Group 10
ENGINE TUNE-UP

Fundamentally, a badly worn engine cannot be tuned up; therefore, certain inspections and tests must be made to determine whether a major overhaul is necessary or whether a tune-up will bring the engine to peak efficiency of operation.

Three important conditions are necessary for efficient and economical engine performance: sufficient compression, proper timing, and correct fuel-air mixture or injection delivered to each combustion chamber.

COMPRESSION TEST

If engine parts are excessively worn, sufficient compression can only be obtained by a major overhaul.

To make the compression test, proceed as follows:

1. Start the engine and allow it to warm up to normal operation temperature.
2. Check oil pressure at starting and later at operating speed of 1900 rpm.
3. When engine reaches its normal operating temperature, shut off engine.
4. On gasoline tractors, advance hand throttle to its maximum open or forward position. On diesel tractors, pull out fuel shut-off knob (-31000) or pull hand throttle past offset into the "no fuel" position (31001-up).
5. Remove spark plugs or injector nozzles.
6. Hold compression gauge firmly in place in No. 1 (front) cylinder spark plug or nozzle hole, and crank engine for several seconds with starter.

NOTE: Make sure battery is fully charged in order to develop full cranking speed for this test.

7. Note pressure gauge reading.

The minimum compression reading of an engine (with rings seated) should be as follows: Gasoline- 125 psi at 200 rpm cranking speed; Diesel- 300 to 350 psi at 150 rpm cranking speed or 350 to 400 psi at 250 rpm cranking speed. Repeat this test on No. 3 cylinder; then No. 4 cylinder; then on No. 2 cylinder.

In general an engine with excessively low compression must be reconditioned before a tune-up can be effective.

By cranking the engine, much can be learned of its condition. The engine will rotate with practically no resistance if compression pressure is low in all cylinders. With pressure low in one cylinder, resistance can be felt when a good piston is coming upward on compression stroke. If the intake or exhaust valves are leaking, this can be heard while cranking.

If the pressure was found to be good in all cylinders, tune up the engine by the following procedure:

IGNITION AND ELECTRICAL SYSTEMS

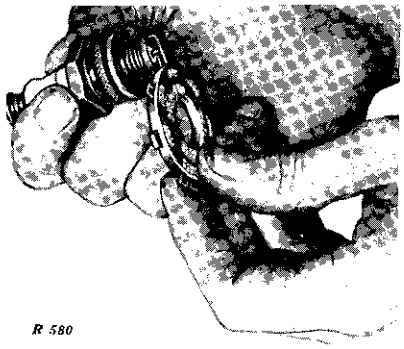


Fig. 40-10-1—Checking Spark Plug Point Gap

SPARK PLUGS

On gasoline engines, check, clean, and regap spark plugs according to instructions in Section 100, Group 10 of this manual. Clean up electrodes with a point file. Electrode gap of spark plugs should be .025 inch. Install spark plugs, using new gaskets, and tighten to 35 ft-lbs.

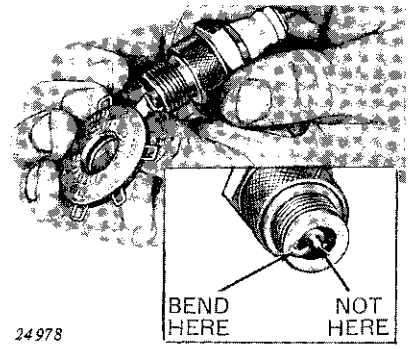


Fig. 40-10-2—Adjusting Spark Plug Point Gap

GENERATOR BELT

Adjust generator belt tension. With the generator bracket cap screw and adjusting cap screw loose, force the generator away from the engine until there is a 5/8-inch flex at 25 pounds pull on one side of the belt (Fig. 40-10-3).

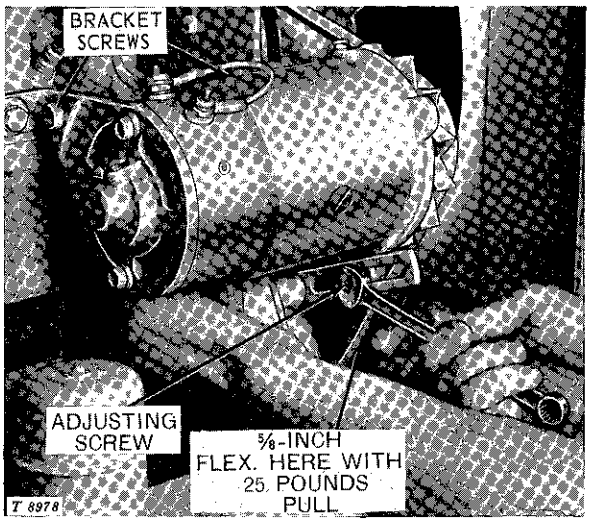


Fig. 40-10-3—Adjusting Generator Belt Tension

IGNITION AND ELECTRICAL CIRCUITS

Test ignition and electrical circuits by referring to Section 100, Group 10 of this manual.

