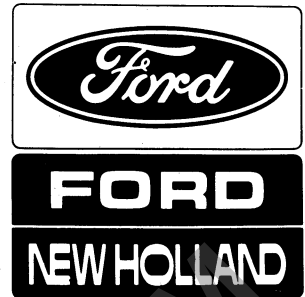
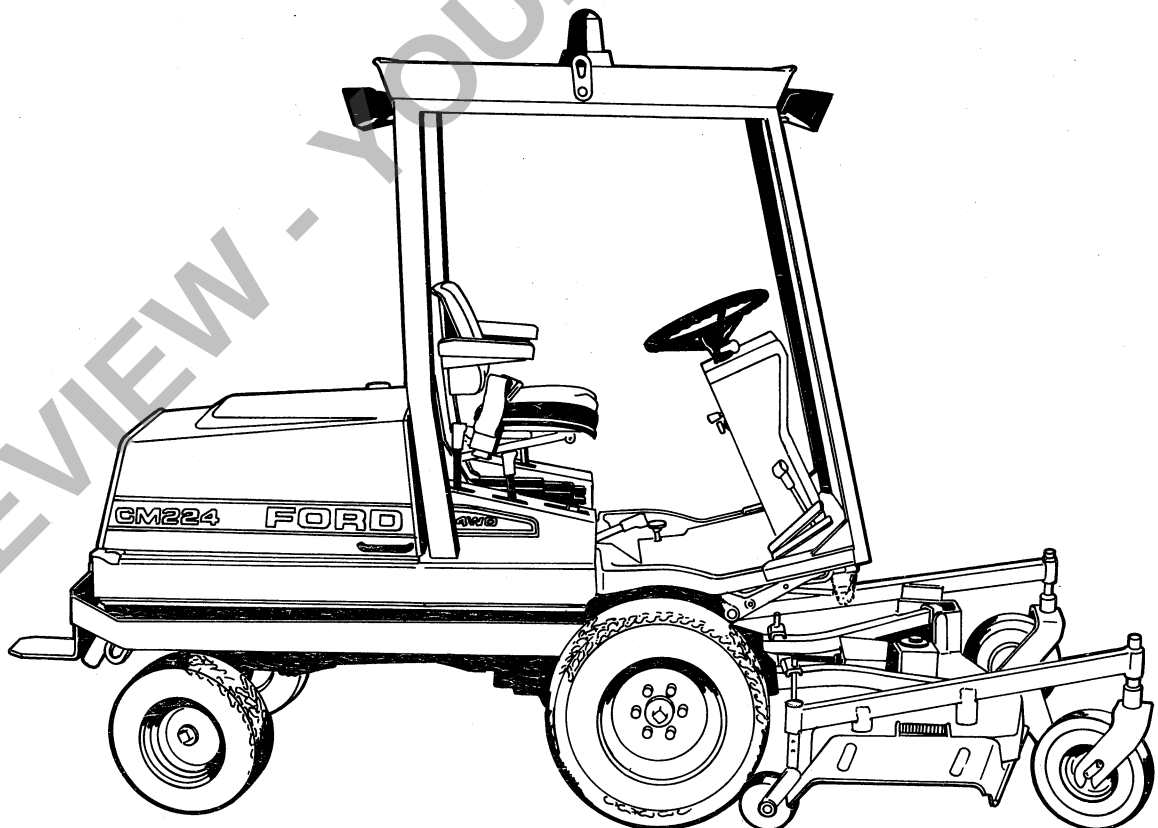


FORD

Service Manual



CM224 and CM274 Commercial Mowers



Reprinted

PART 1

ENGINE SYSTEMS

MODELS CM224 & 274

Chapter 1

ENGINE AND LUBRICATION SYSTEM

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Chapter 2

COOLING SYSTEM

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Chapter 3

TROUBLE SHOOTING, SPECIFICATIONS

AND SPECIAL TOOLS

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SAFETY PRECAUTIONS



Practically all service work involves the need to drive the commercial mower. The Operator's Manual, supplied with each commercial mower, contains detailed safety precautions relating to driving, operating and servicing that commercial mower. These precautions are as applicable to the service technician as they are to the operator, and should be read, understood and practiced by all personnel.

Prior to undertaking any maintenance, repair, overhaul, dismantling or re-assembly operations, whether within a workshop facility or out "in the field," consideration should be given to factors that may have an effect upon safety, not only upon the mechanic carrying out the work, but also upon bystanders.

