INTEGRA™
TECHNOLOGIES

OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner

Section 1

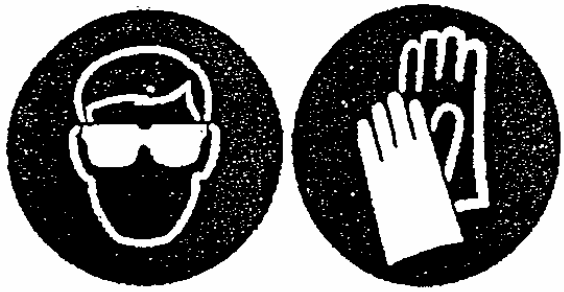
Safety Notes

Rev. 3, 05/99

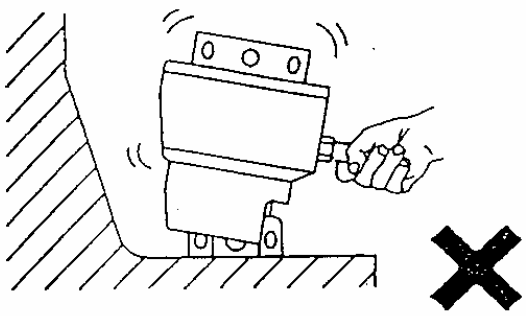
INTEGRA TECHNOLOGIES

I. SAFETY NOTES

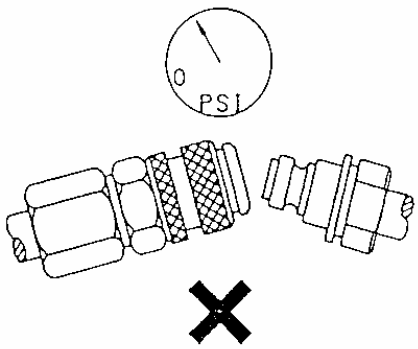
1 Eye protection and gloves should be worn at all times.



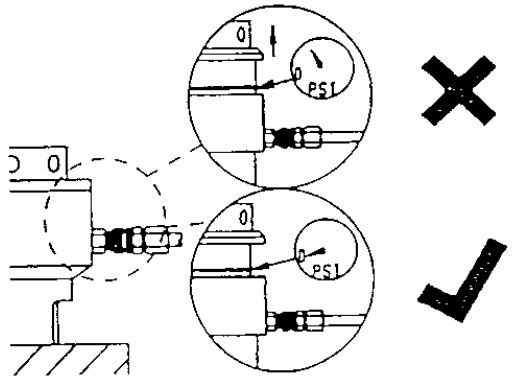
2 Do not handle the tools by the Hydraulic Connection.



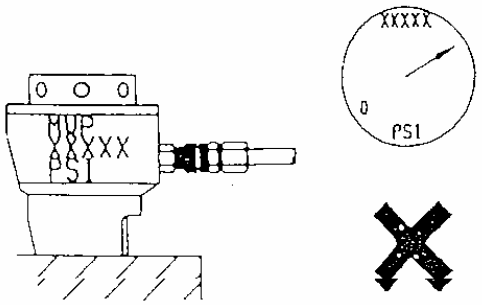
3 Before pressurizing, ensure that all quick release hydraulic connections are firmly coupled together.



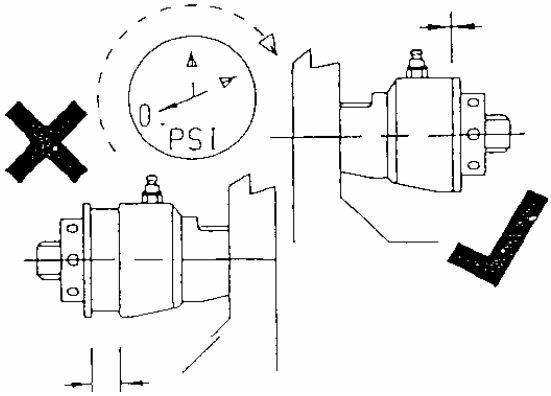
4 **DO NOT** exceed the max. stroke of the tool. This is indicated by the appearance of a ring on the outside of the Ram as it extends.



5 Under no circumstances, exceed the maximum stated working pressure.



6 Always ensure that the rams are fully retracted before pressurization begins.



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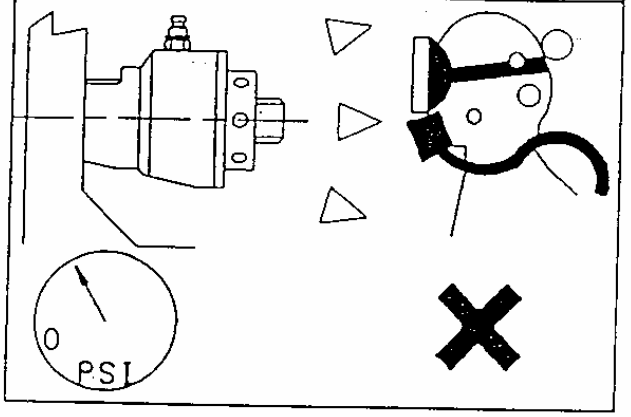
7

DO NOT position yourself in line with the direction of force of the Tensioners when the system is under pressure.



8

In case of emergency, contact INTEGRA on the following telephone number...

S.O.S.

713) 477-5505 OR (800) 779-2658
24 HOUR COVERAGE

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Section 2

Studbolt & Flange Preparation

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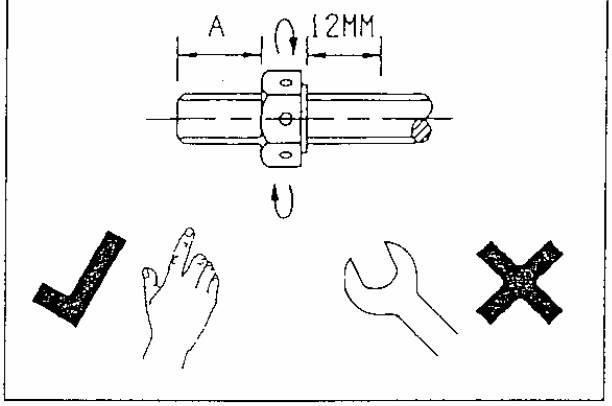
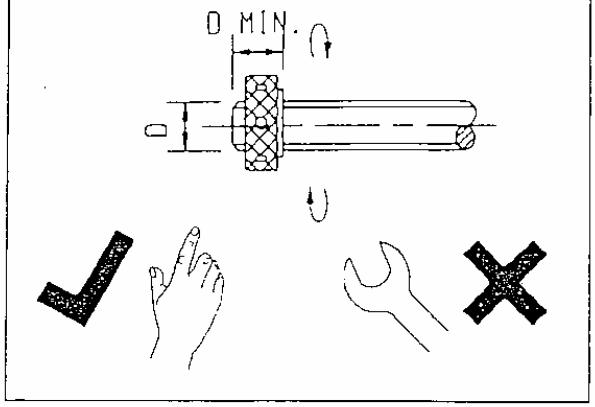
2. STUDBOLT & FLANGE PREPARATION

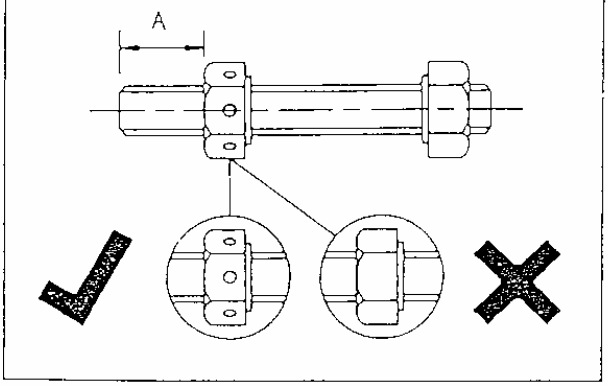
1	Ensure that the drilled nut is free running over the studbolt for the length shown.



