



**TYPE S & T BEHIND DASH  
DRIVES FOR CABLE STEERED  
POWER BOATS**

**INSTALLATION MANUAL**

OC15347

## Revision History

Revision	Description
<b>NEW</b>	First Edition
<b>A</b>	Second Edition
<b>B</b>	Deleted OC15SUK09 20' and OC15SUK17 20'
<b>C</b>	Updated per CMP DCR # 2461
<b>D</b>	Third Edition

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# CONTENTS

<b>A</b>	<b>Introduction</b>	
A1	System Overview . . . . .	4
A2	Compatibility . . . . .	4
<b>B</b>	<b>Mechanical Installation</b>	
B1	Available Space - Physical Envelope & Orientation . . . . .	5
B2	Cable Compatibility . . . . .	6
	<i>B2a Morse 304411-xxx or Teleflex SSC52-xx</i> . . . . .	6
	<i>B2b Teleflex SSC61-xx or Teleflex SSC62-xx</i> . . . . .	6
	<i>B2c Uflex M66-xx</i> . . . . .	7
	<i>B2d Morse 304415-xxx, Teleflex SSC72-xx or Uflex M47-xx</i> . . . . .	7
B3	Type S Straight Shaft Drive . . . . .	8
	<i>B3a Mounting Kits</i> . . . . .	8
	<i>B3b Fitting The Drive Unit</i> . . . . .	9
	<i>B3c Electrical Installation</i> . . . . .	12
	<i>B3d Spacer Kits</i> . . . . .	13
B4	Type T Tilt Steering Drive . . . . .	14
	<i>B4a Mounting Kits</i> . . . . .	14
	<i>B4b Fitting The Drive Unit</i> . . . . .	14
	<i>B4c Electrical Installation</i> . . . . .	17
	<i>B4d Spacer Kit</i> . . . . .	18
B5	Replacing Steering Cable . . . . .	19
	<i>B5a Cable Length Calculation</i> . . . . .	19
	<i>B5b Running New Steering Cable</i> . . . . .	20
B6	Installing the Wireless Controller . . . . .	21
B7	Friction Brake . . . . .	21
<b>C</b>	<b>Appendix</b>	
C1	Accessories . . . . .	22
C2	General Maintenance Guide . . . . .	22

## A INTRODUCTION

### A1 System Overview

The IntelliSteer Type S and Type T Remote Drives are rotary drives designed to replace the existing steering helm on powerboats with mechanical push-pull cable steering and work in conjunction with the IntelliSteer Wireless Steering System. As the drive units are concealed behind the dash they give a neat, professional installation.

The two models incorporate a drive motor and solenoid clutch and are suitable for both straight shaft (Type S) and adjustable steering rake (Type T) configurations.

### A2 Compatibility

- The drives are recommended for use on boats with a maximum speed of 40mph (65km/h) and should not be fitted to boats which can exceed this.
- The drives should not be fitted to boats where the engine max horsepower exceeds the max horsepower rating for the boat as stated on the boat manufacturer's tag.
- The drive unit either replaces or is used in conjunction with common brands of mechanical rotary and rack & pinion steering helm units. The drive is based on the Morse 290 rotary helm unit and accepts Morse 304411 and Teleflex SSC52 rotary cables without modification. If the boat is fitted with any of the following systems:

***Teleflex Safe T or Teleflex Big T  
Uflex T71, Uflex T73NR or Uflex T81***

a cable adapter, included with the drive, must be fitted to the cable before installing the drive.

- If the boat has a rack and pinion type steering system (or other brands of rotary system), the drive can be used, but the steering cable must also be replaced with a Morse 304411 or Teleflex SSC52.
- The drive is designed to produce a maximum cable push/pull of 300lbs (136kg), which makes it suitable for the vast majority of cable steered boats. However some boats 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 drive will steer boats that do not require more than a 15lb force on the rim of a 14in diameter steering wheel to hold a course, this equals 105in-lb of torque. If the steering wheel input torque exceeds this figure it is recommended that a hydraulic linear actuator drive system is used.
- If the existing steering system is a NFB (non feedback) type, the Type S and T drives can be fitted, but it is **strongly** advised that the helmsperson is formally familiarized with the different operational characteristics of the new helm.

## B MECHANICAL INSTALLATION

When planning the installation, it is recommended that the following are considered:

- Ensure there is adequate space available to accommodate the drive.
- Determine the compatibility of the existing steering cable and select the appropriate cable adaptor if required.
- Select the appropriate dashboard bezel kit and determine whether helm spacers are needed.
- Determine whether any additional accessories are needed.

### B1 Available Space - Physical Envelope & Orientation

The depth required behind the dashboard for the drive will vary slightly depending upon the drive type and mounting style used, but all require around 10in (250mm) clearance. If sufficient depth is not available it may be possible to re-route wiring harnesses or move components etc. Additional clearance can also be gained using spacers - see sections B3c (Type S) or B4c (Type T) for further details.

