INSTRUCTION MANUAL IM-325
For Steam Turbine Tensioned Studs and Nuts

Applicable Bolting Connections

D14 Steam Turbine, IP-HP Flange

Applicable GE Ordering Sheet Part Numbers

103T5547P0001	107T8612G0001
103T5547P0002	
103T5547P0101	121T8613G0001
103T5547P0102	

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Fax: +1 315 768 4941
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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.

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.

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 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

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.

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 foot assembly is free to turn.

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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

WARNING

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

2.0 Scope and GE Part Number Cross Reference

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 Steam Turbine connections.

The various frame configurations covered in this manual are listed in Sections 2.1 through 2.2 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 D14 Steam Turbine, IP-HP Flange

GE Part Number	Riverhawk P/N	GE VENDOC P/N
103T5547P0001	HF-5077	GE 269B8752
103T5547P0101	HF-5077	GE 269B8752
107T8612G0001	HF-5077	GE 269B8752
121T8613G0001	HF-5077	GE 269B8752

The hydraulic tooling used for installation and removal is Riverhawk HT-5298.

These hardware drawings depict the stud and nut set for the Steam Turbine IP to HP Flange (3" size, Qty 14).

2.2 Hydraulic Tooling

GE Part Number	Riverhawk P/N	GE VENDOC P/N
103T5547P0002	HT-5298	GE 269B8767
103T5547P0003	AP-6048	GE 269B8768
103T5547P0102	HT-5298-FR	GE 269B8767
103T5547P0103	AP-6048-FR	GE 269B8768
107T8612G0001	HT-5298-FR	GE 269B8767

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 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.

☐ Set stick-out dimension on the internal threaded side of the stud. Tighten nut set screws.

☐ Install studs and nuts into the flange.

☐ Firmly seat stud/nut assembly using spanner ring and pin wrench. Loosen nut set screws but do not remove.

☐ Verify stick-out measurement **(VERY IMPORTANT)**

☐ Measure and record starting stud installation gauge readings.

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 retention screws into the adjacent studs on either side of the stud to be tensioned.

☐ Install the spanner ring onto the nut.

☐ Thread the puller screw into the stud.

- ☐ Insert Allen wrench into the puller screw and tighten the puller screw until tight and then loosen the puller screw 1/2 of a turn. Do not allow stud to turn. Retighten the puller screw by hand and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- ☐ Slide the foot over the puller screw and orientate the foot into position.
- ☐ Thread the tensioner onto puller screw until it stops. There should be a 1/16” to 3/16” gap between the foot and tensioner. **See section 11.1 for use of lifting cradle.**
- ☐ Place the guard over tensioner and position the guard’s pocketed slots into retention screws.
- ☐ Tighten the retention screw nuts by hand until seated inside the guard’s pocketed slots with no gap.
- ☐ Push the center of the interlock fitting towards the tensioner while pulling back on the fitting’s pull tabs until it locks onto the tensioner and release the pull tabs.
- ☐ Connect the hydraulic pump to the tensioner and tension to 50%. Consult manual for correct pressure.
- ☐ Use the pin wrench to turn the spanner ring to firmly tighten nut.
- ☐ Release pressure and allow the tensioner to fully retract.
- ☐ Disconnect the hose and release the interlock fitting by pushing the center of the interlock fitting towards the tensioner while pulling back on the fitting’s pull tabs.
- ☐ Loosen the retention screw nuts and remove the guard.
- ☐ Unscrew the tensioner from the puller screw. **See section 11.1 for use of lifting cradle.**
- ☐ Remove the foot, puller screw, spanner ring, and retention screws.
- ☐ Move to the next stud in the pattern. Tension all studs to 50% before proceeding to final pressure.
- ☐ Repeat above steps at final pressure.

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☐ Measure final stud length and record on stretch datasheets. Calculate final stretch measurement.

☐ Torque the nuts' set screws.

DETENSIONING (Stud Removal)

☐ 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.**

☐ Install the retention screws into the adjacent studs on either side of the stud to be detensioned.

☐ Install the spanner ring onto the nut.

☐ Thread the puller screw into the stud. **See section 11.1 for use of lifting cradle.**

☐ Tighten the puller screw until hand tight and then loosen the puller screw 1/2 of a turn. Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**

☐ Slide the foot over the puller screw and orientate the foot into position.

☐ Thread the tensioner onto puller screw until it stops. There should be a 1/16" to 3/16" gap between the foot and tensioner.

☐ Place the guard over tensioner and position the guard's pocketed slots into retention screws.

☐ Tighten the retention screw knurled nuts by hand until they press firmly against tensioner (no gap).

☐ The retention screws must be inside the guard's pocketed slots.

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- ☐ Push the center of the interlock fitting towards the tensioner while pulling back on the fitting's pull tabs until it locks onto the tensioner and release the pull tabs.
- ☐ Connect the hydraulic pump to the tensioner and tension to final pressure. Consult manual for correct pressure.
- ☐ Loosen nut with the spanner ring and pin wrench approximately ½ of a turn.
- ☐ Release pressure and allow the tensioner to fully retract.
- ☐ Disconnect the hose and release the interlock fitting by pushing the center of the interlock fitting towards the tensioner while pulling back on the fitting's pull tabs.
- ☐ Loosen the retention screw knurled nuts and remove the guard.
- ☐ Unscrew the tensioner cylinder from the puller screw. **See section 11.1 for use of lifting cradle.**
- ☐ Remove the foot, puller screw, spanner ring, and retention screws.
- ☐ 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 shafts is required. 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

The studs are supplied in component balanced sets. A stud can be exchanged with another stud 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 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 nut in its set without affected 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 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.

