

JTW Astronomy



**Trident P75
Operator's Manual**

Safety Information

Please read the manual from start to finish before starting the installation process

Manual Handling

The Trident P75 is heavy. When fully assembled do not attempt to move the mount without at least two people. Do not lift the mount using the motors or drive bodies (the blocks that the motors are attached to).

Electricity

The mount uses 12 VDC via a 120/230 VAC adapter. Appropriate measures should be taken such as using earthed, outdoor grade power cables/sockets. If the power cable becomes damaged the mount should not be used until the cable is replaced.

Important

The topics below are covered in detail further in the manual but are mentioned here due to how important they are.

1. Do not slew the mount with the brakes engaged
2. Do not use the mount if the drive is slipping, always solve the cause first
3. Do not over-tighten the drive clutch, listen to the motors for sounds of straining
4. Always use the brakes when changing instrumentation
5. Disengage the drive during transport of the mount, they're spring loaded, it's only necessary to loosen the thumbscrew until the axis can rotate freely
6. Do not perform polar alignment with the locking bolts too tight
7. Do not loosen the latitude locking bolts without the adjustment pin engaged
8. Always cover your equipment with a waterproof cover when not in use if stored outside or in an unheated observatory/building
9. Always disengage the drive before repositioning the mount manually

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Friction Drive Basics

The Trident P75 is Direct Friction Drive. The mount uses precision machined rollers rather than gears, the ease of manufacture means a more precise drive for a lower price than a typical gear driven mount. There are some considerations that are specific to friction drive that if adhered to will unlock the full potential of the mount.

- Balance
 - The telescope must be as close to perfectly balanced as possible. This extends as far as 3D balancing with large/asymmetric setups
- Clutch pressure
 - The clutch should be tightened as lightly as possible, where the mount slews without slipping.
 - Over-tightening the clutch should be avoided, it's designed in such a way that it's (almost) impossible to over-tighten by hand.
- Polar alignment
 - Take the time to properly polar align the mount. Error should be under 30", preferably under 10".
- Rigid setup
 - Solid pier/tripod
 - Flex eliminated as much as possible in the instrumentation
 - Use of an OAG
- Dual axis tracking
- 9-point alignment or pointing model

