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BIDIRECTIONAL™ TRACTOR SERVICE

9030

Vol. 1

40903000

BIDIRECTIONAL™ TRACTOR SERVICE

9030

Vol. 2

40903000

06900901

9030 BIDIRECTIONALTM TRACTOR
SERVICE MANUAL
CONTENTS

This service manual refers to serial number breaks at various times throughout the text. It is important to understand the order in which 9030 Bidirectional tractors were built.
The following chart shows how 9030 tractors were built in the following ranges based on year of production:

SERIAL NUMBER RANGE YEAR OF PRODUCTION
0470100 - 0479999 1991
0487501 - 0489999 1992
0932000 - 0939999 1993
0200000 - AND ABOVE 1994 AND ON

An example of correctly identifying a unit follows:
The text reads "units built after *SIN* 0200234 ..... " The tractor being repaired is *SIN* 0487698.
0487698 is a tractor built **before** *SIN* 0200234 and will not *have* the component or feature described in the text.

9030 VERSATILE TRACTOR SAFETY, OPERATION AND GENERAL INFORMATION

SAFETY PRECAUTIONS

Practically all service work involves the need to drive the tractor. The Operator's Manual, supplied with each tractor, contains detailed safety precautions relating to driving, operating and servicing. 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 reassembly 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

- Loose clothing 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, welding, and painting.
- **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.
- **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 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 be sure that the machine guards are in position and serviceable. These guards not only prevent parts of the body or clothing from 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**
  Be sure 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.
- **Compressed Air**
  The pressure from a compressed air line is often higher than 100 psi (6.9 bar). It is perfectly safe, if used correctly. Misuse may cause injury.

Never use compressed air to blow dust, filings and dirt away from your work area unless the correct type of nozzle is fitted and eye protection is used.

Compressed air is not a cleaning agent, it will only move dust, from one place to another. Look around before using an air hose as bystanders may get grit into their eyes, ears or skin.

- **Hand Tools**
  Many cuts, abrasions and injuries are caused by defective tools. Never use the wrong tool for the job, as this generally leads either to some injury or to a poor job.

  Never use:

  — A hammer with a loose head or split handle.
  — Spanners or wrenches with splayed or worn jaws.
  — Spanners or files as hammers; or drills, clevis pins or bolts as punches.

For removing or replacing hardened pins use a copper or brass drift rather than a hammer alone.

For dismantling, overhaul and assembly of major and sub components, always use the Special Service Tools recommended. They will reduce the work effort, labor time and the repair cost.

Always keep tools clean and in good working order.

- **Electricity**
  Electricity has become so familiar in day to day usage, that its potentially dangerous properties are often overlooked. Misuse of electrical equipment can endanger life.

  Before using any electrical equipment — particulary portable appliances — make a visual check to make sure that the cable is not worn or frayed and that the plugs and sockets are intact. Make sure you know where the nearest isolating switch for your equipment is located.

GENERAL CONSIDERATIONS

- **Solvents**
  Use only cleaning fluids and solvents that are known to be safe. Certain types of fluids can cause damage to components, such as seals, and can cause skin irritation. Solvents should be checked that they are suitable not only for the cleaning of components and individual parts, but also that they do not affect the personal safety of the user.

- **Housekeeping**
  Many injuries result from slipping or tripping on objects or material left lying around by a careless worker. Prevent these accidents from occurring. If you notice a hazard, don't ignore it — remove it.

  A clean, hazard-free place of work improves the surroundings and daily environment for everybody.

- **Fire**
  Fire has no respect for persons or property. The destruction that a fire can cause is not always fully realized. Everyone must be constantly on guard.

  — Extinguish matches, cigars, and cigarettes, before throwing them away.
  — Work cleanly, disposing of waste material into proper containers.
  — Locate the fire extinguishers and find out how to operate them.
  — Do not panic — warn those near and raise the alarm.
  — Do not allow or use an open flame near the fuel tank, battery or component parts.

- **First Aid**
  In the type of work that mechanics are engaged in, dirt, grease, and fine dusts settle upon the skin and clothing. If a cut, abrasion or burn is disregarded, it may be found that a septic condition has formed within a short time. What appears at first to be trivial could become painful and injurious. It only takes a few minutes to have a fresh cut dressed, but it will take longer if you neglect it. Make sure you know where the First Aid box is located.

- **Cleanliness**
  Cleanliness of the fuel and hydraulic system is essential for optimum performance. When carrying out service and repairs, plug all hose ends and component connections to prevent dirt entry.

  Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficiency and working life of a component and lead to costly replacement. Use of a high pressure washer or steam cleaner is recommended.

OPERATIONAL CONSIDERATIONS

Use a trailer of at least 10 ton (9080 kg) capacity to haul the tractor.

Chain the tractor securely to the trailer, chock the wheels, set the parkbrake and engage the articulation lock to limit the tractor movement.

IMPORTANT: If the tractor is transported on a truck or trailer, cover the muffler outlet so that wind does not spin the turbocharger and damage the bearings.

Turbocharger turbine freewheeling (turning without engine running) must be avoided since lubrication is not being furnished to the turbocharger bearings under this conditions.

- Park the tractor on a clear, level area. Stop the engine, if at all possible, before performing any service. Center the steering, put all controls in neutral, set the parkbrake, shut down the engine and remove the key. Engage the articulation lock and chock the wheels.

- Place a warning sign on tractors which, due to service or overhaul, would be dangerous to start. Disconnect the battery leads if leaving such a unit unattended. Always disconnect the ground lead first. When reconnecting, connect the ground lead last.

- Do not attempt to start the engine while standing beside the tractor or attempt to bypass the neutral start switch.

- Avoid prolonged running of the engine in a closed building or in an area with inadequate ventilation as exhaust fumes are highly toxic.

- Always turn the radiator cap to the first stop to allow pressure in the system to dissipate when the coolant is hot.

