721D Loader
Service Manual
6-47281

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ELECTRICAL WIRE IDENTIFICATION

Wire Identification Codes

21C Bk - 1.0

- 21C = Wire Name
- Bk = Wire Color
- 1.0 = Wire Size (mm^2)

Wire Size (mm^2)				
0.8 mm	1.0 mm	2.0 mm	5.0 mm	

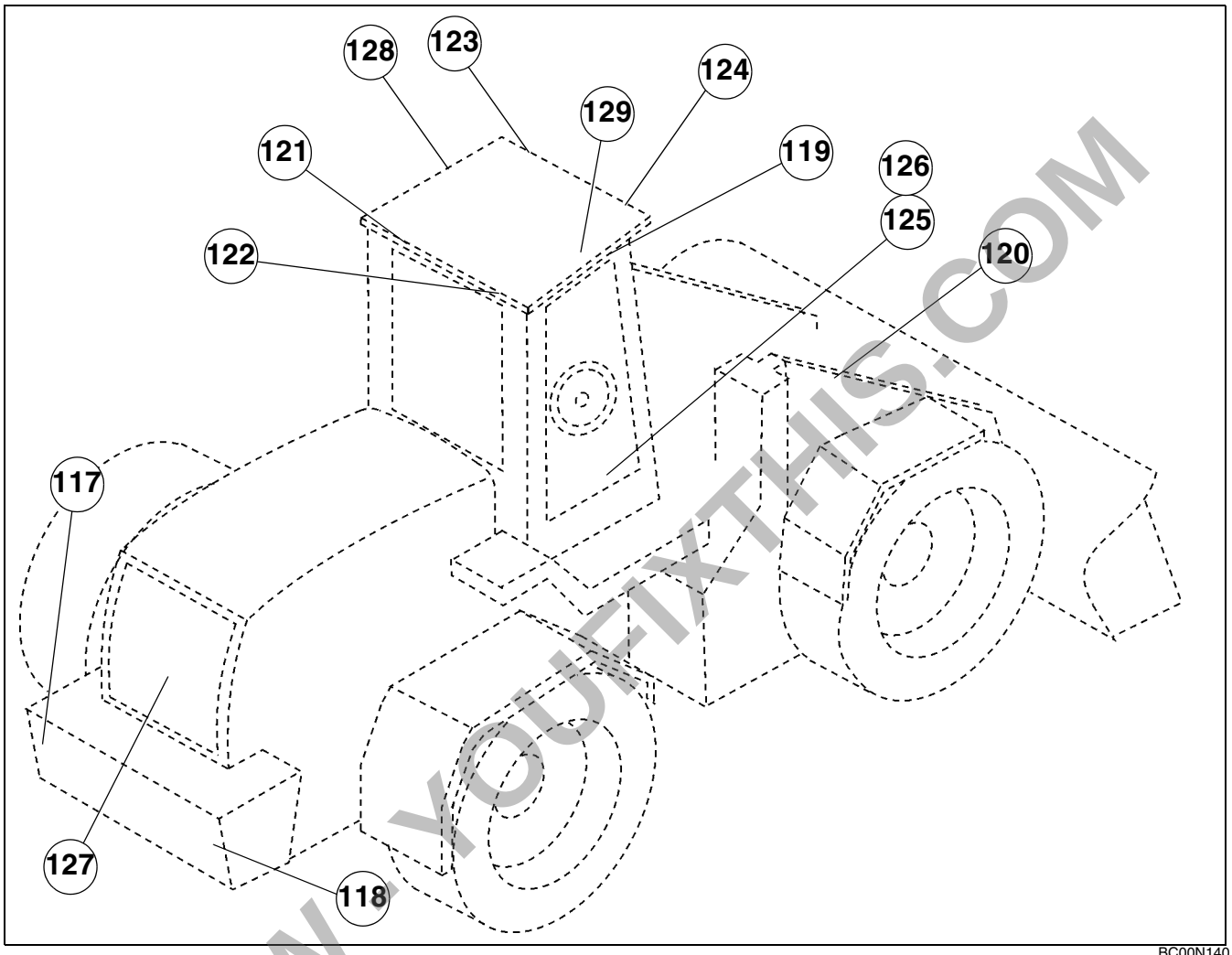
Wire Color				
Bk = Black	DU = Dark Blue	S = Gray	LG = Light Green	K = Pink
T = Tan	W = White	N = Brown	G = Green	U = Blue
LU = Light Blue	Or = Orange	R = Red	P = Purple	Y = Yellow

Wire Identification			From Connector		To Connector	
Wire	**Circuit**	**Color, Size, and Material**	**Connector**	**Cavity**	**Connector**	**Cavity**
14	Alternator D+	Lg 1.0 SXL	21M Engine Cab	26	154 Alternator	3
44	Brake Lt Input Signal	T 1.0 SXL	159 Brake Lt Press Sw	2	1M Cab Front Chassis	23
52	Fan Reverse Sol	W 1.0 SXL	132 Trans Engine	5	22M Cab Transmission	26
57	Pin Engage Sol Pwr	W 1.0 SXL	1M Cab Frnt Chas	20	107M Pin Engage Opt	A
58	Ride Cntrl Sol Pwr	W 1.0 SXL	1M Cab Frnt Chas	21	SPL A7 SPL A7	Splice
64	Horn	Or 1.0 SXL	1M Cab Frnt Chas	13	147 Horn Pwr	1
0 AA	Height RTT Grnd	Bk 1.0 SXL	10 Height Cntrl RTT	B	SPL A2 SPL A2	Splice
0 AB	Pin Engage Grnd	Bk 1.0 SXL	107M Pin Engage Opt	B	SPL A1 SPL A1	Splice
0 AC	Ride Cntrl Grnd	Bk 1.0 SXL	5F Ride Control Opt	2	SPL A1 SPL A1	Splice
0 AD	Horn Grnd	Bk 1.0 SXL	146 Horn Grnd	1	SPL A1 SPL A1	Splice
0 AF	RTD Grnd	Bk 1.0 SXL	12F RTD	B	SPL A2 SPL A2	Splice
0 AG	Lights Grnd RH	Bk 1.0 SXL	8 Lights RH	1	SPL A1 SPL A1	Splice
0 AH	Grnd Frnt Chas	Bk 5.0 SXL	144 Grnd Rear Chas	1	143 Grnd Frnt Chas	1
0 AJ	Grnd Cab	Bk 2.0 SXL	145 Grnd Cab	1	SPL A1 SPL A1	Splice
0 AK	Grnd Cab	Bk 1.0 SXL	145 Grnd Cab	1	SPL A2 SPL A2	Splice
0 AL	Lights Grnd LH	Bk 1.0 SXL	6 Lights LH	1	SPL A1 SPL A1	Splice
0 AM	RTD Grnd	Bk 1.0 SXL	12M RTD	B	200 RTD	B
0 AP	Ground	Bk 1.0 SXL	SPL A6 SPL A6	Splice	179F Float Solenoid	2
0 AQ	Ground	Bk 1.0 SXL	229M Diode Module	C	SPL A6 SPL A6	Splice
0 AR	Ground	Bk 1.0 SXL	SPL A2 SPL A2	Splice	SPL A6 SPL A6	Splice
0 AS	Brake Warn Pres Sw Grnd	Bk 1.0 SXL	88 Brake Warn Pres Sw	2	SPL A4 SPL A4	Splice
0 AT	Park Brake Solenoid Grnd	Bk 1.0 SXL	87 Park Brake Solenoid	2	SPL A4 SPL A4	Splice
0 AU	Ground	Bk 1.0 SXL	SPL A4 SPL A4	Splice	145 Ground Cab	1
0 BA		Bk 1.0 SXL	SPL B1	Splice	177 Engine Ground	1
0 BAA		Bk 2.0 TXL	SPL B7 B+ Power	Splice	134 EDC7	14
0 BAB		Bk 2.0 TXL	SPL B7 B+ Power	Splice	134 EDC7	15
0 BAC	EDC7 Diagnostic Grnd	Bk 3.0 SXL	164 Engine Ground	1	SPL B7 B+ Power	Splice
0 BAD	Sec Str Sig Grnd	Bk 1.0 SXL	132F Engine Trans	2	177 Engine Ground	1
0 BAE	Hot Cool Lev Grnd	Bk 1.0 SXL	132F Engine Trans	1	177 Engine Ground	1

