

DISASSEMBLY & REASSEMBLY OF TCR3000

General

INTRODUCTION

This document provides instructions for the disassembly and reassembly of the Harrington 3 Ton TCR Air Hoist. It is arranged as follows:

DISASSEMBLY

- Initial Disassembly
- Motor Disassembly
- Valve Body Disassembly
- Planetary Gear Disassembly

REASSEMBLY

- Planetary Gear Reassembly
- Wheel Housing Reassembly
- Gear Case Reassembly
- Brake Reassembly
- Motor Reassembly
- Control Valve Reassembly
- Final Reassembly

The nomenclature used in this document is taken from the Parts List section of the Harrington TCR Air Hoist Owner's Manual.

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Disassembly

INITIAL DISASSEMBLY

1. Set the hoist on end with the Control Valve facing up.
2. Remove the Control Valve assembly, with the Limit Shaft and Chain Lever still attached. This is accomplished by removing the Socket Bolts that attach the Control Valve assembly to the hoist motor section.
3. Remove the motor.
 - a. Remove 3 Socket Bolts holding motor housing together.
 - b. There are two small Parallel Pins installed in the Rear Plate of the Motor. These pins are loose and will fall out if the Motor is turned upside down. Remove the Parallel Pins and set aside.
 - c. Pull upward on the Motor housing until the Brake Tube is clear of the Wheel Housing. Remove the Knock Pin.
 - d. Remove the Brake Tube from the Motor. Inspect the O-Ring on the Brake Tube. Replace if any signs of damage.
4. At this point, turn the remaining sections of the Hoist Body over such that the Brake Cover is facing upward. Be careful to not allow parts to fall out of the Wheel Housing while turning the Hoist.
5. Remove Brake.
 - a. Loosen two Socket Bolts in the Piston Cover.
 - b. Loosen and remove 4 Socket Bolts on the Brake Cover gradually to release compression to the Disc Springs evenly. Lift the Brake Assembly off of the Hoist Body and place on a flat surface.
 - c. Remove the Brake Cover by pushing down on the Piston Cover while lifting on the Brake Cover. Disc Springs are loose so remove and set aside. Inspect the 2 Brake Piston O-rings.
 - d. Remove the Piston Cover from Brake Piston. Inspect the O-Ring on the Piston Cover. Replace if any signs of damage.
6. Remove Brake Disc.
 - a. Remove Retaining Ring.
 - b. Remove Brake Disc and Shaft Keys. Inspect Brake Disc.
7. Remove Gear Case
 - a. Inspect Gear Case O-rings.
 - b. Remove 4 Socket Bolts on motor side which retain Gear Case. Lift Gear Case off by carefully prying.
 - c. Inspect Ring Gear teeth. Remove and replace if excessively worn.

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- d. Remove the planetary gear assembly by lifting straight up and set aside for further disassembly.
- e. Leave the brake end bearing on the planetary gear assembly.
8. Remove chain by:
 - a. Detaching both ends of the chain from hoist.
 - b. Pull chain through the hoist. (This will spin the load sheave.)
9. Turn the hoist over so that it is resting on the load sheave. Remove Coupling and set aside.
10. Remove Load Sheave.
 - a. Remove Retaining Ring.
 - b. Remove the Chain Separator by removing 4 Socket Bolts.
 - c. Lift the Wheel Housing off of the Load Sheave, turn over and place on flat surface
 - d. Lift and remove Spacer from the Bearing on inside of Wheel Housing.
11. Remove Chain Guide.
 - a. Prior to removing the Chain Guide note the orientation. The groove for the chain in the Chain Guide is closer to the Gear Case side of the Wheel Housing.
 - b. Remove the Chain Guide through the opening in the bottom of the Wheel Housing.
 - c. Inspect the two bearings that fit into the Wheel Housing. Remove and replace if necessary. These bearings fit snugly into the Wheel Housing, but they are not a press fit. Although the orientation of these bearings is not important to their function, the usual convention for the TCR hoist is to install the bearings so the number on the bearing faces out.

MOTOR DISASSEMBLY

1. Remove Parallel Pins from the rear plate of the Motor.
2. Place Motor on flat surface with Rear Plate down and Rotor shaft facing up.
3. Remove Retaining Ring.
4. Lift Stator off of Rear Plate by pushing down on Rotor shaft and Lifting on Stator. Do this slowly and carefully so that motor Vanes remain positioned on rotor.
5. Remove Vanes and Vane Springs from Rotor.

