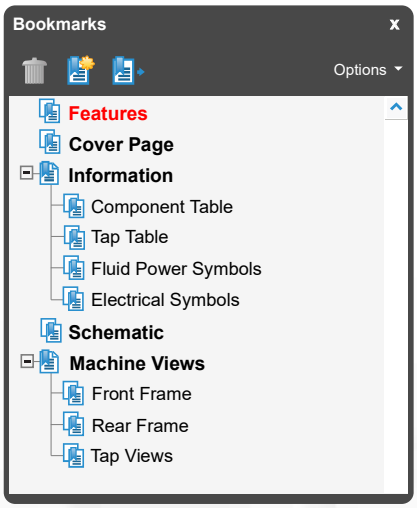
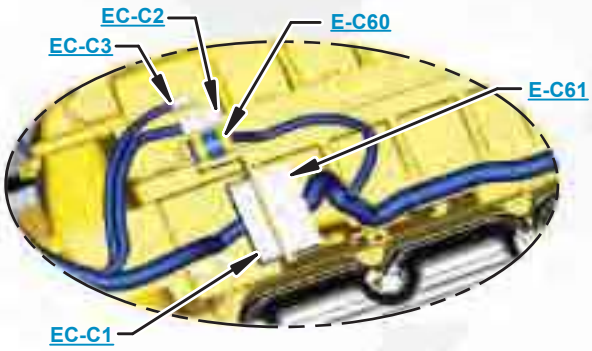
# INTERACTIVE SCHEMATIC




***This document is best viewed at a screen resolution of 1024 X 768.***

To set your screen resolution do the following:
**RIGHT CLICK** on the **DESKTOP**.
Select **PROPERTIES**.
**CLICK** the **SETTINGS TAB**.
**MOVE THE SLIDER** under **SCREEN RESOLUTION** until it shows **1024 X 768**.
**CLICK OK** to apply the resolution.

**The Bookmarks panel will allow you to quickly navigate to points of interest.**




**Click on any text that is BLUE and underlined. These are hyperlinks that can be used to navigate the schematic and machine views.**

**VIEW ALL CALLOUTS**

**When only one callout is showing on a machine view this button will make all of the callouts visible. This button is located in the top right corner of every machine view page.**

| HOTKEYS (Keyboard Shortcuts) | | |
|---|---|---|
| | **FUNCTION** | **KEYS** |
| | Zoom In | "CTRL" / "+" |
| | Zoom Out | "CTRL" / "-" |
| | Fit to Page | "CTRL" / "0" (zero) |
| | Hand Tool | "SPACEBAR" (hold down) |
| | Find | "CTRL" / "F" |

CATERPILLAR®

RENR3587-04
May 2012

# Schematic

## 416D, 420D, 424D, 428D, 430D, 432D, 438D, and 442D Backhoe Loaders Electrical System

| 416D: | 420D: | 424D: | 428D: |
|---|---|---|---|
| BKG1-3499 | BKC1-919 | BGP1-UP | BNB1-UP |
| BGJ1-1049 | BMC1-1059 | BKR1-UP | BLL1-UP |
| BFP1-12899 | BLN1-10299 | | BNS1-UP |
| CXP1-939 | FDP1-18399 | | BMT1-UP |

| 430D: | 432D: | 438D: | 442D: |
|---|---|---|---|
| BNK1-5899 | BLD1-UP | BPE1-UP | BRG1-UP |
| BML1-4800 | | BPN1-UP | BRY1-UP |

**Volume 1 of 2: ENGINE AND CHASSIS**
**Volume 2 of 2: CAB**



Printed in U.S.A.

# COMPONENT LOCATION
# Volume 1 of 2 - ENGINE AND CHASSIS
# Page 1 of 2

| Component | Schematic Location | Machine Location |
|---|---|---|
| Alarm - Backup | I-14 | 4 |
| Alternator | E-1 | 5 |
| Arc Suppressor - All Wheel Drive | F-4 | 24 |
| Arc Suppressor - HVAC | H-1 | 25 |
| Battery #1 | D-4 | 6 |
| Battery #2 | D-4 | 6 |
| Block - Lighting Diode | D-12 | A |
| Coil - Thermal Starting Aid | F-1 | 86 |
| Control - Shuttle Handle | H-6 | 24 |
| Flasher | G-9 | A |
| Fuse - Air Conditioning | D-7 | C |
| Fuse - Air Suspension Seat | A-7 | B |
| Fuse - All Wheel Drive | B-7 | B |
| Fuse - All Wheel Steer | C-7 | C |
| Fuse - Atch Front Flood | B-7 | B |
| Fuse - Atch Rear Flood | B-7 | B |
| Fuse - Aux Hydraulics | C-7 | C |
| Fuse - Beacon | D-7 | C |
| Fuse - Bucket Position | B-7 | B |
| Fuse - Engine | B-7 | B |
| Fuse - Front Wiper | D-7 | C |
| Fuse - Horn | A-7 | B |
| Fuse - Key Start | A-7 | B |
| Fuse - Left Tail Lamp | D-7 | C |
| Fuse - Monitor | C-7 | B |
| Fuse - Power Port | B-7 | B |
| Fuse - Radio | A-7 | B |
| Fuse - Rear Hydraulics | B-7 | B |
| Fuse - Rear Std Floods | D-7 | C |
| Fuse - Rear Wiper | D-7 | C |
| Fuse - Ride Control | C-7 | C |
| Fuse - Right Tail Lamp | D-7 | C |
| Fuse - Signal Lamp | A-7 | B |
| Fuse - Spare 1 | A-7 | B |
| Fuse - Spare 2 | D-7 | C |
| Fuse - Start | B-7 | B |
| Fuse - Start Aid | C-7 | C |
| Fuse - Transmission | B-7 | B |
| Gauge - Converter Temperature | F-13 | A |
| Gauge - Coolant Temperature | F-13 | A |

