8160, 8260, 8360, 8560 TRACTOR REPAIR MANUAL CONTENTS

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CHAPTER 1
INTRODUCTION

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FOREWORD

Appropriate service methods and correct repair procedures are essential for the safe, reliable operation of all equipment, as well as the personal safety of the individual performing the repair.

This Service Manual provides troubleshooting, overhaul, and pressure-testing instructions using recommended procedures and equipment. Following these instructions will ensure the safe, efficient, and timely completion of the service or repair.

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 their personal safety, the safety of others, and the integrity of the machine will not be compromised by the choice of methods, tools or parts.

The manual is divided into sections which are subdivided into chapters. Each chapter contains information on general operating principles, detailed inspection, overhaul and, where applicable, specific troubleshooting, special tools, and specifications.

Any reference in this manual to right, left, rear, front, top, or bottom is as viewed from the operator's seat, looking forward.

All data and illustrations in this manual are subject to variations in build specification. This information was correct at the time of issue, but New Holland policy is one of continuous improvement, and the right to change specifications, equipment, or design at any time, without notice, is reserved.

PRECAUTIONARY STATEMENTS

PERSONAL SAFETY

Throughout this manual and on machine decals, you will find precautionary statements ("CAUTION", "WARNING", and "DANGER") followed by specific instructions. These precautions are intended for the personal safety of you and those working with you. Please take the time to read them.

CAUTION: THE WORD "CAUTION" IS USED WHERE A SAFE BEHAVIORAL PRACTICE ACCORDING TO OPERATING AND MAINTENANCE INSTRUCTIONS AND COMMON SAFETY PRACTICES WILL PROTECT THE OPERATOR AND OTHERS FROM ACCIDENT INVOLVEMENT.

WARNING: THE WORD "WARNING" DENOTES A POTENTIAL OR HIDDEN HAZARD WHICH HAS A POTENTIAL FOR SERIOUS INJURY. IT IS USED TO WARN OPERATORS AND OTHERS TO EXERCISE EVERY APPROPRIATE MEANS TO AVOID A SURPRISE INVOLVEMENT WITH MACHINERY.

DANGER: THE WORD "DANGER" DENOTES A FORBIDDEN PRACTICE IN CONNECTION WITH A SERIOUS HAZARD.

FAILURE TO FOLLOW THE "CAUTION", "WARNING", AND "DANGER" INSTRUCTIONS MAY RESULT IN SERIOUS BODILY INJURY OR DEATH.

MACHINE SAFETY

Additional precautionary statements ("ATTENTION" and "IMPORTANT") are followed by specific instructions. These statements are intended for machine safety.

ATTENTION: The word "ATTENTION" is used to warn the operator of potential machine damage if a certain procedure is not followed.

IMPORTANT: The word "IMPORTANT" is used to inform the reader of something he needs to know to prevent minor machine damage if a certain procedure is not followed.

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 that tractor. 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 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 length of time used oil stays on your 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, 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.

Lifting 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 mineral spirit and kerosene 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.

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 Devices

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 raised implement.

Compressed Air

The pressure from a compressed-air line often exceeds 100 PSI (690 kPa). It is perfectly safe if used correctly. Any misuse may cause injury.

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

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.

When removing or replacing hardened pins, use a copper or brass drift rather than a hammer.

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

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 - particularly portable appliances - make a visual check to make sure that the wiring 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 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 tripping over or slipping 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 tractor 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 become infected within a short time. Seek medical aid immediately.

Cleanliness

Cleanliness of the tractor 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

Stop the engine, if at all possible, before performing any service.

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.

Do not attempt to start the engine while standing beside the tractor or attempt to bypass the safety 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.

Never work beneath a tractor which is on soft ground. Always take the unit to an area which has a hard working surface, preferably concrete.

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

Certain repair or overhaul procedures may necessitate separating the tractor, either at the engine/transmission or transmission/rear axle location. These operations are simplified by the use of the Tractor Splitting Stands. Should this equipment not be available, every consideration must be given to stability, balance and weight of the components, especially if a cab is installed.

Use footsteps or working platforms when servicing those areas of a tractor that are not within easy reach.

Before loosening any hoses or tubes connecting implements to remote control valves, etc., switch off the engine, remove all pressure in the lines by operating levers several times. This will remove the danger of personal injury by oil pressure.

Prior to pressure testing, make sure all hoses and connectors of the tractor and the test equipment are in good condition and tightly sealed. Pressure readings must be taken with the 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 HYDRAULIC/DIESEL FLUID 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 LINES.

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

Use "position control" when equipment or implements are required to be attached to the hydraulic linkage either for testing purposes or for transportation.

Always lower equipment to the ground when leaving the tractor.

