

WARNING: THIS MANUAL IS ONLY FOR
 HYDRAULIC TENSIONERS WITH
 THE **ORANGE** SAFETY GUARD.
 DO NOT USE IF THE GUARD
 IS A DIFFERENT COLOR.

REVISION LETTER	GE ALTERATION NOTICE NUMBER

INSTRUCTION MANUAL IM-255
For Syngas Turbine Tensioned Studs and Nuts

Applicable Bolting Connections

7FB Syngas Turbine to Load Coupling
 7FB Syngas Load Coupling to Generator

Applicable GE Ordering Sheet Part Numbers

101T4503P001
 101T4503P002
 101T4503P003
 101T4503P004
 101T4503P005
 101T4503P006
 101T4503P007

GE Power Generation		GENERAL ELECTRIC COMPANY Schenectady, NY	
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**Instruction Manual IM-255
For Gas Turbine Tensioned Studs & Nuts**

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1.0 Cautions and Safety Warnings

NOTICE

As of summer 2011, this manual is to be used in relation to the interlocking style tensioner. This new tensioner can be identified by its ORANGE safety guard. Note: yellow guarded tensioner requires the use of different set of instructions, consult Riverhawk for assistance

TO AVOID FAILURE, ENSURE SAFETY AND PROPER OPERATION THE TENSIONER AND INERLOCK SAFETY GUARD MUST INSTALLED ON THE FLANGE BEFORE TENSIONING BEGINS. DO NOT USE THE TENSIONER ASSEMBLY AT ANY PRESSURE UNLESS THE TOOL IS INSTALLED ON THE FLANGE.

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the conical thread of the stud. Proper engagement is achieved when the puller screw is tight in the stud and is not cross-threaded into the conical thread.

WARNING

The safety guard **MUST** be in place and hands kept out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.

CAUTION

DO NOT EXCEED THE MAXIMUM PRESSURE MARKED ON THE TENSIONER. Excessive pressure can damage the stud and the puller screw.

WARNING:

Keep hands clear of the tool while the pressure is building up. This includes the pin wrench for tightening the spanner ring (nut). Once the tool is stabilized at pressure then and only then can the nut be tightened. This reduces the potential of personal injury.

Note: Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use "Never Seize" on the conical threads. This procedure will ease assembly and assure positive mating of the threads before tightening.



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2.0 Scope

This document describes the steps to install a set of hardware containing the studs and nuts supplied by Riverhawk Company at the turbine/coupling and coupling/generator connections. This hardware is depicted on the following drawings. These drawings as well as Tooling drawings form part of this manual.

GE Purchasing Ordering Part Number	GE Hardware Set Drawing Number	Riverhawk Hardware Set Part Number	Description
101T4503P001 101T4503P002 [#]	359B2514	HF-0771	2-1/4" and 2-3/4" Hardware Set for 7F (both ends of load coupling)
101T4503P003 [#]	n/a	n/a	2-1/4" and 2-3/4" Installation tooling only (includes Hydraulic pump)
101T4503P004	359B2539	HF-2447	2-1/4" Hardware Set for 7F (turbine end of load coupling)
101T4503P005	359B2520	HF-0803	2-3/4" Hardware Set for 7F (generator end of load coupling)
101T4503P006 [#]	n/a	n/a	Hydraulic Tensioner for 2-1/4" hardware (Hydraulic pump and hardware set are not included with this part)
101T4503P007 [#]	n/a	n/a	Hydraulic Tensioner for 2-3/4" hardware (Hydraulic pump and hardware set are not included with this part)

[#] denotes GE part numbers that include installation tooling



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3.0 Quick Checklist

The following checklist is intended as a summary of the steps needed to use the Riverhawk-supplied equipment. New personnel or those experienced personnel who have not used the Riverhawk equipment recently are encouraged to read the entire manual.

EQUIPMENT INSPECTION

- Check oil level in hydraulic pump.
- Check air pressure at 80 psi [5.5 bar] minimum. (For air-driven pumps)
- Check hydraulic hose for any damage.
- Test pump.
- Inspect tensioner for any damage.

NUT AND STUD PREPARATION

- Inspect studs and nuts for any damage.
- Clean the studs and nuts.
- Measure stud lengths. (**VERY IMPORTANT**)
- Install studs and nuts into the flange.
- Set stick-out dimension on the coupling side of the flange.
- Hand tighten nuts on generator side of flange.
- Verify stick-out measurement (**VERY IMPORTANT**)



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Tensioning TURBINE END (Stud installation)

- Check tensioner's drawing for correct parts and part numbers.
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Install spanner ring onto nut.
- Thread puller screw onto the stud.
- Insert Allen wrench into the back side of the stud to stop the stud from rotating when installing puller screw.
- Using an Allen wrench, tighten the puller screw. Then back off puller screw 1/2 a turn.
- Retighten puller screw by hand until it is fully inserted. **DO NOT BACK OFF PULLER SCREW.**
- Slide foot over puller stud and orientate into position.
- Thread the tensioner onto puller screw. Lightly turn the tensioner onto the puller screw, until it stops. The gap between the foot and tensioner is about 1/16" to 3/16".
- Place guard over tensioner and position guide pin into the hole in the backside of the stud.
- Tighten knurled interlock fitting by hand until it presses firmly against tensioner. (no gap)
- Slide and engage custom connector from rear of guard to lock tensioner into place.
- Tension to 50%. Consult manual for correct pressure.

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Tensioning TURBINE END (Stud installation)

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- Use the pin wrench in spanner ring to tighten nut.
- Release pressure, allow tensioner to fully retract.
- Disconnect hose from tensioner.
- Loosen knurled fitting and remove guard.
- Unscrew tensioner from puller screw. Use **caution** to insure that hands are not between tensioner and coupling when tensioner becomes disengaged from puller screw.
- Remove foot.
- Remove puller screw from stud.
- Remove spanner ring from nut, move to next stud in pattern.
- Tension all studs to 50% before proceeding to final pressure.
- Repeat above steps at final pressure.
- Measure final stud length and record on stretch datasheets. Calculate stretch and verify per section 9.2
- Torque nuts' set screws per section 11.



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Tensioning GENERATOR END (Stud installation)

- Check tensioner's drawing for correct parts and part numbers.
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Install spanner ring onto nut.
- Thread puller screw into the stud.
- Insert Allen wrench into the back side of the stud to stop the stud from rotating when installing puller screw.
- Using an Allen wrench. tighten the puller screw. Then back off puller screw 1/2 a turn.
- Retighten puller screw by hand until it is fully inserted. **DO NOT BACK OFF PULLER SCREW.**
- Install retention studs into adjacent studs, both sides of puller screw.
- Install backside guard covering stud to be tensioned and lightly threaded into backside of adjacent studs.
- Slide foot over puller stud and orientate into position.
- Thread the tensioner onto puller screw. Lightly turn the tensioner onto the puller screw, until it stops. The gap between the foot and tensioner is about 1/16" to 3/16".
- Place guard over tensioner and position locating cutouts onto retention studs.
- Tighten knurled interlock fitting by hand until it presses firmly against tensioner. (no gap) This will also seat retention studs into guard locating cutouts.

