



# Series 1520/1580 - Enclosure V3 User Manual

**Revision 3.0**

**Manual SKU#: XRKY**

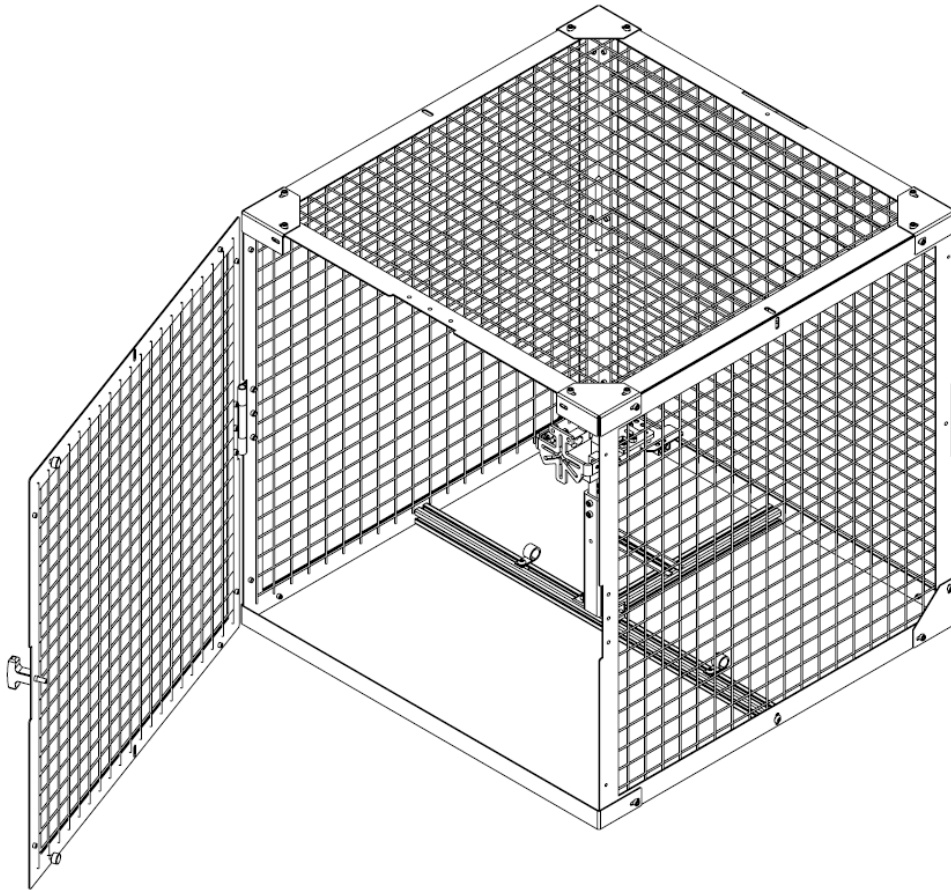


Image above shows the enclosure with the door open (Series 1580 shown inside not included).

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# Chapter 1: Introduction

The Series 1520/1580 enclosure prevents parts larger than 6mm from being ejected during a dynamometer test when used within the specifications. It can also help to prevent operators from getting too close to the spinning propellers.

The enclosure features a door which allows users to quickly change the motor or propeller on the thrust stand. The stainless steel mesh has been tested and proved safe for plastic and carbon fiber propellers no larger than 16 inches respecting the speed limits specified in this document.

Propeller's diameter (inch)	Propeller's material	Rotation speed limit (RPM)	Linear speed limit (m/s)
< 6"	Nylon/Polymer	25000	199.49
6" to 10"	Nylon/Polymer	15000	199.49
10" to 16"	Nylon/Polymer	8000	170.23
< 12"	Carbon Fiber	10000	159.59
All other propellers <16" in nylon, polymer and carbon fiber		6000	127.67

You still need to use safety goggles as the airflow can project very small parts at high speed. The user manual of the enclosure is regularly updated. To ensure you have accurate information, please download the latest PDF copy from our website:

<https://www.tytorobotics.com/blogs/manuals-and-datasheets>

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## IMPORTANT!

**We highly recommend that all operators who will be working with the assembly of the enclosure carefully read this user manual in its entirety.**

Please note that not following the instructions in this user manual may result in structural failure of the enclosure and the test tool in it. Spinning motors and propellers may cause serious injuries or death of the operator.

In this manual, any text following a # represents the Tyto Robotics SKU number for this item. You may refer to this number to order spare parts.

## 1.1 Item checklist for the enclosure

The Series 1520/1580 enclosure ships in a single package. You may use the following item checklist to verify the items:0

Square corrugated carton:

- Structure Fastener Bag (SKU#: CZHK) x1
- Stand Fastener Bag (SKU#: KGRV) x1
- Door Fixtures Bag (SKU#: HBHQ) x1
- Frame 565 mm x 565 mm (SKU#: PZUQ) x5
- Square Tube Stand 1"x1" x 160 mm length (SKU#: WUPP) x1
- T-slotted beam 565 mm (SKU#: GRFR) x1
- T-slotted beam 270 mm (SKU#: EBMU) x1
- T-slotted beam 45 degree support (SKU#: CKYX) x1
- U Front joiner (SKU#: JTQW) x1

## Chapter 2: General Safety Rules

### **Always put safety first! It is your responsibility!**

It is always important to stay alert to work with a thrust stand. The enclosure protects the operators under most circumstances, however, it is not a guarantee of security and any abuse or misuse of the enclosure may result in damage to the equipment or injury to the users.

