SERVICE MANUAL
Crawler
650
8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL
Crawler
650
8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL
Crawler
650
8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

SERVICE MANUAL
Crawler
650
8-11261

1. Trim along dashed line.
2. Slide into pocket on Binder Spine.

TYPE 1-4

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1001

STANDARD TORQUE SPECIFICATIONS

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Bur 8-71600

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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.*

811360B

TORQUE SPECIFICATIONS - METRIC HARDWARE

Use the following toques 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 if used.

Grade 8.8 Bolts, Nuts, and Studs

8.8

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
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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

10.9

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

12.9

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

TORQUE SPECIFICATIONS - O-RING FACE SEAL FITTING

Nom. SAE Dash Size	Tube OD	Thread Size	Pound-Feet	Newton Metres	Thread Size	Pound-Feet	Newton Metres
		O-ring Face Seal End			**O-ring Boss End Fitting or Locknut**		
-4	**1/4 In** 6.4 mm	9/16-18	10-12	14-16	7/16-20	17-20	23-27
-6	**3/8 in** 9.5 mm	11/16-16	18-20	24-27	9/16-18	25-30	33-40
-8	**1/2 in** 12.7 mm	13/16-16	32-40	43-54	3/4-16	45-50	61-68
-10	**5/8 in** 15.9 mm	1-14	46-56	60-75	7/8-14	60-65	81-88
-12	**3/4 in** 19.0 mm	1-3/16-12	65-80	90-110	1-1/16-12	85-90	115-122
-14	**7/8 in** 22.2 mm	1-3/16-12	65-80	90-110	1-3/16-12	95-100	129-136
-16	**1.0 in** 25.4 mm	1-7/16-12	92-105	125-140	1-5/16-12	115-125	156-169
-20	**1-1/4 in** 31.8 mm	1-11/16-12	125-140	170-190	1-5/8-12	150-160	203-217
-24	**1-1/2 in** 38.1 mm	2-12	150-180	200-254	1-7/8-12	190-200	258-271

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Section

1002

FLUIDS AND LUBRICANTS

CASE CORPORATION

Bur 8-14430

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ENGINE OIL RECOMMENDATIONS 3

DIESEL FUEL 4

CAPACITIES AND LUBRICANTS

Engine Oil

Capacity with filter change ..... 11 U.S. quarts (10.4 litres)

Type of oil ..... See Engine Oil Recommendations on page 3

Engine Cooling System

Capacity ..... 20 U.S. quarts (18.9 litres)

Type of coolant ..... Ethylene glycol and water mixed for lowest ambient temperature (at least half water and half coolant)

Fuel Tank

Capacity ..... 40 U.S. gallons (151 litres)

Type of fuel ..... See Diesel Fuel Specifications on page 4

Hydraulic System

Hydraulic reservoir refill capacity ..... 12 U.S. gallons (45.4 litres)

Type of oil ..... Case TCH Fluid

Transmission

Capacity ..... 8 U.S. gallons (30.3 litres)

Type of oil ..... Case TCH Fluid

Final Drives

Refill capacity (each side) ..... 7.5 U.S. quarts (7.1 litres)

Type of oil ..... CaseIH 135-H EP Gear Lube

Brake Reservoir

Type of fluid ..... Case TCH Fluid or Dexron II Fluid

NOTE: *During cold weather use Case brake oil, Case part number B91244.*

ENGINE OIL RECOMMENDATIONS

CaseIH No. 1 Engine Oil is recommended for use in your CaseIH Engine. CaseIH Engine Oil will lubricate your engine correctly under all operating conditions. If CaseIH No. 1 Multi-Viscosity Engine Oil is not available, CaseIH No. 1 Single Grade Engine Oil can be used.

If CaseIH No. 1 Multi-Viscosity or Single Grade Engine Oil is not available, use only oil meeting API engine oil service catergory CE.

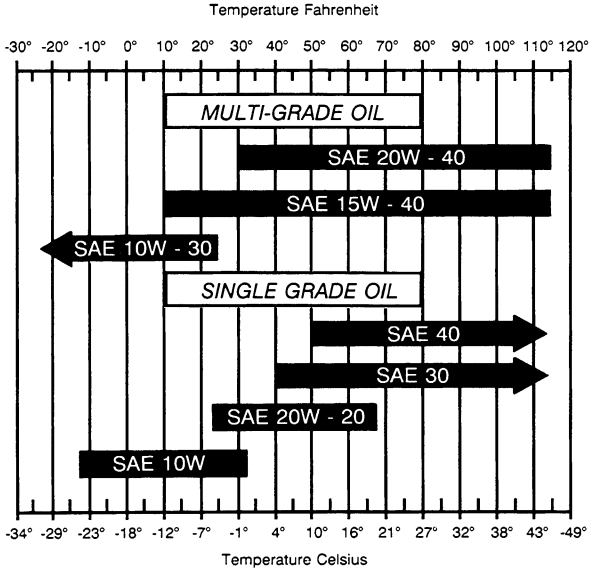
654L9

See the chart below for recommended viscosity at ambient air temperature ranges.

