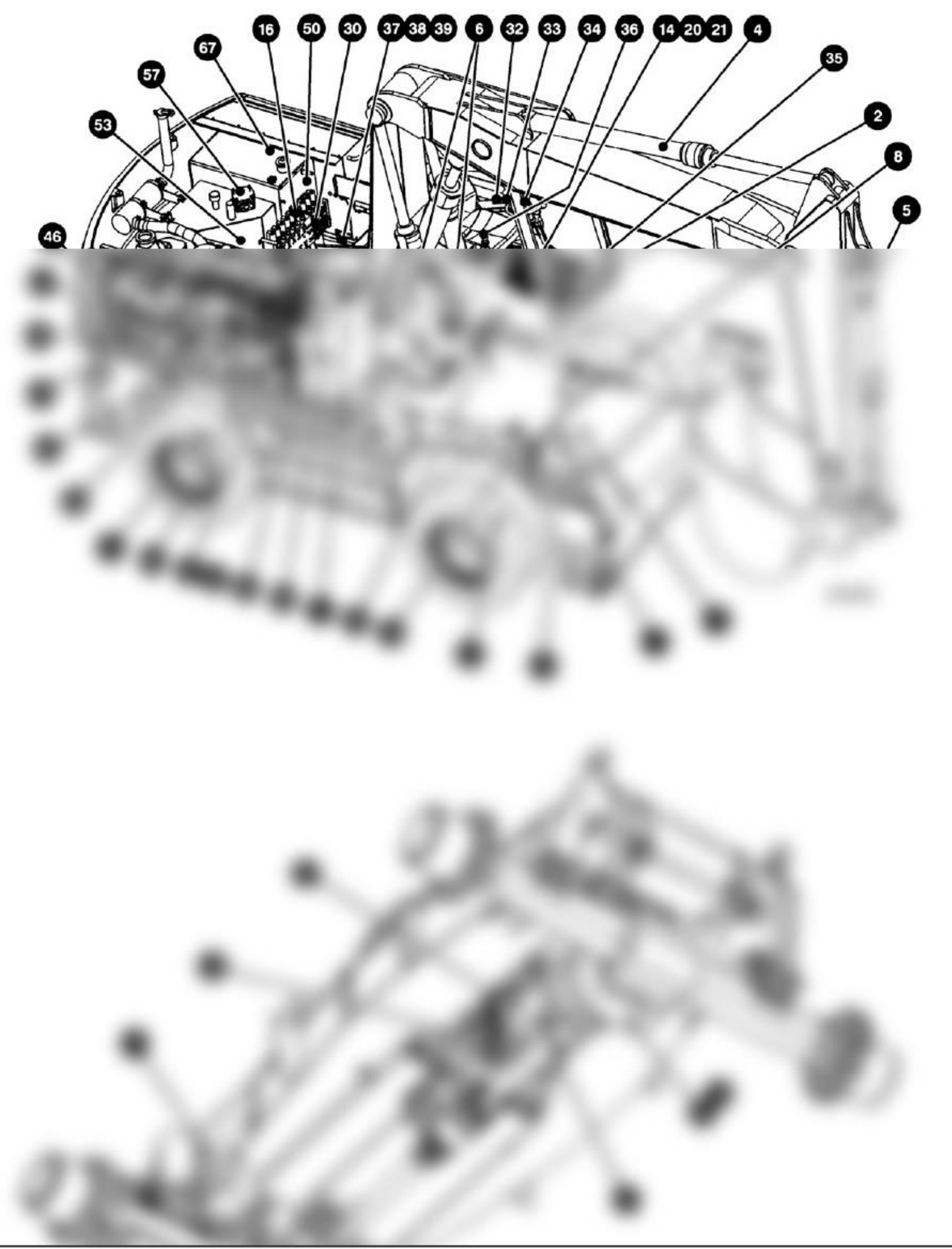
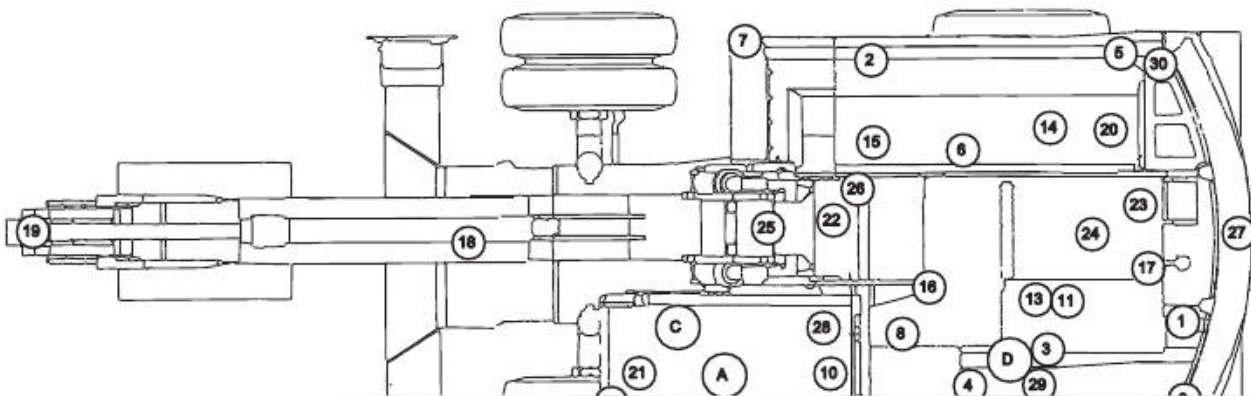




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Resistor, Sender and Solenoid Specifications		
Part No.	Component Description	Resistance (Ohms)
3E-1906	Solenoid: A/C Clutch	17.6 ± 0.6
8C-3663	Solenoid: Engine Start/Stop	Latch Coil: 1.56 ± .15 Unlatch Coil: 10.3 ± 1.03
8U-6424	Aux. Hyd and Cab Riser Blade Front Blade Rear Hammer Heavy Lift Solenoid: Left Front Stabilizer Lockout Left Rear Stabilizer Lockout Parking Brake Right Front Stabilizer Lockout Right Rear Stabilizer Lockout Transmission Speed	19
172-7029	OSC Axle Lock Creeper Speed Swing Brake Travel Activation Implement Activation	33.8/17 Watt
112-7178	Sender: Fuel Level	Full = 0.4 Empty = 70.6

