

John Deere 499 Cotton Picker



JOHN DEERE

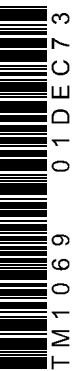
TECHNICAL MANUAL

John Deere
499 Cotton Picker

TM1069 (01DEC73) English

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499 Cotton Picker

Technical Manual
TM-1069 (Dec-73)

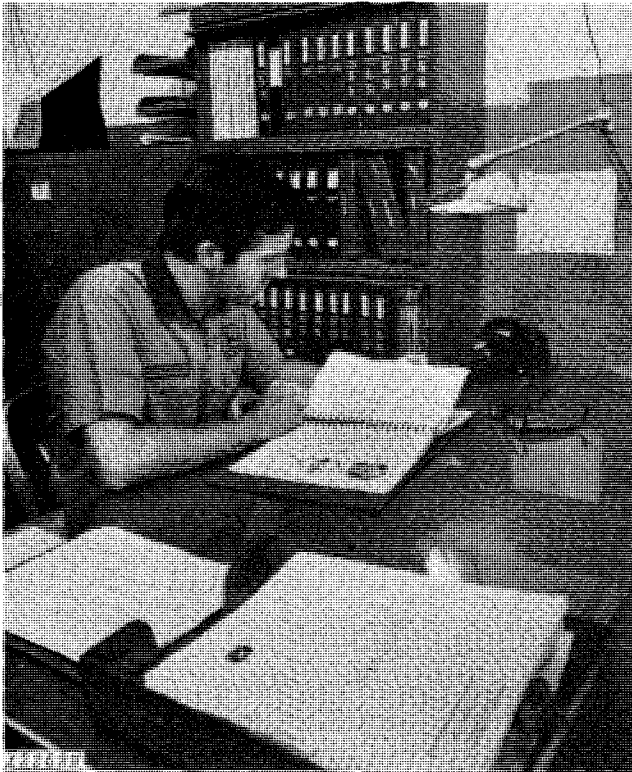
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The specifications and design information contained in this manual were correct at the time this machine was manufactured. It is John Deere's policy to continually improve and update our machines. Therefore, the specifications and design information are subject to change without notice. Wherever applicable, specifications and design information are in accordance with SAE and IEMC standards.

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INTRODUCTION



Use FOS Manuals for Reference



Use Technical Manuals for Actual Service

This technical manual is part of a twin concept of service:

- **FOS Manuals—**for reference
- **Technical Manuals—**for actual service

The two kinds of manuals work as a team to give you both the general background and technical details of shop service.

Fundamentals of Service (FOS) Manuals cover *basic* theory of operation, *fundamentals* of trouble shooting, *general* maintenance, and *basic* types of failures and their causes. FOS Manuals are for training new men and for reference by experienced men.

Technical Manuals are *concise* service guides for a *specific* machine. Technical Manuals are on-the-job guides containing only the vital information needed by a journeyman mechanic.



When a serviceman should refer to a FOS Manual for more information, a FOS symbol like the one at the left is used in the TM to identify the reference.

Some features of this technical manual:

- *Table of contents at front of manual*
- *Exploded views showing parts relationship*
- *Photos showing service techniques*
- *Specifications grouped for easy reference*

This technical manual was planned and written for you—a journeyman mechanic. Keep it in a permanent binder in the shop where it is handy. Refer to it whenever in doubt about correct service procedures or specifications.

Using the technical manual as a guide will reduce error and costly delay. It will also assure you the best in finished service work.



This safety alert symbol identifies important safety messages in this manual. When you see this symbol, be alert to the possibility of personal injury and carefully read the message that follows.

Section 10 GENERAL

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Group 5 SPECIFICATIONS

DESCRIPTION

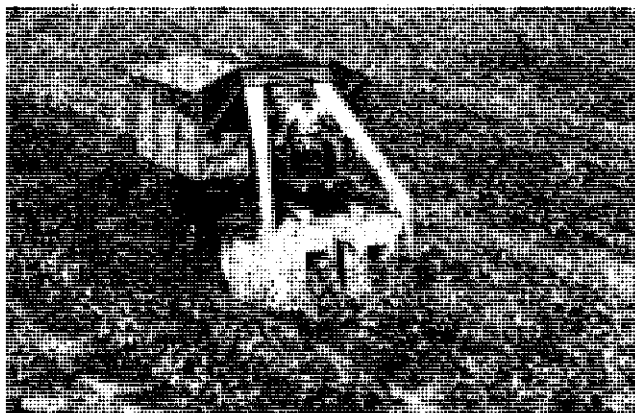


Fig. 1-499 Cotton Picker

The 499 Cotton Picker is a two-row self-propelled machine. The machine has four basic components:

1. Picking units
2. Jet-Air-Trol conveying system and basket
3. Operator's platform
4. Propelling mechanism

The picking units are either high or low-drum and are adjustable from 38 to 40-inch rows. The high-drum picking units have 1120 individual barbed spindles and the low-drum units have 784 spindles.

The Jet-Air-Trol conveying system consists of a fan located in the engine area to convey the cotton to the basket which holds 2,300 lbs. of seed cotton.

The operator is right on top of the picking operation when at the controls of the cotton picker. All controls are within easy reach of the operator.

The cotton picker is propelled by a gasoline, LP-Gas, or diesel engine (Models NB217, NA219, or NB329).

All references in this manual to front, rear, left, and right are in relation to the position of the operator seated on the operator's platform.

SERIAL NUMBERS

The cotton picker serial number is on a plate located on the left-hand platform support.

The picking unit serial numbers are on plates located on the top outer side of each picking unit.

The engine serial number is on a plate located on the left-hand side of the engine block.

SPECIFICATIONS

Picking Units

Number of units	2
Number of picking drums	4
Number of picker bars (per unit)	
Front drum	16
Rear drum	12
Number of spindles (per machine)	
Low drum units	784
High drum units	1120

Picking Unit Speeds

Picking unit drive shaft	
Low range	784 rpm
High range	1046 rpm
Picking drum	
Front drum (16 bar)	
Low range	70.4 rpm
High range	93.9 rpm
Rear drum (12 bar)	
Low range	93.8 rpm
High range	125.2 rpm
Doffer shaft	
Front drum (16 bar)	
Low range	1135 rpm
High range	1514 rpm
Rear drum (12 bar)	
Low range	1152 rpm
High range	1537 rpm
Spindle	
Front drum (16 bar)	
Low range	2454 rpm
High range	3274 rpm
Rear drum (12 bar)	
Low range	2418 rpm
High range	3226 rpm

Ground Speeds (Full Throttle)

Picking speeds	
1st Gear	2.06 mph
2nd Gear	2.65 mph
3rd Gear	3.12 mph
Transport speeds	
4th Gear	8.12 mph
5th Gear	10.46 mph
6th Gear	12.32 mph
Reverse	3.24 mph

Capacities

Cotton basket	465 cu. ft. (2300 lbs. seed cotton)
---------------	---

Fuel tank	
Gasoline and diesel	
NB217 (Gasoline)	33 U.S. Gal.
NA219	33 U.S. Gal.
NB329	56 U.S. Gal.
LP-Gas (80% full)	
NB329	46 U.S. Gal.
NB217	36 U.S. Gal.
Water tank	61 U.S. Gal.
Cooling system	
NB217	28 U.S. Quarts
NA219	24 U.S. Quarts
NB329	28 U.S. Quarts
Engine crankcase	
NB217	7 U.S. Quarts
NA219	7 U.S. Quarts
NB329	10 U.S. Quarts
Hydraulic system	
Standard lift	17 U.S. Quarts
High lift	19 U.S. Quarts
Transmission	22 U.S. Quarts
Final drives (each)	2 U.S. Quarts

Tires

Front drive wheels	
Low drum (R1, R2, & R3)	14.9-26, 8 PR
High drum (R1)	16.9-26, 8 PR
Rear guide wheel	9.50L-15, 8 PR

Weight

High drum	12,200 lbs.*
Low drum	11,400 lbs.*
* With cab add 500 lbs.	