NOTE: *Do not put Performance Additives or other oil additive products in the engine crankcase. The oil intervals given in this manual are according to tests with CaseIH lubricants.*

LUBRICATION OIL VISCOSITY

AMBIENT AIR TEMPERATURE RANGES



737L9

DIESEL FUEL

Use No. 2 diesel fuel in the engine of this machine. The use of other fuels can cause the loss of engine power and high fuel consumption.

In very cold temperatures, a mixture of No.1 and No. 2 diesel fuels is temporarily permitted. See the following Note.

NOTE: *See your fuel dealer for winter fuel requirements in your area. If the temperature of the fuel lowers below the cloud point (wax appearance point), wax crystals in the fuel will cause the engine to lose power or not start.*

The diesel fuel used in this machine must meet the specifications in the chart below or Specification D975-81 of the American Society for Testing and Materials.

Fuel Storage

If you keep fuel in storage for a period of time, you can get foreign material or water in the fuel storage tank. Many engine problems are caused by water in the fuel.

Keep the fuel storage tank outside and keep the fuel as cool as possible. Remove water from the storage container at regular periods of time.

Fill the fuel tank at the end of the day to prevent condensation in the fuel tank.

Specifications for Acceptable No. 2 Diesel Fuel

API gravity, minimum	34
Flash point, minimum	140°F (60°C)
Cloud point (wax appearance point), maximum	-5°F (-20°C) See Note above
Pour point, maximum	-15°F (-26°C)
Distillation temperature, 90% point	540 to 640°F (282 to 338°C)
Viscosity, at 100°F (88°C)	
Centistokes	2.0 to 4.3
Saybolt Seconds Universal	32 to 40
Cetane number, minimum	43 (45 to 55 for winter or high altitudes)
Water and sediment, by volume, maximum	0.05 of 1%
Sulfur, by weight, maximum	0.5 of 1%
Copper strips corrosion, maximum	No. 2
Ash, by weight, maximum	0.01 of 1%

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Section

2000

ENGINE STALL TESTS

CASE CORPORATION

Bur 8-14450

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Understanding the Results of the Test 5

TEST NO. 3 - HYDRAULIC STALL
Test Procedure 6

Understanding the Results of the Test 6

GENERAL INFORMATION

During these tests the engine runs at full throttle and works against the torque converter, the hydraulic pump, or both the torque converter and the hydraulic pump. The results of these tests can show if the cause for bad performance is in the engine, in the torque converter or transmission, or in the hydraulic system.

For accurate results, use a photo tachometer or other tachometer of equal accuracy.

SPECIFICATIONS

Low idle ..... 750 to 800 rpm (r/min)

Full throttle ..... 2200 to 2280 rpm (r/min)

Torque converter oil temperature (center of green zone on temperature gauge) ..... 210°F (99°C)

Hydraulic oil temperature ..... 125 to 175°F (52 to 79°C)

Stall speeds

Torque converter ..... 1880 to 2000 rpm (r/min)

Hydraulic ..... 2100 rpm (r/min) minimum

Torque converter and hydraulic ..... 1500 to 1665 rpm (r/min)

Number of teeth on the flywheel 127

SPECIAL TOOLS

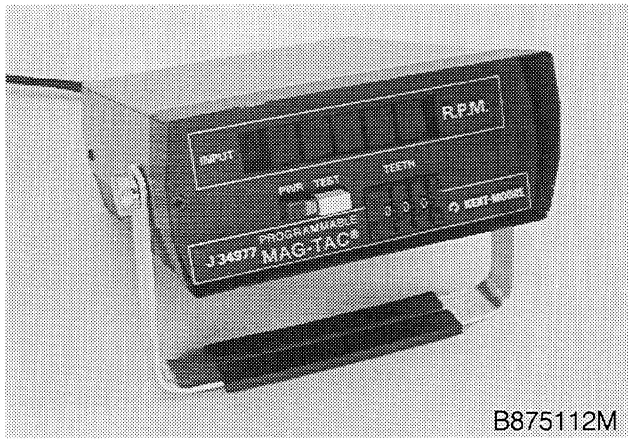
Order special tools from one of the following addresses:

In the U.S.A. and Canada

Service Tools
P.O. Box 314
Owatonna, Minnesota 55060

In Europe

VL Churchill Ltd
P.O. Box 3, Daventry Northants, NN11 4NF
England



CAS-10778

The special tool shown above is used to check the engine rpm (r/min).

