REVISION LETTER	GE ALTERATION NOTICE NUMBER

INSTRUCTION MANUAL IM-100

For Gas Turbine Tensioned Studs and Nuts

Fr. 6B Turbine to 6A6 or 5A4 Generator	**GE 137A3349P001** **GE 137A3349P003** **GE 356A3962P003** **GE 392A7490P010** **GE 392A7490P011**
Fr. 6B Turbine to Load Gear	**GE 356A3962P006** **GE 392A7490P005**
Load Gear to 6A6 or 5A4 Generator	**GE 392A7490P006**
Load Coupling to 6A6 or 5A4 Generator	**GE 356A3962P005**
Fr. 6B Turbine to 6A3 Generator	**GE 356A3962P001**
Fr. 5P Turbine to 6A6 or 5A4 Generator	**GE 358A7205P001**

GE Power Generation

GENERAL ELECTRIC COMPANY
Schenectady, NY

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1.0 Cautions and Safety Warnings

WARNING

TO AVOID FAILURE, ENSURE SAFETY AND PROPER OPERATION THE TENSIONER ASSEMBLY MUST BE MOUNTED ON THE STUD BEFORE BLEEDING THE SYSTEM AND TENSIONING BEGINS. DO NOT USE THE TENSIONER ASSEMBLY AT ANY PRESSURE UNLESS THE TOOL IS MOUNTED ON THE STUD.

Caution: 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 thread of the stud. Proper engagement is achieved when the puller screw is tight in the stud and the Tensioner Assembly is free to rotate.

WARNING

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

CAUTION

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

WARNING

Fire Hazard! DO NOT heat when the puller assembly is in place. Personal injury or equipment damage may occur. Use of an Oxy-Acetylene torch is not recommended.

NOTICE

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

CAUTION

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

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

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2.0 Scope

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

The various frame configurations covered in this manual are listed in Sections 2.1 through 2.9 with differences as related to connective hardware defined. Listed also are the pertinent hardware drawings (HF-). These drawings as well as tooling drawings (HT-) form part of this manual.

2.1 Fr. 6B Turbine to 6A6 or 5A4 Generator

GE 137A3349P001	**HF-0708**
GE 137A3349P003	**HF-0708**
GE 356A3962P003	**HF-0708**
GE 392A7490P010	**HF-0799 & HF-2735**
GE 392A7490P011	**HF-0799 & HF-2735**

The hardware drawing depicts the stud and nut set for both Turbine to Load Coupling and Load Coupling to Gearbox (1-1/8” size, Qty 48) as well as Gearbox to Generator (1-1/4” size, Qty 20)

2.2 Fr. 6B Turbine to Load Gear

GE 356A3962P006	**HF-0799**
GE 392A7490P005	**HF-0799**

The hardware drawing depicts the stud and nut set for the Turbine to Coupling and Coupling to Appropriate Accessory (1-1/8” size, Qty 48)

2.3 Load Gear to 6A6 or 5A4 Generator

GE 392A7490P006	**HF-2735**

The hardware drawing depicts the stud and nut set for Gearbox to Generator (1-1/4”size, Qty 20)

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2.4 Load Coupling to 6A6 or 5A4 Generator
GE 356A3962P005 HF-0798

The hardware drawing depicts the stud and nut set for the load Coupling to Gearbox (1-1/8”size, Qty 24) and the Gearbox to Generator (1-1/4”size, Qty 20)

2.5 Fr. 6B Turbine to 6A3 Generator
GE 356A3962P001 HF-0709

The hardware drawing depicts the stud and nut set for both Turbine to Load Coupling and Coupling to Gearbox (1-1/8” size, Qty 48) as well as Gearbox to Generator (1-1/2” size, Qty 16)

2.6 Fr. 5P Turbine to 6A6 or 5A4 Generator
GE 358A7205P001 HF-0820

The hardware drawing depicts the stud and nut set for Load Coupling to Gearbox (1-1/8”size, Qty. 24) and Gearbox to Generator (1-1/4” size, Qty 20). The drawing also depicts a 1” size Socket Head Cap Screw for a Turbine to Coupling connection. Torquing requirements for the Socket Head Cap Screws will be specified on another appropriate General Electric drawing.

2.7 Fr.6B Turbine to Generator
RTO40681 HF-3167

The hardware drawing depicts the stud and nut set for one end of the flexible coupling (1-1/8” size, Qty. 24).

2.8 Fr.6B Turbine Mechanical Drive
RTO40682 HF-3168

The hardware drawing depicts the stud and nut set for one end of the flexible coupling (1-1/8” size, Qty. 24, lock-tite nuts).

2.9 Fr.6B Turbine Mechanical Drive
RTO40683 HF-3169

The hardware drawing depicts the stud and nut set for one end of the flexible coupling (1-1/8” size, Qty. 22, lock-tite nuts).

3.0 Quick Checklist

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

EQUIPMENT INSPECTION

☐ • Check oil level in hydraulic pump.

☐ • Check air pressure at 80 psi [5.5 bar] minimum. (For air-driven pumps)

☐ • Check hydraulic hose for damage.

☐ • Test pump.

☐ • Inspect tensioner for any damage.

NUT AND STUD PREPARATION

☐ • Inspect stud and nuts for any damage.

☐ • Measure stud length.

☐ • Clean the studs and nuts.

☐ • Install studs and nuts (off-center) into the flange.

☐ • Set stick-out dimension on the coupling side of the flange.

☐ • Hand tighten all studs.

☐ • Verify stick-out measurement (VERY IMPORTANT)

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Tensioning (Bolt installation)

- ☐ • Match the tensioner setup to the flange joint.
- ☐ • Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- ☐ • Slide spanner ring over the puller screw.
- ☐ • Mount the tensioner on the stud in flange and install spanner ring onto nut.
- ☐ • Insert 1/2" hex Allen wrench into the back side of the stud.
- ☐ • Tighten the puller screw. Then back off puller screw 1/2 a turn.
- ☐ • Retighten the puller screw and leave tight. **DO NOT BACK OFF PULLER SCREW.**
- ☐ • Tighten puller nut and then back nut off two flats or 120 degrees to allow for stud stretch.
- ☐ • Bleed the tensioner. **Do NOT bleed tensioner off of a stud! Damage to the tool will result!**
- ☐ • 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 nuts' set screws.

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Detensioning (Stud removal)

- ☐ • Loosen nuts' set screws
- ☐ • Inspect and clean studs' conical threads. **Do not continue until ALL debris is removed from the threads! Do not try to use the tensioner to remove a damaged stud!**
- ☐ • Apply a light coat of clean turbine oil or spray lubricant to the puller screw. **DO NOT USE "NEVER SEIZE" ON THE CONICAL THREADS.**
- ☐ • Slide spanner ring over the puller screw.
- ☐ • Mount the tensioner on the stud.
- ☐ • Install spanner ring into nut.
- ☐ • 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.**
- ☐ • Tighten puller nut and then back nut off two flats or 120 degrees to allow for stud stretch.
- ☐ • Bleed the tensioner. **Do NOT bleed tensioner off of a stud! Damage to the tool will result!**
- ☐ • Apply final pressure.
- ☐ • Loosen nut with the spanner ring and pin wrench.
- ☐ • Move to next stud in pattern

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4.0 General Preparations

Read and understand all instructions before installing and tensioning studs.

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

High-pressure fluid from the Hydraulic Pressure Kit system pressurizes the tensioner which generates a stretching force that actually stretches the stud. As the stud is stretched the nut lifts off the flange. The nut is then reseated into position on the flange by turning 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.

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

- 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

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.
- 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.