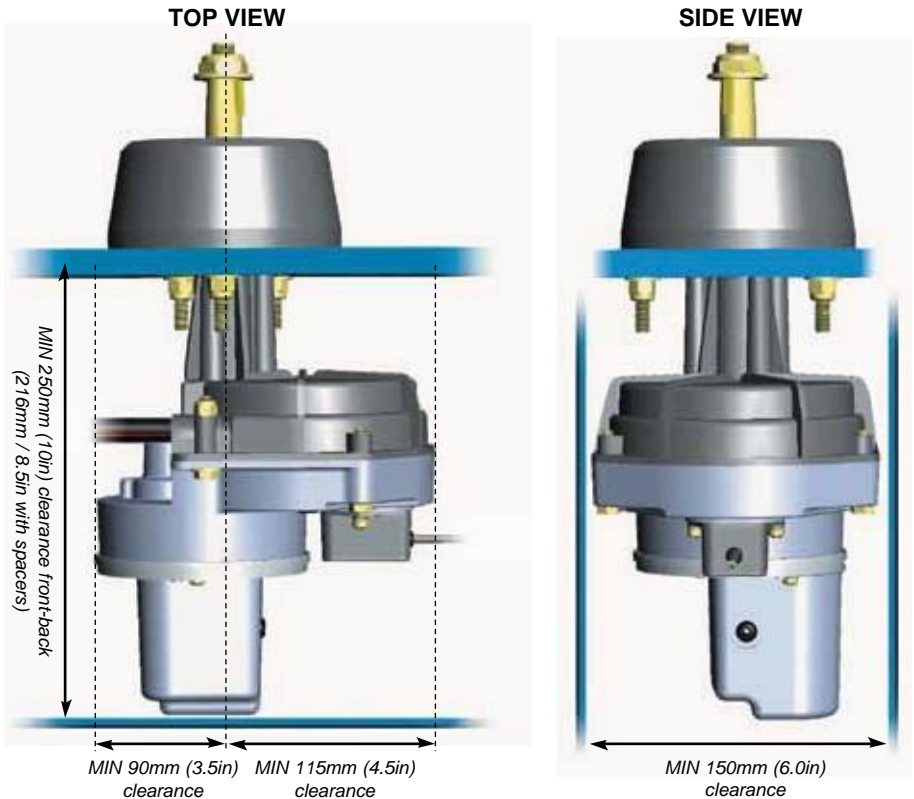


Fig B1 - Physical drive envelope

**B2 Cable Compatibility**

The Type S and Type T drives are based on the Morse 290 rotary helm unit which accepts **Morse 304411** and **Teleflex SSC52** rotary steering cables. Cable adapters are available to accept rotary steering cables from other popular manufacturers.

- If you are unsure of the make/model of steering cable fitted to the vessel, the part number and length of the cable is usually printed on the cable outer casing near to the tiller/engine connection. Using either the cable part number or by comparing the outer cable head detail with the diagrams in sections B2a - B2d, establishes if a cable adaptor is required.
- If the existing steering system is a rack and pinion type then the steering cable must be replaced with a Morse 304411 or Teleflex SSC52 rotary steering cable, see section B5a for instructions on calculating the cable length.

**B2a Morse 304411-xxx or Teleflex SSC52-xx (x = length in feet)**

If the boat is fitted with either of these cable types then it can be connected directly to the drive - no cable adaptor is required.

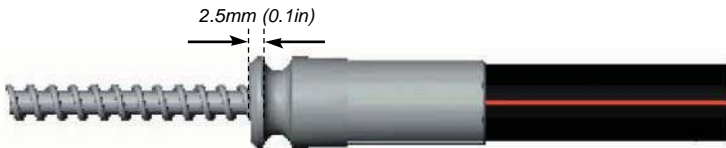
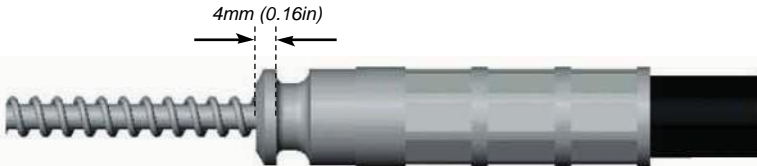


Fig B2 - Morse 304411 and Teleflex SSC52 steering cable

**B2b Teleflex SSC61-xx or Teleflex SSC62-xx (x = length in feet)**

Use cable adaptor **OC15SUK08**.

