Instruction Manual IM-126

For

6B Gas Turbine Tensioned Studs and Nuts

For

Baker Hughes Nuovo Pignone

Repairs – Rentals
Field Service

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1.0 Scope

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

The various frame configurations covered in this manual are listed in Sections 1.1 through 1.3 with differences as related to connective hardware defined. Listed also are the pertinent hardware drawings. These drawings as well as tooling drawings form part of this manual.

1.1 Frame 6B Turbine to BHS Gear HF-1224, HT-1238

The hardware drawing depicts the stud and nut set for both Turbine to Load Coupling (1 1/8" size, Qty 24) and Coupling to Gearbox (1" size, Qty 22)

1.2 Frame 6B Gas Turbine Flange HF-3168, HT-0486

The hardware drawing depicts the stud and nut set for the turbine flange only. (1-1/8" size, Qty 24).

1.3 Frame 6B Gas Turbine Driven Flange HF-3169, HT-1238

The hardware drawing depicts the stud and nut set for the driven flange only (1" size, Qty 22)

2.0 General

Read and understand all instructions before installing and tensioning studs.

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

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

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2.1 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.

2.2 Hardware – Balance

- Hardware is supplied in weight balanced sets
- Studs and Nuts are interchangeable within sets
- Do not mix with other sets
- Save weight certification data supplied with each set for purchase of spares

2.3 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
- Long term storage – coat tensioner with oil, return to original container, seal container and protect from moisture.
- Shipment – coat tensioner with oil and ship in original container

2.4 Hand Tools

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

- 5/8” open-end wrench
- 3/8” Allen wrench
- 1 1/4” wrench
- 5” – 6” micrometer
- 3” – 4” micrometer

2.5 Special Tools

- Hydraulic Pressure Kit MP-0130
- 1-1/8” Hydraulic Tensioner Kit HT-0486
- 1” and 1-1/8” Hydraulic Tensioner Kit HT-1238

3.0 Preparation of Hardware

3.1 Nut Preparation

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

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.

If previous installation employed a thread locking compound, which will be visible as a grayish-green residue, remove as much of this compound as possible.

Do not apply thread lubricants to the threads.

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

3.2 Stud Preparation

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

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

If previous installation employed a thread locking compound, which will be visible as a grayish-green residue when the nut is removed, remove as much of this compound as possible.

Do not apply thread lubricants to the threads.

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

3.3 Stud Length Measurement

Measure and record the initial length 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.
- Mark the location of the measurement on stud end with a permanent marker.
- Measure each stud to nearest 0.001 inch.
- Record each measurement on the supplied charts.
- Do not allow the measuring instruments to set in the sun

4.0 Stud and Nut Assembly

Refer to the Hardware Assembly Set Drawing listed in Section 1.0 of this manual.

1. Assemble the cylindrical nut to the tapered thread end (Pull End) of the stud.

2. Slide the stud and cylindrical nut assembly into the flange as shown in Figures 1, 2 & 3 and install the other nut on the backside.

3. Adjust nut/stud assembly so that the stud protrudes from the face of the cylindrical nut the amount depicted on the hardware set drawing from section 1. **SETTING THIS PROTRUSION OF STUD TO NUT IS CRITICAL FOR PROPER TENSIONER OPERATION.**

4. Hand tighten the assembly to a snug fit**.**

5.0 Assembly of Hydraulic Tensioner Equipment

5.1 Kit Assembly

Assemble the hydraulic pump with its hose to the tensioner and bleed the system of air per following instructions.

5.1.1 Fittings

Make sure both male and female parts are clean and free of debris, see Figure 4 for fitting configuration. Hold female part securely when tightening so as to prevent damage to the adjacent tubing. If the fitting leaks first try retightening as needed. If leaking continues then

disassemble and check for scratches or debris on the seating conical surfaces. Clean as required. Replace plastic protective caps when finished with the tooling.

5.2 Pump

Pump kit is shipped full of hydraulic oil. To prevent oil spillage close cap when not in use, during storage and shipment. Lost oil should be replaced with Enerpac Hydraulic Oil. ISO 32 Mineral Oil may be substituted, if necessary.

5.3 Bleeding Hydraulic System

Follow the tensioner assembly instructions of Section 6.0.

TO AVOID FAILURE, ENSURE SAFETY AND PROPER OPERATION THE TENSIONER ASSEMBLY MUST BE MOUNTED ON THE STUD BEFORE BLEEDING THE SYSTEM AND TENSIONING BEGINS.

1. Mount tensioner on a stud per the assembly instructions of Section 6.0.
2. Make sure the pump is situated below the tensioner assembly.
3. The tensioner assembly has two ports, one for pressurizing and one for bleeding the system. These ports service a common chamber and therefore may be treated interchangeability. The bleed port must always be oriented in the uppermost position.
4. The tensioner is shipped with a 5/8 in. hex coned stem bleeder fitting installed. With this fitting loosened, stroke the pump repeatedly until the stream of oil exiting the tool is free of air then retighten the fitting.