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EXTERNAL LIGHTS AND SIGNALS, ROTARY LAMP SWITCH, AND CAB LIGHTS

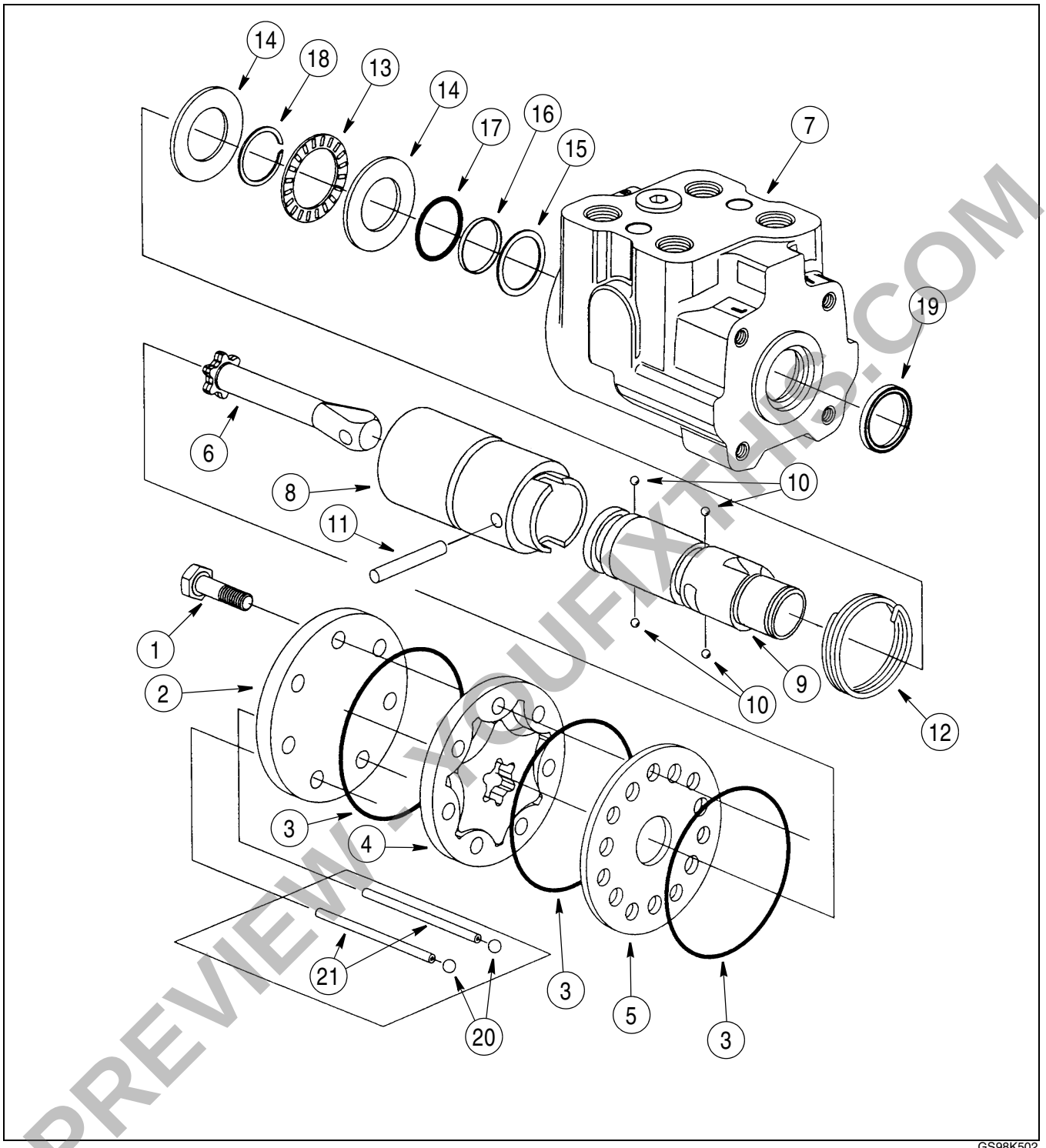


BC00N140

117. LEFT HAND REAR COMBINATION LAMP
118. RIGHT HAND REAR COMBINATION LAMP
119. LEFT HAND FRONT COMBINATION LAMP
120. RIGHT HAND FRONT COMBINATION LAMP
121. LEFT HAND REAR WORK LAMP
122. RIGHT HAND REAR WORK LAMP
123. LEFT HAND FRONT WORK LAMP
124. RH FRONT WORK LAMP
125. FIVE POSITION ROTARY LAMP SWITCH
126. HIGH/LOW BEAM RELAY NO. 13
127. LICENSE PLATE LAMP
128. DOME LAMP
129. COURTESY LAMP

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GS98K502

1. CAP SCREW
2. END CAP
3. O-RING
4. GEROTOR
5. SPACER PLATE
6. DRIVE SHAFT
7. STEERING CONTROL HOUSING
8. SLEEVE
9. SPOOL
10. BALL CHECK
11. PIN
12. CENTERING SPRING
13. NEEDLE THRUST BEARING
14. BEARING RACE
15. BACKUP WASHER
16. SEAL RING
17. O-RING
18. RETAINING RING
19. DUST SEAL
20. BALL CHECK
21. ROLL PIN

FIGURE 2. STEERING CONTROL VALVE - EXPLODED VIEW

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TORQUE SPECIFICATIONS - DECIMAL HARDWARE

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 graphities, Molydisulfide greases, or other extreme pressure lubricants are used.

Grade 5 Bolts, Nuts, and Studs



Size	Pound-Inches	Newton metres
1/4 inch	108 to 132	12 to 15
5/16 inch	204 to 252	23 to 28
3/8 inch	420 to 504	48 to 57
Size	Pound-Feet	Newton metres
7/16 inch	54 to 64	73 to 87
1/2 inch	80 to 96	109 to 130
9/16 inch	110 to 132	149 to 179
5/8 inch	150 to 180	203 to 244
3/4 inch	270 to 324	366 to 439
7/8 inch	400 to 480	542 to 651
1.0 inch	580 to 696	787 to 944
1-1/8 inch	800 to 880	1085 to 1193
1-1/4 inch	1120 to 1240	1519 to 1681
1-3/8 inch	1460 to 1680	1980 to 2278
1-1/2 inch	1940 to 2200	2631 to 2983

Grade 8 Bolts, Nuts, and Studs



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

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

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ENGINE FAULT CODE FAILURE CHART

Blink Code	Failure Description	Lamp Status	System Degradation
1.2	Multiple State Switch	Off	1
1.4	Accelerator Pedal Signal	On	1
1.8	Diagnostic Lamp	Off	1
2.1	Coolant Temperature Signal	On	1
2.2	Boost Temperature Signal	Off	1
2.3	Fuel Temperature Signal	Off	1
2.4	Boost Pressure Signal	On	1
2.5	Atmospheric Pressure Signal	Off	1
2.6	Oil Pressure Signal	On	1
2.7	Oil Temperature Signal	On	1
2.8	Power Stage Fuel Filter Heater	Off	1
3.7	Battery Voltage Signal	On	1
3.8	Ls Power Stage Cold Start Lamp	Off	1
3.9	Cold Start Heater Monitoring	Off	1
5.1	Injector Solenoid Valve Cylinder 1	On	1
5.2	Injector Solenoid Valve Cylinder 2	On	1
5.3	Injector Solenoid Valve Cylinder 3	On	1
5.4	Injector Solenoid Valve Cylinder 4	On	1
5.5	Injector Solenoid Valve Cylinder 5	On	1
5.6	Injector Solenoid Valve Cylinder 6	On	1
5.7	Injector Booster Voltage C1	On	1
5.8	Injector Booster Voltage C2	On	1
6.1	Increment Speed Signal	On	2
6.2	Segment Speed Signal	On	2
6.3	Engine Speed Sensing	On	1
6.4	Engine Overspeed	Flashing	1
6.5	Hs Power Stage 8 For Starter Control	Off	1
8.1	Fuel Pressure Monitoring Cp3	Flashing	3
8.2	Fuel Pressure Signal	Flashing	3
8.3	CC HS Power Stage 1 Fuel Pressure Control	Flashing	3
8.4	Monitoring Of Rail Pressure Relief Valve	Flashing	3
8.5	Fuel Pressure Monitoring CP3 (High)	Flashing	4
9.4	Main Relay Defect	On	1
9.6	ECU Self Test Shutoff Paths	On	1
9.7	Power Supply For Sensors	On	1

System Degradation:
1 = 0% Derate; 2 = Moderate Derate; 3 = Significant Derate; 4 = Engine Stop

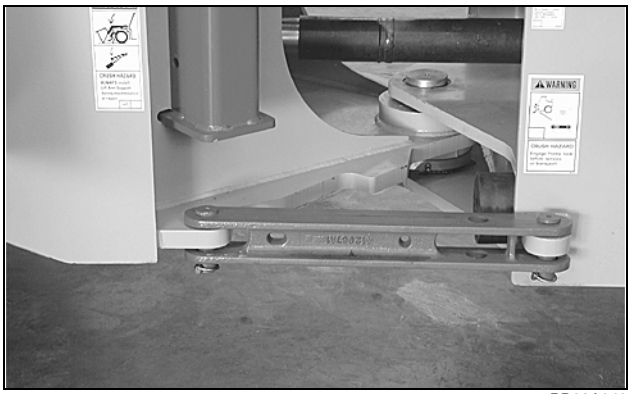
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ENGINE

Removal

STEP 1



BD03A040

Park machine on a level surface and lower bucket to ground. Put articulation lock in LOCKED position.

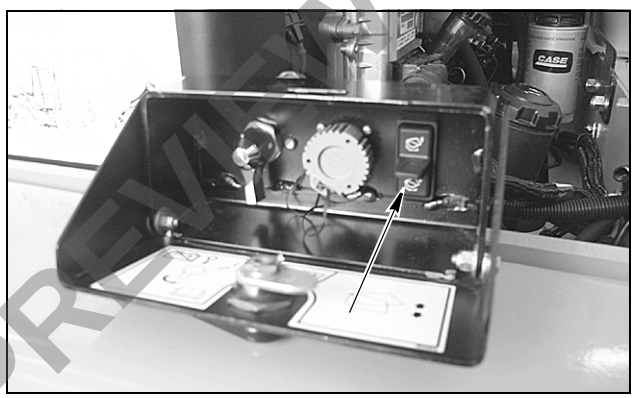
STEP 2

Stop engine. Actuate brake pedal several times to discharge brake accumulators. Put key switch in ON position and move loader control lever back and forth at least 30 times to release any pressure from hydraulic circuit. Put key switch in OFF position.

STEP 3

Slowly loosen the filler cap for hydraulic reservoir to release air pressure in hydraulic reservoir.

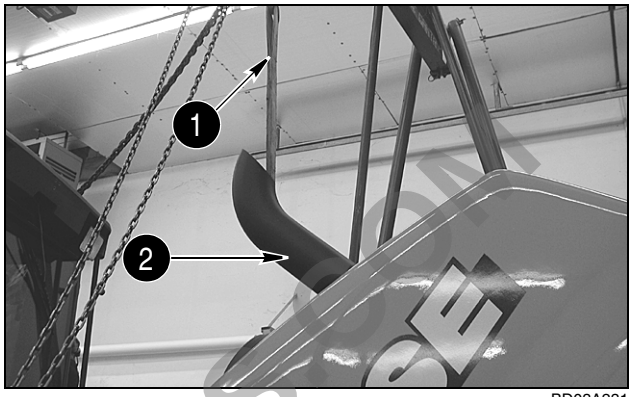
STEP 4



BD03A222

Raise the hood with the hood lift motor. Put master disconnect switch in OFF position. Remove both battery covers and disconnect batteries from the machine.