The tool must be programmed for the number of teeth on the flywheel. The 650 Crawler has 127 teeth on the flywheel.

Install the magnetic sensor into the threaded hole in the flywheel housing. Turn the magnetic sensor clockwise until the sensor contacts the flywheel, then turn the sensor counterclockwise 1/2 to 3/4 of a turn and tighten the lock nut.

PROCEDURE TO HEAT THE OIL

Torque Converter

1. Do the following steps to check the parking brake:

   a. Apply the parking brake.

   b. Put the range control lever in LO.

   c. Start and run the engine at low idle.

   d. Put the track speed control levers in HI.

   e. Put the direction control lever in F.

   f. Slowly increase the engine speed to full throttle. If the parking brake does not prevent the machine from moving, stop the engine.

   g. See Section 7001 and adjust the parking brake.

   h. Repeat steps 1a through 1g until the parking brake prevents the machine from moving with the engine running at full throttle.

2. Run the engine at low idle.

3. Put the range control lever in HI.

4. Put both track speed control levers in HI.

5. Put the direction control lever in F.

6. Run the engine at full throttle with the direction control lever in F for two minutes. Then reduce engine speed to low idle and put the direction control lever in NEUTRAL.

7. Run the engine at full throttle with the direction control lever in NEUTRAL for one minute. Then reduce engine speed to low idle and put the direction control lever in F.

8. Repeat steps 6 and 7 until the needle in the temperature gauge is in the green zone.

Hydraulic System

1. Apply the parking brake.

2. Put the transmission control levers in NEUTRAL.

3. Start and run the engine at full throttle.

4. Put the blade control lever in TILT position.

5. Hold the blade control lever in the TILT position for 15 seconds. Then put the blade control lever in NEUTRAL for 30 seconds.

6. Repeat steps 4 and 5 until the temperature of the hydraulic oil is between 125 and 175°F (52 to 79°C). If a thermometer is not available, feel the tube connected to the inlet of the equipment control valve. The tube must be very warm.

TEST NO. 1 - TORQUE CONVERTER AND HYDRAULIC STALL TOGETHER

Test Procedure

1. Apply the parking brake.

2. Put the range control lever in HI. Put all other transmission control levers in NEUTRAL.

3. Start and run the engine at low idle.

4. Put the track speed control levers in HI.

5. Put the direction control lever in the F position.

6. Increase the engine speed to full throttle.

7. Hold the blade control lever in a TILT position.

8. Measure the engine speed with a tachometer. Make a record of the engine speed.

9. Put the blade control lever in NEUTRAL.

10. Stop the engine.

Understanding the Results of the Test

1. If the engine speed was correct, the engine, the torque converter and transmission, and the hydraulic system are probably good.

2. If the engine speed was above or below the specified speed, do Test No. 2 and Test No. 3.

TEST NO. 2 - TORQUE CONVERTER STALL

Test Procedure

1. Apply the parking brake.

2. Put the range control lever in HI. Put all other transmission control levers in NEUTRAL.

3. Start and run the engine at low idle.

4. Put the track speed control levers in HI.

5. Put the direction control lever in the F position.

6. Increase the engine speed to full throttle.

7. Measure the engine speed with a tachometer. Make a record of the engine speed.

8. Keep the range control lever in HI. Put all other transmission control levers in NEUTRAL.

9. Stop the engine.

Understanding the Results of the Test

1. If the engine speed was correct, the engine, torque converter, and transmission are probably good.

2. If the engine speed was below the specified speed, do Test No. 3.

3. If the engine speed was above the specified speed, the torque converter, the transmission, or both the torque converter and the transmission are probably the cause. See Section 6002 for information on troubleshooting.

TEST NO. 3 - HYDRAULIC STALL

Test Procedure

1. Apply the parking brake.

2. Put the range control lever in HI. Put all other transmission control levers in NEUTRAL.

3. Start and run the engine at low idle.

4. Hold the blade control lever in TILT position.

5. Increase the engine speed to full throttle.

6. Measure the engine speed with a tachometer. Make a record of the engine speed.

7. Put the blade control lever in NEUTRAL.

8. Stop the engine.

Understanding the Results of the Test

1. If the engine speed was correct, the engine and hydraulic system are good.

2. If the engine speed was above the specified speed, the hydraulic system is probably the cause. See Section 8002 for troubleshooting information.

