

SiTech Telescope Driver Manual, version 0.91T 05-31-2016

Users Group: <http://tech.groups.yahoo.com/group/SiTechservo/>
Installation:

You **MUST** have the free microsoft Dot Net 4 installed. If you don't have this installed already, please download and install from the microSoft website.

If you want to control the SiTech Telescope Driver with a planetarium program, then you should install the ASCOM version 6 from here:
<http://ascom-standards.org/Downloads/Index.htm>

We have an ASCOMLess version that you can also install. In this case, you don't need the ASCOM installed.

Once these two applications are installed, then you are ready to install the SiTech Telescope Driver.

To install, download the latest version on the SiTech website (0.91a is the latest as of this writing), <http://siderealtechnology.com/> click on Support, then find the link to the latest installer.

If you're using a Servoll or Brushless controller, and the USB driver is not installed automatically after connecting the USB to the controller, then you may have to install the USB driver manually. There is a link to that on our website too.

Running the SiTech Telescope Driver:

Generally speaking, before you connect using your planetarium software, you should get the driver up and running. An ICON is automatically placed on your desktop when you install it, so just double click this ICON.

This is not absolutely necessary, the driver will start up automatically when requested by a planetarium program, but it takes a lot longer to connect when doing it this way.

See Appendix A at the end of this document, to see the Extended (in addition to ASCOM) commands, and Extended CommandString features;

The rest of this document is a copy and paste of all of the help screens. Please read in case of insomnia.

SiTechExe Help Scope Tab as of Version 0.91A

Please see the end of this file for all acknowledgements.

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TIP Not too many folks know about!

If you haven't turned off your controller, but you restarted SiTechExe, you will see the message "Not Initialized" on the message area.

As long as you don't have the message "Below Horizon Limit", and even if you've moved your telescope with the handpad, it's still ok, JUST CLICK ON THE "Start" button, and your scope will be initialized. You may have to load your telescope model manually if you don't have AutoLoad.pxp set to load automatically.

This is the main screen for the SiTech ASCOM driver. There are five tabs, with different help files for each tab. The five tabs are:

1. Scope (This screen)
2. Numbers (has a lot of useful numbers)
3. Features (The SiTech ASCOM driver has some really cool features, they're accessed here).
4. Goto/Sync
5. Config (you can call up the SiTech Configuration here, as well as have a look at your slew, pan and guide speeds, and also your programmed Ticks per revolution).

At the top is the virtual handpad. The Inside arrow keys move the scope at the Pan speed, and the outside arrow keys move the scope at the Slew speed. The scope slews or pans while you hold the mouse button down, and stops when you let it up.

There is a checkbox labeled "Jog ArcMins, and a textbox labeled Jog Dist. If you check the checkbox, clicking on an inside arrow will move the mount the "Jog Dist" in arc minutes as specified in the textbox. If you click the outside (fast) button, it will move the "Jog Distance" times 25.

The PointXP button, next button down allows you to inspect the current Telescope Mount Model. This large button displays your current number of calibration points, and your RMS and Peak position error in DD:MM:SS.

Click this button if you want to inspect your telescope model, or change terms, etc. If you have the ActiveX PointXP selected in your SiTechExe configuration, it will bring up the User Interface for the ActiveX PointXP.

Tip! If you want to clear all of your calibration points, right click this button.

Acknowledgement: Dave Rowe wrote PointXP, and all of us are forever grateful to him.

The next TextBox contains the current controller mode: Slew, Pan or Guide. This is information only....

SkyView Button:

We moved this button in this latest version to the main screen. Also, you can configure it to open automatically in the SiTechExe configuration.

Park and UnPark:

The next three buttons control the Park position of the scope.

Clicking the "SetPark" button will cause the SiTech AscCom driver to "remember" the current telescope position (axis angle, not R/A Dec) so the Park button will force a Slew to this point. You MUST Stop Tracking for this to work.

Clicking the UnPark button will cause the telescope to be removed from the "parked" position, and start tracking. It will not actually perform a "GoTo" until the SiTech driver is commanded to perform a GoTo.

Also, if you don't have the "load AutoLoad.pxp on Start" selected in the SiTechExe Configuration, then it will load the PointXP file that was in use when you clicked on "SetPrk" button.

Clicking the "Park" button will cause the telescope to move to the Parked position, you set up earlier.

This is a really cool feature as it will allow you to look at planets and bright stars in the daytime! After your telescope is initialized, you can find a distant mountain top, tree or radio tower, point the telescope to this, and click on the "Set Park" button.

The next day, you align the telescope on this feature, and then click the "UnPark" button, and the telescope will be fully initialized, and ready to perform a GoTo! Please be careful of pointing your scope toward the Sun!

New Additional Locations Park feature for version 0.90XD and later!

Now instead one park and Setpark location, there are THREE!

This can be useful if you have a dark frame location (for a shutterless camera), and/or a Flat Field location.

There is no "UnPark" for these extra two locations, just Park and Setpark.

To access them, simply right click on the buttons instead of left click.

Stop and Track Buttons:

Under the multi-tab section, is the Stop button and the Track button. If the scope is not initialized, and you click on track, it will initialize itself, based on latest information and start tracking. You may have to perform an init for your GoTo's and Tracking to be accurate.

Messages:

Next is a text box that shows various messages, one at a time. There is always at least one message.

If there is more than one message to display, it will rotate the strings until they are all displayed, then repeat the sequence.

Here are the possible messages, along with the description:

Faking Servos:

This means there is no communication with the SiTech Servo controller. The Ascom Driver is emulating its presence, so you can see how the driver works with your planetarium program, even without the controller connected!

Reading Servo Params:

Upon opening the SiTech Ascom driver, certain parameters are read from the SiTech servo Controller. These are the Slew Speeds, the Pan Speeds, the Guide Speeds, and the Motor Encoder Ticks Per Revolution. This message will go away, once all the parameters are read.

Bad Scope Commun:

If there is no communication with the SiTech Servo Controller, this message is displayed.

Tracking:

Displayed while the telescope is tracking

Slewing:

Displayed while the telescope is slewing

Scope Parked:

Displayed if the telescope is parked

Stopped:

Displayed if the telescope is stopped.

Move By HandPad:

If the telescope handpad or autoguider is giving inputs to the SiTech Servo Controller, you will see this message.

Not Initialized:

If you get this message, then your scope is not initialized. If you've just restarted SiTech, and you haven't turned off the controller, then you can click on the "Start" button and it will be initialized. If you've set up a park location, you can initialize your telescope by moving it with the handpad to your park location, then click "UnPark". Otherwise, best thing to do is point it to a known star, find it in SkyView, and click on it in the SkyView, and select "Sync" option. If you have a camera, and have this all set up properly, and you also have the New Dave Rowe's PS3 Selected, and the Catalog is installed properly, you can click on the button labelled "Do a Single Photo-Init" from the "Features/RunScript/Plate Solve Stuff" to get initialized.

Parking Scope:

If the telescope is moving to the park location, you'll see this message.

Below Horizon Limit:

If the telescope is below your configured horizon limit (or if SiTechExe THINKS it is), you'll get this message.

Az/Ra Encdr Track Err:

We get a lot of calls on this one, and the answer is so simple.

In SiTechExe/Config/ChangeConfig/Scope Encoders, you don't have "Ignore" selected.

So, let's assume for the moment, that you do have a scope encoder on your Primary (Azimuth or Right Ascension) axis.

For some reason, the scope encoder angle doesn't agree with the motor encoder angle by 10 deg's.

Don't think of it as a nuisance, it's protecting your equipment.