Dimensions

Length	
* High drum	21 feet 3 inches
* Low drum	21 feet 1 inch
Height	11 feet 11-1/2 inches
Width	9 feet 10 inches
Tread	6 feet 9 inches
* With stalk lifter extensions add 1 foot 1 inch.	

Basket Dumping Height

Lip (standard)	8 feet 7 inches
Lip (high lift)	9 feet 5 inches
Basket pivot (standard)	9 feet 1 inch
Basket pivot (high lift)	9 feet 11-3/8 inches
Under axle clearance	31 inches

Final Drive

Type	Pinion and ring gear
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Electrical System

		NA219	NB329
Battery voltage	12-volts	Firing order	1-3-4-2
Battery specific gravity at full charge (corrected to 80°F.)	1.260 (± 0.010)	Tappet clearance	
Battery terminal grounded (NA219 and NB329)	Negative	Intake	0.014 in.
Battery terminal grounded (NB217)	Positive	Exhaust	0.018 in.
Alternator regulation (NA219 and NB329)	Voltage regulator	Injection pump	
Generator regulation (NB217)	Voltage regulator	Timing	TDC
		Engine speeds	
		Fast idle (no load)	2650-2670 rpm
		Rated (under field load)	2500 rpm
		Slow idle	800 rpm

Engine (Gasoline)

	NB219	NB217	NB329
Make	John Deere	John Deere	John Deere
Model	NA219G	NB217G	NB329G
No. of cylinders	4	6	6
Bore	4.02 in.	3.625 in.	4.02 in.
Stroke	4.33 in.	3.50 in.	4.33 in.
Displacement	219 cu. in.	217 cu. in.	329 cu. in.
Horsepower	70 hp	77 hp	105 hp
Firing order	1-3-4-2	1-5-3-6-2-4	1-5-3-6-2-4
Compression ratio	8.1 to 1	7.6 to 1	8.1 to 1
Tappet clearance			
Intake	0.014 in.	0.012 in.	0.014 in.
Exhaust	0.022 in.	0.018 in.	0.022 in.
Ignition system			
Coil voltage	12 volt	12 volt	12 volt
Spark plug gap	0.025 in.	0.025 in.	0.025 in.
Distributor point gap			
Delco	0.016 in.	0.016 in.	0.016 in.
Prestolite	0.022 in.	0.020 in.	0.020 in.
Engine speeds			
Fast idle (no load)	2675-2725 rpm	2600 rpm	2650-2700 rpm
Rated (under field load)	2500 rpm	2500 rpm	2500 rpm
Slow idle	600-700 rpm	600 rpm	600-700 rpm

Engine (LP-Gas)

	NB217	NB329
Make	John Deere	John Deere
Model	NB217L	NB329L
No. of cylinders	6	6
Bore	3.625 in.	4.02 in.
Stroke	3.50 in.	4.33 in.
Displacement	217 cu. in.	329 cu. in.
Horsepower	77 hp	105 hp
Firing order	1-5-3-6-2-4	1-5-3-6-2-4
Compression ratio	9.0 to 1	8.1 to 1
Tappet clearance		
Intake	0.012 in.	0.014 in.
Exhaust	0.018 in.	0.022 in.
Ignition system		
Coil voltage	12 volt	12 volt
Spark plug gap	0.015 in.	0.015 to 0.018 in.
Distributor point gap		
Delco	0.016 in.	0.016 in.
Prestolite	0.020 in.	0.020 in.
Engine speeds		
Fast idle (no load)	2600 rpm	2650-2700 rpm
Rated (under field load)	2500 rpm	2500 rpm
Slow idle	600 rpm	600-700 rpm

Engine (Diesel)

	NA219	NB329
Make	John Deere	John Deere
Model	NA219D	NB329D
No. of cylinders	4	6
Bore	4.02 in.	4.02 in.
Stroke	4.33 in.	4.33 in.
Displacement	219 cu. in.	329 cu. in.
Horsepower	70 hp	105 hp
Compression ratio	16.3 to 1	16.3 to 1

(Specifications and design are subject to change without notice)

Group 10

TUNE-UP AND ADJUSTMENT

GENERAL INFORMATION

Before tuning up an engine, determine if it is in condition whereby performance can be restored by tune-up. Perform the following preliminary tests.

PRELIMINARY ENGINE TESTING

Operation	Specifications	Reference
Check radiator for air bubbles and indication of oil		Section 20, Group 30
Test cylinder compression	120 psi Gasoline and LP-Gas 300 psi - Diesel	See FOS "Engine" Manual
Test engine power output (use dynamometer)	Note horsepower output and compare with output after tune-up	See FOS "Engine" Manual
Test vacuum (at air cleaner, Diesel)	8 - 25 inches of water at fast idle	See FOS "Engine" Manual
Test manifold vacuum (Gasoline or LP-Gas)	18 - 20 inches mercury at fast idle	See FOS "Engine" Manual

ENGINE TUNE-UP

Operation	Specifications	Reference
Air Intake System		
Air cleaner - clean primary element and dust cup		Section 30, Group 15
Air cleaner - clean precleaner screen		Section 30, Group 15
Check crankcase and hydraulic breather caps		See Operator's Manual
Check valve clearance	Diesel-Exhaust - 0.018 in. Intake - 0.014 in. (NA219 or NB329) Gas and LP-Gas-Exhaust - 0.022 in. Intake - 0.014 in. (NB217) Gas and LP-Gas-Exhaust - 0.018 in. Intake - 0.012 in.	Section 20 Section 20 Section 20 Section 20 Section 20 Section 20
Retorque cylinder head cap screws	110 ft-lbs	Section 20

ENGINE TUNE-UP—Continued

Operation	Specifications	Reference
Alternator (NB329 and NA219)		
Check belt tension	20 lbs. at 3/4 in. (NB329) 25 lbs. at 3/4 in. (NA219)	See Operator's Manual
Replace brushes	If less than 1/4 in. beyond holder	.....
Generator (NB217)		
Check belt tension	25 lbs. at 3/4 in.	.....
Replace brushes	If less than 1/4 in. beyond holder	.....
Battery		
Check electrolyte level .....	.....	See Operator's Manual
Clean cables, terminals, and box .....	.....	.....
Tighten cable clamps .....	.....	.....
Ignition System		
Clean distributor cap, rotor, and wiring .....	.....	See Operator's Manual
Clean, adjust, or replace points	0.016 in. gap (Delco) 0.020 in. gap (Prestolite)	See Operator's Manual
Lubricate distributor cam	Cam lubricant	.....
Time distributor	"TDC" mark on flywheel at 2500 rpm, NB329 24 degree mark - NA219 24 or spark - NB217	See Operator's Manual
Gasoline and LP-Gas Fuel Systems		
Check fuel tank and lines for leaks or restrictions .....	.....	.....
Clean fuel pump sediment bowl .....	.....	.....
Replace fuel line filter .....	.....	.....
Adjust carburetor and check engine speed .....	.....	Section 30, Group 15
Drain and clean converter (LP-Gas only) ..	.....	Section 30, Group 15