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

6.0 Assembly of Tensioner on Stud

All tensioning (pulling) will be performed from the tapered thread end of the stud with orientation of the stud to the flange as shown in Figures 1, 2, & 3.

6.1 Assembly of Tensioner with Integral Safety Cage

Refer to Tensioner Assembly drawing and Figure 7 for tensioner to flange mounting. This assembly has the following features which should make stud tensioning safer and easier.

The safety cage is integral (bolted) to the tensioner
- The hydraulic piston is spring loaded to retract
- The puller screw is a 2-piece design. This requires that the operator tighten the puller screw into the stud and then install a puller nut.

Assembly sequence is as follows:

1. Open the hydraulic return valve on the pump to allow hydraulic fluid to be pushed back from the tensioner into the pump reservoir. (This is automatic on the air-operated hydraulic pump)
2. Place the spanner ring on the puller side cylindrical nut.
3. Apply a light coat of clean turbine oil or a spray lubricant to the puller screw. Do not use “Never Seize” on the conical threads.
4. Place and hold the tensioner over the end to be tightened.
5. Insert the puller screw through the tensioner into the tapered thread of the stud and tighten.
6. **Be sure not to cross-thread the assembly.**
7. Tighten the puller screw using Allen wrenches on the puller screw and the stud. DO NOT wrench on the Hex nut opposite the tensioner.
8. Install the puller nut until it seats snugly on the piston and then back-off 2 flats. This is particularly important for removal because the stud shortens during disassembly and the tensioner may then bind.
9. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE**, the puller screw is tight in the stud and the puller nut has been backed-off the 2 flats.

6.2 Assembly of Tensioner Kit with Separate Safety Chains

Refer to Tensioner Assembly drawing and Figure 5 for tensioner to flange mounting. This assembly has the following features which should make stud tensioning safer and easier.

- The safety chains are attached to the tensioner and installed into adjacent studs
- The hydraulic piston is spring loaded to retract

- The puller screw is a 2-piece design, This requires that the operator tighten the puller screw into the stud and then install a puller nut.

Assembly sequence is as follows:

1. **Open the hydraulic return valve on the pump to allow hydraulic fluid to be pushed back from the tensioner into the pump reservoir.**
2. Place the spanner ring on the puller side cylindrical nut.
3. Place and hold the tensioner over the end to be tightened.
4. Insert the puller screw through the tensioner into the tapered thread of the stud and tighten.
5. **Be sure not to cross-thread the assembly.**
6. Tighten the puller screw using Allen wrenches on the puller screw and the stud. DO NOT wrench on the Hex nut opposite the tensioner.
7. Install the puller nut until it seats snugly on the piston and then back-off 2 flats. This is particularly important for removal because the stud shortens during disassembly and the tensioner may then bind.
8. At this point the Tensioner Assembly **MUST BE FREE TO ROTATE**, the puller screw is tight in the stud and the puller nut has been backed-off the 2 flats.
9. Install the safety chain plugs into adjacent studs as shown on HT-1238 and attach to the tensioner as shown

Note: If the tool is not free to rotate it is most likely that the nuts must be repositioned so that the stud may be shifted slightly to the tensioner side of the flange. This can be accomplished as follows:

1. Back off the puller nut and slightly loosen the puller screw.
2. Back off the Hex nut opposite the tensioner about 1 /2 turn.
3. Tighten the puller screw side cylindrical nut to take up the slack
4. Retighten the puller screw per above and check for tool looseness

Note: Do not over extend the stud. Over extension 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.

7.0 Stud Pulling and 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.

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

WARNING

The SAFETY GUARD AND/OR CHAINS MUST be in place and hands kept out of designated areas at all times when the tensioner is pressurized otherwise personal injury can occur.

7.1 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

Flange	Stud Diameter	50% Pressure
Turbine/Coupling	1.125 in.	9000 psi
Coupling/Driven	1.000 in.	8000 psi

7.1.1 Tightening of 1-1/8” Nuts

Tighten the cylindrical nuts hand tight using the pin wrench and spanner ring, refer to Figure 7.

7.1.2 Tightening of 1” Nuts

Tighten the cylindrical nuts hand tight using the pin wrench and spanner ring refer to Figure 5.

7.1.3 Tensioner Removal

Tensioner removal is to be accomplished as follows:

1. Release the tensioner pressure by opening the valve on the pump. **Leave valve open**.
2. Unscrew the puller screw using a wrench.
3. Tapping the wrench with a hammer may be necessary to loosen the puller screw
4. Move the tool to the next stud/nut assembly to be tensioned, following the sequence/pattern as defined on the supplied data sheets

7.2 Tensioning at Final Pressure

Repeat the pulling and tensioning procedure from in Section 7.1 at final pressure. Measure the length of the studs after all have been pulled. The required stretch values are listed in the following table.