Best thing to do is click on the Features Tab, then click on "ControllerStuff".

Take a look at your Primary Axis Motor Angle and the Scope Encoder angle. You'll see that they're different by more than 10 deg's.

Now use the handpad and move your primary axis with the right button.

What should happen is the angle for the motor increases, and the angle for the scope encoder also increases.

If the scope encoder decreases, then you have the scope encoder configured backwards. Use ServoConfig to fix this.

If the scope encoder isn't moving, then you have an encoder or wiring problem, or maybe a mechanical problem (scope moves but encoder isn't turning).

If the angles change, but they are changing differently, you probably have the TICKS Per Rev configured wrong. Use ServoConfig to correct.

Al/Dec Encdr Track Err:

Same as Az/Ra Encdr Track Err, except for your secondary axis.

Next are three TextBoxes which provide the telescope Right Ascension, Hour Angle, and Declination.

HIDE or RESTORE button:

There is a small vertical button labelled "Hide". If you click on this, the SiTech ASCOM window hides itself on the right hand side of the screen with just a little bit showing, enough to click on the "Restore" button and get it back. Some folks may like this better than minimizing on the taskbar.

Motors Automatic or Motor(s) in Blinky:

Lastly, there is a button that normally says "Motors Automatic", and is grayed out. If the motors go to what is fondly called the "BLINKY" mode, this will say "Motors in Blinky Mode" and if you

click it, the controller will be sent a command to put the motors back in automatic. If it continually goes to blinky, then you have a problem with your motor, friction, imbalance, encoder wiring, configuration, or other issues.

Acknowledgements.

Program Code Acknowledgements:

Genius Dave Rowe wrote PointXP, the telescope modelling algorithm. Dave's new version is an activeX. The original version was included, I line by line converted it from Visual Basic to C#. (With version 0.9, You can choose either PointXP in the configuration under Mount Parameters). Dave also wrote the incredible PlateSolve2, which does incredibly fast, reliable and accurate plate solves, and also does automatic focusing using multiple stars. Starting with version 0.90XC, you can also use Dave Rowe's new PlateSolve3, which does very fast all sky platesolves.

Also, the autofocus routines in 0.90XD and later, come from Dave Rowe's PlateSolve2.

One more piece of software, Dave wrote the CalPoints, which figures out the best positions to put the calibration points.

Bill Gray from Project Pluto has provided a lot of program source code on his website. I converted his CPP implementation of SGP, SGP4, SGP8, SDP4 and SDP8 to C# for satellite tracking, thanks Bill.

I also converted his planet position code to C# as well.

Russ Genet and Mark Trueblood's book "Microprocessor Control of Telescopes" was instrumental in early versions, along with Meaus

Jean Meeus's book Astronomical Algorithms, has been very useful over time.

Beta Testing Acknowledgements

Well Gosh, there's too many to list. If I left you out, please feel free to drop me an email.

My main beta tester, and life mentor, Chuck Shaw

Don Westergren has been a steady beta tester and instruction manual editing.

Dave Lane (from ECU fame) has been very instrumental in pointing out problems and excellent ideas on features.

Ok, that's it for now, but there's many more unmentioned that have found undocumented "features", etc.

Database Acknowledgements:

The data for the stars in the SkyView came from David Nash's HYG Database: Come to find out, David is right here in Portland!

The data from NamedStars.dat came from Bill Gray's Guide 8. I have converted it to a different format, however, the data came from Bill Grays file named "COMMON2.NAM". Used by verbal permission, 5-11-2007.

The data from Messier.dat came from Bill Gray's Guide 8. I have converted it to a different format, however, the data came from Bill Grays file named "messier.nam". Used by verbal permission, 5-11-2007.

Thanks Bill!

The Flamsteed and Bright Star Catalogs all 5thMagStars and 3rdMagStars came from Don Ware, Thanks

Don!

The data for the NGC and IC data that's in the GoTo/Sync tab came from:
<http://www.ngcic.org/>

Here is the quote from their website:

**The Historically Corrected New General Catalogue™ (HCNGC) Ver 1.11
Copyright© 2006 by The NGC/IC Project LLC (<http://www.ngcic.org>) - All rights reserved.**

Permission is given for any non-commercial use of this data. For commercial use (Magazines, software, starcharts), permission for limited use is granted if the following acknowledgement is provided: 'The data used in this product, in whole or in part, is used with permission of The NGC/IC Project LLC - <http://www.ngcic.org>' - please contact Bob Erdmann at hengc@ngcic.org for any questions or clarifications.

I have also changed the format of the data as well.

Dan Gray
<http://www.siderealtechnology.com>

SiTechExe Help Initialization Help as of Version 0.91A

When you use the "Sync" feature of your planetarium program, or if using the built in Sync from SkyView or the GoTo/Sync tab, then this screen is called up, and if no button is pressed, the default init is performed after about 15 seconds. This needs to be this way to remain ASCOM compliant, where no popup will remain up, and possibly freeze the ASCOM driver, if it is being controlled from remote controlled software. However, many times you'll want to take your time, and have a look at things, or, re-do the same init, or something. So, you can keep the window up by clicking on "Keep Window Up" within the first five seconds.

If you find that this delay is annoying, you can change the delay in the SiTechExe/Config/ChangeConfig/Misc Tab, There's a text box labelled "Init Window Timeout". A value of 1 is 1 second, a value of 0, is never Timeout, it will remain up until clicked on.

There are several self explanatory textboxes, with the current Right Ascension, Declination, and the Azimuth (RA), and Altitude (Declination) of the telescope mount. Also, the Current Hour Angle, Scope Latitude, Scope Longitude. You can use these displays if you are interested in them. The particular one of interest is the Scope Latitude as explained below.

The SiTech Telescope driver can control 4 types of telescopes, Equatorials, German Equatorial Mounts (GEM's), Alt/Az and Alt/Alt mounts. The initialization of each type is slightly different, so there are appropriate notes where required.

The telescope Primary axis is the Right Ascension axis of the equatorial mount, or the Azimuth of an Alt/Az mount. The Secondary axis of an equatorial mount is the Declination axis of an equatorial mount and the Altitude Axis of an Alt/Az mount.

Using the Handpad to Initialize:

First, you must click on "Keep Window Up", the large button on the left. Now you center the star using the handpad. You can do a "Load Cal Star", or an "Offset Init" using the handpad.

Offset Init:

You perform an offset init by pressing the "ESC" key or Top Left key on the handpad.

Load Cal Star Init:

You perform an offset init by pressing the "RTN" key or Top Right key on the handpad.

Simple Offset Init vs. Load Cal Star:

Offset Inits:

I like to explain an offset init by the analogy of "grabbing the sky and moving it until the star is centered. As soon as you do an offset init, your telescope will start to track. If you've an Alt/Az or Alt/Alt telescope, the tracking will be based on your latitude and longitude, and assumes your scope is level, and in the case of an Alt/Alt, it's pointed North. Your "GoTo's" will probably not be too accurate yet, but this will give you time to re-center the star to load your first init point. If you've an equatorial telescope, and you're polar alignment is good, you may not want to add the complexity of adding init points, it may be accurate enough as it is.

Load Cal Star Inits:

Instead of "shifting the sky", which effectively the Offset Init does, the Load init point inits load the hour angle, declination, primary axis angle, secondary axis angle into PointXP by Dave Rowe. As soon as the 2nd star is "loaded", the polar transformations are performed to convert between the telescopes primary and secondary axis, and the Hour Angle and declination of the object(s). If you have a mis-aligned equatorial telescope, your goto's will be accurate, even though you're mis-aligned, after you load the 2nd star.