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 may be required to perform installation and measurement of the studs:

5/8” Wrench
3/4” Wrench
13/16” Wrench
A set of Allen Wrenches
3’ to 4’ Breaker Bar
10” to 11” Depth Micrometer or Caliper

4.5 Special Tools

Hydraulic Tensioner Kit:	HT-5298 Hydraulic Tensioner, 3” (reference GE VENDOC 269B8767)
Hydraulic Pump Kit:	AP-6048 Air-Operated Hydraulic Pump (reference GE VENDOC 269B8768)

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

5.1 Nut Preparation

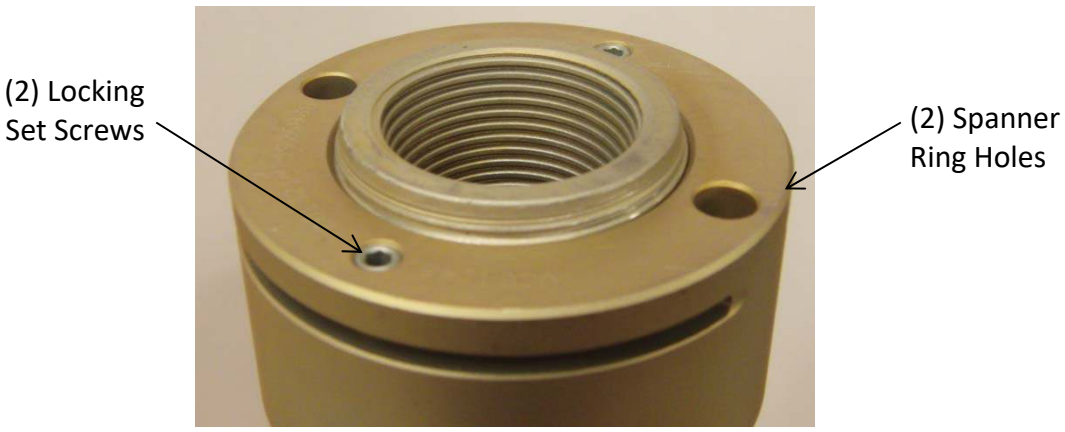

Figure 5A - Riverhawk Locknut

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.

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.

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New Hartford, NY 13413
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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.

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-4253 or a similar 1" diameter Brass power brush.

Figure 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. 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 “Never Seize” to the stud’s threads.

10. Finish the cleaning process by rinsing in a volatile solvent such as acetone and allow the stud 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 position 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 the manual.

1. Lubricate the stud’s threads with clean turbine oil or spray lubricant.

2. Assemble the cylindrical nut onto the internal, conical thread end of the stud.

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

Figure 6A – Use of gage to measure stick-out

Figure 6B – Use of drop gage to measure stick-out

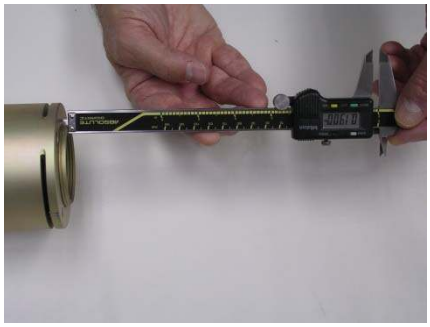

Figure 6C – Use of calipers to measure stick-out

4. With stick-out set, tighten the 3/8-24 set screws on the nut to 200 in·lbs - 250 in·lbs [22.6 N·m – 28.2 N·m]. If necessary, use the spanner ring and pin wrench to hold nut stationary while tightening the set screws.

5. Recheck the stud stick-out length. If the stick-out length does not match the hardware drawing, adjust the nuts as necessary.

6. Using spanner ring and pin wrench install stud/nut assembly into flange. Firmly seat nut against flange face with approximately 20 ft·lbs [27 N·m] of torque.

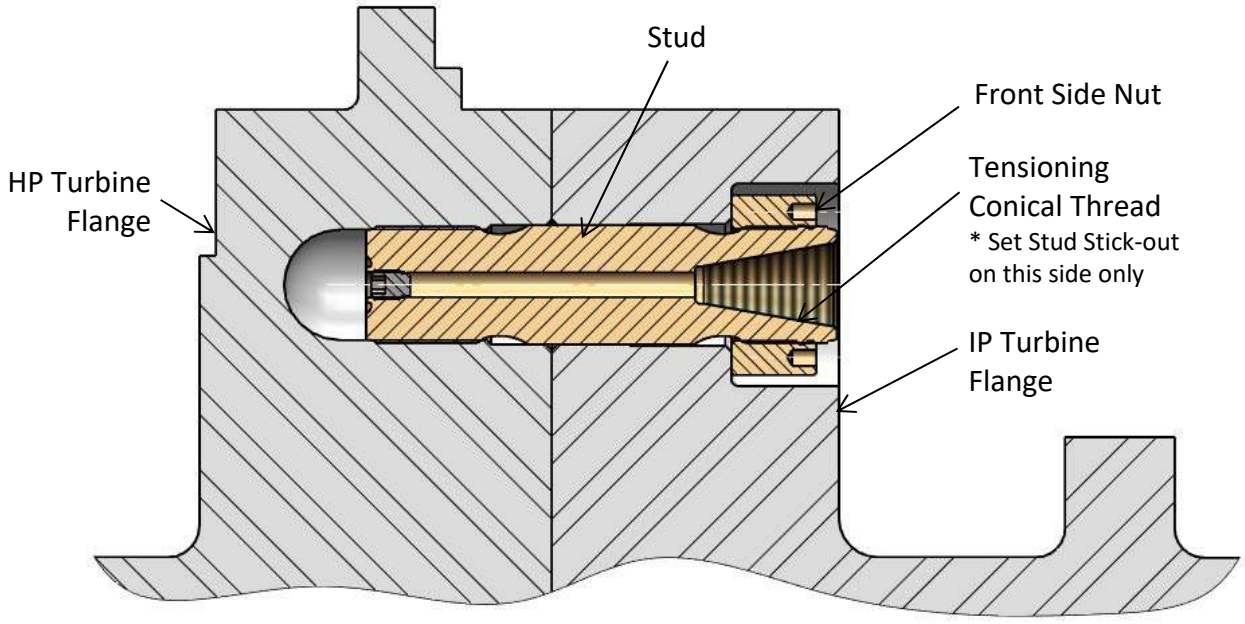

Figure 6D – Cross-section View of IP-HP Flange Connection

7. Loosen the 3/8”-24 set screws on the nut, but do not remove from the nut.

8. Recheck the stud stick-out length. If the stick-out length does not match the hardware drawing, adjust the nuts as necessary. **NOTE:** Nuts must be seated firmly on flange face AND stud stick-out must be correct for tool to function properly.

9. Measure and record starting stud length. See Appendix B1

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.

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This tensioner does not require bleeding. See section 8.3

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.

Clean puller screw and check for any debris and dents.

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. Also, be sure the rubber pads are in place, if missing, replace.