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Tensioning GENERATOR END (Stud installation)

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- Slide and engage custom connector from rear of guard to lock tensioner into place.
- Tension to 50%. Consult manual for correct pressure.
- Use the pin wrench in spanner ring to tighten nut.
- Release pressure, allow tensioner to fully retract.
- Disconnect hose from tensioner.
- Loosen knurled fitting and remove guard.
- Unscrew tensioner from puller screw. Use **caution** to ensure that hands are not between the tensioner and coupling when tensioner becomes disengaged from the puller screw.
- Remove foot from puller screw.
- Remove puller screw from stud and retention studs.
- Remove spanner ring from nut, move to next stud in pattern.
- Tension all studs to 50% before proceeding to final pressure.
- Repeat above steps at final pressure.
- Measure final stud length and record on stretch datasheets. Calculate stretch and verify per section 9.2
- Torque nuts' set screws per section 11.



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Detensioning TURBINE END (Stud removal)

- Loosen nuts' set screws
- Inspect and clean studs' conical threads. **Do not continue until ALL debris is removed from the threads!** Reference instruction manual IM-220. **Do not try to use the tensioner to remove a damaged stud!**
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Install spanner ring onto nut.
- Thread puller screw onto the stud.
- Using Allen wrench tighten the puller screw. Then back off puller screw 1/2 a turn.
- Lightly retighten puller screw by hand until it is fully inserted. **DO NOT BACK OFF PULLER SCREW.**
- Slide foot over puller stud and orientate into position.
- Thread the tensioner onto puller screw. Lightly turn the tensioner onto the puller screw until it stops. The gap between the foot and tensioner is about 1/16" to 3/16".
- Place guard over tensioner and position guide pin into the hole in backside of stud.
- Tighten knurled interlock fitting by hand until it firmly presses against tensioner. (no gap)

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Detensioning TURBINE END (Stud removal)

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- Slide and engage custom connector from rear of guard to lock tensioner into place.
- Apply final pressure.
- Loosen nut with the spanner ring and pin wrench.
- Release pressure, allow tensioner to fully retract.
- Disconnect hose from tensioner.
- Loosen knurled fitting and remove guard.
- Unscrew tensioner from puller screw.
- Remove foot.
- Remove puller screw from stud. It may be necessary to insert an Allen wrench into the backside of stud to remove puller screw.
- Remove spanner ring from nut.
- Move to next stud in pattern.



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Detensioning GENERATOR END (Stud removal)

- Loosen nuts' set screws
- Inspect and clean studs' conical threads. **Do not continue until ALL debris is removed from the threads!** Reference instruction manual IM-220. **Do not try to use the tensioner to remove a damaged stud!**
- Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- Install spanner ring onto nut.
- Thread puller screw onto the stud.
- Using an Allen wrench, tighten the puller screw. Then back off puller screw 1/2 a turn.
- Lightly retighten puller screw by hand until it is fully inserted. **DO NOT BACK OFF PULLER SCREW.**
- Slide foot over puller stud and orientate into position.
- Install retention studs into adjacent studs hand tight
- Install backside guard covering stud to be tensioned and lightly threaded into backside of adjacent studs.
- Thread the tensioner onto puller screw. Lightly turn the tensioner onto the puller screw until it stops. The gap between the foot and tensioner is about 1/16" to 3/16".
- Place guard over tensioner and position locating cutouts onto retention studs.
- Tighten knurled interlock fitting by hand until it firmly presses against tensioner. (no gap)

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Detensioning GENERATOR END (Stud removal)

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- Slide and engage custom connector from rear of guard to lock tensioner into place.
- Apply final pressure.
- Loosen nut with the spanner ring and pin wrench.
- Release pressure, allow tensioner to fully retract.
- Disconnect hose from tensioner.
- Loosen knurled fitting and remove guard.
- Unscrew tensioner from puller screw. Use **caution** to ensure that hands are not between the tensioner and coupling when tensioner becomes disengaged from the puller screw.
- Remove foot from puller screw.
- Remove puller screw from stud. It may be necessary to insert an Allen wrench into the backside of stud to remove puller screw.
- Remove spanner ring and retention studs.
- Move to next stud in pattern.



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4.0 General Preparations

Read and understand all instructions before installing and tensioning studs

This equipment produces very high hydraulic pressures and very high forces. Operators must exercise caution, wear safety glasses and hard hats when using this equipment.

High-pressure fluid from the Hydraulic Pressure Kit system pressurizes the tensioner which generates a stretching force that actually stretches the stud. As the stud is stretched the nut lifts off the flange. The nut is then reseated into position on the flange by turning spanner ring with the pin wrench. When the nut is tight against the flange, the pressure in the tensioner is released leaving the stud loaded to its predetermined value.

4.1 Machine Preparation

The flange to be tensioned must be fully closed prior to positioning of studs in the flanges. Turning the shafts of the turbine and the generator are not required, but may be useful. Also, it will be advantageous to remove as many obstructions as possible from the flange area, such as speed probes, shipping plates, and conduit.

4.2 Hardware - Balance

Hardware is supplied as weight balanced sets. Studs and Nuts are interchangeable within a set. Do not mix stud and nuts from multiple sets.

Save the weight certification that is supplied with each set. It will be needed for the purchase of replacement hardware

4.3 Tensioner - Care and Handling

When not in use, the tensioner shall be maintained in a clean environment with all caps and plugs for hydraulic openings and fittings in place.

When in use, the tensioner shall be protected from sand and grit.



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4.4 Hand Tools

Several hand wrenches and micrometers may be required to perform installation and measurement of the studs:

- 5/8" wrench
- A set of Allen Wrenches
- 3' - 4' Breaker Bar
- 8" to 9" Micrometer or Caliper
- 9" to 10" Deep Throat Micrometer or Caliper

4.5 Special Tools

- Hydraulic Tensioner Kit:
- HT-5494 Hydraulic Tensioner
(Both Syngas Generator and
Turbine Flanges)
(reference GE 269B8729)
 - HT-5194 Hydraulic Tensioner
(Syngas Generator Flange)
(reference GE 269B8702)
 - HT-5222 Hydraulic Tensioner
(Turbine Flange)
(reference GE 269B8697)
- Hydraulic Pump Kit:
- AP-0532 Air-Operated Hydraulic Pump
(recommended)
(reference GE 359B2502)
 - MP-0130 Manual Hand-Operated
Hydraulic Pump
(reference GE 359B2506)

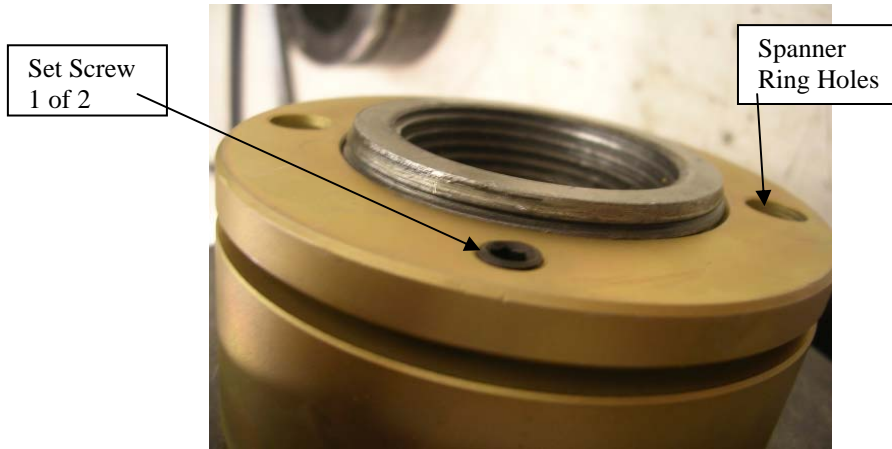


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5.0 Preparation of Hardware

5.1 Nut Preparation



Sample Picture of a Riverhawk Locknut

If there is any visible damage on a nut, do not use the nut and contact the Riverhawk Company for a replacement nut. Please be prepared to supply the turbine number, weight certification, and digital photographs for evaluation.