2	Ensure that a Reaction Nut is free running over the studbolt for the length shown,



3	Assemble the hexagon nuts to the studbolts as shown below.



4	Length "A" is determined by the tool size being used. This is the amount of stud above the nut needed to install the tool.

TOOL REF.	Z	A	B	C	D
LENGTH "A" inches	5.32"	5.59"	5.90"	6.07"	6.30"
TOOL REF.	E	F	G	H	I
LENGTH "A" inches	7.13"	7.41"	7.53"	8.51"	8.87"

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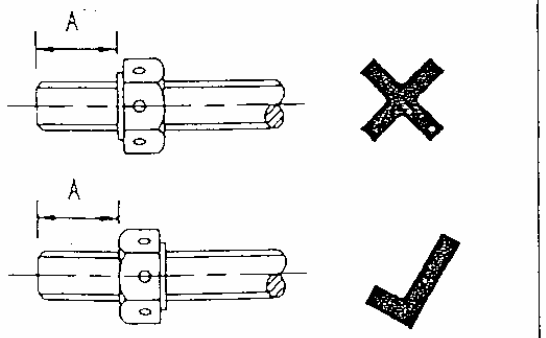
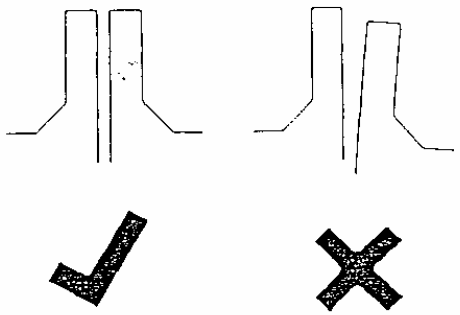
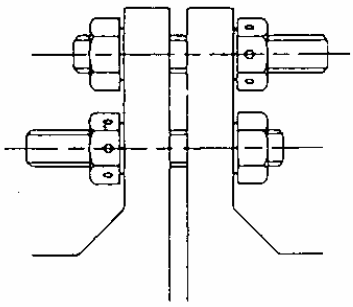
5	The washer face of the hexagon nuts should be facing inwards.



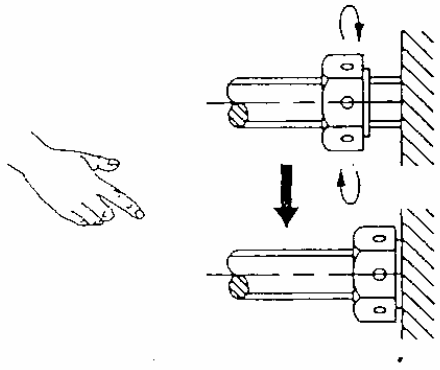
6	Before assembling the studbolts to the flange, ensure that the flange faces are close and square to each other.



7	Assemble the studbolts to the flange with the longer protrusion and drilled nuts positioned alternately on either side.



8	The hexagon nuts should be hand tightened up to the face of the flange.



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Sea Serpent Tensioner

Section 3

Tool Assembly to Flange

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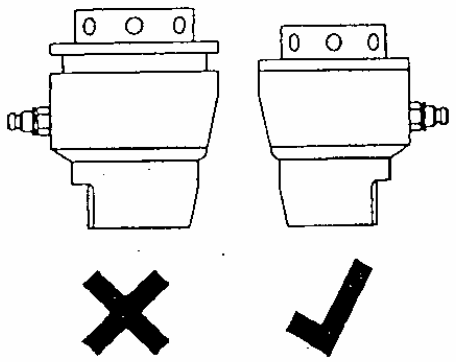
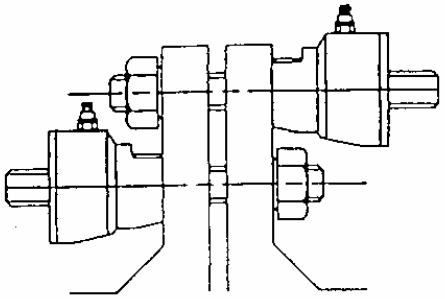
3. TOOL ASSEMBLY TO FLANGE

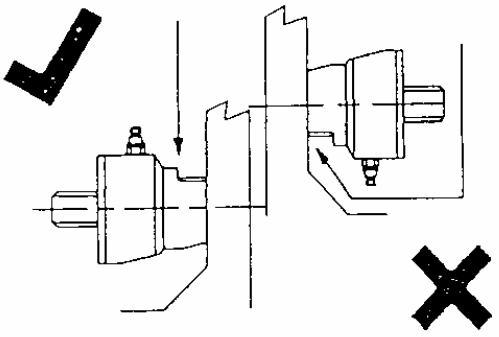
1 Ensure that the rams are fully retracted.



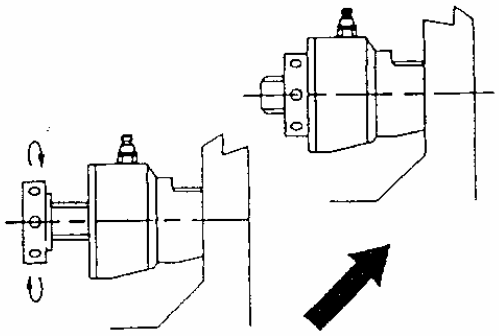
2 Slide the tools onto the longer protrusion of studbolt, on alternate sides of the flange.



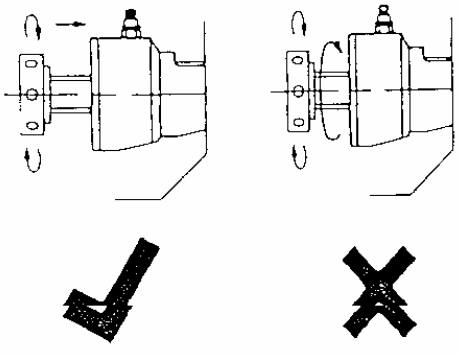
3 Ensure that the Bridge window is facing radially outwards, allowing free access to the drilled nut.



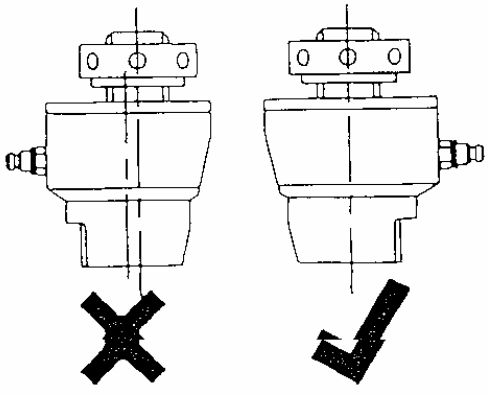
4 Screw the Reaction Nuts onto the studbolts until they clamp down onto the tool Rams.