Inspect the outside of the tensioner cylinder 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 (Riverhawk HT-xxxx listed in section 2.0 and 4.5). 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. The burst disc's location is shown on the tensioner's technical drawing (Riverhawk HT-xxxx listed in section 2.0 and 4.5).

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 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.

7.2 The 3/8” High Pressure Fitting Assembly

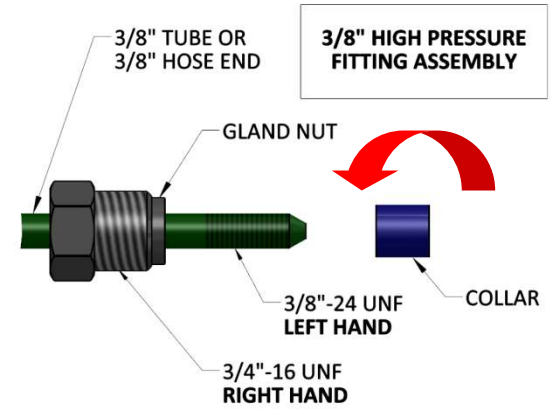

Illustration 1

The Riverhawk hydraulic hose may use a 3/8" High Pressure Fitting to connect to a tensioner. The hose connector is made from a three piece assembly: a gland nut, a collar, and a 3/8” tube or 3/8” hose end. (See Illustration 1)

To assembly the fitting, slide the gland nut over the 3/8” tube or 3/8” hose end. Turn the collar counter-clockwise (**left hand** thread) on to the tube or hose end as shown in Illustration 1.

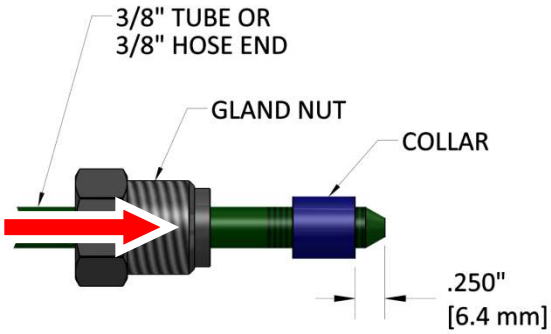

Illustration 2

The collar should be placed .250” (6.4 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.

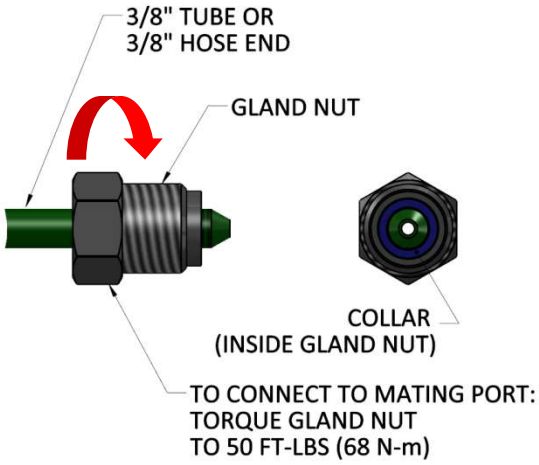

Illustration 3

Slide the gland nut down over the collar. (See Illustration 3) Insert the 3/8" tube or 3/8" 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 50 FT-LBS (68 N-m).

Tips:

- Make sure all parts are clean and free from debris.
- Protect the cone on the end of the 3/8" tube or 3/8" hose end from scratches as this is the sealing surface.
- Replace red plastic caps when finished to protect the threads and cone.

8.0 Assembly of Tensioner on a Stud

The tensioner used in this application can be identified by its ORANGE safety guard. If the tensioner's safety guard is YELLOW, a different set of instructions are required. Consult the Riverhawk factory for assistance.

8.1 Handling of the Tensioner

To assist with lifting, the tensioner kit is supplied with a hydraulic cylinder lift cradle (GT-6300). This tool is designed to allow for the use of a lifting strap and mechanical lift to support and position the hydraulic cylinder for installation and removal onto the puller screw.

Warning

The hydraulic cylinder lift cradle is designed to support the hydraulic cylinder; any excessive force on the lift cradle will cause damage. Caution must be used to insure the lifting strap support does pull or otherwise exert additional forces on the lift cradle.

Assembly sequence of installing the hydraulic cylinder using lift cradle:

1. With hydraulic cylinder resting on face, place open lift cradle on flat surface next to hydraulic cylinder.

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Figure 8A – Hydraulic cylinder and lifting cradle

2. Tip hydraulic cylinder into lift cradle. The lift cradle will close slightly onto cylinder.
3. Press lift cradle closed around the cylinder and loop the lifting strap around support arms on the lift cradle.

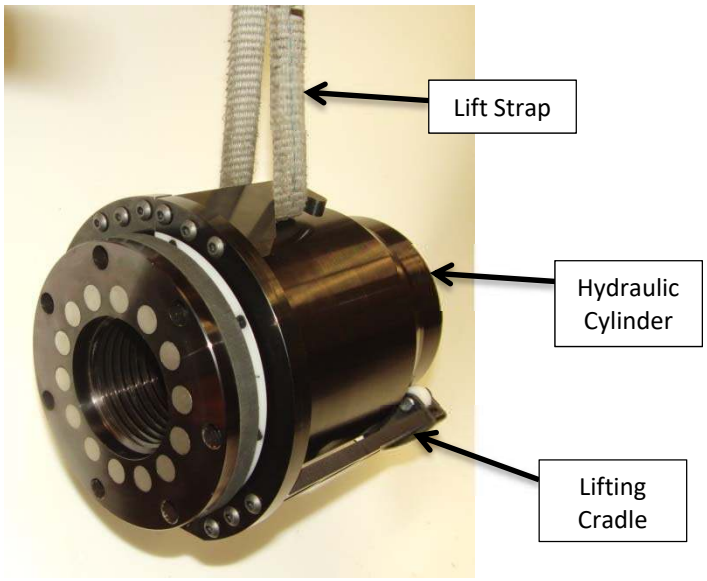

Figure 8B – Hydraulic cylinder in lifting cradle

4. Using mechanical lift position hydraulic cylinder onto the end of puller screw.
5. Turn the hydraulic cylinder in the lift cradle to engage the puller screw threads.