Component Location		
Component	Schematic Location	Machine Location
AEC - Aux. Hyd.	F - 8	D
Alternator Fuse	C - 13	2
Alternator Fuse	C - 15	5
Battery 12v (2)	H - 13	3
Cigar Lighter	F - 2	A
Converter 24v - 12v	D - 3	A
Diode - A/C	E - 13	D
Diode - AEC - Aux. Hyd.	F - 8	D
Diode - Brake	D - 6	D
Diode - Harness AS	B - 8	D
Diode - HCR & AEC	F - 8	D
Diode - Stop Lamp	E - 8	D
Diode - Temp	E - 6	D
Engine Control	C - 12, B - 12	A
Engine Pump Control	B - 11, C - 11	A
Engine Speed Dial	C - 2	C
Flasher	F - 7	C
Fuse Block (A Black)	F - 10	D
Fuse Block (B Yellow)	E - 9	D
Component Location		
Component	Schematic Location	Machine Location
Solenoid - Main Pump PRV	G - 14	16
Solenoid - OSC Axle Lock	F - 14	8
Solenoid - Parking Brake	F - 14	11
Solenoid - Right Front Stabilizer Lockout	G - 1	18
Solenoid - Right Rear Stabilizer Lockout	H - 10	27
Solenoid - Start	C-14	18
Solenoid - Swing Brake	G - 15	16
Solenoid - Swing Pump PRV	G - 14	16
Solenoid - Transmission Speed	F - 13	11
Solenoid - Travel Activation	G - 15	16
Secondary Steering Control	H - 14	4
Switch - AEC	B - 10	C
Switch - AEC Boom Cyl. Pressure	E - 15	19
Switch - AEC Implement Travel	F - 15	19
Switch - AEC Stick Cyl. Pressure	E - 15	19
Switch - AEC Swing Pressure	E - 15	16
Switch - Air Filter Clog	C - 15	20
Switch - Air Horn	G - 2	A
Switch - Aux. Hyd. (Trans. activation)	E - 9	8



REN4035
June 2000

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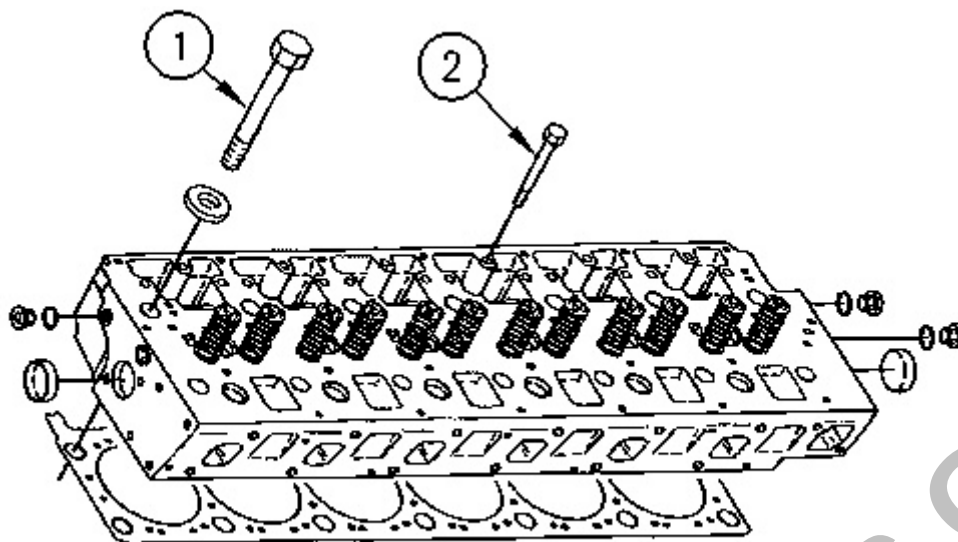


Illustration 2

g00654709

2. Remove bolts (1) and (2) that hold the cylinder head to the cylinder block. Carefully remove the cylinder head from the cylinder block. The cylinder head for the 3116 engine weighs approximately 85 kg (187 lb).

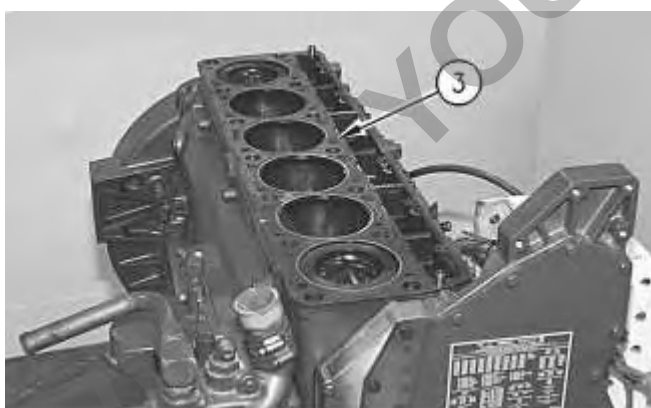


Illustration 3

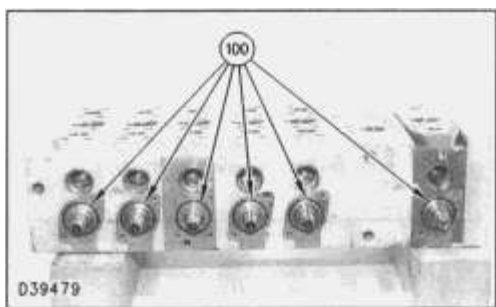
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3. Remove cylinder head gasket (3) .

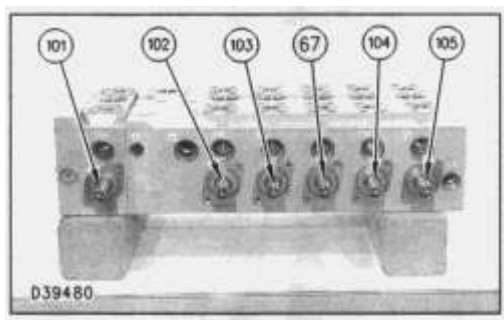
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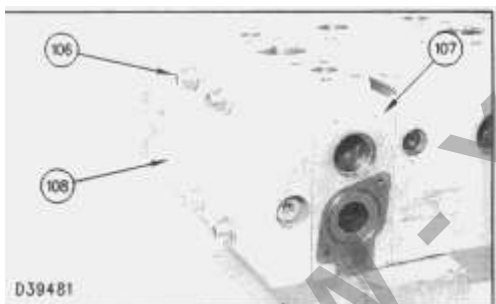
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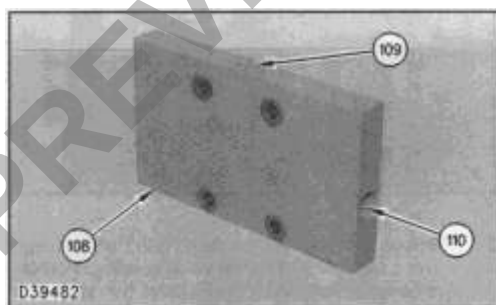
30. Remove 12 O-ring seals (100) from the valve housing.



31. Remove VA boom control valve piston (101), dozer control valve piston (102), stick control valve piston (103), travel control valve piston (67), bucket control valve piston (104) and boom control valve piston (105) from the valve housing.



