

Sidereal Technology ASCOM Driver

**This document is NOT complete by any means.
We feel you'll be able to get things working just fine,
especially with technical support.**

WHAT IS AN ASCOM DRIVER?

ASCOM is an acronym for Astronomy Common Object Model. It is free software that was developed by a dedicated group to provide a way for many planetarium programs or other software to control many kinds of telescopes. This makes it easy for a telescope control system company to write only one driver, and suddenly, all planetarium programs can control their telescope. ASCOM, as well as the SiTech ASCOM driver, is free software.

GEM Terminology: It can be confusing talking about which side of the pier the telescope is on, so we've created terms for this manual. If the scope is on the east side of the pier, and you're looking west, then I call this "Looking West". If the scope is on the west side of the pier, and you're looking on the east side of the meridian, I call this "Looking East".

FEATURES:

Connects directly to the Sidereal Technology Dual Servo Controller, via an RS232 connection.
Communicates with a fast binary protocol, with error checking for precise, quick control.

Acts on every ASCOM Version 2 Telescope Method and Procedure, except the "Home" Method, as currently there is no "homing" hardware. This includes functions that are rarely included in ASCOM telescope drivers, such as Offset tracking, Pulse Guiding, SlewToAltAz, MoveAxis, etc.

This driver can be used as an ASCOM Telescope Simulator. If there is no telescope detected, the SiTech ASCOM driver will emulate its presence. This allows you to "slew", Track, etc, and get used to the driver, without actually being connected with the telescope. You can download the SiTech driver, and test drive it, without actually having a telescope!!!

Will operate all typical kinds of telescopes, Alt/Az, Equatorial, and German Equatorial.

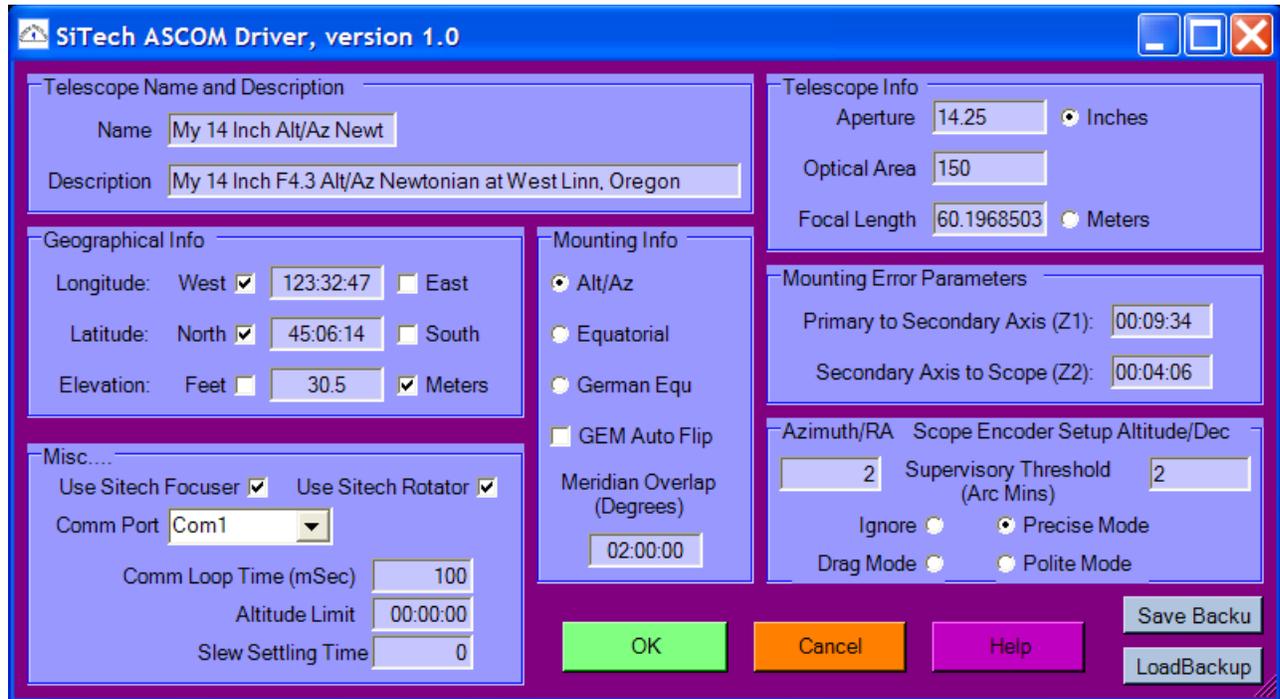
The SiTech ASCOM driver can calculate your telescope mechanical errors, and save the parameters to a file for very accurate control. Dan Gray is getting better than 2 arc minutes of average pointing accuracy using his 14" Alt/Az telescope.