Flange	Size	Stretch (in.)	Pressure
Turbine/Coupling	1.125 in.	.010/.012	18000 psi
Coupling/Driven	1.000 in.	.006/.008	15500 psi

CAUTION

DO NOT EXCEED THE MAXIMUM PRESSURE VIBROSCRIBED ON THE PULLER BODY. Excessive pressure can damage the stud and the puller screw.

Excessive stretch variations or low stretch values can be corrected by retensioning 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.

8.0 Thread Locking Using a Liquid Locking Compound

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

Apply the specified number of drops (see table below) of thread locking compound Loctite “Threadlocker 290” or Permatex Industrial “After Lock No. 81794” (included with each set of hardware from the factory) to each end of the stud at the stud/nut interface as follows.

Apply the drops to the face of the nut at the top of the assembly allowing material to run down into the stud threads.

An alternate method of applying the thread locking compound is to use a short (2-3”) length of thin wire. Place the bottom tip of the wire at the top of the nut/stud thread interface with the wire held at about a 45° angle. Apply the liquid to the wire so that it runs along the wire into the threads.

Stud Size	**Amount of Liquid**
1.125 in.	4 drops
1.000 in.	4 drops

NOTICE

Do not use more thread locking compound other than recommended or the nut may be VERY difficult to remove at disassembly.

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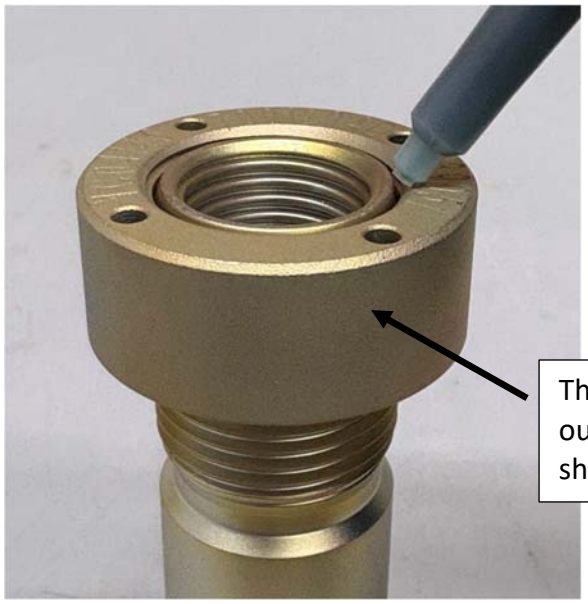
9.0 Removal of Assemblies with Liquid Locking Compound



For nuts which have been locked with the liquid locking compound, removal is accomplished as follows:

- Using a wire brush and shop air clean the internal tapered thread of the stud to remove any debris/deposits that may have accumulated during service.
- Install the appropriate tensioner to the stud as described in Section 6.0.
- Apply hydraulic pressure per the following table and without using unreasonable force attempt to loosen the nut using the spanner ring and spanner wrench as shown in Figure 5 and 7.

Nut Size	Pressure
1.125 in.	18,000 psi
1.000 in.	15,500 psi

- **If the nut cannot be loosened, release the pressure and repeat the procedure.**
- **Ordinarily two or three attempts are sufficient to break the bond.**
- **Should the nut refuse to loosen after three attempts the application of heat will be required.**

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CAUTION

DO NOT EXCEED THE MAXIMUM PRESSURE LISTED ABOVE. Excessive pressure can damage the stud and the 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

Apply a smear of **550/650-deg F** tempil stick to the side of the nut opposite the application of heat and heat the nut using a propane torch. Continue to apply heat until the tempil smear indicates that the nut has reached **550/650 deg F**. **Never overheat to a cherry red condition.** Remove the source of heat and as quickly as possible reinstall the appropriate tensioner, apply the appropriate pressure per the following table and loosen the nut. Then release the pressure and remove the tensioner.

10.0 Revision History

Revision Letter	Effective Date	Description
C	May 15, 2026	Added pictures to sections 8 and 9
B	May 18, 2022	Added EC Declaration of Conformity and UKCA Declaration of Conformity
A	Sept 21, 2011	Added sections 1.2 and 1.3
-	Oct 2, 2000	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 4413:2010, and ISO 4414:2010.