Special notes for GEM users:

A GEM mount has a "looking West" side, and a "looking East" side. Changing from one side to the other is called a "meridian flip". Normally the default will be correct, however, sometimes when things get totally mixed up, the default can be wrong. It's extremely important that you correct this using the radio buttons labelled "GEM Scope is Looking West", or "GEM Scope is Looking East".

Things to keep in mind.

1. First Two Stars:

For best results, take care when loading your first two Cal Stars, especially if you only intend to load 2 stars. For superior accuracy, use a crosshair eyepiece, or a ccd camera and PlateSolve, available from the Run Script feature. As you add more cal stars, these first two stars take on less and less meaning, but if you are only doing a 2 star alignment, then take the following into consideration:

You need to have as wide as possible azimuth (alt/az scopes) or right ascension (equatorial scopes), and as close as possible in altitude (Alt/Az scopes) or Declination (equatorial scopes).

If you have an Alt/Az scope, you can use Polaris as your first star, and then another star with roughly the same altitude, 120 deg's away.

If you have an Equatorial scope (non GEM), choose two stars about 90 deg's apart, near the celestial equator. These two stars should have different hour angles on each side of the meridian, for instance shouldn't be centered around the meridian.

Also, **and this is extremely important if you have a GEM** please get used to checking the Looking East and Looking West radio buttons, to be sure they agree with your telescope mount. Your telescope may run away if this is not done properly. Fortunately, the default is usually correct.

3. Watch your scope latitude:

The Scope Latitude is the latitude the scope would be at if the primary axis was pointing straight up. To explain further, let's say your alt/az scope is at latitude 45 degrees, but the South end of the base is 1 degree lower than the North end of the base. This is the same thing as having the scope at latitude 44 degrees, and being perfectly level.

There is a text box called Scope Latitude and Scope Longitude. Its hard to have accurate results for the scope longitude, so don't pay too much attention to this, but your scope latitude is crucial. When you load the 2nd cal star to PointXP, get the habit of looking at the scope latitude. If you have an equatorial telescope, theoretically the scope latitude will indicate how far you are away from the celestial pole. If you have an alt/az scope, it should agree with your site latitude, within the errors of your mounting levelness.

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4. Adding additional Cal Stars:

Please scatter your Cal stars around the sky. If you are going for maximum accuracy, at least 16 stars are recommended. Some of the mount error terms are turned off until 16 stars are entered.

5. Know when to use Load Cal Stars and when to use Offset Inits:

It is extremely important that you understand this. If you follow these directions, you can have less than 1 minute of GoTo accuracy (10 arc seconds if using Renishaw High Resolution Encoders), as well as extremely accurate tracking for long periods of time if you have a reasonably accurate telescope mounting. This is all because of incorporating PointXP by David Rowe into the SiTech Telescope driver.

However, it's really easy to mess things up if done wrong! So, when you start initializing your telescope, do all the offset inits you want, but once you start "adding Cal Stars", do NOT I repeat do NOT perform any more offset inits until you have added all the stars you want. Once you've added all the stars into PointXP, then it's ok to start performing offset inits, but once you do ONE offset init, then you do NOT want to do any more "add Cal Star" inits.

The SiTech Telescope driver "knows" this, and the default will be offset inits, until you perform one "load init point" init, then the defaults will be "load init points" until you do one offset init, then the default will remain "offset inits".

PointXP:

There are 3 indicators on the Init Screen, that relate to PointXP. There is a textbox that tells you how many Cal Stars have been loaded, and then there is the RMS and Peak pointing error.

Using your previously saved Mount Error Terms (using the Built In PointXP only):

This feature doesn't work if you're using the ActiveX version of PointXP.

There is a button labelled "Just Load Star (No Terms)". If you've already performed a mount analysis, and have saved the terms to the Configuration (using the PointXP screen), then you can just do a 2 to 5 "Just Load Star (NoTerms)" initializations. After these stars have been loaded, then you can click on "Calc Only Offsets/Align", and the stars will be used just to recalculate your polar (zenith on alt/az scopes) alignment, and your offsets. Now there is no need to perform a detailed calibration, but all the terms you've calculated before will be in place.

Please see the PointXP help file for details on deleting particular Cal Stars, and other details about PointXP.

E-Stop:

Occasionally, with a bad init, (remember garbage in, garbage out), your telescope can run away. An E-Stop button is provided on this screen for your safety. You can then click on "Clear All Inits", and start from scratch. The most frequent cause of this is using the wrong data in the "Looking

West" or "Looking East" radio buttons when initializing a GEM mounting.

SiTechExe Setup Help **Scope InfoTab** **as of Version 0.91A**

Config Change Config Configuration Scope Info Tab

Important: You Must set up various parameters in the SiTech Dual Servo Controller Flash ROM using the free ServoConfig before the SiTech Telescope Driver will work properly!

The parameters that MUST be set up are:

1. Primary (R/A or Azimuth) MOTOR Ticks per telescope revolution
2. Secondary (Dec or Altitude) MOTOR Ticks per telescope revolution
3. Primary (R/A or Azimuth) Telescope Encoder Ticks per telescope revolution (if used)
4. Secondary (Dec or Altitude) Telescope Encoder Ticks per telescope revolution (if used)
5. Slew Speed (Srimary and Secondary)
6. Pan Speed (Primary and Secondary)
7. Guide Speed (Primary and Secondary)

FOLDER LOCATIONS:

The top two UnEditable Text boxes are where your program and data folders are.
You can copy them, and paste them into your "MyComputer" to view all of your files.
The one labeled "Folder For SiTech.cfg" includes the filename "SiTech.cfg".
If you want to get to the folder, simply edit the "SiTech.cfg" from the string you copy.

NAME:

The default name of the telescope is "Pat" (taken from an old Saturday Night Live skit!)
This is used by some ASCOM applications that will save the telescope name in a FITS header,
for example. You should probably change it to something of your liking..
The Name has no effect on SiTechExe operations.

DESCRIPTION:

The Description is also up to you, whatever works.
The Description has no effect on SiTechExe operations.

OPTICAL INFO

The only one that effects operations of SiTechExe is the Focal Length. It is used in the Calculate
Field Of View tool. Be sure that's correct. It helps when doing plateSolves.

The Aperture and Optical area are up to you, they have no effect on SiTechExe operations,
however, other applications (such as MaximDL) may use them.

GEOGRAPHICAL INFORMATION:

Fairly obvious what to do here. Please make them fairly accurate so refraction can be calculated
properly.

You can enter all of the numbers in decimal format, or DD:MM:SS format.

The old default location is an old house I used to own.

The new default location (starting in version 0.90XJ) is Shepherds Lair Observatory, where we
live now:
<https://www.google.com/maps/place/45%C2%B019'29.0%22N+122%C2%B018'51.1%22W/@45.324721,-122.3147563,221m/data=!3m2!1e3!4b1!4m2!3m1!1s0x0:0x0>

If you're going to track satellites, you need to set up ALL 3, (including Elevation) extremely accurately.

SiTechExe Setup Help **Mount Parm's Tab** **as of Version 0.91A**

Configuration -> Mount Parm's Tab

You can have 4 types of mounts, please select the proper type.

Configuration -> Mount Parm's Tab

You can have 4 types of mounts, please select the proper type.

Alt Alt mount:

If you are going to use an Alt/Alt mount (see Shepherds Lair Observatory)

<http://siderealtechnology.com/SLO/index.html>

Make sure you line up the primary axis north and south.

Make sure the RIGHT button on the handpad moves the scope to the west.