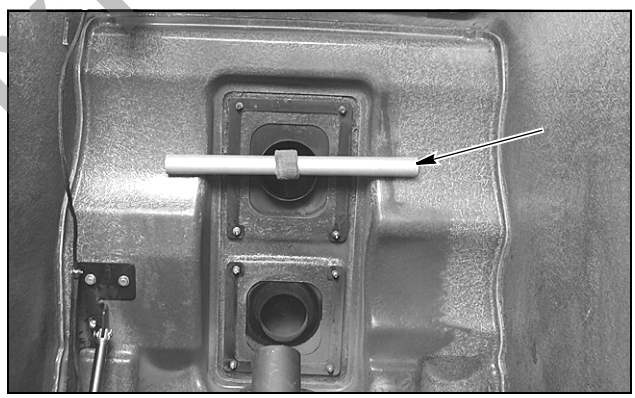
STEP 5



BD03A231

Double up a nylon lifting strap (1) and slide through the exhaust stack (2) on the hood.

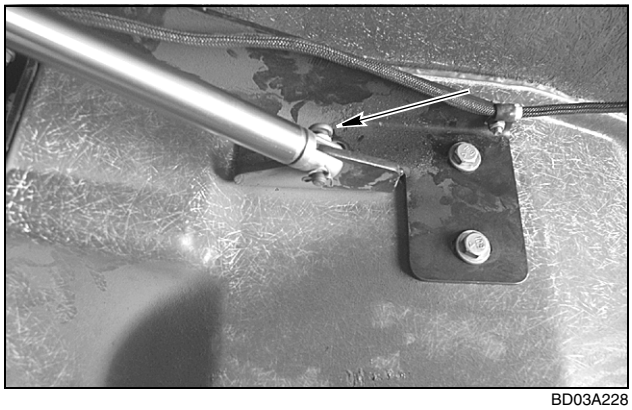
STEP 6



BD03A230

Place a solid steel bar through the strap, raise the hood and release tension on the lifting motor.

STEP 7



BD03A228

Remove the pin from the top of the lifting motor.

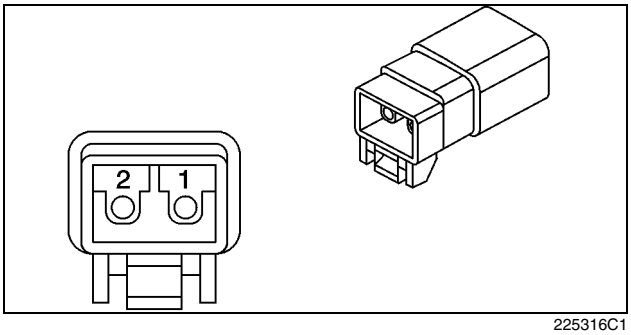
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CONNECTOR 19F - TRANSMISSION ELECTRONIC CONTROL MODULE TO MAIN CAB HARNESS

CAV	WIRE IDENT	CIRCUIT
1	0_DP Bk-0.8	Diag TECM Ground
2	0_DQ Bk-0.8	Diag TECM Ground
3	0_DM Bk-0.8	Speed Sensors Ground
4	0_DN Bk-0.8	Out Speed Sensor Ground
5	32J_C Y-0.8	Trans Enable Lt
6		None
7	35C Y-0.8	Backup Alarm Pull Down
8	58H_B W-0.8	Ride Cntl Sw Power VPS2
9	25P_A LU-0.8	Trans Sol Valve Y5
10	25L_A LU-0.8	Trans Sol Valve Y2
11	22E_A W-0.8	ADM6 Torque Signal
12	25S_B LU-0.8	Output Sw Power VPS1
13	25S_C LU-0.8	Output Sw Power VPS1
14		None
15	37D_A P-0.8	Diagnostic Signal
16		None
17	32F_A Y-0.8	Trans Filter Maint Switch
18	37E P-0.8	Diagnostic Signal
19	25A_A LU-0.8	Engine Speed Signal
20	26F_B LU-0.8	FNR Forward Signal
21	52P_A W-0.8	Park Brake Relay Out
22	25Y_B LU-0.8	Trans Kickdown Signal
23	19T_A Or-0.8	Time Delay Fused Power
24		None
25	50H_A Y-0.5	CAN H
26	50L_B G-0.5	CAN L
27	50L_C G-0.5	CAN L
28		None
29	25H LU-0.8	Trans Auto Signal
30	26R_B LU-0.8	FNR Reverse Signal
31	26E LU-0.8	Trans Enable Signal
32	25M_A LU-0.8	Trans Sol Valve Y3
33		None
34		None
35		None
36		None
37		None
38		None
39	36T_A P-0.8	Valve Body Temp Signal
40		None
41	25B_A LU-0.8	Turb Speed Signal
42	25C_A LU-0.8	Int Speed Signal
43	25F_A LU-0.8	Forward Signal
44	26N_B LU-0.8	FNR Neutral Signal
45	19A_K Or-0.8	Cab Switched Power
46	36R_E P-0.8	Valve Body Temp Return
47		None
48		None
49	36G_A P-1.0	Torque Conv Out Temp Signal
50		None
51	25J_A LU-0.8	Trans Sol Valve Y6
52		None
53		None
54		None
55	25N_A LU-0.8	Trans Sol Valve Y4
56	25K_A LU-0.8	Trans Sol Valve Y1
57	0_DD Bk-0.8	Ride Control Relay Sink
58		None
59		None
60		None
61		None
62	25D_A LU-0.8	Output Speed Signal
63	25Z_A LU-0.8	1st and 4th Gear Signal
64	25R_A LU-0.8	Reverse Signal
65	25W_A LU-0.8	3rd and 4th Gear Signal
66	25G_B LU-0.8	Declutch Signal
67	25T_D LU-0.8	Neutral Signal
68	19T_B Or-0.8	Time Delay Fused Power

CONNECTOR 20M - TRANSMISSION KICK-DOWN SWITCH TO MAIN CAB HARNESS



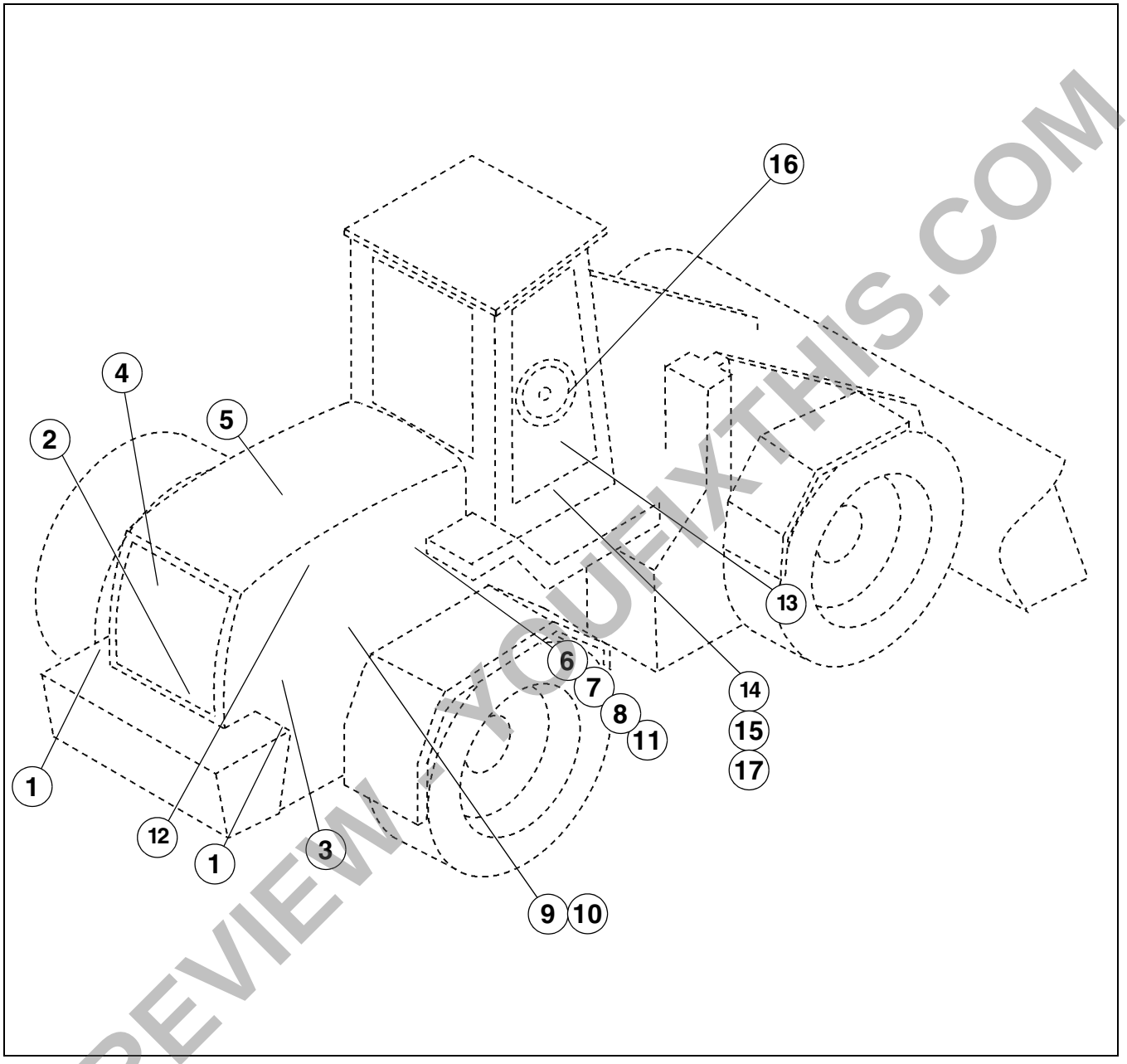
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CAV	WIRE IDENT	CIRCUIT
1	19A_U Or-0.8	Cab Switched Power
2	25Y_C LU-0.8	Trans Kickdown Signal

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BATTERIES, ELECTRONIC DIESEL CONTROL, CHARGING, STARTING, ALTERNATOR, HEATERS, THROTTLE PEDAL, IGNITION SWITCH AND RELAYS



