DASHBOARD MOUNTED AUTOPILOT DRIVE UNITS

AND

REMOTE MOUNTED AUTOPILOT DRIVE UNITS

FOR

PUSH PULL CABLE STEERED BOATS

CONTENTS:

SECTION A

SELECTION & INSTALLATION GUIDES

SELECTION & INSTALLATION GUIDE
AUTOPILOT DRIVE UNIT – TYPE S & T - DASHBOARD MOUNTING

A1. SYSTEM OVERVIEW:

1. The Octopus rotary mechanical autopilot drive (model MDR-40) is an automatic pilot drive system which makes it easy and economical to install an automatic pilot on smaller powerboats steered with mechanical push pull cable steering systems and small sailboats with access to a quadrant or tiller. The unit is powerful and fast - capable of delivering over 300lbs of cable thrust, with a normal H.O. to H.O. time of 15 seconds.

2. The drive unit either replaces or is used in conjunction with common brands of mechanical rotary and rack & pinion steering helm units, it incorporates a drive motor, a solenoid clutch and offers rudder feed back (RFB) capability. The MDR40 drive is based on the MORSE 290 rotary helm unit and accepts MORSE 304415 and Teleflex SSC52 rotary cables without modification. If the vessel is fitted with a TELLEFLEX 'Safe T' or 'Big T' or UFLEX 'T71', T73NR', 'T81' system, a simple cable end adapter must be fitted to the cable before installing the drive. If the vessel is fitted with a rack and pinion type steering system (or other brands of rotary system), the MDR40 drive can be used, but the steering cable must also be replaced with a MORSE 304415 or Teleflex SSC52.

A2. PRODUCT LIMITATION:

The MDR40 drive will fit a large number of vessels, which were just difficult or economically not practical to fit automatic pilots to before. The product does have some limitations, which must be observed, please note the following:

1. The MDR40 drive unit is designed around the MORSE 290 Rotary Drive Helm manufactured by Morse Controls of Hudson Ohio, USA. To meet A.B.Y.C. regulations, this type of steering is recommended for use on vessels with a maximum speed of 40 m.p.h. The MDR40 should not be fitted to vessels, which exceed this speed.

2. The MDR40 drive unit 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. If the existing steering system on the vessel is a **NFB** (no feed back) type. The MDR40 drive, which is **NOT** a **NFB** helm, can be fitted, but it is **STRONGLY** advised that the helmsman be formally familiarized with the operational characteristics of the new helm.

4. In the event of **UNCONTROLLED** automatic steering or other **EMERGENCY** situations, automatic return to **MANUAL** steering is provided through the operation of a built in slip clutch. It is **STRONGLY** advised that the helmsman be formally familiarized with this **MANUAL OVERIDE** procedure.

5. The MDR40 drive is designed to produce a maximum cable push/pull of 300lbs, which requires a peak power of 60 watts. This makes the unit very capable of handling the vast majority of cable steered vessels. However some vessels fitted with push pull cable steering systems have very stiff steering or steering which is heavily loaded in one direction due to hull design and engine considerations. Generally speaking, the MDR40 will steer vessels that do not require more than a 15-lb force on the rim of a 14-inch diameter steering wheel to hold a course, this equals 105 in/pounds of torque. If the steering wheel input torque exceeds this figure, the MDR40 is not a satisfactory drive system and we would suggest that the vessel be fitted with a hydraulic linear actuator drive system such as our OCTOPUS 1212LAM12.

A3 4 – STEP INSTALLATION PLANNING:

When planning an installation, it is recommended that you follow 4 steps :

STEP 1: Ensure that there is adequate space available to accommodate the drive.

STEP 2: Determine the compatibility of the existing steering cable – cable adapter selection.

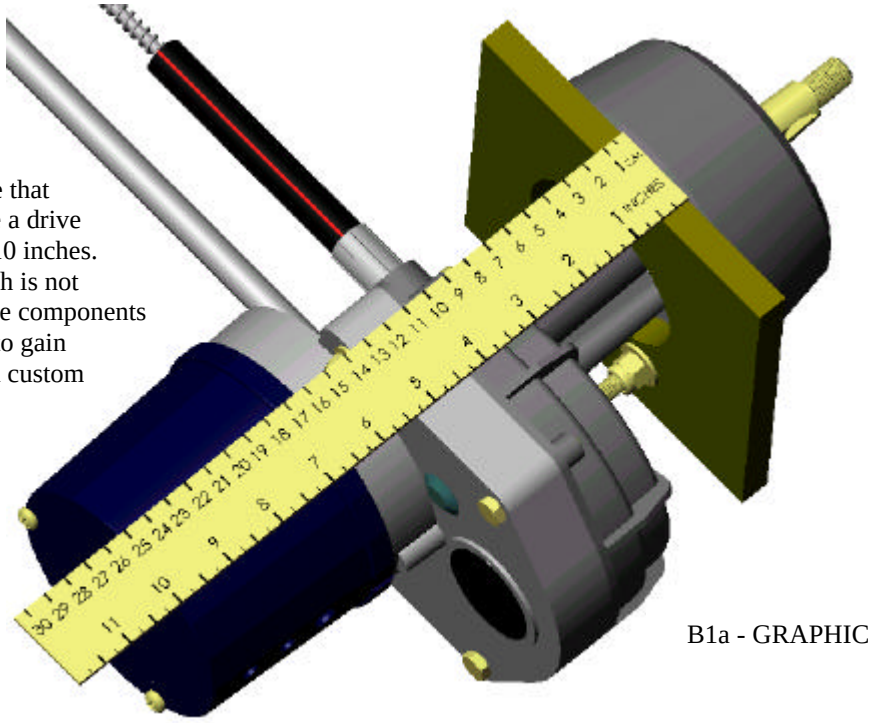
STEP 3: Determine the dashboard mounting style – Bezel Kit + Helm Spacer Kit.

STEP 4: Accessories Selection Review.

B1 STEP 1 – Determine Available Space behind dashboard

B1a DEPTH

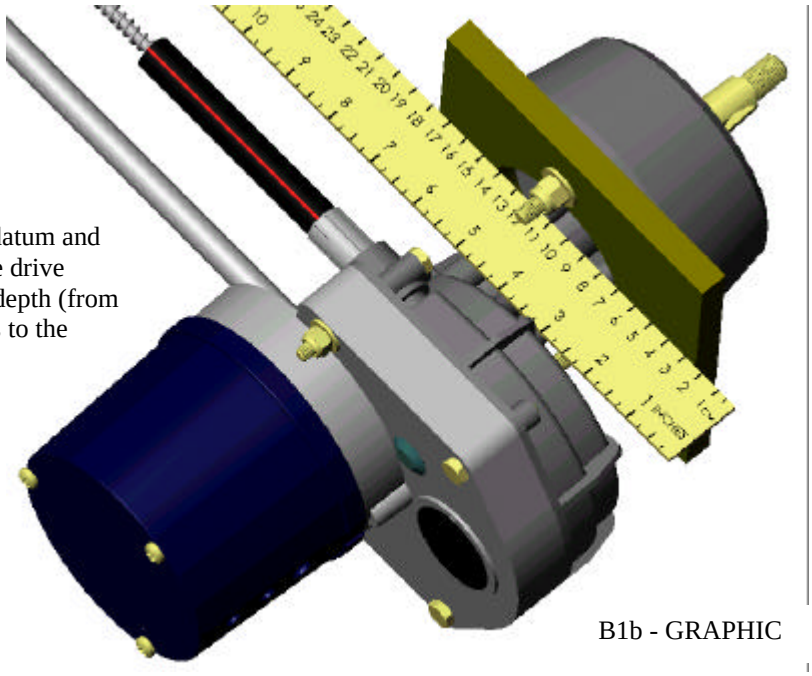
Depending upon the dashboard mount style that is used, the depth required to accommodate a drive will vary slightly, but all styles are within 10 inches. Note that in some cases where enough depth is not available, it may be possible to re-rout some components or wiring harness etc. Also there is a way to gain additional depth clearance by introducing a custom spacer. See page 15 for details.



B1a - GRAPHIC

B1b LEFT - RIGHT

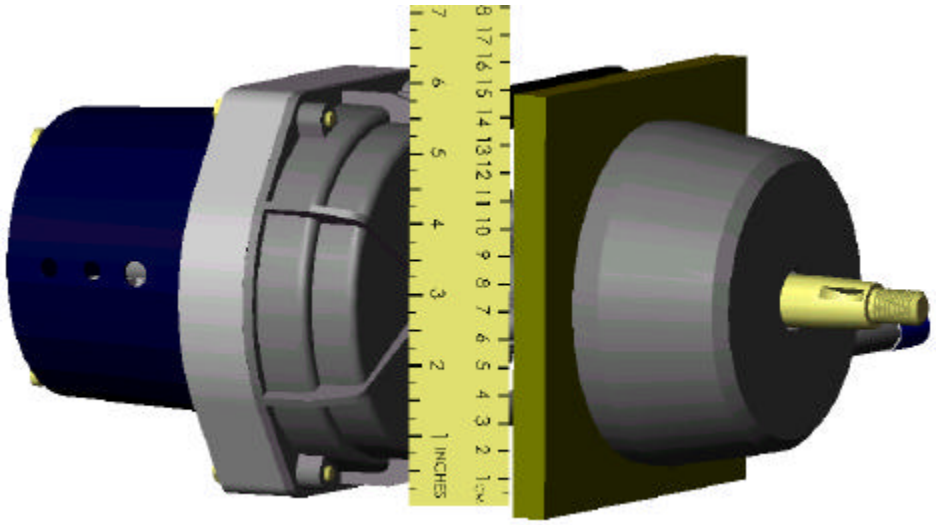
Using the centerline of the steering wheel shaft as datum and looking forward in normal helmsman position. The drive requires 4-1/4 inches to the left x approx. 6 inches depth (from the rearmost face of the dashboard and 3-1/2 inches to the right x 10 inches.



B1b - GRAPHIC

B1c UP - DOWN

Using the centerline of the steering wheel shaft as datum and looking forward in normal helmsman position. The drive requires 3 inches up x 10 inches and 3 inches down x 10 inches.



B1c - GRAPHIC

C1 STEP 2 – Determine Steering Cable Compatibility

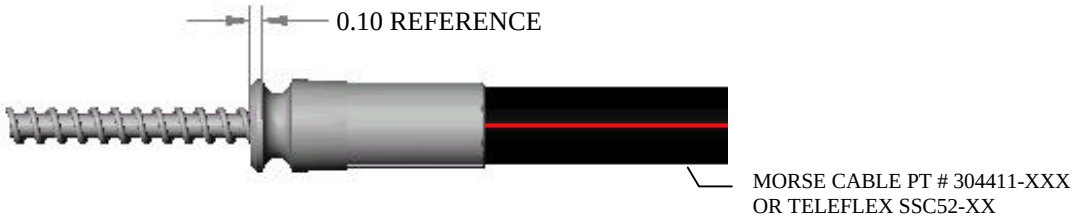
The Octopus drive is based upon the Morse 290 rotary helm unit and accepts Morse 304415 rotary steering cables and Teleflex SSC52 rotary steering cables. Cable adapters are available to accept rotary steering cables from other popular rotary helm manufacturers.

a. Manufacturers identify the steering cable with a part number and length. This can usually be found on the outer case near to the tiller/engine connection. Using either cable part number or by comparison of outer cable head detail, see graphics C2a thru C2d, establish if a cable adapter is required.

b. If the existing steering cable/helm is a RACK type, see graphic C2e. A new Morse 304415 or Teleflex SSC52 rotary steering cable must be fitted, see section ? for guide to calculating the cable length.

C2. STEP 2 – Cable Head Detail Graphics

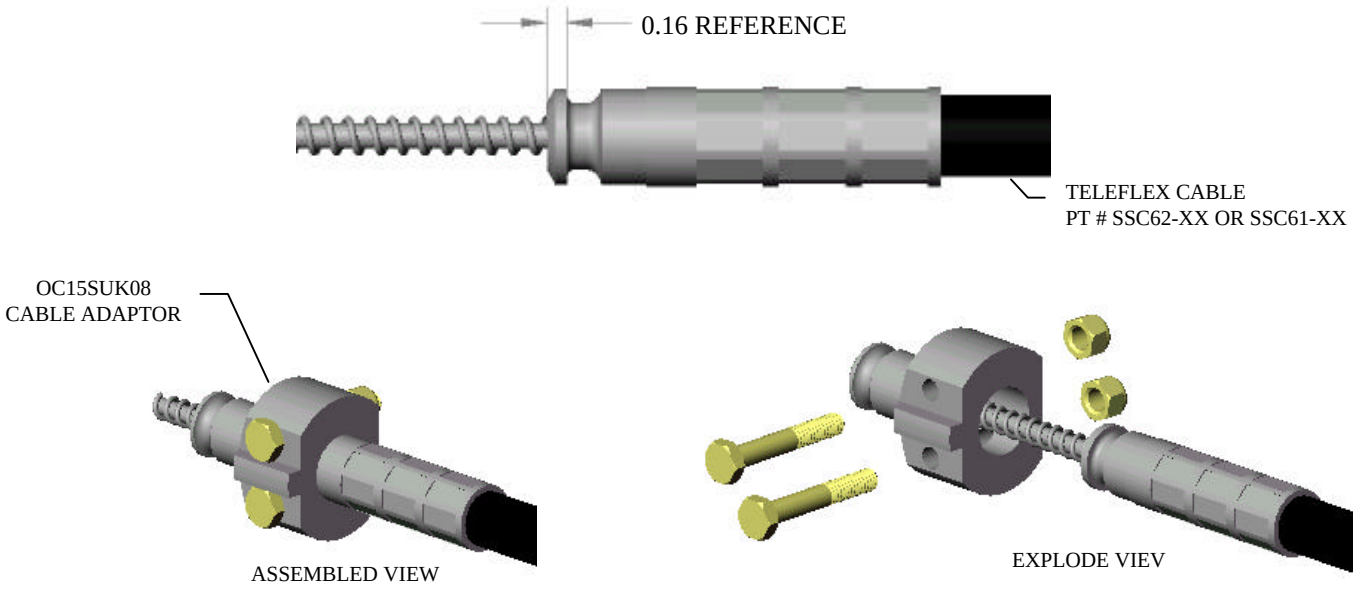
C2a. Morse Cable Part # 304411-XXX or Teleflex Cable Part # SSC52-XX (No Cable Adapter Required)



C2a - GRAPHIC

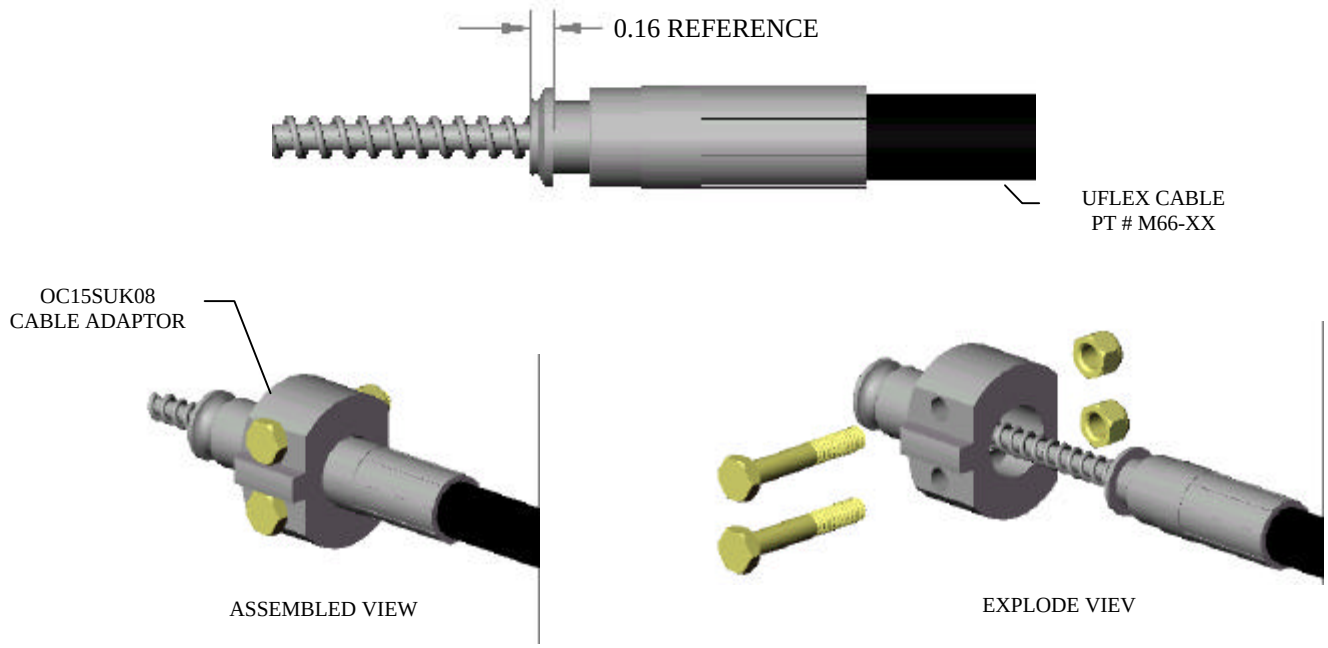
C2. STEP 2 – Cable Head Detail Graphics (Continued)

C2b. Teleflex Cable Part # SSC62-XX - Order OC15SUK08 Cable Adaptor



C2b - GRAPHICS

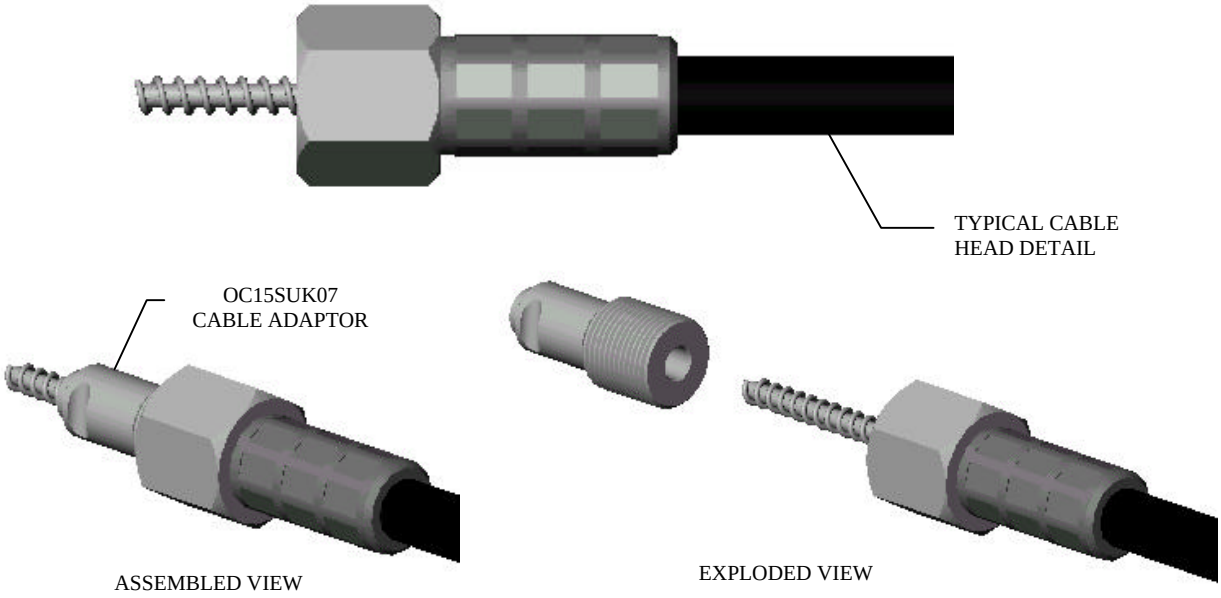
C2c. Uflex Cable Part # M66-XX - Order OC15SUK08 Cable Adaptor



C2c - GRAPHICS

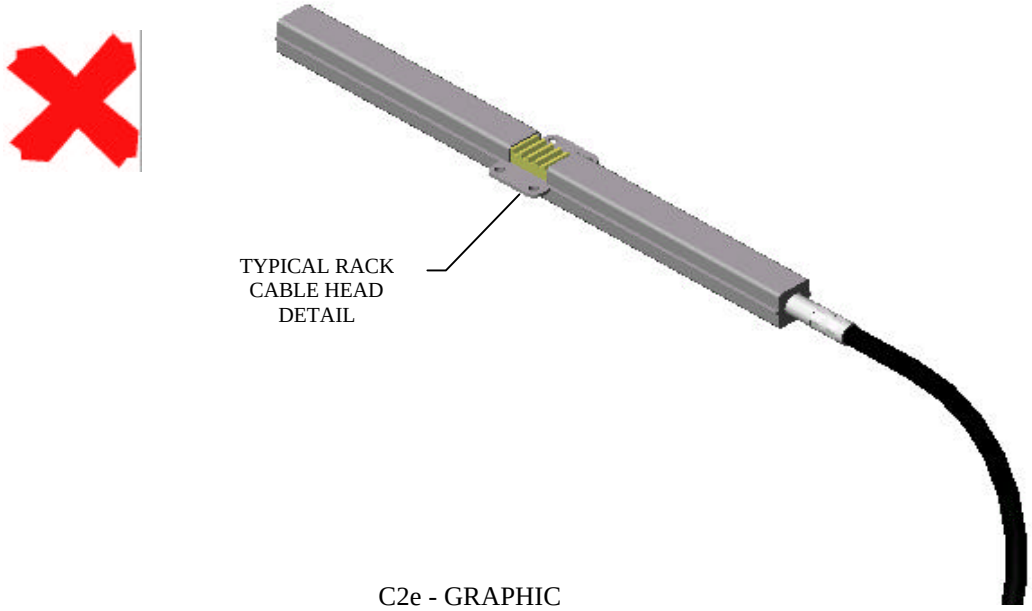
C2. STEP 2 – Cable Head Detail Graphics (Continued)

C2d	**Morse Cable Part # 304415-XXX – Order OC15SUK07 Cable Adaptor Kit** **Teleflex Cable Part # SSC72-XX – Order OC15SUK07 Cable Adaptor Kit** **Uflex Cable Part # M47-XX – Order OC15SUK07 Cable Adaptor Kit**



C2d - GRAPHICS

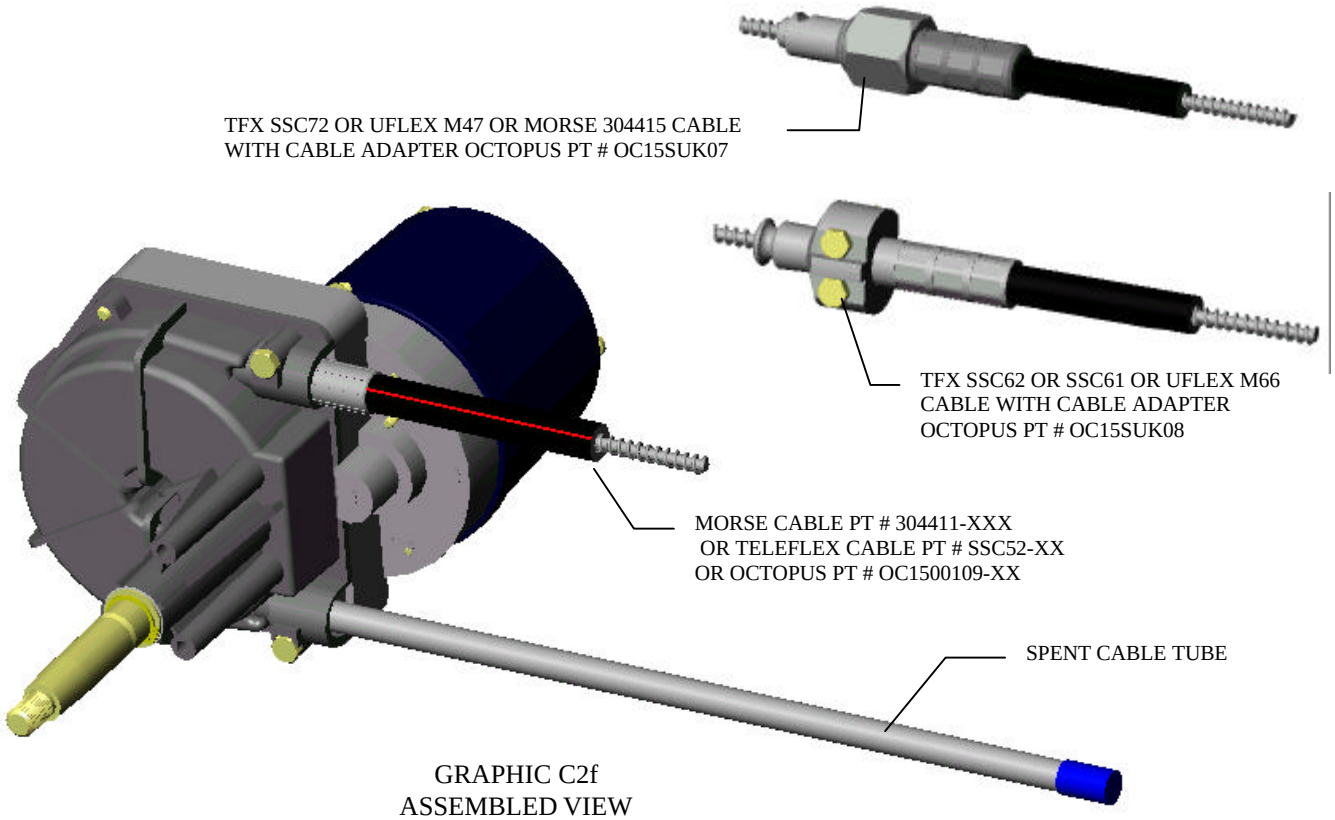
C2e	**RACK Style Cable – Replace Rack Cable with new Rotary Cable - Order OC15109-XX Cable)** **See section ? on page ? for guide to calculating Cable length.**



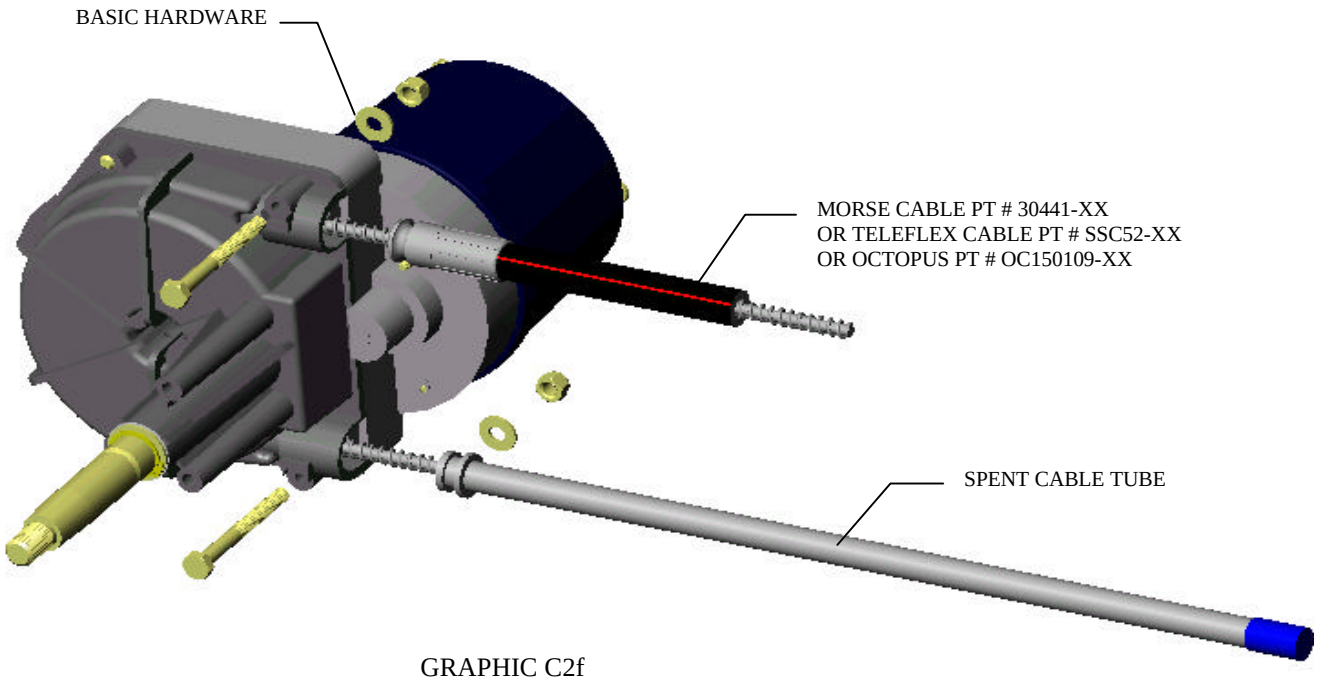
C2e - GRAPHIC

C2 STEP 2 – Cable Head Detail Graphics (Continued)

C2f STEP 2 – Typical Cable Head to Helm Installation Graphic



GRAPHIC C2f
ASSEMBLED VIEW



GRAPHIC C2f
EXPLODED VIEW

D1 STEP 3 – Determine the Dashboard Mounting Style

In order to accommodate the full range of dashboard mounting orientations, bezels and rigid/tilt steering wheel shaft options. The Octopus drive can be mounted to the dashboard panel in a variety of ways using different mounting brackets and if required, spacers and bezel kits. There are 2 main dashboard mounting types.