If high lift attachments are installed on a tractor, beware of overhead power, electric or telephone cables when traveling. Drop the attachment near to ground level to increase stability and minimize risks.

Do not park or attempt to service a tractor on an incline. If unavoidable, take extra care and block all wheels.

Observe recommended precautions as indicated in this Service Manual when dismantling the air-conditioning system as escaping refrigerant can cause frostbite.

Prior to removing wheels and tires from a tractor, check to determine whether additional ballast (liquid or weights) has been added. Seek assistance and use suitable equipment to support the weight of the wheel assembly.

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

SECTION 1

ENGINES

CHAPTER 1

ENGINE

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DIESEL ENGINE – DESCRIPTION AND OPERATION

The engines are 6 cylinder and available in naturally aspirated and turbocharged forms.

All engines feature cross flow cylinder heads, with the inlet and exhaust manifolds on opposite sides of the cylinder head. The fuel and air combustion process, takes place in the specially designed bowl in the crown of the pistons.

CYLINDER HEAD ASSEMBLY

The cylinder head incorporates valves and springs, with the valve rocker arm shaft assembly bolted to the cylinder block through the cylinder head. Cylinder head retaining bolts are evenly spaced with a six point pattern around each cylinder, this ensures an even clamping load across the cylinder head area.

The intake and exhaust manifolds are bolted to the head, the intake manifold is mounted on the right hand side of the engine, with the diesel injectors mounted outside the rocker cover. The exhaust manifold is mounted on the left hand side of the engine. Water outlet connections and thermostat being attached to the front of the cylinder block directly behind the radiator.

Valve guides are integral in the cylinder head, and valves with oversize stems are available in service. Special replaceable cast alloy valve seats are pressed into each valve port during manufacture, with oversize valve seats also available in service.

All valves are fitted with positive valve rotators, with both Intake and exhaust valves using umbrella type oil seals. Valve clearance is maintained by adjustment of the self locking adjusting screw, mounted in each of the rocker arms.

CAMSHAFT ASSEMBLY

The camshaft runs in 5 replaceable bearings. The camshaft drive gear is in mesh with and driven by the camshaft idler gear which is driven by the crankshaft timing gear.

Camshaft end thrust is controlled by a thrust plate bolted to the block, and located between the camshaft gear and the front camshaft journal.

A helical gear is mounted on the rear of the camshaft, and drives the engine oil lubrication pump mounted forward of the flywheel.

CRANKSHAFT ASSEMBLY

The crankshaft is supported in the cylinder block by 7 main bearings.
The crankshaft is manufactured from steel with machined finished crank webs
End thrust is controlled by a thrust bearing incorporated in the center main bearing of the crankshaft.

An external damper is fitted to the crankshaft pulley to ensure smooth running operation. Front and rear crankshaft oil sealing is effected by one piece seals that are designed for long and durable service life.

CONNECTING RODS

Connecting rods "Teepee" (wedge) shaped at the small end have been designed to reduce the reciprocating weight at the piston end. The connecting rods are of a heavy beam construction and are assembled as a matched set to each engine, attached to the crankshaft, by means of insert–type bearings.

They are retained in position by the connecting rod big end cap and secured by two bolts per rod. The small end of the connecting rod is fitted with a replaceable bronze bushing, through which the free floating piston pin is fitted. The steel pin being held in place within the piston by two snap rings.

PISTONS

Pistons are constructed of an aluminum silicon alloy with an iron insert for the top ring. The combustion chamber being recessed into the piston crowns.
Each piston has two compression rings and one oil control ring, to reduce friction and increase positive sealing. All rings are located above the piston pin.

MANIFOLDS

The cross flow design aluminum intake, and cast iron exhaust manifolds, are on opposite sides of the cylinder head. This is designed to maintain balanced heat distribution within the cylinder head. The configuration of the manifolds also ensures minimum heat transfer to the intake manifold.

The intake manifold is connected through tubing to the air cleaner and at the inlet of the manifold a tapped hole is provided for installation of a thermostart cold starting aid.

NOTE: *On tractors where cold start equipment is not installed ensure the plug in the intake manifold is kept tight at all times. Considerable damage to the cylinder bores, may be incurred by entry of grit or other foreign material if the plug is left loose or missing. Also dirt and grit may be drawn through the air cleaner connections if they are not properly secured.*

CYLINDER BLOCK ASSEMBLY

The cylinder block is an alloy cast iron with deep cylinder skirts, and water jackets for cooling the cylinders. The cylinder bores are machined integral with the cylinder block, during the manufacturing process.

Cylinders are in line and vertical and numbered from 1 to 6 from the front to the rear of the engine. They can be bored oversize for the fitment of sleeves, which are available in service.