### **To ensure safety, please follow these instructions:**

1. Wear safety goggles during a test.
2. Wear gloves during assembly of the cage.
3. Make sure you have all the components and tools needed before construction.
4. Inspect all fasteners before every experiment and as often as possible.
5. Do not place the enclosure near the presence of flammable liquids or gases.
6. Always keep your work area and enclosure clean, do not work on surfaces that are dirty with oil. Small metal chips may be blown up and hit the propeller by accident. Clean your testing room before every test.
7. Respect Murphy's law. If you think something might go wrong, it will.
8. Make sure you are dressed for safety. Do not wear jewelry or long clothing when operating the tool. Tie long hair before a test.
9. Do not let children around the Series 1520/1580.
10. Do not use or assemble the tool alone.
11. Do not substitute parts or modify the instrument.
12. Always disconnect the power source before opening the door on the enclosure.
13. Do not store anything near or above the enclosure, especially when performing a test.
14. The enclosure is tested for containing a propeller failure. It should also protect in case the Series 1520/1580 comes apart (loose screw or mechanical failure).
15. Do not stay in the plane drawn by the spinning propeller or directly behind it. This is where small parts are most likely to be ejected from the cage.
16. Wait for the propeller to stop spinning before opening the door of the enclosure.

## Chapter 3: Installation of the Enclosure

In this chapter, we will present you a full guide to install the enclosure for the Series 1520/1580. Every section represents the suggested procedure to assemble and to install the enclosure, please follow the sequence accordingly.

### 3.1 Main cage frame

Please unpack the following items:

Item name	Item SKU	Qty	Located in (SKU# if exist)
Structure Fastener Bag	CZHK	1	Main Carton Box (#XRKY)
U Front Joiner	JTQW	1	Main Carton Box (#XRKY)
Frame 565 mm x 565 mm	PZUQ	5	Main Carton Box (#XRKY)

You can find the following components inside the Structure Fastener bag (#CZHK):

Item name	Item SKU	Qty
M4 x 8 mm Socket Head Screw	CG9T	24
Three-way corner	LRDZ	4
L-joiner	GALA	2

**Take case when handling the frame, the mesh can cut.**

Please follow these instructions to assemble the main frame:

- ❖ Open the Structure Fastener Bag (#CZHK) and take out the two L-joiners (#GALA) and eight M4 socket head screws (#CG9T).
- ❖ Position the L-joiners (#GALA) in the lower outside corner of the Frame (#PZUQ) and connect them with two M4 screws (#CG9T) by passing them through the two slots. Be careful with the direction of the frame (#PZUQ). The mesh and extruded threaded holes must be facing inside the cage. The two slots must be positioned at the top and bottom of the frame (#PZUQ).
- ❖ Repeat the same step with the second L-joiner (#GALA) by having one L-joiner at the bottom left, and the other one at the bottom right of the Frame (#PZUQ). **Do not fully tighten the screws as you may need room to move the parts around.**
- ❖ This frame (#PZUQ) assembled with the two L-joints (#GALA) at its bottom represents the panel that will be located at the back of the cage.

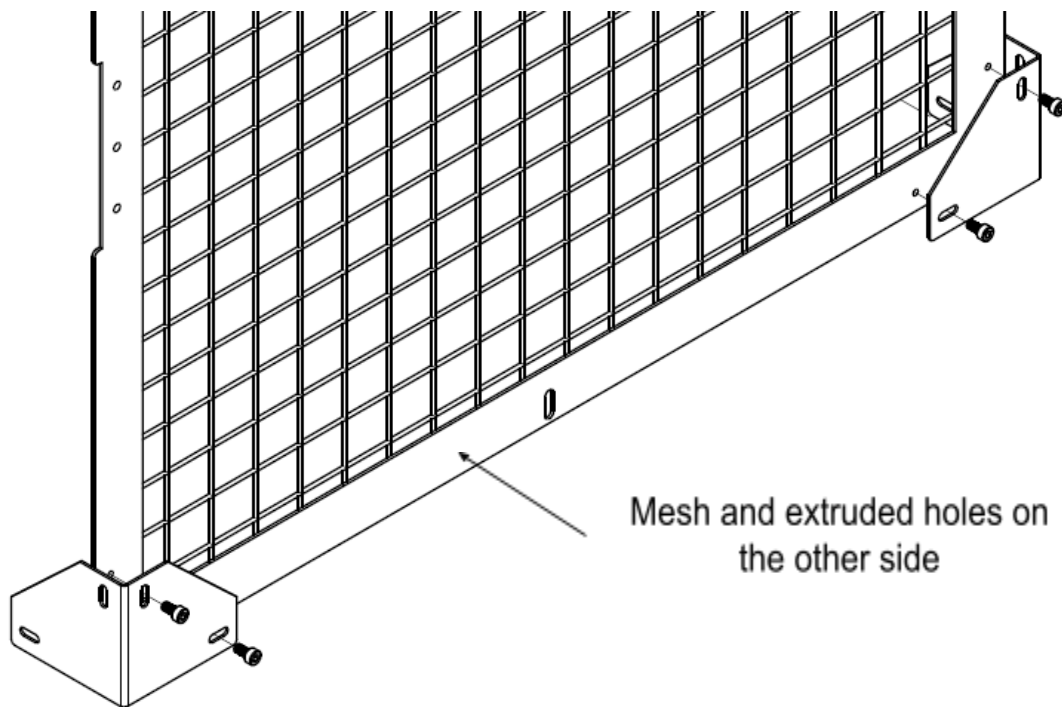


Fig 3.1: Assemble the L-joiner and the Frame

- ❖ Take two more frames (#PZUQ) out of the main carton box (#XRKY) and get the four remaining M4 screws (#CG9T).
- ❖ Position them at 90 degrees from the previously assembled frame (#PZUQ) with the two L-joiners (#GALA) and connect them with two M4 screws (#CG9T) each.
- ❖ These two frames (#PZUQ) will represent the sides of the cage. Extra attention to position them as follows: the mesh and extruded threaded holes should face the inside of the cage and the screws' head should remain outside of the cage. The two slots in the center should be placed at the top and bottom. Position the set of three extruded tapped holes opposite the back Frame (#PZUQ). This will allow you to place the door opening on the left or right side.

