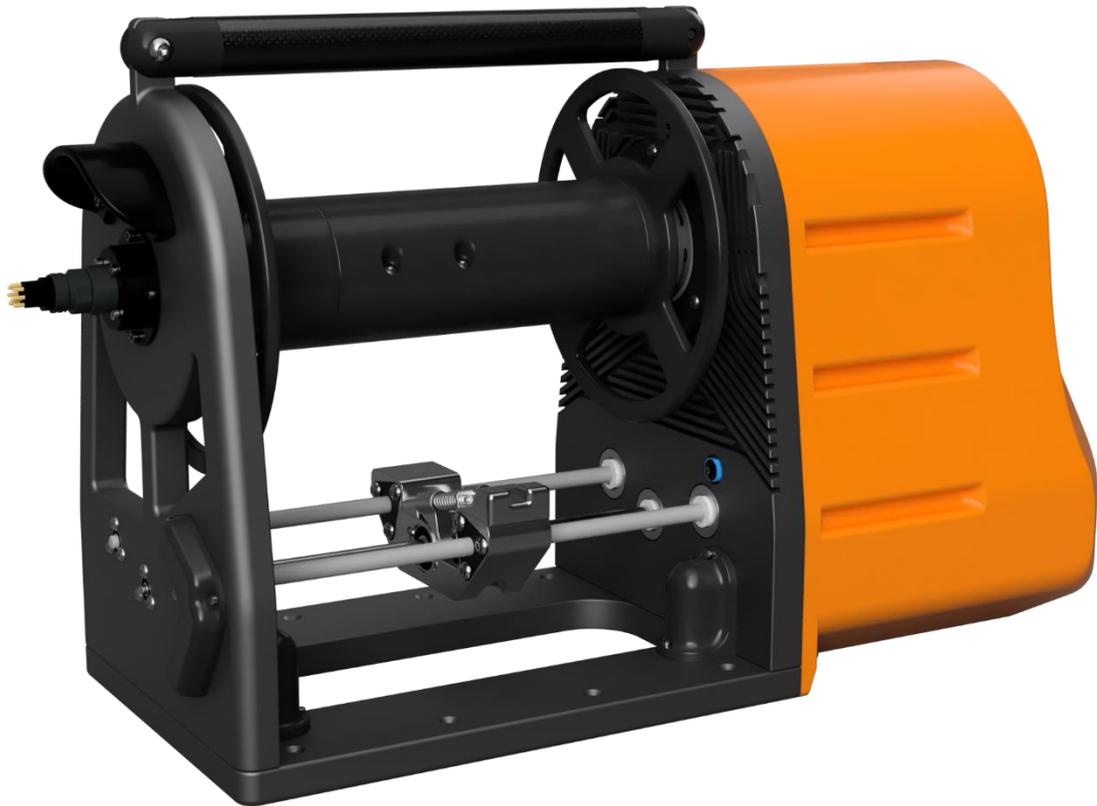


TMS (UNI-WINCH MINI)

Operations Manual



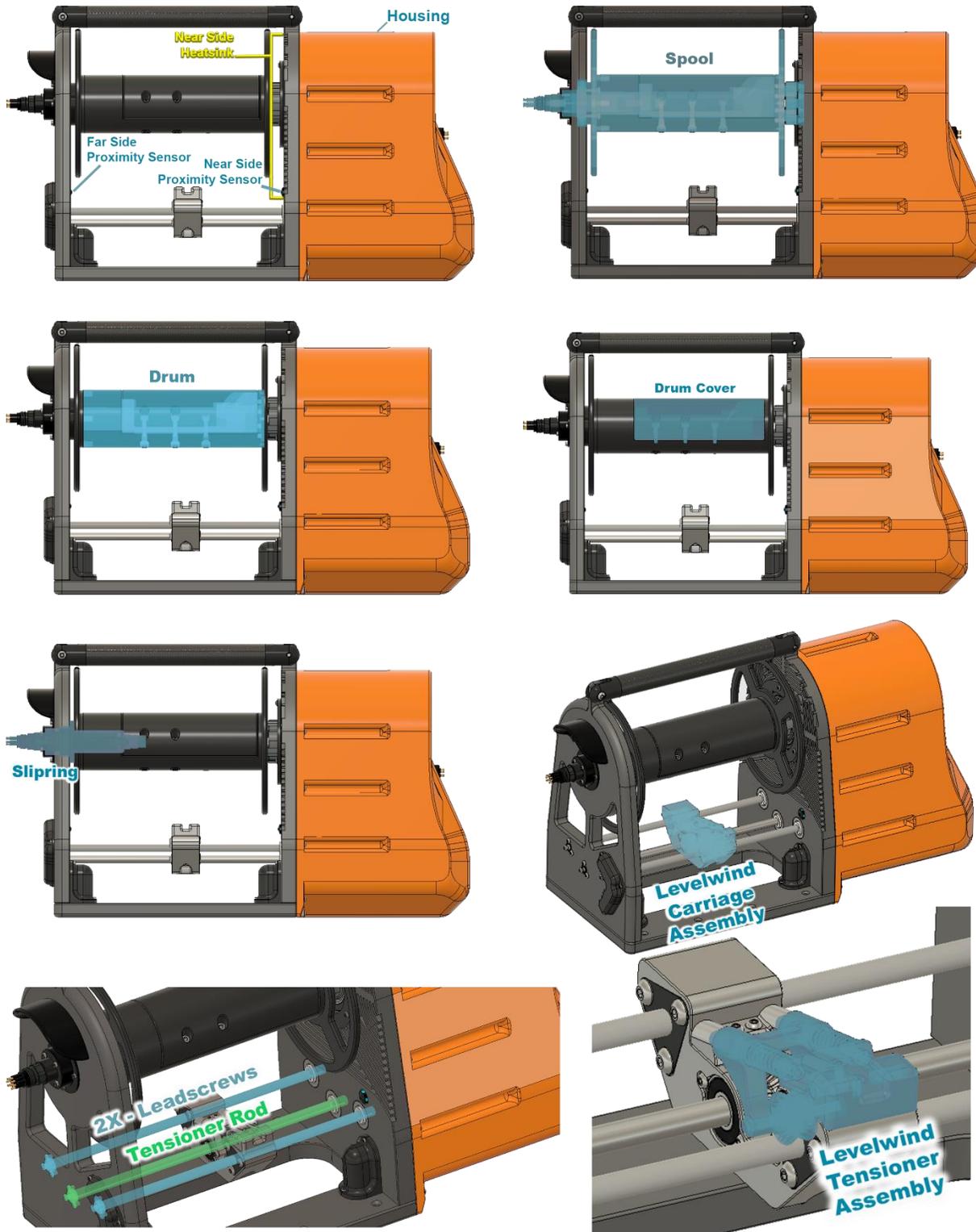
Hybrid Robotics
REV1.3

Contents

Introduction:.....	2
Anatomy of a TMS	2
Connecting to the TMS.....	3
Tether In/Out Button Operation:.....	5
Alternative Keyboard Shortcuts for Tether Control:.....	5
Default Network Configuration	5
Calibrate Definition	5
Change Tether.....	6
Step 1 – Ensure that Your Tether is Unloaded to its Minimum Extent:	6
Step 2 – Disengage the Drum Brake:.....	7
Step 3 – Manually Turn the Drum Back to the Zero Position:	8
Step 4 – Engage the Drum Brake:.....	9
Step 5 – Get TMS Back Into the Stopped State (Bug Workaround – Fix Coming):	10
Step 5 - Alternative Method:.....	11
Step 6 – Home TMS:.....	12
Step 7 – Remove Screws from the drum cover:	13
Step 8 – Remove Screws from the <i>Levelwind Tensioner Assembly</i> :.....	14
Step 9 – Remove the Levelwind Tensioner Assembly:.....	15
Step 10 – Remove the <i>Spool Drum Cover</i> and <i>Tether</i> :.....	16
Step 11 – Feed <i>Tether</i> up through through <i>Levelwind Carriage</i> :.....	17
Step 12 – Install the Levelwind Tensioner Assembly:	18
Step 13 – Install flathead screws into the <i>Levelwind Tensioner Assembly</i> :	19
Step 14 – Wrap Tether Around Drum:.....	20
Step 15 – Install Drum Cover	21
Step 16 – Install Screws Into Drum Cover & Pull Loose Cable Through <i>Levelwind</i> :.....	22
Step 17 – Change Tether Diameter and Length in the User Interface:	23
Step 18 – Establish a Fresh Connection with the TMS (Bug Workaround – Fix Coming):	24
Step 19 – Home TMS:.....	25
Step 20 – Pay in the First Few Wraps of Tether:	26
Step 21– Manually Organize the Wraps so That the Tether Does Not Cross Over Itself:	27
Glossary	28
Pinouts	28
Standard Pinouts.....	28
External Proximity Endstop (If included).....	28
Specifications:	29

Introduction:

