STEERING SYSTEM
Inboard/jets

IMPORTANT INFORMATION FOR THE INSTALLER

The information in this booklet should be read in conjunction with the separate installation manual provided.

Please also refer to all warnings and instructions packed in with the individual cylinders, helms and fittings.

Please also note that whilst maintenance on the installed steering system is minimal, regular checks on the security of all nuts, bolts and fittings should be carried as a part of regular service and maintenance of your steering system. All attaching bolts and connections to the tiller and cylinder should be examined regularly to ensure they are tight and secure.

Failure of those parts to be correctly secured can potentially lead to the loss of steering which in turn can result in accidental damage and or bodily injury.

ATTENTION INSTALLING DEALERS AND BOAT BUILDERS

Please ensure that you pass on the following items to your customer for future serviceability of the HyDrive hydraulic steering system.

- ***INSTALLATION MANUAL***
- ***BLEEDER BOTTLE***
- ***BLEEDER CAP WITH TAIL***
- ***BLEEDER HOSE***
- ***ANY REMAINING OIL***

The installation manual contains important information for the owners on service, spare parts and maintenance. The above items should be considered an important part of your supply to them.

Thank you for your co-operation,

HyDrive Engineering Pty Ltd
59 Wingfield Road,
Wingfield, South Australia 5013

STEERING KIT

Dear Customer,

Congratulations on becoming the proud owner of a new HyDrive *Admiral* hydraulic steering unit and welcome to the very large group of people world-wide who have experienced the quality and advantage of our equipment. So that you may get the most out of your new system, we have included a lot of information on correct installation. It is designed to be of assistance to you, and not to hinder you. Please take the time to read it thoroughly ***before*** attempting to install the unit.

The comprehensive installation manual has been included ***inside* the helm pump** box and gives full details on the installation and bleeding of all HyDrive Admiral Series Hydraulic steering equipment. There is a section specifically for your type of installation and you should follow the instructions in the manual exactly.

Where your unit is using a tilt-tube type cylinder (210T or 210TSE), for best results always ensure that you have cleaned the motor's tilt-tube thoroughly and that you have removed all scale or rust, particularly on old motors. Use a water-proof grease inside the tube and also on the outside thread, making sure you get a good coating. This will prevent problems with the ***steel*** tube rusting. and allow the cylinder to tilt freely at all times. Be careful - not all automotive greases are waterproof, in fact many of them are hydroscopic and will absorb water which is not good for any marine application. MAKE SURE that you follow all warning and advice concerning the attachment of the extension rod.

When installing the cylinder to the tilt-tube - **DO NOT** force the thread on if it is tight. You must be able to screw the cylinder on without the need for tools of any kind. If you cannot, it means that the tilt-tube thread of the motor is covered with paint or has been damaged. Repair the thread first if necessary and then thoroughly clean and re-grease. ***If the bore is corroded then the tilt tube must be replaced with a new one.***

The Special bleeder T-pieces have been supplied in a separate packet, and **must be loc-tited into place**, once you have installed the cylinder and decided on the route for the tubing. The fittings can be mounted at any angle you require. Be careful when inserting the fittings to avoid crossing the fine threads. Take your time. Follow the instructions in the book concerning the use of loc-tite, and remember ***DO NOT OVER TIGHTEN*** the fittings. If you cannot reasonably position the T-piece with only firm pressure on a small 6" spanner, then back-off the T-piece to the first and nearest position. Remember you can swap the bleeder valve to the other branch of the T-piece if you need to. The loc-tite will set the position of the T-piece very strongly, but it must be left un-touched for **at least 3 hours** before applying any load to it. Always use 2 spanners when fitting the tubing as instructed.

Finally to protect your investment and ensure a long service life on cylinders fitted to outboards, make sure to fully wash down the cylinder with fresh water after each salt-water trip (as well as the motor) and give a light spray of WD40, RP7 or similar de-watering fluid. This will maintain the stunning good looks of your system and increase seal life, and - ***NEVER*** leave your battery connected to the motor when not in use.

All other information is covered in the manual, but should you have any questions, don't hesitate to contact your supplier for assistance.

