



SELECTION & INSTALLATION GUIDE

REV: B 05 JUNE 2008

TYPE H - HYDRAULIC

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INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

A1. SYSTEM OVERVIEW:

1. The Intellisteer Type H Remote Steering Control is versatile, easy and economical to install on powerboats, party boats, pontoon boats or houseboats equipped with a hydraulic steering system. The drive unit is based upon the famous Octopus reversing pumpset which is extremely power efficient and adjustable in flow. It is powerful and fast - capable of delivering over 800 pounds per square inch of pressure and a normal H.O. to H.O. time of 15 seconds on an 18 cubic inch steering cylinder. The motor control unit has a built in current overload protection circuit, which automatically resets when the drive unit is reversed. The hand held control unit with either curly cord or fixed cord can be located for maximum convenience, stowed with the supplied mounting clip. Additional control units are available, up to a maximum of 5 per system.
2. The Intellisteer Type H System is used in conjunction with common brands of hydraulic steering systems, it incorporates a reversing pumpset, a motor control unit and control pendant to the existing steering system. The Intellisteer components are easy to install, the pumpset is plumbed into the existing steering system, the motor control is connected to the power supply and the pumpset and then the control unit connected to the motor control. The speed of the rudder response can be adjusted to suit the helmsman's preference by simply adjusting the flow rate of the pumpset.

A2. PRODUCT LIMITATION:

The Intellisteer Type H Remote Steering Control will fit a large number of vessels, which were just difficult or economically not practical to fit remote steering control to before. The product does have some limitations, which must be observed, please note the following:

1. The Intellisteer Remote Steering Control System is recommended for use on vessels with a maximum speed of 40 m.p.h. The Intellisteer helm drive should not be fitted to vessels, which exceed this speed.
2. The Intellisteer Type H System should not be fitted to boats where the maximum horsepower of the engines exceeds the maximum horsepower rating for the vessel as stated on the vessel manufacturers tag.
3. In the event of **UNCONTROLLED** remote steering or other **EMERGENCY** situations, **MANUAL** steering is possible by operating the manual helm against the flow of the Intellisteer pumpset. In this situation steering control **WILL** be **ERRATIC**, power supply to the Intellisteer System **MUST** be isolated **IMMEDIATELY** to return to normal **MANUAL** steering. It is **STRONGLY** advised that the helmsman be formally familiarized with this **MANUAL OVERRIDE** procedure.
4. The Intellisteer Type H System is designed to operate on vessels with hydraulic steering systems. Set at maximum flow rate, the system will produce 750 pounds per square inch and will auto-protect at pressure levels above this figure. This makes the unit very capable of handling the vast majority of hydraulically steered pleasure boats. If the vessel is steered by mechanical push pull cable, Intellisteer Type H is not a suitable system and we would suggest that the vessel be fitted with Intellisteer Type S – T or R system.

A3. 5 – STEP INSTALLATION PLANNING:

When planning an installation, it is recommended that you follow 5 steps:

- STEP 1: Ensure there is a suitable power supply available.
- STEP 2: Determine the size and type of existing steering cylinder & hydraulic plumbing.
- STEP 3: Ensure there is a suitable physical mounting location for the pumpset and motor control unit.
- STEP 4: Review System & Accessories Selection Options – System Checklist.
- STEP 5: Install the System.

B1. STEP 1 – Ensure Suitable Power Supply

B1a. Power Supply

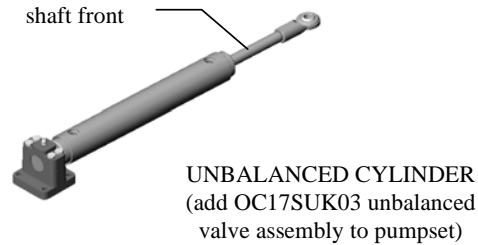
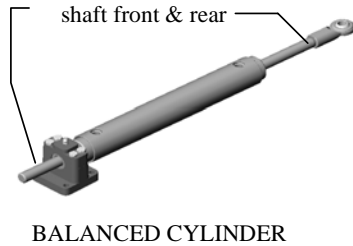
1. The Intellisteer motor control unit (model MC35) requires a power supply of 10-30 volts dc at MAX 25 amps (12v) or MAX 12 amps (24v).
2. The Intellisteer motor control unit (model MC35) has an internal motor overload protection circuit. If the motor is overloaded, the motor control circuit will detect this condition and shut the motor down in the direction in which it is running. If overloaded, the motor can still run in the opposite direction, when it does run in the opposite direction, the overload condition is reset in the original direction. This feature protects the motor and the control unit if the steering system is driven into the rudder stops.
3. Additional power supply protection is provided by an AGC type fuse fitted to the unit. This fuse will blow in the event of reverse polarity connection. The fuse rating (25amps) is shown on the unit. The rating of this fuse must not be exceeded.
4. Use 12-14 AWG wire for any additional power supply or motor cabling.

C1. STEP 2 – Determine the size and type of existing steering cylinder & hydraulic plumbing.

C1a. Steering Cylinder

1. The effective volume (displacement) of the steering cylinder must be within the range of the pump's flow capacity to ensure adequate rudder speed. The pump is adjustable in flow, when set at maximum can drive a 20 cubic inch cylinder HO to HO in approx 15 seconds. This rudder speed is typically used for autopilot steering control and is recommended for Intellisteer.
2. To determine the effective volume (displacement) of the existing steering cylinder, check the cylinder model or part number in the tables 1-5 below or you can calculate by using the formulae in table 6, see pages 11-16.
3. The pump is designed to operate on a balanced hydraulic system where the volume of oil on each side of the steering cylinder is the same. If the hydraulic system is unbalanced, an additional unbalanced valve must be added to the pump. Part number OC17SUK03 must be ordered as an accessory.
4. To determine if the hydraulic system is balanced, look at the steering cylinder. The cylinder is unbalanced if the actuating shaft only extends from the front of the cylinder, when the cylinder is fully retracted. If the actuating shaft extends from both the front and the rear of the cylinder, it is a balanced cylinder. See Graphics below.

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C1b. Hydraulic Plumbing

1. Establish the type of existing hydraulic plumbing lines to determine the most effective method of connecting the pumpset. The Basic Intellisteer Type H System includes fittings and special nylon tube (1000 psi rated) for installing the pumpset to the 3 main types of plumbing lines usually found on pleasure craft. The 3 installations are described below. Note that other types of plumbing lines which will require special fittings (not supplied in basic kit) will be encountered. A hydraulics specialist should be consulted for these types of plumbing lines.

