



INSTRUCTION MANUAL IM-377
For Gas Turbine
Tensioned Studs and Nuts

Applicable Bolting Connections


Frame 9FA Gas Turbine to 324 Generator	9F.04 Gas Turbine to Load Coupling
Frame 9FA Gas Turbine to Load Coupling	
Load Coupling to 324 Generator	
Steam Turbine to 324 Generator	

Applicable GE Ordering Sheet Part Numbers

361A6162P002	106T9921P001	107T7526P0001	101T6386P001
361A6162P006	106T9921P002	107T7526P0002	
361A6162P007	106T9921P003	107T7526P0003	305T8055P0001
361A6162P008	106T9921P004	107T7526P0004	305T8055P0002
361A6162P009	106T9921P005	107T7526P0005	305T8055P0003
361A6162P010	106T9921P007	107T7526P0007	305T8055P0004
361A6162P011			

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1.0 Cautions and Safety Warnings

WARNING

Improper tool use and the failure to follow the correct procedures are the primary root causes of tool failures and personal injuries. A lack of training or experience can lead to incorrect hardware installation or incorrect tool use. Only trained operators with careful, deliberate actions should use hydraulic tensioners. Contact Riverhawk Company with any training needs.

WARNING

Risk of high-pressure hydraulic fluid injection. Riverhawk tools operate under high pressure. Thoroughly inspect all hoses and connections for damage or leaks prior to using this equipment.

CAUTION

Personal injury and equipment damage can occur if the proper health and safety codes and procedures are not followed. Contact the site's health and safety office to determine all applicable safety rules and regulations.

WARNING

The proper personal protective equipment must be worn at all times. Riverhawk recommends at a minimum, safety glasses, long sleeve shirt, hard hat, heavy work gloves, and steel toe shoes.

CAUTION

It is especially important to check the condition of the conical thread used to tension the stud. Thread damage from previous abuse can lead to failure of the stud or tensioning equipment

CAUTION

Riverhawk recommends that the tensioner should be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.

WARNING

A damaged burst disc must be replaced with a with a burst disc of the same design and pressure rating. Do not substitute a damaged burst disc with a different disc type, a different pressure rating, or a foreign object.



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WARNING

To avoid failure, ensure safety, and proper operation, the tensioner assembly must be installed on a stud in the flange before bleeding and pressurizing the tensioner. Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.

CAUTION

Do not over extend the tensioner. Over extension may cause the piston to lose its seal and leak oil.

CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the tensioner assembly is free to turn.

WARNING

The safety interlock guard must be in place at all times. When the tensioner is pressurized hands must be kept out of designated areas to avoid any potential for personal injury.

CAUTION

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. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

WARNING

FIRE HAZARD: DO NOT heat when puller assembly is in place. Personal injury or equipment damage may occur. Use of an Oxy-Acetylene torch is not recommended



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2.0 Scope

This document describes the procedure to be used to install the stud and nut sets supplied by the Riverhawk Company in the flanges at the Turbine/Coupling, and Coupling/Generator.

The various frame configurations covered in this manual are listed in Sections 2.1 through 2.6 with differences as related to connective hardware defined. Listed also are the pertinent hardware drawings (HF-xxxx). These drawings as well as tooling drawings (HT-xxxx) form part of this manual.

2.1 Frame 9FA Gas Turbine to 324 Generator

GE Part Number	Riverhawk P/N	GE VENDOC P/N
361A6162P002	HF-3234	GE 359B2580
361A6162P008	HF-3234	GE 359B2580
101T6386P001	HF-3234	GE 359B2580
106T9921P001	HF-3234	GE 359B2580
106T9921P002	HF-3234	GE 359B2580
107T7526P0001	HF-3234	GE 359B2580
107T7526P0002	HF-3234	GE 359B2580

The hydraulic tooling used for installation and removal is Riverhawk HT-6749 with the exception that 106T9921 requires Riverhawk HT-6749-ES.

These hardware drawings depict the complete stud and nut package for the Gas Turbine to Load Coupling (3" size, Qty 18) as well as the Load Coupling to Generator (2-3/4" size, Qty 16). The drawing also depicts the windage plugs (Qty 34) used to enclose the conical thread of each stud.

2.2 Frame 9FA Gas Turbine to Load Coupling

GE Part Number	Riverhawk P/N	GE VENDOC P/N
361A6162P007	HF-3821	GE 359B2594
361A6162P010	HF-3821	GE 359B2594
106T9921P004	HF-3821	GE 359B2594
106T9921P007	HF-3821	GE 359B2594
107T7526P0004	HF-3821	GE 359B2594

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107T7526P0007	HF-3821	GE 359B2594
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The hydraulic tooling used for installation and removal is Riverhawk HT-6749 with the exception that 106T9921 requires Riverhawk HT-6749-ES.

These hardware drawings depict the complete stud and nut package for the Gas Turbine to Load Coupling (3" size, Qty 18). The drawing also depicts the windage plugs (Qty 18) used to enclose the conical thread of each stud.

2.3 Load Coupling to 324 Generator

GE Part Number	Riverhawk P/N	GE VENDOC P/N
361A6162P006	HF-3820	GE 359B2595
361A6162P009	HF-3820	GE 359B2595
106T9921P003	HF-3820	GE 359B2595
106T9921P006	HF-3820	GE 359B2595
107T7526P0003	HF-3820	GE 359B2595
107T7526P0006	HF-3820	GE 359B2595

The hydraulic tooling used for installation and removal is Riverhawk HT-6749 with the exception that 106T9921 requires Riverhawk HT-6749-ES.

These hardware drawings depict the complete stud and nut package for the Load Coupling to Generator (2-3/4" size, Qty 16). The drawing also depicts the windage plugs (Qty 16) used to enclose the conical thread of each stud.

2.4 Steam Turbine to 324 Generator

GE Part Number	Riverhawk P/N	GE VENDOC P/N
361A6162P006	HF-3820	GE 359B2595
361A6162P009	HF-3820	GE 359B2595
106T9921P003	HF-3820	GE 359B2595
106T9921P006	HF-3820	GE 359B2595
107T7526P0003	HF-3820	GE 359B2595
107T7526P0006	HF-3820	GE 359B2595

The hydraulic tooling used for installation and removal is Riverhawk HT-6749 with the exception that 106T9921 requires Riverhawk HT-6749-ES.

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GE DRAWING NUMBER	REV
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These hardware drawings depict the complete stud and nut package for the Load Coupling to Generator (2-3/4" size, Qty 16). The drawing also depicts the windage plugs (Qty 16) used to enclose the conical thread of each stud.

2.5 Frame 9F.04 Gas Turbine to Load Coupling

GE Part Number	Riverhawk P/N	GE VENDOC P/N
305T8055P0001	HF-10150	GE 101B0811

The hydraulic tooling used for installation and removal is Riverhawk HT-10156.

This hardware drawing depicts the complete stud and nut package for the Gas Turbine to Load Coupling (2-3/4" size, Qty 18). The drawing also depicts the windage plugs (Qty 18) used to enclose the conical thread of each stud.

