

Product: Case 580SR,590SR,695SM,695SR Backhoe Loaders Service Repair Workshop Manual
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Backhoe Loader

580SR-590SR-695SM-695SR

Service Manual

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NOTE: CASE Company reserves the right to make changes in the specification and design of the machine without prior notice and without incurring any obligation to modify units previously sold.

The description of the models shown in this manual has been made in accordance with the technical specifications known as of the date of design of this document.

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January 2005

COMPANY POLICY

Company policy, which is one of continuous improvement, reserves the right to make changes in design and specification at any time without notice and without obligation to modify units previously built.

All data given in this book is subject to production variations. Dimensions and weights are approximate only and the illustrations do not necessarily show tractors in standard condition. For exact information about any particular machine please consult your Dealer.

PARTS AND ACCESSORIES

Genuine parts and accessories have been specifically designed for these machines.

We would like to point out that “non-genuine” parts and accessories have NOT been examined and released by the Company. The installation and or use of such products could have negative effects upon the design characteristics of your machine and thereby affect its safety. The Company is not liable for any damage caused by the use of “non-genuine” parts and accessories.

MODEL CODES

The complete range of Backhoe Loaders described in this manual are identified below :

| | EUR | | | | | | | NA | | | |
|-----------------------------------|------------|------------|-------------|--------------------|-----------|-----------|-----------|------------|------------|-------------|--------------------|
| | LB 90.B | LB 95.B | LB 110.B | LB 115.B 4WS | 580 SR | 590 SR | 695 SM | LB 75.B | LB 90.B | LB 110.B | LB 115.B 4WS |
| | | | | | | | 695 SR | | LB 95.B | | |
| Moteur 95HP FAGE0454C | X | X | | | X | | | X | | | |
| Moteur 110HP FAGE0484G | | | X | X | | X | X | | X | X | X |
| PowerShuttle | X | X | X | | X | X | | X | X | X | |
| PowerShift | | | X | X | X | X | X | | | X | X |
| Cab | X | X | X | X | | | X | X | X | X | X |
| Euro. cab | | | X | X | X | X | X | | | | |
| ROPS | X | | | | X | | | X | X | X | |
| Central Pivot | | | X | X | | | X | X | X | X | X |
| Side Shift | X | X | X | X | X | X | X | | | | |
| 2 WD | | | | | X | | | X | | | |
| 4 WD | X | X | X | X | X | X | X | X | X | X | X |
| 4 WS | | | | X | | | X | | | | X |
| Mechanical control | X | X | X | X | X | X | X | X | X | X | X |
| Pilot control | X | X | X | X | X | X | X | X | X | X | X |

The vehicles listed above may not be available in all countries or markets, therefore for the latest information consult your local authorised dealer.

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SECTION 00 - MAINTENANCE

Chapter 1 - General Instructions

IMPORTANT NOTICE

All maintenance and repair operations described in this manual should be carried out exclusively by authorised workshops. All instructions detailed should be carefully observed and special equipment indicated should be used if necessary.

Everyone who carries out service operations described without carefully observing these prescriptions will be directly responsible of deriving damages.

SHIMMING

At each adjustment, select adjusting shims, measure them individually using a micrometer and then sum up recorded values. Do not rely on measuring the whole shimming set, which may be incorrect, or on rated value indicated for each shim.

ROTATING SHAFT SEALS

To correctly install rotating shaft seals, observe the following instructions:

- Let the seal soak into the same oil as it will seal for at least half an hour before mounting;
- Thoroughly clean the shaft and ensure that the shaft working surface is not damaged;
- Place the sealing lip towards the fluid. In case of a hydrodynamic lip, consider the shaft rotation direction and orient grooves in order that they deviate the fluid towards the inner side of the seal;
- Coat the sealing lip with a thin layer of lubricant (oil rather than grease) and fill with grease the gap between the sealing lip and the dust lip of double lip seals;
- Insert the seal into its seat and press it down using a flat punch. Do not tap the seal with a hammer or a drift;
- Take care to insert the seal perpendicularly to its seat while you are pressing it. Once the seal is settled, ensure that it contacts the thrust element if required.;
- To prevent damaging the sealing lip against the shaft, place a suitable protection during installation.

'O' RINGS

Lubricate the 'O' rings before inserting them into their seats. This will prevent the 'O' rings from rolling over and twine during mounting which will jeopardise sealing.

SEALERS

Apply FLEXIBLE GASKET SEALANT 82995770 or a suitable equivalent, over the mating surfaces marked with an X.

Before applying the sealer, prepare the surface as follows:

- remove possible scales using a metal brush;
- thoroughly degrease the surfaces using DEGREASER 82995779, or a suitable equivalent.

BEARINGS

It is advisable to heat the bearings to 80 to 90°C before mounting them on their shafts and cool them down before inserting them into their seats with external tapping.

SPRING PINS

When mounting split socket spring pins, ensure that the pin notch is oriented in the direction of the effort to stress the pin.

Spiral spring pins should not be oriented during installation.

NOTES FOR SPARE PARTS

USE EXCLUSIVELY GENUINE SPARE PARTS

Only genuine parts guarantee same quality, life, safety as original components as they are the same as mounted in production.

Only the **genuine spare parts** can offer this guarantee.

All spare parts orders should be complete with the following data:

- Machine model (commercial name) and frame number;
- engine type and number;
- part number of the ordered part, which can be found on the "Microfiches" or the "Spare Parts Catalogue", which is the base for order processing.

NOTES FOR EQUIPMENT

Equipment which proposes and shows in this manual are as follows:

- studied and designed expressly for use on company machines;
- necessary to make a reliable repair;
- accurately built and strictly tested to offer efficient and long-lasting working means.
- we also remind the Repair Personnel that having these equipment means:
- work in optimal technical conditions;
- obtain best results;
- save time and effort;
- work more safely.

NOTICES

Wear limits indicated for some details should be intended as advised, but not binding values. The words "front", "rear", "right hand", and "left hand" referred to the different parts should be intended as seen from the operator's seat oriented to the normal sense of movement of the Machine.

HOW TO MOVE THE MACHINE WITH THE BATTERY REMOVED

Cables from the external power supply should be connected exclusively to the respective terminals of the Machine positive and negative cables using pliers in good condition which allow proper and steady contact.

Disconnect all services (lights, wind-shield wipers, etc.) before starting the Machine.

If it is necessary to check the Machine electrical system, check it only with the power supply connected. At check end, disconnect all services and switch the power supply off before disconnecting the cables.

SAFETY RULES

PAY ATTENTION TO THIS SYMBOL



This warning symbol points out important messages involving personal safety. Carefully read the safety rules contained herein and follow advised precautions to avoid potential hazards and safeguard your safety and personal integrity. In this manual you will find this symbol together with the following key-words:



WARNING (ATTENZIONE) - it gives warning about improper repair operations and deriving potential consequences affecting the service technician's personal safety.

DANGER (PERICOLO) - it gives specific warning about potential dangers for personal safety of the operator or other persons directly or indirectly involved.

TO PREVENT ACCIDENTS

Most accidents and personal injuries taking place in workshops are due from non-observance of some simple and essential prudential rule and safety precautions. For this reason, IN MOST CASES THEY CAN BE AVOIDED. It suffices to foresee possible causes and act consequently with necessary caution and care.

The possibility that an accident might occur with any type of machines should not be disregarded, no matter how well the machine in question was designed and built.

A wise and careful service technician is the best precautions against accidents.

Careful observance of this only basic precaution would be enough to avoid many severe accidents.

DANGER: Never carry out any cleaning, lubrication or maintenance operations when the engine is running.