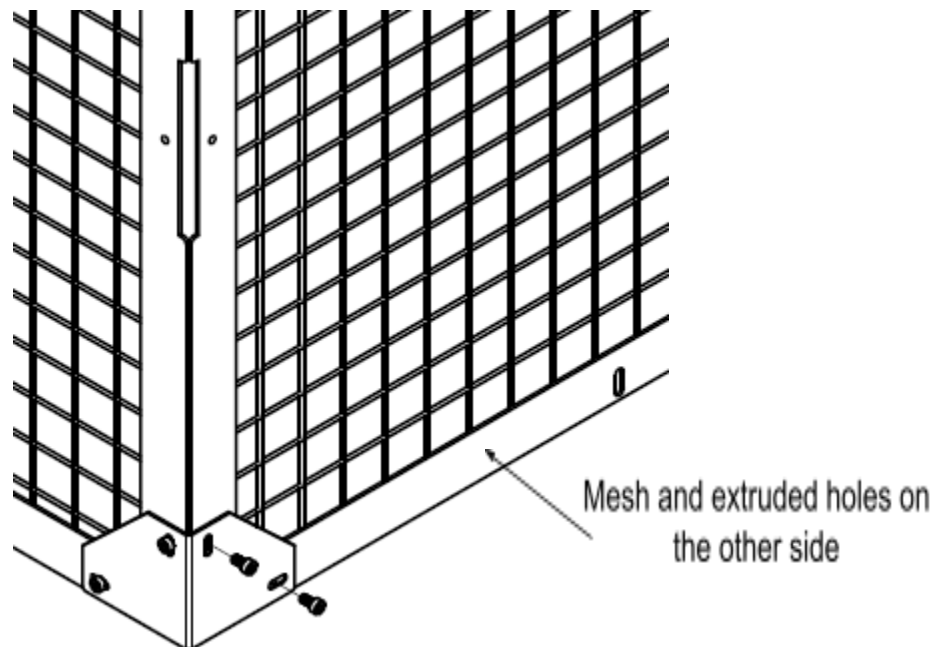


Fig 3.2: Assemble the L-jointer and the sides Frames

- ❖ Take the U Front Joiner (#JTQW) from the main carton box (#XRKY).
- ❖ Open the Structure Fastener Bag (#CZHK) and take out two M4 socket head screws (#CG9T).
- ❖ Position the U Front Joiner (#JTQW) on the ground and at the front of the structure. Place it on the outside of the two side Frames (#PZUQ) and screw it in place with two M4 screws (#CG9T) through the slots.



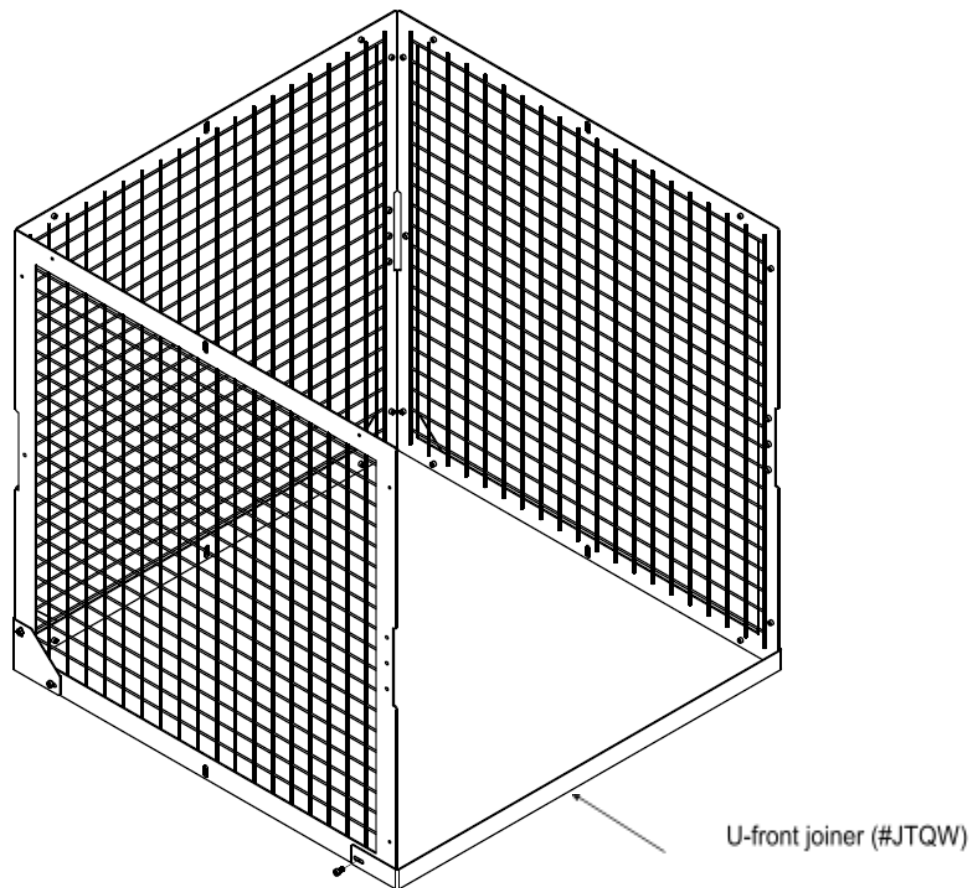


Fig 3.3: Assemble the U Front Angle and the two sides Frames

- ❖ Open the Structure Fastener Bag (#CZHK) and take out the four 3-way corner (#LRDZ) and fourteen M4 socket head screws (#CG9T).
- ❖ Take one Frame (#PZUQ) out of the main carton box (#XRKY).
- ❖ Position a 3-way corner (#LRDZ) in one corner and outside the Frame (#PZUQ). Connect these two parts with two M4 screws (#CG9T) through the slots. Please take note that, the mesh and extruded threaded holes must face the inside of the cage and the 3-way corner (#LRDZ) must be at the outside of the cage.
- ❖ Repeat this operation for the other three 3-way corners (#LRDZ) in the other three corners of the Frame (#PZUQ). This frame represents the roof of the cage and the 3-way corners represent the junction between the roof and the cage structure.

