

Wire Number	Wire Color	Wire Description	Wire Number	Wire Color	Description
101	RD	Accessory Socket	513	OR	Relay To Ignition Switch
102	RD	Wiring Harness	521	YL	Fan Speed Switch To Air Pressure Switch
103	RD	Brake Lamp	522	WH	A/C Clutch To Throttle Switch
104	RD	Key Switch	523	OR	Ignition Switch To Throttle
105	RD	Key Switch	524	WH	All Wheel Drive Solenoid
111	RD	Brake Lamp	525	OR	Rear Wheel Internal Switch To Wiper Switch
112	RU	Main Power Relay Output	526	OR	Warning Buzzer To Display
113	OR	Motor #1	527	PK	A/C Switch Lamp #1
114	RD	Accessory Socket	528	OR	Lighting Circuit
115	OR	Rear Flood Lamp	601	OR	Dash Lamp - High
117	YL	Rear Flood Lamp L/HD	602	OR	Dash Lamp - Low
118	OR	Front Wiper Motor	604	OR	Stop Lamp
119	PK	Front Wiper Motor	605	YL	Turn Lamp - Left
122	BU	Wiper A/C Switch	606	OR	Turn Lamp - Right
123	OR	Wiper Motor	607	PK	Front Lamp - Right #1
124	OR	Wiper Motor	608	OR	Front Lamp - Right #2
125	OR	Product Link Radio	610	OR	Headlamps - Stop
126	OR	Transmission Control	611	OR	Headlamps - High Beam
133	OR	Wiring Harness	614	PK	Tail / Prox. / Dash Lamp
143	BR	Instrument Bezel	617	BR	Tail / Prox. / Dash Lamp
144	OR	Beacon	618	YL	Tail / Prox. Lamp - Right
145	OR	PMR Mount #1	619	OR	Headlamps - Low Beam
155	YL	Front Flood L/HD	620	OR	Front Lamp - Right
156	BR	Front Flood	627	YL	Fog Lamp
159	BU	Lum Signal	630	OR	Rear Lamp - Rear Attachment #1
161	RD	Head Lamp	631	OR	Control Circuit
162	OR	Operational Light	720	OR	Transmission Brake Switch - Junior
163	OR	Operational Light	728	YL	Transmission Hold Switch
200	BR	Main Chassis	729	RU	Transmission Brake Switch
202	BR	Transmission Control #1	730	YL	Transmission Stop Solenoid #2
216	BR	Transmission M Cable	734	BU	Transmission Shift Solenoid 3 or 4
220	BR	Brake Solenoid To Sensor	735	YL	Brake Position Solenoid Switch
265	BR	Electronic Pump Control #1 Code 2	766	OR	Transmission Chassis Solenoid
304	WH	Start Relay #1 Output	821	OR	All Wheel Drive Solenoid Solenoid
306	OR	Key Switch To Starter Relay	823	OR	Transmission Solenoid 2 or 3 Return
307	OR	Key Switch To Neutral Start Switch	824	OR	Transmission Solenoid 3 Return
358	YL	Main Power Relay Coil	826	OR	Ride Control Solenoid #1
359	OR	Motor Relay	827	OR	Ride Control Solenoid #2
310	RU	Start Sol Switch To Start Sol Solenoid	A305	YL	Relay To Warning Horns
318	OR	Start Sol Switch To Start Solenoid	A306	OR	Relay To Warning Horns
321	BR	Brake Alarm Switch To Starter Alarm	A346	BU	Ground Sensor Output - MSS
322	OR	Forward Warning Horn	A347	OR	Switch For Power Output - MSS
324	BU	Differential Lock Solenoid	C211	WH	Relay Power
327	PK	Engine Shutdown Solenoid	C261	WH	Right Rear Speed Sol
330	OR	Key Switch To Terminal	C268	WH	Hyd. Motor Motor (MSS)
367	BU	Rear Warning Horn	E228	PK	MANC On/Off Switch To Blower Speed Sol
384	BU	Blow Plug	E230	YL	Blower Switch - Junior
403	OR	Alternator #1 Terminal - Engine #1	E218	OR	Implement Lock Switch (N.C.)
404	YL	Hyd. Oil Temperature Sensor	E261	OR	Implement Lock Switch (N.O.)
406	OR	Engine Oil Pressure Switch (Low)	F201	OR	Indicator - Warning
408	OR	Control Temperature	F228	OR	Anti-Roll Control Switch (N.C.)
410	YL	Parking Brake Sensor	F246	PK	Leaf Drive
420	OR	Fuel Filter	G413	PK	High Pressure Implement Filter 2
430	PK	Brake Oil Pressure	G203	OR	Clack Dog Valve
438	YL	Indicator - Lamp	G268	OR	Leaf Drive 2
441	OR	Control Temperature Gauge	G281	PK	Thrust Arm Coupler
447	PK	Fuel Level Gauge	H771	BR	Stabiliser Lock Solenoid
450	YL	Engine #1 Temperature Indicator (L)	J28	BR	Stabiliser Solenoid
451	RU	Control Temperature (O) Temperature	M713	OR	Stabiliser Lock Solenoid
500	BR	Wiper - Front (Park)	M720	BU	Stabiliser Left Relay
501	OR	Wiper - Front (Low)	M721	WH	Solenoid Right Switch
502	OR	Wiper - Front (High)	M826	BR	Flow Control Switch
503	BR	Wiper - Rear (Park)	N756	PK	Flow Control Priority Switch
506	RU	Wiper - Front	N859	OR	Flow Control Solenoid 2
507	OR	Wiper - Rear	N860	OR	Flow Control Solenoid 1
508	RU	Radio Speaker - Left (L)	N867	PK	FXD - Conn 1
509	WH	Radio Speaker - Left (R)	N869	OR	FXD - Conn 1
511	BR	Radio Speaker - Right (L)	N870	YL	OTB - Conn 1
512	OR	Radio Speaker - Right (R)	N871	OR	OTB - Conn 1
513	OR	A/C Refrigerant Pressure Switch	N879	OR	Signal Ground - Conn 1
516	OR	Tractor Blower Motor #1 (High)	R612	OR	Hydraulic Hold Lock Solenoid
518	OR	Tractor Blower Motor #1 (Medium)	R617	YL	Tail Lamp Lock
517	BU	Tractor Blower Motor #1 (Low)	R617	YL	Tail Lamp Lock

