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


<b>Grade 5 Bolts, Nuts, and Studs</b>		
		
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


<b>Grade 8 Bolts, Nuts, and Studs</b>		
		
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
<b>NOTE:</b> Use thick nuts with Grade 8 bolts.		

## TORQUE SPECIFICATIONS - METRIC HARDWARE

Use the following torques when specifications 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.

<b>Grade 8.8 Bolts, Nuts, and Studs</b>		
		
Size	Pound-Inches	Newton metres
M4	24 to 36	3 to 4
M5	60 to 72	7 to 8
M6	96 to 108	11 to 12
M8	228 to 276	26 to 31
M10	456 to 540	52 to 61
Size	Pound-Feet	Newton metres
M12	66 to 79	90 to 107
M14	106 to 127	144 to 172
M16	160 to 200	217 to 271
M20	320 to 380	434 to 515
M24	500 to 600	675 to 815
M30	920 to 1100	1250 to 1500
M36	1600 to 1950	2175 to 2600

<b>Grade 10.9 Bolts, Nuts, and Studs</b>		
		
Size	Pound-Inches	Newton metres
M4	36 to 48	4 to 5
M5	84 to 96	9 to 11
M6	132 to 156	15 to 18
M8	324 to 384	37 to 43
Size	Pound-Feet	Newton metres
M10	54 to 64	73 to 87
M12	93 to 112	125 to 150
M14	149 to 179	200 to 245
M16	230 to 280	310 to 380
M20	450 to 540	610 to 730
M24	780 to 940	1050 to 1275
M30	1470 to 1770	2000 to 2400
M36	2580 to 3090	3500 to 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- Inches	Newton metres
<b>37 Degree Flare Fitting</b>			
1/4 inch 6.4 mm	7/16-20	72 to 144	8 to 16
5/16 inch 7.9 mm	1/2-20	96 to 192	11 to 22
3/8 inch 9.5 mm	9/16-18	120 to 300	14 to 34
1/2 inch 12.7 mm	3/4-16	180 to 504	20 to 57
5/8 inch 15.9 mm	7/8-14	300 to 696	34 to 79
Tube OD Hose ID	Thread Size	Pound- Inches	Newton metres
3/4 inch 19.0 mm	1-1/16-12	40 to 80	54 to 108
7/8 inch 22.2 mm	1-3/16-12	60 to 100	81 to 135
1.0 inch 25.4 mm	1-5/16-12	75 to 117	102 to 158
1-1/4 inch 31.8 mm	1-5/8-12	125 to 165	169 to 223
1-1/2 inch 38.1 mm	1-7/8-12	210 to 250	285 to 338

Tube OD Hose ID	Thread Size	Pound- Inches	Newton metres
<b>Straight Threads with O-ring</b>			
1/4 inch 6.4 mm	7/16-20	144 to 228	16 to 26
5/16 inch 7.9 mm	1/2-20	192 to 300	22 to 34
3/8 inch 9.5 mm	9/16-18	300 to 480	34 to 54
1/2 inch 12.7 mm	3/4-16	540 to 804	57 to 91
Tube OD Hose ID	Thread Size	Pound- Inches	Newton metres
5/8 inch 15.9 mm	7/8-14	58 to 92	79 to 124
3/4 inch 19.0 mm	1-1/16-12	80 to 128	108 to 174
7/8 inch 22.2 mm	1-3/16-12	100 to 160	136 to 216
1.0 inch 25.4 mm	1-5/16-12	117 to 187	159 to 253
1-1/4 inch 31.8 mm	1-5/8-12	165 to 264	224 to 357
1-1/2 inch 38.1 mm	1-7/8-12	250 to 400	339 to 542

<b>Split Flange Mounting Bolts</b>		
Size	Pound- Inches	Newton metres
5/16-18	180 to 240	20 to 27
3/8-16	240 to 300	27 to 34
7/16-14	420 to 540	47 to 61
Size	Pound- Feet	Newton metres
1/2-13	55 to 65	74 to 88
5/8-11	140 to 150	190 to 203

# Section 2001

## ENGINE AND RADIATOR REMOVAL AND INSTALLATION 1150G Crawler

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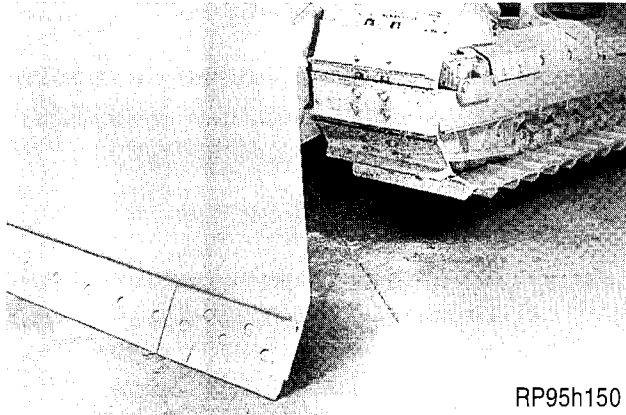
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# ENGINE REMOVAL

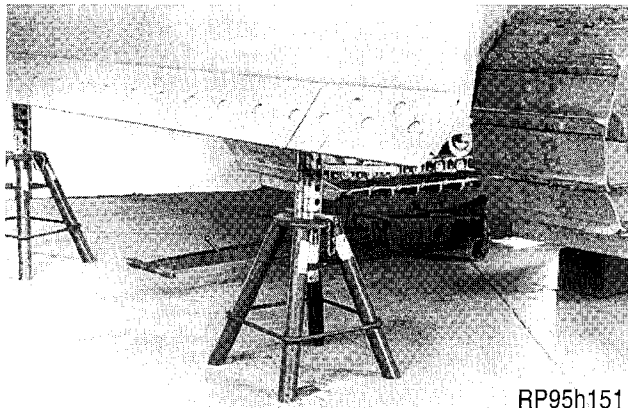
## STEP 1



RP95h150

Place the crawler on blocks at least 8 inches high to allow the C-Frame to drop below the bolts mounting the radiator shroud. Alternate Method is to remove the dozer blade and C-Frame as an assembly.

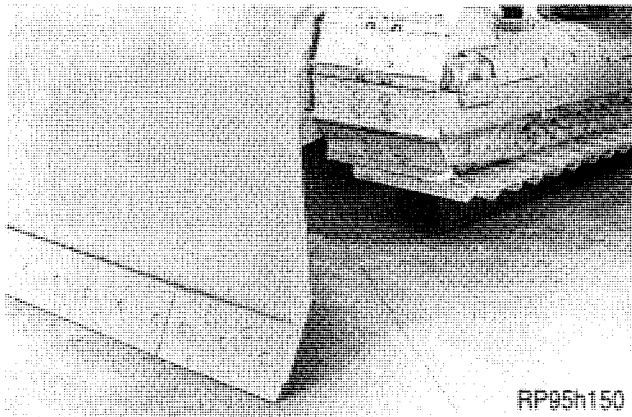
## STEP 2



RP95h151

Raise and block the dozer blade up. Use a floor jack to support the undercarriage guards and remove the guards from under the engine and torque converter.

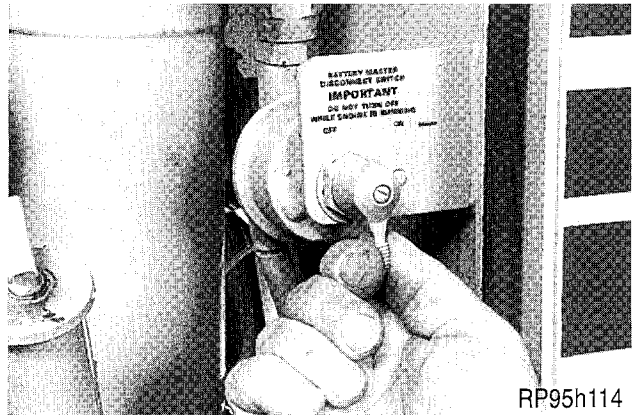
## STEP 3



RP95h150

Remove the blocking from under the dozer blade and lower dozer blade to the floor.

## STEP 4



RP95h114

Turn the master disconnect switch for the battery to the OFF position.

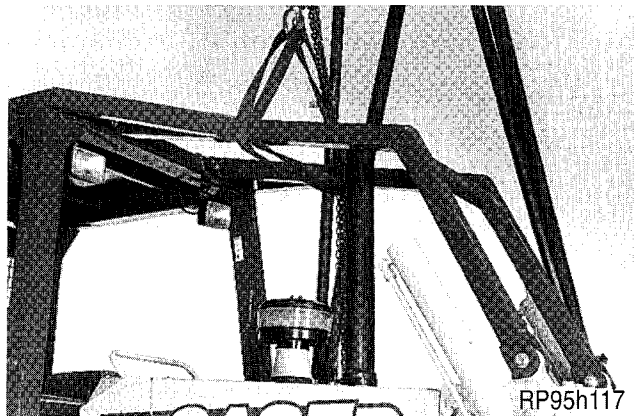
## STEP 5

Obtain three clean 5 gallon (20 liter) containers. Remove the drain plug in the bottom of the transmission housing and drain the transmission fluid into the clean containers, approximately 14 U.S. gallons (53.0 liters). Store the transmission fluid in a safe and clean area if the fluid is to be reused.

**WARNING:** *When handling lubricants (oil, grease, etc.) and other chemical products, always follow the instructions for their proper use. Use proper containers to collect the fluid. Dispose of fluids and filters in a way that will protect the environment and in accordance with the laws. DO NOT smoke or use an open flame during the servicing procedure. Use eye protection.*

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## STEP 6



RP95h117

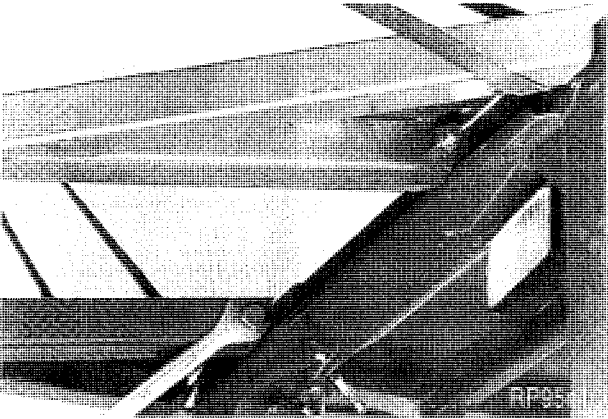
Attach a sling and overhead hoist to the brush guard assembly.

**STEP 7**



Remove the bolts, nuts and washers holding the right and left hand mounting bases for the brush guard.

**STEP 8**



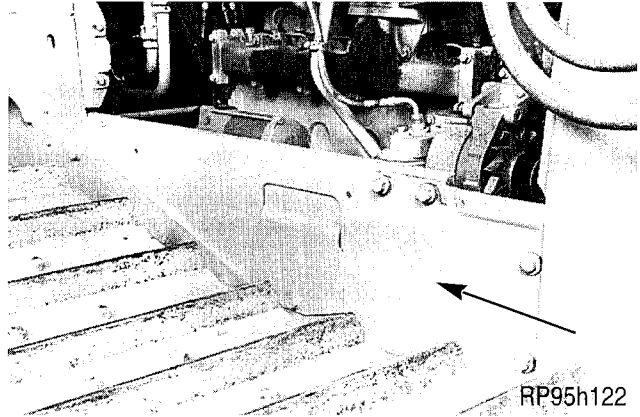
Remove the bolts, nuts and washers fastening the brush guard to the ROPS canopy and remove the brush guard.

**STEP 9**



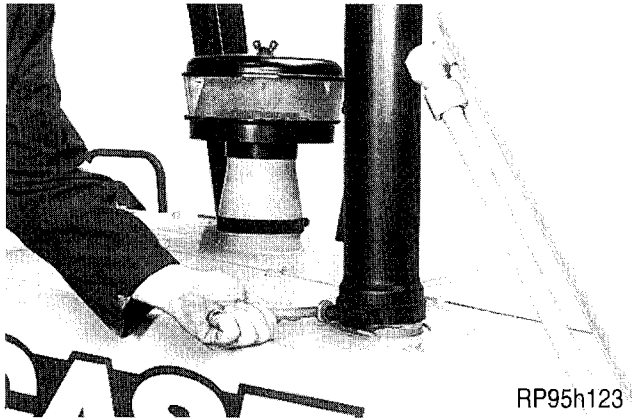
Remove the right and left hand side screens for the engine compartment.