BATTERY

Inspect battery and cables according to instructions given in Section 100, Group 30 of this manual.

Check level of electrolyte solution in battery. Fill battery cells, if necessary, to level of filler ring. Use distilled water, if possible, or clean water with a low mineral content.

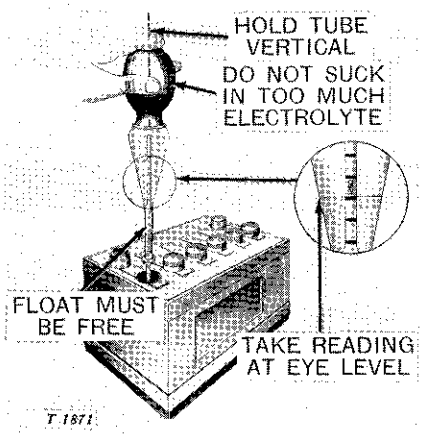


Fig. 40-10-4—Checking Specific Gravity of Battery

Check specific gravity of battery (Fig. 40-10-4). If specific gravity of battery is below 1.225, recharge the battery (Section 100, Group 30).

STARTER AND GENERATOR

Complete service information on starting motors and generators is covered in Service Manual SM-2029, John Deere Electrical Systems.

DISTRIBUTOR

Test and service distributor following instruction given in Section 100, Group 5 of this Manual and in Service Manual SM-2029, John Deere Electrical Systems.

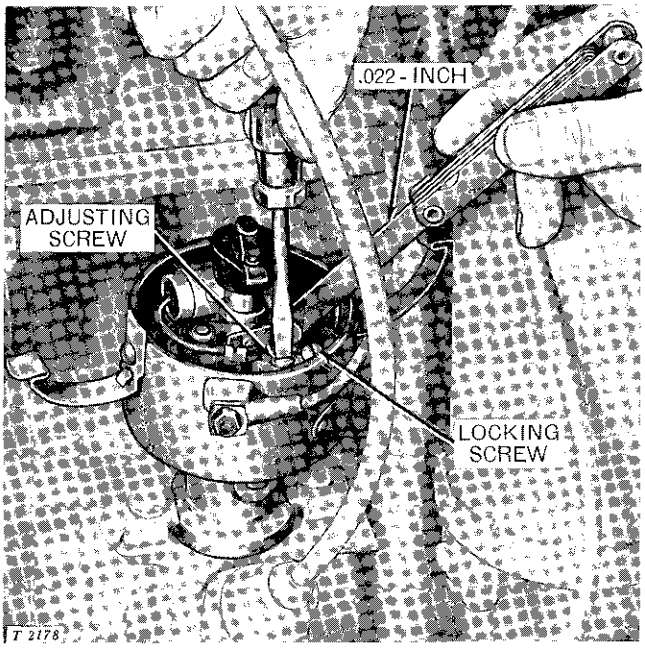


Fig. 40-10-5—Setting Distributor Point Gap (Delco-Remy Illustrated)

