Propulseur hydraulique

Installation et utilisation

Section 7 – Réglage et démarrage

Vérification hydraulique :

- Effectuez une double vérification de toutes les conduites pour vous assurer que l'ensemble des tuyaux ont été installés et qu'ils sont raccordés sur les orifices appropriés.
- Assurez-vous du serrage approprié de tous les raccords.
- Vérifiez que tous les éléments sont correctement fixés.
- Si vous suspectez une pollution de l'installation, rincez l'ensemble des conduites hydrauliques avant le démarrage. Il est utile, au démarrage, d'effectuer un rinçage du système en branchant les raccords P-A et BT sur le distributeur et en branchant le raccord A-B sur le propulseur. Cela permet d'isoler le propulseur et son distributeur au cours du démarrage initial, lorsque le rinçage des conduites hydrauliques s'effectue vers le réservoir. L'inconvénient de cette approche réside dans le fait que le système est désormais plein d'huile, et le rebranchement des conduites hydrauliques à leurs points appropriés s'avère assez sale. C'est la raison pour laquelle il est important de maintenir les conduites hydrauliques très propres au cours de l'installation.
- Vérifiez le groupe de la pompe. Assurez-vous que le raccordement de la pompe est correctement aligné et que toutes les attaches sont serrées au couple spécifié. Assurez-vous que le carter de protection de la pompe est en place.
- Vérifiez le système électrique et assurez-vous que tous les raccordements électriques sont serrés.
- Lors du démarrage, vérifiez si le système émet un bruit. Il est normal que les pompes émettent un bruit lors du démarrage. Toutefois, ce bruit doit cesser dans les 15 secondes. Si vous entendez un quelconque bruit excessif après 15 secondes, arrêtez le système et déterminez le problème avant de continuer.
- Bien que les propulseurs TRAC soient les plus silencieux du marché, ils ne sont en aucun cas totalement silencieux. Attendez-vous à ce que la zone du tunnel du propulseur émette un bruit important. N'oubliez pas que le nombre de chevaux-vapeur en action dans cette toute petite zone est très important. Il est normal d'entendre un certain niveau de bruit.

DANGER!	**Assurez-vous qu'aucun technicien ou nageur ne se trouve dans l'eau.**

DANGER!	**Les systèmes hydrauliques engendrent une forte pression. Les tuyaux hydrauliques défectueux peuvent ne pas fonctionner au démarrage initial et provoquer de graves blessures corporelles. Restez à l'écart des conduites et tuyaux hydrauliques lors du démarrage. De l'huile à haute pression peut pénétrer dans la peau et entraîner des dégâts tissulaires importants. Veillez à porter des lunettes de protection.**

REMARQUE : lors du démarrage initial, il se peut que les contacteurs de niveau d'huile disjonctent, déclenchant ainsi une alarme sonore. Une alarme de niveau d'huile extrêmement bas désenclenche l'embrayage. Ce dernier se réenclenche lorsque le niveau d'huile redevient approprié.

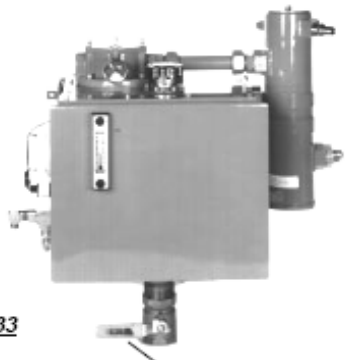


Figure 33

- Ouvrez le clapet de refoulement du réservoir.
- Remplissez le réservoir d'huile. Disposez d'une réserve d'huile supplémentaire.
- Activez le disjoncteur du système.
- Démarrez le moteur primaire et faites-le tourner au ralenti.
- *Si le système dispose d'une pompe sous tension*, le niveau d'huile diminue immédiatement lors du remplissage des conduites hydrauliques. Renouvelez immédiatement l'huile du réservoir. Au besoin, arrêtez le moteur primaire. ***Ne faites jamais fonctionner la pompe hydraulique à sec!***
- *Si le système dispose d'un embrayage*, mettez le système sous tension à l'aide d'un commutateur START (démarrage) du poste de commande du propulseur.

Remarque : vous devez maintenir appuyé le commutateur START (démarrage) ou STOP (arrêt) au minimum 0,2 seconde avant que le système ne reconnaisse votre commande. Écoutez l'embrayage s'enclencher. S'il s'enclenche, l'huile se vidange rapidement du réservoir. Demandez à quelqu'un de couper le système à l'aide du commutateur OFF (arrêt) du poste de commande du propulseur ou de couper le moteur primaire jusqu'au renouvellement de l'huile dans le réservoir. *Ne faites jamais fonctionner la pompe hydraulique à sec!*

Poste de commande du propulseur d'étrave et de poupe

Poste de commande du propulseur

Figure 34

Poste de démarrage/arrêt

NOTE! On some systems the clutch does not engage until a jog lever is moved either right or left.

- Vérifiez le débit de l'eau de refroidissement. La pompe peut nécessiter 30 secondes pour amorcer et remplir l'échangeur de chaleur d'eau.
- Écoutez l'accouplement du groupe de la pompe. Vérifiez la présence éventuelle de vibrations excessives. Le cas échéant, coupez le moteur primaire et vérifiez l'alignement de l'accouplement de la pompe.

Figure 35

Keep Reservoir Full Of Oil During Startup!

- Si l'embrayage s'enclenche et que l'huile du réservoir ne descend pas immédiatement, COUPEZ IMMÉDIATEMENT LE SYSTÈME et assurez-vous que le clapet de refoulement du réservoir est OUVERT! En outre, vérifiez à nouveau la rotation de la pompe et la position des tuyaux d'entrée et de sortie pour vous assurer qu'elles sont correctes. La méthode la plus efficace pour vous assurer que la pompe est correctement installée consiste à vérifier que le niveau d'huile descend dans le réservoir. Dans le cas contraire, contrôlez minutieusement le système pour déceler tout problème!

- Lorsque le niveau du réservoir se stabilise, placez le levier de réglage en position de poussée minimale.

AVERTISSEMENT!	**À cet instant, le propulseur peut atteindre une puissance élevée! Assurez-vous que le navire est correctement attaché à l'aide de défenses appropriées. Affectez une personne à la surveillance depuis le quai. Prévenez tout le personnel se trouvant à proximité que le propulseur est susceptible de fonctionner. Soyez prêt à couper le système du propulseur.**

- Si le distributeur du propulseur s'ouvre correctement, la boucle hydraulique du propulseur se remplit d'huile et le niveau du réservoir rediminue immédiatement. *Refaites le niveau d'huile immédiatement.*
- Testez toutes les autres charges et *refaites le niveau d'huile immédiatement.*

Remarque : sur les systèmes entraînés par le moteur principal, l'incapacité de l'embrayage à s'engager peut être provoquée par un capteur de vitesse nécessitant une intervention. Le but du capteur de vitesse est de désenclencher l'embrayage si la vitesse du moteur principal dépasse 1 100 tr/min et de le réenclencher une fois que la vitesse atteint 900 tr/min (des écarts mineurs peuvent survenir). L'objectif de ces réglages de vitesse est d'empêcher la pression de fonctionnement des pompes de dépasser la pression maximale autorisée du système.

Réglage :

Deux méthodes permettent de régler le poste de commande du propulseur : le réglage par pression et le réglage électrique. Ces deux méthodes sont décrites ci-dessous.

Le capteur de vitesse est monté sur la bride d'entrée de l'embrayage. Une DEL, à première vue, difficile à repérer se situe au-dessus du capteur, à l'endroit où les fils dépassent. Cette DEL doit clignoter en rouge. Dans ce cas, il est certain que le capteur de vitesse fonctionne correctement. Dans le cas contraire, vérifiez l'écart entre le capteur de vitesse et la roue de son. L'écart doit être compris entre 0,508 et 0,762 mm (0,020 po-0,030 po). Assurez-vous également que des copeaux métalliques ne sont pas coincés à l'extrémité du capteur.

Réglage par pression :

- Activez le premier poste de commande du propulseur.
- Si le système est entraîné par le moteur principal, augmentez le régime de ce dernier à 800 tr/min.
- Placez le levier de réglage en position de poussée minimale.
- Ajustez le potentiomètre THRESHOLD (seuil) en bas du levier de réglage jusqu'à ce que le manomètre du système indique une valeur de 4 136,86 kPa (600 psi) (ou toute autre pression minimale souhaitée).
- Placez le levier de réglage en position de poussée maximale.
- Tournez 20 fois dans le sens horaire le potentiomètre MAXOUT (max.) en bas du levier de réglage. Tournez ensuite le compteur dans le sens antihoraire jusqu'à ce que la pression indiquée sur le manomètre du distributeur commence à chuter. Tournez dans le sens horaire jusqu'à ce que la pression maximale s'affiche à nouveau.
- Les réglages MAXOUT et THRESHOLD ont une incidence l'un sur l'autre. En conséquence, il est nécessaire de répéter ces deux réglages 3 ou 4 fois pour atteindre les réglages finaux souhaités.
- Une fois les réglages MAXOUT et THRESHOLD effectués, déplacez rapidement le levier de réglage d'une poussée nulle à une poussée pleine. L'accélération de la pression doit mettre environ 3/4 de

seconde à se faire sentir. Réglez le potentiomètre RAMPTIME (temps de rampe) jusqu'à atteindre 3/4 de seconde. La rotation dans le sens horaire augmente le temps et vice versa.

- Répétez la procédure pour l'ensemble des postes de commande du propulseur.

Poste de commande du propulseur

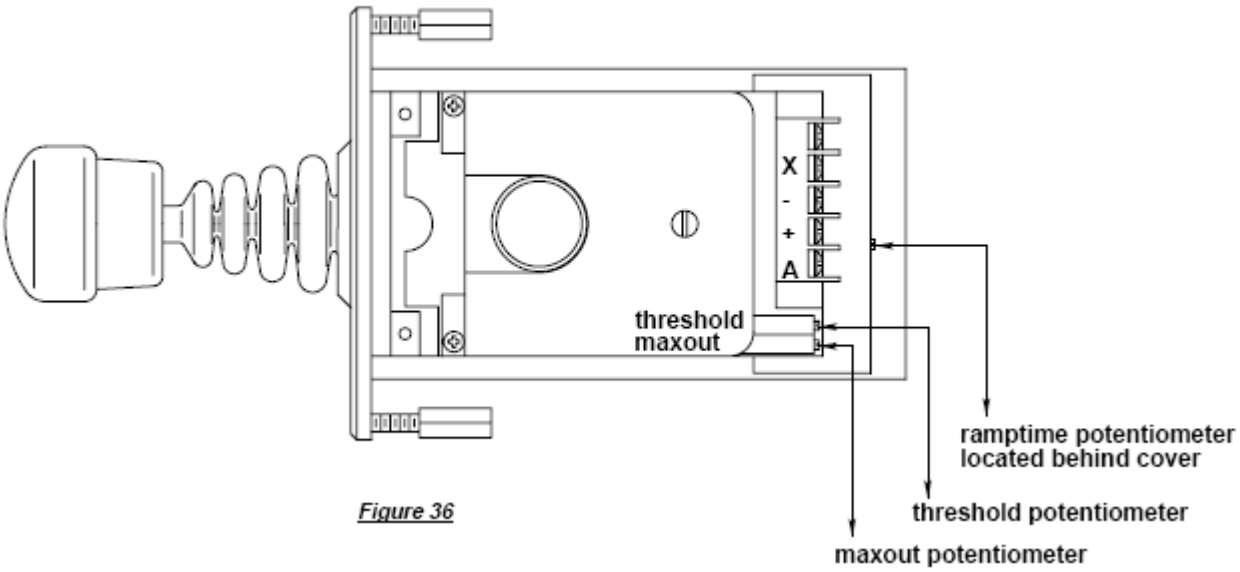


Figure 36

Réglage électrique :

- Activez le premier poste de commande du propulseur.
- Si le système est entraîné par le moteur principal, augmentez le régime de ce dernier à 800 tr/min.
- Placez le levier de réglage en position de poussée minimale.
- Définissez le voltmètre sur la tension continue et connectez le fil de tension au terminal (A), (signal en impulsion) et le fil commun au terminal (–).
- Réglez le potentiomètre THRESHOLD en bas du levier de réglage jusqu'à ce que le voltmètre indique une valeur de 3 V c.c. (ou toute autre tension souhaitée).
- Placez le levier de réglage en position de poussée maximale.
- Tournez le potentiomètre MAXOUT en bas du levier de réglage jusqu'à ce que le voltmètre indique une valeur de 11 V c.c. (ou toute autre tension souhaitée).
- Les réglages MAXOUT et THRESHOLD ont une incidence l'un sur l'autre. En conséquence, il est nécessaire de répéter ces deux réglages 3 ou 4 fois pour atteindre les réglages finaux souhaités.
- Une fois les réglages MAXOUT et THRESHOLD effectués, déplacez rapidement le levier de réglage d'une poussée nulle à une poussée pleine. L'accélération de la pression doit mettre environ 3/4 de seconde à se faire sentir. Réglez le potentiomètre RAMPTIME jusqu'à atteindre 3/4 de seconde. La rotation dans le sens horaire augmente le temps et vice versa.
- Répétez la procédure pour l'ensemble des postes de commande du propulseur.

Systèmes dotés de pompes à cylindrée variable :

ARCTURUSMARINE™

TRAC®

THRUSTERS • DIGITAL STABILIZERS • INTEGRATED HYDRAULICS

Hydraulic Thruster

Installation & Operation

35989

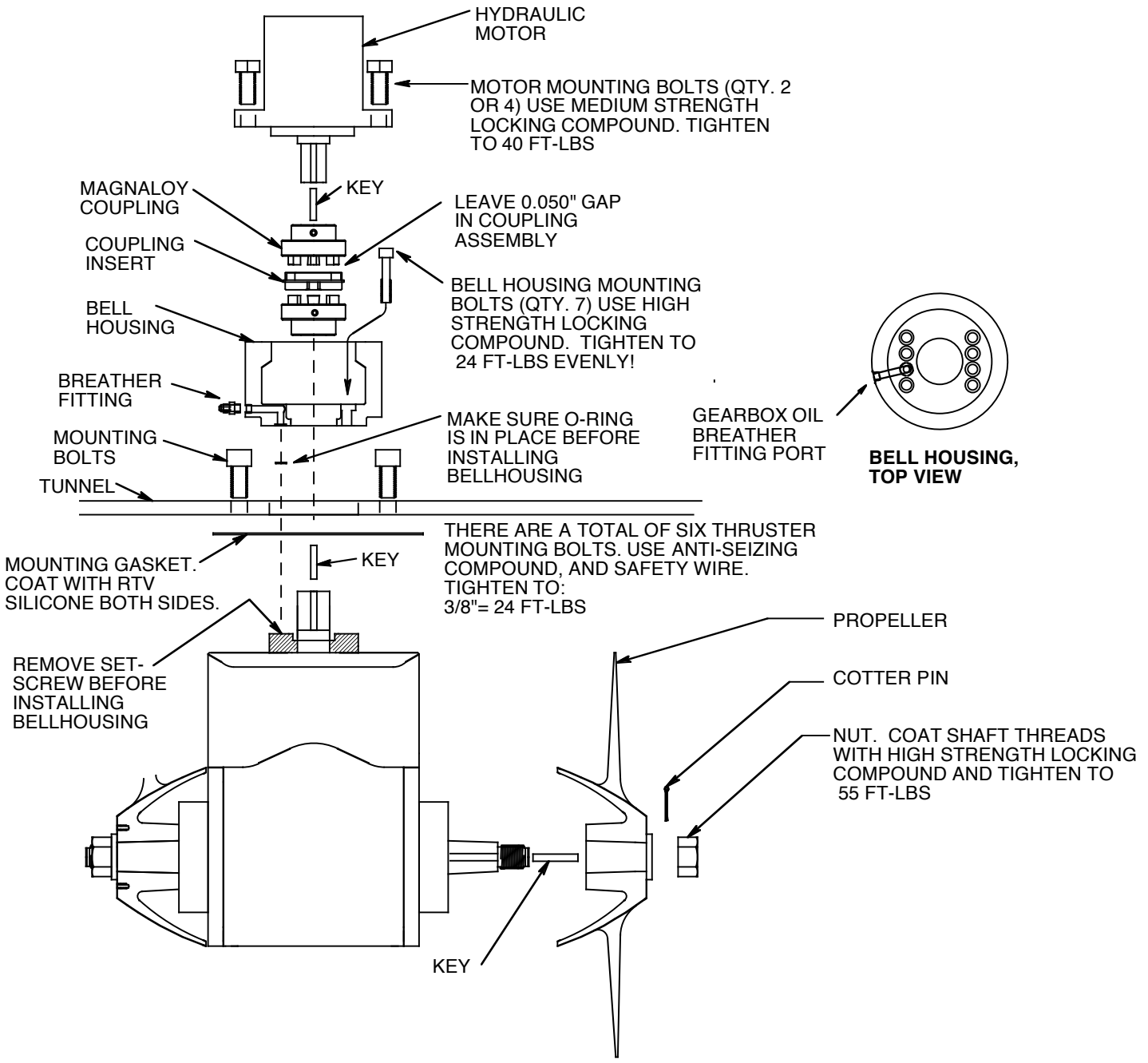
Arcturus Marine / American Bow Thruster
Standard Installation and Operating Instructions
Version 6.99.1_c
Hydraulic TRAC Table of Contents

