CATERPILLAR®

99759-62100

Service Manual

EP16K, EP18K, EP20KC
Chassis & Mast

EP16K	**ETB6A-00001-up**	**AC**
EP18K	**ETB6A-50001-up**	**MC**
EP20KC	**ETB7A-00001-up**	

Problem: Left Drive Motor, Field Over-current

Indication: “29” display. Vehicle operation disabled.

(1) Situation

Indication: “29” display. Vehicle operation disabled.

(2) Cause

Faulty left motor field circuit, faulty logic card.

(3) Inspection

Disconnect battery plug.
Check H bridge card for abnormality.

Acceptable — Unacceptable

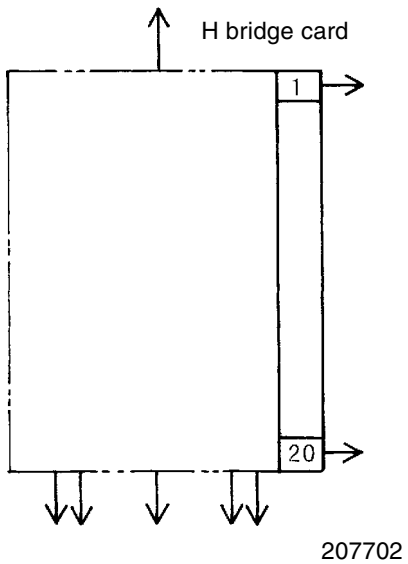
(4) Check left motor field wiring for shorting.

Shorted wire — No shorted wire

(5) Correct or replace left motor field wiring.

(6) Replace logic catd.

(7) Replace H bridge card.



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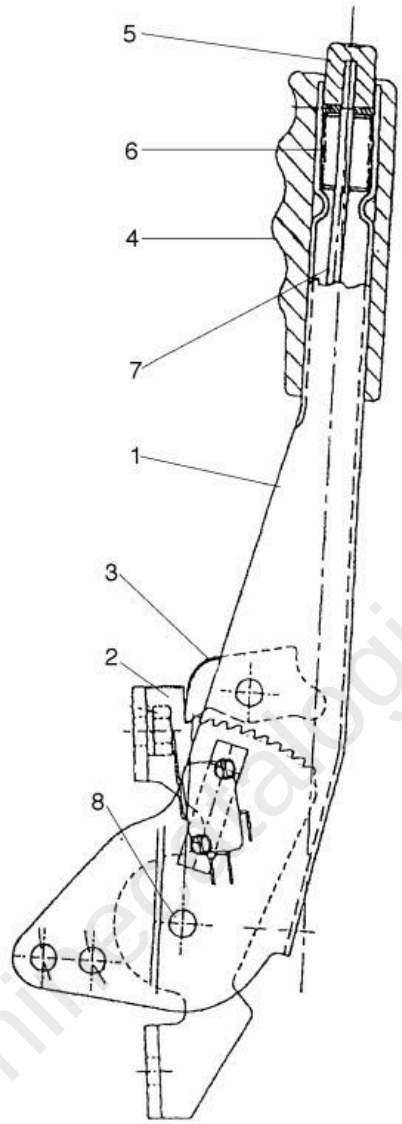
Parking Brake Lever



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1 Lever body
2 Gear
3 Pawl
4 Grip
5 Stopper
6 Spring
7 Hook
8 Pin

The parking brake lever is mounted on the left side of the dashboard.

When the grip is pulled, the parking brake cable activates the pad assembly of the caliper to clamp the brake disc and apply stopping force.

Notch 3 engages with gear 2 to retain the lever in position. To release the parking brake, pull the grip and press stopper 5. This disengages the gear from the notch, and the lever can be returned to the original position.

