



**Hydraulic Boat Steering
INSTALLATION
INSTRUCTIONS**

&

**OWNER'S MANUAL
*ADMIRAL & COMMANDER SERIES***

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MANUFACTURED BY

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SAFETY INFORMATION

THIS MANUAL HAS BEEN SUPPLIED FOR *YOUR* BENEFIT AND PROTECTION. IT IS OF **NO** VALUE IF YOU DO NOT READ IT **CAREFULLY** PRIOR TO ATTEMPTING TO INSTALL YOUR NEW **HYDRIVE** UNIT. FAILURE TO ADHERE TO THESE INSTRUCTIONS MAY RESULT IN **STEERING FAILURE AND POTENTIAL DAMAGE** TO THE BOAT AND INJURY TO THE OCCUPANTS. **DO NOT TAKE SHORT-CUTS.** Stick **strictly** with our methods and do not adopt your own. It will make the system faster to install and safer to use.

PLEASE READ THIS SECTION MOST CAREFULLY

It is absolutely *ESSENTIAL* that you read **ALL** the information contained in this MANUAL relating to your particular model and installation type **BEFORE** you attempt to install the unit. **FAILURE** to do so may result in problems when you come to bleed the unit later.

ATTENTION HYDRAULIC EXPERTS - HYDRIVE hydraulic systems are **NOT** power-assisted units, and are extremely different from such systems, it is **essential that you read this manual BEFORE attempting to install the system**. We have a much higher incidence of installer-error with people who claim hydraulic expertise, than with your average handyman because they proceed on the mistaken assumption that HyDrive systems are just like all the others, or that they know all there is to know about installing our equipment. The short time taken to read this booklet will ensure that the installation goes without a hitch.

VERY IMPORTANT POINTS TO NOTE

Before proceeding please read the following sections relating to items that are of major importance to the correct installation and selection of components.

DO NOT USE BRAKE FLUID IN THIS SYSTEM - IT WILL DAMAGE SEALS AND OTHER COMPONENTS.

USE ONLY **HYDRIVE ULTRA-15** HYDRAULIC OIL...WARNING: Use of alternative hydraulic fluids may result in premature seal wear and possibly cause damage to your system. Such damage is not covered under your conditions of warranty. **DO NOT USE Automatic Transmission Fluid.**

WHEN INSTALLING **ADMIRAL** or **COMMANDER** STEERING SYSTEMS YOU MAY USE EITHER NYLON OR COPPER TUBING FOR THE OIL LINES. THIS MUST BE SPECIFIED AT THE TIME OF ORDERING AS THE CORRECT FITTINGS MUST BE SUPPLIED.

However, Nylon Tubing Must Not Be Used On Sailboats

WHERE USING NYLON TUBING:- YOU MUST USE NYLON TUBING WHICH MEETS OUR EXACTING SPECIFICATIONS, NAMELY:-

1. 1/2" O.D. SEMI-RIGID NYLON 11 OR NYLON 12 TUBING WITH A Working Pressure (WP) of 620psi and MINIMUM BURST PRESSURE OF 2500PSI.

OR:-

2. 3/8" O.D. SEMI-RIGID NYLON 11 OR NYLON 12 TUBING WITH A WP of 620psi and MIN.BURST PRESSURE OF 2500PSI. (This size tube should not be used for lengths greater than 10 metres)

DO NOT SUBSTITUTE FOR ANY OTHER TYPE OF NYLON OR FLEXIBLE TUBING, NO MATTER WHAT ANOTHER TUBING SUPPLIER MAY ADVISE. The performance of the steering can be seriously affected by the wrong tubing being installed, **Even if the burst pressure is greater.** BEFORE making any change to the tubing specs, contact your authorised HYDRIVE dealer or the factory direct. **Once again, nylon tubing MUST NOT be used on sailboats.**

ALL WARRANTY IS VOID IF INCORRECT TUBING IS USED.

Careful attention should be paid to the following sections on the correct installation of nylon tubing to ensure safe and secure fitting of the tubing.

COPPER tubing can be substituted with either steel or stainless steel hydraulic tubing. **IT SHOULD NEVER BE SUBSTITUTED WITH HIGH PRESSURE FLEXIBLE HYDRAULIC HOSE.**

IMPORTANT NOTES RE OUTBOARD MOTORS: All outboard motors are equipped with small "**TRIM**" tabs immediately behind the propeller. In some motors, these also act as Anodes. **DO NOT UNDERESTIMATE THE IMPORTANCE OF THESE SMALL ITEMS.**

These must be adjusted once the motors are installed on the boat, and should be done for the normal cruising speed of the vessel. For high horsepower/performance motors, these are of critical importance as incorrect positions can **INCREASE** steering torques as much as 500%. They are **NOT** factory set and **MUST** be done after proper installation. Experimentation is the only means of arriving at the best results.

Where they are also used as anodes, they should be maintained in good condition and replaced as soon as corrosion begins to affect steering performance. It is also important that you appreciate the effect of poor motor trim angle to the transom, which can also increase steering effort unnecessarily. **No steering gear can compensate for poor trim.**

STEERING WHEEL DIAMETERS are of importance so please note the maximum recommended size listed below:

ADMIRAL/COMMANDER helm unit - **26" diameter, max dish 6"**
Wheel sizes in excess of that listed will void warranty.

POINTS TO WATCH PRIOR TO INSTALLATION

All hydraulic equipment requires a good degree of workmanship for its installation, and this is also true of steering gear, if future performance and serviceability is to be assured. Extra care must be taken by the installer to see the following points are closely watched.

BE CLEAN when installing the unit. Strain all oil - even if it is new (unless out of new PLASTIC containers). It only takes a few moments to be particular.

DO NOT CUT TUBING WITH A HACKSAW. Use a proper tube cutter for COPPER or steel tubing, and a very sharp knife for NYLON tubing.

Always make sure that no burrs or particles enter the tubing.

Make sure that copper or steel tubing is saddled firmly at regular intervals to prevent vibration and chafing. **WHEN USING COPPER IN AN ALUMINIUM BOAT** there is no risk of galvanic action between the copper and aluminium providing that **NYLON** saddles are used to hold the copper in place.