**STEP 10**



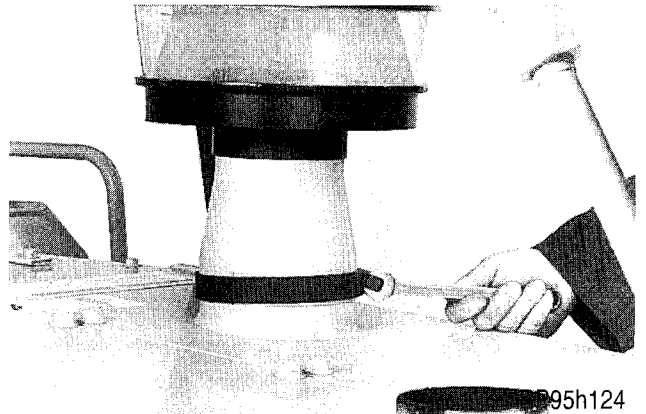
Remove the right and left hand lower side shields for the engine compartment.

**STEP 11**



Loosen the clamp holding the exhaust pipe and remove the exhaust pipe.

**STEP 12**



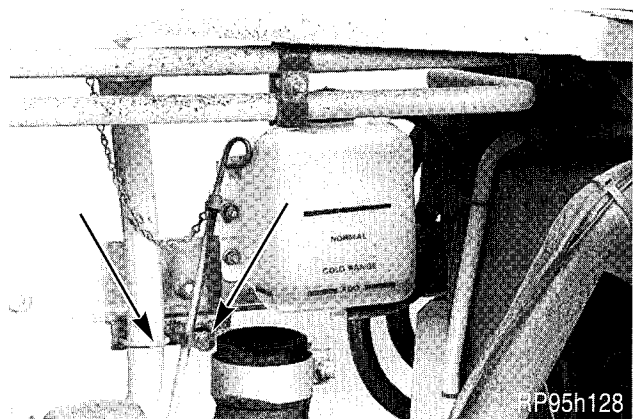
Loosen the clamp holding the inlet stack and precleaner for the air intake and remove the inlet stack.

**STEP 13**



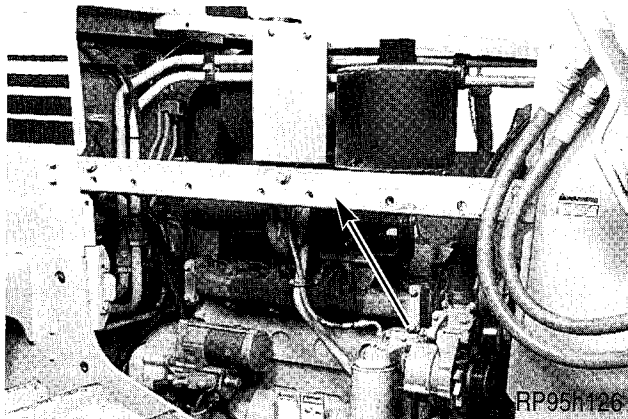
Only loosen the lower cap screws on each side and remove the cap screws from the top side of the hood. Remove the right and left hand hood sections.

**STEP 16**



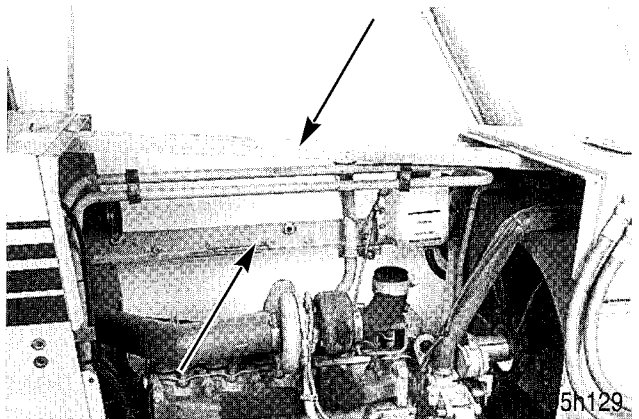
Loosen and remove the U-bolt for the oil filler tube and the bolt in the clamp for the dipstick.

**STEP 14**



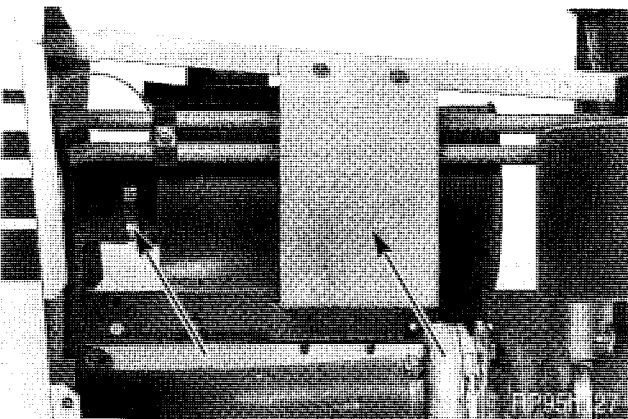
Remove RH side shield to hood mounting bracket.

**STEP 17**



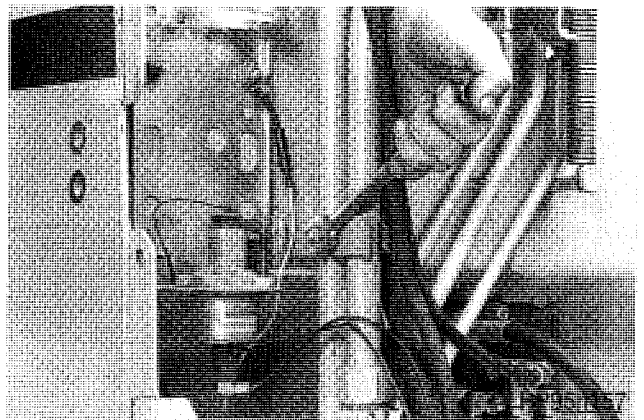
Remove the LH side shield to hood mounting bracket and the radiator surge tank as an assembly. Remove the center mounting bracket for the hood.

**STEP 15**



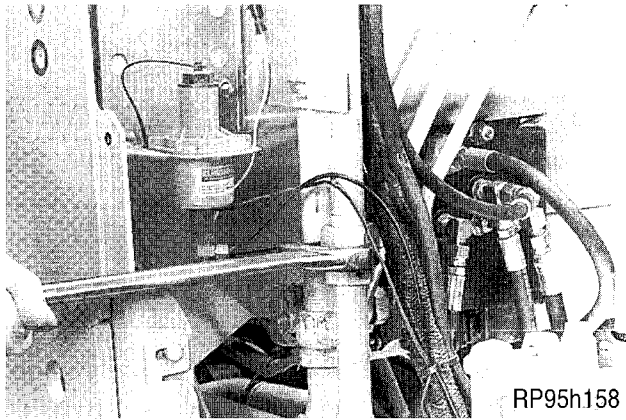
Loosen the hose clamp for the air cleaner outlet and remove the hose. Remove the mounting bracket and air cleaner as an assembly.

**STEP 18**



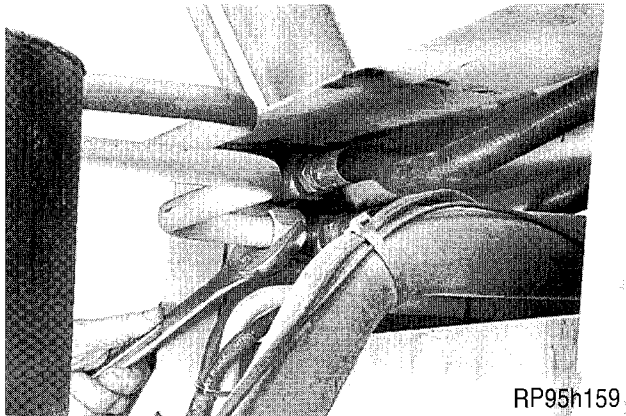
Remove the bolt, nut and clamp for the hydraulic tubes to the lift cylinders.

**STEP 19**



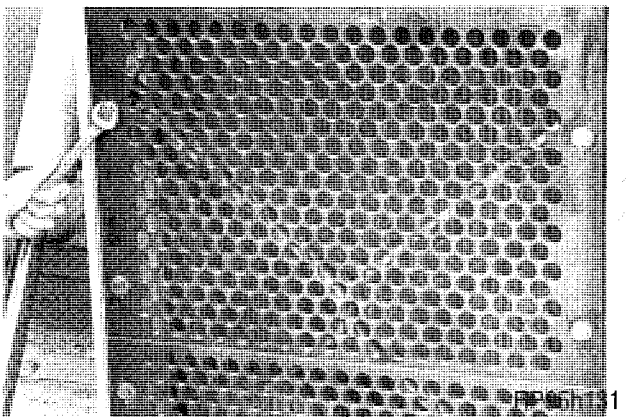
Loosen and disconnect the two hydraulic tubes to the lift cylinders at the connection behind the engine. Make sure to plug and cap the fittings on the tubes.

**STEP 20**



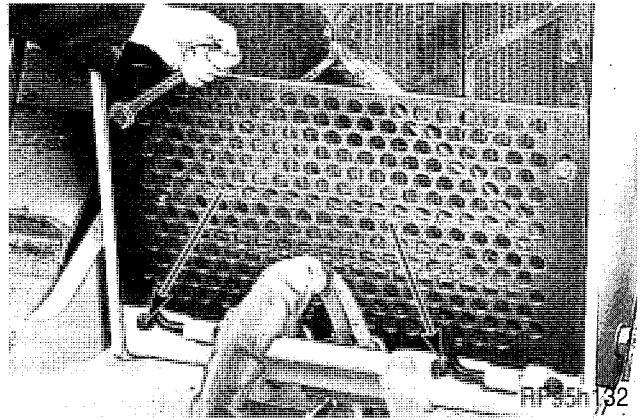
Loosen and disconnect the two hydraulic tubes to the lift cylinder at the connection above the radiator. Remove the two tubes from over the top of the engine. Make sure to plug and cap the fittings on the tubes.

**STEP 21**



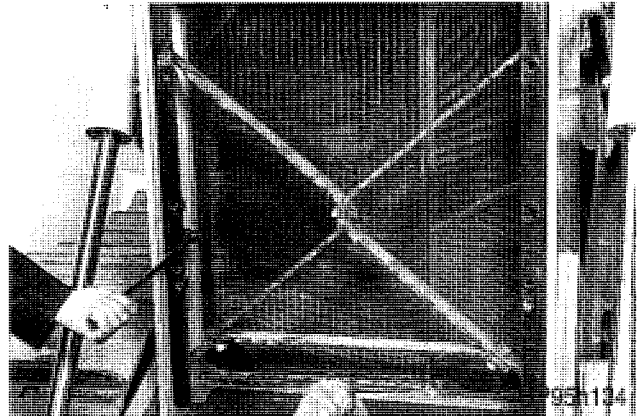
Remove the cap screws retaining the upper grille and remove the grille.

**STEP 22**



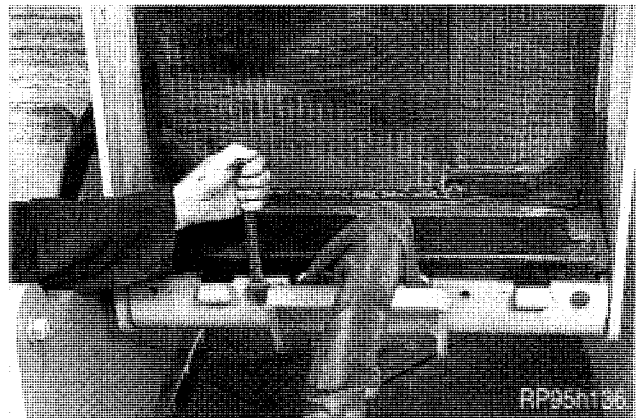
Remove two cap screws in the mainframe to clear the hinge for the lower grille. Remove the two cap screws retaining the lower grille and remove the grille.

