

John Deere Cooling Systems

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General -- The cooling system is built on the thermo-siphon principle wherein hot water rises over cooler water. As a result, the coolant circulates automatically without the need for a water pump...less parts to cause trouble. There is no thermostat to stick and no fan belt to slip. The coolant does not begin to circulate until the engine is hot enough to burn the fuel properly -- the circulation then keeps pace with the cooling requirements of the engine. Horizontal two-cylinder engine design has enabled John Deere engineers to place the engine on the same level as the lower part of the radiator so that the cool water enters the water jackets around the exhaust valves first. This is the hottest part of any engine, where cooling is needed most. A radiator curtain or shutter enables you to maintain this temperature under varying weather and work conditions. A water temperature gauge, located in plain sight from the tractor seat, tells you when to adjust the curtain or shutter.

Antifreeze -- When adding antifreeze like the conventional green coolant such as NAPA brand prepared for NAPA by the makers of PEAK, strive to avoid having all of the antifreeze in the bottom of the cooling system. Don't just pour the antifreeze in first! Mix! Mixing antifreeze with water before pouring the mixture into the radiator will prevent development of an "antifreeze block" in your cooling system. In your JD "H" tractor, heated water will rise over unheated water because heated water has a lower "specific gravity," i.e., it is not as dense, thus lighter in weight. This "automatic circulation" does not happen until water in the lower part of the coolant jacket (engine) is heated to achieve this "less dense" state so as to rise. The specific gravity of "regular" antifreeze (such as PEAK) is 1.12. That is 12% heavier than pure water! Its density is not known to change much with temperature, and it will NEVER become less dense than pure water. So, if the lower half of your coolant jacket is filled with pure antifreeze, it just WILL NOT rise over water, meaning that you may have NO circulation! The temperature gauge reads HOT, yet the upper radiator tank is COLD. If this happens, drain, mix and then reinstall the mixture into the tractor. Caution: Never drain coolant from a super-heated engine; just shut it down and let it cool.

50-50 Premix -- For most of us, we are accustomed to purchasing "ordinary permanent, ethylene-glycol" type antifreeze which, when mixed with equal amounts of water will protect your cooling system to minus (-) 34°F. Recent attempts to buy this product reveals the same massive proliferation of antifreeze products as one would find when looking for hotdogs in your grocer's cold goods case! First off, there is a very popular 50-50 premix, then there are long-life, extended life, and "dex-cool" varieties. At Wal-Mart, I found Prestone 50-50 premix for sale at \$8.00 per gallon, and store-brand full-strength at \$9.00 per gallon. Both products make similar claims in terms of protecting your cooling system. But buying the premix nearly doubles your cost! One advantage, however, assuming you want to end up with a 50-50 ratio of antifreeze to water, buying the premix deletes the concern for "antifreeze block" as discussed above. Assuming you live in the South, and need only a 20-80 mix of antifreeze-to-water, then buy the full strength, then mix at a rate of 20-80 **BEFORE** filling your tractor's coolant jacket. The procedure -- drain the current cooling system's contents, reinstall drain plug, and then add the premixed solution.

New 5-yr Antifreeze -- DEX-COOL™ is a protected name for GM's version. DEX-COOL™ is super sensitive to exposure to oxygen and atmospheric carbon dioxide, so unless your cooling system has a pressure cap and an overflow tank (closed system - no air pockets), this substance shouldn't be used. Many are saying that the organic compounds in the DEX-COOL™ attack the radiator solder alloy and leach out the tin leaving the lead behind. During the heat/cool cycles the lead begins to break down and allows the joints to pull apart. They go on to say that repair is nearly impossible because of the

chemically-altered solder that remains; plus erosion of the copper or brass surfaces. Vintage tractors were constructed when lead-based solders were very cheap and brass was the first choice material for cooling systems. Times have changed and so have the construction methods and materials. Yesterday's tractors get along very well with the older glycol coolants because they were very well tested through the years and have proven themselves over time. The bottom line -- **I would not use any of the new 5-year antifreeze compounds in my two-cylinder John Deere!**

Cooling System – Renewal

Do not be fooled into thinking of this as an easy one. More often than not, some shortcoming is likely to surface; perhaps as little as a defective radiator cap gasket, or as serious as a leaking radiator core, or one clogged up with "debris of the years".

