



OCTOPUS

SELECTION & INSTALLATION GUIDE

OC15270 REV: C - 10 MAY 2010



AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

SECTION	DESCRIPTION	PAGE	REVISION
A1.	System Overview	2	NEW
A2.	IMPORTANT INFORMATION	2	
	IMPORTANT SAFETY FEATURES	3	
A3	4 Step Installation Planning	4	NEW
B1	STEP 1 – Determine Available Space	4	NEW
B1a	STEP 1 – Depth	4	NEW
B1b	STEP 1 – Left – Right	4	NEW
B1c	STEP 1 – Up – Down	5	NEW
C1	STEP 2 – Determine Steering Cable Compatibility	5	NEW
C2	STEP 2 – Steering Cable Head Detail Graphics	5	NEW
C2a	STEP 2 – Morse Cable 304411 or TFX SSC52 (no adapter required)	5	NEW
C2b	STEP 2 – TFX Cable SSC62 (OC15SUK08 adapter required)	6	NEW
C2c	STEP 2 – Uflex Cable M66 (OC15SUK08 adapter required)	6	NEW
C2d	STEP 2 – Morse Cable 304415 (OC15SUK07 adapter required)	7	NEW
	TFX Cable SSC72 (OC15SUK07 adapter required)		
	Uflex Cable M47 (OC15SUK07 adapter required)		
C2e	STEP 2 – RACK Style Cable (in all case must be replaced with Morse Cable 304411 or TFX Cable SSC 52)	7	NEW
C2f	STEP 2 – Typical Steering Cable to Helm Detail Graphic	8	NEW
D1	STEP 3 – Determine Dashboard Mounting Style	9	NEW
D2	STEP 3 – Dashboard Mounting Style Detail Graphics	10	NEW
D2a	STEP 3 – Type S – Rigid Shaft – Morse 90 degree mounting	10	NEW
D2b	STEP 3 – Type S – Rigid Shaft – Morse 20 degree mounting	11	NEW
D2c	STEP 3 – Type T – Tilt Shaft – TFX Performance Tilt Mechanism	12	NEW
E1	STEP 4 – Accessory Selection Review	13	NEW
E2a	STEP 4 – Helm Spacer for Type S with 90 degree mount (OC15SUK16 spacer kit required)	14	NEW
E2b	STEP 4 – Helm Spacer Type S with 20 degree mount (OC15SUK17 spacer kit required)	15	NEW
E2c	STEP 4 – Helm Spacer for Type T - TFX Performance Tilt mount (OC15SUK18 spacer kit required)	16	NEW
E3	STEP 4 – Friction Brake (OC15SUK11 friction brake required)	17	NEW
E4	STEP 4 – Rudder Feed Back Module – Calibration Procedure	18	NEW
F1	Electrical Hook Up	19	NEW
G1	System & Accessory Checklist	19	NEW

SELECTION & INSTALLATION GUIDE (continued)
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. IMPORTANT INFORMATION:

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. 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.

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

5. IMPORTANT SAFETY FEATURES

Ensure that the Helmsperson is made aware of the two following safety features when using the Autopilot.

A: MANUAL RELEASE

A 'manual release' feature is included in the drive in case the Autopilot is switched to manual mode by mistake creating a dangerous manoeuvre or violent movement of the steering wheel on a Power Boat due to propeller action or trim forces.

The drive unit while under consistent load from the boats steering system in one direction or no movement, will maintain the clutch engaged when the Autopilot is switched to manual mode.

This feature minimizes uncontrolled boat swing, violent steering wheel movement and potentially dangerous manoeuvres.

Manual Release Procedure.

The wheel or tiller is required to be moved slightly to disengage the drive. A small joggle action (turning the wheel from side to side) will release the clutch and allow return to manual control.

IMPORTANT

The helmsperson should always be ready to take manual control of the boat when the Autopilot is returned to manual mode.

B: MANUAL OVERRIDE

In the event of **UNCONTROLLED** automatic steering or other **EMERGENCY** situations, automatic return to **MANUAL** steering is provided through the operation of a thrust limiter. It is **STRONGLY** advised that the helmsperson be formally familiarized with this **MANUAL OVERRIDE** procedure.

Manual Override Procedure. The helmsperson can overcome the steering action of the drive unit by exerting force on the steering wheel in the opposite direction to the drive. With this action the drive unit thrust limit will 'slip' allowing the helmsperson to take control.

DOCKSIDE TESTING

Due to the 'Manual Release' safety feature, when the yacht is not in motion it might be required to joggle the wheel/Tiller (move from side to side) to engage or disengage the drive.

SEA TRIAL

Before the Autopilot is tested at sea the helmsperson should be made aware of the two safety features and the procedures required.

SELECTION & INSTALLATION GUIDE (continued) AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

A3 4 – STEP INSTALLATION PLANNING:

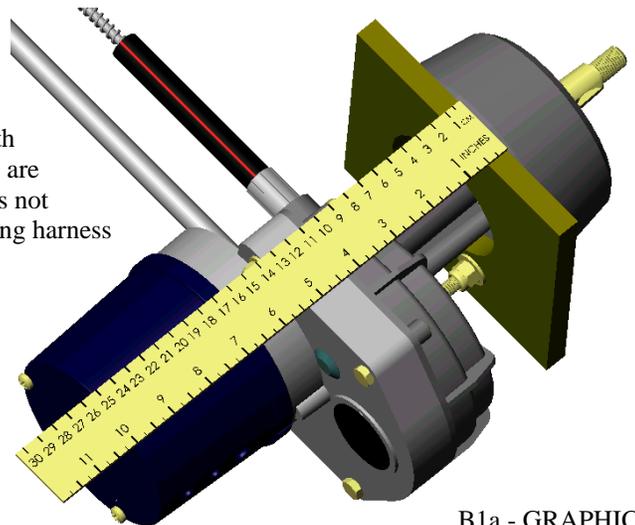
When planning an installation, it is recommended that you follow 4 steps :

- 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

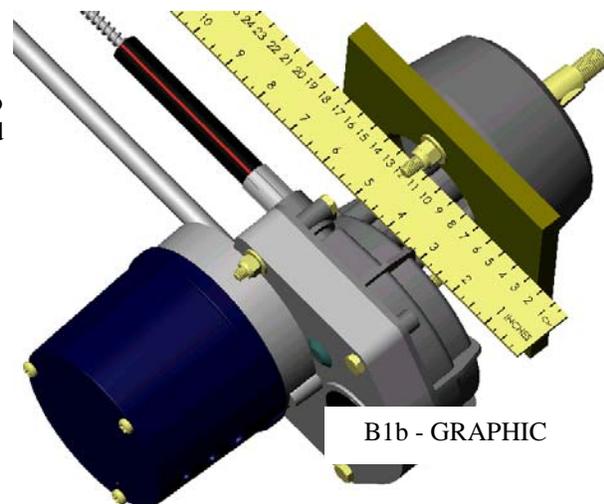
Depending upon the dashboard mount style that is used, the depth required to accommodate a drive will vary slightly, but all styles are within 10 inches. Note that in some cases where enough depth is not available, it may be possible to re-route some components or wiring harness etc. Also there is a 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.