4.4 Hand Tools

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

5/8″ wrench
15/16" wrench
1″ wrench
A set of Allen Wrenches
3′ – 4′ Breaker Bar
5″ to 6″ micrometer
6″ to 7″ micrometer
10″ to 11″ micrometer

4.5 Special Tools

Hydraulic Tensioner Kit:

HT-2569 Hydraulic Tensioner, 1-1/8″
(recommended)
(reference GE 364B3418)

HT-2286 Hydraulic Tensioner, 1-1/8″
(recommended for RTO40681)
(reference GE 364B3422)

HT-0406 Hydraulic Tensioner, 1-1/8″
(for Goodrich load coupling)
(reference GE 364B3418)

HT-5332 Hydraulic Tensioner, 1-1/8″
(for GENP SOM5459019)

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HT-0251 Hydraulic Tensioner, 1-1/8”
(obsolete)

HT-0245 Hydraulic Tensioner, 1-1/8”
(obsolete)

HT-0141 Hydraulic Tensioner, 1-1/8”
(for Zurn load coupling)

HT-1466 Hydraulic Tensioner, 1-1/4”
(recommended)
(reference GE 364B3419)

HT-0815 Hydraulic Tensioner, 1-1/4”
(obsolete)

HT-0219 Hydraulic Tensioner, 1-1/4”
(obsolete)

HT-0176 Hydraulic Tensioner, 1-1/4”
(obsolete)

HT-1019 Hydraulic Tensioner, 1-1/2”
(recommended)

HT-0208 Hydraulic Tensioner, 1-1/2”
(obsolete)

Hydraulic Pump Kit:

MP-0130 Manual Hand-Operated
Hydraulic Pump
(recommended)
(reference GE 359B2506)

AP-0532 Air-Operated Hydraulic Pump
(reference GE 359B2502)

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5.0 Hardware Set Preparations

5.1 Nut Preparation

Sample Picture of a Riverhawk Locknut

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

5.1.1 Nut Cleaning - New Installations

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

5.1.2 Nut Cleaning - Old Installations

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

5.1.3 Nut Cleaning - Very Old Installations

If previous installations employed a thread-locking compound, which will be visible as a grayish-green residue, remove as much of this compound as possible. Finish the cleaning process by rinsing in a volatile solvent such as acetone and allow to dry.

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Riverhawk Company strongly recommends replacing this style of nut with the current nut with a re-useable mechanical locking feature.

5.2 Stud Preparation

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

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

5.2.1 Stud Cleaning - New Installations

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

5.2.2 Stud Cleaning - Old Installations

Previously installed studs 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-4354 or a similar 1/2" diameter Brass power brush.

Picture of Brass Power Brush

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

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4. Work the drill in a circular motion while moving the brush in and out to clean all of the threads. Try not to hold the brush in one place too long, so as not to remove the stud's protective coating.

5. Blow out the threads with compressed air to remove loosened debris.

6. Visually inspect threads for cleanliness. Threads should be bright and shiny.

7. Repeat if any dirt can be seen in the threads.

8. Inspect threads for any damage that may have been caused by previous installation.

Do not apply thread lubricants to the threads.

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

5.2.3 Very Old Installations

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 from the stud’s threads.

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

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5.3 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.**

6.0 Stud and Nut Assembly

Refer to the Hardware Assembly Drawing (HF-) listed in Section 1.0 of this manual. Assemble the cylindrical nut to the tapered thread end (Pull End) of the stud. 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. **Adjust nut/stud assembly so that the stud protrudes from the face of the cylindrical nut the amount depicted on the hardware drawing (HF-). SETTING THIS PROTRUSION OF STUD TO NUT IS CRITICAL FOR PROPER TENSIONER OPERATION. Hand tighten the assembly to a snug fit.**

7.0 Assembly of Hydraulic Tensioner Equipment

7.1 Kit Assembly

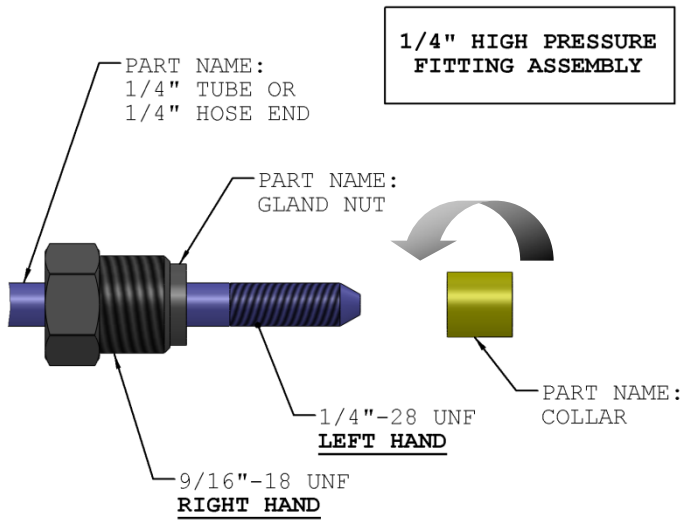
Assemble the hydraulic pump with its hose to the puller tool and bleed the system of air per following instructions.

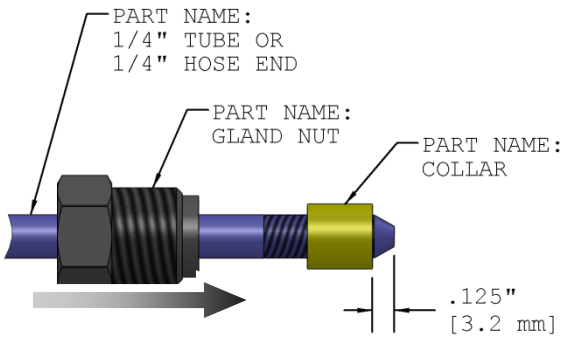
Clean puller screw and check for any debris and dents.

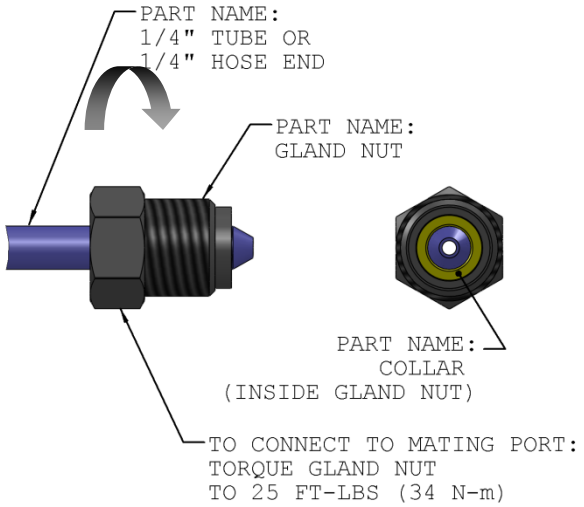
Puller screw should be free to rotate and move back and forth.

Inspect tensioner guard for any signs of damage. Bent guards should be replaced.

7.1.1 Hydraulic Fittings







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.

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.

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

Slide the gland nut down over the collar. Insert the 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 from scratches as this is the sealing surface.
- Replace red plastic caps when finished to protect the threads and cone.

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7.2 Pump

Pump kit is shipped full of hydraulic oil. The pump reservoir cap is sealed for shipment. To use, turn cap to the vent position. 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.

7.3 Bleeding Hydraulic System

Follow the tensioner assembly instructions of Section 8.0.

WARNING

TO AVOID FAILURE, ENSURE SAFETY AND PROPER OPERATION THE TENSIONER ASSEMBLY MUST BE MOUNTED ON THE STUD BEFORE BLEEDING THE SYSTEM AND TENSIONING BEGINS. DO NOT USE THE TENSIONER ASSEMBLY AT ANY PRESSURE UNLESS THE TOOL IS MOUNTED ON THE STUD.

Mount tensioner on a stud per the assembly instructions of Section 8.0. Make sure the pump is situated below the tensioner assembly. 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. The puller tool is shipped with a 5/8 in. [16 mm] 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 puller tool 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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8.0 Assembly of Tensioner on Stud

Two types of Tensioner Kits will be encountered in the field. They are most readily identified by the safety cages that they employ. One cage is separate from the puller tool and the other is integral. Other design differences and operational characteristics are defined in Sections 6.1 and 6.2 which follow. The two assemblies are depicted in Figures 6 & 7.

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.

8.1 Assembly of Tensioner with Separate Safety Cage

Refer to Tensioner Assembly drawing and Figure 6 for tensioner to flange mounting. 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 as the puller tool is tightened. (This is automatic on the air-operated hydraulic pump)
2. Place the spanner ring on the puller side 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 puller tool over the end to be tightened.
5. Insert the puller screw through the puller tool into the tapered thread of the stud and hand tighten
6. **Be sure not to cross-thread the assembly**
7. Tighten the puller screw using an open-end wrench and spanner or Allen wrench, depending on hardware configuration, on the opposite end of the stud (DO NOT WRENCH THE NUT).
8. At this point the puller screw must be tight in the stud and the tensioner assembly **MUST BE FREE TO ROTATE.**

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Note: If the tool is not free to rotate when the puller screw is tight, then either: (1) the piston is not fully retracted; open the valve on the pump and retighten the puller screw. Or (2), the nuts must be repositioned so that the stud is shifted slightly more on the puller tool side. This can be done as follows:

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

8.2 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 puller tool

- 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 puller tool 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 puller tool over the end to be tightened.
5. Insert the puller screw through the puller tool 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 puller tool.