**STEP 23**



Remove both the LH and RH mounting brackets for the grille and the X support brace.

**STEP 24**



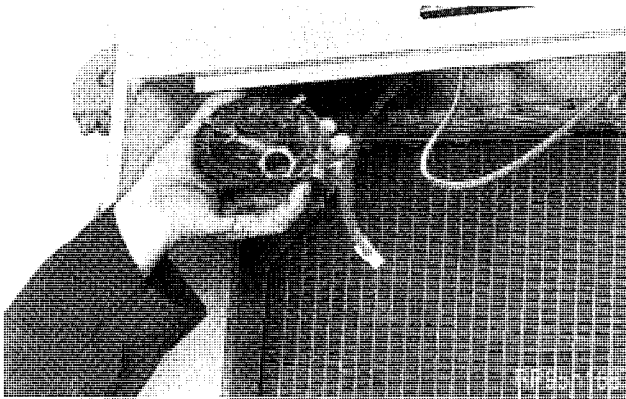
Remove the two cap screws still retaining the lower baffle panel for the radiator and remove the baffle panel.

**STEP 25**



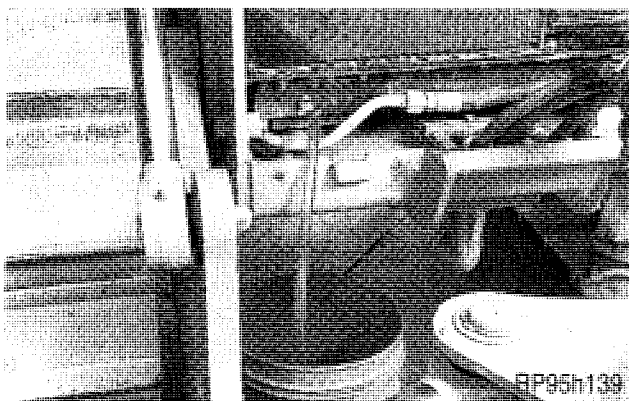
Remove the upper baffle panel for the radiator

**STEP 26**



Remove both the LH and RH horns, if equipped.

**STEP 27**

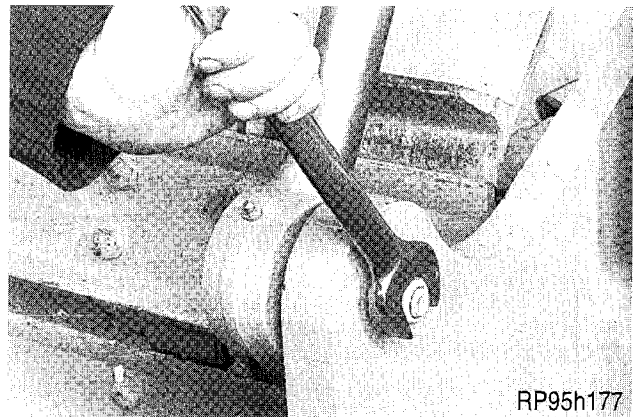


Drain the coolant from the radiator into a clean bucket.



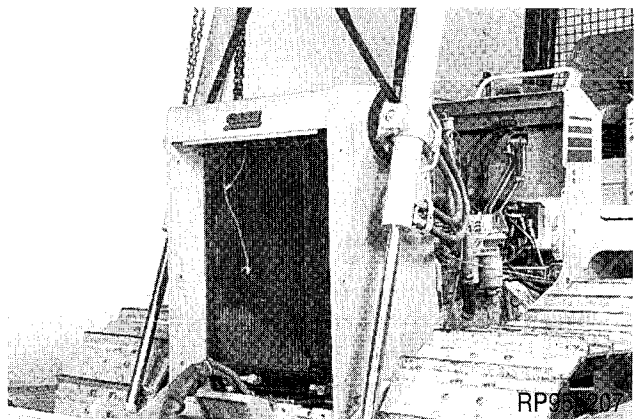
**WARNING:** When handling lubricants (oil, grease, etc.) and other chemical products, always follow the instructions for their proper use. Use proper containers to collect the fluid. Dispose of fluids and filters in a way that will protect the environment and in accordance with the laws. **DO NOT** smoke or use an open flame during the servicing procedure. Use eye protection. SM475

**STEP 28**



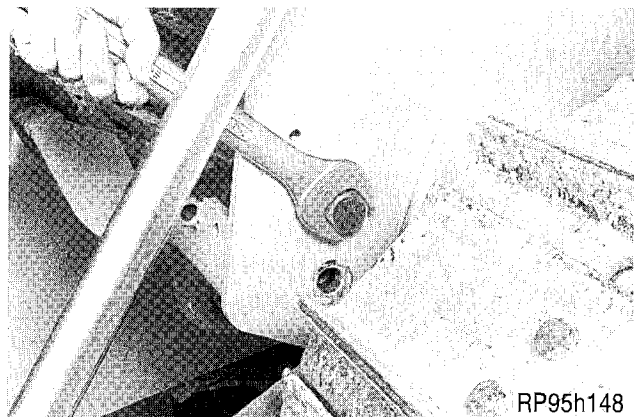
Loosen and remove both the LH and RH nut, bolt and mount for the piston rod eye to C-frame.

**STEP 29**



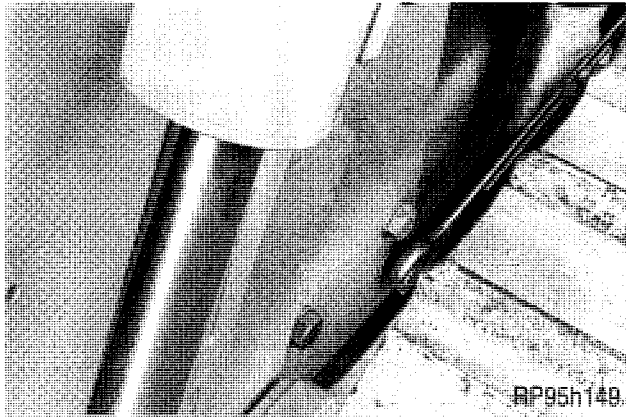
Attach a sling and overhead hoist to the radiator shroud and lift cylinders assembly.

**STEP 30**



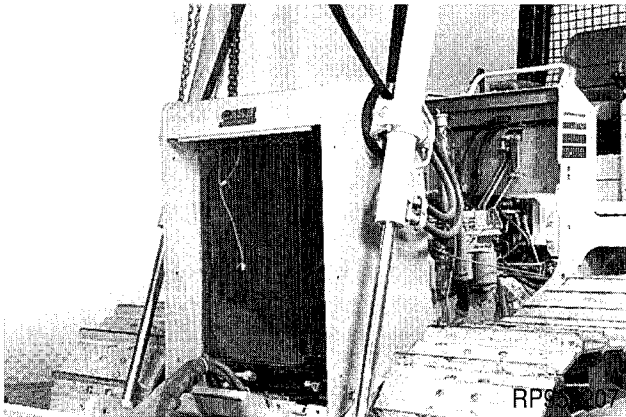
Remove the two front cap screws on each side fastening the radiator shroud to the main frame.

**STEP 31**



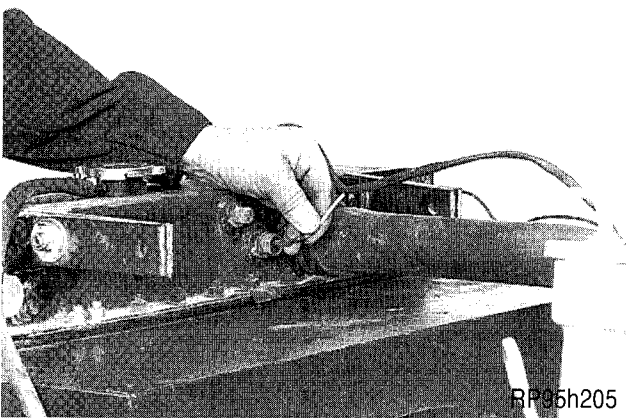
Remove the three rear cap screws on each side fastening the radiator shroud to the main frame.

**STEP 32**



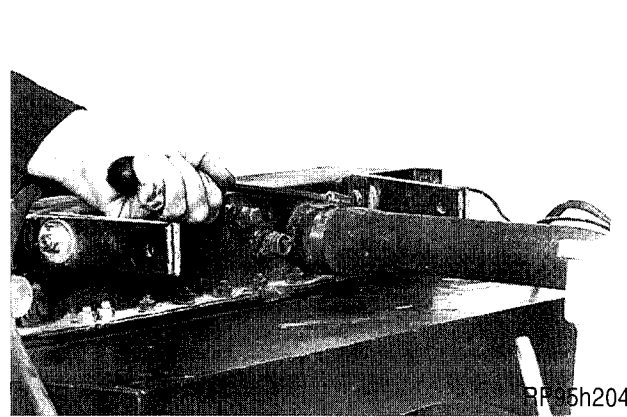
Use the overhead hoist to lift the radiator shroud straight up until the shroud is clear of the radiator and main frame. Set the radiator shroud down on the floor away from the machine.

**STEP 33**



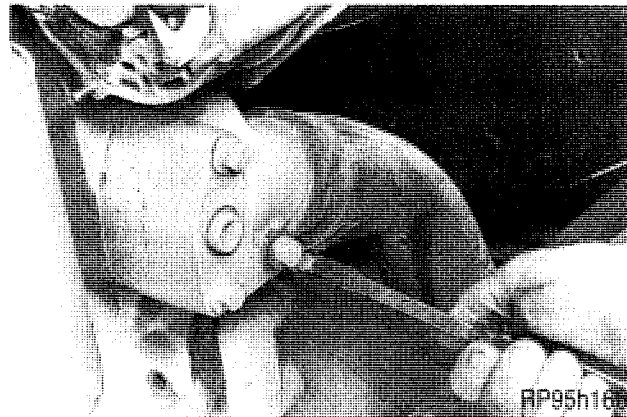
Disconnect the wire harness from the coolant level indicator.

**STEP 34**



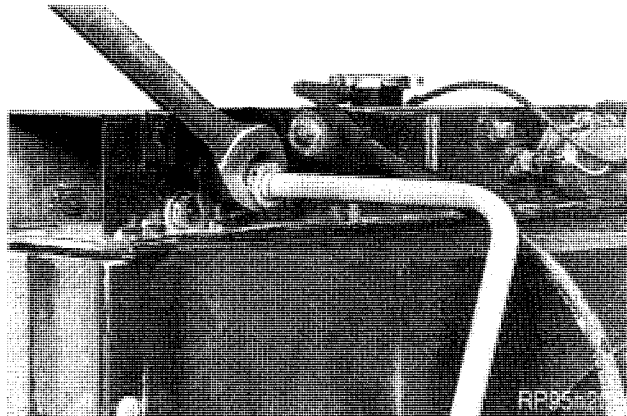
Loosen the hose clamp on the top radiator hose and remove the hose from the radiator.

**STEP 35**

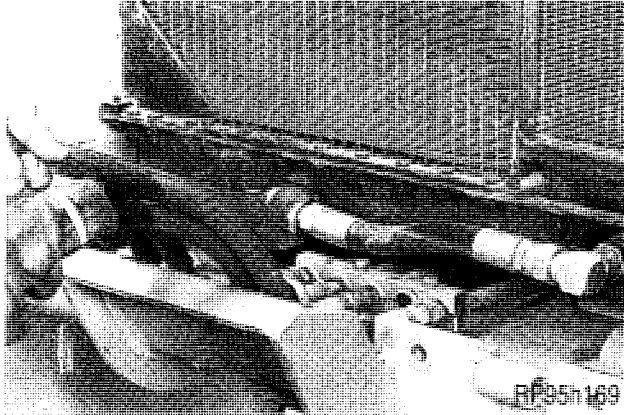


Loosen the hose clamp on the bottom radiator hose and remove the hose from the coolant inlet to the engine.

