PATRIOT® 4420 Sprayer

Service Manual

Book 1
General, Engine, Electrical

84190697
Issued February, 2009
First Printing

CASE IH AGRICULTURE

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NOTE: *Engine repair information is not contained within this service manual. For engine repair on this machine see 87515687 Agricultural Products Service Manuals 8.3 and 9.0L 6 Cylinder, 24 Valve CNH Engine With High Pressure Common Rail Fuel System.*

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SAFETY

Understand that your safety and the safety of other persons is measured by how you operate and service this machine. Know the positions and operations of all controls before you try to operate them. **MAKE SURE YOU CHECK ALL CONTROLS IN A SAFE AREA BEFORE STARTING YOUR WORK.**

READ THIS MANUAL COMPLETELY and make sure you understand the controls.

The safety information given in this manual does not replace safety codes, insurance needs, federal, state and local laws. Make sure your machine has the correct equipment needed as designated by the local laws and regulations.

CNH America LLC is continuing to work for your safety and protection by giving these rules for safe operation.

> ⚠ **WARNING:** *THIS SAFETY ALERT SYMBOL INDICATES IMPORTANT SAFETY MESSAGES IN THIS MANUAL. WHEN YOU SEE THIS SYMBOL, CAREFULLY READ THE MESSAGE THAT FOLLOWS AND BE ALERT TO THE POSSIBILITY OF DEATH OR SERIOUS INJURY.*
>
> M171C

⚠ Personal Safety ⚠

Throughout this manual and on the machine's safety decals, you will find precautionary statements: **DANGER**, **WARNING**, or **CAUTION** followed by specific instructions or ISO two panel safety pictorial symbols. These precautions are intended for your personal safety.

Failure to follow the **DANGER**, **WARNING,** or **CAUTION** instructions may result in serious bodily injury or death.

- **DANGER:** Indicates an immediate hazardous situation that, if not avoided, will result in death or serious injury. The color associated with Danger is RED.
- **WARNING:** Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury. The color associated with Warning is ORANGE.
- **CAUTION:** Indicates a potentially hazardous situation that, if not avoided, could result in minor or moderate injury. It may also be used to alert against unsafe practices. The color associated with Caution is YELLOW.

ISO two panel **pictorial symbol decals** are defined as follows:

- The first panel indicates the nature of the hazard.
- The second panel indicates the appropriate avoidance of the hazard.
- Background color is YELLOW.
- Prohibition symbols such as and if used, are RED.

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TORQUE SPECIFICATIONS - U.S. HARDWARE

IMPORTANT: *If replacing hardware must use the hardware noted in this machine's parts manual.*

IMPORTANT: *The torque specifications listed in this section are for original fasteners and fasterners listed in the parts manual for this machine.*

NOTE: *Engine hardware requires different torque specifications. For engine torque specifications see Agricultural Service Manual for the engine installed in this machine.*

Use the torques in this chart when special torques are not given.

These torques apply to fasteners with both UNC and UNF threads as received from suppliers dry, or when lubricated with engine oil. Not applicable if special graphites, moly disulfide greases, or other extreme pressure lubricants are used.

U.S. Hardware With ZND Finished Nuts, Bolts And Studs

NOTE: *The ZND finish is a silver-yellow coloring.*

The ZND finish is a zinc dichromate finish. This coating is for corrosion protection.

Grade 5 Bolts, Nuts, and Studs

Size	Newton metres	Inch Pounds
1/4 inch	12 to 15	106 to 132
5/16 inch	23 to 28	204 to 252
3/8 inch	48 to 57	420 to 504
Size	Newton metres	Foot Pounds
7/16 inch	73 to 87	54 to 64
1/2 inch	109 to 130	80 to 96
9/16 inch	149 to 179	110 to 132
5/8 inch	203 to 244	150 to 180
3/4 inch	366 to 439	270 to 324
7/8 inch	542 to 651	400 to 480
1.0 inch	787 to 944	580 to 696
1-1/8 inch	1085 to 1193	800 to 880
1-1/4 inch	1519 to 1681	1120 to 1240
1-3/8 inch	1980 to 2278	1460 to 1680
1-1/2 inch	2631 to 2983	1940 to 2200

Grade 8 Bolts, Nuts, and Studs

Size	Newton metres	Inch Pounds
1/4 inch	16 to 20	144 to 180
5/16 inch	33 to 39	288 to 348
3/8 inch	61 to 73	540 to 648
Size	Newton metres	Foot Pounds
7/16 inch	95 to 114	70 to 84
1/2 inch	149 to 179	110 to 132
9/16 inch	217 to 260	160 to 192
5/8 inch	298 to 358	220 to 264
3/4 inch	515 to 618	380 to 456
7/8 inch	814 to 976	600 to 720
1.0 inch	1220 to 1465	900 to 1080
1-1/8 inch	1736 to 1953	1280 to 1440
1-1/4 inch	2468 to 2712	1820 to 2000
1-3/8 inch	3227 to 3688	2380 to 2720
1-1/2 inch	4285 to 4827	3160 to 3560

NOTE: *Use thick nuts with Grade 8 bolts.*

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MAINTENANCE SCHEDULE

NOTE: *For torque specifications not listed, see section 1000 Standard Torque. If replacing hardware must use the hardware noted in this machine's parts manual.*

Recommended Break-In Maintenance

The following maintenance is required for first time required maintenance and whenever the component is changed or overhauled. Regularly scheduled maintenance is still required in addition to the break-in maintenance.

HOURS	SERVICE POINTS	SERVICE REQUIRED						
		GREASE	DRAIN	CHECK	CLEAN	CHANGE	FILL	TORQUE
8	Wheel Nuts							x
50	Hub Lubricant					x	x	
50	Air Conditioning Belt			x				
50	Hydraulic Return Filter					x		
50	Charge Pump Filters					x		
50	Battery Cables And Terminals			x				
100	Pump Drive Lubricant					x	x	
100	Engine Oil					x	x	
100	Engine Oil Filter					x		
100	Fuel Filter					x		
100	Engine Air Filter			x				

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Hub Lubricant Replacement

IMPORTANT: *The oil can be warm and under slight pressure - use caution when removing the plug and draining the oil.*

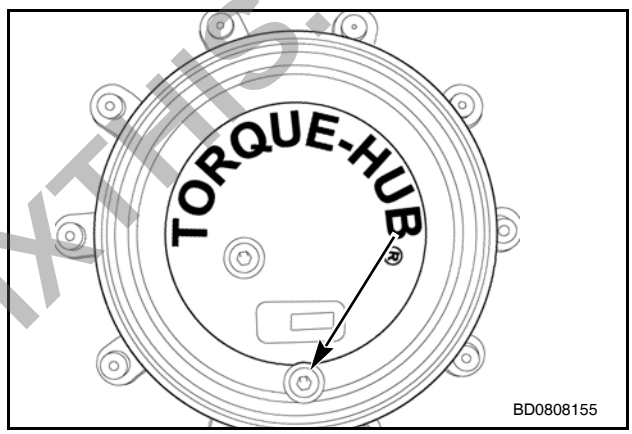
IMPORTANT: *Hub lubricant needs to be changed after the first 50 hours of operation and anytime the hubs or gear are changed.*

STEP 1

Park the sprayer on level ground.

STEP 2

Turn the hub until the drain plug is at the bottom.



STEP 3

Remove the drain plug and drain the oil.

NOTE: *For best results drain the oil when the oil is warm but use caution when removing the plug.*

NOTE: *It may be necessary to remove fill plug to drain the hub.*

STEP 4

Insert the drain plug. Add oil back into the hub. See Hub Lubricant Level Check on Page 14 in this section.