SAFETY RULES

- Carefully follow specified repair and maintenance procedures.
- Do not wear rings, wristwatches, jewels, unbuttoned or flapping clothing such as ties, torn clothes, scarves, open jackets or shirts with open zips which could get hold into moving parts. We advise to use approved safety clothing such as anti-slipping footwear, gloves, safety goggles, helmets, etc.
- Never carry out any repair on the machine if someone is sitting on the operator's seat, except if they are certified operators to assist in the operation to be carried out.
- Never operate the machine or use attachments from a place other than sitting at the operator's seat.
- Never carry out any operation on the machine when the engine is running, except when specifically indicated.
- Stop the engine and ensure that all pressure is relieved from hydraulic circuits before removing caps, covers, valves, etc.
- All repair and maintenance operations should be carried out with the greatest care and attention.
- Service stairs and platforms used in a workshop or in the field should be built in compliance with the safety rules in force.
- Disconnect the batteries and label all controls to warn that the Machine is being serviced. Block the machine and all equipment which should be raised.
- Never check or fill fuel tanks and accumulator batteries, nor use starting liquid if you are smoking or near open flames as such fluids are flammable.
- Brakes are inoperative when they are manually released for maintenance purposes. In such cases, the machine should be kept constantly under control using blocks or similar devices.
- The fuel filling gun should remain always in contact with the filler neck. Maintain this contact until the fuel stops flowing into the tank to avoid possible sparks due to static electricity buildup.
- Use exclusively specified towing points for towing the Machine. Connect parts carefully. Ensure that foreseen pins and/or locks are steadily fixed before applying traction. Do not stop near towing bars, cables or chains working under load.
- To transfer a failed Machine, use a trailer or a low loading platform trolley if available.
- To load and unload the machine from the transportation mean, select a flat area providing a firm support to the trailer or truck wheels. Firmly tie the machine to the truck or trailer platform and block wheels as required by the forwarder.
- For electrical heaters, battery-chargers and similar equipment use exclusive auxiliary power supplies with a efficient ground to avoid electrical shock hazard.

- Always use lifting equipment and similar of appropriate capacity to lift or move heavy components.
- Pay special attention to bystanders.
- Never pour gasoline or diesel oil into open, wide and low containers.
- Never use gasoline, diesel oil or other flammable liquids as cleaning agents. Use non-flammable non-toxic proprietary solvents.
- Wear protection goggles with side guards when cleaning parts using compressed air.
- Do not exceed a pressure of 2.1 bar, in accordance with local regulations.
- Do not run the engine in a closed building without proper ventilation.
- Do not smoke, use open flames, cause sparks in the nearby area when filling fuel or handling highly flammable liquids.
- Do not use flames as light sources when working on a machine or checking for leaks.
- Move with caution when working under a Machine, and also on or near a Machine. Wear proper safety accessories: helmets, goggles and special footwear.
- During checks which should be carried out with the engine running, ask an assistant to seat at the operator's seat and keep the service technician under visual control at any moment.
- In case of operations outside the workshop, drive the Machine to a flat area and block it. If working on an incline cannot be avoided, first block the Machine carefully. Move it to a flat area as soon as possible with a certain extent of safety.
- Ruined or plied cables and chains are unreliable. Do not use them for lifting or trailing. Always handle them wearing gloves of proper thickness.
- Chains should always be safely fastened. Ensure that fastening device is strong enough to hold the load foreseen. No persons should stop near the fastening point, trailing chains or cables.
- The working area should be always kept CLEAN and DRY. Immediately clean any spillage of water or oil.
- Do not pile up grease or oil soaked rags, as they constitute a great fire hazard. Always place them into a metal container.
Before starting the Machine or its attachments, check, adjust and block the operator's seat. Also

ensure that there are no persons within the Machine or attachment operating range.

- Do not keep into your pockets any object which might fall unobserved into the Machine's inner compartments.
- Whenever there is the possibility of being reached by ejected metal parts or similar, use protection eye mask or goggles with side guards, helmets, special footwear and heavy gloves.
- Wear suitable protection such as tinted eye protection, helmets, special clothing, gloves and footwear whenever it is necessary to carry out welding procedures. All persons standing in the vicinity of the welding process should wear tinted eye protection. **NEVER LOOK AT THE WELDING ARC IF YOUR EYES ARE NOT SUITABLY PROTECTED.**
- Metal cables with the use get frayed. Always wear adequate protections (heavy gloves, eye protection, etc.)
- Handle all parts with the greatest caution. Keep your hands and fingers far from gaps, moving gears and similar. Always use approved protective equipment, such as eye protection, heavy gloves and protective footwear.

START UP

- Never run the engine in confined spaces which are not equipped with adequate ventilation for exhaust gas extraction.
- Never bring your head, body, arms, legs, feet, hands, fingers near fans or rotating belts.

ENGINE

- Always loosen the radiator cap very slowly before removing it to allow pressure in the system to dissipate. Coolant should be topped up only when the engine is stopped or idle if hot.
- Do not fill up fuel tank when the engine is running, mainly if it is hot, to avoid ignition of fires in case of fuel spilling.
- Never check or adjust the fan belt tension when the engine is running.
Never adjust the fuel injection pump when the Machine is moving.
- Never lubricate the Machine when the engine is running.

ELECTRICAL SYSTEMS

- If it is necessary to use auxiliary batteries, cables must be connected at both sides as follows: (+) to (+) and (-) to (-). Avoid short-circuiting the terminals. **GAS RELEASED FROM BATTERIES IS HIGHLY FLAMMABLE.** During charging, leave the battery compartment uncovered to improve ventilation. Avoid checking the battery charge by means of "jumpers" made by placing metallic objects across the terminals. Avoid sparks or flames near the battery area. Do not smoke to prevent explosion hazards.
- Prior to any service, check for fuel or coolant leaks. Remove these leaks before going on with the work.
- Do not charge batteries in confined spaces. Ensure that ventilation is appropriate to prevent accidental explosion hazard due to build-up of gasses relieved during charging.
- Always disconnect the batteries before performing any type of service on the electrical system.

HYDRAULIC SYSTEMS

- Some fluid slowly coming out from a very small port can be almost invisible and be strong enough to penetrate the skin. For this reason, **NEVER USE YOUR HANDS TO CHECK FOR LEAKS**, but use a piece of cardboard or a piece of wood to this purpose. If any fluid is injected into the skin, seek medical aid immediately. Lack of immediate medical attention, serious infections or dermatosis may result.
- Always take system pressure readings using the appropriate gauges.

WHEELS AND TYRES

- Check that the tyres are correctly inflated at the pressure specified by the manufacturer. Periodically check possible damages to the rims and tyres.
- Keep off and stay at the tyre side when correcting the inflation pressure.
- Check the pressure only when the Machine is unloaded and tyres are cold to avoid wrong readings due to over-pressure. Do not reuse parts of recovered wheels as improper welding, brazing or heating may weaken the wheel and make it fail.
- Never cut, nor weld a rim with the inflated tyre assembled.

- To remove the wheels, block both front and rear Machine wheels. Raise the Machine and install safe and stable supports under the Machine in accordance with regulations in force.
- Deflate the tyre before removing any object caught into the tyre tread.
- Never inflate tyres using flammable gases as they may originate explosions and cause injuries to bystanders.

REMOVAL AND INSTALLATION

- Lift and handle all heavy components using lifting equipment of adequate capacity. Ensure that parts are supported by appropriate slings and hooks. Use lifting eyes provided to this purpose. Take care of the persons near the loads to be lifted.
- Handle all parts with great care. Do not place your hands or fingers between two parts. Wear approved protective clothing such as safety goggles, gloves and footwear.
- Do not twine chains or metal cables. Always wear protection gloves to handle cables or chains.

IMPORTANT ECOLOGICAL CONSIDERATIONS

The following are recommendations which may be of assistance:

- Become acquainted with and ensure that you understand the relative legislation applicable to your country.
- Where no legislation exists, obtain information from suppliers of oils, fuels, antifreeze, cleaning agents, etc., with regard to their effect on man and nature and how to safely store, use and dispose of these substances.

HELPFUL HINTS

1. Avoid filling tanks using jerry cans or inappropriate pressurised fuel delivery systems which may cause considerable spillage.
2. In general, avoid skin contact with all fuels, oils, acids, solvents, etc. Most of them contain substances which can be harmful to your health.
3. Modern oils contain additives. Do not burn contaminated fuels and/or waste oils in ordinary heating systems.
4. Avoid spillage when draining off used engine coolant mixtures, engine, gearbox and hydraulic oils, brake fluids, etc. Do not mix drained brake fluids or fuels with lubricants. Store them safely until they can be disposed of in a proper way to comply with local legislation and available resources.
5. Modern coolant mixtures, i.e. antifreeze and other additives, should be replaced every two years. They should not be allowed to get into the soil but should be collected and disposed of safely.
6. Do not open the Air-Conditioning system yourself. It may contain gasses which should not be released into the atmosphere. Your air conditioning specialist has a special equipment for discharging and charging the system.
7. Repair any leaks or defects in the engine cooling or hydraulic system immediately.
8. Do not increase the pressure in a pressurised circuit as this may lead to a catastrophic failure of the system components.
9. Protect hoses during welding as penetrating weld splatter may burn a hole or weaken them, causing the loss of oils, coolant, etc.

