BELARUS

WORK SHOP MANUAL

500-800-900 SERIES

MTZ 50-80-90 MODELS & MTZ 500-800-900 MODELS

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BELARUS 500-800-900 SERIES

Workshop Repair Manual

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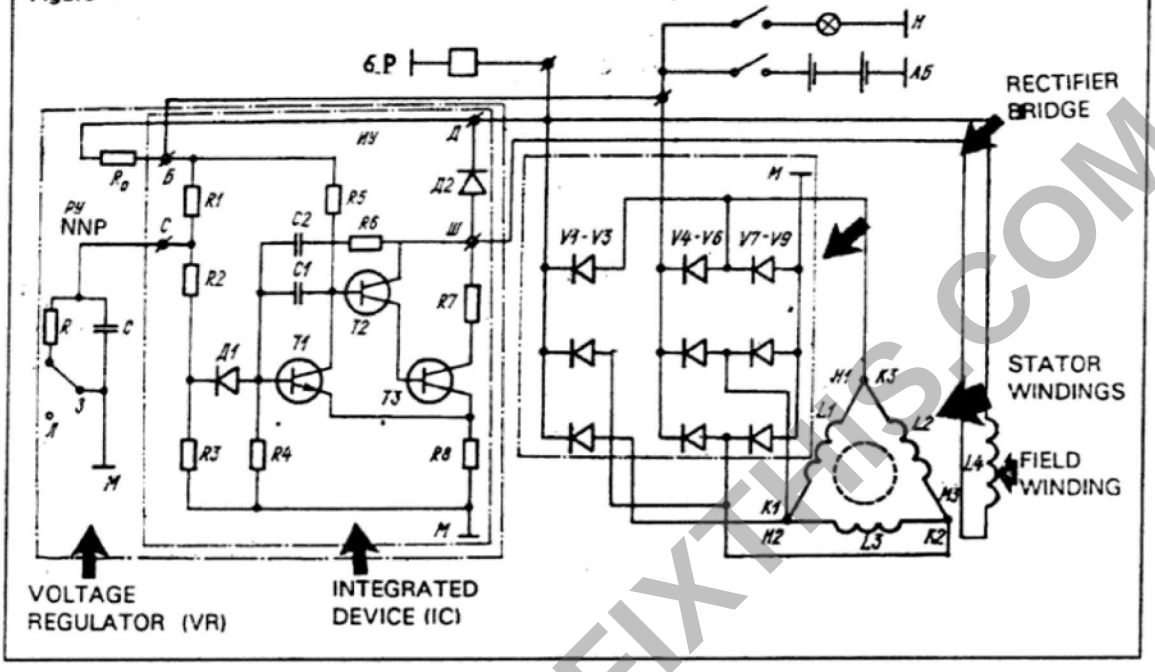
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Figure 4



464.3701 GENERATOR ELECTRICAL CIRCUIT

L1, L2, L3	Stator phase winding
L4	Field winding
V1-V3	Additional rectifier diodes
V4-V6	Straight polarity diodes
V7-V9	Opposite polarity diodes of power rectifier K,
H	Phase winding ends
IC	Integrated device
	Integrated device terminals
VR	Voltage regulator
R, Ro	Resistors of regulator
C	Regulator capacitor
R1-R8	IC resistors
D1-D2	IC diodes
C1-C2	IC capacitors
T1-T3	IC transistors
M	Ground
NNP	Seasonal voltage regulator switch
	Summer
3	Winter
F6	Blocking relay
A 6	Storage battery
H	Load

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THE HYDRAULIC SYSTEM

The Belarus tractor is equipped with a hydraulic system that provides the operator with accurate sensitive control of implements over a wide range of operating conditions, as follows:

A. DRAFT CONTROL allows the depth of work to be automatically controlled from the top link after the depth has been set. Draft control is most suitable for mounted implements with or without depth control wheels.