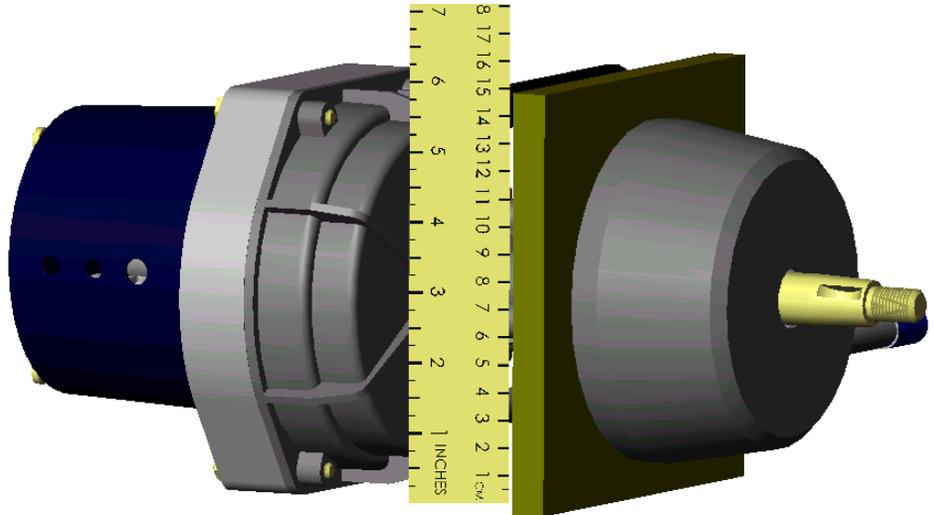


B1b - GRAPHIC

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

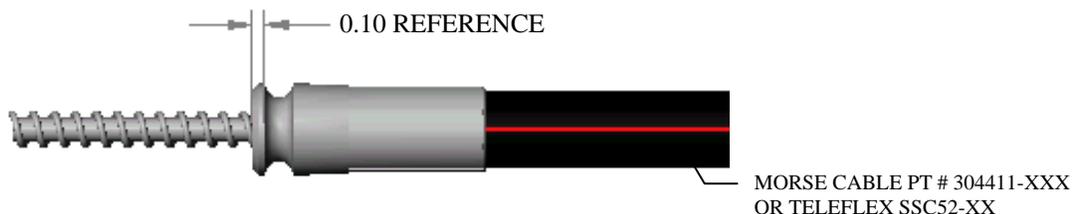
C1 STEP 2 – Determine Steering Cable Compatibility

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)**

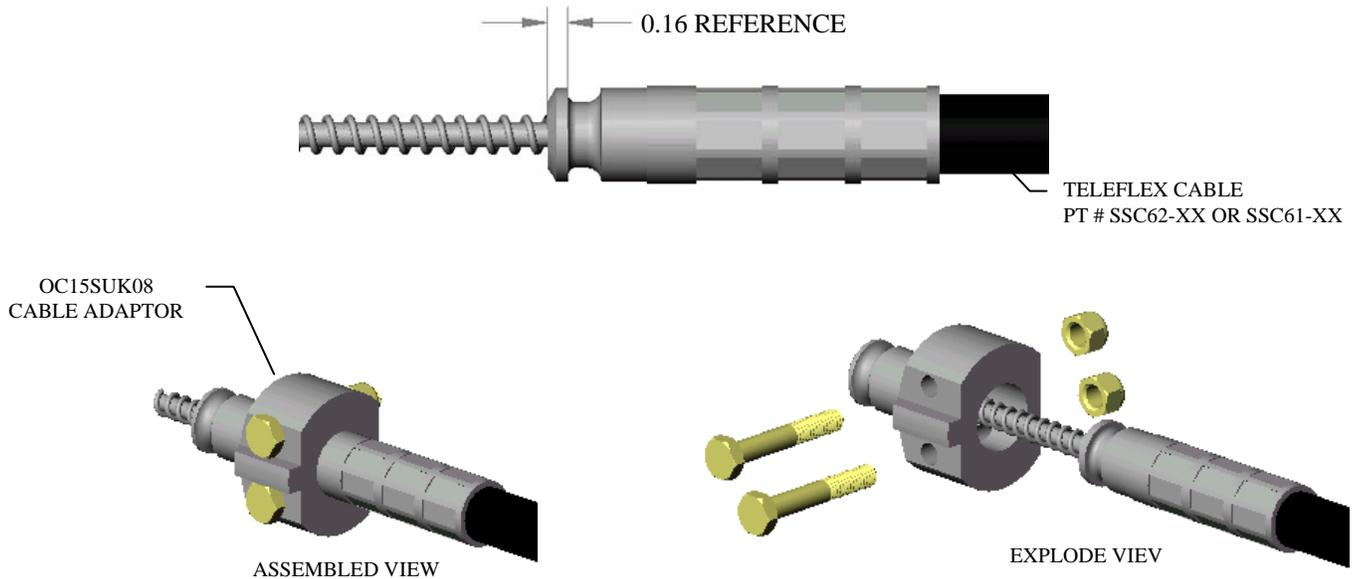


C2a - GRAPHIC

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

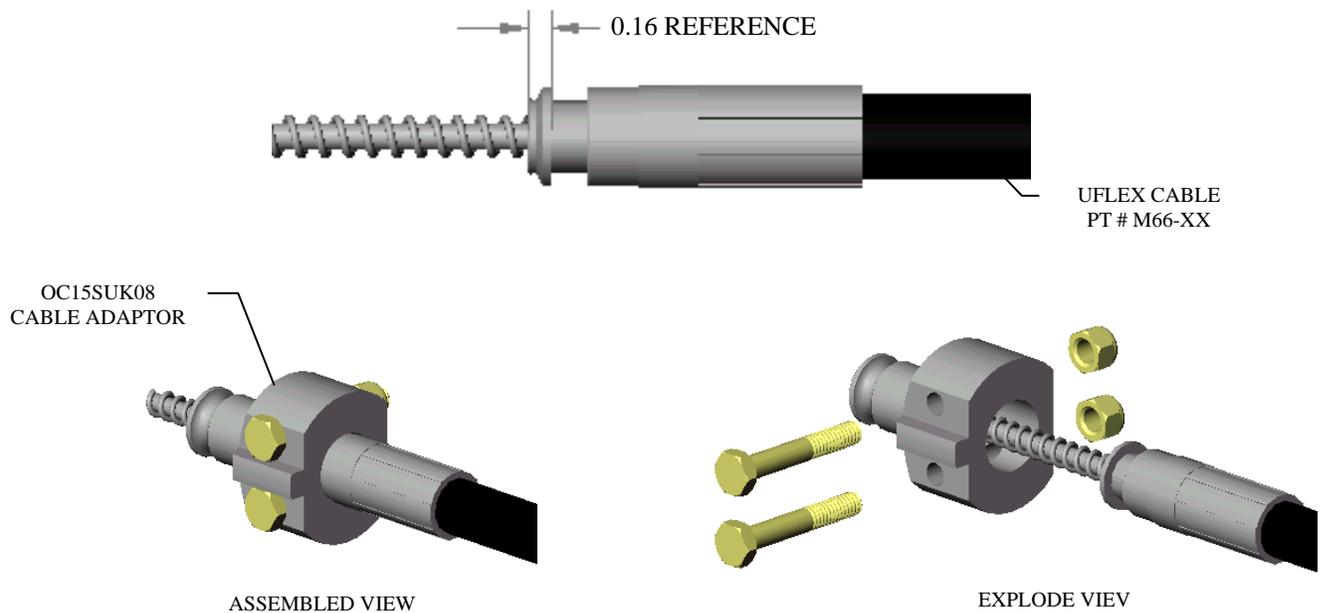
C2. STEP 2 – Cable Head Detail Graphics (Continued)