| Component | Schematic Location | Machine Location |
|---|---|---|
| Gauge - Fuel Level | F-12 | A |
| Gauge - Tachometer | F-12 | A |
| Gauge - Tachometer with A/C Shutoff | I-8 | A |
| Gauge - Voltmeter | F-14 | A |
| Ground - Cab | D-4 | 87 |
| Ground - Engine #1 | D-1 | 12 |
| Ground - Engine #2 | D-3 | 89 |
| Ground - Frame | D-4 | 90 |
| Ground - Right Cab 1 | F-7 | A |
| Ground - Right Cab 2 | E-7 | A |
| Ground - Top of Cab | C-12 | 1 |
| Group - Basic Lamp | H-15 | A |
| Group - Fault Lamp | F-15 | A |
| Group - Function Lamp | E-4 | D |
| Horn - Backup Alarm | H-13 | 4 |
| Horn - Forward | G-1 | 26 |
| Horn - Rear | I-14 | 4 |
| Lamp - Left Headlight | H-2 | 95 |
| Lamp - Right Headlight | G-3 | 96 |
| Meter - Service | D-3 | 24 |
| Motor - Air Suspension Seat | I-11 | 29 |
| Motor - Front Washer Pump | I-3 | 10 |
| Motor - Front Wiper | C-10 | 2 |
| Motor - HVAC Blower | H-8 | 30 |
| Motor - Rear Washer Pump | I-3 | 10 |
| Motor - Rear Wiper | C-15 | 8 |
| Motor - Starter | D-2 | 7 |
| Power Port | G-9 | C |
| Relay - A/C Shutoff | I-8 | A |
| Relay - All Wheel Drive Braking | E-6 | C |
| Relay - Attachment | D-6 | C |
| Relay - Aux Lighting | B-7 | B |
| Relay - Aux Flood | D-10 | B |
| Relay - Cab | C-6 | C |
| Relay - High Speed | H-9 | A |
| Relay - HVAC | D-6 | C |
| Relay - Main | B-7 | B |
| Relay - Pressure Switch Timer | G-13 | A |
| Relay - Start | B-7 | B |
| Relay - Std Flood | D-10 | A |

Machine locations are repeated for components located close together.

A = Located inside/on right console.

B = Located in machine electrical center 1.

C = Located in machine electrical center 2.

D = Located inside/on front console.

# COMPONENT LOCATION
# Volume 1 of 2 - ENGINE AND CHASSIS
# Page 2 of 2

| Component | Schematic Location | Machine Location |
|---|---|---|
| Relay - Std Lighting | A-7 | B |
| Resistor - Motor Speed | H-9 | 15 |
| Sender - Converter Temperature | F-1 | 12 |
| Sender - Coolant Temperature | H-1 | 13 |
| Sender - Fuel Level | G-1 | 11 |
| Sensor - Bucket Position | I-15 | 16 |
| Solenoid - Bucket Position | F-2 | 17 |
| Solenoid - Cold Start Advance | F-1 | 31 |
| Solenoid - Forward Transmission | I-1 | 18 |
| Solenoid - Front Drive | G-1 | 19 |
| Solenoid - Fuel Shutoff | E-1 | 20 |
| Solenoid - Hydraulic Shutoff | H-12 | 91 |
| Solenoid - Pilot Shutoff | H-12 | 92 |
| Solenoid - Pilot Hydraulics Shutoff | H-13 | 91 |
| Solenoid - Reverse Transmission | I-1 | 18 |
| Solenoid - Side Shift Lock | H-12 | 93 |
| Switch - Air Filter Pressure | I-3 | 10 |
| Switch - All Wheel Drive | F-3 | D |
| Switch - Atch Front Flood | D-13 | A |
| Switch - Atch Rear Flood | D-13 | A |
| Switch - Backhoe Handle Pushbutton | H-13 | 85 |
| Switch - Backhoe Handle Pushbutton | I-13 | 85 |
| Switch - Backhoe Hydraulic Shutoff | D-15 | A |
| Switch - Beacon | E-13 | A |
| Switch - Blower Speed | H-10 | A |
| Switch - Brake A | I-6 | 22 |
| Switch - Brake B | I-6 | 22 |

| Component | Schematic Location | Machine Location |
|---|---|---|
| Switch - Brake Fluid Level | I-3 | 10 |
| Switch - Cold Start Temperature | F-1 | 5 |
| Switch - Coolant Temperature | H-1 | 3 |
| Switch - Engine Oil Pressure | H-1 | 20 |
| Switch - Front Horn | D-3 | D |
| Switch - Front Roading Lamps | F-3 | 3 |
| Switch - Hazard | E-3 | D |
| Switch - Heater / Air Conditioning | G-10 | A |
| Switch - Heater Vent | H-7 | A |
| Switch - Hydraulic Filter Pressure | G-1 | 32 |
| Switch - Key Start | F-14 | A |
| Switch - Loader Neutralizer | C-8 | 85 |
| Switch - Neutral Lock | G-3 | D |
| Switch - Park Brake | C-8 | 42 |
| Switch - Rear Horn | D-14 | A |
| Switch - Rear Washer / Wiper | E-14 | A |
| Switch - Refrigerant Pressure | I-1 | 25 |
| Switch - Return To Dig | I-15 | 26 |
| Switch - Side Shift Lock | E-15 | A |
| Switch - Stalk | H-6 | 24 |
| Switch - Start Aid | E-13 | A |
| Switch - Std Front Flood | G-11 | A |
| Switch - Std Rear Flood | G-11 | A |
| Switch - Thermostat | I-7 | 97 |
| Switch - Transmission Neutralizer | E-5 | 56 |
| Switch - Water Separator | G-1 | 36 |
| | | |

Machine locations are repeated for components located close together.

A = Located inside/on right console.

B = Located in machine electrical center 1.

C = Located in machine electrical center 2.

D = Located inside/on front console.

# COMPONENT LOCATION
# Volume 2 of 2 - CAB

| Component | Schematic Location | Machine Location |
|---|---|---|
| Antenna - Radio | I-3 | 1 |
| Arc Suppressor - All Wheel Steer | A-11 | 80 |
| Arc Suppressor - Dead Engine Lower | B-6 | A |
| Arc Suppressor - Ride Control | G-4 | A |
| Coil - Machine Security Exciter | F-13 | A |
| Control - Autoshift | D-3 | 6 |
| Control - Aux Hydraulics | H-14 | A |
| Control - Machine Security | E-14 | A |
| Control - Pilot Hydraulics Loader Handle | G-12 | 38 |
| Control - Shift Handle | F-6 | 24 |
| Diode - Autoshift 1 | D-4 | 6 |
| Diode - Autoshift 2 | D-4 | 6 |
| Dome Lamp | I-6 | 41 |
| Horn - Backup Alarm | E-9 | 4 |
| Lamp - Indicator | C-11 | A |
| Lamp - License | G-8 | 81 |
| LED - Diagnostic | D-3 | 6 |
| LED - Machine Security | D-13 | A |
| Radio | I-3 | 2 |
| Relay - Dead Eng Lower Command | A-7 | A |
| Relay - Dead Eng Lower Enable | B-7 | A |
| Relay - Left Broom Angle | G-9 | A |
| Relay - Left Steer | A-15 | A |
| Relay - Machine Security Engine | E-13 | A |
| Relay - Quick Coupler (AWS) | B-15 | A |
| Relay - Quick Coupler Interlock | G-9 | A |
| Relay - Ride Control | G-4 | A |
| Relay - Right Broom Angle | G-9 | A |
| Relay - Right Steer | A-14 | A |
| Relay - Park Brake Alarm | E-6 | A |
| Sensor - Rear Steer Position | A-10 | 82 |
| Sensor - Speed | C-7 | 18 |
| Solenoid - Aux Hydraulics 1 | G-11 | 42 |
| Solenoid - Aux Hydraulics 2 | G-11 | 42 |