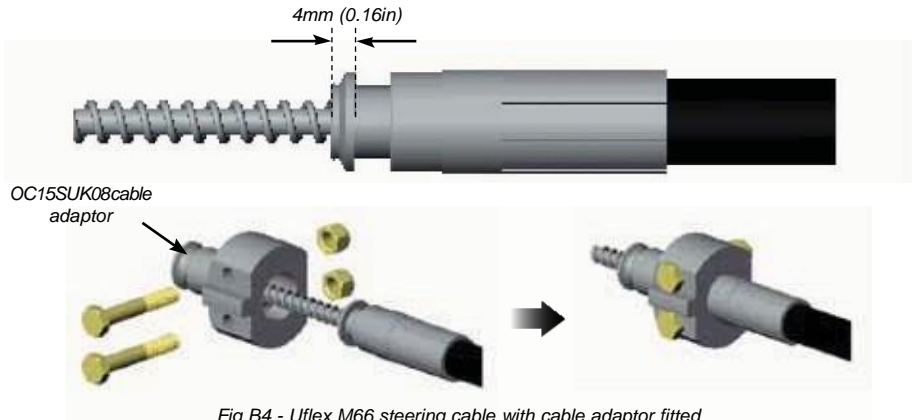


OC15SUK08 cable adaptor

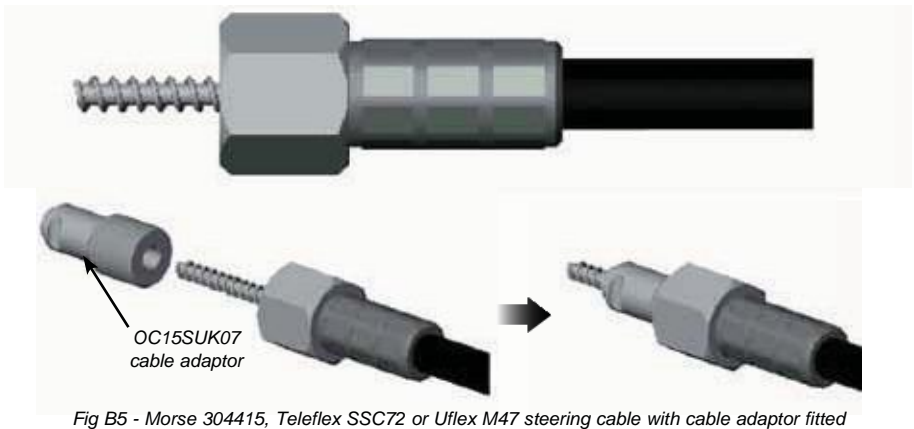


Fig B3 - Teleflex SSC61 or SSC62 steering cable with cable adaptor fitted

**B2c Uflex M66-xx (x = length in feet)**  
Use cable adaptor **OC15SUK08**.

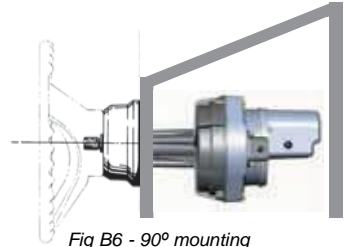


**B2d Morse 304415-xxx, Teleflex SSC72-xx or Uflex M47-xx (x = length in ft)**  
Use cable adaptor **OC15SUK07**.



**B3 Type S Straight Shaft Drive**  
**B3a Mounting Kit**

- **90° Bezel Kit OC15SUK10:** This kit is used when the steering wheel is mounted 90° to the dashboard (Fig B6).



*Fig B6 - 90° mounting*

Spacer kits are also available to reduce the space required behind the dashboard if required. See section B3c for further details.



**B3b Fitting The Drive Unit**

- Remove the existing steering helm.

- i) Remove the steering wheel.

- ii) Unbolt and remove the helm unit\*. If the existing steering is rack and pinion the pinion will need to be unbolted from the rack before it can be removed.

*\* Depending on the boat layout and accessibility to the space behind the dashboard, it may be more convenient to remove the steering cable **before** unbolting the existing manual helm and to refit the steering cable **after** the drive has been mounted to the dashboard, rather than the order of installation given in these instructions.*

- Prepare dashboard to receive drive bezel plate. Refer to Fig B8 or use the bezel plate as a template for the mounting holes that will need to be drilled.

- i) Care must be taken not to damage any electrical wiring or throttle cables behind the dashboard when drilling - if necessary tape these out of the way temporarily.

- ii) If it is necessary to enlarge the existing steering shaft hole in the dashboard for the drive unit, clamp a piece of wood over the hole as a guide for the hole saw. This will ensure that the hole is cut accurately and the hole saw doesn't jump while drilling, which could scratch or damage the dashboard.

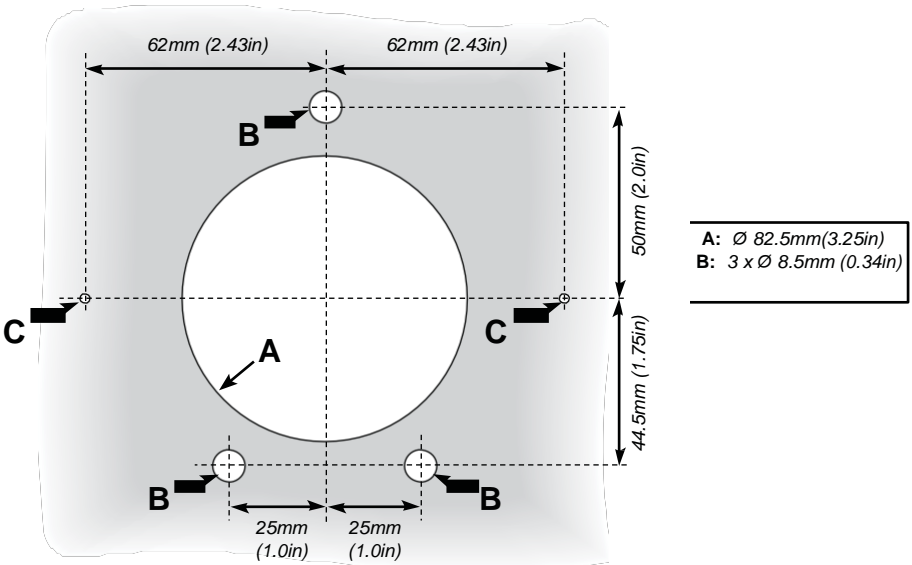


Fig B8 - Mounting holes for 90° bezel plates

- Fit the bezel plate to the dashboard (Fig B9).

- Use the 3 x 5/16 nuts, bolts and washers supplied with the kits.
- Ensure that the nuts, bolts and washers are fitted in the correct order - the washers should be between the nuts and the rear of the dashboard.
- Do not fit the plastic bezel cover at this stage.

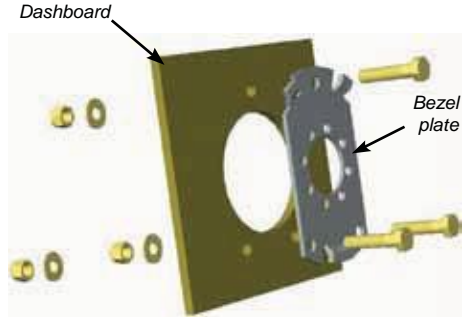


Fig B9 - 90° bezel plate fitted to dashboard

- Remove the steering cable from the helm unit (Fig B10).

- Make a careful note of both the orientation of the helm unit and which side of the helm that the cable is inserted - if this is refitted incorrectly the steering will work in reverse.
- Unfasten the retaining bolt or locking nut (depending on cable type) at the cable entry port.
- Pull the cable retaining collar away from the helm unit.
- The inner cable can be wound out by turning the steering shaft (it may help if the wheel is refitted).