The SiTech ASCOM driver automatically calculates and compensates for atmospheric refraction, on both equatorial and alt/az scopes.

There are 4 different ways to use telescope encoders:

1. Precise Mode
2. Polite Mode (won't correct except after a slew) Great for photography.
3. Drag Mode. The two previous modes, the telescope will move back if you move it by physically moving the telescope. With the Drag mode, the telescope will simply track at the new rates if moved by hand.
4. Ignore.

Simple Setup of parameters. Once you've configured your controller using ServoConfig, then you're ready to configure the ASCOM driver. Here's a screen shot:



Will have Periodic Error Correction (PEC) in Fall/Winter of 2006

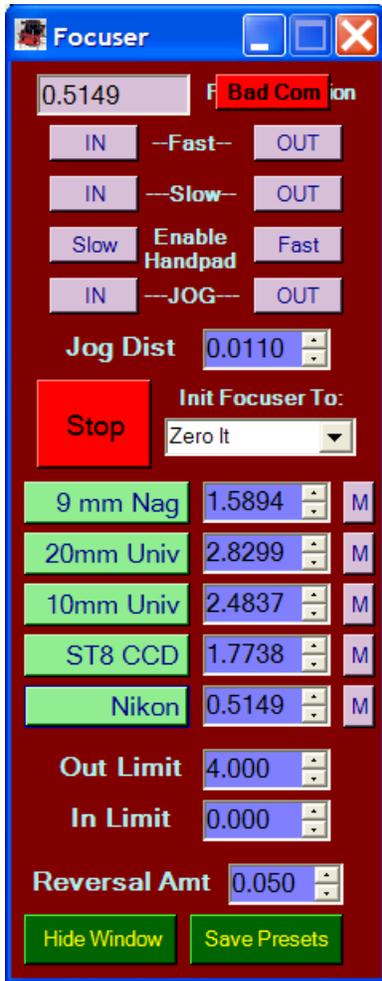
If you've a second Sidereal Technology Dual Servo controller, you can use this controller for your Focuser and/or a field de-rotator.

The focuser is ASCOM compatible, thus focusing can be automatically done using FocusMax, or Maxim DL's focus routines.

There is a focuser window, which allows setting different focuser setpoints, so you can change eyepieces or camera's, then click on the named eyepiece, and the focuser will move to the focus location of that eyepiece. There are 5 presets available.

The focus routine automatically removes focus backlash by moving the focuser beyond the desired position, then returning to the desired position on one of the focus directions.

If you don't have a handpad for the second controller, you can control it with the Top Left and Top Right keys of the telescope handpad. There is a communication delay with this method.



You can connect a field de-rotator (or field rotator if you've an equatorial scope), and control it with the following window. As you can see from the following screen capture, there are many useful features, which can be used to find guide stars, position the camera, etc.