BC00N140

1. BATTERIES
2. MASTER DISCONNECT SWITCH
3. ELECTRONIC DIESEL CONTROL
4. ALTERNATOR
5. STARTER MOTOR
6. STARTING RELAY
7. CRANK CONTROL RELAY
8. FUEL FILTER HEATER RELAY NO. 16
9. WATER SEPARATOR HEATER
10. FIRST FUEL HEATER
11. GRID HEATER RELAY
12. GRID HEATER
13. THROTTLE PEDAL
14. ENGINE CONTROL RELAY NO. 6
15. NEUTRAL START RELAY NO. 8
16. IGNITION SWITCH
17. IGNITION RELAY NO. 1

NOTE: *The battery must be at full charge and all connections clean and tight before doing any testing of the electrical system. Use a Multimeter for the following tests.*

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84 – Rear Wiper and Washer Switch		
Check Points	**Reading**	**Possible Cause of Bad Reading**
Terminal for wire 0_DW to ground	Continuity	Bad ground circuit.
NOTE: *Put master disconnect switch and ignition switch in ON position.*		
Terminal for wire 19K_D to ground	24 volts	Bad fuse K or ignition relay No. 2 (18). Also check circuit 19K.
Terminal for wire 19K_C to ground	24 volts	Bad fuse K or ignition relay No. 2 (18). Also check circuit 19K.
NOTE: *Put the rear wiper and washer switch in the ON position.*		
Terminal for wire 68L_A to ground	24 volts	Bad rear wiper and washer switch.
NOTE: *Press and hold the rear wiper and washer switch in the WASH position.*		
Terminal for wire 68W_A to ground	24 volts	Bad rear wiper and washer switch.
NOTE: *Put the five position rotary lamp switch in position 3 or higher.*		
Terminal for wire 49_L to ground	24 volts	Check rotary lamp switch (125) and circuit 49. If LEDs in rear wiper and washer switch are not ON with 24 volts at check point, replace rear wiper and washer switch.

85 – Rear Washer Pump Motor		
Check Points	**Reading**	**Possible Cause of Bad Reading**
Terminal for wire 0_BC to ground	Continuity	Bad ground circuit.
NOTE: *Put master disconnect switch and ignition switch in ON position. Depress and hold rear wiper and washer switch (84) in WASH position.*		
Terminal for wire 68W to ground	24 volts	Bad rear wiper and washer switch (84) Also check wires 68W_A and 68W.
NOTE: *If the readings are good, replace the rear washer pump motor.*		

86 – Rear Wiper Motor		
Check Points	**Reading**	**Possible Cause of Bad Reading**
Terminal for wire 0_MA to ground	Continuity	Bad ground circuit.
NOTE: *Make sure the rear wiper and washer switch (84) is in the OFF position.*		
Between terminals for wires 68C_B and 68L_C	Continuity	Bad rear wiper and washer switch (84).
NOTE: *Put the master disconnect switch and the ignition switch in the ON position.*		
Terminal for wire 19K to ground	24 volts	Check fuse K, also check circuit 19K.
NOTE: *Put the rear wiper and washer switch (84) in the ON position.*		
Terminal for wire 68L_C to ground	24 volts	Bad rear wiper and washer switch (84).
Terminal for wire 68C_B to ground	0 volt	Bad rear wiper and washer switch (84).
NOTE: *If the readings are good, replace the rear wiper motor.*		

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SPECIFICATIONS

Electrical System ..... Two 12 volt batteries connected in series, negative ground
System Voltage ..... 24 volts

Batteries

Specifications are the same for production battery and replacement battery.

Production Battery Case P/N A176482
Replacement Battery Case P/N A180406
Group Size 31
Reserve Capacity ..... 170 minutes
Cold Cranking Capacity At -17°C (0°F) for 60 Seconds At 6.0 Volts ..... 700 amperes
Load of Capacity (Load) Test ..... 400 amperes
Plates per Cell 17
Approximate weight with electrolyte ..... 25.9 kg (57.1 pounds)
Nonspill caps ..... Standard

Alternator ..... 24 volt, 70 amperes
Voltage Regulator ..... Solid State, Not Adjustable
Starter ..... 24 volt, Solenoid Actuated
Bucket Control Valve (Joystick) Detent Electromagnets Resistance at 20°C (68°F) (Nominal) ..... 68.2 ohms
Bucket Control Valve (Single Axis) Detent Electromagnets Resistance at 20°C (68°F) (Nominal) ..... 305 ohms
Fuel Level Sender ..... 33 to 240 ohms
Coolant, Torque Converter, and Hydraulic Temperature Sender 20°C (68°F) ..... 3521 ohms
Coolant and Hydraulic Temperature Sender (Yellow Line) 105°C (221°F) ..... 154 ohms
Coolant and Hydraulic Temperature Sender (Red Line) 110°C (230°F) ..... 133.9 ohms
Transmission Filter Restriction Switch with 510 ohms Internal Resistor (Normally Open)

Closing Setpoint ..... 2.8 Bar (40 psi)

Hydraulic Filter Restriction Switch (Normally Open) Closing Setpoint ..... 2.8 Bar (40 psi)
Air Filter Restriction Switch (Normally Open) Closing Setpoint ..... -6.4 kPa (Gauge) (-0.928 psig)
Brake Warning Pressure Switch (Normally Closed) Opening Setpoint ..... 110.3 Bar (1600 psi)
A/C High Pressure Switch (Normally Open) Closing Setpoint ..... 27.6 Bar (400 psi) (increasing pressure)
A/C Low Pressure Switch (Normally Closed) Opening Setpoint ..... 1.4 Bar (20 psi) (decreasing pressure)
Thermostat Switch

Contacts 2 to 3 close at initial turn of the switch. Contacts 1 to 2 close with thermal setting.

Engine Oil Pressure Switch (Normally Closed) Opening Setpoint ..... 0.69 Bar (10 psi)
Brake Declutch Pressure Switch (Normally Closed) Opening Setpoint ..... 24 Bar (350 psi)
Redundant Brake Pressure Switches (Normally Open) Closing Setpoint ..... 62 Bar (900 psi)
Brake Lamp Pressure Switch (Normally Open) Closing Setpoint ..... 4.1 Bar (60 psi)
Secondary Steering Pressure Switch (Form C) Closing Setpoint ..... 2.4 Bar (35 psi)
Fuel Filters Heater Resistance At 20°C (68°F) (Nominal) ..... 1.9 ohms
Parking Brake Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 40.3 ohms
Pilot Pressure Solenoid (Joystick) DC Resistance At 20°C (68°F) (Nominal) ..... 29.9 ohms
Pilot Pressure Solenoid (Single Axis) DC Resistance At 20°C (68°F) (Nominal) ..... 27.4 ohms
Ride Control Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 22.7 ohms
Pin Engage Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 28.8 ohms
Secondary Steering Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 39.3 ohms
Fan Reversing Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 39.3 ohms
Float Solenoid DC Resistance At 20°C (68°F) (Nominal) ..... 39.7 ohms
Rollback Pressure Switch (Normally Closed) Opening Setpoint ..... 6.2 Bar (90 psi)

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D. Press the up/down count switch to up count once, so the display reads 01.

E. Shift the transmission selector into 3rd forward and slowly increase the engine rpm.

F. The park brake should hold the machine at full throttle.

G. To exit the test mode, press the program/reset switch to reset.

Transmission Clutch Calibration

Clutch Calibration ensures the most optimum shifting of the transmission. Before doing the following transmission clutch calibration procedures make sure of the following:

1. The machine is running and the transmission oil is warm.
2. Engine low idle speed is correct.
3. The transmission is in neutral.
4. The park brake is applied.
5. If steps 1 through 4 have been accomplished, calibrate the transmission clutches as follows:

   A. Put the transmission in the manual shift mode and the gear selector in 3rd gear neutral.

   B. Press the program/reset switch to program.

   C. Press the up/down count switch to up count until the display reads 011.

   D. Put the program/reset switch in the OFF (center) position.

   E. Press the up/down count switch to up count twice, so the display reads 02.

   F. 2 00 00 will begin to flash in the display center.

   G. After one second, the Clutch Calibration Main Code status will be displayed in the 3rd and 4th spaces (2 XX 00, the XX represents the 3rd and 4th spaces).

   H. The Modulation Cycle Number will be displayed in the 1st and 2nd spaces (2 00 XX, the XX represents the 1st and 2nd spaces).

   I. During Clutch Calibration, the Clutch Calibration Main Code will change from 01 to 07 as the process is completed. Code 07 indicates that the calibration process is complete and the information center will return to normal working status.

   J. If any of the Clutch Calibration parameters are incorrect, the display center will stop flashing and display a code in the 1st, 2nd, 3rd, and 4th spaces.

   If this occurs, the code in the 3rd and 4th spaces will be a Clutch Calibration Main Code 09 through 14 and indicate what process the calibration was in when it was aborted

   The 1st and 2nd spaces will produce the Clutch Calibration Sub Code, which is the code that informs the operator of the reason the process was aborted.

   K. After completing the Clutch Calibration procedure, turn the machine OFF for 15 seconds. This sets the calibration in the controller.

CLUTCH CALIBRATION MAIN CODES	
Main Code	Meaning
00	Clutch Calibration Mode was not initiated because one of the requirements was not met.
01	Adjusting 1st gear.
02	Adjusting 2nd gear.
03	Adjusting 3rd gear.
04	Adjusting 4th gear.
05	Adjusting Forward gear.
06	Adjusting Reverse gear.
07	Clutch Calibration Completed.
08	Operator aborted calibration procedure.
09	Aborted while adjusting 1st gear.
10	Aborted while adjusting 2nd gear.
11	Aborted while adjusting 3rd gear.
12	Aborted while adjusting 4th gear.
13	Aborted while adjusting Forward gear.
14	Aborted while adjusting Reverse gear.

CLUTCH CALIBRATION SUB CODES	
Sub Code	Meaning
00	Calibration in process.
01	Fault present.
02	Shift lever not in neutral.