Operation	Specifications	Reference
Diesel Fuel System		
Clean fuel pump sediment bowl		
Check fuel tank, lines, and connections for leaks or restrictions		
Replace fuel filters		
Time injection pump		Section 30, Group 10
Check injection pump advance		Section 30, Group 10
Bleed fuel system		
Adjust throttle control linkage and check engine speed		Section 30, Group 10

Cooling System

Check water pump for leaks		
Clean and flush cooling system		
Clean trash from radiator		
Test thermostat and pressure cap		Section 20

Engine Lubricating System

Check engine oil pressure	45-65 psi at 2500 rpm (NB329 and NA219)	Section 20, Group 10 and 15
	35-50 psi at 2500 rpm (NB217)	Section 20, Group 20

FINAL ENGINE TESTING

Use a dynamometer in final testing to determine if engine is performing at rated horsepower, (NB217 - 77 hp), (NB329 - 105 hp), or (NA219 - 70 hp).

Compare output of engine with horsepower delivered prior to tune-up.

Use a dynamometer and exhaust gas analyzer for accurate and efficient carburetor adjustment.

COTTON PICKER ADJUSTMENTS

Make the following cotton picker adjustments whenever the engine is tuned-up.

Operator	Specifications	Reference
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Brakes

Check brake adjustment Section 60, Group 10

Power Steering

Bleed steering system Section 70, Group 25

Hydraulic System

Test hydraulic system Section 70, Group 5

Tires

Check tire inflation See Operator's Manual

TIGHTEN ACCESSIBLE BOLTS AND CAP SCREWS See torque chart below.

STANDARD TORQUE CHART

RECOMMENDED TORQUE IN FOOT-POUNDS
 COARSE AND FINE THREADS



Bolt Diameter	Plain Head	Three Radial Dashes	Six Radial Dashes
1/4	Not used	10	14
5/16	Not used	20	30
3/8	Not used	35	50
7/16	35	55	80
1/2	55	85	120
9/16	75	130	175
5/8	105	170	240
3/4	185	300	425
7/8	160	445	685
1	250	670	1030

Group 15 LUBRICATION

GENERAL INFORMATION

Carefully written and illustrated lubrication instructions are included in the operator's manual furnished with your customer's machine. Remind him to follow these instructions.

For your convenience, the following chart shows capacities and types of lubricants for the cotton picker components and systems. Specifications for lubricants follow this chart.

	Capacity	Type of Lubricant	Interval of Service
Engine crankcase	10 U.S. quarts (NB329) 7 U.S. quarts (NA219 and NB217)	See page 15-2	10 Hours - Check 100 Hours - Drain and refill change filter
Transmission	22 U.S. quarts	SAE 90 regular type gear lubricant	10 Hours - Check 250 Hours - Drain and fill
Final drives	2 U.S. quarts (each)	SAE 90 regular type gear lubricant	100 Hours - Check 250 Hours - Drain and fill
Hydraulic System	19 U.S. quarts (High Lift) 17 U.S. quarts (Standard Lift)	See page 15-2	10 Hours - Check 200 Hours - Drain and fill hydraulic reservoir - 8 qt.
Grease fittings	.....	John Deere Multi-Purpose Lubricant or an equivalent	See Operator's Manual
Distributor cam	Trace	Distributor cam lubricant	250 Hours
Stalk lifters and doffer chains	2 or 3 drops	SAE 20W engine oil	10 Hours
Picker bar cams, cam follower bearings, sun gears, spindle drive gears	2 or 3 shots	John Deere Spindle Lu- bricant	10 Hours
Picker bars	Until grease appears at bearing caps	John Deere Spindle Lu- bricant	20 Hours
Unit stop upper rockshaft	2 or 3 drops	SAE 20W engine oil	30 Hours
Unit drive gear case	3 pounds	John Deere Multi-Purpose Lubricant or an equivalent	250 Hours - Clean and pack bearings

Section 20 ENGINE

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Group 5 GENERAL INFORMATION, DIAGNOSIS, AND REMOVAL

GENERAL INFORMATION

The engines are 6-cylinder or 4-cylinder, valve-in-head, vertical in-line four-cycle engines. Three types of fuel, each with the appropriate fuel delivery devices are available—gasoline, LP-Gas, and diesel.



For basic theory of engine operation see the FOS Manual 30 - ENGINES.

DIAGNOSING MALFUNCTIONS

WILL NOT START

Fuel System Malfunction - See Section 30

- Foreign matter in fuel
- Improper fuel
- Faulty fuel pump
- Fuel shut-off at tank
- Restricted air intake system
- Faulty injection nozzles
- Carburetor malfunction
- Sticking choke

Electrical System Malfunction - See Section 40

- Corroded or loose battery connection
- Faulty or loose wiring
- Faulty key switch
- Faulty safety start switch
- Faulty ignition system

UNEVEN RUNNING OR FREQUENT STALLING

Basic Engine Problem - See This Section

- Improper valve clearance
- Cylinder head gasket leaking
- Valves sticking or burned
- Worn or broken compression rings
- Low compression
- Incorrect timing
- Coolant temperature below normal
- Engine overheating

Fuel System Malfunction - See Section 30

- Low fuel supply
- Restricted fuel lines or filters
- Faulty fuel pump
- Faulty fuel injection pump
- Faulty injection nozzles
- Exhaust system restricted
- Carburetor adjusted incorrectly
- Leaking carburetor or intake manifold gasket

Electrical System Malfunction - See Section 40

- Faulty ignition system.

ENGINE MISSES

Basic Engine Problems - See This Section

- Worn camshaft lobes
- Weak valve springs
- Incorrect valve clearance
- Burned, warped, pitted, or sticking valves
- Low compression
- Incorrect timing
- Engine overheating
- Faulty governor
- Detonation or preignition

Fuel System Malfunction - See Section 30

- Air in fuel
- Faulty injection nozzles
- Faulty injection pump
- Water in fuel
- Mixture of gasoline and diesel fuels
- Faulty fuel pump
- Faulty carburetor

Electrical System Malfunction - See Section 40

- Incorrect type spark plugs. (preignition)
- Leaks in wiring
- Faulty ignition system

LACK OF POWER

Basic Engine Problem - See This Section

- Blown cylinder head gasket
- Worn camshaft lobes
- Incorrect valve clearance
- Burned, warped, pitted, or sticking valves
- Weak valve springs
- Incorrect timing
- Low compression
- Wrong oil viscosity
- Coolant temperature above or below normal
- Engine overheating
- Incorrect throttle linkage
- Governor binds

Fuel System Malfunction - See Section 30

- Plugged fuel filters
- Improper fuel
- Faulty injection pump
- Faulty injection nozzles
- Faulty fuel pump
- Restricted air cleaner
- Restricted exhaust system
- Low intake manifold system
- Obstructed fuel line (frosted on LP-Gas engines)
- Faulty carburetor

Power Train Malfunction - See Section 50

- Clutch slipping

ENGINE OVERHEATS

Basic Engine Problem - See This Section

- Defective head gasket
- Incorrect timing
- Crankcase oil level low
- Low coolant level
- Radiator or grille screens dirty
- Loose or broken fan belt
- Faulty thermostat
- Cooling system limed up
- Defective radiator pressure cap
- Faulty water pump