32. Remove four socket head bolts (106), the washers, cover plate (108) and VA boom valve housing (107) from the valve housing.



Disassembly and Assembly M318 and M320 Excavators Power Train

Media Number -SEN6258-06

Publication Date -01/08/2008

Date Updated -14/08/2008

101328883

Travel Brake Valve - Remove

SMCS - 4265-011; 5811-011

Removal Procedure

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Tools and Shop Products Guide" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.



WARNING

At operating temperature, the hydraulic oil is hot and under pressure. Hot oils can cause burns.

To prevent possible personal injury, release the pressure in the implement hydraulic circuit (boom, stick, bucket, and swing), travel circuits, and the hydraulic oil tank at the filler cap before any hydraulic lines or components are disconnected or removed.

Remove the filler cap only when the engine is stopped and the filler cap is cool enough to touch.

G	1P-0510	Driver Gp	1
H	5P-4197	Spacer	1
J	1A-1935	Full Nut	1
	3H-0465	Push-Puller Plate	4
	5F-7342	Adapter	2
	5F-7343	Bearing Puller Gp	1
	5F-7366	Forcing Screw	1
	5P-8248	Hard Washer	2
	6B-6684	Full Nut	2
	6V-8237	Washer	1
	8B-7549	Puller Leg	2
	9S-7338	Crossblock	1

Start By:

- A. Remove the tire and rim (front). Refer to Disassembly and Assembly, "Tire and Rim - Remove (Front)" in this manual.

NOTICE

Failure to properly assemble parts or failure to follow established procedures can lead to damage of the parts and assembly.

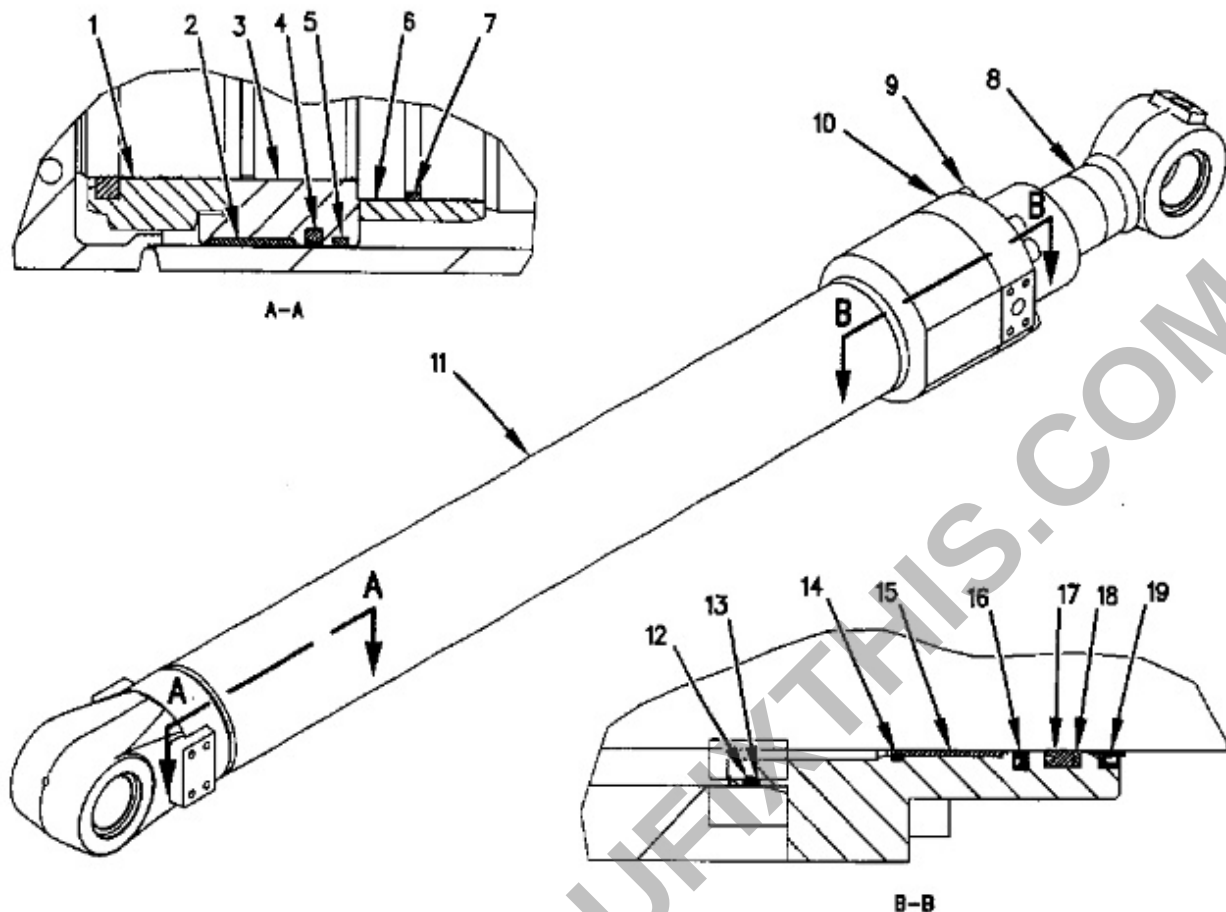
To avoid damage to parts, always identify and mark the parts so that they can be installed in the same location. Ensure that gear surfaces align. Never force parts during assembly.

NOTICE

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the product. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids.

Refer to Special Publication, NENG2500, "Caterpillar Dealer Service Tool Catalog" for tools and supplies suitable to collect and contain fluids on Caterpillar products.

Dispose of all fluids according to local regulations and mandates.



D27200

Bucket Cylinder

1. Put the bucket cylinder on Tooling (A). The weight of the bucket cylinder is 155 kg (340 lb).
2. Remove eight socket head bolts (9) that hold head (10) to cylinder assembly (11).
3. Using Tooling (A), slide rod and bearing assembly (8), with head (10), out of cylinder assembly (11).
4. Remove ring (2), seal assembly (4) and ring (5) from piston (3).
5. Using Tooling (B), remove locknut (1) that holds piston (3) to rod and bearing assembly (8). Remove the piston from the rod and bearing assembly.
6. Remove stop (6) and seal ring (7) from rod and bearing assembly (8).
7. Slide cylinder assembly (11) back onto the rod and bearing assembly with the head. Install eight socket head bolts (9) that hold head (10) to the cylinder assembly. Pull the cylinder assembly and head, as a unit, away from the rod and bearing assembly. Remove the head from the cylinder assembly.

