



## **INSTRUCTION MANUAL IM-328**

### **For Gas Turbine Tensioned Studs and Nuts**

#### **Applicable Bolting Connections**

Frame 6B Gas Turbine to 6A6 Generator

Frame 6B Gas Turbine to 6A6 Generator with a Goodrich or Altra coupling


Frame 6B Gas Turbine to Load Coupling

Frame 6B Gas Turbine to Load Gear

Load Gear to 6A6 Generator

#### **Applicable GE Ordering Sheet Part Numbers**

110T7965P0002	128T8633P0001	392A7490P001	392A7490P013
110T7965P0003	128T8633P0002	392A7490P003	392A7490P014
110T7965P0004	128T8633P0003	392A7490P005	392A7490P015
110T7965P0005	128T8633P0004	392A7490P006	392A7490P016
110T7965P0006	128T8633P0005	392A7490P007	392A7490P017
110T7965P0007	128T8633P0006	392A7490P008	
110T7965P0008	128T8633P0007	392A7490P009	
110T7965P0009	128T8633P0008	392A7490P010	
110T7965P0012	128T8633P0009	392A7490P012	

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**Table of Contents**

Section	Description	Page Number
1.0	Cautions and Safety Warnings	3
2.0	Scope and GE Part Number Cross Reference	4
3.0	Quick Checklist	7
4.0	General Preparations	10
5.0	Hardware Set Preparations	12
6.0	Stud and Nut Assembly	15
7.0	Hydraulic Tensioner Equipment Assembly	18
8.0	Assembly of Tensioner on Stud	21
9.0	Stud Tensioning	25
10.0	Thread Locking	27
11.0	Stud and Nut Removal	28
12.0	Storage Instructions	32
13.0	Frequently Asked Questions	33
14.0	Revision History	35
Appendix A1	EC Declaration of Conformity	36
Appendix B1	24-Bolt Tensioning Pattern (GT-LC) Record Sheet	37
Appendix B2	24-Bolt Tensioning Pattern (LC-LG) Record Sheet	38
Appendix B3	20-Bolt Tensioning Pattern (LG-GEN) Record Sheet	39



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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 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.

### WARNING

Do not use the tensioner at any pressure unless the tool is installed on a stud in a flange.



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**CAUTION**

Do not over stroke the tensioner. Over stroke can 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 cage 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

## 2.0 Scope

This document describes the procedure to be used to install the stud and nut sets supplied by the Riverhawk Company for the flanges at the Gearbox/Generator connection.

The various frame configurations covered in this manual are listed in Sections 2.1 through 2.7 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.



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**2.1 Frame 6B Gas Turbine to 6A6 Generator**

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 110T7965P0004 (Obsolete)	Not Applicable	Not Applicable
GE 110T7965P0005 (Obsolete)	HF-0708	GE 364B3420
GE 110T7965P0007 (Obsolete)	HF-0708	GE 364B3420
GE 392A7490P012	HF-0708	GE 364B3420
GE 392A7490P013	HF-0708	GE 364A3420

The hydraulic tools used for installation and removal are Riverhawk HT-6829 (load coupling) and HT-6331 (generator).

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 128T8633P0009	HF-8120	GE 101B0728

The hydraulic tools used for installation and removal are Riverhawk HT-6829 (load coupling) and HT-8113 (generator).

These hardware drawings depict the complete stud and nut package for the Gas Turbine to Load Coupling (1-1/8" size, Qty 24), and Load Coupling to Load Gear (1-1/8" size, Qty 24), and Load Gear to Generator (1-1/4" size, Qty 20).

**2.2 Frame 6B Gas Turbine to 6A6 Generator with a Goodrich or Altra coupling**

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 392A7490P010	HF-0708	GE 364B3420

The hydraulic tools used for installation and removal are Riverhawk HT-0406 (load coupling) and HT-6331 (generator).

These hardware drawings depict the complete stud and nut package for the Gas Turbine to Load Coupling (1-1/8" size, Qty 24), and Load Coupling to Load Gear (1-1/8" size, Qty 24), and Load Gear to Generator (1-1/4" size, Qty 20).

**2.3 Frame 6B Gas Turbine to Load Coupling**

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 128T8633P0006	HF-8123	GE 101B0726
GE 392A7490P009	HF-7695	GE 101B0695

The hydraulic tooling used for installation and removal is Riverhawk HT-6829.



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The hardware drawing depicts the complete stud and nut package for Gas Turbine to Load Coupling (1-1/8" size, Qty 24).

## 2.4 Frame 6B Gas Turbine to Load Gear

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 110T7965P0006 (Obsolete)	HF-0799	GE 101B0656
GE 110T7965P0008 (Obsolete)	HF-0799	GE 101B0656
GE 128T8633P0004	HF-8121	GE 101B0724
GE 392A7490P005	HF-0799	GE 101B0656
GE 392A7490P015	HF-0799	GE 101B0656

The hydraulic tooling used for installation and removal is Riverhawk HT-6829.

The hardware drawing depicts the complete stud and nut package for Gas Turbine to Load Coupling (1-1/8" size, Qty 24) and Load Coupling to Load Gear (1-1/8" size, Qty 24).

## 2.5 Load Gear to 6A6 Generator

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 110T7965P0009 (Obsolete)	HF-2735	Not Available
GE 110T7965P0012 (Obsolete)	HF-2735	Not Available
GE 392A7490P006	HF-2735	Not Available
GE 392A7490P016	HF-2735	Not Available

The hydraulic tooling used for installation and removal is Riverhawk HT-6331.

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 128T8633P0005	HF-8122	GE 101B0725

The hydraulic tooling used for installation and removal is Riverhawk HT-8113.

The hardware drawing depicts the complete stud and nut package for the Load Gear to Generator (1-1/4" size, Qty 20)

## 2.6 Load Coupling to Load Gear

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 128T8633P0007	HF-8124	GE 101B0727



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The hydraulic tools used for installation and removal are Riverhawk HT-6829.

These hardware drawings depict the complete stud and nut package for the Load Coupling to Load Gear (1-1/8" size, Qty 24).

