



Bow Installation Guide

Introduction

This guide covers the installation of a DockStar Smart Thruster to the bow of a boat. For stern thruster installations, please see the “Stern Installation Guide”.

Not all boats are suitable for mounting the Smart Thruster on to their bows. The Smart Thruster should not be mounted to the bow of a boat that travels at more than 8 knots. Bow installations are intended strictly for displacement hulls. However, the Smart Thruster is well suited as a stern thruster on high speed boats as well as displacement boats.

Some boats have features that are not compatible with Smart Thruster bow installations. These features include:

- Boats with short bow lengths and wide bow sprits. The wide bow sprit does not allow for sliding the Smart Thruster’s shaft up above the deck level. The short bow length then does not allow raising the Smart Thruster motors far enough above the water. There should be at least 2.5 feet of clearance between the retracted Smart Thruster motors and the water line.
- Boats with bob stays. Bob stays don’t allow the Smart Thruster motors to slide down the bow.
- Boats with interfering anchors. Normally anchors do not present a problem, but some anchor installations present too large of an obstacle to properly raise the Smart Thruster.

The boat owner must determine whether there is adequate clearance to enable the Smart Thruster to slide up sufficiently above the water line and to slide down sufficiently to place the motors deep enough in the water. For bow installations, the motors should be at least 12 inches under water when deployed. Stern thrusters only require 8 inches. This guide gives some ideas on how to mount the Smart Thruster for a variety of bow configurations.

Getting Started

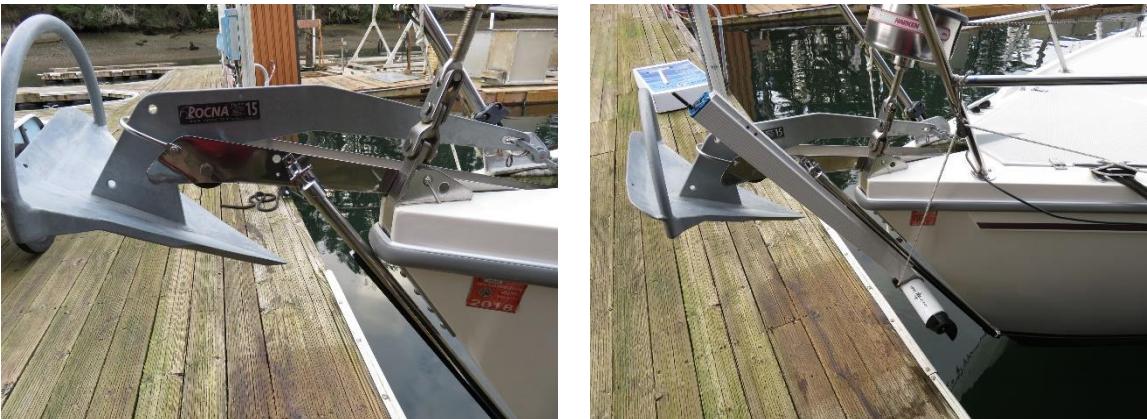
The Smart Thruster is mounted to the bow of your boat by first mounting a stainless tube and T-track assembly to your hull and then sliding the Smart Thruster up and down on this T-track. The T-track assembly is mounted to the hull at the top and bottom of the Stainless tube using deck hinge fixtures.

A mounting plan should be developed to suit the needs of the particular boat. There are really only five questions that need to be answered:

1. **Where is the top mounting fixture going to be located?** This could be to the side of an anchor roller, the bottom of an anchor roller, the side of a narrow bow sprit, the bottom of a bow sprit, or to the hull itself.

The following pictures are intended to show what some of the options are for locating the top fixture:





On this Catalina 36 above, the anchor roller is offset to the starboard side to avoid interference with the fore-stay. This allows the Smart Thruster to be mounted to the port side of the anchor roller and end up on the center line of the boat. Notice that clearance is required for the anchor, the anchor roller bail wire, and the boat's rub rail. Clearing these items is accomplished by proper placement of the top fitting. Fortunately, the Smart Thruster's shaft is small in cross sectional area so these objects are easily cleared in this example. Also notice that a standard deck hinge is used for the top fitting since it is mounted to a vertical surface.