STEP 5

1. If the hub is overfull, drain to proper level.
2. Recheck after two hours of operation.
3. If it is overfull again it is likely the wheel motor has a shaft seal that is leaking hydraulic oil into the hub and will have to be replaced. See Wheel Motor Seal Replacement in section 8050.

NOTE: *See section 1030 for total oil capacity of each hub.*

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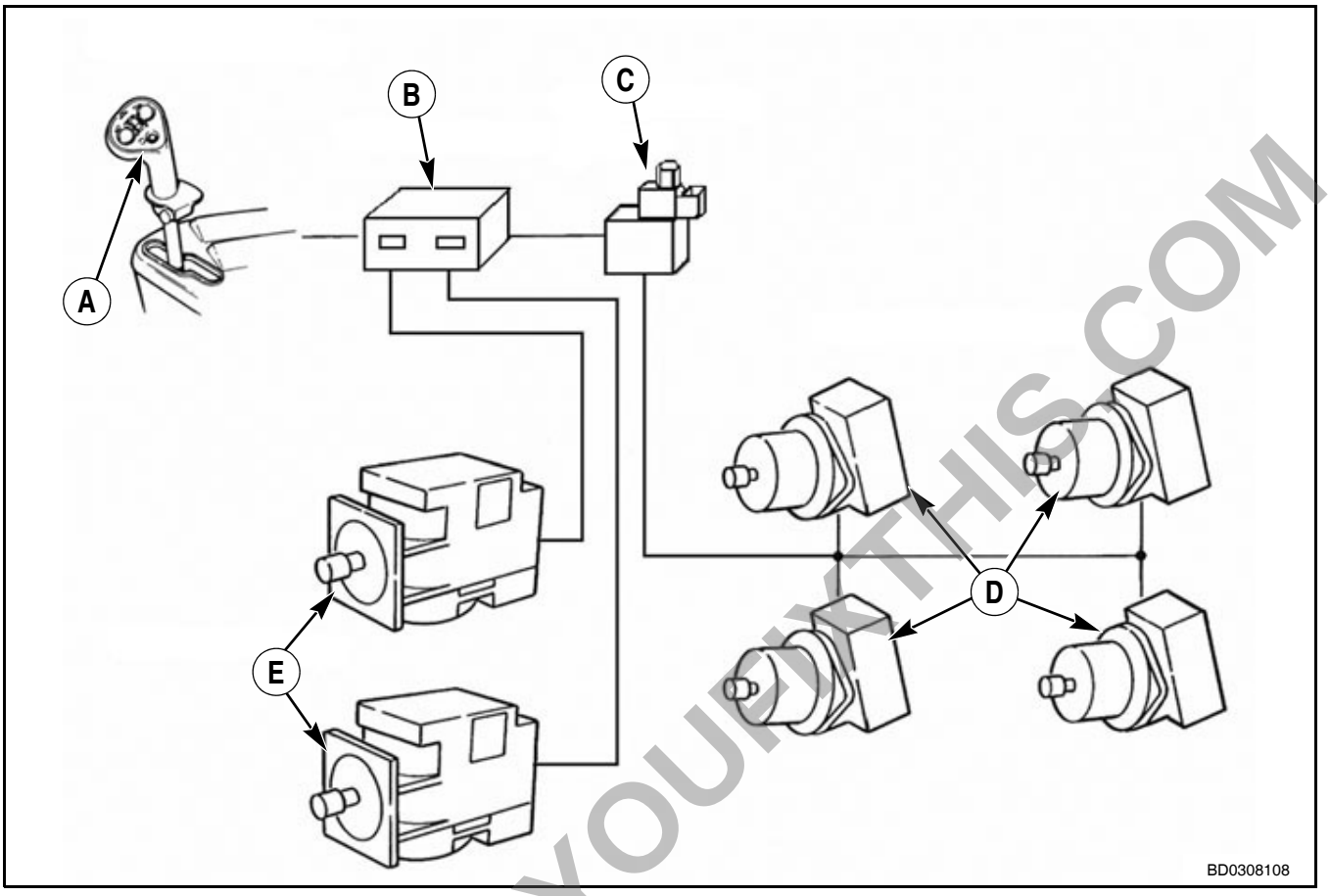
Hydraulic Component Schematics



A. Hydrostat Lever
B. Power Train Control Module
C. Motor Control Valve
D. 51 Series Wheel Motors
E. 90 Series Pumps

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ECU Error Codes

ECU Error Code	Code Meaning
1015	Seat switch may be stuck closed.
3020	GOV ENGINE speed data is “ERROR” or “NOT AVAILABLE” state from GOV.
3022	Engine Overspeeding.
5010	ENGINE Oil pressure data is “ERROR” or “NOT AVAILABLE” state from GOV.
5011	ENGINE Oil pressure sensor voltage out of range low.
10031	Loss of valid engine hours.
10032	Loss of System configuration information (vehicle model, controller configuration).
10033	Loss of Customer configuration information (tire radius, radar cal, units settings).
10034	Loss of valid Fuel Table.
10035	Service EEPROM checksum error.
10036	Displayed data EEPROM checksum error.
10037	Implement width EEPROM checksum error.
10038	Loss of valid remote timer data.
11011	Fuel level sensor voltage out of range low.
12091	GOV off line.
13010	ENGINE coolant temperature data is “ERROR” or “NOT AVAILABLE” state from GOV.
13011	ENGINE coolant temperature sensor voltage out of range low.
13012	ENGINE coolant temperature sensor voltage out of range high.
13021	Transmission Oil Temperature sensor voltage out of range low.
13040	Engine Intake Air Temperature data is “ERROR” or “NOT AVAILABLE” state from GOV.
13045	Accelerator pedal voltage out of range high or low.
53001	ECU2 module configuration is incorrect.
53002	Air to Air sensor installation does not match vehicle model configuration.

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CHASSIS/CAB TROUBLESHOOTING CHARTS

Stop Engine Light Troubleshooting Chart

Symptom	Possible Cause	Corrective Action
Engine stop light on and engine will not operate over 1500 RPM.	Hydraulic oil level indicating too low.	Fill hydraulic tank. See Hydraulic Oil Tank Filling section 8020.
		Check the oil warning sensor and wiring. See Hydraulic Caution Or Warning Light Troubleshooting Chart on Page 79 in this section.
Engine stop light on and engine operates normally.	Engine oil pressure indicating too low.	Check fill engine oil to the proper level. See Specification section 1030 for correct engine oil
		Troubleshoot the engine oil system. See the Agricultural Engine Service Manual.
	Engine coolant temperature indicating too high.	Check and fill the engine coolant. See Specification section 1030 for correct engine coolant.
		Clean the radiator fins. See Radiator Assembly Cleaning section 9030.
		Troubleshoot the engine coolant system. See the Agricultural Engine Service Manual.
	Engine coolant level indicating too low.	Check and fill the engine coolant. See Specification section 1030 for correct engine coolant.
		Troubleshoot the engine coolant system. See the Agricultural Engine Service Manual.
	Hydraulic oil level indicating too low.	Fill hydraulic tank. See Hydraulic Oil Tank Filling section 8020.
		Test the oil warning sensor and wiring. See Hydraulic Caution Or Warning Light Troubleshooting Chart on Page 79 in this section.