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

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

Appendix A2

UKCA Declaration of Conformity

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

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

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

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

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

FIGURE 1

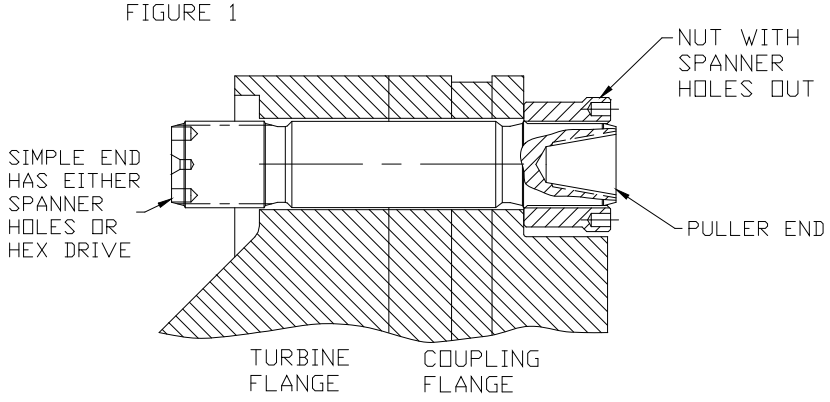

FIGURE 2

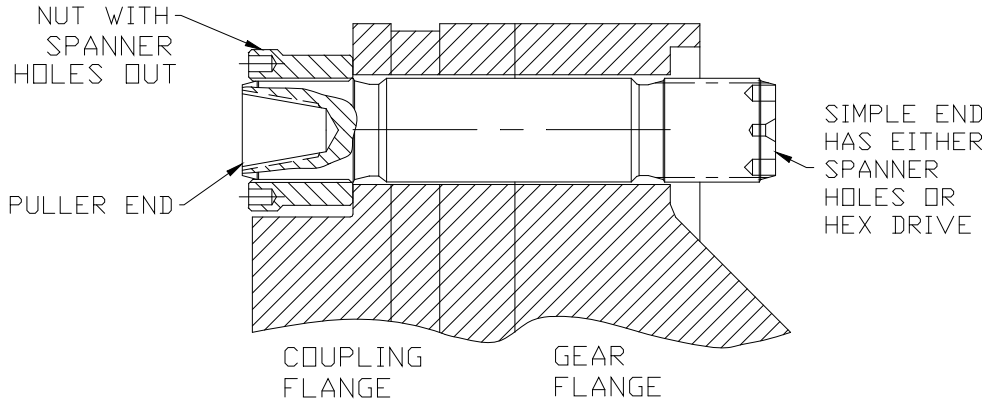

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FIGURE 3

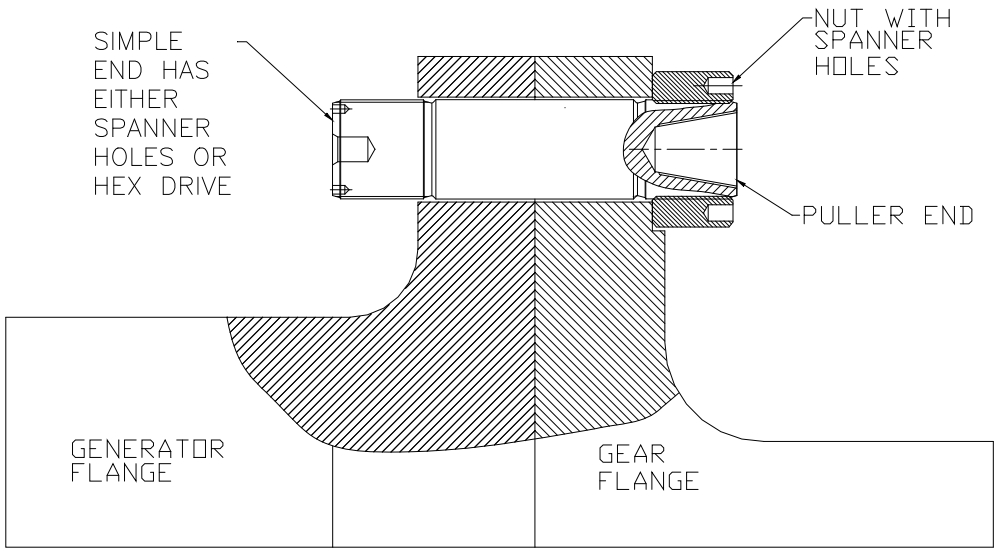

FIGURE 4 PRESURE PORT

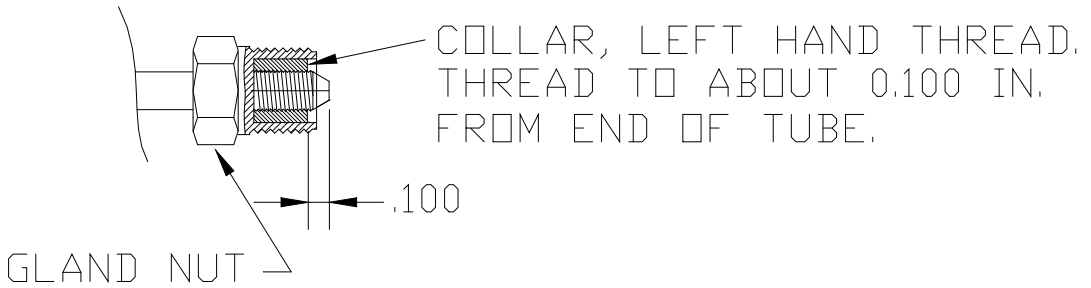

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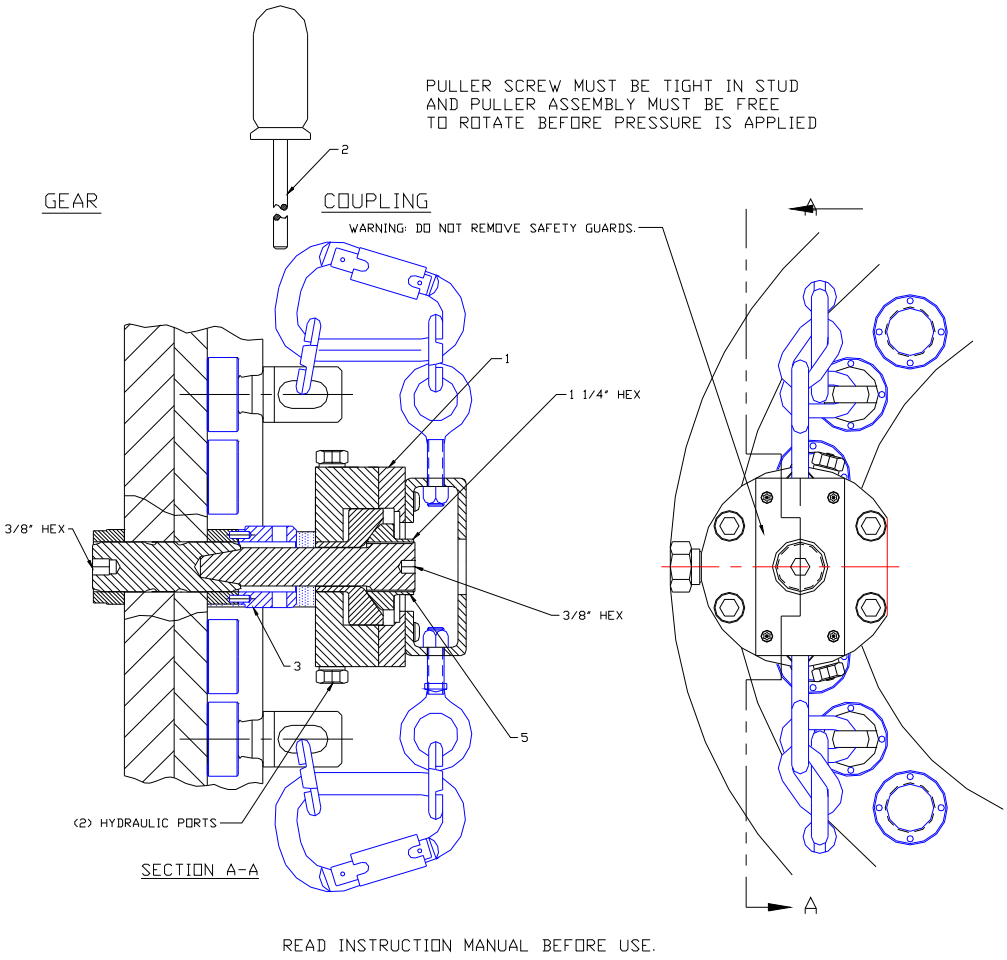
FIGURE 5



(Figure 6 is not required in the manual)

