

## **Gemini G53F German Equatorial Mount    User Manual Ver2.7**

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### **General**

The G53F is a Friction Drive Telescope Mount, there are no traditional gears used. This ensures smooth, high precision and backlash free motion in silence. Moving parts roll on each other which guarantees a long life.

The drive unit consists of a stepper motor, reduction gear (Gemini Fluidio) and the drive roller. The drive roller is pushed against the drive disk with the torque limited lock knob. The gearing has an integrated slip clutch that prevets damage to the drive roller and the gearing itself.

To ensure high goto precision, encoders are fitted directly to both axes. The encoders correct any slip that may occur if the slip clutch enters in action or the lock knobs are opened. If you hear a beep after a goto that indicates a large slip that will not be corrected for safety reasons – the mount probably has hit something.

Both encoders have an absolute position signal that helps recovering lost positioning in remote applications. The RA encoder can be used to correct tracking speed for unguided photography. All cables are routed internally (as of 06.2016)

The equatorial head can be separated in two parts for transport and storage.

## ***Technical parameters***

Steppers: NEMA 17, 400 step, 1,5 Amp  
Drive disk: D 220 mm, stainless steel  
Drive roller: D 6 mm, hardened and coated steel  
Encoders: Optical incremental, 72 000 pulse/rev  
Weight: 20 kg  
Load capacity: 45 kg  
Maximum unbalanced torque: 15 Nm (1,5kg at 1m radius)  
Elevation range: 20 - 90 deg  
Temperature range: -20 to +30  
Driver: Pulsar2 <http://www.geminitelescope.com/pulsar-goto-controllers/>  
Slewing precision: cca +/- 30 arcsec  
Max slewing speed with Pulsar2. 4 deg/sec  
Tracking precision: 2"/5 minutes  
Power: 12-18VDC, 3A (1A continuous draw at 12V)  
Telescope interface: Losmandy rail or custom

Power supply choice: universal laptop psu, traditional linear (transformer +rectifier), car or solar panel lead battery are all suitable. Switching PSUs can sometimes create interference and not work properly. **IF YOUR MOTORS DO NOT WORK PROPERLY STOP AND DO NOT CHANGE PARAMETERS! USE A CAR BATTERY. IF THIS DOES NOT SOLVE THE PROBLEM CONTACT US FOR ADVICE!!**

## ***Delivered Parts***

Equatorial head with Losmandy adapter, Counterweight shaft (30mm), Pulsar2 driver with hand controller, cables, cable guide ring. **Optional:** counterweights, polar finder, tripod, splitter box for the 12VDC supply on the RA head (specify length, number and type of connectors).

## ***Mount specific Pulsar2 parameters***

(Non default values only)

Total Red: enter 350, the exact value will be calculated by Pulsar2  
Track current: 850mA  
GoTo current: 1200mA  
Stop current: 400mA or 800 for guided photography  
Motor step R/D: 400

Encoders: Mount encoders are fitted (answer Yes to Mount encoder RA and DEC, answer No to Motor encoder RA and DEC)  
Resolution: 72 000 both RA and DEC  
Rotation: leave as it is, will be defined by Pulsar2  
Umod Sp limit (user parameters) 990  
Ramp (user parameters) Ra 1, Dec 2  
Backlash (user parameters):0 arcsec

There are videos on YouTube to help with the setup and other features. Visit this link to see the updated list: <http://www.geminitelescope.com/gemini-german-fork-mounts-goto-manuals/>

## Assembling/Disassembling the two parts

1 To assemble the G53F Equatorial Head, rotate the RA head into the approximate position shown below, lock the red lock knob until it emits a click, and place the DEC head into the saddle as shown below. Attention, it may fall out of the saddle if left alone in an unsuitably horizontal position!