Make sure the UP button on the handpad moves the scope to the north (if looking near the southern meridian). Use ServoConfig to change these motor directions if necessary.

German Equatorial Telescope Settings:

Sometimes, I wish the GEM scope had never been invented! I have two, but it's only because I have to make sure this software works!

GEM AutoFlip on GOTO. If selected, if you try a goto to an object on the other side of the meridian, the telescope will perform an automatic GEM flip.

Normally, this would be selected, however, if you have dangling wires, and want to manage them manually, then you could un-check this.

GEM AutoFlip on Track. If selected, if the tracking comes up to the western meridian limit PLUS the Track Past parameter, then a GOTO (with a GEM flip) to the same object on the west side of the meridian will be performed.

Reverse Guide Mode when Looking East (Declination)

Reverse Guide Mode when Looking East (Right Ascension)

There has been a LOT of confusion about what to do about guiding, and some guiding software will automatically flip guiding when a meridian flip happens, it's really pretty crazy.

So, we added these options, and you can figure it out, and make it work with your system! Have FUN!

New Meridian Overlap Settings.

Lucas from the Mesu mounts had a suggestion that would place the meridian overlap area, somewhere else entirely. This is also very helpful on the Ealing mounts, such as the one from the Wallace Observatory from MIT.

Now there are separate OVER POLE settings, and also UNDER POLE settings, and they don't have to be around the meridian.

So, keep in mind that the value of the angle starts at the Southern meridian as ZERO. As you go WEST, it increases. As you go East, it Decreases to a negative number. If you keep going east, you will eventually hit the Northern meridian. At the Northern meridian, the angle is 180 degs (or

-180 degrees if even a fraction of an arc second East of the North Meridian Horizon).

If you're EAST of the Northern meridian (From Northern Horizon) by 1 degree, it would be -179. If you're WEST of the Northern meridian (From Northern Horizon) by 1 degree, it will be 179.

Now keep in mind that the East and West in the above sentence is stated as related to the due north on horizon. In a GEM mount, when tracking "West", it will move to the EAST side of due NORTH horizon! Now that is confusing, but if you read carefully, about 5 times, then it might make sense!

So, when we are referring to the Meridian Limit West Under Pole, this would normally be on the EAST side of due North Azimuth. This value would normally be -175 or so, depending on your wishes.

In addition, when we are referring to the Meridian Limit East Under Pole, this would normally be on the WEST side of due North Azimuth. This value would normally be 175 or so, depending on your wishes.

Let's say you want standard settings of 5 degrees past the meridian at all locations, and you want to track 3 degrees past the western limit. Your numbers should look like this:

<u>OVER POLE</u>	<u>UNDER POLE</u>
<u>05:00:00 ---Meridian Limit West (Degs)---</u>	<u>-175:00:00</u>
<u>-05:00:00 ---Meridian Limit East (Degs)---</u>	<u>175:00:00</u>
<u>03:00:00 Track Past Meridian Overlap</u>	

Your meridian overlap lines are drawn on the SkyView screen if you have a GEM.

Let's say you have an Ealing mount, (we have our brushless controller on this one):

<http://web.mit.edu/wallace/>

So, you normally can see all of the sky with the scope in the "Looking West" position, but there is a small portion of the sky where you want to do a meridian flip.

Here's some appropriate settings:

<u>OVER POLE</u>	<u>UNDER POLE</u>
<u>-90:00:00 ---Meridian Limit West (Degs)---</u>	<u>170:00:00</u>
<u>-100:00:00 ---Meridian Limit East (Degs)---</u>	<u>-170:00:00</u>
<u>03:00:00 Track Past Meridian Overlap</u>	

With these settings, SkyView looks like this:

<http://siderealechnology.com/MeridianOverlapInEast.jpg>

Keep in mind that the software will keep you from entering numbers that cross, ie, OverPole Meridian Limit East ALWAYS has to be less than Meridian Limit OverPole West. You may have to enter your most negative number first in the meridian Limit East textbox before you are able to enter your desired Meridian Limit West number.

New Track Past Setting:

This works on the OVER Pole settings and also the UNDER Pole settings.

So, if you're "Looking East", and your mount is tracking, and it goes past the Southern meridian to the Over Pole Meridian Limit West setting, it will continue tracking until it hits the Meridian Limit West PLUS the Track Past Setting.

Now that was hard to make it work correctly, and it seems, even harder to describe!

Have I mentioned that I really don't like GEM's!

If you have an equatorial or GEM mount, you have the following selections:

Freeze Declination:

The declination may move slowly for two reasons, it will track the declination very slowly to keep up with refraction, and if you have a Telescope Model loaded, then it will track the declination to

compensate for any polar mis-alignment, and all of your corrected telescope errors.

Track on Start:

Selecting this will force the SiTech driver to start tracking on startup. If you use SiTechExe, you probably SHOULDN'T use this feature, it basically negates your park position. Keep in mind this is a different setting than the EQUATORIAL mode in ServoConfig.

Equatorial mode in Servo config has only one purpose. It will track your telescope at the sidereal rate (that you specify in ServoConfig) when you power up the controller, that's it, nothing else. This is named wrong (my fault, many years ago), and many folks assume that if they have an equatorial, they should check this. That makes sense, so it's a mistake on our part, but we're not upgrading ServoConfig, so this will remain until Taj gets the new servoConfig finished.

So, Unless you want to use your scope visually, without a computer, best NOT to select EQUATORIAL mode in ServoConfig, and unless you truly want to track on start of SiTechExe, you should not check this.

Approach Declination from Same Direction:

If you have backlash in your declination, and you want to make a telescope model, then check this before you make your telescope model.

It will always take up backlash if you do this.

If this is NOT checked, then it will still take up backlash, but in the direction that it will be tracking the declination! So, best NOT to check this during normal operations, or the declination won't track until the backlash is taken up.

Disable Dec(Alt) Cosines for Pan/Guide (Relay Guiding Only)

If you're using guiding relays (the guide port on the Servoll or on the receiver of a Servol), then you have a possible issue.

The Servol and the Servoll controllers automatically compensate the guide rates based on the cosine of the declination.

This is a problem if your guiding software ALSO does this, it would be a Cosine on a Cosine!

So, if your guiding software does this, make sure you check this option.

Note: This option has no effect on the brushless controller (Force One).

Azimuth No Wrap:

If you have a Fork Mount Equatorial, OR an Alt/Az telescope, you can check this, and the scope won't track or slew through the northern meridian.

Altitude Limit:

Two ways to deal with it, a simple number, or a custom horizon file.

If you want to just have an altitude limit, enter it here, and make sure the checkbox labeled "Use Horizon File SiTech.hrz" is NOT checked.

If you want to make your own custom horizon file, then check the checkbox labeled "Use Horizon File SiTech.hrz", and setup your horizon file in the "Horizon File" tab of SiTech Config.

Enable Joystick Control:

If you want to try using a standard Windows joystick, then check this box. Hopefully your joystick will work, there's some reports of some types not working.

Motors to Manual on Park:

Andrew Aurigema (the very first SiTechExe beta tester, date 3-06-06) coined the term "Blinky Mode". "Blinky mode" is the same as "Manual Mode", except it's a much cuter name. The LED flashes (blinks) when it's in manual!

If you leave your telescope unattended, it may be wise to use this option. If a wire broke on an encoder while it's in the "Normal Mode", it could feasibly "run away", but if it's in the "blinky"

mode, it will not.

When you "UnPark", it will automatically change to "Auto" mode.