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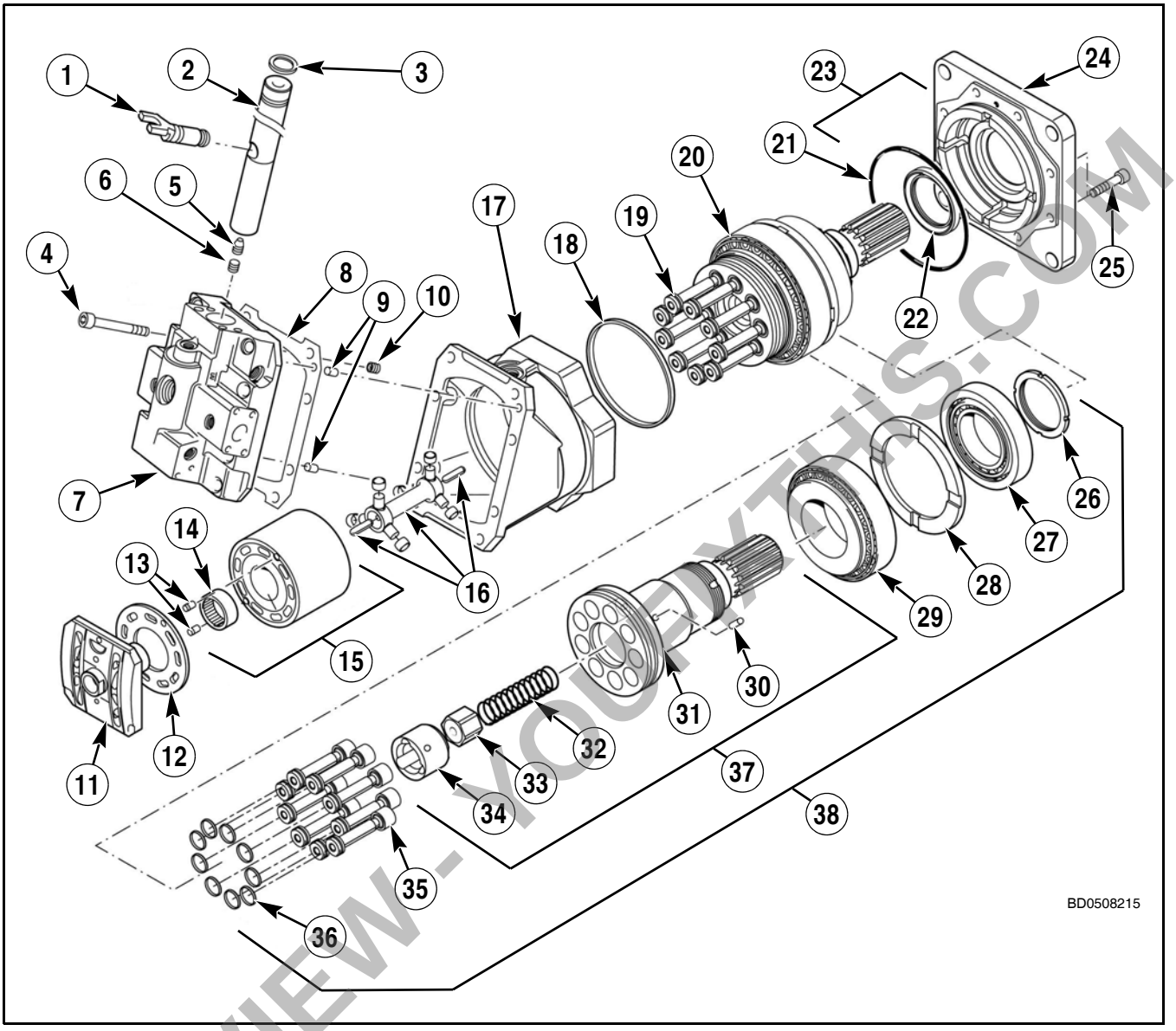
Wheel Motor Exploded View



1. Feedback Fork/Setting Lug
2. Servo Piston
3. Glide Ring
4. Cap Screws
5. Cone Point Set Screw
6. Lock Screw
7. End Cap
8. Gasket
9. Alignment Pins
10. Set Screw
11. Valve Segment
12. Bearing Plate
13. Locating Pins
14. Cylinder Block Bearing
15. Cylinder Block Assembly
16. Synchro Shaft Assembly
17. Main Housing
18. Speed Sensor Ring
19. Piston Assemblies
20. Output Shaft Assembly
21. O-ring
22. Shaft Seal
23. Retaining Flange Assy.
24. Retaining Flange
25. Screw - 6mm
26. Retaining Nut
27. Small Shaft Bearing
28. Internal Spring
29. Large Shaft Bearing
30. Hardened Steel Pins
31. Shaft
32. Internal Spring
33. Spring Seat
34. Synchro Shaft Insert
35. Piston Assemblies
36. Piston Rings
37. Output Shaft
38. Output Shaft Assembly

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INTERFACE CAB/APPLICATION

SEE APPLICATION SCHEMATIC FOR DETAILS OF THE OTHER HALF OF THE INTERFACE CONNECTORS FOR NECESSARY COMPONENTS TO COMPLETE THE VEHICLE SCHEMATIC.

THIS CONNECTOR IN LOCATED IN THE ELECTRICAL BAY AMD CONNECTS TO THE COMPARTMENT HARNESS.

P080 CONNECTOR

	PIN	FUNCTION	FUNCTION	PIN	
(36) [152]	01	SW PWR F20	FLOWMETER GROUND	36	[726]
(36) [153]	02	SW PWR F21	FLOWMETER SIGNAL	37	[727]
(36) [154]	03	SW PWR F18	POWER CNTRL	38	[757] (30)
(36) [155]	04	ACC PWR F42	MAIN AUGAR	39	[744] (30)
(36) [156]	05	ACC PWR F43	BOOM ON SIG	40	[743] (30)
	06	OPEN	BRAKE LIGHT SIGNAL CNTRL	41	[232] (11)
(12) [174]	07	PLUS1 POWER	RH FENCE ROW	42	[608]
(12) [147]	08	NEUTRAL CNTRL	BOOM SECTION #1	43	[601]
(36) [351]	09	REVERSE SIGNAL	BOOM SECTION #2	44	[602]
(28) [503]	10	NOT NEUTRAL	BOOM SECTION #3	45	[603]
(12) [037]	11	PARK BRAKE–	BOOM SECTION #4	46	[604]
(28) [526]	12	LEFT REV	BOOM SECTION #5	47	[605]
(28) [527]	13	LEFT FWD	BOOM SECTION #6	48	[606]
(16) [219]	14	MARKER/BLITES LIGHT	BOOM SECTION #7	49	[607]
(28) [706]	15	2SP ON / AXLE IN	LH FENCE ROW	50	[600]
(28) [707]	16	AUX DRIVE ON /AXLE OUT	SPARGE PSI SIG	51	[616] (30)
(27) [750]	17	DE–ACEL(ALT DROOP)	BOOM PSI SIG	52	[617] (30)
(28) [062]	18	GROUND (SX)	LH FOAM	53	[521] (30)
(31) [535]	19	CRUISE ON/OFF	RH FOAM	54	[522] (30)
(31) [536]	20	CRUISE RESUME	SENSOR/RADAR PWR	55	[135] (29)
(31) [537]	21	CRUSE SET	RADAR SIGNAL	56	[533] (28)
(31) [404]	22	THROTTLE POT +5 V	RADAR PRESENT	57	[534] (28)
(31) [405]	23	THROTTLE POT GROUND	CLEAN GROUND	58	[035] (30)
(31) [406]	24	THROTTLE POT SIGNAL	GAUGE EXCITE	59	[170] (30)
(31) [407]	25	ON IDLE VALID	PARK BRAKE ON	60	[502] (12)
(31) [408]	26	OFF IDLE VALID	LH STABLIZER ON	61	[747] (30)
(30) [742]	27	PUMP ON SIG	RH STABLIZER ON	62	[748] (30)
(28) [765]	28	2SP OFF	RIGHT FWD	63	[528] (28)
(28) [767]	29	AUX DRIVE OFF	RIGHT REV	64	[529] (28)
(19) [157]	30	BOOM LITES	MOTOR CNTRL	65	[530] (28)
(32) [701]	31	4WHEEL ON	PSI SENSOR RET.	66	[059] (30)
[722]	32	P_PUMP / PWM (CNTRL)	APP CAN BAT (J1939)	67	[C25R] (34)
[723]	33	P_PUMP +	APP CAN GND (J1939)	68	[C25B] (34)
(32) [614]	34	4WHEEL OFF	APP CAN LOW (J1939)	69	[C25G] (34)
[725]	35	FLOWMETER POWER	APP CAN HIGH (J1939)	70	[C25Y] (34)