3. If the engine speed was below the specified speed in Test No. 1, Test No. 2, and Test No. 3, the engine is probably the cause.

Section

2001

ENGINE REMOVAL AND INSTALLATION AND RADIATOR REMOVAL AND INSTALLATION

CASE CORPORATION

Bur 8-14460

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Assembly of the Radiator 10

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ENGINE INSTALLATION 29

SPECIFICATIONS

Special Torques

Cap screws that fasten the radiator to the mounting brackets ..... 50 to 60 pound-feet (68 to 82 Nm)

Bolts that fasten the rear of the brush guard to the ROPS cab or ROPS canopy ..... 350 to 400 pound-feet (474 to 542 Nm)

Cap screws that fasten the drive ring to the torque converter ..... 456 to 504 pound-inches (52 to 57 Nm)

Cap screws that fasten the drive ring to the flywheel ..... 156 to 180 pound-inches (18 to 20 Nm)

Cap screws that fasten the torque converter housing to the flywheel housing ..... 456 to 540 pound-inches (52 to 61 Nm)

Bolts that fasten the front engine mount and the rear engine mounts to the frame ..... 135 to 165 pound-feet (183 to 224 Nm).

Cooling System Capacity ..... 20 U.S. quarts (18.9 litres)

Torque Converter Installation

Torque converter must be centered on the flywheel to within 0.004 inch (0.1 mm) so that the full indicated movement is 0.008 inch (0.2 mm) or less.

SPECIAL TOOLS

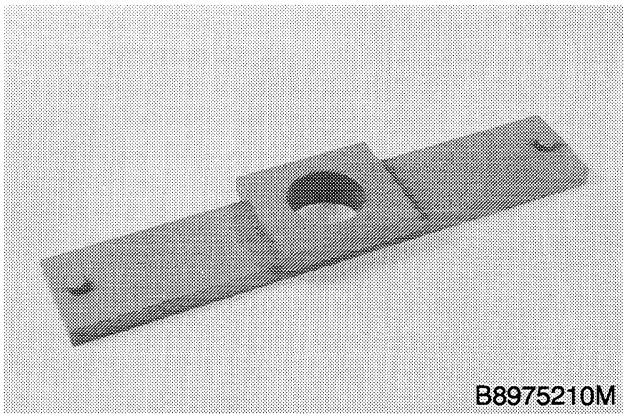
Order special tools from one of the following addresses:

In the U.S.A. and Canada

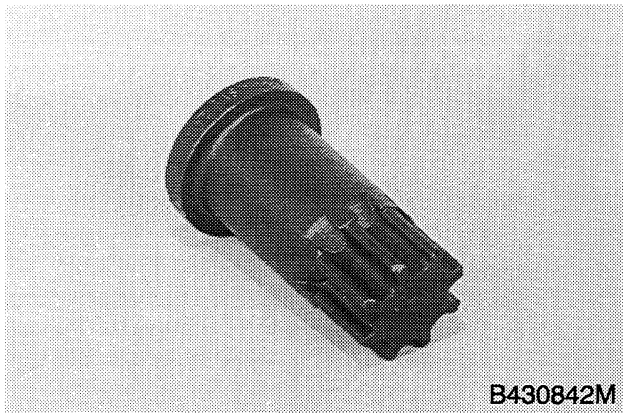
Service Tools
P.O. Box 314
Owatonna, Minnesota 55060

In Europe

VL Churchill Ltd
P.O. Box 3, Daventry
Northants, NN11 4NF
England



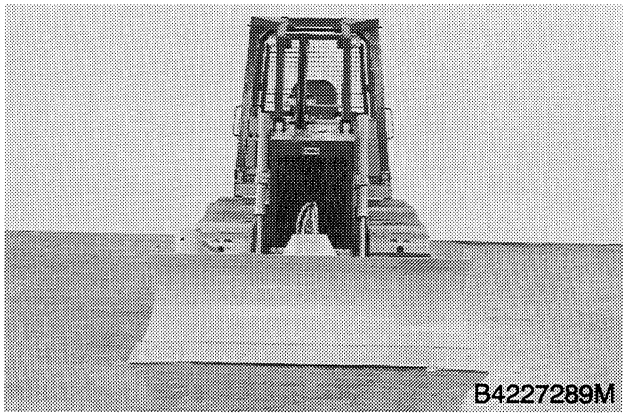
CAS-2018 Alignment Tool. This tool is first used in step 124.