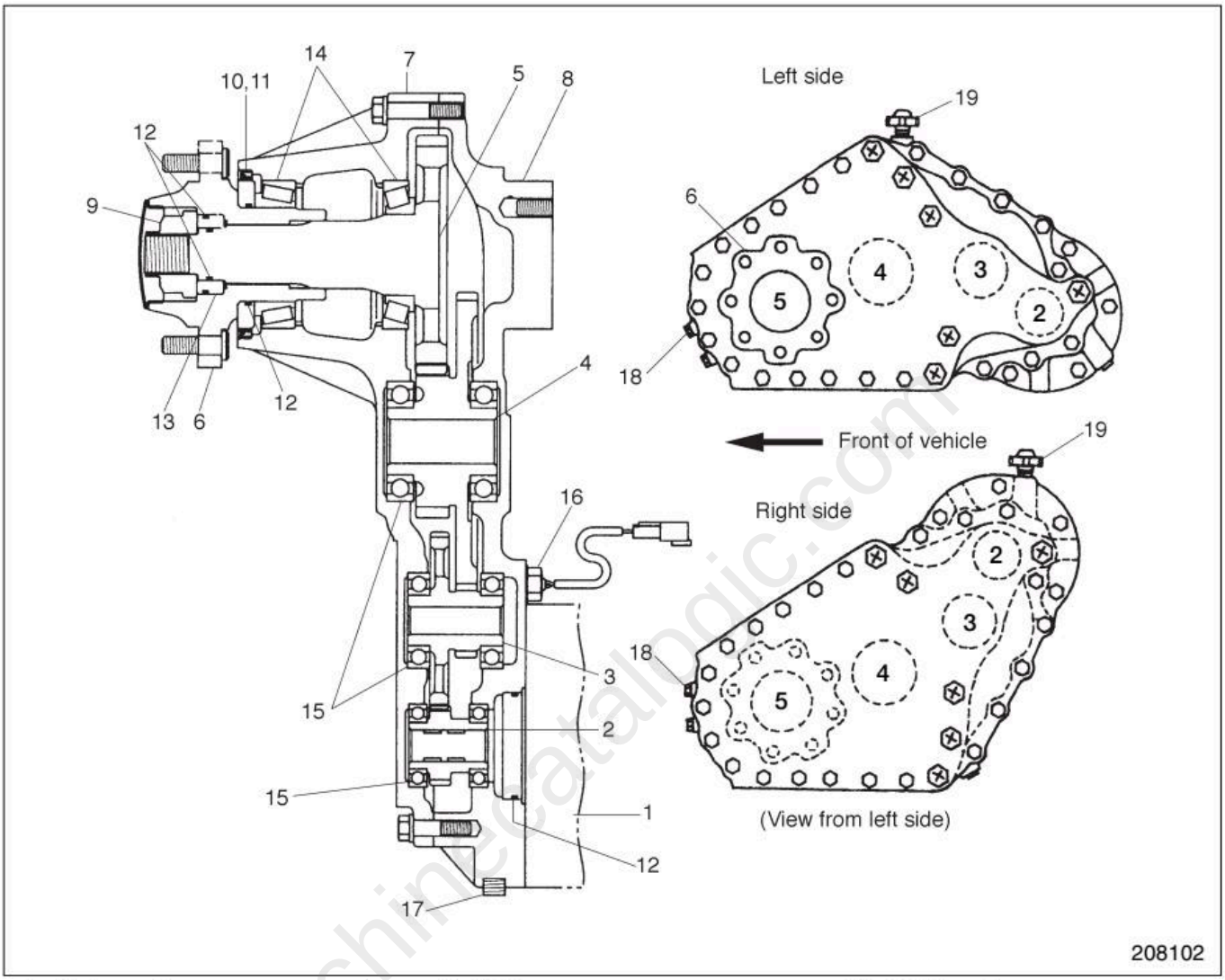
The maximum lever stroke is 50 degrees. There are a total of 10 gear teeth. Adjust the parking brake so that the brake activates and applies force when the third or fourth tooth of gear 2 engages with the pawl.