The oil pan which is attached to the bottom of the cylinder block, is the reservoir for the engine oil lubrication system. A cast iron engine front cover and front plate is attached to the front of the engine and covers all of the timing gear assembly.

TIMING GEARS

The crankshaft timing gear is heated and press fitted on to the front of the crankshaft, to a high degree of accuracy during manufacturing. This enables precise timing being maintained during the life of the engine. The crankshaft gear drives the camshaft idler gear which is attached to the front of the cylinder block. The idler gear then drives the camshaft and the injection pump via meshing helical gears.
The camshaft gear is bolted to the front of the camshaft, and is keyed to maintain position of the gear on the camshaft.

LUBRICATION SYSTEM

Lubrication of the engine, Figure 1-1-1, is maintained by a rotor type oil pump mounted in the rear of the engine block, forward of the flywheel on the left hand side of the engine. The oil pump is driven from the rear of the camshaft and draws oil from the engine oil pan through a tube and screen assembly.

A spring loaded relief valve is integral with the oil filter body mounted on the left hand side of the engine block, and prevents over pressurization of the system.

A spin on type oil filter is mounted externally to its support housing, on the left hand side of the engine. Oil flows from the filter to the main oil gallery, which runs the length of the cylinder block, which also intersects the camshaft follower chamber.

The main gallery also supplies oil to the crankshaft main bearings and connecting rods both big and small ends. The underside of the pistons and pins, are lubricated by oil pressure jets mounted adjacent to each main journal housing.

The camshaft drive gear bushing is pressure lubricated through a drilled passage from the front main bearing. The gear has small oil passages machined on both sides allowing excess oil to escape.

Timing gears are lubricated by splashed oil from the cam follower chamber, and the pressure lubricated camshaft drive gear bushing.

An intermittent flow of oil is directed to the valve rocker arm shaft assembly via a drilled passage in the cylinder block. This is located vertically above No.1 camshaft bearing, and aligns to a hole in the cylinder head. The rotation of the camshaft allows a controlled intermediate flow of lubrication.

The turbocharger where fitted, is supplied with oil from the oil filter support housing, mounted on the left hand side of the engine.