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



C2b - GRAPHICS

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

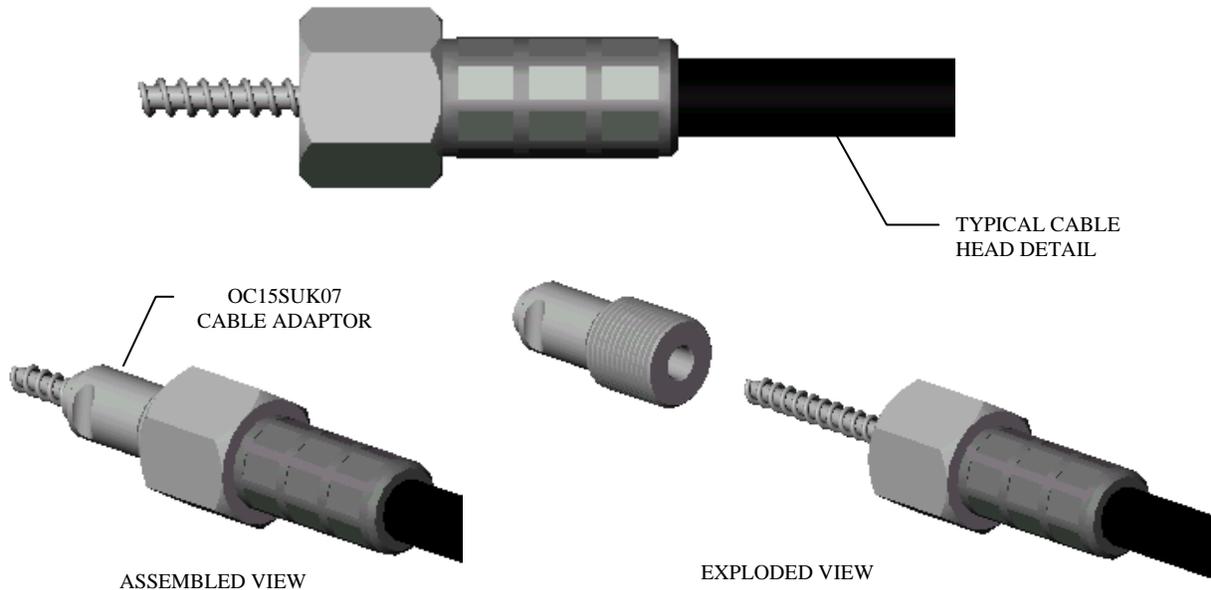


C2c - GRAPHICS

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

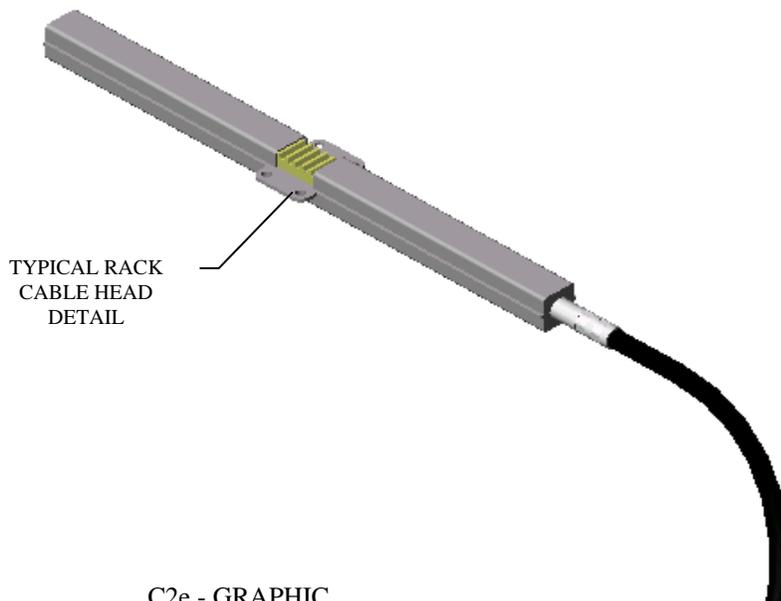
C2. STEP 2 – Cable Head Detail Graphics (Continued)

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.