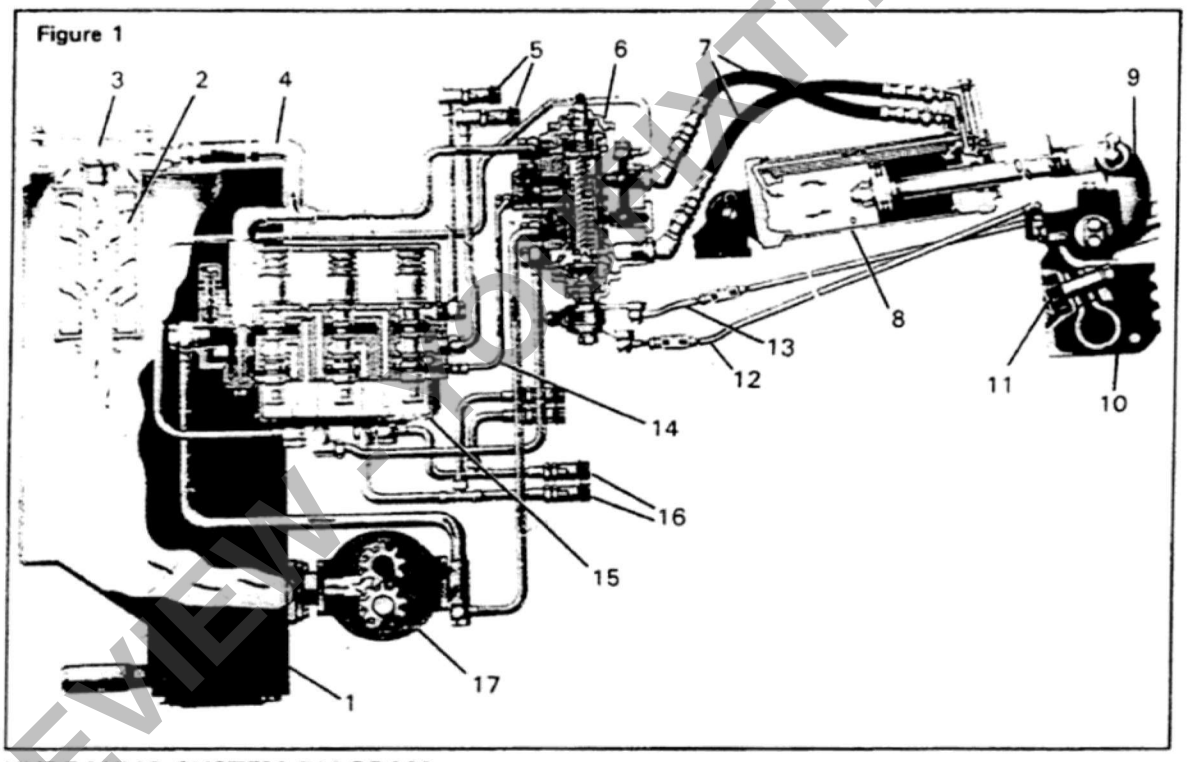
B. POSITION CONTROL allows the implement to be held at a fixed height in relation to the tractor. The height and depth are controlled by the arms. Position control is recommended mainly for regulation of implement position above soil.

C. MIXED CONTROL allows simultaneous use of the position and draft control systems.

D. FLOAT POSITION allows the linkage to move freely. The implement rests on soil and follows the ground contours.

The Hydraulic system includes oil tank, filter, hydraulic gear pump, distributor, draft unit, ram, control levers and draft control top link sensor.

Figure 1



HYDRAULIC SYSTEM DIAGRAM

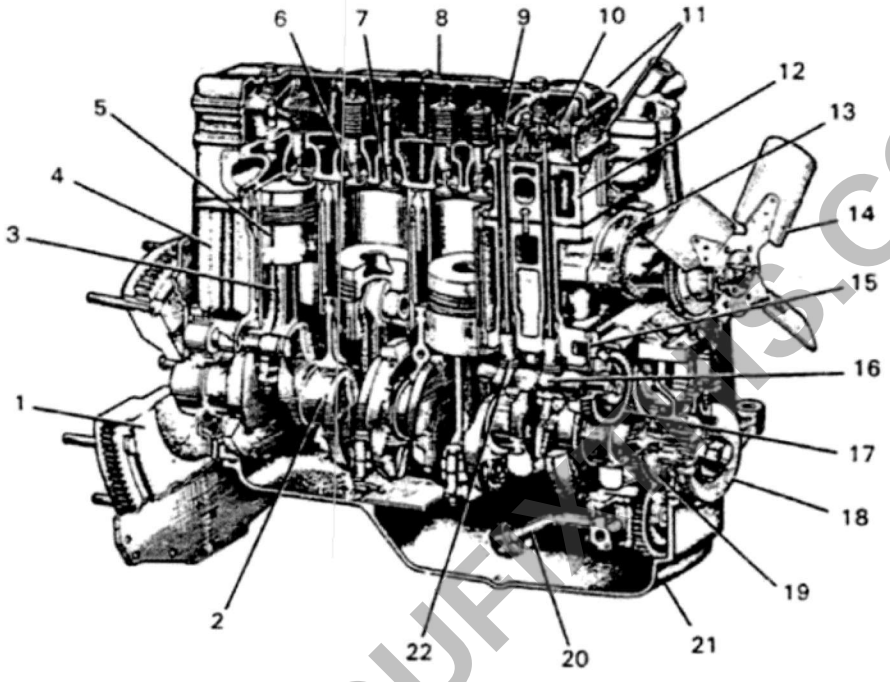
1. Oil tank
2. Filter
3. Safety valve
4. Drain line
5. Distributor remote outlets
6. Draft control unit
7. Hoses
8. Ram (cylinder)
9. Rock shaft arm
10. Top link bracket
11. Draft unit sensor springs
12. Draft control system rod
13. Position control system rod } Early system
14. Bypass valve control line (pilot line)
15. Distributor
16. Remote cylinder outlets
17. Pump