SERVICE TECHNIQUES

GENERAL

Clean the exterior of all components before carrying out any form of repair. Dirt and abrasive dust can reduce the efficient working life of a component and lead to costly replacement.

Time spent on the preparation and cleanliness of working surfaces will pay dividends in making the job easier and safer and will result in overhauled components being more reliable and efficient in operation.

Use cleaning fluids which are known to be safe. Certain types of fluid can cause damage to 'O' rings and cause skin irritation. Solvents should be checked that they are suitable for the cleaning of components and also that they do not risk the personal safety of the user.

Replace 'O' rings, seals or gaskets whenever they are disturbed. Never mix new and old seals or 'O' rings, regardless of condition. Always lubricate new seals and 'O' rings with hydraulic oil before installation.

When replacing component parts, use the correct tool for the job.

HOSES AND TUBES

Always replace hoses and tubes if the cone end or the end connections on the hose are damaged.

When installing a new hose, loosely connect each end and make sure the hose takes up the designed position before tightening the connection. Clamps should be tightened sufficiently to hold the hose without crushing and to prevent chafing.

After hose replacement to a moving component, check that the hose does not foul by moving the component through the complete range of travel.

Be sure any hose which has been installed is not kinked or twisted.

Hose connections which are damaged, dented, crushed or leaking, restrict oil flow and the productivity of the components being served. Connectors which show signs of movement from the original swagged position have failed and will ultimately separate completely.

A hose with a chafed outer cover will allow water entry. Concealed corrosion of the wire reinforcement will subsequently occur along the hose length with resultant hose failure.

Ballooning of the hose indicates an internal leakage due to structural failure. This condition rapidly deteriorates and total hose failure soon occurs.

Kinked, crushed, stretched or deformed hoses generally suffer internal structural damage which can result in oil restriction, a reduction in the speed of operation and ultimate hose failure.

Free-moving, unsupported hoses must never be allowed to touch each other or related working surfaces. This causes chafing which reduces hose life.

'O' RING FLAT FACE SEAL FITTINGS

When repairing 'O' ring face seal connectors, the following procedures should be observed.



WARNING



NEVER DISCONNECT OR TIGHTEN A HOSE OR TUBE THAT IS UNDER PRESSURE. IF IN DOUBT, ACTUATE THE OPERATING LEVERS SEVERAL TIMES WITH THE ENGINE SWITCHED OFF PRIOR TO DISCONNECTING A HOSE OR TUBE.

1. Release the fittings and separate the hose or tube assembly, then remove and discard the 'O' ring seal from the fitting.
2. Dip a new 'O' ring seal into clean hydraulic oil prior to installation. Install a new 'O' ring into the fitting and, if necessary, retain in position using petroleum jelly.
3. Assemble the new hose or tube assembly and tighten the fitting finger tight, while holding the tube or hose assembly to prevent it from turning.
4. Use two suitable wrenches and tighten the fitting to the specified torque according to the size of the fitting. Refer to the following torque chart.

NOTE: To ensure a leak-free joint is obtained, it is important that the fittings are not over or under torqued.

'O' RING FLAT FACE SEAL FITTING TORQUE VALUES

| Nominal O.D (in.) | Tube (mm) | Dash Size | Thread Size In. | Swivel Nut Torque | |
|-------------------------|--------------|--------------|-----------------------|----------------------|-----|
| | | | | lbf. Ft | Nm |
| 0.250 | 6.35 | -4 | 9/16-18 | 12 | 16 |
| 0.375 | 9.52 | -6 | 11/16-16 | 18 | 24 |
| 0.500 | 12.70 | -8 | 13/16-16 | 37 | 50 |
| 0.625 | 15.88 | -10 | 1-14 | 51 | 69 |
| 0.750 | 19.05 | -12 | 1 3/16-12 | 75 | 102 |
| 0.875 | 22.22 | -14 | 1 3/16-12 | 75 | 102 |
| 1.000 | 25.40 | -16 | 1 7/16-12 | 105 | 142 |
| 1.250 | 31.75 | -20 | 1 11/16-12 | 140 | 190 |
| 1.500 | 38.10 | -24 | 2-12 | 160 | 217 |

SEALER SPECIFICATIONS

The following sealers should be used as directed in the manual:

| SEALERS | PART NUMBER | TRADE DESCRIPTION |
|-------------------------|-------------|--|
| Anaerobic sealer | 82995770/1 | LOCTITE GASKET ELIMINATOR 518 |
| RTV silicone sealer | 82995775/6 | LOCTITE SUPERFLEX 593, 595 or 596 LOCTITE ULTRA BLUE 587 DOW CORNING SILASTIC 732 GENERAL ELECTRIC RTV 103 OR 108 |
| Pipe sealant | 82995768 | PST 592 PIPE SEALANT WITH TEFLON |
| Thread-locking compound | 82995773 | LOCTITE 271 THREADLOCKER/SEALANT (red) |

HARDWARE TORQUE VALUES

Check the tightness of hardware periodically.

Use the following charts to determine the correct torque when checking, adjusting or replacing hardware on the Backhoe Loader.

IMPORTANT: DO NOT use the values listed in the charts if a different torque value or tightening procedure is specified in this manual for a specific application.

cedure is specified in this manual for a specific application. Torque values listed are for general use only.

Make sure fastener threads are clean and not damaged.

NOTE: A torque wrench is necessary to properly torque hardware.

MINIMUM HARDWARE TIGHTENING TORQUES

IN FOOT POUNDS - LBF. FT (NEWTON-METRES - Nm)
FOR NORMAL ASSEMBLY APPLICATIONS

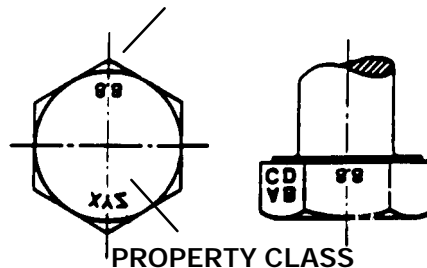
METRIC HARDWARE AND LOCKNUTS

| NOMINAL SIZE | CLASS 5.8 | | CLASS 8.8 | | CLASS 10.9 | | LOCKNUT CL.8 W/CL8.8 BOLT |
|-----------------|-----------|------------------|-----------|------------------|------------|------------------|------------------------------------|
| | UNPLATED | PLATED W/ZnCr | UNPLATED | PLATED W/ZnCr | UNPLATED | PLATED W/ZnCr | |
| M4 | 15* (1.7) | 19* (2.2) | 23* (2.6) | 30* (3.4) | 33* (3.7) | 42* (4.8) | 16* (1.8) |
| M6 | 51* (5.8) | 67* (7.6) | 79* (8.9) | 102* (12) | 115* (13) | 150* (17) | 56* (6.3) |
| M8 | 124* (14) | 159* (18) | 195* (22) | 248* (28) | 274* (31) | 354* (40) | 133* (15) |
| M10 | 21 (28) | 27 (36) | 32 (43) | 41 (56) | 45 (61) | 58 (79) | 22 (30) |
| M12 | 36 (49) | 46 (63) | 55 (75) | 72 (97) | 79 (107) | 102 (138) | 39 (53) |
| M16 | 89 (121) | 117 (158) | 137 (186) | 177 (240) | 196 (266) | 254 (344) | 97 (131) |
| M20 | 175 (237) | 226 (307) | 277 (375) | 358 (485) | 383 (519) | 495 (671) | 195 (265) |
| M24 | 303 (411) | 392 (531) | 478 (648) | 619 (839) | 662 (897) | 855 (1160) | 338 (458) |