GE Part Number	Riverhawk P/N	GE VENDOC P/N
305T8055P0003	HF-10274	GE 101B0813

This hardware drawing depicts the complete windage plug package for the Gas Turbine to Load Coupling (Qty 18) used to enclose the conical thread of each stud.

GE Part Number	Riverhawk P/N	GE VENDOC P/N
305T8055P0004	HF-10275	GE 101B0814

The hydraulic tooling used for installation and removal is Riverhawk HT-10156.

This hardware drawing depicts the complete stud and nut package for the Gas Turbine to Load Coupling (2-3/4" size, Qty 18). This hardware set does not include the windage plugs (Qty 18) used to enclose the conical thread of each stud.

2.6 Hydraulic Tooling

GE Part Number	Riverhawk P/N	GE VENDOC P/N
361A6162P011	HT-6749 AP-0532	GE 101B0653 GE 359B2502
106T9921P005	HT-6749-ES AP-0532-ES	GE 101B0653 GE 359B2502

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GE DRAWING NUMBER	REV
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107T7526P005	HT-6749 AP-0532	GE 101B0653 GE 359B2502
305T8055P0002	HT-10156 AP-0532	GE 101B0810 GE 359B2502

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 80psi [5.5 bar] minimum. (For air-driven pumps)
- Check hydraulic hose for damage.
- Test the 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)
- Lubricate the stud's threads with clean turbine oil or spray lubricant. Lubricate the nut's threads and nut face with clean turbine oil or spray lubricant.
- Install studs and nuts into the flange.

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- Set stick-out dimension on the coupling side of the flange.
- Hand tighten nuts on turbine / generator side of flange.
- Verify stick-out measurement (**VERY IMPORTANT**)

TENSIONING (Bolt Installation)

- Check tensioner 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 the spanner ring onto the nut.
- Install one puller screw release tape strip into stud. (Appendix B1)
- Install the tensioner on the stud in flange.
- Insert 1/2” hex Allen wrench into the back side of the stud.
- Tighten the puller screw. Then back off puller screw 1/2 a turn.
- Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- Place the guard over the tensioner positioning the guide pin into the backside of the stud and the tensioner handle into the locating slot in the guard.
- Hand-tighten the guard’s clamping screw. It should press firmly against tensioner’s puller screw.
- Push interlock knob to insert interlock screw into port on the tensioner and tighten firmly.
- Tension to 50%. Consult manual for correct pressure.
- Use the pin wrench in spanner ring to tighten nut.
- Release pressure, move to next stud in pattern.



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- Repeat above steps at final pressure.
- Measure final stud length and record on stretch datasheets. Calculate stretch.
- Torque the nuts' set screws.
- Install the windage plugs (if included) and torque their set screws.

DETENSIONING (Stud Removal)

- Loosen the windage plugs' (if included) set screws and remove the windage plugs from the studs
- Loosen nuts' set screws
- Inspect and clean studs' conical threads. **Do not continue until ALL debris is removed from the threads!** See 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.**
- Slide spanner ring onto nut.
- Install the tensioner on the stud in flange.
- Tighten the puller screw. Then back off puller screw 1/2 a turn.
- Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- Place the guard over the tensioner positioning the guide pin into the backside of the stud and the tensioner handle into the locating slot in the guard.
- Hand-tighten the guard's clamping screw. It should press firmly against tensioner's puller screw.
- Push interlock knob to insert interlock screw into port on the tensioner and tighten firmly.
- Apply final pressure.



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- Loosen nut with the spanner ring and pin wrench.
- Move to next stud in pattern

4.0 General Preparations

Read and understand all instructions before installing and tensioning studs.

Operators should be trained or have previous experience using Riverhawk tensioning equipment. Training will minimize the chance of improper use of the equipment.

The hydraulic tooling including the hydraulic hoses should be inspected prior to use. Inspection guidelines are listed in the following sub-sections.

This equipment produces very high hydraulic pressures and very high forces. Operators must exercise caution and wear the appropriate personal protective equipment when handling and operating the hydraulic tooling.

High-pressure oil from the hydraulic pump pressurizes the tensioner which generates a very large force that actually stretches the stud. As the stud is stretched the nut lifts off the flange. The nut is then turned by hand using the supplied spanner ring. Once the nut is tight against the flange, the pressure in the tensioner is released. The hardware is now clamping the flange together.

4.1 Machine Preparation

The flange to be tensioned must be fully closed prior to positioning of studs in the flanges. Turning the turbine and generator shafts is 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 sets. Do not intermix sets.



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Save the weight certification 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 and all caps and plugs for hydraulic openings and fittings must be in place.

Use ISO 32 grade oil.

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

See section 12 for long term storage requirements.

4.4 Hand Tools

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

5/8" Wrench	3' to 4' Breaker Bar	
1/2" Drive Ratchet	A set of Allen Wrenches	12" to 13" Micrometer

4.5 Special Tools

Hydraulic Tensioner Kit:	HT-6749 Hydraulic Tensioner, 2-3/4", 3" (reference GE VENDOC 101B0653)
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HT-10156 Hydraulic Tensioner, 2-3/4" (reference GE VENDOC 101B0810)
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Hydraulic Pump Kit:	AP-0532 Air-Operated Hydraulic Pump (recommended) (reference GE VENDOC 359B2502)
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CAUTION

Riverhawk recommends that the tensioners be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are



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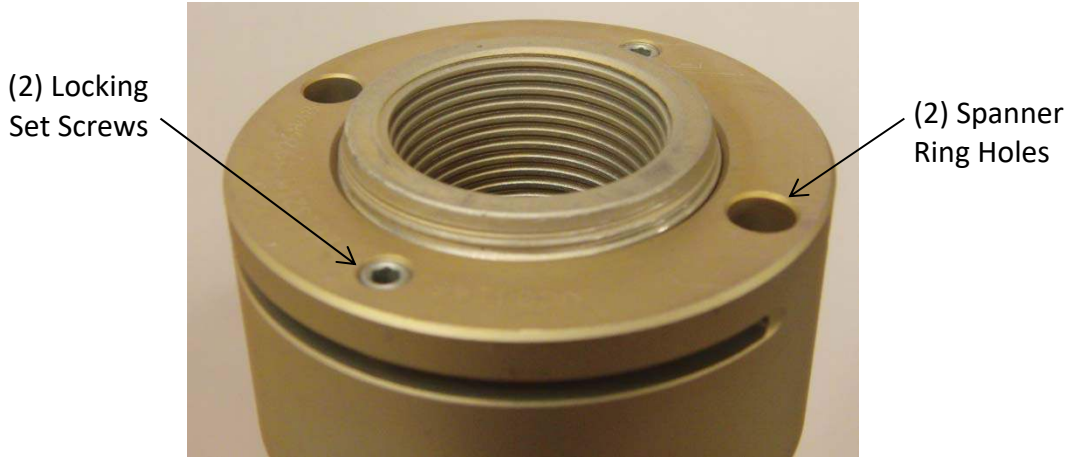
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also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.

5.0 Hardware Set Preparations

5.1 Nut Preparation



Picture 5A - 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.

CAUTION

It is especially important to check the condition of the conical thread used to tension the stud. Thread damage from previous abuse can lead to failure of the stud or tensioning equipment.