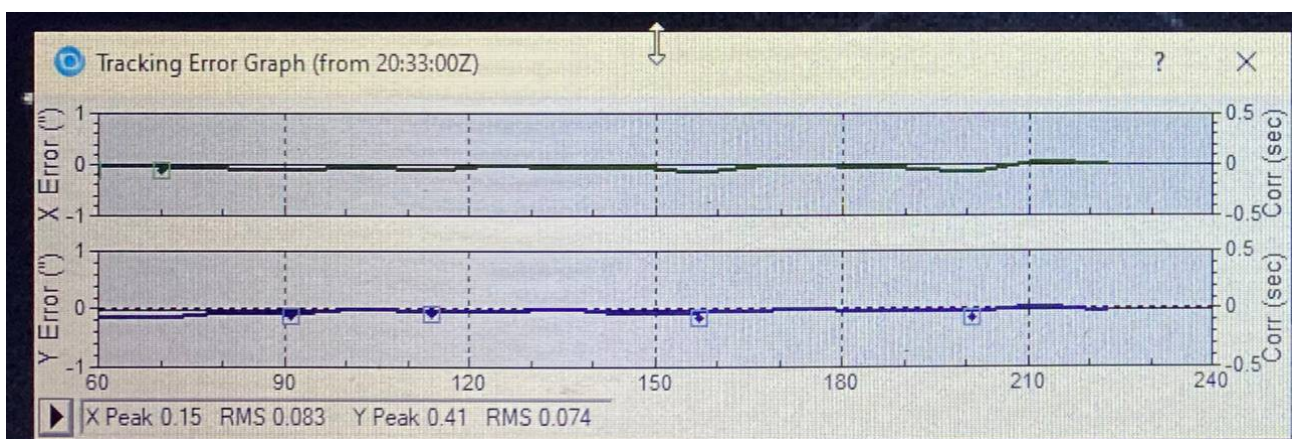


Fig. 1.1 – Guide graph from a well installed Trident

Anatomy of a Trident P75

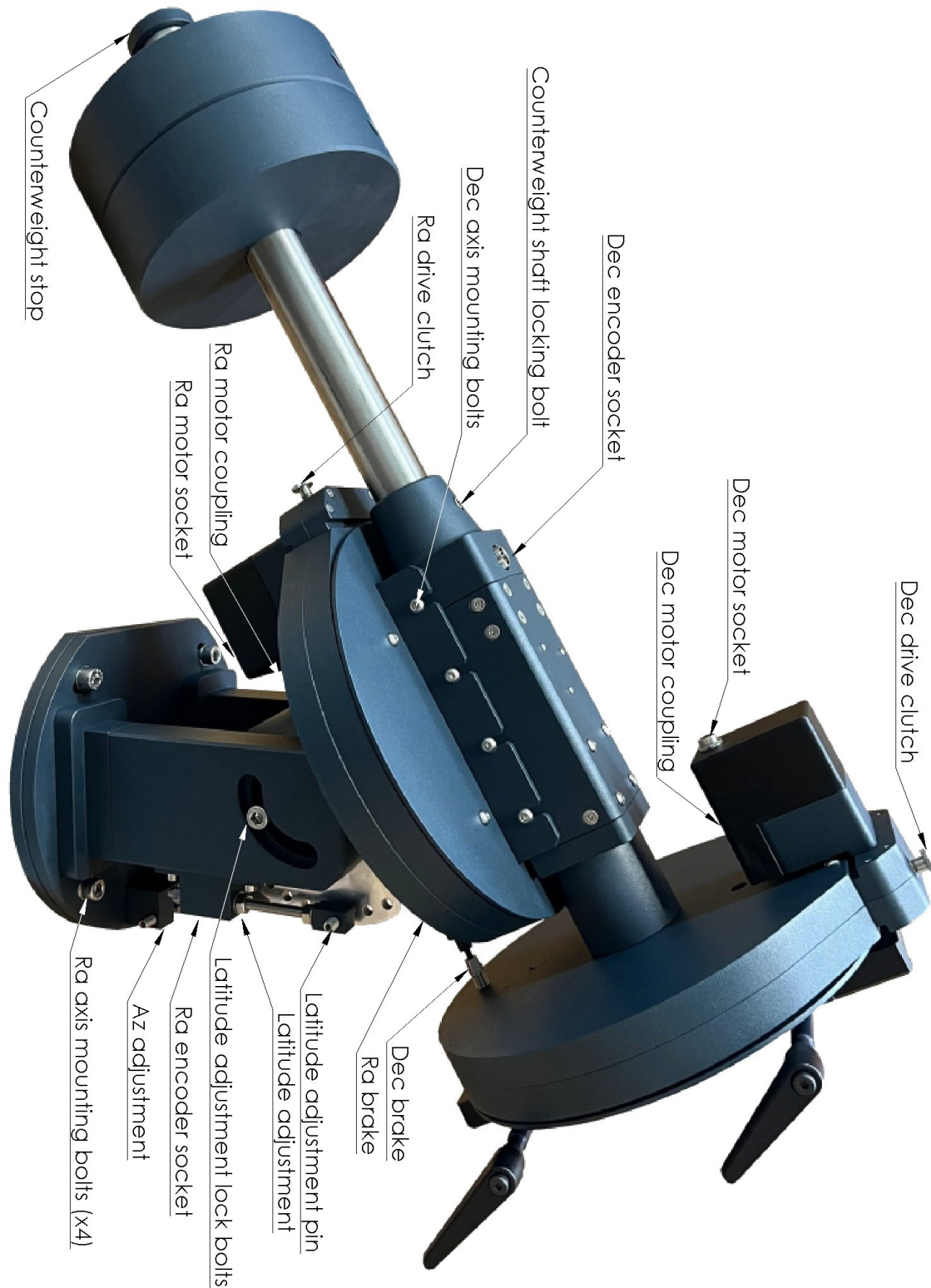


Fig. 1.2 – Trident Features

Mount Installation

The first step is to unpack the Trident and ensure all components are present and undamaged.