What Can I Expect From My New HyDrive *Admiral Steering system?*

- ***Will my new HyDrive steering unit be lighter and smoother than my old cable steering?***

Yes.....***and.***...No. You see, it all depends on how good your cable was to start with and if you are comparing the Hydrive unit while the boat is still on the trailer or at the wharf instead of under power at cruising speed.

If you turn a cable steering attached to an outboard when the unit is just sitting on the trailer and there is no load on the cable, it will most likely be lighter than rotating your new HyDrive helm unit. Consider that instead of pulling a single piece of wire around a drum, you are rotating a rather complex pump with 7 pistons, bearings, thrust rings and then pumping oil through a valve and along several metres of small-bore tubing. Naturally, it takes just a little effort to get that all happening. Right? The rubber mounts on the motor's tiller arm also allow the motor to wobble as the cylinder moves across in a fast-slow action which is normal for hydraulic steering due to the intermittent flow of oil.

When you put the boat into the water, fire up the engine and then roar off into the rolling swells, the load on the poor old cable will make the steering much MUCH heavier. ***NOW*** compare the HyDrive unit and you will see that your new hydraulic steering is smoother ***and*** takes **MUCH LESS** effort than the cable steering to handle these high loads. This is where the power of the hydraulic system really shines.

Yes the HyDrive will have a higher static effort to turn than a cable which is in good condition, but under LOAD, you will find HyDrive hydraulic steering delivers the power you just can't get from a cable.

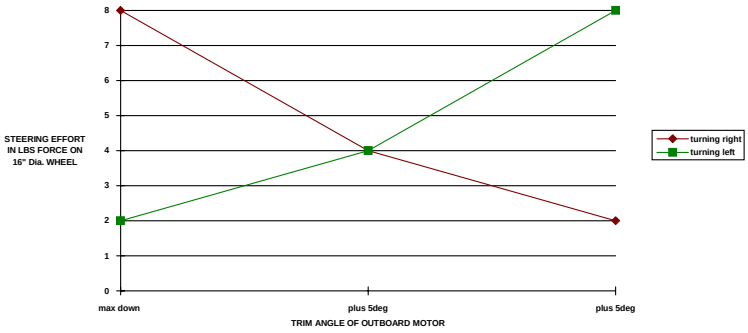
- ***Will the steering effort be the same both ways?***

On most in-board rudders, the answer is YES, but on outboards that is a rather complex question. For single outboards, or twin outboards which are non counter-rotating, there will always be more prop torque one way. This can be compensated for in two ways. **The first and most important one is to set the small TRIM TAB on the rear of the outboard engine's cavitation plate.** Many people think that they are factory pre-set in the right position - they are NOT. For the best performance in most engines, the correct position for this tab is hard-over against the stop with the trailing edge of tab furthest to the right-hand side of the boat. Some experimentation is required to find the best position for your boat. They are normally adjusted by loosening a bolt or screw and turning the small fin and then re-locking the bolt.

You will see mention of this is made in our installation manual - do not underestimate the importance of this tiny device. Remember the gigantic ***QEII*** luxury passenger liner is steered entirely by rudders much smaller in scale than these little tabs.

Finally, the steering loads of any outboard motor installation can be seriously affected by the "TRIM" of the motor itself. That is the angle of the propeller relative to the angle of the transom. Most outboards have electric trim & tilt controls, and you must understand the function and effect of this control. The following graph shows the direct effect in an actual field test of a single 115HP outboard fitted with a small HyDrive cylinder. You will note that from the motor's position in the maximum DOWN position to the highest trimmed position (only a movement of some 10 degrees), the steering loads completely reversed their bias.

Whereas it took almost 4 times the effort to steer to the ***left*** in the down position, it took 4 times the effort to steer to the ***right*** when in the uppermost position. This steering load is generated by the forces of the motors thrust-geometry, and the steering device cannot hide them, or overcome them.



It is up to you to find the "sweet" spot or trim angle which gives you the combination of the best ride, speed and handling. With some boats however, because of balance, transom angle or other factors, you may not be able to get the balance of all three, and may have to sacrifice one or more of them.

