

780D Loader Backhoe
Service Manual

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1001

STANDARD TORQUE SPECIFICATIONS

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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 graphites, molydisulfide greases, or other extreme pressure lubricants are used.

Grade 5 Bolts, Nuts, and Studs		
		
Size	Pound-Feet	Newton metres
1/4 in	9-11	12-15
5/16 in	17-21	23-28
3/8 in	35-42	48-57
7/16 in	54-64	73-87
1/2 in	80-96	109-130
9/16 in	110-132	149-179
5/8 in	150-180	203-244
3/4 in	270-324	366-439
7/8 in	400-480	542-651
1.0 in	580-696	787-944
1-1/8 in	800-880	1085-1193
1-1/4 in	1120-1240	1519-1681
1-3/8 in	1460-1680	1980-2278
1-1/2 in	1940-2200	2631-2983


Grade 8 Bolts, Nuts, and Studs		
		
Size	Pound-Feet	Newton metres
1/4 in	12-15	16-20
5/16 in	24-29	33-39
3/8 in	45-54	61-73
7/16 in	70-84	95-114
1/2 in	110-132	149-179
9/16 in	160-192	217-260
5/8 in	220-264	298-358
3/4 in	380-456	515-618
7/8 in	600-720	814-976
1.0 in	900-1080	1220-1465
1-1/8 in	1280-1440	1736-1953
1-1/4 in	1820-2000	2468-2712
1-3/8 in	2380-2720	3227-3688
1-1/2 in	3160-3560	4285-4827


NOTE: Use thick nuts with Grade 8 bolts.

TORQUE SPECIFICATIONS - METRIC HARDWARE

Use the following torques when special torques are not given.

These values apply to fasteners with coarse threads as received from supplier, plated or unplated, or when lubricated with engine oil. These values do not apply if graphite or molydisulfide grease or oil is used.

Grade 8.8 Bolts, Nuts, and Studs		
		
Size	Pound-Feet	Newton metres
M4	2-3	3-4
M5	5-6	6.5-8
M6	8-9	10.5-12
M8	19-23	26-31
M10	38-45	52-61
M12	66-79	90-107
M14	106-127	144-172
M16	160-200	217-271
M20	320-380	434-515
M24	500-600	675-815
M30	920-1100	1250-1500
M36	1600-1950	2175-2600

Grade 10.9 Bolts, Nuts, and Studs		
		
Size	Pound-Feet	Newton metres
M4	3-4	4-5
M5	7-8	9.5-11
M6	11-13	15-17.5
M8	27-32	37-43
M10	54-64	73-87
M12	93-112	125-15
M14	149-179	200-245
M16	230-280	310-380
M20	450-540	610-730
M24	780-940	1050-1275
M30	1470-1770	2000-2400
M36	2580-3090	3500-4200

Grade 12.9 Bolts, Nuts, and Studs



Usually the torque values specified for grade 10.9 fasteners can be used satisfactorily on grade 12.9 fasteners.

TORQUE SPECIFICATIONS - STEEL HYDRAULIC FITTINGS

Tube OD Hose ID	Thread Size	Pound- Feet	Newton metres
37 Degree Flare Fittings			
1/4 in 6.4 mm	7/16-20	6-12	8-16
5/16 in 7.9 mm	1/2-20	8-16	11-21
3/8 in 9.5 mm	9/16-18	10-25	14-33
1/2 in 12.7 mm	3/4-16	15-42	20-56
5/8 in 15.9 mm	7/8-14	25-58	34-78
3/4 in 19.0 mm	1-1/16-12	40-80	54-108
7/8 in 22.2 mm	1-3/16-12	60-100	81-135
1.0 in 25.4 mm	1-5/16-12	75-117	102-158
1-1/4 in 31.8 mm	1-5/8-12	125-165	169-223
1-1/2 in 38.1 mm	1-7/8-12	210-250	285-338

Tube OD Hose ID	Thread Size	Pound- Feet	Newton metres
Straight Threads with O-ring			
1/4 in 6.4 mm	7/16-20	12-19	16-25
5/16 in 7.9 mm	1/2-20	16-25	22-23
3/8 in 9.5 mm	9/16-18	25-40	34-54
1/2 in 12.7 mm	3/4-16	42-67	57-90
5/8 in 15.9 mm	7/8-14	58-92	79-124
3/4 in 19.0 mm	1-1/16-12	80-128	108-174
7/8 in 22.2 mm	1-3/16-12	100-160	136-216
1.0 in 25.4 mm	1-5/16-12	117-187	159-253
1-1/4 in 31.8 mm	1-5/8-12	165-264	224-357
1-1/2 in 38.1 mm	1-7/8-12	250-400	339-542

Split Flange Mounting Bolts		
Size	Pound- Feet	Newton metres
5/16-18	15-20	20-27
3/8-16	20-25	26-33
7/16-14	35-45	47-61
1/2-13	55-65	74-88
5/8-11	140-150	190-203

2001

ENGINE REMOVAL AND INSTALLATION AND RADIATOR REMOVAL AND INSTALLATION

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ENGINE REMOVAL

STEP 1



Park the machine on a level surface and apply the parking brake.

STEP 4



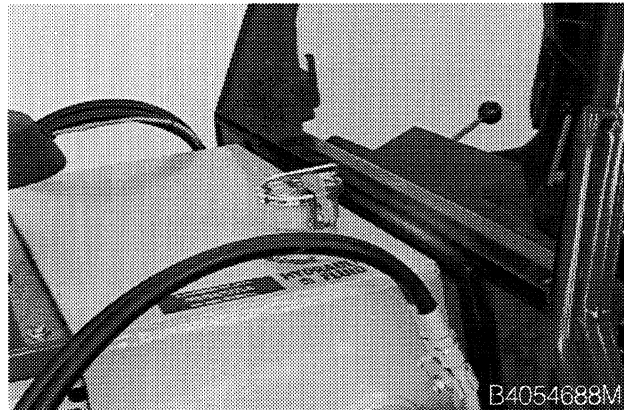
Remove both side panels for the engine compartment.

STEP 2



Remove the pin that holds the strut in place and lower the strut onto the lift cylinder.

STEP 5



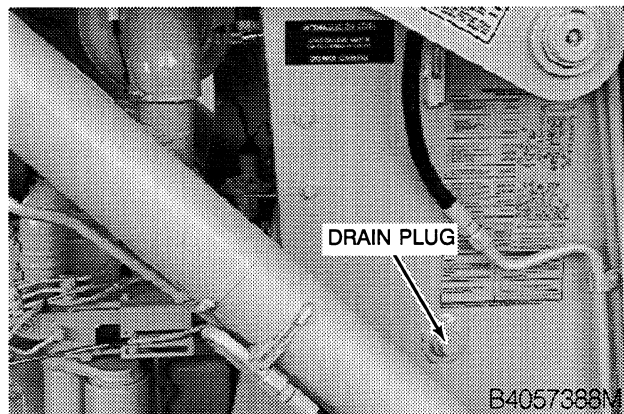
Loosen the fill cap for the reservoir to remove the air pressure.

STEP 3



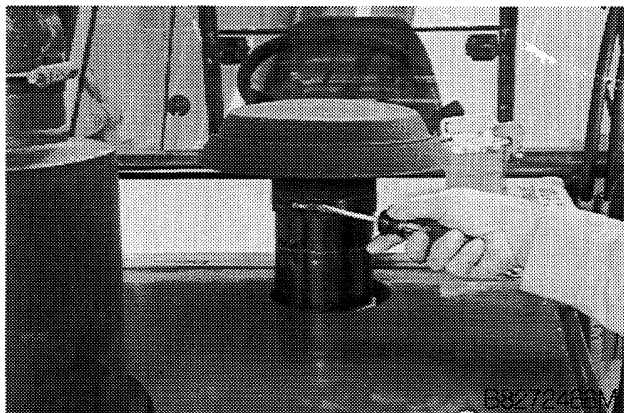
Raise the loader frame until the strut is against the end of the lift cylinder. Install the pin in the strut. Stop the engine.

STEP 6



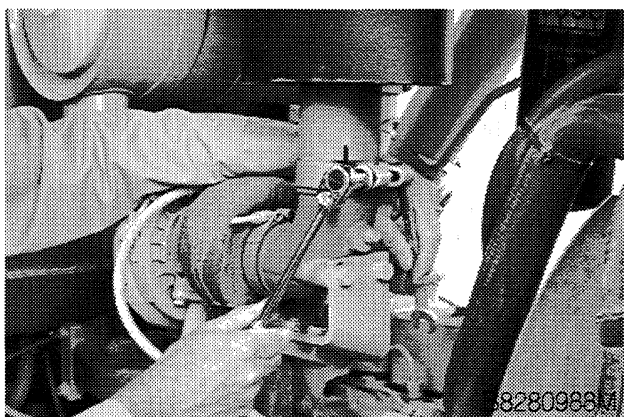
Drain or use a pump to remove the oil from the reservoir. The reservoir contains 18.9 U.S. gallons (71.5 litres) of oil.

STEP 7



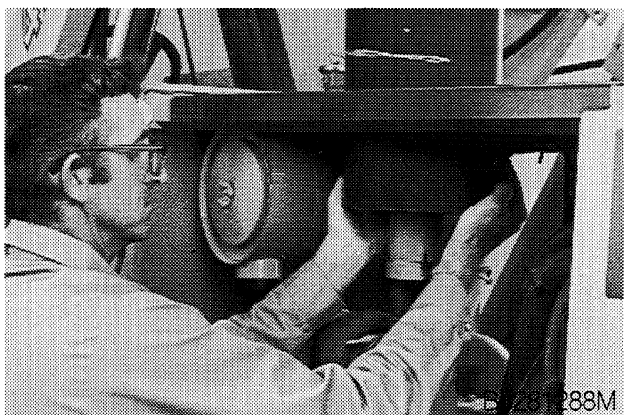
Loosen the clamp for the air cleaner cap and remove the air cleaner cap.

STEP 8



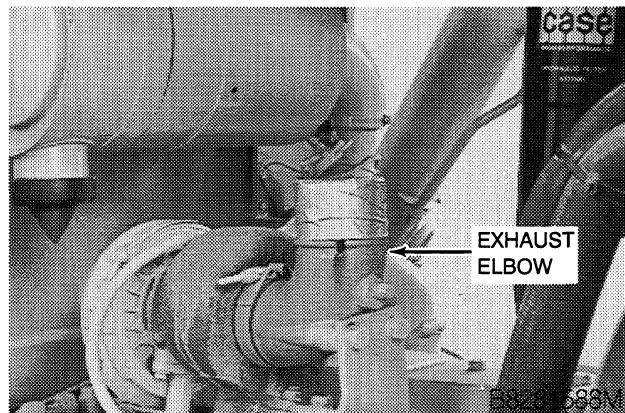
Loosen the clamp for the muffler.

STEP 9



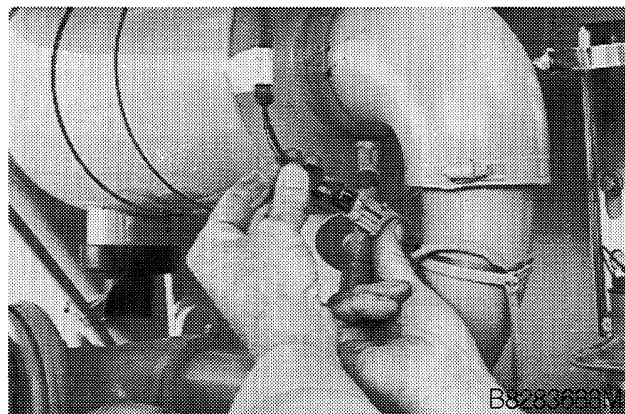
Remove the muffler.