TYPE S – STRAIGHT SHAFT: This type can be mounted in 2 ways, either at 90 degrees to the dashboard or at 20 degrees to the dashboard. Spacer Kits are also available to reduce the space required behind the dashboard. See graphics D2a & D2b for basic Bezel Kits and E2a & E2b for Bezel Kits + Spacer Kits.

TYPE T – TILT SHAFT: This type mates the drive with the tilt steering mechanism that was supplied with the original steering system. Currently the Teleflex Performance Tilt mechanism is supported by a factory configured drive unit. Spacer Kits are also available to reduce the space required behind the dashboard. See graphics D2c for basic Tilt Mechanism and E2c for Tilt Mechanism + Spacer Kits.

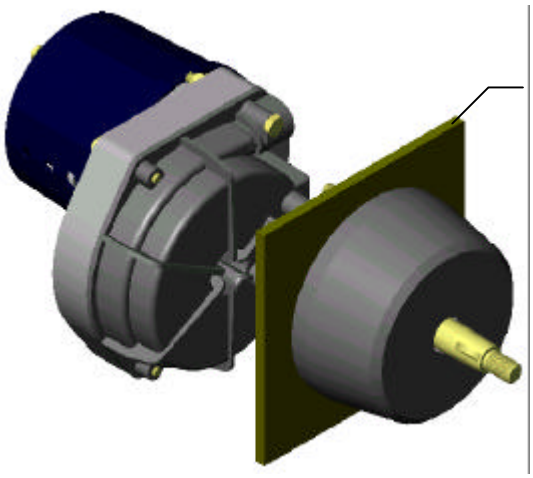
NOTE: Consult factory for information on available retro-fit components for mating to older Tilt Mechanisms manufactured by Morse, Teleflex and Uflex.

D2 STEP 3 – Dashboard Mounting Style Detail Graphics

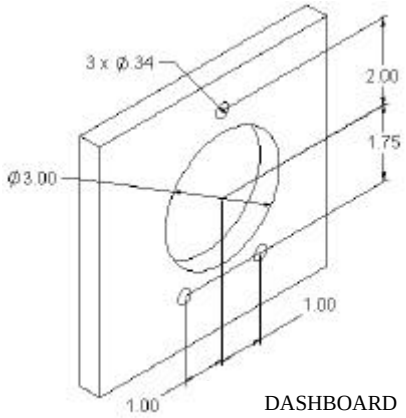
D2a TYPE S – STRAIGHT SHAFT: 90-Degree Mounting

REQUIRED PARTS:

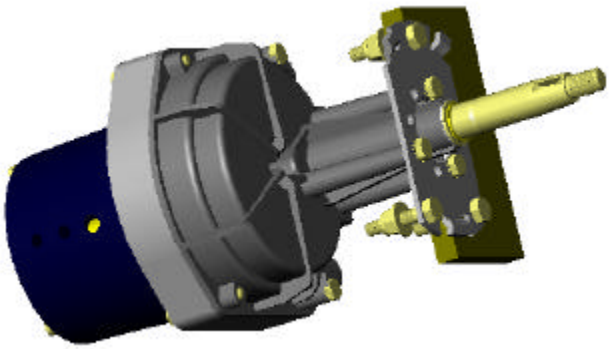
a. Octopus Part Number AFMDMSRW (straight shaft drive unit)
b. Octopus Part Number OC15SUK10 (90 degree bezel kit)
c. Octopus Part Number OC15SUK06A thru E (rudder feed back kit)
See section E4 on page 21 for additional selection information



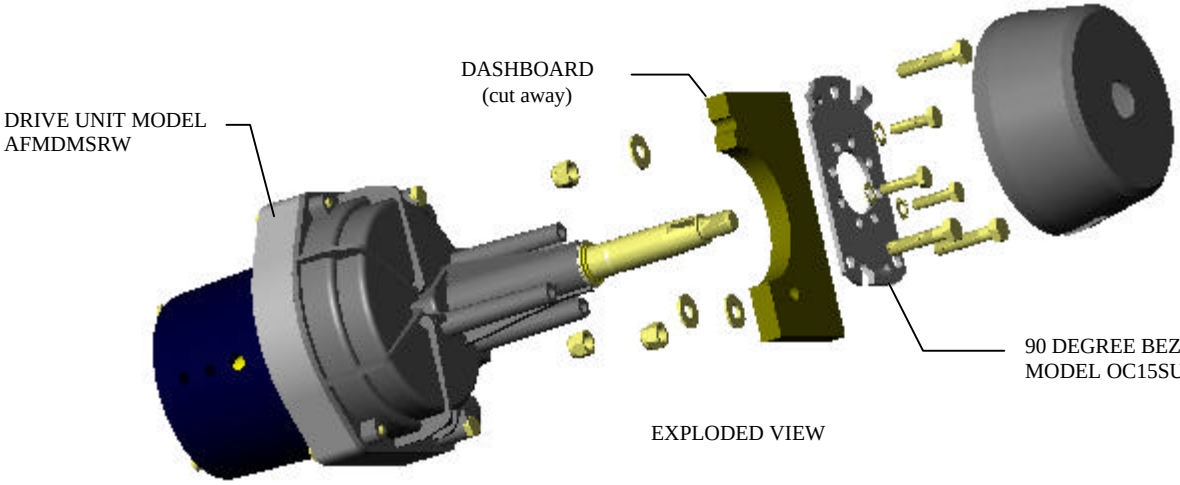
COMPLETE INSTALLATION



DASHBOARD PREPARATION



ASSEMBLED VIEW
(bezel omitted)



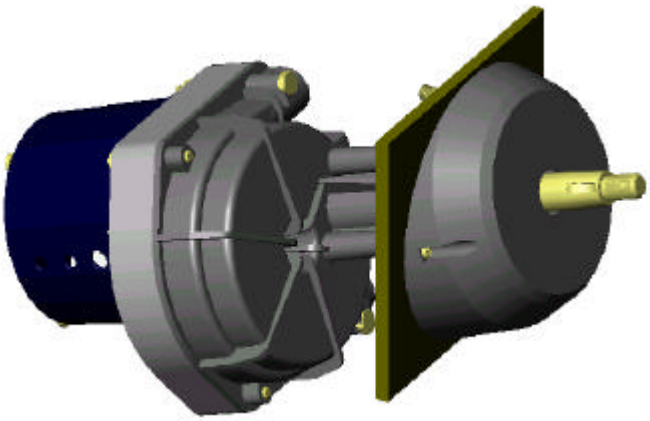
EXPLODED VIEW

D2 STEP 3 – Dashboard Mounting Style Detail Graphics (Continued)

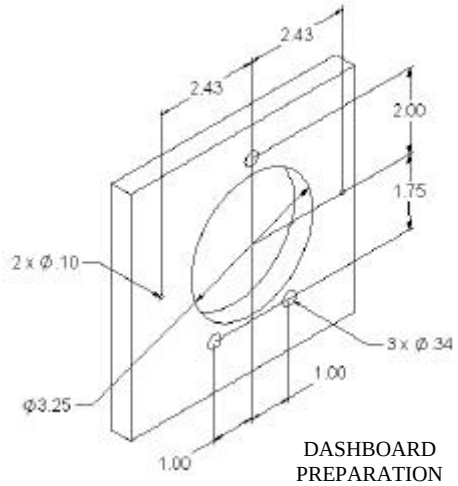
D2b TYPE S – STRAIGHT SHAFT: 20-Degree Mounting

REQUIRED PARTS:

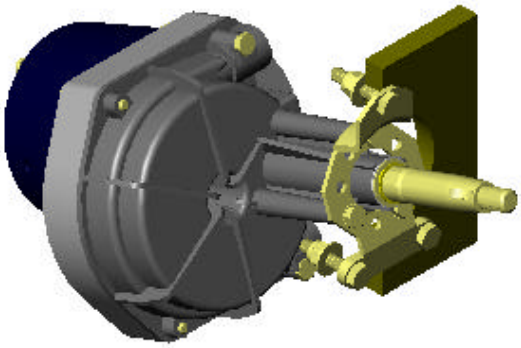
a. Octopus Part Number AFMDMSRW (rigid shaft drive unit)
b. Octopus Part Number OC15SUK09 (20 degree bezel kit)
c. Octopus Part Number OC15SUK06A thru E (rudder feed back kit)
See section E4 on page 21 for additional selection information



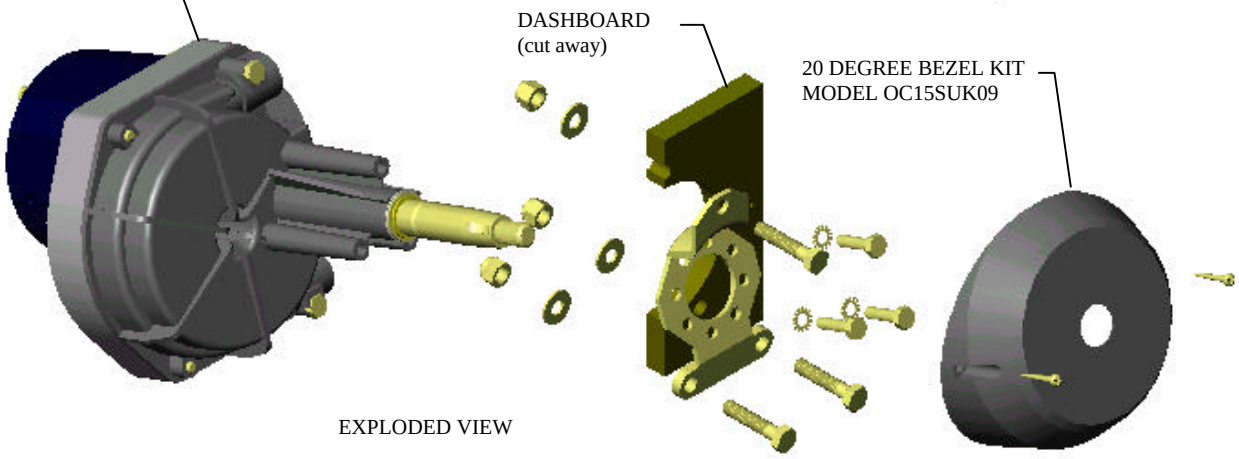
COMPLETE INSTALLATION



DASHBOARD PREPARATION



ASSEMBLED VIEW (bezel omitted)



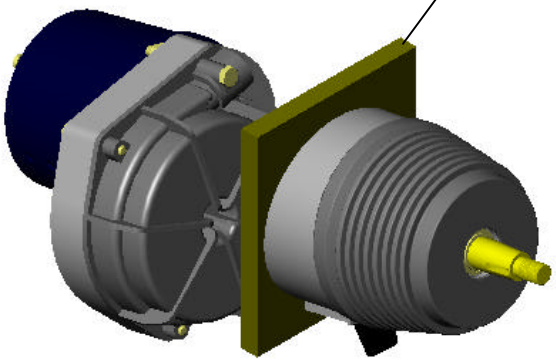
EXPLODED VIEW

D2. STEP 3 – Dashboard Mounting Style Detail Graphics (Continued)

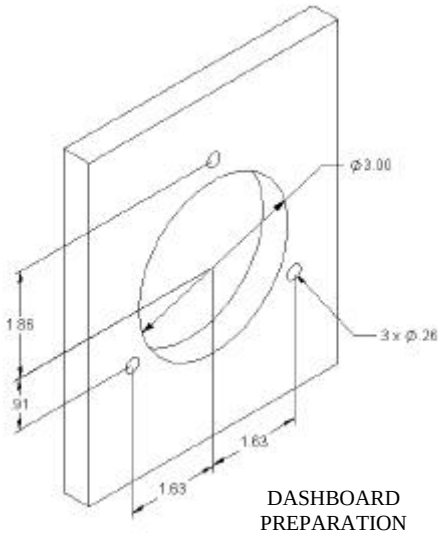
D2c. TYPE T – TILT SHAFT: TFX Performance Tilt Mechanism

REQUIRED PARTS:

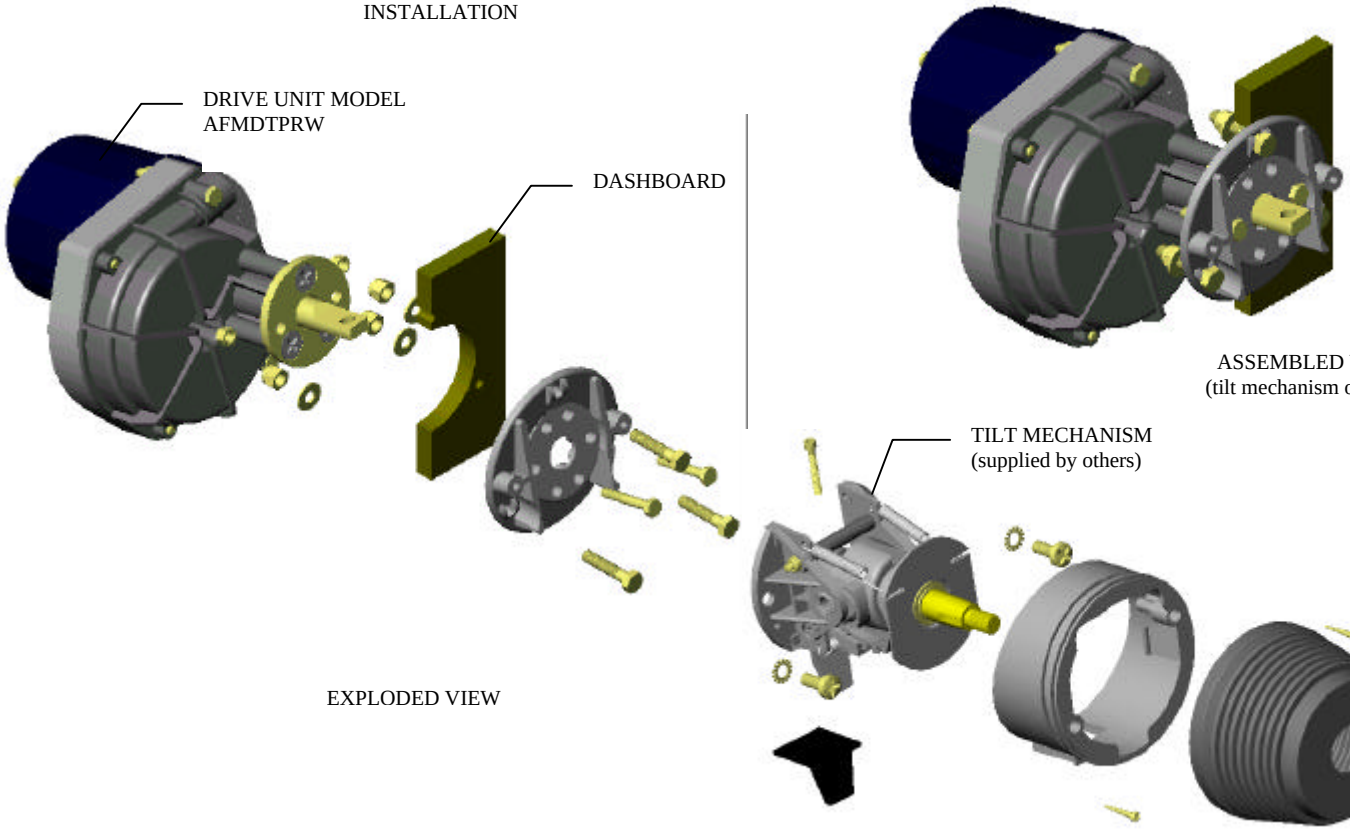
a. Octopus Part Number AFMDTPRW (TFX Performance tilt drive unit)
b. Octopus Part Number OC15SUK06A thru E (rudder feed back kit)
   See section E4 on page 21 for additional selection information
c. Teleflex Performance Tilt Mechanism (supplied by end user)



COMPLETE INSTALLATION



DASHBOARD PREPARATION



EXPLODED VIEW

ASSEMBLED VIEW (tilt mechanism omitted)

E1. STEP 4 – Accessory Selection Review

There are 6 types of accessory to be considered.

RUDDER FEED BACK MECHANISM: All autopilot installations require a rudder angle feed back device. The Octopus mechanism is based upon a rotary potentiometer, attaches directly to the drive unit with 2 screws and the calibration procedure is simple. Alternate devices attach directly to the tiller arm using a linkage mechanism; they require hard wiring and adequate protection from the elements and in many cases from accidental damage due to poor stowage of equipment or simply being stepped on. See graphic E4 on page 21 for further details.

STEERING CABLE ADAPTERS: When replacing the originally installed rotary helm unit, it is usually possible to re-use the original steering cable. The most popular types of rotary steering cable can be adapted to mate with the Octopus drive unit. See section C on pages 8 thru 11 for further details. Note that when replacing a "RACK" type helm a new rotary steering cable must ALWAYS be fitted.

HELM BEZEL KIT: Helm bezel kits are used to mount the straight shaft helm to the dashboard and provide an aesthetic finish. They are available in black only at either 90 degree or 20 degree. See section D on page 12 thru 14 for further details.

TILT MECHANISM: The available factory configured tilt shaft drive unit is designed to mate with the Teleflex Performance Tilt Mechanism. Retro-fit components are available to enable drive units to mate with older types of tilt mechanism from Morse, Teleflex and Uflex. Consult factory for more details.

HELM SPACER KIT: These spacer kits can be used to shift the helm rearwards in order to reduce the amount of space required behind the dashboard. The kits consist of multiple stackable spacers and connection hardware. The individual spacers are manufactured from aluminum and are protected from the environment with a black anodized finish. Consult factory for other finishing options. See graphics E2a thru E2c on page 17 thru 19 for further details.

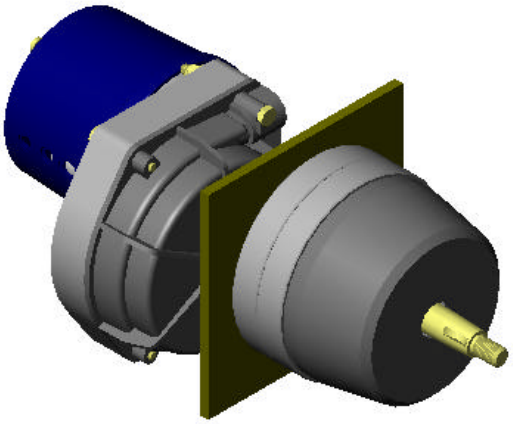
FRICTION BRAKE: This device is only available for the TYPE S – STRAIGHT SHAFT installation. It attaches to the neck of the helm and steering shaft and applies an adjustable friction force resisting the rotation of the steering shaft. It has the effect of dampening out helm backlash and resisting steering bias loads that can be transmitted from the forces created by propeller wash, especially on outboard engine installations. See graphic E3 on page 20 for further details.

E2. STEP 4 – Accessory Selection Detail Graphics

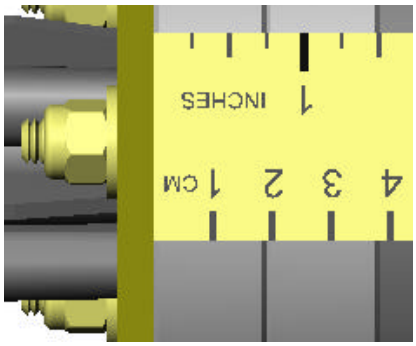
E2a. Type S - Straight Shaft 90 degree Mount with Helm Spacer

REQUIRED PARTS:

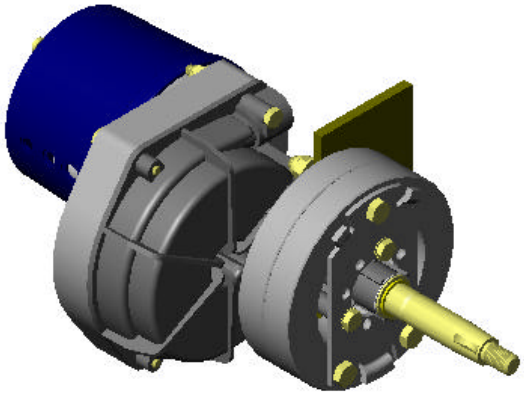
a. Octopus Part Number OC15SUK16 (90 degree mount spacer kit)



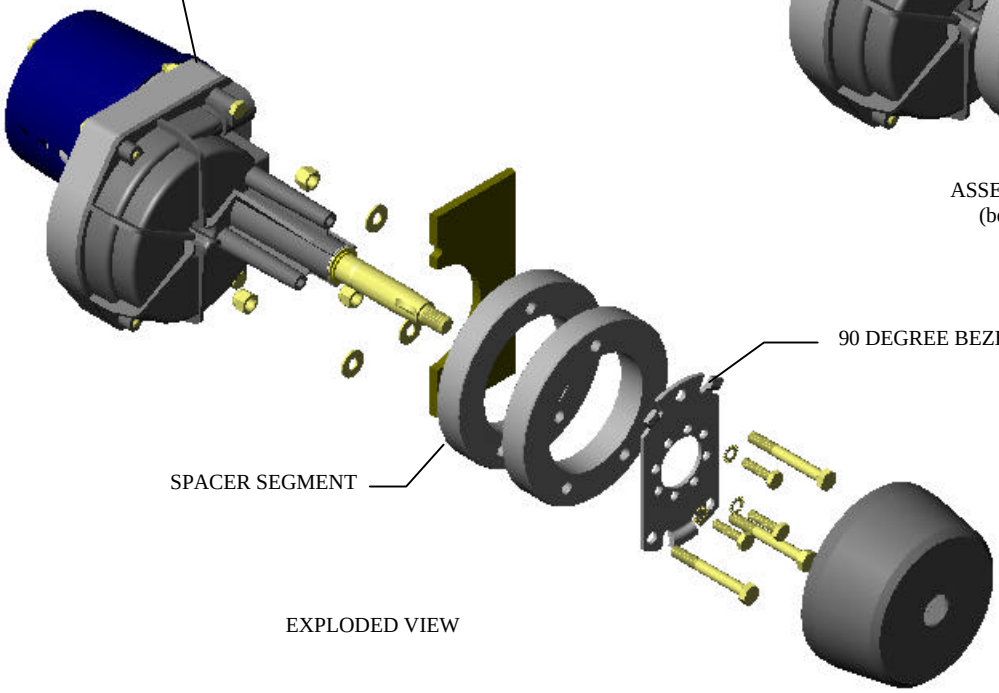
COMPLETE INSTALLATION



MAX THICKNESS =1.5 INCHES
OR 38mm (2 SPACERS)



ASSEMBLED VIEW
(bezel omitted)



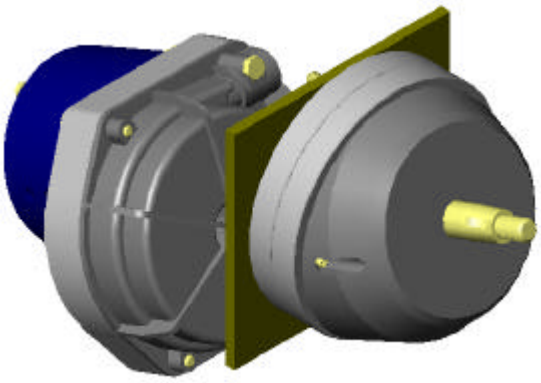
EXPLODED VIEW

E2. STEP 4 – Accessory Selection Detail Graphics (continued)

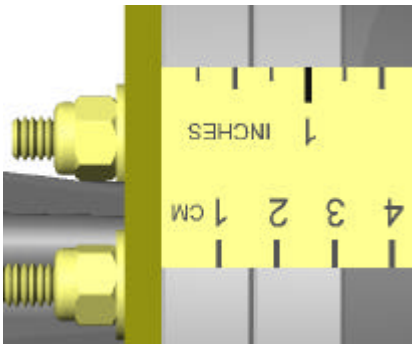
E2b. Type S - Straight Shaft 20 degree Mount with Helm Spacer