- ***What about the funny clicking or buzzing noise I sometimes hear from the helm unit?***

Relax - and don't worry. That noise is perfectly normal, especially when you are changing directions. You are only likely to hear this noise when the boat is on the trailer and the engine isn't running. Once your under way, you won't hear it - it is a perfectly normal sound made by the small lock-valve in the rear of the unit, and some boat's dash constructions act as an amplifier and make it slightly louder. It is perfectly harmless and will not affect the operation of the unit in any way.

- ***After a hard turn, sometimes my unit is a bit notchy , or rattles, when I try to straighten up. Is this normal?***

With OUTBOARD engines which are poorly trimmed and with a heavy bias in one direction, you will find that the motor wants to move hard-over faster than you turn the wheel. If you were steering with a cable, it would probably pull it out of your hands.

With your HyDrive pump unit however, you have an in-built protection in the form of a special lock valve in the rear of the pump. This prevents the over-run by the engine, and the notchy feel is simply the valve checking the motion of the engine. This noise and feeling is harmless to the unit, but **we would recommend that you attempt to trim your engines as outlined earlier to minimise this effect.**

- ***Do you have any tips for protection of the units?***

For in-boards, maintenance is minimal (simply grease the nipples regularly), but for outboard systems which are subject to constant immersion in salt water, no matter what materials we make these units out of, ***you*** can always do something to protect your investment.

- Treat the steering cylinder like you should treat your engine - ***WASH*** with plenty of fresh water after each salt-water trip. A light spray with RP7, WD40 or similar de-watering fluid afterwards will acts as an insulator against electrolysis.

- ***NEVER*** leave your battery connected. Slow earth leakage from batteries are a constant source of electrolysis in all brands of outboard motors, and this can affect the appearance of your steering unit. Our beautiful chrome plating was deposited by electricity - it can be removed in exactly the same way by earth leakage.

- ***ALWAYS*** keep your outboard anodes in excellent condition and replace them as soon as they reach below 50% of their original size. This will protect not only your steering gear but most essentially - your engine!

- ***Don't overfill*** your helm unit - it will simply leak out of the filler cap on a warm day. Check the installation manual for the correct level.

- ***NEVER*** mix the oil in the steering units with other types of fluid. Stick strictly to the oil specifications clearly supplied.

Happy And Safe Boating!

Installation on STANDARD Rudders

HyDrive Admiral and Sports INBOARD cylinders with mounting brackets are designed for use with conventional rudders or jet units. The universal action of the mounting brackets assist in minor misalignments in the installation. The geometry of the installation is still very critical to the ultimate performance of the unit so the following sections should be studied carefully.

RUDDER STOPS are recommended to be fitted to limit the rudder movement, and should ensure the stops engage just before the cylinder reaches the end of the stroke. This is to prevent cylinder damage in the event of underwater collision.

TYPICAL SINGLE CYLINDER INSTALLATION

The following is a typical installation using single standard cylinder units.