Prefix: Gearbox Installation Drawings (all TRAC sizes):

List of Graphics & Tables:

Arcturus Marine
517-A Martin Avenue
Rohnert Park, CA 94928
U.S.A.
Tel:707.586.3155
Fax: 707.586.3159
www.thrusters.com

BILL OF MATERIAL			
ITEM NO	QTY	PART NO	DESCRIPTION



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TOLERANCES ARE: .XX± .01 .XXX± .005 SUFACES: 63 ANGLES:± 2°
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DIMENSIONS AND TOLERANCES ARE PER ANSI Y 14.5
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8" TRAC HYDRAULIC THRUSTER INSTALLATION

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C		INM8TRACHYD	B

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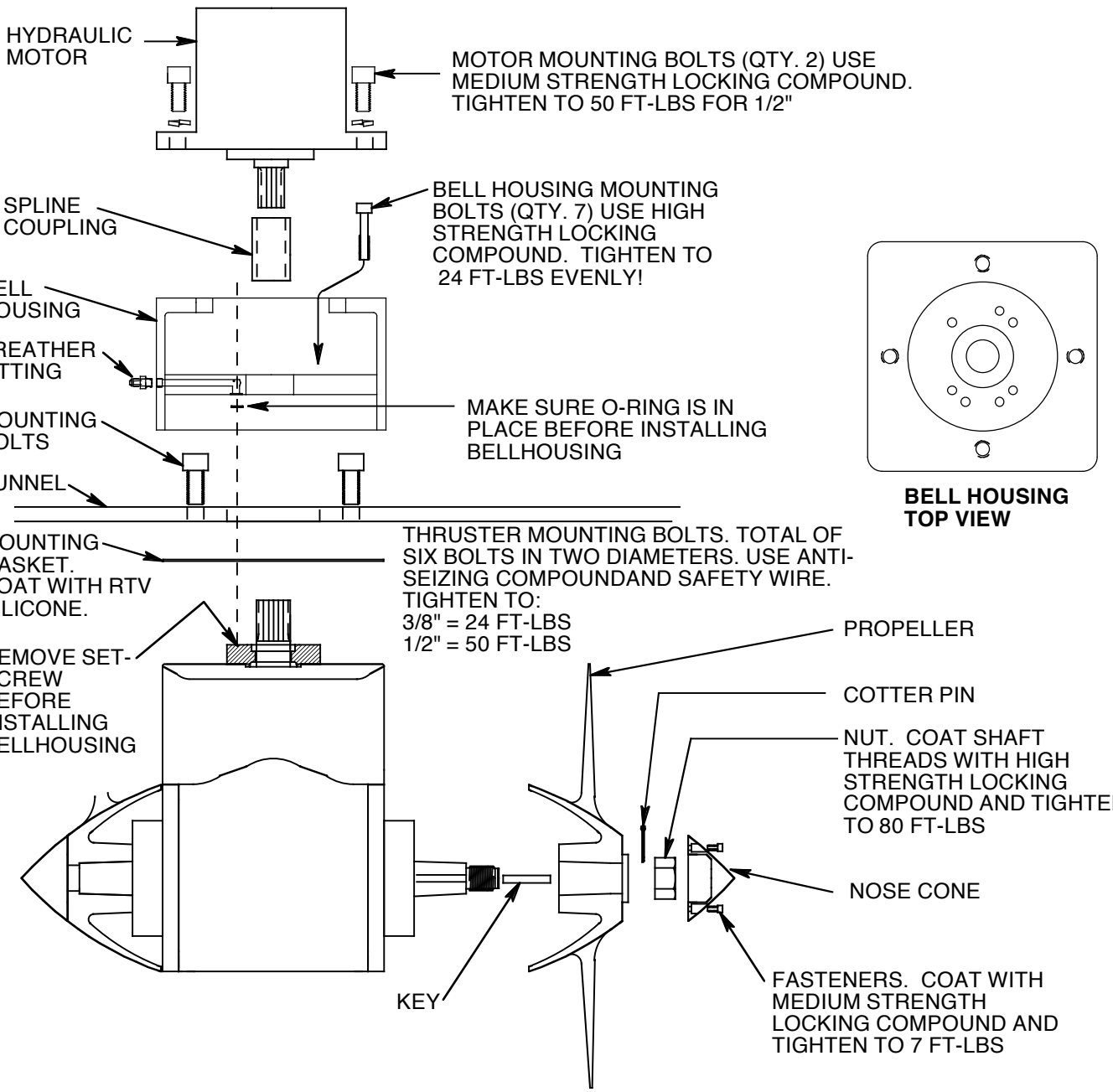

BELL HOUSING TOP VIEW

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10" AND 12" TRAC HYDRAULIC THRUSTER INSTALLATION

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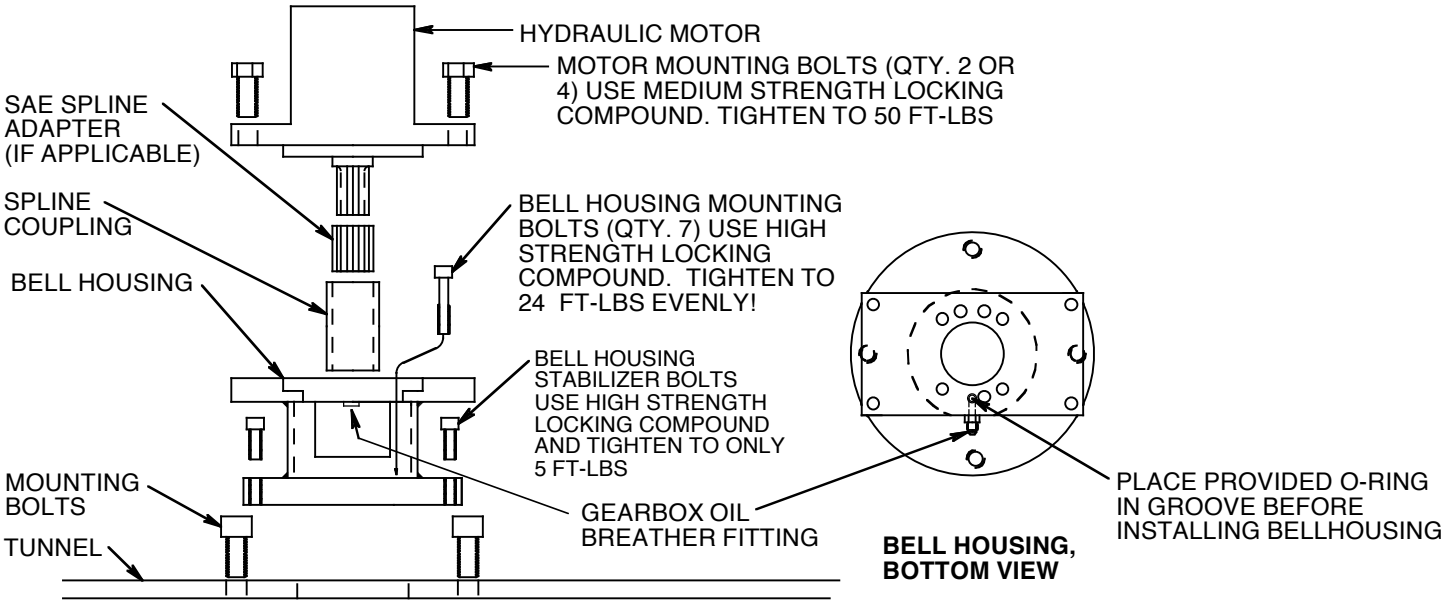

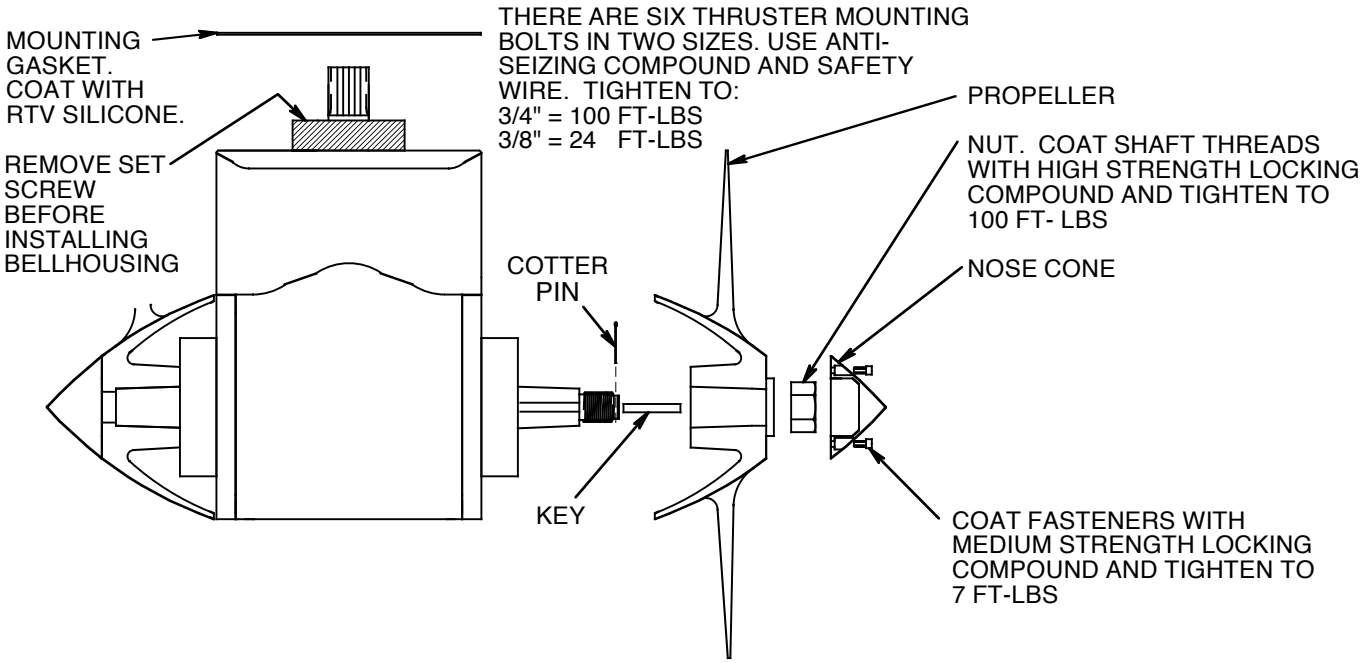

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16" TRAC HYDRAULIC THRUSTER INSTALLATION

SIZE	FSCM NO.	DWG. NO.	REV.
C		INM16TRACHYD	C

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1:5		1 of 1

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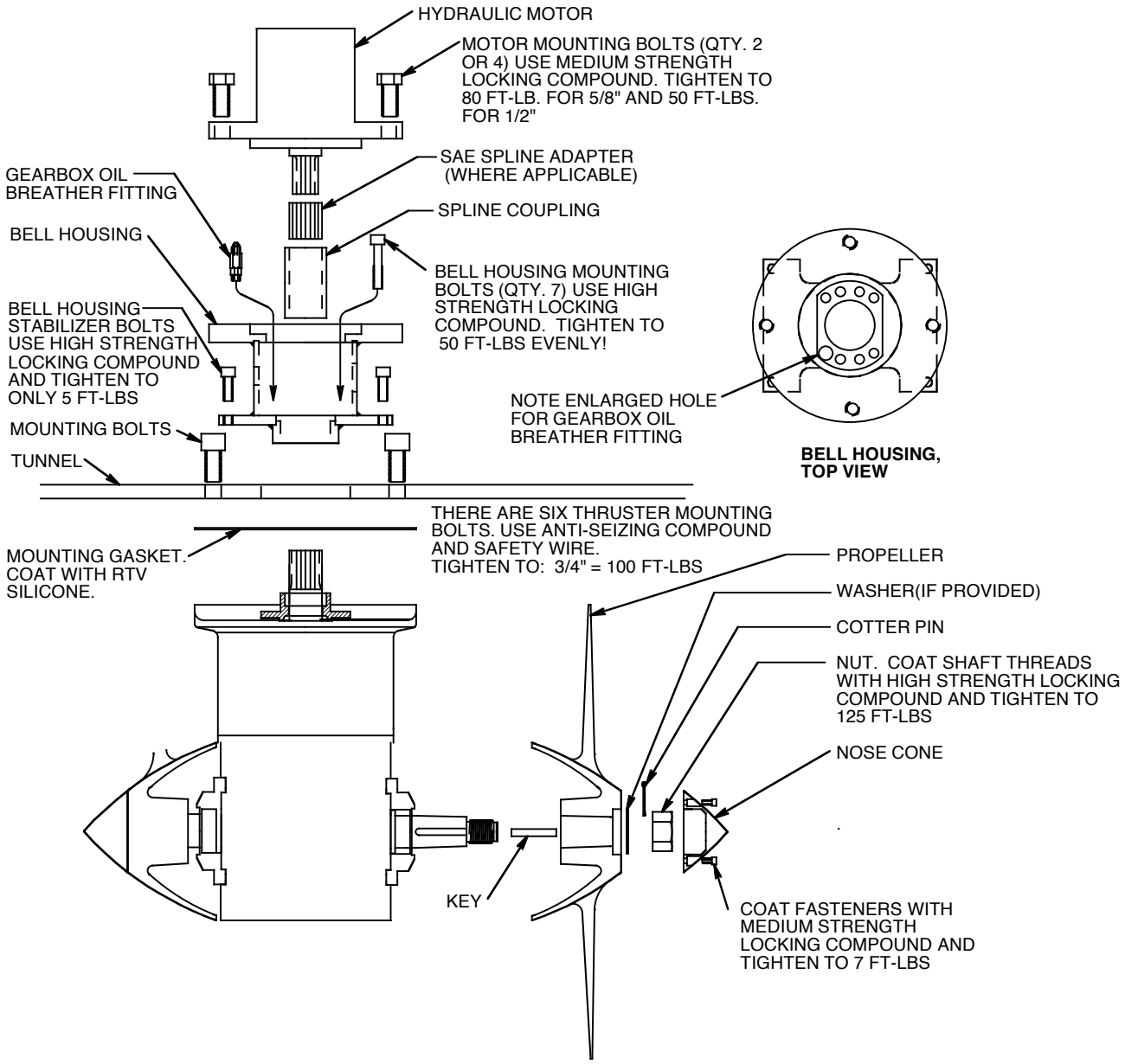

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20" TRAC HYDRAULIC THRUSTER INSTALLATION