Anatomy of a TMS

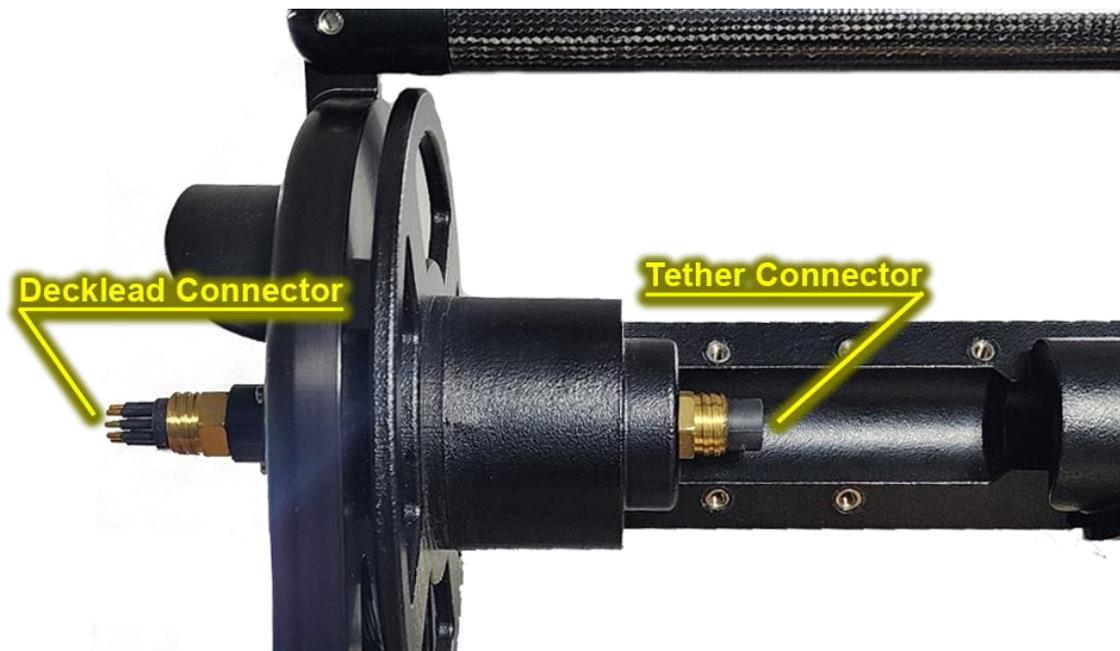


Connecting to the TMS

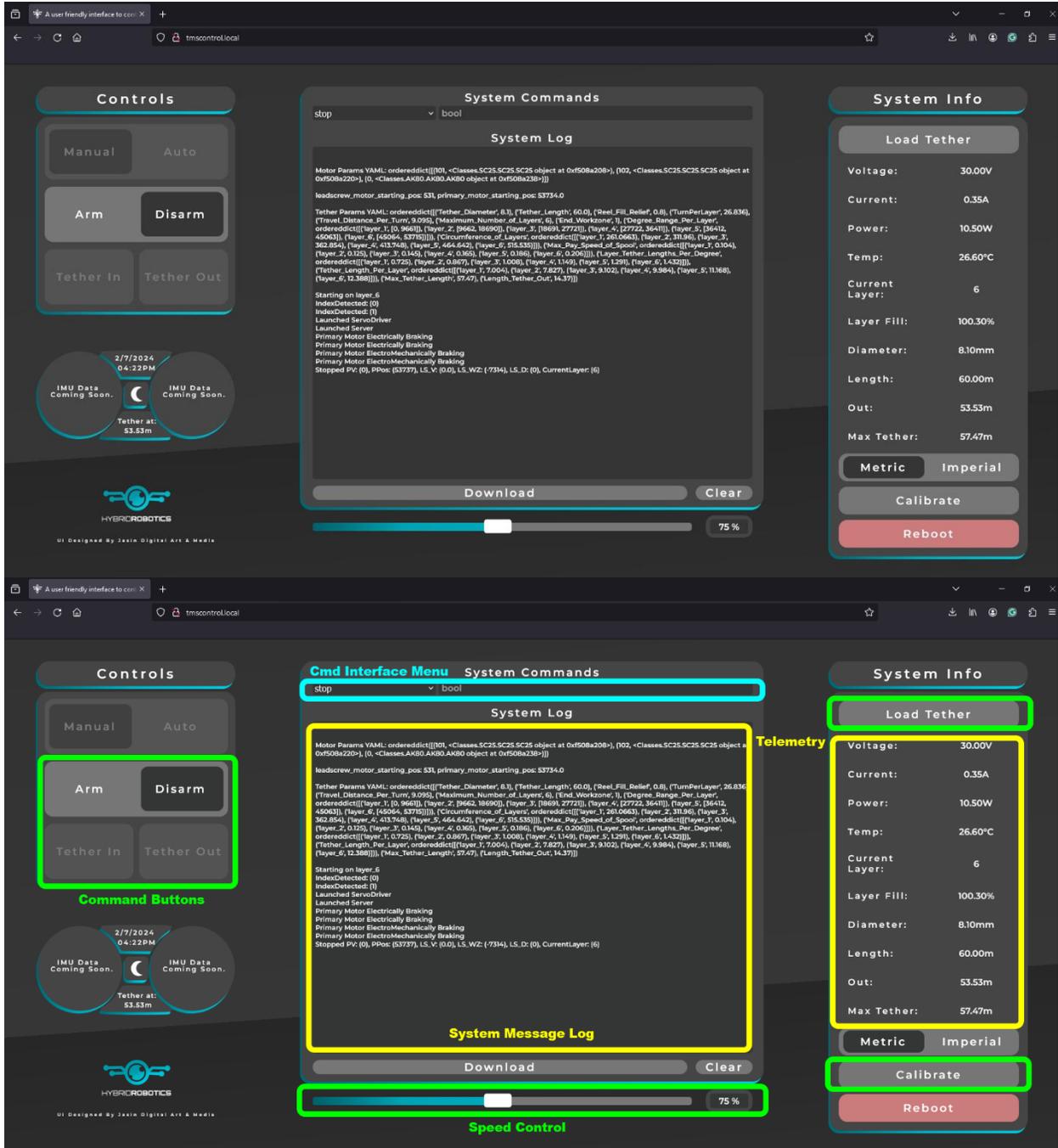
The standard TMS has two connectors on the housing: Power (20-30Vdc) and communications (Ethernet), as shown in the image below.



There are two connectors on the sliping for connecting the tether and decklead; see the image below.



To access the control interface, navigate to *tmscontrol.local* in a web browser.



Tether In/Out Button Operation:

You can use a click-and-drag technique to continuously operate the Tether In or Tether Out function without holding down the button. Simply left-click and hold down on either the Tether In or Tether Out button, drag your mouse cursor away from the button, and then release. This action will 'lock' the command, allowing continuous operation without needing to press the button. You can left-click either button again or use the disarm function to stop the drum's motion. The drum will also automatically stop at the minimum or maximum extent of the drum load, provided it accurately knows its position.

Alternative Keyboard Shortcuts for Tether Control:

When the *tmscontrol.local* interface is the active window on your computer; you can utilize keyboard shortcuts for quick tether commands. Press the 'i' key to initiate a 'Tether In' command at the speed set on the slider bar, and press the 'o' key for a 'Tether Out' command at the preset speed. These shortcuts offer an efficient alternative to mouse clicks, streamlining the operation process.

Default Network Configuration

TMS Network Config:

- IP – 192.168.2.37
- Subnet Mask: 255.255.255.0

Example Control Computer Network Config:

- IP – 192.168.2.1
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.2.37

To change the TMS network settings, you can access the control computer's desktop using VNC Viewer at either the TMS IP address or *tmscontrol.local*.

Calibrate Definition

The calibrate button only homes the Levelwind Carriage position. If the Levelwind Carriage is not in the correct position or fails to switch directions, you should run a Calibration. It will follow the below steps to complete this:

1. Feed some cable up through the top of the Levelwind Carriage, giving some slack.
2. Travel to the Nearside Proximity Sensor.
3. Find Leadscrew 0 position.
4. Travel back to the correct position.
5. Then, feed the loose cable back through the bottom of the Levelwind Carriage.

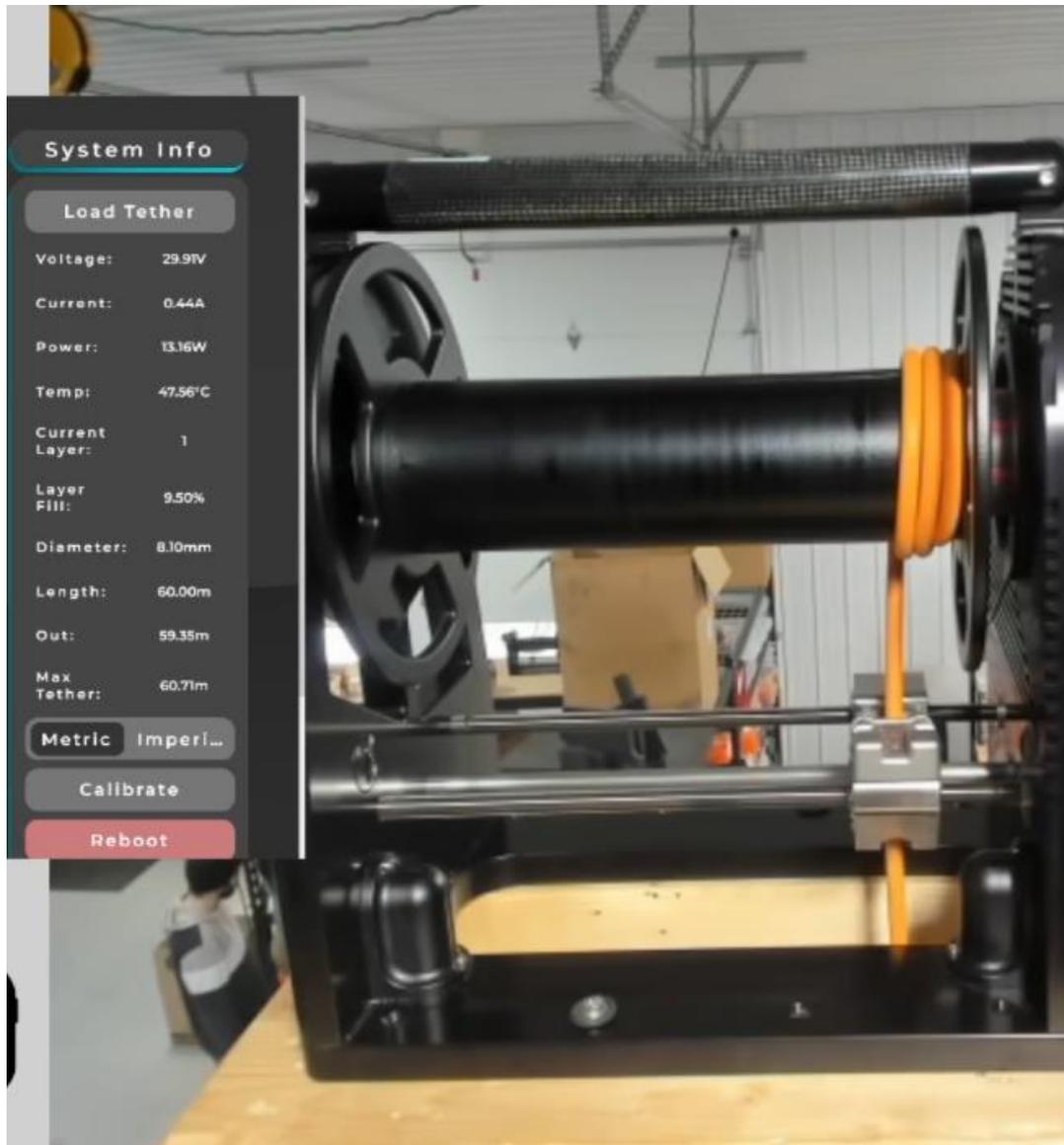
You should pay out a few meters of cable after running a calibration to ensure a clean fill.

Change Tether

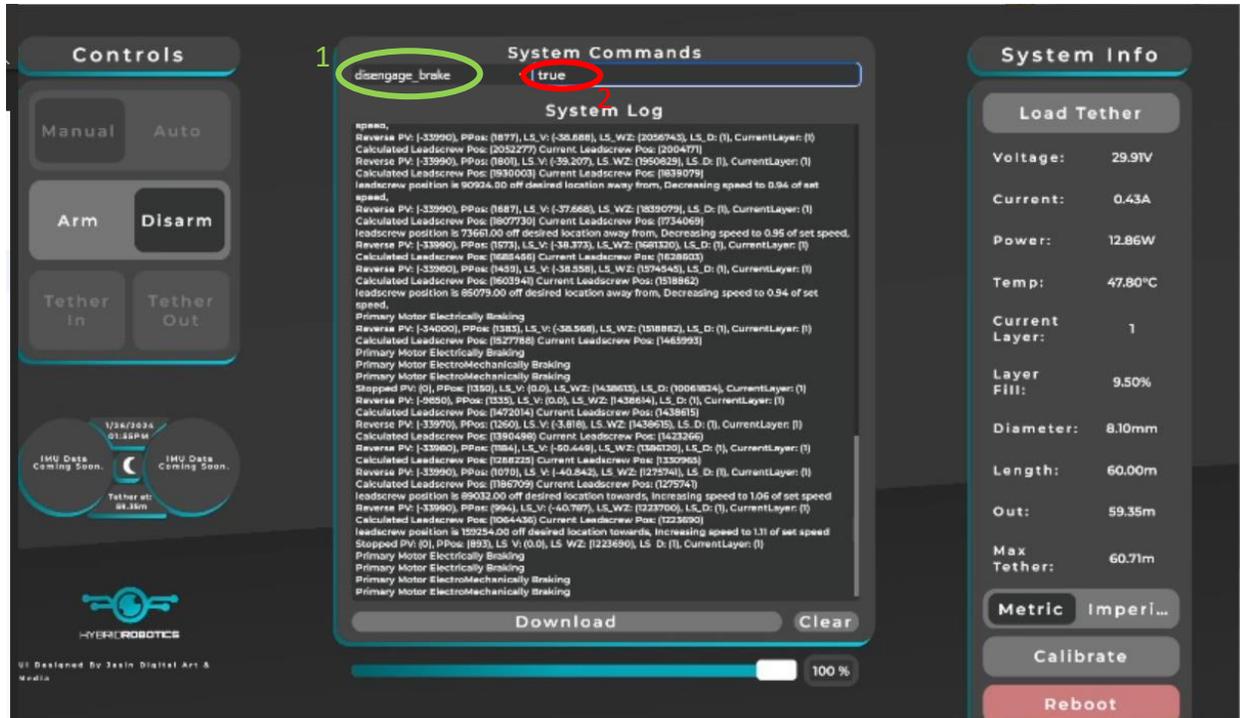
The following steps are instructions that will allow you to unload the last few degrees of the tether, home the *levelwind carriage*, and then change the tether to a different diameter. If you do not have tether loaded on the TMS, skip to **Step 7**.