STEP 10



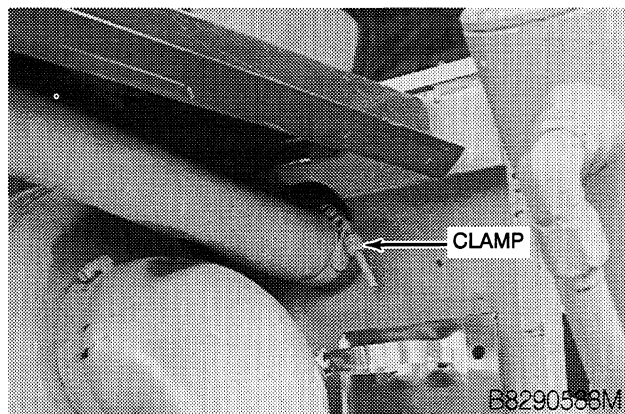
Cover or close the opening in the exhaust elbow.

STEP 11



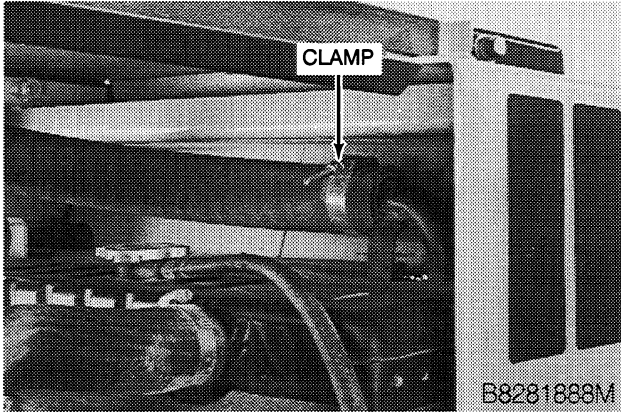
Disconnect the wire harness for the hydraulic oil filter.

STEP 12



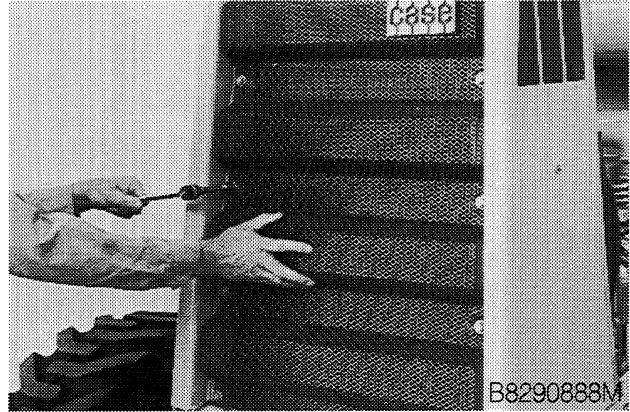
Loosen the clamp that connects the hose from the hydraulic oil filter to the reservoir. Disconnect the hose. Install a plug in the hose and a cap on the reservoir.

STEP 13



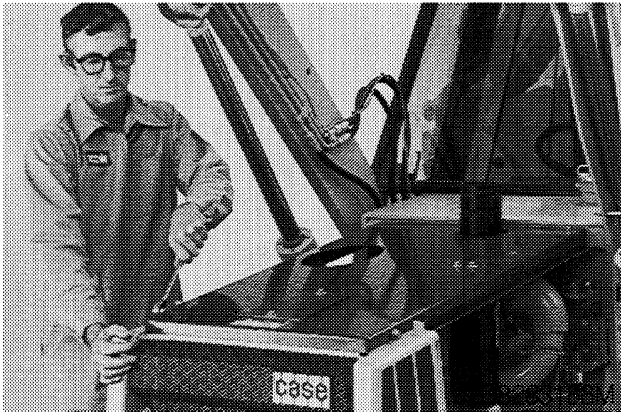
Loosen the clamp that connects the hose for the hydraulic oil filter to the oil cooler. Disconnect the hose. Install a plug in the hose and a cap on the tube.

STEP 16



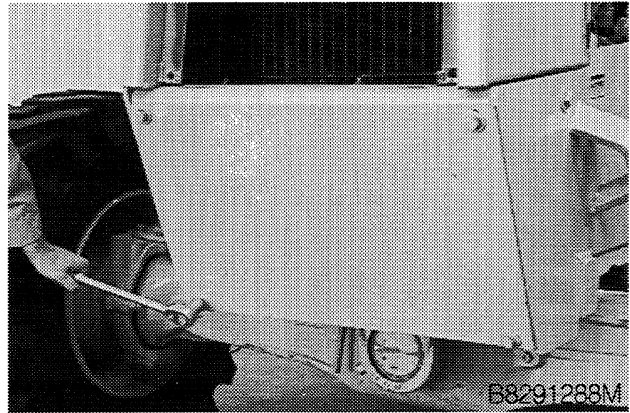
Loosen and remove the cap screws, lock washers, and flat washers that fasten the grille. Remove the grille.

STEP 14



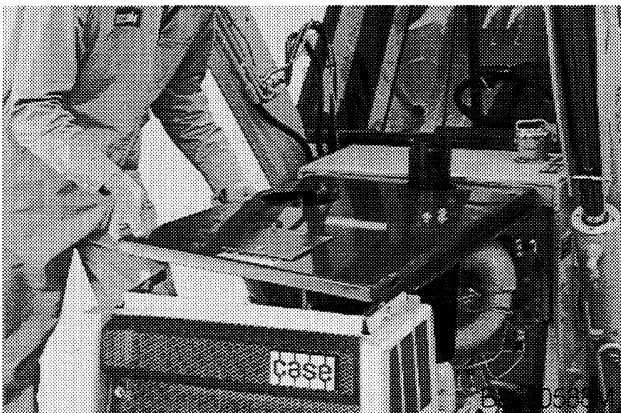
Loosen and remove the cap screws, lock washers, flat washers, and spacers that fasten the front of the hood. Loosen and remove the nuts, lock washers, flat washers, and bolts that fasten the rear of the hood.

STEP 17



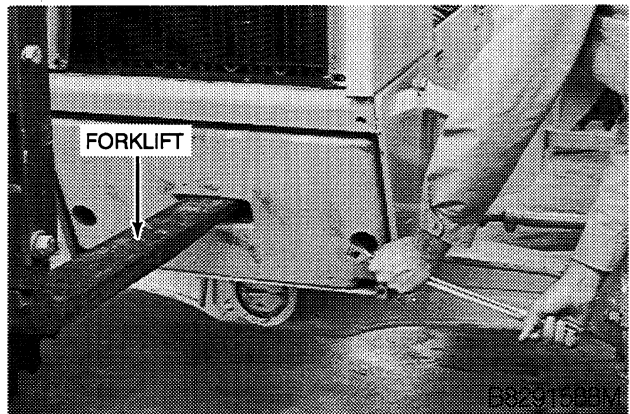
Loosen and remove the cap screws, lock washers, and flat washers that fasten the cover to the front of the machine. Remove the cover.

STEP 15



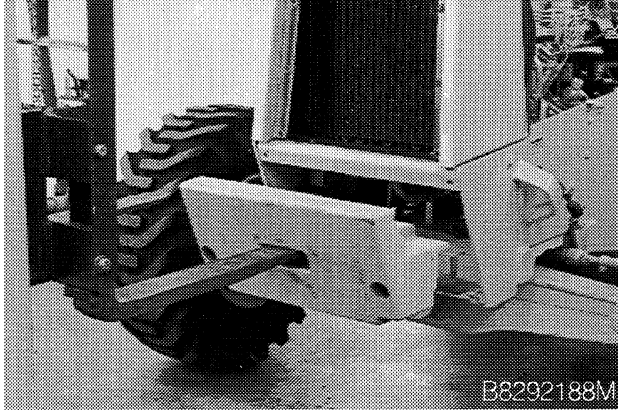
Remove the hood. If necessary, have another person help you.

STEP 18



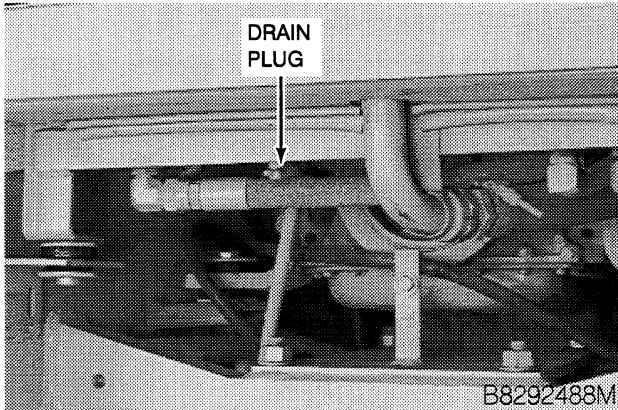
If your machine is equipped with an extendable dipper, loosen and remove the cap screws and flat washers that fasten the counterweight to the frame. The weight of the counterweight is 710 pounds (322 kg).

STEP 19



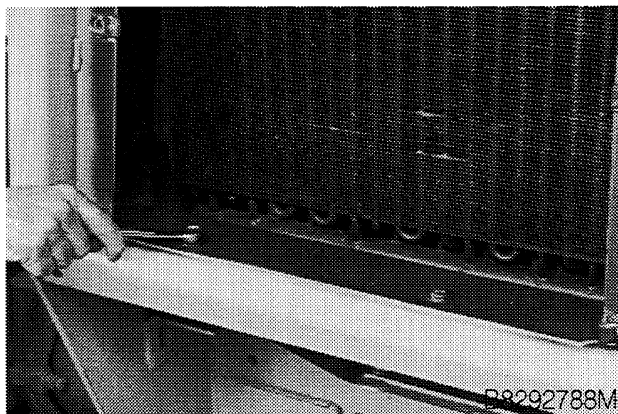
Remove the counterweight.

STEP 20



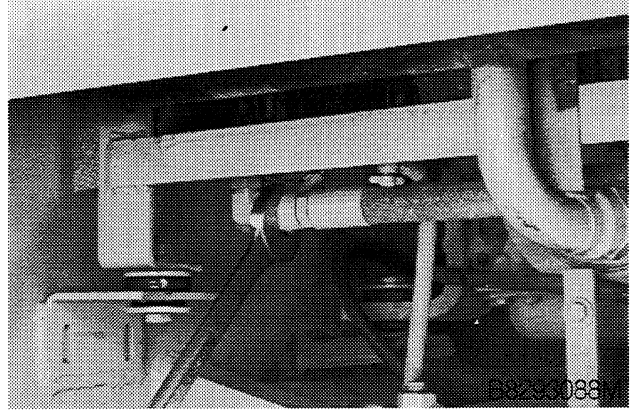
Remove the cap from the radiator and open the drain valve to drain the cooling system. The cooling system holds approximately 6.75 U.S. gallons (25.6 litres) of coolant.

STEP 21



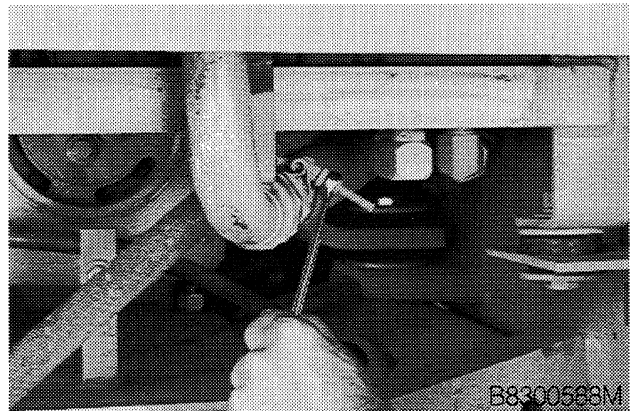
Loosen and remove the cap screws, lock washers, and flat washers that fasten the plate to the frame. Remove the plate.

STEP 22



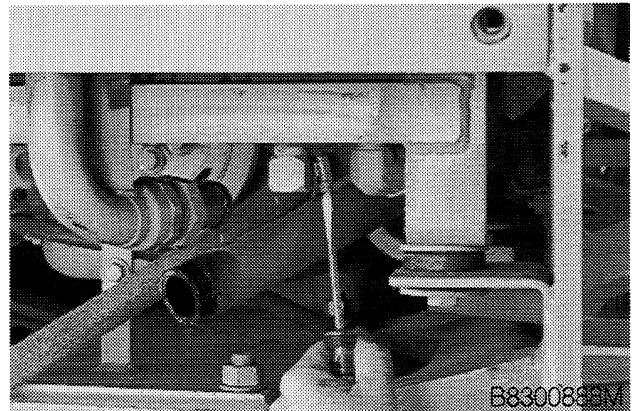
Disconnect the hose from the right side of the transmission oil cooler.