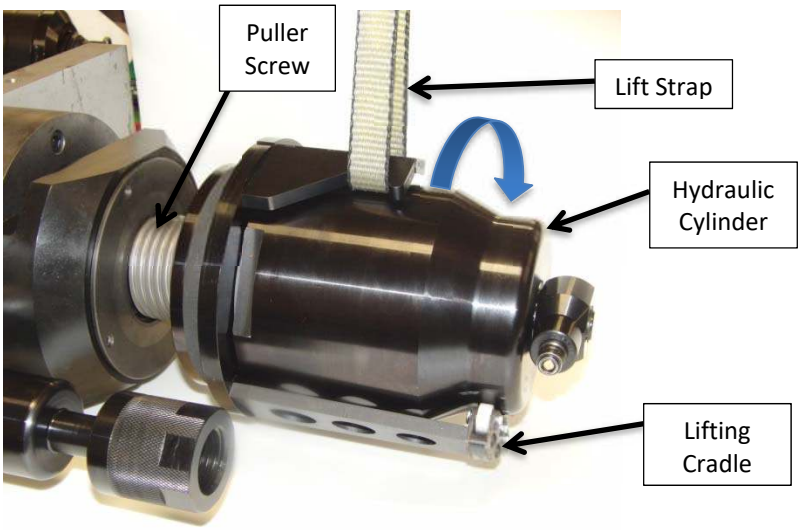

Figure 8C – Thread Hydraulic cylinder onto Puller Screw

6. Thread hydraulic cylinder onto puller screw.
7. Remove lifting strap from lifting cradle. Caution: Lifting cradle is not attached to the hydraulic cylinder and may drop once the lifting strap is removed.
8. Holding one side, pull the lifting cradle from around the hydraulic cylinder and set aside

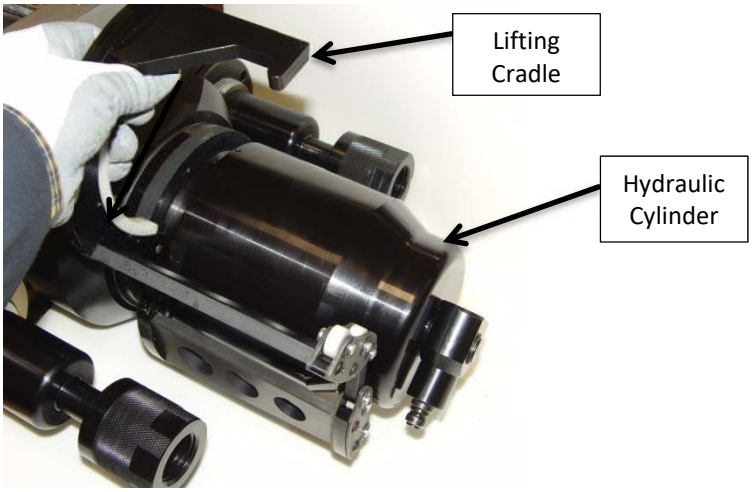

Figure 8D – Remove lift cradle from assembly

9. Continue tensioner installation.

8.2 Kit Assembly

Connect the hydraulic hose from the hydraulic pump to the tensioner.

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 flange for its correct operation.