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Design of D-240 Diesel Engine and its Modifications

Figure 4



1. Flywheel
2. Crankshaft
3. Connecting rod
4. Crankcase (Engine Block)
5. Piston
6. Inlet valve
7. Exhaust valve
8. Breather
9. Push rod
10. Rocker arm
11. 2 piece valve cover
12. Cylinder head
13. Water pump
14. Fan
15. Timing gear plate
16. Camshaft
17. Camshaft gear
18. Crankshaft pulley
19. Oil pump driving gear
20. Oil pump
21. Oil sump
22. Camfollower

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The main and rod journals of the crankshaft are normally manufactured with nominal diameters, which are designated as 'IH' on the 8th flange of crankshaft counterbalance weight.

To prolong the crankshaft service life in case the journals exceed the specified wear limit, it is recommended to regrind the journals to the next undersize bearing. To obtain the desired clearance, undersize bearings are installed in correspondence with the undersize journals (see tables).

Nominal Size	Crankshaft Journal Diameter				Width of 5th Main Journal	
	Main		Rod			
IH	2.9625	-.0032 -.0039	2.6870	-.0030 -.0037	1.7716	+.0039

Under-size Group	Crankshaft Journal Diameter				Width of 5th Main Journal	
	Main		Rod			
P1	2.9330	-.0031 -.0037	2.6574	-.0019 -.0037	1.7795	+.0039
P2	2.9133	-.0031 -.0037	2.6377	-.0029 -.0037	1.7873	+.0039
P3	2.8936	-.0031 -.0037	2.6181	-.0025 -.0037	1.7952	+.0039
P4	2.8740	-.0031 -.0037	2.5984	-.0029 -.0037	1.8031	+.0039

Nominal Size	Crankshaft Journal Diameter				Width of 5th Main Journal	
	Main		Rod			
IH	75.25	-.082 -.101	68.25	-.077 -.096	45	+.1

Under-size Group	Crankshaft Journal Diameter				Width of 5th Main Journal	
	Main		Rod			
P1	74.5	-.080 -.095	67.5	-.050 -.095	45.2	+.1
P2	74.0	-.080 -.095	67.0	-.075 -.095	45.4	+.1
P3	73.5	-.080 -.095	66.5	-.065 -.095	45.6	+.1
P4	73.0	-.080 -.095	66.0	-.075 -.095	45.8	+.1

Thrust Bearing Washer Thickness	.1575" -.0027" -.0043"	4mm -.070mm -.110mm

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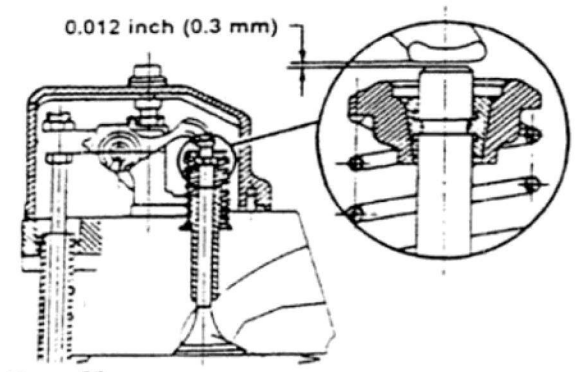


Figure 55:

Engine Valve Adjustment

After the first 60 hours of operation and every 500 service hours (or 6 months) thereafter, adjust the engine inlet and exhaust valve rocker arm clearance. Check the valve adjustment when the engine is still hot from operation. Valve clearance should not exceed 0.012 inch (0.30 mm) for the intake or exhaust valves.