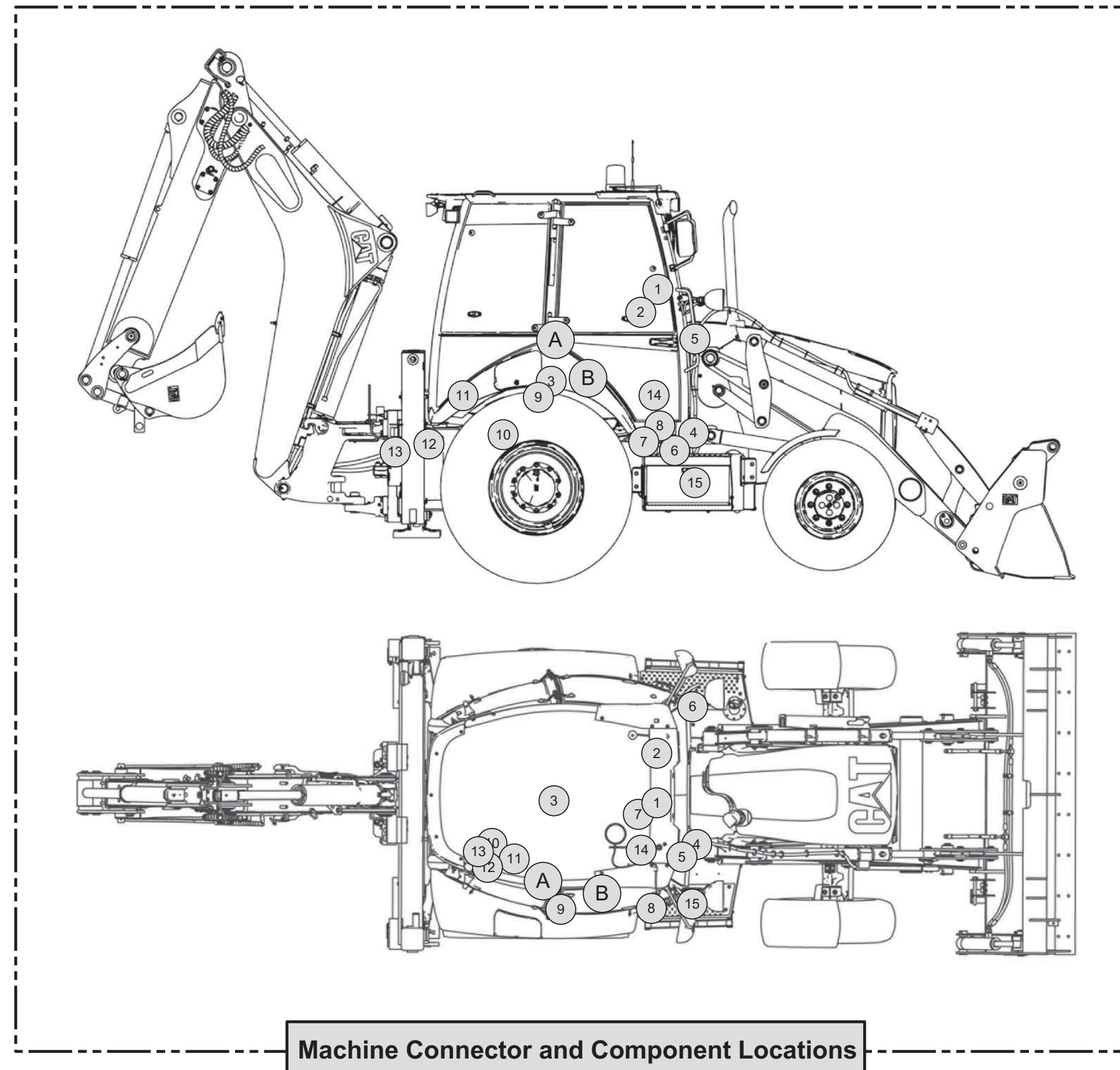
Title	Form Number
Electric Starting Motor	143-0529
	SEM3628

Component	Volume 1 - Component Location		Schematic Location	Machine Location	
	Schematic Location	Machine Location			
Alarm - Stabiliser	D-12	A	Switch Brake RH	G-9	2
Alarm - Front Shift Handle	G-9	1	Switch - Differential Lock	H-5	6
Flasher	C-5	B	Switch - Front Console Horn	H-7	2
Main - Service	H-7	2	Switch - Front Work Lamp	D-14	A
Motor - PMR #1	H-4	A	Switch - Hazard	E-5	1
Motor - PMR #2	H-4	A	Switch - Horn	A-10	A
Motor - PMR #3	H-5	A	Switch - Key	A-10	A
Motor - Operator Seat	D-2	3	Switch - Loader Handle Neutralizer	F-2	A
Park - Power	D-12	A	Switch - Parking Brake	E-12	A
Relay - AWD	F-4	B	Switch - Rear Fog Lamp	B-14	A
Relay - Backup Alarm	F-4	B	Switch - Rear Work Lamp	D-14	A
Relay - Forward Horn	G-4	B	Switch - Rear Work Lamp	G-14	A
Relay - Rear Horn	G-4	B	Switch - Return To Dig	G-2	2
Relay - Ride Control	F-4	B	Switch - Ride Control	D-2	2
Sensor - Bucket Position	E-2	A	Switch - Ride Control Pressure	G-1	5
Solenoid - Return To Dig	D-2	A	Switch - Horn	G-14	A
Solenoid - Ride Control #1	H-1	5	Switch - Side Shift Lock	D-14	A
Solenoid - Ride Control #2	H-1	5	Switch - Stabiliser Lift Up	G-14	A
Suppressor - Ride Control Acc	H-1	5	Switch - Stabiliser Lift Up	G-14	A
Suppressor - Stabiliser Alarm Acc #1	G-14	A	Switch - Stop	F-8	2
Suppressor - Stabiliser Alarm Acc #2	G-14	A	Switch - Stop	A-14	A
Switch - AWD	H-7	2	Switch - XSMN Handle Neutralizer	F-2	9
Switch - Beacon	G-14	A	Switch - XSMN Lock	H-7	2
Switch - Brake LM	G-9	2			