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Patriot 4420

Cab, Engine & Frame Electrical Schematic

For Serial Numbers Y9T024763 and Lower

84202154
Issued February, 2009

CASE IH

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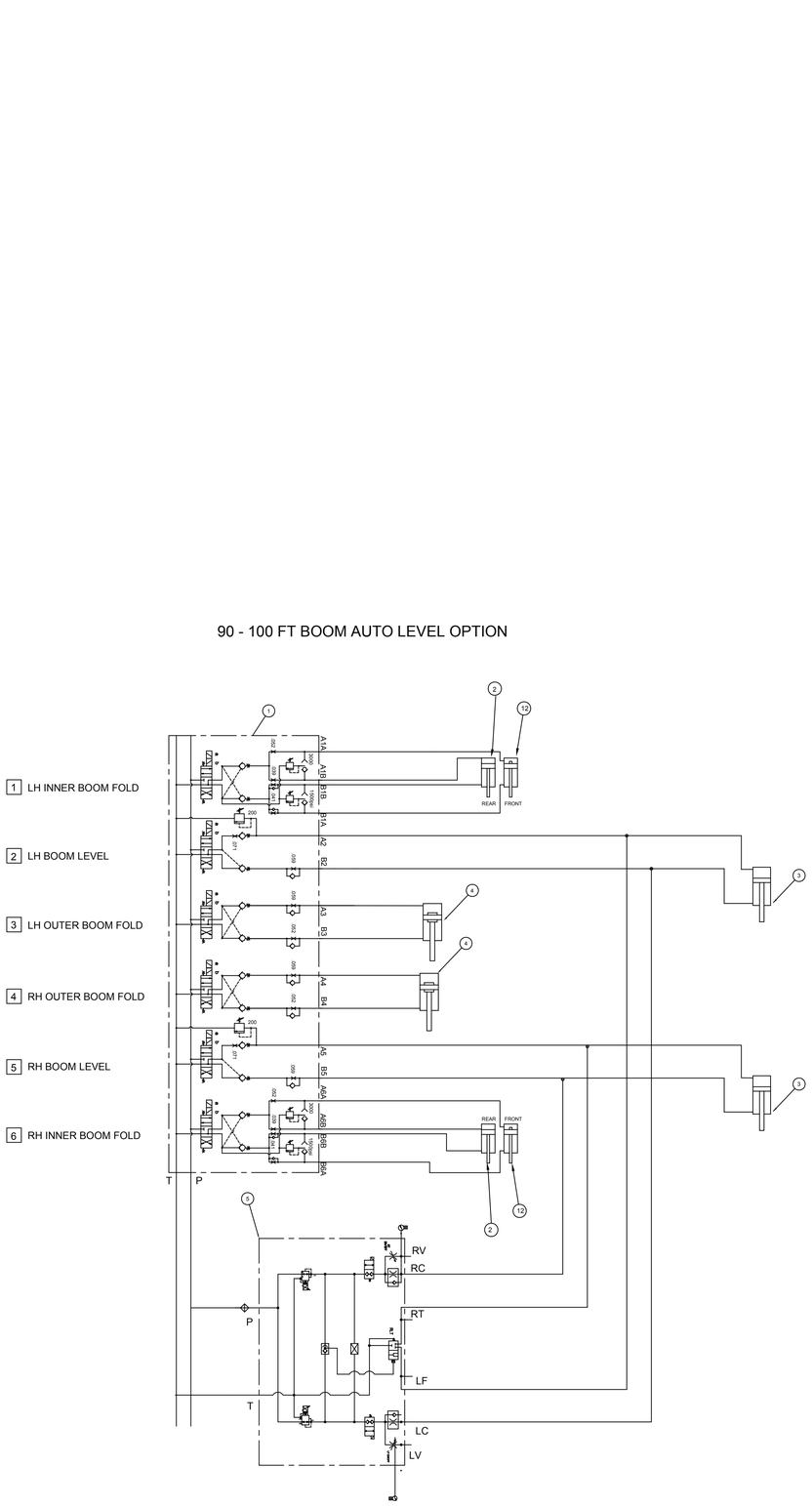
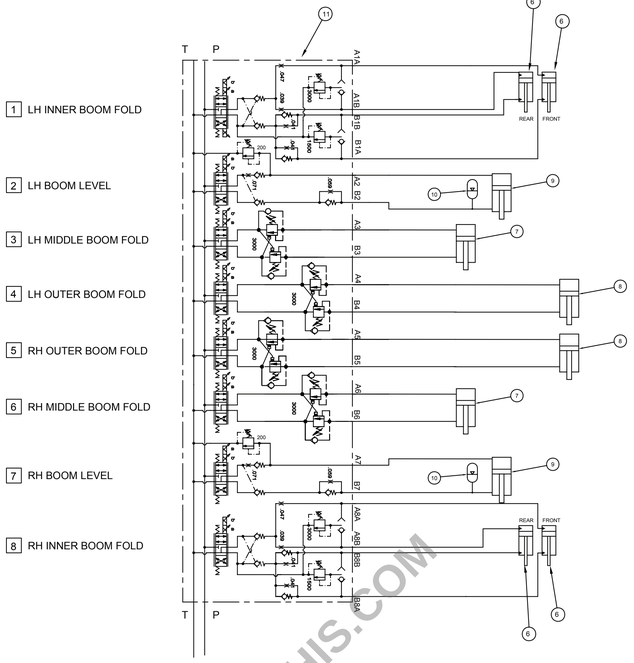
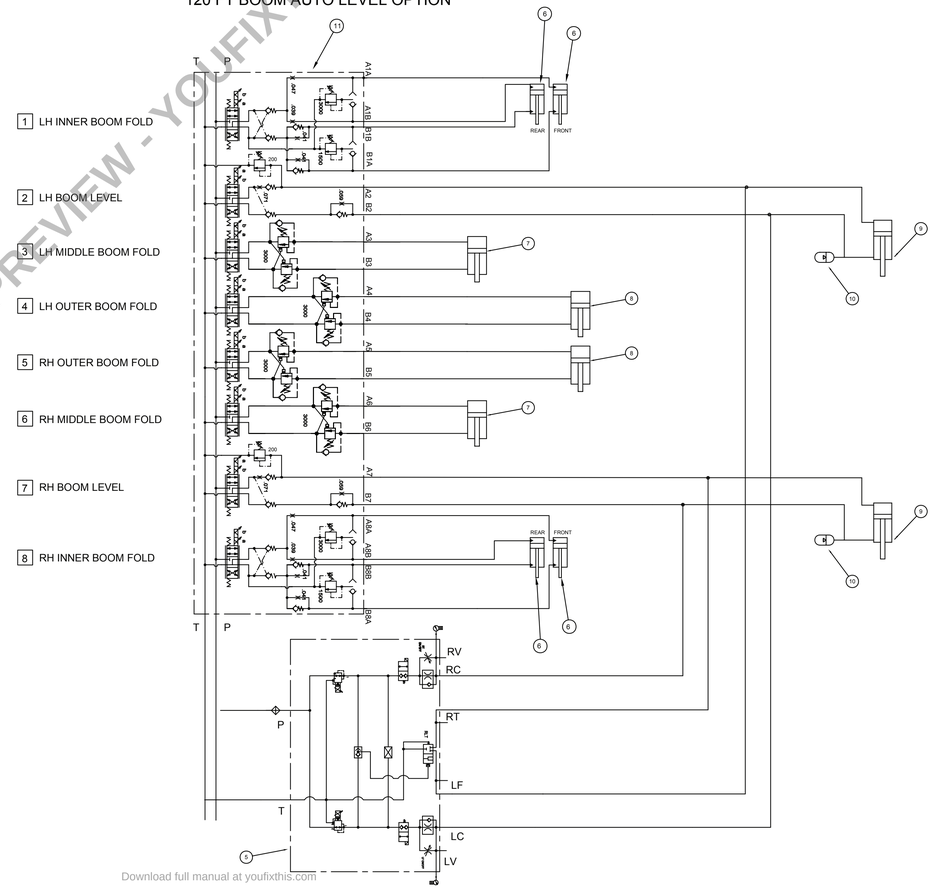
90 - 100 FT BOOM AUTO LEVEL OPTION