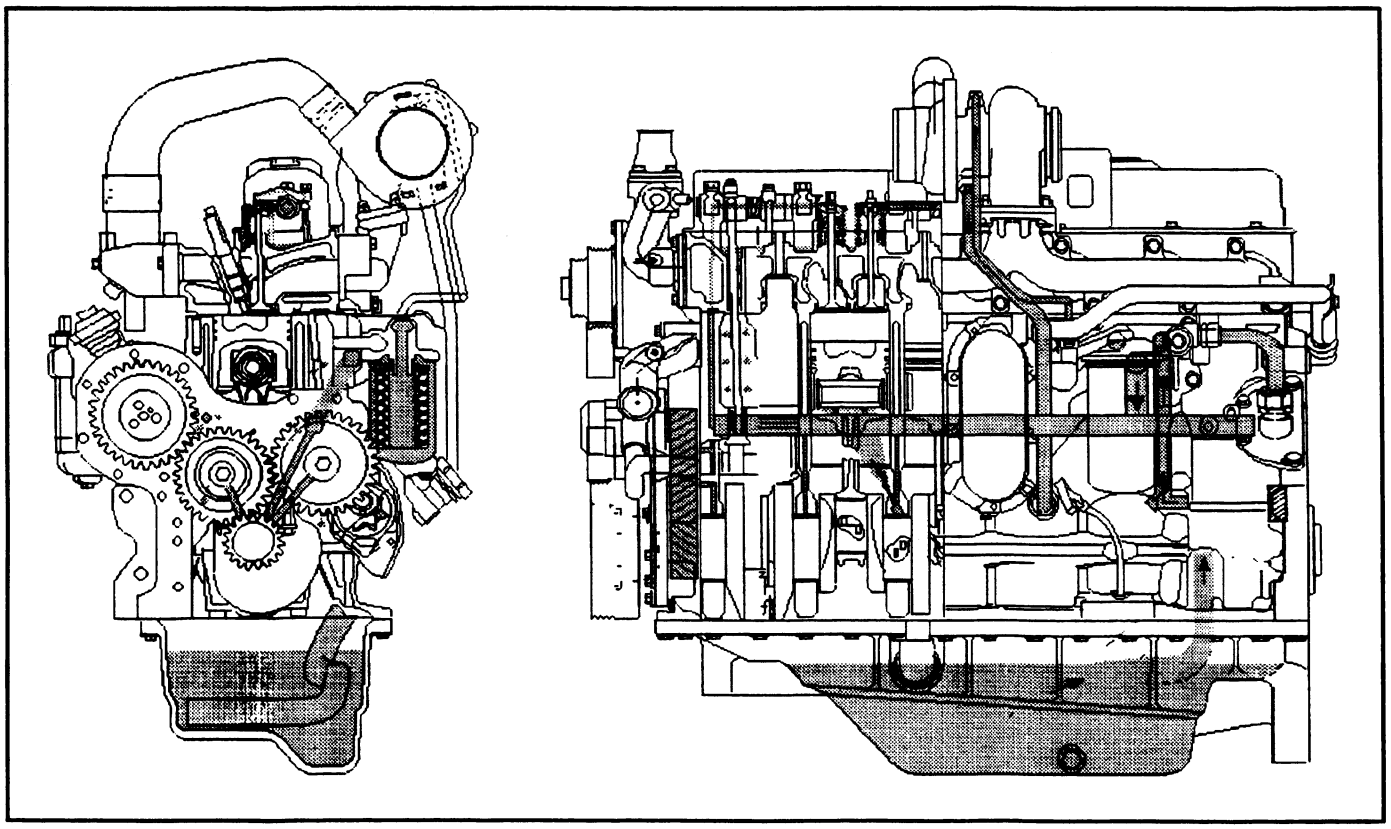


Figure 1-1-1

Engine Lubrication System With Turbocharger Fitted

COOLING SYSTEM

The function of the water pump mounted at the front of the engine, is to maintain a continuous flow of water around the cooling system. This is essential to ensure correct engine temperature, and performance, during vehicle operation.

The pump is driven by a "Poly V" Belt from the crankshaft pulley, when the engine is running. The fan belt tension is maintained by a spring loaded belt tensioner, bolted to the front cover of the engine.

The cooling system for the new generation of engines, is of the recirculating by–pass type with full length water jackets for each cylinder. The coolant is drawn from the bottom tank of the radiator by the water pump, which passes the coolant to the cylinder block. This coolant then flows through cored passages to cool the cylinder walls.

Passages in the cylinder head gasket allow coolant to flow from the cylinder block, into the cylinder head. Cored passages also conduct the coolant to the fuel injector nozzle locations, before re–entering the water pump below the thermostat.

The thermostat is located in the top of the water pump body, and controls the flow of the water as required by temperature changes.

NOTE: *A faulty thermostat may cause the engine to operate at too high (hot), or Low (cold) an operating temperature. If not replaced this could result in a damaged engine, or impaired engine performance.*

When the thermostat is closed a recirculating by–pass is provided to allow the coolant to recirculate from the head to the block to effect a faster warm–up.

Once the engine has reached its normal operating temperature, the thermostat will open and allow water to be drawn through the radiator by the pump action. Cooled water then returns to the engine system.