CAS-1690 Tool Used to Rotate the Flywheel. This tool is first used in step 131.

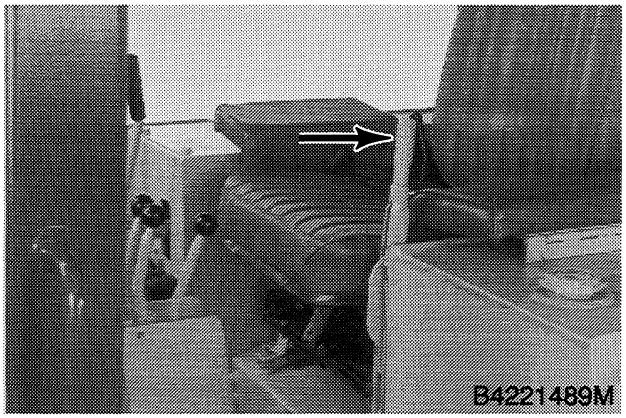
RADIATOR REMOVAL

STEP 1



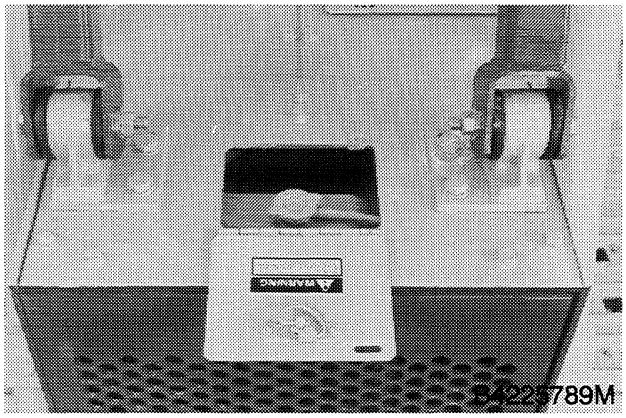
Park the machine on a level surface. Lower ALL hydraulically controlled attachments to the floor.

STEP 2



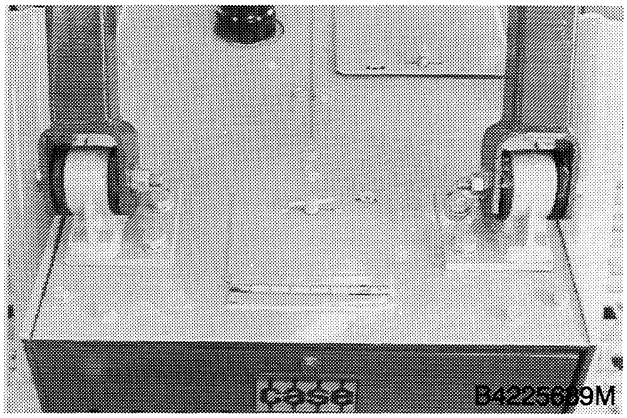
Apply the parking brake and stop the engine.

STEP 3



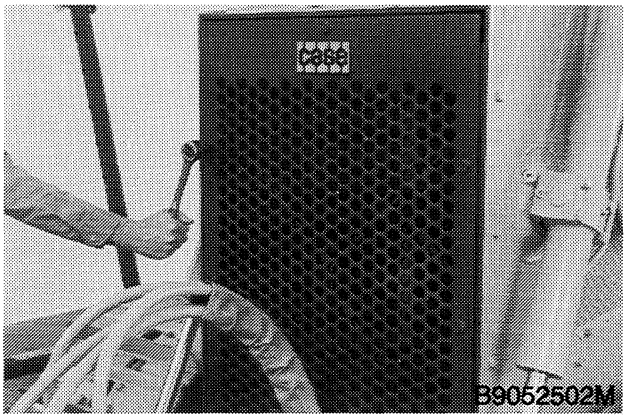
Open the access door and remove the radiator cap.

STEP 4



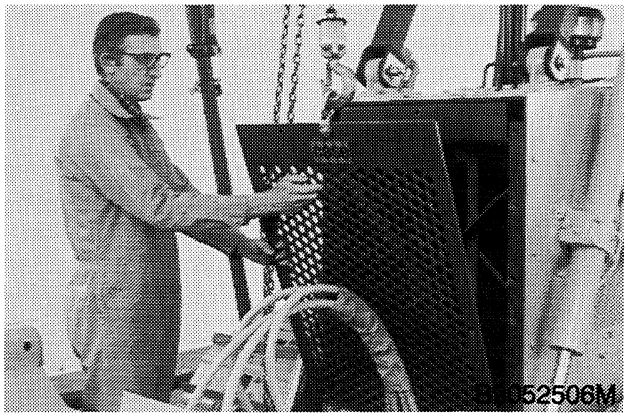
Close the access door.