REQUIRED PARTS:

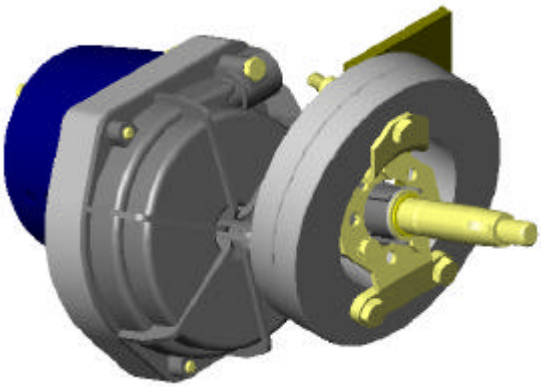
a. Octopus Part Number OC15SUK17 (20 degree mount spacer kit)



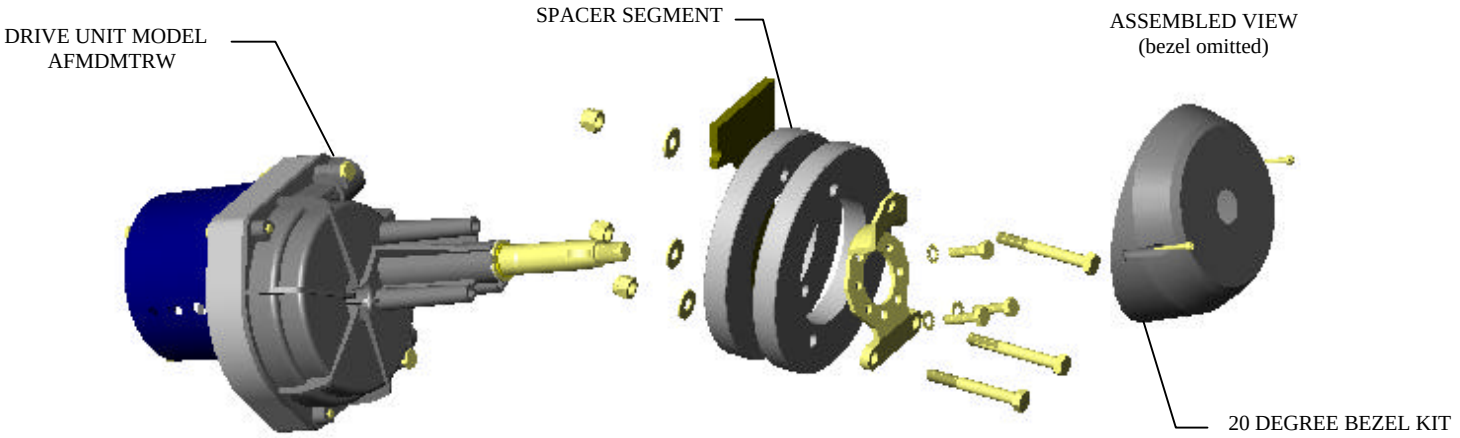
COMPLETE INSTALLATION



MAX THICKNESS = 1.25 INCHES
OR 32mm (2 SPACERS)



ASSEMBLED VIEW
(bezel omitted)



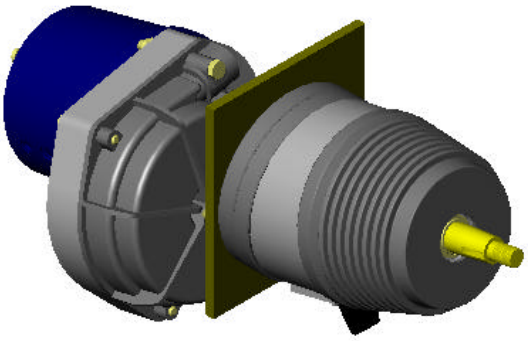
EXPLODED VIEW

E2. STEP 4 – Accessory Selection Detail Graphics (Continued)

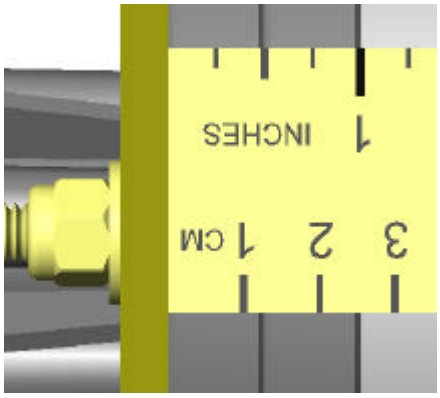
E2c. Type T - Tilt Shaft for TFX Performance Tilt Mechanism with Helm Spacer

REQUIRED PARTS:

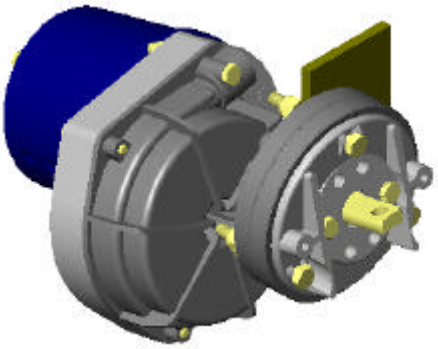
b. Octopus Part Number OC15SUK18 (TFX Performance tilt mount spacer kit)



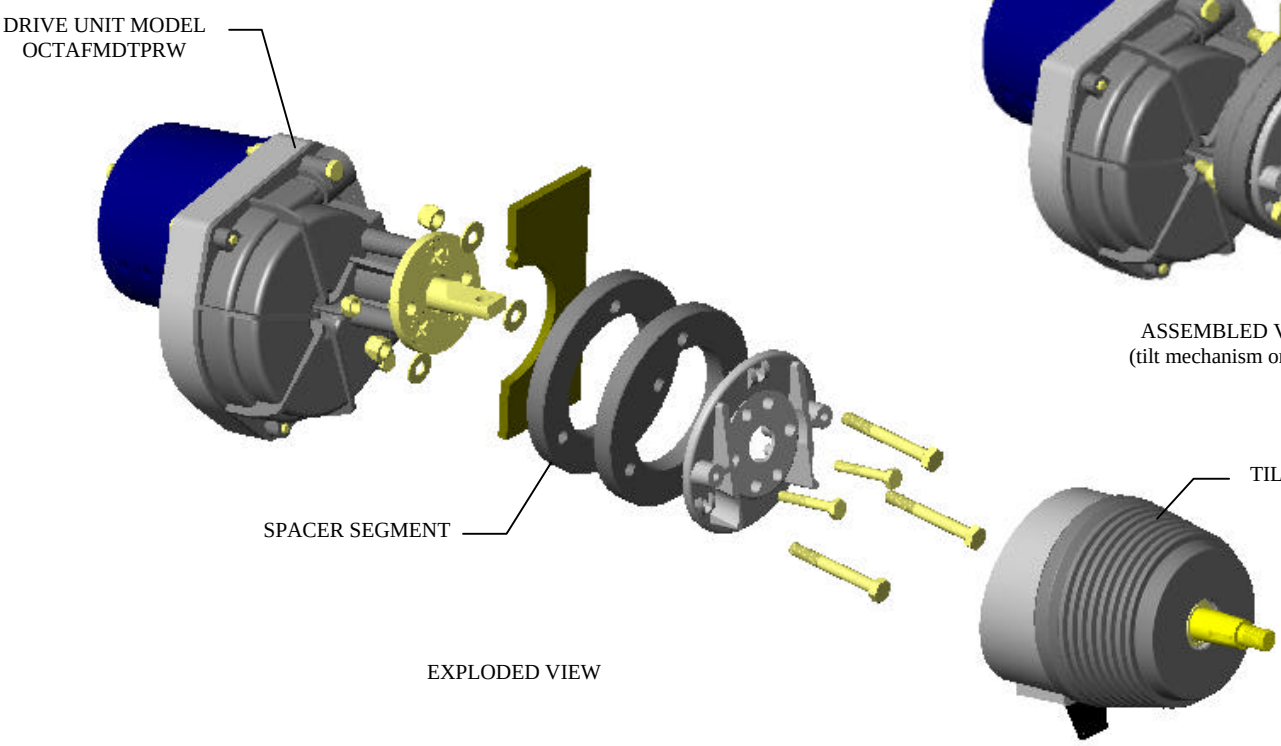
COMPLETE INSTALLATION



MAX THICKNESS = 1.0 INCHES
OR 25mm (2 SPACERS)



ASSEMBLED VIEW
(tilt mechanism omitted)



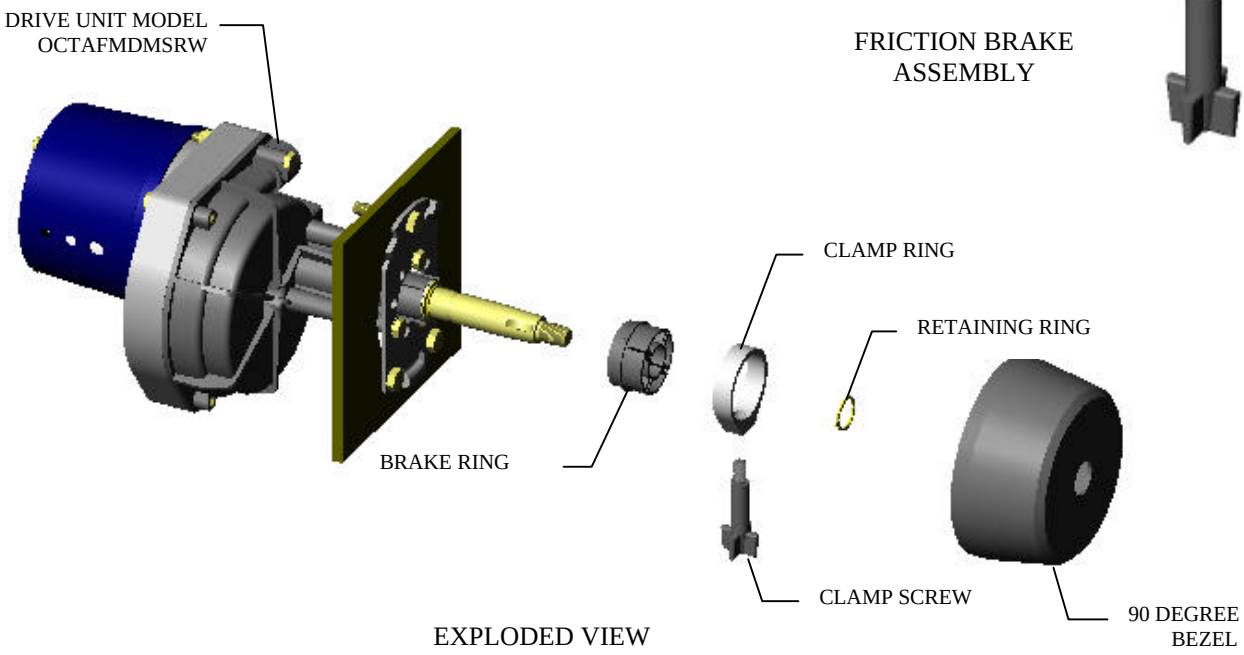
EXPLODED VIEW

E3. STEP 4 – Accessory Selection Detail Graphics (Continued)

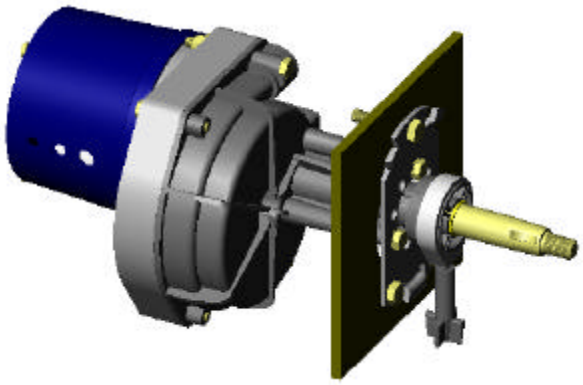
E3 FRICTION BRAKE

REQUIRED PARTS:

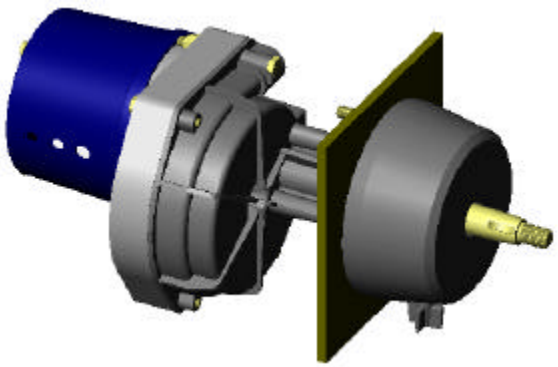
a. Octopus Part Number OC15SUK11



EXPLODED VIEW



COMPLETE
INSTALLATION
(bezel omitted)



COMPLETE
INSTALLATION

E4. STEP 4 – Accessory Selection Detail Graphics (Continued)

E4 RUDDER FEED BACK MODULE

REQUIRED PARTS:

a. Octopus Part Number OC15SUK06A THRU H
(for specific autopilot model & manufacturer)
b. Octopus Part Number OC15SUK06
(universal – for all major Autopilot Models)

MECHANICAL CALIBRATION PROCEDURE

1. Before installing the drive unit into the vessel, disassemble the RFB module from the drive housing, by removing 2 attach screws.

2. Install the drive unit into the vessel and install the remote steering cable following the drive installation guide.

3. Complete the electrical hook up of the drive following the drive-autopilot installation guide.

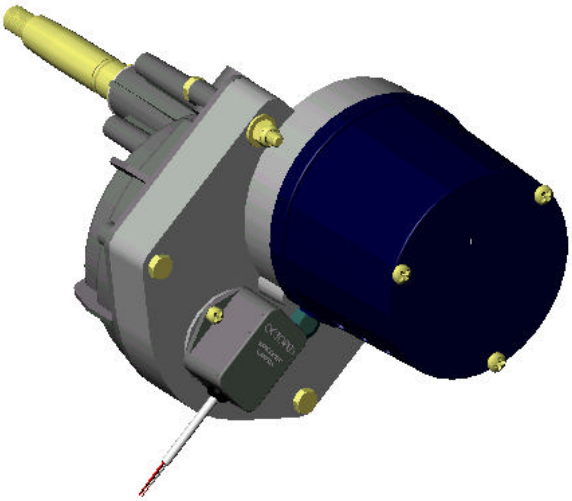
4. Complete the electrical hook up of the RFB module following the drive-autopilot installation guide.

5. Center the gear on the RFB module by aligning the red paint mark on the gear with the red paint mark on the housing as shown in underside view graphic below.

6. By turning the steering wheel of the helm unit, centre the rudder. Note that on power assisted steering systems, you may need to run the engine to achieve this.

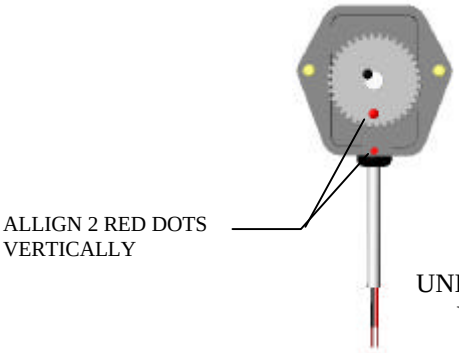
7. Reassemble the RFB module to the drive housing and install and tighten the 2 attach screws. Ensure that the mesh between the RFB module and the drive gear is not excessive.

8. See autopilot installation guide for instructions on additional software controlled RFB fine calibration and HO limitation.



COMPLETE INSTALLATION

RFB MODULE



UNDERSIDE
VIEW

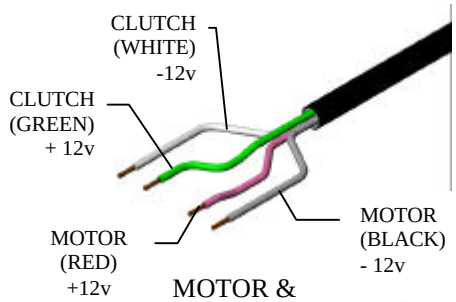
F1 Electrical Hook Up

F1a Motor and Clutch Power Supply Cable

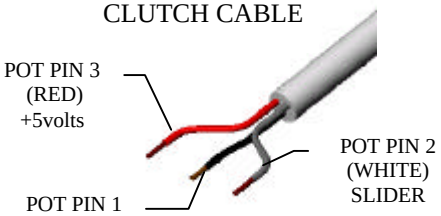
i. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 4 x 10 AWG wires (supplied in jacketed cable from drive) with Auto Pilot junction box.
ii. Following Auto Pilot manufacturers installation guide, perform electrical tests.

F1b Rudder Feed Back Signal Cable

i. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 3 x 24 AWG wires + shield core (supplied in jacketed cable) from RFB module with Auto Pilot junction box.
ii. Following Auto Pilot manufacturers installation guide, perform electrical tests.



MOTOR & CLUTCH CABLE



RFB CABLE

G1 System & Accessory Checklist

CHECKLIST 1				
MDR DASHBOARD MOUNT A/P DRIVE SYSTEM				
DESCRIPTION			**PART NUMBER**	**ORDER**
MANDATORY SELECT 1 DRIVE UNIT	**BASIC SYSTEM**	straight shaft drive unit (includes 90 degree bezel kit)	AFMDMSRW (with RFB - supply a/p make & model)	
			AFMDMSW (without RFB)	
		tilt shaft drive unit (to match up to TFX performance tilt mechanism)	AFMDTPRW (with RFB - supply a/p make & model	
			AFMDMSW (without RFB)	
OPTIONAL ACCESSORY SELECTIONS	**RUDDER FEED BACK**	RFB potentiometer module (supply autopilot model and manufacturer)	OC15SUK06 A thru F	
	STEERING CABLE OPTIONS	adaptor for TFX SSC61	OC15SUK08	
		adaptor for TFX SSC62	OC15SUK08	
		adaptor for TFX SSC72	OC15SUK07	
		adaptor for MORSE 304415	OC15SUK07	
		adaptor for UFLEX M47	OC15SUK07	
		steering cable	OC15109-XX (length calculated from routing path)	
	HELM MOUNT OPTIONS	90 degree bezel kit	OC15SUK10	
		20 degree bezel kit	OC15SUK09	
		90 degree bezel spacer kit	OC15SUK16	
		20 degree bezel spacer kit	OC15SUK17	
		TFX tilt mechanism spacer kit	OC15SUK18	
		friction brake kit	OC15SUK11	

SELECTION & INSTALLATION GUIDE
AUTOPILOT DRIVE UNIT – TYPE R - REMOTE MOUNTING

A1 SYSTEM OVERVIEW:

1. The Octopus remote rotary mechanical autopilot drive (model MDR-40 Type R) is an automatic pilot drive system which makes it easy and economical to install an automatic pilot on smaller powerboats steered with mechanical push pull cable steering systems and small sailboats with access to a quadrant or tiller. The unit is powerful and fast - capable of delivering over 300lbs of cable thrust, with a normal H.O. to H.O. time of 15 seconds.

2. The type R drive unit can be installed in any convenient location, it requires the addition of a second steering cable and connection kit. It incorporates a drive motor, a solenoid clutch and offers rudder feed back (RFB) capability. The MDR40 Type R drive is based on the MORSE 290 rotary helm unit and accepts MORSE 304415 steering cables and Teleflex SSC52 steering cables without modification. Simple cable adapters are available to enable connection to other popular steering cables. When the helmsman is hand steering, the only the type R drive second steering cable is back driven due to the clutch. When the type R drive is steering, the manual steering cable and helm are back driven.

A2 PRODUCT LIMITATION:

The MDR40 drive will fit a large number of vessels, which were just difficult or economically not practical to fit automatic pilots to before. The product does have some limitations, which must be observed, please note the following:

1. The MDR40 type R drive unit is designed around the MORSE 290 Rotary Drive Helm manufactured by TFX-Morse of Limerick Pennsylvania, USA. To meet A.B.Y.C. regulations, this type of steering is recommended for use on vessels with a maximum speed of 40 m.p.h. The MDR40 type R drive should not be fitted to vessels, which exceed this speed.

2. The MDR40 type R drive unit 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. If the existing steering system on the vessel is a **NFB** (no feed back) type, the MDR40 type R drive can **NOT** be fitted. The existing steering system **MUST** be capable of being back driven.

4. In the event of **UNCONTROLLED** automatic steering or other **EMERGENCY** situations, automatic return to **MANUAL** steering is provided through the operation of a built in slip clutch. It is **STRONGLY** advised that the helmsman be formally familiarized with this **MANUAL OVERIDE** procedure.

5. The MDR40 type R drive is designed to produce a maximum cable push/pull of 300lbs, which requires a peak power of 60 watts. This makes the unit very capable of handling the vast majority of cable steered vessels. However some vessels fitted with push pull cable steering systems have very stiff steering or steering which is heavily loaded in one direction due to hull design and engine considerations. Generally speaking, the MDR40 type R drive will steer vessels that do not require more than a 15-lb force on the rim of a 14-inch diameter steering wheel to hold a course, this equals 105 in/pounds of torque. If the steering wheel input torque exceeds this figure, the MDR40 type R is not a satisfactory drive system and we would suggest that the vessel be fitted with a hydraulic linear actuator drive system such as our OCTOPUS 1212LAM12.

A3 4 – STEP INSTALLATION PLANNING:

When planning an installation, it is recommended that you follow 4 steps:

STEP 1: Ensure that there is adequate space available to accommodate the drive unit.

STEP 2: Determine the type of cable connection kit required (see application tables).

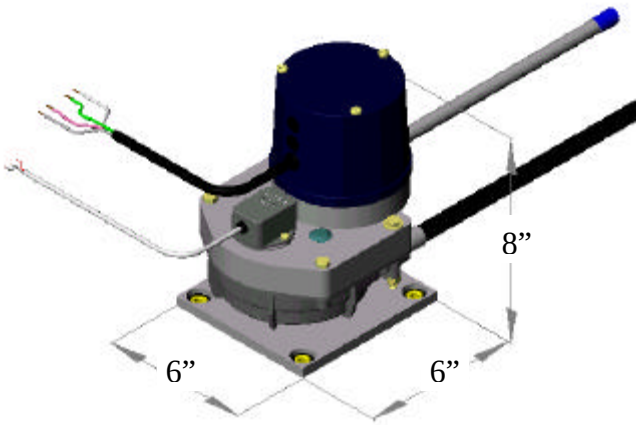
STEP 3: Determine the length of second steering cable required.

STEP 4: System & Accessories Selection Review.

B1 STEP 1 – Determine Available Space

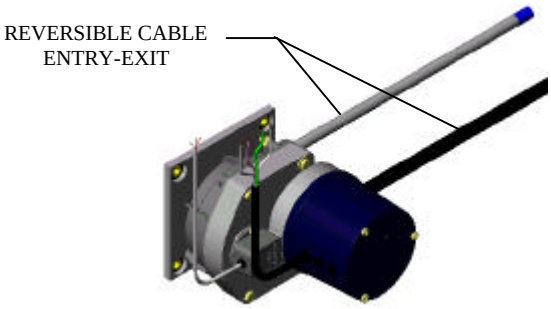
B1a Physical Envelope & Orientation

1. The selected installation site should provide adequate space to accommodate the drive envelope including the entry and exit points for the steering cable. The drive can be mounted at any angle. See detailed graphics of drive envelope and mounting samples below. Note that no access for maintenance purposes is required.

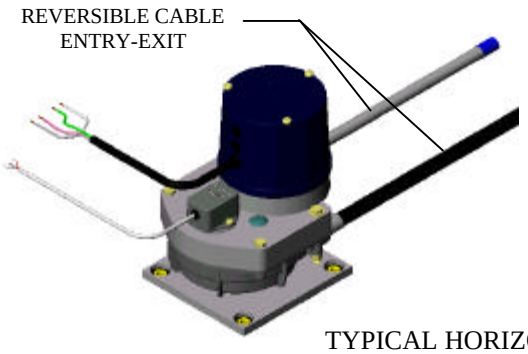


DRIVE ENVELOPE

2. The selection of the steering cable entry/exit port does **NOT** have a preference. To provide more flexibility for routing the steering cable, the entry/exit port arrangement can be reversed. If ports are reversed, the steering direction will also be reversed. To compensate for this, the autopilot software or motor wiring can be adjusted.