5.1.1 Nut Cleaning - New Installations

For new installations, the nuts should come sealed from the factory and will need no cleaning.

5.1.2 Nut Cleaning - Old Installations

Previously installed nuts require cleaning as follows:
Wire brush using a petroleum based solvent to remove any foreign material on the external surfaces and threads.



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5.2 Stud Preparation

Check the stud for any visible damage. If there is any visible damage, do not use the stud and contact the Riverhawk Company for a replacement stud. Please be prepared to supply the turbine number, weight certification, and digital photographs for evaluation.

The conical threads of each stud must be clean before installation or removal. This ensures the proper seating of the puller screw.

5.2.1 Stud Cleaning - New Installations

For new installations, the studs should come sealed from the factory and will need no cleaning.

5.2.2 Stud Cleaning - Old Installations

Previously installed studs will require cleaning. Clean conical threads should have a bright and shiny appearance.

Notice:

Failure to properly clean the studs could result in improper mating of threads. Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered thread of the stud.

If cleaning is required, follow these steps:

1. Blow out the threads with compressed air to remove loose debris and dry conical threads. Reference instruction manual IM-220 for more detailed instructions. Do not apply a solvent or other cleaning solution to the threads as this may chemically attack the stud.
2. Use Stud Cleaning Kit, GT-4253 or a similar 1" diameter Brass power brush.



Picture of Brass Power Brush

3. Insert the brush into an electric drill and set drill to run in a counterclockwise direction at high speed.



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4. Work the drill in a circular motion while moving the brush in and out to clean all of the threads. Try not to hold the brush in one place too long, so as not to remove the stud's protective coating.
5. Blow out the threads with compressed air to remove loosened debris.
6. Visually inspect threads for cleanliness. Threads should be bright and shiny.
7. Repeat if any dirt can be seen in the threads.
8. Inspect threads for any damage that may have been caused by previous installation.

Do not apply thread lubricants to the threads.

Finish the cleaning process by rinsing in a volatile solvent such as acetone and allow to dry.

5.3 Stud Length Measurement

Measure and record the initial lengths of the studs on the supplied stretch datasheet in Appendix B of this manual.

The following recommendations will improve your results.

- Plan to start and finish any flange in the same day.
- Studs and flange must be at the same temperature.
- Keep the measuring instruments out of the sunlight.
- Number each stud with a marker for later stretch measurement tracking.
- Mark the location of measurement on stud end with a permanent marker.
- The same person should make all measurements.
- Measure each stud to nearest 0.001 inch (.01 mm).
- Record each measurement on the stretch record sheets in this manual's appendix.



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6.0 Stud and Nut Assembly

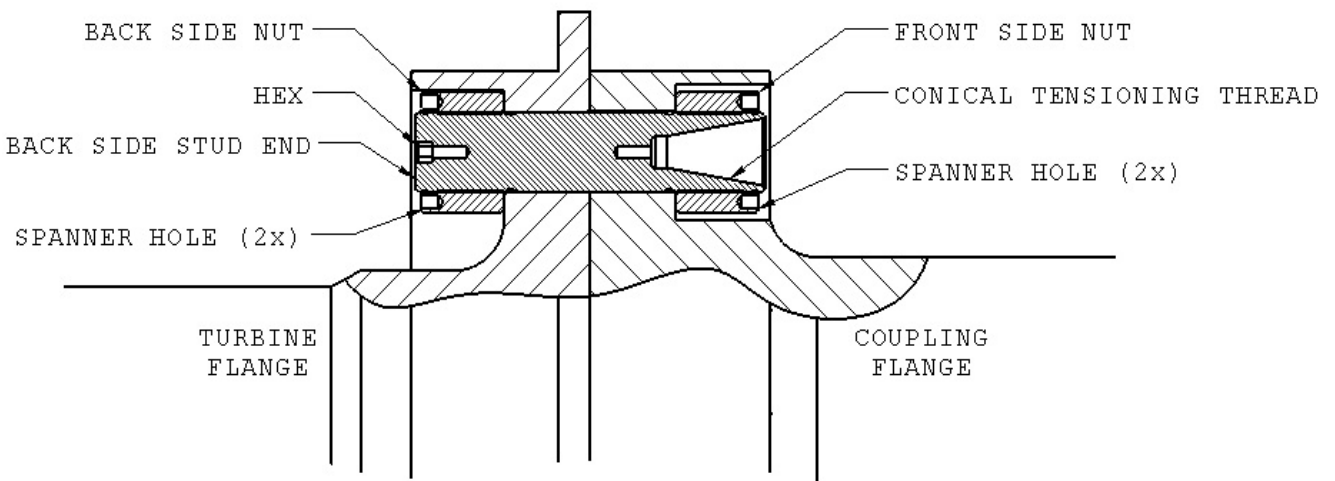
Refer to Hardware Set Part Number drawing listed in Section 2.0 of this manual. If you don't have a hardware set drawing, it can be found in the GE drawing system or contact Riverhawk Company.

Assemble the nut to the conical tensioning thread end (front side) of the stud.

Slide the assembly into the flange from the coupling side as shown in Figures 1 & 2 then install the other nut on the backside.

Ensure that backside's nut orientation is correct with thread locking screws facing outward of the flange.

The nuts are the same on the Turbine end (2.25").