The saddles should be of the type that holds the tubing clear of the hull or bulkhead. This means that there is **NO** metal-to-metal contact.

ENSURE that all pipe joints and fittings are tight and carefully sealed using **LOC-TITE THREAD SEALANT** or similar product. **DO NOT USE Teflon Tape as it can be introduced into the system by inexperienced installers. THIS MAY CAUSE VALVE FAILURE.**

Use the **RIGHT TOOLS** for the job. **DO NOT USE** stilsen wrenches or pliers or incorrect spanners which will burr the fittings etc. Don't over-tighten bleeder valves.

DO NOT RE-USE OIL FROM BLEEDING THE SYSTEM without first filtering it to remove foreign material (which will come out of the lines), and **ALWAYS** allow the air to settle out of it first. **YOU WILL REQUIRE FAR MORE OIL TO BLEED THE SYSTEM THAN YOU NEED TO FILL THE SYSTEM.** Allow about 2 litres for small single station unit and about 5 litres for a small dual station unit.

After installation, **grease all points** that have grease nipples (not bleeder nipples). Use good waterproof grease. This should be carried out every 6 months at which time you should always check the security of all bolts, nuts and split pins on the steering mechanism (Not every model has such items, so check your system thoroughly and become familiar with it). Vibration can often result in nuts becoming loose.

WHERE USING COPPER TUBING;

Always use only **FULLY ANNEALED** tubing and the following rules should be strictly adhered to:-

- 1) Use compressed air and blow out all tubing to remove dust and debris from storage. **DO NOT CUT WITH A HACKSAW - USE ONLY A PIPE CUTTER.**
- 2) **Avoid brazing or soldering joints** as this introduces scale and burnt flux into the tubes. Use commercial hydraulic joining fittings to avoid this. If you cannot, or will not, avoid soldering, then you **MUST** air-test **each** of the joints and flush the system using kerosene or similar to remove the solder, flux and scale **BEFORE CONNECTING** it to the steering unit.
- 3) Where the tubing is to be bent, you should use a proper tube-bender to avoid kinking the tubing, which could result in firm steering. Follow steps 4 to 6 in the following section on using Nylon tubing.
- 4) Now proceed to section (4) in the following section on NYLON tubing.

WHERE USING NYLON TUBING THE FOLLOWING STEPS MUST BE FOLLOWED:-

- 1) **USE ONLY THE SEMI-RIGID NYLON with a MINIMUM burst pressure of 2500PSI** as previously discussed. **DO NOT SUBSTITUTE** for any other material, even if the rated burst-pressure is higher.
- 2) **USE ONLY BLACK NYLON** as the black material is U.V. stabilised. White, opaque or other colours will harden in the sun.
- 3) Nylon tubing is fitted to HyDrive steering using nuts and compression cones supplied with the unit. It is most important that cones be fitted exactly square to the hose fitting to ensure proper sealing. Cut the tubing with a sharp knife **SQUARELY** and **UNDER NO CIRCUMSTANCES** use a hacksaw.
- 4) First install the fittings into the cylinder and helm unit exactly as described in the instructions packed with the fittings themselves. Slide the nut onto the tube and then the cone.
- 5) Push the tubing right into the hose fitting and slide the cone up against the tapered seat on the fitting. Slide up the nut and screw it on

squarely so as not to cross the thread. Tighten it by hand only until it becomes firm.

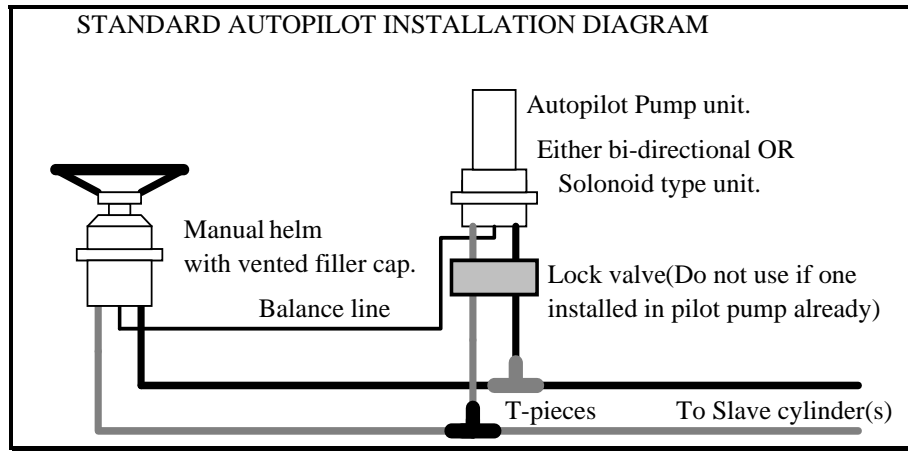
- 6) At this point, **pull the tubing back about 1-2mm,(no more)** and then tighten up the nut using the correct spanners. ***YOU MUST USE TWO SPANNERS*** - one on the fitting (T-piece, elbow or straight fitting) and the other on the nut. Use the two spanners against each other to take the load - not the fitting. Use only 6" or 150mm long spanners - **NO LARGER**. In this way you can apply much greater force without damaging the fitting itself. This compresses the cone into the tubing and ensures it will not come out under force. **IT IS ESSENTIAL THAT THE TUBING BE REMOVED THE 1-2mm AS DESCRIBED** or else it may come out under pressure.

DO NOT SUBSTITUTE THE FITTINGS SUPPLIED. This will void all warranty. If you feel it necessary to consider such action, contact your **AUTHORISED** dealer or the factory before doing so.

NOTE: The fittings have been supplied loose with instructions for your convenience. This allows you to install the fittings at the most convenient angle for your installation. Take care when installing the fittings and do not use Teflon tape. Instead, use the **LOCTITE** thread sealant provided. **FOLLOW** the instructions provided with the fittings. Do not over-tighten the fitting in order to line it up at the desired angle. Instead reverse the direction of the fitting to the desired position and allow the **LOCTITE** to set at the correct angle. ***DO NOT FORCE THE FITTING - you risk stripping the thread.***

INSTALLING AUTOMATIC PILOTS

HyDrive hydraulic steering equipment has been designed to be used with most brands of hydraulic automatic pilots. Installation of the autopilot should be carried out in accordance with the autopilot manufacturer's recommendation. In the event that they do not supply adequate technical support in this regard, then the following hydraulic circuit can act as a guide for you.