GETTING STARTED:

Ok, Here's how to get going:

1. Install ASCOM:

<http://download.ascom-standards.org/ascom41.exe>

2. Make sure your computer has DotNet 1.1:

<http://www.microsoft.com/downloads/details.aspx?FamilyID=262d25e3-f589-4842-8157-034d1e7cf3a3&displaylang=en>

3. Make sure you have the latest MS Windows service paks, etc:

<http://update.microsoft.com/windowsupdate/v6/default.aspx?ln=en-us>

4. Get latest ServoConfig:

<http://www.siderealtechnology.com/ServoConfig0.9999.exe>

5. Using ServoConfig, install the latest Firmware:

<http://www.siderealtechnology.com/V18A.BIN>

6. Using ServoConfig, set the necessary parameters in the controller.

- A. Slew Speed
- B. Pan Speed

C. Guide Speed

D. Motor Encoder Ticks Per Rev, Primary and Secondary Axis

E. Telescope Encoder Ticks per Rev, Primary and Secondary Axis (If you've got them)

F. Motor and encoder directions (Important).

Using ServoConfig, you MUST set up the MOTOR and SCOPE (if you have them) ENCODER ticks per rev, because the SiTech ASCOM driver uses the numbers that are programmed into the controller. This is also true for the field de-rotator and focuser, which is the "altitude" and "Azimuth" of address 3.

Using ServoConfig, you also MUST set up the directions of motion. The right button must move the telescope clockwise (looking down from zenith (alt/az scope) or the celestial pole (Equatorial scope)). The Up button must move the telescope towards the zenith (or pole). If you've a GEM, the up button must move towards the pole while the telescope is "Looking West". Be sure the proper buttons are highlighted on the ServoConfig or the SiTech driver when pressing them.

If you've telescope encoders, the directions of the numbers must match the motor directions, ie when the motor encoder numbers move higher, the telescope encoder numbers must also move higher.

7. Install the latest SiTech Driver:

<http://www.siderealtechnology.com/SiTech013.zip>

If you are upgrading the SiTech Driver from a previous version, you have to go to Control Panel, Add/Remove programs, and Remove the SiTech driver, before installing the new driver.

Place the new zip file in a folder all by itself, unzip it, and run the Setup.exe.

8. Run your favorite Planetarium software that has ASCOM telescope control, and select the ASCOM telescope driver, and Choose the SiTech telescope.

9. Click on the "Setup" button, and configure the settings for your telescope, it's important that you include the type of mount, the operation of the telescope encoders, and your longitude and latitude.

10. Have fun.

USING THE SiTech AUTOTRACKING Feature:

The SiTech Dual Servo will track your equatorial or alt/az telescope with no computer connected. We recommend that you set up your controller using ServoConfig to automatically track your telescope. When the controller detects the SiTech ASCOM driver, it automatically drops out of the auto track mode. This allows telescope tracking right after you set up your telescope, before your computer is connected. Please read the Controller document, and/or the Servo Config document to learn more about Auto Tracking (DragNTrack, SlewNTrack, and Equatorial modes)

Initialization:

The first thing you want to do when running the ascom driver, is get the telescope initialized. At this point, slew the telescope by using the handpad to this bright star, and center it up. Using features of your planetarium software, select the star, then click on “Sync”. The following screen appears:



There is a timer that counts down, and after 5 seconds, a default initialization will take place. Just wait for the initialization screen to dis-appear.

After this your scope has an “Offset Init”, and tracking will be turned on, and GoTo-ing will be possible. It won't be as accurate until you add two or three “Load Init Point” stars.

It might be a good idea to now to turn on the Tracking of your planetarium software, so the circle or other indicator will follow the telescope.

Loading Init Points, Alt/Az Scope:

First you must scientifically select your stars. These should be about 45 deg's in elevation, and roughly 120 deg's apart. Try to stay away from the celestial pole.

Select the first star on your screen, and “GoTo” it. Use the Synch funtion of you planetarium software. When the screen comes up, and before the timer times out, click on “Load Init Point”. It's a good idea to check the star again, and be sure it's centered. If not, you can re-center, then click on the “Load Init

Point” again. Once the star has been loaded, click the OK button. Now select the second star on your screen, and perform a “GoTo”. The scope should slew to the vicinity of the second star. (you may have to zoom out to see this star, and the telescope circle at the same time).