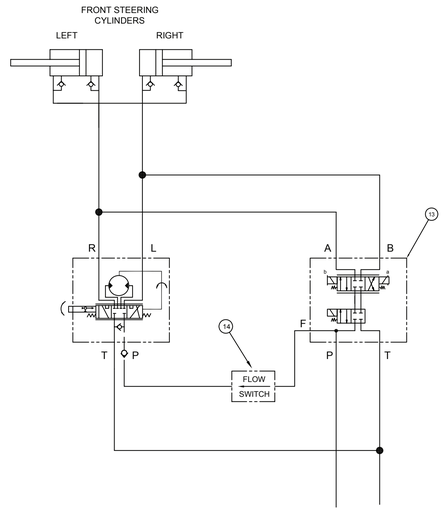
120 FT BOOM OPTION



120 FT BOOM AUTO LEVEL OPTION



AUTO STEER OPTION



ITEM	DESCRIPTION	QTY.
14	FLOW SWITCH	1
13	VALVE, MANIFOLD	1
12	CYL., RH & LH INNER BOOM FOID CUSHIONED	2
11	8- SECTION VALVE BANK, 120 FT	1
10	ACCUMULATOR	2
9	CYL., RH & LH BOOM LEVEL 120 FT	2
8	CYL., OUTER TIP FOLD 120FT	2
7	CYL., MID BOOM FOLD 120FT	2
6	CYL., RH & LH INNER BOOM FOID 120 FT	4
5	VALVE RAVEN AUTO LEVEL	1
4	CYL., OUTER BOOM FOLD CUSHIONED	2
3	CYL., RH & LH BOOM LEVEL	2
2	CYL., RH & LH INNER BOOM FOID	2
1	6 - SECTION VALVE BANK, 90/100FT	1

PATRIOT 4420 SPRAYER HYDRAULIC SCHEMATIC

84202156

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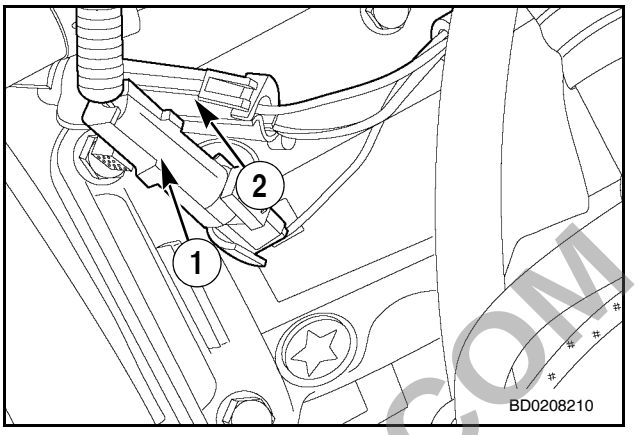
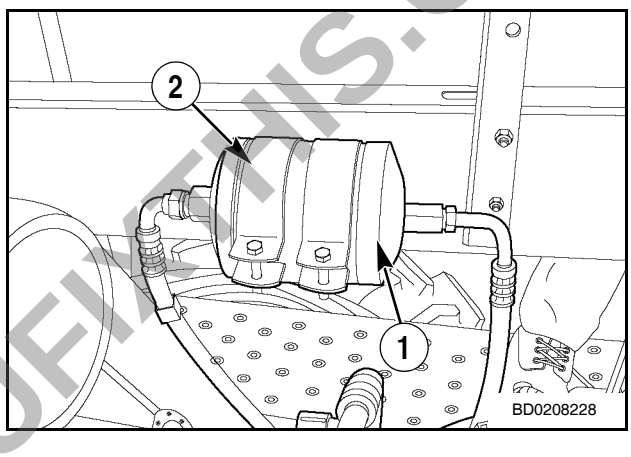
STEP 24

Connect the A/C clutch **(1)** and A/C safety switch **(2)** wire connectors to the compressor.



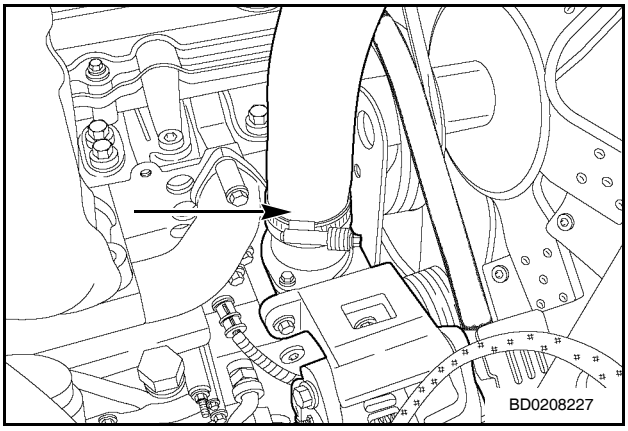
STEP 25

Install the receiver drier **(1)** and tighten the straps **(2)**.



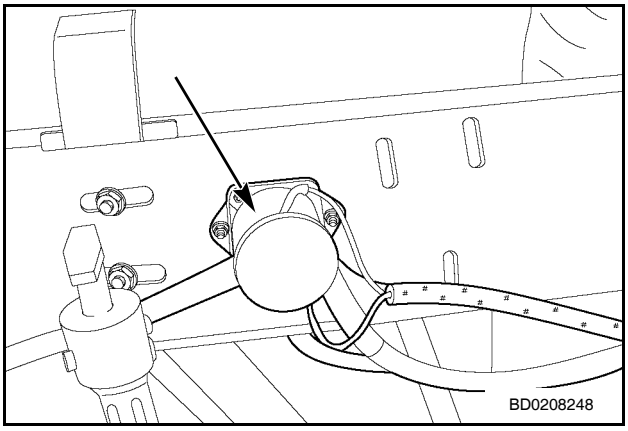
STEP 26

Install the upper radiator hose and secure with clamp.



STEP 27

Install the engine grid heater relay onto left rail and secure with hardware.



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Back-up Alarm Trouble Shooting Chart

Symptom	Possible Cause	Corrective Action
Back-up alarm does not operate.	Wiring faulty. Alarm faulty.	Test back-up circuit. See Back-Up Alarm on Page 87 in this section.
	Reverse switch faulty or out of adjustment.	Repair or replace faulty component. Adjust switch. See Reverse Switch Adjustment on Page 174 in this section.