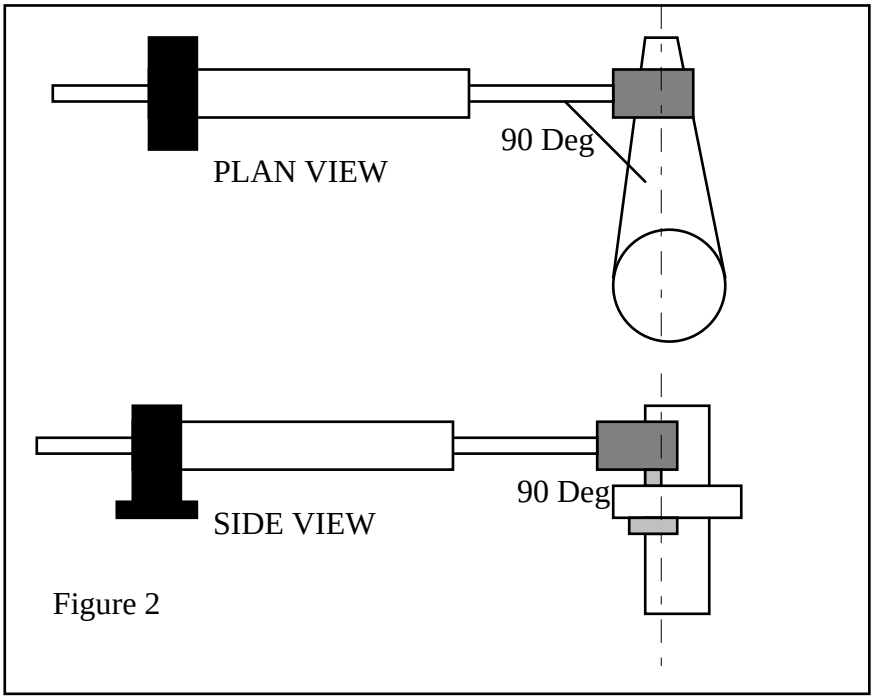


Figure 2

A typical single rudder installation is shown in Fig.2 above. The rudder should be in-line with the tiller arm, and the slave cylinder should be mounted squarely to the tiller arm. Please also note that the cylinder should be both square and parallel to the tiller arm.

For **twin rudders** the cylinder can be mounted on the outside of the tillers, or can push a pivot on the tie-rod itself. Please ensure that the cylinder is mounted so that it does not foul on the tie-bar as it turns hard-over.

Because of obstructions in some boats, it may be necessary to position the slave cylinder fore and aft, rather than across the beam. In this case the tiller arm should be fixed at right angles to the rudder, and the slave cylinder should be mounted square to the tiller arm when the rudder is mid-ships. Place the cylinder in mid-stroke (measure the distance evenly from both sides) For canoe-sterns or other tapered locations you can set the tiller arm at any angle around the clock on the rudder stock and then attach the cylinder at 90 degrees to the tiller arm when the rudder is dead-ahead.

Please also ensure that the cylinder bolts and the structure to which it is attached is strong enough to withstand to forces required to handle the rudder torque and maximum cylinder capacity.

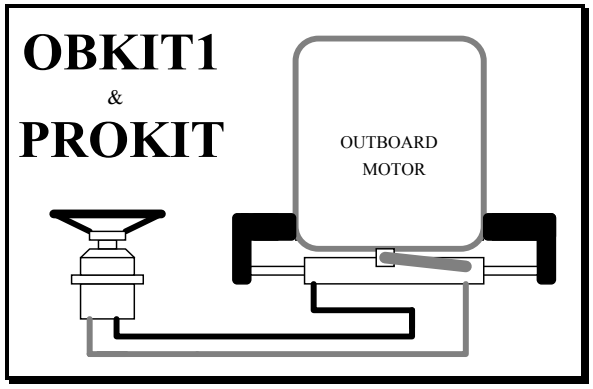
PLEASE FOLLOW ALL DETAILS IN THE INSTALLATION MANUAL ENCLOSED WITH THE STEERING SYSTEM

HYDRIVE

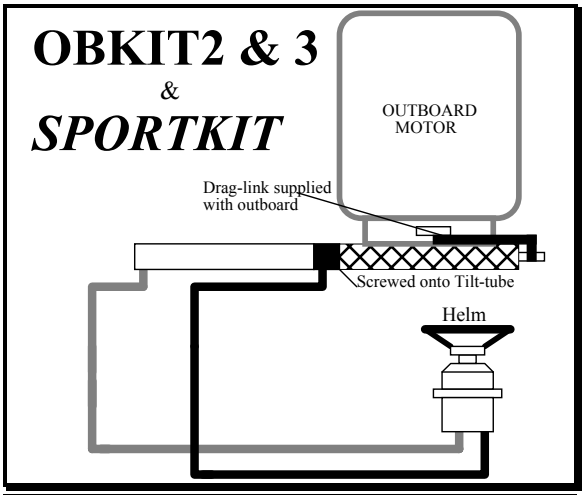
HYDRAULIC CIRCUIT LAYOUTS - ADMIRAL SERIES

The following range of circuit diagrams gives the layouts for all the most common HyDrive steering installations and you should take note of the piping requirements for your particular installation. The sequence of connection to the helm unit and the cylinder is indicated in the two-tone drawing of the cylinder lines. The helm unit has been drawn with the helm facing the forward side of the vessel as it would normally be.