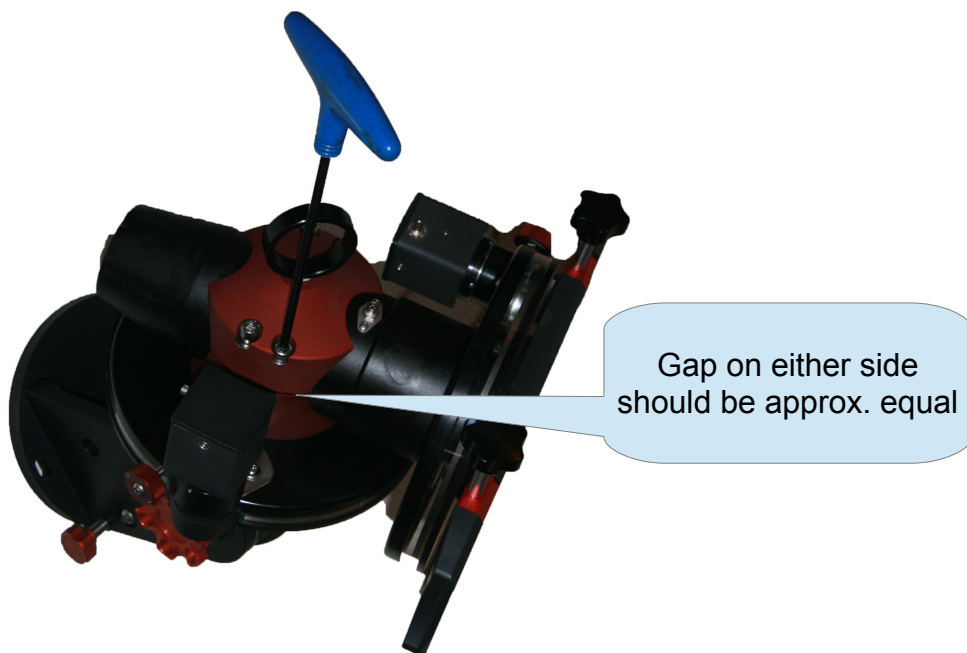
Make sure the orienting pin in the lower saddle engages the hole in the DEC head. This ensures the correct contact of the DB9 connector.



2 Next, place the upper saddle on the DEC head as shown below. Find the position when the bolts enter their relative threaded holes in the lower saddle. The gaps at the two sides should be approximately equal.



3 Fasten the 4 bolts evenly, changing sides frequently. Fasten them firmly finally. You will need a 6 mm Allen key (hexagonal).



You are ready now. Disassembling is the reverse of assembling.



## Adjusting Polar Elevation and Azimuth

The adjustment range of the elevation screw is cca 20 degrees. If you need more adjustment you have to reposition the RA head in the elevation plates as explained below.

1 Remove the DEC head from the RA head. This makes the procedure much more easy to do.

2 Turn the elevation screw close to the OUT position. (when the threaded rod has most of its length between the two cross rods) This makes the procedure easier.

3 Remove both elevation locks and the centering rings which are below the locks. These come out if you release all load on them by turning the mount head on its side for example.