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SPECIFICATIONS

Low idle .....770 to 830 rpm
Full throttle (no load).....2100 to 2220 rpm
Temperature of the torque converter oil.....82° to 104° C (180° to 220° F)
Temperature of the hydraulic oil.....54° to 57°C (129° to 134°F)

Stall Speeds

Torque converter.....1970 to 2130 rpm
Hydraulic system .....1895 to 2205 rpm
Torque converter and hydraulic system together.....1430 to 1740 rpm

STALL TESTS

During these tests the engine runs at full throttle and works against the torque converter, the hydraulic system, or both the torque converter and the hydraulic system. The results of these tests will show if the cause of poor performance is one or more of the following: (1) engine, (2) torque converter or transmission, and (3) hydraulic system.

Procedure to Heat the Oil

Torque Converter

1. Sit in the seat.
2. Start the engine and run the engine at low idle.
3. To measure the oil temperature with the instrument cluster:
   A. Press the program switch.
   B. Press the up count switch to function 007.
   C. Return the program switch to the OFF (center) position.
4. Place the declutch switch in the OFF position.
5. Place the automatic switch in the manual mode position.
6. Release the parking brake.
7. Move the transmission control lever to Forward and turn the transmission control lever to 3rd gear.
8. Increase the engine speed to full throttle and run the engine at this speed until the instrument cluster shows a temperature of 115°C (239°F).
9. Decrease the engine speed to low idle and move the transmission control lever to the Neutral position.
10. Wait and allow the converter temperature to cool to 90°C (194°F).
11. Repeat steps 4 through 9 three times until the temperature of the torque converter oil is 82° to 104°C (180° to 220°F).

Hydraulic System

1. Apply the parking brake.
2. Start the engine and run at full throttle.
3. Hold the bucket control lever in the ROLLBACK position and hold the lift control lever in the FLOAT position.
4. View the oil temperature by pressing the program switch, then press the up count switch to function 008. Return the program switch to the center (OFF) position.
5. Continue holding until the temperature of the hydraulic oil is 54° to 57°C (129° to 134°F).

Test No. 1 - Torque Converter and Hydraulic Stall Together

1. Sit in the seat.
2. Start the engine and run the engine at low idle.
3. Press the brake pedal, and shift into Forward.
4. Make sure the parking brake is released (OFF).
5. Run engine at low idle. Push the clutch cutout switch to OFF. Put the transmission in manual mode. Push down and hold the brake pedal for the remainder of this procedure.
6. Make sure that the transmission is in Forward and turn the transmission control lever to third gear.
7. Increase the engine speed to full throttle.
8. Hold the bucket control lever in the ROLLBACK position and raise the lift arms. The stall speed must be read while the lift arms are in motion.

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SPECIAL TORQUES (CONTINUED)

Duct plate
- Screws ..... 25 Nm (221 lb-in)
- Screw plug ..... 30 Nm (265 lb-in)

Hydraulic control unit ..... 9.5 Nm (84 lb-in)

Filter
- Filter head screws ..... 25 Nm (221 lb-in)
- Oil distribution cover screws ..... 25 Nm (221 lb-in)

Speed sensor and inductive transmitter
- Speed sensor screw ..... 23 Nm (204 lb-in)
- Inductive transmitter ..... 30 Nm (265 lb-in)
- Cover plate ..... 23 Nm (204 lb-in)
- Screw plug ..... 140 Nm (103 lb-ft)

SPECIFICATIONS

Clutch KV and KR plate clearance ..... 2.7 to 2.9 mm (0.106 to 0.114 in)

Clutch K1plate clearance ..... 2.4 to 2.6 mm (0.094 to 0.102 in)

Clutch K2 and K3 plate clearance ..... 1.8 to 2.0 mm (0.071 to 0.079 in)

Clutch K4 plate clearance ..... 1.2 to 1.4 mm (0.047 to 0.055 in)

NOTE: *The CNH reserves the right to make improvements in design or changes in specifications at any time without incurring any obligation to install them on units previously sold.*

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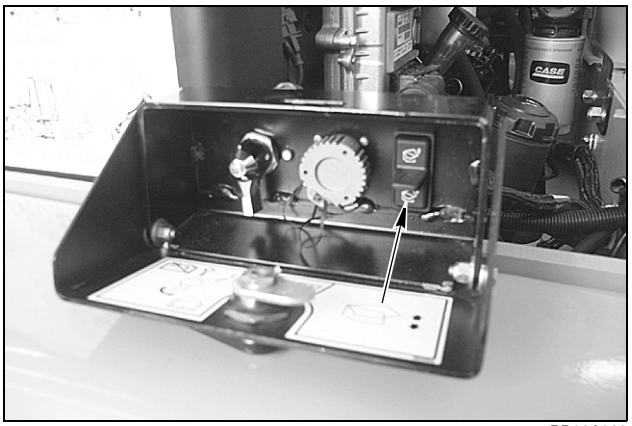
ALTERNATOR

Removal

STEP 1

Park machine on a level surface and lower bucket to ground.

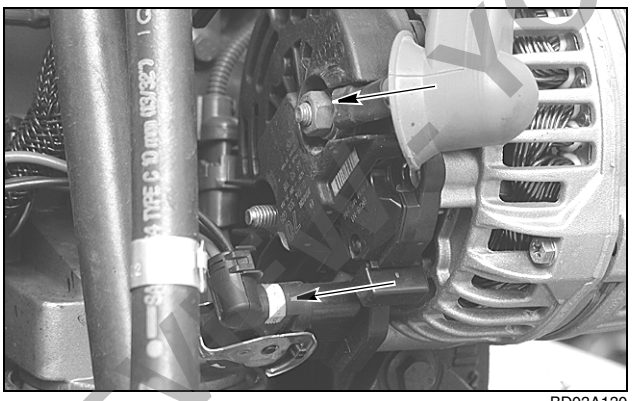
STEP 2



BD03A222

Raise the engine compartment with lifting motor. Place the master disconnect switch in the OFF position.

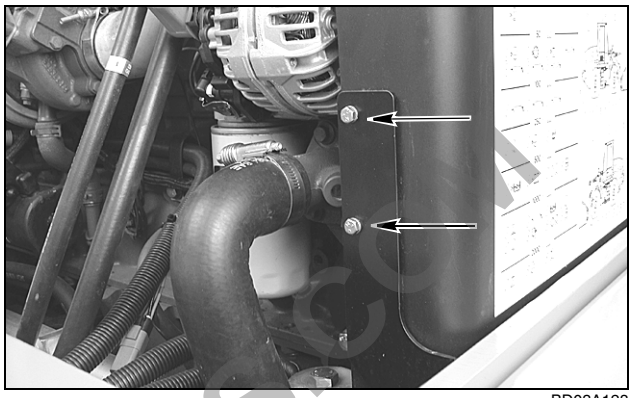
STEP 3



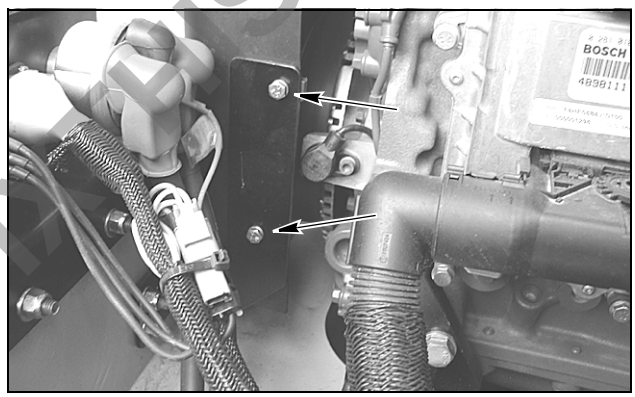
BD03A130

Disconnect wires from the alternator.

STEP 4



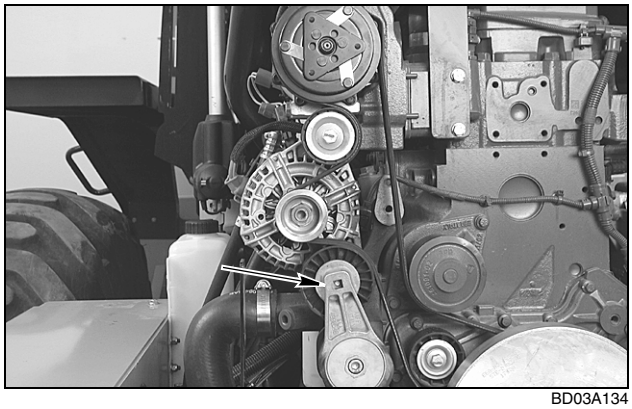
BD03A128



BD03A129

Remove four belt cover mounting bolts, remove cover.

STEP 5



BD03A134

Use a wrench to move the belt tensioner to loosen the tension on the belt. Remove the belt.