## 2.7 Hydraulic Tooling

GE PART NUMBER	RIVERHAWK P/N	GE VENDOC P/N
GE 128T8633P0001	MP-0130	GE 359B2506
GE 128T8633P0002	HT-8113	GE 101B0723
GE 128T8633P0003	HT-6829	GE 101B0651
GE 128T8633P0004	HT-6829	GE 101B0651
	HT-8113	GE 101B0723
	MP-0130	GE 359B2506
GE 110T7965P0002 (Obsolete)	HT-6331	GE 373A4071
GE 392A7490P007	HT-6331	GE 373A4071
GE 110T7965P0003 (Obsolete)	HT-6829	GE 101B0651
GE 392A7490P008	HT-6829	GE 101B0651
GE 392A7490P001	MP-0130	GE 359B2506
GE 392A7490P003	HT-0406	GE 364B3418
GE 392A7490P014	HT-6829	GE 373A4071
	HT-6331	GE 373A4071
	MP-0130	GE 359B2506

## 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.



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- ☐ 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 gear side of the flange.
- ☐ Hand tighten nuts on 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.**
- ☐ Place spanner ring on the nut threaded onto the stud end with the conical thread.
- ☐ Insert 3/8" hex Allen wrench into the back side of the stud.
- ☐ Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand.
- ☐ Insert puller screw through the tensioner and the spanner ring.
- ☐ Tighten the puller screw. Then back off puller screw 1/2 a turn.



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- ☐ Retighten the puller screw and leave hand tight. **DO NOT BACK OFF PULLER SCREW.**
- ☐ **For the Load Coupling Tensioner only**, tighten puller nut and then back nut off two flats or 120 degrees to allow for stud stretch.
- ☐ Tensioner should be free to rotate. If tight against flange, remove and check stick-out dimension of the stud.
- ☐ Place guard over assembly and tighten threaded hydraulic interlock knob firmly into tensioner body.
- ☐ 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.
- ☐ Repeat above steps at final pressure.
- ☐ Measure final stud length and record on stretch datasheets. Calculate stretch.
- ☐ Torque the nuts' set screws.

#### **DETENSIONING (Stud Removal)**

- ☐ If present, loosen the windage plugs' 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.**
- ☐ Place spanner ring on the nut threaded onto the stud end with the conical thread.
- ☐ Insert 3/8" hex Allen wrench into the back side of the stud.



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- ☐ Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand.
- ☐ Insert puller screw through the piston of the tensioner and the spanner ring.
- ☐ 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.**
- ☐ **For the Load Coupling Tensioner only**, tighten puller nut and then back nut off two flats or 120 degrees to allow for stud stretch.
- ☐ Tensioner should be free to rotate. If tight against flange, remove and inspect.
- ☐ Place guard over assembly and tighten threaded hydraulic interlock firmly into tensioner body.
- ☐ Apply final pressure.
- ☐ 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.



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373A4073	F

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 the studs in the flanges. There must be provisions for turning the shafts of the turbine, coupling, gearbox, and generator. Also, it will be advantageous to remove as many obstructions as possible from the flange area, such as speed probes and conduit.

#### 4.2 Hardware – Balance

The studs are supplied in component balanced sets. A stud can be exchanged with another in its set without affected the overall balance of the equipment. Do not exchange a stud from one set with another stud from a different set. When shipped from Riverhawk, the studs are not assigned to any specific hole in the load coupling flange; this is optional and can be done at the installation site. The set size is determined by the relevant GE order drawing (see section 2.0).

The nuts are supplied in component balanced sets. A nut can be exchanged with another in its set without affecting the overall balance of the equipment. Do not exchange a nut from one set with another nut from a different set. When shipped from Riverhawk, the nuts are not assigned to any specific hole in the load coupling flange; this is optional and can be done at the installation site. The set size is determined by the relevant GE order drawing (see section 2.0).

A weight balance certification is supplied with each order. Store this certification in an appropriate location as it will be needed for the purchase of replacement equipment.

#### 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.



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#### 4.4 Hand Tools

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

5/8" wrench	1' – 2' (30cm-60cm) Breaker Bar
1" wrench	5" to 6" (125mm-150mm) micrometer
A set of Allen Wrenches (inch series)	6" to 7" (150mm-175mm) micrometer

#### 4.5 Riverhawk Tools

Hydraulic Tensioner Kits:	HT-6829 Hydraulic Tensioner, 1-1/8" (reference GE VENDOC 101B0651)
	HT-6331 Hydraulic Tensioner, 1-1/4" (reference GE VENDOC 373A4071)
	HT-8113 Hydraulic Tensioner, 1-1/4" (reference GE VENDOC 101B0723)
Hydraulic Pump Kit:	MP-0130 Manual Hand-Operated Hydraulic Pump (recommended) (reference GE VENDOC 359B2506)
	AP-0532 Air-Operated Hydraulic Pump (reference GE VENDOC 359B2502)
Stud Cleaning Kit:	GT-4354 Stud Cleaning Kit (recommended) (reference GE VENDOC 373A4027)

#### CAUTION

**Riverhawk recommends that the tensioners 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.**

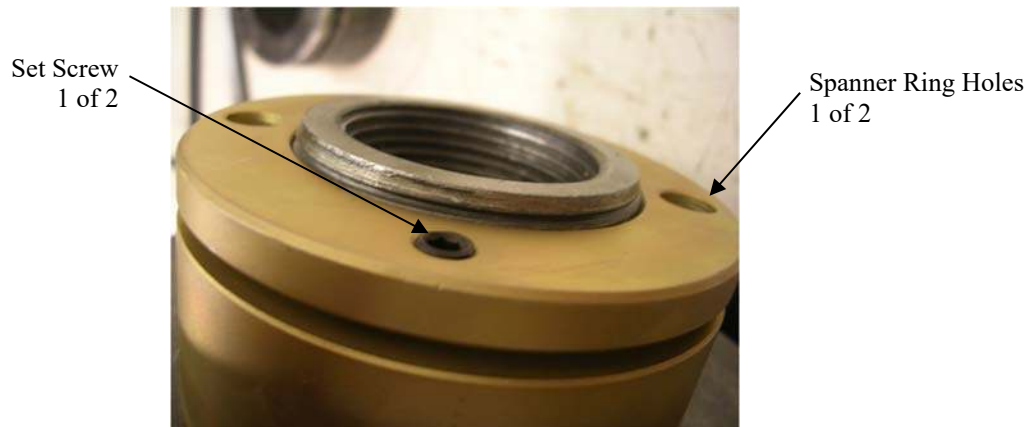
#### 5.0 Hardware Set Preparations



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373A4073	F

## 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.

Before threading the nut onto the stud, the set screws should be loose and free to turn.

### 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.

Before threading the nut onto the stud, the set screws should be loose and free to turn.

## 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.



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373A4073	F

**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. Clean conical threads should have a bright and shiny appearance. (Reference Riverhawk IM-220)

If cleaning is required, follow these steps:

1. Blow out the threads with compressed air to remove loose debris and dry conical threads. 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-4354 or a similar 1/2" diameter Brass power brush.