Power Mirror Troubleshooting Chart

Symptom	Possible Cause	Corrective Action
Power mirrors do not work.	Fuse #34 faulty.	Check fuse and replace if necessary
	Power supply or ground is faulty.	Test power mirror power and supply. See Power Mirror Switch Power and Ground Supply Test on Page 99 in this section.
Right side power mirror does not work or up and down movement inoperable.	Mirror switch faulty.	Test power mirror switch. See Power Mirror Switch Test on Page 100 in this section.
	Mirror assembly or wiring faulty.	Test right mirror circuit. See Right Mirror Circuit Test on Page 97 in this section.
Left side power mirror does not work or up and down movement inoperable.	Mirror switch faulty.	Test power mirror switch. See Power Mirror Switch Test on Page 100 in this section.
	Mirror assembly or wiring faulty.	Test right mirror circuit. See Left Mirror Circuit Test on Page 98 in this section.

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Capacity (Load) Test

The capacity of a battery is the ability to give current and maintain voltage. If the battery passes the capacity test, the battery is in satisfactory condition. However, the battery may need additional charging.

When a battery is cold, below 27°C (80°F), the battery can have a lower discharge capacity. If a cold battery fails the capacity test, let the battery stand until the temperature reaches 27°C (80°F). Then test the battery again.

Procedure

1. Turn the load control knob on the tester to the OFF position.
2. Turn the voltage switch on the tester to 16 volts for a 12 volt battery.
3. Connect the tester wires as shown:
   A. Red clips to battery positive post.
   B. Black clips to battery negative post.

NOTE: *The wire clips from the voltmeter side of the tester must contact the battery posts.*

4. Turn the load control knob clockwise until the ampere hour rating of the battery is reached. If the tester is not equipped with an ampere hour rating scale, set the load control at three times the ampere hour rating of the battery.

EXAMPLE: 180 amperes for a 60 ampere hour battery.

NOTE: *If the battery being tested has been made for use in high temperature climates, set the load control at two and a half times the ampere hour rating of the battery.*

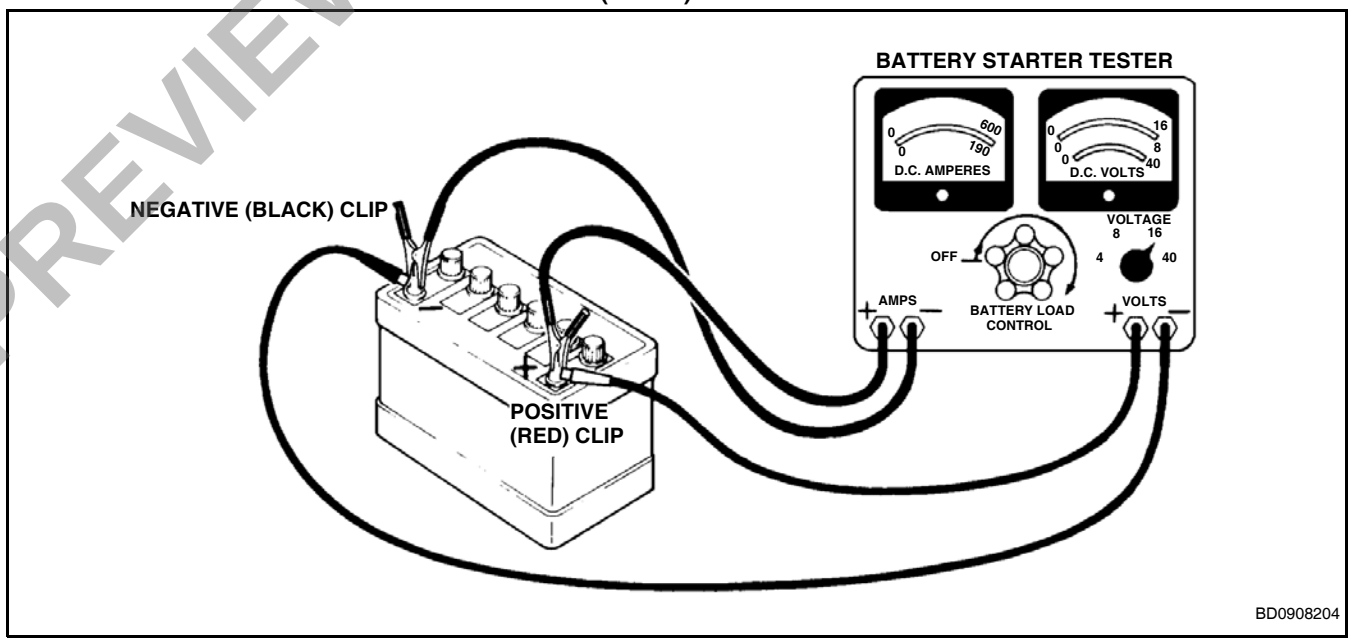
5. Only apply the load on the battery for 15 seconds. Check voltmeter figure and turn load control counterclockwise to the OFF position.

If the voltmeter reading was in the green band or at least 9.6 volts for a 12 volt battery, the battery has good output capacity. Test the specific gravity of the battery and charge if necessary before putting in service.

If the voltmeter reading varied by more than 0.1 volts, the battery has one or more defective cells.

If the voltmeter reading was below 9.6 volts for a 12 volt battery, do the Three Minute Charge Test to see if the battery is discharged or defective.

CAPACITY (LOAD) TEST HOOK UP



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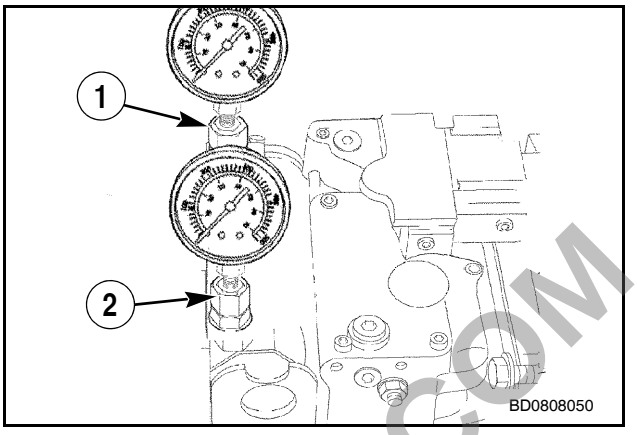
STEP 2

Install a gauge in the M4 port **(1)** and a gauge in the M5 port **(2)** on the same hydrostatic pump.

NOTE: *Gauges installed in these ports monitor the command from the hydraulic displacement control on the pump.*

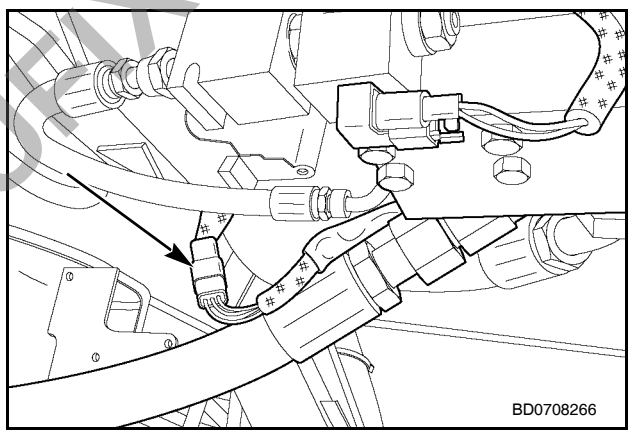


STEP 3

Disconnect the parking brake quick coupler. See PARKING BRAKE SYSTEM on Page 47 in this section.

STEP 4

Disconnect the EDC control.



STEP 5

Properly anchor the machine so it will not move unexpectedly or raise the machine so all four wheels are off the ground and properly support the machine with jackstands.

STEP 6

Start the engine and operate at high engine idle (2260 RPM).