You will see that we recommend the use of a LOCK-VALVE in the circuit. The suppliers of your autopilot may suggest that this is unnecessary, however unless your autopilot pump is already fitted with one, we feel that our circuit is the **ONLY** way to absolutely guarantee steering in the event of failure of either the autopilot pump or solenoid valve (depending on the type). In order to determine if you require this lock-valve please consult with the supplier of the autopilot pump unit to see if it is equipped WITH IT'S OWN LOCK-VALVE or not.

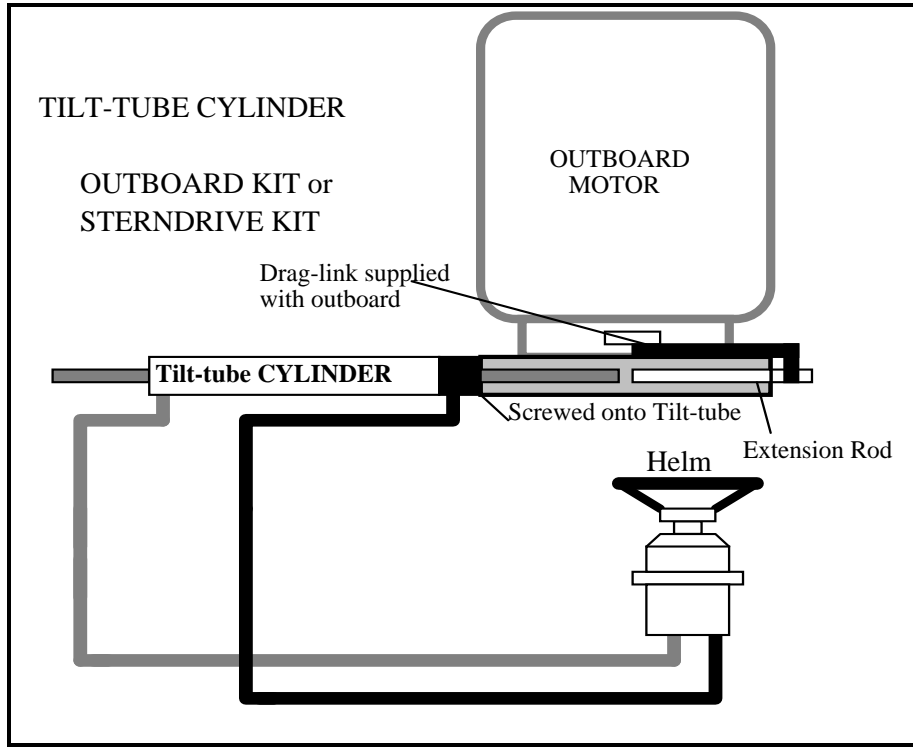
Keep in mind that if you decide not to fit the lock-valve for economy reasons only, then in the event of failure of the autopilot pump or solenoid valves it is **POSSIBLE** that the manual hydraulic steering may become totally **INOPERABLE ALSO**. For further information contact you're nearest **AUTHORISED** dealer or contact the factory direct.

INSTALLATION ON OUTBOARD MOTORS:

There are two basic types of cylinders designed for use with outboard motors. These install directly to the outboards as follows:-

TILT-TUBE CYLINDERS

These are designed to replace conventional cable steering systems, and attach directly to the tilt-tube of the outboard in much the same way as a conventional through-the-tube cable steering does.



Simply fit the extension rod to the piston rod, and secure using a small quantity of loctite (1-2 drops only). Follow the detailed instructions which are packed with the extension rod. **DO NOT GRIP THE PISTON ROD AT ANY TIME WITH ANY TOOLS ON THE WORKING SURFACE OF THE ROD.**

- 1) Inspect the TILT-TUBE of the outboard carefully, particularly if it is an old engine. These tubes are only made out of mild steel and often corrode. If any corrosion is present, the tube must be thoroughly

cleaned and REAMED if possible before coating with good quality **WATER-PROOF** grease.

- 2) A separate booklet has been provided together with this manual. The booklet is titled **OUTBOARD STEERING SYSTEM – Tube-Mount. IMPORTANT INFORMATION FOR THE INSTALLER.** Read this carefully for details on assembly of the cylinder to the motor. Further warnings are included with the extension rod which should be followed.
- 3) Install the tubing in accordance with the sections previously outlined for both nylon and copper tubing.

Attach the drag-link supplied with the outboard motor (this is a standard part supplied when the motor is new and is different for each brand). This connects to the tiller arm on one end and to the hole in the extension rod on the other.

BULLHORN TYPE CYLINDERS

The HyDrive bullhorn type cylinders are designed to be installed on all brands of outboards equipped with tilt-tubes. They are simple to install by following these simple instructions.



This image is only indicative of the bullhorn type cylinder and the instructions cover models:- 210BH, 211BH, 212BH, 411BH & 511BH

- 1) The cylinder has been supplied fully assembled for ease of installation. A separate booklet has been provided together with this manual. The booklet is titled OUTBOARD STEERING SYSTEM – TYPE BH. IMPORTANT INFORMATION FOR THE INSTALLER. Read this carefully for details on assembly of the cylinder to the motor and options on tiller connections.
- 2) Screw the threaded adjusting spacer fully on to the tilt-tube of the outboard until it completely clears the thread at the end of the tube. On some outboards, the tilt-tube is threaded on both sides. Fit the second threaded spacer if this is the case. Apply a liberal coating of waterproof grease inside the tilt-tube after ensuring that the tilt-tube is clean and scale/rust-free.
- 3) Position the motor dead-ahead so that the tiller arm of the motor is central. Now holding the cylinder firmly, position it either side of the tilt-tube. By aligning the hole of the tiller arms together, you can determine the best combination of the spacers to mount the cylinder close to central (You have been supplied with two threaded adjusting spacers, two large solid spacers and two small ones. Tilt-tube widths vary from one motor to another so a combination of these sizes will allow you to fit the cylinder to any of them. Choose the best combination to best fill the gap).
- 4) Insert the support rod through the port-side (left) horn casting and fit the plastic spacer(s) onto the rod between the horn and the tube. Push the rod through the spacer and then into the tilt-tube until it comes out the other side. Then fit one of the plastic spacers between the adjusting spacer and the horn. Push the rod completely through and then fit the washers and Nyloc nuts to the rod. It is **ESSENTIAL** that there is a plastic spacer between each horn and the tilt-tube or adjusting spacer. The horns **MUST NOT** touch metal. They are fitted with internal electrical insulators, and contact with metal would render them useless. **TIGHTEN** the large nyloc nuts firmly, using two spanners. **DON'T OVER-TIGHTEN.**
- 5) With the support rod now tight, unscrew the adjusting spacer(s) to take up the slack between the spacers and the horn castings.