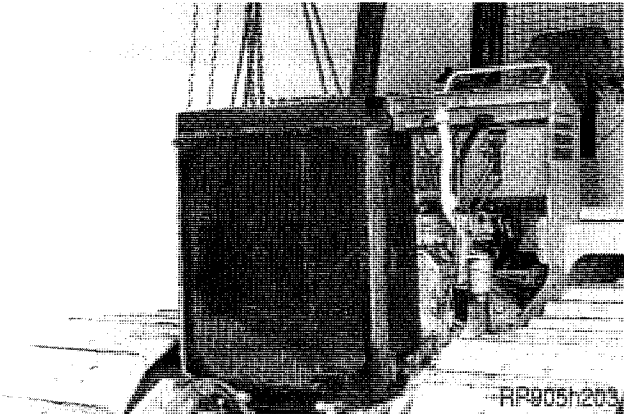
**STEP 36**



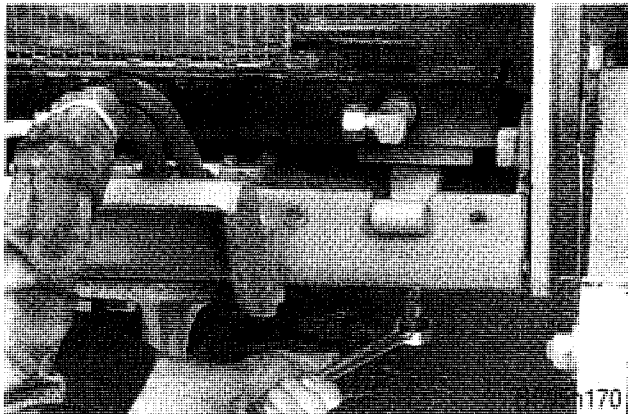
Loosen and disconnect the fitting on the tube to the inlet of the cooler for the transmission fluid. Make sure to plug and cap the fittings.

**STEP 37**

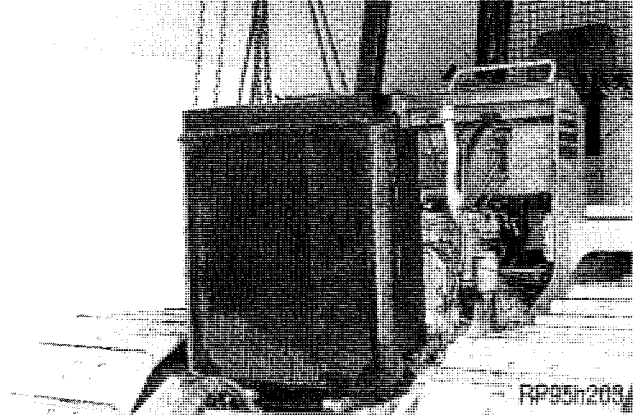
Disconnect and remove the hose from the outlet of the cooler to the tube for the transmission fluid. Make sure to plug and cap the hose and tube fittings.

**STEP 38**

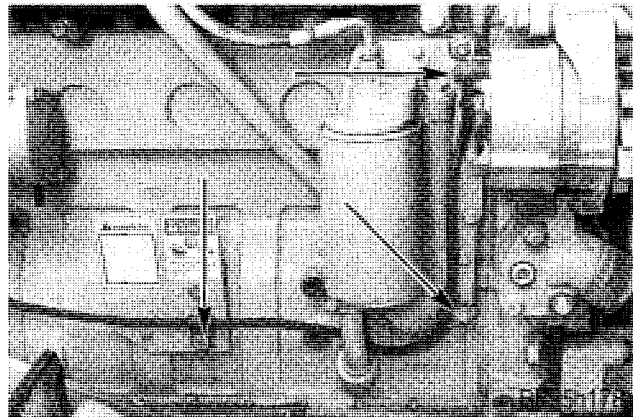
Attach a sling and overhead hoist to the top of the radiator.

**STEP 39**

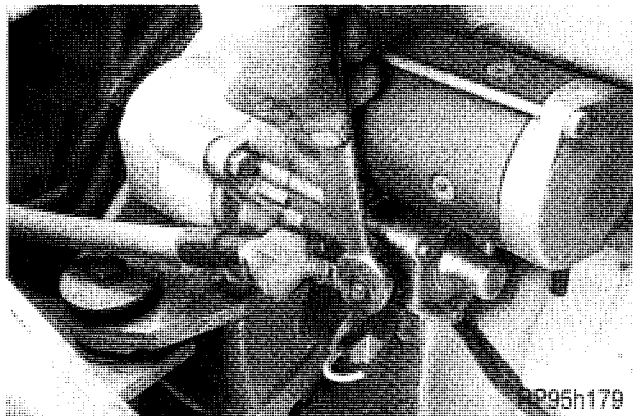
Remove the two bolts from the two bottom mounts for the radiator.

**STEP 40**

Remove the radiator and place it on the floor away from the machine.

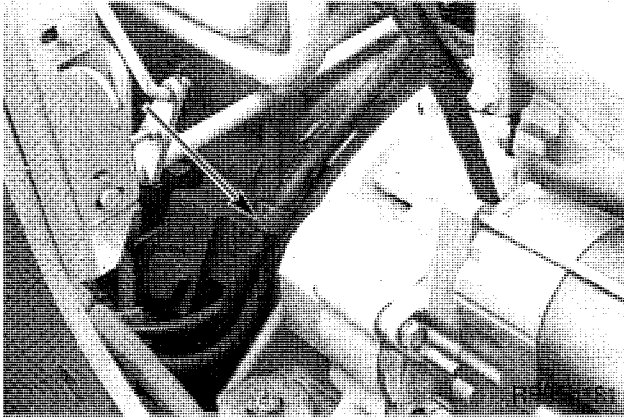
**STEP 41**

Disconnect the wire harness from the alternator. Remove the cap screws from the clamps fastening the wire harness to the engine block.

**STEP 42**

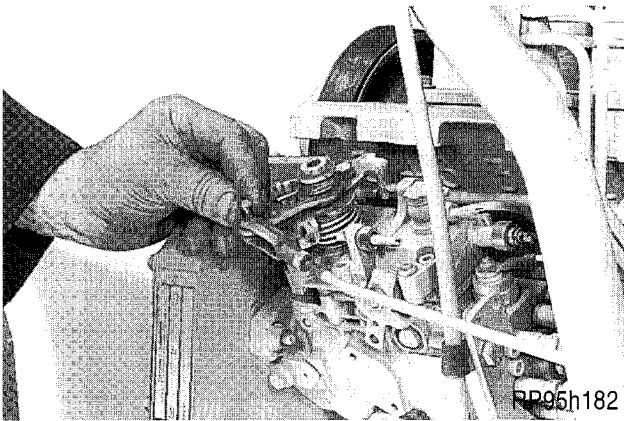
Make sure the Master Disconnect switch is in the OFF position. Loosen the nut on the starter solenoid and remove the positive battery cable and wire harness wires from the starter.

**STEP 43**



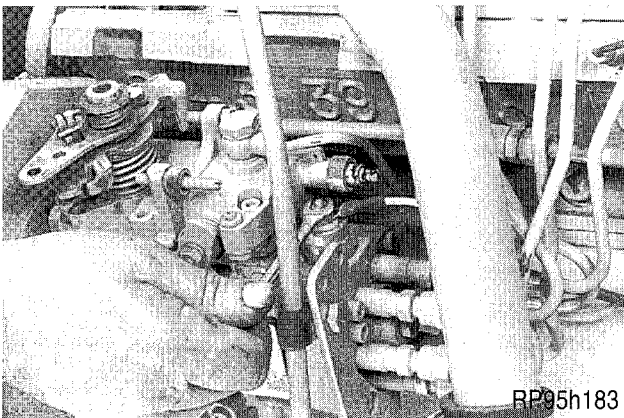
Remove the cap screw from the clamp fastening the hoses and wire harness to the torque converter housing.

**STEP 44**



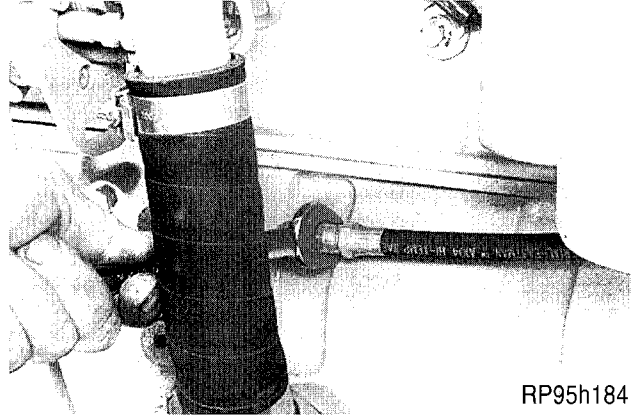
Remove the clevis pin attaching the clevis for the control rod to the control arm on the injection pump.

**STEP 45**



Disconnect the wire harness from the fuel shutoff solenoid on the injection pump.

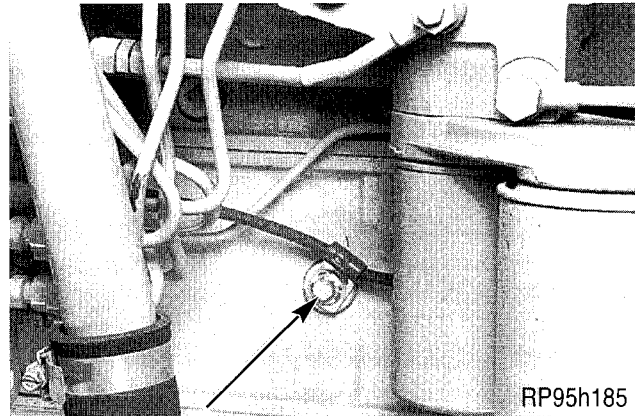
**STEP 46**



RP95h184

Disconnect the hose to the engine oil pressure gauge from the fitting in the engine block. Make sure to plug and cap the fittings.

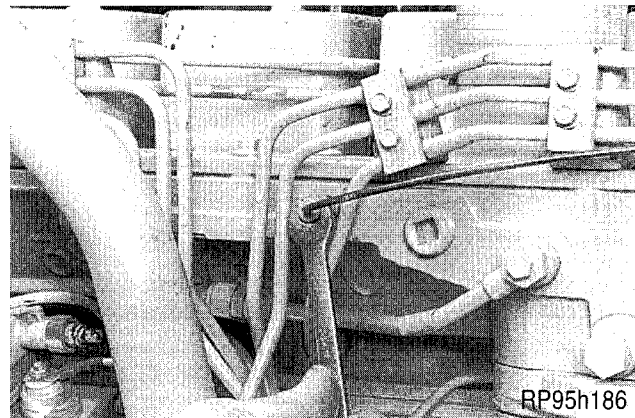
**STEP 47**



RP95h185

Remove the cap screw from the clamp fastening the wire harness to the engine block.

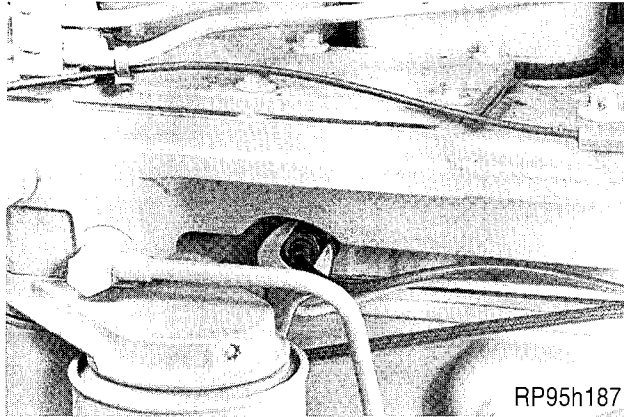
**STEP 48**



RP95h186

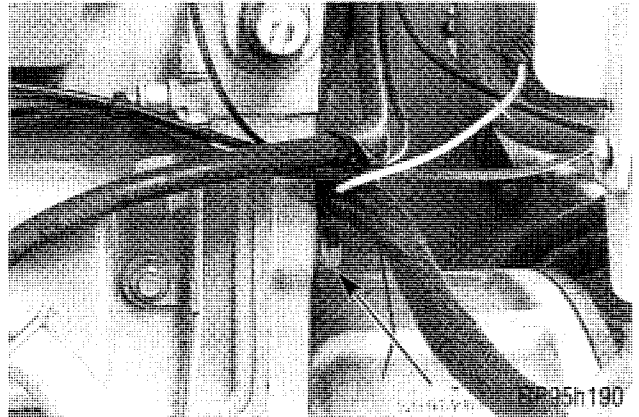
Loosen the fitting and remove from the intake manifold the tube from the cold start solenoid, if equipped.