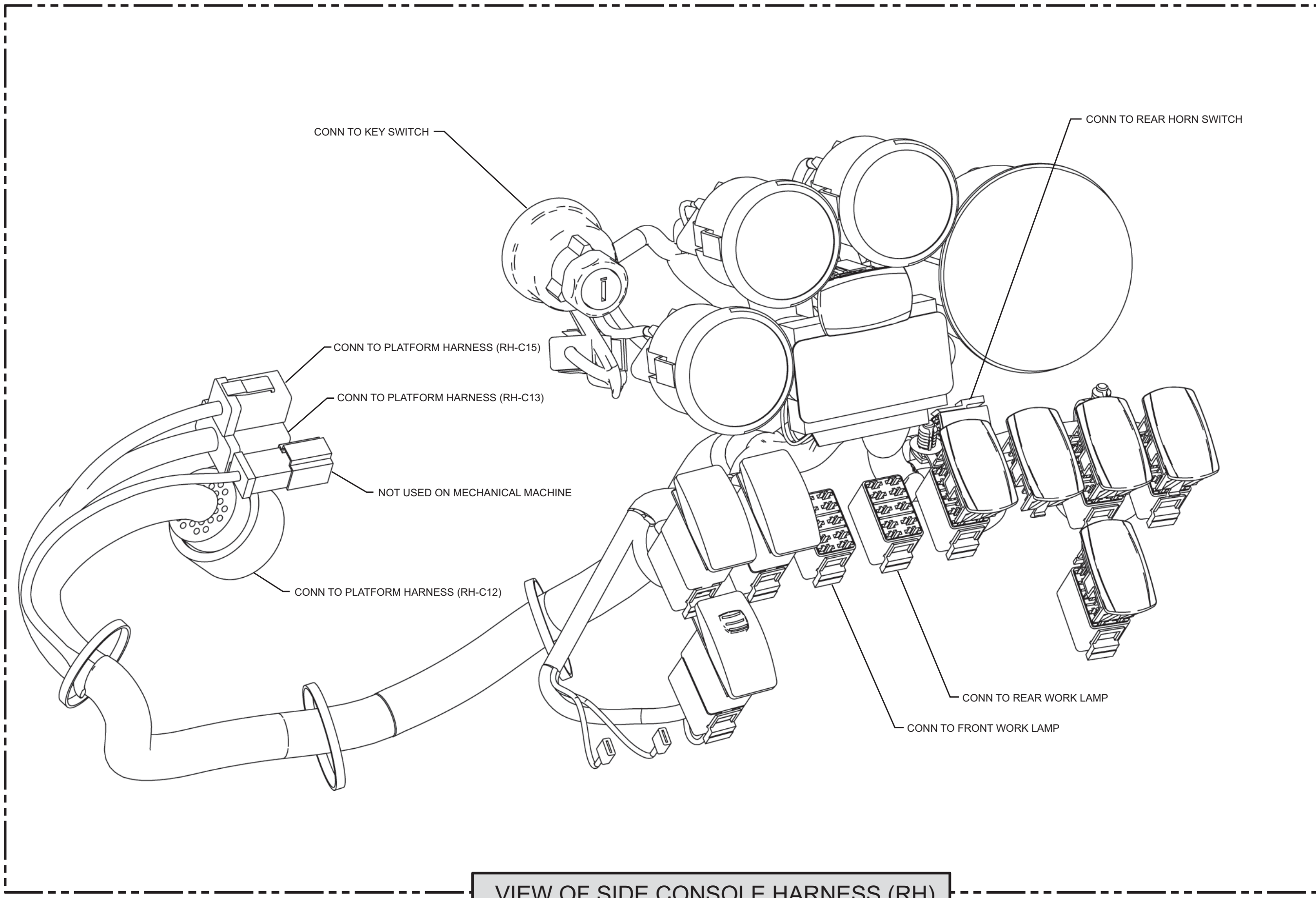
Connector Number	Volume 1 - Connector Location		Machine Location
	Schematic Location	Machine Location	
CONN 1	D-12	A	H-7
CONN 2	H-7	2	D-14
CONN 3	H-4	A	D-14
CONN 4	H-5	A	D-14
CONN 5	H-4	A	H-12
CONN 6	D-12	A	H-12
CONN 7	H-7	2	H-12
CONN 8	F-4	B	H-12
CONN 9	F-4	B	H-12
CONN 10	H-4	A	H-12
CONN 11	F-4	B	H-12
CONN 12	H-7	2	H-12
CONN 13	H-7	2	H-12
CONN 14	H-7	2	H-12
CONN 15	H-7	2	H-12

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

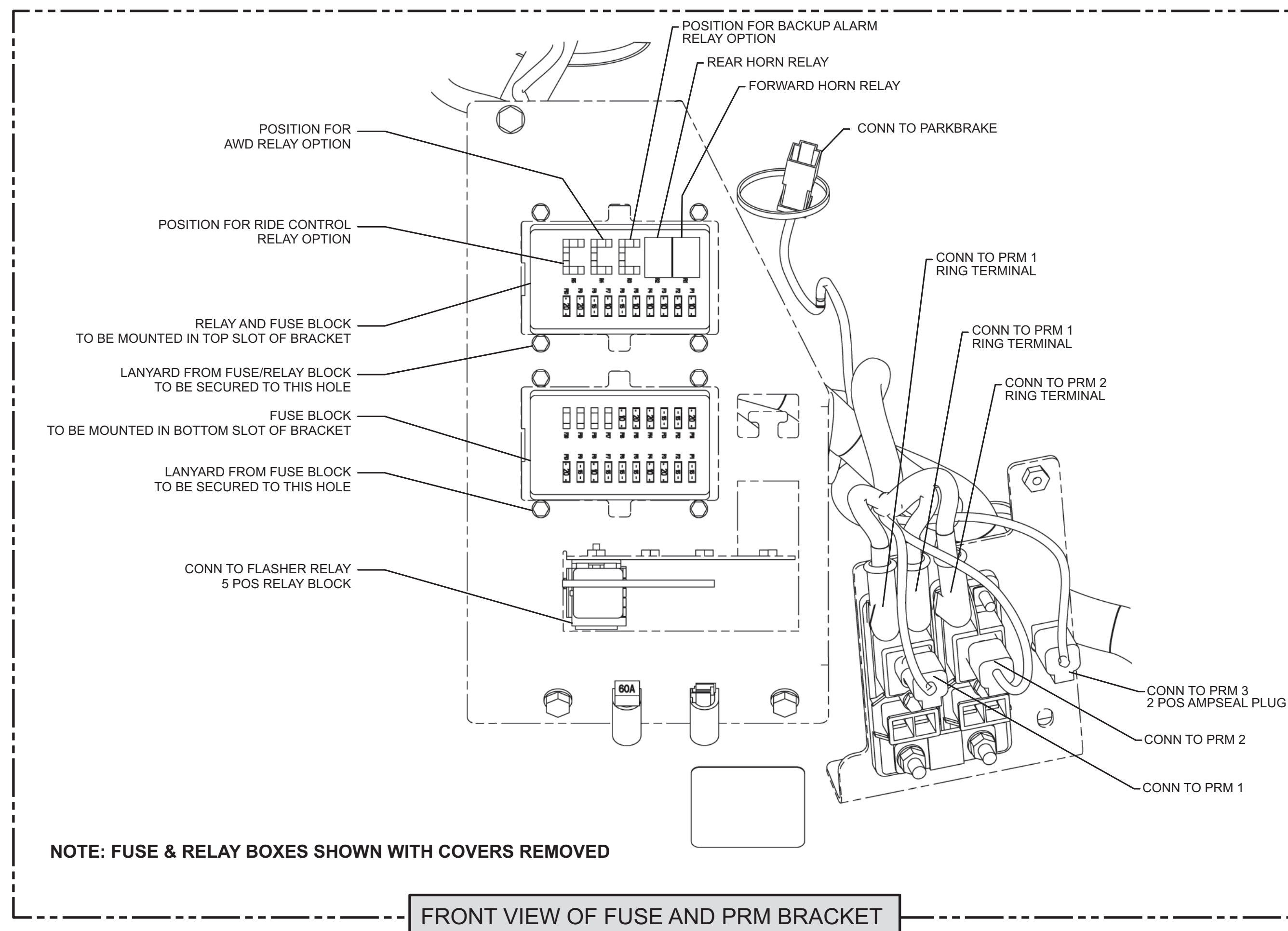
Machine locations are provided for components located close together.  
A = Located inside of side console.  
B = Located on fender and PMR bracket.