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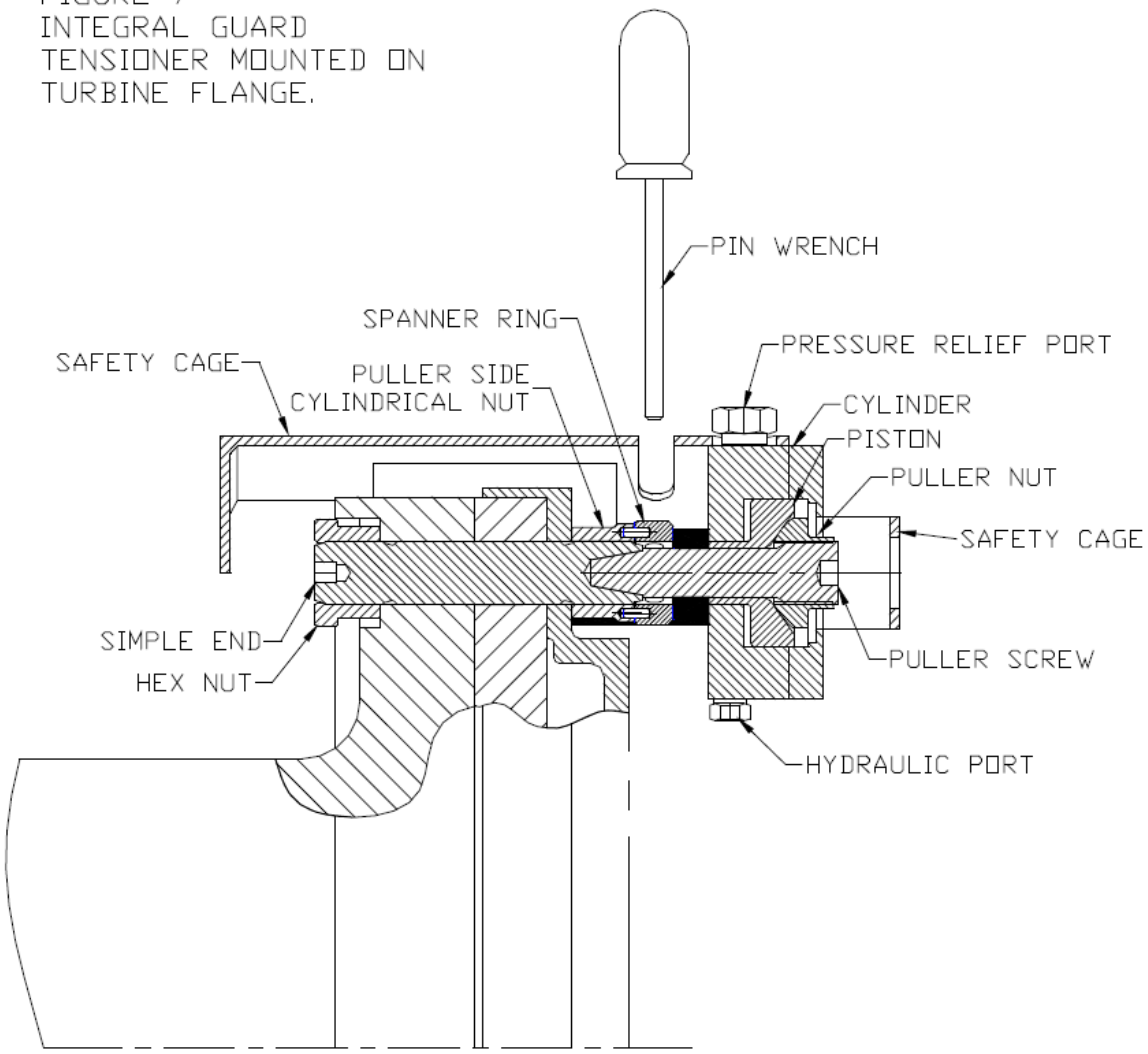
FIGURE 7
INTEGRAL GUARD
TENSIONER MOUNTED ON
TURBINE FLANGE.



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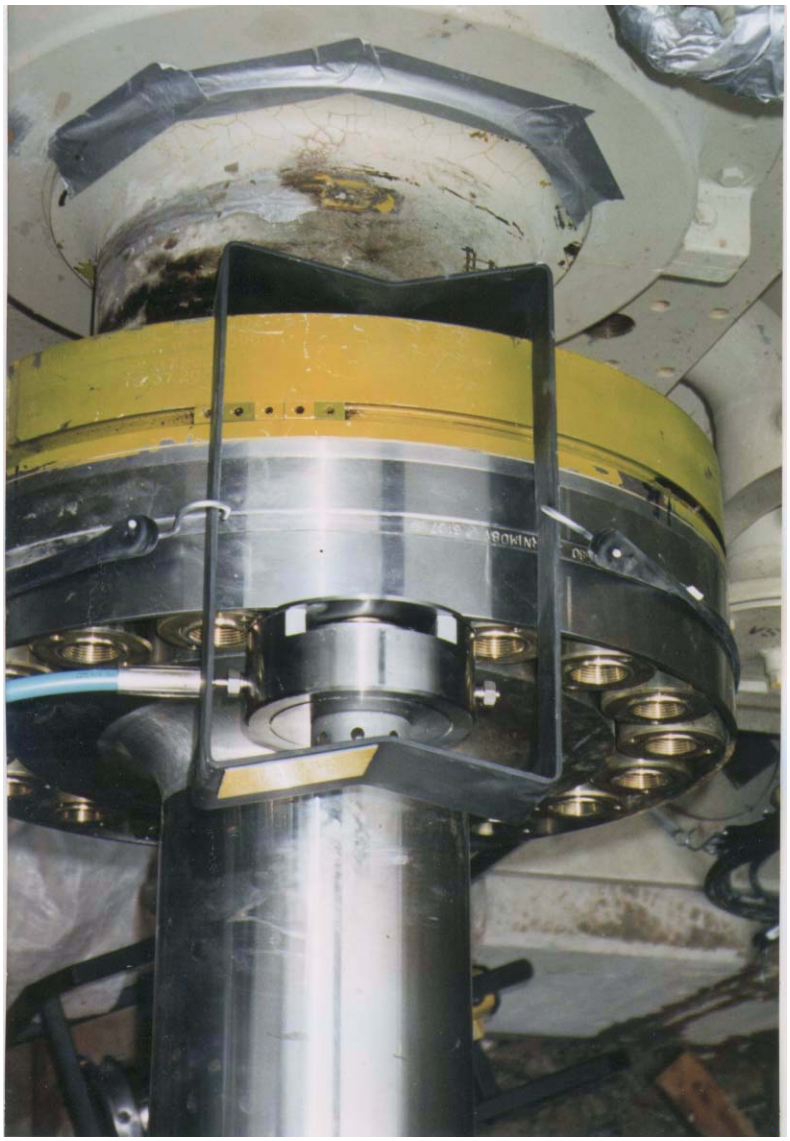