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DIESEL ENGINE

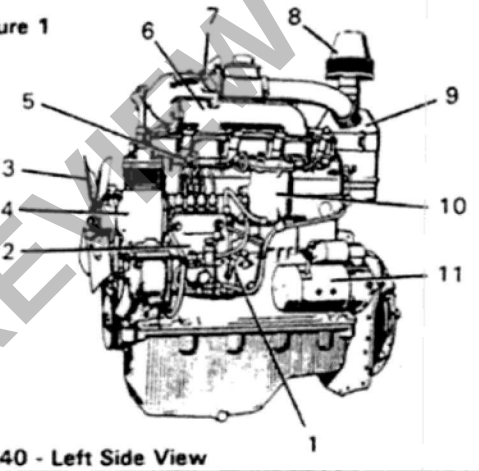
Diesel engine models D-50, D-60, D-240, D-242, D-243, and D-244 are all four-cycle, four-cylinder, vertical, in-line, water-cooled design.

The main differences between them are found in the injection system, power and speed specifications, fuel injection pump models, and the intake and exhaust manifold components.

1. Fuel injection pump control lever
2. Fuel injection pump
3. Fan
4. Air compressor
5. Injector
6. Intake manifold
7. Engine emergency stop throttle lever
8. Air precleaner
9. Air cleaner
10. Fine fuel filter
11. Starter
12. Oil filler neck
13. Timing advance setting feeler
14. Flywheel
15. Coarse fuel filter
16. Exhaust manifold
17. Centrifugal oil filter
18. Breather
19. Preheater plug with fuel tank
20. Thermostat housing
21. Alternator
22. Power steering oil pump

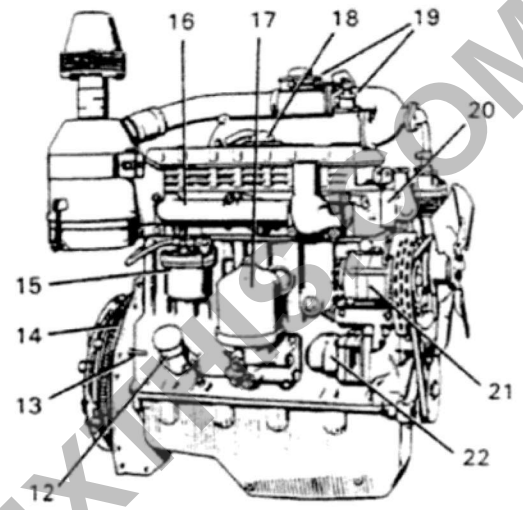
D-242 and D-244 diesel engines differ from the D-240 diesel engine in the power and speed characteristics, design of intake manifold, crankshaft (without counterweights) and the fuel injection pump setting.