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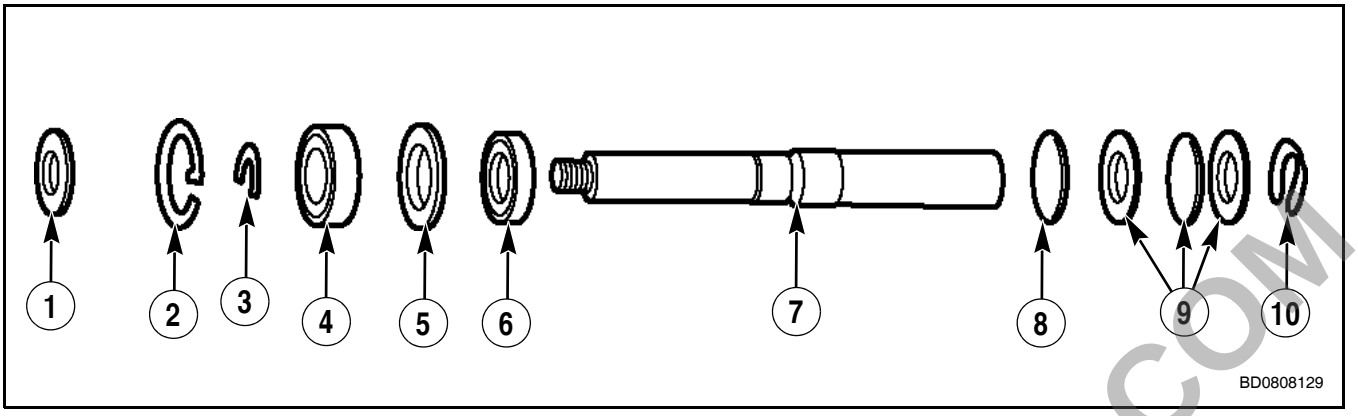
Product Pump Motor Shaft Disassembly and Repair



1. Slinger ring
2. Retaining ring
3. Snap ring
4. Ball bearing
5. Spacer
6. Shaft seal
7. Shaft
8. Seal spacer
9. Thrust bearing assembly
10. Large retaining ring

STEP 1

Remove large retaining ring **(8)** from shaft **(7)**. Remove thrust bearing assembly **(9)** from the shaft **(7)** and the seal spacer **(8)**.

NOTE: *Thrust bearing assembly **(9)** includes the thrust bearing and two thrust bearing races.*

STEP 2

Remove the small retaining ring **(3)** next to the shaft ball bearing **(4)**.

NOTE: *The slinger ring **(1)** and retaining ring **(2)** were removed when the shaft was removed from the motor housing.*

STEP 3

To remove the bearing from the shaft **(7)**, place the shaft (threaded end up) in a press. Press the shaft through the ball bearing **(4)**, seal spacer **(5)** and seal **(6)**.

STEP 4

Inspect the sealing area of the shaft **(7)** for wear. Inspect other shaft assembly components for wear and replace if necessary.

STEP 5

> **WARNING:** *When using solvents, acids or alkaline materials for cleaning, follow the manufacturer's recommendations for use. Wear goggles and protective clothing to reduce the possibility of personal injury. Failure to comply could result in death or serious injury.*
>
> M995A

While motor is completely disassembled, clean all parts in a solvent bath.

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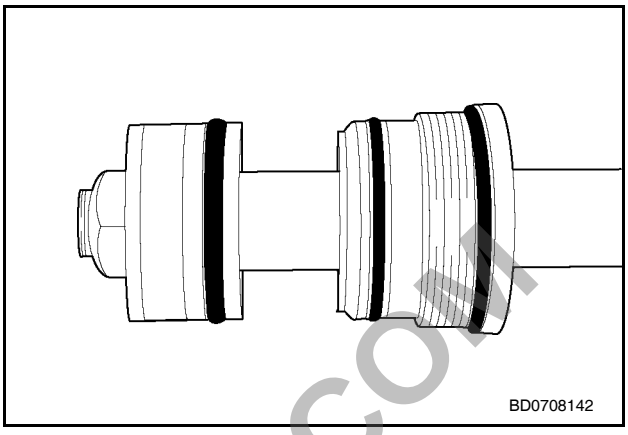
STEP 3



Apply Loctite® 271 to threads of the piston rod. Install locknut onto rod and torque.

NOTE: *Use information below for required torque of the cylinder rod nut for the cylinder being assembled.*

Rod Nut	Metric Value	U.S. Value
Axle Adjust	288 Nm	(212 ft.-lb.)
Boom Level	481 Nm	(355 ft.-lb.)
Inner Boom Fold 60 ft. 90 ft. 100 ft. Boom	287 Nm	(212 ft.-lb.)
Inner Boom Fold 120 ft Boom	481 Nm	(355 ft.-lb.)
Ladder	14 Nm	(10.5 ft.-lb.)
Mid Boom Fold 120 ft Boom	406.75 Nm	300 ft.-lb.
Outer Boom Fold 60 ft. 90 ft. 100 ft. Boom	203 Nm	(150 ft.-lb.)
Parallel Link	287 Nm	(212 ft.-lb.)
Steering	288 Nm	(212 ft.-lb.)

STEP 4

Liberally apply hydraulic oil to the piston and gland head.

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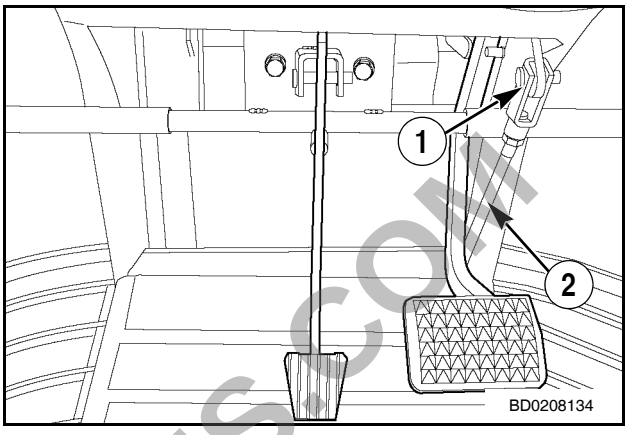
ACCESSING AND REPLACING THE MODE DOOR MOTOR

STEP 1

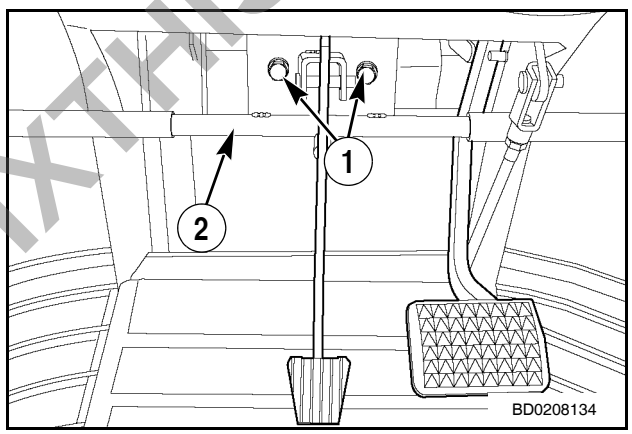
Remove pin **(1)** from the brake rod clevis and remove brake rod **(2)**.



STEP 2

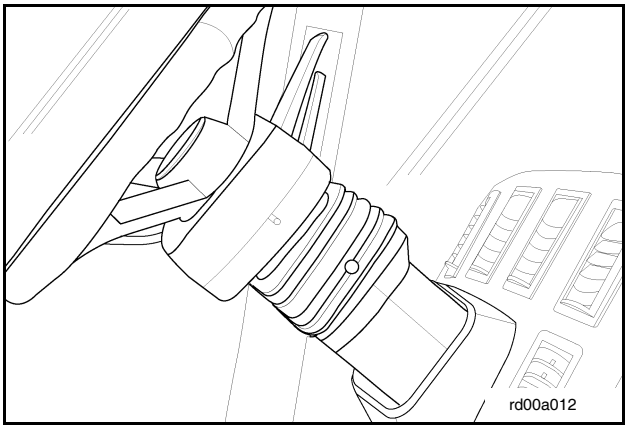
Remove the two bolts **(1)** on steering column release pedal assembly **(2)**.