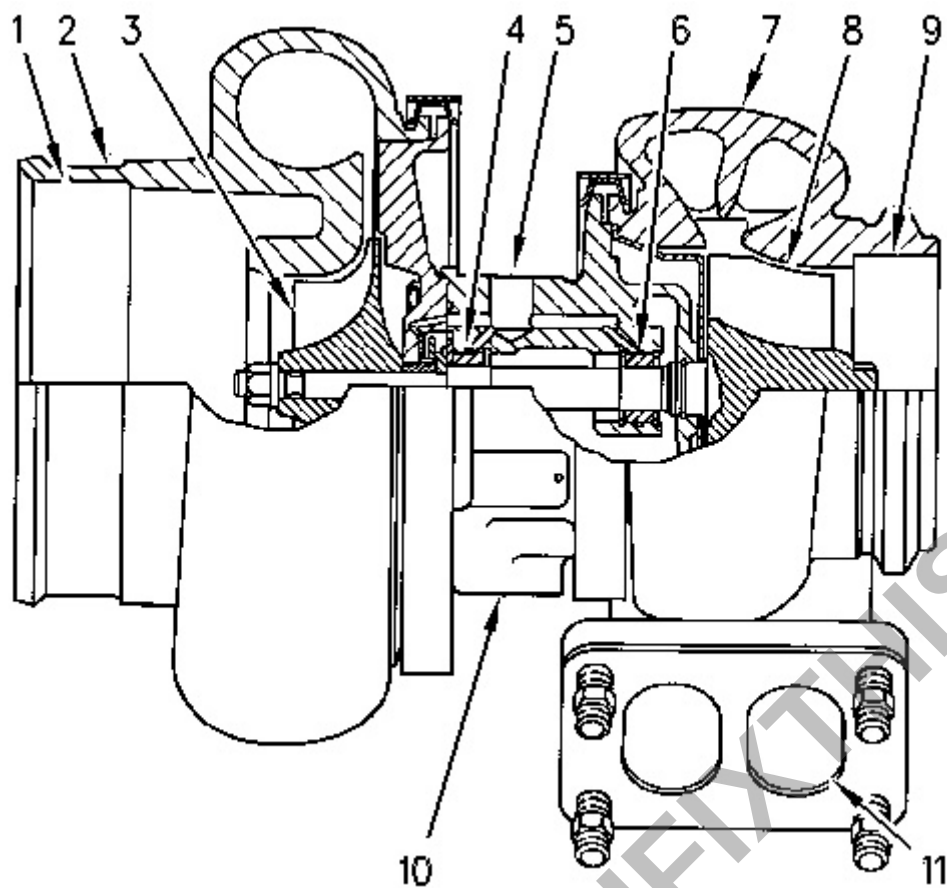


Illustration 3

g00294193

Turbocharger

- (1) Air inlet
- (2) Compressor housing
- (3) Compressor wheel
- (4) Bearing
- (5) Oil Inlet port
- (6) Bearing
- (7) Turbine housing
- (8) Turbine wheel
- (9) Exhaust outlet
- (10) Oil outlet port
- (11) Exhaust inlet

The turbocharger is installed on the center section of the exhaust manifold. All the exhaust gases from the engine go through the turbocharger. The compressor side of the turbocharger is connected to the aftercooler by pipe.

Disassembly and Assembly

446 and 446B Backhoe Loaders, Lexion 450 Combine, 3114 and 3116 Engines, IT18F Integrated Toolcarrier, D6M Track-Type Tractor and 928F, 950F and 950G Wheel Loaders

Media Number -SEN3611-18

Publication Date -01/05/2009

Date Updated -27/05/2009

i01929610

Flywheel - Remove

SMCS - 1156-011

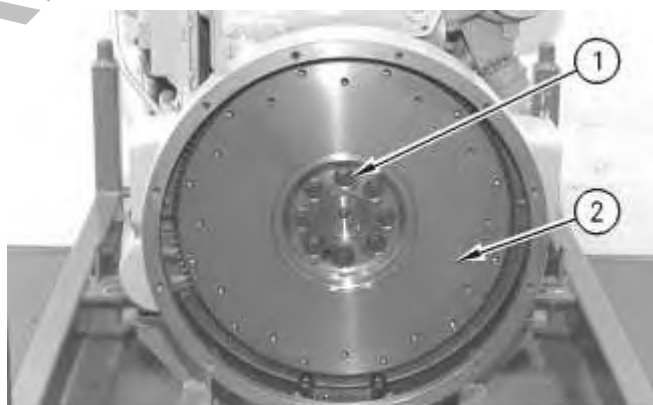
Removal Procedure

Table 1

Required Tools			
Tool	Part Number	Part Description	Qty
A	138-7573	Link Bracket	2
B	-	Guide Bolt (M16 x 2 by 4 inch)	1

Note: For information on the reusability of the flywheel on 3116 engines, refer to Guideline For Reusable Parts And Salvage Operations, SEBF8207, "Flywheel Specifications for 3116 Engines".

1. Support the engine with blocks or a suitable lifting device.
2. Install Tooling (A) on the flywheel. Fasten a suitable lifting device to the flywheel.



external, and select the option button for the appropriate customer. Next, click the "Transfer Subscription to UCID" button.

- If PLM registration is successful and equipment does not exist in equipment data or is not associated with a Customer or UCID, the customer field will be blank. Caterpillar recommends to create the equipment record in equipment data and complete the UCID association before accepting the subscription in "Automatic Subscription".
- The "Automatic Subscription" feature will not activate a subscription if it has been previously downgraded. In this case, the manual downgrade flag is retained and accepted.
- When a subscription is purchased at a customer level, the customer will see the data from the purchase date of the subscription. The dealer view of subscriptions at either the customer or the dealer level allows the view of data from registration date.

Rules for Automatic Downgrade

The following rules apply to automatic downgrades:

- Automatic downgrades occur to existing subscriptions if customer (UCID) ownership changes between registrations.

Note: The subscription will be downgraded for the previous customer (UCID), and the "Automatic Subscription" screen will display the new customer (UCID).

- Automatic downgrades occur to existing subscriptions if a module is registered again under a new dealer code.

Note: The subscriptions will be downgraded for the previous customer (UCID) and/or dealer as applicable. The subscriptions will be displayed on the "Automatic Subscription" screen for the new dealer that is registering.

Note: EquipmentManager history is associated with the previous customer will not be viewable by the new customer.

Edit Subscriptions

Edit Dealer or Customer Subscriptions

In order to upgrade or downgrade a dealer subscription, complete the following procedure:

Note: Only the dealer administrator and the customer administrator can upgrade or downgrade subscriptions for equipment, which is done through the "Edit Subscription" option in EquipmentManager.

from EquipmentManager. This frequency will be used for the entry of data of service meter units for equipment with Maintenance Watch subscriptions. The following values are available: "Weekly", "Monthly", "6 Weeks" and "Never".