5 When screwing the Reaction Nut onto the studbolt, ensure that the studbolt does not turn.



6 Ensure that the spigot on the Reaction Nut is correctly located in the tool.



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Sea Serpent Tensioner

Section 4

Tensioning Procedure

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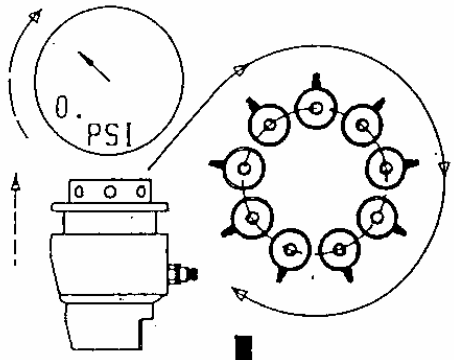
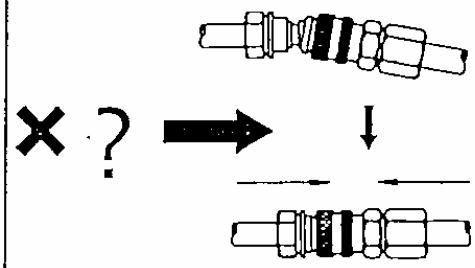
4. TENSIONING PROCEDURE

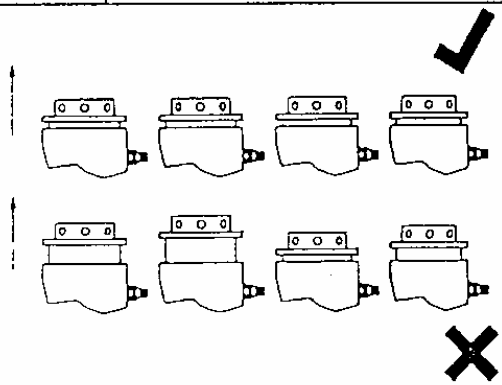
1 Operate the pump, instruct the diver to check that a gap is appearing between the Rams and Bodies of the tools.



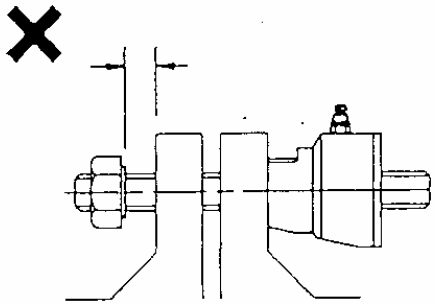
2 If not, check that all Hose connections are properly made.



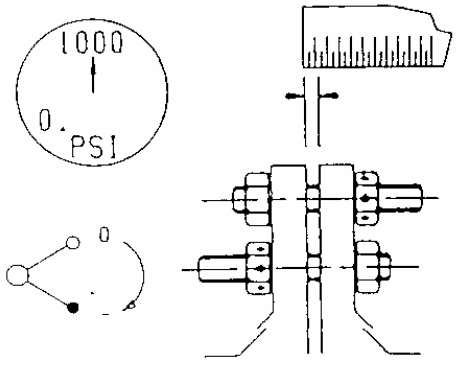
3 Also, check that no one tool has a gap excessively different to any other.



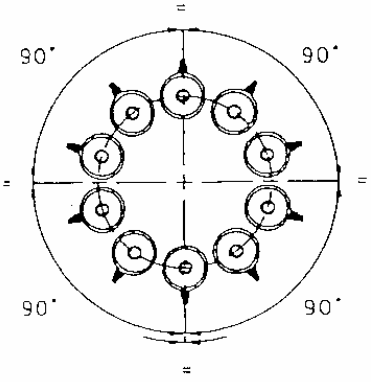
4 If so, check that the hex. nut on the back of the flange is tight up against the flange.



5 At pressure 1000psi, stop the pump and take measurements between the flange faces.



6 At 90° increments, this gap should be equal, indicating that the flange is being pulled together squarely.



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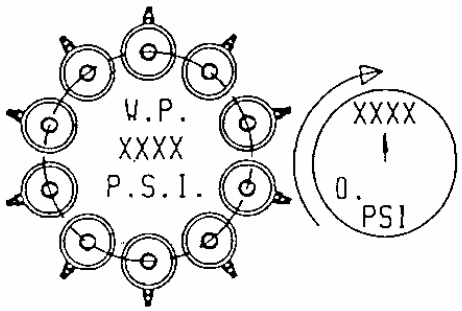
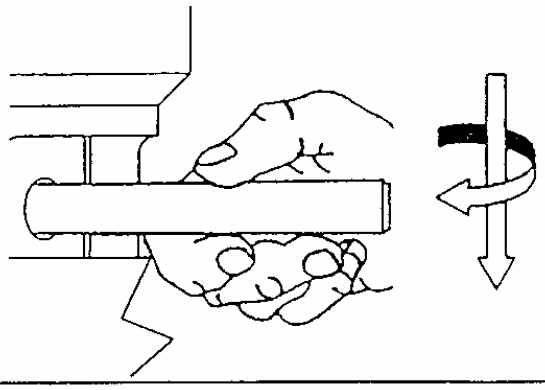
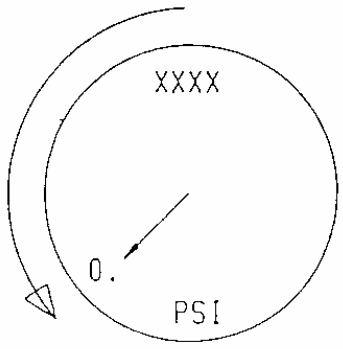
7	Increase the hydraulic oil pressure to that recommended for the flange being tightened.



8	Tighten down the hexagon nuts by inserting a Tommy bar into the drilled holes and turning clockwise.

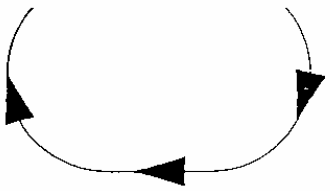


9	Release the hydraulic oil pressure.



10	Repeat operations 8 and 9 once more. Remove the tools from the flange.

OPS 8&9 (x1).



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Sea Serpent Tensioner

Section 5

De-Tensioning Procedure

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Determination of
Pressure "A" and Pressure "B"

In order to determine pressure "A" and pressure "B" the following information is required:

1) The grip length of the bolts being tensioned (Refer to Fig. 4 on the following page).

2) The required minimum residual stress to be developed in the bolts.

3) The bolt diameter and pitch.

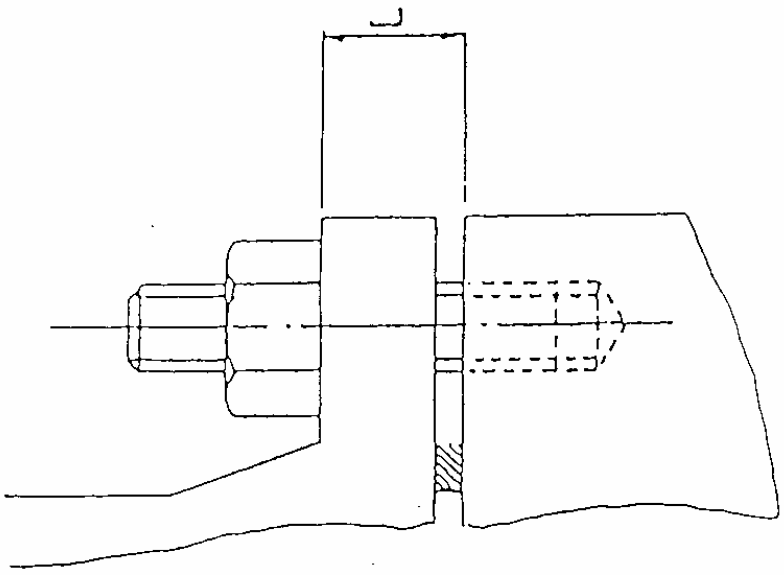
4) The tool reference number of the tool being used.

5) Select the graph corresponding to the bolt diameter and tool number being used.

6) Determine the grip length of the bolts to be tensioned.

7) For the grip length selected, read off the graph the oil pressure "B" corresponding to the minimum residual bolt stress required.