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.

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 puller tool 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 puller tool 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

Caution: 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.

9.0 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 cage MUST be in place and hands kept out of designated areas at all times when the puller tool is pressurized otherwise personal injury can occur.

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.

Flange Position	Stud Size	50% Pressure	50% Stretch
Turbine to Coupling	1-1/8" [29 mm]	9000 psi [620 bar]	Do not measure Do not use
Coupling to Gearbox	1-1/8" [29 mm]	9000 psi [620 bar]	Do not measure Do not use
Gearbox to Generator **Check Tool markings for part number**	1-1/4" [32 mm]	9000 psi [620 bar] w/ **HT-1466** 6000 psi [420 bar] w/ **HT-0176, HT-0219,** & **HT-0815**	Do not measure Do not use
Gearbox to Generator	1-1/2" [38 mm]	7500 psi [520 bar]	Do not measure Do not use

9.1.1 Tightening of 1 1/8" Nuts

Tighten the cylindrical nuts hand tight using the pin wrench and spanner ring, ref. Figures 6&7.

9.1.2 Tightening of 1 1/4" Nuts

Tighten the cylindrical nuts using the pinwrench and the spanner ring, ref, Figures 6&7. Turn the nut 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.

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9.1.3 Tightening of 1 1/2" Nuts

Tighten the cylindrical nuts hand tight using the pin wrench and spanner ring ref. Figures 6&7.

9.2 Removing the Tensioner from an Installed Stud

Puller tool removal is to be accomplished as follows:

1. Release the puller tool pressure by opening the valve on the pump. Leave valve open. (This is automatic on the air-operated hydraulic pump)
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.

9.3 Tensioning at Final Pressure

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

Flange Position	Stud Size	Final Pressure	Final Stretch
Turbine to Coupling	1-1/8″ [29 mm]	18000 psi [1250 bar]	0.010" - 0.012" [0.25 mm - 0.30 mm] 0.008" - 0.010" [0.20 mm - 0.25 mm] (for special 4.400″ [111.8mm] long stud)
Coupling to Gearbox	1-1/8″ [29 mm]	18000 psi [1250 bar]	0.010" - 0.012" [0.25 mm - 0.30 mm] 0.008" - 0.010" [0.20 mm - 0.25 mm] (for special 4.400″ [111.8mm] long stud)
Gearbox to Generator **Check Tool markings for part number**	1-1/4″ [32 mm]	18000 psi [1250 bar] w/ **HT-1466** 12500 psi [860 bar] w/ **HT-0176, HT-0219,** & **HT-0815**	0.011" - 0.013" [0.28 mm - 0.33 mm
Gearbox to Generator	1-1/2″ [38 mm]	15000 psi [1035 bar]	0.021" - 0.024" [0.53 mm - 0.61 mm

CAUTION

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

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10.0 Retensioning

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.

11.0 Thread Locking

Once pulling and tensioning is completed all stud nuts must be locked in position. Two methods of thread locking may be encountered in the field. Early version hardware entails a liquid thread locking compound while the current configuration employs a mechanical locking device. Each method is described in detail in Sections 11.1 and 11.2.

11.1 Thread Locking Using a Liquid Locking Compound

These nuts have no visible locking feature. Contact Riverhawk Company if you have any of these older style nuts.

Riverhawk Company strongly recommends replacing this style of nut with the current nut with a re-useable mechanical locking feature.

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11.2 Thread Locking Using a Mechanical Locking Device.

Sample Picture of a Riverhawk Locknut

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

Stud Size	Set Screw Size	Torque
1-1/8″ [29 mm]	#10-32 UN	30 in·lbs - 36 in·lbs [3.4 N·m – 4.1 N·m]
1-1/4″ [32 mm]	#10-32 UN	30 in·lbs - 36 in·lbs [3.4 N·m – 4.1 N·m]
1-1/2″ [38 mm]	1/4"-28 UN	65 in·lbs - 87 in·lbs [7.3 N·m – 9.8 N·m]

12.0 Stud/Nut Removal

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

12.1 Removal of Assemblies with Liquid Locking Compound

For those assemblies 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. (see section 5.2.2)
- Install the appropriate puller tool to the stud as described in Section. 8.0.
- 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.

Flange Position	**Stud Size**	**Final Pressure**
Turbine to Coupling	1-1/8″ [29 mm]	18000 psi [1250 bar]
Coupling to Gearbox	1-1/8″ [29 mm]	18000 psi [1250 bar]
Gearbox to Generator **Check Tool markings for part number**	1-1/4″ [32 mm]	18000 psi [1250 bar] w/ **HT-1466** 12500 psi [860 bar] w/ **HT-0176**, **HT-0219**, & **HT-0815**
Gearbox to Generator	1-1/2″ [38 mm]	15000 psi [1035 bar]

- **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.**

CAUTION

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

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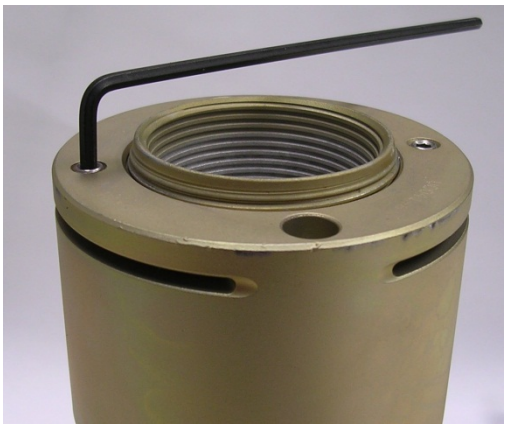
WARNING:
FIRE HAZARD; DO NOT heat when puller assembly is in place. Personal injury or equipment damage may occur. Use of an Oxy-Acetylene torch is not recommended

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 puller tool, apply the appropriate pressure per the following table and loosen the nut. Then release the pressure and remove the puller tool.

12.2 Removal of Assemblies with Mechanical Locknuts

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

1. Using a wire brush and shop air clean the internal tapered thread of the stud to remove any debris/deposits which may have accumulated during service. (see section 5.2.2) With an Allen-wrench loosen the two locking set screws but do not remove from nut.



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

2. Install the appropriate puller tool to the stud as described in Section 8.0.

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3. Apply the appropriate hydraulic pressure per the table of Section 12.1 and using the spanner ring and spanner wrenches loosen the nut, then release the pressure and remove the puller tool.

13.0 Storage Instructions

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

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

13.1 Hydraulic Pump Kit Storage

13.1.1 MP-0130 Manual hydraulic pump

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

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

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

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

Place the hydraulic pump kit into the original shipping container.

13.1.2 AP-0532 Air-Driven hydraulic pump

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

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

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

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

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

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

Place the hydraulic pump kit into the original shipping container.

13.2 Hydraulic Tensioner Storage

Check the tensioner for any damage

1. Clean puller screw and check for any debris and dents.
2. Puller screw should be free to rotate and move back and forth.
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.

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

Place protective red plastic cap into the hydraulic port.

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

13.3 Store shipping container

Secure the hydraulic pump and hydraulic tensioner into the original shipping containers using the supplied wood braces.

Seal the original shipping container and store under shelter and protected from moisture, sand, and grit.

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14.0 Frequently Asked Questions

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

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

A: No. Both the tensioner and the stud may have been damaged. 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. 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.

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

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

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

A: Remove the stud from the bolt hole. Check if the hydraulic pump is set to the right pressure. Re-measure the stud's initial length then try to install the stud again.

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Q: Is there an easier way to support or move the tensioner around the coupling shaft?

A: Use two straps. One around the coupling shaft and the other attach to any overhead support. Straps must be slack during mounting tensioner to stud and during tensioning.

Q: The tensioner is at its final pressure, but the nut cannot be loosen.

A: If the nuts cannot be loosened at the final pressure, continually increasing the pressure will not help and can be dangerous and in some cases make it harder to remove the nut. Check the nut to see if its set screws have been loosened. Check for and remove any corrosion around the nut's threads.

Q: How do I clean the conical threads on a stud?

A: The conical threads are best cleaned using a spiral wound brass brush in a drill as described in section 5.2.2

Q: During the initial steps of removing a tensioned stud, the stick-out length is found to be wrong.