**STEP 49**



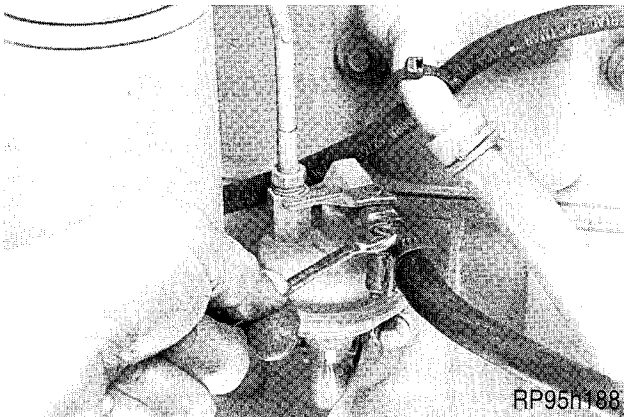
Loosen and remove the capillary tube for the engine coolant temperature gauge from the engine block.

**STEP 52**



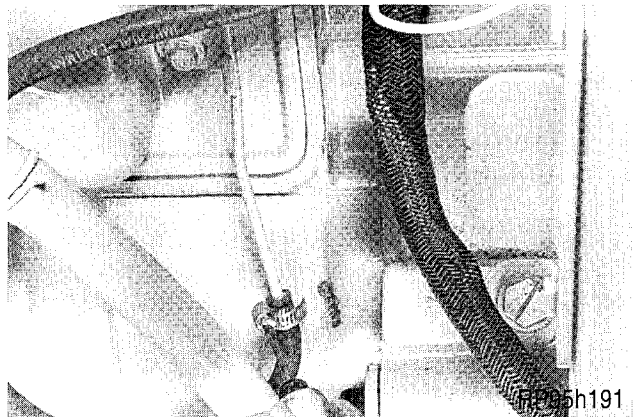
Remove the cap screw fastening the clamp for the wire harness and hoses to the engine block.

**STEP 50**



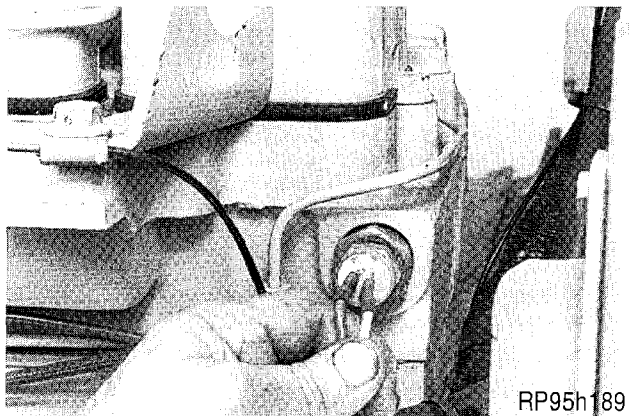
Crimp the fuel line hose to prevent fuel leakage. Loosen the clamp on the hose and remove the hose from the fuel pump.

**STEP 53**



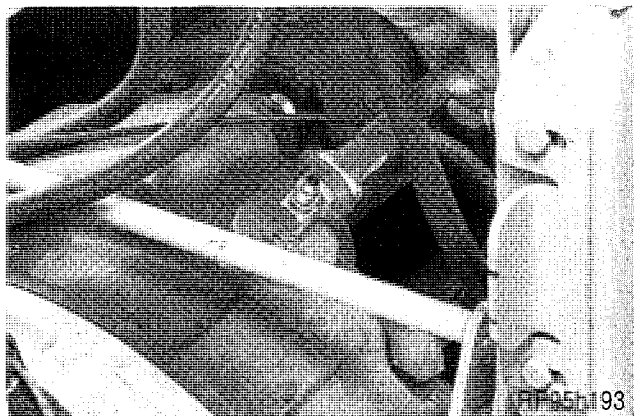
Loosen the clamp and remove the fuel line drain back hose from the tube fastened to the engine side cover.

**STEP 51**



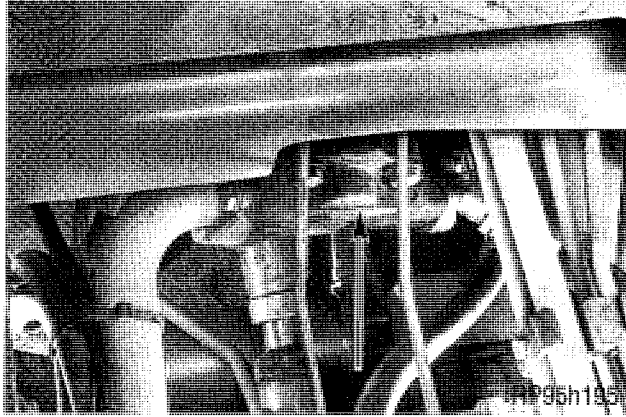
Disconnect the wire harness from the thermocouple switch for the cold start solenoid, if equipped.

**STEP 54**



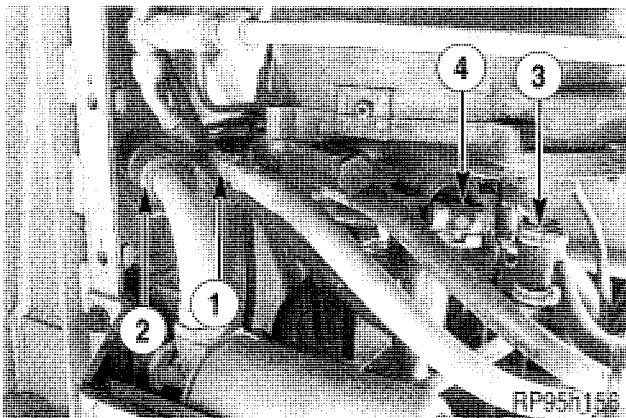
Disconnect the hoses from the tee on the top of the torque converter housing. Make sure to cap and plug all of the fittings.

**STEP 55**



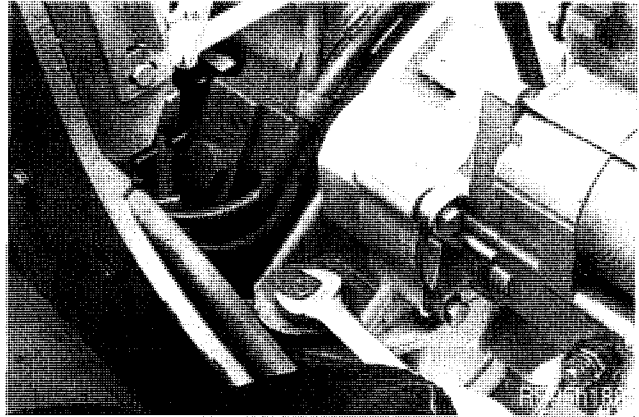
1. Remove the brake floor plate. Attach a sling around the hydraulic system pump and to the frame of the crawler, to support the pump and the hydraulic lines when the torque converter is removed with the engine.
2. Remove the four cap screws fastening the hydraulic system pump to the torque converter.

**STEP 56**



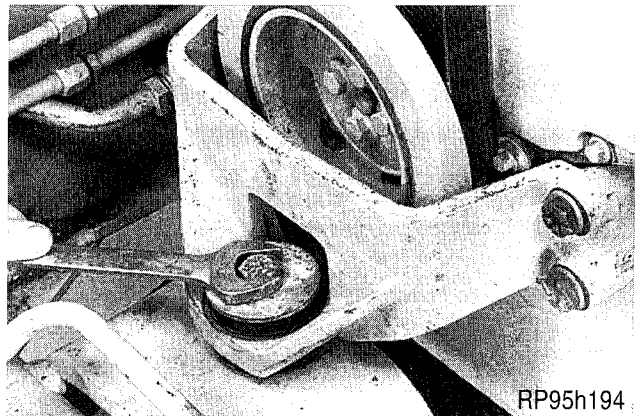
1. Disconnect the hoses from the tee at the inlet of the regulator valve. Make sure to cap and plug the fittings.
2. Loosen the clamps on the hose and move the hose to disconnect the tube to the transmission charge pump from the tube to the filter.
3. Loosen the clamps on the hose connecting the drain line to the torque converter housing. Disconnect the hose from the fitting in the torque converter housing.
4. Remove the four cap screws fastening the drive shaft to the companion flange on the torque converter output shaft.

**STEP 57**



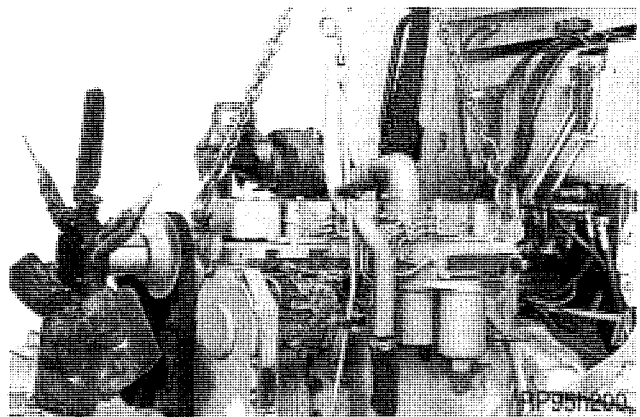
Remove the bolts and nuts securing the rear engine mounts.

**STEP 58**



Remove the bolt and nut securing the front engine mount.

**STEP 59**



Attach an engine lifting device to an overhead hoist and to the lifting eyes on the engine. Remove the engine and torque converter assembly from the crawler frame.

**STEP 60**

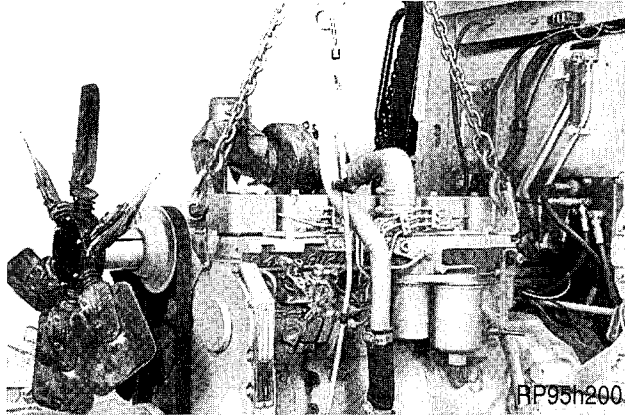
Remove the torque converter from the engine. See Section 6001 for torque converter removal.

## ENGINE INSTALLATION

### STEP 61

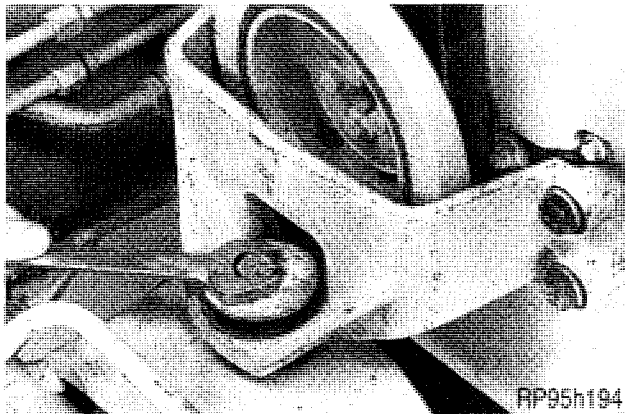
See Section 6001 for installing the torque converter onto the engine.

### STEP 62



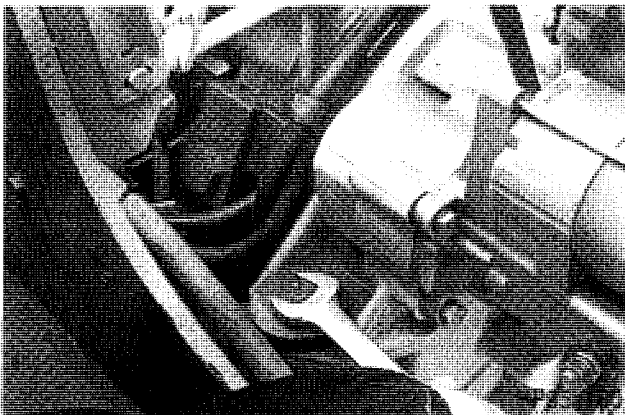
Attach an engine lifting device to an overhead hoist and to the lifting eyes on the engine. Install the engine and torque converter assembly into the main frame.