Unit: N (kgf) [lbf]

Grip operating effort	294 (30) [66]

Inspection/Maintenance Location and Item		Pre-operation Inspection	Periodic Inspection Interval				Remarks Service Standard
			Every Month or 200 Hours	Every 3 Months or 600 Hours	Every 6 Months or 1200 Hours	Every 12 Months or 2400 Hours	
Chains and chain wheels	Length of lift chains (20 links)	○	○	○	○	○	Allowed lift chain stretch: 1-ton class: 327 mm (12.87 in.) 2-ton class: 392 mm (15.43 in.)
	Chain deformation, damage, lubrication and rusting		○	○	○	○	
	Chain bushing coupling, bolt deformation and damage		○	○	○	○	
	Chain wheel deformation and damage					○	
	Chain wheel bearing rattle		○	○	○	○	
Attachments	Attachment abnormality and mounting conditions	○	○	○	○	○	
Hydraulic system							
Cylinders	Looseness, deformation and damage of rods, rod bolts and rod ends					○	
	Cylinder operating condition	○	○	○	○	○	
	Drift lowering and forward tilting distances				○	○	Drift lowering distance: 50 mm (1.97 in.)/15 min Drift forward tilting distance: 1-ton class: 22 mm (0.87 in.)/15 min 2-ton class: 20 mm (0.79 in.)/15 min
	Cylinder oil leaks and damage	○	○	○	○	○	
	Wear and damage of piston and cylinder shaft bearings					○	
Oil pump	Oil leaks, abnormal noise, wear in drive unit, and mounting looseness	○	○	○	○	○	
Hydraulic tank	Oil level and contamination	○	○	○	○	⊗	N level: 13.1 liter (3.5 U.S.gal) H level: 16.7 liter (4.4 U.S.gal)
	Filter clogging				⊗	⊗	
Operation levers	Linkage looseness		○	○	○	○	
	Lever functions		○	○	○	○	
Control valves	Oil leaks	○	○	○	○	○	
	Safety valves	○	○	○	○	○	
	Release pressure measurement					○	18142 $^{+490}_{0}$ kPa (185 $^{+5}_{0}$ kgf/cm^2) [2631 $^{+71}_{0}$ psi]

Structure and Functions (Part 2)



1	Drive motor	8	Main case	15	Ball bearing
2	Input gear	9	Nut	16	Pulse generator
3	Second gear	10	Retainer (Oil seal)	17	Plug
4	Third gear	11	Oil seal	18	Oil level plug
5	Output shaft	12	O-ring	19	Air breather
6	Wheel hub	13	Spacer	Bolts marked with × :	
7	Cover	14	Taper roller bearing	Bolts for mounting transfer units to frame	

The left and right transfer units are identical, and are mounted on the frame with bolts marked with × in the illustration.

The left and right transfer units are installed with drive motors. The motor shafts are jointed to the involute splines of input gears.

Driving force is transmitted via the input gear, second gear, third gear, then to the output shaft that rotates wheel hub.

The pulse generator detects rotating speed.

Helical gears are used for reduced operating noise.

The output shaft is provided with two taper roller bearings to withstand heavy cargo.

Transfer reducing gear ratio	17.478

Key Points for Reassembly

Spool

(1) Install O-ring on cap screw 7 (5 Hex), insert the spring guide section in the spring, then tighten the cap screw on spool 8.

Unit: N·m (kgf·m) [lbf·ft]

Tightening torque	12 to 14 (1.2 to 1.4) [8.76 to 10.2]

(2) Install O-ring on plug 11, and screw the plug into inlet housing by rotating two to three full turns.

(3) Slowly insert the above spool assembly from the opposite side. Make sure the spool assembly slides smoothly before it contacts plug 9. Install the spool assembly into inlet housing, and make sure it slides smoothly.

(4) Tighten plug 10 (27 Hex) and plug 11 (27 Hex).