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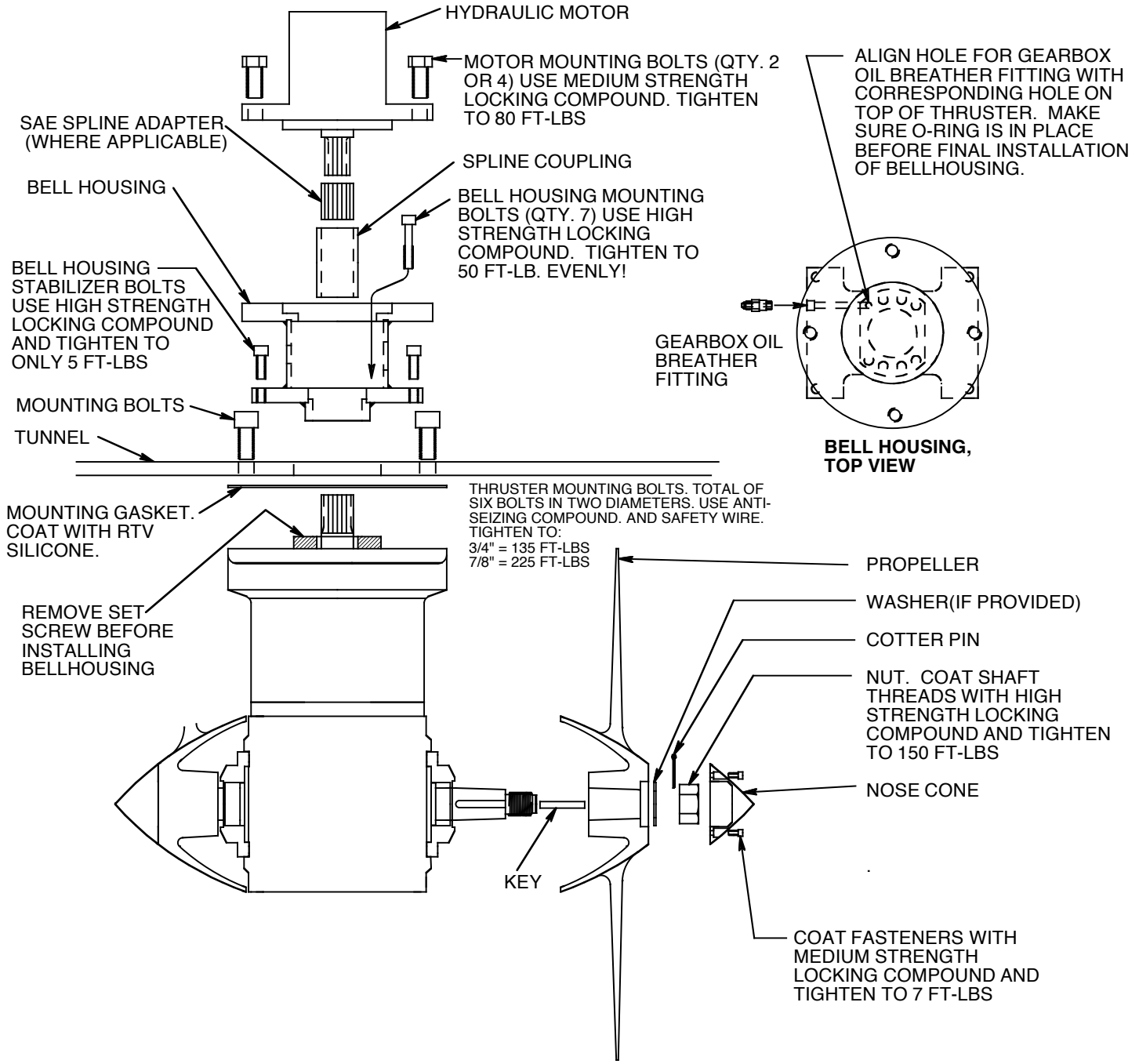

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24" & 28" TRAC HYDRAULIC THRUSTER INSTALLATION

SIZE	FSCM NO.	DWG. NO.	REV.
C		INM2428TRACHYD	B

SCALE: 1:5 SHEET 1 of 1

Graphics, Pictures, Diagrams and Tables:

Section 1 - Before Starting Installation:

Please read this manual in its entirety before starting installation! ***It will save you money!***

Technical Assistance:

Listed below are several numbers you can call in case you have any questions about your system, or if you need technical assistance. Please call us at:

(800) 535-5377 or
(707) 586-3155 or
(800) 752-0661 or

We want to help!

Protect Against Contamination

Hydraulic system contamination prior to initial start-up is, by far, the biggest problem experienced in the field. We define contamination as any substance other than hydraulic fluid that has penetrated and possibly degraded the hydraulic lines. Contaminants include, but are not limited to, dirt, metal shavings, grinding grit, water, grease, rags, etc. Keep hydraulic reservoirs, pumps, valves, and plumbing lines closed, capped, and sealed prior to final hookup.

Remember, *system failure or damage due to contamination can be very costly to repair. Protect your investment! Talk about the need for system cleanliness with your workers.*

Section 2 - Basic Component Installation

Tunnel Installation:

WARNING! **Thruster tunnel becomes an integral part of the hull. Installation of thruster tunnel should be undertaken only by professionals with certified competency in the fabrication and repair of the hull material in question. Proper mechanical bonding of the tunnel to the hull and support of the tunnel must be confirmed and certified with your naval architect.**

Tunnel Positioning:

Priority 1 - Locate top of tunnel at least 1/2 diameter below the waterline. *It is strongly recommended that this distance be at least 1 diameter whenever possible.* Deeper is better.

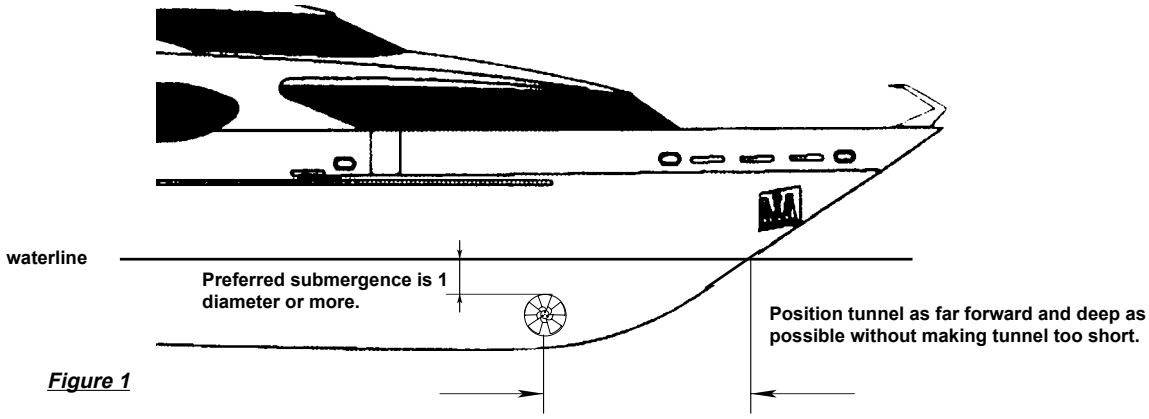


Figure 1

Priority 2 - Locate the tunnel as far forward as possible while maintaining adequate tunnel length. At a minimum, the tunnel must be long enough so that no part of the thruster protrudes. *(See page 2-3, "propeller free wheeling" and "tunnel gratings")*

Marking the Tunnel Cutout:

1 - Measure and re-measure to exactly pinpoint the center of the tunnel on the inside of the hull on both sides. Be sure that the location is square in all directions.

2 - Drill a horizontal 3/16" diameter hole through the hull at each center point.

3 - Fabricate a scribing tool from 1/8" steel rod as shown. Bend the end of the rod into a hook shape having a diameter equal to the tunnels O.D. radius. Pass the scribing tool through the holes in the hull as shown and scribe the tunnel openings on both sides of the hull.

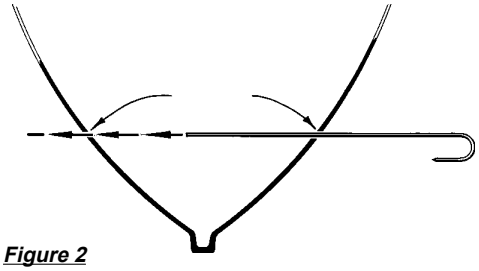


Figure 2

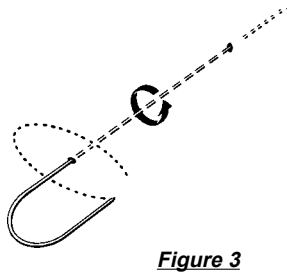


Figure 3

4 - Cut holes in both sides of hull at scribe mark. Try to hold cutting device parallel to the ground.

Tunnel/Hull Joint Radius:

To minimize inlet turbulence, which can reduce thrust, it is best if the tunnel/hull joint radius be not more or less than 1/10 the tunnel diameter. It is recognized that fabrication of such a radius can be quite time consuming and expensive. It should be noted that this recommendation is made in the pursuit of an ideal situation and that in practice is not often achieved.

On steel and aluminum tunnels, where such a radius is most difficult, but where performance is critical, a 45 degree chamfer, also 1/10 the tunnel diameter in dimension, can be fabricated at the tunnel/hull joint.

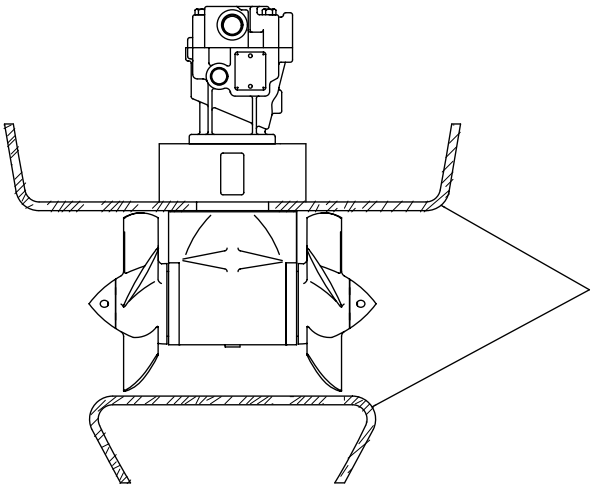


Figure 4

Other Tunnel/Hull Joint Treatments:

The "eyebrow":

This treatment was very common 5-10 years ago. An "eyebrow" would be built up at the leading edge of the tunnel. The theory was that the eyebrow would deflect water from "tripping" on the trailing edge of the tunnel and thus reducing turbulence drag. It is our opinion that this theory is not technically supportable. However, it is acknowledged that an eyebrow may have some benefit in deflecting larger debris from hitting the trailing edge of the tunnel although damage to a vessel from this type of impact has never been reported. Eyebrows have also been used successfully in the reduction of propeller freewheeling while underway. (See page 2-3)

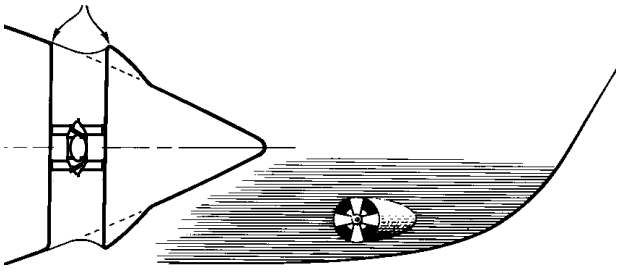


Figure 5

The "scallop":

A few builders have gone to the expense of scalloping out the trailing edge of the tunnel so as to soften or eliminate the corner of the trailing edge of the tunnel. The theory behind this approach is that, if left untreated, the trailing edge corner will cause turbulence and hull drag.

In recent tank tests some builders have sought to determine what type of tunnel opening treatment is best. Tests have shown that with or without tunnel opening treatments, drag from thruster tunnels is so little that it cannot be measured.

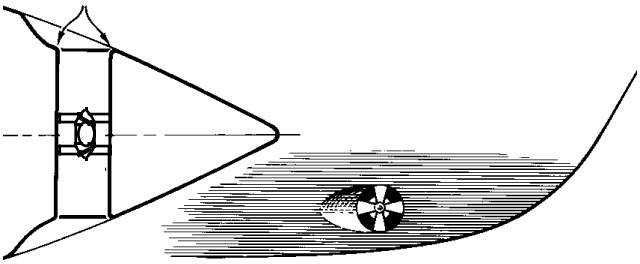


Figure 6

Propeller Free Wheeling:

In some hull shapes while a vessel is underway water flow through a tunnel can cause the thruster propeller and motor to spin at very high rpm in certain sea conditions. In some cases considerable noise can be generated.

Thruster free wheeling has been solved in the past in two ways. The first is to install a tunnel eyebrow as described above. It is not clearly understood why this works, but it does!

The second fix is through the use of a special hydraulic valve sandwich that would be installed in your existing directional valve.

All thruster propellers free wheel to a certain extent while underway. It is only those that free wheel to a degree resulting in significant noise that are a problem and require the measure stated above.

Only a very, very few vessels experience this problem, but all installations had two similar characteristics:

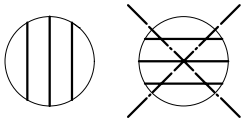
1 - the tunnels were extremely short
2 - the hulls had very fine entry at the bow

Tunnel gratings:

Tunnel gratings are installed to keep people and large debris out of thruster tunnels. We recommend the use of tunnel gratings.

We suggest placing bars 3.5 - 5 inches apart. Usually bars made of 1/4" x 2" stainless flat stock are used. The size of material can be varied according to thruster diameter. The bars should be located perpendicular to the normal water flow past the tunnel opening while the vessel is underway. This means that the bars will be approximately vertical in position, not horizontal as might be expected.

Figure 7



yes ***no***

It is believed that placing the gratings in this position helps to maintain laminar flow past the tunnel opening which should reduce tunnel drag. Tunnel gratings are also believed to reduce the potential for excess propeller free wheeling.

Thruster Installation:

• The thruster is held in the tunnel by 6 socket head cap screws. The diameter of the screws vary with thruster size and material. Use only screws supplied by American Bow Thruster. A gasket is usually used between the strut (thruster mounting surface) and the inside of the tunnel. Because some tunnels may be slightly undersized, oversized, or out of round, it is acceptable to:

- use the gasket provided
- eliminate the gasket
- use two gaskets

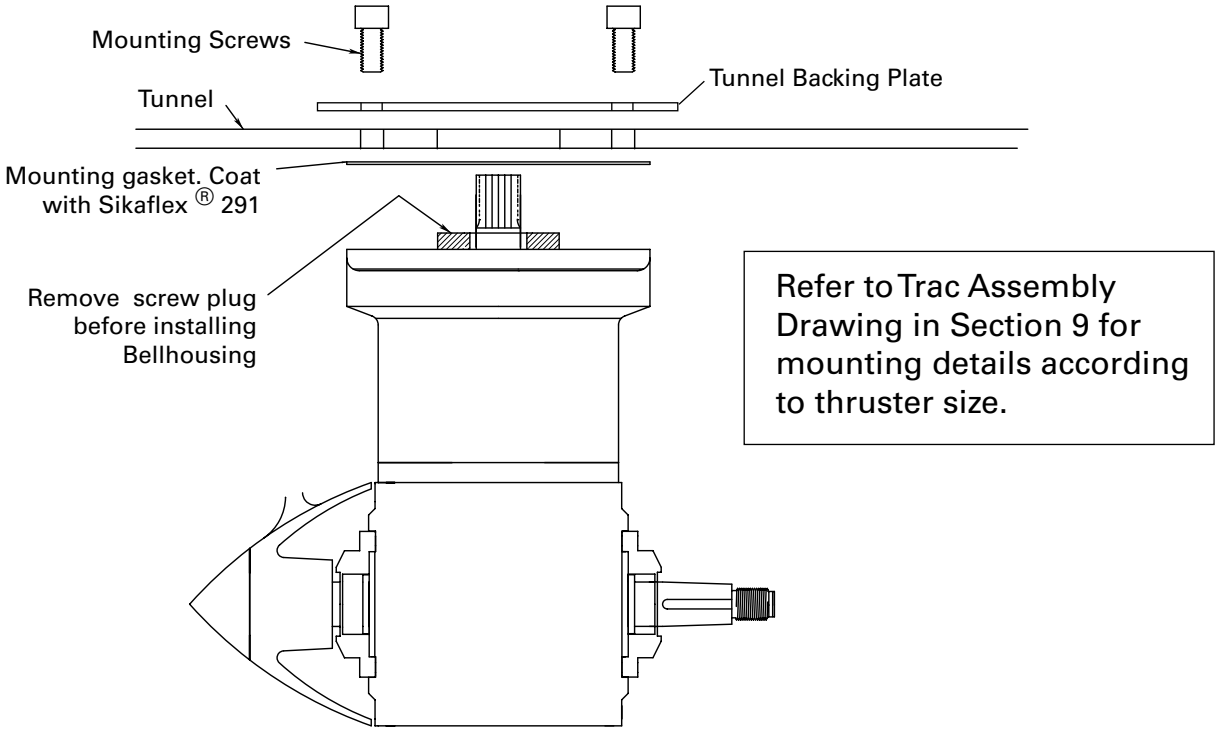


Figure 8

Please read the following instructions for more details.