- a. Nylon Tube – 3/8 inch Diameter

Use of nylon tubing for hydraulic steering lines is popular on inboards and sterndrives. The tubing has a working pressure rating of 1000 psi (pounds per square inch) and is flexible. It is possible to cut the nylon tube at any convenient location between the steering cylinder and the helm pump. When the physical mounting location for the pumpset and the routing for the connecting lines from the pumpset to the hydraulic steering lines have been determined, cut the steering lines nylon tube and insert the supplied compression T fittings. Using short lengths of the supplied special nylon tube and straight compression fittings, connect the 2 steering ports on the Intellisteer pumpset to the third leg of the compression T fittings. Either port can connect to either steering line at this stage. Using the supplied special tubing and compression fittings, connect the third port on the pumpset to the lower port on the rear of the helm pump. See system installation diagram on page 18.

- b. Metallic - Copper or Stainless Steel Tube – 3/8 inch Diameter

Metallic tubing for hydraulic steering lines can be found on all types of vessels. The tubing has a working pressure rating in excess of 1000 psi (pounds per square inch) and is rigid. Short lengths of flexible hose usually connect the ends of this tube to the steering cylinder and helm pump. It is possible to cut the metallic tube at any convenient location between the steering cylinder and the helm pump. When the physical mounting location for the pumpset and the routing for the connecting lines from the pumpset to the hydraulic steering lines have been determined, cut the steering lines metallic tube and insert the supplied compression T fittings. Using short lengths of the supplied special nylon tube and straight compression fittings, connect the 2 steering ports on the Intellisteer pumpset to the third leg of the compression T fittings. Either port can connect to either steering line at this stage. Using the supplied special nylon tubing and compression fittings, connect the third port on the pumpset to the lower port on the rear of the helm pump. See system installation diagram on page 18.

- c. High Pressure Flexible Hoses

Use of high pressure flexible hoses is popular on outboards. The hose has a working pressure rating in excess of 1000 psi (pounds per square inch) and is flexible. These hoses have end fittings factory swaged and are supplied at the correct length. It is NOT practical to cut these hoses and insert T fittings. It is NOT practical to connect T fittings at the steering cylinder ports. It is RECOMMENDED to disconnect the hoses from the rear of the helm pump, remove the straight fittings from the helm pump and to insert the supplied T fittings which enable the re-connection of the hoses and the Intellisteer pumpset steering lines. When the physical mounting location for the pumpset and the routing for the connecting lines from the pumpset to the rear of the helm pump have been determined, use appropriate lengths of the supplied special nylon tube and straight compression fittings, connect the 2 steering ports on the Intellisteer pumpset to the third leg (compression) of the T fittings on the rear of the helm pump. Either port can connect to either steering line at this stage. Using the supplied special nylon tubing and compression fittings, connect the third port on the pumpset to the lower port on the rear of the helm pump. See system installation diagram on page 17.

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D1. STEP 3 – Ensure there is a suitable physical mounting location for the pumpset and motor control unit.

D1a. Reversing Pumpset

1. The Intellisteer pumpset must be installed correctly to function well. The pump unit has a shut off valve attached to the front face; this valve facilitates pump service without loss of hand steering. When planning an installation, it is advisable to mount the pump in an area with reasonable access.
2. Mount the pump anywhere in the vessel where it is close to the tubes/hoses connecting the hand steering helm pump to the steering cylinder or to the helm pump on vessels using high pressure flexible hoses.
3. Ideally the surface should be horizontal in a clean dry area, vertical mounting is also possible. The best location is usually in the engine bay or behind the dashboard bulkhead. Be careful not to mount the pump on a flimsy panel as this may resonate and amplify any noise the pump makes.
5. The pumpset is 3-1/2 inch diameter (90mm) x 8 inches long (203mm). It has flexible rubber mounting feet that require approx 5 inches x 4 inches (127mm x 102mm) mounting surface. There are 4 x 1/4 inch (6.3mm) diameter holes for attachment screws.



PUMP SET

D1b. Motor Control Unit

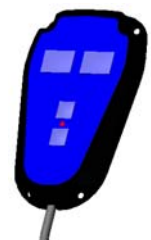
1. The Intellisteer motor control unit (model MC35) unit should be mounted in any convenient, dry location; this is usually in the engine bay or behind the dashboard. Be careful to mount the unit so as to give access to the external fuse.
2. The unit is 2-1/4 inch high (55mm) and has a mounting base plate 4 inches x 5-1/2 inches (100mm x 140mm), there are 4 x 3/16 inch (4.5mm) diameter holes for attachment screws.



MOTOR CONTROL

D1c. Hand Held Pendant

1. The Intellisteer flex Hand Held Pendant comes complete with a 15 foot flexible curly cord and a mounting clip. The clip is secured to the hull structure with 2 (supplied) wood screws. The clip/pendant should be mounted in any convenient location within easy reach of the helmsman. Additional hand held pendants and 15 foot extension cables are available as options.
2. The Intellisteer fixed Hand Held Pendant comes complete with a 15 foot hard wire cable. The Pendant is secured directly to the hull structure with 4 (supplied) wood screws. The Pendant should be mounted in any convenient location within easy reach of the helmsman. Additional hand held pendants and 15 foot extension cables are available as options.



CONTROL UNIT

INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

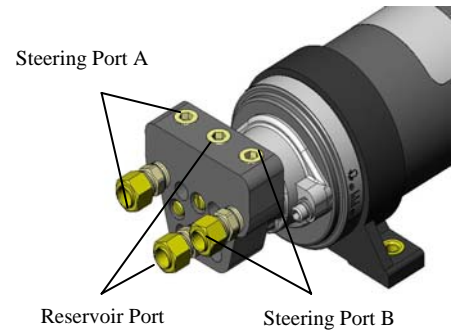
F1. STEP 5 – Install the System

F1a. Motor Control Unit & Hand Control Pendant

1. Isolate vessel power supply before attempting any electrical connections.
2. Locate motor control unit in final position and route power supply cable (12 feet supplied) to vessel breaker.
3. Trim and prepare cable as required and connect to power supply with correct polarity. Black jacket = negative and white jacket = positive.
4. Locate Hand Control Pendant in selected position and either attach holster clip or direct mount Pendant (if required). If additional Hand Control Pendants are to be installed, these items should be installed now.
5. Route control cable from Pendant to Motor Control Unit (MCU) and connect to fly lead on MCU with watertight plug. Note that this plug needs a firm push to engage and that a built in latch will snap into position when the engagement is complete. To disengage, firm pressure must be applied to the side of the plug directly onto the red dot, whilst pulling the 2 plug halves apart.
6. Secure MCU to structure using suitable # 8 fasteners thru 4 holes provided in baseplate.