Machine Connector and Component Locations

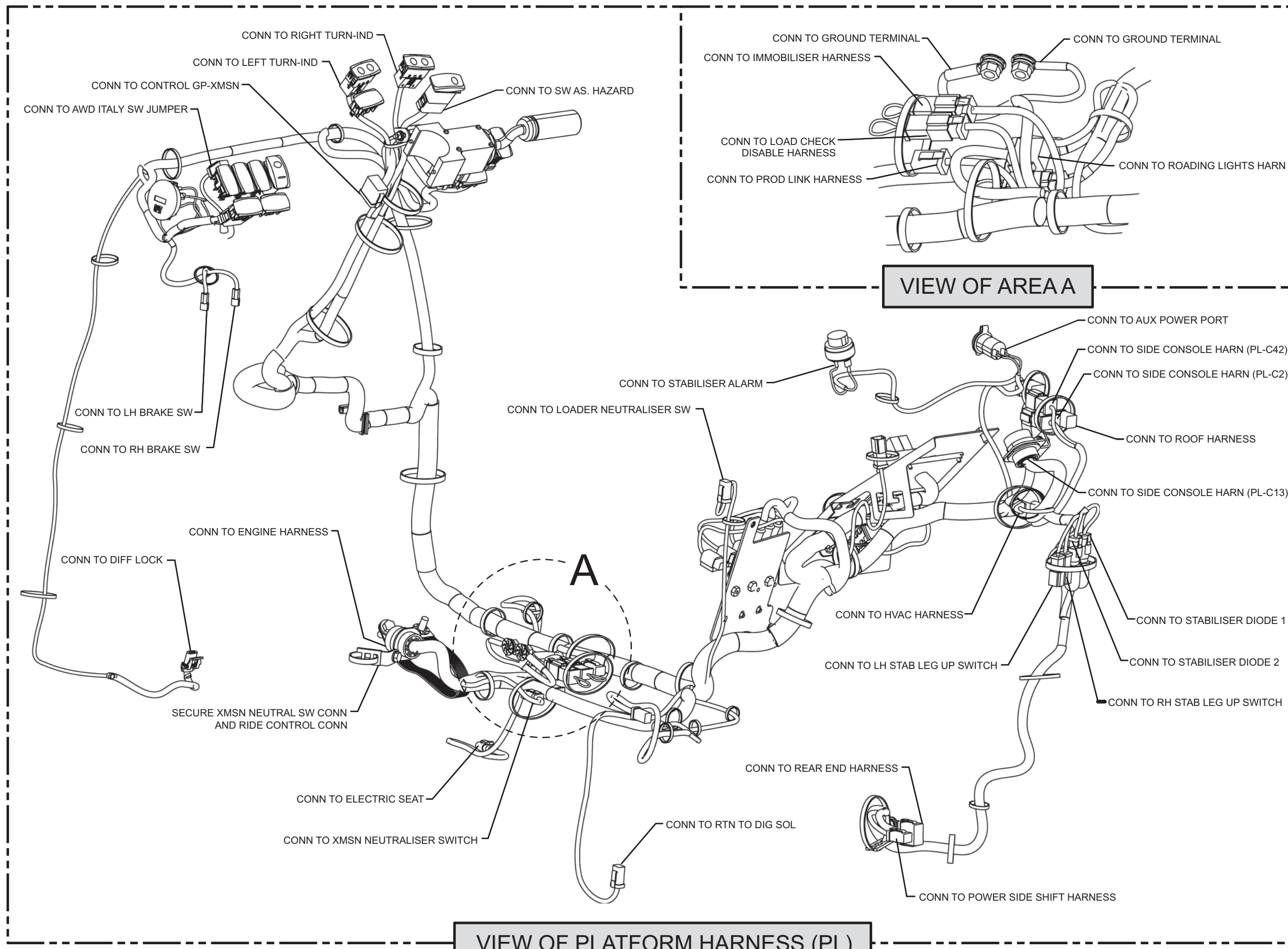


VIEW OF SIDE CONSOLE HARNESS (RH)



NOTE: FUSE & RELAY BOXES SHOWN WITH COVERS REMOVED

FRONT VIEW OF FUSE AND PRM BRACKET



VIEW OF PLATFORM HARNESS (PL)

# Schematic

## 422E and 428E Backhoe Loader Electrical System

422E: HBE1600-UP  
428E: SNL2200-UP

Volume 1 of 2: Cab

© 2013 Caterpillar. All Rights Reserved

Printed in U.S.A.

### Harness And Wire Electrical Schematic Symbols

**Symbols**

Fuses Symbol  
 Switches Symbol  
 Relays 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. No circle indicates that the wire cannot be disconnected from the component.

**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 (Weld):** 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 its 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 an 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**

Wiring Harness Symbol  
 Wire Symbol  
 Cable Symbol  
 Homes Symbol

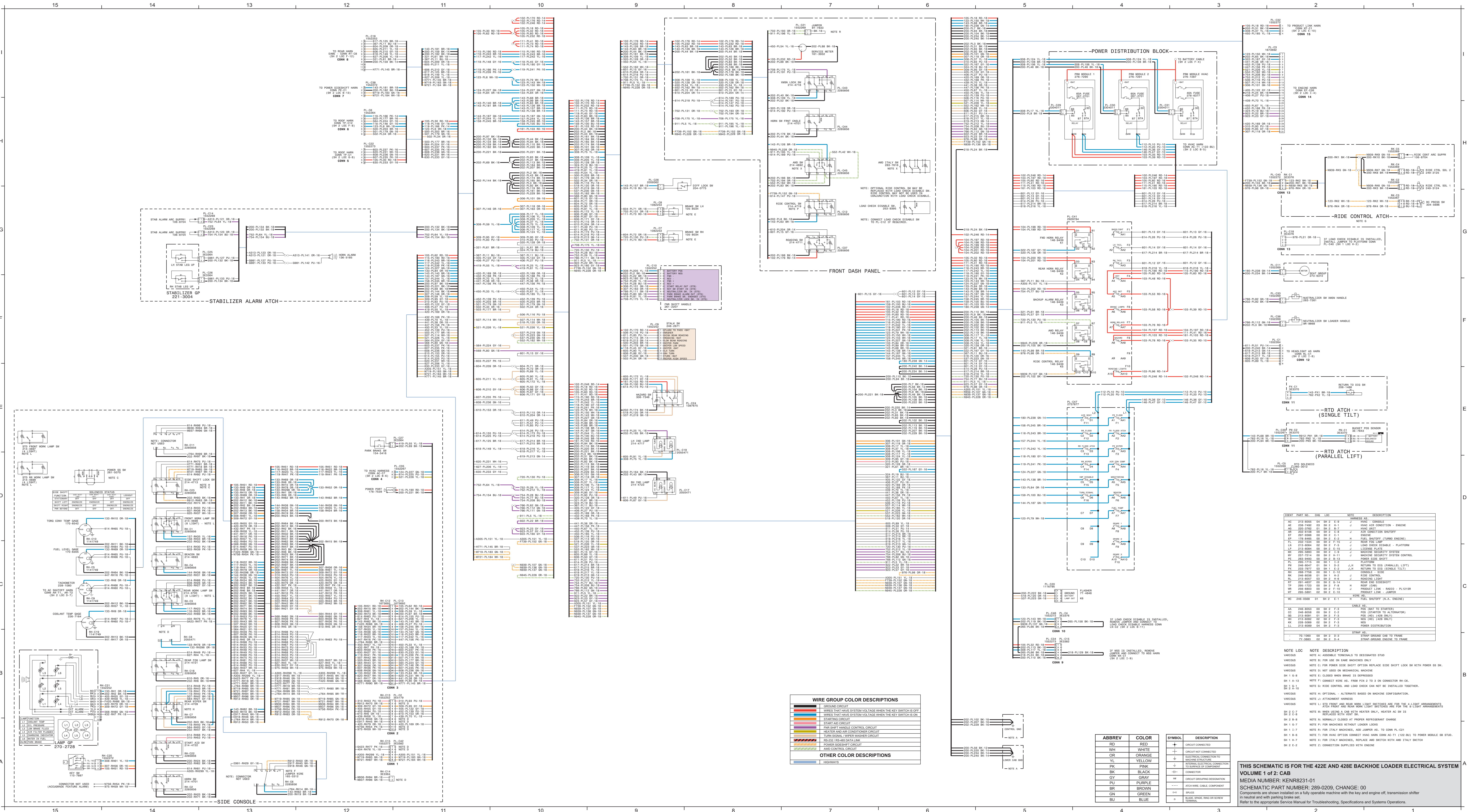
**Wiring Harness:** A wiring harness is a collection of wires that are bundled together and protected by a sheath. It is used to connect various components in a machine.  
**Wire:** A wire is a single conductor used to carry electrical current.  
**Cable:** A cable is a bundle of wires used to carry electrical current.  
**Homes:** Homes are electrical terminals used to connect wires to components.