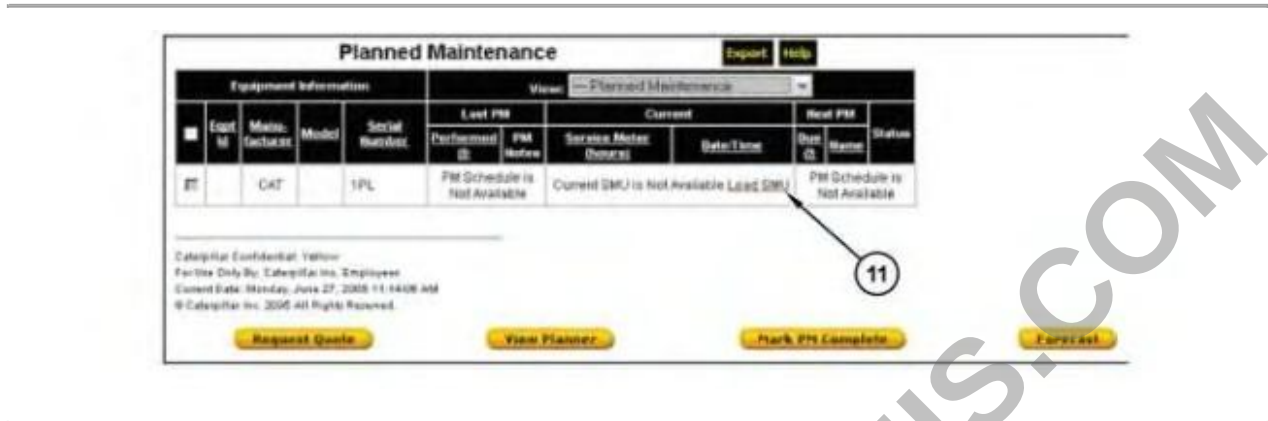


Illustration 13

g01708156

The "Planned Maintenance" screen with "Load SMU"

(11) "Load SMU" link

Illustration 13 above displays the "Planned Maintenance" screen for a piece of equipment that has no PLM and a Maintenance Watch subscription. Notice that "Load SMU" link (11) is present in the "Current" column. In order to update the SMU manually, select this link. After clicking this link, the "Manual Maintenance – Service Meter Update" window will be displayed.

Testing and Adjusting

Product Link - PL522/523

Media Number -REN8143-02

Publication Date -01/07/2013

Date Updated -23/07/2013

103995041

Electronic Control Module (ECM) - Replace

SMCS - 7610-510

Before the PL522 or 523 is replaced, ensure that replacement is necessary. The PL522 or 523 is seldom the cause of a fault. Always check that power is available to the PL522 or 523. Battery voltage is required between contacts 1 and 2 of the machine harness connector for the PL522 or 523. Continue ONLY if all other attempts to isolate the problem have failed. Always consult your dealerships Technical Communicator for possible consultation with Caterpillar. This consultation may greatly reduce the time that is required for a repair.

1. Turn the disconnect switch and the key start switch to the OFF position. Disconnect the machine harness from the PL522 or 523.
2. Remove the PL522 or 523.
3. Ensure that the replacement PL522 or 523 kit is the correct part number.
4. Install the replacement PL522 or 523 system according to the Special Instructions that are included in the installation kits.
5. Flash the software to the new module in order to ensure that the latest version of the software is on the system.

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Tighten the screw on the switch terminal to the following torque. ... $2.25 \pm 0.25 \text{ N}\cdot\text{m}$ ($20 \pm 2 \text{ lb in}$)

Solenoid

Current draw at 12 Volt and 25 °C (77 °F)

Pull-in windings ... 90 Amp

Hold-in windings ... 30 Amp

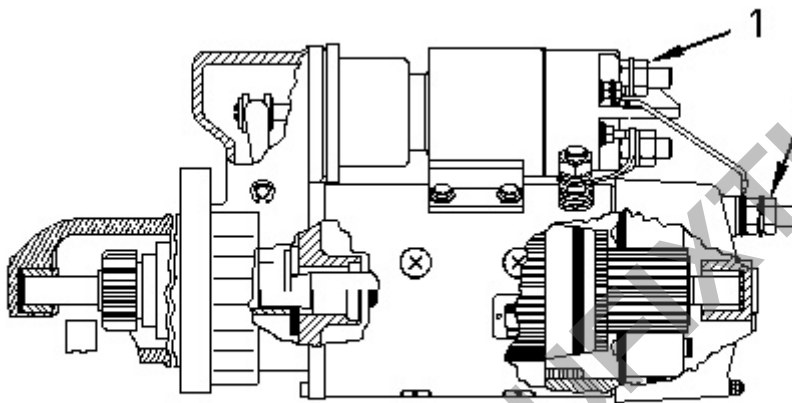


Illustration 5

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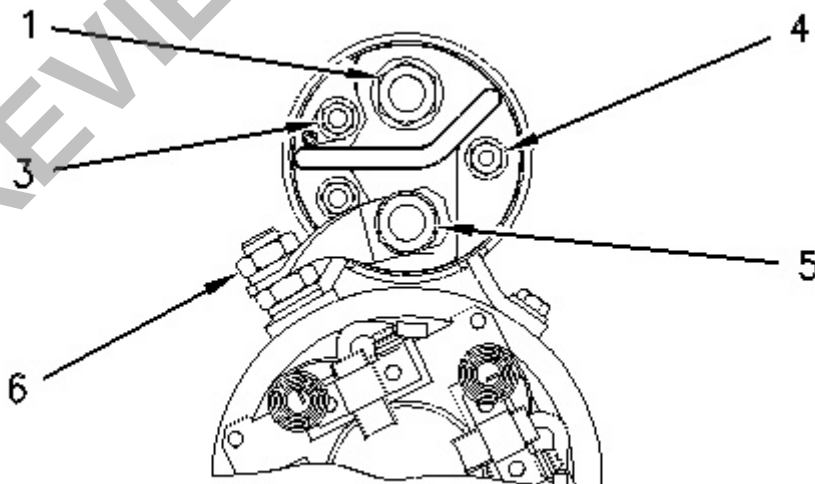


Illustration 6

g00605533

(5) Tachometer

(6) Speed control knob

7. Connect the test bench to an electrical outlet. Turn on tachometer (5) .
8. Turn the switch for the test bench to the ON position.

NOTICE

Do not turn the speed control knob unless the test bench is running. Damage to the variable speed drive may result. Except in the event of an emergency, the speed control knob should always be returned to the slowest rpm setting before the calibration bench is turned off.

9. Turn speed control knob (6) in the counterclockwise (CCW) direction to the slowest speed. Check all fluid connections for leaks. If leaks are found, perform any necessary repairs.

Note: Always approach a specified rpm setting from a minimum of 100 rpm above the rpm that is required. This will ensure that the test readings are consistent for the entire test procedure.

Note: All specifications for the governor adjustment procedure are in the Technical Marketing Information (TMI). If no values are listed in the specifications for a particular functional test, proceed to the next step in the test.

Note: If any of the adjustments for the function checks cannot be performed during the governor setting procedure, stop the procedure and inspect the governor for possible problems.