The conical threads of each stud must be clean of grit and dirt 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 may require cleaning using Riverhawk Stud Cleaning Kit #GT-4253 (GE VENDOCS 373A4026). Clean internal conical threads should have a bright and shiny appearance.

Follow instruction manual IM-220 (GE VENDOCS 373A4025) for cleaning procedure of the conical threads on Riverhawk studs using a brass power brush. The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.



Picture 5B - Brass Power Brush

5.3 Stud Length Measurement

Measure and record the initial lengths of the studs. The following suggestions will improve your results.

- Plan to start and finish any flange in the same day.
- Studs and flange must be at the same temperature.



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- Number each stud with a marker for later stretch measurement tracking.
- Mark the location of measurement on stud end with a permanent marker.
- Measure each stud to nearest 0.001 inch (.01 mm).
- Record each measurement on the supplied record sheets.
- Do not allow the measuring instruments to sit in the sun.
- The same person should make all measurements.

6.0 Stud and Nut Assembly

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual.

1. Assemble the cylindrical nut to the internal, conical thread end of the stud.
2. Slide the stud and cylindrical nut assembly into the flange as shown in Figure 6A and 6B.

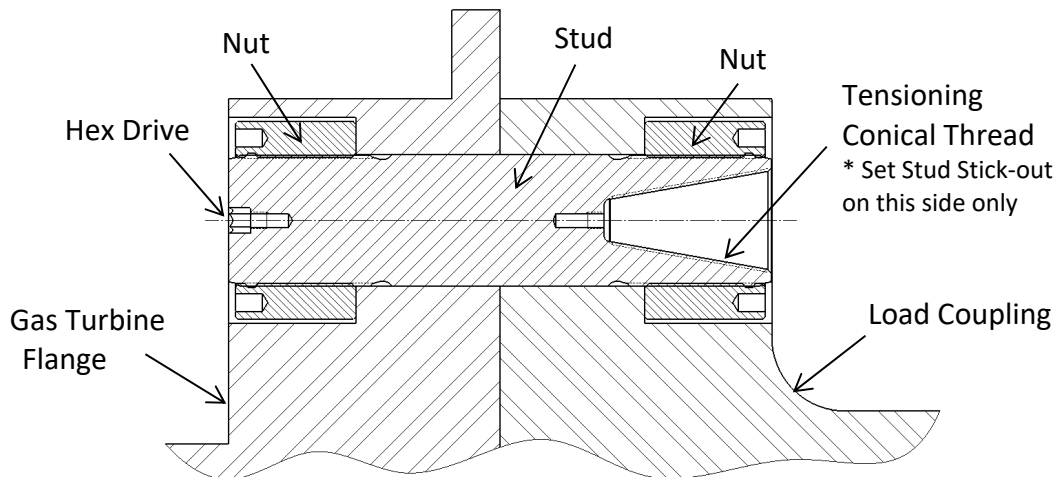


Figure 6A – Cross-section View of Gas Turbine to Load Coupling Bolted Flange Connection for most applications



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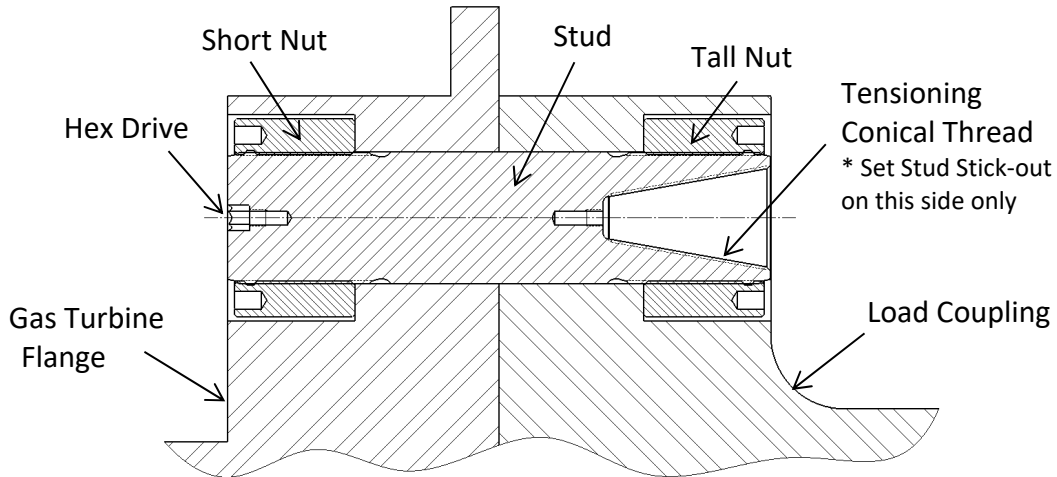


Figure 6B – Cross-section View of Gas Turbine to Load Coupling Bolted Flange Connection for 9F.04 (GE 305T8055)

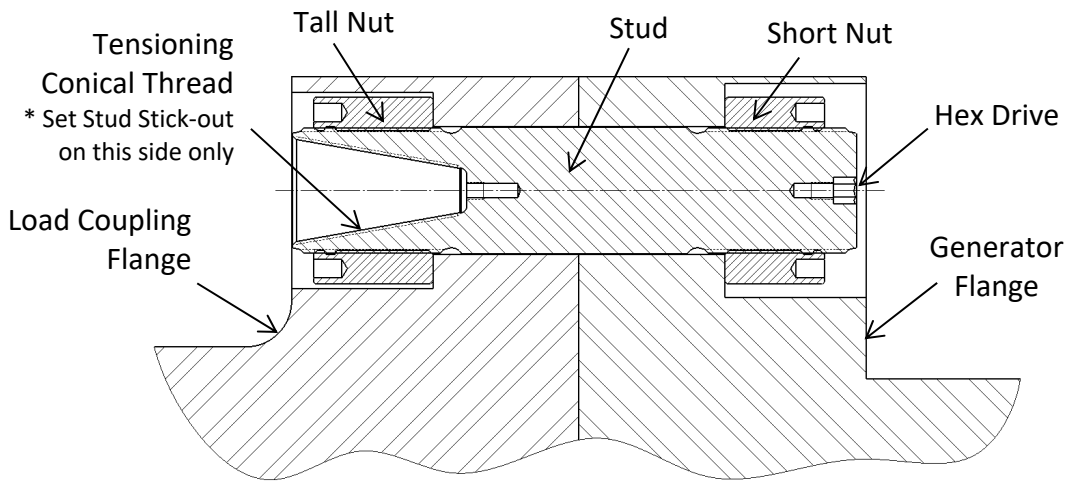


Figure 6C – Cross-section View of Load Coupling to Generator Bolted Flange Connection

3. Install the other nut on the backside.
4. Adjust the nut/stud assembly so that the stud protrudes (or sticks out) from the face of the cylindrical nut the distance specified on the hardware drawing (HF-xxxx). **SETTING THIS PROTRUSION OF STUD TO NUT IS CRITICAL FOR PROPER TENSIONER OPERATION.**



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A metal stick-out gage is provided with the tensioner to assist the operator in setting the protrusion dimension



Picture 6D – Use of Stick-Out Gage on Load Coupling to Generator Bolted Flange Connection

5. Hand tighten the assembly to a snug fit.
6. Recheck the stud stick-out length. If the stick-out length does not match the hardware drawing, adjust the nuts as necessary.