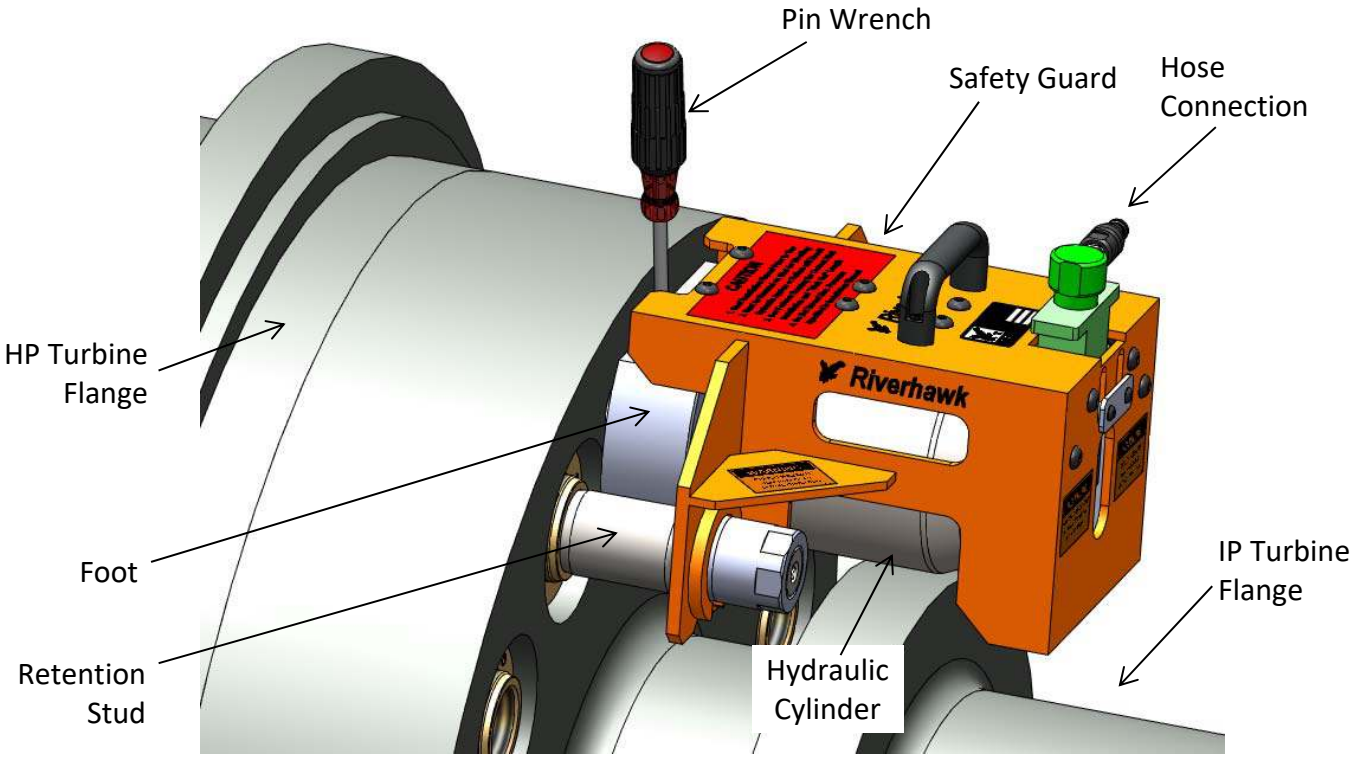

Figure 8E – Features of the Hydraulic Tensioner HT-5298

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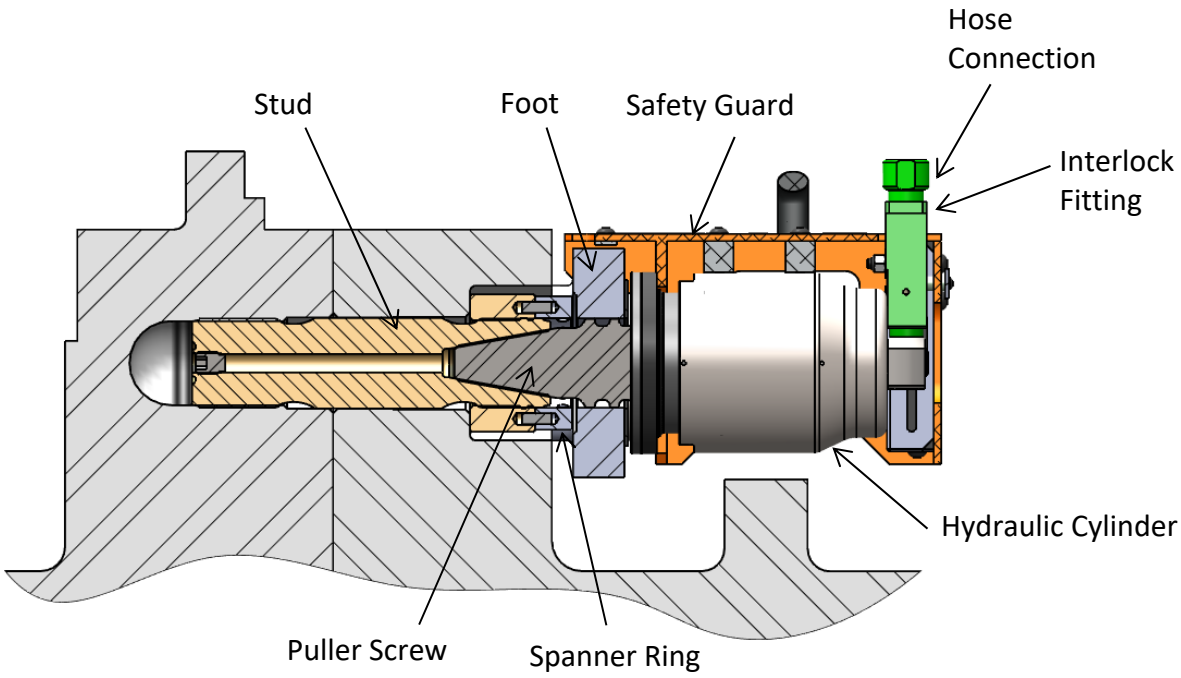

Figure 8F – Cutaway view of Hydraulic Tensioner HT-5298

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. Thread the retention screws into the adjacent studs on either side of the stud to be tensioned until hand tight.
3. Place the spanner ring on the nut to be tensioned.
4. Insert the puller screw into the tapered thread of the stud to be tensioned and hand tighten. **Be sure not to cross-thread the puller screw.**
5. Using an Allen wrench, tighten the puller screw and then back off the puller screw 1/2 a turn. Retighten the puller screw by hand until it is fully inserted. **DO NOT BACK OFF THE PULLER SCREW.**
6. Place the foot over the puller screw and orientate it into position.
7. Thread the hydraulic cylinder onto the puller screw until it stops. Please note that the internal stop inside the tensioner will cause a gap in between the foot and tensioner.

The gap should be 1/16”[1.6mm] to 3/16”[4.8mm]. **DO NOT ATTEMPT TO TIGHTEN THE TENSIONER AGAINST THE FOOT.** **See section 8.1 for use of cylinder lifting cradle.**

8. Place the guard over the tensioner and position the pocketed slots into the retention screws.
9. Tighten the knurled nuts on retention screws by hand until they lightly press against the tensioner guard. The retention screw nuts must be inside the guard’s pocketed slots.

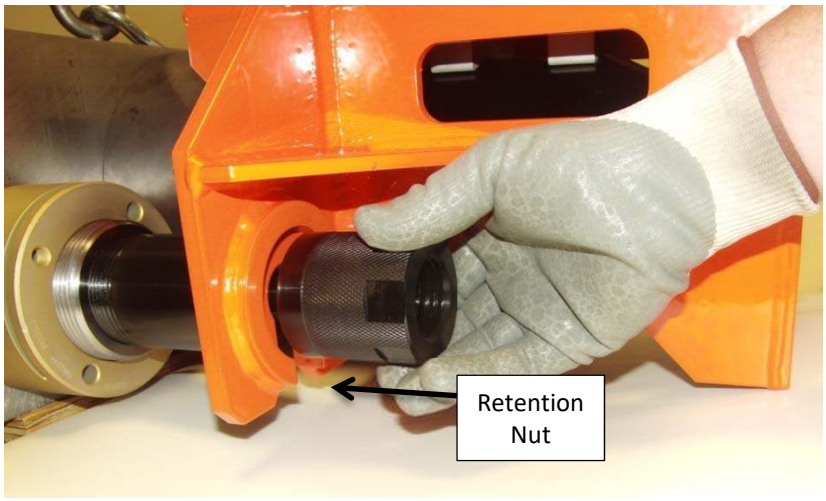

Figure 8G – Tighten retention nut against guard

10. Activate the custom connector from the top of guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger. Push the assembly downward until it locks into the tensioner. Release fingers from the tabs and then remove thumb, Ensure connection is firmly engaged or else the tensioner will not be connected to the pump.