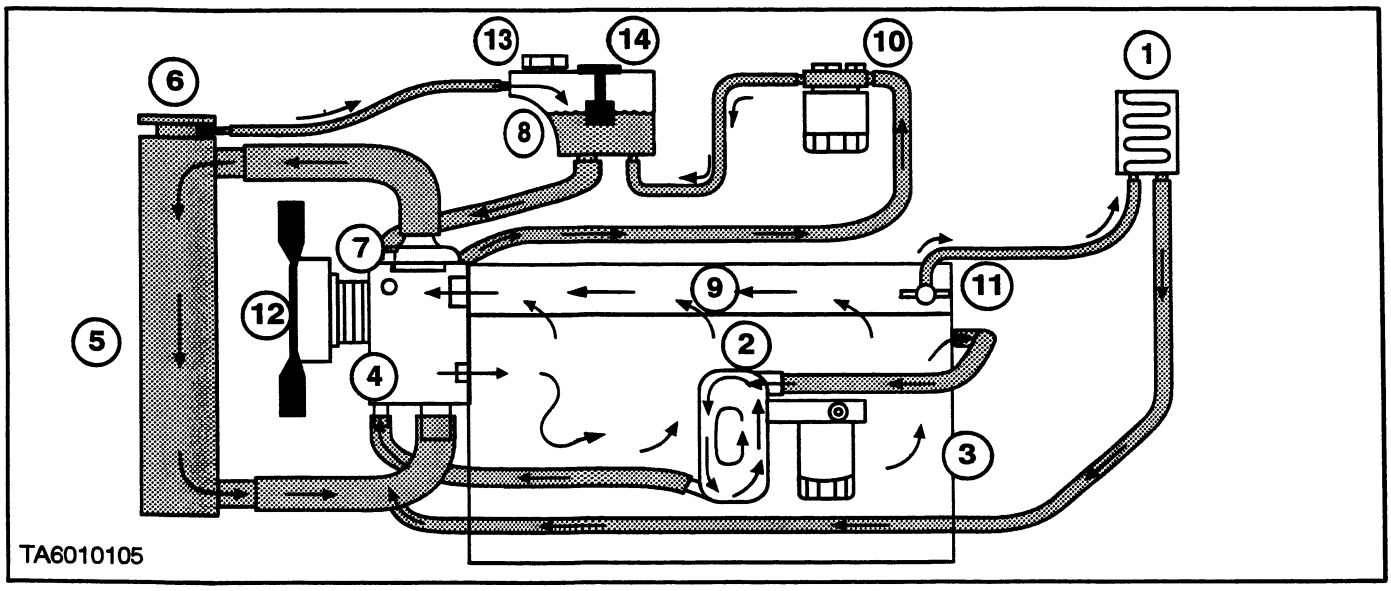


Figure 1-1-2

Cooling System

1. Cab Heater Core
2. Engine Oil Cooler (Turbo Engines)
3. Engine Block
4. Water Pump
5. Radiator
6. Radiator Blanking Cap
7. Thermostat
8. Header Tank
9. Cylinder Head
10. Water Filter
11. Cab Heater Tap
12. Fan and Viscous Unit
13. System Pressure Cap
14. Cold Coolant Level sender

Cooling occurs as the coolant passes down through the radiator cores, which are exposed to the air as it is drawn through the radiator by the fan.

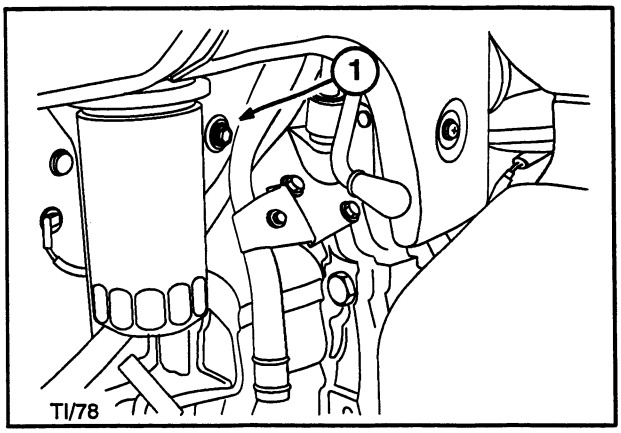


Figure 1-1-3

NOTE: *Do not operate an engine without a thermostat. It is recommended that a solution of a 50% clean water, and 50% antifreeze is used. A replaceable coolant filter/ conditioner is installed on the tractor and contains a conditioner in the form of a paste. No additional inhibitor is required.*

The cooling system incorporates a drain plug (1), Figure 1-1-3, on the left hand side of the cylinder block. The system pressure cap is located on the header tank. The cap on the radiator is a blanking cap and should not be removed unless refilling the system from empty. Normal topping up should occur at the header tank.

The engine cooling fan is mounted on a viscous drive hub (1), Figure 1-1-4, which is belt driven from the crankshaft. The viscous drive allows the fan to operate only when required by the cooling system permitting a faster engine warm up, reduced parasitic power loss when the fan is not engaged and reduced noise levels.

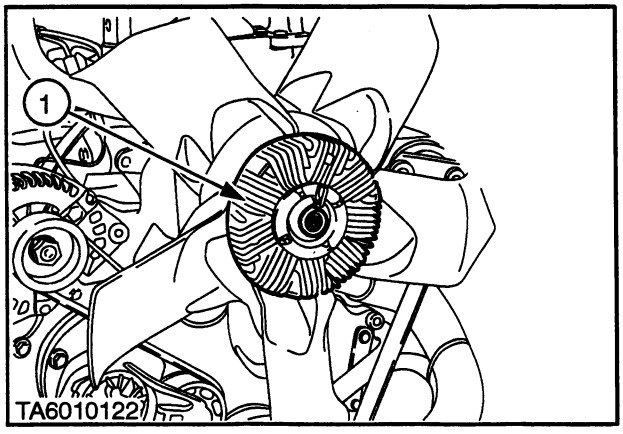


Figure 1-1-4

Figure 1-1-5 – A, Cool air from radiator, fan idling
Figure 1-1-6 – B, Hot air from radiator, fan driving

Air temperature behind the radiator is sensed by a Bi–metallic coil (4), Figure 1-1-6, located in the center of the fan hub face. As the temperature increases the coil gradually opens a valve (5), Figure 1-1-6, within the hub (3), Figure 1-1-6, which allows a modulated flow of viscous fluid (3), Figure 1-1-5, to pass from an integral reservoir (2), Figure 1-1-5, to the drive area, due to centrifugal force, providing a gradual take up of fan drive.