Step 1 – Ensure that Your Tether is Unloaded to its Minimum Extent:

- It should look similar to the image below, with only a few wraps of tether towards the drum's near side extent.

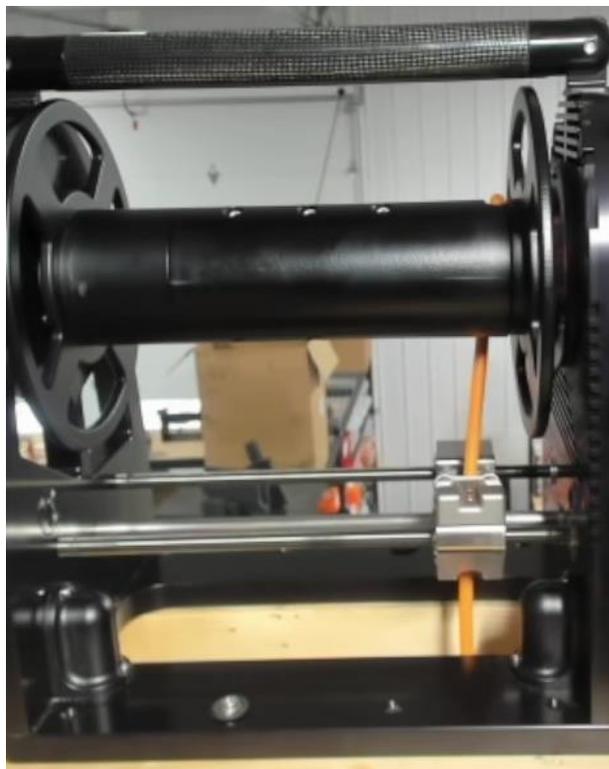
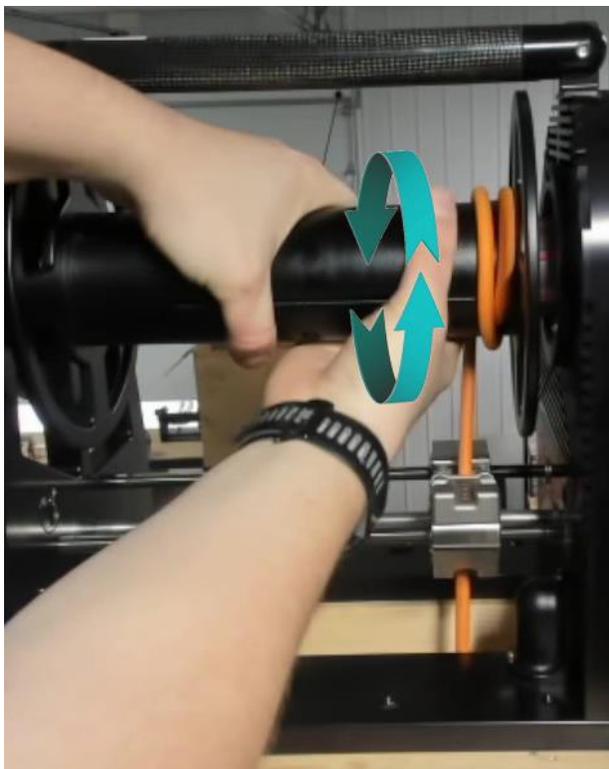


Step 2 – Disengage the Drum Brake:

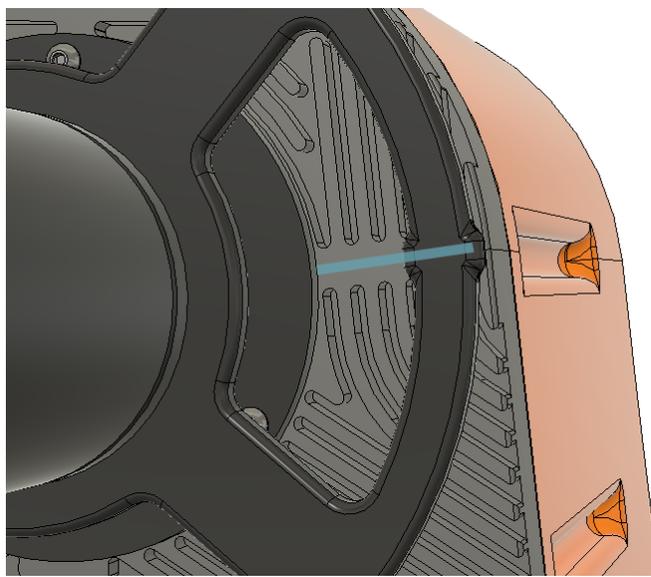
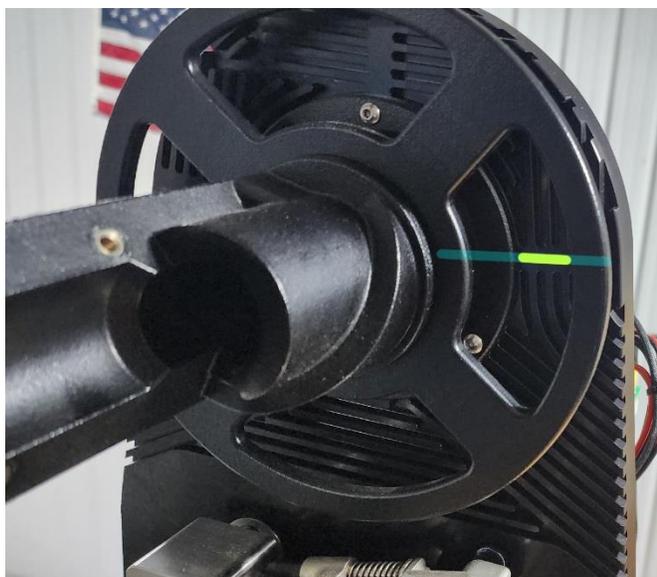


1. Dropdown Menu Selection (Green Oval):
 - Locate and select *disengage_brake* from the dropdown menu.
2. Input in Text Box (Red Oval):
 - Type *true* in the provided text box.
3. Execute Command:
 - Press Enter to send the command.
4. Auditory Confirmation:
 - Listen for a click sound, indicating the brake has disengaged.

Step 3 – Manually Turn the Drum Back to the Zero Position:



- Manually turn the drum until there are no more full wraps of tether around the drum.
- Ensure the drum cover is facing the proximity sensors.
- Use the heatsink pattern as a guide to align the center of the cover side wheel with the thicker portion of the heatsink pattern, as shown in the images below.



Step 4 – Engage the Drum Brake:

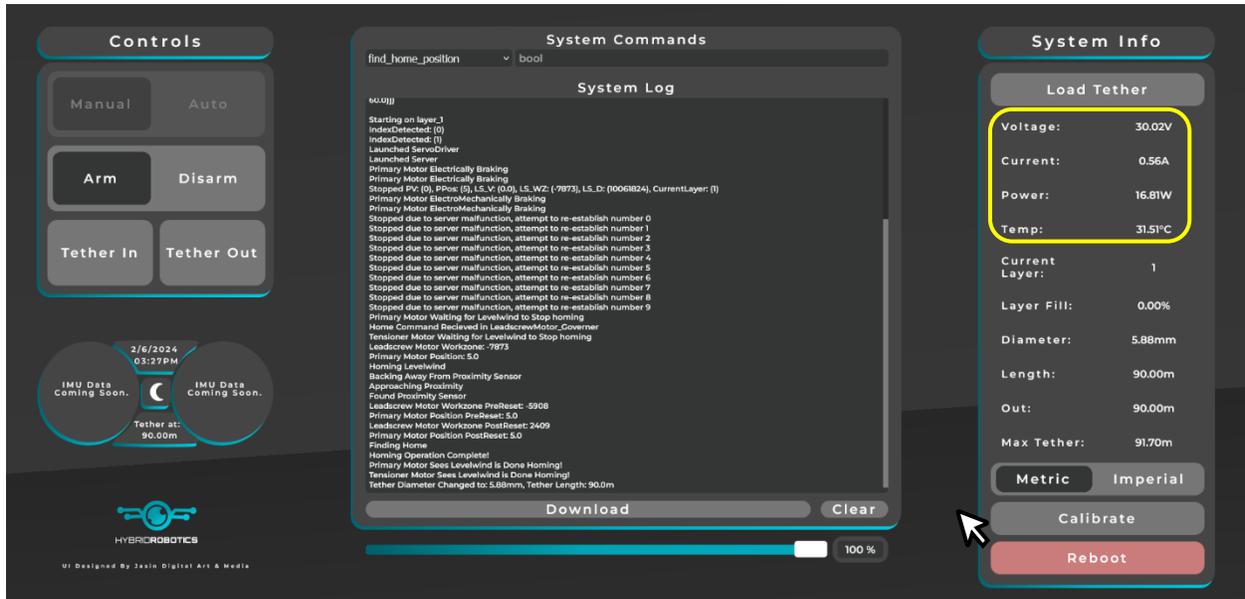
The screenshot shows a control interface with several sections:

- Controls:** Manual, Auto, Arm, Disarm, Tether In, Tether Out.
- System Commands:** A dropdown menu with 'disengage_brake' selected (green oval) and a text input field containing 'false' (red oval).
- System Log:** A scrollable log of system events, including lead screw positions and speeds.
- System Info:** Load Tether information: Voltage: 29.89V, Current: 0.45A, Power: 13.45W, Temp: 45.83°C, Current Layer: 1, Layer Fill: 0.10%, Diameter: 8.10mm, Length: 60.00m, Out: 59.99m, Max Tether: 60.71m.
- Buttons:** Download, Clear, Metric, Imperi..., Calibrate, Reboot.

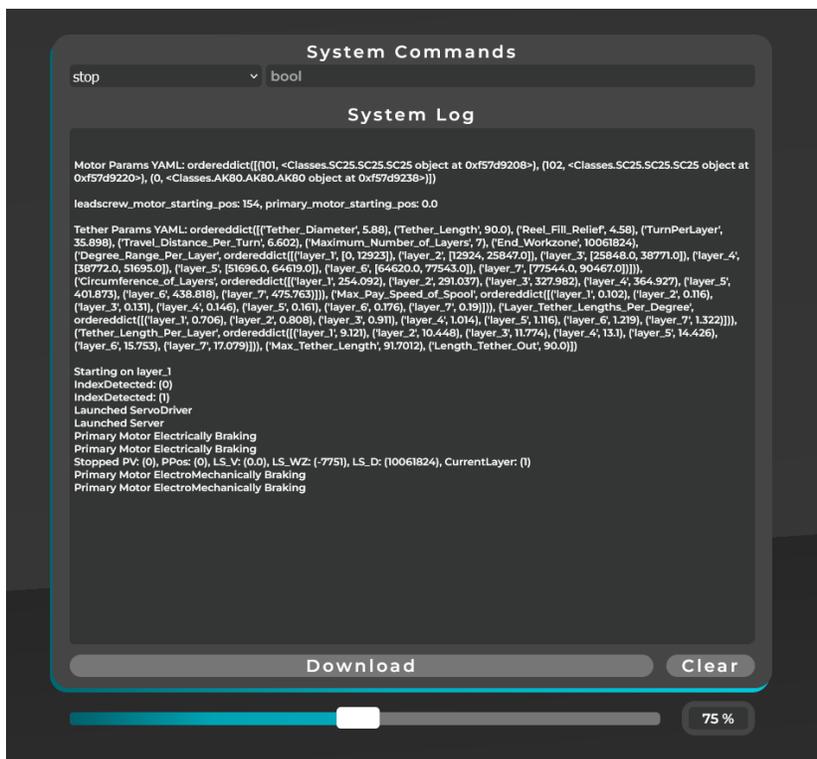
1. Dropdown Menu Selection (Green Oval):
 - o Locate and select `disengage_brake` from the dropdown menu.
2. Input in Text Box (Red Oval):
 - o Type `false` in the provided text box.
3. Execute Command:
 - o Press Enter to send the command.
4. Auditory Confirmation:
 - o Listen for a click sound, indicating the brake has engaged.