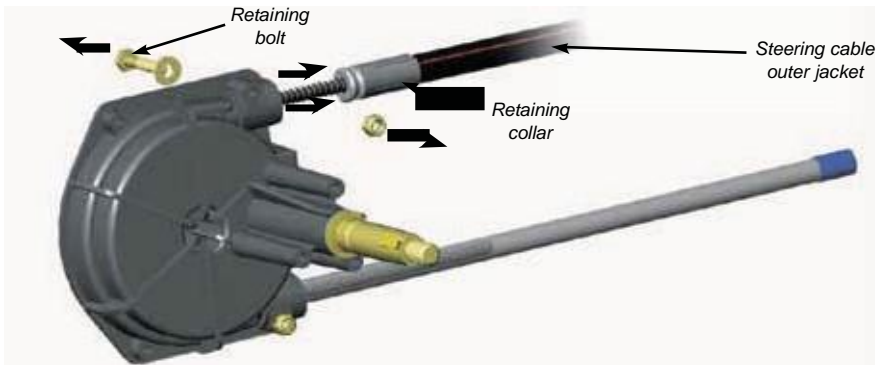


Fig B10 - Remove steering cable from existing manual helm

- Fit the steering cable (Fig B11).
  - i) Fit cable adaptor to cable (if required).
  - ii) Apply a thin coat of marine grade grease to the exposed section of the cable.
  - iii) Insert the steering cable into the drive port. Using moderate force, guide the inner cable around the driving hub and out of the opposite port.
  - iv) Push the cable jacket into the port until the retaining collar butts against the drive housing. Turn the steering shaft to wind the cable into the drive - it may help to fit the wheel in order to do this.
  - v) Insert lock bolt to hold cable in place.
  - vi) If undue force is required to insert the cable, this may be caused by the end of the inner cable fouling the outer face of the nylon guide. If this is the case, remove the cable and inspect for sharp edges. If possible, twist the cable so that the sharp edge is towards the inside of the radius, or use a file or burr type tool to remove the sharp edges.
  - vii) Fit the spent cable tube to the opposite port and insert the lock bolt.
  - viii) Fit washers & nuts to both lock bolts, tighten & torque to 40-45in-lbs (4Nm).

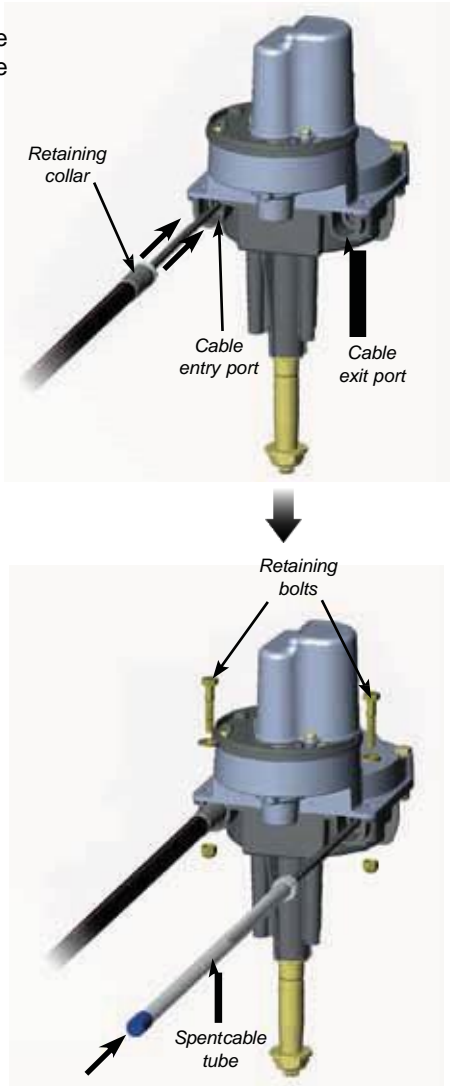
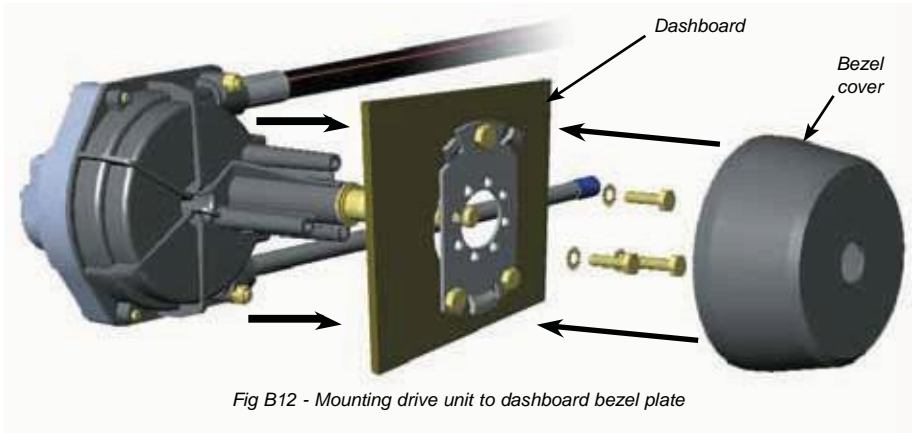


Fig B11 - Fitting steering cable and spent cable tube to drive unit

- Fit the drive unit to the dashboard.
  - i) Position the drive unit behind the dashboard and bolt it to the bezel plate using the 3 x 1/4" bolts supplied (Fig B12). Tighten and torque to 3-35in-lbs.
  - ii) Fit the plastic cover\* over the bezel plate.  
\* This is a snap fit.
  - iii) Insert the locating key ("Woodruff Key") into the recess on the steering shaft and refit the steering wheel.



- Check the installation
  - i) Rotate the wheel fully from lock to lock to check that the steering works smoothly across its full range and that it is steering in the right direction.
  - ii) If the rudder moves in the opposite direction to the wheel, the cable has been inserted into the drive unit the wrong way and needs to be inserted in the other port - swap the cable and take-up tube over.

**B3c Spacer Kits**

If there is not the required 250mm (10in) clearance behind the dashboard for the Type S drive unit, this can be reduced with the use of spacer kits (Fig B13).