F1b. Pumpset

1. Locate pumpset in final position.
2. Route pumpset power cable (24 feet supplied) to motor control unit.
3. Trim and prepare cables as required and splice pumpset power cable to motor fly lead on MCU using supplied cable splices. Black jacket to black jacket – white jacket to white jacket.
4. Connect the 3 supplied flexible tube, 2 from the steering ports A & B of the pumpset to the existing steering lines (or directly to the helm pump fittings) and 1 from the reservoir port of the pumpset to the helm pump.
5. Remove the 6 plastic shipping plugs from the ports on the front of the pumpset. Using the supplied straight compression fittings, connect the 3 supplied flexible tube ends to the pumpset and using the supplied NPT plugs to plug the rest of ports.



PORTING GUIDE

There are different configurations of connections Figs showing below:



6. If there are 2 helm stations, use the most convenient.
7. For existing steering lines of nylon or copper tubing. Connect the ends of the steering ports A & B tubes to the steering line using the supplied 'T' compression fittings.
8. For existing steering lines of high pressure flexible hose. Connect the ends of the steering ports A & B tubes to the steering line using the supplied 'T' Compression/flare fittings directly to the rear of the helm pump.
9. Remove the blanking plug from the lower port at the rear of the helm pump. Connect the end of the pumpset upper port tube directly to lower port at the rear of the helm pump. The correct installation of this **VENT/DRAIN LINE** is crucial for the operation of the pump.

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10. Secure the Pumpset to the structure using suitable ¼ inch fasteners thru the holes provided in the rubber mounts.

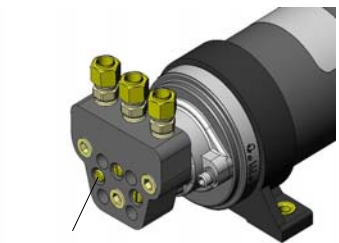
Note:

1. Ensure that the existing hydraulic system incorporates non-return (lock out) valves in the helm pump (check with the steering system manufacturer); if it does not, then suitable valves must be fitted. Most North American steering systems have built in non-return valves.
2. A suitable liquid pipe thread sealer may be used sparingly. Do not use plastic or PTFE tape, this can very easily separate and allow fragments into the system.

F1c. Filling & Purging the System

After installing the Intellisteer Pumpset the steering system can be re-filled following the steering system manufacturer's instructions. The Intellisteer Pumpset can then be started using the following procedure:

1. Switch vessel power supply on.
2. Switch Intellisteer system on by pressing the 'ON' button on the hand control pendant. Note that red LED light on pendant will turn on
3. From fully closed, open the 3 brass needle valves 2 full turns each. (The manifold on the front of the pumpset has a built in 'Shut Off' feature. This feature is controlled by 3 brass needle valves located radially).
4. Turn the steering wheel (direction not important) until the rudder is hard over. At hard over apply light hand pressure to the steering wheel forcing the rudder against the rudder stop.
5. Whilst holding the rudder against the rudder stop via the steering wheel. Energize the pump by pressing and holding one of the direction buttons on the hand control pendant, occasionally reversing the direction.
6. Repeat steps 4 & 5 until the pump runs smoothly, driving the rudder in both directions.



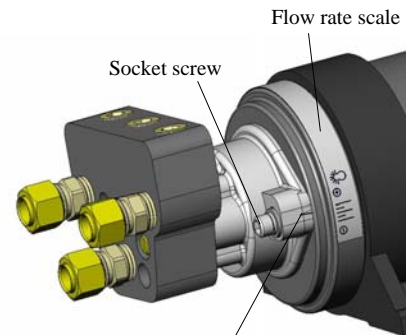
SHUT OFF

F1d. Adjusting Rudder Speed - (Pump Flow Rate)

The Intellisteer Pumpset is shipped set at its maximum rated flow. If your rudder speed is too fast the flow can be reduced using the following procedure. (Note that the recommended rudder speed for remote steering control is 15 seconds for Full Hard over to Full Hard over).

If your steering system is pressurized with air, it should be de-pressurized during the adjustment procedure.

1. Crack and loosen the 2 socket screws that hold the pump body onto the front endshield of the motor 1-1/2 to 2 full turns. Use the 5/32 (4mm) allen key wrench supplied with system.
2. Using thumb pressure, slide the right hand side of the pump body down to a lower setting. A marker and graduated scale are provided as a guide.
3. Re-tighten the 2 socket screws.
4. It may be necessary to try several settings to get the optimum performance.



Marker
SPEED ADJUSTMENT

For additional information see Service Procedure SP002 – Flow Adjustment Procedure.

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G1. Troubleshooting

If the system fails to operate after installation is complete, check for the following common causes.

1. Red LED on Hand Held Pendant does not light up when 'ON' button is pressed:
 - i. No voltage applied to motor control unit. (verify vessel power supply is switched on).
 - ii. Fuse blown in motor control unit (replace with AGC 25amp fuse).
 - iii. Watertight Plug on pendant control cable not fully engaged. (rotate 2 plug bodies firmly together until lock latch snaps into position).

2. Red LED on Hand Held Pendant does light up when 'ON' button is pressed but pumpset motor does not run when either direction button is pressed.
 - i. No voltage applied to motor. (check voltage at motor with voltmeter whilst holding direction button).

3. Red LED on Hand Held Pendant does light up when 'ON' button is pressed and Pumpset motor does run when either direction button is pressed but Pump does not move the rudder.
 - i. System not filled with oil. (fill and purge system).
 - ii. Shut off needle valve closed. (open needle valves 2 full turns each).
 - iii. Pump adjustment set too low. (adjust flow setting up).
 - iv. Hydraulic connection incorrect. (check that ports A & B on pumpset manifold connect to steering cylinder hoses).
 - v. Vent/Drain line (top hose on pumpset manifold) not connected. (Must connect to reservoir).
 - vi. Pump has been dismantled and not assembled correctly. (ensure piston is not backwards).

