

# Teleflex Marine Steering

## Safe Steering

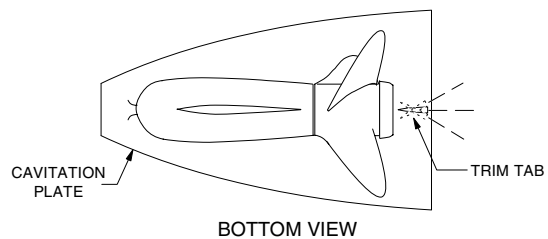
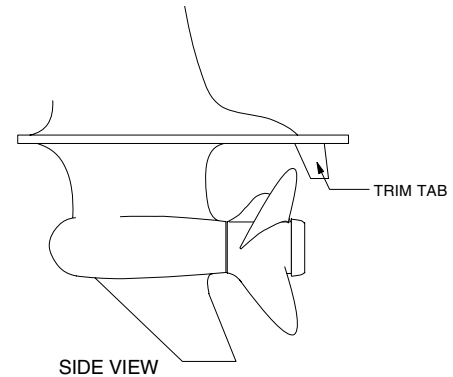
**All Teleflex Marine steering systems exceed A.B.Y.C. safety standards as well as ISO/I.M.C.I./N.M.M.A. certification requirements, and feature corrosion-resistant materials.**

**Because steering forces vary considerably in the variety of boat and motor combinations available, selection of the most appropriate system is critical.**

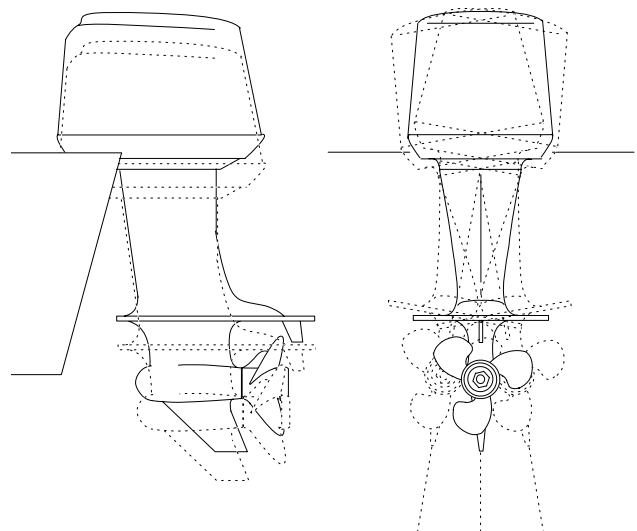
**Teleflex will provide assistance in this when requested. When making a steering system selection, the following critical areas must be considered:**

1. The combination of boat speed and engine horsepower exert varying loads on steering systems. Engine horsepower must not exceed maximum horsepower rating of the boat.
2. Some high performance boats/engine combinations develop instability at high speed. Instability becomes more prevalent in boats faster than 50 MPH. Dual-cable mechanical steering or SEASTAR PRO® systems are recommended by Teleflex and engine makers for these boats.
3. Corrosion and build up of dirt or salt deposits at the point of the cable connection to the engine will lead to stiff operation and possibly complete seizure. It is necessary to periodically remove cable from the engine, clean both cable output end and tilt tube thoroughly, lubricate with waterproof grease, and reassemble correctly. Together with regular cleaning and lubrication, Teleflex **Cable Gard™** helps prolong cable life by keeping lubrication in and dirt out. We recommend it for all engines with tilt tubes.
4. The routing of a steering system should be chosen to minimize bends and kinks. Obstructions, sharp edges, and/or chaffing must be completely avoided.

**All boats should be water tested to ensure safe, dependable operation. The trim tab setting and engine tilt position are critical for safe steering of outboard motors. The engine maker's manual gives instructions for the correct settings. These must be followed and all boats should be water tested to confirm these settings for safe and dependable steering.**



**Correct adjustment of the trim tab on the motor and engine tilt is essential. Follow motor manufacturer's instructions.**



**The mounting position of the outboard can affect steering loads and boat handling. Follow motor manufacturer's instructions.**

# What to Consider when selecting Steering

## *When Replacing Steering, Try to Retain the Type Originally Installed on the Boat:*

**Generally, it is a good practice to replace a steering system with one of the same type: rotary with rotary (i.e. SAFE-T®), rack with rack (i.e. THE RACK™), hydraulic with hydraulic (i.e. SEASTAR®), etc. Use a steering system with the same number of steering wheel turns lock-to-lock as the original system.**

This insures the boat continues to perform in maneuvers as designed and makes installation of the replacement system as simple as possible.