TYPICAL VERTICAL MOUNT

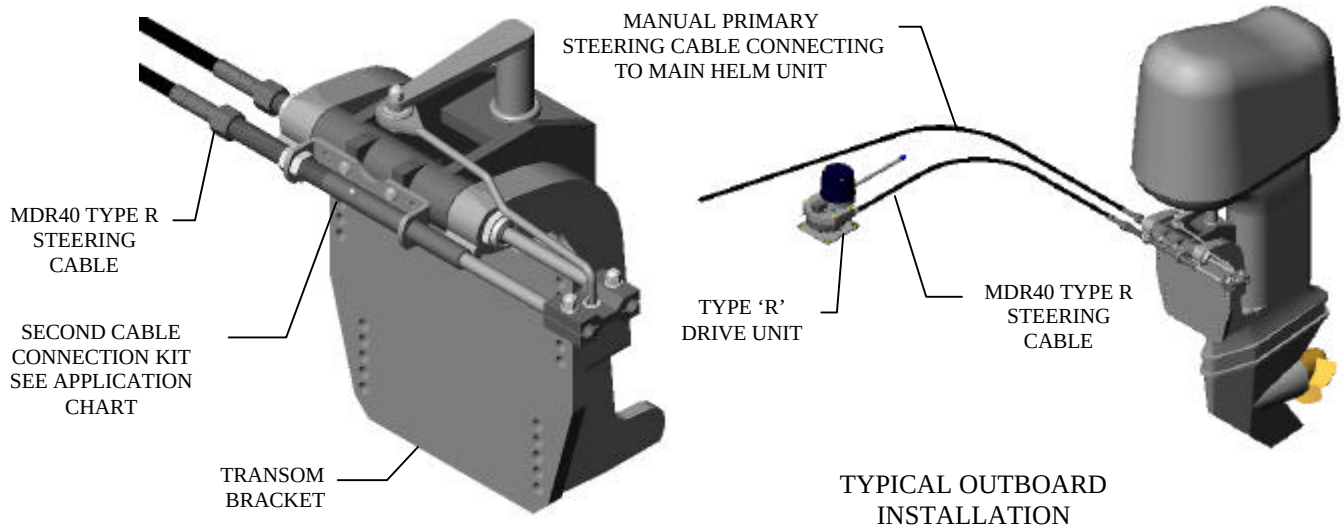


TYPICAL HORIZONTAL MOUNT

C1 STEP 2 – Determine Type of Cable Connection Kit

C1a OUTBOARDS

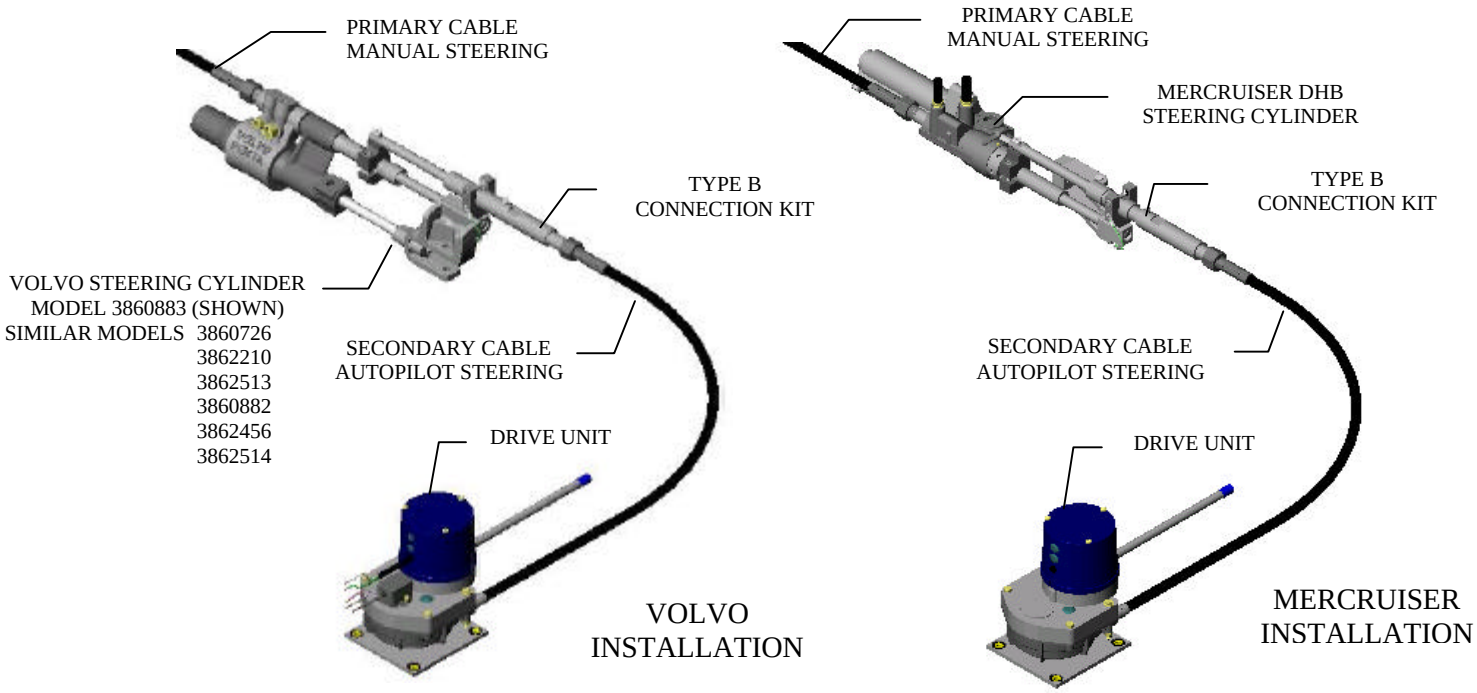
1. Starting at approximately 70 HP, most outboard engines can facilitate the addition of a second cable connection kit. The connection kit attaches to a bolt pattern on the front face of the tilting member of the transom bracket. A typical arrangement is shown in graphic below. See application chart on page 32 for further details.



TYPICAL OUTBOARD INSTALLATION

C1b STERNDRIVES

1. Sterndrives usually have engine driven power assisted hydraulic steering, which is CONTROLLED by a manual helm and push pull steering cable. Using a second cable connection kit, the MDR40 type R drive unit can be attached to most of the popular sterndrive steering cylinders. Typical arrangements are shown in the graphic below. See application chart on page 32 for further details.



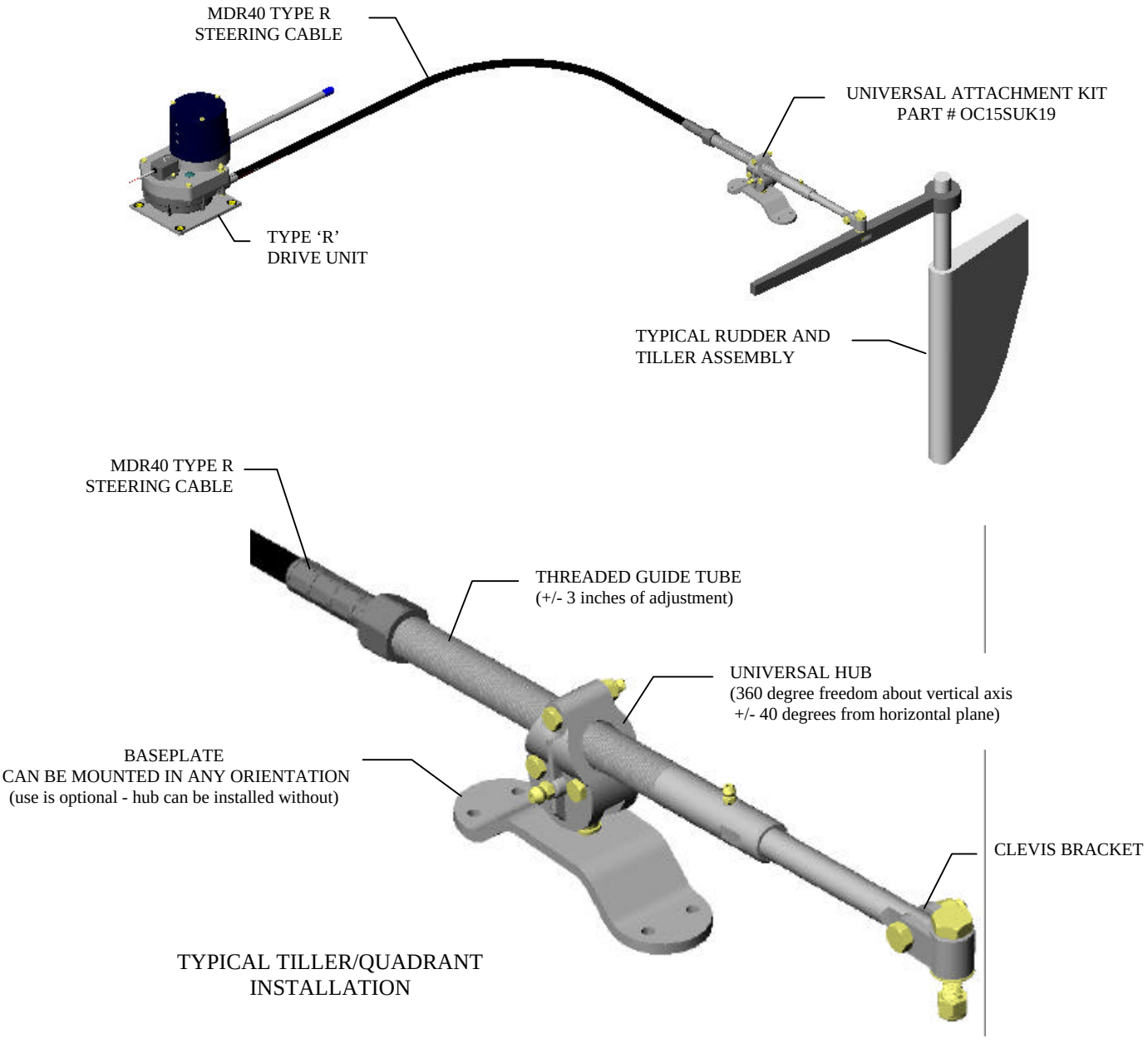
VOLVO INSTALLATION

MERCRUISER INSTALLATION

C1 STEP 2 – Determine Type of Cable Connection Kit (Continued)

C1c INBOARDS & SAILBOATS

1. The MDR40 Type R drive can control mechanically steered smaller inboards or sailboats with access to a quadrant or tiller. In all cases the existing primary steering system MUST be capable of being BACK DRIVEN. Using a universal second cable connection kit, the type R drive can be attached in a variety of ways. Note that custom brackets may be required. A typical arrangement is shown in graphic below.



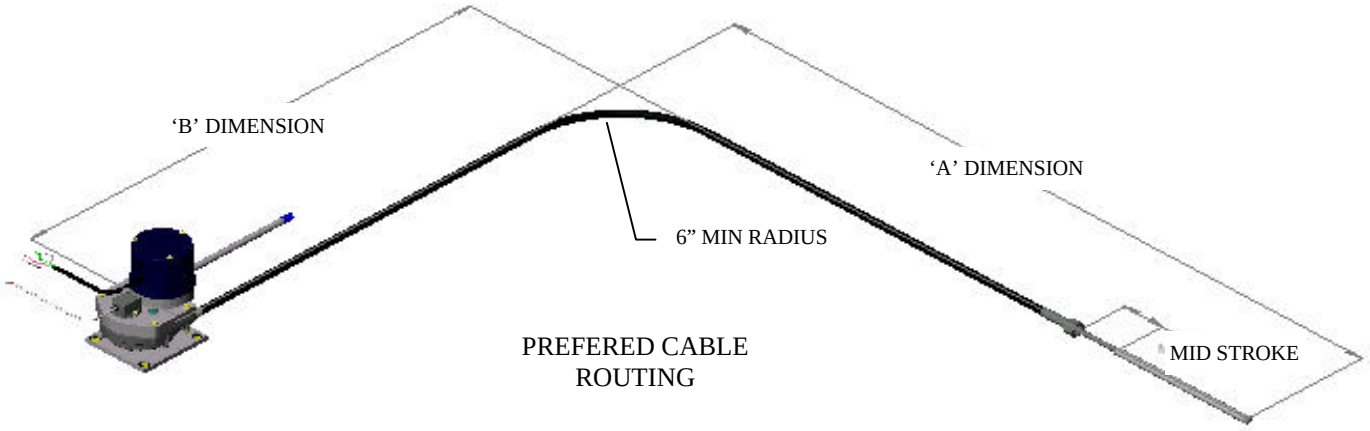
TYPICAL TILLER/QUADRANT
INSTALLATION

D1 STEP 3 – Determine Routing and Length of Steering Cable

D1a Cable Routing

1. After selection of the Cable Connection Kit and the physical location of the type 'R' drive unit, the routing of the mdr40 type R Steering Cable must be determined.

2. The cable routing should take into consideration the extreme movements of the steering mechanism during HO to HO steering and also tilt movements on the outboards. Care should be taken to maximize the bend radius and to minimize the total number of bends. It is recommended that bends are no smaller than the minimum bend radius (6") and that the total angle of all bends combined be minimized and no larger than 270 degrees. See detailed graphic showing preferred routing and bend definition.

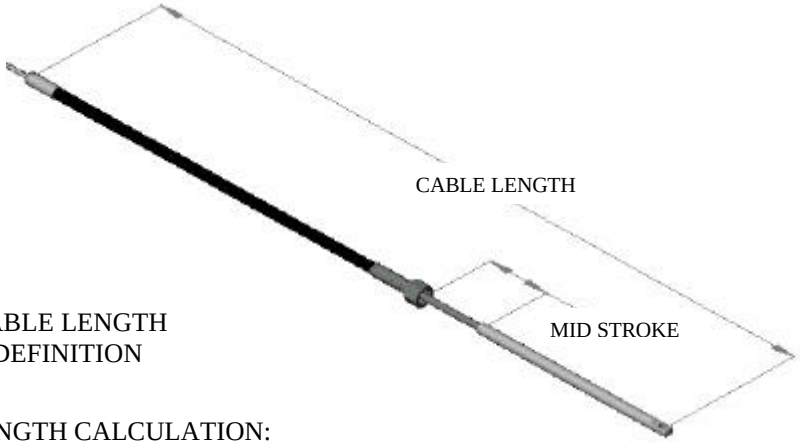


PREFERED CABLE ROUTING

D1b. Cable Length Calculation

1. When the Steering Cable Routing has been determined, the required cable length can be measured.

2. Use a length of rope or electrical cable to simulate the routing, then measure the total length required. See graphic of cable length definition.



CABLE LENGTH DEFINITION

EXAMPLE OF STEERING CABLE LENGTH CALCULATION:

Add 'A' + 'B' dimensions and subtract 4" for a 90 degree bend. Round UP result to nearest full foot size.

For steering cable x length in feet order OC15109-XX

E1 STEP 4 – Accessory Selection Review

There are 2 types of accessory to be considered.

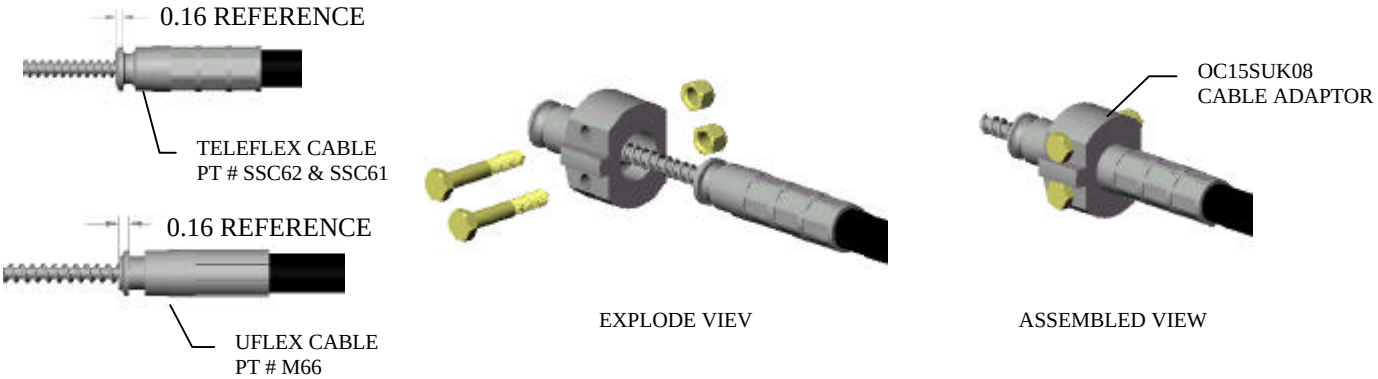
E1a RUDDER FEED BACK MECHANISM: All autopilot installations require a rudder angle feed back device. The Octopus mechanism is based upon a rotary potentiometer, attaches directly to the drive unit with 2 screws and the calibration procedure is simple. Alternate devices attach directly to the tiller arm using a linkage mechanism; they require hard wiring and adequate protection from the elements and in many cases from accidental damage due to poor stowage of equipment or simply being stepped on. See graphic E3 on page 30 for further details.

E1b STEERING CABLE ADAPTERS: Used when adapting steering cables designed to mate with different helms. The most popular types of rotary steering cable can be adapted to mate with the MDR40 type R drive unit. See graphics E2 below.

E2 Accessories - Steering Cable Adapters - Graphics

a. For Morse Cable Pt # 304415 or Teleflex Cable Pt # SSC72 or Uflex Cable Pt # M47 - Order OC15SUK07

b. For Teleflex Cable Part # SSC62 & SSC61 or Uflex Cable Part # M66. - Order 15SUK08



E3 Accessories – Rudder Feed Back Module - Graphics

REQUIRED PARTS:

a. Octopus Part Number OC15SUK06A THRU H
(for specific autopilot model & manufacturer)
b. Octopus Part Number OC15SUK06
(universal – for all major Autopilot Models)

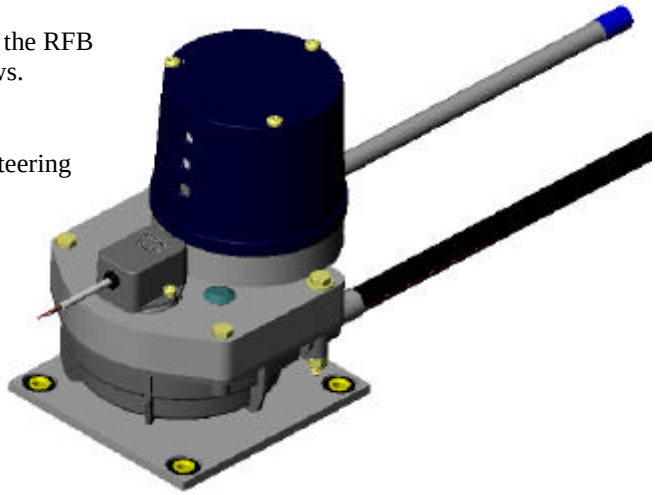
MECHANICAL CALIBRATION PROCEDURE

1. Before installing the drive unit into the vessel, disassemble the RFB module from the drive housing, by removing 2 attach screws.

2. Install the drive unit into the vessel and install the remote steering cable following the drive installation guide.

3. Complete the electrical hook up of the drive following the drive-autopilot installation guide.

4. Complete the electrical hook up of the RFB module following the drive-autopilot installation guide.



COMPLETE INSTALLATION

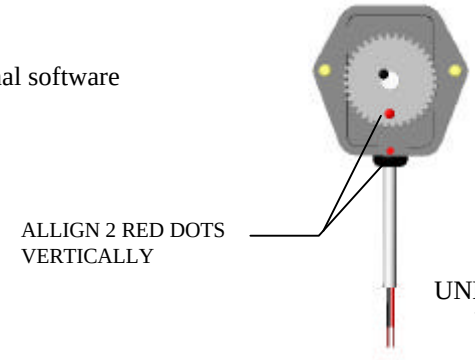
5. Center the gear on the RFB module by aligning the red paint mark on the gear with the red paint mark on the housing as shown in underside view graphic below.

6. By turning the steering wheel of the helm unit, centre the rudder. Note that on power assisted steering systems, you may need to run the engine to achieve this.

RFB MODULE

7. Reassemble the RFB module to the drive housing and install and tighten the 2 attach screws. Ensure that the mesh between the RFB module and the drive gear is not excessive.

8. See autopilot installation guide for instructions on additional software controlled RFB fine calibration and HO limitation.



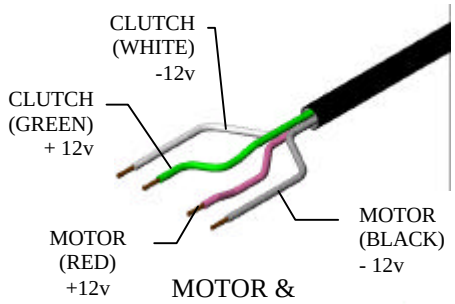
UNDERSIDE
VIEW

F1 Electrical Hook Up

F1a Motor and Clutch Power Supply Cable

i. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 4 x 10 AWG wires (supplied in jacketed cable from drive) with Auto Pilot junction box.

ii. Following Auto Pilot manufacturers installation guide, perform electrical tests.

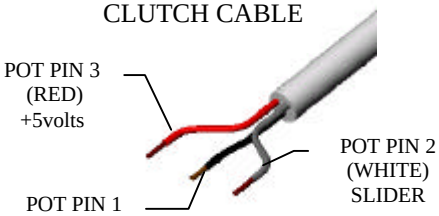


MOTOR & CLUTCH CABLE

F1b Rudder Feed Back Signal Cable

i. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 3 x 24 AWG wires + shield core (supplied in jacketed cable) from RFB module with Auto Pilot junction box.

ii. Following Auto Pilot manufacturers installation guide, perform electrical tests.



RFB CABLE

G1 System & Accessory Checklist

CHECKLIST 1					
MDR REMOTE MOUNT A/P DRIVE SYSTEM					
DESCRIPTION				**PART NUMBER**	**ORDER**
MANDATORY SELECT 1 DRIVE UNIT + 1 ENGINE CONNECTION KIT + 1 STEERING CABLE x LENGTH	**BASIC SYSTEM**	drive unit		AFMDRERW (with RFB - supply a/p make & model)	
				AFMDREW (without RFB)	
		engine connection kit	outboard	engine specific see application chart 8	
			sterndrive	drive specific see application chart 9	
			inboard	OC15SUK19	
		steering cable		OC15109-XX (length calculated from routing path)	
OPTIONAL ACCESSORY SELECTIONS	**RUDDER FEED BACK**	RFB potentiometer module (supply autopilot model & manufacturer)		OC15SUK06 A thru F	
	STEERING CABLE OPTIONS	adaptor for TFX SSC61		OC15SUK08	
		adaptor for TFX SSC62		OC15SUK08	
		adaptor for TFX SSC72		OC15SUK07	
		adaptor for MORSE 304415		OC15SUK07	
		adaptor for UFLEX M47		OC15SUK07	

H1 Outboard Engine Connection Kit Application Chart

APPLICATION CHART 8				
OUTBOARD ENGINE SECOND CABLE CONNECTION KIT				
DESCRIPTION			**CONNECTION KIT PART #**	**ORDER**
ENGINE MAKE	**ENGINE TYPE**	**COMMENTS**		
YAMAHA	70 hp upwards	1. Yamaha engines have metric threads	OC15SUK15A	
SUZUKI	DT75 - DT225 DF60 - DF140	1. All engines	OC15SUK15B	
HONDA	BF75 upwards	1. All engines	OC15SUK15B	
MERCURY MARINER	70 hp upwards	1. From 1985 & newer	OC15SUK15B	
FORCE	90 hp & 120 hp	1. From 1996 & newer	OC15SUK15B	
JOHNSON EVINRUDE	70 hp upwards	1. 2 stroke only . 3 cyl-V6, 1989 & newer exept 88 hp & 112 hp.	OC15SUK15B	
JOHNSON	70 hp upwards	1. 4 Stroke only. (same application as Suzuki)	OC15SUK15B	
Note :	1. To accommodate a second cable bracket, there must be a 4 hole bolt pattern on the front of the tilting bracket (usually on a raised surface), just above the tilt tube. 2. Hydraulic steering is more common on engines starting at 110 hp upwards.			

H2 Sterndrive Connection Kit Application Chart

APPLICATION CHART 9				
STERNDRIVE SECOND CABLE CONNECTION KIT				
DESCRIPTION			**CONNECTION KIT PART #**	**ORDER**
STERNDRIVE MAKE	**ENGINE/DRIVE TYPE**	**COMMENTS**		
VOLVO	Gasoline & Diesel powered SX & DP-S drives from1997	1. Gasoline power more common in N. American market 2. Diesel engines AD31 & KAD32 offered with SX & DP-S drives	OC15SUK12B	
MERCRUISER	Alpha 1 gen II & Bravo drives from 1994	1. DHB power steering system fitted to all drives both gasoline and diesel powered since 1994	OC15SUK12B	
VOLVO	Diesel powered DP-E/G drives	1. Diesel engines more common outside North America	OC15SUK12C	
MERCRUISER	Alpha 1 gen II & Bravo drives 1983 thru 1993	1. Saginaw power steering system fitted to all drives both gasoline and diesel powered since 1983	OC15SUK12C	

SECTION B

DETAILED INSTALLATION PROCEDURES

I. TYPE R – REMOTE MOUNTING DRIVE UNIT (page 35 –38)

II. TYPE B – MULTI I/O CONNECTION KIT (page 39-46)
For: Mercruiser DHB (from 1994)
Volvo Models 3860882 & 3860883
Gasoline Powered SX & DP-S Drives
Diesel Powered SX Drives (from 1997)

III. TYPE C – MULTI I/O CONNECTION KIT (page 47-53)
For: Mercruiser Saginaw (up to 1993)
Volvo Model 872215 (European Diesel)
Diesel Powered DP Drives (from 1994)

IV. UNIVERSAL O/B CONNECTION KIT (page 55-58)

DETAILED INSTALLATION PROCEDURE
TYPE R - REMOTE MOUNTING DRIVE UNIT

A. SYSTEM OVERVIEW:

1. The Octopus remote rotary mechanical autopilot drive (model MDR-40) makes it easy and economical to install a Jog control (Octopus Intellisteer) or an automatic pilot on smaller powerboats steered with mechanical push pull cable steering systems including Outboards, Inboard/Outboards also small sailboats with access to the quadrant or tiller.

2. The remote drive unit can be installed in any convenient location. It requires the addition of a second steering cable and cable connection kit. The location of the drive unit relative to the second cable connection kit will determine the required length of the second steering cable. As a guide, a 72 inch (6 foot – 2 metre) cable is required to connect a drive located in the port side of the engine compartment to a connection kit mounted on a single engined I/O vessel.

Note: See Octopus Selection & Installation Guide for Remote – Rotary Mechanical Drive for additional information on the different types of second steering cable connection kits that are available. See also Octopus Selection & Installation Guide for Behind the Dashboard – Rotary Mechanical Drive for additional information on a drive unit that replaces the manual helm and uses the existing steering cable.

B. REQUIRED PARTS:

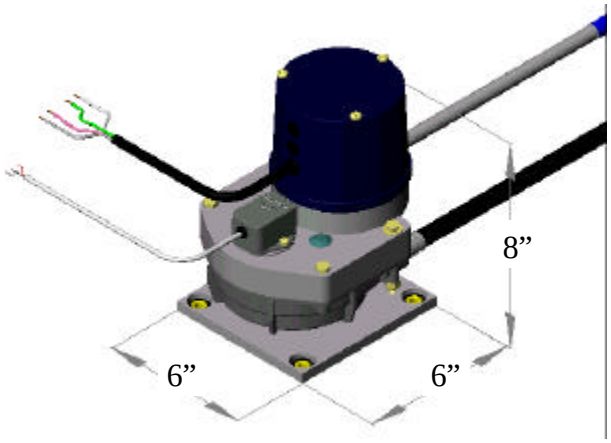
1. Part # AFMDRERW — Remote Rotary Mechanical Drive Unit
2. Part # OC15109-6 — 6 foot long Steering Cable (other lengths available)
3. Part # OC15SUK-12 or -15 or -19 — Cable Connection Kit
4. Part # OC15SUK06A thru –E — Rudder Feed Back Module
5. General Shop Tools

C. PREPARATION:

Before performing an installation, you must establish the following:

1. The installation site (for the drive) will provide adequate space to accommodate the drive envelope including the entry and exit points for the steering cable. The drive can be mounted at any angle and the steering cable entry/exit points can be reversed if required. See detailed graphics of drive envelope and mounting samples below. Note that no access for maintenance purposes is required.