STEP 23



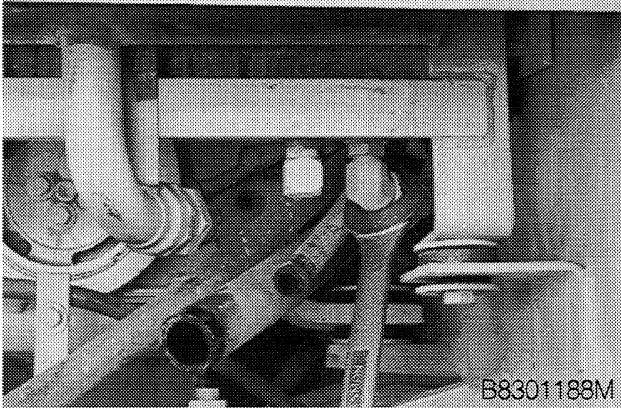
Loosen the clamp and disconnect the hose from the hydraulic oil cooler.

STEP 24



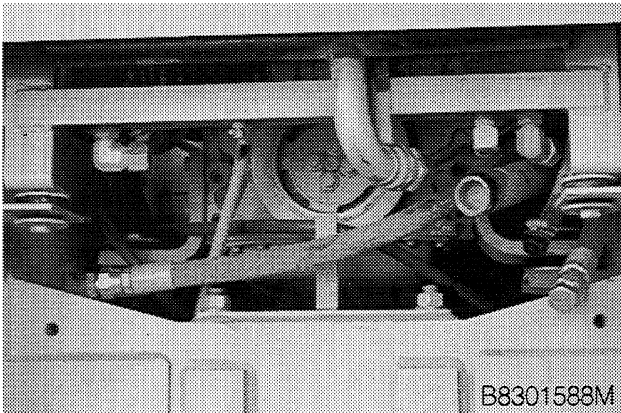
Loosen the clamp and disconnect the hose from the fitting.

STEP 25



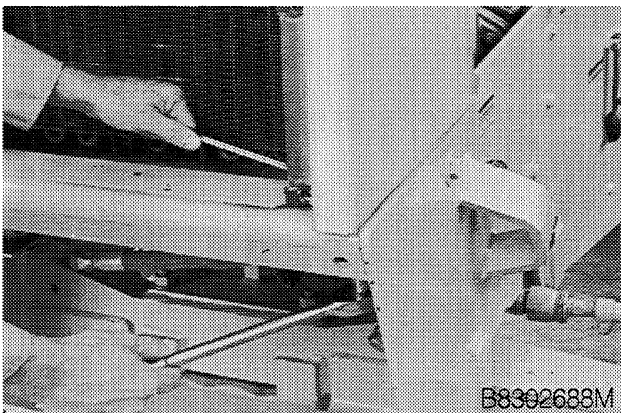
Disconnect the hose from the left side of the transmission oil cooler.

STEP 26



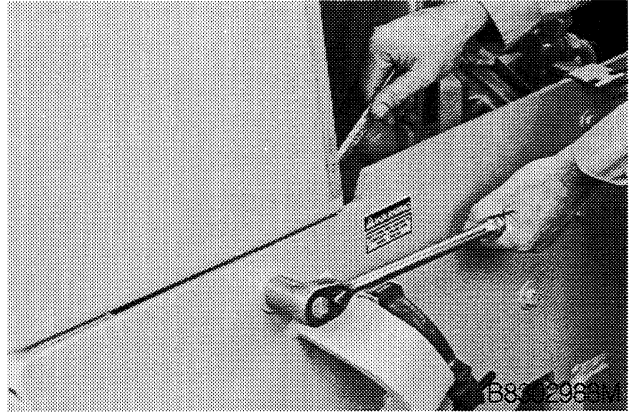
Install plugs in the hoses and caps on the fittings.

STEP 27



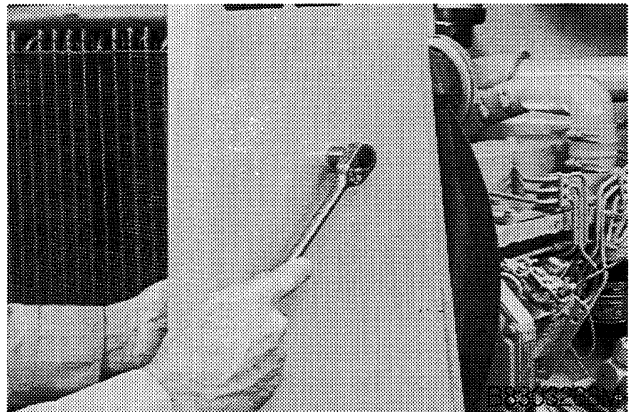
Loosen and remove the nuts, hardened washers, and bolts that fasten each side of the front of the radiator shroud to the frame.

STEP 28



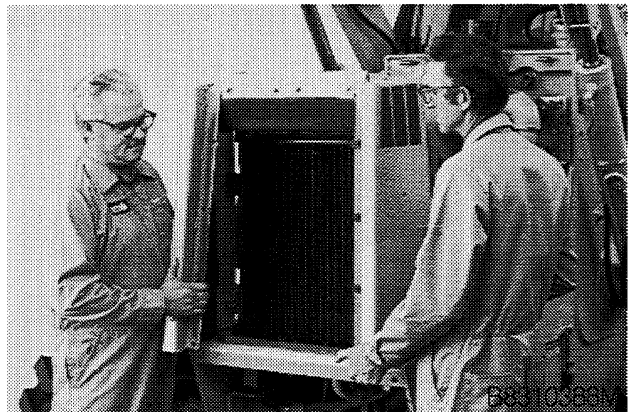
Loosen and remove the nuts, lock washers, flat washers, and bolts that fasten each side of the rear of the radiator shroud to the frame.

STEP 29

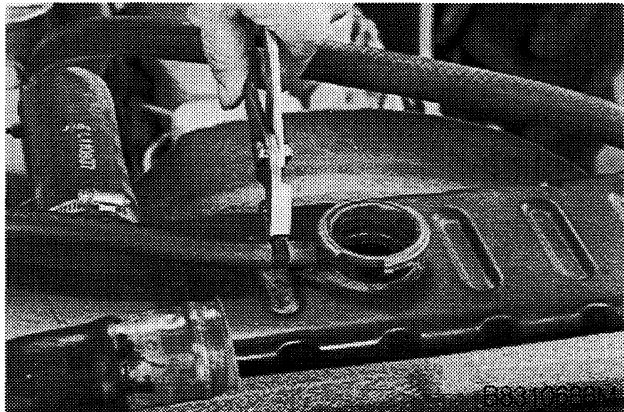


Loosen and remove the nuts, flat washers, lock washers, and bolts that fasten each side of the radiator shroud to the radiator mounting straps.

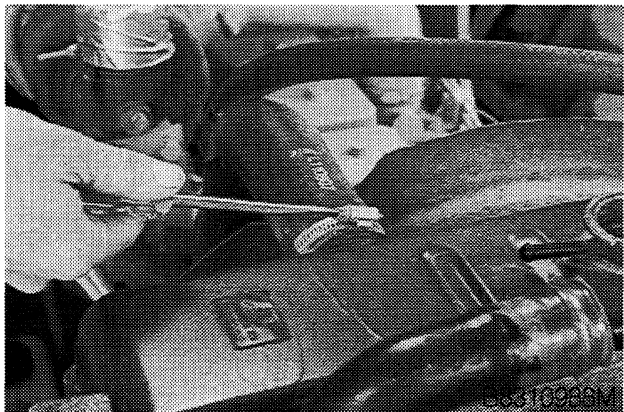
STEP 30



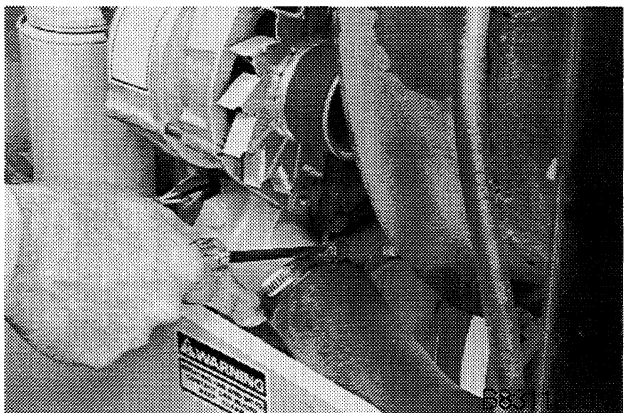
Remove the radiator shroud.

STEP 31

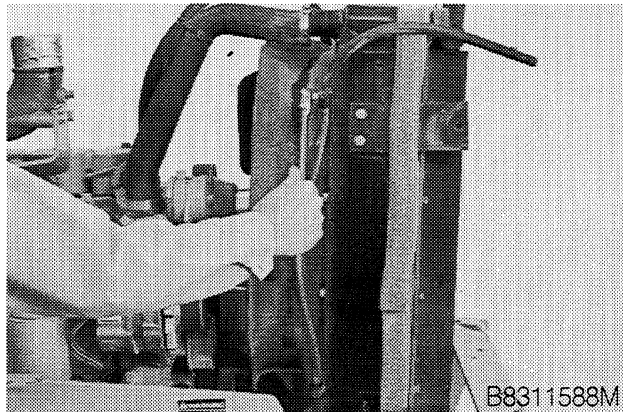
Disconnect the drain hose.

STEP 32

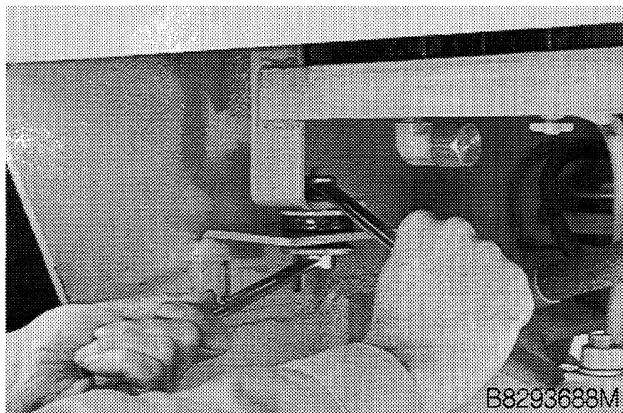
Loosen the clamp and disconnect the top radiator hose.

STEP 33

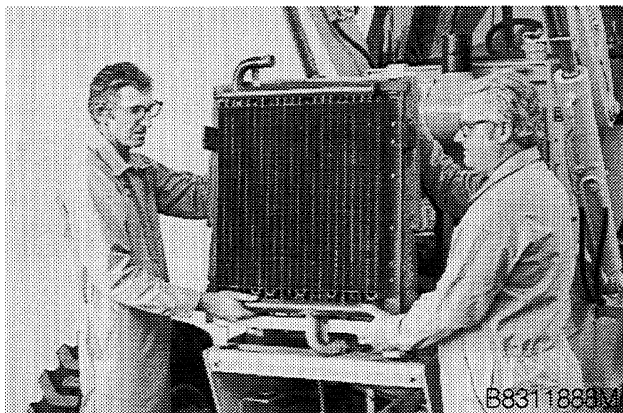
Loosen the clamp and disconnect the bottom radiator hose from the water pump.

STEP 34

Loosen and remove the cap screws, lock washers, and flat washers that hold the clamps for the hoses and the fan shroud to each side of the radiator. Move the hoses out of the way and move the fan shroud toward the engine.