DO NOT USE TOOLS TO DO THIS.

Only use firm hand pressure as this is only to prevent minor side-movement of the cylinder. **The cylinder MUST be free** to rotate as the motor tilts. Once **FIRMLY** in position, tighten the grub-screws in the spacer(s) to prevent it loosening or tightening further as the motor tilts.

- 6) The pivot bolt can be inserted into the tiller of the outboard motor through the pivot bush in the steering unit's arm. The cylinder's tiller should be attached under the tiller arm on most brands of outboards. In the event that the tiller interferes with other parts of the outboard, then it can be mounted on top of the tiller instead. The bolt should be fitted so that the stainless washer is in contact with the underside of the tiller bolt, hard against the bush. The bush should be tightened hard against the motor's tiller as it will turn freely in the steering unit arm. Use the nyloc nut to ensure total mechanical lock onto the tiller. Now the cylinder and motor must be swung from lock-to-lock to ensure that there is no binding of the tiller arms. **IT IS VERY IMPORTANT TO ENSURE THAT THE TILLER ARMS DO NOT LINE UP, AND CREATE THE POSSIBILITY OF BINDING.** The separate information booklet also includes a template for you to cut out and check the geometry of your tiller set-up. Please use this to ensure the safety of your installation. Should your geometry be in the "red zone" on the template then you must adjust the cylinder to move the body of the cylinder closer to the right side of the boat, thus reducing the risk of the tillers being in line with each other. **NOTE:-** The motor will be off-centre when the cylinder is mid-stroke by between 10-20mm (depending on brand of outboard). This is because the two arms swing different arcs and the geometry results in different rates of turn in each direction. The angle swung in each direction from centre will be the same.

FRONT-MOUNT CYLINDERS

Front-mount cylinders are another option for steering outboard motors which have the advantage of remaining stationary while the piston rod moves and therefore the hoses do not move during normal steering, unlike the bullhorn style cylinder which moves on the fixed piston rod.

The disadvantage of the front-mount type cylinder is that it has a wider foot-print and therefore requires more clearance in the engine well.



Model 216FM shown. Also available in model 516FM

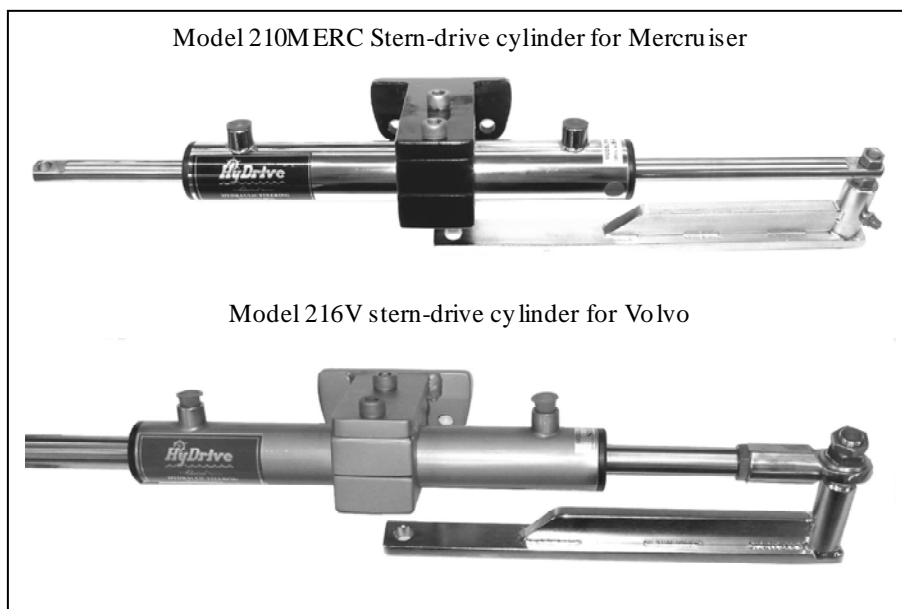
Installation is very simple and a fully detailed instruction sheet is included with the cylinder itself. You should follow these instructions carefully

INSTALLATION ON STERNDRIVES

For those fitting tube-mount cylinders to stern-drives, the installation is very simple indeed. The stern-drive should have been supplied with a bracket which incorporates a threaded tube, normally used with a standard through-the-tube cable steering system. The Tube-mount cylinder assembles and attaches exactly as described in the previous section on Outboards, with the threaded mounting tube replacing the outboard's tilt-tube. The standard drag-link supplied with brand of stern-drive should be used. Where the unit is to be used with a stern-drive equipped with a power steering system, then the fitting is also the same. **NOTE:** For power assisted stern-drives, the *Model 212T* cylinder is the correct unit to use.

SPECIAL STERN-DRIVE CYLINDERS

Where it is impossible to fit the conventional tube-mount cylinders to stern-drives because of side-clearance problems, then there are alternative cylinders designed to mid-mount directly on the transom-shield of the stern-drive itself. This minimises side-clearance issues. There are models to supply most makes of stern-drives and you should ensure that the correct model has been selected for your boat.



These cylinders bolt directly to the transom shield of the stern drive, locating into the 'B'-shaped indentation of the casting and using the studs already there. (The model 210V suits older model stern-drives and bolts down onto to the top of the flat section of the transom shield)

The drag-link of the cylinder then connects directly to the tiller-arm with the bolt kit supplied. Centralising the stroke of the cylinder can be adjusted by loosening the clamp bolts on the bracket holding the cylinder barrel and then moving the cylinder one way or the other to centralise the angle swung by the tiller arm. It is essential that the tiller arm does NOT hit the metal stops on the transom shield. It should stop just prior to contact. Re-tighten the clamp screws to torque of 35ft lbs then continue installation as per the following instructions for either single or dual station.