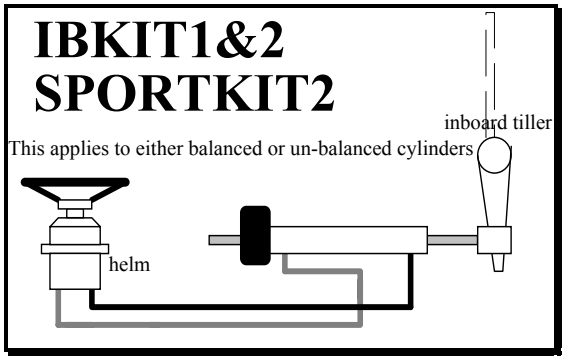
OBKIT1 & PROKIT



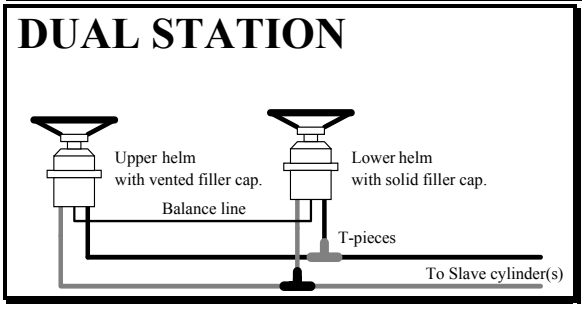
OBKIT2 & 3 & *SPORTKIT*



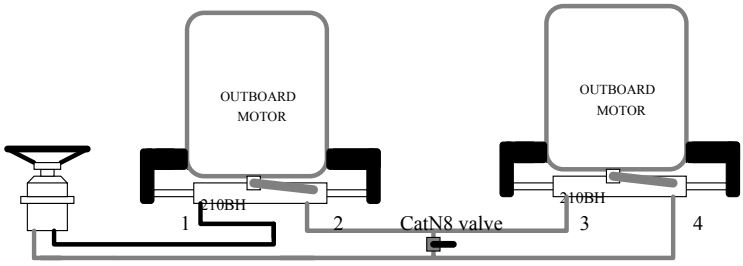
IBKIT1&2 SPORTKIT2



DUAL STATION

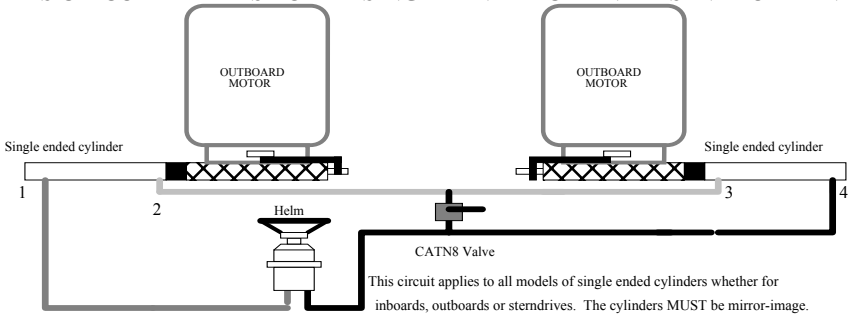


Fluid-link system for Catamaran



Note this circuit applies to all models of balanced cylinder, inboard or outboard systems.