STEP 5



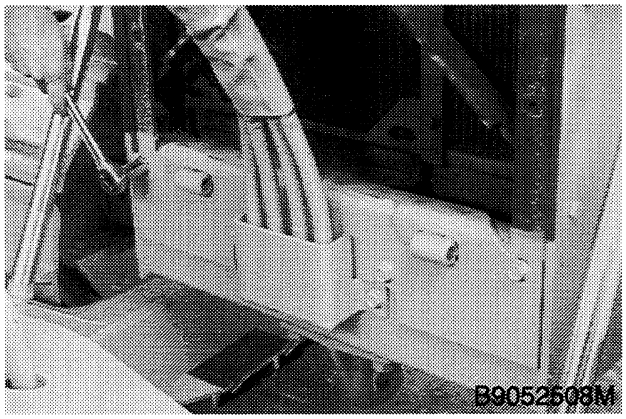
Loosen and remove the cap screws that hold the grille.

STEP 6



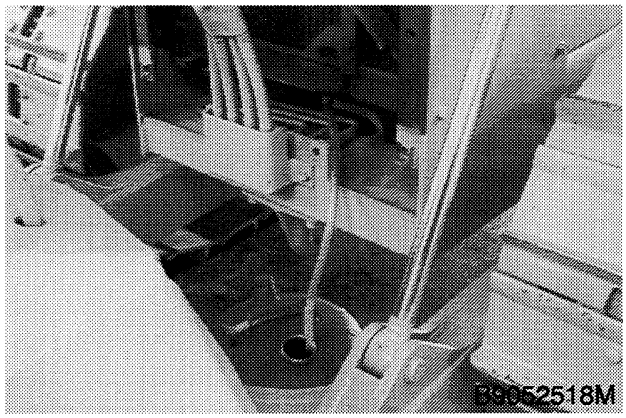
Tilt the grille forward and connect suitable lifting equipment to the grille. Remove the grille from the mounting bracket.

STEP 7



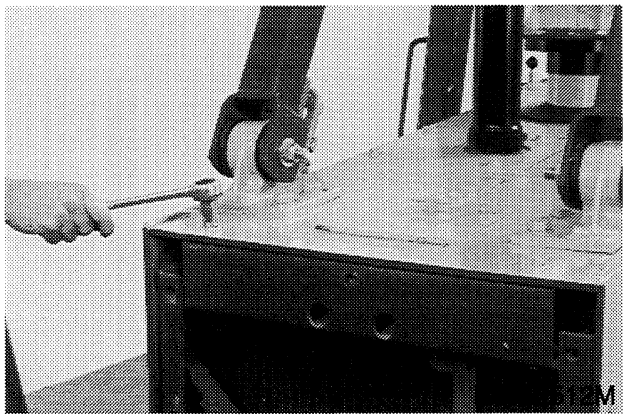
Loosen and remove the cap screws that hold the mounting bracket.

STEP 8



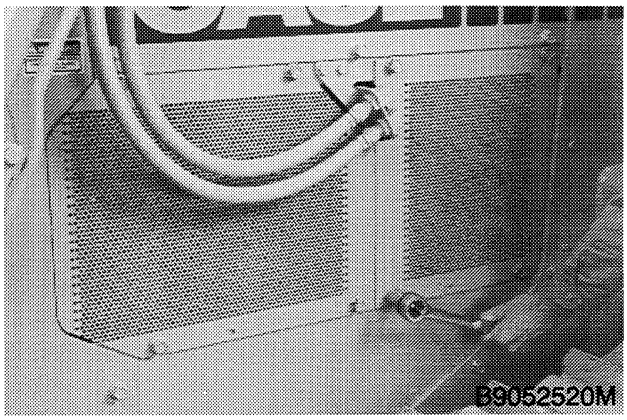
Install a hose on the drain valve. Open the drain valve and drain the cooling system. The cooling system holds 20 U.S. quarts (18.9 litres) of coolant.

