related Problems 3-60
7.4 Warning Device Problems 3-61
7.5 Battery-Related Problems 3-62

Chapter 4 CONTROLLERS

1. Outline 4-1
1.1 System Configuration 4-1
1.2 Color Coding 4-3
1.3 Controller External View 4-4
2. Service Tool Functions 4-12
2.1 Menu Structure 4-12
2.2 Input Monitor and Output Monitor 4-13
2.3 Truck Status 4-17
2.4 Truck History 4-18
3. Diagnostic Code List 4-19
4. Troubleshooting 4-20
4.1 General Precautions 4-20
4.2 VCM Memory Check Warning (F01) 4-22

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >

4.3 VCM Battery Voltage Warning (F02) 4-23
4.4 VCM Communication Warning (F03) 4-25
4.5 Meter Panel Communication Warning (F07) 4-27
4.6 Lift Lever Neutral Warning (F10) 4-28
4.7 Tilt Lever Neutral Warning (F11) 4-30
4.8 Attachment 1 Lever Neutral Warning (F12) 4-32
4.9 Attachment 2 Lever Neutral Warning (F13) 4-34
4.10 Attachment 3 Lever Neutral Warning (F14) 4-36
4.11 Direction Lever Warning (F16) 4-38
4.12 Vehicle Speed Warning (F17) 4-39
4.13 Lift Lever Warning (F20) 4-40
4.14 Tilt Lever Warning (F22) 4-42
4.15 Attachment 1 Lever Warning (F24) 4-44
4.16 Attachment 2 Lever Warning (F26) 4-46
4.17 Attachment 3 Lever Warning (F28) 4-48
4.18 Joystick Duplicate Warning (F29) 4-50
4.19 Vehicle Speed Sensor Warning (F34) 4-52
4.20 Output Unit Warning (F41) 4-53
4.21 Output Unit Supply Voltage Warning (F44) 4-54
4.22 Output Unit Communication Warning (F45) 4-56
4.23 Input Unit Warning (F46) 4-58
4.24 Input Unit Communication Warning (F49) 4-59
4.25 Lift up Solenoid Warning (F50) 4-61
4.26 Lift Down Solenoid Warning (F52) 4-63
4.27 Lift Solenoid Leak (F54) 4-65
4.28 Tilt Forward Solenoid Warning (F55) 4-68
4.29 Tilt Backward Solenoid Warning (F57) 4-70
4.30 Tilt Solenoid Leak (F59) 4-72
4.31 Attachment 1A Solenoid Warning (F60) 4-75
4.32 Attachment 1B Solenoid Warning (F62) 4-77
4.33 Attachment 1 Solenoid Leak (F64) 4-79
4.34 Attachment 2A Solenoid Warning (F65) 4-82
4.35 Attachment 2B Solenoid Warning (F67) 4-84
4.36 Attachment 2 Solenoid Leak (F69) 4-86
4.37 Attachment 3A Solenoid Warning (F70) 4-89
4.38 Attachment 3B Solenoid Warning (F72) 4-91
4.39 Hour Meter Gap Warning (F73) 4-93
4.40 Attachment 3 Solenoid Leak (F74) 4-94
4.41 Unload Solenoid Warning (F75) 4-97
4.42 Unload Solenoid Leak (F79) 4-99
4.43 Transmission Forward Solenoid Warning (F85) 4-101
4.44 Transmission Reverse Solenoid Warning (F87) 4-103
4.45 Transmission Solenoid Leak (F89) 4-105
4.46 VCM Speed Change Solenoid 1 Warning (F93) 4-107
4.47 VCM Setting Warning (F96) 4-109

Chapter 5 POWER TRAIN

1. Specifications 5-1
2. Structure 5-2

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >

(16) Check continuity of attachment 3 section harness and tilt section harness.

Between 586 (Output unit: 30) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (17) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (18) Replace output unit.

(19) Check continuity of attachment 3 section harness and tilt section harness.

Between 587 (Output unit: 31) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (20) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (21) Replace output unit.

(22) Check continuity of attachment 3 section harness and attachment 1 section harness.

Between 582 (Output unit: 19) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (23) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (24) Replace output unit.

(25) Check continuity of attachment 3 section harness and attachment 1 section harness.

Between 583 (Output unit: 20) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (26) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (27) Replace output unit.

(28) Check continuity of attachment 3 section harness and attachment 2 section harness.

Between 578 (Output unit: 22) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (29) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (30) Replace output unit.

(31) Check continuity of attachment 3 section harness and attachment 2 section harness.

Between 579 (Output unit: 23) and 576 (Output unit: 14)

Continuity (Several 10Ω or less) → (32) Isolate harnesses or replace harness.

No continuity (Several MΩ) → (33) Replace output unit.