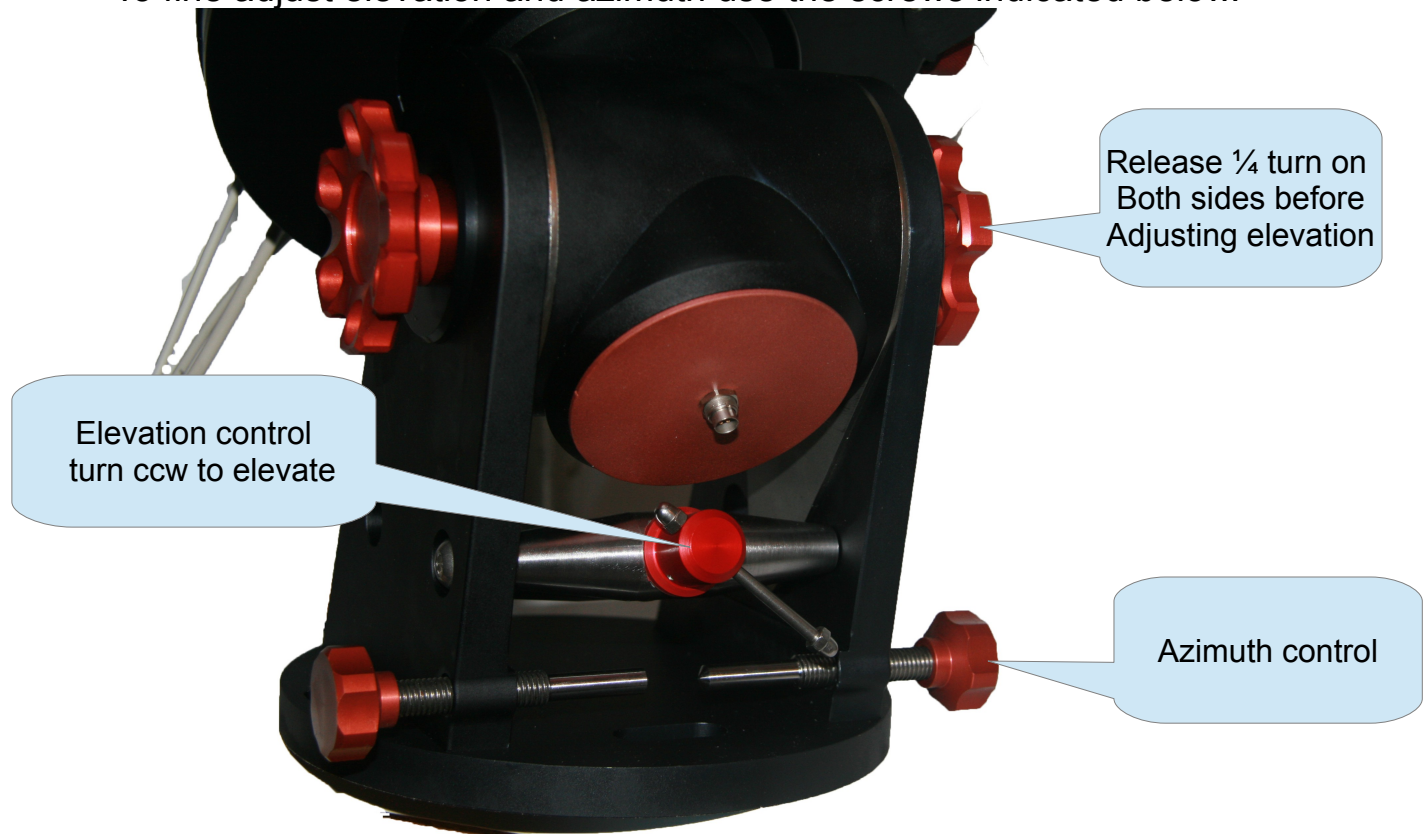
4 Pull out backwards the RA head from the fork base.



5 The pin is marked with a **blue** dot. You must pull the plates away and put the pins into the correct holes (**1** to **4**) for your desired latitude. The actual position (**2**) is for mid Northern/Southern latitudes, **4** is down to 20 deg, **1** is for far North.

6 Push the RA head back into the fork base, insert the centering rings and the locks, finally mount the DEC head.

To fine adjust elevation and azimuth use the screws indicated below.



1 turn of the elevation screw is cca 0,6 degree change in elevation.

## Connecting Cables

You need to connect 3 plugs to Pulsar2 and one to the G53F. The rest is routed internally. You also have a power plug routed to the RA head to supply all your 12V DC equipment on the scope, without additional cables.

You can order an optional splitter box with the connectors you specify for your equipment's power requirements.

Important notice: the RA axis is limited in its rotation at Hour Angle 12h with a hard stop. Do not attempt to force it over this position.