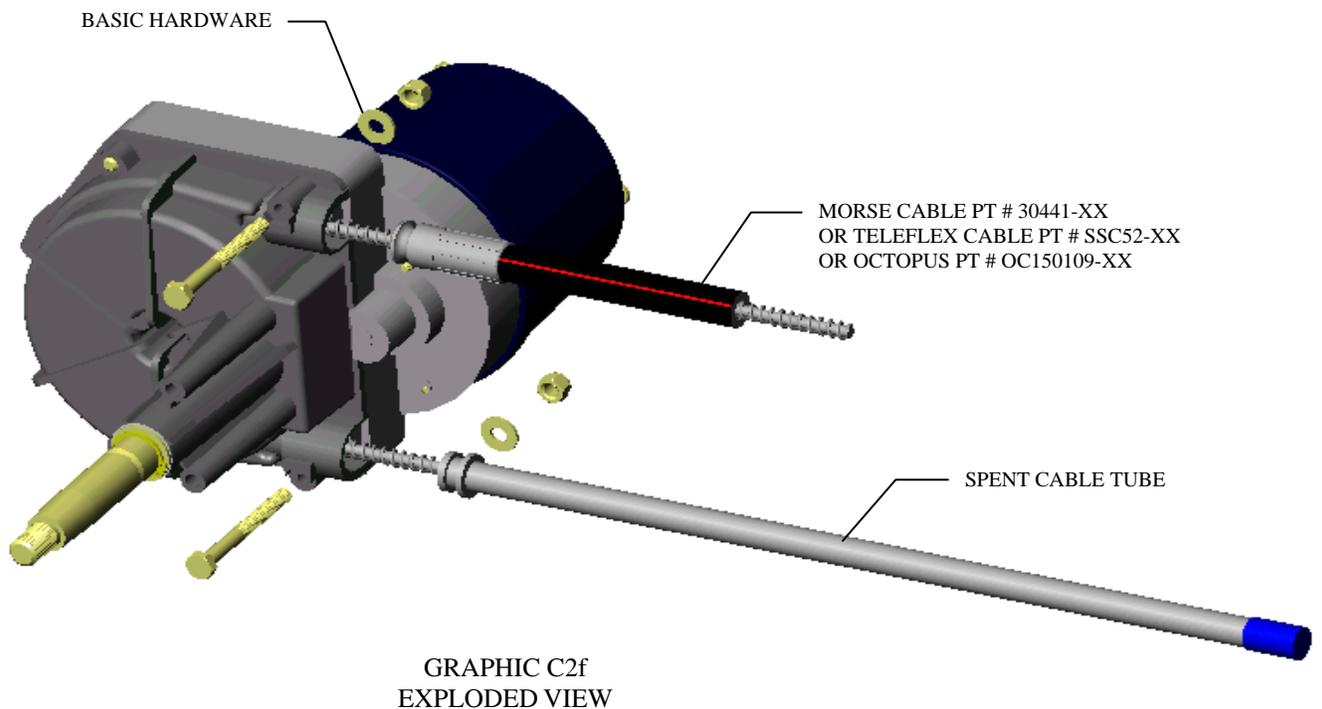
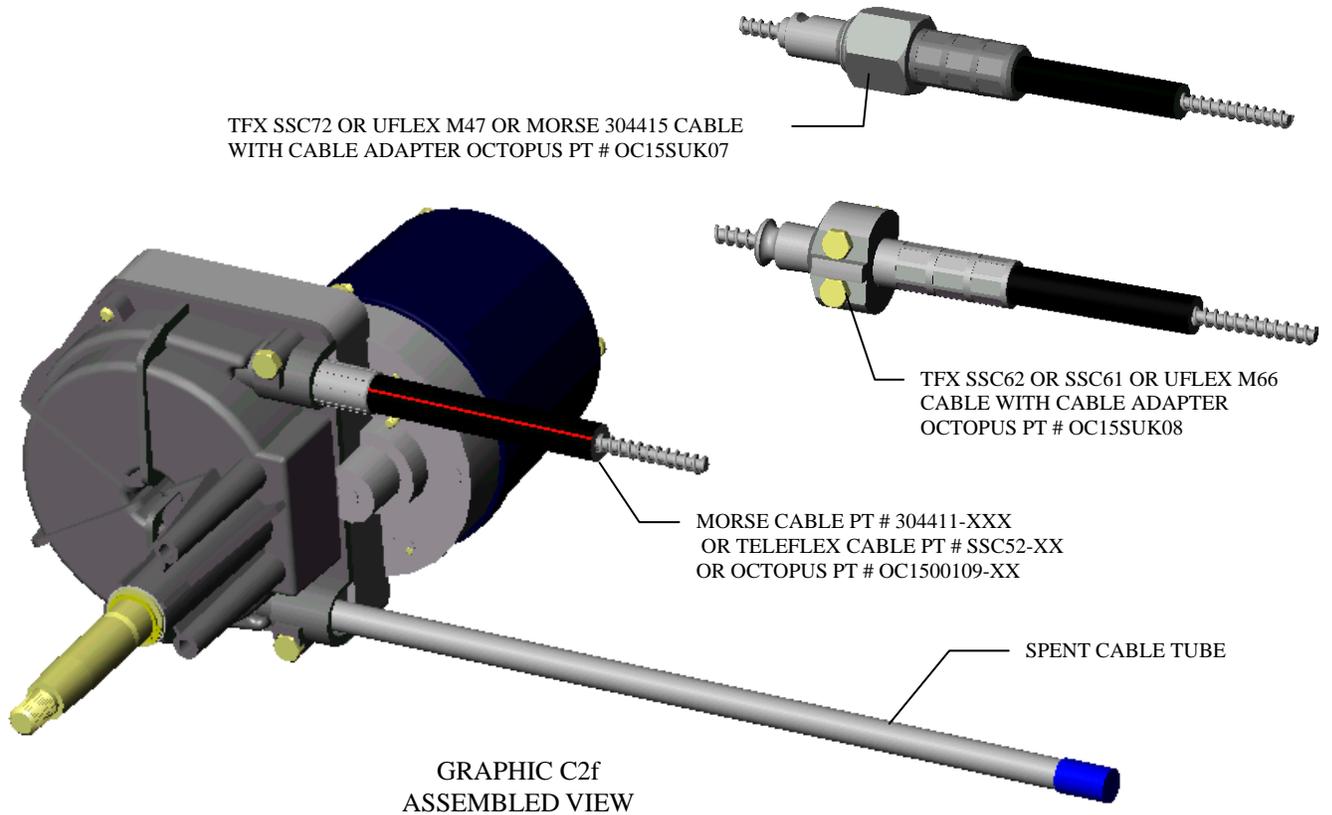


C2e - GRAPHIC

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

C2 STEP 2 – Cable Head Detail Graphics (Continued)

C2f STEP 2 – Typical Cable Head to Helm Installation Graphic



OCTOPUS PRECISION PRODUCTS - VANCOUVER CANADA

TEL 604 940 2010 - FAX 604 952 2650 – www.octopusmarine.ca – www.octopus europe.com

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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.

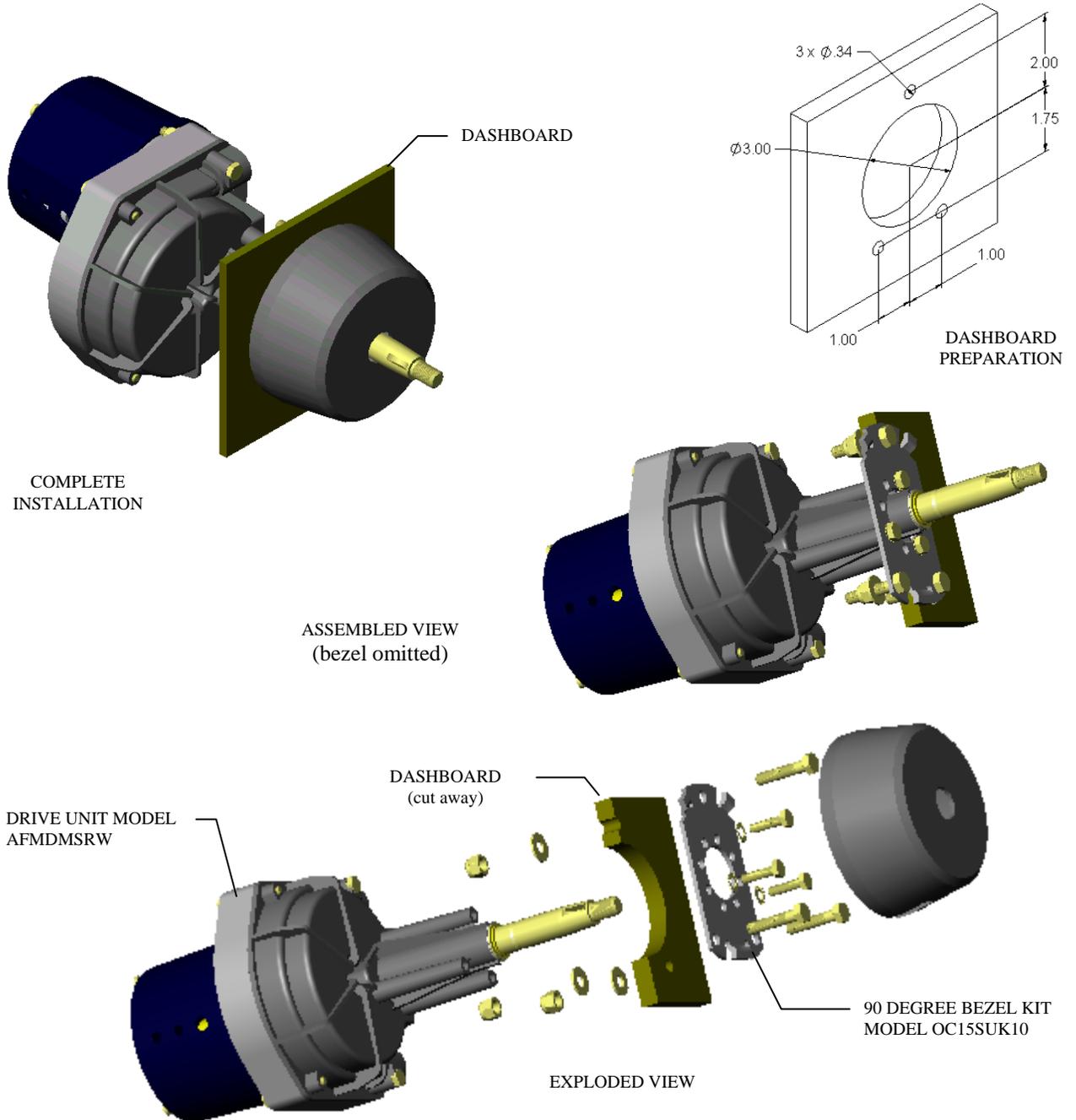
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