Service Problems - See Section 10

- Engine overheated
- Crankcase oil level low
- Improper fuel

Fuel System Malfunction - See Section 30

- Excessive fuel delivery
- Faulty carburetor

EXCESSIVE OIL CONSUMPTION

Basic Engine Problems - See This Section

- Restricted oil passage from valve cover
- Worn valve guides or valve stems
- Oil control rings worn or broken
- Scored liners or pistons
- Excessive ring groove wear in piston
- Rings sticking in grooves of pistons
- Oil return slots in piston clogged
- Insufficient piston ring tension
- Piston ring gaps not staggered
- Worn crankshaft thrust washer (misaligned piston and rod)
- Excessive main or connecting rod bearing clearance
- Front or rear crankshaft oil seal faulty
- Crankcase oil too thin
- Oil pressure too high
- Oil level too high
- Intake valve O-ring worn or missing (Gasoline)

Service Problems - See Section 10

- Crankcase oil too thin
- Oil level too high

Fuel System Malfunction - See Section 30

- Restricted air intake

LOW OIL PRESSURE

Basic Engine Problems - See This Section

- Excessive main and connecting rod bearing clearance
- Low oil level
- Leakage in internal oil passages
- Faulty fuel pump
- Improper regulating valve adjustment
- Improper oil
- Defective oil cooler

Service Problem - See Section 10

- Low oil level
- Improper oil

Electrical System Malfunction - See Section 40

- Defective oil pressure indicator lamp
- Faulty oil pressure sending unit

HIGH OIL PRESSURE

Basic Engine Problem - See This Section

- Low compression
- Restricted air cleaner
- Faulty injection nozzles
- Faulty injection pump
- Faulty carburetor

Electrical System Malfunction - See Section 40

- Faulty ignition system

BLACK OR GREY EXHAUST SMOKE

Basic Engine Malfunction - See This Section

- Incorrect engine timing

Service Problem - See Section 10

- Improper grade of fuel
- Engine overloaded

Fuel System Malfunction - See Section 30

- Excessive fuel delivery
- Restricted air intake
- Defective muffler
- Faulty injection nozzle
- Faulty carburetor

WHITE EXHAUST SMOKE

Basic Engine Problem - See This Section

- Low compression
- Incorrect timing

Fuel System Malfunction - See Section 30

- Faulty injection nozzles
- Improper fuel

SLOW ACCELERATION

Fuel System Malfunction - See Section 30

- Faulty injection pump
- Faulty injection nozzles
- Faulty carburetor

Electrical System Malfunction - See Section 40

- Faulty ignition system

DETONATION OR PREIGNITION

Basic Engine Problem - See This Section

- Carbon buildup in compression

Fuel System Malfunction - See Section 30

- Oil picked up by air intake stream
- Faulty fuel injection

ENGINE BACKFIRES

Fuel System Malfunction - See Section 30

- Faulty carburetor

Electrical System Malfunction - See Section 40

- Faulty ignition system

DIAGNOSING MALFUNCTIONS— Continued

ABNORMAL ENGINE NOISE

Basic Engine Problem - See This Section

Excessive valve clearance
Worn cam followers
Bent push rods
Worn rocker arm shafts
Worn main or connecting rod bearings
Foreign material in combustion chamber
Worn piston pins and pin bushings
Scored pistons
Incorrect timing
Excessive crankshaft end play
Loose main bearing caps
Worn gears
Broken oil pump shaft
Low engine oil level

REMOVAL

Whenever it is necessary to remove the engine from the 499 Cotton Picker for servicing, you first must remove the basket or raise basket and block firmly. Remove or disconnect the following items.

Also, identify each item removed or disconnected to facilitate assembly when the engine is reinstalled.