Step 5 – Get TMS Back Into the Stopped State (Bug Workaround – Fix Coming):

1. Power cycle the TMS
2. Wait for the TMS to finish booting. You will know it has finished if the telemetry values under System Information start updating.



Once the connection is established, left-click the *Clear* button under *System Log* and refresh the page. After refreshing, the *System Log* should look similar to the image below.

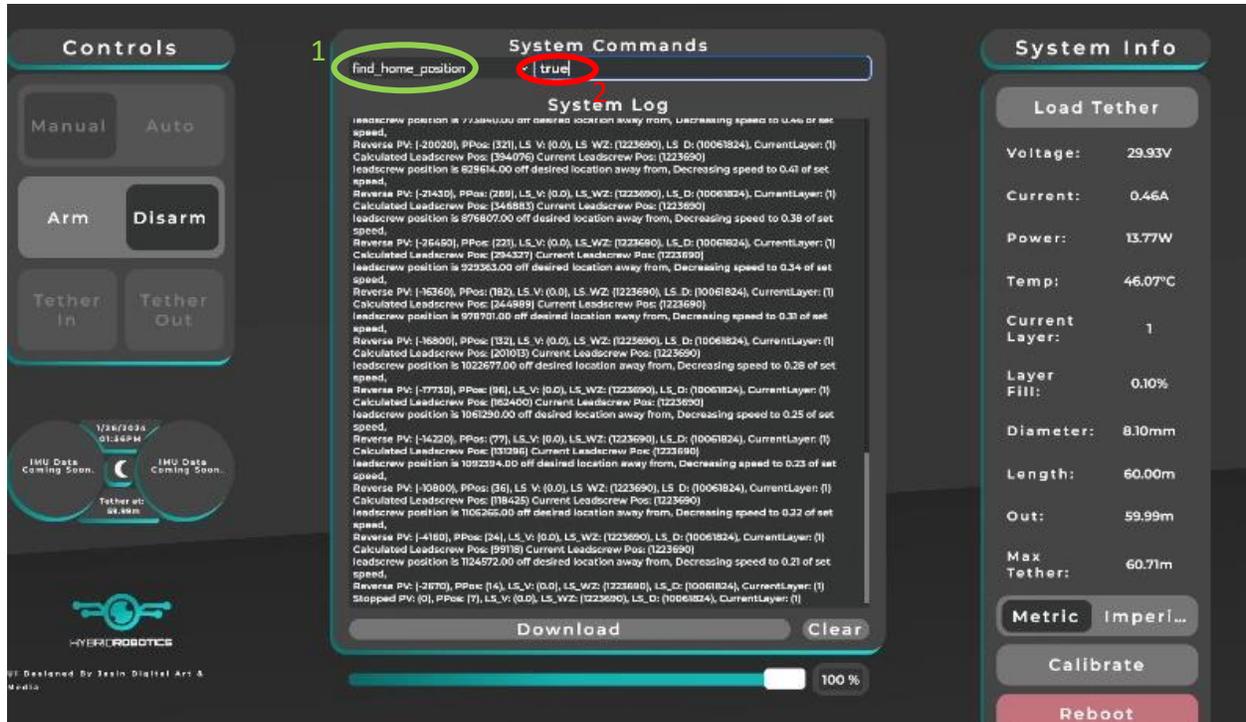


Step 5 - Alternative Method:

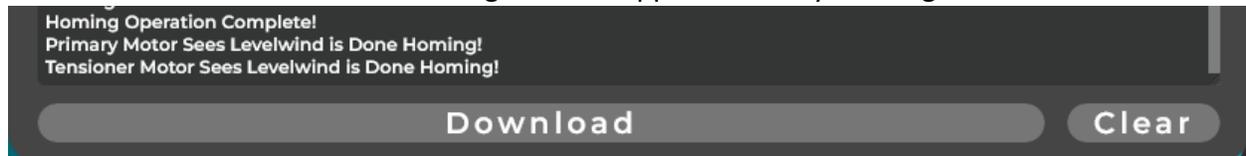
1. **Manually Turn the Drum:** When we rotate the drum to the zero position, it temporarily disrupts the unit's 'officially stopped' state.
2. **Re-engage System to Stopped State:**
 - o Use the 'tether in' button to reset the system without further drum adjustment.
 - o Press 'tether in' briefly, for about 1-2 seconds, then release.
 - o Repeat this process and monitor the system log.
 - o Once the 'stopped' message appears in the system log, the system is back in its stopped state. It is highlighted in the image below.
 - o This procedure is a workaround for a software bug, pending resolution in future updates.

The screenshot displays the HyperRobotics control interface. The 'System Log' window is the central focus, showing a sequence of messages for a 'Reverse PV' operation. The final message, 'Stopped PV (3), PPos (7), LS_V (0.0), LS_WZ (1223690), LS_D (10061824), CurrentLayer (1)', is highlighted in yellow, indicating the system has reached a stopped state. The 'Controls' panel on the left features a 'Tether In' button that is highlighted with a mouse cursor. The 'System Info' panel on the right provides real-time telemetry data for the tether system.

Step 6 – Home TMS:



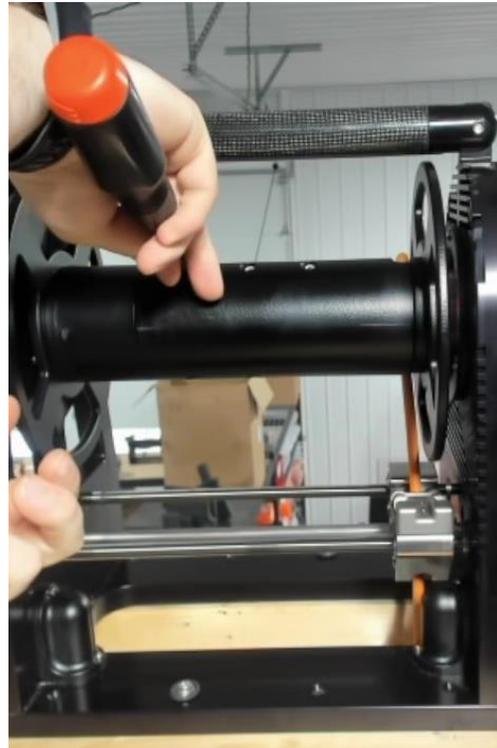
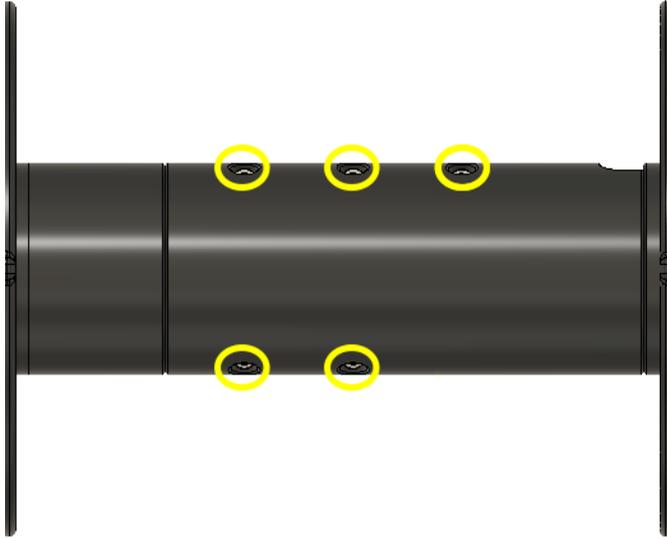
1. Dropdown Menu Selection (Green Oval):
 - o Locate and select *find_home_position* from the dropdown menu.
2. Input in Text Box (Red Oval):
 - o Type *true* in the provided text box.
3. Execute Command:
 - o Press Enter to send the command.
4. Levelwind will travel to the nearside proximity sensor:
 - o Wait to see the messages below appear in the system log



Step 7 – Remove Screws from the drum cover:

Use a 4mm hex drive.

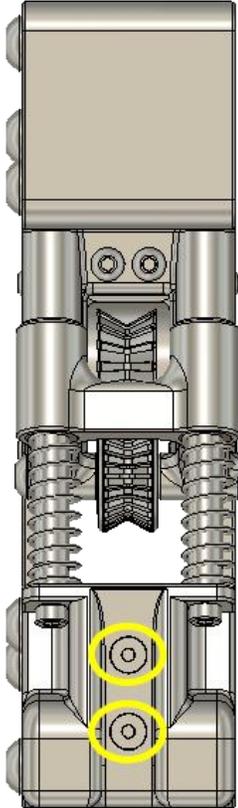
Remove the five M5x20 socket head cap screws from the drum cover.



Step 8 – Remove Screws from the *Levelwind Tensioner Assembly*:

Use a 2mm hex drive.

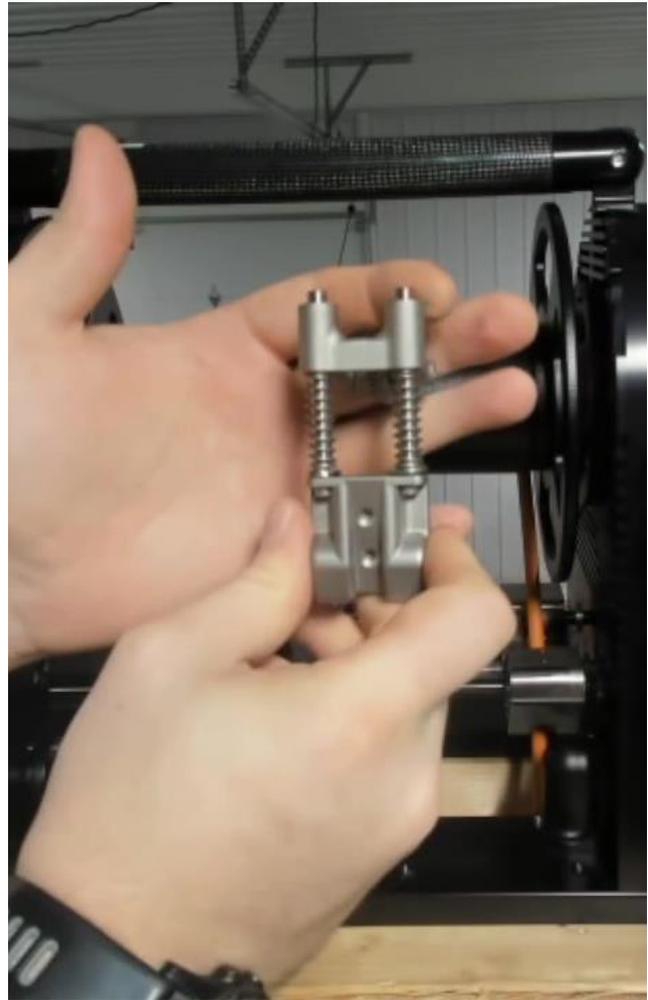
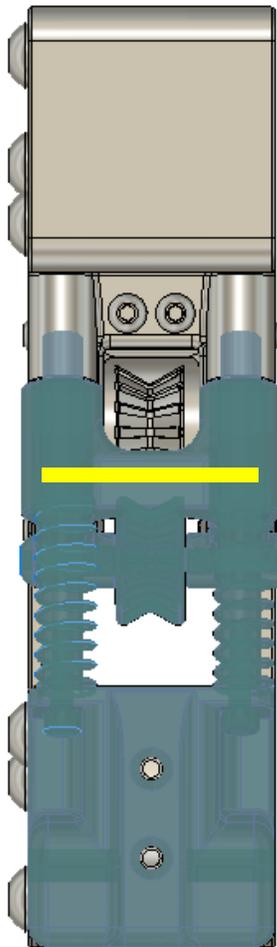
Remove the two M3x12 flat head screws from the levelwind mount.