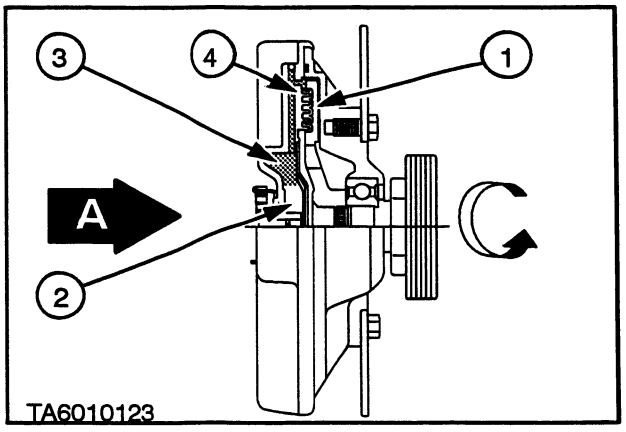


Figure 1-1-5

Within the drive area are two sets of interlocking annular fins, one set on the drive member (1), Figure 1-1-5, and the other on the free–wheeling hub body (4), Figure 1-1-5, to which the fan blade assembly (2), Figure 1-1-6, is attached. Viscous liquid passes between the interlocking blades and the resulting drag transmits torque to the fan. The fluid is then recirculated to the reservoir by a pump plate (6), Figure 1-1-6, incorporated in the drive member (1), Figure 1-1-6.

When the air temperature behind the radiator drops sufficiently, the Bi–metallic coil closes the valve preventing fluid from entering the drive area and the fan hub is allowed to idle with respect to the drive member.

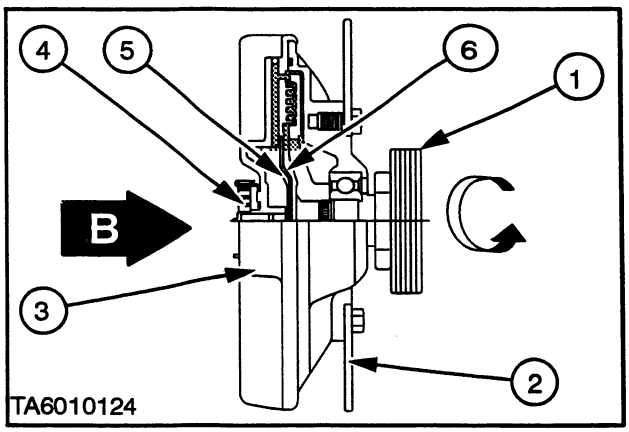
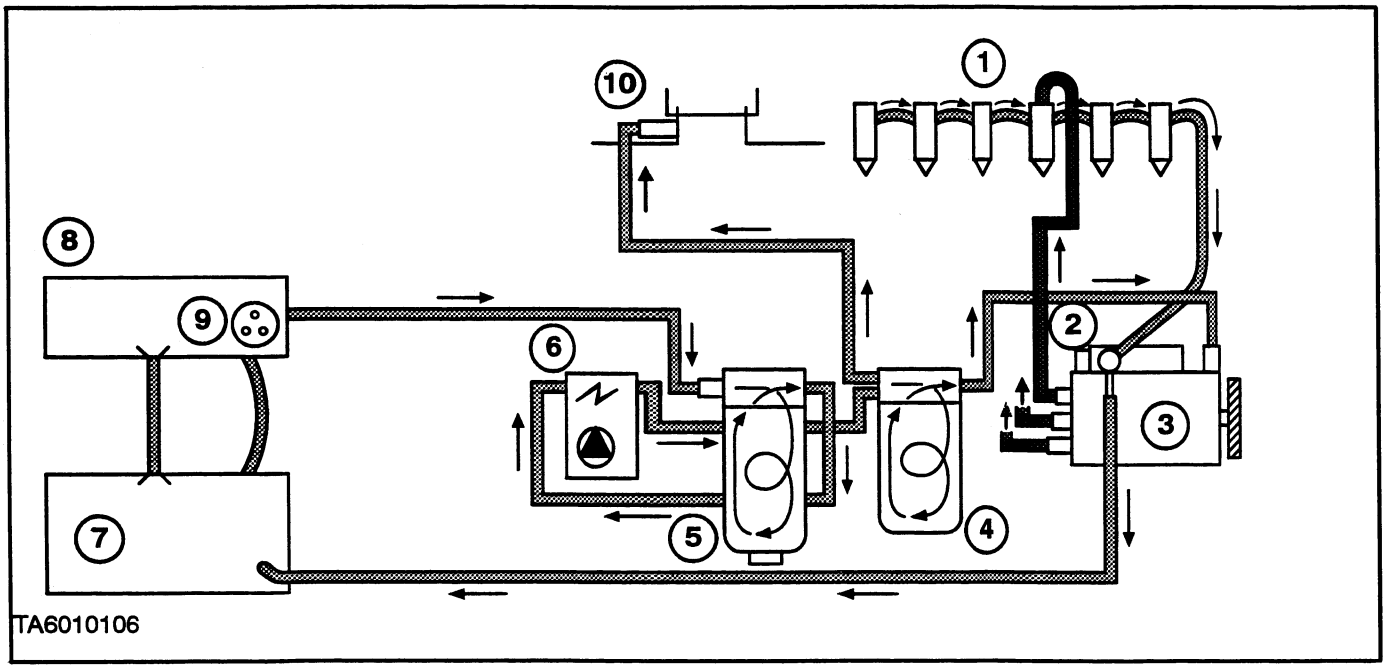