STEP 9



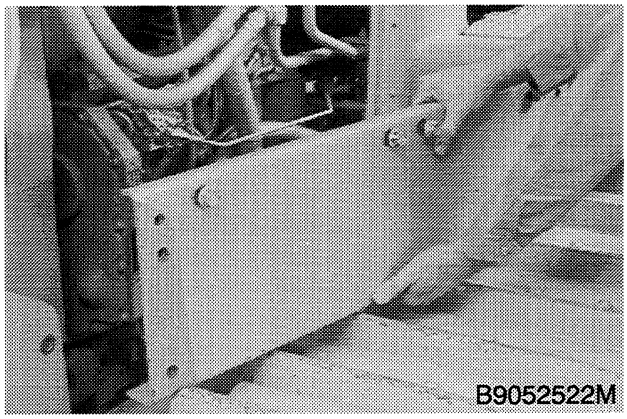
Loosen and remove the cap screws that fasten the baffle to the top of the radiator shroud. Remove the baffle.

STEP 10



Loosen the bottom cap screws for the top side panel. Loosen and remove the top cap screws and remove the top side panel.

STEP 11

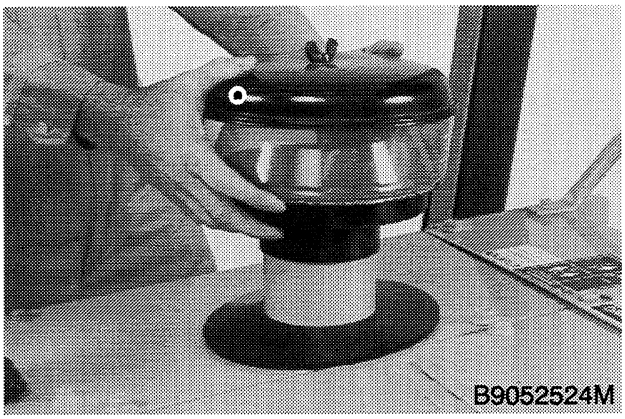


Loosen and remove the cap screws that hold the bottom side panel. Remove the bottom side panel.

STEP 12

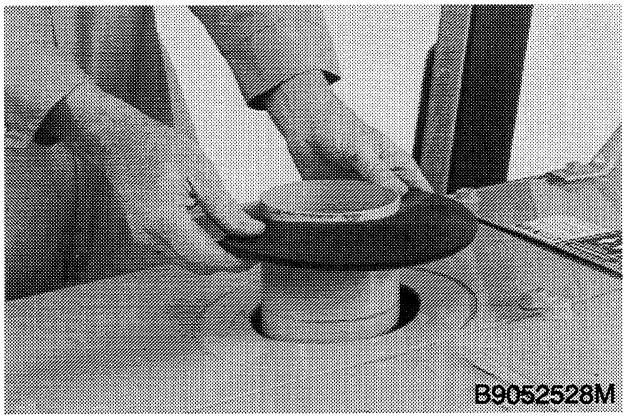
Repeat steps 10 and 11 for the top side panel and the bottom side panel on the right side of the machine.

STEP 13



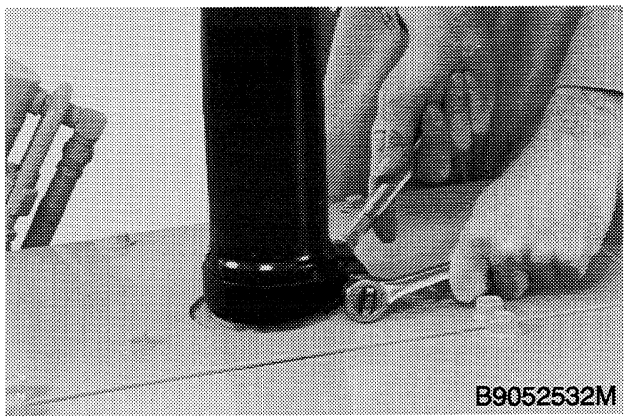
Remove the precleaner.

STEP 14



Remove the grommet.

STEP 15



Loosen the clamp that fastens the extension pipe to the muffler. Remove the extension pipe.

STEP 16

Loosen and remove the cap screws that hold the left side of the hood.

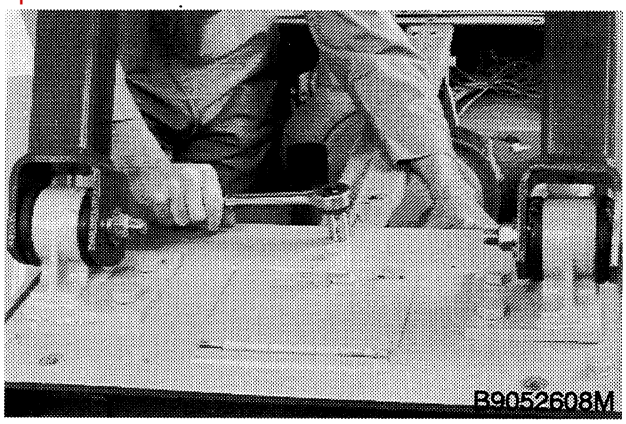
STEP 17

Remove the left side of the hood.