D2 STEP 3 – Dashboard Mounting Style Detail Graphics

D2a TYPE S – STRAIGHT SHAFT: Morse 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 E3 on page 19 for additional selection information



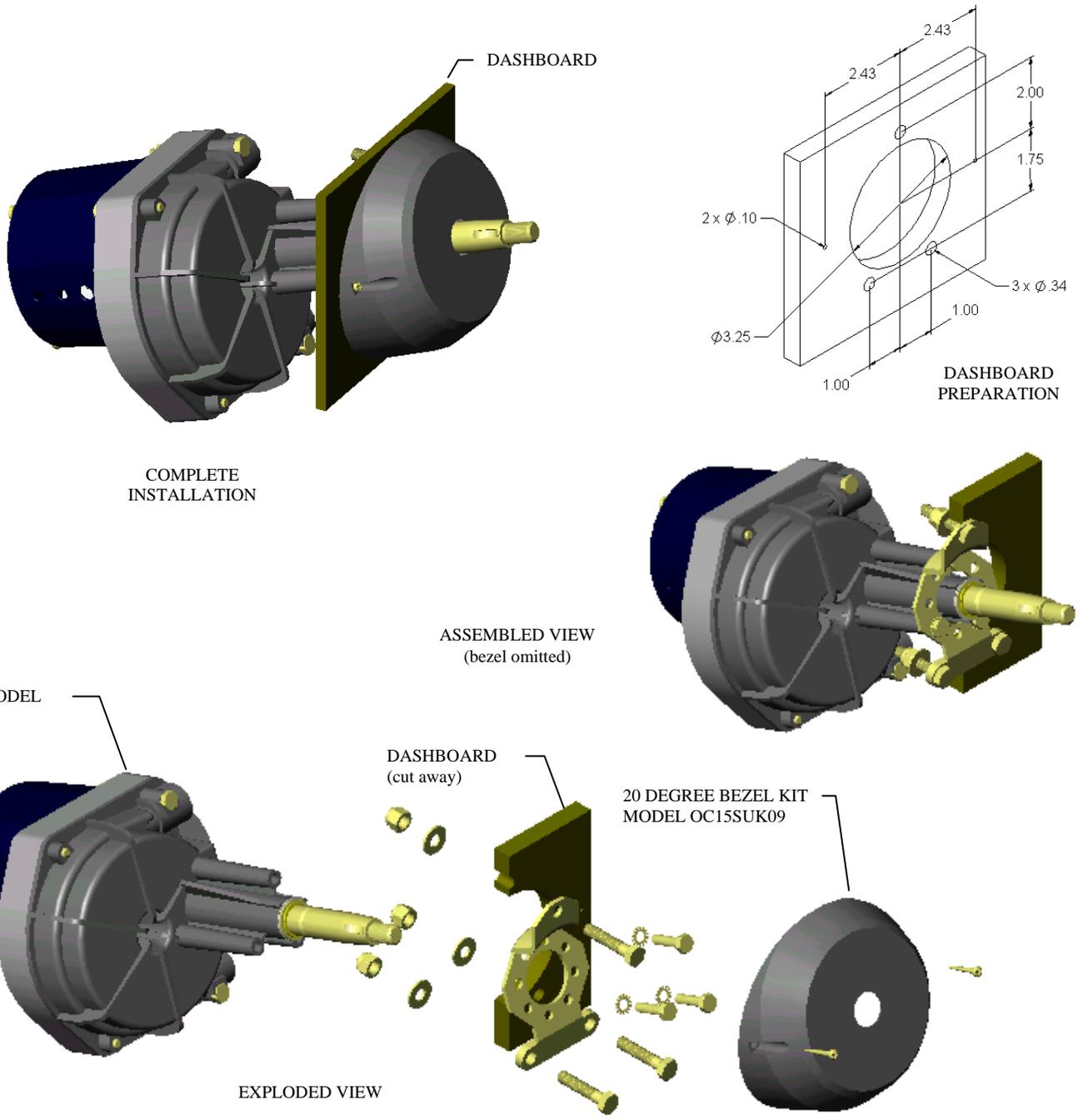
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

D2b TYPE S – STRAIGHT SHAFT: Morse 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 E3 on page 19 for additional selection information



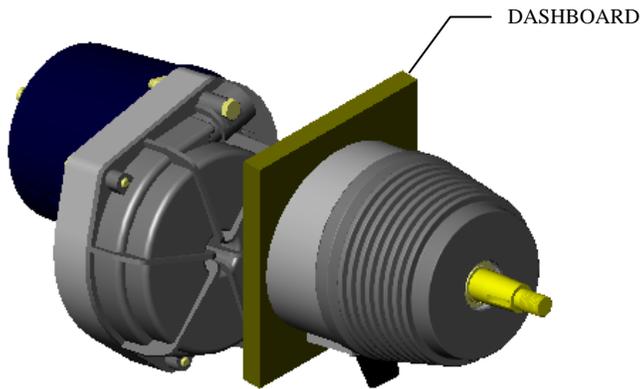
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

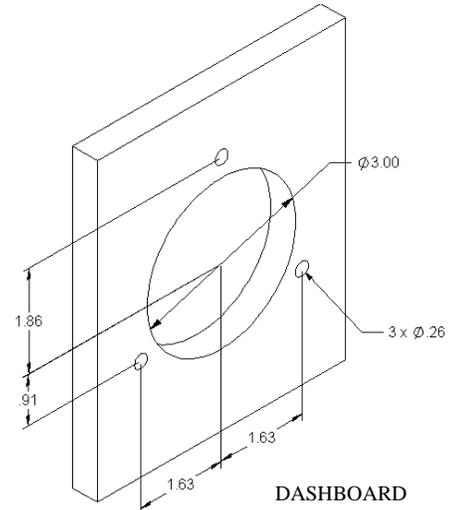
D2c. TYPE T – TILT SHAFT: TFX Performance Tilt Mechanism

REQUIRED PARTS:

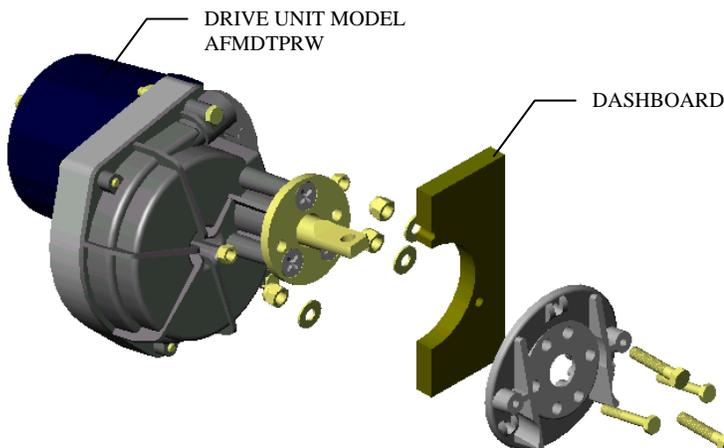
- a. Octopus Part Number AFMDTPRW (TFX Performance tilt drive unit)
- b. Octopus Part Number OC15SUK06A thru E (rudder feed back kit)
See section E3 on page 19 for additional selection information
- c. Teleflex Performance Tilt Mechanism (supplied by end user)