**Changing the type of steering on a boat requires some careful consideration.** Your steering system was selected by the boat builder based on the following criteria:

- **Fit:** steering components accommodate dash design and splashwell dimensions.
- **Performance:** meets manufacturer's performance specifications.
- **Value:** quality products supplied by a reliable, experienced company that stands behind them.



Any change from the original steering system may affect the handling and feel of the boat. In addition, installation may be further complicated by modifications needed to accommodate components for which the boat was not originally designed.

## *Steering Technology Has Improved!*

With systems such as Teleflex mechanical No-FeedBack (NFB™) High Performance Steering (HPS®) and the hydraulic SeaStar® and SeaStar Pro®, marine steering technology has advanced significantly compared to the available options of just a few years ago.

Upgrading the system to NFB or SeaStar is recommended for all non-power-assisted outboards. SeaStar Pro is recommended for all high speed single outboards (55-75 MPH). Upgrading to HPS or SeaStar is recommended for small boats with power-assisted steering. The same general rule applies: replace rotary with rotary, rack with rack, hydraulic with hydraulic, etc.

For that reason, Teleflex offers many different NFB and SeaStar systems: there is one to match the type and number of turns for nearly every marine steering system ever made (except rope and pulley, of course).

## *What if The Driver Wants Easier (or More Responsive) Steering?*

A driver may want faster response or lower steering effort. NFB, SeaStar and HPS offer **upgrade paths** to either increase steering response or reduce steering effort.

*(continued on next page)*

# Teleflex Marine Steering

When changing steering, **water test the boat after installation** to ensure safe, dependable operation. Using caution, the driver should gradually become familiar with the new steering system as some handling characteristics of the boat may change.

## Response vs. Effort:

**Steering wheel effort is directly proportional to the number of wheel turns lock-to-lock.**

The number of wheel turns lock-to-lock is dependent on these factors:

### Mechanical systems:

- The gear ratio of the helm. Numerically higher gear ratio = more wheel turns with less effort. Lower gear ratio = less wheel turns with higher effort.

### Hydraulic systems:

- The displacement of the helm pump. Higher helm displacement = less wheel turns/faster response with more effort. Less displacement = more wheel turns.
- The volume of the cylinder. More cylinder volume = more wheel turns with less effort. Less volume = less wheel turns with higher effort.

### Other factors that can influence steering effort are:

- Allowable movement of engine, rudder or drive unit.
- Vessel speed.
- Type of engine (outboard, stern drive, inboard).
- Unusual propeller selections.
- Hull type (i.e., displacement, planing, etc.).

**All boats should be water tested to ensure safe, dependable operation!**

### A BALANCING ACT:

**More wheel turns lock-to-lock = less steering effort, slower response**

**Less wheel turns lock-to-lock = more steering effort, faster response**

## Why So Many Different Types of Steering?

The great variety of boats dictate this: the steering system which is right for a 14-foot runabout with a 50 H.P. engine, would not be right for a 25-foot offshore fishing boat equipped with two 200 H.P. engines. Marine steering can be divided into three major types:

- Mechanical (cable) steering
- Hydraulic Steering
- Power-Assisted Steering

## Mechanical Steering Designs:

**Mechanical cable steering is durable and reliable and comes in two main forms, each of which has advantages in specific applications. They are:**

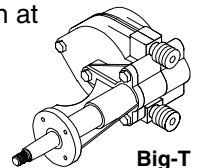
- Rotary (cable wraps around a gear).
- Rack & Pinion (cable attached to rack gear moved by a pinion).

All mechanical steering systems except Big-T are for single station use only.

### Rotary Steering (2 types):

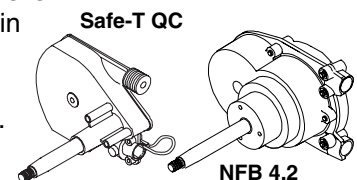
Various Rotary helms are available, each resulting in a different number of lock-to-lock steering wheel turns. All Teleflex helms feature a unique mounting plate that allows installation at several angles to accommodate the many space constraints which occur behind all dashboards. Most versions are available with No FeedBack (NFB) technology.

NFB is recommended for all outboards and stern drives *without* power-assisted steering. HPS and Safe-T QC are offered for most boats with power-assisted steering. Big-T is a good choice for small inboards, especially those with twin stations. There are two main rotary helm designs:



Big-T

**Reduction Gear Type:** (one or more gears mesh externally with the drum to move the helical core of the steering cable). This is the best rotary design in terms of strength and efficiency as there are usually only two gears. The one drawback is that the helm shaft must be placed outside the cable drum, resulting in a fairly large round helm behind the dash. These helms often cannot be used in small dashboards.