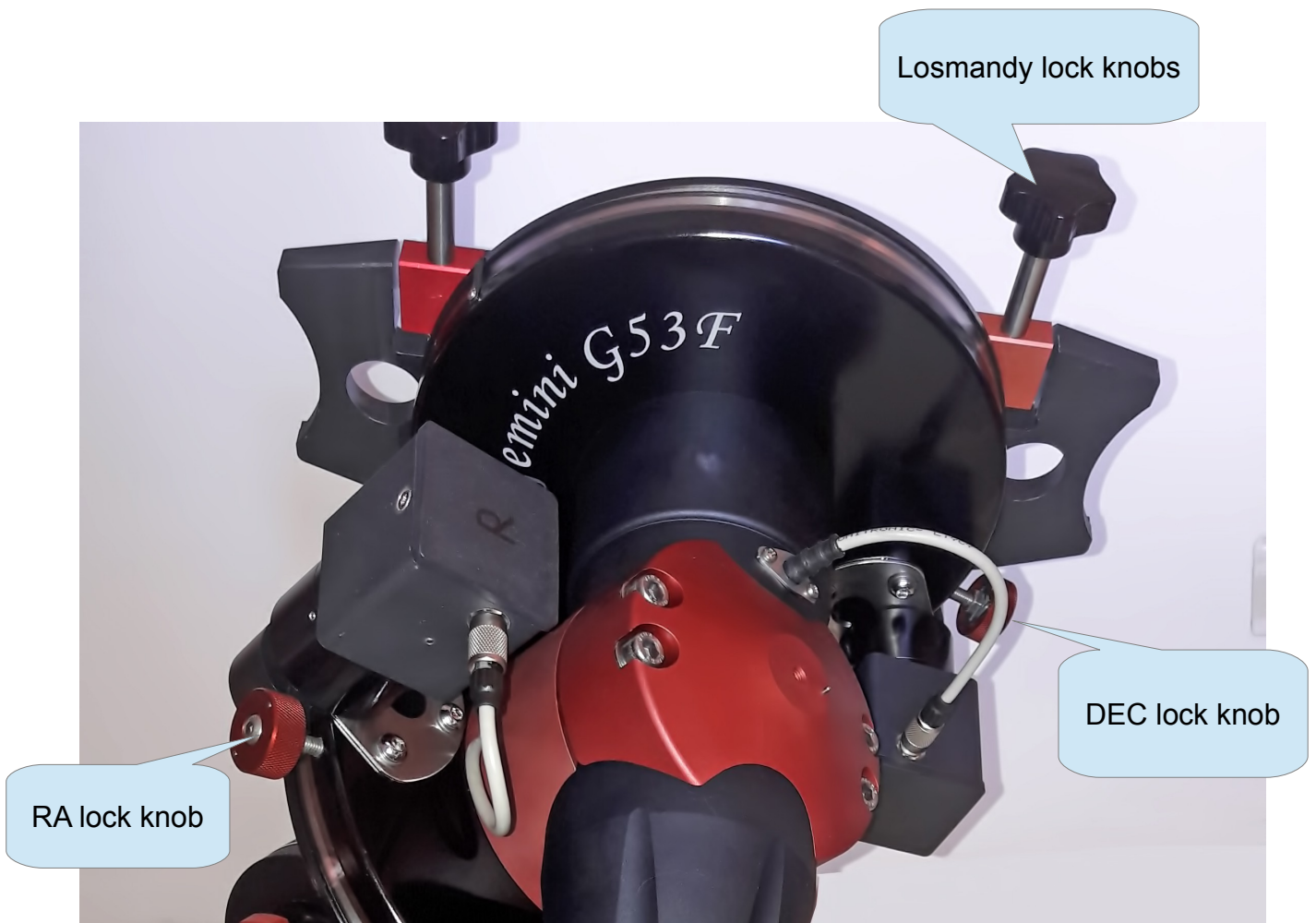
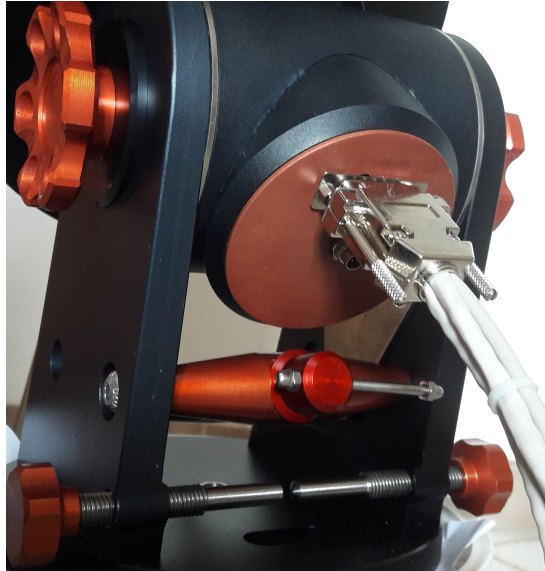
The DEC axis can be rotated without restriction.

Pulsar2 side of cable connections shown below. The cable is cca 60 cm long.



No damage will occur if you swap the encoder cables but the mount will not operate correctly. The plugs are marked R and D for identification.