Unit: N·m (kgf·m) [lbf·ft]

Tightening torque	71 ± 2 (7.1 ± 0.2) [51.8 ± 1.5]

Main Relief Valve

Refer to the “Main Relief Valve Service Procedures” on page 11-53.

Pilot Relief Valve

Install spring 3 and pilot poppet 2 on plug 4, and insert the plug into inlet housing and tighten.

Unit: N·m (kgf·m) [lbf·ft]

Tightening torque	23 ± 1 (2.3 ± 0.1) [16.8 ± 0.73]

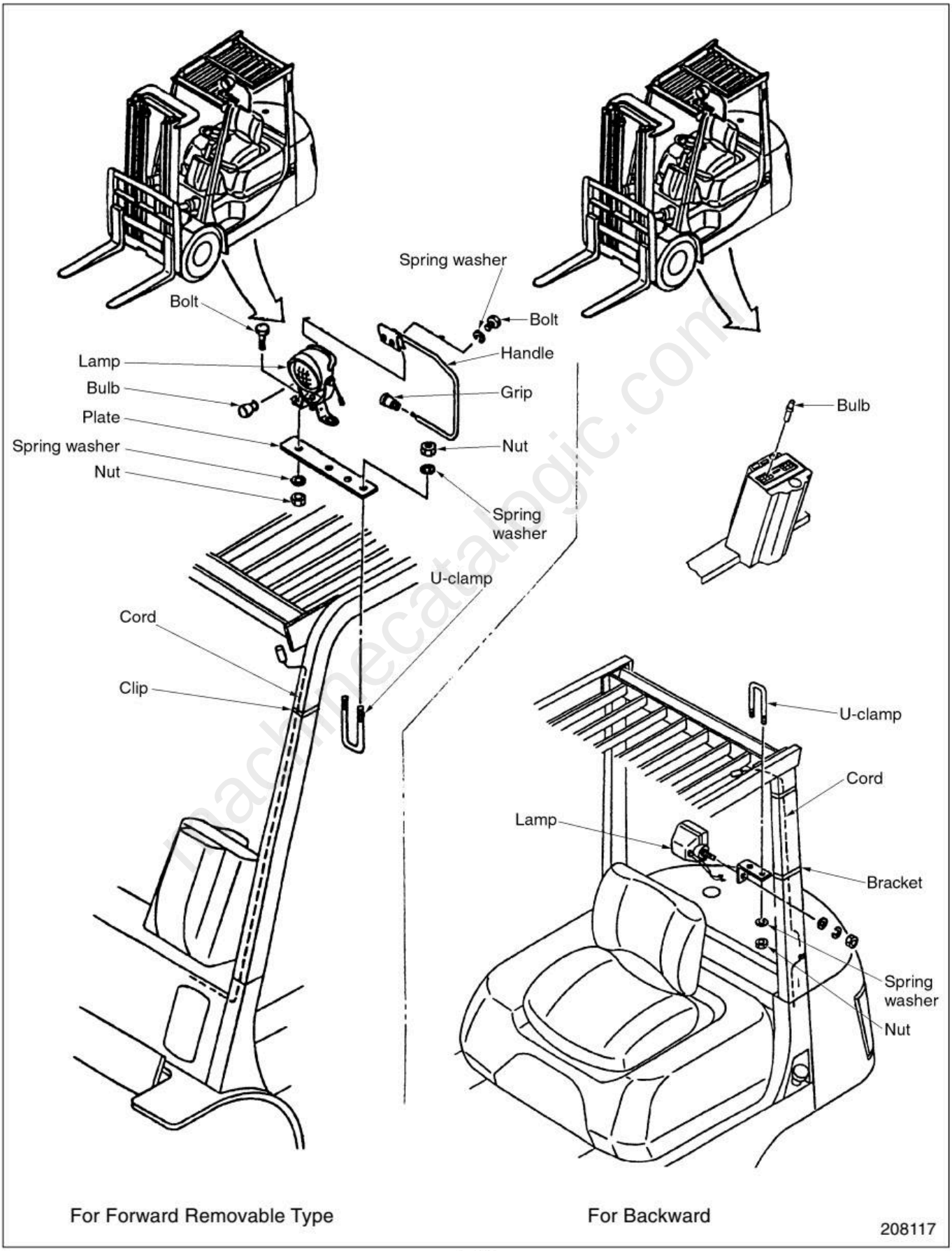
NOTE

If adjuster kit 1 (17 Hex) was loosened, after installation on the vehicle, adjust the set screw (6 Hex) using a pressure gauge. After adjustment, tighten the hexagon nut (17 Hex) to lock in position.

Logic Voltage Checks CH2

Logic Terminal		Function	*Normal Voltage	Activated Voltage	Test Procedures
(P3)	39	L&R ARMATURE VOLTAGE	Low	5 to 20 V	Low: Line contactor opens 5 to 20 V: Line contactor closes (Forward/reverse lever in neutral, accelerator pedal OFF)
	40	PUMP Tr. VOLTAGE	Low	B+	Low: Line contactor opens B+: Line contactor closes (no pump motor operation)
	41	R. Tr. VOLTAGE	Low	5 to 20 V	Low: Line contactor opens 5 to 20 V: Line contactor closes (Forward/reverse lever in neutral, accelerator pedal OFF)
	42	L. Tr. VOLTAGE	Low	5 to 20 V	Low: Line contactor opens 5 to 20 V: Line contactor closes (Forward/reverse lever in neutral, accelerator pedal OFF)
	43	CONT THERRMO SENSOR	0 to 5 V	0 to 5 V	Controller Temperature
	44	GND	0 V	0 V	signal GND