### STEP 63



Install the bolt and nut into the front engine mount and leave loose.

### STEP 64

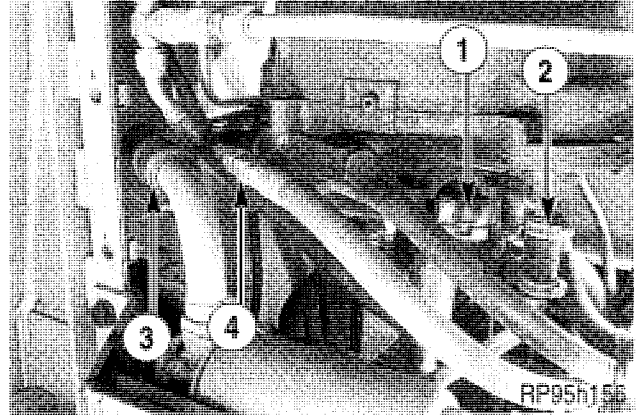


Install the bolts and nuts into the two rear engine mounts.

### STEP 65

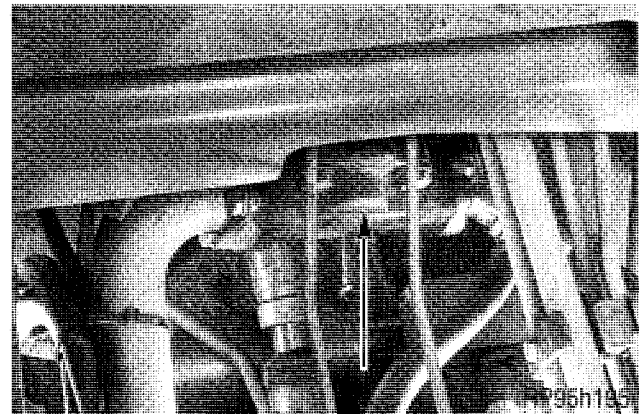
Tighten the three bolts and nuts securing the engine mounts to a torque of 150 to 180 foot pounds (203 to 244 Nm).

### STEP 66



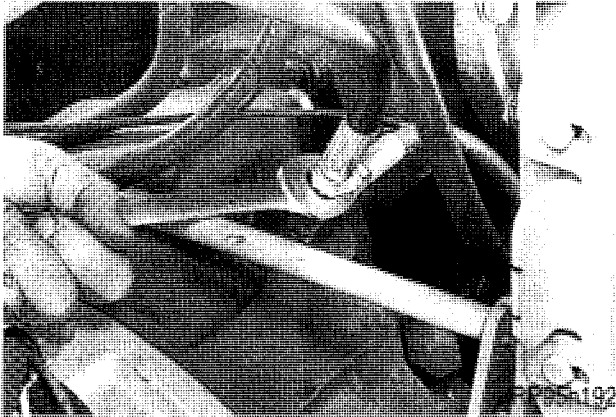
1. Install the four cap screws fastening the drive shaft to the companion flange on the torque converter output shaft and tighten to a torque of 37 to 49 foot pounds (50 to 66 Nm).
2. Install the hose connecting the drain line to the fitting in the bottom of the torque converter housing and secure the hose clamps on the hose.
3. Install the hose connecting the tube from the filter to the tube to the transmission pump inlet and secure the hose clamps on the hose.
4. Install and tighten the two hoses to the tee at the inlet of the regulator valve.

### STEP 67



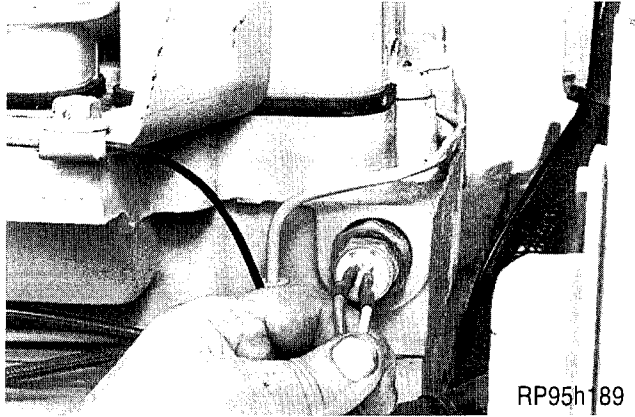
1. Install the hydraulic system pump into the drive coupling in the torque converter. Install and tighten the four cap screws fastening the pump to the torque converter housing.
2. Remove the sling used to support the pump while the torque converter was removed.

**STEP 68**



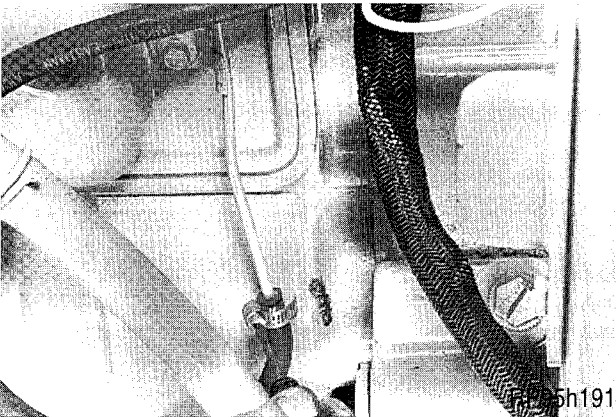
Connect and tighten the two hoses to the tee on the top of the torque converter housing.

**STEP 71**



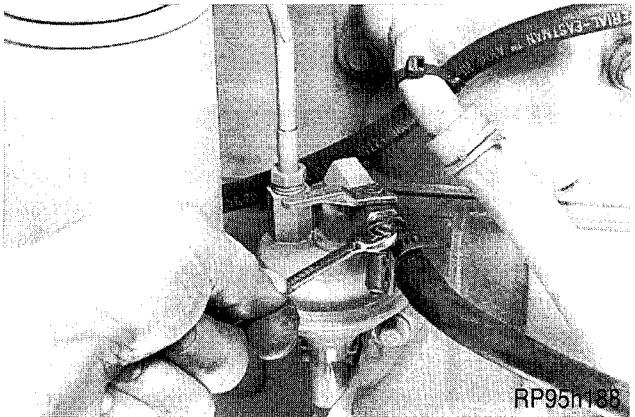
Connect the wire harness to the thermocouple switch for the cold start solenoid, if equipped.

**STEP 69**



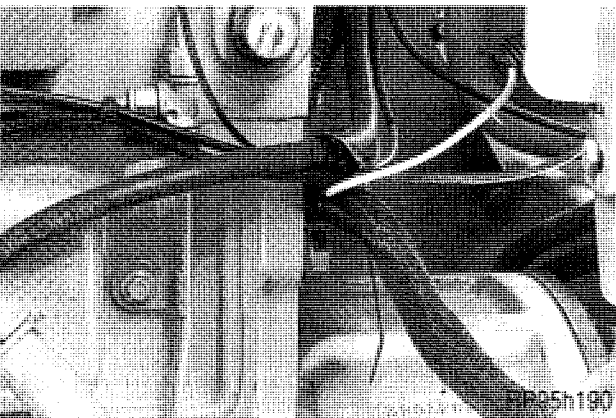
Install the drain back hose for the fuel line onto the tube fastened to the engine side cover and secure the hose clamp on the hose.

**STEP 72**



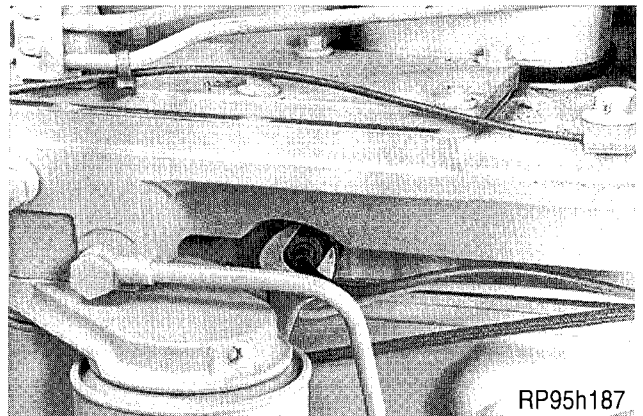
Install the hose for the fuel line onto the fitting on the fuel pump and secure the hose clamp on the hose.

**STEP 70**

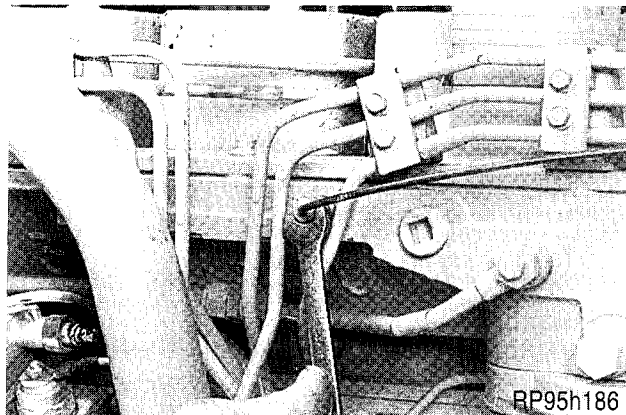


Install and tighten the cap screw fastening the clamp for the wire harness and hoses to the engine block.

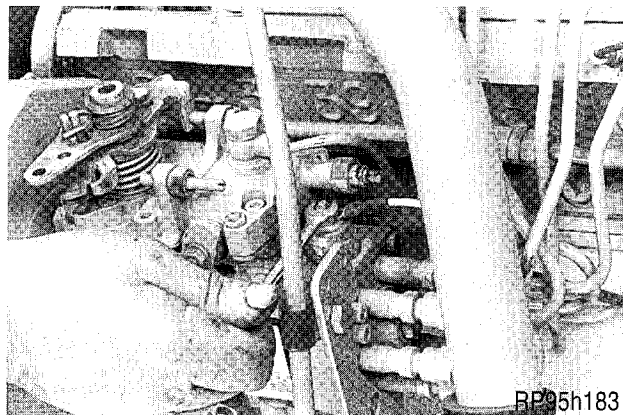
**STEP 73**



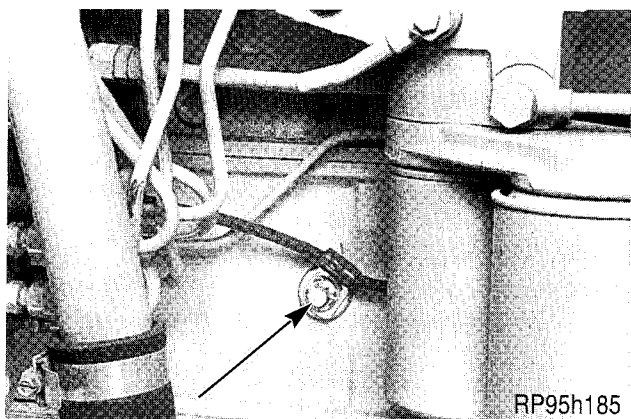
Install the capillary tube for the engine coolant temperature gauge into the fitting in the engine block and tighten the retaining nut.

**STEP 74**

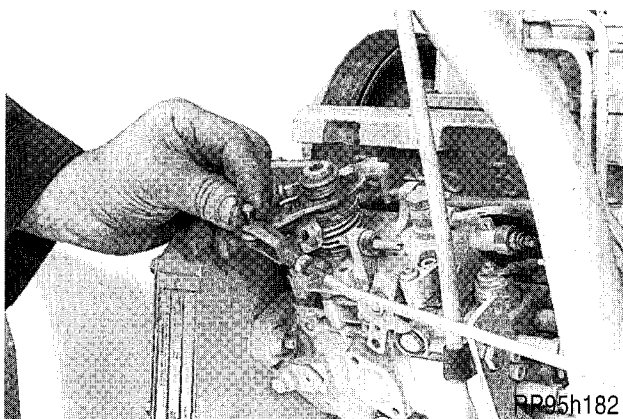
Install the tube from the cold start solenoid into the fitting in the intake manifold and tighten the retaining nut, if equipped.