NOTE:- where access to the bleeder valves is very difficult – you can obtain a remote-bleeder kit which will allow you to fit extension hoses to bleed further to the side of the cylinder for convenience. Contact your supplier for further information.

INSTALLATION ON STANDARD RUDDERS

Hydrive standard cylinders with mounting brackets are designed for use with conventional rudders or jet units. The universal action of the mounting brackets assists 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** should always be fitted to limit the rudder movement, and should ensure the stops engage before the cylinder reaches the end of the stroke. This is to prevent cylinder damage in the event of underwater collision.



Typical inboard cylinders – Admiral Series

SOME TYPICAL SINGLE CYLINDER INSTALLATIONS

The following is a short summary of some typical installations using single standard cylinder units. This is by no means the only way to install them, but is by far the most common. Should these methods present some difficulty for your boat, then please contact your agent, or the factory for their recommendations.

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.

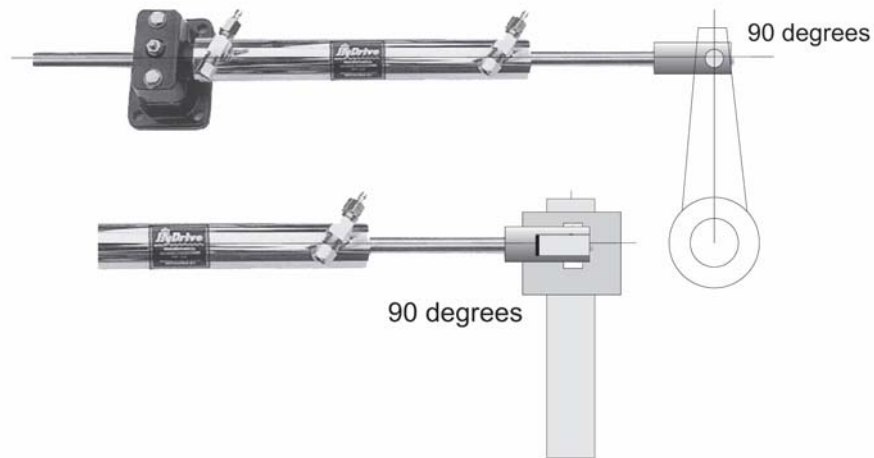


Fig.2 geometry of single tiller and cylinder for inboard installation

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.

GETTING STARTED

The most important things to keep in mind before starting to install the unit is to ensure that you:-

- Have the right tools for the job.
- Have enough clean oil (*Only HYDRIVE ULTRA-15*)
- Have studied the preceding sections of this book, and know exactly which sections apply to your installation.
- Take care to follow ALL Instructions and Warnings given.
- Make NO changes to specifications of tubing, oil or method of installation without contacting your dealer FIRST.
- Study the circuit layout for your installation **as shown in the separate Hydraulic circuit drawings supplied with this manual.**

YOU NOW ARE READY TO PROCEED.

- 1) Firstly UNPACK all the cartons and carefully lay each component out on a clean floor or table. Check to see that all the components are there and familiarise yourself with all the items, and fittings you have been supplied with.
- 2) Install the helm unit(s) into place firstly using the drill template provided, and the studs and nuts supplied for this purpose. Keep the filler cap and the plugs in the pump at all times until the tubing is ready for attachment. Never leave the pump with the filler cap open or fittings un-covered to avoid dirt, sawdust etc from entering the pump unit. **Carefully loctite the fittings into place as per the instructions supplied with them.**
- 3) Install the cylinder(s) as shown in the previous sections, taking care to keep the geometry correct. Loctite fittings as per instructions.

- 4) Install any lock-valves or ball valves (if required) in a position that is convenient to work in, and to reach with all the tubing. Keep in mind that the ball valve kit for catamaran-type steering must be easy to reach for re-synchronising the cylinders from time to time.
- 5) Install all tubing exactly as outlined in the separate Hydraulic Circuit drawings supplied with this manual. For dual stations, do not forget to install the balance line as shown. Remember **DO NOT** solder copper tubing and **DO NOT** use Teflon tape. Also **SADDLE** all copper tubing and be careful when using nylon tubing to use the fittings correctly.
- 6) Be very careful with the fittings and the hose connections to each of the components. **REMEMBER A FITTING THAT IS POORLY INSTALLED CAN LEAK AIR EVEN THOUGH IT DOES NOT LEAK OIL - THIS WILL CAUSE YOU TROUBLE IN BLEEDING THE SYSTEM.** Cracked copper flares, crushed olives, thread sealant poorly applied and fittings simply not tight enough can all result in this problem. **LEAVE** all loctited fittings 3-4 hours to set.
- 7) **NOW YOU ARE READY TO BLEED THE SYSTEM**, and this will be made much easier if you can obtain the assistance of two other people. The additional help will reduce bleeding time to only a few minutes. Remember when using the bleeder valves, that you use **TWO 6" (150mm) SPANNERS** - not one. **ONE** spanner *supports* the T-piece and the other opens the bleeder nut. **DO NOT OVERTIGHTEN**, and do not try it with one single tool - You risk damage to the fitting.

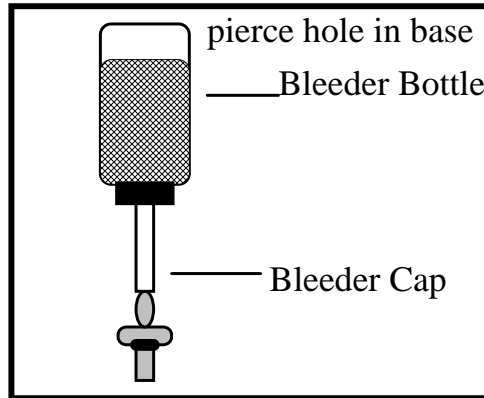
BLEEDING SINGLE STATIONS

Having first installed the unit **CORRECTLY**, bleeding the system is now a very simple, step-by-step procedure that will present no difficulties, **BUT ONLY IF** the instructions are followed **EXACTLY**. Please **DO NOT** try to take short-cuts, or ignore any of the advice given.