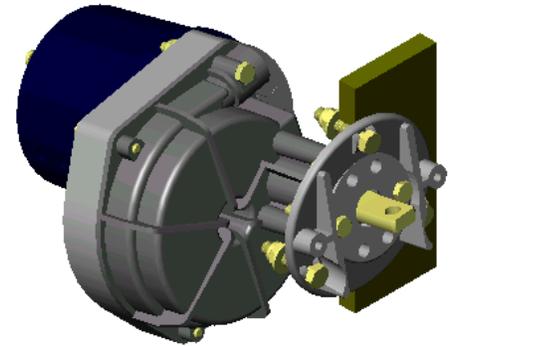
**COMPLETE
INSTALLATION**



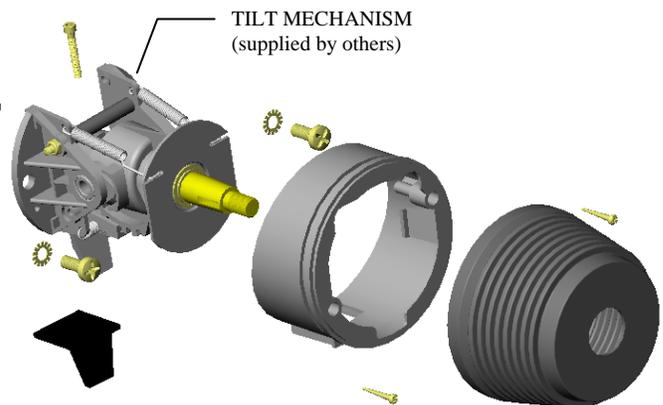
**DASHBOARD
PREPARATION**



EXPLODED VIEW



**ASSEMBLED VIEW
(tilt mechanism omitted)**



**TILT MECHANISM
(supplied by others)**

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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 17 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 4 thru 7 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 8 thru 10 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 13 thru 15 for further details.

FRICITION 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 16 for further details.

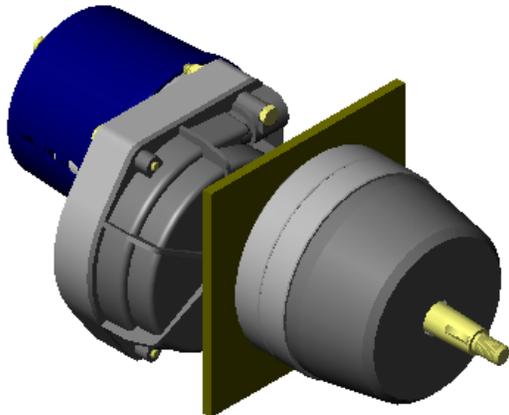
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

E2. STEP 4 – Accessory Selection Detail Graphics

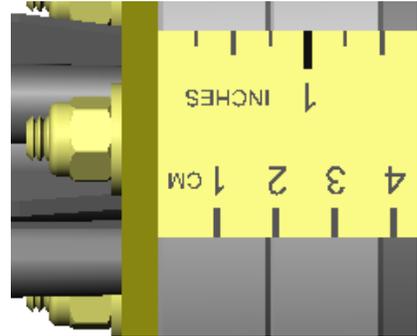
E2a. Type S - Straight Shaft 90 degree Mount with Helm Spacer

REQUIRED PARTS:

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

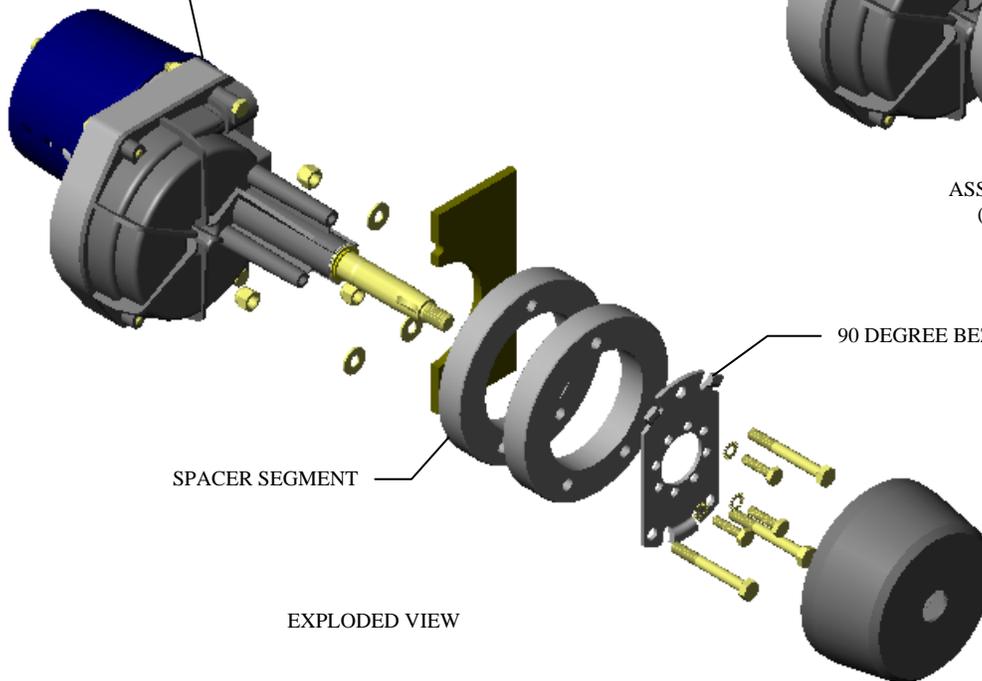


COMPLETE INSTALLATION

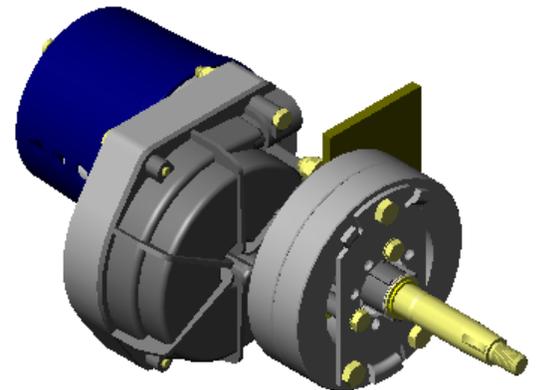


MAX THICKNESS = 1.5 INCHES
 OR 38mm (2 SPACERS)

DRIVE UNIT MODEL
 AFMDMSRW



EXPLODED VIEW



ASSEMBLED VIEW
 (bezel omitted)

90 DEGREE BEZEL KIT

SPACER SEGMENT

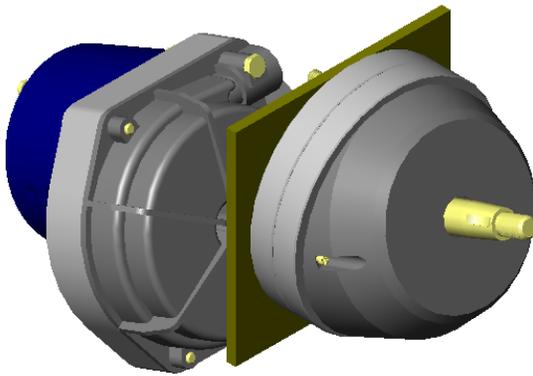
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