- If possible take the unit to an area which has a hard working surface, preferably concrete.

- If it is necessary to raise the tractor for ease of servicing or repair, make sure that safe and stable supports are installed beneath the axle housings, casings, etc., before commencing work.

- Before loosening any hydraulic hose, lower the attachment to the ground, switch off the engine and relieve all hydraulic pressure by operating the control lever several times. This will remove the danger of personal injury from oil pressure or accidently dropping the attachment.

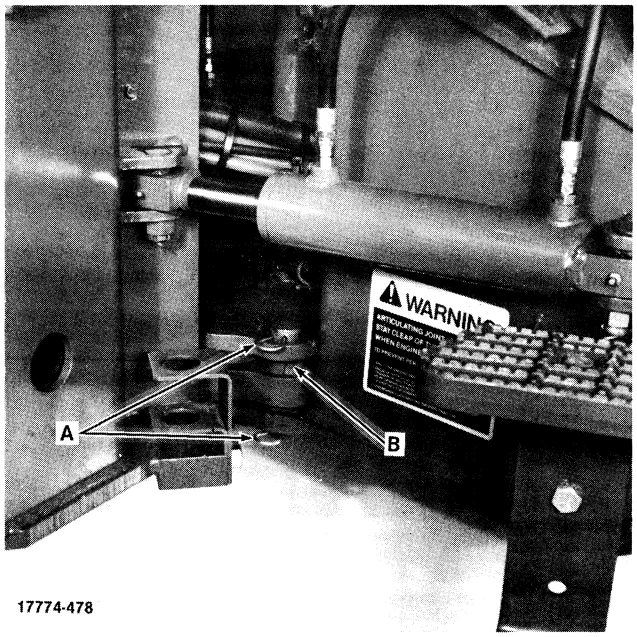
- Prior to pressure testing, make sure all hoses and connections on the tractor and the test equipment are in good condition and tightly sealed. Pressure readings must be taken with gauges specified. The correct procedure should be rigidly observed to prevent damage to the system or the equipment, and to eliminate the possibility of personal injury.

WARNING: ESCAPING FLUID, OF ANY KIND, UNDER PRESSURE, CAN PENETRATE THE SKIN CAUSING SERIOUS INJURY.

- **DO NOT USE YOUR HAND TO CHECK FOR LEAKS. USE A PIECE OF CARDBOARD OR PAPER TO SEARCH FOR LEAKS.**

- **STOP THE ENGINE AND RELIEVE PRESSURE BEFORE CONNECTING OR DISCONNECTING LINES.**

- **TIGHTEN ALL CONNECTIONS BEFORE STARTING THE ENGINE OR PRESSURIZING THE LINES.**



Articulation Lock **Figure 1**
A Hair pins
B Lock pin

- **IF ANY FLUID IS INJECTED INTO THE SKIN, OBTAIN MEDICAL ATTENTION IMMEDIATELY OR GANGRENE MAY RESULT.**

- When inflating tires to the recommended pressure for seating beads, use a remote chuck and keep hand away from the tire.

- When inflating tires, beware of over inflation — constantly check the pressure. Over inflation can cause tires to burst and result in personal injury.

- Use the articulation lock, B, Figure 1, during stationary applications, servicing, jacking or overhaul operations. Before installing the lock, drive the tractor to a level surface, put the steering straight, engage the parkbrake, put the gearshift in neutral and stop the engine. Remove the hair pins, A, securing the lock pin in the storage position on the front frame. It may be necessary to start the engine and articulate the frame slightly to be sure the lockpin is engaged.

  When disengaging the lockpin, secure it in the storage position with the hair pins.

CAUTION: DO NOT ALLOW PERSONNEL TO ENTER THE ARTICULATION AREA WITH THE ENGINE RUNNING, UNLESS THE ARTICULATION LOCK AND THE PARKBRAKE ARE ENGAGED.

DO NOT INSERT FINGERS THROUGH HOLES WHILE INSTALLING THE ARTICULATION LOCK.

- The cab has three exits which may be used in an emergency — the two doors and the rear window.

  Open the rear window by unlocking the two latches. Push the window open at the bottom.

Safety precautions are very seldom the figment of someone's imagination. They are the result of sad experience where, most likely, someone has paid dearly through personal injury.

Heed these precautions and you will protect yourself accordingly. Disregard them and you may duplicate the sad experience of others.

SERVICE SAFETY

Appropriate service methods and proper repair procedures are essential for the safe, reliable operation of all machinery, as well as the personal safety of the individual doing the work. This Service Manual provides general directions for accomplishing service and repair work with tested, effective techniques. Following them will help assure reliability.

There are numerous variations in procedures, techniques, tools, and parts for servicing machines, as well as in the skill of the individual doing the work. This manual cannot possibly anticipate all such variations and provide advice or cautions as to each. Accordingly, anyone who departs from the instructions provided in this manual must first establish that he compromises neither his personal safety nor the integrity of the machine by his choice of methods, tools or parts.