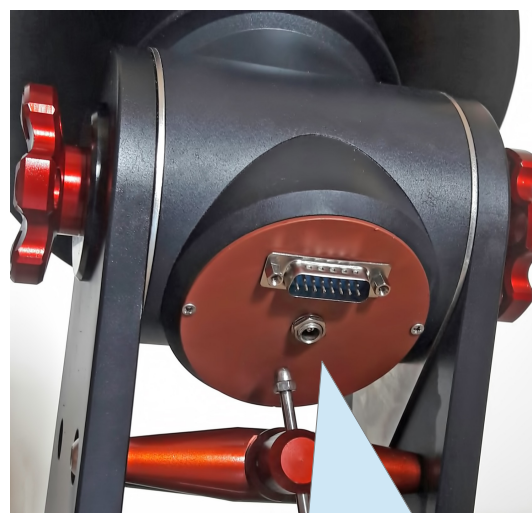
Mount side connector







12VDC output on RA head



12VDC connector input

## Using the G53F

### *First time setup*

If you are using the G53F for the first time or have replaced the Pulsar2 controller check the [Mount Parameters](#) in Pulsar2 (and see also the Pulsar2 manual). Lock the red knob in RA and check if the mount tracks westward, if not change the [Rotation \(mount parameters menu\)](#)! If all is correct you will want to do the automatic setup process which calculates the total reduction and the encoder direction.

Insert the counterweight shaft and lock the axes by turning both red knobs right until you hear a click. The mount is well balanced with the counterweight shaft, remove any load from the telescope platform.



Correct position for running Red autoset

You find an overview of the Pulsar2 menu [structure here](#).

Enter the **Mount Parameters** menu, **Red** (unction) **autoset** submenu and start the process. The mount will start rotating slowly cca 45 degrees and back in both axes. You will have to acknowledge by a right click the calculated values. (slip factor and reduction). For the slip factor you should get a value above 98%, if it is much lower the balance is off.

When finished, exit the menu, the controller is ready for use.

For loading counterweights and telescopes leave the RA axis open, close the DEC by turning the DEC red knob right until you hear a click.

For balancing release both axes with the red knob. Try to get a good balance!

### ***Making a goto***

To use the goto capability of your G53F you need to follow this procedure (as applicable to your situation and skill)

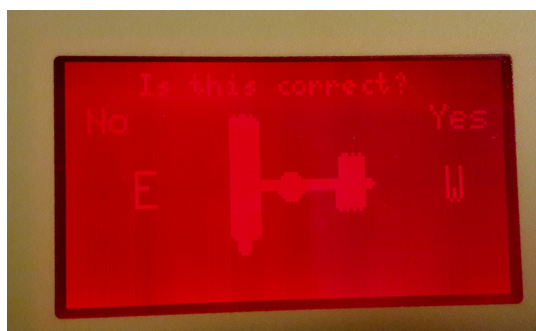
Have the parameters set up correctly (see First time setup paragraph). Set User parameters/Goto mode/Pulsar2 logic. This is for GE mounts like the G53F. Set also DEC rotation for the flip as explained on p13.