Packing list -

1. Ra axis assembly and motor/encoder cables
2. Dec axis assembly
3. Controller, counterweight safety stop, pier plate mounting bolts, controller mounting plate, saddle clamp components, power supply, QC report and software license
4. Counterweight shaft
5. Counterweights (individually boxed)

Before installing the pier plate confirm that North/South is accurately known and marked on the pier. The best method for this is to use Solar Noon (<https://gml.noaa.gov/grad/solcalc/>) and mark the top of your pier, a regular compass can be used with care, smartwatches and smartphone compasses aren't accurate enough for this task.

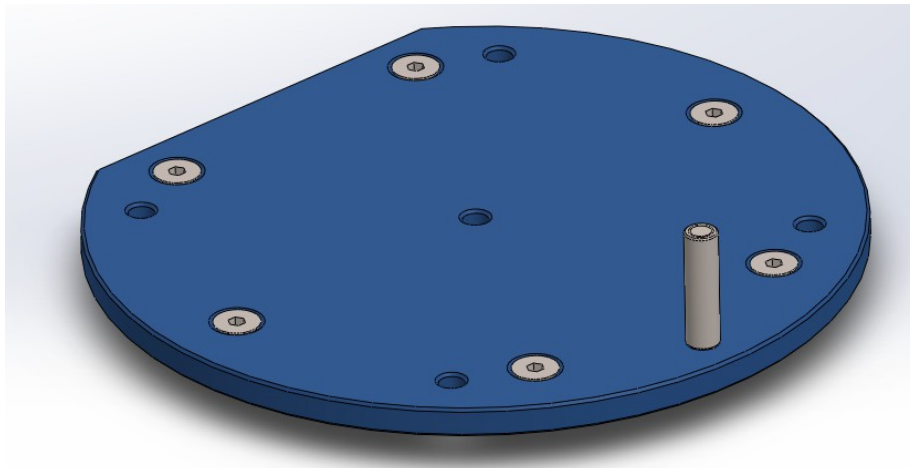


Fig. 1.3 – Trident pier plate

The top of the pier should be adapted to the base of the Trident using the technical drawing in the Appendix. This can be achieved by drilling holes or by use of a custom machined adapter. If using a machined adapter we recommend to use M8x1.25 threads as per the drawing. If bolting to a tip/tilt plate it may be easier to use 8.2 mm diameter holes.

Once the pier plate is bolted down check that it is level using an inclinometer or a good spirit level, make adjustments to the tip/tilt as needed.

Provided with the Trident is a controller mount plate, the installation of this is optional but it can be used to mount the controller at the rear of the mount. If this is to be used it needs to be installed before the Ra axis assembly is attached to the pier plate. Remove the M6 bolts on the underside of the Ra axis and remove the Az adjustment boss, sandwich the plate between the adjustment boss and top plate, reinstall the bolts.

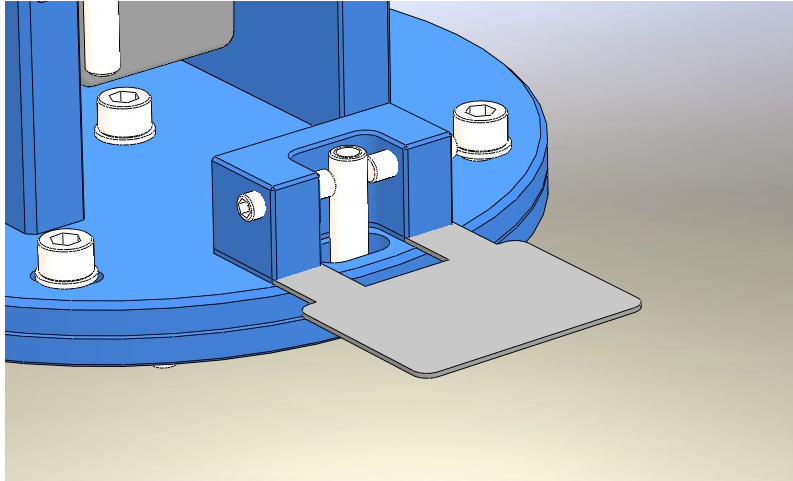


Fig. 1.4 – Controller mounting plate

Apply a thin layer of molybdenum grease to the pier plate and attach the RA axis using the provided M10x20 cap head bolts and tighten them (do not over-tighten, see notes on polar alignment). Quickly check the Ra axis by ensuring the axis rotates freely and silently with the brake off and drive disengaged, engage the drive and confirm that the friction system is working properly. The motor coupling is accessible from the rear of the motor drive assembly, it can be rotated with a fingertip to ensure the axis moves as expected.