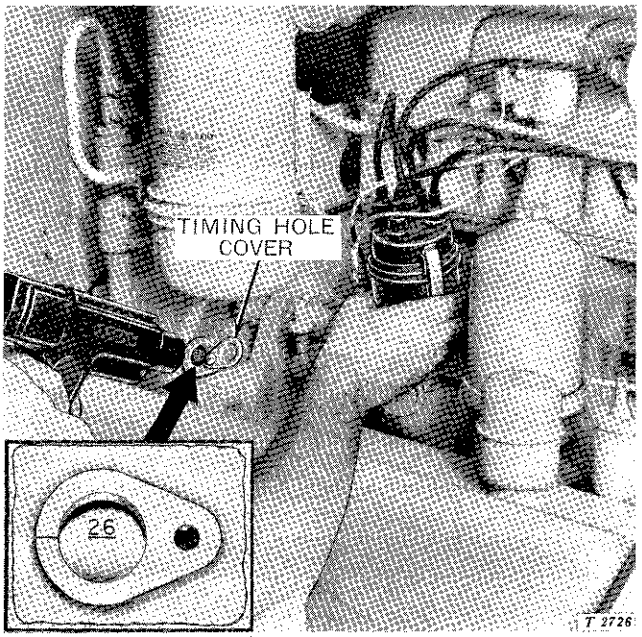


Fig. 40-10-6—Timing Distributor with Timing Light

Checking Distributor Points and Point Gap

The distributor rotates counterclockwise, viewed from the top. The automatic spark advance is 26 degrees of engine rotation. Clean

points to remove corrosion and set point gap to .022 inch (Fig. 40-10-5). Pitted or corroded points cannot be accurately set with a feeler gauge. (For details, see Section 100, Group 10 of this Manual.)

Timing Distributor with Power Timing Light

Although the distributor can be timed either by use of a power timing light or by the manual method, it is highly recommended that the power timing light method be used.

Instructions for using power timing lights are provided by the timing light manufacturer. However, the following steps must be taken to prepare the engine for timing by this method.

1. Start engine and allow it to run until normal operating temperature is reached.
2. Uncover timing hole (Fig. 40-10-6).
3. Stop engine and follow manufacturer's instructions for attaching timing light leads to battery and to No. 1 (front) spark plug. (Positive side of battery is grounded in 1000 Series Tractors.)
4. Start engine and bring it up to 2500 rpm, plus or minus 25 rpm.
5. Loosen distributor attaching cap screws.
6. Direct timing light toward timing hole in center frame (Fig. 40-10-6) and rotate distributor body until "26" mark on flywheel lines up with mark on timing hole.
7. Hold distributor in this timed position and tighten attaching cap screws.
8. Recheck position of "26" mark. When engine is properly timed, remove timing light leads in order outlined in manufacturer's instructions.
9. Slide cover over timing hole and tighten screw securely.

Timing Distributor by Manual Method

The 1000 Series Tractors may be equipped with either Delco-Remy or Wico Distributors. The automatic advance mechanism differs slightly in the two distributors. On the Delco-Remy models, both the rotor and the cam advance in operation. On the Wico Model, only the cam advances. Due to these differences, the procedures for manual timing differ slightly (as shown in Step 4).

NOTE: Use of a timing light is recommended for more accurate timing. When using a timing light, the procedure for either distributor, Delco-Remy or Wico, is the same.

1. Uncover timing hole located on distributor side of clutch housing (Fig. 40-10-7).

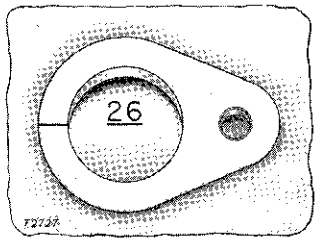


Fig. 40-10-7—Flywheel Timing Mark

2. Remove all spark plugs.
3. Turn engine very slowly. Place thumb in spark plug port of No. 1 (front) cylinder. Turn engine until considerable air pressure is felt against thumb; then continue turning until "26" mark on flywheel lines up with marks on side of timing hole (Fig. 40-10-7). Do not reverse rotation of engine if "26" mark goes past hole; instead, repeat procedure.
4. On Delco-Remy distributors, remove distributor cap and dust cover. Install distributor rotor and turn it counterclockwise as far as possible. While holding rotor in this position, rotate distributor body slowly until points are just beginning to open (Fig. 40-10-8).