PERSONAL CONSIDERATIONS

- The wrong clothes or carelessness in dress can cause accidents. Check to see that you are suitably clothed.
- Some jobs require special protective equipment.
- **Skin Protection**
Used motor oil may cause skin cancer. Follow work practices that minimize the amount of skin exposed and the length of time used oil stays on skin.
- **Eye Protection**
The smallest eye injury may cause loss of vision. Injury can be avoided by wearing eye protection when engaged in chiselling, grinding, discing, welding, painting, etc.
- **Breathing Protection**
Fumes, dust and paint spray are unpleasant and harmful. These can be avoided by wearing respiratory protection.
- **Hearing Protection**
Loud noise may damage your hearing and the greater the exposure the worse the damage. If the noise is excessive, wear ear protection.
- Avoid injury by correctly handling components. Make sure you are capable of lifting the object. If in doubt get help.
- **Hand Protection**
It is advisable to use a protective cream before work to prevent irritation and skin contamination. After work clean your hands with soap and water. Solvents such as white spirit, paraffin, etc., may harm the skin.
- **Foot Protection**
Substantial or protective footwear with reinforced toe-caps will protect your feet from falling objects. Additionally, oil-resistant soles will help to avoid slipping.
- **Special Clothing**
For certain work it may be necessary to wear flame or acid-resistant clothing.
- Avoid injury through incorrect handling of components. Make sure you are capable of lifting the object. If in doubt get help.

EQUIPMENT CONSIDERATIONS

- **Machine Guards**
Before using any machine, check to ensure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing coming in contact with the moving parts of the machine, but also ward off objects that might fly off the machine and cause injury.
- **Lifting Appliances**
Always ensure that lifting equipment, such as chains, slings, lifting brackets, hooks and eyes are thoroughly checked before use. If in doubt, select stronger equipment than is necessary.

Never stand under a suspended load or a raised implement.

7. Loosen the clamp (1) at the muffler and allow it to slide downward, Figure 6.
8. Remove the exhaust manifold and muffler assembly (2) from the cylinder head, Figure 6.

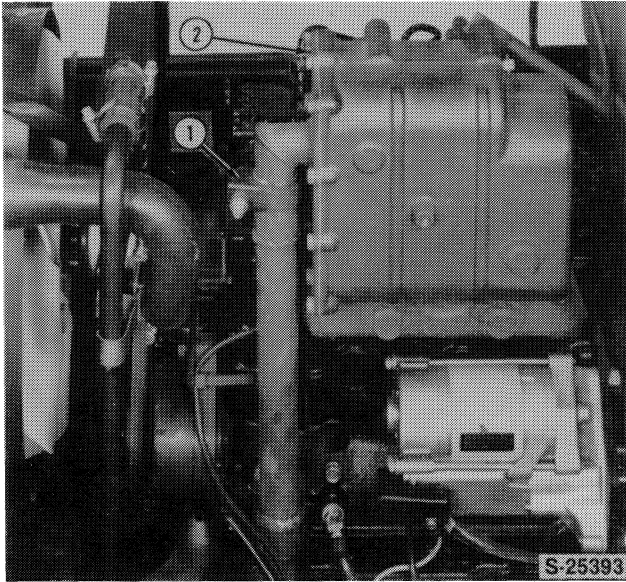


Figure 6
Muffler Removal

1. Clamp
2. Exhaust Manifold and Muffler
9. Disconnect the temperature and oil sender wires, Figure 5.
10. Remove the upper radiator hose (4), Figure 4.
11. Remove the banjo bolt from the oil pressure tube (1) at the front of the cylinder head, Figure 7.
12. Remove the glow plugs.
13. Remove the water pump (1) and thermostat (Model CM224), Figure 8. On the Model CM274 remove the thermostat housing, thermostat and water pump.
14. Remove the rocker cover and intake manifold assembly (1) from the cylinder head on the Model CM224, Figure 9. On the Model CM274 the rocker cover (1) and intake manifold (3) with spacer (2) must be removed, Figure 10.
15. Remove the rocker arm assembly and push rods, Figure 11.

NOTE: The rocker arms on the Model CM274 are contained in a housing, Figure 12.