Safe-T QC

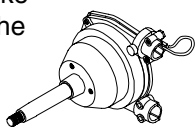
NFB 4.2

## an introduction to mechanical & hydraulic steering

The original, time-proven Teleflex helms such as Big-T®, Easy-T® and Safe-T® were designed with reduction gears, resulting in simple, efficient gearboxes. With smaller, more crowded dashboards came the need for a more compact helm, thus one with planetary gears to save space.

**Planetary Gear Type:** (three or more gears mesh internally with the cable drum to move the helical core of the steering cable). This is an alternative rotary design whose purpose is to take up the least possible space behind the dash, useful in boats with small dashboards and/or instruments clustered right around the wheel.

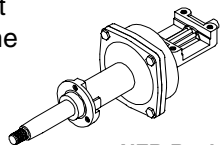
The drawbacks to the planetary gear design are the many wear points and more accumulated backlash (free play or "slop") from four or more gears meshing versus two (typically) in a reduction gear helm. Teleflex does not offer a planetary gear helm for outboard engines larger than V-4.



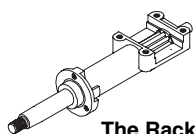
Safe-T II

### Rack and Pinion (1 type):

There is only one kind of Rack and Pinion. A pinion gear hobbled directly into the helm shaft engages a rack gear in a tubular housing. Rack and pinion steering is the most efficient mechanical approach to moving the cable. The major drawback is that it requires a long tubular rack housing and cannot fit behind many dashboards. Teleflex rack mounting allows installation of the rack tube at several different angles, but because it is very long, there is not as much mounting flexibility as with rotary helms. The Rack (without the NFB feature) is offered for most boats with power-assisted steering.



NFB Rack



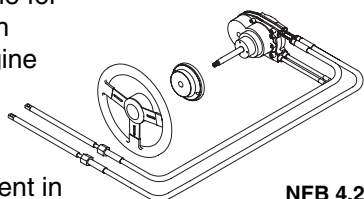
The Rack  
(new "back  
mount" type)

### Dual (Twin) Cable Systems:

All mechanical steering systems rely on a push-pull cable to do the work of moving the engine or rudder. The efficiency of the system depends on the efficiency of the cable. By virtue of their design, all cables have some backlash or lost motion.

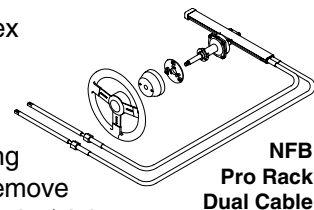
While this is acceptable for most boats, some high performance boat/engine combinations develop instability at high speed. Instability becomes more prevalent in boats faster than 50 MPH.

Dual cable (or SeaStar PRO) steering



NFB 4.2  
Dual Cable

is recommended by Teleflex and engine makers for these boats. Dual cable steering allows adjustment at the engine of one steering cable versus the other to remove most of the backlash (free play) inherent in even the best mechanical systems. This reduction of backlash helps minimize engine flutter and the resulting handling instability.



NFB  
Pro Rack  
Dual Cable

### Hydraulic Steering Designs:

A SeaStar® hydraulic system is the most comfortable and efficient approach to steering a boat. It is durable and reliable, with a smooth, positive response at the wheel. Several helm displacements and cylinder options are available (except for SeaStar PRO®), allowing a choice in the number of steering wheel turns to suit boat handling characteristics and individual driving preferences. All hydraulic systems exceed A.B.Y.C. safety standards and ISO/I.M.C.I./N.M.M.A. certification requirements and are constructed with high quality corrosion-resistant materials. **Hydraulic steering is offered in two main forms:**

#### Manual (helm pump moves cylinder directly).

These are available in two line systems (SeaStar) and three-line systems (Hynautic). The advantage of a three-line system is remote fill; the drawback is a more complicated installation and maintenance. The advantage of a SeaStar 2-line system is incredible reliability and simplicity; the drawback is that you have to be really careful not to spill when you add oil because you fill at the helm.

Some high performance boats develop instability at high speed, becoming more prevalent in boats faster than 50 MPH. SeaStar PRO (or dual-cable mechanical steering systems) are recommended by Teleflex and engine makers for single-engine boats with these handling characteristics. SeaStar PRO features special helm valving to maintain equivalent line pressures, which reduces the free-play (or deadband) at the wheel, reducing steering instability at high speeds.

#### Power Assist (mechanical cable or hydraulic helm moves servo, which directs pressurized fluid from a pump to the steering cylinder).

Power assisted steering is the easiest to operate. It is essential in many larger boats. The hydraulic helm type is preferred as it offers unmatched reliability, an easy autopilot interface and superior manual back-up steering. SeaStar Power Steering is a hydraulic helm type of system which is designed for larger vessels.