Note: The tolerances that are found in the TMI, refer to the Specifications, "Governor Performance Data" section in this manual, are applicable to all of the governor adjustments. The Expanded Tolerance Band that is referred to in the governor checking procedure is applicable to rechecking a governor that has been previously adjusted.

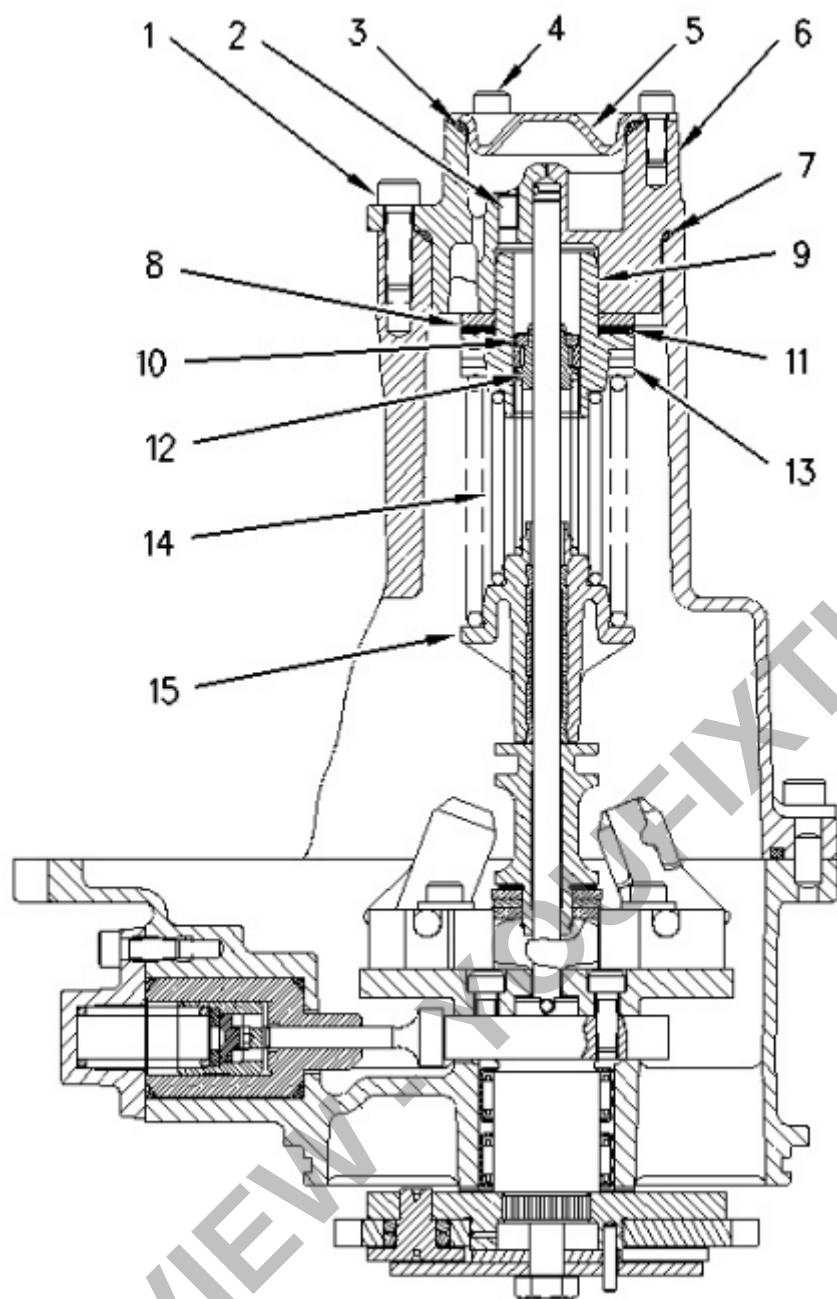


Illustration 1

g00521797

Typical Governor

- (1) Bolt
- (2) Orifice for the dashpot
- (3) O-ring seal
- (4) Bolt
- (5) Cover
- (6) Cover assembly
- (7) O-ring seal

- (2) Port (Swing Left)
- (3) Port (Stick Out)
- (4) Port (Swing Right)
- (P) Port (Inlet)
- (T) Port (Return)

The oil at the opposite end of the main control valve stem flows through the port return passage and to the return chamber to the hydraulic tank.

The centering spring in the pilot control valve provides the necessary force in order to allow the joysticks to return to the NEUTRAL position when the joysticks are released.

When the joystick is actuated, the metering springs are compressed. This causes the metering spool to move downward. The metering spool controls the pilot oil pressure to the main control valve. The pilot pressure that is delivered to the main control valve is proportional to the travel distance of the joystick. Movement of the main control valve stems causes a change in the flow rate of oil to the implements and/or the motors proportionally to the change in pilot pressure.

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Groove depth ... 1.35 mm (0.053 inch)

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PREVIEW - YOUFIXTHIS.COM



Illustration 7

g00710245

8. Remove shaft (13) .



Illustration 8

g00710254

9. Remove carrier (14) .

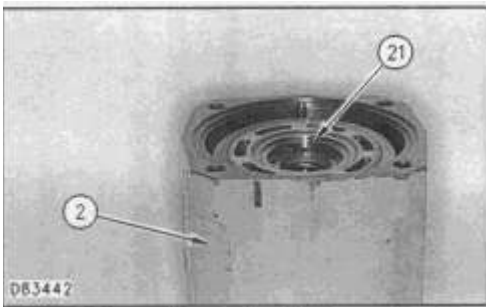


Illustration 9

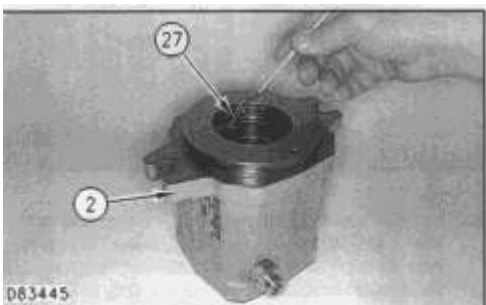
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10. Remove bearing (15) .

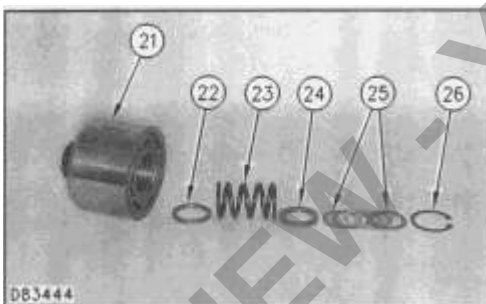
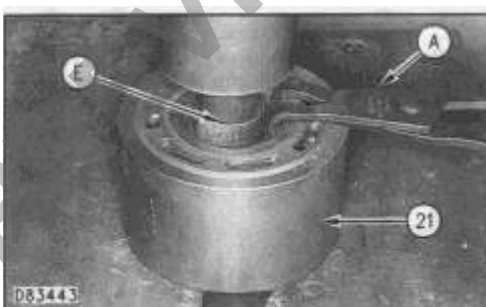
30. Install retraction plate (30) with seven pistons (28) and retaining ring (29) in housing (2). Make sure to align the small hole in the retaining ring with the small hole in the housing.