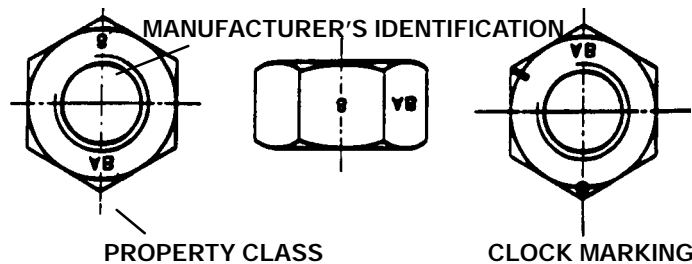
NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION HEX CAP SCREW AND CARRIAGE BOLTS CLASSES 5.6 AND UP

MANUFACTURER'S IDENTIFICATION



HEX NUTS AND LOCKNUTS CLASSES 05 AND UP



MINIMUM HARDWARE TIGHTENING TORQUES

IN FOOT POUNDS - LBF. FT (NEWTON-METRES - Nm)
FOR NORMAL ASSEMBLY APPLICATIONS

INCH HARDWARE AND LOCKNUTS

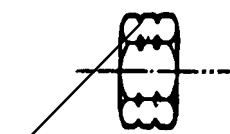
| NOMINAL SIZE | SAE GRADE 2 | | SAE GRADE 5 | | SAE GRADE 8 | | LOCKNUTS | | NOMINAL SIZE |
|--------------|---------------------------|--------------------|---------------------------|--------------------|---------------------------|--------------------|-----------------|-----------------|--------------|
| | UNPLATED or PLATED SILVER | PLATED W/ZnCr GOLD | UNPLATED or PLATED SILVER | PLATED W/ZnCr GOLD | UNPLATED or PLATED SILVER | PLATED W/ZnCr GOLD | GR.B w/GR5 BOLT | GR.C w/GR8 BOLT | |
| 1/4 | 55* (6.2) | 72* (8.1) | 86* (9.7) | 112* (13) | 121* (14) | 157* (18) | 61* (6.9) | 86* (9.8) | 1/4 |
| 5/16 | 115* (13) | 149* (17) | 178* (20) | 229* (26) | 250* (28) | 324* (37) | 125* (14) | 176* (20) | 5/16 |
| 3/8 | 17 (23) | 22 (30) | 26 (35) | 34 (46) | 37 (50) | 48 (65) | 19 (26) | 26 (35) | 3/8 |
| 7/16 | 27 (37) | 35 (47) | 42 (57) | 54 (73) | 59 (80) | 77 (104) | 30 (41) | 42 (57) | 7/16 |
| 1/2 | 42 (57) | 54 (73) | 64 (87) | 83 (113) | 91 (123) | 117 (159) | 45 (61) | 64 (88) | 1/2 |
| 9/16 | 60 (81) | 77 (104) | 92 (125) | 120 (163) | 130 (176) | 169 (229) | 65 (88) | 92 (125) | 9/16 |
| 5/8 | 83 (112) | 107 (145) | 128 (174) | 165 (224) | 180 (244) | 233 (316) | 90 (122) | 127 (172) | 5/8 |
| 3/4 | 146 (198) | 189 (256) | 226 (306) | 293 (397) | 319 (432) | 413 (560) | 160 (217) | 226 (306) | 3/4 |
| 7/8 | 142 (193) | 183 (248) | 365 (495) | 473 (641) | 515 (698) | 667 (904) | 258 (350) | 364 (494) | 7/8 |
| 1 | 213 (289) | 275 (373) | 547 (742) | 708 (960) | 773 (1048) | 1000 (1356) | 386 (523) | 545 (739) | 1 |

NOTE: Torque values shown with * are inch pounds.

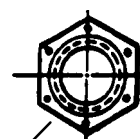
IDENTIFICATION CAP SCREWS AND CARRIAGE BOLTS



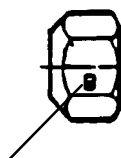
LOCKNUTS



GRADE IDENTIFICATION
GRADE A NO NOTCHES
GRADE B ONE CIRCUMFERENTIAL NOTCH
GRADE C TWO CIRCUMFERENTIAL NOTCHES



GRADE IDENTIFICATION
GRADE A NO MARKS
GRADE B THREE MARKS
GRADE C SIX MARKS
MARKS NEED NOT BE LOCATED AT CORNERS



GRADE IDENTIFICATION

GRADE A NO MARK
GRADE B LETTER B
GRADE C LETTER C

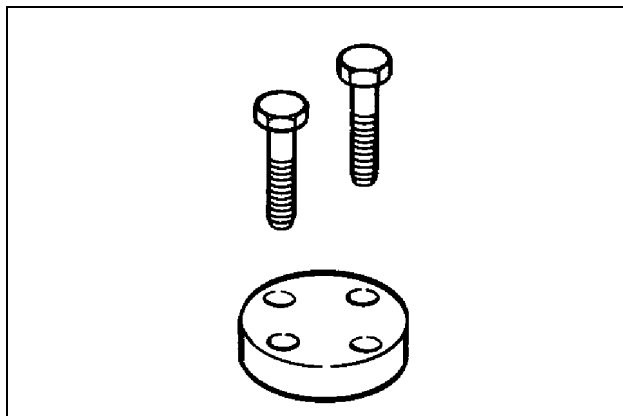
SECTION 10 - ENGINE

Chapter 1 - Injection pump

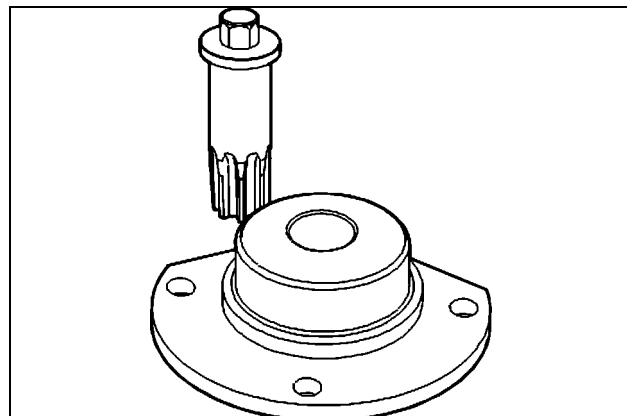
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| REMOVAL | 2 |
| INSTALLATION | 7 |

SPECIAL TOOLS



BC04A194

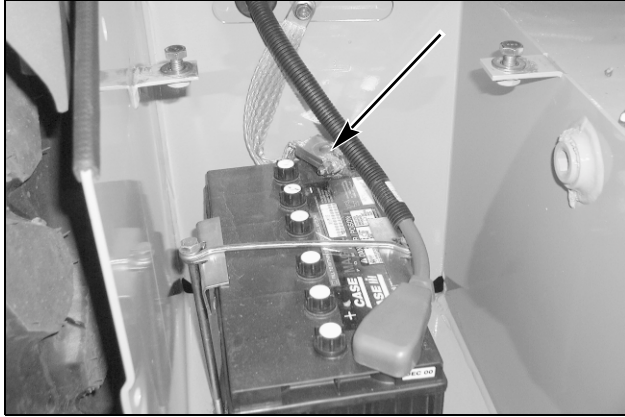
CAS 1691A GEAR PULLER.

BC04A195

380000988**ENGINE TURNING TOOL**

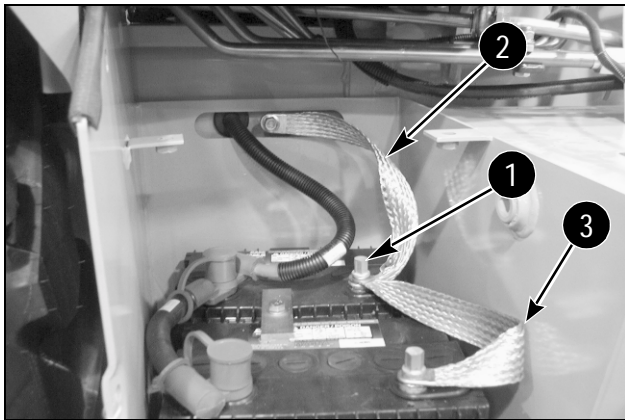
REMOVAL**STEP 1**

Secure loader in raised position, (see Operator Manual), and stop engine.