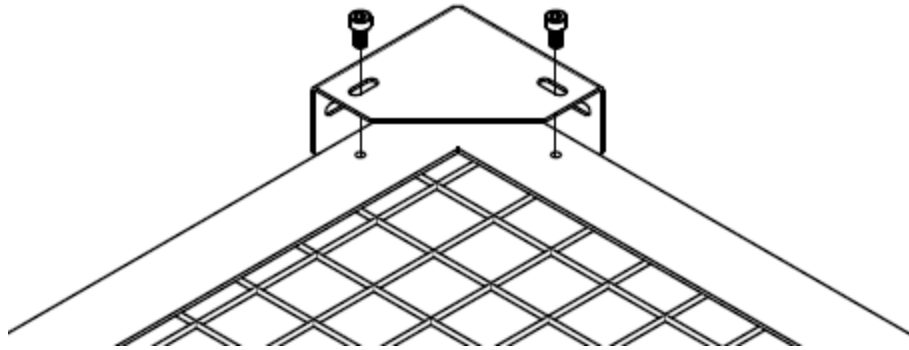


Fig 3.4: Assemble the 3-way corner and the upper Frame

- ❖ Once finished, you can place the Frame (#PZUQ) with the four 3-way corners (#LRDZ) on top of the previous structure to build the enclosure. The 3-way corners (#LRDZ) must overlap the Frames (#PZUQ) by placing them on the outside of the structure. Orient the two slots on the Frame (#PZUQ) to the left and right of the structure.
- ❖ Screw each 3-way corner (#LRDZ) to the three vertical Frames (#PZUQ) using the remaining six M4 screws (#CG9T).
- ❖ Now, you would have an enclosure assembled with the left, right, behind and top panels installed in place. You can tighten all the screws and adjust the Frames (#PZUQ) to limit the empty space between them.

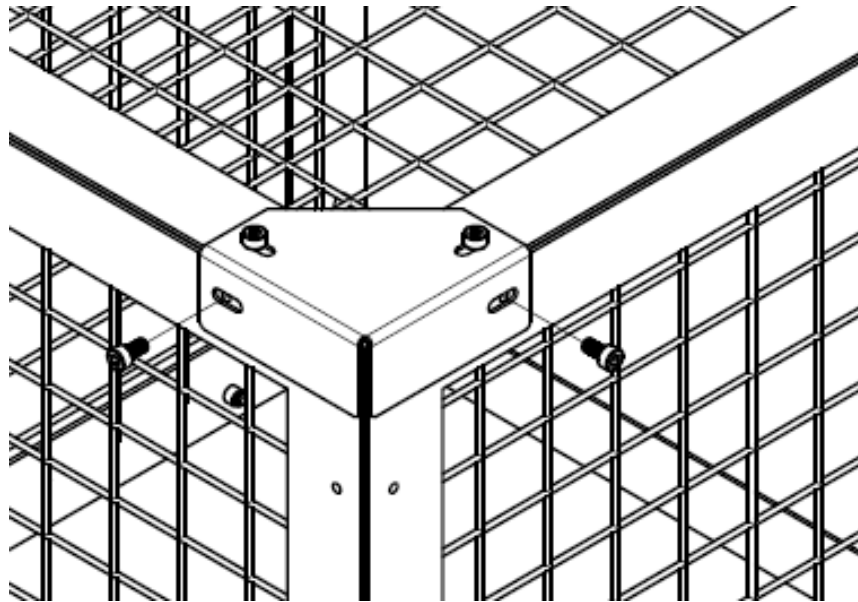


Fig 3.5: Installation of the upper Frame with the structure

## 3.2 Reclosable door assembly

In this section, you will assemble the door. Please retrieve the following items:

Item name	Item SKU	Qty	Located in (SKU# if exist)
Frame 565 mm x 565 mm	PZUQ	1	Main Carton Box (#XRKY)
Stand Fastener Bag	KGRV	1	Main Carton Box (#XRKY)
Door Fixtures Bag	HBHQ	1	Main Carton Box (#XRKY)

You can find the following components inside the Stand Fastener bag (#KGRV):

Item name	Item SKU	Qty
M5 x 8 mm Button head screw	PSRY	19
M5 T-nut	ZQSS	8
L Corner Bracket	HLCP	4
Rubber Grommet	HEMT	2
Cable Holders	TRBG	2

You can find the following components inside the Door Fixtures bag (#HBHQ):

Item name	Item SKU	Qty
Hinge	NXPR	1
Retaining Magnet	BQCB	2
T-handle	NPYC	1

Please follow these instructions to assemble the door:

- ❖ Take out the last Frame (#PZUQ) from the main carton box (#XRKY).
- ❖ Open the Stand Fastener bag (#KGRV) and take out six M5 screws (#PSRY).
- ❖ Open the Door Fixtures bag (#HBHQ) and take out the hinge (#NXPR).

- ❖ Using three M5 screws, position the hinge (#NXPR) on the outside of the Frame (#PZUQ) where the three tapped holes are located in the middle. Be sure to place the hinge pin (#NXPR) inside the enclosure of the Frame (#PZUQ).
- ❖ Depending on your preference, screw the second part of the hinge (#NXPR) to the left or right side frame (#PZUQ) with the three other M5 screws (#PSRY).

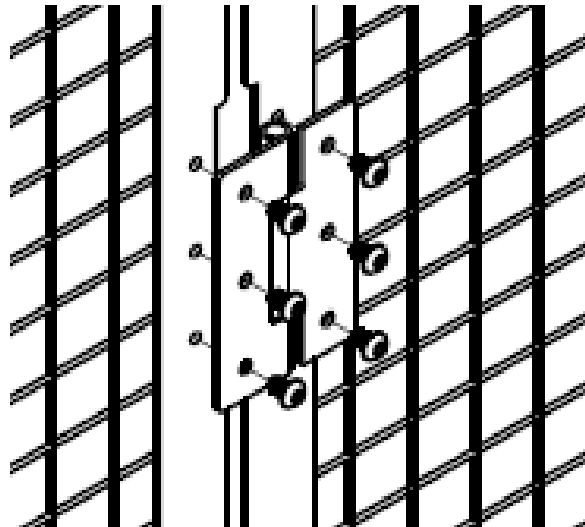


Fig 3.6: Install the hinge on the enclosure using M5 screws

- ❖ Open the Door Fixtures bag (#HBHQ) and take out the two retaining magnets (#BQCB) and the T-Handle (#NPYC).
- ❖ On the inside of the door, on the opposite side of the hinge (#NXPR) previously installed, screw the two retaining magnets (#BQCB) onto the Frame (#PZUQ). The first one is screwed in the highest threaded hole of the door, the second in the lowest hole.