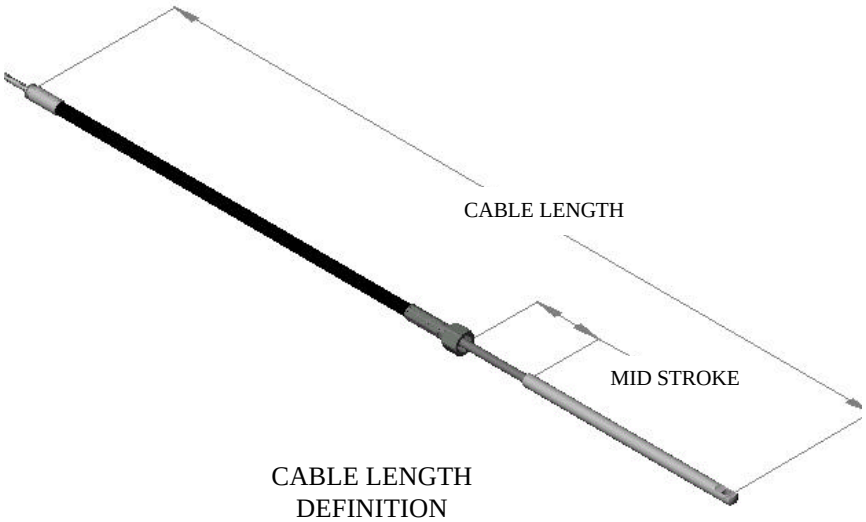
2. That the selected second steering cable connection kit is correct for the steering system on the vessel.



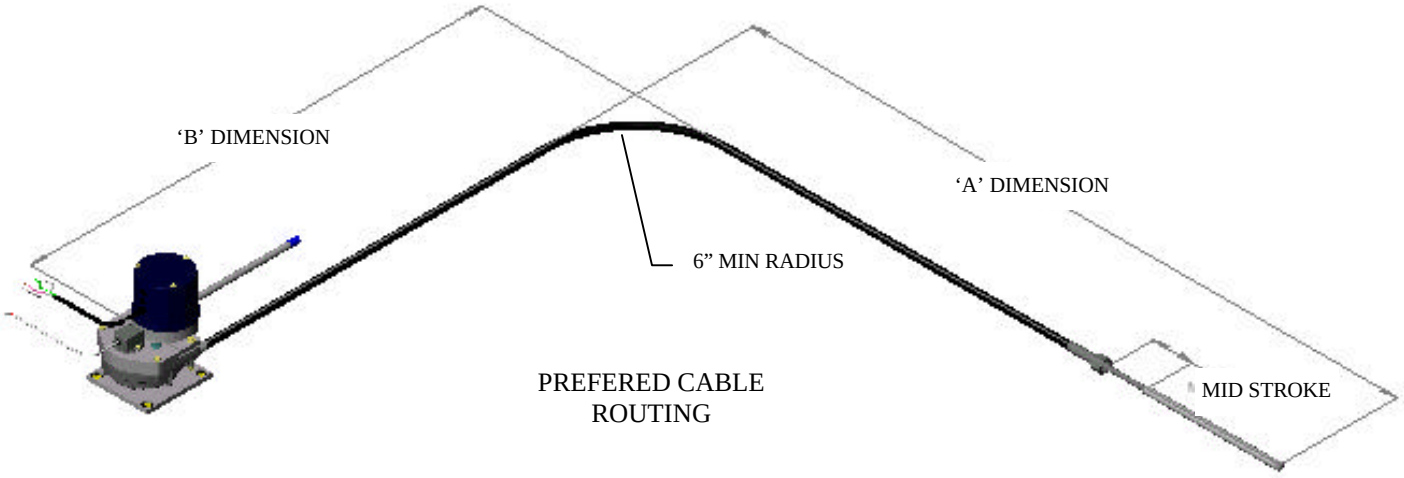
DRIVE ENVELOPE

C. PREPARATION (Continued)

3. That the selected steering cable length (6 foot standard) and its routing from the connection kit to the drive unit is within acceptable limits. See the detailed graphics showing cable length definition, preferred routing and example of length calculation for different cable connection kits. It is recommended that bends are no smaller than the minimum bend radius (6") and that the total angle of all bends combined be minimized and no larger than 270 degrees.



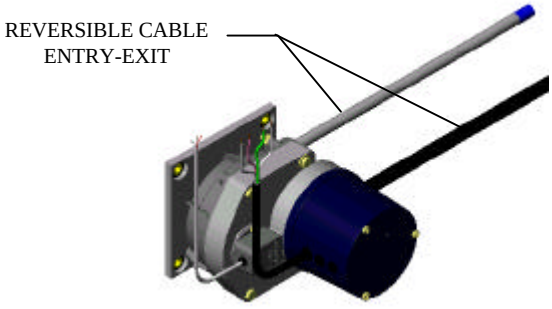
CABLE LENGTH DEFINITION



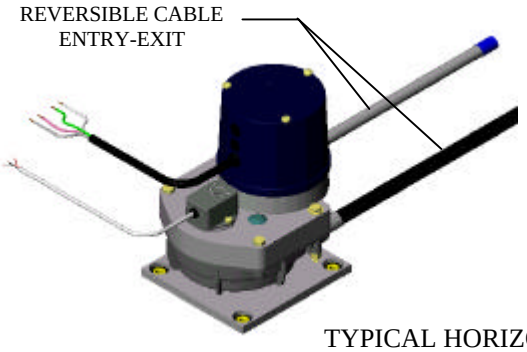
PREFERED CABLE ROUTING

EXAMPLE OF STEERING CABLE LENGTH CALCULATION:

Add 'A' + 'B' dimensions and subtract 4" for a 90 degree bend. Round UP result to nearest full foot size.



TYPICAL VERTICAL MOUNT

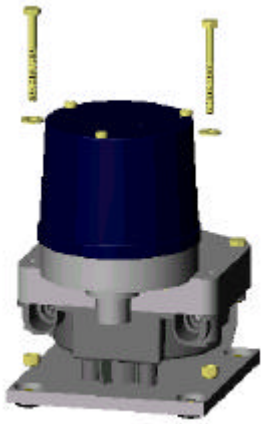


TYPICAL HORIZONTAL MOUNT

D. RECOMMENDED INSTALLATION PROCEDURE

D1. Install the Second Steering Cable Connection Kit and Steering Cable following the detailed installation procedure that is supplied with the kit. Ensure that the Cable routing follows the planned path.

D2. Physically Install Drive Unit & Steering Cable

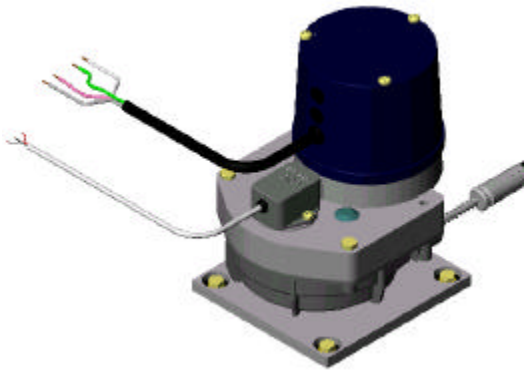


i. Remove 2 steering cable entry – exit lock bolts, nuts and washers.

ii. Position drive unit in final location. Verify position by simulating the steering cable connection whilst steering cable is NOT connected.

iii. Transfer bolt pattern from the drive base plate (4 x ¼" diameter holes), into mounting structure.

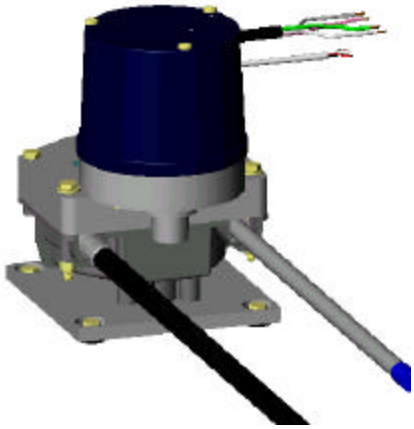
iv. Remove drive unit and prepare holes in mounting structure to receive mounting fasteners. Note that this connection does NOT transmit any steering loads.



v. Re-position drive unit and install fasteners, tighten and torque.

vi. Install steering cable in planned drive port. Guide inner cable into port and exert moderate force using 2 hands to drive cable around the driving hub. This action will back drive the unit and the inner cable will appear out of the opposite port. To complete the cable installation, the cable outer jacket will enter the port and butt against the drive housing. This will enable the insertion of the lock bolt.

vii. Note that undue force required to drive the inner cable around the driving hub may be caused by the leading edge of the inner cable gouging into outer face of the nylon guide. Remove the cable and inspect the leading edge for sharp edges, if possible, twist the cable and re insert with sharp edge towards inside of radius or using a burr type tool remove the sharp edges.



viii. Install spent cable tube in exit port.

ix. Replace 2 x lock bolt, nut and washer. Tighten and torque 40-45 in-lbs (4Nm).

D3. Physically Calibrate Rudder Feed Back Mechanism

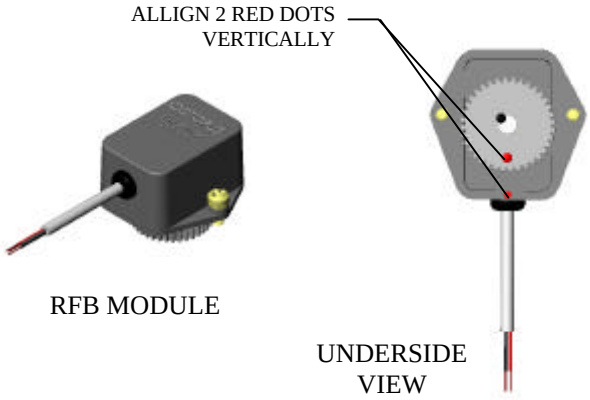
i. Disassemble the RFB module from the drive housing, by removing 2 attach screws.

ii. Center the gear on the RFB module by aligning the red paint mark on the gear with the red paint mark on the housing as shown in underside view graphic below.

iii. By turning the steering wheel of the helm unit, centre the rudder. Note that on power assisted steering systems, you may need to run the engine to achieve this.

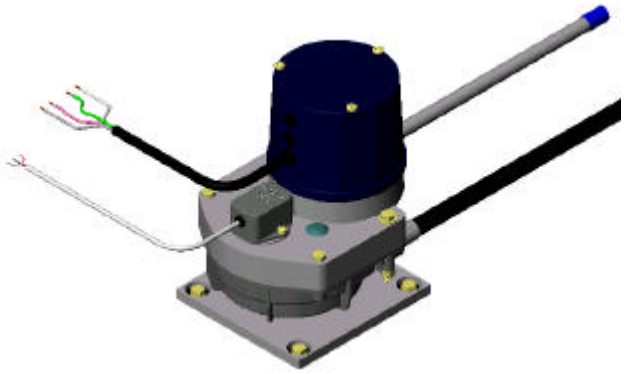
iv. Reassemble the RFB module to the drive housing and install and tighten the 2 attach screws. Ensure that the mesh between the RFB module and the drive gear is not excessive.

v. See Auto Pilot installation guide for instructions on additional software controlled RFB fine calibration and HO limitation.



RFB MODULE

UNDERSIDE
VIEW



COMPLETE INSTALLATION

D4 Electrical Hook Up

D3a. Connect Motor and Clutch Power Supply Cable

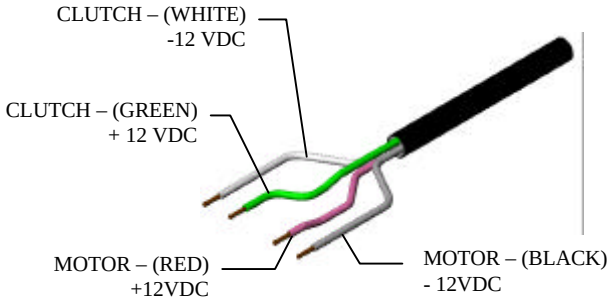
v. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 4 x 10 AWG wires (supplied in jacketed cable from drive) with Auto Pilot junction box.

vi. Following Auto Pilot manufacturers installation guide, perform electrical tests.

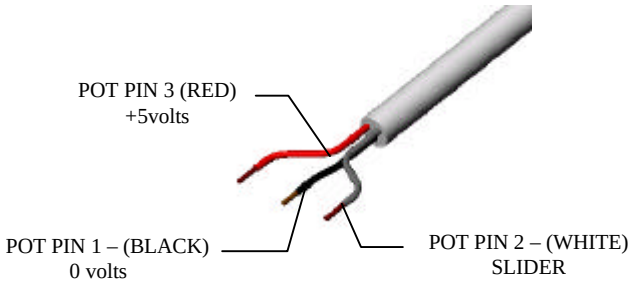
D3b. Connect Rudder Feed Back Signal Cable

v. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 3 x 24 AWG wires + shield core (supplied in jacketed cable) from RFB module with Auto Pilot junction box.

vi. Following Auto Pilot manufacturers installation guide, perform electrical tests.



MOTOR &
CLUTCH CABLE



RFB CABLE

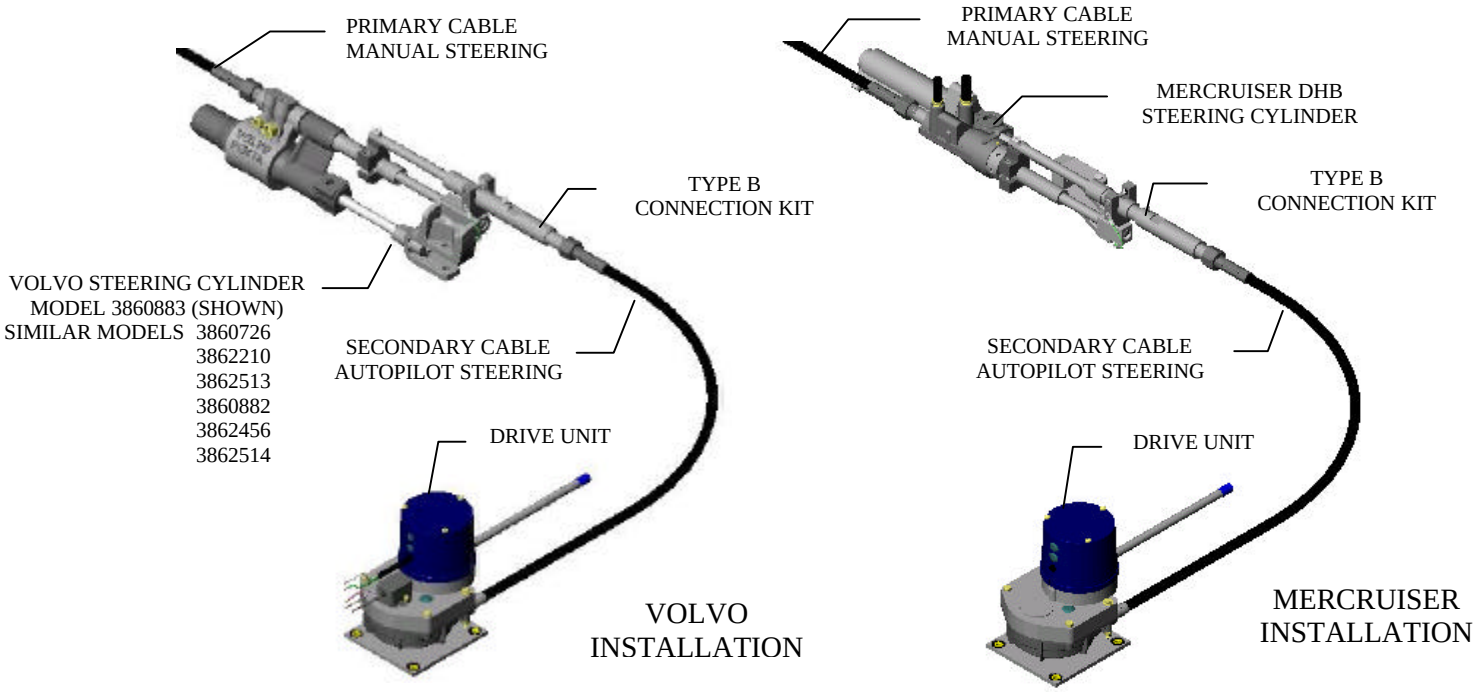
DETAILED INSTALLATION PROCEDURE
TYPE B – MULTI I/O CONNECTION KIT

A. SYSTEM OVERVIEW:

1. The Octopus Type B – Multi I/O connection kit can be fitted to mechanical push-pull cable controlled sterndrive power assisted steering cylinders made by Volvo (models noted below) and Mercruiser (DHB). Installation of the kit allows the addition of a second steering cable which can be used for autopilot control when connected to the Octopus Remote Mechanical Drive or Jog control when connected to the Octopus Intellisteer remote Mechanical Drive.

2. Volvo steering cylinder models 3860882 – 3862456 – 3862514 are fitted to Diesel Powered SX drives from 1997. Volvo steering cylinder models 3860726 – 3860883 – 3862210 – 3862513 are fitted to Gasoline Powered SX & DP-S drives from 1997 and newer. Mercruiser DHB steering cylinders are fitted to Alpha One Generation II and Bravo Sterndrives from 1994 and newer.

Note: See separate guide OC15SUK12C – Type C – Multi I/O Connection Kit for – Mercruiser Saginaw Steering Cylinder fitted to Alpha One Generation II and Bravo Sterndrives from 1983 to 1993 and Volvo model 872215 fitted to Diesel powered DP drives from 1994. Steering Cylinders from other Manufactures are not compatible with this system at this time. Consult the factory for additional information.



B. REQUIRED PARTS:

1. Part # OC15SUK12B - Type B – Multi I/O Connection Kit
2. Part # OC15109-6 secondary steering cable (6 foot standard) – other lengths available
   (Equivalent Steering Cables manufactured by Morse, Uflex or Teleflex may be used with the addition of cable end adapters. OC15SUK08 for the Uflex M66 or Teleflex SSC62 - OC15SUK07 for the Uflex M47, Teleflex SSC72 or Morse 304415)
3. OCAFMDRERW drive unit (see separate detail installation guide)
4. General Shop Tools

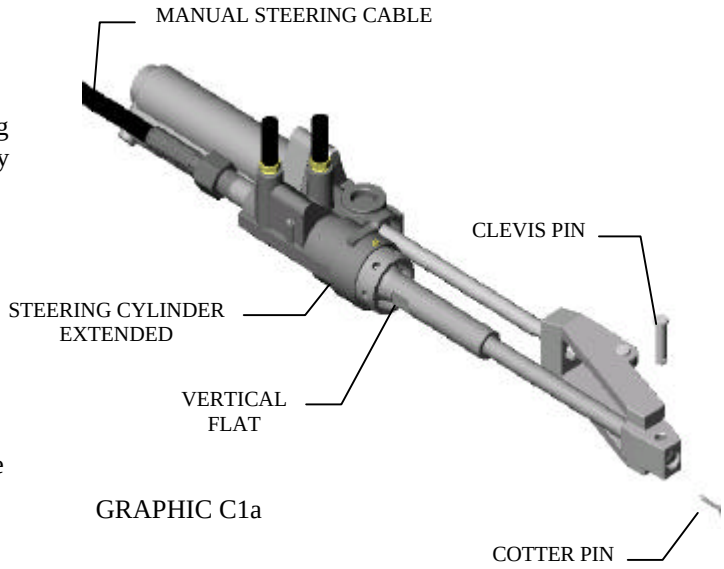
C1. Recommended Installation Procedure For Mercruiser DHB steering Cylinder

C1a. Prepare Steering Cylinder

i. Using the manual steering helm, extend the steering cylinder to full HO as shown. Note that it may be necessary to run the engine to achieve this.

ii. Using shop tools, remove the cotter pin and clevis pin connecting the manual steering cable rod end to the steering cylinder clevis bracket.

iii. Ensure that the position of the flats on the steering cylinder sleeve is vertical. Note that it may be necessary to crack the nut on the manual steering cable to achieve this. If so re-torque the nut to 175 in-lbs (20Nm).



GRAPHIC C1a

C1b. Install Drive Collar & Spacer Bush

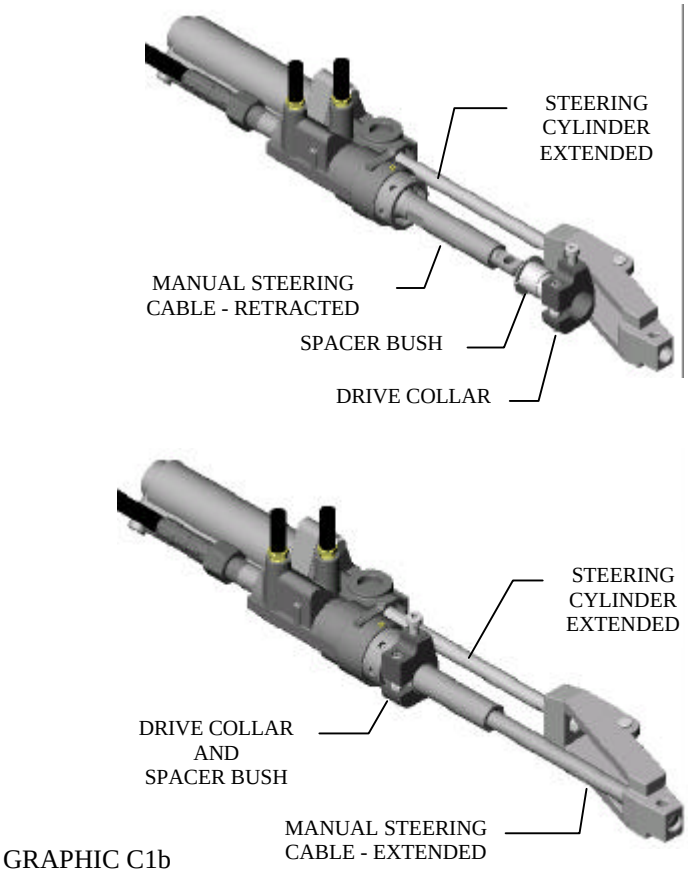
i. Using the manual steering helm, retract the manual steering cable to full HO as shown.

ii. Loosen the clamp screw and lock nut on the Drive Collar.

iii. Assemble Spacer Bush onto sleeve of steering cylinder. See graphic for orientation.

iv. Assemble Drive Collar onto sleeve of steering cylinder and over Spacer Bushing. See graphic for orientation. DO NOT tighten clamp screw at this time.

v. Using the manual steering helm, extend the manual steering cable back to full HO as shown.



GRAPHIC C1b

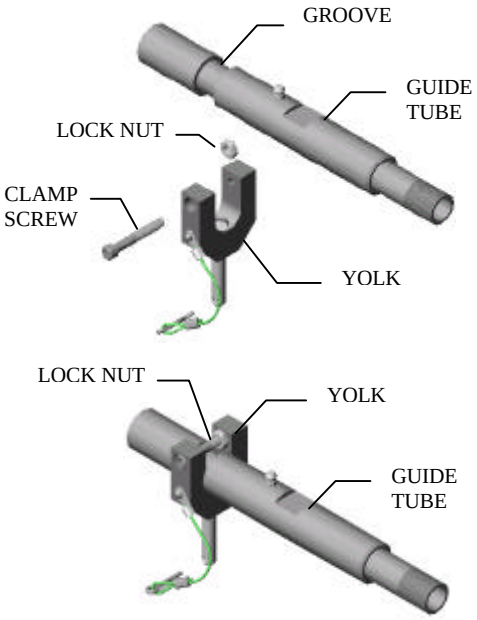
C1c. Pre-Assemble Guide Tube to Yolk - (only if required, this step is factory assembled before shipping)

i. Crack lock nut and remove both clamp screw and lock nut from Yolk.

ii. Lower Guide Tube into Yolk – engaging Yolk slot onto groove of Guide Tube.

iii. Insert Clamp Screw into front leg of Yolk and engage Lock Nut – screw into both Lock Nut and rear leg of Yolk.

iv. Torque Clamp Screw to Yolk to 27 in-lbs (3Nm). Torque Lock Nut to Yolk to 45 in-lbs (5Nm).



GRAPHIC C1c

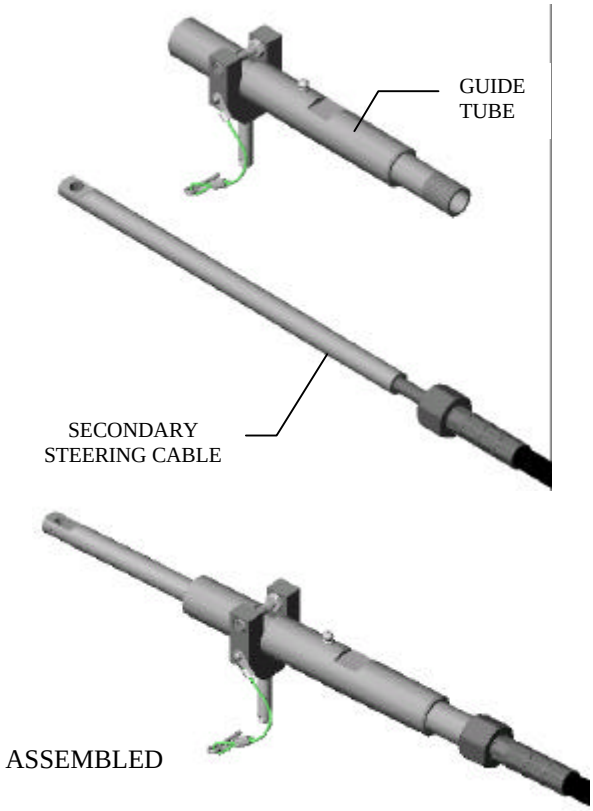
C1d. Pre-assemble Secondary Steering Cable to Guide Tube/Yolk

i. Ensure that both the nut and the male thread are lubricated with marine quality grease before assembly.

ii. Ensure that the static portion of the rod end and the inside of the guide tube are liberally coated with marine quality grease.

iii. Insert the rod end portion of the secondary steering cable into the threaded side of the guide tube assembly.

iv. Engage 7/8-14 UNF nut on male thread, hand tighten and torque to 175 in-lbs (20Nm). Note that the nut has an internal thread locking feature that can increase the effort required to initial hand tighten.