7.0 Hydraulic Tensioner Equipment Assembly

7.1 Hydraulic Equipment Inspection

7.1.1 Hydraulic Tensioner Inspection

CAUTION

Riverhawk recommends that the tensioner be returned to Riverhawk for periodic inspections. Replacement of obsolete tensioners is recommended. Functional upgrades are also recommended. The Riverhawk Service Returns Coordinator should be notified 3-6 months prior to a planned outage to schedule an inspection service.

WARNING

To avoid failure, ensure safety, and proper operation, the tensioner assembly must be installed on a stud in the flange before pressurizing the tensioner. Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.



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Check puller screw usage life with Riverhawk service bulletin SB-08001.

Clean puller screw and check for any debris and dents.

Puller screw should be free to rotate and move back and forth.

Seam between cylinders closed tightly.

Inspect the tensioner guard for any signs of damage including cracked welds. Any guards modified in the field should be replaced. Bent guards should be replaced.

Inspect the outside of the tensioner for discoloration patterns that may indicate submersion and internal damage.

Perform an inventory of the loose equipment supplied with the tensioner. An inventory list is provided on the tensioner's technical drawing (for example Riverhawk HT-xxxx). Replacement parts are available from Riverhawk.

7.1.2 Hydraulic Pump Kit Inspection

Refer to the Hydraulic Pump Kit Instruction Manual, IM-293 (GE VENDOC 373A4058). The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.

8.0 Assembly of Tensioner on a Stud

8.1 Handling of the Tensioner

A strap can be placed around the cylinder lifting handle on the hydraulic connection side only to help the operator support the tensioner during installation. The lifting strap must be loose during tensioning.

8.2 Kit Assembly

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual and the tensioner assembly drawing (HT-xxxx) listed in Section 4.5 of this manual to determine which side of the flange the tensioner must be located on in order to use the tensioner properly.

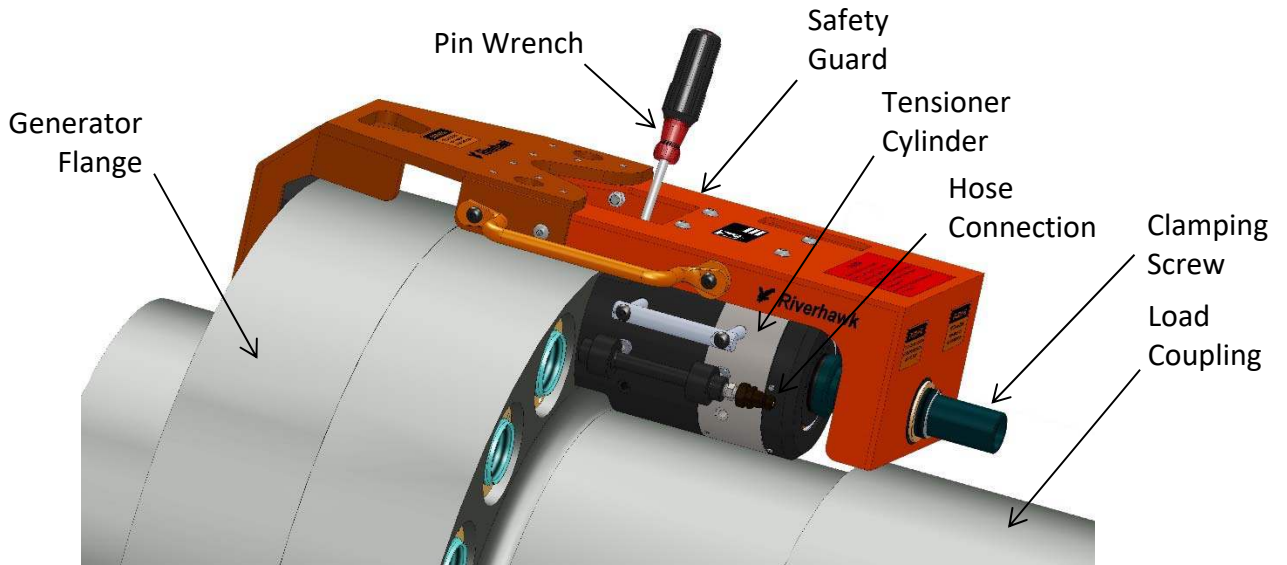


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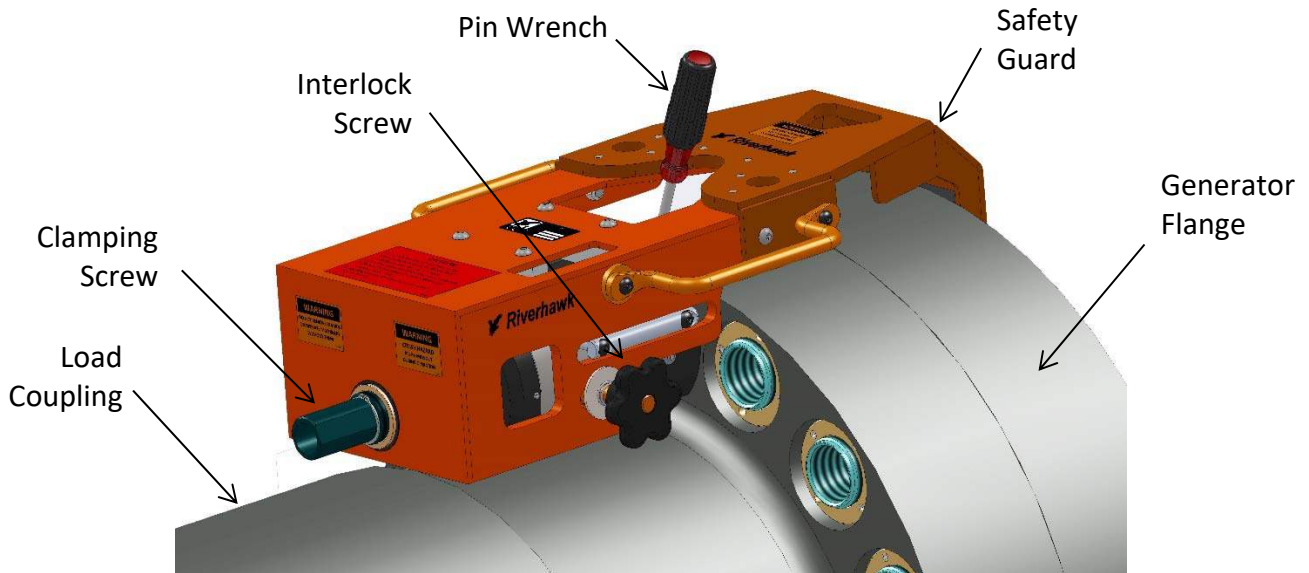
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Picture 8A – Features of the Hydraulic Tensioner HT-6749/HT-10156