4. System acts erratically with intermittent fault/no fault operation.
 - i. Physical damage to control cable. (verify integrity of outer casing of complete length of all control cable).
 - ii. Salt water contamination inside watertight plug on any pendant control cable or control cable extension. (Unplug and inspect all pins for corrosion damage, thoroughly wash plug inside surfaces and pins with fresh water and allow to completely dry. Hot air may be used to accelerate drying period).

5. System operates satisfactory but tends to labour or stall in one direction.
 - i. Steering Cylinder is Unbalanced. (add unbalanced valve accessory part # OC15SUK03 to pumpset).

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H1. Service

H1a. Pumpset - Service

The Intellisteer Pumpset has only 3 moving parts and requires no routine service. Installed correctly it will give many thousands of hours of trouble free operation. If it becomes necessary to service the pumpset, it can be removed from the vessel WITHOUT draining the steering system (and therefore losing manual steering). To remove the pump use the following procedure.

1. Close the 3 brass needle valves positioned radially on the manifold on the front of the pumpset.
2. Remove the 4 socket screws that hold the shut off valve to the pump body. Use the 5/32 (4mm) allen key wrench supplied with system.
3. Disconnect the electric power cable from the motor control and the bolts holding the pump to the hull structure.
4. The pump is now free and can be removed for service.

H1b. Motor Control Unit - Service

The Intellisteer Motor Control Unit is a solid state switch with no moving parts and requires no routine service. Installed correctly it will give many thousands of hours of trouble free operation. If it becomes necessary to service the motor control, it can be easily removed from the vessel. To remove the unit, use the following procedure.

1. Isolate vessel power supply before attempting any electrical disconnection.
2. Disconnect the power supply cable to the motor control unit.
3. Disconnect the pumpset power cable from the motor control unit.
4. Disengage the hand held pendant control cable by unplugging the watertight plug. Note that firm pressure must be applied to the side of the plug directly onto the red dot, whilst pulling the 2 plug halves apart.
5. Disconnect the bolts holding the motor control unit to the hull structure.
6. The motor control unit is now free and can be removed for service.

H1c. Hand Held Pendant - Service

The Intellisteer Hand Held Pendant is completely sealed requires no routine service. Installed correctly it will give many thousands of hours of trouble free operation. If it becomes necessary to service the pendant, it can be easily removed from the vessel. To remove the unit, use the following procedure.

1. Disengage the hand held pendant control cable by unplugging the watertight plug.
2. The hand held pendant is now free and can be removed for service.

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J1. Common Steering Cylinder Data

TABLE 1							
COMMON STEERING CYLINDER DATA							
TELEFLEX							
	PART NUMBER	MODEL NUMBER	BORE DIA. Inches (mm)	SHAFT DIA. Inches (mm)	STROKE Inches (mm)	AREA SQUARE Sq.in. (cm)	VOLUME CUBIC In (cc)
SEASTAR CAPILANO INBOARD	HC5349/55	BA150-7	1.50 (38.1)	.625 (15.9)	7.0 (178)	1.46 (9.4)	10.2 (167)
	HC5350/56	BA175-7	1.75 (44.4)	.625 (15.9)	7.0 (178)	1.96 (12.7)	13.7 (225)
	HC5351/57	BA200-7	2.00 (50.8)	.625 (15.9)	7.0 (178)	3.14 (20.2)	18.9 (310)
	HC5378/79	**BA200-11	2.00 (50.8)	.625 (15.9)	11.0 (279)	3.14 (20.2)	29.7 (486)
SEASTAR INBOARD	HC5312	BA125-7ATM	1.25 (31.7)	.500 (12.7)	7.0 (178)	1.03 (6.7)	7.2 (118)
	HC5313	BA135-7ATM	1.37 (34.9)	.625 (15.9)	7.0 (178)	1.18 (7.6)	8.3 (135)
	HC5314	BA150-7ATM	1.50 (38.1)	.625 (15.9)	7.0 (178)	1.46 (9.4)	10.2 (167)
	HC5318	BA150-7AT	1.50 (38.1)	.625 (15.9)	7.0 (178)	1.46 (9.4)	10.2 (167)
	HC5319	BA175-7AT	1.75 (44.4)	.750 (19.0)	7.0 (178)	1.96 (12.7)	13.7 (225)
STERN DRIVE	HC5326	BA150-7EM	1.50 (38.1)	.625 (15.9)	7.0 (178)	1.46 (9.4)	10.2 (167)
	HC5328	*125-8EM (rod side)	1.25 (31.7)	.500 (12.7)	8.0 (203)	1.03 (6.7)	8.3 (135)
	HC5329	*125-8EM (no rod side)	same	n/a	same	1.23 (7.9)	9.8 (161)
	HC5331	*125-8EM	same	n/a	same	same	same
	HC5330	BA-125-8EMV	1.25 (31.7)	.500 (12.7)	8.0 (203)	1.03 (6.7)	8.3 (135)
OUTBOARD	HC5345	FRONT MOUNT PIVOTING	1.34 (34.0)	.750 (19.0)	8.0 (203)	0.82 (5.3)	7.8 (128)
	HC5342/0	FRONT MOUNT STANDARD	1.262 (32.0)	.750 (19.0)	1.00 (254)	0.82 (5.3)	7.8 (128)
	HC5365	FRONT MOUNT COMPACT	1.338 (34.0)	.750 (19.0)	7.0 (178)	0.97 (6.3)	6.87 (111)
	HC5370	*SIDE MOUNT (rod side)	1.25 (31.7)	.500 (12.7)	8.0 (203)	1.03 (6.7)	8.25 (135)
	same	*SIDE MOUNT (no rod side)	same	n/a	same	1.23 (7.9)	9.8 (161)
	HC5380	*SPLASHWELL MOUNT (rod side)	1.25 (31.7)	.500 (12.7)	9.0 (228)	1.03 (6.7)	9.3 (152)
	same	*SPLASHWELL MOUNT (no rod side)	same	n/a	same	1.23 (7.9)	11.0 (181)
Note	* Denotes Unbalanced Cylinder - Pump Requires Addition of OC17SUK01 Unbalanced Valve. ** Denotes Cylinder Volume Greater than Recommended for Standard Intellisteer Type 1 Pump. Use Type 2 Pump or Consult Factory for Larger Pumpset Options.						