| Component | Schematic Location | Machine Location |
|---|---|---|
| Solenoid - Circle Steer (AWS) | B-10 | 80 |
| Solenoid - Forward High Transmission (Gp A) | C-6 | 18 |
| Solenoid - Forward Low Transmission (Gp A) | C-6 | 18 |
| Solenoid - Left Hand Steer (AWS) | A-10 | 80 |
| Solenoid - Left Loader Lock Valve | B-2 | 36 |
| Solenoid - Loader Detent Gp | I-13 | 83 |
| Solenoid - Lock Valve (AWS) | B-10 | 80 |
| Solenoid - Quick Coupler | H-9 | 48 |
| Solenoid - Ride Control | G-3 | 49 |
| Solenoid - Right Hand Steer (AWS) | A-10 | 80 |
| Solenoid - Right Loader Lock Valve | B-2 | 45 |
| Solenoid - Shutoff (AWS) | A-10 | 80 |
| Solenoid - Speed Clutch 1 | C-7 | 18 |
| Solenoid - Speed Clutch 2 (Gp B) | C-7 | 18 |
| Solenoid - Speed Clutch 3 (Gp B) | C-7 | 18 |
| Speaker - Left | I-4 | 46 |
| Speaker - Right | I-4 | 47 |
| Switch - A Shift Ride Cont | H-4 | D |
| Switch - All Wheel Steer Mode Select | B-11 | D |
| Switch - Auto / Manual | E-3 | D |
| Switch - AWS Pressure | C-14 | 84 |
| Switch - Continuous Flow | I-7 | D |
| Switch - COSA Ride Cont | H-4 | D |
| Switch - Dead Engine Lower | A-4 | D |
| Switch - Dual Function Ride Control | A-3 | D |
| Switch - Float Detent Limit | B-2 | 32 |
| Switch - Loader Rod End Pressure | G-3 | 52 |
| Switch - OROPS Turn Signal | G-8 | 53 |
| Switch - Quick Coupler Pins | I-9 | D |
| Switch - Rear Fog | F-11 | A |
| Switch - Rear Steer | B-15 | 85 |
| Switch - Std Ride Control | H-5 | D |
| Switch - Washer Atch | I-7 | D |

Machine locations are repeated for components located close together.

A = Located inside/on right console.

B = Located in machine electrical center 1.

C = Located in machine electrical center 2.

D = Located inside/on front console.

# CONNECTOR LOCATION
# Volume 1 of 2 - ENGINE AND CHASSIS

| Connector Number | Schematic Location | Machine Location |
|---|---|---|
| CONN 1 | A-15, C-14, B-13 | 34 |
| CONN 2 | F-15 | 57 |
| CONN 3 | C-13, I-12 | 59NA, 60COS |
| CONN 4 | C-13 | 57 |
| CONN 5 | H-12, I-12 | 62 |
| CONN 6 | H-12, I-12 | 62 |
| CONN 7 | G-12 | 63 |
| CONN 8 | D-11, B-14 | 64 |
| CONN 9 | D-11 | 63 |
| CONN 10 | G-11 | A |
| CONN 11 | H-11 | A |
| CONN 12 | H-11 | A |
| CONN 13 | I-10 | 63 |
| CONN 14 | I-10 | 63 |
| CONN 15 | F-10 | A |
| CONN 16 | F-10 | A |
| CONN 17 | F-10 | A |
| CONN 18 | I-8 | A |
| CONN 19 | D-8 | A |
| CONN 20 | I-4 | 18 |
| CONN 21 | H-4 | 18 |
| CONN 22 | H-4 | D |
| CONN 23 | G-4 | D |
| CONN 24 | F-4 | D |
| CONN 25 | I-3 | 10 |
| CONN 26 | H-2 | 25 |
| CONN 27 | H-2 | 25 |
| CONN 28 | E-1 | 25 |
| CONN 29 | I-15, F-1 | 45 |
| CONN 30 | F-1 | 12 |
| CONN 33 | E-10 | A |
| CONN 37 | F-2 | 18 |
| CONN 50 | C-8 | 42 |
| CONN 54 | H-6 | D |
| CONN 60 | C-10 | 2 |
| CONN 62 | C-15 | 8 |
| CONN 64 | H-6 | 24 |

The connectors shown in this chart are for harness to harness connectors. Connectors that join a harness to a component are generally located at or near the component. See the Component Location Chart.

# CONNECTOR LOCATION
# Volume 2 of 2 - CAB

| Connector Number | Schematic Location | Machine Location |
|---|---|---|
| CONN 4 | I-6 | 57 |
| CONN 9 | I-6 | 63 |
| CONN 10 | E-10 | A |
| CONN 11 | I-12, C-14 | A |
| CONN 12 | C-9, A-7, G-6 | A |
| CONN 15 | I-13 | A |
| CONN 17 | E-8 | A |
| CONN 19 | E-13, F-7, B-7, B-6 | A |
| CONN 31 | B-15, G-10 | A |
| CONN 32 | D-14, D-11 | A |
| CONN 33 | F-13 | A |
| CONN 34 | C-12 | D |
| CONN 35  Cat Data Link | I-12, D-11 | A |
| CONN 36 | H-11 | 18 |
| CONN 37 | H-11 | 18 |
| CONN 38 | E-11 | 17 |
| CONN 39 | E-11, F-7 | 17 |
| CONN 40 | A-12 | 17 |
| CONN 41  Cat Data Link | E-10 | A |
| CONN 42 | F-10 | A |
| CONN 43 | F-10 | A |
| CONN 44 | G-10 | A |
| CONN 45 | H-10 | 10 |
| CONN 46 | I-10 | D |
| CONN 47 | H-9, H-6 | D |
| CONN 48 | D-8, F-8 | A |
| CONN 49 | H-8 | 48 |
| CONN 50 | G-10 | 42 |
| CONN 51 | I-8 | D |
| CONN 52 | H-7 | 48 |
| CONN 53 | H-7 | 48 |
| CONN 54 | G-7 | D |
| CONN 55 | E-7, H-4 | D |
| CONN 56 | A-5 | D |
| CONN 57 | B-5 | 42 |
| CONN 58 | C-5 | 56 |
| CONN 59 | D-5 | 42 |
| CONN 60 | I-4 | 2 |
| CONN 61 | G-4 | 42 |
| CONN 62 | I-6 | 8 |
| CONN 63 | G-6 | D |
| CONN 64 | F-4 | 24 |
| CONN 65 | D-4 | 42 |
| CONN 66 | E-3 | D |
| CONN 67 Harness Code | B-3 | 6 |

The connectors shown in this chart are for harness to harness connectors. Connectors that join a harness to a component are generally located at or near the component.  See the Component Location Chart.