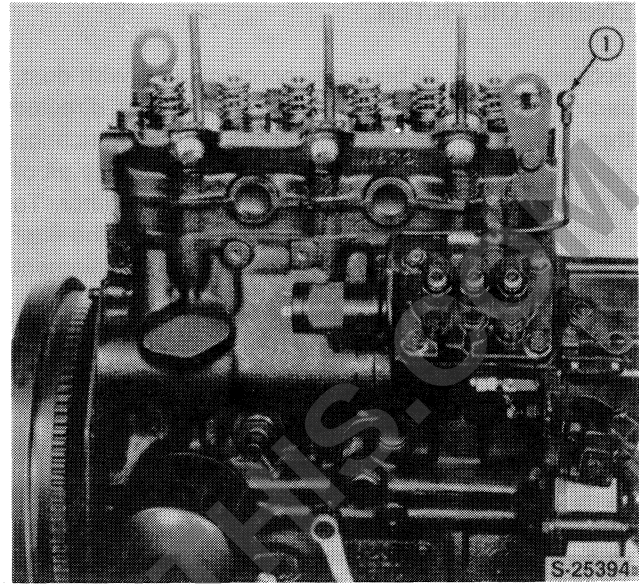


Figure 7
Cylinder Head Removal
1. Oil Pressure Tube

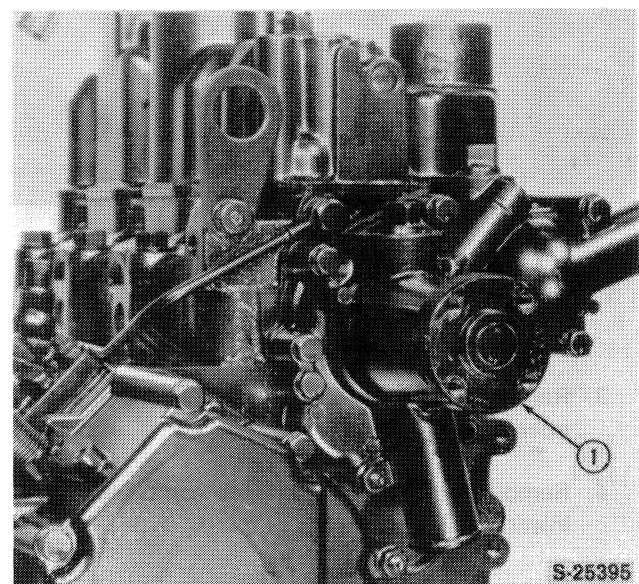


Figure 8
Water Pump Removal (CM224 Shown)
1. Water Pump

ENGINE OIL FILTER

Because engine oil becomes contaminated with dust, carbon particles, metal dust and sludge, it is directed through a filter before entering the engine lubrication passages. The filter is a full-flow type whereby all of the oil from the pump is routed through the filter. To protect the engine from a loss of lubrication, the filter contains, a by-pass valve which opens if the element becomes plugged, Figure 2.

B. OVERHAUL

CYLINDER HEAD REMOVAL

The cylinder head can be removed and replaced for service without removing the engine.

1. Drain the radiator coolant into a clean container.
2. Remove the air cleaner (2) and hose (1), Figure 3.

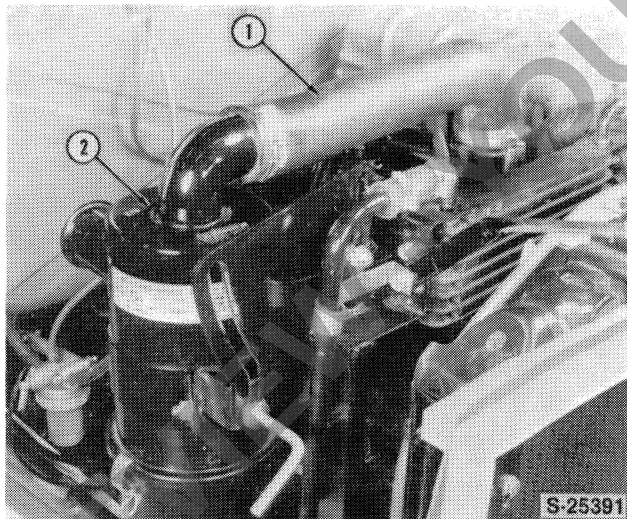


Figure 3
Air Cleaner Removal

1. Hose
2. Air Cleaner

3. Remove the transmission oil cooler (3) and cap all openings, Figure 4.
4. Remove the injector lines (1) leak-off tubes (3) and injectors (2), Figure 5.
5. Disconnect the vent tubes from the rocker cover, Figure 5.
6. Remove the exhaust manifold brace.