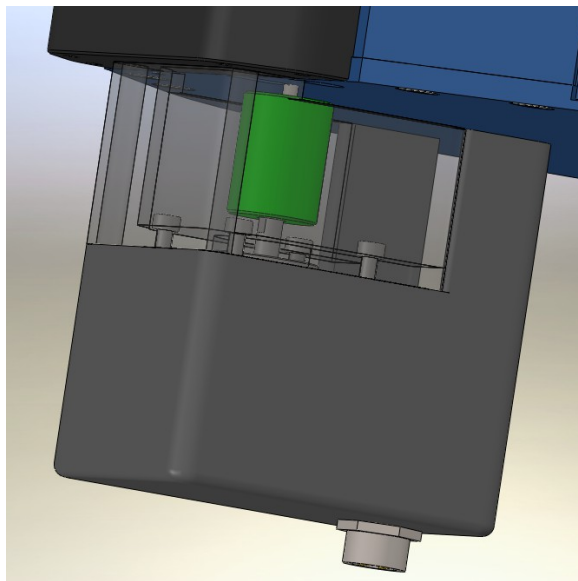


Fig. 1.5 – Motor coupling (highlighted in green)

Before proceeding to install the declination axis the mount needs to be in the following configuration -

- Ra base bolting is tight
- Ra brake engaged
- Ra drive disengaged
- Latitude set approximately
- Latitude adjustment pin engaged into the adjustment plate

To install the Dec axis, loosen the 8x M6 bolts on the sides of the Dec axis body and mount the Dec axis to the Ra axis using the slots on the mounting point. Take care to align it properly. It may require some pressure to slide into position and be fully seated. Tighten the M6 bolts. The last step is to attach the counterweight shaft, ensure that the locking bolt is properly engaged into the anti-fall hole in the counterweight shaft. Perform the same functionality check on the Dec axis as performed for the Ra axis.

Before proceeding ensure that -

- Dec axis is properly seated and bolting it tight (do not over-tighten)
- Dec axis brake is on
- Dec drive disengaged

The final step of building up the Trident is to attach the saddle clamps found in the box that contained the controller & QA report. Clamping handle assemblies need to be built in the following order

- Handle
- Extension tube
- Clamping block
- Spring
- Align to the pins on the dovetail saddle and install

The final step is to install the controller and cabling as per the markings on the controller and the drawing in the appendix.

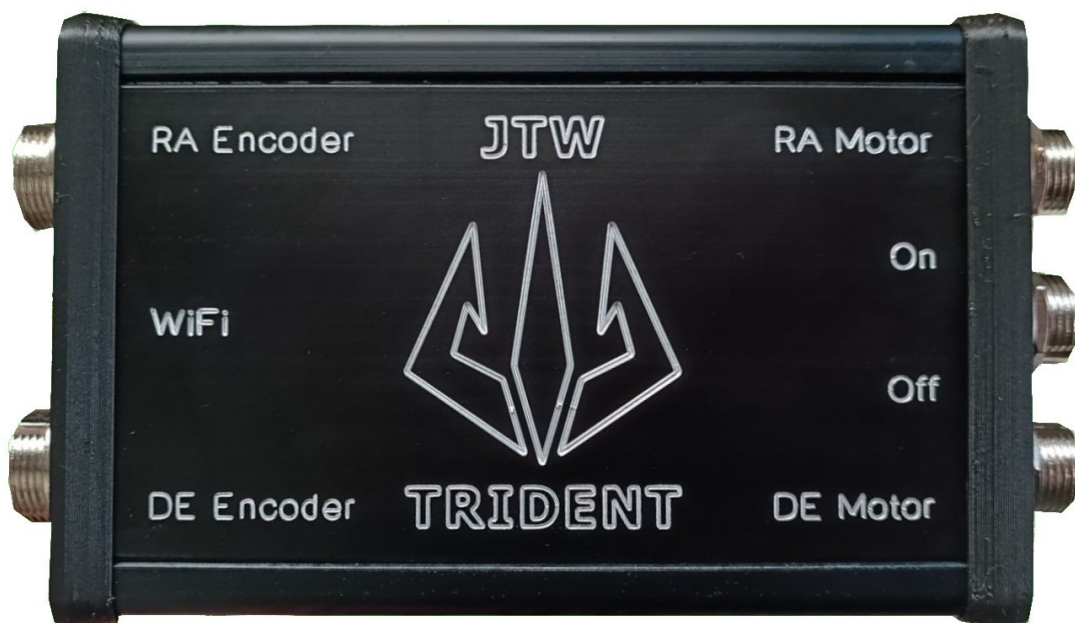


Fig. 1.6 – Trident Controller (with encoder option)