THIS CIRCUIT APPLIES TO ALL SINGLE-ENDED CYLINDERS IN FLUID LINK



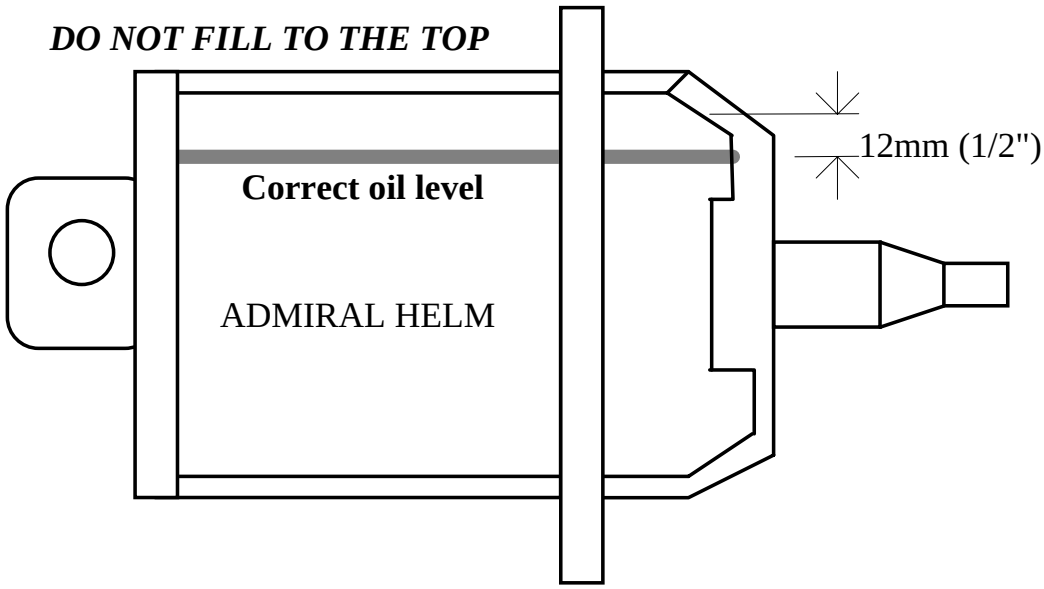
This circuit applies to all models of single ended cylinders whether for inboards, outboards or sterndrives. The cylinders MUST be mirror-image.

TECHNICAL BULLETIN 201-10
HYDRIVE *ADMIRAL Series* Helm units - OIL LEVEL

The correct oil level is very important when first installing a new HyDrive helm unit. You ***MUST NOT*** fill the helm unit to the top of the filler/breather hole. It must be at least 12mm or 1/2" from the bottom of the thread in the casting.

This allows for thermal expansion and contraction of the oil during normal daily use and temperature changes. If you overfill the helm unit it will probably leak from the filler cap slowly and trickle down the front of the pump housing. The oil then follows around the seal retainer and trickles from the bottom of the shaft giving the appearance of a seal leak. It is not a seal leak - it is simply an ***over-filled*** helm unit.

On long lengths of lines, or where fitted to catamarans with the extra fluid-link lines, the oil level may need to be lowered further to compensate for the volume changes within the Nylon lines themselves. The presence of any air in the system will exaggerate any oil volume change due temperature change and heavy operation, so it is imperative that all air be bled correctly from the system.



Do not underestimate the importance of the oil level, and please ensure that any Maintenance Staff are made aware that they should NOT fill the helm unit with oil above the recommended level. The first sign that they (or you?) have done so will be an apparently leaking seal.

Where units are installed with autopilots or where oil lines are installed through engine rooms and temperatures can vary considerably, it may be necessary to substitute a solid or non-vented filler cap and use an expansion tank fitted to the rear-top balance-line port due to excessive thermal expansion.

Expansion tanks may be required for some units if used on large systems incorporating multiple stations or fluid-link circuits etc. These are used only as a last resort and in 99% of cases are not required. Bleeding the system correctly to eliminate the air from the balance-line and other parts of the circuit will ensure the minimum problems of thermal expansion and overfilling.

SYSTEM TESTING PRIOR TO LAUNCH

IT IS VERY IMPORTANT THAT YOU FULLY TEST THE HYDRAULIC STEERING SYSTEM PRIOR TO LAUNCHING OR DRIVING THE BOAT.