# CID / MID / FMI
# Volume 1 of 2 - ENGINE AND CHASSIS

| Component Identifiers (CID)[1] and Module Identifier | |
|---|---|
| **CID** | **Component** |
| **Autoshift Transmission Control (MID[2] No. 81)** | |
| 0168 | Battery Voltage Above Normal |
| 0168 | Battery Voltage Below Normal |
| 0268 | Erratic programmed parameter fault |
| 0346 | Ride Control Relay Open Circuit |
| 0346 | Ride Control Relay Short to Ground |
| 0346 | Ride Control Relay Short to Battery |
| 0367 | Invalid Ride Control Switch Input |
| 0368 | Transmission auto/man open circuit |
| 0368 | Transmission auto/man grounded |
| 0520 | Trans Configuration Incorrect |
| 0621 | Invalid Downshift Switch |
| 0641 | Trans Solenoid 1 Open Circuit |
| 0641 | Trans Solenoid 1 Short to Ground |
| 0641 | Trans Solenoid 1 Short to Battery |
| 0642 | Trans Solenoid 2 Open Circuit |
| 0642 | Trans Solenoid 2 Short to Ground |
| 0642 | Trans Solenoid 2 Short to Battery |
| 0643 | Trans Solenoid 3 Open Circuit |
| 0643 | Trans Solenoid 3 Short to Ground |
| 0643 | Trans Solenoid 3 Short to Battery |
| 0644 | Trans Solenoid 4 Open Circuit |
| 0644 | Trans Solenoid 4 Short to Ground |
| 0644 | Trans Solenoid 4 Short to Battery |
| 0645 | Trans Solenoid 5 Open Circuit |
| 0645 | Trans Solenoid 5 Short to Ground |
| 0645 | Trans Solenoid 5 Short to Battery |
| 0646 | Trans Solenoid 6 Open Circuit |
| 0646 | Trans Solenoid 6 Short to Ground |
| 0646 | Trans Solenoid 6 Short to Battery |
| 0650 | Harness Code Unknown |
| 0668 | Shift Lever Not Responding |
| 0668 | Invalid Shift Lever Input |
| 0683 | In-Gear Relay Open Circuit |
| 0683 | In-Gear Relay Short to Ground |
| 0683 | In-Gear Relay Short to Battery |

[1] The CID is a diagnostic code that indicates which component is faulty.

[2] The MID is a diagnostic code that indicates which electronic control module diagnosed the fault.

| Component Identifiers (CID)[1] and Module Identifier | |
|---|---|
| **CID** | **Component** |
| **Shift Handle Control (MID[2] No. 117)** | |
| 0168 | Battery Voltage Above Normal |
| 0168 | Battery Voltage Below Normal |
| 0668 | Shift Lever Bad Device or Component |
| **Machine Security Control (MID[2] No. 124)** | |
| 0168 | Battery Voltage |
| 0248 | Cat Data Link Error |
| 0254 | ECM |
| 0817 | Backup Battery |
| 1391 | MSS Output Driver #1 |
| 1392 | MSS Output Driver #2 |
| **Auxiliary Hydraulic Control (MID[2] No. 106)** | |
| 1180 | Auxiliary Hydraulic Solenoid #1 |
| 1181 | Auxiliary Hydraulic Solenoid #2 |
| 1184 | Auxiliary Hydraulic Solenoid Supply |
| 1187 | Continuous Flow Switch |
| 1189 | Auxiliary Proportional Lever Switch |
| 1529 | Quick Coupler Switch |
| 1530 | Quick Coupler Solenoid |

[1] The CID is a diagnostic code that indicates which component is faulty.

[2] The MID is a diagnostic code that indicates which electronic control module diagnosed the fault.

| Failure Mode Identifiers (FMI)[1] | |
|---|---|
| **FMI No.** | **Failure Description** |
| 0 | Data valid but above normal operational range. |
| 1 | Data valid but below normal operational range. |
| 2 | Data erratic, intermittent, or incorrect. |
| 3 | Voltage above normal or shorted high. |
| 4 | Voltage below normal or shorted low. |
| 5 | Current below normal or open circuit. |
| 6 | Current above normal or grounded circuit. |
| 7 | Mechanical system not responding properly. |
| 8 | Abnormal frequency, pulse width, or period. |
| 9 | Abnormal update. |
| 10 | Abnormal rate of change. |
| 11 | Failure mode not identifiable. |
| 12 | Bad device or component. |
| 13 | Out of calibration. |
| 14 | Parameter failures. |
| 15 | Parameter failures. |
| 16 | Parameter not available. |
| 17 | Module not responding. |
| 18 | Sensor supply fault. |
| 19 | Condition not met. |
| 20 | Parameter failures. |

[1] The FMI is a diagnostic code that indicates what type of failure has occurred.

# CID / MID / FMI
# Volume 2 of 2 - CAB

| CID | Component |
|---|---|
| **Autoshift Transmission Control (MID[2] No. 81)** | |
| 0168 | Battery Voltage Above Normal |
| 0168 | Battery Voltage Below Normal |
| 0268 | Erratic programmed parameter fault |
| 0346 | Ride Control Relay Open Circuit |
| 0346 | Ride Control Relay Short to Ground |
| 0346 | Ride Control Relay Short to Battery |
| 0367 | Invalid Ride Control Switch Input |
| 0368 | Transmission auto/man open circuit |
| 0368 | Transmission auto/man grounded |
| 0520 | Trans Configuration Incorrect |
| 0621 | Invalid Downshift Switch |
| 0641 | Trans Solenoid 1 Open Circuit |
| 0641 | Trans Solenoid 1 Short to Ground |
| 0641 | Trans Solenoid 1 Short to Battery |
| 0642 | Trans Solenoid 2 Open Circuit |
| 0642 | Trans Solenoid 2 Short to Ground |
| 0642 | Trans Solenoid 2 Short to Battery |
| 0643 | Trans Solenoid 3 Open Circuit |
| 0643 | Trans Solenoid 3 Short to Ground |
| 0643 | Trans Solenoid 3 Short to Battery |
| 0644 | Trans Solenoid 4 Open Circuit |
| 0644 | Trans Solenoid 4 Short to Ground |
| 0644 | Trans Solenoid 4 Short to Battery |
| 0645 | Trans Solenoid 5 Open Circuit |
| 0645 | Trans Solenoid 5 Short to Ground |
| 0645 | Trans Solenoid 5 Short to Battery |
| 0646 | Trans Solenoid 6 Open Circuit |
| 0646 | Trans Solenoid 6 Short to Ground |
| 0646 | Trans Solenoid 6 Short to Battery |
| 0650 | Harness Code Unknown |
| 0668 | Shift Lever Not Responding |
| 0668 | Invalid Shift Lever Input |
| 0683 | In-Gear Relay Open Circuit |
| 0683 | In-Gear Relay Short to Ground |
| 0683 | In-Gear Relay Short to Battery |