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TABLE 2						
COMMON STEERING CYLINDER DATA						
HYNAUTIC						
DESCRIPTION	MODEL NUMBER	BORE DIA. Inches (mm)	SHAFT DIA. Inches (mm)	STROKE Inches (mm)	AREA SQUARE Sq.in. (cm)	VOLUME CUBIC In (cc)
BRASS CYLINDER UNIVERSAL MOUNT	K-1-B	1.50 (38.1)	.750 (19.0)	9.0 (228)	1.33 (8.6)	12.1 (198)
	K-1-C	1.50 (38.1)	.750 (19.0)	9.0 (228)	1.33 (8.6)	12.1 (198)
	K-2-B	1.75 (44.4)	.750 (19.0)	9.0 (228)	1.96 (12.7)	17.6 (288)
	K-2-C	1.75 (44.4)	.750 (19.0)	9.0 (228)	1.96 (12.7)	17.6 (288)
	**K-3-B	2.00 (50.8)	.875 (22.2)	9.0 (228)	2.69 (17.4)	23.1 (379)
	**K-3-C	2.00 (50.8)	.875 (22.2)	9.0 (228)	2.69 (17.4)	23.1 (379)
	**K-4-B	2.00 (50.8)	.875 (22.2)	12.0 (305)	2.69 (17.4)	30.5 (500)
	**K-4-C	2.00 (50.8)	.875 (22.2)	12.0 (305)	2.69 (17.4)	30.5 (500)
	*K-5 (rod side)	1.75 (44.4)	.875 (22.2)	9.0 (228)	1.80 (11.6)	15.9 (260)
	*K-5 (no rod side)	same	n/a	same	2.40 (15.5)	21.6 (354)
	**K-8	2.50 (63.5)	1.00 (25.4)	9.5 (241)	4.12 (26.6)	39.2 (642)
	**K-9	2.50 (63.5)	1.00 (25.4)	14.5 (368)	4.12 (26.6)	59.8 (980)
BRASS CYLINDER FIXED MOUNT	K-22	1.50 (38.1)	.750 (19.0)	10.0 (254)	1.33 (8.6)	13.3 (218)
	K-27	1.50 (38.1)	.750 (19.0)	10.0 (254)	1.33 (8.6)	13.3 (218)
	K-28	1.50 (38.1)	.750 (19.0)	12.0 (305)	1.33 (8.6)	16.0 (262)
	K-29	1.50 (38.1)	.750 (19.0)	12.0 (305)	1.33 (8.6)	16.0 (262)
BRASS CYLINDER PIVOT MOUNT	**K-31	2.0 (50.8)	.875 (22.2)	10.0 (254)	2.54 (16.4)	25.5 (418)
ALUMINUM CYLINDER BASE MOUNT	K-6	1.50 (38.1)	.875 (22.20)	7.8 (196)	1.17 (7.5)	9.0 (147)
ALUMINUM CYLINDER ENGINE MOUNT	K-7	1.50 (38.1)	.750 (19.0)	9.5 (241)	1.32 (8.5)	12.5 (205)
	K-10	1.25 (31.8)	.750 (19.0)	9.5 (241)	0.79 (5.1)	7.5 (123)
ALUMINUM CYLINDER BALL JOINT	*K-11 (rod side)	1.25 (31.7)	.562 (14.3)	9.0 (228)	0.98 (6.3)	9.0 (148)
	*K-11 (no rod side)	same	n/a	same	1.23 (7.9)	11.0 (180)
	*K-12 (rod side)	1.25 (31.7)	.562 (14.3)	7.0 (178)	0.98 (6.3)	7.0 (115)
	*K-11 (no rod side)	same	n/a	same	1.23 (7.9)	8.6 (141)
	K-18	1.25 (31.7)	.562 (14.3)	7.0 (178)	0.98 (6.3)	7.0 (115)
	K-19	1.25 (31.7)	.562 (14.3)	9.0 (228)	0.98 (6.3)	9.0 (148)
ALUMINUM CYLINDER TUBE MOUNT	*K-13 (rod side)	1.25 (31.7)	.562 (14.3)	9.0 (228)	1.23 (7.9)	11.0 (180)
	*K-13 (no rod side)	same	n/a	same	0.98 (6.3)	7.0 (115)
	*K-14 (rod side)	1.25 (31.7)	.562 (14.3)	7.0 (178)	1.23 (7.9)	8.6 (141)
	*K-14 (no rod side)	same	n/a	same	0.98 (6.3)	7.0 (115)
ALUMINUM CYLINDER UNIVERSAL MOUNT	K-51	1.50 (38.1)	.625 (15.9)	7.0 (178)	1.46 (9.4)	10.2 (167)
Notes	* Denotes Unbalanced Cylinder - Pump Requires Addition of OC17SUK03 Unbalanced Valve. ** Denotes Cylinder Volume Greater than Recommended for Standard Intellisteer Type 1 Pump. Use Type 2 Pump or Consult Factory for Larger Pumpset Options.					

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INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