Step 9 – Remove the Levelwind Tensioner Assembly:

Pull Out: Carefully pull the Levelwind Tensioner Assembly out of the Levelwind Tensioner Backstop. It would help if you held onto the yellow area while you remove it to ensure that the assembly doesn't force itself apart due to the spring torsion.

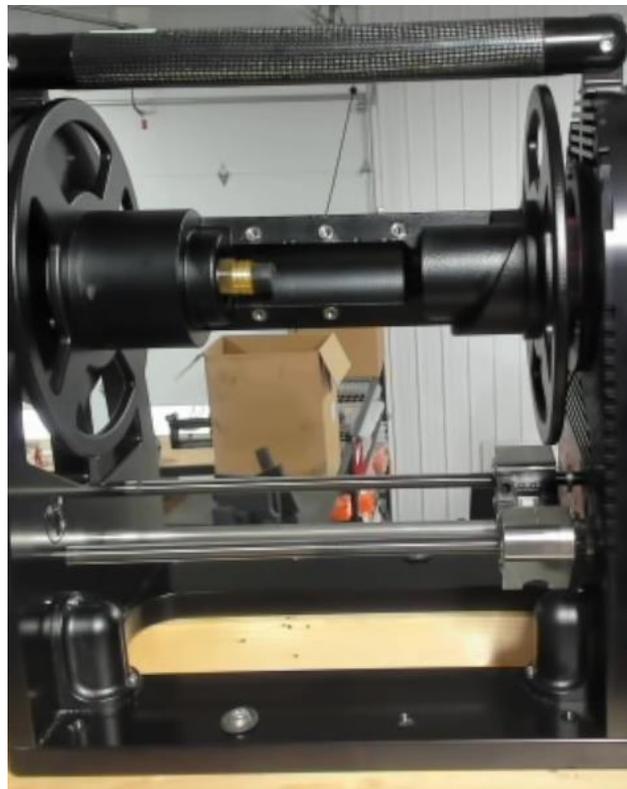
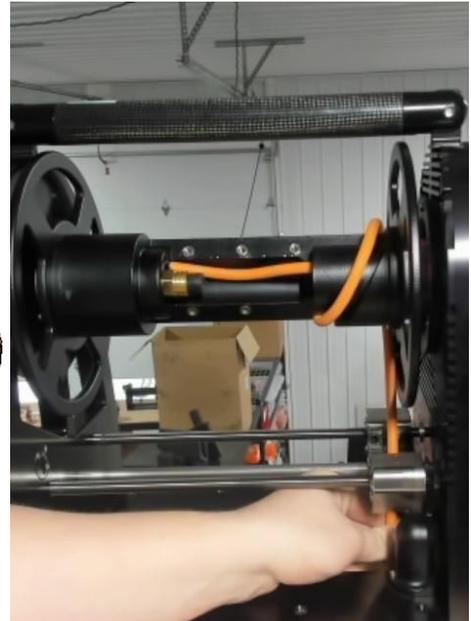
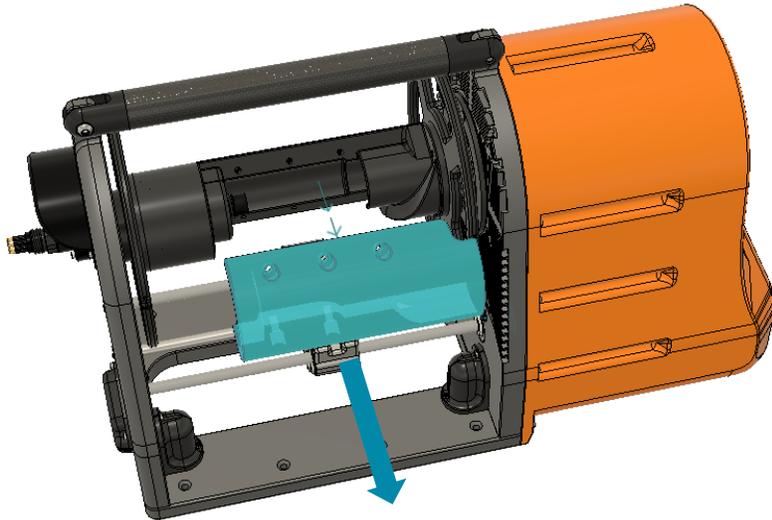
Wiggle Gently: It might require a bit of maneuvering, so gently wiggle the Levelwind Tensioner Assembly to loosen it.



Step 10 – Remove the *Spool Drum Cover and Tether*:

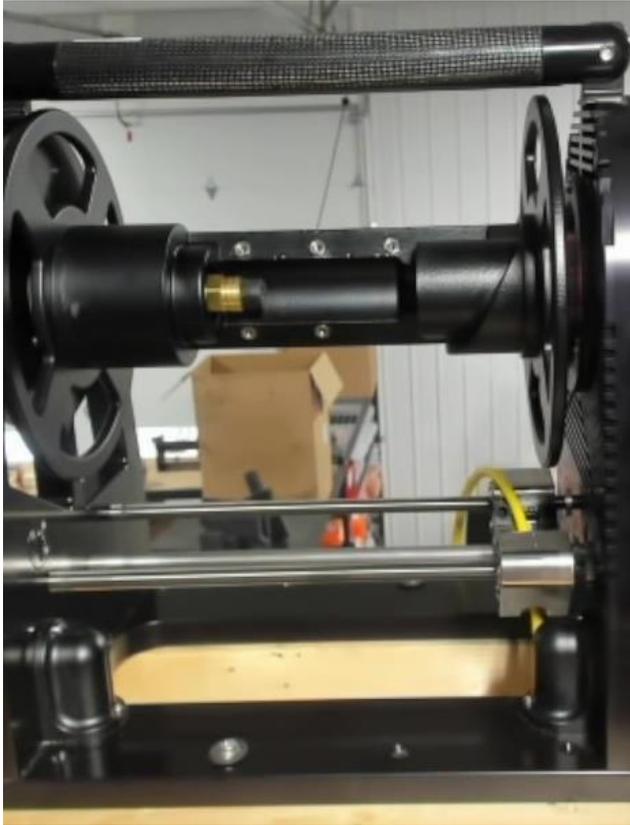
Pull Off: Carefully pull the cover off of the Drum.

Remove Tether: Pull the tether out of the drum and through the bottom of the levelwind to remove the tether from the system.



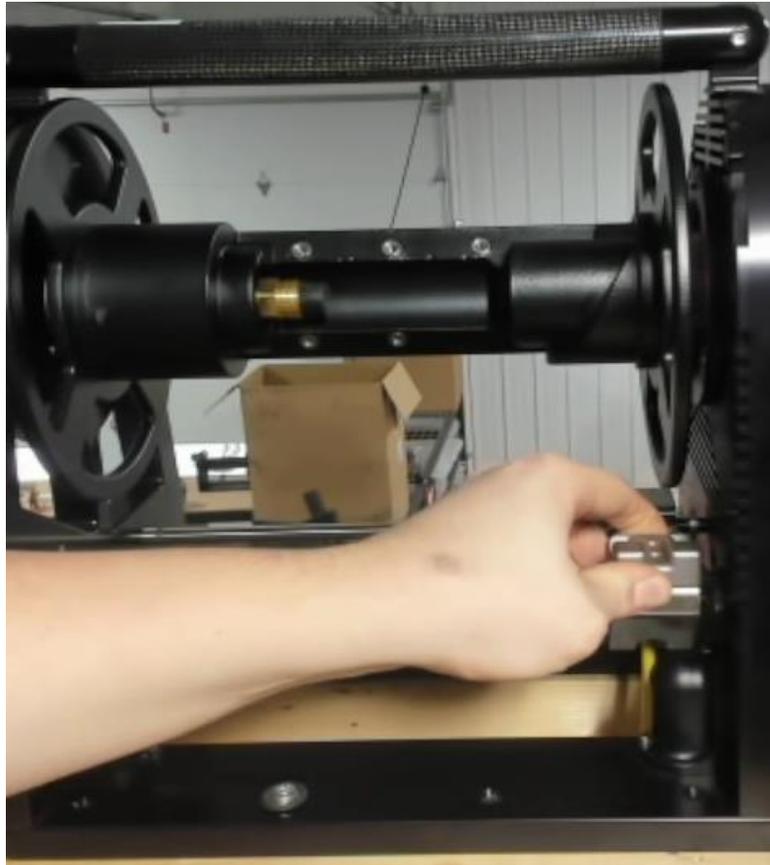
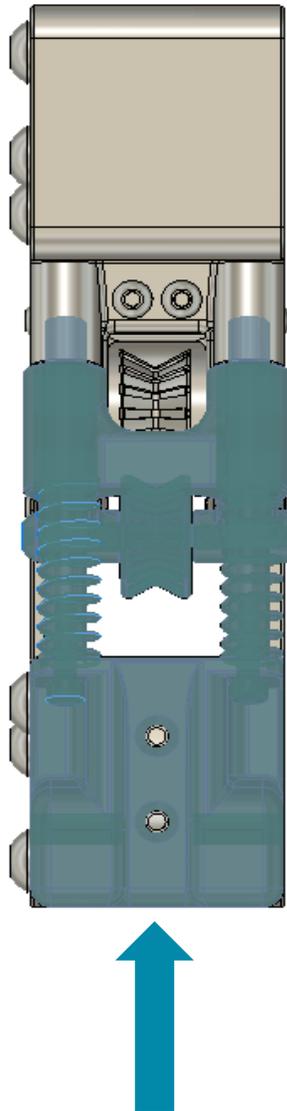
Step 11 – Feed *Tether* up through through *Levelwind Carriage*:

Feed Tether: Feed the tether up through the bottom of the levelwind carriage.