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Wire Identification Codes

21C Bk - 1.0

- 21C — Wire Name
- Bk — Wire Color
- 1.0 — Wire Size (mm^2)

Wire Size (mm^2)			
0.8 mm	1.0 mm	2.0 mm	5.0 mm

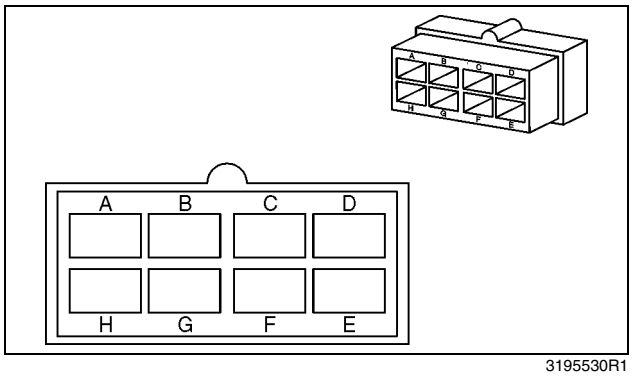
Wire Color				
Bk = Black	DU = Dark Blue	S = Gray	LG = Light Green	K = Pink
T = Tan	W = White	N = Brown	G = Green	U = Blue
LU = Light Blue	Or = Orange	R = Red	P = Purple	Y = Yellow

Wire Identification			From Connector		To Connector	
Wire	**Circuit**	**Color, Size, and Material**	**Connector**	**Cavity**	**Connector**	**Cavity**
25T B	Neutral Signal	LU 0.8 SXL	70 Transmission Shifter	D	13M Pedestal Cab	46
25T C	Neutral Signal	LU 0.8 SXL	13F Cab Pedestal	46	SPL D18 Neutral Signal	1
25T D	Neutral Signal	LU 0.8 SXL	19F TECM	67	SPL D18 Neutral Signal	1
25T E	Neutral Signal	LU 0.8 SXL	54F Neutral Start Relay	86	SPL D18 Neutral Signal	1
25W	3rd And 4th Gear Signal	LU 0.8 SXL	13M Pedestal Cab	48	183 Transmission Shifter	B
25W A	3rd And 4th Gear Signal	LU 0.8 SXL	19F TECM	65	13F Cab Pedestal	48
25Y	Trans Kickdown Signal	LU 0.8 SXL	13M Pedestal Cab	50	183 Transmission Shifter	D
25Y A	Trans Kickdown Signal	LU 0.8 SXL	13F Cab Pedestal	50	SPL D11 Trans Kick Down Signal	1
25Y B	Trans Kickdown Signal	LU 0.8 SXL	19F TECM	22	SPL D11 Trans Kick Down Signal	1
25Y C	Trans Kickdown Signal	LU 0.8 SXL	20M Trans Kick Down	2	SPL D11 Trans Kick Down Signal	1
25Z	1st And 4th Gear Signal	LU 0.8 SXL	13M Pedestal Cab	49	183 Transmission Shifter	C
25Z A	1st And 4th Gear Signal	LU 0.8 SXL	19F TECM	63	13F Cab Pedestal	49
26E	Trans Enable Signal	LU 0.8 SXL	19F TECM	31	199F Trans Enable Sw	3
26F A	FNR Forward Signal	LU 0.8 SXL	198 FNR Switch	6	197M FNR Main Cab	2
26F B	FNR Forward Signal	LU 0.8 SXL	19F TECM	20	197F Main Cab FNR	2
26J	FNR Switch Jumper	LU 0.8 SXL	198 FNR Switch	2	198 FNR Switch	4
26N A	FNR Neutral Signal	LU 0.8 SXL	198 FNR Switch	3	197M FNR Main Cab	3
26N B	FNR Neutral Signal	LU 0.8 SXL	19F TECM	44	197F Main Cab FNR	3
26R A	FNR Reverse Signal	LU 0.8 SXL	198 FNR Switch	1	197M FNR Main Cab	4
26R B	FNR Reverse Signal	LU 0.8 SXL	19F TECM	30	197F Main Cab FNR	4
28F A	Fltr Htrs Control	W 0.8 TXL	93F Engine Relay	12	134 EDC7	36
28F B	Fltr Htrs Control	W 1.0 SXL	93M Relay Box	12	130 Filter Htrs Relay	86
28G A	Grid Heater Control	W 2.0 TXL	123 Grid Htr Relay	1	134 EDC7	16
31A A	Diag Request Sw	Y 0.8 GXL	43 Diagnostic Switch	3	13M Pedestal Cab	24
31A B	Diag Request Sw	Y 0.8 GXL	13F Cab Pedestal	24	21F Cab Engine	4
31A C	Diag Request Sw	Y 0.8 TXL	21M Engine Cab	4	134 EDC7	27
31D	Coolant Level Signal	Y 1.0 GXL	104 Cool Level Sensor	A	22M Cab Transmission	2
31D A	Coolant Level Signal	Y 0.8 SXL	22F Cab Transm	2	13F Cab Pedestal	4
31D B	Coolant Level Signal	Y 0.8 SXL	76 Instrument Cluster	4	13M Pedestal Cab	4
31D C	Coolant Level Signal	Y 0.8 SOLID	274F Coolant Jump Rear Chs	A	275M Coolant Jump Coolant Sndr	A
31F	Air Filter Rest Sw Signal	Y 1.0 SXL	21M Engine Cab	28	117 Air Filter Res Sw	1

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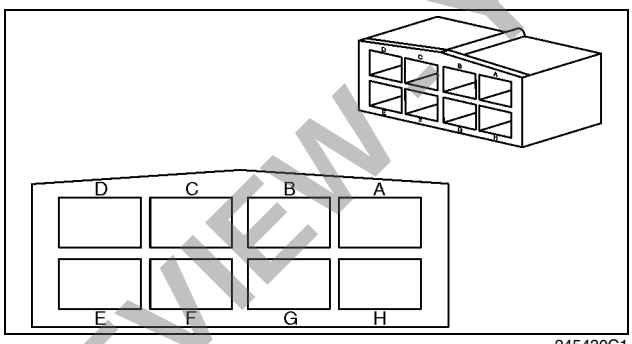
CONNECTOR 23F - CAB MAIN HARNESS TO CAB ROOF HARNESS



3195530R1

CAV	WIRE IDENT	CIRCUIT
A	68C_A Or-1.0	Rear Wiper Park
B	0_DT Bk-1.0	Dome Court Work Light Ground
C	0_DU Bk-1.0	Beacon Wiper Diode Ground
D	19U_A Or-1.0	Dome Light Horn Fused Power
E	46_A K-0.8 46_C K-1.0	Beacon Switched Power
F	19K_B Or-1.0	Rear Wiper Wash Fused Power
G	68L_A Or-1.0	Rear Wiper Low Speed
H	42R_B DU-0.8	Rear Work Light Power

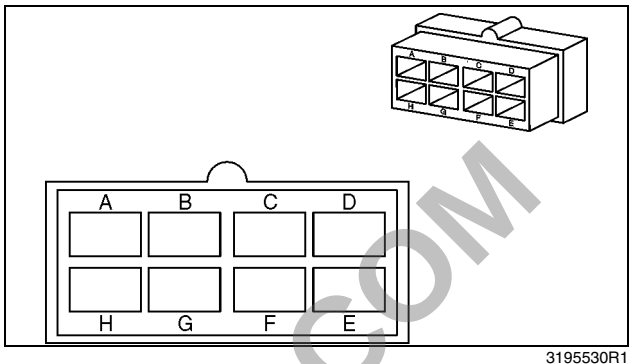
CONNECTOR 23M - CAB ROOF HARNESS TO CAB MAIN HARNESS



245430C1

CAV	WIRE IDENT	CIRCUIT
A	68C_B Or-1.0	Rear Wiper Park
B	0_MG Bk-1.0	Rear Work Light Ground
C	0_MD Bk-1.0	Beacon Rear Wiper Ground
D	19U_D Or-1.0	Dome Light Fused Power
E	46_D K-1.0	Beacon Switched Power
F	19K_E Or-1.0	Rear Wiper Wash Fused Power
G	68L_C Or-1.0	Rear Wiper Low Speed
H	42R_F DU-1.0	Rear Work Light Power

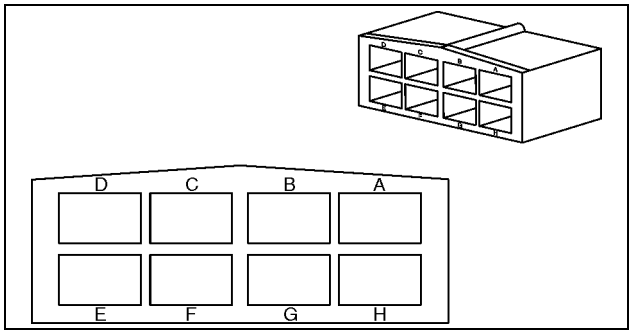
CONNECTOR 24F - CAB ROOF HARNESS TO CAB MAIN HARNESS



3195530R1

CAV	WIRE IDENT	CIRCUIT
A		None
B		None
C		None
D		None
E	0_MN Bk-0.8	Dome Courtesy Light Ground
F	49_V S-0.8	Courtesy Pilot Light
G	0_MK Bk-1.0	Front Work Light Ground
H	42C_D DU-1.0	Front Work Lights Power

CONNECTOR 24M - CAB MAIN HARNESS TO CAB ROOF HARNESS



245430C1

CAV	WIRE IDENT	CIRCUIT
A		None
B		None
C		None
D		None
E	0_DR Bk-1.0	Dome Court Work Light Ground
F	49_S S-1.0	Courtesy Pilot Light
G	0_DS Bk-1.0	Dome Court Work Light Ground
H	42C_A DU-1.0	Front Work Lights Power

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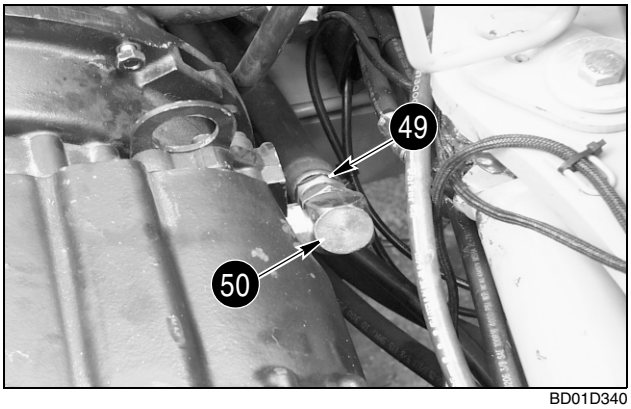
FAULT CODES