TABLE 3						
COMMON STEERING CYLINDER DATA						
HYDRAFLEX						
DESCRIPTION	MODEL NUMBER	BORE DIA. Inches (mm)	SHAFT DIA. Inches (mm)	STROKE Inches (mm)	AREA SQUARE Sq.in. (cm)	VOLUME CUBIC In (cc)
INBOARD STEERING LD SERIES	I-B116	1.26 (32.0)	.550 (14.0)	7.0 (178)	1.00 (6.5)	7.0 (116)
	I-B173	1.56 (39.7)	.750 (19.0)	7.0 (178)	1.48 (9.5)	10.5 (173)
	I-B222	1.56 (39.7)	.750 (19.0)	9.0 (228)	1.48 (9.5)	13.5 (222)
INBOARD STEERING HD SERIES	I-B293	1.90 (50.0)	.787 (20.0)	7.0 (178)	2.56 (16.5)	17.9 (293)
	**I-B378	1.90 (50.0)	.787 (20.0)	9.0 (228)	2.56 (16.5)	23.0 (377)
	**I-B648	2.36 (60.0)	1.00 (25.0)	11.0 (279)	3.60 (23.2)	39.5 (648)
STERNDRIVE STEERING	IO-B133	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.1 (132)
	*IO-133S (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.1 (132)
	*IO-133S (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
	*IO-133L (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.1 (132)
	*IO-133L (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
OUTBOARD STEERING FRONT MOUNT CYLINDERS	PMAXQM	1.50 (38.0)	0.87 (22.0)	7.5 (190)	1.17 (7.57)	8.8 (144)
	OB-BFM	1.26 (32.0)	0.71 (18.0)	9.5 (241)	0.85 (5.50)	8.1 (132)
OUTBOARD STEERING SIDE MOUNT CYLINDERS	*OB-SM (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.1 (132)
	*OB-SM (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
Notes	* Denotes Unbalanced Cylinder - Pump Requires Addition of OC17SUK01 Unbalanced Valve. ** Denotes Cylinder Volume Greater than Recommended for Standard Intellisteer Type 1 Pump. Use Type 2 Pump or Consult Factory for Larger Pumpset Options.					

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INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

TABLE 4						
COMMON STEERING CYLINDER DATA						
ULTRAFLEX						
DESCRIPTION	MODEL NUMBER	BORE DIA. Inches (mm)	SHAFT DIA. Inches (mm)	STROKE Inches (mm)	AREA SQUARE Sq.in. (cm)	VOLUME CUBIC In (cc)
INBOARD STEERING LD SERIES	UC116-I	1.26 (32.0)	.550 (14.0)	7.0 (178)	1.00 (6.5)	7.0 (116)
	UC168-I	1.57 (40.0)	.787 (20.0)	7.0 (178)	1.47 (9.4)	10.3 (168)
	UC215-I	1.57 (40.0)	.787 (20.0)	9.0 (228)	1.47 (9.4)	13.1 (215)
STERNDRIVE STEERING	UC133-IOB	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.0 (132)
	*UC133-IOS (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.0 (132)
	*UC133-IOS (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
	*UC133-IOL (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.0 (132)
	*UC133-IOL (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
OUTBOARD STEERING FRONT MOUNT CYLINDERS	UC128-OBF	1.37 (35.0)	0.79 (20.0)	7.8 (198)	1.00 (6.5)	7.8 (128)
OUTBOARD STEERING SIDE MOUNT CYLINDERS	*UC132-OBS (rod side)	1.26 (32.0)	.550 (14.0)	8.0 (203)	1.00 (6.5)	8.0 (132)
	*UC132-OBS (no rod side)	same	n/a	same	1.25 (8.0)	10.0 (164)
Notes	* Denotes Unbalanced Cylinder - Pump Requires Addition of OC17SUK03 Unbalanced Valve.					

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INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

TABLE 5						
COMMON STEERING CYLINDER DATA						
HYDRIVE						
DESCRIPTION	MODEL NUMBER	BORE DIA. Inches (mm)	SHAFT DIA. Inches (mm)	STROKE Inches (mm)	AREA SQUARE Sq.in. (cm)	VOLUME CUBIC In (cc)
OBKIT1	210BH	1.37 (35.0)	.625 (16.0)	8.0 (204)	1.17 (7.5)	9.3 (154)
PROKIT	212BH	1.37 (35.0)	.625 (16.0)	7.0 (178)	1.17 (7.5)	8.2 (134)
OBKIT2	210T	1.37 (35.0)	.625 (16.0)	8.0 (204)	1.17 (7.5)	9.3 (154)
OBKIT3	*210TSE (rod side)	1.37 (35.0)	.625 (16.0)	8.0 (204)	1.17 (7.5)	9.3 (154)
	*210TSE (no rod side)	same	n/a	same	1.77 (11.4)	11.9 (195)
SPORTKIT	212T	1.00 (25.4)	.500 (12.7)	8.0 (203)	0.60 (3.9)	4.8 (78)
OBKIT5	216FM	1.37 (35.0)	.750 (19.0)	8.0 (203)	1.05 (6.7)	8.4 (137)
IBKIT1	210	1.37 (35.0)	.625 (16.0)	8.0 (204)	1.17 (7.5)	9.3 (154)
IBKIT2	*210TSE (rod side)	1.37 (35.0)	.625 (16.0)	8.0 (204)	1.17 (7.5)	9.3 (154)
	*210TSE (no rod side)	same	n/a	same	1.77 (11.4)	11.9 (195)
SPORTKIT2	212	1.00 (25.4)	.500 (12.7)	7.0 (178)	0.60 (3.9)	4.1 (68)
IBKIT3	216	1.37 (35.0)	.750 (19.0)	8.0 (203)	1.05 (6.7)	8.4 (137)
IBKIT4	213	1.50 (38.1)	.750 (19.0)	8.0 (203)	1.32 (8.5)	10.7 (175)
HEAVY DUTY HYDRIVE 2000 SERIES	313	1.50 (38.1)	.750 (19.0)	9.0 (229)	1.32 (8.5)	11.9 (196)
	314	1.78 (45.2)	.875 (22.2)	10.0 (254)	1.89 (12.2)	18.9 (310)
	316	1.37 (35.0)	.750 (19.0)	8.0 (204)	1.05 (6.8)	8.4 (137)
	150-9	1.50 (38.1)	.875 (22.2)	9.0 (229)	1.17 (7.5)	10.5 (172)
	150-12	1.50 (38.1)	.875 (22.2)	12.0 (305)	1.17 (7.5)	14.0 (229)
	175-10	1.75 (44.5)	.875 (22.2)	10.0 (254)	1.80 (11.6)	18.0 (296)
	**175-12	1.75 (44.5)	.875 (22.2)	12.0 (305)	1.80 (11.6)	21.6 (355)
	**200-12	2.00 (50.8)	1.00 (25.4)	12.0 (305)	2.36 (15.2)	28.2 (463)
	***200-15	2.00 (50.8)	1.00 (25.4)	15.0 (381)	2.36 (15.2)	35.3 (579)
	***250-12	2.50 (63.5)	1.00 (25.4)	12.0 (305)	4.12 (26.6)	49.5 (811)
***250-15	2.50 (63.5)	1.00 (25.4)	15.0 (381)	4.12 (26.6)	61.8 (1014)	
Notes	* Denotes Unbalanced Cylinder - Pump Requires Addition of OC17SUK03 Unbalanced Valve. ** Denotes Cylinder Volume Greater than Recommended for Standard Intellisteer Type 1 Pump. Use Type 2 Pump or Consult Factory for Larger Pumpset Options. *** Denotes Cylinder Volume Greater than Recommended for Type 2 Pump. Consult Factory for Larger Pumpset Options.					