STEP 2

BD01B353

Remove the battery cover from the right step. If the machine has only one battery, disconnect the negative battery cable from the battery, (See Operator Manual).

STEP 3

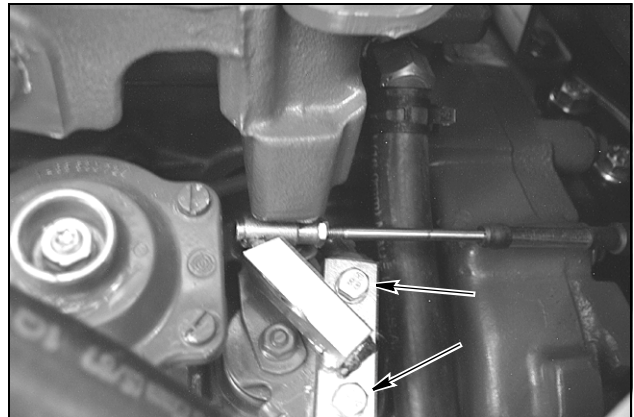
BD01B352

If the machine has two batteries, remove the terminal nut (1). Remove the negative battery cable (2) from the terminal and move the negative battery cable away from the battery. Make sure the jumper cable (3) is installed on the terminal and start the terminal nut (2) onto the terminal.

STEP 4

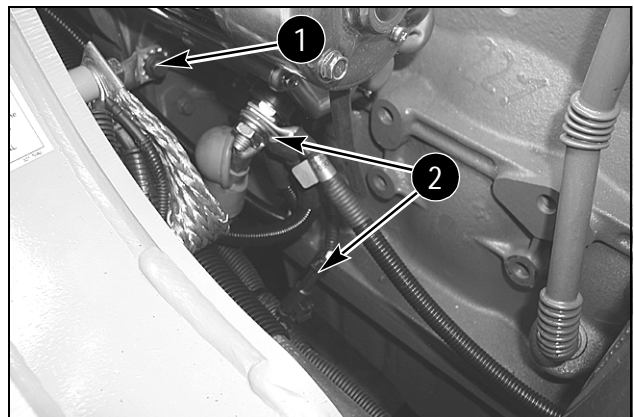
BD04A029

Loosen jam nut for throttle cable.

STEP 5

BS03K002

Remove the two throttle arm mounting bolts, move the throttle cable out of the mounting bracket.

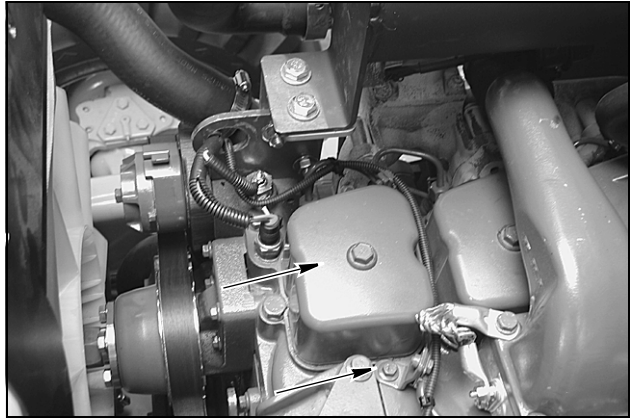
STEP 6

BS03K005

Disconnect the ground strap (1). Disconnect the wires (2) from the starter.

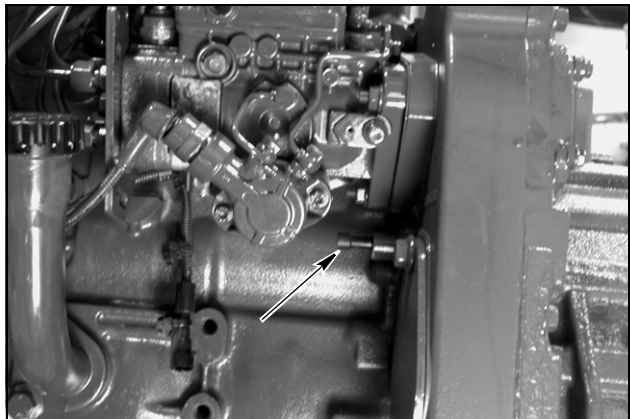
STEP 7

Remove the starter from the engine and install 380000988 engine turning tool.

STEP 8

BD04A014

Remove the front rocker arm cover and injector line retaining bracket mounting bolt. Using engine turning tool turn engine in direction of running rotation until push rods can be turned freely.

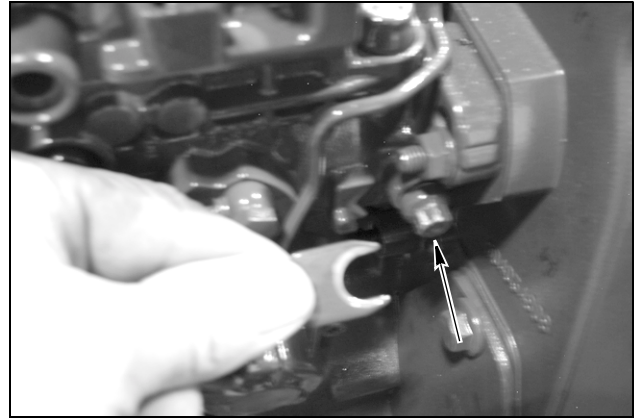
STEP 9

BD04A015

Have an assistant continue to turn the engine with turning tool while pressing in on lock pin located just below injector pump.

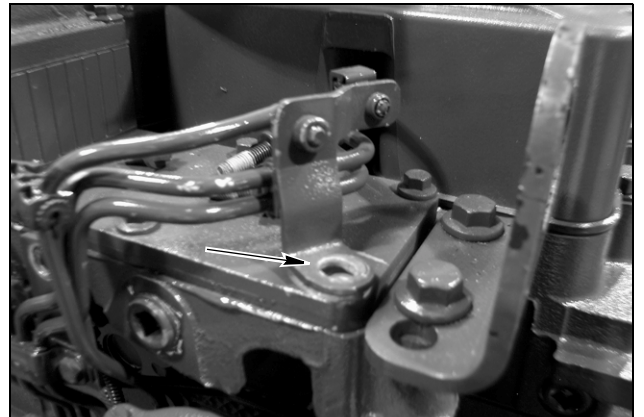
STEP 10

Once the lock pin has engaged continue to turn with light pressure on turning tool until engine has completely stopped rotating.

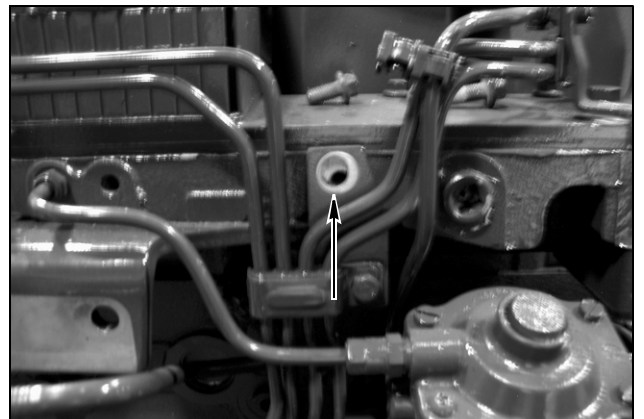
STEP 11

BD04A016

Loosen injector pump locking bolt and remove the slotted plate, tighten the locking bolt to 20 to 24 lb-ft (27 to 33 Nm).