	45	R.ARMATURE CURRENT	0 to 0.3 V	0 to 4.2 V	R. ARM Current: Activated by drive motor ON
	46	R.ARMATURE CURRENT RTN	0 V	0 V	R. Armature Current Return
	47	L.ARMATURE CURRENT	0 to 0.3 V	0 to 4.2 V	L. ARM Current: Activated by drive motor ON
	48	L.ARMATURE CURRENT RTN	0 V	0 V	L. Armature Current Return
	49	PUMP CURRENT	0 to 0.3 V	0 to 4.2 V	Pump Current: Activated by pump motor ON
	50	PUMP CURRENT RTN	0 V	0 V	Pump Current Return
	51	15 V	15 V	15 V	15 V = key SW ON, 0 V = key SW OFF
	52	15 V	15 V	15 V	15 V = key SW ON, 0 V = key SW OFF
	53	15 V	15 V	15 V	15 V = key SW ON, 0 V = key SW OFF
	54	EMPTY			
	55	PUMP CONTACTOR	B1+	33 to 39 V	B1+: Contactor opens, 33 to 39 V: Contactor closes
	56	REGEN CONTACTOR	B1+	33 to 39 V	B1+: Contactor opens, 33 to 39 V: Contactor closes
	57	LINE CONTACTOR	B1+	33 to 39 V	B1+: Contactor opens, 33 to 39 V: Contactor closes
	58	SPARE			
	59	48 VE	B+	B1+	0 V = key SW OFF, B1+ = key SW ON
	60	48 VE	B+	B1+	0 V = key SW OFF, B1+ = key SW ON
	61	48 VE	B+	B1+	0 V = key SW OFF, B1+ = key SW ON
	62	48 VE	B+	B1+	0 V = key SW OFF, B1+ = key SW ON
	63	GND	0 V	0 V	signal GND
	64	GND	0 V	0 V	signal GND

Working Lamp Kit



Full Version Available

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Caterpillar EP16K forklift service manual, electric truck repair, hydraulics, drive unit, wiring and service data. Instant PDF download.