**STEP 77**

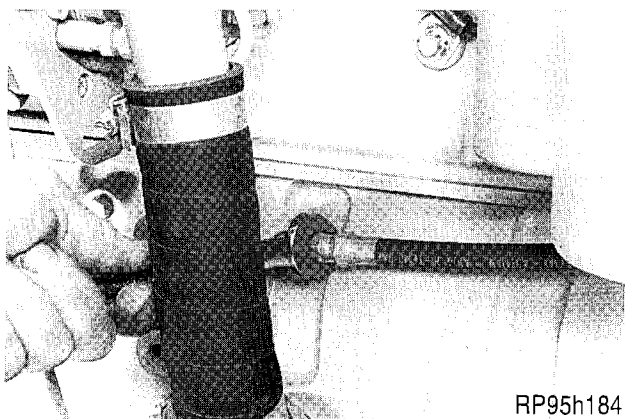
Connect the wire harness to the fuel shutoff solenoid on the injection pump and tighten the retaining nut.

**STEP 75**

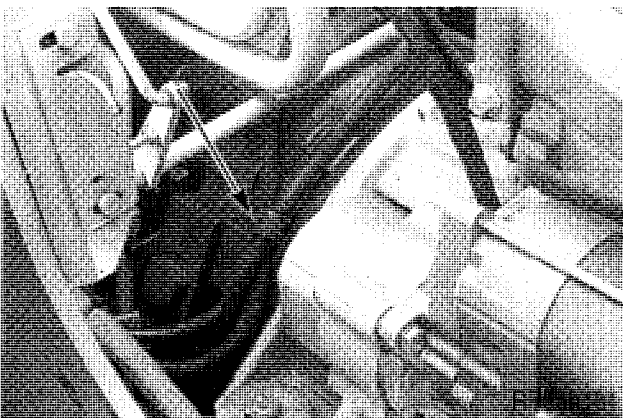
Install and tighten the cap screw fastening the clamp for the wire harness to the engine block.

**STEP 78**

Install the clevis pin attaching the clevis for the throttle control rod to the outer hole in the control arm on the injection pump and secure with a cotter pin.

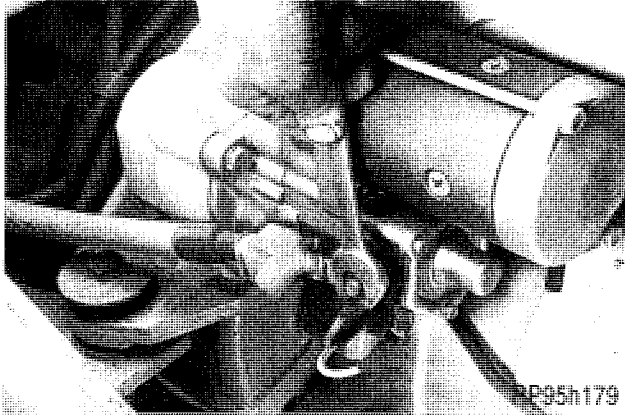
**STEP 76**

Connect the hose to the engine oil pressure gauge to the fitting in the engine block and tighten the fitting.

**STEP 79**

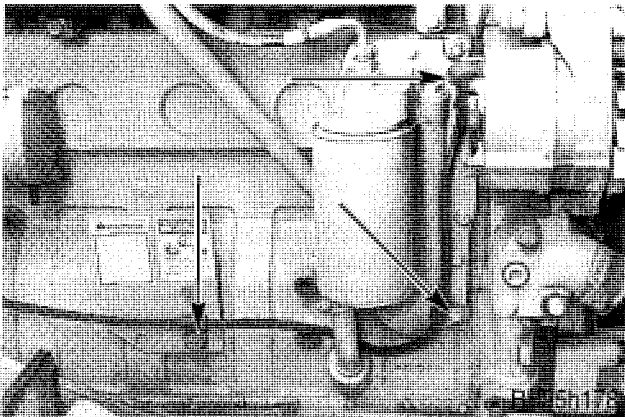
Install and tighten the cap screw fastening the clamp for the hoses and wire harness to the top of the torque converter housing.

**STEP 80**



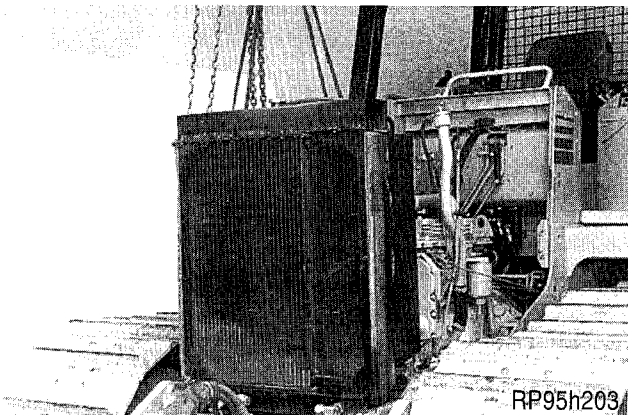
Make sure the Master Disconnect switch is in the OFF position. Install the positive battery cable and wire harness wires on the terminal of the starter solenoid and tighten the nut that secures the cable.

**STEP 81**



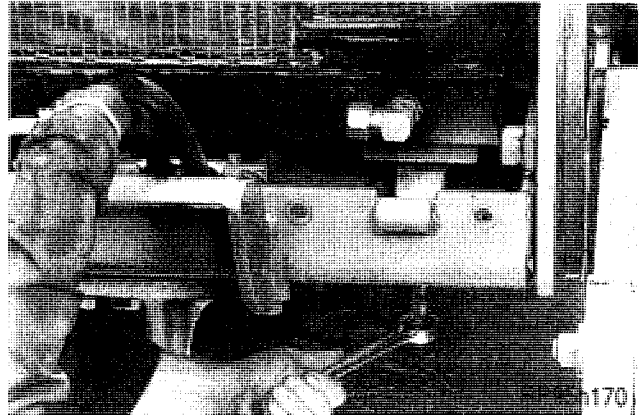
Connect the wire harness to the terminal on the alternator and tighten the nut securing the wire. Install and tighten the cap screws fastening the clamps for the wire harness to the engine block.

**STEP 82**



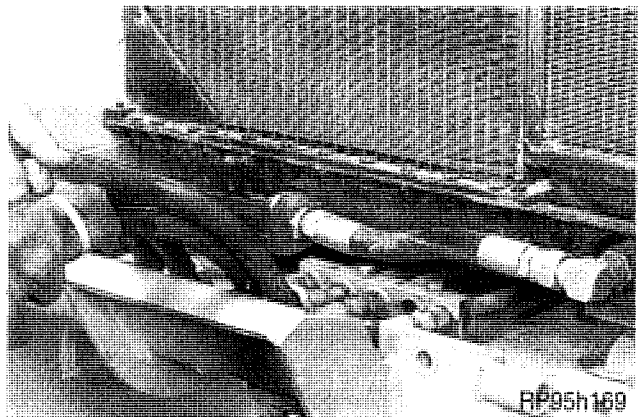
Attach a sling and over head hoist to the top of the radiator and place the radiator on the mounts in the main frame. Make sure the foam insulation strips are installed on both sides of the radiator.

**STEP 83**



Install and tighten the two bolts and washers that secure the bottom mounts for the radiator.

**STEP 84**



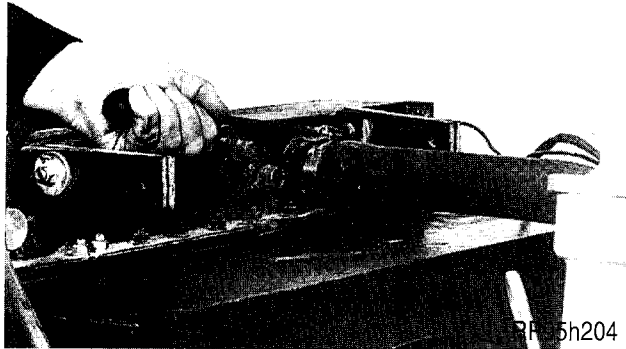
Connect the hose from the outlet of the cooler for the transmission fluid to the tube to the transmission and tighten the tube fitting.

**STEP 85**



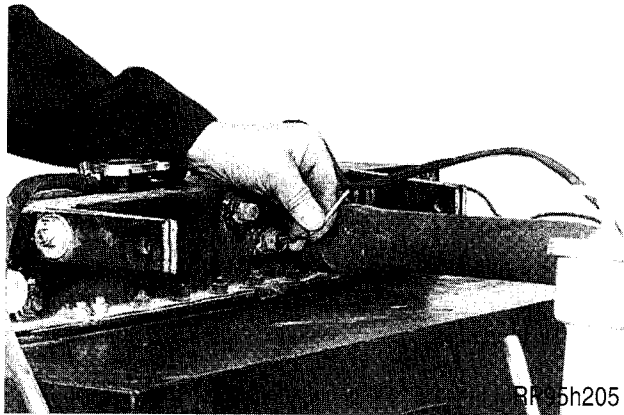
Install the bottom radiator hose onto the coolant inlet to the engine and tighten the hose clamp securing the hose.

**STEP 86**



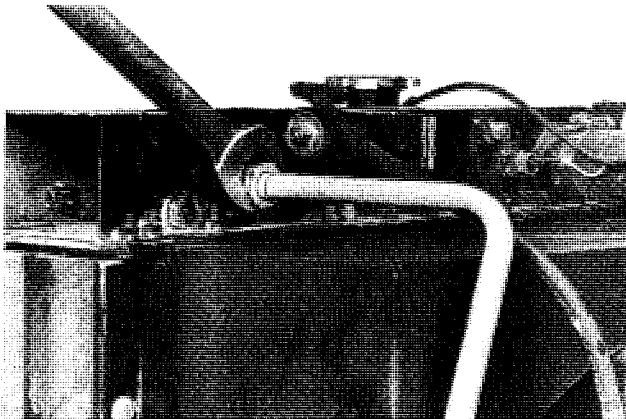
Install the top radiator hose onto the inlet to the radiator and tighten the hose clamp securing the hose.

**STEP 87**



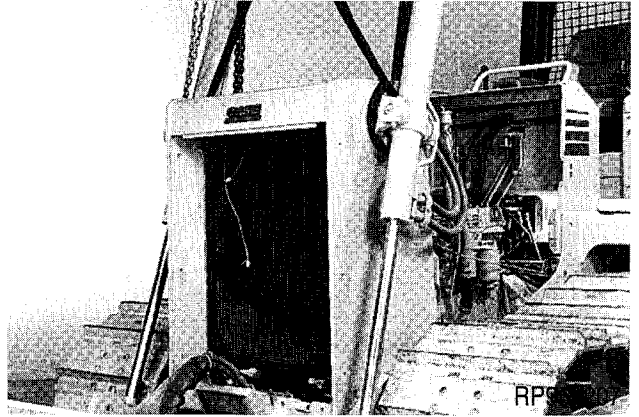
Connect the wire harness to the coolant level indicator.

**STEP 88**



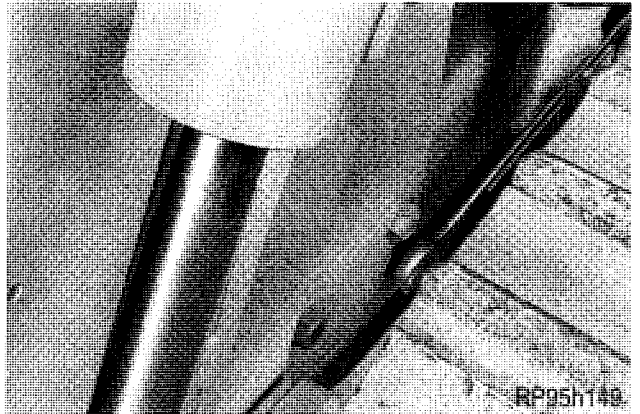
Connect the tube from the torque converter to the fitting at the inlet of the cooler for the transmission fluid and tighten the tube fitting.