Picture 8B – Features of the Hydraulic Tensioner HT-6749/HT-10156

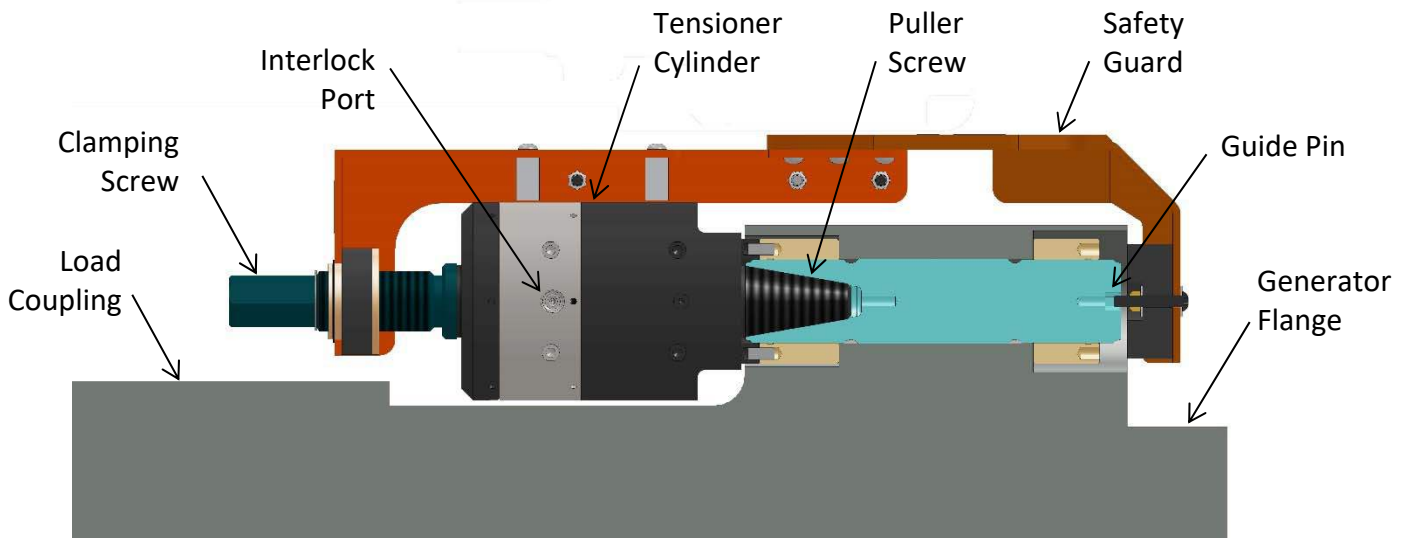


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Picture 8C – Cutaway view of Hydraulic Tensioner HT-6749

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.

Assembly sequence is as follows:

1. Open the hydraulic return valve on the pump to allow hydraulic fluid to be pushed back from the puller tool into the pump reservoir. (This is automatic on the air-operated hydraulic pump)
2. Place the spanner ring on the nut aligning the pins in the spanner ring with the holes on the nut.
3. 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.
4. Install one puller screw release tape strip into end of stud. (Appendix B1)
5. Place and hold the tensioner assembly over the end of the stud to be tightened.
6. Slide the puller screw in to the tapered thread of the stud and hand tighten. **Be sure not to cross thread assembly.**
7. Hold the stud steady with a 1/2" hex key wrench and using 1/2" drive ratchet wrench on end of puller screw. Tighten the puller screw into the conical thread of the stud with the ratchet wrench.
8. Back off the puller screw 1/2 a turn.

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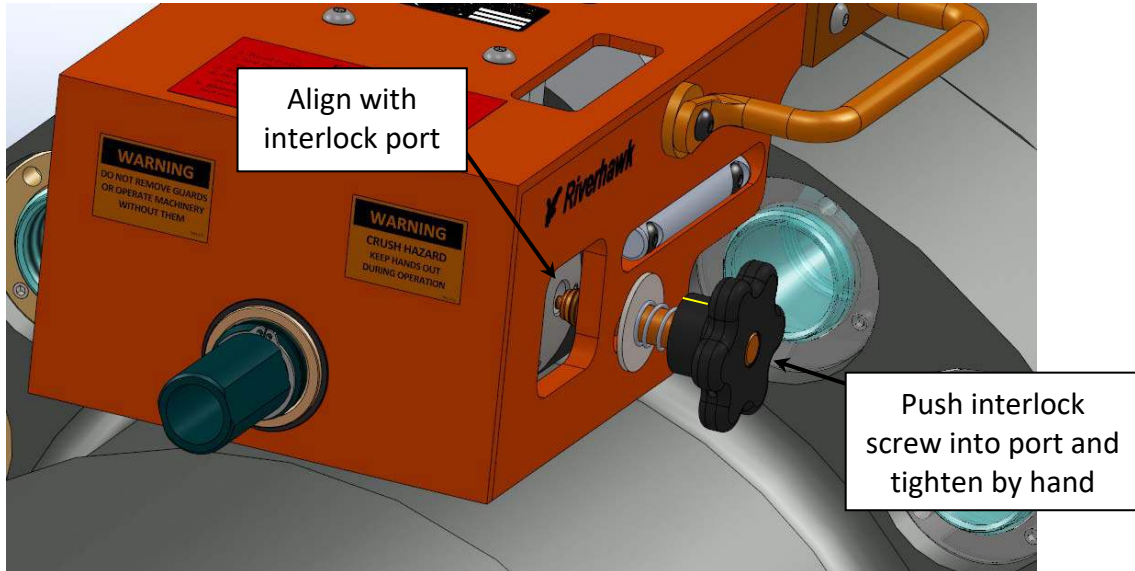
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9. Retighten the puller screw.
10. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE**, the puller screw must be tight in the stud. **DO NOT BACK OFF PULLER SCREW.**
11. Place guard assembly over top of cylinder and flange and position the guide pin into the hole in the backside of the stud.
12. Tighten the knurled clamping screw until it firmly presses against the tensioner puller screw with the screw pin inside of the 1/2 drive hole.
13. Align the interlock screw with the port on the cylinder. Tighten to firmly seat internal interlock valve.



Picture 8D – Activation of Safety Interlock

14. Connect the hydraulic pump to the tensioner. The tensioner should be completely assembled and ready for use.

If the tensioner is not free to rotate when the puller screw is tight then, either (1) the stud is not properly positioned in the flange and recheck the stick-out length and reposition the nuts, or (2) The tensioner is damaged and must be returned for repair.

CAUTION

Do not over extend the stud. Over extension can cause the piston to lose its seal and leak oil.



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CAUTION

Personal injury and equipment damage can occur if the puller screw is not securely engaged with the tapered threads of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the tensioner assembly is free to turn.

8.3 Bleeding Hydraulic System

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

9.0 Stud 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 record sheets found at the end of this manual.

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.

WARNING

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

CAUTION

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. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

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<u>Flange Position</u>	<u>Stud Size</u>	<u>50% Pressure</u>	<u>50% Stretch</u>
Gas Turbine to Load Coupling	3" [76 mm]	10000 psi [690 bar]	Do not measure Do not use
Gas Turbine to Load Coupling (HT-10156 only)	2-3/4" [71 mm]	10000 psi [690 bar]	Do not measure Do not use
Load Coupling to Generator	2-3/4" [71 mm]	10000 psi [690 bar]	Do not measure Do not use
Steam Turbine to Generator	2-3/4" [71 mm]	10000 psi [690 bar]	Do not measure Do not use

9.1.1 Tightening of 3" and 2-3/4" nuts

Turn the cylindrical nut using the spanner ring and pin wrench until it bottoms firmly on the flange.