A: Do not proceed. Contact Riverhawk for assistance. With the wrong stick-out length, the hydraulic tensioner has a limited stroke and may not work properly and can be damaged.

Q: The hydraulic pump appears to be leaking.

A: Check the hose connection to the hydraulic pump. If the 1/4" high pressure fitting is not assembled correctly, it may look like the pump is leaking. If the problem continues, it may be necessary to open the pump kit. Contact Riverhawk for guidance.

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Q: The hydraulic hose has a collar on it that can't be moved by hand

A: The collar is sometimes held in place with a thread locking compound. This prevents the collar from moving too easily. It may be necessary to adjust this collar with a set of vise-grip pliers. Be careful to not strip the threads off the tube or hose end.

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15.0 Revision History

Revision Letter	Effective Date	Description
AC	Sep 2, 2011	Added HT-5332 to section 4.5
AB	Nov 12, 2010	Added HT-2268 to section 4.5
AA	Aug 18, 2009	Revise page 1 for GE 392A7490, Revised sections 2.1 thru 2.9, Revised sections 4.4, 5.1, 7.1.1, 11.1, 11.2, and 12.2, Added section 13, Removed figure 4
Z	Aug 12, 2009	Added section 2.9, revised section 4.5 by adding HT-2569
Y	Jun 10, 2009	Added turbine oil and removed "Never Seize" from sections 1.0, 3.0, 8.1, 8.2, and 9.0
X	Mar 25, 2009	Added sections 3.0 and 13.0
W	Mar 04, 2009	Expanded warning statement on bleeding tensioner and page 2 and 7
V	Aug 29, 2007	Added HT-2286
U	Jan 25, 2007	Added GE title block
T	Jul 26, 2005	Revised stretch values for 1.25" stud
S	May 27, 2005	Clarified HT-1466 note
R	Dec 15, 2004	Moved caution notes
Q	Apr 30, 2004	Added HT-1019 to tool list
P	May 01, 2003	Added short stud reference
N	Jul 09, 2002	Added AP-0532
M	Jul 01, 2002	Added dual units [metric]
L		

Revision Letter	Effective Date	Description
K	Dec 14, 2001	Page 3 para 2.5, Page 8 para 7.1, Page 9 para 7.2
J	Jun 09, 2000	Page 2 para 2.0, Page 5 para 4.0 & 5.3, Page 9 para 7.2, page 11 para 9.1
H	Jan 10, 2000	Page 1
G	Jul 20, 1999	
F	Mar 23, 1999	
E	Nov 09, 1998	
D	Oct 22, 1997	
C	May 09, 1997	
B	Feb 11, 1997	
A	Nov 25, 1996	
-	Jun 19, 1995	Released

