CAT® Lift Trucks

Service Manual

MicroCommand II Control

2EC15	A2EC1-60001-79999
2EC18	A2EC1-60001-79999
2EC20	A2EC2-60001-79999
2EC25	A2EC2-60001-79999
2EC25E	A2EC3-60001-79999
2EC30	A2EC3-60001-79999

SENB8604-02

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

Table of Contents

Cat Lift Truck Important Safety Information 1

Specifications 2

Component Measurements 2
Current Measurements 2
Transistor Measurements 3
Transistor Connections 3
Head Capacitor 3
Control Panel Thermal Switch 4
Contactors Tip Clearance (Gap) 4
Fuses 4
Drive and Pump Motor Shunt Field Resistances 4
Control Panel 5

Systems Operation 6

Glossary 6
Location of Control Panel Components 10
Symbol Library 11
General Information 14
Programmable Setup Options 15
Accessing Programmable Setup Options 20
Operational Circuit Elements 23
Run-Time Diagnostics 26
Chat Mode 30
Contactors 30
Accelerator Control 30
Circuits 31
Drive Circuit 32
Drive Circuit 33
Power Transistors 34

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

Testing and Adjusting 47
Accessing Stored Fault Codes 47
Troubleshooting 48
Troubleshooting Checklist 48
Control And Power System Operational Checks 51
Circuit Tests 54
Troubleshooting Charts 57
Systems Operation and Test Equipment 125
Conductor And Switch Continuity Tests 130
Contactor 131
Driver Board Tests 134
Traction Motor Current Sensor Test 137
Hydraulics 138
Actuation Circuit 138
Capacitor Charging Circuit 139
Hydraulic Pump Motor Circuit 140
Lift Circuit 148
Electrical Testing 160
Testing Transistors 160
Electrical System Adjustments 163

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

A

Accelerator
- Adjustment 163
- Continuity Test 128
- Control Diagnostic 30

B

Battery
- BDI Adjustment Charts 169
- Cell Voltage Test 49
- Hydrometer Test 49
- Load Test 49
- Maintenance 49

Brakes
- Parking Brake Switch Adjustment 164
- Plugging Circuit 39
- Regen Circuit 37
- Test and Adjust Electric Brakes 167

Bypass Circuit
- Circuit with Shunt Field Activated 45
- Circuit Without Shunt Field Activated . . 46

C

Chat Mode 30
Circuit Tests 54
Circuits
- Bypass 45
- DC/DC Converter 31
- Drive Control 32
- Drive Motor 41
- Drive Power 33
- Failure Protection Circuit 44
- Horn 31
- Hydraulic Circuits 138
- Plugging Circuit 39
- Power Transistors 34
- Regenerative Braking 37
- Thermal Protection Circuits 44

Contactors
- Continuity Test 131
- General Information 30
- Pump Contactor Operation Circuit 155

Continuity Tests
- Accelerator Control 130
- Contactors 131
- DC/DC Converter 133
- Diodes 133
- Head Capacitor 130
- Vehicle Monitoring System 133

Control Panel
- Component Location 10
- Electrical Testing 162
- Specifications 5
- Thermal Protection Circuit 44