- **90° Mount Spacer Kit OC15SUK16:** This kit is for use in conjunction with the OC15SUK10 90° Bezel Kit only. Each spacer segment reduces the required depth by 19mm (0.75in) and a maximum of two spacer kits can be used on an installation for a maximum depth reduction of 38mm (1.5in).

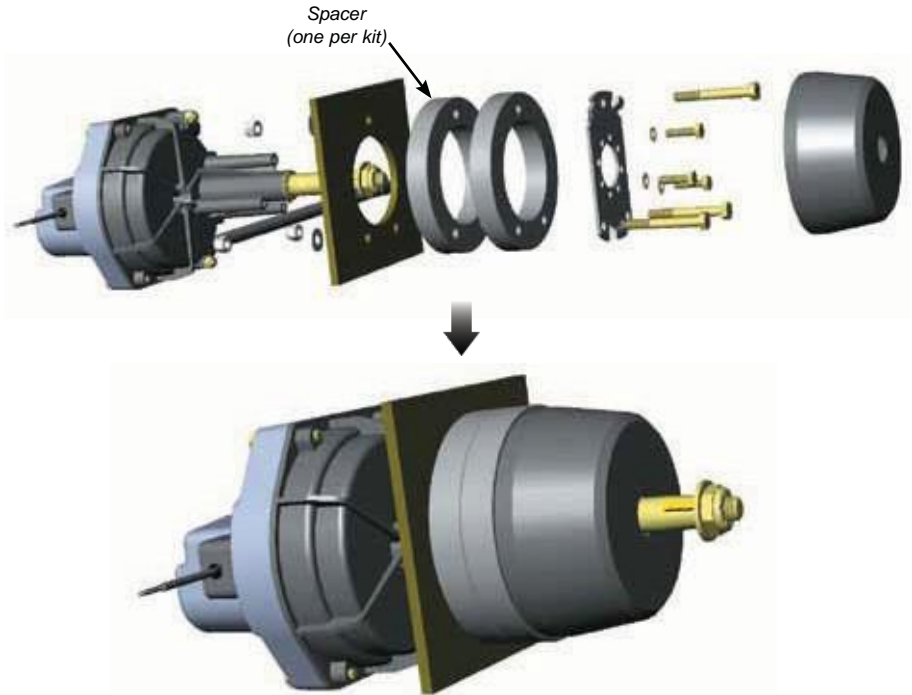


Fig B13 - Using spacer kits to reduce the required clearance behind the dashboard

**B4 Type T Tilt Steering Drive**

**B4a Mounting Kit**

The Type T drive package includes a dashboard mount bezel which is designed to connect to a Teleflex Performance Tilt mechanism (not supplied)

A spacer kit is also available to reduce the space required behind the dashboard if required. See section B4c for further details.

**NOTE:** Please contact IntelliSteer Technical Support regarding retrofit components available for using the Type T drive with older Morse, Teleflex or Uflex tilt systems.

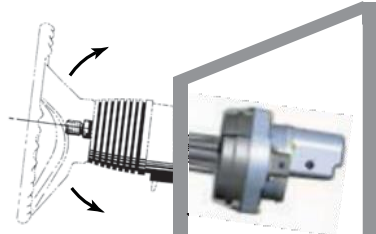


Fig B14 - Tilt steering (TFX Performance Tilt Mechanism)

**B4b Fitting The Drive Unit**

- Remove the existing steering helm.
  - i) Remove the steering wheel and the tilt mechanism.
  - ii) Unbolt and remove the helm unit\*. If the existing steering is rack and pinion the pinion will need to be unbolted from the rack before it can be removed.
 

*\* Depending on the boat layout and accessibility to the space behind the dashboard, it may be more convenient to remove the steering cable **before** unbolting the existing manual helm and to refit the steering cable **after** the drive has been mounted to the dashboard, rather than the order of installation given in these instructions.*
- Refer to Fig B15 for the required hole centres to fit the tilt mechanism mounting plate. As the plate is designed to fit a standard TFX tilt mechanism the existing holes should be correct.

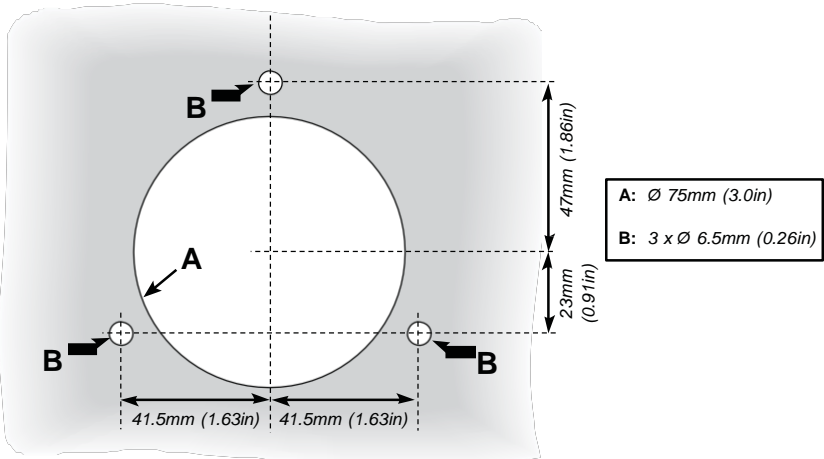


Fig B15 - Mounting holes for modified tilt mechanism mounting plate

- Fit the modified tilt mechanism mounting plate supplied with the Type T drive to the dashboard (Fig B16). This part replaces the existing mounting plate which is discarded.

- Use the 3 x 5/16in nuts, bolts and washers supplied with the kit.
- Ensure that the nuts, bolts and washers are fitted in the correct order - the washers should be between the nuts and the rear of the dashboard.
- Do not fit the tilt mechanism at this stage.