Now go through the same procedure to sync to this second star (Load Init Point), and presto, you're all aligned and ready to GoTo other objects.

If you're testing in the daytime, and you don't really know where the stars are, sometimes I right click on the star to get the current alt/az of the star, and move my scope to roughly this point in the sky.

Don't worry too much about the park and unpark at this point, but if you want to, it's really simple. After you've done an alignment, then point the scope where you want it to be parked. Now click "SetPrk". The software will "memorize" this location. Now, the next session, after starting up, before you click on "track" or anything, just make sure your telescope is in the same physical position as it was when you "parked" it. Now click "UnPrk". The telescope will be initialized, and you won't have to do an alignment, or maybe perform a simple "offset" alignment.

FOCUSER:

If you're setting up a focuser or rotator, you have to remember, ServoConfig will only talk to one controller at a time, so you have to unplug the serial port of the other controller.

Make sure the focuser is plugged into the AZIMUTH motor, and make sure the rotator/focuser is configured for address 3.

Other than that, you have to select the SiTech telescope driver, and the SiTech Focuser driver in Maxim DL.

There is no configuring the focuser, but if you want it to be in 1/10,000 of an inch, then set the AZIMUTH Ticks per Revolution on the Rotator/Focuser servo controller to how many motor encoder ticks for 1 inch of operation. If you want it to be in microns, then put how many motor encoder ticks for one centimeter.

When setting up MaximDL, you have to click on Options, then Setup to get to the SiTech configuration. You don't have to do the focuser setup.

Other setup options are un-necessary but you can update them if you want to, such as aperture, area, focal length, altitude, etc.

Connect to the telescope first, then connect to the focuser

Sync the telescope on a star, it should start tracking! You can simply wait for the synch screen to disappear, or click on Keep Window Up, or click on Simple Offset Init if you don't want to add two or three stars to the matrix.

Much more to tell you, hopefully this will get you started.

INITIALIZING:

Question: Why does the initialization window dis-appear after a few seconds?

Answer: The ASCOM standard requires that no window can appear in the ascom driver that has to have operator intervention. Well, my initialization routines might require operator intervention if certain features are to be used. In order to accomplish this, the initialization screen is brought up, and if nothing is clicked, then it does a default initialization. The first three automatic initializations, or just clicking the "OK" button, will perform a "Load Init Point" initialization. After that, they are all "Offset" initializations.

Question: What's the difference between an "Offset" initialization and a "Load Init Point" initialization?

Answer:

An offset init simple "moves" the motor readings, until they agree with the sky. It would be the same as reaching up and dragging the sky until the object is centered in your scope. No other math involved, except offsetting the position of the motors. I was going to try to figure out how to drag the sky, but I think even if I did, all other telescope owners would be mad because the stars aren't where they were supposed to be!!!!

A "Load Init Point" init takes the hour angle and declination of the star, along with the two telescope axis's, total of 4 readings, and stores it in a structure. When you load the second star, it is also loaded into the structure, then a lot of matrix trig is applied, which does co-ordinate transformation between the telescope axis's, and the Polar Co-ordinates. Taki was the originator of this method, and it was published SkyNScope in the late 80's. I converted his BASIC program to "C" for my stepper system, and then to "C#" for the ASCOM driver. When you do the matrix math of the Taki method, the latitude and the longitude can be pulled out of the matrix, that's what's shown on the init screen. These should agree within a degree or even closer if you've a good telescope mounting, with your actual lat/long if you have an alt/az scope. If you've an equatorial, the latitude should be close to 90 deg's and it will probably read the amount of deviation from 90, which will be your polar mis-alignment.

Initialization trick.