**Picture 5B - Brass Power Brush**

3. Insert the brush into an electric drill and set drill to run in a counterclockwise direction at high speed.
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. Use a sharp dental pick or seal pick to lightly scrape the root of the threads to check for debris. Repeat if any dirt can be seen in the threads.
8. Inspect threads for any damage that may have been caused by previous installation.
9. Do **not** apply thread lubricants such as "Never Seize" to the stud's threads.



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10. 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. 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.
- 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

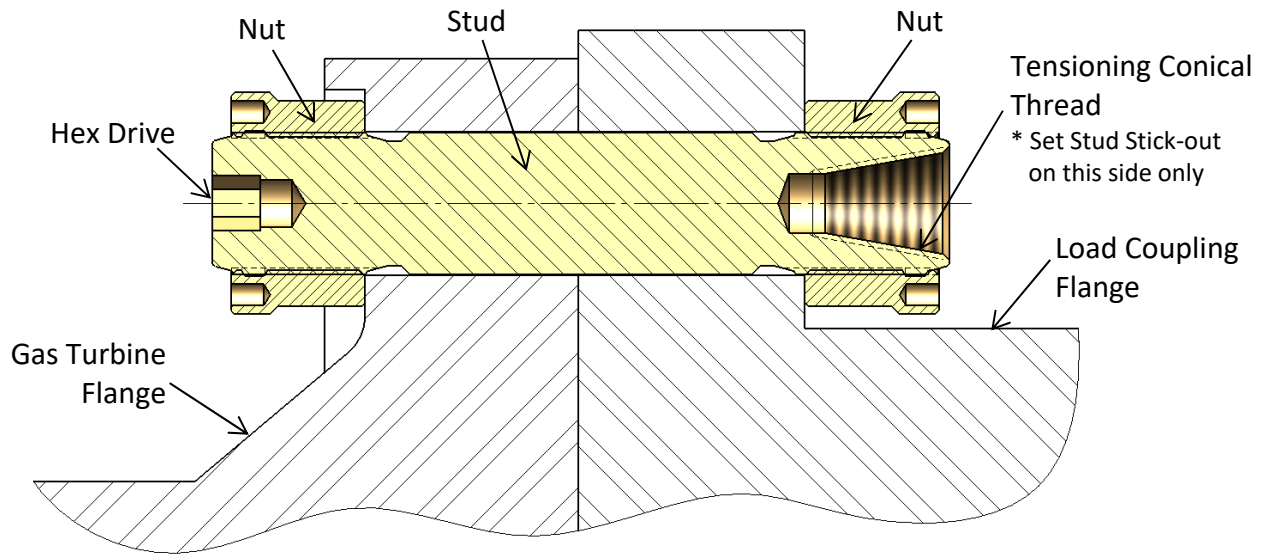
Refer to the hardware assembly drawing (HF-xxxx) listed in Section 2.0 of this manual.

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, 6B, 6C, and 6D.

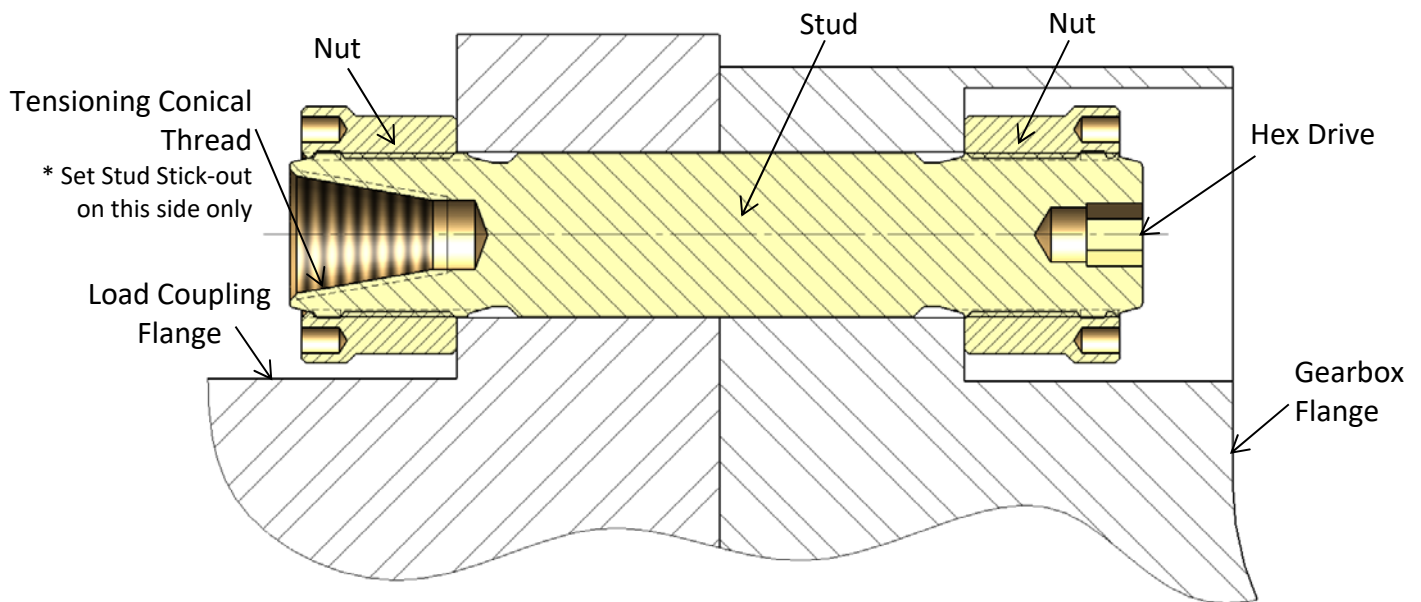


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**Figure 6A** – Cross-section View of Gas Turbine to Load Coupling Bolted Flange Connection