SECTION 1
ENGINE SYSTEMS

CONTENTS

SECTION 1
ENGINE SYSTEMS
DIESEL ENGINE

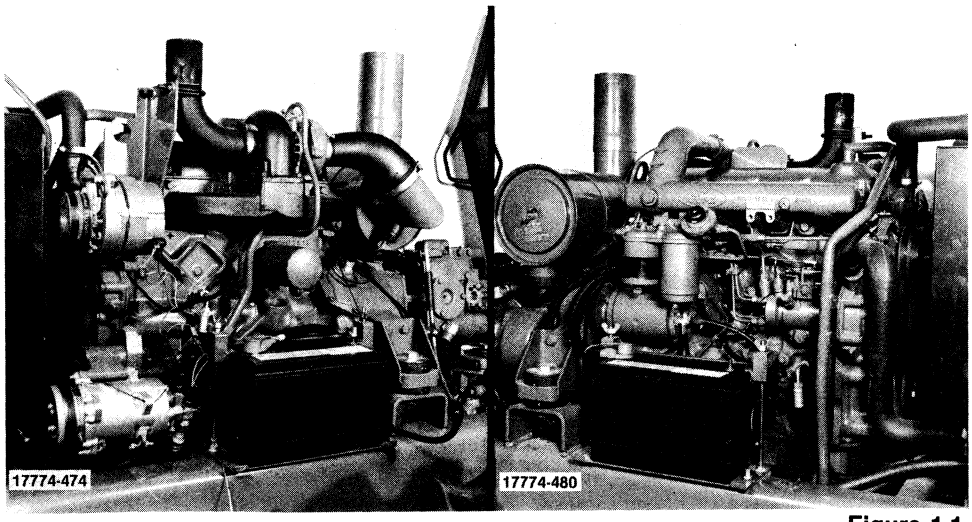


Figure 1-1

Four Cylinder Engine — Left Side
SHIELDS REMOVED FOR CLARITY

Four Cylinder Engine — Right Side
SHIELDS REMOVED FOR CLARITY

DESCRIPTION AND OPERATION

This section describes the overhaul and repair of the 4-cylinder direct injection diesel engine.

NOTE: The engine used in the 9030 tractor is of special manufacture. A "BSD" engine is NOT to be used in a 9030. See S/B 4/92-G12 for further information on engine differences between a 9030 and a BSD engine.

The engine, Figure 1-1, features a cross flow cylinder head with the inlet and exhaust manifolds on opposite sides of the head. The combustion chamber is formed in the crown of the piston which has two compression and one oil control ring all located above the piston pin.

The cylinder head assembly incorporates the valves, valve springs, and the spring retainers. Valve guides are an integral part of the cylinder head with replaceable valve seats pressed into the valve ports. Valve guides are not replaceable.

Cylinder Head Assembly

The cylinder head assembly incorporates the valves, valve springs, and rotators. The valve rocker arm shaft assembly is bolted to the cylinder block, through the head. The intake and exhaust manifolds are bolted to the head, the intake on the right side, and the exhaust on the left. The water outlet connection and thermostat are attached to the front of the cylinder head.

Valve guides are integral with the cylinder head, and valves with oversize stems are available for service. Special replaceable cast alloy valve seats are pressed into each valve port, and exhaust valves are fitted with positive valve rotators. The valves use umbrella-type seals.

Valve lash is maintained by self-locking adjusting screws. The cam shaft runs in four replaceable bearings, and is driven by the camshaft idler gear in mesh with the camshaft and crankshaft gears. Camshaft thrust is controlled by a plate secured to the block and located between the camshaft gear and the front journal of the camshaft.

The cylinder head bolts are evenly spaced in a six-point pattern around each cylinder. Diesel engine injectors are mounted outside the rocker cover.

The engine cylinder head is designed with the entire face of the cylinder head flat. The combustion chambers are recessed into the piston crowns.

Crankshaft Assembly

The crankshaft is supported in the cylinder block by five main bearings and the crankshaft end thrust is controlled by a thrust bearing located on the center main bearing.

A crankshaft driven dynamic balancer counteracts out-of-balance forces and thereby reduces engine vibration. The balancer housing is bolted to the bottom of the cylinder block and contains two meshing gears which are driven and timed from a gear on the crankshaft.

Front and rear crankshaft oil sealing is effected by a one piece, single lip type seal.

The piston is connected to the crankshaft by a heavy I-beam connecting rod with a tapered top end. The crankshaft end of the connecting rod has an insert-type copper lead or aluminum tin alloy bearing. The piston end of the connecting rod has a replaceable bronze bushing. The piston pin is a free-floating steel pin held in place in the piston by two snap rings.

Pistons

Pistons are an aluminum alloy with combustion chambers recessed into the piston crowns. Each piston has two compression rings and one oil control ring, all of which are located above the piston pin.

Connecting Rods

The piston connecting rods have replaceable bronze piston pin bushings. A centrally drilled hole facilitates both pressure lubrication of the piston pin bushing and cooling of the piston crown. Full-floating piston pins are retained by two snap rings in each piston.

Manifolds

The aluminum intake and cast iron exhaust manifolds are on opposite sides of the cylinder head for better heat distribution in the head, and less heat transfer to the intake manifold. All tractors are fitted with vertical exhaust systems.

The intake manifolds are connected through tubing to the air cleaner. The turbocharger crossover tube is provided with a tapped hole for installation of an ether cold starting aid kit.

Cylinder Block Assembly

The cylinder block is a cast iron alloy with heavy webbing and deep cylinder skirts. The block features full length water jackets for cooling the cylinders, which are bored integral with the block. Cylinders are in-line and vertical, and numbered from 1 to 4, front to rear.

The oil pan is attached to the bottom of the cylinder block and is the sump for the lubrication system. The engine front cover is attached to the front engine adapter plate forming a cover for the timing gears.

The crankshaft gear is keyed and press fitted on the front of the crankshaft (later engines do not use a key). The crankshaft gear drives the idler gear, which is attached to the front of the cylinder block. The idler gear drives the camshaft gear and the injection pump drive gear.

The camshaft gear is attached to the front of the camshaft by a key, bolt, lock washer, and flat washer. This ensures the gear maintains correct position on the camshaft.

All the timing gears are timed to each other via an identification mark to insure proper gear position in relation to each other.

Lubrication System

Lubrication of the engine is maintained by a gerotor type oil pump mounted at the base of the engine block. The oil pump is driven from the camshaft and draws oil from the engine sump through a wire mesh screen.

A spring loaded relief valve in the pump body limits the pressure in the system by directing excess oil back to the intake side of the pump.

Oil passes from the pump to an external, throw-away, spin-on type filter incorporating a relief valve which permits oil to be bypassed if filter blockage occurs, and so ensures engine lubrication at all times.