Checking propeller tip clearance:

• Test mount the thruster in the tunnel. Use the single gasket provided. Pull the thruster up tight with the screws provided. Slide both propellers on their respective shafts and check for adequate tip clearance. Aluminum tunnels warp considerably during installation and give the most trouble in so far as tip clearance is concerned.

Because the thruster strut is machined with the same radius as the inside of the tunnel it tends to nest squarely in the tunnel. The result is propeller shafts that are well centered. However, by loosening the mounting screws the thruster can be twisted to a small degree in order to improve propeller tip clearance.

You may add an extra gasket or remove the gasket entirely to aid in propeller positioning.

Once it has been established that the propeller tip clearance is acceptable, remove the propellers and dismount the thruster.

Final Thruster Mounting:

• Carefully clean the mounting surfaces on the thruster strut and the inside of the tunnel.

• Apply Sikaflex ® Sealant to both sides of the gasket. (If a gasket is not being used, coat the thruster mounting surface with the Marine-Grade Sealant.)

• With gasket in place, fasten thruster in tunnel with the screws provided. Screw threads should be coated with an anti-seizing compound.

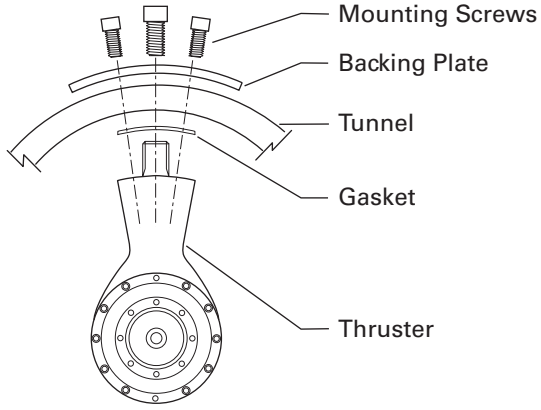
• Before torquing fasteners, slide props in place to be sure that thruster is centered properly.

• Torque fasteners to the values listed in Table 1 or on the Assembly drawing.

• Safety wire the thruster mounting screws so that they cannot loosen with vibration.

Thruster Safety Wiring :

• After Installing the thruster in the tunnel, (see Thruster Assembly drawing) the six mounting screws must be safety wired. The mounting screws supplied by American Bow Thruster come predrilled to accept the safety wire. There will be a length of stainless safety wire included in the mounting kit that must be used. Refer to the diagram for proper wiring technique.



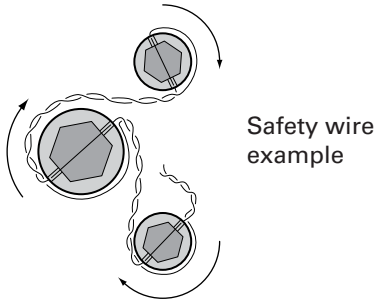


Figure 9

Propeller Mounting:

• Clean the propeller shaft and the inside of the propeller hub. Fit key into shaft key way and test fit the propeller. Propeller should make up on the shaft cleanly. If propeller does not fit snug and clean, remove propeller and correct problem.

• For final mounting fit key into shaft keyway. Coat both propeller shafts with anti-seizing compound. Slide propeller onto shaft, making sure that key does not "cock up". Propeller should make up on the shaft cleanly.

• Slide prop nut washer onto shaft end (when provided).

• Coat prop shaft threads with high strength locking compound.

• Tighten prop nuts to torque listed on Assembly drawing.

Nut materials: Bronze thrusters must use **Monel** nuts. These nuts are usually marked "NICU".

Aluminum thrusters must use **316 stainless** nuts. These nuts are usually marked 316.

• Check to see that propeller rotates freely and is not binding up on the face of the thruster gearbox.

• Insert cotter pin in the hole provided in the end of the prop shaft and bend ends around shaft.

• All TRAC thrusters 10" and up will have propeller nose cones.

• Install nose cone by fastening to face of propeller with the screws provided. Coat screws with medium strength locking compound. *Tighten to 7 ft. lbs. (see table 1)*

Nose cone screw materials: Bronze thrusters must use **Monel** screws. These screws are usually marked **"NICU".**

Aluminum thrusters must use **316 stainless** nuts. These nuts are usually marked **316.**

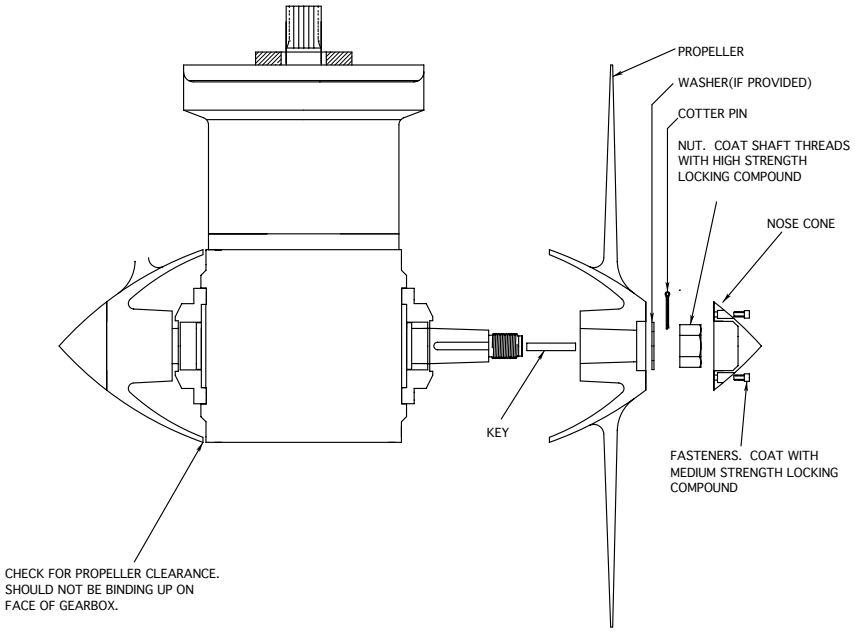


Figure 10

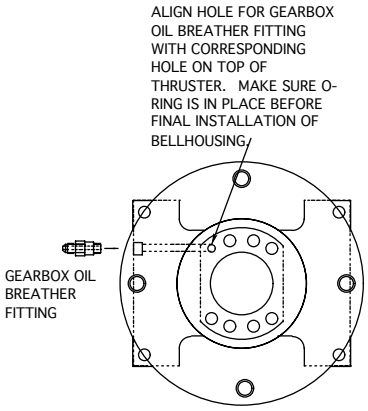
Motor Bell Housing Mounting (Splined Shaft):

• The bell housing is designed to slide onto a boss on the pinion shaft seal housing. This aligns the bell housing perfectly with the pinion shaft. The bell housing fastens through the seal housing into the top of the thruster strut. Some bell housings have stabilizer screws for added motor support. It is important that the bell housing remain square with the top of the thruster. This will ensure that the motor shaft is in perfect alignment with the thruster pinion shaft.

• Clean the mating surfaces on the bottom of the bell housing. Apply a light coat of medium to heavy weight grease. Also clean the pinion shaft seal housing on the top of the thruster.

• Locate the bell housing onto the top of the pinion shaft seal housing. ***Be sure that the bell housing seats squarely on the seal housing. The bell housing must not touch the tunnel.*** It may be necessary to use a grinder to smooth out any rough spots on the outside of the tunnel that interfere with bell housing mounting.

• It is apparent that there are 7 mounting holes that must align and one port for the gearbox oil breather. The clearance hole for this breather is smaller than the clearance holes for the fasteners. Be sure that the port and fastener holes are aligned properly.



Bell housing top view

Figure 11

• Remove the set screw from the pinion seal housing and install the o-ring.

• Coat the seven fasteners with high strength locking compound and tighten to the correct torque. *(refer to Thruster Assembly drawing or table 1)*

• Install case drain fitting to side of motor bell housing and cap or cover until header tank hose is attached

• Coat bell housing stabilizer screws (where provided) with high strength locking compound and tighten evenly by hand, until the end of the screws come into contact with the tunnel. *Do not over tighten!*

Note: On fiberglass tunnels place stainless pressure pads underneath bell housing stabilizer screw tips. These pads can be bedded with Sikaflex or 5200.

Hydraulic Motor Mounting (Splined Shaft):

• Apply heavy grease to pinion shaft spline and install spline coupling.

• Where applicable, install Spline Sizing adapter.

• Apply heavy grease to hydraulic motor shaft spline and fit onto bell housing.

Note: Bell housing heights vary. Be sure that your bell housing is not too short. There should be .100" - .350" clearance between the ends of the two shafts.

• Coat motor mounting bolts with medium strength locking compound and install through motor flange into bell housing top flange. *Tighten to appropriate torque.* (See table 1 or assembly drawing)

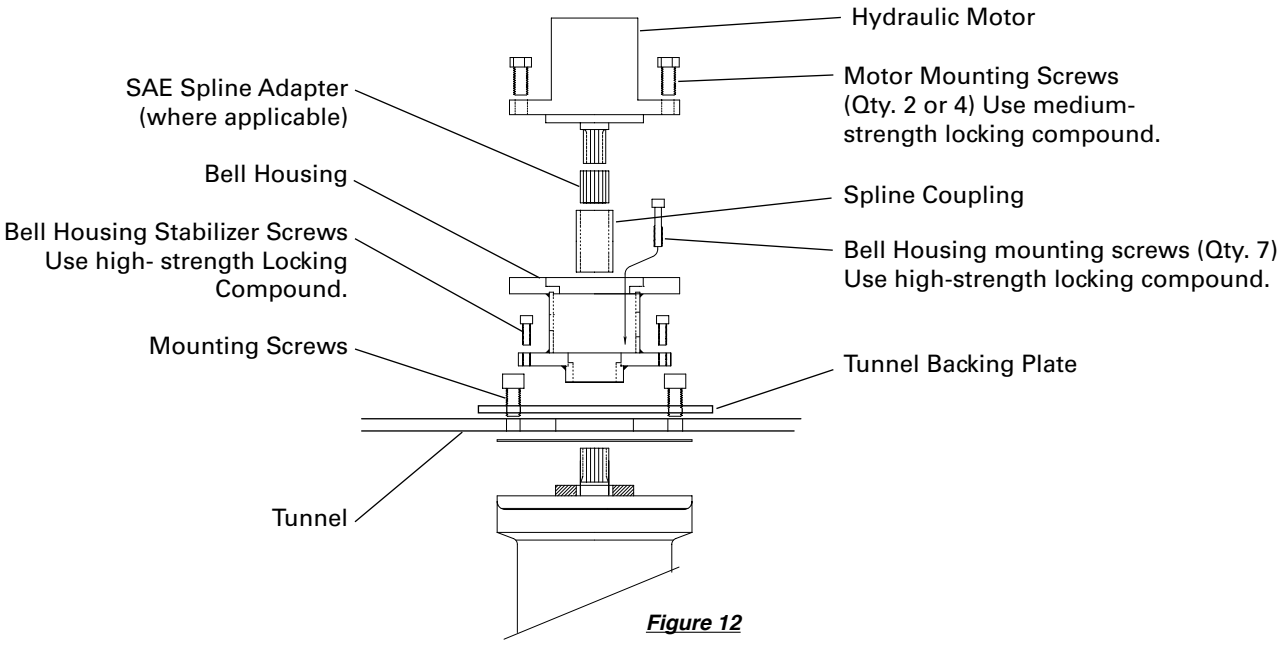


Figure 12

Table 1 - Thruster Assembly Torque Requirements

	Thruster mounting bolts		Propeller Nut	Nose Cone Screws	Bell Housing Bolts	Hydr. Motor Bolts	
TRAC 8	3/8"		55 Ft.lbs	N/A	24 Ft.lbs	40 Ft.lbs	
	24 Ft.lbs						
TRAC 10	3/8"	1/2"	80 Ft.lbs	7 Ft.lbs	24 Ft.lb	50 Ft.lbs	
	24 Ft.lbs	50 Ft.lbs					
TRAC 12	3/8"	1/2"	80 Ft.lbs	7 Ft.lbs	24 Ft.lbs	50 Ft.lbs	
	24 Ft.lbs	50 Ft.lbs					
TRAC 16	3/8"	3/4"	100 Ft.lbs	7 Ft.lbs	24 Ft.lbs	50 Ft.lbs	
	24 Ft.lbs	100 Ft.lbs					
TRAC 20		3/4	125 Ft.lbs	8 Ft.lbs	63 Ft.lbs	1/2"	5/8"
		100 Ft.lbs				63 Ft.lbs	85 Ft.lbs
TRAC 24	3/4"	7/8"	150 Ft.lbs	7 Ft.lbs	50 Ft.lbs	80 Ft.lbs	
	100 Ft.lbs	150 Ft.lbs					
TRAC 28	3/4"	7/8"	150 ft.lbs	7 Ft.lbs	50 Ft.lbs	80 Ft.lbs	
	100 Ft.lbs	150 Ft.lbs					

Header Tank Mounting/Lubrication Requirements:

WARNING! ***On some systems, the header tank fitting and plumbing must be connected before the driveline or motor are installed, or they cannot be reached.***

The header tank maintains positive fluid pressure inside the thruster gearbox to prevent water intrusion in the unlikely event of a leak. Although rare, the most probable source of a leak in the thruster is through the shaft seals.

In the event of a leak, case fluid will slowly seep out of the thruster gearbox, rather than water seeping in. The fluid level in the header tank should be monitored on a regular basis, and must be kept 1/2 full.

1- Using the brackets provided, mount the header tank in any convenient location near the thruster. The header tank should be mounted at least 30" above the waterline.

2- Connect the header tank hose to the supplied fitting on the thruster with the 3/8" diameter, oil resistant, low pressure hose. The fittings on the header tank and the thruster are -6 male JIC.

3- Fasten the hose along its route to the hull or bulkhead with nylon straps or clamps.

NOTE: Be sure that the hose cannot be pinched or become crimped at a later date by stowed gear or equipment.

4- Remove the breather cap on the header tank and begin filling with the gear oil supplied.

NOTE: Use ONLY Chevron Delo Gear Lubricant SAE 80-90.
Thruster is shipped pre-filled with gear oil.

5- Fill the header tank approximately 1/2 full. Store remaining fluid for future use.