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FIGURE 1

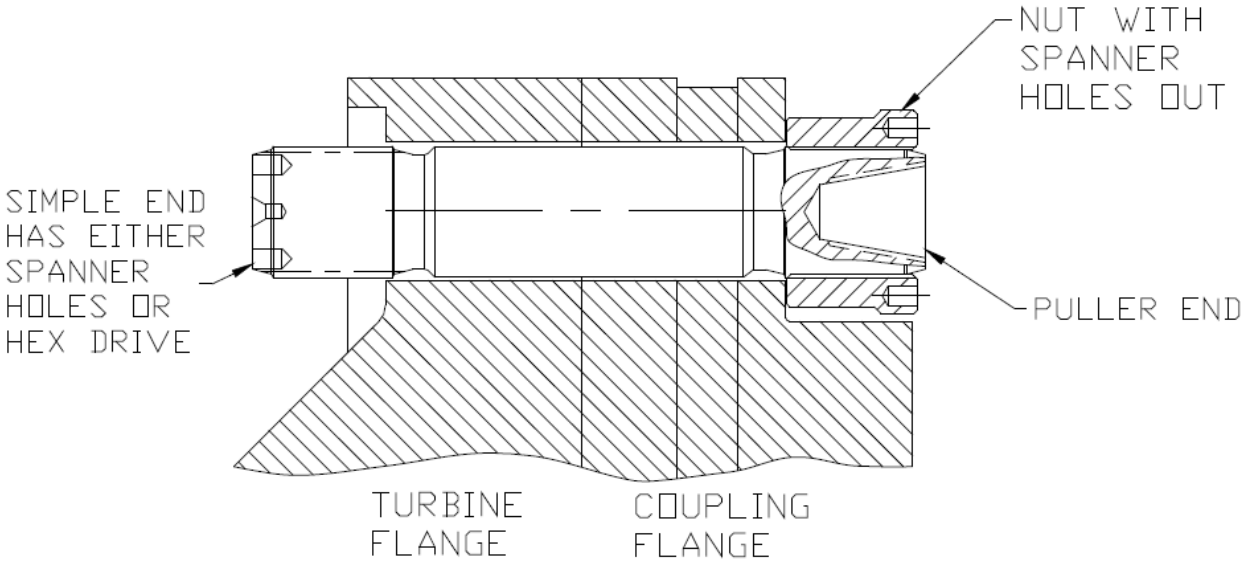

FIGURE 2

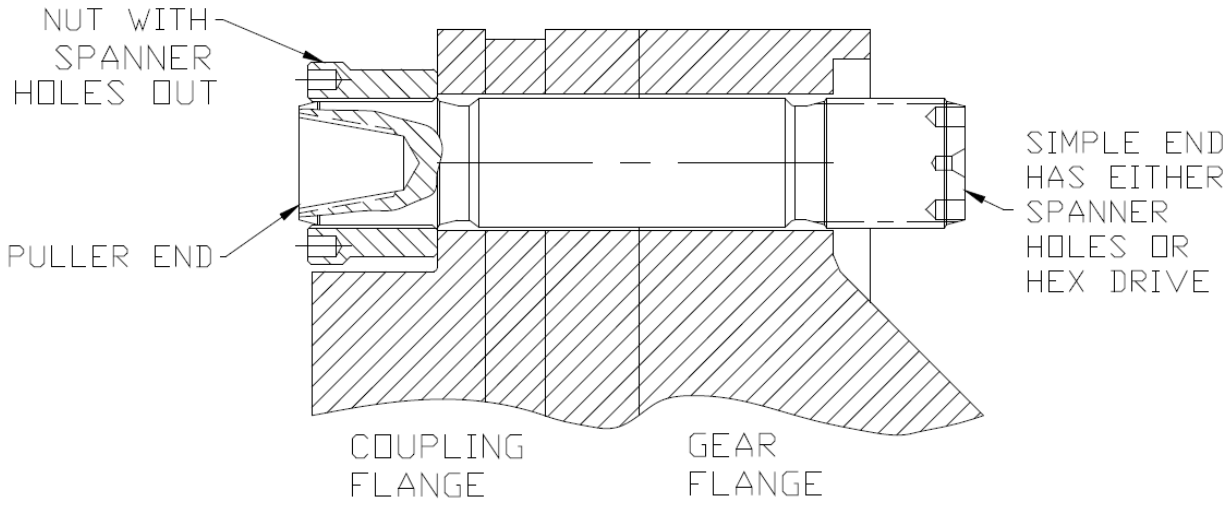

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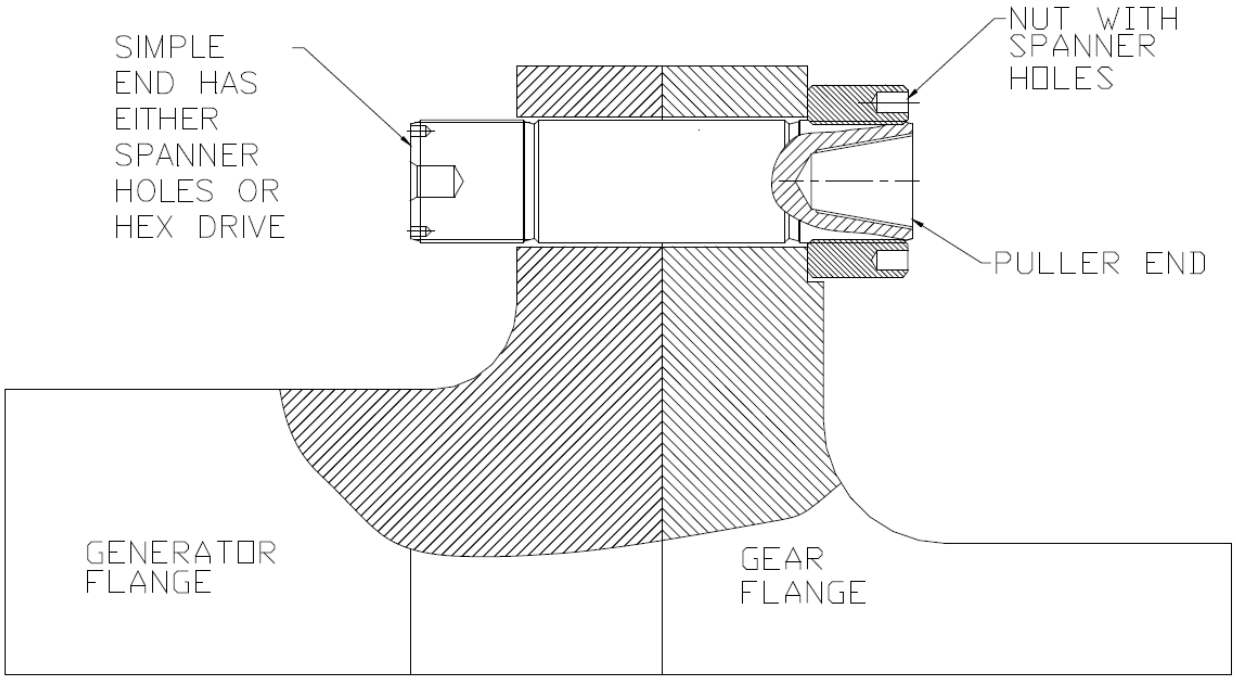
FIGURE 3



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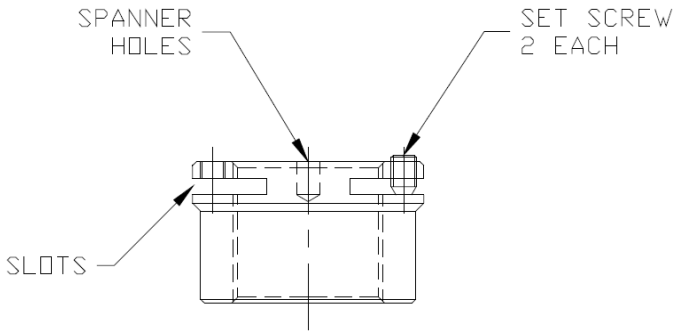

TYPICAL STUD LOCKNUT
FIGURE 5

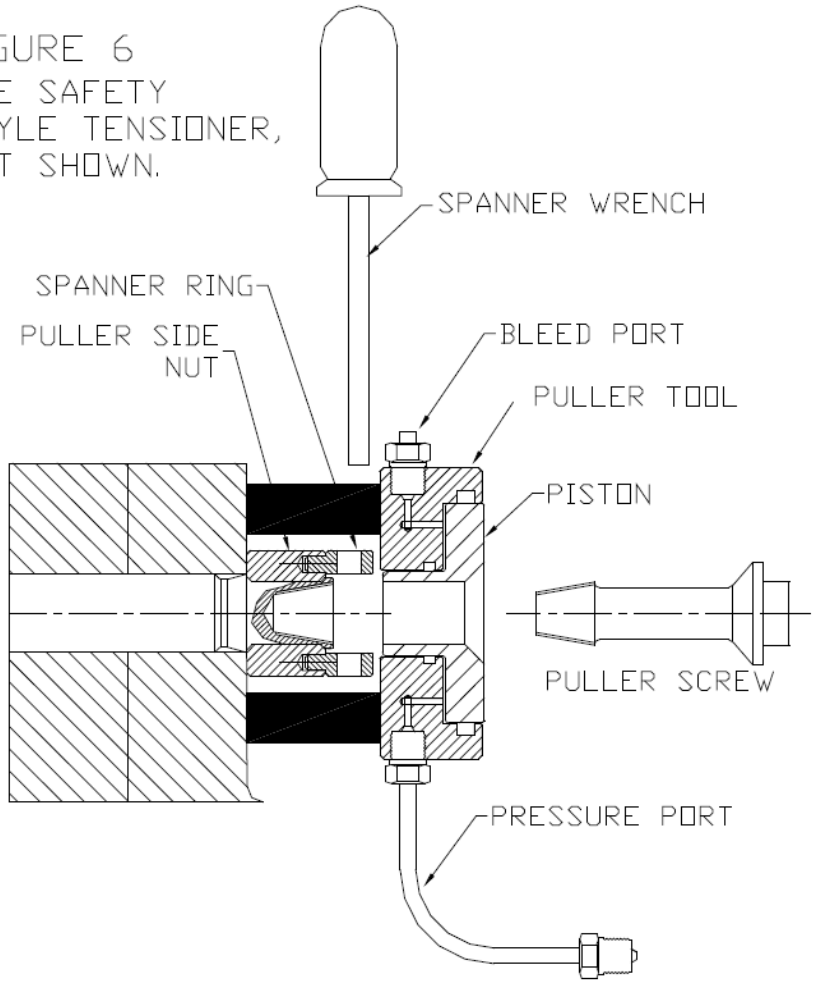

FIGURE 6
SEPARATE SAFETY CAGE STYLE TENSIONER, CAGE NOT SHOWN.

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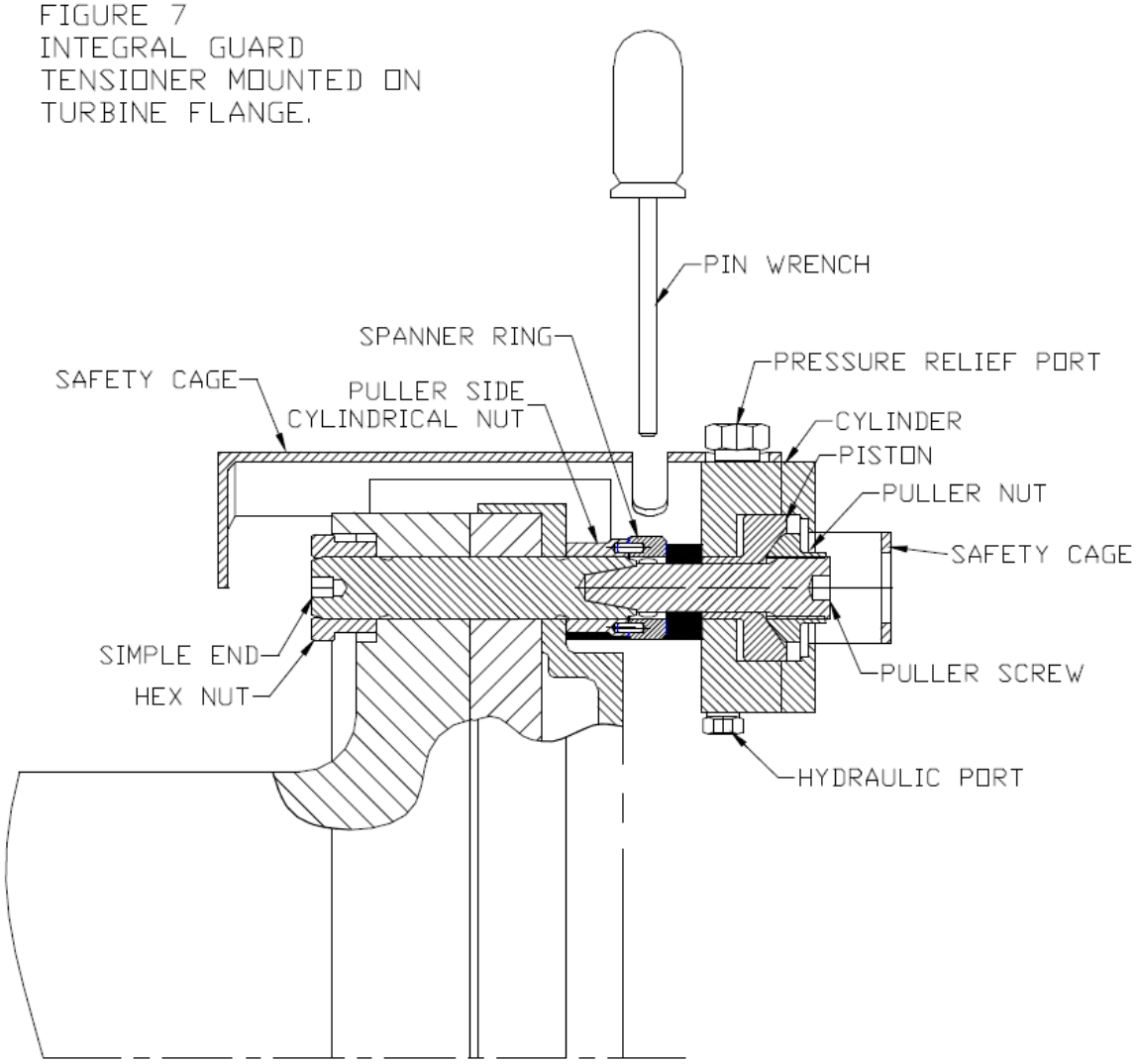
FIGURE 7
INTEGRAL GUARD
TENSIONER MOUNTED ON
TURBINE FLANGE.