Oil flows from the filter to the main oil gallery which runs the length of the cylinder block and intersects the camshaft follower chambers.

The main gallery also supplies oil to the crankshaft main bearings and to the connecting rod journals via drillings in the crankshaft. Drilled passages from each main bearing direct oil to the camshaft bearings.

The idler gear bushing is pressure lubricated through a drilled passage from the front main bearing. The gear has small oil passages machined on both sides which allow the oil to escape.

The timing gears are lubricated by oil from the cam follower chamber and the pressure lubricated idler gear bushing.

The dynamic balancer is lubricated through a drilled passage from the cylinder block intermediate thrust bearing web to the balancer housing. Oil flows through the balancer housing to the drilled balancer gear shafts and onto the bushings in the balancer gears.

Cylinder walls, piston, and piston pins are splash lubricated by the connecting rods and rotating crankshaft.

The connecting rods have a centrally drilled hole which facilitates both pressure lubrication of the piston pin bushing and cooling of the piston crown.

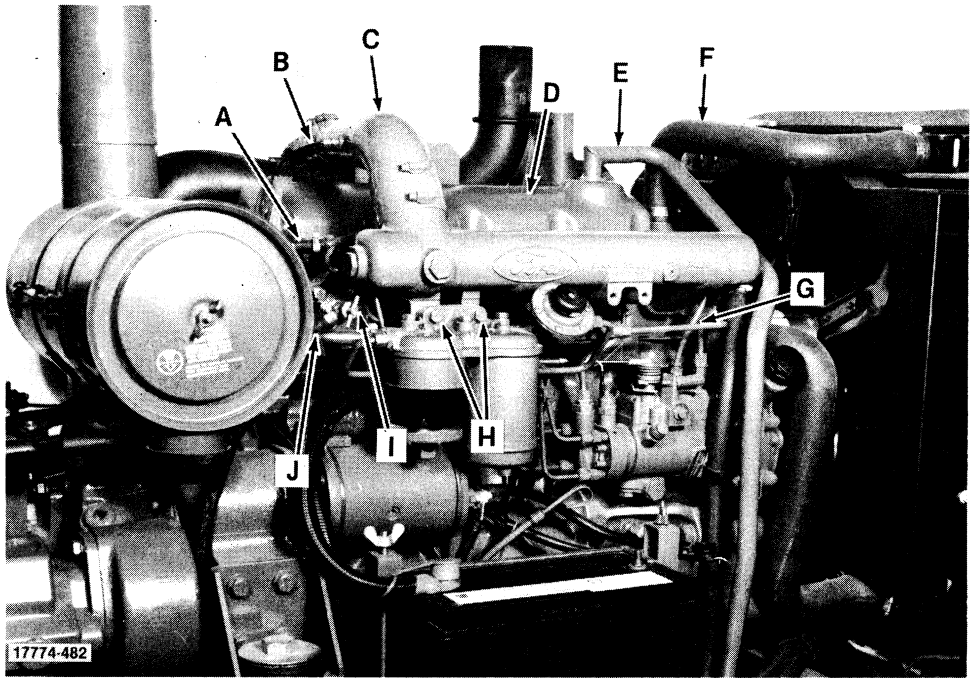
An intermittent flow of oil is directed to the valve rocker arm shaft assembly via a drilled passage in the cylinder block located vertically above No. 1 camshaft bearing. This drilling aligns with a corresponding hole in the cylinder head.

As the camshaft turns, holes in the camshaft and camshaft bearing align and a regulated stream of oil is directed to the cylinder head and on up the rocker arm shaft support bolt to the rocker shaft.

The oil flows from the shaft through drilled holes in each rocker arm bushing to lubricate both ends of the arms. Excess oil flows down the push rods and assists in lubricating the cam followers before draining back into the sump through cored openings in the block.

A water-to-oil type oil cooler, located in the base of the radiator, is connected into the lubrication system main oil gallery and cools a portion of the circulating oil. A restrictor at the oil outlet limits the flow to the cooler and maintains internal lubrication at low engine speeds. Return oil from the cooler is fed back to the engine sump via a pipe tapped into the skirt of the cylinder block.

SECTION 1A
CYLINDER HEAD



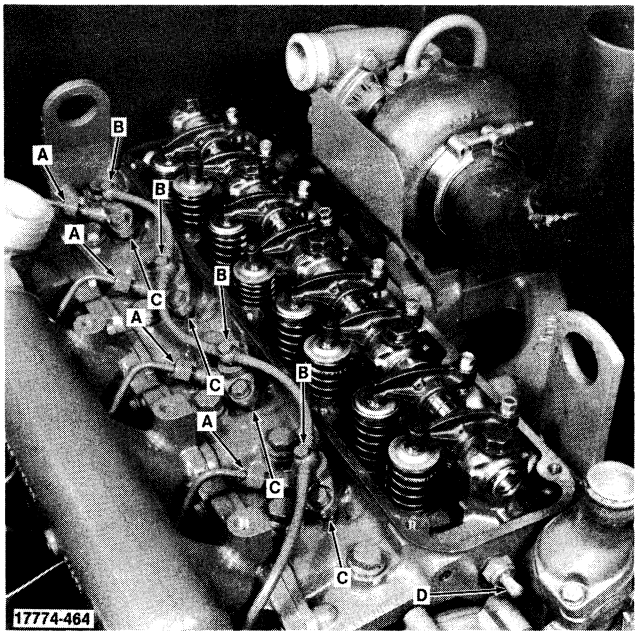
Engine — Right Side **Figure 1A-1**

A	Leak-off line - rear	E	Crankcase breather tube	I	Heater inlet valve
B	Cold start tube	F	Upper radiator hose	J	Heater inlet hose
C	Turbo transfer tube	G	Leak-off line - front		
D	Rocker cover	H	Bolts		