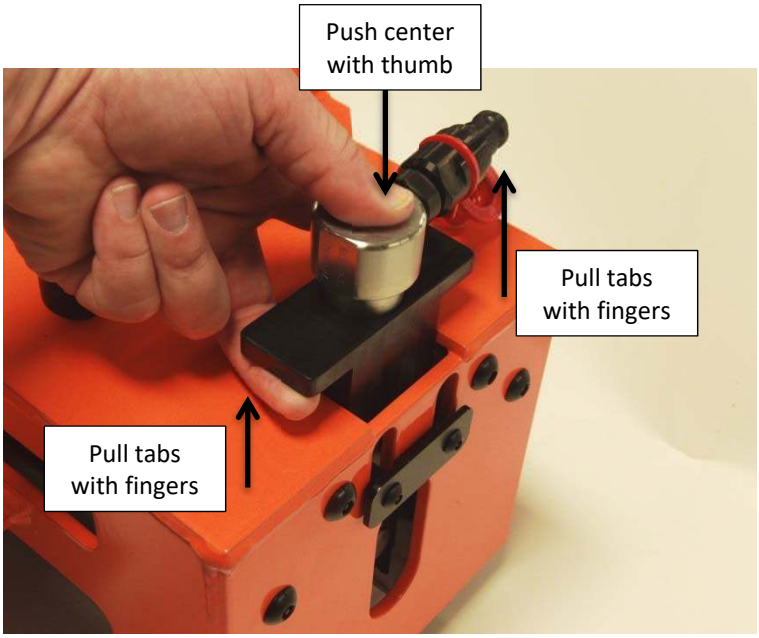

Figure 8H - Activation of the safety interlock

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

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 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.

Flange Position	Stud Size	50% Pressure	50% Stretch
IP-HP Flange	3" [76 mm]	13000 psi [900 bar]	Do not measure Do not use

Firmly tighten the cylindrical nuts with approximately 20 ft·lbs [27 N·m] of torque using the pin wrench and spanner ring. Turn the nut until it bottoms 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 or by opening the valve on the MP-0130 Manual Pump Kit and leave the valve open.
2. Allow the tensioner cylinder to fully retract.
3. Disengage the custom connector from the top of guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger.

4. Loosen retention screw nuts.
5. Remove guard from assembly.
6. Unscrew the tensioner from puller screw. See section 11.1 for use of lifting cradle.
7. Remove foot from around the puller screw.
8. Unscrew the puller screw using an Allen wrench. Tapping the Allen wrench with a hammer or the use of a 3-4’ breaker bar may be necessary to loosen the puller screw. Do not use an impact wrench as this can damage the puller screw.
9. Remove the spanner ring from the nut.
10. Unscrew the retention screws using an Allen wrench. It may be necessary to tap the Allen wrench with a hammer or use a 3-4’ breaker bar to loosen the retention screws. Do not use an impact wrench as this can damage the retention screws.
11. 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.

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.

Flange Position	Stud Size	Final Pressure	Final Stretch
IP-HP Flange	3" [76 mm]	25000 psi [1725 bar]	0.018" - 0.021" [0.46 mm - 0.53 mm]

Firmly tighten the cylindrical nuts with approximately 20 ft·lbs [27 N·m] of torque using the pin wrench and spanner ring. Turn the nut until it bottoms on the flange.

Failure to achieve the correct final stretch values will result in an incorrectly tensioned stud.

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.

10.0 Thread Locking

10.1 Nut Locking Feature

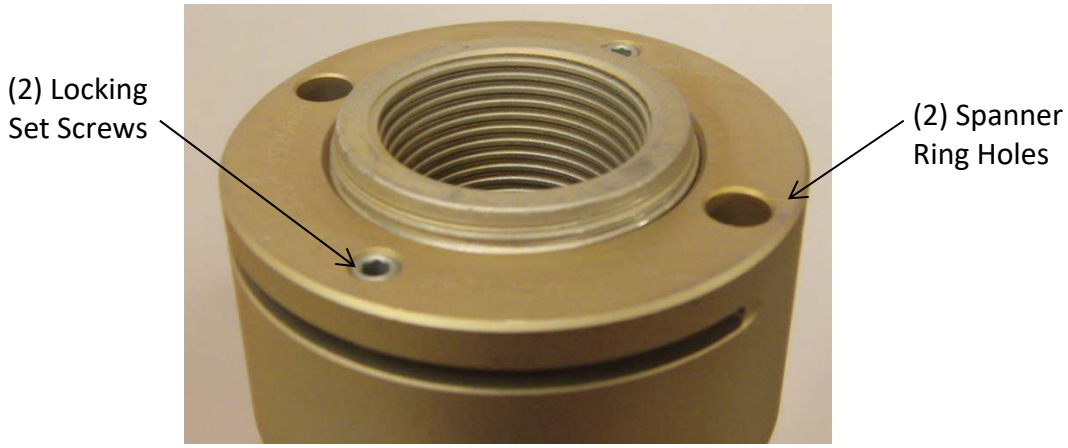

Figure 10A - Riverhawk Locknut

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 thereby creating the desired locking action.

Flange Position	Stud Size	Set Screw Size	Torque
IP-HP Flange	3" [76 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.

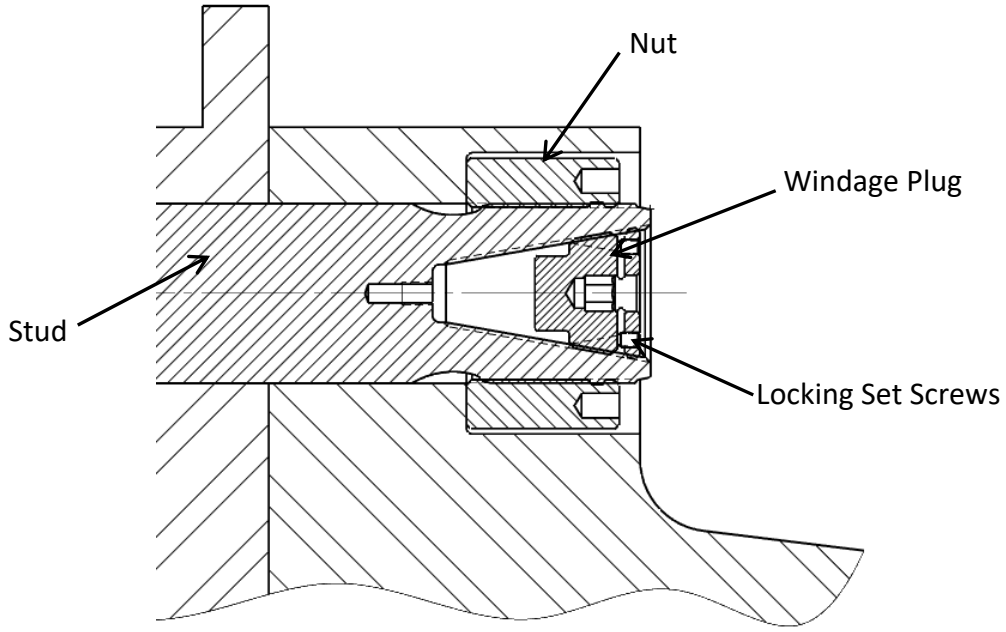

Figure 10B – Windage Plug Installation

Tools Required:
- Torque Wrench.
- 1/2” Allen Driver for Windage plug.
- 1/8” Allen Driver for set screws.

