



Teardown and reassembly of TT-350 or newer version, designated as TT-560. These also have the same internal design as TT-660.

All references to part numbers on this document should be matched to the drawing for items # 4001174 (TT560).

All bolts should be torqued to standard torque spec for grade 8 bolts (lubricated). The only exceptions are fluid end nuts or bolts, and liner clamp nuts or bolts. They are particular to TRI units and should be torqued to 600 ft pounds for fluid end nuts or bolts, 500 ft pounds for liner clamp nuts or bolts.

Fasteners that are used on expendable parts such as studs, pony rods and piston rods that will need to be changed on regular interval should be coated with anti-seize or other material to prevent rusting or seizing together to make removal easier. Any bolt that passes thru the frame or will come in contact with oil inside the unit should be treated with Loctite 545 or equivalent, to prevent leaking of oil from unit and prevent contamination from outside sources. Bolts that do not pass thru or are used for internal parts should be treated with Loctite 262 or equivalent to prevent the bolts from loosening from vibration. RTV silicone can be used on gaskets but should be used on one side only and in small amounts. Excess sealant should not be allowed to contaminate the oil this can cause the lube system to become clogged and fail prematurely.

Teardown should be done after the unit has been drained of fluids and cleaned to allow for inspection of parts. It is important to make sure hard to reach places like under the cross slides #86 are cleaned completely. It is recommended that the cross slides should not be removed unless damaged or need alignment. If the cross slides are needing to be removed, take care to mark the cylinder location as well as the top or bottom mount. This is very important as the older pumps have different size cross slides on the top and bottom, and will not interchange. If you are installing new cross slides, they are interchangeable and can be used on top or bottom locations along with the crossheads #76. They should be free of built up metal and other materials, steam pressure washing with grease remover is recommended and unit should be blown dry and as much moisture removed as possible to prevent rusting of unpainted surfaces.

The teardown is pretty straight forward, remove the chain and large sprocket. The large sprocket is slip fit and should be removable with gear puller but may require heat to be removed. The chain box is held on with long bolts that are drilled to accept safety wire to prevent loosening, and should be tied in place when re-installed. The eccentric (crankshaft) will need to be supported while the outer main bearing seal plates and bearing housings are removed. The two main bearings #63 are sweat fit and are heated and installed on the eccentric #87, and will require heat to be removed after removal of these bearings. The seal area and bearing area should be checked for excessive wear, which can result in leaking seals or the improper fit of bearings and possible failure. If unsure of measurements, contact TRI service for size details.

The connecting rods will need to be slipped over the lobes on the eccentric as it is removed from the long shaft side of the unit, using an overhead crane or engine stand to hold the eccentric. While pulling it out of the frame each rod will need to be slid over the next lobe until the unit is fully removed. The rod bearings are in two pieces- the roller is slip fit into the rod and the race is sweat fit onto the eccentric lobes. They have a hollow pin that is used to hold the race in place and lube the bearing, and will need to be removed before removing the race. If the pin is not tapped or threaded, it can be tapped with ¼-20 or similar size thread to allow a puller to be screwed into the pin and be removed with slide hammer. If removal cannot be accomplished with puller, the pin can be drilled out with high carbon bit. Make sure not to enlarge the hole and remove any material from the lube hole. Air should be blown into the lube hole in the center of the eccentric to make sure the passages are all clear before re-assembly.

When starting re-assembly of the pump, the first step is to make sure the cross slides and cross heads are in good condition. Scratches will appear on the lower cross slide and is normal wear. This should be cleaned as well as possible by sanding any grooves that protrude above the machined surface. Care should be taken to remove as little material as possible to make the surface smooth, on the cross slides and crossheads. Clean with paint thinner or acetone so that the surface is clean and dry. Use the crosshead to slide on the surface of the cross slide, it should slide freely and without noise. If loud noise or file rasping sounds are heard, then the cross head or slides will need to be polished with as fine a sanding material as is available to insure a slick surface. Excess friction will cause the crosshead to heat up and expand, and will cause failure of the pump. The bottom cross slide is the first thing to be installed. It is secured with 4 bolts and blocks #13 and #80. Make sure they are in good condition or new.

Install the blocks into the frame and place the cross slide in position over the blocks. Thread the bolts in until tight, and place the cross head on the slide. Push it thru the front opening of the pump. The crosshead and cross slide must be clean and dry. If the cross head hits the opening and will not slide thru, remove the cross head and loosen the bolts #13. Without removing the slide, slip shims under the cross slide to raise it starting with .015 shim pieces. These should be cut 6" long and ½" wide, and it takes 4 pieces for each cross slide. Steel shim stock is preferred, as brass or aluminum can crush and lead to incorrect readings. Tighten the bolts and retry sliding the crosshead thru the front of the pump. If it makes contact with the bottom of the opening, continue to add shim material .002 at a time until it fits thru the front opening of the pump without touching top or bottom. At this point you will need to set the alignment, as this is vital to piston and liner wear. If this is not correct, the piston metal can come in contact with the liners and cause premature failure of liners. The process is very tedious but necessary to the performance of the pump and longevity of expendables. With the crosshead slide 1/8" thru the front opening of the pump, use feeler gauges to check in several places along the top and bottom ¼ of the opening, and the crosshead top and bottom gap must be as close as possible to the same size to (+ - .002). The top cross slide can now be installed and bolted in the same way using blocks. Tighten bolts and slide the crosshead in place between the slides. Check the top clearance between the crosshead and top slide with crosshead in several locations. From front to back of slide this should be at its tightest spot- between .015 to .020. If any tighter, the crosshead can rub causing overheating and any looser the crosshead can kick up and cause noise when running and damage the upper cross slide. Shim the upper cross slide by shimming the top slide down. Never change the bottom slide after alignment is complete, as this will change the centering of the crosshead. When checking the upper cross slide, check center and each side to make sure the crosshead has minimal clearance. It may be possible to have tight clearances on the side, and more in the middle area. Remember the clearance should be set at its

tightest point. You may have some areas that are looser but you cannot have any area tighter than .015. Repeat these steps on all three cylinders until correct.