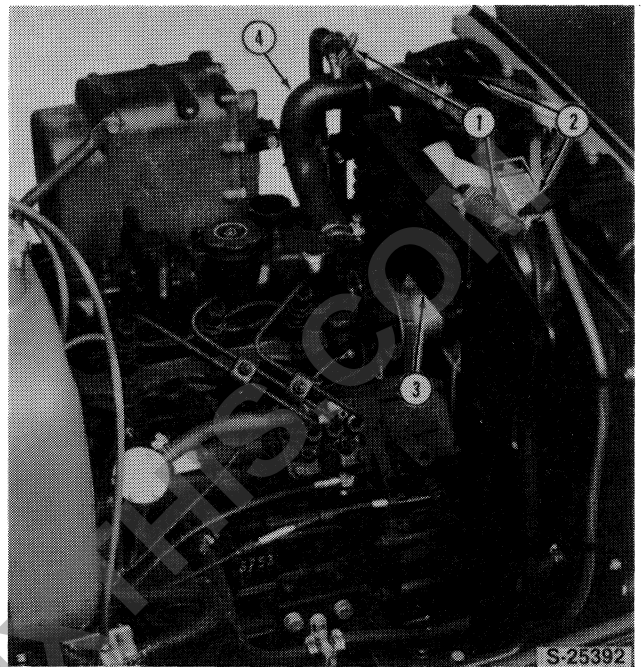


Figure 4
Oil Cooler Removal

1. Cooler Hoses
2. Braces — Radiator
3. Oil Cooler
4. Upper Radiator Hose

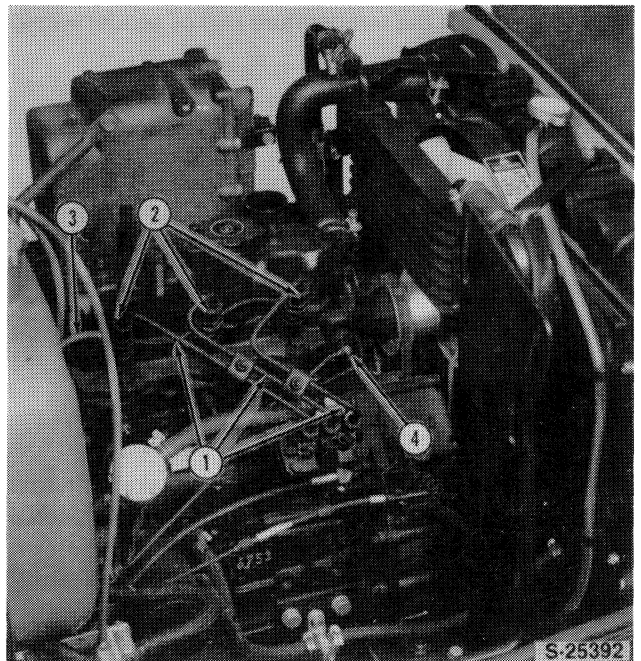


Figure 5
Injector Removal

1. Injector Lines
2. Injectors
3. Leak-Off Tube
4. Oil Pressure Switch

B. SPECIFICATIONS

GENERAL SPECIFICATIONS

Commercial Mower	CM224	CM274
Engine Model	S753	J823
Number of Cylinders	3	3
Bore x Stroke	2.95 x 2.83 in. (75 x 72 mm)	3.22 x 3.15 in. (82 x 80 mm)
Displacement	58.2 cu in. (954 cc)	77.2 cu. in. (1267 cc)
Compression Ratio	23:1	22:1
Rated Speed (rpm)	2500	
Muffler	Horizontal	
Firing Order	1-2-3	1-2-3
Idle Speed	800-900 rpm	800-900 rpm
Maximum No-Load Speed	3000 rpm	3000 rpm
Cylinder Arrangement	In-line Vertical	
Valve Arrangement	Overhead	
Compression Pressure @ 200 rpm (cylinder speed)	427 ± 50 psi	427 ± 50 psi
Variation between cylinders	(29.4 ± 1.8 bar)	(29.4 ± 1.8 bar)