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6. Remove Front Plate by lightly tapping from inside of the Stator with a non-marring tool.
7. Inspect Motor parts:
 - a. Surfaces of the inside of the Stator.
 - b. Surfaces of the Front Plate and Rear Plate.
 - c. Motor Vane wear.
 - d. Motor Vane Springs.
 - e. Rotor – press fit (into Rear Plate) and free rotation.

VALVE BODY DISASSEMBLY

1. Remove Valve Packing (gasket).
2. Remove Chain Lever from Limit Shaft by removing Retaining Ring from end of Shaft.
3. Remove Retaining Ring on Limit Shaft adjacent to Limit Guide.
4. Remove Under Cover and Under Packing.
5. Remove Limit Shaft by carefully tapping the end of the shaft.
6. Remove Limit Lever.
7. Should not be necessary to remove the Limit Guide.
8. Remove the Hex Nut and Set Screw (Load Limiter) from Side Cover L.
9. Remove Side Cover R and Side Packing.
10. Remove Main Spool. (Note only required orientation is that the slot in the middle of the valve must face the Under Cover opening so that the Limit Lever can actuate it.)
11. Remove Brake Spool. (Note the wider of the three grooves must be closest to Side Cover R.)
12. Remove Side Cover L:
 - a. Turn Control Valve Body such that Side Cover L is up.
 - b. Be aware, Spring and Limit Spring are compressed under Side Cover L. Press down on Side Cover L while removing Side Cover L Socket Bolts.
 - c. Remove Side Cover L and Packing.
 - d. Remove Brake Nut, Spring, Limit Spring, and Brake Retainer.
 - e. Remove Retaining Ring and Exhaust Silencer.
13. Remove Top Cover (muffler):

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- a. Remove 3 Socket Bolts in Top Cover to separate cover from Valve Body.
- b. Lift Top Cover off.
- c. Remove Top Packing.
- d. Remove Nylon Silencer (muffler material).

PLANETARY GEAR DISASSEMBLY

1. Remove Bearings from both ends of Planetary Gear Assembly (note the bearing from the end of the assembly with the hex shaft may have stayed in the Load Sheave when the Planetary Gear Assembly was removed)
2. To Remove a Star Gear remove Retaining Ring with Spacer P from Pin and drive Pin out of Cage. Star Gear (1), Thrust Collars (2), Needle Bearings (2), and Retainer (1) can then be removed from the Cage.
3. Remove Pinion:
 - a. Remove a Retaining Ring from either end of Cage.
 - b. Slide Pinion in as far as it will go and back to its original position. This should dislodge the bearing and permit its removal.
 - c. Once the Bearing is removed, this will expose the inner Retaining Ring for removal.
 - d. Remove the Retaining Ring from the opposite end of the Cage.
 - e. Remove the Pinion from the Cage.

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PLANETARY GEAR REASSEMBLY

Note that there is no gear timing requirements relating to the reassembly of the Planetary Gears.

1. Star Gears:
 - a. Insert 2 Needle Bearings (with a Retainer in between) into each Star Gear.
 - b. Insert each assembled Star Gear and 2 Thrust Collars (one at either end of Star Gear) into position in the Cage.
 - c. Insert the Pin from the end of the Cage with the smaller boss. Carefully tap the Pin while positioning the Star Gear assembly.
 - d. Once the Pin is seated place the Spacer P and attach Retaining Ring to end of Pin.
2. Pinion:
 - a. Install an inside Retaining Ring and Bearing to one end of the Cage.
 - b. Insert the Pinion from the opposite end of the Cage such that the keyed end of the Pinion protrudes from the end of the Cage with the larger boss.
 - c. Install outside Retaining Ring on Pinion shaft adjacent to the installed Bearing.
 - d. Install second inside Retaining Ring at opposite end of Cage.
 - e. Install second Bearing onto Pinion.
 - f. Install second outside Retaining Ring onto Pinion Shaft to complete Planetary Gear Assembly.

WHEEL HOUSING REASSEMBLY

1. Install Bearings. These bearings fit snugly into the Wheel Housing, but they are not a press fit. Although the orientation of these bearings is not important to their function, the usual convention for the TCR hoist is to install the bearings so the number on the bearing faces out.
 - a. Install the Bearing into the Gear Case side of the Wheel Housing.
 - b. Install the Bearing into the Motor side of the Wheel Housing.
2. Lay the Wheel Housing on its side with the Gear Case side up.
 - a. Install the Chain Guide into the Wheel Housing. The Orientation of the Chain Guide is important. The groove in the Chain Guide is offset, and the Chain Guide must be installed so that the groove is closer to the Gear Case side of the Wheel Housing.