Figure 1



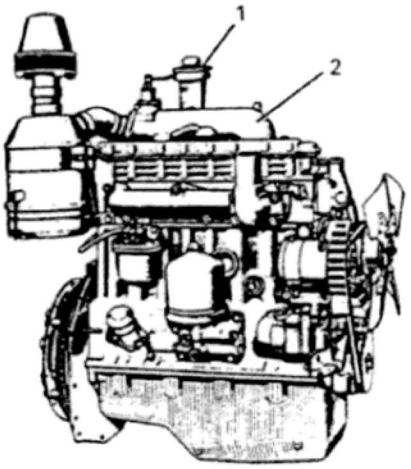
D-240 - Left Side View

Figure 2



D240 - Right Side View

Figure 3



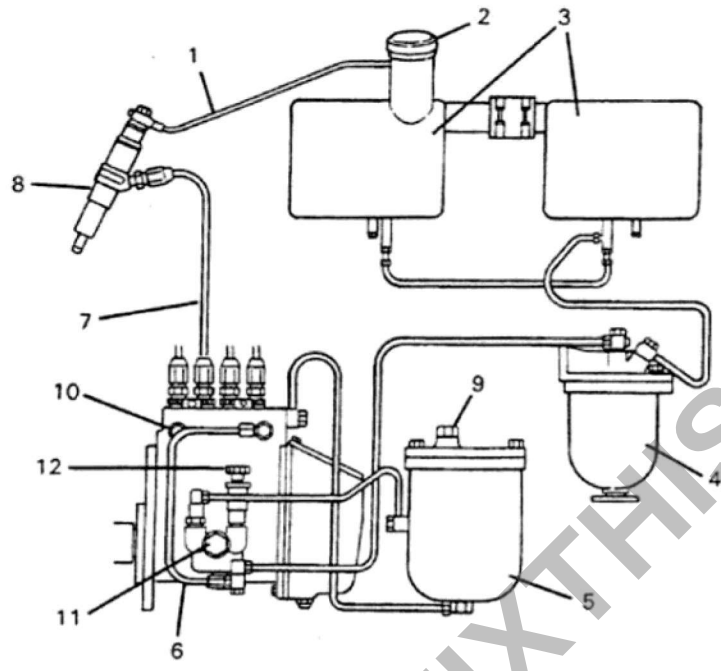
D-242/244 - Right Side View

1. Preheater plug fuel tank
2. Intake manifold

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Figure 23



FUEL SYSTEM

When the engine is operating, fuel is fed from the fuel tank (3) through the coarse fuel filter (4) and the fine fuel filter (5), to the injection pump (6) by the fuel priming (feed) pump (11). From the injection pump (6), a measured quantity is transerred under high pressure to the injectors (8), where it is atomized upon injection into the cylinder. The coarse fuel filter (4) removes water and coarse contaminants. The fine fuel filter (5) passes the fuel through a paper filter element, where it is completely cleansed of impurities.

Usually excess fuel is delivered to the injection pump, and this excess is fed to the entry of the priming pump. The fuel leaked from the injector plungers returns to the fuel tank via the fuel return line.

If air enters the fuel system, it is necessary to bleed the system before starting the engine. First remove the air from the fine fuel filter and the injector pump by loosening their respective plugs (9) and (10). Then bleed the fuel system with the hand priming pump.

1. Drain pipe
2. Filler neck of fuel tanks
3. Fuel tanks
4. Coarse fuel filter (Stage one)
5. Fine fuel filter (Stage two)
6. Injection pump
7. Injection pipe
8. Injector (Injection nozzle)
9. Bleeding plug of fine fuel filter
10. Bleeding plug of injection pump
11. Fuel priming pump

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TECHNICAL DATA OF DIESEL ENGINES APPLIES IN BELARUS TRACTORS

Engine Model	D-50	D-244	D-60	D-242	D-240	D-243
Net Rated Horse Power (KW)	57 (42.5)	57 (42.5)	62 (46.2)	62 (46.2)	80 (59.7)	81 (60.4)
Operating Horse Power (KW)	55 (41)	55 (41)	60 (44.8)	60 (44.8)	78 (58.2)	78 (58.2)
RPM's at rated HP	1700	1700	1800	1800	2200	2200
Number of cylinders	4	4	4	4	4	4
Firing order	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2	1-3-4-2
Bore - (mm)	4.3307 (110)	4.3307 (110)	4.3307 (110)	4.3307 (110)	4.3307 (110)	4.3307 (110)
Piston stroke - (mm)	4.9213 (125)	4.9213 (125)	4.9213 (125)	4.9213 (125)	4.9213 (125)	4.9213 (125)
Total displacement, Litres	4.75	4.75	4.75	4.75	4.75	4.75
Compression ratio	16:1	16:1	16:1	16:1	16:1	16:1
Rotation crankshaft viewed from front	clockwise	clockwise	clockwise	clockwise	clockwise	clockwise
Maximum torque - ft.lbs.	143.5 n/m	144.0 n/m	238 n/m	238 n/m	280 n/m	280 n/m
Oil pressure in main gallery @ 99 to 102 F (70 to 95 C)						
At rated speed of engine	1.9-3 kgf/cm² 28 to 43 psi	1.9-3 kgf/cm² 28 to 43 psi	1.9-3 kgf/cm² 28 to 43 psi	1.9-3 kgf/cm² 28 to 43 psi	1.9-3 kgf/cm² 28 to 43 psi	1.9-3 kgf/cm² 28 to 43 psi
At minimum idling speed	11 psi	11 psi	11 psi	11 psi	11 psi	11 psi
Weight (with fan, alternator, air cleaner, without clutch)	419 kg	419 kg	419 kg	430 kg	430 kg	430 kg