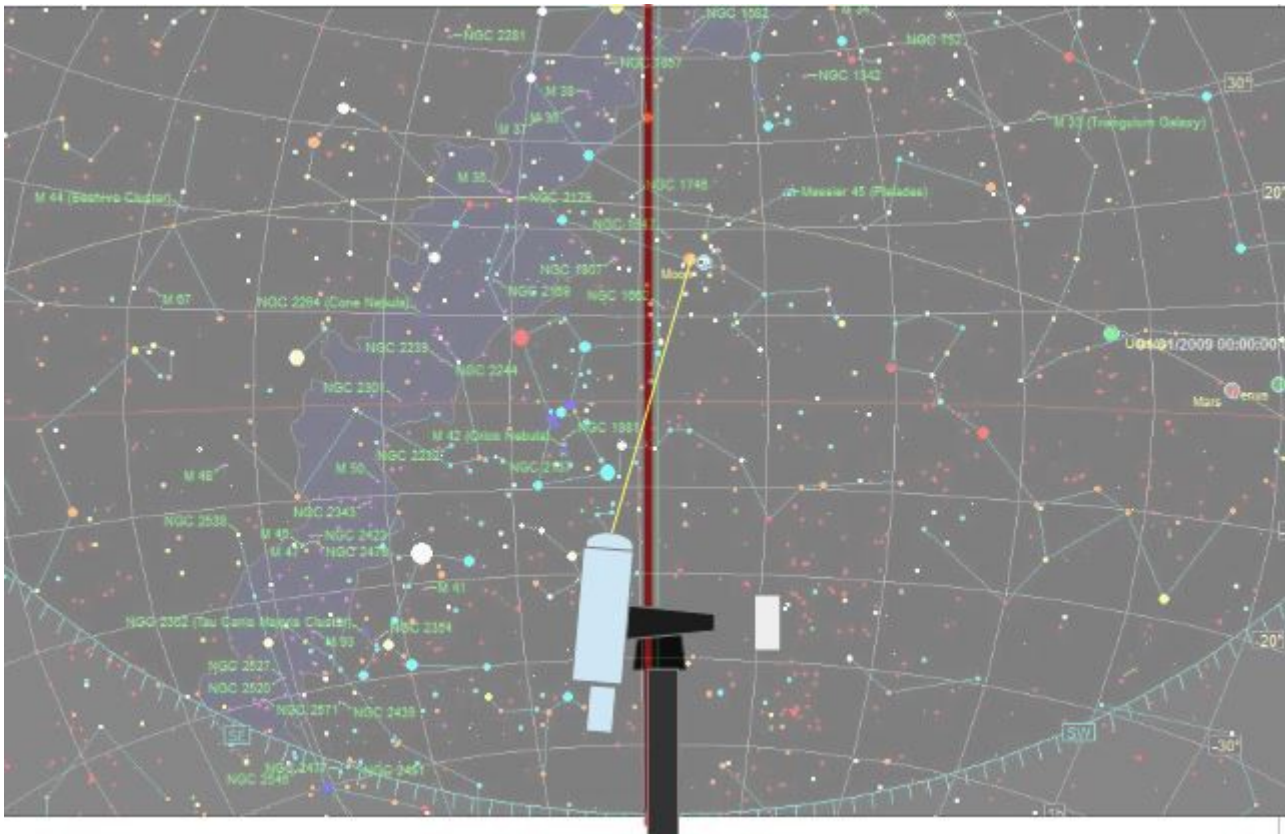
Have the mount decently polar aligned (got precision heavily depends on polar alignment)

Turn the GPS on to refresh time (UT) and position. The GPS is behind the hand unit LCD, orient it to a free view of the sky.

Follow the autoinit procedure (beginner) or initialize manually (advanced) with the hand controller. Here is a tutorial: <https://www.youtube.com/watch?v=PtAfKWscf80&feature=youtu.be>

In the example below the OTA is placed East of the pier, the telescope is pointing slightly West of the Meridian. On the Pulsar2 display you must see this at the end of the Autoinit procedure, and click Yes (to the right):





After a one star init you are ready to slew to any object in the database or connect to a planetarium program and use it via ascom or LX200. You find the manuals here (Pulsar2 section) for some specific programs like Maxim, TheSky or C2A. <http://www.geminitelescope.com/gemini-german-fork-mounts-goto-manuals/>

## ***Absolute Position Reference***

The G53F when used with Pulsar2 can memorize the absolute position signal of the encoders (sent once in every full rotation of the axes) and use this as a reference for initializing the mount. **You still need to be polar aligned and have time (UT) and lat/long (in decimals) set correctly.** With this feature you can initialize the G53F remotely, using only an IP camera as your „eyes“.

To save a reference, select the **Set Reference** submenu in **Mount Parameters** and follow the instructions. You need to have the mount initialized on a star beforehand. You are asked to slew the mount until the signal has been received.

The RA absolute signal is factory adjusted to fall within 2 hours of the meridian with the OTA on the Western side.

In Declination the absolute signal is in the zone of cca -10/+30 deg. This will allow a safe and convenient initializing when needed. Note that the Losmandy lock **handknobs must face upwards** for the reference to fall in the above zone.

To initialize the G53F with the encoders go to the **Get Reference** submenu in the **User Parameters** menu and slew the mount into the above mentioned positions as prompted by the hand

controller. Reaching the signal is acknowledged by a beep and the slew stops automatically



Tutorial. <http://youtu.be/0RQyp3Hnb08> and <http://youtu.be/rvYxOLQJfgQ>

### ***Using real time tracking speed correction***

The encoder fitted to the G53F allows a closed loop control of sidereal tracking speed with a precision of 2" pv, suitable for shooting unguided images with short focal lengths or doing automated photometry sessions.

The tracking correction can be turned on in the PEC menu of Pulsar2.