NOTE: *These two bolts are removed to allow the steering column pedal assembly to move just enough to allow the steering console to be raised up and rearward to gain access to the mode door motor.*



STEP 3

Position steering wheel so it is straight and fully extended.



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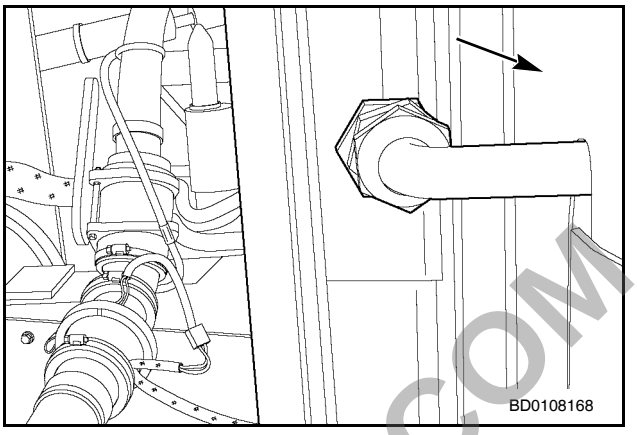
STEP 4

Install the four side radiator baffles.

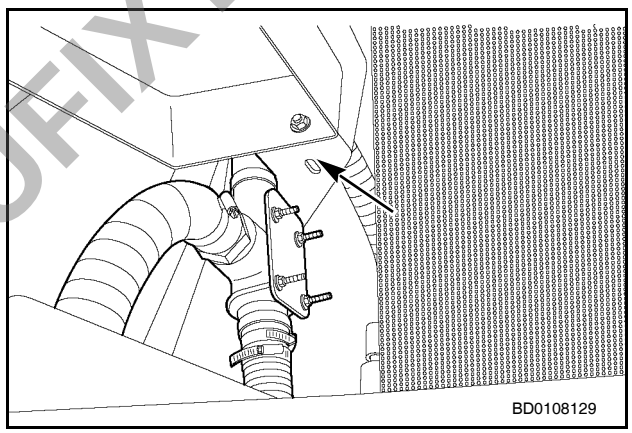


STEP 5

Install the engine hood grille. See Engine Hood Grille Installation on Page 13 in this section.

STEP 6

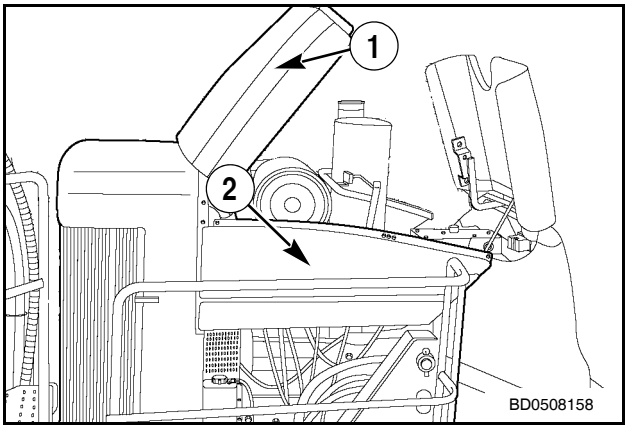
Install plumbing bracket onto walkway and attach hose at top rear of product tank.



STEP 7

Install the top front engine hood **(1)** and left and right engine side hoods **(2)**.

NOTE: *See Top Front Engine Hood Installation on Page 8 and LH, RH Side Engine Hood Installation on Page 10 in this section.*



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Section

11000

LIQUID PLUMBING SYSTEM GENERAL INFORMATION AND TROUBLESHOOTING

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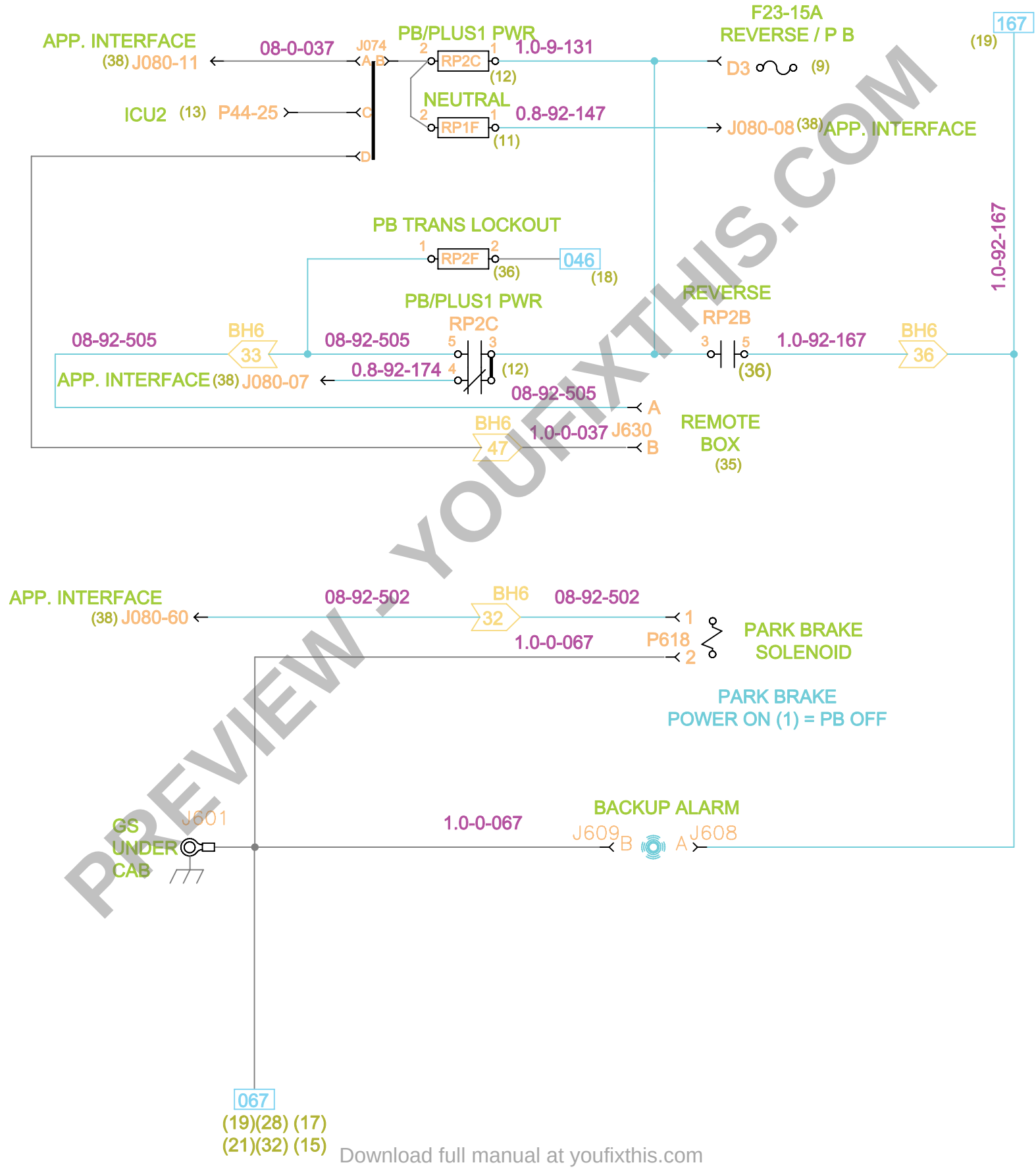
PARK BRAKE / BACKUP ALARM



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