Load "AutoLoad.pxp On Start:

If you made a nice telescope model using SiTech Scripting and PointXP, then you may want that model loaded, whenever you start SiTechExe.

If so, save the new telescope model using the pointXP File "Save Calibration Az", and save it to the SiTech Data folder, and then you can check this checkbox. When you run SiTechExe, this model will be automatically loaded. Also, if you have this option selected, the "UnPark" command Won't load a model.

Using Absolute Encoders:

I admit, I'm spoiled, I love absolute encoders! The software will ALWAYS know where the scope is, no initializing necessary.

You must have them on BOTH axis's before you check this box.

The Servoll requires an "LBB" in order to interface to Renishaw Absolute 26 bit encoders. (LBB means "Little Black Box")

If you have them, then select this checkbox. SiTechExe will always "know" where your telescope is.

Note that you can still make an offset init, and it will adjust the offset settings in the SiTechConfig file.

Note: this option only affects how SiTechExe treats the position data coming back from the controller. You MUST configure your controller (using ServoConfig or BrushlessServoConfig) for the encoders to work properly.

Note: Resolution, these encoders have 2²⁶ ticks per revolution, or 67,108,864 ticks per revolution. That's about 52 ticks per arc second!

Keep Above Horizon Limit while Slewing:

We had a customer that needed this feature badly, and the way it's implemented is a huge shortcut, and not ideal, but if you have an interference problem, or don't want your telescope tube to point down, then you may want to select this option.

The way it works is simple. During your slew, the axis that is driving the scope in a negative altitude direction is slowed down.

If the scope is below the horizon at the start of the slew, it makes a two stage slew, and slews above the horizon limit first, and will then start the slew with the above algorithm.

That's it!

Someday I'll make it better.

Script After Slew:

You can make a Visual Basic script that can run after a slew is finished. While your script is executing, the ASCOM property called "Slewing" will be true. If the script is running longer than the Start Delay, it will terminate the script, and move on. After writing your script, you can "Browse to Script" to choose the script you want to run.

Script On Error:

If you get the message "Lost Communication With SiTech" (now where have I heard that before?), OR if your telescope goes into Manual mode (Blinky mode), and you have this checkbox checked, and have set up the script, AFTER the time delay, it will run your script. It's purpose is to do things like email you that something went wrong, or do something with ACP, or whatever you want to happen.

Axis Settings:

1. Gain:

So, the way SiTechExe and the Servo Controller works is this.
There is a standard axis rate that is sent to the controller, but this doesn't correct for errors. But
there is also two other parameters that are sent to the controller, one is an OFFSET rate that is
ADDED to the standard axis rate, and there is a Time that this added rate is in effect.
So SiTechExe calculates the position error, based on where the telescope is, and where it should
be, and turns this number into an offset rate and offset time, but this offset rate is multiplied by the
GAIN that you set.
Normally this should be set at 0.9.

2. Ticks Per Worm Rev

This is a future parameter for Automatic PEC control, and is not used yet.

3. Slew Before Amount

Normally, when you slew to something, SiTechExe slews to a position Just Before the final
destination (opposite the tracking direction to take up backlash). The values you put here will
control how far it moves. If you have a direct drive telescope, these should be at zero, because
you won't have backlash. This number should be slightly larger than the amount of mechanical
backlash that you have.

SiTechExe Setup Help **Scope Encoders Tab** **as of Version 0.91A**

Configuration -> Scope Encoders Tab

Scope Encoder Setup:

My definition of a low resolution encoder are encoders such as the USDigital 10K encoders.

My definition of a medium resolution encoder are encoders such as the Gurley 320K tick
encoders.

My definition of a high resolution encoder are encoders such as 13,000,000 tick Renishaw or
Heidenhain encoders (at least 10 ticks per arc second).

Note about "Tracking Error" Message.

If you get a Tracking error message on the main window of SiTechExe, it simply is a protection
scheme. It means that the Scope Encoder (for the axis indicated) does NOT agree with the
Motor Encoder, by 10 degrees.

SiTechExe puts your motors in Manual "blinky" mode if that happens.

What to do? First of all, if you go to this Config screen Scope Encoders, you can click on "Ignore"
for the affected axis. Your scope will work again.

But of course, you really should fix the problem.

You could have a bad scope encoder or wiring, you could have a bad motor encoder or wiring
(but not likely because we assume here that the motors work at all). You could have the scope
encoder direction wrong, (ie the counts go down when the motor moves more positive), you have
the wrong ticks per revolution programmed for the scope encoder or the motor encoder, a belt
has fallen off or a clutch is slipping (mechanical problem).

The easiest place to check this is go to the Features tab, then click on Controller Stuff, and watch
the motor encoder angle change, and the scope encoder angle change, and see what is going
wrong.

There are several ways to use the Scope encoders:

1. Ignore:

If selected, then the telescope position will exclusively come from the motor Encoders. If you have some sort of scope encoders, you can still use them when you wish, by going to the "Controller Stuff" window under the Features tab. You can update the Motor Encoders to the angle of the Scope Encoders or vice versa.

2. Precise Mode:

If selected, then as soon as there is a dis-agreement between the motor location and the encoder location that exceeds the Supervisory Threshold, then the motor location is updated to the encoder location, and the scope will re-center. Use the Precise mode if you have the low resolution encoders, but you're not doing photography (the "Precise" word is used loosely!).

Make sure that you set up the "Supervisory Threshold" to have a value of about 1.5 to 2 times the resolution of the encoder.

As an example, if you have 10,000 tick (2500 line) USDigital encoders, then you have about 2 arc minute resolution. You should set up your "Supervisory Threshold to at least 3 arc minutes.

3. Polite Mode:

If you are doing photography, and have low resolution encoders such as the USDigital 10,000 tick encoders, then you may want to use the Polite mode. In this mode, the encoders are used when slewing, and when initializing, but not when tracking. Thus, there will be no jump if you're tracking and the disagreement reaches the "supervisory threshold". This would ruin an exposure!

Make sure that you set up the "Supervisory Threshold" to have a value of about 1.5 to 2 times the resolution of the encoder.

As an example, if you have 10,000 tick (2500 line) USDigital encoders, then you have about 2 arc minute resolution. You should set up your "Supervisory Threshold to at least 3 arc minutes.

Use Polite mode if you have the low resolution encoders and want to do photography (the "Precise" word is used loosely!).

4. Cascade Mode:

You can ONLY use this mode if you have High Resolution Encoders on the particular axis. If you do have accurate high resolution encoders on your axis, then you will have a nearly perfect telescope! We like the Renishaw 26 bit absolute encoders, or the Renishaw minimum of 13,000,000 tick encoders (about 10 ticks per arc second).

The cascade mode works by positioning the motors to a location where there is zero error on the scope encoders.

5. Tick Management Mode:

You can use the Tick Management mode if you have medium resolution encoders, such as the Gurley 320,000 tick encoders.

Tick Management works by using the motor encoder ticks to count where the scope axis is between scope encoder ticks. For instance, a 320K Gurley encoder only has about 4 arc seconds resolution. This is NOT enough resolution to track a telescope. Tick Management mode makes a medium resolution encoder be useful.

But what we found (the hard way) was that even though the accuracy of the encoder was within Gurley specifications, there was some very fast periodic error, that was left over from the internal interpolation. We invented a system that will automatically correct for this interpolation error. So, if you have a Gurley encoder (320K or 500K), then you will definitely want to use Gurley Interpolation to correct for this.

_____ a. Gurley Interpolation Correction 320K

_____ b. Gurley Interpolation Correction 500K

Gurley interpolation works by comparing the motor encoders over time with the Gurley encoder, and averaging this result. So it takes a minute or two of tracking for the Gurley Interpolation to start working properly. When you slew to another object, it will still use what it's learned the first time, but will keep "learning".