9.2 Removing the Tensioner from an Installed Stud

The tensioner removal is accomplished by the follows steps:

1. Release the hydraulic pressure by either releasing the hand switch on the AP-0532 Pump Kit.
2. Wait for the tensioner to fully retract and the tensioner is free to rotate.
3. Unscrew the hydraulic interlock knob until the screw is disconnected from the cylinder.
4. Unscrew the knurled clamping screw and remove the guard from the tensioner.
5. Unscrew the puller screw using a wrench and breaker bar. Do not use an impact wrench as this can damage the tensioner.
6. Remove the spanner ring from the nut.
7. Move the tool to the next bolt hole following the tensioning pattern from the stretched record sheets at the end of this manual.

9.3 Tensioning at Final Pressure

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



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WARNING

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

CAUTION

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. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use "Never Seize" on the conical threads.

CAUTION

Do not exceed the maximum pressure marked on the tensioner. Excessive pressure can damage the stud and puller screw.

CAUTION

Do not tighten the nut while the tool is coming up to pressure; wait until pressure is achieved before attempting to tighten the nut with the spanner ring. If the tool is not properly installed, the tool could jump off the stud while coming up to pressure.

<u>Flange Position</u>	<u>Stud Size</u>	<u>Final Pressure</u>	<u>Final Stretch</u>
Gas Turbine to Load Coupling	3" [76 mm]	18000 psi [1240 bar]	0.020" - 0.022" [0.51 mm - 0.56 mm]
Gas Turbine to Load Coupling (HT-10156 only)	2-3/4" [71 mm]	18700psi [1290 bar]	0.020" - 0.023" [0.41 mm - 0.58 mm]
Load Coupling to Generator	2-3/4" [71 mm]	19000 psi [1310 bar]	0.025" - 0.027" [0.64 mm - 0.69 mm]
Steam Turbine to Generator	2-3/4" [71 mm]	19000 psi [1310 bar]	0.025" - 0.027" [0.64 mm - 0.69 mm]

Incorrect stretch values can be corrected by uninstalling some or all of the selected studs. Re-measure the initial length of the studs and repeat the installation instructions studs. Excessive stretch variations can also be corrected by the same method.

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



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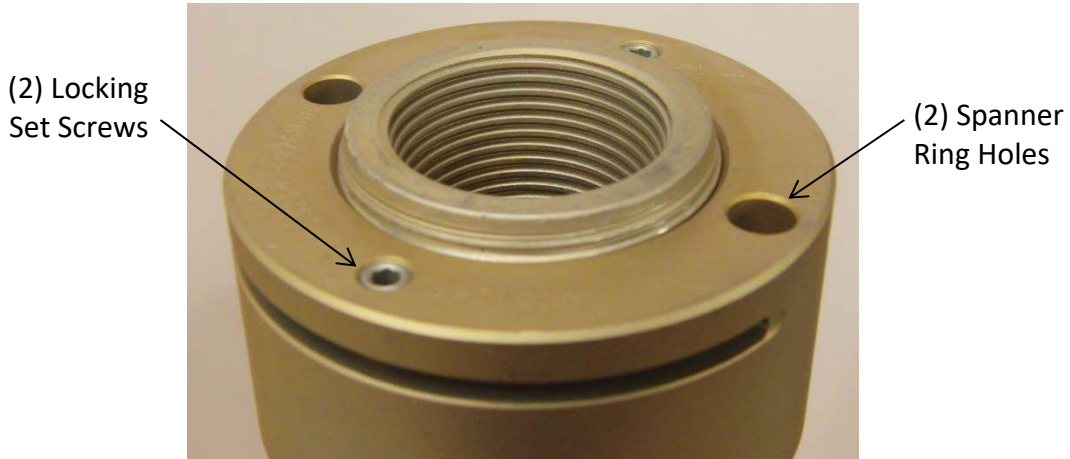
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10.0 Thread Locking and Windage Plug Installation

10.1 Thread Locking



Picture 10A - Riverhawk Locknut

Mechanical lock nuts have two set screws located in the top face. Before threading the nut onto the stud check to be certain 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>
3" [76 mm]	3/8"-24 UN	200 in·lbs – 250 in·lbs [22.6 N·m – 28.2 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]

10.2 Windage Plug Installation

Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual to determine if windage plugs are required for the installation.



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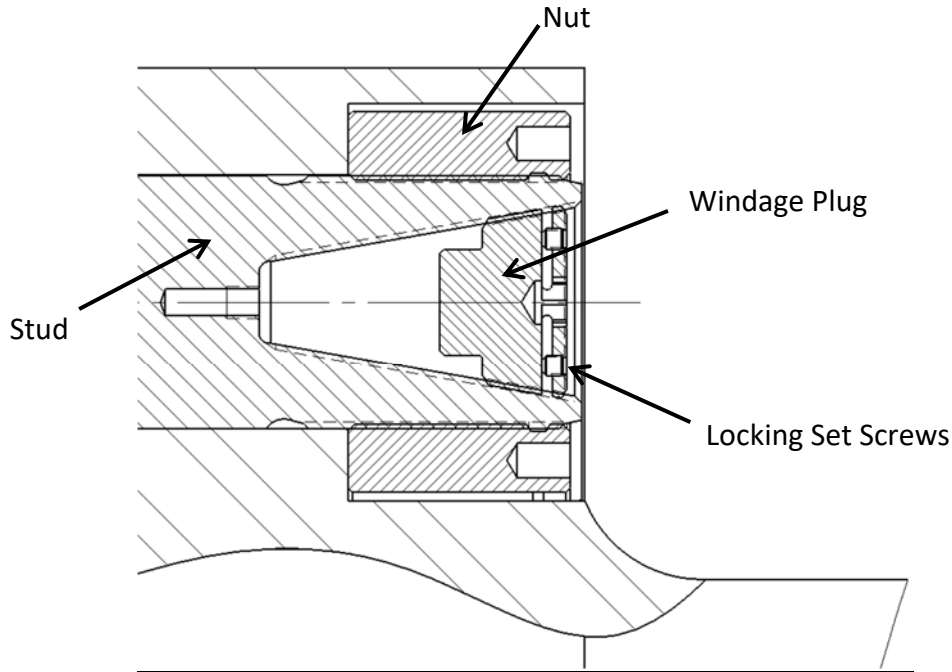


Figure 10B – Windage Plug Installation

Assembly sequence is as follows:

1. Verify the stud's internal threads are clean and free from oil.
2. Fully insert Windage Plug by threading it into the stud's internal thread.
3. Torque the windage plug to 200-250 in·lbs (22.6 – 28.2 N·m).
4. Tighten the windage plug's set screws.

Windage Plug Part Number	Set Screw Torque
7001867	80-90 in-lbs [9.0-10.1 N·m].
7003513	145-155 in-lbs [16.4-17.5 N·m].

5. Check the distance the plug is inside of the stud. The plug should be at a minimum of .06" (1.5mm) below the face of the stud.