Functionality Test

This step is optional but we recommend to quickly test the mount before spending a lot of time and effort to install the instrumentation

- Install the OnStep mobile app, either OnStep in the Android app store or Gotomote for iOS
- Ensure the drive of both axes is disengaged and the brakes are on
- Turn the controller on and connect to the WiFi
 - SSID – 'JTW Trident'
 - Password – 'password'
- Start the app, turn tracking on and perform some movements using the hand pad to ensure the motors operate as expected.

Instrumentation

Safety Notes

Proper precautions must be taken before installing heavy instrumentation

- Two or more people may be needed to install a heavy telescope and tighten the saddle clamps
- Always double check that the brakes are on and engaged
- Drive on both axes is disengaged
- Latitude bolts are tight
- It is strongly recommended to have a bolt in each end of the dovetail to eliminate the possibility of the telescope sliding out of the saddle
- Always attach the counterweights first and remove them last, do not rely on the brakes alone. To stop the Trident being top heavy leave one weight attached.
- When using a tripod pay extra attention while installing heavy equipment. Use of a weight attached under the tripod to help prevent tipping may be required. Take extra care during adding/removing equipment that the center of gravity doesn't move so far as to cause the tripod to tip over.

General Advice

- Balance is very important for a friction drive, take care to balance the whole system as much as possible, 3D balancing for asymmetric systems may be required.
- Polar alignment, covered later in the manual, needs to be as precise as possible
- The drive should be tightened as little as possible, only enough to ensure the drive doesn't slip. Tightening beyond what is required can reduce the performance of the mount
- The Trident has external cabling. Together with the cabling of the instrumentation, proper cable management is strongly recommended

Software & Drivers

At this point the mount should be assembled and bolted down, the controller is installed, the instrumentation is attached and the polar alignment should be approximately correct. The next step is to set up the software.

Prerequisites

- ASCOM Platform
 - <https://www.ascom-standards.org/>
- Trident ASCOM driver
 - https://groups.io/g/jtw-astronomy-users/topic/trident_ascom_driver/96284154?
- Sky Planetarium
 - http://www.stellarjourney.com/index.php?r=site/software_sky
 - See documentation delivered with the Trident for license key
- N.I.N.A.
 - <https://nighttime-imaging.eu/>
 - Three point polar alignment plug-in

Initial Setup

Connection to the mount is possible via USB-C and WiFi. A wired connection is recommended for operation of the mount. Access to the Smart Web Server is only possible via WiFi. The SWS can be used for changing parameters of the mount that are not accessible from planetarium software. The SWS can be accessed by opening a browser and browsing to 192.168.0.1:9999.

The controller will be auto-detected by Windows when first connected via USB and will appear as a COM port. Sky Planetarium is recommended for use with the Trident as it's the native system for OnStep. It's possible to use a 3rd party planetarium via ASCOM, even if this is intended the initial setup should be done with Sky Planetarium.

Once all the mount parameters have been set it will be possible to do some testing. Using the planetarium software it will be possible to perform some GOTO's and to check that the mount is performing as expected.

Polar Alignment

The next step in setting up the mount is to perform polar alignment. N.I.N.A and the three star polar alignment is recommended for this as it allows polar alignment on any part of the sky. The process in N.I.N.A. is self explanatory. It's worth the time to get a very precise polar alignment. Less than 30" error is good, under 10" is excellent.

When performing polar alignment it's import to not have the locking bolts too tight, they need to be lightly nipped up, enough to remove play. When alignment is finished it's equally important not to over-tighten the lock bolts as this can cause the alignment to shift.

Alignment Model

The final step of the installation is to perform a 9-point alignment model using Sky Planetarium. This is found under Connections>Telescope>Alignment. Use as much of the sky as possible and use stars on both sides of the pier. Congratulations! Your new Trident is ready for use.