**Part Number for Connector Plug:** AG-C4 111-7999  
**Part Number for Connector Receptacle:** LC-12 3E-5179  
**Part Number for Connector Receptacle:** 3E-5179

**Detach connector:** Typical representation of a Detach connector. The plug contains all sockets and the receptacle contains all pins.  
**Secure-Seal connector:** Typical representation of a Secure-Seal connector. The plug contains all sockets and the receptacle contains all pins and sockets.

**Wiring Harness Identification Code:** The "W" stands for "Wiring" and the number indicates which connector in the harness (C1, C2, C3, ...).  
**Wire Color:** The color of the wire is indicated by a letter and a number (e.g., H-7, D-14).





**WIRE GROUP COLOR DESCRIPTIONS**

[Red]	GROUND CIRCUIT
[White]	WIRE THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS ON
[Yellow]	WIRE THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS OFF
[Orange]	STARTING CIRCUIT
[Green]	START AND CHARGE
[Blue]	STARTING CIRCUIT
[Purple]	STARTING CIRCUIT
[Brown]	STARTING CIRCUIT
[Pink]	STARTING CIRCUIT
[Black]	STARTING CIRCUIT
[Grey]	STARTING CIRCUIT
[Light Blue]	STARTING CIRCUIT
[Light Green]	STARTING CIRCUIT
[Light Orange]	STARTING CIRCUIT
[Light Purple]	STARTING CIRCUIT
[Light Brown]	STARTING CIRCUIT
[Light Pink]	STARTING CIRCUIT
[Light Black]	STARTING CIRCUIT
[Light Grey]	STARTING CIRCUIT
[Light Light Blue]	STARTING CIRCUIT
[Light Light Green]	STARTING CIRCUIT
[Light Light Orange]	STARTING CIRCUIT
[Light Light Purple]	STARTING CIRCUIT
[Light Light Brown]	STARTING CIRCUIT
[Light Light Pink]	STARTING CIRCUIT
[Light Light Black]	STARTING CIRCUIT
[Light Light Grey]	STARTING CIRCUIT
[Light Light Light Blue]	STARTING CIRCUIT
[Light Light Light Green]	STARTING CIRCUIT
[Light Light Light Orange]	STARTING CIRCUIT
[Light Light Light Purple]	STARTING CIRCUIT
[Light Light Light Brown]	STARTING CIRCUIT
[Light Light Light Pink]	STARTING CIRCUIT
[Light Light Light Black]	STARTING CIRCUIT
[Light Light Light Grey]	STARTING CIRCUIT
[Light Light Light Light Blue]	STARTING CIRCUIT
[Light Light Light Light Green]	STARTING CIRCUIT
[Light Light Light Light Orange]	STARTING CIRCUIT
[Light Light Light Light Purple]	STARTING CIRCUIT
[Light Light Light Light Brown]	STARTING CIRCUIT
[Light Light Light Light Pink]	STARTING CIRCUIT
[Light Light Light Light Black]	STARTING CIRCUIT
[Light Light Light Light Grey]	STARTING CIRCUIT

**OTHER COLOR DESCRIPTIONS**

[Red]	RED
[White]	WHITE
[Orange]	ORANGE
[Yellow]	YELLOW
[Pink]	PINK
[Black]	BLACK
[Grey]	GRAY
[Purple]	PURPLE
[Brown]	BROWN
[Green]	GREEN
[Blue]	BLUE
[Light Blue]	LIGHT BLUE
[Light Green]	LIGHT GREEN
[Light Orange]	LIGHT ORANGE
[Light Purple]	LIGHT PURPLE
[Light Brown]	LIGHT BROWN
[Light Pink]	LIGHT PINK
[Light Black]	LIGHT BLACK
[Light Grey]	LIGHT GRAY
[Light Light Blue]	LIGHT LIGHT BLUE
[Light Light Green]	LIGHT LIGHT GREEN
[Light Light Orange]	LIGHT LIGHT ORANGE
[Light Light Purple]	LIGHT LIGHT PURPLE
[Light Light Brown]	LIGHT LIGHT BROWN
[Light Light Pink]	LIGHT LIGHT PINK
[Light Light Black]	LIGHT LIGHT BLACK
[Light Light Grey]	LIGHT LIGHT GRAY
[Light Light Light Blue]	LIGHT LIGHT LIGHT BLUE
[Light Light Light Green]	LIGHT LIGHT LIGHT GREEN
[Light Light Light Orange]	LIGHT LIGHT LIGHT ORANGE
[Light Light Light Purple]	LIGHT LIGHT LIGHT PURPLE
[Light Light Light Brown]	LIGHT LIGHT LIGHT BROWN
[Light Light Light Pink]	LIGHT LIGHT LIGHT PINK
[Light Light Light Black]	LIGHT LIGHT LIGHT BLACK
[Light Light Light Grey]	LIGHT LIGHT LIGHT GRAY

**ABBREVIATION COLOR SYMBOL DESCRIPTION**

ABBREVIATION	COLOR	SYMBOL	DESCRIPTION
ED	RED	[Red]	GROUND CONNECTED
WH	WHITE	[White]	GROUND NOT CONNECTED
OR	ORANGE	[Orange]	ELECTRICITY PROTECT
YL	YELLOW	[Yellow]	ELECTRICITY PROTECT
PK	PINK	[Pink]	ELECTRICITY PROTECT
BL	BLACK	[Black]	ELECTRICITY PROTECT
GY	GRAY	[Grey]	ELECTRICITY PROTECT
PUR	PURPLE	[Purple]	ELECTRICITY PROTECT
BR	BROWN	[Brown]	ELECTRICITY PROTECT
GN	GREEN	[Green]	ELECTRICITY PROTECT
BLU	BLUE	[Blue]	ELECTRICITY PROTECT

**THIS SCHEMATIC IS FOR THE 422E AND 428E BACKHOE LOADER ELECTRICAL SYSTEM**  
**VOLUME 1 of 2 CAB**  
 MEDIA NUMBER: KENR8231-01  
 SCHEMATIC PART NUMBER: 289-0209, CHANGE: 00  
 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.