Control System Checks 51

D

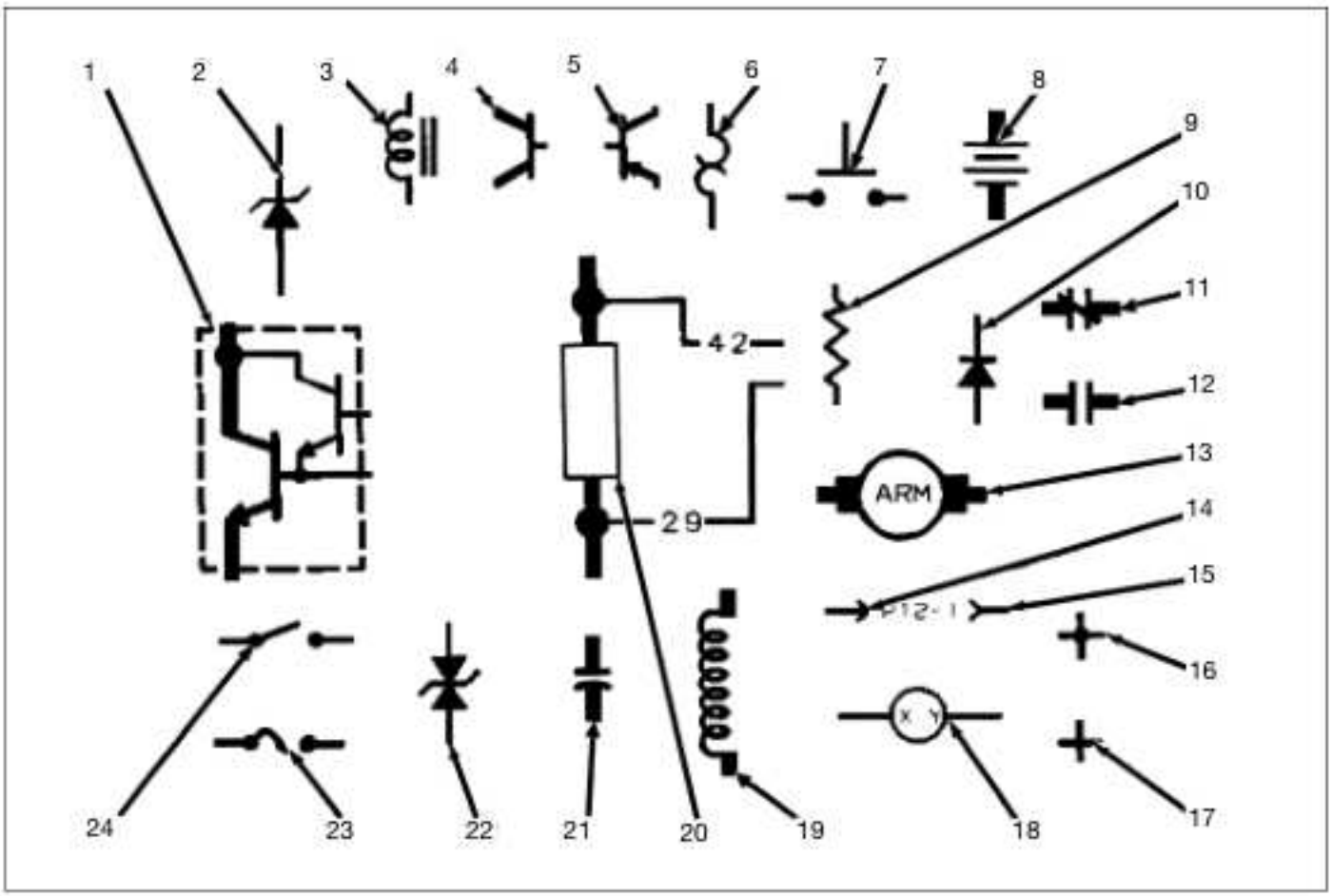
DC/DC Converter
- Circuit 31
- Continuity Test 133

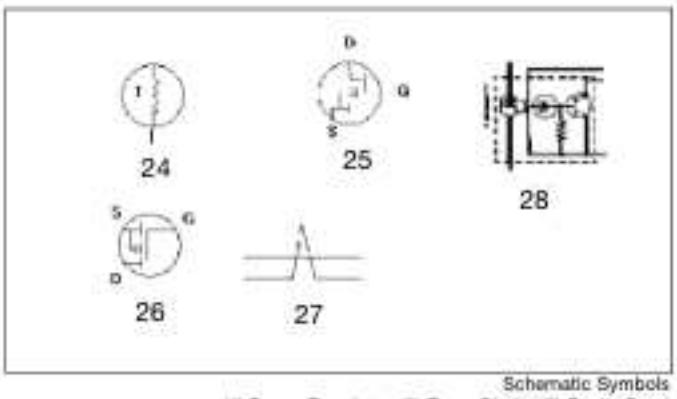
Diagnostics
- Built-In Diagnostic Operation 52
- Chat Mode 30
- Run-Time Diagnostic Functions 52
- Run-Time Diagnostics 26
- Self-Diagnostics 53
- Stored Fault Codes 47