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- b. Install the spacer against the inside of the Bearing on the Motor side of the Wheel Housing. Do this from the inside of the Wheel Housing by laying it on top of the motor side Bearing. The flat side of the spacer should be facing away from the Bearing.
3. Install the Load Sheave into the Wheel Housing from the Gear Case side of the Wheel Housing. Install the Retaining Ring on to the Motor Side of the Load Sheave.
4. Install Chain Separator. Make sure the side of the Chain Separator with the cutout and recess faces the Motor side of the Wheel Housing.

GEAR CASE REASSEMBLY

1. Lay the Wheel Housing on its side with the Gear Case side up.
2. Install the Bearing that supports one end of the Planetary Gear Assembly into the gear ring portion of the Load Sheave. Again, the orientation of these bearings is not important to their function, but the usual convention for the TCR hoist is to install the bearings so the number on the bearing faces out.
3. Install the Planetary Gear Assembly into the gear ring portion of the Load Sheave. The hex end of the Pinion shaft must be toward the Motor side of the hoist, and the keyed end of the Pinion shaft must be toward the Brake side of the hoist.
4. Install the Bearing on to the Brake side of the Pinion shaft.
5. Install the Gear Case onto the Planetary Gear Assembly. Again, note that there is no gear timing requirement regarding the gear system on the TCR. You may have to tap carefully on the mounting hole ears of the Gear Case while slightly turning the Pinion shaft to seat the Gear Case against the Wheel Housing.

BRAKE REASSEMBLY

1. Turn the partially assembled hoist on end so that the Motor side is down and the Brake side is up.
2. Install the Brake Disc onto the protruding keyed portion of the shaft. The side of the Brake Disc with the longer hub goes down facing the Gear Case. Line up the shaft keyway and the Brake Disc cutouts, then the two Keys and the Retaining Ring. Make sure the surfaces of the Brake Disc remain free of any grease or oil.
3. Install the Brake Piston on to the Gear Case:
 - a. Coat the O-Rings with a light application of grease.

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- b. The Brake Piston must be oriented so that the smallest of the four holes closest to the center hole is up, such that it is oriented toward the hoist's top hook.
- c. The four through holes must line up with the four threaded holes in the Gear Case.
- d. Carefully push the Brake Piston into position onto the Gear Case.
4. Install the six Disc Springs into the six large holes in the Brake Piston.
5. Install the Brake Cover and Piston Cover:
 - a. Again, coat O-Rings with a light application of grease.
 - b. Line up the four holes in the Brake Cover with the four through holes in the Brake Piston (see 3c above). Install the Brake Cover using the four Socket Bolts.
 - c. Orient the Piston Cover so that its two mounting holes line up with the two visible threaded holes in the Brake Piston, Install the Piston Cover using the two Socket Bolts.

MOTOR REASSEMBLY

Note, it is particularly important that components involved in the Motor reassembly be clean – free of grit, grime, and dirt.

1. Position the Rotor and Rear Plate Assembly on the table with the Rotor up and the Rear Plate down.
2. Install Stator onto to Rotor and Rear Plate assembly:
 - a. Orient the side of the Stator with the small recess and Motor air ports to mate with the Rear Plate.
 - b. Line up three bolt holes of Stator with the three bolt holes of the Rear Plate and assemble together.
 - c. Make certain that once parts are assembled, that the height of the Rotor is lower than the height of the Stator recess.
3. Install Motor Vanes:
 - a. Install Vane Springs onto Vanes.
 - b. The only orientation requirement for the Motor Vane installation is that the Vane Spring is toward the center of the Rotor.
 - c. To install Vanes into Rotor depress the legs of the Vane Spring such that they do not cross. Then while depressing the Vane Spring legs, slide the Motor Vane and Vane Spring into slot in the Rotor. Release the Vane Spring while sliding the Motor Vane into slot.