CYLINDER HEAD — REMOVAL

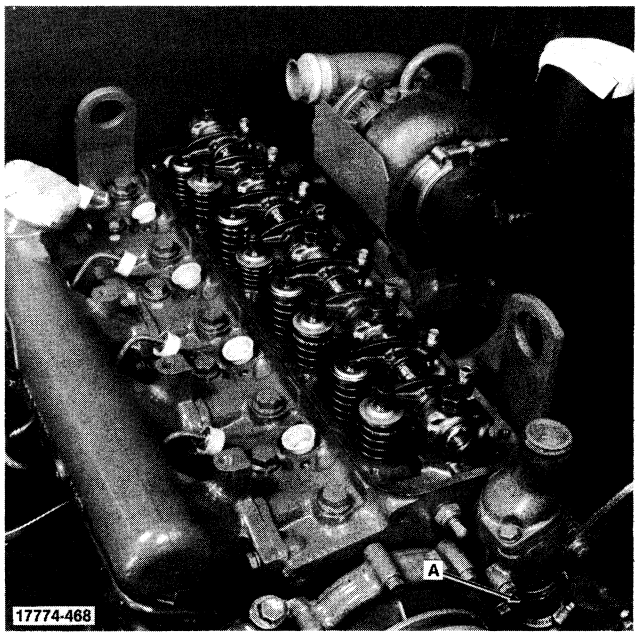
NOTE: The cylinder head can be removed with the engine installed in the tractor. If only the valves are to be adjusted, follow Steps 4 through 7 and then see "Cylinder Head - Installation" in this section.

1. Disconnect the batteries. See "Battery - Removal" Section 3, Electrical, in this manual.
2. Remove the muffler.
3. Drain the radiator and cylinder block. See "Radiator - Removal" in this section.
4. Remove the side panels and hood.
5. Remove the cold start tube, B, Figure 1A-1, and the turbocharger crossover tube, C.
6. Remove the crankcase breather tube, E.
7. Remove the rocker cover, D, and gasket.
8. Close the heater inlet valve, I. Remove and cap the heater inlet line, J.
9. Remove and cap the injector leak-off line. Front, G, and rear, A.
10. Remove and cap the upper radiator hose, F.
11. Remove two bolts, H, securing the fuel filters to the intake manifold.



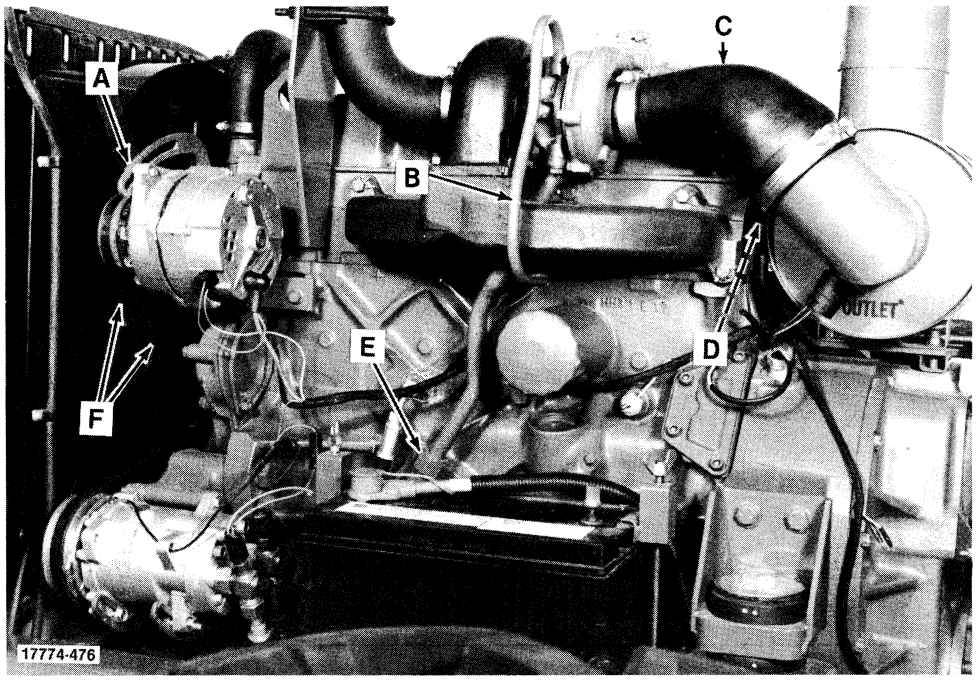
Top of Engine **Figure 1A-2**

A Fuel injector lines
B Leak-off line banjo bolts
C Fuel injectors
D Coolant temperature sender



Thermostat Bypass Hose **Figure 1A-3**

A Thermostat bypass hose



Engine Left Side **Figure 1A-4**

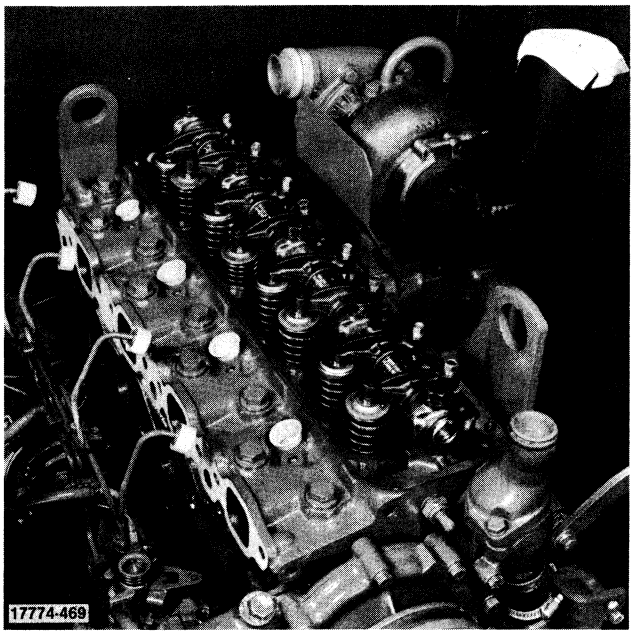
A Alternator adjustment bolt
B Turbocharger oil pressure line
C Turbocharger air inlet hose
D Thermo-Guard™
E Turbocharger oil return tube
F Alternator belts

12. Remove and cap the fuel injector lines, A, Figure 1A-2. Remove the fuel injector leak-off lines, B. Remove and cap the fuel injectors, C.