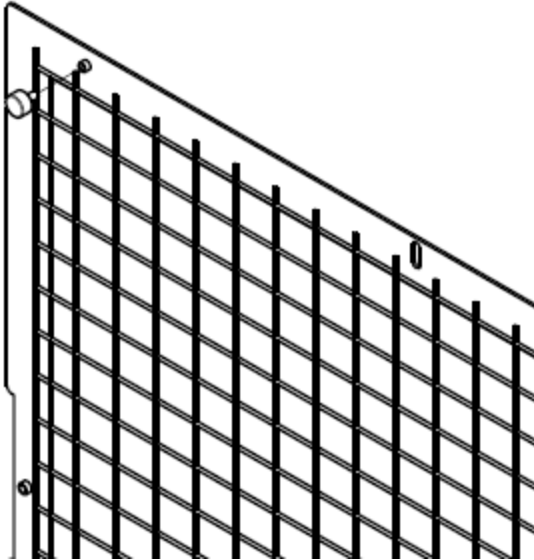


Fig 3.7: Installation of the 2 retaining magnets on the door Frame

- ❖ On the outside of the door, screw the T-handle (#NPYC) into the tapped hole in the middle of the Frame (#PZUQ) and on the other side of the hinge (#NXPR).

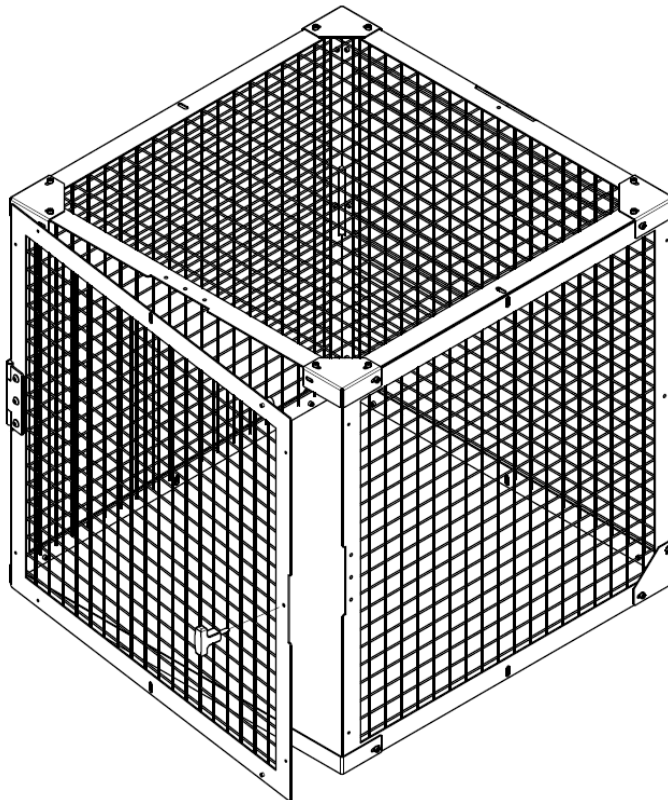


Fig 3.8: Installation of the T-handle on the door Frame

### 3.3 Mounting the stand support

In this section you will assemble the mounting system for the 1520/1580 Series test stands. Please retrieve the following items:

Item name	Item SKU	Qty	Located in (SKU# if exist)
Enclosure main body with door	N/A	1	built by you
Stand Fastener bag	KGRV	1	Main Carton Box (#XRKY)
Square Stand Tube	WUPP	1	Main Carton Box (#XRKY)
T-slotted beam 565 mm	GRFR	1	Main Carton Box (#XRKY)
T-slotted beam 270 mm	EBMU	1	Main Carton Box (#XRKY)
T-slotted beam 45 degree support	CKYX	1	Main Carton Box (#XRKY)

Please retrieve the remaining material from the Stand Fastener bag (#KGRV):

Item name	Item SKU	Qty
M5 x 8 mm Button head screw	PSRY	13
M5 T-nut	ZQSS	8
L Corner Bracket	HLCP	4
Rubber Grommet	HEMT	2
Cable Holders	TRBG	2

Please make sure that you insert the correct amount of T-nut into the slots of the beams before screwing it to the Frame.

Please follow these instructions to install the door on the enclosure:

- ❖ Take from the stand fastener bag (#KGRV) two L corner brackets (#HLCP), four M5 screws (#PSRY) and four M5 T-nuts (#ZQSS).
- ❖ Take the 565 mm beam (#GRFR) and slide two T-nuts (#ZQSS) in one of the slots.
- ❖ Use an M5 screw (#PSRY) to connect an L corner bracket (#HLCP) to the beam (#GRFR) by screwing it into the T-nut (#ZQSS) previously positioned in the slot. Keep them loose to allow the piece assembly to move along the slot.

- ❖ Repeat this operation a second time to create an assembly as shown in Fig 3.9.