CODE	DEFINITION	POSSIBLE STEPS FOR REPAIR
12110	Engine coolant temperature is 110° C (230° F) or greater	Troubleshoot electrical circuits.
12900	Engine coolant temperature sensor short circuit measuring less than 50 ohms.	
12901	Engine coolant temperature sensor open circuit measuring greater than 10,000 ohms with hydraulic oil temperature at 40° C (104° F) or more, indicated by a resistance of 1463 ohms or less.	
13000	Low engine coolant level - This code will not be generated if the engine coolant temperature is below 20° C (68° F).	1. A critical stop function warning has occurred. 2. Red stop indicator comes on and continuous buzzer sounds. 3. Stop machine and perform required service on the critical area.
21070	Engine oil pressure is measured below 70 kPa (10 psi)	
21900	Engine oil pressure sensor short circuit measuring less than 16 ohms and engine coolant temperature is greater than or equal to 70° C (158° F).	Troubleshoot electrical circuits. **NOTE:** *Fault code 21900 is possible during cold engine start-up. After machine warm up, verify proper operation.*
21901	Engine oil pressure sensor open circuit measuring more than 270 ohms.	
33900	Fuel level sender short circuit measuring less than 16 ohms.	Troubleshoot electrical circuits.
33901	Fuel level sender open circuit measuring more than 270 ohms.	
34000	Short circuit in fuel solenoid circuit.	
35000	High air filter restriction.	1. A caution level warning has occurred. 2. Yellow caution indicator comes on and buzzer sounds for 3 seconds. 3. Perform required service on the cautioned area.
42125	Transmission temperature measured above 125° C (257° F)	1. A critical stop function warning has occurred. 2. Red stop indicator comes on and continuous buzzer sounds. 3. Stop machine and perform required service on the critical area.
45000	High transmission filter restriction when the transmission oil is above 20° C (68° F).	1. A caution level warning has occurred. 2. Yellow caution indicator comes on and buzzer sounds for 3 seconds. 3. Perform required service on the cautioned area.
46017	Gear range fault error	1. Check the cables from TCU to shift lever. 2. Check signal combinations of shift lever positions for gear range.
46018	Logical error at direction select signal	1. Check the cables from TCU to shift lever. 2. Check signal combinations of shift lever positions F-N-R.

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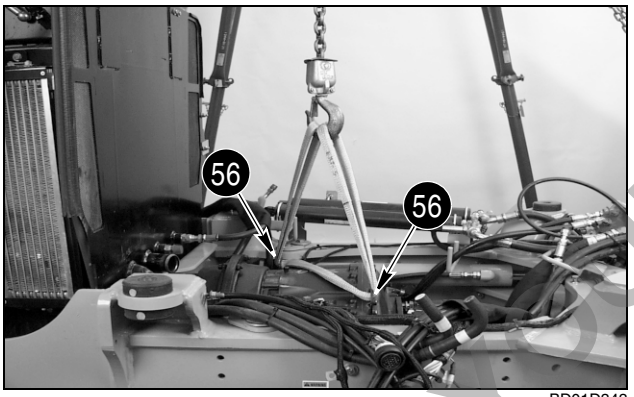
STEP 21



BD01D340

Repeat Steps 20 and 21 to disconnect cooler hose (49) and remove fitting (50).

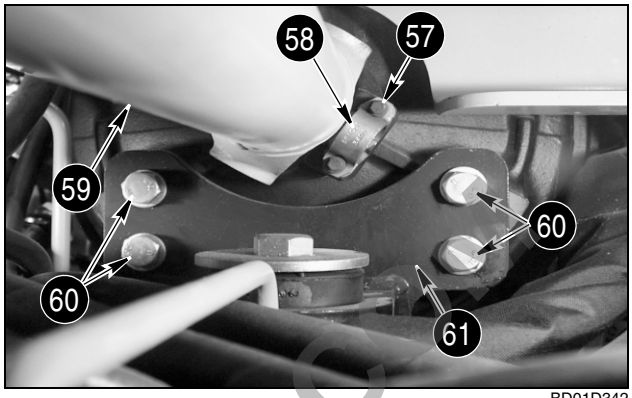
STEP 22



BD01D343

Connect lifting equipment to transmission lifting eyes (56). Take up all slack in lifting equipment.

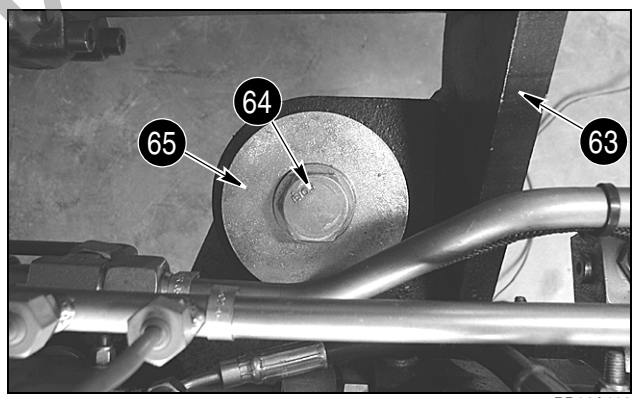
STEP 23



BD01D342

In area between rear of transmission and front of engine, remove four bolts (57) and two straps (58). Discard bolts (57) and straps (58). Use pry bar to disconnect engine drive shaft (59) from transmission. Using 3/4 inch drive socket, extensions, and impact wrench, remove four bolts (60) and washers securing transmission to top mounting bracket (61).

STEP 24



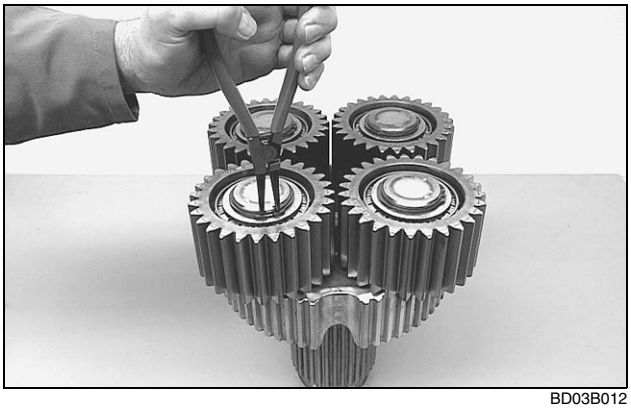
BD03A163

Remove bolts (64) and washers (65) securing RH and LH mounting brackets (63) to rear chassis.

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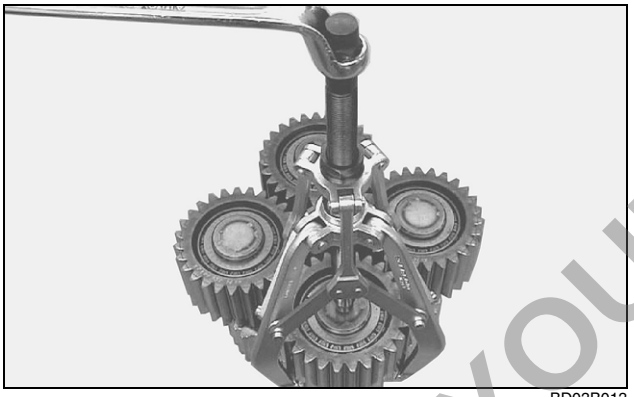
STEP 12



BD03B012

Remove the snap rings from the planet gear shaft using 380001585 snap ring pliers.

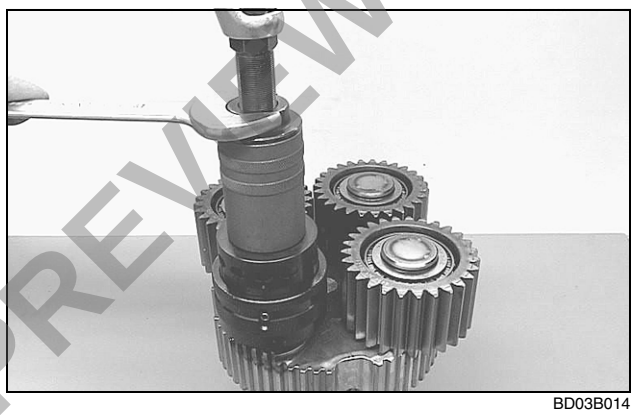
STEP 13



BD03B013

Remove the planet gear using 380001563 gear puller and 380001539 step plate.

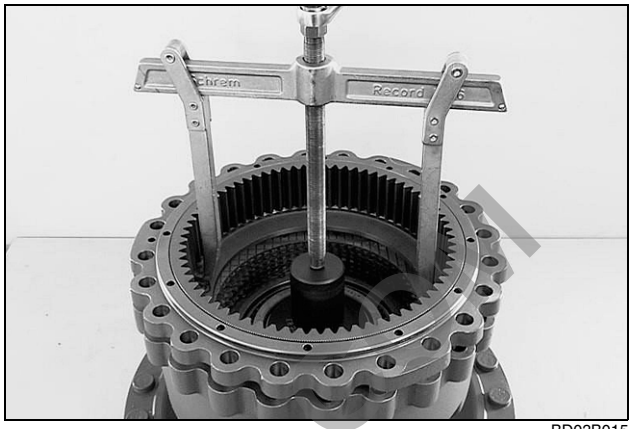
STEP 14



BD03B014

Remove the bearing from the planetary using 380001757 collet set, 380001575 puller body and screw, and 380001539 step plate.

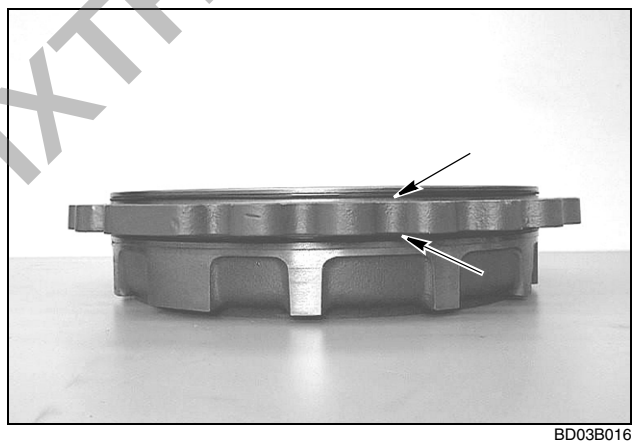
STEP 15



BD03B015

Using suitable puller, remove planetary ring gear from brake housing.

STEP 16



BD03B016

Remove O-rings from the annular grooves of the ring gear.

STEP 17



BD03B017

Remove O-ring from recess of the brake housing.