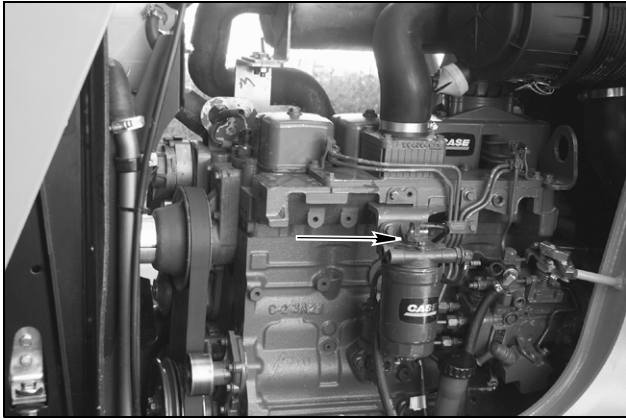
STEP 12

BD04A017



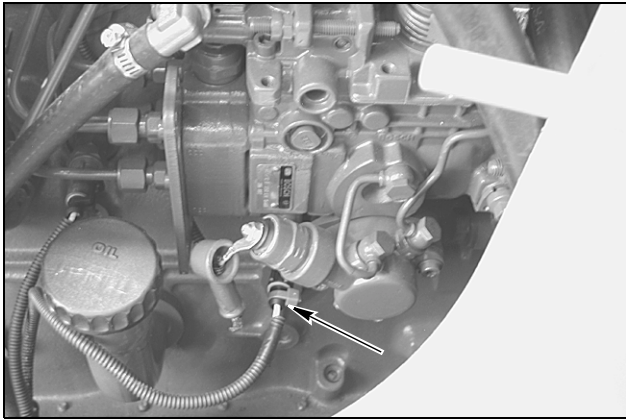
BD04A019

Remove the injector line retaining bracket mounting bolts.

STEP 13

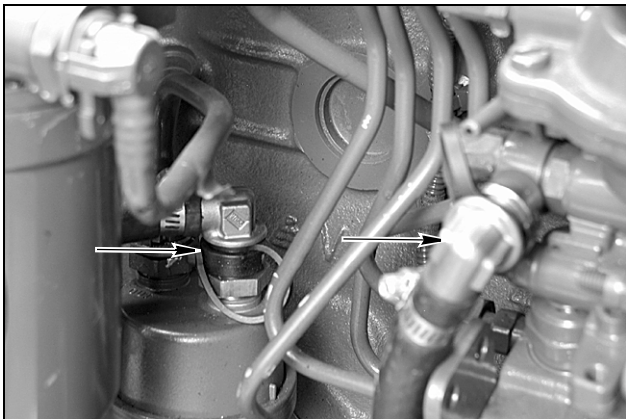
BD03K068

Remove fuel filter and mounting bracket from engine.

STEP 14

BS03K009

Disconnect the power lead to the injector pump.

STEP 15

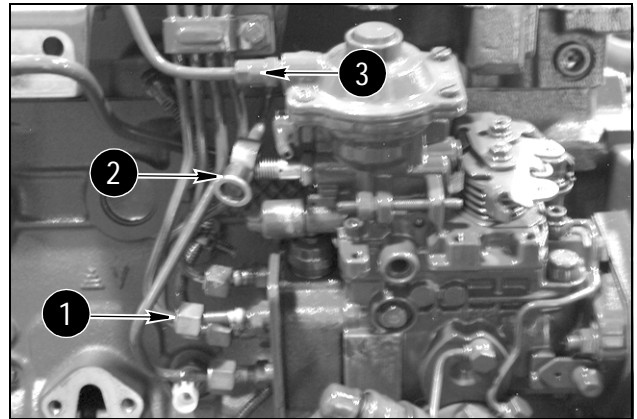
BS03K010

Disconnect the fuel inlet line from the fuel pump and fuel return line from the injector pump. Cover line and fitting to keep foreign material from entering the fuel system.

STEP 16

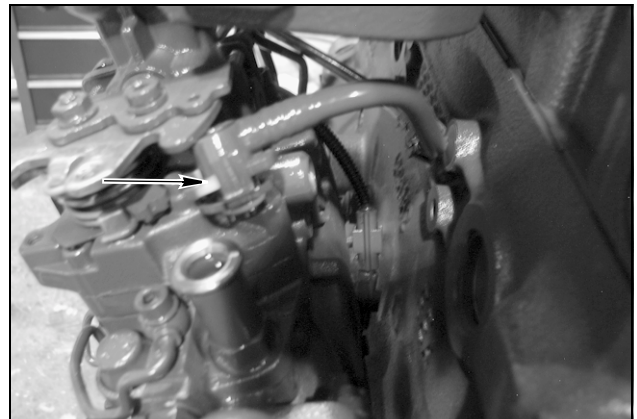
Remove the mechanical fuel pump and engine oil filler tube from the engine.

NOTE: In the following photos the engine is shown removed from the machine, this is for clarity only, it is not required to remove the engine.

STEP 17

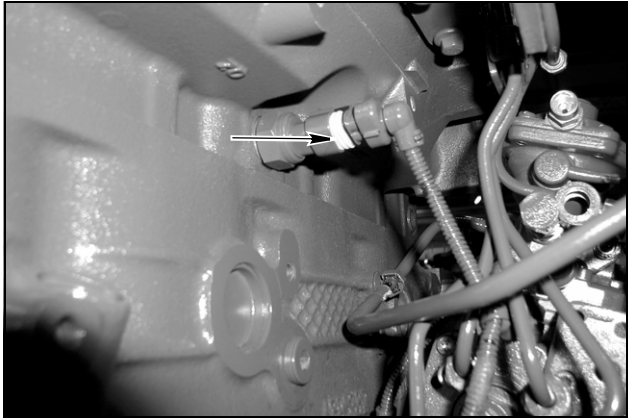
BD04A020

Loosen fuel injector lines (1), disconnect fuel return line (2), and boost line (3) at the pump. Cover lines and fittings to keep foreign material from entering the fuel system.

STEP 18

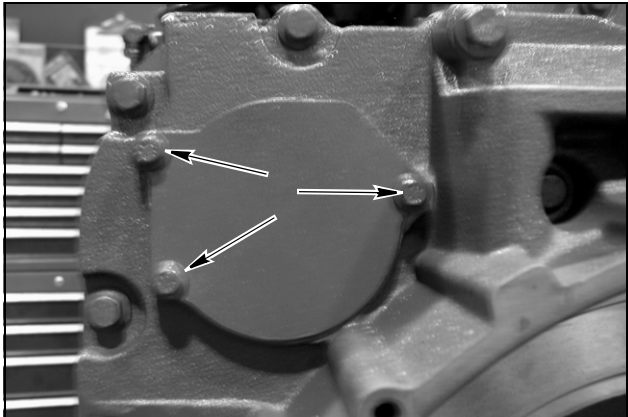
BD04A021

Disconnect fuel feed line from injector pump. Cover line and fitting to keep foreign material from entering the fuel system.

STEP 19

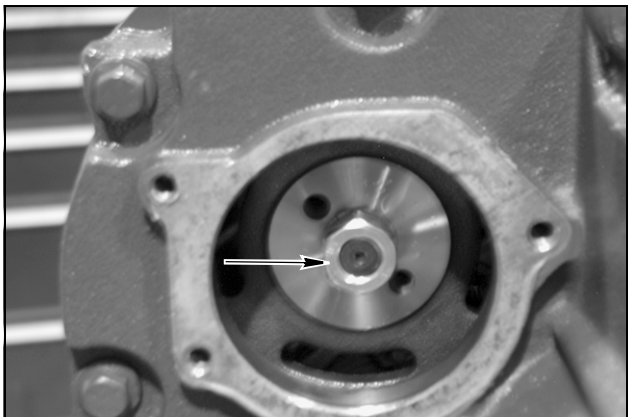
BD04A022

Disconnect temperature sensor.

STEP 20

BD04A023

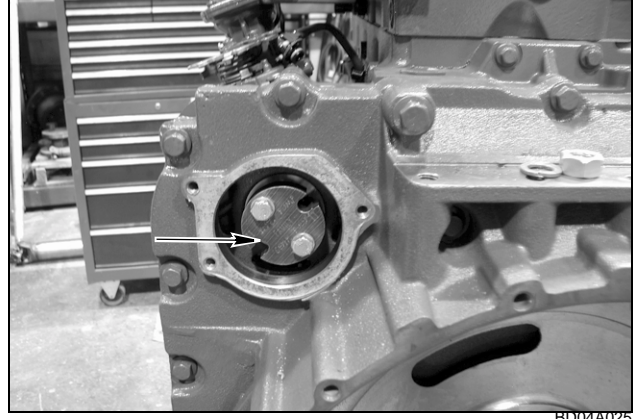
Reaching through the inlet hole in the frame, remove the three plate retaining bolts, remove the plate.