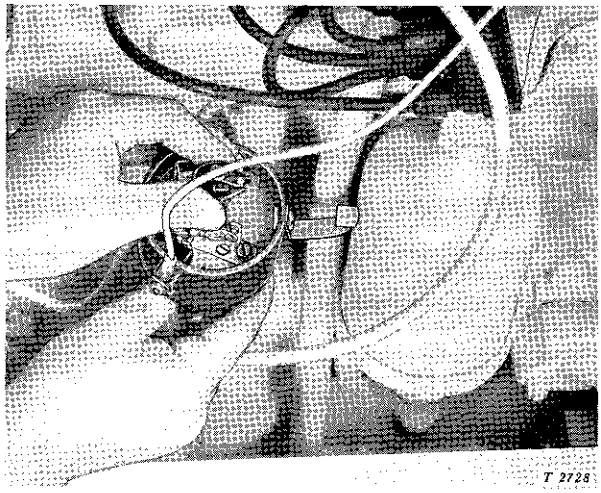


Fig. 40-10-8—Timing Delco-Remy Distributor

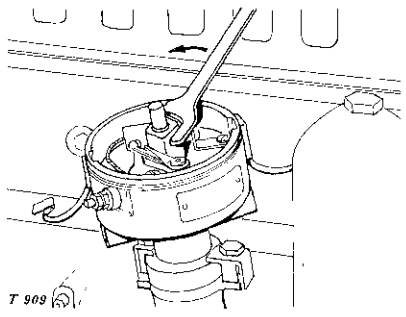


Fig. 40-10-9—Timing Wico Distributor

On Wico distributors, remove distributor cap, dust cover, and rotor. Using an open end wrench, turn cam counterclockwise as far as possible. While holding cam in this position, rotate distributor body slowly until points are just beginning to open (Fig. 40-10-9).

TIMING INJECTION PUMP (DIESEL)

The engine and the fuel injection pump must be timed to each other. To check the timing, do the following:

1. Uncover timing hole on clutch housing (Fig. 40-10-10).

2. Turn engine in direction of rotation (counterclockwise when viewed from flywheel end) until No. 1 piston is on a compression stroke and the "DC" mark on the flywheel rim aligns with timing mark on the clutch housing (Fig. 40-10-10).

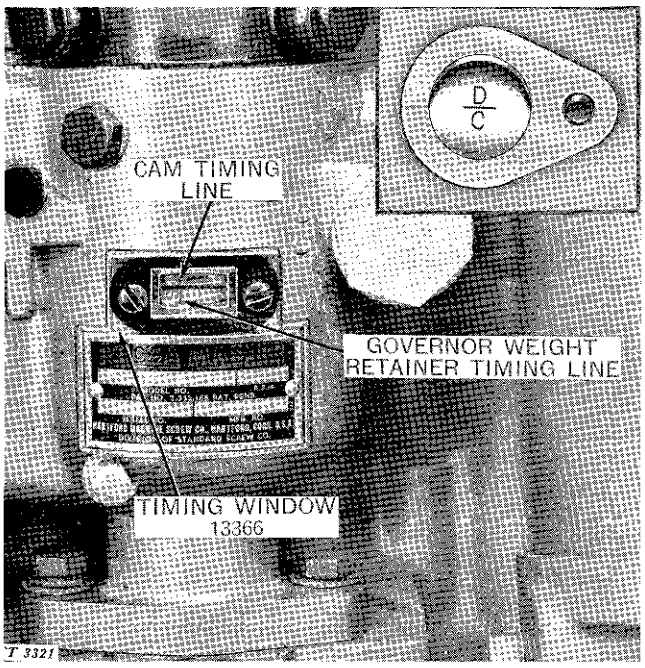


Fig. 40-10-10—Timing Lines

3. Remove timing hole cover on injection pump housing and check to see if the timing line on the weight retainer hub aligns with the mark on the cam rim as shown in Fig. 40-10-10. If adjustment is required, loosen pump mounting bolts. and turn injection pump assembly by hand so that the timing marks line up, and retighten mounting bolts.

4. Turn engine over two revolutions in direction of engine rotation and recheck pump timing.

NOTE: When rotating crankshaft, care must be taken so that the crankshaft is not rotated beyond the specified timing mark. If the timing mark has been passed, it will be necessary to turn the engine backward at least 1/4 turn and again rotate the crankshaft counterclockwise, thus removing all gear train backlash.

5. Replace timing hole cover on clutch housing and on fuel injection pump. Bleed fuel system as described under "Fuel System" in this Group.

CHECKING INJECTION PUMP LOAD ADVANCE

See Section 91, Group 20 for correct procedure.

ADJUSTING VALVE CLEARANCE

To adjust valve clearance properly, each piston must be at top dead center at end of its compression stroke at time adjustment is made.

To determine correct postion, turn engine until No. 1 (front) piston is at top dead center on compression stroke (both valves closed). The "DC" mark on flywheel will now be lined up with the mark on timing hole (Fig. 40-10-11).