Drive Motor
- Circuit 41
- Current Limit 43
- Drive Control Circuit 32

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

Symbol Library





Schematic Symbols
(1) Power Transistor (2) Zener Diode (3) Ferrite Bead
(4) NPN Transistor (5) PNP Transistor (6) Thermal Switch
(7) Switch (8) Battery (9) Resistor
(10) Diode (11) Normally closed contacts
(12) Normally open contacts (13) Armature
(14) Male contact of a connector (pin)
(15) Female contact of a connector (socket)
(16) Wire Connection (17) No wire connection
(18) Contactor Coil (19) Current Shunt
(20) Field Windings (21) Capacitor (22) Varistor of Wires
(23) Fuse (24) Switch (25) N-Channel MOSFET
(26) P-Channel MOSFET (27) Twisted Pair
(28) Hall Effect Current Sensor (29)Thermistor

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

DISPLAY = 44 - Pump output overcurrent fault
Cause: A code 44 occurs when the processor senses that one or more of the output drivers (Q106 - Q108) are going into a current limit situation.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 50 - Combination of 10 and 30
Cause: Combination of 10 and 30.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 51 - Combination of 11, 31, and 32
Cause: Combination of 11 and 31.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 60 - Serial communication fault
Cause: A code 60 occurs when the serial communication system fails to communicate a message in a given amount of time between the logics and display.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 61 - EEPROM error
Cause: A code 61 occurs when the processor cannot program a location correctly, or when reading an EEPROM value and its complement, they don't agree.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 62 - Frame Fault positive voltage (nonactive)
Cause: Connection between the lift truck frame and a positive voltage source.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 63 - Frame Fault Negative voltage (nonactive)
Cause: Connection between the lift truck frame and a negative voltage source.
Response: Truck shuts down and error code is displayed.

DISPLAY = 65 - Truck size not initialized
Cause: A code 65 occurs when the truck is powered up in RUN mode with option 30 (Truck size and type) equal to 0 0.0.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 66 - Watchdog timer failure
Components Involved: Logic Card
Location: Panel
Cause: A code 66 occurs when the logic senses that its watchdog timer is not functioning. Because this circuit monitors the processor proper operation it must always be functional.
Response: Truck shuts down and the error code is displayed.

DISPLAY = 67 - Battery volts too low
Cause: A code 68 occurs when the processor senses that the battery volts are too low for the battery voltage chosen by the jumper.
24 > 36/48V BATTERY
60 > 72/80V BATTERY
Response: Truck shuts down and the error code is displayed.

DISPLAY = 69 - Battery volts too high
Cause: A code 69 occurs when the processor senses that the battery volts are too high for the battery voltage chosen by the jumper.
36/48V BATTERY > 60
Response: Truck shuts down and the error code is displayed.

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >

DC /DC Converter

Refer to Problem 55 in the Troubleshooting section.

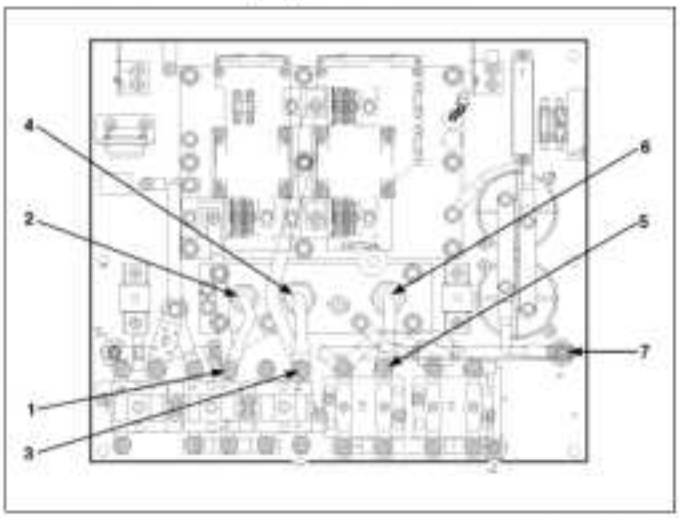
Diodes

⚠ WARNING

Battery voltage and high amperage are present. Injury to personnel is possible. Disconnect the battery and discharge the head capacitor (HEAD CAP) before any contact is made with the control panel.