| CID | Component |
|---|---|
| **Shift Handle Control (MID[2] No. 117)** | |
| 0168 | Battery Voltage Above Normal |
| 0168 | Battery Voltage Below Normal |
| 0668 | Shift Lever Bad Device or Component |
| **Machine Security Control (MID[2] No. 124)** | |
| 0168 | Battery Voltage |
| 0248 | Cat Data Link Error |
| 0254 | ECM |
| 0817 | Backup Battery |
| 1391 | MSS Output Driver #1 |
| 1392 | MSS Output Driver #2 |
| **Auxiliary Hydraulic Control (MID[2] No. 106)** | |
| 1180 | Auxiliary Hydraulic Solenoid #1 |
| 1181 | Auxiliary Hydraulic Solenoid #2 |
| 1184 | Auxiliary Hydraulic Solenoid Supply |
| 1187 | Continuous Flow Switch |
| 1189 | Auxiliary Proportional Lever Switch |
| 1529 | Quick Coupler Switch |
| 1530 | Quick Coupler Solenoid |

[1] The CID is a diagnostic code that indicates which component is faulty.

[2] The MID is a diagnostic code that indicates which electronic control module diagnosed the fault.

| Failure Mode Identifiers (FMI)[1] | |
|---|---|
| **FMI No.** | **Failure Description** |
| 0 | Data valid but above normal operational range. |
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| 3 | Voltage above normal or shorted high. |
| 4 | Voltage below normal or shorted low. |
| 5 | Current below normal or open circuit. |
| 6 | Current above normal or grounded circuit. |
| 7 | Mechanical system not responding properly. |
| 8 | Abnormal frequency, pulse width, or period. |
| 9 | Abnormal update. |
| 10 | Abnormal rate of change. |
| 11 | Failure mode not identifiable. |
| 12 | Bad device or component. |
| 13 | Out of calibration. |
| 14 | Parameter failures. |
| 15 | Parameter failures. |
| 16 | Parameter not available. |
| 17 | Module not responding. |
| 18 | Sensor supply fault. |
| 19 | Condition not met. |
| 20 | Parameter failures. |

[1] The FMI is a diagnostic code that indicates what type of failure has occurred.

# SPECIFICATIONS AND RELATED MANUALS
# Volume 1 of 2 - ENGINE AND CHASSIS

| Related Electrical Service Manuals | |
|---|---|
| **Title** | **Form Number** |
| Alternator: 105-2812 | SENR5841 |
| Optional (90A): 105-2813 | SENR5841 |
| Electric Starting Motor: 143-0539 | SENR3828 |
| Autoshift Control: | RENR2869 |
| Aux Hydraulic Control: | RENR3588 |
| Machine Security: | RENR2462 |

| Off Machine Switch Specification | | | | |
|---|---|---|---|---|
| **Part No.** | **Function** | **Actuate** | **Deactuate** | **Contact Position** |
| 6T-2665 | Engine Coolant Temperature | 107.2 ± 2.8°C (225 ± 5°F) | 93°C MIN (196°F MIN) | Normally Open |
| 7W-1238 | Engine Oil Pressure | 62.1 to 95.1 kPa (9 to 13.8 psi) | 62.1 to 95.1 kPa (9 to 13.8 psi) | Normally Closed |
| 7X-8549 | Hyd. Filter Pressure | 110.3 to 138 kPa (16 to 20 psi) | 86.2 to 103.4 kPa (12.5 to 15 psi) | Normally Open |
| 114-5333 | Refrigerant Pressure | 275 to 1750 kPa[1] (40 to 255 psi) | -- -- | Normally [2] Open |
| 119-9631 | Thermostat | -0.6 ± 1.4°C (31 ± 2.5°F) | 4.2 ± 1.4°C (39.5 ± 2.5°F ) | Normally Closed |
| 128-5091 | All Wheel Steer Pressure | 551 kPa Max (80 psi) | 344 ± 20 kPa (50 ± 3 psi) | SPDT |
| 131-9203 | Loader Cylinder Pressure | 3500 kPa Max (507.6 psi) | 3000 ± 150 kPa (435.1 ± 21.8 psi) | SPDT |
| 173-7527 | Cold Start Temperature | 47 to 53°C (117 to 127°F) | 37 to 43°C (99 to 109°F) | Normally Open |
| 194-2553 | Pilot Hydraulic Pressure | 2200 kPa Max (319.1 psi) | 1800 ± 175 kPa (261.1 ± 25.4 psi) | Normally Closed |

[1] With increasing pressure the closed condition can be maintained up to 2800 kPa (405 psi), with decreasing pressure the closed condition can be maintained down to 170 kPa (25 psi).

[2] Contact position at the contacts of the harness connector.

| Sender and Solenoid Specifications | | |
|---|---|---|
| **Part No.** | **Component Description** | **Resistance (Ohms)[1]** |
| 3E-1908 | Solenoid: A/C Clutch | 17.6 ± 0.6 |
| 4W-9972 | Sender: Converter Temp | 54°C (130°F) - 560 to 716<br>110°C (230°F) - 72 to 82 |
| 121-4036 | Solenoid: Front Drive | 10.5 |
| 171-8775 | Solenoid: Pilot Hyd. Shutoff | 10.5 |
| 175-3070 | Sender: Coolant Temp | 54°C (130°F) - 560 to 716<br>110°C (230°F) - 72 to 82 |
| 187-8936 | Sender: Fuel Level<br>Full:<br>Empty: | <br>240 - 260<br>27.5 - 39.5 |

[1] At room temperature unless otherwise noted.

# SPECIFICATIONS AND RELATED MANUALS
# Volume 2 of 2 - CAB

| Related Electrical Service Manuals | |
|---|---|
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| Optional (90A): 105-2813 | SENR5841 |
| Electric Starting Motor: 143-0539 | SENR3828 |
| Autoshift Control: | RENR2869 |
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**Off Machine Switch Specification**

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**Sender and Solenoid Specifications**

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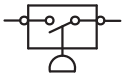
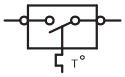
| 187-8936 | Sender: Fuel Level | Full: 240 - 260<br>Empty: 27.5 - 39.5 |

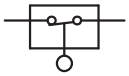
[1] At room temperature unless otherwise noted.