Wire Description					
Wire Number	Wire Color	Description	Wire Number	Wire Color	Description
101	RD	Battery (+)	518	OR	Switch To Hazard Flasher
102	RD	Burning Lamps	521	YL	Fan Speed Switch To A/C Pressure Switch
103	RD	Brake Lamps	522	WH	A/C Clutch To Thermostat Switch
104	RD	Horn Relay	537	GN	Turn Signal Switch To Flasher
105	RD	Key Switch	552	WH	All Wheel Drive Solenoid
111	RD	Brake Lamps	564	GT	Rear Wiper Wiper Switch To Wiper Switch
112	PU	Main Power Relay Output	568	GN	Warning Buzzer To Diodes
113	OR	Monitor 1	569	PK	A/C Switch Jumper #2
115	RD	Accessory Socket			<b>Lighting Circuits</b>
116	BR	Rear Flood Lamp	601	GY	Dash Lamps - High
117	YL	Rear Flood Lamp ATCH	603	PK	Rotary Beacon Lamp #1
118	GY	Front Wiper Motor	604	OR	Stop Lamps
119	PK	Rear Wiper Motor	605	YL	Turn Lamps - Left
122	BU	Heater A/C Switch	606	GY	Turn Lamps - Right
123	WH	Fuel Pump	607	PK	Flood Lamps - Front #1
124	GN	HVAC	608	GN	Flood Lamps - Rear #1
125	OR	Product Link Radio	610	OR	Headlamps - Beam
126	RD	Transmission Control	611	PU	Headlamps - High Beam
133	OR	Monitoring	614	PU	Tail / Position / Dash Lamps
143	BR	Implement Disable	617	BR	Tail / Position Lamp - Left
144	GN	Beacon	618	YL	Tail / Position Lamp - Right
146	GY	PRM Module 1	619	GN	Headlamps - Low Beam
157	YL	Front Flood ATCH	620	WH	Flood Lamps - Engine
158	BR	Front Flood	627	YL	Fog Lamps
159	BU	Turn Signal	630	GY	Flood Lamps - Rear Attachment #1
161	RD	Hazard Lamp			<b>Control Circuits</b>
180	GN	Operator Seat	702	DR	Transmission Brake Switch Jumper
			708	YL	Transmission Hold Switch
			720	PU	Transmission Brake Switch
200	BK	Main Chassis	752	YL	Transmission Shift Solenoid 2
202	BK	Transmission Control 1	754	BU	Transmission Shift Solenoid 3 or 1
218	BK	Transmission Id Code 1	762	YL	Reverse Proprietary Solenoid Switch
225	PK	Hydro Solenoid To Sensor	766	GN	Transmission Disconnect Solenoid
265	BK	Electronic Pump Control Id Code 2	911	YL	All Wheel Drive Mode Switch Jumper
			922	BR	Transmission Solenoid 2 Return
304	WH	Starter Relay #1 Output	923	GY	Transmission Solenoid 3 or 1 Return
306	GN	Key Switch To Starter Relay	975	WH	AutoShift Solenoid Return
307	OR	Key Switch To Neutral Start Switch	976	DR	Ride Control Solenoid 1
308	YL	Main Power Relay Coil	A250	BK	Battery (-)
309	GY	Alternator Regulator	A305	YL	Relay To Warning Horn(s)
310	PU	Start Aid Switch To Start Aid Solenoid	A313	OR	Stabilizer Alarm (+)
320	OR	Horn Switch To Horn Relay	A346	BU	Crank Driver Output - MSS
321	BR	Backup Alarm Lamp / Travel Alarm	A347	GN	Switch For Driver Output - MSS
322	GY	Forward Warning Horn	C511	WH	Relay Power
324	BU	Differential Lock Solenoid	C561	WH	Right Rear Speaker (+)
327	PK	Engine Shutdown Solenoid	C568	WH	HVAC Blower Motor (Mtr)
333	GN	Key Switch To Terminal	E528	PU	HVAC On/Off Switch To Blower Speed Sw
367	BU	Rear Warning Horn	E529	YL	Blower Switch Jumper
384	BU	Glow Plugs	E517	WH	Implement Lockout Switch (N.O.)
			E518	GN	Implement Lockout Switch (N.C.)
			E981	GY	Multi-Function Output 3
403	GN	Alternator (+) Terminal - Engine #1	F420	GN	Indicator - Warning
404	YL	Hydraulic Oil Pressure Sensor	F428	GN	Active Ride Control Switch (N.C.)
405	GY	Engine Oil Pressure Switch (Low)	F540	PU	Leak Driver 1
406	PU	Coolant Temperature	G423	PK	High Pressure Implement Filter 2
410	YL	Parking Brake Sensor	G703	GN	Quick Drop Valve
420	OR	Fuel Filter	G848	GN	Leak Driver 2
432	PK	Brake Oil Pressure	G861	PU	Travel Alarm Disable
439	YL	Indicator - Lamp	H771	BR	Sideshift Lock Solenoid
441	OR	Coolant Temperature Gage	J764	BR	Switch - Sensor Return
447	PK	Fuel Level Gage	M719	GN	Sideshift Left Switch
450	YL	Engine #1 Tachometer Sender (V)	M720	BU	Sideshift Left Relay
462	PU	Torque Converter Oil Temperature	M721	WH	Sideshift Right Switch
			MS36	BR	Flow Control Switch
			MS37	GN	Flow Control Proximity Switch
			N756	PK	Alarm Horn
500	BR	Wiper - Front (Park)	N839	GN	Ride Control Solenoid 2
501	GN	Wiper - Front (Low)	N845	OR	Front Brake Solenoid 1
502	OR	Wiper - Front (High)	N857	PK	RKD - Comm 1
503	BR	Wiper - Rear (Park)	N860	OR	TXD - Comm 1
506	PU	Washer - Front	N870	YL	DTB - Comm 1
507	WH	Washer - Rear	N873	BR	DCD - Comm 1
508	PU	Radio Speaker - Left (+)	N879	GN	Signal Ground - Comm 1
509	WH	Radio Speaker - Right (+)	R812	DR	Hydraulic Pedal Lock Solenoid
511	BR	Radio Speaker - Right (-)	X877	YL	Fuel Pump (+)
512	GN	Radio Speaker - Left (-)			
513	OR	A/C Refrigerant Pressure Switch			
515	GY	Hvac Blower Motor #1 (High)			
516	GN	Hvac Blower Motor #1 (Medium)			
517	BU	Hvac Blower Motor #1 (Low)			

Volume 2 - Component Location					
Component	Schematic Location	Machine Location	Component	Schematic Location	Machine Location
Alarm, Backup	G-11	1	Solenoid, Cold Start	E-2	4
Alternator	D-2	2	Solenoid, Differential Lock	F-3	10
Battery, HD/STD	F-4	3	Solenoid, Forward	I-3	10
Diode, Immobiliser	I-12	4	Solenoid, Fuel Shutoff	F-2	4
Horn, Forward	G-2	5	Solenoid, Left Side Shift	E-12	13
Motor, Blower	B-8	6	Solenoid, LH Lock Valve	C-10	14
Motor, Front Washer	H-2	6	Solenoid, Lock Out	D-12	13
Motor, Front Wiper	F-6	6	Solenoid, Reverse	I-3	10
Motor, Fuel Lift Pump	E-2	7	Solenoid, RH Lock Valve	B-10	15
Motor, Rear Washer	H-2	6	Solenoid, Right Side Shift	E-12	13
Motor, Rear Wiper	F-8	6	Solenoid, Side Shift Lock	G-12	1
Motor, Starter	D-3	8	Suppressor, Fuel Lift Pump	E-2	10
Plugs, Glow	D-2	4	Suppressor, HVAC	I-1	12
Radio, Product Link	B-3	3	Suppressor, Left Side Shift	E-12	13
Reader, Touchkey	I-8	A	Suppressor, Load Check Disable #1	B-10	14
Relay, A/C Shutoff	D-7	A	Suppressor, Load Check Disable #2	B-10	15
Relay, Crank Interlock	I-8	A	Suppressor, Lockout	D-12	13
Relay, Dead Engine Lower Command	A-10	9	Suppressor, Right Side Shift	D-12	13
Relay, Dead Engine Lower Enable	A-10	9	Suppressor, Side Shift #1	D-12	16
Relay, Fuel Lift Pump	E-2	8	Suppressor, Side Shift #2	C-12	16
Relay, High Speed	B-5	A	Switch, A/C Refrigerant Pressure	I-1	12
Relay, Solid State	H-12	4	Switch, Air Filter	H-2	17
Relay, Start	C-2	8	Switch, Blower Speed	B-8	A
Relay, Start Aid	D-2	8	Switch, Brake Fuel Level	F-2	6
Resistor, Excitation	D-2	10	Switch, Cold Start Temperature	E-3	7
Resistor, Motor Speed	A-8	A	Switch, Coolant Temperature	H-2	18
Sender, Conv. Temperature	G-2	8	Switch, Engine Oil Pressure	G-2	19
Sender, Coolant Temperature	H-2	2	Switch, Flood Detent Pressure	B-10	20
Sender, Fuel Level	G-2	11	Switch, Heater A/C	C-8	A
Sensor, Fuel Water Separator	I-2	6	Switch, Thermostat	A-8	A
Solenoid, A/C Compressor Clutch	I-1	12	Valve, Immobiliser	I-12	4
Solenoid, AYD	F-3	10			