GRAPHIC C1d

C1e. Assemble Connection Kit & Second Steering Cable to Steering Cylinder

i. Remove Shoulder Screw from Drive Collar.

ii. Position Connection Kit & Second Steering Cable above the Steering Cylinder as shown in Stage 1 graphic

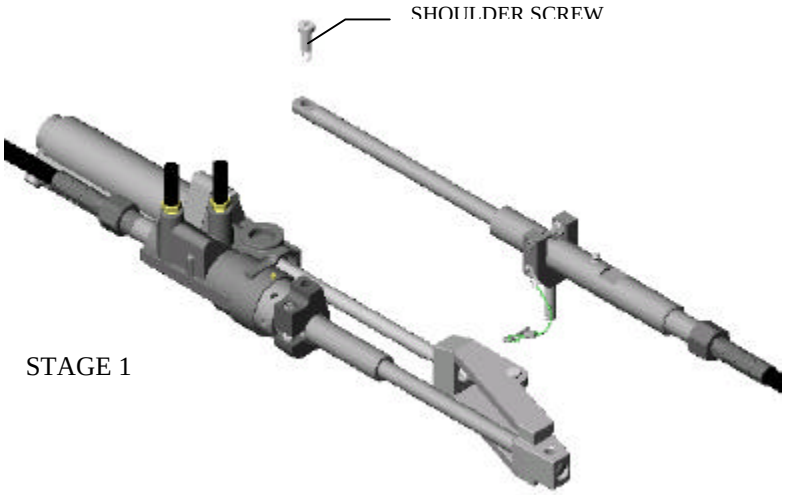
iii. Lower Connection Kit & Second Steering Cable onto Steering Cylinder. Ensure that the clevis pin enters the both the holes in the Steering Cylinder clevis bracket and the manual Steering Cable rod end. Insert Hitch Pin.

iv. Misalignment may prevent engagement of the new Yolk clevis pin. If so, re-align cross hole in manual Steering Cable rod end with hole in Steering Cylinder clevis bracket by adjusting the manual steering helm slightly.

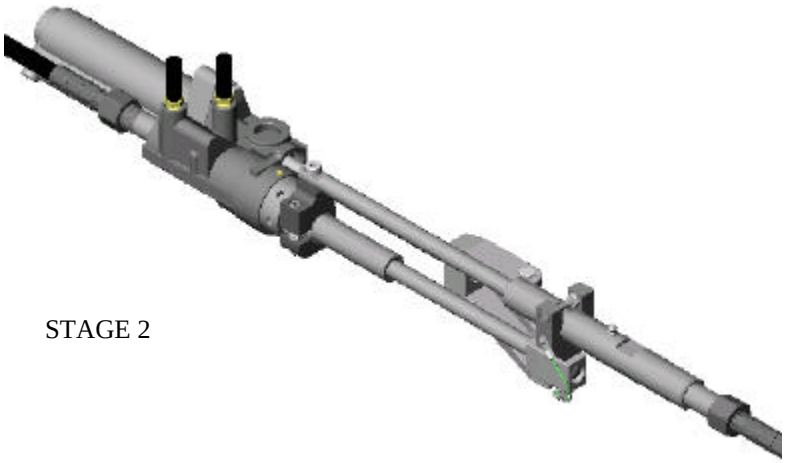
v. Adjust the position of the Second Cable rod end and the Drive Collar to align the Shoulder Screw holes. Insert Shoulder Screw – Torque to 55 inlbs (6Nm). Note that the Shoulder Screw has a thread locking feature which increases the torque required for thread running.

vi. Axially position Drive Collar to set the 0.25 inches gap (see graphic). Torque Clamp Screw to Drive Collar to 45 inlbs (5Nm). Torque Lock Nut to Drive Collar to 45 inlbs (5Nm).

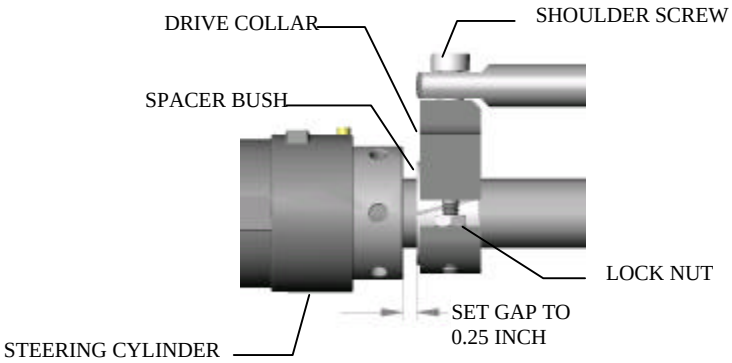
vii. It is recommended that the drive unit is NOT attached to the Second Steering Cable when performing operation v. & vi. above. If the drive unit is already attached, it will be HARDER to fine adjust the position of the cable rod end. Providing 12v dc power to the clutch and motor circuit may be necessary.



STAGE 1



STAGE 2



STAGE 3

GRAPHIC C1e

C1f. Install Drive Unit

i. See separate Detail Installation Guide for Drive Unit.

C1g. Perform Interference Evaluation (2 people required)

i. It is extremely important that a steering system FULL FUNCTION AND OPERATING CLEARANCE CHECK be performed between the new Connection Kit & Second Steering Cable and ALL adjacent hardware including hoses, electrical cables and control cables.

ii. The drive unit MUST be installed with the Second Steering Cable Assembled before performing the Function & Interference Evaluation. Note that the Guide Tube and Steering Cable Outer Jacket (at the Guide Tube end) DO MOVE when the steering system is activated.

iii. With one person operating the manual steering Helm and one person observing the tiller area. Slowly run the tiller to full HO left and then to full HO right while the observer ensures that there are no physical interferences and that the Steering System is functional. Note that it will be necessary to run the engine to perform this operation.

iv. It may be necessary to re-rout hoses, electrical cables or control cables. ALL hardware must be well clear of the new Connection Kit and Second Steering Cable. Note that chaffing can occur if parts are allowed to come into contact.

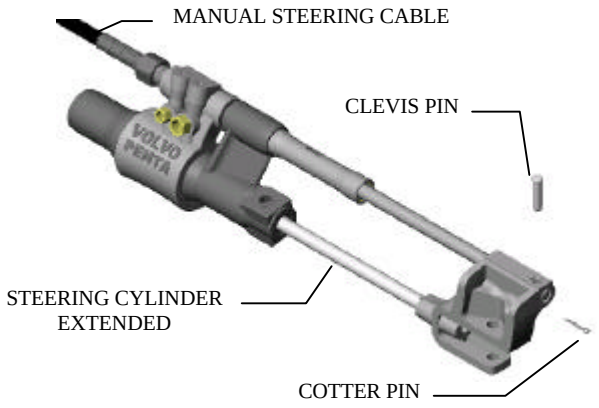
C2. Recommended Installation Procedure For Volvo model 3860883 steering Cylinder (shown)
Similar for models 3860726 – 3862210 – 3862513 – 3860882 – 3862456 - 3862514

C2a. Prepare Steering Cylinder

i. Using the manual steering helm, extend the steering cylinder to full HO as shown. Note that it may be necessary to run the engine to achieve this.

ii. Using shop tools, remove the cotter pin and clevis pin connecting the manual steering cable rod end to the steering cylinder clevis bracket.

iii. Ensure that the position of the flats on the steering cylinder sleeve is vertical. Note that it may be necessary to crack the nut on the manual steering cable to achieve this. If so re-torque the nut to 175 in-lbs (20Nm).



GRAPHIC C2a

C2b. Install Drive Collar & *Spacer Bush

i. Using the manual steering helm, retract the manual steering cable to full HO as shown.

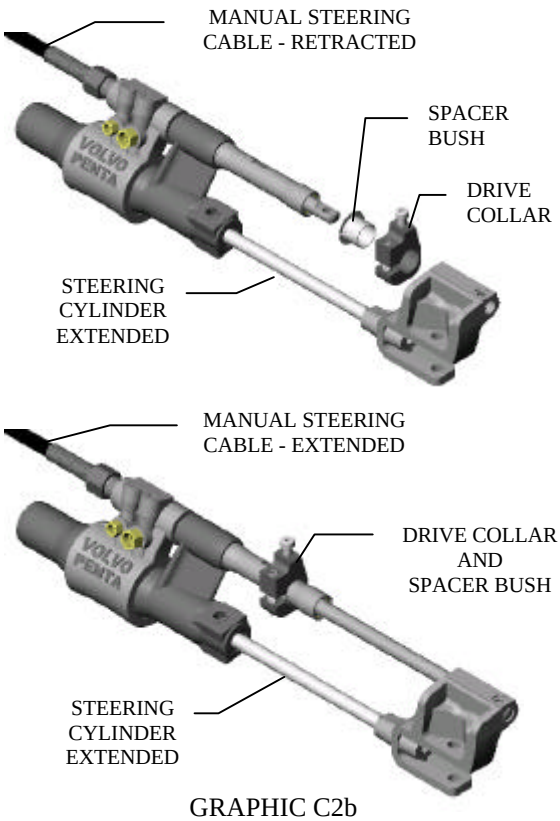
ii. Loosen the clamp screw and lock nut on the Drive Collar.

iii. Assemble Spacer Bush onto sleeve of steering cylinder. See graphic for orientation.

iv. Assemble Drive Collar onto sleeve of steering cylinder and over Spacer Bushing. See graphic for orientation. DO NOT tighten clamp screw at this time.

v. Using the manual steering helm, extend the manual steering cable back to full HO as shown.

* Note that the Spacer Bush is not required on models 3862513 & 3862514 which are fitted to drives from September 2003. On these models, the drive collar will clamp directly onto the manual steering cable guide tube.



GRAPHIC C2b

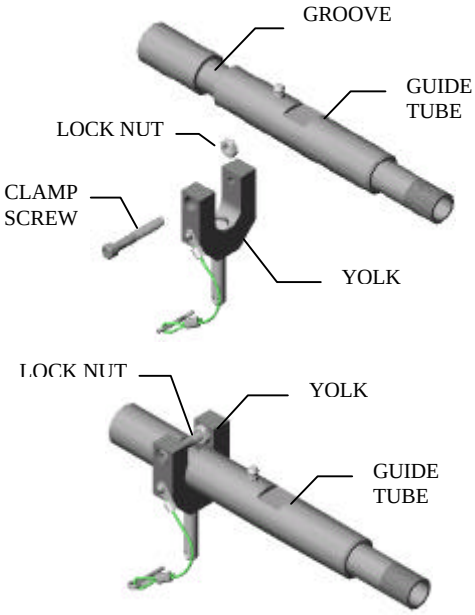
C2c. Pre-Assemble Guide Tube to Yolk - (only if required, this step is factory assembled before shipping)

i. Crack lock nut and remove both clamp screw and lock nut from Yolk.

ii. Lower Guide Tube into Yolk – engaging Yolk slot into groove of Guide Tube.

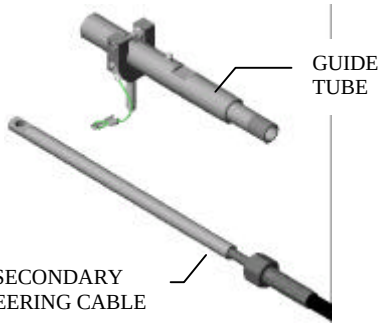
iii. Insert Clamp Screw into front leg of Yolk and engage Lock Nut – screw into both Lock Nut and rear leg of Yolk.

iv. Torque Clamp Screw to Yolk to 27 in-lbs (3Nm). Torque Lock Nut to Yolk to 45 in-lbs (5Nm).



GRAPHIC C2c

C2d. Pre-assemble Secondary Steering Cable to Guide Tube/Yolk

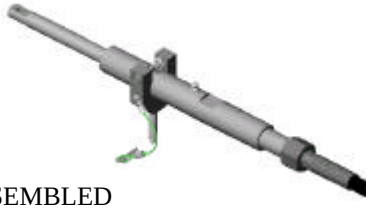


i. Ensure that both the nut and the male thread are lubricated with marine quality grease before assembly.

ii. Ensure that the static portion of the rod end and the inside of the guide tube are liberally coated with marine quality grease.

iii. Insert the rod end portion of the secondary steering cable into the threaded side of the guide tube assembly.

iv. Engage 7/8-14 UNF nut on male thread, hand tighten and torque to 175 in-lbs (20Nm). Note that the nut has an internal thread locking feature that can increase the effort required to initial hand tighten.



ASSEMBLED

GRAPHIC C2d

C2e. Assemble Connection Kit & Second Steering Cable to Steering Cylinder

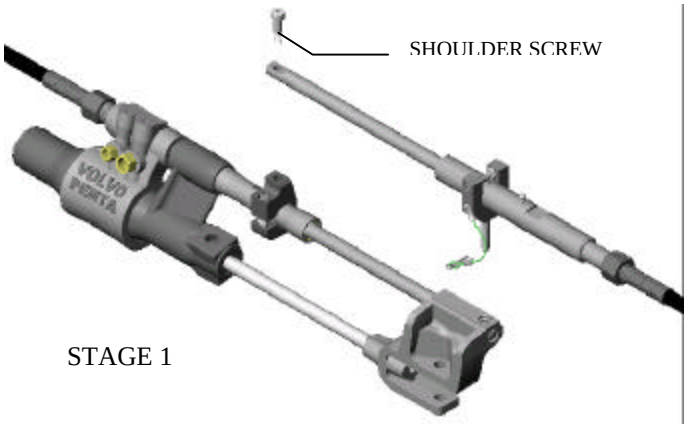
i. Remove Shoulder Screw from Drive Collar.

ii. Position Connection Kit & Second Steering Cable above the Steering Cylinder as shown in Stage 1 graphic

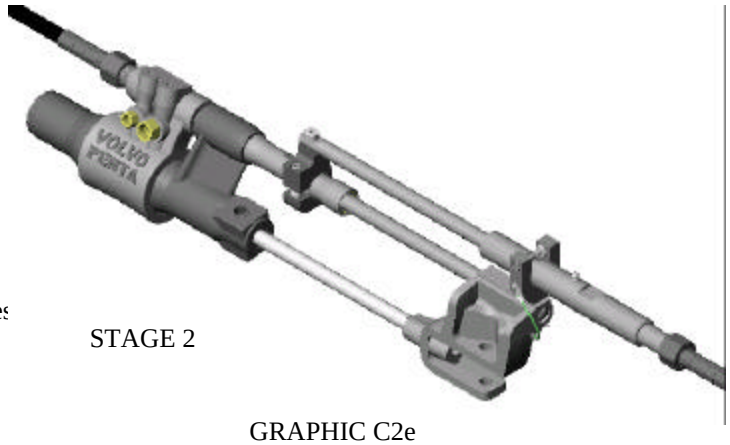
iii. Lower Connection Kit & Second Steering Cable onto Steering Cylinder. Ensure that the clevis pin enters the both the holes in the Steering Cylinder clevis bracket and the manual Steering Cable rod end. Insert Hitch Pin.

iv. Misalignment may prevent engagement of the new Yolk clevis pin. If so, re-align cross hole in manual Steering Cable rod end with hole in Steering Cylinder clevis bracket by adjusting the manual steering helm slightly.

v. Adjust the position of the Second Cable rod end and the Drive Collar to align the Shoulder Screw holes. Insert Shoulder Screw – Torque to 55 inlbs (6Nm). Note that the Shoulder Screw has a thread locking feature which increases the torque required for thread running.



STAGE 1



STAGE 2

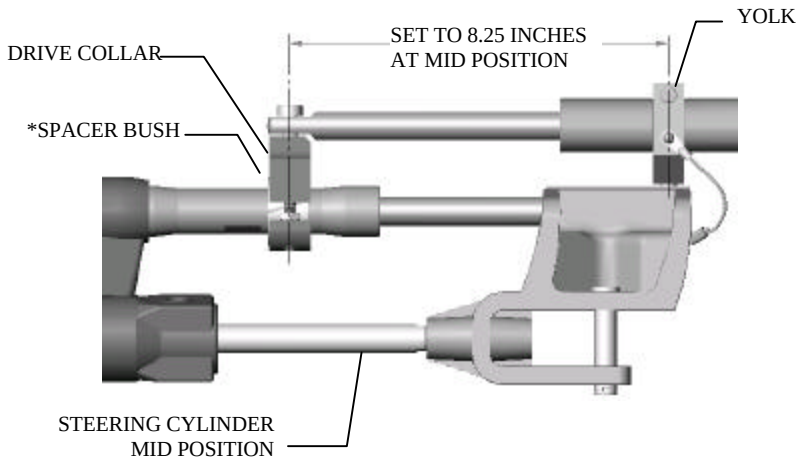
GRAPHIC C2e

C2f. Axially Position Drive Collar and Tighten Clamp Screw

i. Using the manual steering helm, set the steering cylinder to mid position as shown. Note that it may be necessary to run the engine to achieve this.

ii. Axially position Drive Collar to set the 8.25 inches dimension to Yolk (see graphic). Torque Clamp Screw to Drive Collar to 45 inlbs (5Nm). Torque Lock Nut to Drive Collar to 45 inlbs (5Nm).

iii. It is recommended that the drive unit is NOT attached to the Second Steering Cable when performing operation i. & ii. above. If the drive unit is already attached, it will be HARDER to fine adjust the position of the cable rod end. Providing 12v dc power to the clutch and motor circuit may be necessary.



GRAPHIC C2f

* Note that the Spacer Bush is not required on models 3862513 & 3862514 which are fitted to drives from September 2003. On these models, the drive collar will clamp directly onto the manual steering cable guide tube.

C2g. Install Drive Unit

i. See separate Detail Installation Guide for Drive Unit.

C2h. Perform Interference Evaluation (2 people required)

i. It is extremely important that a steering system FULL FUNCTION AND OPERATING CLEARANCE CHECK be performed between the new Connection Kit & Second Steering Cable and ALL adjacent hardware including hoses, electrical cables and control cables.

ii. The drive unit MUST be installed with the Second Steering Cable Assembled before performing the Function & Interference Evaluation. Note that the Guide Tube and Steering Cable Outer Jacket (at the Guide Tube end) DO MOVE when the steering system is activated.

iii. With one person operating the manual steering Helm and one person observing the tiller area. Slowly run the tiller to full HO left and then to full HO right while the observer ensures that there are no physical interferences and that the Steering System is functional. Note that it will be necessary to run the engine to perform this operation.

iv. It may be necessary to re-rout hoses, electrical cables or control cables. ALL hardware must be well clear of the new Connection Kit and Second Steering Cable. Note that chaffing can occur if parts are allowed to come into contact.

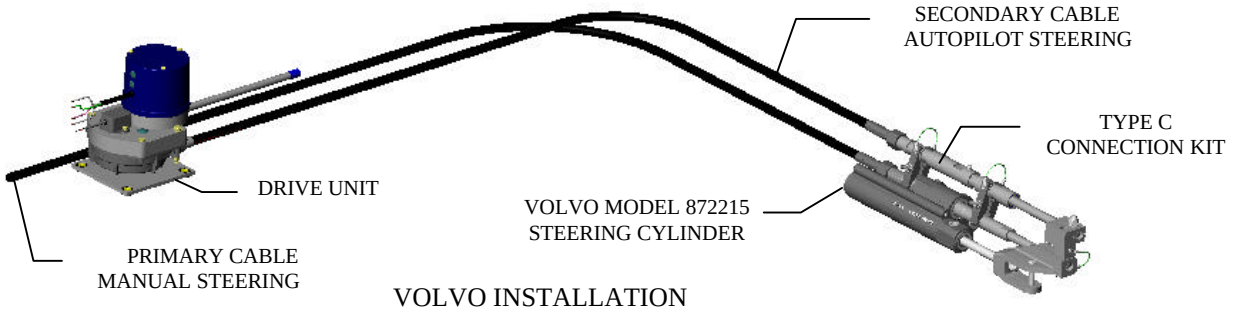
DETAILED INSTALLATION PROCEDURE
TYPE C – MULTI I/O CONNECTION KIT

A. SYSTEM OVERVIEW:

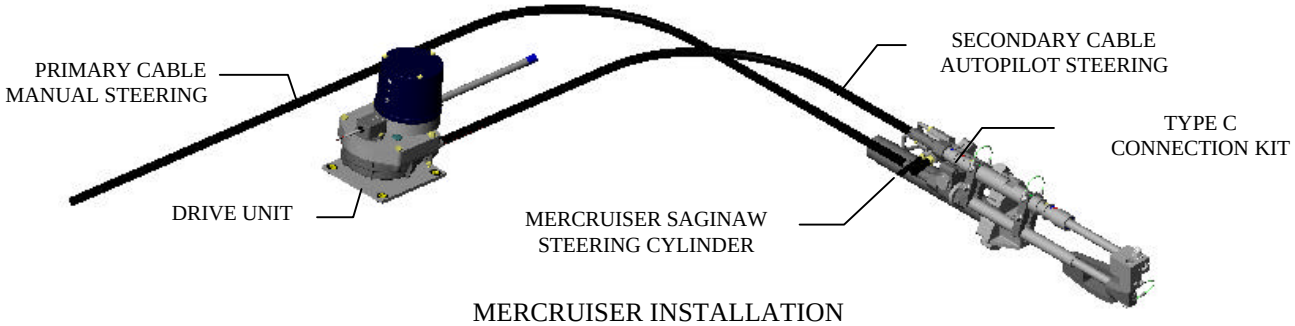
1. The Octopus Type C – Multi I/O connection kit can be fitted to mechanical push-pull cable controlled sterndrive power assisted steering cylinders made by Volvo (model 872215) and Mercruiser (Saginaw). Installation of the kit allows the addition of a second steering cable which can be used for autopilot control when connected to the Octopus Remote Mechanical Drive or Jog control when connected to the Octopus Intellisteer remote Mechanical Drive.

2. The model 872215 steering cylinder is fitted to Diesel Powered DP drives from 1994 onwards. The Saginaw steering cylinder is fitted to Alpha One Generation II and Bravo Sterndrives from 1983 to 1993.

Note: See separate guide OC15SUK12B – Type B – Multi I/O Connection Kit for – Mercruiser DHB Steering Cylinder fitted to all drives from 1994 and newer and Volvo models 3860726 – 3860883 – 3862210 - 3862513 Steering Cylinders fitted to Gasoline Powered SX & DP-S drives from 1997. Steering Cylinders from other Manufactures are not compatible with this system at this time. Consult the factory for additional information.



VOLVO INSTALLATION



MERCRUISER INSTALLATION

B. REQUIRED PARTS:

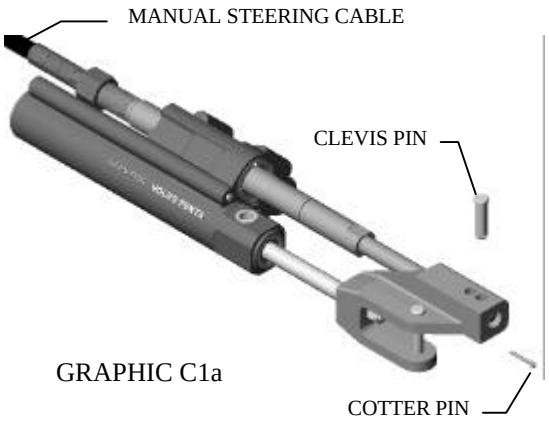
1. Part # OC15SUK12C – Type C – Multi I/O Connection Kit
2. Part # OC15109-6 secondary steering cable (6 foot) – other lengths available
   (Equivalent Steering Cables manufactured by Morse, Uflex or Teleflex may be used with the addition of cable end adapters. OC15SUK08 for the Uflex M66 or Teleflex SSC62 - OC15SUK07 for the Uflex M47, Teleflex SSC72 or Morse 304415)
3. OCAFMDRERW drive unit (see separate detail installation guide)
4. OC15SUK25 – Vent Filter Bracket (for Volvo KAD32 engines only)
5. General Shop Tools

C1. Recommended Installation Procedure For Volvo model 872215 steering cylinder

C1a. Prepare Steering Cylinder

i. Using the manual steering helm, centre the tiller. Note that it may be necessary to run the engine to achieve this.

ii. Using shop tools, remove the cotter pin and clevis pin connecting the manual steering cable rod end to the steering cylinder clevis bracket.



GRAPHIC C1a

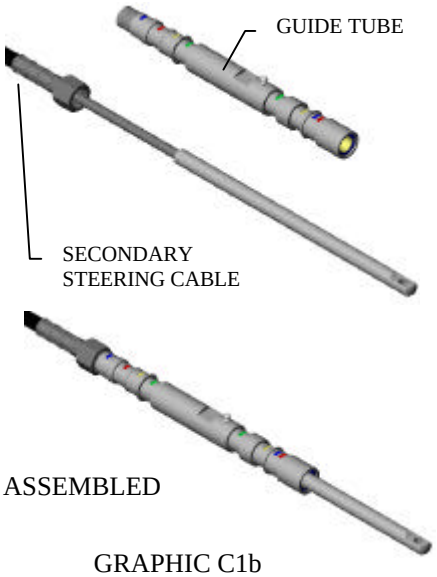
C1b. Pre-assemble Secondary Steering Cable to Guide Tube Assembly

i. Ensure that both the nut and the male thread are lubricated with marine quality grease before assembly.

ii. Ensure that the static portion of the rod end and the inside of the guide tube are liberally coated with marine quality grease.

iii. Insert the rod end portion of the secondary steering cable into the threaded side of the guide tube assembly.

iv. Engage 7/8-14 UNF nut on male thread, hand tighten and torque to 175 in-lbs (20Nm). Note that the nut has an internal thread locking feature that can increase the effort required to initial hand tighten.



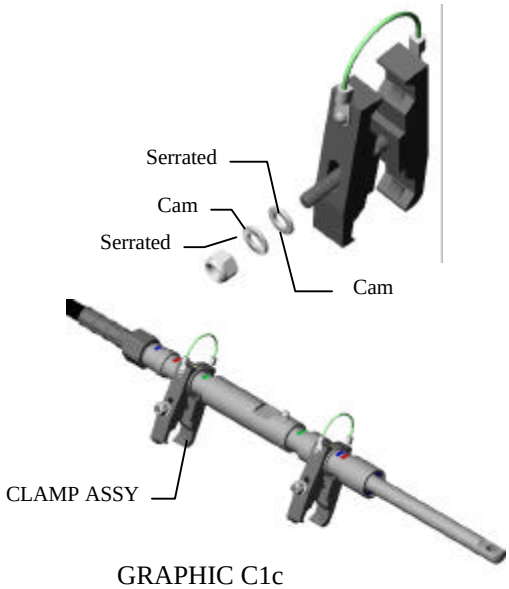
GRAPHIC C1b

C1c. Pre-assemble 2 x Clamp Assemblies to Guide Tube Assembly

i. Ensure that the anti-vibration cam-washers are assembled correctly on both of the Clamp Assemblies. The serrated face of the washers should be in contact with the nut face and the clamp face. The cam feature face of the washers should be in contact with each other.

ii. Orientate both of the Clamp Assemblies with the nut adjusted to maximum 'open' and facing forwards with the green lanyard at the top.

iii. Slide the Clamp Assemblies over the open end of the rod end and guide tube and locate them in the YELLOW color coded slots on the outside diameter of the guide tube.