CYLINDER BLOCK

	CM224	CM274
Bore		
Standard	2.9527-2.9534 in. (75.0 mm)	3.228-3.229 in. (82.0 mm)
Maximum	2.964 in. (76.02 mm)	3.237 in. (83.02 mm)
Head Surface Warp		
Standard	.002 in. (.05 mm)	.002 in. (.05 mm)
Maximum	.005 in. (.12 mm)	.005 in. (.12 mm)
Re-Bore Size*		
.020 in. oversize (.5 mm)	2.9724-2.9731 in. (75.52 mm)	3.246-3.252 in. (82.45-82.60 mm)
.040 in. oversize (1.0 mm)	2.9921-2.9928 in. (76.02 mm)	3.266-3.271 in. (82.95-83.08 mm)

*CM224 — If bore size exceeds 3 in. (76.2 mm) replace the block

*CM274 — If bore size exceeds 3.275 in. (83.2 mm) replace the block

PART 1

ENGINE SYSTEMS

MODELS CM224 & CM274

Chapter 3

TROUBLE SHOOTING, SPECIFICATIONS AND SPECIAL TOOLS

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A. TROUBLE SHOOTING

ENGINE

CONDITION	POSSIBLE CAUSES
Engine Does Not Develop Full Power	<ol style="list-style-type: none">1. Clogged air cleaner.2. Fuel line obstructed.3. Improper injection timing.4. Improper nozzle injection pressure and angle.5. Low cylinder compression.6. Insufficient fuel injection.7. Improper valve lash adjustment.8. Burned, worn or sticking valves.9. Blown head gasket.10. Worn or sticking piston ring.11. Faulty engine stop solenoid.
Engine Will Not Stop	<ol style="list-style-type: none">1. Faulty engine stop solenoid.2. Faulty starter switch.
Low Cylinder Compression	<ol style="list-style-type: none">1. Burned, worn or sticking valves.2. Bent valve stem.3. Broken or weak valve spring.4. Blown cylinder head gasket.5. Worn or sticking piston ring.6. Scored piston.
Poor Engine Idling	<ol style="list-style-type: none">1. Improper injection timing.2. Air in injection pump.3. Improper governor adjustment.

B. SPECIFICATIONS (Cont'd)**TORQUE SPECIFICATION (Cont'd)**

	CM224	CM274
Crankshaft Main Bearing Holder Bolts		
Rear Main	18-22 lbs. ft. (25-29 Nm)	18-22 lbs. ft. (25-29 Nm)
Center Mains	18-22 lbs. ft. (25-29 Nm)	36-40 lbs. ft. (49-54 Nm)
Engine Rear Mounting Plate	34-40 lbs. ft. (46-54 Nm)	9-12 lbs. ft. (12-17 Nm)
Flywheel Retaining Bolts	51-58 lbs. ft. (68-78 Nm)	51-58 lbs. ft. (68-78 Nm)
Engine Front Plate	6-9 lbs. ft. (9-12 Nm)	6-9 lbs. ft. (9-12 Nm)
Crankshaft Pulley Nut	86-94 lbs. ft. (117-127 Nm)	202-246 lbs. ft. (274-333 Nm)
Cylinder Head Bolts	36-38 lbs. ft. (49-52 Nm)	65-69 lbs. ft. (88-93 Nm)
Rocker Arm Assembly	14-18 lbs. ft. (19-25 Nm)	14-18 lbs. ft. (19-25 Nm)
Rocker Arm Locknut	8-12 lbs. ft. (11-16 Nm)	8-12 lbs. ft. (11-16 Nm)
Oil Tube Banjo Bolt	7-9 lbs. ft. (9-13 Nm)	7-9 lbs. ft. (9-13 Nm)
Oil Pressure Switch	10-14 lbs. ft. (14-20 Nm)	10-14 lbs. ft. (14-20 Nm)
Rocker Cover Bolts	7-9 lbs. ft. (9-12 Nm)	6-9 lbs. ft. (7-12 Nm)
Glow Plugs	11-14 lbs. ft. (14-20 Nm)	11-14 lbs. (14-20 Nm)
Cooling Fan Bolts	6-9 lbs. ft. (8-13 Nm)	6-9 lbs. ft. (8-13 Nm)