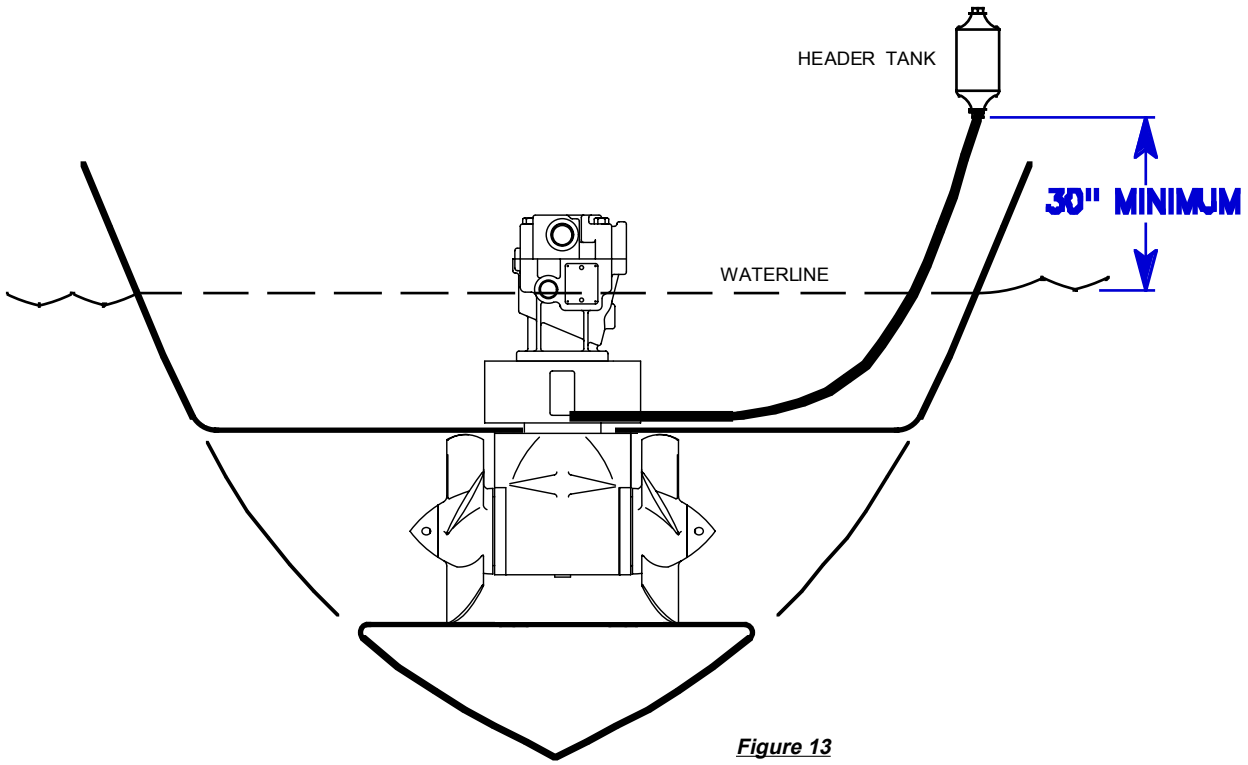


Figure 13

Electrical Component Installation:

Thruster Control Station (TCS):

Thruster Control Stations (TCS's) should be located at steering stations near main engine throttle and shift controls. A console cutout template and gasket is provided with each TCS. Make the console cutout as shown and drill the four mounting holes. The TCS mounts with four pre-installed stainless 10-32 studs. Extra long coupling nuts are provided for tightening.

Note: On variable speed TCS's there are three electronic adjustments (pots) that will need to be adjusted at start-up (see pg. 7-3 and 7-4). Keep this in mind when locating the TCS and before tightening in place.

The portion of the TCS that extends below the console is NOT weather resistant. In situations where the area below the mounting surface is open to the environment, a protective cover for the bottom of the TCS must be fabricated.

Bow / Stern Thruster Control Station

Thruster Control Station

Remote Start Stop Station

Figure 14

Relay Box or Switch Box:

The relay box should be mounted in the engine room in a dry, central location, where the ambient temperature will not exceed 120 degrees F. Access to the relay box is key in troubleshooting.

Nearly all control wiring leads to the relay box. Run all wires in the sizes indicated on the accompanying wiring diagram.

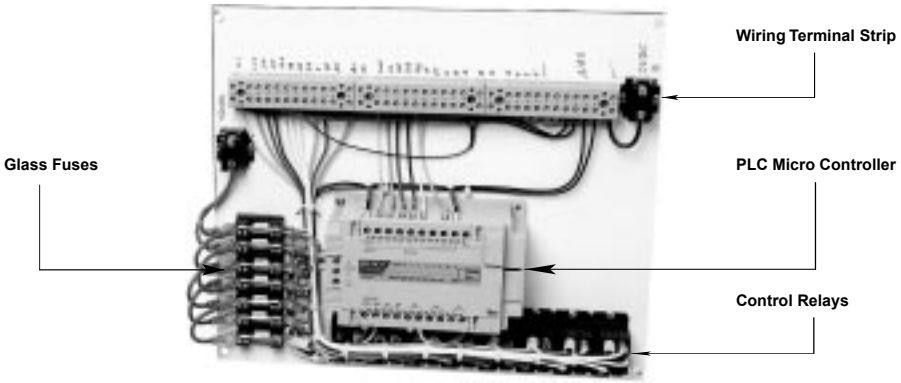


Figure 15

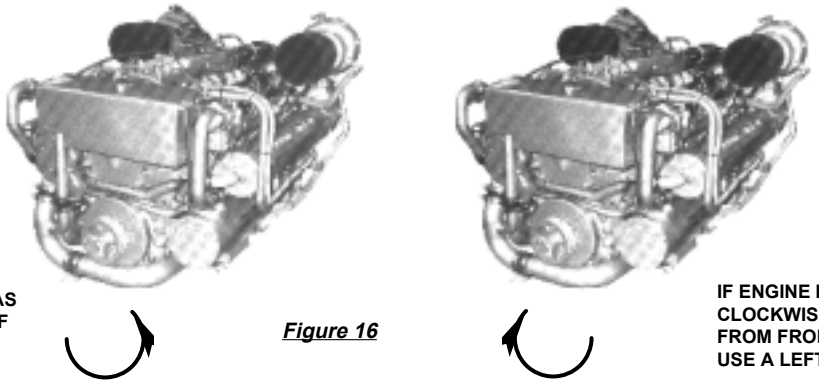
PLC / Switch Board

Hydraulic Pump Installation:

WARNING! ***Operation of a hydraulic pump having the wrong rotation will cause serious damage to the pump. Confirmation of proper pump rotation is the responsibility of the installer!***

WARNING! ***Operation of a hydraulic pump having inlet and outlet plumbing accidently reversed will cause serious damage to the pump. Confirmation of proper port location is the responsibility of the installer! Do not rely on pictorial plumbing diagrams for determination of proper port location.***

for gear pumps driven from the front of the engine



IF ENGINE ROTATION IS COUNTER CLOCKWISE AS VIEWED FROM FRONT OF ENGINE, USE A RIGHT HAND PUMP.

IF ENGINE ROTATION IS CLOCKWISE AS VIEWED FROM FRONT OF ENGINE, USE A LEFT HAND PUMP.

Figure 16

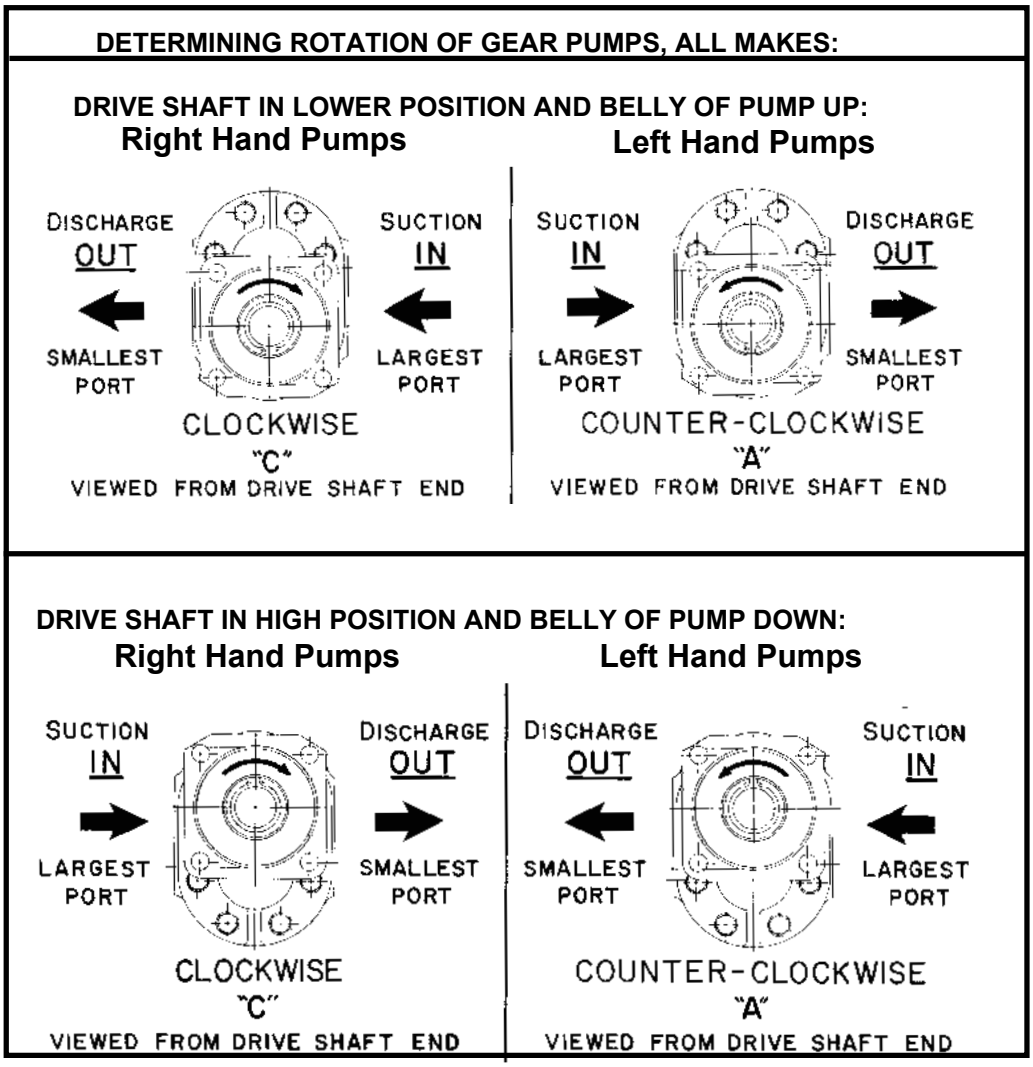


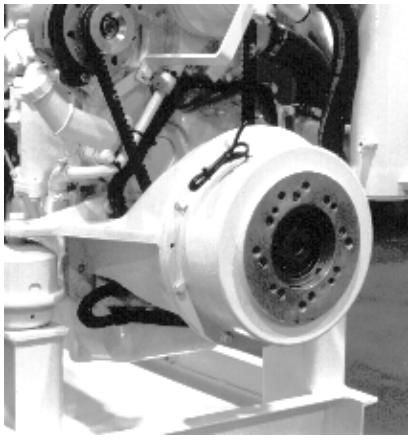
Figure 17

For assistance determining rotation on hydraulic pumps other than GEAR pumps, contact factory.

Engine PTO Location:

Where an SAE pump PTO is provided on the front of the engine:

- Ensure that the PTO mounting and shaft connection match the hydraulic pump being used.
- Check to be sure that pump rotation is correct. ***Important!***
- Grease pump shaft.
- Insert shaft into PTO and bolt pump in place using grade 8 bolts.



Hydraulic pump PTO with electric clutch on front end of generator. (Northern Lights.)

Figure 18

NOTE: Most variable displacement pumps require that the pump be mounted with the controller on top. Call factory for options.

• Fill variable displacement pump cases and inlets with oil prior to start-up.

Wet Splines:

In some cases an engine supplied PTO for a hydraulic pump may be wet with oil on the engine side while running. This is called a wet spline. In these cases the hydraulic pump face must be coated with a high temperature gasket forming compound that is resistant to hydraulic oil.

Where American Bow Thruster supplies clutch, bracket, and CENTAFLEX coupling:

A platform for the pump group must be fabricated. Where the driving engine is on mounts that allow the engine to move with vibration, the pump group platform must be rigidly connected to the engine block so that the pump group and engine will vibrate in unison.

If the engine is mounted directly to the engine bed stringers and where the engine does not deflect at all when in operation at any load or rpm, call factory for approval to fasten pump mounting platform to engine stringers.

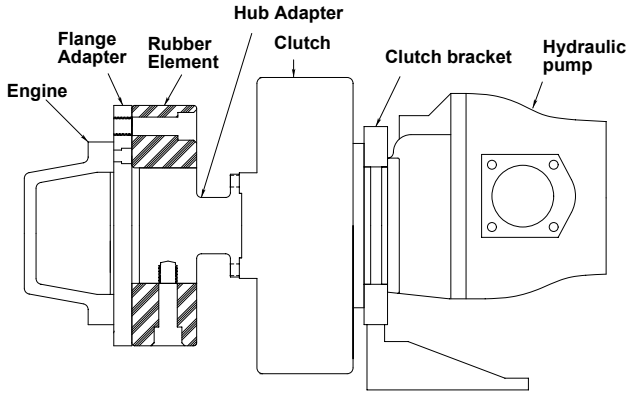


Figure 19

CENTAFLEX Coupling Installation:

CENTAFLEX Coupling Information:

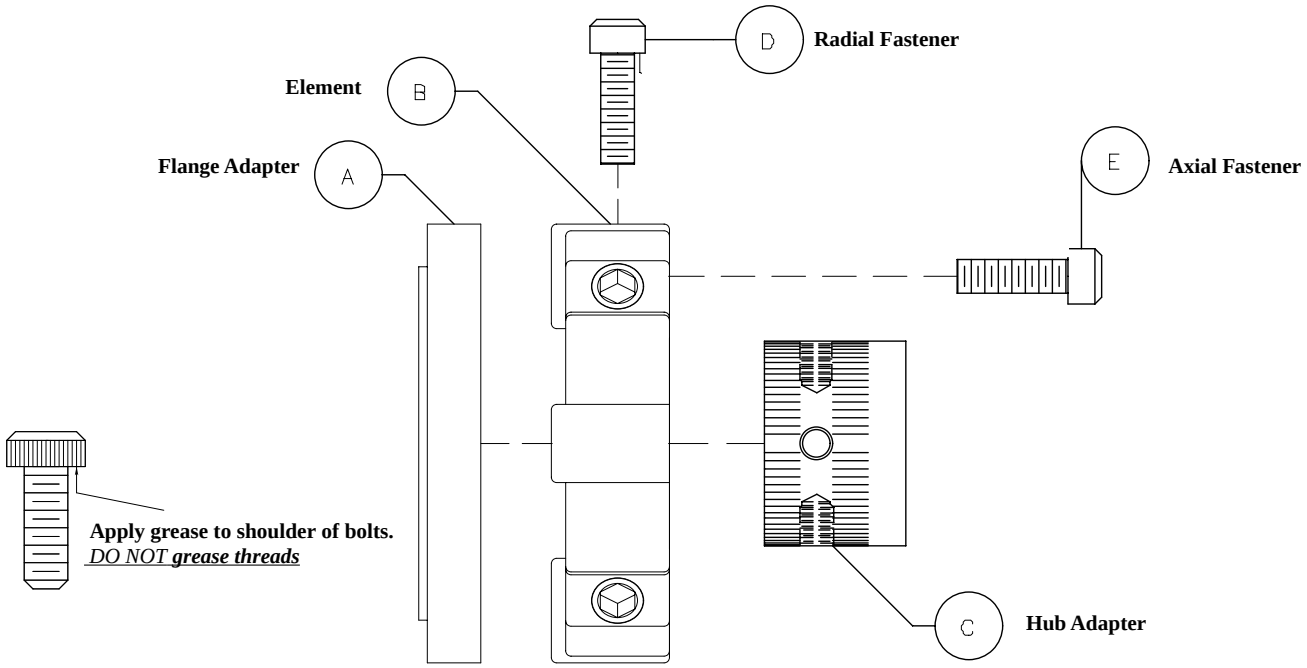


Figure 20

WARNING!	**Improperly installed couplings are a frequent area of trouble with the system. They can cause excessive wear on the coupling and can even cause the attached clutch to break. Make sure that the instructions enclosed with the coupling are followed by the letter to avoid future problems.**

Installation Notes:

- Either the hub adapter or the flange adapter will face the clutch depending on the drive line design. See drive line drawing for further details.