The rate of correction is 60 sec, so there is a need to wait about 60 seconds from the end of a slew before tracking becomes stable.

A precise Polar Alignment is necessary for unguided imaging. I suggest the King method offered by C2A, a free Planetarium program.

Here is a manual for using this method and other features of the program.

[http://www.geminitelescope.com/Manuals/Pulsar2\\_C2A\\_manual\\_eng.pdf](http://www.geminitelescope.com/Manuals/Pulsar2_C2A_manual_eng.pdf)

### ***Practical hints***

You can open the axes while the mount is in use and rotate the telescope by hand but if you do very fast movements positioning will partially be lost.

If the mount hits something the slip clutch will disengage and protect the drive system and the telescope from damage. If a goto fails for the above reason you will hear a beep and there will be no correction. The coordinates will stay



correct.

If the red knobs are lightly locked, the drive rollers may slip which eventually may damage them. To avoid this either open the red knobs completely (1,5 turns left from locked position) or lock them fully, until you hear the click.

The slewing speed depends on the load you have on the G53F. With a medium sized telescope (10" SC) you can use 999. For larger loads experiment with speed, Umod sp limit and ramp to get a reliable result (reduce speed, Umod sp limit and ramp if necessary).

Run the Red Autoset routine (Mount Parameters menu) if the ambient temperature has changed more than 15 deg C. This ensures the precise tracking rate without real time correction (with encoders).

**Before you look for other reasons of goto pointing errors check your polar alignment.** If a 15 min unguided image above +60 deg declination shows no drift (less than 5 arcsec) you are ok.

### ***Astrophotography with the G53F***

There are a few things to remember for successful imaging.

- 1) use the correct guide speed for your pixel scale. E.g. Speed 1-2 for high resolution (up to 1.5"/pixel), speed 3-4 for medium and 5 for telephoto imaging.
- 2) Have stop current set close to track current to avoid jumps in declination
- 3) Do not let any cables hang off the telescope or camera. Route them all via the center of the declination head, thru the supplied cable guide ring.



Cable guide ring  
standard acc.

- 4) Balance the mount as precisely as possible. If you have a Newtonian orient the focuser exactly facing or opposing the telescope platform. All other positions will imbalance the telescope in some sky position. If you have a guidescope on the main tube the same is valid for that.
- 5) If you have to flip meridian (User parameters/Goto mode/Pulsar2 logic) make sure to select the correct direction in Setup(6)/User parameters/Pole crossing/Tube rotation. For Newtonians select North, for all other telescopes that have the camera at the lower end select South. This will prevent cable problems if you have routed

them thru the provided ring.

- 6) The controller Pulsar2 connects to the computer either as an LX200 non GPS device or via the ASCOM platform and its dedicated driver. See <http://www.geminitelescope.com/gemini-german-fork-mounts-goto-manuals/> for more help. It has been tested with MaxIm and Astroart. You can use an autoguider cable but connecting the mount via the serial/usb port gives more precise corrections. The ascom driver supports pulse guiding.

## Remote use of the G53F

To use the G53F in remote, follow the steps below:

Install the ascom platform and the Pulsar2 [ascom driver](#). [Connect](#) Pulsar2 to the PC.

Check/set mount and user parameters as described in this manual.

Make a rough polar alignment and a one star reference (p7 of Pulsar2 manual or [video](#)).

Polar align the mount, preferably with the [King method](#) or a polar aligning CCD.

Repeat the one star reference (because you have tuned polar alignment).

Program the absolute reference as described in this manual (optional)

Program your Parking/Homing position (p8 of Pulsar2 manual). You will use Park/Unpark from ascom to shut down the mount and to start your next session.

Now you can leave the observatory and proceed with your first observing session in remote.

At the end of the night shut the mount down by Parking it from your ascom program.

The next night you can start the mount by Unparking and go on with your session immediately.

If you have an accidental blackout you can use the [absolute reference](#) to initialize the mount remotely.

## Maintenance

The anodised aluminium surfaces will keep their gloss for a long time if treated regularly with paraffin oil or silicone oil. Use a soft cloth to disperse the oil on the surface.

Protect the mount from dust, sand and dirt. If you see dirt on the drive disc, remove the plastic protection cap around the drive unit and wipe it off with a cotton tip.

No maintenance of the drive system is necessary. For longer periods of cloudy nights and transport leave the axes disengaged.

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