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11.0 Stud and Nut Removal

11.1 Handling of the Tensioner

A strap can be placed around the cylinder lifting handle on the hydraulic connection side only to help the operator support the tensioner during installation. The lifting strap must be loose during tensioning.

11.2 Stud and Nut Removal

Removal is accomplished as follows:

- If present, remove the windage plugs from the studs by reversing the installation instructions from section 10.2. It may be necessary to use two Allen wrenches: one to stop the windage plug from rotating, one to remove the set screws. Do not misplace the set screws.
- Using a wire brush, GT-4253, and shop air clean the internal tapered thread of the stud to remove any debris/deposits which may have accumulated during service as described in section 5.2.2.
- With an Allen-wrench loosen the two locking set screws but do not remove from the nut.



Picture 11A - Loosening of a nut's set screws

- Install the appropriate tensioner to the stud as described in Section 8.0.
- Apply the appropriate hydraulic pressure per this table. **DO NOT BACK OFF THE PULLER SCREW.**



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<u>Flange Position</u>	<u>Stud Size</u>	<u>Removal Pressure</u>
Gas Turbine to Load Coupling	3" [76 mm]	18000 psi [1240 bar]
Gas Turbine to Load Coupling (HT-10156 only)	2-3/4" [71 mm]	18700psi [1290 bar]
Load Coupling to Generator	2-3/4" [71 mm]	19000 psi [1310 bar]
Steam Turbine to Generator	2-3/4" [71 mm]	19000 psi [1310 bar]

- Using the spanner ring and spanner/pin wrenches, loosen the nut, then release the pressure.

11.3.1 Removing the Tensioner from a Stud

The tensioner removal is accomplished by the follows steps:

1. Release the hydraulic pressure by either releasing the hand switch on the AP-0532 Pump Kit.
2. Wait for the tensioner to fully retract and the tensioner is free to rotate.
3. Unscrew the hydraulic interlock knob until the screw is disconnected from the cylinder.
4. Unscrew the knurled clamping screw and remove the guard from the tensioner.
5. Unscrew the puller screw using a wrench and breaker bar. Do not use an impact wrench as this can damage the tensioner.
6. Remove the spanner ring from the nut.
7. Move the tool to the next bolt hole following the tensioning pattern from the stretched record sheets at the end of this manual.

12.0 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.



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12.1 Hydraulic Pump Kit Storage

Refer to the Hydraulic Pump Kit Instruction Manual, IM-293 (GE VENDOC 373A4058). The latest revision may be obtained by contacting Riverhawk Company or thru www.riverhawk.com.

12.2 Hydraulic Tensioner Storage

Check the tensioner for any damage

1. Clean puller screw and check for any debris and dents.
2. Puller screw should be free to rotate and move back and forth.
3. Seam between cylinders closed tightly.
4. Inspect tensioner guard for any signs of damage. Bent guards should be replaced.

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

Place protective red plastic cap into the hydraulic port.

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

12.3 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.

13.0 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: Can I rent a hydraulic tensioner kit?

A: Yes, Riverhawk has rental tensioner kits available for most of our hydraulic tensioners.



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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.

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.



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- 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 5.2.2
- Q:** During the initial steps of removing a tensioned stud, the stick-out length is found to be wrong.
- A:** Do not proceed. 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 Appendix B2, 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.
- Q:** The hydraulic hose has a collar on it that can't be moved by hand
- A:** The hydraulic fitting is shown in Appendix B2. 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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14.0 Revision History

Revision Letter	Effective Date	Description
F	May 30, 2023	Added GE 305T8055 and 9F.04 to Load Coupling to title page; Inserted section 2.5; Added 305T8055P0002 to section 2.6; Inserted figure 6B into section 6; Added HT-10156 to pictures 8A and 8B; Added HT-10156 to pressure tables in sections 9.1, 9.3, and 11.2
E	Feb 1, 2023	Added Windage Plug Part Number chart to section 10.2
D	Apr 5, 2022	Updated EC Declaration of Conformity; Added UKCA Declaration of Conformity
C	Aug 22, 2016	Added GE P/N's to section 2
B	Mar 16, 2016	Updated section 3 clamping screw step
A	Mar 3, 2016	Replaced rupture disc references with burst disc
-	Sep 21, 2015	Released



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Appendix A1 – EC Declaration of Conformity

EC Declaration of Conformity

Manufacturer: Riverhawk Company
Address: 215 Clinton Road
New Hartford, NY 13413, USA

The hydraulic pump and bolt tensioning tool described in this manual are used for installing and applying tension to large bolts that are specifically designed by Riverhawk Company to be tensioned hydraulically.

All applicable sections of European Directive 2006/42/EC for machinery have been applied and fulfilled in the design and manufacture of the hydraulic pump and bolt tensioning tool described in this manual. Reference also ISO 12100:2010, ISO 4413:2010, and ISO 4414:2010.

Furthermore, this equipment has been manufactured under the Riverhawk quality system per EN ISO 9001:2015

Consult the Declaration of Conformance included with the shipment of this equipment that identifies the authorized Riverhawk representative, applicable serial numbers, and appropriate signature.



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Appendix A2 – UKCA Declaration of Conformity

UKCA Declaration of Conformity

Manufacturer: Riverhawk Company
Address: 215 Clinton Road
New Hartford, NY 13413, USA

The hydraulic pump and bolt tensioning tool described in this manual are used for installing and applying tension to large bolts that are specifically designed by Riverhawk Company to be tensioned hydraulically.

All applicable sections of Supply of Machinery (Safety) 2008 have been applied and fulfilled in the design and manufacture of the hydraulic pump and bolt tensioning tool described in this manual. Reference also ISO 12100:2010, ISO 4413:2010, and ISO 4414:2010.

Furthermore, this equipment has been manufactured under the Riverhawk quality system per EN ISO 9001:2015

Consult the Declaration of Conformance included with the shipment of this equipment that identifies the authorized Riverhawk representative, applicable serial numbers, and appropriate signature.



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Appendix B1 – Puller Screw Release Tape Installation

Reference: GT-6516 (GE 373A4080)

Caution

Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. This procedure will ease assembly and assure positive mating of the threads before tightening. Do not use “Never Seize” on the conical threads.

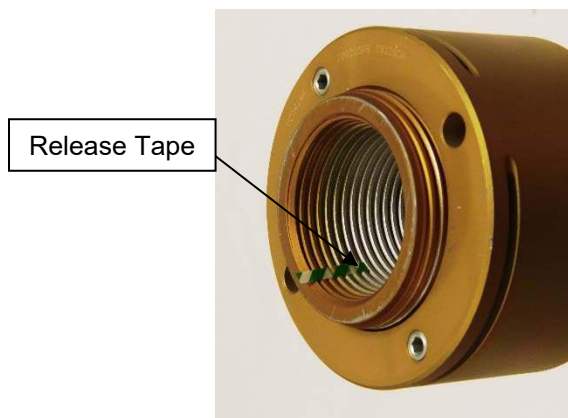
To use puller screw release tape

-During tensioner assembly

1. Following steps in the tensioner installation manual, before inserting the puller screw into the stud.
2. Insert a single puller screw release tape onto the internal thread of the stud leaving approximately 1/8” [3mm] sticking out of the end of the stud. (see picture below)
3. Insert puller screw into stud, per instruction manual and continue assembly of the tensioner.