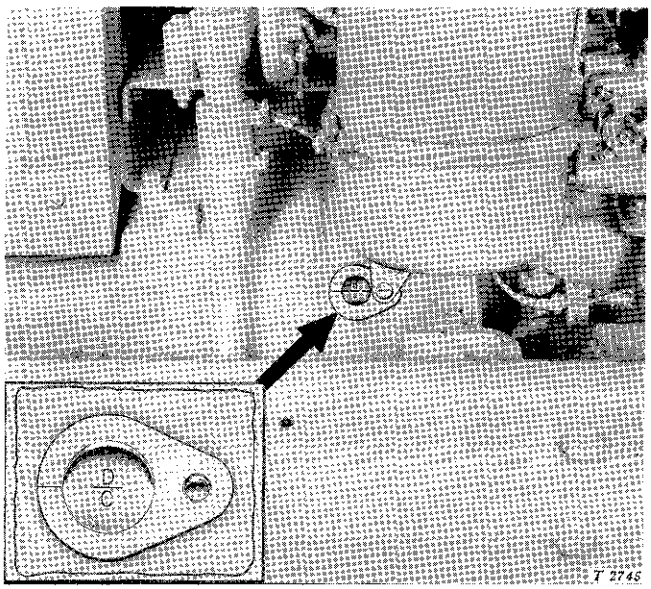


Fig. 40-10-11—"DC" Mark on Flywheel

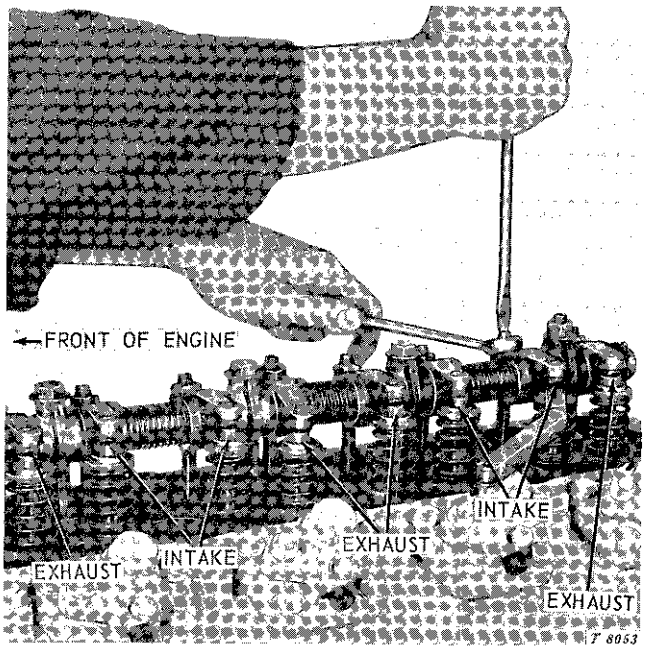


Fig. 40-10-12–Adjusting Valve Tappet Clearance

Adjust valve clearance (Fig. 40-10-12). Start with the No. 1 (front) cylinder valves. Intake valves are set at .012-inch and exhaust valves are set at .018-inch when engine is cold. Turn engine 1/2 revolution of crankshaft and set No. 3 valves. Turn engine 1/2 revolution of crankshaft and set No. 4 valves; turn engine 1/2 revolution of crankshaft and set No. 2 valves.

CYLINDER HEAD GASKET AND BOLTS

NOTE: Refer to Sections 50 and 51 for servicing details.

While rocker arm cover is removed, re-torque cylinder head bolts. First check cylinder head gasket for possible leaks. (Any compression leaks would have been indicated during the compression test which preceded this.) Replace gasket if any air, water, or oil leaks are evident. Re-torque cylinder head bolts to 150 ft-lbs in the sequences shown in Figures 50-15-14 (Gasoline) or 51-15-13 (Diesel).

COOLING SYSTEM

RADIATOR

Run the engine sufficiently to stir up any rust or sediment. Stop the engine and drain the cooling system completely before sediment settles again. Close drain cocks and fill radiator with a solution composed of one pound of washing soda per gallon of water. (Cooling system capacity is 2-3/4 U.S. gallons.) Install the filler cap and run the engine for one hour.

Drain out the solution, add fresh water, and run the engine for a few minutes. Stop the engine and drain out this flushing water.

Fill system with fresh water.

CAUTION: Do not pour hot water in a cold engine or cold water in a hot engine at any time. Do not operate the tractor without water even for a few minutes.

If radiator still shows signs of being clogged, it may require more drastic cleaning such as use of commercial cleaners and back flushing (Section 80, Group 5).