13. Remove the electrical lead from the coolant temperature sender, D.

14. Loosen the clamp on the thermostat bypass hose, A, Figure 1A-3.

15. Remove the alternator adjustment bolt, A, Figure 1A-4, drive belts, F, and adjustment arm. Let the alternator rotate down as far as possible.



Inlet Manifold Removed Figure 1A-5

Exhaust Manifold Removed Figure 1A-6

16. Disconnect the turbocharger oil pressure line, B. Disconnect the turbocharger return oil line, E.

17. Remove the turbocharger air inlet hose, C.

18. Disconnect the Thermo-Guard™ electrical lead, D.

19. Loosen the rocker shaft retaining bolts, which also serve as cylinder head bolts, evenly and alternately. Remove the rocker shaft assembly.

NOTE: Leave the bolts in the rocker shaft supports during removal as they retain the supports on the shaft.

NOTE: At this point if the head gasket only is being replaced, proceed with Steps 22 through 24. If the valves are to be removed, proceed with the complete cylinder head removal procedure.

20. Remove the retaining bolts and lock washers and remove the inlet manifold from the cylinder head, Figure 1A-5.

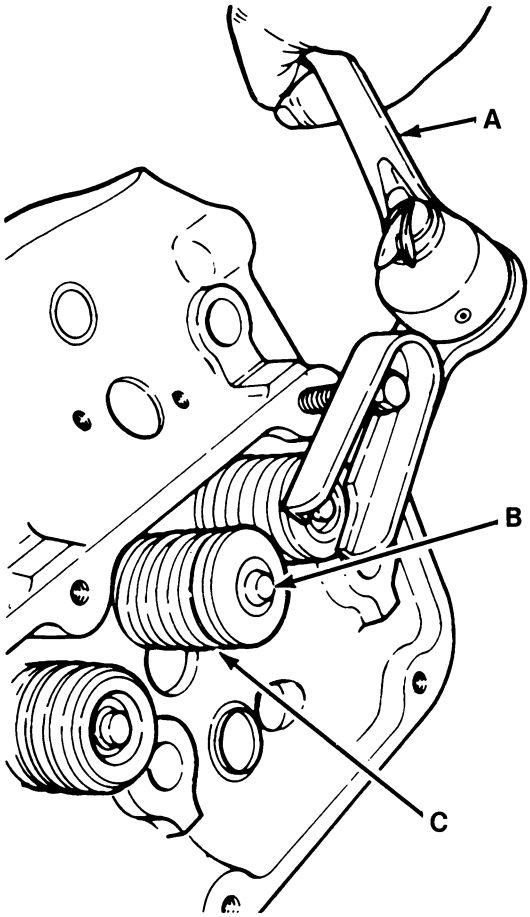
21. Straighten the lock tabs on the attaching bolts, remove the bolts. Remove the exhaust manifold and turbocharger as an assembly, Figure 1A-6.

22. Remove the push rods and place in a numbered rack.

23. Remove the remaining cylinder head bolts and washers working inwards from the ends toward the center of the head.

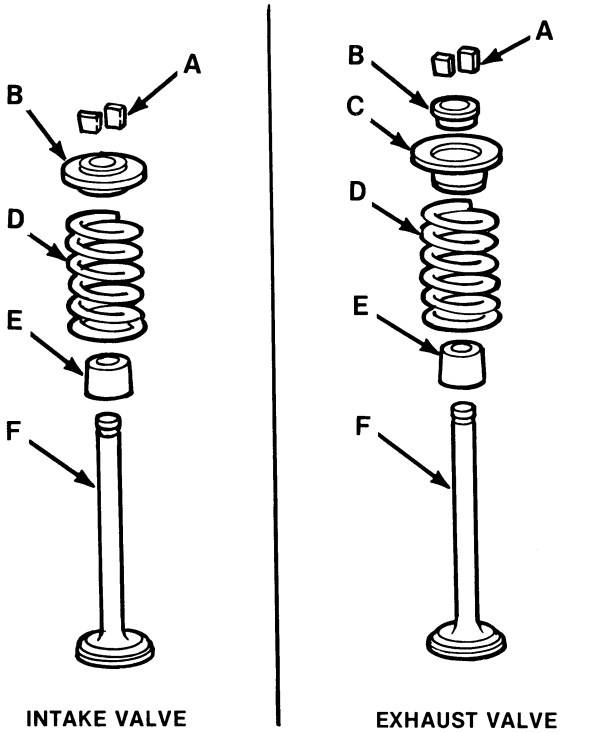
24. Attach a suitable lifting device to the cylinder head lifting brackets. Lift the cylinder head assembly from the tractor. If necessary, use the pads provided to pry the cylinder head from the block. Take care not to damage the block or head.

25. Remove the retaining bolts and the thermostat housing from the cylinder head.



Valve Removal **Figure 1A-7**

A Valve spring compressor
B Retainer locks
C Spring



INTAKE VALVE EXHAUST VALVE

Valve Components **Figure 1A-8**

A Retainer locks
B Retainer
C Rotator (exhaust valve only)
D Spring
E Seal
F Valve

CYLINDER HEAD — DISASSEMBLY

1. Clean the head of all gasket material and remove the carbon from around the valve heads.

2. Using a valve spring compressor, A, Figure 1A-7, remove the retainer locks, B, spring retainers/rotators, springs, and seals from each valve. See Figure 1A-8 for valve assembly layout.