SEA SERPENT® STUD TENSIONERS



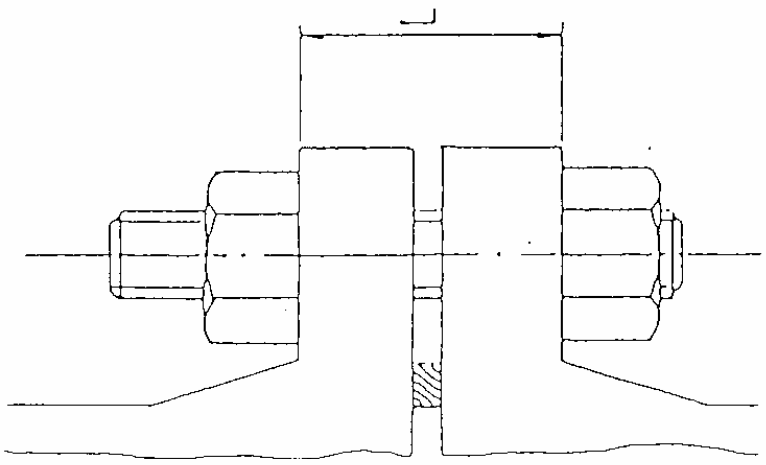


Fig. 4. Grip length

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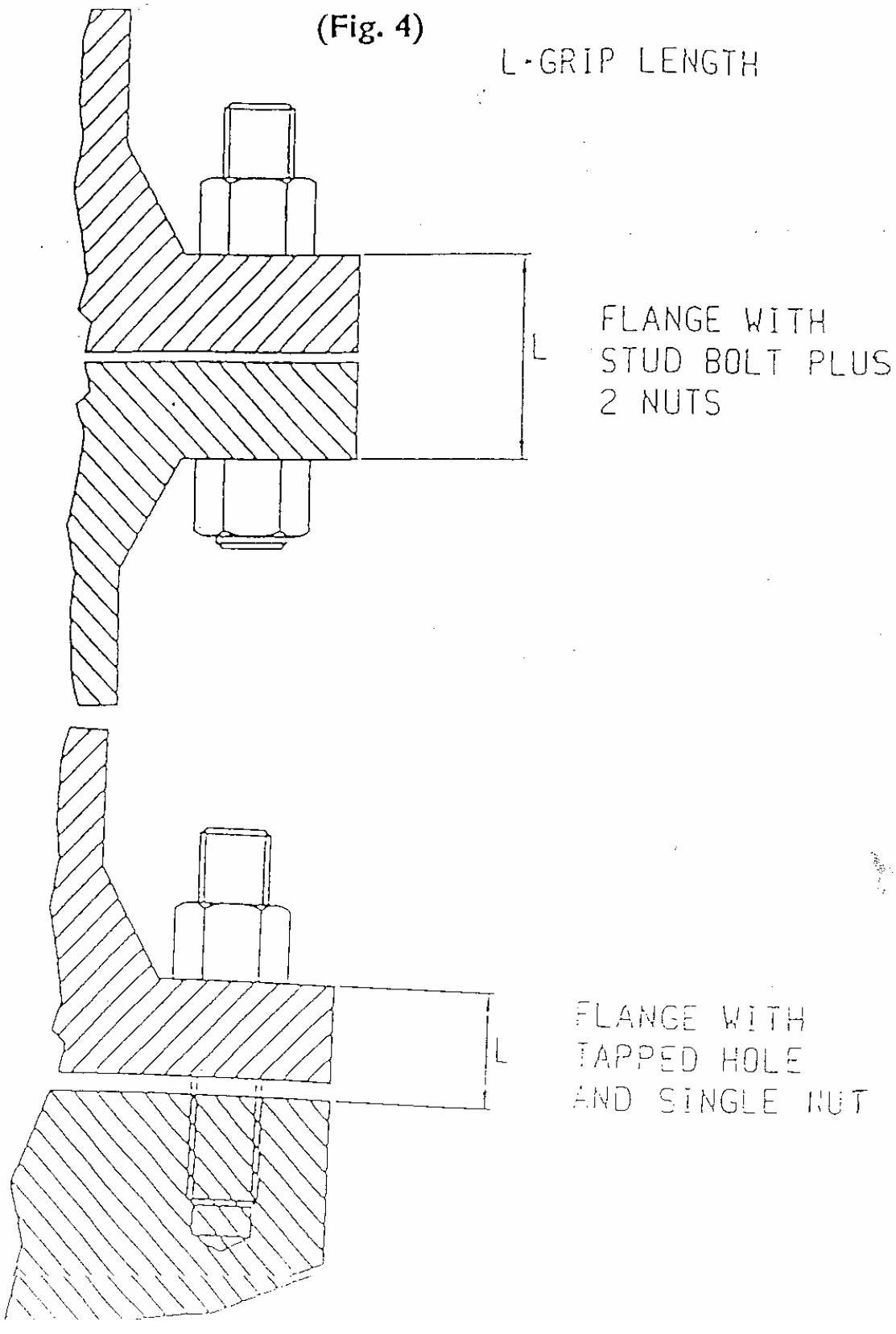
SEA SERPENT® STUD TENSIONERS

EXPLANATION OF GRIP LENGTH

(Fig. 4)



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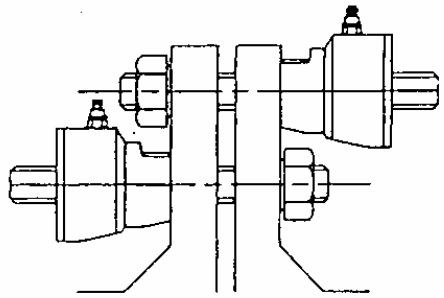
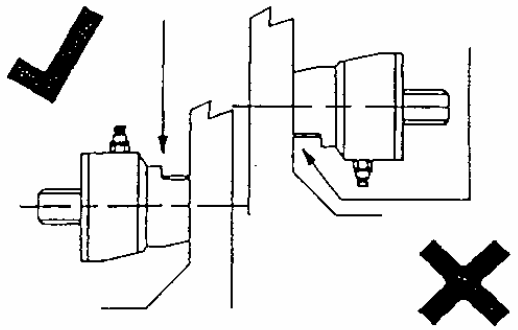
5. DE-TENSIONING PROCEDURE

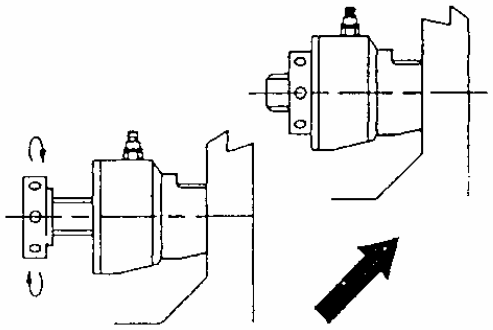
1 Slide the tools onto the longer protusion of the studbolt, on alternate sides of the flange.



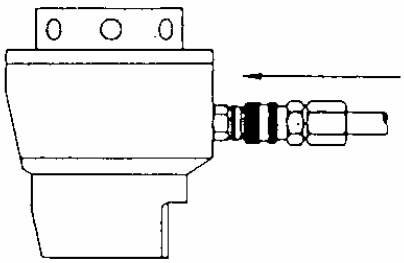
2 Ensure that the Bridge window is facing radially outwards, allowing free access to the drilled nut.