For this Hunter 36 above, the owner never used his smaller port side anchor roller so he opted to mount his Smart Thruster inside the port side roller. The roller itself was removed to make room for this. He also chose to mount the top fixture to the bottom of the anchor roller so a swivel deck hinge was used as shown in the picture on the right.



In this example, the anchor in the starboard anchor roller was in the way. So the owner chose to mount the top fitting offset to port. Again this mounting also was to the bottom of the anchor roller so a swivel deck hinge was used. The slight offset to port is shown in the picture on the right. This does not interfere with the performance of the thruster and is not even noticeable unless you look for it.

In this Freedom 33 on the right, the anchor roller is mounted on top of a narrow bow sprit. There was not enough bow length to allow mounting the Smart Thruster to the bottom of the sprit, so it was mounted to the port side of the sprit. This results in a slightly crooked mount, but this does not affect the performance of the thruster.

Once the mounting location for the top fitting is determined, it is time to move on to the second question.



2. **Which mounting fixture is going to be used for the top mount?** There are two choices. If the top fitting is going to mount to be mounted to a horizontal surface such as the bottom of a bow sprit, then a swivel deck hinge is used. If the top fitting is going to be mounted to a vertical surface such as the side of an anchor roller or the hull then a standard deck hinge is used. The standard deck hinge mounted to a vertical surface is shown in the Catalina 36 pictures above. The swivel deck hinge mounted to a horizontal surface is shown in the Hunter 36 pictures above

See the pictures below for clarity:



Swivel deck hinge for horizontal surfaces



Standard deck hinge for vertical surfaces

3. **How far above the water line should the bottom fixture be mounted along the bow?** In all cases, a pivoting deck hinge is used to mount the bottom of the stainless tube to the hull. The center pivot point of the bottom mounting fixture is mounted to the center of the bow about 4 to 8 inches above the water line. Boats with a lot of bow curvature may require mounting closer to the 8 inch value. The goal is to mount the Smart Thruster low enough so that the motors are at least 12 inches under water. The motors extend down 22 inches below the center of the bottom mounting fixture. Remember to account for the loss of depth for bows with sloping bow lines. For example, a bow that slopes at 30 degrees will have the motors only 19 inches (not 22") below the center of the bottom mounting fixture. This is where that high school trigonometry comes in useful!

Below is what the bottom mounting fixture looks like and how it is mounted onto the bow:



Pivoting Hinge for the bottom



The pivoting hinge mounted to the hull

4. **How long should the Stainless tube be?** Once the positions of the top and bottom mounting fixtures are known, the length of the stainless tube can be determined. We need to proceed with the actual installation before this question can be fully answered.
5. **How long should the T-track be?** The T-track should be as long as possible so that the Smart Thruster can be raised up out of the water as far as possible. There are two strategies for figuring out how high up the T-track should go on the stainless tube. One is to make the top of the track short enough so that the Smart Thruster disengages from the track before the motors run into any obstacles. The other is to bring the T-track all the way to the top of the rail and to use the quick disconnect pin to release the top of the track assembly and pivot the track assembly away from the the obstacles to allow the Smart Thruster to be removed.

The pictures below shows these two strategies:



The picture on the left shows the thruster being disengaged from the T-track below where the motors would run into the anchor or anchor roller. Notice that the T-track does not extend all the way to the top of the stainless rail to allow this to happen. The picture on the right shows the T-track assembly un-pinned from the top fitting to allow the thruster to slide up off the track and avoid running into the anchors and anchor rollers. The track assembly is held up by a lanyard permanently mounted to the track assembly and to the anchor roller.

In normal usage, the Smart Thruster does not need to be removed form the track. It simply slides up and down the track as needed. However, occasionally it is desired to remove the thruster from the track (for winter storage for example).