HOSES

Inspect radiator hoses for "mushy" interior. Hoses may look good outwardly but be partially deteriorated inside, requiring new hoses. Whenever in doubt, install new hoses, making sure all connections are tight.

GRILLE AND RADIATOR CORE

Remove hood and grille. Blow out all traces of dirt and chaff from grille and radiator core with compressed air. Straighten all bent fins.

AIR CLEANER

OIL-BATH TYPE (See Section 91, Group 35)

Remove air cleaner cup and clean out thoroughly.

Check air cleaner hole, cleaner body, and wire filter element. Wash all parts in solvent.

CAUTION: Do not dry the oil bath-type filter element with compressed air because of possible damage. Do not steam-clean the element, as tiny mud balls may be formed which cannot be removed.

Replace air cleaner, making sure all hose connections are tight. Fill cup to level with same weight of oil as is used in crankcase. Replace cup.

Be sure cup is properly seated against upper body and that band is properly fitted in place. Tighten thumb screw on band only until finger-tight. (Do not use any tools.)

DRY-TYPE (See Section 91, Group 36)

Remove and empty dust cup.

Check filter element, filter body, air cleaner hole, and all hose connections.

If filter needs cleaning, use one of the following methods:

Dry or Dusty Element: Use compressed air (not over 100 psi at the nozzle) to blow dust from element keeping a reasonable distance between air nozzle and filter.

Oily or Sooty Element. Wash the element in warm water (not over 100° F), adding John Deere Dry Filter Element Cleaner (R36757R) to the water.

CAUTION: Never wash dry-type filter element in fuel oil, gasoline, or solvents. Never use compressed air to dry a wet element.

Reinstall filter, dust cup and baffle. Tighten clamp on dust cup only until finger-tight. Reset restriction indicator if red signal is showing (see Section 91, Group 36.)

IMPORTANT: Replace filter element after six cleanings or one year of service, whichever occurs first. Always be sure wing nut on element is tightened securely, as dirt can be drawn into engine if element is loose.

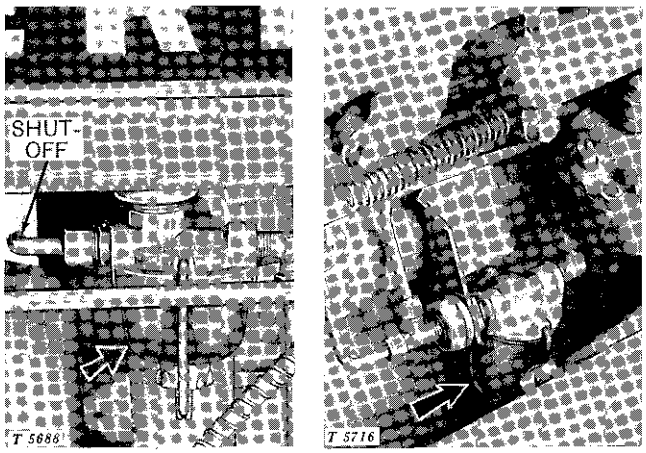
FUEL SYSTEM

GASOLINE

Fuel Tank and Lines

Check fuel tank and lines for dirt or foreign matter and remove to clean if necessary.

Fuel Filter



(-15782) (15783-Up)

Fig. 40-10-13–Gasoline Fuel Filter

Clean sediment bowl and filter screen thoroughly. (Fig. 40-10-13).

Install filter screen, gasket, and bowl.

NOTE: Use new gasket, making sure gasket and screen are properly seated before tightening jam nut.

DIESEL

Fuel Tank and Lines

Inspect fuel tank and lines for dirt or foreign matter and remove to clean if necessary.

Fuel Strainer and Fuel Filters

Remove and clean fuel sediment bowl. On tractors (-42000), reinstall filter screen, gasket, and bowl. Use new gasket and be sure gasket and screen are properly seated before tightening jam nut. On tractors (42001-up), reinstall first-stage filter bowl and tighten large stud screw until finger tight. Be sure gasket is in place on shoulder of filter element before tightening stud.