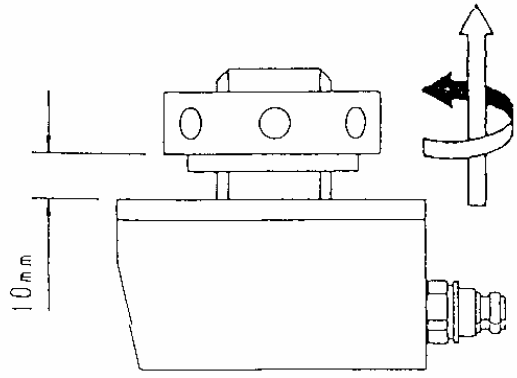
3 Screw the Reaction nuts onto the studbolts until they clamp down onto the tool rams.



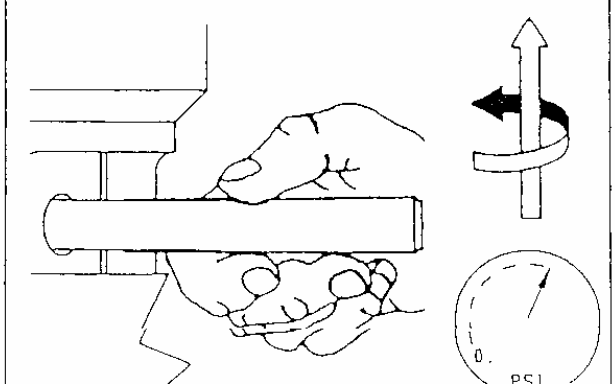
4 Connect the Hydraulic Harness to the Tensioners.



5 Screw back the Reaction nuts until a 10mm gap appears between them and the Hydraulic Head.



6 Slowly pressurize the tensioner until the nut can be loosened using a tommy bar inserted into the drilled holes.



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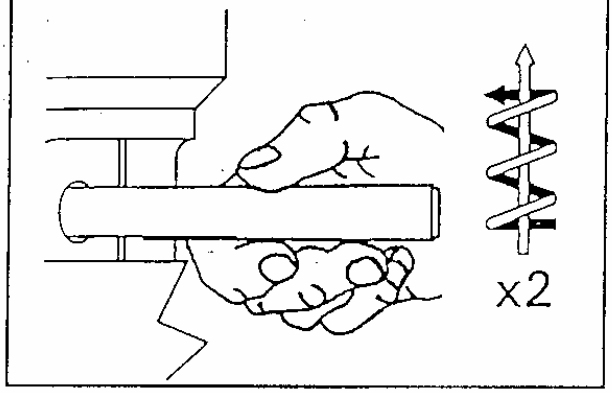
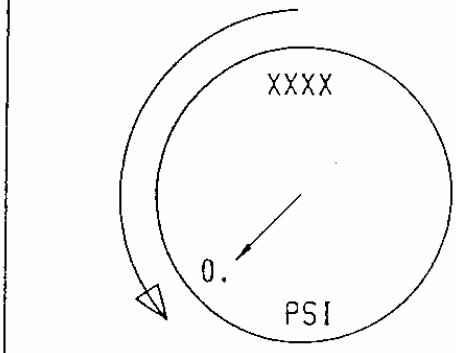
7	Screw back the hexagon nuts two complete turns, i.e, 12 flats.



8	Release the hydraulic oil pressure and remove the Tensioners from the flange.



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SAFETY MANUAL
Sea Serpent Tensioner

Section 6

After Using the Tensioners

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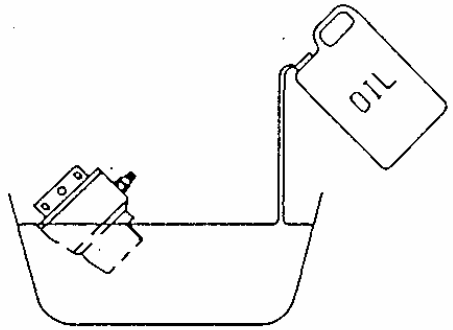
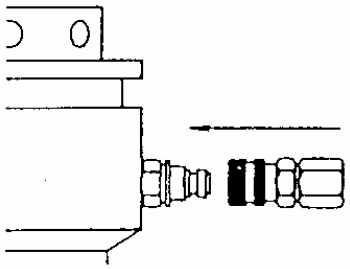
6. AFTER USING THE TENSIONERS

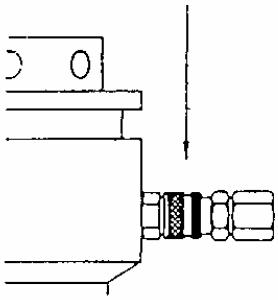
1 Rinse each tool in a light oil.



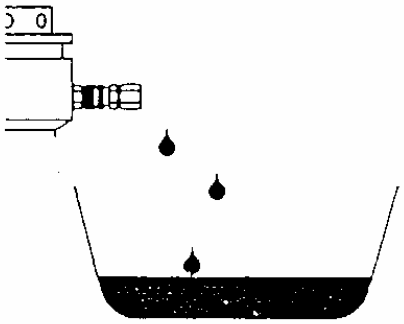
2 Connect an open ended female coupling to the male nipple on the tools.



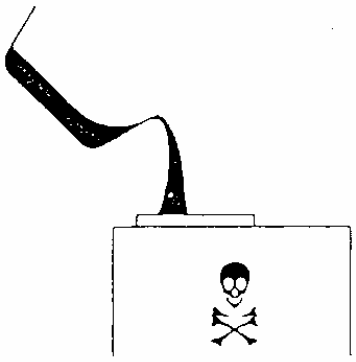
3 Retract the Ram either manually or by using an Hydratight Ram retract jig.



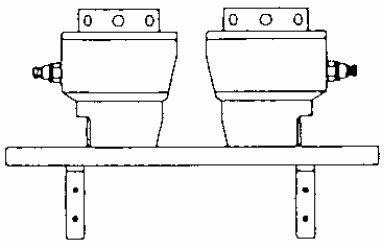
4 As the Ram is retracted, collect the oil that pours from the open ended female coupling.



5 Discard this oil as it will have been contaminated by sea water.



6 Remove the tools to storage.



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Section 7

Important Notes & Maintenance

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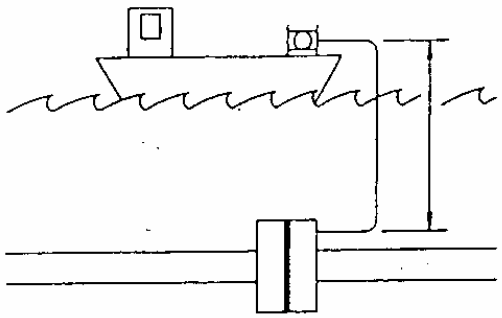
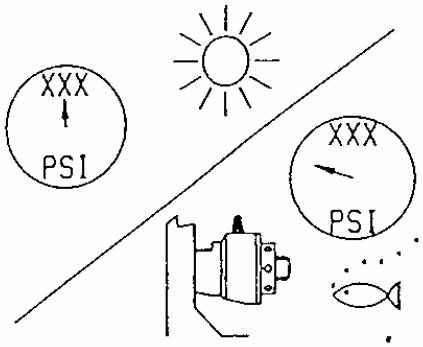
7. IMPORTANT NOTE

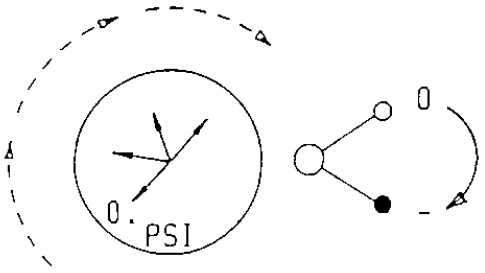
1 Due to the long distance that the hydraulic oil has to travel from the pump to the system...