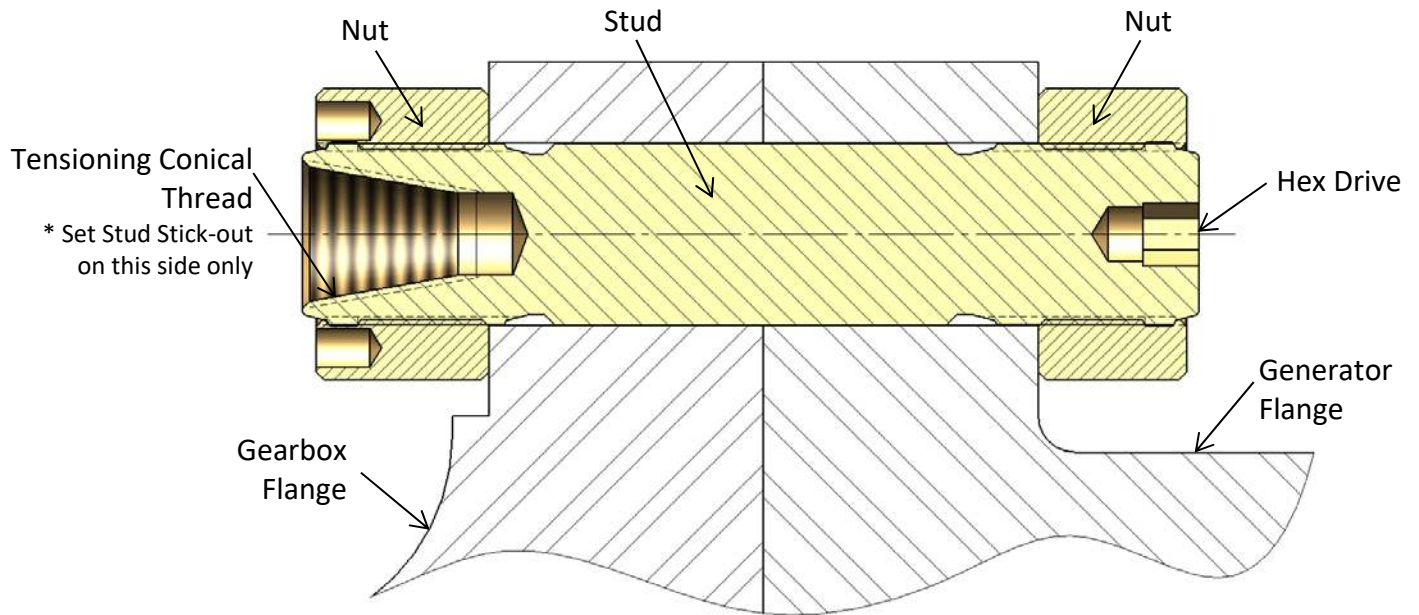
**Figure 6B** – Cross-section View of Load Coupling to Load Gear Bolted Flange Connection



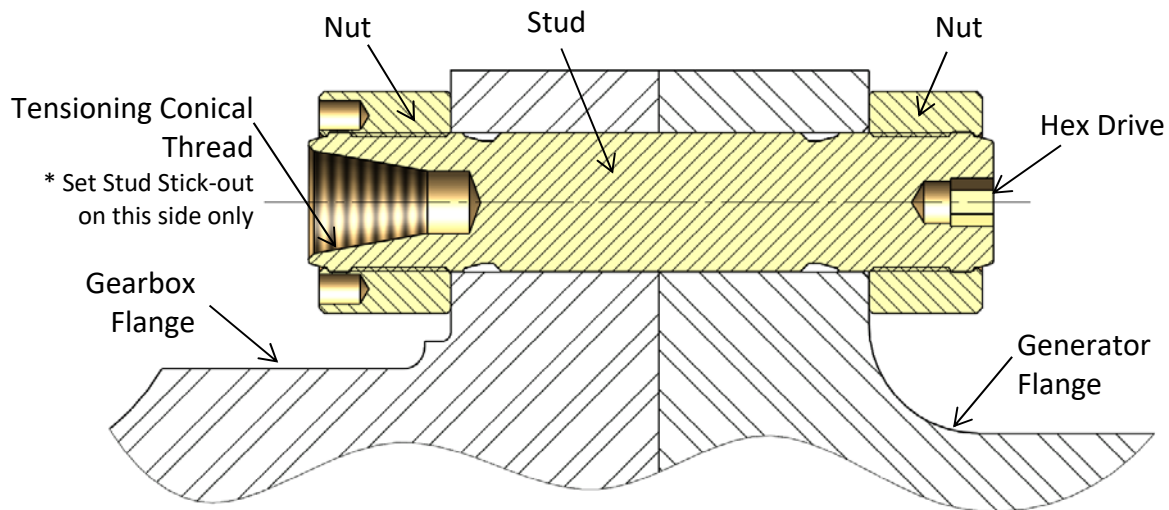
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**Figure 6C** – Cross-section View of Load Gear to Generator Bolted Flange Connection from GE 145E6290 Flange Outline Drawing



**Figure 6D** – Cross-section View of Load Gear to Generator Bolted Flange Connection from GE 128T7352 Flange Outline Drawing

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.**
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.**

Do **not** bleed the air from the hydraulic line and tensioner at this time. See section 8 for bleeding instructions on when to bleed the air from the hydraulic line.

#### 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.**

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 must be 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.



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373A4073	F

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.

#### 7.1.1.1 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.**

#### 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](http://www.riverhawk.com).



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GE DRAWING NUMBER	REV
373A4073	F

## 7.2 Hydraulic Fittings

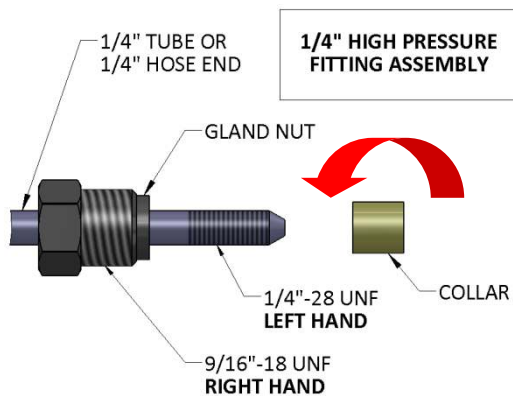


Illustration 1

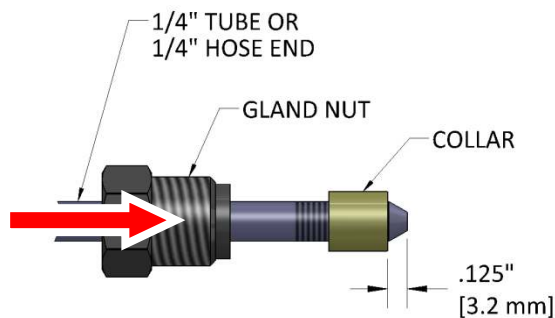


Illustration 2

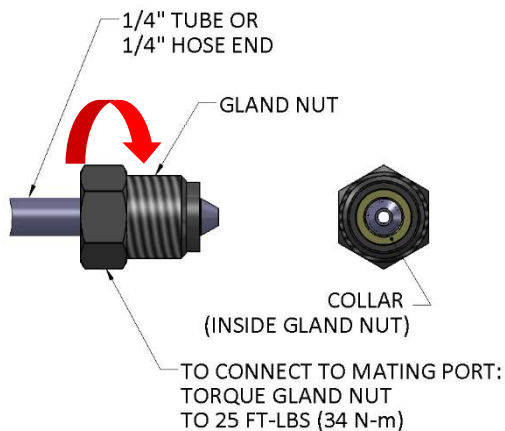


Illustration 3

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.