- Apply locking compound on the flange / hub adapter fasteners.

- Grease the shoulders of the radial and axial element fasteners. (to avoid incorrect element orientation)

- Adhere to the torque values listed in table 2.

- Make sure that the alignment of the coupling is according to the specifications liste in table 2. ***Incorrect allignment will result in premature failure of the element and possibly breaking of the clutch.***

CENTAFLEX Alignment Suggestions:

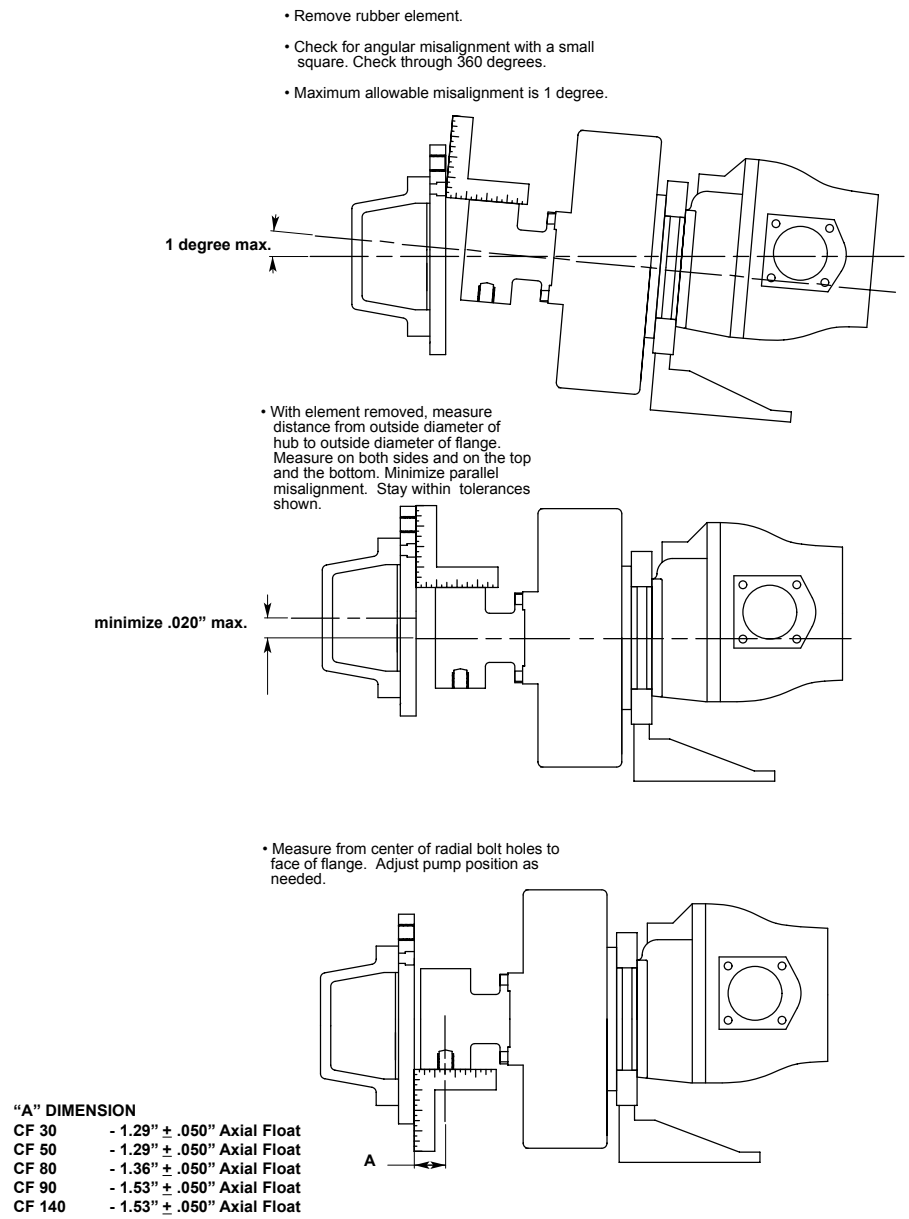


Figure 21

Table 2 - CENTAFLEX Data

CENTAFLEX SIZE	22	25	28	30	50	80	90	140
Screw size	M14	M14	M16	M16	M16	M16	M20	M20
Bolt torque (ft. lb.)	65	105	105	150	150	150	330	330
No. of bolts	4	3	4	3	4	4	3	4
Wrench size	10mm	12mm	12mm	14mm	14mm	14mm	17mm	17mm
Angular error	1 deg.	1 deg.	1 deg.	1 deg.	1 deg.	1 deg.	1 deg.	1 deg.
Parallel error (+/-)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Axial float (+/-)	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05

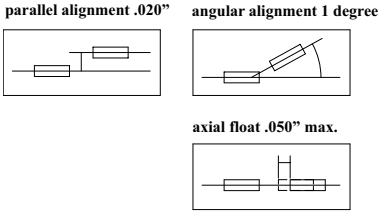
Centaflex couplings are always supplied with Centaflex, Lovejoy fasteners that are coated with a special locking compound. Use only these fasteners! These fasteners should be assembled and torqued only once if possible. However, the locking compound on these fasteners is rated for up to three tightenings.

Be sure to read the installation notes on Centaflex Couplings (pg. 2-13) before installation including details on:

* required fastener torque
* maximum misalignment specifications
* greasing bolt shoulders (not threads!) of Centaflex fasteners prior to torquing.

WARNING! **Do NOT use any type of liquid anaerobic compound on or near a rubber Centaflex element. These compounds can attack the bond between the rubber element and its integrally molded aluminum inserts.**

Adapter to engine/clutch fasteners should be grade 8 hex cap screws or alloy socket head cap screws. High collar lock washers and locking compound should be used for retention.



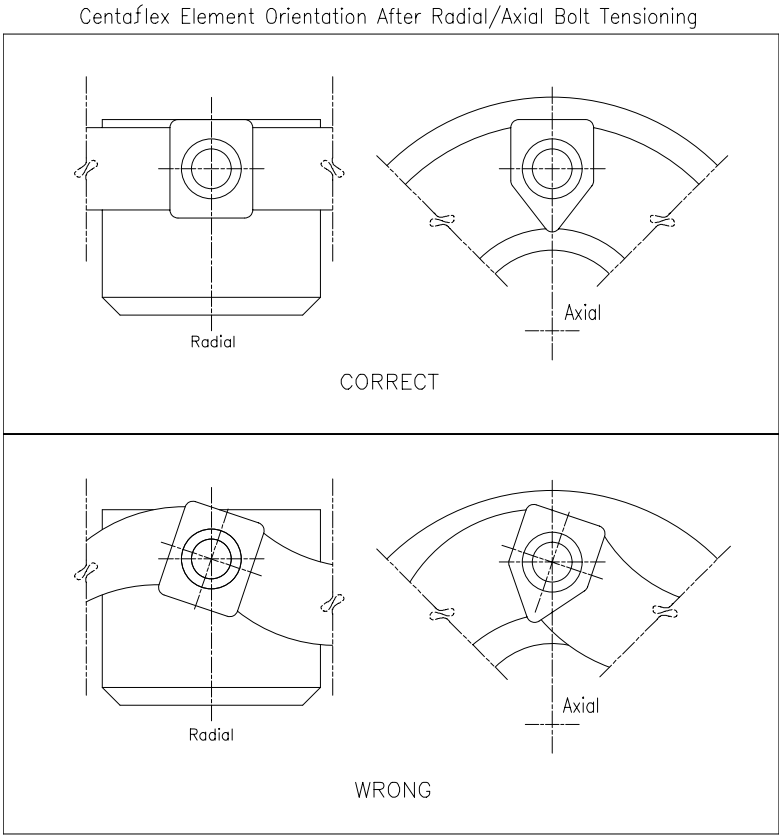


Figure 22

SPICER Coupling Installation:

Where American Bow Thruster supplies clutch, bracket, and SPICER SHORT COUPLED DRIVE LINE coupling:

If a Spicer short coupled drive line is used the pump platform may be fastened to the engine stringers. However, the face of the clutch input hub must be parallel with the face of the engine drive shaft pulley! ***This is very important!*** See diagram.

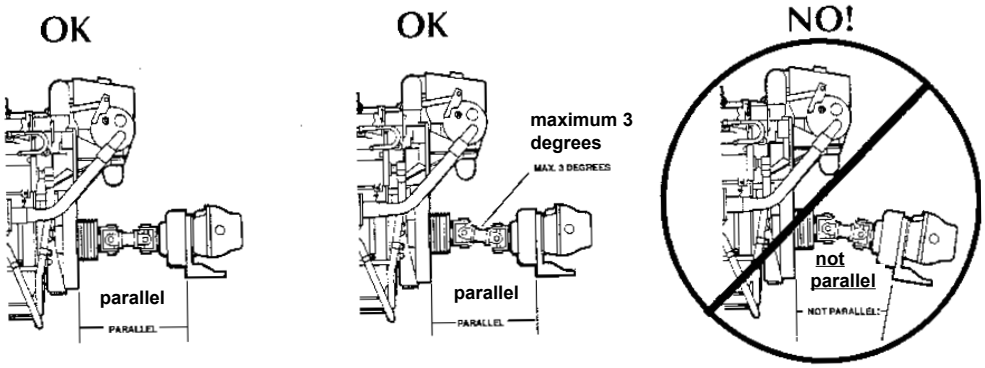


Figure 23

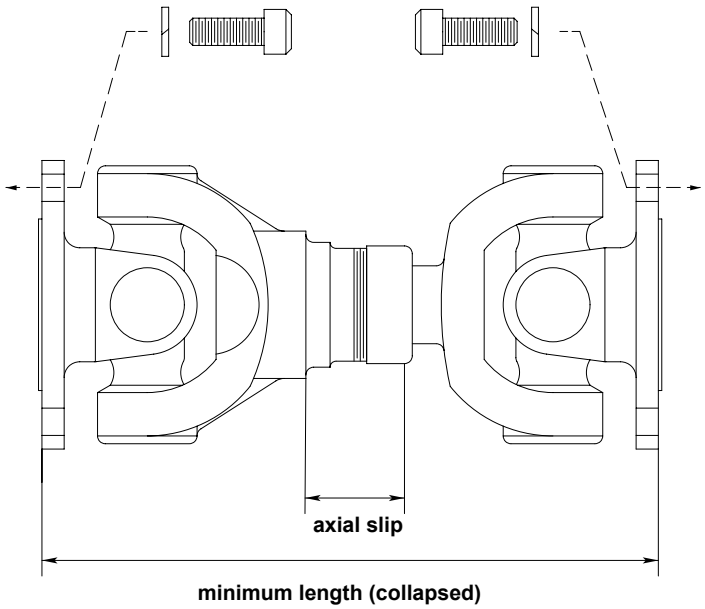


Figure 24

Table 3 - Spicer Short Coupled Drive Data

Model	1280	1310	1350	1410	1480
Minimum Length (collapsed)	8.88"	8.88"	9.50"	9.50"	9.50"
Axial Slip	1.25"	1.25"	.75"	.75"	1.00"
Operating Angle	3 deg.	3 deg.	3 deg	3 deg.	3 deg.

Miscellaneous Pump Information:

Adapters:

Adapters that allow for direct bolt up of the pump coupling to the engine are usually provided. It is important that all fasteners associated with the pump coupling be given close attention. All required fasteners are usually provided by the factory. However, the installer still has the responsibility to ensure that the length of the fasteners is correct. Fasteners must not be too long or too short. Generally thread engagement of at least 1-1/2 times the fastener diameter is required.

DANGER! **Fasteners that are too long may cause the adapter to not mount tight to the engine PTO. Fasteners that are too short may result in breaking of those fasteners, resulting in dangerous or even life threatening situations.**

Crankshaft Pulley Reinstallation:

On installations where the crankshaft pulley is temporarily removed for the installation of coupling adapters, or even replaced by a coupling adapter, be sure to consult the engine manufacturer for instructions on reinstallation. Be sure to torque crankshaft pulley retaining fasteners or nuts to full torque values as specified by the engine manufacturer.

Pump Group Coupling Guard:

DANGER! **The coupling of the pump group to the prime mover results in exposed moving parts. A suitable guard or shroud should be fabricated to protect against injury from personal contact with any pump group coupling parts.**

Live Pump Installations:

In some cases a system is designed without a clutch to disengage the pump from the prime mover. If this system is of this type remember that the hydraulic pump will turn whenever the prime mover is turned over or is running. If you need to start the prime mover prior to completion of the hydraulic system installation, remove the hydraulic pump from the engine first, and reinstall later.

WARNING! **Hydraulic pumps must never be run dry! Not even for a few seconds! Before running, be sure that the hydraulic system is installed completely, the system filled with oil, the reservoir outlet valve is open, and the hydraulic system is ready to start-up.**

Extra Long Pumps:

Sometimes a double hydraulic pump is used in a system. These pumps tend to be extra long. Because of their length and the overhung load, it is recommended that a support for the back end of the pump be made to reduce stress on the pump face mounting flange.

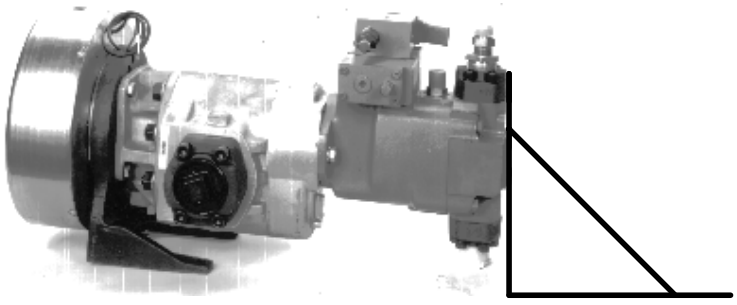


Figure 25 **EXTRA LONG PUMPS REQUIRE REAR SUPPORT.**

Reservoir Installation:

The reservoir assembly should be mounted close to, and above the hydraulic pump.

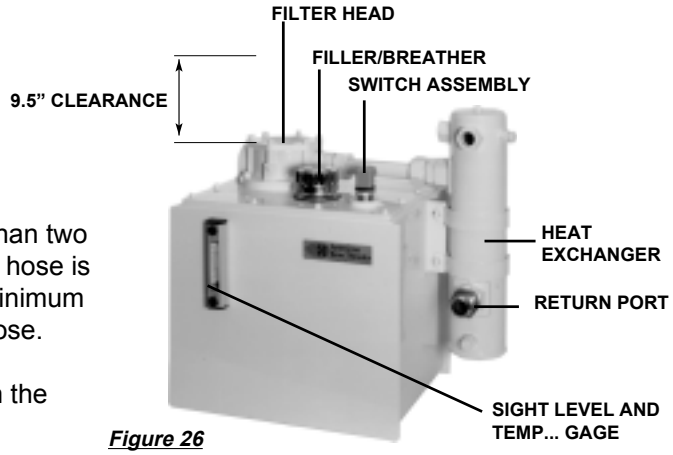


Figure 26

Plan reservoir location so that there will be no more than two 90 degree elbows in the pump suction hose. Suction hose is large in diameter, is very stiff, and has a very large minimum bend radius. Be sure to plan a path for the suction hose.

Note: The suction valve may be located anywhere in the suction line.

Be sure to take into consideration the weight of the hydraulic oil when mounting the reservoir.

11 and 20 gallon reservoirs require 9.5" of clearance above the filter assembly for replacement of the filter element.