Photo 1
Looking down on gear to generator flange of 6FA machine. Shows 2” tensioner mounted with safety cage in place.

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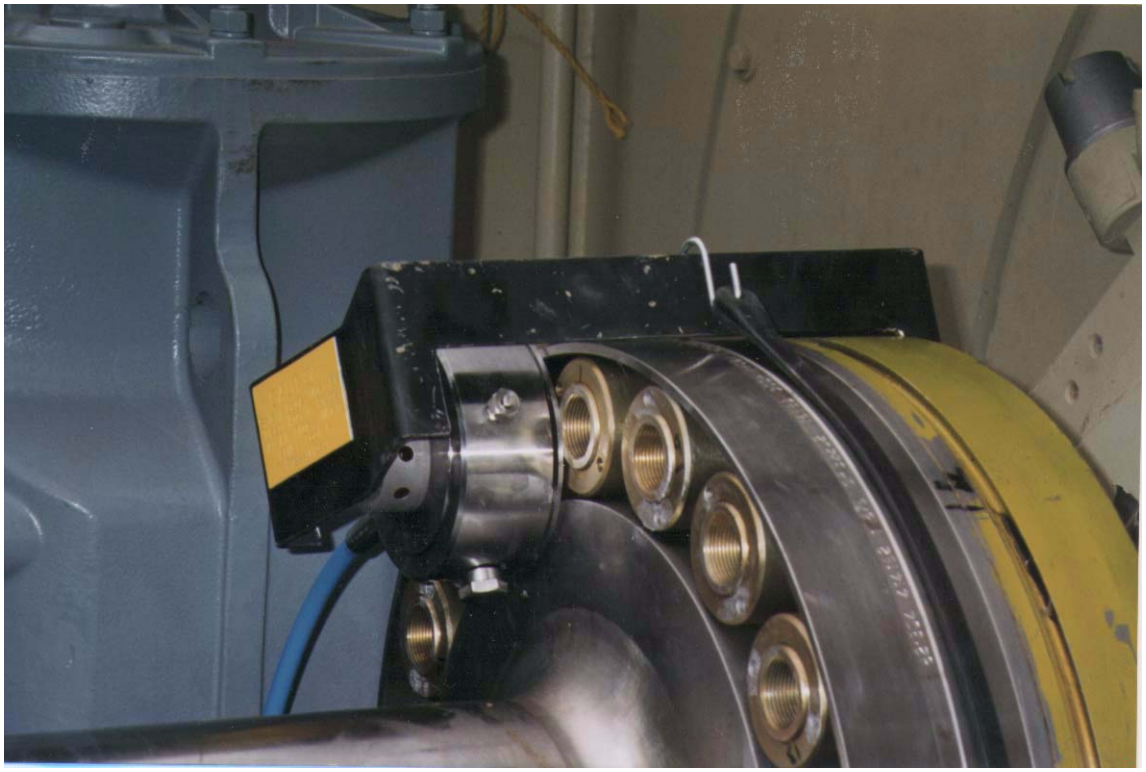

Photo 2
Side view of 2” tensioner and safety cage on 6FA machine.