Figure 1-1-6

FUEL SYSTEM



Fuel System

Figure 1-1-7

1. Injectors
2. Shut–off Solenoid
3. Fuel Injection Pump
4. Fuel Filter
5. Fuel sedimenter
6. Electric Lift Pump
7. Right Hand Fuel Tank
8. Left Hand Fuel Tank
9. Fuel Gauge Sender Unit
10. Thermostart

The diesel fuel system consists of fuel tank, fuel sedimenter, electric lift pump, fuel filter, BOSCH VE distributor type fuel injection pump, fuel injectors, and interconnecting tubes and lines, Figure 1-1-7.

The fuel injection pump is pressure fed from an electric lift pump. Fuel flows from the fuel tank to the sediment separator, through the electric lift pump and then through the fuel filter. From the filter the fuel passes to the transfer pump which is an integral part of the fuel injection pump.

The transfer pump delivers fuel to the injection pump to supply fuel at high pressure to each injector and also provides extra fuel which lubricates and cools the injection pump.

This extra fuel is recirculated, via a fitting on the fuel injection pump governor control housing to the fuel tank, by means of the injector leak off line.

On all models excess fuel that leaks past the needle valve of the injectors is directed back into the fuel tank, by means of the injection leak off line.

Fuel Shut Off (Injection Pump)

All fuel injection pumps are equipped with an electrically operated fuel shut off solenoid.

The fuel shut off solenoid is energized by operation of the ignition switch mounted in the instrument panel.

With the ignition switched "OFF" a spring loaded plunger in the solenoid (held in position by the spring tension), prevents fuel flowing into the pump from the main fuel feed port.

With the ignition switched "ON" the magnetized plunger is energized by an internal coil and is drawn up into the body of the solenoid. Fuel is then allowed to flow through the open port into the pump.

Fuel Sedimenter

The sedimenter, Figure 1-1-8 is positioned between the fuel tank, and the electric lift pump, on the right hand side of the engine. The fuel enters the sedimenter and flows into the head, to be directed down, and around the edges of the sediment separator cone.

The larger particles of dirt and water (which are heavier than fuel oil), are separated out and sink to the collecting bowl which can be removed and cleaned. The clean fuel is then drawn back through the top of the unit by the electric lift pump and on to the fuel filter.

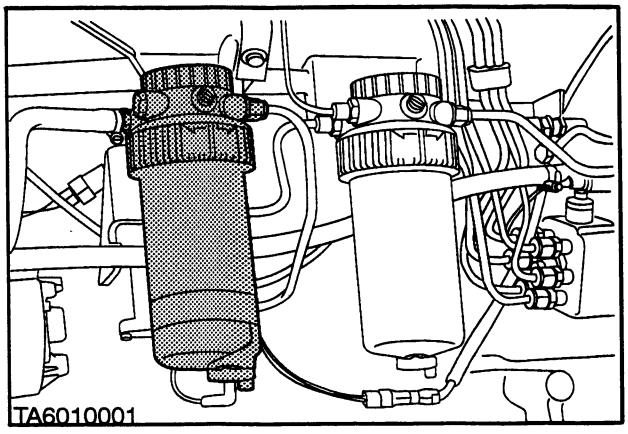


Figure 1-1-8

Electric Lift Pump

An electric fuel pump is fitted to all models. Located behind the sedimenter, (1) Figure 1-1-9, the pump draws fuel from the tank, via the sedimenter and passes fuel under pressure to the filter and onto the fuel injection pump.

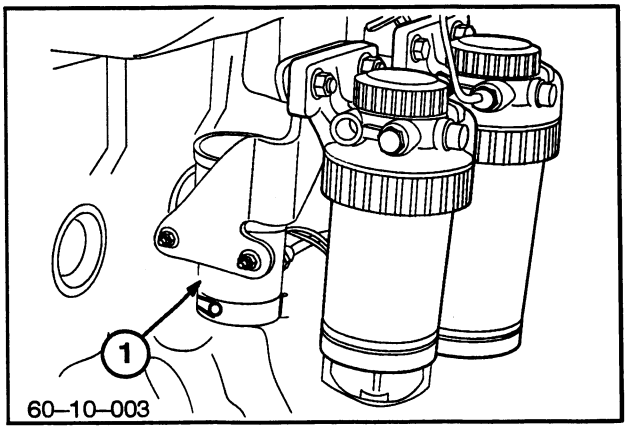


Figure 1-1-9

Fuel Filter

The fuel filter situated to the right hand side of the engine, close to the sedimenter, receives the clean fuel from the electric pump. From the filter head the fuel is directed down, through the filter paper and into the base chamber, Figure 1-1-10.