Most of the water jacket on the "H" is cast iron, and this means lots of opportunity for rust. Rust particles can choke up a radiator core in a heartbeat. Another enemy is that limestone buildup is very common in many parts of this country. For older tractors, farmers frequently used water only, planning to drain water from the tractor on nights when they considered hard freeze a possibility. But the step of draining the tractor was easily overlooked, and some of them DID freeze and break! Years ago, farmers were torn between alcohol that tended to boil off as the engine reached operating temperature and a wide-spread fear of using permanent antifreeze. Accordingly, look for broken and/or cracked radiator tanks and pipes, and for cracks and/or welds in the cylinder head and/or in the block.

The upper water pipe is prone to be close to the end of its life because of rusting through, and it is the lower pipe that is to be suspect for having been cracked by a freeze. So there is ample room for problems in the interconnecting pipes, hoses, clamps, overflow systems, and perhaps no shutter. Don't overlook the fan. HINT: For H-26999 and earlier, a section of standard 2 inch schedule 40 water pipe can be used to replace the lower pipe -- available at many hardware and builder's supply stores.

Radiator Overhaul

Radiator disassembly, cleaning and repair --- For most John Deere two-cylinder tractors including the "H", the radiator amounts to four pieces of cast iron and a copper core bolted together. The top and bottom tanks, held in strict relation to each other by the two sides, envelop the core. Many small cap screws and/or bolts hold together the sandwich of iron pieces and the top and bottom plates of the core. This is their interface. For a *Spruce up*, one may be spared the task of disassembly, provided the radiator isn't leaking and the tractor isn't overheating. For *Restoration*, or for a tractor that hasn't been running for a very long time however, full disassembly is the way to go. This means removing many small, perhaps rusted-in 3/8-16 and 5/16-18 inch studs and/or cap screws from the tank castings. Prepare the radiator well in advance. Apply several liberal doses of penetrating compound (PB Blaster™ or Kroil™) to nuts and bolts and to studs and cap screws. Allow a day or two for soaking before attempting to remove them. Techniques vary as to how to back these stubborn fasteners out of cast iron. Application of heat is too risky -- it may damage the core. A firm grip between fastener and wrench is foremost. Now - think "impact" -- but not with overwhelming force! Some sort of shock works best. A small hammer (on the wrench) used with patience -- "tap-tap" one way, then "tap-tap" the other. Watch for movement. Then try working it back and forth. Applying a slow, steady force increases likelihood of a twist-off! Replace all fasteners with new stock, chase tapped holes. **See Homepage for Radiator Bolt Sets under Parts & Products for sale.**

Separate the pieces, applying utmost care to protect the core from any stress or shock whatsoever! Most likely, one or more of the fasteners will twist off. One must then use wisdom, and conventional methods of removal. Complete the removals and make other repairs as necessary such as welding a crack. Clean and prepare the various castings (sandblast and prime if called for), straps and fasteners for painting. Sandblasting can be an effective means for dealing with rust inside the tanks once separated from the core. Following prime painting and before finish painting, use appropriate sized bottom taps to chase all threaded holes in castings. Insert dummy bolts into threaded holes prior to finish paint. Unserviceable threaded tapped holes in the tank castings should be over-bored and fitted with suitable Helicoils™ or Keenserts™. JB Weld™ can come in handy to back-fill huge voids in the tank casting's gasket regions. Clean all debris from the core with shop air. Straighten the copper fins of the core (BONDO™ applicators come in handy for this). Once all cleaning and preparation is finished, the core is generally left in its oxidized copper color, and the iron pieces all painted John Deere Classic Green. Allow sufficient time for the paint to cure before final assembly.

Caution: If you carry the radiator core to a service shop for checkout or for repair work, be sure it gets a nice cushioned ride. The metal is some 6 decades old, is hardened and very fragile. Vibration is NOT your radiator core's friend!