STEP 18

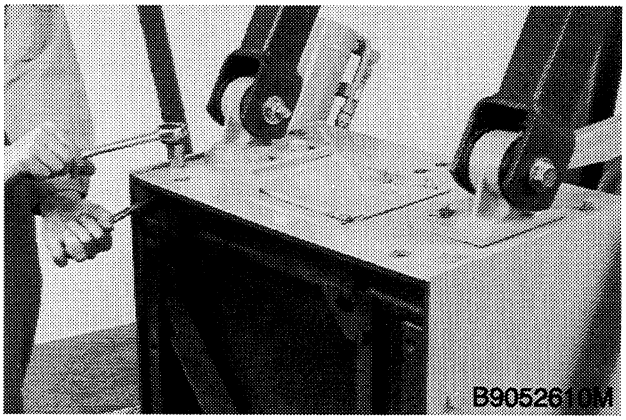
Repeat steps 16 and 17 for the right side of the hood.

STEP 19



Loosen and remove the self-locking nuts, hardened washers, and bolts that fasten the center hood brace to the top plate.

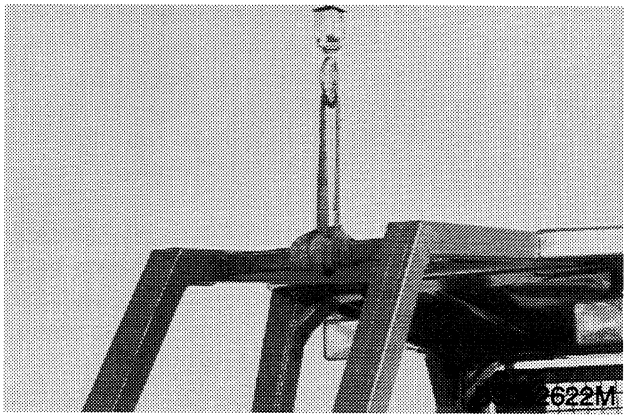
STEP 20



Loosen and remove the nuts and bolts that fasten the top plate to both sides of the radiator shroud. If the machine is not equipped with a brush guard, remove the top plate.

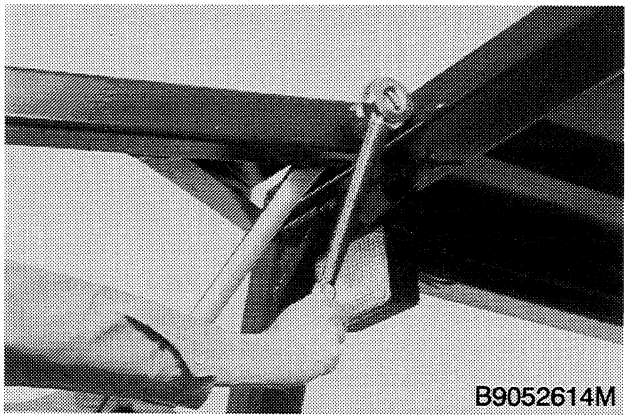
NOTE: *If the machine is equipped with a brush guard, do steps 21, 22, and 23. If the machine is not equipped with a brush guard, go to step 24.*

STEP 21



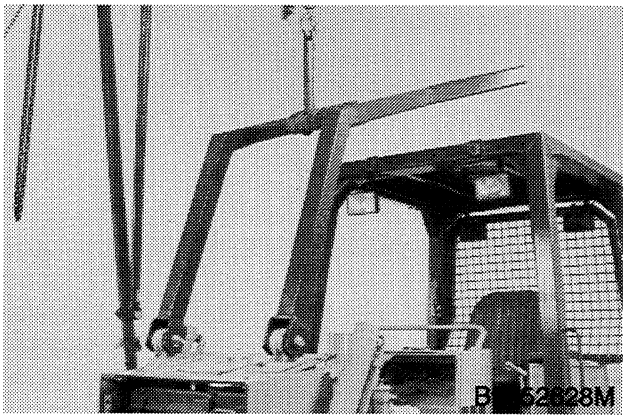
Connect suitable lifting equipment to the brush guard.

STEP 22



Loosen and remove the self-locking nuts and bolts that fasten the rear of the brush guard to the ROPS cab or ROPS canopy.

STEP 23



Remove the brush guard and top plate from the machine.