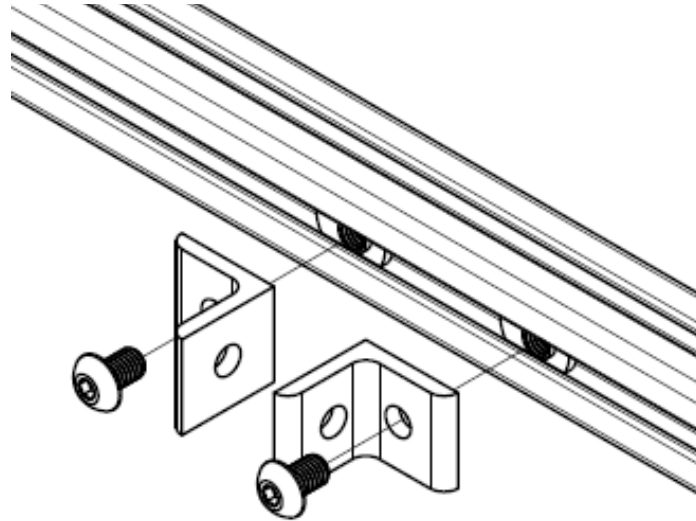


Fig 3.9: Insert the L bracket into the beam by using M5 screw and T-nut

- ❖ Take the 270 mm beam (#EBMU) and place two T-nuts (#ZQSS) in two of the parallel slots.
- ❖ Connect the two beams (#GRFR) and (#EBMU) perpendicularly.
- ❖ Connect them together using the two L corner brackets (#HLCP) you just assembled by adding an M5 screw (#PSRY) through them and screw into the two T-nuts (#ZQSS) you just added on the beam (#EBMU).

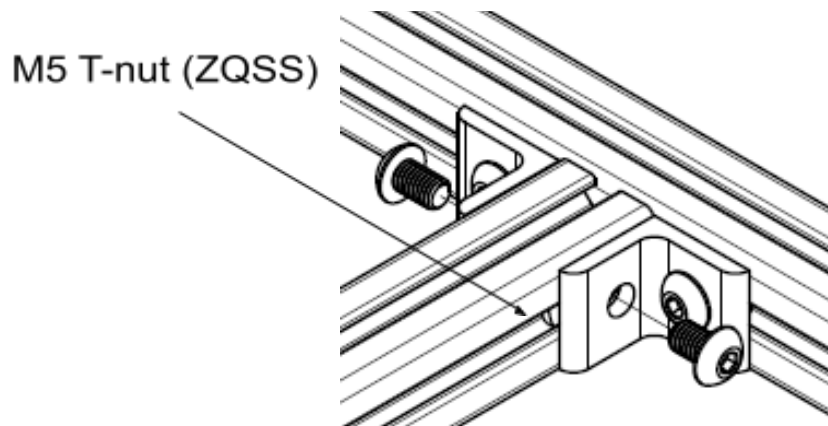


Fig 3.10: Link the two beam together

- ❖ You can now place the 270 mm beam (#EBMU) in the center of the 565 mm beam (#GRFR) and tighten the four M5 screws (#PSRY).
- ❖ The T-structure you just built will sit on the ground to accommodate the stand.
- ❖ Take two L corner brackets (#HLCP), four M5 screws (#PSRY) and four M5 T-nuts (#ZQSS) from the stand fastener bag (#KGRV).
- ❖ Take the Square Tube Stand 1"x1" x 160 mm length (#WUPP) from the main carton box (#XRKY).
- ❖ Take the 565 mm beam (#GRFR) and place four T-nuts (#ZQSS) in the slots located on the top of the T-structure.
- ❖ Use two M5 screw (#PSRY) to connect two L corner bracket (#HLCP) to the beam (#GRFR) by using two T-nuts (#ZQSS) previously positioned in the slot. Keep them loose to allow the piece assembly to move along the slot.

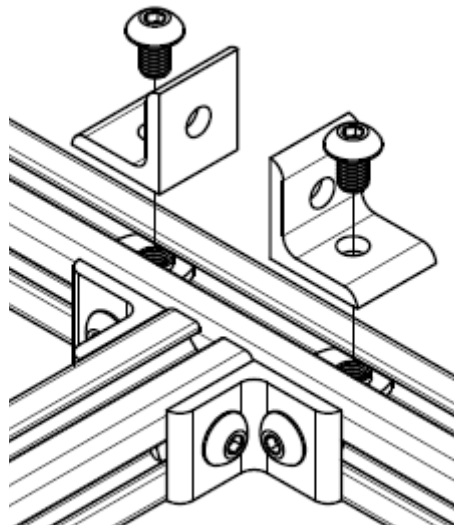


Fig 3.11: Insert the L bracket into the beam by using M5 screw and T-nut

- ❖ Place the square tube (#WUPP) on the 565 mm beam (#GRFR) and between the two L corner brackets (#HLCP) previously installed. The bottom of this tube has a threaded hole on two parallel sides.



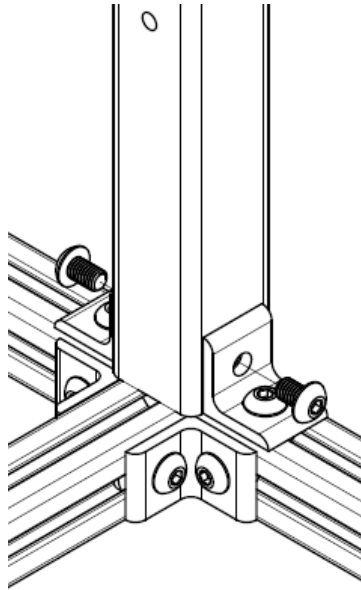


Fig 3.12: Insert the Square Tube and screw it by using two M5 screws

- ❖ Use two M5 screws (#PSRY), to connect the two L corner brackets (#HLCP) to the square tube (#WUPP) as shown in Fig 3.12, placing it as close to the center of the beam as possible (#GRFR).
- ❖ You can now firmly tighten these four M5 screws (#PSRY).
- ❖ Take out two M5 screws (#PSRY), two M5 T-nuts (#ZQSS) and two cable holders (#TRBG) from the stand fastener bag (#KGRV) .
- ❖ Screw the two cable holders (#TRBG) with the two M5 screws (#PSRY) on the two remaining T-nuts (ZQSS) in the slot of the beam (#GRFR). Please place these cable holders (#TRBG) where you wish to organize all the cables.