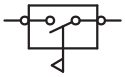
# HARNESS and WIRE
## Electrical Schematic Symbols

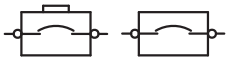
## Symbols


Pressure Symbol


Temperature Symbol

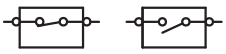

Level Symbol

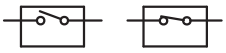

Flow Symbol

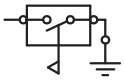

Circuit Breaker Symbol

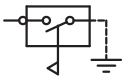
## Symbols and Definitions


**Fuse:** A component in an electrical circuit that will open the circuit if too much current flows through it.

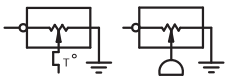

**Switch (Normally Open):** A switch that will close at a specified point (temp, press, etc.). The circle indicates that the component has screw terminals and a wire can be disconnected from it.

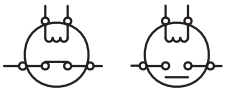

**Switch (Normally Closed):** A switch that will open at a specified point (temp, press, etc.). No circle indicates that the wire cannot be disconnected from the component.

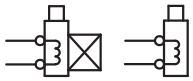

**Ground (Wired):** This indicates that the component is connected to a grounded wire. The grounded wire is fastened to the machine.

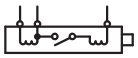

**Ground (Case):** This indicates that the component does not have a wire connected to ground. It is grounded by being fastened to the machine.


**Reed Switch:** A switch whose contacts are controlled by a magnet. A magnet closes the contacts of a normally open reed switch; it opens the contacts of a normally closed reed switch.


**Sender:** A component that is used with a temperature or pressure gauge. The sender measures the temperature or pressure. Its resistance changes to give an indication to the gauge of the temperature or pressure.

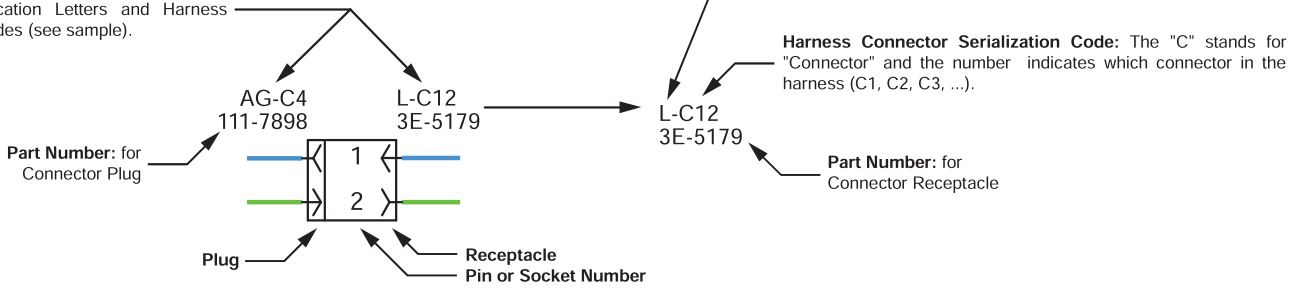

**Relay (Magnetic Switch):** A relay is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close the switch part of the relay.

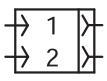

**Solenoid:** A solenoid is an electrical component that is activated by electricity. It has a coil that makes an electromagnet when current flows through it. The electromagnet can open or close a valve or move a piece of metal that can do work.


**Magnetic Latch Solenoid:** A magnetic latch solenoid is an electrical component that is activated by electricity and held latched by a permanent magnet. It has two coils (latch and unlatch) that make electromagnet when current flows through them. It also has an internal switch that places the latch coil circuit open at the time the coil latches.

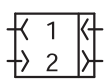
## Harness and Wire Symbols

**Wire, Cable, or Harness Assembly Identification:** Includes Harness Identification Letters and Harness Connector Serialization Codes (see sample).