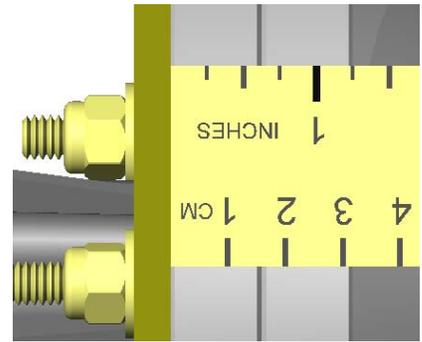
E2b. Type S - Straight Shaft 20 degree Mount with Helm Spacer

REQUIRED PARTS:

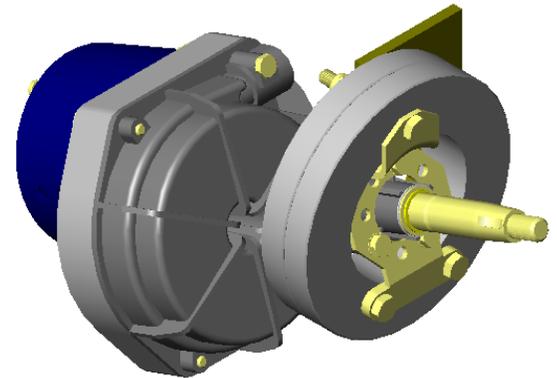
- a. Octopus Part Number OC15SUK17 (20 degree mount spacer kit)



COMPLETE INSTALLATION



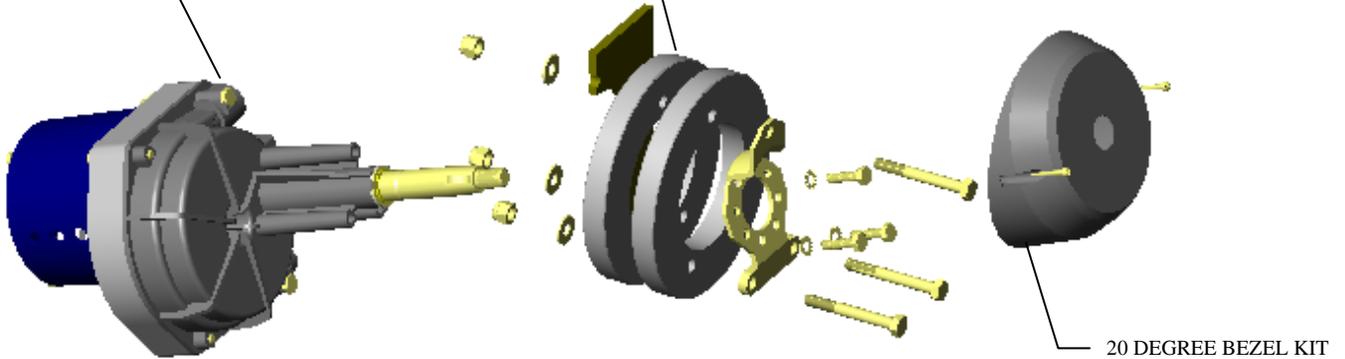
MAX THICKNESS = 1.25 INCHES
OR 32mm (2 SPACERS)



DRIVE UNIT MODEL
AFMDMTRW

SPACER SEGMENT

ASSEMBLED VIEW
(bezel omitted)



EXPLODED VIEW

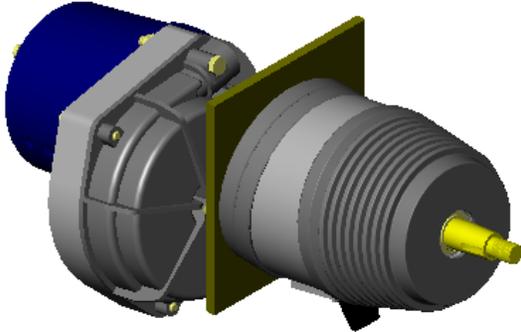
SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

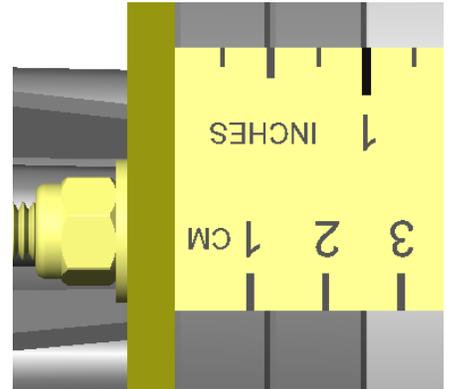
E2c. Type T - Tilt Shaft for TFX Performance Tilt Mechanism with Helm Spacer

REQUIRED PARTS:

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

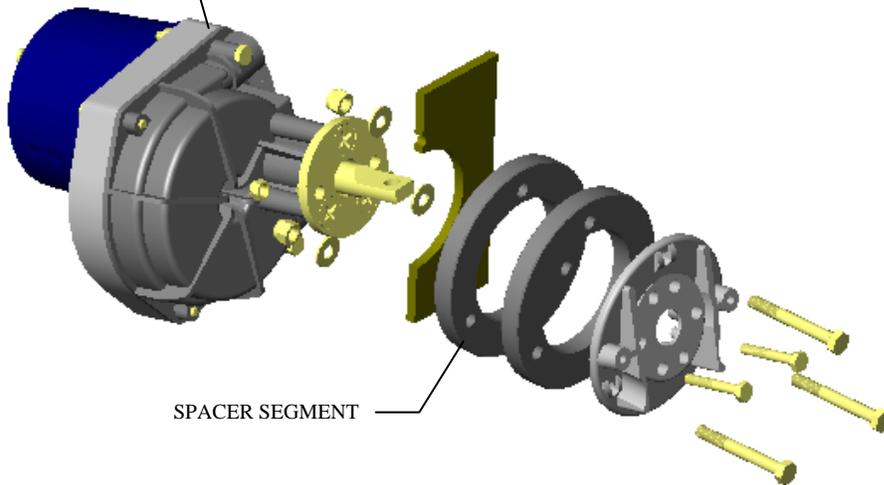


COMPLETE INSTALLATION



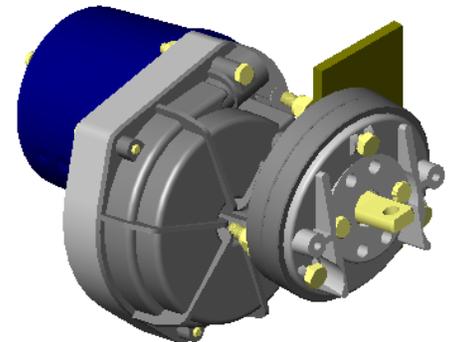
MAX THICKNESS = 1.0 INCHES
OR 25mm (2 SPACERS)

DRIVE UNIT MODEL
OCTAFMDTPRW



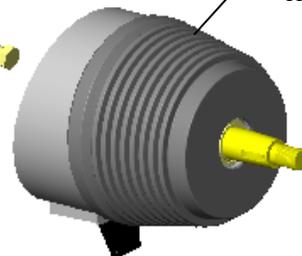
SPACER SEGMENT

EXPLODED VIEW



ASSEMBLED VIEW
(tilt mechanism omitted)