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 not to strip the threads off the tube or hose end.

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.



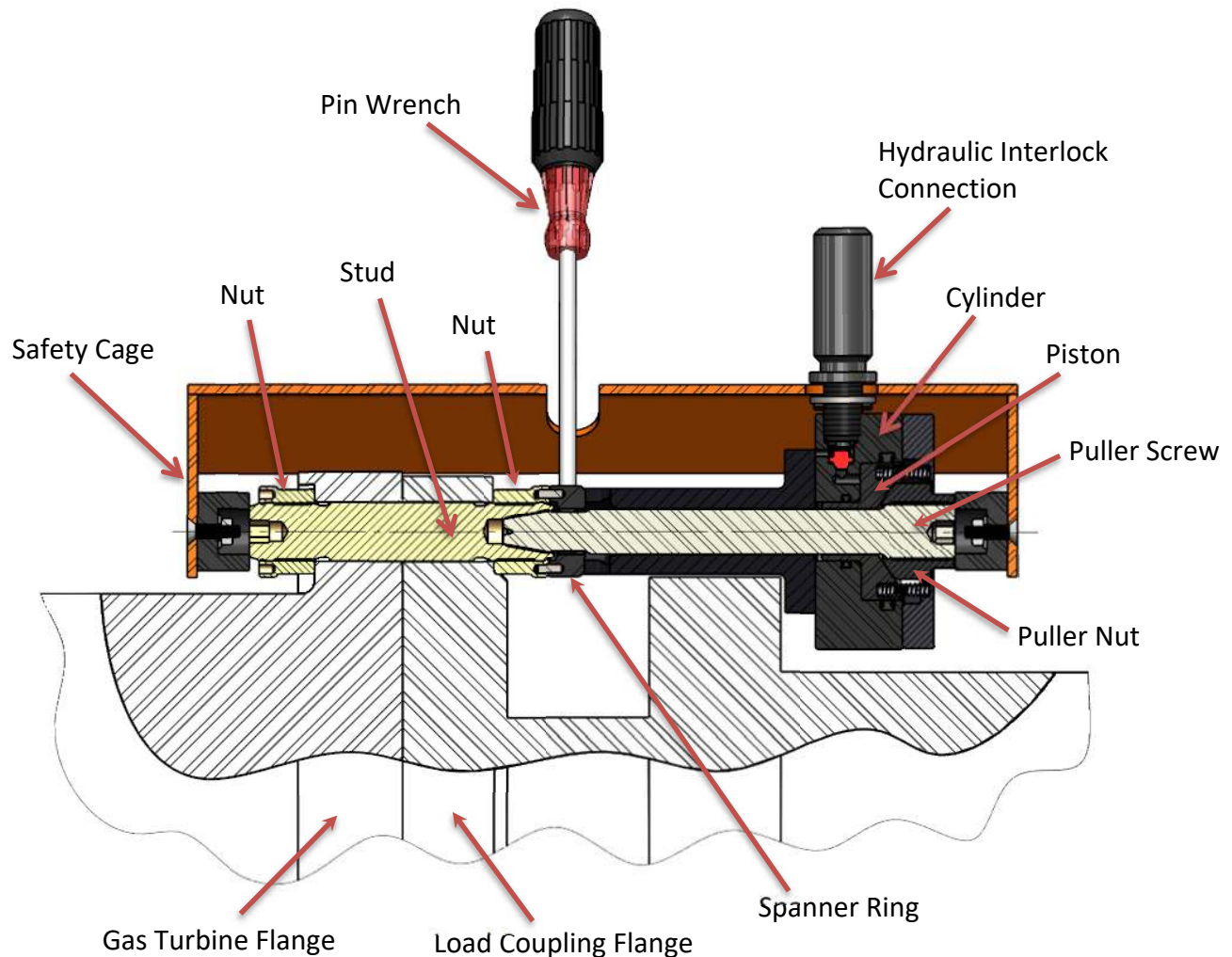
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## 8.0 Assembly of Tensioner on Stud

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.