Installation Steps

Once a mounting plan has been decided upon, it is time to actually start the installation. A number of components are provided to assist with the installation. These are shown in the photo below for the longer bow installation kit:



- At the top is an 8-32 threaded rod. This is used to insert the plastic nut holders.
- On the left is the yacht braid to be used for the lanyard.
- Below that is the block and sling for the lanyard.
- Going to the right and starting at the top is a hex wrench, a 3/16" drill bit, and a small bottle of thread lock.
- To the right of that are four 3"X10-32 flat-head screws with washers, backing plates, and nylock nuts.
- To the right of that are two end-cap nut holders and 6 nut holders (the short bow installation kit will only have 2 nut holders).
- To the right of that is a spring hook and a pad eye for the lanyard. Below that is a piece of steel conduit to be used to protect the stainless tube when cutting the T-track.
- Finally, at the far right are the mounting fixtures. At the top is a end-cap for the top of the stainless tube, a standard deck hinge, and a pivoting deck hinge with clevis end-cap for the the lower tube mount. The swivel deck hinge is not provided, but it is comonly available at many on-line marine parts stores (including Amazon).

DockStar offers two different lengths of T-track assemblies. The shorter T-track length is 49" mounted to a 64" stainless tube. The longer T-track length is 70" T-track mounted to 72" stainless tube.

Here's a picture of the shorter T-track assembly for a bow installation:



The bottom of the track assembly is on the left in this picture with the thruster track stop near the bottom.

Here's a picture of the longer T-track assembly:



The holes for the top screws of both T-track assemblies are not drilled. This is to allow the user to shorten the tubes and the T-track to suit the lengths required for her boat. The two versions support the following lengths of T-track:

Short T-track Assembly: 49", 46", 43"

Long T-track Assembly: 70", 67", 64", 61", 58", 55", 52"

The mounting holes for the T-track are on 3" centers. If the T-track needs to be shortened, it should be cut in increments of 3" so that the cut is made 0.5" from the top mounting hole. The Smart Thruster should have at least 12" of engagement with the T-track when it is fully retracted.

The actual installation steps are discussed next.

Step 1: Mount the lower mounting fixture. 3" X 10-32 screws, washers, and nylock nuts are provided to through-bolt the fixture to the hull. The interior of some bows are not flat. Delrin half-cylinders are provided to use as backing plates for these cases. Place the convex surface of the delrin half-cylinders toward the concave interior surface of the bow. Be sure to use sealant around the screws and under the fixture to prevent water incursion. On sharply rounded bows it may be necessary to use epoxy putty around the fixture to provide support.

Step 2: Mount the upper mounting fixture. Only drill a hole for one screw at this time. The second screw hole will be drilled once everything is assembled and aligned. Install the one screw and tighten it enough to hold the fixture tightly in place for the alignment step later.

Step 3: Determine the exact length of the stainless tube. Measure the distance between the lower rim of the upper end-cap and the upper rim of the lower end-cap. Add to that distance the inside depth of the upper end-cap and the inside depth of the lower end-cap. Typically, the depth of the lower end-cap is 1" and the depth of the upper end-cap is 1-1/8". So typically, you would add 2-1/8" inches to the distance between the two end-caps. Do not cut the tube yet.

Step 4: Determine the desired length for the T-track. The T-track can not be longer than the distance between the two end-caps, but it can be shorter (and typically is a bit). Generally, the T-track should be as long as what can fit between the two end-caps. However, it may need to be shorter to allow for removal of the Smart Thruster from the track as discussed in question 5 above. The length of the T-track is selected in increments of 3 inches. The cut should be made $\frac{1}{2}$ " above the last counter sunk hole.