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SLEEVE

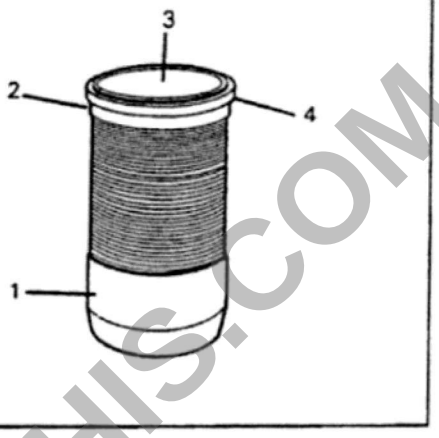
The cylinder sleeve is made of a cast iron alloy with highly wear resistant features. All cylinder sleeves are the replaceable wet type and are sealed to the crankcase sleeve borings with two 'O'-rings at the lower end.

The cylinder sleeve protrusion should be 0.05 to 0.11 mm (.002" - .004"). This prevents gases from escaping the cylinders into the coolant jacket of the engine.

The inside surface of the sleeve is specially honed to obtain the required superfinish machining, with 'cross-hatch' surface pattern. Sleeves are divided into three groups, by inner diameter, 'B' for big, 'C' for middle, and 'M' for small. Designation of the dimensional group is marked on the top edge of the sleeve. See table below for sleeve dimensions.

1. Fitting surface of sleeve
2. Fitting surface of sleeve
3. 'Cross-hatch' surface pattern of sleeve
4. Sleeve shoulder

Figure 6



Sleeve Group	Dimensions (Inches)		Dimensions (mm)	
M	4.3307	+0.000	110	+0.02
C	4.3307	+0.001 +0.000	110	+0.04 +0.02
B	4.3307	+0.002 +0.001	110	+0.06 +0.04

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B

Engine Lubrication System

Checking Engine Oil Level

Check the engine oil level daily. Park the tractor on a level surface and stop the engine. After the engine has been stopped for 5 minutes, remove the crankcase oil level dipstick. Oil level should be at or near the upper (full) mark on the dipstick. If the oil level is below the "add" (lower) mark, add oil of the recommended type. **DO NOT OVERFILL.**



Figure 5: Oil Level Dipstick

To add oil or fill the crankcase, wipe the area around the filler cap. Remove the filler cap.

NOTE: *Periodically inspect the filler cap o-ring seal for damage of wear.*



Figure 6: Oil Filler

Changing Engine Oil

Change the engine crankcase oil every 125 service hours (or 3 months). For the best results, remove the drain plug and drain the crankcase while the engine is still warm from operating. Be sure the tractor is parked on a level surface when draining or checking oil level.

After draining, install and tighten the drain plug. Put the recommended type and correct amount of new oil in the crankcase as indicated in the oil viscosity chart.

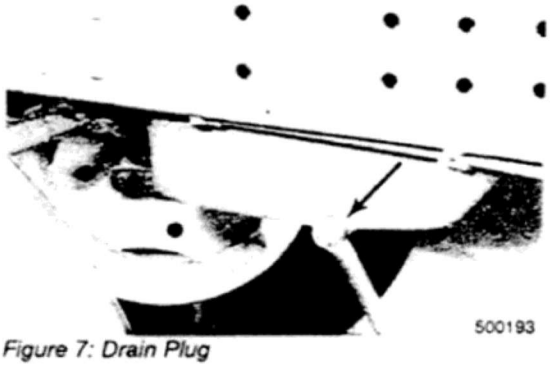


Figure 7: Drain Plug

Engine Centrifugal Oil Filter

Cleaning the centrifugal oil filter is required each time the engine crankcase oil is changed.

Procedure:

1. Remove the filter housing retaining nut.

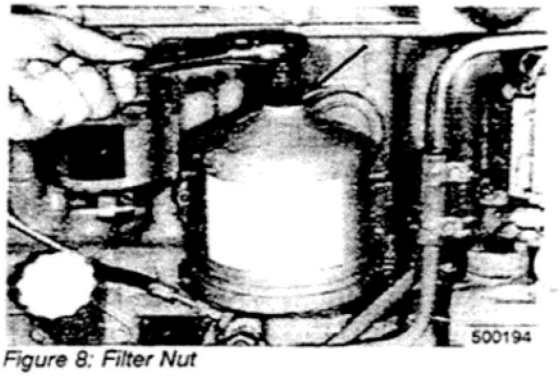


Figure 8: Filter Nut

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