NOTE: *The following test procedure can be applied to diode D4P, D4D and D5D. Diode D5D will be used in the following examples.*

1. Disconnect the battery and discharge the head capacitor.
2. Disconnect the D5D cathode lead wire (5).
3. Set the multimeter to the diode test position.
4. Connect the negative multimeter lead on D5D cathode lead wire (5). Connect the positive multimeter lead to battery negative (7). The multimeter should indicate .3 to .9 volts.
5. Reverse the multimeter leads. The multimeter should indicate OL. If any of the measurements are not correct, replace the diode.



97CS4-00300
1)D4P Cathode lead wire 2) D4P 3)D4D cathode lead wire 4)D4D 5)D5D Cathode lead wire 6)D5D 7) Battery Negative

Diode Replacement

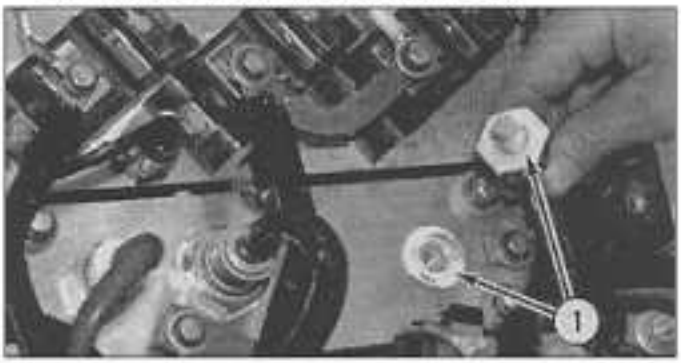
⚠ WARNING

Battery voltage and high amperage are present. Injury to personnel is possible. Disconnect the battery and discharge the head capacitor (HEAD CAP) before any contact is made with the control panel.

1. Disconnect the battery and discharge the head capacitor.
2. Remove the logics.
3. Disconnect the cathode and remove the diode.
4. Wipe contact surface of the diode (1) clean. Put a small amount of 5P8937 or 5P9810 Thermal Joint Compound on contact surfaces (1), but not on the threads.
5. Install the diode and tighten to the specification listed in the following chart:

Diode	Torque
D4D, D5D	36 N·m (320 lb in)
D4P	13 N·m (16 lb in)

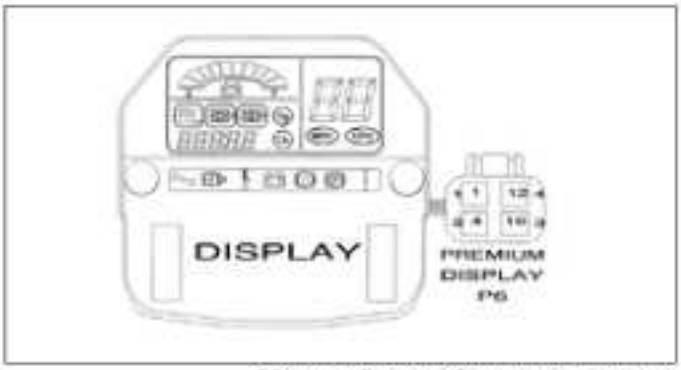
6. Connect all wires that were removed.



C25486P1
Diode Installation (Typical example)
(1) Contact surfaces

Vehicle Monitoring System

The display panel performs a lamp test during power up. All segments and LEDs should light for three seconds.



P6 Harness Connector Contact Layout (end view)

MidWestTech | Caterpillar MicroCommand II Forklift Controller Service Manual | Publication... Order the manual at mid-west-tech.com >