Step 5: Cut the T-track to the desired length. Slide the piece of steel conduit around the stainless tube and under the T-track. Position the section of conduit under the T-track where it is to be cut as shown in

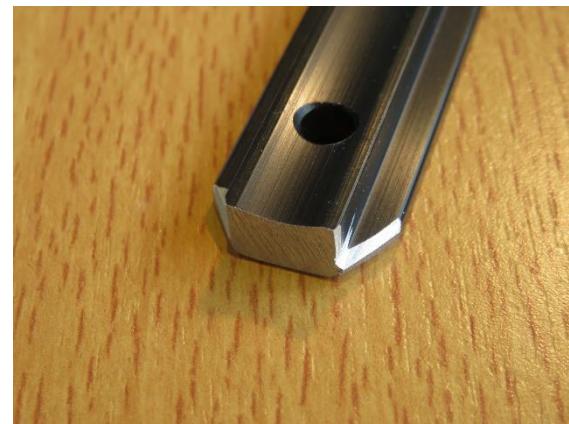


the picture to the left. It may be necessary to loosen one or two of the existing screws to allow the conduit to freely slide in place. Do not loosen the existing screws more than 2 turns to avoid disengaging them from their internal blind nuts.

Use care so as to not bend the T-track while cutting it. A good tool to use is a chop saw with a metal cutting blade. Alternatively, a cut-off saw blade on a portable grinder can be used. Support the end of the T-track so as not to bend it. This is very important to ensure the Smart Thruster can slide smoothly down the track. Also, do not cut through the conduit as this would cause damage to the stainless tube underneath.

Remove the section of conduit and re-tighten any screws loosened.

Step 6: File off the corners on the top end of the T-track to make it easier to slide the thruster onto the T-track and to keep the sharp edges of the T-track from gauging into the thruster's track guide. Chamfer both the top portion of the "T" and the bottom portion as shown below.



Step 7: Cut the stainless tube to length. Be careful in your measurements so as to not cut the tube too short. Remember, you can always shorten it by cutting more off, but you can not lengthen it if you cut it too short. Confirm the tube fits properly in the upper and lower end-caps while they are secured to the boat. Remove the tube from the upper fixture and remove the clevis end-cap from the bottom fixture.

Step 8: Drill the holes in the stainless tube for the un-drilled upper counter sunk holes if any:

(Note: The following pictures show a shorter stern thruster T-track assembly, but the concepts are the same for securing the longer bow T-track to the stainless tube.)



- Attach the bottom end-cap to rail making sure the tube goes in all the way.
- Clamp bottom end-cap clevis tangs in vice.
- Place a block under the top end of rail so that rail is level.
- Rotate the tube so that the T-track is perfectly level.
- Tighten clevis end-cap set screw.
- Clamp unsecured section of T-track to rail.
- Use the T-track counter-sunk holes as a drill guide.
- Use the 3/16" drill bit provided.
- Using a punch, make an indent in the stainless tube centered in the lowest un-drilled hole on the T-track. Punching helps control drill "walking"
- Drill a hole through the stainless rail. Use slow drill speeds, oil the drill bit, and use plenty of pressure (about 25 lbs of force)
- Make sure to drill perpendicular to the T-

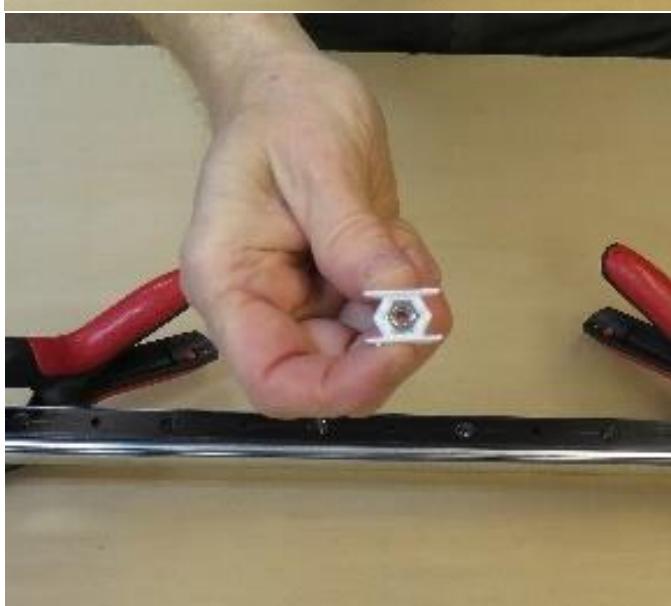
track face.