**Figure 1 - Cutaway View of Turbine Flange
and Coupling Flange Bolted Joint**

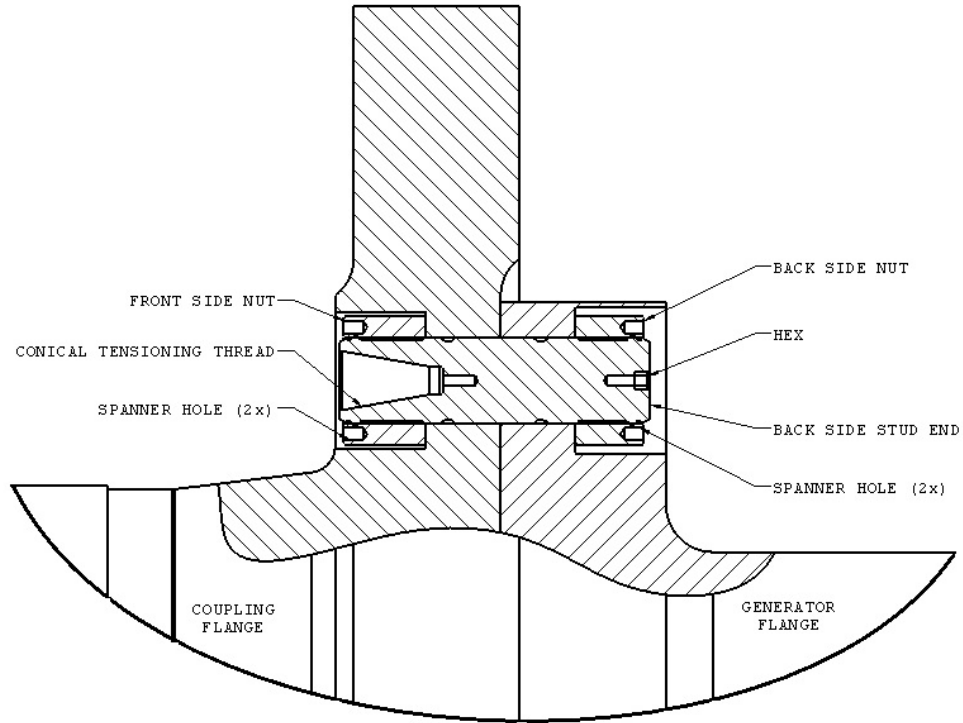


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The nuts are different on the Generator end (2.75"); the shorter nut goes on the back side or the side closest to the Generator.



**Figure 2 - Cutaway View of Generator Flange
and Coupling Flange Bolted Joint**

Adjust the front side stud/nut assembly so that the stud sticks out from the face of the nut the amount shown on the hardware set drawing. If you don't have a hardware set drawing, it can be found in the GE drawing system or contact Riverhawk Company. (See section 2)

**SETTING THE STICK-OUT LENGTH IS CRITICAL FOR THE
HYDRAULIC TENSIONER TO WORK CORRECTLY.**

**THE STICK-OUT LENGTH IS ALWAYS SET FROM THE COUPLING SIDE
OF THE FLANGE.**



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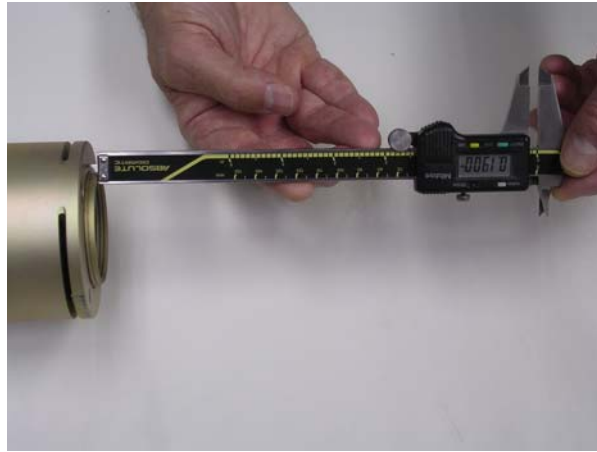
The stick-out length can be checked three different ways.



Stick-Out Gage



Drop Gage



Digital Calipers

Sample Pictures of a Stick-Out Measurement

Hand tighten the assembly to a snug fit. See Figures 1 & 2 for a view of the assembly of studs and nuts in the flange prior to tensioning.



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7.0 Hydraulic Equipment Preparations

7.1 Check Hydraulic Equipment

7.1.1 Check Hydraulic Hose

Check the hydraulic hose for any damage including bent hose ends and split outer lining. If any damaged is found, replace the hose immediately by contacting the Riverhawk Company.

7.1.2 Check Hydraulic Tensioner

Clean puller screw and check for any debris and dents.

Inspect tensioner guard for any signs of damage. Bent guards should be replaced. Also, be sure the rubber pad is in place on the end of the guard. If missing, contact Riverhawk for a replacement guard.



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7.1.3 Check Air-Driven Pump Kit

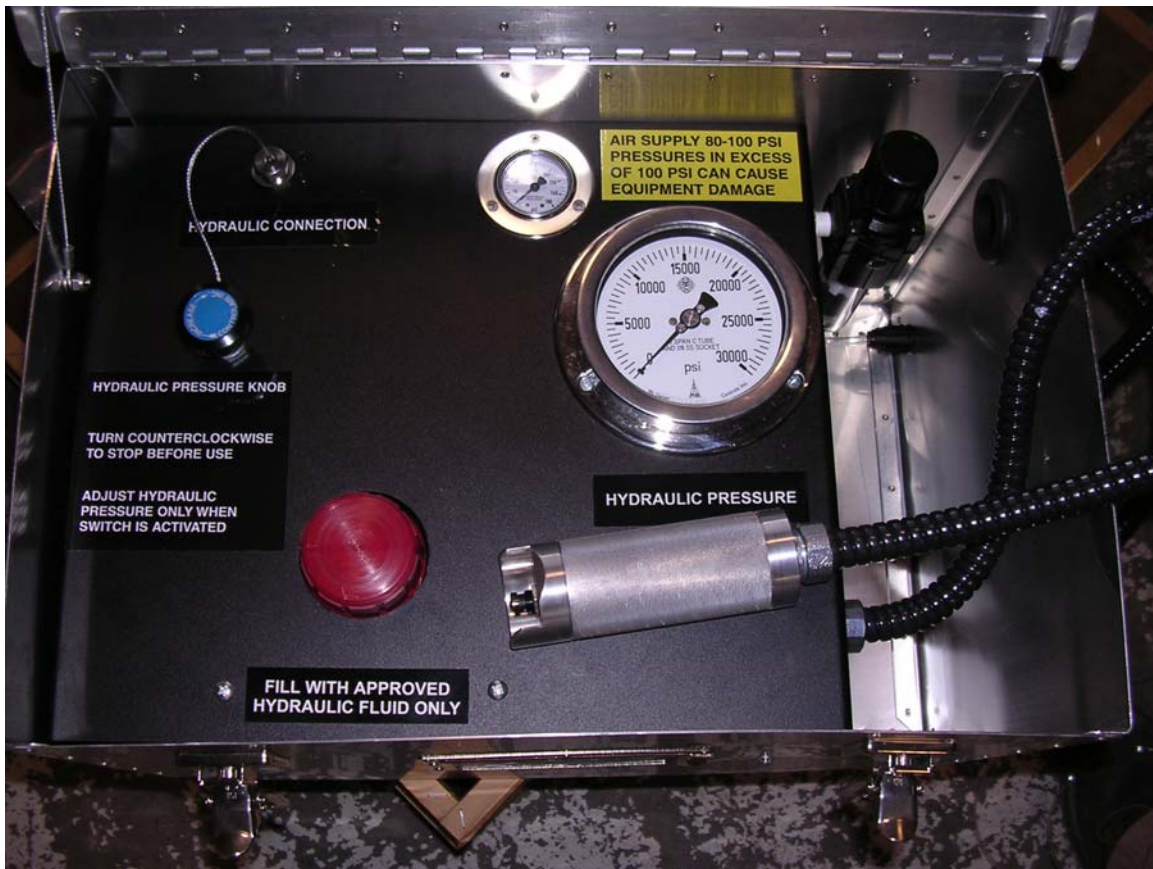
The pump kit is shipped full of hydraulic oil. The pump reservoir cap is sealed for shipment.

Replace the grey shipping cap with the red plastic reservoir cap.

