

PANTHER |

Telescope Mount TTS-160

Telescope rOTAtor



User manual

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Introduction

TTS-160 Telescope rOTAtor is an optional accessory to be installed and used on the TTS-160 telescope mount (can also be used on TTS-300). The telescope rOTAtor is installed between the mounting head and the telescope and rotates the entire optical tube assembly (OTA) including any piggybacked equipment (guide scope, telephoto lenses etc.). With the Telescope rOTAtor installed it's easy to do high precision long exposure astrophotography with the TTS-160 Panther Mount. And it can be done after a very quick setup without leveling or polar alignment.



NOTICE:

The TTS-160 Panther Mount is described in its own user manual. Please read that user manual before you start using the Telescope rOTAtor

Product safety



WARNING:

Never point a telescope towards the sun without a proper full aperture solar filter.

Do never look in the eyepiece when the mounting is slewing during daytime as the telescope might pass the sun.

Always setup the mounting on a level surface so that it cannot fall over.

The mounting consists of heavy parts – be careful not to drop these.

Always keep a hand on the telescope when the dovetail adapter is not tightened (for balancing etc.). All dovetails must have a security stop in each end ensuring the dovetail can't slide out of the dovetail saddle.

Electrical safety:

The mounting must be powered from a 12V battery with a 3 Amp fuse. **Always connect all cables to the mount and peripherals before connecting the battery power.**

Disconnect the battery power when the mounting is not in use.



WARNING:

Never use mains power and a power supply for outdoor use.

Receiving the telescope rOTAtor

The telescope rOTAtor is unpacked from the shipping boxes and is immediately ready for use. The delivered parts are:

- Telescope rOTAtor assembly
- Split power cable
- Signal connection cable – spiral cable

Installation

This section describes how to mount the telescope rOTAtor on the TTS-160 Panther mount. The setup of the pier and mount head is described in the mount user manual.

Install the telescope rOTAtor on the mount head

Setup the Pier and mount head.

Loosen the two bat screws at the dovetail saddle until the two brass pins can be pushed all the way in.

The dovetail on the telescope rOTAtor is inserted into the saddle in the side opposite to the locking screws. The front end of the rOTAtor - with the brass gear – must point away from the connectors on the mount head. Slide the rOTAtor backwards as much as possible. Lock the dovetail locking screws.



Check the rOTAtor is fixed correctly before mounting the telescope

Mount telescope OTA

Loosen the two bat screws on the *telescope rOTAtor* dovetail saddle until the two brass pins can be pushed all the way in. The dovetail on the telescope is inserted into the saddle in the side opposite to the locking screws.

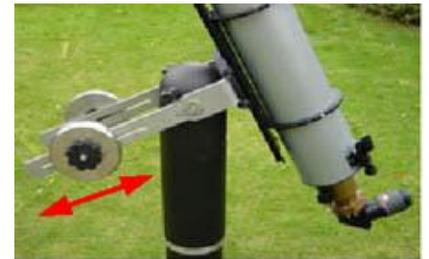
Balancing telescope and mounting

Start by balancing the telescope lengthwise. Leave the counter weights in the lowest position and the telescope HORIZONTAL.

The two altitude hand screws are loosened and the telescope is tilted up and down to feel the balance. Release the *telescope rOTAtor* dovetail locking screws and slide the telescope in the dovetail saddle until the balance is right. Lock the dovetail locking screws again.



Now the counter weights are balanced. Loosen the altitude hand screws and point the telescope 60-80 degrees upwards. Now the counter weights can be positioned where the balance is right. Place the two counter weights in approximately the same height.



Place the telescope horizontally and lock the altitude hand screws. The setup is now completed.



WARNING: Ensure that the dovetail locking screws are tightened before letting go of the telescope

Insert Cables and power up

Split Power Cable:

The long end of the split power cable is inserted into the connector labeled 12V on the telescope rOTAtor unit. The short end of the cable is inserted into the connector labelled 12V on the mount head.

Signal connection cable:

The signal cable is installed between the connectors labelled AUX on the mount head and the rOTAtor unit.