1. Remove hood.
2. Disconnect main drive shaft.
3. Disconnect clutch linkage.

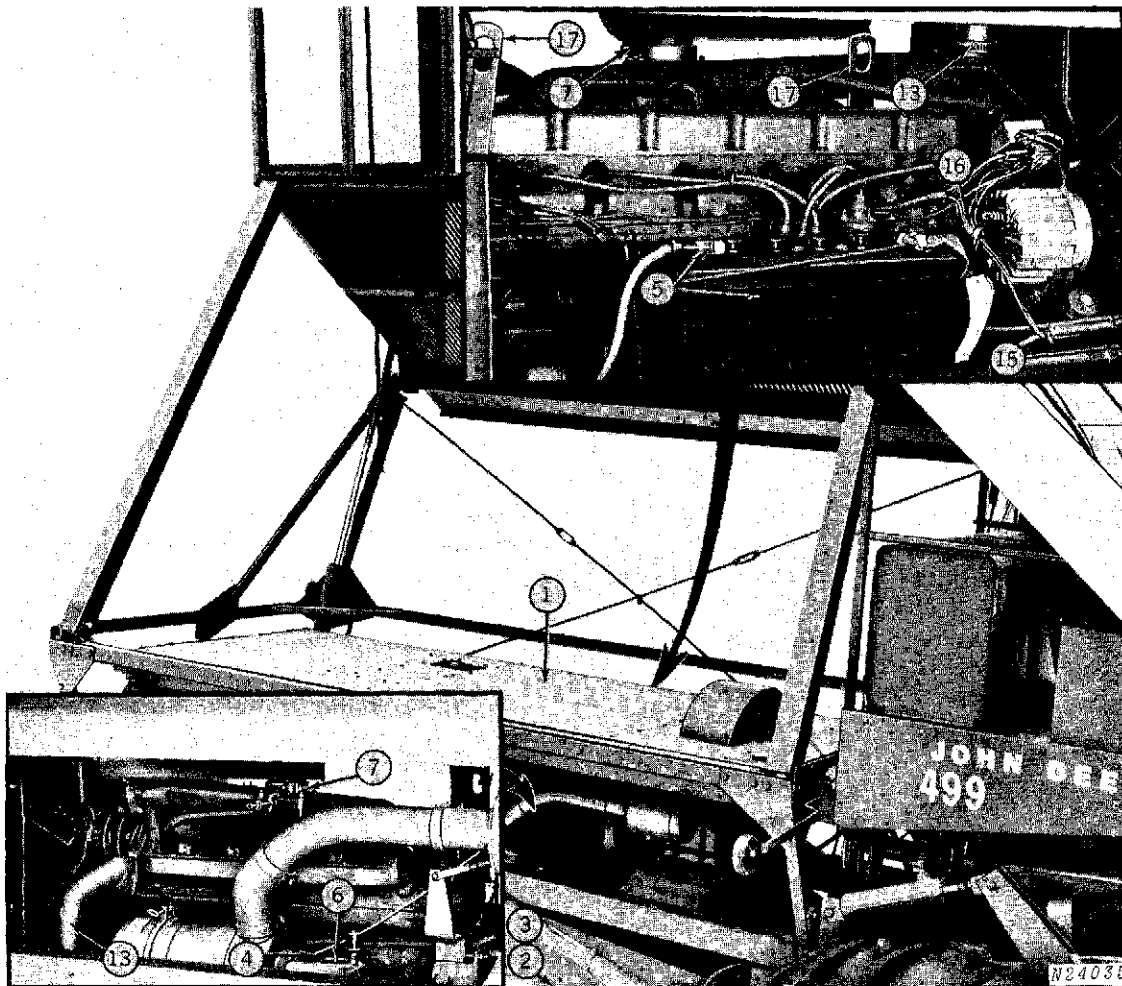


Fig. 1-Engine Removal and Installation

4. Disconnect choke cable at carburetor.
5. Disconnect battery cables at battery and remove battery.
6. Disconnect air intake hose.
7. Remove muffler.
8. Drain engine, block, and radiator. (Not illustrated)
9. Drain oil. (Not illustrated)
10. Disconnect fuel line at fuel pump. (Not illustrated)
11. Disconnect fuel return line at injection pump (diesel). (Not illustrated)
12. Disconnect fuel line at fuel lock (LP-Gas). (Not illustrated)
13. Disconnect upper and lower radiator hose.
14. Remove clutch housing and sheaves. (Not illustrated)
15. Remove pump. Do not disconnect hoses. Wire pump to frame.
16. Disconnect electrical wires at terminal points on engine. (Not illustrated)
17. Connect a chain or cable to the engine hoisting brackets.
Attach the chain to hoist and take up slack.
Remove engine mounting bolts.
Raise engine up and to the front slightly to clear fan shroud. Then raise straight up and away from picker.

INSTALLING ENGINE

Check condition of rubber engine-mounting pads in engine frame. If replacement is necessary, soap outside of mounts and press into engine frame.

Position engine in engine frame and tighten bolts.

Install clutch housing and sheaves. Install drive belt at this time.

Connect all wires at correct terminal points on the engine.

Install upper and lower radiator hoses.

Connect fuel line at fuel lock on the LP-Gas engine only.

Connect fuel line at fuel pump on Gas and Diesel engines. Connect fuel return line at fuel injection pump on the Diesel engine only.

Install muffler.

Connect air intake hose from air cleaner to engine manifold (diesel) or carburetor (gas or LP-Gas).

Install battery and battery cables.

Install choke cable at carburetor.

Connect throttle linkage and clutch linkage. Connect drive shaft at clutch housing.

Install engine hood.

Fill crankcase with recommended oil. See Section 10, Group 15, page 1.

Fill radiator as recommended in Operator's Manual.

Remove safety braces and lower basket.

Group 10 NB329 ENGINE

CYLINDER HEAD, VALVES, AND CAMSHAFT

GENERAL INFORMATION

Cylinder heads on cotton picker power units contain intake and exhaust valves, intake and exhaust passages, and coolant passages. Valve guide ports are integral with the cylinder head. Valve seats are ground directly into the cylinder head casting, except where seat inserts are used.

Diesel engines are equipped with hardened valve stem caps that reduce wear on the valves, valve guides, and rocker arms.

On gasoline engines, the exhaust valves are equipped with valve rotators.

Valve seat inserts on exhaust valves of LP-Gas engines are replaceable.

Valves are opened by rocker arms assembled on a rocker arm shaft mounted on top of the cylinder head. These rocker arms are actuated by the camshaft through the cam followers and push rods. Valves are closed by springs; held in place with keepers and caps.

DIAGNOSIS

See Group 5 for diagnosing malfunctions.

REMOVAL

Drain coolant from both radiator and engine block.

The engine need not be removed from the cotton picker to service cylinder head, valves, and related parts.

Detach and remove water outlet elbow from cylinder head.

Remove exhaust manifold attaching cap screws and lift it off.

Disconnect coolant temperature wire from sending unit.

On diesel engines, disconnect fuel injection lines and identify each line for assembly. Disconnect injection leak-off line and remove injection nozzles (see Section 30). Detach fuel inlet and outlet lines at fuel filter and remove fuel filters from cylinder head. Plug all fuel lines and fuel openings to keep dirt out of system.

On gasoline and LP-Gas engines, disconnect wires from ignition coil and spark plugs.

Remove vent tube from rocker arm cover.

Remove rocker arm cover and gasket.

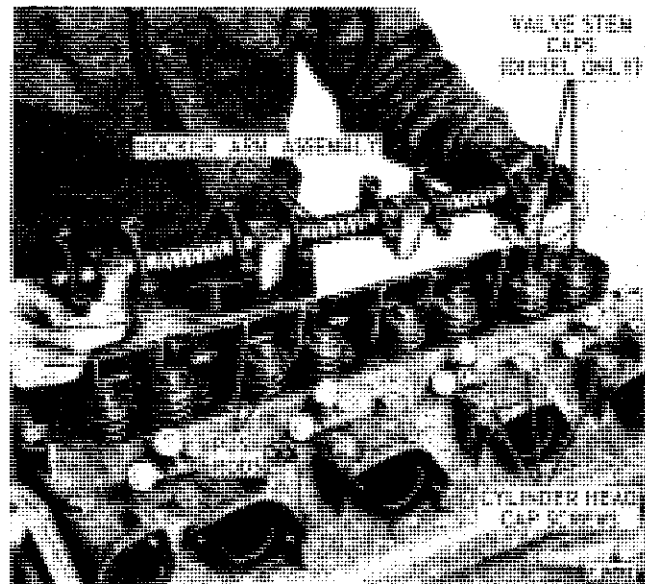


Fig. 1-Removing Rocker Arm Assembly

Remove rocker arm assembly (Fig. 1). On diesel engines, remove valve stem caps.

Remove push rods and identify for reassembly.

REMOVAL—Continued

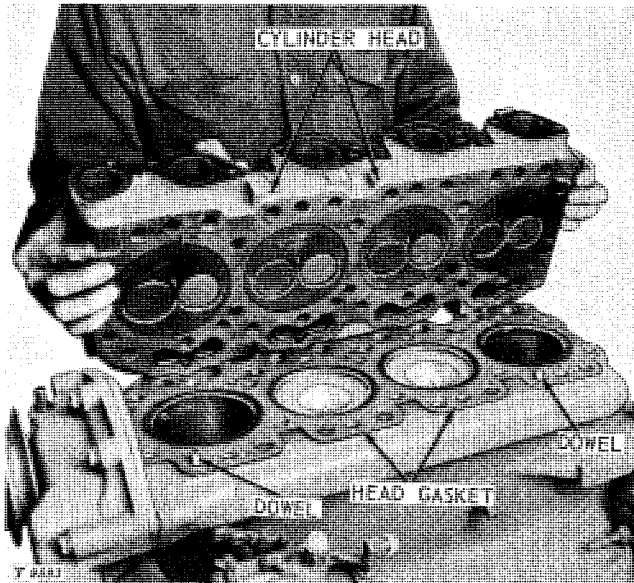


Fig. 2-Removing Cylinder Head

Remove cylinder head bolts, cylinder head, and gasket (Fig. 2).

NOTE: On diesel engines, remove injection nozzles before removing cylinder head. If nozzles have not been removed, do not set head down on protruding nozzles.

IMPORTANT: Do not rotate crankshaft with cylinder head removed unless all cylinder liners are bolted down.