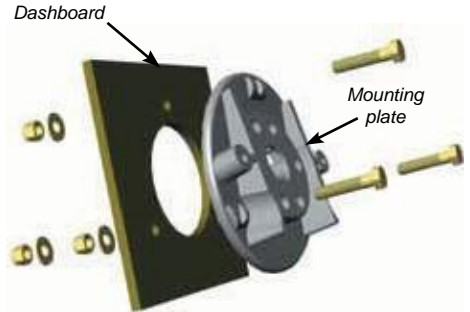


Fig B16 - Tilt bezel plate fitted to dashboard

- Remove the steering cable from the helm unit.
  - Make a careful note of both the orientation of the helm unit and which side of the helm that the cable is inserted - if this is refitted incorrectly the steering will work in reverse.
  - Unfasten the retaining bolt or locking nut (depending on cable type) at the cable entry port.
  - Pull the cable retaining collar away from the helm unit
  - The inner cable can be wound out by turning the steering shaft (it may help if the wheel is refitted).

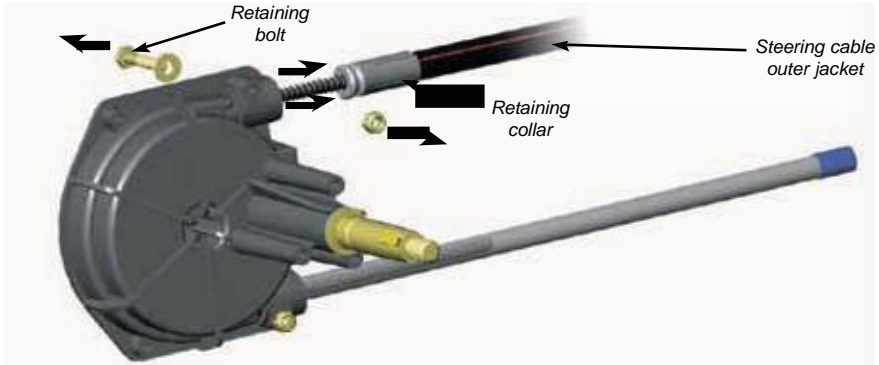


Fig B17 - Remove steering cable from existing manual helm

- Fit the steering cable (Fig B18).
  - i) Fit cable adaptor to cable (if required).
  - ii) Apply a thin coat of marine grade grease to the exposed section of the cable.
  - iii) Insert the steering cable into the drive port. Using moderate force, guide the inner cable around the driving hub and out of the opposite port.
  - iv) Push the cable jacket into the port until the retaining collar butts against the drive housing. Turn the steering shaft to wind the cable into the drive - it may help to fit the wheel in order to do this.
  - v) Insert lock bolt to hold cable in place.
  - vi) If undue force is required to insert the cable, this may be caused by the end of the inner cable fouling the outer face of the nylon guide. If this is the case, remove the cable and inspect for sharp edges. If possible, twist the cable so that the sharp edge is towards the inside of the radius, or use a file or burr type tool to remove the sharp edges.
  - vii) Fit the spent cable tube to the opposite port and insert the lock bolt.
  - viii) Fit washers & nuts to both lock bolts, tighten & torque to 40-45in-lbs (4Nm).

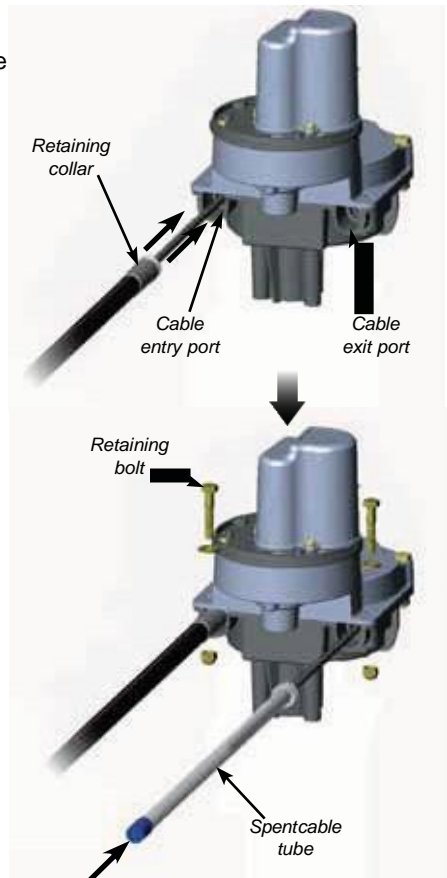
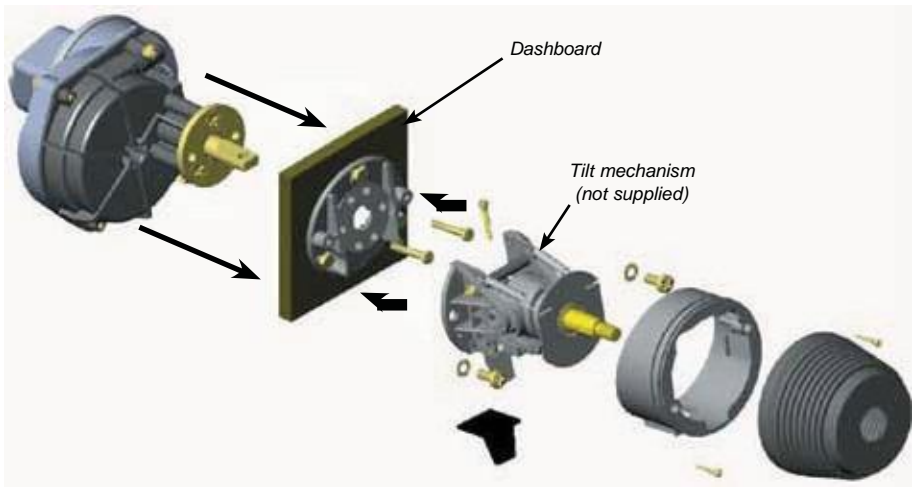


Fig B18 - Fitting steering cable and spent cable tube to drive unit



- Fit the drive unit to the dashboard.
  - i) Position the drive unit behind the dashboard and bolt it to the bezel plate using the 2 x 1/4x1.5 bolt supplied (Fig B19). Tighten and torque to 30-35in-lbs.
  - ii) Fit the tilt mechanism to the bezel plate using the fixings supplied with the tilt mechanism. Tighten and torque to 30-35in-lbs.
  - iii) Ensure the locating key (“Woodruff Key”) is fitted into the recess on the steering shaft and refit the steering wheel.