Powering up the mount head and rOTAtor:

When ALL the cables – including handpad and if wished PC cable – is connected the mount can be powered up.

When the battery power is connected the telescope rOTAtor will initialize. When initializing the rOTAtor will rotate to each endstop and finally stop in the center position. It takes approximately 30 seconds.



WARNING: All cables for the mount must be connected before the power cable is connected to the battery

Imaging with the telescope rOTAtor

With the telescope rOTAtor it's easy to take long exposure deep sky images. The rOTAtor rotates the complete OTA and any piggy backed guide scopes or telephoto lenses. Therefore it's possible to use well known imaging and guide principles on a stable alt/az mount that's easy to setup.

Basic setup for imaging

A basic setup for long exposure deep sky imaging should consist of:

- TTS-160 Panther Mount
- Telescope rOTAtor
- Main imaging telescope
- Main imaging camera
- Piggy backed guide telescope – or off axis guider
- Guide camera

It's important that the guide telescope is fixed firmly to the main telescope to avoid any flexing between the imaging camera and the guide camera.

Rotation center and imaging center line-up

To achieve good results with the telescope rOTAtor the center of rotation must line up with the main telescope field of view center.

This can be tested following this procedure:

1. Install main telescope on the mount with rOTAtor
2. Align the mount and slew to a star field with bright stars (e.g. milky way field)
3. The mount must be tracking
4. Install and focus the main imaging camera on the telescope
5. Start a 30 sec exposure
6. In the handpad select "rOTAtor" – "Rewind CW". This will make the rOTAtor rotate to the side end stop. Rotation must take place while the camera is imaging.

Inspect the resulting image – the stars will show up as small arcs and the center point of these arcs is the center of rotation. This point must be in the center of the camera field. If this is not the case the dovetail must be aligned in relation to the telescope. This can be done by shimming up tube rings beneath and/or in the side.

When the line up is complete the system is ready for imaging. Please note that this lining up will also improve the general goto precision of the mount.

Step by step imaging procedure

Below follows a complete step by step procedure for taking a long exposure image:

1. Setup the mount and rOTAtor as described in this manual
2. Install and balance the telescope OTA including the guide scope and cameras as listed above
3. Power up the mount and see the rOTAtor initializes
4. Perform a 2 star alignment of the mount. The alignment must be made through the main imaging telescope
5. Focus the camera carefully – the second alignment star can be used for this
6. Make a goto to the selected object
7. Rewind the rOTAtor by selecting “Smart rewind ” in the “rOTAtor” menu. This will make the rOTAtor slew to one side.
8. Center and frame the object
9. Start the guide camera to identify a suitable guide star
10. Perform calibration of guide system (procedure is guide-software dependent)
11. Start guiding
12. Start the rOTAtor by selecting “rOTAtor on/off” in the rOTAtor menu (this toggles the rOTAtor on/off. An asterisk shows when the rOTAtor is on)
13. Start imaging

The telescope rOTAtor can rotate 26 degrees. After this angle the rOTAtor stops and must be rewound. As the field rotation speed varies around the sky it can't be said how long time it will take to rotate the 26 degrees. But most places in the sky expect 1-2 hours.

The handpad can display the rotation speed and the absolute field rotation angle. To select these coordinates select “Field rotation” in the “Choose Coordinate system” menu.



- The left number shows the absolute field rotation angle in degrees. The field rotation angle is always zero when an object passes the meridian in south.
- The right number is the field rotation speed in degrees per minute.

These two numbers can be used to estimate how long time will pass before the telescope rOTAtor will reach its endstop.

To switch off the rOTAtor select "rOTAtor on/off" in the "rOTAtor" menu. This will stop the rOTAtor where it is (asterisk disappears)

To rewind the rOTAtor select "Smart rewind" in the "rOTAtor" menu.

Manual selection of rewind direction

In some cases imaging in east and west where the field rotation angle changes direction it can be an advantage to select "Rewind to center" instead of "Smart rewind".