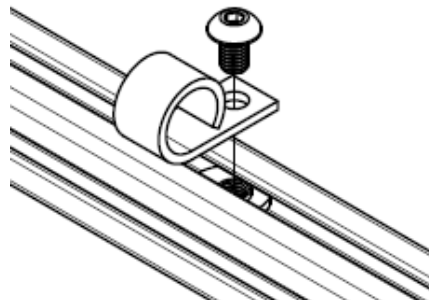


Fig 3.13: Fix the cable holder to the beam with an M5 screw and a T-nut

- ❖ Take the T-slotted beam 45 degree support (#CKYX) from the main carton box (#XRKY). A T-nut and a screw has already been pre-installed on the 45 degree support. You can remove them first.
- ❖ Place one of the T-nuts you just removed in the top slot of the 270 mm beam (#EBMU).
- ❖ Place one of the T-nuts you just removed in the top slot of the 270 mm beam (#EBMU). Then screw the 45 degree beam (#CKYX) into this T-nut using one of the screws and washers you removed before. Do not tighten so you can slide the assembly along the slot.

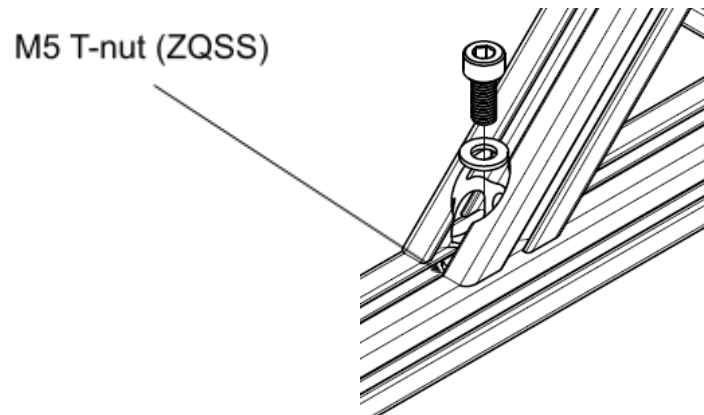
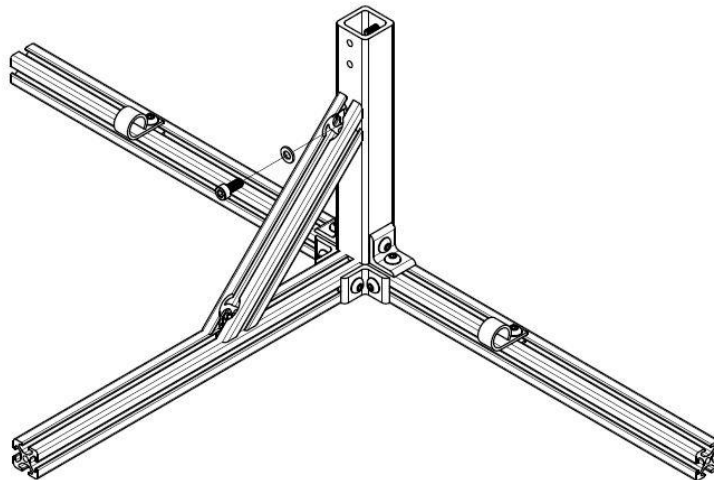


Fig 3.14: Fix the 45 degree support to the beam with an M5 screw and a T-nut

- ❖ You can now screw the 45-degree beam (#CKYX) to the square tube (#WUPP) you installed earlier by moving it along the slot. Tighten the screw on the 45-degree beam into the square tube (#WUPP), see Fig 3.15. The remaining T-nut will not be needed for further assembly.



- ❖ Take the three remaining M5 screws (#PSRY) from the bracket bag (#KGRV).
- ❖ You can now place the T-structure inside the cage you have assembled.
- ❖ The T-slotted rails have tapped holes at their ends, use the through holes at the bottom of each frame (#PZUQ) to firmly connect the rails into the enclosure from the outside of the cage with the three M5 screws (#PSRY).
- ❖ Make sure the cage is on a flat surface when assembling the t-slotted rail to the mesh.