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >

Condition		Possible cause		Action
Abnormal noise	Torque converter	Flexible plate broken		Replace
		Bearings damaged		Replace
		Stator rubbing		Replace
		Bolts loose		Retighten or replace bolts
		Splines worn out		Replace
		Oil pump worn out		Disassemble/inspect, if defective, replace
	Transmission	Dragging noise due to seized clutch		Replace clutch plate
		Bearing worn out or seized		Replace
		Broken gears		Replace
		Bolts loose		Retighten or replace bolts
		Splines worn out		Replace
	Loud noise	Oil strainer clogged		Clean or replace
		Main regulator valve spool malfunction		Clean or replace
		Restriction in oil pipe		Replace
		High oil viscosity in cold weather		See "12. SERVICE DATA" and replace
		Instrument malfunction		Replace
		Incorrect oil		See "12. SERVICE DATA" and replace
	Low noise	Oil strainer clogged		Wash or replace
		Oil pump malfunction		Replace
		Excessive oil leak	Main regulator spring malfunction	Replace spring
			Main regulator valve spool malfunction	Repair or replace spool
		Air sucking		Tighten or replace packing
		Oil level too low		Add
Oil leaks	Leaking oil from oil seal			Check lips and sliding surfaces for wear, and replace seals if worn
	Leaking oil from case joint			Tighten or replace packing
	Leaking oil from pipes and joints			Repair or replace pipes, gaskets, O-rings, etc.
	Leaking oil from drain plug			Retighten and replace gasket
	Leaking from cracks			Replace
	Oil flowing-out from transmission case	Water mixed in oil		Change oil
		Air sucking from joint of inlet port		Tighten or replace packing
		Oil leaks from air hole of air breather		Repair
	Oil level too high			Drain oil to the specified level

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >

9. Service Data

Item				DP100NM1	DP120NM1	DP135NM1	DP150NM1
Fork and chain	Difference of height at blade tips		Standard value	5 mm (0.20 in.) or less			
	Chain elongation (mm/20 links)		Standard value	889 mm (35.00 in.)			1016 mm (40.00 in.)
			Limit value	915 mm (36.02 in.)			1046 mm (41.18 in.)
	Nut of chain anchor bolt		Tightening torque	393 ± 39.3 N·m (40.1 ± 4.01 kgf·m) [289.86 ± 28.986 lbf·ft]			441 ± 44.1 N·m (45.0 ± 4.50 kgf·m) [325.26 ± 32.526 lbf·ft]
Rollers	Main roller outside diameter	S	Standard value	203 mm (7.99 in.)			
		M	Standard value	205 mm (8.07 in.)			
		L	Standard value	207 mm (8.15 in.)			
	Side roller outside diameter		Standard value	$58\ ^{0}_{-0.1}$ mm ($2.28\ ^{0}_{-0.004}$ in.)			
Outer mast and inner mast	Smallest inner width of outer mast	1)	Standard value	$890\ ^{+0.5}_{-1.0}$ mm ($35.04\ ^{+0.02}_{-0.04}$ in.)			$884\ ^{+0.5}_{-1.0}$ mm ($34.80\ ^{+0.02}_{-0.04}$ in.)
		2)	Standard value	$890\ ^{+1.0}_{-0.5}$ mm ($35.04\ ^{+0.039}_{-0.020}$ in.)			$884\ ^{+1.0}_{-0.5}$ mm ($34.80\ ^{+0.039}_{-0.020}$ in.)
	Smallest inner width of inner mast	3)	Standard value	$704\ ^{+0.5}_{-1.0}$ mm ($27.72\ ^{+0.02}_{-0.04}$ in.)			$692\ ^{+0.5}_{-1.0}$ mm ($27.24\ ^{+0.02}_{-0.04}$ in.)
		4)	Standard value	$704\ ^{+1.0}_{-0.5}$ mm ($27.72\ ^{+0.039}_{-0.020}$ in.)			$692\ ^{+1.0}_{-0.5}$ mm ($27.24\ ^{+0.039}_{-0.020}$ in.)
	Clearance between main roller and rolling face (whole lifting stroke)	5)	Standard value	0.5 to 2.8 mm (0.020 to 0.110 in.)			
	Clearances between side roller and rolling surfaces K (at the maximum height)	6)	Standard value	0.5 to 1.5 mm (0.020 to 0.059 in.)			
	Clearance between mast strap and sliding face	7)	Standard value	0.5 to 1.5 mm (0.020 to 0.059 in.)			
	Thickness of mast strip		Standard value	9 mm (0.35 in.)			
			Limit value	7 mm (0.28 in.)			
Tilt cylinder	Locknut		Tightening torque	1334 to 1468 N·m (136.0 to 149.7 kgf·m) [983.91 to 1082.74 lbf·ft]			

MidWestTech | Caterpillar DP100NM1, DP120NM1, DP135NM1, DP150NM1 Forklift Se... Order the manual at mid-west-tech.com >