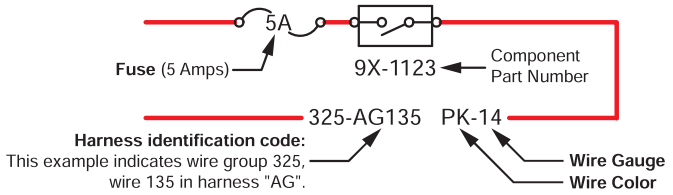


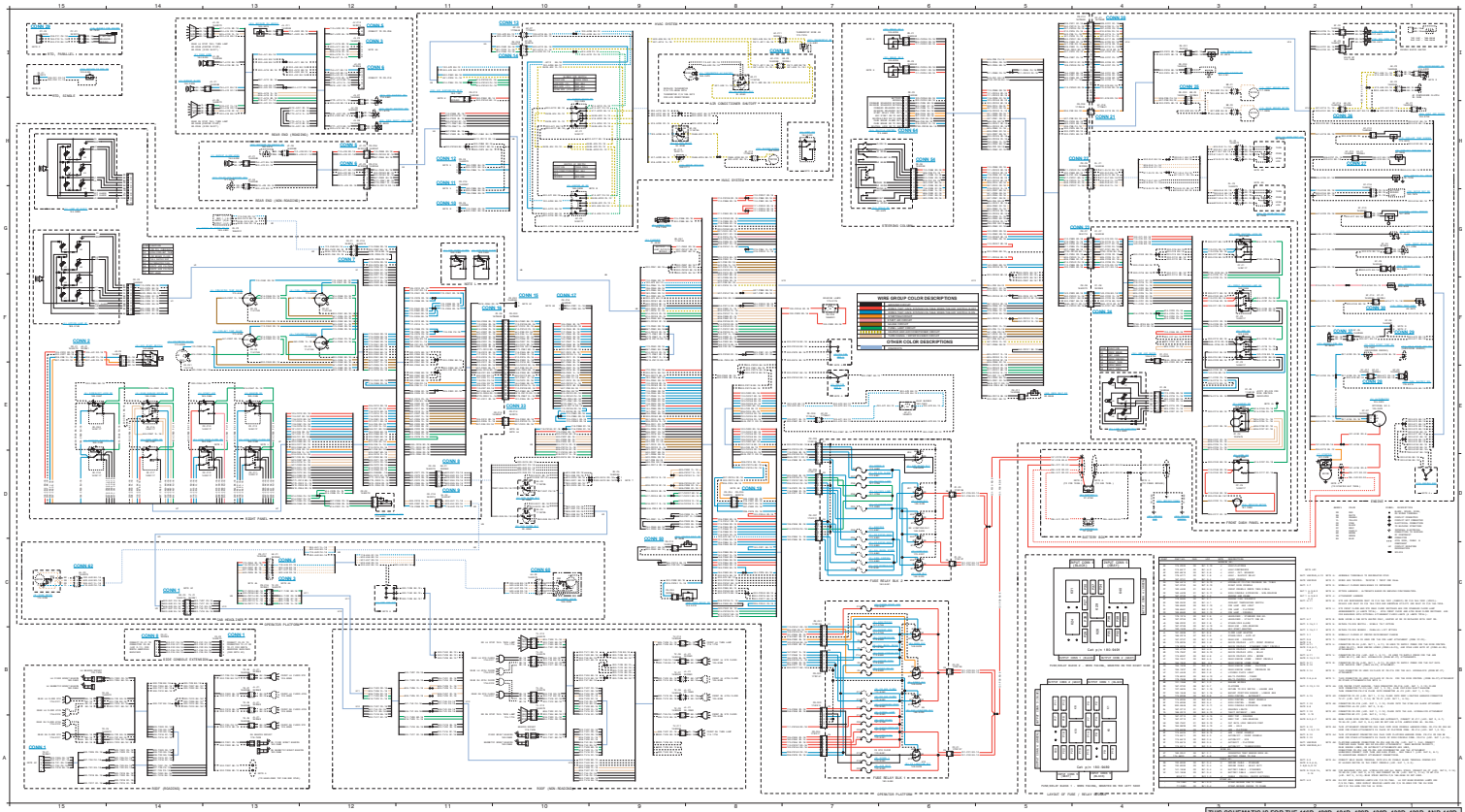



**Deutsch connector:** Typical representation of a Deutsch connector. The plug contains all sockets and the receptacle contains all pins.

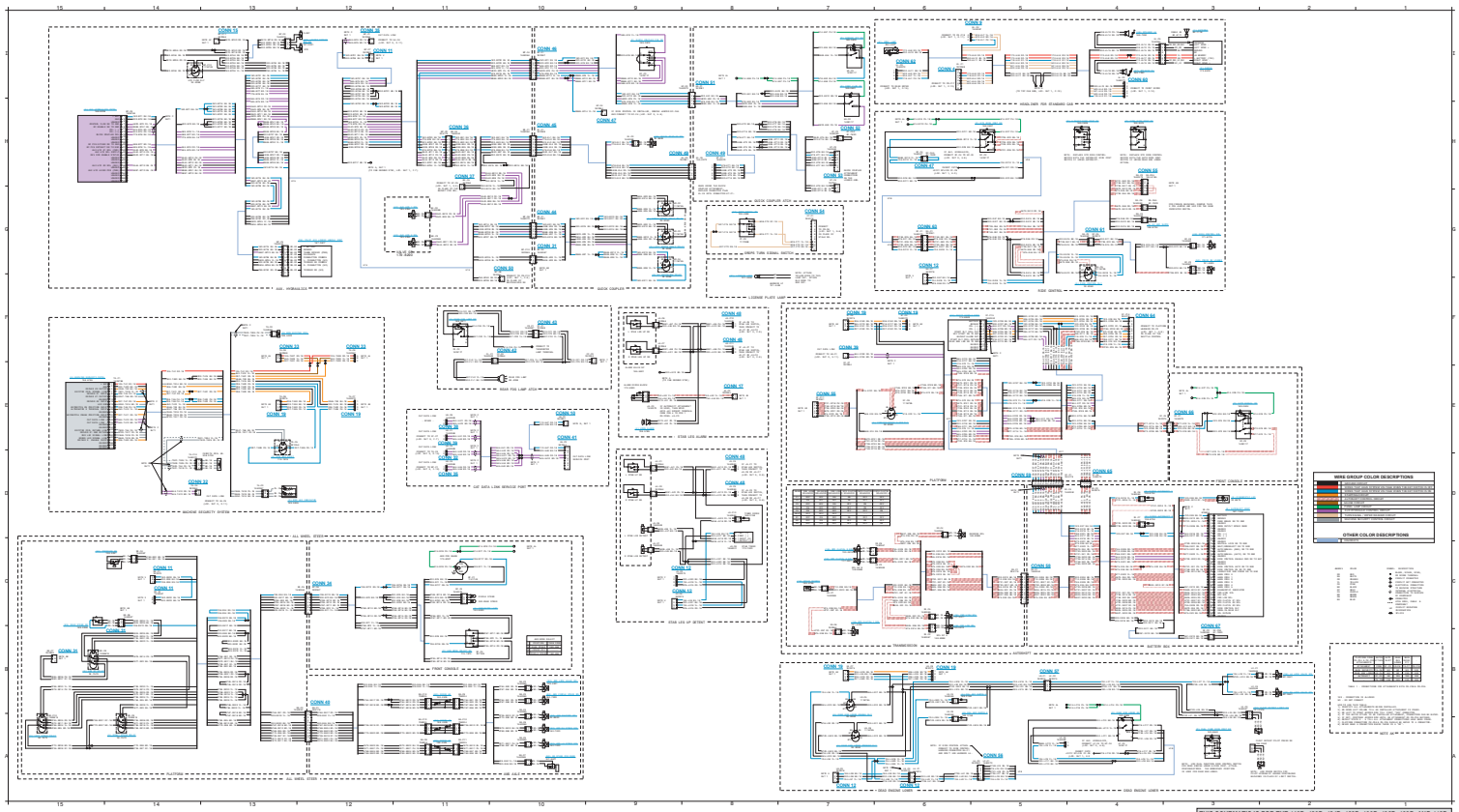


**Sure-Seal connector:** Typical representation of a Sure-Seal connector. The plug and receptacle contain both pins and sockets.