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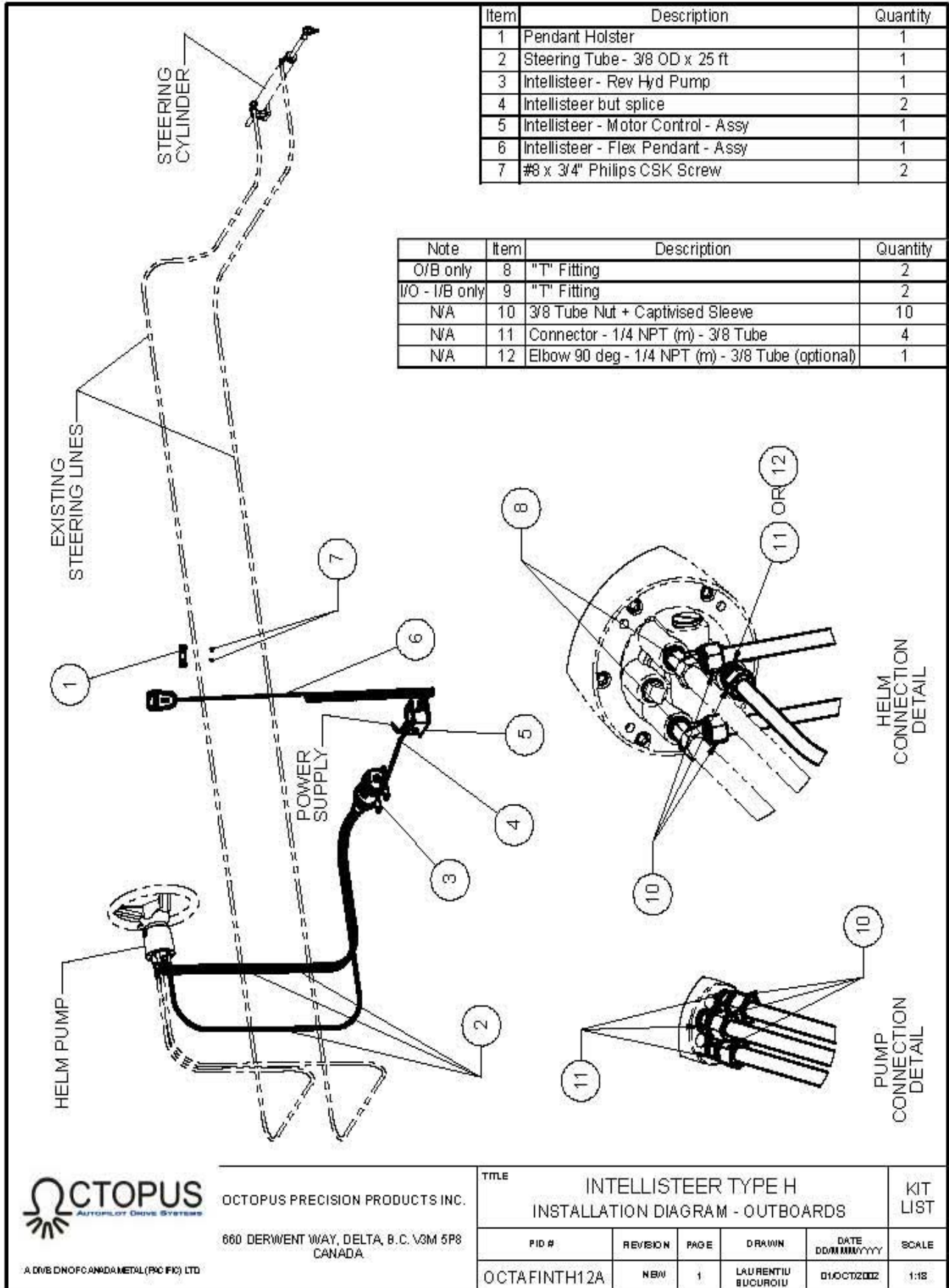
INTELLISTEER TYPE H - HYDRAULIC
SELECTION & INSTALLATION GUIDE (continued)

K1. Example Formulae for Calculating Steering Cylinder Volume

TABLE 6	
FORMULAE FOR CALCULATING EFFECTIVE CYLINDER VOLUME	
NOMENCLATURE	
EFFECTIVE CYLINDER VOLUME = ECV ROD VOLUME = RV CYLINDER VOLUME = CV STROKE = S	CYLINDER INSIDE DIAMETER = CD ROD DIAMETER = RD CYLINDER AREA = CA ROD AREA = RA
BALANCED CYLINDERS	ECV = CV minus RV
UNBALANCED CYLINDERS (rod side)	ECV = CV minus RV
UNBALANCED CYLINDERS (no rod side)	ECV = CV
WHERE:	$CV = CA \times S$ $RV = RA \times S$
	$CA = \frac{3.142 \times CD \times CD}{4}$ $RA = \frac{3.142 \times RD \times RD}{4}$
EXAMPLE 1:	THE EFFECTIVE VOLUME OF A BALANCED CYLINDER WITH A 12 INCH STROKE - 1.75 INCH DIAMETER INSIDE CYLINDER - 0.75 DIAMETER ROD
	$CA = \frac{3.142 \times 1.75 \times 1.75}{4}$ $RA = \frac{3.142 \times .75 \times .75}{4}$
	$CA = 2.406 \text{ sq in}$ $RA = 0.442 \text{ sq in}$
	$CV = 2.406 \times 12$ $RV = 0.442 \times 12$
	$CV = 28.872 \text{ cu in}$ $RV = 5.304 \text{ cu in}$
	$ECV = 28.872 - 5.304$
	ECV = 23.568 cubic inches
EXAMPLE 2:	THE EFFECTIVE VOLUME OF AN UBALANCED CYLINDER WITH A 12 INCH STROKE - 1.75 INCH DIAMETER INSIDE CYLINDER - 0.75 DIAMETER ROD
ROD SIDE	(same as example above) ECV = 23.568 cubic inches
NO ROD SIDE	ECV = CV ECV = 28.872 cubic inches