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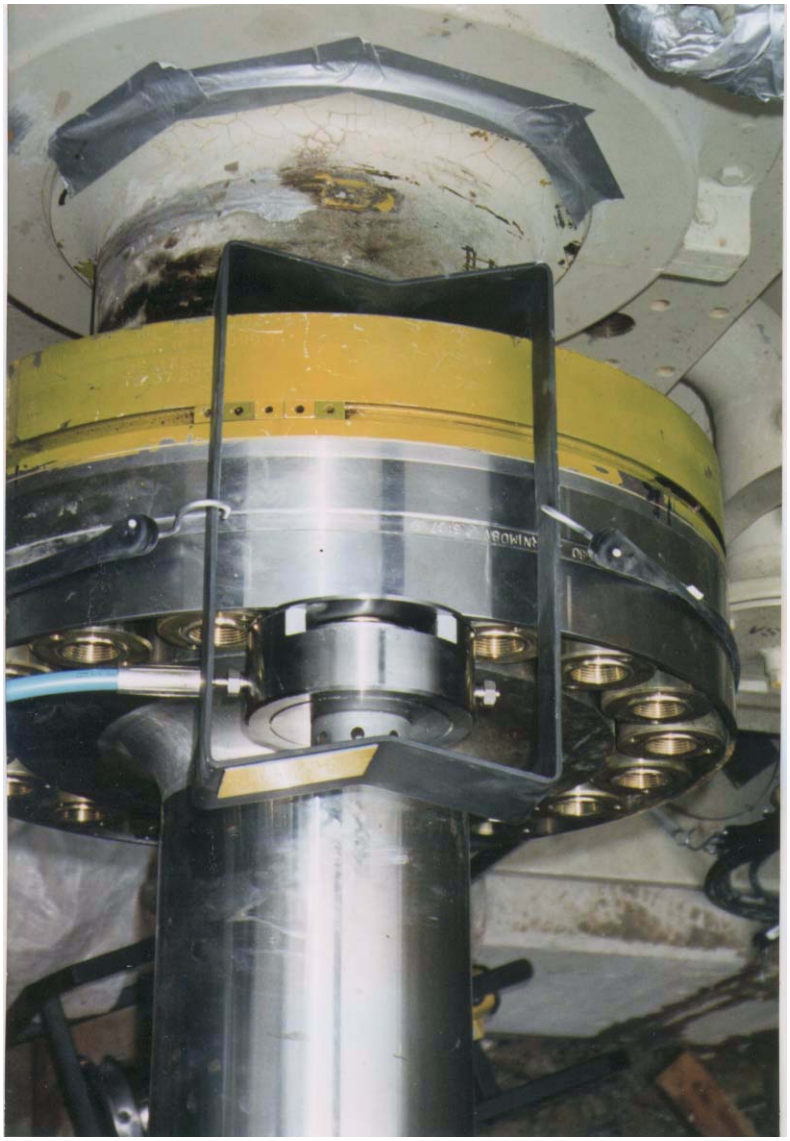

Photo 1
Looking down on gear to generator flange of 6FA machine. Shows 2” puller tool mounted with safety cage in place.

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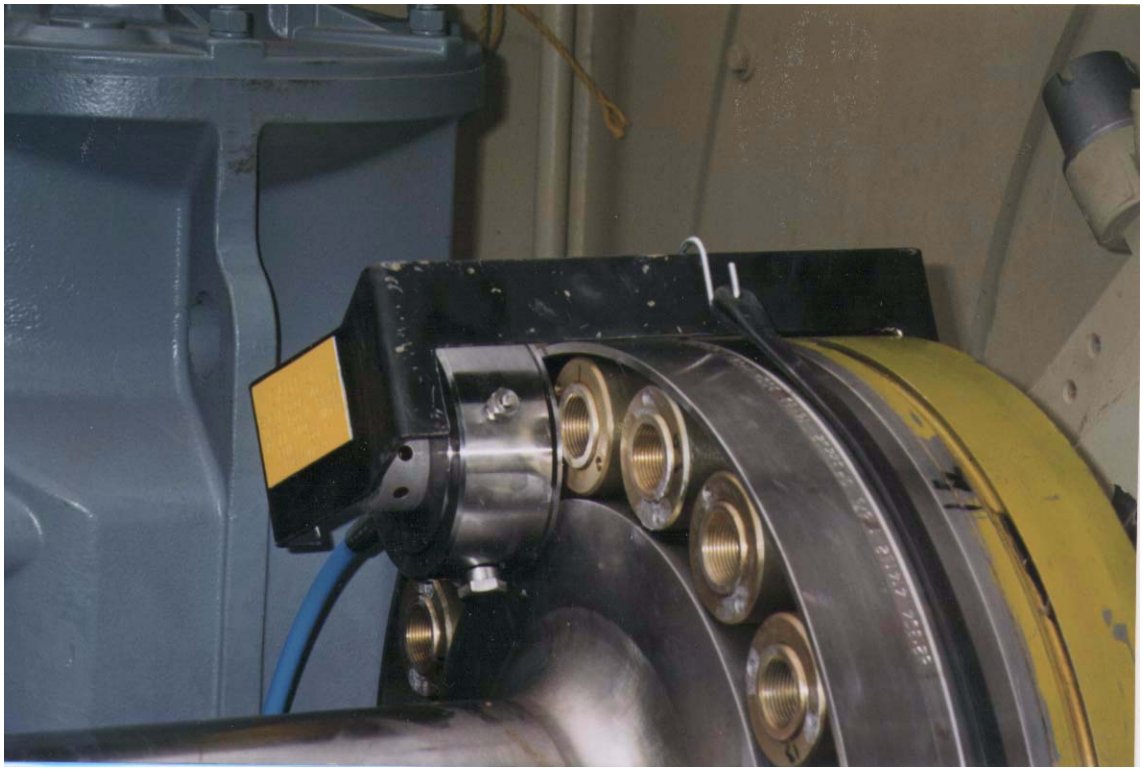

Photo 2
Side view of 2″ puller tool and safety cage on 6FA machine.

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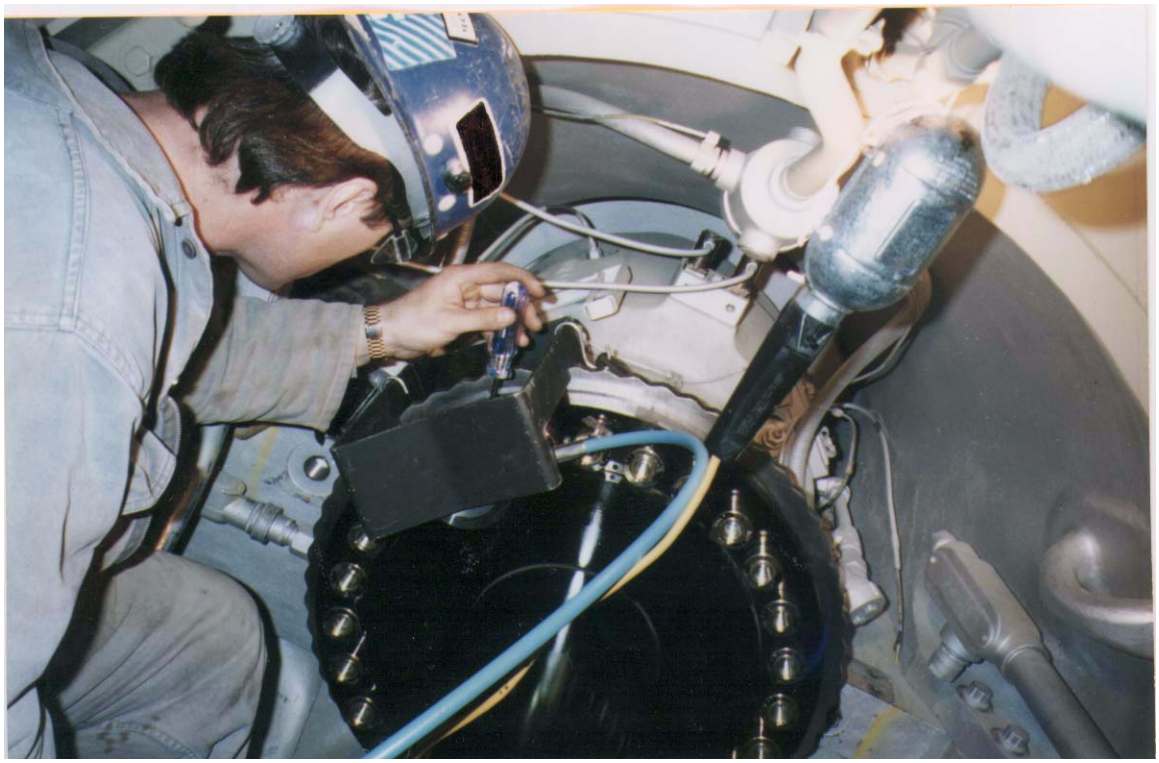