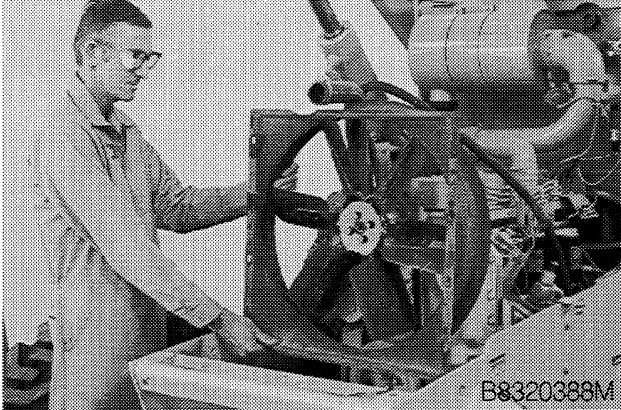
STEP 35

Loosen and remove the nuts, lock washers, flat washers, and bolts that fasten the support for the radiator and oil cooler.

STEP 36

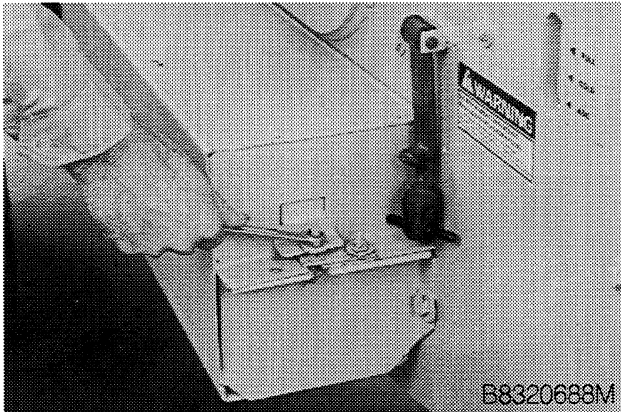
Remove the radiator and oil cooler from the machine.

STEP 37



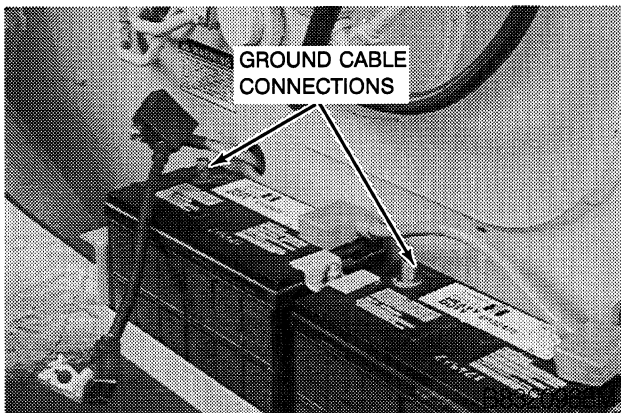
Remove the fan shroud.

STEP 38



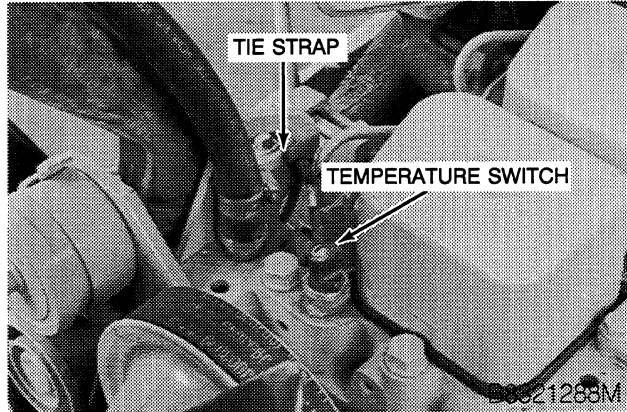
Loosen the nuts that hold the cover for the batteries in place. Remove the cover.

STEP 39



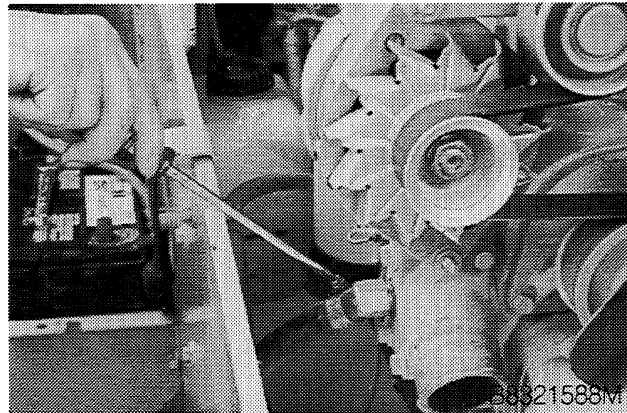
Disconnect the ground cable from both batteries.

STEP 40



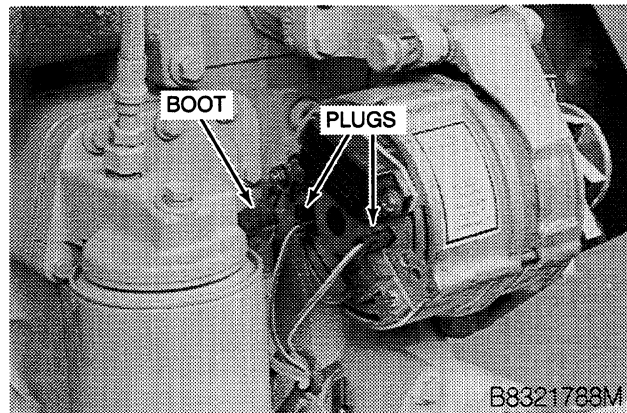
Disconnect wire from the temperature switch. Cut the tie strap shown above.

STEP 41



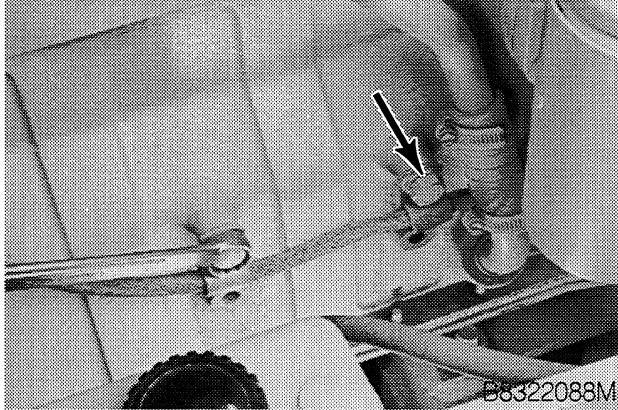
Loosen the clamp on the heater hose and disconnect the hose. Install a plug in the hose.

STEP 42



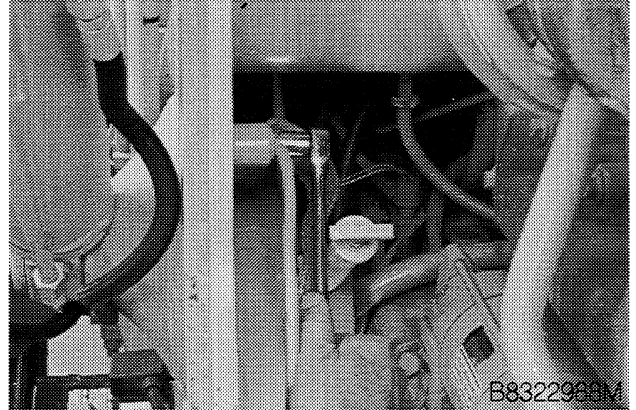
Remove the boot and disconnect the wire and both plugs from the alternator.

STEP 43



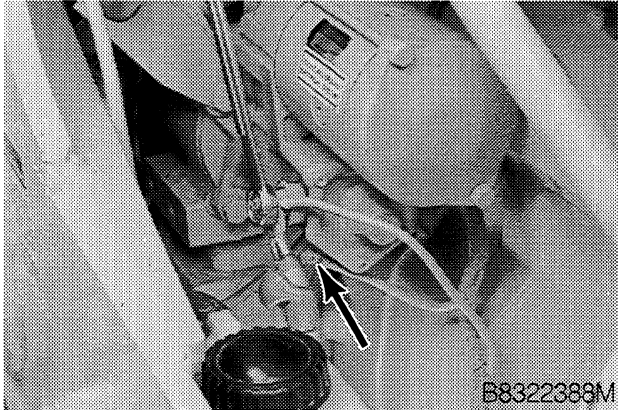
Loosen and remove the cap screws and lock washers that fasten the clamps for the wire harness to the engine.

STEP 46



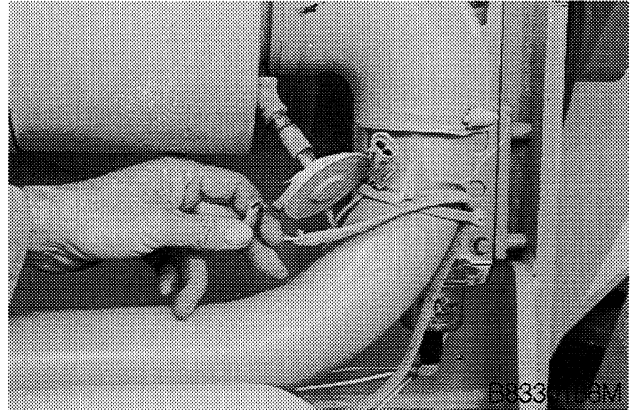
Loosen and remove the nut and lock washer that fasten the cable and ground strap to the frame. Remove the cable and ground strap.

STEP 44



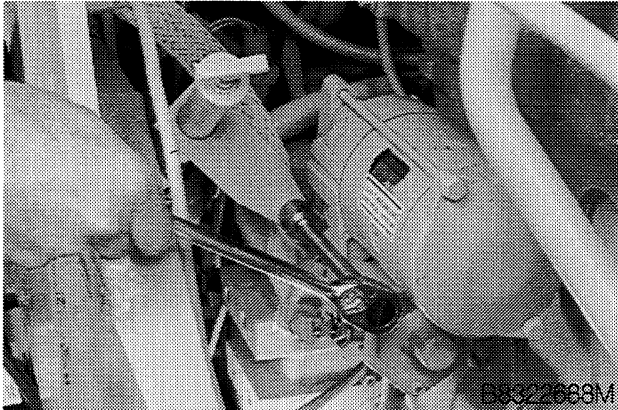
Remove the boot and disconnect the cables from the battery terminal on the starter. Disconnect the small wire from the start terminal on the starter.

STEP 47



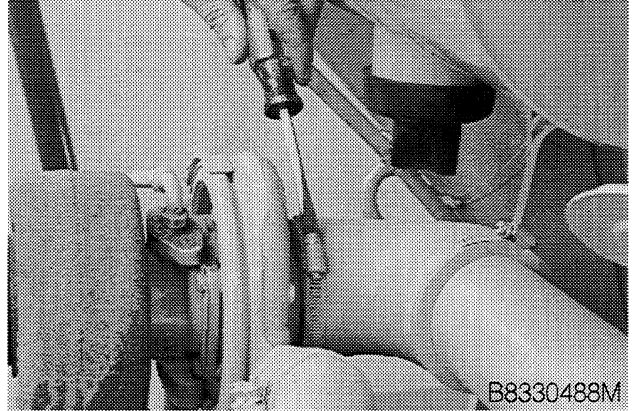
Disconnect the wires from the switch for the air cleaner warning lamp.

STEP 45



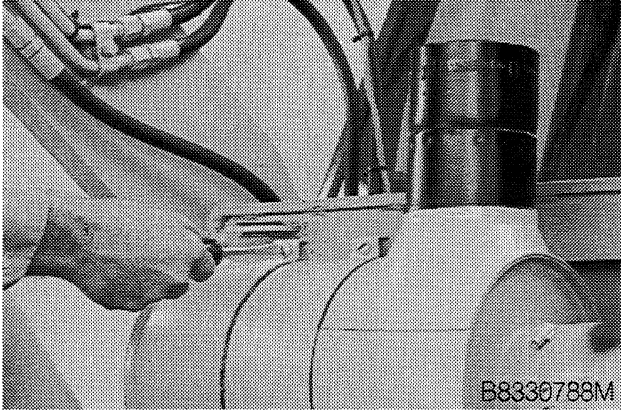
Loosen and remove the cap screw and lock washer that fasten the brace for the dipstick and the ground strap to the starter.