DISASSEMBLY

Rocker Arm Assembly

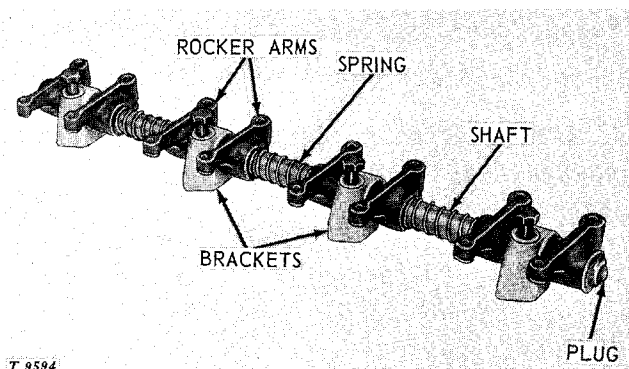


Fig. 3-Rocker Arm Assembly

Remove plug from one end of rocker arm shaft and slide all parts from end of shaft (Fig. 3). Identify rocker arm for reassembly.

Cylinder Head and Valves

Using a valve spring compressor, remove retainer locks, caps, valve springs, and related parts. Remove and identify each valve so that it can be reinstalled in the same guide and seat from which it was removed.

INSPECTION AND REPAIR

Cylinder Head

Clean carbon from cylinder head and inspect for cracks. If any cracks are found, the head must be replaced or repaired.

Measure inside diameter of valve guides. They should measure 0.3745 to 0.3755 in. Valves are available with standard or 0.003, 0.015 or 0.030 in. over-size stems.

Valve guides must be precision reamed to match oversize valves. Make sure valves fit freely in guides. Badly worn valve guides can be sized by knurling. Use knurling tool No. 1002 exactly as recommended by the manufacturer.

NOTE: On LP-Gas cylinder heads, check exhaust valve inserts for cracks or pits. Replace if worn.

Refacing Valves

Check valve face and stem for wear or damage. Reface or replace valves as necessary. Angle of valve face for gasoline and LP-Gas engines is 44 degrees and 43-1/2 degrees for diesel.



For information on valve refacing see "Basic Engines" of FOS Manual 30 - ENGINES.

Valve Springs

Inspect valve springs for alignment, wear, damage, and compression. Place springs on a flat surface to see that they are square and parallel. Do not use springs that are cocked, crooked, or contain broken or rusty coils. Free length of spring is 2.1250 in. A force of 52-64 lbs. should compress the spring to 1.8125 in. and a force of 129-157 lbs. should compress the spring to 1.7187 in.

Check compression strength of springs.

Valve Seats

Check valve seats for cracks or pits.

Check concentricity of valve seat with dial indicator. Total run-out on each seat should not exceed 0.0020 in.

NOTE: On LP-Gas engines, check exhaust valve inserts for cracks or pits. Replace if worn.



For information on valve seat refacing see "Basic Engines" of FOS MANUAL 30 - Engines.

Rocker Arm Assembly

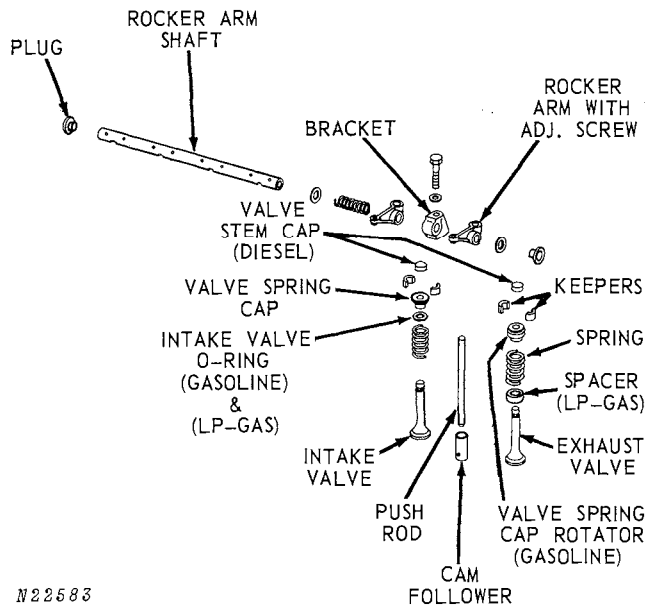


Fig. 4-Exploded View of Rocker Arm Assembly

Make sure that rocker arm oil holes are not plugged.

If ends of arms (Fig. 4) are worn, resurface them.

Thoroughly clean holes in rocker arm mounting brackets. This is especially important for the rear bracket, because it is through this hole that oil is fed to the rocker arm shaft.

On LP-Gas and gasoline engines, replace the intake valve O-ring.

IMPORTANT: If a failed valve has been replaced, also replace the rocker arm and push rod for that valve.

Valve Rotators (Gasoline Engines Only)

On gasoline engines, examine valve rotators for damage which might make them unserviceable. If rotator will not turn freely in one direction, replace with a new part.

ASSEMBLY

Rocker Arm Assembly

Assemble parts on rocker arm shaft in sequence that they were removed (Fig. 4).

Oil hole between rocker arm shaft and shaft support must face downward when assembly is installed on cylinder.

Apply John Deere valve stem lubricant or its equivalent to valve stems. Install valves in same ports from which they were removed, working them back and forth to make sure they slip through the ports easily and seat properly.

On gasoline and LP-Gas engines, place oil deflectors (O-rings) on intake valve stems and place rotocaps on exhaust valves (gasoline only).

1. Use new valve keepers.

2. When installing valve spring, make certain the cylinder head end of valve spring is located correctly in the machined counterbore of the cylinder head.

NOTE: On LP-Gas engines, install exhaust valve spring spacers with chamfered edge down.

3. After installing valve springs and keepers, "pop" each spring and valve assembly three or four times by tapping the end of each valve stem with a soft mallet to insure proper positioning of the keepers.

INSTALLATION

Coat new cylinder head gasket on both sides with permatex No. 3 Sealing Compound and place gasket on cylinder block. Install cylinder head using flat washers under all cap screws.

Start cylinder head-to-cylinder block cap screws by hand and tighten evenly to 110 ft. lbs torque, following the exact sequence shown in Fig. 5.

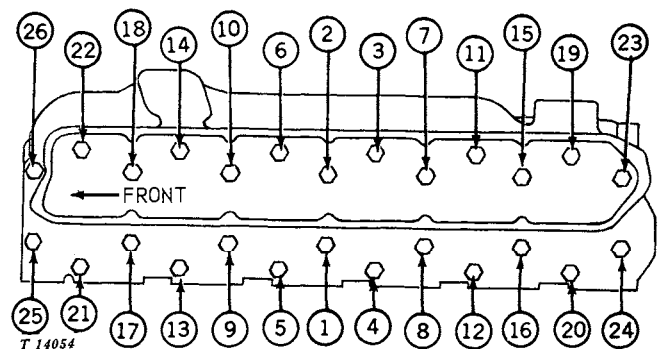


Fig. 5-Proper Sequence for Tightening Cylinder Head Cap Screws

INSTALLATION—Continued

IMPORTANT: Run engine for one hour at 2500 rpm with 1/2 load. Then, retighten cylinder head cap screws in sequence shown (Fig. 5) to 110 ft-lbs torque. Break the cap screws loose 5 to 10 degrees before retightening them.

Install the push rods through push rod holes in cylinder head in the same sequence they were removed.

On diesel engines, position valve stem caps over ends of valve stems. Make certain the caps rotate freely on the stems.

Install rocker arm and shaft into cylinder head. Tighten cap screws to 35 ft-lbs torque.