31. Check the clearance between the retraction disc and the retaining ring with a 1.5 mm (.06 in) feeler gage. The feeler gage must not go between these components.



32. Install pin (27) in housing (2) making sure that it aligns with the small holes in the sliding disc and the retaining ring.



33. Install washer (22), spring (23), washer (24) and shims (25) in cylinder block (21). Use Tooling (E) and an appropriate press to compress spring (23) far enough to install retaining ring (26) with Tool (A).

Disassembly and Assembly M320 EXCAVATOR MACHINE SYSTEMS

Media Number -SEN1957-01

Publication Date -01/02/1999

Date Updated -11/10/2001

Pilot Control Valve (Stick/Swing)

SMCS - 5465-010

Remove & Install Pilot Control Valve (Stick/Swing)

Fluid Spillage Containment

Care must be taken to ensure that fluids are contained during performance of inspection, maintenance, testing, adjusting and repair of the machine. Be prepared to collect the fluid with suitable containers before opening any compartment or disassembling any component containing fluids. Refer to "Tools And Shop ProductsGuide", NENG2500 for tools and supplies suitable to collect and contain fluids in Caterpillar machines. Dispose fluids according to local regulations and mandates.

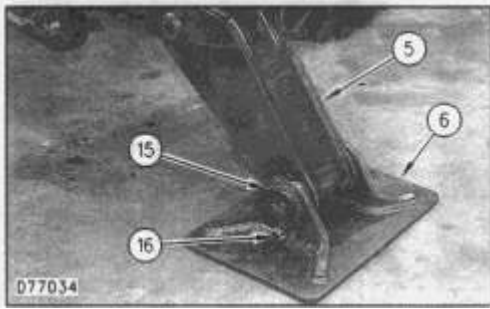
NOTE: Put identification on all lines, hoses, wires and tubes for installation purposes. Cap and plug all connectors, lines, hoses and tubes to prevent the loss of oil and keep foreign material from entering the system.



WARNING

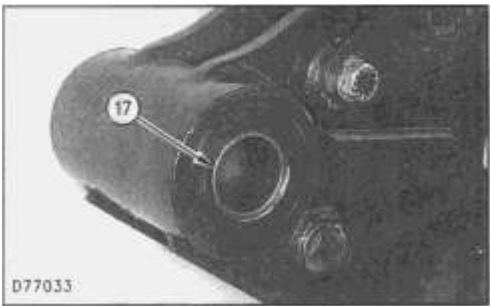
At operating temperature, the hydraulic oil is hot and under pressure. Hot oil can cause burns. To prevent possible personal injury, release the pressure in the implement hydraulic circuits (boom, stick, bucket, and swing), the travel circuits, and the hydraulic oil tank at the breather cap before any hydraulic lines or components are disconnected or removed. Remove the filler plug only when the engine is stopped and the filler plug is cool enough to touch.

1. Release the pressure in the hydraulic system as follows:
 - a. Fully retract the stick cylinder rod.
 - b. Adjust the position of the bucket so it will be flat on the ground when the boom is lowered.
 - c. Lower the boom until the bucket is flat on the ground.



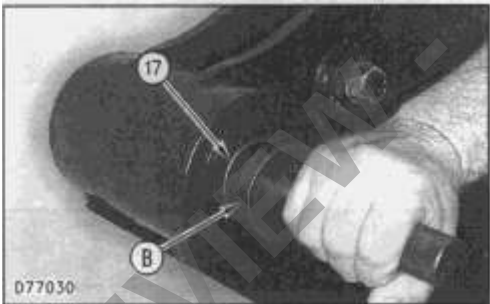
10. Remove bolt (16) and the washer that secure pin (15) to pad (6). Remove pin (15) from stabilizer arm assembly (5) and stabilizer pad (6). Hoist stabilizer arm assembly (5) clear of stabilizer pad (6). The weight of stabilizer arm assembly (5) is 81 kg (179 lb).

11. Repeat Step 9 to remove the stabilizer pad from the other stabilizer arm assembly.

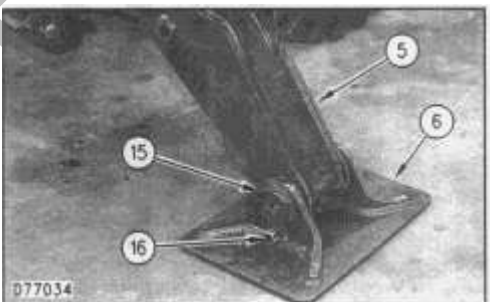


12. Remove sleeve (17) from stabilizer arm assembly (5). Remove the sleeve from the other stabilizer arm assembly.

NOTE: The following steps are for the installation of the stabilizer arm assemblies.



13. Lower the temperature of sleeve (17). Using Tool (B), install the sleeve in stabilizer arm assembly (5). The sleeve must be centered in the arm. Install the sleeve in the other stabilizer arm assembly.



2.7 kg (6.0 lb)	
2.8 kg (6.25 lb)	154
2.9 kg (6.5 lb)	176
3.1 kg (6.75 lb)	198
3.2 kg (7.0 lb)	220
3.3 kg (7.25 lb)	242
3.4 kg (7.5 lb)	265
3.5 kg (7.75 lb)	287
3.6 kg (8.0 lb)	311
3.7 kg (8.25 lb)	334
3.9 kg (8.5 lb)	358
4.0 kg (8.75 lb)	382
4.1 kg (9.0 lb)	406

⁽¹⁾ The unit is mL.

Note: Always use new refrigerant oil and clean equipment to avoid contamination inside the air conditioning system.

Note: Make sure that the equipment for oil injection does not contain air in the supply line to the air conditioning system. This prevents air from being injected into the system which can lead to poor cooling performance and possible system damage.

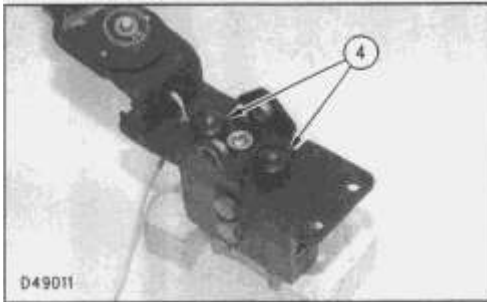
Note: Oil should only be charged into the discharge service port. Failure to charge the oil correctly can cause damage to the compressor from liquid slugging with oil.