STEP 48



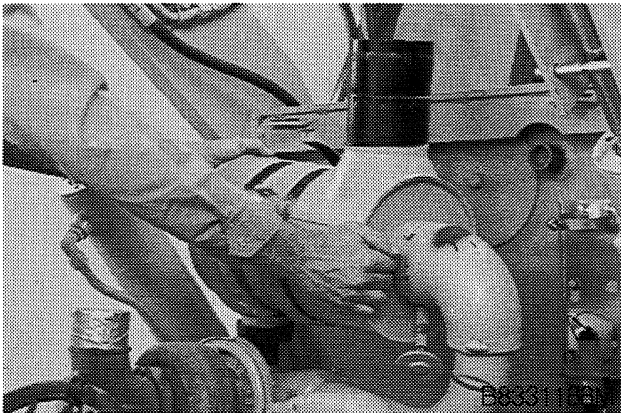
Loosen the clamp on the intake hose for the air cleaner at the turbocharger. Disconnect the hose.

STEP 49



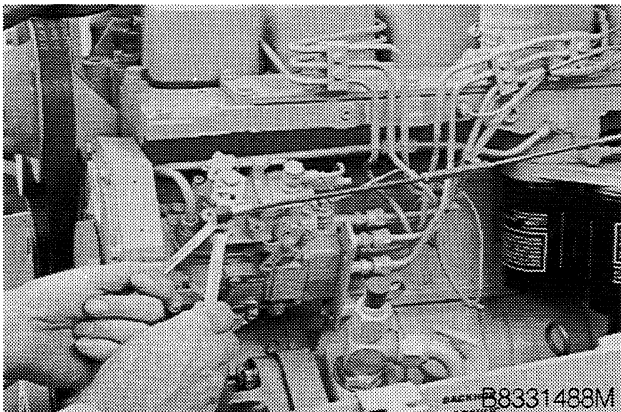
Loosen and remove the nuts and screws that fasten the air cleaner in the mounting straps.

STEP 50



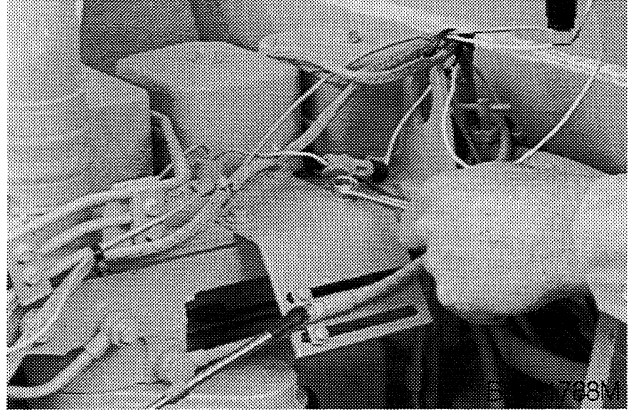
Remove the air cleaner.

STEP 51



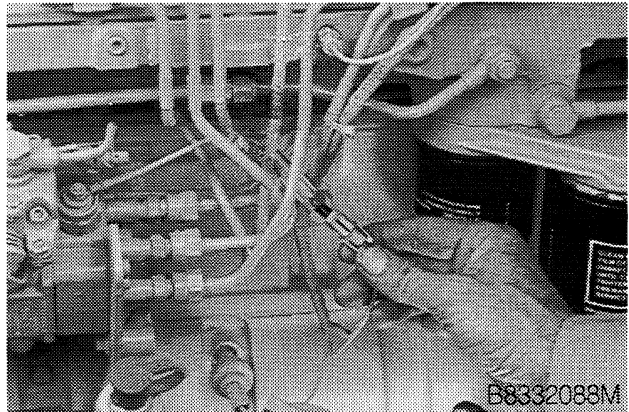
Disconnect the throttle cable from the arm on the fuel injection pump.

STEP 52



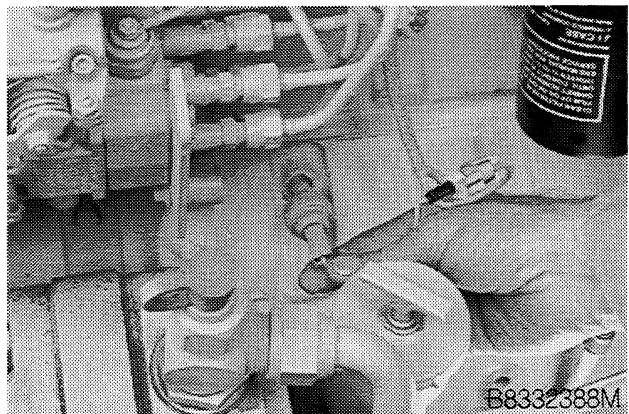
Loosen and remove the cap screws that fasten the bracket for the throttle cable to the engine. Move the throttle cable and bracket out of the way.

STEP 53



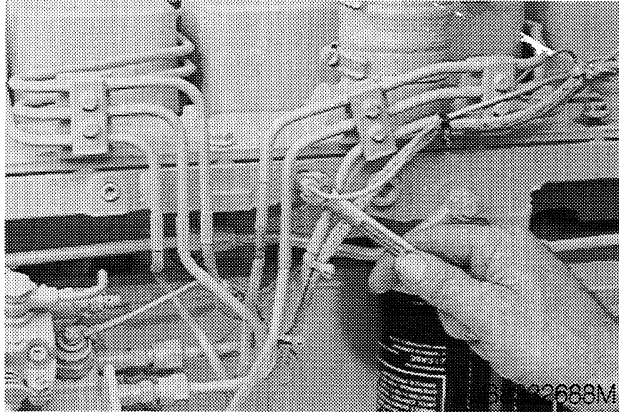
Disconnect the wiring from the connector for the fuel injection solenoid on the fuel injection pump.

STEP 54



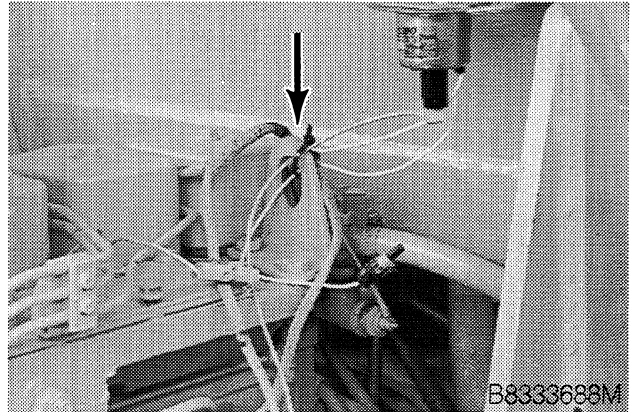
Disconnect the wire harness from the oil pressure switch.

STEP 55



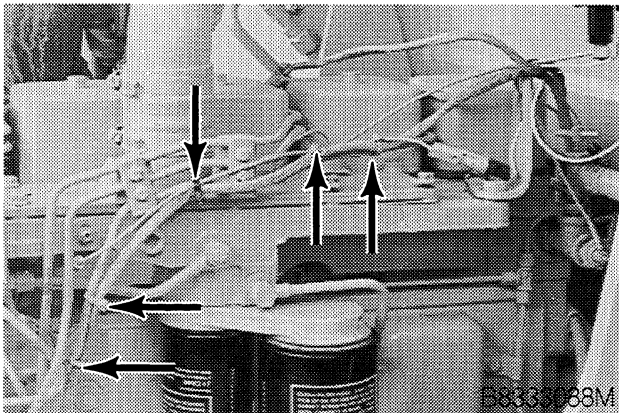
If the machine is equipped with ether injection, disconnect the tube from the intake manifold.

STEP 58



Cut the tie strap that fastens the wiring to the lifting eye.

STEP 56



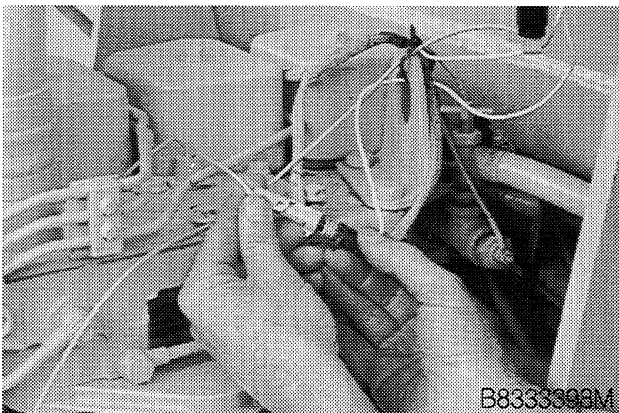
Cut the tie straps that fasten the wire harness and the tube for the ether injection, if equipped.

STEP 59



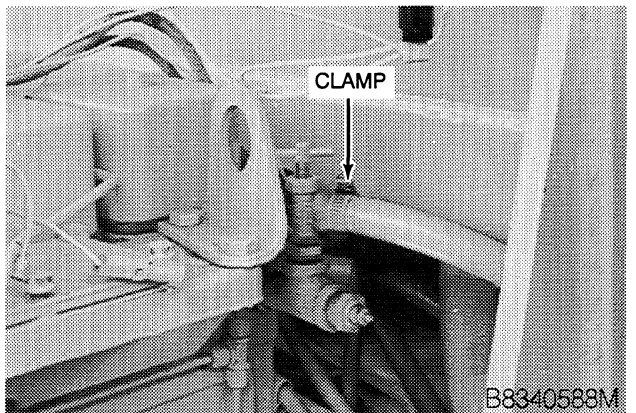
Disconnect the wire for the heater temperature switch. Move all of the wiring and the wire harness out of the way.

STEP 57



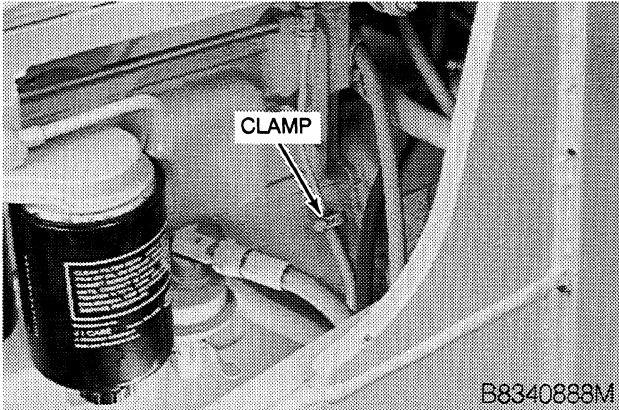
If the machine is equipped with ether injection, disconnect the wiring from the connector for the temperature switch.

STEP 60



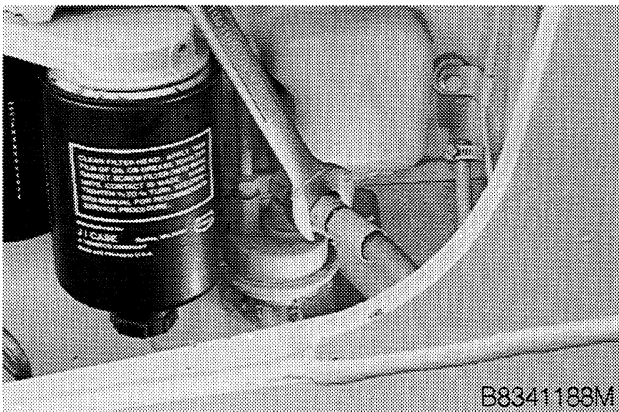
Loosen the clamp on the heater hose and disconnect the hose. Install a plug in the hose and a cap on the fitting.