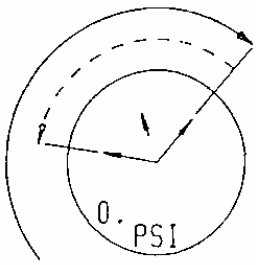
2 ... there will be a difference between the oil pressure reading at the pump, and the actual pressure of the tools.



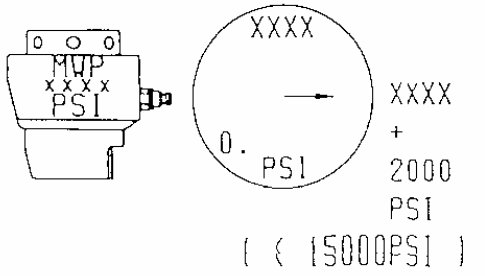
3 To overcome this, the pump must be stopped intermittently...



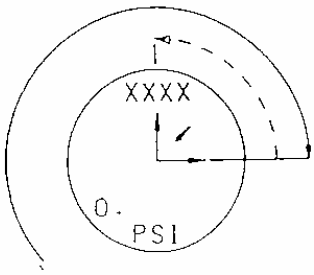
4 ... and the gauge needle allowed to settle. Thus giving the correct pressure reading at the tools.



5 For final operating pressure, the gauge needle should be taken to max. operating pressure + 2000psi...



6 ... to allow the gauge needle to settle back to max. working pressure.



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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner

Changing Oil Seals

The sealing system is very simple and the seals are easily replaced. Is consists of a rubber molding and a plastic back up ring held in place by a steel support ring and several socket head cap screws.

If an oil leak develops from the ram the first thing to check is that the socket head cap screws have not come loose. It is very important not to exert undue torque on to these screws as it may result in the stripping of thread in the seal support ring or gross bending of it. If the socket screws are tight and the oil persists the seal should be changed. To change the seal proceed as follows:

1) Connect an open-ended snap coupling to the tool connection.

2) Loosen the socket head cap screws holding the seal.

3) Insert two screws into the tapped holes in the top of the ram and pull the ram and seal assembly clear of the hydraulic head body.

4) Remove the socket screws and replace the rubber seal, taking care not to damage the "feather edge" on the plastic back up ring. If damaged this too must be replaced. When replacing the screws, leave them slack to assist reassembly into the hydraulic head.

5) Assemble the ram into the hydraulic head, taking care not to pinch the rubber seal.

6) Tighten the screws.
NOTE: Screws should be only lightly tightened. (See following table) Excess pressure on the rubber will cause unnecessary friction in the chamber, thereby making it more difficult to manually push back rams when using the tools.

7) Remove the snap coupling. The tool is now ready for use.

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Torque Setting for Preload Screws

Tool Ref.	Screw Size	Torque
Y	M3	15 LB. IN.
Z	M4	20 LB. IN.
A	M6	4 LB. FT.
B	M6	4 LB. FT.
C	M6	4 LB. FT.
D	M6	4 LB. FT.
E	M8	9 LB. FT.
F	M8	9 LB. FT.
G	M8	9 LB. FT.
H	M10	10 LB. FT.
I	M10	10 LB. FT.

WARNING:

Never exceed the torque figure specified as this could result in the bending of the seal support ring, early failure of the seal and leaking of the hydraulic head.

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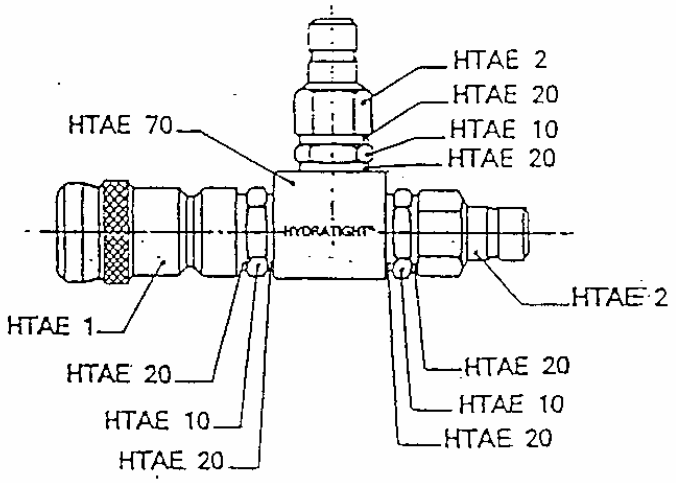
SEA SERPENT® STUD TENSIONERS

DATA SHEET HT 7/10
HARNESS COMPONENT PARTS
WITH FLEXIBLE HOSES AND QUICK
DISCONNECT COUPLINGS

TEE BLOCK. PART No. HTAE 159



Part No.	Description	No. Off
HTAE 1	Quick Disconnect Coupling	1
HTAE 2	Quick Disconnect Nipple	2
HTAE 10	¼" BSP x ¼" BSP Adaptor	3
HTAE 20	¼" BSP Dowty Seal	6
HTAE 70	¼" BSP Tee Block	1

NOTE: All quick disconnect fittings are self sealing when disconnected.
All components are oil filled, air bled and pressure tested.

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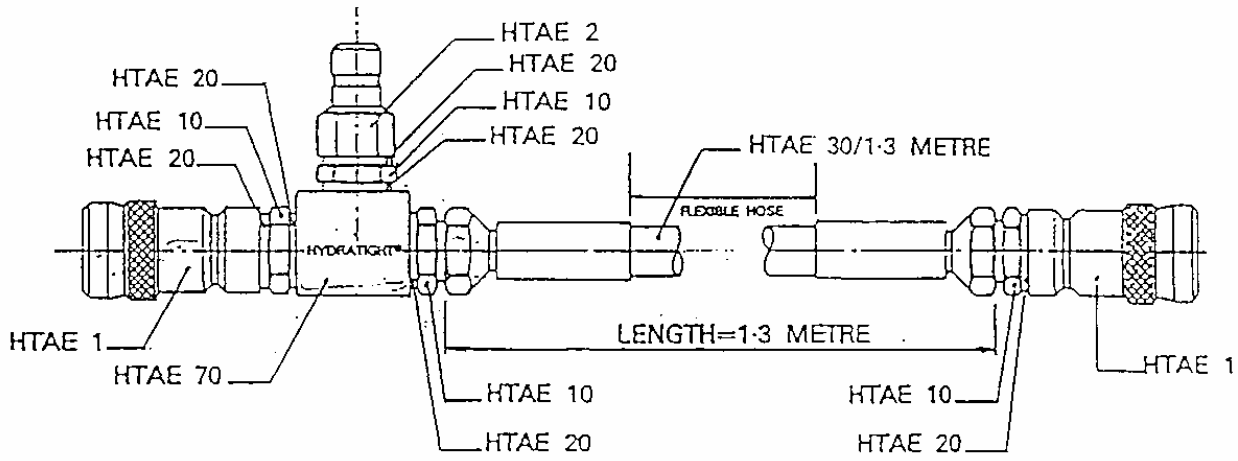
SEA SERPENT® STUD TENSIONERS