*Fig B19 - Mounting drive unit to dashboard bezel plate*

- Check the installation
  - i) Rotate the wheel fully from lock to lock to check that the steering works smoothly across its full range at all tilt angles and that it is steering in the right direction.
  - ii) If the rudder moves in the opposite direction to the wheel, the cable has been inserted into the drive unit the wrong way and needs to be inserted in the other port - swap the cable and take-up tube over.

**B4c Spacer Kit**

If there is not the required 250mm (10in) clearance behind the dashboard for the Type T drive unit, this can be reduced with the use of spacer kits (Fig B20).

- **Spacer Kit OC15SUK18:** This kit is for use in conjunction with the Type T Drive bezel plate only. Each spacer segment reduces the required depth by 12.5mm (0.5in) and a maximum of two spacer kits can be used on an installation for a maximum depth reduction of 25mm (1.0in).

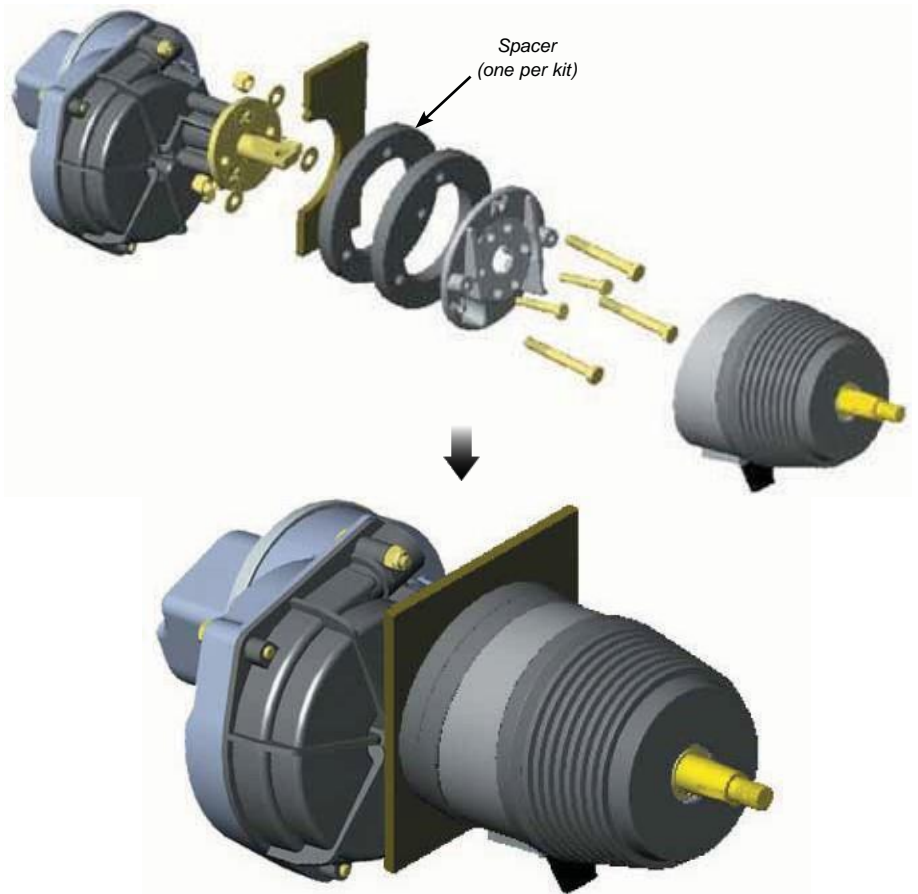


Fig B20 - Using spacer kits to reduce the required clearance behind the dashboard

**B5 Replacing Steering Cable**

Depending on the existing manual steering system fitted to the boat, it may be necessary to replace the steering cable with a type that is compatible with the Type S / Type T drive (either a **Morse 304411-xxx** or **Teleflex SSC52-xx**).

Although the replacement cable will ideally follow the same route as the existing cable, for optimum steering performance - whether under autopilot or steering manually - consideration must be given to the following points:

- i) The chosen route should use the minimum possible number of bends.
- ii) If any bends are necessary, maximize the bend radius as much as possible. It is recommended that bends have a radius of no less than 6in (150mm) and that the combined total angle of all bends is no more than 270°.

**B5a Cable Length Calculation**

Use a length of rope or electrical cable to plan out the steering cable route and then measure the total length required (Fig B21):

**(‘A’ Dimension + ‘B’ Dimension + ‘C’ Dimension) – 8in for 2 x 90° bend**

Round up the result to the nearest full foot size and then refer to section D1 for the appropriate custom cable order code.