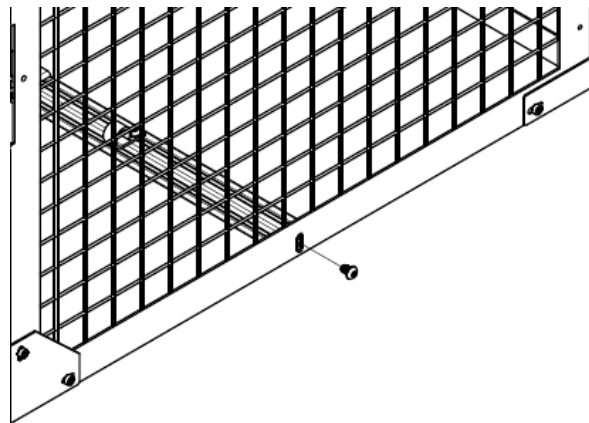


Fig 3.15: Installation of the thrust-stand inside the enclosure

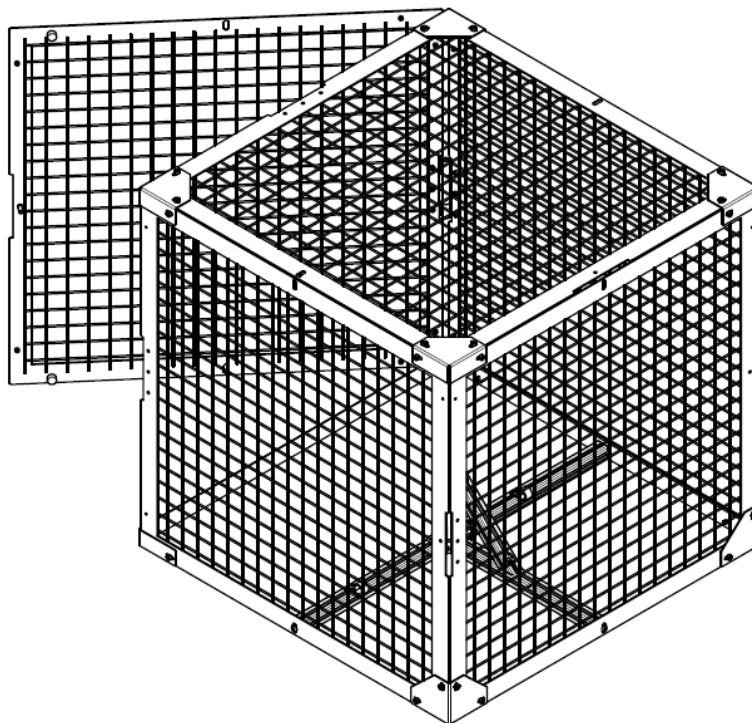


Fig 3.16: Enclosure complete

### 3.4 Mounting of the thrust stand and other accessories

In this section, you will replace the lower support part of the Series 1520 or Series 1580 by an extended-height lower support in order to accommodate propellers of up to 16". You may keep using the original lower support from the current thrust-stand, but please pay attention to the clearance between the ground and the prop.

This section will also demonstrate how you may install the Series 1520/1580 in the enclosure. Please unpack the following items:

Item name	Item SKU	Qty	Located in (SKU# if exist)
Finished enclosure	N/A	1	built by you
Thrust Stand Series 1520/1580	Q81X or J8UD or PKYB	1	Purchased separately
M4 x 12 screws (SHSC)	FXLW	2	Provided with Thrust Stand Series 1520/1580

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#### IMPORTANT!

- For your convenience, please calibrate the load cells, install the ESC, the wires, and all the accessories before installing the Series 1580 into the enclosure.

Please follow these instructions to install the thrust-stand into the enclosure:

- ❖ Remove the lower support of the Series 1520 or 1580.
- ❖ Directly install the thrust load cell to the square tube (#WUPP) with the M4 screws (#FXLW) to hang the stand on the square tube (#WUPP).

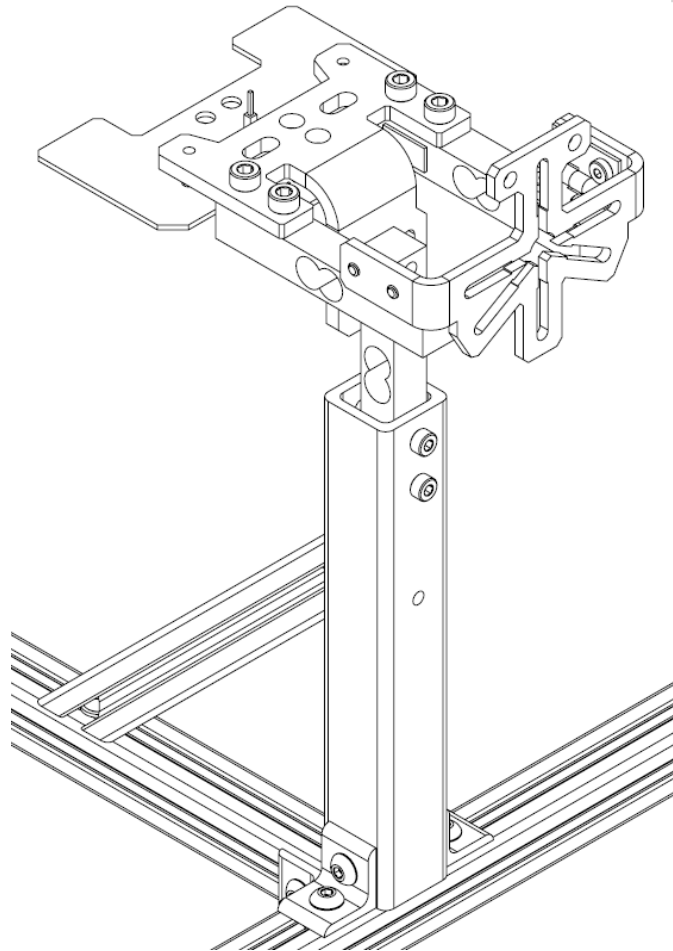


Fig 3.17: Series 1580 replaced with the square tube support

## Chapter 4: Final Preparation before Tests

### 4.1 LiPo battery management

If you are using a LiPo battery as the power source of a test, we recommend putting the LiPo battery **OUTSIDE** the enclosure for safety reasons. It also simplifies changing and charging the batteries.

You should always have a fire extinguisher on hand when testing and handling LiPo batteries.

### 4.2 Cable management

It is easier to connect all the cables before installing the dynamometer inside the enclosure.

You may find two rubber grommets inside the other accessory bag (#RHSC). These grommets have a groove diameter at 1", thus please cut out an adequate hole on the metal mesh and then insert the grommet. Please make sure not to install the grommets on the door. Those grommets are not factory installed to give you more flexibility in positioning the cables in your workspace.

You may then pass the USB cord, the power cord and all necessary wires through these rubber grommets.

### 4.3 Safety goggles sign

The Series 1520/1580 enclosure includes a **CAUTION** sticker to remind end operators to always wear safety goggles. Please attach that sticker to an apparent area on the enclosure, we recommend placing it near the door handle in order to always remind the operator to wear eye protection before and after opening the door.

You can find this sign inside the other accessory bag (#RHSC).

## Chapter 5: Warranty and Technical Support

### 5.1 Technical support

Tyto Robotics offers technical support for the enclosure over the telephone and by email. We recommend sending your questions with pictures to:

[support@tytorobotics.com](mailto:support@tytorobotics.com)

We usually reply within one business day.

### 5.2 Product's warranty

All our products go through a complete quality assurance program before shipping. We offer a 1 year warranty on manufacturing defects.

For safety purposes, if the mesh is damaged, you should stop using the enclosure and contact Tyto Robotics' technical support for information about getting a new mesh to fully enclose the thrust stand inside the structure.