-After tensioning and removal of tensioner from stud

1. Follow appropriate tensioner installation manual for disassembly of the tensioner.
2. Once tensioner is removed, clean studs internal thread and puller screw external thread to remove all debris left behind by puller screw release tape using brass power brush (GT-4253)



-Release tape should only be used for stud installation; puller screw engagement does not require the use of release tape during de-tensioning of the studs.

-Do not substitute for Riverhawk release tape, contact Riverhawk for support (+1) 315-768-4855 or www.Riverhawk.com



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Appendix B2 - Hydraulic Fittings

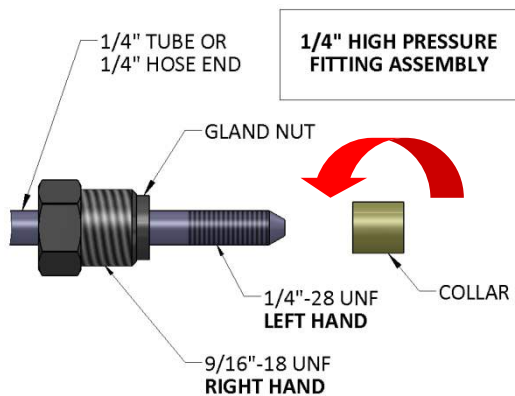


Illustration 1

Riverhawk tensioners use a 1/4" High Pressure port to connect its hydraulic hoses. 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. (See Illustration 1)

To assembly 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 as shown in Illustration 1.

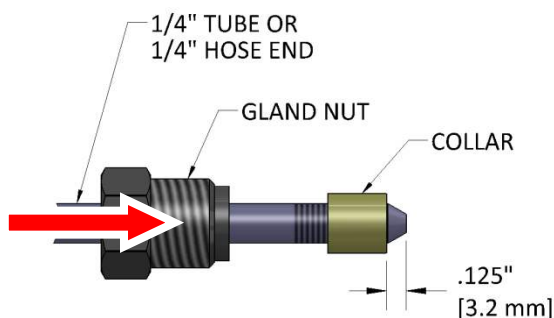


Illustration 2

The collar should be placed .125" (3.2 mm) from the tip of the cone. (See Illustration 2) 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.

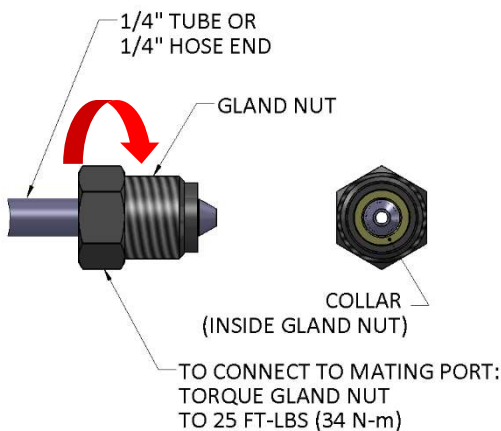


Illustration 3

Slide the gland nut down over the collar. (See Illustration 3) Insert the 1/4" tube or 1/4" hose end into tensioner or hydraulic pump. While firmly holding the tube or 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 on the end of the 1/4" tube or 1/4" hose end from scratches as this is the sealing surface.
- Replace red plastic caps when finished to protect the threads and cone.



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Appendix B3 - Hydraulic Tensioner's Burst Disc Replacement

The hydraulic tensioner's burst disc is a key element in the overall safe use of the hydraulic tensioner.

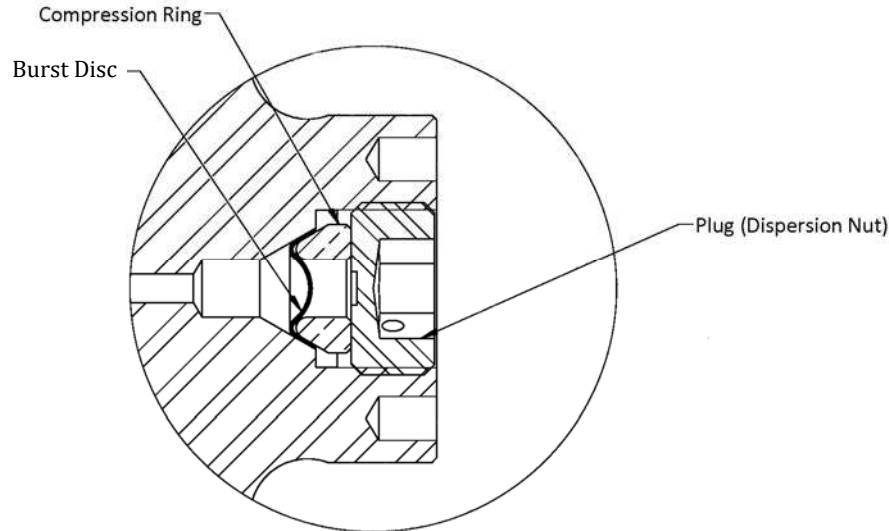
Each tensioner is shipped from our factory with one burst disc already installed in the tensioner and with another spare disc for field replacement. Extra burst discs are available from Riverhawk for replacement purposes.

To replace a damaged burst disc:

1. Remove the hydraulic port's dispersion nut, compression ring, and damaged burst disc.
2. Discard the damaged burst disc.
3. Clean the dispersion nut, compression ring, new burst disc, and the hydraulic port with a solvent to ensure a dirt-free installation.
4. Reassemble new burst disc, compression ring, and dispersion nut into the same hydraulic port.

Warning

A damaged burst disc must be replaced with a with a burst disc of the same design and pressure rating. Do not substitute a damaged burst disc with a different disc type, a different pressure rating, or a foreign object.



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Appendix C1 - Record Sheet 18 Bolt Circle

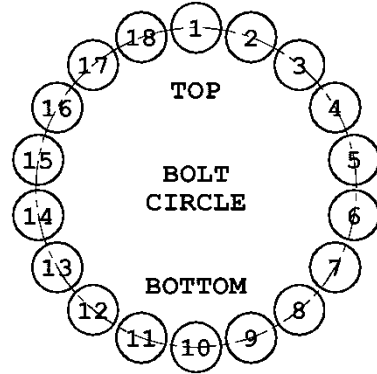
STRETCH RECORD SHEET FOR THE
GAS TURBINE TO LOAD COUPLING

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



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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Appendix C2 - Record Sheet 16 Bolt Circle

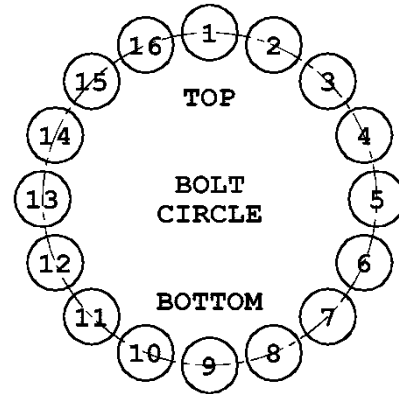
STRETCH RECORD SHEET FOR THE
LOAD COUPLING TO GENERATOR

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



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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