Cooling Pump Installation:

Cooling pumps should be mounted just above (6 inches optimum) the waterline for ease of priming. Pump should be mounted near heat exchanger to minimize pressure losses. Use 3/4" water hose that doesn't kink when bent and with sufficient wall thickness to prevent collapse when used on suction side of pump. Be sure to verify correct coolant flow direction before installation or plumbing. Pump should turn clockwise looking at shaft end of motor. Hoses should be routed so that some water will be retained in pump body to wet the impeller.

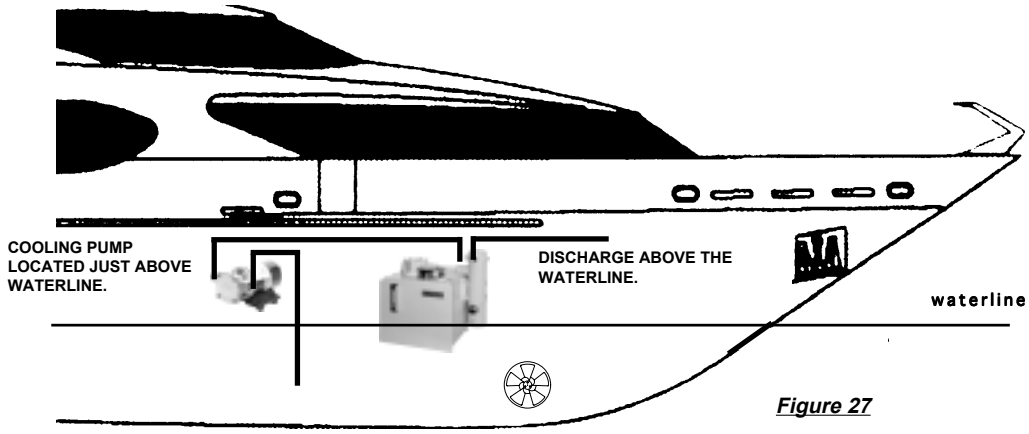


Figure 27

Be sure that pump has adequate through hull water supply, 12 gallons per minute required. Avoid sharing through-hulls. Where a through-hull must be shared be sure that it is of adequate size to supply all pumps.

WARNING! **Most cooling pumps are 12 or 24 vdc. Some pumps are 110 or 220 vac. Be sure to disconnect power before working on any pump or electrical device. Be sure to close through-hull prior to working on cooling pump plumbing. Be sure that through-hull valves are properly maintained and serviced. In systems designed with two heat exchangers, plumb the discharge of the cooling pump to the lowest heat exchanger tube port.**

Cooling pump discharge should be plumbed above the waterline so that positive cooling flow can be visually verified.

Directional Control Valve Installation:

DANGER! **If the pressure line from the pump is accidentally connected to the T port on the DCV instead of the P port there will be no path for oil flow and the relief valve cannot protect the system. Serious system damage that could result in personal injury will occur if a miss-plumbed system is started up!**

Thruster directional valves (dcv's) are mounted between the hydraulic pump and the thruster and should be mounted in the engine room to limit hydraulic noise propagation.

All thruster directional valves have spring centered spools and so can be mounted in any position. Thruster dcv's must be mounted below the reservoir. DCV's supplied with throttling valves (for proportional speed control) must either be mounted so that the stem of the throttle valve is in a vertical position or the throttling valve must be removed and mounted separately so that the stem is vertical.

DCV Port Identification:

On single speed dcv's (8" and 10" systems only) there are four ports in the dcv. They are:

P - supply from the pump
T - return to the tank or reservoir
A - supply to work load port A (thruster or other motor)
B - supply to work load port B (thruster or other motor)

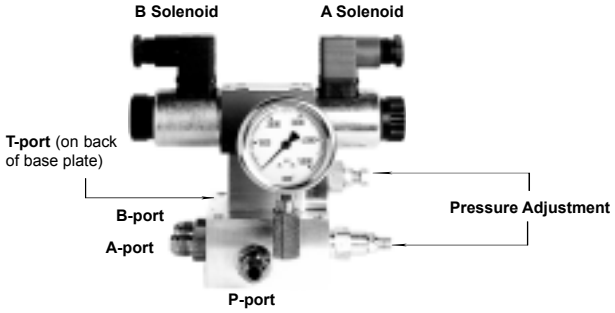


Figure 28 **D03 DCV**

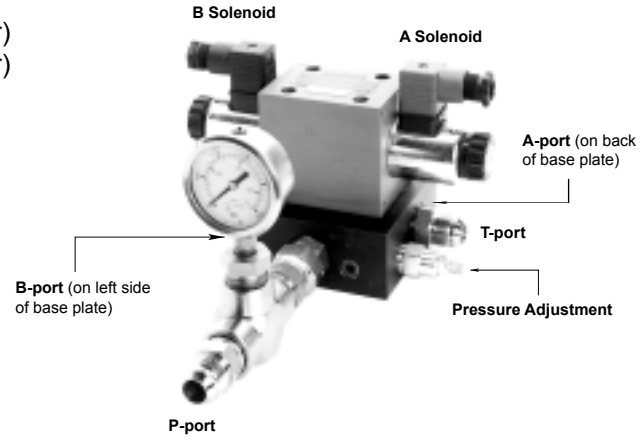


Figure 29 **D05 DCV**

On throttling dcv's there is an additional drain port on the throttling valve. On D08 and D08H throttling dcv's, in addition to the throttling valve drain port there is a dcv pilot drain port, the "**Y**" port.

D08 and D08H valves also have a port marked "**X**". In most cases this port can be used as a gage port if there isn't a separate gage port.

On all thruster dcv's the system main relief is built in to the sub-plate or a sandwich in the dcv. The system relief setting is made at the factory and should not require adjustment.

On ancillary dcv's for other loads or functions there may be other drain ports that will be defined on the plumbing diagram.

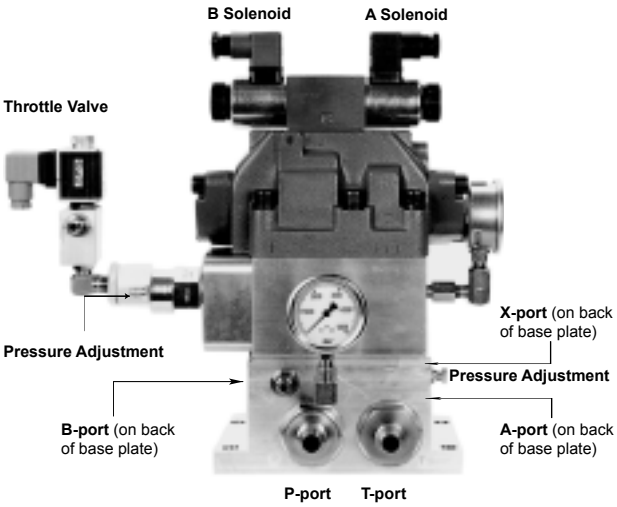


Figure 30 **D08 DCV**

Section 3 - Plumbing

Plumbing:

The system must be plumbed according to the plumbing diagram that accompanies these standard instructions. Pressure ratings on the diagram are minimum working pressure, not burst pressure.

DANGER! **Use of hydraulic hose or pipe not having sufficient working pressure ratings may result in hose or pipe failure which can cause serious personal injury.**

Case Drain Plumbing for Thrusters and Pumps:

Most thruster motors have a case drain port. It is the smallest of the three ports. A low pressure hose must be run from this port back directly to the case drain port on the reservoir. It must never be connected to any other return line. However, it may be Teed into other case drain ports. The case drain line may not pass through any filter.

Do not confuse the hydraulic motor case drain line with that from the thruster gearbox lube oil port which attaches to the header tank.

Most piston pumps also have case drains that must be plumbed to the same case drain port on the reservoir.

Hydraulic Oil

Use only high grade oils meeting ISO 32 standards having anti-wear additives. DO NOT use multi grade oils. The following oils are approved and recommended in their ISO 32 grades:

Chevron AW hydraulic 32
Shell Tellus 32 (not Shell Tellus "T")
Texaco Rando HD 32
Exxon Nutoh H 32

Protect Against Contamination

Hydraulic system contamination prior to initial start-up is by far the biggest problem experienced in the field. Contamination = anything other than hydraulic oil inside the system including dirt, metal shavings (or chunks), grinding grit, water, grease, rags, etc. Keep hydraulic reservoirs, pumps, valves and especially plumbing closed, capped, and sealed prior to final hookup. Remember, contamination failure can be very expensive. Protect your investment! Talk about the need for system cleanliness with your workers.

Generic Hydraulic System Diagram:

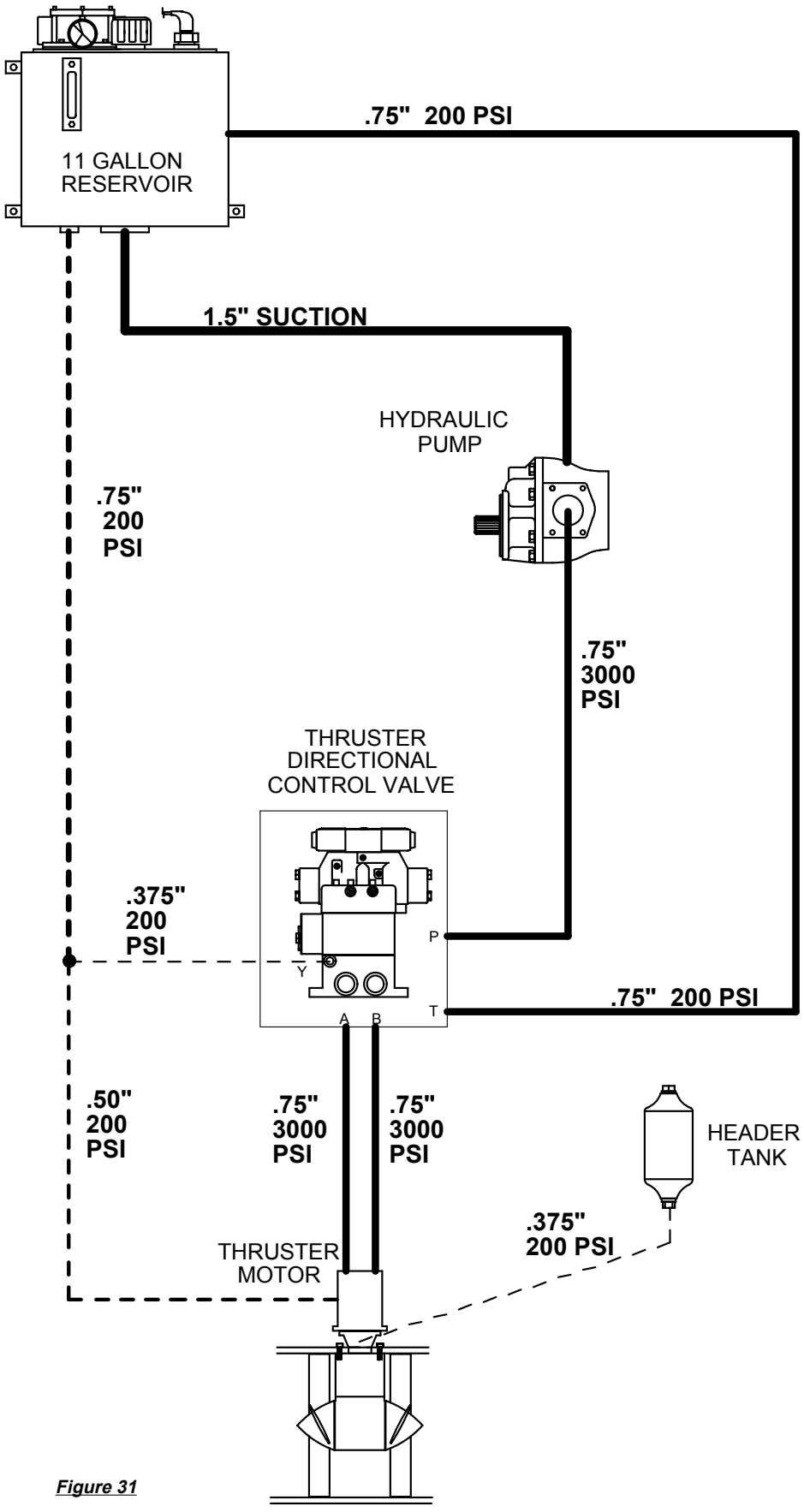


Figure 31

Section 4 - Wiring

Note! **The system must be wired according to the wiring diagram that accompanies these standard instructions. Wire sizes on the diagram are minimums.**

DANGER! **Use of wire of insufficient size can cause system malfunction and equipment damage. It may also result in fire which can cause significant material damage and serious personal injury.**

Thruster Control Station (TCS) Generic Wiring Diagram:

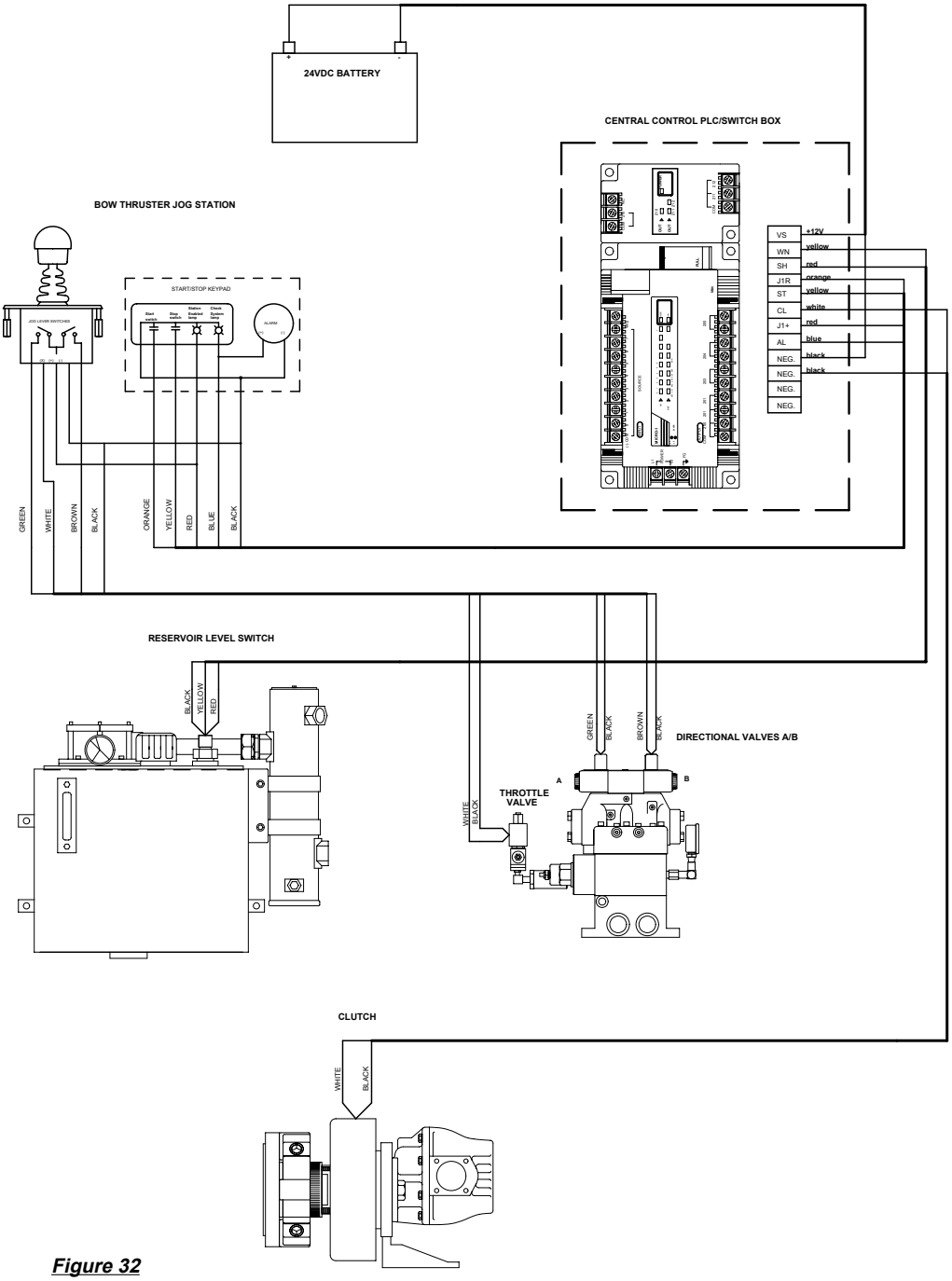


Figure 32

Section 5 - Miscellaneous pre-start-up notes

Corrosion Control:

All seagoing vessels must be protected from corrosion from galvanic and electrolytic potential. American Bow Thruster encourages all boat owners to enlist the services of a corrosion control expert to evaluate your vessel's corrosion control system and how your thruster should be made a part of that system.