Machine locations are repeated for components located close together.  
A = Located inside side console.

Volume 2 - Connector Location		
Connector Number	Schematic Location	Machine Location
CONN 4	B-5	21
CONN 5	G-8	16
CONN 6	F-8	16
CONN 7	D-10	16
CONN 8	G-8	16
CONN 9	I-8	20
CONN 10	B-12	20
CONN 12	I-7	20
CONN 14	I-5	22
CONN 15	B-5	3
CONN 16	F-11	23
CONN 17	E-11	24
CONN 18	H-2	25
CONN 19	A-7	26
CONN 20	A-7	26
CONN 21	B-8	21
CONN 22	B-2, B-4	3
CONN 23	F-3	4
CONN 24	I-2	12

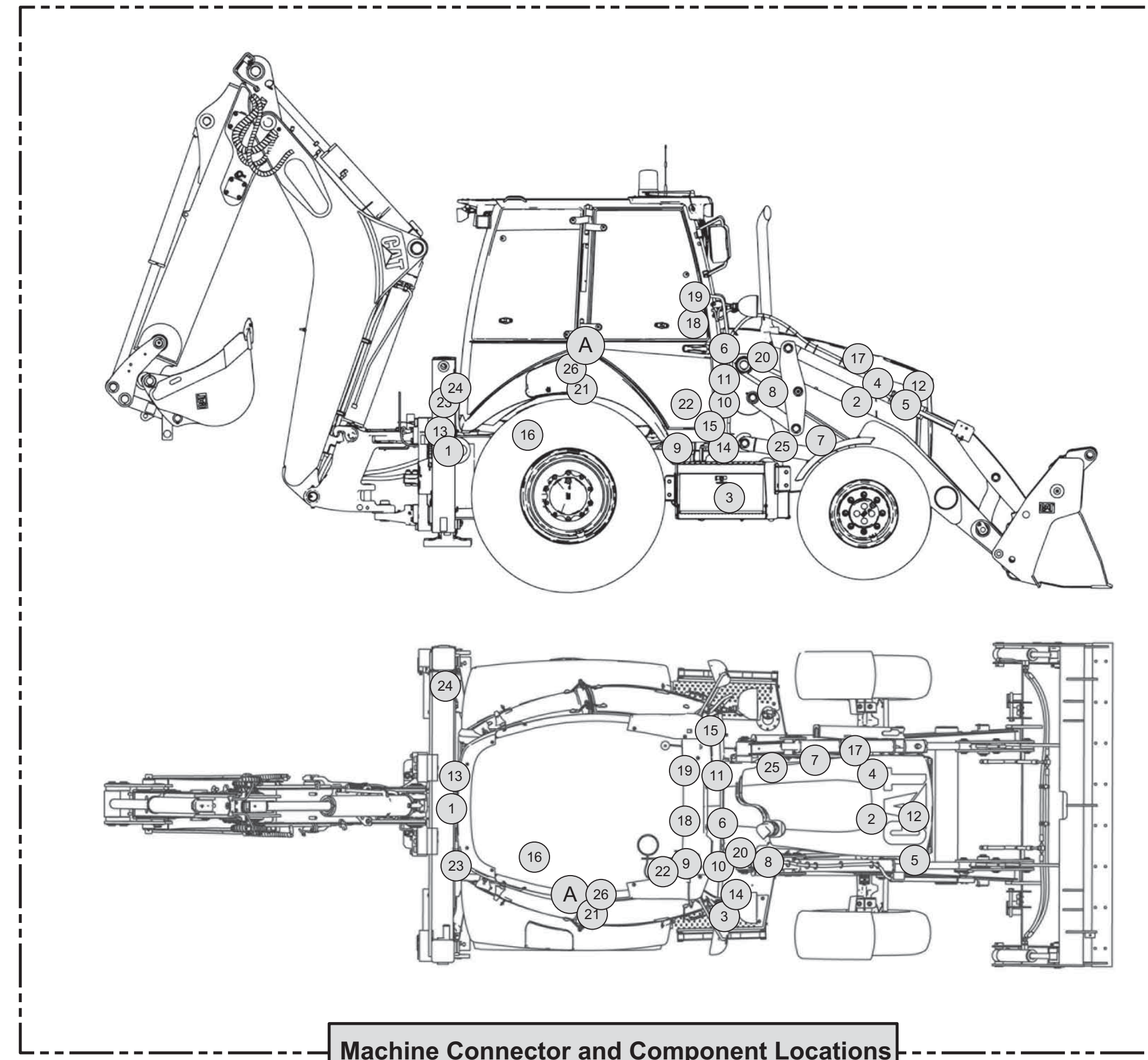
The connectors shown in this chart are for harness to harness connectors. Connectors that join a harness to a component are generally located at or near the component. See the Component Location Chart.

# Schematic

## 422E and 428E Backhoe Loader Electrical System

HBE1600-UP      428E: SNL2200-UP

### Volume 2 of 2: Engine and Chassis



### Harness And Wire Electrical Schematic Symbols

**Symbols**

**Prewire 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 (Wire):** 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**

Wires, Cable, or Harness Assembly Identification includes: Harness Identification Letters and Harness Connector Serialisation Codes (see sample).

Part Number for Connector Plug: AG-C4 111-7268

Part Number for Connector Receptacle: L-C12 3E-1173

Part Number for Connector Receptacle: L-C12 3E-6173

Plug

Receptacle

Pin or Socket Number

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

Fuse (5 Amps)

9X-1123

Component Part Number

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

Harness Identification Code: 325-AG135

PK-14

Wire Gauge

Wire Color

© 2013 Caterpillar  
All Rights Reserved

Printed in U.S.A.