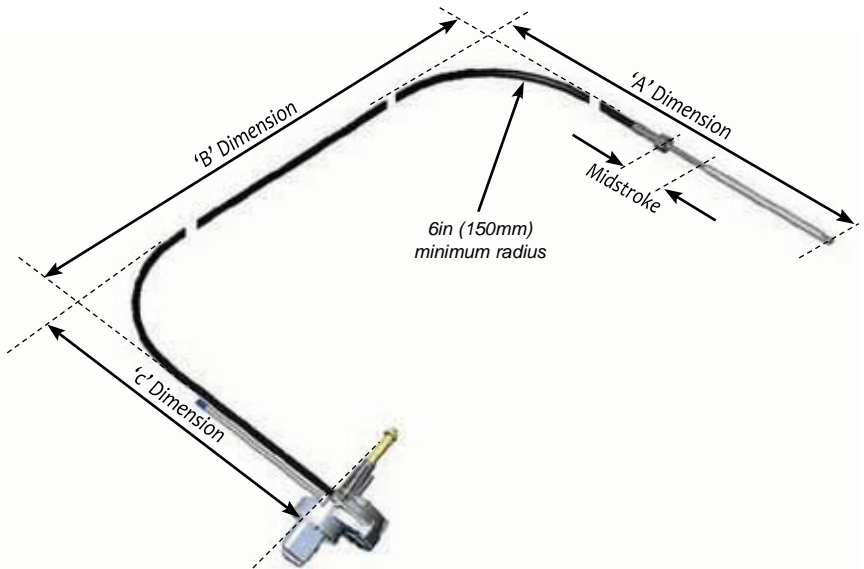


Fig B21 - Preferred cable routing

**B5b Running New Steering Cable**

The accessibility of the steering cable run will depend on the size of the boat - on smaller boats the cable is usually easily accessible, but larger boats may run the cable through ducts that are more difficult to access.

- Changing the cable will be easier if a tag line (or "mouse") is attached to the end of the existing cable before it is removed. This can be used to pull the new cable through.
- Use a strong line for the mouse that will not snap easily, but is thin enough to pass down the duct behind the cable.
- Tie the mouse securely to the cable and use tape to reinforce the joint. Pull the cable through from the rudder end while feeding the mouse line from the steering end. When the old cable has been removed, attach the mouse to the new cable and use it to pull it back through from the rudder end.

Attach the new cable to the steering arm of the boat by pulling out the cotter pin and clevis pin to release the old steering shaft and replacing it with the new steering shaft. Line up the shaft with the steering arm by turning the steering wheel and re-insert the cotter and clevis pins Fig B22.

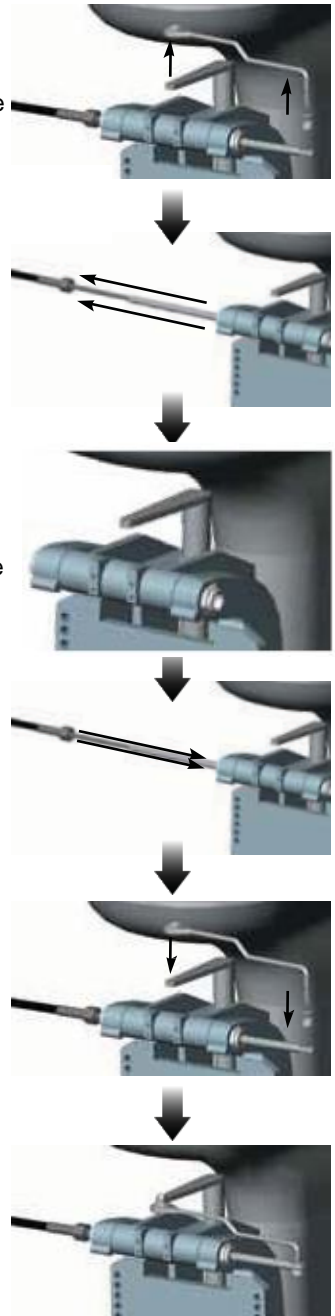


Fig B22 - Replacing steering cable - rudder end



**B6 Electrical Installation**

The wire connection between MDR and IntelliSteer Wireless control receiver is shown below:

Remote receiver Wire color	MDR Wire color	Description
Blue	Red*	Motor Drive
Green	Black	
Orange	White	Motor Clutch
Purple	Green	
Red	n/a	Power 12V+
Black	n/a	Power 0V-
Yellow	n/a	Course Computer Drive Output +
Yellow/Green	n/a	Course Computer Drive Output -
Brown	n/a	Course Computer Clutch 1
Pink	n/a	Course Computer Clutch 2

\*Red is standard color. However, it may look like pink due to the variation of different manufacture.

**Note:** For a standalone drive installation, the four Course Computer Wires (Yellow, Yellow/Green, Brown and \*UH) are not used, and should be wrapped with electrical tape and secured.

**C APPENDIX**  
**C1 Accessories**

Included		OC15SUK10	90 degree Bezel Mounting Kit – for Type S Straight Shaft Drive
		OC15SUK07	Steering Cable Adapter Kit - for TFX SSC72 – Uflex M47 – Mores 304415
		OC15SUK08	Steering Cable Adapter Kit - for TFX SSC62 – Uflex M66
Available for Purchase		OC15SUK16 OC15SUK18	Spacer Kit x 19mm for - 90° Bezel Mounting Kit (Type S) Spacer Kit x 13mm - for TFX Performance Tilt Mechanism (Type T)
		OC15109-6 OC15109-9 OC15109-12	Standard Steering Cable x 6 foot long Standard Steering Cable x 9 foot long Standard Steering Cable x 12 foot long

**C2 General Maintenance Guide**

- Check the complete steering system and all fixings for security and integrity after a few hours of operation and at frequent intervals.
- Inspect all parts periodically for corrosion. Any parts affected by corrosion must be replaced.
- Periodically remove the cable, clean the connector tube and thoroughly lubricate with a waterproof grease. Inspect the cable for cracks, splits or other damage. DO NOT cover cracks in the cable outer sheath with tape or other sealant; this will only delay a failure of the cable. Always replace the cable.
- When replacing fixings, self-locking nuts must always be used.



# ***IntelliSteer***

W I R E L E S S   S T E E R I N G

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