Photo 3
Top view of 1-1/8" puller tool and safety cage in place. Tool is mounted on coupling to gear flange of 6FA machine.

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

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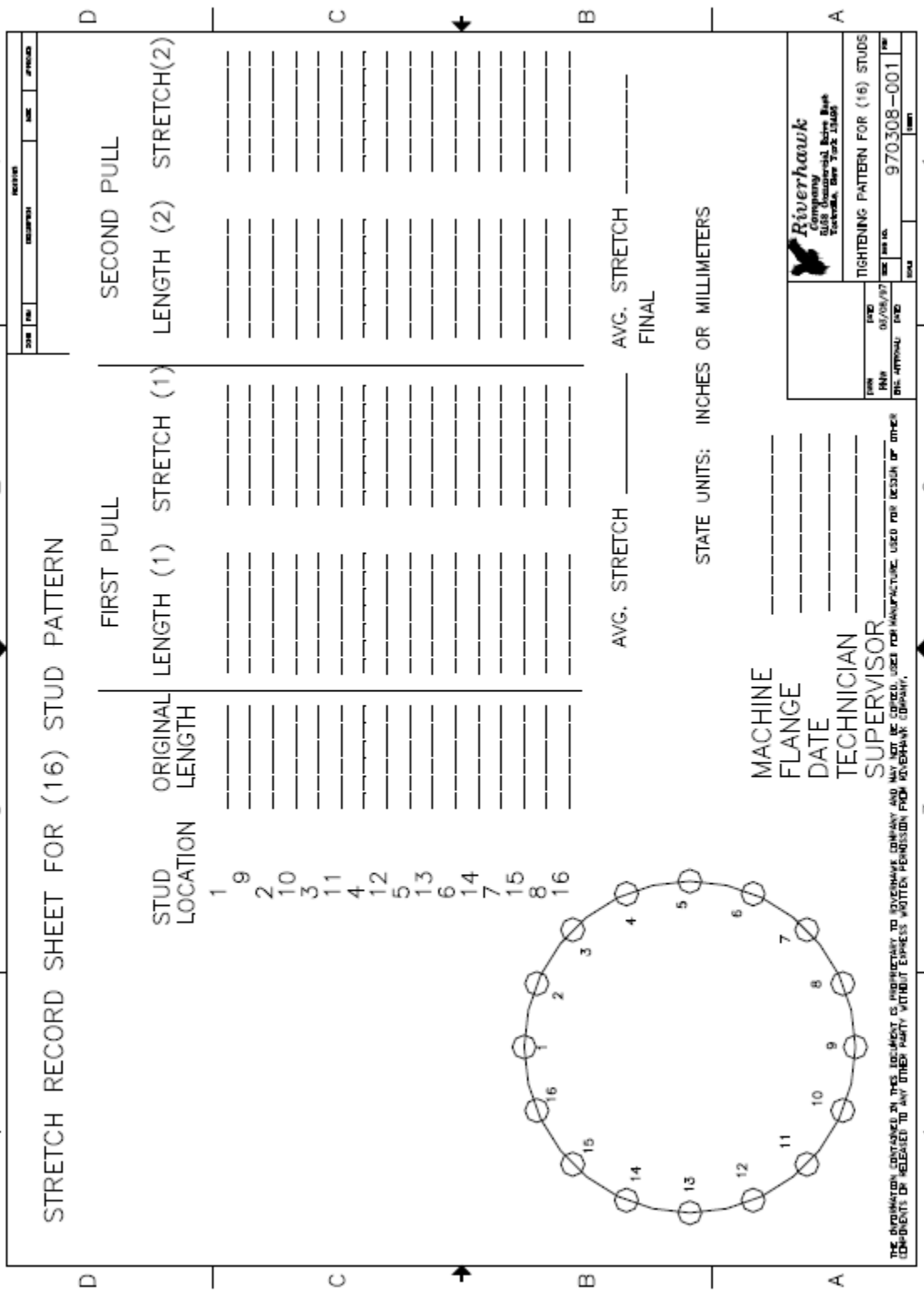

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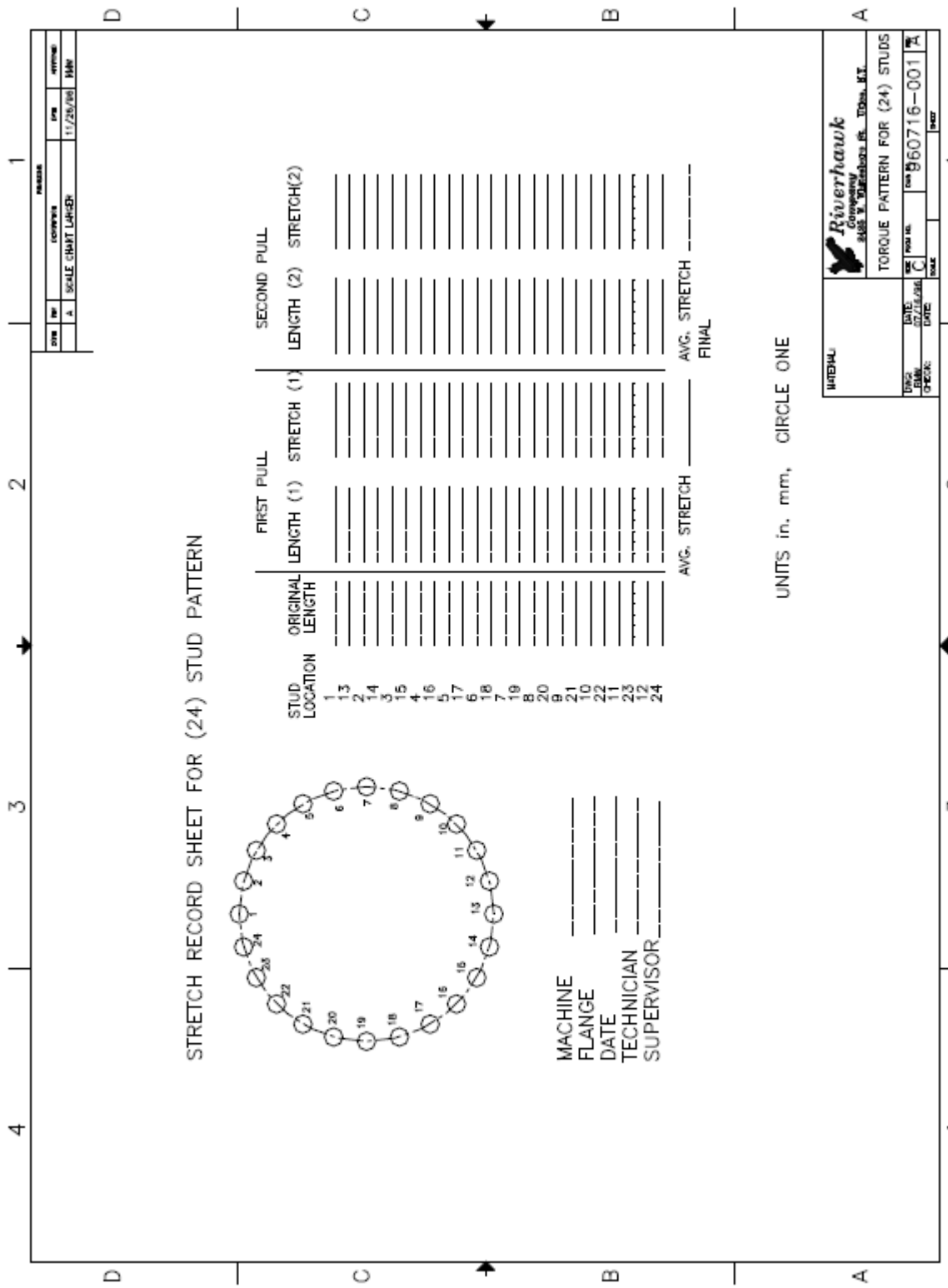