The filtered fuel then flows up the center tube of the element to the filter head outlet, and into the injection pump.

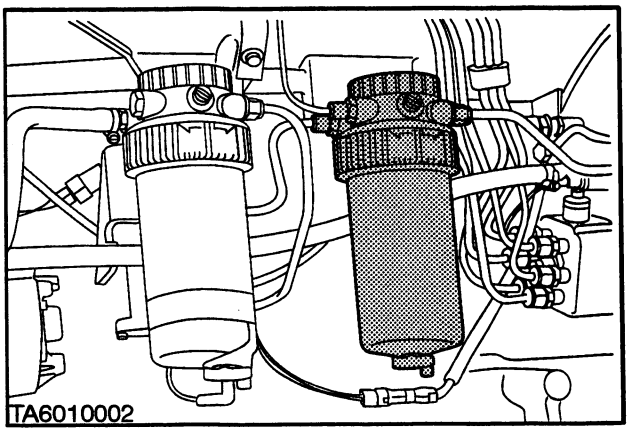


Figure 1-1-10

Thermostart

To aid engine starting in cold weather conditions, a thermostart is standard on all models, Figure 1-1-11.

The thermostart is screwed into the inlet of the intake manifold. A fuel line connects the thermostart to the fuel filter head and the electrical terminal is connected to the ignition switch via the electronic management unit which controls the duration of thermostart operation.

When electrical current is applied, by operating the ignition switch, the heater coil is energized.

As the coil heats up a check valve opens which allows fuel to flow over the hot coil. The fuel is ignited by the coil producing a flame in the manifold which heats the intake air prior to it entering the combustion chamber.

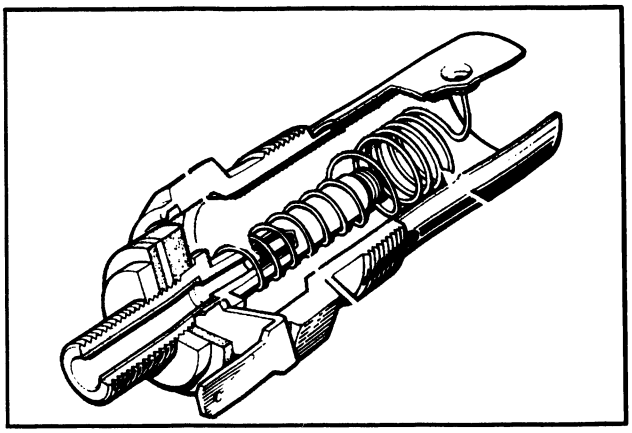


Figure 1-1-11

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DIESEL ENGINE STRIPDOWN

In the following procedures and illustrations the engine 'n the main is shown removed from the tractor.

However there are certain operations that can be performed with the engine still in the tractor, or separated at the connection to the front axle support, or separated from the transmission housing.

The engine overhaul procedure initially describes the assembly process for rebuilding an engine using all new components. Following this section are defined headings which describe detailed repair specifications and procedures, where components are suitable for re–use. Refer to the specifications section to ensure components are serviceable.

Where overhaul of components is required without engine being removed from the tractor refer to the following headings, and the relevant paragraphs, in the main overhaul procedure.

Operations or repairs that can be performed with the engine still in the tractor.

1. Cylinder head and associated inlet and exhaust components.
2. Fuel injection pump and related parts.
3. Water pump, thermostat, and associated components.
4. Oil pump relief valve.
5. Turbocharger.
6. Front timing cover/timing gear removal.
7. Front pulley and damper assembly.

Operations or repairs that can be performed with the engine separated from the front axle

1. Oil pan removal for access to oil pan gasket, crankshaft, bearing shells, piston removal, and oil pump suction tubing.

Operations or repairs that can be performed with the engine separated from the transmission housing, and with oil pan removed

1. Crankshaft rear oil seal and carrier removal, (with oil pan removed).
2. Oil pump and drive gear removal.

Dismantle the engine following conventional techniques, or by referring to the following removal procedure. Referring to the specification section as necessary.

NOTE: *All gaskets, seals, and 'O' rings must be replaced with new upon re–assembly. Where new sealant is to be applied refer to "Engine Specifications".*