AFTER fully bleeding the system but ***PRIOR*** to launching the boat you need to pre-stress the helm and cylinder lines with hydraulic pressure to ensure that you have installed all fittings and compression cones correctly. Remember that if you did NOT back out the tubing 1-2mm before tightening the nut, the hose can blow out and cause total steering failure. Please follow the procedure outlined below:-

1. Rotate the steering wheel full clockwise until the cylinder reaches the end of its stroke.
2. Check to see that the cylinder has reached its full stroke and is not limited by tie-rods or tiller arms on stops etc. If it is, remove the linkages to allow the cylinder to stop internally by itself and not place undue stress on your motor or tiller arm.
3. Lean as hard as you can in a clockwise direction on the wheel. Do this several times in the same direction for a few seconds each. You cannot damage the unit doing this.
4. Reverse the wheel direction and do the same on the other side.
5. You are now generating high pressures internally in the system, and if your fittings now leak, or a hose blows out, ***the system would have failed at sea.***
6. If you find any leaks – fix them immediately. If they are on male threads which have been loctited into cylinders or pumps or valves, then you will need to drain the oil, remove the fitting and thoroughly clean all old loctite from both threads – making sure you do NOT get any particles into the inside of the helms/cylinders/valves etc. You also need to remove all traces of oil using solvent such as acetone or methylated spirits, and re-loctite the fittings allowing for the full curing time.
7. If you have a hose blow out, you need to trim the tubing, obtain a new compression cone and then re-install in the correct manner described in the manual.
8. Having corrected any problems – retest the system as outlined here.

THIS TEST IS TO ENSURE THE TOTAL SAFETY AND SECURITY OF YOUR INSTALLATION – IT SHOULD BE CARRIED OUT ON ALL NEW INSTALLATIONS AND EVERY TIME ANY COMPONENT IS REMOVED FOR SERVICE AND REINSTALLED.

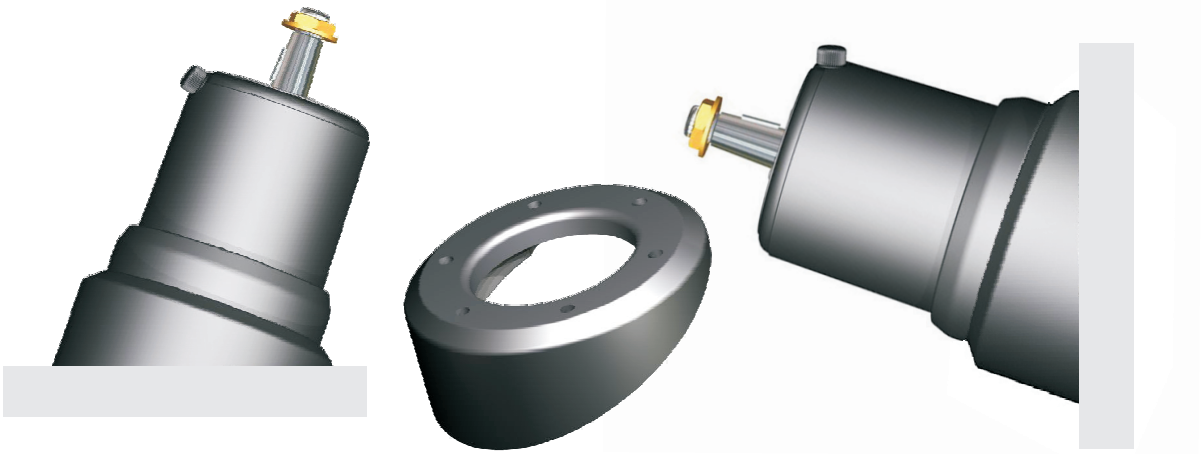
HYDRAULIC BOAT STEERING

Ph +61 8 82431633 fax +61 8 84457938 sales@hydrive.com.au www.hydrive.com.au

HyDrive

401 HELM ACCESSORIES

20 DEGREE WEDGE



WEDGE-401 **20 degree wedge kit for mounting horizontal to vertical installations fits any standard model 401 and 402 helm unit.**

REAR-MOUNT KIT

REAR-MOUNT kit - fits any model 401 & 402 helm unit - adjustable from low-profile to full protrusion for maximum flexibility in helm placement. Simply trim the spacers and studs to adjust the amount of penetration into the helm position. The front dash or console ring is fully O-ring sealed against pump body to prevent water ingress to the rear of the console. Easy to fit - easy to adjust - looks great.

The model 401 & 402 series helms - now the most versatile helm on the market!

Available from your HyDrive supplier