To use the pump, turn cap to the vent position and follow the operating instructions on the inside cover.

To prevent oil spillage, close cap when not in use. Lost oil should be replaced with Enerpac Hydraulic Oil. ISO 32 or equivalent hydraulic oil may be substituted.

Test pump by dead-heading (leave port plug in place) and run pump - should hold steady pressure.



Sample Picture of AP-0532 Hydraulic Pump with hydraulic connection plugged for testing



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7.1.4 Check Manual Pump Kit

The pump kit is shipped from the factory full of hydraulic oil. The pump reservoir's filler plug is tightened to a maximum torque of 175in-lbs [20Nm].

Lost oil should be replaced with an ISO 32 or equivalent hydraulic oil.

Test pump by dead-heading (leave port plug in place) and pump the level arm. The pressure gauge should build pressure and then hold the steady pressure when the lever is motionless.

To use, open the release knob and connect the pump to the tensioner. Close the release knob and pump the lever until the target hydraulic pressure is reached. After tensioning, open the release knob to allow the tensioner to fully retract. This will take at approximately 20 seconds. After the tensioner is fully retract, detach hydraulic hose from the tensioner.



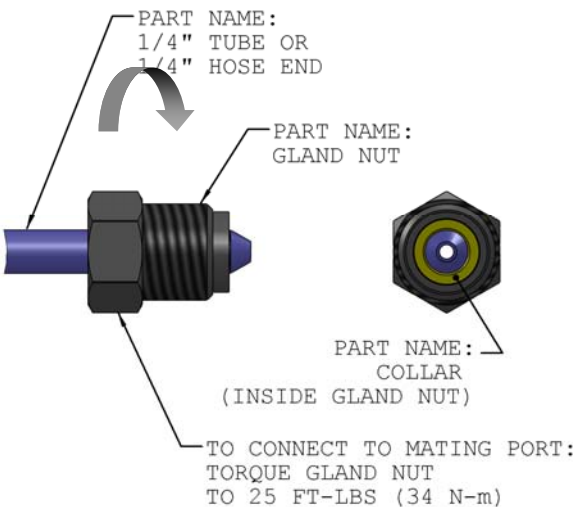
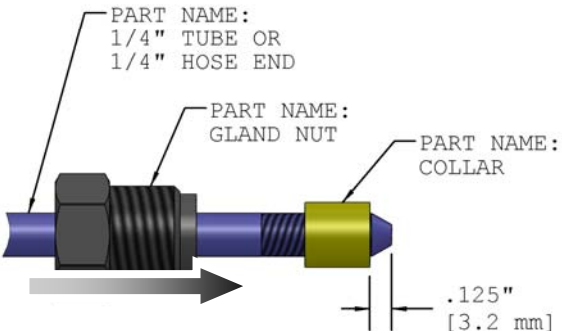
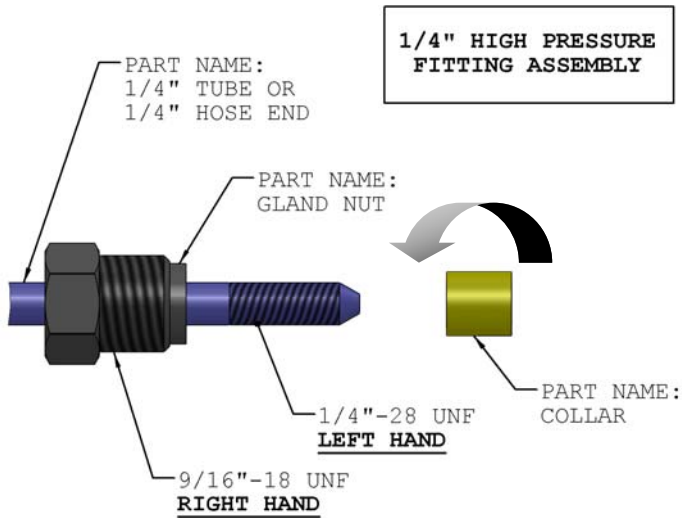
**Sample Picture of MP-0130 Hydraulic Pump with hydraulic connection
plugged for testing**



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7.2 Hydraulic Fittings



Riverhawk tensioners use a 1/4" High Pressure port to connect the coupler to hydraulic hose. The hose connector is made from a three piece assembly: a gland nut, a collar, and a 1/4" tube or 1/4" hose end.

To assemble the fitting, slide the gland nut over the 1/4" tube or 1/4" hose end. Turn the collar counter-clockwise (**left hand** thread) on to the tube or hose end.

The collar should be placed .125" (3.2 mm) from the tip of the cone. It may be necessary to adjust this collar with a set of vise-grip pliers. Be careful to not strip the threads off the tube or hose end.

Slide the gland nut down over the collar. Insert the tube or hose end into coupler or hydraulic pump. While firmly holding the 1/4" tube or 1/4" hose end to stop it from rotating, turn the gland nut clockwise (**right hand** thread) and torque the gland nut to 25 FT-LBS (34 N-m).

Tips:

- Make sure all parts are clean and free from debris.
- Protect the cone from scratches as this is the sealing surface.
- Replace red plastic caps when finished to protect the threads



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7.3 Bleeding Hydraulic System

Bleeding of the hydraulic system is not necessary with this tensioner design.

8.0 Assembly of Tensioner on Stud

This tensioner kit is most readily identified by the safety orange cages (guard assembly) they employ.

NOTICE

As of summer 2011, this manual is to be used in relation to the interlocking style tensioner. This new tensioner can be identified buy its **ORANGE** safety guard. Note: yellow guarded tensioner requires the use of different set of instructions, consult Riverhawk for assistance.

All tensioning will be performed from the conical tensioning thread end of the stud with orientation of the stud to the flange as shown in Figures 1 & 2.

8.1.1 Assembly of Tensioner Kit TURBINE END

Refer to Tensioner drawing and Figure 5 for tensioner to flange mounting. Assembly sequence is as follows:

1. Carefully check the cleanliness of both the stud's and the puller screw's conical threads.
2. Insure stud length measurement is documented.
3. Verify stick out length of stud to nut.
4. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use "Never Seize" on the conical threads.
5. Place the spanner ring onto the nut
6. Insert the puller screw into the tapered thread of the stud and hand tighten. Be sure not to cross-thread the assembly
7. Using an Allen wrench tighten puller screw, then back off puller screw 1/2 a turn.
8. Retighten puller screw by hand until it is fully inserted.
DO NOT BACK OFF PULLER SCREW.
9. Place the foot over puller screw, orientate into position.
10. Thread tensioner onto puller screw. Note: Internal stop in tensioner will result in gap with foot. **DO NOT TIGHTEN TENSIONER AGAINST FOOT. (GAP SHOULD BE 1/16" to 3/16")**
11. Place guard over tensioner and position guide pin into hex end of stud.



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12. Tighten knurled interlock fitting by hand until it firmly presses against tensioner. (no gap)
13. Activate custom connector from rear of guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger. Push the assembly forward until it locks onto the tensioner. Release fingers from tabs and then remove thumb. Ensure connection is firmly engaged or else the tensioner will not be connected to pump.