ADJUSTING VALVE CLEARANCE

The engine may be either hot or cold during valve adjustment. Adjust as follows:

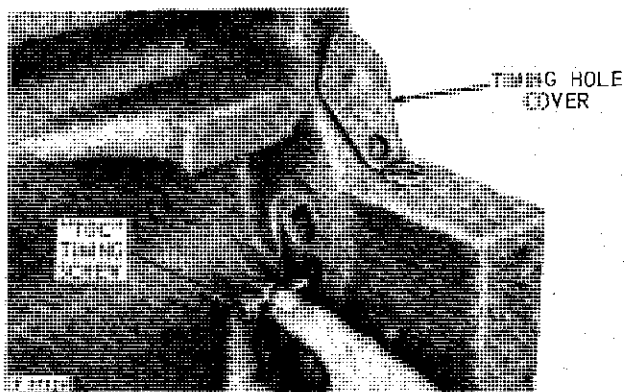


Fig. 6-Using Timing Screw to Set Engine at "Top Dead Center"

Set No. 1 piston at "top dead center" of its compression stroke by turning the engine. Remove the timing cover and screw from the flywheel housing, and, reversing the screw, insert it into the flywheel housing hole. Rock the flywheel until screw slides into hole in the flywheel.

With piston No. 1 at "top dead center" of its compression stroke, adjust the clearance on No. 1, 2, and 4 intake, and No. 1, 3, and 5 exhaust valves to specifications.

Valve clearance is:

Gasoline and LP-Gas-intake	0.014 in.
Gasoline and LP-Gas-exhaust	0.022 in.
Diesel-intake	0.014 in.
Diesel-exhaust	0.018 in.

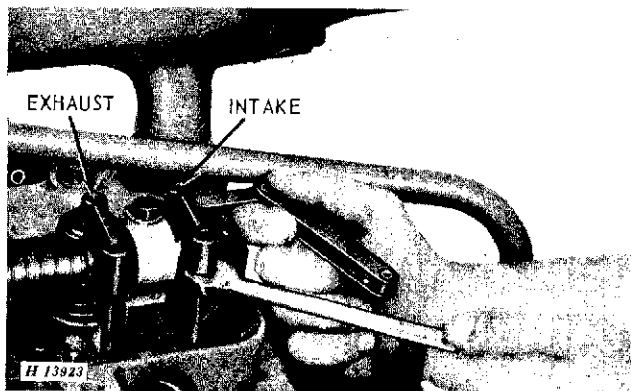


Fig. 7-Adjusting Valve Tappet Clearance

Using a feeler gauge to measure clearance (Fig. 7), turn valve adjusting nut up or down until clearance is correct.

Remove timing screw from flywheel. Rotate engine flywheel 360 degrees and reinsert timing screw into hole in flywheel rim.

Adjust the remaining valves, No. 3, 5, and 6 intake and No. 2, 4, and 6 exhaust valves to specifications.

Remove timing screw from flywheel and reinstall timing cover.

IMPORTANT: Valve clearance must be rechecked and adjusted to specified clearance after the engine has been in operation for one hour at 2500 rpm at 1/2 load, and after cylinder head cap screws have been retightened.

Make sure that the rocker arm cover gasket is in good condition. Cement gasket to rocker arm cover with sealing compound and install gasket, cover, and vent tube.

On gasoline and LP-Gas engines, connect wires to ignition coil and spark plugs.

Connect water hoses.

Connect air intake hose.

Install intake and exhaust manifolds on cylinder head (if removed).

On diesel engines, install injection nozzles (see Section 30). Connect fuel injection lines to proper fittings at filters and nozzles. Fasten clamps over lines. Bleed fuel system before operating the engine.

Fill cooling system as specified in your Cotton Picker Operator's Manual.

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CAMSHAFT

General Information

The camshaft is alloy iron. All cams are integral. The gasoline and LP-Gas engine camshafts are cast with an integral distributor drive gear.

The camshaft is driven at one-half engine speed by the top idler gear and is supported by four pressure-lubricated bores integral with the cylinder block. Camshaft thrust is taken by a thrust plate fastened to the rear of the cylinder block.

Removal

To repair camshaft and related parts, engine must be removed from cotton picker (See Section 20, Group 5).

Remove cylinder head. Using a wire with a 90-degree bend on the end, reach down through top of cylinder head and raise cam followers off camshaft lobes. Secure wires so that cam followers will not drag on camshaft during removal.

NOTE: If cylinder block is removed from machine and secured on an engine stand upside down, cam followers need not be wired up.

Remove top idler gear from engine front plate. This will allow camshaft to rotate when lining up camshaft attaching cap screws.

Remove cap screws and pull camshaft from block.

Repair

Determine if camshaft journals and bores measure 2.1997 to 2.2007 in.

Thrust plate thickness must be within 0.1560 to 0.1580 in. as the thrust plate determines camshaft endplay.

Replace camshaft drive gear, if necessary, by pressing shaft from gear. Press on gear until it is tight against flange on camshaft. Timing marks must face away from camshaft.

Support camshaft under its first bearing while pressing on gear.

Whenever a new camshaft is installed, replace the cam followers with new parts.

If replacing tachometer drive, press on new drive gear until shoulder of gear bottoms on rear of camshaft.

Installation

Coat entire camshaft with a light film of oil.

NOTE: When installing camshaft, do not permit cam lobes to drag on camshaft bores.

Turn the camshaft gear until the cap screws and locks which secure the thrust plate can be installed and tightened to 35 ft-lbs torque.

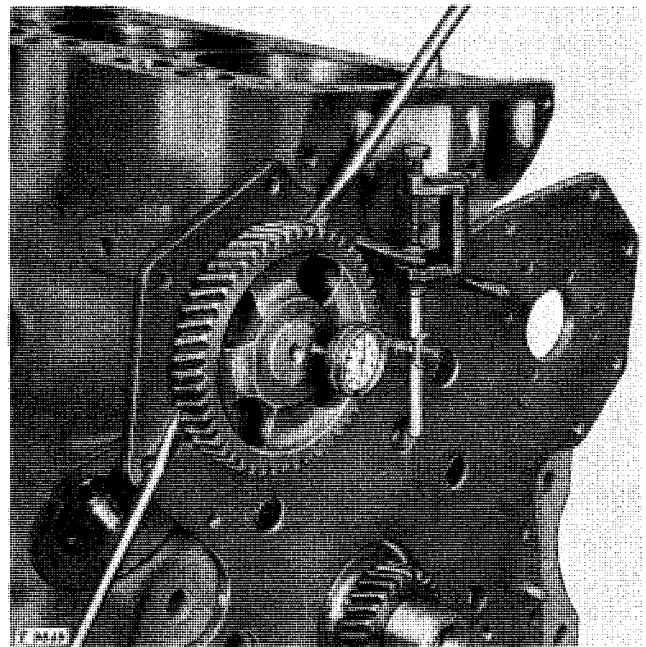


Fig. 8-Checking Camshaft End Play

The camshaft end play must be within 0.0025 to 0.0085 in. (Fig. 8). (New camshaft and thrust plate should restore this.)

Before installing the idler gear, set flywheel at "TDC" with No. 1 piston on the compression stroke. Align the timing marks on the camshaft drive gear with the center of the crankshaft, using timing tool JD-254.

With timing marks aligned, install top idler gear and secure to front plate with flat washer and cap screw. Tighten cap screw to 35 ft-lbs torque.

Install all parts previously removed.

After installing camshaft, retime the gear train. See page 20-10-14.

CYLINDER BLOCK, LINERS, PISTONS AND RODS

GENERAL INFORMATION

Cylinder block and crankcase are cast in one piece.