- 1) The first task is to fill the pump itself **BEFORE** fitting the bleeder bottle etc. Remove the filler cap of the pump unit and **SLOWLY** fill the pump until it is full. When the pump is totally full, fit the special

hose-tail supplied with the bleeder kit. This has an O-ring seal and must be firmly secured.

- 2) A special plastic bottle cap with bleeder hose attached has been supplied. This connects to one of the 1 Litre oil bottles supplied. Screw the special cap to the bottle and invert after attaching the hose to filler cap of pump unit.



Once inverted, pierce the bottom of the bottle with a large sharp nail or similar to allow air to enter freely. Be careful not to make swarf in the process which can enter the pump, once empty, you can then cut the bottom out of the bottle so it can be used as a funnel and keep the level topped up without removing it if desired.

- 3) You also have been supplied a smaller bore plastic hose which is to be fitted to the bleeder nipples of the cylinder, to direct oil into a **CLEAN** empty container. This oil can be re-filtered and re-used. Connect this hose to the side of the bleeder on the cylinder attached to the **PORT** side fitting of the **HELM** unit. This is the fitting that will pump oil when the wheel is rotated **ANTI-CLOCK-WISE**.
- 4) Unscrew that bleeder nipple 2 full turns and attach the hose. **DO NOT REMOVE THE BLEEDER SCREW** completely as the oil will leak during bleeding. **NEVER OPEN MORE THAN ONE BLEEDER AT A TIME.**
- 5) Turn the steering wheel **ANTI-CLOCKWISE** at a speed of **1 TURN PER SECOND OR FASTER**. **DO NOT BLEED SLOWLY**, as this will simply make your job either impossible or much slower. At no time let the oil in the filler bottle run out. **DO NOT STOP TURNING**

THE WHEEL to maintain the oil level, as this will result in poor bleeding, particularly on larger craft. This is where the extra people come in, one to turn the wheel, one to look after the oil level, and one to control the bleeder valves on the cylinder. Continue bleeding this side for a few MINUTES, and until a reasonably steady flow of oil is coming from the cylinder. It is not necessary for ALL air to be out of the oil at this point. DO NOT STOP BLEEDING just because the cylinder rod moves to the end of the stroke. This is normal and should be totally ignored.

- 6) AFTER a few minutes, stop turning the wheel and lock off the bleeder valve. Change hose to the other bleeder, open it 2 turns and then reverse the direction of the wheel. Maintain the same speed for about the same length of time as before (The larger the boat - the longer the time). At this point the oil may still have some small air bubbles present. Lock off the bleeder.
- 7) Repeat steps 5 and 6 once more, this time bleeding until no air is present in the oil. Then close the bleeder valves. If you have purchased a kit with only 2 litres of oil included, then you will have re-used this oil several times in order to carry out the bleeding process.
- 8) If all the air is out of the system, then the final test is the amount of free-play in the system. The only free-play between wheel motion and cylinder motion will be about 5 degrees. This is caused by the internal operation of the in-built lock valve, and only occurs if the wheel direction is reversed. If this is not the case, then you have not eliminated all of the air.
- 9) If you experience difficulties in getting the air out, then you should firstly re-check your procedure against ours. Many think that they can take short-cuts, or ignore our instructions, only to find they make a simple job - a difficult one. If you have NOT done it our way, then start at the beginning and do it again OUR way. If you have indeed followed the instructions carefully, then repeat the procedure again, using fresh oil - no bubbles, making sure that the bleeder bottle, hose clamps and filler cap is all totally sealed firmly. If you still have trouble, then you must check each of your fittings, because air is being drawn INTO the system as you are bleeding the oil OUT. It cannot be caused any other way.

- 10) Now that the unit is bled correctly, you need to reduce the oil level in the helm unit. To do this simply open the last bleeder screw used, and rotate the pump in the same direction **SLOWLY** until the oil level in the bottle drops completely. **DO NOT OVERDO THIS**. The oil level should be exactly 12mm or 1/2" from the bottom of the thread in the filler hole. This allows thermal expansion of the oil. If the pump is left totally full, then oil will overflow on a hot day. Replace the bleeder fitting in the helm with the original filler cap which is vented.

IMPORTANT FOR Single-Ended CYLINDERS (210TSE and 212T)

Where single-ended cylinders are installed, there is more oil volume in one side than the other. It is important to adjust the oil level in the pump to the correct level when the cylinder has the piston rod **retracted fully INTO it**. If you fail to adjust at this point, the oil can overflow when the "big" end returns its extra oil to the reservoir.

THE SYSTEM IS READY FOR SYSTEM TESTING
as per details given in the information booklet.

BLEEDING DUAL STATIONS

- 1) For bleeding of dual stations, the basic procedure is exactly as outlined above, but with the addition of another station. Firstly it is necessary to use the **SOLID** filler cap provided in the DUAL HELM KIT in the **upper** station. It should be fitted firmly ensuring the O-ring seals on the pump body. Where the two stations are fitted on same level, simply choose one to be the vented station, and fit the solid filler cap to that one. The balance-line **MUST** be fitted as shown in drawing.
- 2) Having installed the solid filler cap in the upper station now follow **STEPS 1 TO 7** as detailed in the above section on bleeding **SINGLE STATIONS** for the lower station..
- 3) Having bled the lower station (steps 1 to 7), you are now ready to bleed the upper station. **REMOVE** the solid filler cap from the upper station **BEFORE** removing the filler bottle. The oil level in the filling bottle will rise.
- 4) **REMOVE** the filler bottle and fit the **SOLID** filler cap to the lower station, making sure the pump is totally full of oil.