Wrist pin bushings #89.2 are located at the end of the connecting rod #89. The bushing should be checked using a new wrist pin #84, slide the pin in the bushing dry and clean (never lubricate for testing as this will give inaccurate readings). The pin should slide thru the bushing without resistance. Once it is in position, never force it thru. The pin should be a tight fit, and should have no noticeable movement on the ends up and down. If the pin is loose then the bushings will need to be replaced. The bushing is replaced by heating the end of the connecting rod, and placing the bushing frozen into the end and left to cool. Once the bushing has cooled, then it can be machined to correct size. The bushing inside diameter, and lube grooves are machined after installation.

Connecting rods #89 will receive the roller part of the rod bearing #95, and it should be laid flat and the roller positioned over the rod opening. Using a brass or rubber hammer, tap into place. Once the bearing is started correctly, it should slide in with minable help and by drop in under its own weight. The retainers should be installed on the rod- depending on the year, clips or retainer rings will be used on each side of the rod. The other piece of the bearing, the race #95 will need to be installed on the eccentric. This will have to be heated until it will fit over the lobes of the eccentric. Two of the races will be installed over the short end of the eccentric, and one will be installed on the long end. The race is drilled to accept the roll pin and should be aligned with the corresponding hole on the eccentric. After the race is installed and the holes lined up on the eccentric and race, a temporary ¼ bolt should be put in place to hold the race until it cools. The pin should be installed after the race has cooled. Install retainer clips or rings depending on the model year to hold the races in place. The main bearing can be installed on the long end of the eccentric by heating the bearing with a torch until it will slip onto the lobe- hold the bearing in place until cooled. Next the connecting rods should be installed in the pump. Place cardboard under the end of the rods to avoid damaging the cross slides, then start installing the eccentric. From the chain box side keep, the eccentric supported by crane or engine stand as you install the eccentric. You will slide the rods over the lobes the same as teardown. When all the rods are on the eccentric, you can heat up and install the bearing on the short end. Ensure the bearing slides all the way onto the eccentric until it hits the stop. Replace the bearing housing and gaskets on both sides #78 and #71. Use RTV sealant on one side of the gasket to insure seal. Ensure the oil fitting is at the top of the housing and the fitting is facing the correct direction toward the front of the pump. The long shaft side should be bolted with temporary bolts and torqued, but will need to be removed to install the chain box after the eccentric end play has been set. The shim plates #79 has a seal #68, do not install the seal at this point. You will need to remove the plate to set end play and it could be damaged. There are several different thickness of shims see #72 and #74. You need to start with some amount on each side of the pump. Install a random shim on each side. We suggest using the thickest that is available. Install the same thickness on each side, and mount a dial indicator on the pump to check the play from side to side of the eccentric. Using a bar, pry the eccentric to one side of the pump and set a dial indicator to zero. Using a bar, pry the eccentric in the other direction to determine the movement of the eccentric. You will want to have .008 to .012 of travel to allow the bearing to heat up and expand. Remove the same amount from each side, and replace with thicker or thinner shims until this is accomplished. Next install the oil seals on the seal plates before installing chain box. Remove the temporary bolts in the main bearing housing to install the chain box. Only use RTV sealant on one side of the gaskets, as this will make removal easier. Alignment of the large and small sprockets is very important. It is best to have the

unit mounted where it will be running, to make sure the chain box or pump are not being pulled or pushed. Check the alignment between the two with straight edge to insure the sprockets are in line with each other. The larger sprocket can be moved in or out with spacers under the keeper on the end of the shaft.

After the eccentric end play is correct, slide the crossheads in thru the front opening of the pump making sure the cross cut is on the top for oiling, and install wrist pins holes up. If these are installed incorrectly, the unit will fail. It is extremely important that they are installed correctly. We suggest to mark with an arrow in the up position of the wrist pin, to ensure it is installed correctly. Install the retainers one at a time starting with the middle, and then each outside. If not equipped, you should install retainers on both sides of the wrist pin to keep them from coming out. If the bolts are sheared off the pin, they can hit the other cross heads and cause major damage. After crossheads are connected to the rods, re-install the lube lines, inspection cover plates, and pony rod seal housings. These will need to be aligned as well, and is very important for seal life. Tulsa Rig Iron offers a tool to align the housings and seals. Re-install the pony rods and refill with oil and new filter. If there has been metal contamination in the power end, you should flush all lube lines and replace PTO driven lube pump. The unit will splash lube most of the inner parts of the pump, but cross slides and cross heads need to be pressure lubed to prevent overheating. Lube pressure is one of the most common asked questions. We use full flow to lube the pump. There are no restrictions because of the wide range of temps the pumps are used in. When using 80-90 weight, in extreme cold temperatures the pump will produce in excess of 150 psi- we have the relief valve set to 100 psi to prevent filter damage. When operating in extreme heat, the unit may produce as little as 1-5 psi, and you may have to open the unit and visibly check for oil flow to insure the unit is being lubed correctly. If you have any other questions, please contact the Tulsa Rig Iron service department at 918-321-3330.