Volume 2 - Resistor, Sender and Solenoid Specifications		
Part No.	Component Description	Resistance (Ohms) <sup>1</sup>
244-3106	Sender: Coolant Temperature	54°C (130°F) - 560 to 716 110°C (230°F) - 72 to 82
274-8034	Solenoid: Differential Lock, AWD	
273-3525	Solenoid: Lockout	8.8
4W-9972	Sender: Conv. Temperature	54°C (130°F) - 560 to 716 110°C (230°F) - 72 to 82
251-3231	Sender: Fuel Level (EAME)	Empty - 240 to 250 Full - 28 to 33
202-7160	Solenoid: Left Side Shift, Right Side Shift	10.2 ± 0.6
214-4302	Solenoid: A/C Compressor Clutch	3.2

<sup>1</sup> At room temperature unless otherwise noted.

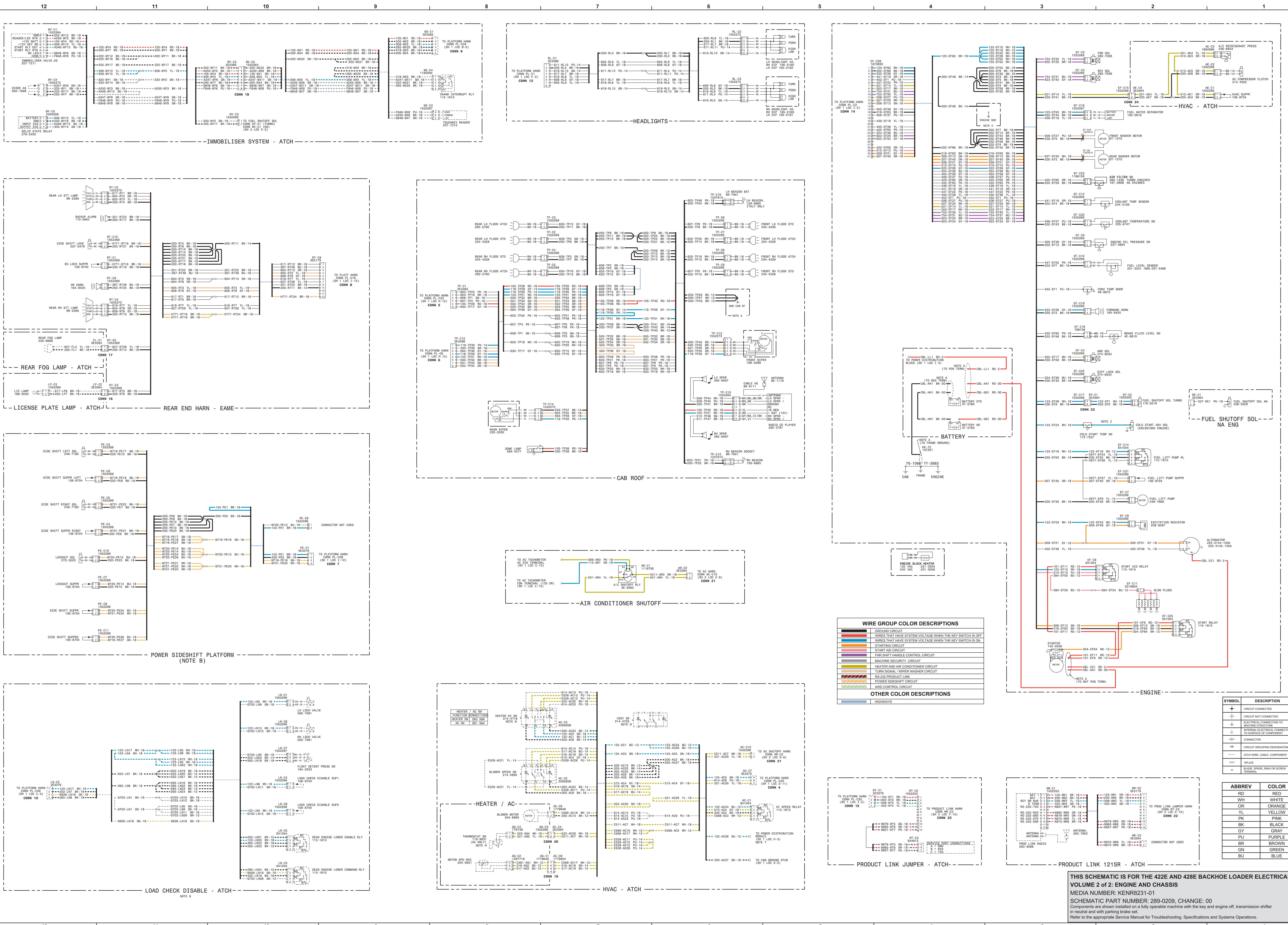
Volume 2 - Off Machine Switch Specification				
Part No.	Function	Actuate	Deactuate	Contact Position
119-9631	Thermostat Switch	<0.6 ± 1.4°C (31 ± 2.5°F)	4.2 ± 1.4°C (39.5 ± 2.5°F)	Normally Closed
236-6923	A/C Refrigerant Switch	275 kPa MAX* (40 psi)	170 ± 95 kPa (24.6 ± 8 psi)	Normally Open <sup>†</sup>
194-2563	Flood Detent Pressure	2200 kPa Max (318 ± 4 psi)	1800 ± 175 kPa (261 ± 25 psi)	Normally Closed

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 (25psi).

<sup>†</sup> Contact position at the contacts of the harness connector.

Related Electrical Service Manuals		
Title	Form Number	
Electric Starting Motor	143-0539	SENK308





**WIRE GROUP COLOR DESCRIPTIONS**

[Red]	GROUND CIRCUIT
[Blue]	WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS OFF
[Green]	WIRES THAT HAVE SYSTEM VOLTAGE WHEN THE KEY SWITCH IS ON
[Yellow]	STARTING CIRCUIT
[Purple]	START AID CIRCUIT
[Orange]	TRN SHFT HANDLE CONTROL CIRCUIT
[Pink]	MACHINE SECURITY CIRCUIT
[Light Blue]	HEATER AND AIR CONDITIONER CIRCUIT
[Light Green]	TURNS SIGNAL / WIPER WASHER CIRCUIT
[Light Purple]	16-20 PRODUCT LINK
[Light Orange]	POWER SIDESHIFT CIRCUIT
[Light Yellow]	OTHER COLOR DESCRIPTIONS
[Dashed]	HIGHWAYS

**SYMBOL DESCRIPTION**

[Solid line]	CIRCUIT CONNECTED
[Dashed line]	CIRCUIT NOT CONNECTED
[Arrow]	ELECTRICAL CONNECTION TO MACHINE STRUCTURE
[Downward arrow]	INTERNAL ELECTRICAL CONNECTION TO SOURCE OF COMPONENT
[T-junction]	CONNECTOR
[Wavy line]	CIRCUIT GROUPING DESIGNATION
[Circle]	ATTACH/ WIRE, CABLE, COMPONENT
[Dotted line]	SPLICE
[Square]	BLACK, BRN, GRN OR SCREW TERMINAL

**ABBREV COLOR**

RD	RED
WH	WHITE
OR	ORANGE
YL	YELLOW
PK	PINK
BK	BLACK
GY	GRAY
PLU	PURPLE
BR	BROWN
GN	GREEN
BU	BLUE

THIS SCHEMATIC IS FOR THE 422E AND 428E BACKHOE LOADER ELECTRICAL SYSTEM VOLUME 2 of 2: ENGINE AND CHASSIS  
 MEDIA NUMBER: KENR8231-01  
 SCHEMATIC PART NUMBER: 289-2009, CHANGE: 00  
 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.