Maintenance

The Trident is designed to be very low maintenance. All bearings are sealed for life. If the mount is stored outdoors or in an unheated observatory and has not been used for a while it's necessary to remove the cover from it and allow it to air out, this should be done at least once a month. It's also recommended to power the mount up and perform some manual exercises, slew each axis over the full range of it's motion

Warranty Information

The JTW Trident has a two year warranty. For any issues please contact us at info@jtwastronomy.com

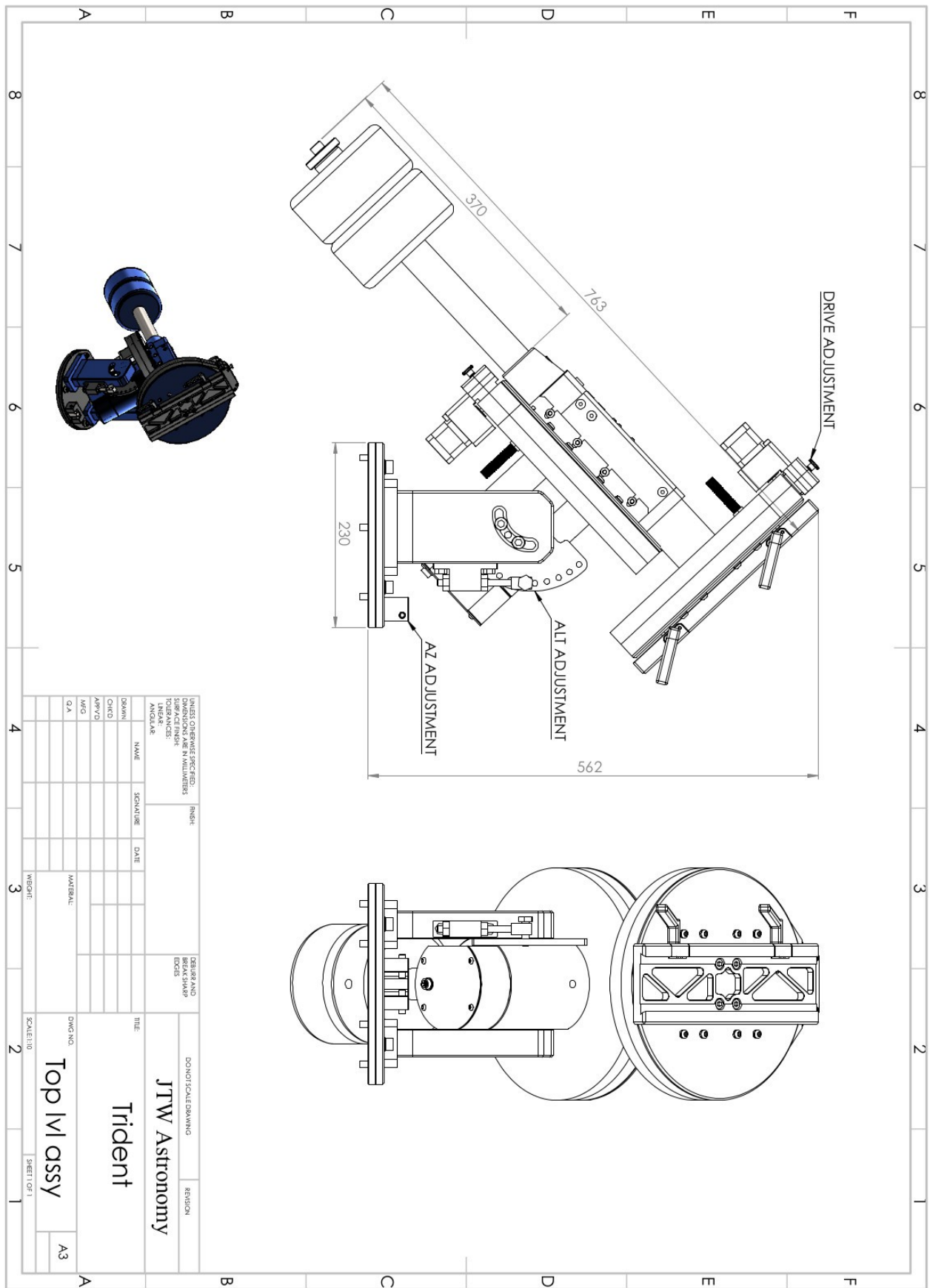


Fig. 1.8 – Trident dimensions

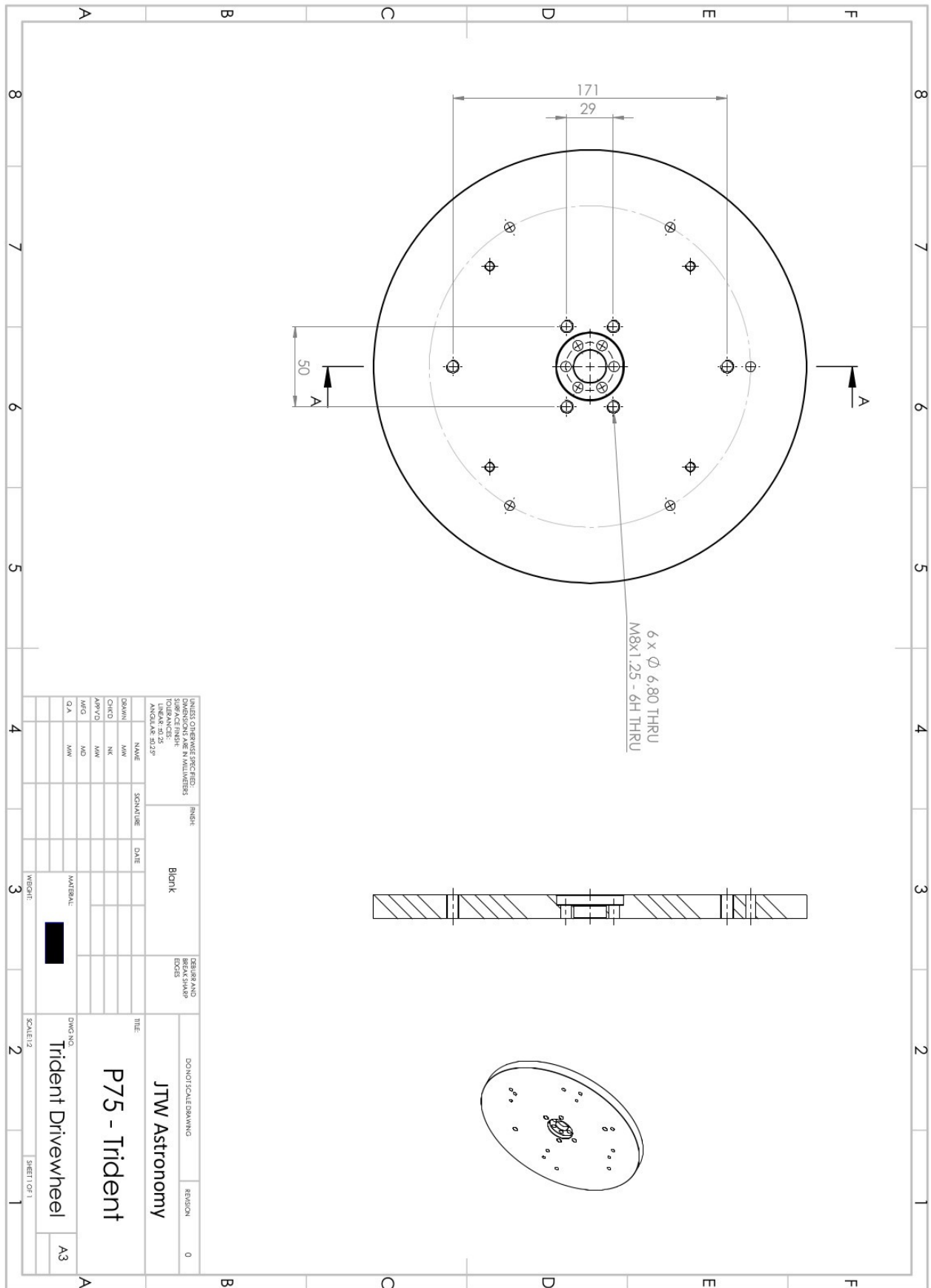


Fig. 1.9 – Dec drive wheel bolting pattern (for alternative saddles)