	General Torque Values	
Bolt, Nut	Standard Bolt	Special
M 6	4-6 lbs. ft. (5-8 Nm)	7-9 lbs. ft. (9-12 Nm)
M 8	9-13 lbs. ft. (12-18 Nm)	18-25 lbs. ft. (24-34 Nm)
M 10	14-22 lbs. ft. (19-30 Nm)	40-51 lbs. ft. (54-69 Nm)
M 12	36-43 lbs. ft. (49-58 Nm)	65-80 lbs. ft. (88-108 Nm)
M 16	72-87 lbs. ft. (98-118 Nm)	116-130 lbs. ft. (157-176 Nm)
M 18	87-101 lbs. ft. (117-137 Nm)	145-174 lbs. ft. (196-236 Nm)
M 20	108-123 lbs. ft. (146-167 Nm)	174-188 lbs. ft. (236-255 Nm)

B. SPECIFICATIONS (Cont'd)

LUBRICATION SYSTEM

	CM224	CM274
Pressure Relief Valve	42.66-49.7psi	42.66-49.7 psi
Opening Pressure	(2.9-3.4 bar)	(2.9-3.4 bar)
Fully open at 3000 rpm	71.1 psi	71.1 psi
	(4.9 bar)	4.9 bar)
Rotor-to-Vane Clearance		
Standard	.004-.006 in.	.004-.006 in.
	(0.1-0.15 mm)	(.01-.15mm)
Maximum	0.010 in.	.010 in.
	(0.25 mm)	(.25 mm)
Rotor-to-Cover Clearance		
Standard	0.004-.0.006 in.	.004-.006 in.
	(0.1-0.15 mm)	(0.1-0.15mm)
Maximum	0.008 in.	.008 in.
	(0.20 mm)	(.20 mm)
Oil Pump Volume	.8 gal (3.2L)	1.18 gal (4.5L)

COOLING SYSTEM

	CM224	CM274
Type of System	Pressurized liquid w/recirculating by-pass	
Water pump:	Centrifugal	
Drive Belt Deflection (Tension)	3/16 inch (5 mm) when 2-3 lbs (1 kg) force is applied midway between pulleys.	
Thermostat		
Starts to Open	160°F (71°C)	
Fully Open	180°F (82°C)	
Radiator Cap Pressure Rating	13 psi (.9 bar)	
Coolant	Ethylene glycol and water in a 50/50 mixture.	
Capacity	U.S. Qts.	Imp. Qts. Liters
CM224 & CM274	5.8	4.8 5.5

TORQUE SPECIFICATION

	CM224	CM274
Connecting Rod Cap Bolts	22-25 lbs. ft.	36-40 lbs. ft.
	(24-27 Nm)	(49-54 Nm)
Main Bearing Retaining Bolts		
No. 2 & 3	18-22 lbs. ft.	36-40 lbs. ft.
	(25-29 Nm)	(49-54 Nm)
No. 4	14-18 lbs. ft.	(49-54 Nm)
	(20-25 Nm)	
Relief Valve Assembly	43-51 lbs. ft.	43-51 lbs. ft.
	(59-69 Nm)	(59-69 Nm)

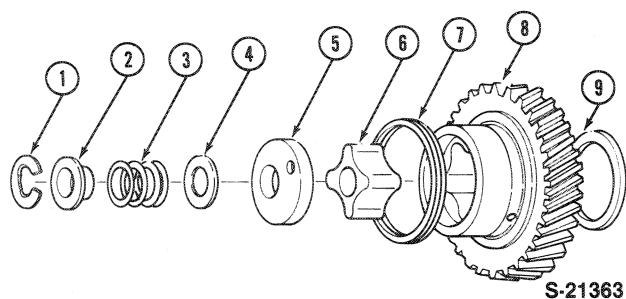


Figure 39

Idler Gear and Oil Pump Components

- | | |
|-------------|------------------|
| 1. "E" Ring | 6. Rotor |
| 2. Collar | 7. Spring |
| 3. Spring | 8. Idler Gear |
| 4. Shim | 9. Thrust Washer |
| 5. Cover | |