### 8.1 Assembly of Tensioner

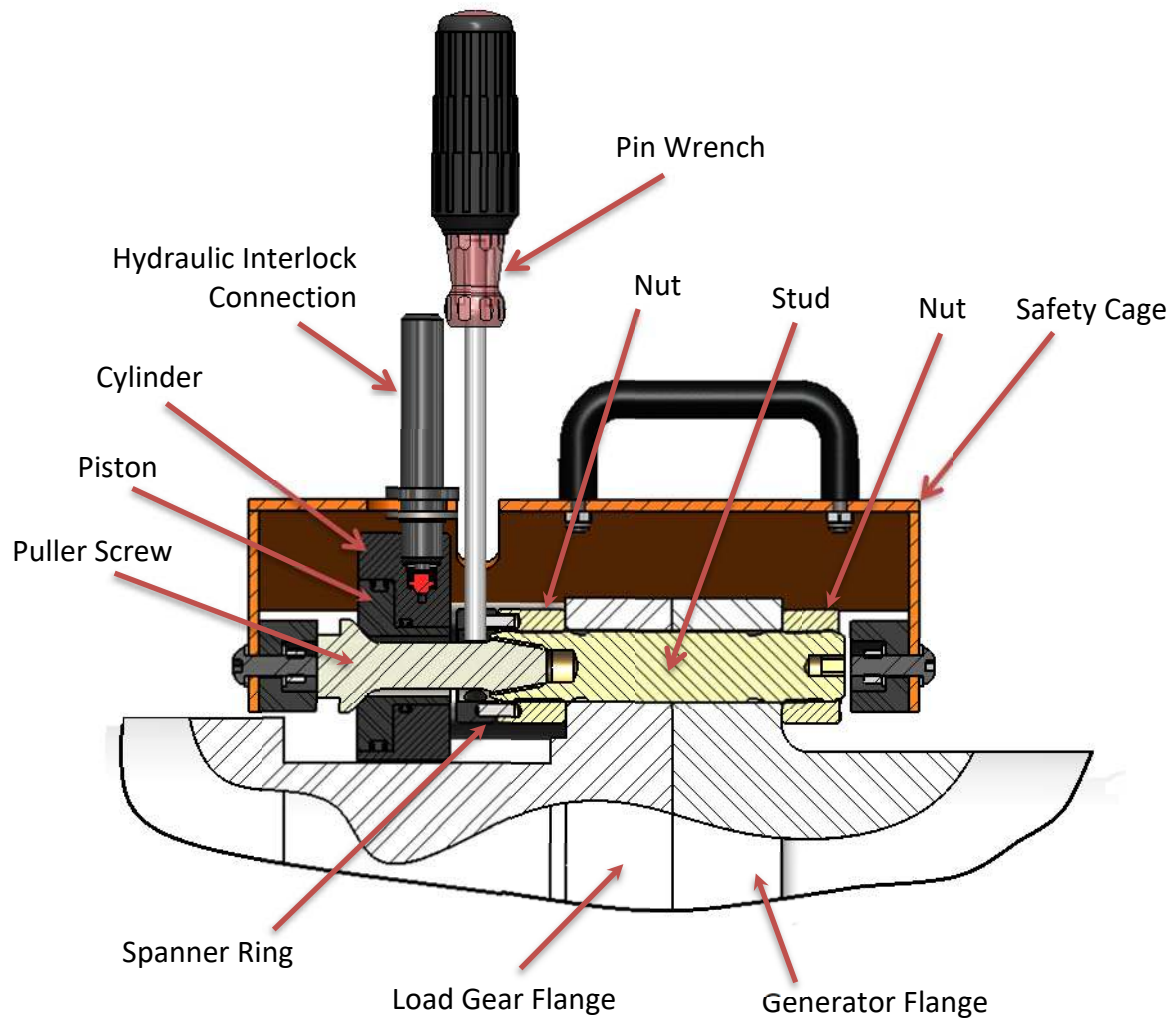


**Figure 8A – Cross-section View of HT-6829 on the 6B Turbine/Load Coupling Flange**



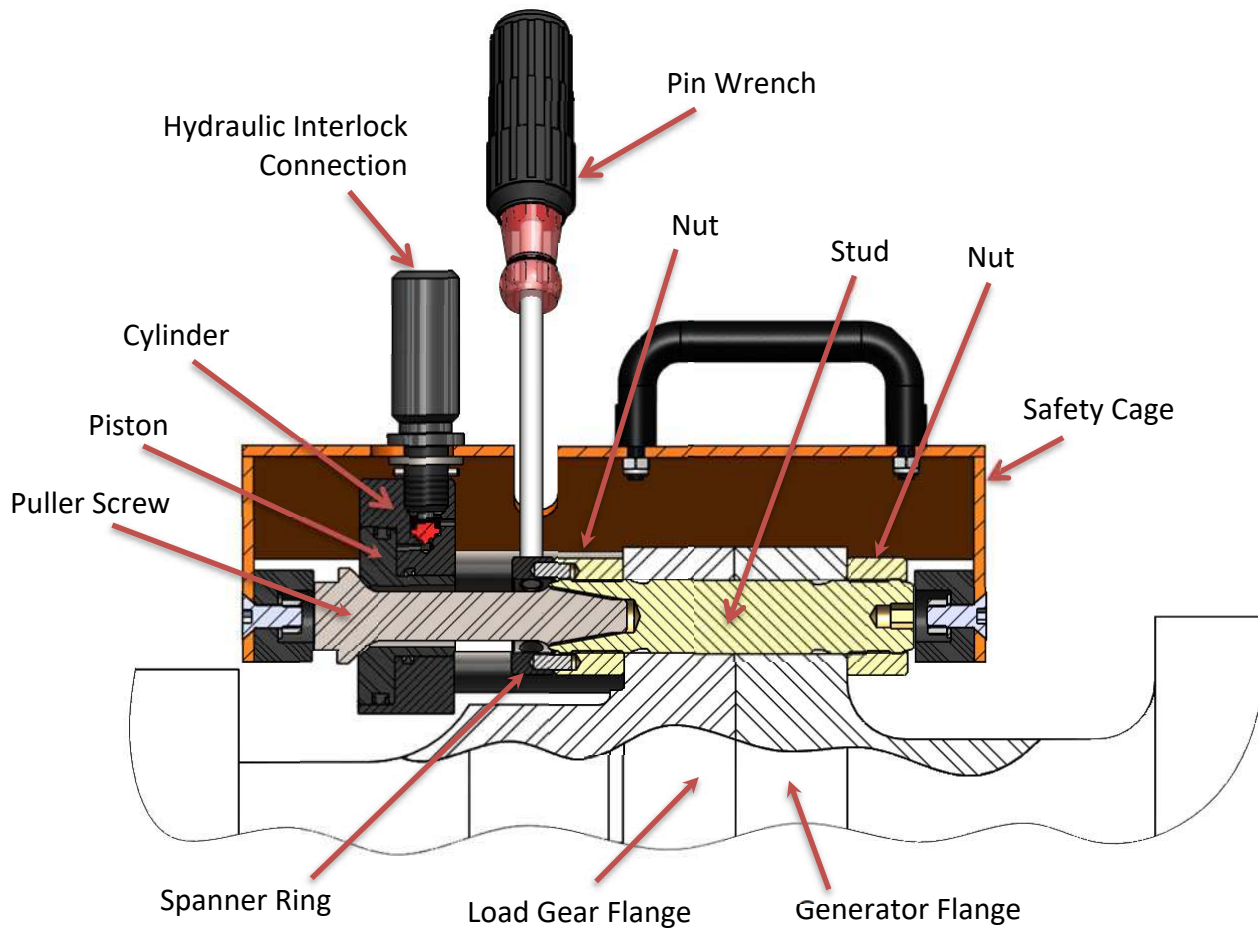
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373A4073	F



**Figure 8B** – Cross-section View of HT-6331 on the 6B Load Gear/Generator Flange from GE 145E6290 Flange Outline Drawing





**Figure 8C** – Cross-section View of HT-6331 on the 6B Load Gear/Generator Flange from GE 128T7352 Flange Outline Drawing

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. 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.
3. Place spanner ring on the nut threaded onto the stud end with the conical thread. The spanner ring's drive pins should fit into the mating holes in the nut.
4. Insert 3/8" hex Allen wrench into the back side of the stud.