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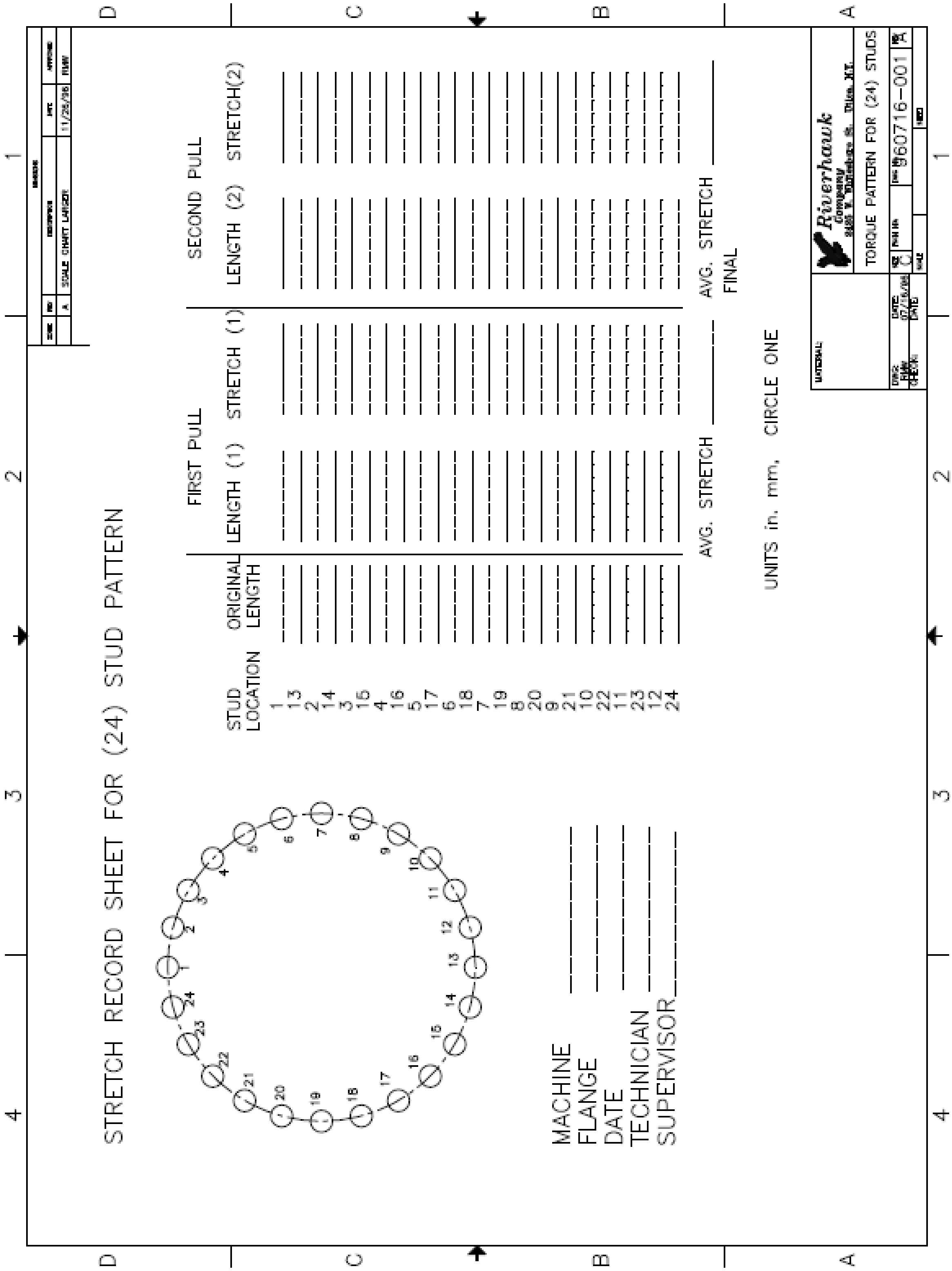

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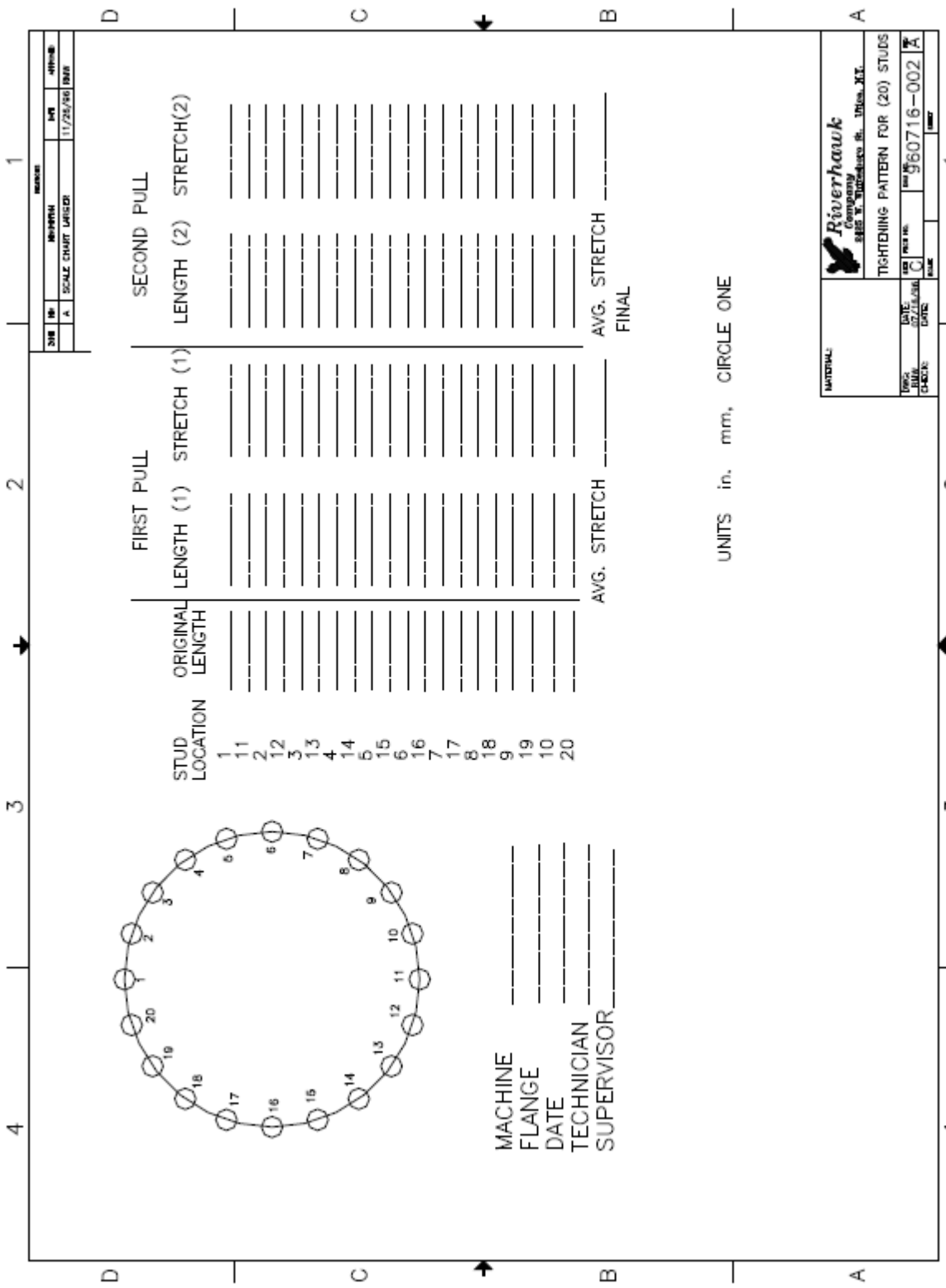

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