Cosmetic issues – Radiator Core & Fan Blades -- Radiator cores were not painted by Deere (except for overspray of green during factory painting). But if you must paint the core, choose black. It is generally agreed that fan blades were green, then hand-painted yellow (or white) on the back side for safety reasons until the mid 1940's. After that, fan blades were left green. However, fans for service parts were painted yellow! Other cosmetic issues relating to the cooling system are: (a) do NOT paint the hose sections, and (b) wire-type hose clamps were original and painted green.

Radiator Final Assembly -- Establish a clean work area for final assembly of the radiator. Usually, these decades-old castings no longer have smooth interface surfaces. Two thoughts come to mind. One is to take you tank halves to an auto engine rebuilder for some "flattening" just like one would for an engine head, and the other is to apply a non-hardening gasket sealer to both sides of each gasket. Permatex® Aviation Form-A-Gasket® Sealant has proven successful and the residue (squeezed out part) cleans up easily with mineral sprits. Or, you may choose Loctite™ Hi Tack type. Another solution is adhesive-backed cork gasketing between core and tank sections; source at an auto parts store or a radiator shop.

All of the bolts and studs should be renewed. Apply anti-seize to all threads. Do not apply massive torque to those fasteners. Draw them up as equally as possible. Observe that there are many fasteners decreasing a need for lots of torque. The 3/8 pieces may be drawn up quite tight; they along with the sides form the frame for the entire assembly. Once assembled, a final go-around on all fasteners is wise, but not drawn so tight as to warp the bolt straps. **See Homepage to order Radiator Bolt Sets.**

Cooling System Sealing -- Once the whole cooling system is reinstalled on the tractor and considered serviceable, the entire system should be sealed. Install a dummy plug in the upper water pipe where the temperature gauge normally goes. K&W Block Seal is one brand of sealer that is popular and effective. Always seal before adding permanent antifreeze. Regardless of your choice of brand, it's important to follow manufacturer's instructions.

Model "H" Radiator Bolt Set – Analysis

On top, the 5/16 fasteners screw into blind tapped holes of the top tank. Accordingly, they should be screwed into the tank exactly as called out in this document, mirroring the engineering. See Figs 1 & 2.

NOTE -- When inserting studs into the upper tank casting, the engineering standard for studs into this casting is 1.5 times stud diameter. For 5/16" diameter studs, this distance is 15/32", 8-1/2 threads in, or nearly 1/2 inch in.



Fig 1. Top Front View – 5/16 bolts should be Square Head

Top Front: (Figure 1 above) Square head machine bolts -- Call-out is six (6) bolts @ 7/8" long. As you view Figure 1, just realize the exception – you see **Hex Head Cap Screws** where square head bolts should be!



Fig 2. Top Rear View – Note Studs with Heavy Hex Nuts

Top-Rear: (Figure 2 above) Studs with Nuts – Call-out is four (4) studs 15/16" long, two (2) studs 1-3/16" long, and six (6) H1503R Hex Nuts. The closest commercially-available hex nut is a "Heavy Hex" nut SAE grade 2 strength which takes 9/16" (or 14 mm) socket to drive. In view of the thickness of this nut, use

studs 1" long and 1-1/4" long respectively. Short studs are for straps, and longer studs for side castings -- 12 pieces (six studs & six heavy hex nuts).



Fig 3. Bottom Front View

Bottom, front & rear are the same: (Figure 3 above and 4 below) -- Two call-outs here: F/N 38 is twelve (12) square head bolts (5/16 x 7/8") with full sq nuts – should be eight (8), and F/N 41 is four (4) square head bolts (5/16 x 1-1/8") with full square nuts. On each side (front & rear), use four (4) 5/16 x 7/8" strap-to-tank, and two (2) 5/16 x 1-1/8" side-to-tank at the bottom.



Fig 4. Bottom Rear View



Fig 5. Bottom Rear-Side View – Note HCS at the Corner – Shown here w/lock washers

Corners: (Figure 5) -- Called out at each of the corners, top & bottom, are hex head cap screws, 3/8 x 1" long (lock washers are optional -- not called out). ++++