Cylinder liners are of the replaceable wetsleeve type, made of hardened alloy cast iron and are a slip fit in the cylinder block. The flange of each liner rests on a shoulder within the block and is sealed by a rubber packing. The top edge of the liner is sealed flush with the cylinder head and gasket.

Pistons are aluminum-alloy, cam ground, and weight controlled, with two compression rings and one oil control ring. The crown of each diesel piston has a cut-out swirl cup.

Connecting rods have a bronze bushing for the piston pin and replaceable, steel-backed, aluminum-lined bearings.

The case-hardened steel piston pins are full floating and held in place by snap rings.

REMOVAL

The engine must be removed from the cotton picker to service cylinder block, pistons, liners, and connecting rods. See page 20-5-4.

Remove the pistons and connecting rods, noting the following:

Do not rotate crankshaft with cylinder head removed unless all cylinder liners are bolted down. Bolt down cylinder liners before removing pistons.

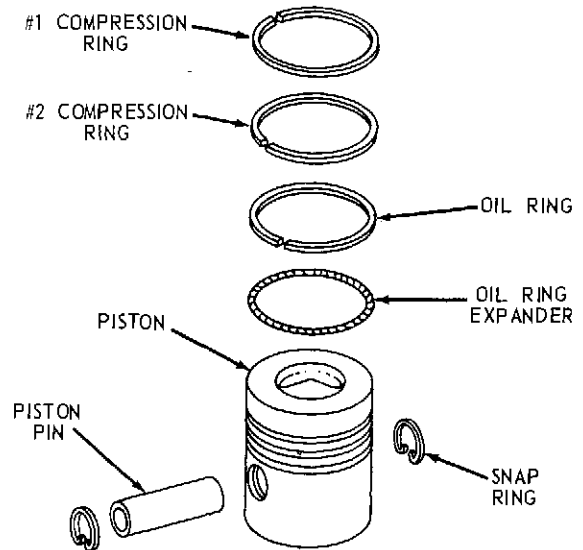
Keep rod bearings with their respective rods and caps to assure correct reassembly.

Each connecting rod and piston must be reinstalled in the cylinder bore from which it was removed. Observe the word "FRONT" stamped on the head of all pistons and in the rib of the connecting rods. These must face toward the fan end of the engine at the time of reassembly.

Measure cylinder liners for clearance before removal from the cylinder block. See "Repair" in this group.

REPAIR

Pistons



N22584

Fig. 9-Piston with Rings

Check ring grooves for excessive wear by inserting ring in the proper groove at several points around the piston (Fig. 9). Clearance between ring and groove should measure 0.0035 to 0.0053 in.

Measure the piston at the skirt section for wear. Be sure that all diameters are measured at a 90 degree angle from the piston pin. (Pistons are cam ground with the largest diameter at right angles to the piston pin.)

Inspect piston pins for wear and damage. Always use new piston pins and snap rings when installing new piston.

Rods

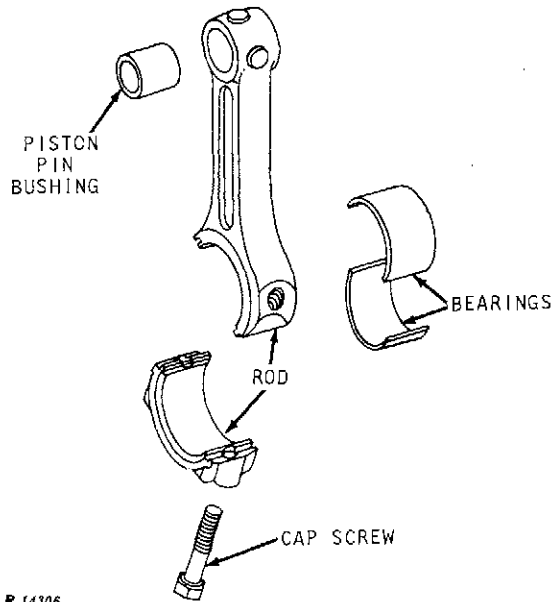


Fig. 10-Connecting Rod and Bearings

At every major overhaul, replace connecting rod bearings (Fig. 10) and piston pin bushings.

Rod and cap are an assembly; if either is damaged, both must be replaced.

Check rod and cap assembly for straightness. If piston contact pattern is not centered on center of piston at top and bottom of skirt, the rod needs to be straightened or replaced.

Install caps on rods with bearings in place. Tighten to 65 ft-lbs torque.

The inside diameter of the piston pin bushing should measure 1.1886 to 1.1896 ± 0.0020 in. Ream bushing after it is pressed into position to provide a "thumb-press fit" for pin.

Block

Clean block thoroughly with cleaning solution or by pressure steam cleaning. Make sure all passages and crevices are cleared of sludge, rust, and grease. Be sure coolant passages are cleaned of lime deposits and scale.

Check oil gallery steel ball plugs in cylinder block for leaks. If gallery hole is leaking oil, steel ball plugs must be removed and holes in cylinder block tapped and plugged with pipe plugs.

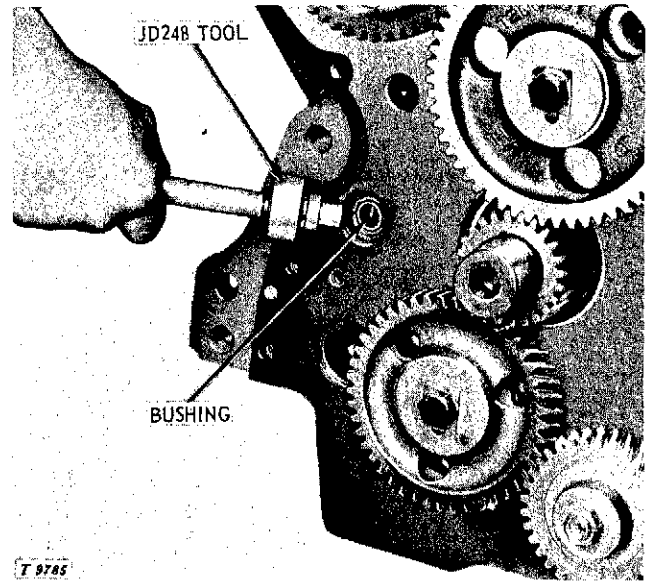


Fig. 11-Pressing in Oil Pressure Regulating Valve Bushing

Inspect oil pressure regulating valve bushing in fan end of cylinder block. If valve seating area is worn or damaged, remove bushing from block and install new bushing using JD248 tool (Fig. 11). Press bushing in until outer edge is flush with face of counterbore in block. Do not press on raised inner rim of bushing; this is the seat for the oil pressure regulating valve.

If dipstick nipple has been removed, coat threads with joint sealing compound and install in cylinder block. On diesel engines equipped with an integral oil cooler the distance must be 15-11/16 inches. The distance must measure 15-9/16 inches on engines equipped with an external oil cooler.

If filter base nipple has been damaged, remove it and press in a new one, flush with face of the bore in block. Position nipple so threaded boss is facing away from side of block as far as possible.

Inspect the oil sleeve in the lower right front bore of cylinder block for damage or signs of oil leakage. This sleeve plugs the drilled oil passage to the main oil gallery and helps maintain engine oil pressure. Remove sleeve. Press sleeve in from fan end of the engine until flush with chamfer on rim of bore using JD249 tool.