DATA SHEET HT 7/9

HARNESS COMPONENT PARTS
WITH FLEXIBLE HOSES AND QUICK
DISCONNECT COUPLINGS

INTERCONNECTING PIPE. PART No. HTAE 158

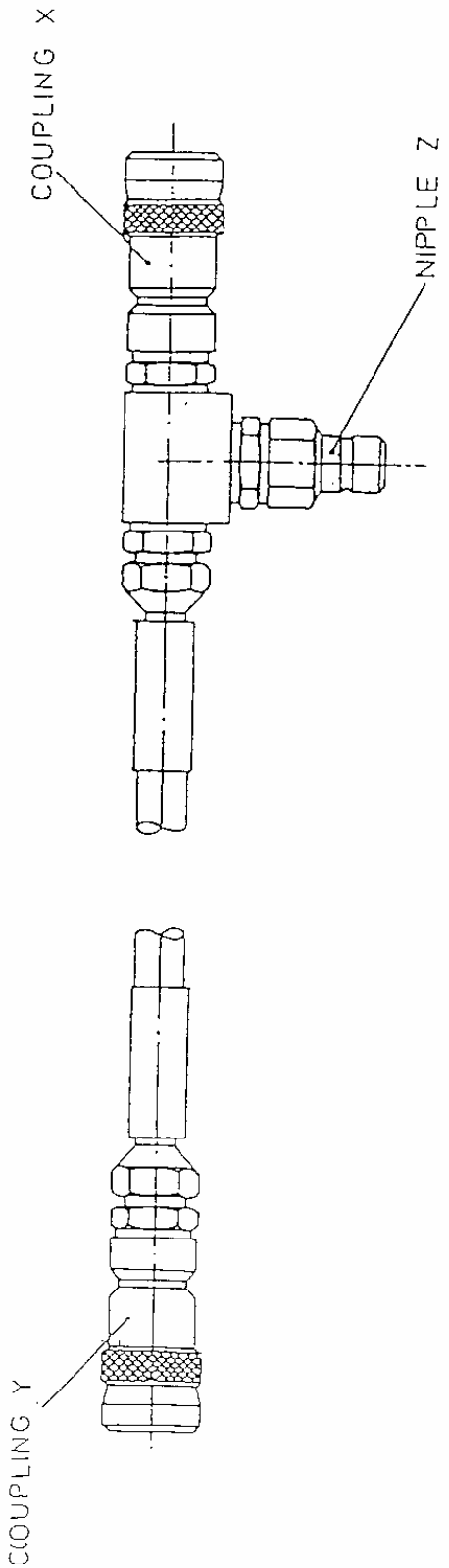


VARIOUS LENGTHS AVAILABLE

Part No.	Description	No. Off
HTAE 1	Quick Disconnect Coupling	2
HTAE 2	Quick Disconnect Nipple	1
HTAE 10	¼" BSP×¼" BSP Adaptor	4
HTAE 20	¼" BSP Dowty Seal	6
HTAE 30/1·3	High Pressure Flexible Hose with swivel end connections	1
HTAE 70	¼" BSP Tee Block	1

NOTE: All quick disconnect fittings are self sealing when disconnected.
All components are oil filled, air bled and pressure tested.

SEA SERPENT® STUD TENSIONERS



INTERCONNECTING PIPE HTAE 158

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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner

Section 8

Operating Instructions

HYDRAULIC PUMP UNIT

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&
SAFETY MANUAL
Sea Serpent Tensioner
PUMP SAFETY NOTES

1. Never pressurize the pump unit while the oil outlet nipple is disconnected. **IT IS DANGEROUS TO PRESSURIZE THE BACK OF AN UNCOUPLED QUICK DISCONNECT NIPPLE OR COUPLING.** All couplings MUST be connected or blanked off before pressurizing.

2. **Before connecting the air supply, ensure that the air flow valve is closed.** (i.e. handle in vertical position) and the oil return-to-tank valve is open. Connecting the air supply with the air valve open and oil return valve closed will immediately start the pump and could lead to excessive system pressure, especially if the pump has not been regulated as recommended in pump operations 1-12.

3. Always ensure that quick disconnect couplings are properly coupled before pressurizing.

4. Always wear safety glasses while operating the pump.

5. Never operate the pump when the lubricator has run dry as this will quickly damage the pump.

6. Keep pressurized times to a minimum. Work quickly and efficiently while system is pressurized. Always depressurize when leaving system unattended.

7. Never position yourself in line with the axis of the hydraulic bolt tensioning tool.

8. Ensure proper thread engagement of puller on the stud.

9. Never exceed maximum ram stroke.

10. Never exceed INTEGRA recommended pressures.

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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner
AIR DRIVEN HYDRAULIC PUMP UNIT

A compact robust unit designed for simplicity and speed of operation. Measuring 38 x 36 x 44 cms high, the unit weights approximately 35 kgs and comprises of a reciprocating piston pump mounted in a tubercular frame containing an oil reservoir and all air/oil valves and fittings. It consists of the following:

1. **Air Filter** - Ensures a clean dry air supply is maintained. Any water is collected in the bowl and can be drained off turning the "filter" drain screw clockwise.
2. **Air Regulator** - Complete with its own pressure gauge, regulates the air pressure to the pump. To increase air pressure screw the air pressure regulator into its body.
3. **Air Lubricator** - Lubricates air supply and should be set to give one drop for every forty (40) stokes of the pump, by adjusting the red knob A. Top up when required using a good grade lubricating oil. (HLP 10 or equivalent)
4. **Air Flow Valve** - Controls air supply to pump and gives variable pump speed control.
5. **Reservoir** - Capacity nine (9) liters, has coarse filter at filler neck and fine filter at outlet pipe. Level indication tube should show minimum half full. Top up when required using hydraulic oil with a viscosity of 22.
6. **Oil Return to Tank Valve** - When open allows oil to flow back to reservoir. To open turn handle anti-clockwise.
7. **Pump** - Piston type unit - Full breakdown details and spares kits available on request.
8. **Oil Pressure Gauge** - 0/1700 Bar (0/25,000 psi). Accuracy should be checked periodically.
9. **Oil Outlet Nipple** - Quick disconnect type sealing to prevent dirt penetration and oil drips.

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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner

NOTE: Pump is to be shipped from factory WITHOUT Hydraulic Oil.

ADD HYDRAULIC OIL BEFORE OPERATING PUMP

ISO VISCOSITY GRADE 68
SUCH AS:

AMOCO AW 68	MOBIL DTE 26
ARCO DURO AW 68	PHILLIPS MAGNUS A OIL 68
BP ENERGOL HLP 68	SHELL TELLUS 68
CHEVRON EP HYD OIL 68	SOHIO INDUSTRON 53 CITGO
A/W HYD OIL 68	SUN SUNVIS 754
EXXON NUTO 68	TEXACO RANDO HD 68
GETTY VEEDOL AW 61	UNION UNAX AW 68
GULF HARMONY 68 AW	VALVOLINE AW OIL 30

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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner
SERVICING OF HYDRAULIC PUMP UNITS

We would recommend that in the event of failure or of general maintenance, the pump be returned to ***INTEGRA Technologies*** where our experienced Service Engineers can carry out the necessary repairs.

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OPERATORS INSTRUCTION
&
SAFETY MANUAL
Sea Serpent Tensioner
TESTING

It is recommended at approximately six (6) month intervals, if the tools/equipment have not been used, they should be tested/operated as detailed below.

HYDRAULIC BOLT TENSIONING (Sea Serpent) Tools

1. Fit a Sea Serpent tool over the correct test bolt (not provided with original equipment) and screw the ring nut until it is in contact with the rams.

2. Connect tools to air driven pump unit and slowly apply oil pressure up to 15,000 psi (1034 bar). Refer to standard operating instructions for pump operating procedure and safety precautions.

3. Release pressure. Turn the reaction nut back until a gap of approximately 15 mm exists between the ram and the underside of the reaction nut.