INTELLISTEER TYPE H - HYDRAULIC

SELECTION & INSTALLATION GUIDE (continued)



Item	Description	Quantity
1	Pendant Holster	1
2	Steering Tube - 3/8 OD x 25 ft	1
3	Intellisteer - Rev Hyd Pump	1
4	Intellisteer but splice	2
5	Intellisteer - Motor Control - Assy	1
6	Intellisteer - Flex Pendant - Assy	1
7	#8 x 3/4" Philips CSK Screw	2

Note	Item	Description	Quantity
O/B only	8	"T" Fitting	2
I/O - I/B only	9	"T" Fitting	2
N/A	10	3/8 Tube Nut + Captivised Sleeve	10
N/A	11	Connector - 1/4 NPT (m) - 3/8 Tube	4
N/A	12	Elbow 90 deg - 1/4 NPT (m) - 3/8 Tube (optional)	1



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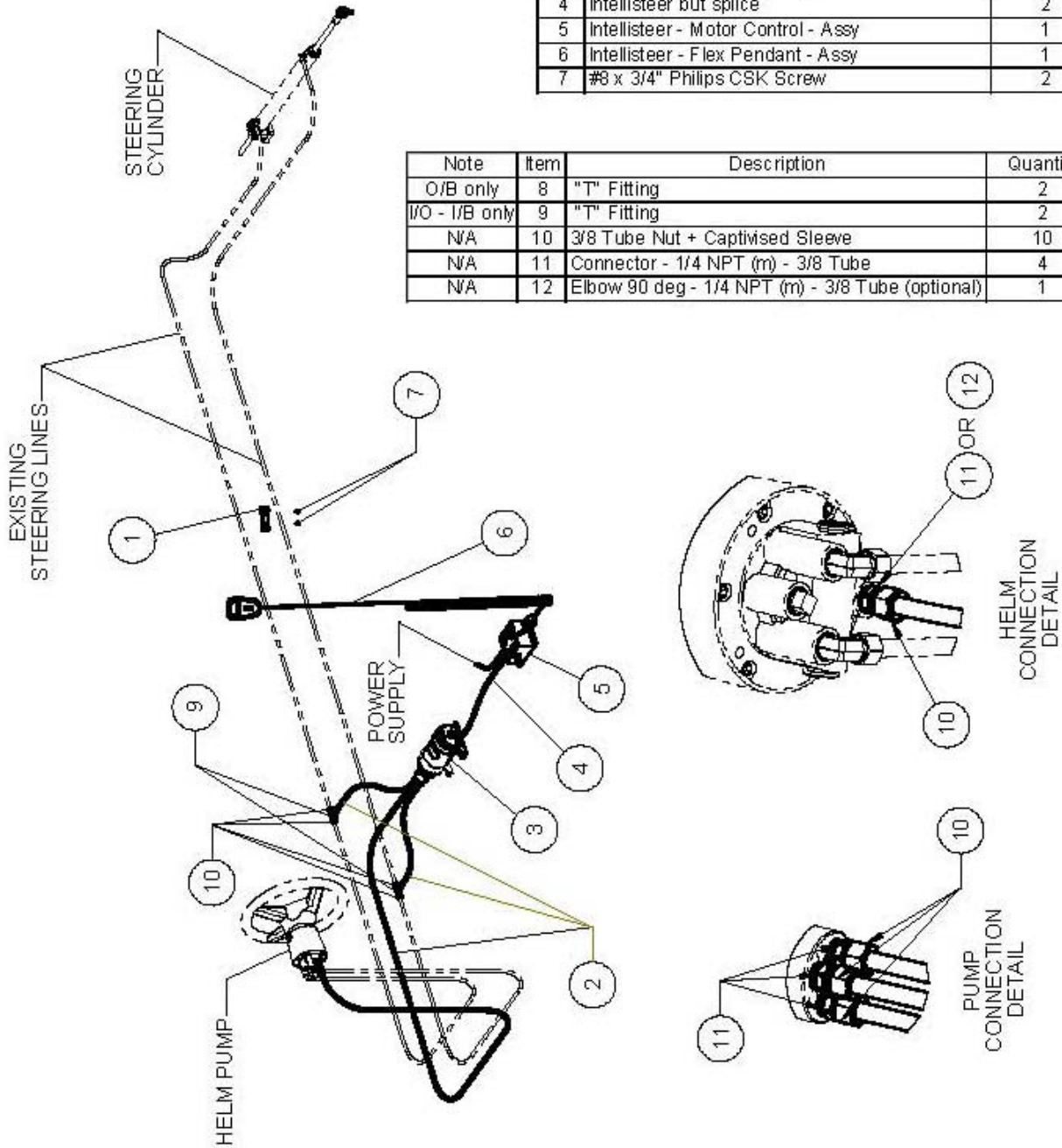
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INTELLISTEER TYPE H INSTALLATION DIAGRAM - OUTBOARDS					
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OCTAFINTH12A	NEW	1	LAURENTIU BUCUROIU	01/OCT/2002	1:18

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SELECTION & INSTALLATION GUIDE (continued)

Item	Description	Quantity
1	Pendant Holster	1
2	Steering Tube - 3/8 OD x 25 ft	1
3	Intellisteer - Rev Hyd Pump	1
4	Intellisteer but splice	2
5	Intellisteer - Motor Control - Assy	1
6	Intellisteer - Flex Pendant - Assy	1
7	#8 x 3/4" Philips CSK Screw	2

Note	Item	Description	Quantity
O/B only	8	"T" Fitting	2
I/O - I/B only	9	"T" Fitting	2
N/A	10	3/8 Tube Nut + Captivised Sleeve	10
N/A	11	Connector - 1/4 NPT (m) - 3/8 Tube	4
N/A	12	Elbow 90 deg - 1/4 NPT (m) - 3/8 Tube (optional)	1



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TITLE					KIT LIST
INTELLISTEER TYPE H					KIT LIST
INSTALLATION DIAGRAM - STERN DRIVE / INBOARD					
PID #	REVISION	PAGE	DRAWN	DATE	SCALE
OCTAFINTH12A	NEW	2	LAURENTIU BUCURDIU	18/NOV/2012	1:12

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