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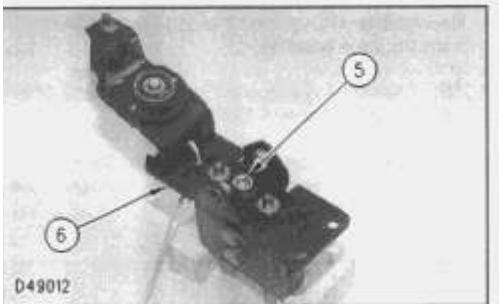
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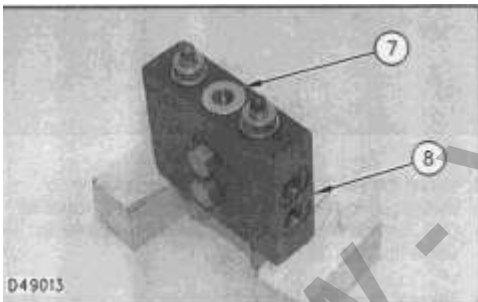
1. Loosen the setscrew through opening (1). Remove pin (2). Remove pedal (3) from the plate.



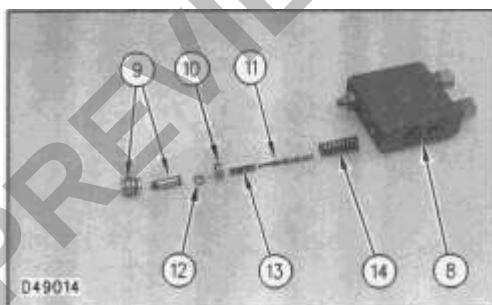
2. Remove two bellows (4) from the plunger groups in the pilot valve.



3. Remove socket head bolt (5) and plate (6) from the valve housing.



4. Remove washer (7) from valve housing (8).



5. Remove plunger group (9), two retainers (12), retainer (10), spring (13), piston (11) and spring (14) from valve housing (8).

6. Repeat Step 5 to remove the other valve assembly from the valve housing.

NOTE: The following steps are for the assembly of the pilot control valve (travel & fore boom).



Illustration 8

g00645420

- b. Install **4C-6723** Socket (part of Tooling (C)) on the end of **4C-4058** Spanner Wrench (part of Tooling (B)).
- c. Install the remainder of Tooling (C) on the end of Tooling (B) , as shown. Rotate the hub while spanner nut (21) is being tightened. Use Tooling (B) and Tooling (C) to tighten the spanner nut to a torque of 1200 N·m (885 lb ft).
- d. Make sure that lubrication holes (L1) are not blocked. If lubrication holes (L1) are blocked, continue to tighten spanner nut (21) . Do not exceed a torque of 1400 N·m (1035 lb ft). Remove Tooling (C) and Tooling (B) .

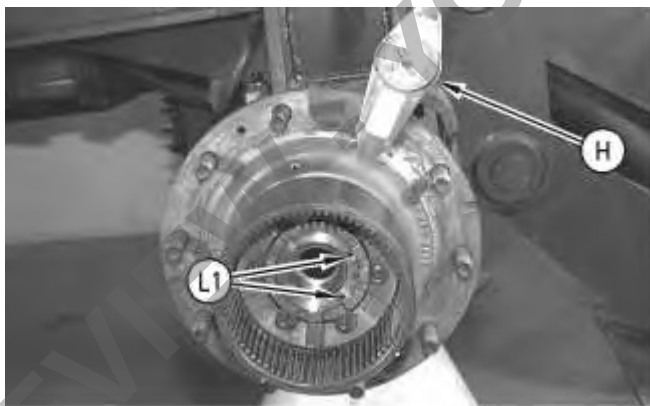


Illustration 9

g00645428

(L1) Lubrication holes

10. Install two lug nuts on one of the wheel studs. Tighten the lug nuts against each other so that the lug nuts cannot move. Install an appropriate socket and Tooling (H) on the lug nut. Position Tooling (H) so that Tooling (H) is in line with the radius of the hub, as shown.

Note: Tooling (H) must be in line with the radius of the hub, as shown.

Note: The required rolling torque for the roller bearing is 15 ± 3 N·m (133 ± 27 lb in).

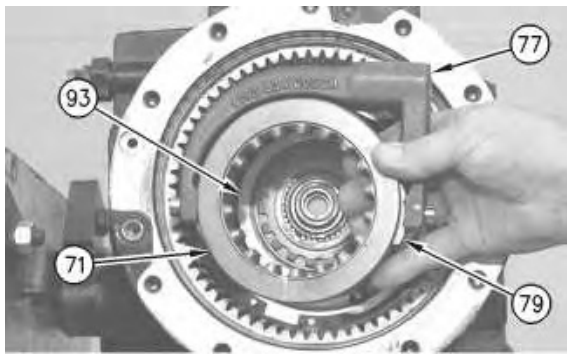


Illustration 13

g00679669

14. Install two thrust pads (79) in shift fork (77) . Install sliding collar (71) on the shift fork, as shown. Place the sliding collar and the shift fork in position in the transmission housing. Make sure that sliding collar (71) engages with shifting collar (93) .

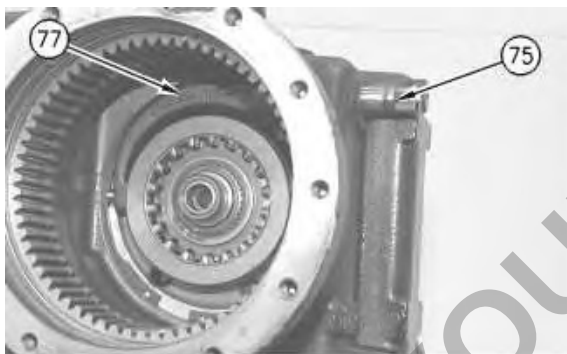


Illustration 14

g00679693

15. Install pin (75) in the transmission housing and shifting fork (77) .

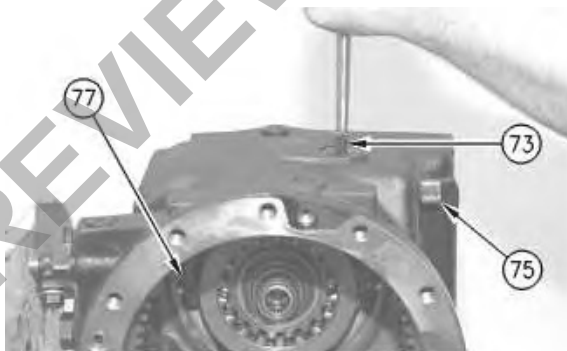


Illustration 15

g00679743

Note: Spring pin (73) holds pin (75) in shift fork (77) . Make sure that spring pin (73) is centered in shift fork (77) after the spring pin is installed. The spring pin must not interfere with the transmission housing.

16. Use a hammer and a punch to install spring pin (73) in shift fork (77) and in pin (75) . Make sure that the spring pin is centered in the assembly.

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