1. Be sure internal threads in stud are clean and free from oil.
2. Insert Windage Plug Fully, Tighten to 200-250 in-lbs (22.6-28.2 Nm) Torque
3. Tighten Set Screws to 80-90 in-lbs (3-4 Nm) Torque

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4. Caution Plug must rest a minimum of .12” (3 mm) below the face of the stud

11.0 Stud and Nut Removal

11.1 Handling of the Tensioner

To assist with lifting, the tensioner kit is supplied with a hydraulic cylinder lift cradle (GT-6300). This tool is designed to allow for the use of a lifting strap and mechanical lift to support and position the hydraulic cylinder for removal from the puller screw.

Warning

The hydraulic cylinder lift cradle is designed to support the hydraulic cylinder; any excessive force on the lift cradle will cause damage. Caution must be used to insure the lifting strap support does pull or otherwise exert additional forces on the lift cradle.

Assembly sequence for removing the hydraulic cylinder using lift cradle:

1. With tensioner safety guard removed, hold one side of the lifting cradle and slide loose side under the hydraulic cylinder and close both sides together at the top of the hydraulic cylinder.

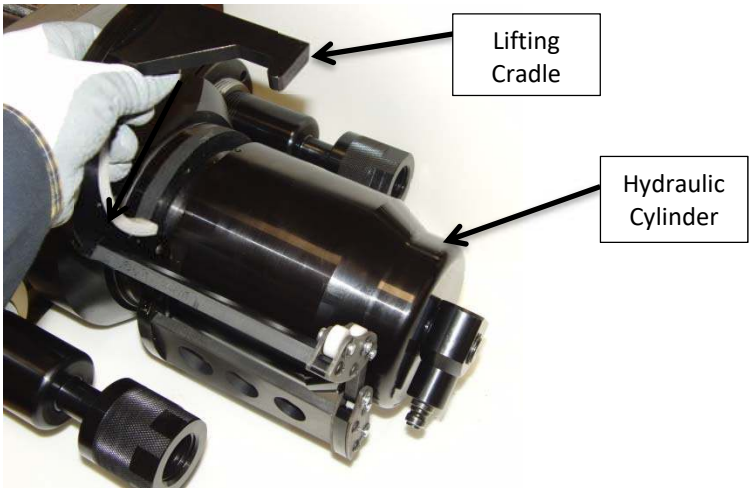

Figure 11A – Position lift cradle around hydraulic cylinder

2. Use a lifting strap to secure the lifting cradle around the hydraulic cylinder.
3. Using a mechanical lifting device, remove slack from lifting strap. Caution: do not apply any lifting force to the cradle.
4. Unscrew the hydraulic cylinder from the puller screw.

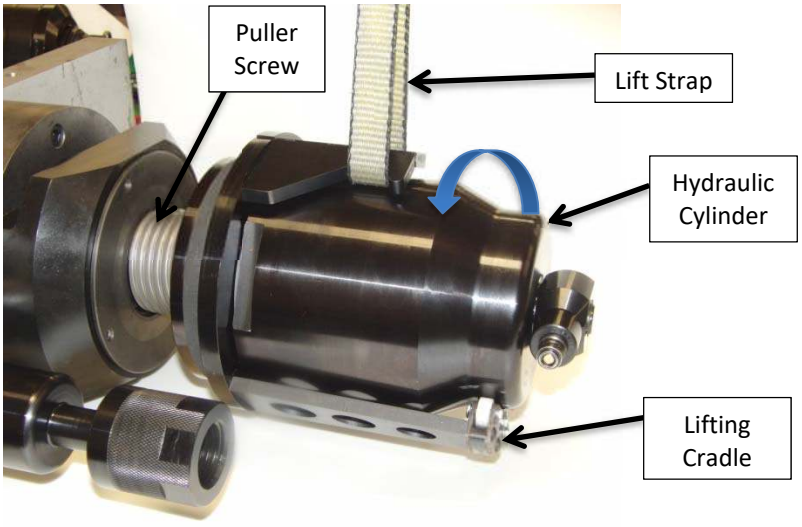

Figure 11B – Unscrew hydraulic cylinder from the puller screw

5. With hydraulic cylinder disengaged from puller screw, lift and clear from work area.

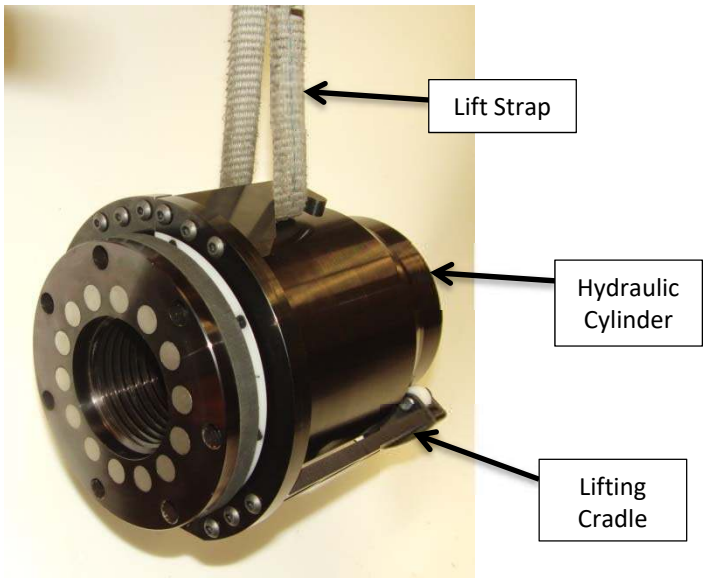

Figure 11C – Hydraulic cylinder in lifting cradle

11.2 Stud and Nut Removal

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 in the flange 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. 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. Do not continue until ALL debris is removed from the threads.