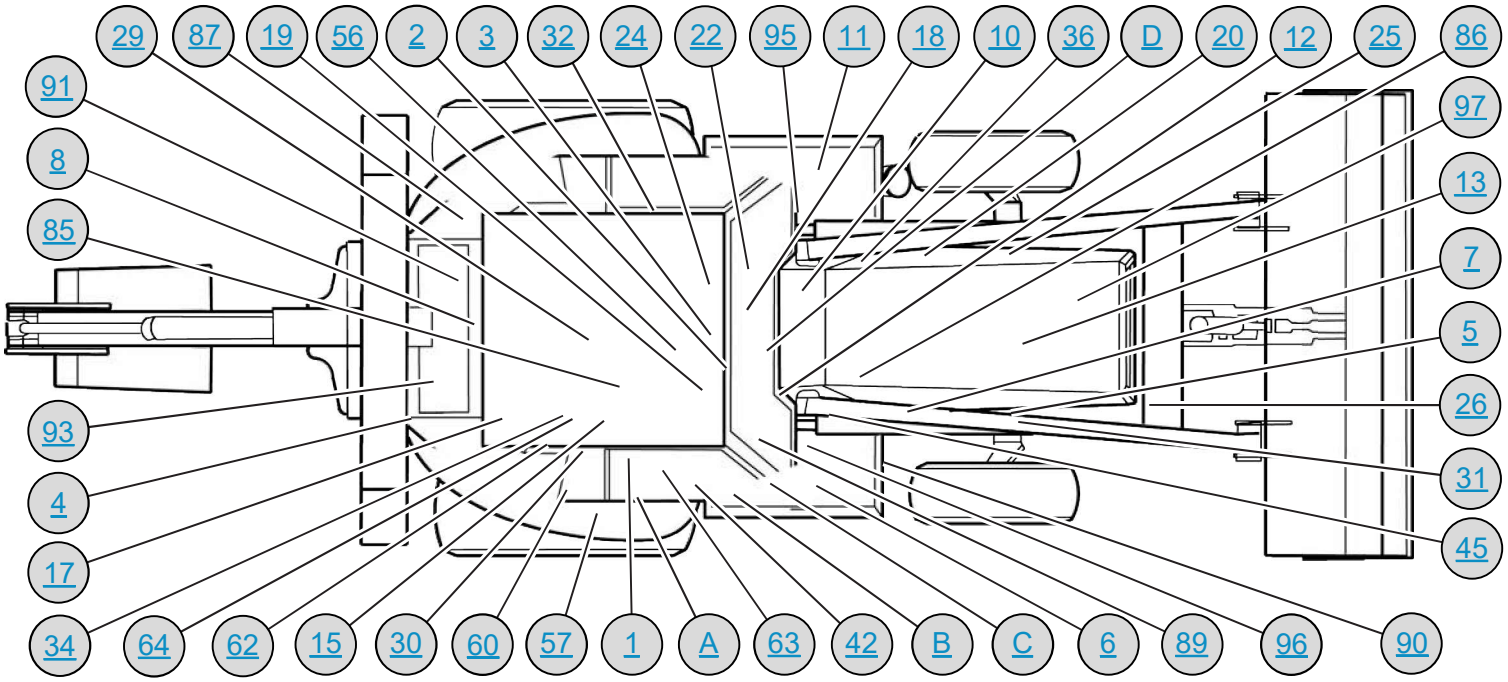


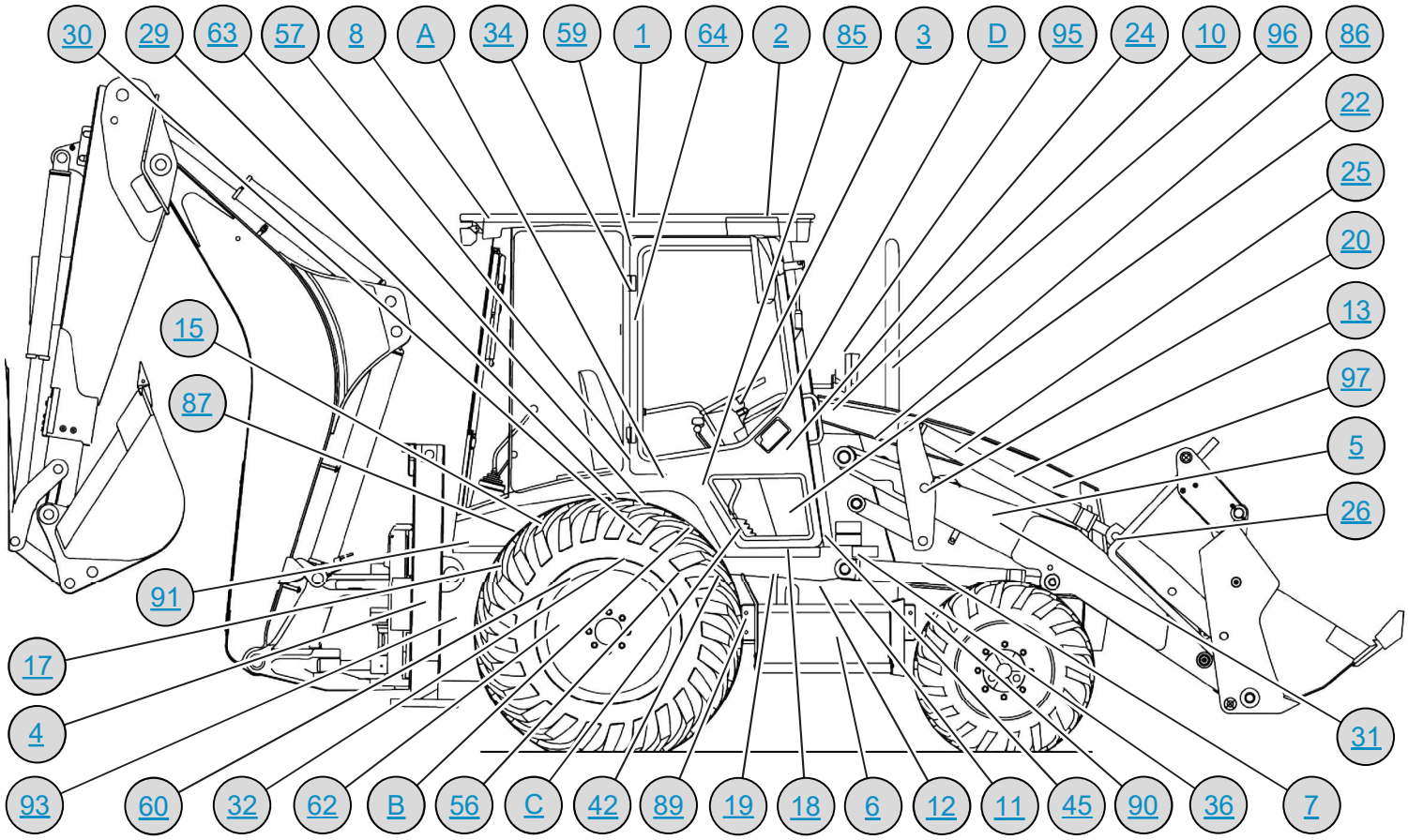

**THIS SCHEMATIC IS FOR THE 416D, 420D, 424D, 426D, 430D, 432D, 438D, AND 442D BACKHOE LOADER ELECTRICAL SYSTEM**
**VOLUME 1 of 2: ENGINE AND CHASSIS**
MEDIA NUMBER: RENR3587-04
SCHEMATIC PART NUMBER: 176-0268, CHANGE: 01, VERSION: -
Components are shown installed on a fully operable machine with the key and engine off, transmission shifter in neutral and with parking brake set.
Refer to the appropriate Service Manual for Troubleshooting, Specifications and Systems Operations.



**THIS SCHEMATIC IS FOR THE 416D, 420D, 424D, 428D, 430D, 432D, 438D, AND 442D BACKHOE LOADER ELECTRICAL SYSTEM**
**VOLUME 2 of 2: CAB**
MEDIA NUMBER: RENR3587-04
SCHEMATIC PART NUMBER: 179-0268, CHANGE: 01, VERSION: -
Components are shown installed on a fully operable machine with the key and engine off, transmission shifter in neutral, and all switches off.
Refer to the appropriate Service Manual for Troubleshooting, Specifications and Systems Operation.

# MACHINE HARNESS CONNECTOR AND COMPONENT LOCATIONS - ENGINE AND CHASSIS



# MACHINE HARNESS CONNECTOR AND COMPONENT LOCATIONS - CAB