8.1.2 Assembly of Tensioner Kit GENERATOR END

Refer to Tensioner drawing and Figure 6 for tensioner to flange mounting. Assembly sequence is as follows:

1. Carefully check the cleanliness of both the stud's and the puller screw's conical threads.
2. Ensure stud length measurement is documented.
3. Verify stick out length of stud to nut.
4. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use "Never Seize" on the conical threads.
5. Place spanner ring onto nut.
6. Insert the puller screw into the tapered thread of the stud and hand tighten. Be sure not to cross-thread the assembly
7. Using an Allen wrench tighten puller screw, then back off puller screw 1/2 a turn.
8. Retighten puller screw by hand until it is fully inserted. **DO NOT BACK OFF PULLER SCREW.**
9. Install backside guard covering stud to be tensioned and lightly threaded into backside of adjacent studs.
10. Install retention studs into adjacent studs hand tight.
11. Place the foot over puller screw, orientate into position.
12. Thread tensioner onto puller screw. Note: Internal stop in tensioner will result in gap with foot. **DO NOT TIGHTEN TENSIONER AGAINST FOOT. (GAP SHOULD BE 1/16" to 3/16")**
13. Place guard over tensioner and position locating cutouts onto retention studs.
14. Tighten knurled interlock fitting by hand until it firmly presses against tensioner. (no gap) This will also seat retention studs into guard locating cutouts.

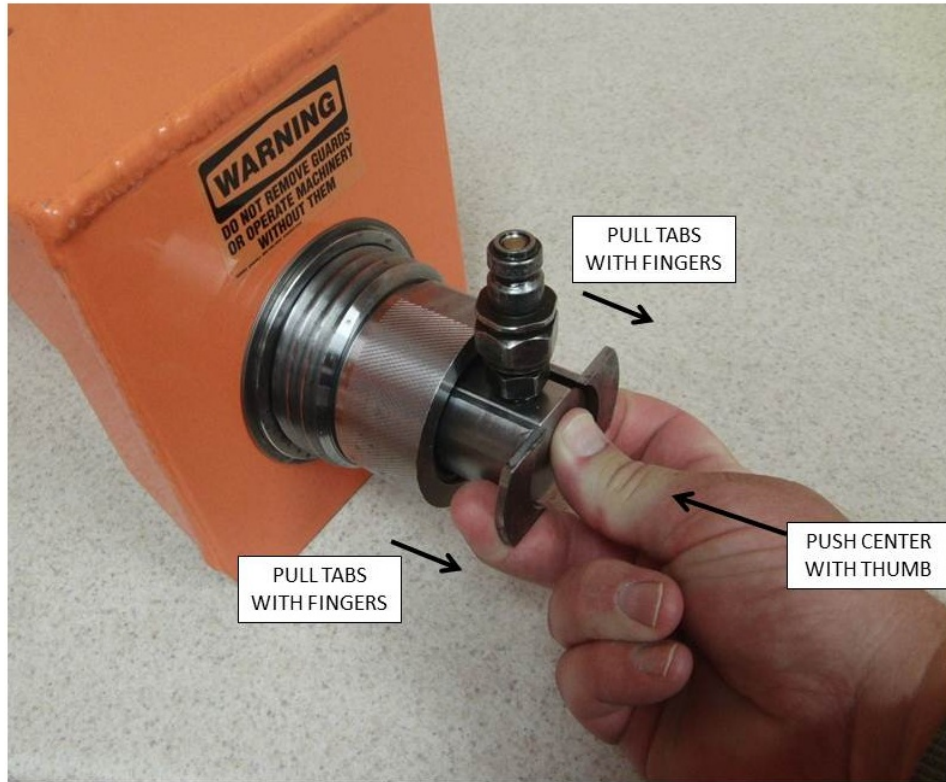


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15. Activate custom connector from rear of guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger. Push the assembly forward until it locks onto the tensioner. Release fingers from tabs and then remove thumb. Ensure connection is firmly engaged or else the tensioner will not be connected to pump. See figure 4.



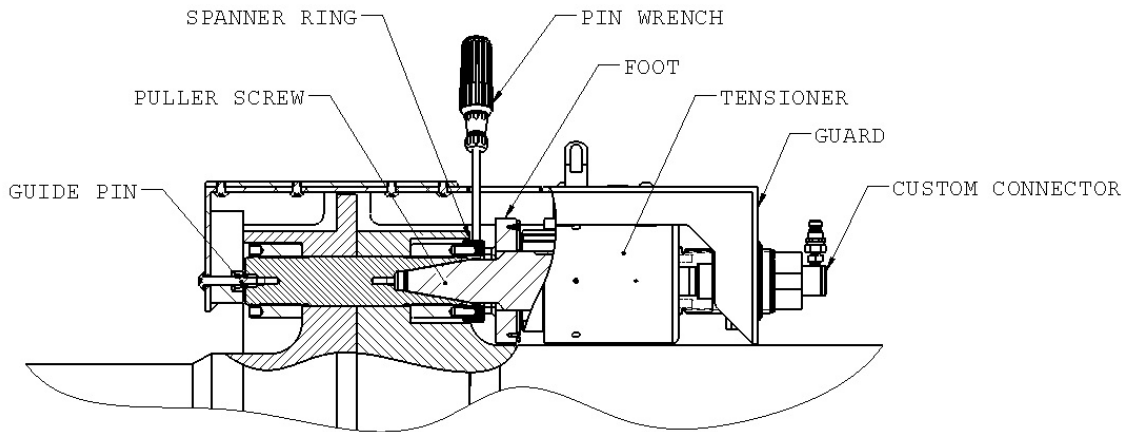
**Figure 4 - Activation of
custom connector**



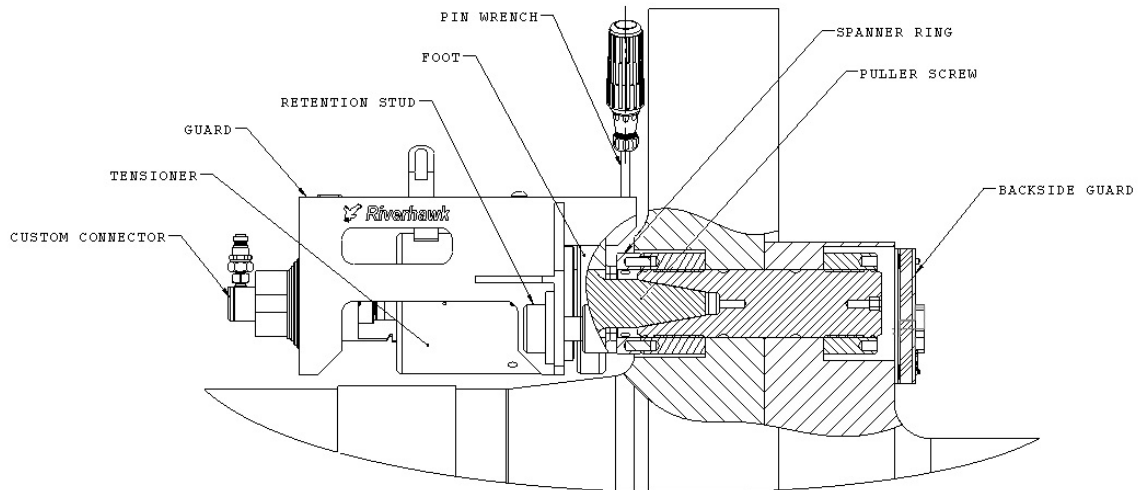
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**Figure 5 - Cutaway View of
Tensioner Installed on Turbine Flange**



**Figure 6 - Cutaway View of
Tensioner Installed on Generator Flange**

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the conical threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and is not cross-threaded into the conical thread.