STEP 61



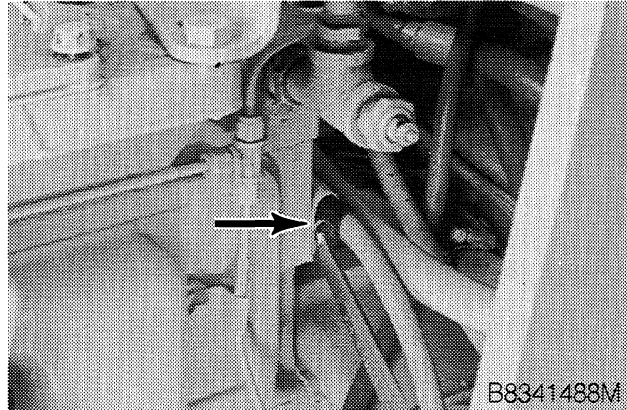
Close the shutoff valve for the fuel line at the bottom of the fuel tank. Loosen the clamp on the hose for the fuel return line and disconnect the hose. Install a plug in the hose and a cap on the fuel return line.

STEP 62



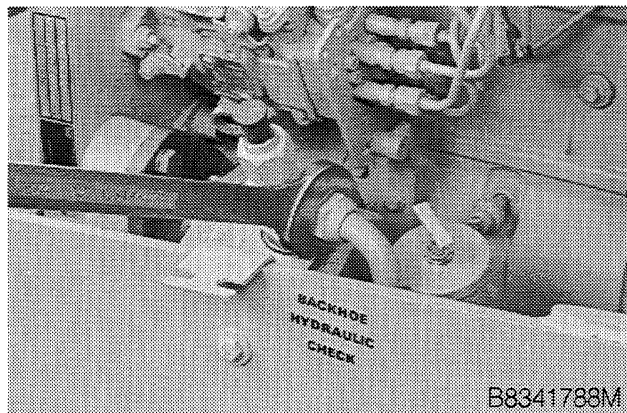
Disconnect the fuel supply line from the hand primer pump. Install a plug in the hose and a cap on the fitting.

STEP 63



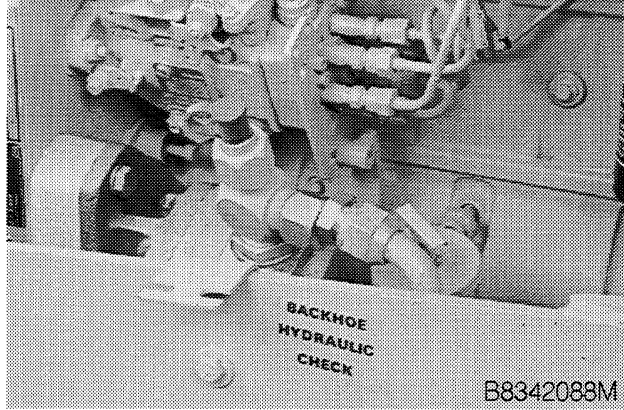
Loosen and remove the cap screw and lock washer that fasten the clamp for the hose to the rear of the engine.

STEP 64



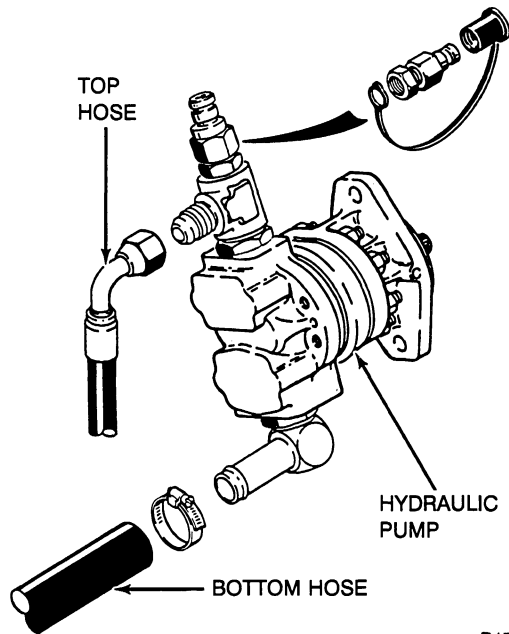
Disconnect the top hose from the hydraulic pump.

STEP 65



Install a plug in the hose and a cap on the fitting.

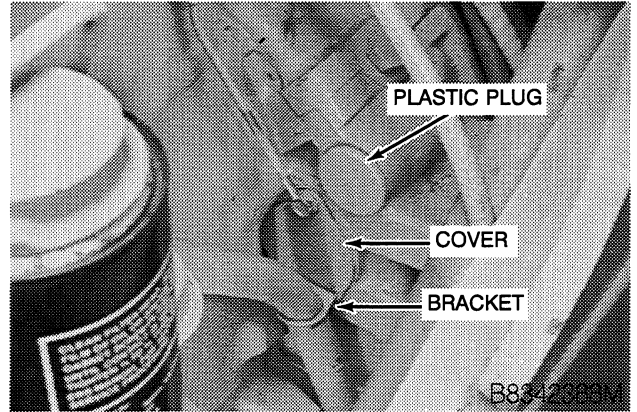
STEP 66



Disconnect the bottom hose from the hydraulic pump. Install a plug in the hose and a cap on the fitting.

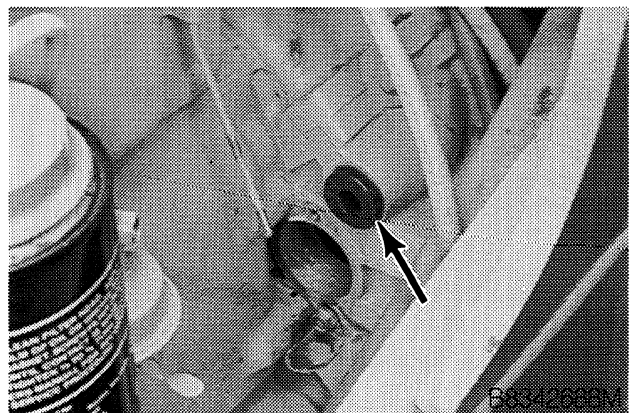
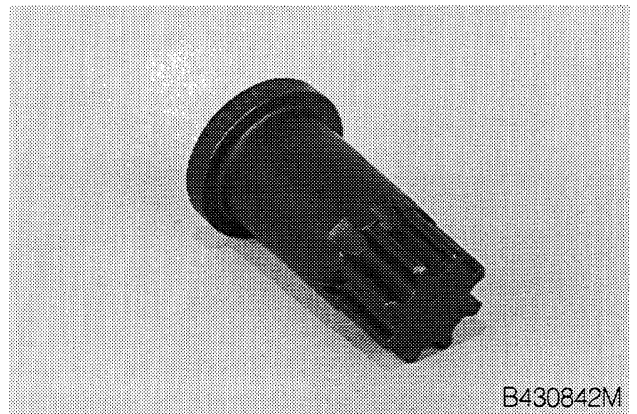
NOTE: There are eight cap screws with lock washers that fasten the flex plates to the flywheel. The engine must be rotated to align each cap screw with the access hole in the flywheel housing at the left side of the engine.

STEP 67



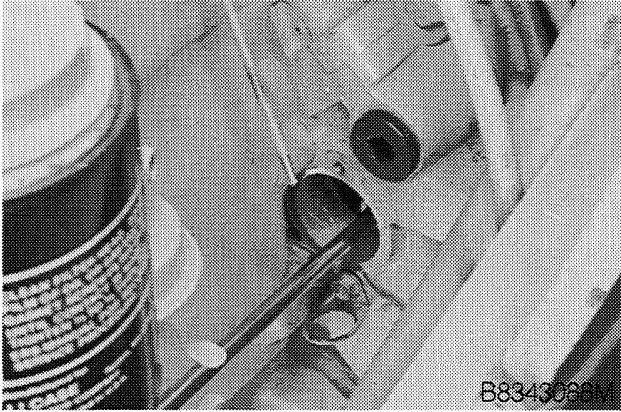
Remove the plastic plug from the flywheel housing. Remove the hose from the bracket and remove the cover and gasket from the access hole for the cap screws.

STEP 68



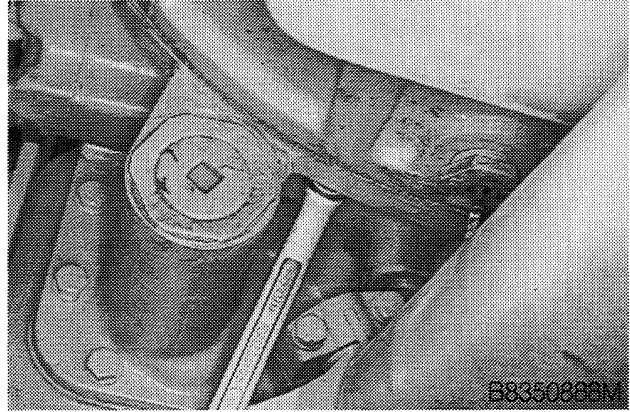
Install the CAS-1690 tool shown above to turn the flywheel.

STEP 69



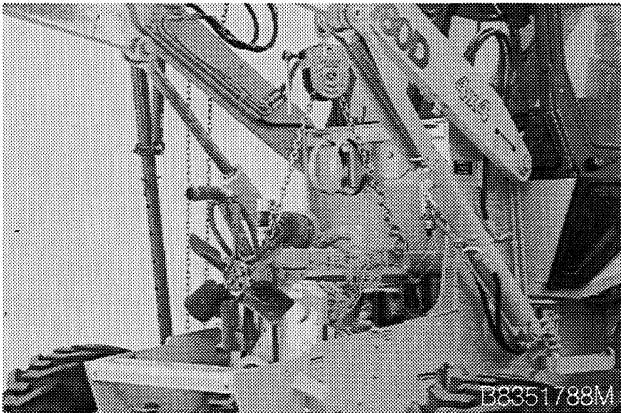
Loosen and remove all eight cap screws and lock washers that fasten the flex plates to the flywheel.

STEP 72



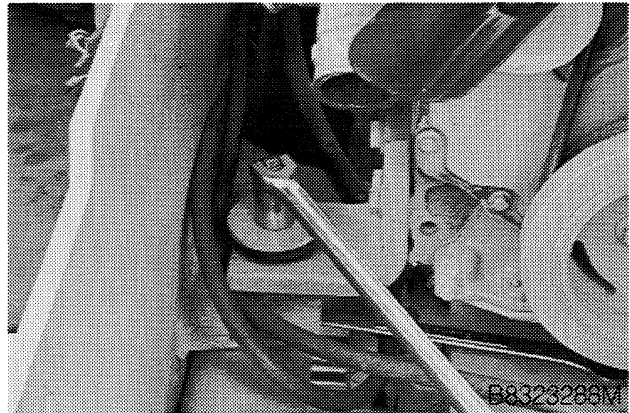
Loosen and remove the cap screws and lock washers that fasten the transmission to the flywheel housing.

STEP 70



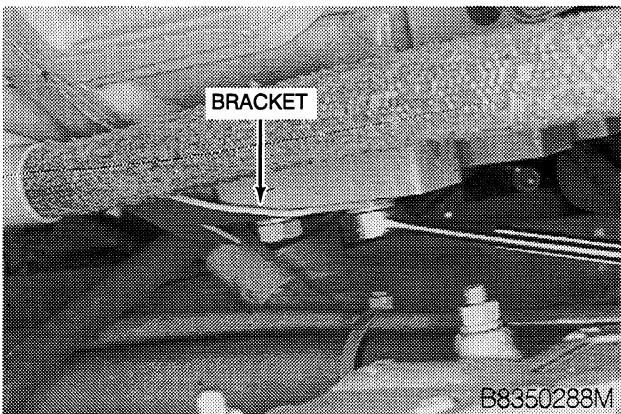
Connect an adjustable lifting sling to the lifting eyes on the engine. Connect a chain hoist to the adjustable lifting sling.