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GE DRAWING NUMBER	REV
373A4073	F

5. Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand while installing the puller screw.
6. Insert puller screw through the piston of the tensioner and the spanner ring. Thread the puller screw into the tapered thread of the stud and tighten.
7. **Be sure not to cross-thread the puller screw.**
8. Use an Allen wrench on the backside of the stud to hold the stud stationary and tighten the puller screw into the stud.
9. Back-off the puller screw 1/2 a turn and retighten. **PULLER SCREW MUST BE HAND TIGHT BEFORE TENSIONING. DO NOT OVER TORQUE.**
10. **For the Load Coupling Tensioner only**, tighten the puller nut and then back nut off two flats or 120 degrees to allow for stud stretch. The Load Gear/Generator tensioner does not have a puller nut to tighten.
11. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE**, the puller screw is tight in the stud. If not, recheck the nut and verify the correct stud stick-out length.
12. Place guard over assembly and tighten threaded hydraulic interlock knob firmly into tensioner body.

**CAUTION**

**Do not over stroke the tensioner. Over stroke can 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.**

## 8.2 Bleeding the Hydraulic System

Attach hose to pump and slowly bleed hose into catch reservoir. When a steady stream of oil is seen from the hose, immediately attach hose to tensioner cylinder. Bleeding of tensioner was completed at the factory and does not require further bleeding.

**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.**

**Note:** The hose is stiff; use of this tooling can be simplified by temporarily installing the tensioner on one stud prior to final tightening of fittings. This will reduce the tendency for the fittings to loosen during use.



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## 9.0 Stud Tensioning

The studs will be tensioned in two steps, at approximately 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.

### 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 during operation. 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>50% Pressure</u>	<u>50% Stretch</u>
Gas Turbine to Load Coupling	1-1/8" [29 mm]	9000 psi [620 bar]	Do not measure Do not use
Load Coupling to Load Gear	1-1/8" [29 mm]	9000 psi [620 bar]	Do not measure Do not use
Load Gear to Generator	1-1/4" [32 mm]	9000 psi [620 bar]	Do not measure Do not use



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### 9.1.1 Tightening of the Nuts

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

### 9.2 Removing the Tensioner from an Installed Stud

Tensioner removal is to be accomplished as follows:

1. Release the tensioner pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump)
2. Loosen the hydraulic interlock and remove the guard from the assembly.
3. For the load coupling tensioner only, remove the puller nut from the puller screw.
4. While supporting the tensioner by hand, unscrew the puller screw using a 3/8" Allen wrench. It may be necessary to initially use a break bar to help loosen the puller screw.
5. Remove the puller screw.
6. Slide the tensioner off of the nut and spanner ring.
7. Remove the spanner ring from the 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.

### 9.3 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.

#### WARNING

**The safety cage must be in place during operation. 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.**



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**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	1-1/8" [29 mm]	18000 psi [1250 bar]	0.010" - 0.012" [0.25 mm - 0.30 mm]
Load Coupling to Load Gear	1-1/8" [29 mm]	18000 psi [1250 bar]	0.010" - 0.012" [0.25 mm - 0.30 mm]
Load Gear to Generator	1-1/4" [32 mm]	18000 psi [1250 bar]	0.011" - 0.013" [0.28 mm - 0.33 mm]

Excessive stretch variations or low stretch values can be corrected by uninstalling all or selected studs to the pressure values stated in the above table. Have final stretch values approved by the supervisor responsible for the installation.

### 9.3.1 Tightening of the Nuts

Turn the cylindrical nut using the spanner ring and pin wrench until it bottoms on the flange. Then apply torque to turn the nut an additional 10 deg. This will aid in achieving the desired stretch.

## 10.0 Thread Locking

Once pulling and tensioning is completed all stud nuts must be locked in position. Riverhawk hardware employs a reusable mechanical locking device.



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GE DRAWING NUMBER	REV
373A4073	F



**Picture 10A - Riverhawk Locknut**

Mechanical lock nuts have two set screws located in the top face. During the initial steps of the installation procedure, before threading the nut onto the stud, the set screws should have been loose and 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>
1-1/8" [29 mm]	#10-32 UN	30in·lbs - 36in·lbs [3.4N·m–4.1N·m]
1-1/4" [32 mm]	#10-32 UN	30in·lbs - 36in·lbs [3.4N·m–4.1N·m]

## 11.0 Stud and Nut Removal

### 11.1 Handling of the Tensioner

The tensioner used in this application is designed for no special lifting instructions. Do not drop any part of the tensioner on the operator or other nearby personnel.



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GE DRAWING NUMBER	REV
373A4073	F

## 11.2 Installing the Tensioner and releasing the Nut

### WARNING

The safety cage 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.

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 how the tensioner must be assembled on the load coupling for its correct operation.

Section 8.0 contains diagrams of the tensioner equipment.

**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.

Disassembly sequence is as follows:

1. If present, remove the windage plugs from the studs by loosening the plug's set screws with an Allen wrench and then unscrew the plug from the stud. It may be necessary to use either a flat-bladed screwdriver or another Allen wrench to stop the windage plug from rotating. Do not misplace the set screws.
2. Using shop air and a wire brush, such as one supplied with Riverhawk stud cleaning kit GT-4354, 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. Do not continue until ALL debris is removed from the threads.



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GE DRAWING NUMBER	REV
373A4073	F

**WARNING**

**Do not use a hydraulic tensioner to remove a stud with damaged conical threads.**

3. With an Allen wrench, loosen the nut's two locking set screws but do not remove them from the nut.



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

4. Connect the hydraulic hose from the hydraulic pump to the tensioner. **Do not pressurize** the tensioner at this time or you may cause damage to the tensioner.
5. 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)
6. 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.
7. Place spanner ring on the nut on the load gear side of the flange. The spanner ring's drive pins should be placed into the respective holes in the nut.
8. Insert 3/8" hex Allen wrench into the back side of the stud.
9. Slide the core tensioner over the nut and spanner ring. Hold the tensioner in place by hand while installing the puller screw.
10. Insert puller screw through the piston of the tensioner and the spanner ring. Thread the puller screw into the tapered thread of the stud and tighten.
11. **Be sure not to cross-thread the puller screw.**
12. Use an Allen wrench on the backside of the stud to hold the stud stationary and tighten the puller screw into the stud.