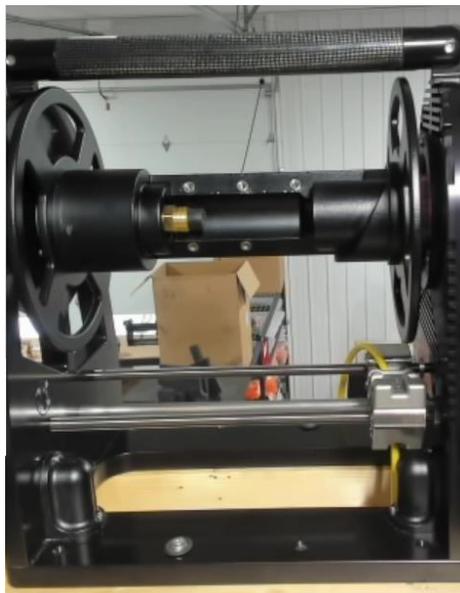
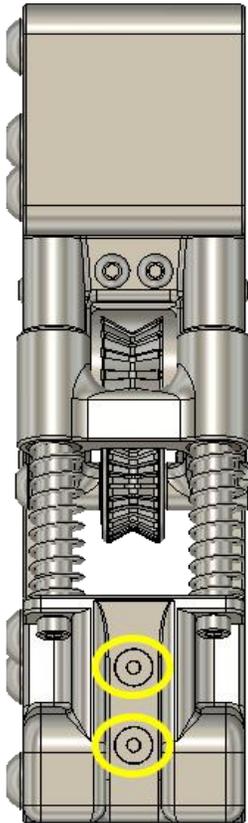
Step 12 – Install the Levelwind Tensioner Assembly:

Insert the Levelwind Tensioner Assembly into the Levelwind Tensioner Backstop with the tether between the two wheels.



Step 13 – Install flathead screws into the *Levelwind Tensioner Assembly*:

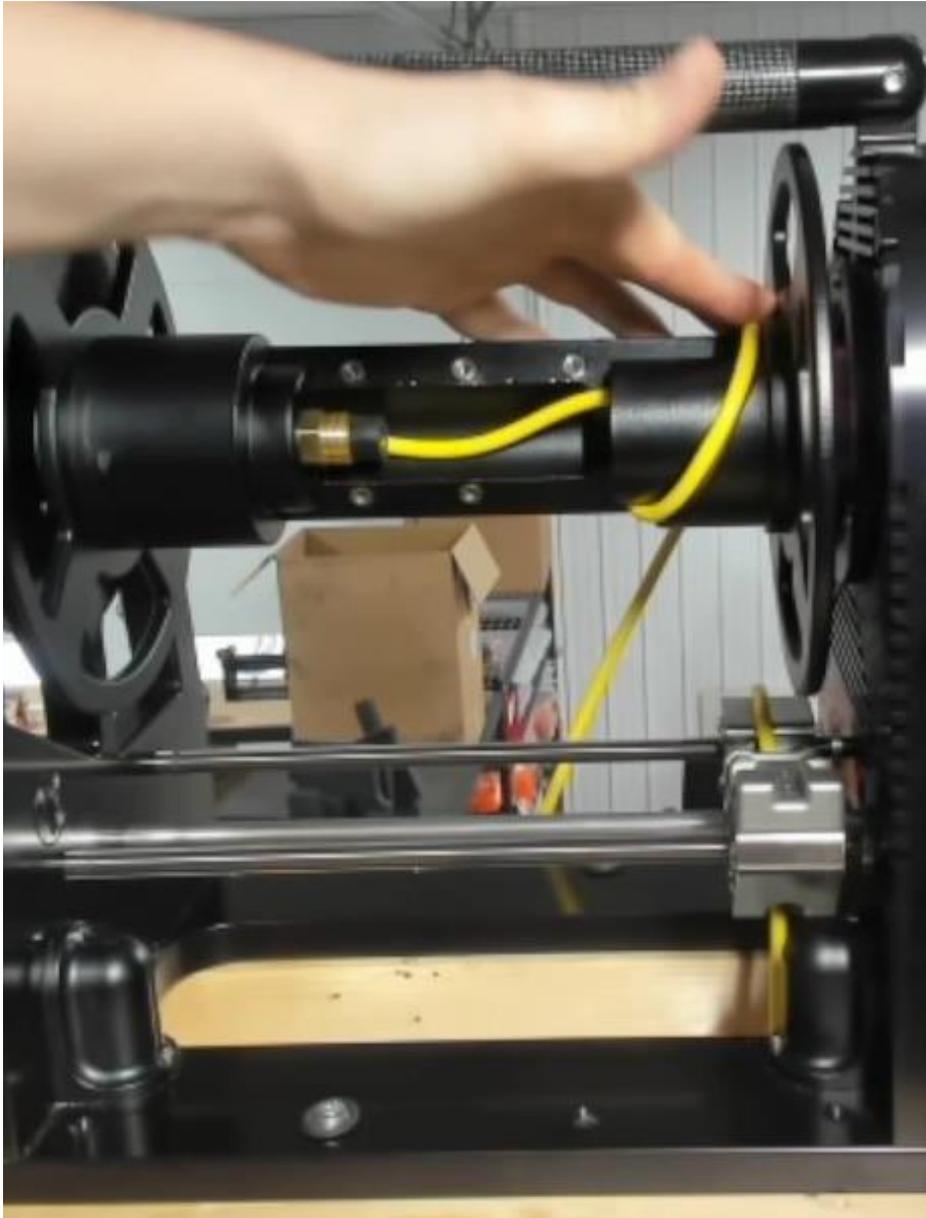
1. Use a 2mm hex drive.
2. Install the two M3x12 flat head screws from the levelwind mount. These do not need to be very tight; 10in-lb of torque is plenty tight.



Step 14 – Wrap Tether Around Drum:

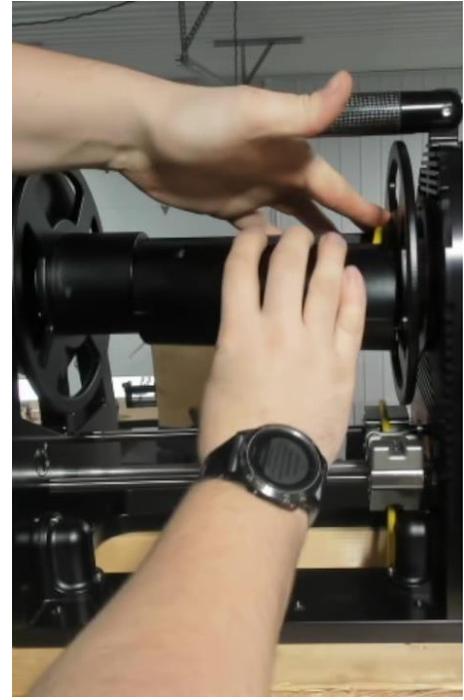
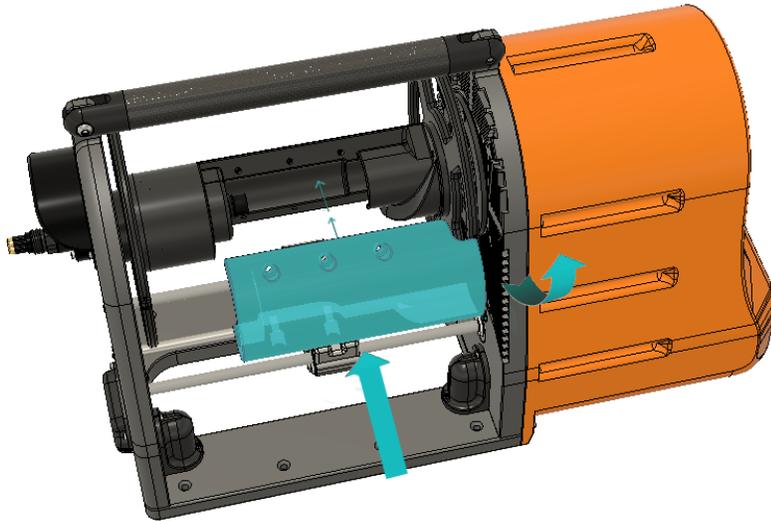
1. Plug the tether into the slipping (**note: not visible here**)
2. Secure the locking collar to the slipping (**note: not visible here**)
3. Wrap the tether around the drum, as shown below.

Note: The tether will likely need to be looped into the hole towards the nearside to make it safely around the bend.



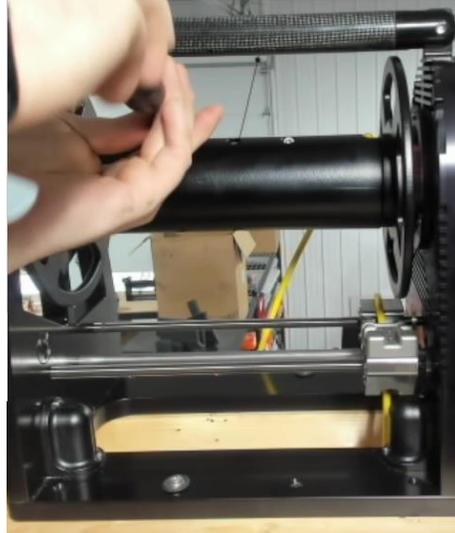
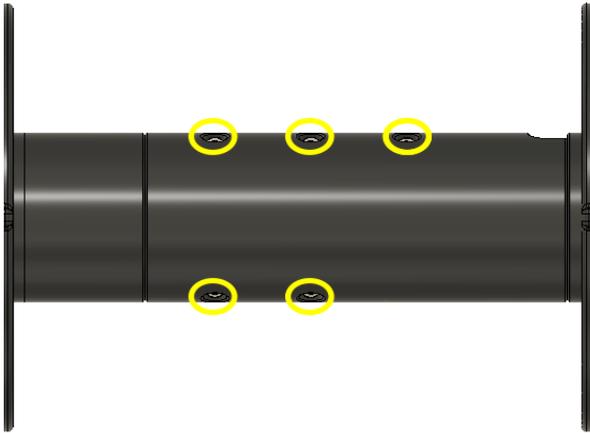
Step 15 – Install Drum Cover

Install the Spool Drum Cover onto the Drum while holding the tether where it is. Putting the cover on can require a slight roll motion toward the tether output, as is shown in the image below.

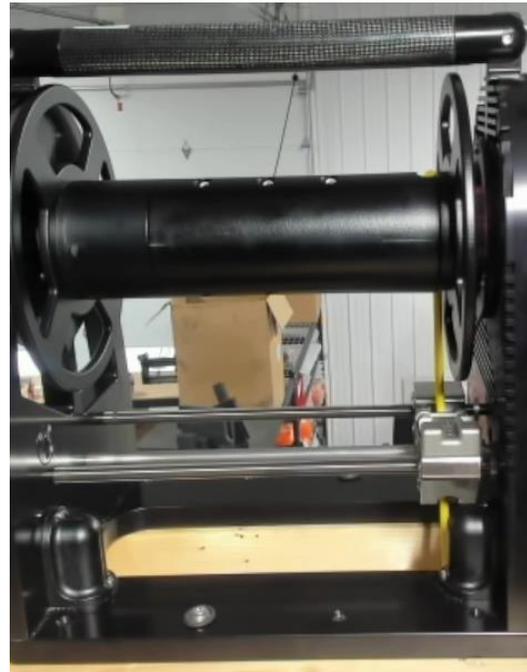
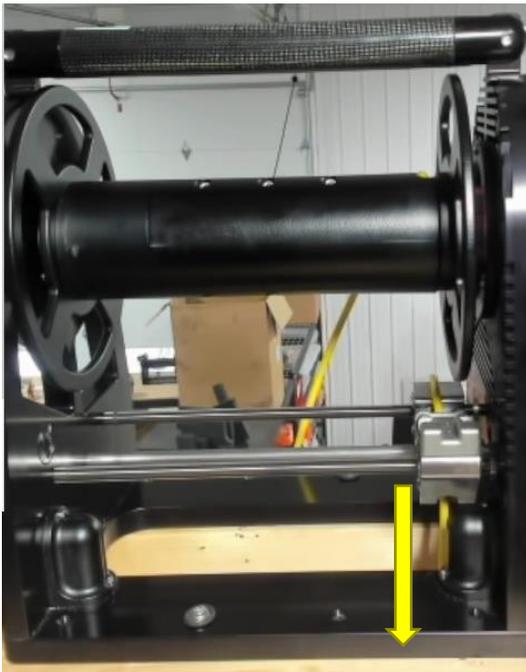


Step 16 – Install Screws Into Drum Cover & Pull Loose Cable Through *Levelwind*:

1. Use a 4mm hex drive.
2. Install the five M5x20 socket head cap screws into the drum cover. These do not need to be very tight; 15in-lb of torque is plenty tight.