GRAPHIC C1c

C1d. Pre-assemble Clevis Block Assembly to Secondary Steering Cable Rod End

i. Disassemble the 3/8-24 nut, cam washers and 3/8-24 bolt.

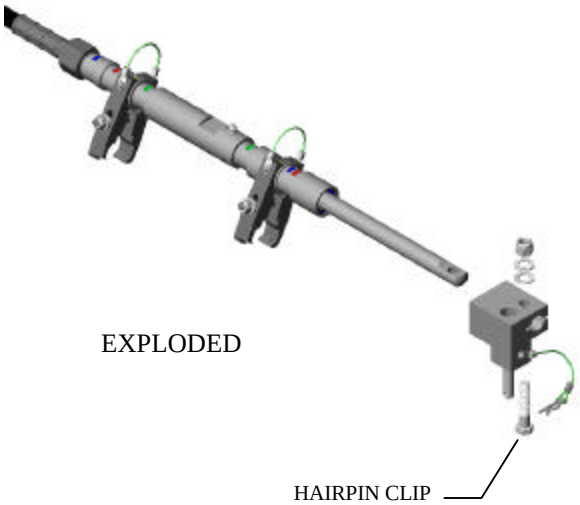
ii. Orientate the Clevis Block with the clevis pin facing down and forward.

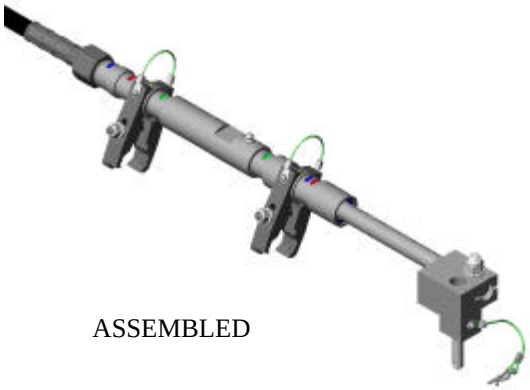
iii. Insert the rod end into the slotted hole of the clevis block. From below insert the 3/8 bolt thru both the clevis block and the rod end.

iv. Assemble 2 x cam washers and self locking nut. See orientation graphic. Tighten and torque to 180-200 in-lbs.

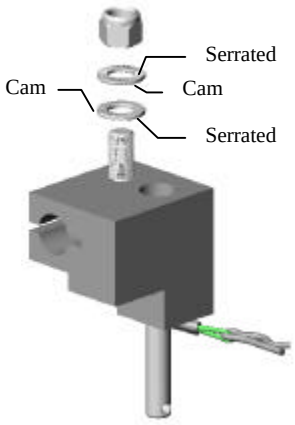
v. Ensure that the anti-vibration cam-washers are assembled correctly. The serrated face of the washers MUST be in contact with the nut face and the clevis block face. The cam feature face of the washers MUST be in contact with each other.

vi. Remove hairpin clip from the clevis pin cross hole and allow to hang freely on green lanyard.



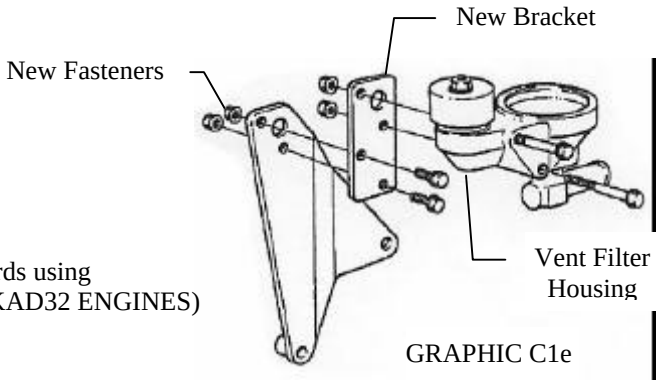


GRAPHICS C1d



CLEVIS BLOCK
CAM WASHER ORIENTATION

C1e. Re-locate Engine Crank Chamber Vent Filter Housing Upwards using OC15SUK25 Bracket Kit. (ONLY REQUIRED ON Volvo KAD32 ENGINES)



GRAPHIC C1e

C1f. Assemble I/O Kit & Second Steering Cable to Steering Cylinder

i. Position I/O Kit & Second Steering Cable sub-assembly above Steering Cylinder as shown in Stage 1 graphic.

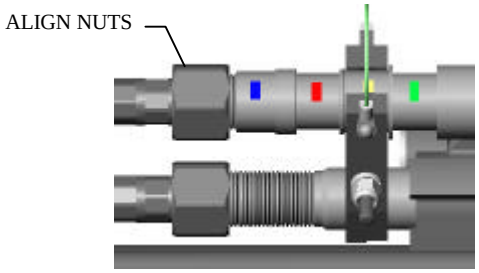
ii. Lower I/O Kit & Second Steering Cable sub-assembly onto Steering Cylinder. Ensure that clevis pin enters both the holes in Steering Cylinder clevis bracket and manual Steering Cable rod end.

iii. Misalignment may prevent engagement of the new Yolk clevis pin. If so, re-align cross hole in manual Steering Cable rod end with hole in Steering Cylinder clevis bracket by adjusting the manual helm slightly.

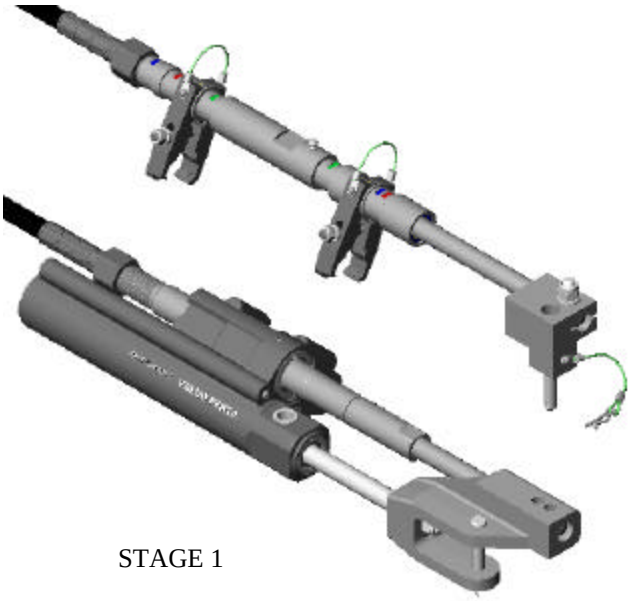
iv. Whilst lowering I/O Kit and engaging clevis pin, hold open 2 Clamp Assemblies and ensure that they are retained in the YELLOW color coded grooves. Guide the open clamps over manual steering cable guide tube.

v. Now I/O Kit & Second Steering Cable is sitting on top of Steering Cylinder with clevis pin fully engaged and 2 open Clamp Assemblies are loosely positioned on the manual steering guide tube and located in the YELLOW color coded grooves. As shown in Stage 2 graphic.

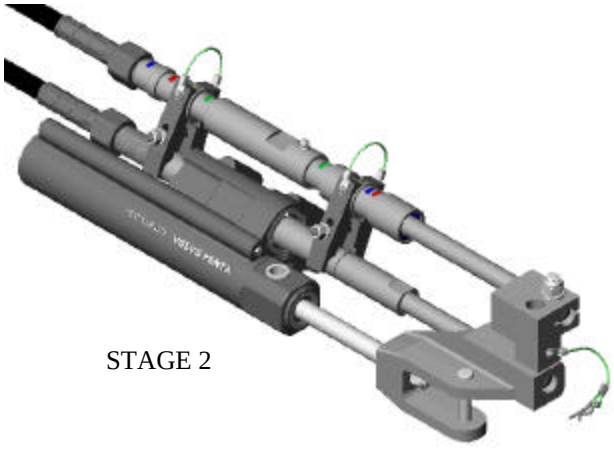
vi. Axially position I/O Kit guide tube so that the nut which connects the steering cable outer jacket is aligned with the similar nut on the manual steering cable outer jacket.



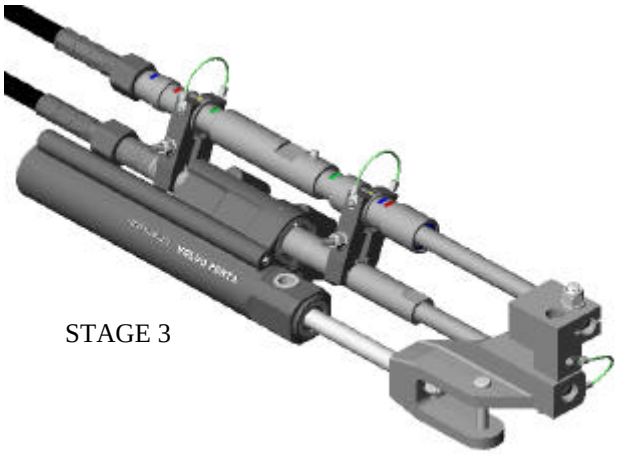
vii. Using a 10mm AF wrench, tighten and torque the 2 clamp nuts to 100 in-lbs (11Nm). Install Hairpin Clip through the cross hole in the clevis pin. As shown in Stage 3 Graphic



STAGE 1



STAGE 2



STAGE 3

GRAPHICS C1e

C1g. Install Drive Unit

i. See separate Detail Installation Guide for Drive Unit.

C1h. Perform Interference Evaluation (2 people required)

i. It is extremely important that a steering system FULL FUNCTION AND OPERATING CLEARANCE CHECK be performed between the new Connection Kit & Second Steering Cable and ALL adjacent hardware including hoses, electrical cables and control cables.

ii. The drive unit MUST be installed with the Second Steering Cable Assembled before performing the Function & Interference Evaluation.

iii. With one person operating the manual steering Helm and one person observing the tiller area. Slowly run the tiller to full HO left and then to full HO right while the observer ensures that there are no physical interferences and that the Steering System is functional. Note that it will be necessary to run the engine to perform this operation.

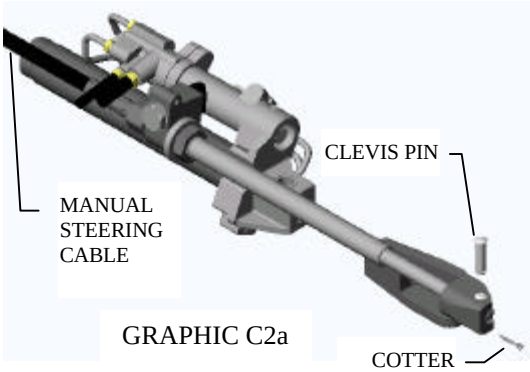
iv. It may be necessary to re-rout hoses, electrical cables or control cables. ALL hardware must be well clear of the new Connection Kit and Second Steering Cable. Note that chaffing can occur if parts are allowed to come into contact.

C2. Recommended Installation procedure For Mercruiser Saginaw Steering Cylinder

C2a. Prepare Steering Cylinder

i. Using the manual steering helm, centre the tiller. Note that it may be necessary to run the engine to achieve this.

ii. Using shop tools, remove the cotter pin and clevis pin connecting the manual steering cable rod end to the steering cylinder clevis bracket.



GRAPHIC C2a

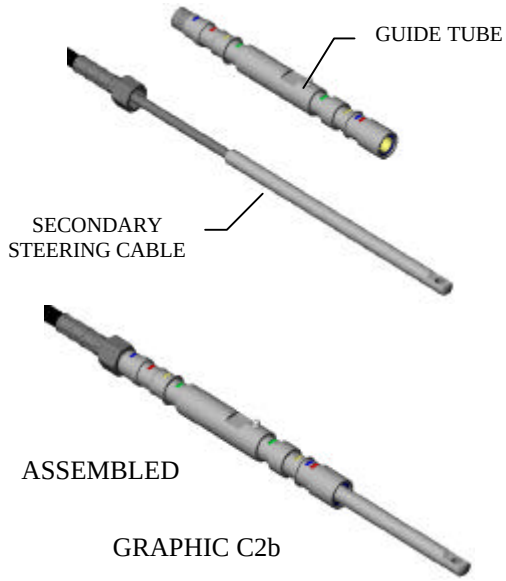
C2b. Pre-assemble Secondary Steering Cable to Guide Tube Assembly

i. Ensure that both the nut and the male thread are lubricated with marine quality grease before assembly.

ii. Ensure that the static portion of the rod end and the inside of the guide tube are liberally coated with marine quality grease.

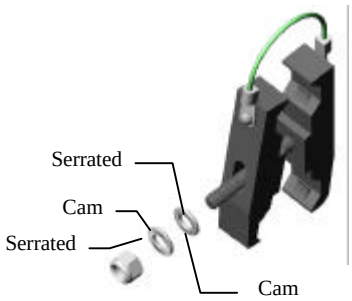
iii. Insert the rod end portion of the secondary steering cable into the threaded side of the guide tube assembly.

iv. Engage 7/8-14 UNF nut on male thread, hand tighten and torque to 175 in-lbs (20Nm). Note that the nut has an internal thread locking feature that can increase the effort required to initial hand tighten.



GRAPHIC C2b

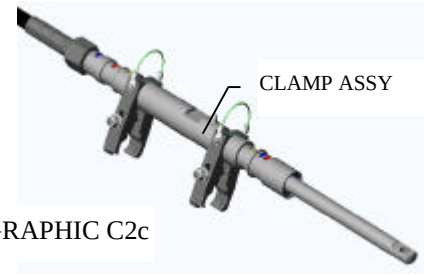
C2c. Pre-assemble 2 x Clamp Assemblies to Guide Tube Assembly



i. Ensure that the anti-vibration cam-washers are assembled correctly on both of the Clamp Assemblies. The serrated face of the washers MUST be in contact with the nut face and the clamp face. The cam feature face of the washers MUST be in contact with each other.

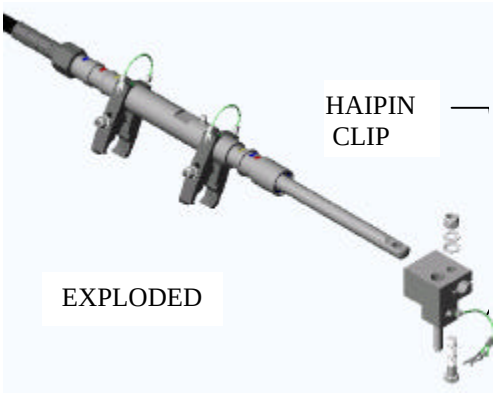
ii. Orientate both of the Clamp Assemblies with the nut adjusted to maximum 'open' and facing forwards with the green lanyard at the top.

iii. Slide the Clamp Assemblies over the open end of the rod end and guide tube and locate them in the GREEN color coded slots on the outside diameter of the guide tube.



GRAPHIC C2c

C2d. Pre-assemble Clevis Block Assembly to Secondary Steering Cable Rod End



i. Disassemble the 3/8-24 nut, cam washers and 3/8-24 bolt.

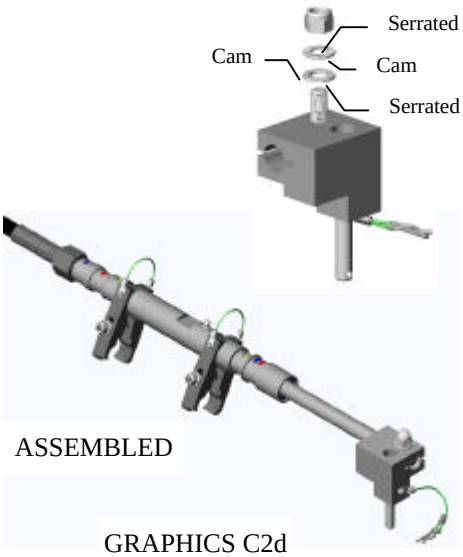
ii. Orientate the Clevis Block with the clevis pin facing down and forward.

iii. Insert the rod end into the slotted hole of the clevis block. From below insert the 3/8 bolt thru both the clevis block and the rod end.

iv. Assemble 2 x cam washers and self locking nut. See orientation graphic. Tighten and torque to 180-200 in-lbs.

v. Ensure that the anti-vibration cam-washers are assembled correctly. The serrated face of the washers MUST be in contact with the nut face and the clevis block face. The cam feature face of the washers MUST be in contact with each other.

vi. Remove hairpin clip from the clevis pin cross hole and allow to hang freely on green lanyard.



GRAPHICS C2d

C2e. Assemble Connection Kit & Second Steering Cable to Steering Cylinder

i. Position Connection Kit & Second Steering Cable sub-assembly above Steering Cylinder as shown in Stage 1 graphic.

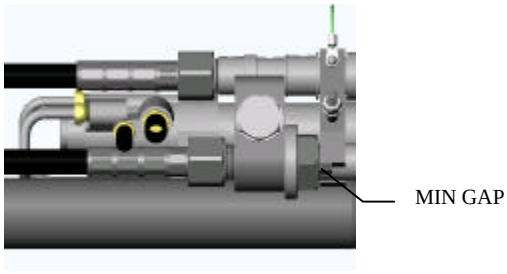
ii. Lower Connection Kit & Second Steering Cable sub-assembly onto Steering Cylinder. Ensure that clevis pin enters both the holes in Steering Cylinder clevis bracket and manual Steering Cable rod end.

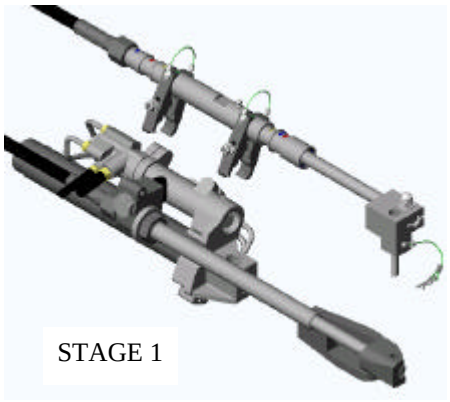
iii. Misalignment may prevent engagement of the new Yolk clevis pin. If so, re-align cross hole in manual Steering Cable rod end with hole in Steering Cylinder clevis bracket by adjusting the manual helm slightly.

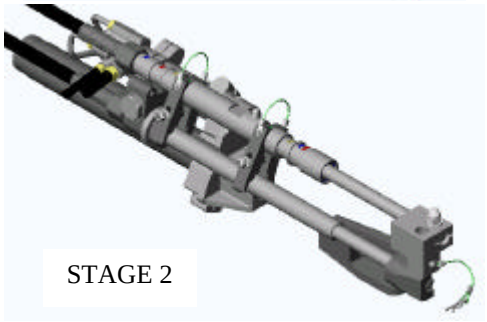
iv. Whilst lowering I/O Kit and engaging clevis pin, hold open 2 Clamp Assemblies and ensure that they are retained in the GREEN color coded grooves. Guide the open clamps over manual steering cable guide tube.

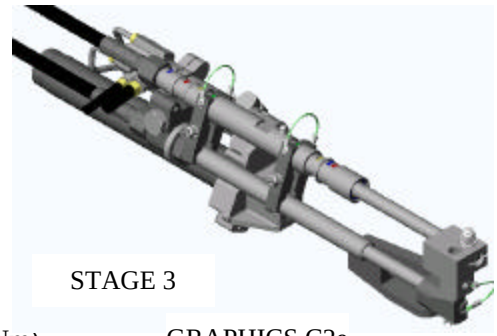
v. Now I/O Kit & Second Steering Cable is sitting on top of Steering Cylinder with clevis pin fully engaged and 2 open Clamp Assemblies are loosely positioned on the manual steering guide tube and located in the YELLOW color coded grooves. As shown in Stage 2 graphic.

vi. Axially position I/O Kit guide tube with a minimum gap between the Clamp Assembly (nearest to the steering cable nut) and the lock nut on the primary steering cable guide tube.









GRAPHICS C2e

vii. Using a 10mm AF wrench, tighten and torque the 2 clamp nuts to 100 in-lbs (11Nm). Install Hairpin Clip through the cross hole in the clevis pin. As shown in Stage 3 Graphic

C2f. Install Drive Unit

i. See separate Detail Installation Guide for Drive Unit.

C1g. Perform Interference Evaluation (2 people required)

i. It is extremely important that a steering system FULL FUNCTION AND OPERATING CLEARANCE CHECK be performed between the new Connection Kit & Second Steering Cable and ALL adjacent hardware including hoses, electrical cables and control cables.

ii. The drive unit MUST be installed with the Second Steering Cable Assembled before performing the Function & Interference Evaluation.

iii. With one person operating the manual steering Helm and one person observing the tiller area. Slowly run the tiller to full HO left and then to full HO right while the observer ensures that there are no physical interferences and that the Steering System is functional. Note that it will be necessary to run the engine to perform this operation.

iv. It may be necessary to re-rout hoses, electrical cables or control cables. ALL hardware must be well clear of the new Connection Kit and Second Steering Cable. Note that chaffing can occur if parts are allowed to come into contact.

DETAILED INSTALLATION PROCEDURE
UNIVERSAL OUTBOARD CONNECTION KIT

A. SYSTEM OVERVIEW:

1. The universal O/B installation kit can be fitted to mechanical push-pull cable steered vessels that are powered by MOST of the popular models of outboard engine. It is recommended for use on vessels with a maximum speed of 40 m.p.h. and should NOT be fitted to vessels where the maximum horsepower of the engine exceeds the maximum horsepower rating for the vessel as stated on the vessel manufacturer's tag.

2. Installation of the kit allows the addition of a second steering cable, which can be used for autopilot control when, connected to the Octopus Remote Mechanical Drive or Jog control when connected to the Octopus Intellisteer remote Mechanical Drive.

3. The O/B installation kit can be configured 2 ways to suite different types of engine mounting. See the included kit list for detailed instructions and compatibility on each configuration.

B. ENGINE COMPATABILITY:

1. CONFIGURATION A: Suitable for use on
   YAMAHA 70 hp upwards from 1984 and newer.
   (note Yamaha engines have METRIC M6 threaded holes)

2. CONFIGURATION B: Suitable for use on
   MERCURY/MARINER 70 hp upwards from 1985
   SUZUKI DT75-DT225 & DF60-DF140
   HONDA BF 75 upwards
   FORCE 90 & 120 hp from 1996
   JOHNSON EVINRUDE 70 hp upwards 2 stroke only
   3 cyl-V6 1989 & newer except 88 hp & 112 hp
   JOHNSON 70 hp upwards 4 stroke only

C. REQUIRED PARTS:

1. Part # OC15SUK15 universal O/B installation kit – (configured to suite engine model)
2. Part # OC15109-6 secondary steering cable (6 foot standard – length may vary)
3. General Shop Tools

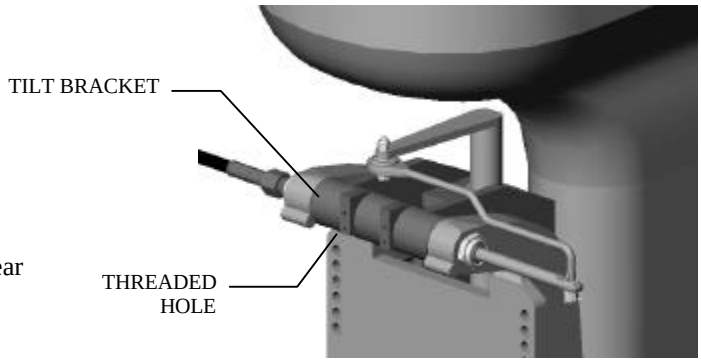
D. RECOMMENDED INSTALLATION PROCEDURE
(For Generic Engine Type):

D1. Prepare Engine Mounting Site

i. Using the manual steering helm, centre the engine.

ii. Ensure that the area immediately in front of the tilt tube is clear of obstructing wires, hoses etc. Re-rout if necessary.

iii. Ensure that the 4 threaded holes on the front face of the tilt bracket are free from paint etc. Re-tap if necessary.



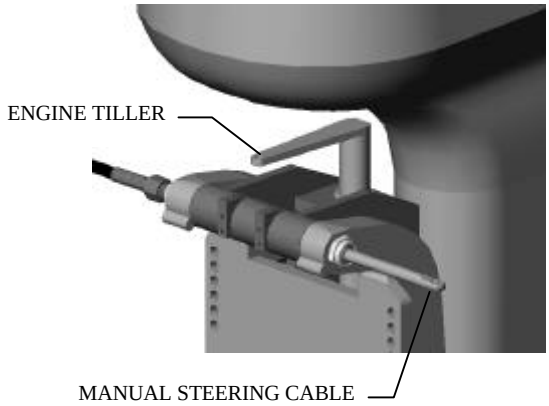
GRAPHIC D1

D2. Remove Steering Link Arm

i. To aid the re-assembly procedure, record details of the connections between the Steering Link Arm and the manual steering cable and the tiller.

ii. Disassemble the connections between the Steering Link Arm and the manual steering cable and the engine tiller. Remove Link Arm.

iii. RETAIN Link Arm and ALL connection hardware for re-use.

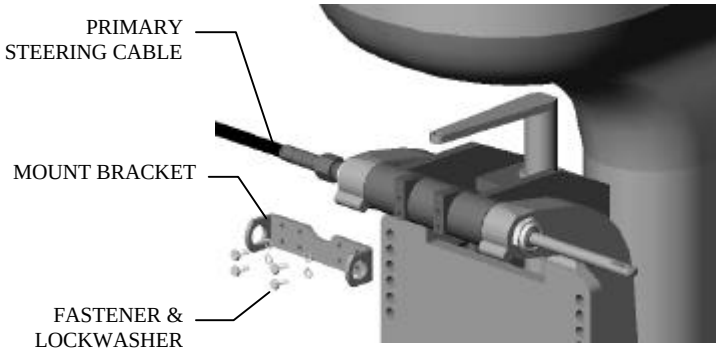


GRAPHIC D2

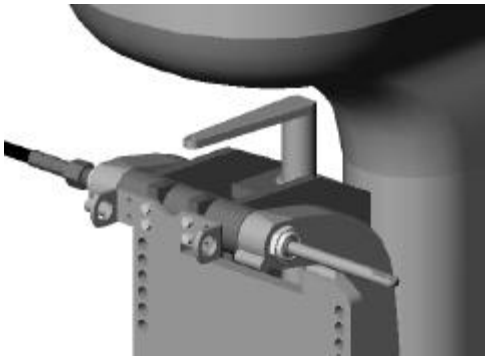
D3. Pre-assemble Secondary Steering Cable Mount Bracket to Engine Tilt Bracket.

i. Offer Secondary Steering Cable Mount Bracket to Engine Tilt Bracket.

ii. Install 4 fasteners and lock washers. Torque to ??100 in-lbs (11Nm).