Supervisory Threshold:

If you use the Precise Mode or the Polite Mode, then make sure you set up the Supervisory Threshold to a value that is GREATER than the resolution of your telescope encoders. Lets say you have an 8192 resolution encoder on your telescope. This is about 3 arc minutes, so you might want to set up your Supervisory threshold to be 4 arc minutes. If you're not using the Precise or Polite mode, these values are ignored.

The "Drag Mode" is a new word invention of mine, it means the tracking of the telescope is totally based on the location in the sky the telescope is at a certain point. There is no RA/Dec setpoints, it's blind tracking (actually, most telescopes use this exclusively).

The "drag Mode" is provided for visual observers that have a clutch on their telescope mount, and want to move the scope by "Dragging" it.

If you select "ignore encoders", then you won't be able to "drag" your telescope, however the same principle applies, there is no RA/Dec setpoints, it still is blind tracking.

Disadvantages of Drag Mode: You will not be able to do any RA/Dec offset tracking, or any other features that affect the Right Ascension or Declination setpoints. Also, the tracking will not be as accurate, because the scope isn't tracking to a particular point in the sky, but blind tracking rates are sent to the servo controller.

SiTechExe Setup Help
Misc Tab
as of Version 0.91A

Configuration -> Misc Tab

Comm Port:

First and Foremost, you must configure your communication port. The drop down box will display comm ports 1 through 99.

If it's available, it will simply read the name of the port in the drop down box, such as COM3

If it's currently being used by another application, it will read COM10 NotAvail

The one that you are using right now will say: COM4 Current

Please note, the available ports MAY be above the one you're selecting, you may have to scroll UP in the drop down box.

Comm Loop Time (mSec)

The fastest you can try is 50mS, however, it's better to use 75 as the fastest. Sometimes it will miss loops at 50mS.

The default is 100mS and is a good choice.

Disable Faking Servo's:

When you start SiTechExe, by default it will "Pretent" that there's a controller connected, even if it can't communicate with the Servo Controller.

This can make it seem like your telescope is working, when really it's not. This could feasibly cause major problems in a remote telescope situation.

Check this box if you don't want SiTechExe to Pretend there is a telescope connected if it can't find the servo controller on the communication port.

AutoOpen SkyView:

Although I don't claim that our SkyView will replace your planetarium program, over the years, it's gotten pretty good, and I find I hardly ever use my planetarium software. If you find that you're opening up SkyView every time you run SiTech, you can check this and it will do it for you.

Mute SiTech Sounds:

If I never hear the sound "Lost Communication With SiTech" again in my entire life, it will be too soon! Checking this, will disable all of SiTech sounds, like "Slew Ended", "Cal Star, Load Init" (That's Chuck Shaw!), etc.

Nutate Coordinates and Aberrate Coordinates:

When software sends commands to and gets data from SiTechExe (via ASCOM), all coordinates should be "Fully Cooked", ie, Precession applied, Nutation applied, Aberration applied. However, MOST software only does Precession, and doesn't bother with Nutation or Aberration. If your software DOES apply Nutation and Aberration, then these should be UnChecked. If your software Doesn't apply Nutation or Aberration, these should be UnChecked.

These two checkboxes have NO effect on anything that is purely inside SiTechExe, such as the SkyView database, the scripting, PointXP, etc.

It is simply a tool to make things more accurate from an ASCOM perspective. The fear is the planetarium software (as an example) could apply nutation and aberration, AND SiTechExe could ALSO apply nutation and Aberration, this would not be good!

I haven't checked in the last few years, but about 3 or 4 years ago (it's 2015 as of this writing), the ONLY software that I know of that applied Nutation and Aberration was TheSky!

So, if you use TheSky, then leave these two UNCHECKED. If you use other software, it would be best if you find out what it does.

Refraction On:

Refraction should always be checked!

Temperature and Pressure:

Temperature and Pressure should be set so the refraction calculation is more accurate. I usually forget about it, but probably shouldn't, especially for high altitudes. For instance, the Barometric Pressure on Haleakala right now is 707 milibars (about 3000 meters in elevation), and in Paia, at the base of the mountain, it's 1012 milibars.

<http://www.ifa.hawaii.edu/haleakalanew/weather.shtml>

You can enter temperature and pressure in Metric units or English units by changing the checkbox.

Camera Control Software (Used in SiTechExe Scripting):

Select your camera software from the radio buttons on the left

Use PlateSolve2 and Use PlateSolve3 radio buttons:

You can use Dave Rowe's Platesolve2, or his PlateSolve3.

In order to do plateSolving, you MUST install the catalogs of the platesolve you want to use. I

suggest Both, because the UCAC3 catalog is also used in SkyView when you zoom in a lot. A description of these catalogs, where to get them, and where to put them, will be at the end of this file.

The main advantage of PlateSolve3 is it will solve anywhere in the sky, if your telescope is "Lost In Space". Other advantages is it uses the newer UCAC4 catalog, so the catalog stars are fainter, and it seems to solve images that PlateSolve2 doesn't solve (which are few).

PlateSolve2 Regions:

If you use PlateSolve2, it will look around the starting coordinates until it finds a match. We've noticed that it usually matches while looking through just a few regions, but the default was about 3000. So we made it configurable, so if it can't find a match, it will stop sooner. I suggest a value of 200 to 500.

FOV Calculator:

If you use this calculator, be SURE that you've set up the focal length of your telescope on the "Scope Info" tab, then simply put in your X and Y number of pixels, and your Microns per pixel, and click on "Calculate Field Of View". It will fill in the "Cam FOVX (ArcMins)", and "Cam FOVY (ArcMins)" text boxes for you.

If you know your camera's field of view, you can simply enter the numbers instead if you wish.

Load Backup Config File:

If you've previously Saved a Backup Config File, you can Load it again using this button.

Save Backup Config File:

This button will save all the data that you're working on right now, to a backup file. It's a good thing to do!

Init Window Timeout:

If you're using something like ACP, you may not want the sync's or inits to take so long. Best way to change that, is to change the Init Window Timeout. If you change it to 0, then it will remain up until you click on it. So, use 1 as the shortest timeout. The default is 15.

All Red Checkbox:

This is a checkbox that makes everything red except SkyView. There are some portions of Windows devices that can't be changed without making your own, so this doesn't control absolutely everything, but if you're trying to dim your screen, this is one way.

Colors Button:

You can make your own colors for the SiTechExe user interface, but I haven't updated all of the new text boxes and buttons, so some things may not look right. Best to leave default for now!

Color File Button:

You can change the colors of your interface, then save it to a file if you like.

PlateSolve3 Catalog locations!

This is important if you want to use PlateSolve3, (I highly recommend it). PlateSolve3 (PS3), does very fast all sky plate solves (Thanks Dave Rowel!)

The Star catalog for PS3 is about 2.1 GBytes zipped up.

You can try to download it here:

<http://siderealtechnology.com/PlateSolve3Catalogs.zip>

If that doesn't work, we're trying to set up a public FTP, when we get it working, we'll announce it on the list.

Anyway, you need to unzip it, and it has to be in an exact location.

In the following paragraphs, we're trying to say where the folders MUST be. On most U.S. computers,

the folders are here:

C:\ProgramData\SiTech\.

But your mileage may vary. Sometimes it's:

C:\users\AllUsers\windows\application data.

and there's a variety of others where windows puts this folder.

You have to figure where the data files for SiTechEXE is, then going up one level.