**STEP 89**



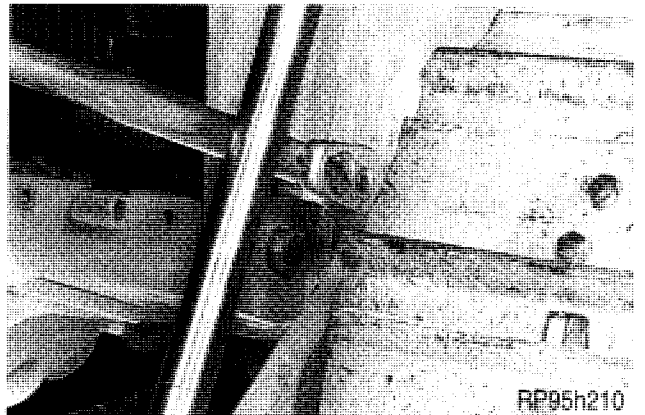
Use an over head hoist to lift the radiator shroud up over the radiator and then lower the shroud straight down into place on the main frame.

**STEP 90**



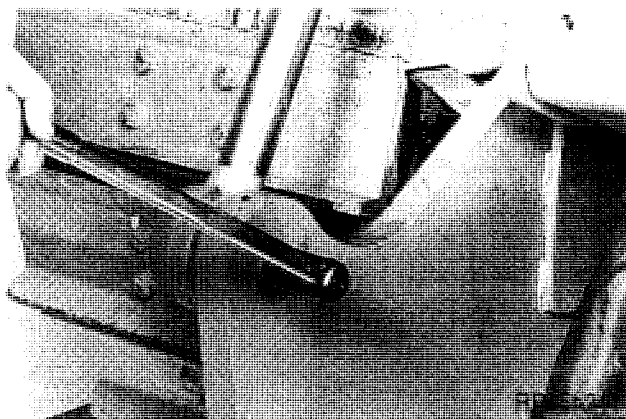
Install the three rear cap screws and washers on each side fastening the radiator shroud to the main frame, leave the cap screws loose.

**STEP 91**



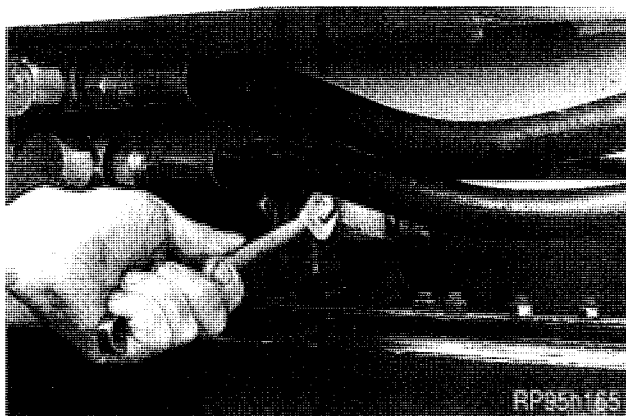
Install the two front cap screws and washers on each side fastening the radiator shroud to the main frame. Tighten all five cap screws on each side to a torque of 580 to 696 foot pounds (787 to 944 Nm).

**STEP 92**



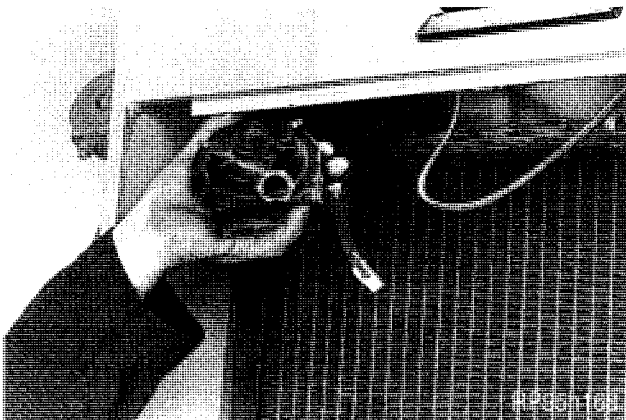
Install the bolt through the mount for the piston rod eye to the C-frame and tighten the nut to a torque of 270 to 324 foot pounds (366 to 439 Nm).

**STEP 93**



Install and tighten the bolts and nuts securing the top radiator mounting straps to the radiator shroud on both sides.

**STEP 94**



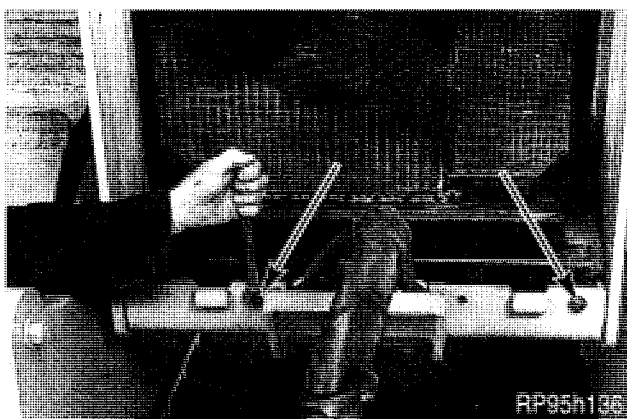
Install both the LH and RH horns, if equipped.

**STEP 95**



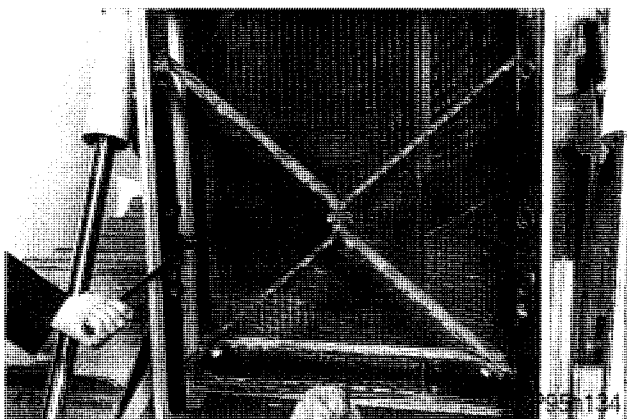
Install and secure the upper baffle panel and foam insulation for the radiator.

**STEP 96**



Install the lower baffle panel for the radiator and secure the baffle with the two cap screws as shown.

**STEP 97**



Install both the LH and RH mounting brackets for the grille and the X support brace



**Suggest:**

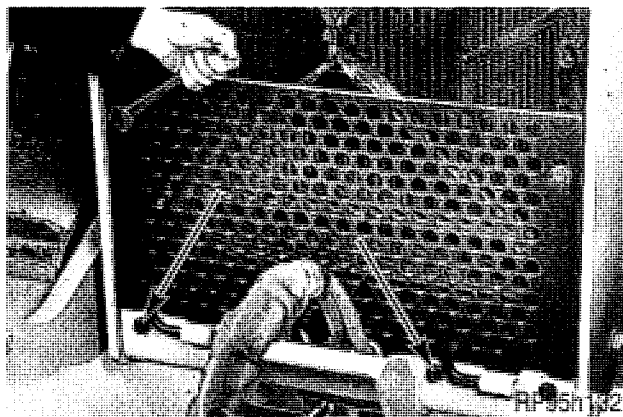
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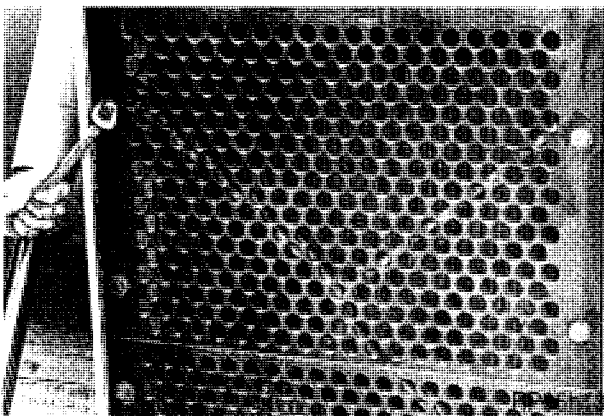
**first, and then click the above link**

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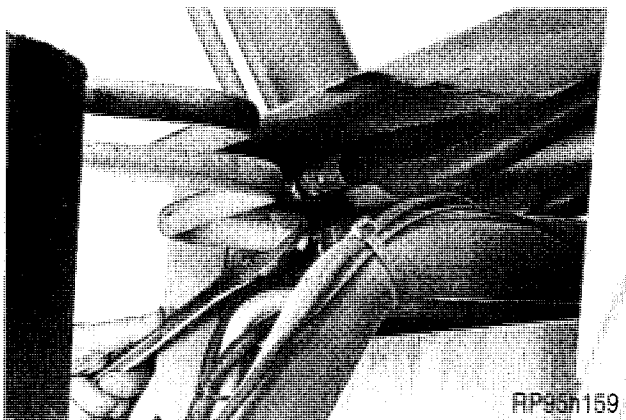
**Thank you so much for reading**

**STEP 98**

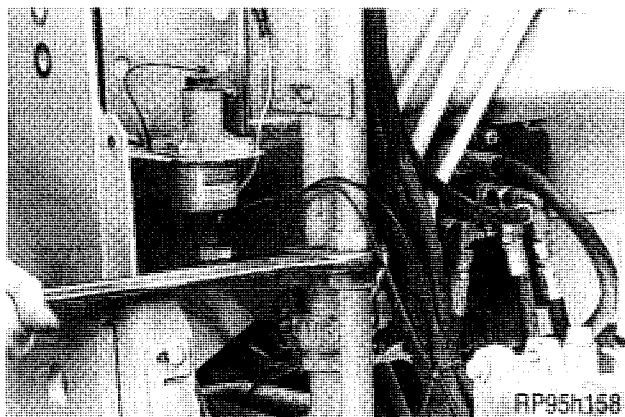
Install the lower grille and secure the grille with the two upper cap screws. Install and tighten the two cap screws that retain the lower baffle panel.

**STEP 99**

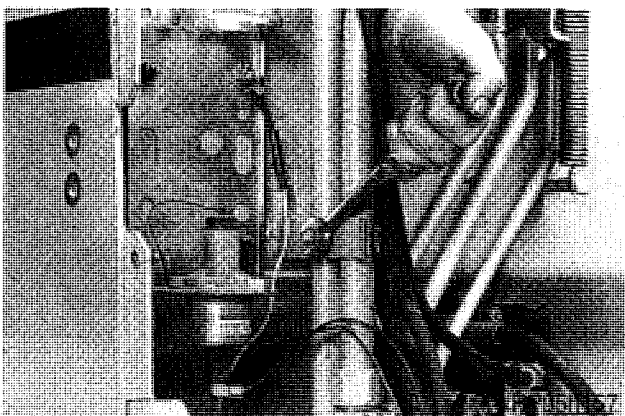
Install the upper grille and fasten in place by tightening the four cap screws.

**STEP 100**

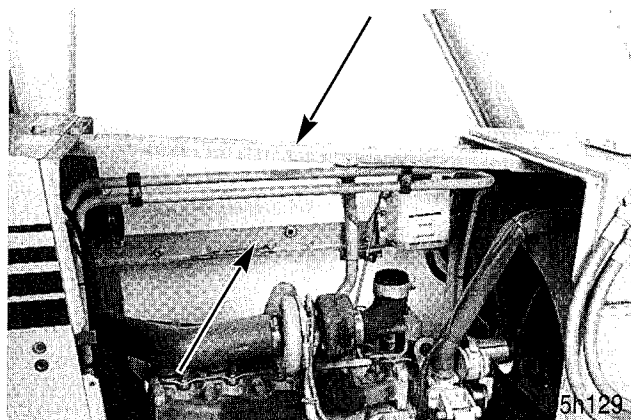
Connect the two hydraulic tubes to the tees to the lift cylinders in the shroud above the radiator and tighten the tube fittings.

**STEP 101**

Connect the two hydraulic tubes to the lift cylinders to the tubes from the control valve at the rear of the engine and tighten the tube fittings.

**STEP 102**

Install and tighten the bolt, nut and clamp for the hydraulic tubes to the lift cylinders.

**STEP 103**

Install the LH side shield to hood mounting bracket and the radiator surge tank as an assembly. Install the center mounting bracket for the hood.

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