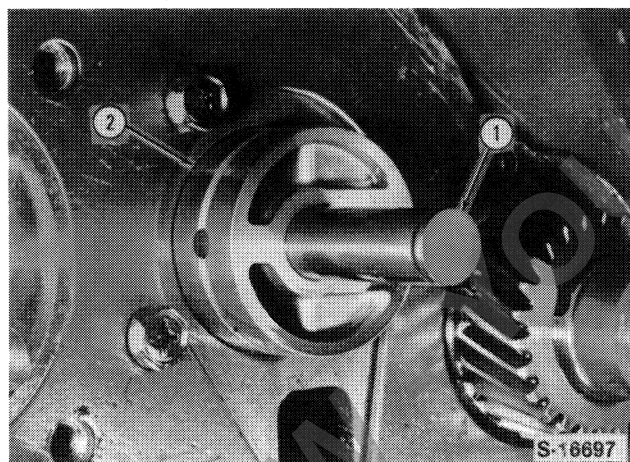


Figure 40

Port Block and Shaft Removal

- | | |
|----------|---------------|
| 1. Shaft | 2. Port Block |
|----------|---------------|



Figure 41

Oil Pump Relief Valve (CM224 Shown)

- | | |
|-----------------|---------------------------------|
| 1. Relief Valve | 2. Engine Identification Number |
|-----------------|---------------------------------|

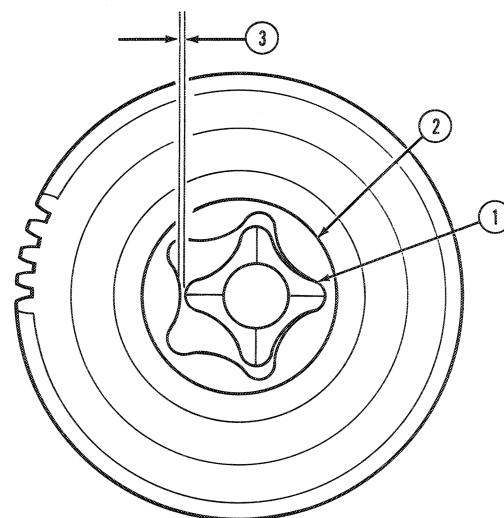


Figure 42

Rotor Clearance Check

- | | |
|----------|--------------|
| 1. Rotor | 3. Clearance |
| 2. Vane | |

- Inspect the pump shaft, inner rotor and vane for excess wear or scratches.
- Measure the rotor-to-vane clearance as shown, Figure 42, and replace defective components as required. See "Specifications," Chapter 3.

NOTE: The oil pump outer rotor (vane) is not serviced separately. If defective, replace the idler gear and vane as an assembly.

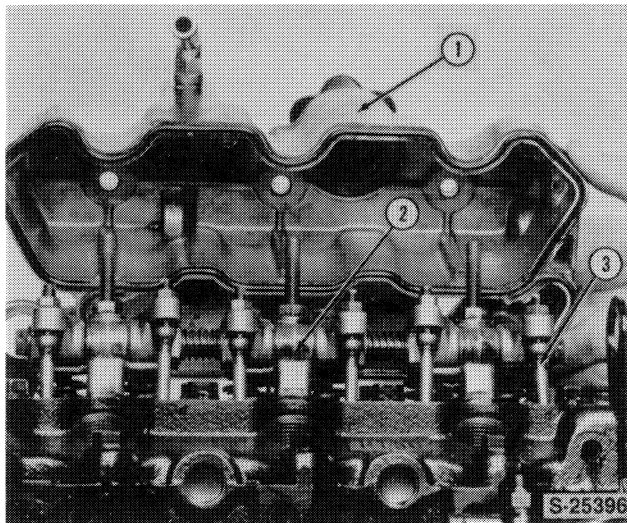


Figure 9

Rocker Arm Cover — CM224

- | | |
|----------------------------------|------------------------|
| 1. Rocker Arm Cover and Manifold | 2. Rocker Arm Assembly |
| | 3. Push Rods |