In the following discussion, I'm going to call it:

C:\YourProgramDataPathWhateverThatMaybe\

You can find this SiTech Data folder by running SiTechExe, clicking on the Config tab, then Click on Change Config. Now look at the path in the top textbox labeled "Folder for SiTech.cfg"

Copy everything from the C: up to but not including the SiTechExe, then paste it into a MyComputer browser.

That's where the catalog files MUST go.

The unzipped files should go here:

C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs

When you unzip the files, sometimes it will make a folder under a folder, like this.

C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs\PlateSolve3Catalogs
WRONG!!!

This is Wrong, and won't work

Again, the files must be here:

C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs

In the above folder, there are 3 sub folders:

Orca

UC4

UC4Mag14

Make sure your PlateSolve3 catalog files are right exactly as above.

Ok, on to the UCAC3 Catalog files for PlateSolve2.

These catalog files are used if you DON'T select "Use Platesolve3" in the SiTechSetup.

Also, these are used if you zoom in far enough to the SkyView, so consider them important.

You can download the files here:

<http://siderealtechnology.com/UCAC3PS.zip>

Again, we'll try to set up a FTP for those soon.

And again, these unzipped files need to be in a certain position.

C:\YourProgramDataPathWhateverThatMaybe\SiTech\UCAC3PS

And again, make sure it's not another UCAC3PS folder under the UCAC3PS folder

There should be a total of 181 files in this folder.

SiTechExe Setup Help **Horizon File Tab** **as of Version 0.91A**

Configuration -> Horizon File Tab

This page is dedicated to helping you make a horizon file.
First of all, nothing you do here will have any effect unless you check the "Use Horizon File SiTech.hrz" checkbox, on the "Mount Params" tab.

Graphic Area:

You can see the green line, which is your current horizon.
The Blue Circles are the elevation in 15 degree increments.
There is a little blue circle that indicates the position of the telescope.

Making a Horizon File:

The easiest way to make a horizon file is as follows:
1. Be sure your telescope is initialized, and points accurately
2. Click on the "Clear Horizon File" to clear it.
3. Click Ok.
4. Click on the Config Tab of SiTechExe, and notice the button that says "**Add Cur Alt/Az to Horizon File**"
5. Move your telescope to all the points, one at a time, that you want in the horizon file, and then click on this button.

You can delete the red points, one at a time, by clicking on the "**Delete Horizon Point**" button, then clicking on the red point.
You can add a red point, one at a time by clicking on the "**Add Horizon Point**", then clicking on the graphic where you want it.

You can drag points around by holding the left button down on the button, and dragging it.

If your telescope is pointed at an elevation and azimuth where you want a limit set, you can click on the button labelled "**Add Cur Alt/Az to Horizon File**".
There is also a similar button on the Config Tab of SiTechExe, so you don't have to edit the "Change Config. Horizon File" every time you want to add a new horizon point.

You can clear the horizon file, or load a previously saved horizon file with the "**Clear Horizon File**" and "**Load Horizon File**" buttons.

When you click **OK**, the current values will be saved in a file called "SiTech.hrz". If you want to make a backup, with a different filename, click on "**Save Current Horizon File**"

When you click **OK**, the new file will be in place, and you can see it in SkyView as a magenta line. You may have to click on the "**Refresh**" button for it to appear with your changes in SkyView.

SiTechExe Setup Help
ASCOS and Logging Tab
as of Version 0.91A

Configuration -> AscOS & Logging Tab

Logging:

Sometimes, if you're having trouble with something, SiTech Tech Support (usually me), will have you log something, and email me the log files.

It's best NOT to log anything, if things are working fine, ESPECIALLY "Log Serial Communications", and "Log Controller Stuff" Those files get big Really Fast!

If they reach 10 MBytes, they will be deleted on start of SiTechExe.

Log Serial Communications:

As mentioned earlier, Log this ONLY if you need to send something to SiTechExe, or if you're curious about the protocol.

After you're done logging, then turn it off!

The filename is the SiTechExe data folder, and a file called ".txt"

Log ASCOM:

This will log all the methods and properties accessed by all ASCOM programs that are accessing the SiTech Telescope (except Get Coordinates), because, the file gets too big too fast with Get Coordinates.

The filename is the SiTechExe data folder, and a file called "ASCOMCalls.txt"

Log Ascom "Get Coordinates":

If this is checked AND if the Log ASCOM is checked, it will also log the "Get Coordinates".

The filename is the SiTechExe data folder, and a file called "ASCOMCalls.txt", same as Log ASCOM.

Log Debug Stuff:

There are many things in SiTechExe that can be logged, some things log anyway, even if this isn't checked, but some things log only if this is checked. If you're having issues, you can "Log Debug Stuff", and then read the log file to see what's up.

The filename is the SiTechExe data folder, and a file called "SiTechDebug.txt"

Log Controller Stuff:

The filename is the SiTechExe data folder, and a file called "ControllerLog.txt"

Log Gurley Interpolation:

If you have Gurley Medium Resolution Encoders, and you want to know information about the interpolation correction, you can log the information.

I think the data may be hard for you to interpret, even for me, even though I wrote it, because it was so long ago!

The filename is the SiTechExe data folder, and a file called "GurleyInterpArrays.txt" and "GurleyInterpPosition.txt".

SiTech Priority:

Check the "Priority Above Normal" Checkbox for priority above normal.

Check the "Priority High Checkbox" Checkbox for priority high.

Uncheck them both for normal priority.

We recomend the Priority High checkbox.

ASCOM SETTINGS:

Enable ASCOM Homing (Must have Axis Sensors):

If you have Homing Switches installed and configured, then you should probably Enable the ASCOM homing. Now ASCOM software such as ACP can home your telescope.

ASCOM AxisRates to R/A and Dec:

If this box is checked, and if another application uses the ASCOM Axis Rate methods, then these rates will be applied to Right Ascension and Declination, which may or may not be your primary axis and your secondary axis, even in an equatorial scope. For instance, if you have an equatorial mount, and you have a model loaded, your Right Ascension doesn't always agree exactly with your right ascension axis. Also, if this is checked, and the primary axis is commanded to move, it will move in Right Ascension, even if you have an Alt/Az or an Alt/Alt

scope. In this case, it will move both axis's to make just the right ascension move.

IsPulseGuiding Returns False WHEN Settled checkbox:

If you are using the PulseGuide method from an ASCOM application such as MaximDL or PHDGuiding, then this checkbox will control how the IsPulseGuiding ASCOM property is returned.

If this is checked, it will return as soon as the movement is complete, or the PulseGuide time is expired, whichever is first.

If this is unchecked, it will Return after the full time of the PulseGuide time command is expired.

Slew Settling Time:

When a slew is complete, then you will hear "Slew Ended", but it may not be perfectly tracking yet, it may take a second or 4 to settle. When an ASCOM application asks a slew, then once the scope is at the coordinates, it will still send back "Slewing=true" to the ASCOM application, for the allotted Slew Settling Time.

Use Smart Slew Settling Time Checkbox:

If you check this checkbox, then a request from an ASCOM Application will return that the slew has ended after the position error is less than the Smart Slew Settle Threshold (Arc Secs)" both axis's, or after the Slew Settling time is expired, whichever comes sooner.

If the buttons **Select Ascom Focuser** and **Select Ascom Rotator** are not enabled, then you're using the ASCOMLess version of SiTechExe.

Select Ascom Focuser Button:

Select Ascom Focuser here:

You REALLY should try the AutoFocus that's built into SiTechExe, and uses features of PlateSolve2 by Dave Rowe.