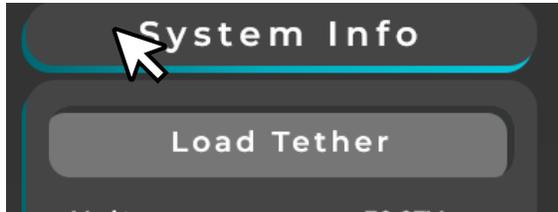
3. Pull any loose cable through the bottom of the *Levelwind Carriage* so there isn't any slack between the drum and the carriage.



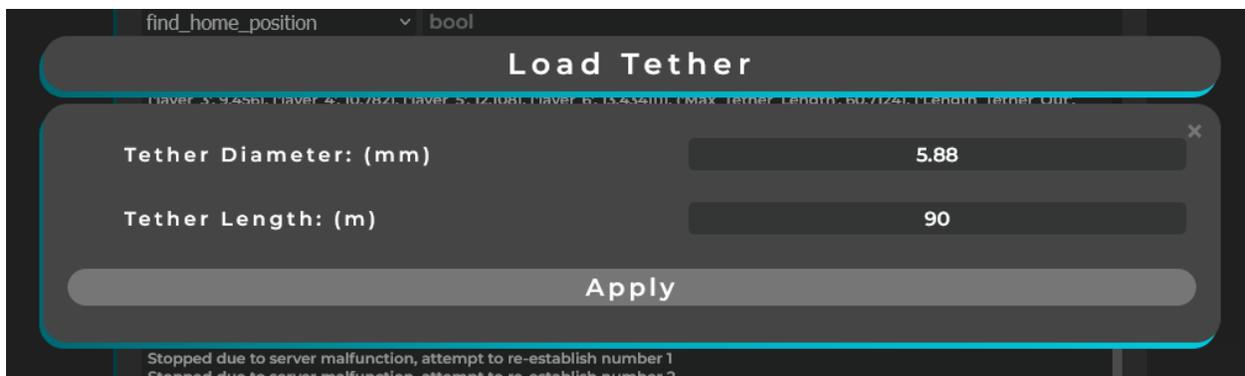
Step 17 – Change Tether Diameter and Length in the User Interface:

1. Left-click on the Load Tether Button in your display's upper right-hand corner.

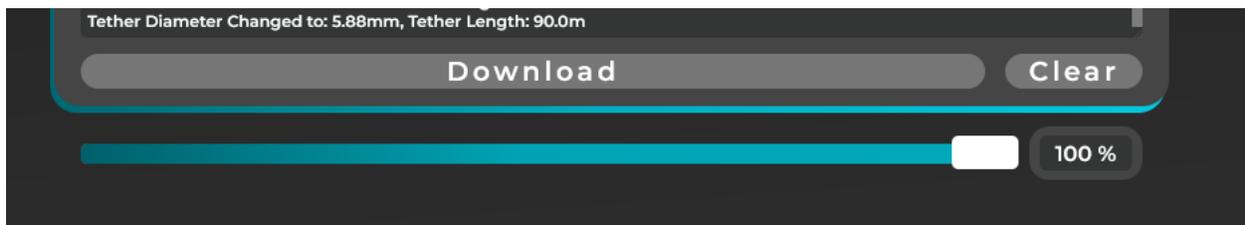
Note: You will only be able to change tether diameter or length if the TMS is at its zero position. Thus, after a *find_home_position* has been completed.



2. In the popup window, input your new tether specifications. In this case, we are using a tether diameter of 5.88mm and a tether length of 90m. Then click Apply.



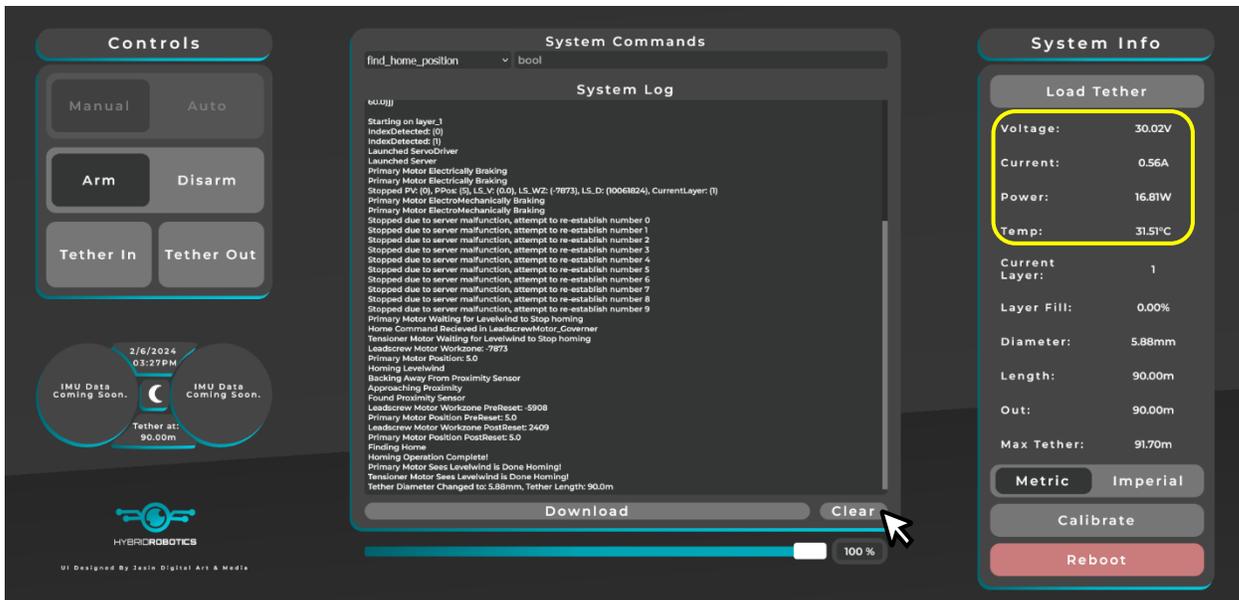
3. This message appears in the *System Log* if it is set correctly.



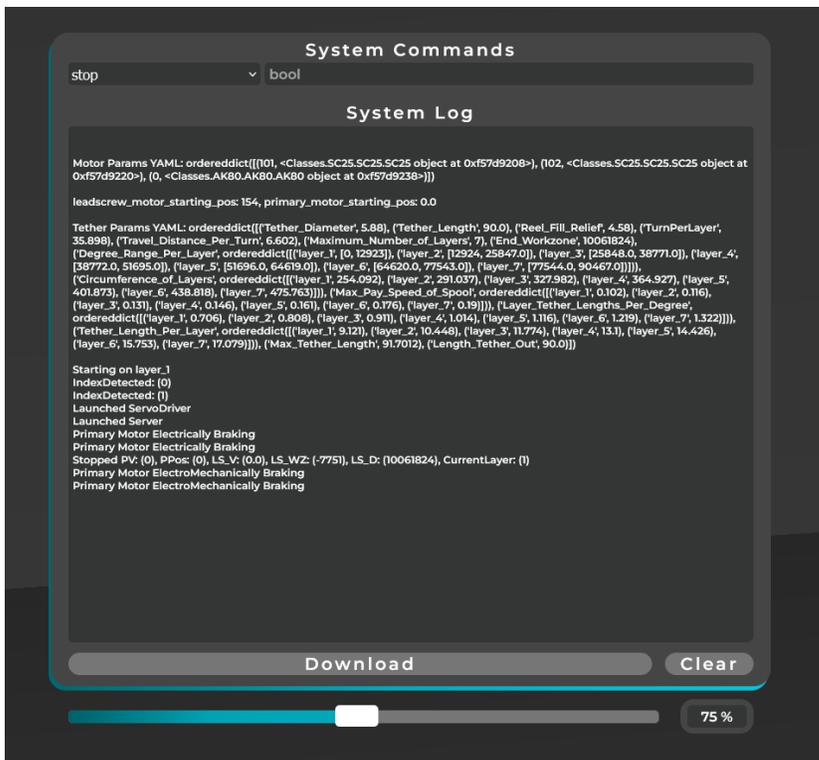
4. Power Cycle the TMS (**Bug Workaround – Fix Coming**)

Step 18 – Establish a Fresh Connection with the TMS (Bug Workaround – Fix Coming):

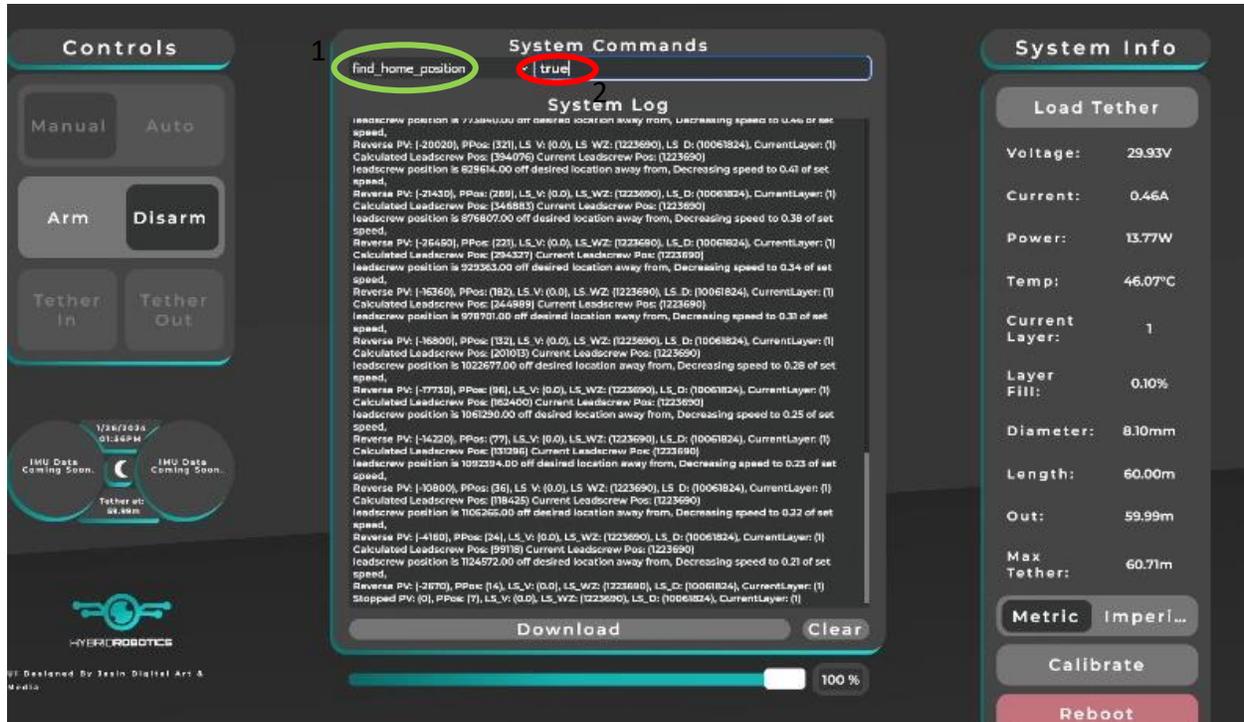
1. Wait for the TMS to finish booting. You will know it has finished if the telemetry values under System Information start updating.