STEP 21

BD04A024

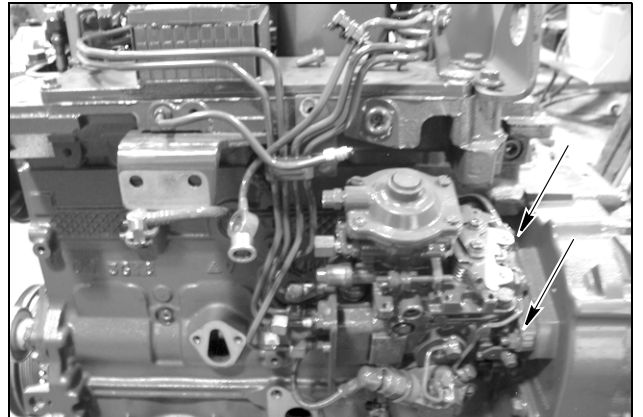
Loosen and remove nut and washer.

WARNING: Use caution when removing nut and washer they can be dropped inside of the engine, engine will have to be disassembled to remove the nut or washer.

STEP 22

BD04A025

Install gear puller and tighten bolts until gear is loose.

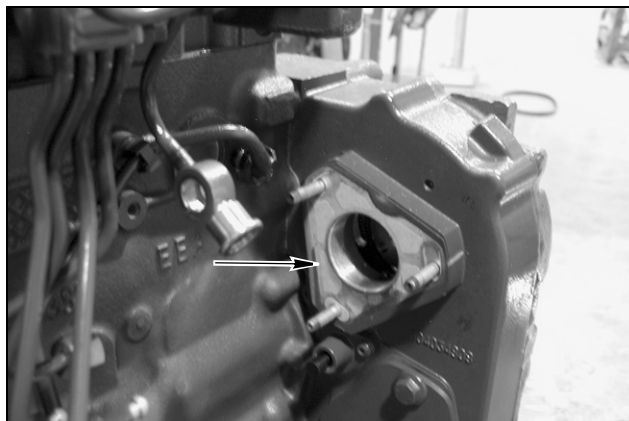
STEP 23

BD04A018

Remove the three mounting nuts from the studs, two are located at arrows, one is located at the bottom of the pump. Remove the pump from the engine

INSTALLATION

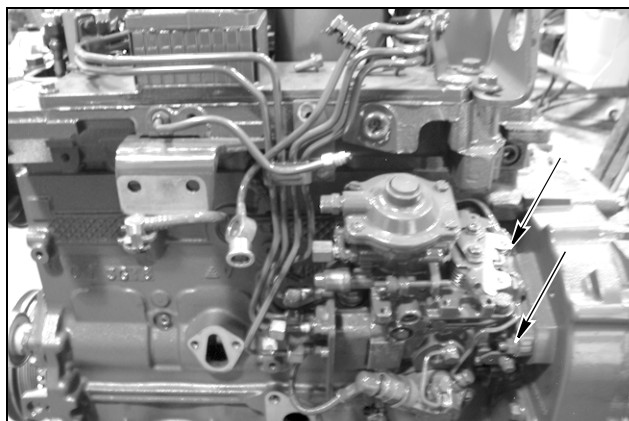
STEP 24



BD04A026

Replace gasket on pump mounting flange.

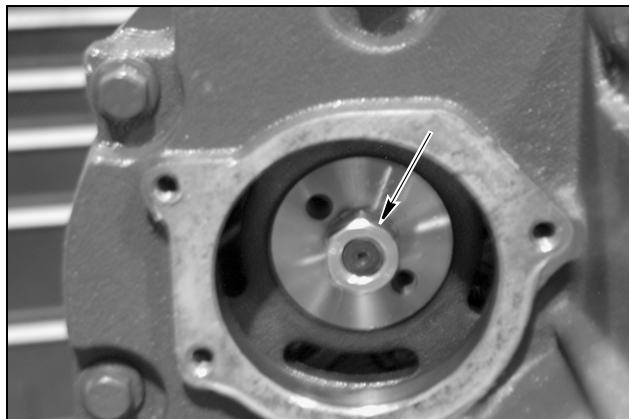
STEP 25



BD04A018

Install pump and tighten the three mounting nuts.

STEP 26

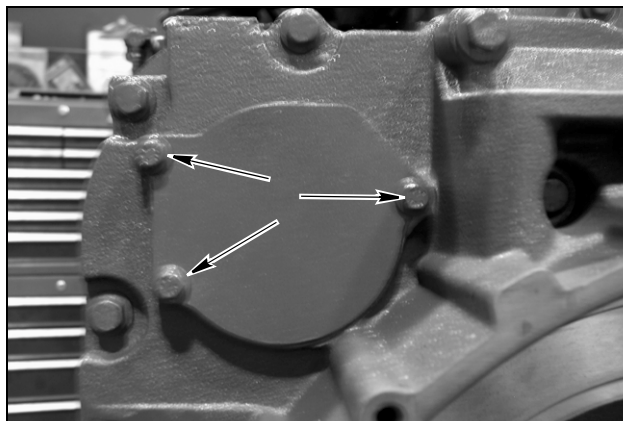


BD04A024

Install lock washer and nut, torque nut to 66 to 70 lb-ft (90 to 95 Nm).

WARNING: Use caution when installing nut and washer they can be dropped inside of the engine.

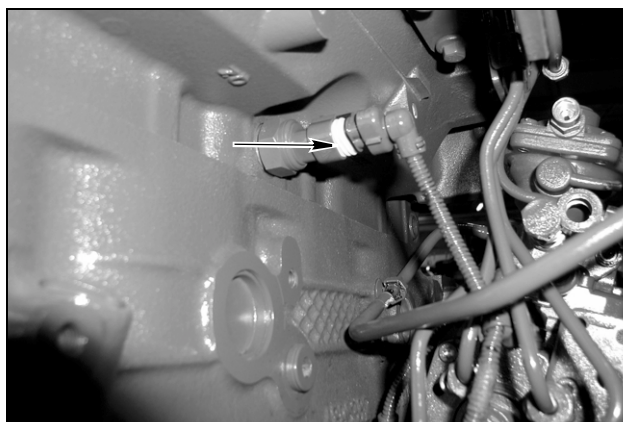
STEP 27



BD04A023

Apply Loctite 5205 to the surface of the cover plate, install cover plate and mounting bolts, tighten bolts.

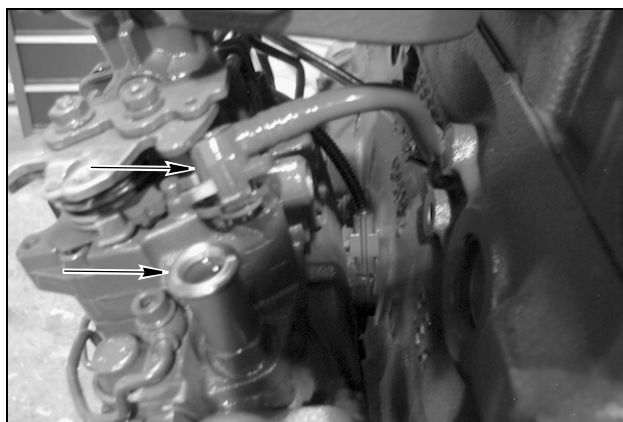
STEP 28



BD04A022

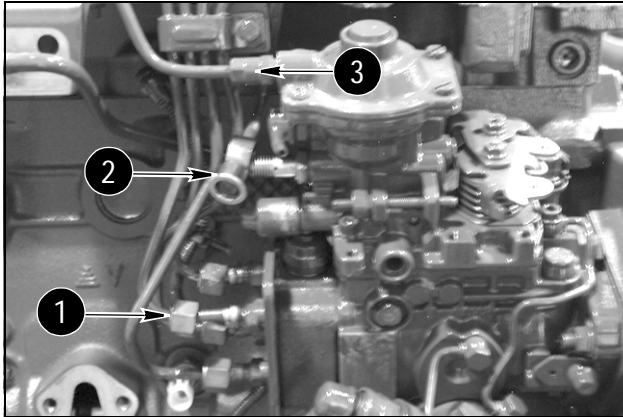
Connect wire to temperature sensor.