- 5) Fill the upper station completely BEFORE fitting the filler cap and the filler bottle etc. as before. Then fill the bottle and proceed to bleed the top station exactly as per steps 1 to 7 again.
- 6) Having bled the top station fully, it is now necessary to bleed air out of the balance-line between the two stations. To do this, LEAVE the filler bottle attached to the top station, keep one person at that position maintaining the oil level, and then proceed to the lower station and bleed it once more going in the anti-clockwise direction rapidly (as per step 3 to 7). Close the bleeder nipple
- 7) BEFORE changing directions, loosen off the SOLID filler cap on the lower station so that it is retained by only a couple of threads and allow accumulated air to escape. Re-tighten the cap as soon as oil flows out. Have a container ready to catch the oil.
- 8) Now repeat the bleeding in the opposite direction (as per step 6 above), at the end of which you release the solid filler cap and allow any more air to escape that may have vented into the pump unit.
- 9) Follow steps 8 to 10 of the Single station bleeding instructions for final testing of the installation.

**THE SYSTEM IS READY FOR SYSTEM TESTING
as per details given in the information booklet.**

**DO NOT OVERFILL THE HELM UNIT; PARTICULARLY WITH
DUAL STATIONS AS THE OIL VOLUME IS GREATER.**

BLEEDING FLUID-LINK FOR CATAMARANS

Refer to the separate Hydraulic Circuit Layout drawings supplied with this manual for the bleeder valve numbers and layout of the circuit.

- 1) Bleeding the fluid-link circuit is not difficult, and indeed the previous sections on either dual or single station unit should be followed carefully. The only variation is to discover which direction the pump

needs to rotate in order to bleed SIDE 1 as shown in the drawings. This is the side that should be bled first - so simply follow the instructions as detailed in the single or dual station bleeding guide.

- 2) Bleed side 1 first, ensuring the ball valve is closed.
- 3) Close side 1, open the ball valve and then systematically bleed side 2, 3 and 4 whilst still rotating in the opposite direction. Open one bleeder valve at a time, and purge the oil through the helm as described in the previous sections. Close the valves after bleeding for a period of a few minutes each to purge the air.
- 4) Repeat steps 1 to 3 above once more. **DON'T WORRY IF THE CYLINDERS APPEAR TO JAM WHEN YOU CLOSE THE BLEEDER VALVES**, this is normal and because the cylinders are not yet synchronised.
- 5) Now that the system is totally bled, and **NO** air is present, then all that remains is for the cylinders to be positioned to align the rudders/motors. To do this, simply open the ball valve and rotate the helm unit until one of the cylinders strokes out completely. The other cylinder is free to float, and can be moved by hand to line up in the same way. Once lined up, simply close the ball valve and the cylinders will track each other constantly.
- 6) To ensure that there is no air in the "tie-line", you should try pushing the rudders or motors against each other. If you can compress them inwards then there is air present, so re-bleed as outlined above.

THE SYSTEM IS READY FOR SYSTEM TESTING as per details given in the information booklet.

Note:- for best results with fluid-link system you should have a rudder indicator fitted for each tiller arm so you can see the exact angle of each rudder at all times.

SERVICE INFORMATION

Servicing of HyDrive steering equipment is seldom required due to the design of the equipment, and in most cases is limited to seal replacements only. Full seal kits are available for each system and can be readily obtained from any of our dealers. Each seal kit comes with a simple instruction sheet on how to replace the seals in your unit. Before obtaining seals you must know the model number of your units, so check the labels before ordering the parts.

Some simple terms that will make ordering parts much simpler - The helm units where the wheels fit are referred to as "PUMPS" or "HELMS". The slave cylinders attached to the motors or tillers are referred to as "CYLINDERS" or "RAMS". Try not to get the two confused or you may end up ordering the wrong parts.

UNDER NO CIRCUMSTANCES attempt to dismantle a helm unit without obtaining service instructions from your dealer. *If under warranty, your warranty becomes void if dismantled by an un-authorized person.* **If poorly handled, you can SERIOUSLY damage your unit.**

MAINTENANCE

Maintenance on HyDrive steering is minimal, but because of this is it is often forgotten altogether. This results in problems at a later date due to wear on components that normally last a lifetime. Specifically mounting brackets on inboard type cylinders do require to be greased at intervals of around 3 months during seasons of heavy use. If the boat is going to be left idle for long periods, then grease thoroughly the grease nipple and ball-joints on the slave cylinder and also cover the stainless shaft to prevent salt build-up etc which can cut the seals when first used. Any other exposed metal should be greased.

ONLY USE WATERPROOF GREASE, as other automotive type greases can absorb moisture and may actually encourage corrosion.

On units installed on outboard motors, as part of your **REGULAR** service on the outboard, all components of the motor and steering should be hosed down with fresh water after each trip. A spray of WD40, RP7 or similar **DE-WATERING LUBRICANT** on all motor parts and steering parts will ensure long life of both.

REGULARLY check :

- 1) **OIL LEVELS**
- 2) **SECURITY OF ALL BOLTS, NUTS, CLEVIS PINS & STUDS which connect the steering to the tiller arm or outboard motor/stern-drive or jet – FAILURE TO MAINTAIN THE INTEGRITY OF FASTINGS CAN RESULT IN CATASTROPHIC FAILURE AND RESULT IN DAMAGE AND POTENTIAL LOSS OF LIFE.**
- 3) **SECURITY OF ALL HOSE FITTINGS**
- 4) **GREASE (Where applicable)**
- 5) **SPRAY WITH RP7 OR SIMILAR PRODUCT**
- 6) **DO NOT MIX DIFFERENT OILS IN THE UNIT.**

TROUBLE SHOOTING GUIDE

LUMPY OR NOTCHY STEERING

The most common cause of this complaint is air in the system. Check all joints and re-bleed the system. It is important to note that a fitting which does not leak oil can still leak air into the system. Any soldered joints in copper tubing should be very carefully inspected. Also check all compression cones on nylon to see if there are any cracked or broken..

Another cause is the use of the wrong grade of tubing. High pressure flexible hoses can allow expansion, and result in notchy steering. Be very careful - not all black nylon tubing is rated at 2500 psi. The more common 1000 psi tubing looks the same but IS NOT! It is dangerous - take it off the boat IMMEDIATELY, and get the right tubing.

IF ON OUTBOARDS, then it is possible that the sensation is quite normal when on the trailer. This is caused by the rubber tiller mount and it will disappear as soon as the boat is in the water and under power.

OIL OVERFLOWING

Do not overfill the pump unit, but leave the oil level about 1" from the

top of the pump (about 1/2" from the bottom of the thread). If it still overflows on a hot day, then you have a pocket of air present in the system. Re-bleed the system.