- Repeat the above sequence to drill 3/16" holes in the stainless tubing in all remaining T-track counter sunk locations.
- Keep the T-track tightly clamped to stainless rail. Do not allow burrs or metal shavings to accumulate under the T-track. Good clamp pressure will help reduce this.
- The holes must all be drilled in a straight line.
- Don't let the T-track bend; it is your guide for drilling well aligned holes.
- Confirm that a 10-32 screw fits smoothly in the drilled holes. It may be necessary to clean the holes out by running the drill bit up and down in the hole. It is important that the screws slide in the holes smoothly.
- Confirm there are no burrs or loose metal filings under the T-track.

Step 9: Insert the 10-32 nuts into the nut holders as required (one for each hole drilled):



Use a screw to pull a 10-32 nut into one of the nut holders.



- The nut should be held securely by the nut holder.

Step 10: Secure the upper section of the T-track to the stainless rail. This is done by screwing 10-32 flat-head screws through the T-track and into the nuts held in place by the nut holders. These nut holders can be positioned using the 8-32 threaded rod provided.



- Thread the 8-32 threaded rod into the nut holder. The threaded rod screws into the hole on the side of the nut holder.



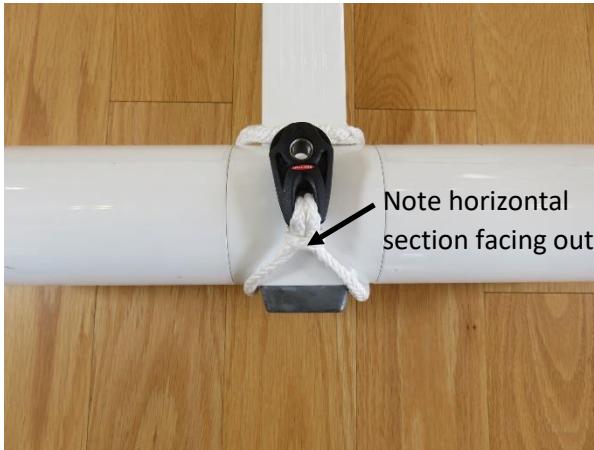
- Slide the nut holder into the tube until it lines up with the center hole.
- The nut holders should be oriented so that their convex surface is on the side closest to the newly drilled holes.



- Align the nut holder to the drilled hole.
- Apply silicon sealant to the screw threads where they will be passing through the aluminum T-track.
- Insert a 10-32 flat top screw into the nut in the nut holder.
- Tighten the 10-32 screw.
- Wipe away the excess sealant.
- Remove the 8-32 threaded rod
- Repeat this sequence for all open holes.

Step 10: Mount the T-track assembly in the two fittings mounted to the boat, but do not tighten the two end-cap set screws.

Step 11: Attach the lanyard block, sling, and lanyard to the Smart Thruster as shown below to assist in lowering the thruster on the T-track.



Step 12: Slide the Smart Thruster onto the T-track.

Step 13: With the set screws in the two end-caps loose, rotate the T-track assembly until the Thruster is properly aligned to the boat. Tighten the end-cap set screws.

Step 14: Remove the thruster. Remove the T-track assembly with the end-caps still attached.

Step 15: Drill a 3/16" hole into each end-cap aligned with the center of the T-track:



- With the set screws still holding the end-caps in the correct position, drill a 3/16" inch hole about 7/16" from the open edge of each end-cap. These holes must be directly in line with the 10-32 flat-head screws holding the T-track. Drill these holes carefully because if they are not well aligned the pan-head screws will interfere with the Smart Thruster sliding along the track. The end-cap is cast 316 stainless steel with a thickness of about 1/8". It is difficult to keep the drill bit from "walking" when drilling by hand. It is recommended that this step is done using a drill press to insure proper alignment.