STEP 29



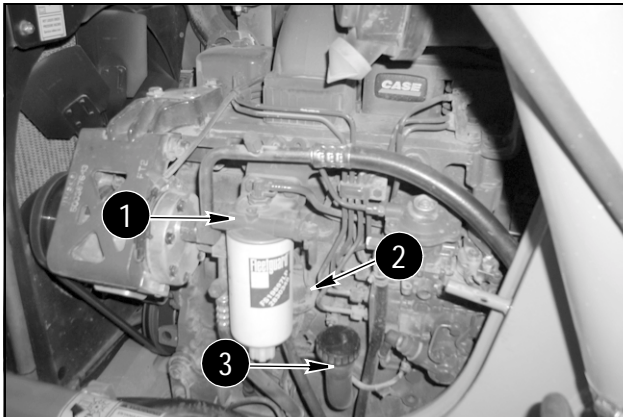
BD04A021

Connect the fuel feed line to the injector pump.

STEP 30

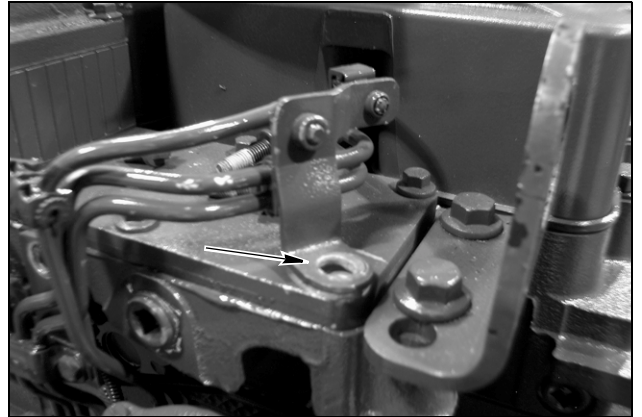
BD04A020

Remove covers from lines and fittings. Connect fuel injector lines (1), connect fuel return line (2), and boost line (3) to the pump.

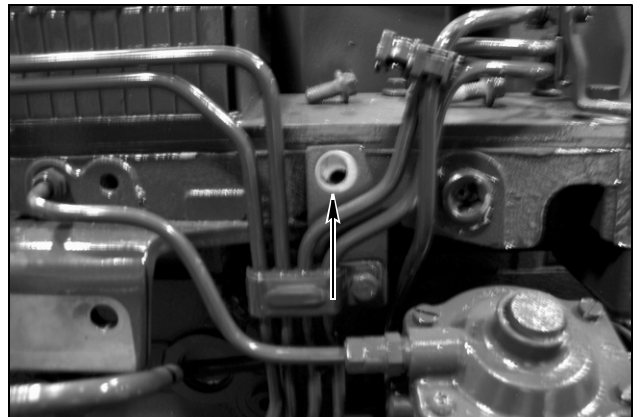
STEP 31

BD04A030

Install oil filler tube (3), mechanical fuel pump (2), and fuel filter (1) on the engine.

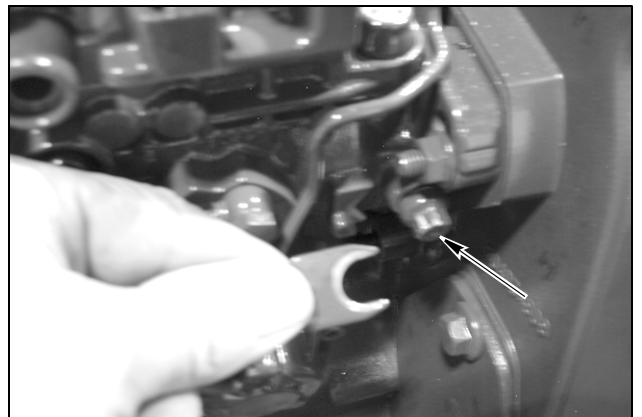
STEP 32

BD04A017



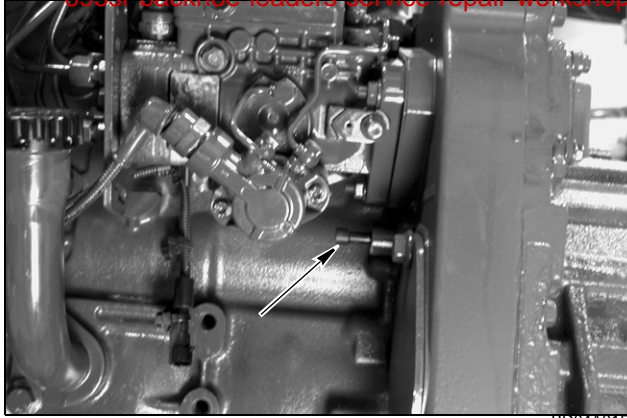
BD04A019

Install the injector line retaining bracket mounting bolts.

STEP 33

BD04A016

Loosen injector pump locking bolt and install the slotted plate, tighten the locking bolt to 9 to 10 lb-ft (12 to 14 Nm).

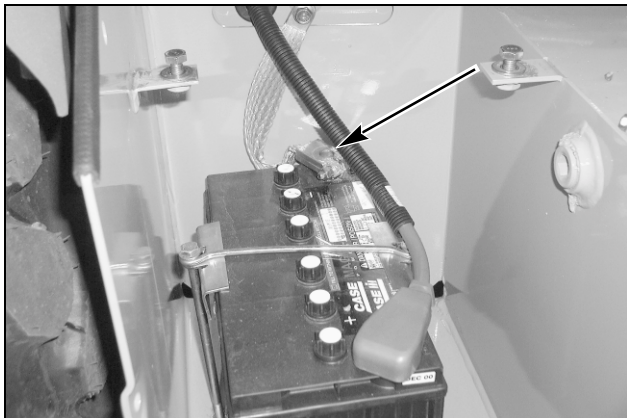
STEP 34

BD04A015

Make sure locking pin is disengaged from gear.

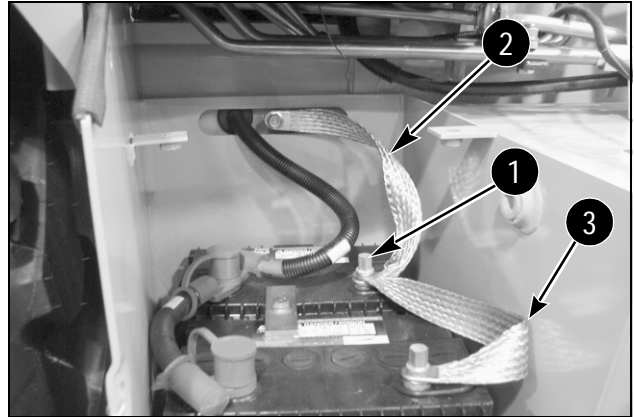
STEP 35

Remove the engine turning tool and install the starter.

STEP 36

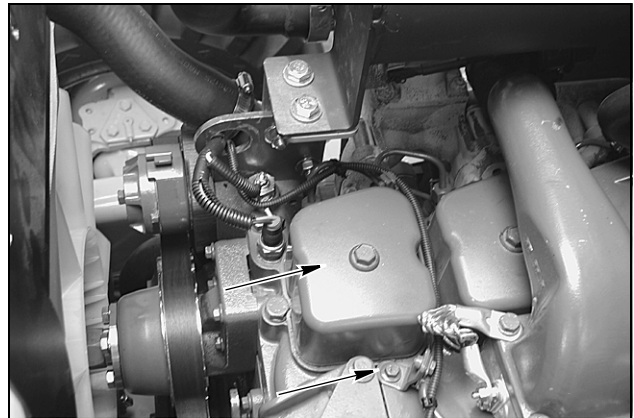
BD01B353

If the machine has only one battery, connect the negative battery cable to the battery. Install the battery cover.

STEP 37

BD01B352

Install grounding cable (2) onto the terminal. Install the jumper cable (3) on the terminal and start the terminal nut (1) onto the terminal. Tighten the terminal nut.

STEP 38

BD04A014

Install the front rocker arm cover and injector line retaining bracket mounting bolt.

STEP 39

BD04A029

Install the throttle cable into the bracket and tighten the jam nut.