On multiple stations, and where oil lines are very long (such as on triple stations with tuna tower) it may be necessary to install an expansion tank to compensate for oil expansion in countries where temperatures range to extremes. This will compensate for the volume change in the oil. Contact your HyDrive dealer for information on the expansion tank kit.

TIGHT STEERING.

Once again, the most common causes are air in the system, and the wrong grade of tubing used. Both faults allow compression of either the air or the tubing and the storage of pressure. This stored pressure results in heavy steering. Correct either of these faults.

Another cause of stiff steering is mechanical. To eliminate the steering as the source of the problem and not merely the means of feeling a problem in the rudders, disconnect the steering from the tiller arm. If the hydraulic steering is now light to operate with the wheel, then you will find the rudders very heavy to move by hand. This should not be the case. Even large rudders should

move freely in their bearings. Correct the mechanical fault with the rudder gear and the steering will then deliver the designed performance.

The final cause of stiff steering can be the entry of foreign material in the lock-valve assembly which can jam the piston. Failure of the piston to move freely can cause a hydraulic lock effect. Cleaning the valve is not difficult but requires that the unit be returned to a qualified technician to be cleaned and tested whilst under warranty.

STEERING SLIPPING

Should the pump appear to be slipping easily or turning without moving the cylinder, then the problem is probably related to some dirt or foreign body lodged in one of the pickup valves inside the pump. It may affect one or if very dirty, can affect both directions of the pump.

The simplest step to take is to try bleeding again with good clean oil. Often the object will be dislodged with rapid purge of clean oil. If this does not fix the problem, then the pump should be returned to a qualified service centre to be carried out by someone familiar with our equipment. This fault most often occurs when first installing and

bleeding the unit, or after carrying out some other service work requiring re-bleeding of the system. The entry of such foreign material is not covered by warranty, and good cleanliness would have avoided the problem.

The same type of condition but to a lesser extent can be caused by worn or damaged seal on the piston of the slave cylinder. If you find that the symptoms are identical in both directions, and that it is only slow, then chances are you require a new seal on the piston rod.

Seal kits are readily available and replacing seals is not a difficult task. Full instructions supplied with the seal kit advise how to proceed.

CATAMARAN STEERING GETTING OUT OF SYNC

A leaking piston seal can result in a Fluid-link Catamaran system getting out of sync with the cylinders wandering. A leaking seal on either cylinder will cause the same problem - Remedy is to replace the seals on BOTH cylinders.

For details on any other problem contact your nearest dealer or write to the factory with a detailed description of your problem.

ADDITIONAL INFORMATION

WITH OUTBOARDS, WE SUGGEST YOU *ALWAYS* DISCONNECT YOUR BATTERY AFTER EACH TRIP - EARTH LEAKAGE CAUSES ELECTROLYSIS ON MOTOR PARTS. There is no need for any other type of maintenance other than that given in the previous section. If a problem does arise, always try to determine the cause as soon as possible. The trouble shooting guide will be of some help to you on that.

Warranty Statement

HyDrive Admiral and Commander Series steering units are warranted by the manufacturer against defect in workmanship and materials for **24 months** from date of sale. *Where systems are used on COMMERCIAL craft, for hire or commercial purposes warranty is limited to 12 months.*

FACTORY WARRANTY

Units suspected of warranty problems should be returned **to the factory**, freight paid together with your name, address and description of the problem. No inbound freight charges will be accepted.

Warranty is limited only to repair or replacement of any component found to be faulty and such repair or replacement is solely at the discretion of the manufacturer. It does not extend to normal wear and tear; collision damage; damage due to entry of foreign material; or corrosion due to electrolysis.

Should the repairs be affected by a *DULY AUTHORISED SERVICEMAN*, then warranty is limited only to the replacement of parts and the labour required to effectively install those parts. Travelling times are **NOT** covered by warranty but must be compensated by the owner. HyDrive Engineering Pty Ltd will in no way be liable for more than the cost of the original product.

BASIC SPECIFICATIONS

HELM UNIT - MODEL 101, 102, 401, 402 & 501

PUMP PORT THREADS - 1/4" BSPT

BALANCE LINE PORT THREADS - 1/4" BSPT

FILLER CAP THREAD - 7/16" UNF

STEERING WHEEL SHAFT THREAD - 5/8" UNF

MOUNTING STUD THREADS - 6mm METRIC

STEERING WHEEL SHAFT TAPER - 3/4" Dia: 1" PER FOOT TAPER

STEERING WHEEL SHAFT KEY SIZE - 3/16" square

LOCK VALVE - BUILT IN.

MAXIMUM WHEEL DIAMETER - 26" MAX. DISH - 6"

SEAL KIT PART NUMBER SK101 – suits models 101 & 102**SEAL KIT PART NUMBER SK401 – suits models 401, 402 & 501****SLAVE CYLINDERS - ALL MODELS**

SLAVE CYLINDER PORT THREADS - 1/4" BSPT

PISTON ROD THREAD - INBOARD VERSION ONLY - 5/8" UNF

SEAL KIT MODEL 210, 210T, 210TSE, 510 - P/N SK210**SEAL KIT MODEL 210BH, - P/N SK210BH****SEAL KIT MODEL 211BH, - P/N SK211BH****SEAL KIT MODEL 212BH-PRO, - P/N SK212PRO****SEAL KIT MODEL 212T-SPORTS, - P/N SK212T****SEAL KIT MODEL 212 - P/N SK212****SEAL KIT MODEL 216 P/N SK216****SEAL KIT MODEL 216FM & 516FM – P/N SK216FM****SEAL KIT MODEL 511BH – P/N SK511BH**

Note; - Do not remove the helm unit or cylinder from the boat in order to replace the seal. Wait until you have the seal kit and then read the instructions. All seal kits include detailed instructions on dismantling and replacing seals supplied. Installation is very **simple** and can be carried out by any competent handy-man. Removal or disconnection from the hydraulic lines is often unnecessary in order to replace seals.

A wide range of marine equipment is available from your favourite Hydrite agent - in particular our own brand of **COURSEMASTER AUTOMATIC PILOTS**, Australia's world leader in autopilot technology. Write for your free full colour Catalogue.