4. Reapply the oil pressure. Ensure that the ram does not extend beyond the full stroke mark machined around the ram.

5. If no leak occurs release the oil pressure. Apply grease to the exposed surface of the ram.

6. Retract the ram by screwing down the reaction nut.

7. Refit dust cap to nipple and store.

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SEA SERPENT® STUD TENSIONERS

Pressurization of Tools - Simultaneously All of the Studs

Each individual flange will have its own pre-calculated value of oil pressure that must be applied to the tools. When tightening all bolts simultaneously only one pressure needs to be applied "Pressure B". See section "Determination/Explanation of Pressure A or B."

Proceed as follows:

1) Apply pressure "B" to the tools.
   a) The diver must check that the gaps are appearing between the rams and bodies of all tools. If not, check that all hose connections are properly made.
   b) That no one tool has an excessive gap significantly more than any other. If so, check that the hexagon nut on the back of the flange is tight up against the flange.
   c) At a pressure of 1,000 psi stop the pump and take measurements between flanges at 90-degree increments. If there is an even gap at all points then pressurization can continue.
2) Tighten down the hexagon nuts by inserting a tommy bar into the drilled hole in the nut, through the slot in the bridge of the tool.
3) Release the hydraulic pressure. **To minimize the effects of embedment, settlement, and thread deflection, repeat steps 1, 2, and 3 two additional times before removing the tools.**

IMPORTANT NOTE: If during pressurization the stroke of the ram approaches the maximum limit before pressure is reached, then the pump must be stopped, the nuts tightened, the pressure released, and the rams pushed back into the tools by manually screwing down the ring nuts using the tommy bar. The tools must remain connected to the pump and the return to tank valve on the pump must be in the fully open position to allow the oil to drain from the tools while retracting the rams. Pressure can then be re-applied to the system.

NOTES:

Because of the long distance that the oil has to travel to the system there is a short time lag in the gauge and the actual pressure at the tools. This means that as the pressure is increased the gauge always reads a higher pressure than that which is present at the tools. To obtain a true reading on the gauge of the pressure, the

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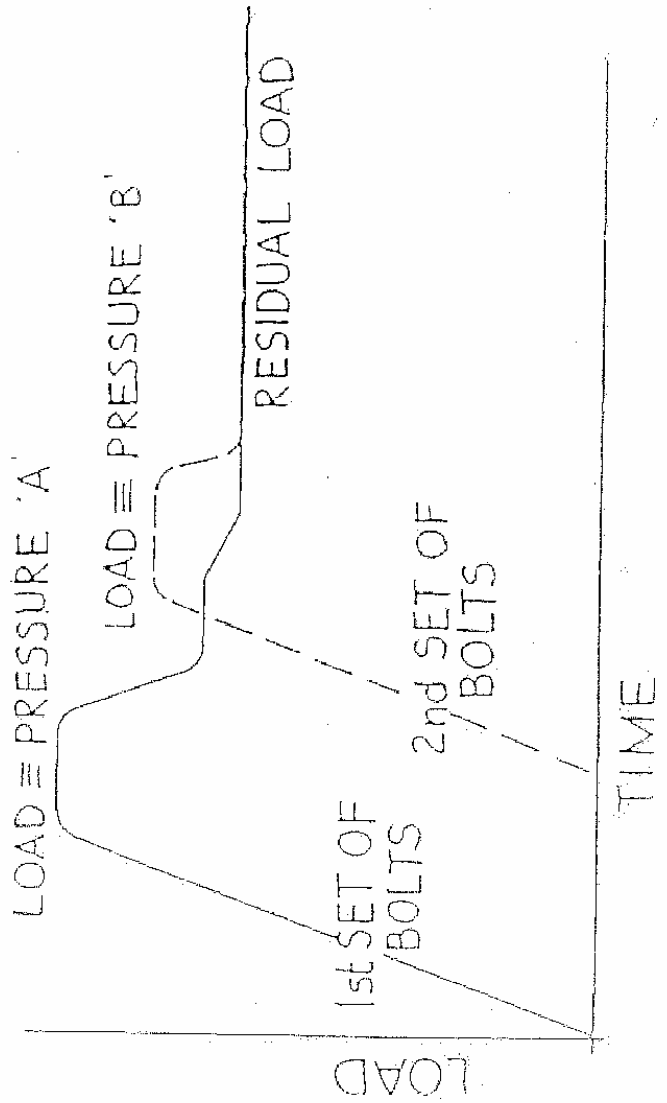
SEA SERPENT® STUD TENSIONERS



pump must be stopped intermittently and the gauge needle allowed to settle back. When nearing the final operating pressure for the flange being tightened the gauge reading can be taken up 2,000 psi over this final operating pressure to allow for settling effect provided the initial pressure does not exceed 15,000 psi. This is the MAXIMUM allowable pressure for the system when the pump is stopped and the gauge needle settles back to a static position corresponding to this pressure.

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SEA SERPENT® STUD TENSIONERS

Explanation of 50% Tensioning

When using 50% tensioning (a tool on every other bolt), it is necessary to apply a higher pressure to the first set of bolts than to the second set. This is to allow for a reduction of the initial applied load when the second set are tensioned. The graph on the following page illustrates how the load varies during the tensioning process.

SEA SERPENT® STUD TENSIONERS

Pressurization of Tools – Simultaneously Tensioning 50% of the Studs

Each individual flange will have its own pre-calculated value of oil pressure that must be applied to the tools (Refer to Section "Determination Explanation of Pressure A and B"). Two values of pressure will be given.

Call the higher:	Pressure "A"
Call the lower:	Pressure "B"

Every other bolt in the flange will have a tool fitted on to it and connected via the manifold to the pump as previously explained.

Proceed as follows:

1) Apply pressure "A" to the tools.

   a) The diver must check that the gaps are appearing between the rams and bodies of all tools. If not, check that all hose connections are properly made.
   b) That no one tool has an excessive gap significantly more than any other. If so, check that the hexagon nut on the back of the flange is tight up against the flange.
   c) At a pressure of 1,000 psi stop and pump and take measurements between flanges at 90-degree increments. If there is an even gap at all points then pressurization can continue.

2) Tighten down the hexagon nuts by inserting a tommy bar into the drilled hole in the nut, through the slot in the bridge of the tool.

3) Release the hydraulic pressure. **To minimize the effect of embedment, settlement, and thread deflection, repeat steps 1, 2, and 3 two additional times before transferring the tools to the next set of studs.**

IMPORTANT NOTE: If during pressurization the stroke of the ram approaches the maximum limit before pressure is reached, then the pump must be stopped, the nuts tightened and the pressure released, and the rams pushed back into the tools by manually screwing down the ring nuts using the tommy bar. The tools must remain connected to the pump and the return-to-tank valve on the pump must be in the fully

open position to allow the oil to drain from the tool while retracting the rams. Pressure can then be reapplied to the system.

4) Transfer the tools to the second set of bolts.

5) Repeat operations 1 thru 3 using pressure "B".

6) Transfer one of the tools back to a bolt of the first set of tensioned. Connect this tool directly to the pump using the down line connection.

7) Insert a tommy bar into a hole in a nut. While exerting only very slight force on the tommy bar in the loosening direction, SLOWLY increase pump pressure until pressure "B" is reached or until the nut starts to turn, whichever occurs first.

If the nut remains tight at pressure "B" the tensioning procedure is complete.

If the nut breaks loose before pressure "B" is reached stop the pump and tighten the nut, noting the break loose pressure.

Continue with step "8".

8) With the tools still on the second set of bolts re-tighten using pressure "A" and repeat operations 2-7.

9) If the nut breaks loose before pressure "B" checks of the flange, gasket, etc. are necessary to ensure that "flange rotation" or gasket damage has not occurred.