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- d. Once Vanes are installed rotate the Rotor to ensure that Vanes are installed correctly and function properly.
- e. Apply light coating of oil to the assembly.
4. Install Front Plate:
 - a. Orient the Front Plate with its flat side facing the Rotor.
 - b. Align the Front Plate so that its bolt holes line up with the bolt holes in the Stator.
 - c. Install the Front Plate on to the Rotor shaft, and lower into the stator such that the Front Plate seats against the recess of the stator.
 - d. Install the Retaining Ring on to the Rotor shaft.
5. Install the Motor on to the hoist:
 - a. Turn the partially assembled hoist on end so that the Brake side is down and the Motor side is up.
 - b. Install the Coupling into the center of the Motor side of the Wheel Housing. The end of the Coupling with the recessed hex shape mates with the Rotor shaft, so the Coupling must be inserted into the Wheel Housing with the recessed end facing up.
 - c. Assemble the Motor to the hoist such that the Rotor shaft that is protruding from one end of the Motor fits into the Coupling (see item b above). Line up the bolt holes of the Motor with the bolt holes of the Wheel Housing.
 - d. Install the Knock Pin by inserting it into its hole in the Rear Plate. It should insert such that none of the Knock Pin protrudes above the Rear Plate.
 - e. Insert the Parallel Pins into their holes in the Rear Plate.
 - f. Make sure that the Brake Tube O-ring is not damaged. Lubricate the ends of the Brake Tube with a light application of oil. Then carefully insert the Brake Tube into the center opening of the Rear Plate.
 - g. Once Brake Tube bottoms, apply pressure to seat the Brake Tube against the Rear Retainer until the Retaining Ring is flush with the top of the Rear Plate.
 - h. Install Socket Bolts to fasten Motor to the Wheel Housing.

CONTROL VALVE REASSEMBLY

1. Insert Nylon Silencer material into Top Cover.
2. Install Top Packing on Top Cover.
3. Attach Top Cover to Valve Body with three Socket Bolts.

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4. Install the Exhaust Silencer into the Top Cover with the coarse mesh of the silencer facing the inside of the Top Cover. Secure with Retaining Ring.
5. Install Side Cover R and Side Packing on to Valve Body with two Socket Bolts.
6. Apply light coating of oil to the Main Spool and insert it into the Main Spool port of the Valve Body (port furthest away from top cover). Note: the only required orientation is that the slot in the middle of the valve must face the Under Cover opening so that the Limit Lever can actuate it.
7. Apply light coating of oil to the Brake Spool and insert it into the Brake Spool port of the Valve Body (port closest to Top Cover). Note: insert Brake Spool such that the end with the widest groove goes in first (wide groove end of the Brake Spool must be adjacent to Side Cover R).
8. Insert Brake Retainer into Brake Spool port. The open side of the Brake Retainer must be facing away from the Brake Spool.
9. Insert Limit Spring and Spring into the open side of the Brake Retainer. The smaller Spring nests inside the larger Limit Spring.
10. Insert Brake Nut into Limit Spring.
11. Install Side Packing.
12. Install Side Cover L with two Socket Bolts. Note: ensure holes in Side Cover L line up with Spring Pins on Valve Body.
13. Install Hex Nut and Set Screw (Load Limiter) into Side Cover L. (Prior to placing the hoist into service adjust the Load Limiter in accordance with the Owner's Manual.)
14. Install Limit Lever with its tab inserted into the slot in the Main Spool.
15. Install Limit Shaft through Valve Body openings and Limit Lever. Make sure to insert the Limit Shaft from the nameplate side of Valve Body and that the threaded hole in the end of the Limit Shaft is vertical. Note: the larger hex-shaped portion of the Limit Shaft fits tightly into the Limit Lever and may require careful tapping with a hammer. Attach Retaining Ring to Limit Shaft adjacent to the Limit Guide – be sure to not distort Retaining Ring.
16. Install the Chain Lever, Limit Roller and Roller Shaft to the small hex end of the Limit Shaft with a Retaining Ring. Align such that the Limit Roller is 180 degrees away from the Top Cover.
17. Install Under Cover and Under Packing with four Machine Screws.
18. If hoist is not placed immediately into service, plug air inlet port on Valve Body.

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FINAL REASSEMBLY

1. Install the Top Hook Set.
2. Lay hoist on work surface with brake side down and motor side up.
3. Install Valve Packing to top of Motor orienting the packing holes to align with holes in the Rear Plate.
4. Assemble the Valve Body to the Motor. Make sure that the Valve Body aligns with the Parallel Pins protruding from Rear Plate.
5. Install Socket Bolts into the Valve Body and make sure that they are evenly torqued to the specified torque value.
6. Re-chain the hoist in accordance with procedures set forth in the Owner's Manual.
7. Perform testing in accordance with ANSI/ASME B30.16. After successful testing, the hoist can be returned to service.