EXPLODED



ASSEMBLED

GRAPHICS D3

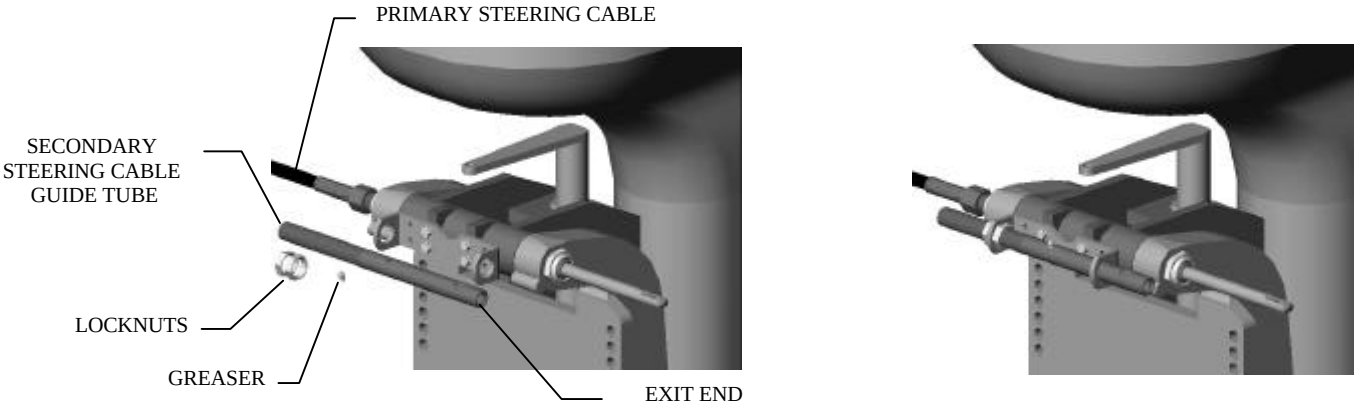
D4. Assemble Secondary Steering Cable Guide Tube to Mount Bracket

i. Ensure that both the lock nuts and the male thread on the Guide tube are lubricated with marine quality grease before assembly.

ii. Offer Secondary Steering Cable Guide Tube to Mount Bracket and install 2 x lock nuts and grease fitting.

iii. Adjust axial position of Guide Tube to align EXIT end with the engine tilt tube

iv. Torque lock nuts/Guide tube to 175 in-lbs (20Nm)



EXPLODED ASSEMBLED

GRAPHICS D4

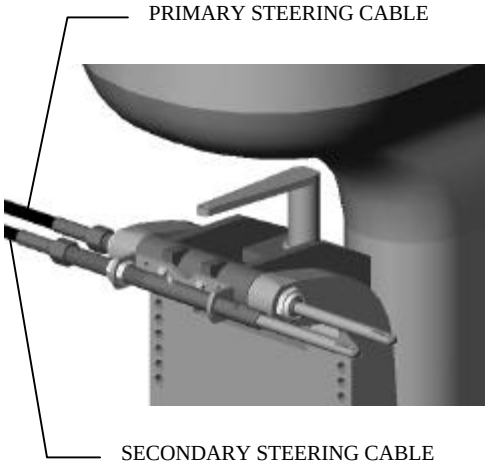
D5. Assemble Secondary Steering Cable

i. Ensure that both the nut and the male thread are lubricated with marine quality grease before assembly.

ii. Ensure that the static portion of the rod end and the inside of the guide tube are liberally coated with marine quality grease.

iii. Insert the rod end portion of the secondary steering cable into the threaded side of the guide tube assembly.

iv. Engage 7/8-14 UNF nut on male thread, hand tighten and torque to 175 in-lbs (20Nm). Note that the nut has an internal thread locking feature that can increase the effort required to initial hand tighten.



GRAPHIC D5

D6. Assemble Dual Block to Rod Ends of Primary & Secondary Steering Cables

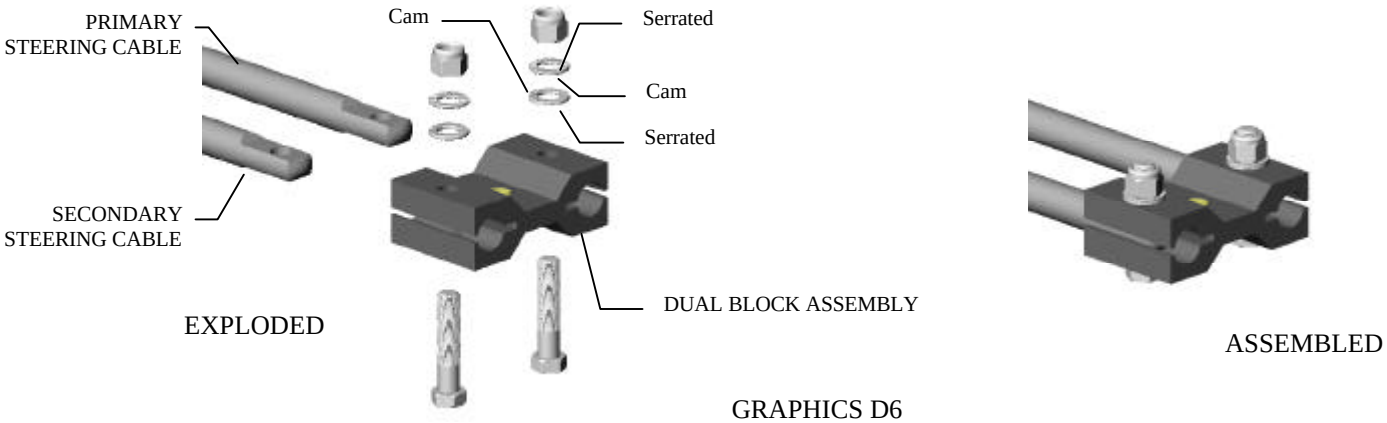
i. Disassemble 2 x 3/8-24 nut, cam washer set and 3/8-24 bolt.

ii. Orientate the Dual Block Horizontally

iii. Insert 2 x rod ends into the slotted holes of the dual block. Align cross-holes; insert 2 x 3/8 bolt thru both the dual block and the rod ends.

iv. Assemble 2 x cam washer set and self lock nut. See orientation graphic. Tighten and torque to 180-200 in-lbs.

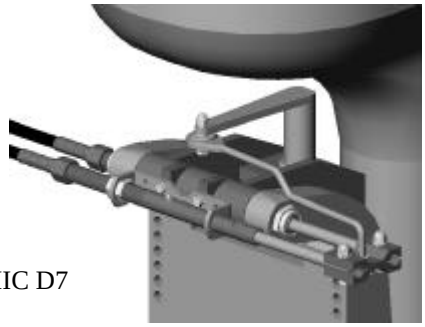
v. Ensure that 2 x anti-vibration cam-washer sets are assembled correctly. The serrated face of the washers MUST be in contact with the nut face and the dual block face. The cam feature face of the washers MUST be in contact with each other.



GRAPHICS D6

D7. Re-assemble Steering Link Arm

i. Referring to records established during prior disassembly. Install the Steering Link Arm and secure the connections between the Steering Link Arm and the dual block and the engine tiller.



GRAPHIC D7

D8. Perform Interference Evaluation (2 people required)

i. It is extremely important that an OPERATING CLEARANCE CHECK be performed between the new O/B Kit & Second Steering Cable and ALL adjacent hardware including hoses, electrical cables and control cables.

ii. With one person operating the manual steering Helm and one-person observing area forward of the engine tilt tube. Slowly run the engine to full HO left and then to full HO right while the observer ensures that there are no physical interferences.

iii. With engine set at full HO left, tilt engine into full up position, ensure that there are no physical interferences. Repeat with engine set to full HO right.

iv. It may be necessary to re-rout hoses, electrical cables or control cables. ALL hardware must be well clear of the new O/B Kit and Second Steering Cable. Note that chaffing can occur if parts are allowed to come into contact.

SECTION C

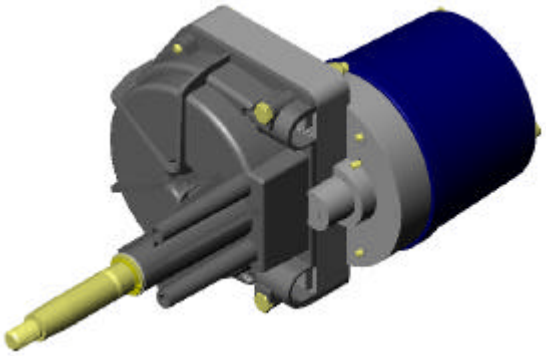
COMPLETE MECHANICAL PRODUCT FAMILY

(page 61-64)

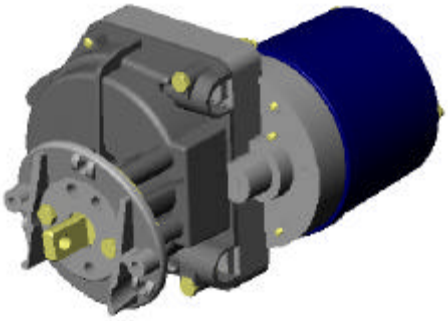
COMPLETE MECHANICAL PRODUCT FAMILY
DRIVE UNITS – CONNECTION KITS - ACCESSORIES

A. Drive Units

i. Behind the Dashboard

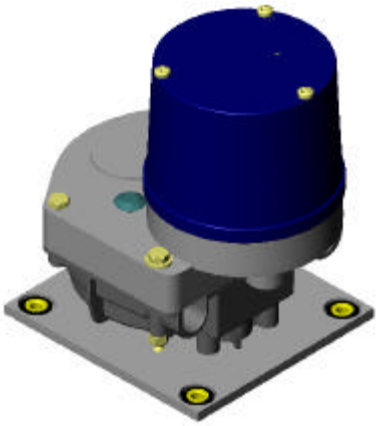


Straight Shaft with Rudder Feed Back Order AFMDMSRW
Straight Shaft without Rudder Feed Back Order AFMDMSW



Tilt Shaft with Rudder Feed Back Order AFMDTPRW
Tilt Shaft without Rudder Feed Back Order AFMDTPW

ii. Remote



Remote with Rudder Feed Back Order AFMDRERW
Remote without Rudder Feed Back Order AFMDREW

B. Accessories For All – Rotary Mechanical Drive Units

i. Rudder Feed Back Potentiometer Module
Order OC15SUK06A thru H (for specific Autopilot Model & Manufacturer)
Order OC15SUK06 (universal – for all major Autopilot Models)

ii. Steering Cables – When replacing steering cable on Behind the Dashboard drives or selecting new cable for Remote Drive installation order Teleflex Part # SSC52-XX (length in feet) generally available from marine mechanical steering wholesale. Or order OC15109-XX (length in feet) from Octopus.

C. Accessories for – Behind the Dashboard – Rotary Mechanical Drive Units

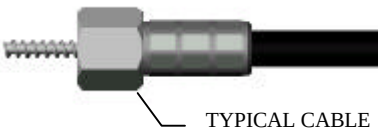
i. Retro-fit Helm Housings

For Morse Tilt Mechanism
Order OC15SUK02 Helm Kit

For TFX Standard Tilt Mechanism
Order OC15SUK03 Helm Kit

ii. Steering Cable Adapters

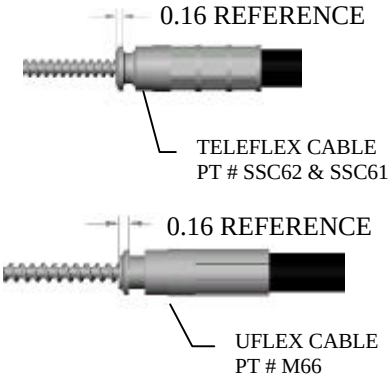
a. For Morse Cable Pt # 304415 or Teleflex Cable Pt # SSC72 or Uflex Cable Pt # M47 - Order OC15SUK07



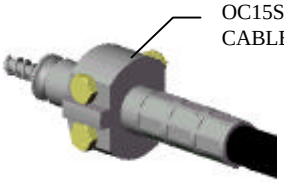
EXPLODED VIEW

ASSEMBLED VIEW

b. For Teleflex Cable Part # SSC62 & SSC61 or Uflex Cable Part # M66. - Order 15SUK08

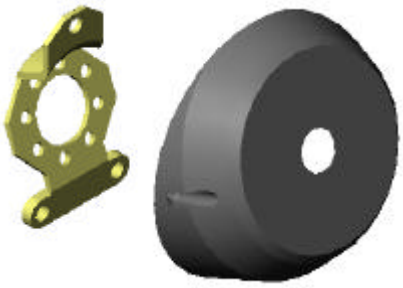


EXPLODE VIEW



ASSEMBLED VIEW

iii. Bezel + Mounting Hardware Kits



20 Degree Bezel Kit &
Order OC15SUK09

90 Degree Bezel Kit &
Order OC15SUK10

iv. Adjustable Friction Brake

For Straight Shaft Drive
With 90 degree Bezel Kit
Order OC15SUK11

v. Helm Spacer + Mounting Hardware Kits

For 90 degree Mount
Order OC15SUK16

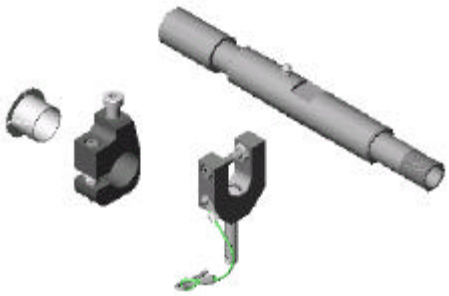
For 20 degree Mount
Order OC15SUK17

For TFX Performance Tilt Mount
Order OC15SUK18

D. Accessories for – Remote – Rotary Mechanical Drive Units

Note that all the connection kits shown in section D require the addition of a Steering Cable of the appropriate length. See section B ii for ordering information.

i. Multi I/O Connection Kits for Second Steering Cable Connection to Sterndrive



Type B – Multi I/O Connection Kit
Suitable For All
Mercruiser Sterndrives from 1994
Volvo Diesel SX Sterndrives from 1997
Volvo Gasoline SX & DP Sterndrives from 1997
See Application Chart - Order OC15SUK12B

Type C – Multi I/O Connection Kit
Suitable For All
Mercruiser Sterndrives from up to 1993
Volvo Diesel DP Sterndrives from 1994
(Mainly European Market)
See Application Chart - Order OC15SUK12C

ii. O/B Connection Kit for Second Steering Cable Connection to Outboard

Suitable for most Yamaha Engines
See Application Chart
Order OC15SUK15A

Suitable for most Mercury-Mariner
& Suzuki Engines
See Application Chart
Order OC15SUKB

iii. Universal Connection Kit for Custom Steering Cable Connection to Tiller or Quadrant
(Inboards or small Sailboats)

Order OC15SUK19

SECTION D

ADDITIONAL OCTOPUS HYDRAULIC PRODUCTS

(page 67-72)

A. POWER BOATS

i. Reversing Pumps

Reversing Pump

- How To Order

OCT-AF-12-12-1706-HK

Product Code
(not always used)

Market Code
AF = Aftermarket
OE = OEM

Max Flow Per Min
10 = 1000 cc (60 ci)
12 = 1200 cc (73 ci)
20 = 2000 cc (120 ci)

Volts DC
12 = 12v
24 = 24v
32 = 32v

Type of Manifold - Ports
1703 = ¼ NPT *
1704 = ¼ SAE
1705 = ¼ NPT – Shut Off
1706 = ¼ SAE – Shut Off
BP12 = 12v # 8 Bypass Valve
BP24 = 24v # 8 Bypass Valve

Type of Accessory
HK = SAE Hose Kit
UB = Unbalanced Valve**

Sailboat Bypass
Reversing Pump

* 1703 Manifold includes 3/8 dia compression fittings
** UB - Unbalanced Valve fits to pump to adapt flow to unbalanced steering cylinder

ii. Type A Continuous Running Pumps

- How To Order

OCT-AF-CRA-02-12- P

Product Code
(not always used)

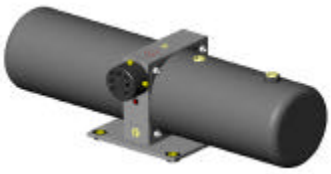
Market Code
AF = Aftermarket
OE = OEM

Model Type

Flow Per Min
02 = 2000 cc (120 ci)
03 = 3000 cc (180 ci)
04 = 4000 cc (240 ci)

Volts DC
12 = 12v
24 = 24v
32 = 32v

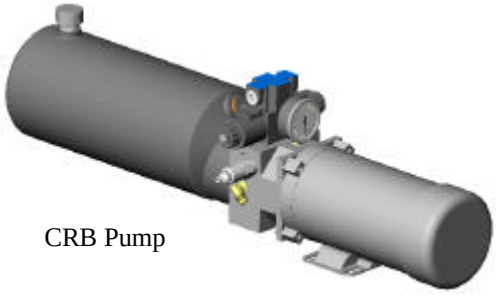
Type of Accessory
P = Pressure Gauge
F = Flow Control*
R = Releif Valve



CRA Pump

* Flow Control Option only available on 2000cc (120 ci) flow models

iii. Type B Continuous Running Pumps



CRB Pump

- How To Order

OCT-AF-CRB-02-12-12-A

Product Code
(not always used)

Market Code
AF = Aftermarket

Model Type

Flow Per Min
02 = 2000 cc (120 ci)
03 = 3000 cc (180 ci)
04 = 4000 cc (240 ci)
06 = 6000 cc (365 ci)
08 = 8000 cc (488 ci)
10 = 10,000 cc (610 ci)
12 = 12,000 cc (732 ci)

Motor Voltage
12 = 12v dc
24 = 24v dc
32 = 32v dc
11S = 110/220 v ac (single phase)
22T = 220/440/575 v ac (three phase)

Solenoid Voltage
12 = 12v dc
24 = 24 v dc
32 = 32 v dc
11 = 110 v ac
22 = 220 v ac

Options
A = Single Speed
B = Single Speed with Flow Control**
C = 2 Speed with Flow Control on Low Speed**

* Flow Rates are approximate depending upon motor selection
** Option B & C not available on all Flow Rates – Consult Factory

B. SAIL BOATS

i. 38mm Bore Linear Drives

38mm Bore
Linear Drive
Remote Style

- How To Order

OCT-AF-12-12-LAR-12

Product Code
(not always used)

Market Code
AF = Aftermarket
OE = OEM

Max Flow Per Min
10 = 1000 cc (60 ci)
12 = 1200 cc (73 ci)

Volts DC
12 = 12v
24 = 24v

Model Style
LAR = Remote Style
LAM= Mounted Style

Stroke
7 = 7 in (18cm)
12 = 12 in (30 cm)

38 mm Bore
Linear Drive
Mounted Style

38mm BORE - SPECIFICATIONS AND DIMENSIONS							
Stroke		Tiller Radius for +/- 35 degrees		Peak Thrust		Stroke Time	Common Vessel Application
in	cm	in	cm	lbs	kg	Seconds	
7	18	6	15	880	400	8	Up to 45ft (14m)
12	30	10	25	880	400	14	Up to 60 ft (18m)

ii. 45mm Bore Linear Drive

- How To Order

OCT-AF-20-12-LAR-12

Product Code
(not always used)

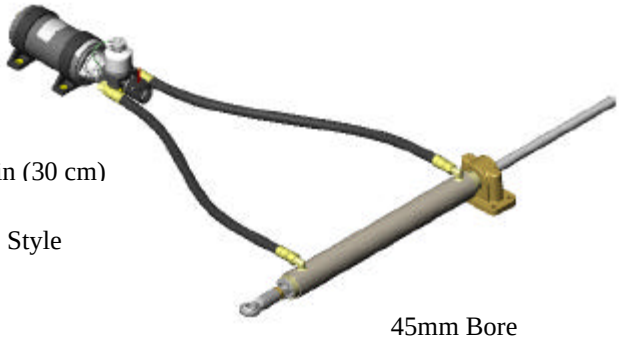
Market Code
AF = Aftermarket

Max Flow Per Min
20 = 2000 cc (120 ci)

Volts DC
12 = 12v
24 = 24v

Model Style
LAR = Remote Style

Stroke
12 = 12 in (30 cm)



45mm Bore
Linear Drive
Remote Style

45mm BORE - SPECIFICATIONS AND DIMENSIONS							
Stroke		Tiller Radius for +/- 35 degrees		Peak Thrust		Stroke Time	Common Vessel Application
in	cm	in	cm	lbs	kg	Seconds	
12	30	10	25	1320	600	16	Over 60 ft (18m)

iii. Heavy Duty 45mm Bore Linear Drive

- How To Order

OCT-AF-CRA-02-12-LAR-12

Product Code
(not always used)

Market Code
AF = Aftermarket

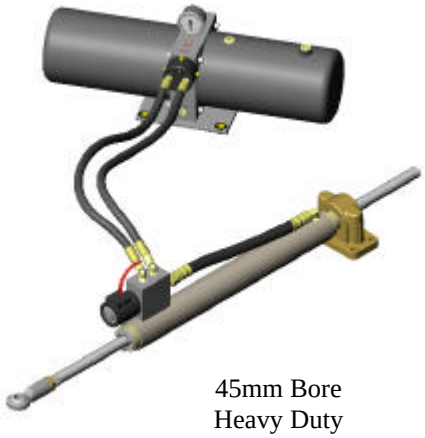
Model Type

Flow Per Min
20 = 2000 cc (120 ci)

Volts DC
12 = 12v
24 = 24v

Model Style
LAR = Remote Style

Stroke
12 = 12 in (30



45mm Bore
Heavy Duty
Linear Drive
Remote Stvle

HEAVY DUTY - 45mm BORE - SPECIFICATIONS AND DIMENSIONS							
Stroke		Tiller Radius for +/- 35 degrees		Peak Thrust		Stroke Time	Vessel Application
in	cm	in	cm	lbs	kg	Seconds	
12	30	10	25	1320	600	16	Up to 80 ft (24m)

C. MODULAR ACCESSORY KITS

i. For Reversing Pumps

a. Manifolds

- How To Order

For ¼ NPT Ports – Order OC17SUK12

For ¼ SAE Ports – Order OC17SUK13

Reversing Pump Manifold

b. Shut Off Valve Manifolds

- How To Order

For ¼ NPT Ports – Order OC17SUK04

For ¼ SAE Ports – Order OC17SUK05

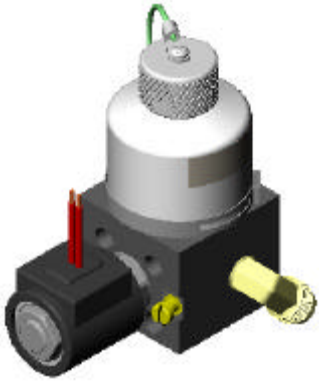
Reversing Pump Shut Off Valve Manifold

c. # 8 Bypass Valve Manifolds

- How To Order

For 12 volts dc – Order OC17SUK01

For 24 volts dc – Order OC17SUK02



Reversing Pump # 8 Bypass Valve Manifold

d. Unbalanced Valve

- How To Order

For All Reversing Pump – Order OC17SUK03

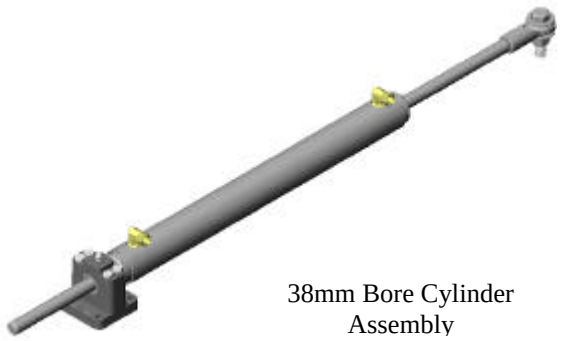
Unbalanced Valve

ii. For Linear Drives

a. 38mm Bore Cylinder Assemblies

- How To Order

For 7 inch (18cm) stroke – Order OC16SUK05
For 12 inch (30cm) stroke – Order OC16SUK06

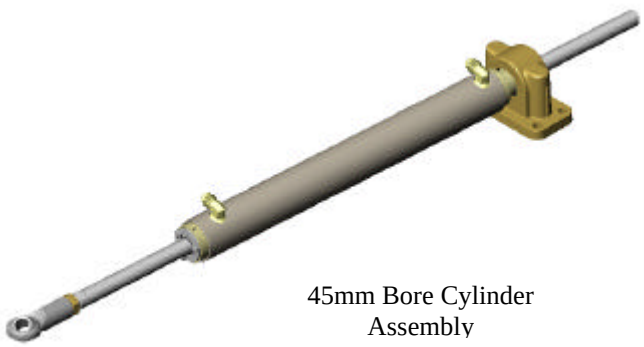


38mm Bore Cylinder Assembly

b. 45mm Bore Cylinder Assemblies

- How To Order

For 12 inch (30cm) stroke – Order OC16SUK07



45mm Bore Cylinder Assembly

c. 3/8 Bore - SAE Hose Assemblies (rotable SAE female fittings both ends)

- How To Order

For 11 inch (28cm) long – Order OC1623
For 12.25 inch (31cm) long – Order OC1637
For 13 inch (33cm) long – Order OC1622
For 24 inch (61cm) long – Order OC1621

3/8 Bore - SAE Hose Assembly

iii. Miscellaneous

a. Constant Flow Regulator Valve (for adding autopilot steering control to 'Orbitrol' style steering systems)

CFR Valve

- How To Order

For 600cc (0.15 gal) nominal flow – 12v – Order OC17SUK19
For 600cc (0.15 gal) nominal flow – 24v – Order OC17SUK20
For 2000cc (0.50 gal) nominal flow – 12v – Order OC17SUK17
For 2000cc (0.50 gal) nominal flow – 24v – Order OC17SUK18
For 4000cc (1.00 gal) nominal flow – 12v – Order OC17SUK21
For 4000cc (1.00 gal) nominal flow – 24v – Order OC17SUK22

b. # 10 Bypass Valve (for direct mount onto steering cylinder)

Direct Mount
10 Bypass Valve

- How To Order

For 12 volts dc - Order OC17SUK15

For 24 volts dc – Order OC17SUK16

c. ¼ Hose Assemblies (for use with reversing pump manifolds)

- How To Order

SAE male fixed – SAE female rotable x 18" (48cm) - Order OC17SUK06
NPT male fixed – NPT female fixed x 18" (48cm) - Order OC17SUK07
NPT male fixed – NPT female fixed x 6" (16cm) - Order OC17SUK08

Typical ¼ Bore
Hose Assembly