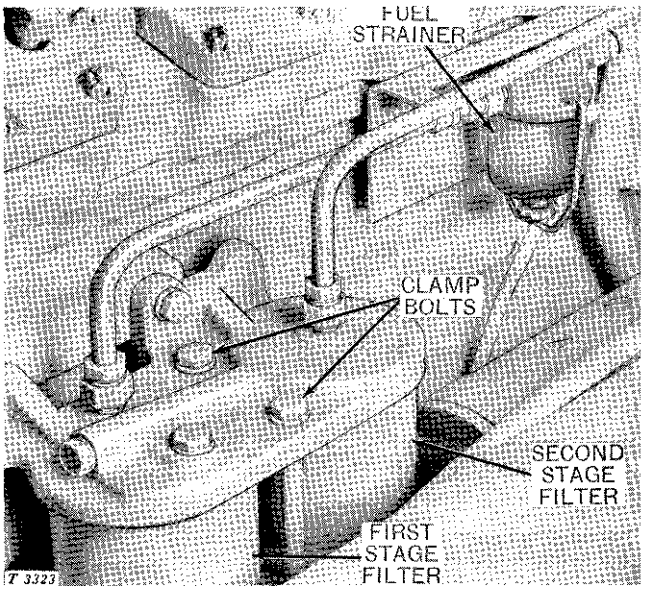


Fig. 40-10-14—Fuel Strainer and Fuel Filters (-42000)

Tractors (-42000). Check first-stage fuel filter element for dirt or water-soaking (Fig. 40-10-14). Loosen bolts holding filter clamp and remove case marked "1ST STA" from filter head. Make sure that metal ferrule on top of element is removed with case. Replace the element if it is dirty or water-soaked. Install a new felt washer on filter sleeve; then grease sleeve and install new "O" ring. Unless first-stage filter is extremely dirty or water-soaked, do not replace second-stage filter except at major overhaul. Install filter case under filter head. Adjust clamp and tighten clamp bolts. Bleed fuel system (see following).

Tractors (42001-up). Check the first-stage filter element (rear) for dirt or water soaking. (Fig. 40-10-16). Back off large stud screw under filter sediment bowl and remove screw and bowl. Remove filter element. Replace element and gaskets if element is dirty or water soaked. Place gaskets on shoulders of element and slip element under filter head. Reinstall screw and bowl under filter element. Be sure gaskets are not crimped, then tighten stud screw until snug. Do not replace second-stage filter element except in the case of major engine overhaul, unless first stage filter is extremely dirty or water-soaked. Bleed fuel system (see next page).

Bleeding Diesel Fuel System (-42000)

Any time the Diesel fuel system is opened or has run dry, it is necessary to bleed the entire fuel system to remove air bubbles. Do this as follows:

Fill fuel stank with No. 1-D or No. 2-D Diesel fuel (see chart, page 91-5-1).

Service the fuel strainer to remove moisture condensation or air lock. Loosen jam nut under sediment bowl and gradually loosen bowl until fuel flows freely. Tighten jam nut.

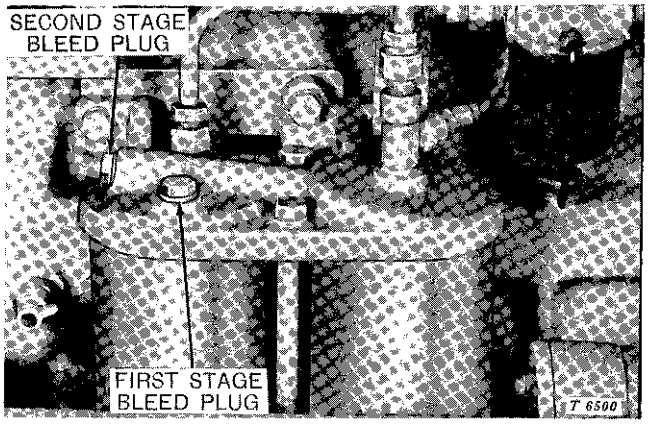


Fig. 40-10-15—Diesel Fuel Filter Bleed Plugs (-42000)

Loosen bleed plug on top of first-stage filter and let fuel flow until it is free of air bubbles (Fig. 40-10-15). Retighten bleed plug.

Loosen bleed plug for second-stage filter and let fuel flow until it is free of air bubbles. Retighten bleed plug.

Loosen the fuel injector nozzle nuts (or screws) on each injector nozzle. Crank engine with starter until fuel begins to slowly flow around loosened injector nozzle. Retighten after air is dispelled. Torque injector nozzle nuts as follows: Tractors (10001-29000)—15 ft-lbs. Tractors (29000-42000)—35 ft-lbs.

CAUTION: Loosen only one turn to avoid excessive fuel spray.

NOTE: If engine is running, loosen only one at a time. Retighten before going on to the next one.

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