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GE DRAWING NUMBER	REV
373A4073	F

13. Back-off the puller screw 1/2 a turn and retighten. **PULLER SCREW MUST BE HAND TIGHT BEFORE TENSIONING. DO NOT OVER TORQUE.**
14. **For the Load Coupling Tensioner only**, tighten the puller nut and then back nut off two flats or 120 degrees to allow for stud stretch. The Load Gear/Generator tensioner does not have a puller nut to tighten.
15. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE**, the puller screw is tight in the stud. If not, recheck the nut and verify the correct stud stick-out length.
16. Place guard over assembly and tighten threaded hydraulic interlock knob firmly into tensioner body.

**CAUTION**

**Do not over stroke the tensioner. Over stroke can 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.**

17. Connect the hydraulic pump to the tensioner and apply the appropriate hydraulic pressure per this table.

<u>Flange Position</u>	<u>Stud Size</u>	<u>Final Pressure</u>
Gas Turbine to Load Coupling	1-1/8" [29 mm]	18000 psi [1250 bar]
Load Coupling to Load Gear	1-1/8" [29 mm]	18000 psi [1250 bar]
Load Gear to Generator	1-1/4" [32 mm]	18000 psi [1250 bar]

18. Turn the spanner ring with the pin wrench. Loosen and turn the nut approximately 3/4 of a turn.
19. Release the hydraulic pressure and move the tool to the next stud/nut assembly to be removed.

### 11.3 Removing the Tensioner from a Stud

Tensioner removal is to be accomplished as follows:



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GE DRAWING NUMBER	REV
373A4073	F

1. Release the tensioner pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump)
2. Loosen the hydraulic interlock and remove the guard from the assembly.
3. For the load coupling tensioner only, remove the puller nut from the puller screw.
4. While supporting the tensioner by hand, unscrew the puller screw using a 3/8" Allen wrench. It may be necessary to initially use a break bar to help loosen the puller screw.
5. Remove the puller screw.
6. Slide the tensioner off of the nut and spanner ring.
7. Remove the spanner ring from the 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.

## 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.

### 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](http://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 in the tensioner assembly.
3. Seam between the cylinder and its end cap is closed tightly.
4. Inspect tensioner guard for any signs of damage. Bent guards should be replaced. Missing rubber pads must be replaced.

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



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GE DRAWING NUMBER	REV
373A4073	F



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.

**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.



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373A4073	F

**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.

**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.



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GE DRAWING NUMBER	REV
373A4073	F

- 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 return the pump kit to the Riverhawk factory. 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 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.

#### 14.0 Revision History

Revision Letter	Effective Date	Description
F	Jan 29, 2018	Added 128T8633 to title page and section 2; Inserted section 2.6; Added Figure 6D and Figure 8C.
E	Jan 11, 2018	Corrected stud and nut package description in Section 2.5
D	Aug 3, 2017	Added 110T7965P0005, P0006, & P0012 to Title page and section 2.0; Added 392A7490P009, P012, & P017 to Title page and section 2.0; Inserted section 2.3
C	Jan 24, 2017	Added 392A7490 to title page and section 2; inserted section 2.2
B	May 15, 2015	Added HT-6829; Added appendices A1, B1, B2; Revised sections 2, 3, 4, 5, 6, 8, 9, 10, 11
A	Jan 16, 2015	Updated sections 1.0 and 4.3.
-	Dec 31, 2013	Released



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373A4073	F

## Appendix A1

### 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, and ISO 4414.

Furthermore, this equipment has been manufactured under the Riverhawk quality system per EN ISO 9001:2008

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

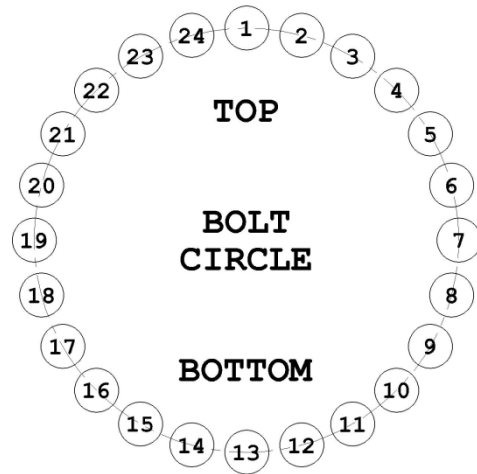
### STRETCH RECORD SHEET FOR THE GAS TURBINE TO LOAD COUPLING

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
13			
14			
2			
3			
15			
16			
4			
5			
17			
18			
6			
7			
19			
20			
8			
9			
21			
22			
10			
11			
23			
24			
12			



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## Appendix B2

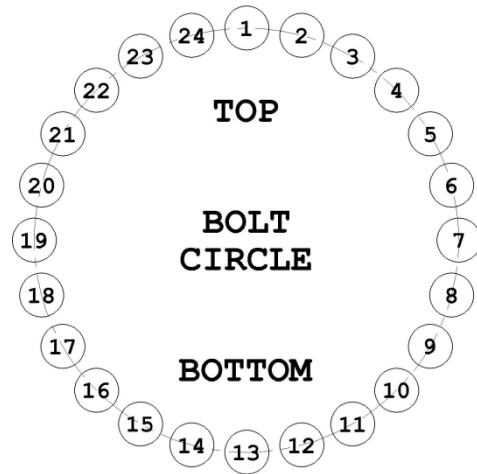
### STRETCH RECORD SHEET FOR THE LOAD COUPLING TO GEARBOX

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
13			
14			
2			
3			
15			
16			
4			
5			
17			
18			
6			
7			
19			
20			
8			
9			
21			
22			
10			
11			
23			
24			
12			



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GE DRAWING NUMBER	REV
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## Appendix B3

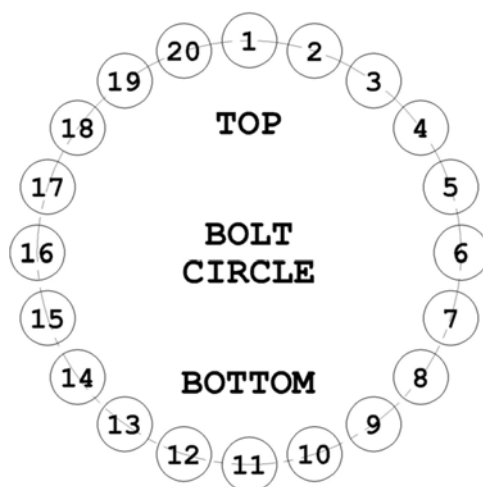
### STRETCH RECORD SHEET FOR THE LOAD GEAR TO GENERATOR

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
11			
12			
2			
3			
13			
14			
4			
5			
15			
16			
6			
7			
17			
18			
8			
9			
19			
20			
10			



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