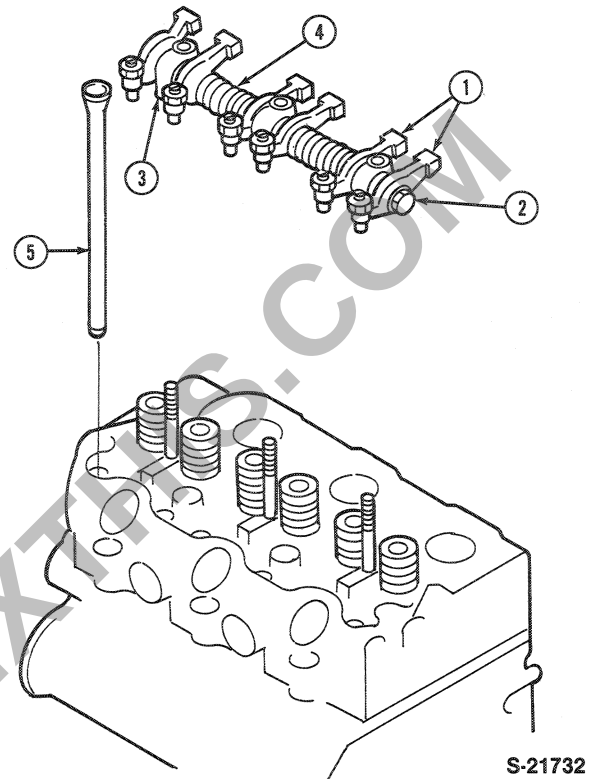


Figure 11

Rocker Shaft Removal — CM224

- | | |
|-----------------------|-------------|
| 1. Rocker Arms | 4. Springs |
| 2. Shaft | 5. Push Rod |
| 3. Rocker Arm Support | |

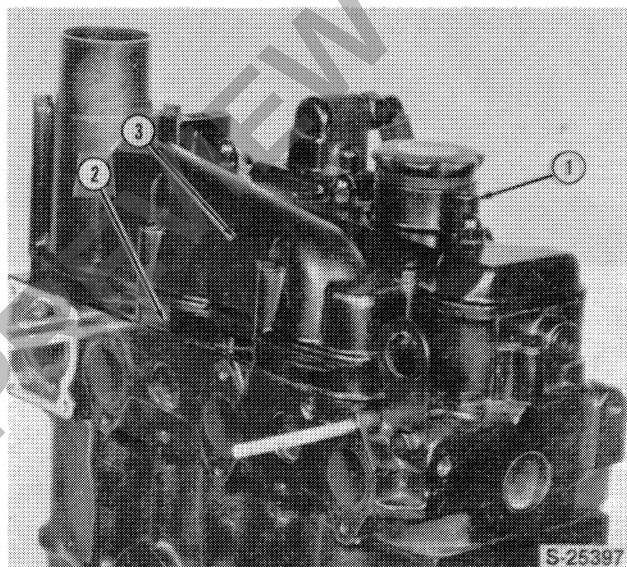


Figure 10

Rocker Arm Cover and Intake Manifold — CM274

- | | |
|---------------------|--------------------|
| 1. Rocker Arm Cover | 3. Intake Manifold |
| 2. Spacer | |

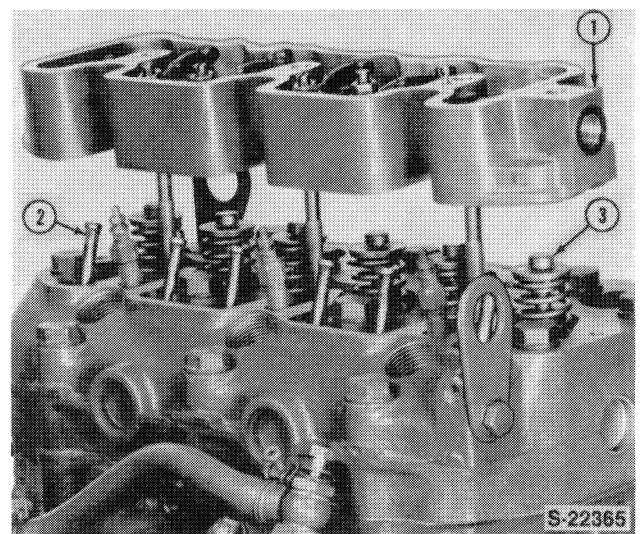


Figure 12

Rocker Arm Assembly

- | | |
|------------------------------------|-------------|
| 1. Rocker Arm and Housing Assembly | 2. Push Rod |
| | 3. Cap |

UNIT PRODUCTION CODE:

First Number YEAR	First Letter MONTH	Second Number DAY OF MONTH	Second Letter PRODUCTION SHIFT
1 — 1991	A—Jan. G—July	01/28/29/30/31	A—Midnight B—Day C—Afternoon
2 — 1992	B—Feb. H—Aug.		
3 — 1993	C—March J—Sept.		
4 — 1994	D—April K—Oct.		
5 — 1995	E—May L—Nov.		
0 — 1990	F—June M—Dec.		

*Example of Production Unit Date Code 7 L 0 3 B

Year of Final
Assembly (1987)

Month of Year
(November)

Day of Month
(Third)

Shift Period
(Day)

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