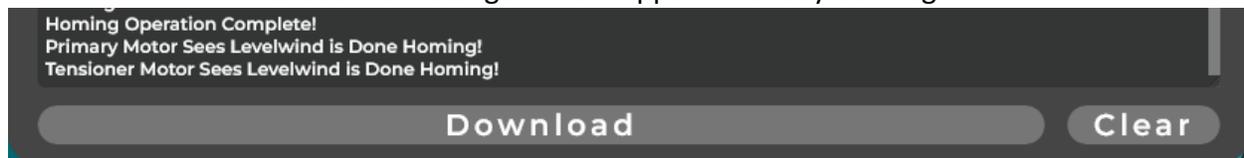
2. Once the connection is established, left-click the *Clear* button under *System Log* and refresh the page. After refreshing, the *System Log* should look like the image below.



Step 19 – Home TMS:



1. Dropdown Menu Selection (Green Oval):
 - o Locate and select *find_home_position* from the dropdown menu.
2. Input in Text Box (Red Oval):
 - o Type *true* in the provided text box.
3. Execute Command:
 - o Press Enter to send the command.
4. Levelwind will travel to the nearside proximity sensor:
 - o Wait to see the messages below appear in the system log

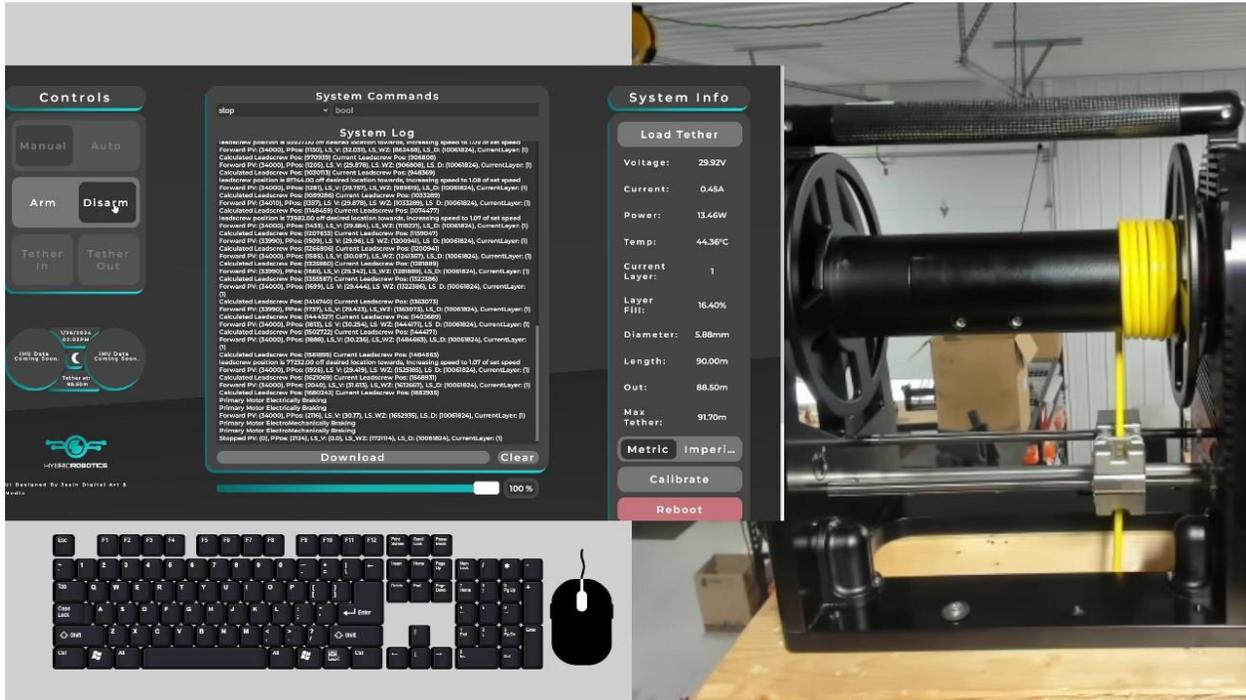


Step 20 – Pay in the First Few Wraps of Tether:

1. Arm the System

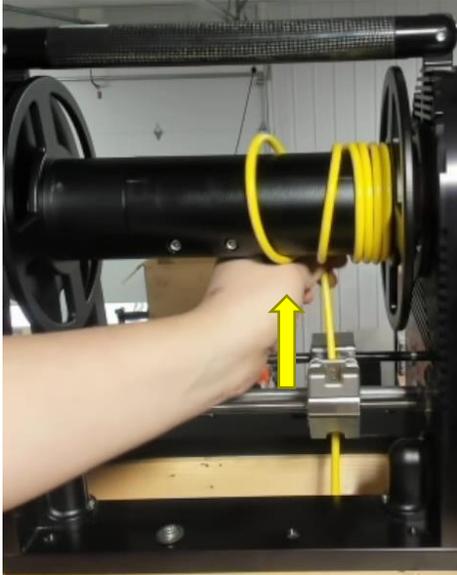


2. Left-click and hold the *tether In* button until the *Layer Fill* is around 15%. Then *Disarm*

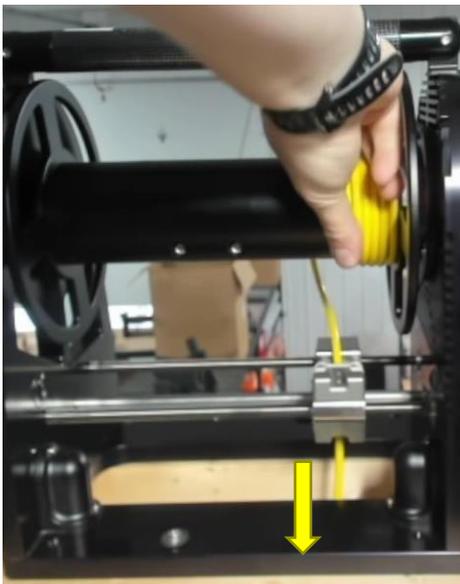


Step 21– Manually Organize the Wraps so That the Tether Does Not Cross Over Itself:

1. Pull a few inches of slack through the top of the levelwind to loosen the current wraps of cable.
2. Start wrapping the tether Around the Drum Manually so that the tether does not cross over itself.



3. While holding your organized cable, pull the *tether* slack back through the *Levelwind Carriage* so there is no slack between the *Levelwind Carriage* and the *Drum*.



4. You are loaded and ready to *tether In* the rest of your cable!

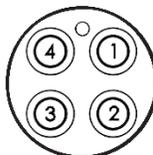
Glossary

Pinouts

Standard Pinouts

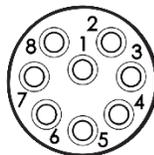
Below, you can find the standard connector pinouts on the TMS. They include the Tether/Decklead, Comms(Ethernet), and Power.

4-pin Male Subconn
(MC-Series) Power
Input



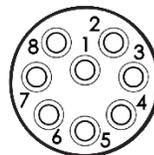
- 1: GND
- 2: GND
- 3: +24Vdc
- 4: +24Vdc

8-pin Male Subconn
(MC-series) Comms
Input



- 1: Blue
- 2: Blue/White
- 3: Orange
- 4: Orange/White
- 5: Green
- 6: Green/White
- 7: Brown
- 8: Brown/White

8-pin Male Subconn
(MC-series) Tether
Input



- 1: PWR(+)
- 2: Comms 1 (+)White (Red Pair)
- 3: Comms 1 (-) Red (Red Pair)
- 4: N/C
- 5: GND (-)
- 6: Comms 2 (+)White (Green Pair)
- 7: Comms 2 (-) Green (Green Pair)
- 8: Shield (Earth)

External Proximity Endstop (If included)

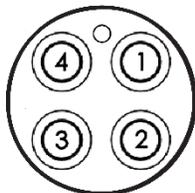
This is only included on TMS systems that have specifically requested this addon.

Note: Testing and certification of this addon is still underway.

Compatible Proximity Sensor Specs:

- 1. Type: NPN-NO (Normally Open)
- 2. Operating Voltage: 10-30V

4-pin Male Subconn
(MC-Series) Proximity
Input



- 1: 24Vdc
- 2: GND
- 3: Signal
- 4: NC

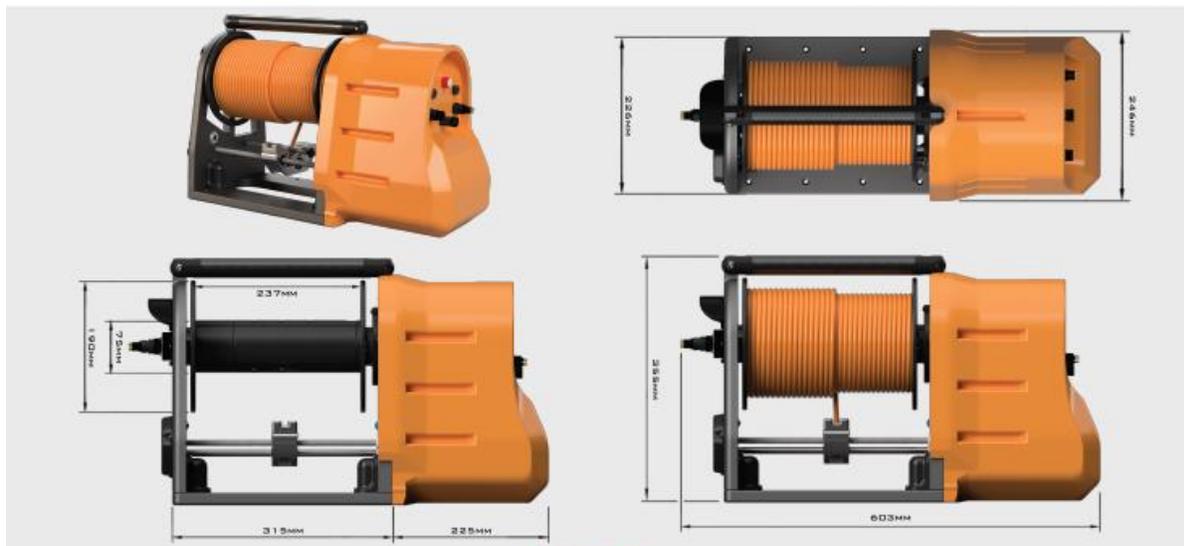
Specifications:

THE NAUTILUS

Tether Management System



HOUSING REV 1.4
DIMENSIONS ARE IN MILLIMETERS



SOFTWARE

COMMUNICATION	WEB INTERFACE & API
PHYSICAL	
WEIGHT (NO TETHER)	24KG
CONTINUOUS MOTOR TORQUE/MAX TORQUE	48NM / 120NM
CONTINUOUS PULL FORCE (VARIES BASED ON TETHER DIAMETER AND AMOUNT OF TETHER ON SPOOL)	40KGF
BRAKE HOLDING TORQUE	100NM
MAX PULL FORCE (DRUM STATIONARY WITH BRAKE APPLIED)	140KG
MAX SPOOL SPEED @ RATED TORQUE	24RPM
INPUT VOLTAGE	20-30VDC
TYPICAL CURRENT/PEAK CURRENT	0.5-10A/20A
COMPATIBLE TETHER DIAMETER RANGE	4-11MM (REV1.4 & LATER WILL BE 4-15MM)
SLIP-RING SPECS	6 @ 24 Vdc, 2 A / 2 @400 Vdc, 10 A
HOUSING REV1.3 DEPTH RATING (TESTED)	50M
HOUSING REV1.4 DEPTH RATING (TARGET)	100M