TILT MECHANISM



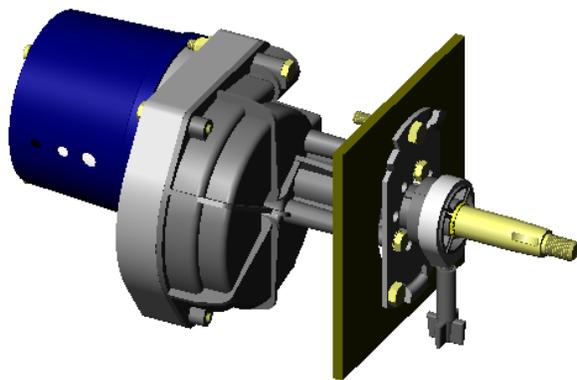
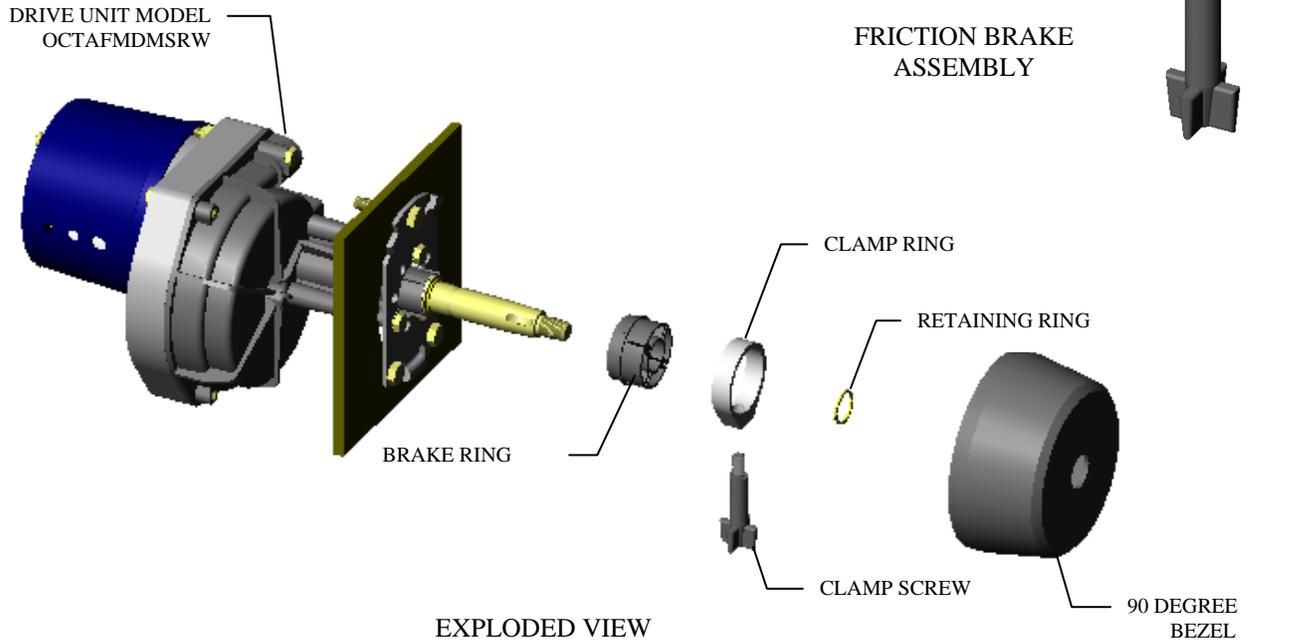
**SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING**

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

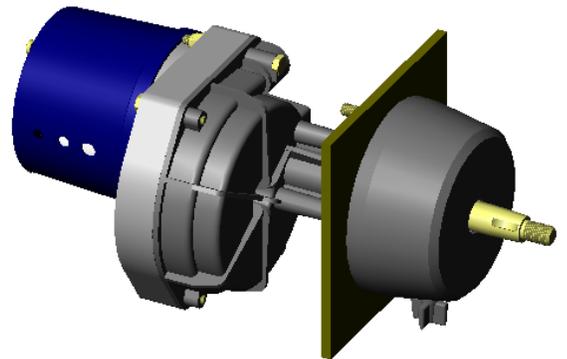
E3 FRICTION BRAKE

REQUIRED PARTS:

- a. Octopus Part Number OC15SUK11



COMPLETE
INSTALLATION
(bezel omitted)



COMPLETE
INSTALLATION

SELECTION & INSTALLATION GUIDE (continued)
AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

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

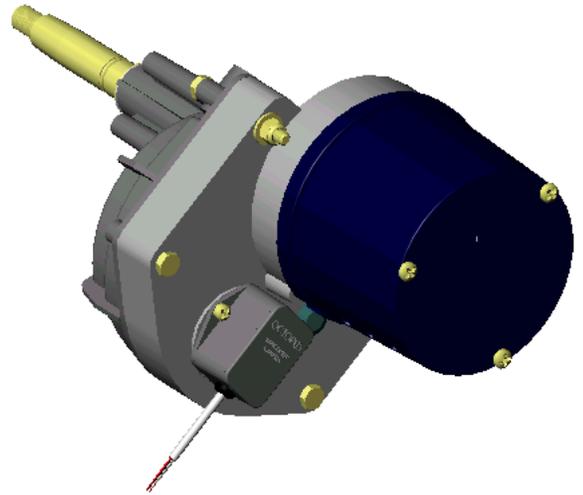
E4 RUDDER FEED BACK MODULE

REQUIRED PARTS:

- a. Octopus Part Number OC15SUK06A THRU F

MECHANICAL CALIBRATION PROCEDURE

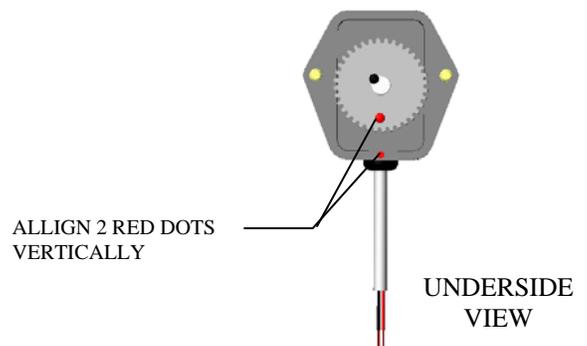
1. Before installing the drive unit into the vessel, disassemble the RFB module from the drive housing, by removing 2 attach screws.
2. Install the drive unit into the vessel and install the remote steering cable following the drive installation guide.
3. Complete the electrical hook up of the drive 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



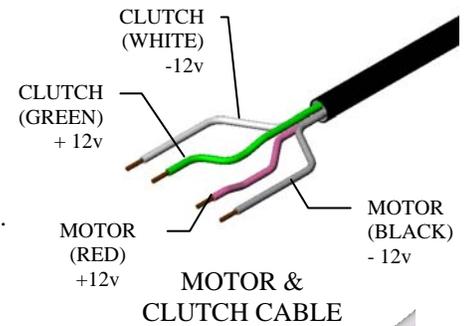
UNDERSIDE VIEW

SELECTION & INSTALLATION GUIDE (continued) AUTOPILOT DRIVE UNIT – TYPE S & T – DASHBOARD MOUNTING

F1 Electrical Hook Up

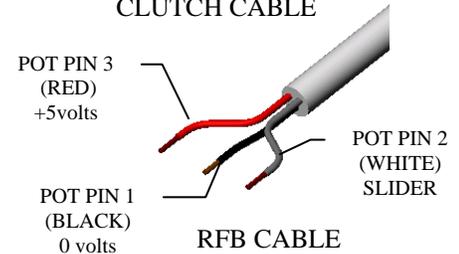
F1a Motor and Clutch Power Supply Cable

- i. Following Auto Pilot manufacturers installation guide and wiring diagram, connect 4 x 16 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.



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 H	
	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		