STEP 73



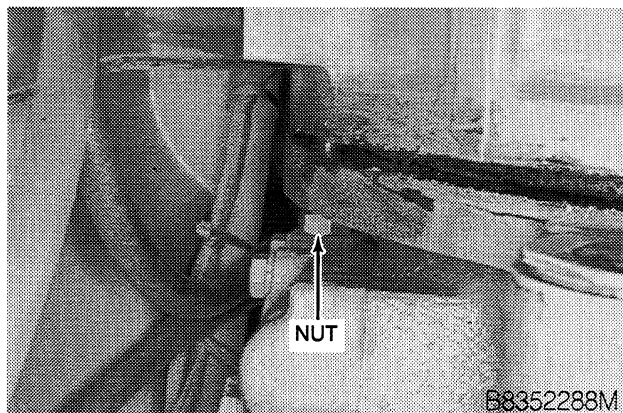
Loosen and remove the self-locking nuts, hardened washers, and bolts that fasten both front engine mounting brackets to the frame.

STEP 71

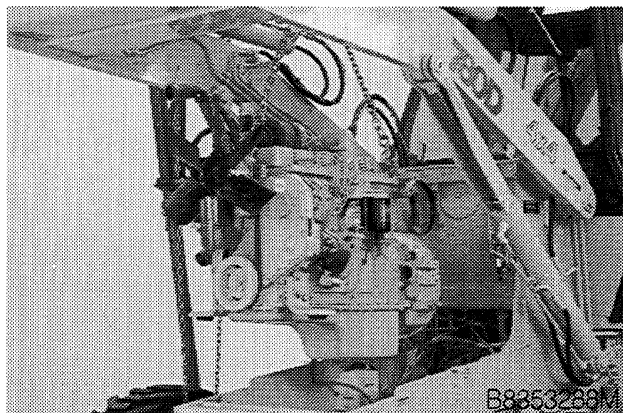


Loosen and remove the cap screws and lock washers that fasten the bracket to the left side of the flywheel housing. Remove the bracket.

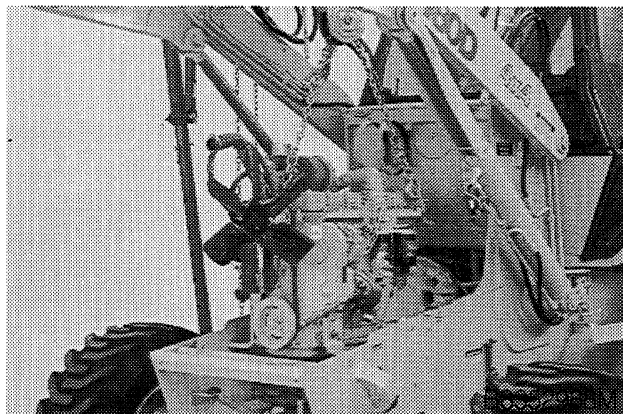
NOTE: *There is a stud located on each side of the flywheel housing. Loosen and remove the nut and lock washer from the stud on the left side of the flywheel housing.*

STEP 74

The other stud is located on the right side of the flywheel housing next to the transmission control valve. Loosen the nut on the stud. Move the engine forward and remove the nut and lock washer from the stud.

STEP 76

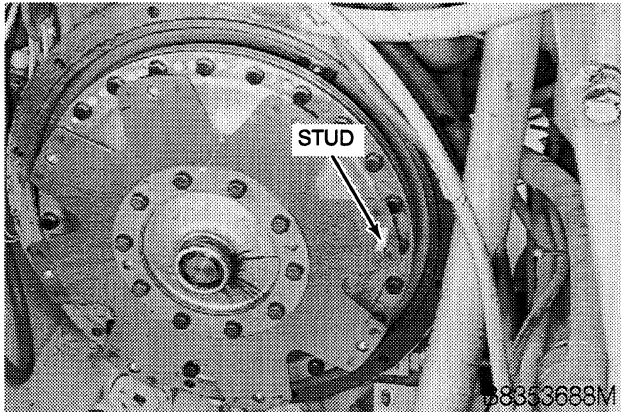
Remove the engine from the machine.

STEP 75

Move the engine forward and raise the engine.

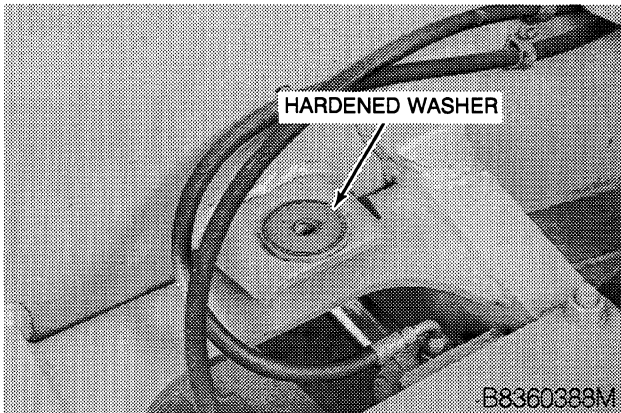
ENGINE INSTALLATION

STEP 77



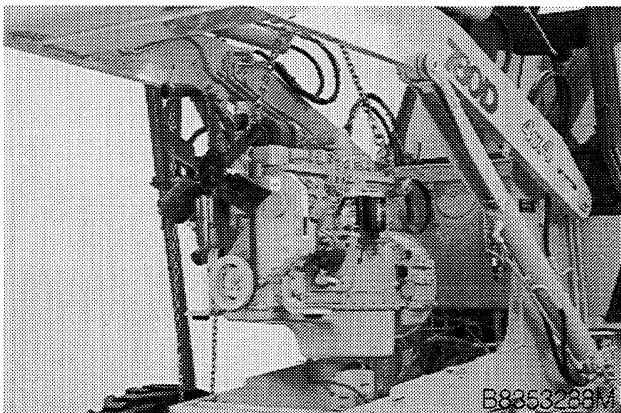
Install a stud 2-3/4 inches (70 mm) long with 3/8 NF threads in one of the holes in the flex plates. Turn the flex plates so that the stud is to the left side as shown. Make sure that the flex plates are not bent or damaged. Turn the crankshaft to align one of the holes in the flywheel with the stud.

STEP 78



Make sure the hardened washer is installed on each front engine mounting bracket.

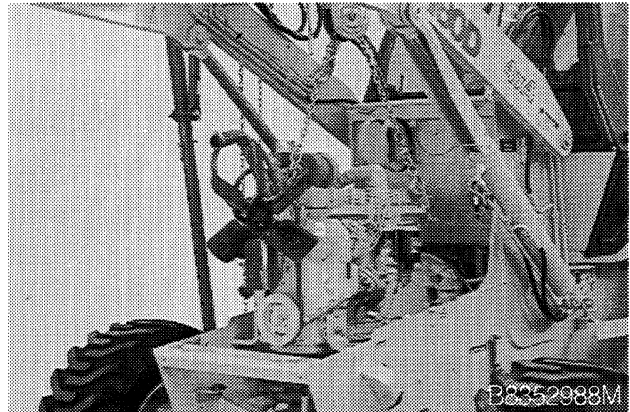
STEP 79



Lower the engine through the loader frame.

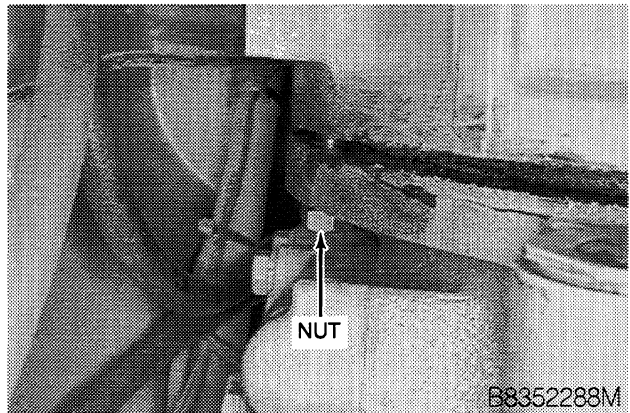
Bur 8-72860

STEP 80



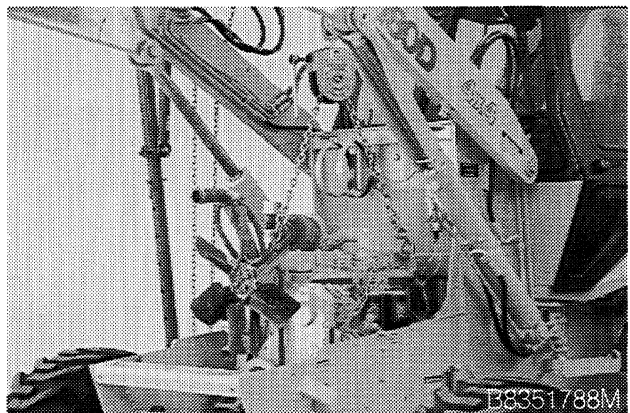
Lower the engine and move the engine toward the rear. Have another person align the stud in the flex plates with the hole in the flywheel.

STEP 81

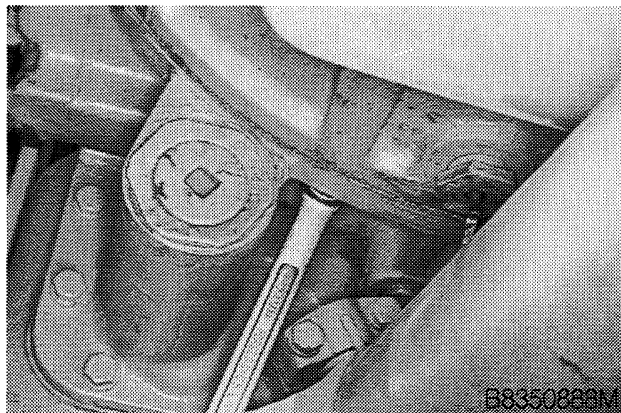


Install the lock washer and nut on the stud located on the right side of the flywheel housing next to the transmission control valve. Install the lock washer and nut on the other stud at the left side of the flywheel housing.

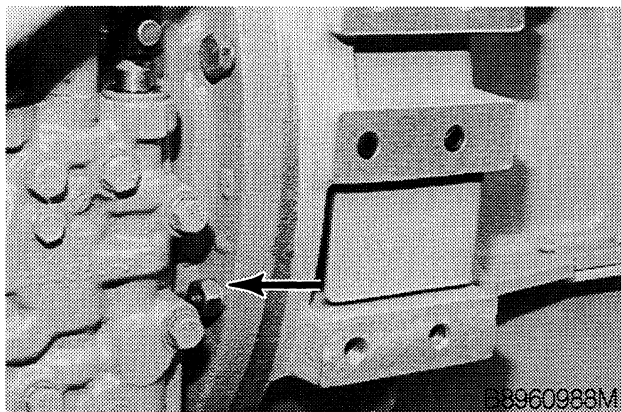
STEP 82



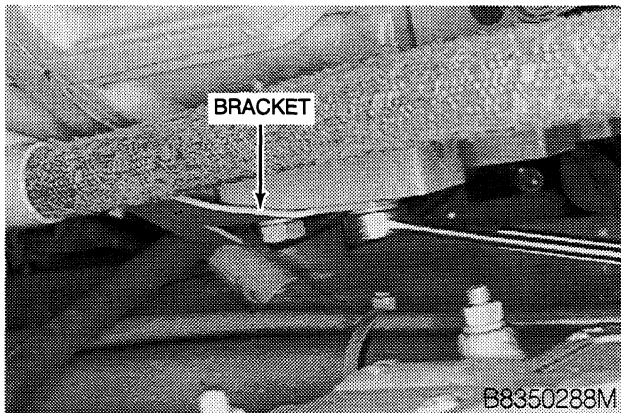
Push the engine to the rear.

STEP 83

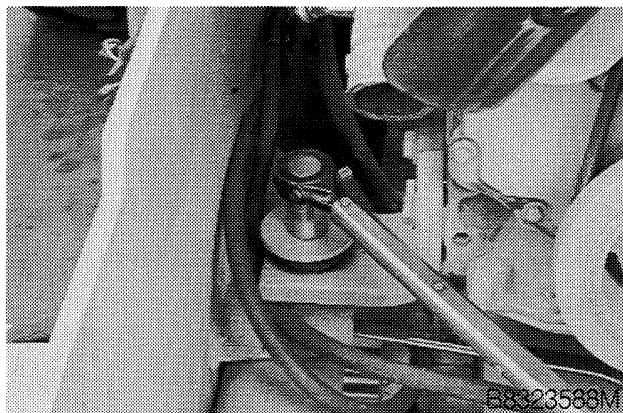
Install and tighten the cap screws and lock washers that fasten the engine to the flywheel housing. Tighten the nut on the left side of the flywheel housing.