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9.0 Stud Pulling and Tensioning

The studs will be tensioned in two steps, at 50% pressure and at final pressure. Follow the tensioning sequence for each flange joint as defined on the data sheets found at the end of this manual.

Note: Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. **Do not use** "Never Seize" on the conical threads. This procedure will ease assembly and assure positive mating of the threads before tightening.

WARNING

The safety guard **MUST** be in place and hands kept out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.



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9.1 Tensioning at 50% pressure

After the tensioner is properly installed apply hydraulic pressure to the tool. Bring the pressure to the 50% level in accordance with the following table.

<u>Flange Position</u>	<u>Stud Size</u>	<u>50% Pressure</u>	<u>50% Stretch</u>
Turbine to Coupling	2-1/4" [58 mm]	9000 psi [620 bar]	Do not measure Do not use
Coupling to Generator	2-3/4" [71 mm]	10000 psi [690 bar]	Do not measure Do not use

9.1.1 Tightening of Nuts

Tighten the cylindrical nuts hand tight using the pin wrench and spanner ring, as depicted in Figures 5 & 6. Turn the nut until it bottoms on the flange. Then apply torque to turn the nut an additional 10 degrees. This will aid in achieving the desired stretch.

WARNING:

Keep hands clear of the tool while the pressure is building up. This includes the pin wrench for tightening the spanner ring (nut). Once the tool is stabilized at pressure then and only then can the nut be tightened. This reduces the potential of personal injury.

9.2.1 Removing the TURBINE END Tensioner from an Installed Stud

The tensioner removal is to be accomplished by the follows steps:

1. Release the tensioner tool pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump) Allow approximately 20 seconds for tensioner to fully retract, then remove hose from tensioner.
2. Unscrew knurled fitting at the end of the guard and remove guard.
3. Unscrew tensioner from puller screw. Use caution to ensure that hands are not between tensioner and coupling when tensioner becomes disengaged from puller screw.
4. Remove the foot.
5. Unscrew the puller screw using an Allen wrench.
6. Tapping the Allen wrench with a hammer or the use of a 3-4' breaker bar may be necessary to loosen the puller screw.



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7. Remove the spanner ring from nut.
8. Move the tool to the next stud/nut assembly to be tensioned, following the sequence/pattern as defined on the supplied data sheets.

9.2.2 Removing the GENERATOR END Tensioner from an Installed Stud

The tensioner removal is to be accomplished by the follows steps:

1. Release the tensioner tool pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump) Allow approximately 20 seconds for tensioner to fully retract, then remove hose from tensioner.
2. Unscrew knurled fitting at the end of the guard and remove guard.
3. Unscrew tensioner from puller screw. Use **caution** to ensure that hands are not between the tensioner and coupling when tensioner becomes disengaged from the puller screw.
4. Remove foot from puller screw.
5. Unscrew the puller screw and retention studs using an Allen wrench.
6. Tapping the Allen wrench with a hammer or the use of a 3-4' breaker bar may be necessary to loosen the puller screw.
7. Remove spanner ring from nut.
8. Move the tool to the next stud/nut assembly to be tensioned, following the sequence/pattern as defined on the supplied data sheets.



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9.3 Tensioning at Final Pressure

Repeat the pulling and tightening procedure stated above at full pressure. Measure the stud length after all of the studs have been tensioned. The final pressure and required stretch values are listed in the following table:

<u>Flange Position</u>	<u>Stud Size</u>	<u>Final Pressure</u>	<u>Final Stretch</u>
Turbine to Coupling	2-1/4" [58 mm]	17000 psi [1170 bar]	0.017" - 0.020" [0.43 mm - 0.51 mm]
Coupling to Generator	2-3/4" [71 mm]	18000 psi [1240 bar]	0.012" - 0.014" [0.31 mm - 0.36 mm]

Note: Before threading the puller screw into the stud, carefully check the cleanliness of both the stud's and the puller screw's conical threads. Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **Do not use** "Never Seize" on the conical threads. This procedure will ease assembly and assure positive mating of the threads before tightening. **DO NOT BACK OFF THE PULLER SCREW.**

CAUTION

DO NOT EXCEED THE MAXIMUM PRESSURE MARKED ON THE TENSIONER. Excessive pressure can damage the stud and puller screw.

Have final stretch values approved by the supervisor responsible for the installation.

NOTICE

Failure to achieve proper final stretch values will result in improperly tensioned stud.



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10.0 Retensioning

For the procedures of Section 9, excessive stretch variations or low stretch values can be corrected by removing all or selected studs. Then re-measure the studs and install to the pressure values stated in the above table. Have final stretch values approved by the supervisor responsible for the installation.



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11.0 Thread Locking

Once pulling and tensioning is completed all stud nuts must be locked in position.



Sample Picture of a Riverhawk Locknut

Mechanical Locknuts have two set screws located in the top face, see picture. Before threading the nut onto the stud check to be certain that the set screws are free to turn. Once the nut is seated, torque the set screws to the values specified in the following table. When seated and torqued to the values specified the load created by the set screw displaces the thread of the nut in the area of the web creating the desired locking action.

<u>Stud Size</u>	<u>Set Screw Size</u>	<u>Torque</u>
2-1/4" [58 mm]	1/4"-28 UN	70 in·lbs - 80 in·lbs [7.9 N·m - 9.0 N·m]
2-3/4" [71 mm]	3/8"-24 UN	200 in·lbs - 250 in·lbs [22.6 N·m - 28.2 N·m]



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12.0 Stud/Nut removal

Begin by checking the stick-out dimension of the installed studs. If the stick-dimensions are wrong, contact Riverhawk for assistance.

Sections 12.1 and 12.2 respectively describe the procedures to be followed in removing nuts with the mechanical locking feature and those that have been locked with liquid locking compound.

12.1 Removal of Assemblies with Mechanical Locknuts

For those assemblies which have been locked using mechanical locknuts, removal is accomplished as follows:

- Using a wire brush, GT-4253, and shop air clean the conical thread of the stud to remove any debris/deposits which may have accumulated during service as described in section 5.2.
- With an Allen-wrench loosen the two locking set screws but do not remove from the nut.



Sample Picture of the loosening of a nut's set screws

- Install the appropriate tensioner onto the stud as described in Section 8.0.
- Apply the appropriate hydraulic pressure per the Table of Section 9.3.
- Using the spanner ring and spanner/pin wrenches, loosen the nut 3/4 turn. Then release the pressure and remove the tensioner.



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13.0 Storage Instructions

Follow these directions to properly store your hydraulic tensioner and hydraulic pump kit for long term storage and shipment.

If any damage is observed, contact the Riverhawk Company to schedule a maintenance inspection.

13.1 Hydraulic Pump Kit Storage

13.1.1 AP-0532 Air-Driven hydraulic pump

Plug the pump's hydraulic port with the pump's metal plug.