WARNING

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

2. With an Allen-wrench loosen the two locking set screws but do not remove from the nut.

Figure 11D - Loosening of a nut's set screws

3. Connect the hydraulic hose from the hydraulic pump to the tensioner.
4. 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)
5. Thread the retention screws into the adjacent studs on either side of the stud to be tensioned until hand tight.
6. Place the spanner ring on the nut.
7. Insert the puller screw into the tapered thread of the stud and hand tighten. **Be sure not to cross-thread the puller screw.**
8. Using an Allen wrench, tighten the puller screw and then back off the puller screw 1/2 a turn. Retighten the puller screw by hand until it is fully inserted. **DO NOT BACK OFF THE PULLER SCREW.**
9. Place the foot over the puller screw and orientate it into position.
10. Thread the tensioner onto the puller screw until it stops. Please note that the internal stop inside the tensioner will cause a gap in between the foot and tensioner. The gap should be 1/16”[1.6mm] to 3/16”[4.8mm]. **DO NOT ATTEMPT TO TIGHTEN THE TENSIONER AGAINST THE FOOT.** **See section 11.1 for use of cylinder lifting cradle**
11. Place the guard over the tensioner and position the pocketed slots onto the retention screws.
13. Tighten the retention screw knurled nuts by hand until firmly pressed against the tensioner guard. The retention screws must be inside the guard’s pocketed slots.
14. Activate the custom connector from the top of the guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger. Push the assembly

until it locks into the tensioner. Release fingers from the tabs and then remove thumb, ensure connection is firmly engaged or else the tensioner will not be connected to the pump.

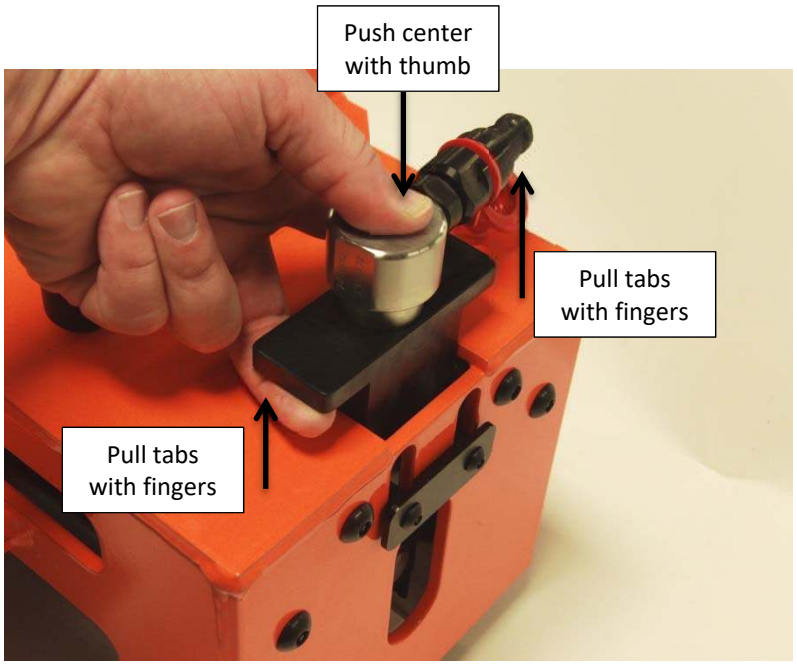

Figure 11E - Activation of the safety interlock

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

Flange Position	Stud Size	Removal Pressure
IP-HP Flange	3" [76 mm]	25000 psi [1725 bar]

16. Turn the spanner ring with the pin wrench. Loosen and turn the nut approximately 1/2 of a turn.
17. Release the hydraulic pressure.
18. Remove tensioner from the stud, section 11.3
19. Remove nut from stud.
20. Thread 3” stud removal tool (Riverhawk p/n 7002812) onto the stud until lightly seated against flange face.

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Fax: +1 315 768 4941
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Figure 11F – Stud removal tool

21. Back off stud removal tool 4 to 5 full turns.
22. Tighten stud removal tool screws using 1/4” Allen wrench.

Figure 11G – Tighten screws on stud removal tool

23. Using 1” wrench on face to removal tool, remove stud from flange.
24. Loosen screws on removal tool and remove tool from stud.

11.3 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 or by opening the valve on the MP-0130 Manual Pump Kit and leave the valve open.
2. Allow the tensioner cylinder to fully retract.
3. Disengage the custom connector from the top of guard by pushing on the center with your thumb and pulling the tabs with your fore finger and middle finger.
4. Loosen retention screw nuts.
5. Remove guard from assembly.
6. Unscrew the tensioner from puller screw. **See section 11.1 for use of lifting cradle.**
7. Remove foot from around the puller screw.
8. Unscrew the puller screw using an Allen wrench. Tapping the Allen wrench with a hammer or the use of a 3-4’ breaker bar may be necessary to loosen the puller screw. Do not use an impact wrench as this can damage the puller screw.
9. Remove the spanner ring from the nut.
10. Unscrew the retention screws using an Allen wrench. It may be necessary to tap the Allen wrench with a hammer or use a 3-4’ breaker bar to loosen the retention screws. Do not use an impact wrench as this can damage the retention screws.
11. Move the tool to the next stud.

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.

12.2 Hydraulic Tensioner Storage

Check the tensioner for any damage

1. Clean puller screw and check for any debris and dents.
2. Knurled interlock fitting should be clean and free to rotate.
3. Inspect the tensioner guard for any signs of damage. Bent guards must be replaced.

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

Place the protective plastic cap on the guard's knurled interlock fitting.

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.

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. Apply penetrating oil between the stud and the nut.

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 3/8" high pressure fitting is not assembled correctly as shown in section 7.2, it may look like the pump is leaking. If the problem continues, it may be necessary to open the pump kit. Contact Riverhawk for guidance.

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
A	Aug 27, 2018	Added 121T8613G0001 to title page and section 2; reorganized appendices
-	Jun 18, 2014	Released

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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

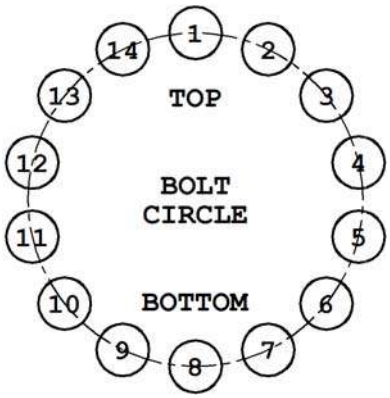
STRETCH RECORD SHEET FOR
THE D14 STEAM TURBINE IP-HP FLANGE

TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:



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

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