Step 16: Secure both end-caps to the stainless tube:



- Remove the end-caps from the tube.
- Insert one of the end-cap nut holders into the tube lined up with each of the holes just drilled.
- The nut holders should be oriented so that their convex surface is on the side closest to the newly drilled holes.
- Slide the end-caps onto the stainless tube, but do not tighten the set screws.
- Align the new hole in each of the end-caps to the new holes in the stainless tube.
- Apply Loctite to a 10-32 pan-head screw.
- Insert and tighten a 10-32 pan-head screw into each end-cap.
- Remove the set screws from the end-caps. They are no longer needed.

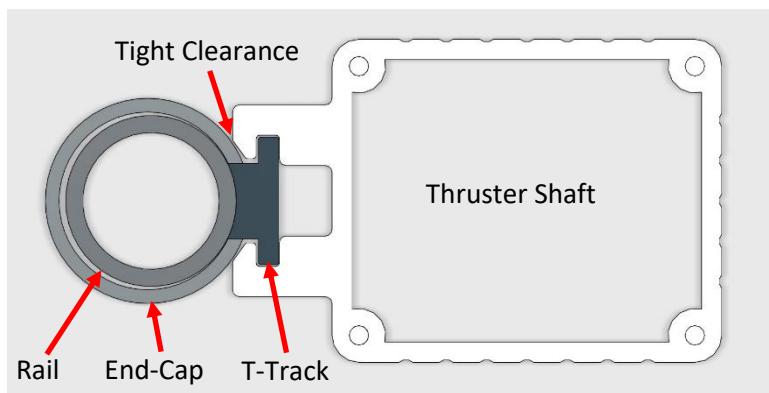




The purpose of the pan-head screws holding the end-caps on is to keep the stainless tube from rotating relative to the end-caps (and thus the boat). Also, the two pan-head screws push the end-caps away from the T-track. This is necessary to provide enough clearance for the track guide on the Smart Thruster to clear the end-caps.

Refer to the sketch to the right. The outer diameter of the stainless rail is smaller than the inner diameter of the end-cap. The pan-head screw (not shown) pulls the rail inside the end-cap tightly to the side nearest the T-track providing sufficient clearance between the thruster shaft and the end-cap.

Unfortunately, the manufacturers of the end-caps do not tightly control the thickness of the end-cap walls. If the walls are too thick, there will be insufficient clearance. If this is encountered the problem can be resolved by grinding away the inside of the end-cap on the side of the T-track to thin the walls and provide the required clearance.



Step 17: Re-install the two end-caps (with the completed T-track assembly) into their respective deck hinges.

Step 18: Slide the Smart Thruster with its lanyard onto the T-track and confirm that the alignment of the thruster to the boat is as intended.

Step 19: Drill the second hole for the top fitting (we only did the first hole in Step 2). Insert and tighten the second bolt.

Step 20: Attach the lanyard to the boat. There is a fair amount of flexibility with this step. The lanyard runs from an anchor point on the bow's deck or pulpit, through the block at the base of the Smart Thruster, and back up to the deck. This end of the lanyard is used to raise and lower the thruster. It can be secured to a cleat or it can be run through another block and then to a cleat.



The picture on the left shows how the block and lanyard should look. The picture on the right shows how the lanyard comes down from the deck on one side, passes through the block at the motors and back up to the deck from the other side.



The position of the lanyard anchor points should be selected such that the lanyard is perfectly vertical in the side view when the thruster is retracted. This ensures that the lanyard is carrying all of the thruster's weight. This particular installation should have its anchor points moved slightly forward to allow the lanyard to be more vertical. When deployed, the lanyard lines will angle back as shown in the picture on the right.



This owner elected to run the lanyard all the way back to the cockpit using a series of stanchion blocks ending with a block and integral cam cleat. This allows the thruster to be deployed and retracted from the cockpit.

Another approach is to run the un-anchored end of the lanyard through a block attached to the pulpit and then tie a loop in the end of the line. The loop can then be easily hooked on a cleat or a hook when retracted. The position of the loop is set so that it stops at the block when the thruster is deployed and just reaches the hook when the thruster is retracted. This allows for quick and easy deployments and retractions.

You are now ready to use your Smart Thruster. Happy sailing.

A dimensional drawing of the Smart Thruster is provided on the following 2 pages for your reference.