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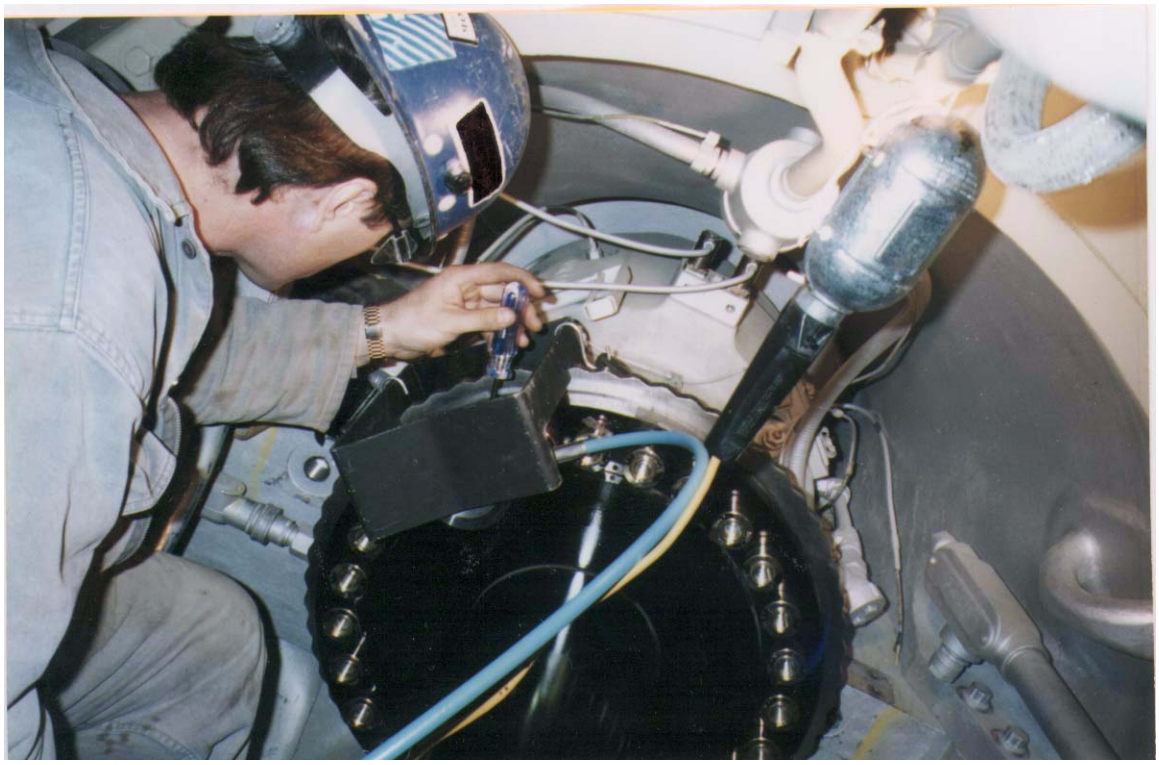

Photo 3
Top view of 1-1/8” tensioner and safety cage in place. Tool is mounted on coupling to gear flange of 6FA machine.

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Photo 4
View of 1-1/8 tensioner and safety cage mounted on turbine to coupling flange of 6FA machine. Tool is pressurized and millwright is tightening nut.

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Appendix B1

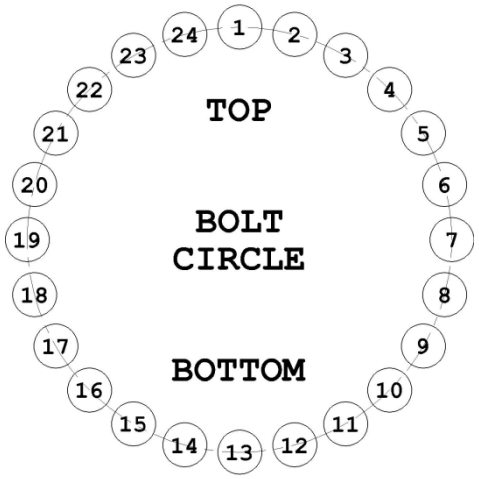
STRETCH RECORD SHEET FOR
THE 24-BOLT CIRCLE PATTERN

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			
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24			
12			

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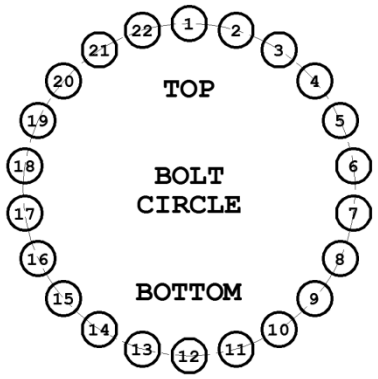
Appendix B2

STRETCH RECORD SHEET FOR
THE 22-BOLT CIRCLE PATTERN



TURBINE NUMBER:

DATE:

TECHNICIAN:

SUPERVISOR:

HOLE NUMBER	STARTING LENGTH	FINAL LENGTH	FINAL STRETCH
1			
12			
2			
13			
3			
14			
4			
15			
5			
16			
6			
17			
7			
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8			
19			
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11			
22			

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