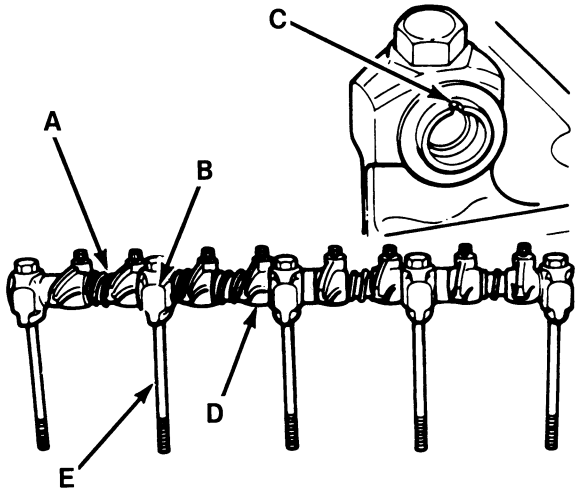
Rocker Arms and Shaft — Disassembly Refer to Figure 1A-9

1. Remove the bolts that attach the rocker arm shaft to the cylinder head.

2. Remove rocker arms, D, rocker arm shaft supports, B, and springs, A, from the shaft.

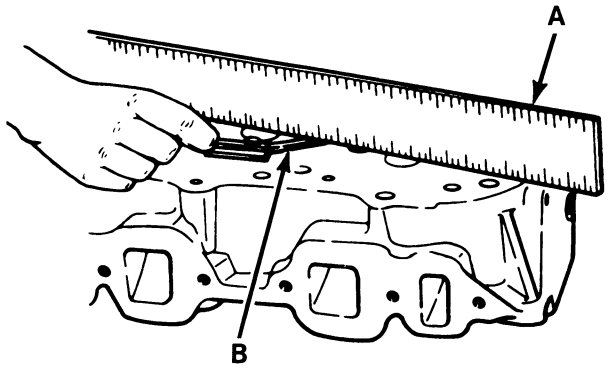
Assembly

1. Coat the rocker arm shaft with engine oil prior to assembly. Lubricate the valve pads on all rocker arms.



Rocker Shaft Components **Figure 1A-9**

A Spring
B Rocker arm shaft support
C Notch
D Rocker arm
E Retaining bolts



Measuring Cylinder Head Flatness **Figure 1A-10**
A Straight edge
B Feeler gauge

2. The rocker shaft has an identification groove at one end of the shaft. Position the mark upwards and use this end as the front of the shaft. The oil holes and grooves in the shaft should be facing down.

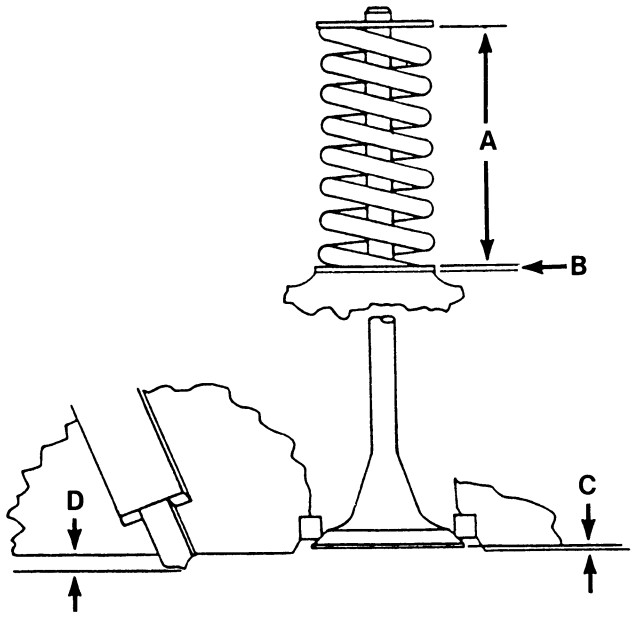
3. Start assembly from the rear of the shaft by first positioning a rocker arm support with the notch, C, on the support to the rear of the shaft.

CYLINDER HEAD — INSPECTION

Scrape all gasket surfaces clean. Wash the cylinder head in a suitable solvent and thoroughly dry with a lint free cloth or compressed air.

Inspect the cylinder head for cracks, nicks, or burrs and, if necessary, remove nicks and burrs from the gasket surfaces using a suitable abrasive. Be sure all traces of abrasive material are removed after repair.

With a straight edge, A, Figure 1A-10, and feeler gauge, B, check the flatness of the cylinder head. Specifications for flatness are 0.006″ (0.15 mm) maximum overall, or 0.003″ (0.08 mm) in any 6.0″ (153.00 mm). Also, the change in flatness must be gradual - not more than 0.001″ (0.025 mm) per 1″ (25.4 mm) of head length.



Valve Recession **Figure 1A-11**
A Installed spring height
B Shim (as required)
C Valve recession
D Injector protrusion

NOTE: If the face of the cylinder head does not meet the flatness specification it may be milled, provided that valve recession is at least 0.059 to 0.084 in. (1.50 to 2.13 mm), see Figure 1A-11. Injector nozzle protrusion must be 0.093 to 0.125 in. (2.4 to 3.2 mm). Maximum material removal from the cylinder head cannot exceed 0.020 in. (0.508 mm). Surface finish of the milled head must be between 60 and 150 micro inches.

Check to make sure that the milled head thickness, measured from the face of the head to the head bolt pad, is not less than 3.96″ (100.58 mm).

The valve spring must stand within 1/16″ of vertical, on both ends, on a flat surface.

If the valve seats must be reground to adjust recession, installed valve spring height may be greater than specified [1.71 to 1.77 in. (43.4 to 45.0 mm)] and should be adjusted with shim(s) (part #C5NE6A526A), as shown in Figure 1A-11.