If you're starting a new initialization, you might consider using this trick I use a lot. When pointed to the first star, the scope won't be tracking, because it is not initialized. This makes it hard to center the star, because it keeps drifting. So instead of letting the auto-init fall through with "Load Init Point", click on "Offset Init". Leave the initialization window up. It will stay up if you do an offset init. It will now be tracking, so it's easier to get the scope to be accurately centered on the star. Now with the star centered, and the scope tracking, click on the "Load Init Point" button. This allows a much more accurate first star init, because the scope is tracking. **IMPORTANT:** only do this when you are sure it is the **FIRST** star to go into the matrix!!!! If you want to be sure, click on the "Clear All Inits" button.

LastMatrix.init:

Whenever you disconnect from the driver, it saves the latest Matrix to a file called LastMatrix.Init. This can be called up manually upon next initialization if desired.

Parking/Unparking New feature in 0.10:

When you park, an init file called ParkMatrix.init is created, and this is used when you unpark.

Following was edited by John Ott:

SciTech controller – ASCOM driver

Creating a new 3-star init file for Alt/Az mounts:

If you already have a good init file you don't have to redo it as long as your longitude hasn't changed, the mount hasn't moved and the computer clock is not drifting. If any of this has changed you can't modify an existing init file, you have to make a new one.

1. To make a new 3 star init file, clear out all the inits.

Note: The first 3 stars are done via "load init point". If you simply let the init screen run it's course, time out, and do it's own thing, the first three inits are automatically "load init points". Inits thereafter are "offset inits" unless you specify otherwise.

2. Start with Polaris if possible, it doesn't drift. Be sure it's very well centered. Perform a **"load init point"** init. The scope will start tracking again.
3. Select a second star approximately 120 deg's away from the first star with roughly the same altitude.
4. You can perform a GOTO to this star, then center it and perform another **"load init point"** init.
5. At this point, if you have a roller-friction drive and you think your azimuth might be slipping a little bit, go back to Polaris and perform an **"offset init"** if it isn't perfectly centered. This step shouldn't be necessary for geared systems or systems with encoders.
6. Now select your third star at a large distance away 120 deg's to the east of and same altitude as Polaris. Perform an **"Load init point"**.
7. Now save these inits as the "default.init" file, and this is the one that will be used with an un-park or pressing track when first turning on.

Creating a new 3-star init file for Equatorial mounts:

The above procedure is the same but rather than Polaris setup on a star close to the intersection meridian/celestial equator.

1. To make a new 3 star init file, clear out all the inits.
2. Perform init 1 at the intersection of the meridian/celestial equator using **"load init point"**.
3. Move to the east a large distance away and do an init 2 **"load init point"** on a star at roughly the same declination as the first init point.
4. If there is any indication of slippage in a friction-roller drive then move back to the first target and redo init point 1 with an **"offset init"**.
5. Then move a large distance away on the West of init point 1 and do a **"load init point"** init on a star with approximately the same declination as the first init point.
6. Now save these inits as the "default.init" file, and this is the one that will be used with an un-park or pressing track when first turning on.

Of course if you are in the southern hemisphere the E/W notations will be reversed. Actually, you can do the E/W in any order

Calculating your telescope's Z1,2,3 errors:

1. Start with an accurate 3 star init, then start low on the horizon, start adding stars using "load init point" inits.
2. Go from approximately 15 degs elevation to 75 deg's elevation. These should be in the same azimuth area.
3. Once you've added all these init points, click on "CalcZ123".
4. Take a look at the New vs: old Z errors, and the new vs old average and peak warps. If things make sense, then select YES.
5. You can now click on Save Z12. This will save the mechanical mounting error angles to the configuration.

GEM Flipping Information:

There are really only 2 ways to do a GEM flip in the SiTech ASCOM driver. 3 and 4 below are a variation of number 2.

1. Turn on the Auto GEM flip, and it attempts to do it automatically, starting with V0.10
2. Move the telescope by hand using the handpad, to the other side, through the north pole.
3. Move the telescope by hand, using clutches if you have encoders, this will work as item 2.
4. Move the scope by hand using clutches without encoders, do an offset init, and force the init to be looking east.

If 3 you will have to stop tracking if you've encoders, unless you're in the drag mode. Otherwise, no other options above require you to stop tracking.