The red oil reservoir cap should be removed and stored inside the pump with the extra air hose fittings.

Place the grey and black storage cap into the oil reservoir opening and tighten to secure the oil from spillage.

Check the hydraulic hose for any damage including bent hose ends and split outer lining. If any damaged is found, replace the hose immediately by contacting the Riverhawk Company.

Place red plastic end caps on the hose ends to protect the hose ends from damage.

Wind the hydraulic hose into a circle no smaller than 14" (360mm) in diameter and place into the original shipping container.

Place the hydraulic pump kit into the original shipping container.



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13.1.2 MP-0130 Manual hydraulic pump

Plug the pump's hydraulic port with the pump's metal plug
Secure the grey vent plug on the reservoir with a 3/8" (10mm) hex Allen key.

Check the hydraulic hose for any damage including bent hose ends and split outer lining. If any damaged is found, replace the hose immediately by contacting the Riverhawk Company.

Place plastic end caps on the hose ends to protect the hose ends from damage.

Wind the hydraulic hose around the pump and secure in place with the hose clamps.

Place the hydraulic pump kit into the original shipping container.

13.2 Hydraulic Tensioner Storage

Check the tensioner for any damage

1. Clean puller screw and check for any debris and dents.
2. Knurled interlock fitting should be clean and free to rotate.
3. Inspect tensioner guard for any signs of damage. Bent guards must be replaced.
4. If any damage is observed, contact the Riverhawk Company to schedule a maintenance inspection.

If any damage is observed, contact the Riverhawk Company to schedule a maintenance inspection.

Place protective plastic cap into the hydraulic port.

Coat the hydraulic tensioner and foot with a light coat of oil and place the tensioner into the original shipping container.

13.3 Store shipping container

Secure the hydraulic pump and hydraulic tensioner into the original shipping containers using the supplied wood braces.
Seal the original shipping container and store under shelter and protected from moisture, sand, and grit.



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14.0 Revision History

Revision Letter	Effective Date	Description
A	Apr 23, 2012	Updated to include HT-5494 allowing tooling for both ends of Syngas load coupling, Revised Sections 3.0, 4.4, 6.0, 8.1, 9.2, 9.3
-	Feb 28, 2012	Released



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Appendix A

Frequently Asked Questions:

This section contains some frequently asked questions and problems. If the steps listed here do not solve your problem, contact the Riverhawk Company thru our website, email, or phone call.

Q: A tensioner has pulled itself out of the stud's conical threads. Can I continue using a tensioner on this stud?

A: No. Both the tensioner and the stud may have been damaged and must be removed from the work area. If the stud is tensioned, a Nut Buster repair kit, from Riverhawk, must be used to remove the damaged stud by drilling out the nut. Leaving a damaged stud in place will lead to a safety hazard on future outages.

Riverhawk can supply a replacement stud and nut based on the initial weight certification supplied with the hardware set (see section 4.2). The damaged tensioner should also be returned to Riverhawk for inspection and repair.

If a stud must be left in place, paint the damaged stud with a generous amount of indelible, bright-colored paint. Notify the appropriate GE Safety and Service personnel. Note the location of the damaged stud in the services notes for the machine.

Q: The hydraulic tensioner has been taken up to its final pressure. The final stretch length is short of the final stretch target. What is the next step?

A: Do not increase the hydraulic pressure. Check if the hydraulic pump is set to the right pressure. Install the tensioner and re-pressurize the tensioner to the final pressure then recheck the stretch measurement. If the stretch value is still short, remove the stud from the hole and re-measure the stud's initial length then try to install the stud again.



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- Q:** The hydraulic tensioner has been taken up to its final pressure. The final stretch length is larger than the final stretch target. What is the next step?
- A:** Remove the stud from the bolt hole. Check if the hydraulic pump is set to the right pressure. Re-measure the stud's initial length then try to install the stud again.
- Q:** The tensioner is at its final pressure, but the nut cannot be loosened.
- A:** If the nuts cannot be loosened at the final pressure, continually increasing the pressure will not help and can be dangerous and in some cases make it harder to remove the nut. Check the nut to see if its set screws have been loosened. Check for and remove any corrosion around the nut's threads.
- Q:** How do I clean the conical threads on a stud?
- A:** The conical threads are best cleaned using a spiral wound brass brush in a drill as described in section 5.2. For detailed description refer to Instruction Manual IM-220.
- Q:** During the initial steps of removing a tensioned stud, the stick-out length is found to be wrong.
- A:** Do not proceed. Refer to Instruction Manual IM-226 or contact Riverhawk for assistance. With the wrong stick-out length, the hydraulic tensioner has a limited stroke and may not work properly and can be damaged.
- Q:** The hydraulic pump appears to be leaking.
- A:** Check the hose connection to the hydraulic pump. If the 1/4" high pressure fitting is not assembled correctly as shown in section 7.2, it may look like the pump is leaking. If the problem continues, it may be necessary to open the pump kit. Contact Riverhawk for guidance.



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- Q:** The hydraulic hose has a collar on it that can't be moved by hand
- A:** The hydraulic fitting is shown in section 7.2. The collar is sometimes held in place with a thread locking compound. This prevents the collar from moving too easily. It may be necessary to adjust this collar with a set of vise-grip pliers. Be careful to not strip the threads off the tube or hose end.



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Appendix B1

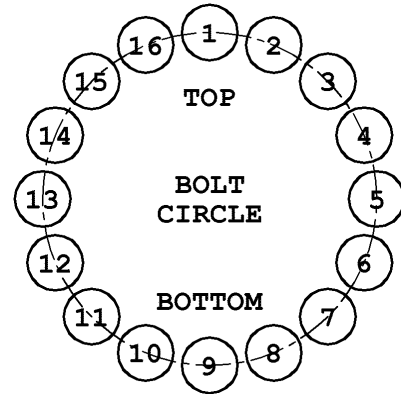
STRETCH RECORD SHEET
FOR THE GENERATOR END

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



NOTE: FINAL STRETCH = FINAL LENGTH - STARTING LENGTH
(EXAMPLE: FINAL STRETCH = 9.963" - 9.950" = .013" STRETCH)

HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
9			
2			
10			
3			
11			
4			
12			
5			
13			
6			
14			
7			
15			
8			
16			



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Appendix B2

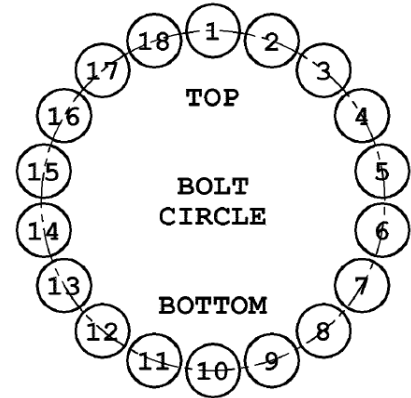
STRETCH RECORD SHEET
FOR THE TURBINE END

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



NOTE: FINAL STRETCH = FINAL LENGTH - STARTING LENGTH
(EXAMPLE: FINAL STRETCH = 10.289" - 10.270" = .019" STRETCH)

HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
10			
2			
11			
3			
12			
4			
13			
5			
14			
6			
15			
7			
16			
8			
17			
9			
18			



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