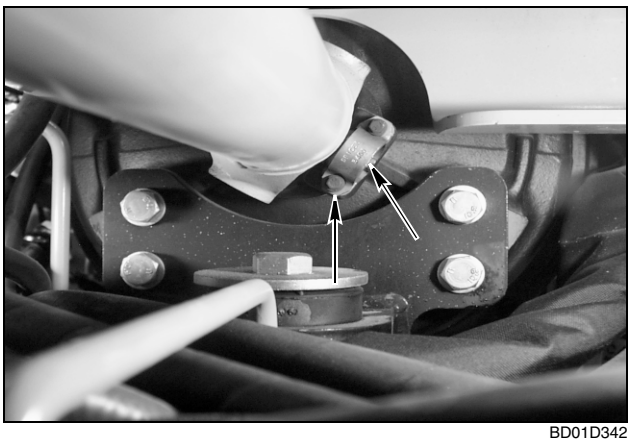
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ENGINE DRIVE SHAFT

Removal

STEP 47

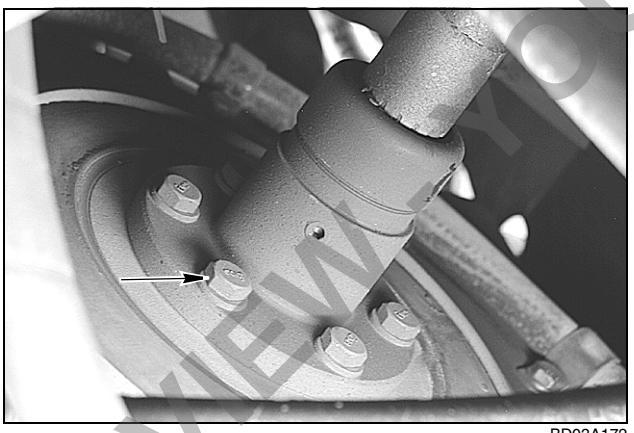


BD01D342

Remove and discard the bolts and straps that fasten the engine drive shaft to the transmission.

IMPORTANT: *The bolts and straps that fasten the engine drive shaft to the transmission must be replaced when removed.*

STEP 48



BD03A172

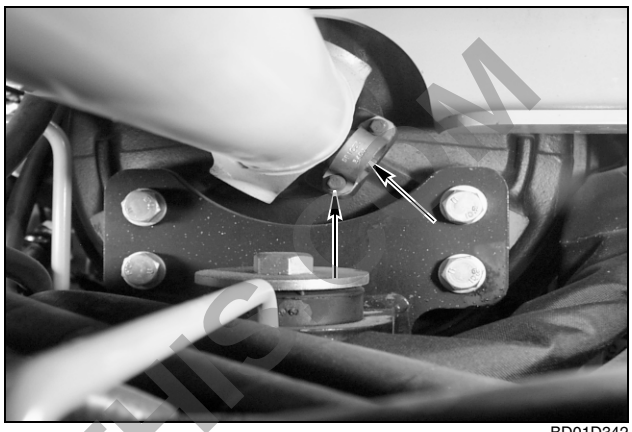
Loosen and remove the six bolts that fasten the engine drive shaft to the engine.

STEP 49

Remove the engine drive shaft from the machine.

Installation

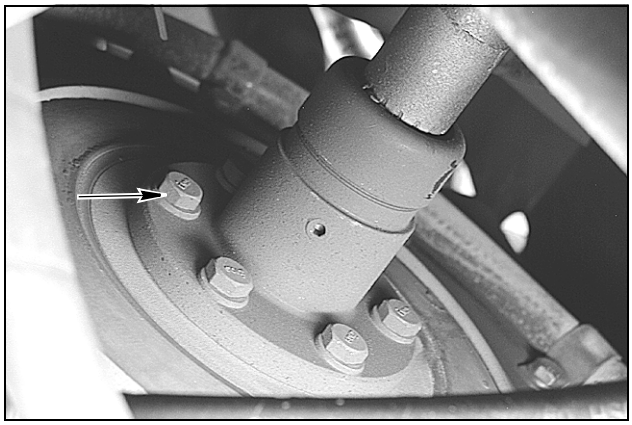
STEP 50



BD01D342

Place the engine drive shaft into position on the transmission and install new straps and bolts. Tighten the bolts to a torque of 61 to 81 Nm (45 to 60 lb ft).

STEP 51



BD03A172

Install the six bolts that fasten the engine drive shaft to the engine. Tighten the bolts to a torque of 53 to 62 Nm (39 to 46 lb ft)

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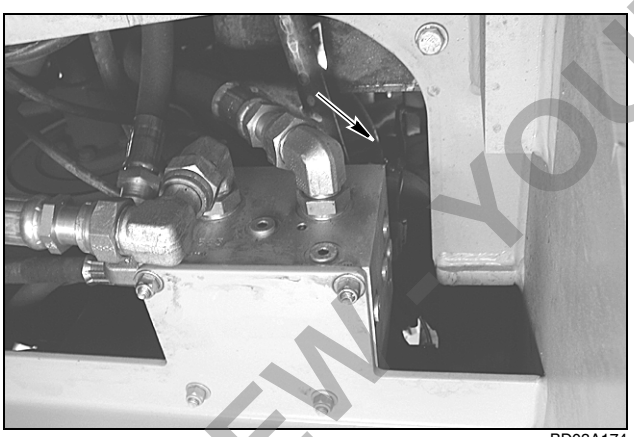
REMOVAL AND INSTALLATION OF THE FAN REVERSING VALVE

Removal

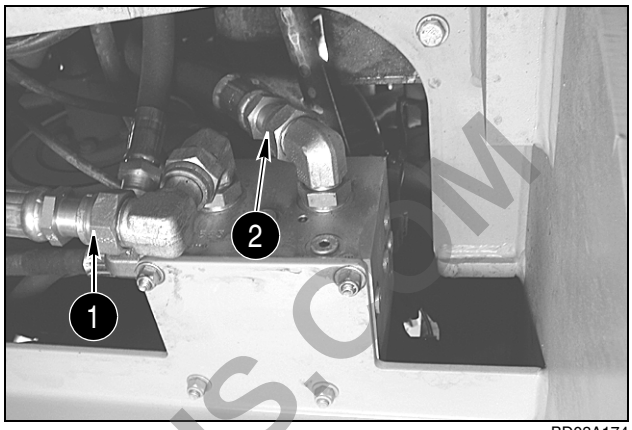
STEP 205
Park the machine on a level surface and lower the bucket to the ground. Stop the engine and apply the parking brake.

STEP 206
With the engine NOT running, pump the brake repeatedly to be sure the brake accumulators have no hydraulic pressure, then move the loader control lever back and forth several times to release any hydraulic pressure in the pilot control circuit.

STEP 207
Loosen the filler cap on the hydraulic reservoir to release the air pressure in the reservoir. Connect a vacuum pump to the hydraulic reservoir, turn on the pump.

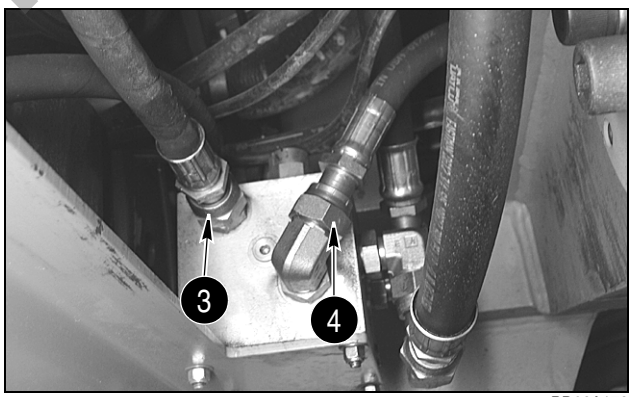
STEP 208

BD03A174

Disconnect the electrical connector for the fan reversing valve.

STEP 209


BD03A174

Tag and disconnect the fan forward hose (1) from the fan reversing valve. Install a plug in the hose and a cap on the fitting. Tag and disconnect the fan reverse hose (2) from the fan reversing valve. Install a plug in the hose and a cap on the fitting.

STEP 210


BD03A173

Tag and disconnect the fan valve return hose (3) from the fan reversing valve. Install a plug in the hose and a cap on the fitting. Tag and disconnect the fan valve supply hose (4) from the fan reversing valve. Install a plug in the hose and a cap on the fitting.

STEP 211
Loosen and remove the nuts, washers and bolts.

STEP 212
Remove the fan reversing valve from the machine.

STEP 213
Remove and discard all O-rings from the fittings.

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SAFETY PROCEDURES



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 PERSONAL INJURY OR DEATH. M171B

ATTENTION: *Only authorized technicians certified by an approved training and certification organization may service or repair motor vehicle or mobile air conditioning systems. It is mandatory that all refrigerant must be RECOVERED and RECYCLED when removed from a system during servicing.*

Refrigerant HFC-134a is the most stable, and easiest to work with of the refrigerants now used in air conditioner systems. Refrigerant HFC-134a does not contain any chlorofluorocarbons (CFC's) which are harmful to the earth's ozone layer.

Safety procedures must be followed when working with Refrigerant HFC-134a to prevent possible personal injury.

1. Always wear safety goggles when doing any service work near an air conditioner system. Liquid refrigerant getting into the eyes can cause serious injury. Do the following if you get refrigerant near or in your eyes:

   A. Flush your eyes with water for 15 minutes.

   B. See a physician immediately.

2. A drop of liquid refrigerant on your skin may cause frostbite. Open the fittings carefully and slowly when it is necessary to service the air conditioner system. Your skin must be treated for frostbite or a physician must be seen if you get refrigerant on your skin.
3. Keep refrigerant containers in the correct upright position. Always keep refrigerant containers away from heat and sunlight. The pressure in a container will increase with heat.
4. Always reclaim refrigerant from the system, if you are going to weld or steam clean near the air conditioner system.
5. Always check the temperature and pressure of the air conditioner system before reclaiming refrigerant and when you test the system.
6. Dangerous gas can form when refrigerant comes in contact with an open flame. Never permit fumes to be inhaled.
7. Never leak test with compressed air or flame testers. Tests have indicated that compressed mixtures of HFC-134a and air can form a combustible gas.
8. Always reclaim refrigerant from the system before removing any air conditioning component.

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