Our thrusters are particularly resistant to all types of corrosion, especially bronze models. However, serious corrosion problems can take their toll on all types of equipment, especially on aluminum boats. Whatever system you use, you must definitely take the thruster system into consideration and include it into your corrosion control system.

Paint and Coatings:

On Hydraulic Systems:

Reservoirs, heat-exchangers and bell housings are painted with Dupont 25P epoxy Primer and IMRON 333 white polyurethane. These are the only components painted on a regular basis. When it is requested that other components in the system be painted, the same coatings will be used.

Thrusters, Propellers, and Tunnels:

Thrusters, propellers, and tunnels should be painted with bottom paint.

Section 6 - Final Check List:

Did You?.....

- be sure to call American Bow Thruster to answer your questions so that expensive mistakes could be avoided down the road?
- install the tunnel at least 1/2 diameter (and preferably deeper) from the waterline to the top of the tunnel?
- have a professional, certified craftsman install the tunnel to the architects standards?
- ensure that thruster does not protrude from tunnel?
- use the thruster mounting screws supplied by American Bow Thruster?
  Monel (NICU) for bronze thrusters
  stainless (316) only for aluminum thrusters
- not over torque the thruster mounting screws?
- safety wire the thruster mounting screws?
- be sure that thruster propeller turns freely and is not scraping tunnel or face of thruster motor?
- include the thruster system in the vessel's corrosion control system?
- use adequately sized wire?
- be sure that voltage supply to thruster controls is strong and without voltage drop?
- fabricate a guard over any moving parts?
- run the header tank plumbing at least 30" above the waterline?
- mount the reservoir above hydraulic pump(s) and thruster dcv?
- mount the reservoir near the pump?
- mount the reservoir securely?
- mount reservoir with 9.5” clearance for replacement of filter element?
- not use more than two 90 degree elbows in pump suction hose?
- open the reservoir outlet valve prior to start up?
- mount the directional valve near the pump in noise sensitive applications?
- mount the directional valve so that the throttle valve stem is vertical and below the reservoir oil level?
- isolate all hydraulic components and plumbing from hull in noise sensitive applications?
- used adequately sized and rated plumbing?
- minimize the use of hard 90 degree fittings in plumbing to reduce pressure drop, noise, and heat?
- carefully check all pump coupling fasteners for proper length, torque and locking mechanism?
- keep all components and plumbing completely clean during installation or flush it completely before start-up?
- plumb all case drains directly to the reservoir and not Teed into any return line?
- Be sure to never run the system over rated pressure?

• On systems fitted with Centaflex couplings:

- fabricate a pump mount according to the instructions? I.e. connected to the engine block when the engine is soft mounted?
- follow the Centaflex technical sheets for important notes on critical alignment?
- not use anaerobic locking compounds near the rubber element?
- use only Lovejoy Centaflex pins and socket head cap screws in conjunction with the element?
- grease the shoulders (not threads!) Centaflex pins and screws prior to torquing?
- torque the Centaflex pins and screws to the proper torques values?

• On systems fitted with Spicer short coupled drivelines:

- maintain alignment within 3 degrees?
- ensure that the face of the pump and face of the crankshaft are parallel on both axes regardless of alignment?
- ensure that if the driveline had been disassembled prior to installation that it was reassembled in proper phase? (Be sure to call factory if you have any questions about this.)

• On systems with seawater cooling pumps:

- mount the cooling pump just above (6 inches) the waterline?
- plumb the cooling pump discharge above the waterline?
- use a through hull with adequate delivery for the cooling pump?

START-UP WARNING

Before any system hydraulic pump is turned, three preparatory steps must be taken:

1) The pump case for every system hydraulic pump must be filled with hydraulic oil.

2) The motor case for every hydraulic thruster motor must be filled with hydraulic oil.

3) Variable displacement pump controllers must be set to low pressure and kept at low pressure until all air is purged from the system.

Failure to take these steps will result in damage to pumps and motors, and will void the ABT equipment warranty for these parts.

Step 1:
For variable displacement pumps, completely fill suction lines and also directly fill the pump- case through whichever case drain port has the highest elevation.

For fixed displacement pumps, fill suction lines and allow flow to exit in a solid stream from a loosened pump discharge fitting.

Step 2:
Thruster motors must be directly filled wit hydraulic oil through the motor's case drain port.

Step 3:
Set pump high pressure controller adjustments to minimum pressure setting (typically full CCW on the high pressure adjusting screw).

Minimum pressure settings must be maintained until air has been purged from all hydraulic lines during subsequent pump operation.

Section 7 - Start-up and Tuning

Hydraulic Check:

• Double check all plumbing to be sure that all hoses have been run and are connected to the right ports.

• Check to see that all fittings and connections are tight.

• Check to see that all components are secured properly.

• If installation contamination is suspected, flush all hydraulic lines prior to start-up. A valuable start-up flush can be done with the system itself by connecting P-A and B-T at the directional valve and by connecting A-B at the thruster. This isolates the thruster directional valve and thruster during initial start-up while hydraulic lines flush back to the reservoir. The drawback of this approach is that the system is now full of oil and reconnecting the hydraulic lines to their proper points will be quite messy. This is definitely a compelling reason to keep the hydraulic system very clean during installation.

• Check pump group. Make sure pump coupling has been properly aligned and that all fasteners are torqued to spec. Be sure pump coupling guard is in place.

• Check electrical system and be sure all electrical connections are tight.

• During start up listen for noise. It is normal for pumps to make noise during start up but they should quiet down within 15 seconds. If you hear excessive noise anywhere after 15 seconds shut system down and determine what problem is before proceeding.

• While TRAC Series thrusters are the quietest on the market, they are by no means silent. Expect considerable noise from the thruster tunnel area. Remember, there is a tremendous amount of horsepower acting within a very small place down there. Some noise is normal.

DANGER! **Be sure there are no workers or swimmers in water.**

DANGER! **Hydraulic systems develop high pressure. Flawed hydraulic hoses are likely to fail on initial start up and can cause serious personal injury. Stay clear of hydraulic hoses and pipes during start up. High pressure oil can penetrate skin and cause major tissue damage. Be sure to wear eye protection.**

• **NOTE:** During initial start up the oil level switches in the reservoir may quite possibly trip causing an audible alarm. An extreme low oil alarm will disengage the clutch, but will reengage the clutch once the oil level is replenished.

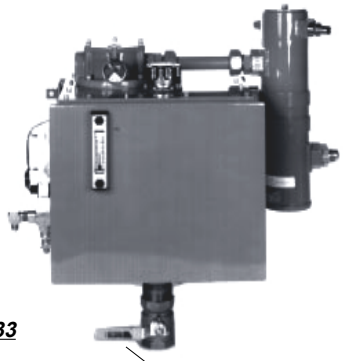


Figure 33

Outlet valve shown in closed position. Be sure to open before starting system.

• Open outlet valve on reservoir.

• Fill reservoir with oil. Have extra oil standing by.

• Turn on circuit breaker to system.

• Start prime mover and run at lowest speed.

• *If system has live pump*, oil level will go down immediately as hydraulic lines fill up. Immediately replenish oil in reservoir. Shut down prime mover if necessary. ***Never run the hydraulic pump dry!***

.

• *If system has a clutch*, turn system ON by pushing any TCS START switch.

Note: You must hold START or STOP switch down for at least 2/10's of a second before the system will acknowledge your command. Listen for clutch to engage. If it does, oil will rapidly drain from reservoir. Have someone standing by to turn system OFF with TCS OFF switch or shut prime mover down until oil is replenished in reservoir. *Never let hydraulic pump run dry!*

Bow And Stern Thruster Control Station

Thruster Control Station (TCS)

Figure 34

Remote Start Stop Station

NOTE! On some systems the clutch does not engage until a jog lever is moved either right or left.

Figure 35

Keep Reservoir Full Of Oil During Startup!

• Check for cooling water flow. It may take 30 seconds for pump to prime and fill heat exchanger with water.

• Listen to pump group coupling. Feel for excessive vibration. If present, shut prime mover down and check pump coupling alignment.

• If clutch engages and oil in reservoir does not go down immediately, SHUT SYSTEM DOWN IMMEDIATELY and check to be sure that reservoir outlet valve is OPEN! Also recheck pump rotation and position of inlet and outlet hoses to be sure they are correct. Seeing the oil level go down in the reservoir is your best assurance that the pump is installed correctly. If it does not, check carefully for problems!

• When reservoir level stabilizes, move jog lever to a minimum thrust position.

WARNING! **Thruster may reach high power at this time! Be sure that vessel is tied securely with adequate fenders. Have dock watch person posted. Warn all nearby personnel that thruster may operate. Be ready to turn thruster system OFF.**

• If thruster dcv opens properly, thruster hydraulic loop will fill with oil and level in reservoir will again immediately go down. *Replenish oil immediately.*

• Test all other loads and *replenish oil immediately.*

Note: On systems driven by the main engine, a failure of the clutch to engage may be the result of a speed sensor needing attention. The purpose of the speed sensor is to disengage the clutch if the main engine speed exceeds 1100 rpm, and to reengage the clutch once the speed reaches 900 rpm (some minor variations may apply). The reason for these speed settings is to prevent the pumps working pressure from exceeding the system's maximum allowed pressure.

Tuning:

There are 2 ways to tune the Thruster Control Station (TCS), by pressure reading or by electrical reading. Both ways are described below.

The speed sensor is mounted on the input flange of the clutch. At the top of the sensor where the wires protrude there is an LED which, at first glance, is hard to see. This LED should be flashing red. If it is, then you can be sure that the speed sensor is working properly. If it is not, check gap between speed sensor and tone wheel. Gap should be between .020" and .030". Also check to see if any metal chips are stuck on the end of the sensor

Tuning by pressure:

- Enable the first TCS.
- If main engine driven system, increase main engine rpm to 800.
- Move the jog lever to the minimum thrust position.
- Adjust the THRESHOLD pot on the bottom of the jog lever until the system pressure gage reads 600 psi. (Or whatever minimum pressure is desired)
- Move the jog lever to the maximum thrust position.
- Turn the MAXOUT pot on the bottom of the jog lever clockwise 20 turns. Then turn counter clockwise until the pressure as read on the dcv gage starts to fall. Turn clockwise until maximum pressure is read again.
- The MAXOUT and THRESHOLD adjustments affect one another. Accordingly, it is necessary to repeat the MAXOUT and THRESHOLD adjustments about 3 or 4 times to achieve the final desired settings.
- Once MAXOUT and THRESHOLD are adjusted move the jog lever quickly from zero thrust to full thrust. It should take about 3/4 of a second for the pressure to ramp up. Adjust the RAMP TIME pot until 3/4's of a second is reached. Clockwise increases time and vice-versa.
- Repeat for all TCS's.

Thruster Control Station

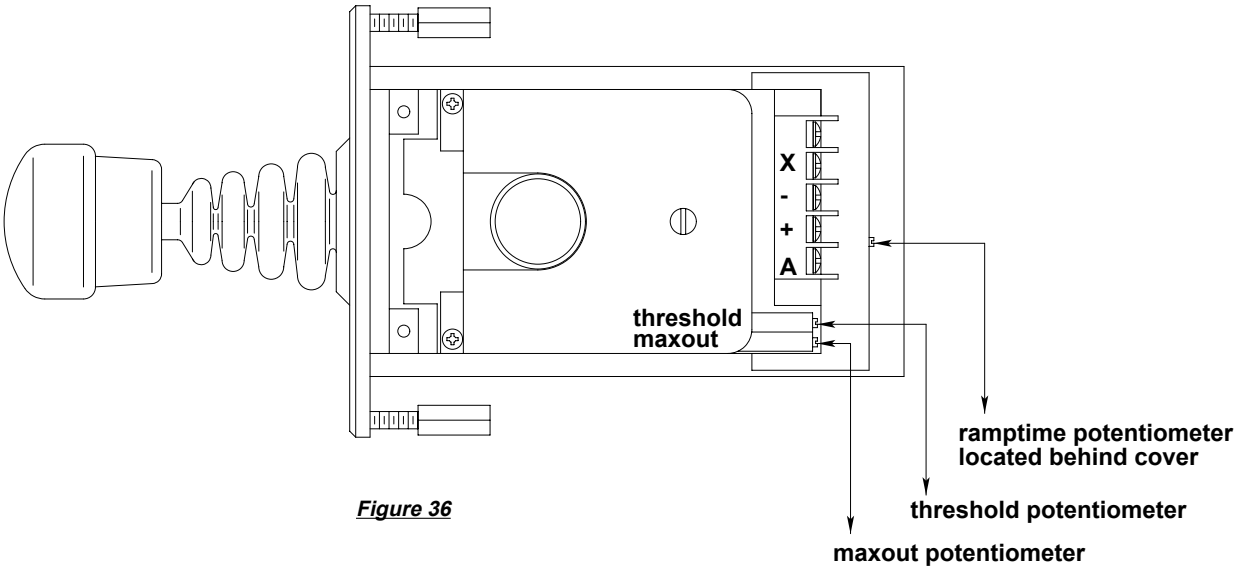


Figure 36

Tuning electrically:

• Enable the first TCS.

• If main engine driven system, increase main engine rpm to 800.

• Move the jog lever to the minimum thrust position.

• Set the Voltmeter to DC voltage and place the voltage lead on terminal (A), (Signal to throttle) and the common lead on terminal (-).

• Adjust the THRESHOLD pot on the bottom of the jog lever unit until the voltmeter reads 3 VDC. (Or whatever voltage is desired)

• Move the jog lever to the maximum thrust position.

• Turn the MAXOUT pot on the bottom of the jog lever unit until the voltmeter reads 11 VDC. (Or whatever voltage is desired)

• The MAXOUT and THRESHOLD adjustments affect one another. Accordingly, it is necessary to repeat the MAXOUT and THRESHOLD adjustments about 3 or 4 times to achieve the final desired settings.

• Once MAXOUT and THRESHOLD are adjusted move the jog lever quickly from zero thrust to full thrust. It should take about 3/4 of a second for the pressure to ramp up. Adjust the RAMP TIME pot until 3/4's of a second is reached. Clockwise increases time and vice-versa.

• Repeat for all TCS's.

Systems with Variable Displacement Pumps:

Variable displacement pumps come with a variety of controls. Call the factory for specific tuning details of these controls prior to system start-up.

Main engine driven systems:

After all tuning is complete, enable any TCS and increase engine rpm to 1300 rpm. Clutch should disengage at about 1100 rpm and should reengage at about 900 rpm. Some systems may be set differently. Check the speed sensor if the system doesn’t function properly, or call the factory.

Les pompes à cylindrée variable disposent de diverses commandes. Avant le démarrage du système, contactez l'usine pour connaître les détails de réglage spécifiques de ces commandes.

Systèmes entraînés par le moteur principal :

Une fois le réglage terminé, activez tout poste de commande du propulseur et augmentez le régime moteur à 1 300 tr/min. L'embrayage doit se désenclencher à environ 1 100 tr/min et se réenclencher à environ 900 tr/min. Certains systèmes peuvent être réglés différemment. Si le système ne fonctionne pas correctement, contrôlez le capteur de vitesse ou contactez l'usine.