After resurfacing a cylinder head, be sure the head bolts will not bottom in the cylinder block. Temporarily install the head without the head gasket. Install the head bolts until they are snug and check with a 0.010″ feeler gauge to ensure that there is no gap between the head of the bolt and the surface of the cylinder head.

Suggest:

If the above button click is invalid.

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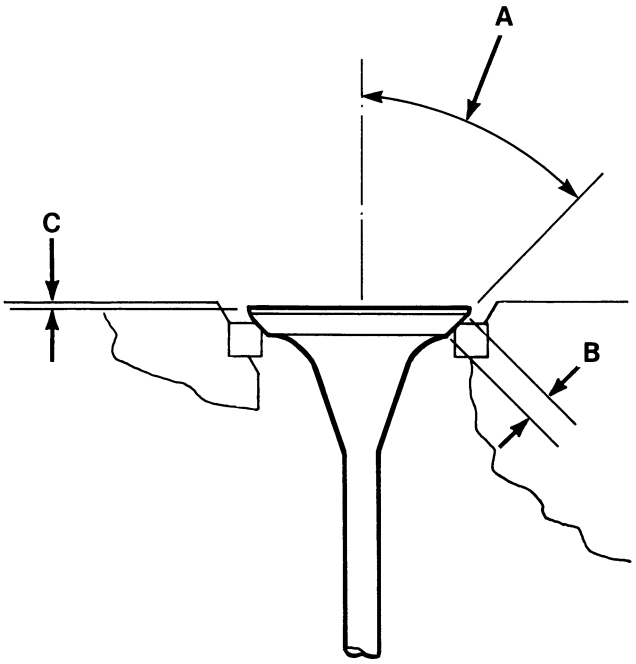
first, and then click the above link

to download the complete manual.

Thank you so much for reading



Valve Seat Dimensions **Figure 1A-12**

A Valve seat angle: 45°00′ - 45°30′ Exhaust 30°00′ 30°30′ inlet

B Valve seat width: Inlet 0.080-0.102 in. (2.032-2.590 mm) Exhaust 0.084-0.106 in. (2.133-2.692 mm)

C Valve head recession: Intake-0.059-0.084 in. (1.5-2.3 mm) Exhaust - 0.059-0.084 in. (1.5-2.3 mm)

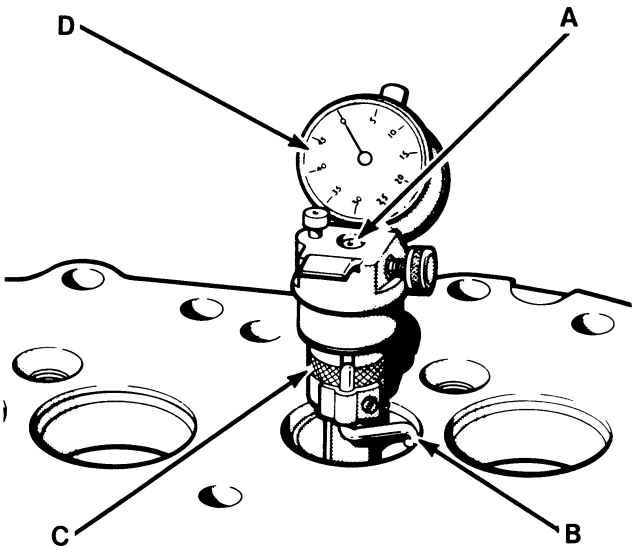
Valve Seats

1. Examine the valve seat inserts and reface if pitted, but renew if loose or damaged. If necessary, install an oversize insert by machining the seat counterbore in the cylinder head. See "Specifications" in this section. The insert must be chilled in dry-ice prior to installation.

   NOTE: Valve seat inserts of 0.010 in. (0.25 mm) and 0.020 in. (0.5 mm) oversize on diameter are sometimes installed in cylinder heads in production. Heads fitted with oversize inserts are stamped $^{SO10}_{OS}$ or $^{SO20}_{OS}$ on the exhaust manifold side in line with the valve seat concerned.

2. When replacing exhaust valve seat inserts be sure the replacement inserts are of the correct type as the size and material specification varies for the different engine types.

3. Check the width of the valve seat inserts and, if necessary, reface by grinding to the dimensions shown in Figure 1A-12.



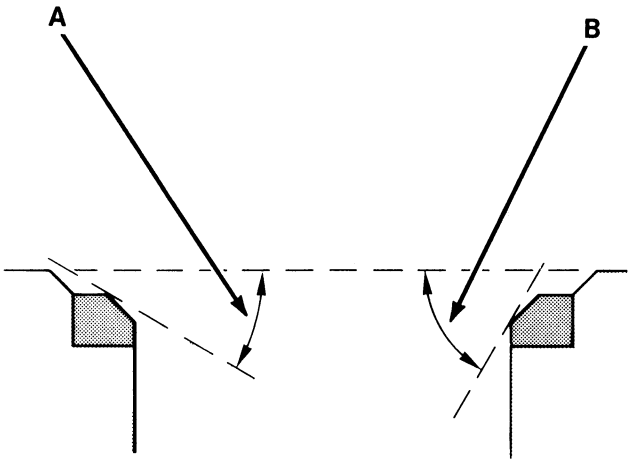
Valve Seat Concentricity **Figure 1A-13**

A Gauge pilot

B Pointer to ride on valve seat face

C Sleeve for rotating pointer

D Dial gauge



Raising/Lowering Valve Seats **Figure 1A-14**

A Use 30° or 15° grinding wheel for lowering the seat

B Use 60° or 45° grinding wheel for raising the seat

4. Measure the concentricity of the valve seat with a suitable gauge, as shown in Figure 1A-13. If the valve seat runout exceeds the specified figure, reface the seat.

5. Using a seat cutter with the correct angle, refer to Figure 1A-14 and "Specifications" in this section, remove only enough stock from the seat to clean up the pits and grooves, or to correct the seat eccentricity. After refacing, the seat width must be within the specified limit.