STEP 84

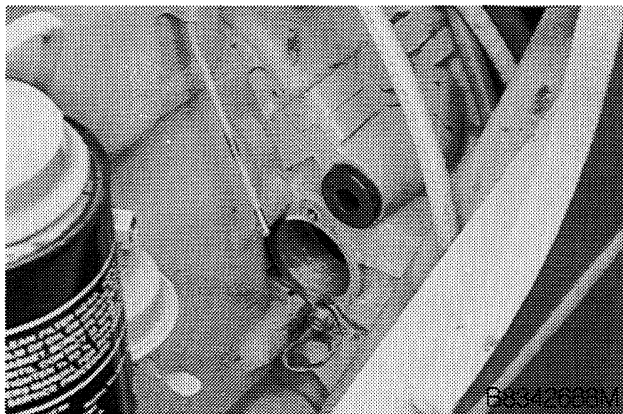
Tighten the nut on the right side of the flywheel housing.

STEP 85

Install the cap screws and lock washers that fasten the bracket to the left side of the flywheel housing. Tighten the cap screws.

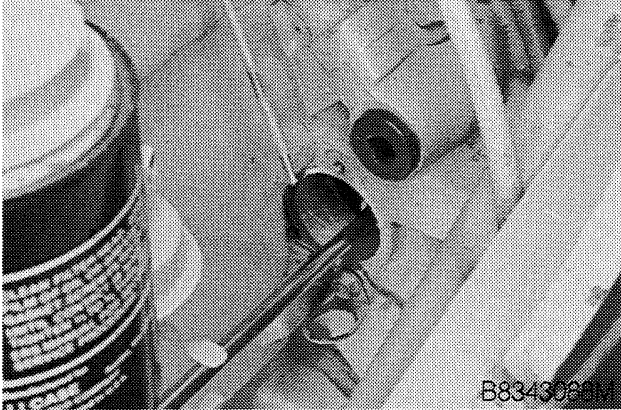
STEP 86

Install the bolts, hardened washers, and self-locking nuts that fasten the front engine mounting brackets to the frame. Tighten the bolts to 150 to 160 pound-feet (203 to 217 Nm).

STEP 87

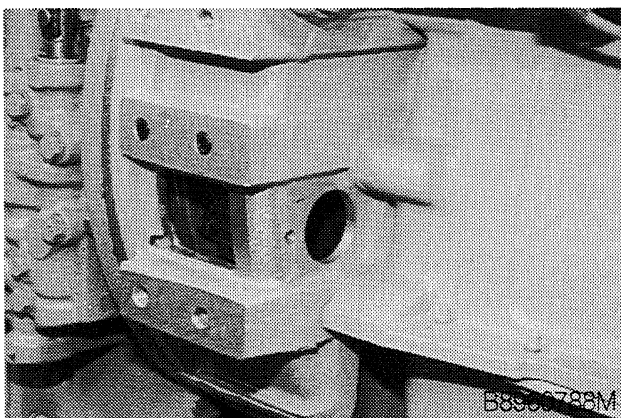
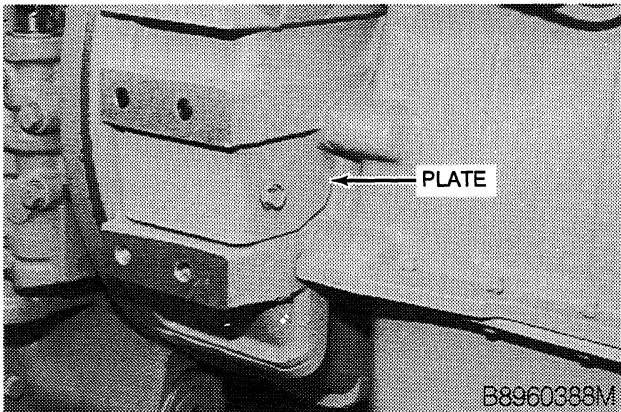
Remove the stud from the flex plates and install a cap screw and lock washer. Install the CAS-1690 tool to turn the flywheel.

STEP 88

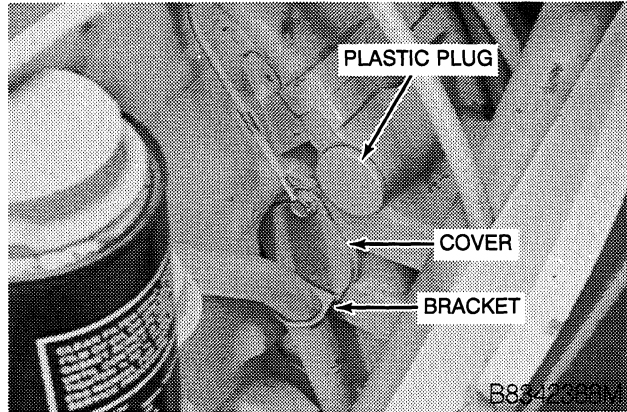


Install the remainder of the cap screws and lock washers. Tighten the cap screws to 300 to 360 pound-inches (34 to 41 Nm).

NOTE: *If one or more of the cap screws is difficult to install, there is a plate located on the right side of the flywheel housing. Removal of the plate will give you access to the hole in the flywheel for the cap screw and also the flex plates behind the flywheel.*

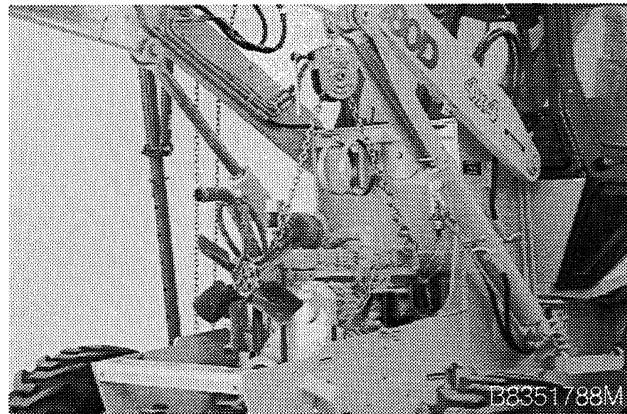


STEP 89



Remove the CAS-1690 tool and install the plastic plug. If necessary, install a new gasket on the cover for the access hole in the flywheel housing. Install the cover. Install the bracket for the hose and install the hose.

STEP 90



Disconnect and remove the lifting equipment from the engine.



Suggest:

If the above button click is invalid.

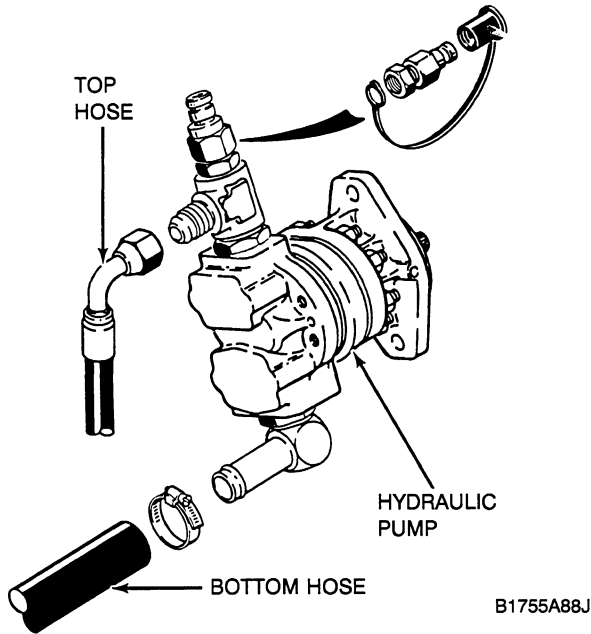
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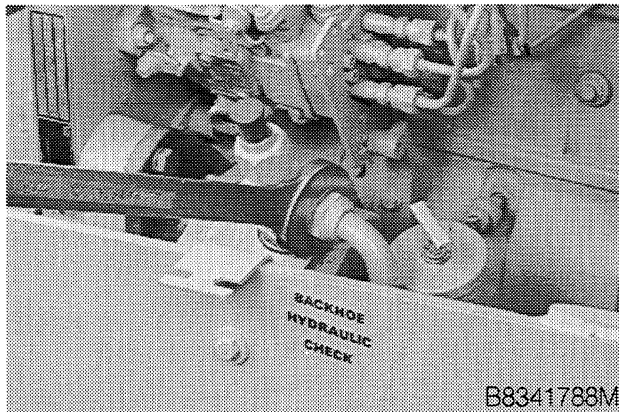
Thank you so much for reading

STEP 91



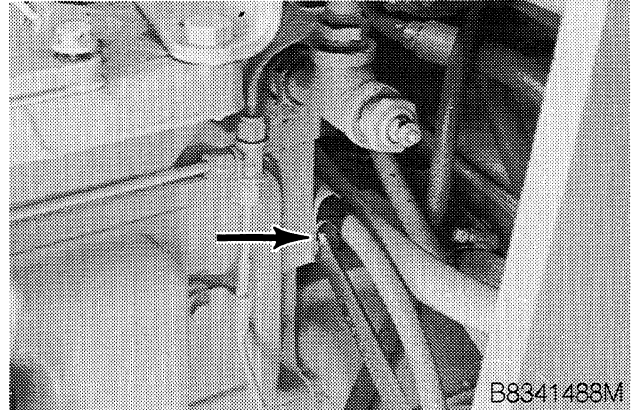
Remove the plug from the hose and the cap from the fitting and connect the bottom hose to the hydraulic pump.

STEP 92



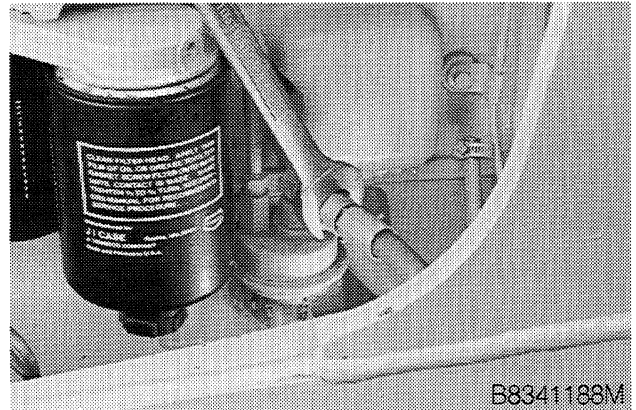
Remove the plug from the hose and the cap from the fitting and connect the top hose to the hydraulic pump.

STEP 93



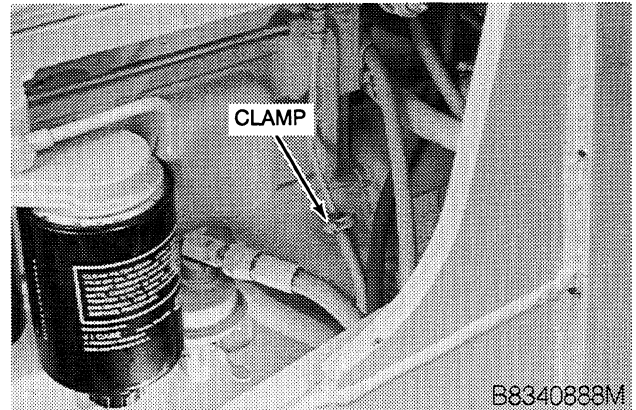
Install the cap screw, lock washer, and clamp that fasten the hose to the rear of the engine. Tighten the cap screw.

STEP 94



Remove the plug from the hose and the cap from the fitting and connect the fuel supply line to the hand primer pump.

STEP 95



Remove the plug from the hose and the cap from the tube and connect the hose to the fuel return line. Tighten the clamp for the hose. Open the shutoff valve for the fuel line at the bottom of the fuel tank.

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