1. Select your ascom focuser here in the SiTech Config/ChangeConfig/Ascom & Logging.
 2. Select your camera in the Misc tab.
 3. Go to the Features Tab and select "Run Script".
 4. Select the "AutoFocus" Tab.
 5. Connect to the ASCOM focuser.
 6. Set up your parameters.
- Click Do AutoFocus.

Dave Rowe's Autofocus beats the heck out of anything else I've ever seen.

Ask me about the free application I wrote called FocusPocus that acts like an ASCOM focuser hub, and connects to a camera and an ASCOM focuser, you can do autofocus from ACP or other applications using a script. It also uses PlateSolve2 by Dave Rowe for the focus analysis.

Select Ascom Rotator Button:

If you have an ASCOM rotator, you can control it using SkyView, and also, you can have the automatic Telescope Model wait until the rotator is finished moving before taking the next exposure (Think "Keep North Up" in an Alt/Az scope here).

SiTechExe Setup Help
Potentiometers Tab
as of Version 0.91A

Configuration -> Potentiometers Tab

It's possible to mechanically connect a potentiometer to your telescope axis. I call this the "poor man's absolute encoder".
They connect to the two Analog Inputs on the Servo, Servoll, or Brushless controllers.
I know of no one using these, but if you want to try, please contact me, and I'll help you through it.

There would be two uses for this.

1. It will get you within a few degrees if your telescope is "Lost In Space", and you have all of the settings correct.
2. It will stop your scope if something goes wrong, and it starts pointing down or something.

Some of the settings are on this screen, and some of the settings have to be set up manually in the SiTech.cfg file.

SiTechExe Help **Numbers Tab** **as of Version 0.91A**

Following is a description of all the Numbers on the "Numbers" tab of SiTechExe

1. Scope Latitude: If you have an alt/az scope, or are doing Multiple Star Inits with an equatorial scope, then pay attention to this number. Before you add the second star, this number is your latitude (if you have an alt/az scope), or 90 degs (if you have an equatorial scope). When you add the 2nd star, this number is updated, based on the PointXP model. It should be close to your latitude if your scope is level and you've an alt/az scope, or should be close to 90 deg's if you have an equatorial scope. If this number moves very far from where it should be, then you've an initialization problem which should be corrected.

2. Scope Longitude: If you have an alt/az scope, or are doing Multiple Star Inits with an equatorial scope, then this number is updated once you add the 2nd (or later) star. It's also on the Initialization window. Before you add the second star, this number is your longitude. When you add the 2nd star, this number is updated, based on the PointXP model. Don't pay too much attention to the longitude if you have an equatorial scope. The math blows up, so it's never accurate if you've an equatorial scope.

The Scope latitude and Scope longitude can be useful if you've an accurate alt/az mount. After doing a pointing model, you can enter these two numbers in your configuration latitude and longitude, and now your alt/az scope will be accurate with only a one star offset init!

3. SAxis Error. Secondary Axis Error. This is the deviation of your altitude or declination axis from its setpoint. If you've selected the "drag mode", this will be zero, as there is no setpoint.

4. PAxis Error. Primary Axis Error. This is the deviation of your azimuth or right ascension axis from its setpoint. If you've selected the "drag mode", this will be zero, as there is no setpoint.

5. SAxis Position. Secondary Axis Position. This is the position of your altitude or declination axis.

6. PAxis Position. Primary Axis Position. This is the position of your azimuth or right ascension axis in degrees.

7. ScopeAz Position. This is the current local Azimuth of the telescope

8. ScopeAl Position. This is the current local Altitude of the telescope

9. Refraction Amount is how much refraction is being calculated, based on your Scope Altitude, Barometric Pressure, and Temperature (Pressure and Temperature are entered in the Config Tab).

10. commdif is the difference in time (mSecs) between the communication between SiTechExe and the servo controller. It is an accurate indicator, based not on windows timing, but on the mSec clock inside the servo controller. It normally is a few mSecs longer than what you have set up in the configuration for Com Loop Time.

11. LST. Local Sidereal Time

12. Air Mass, based on the Young and Irving method

13. Allim. This is the lower altitude limit based on your current configuration. If you've selected the Horizon File, then this altitude limit will probably change with the azimuth of the telescope.

14. ParAng. This is the parallactic angle, for your telescope. For equatorial telescopes, this should be nearly zero (or 359.999), based on your telescope PointXP model. For Alt/Az scopes, this is the angle that the rotator should be to have North Up (should you have one).

15. ParRt. This is the parallactic rate, for your telescope. For equatorial telescopes, this should be nearly zero, based on your telescope PointXP model. For Alt/Az scopes, this is the rate that the rotator would turn (should you have one). A rate of 1.0 would turn one revolution per day.

SiTechExe Help **Features Tab** **as of Version 0.91A**

Polar Align:

Every time you add your second or third star to your PointXP Telescope Model, then your polar alignment altitude and azimuth deviations are captured and displayed.

Selecting your first two stars for this:

Find two stars near the celestial equator (prefer both below or both above the equator). These should be close to one another in Declination, but as far apart as practical in Right Ascension, without going below say about 25 or 30 deg's in elevation. Very carefully perform a "Load Init Point" on these two stars. It's absolutely crucial to either use a camera or a crosshair eyepiece. It's always best to let the R/A catch up so you know it's "pushing" the drive, and always come from the declination in the same direction.

These two stars should NOT be equal distance from the meridian if you're using a non-GEM equatorial mount. One should be lets say within 10 degs of the meridian on one side, then go down to about 40 deg's from the meridian on the other side.

Once the second star is added, then the two windows display the proper offsets. Just move your telescope mount in these directions, clear all inits, and add two init points again.

After you add the two stars, you can perform a GoTo to a star. This star should NOT be near the zenith, or the east or west horizon. preferably a few deg's from the meridian in R/A, and near the southern celestial equator in declination. After centering on the star, perform an Offset init if it's not perfectly centered. Now click on the "Polar Align" button. After a prompt, the telescope will move. Center the star by moving the altitude and the azimuth of your equatorial mounting.

Once you move your mount and the star is centered, then **IMPORTANT**, right click on your

PointXP button on the Scope Tab. You can then clear all of your previous calibration points.

Repeat this process (starting with "loading init points" on two stars), at least one more time, or if desired, a total of 3 times. Each time you will get more accurate. You are now nearly perfectly polar aligned.

Special thanks to Ralph Pass who published this:
<http://www.rppass.com/align.pdf>

Do Gem Flip:

If you have a GEM, Clicking on this button will perform a Gem Flip.

If the object you're on at the start is within the GoTo area of the meridian overlap, it will slew to the same object.

If not, it will slew to the same but opposite polarity hour angle as you were before the flip.

Run Script:

The SiTech ASCOM driver has a powerful script feature. You can make an automatic telescope model, photo init's, autofocus, pan the Lunar terminator using relative pan commands, Pan the Veil Nebula with absolute pans, write your name with starlight, etc. Making the scripts is as easy as moving your scope (or the virtual scope during the day), and clicking on various options. Click on this button and read the associated help file for more information.

Controller Stuff:

You can set the Motor Encoders to the value of the Scope Encoders or vice versa using this window. You can also have a look at many controller internal parameters, and also, there is a terminal mode for direct access to the controller.

Auto PEC:

This is not finished in 0.91A. It is my next SiTechExe project. Promise!

PEC Control:

Now we have R/A PEC control, with onscreen graphs, averaging, slope compensation, etc. This is a very powerful feature, and eliminates the need to use PemPro, saving you hundreds of dollars. You can still use PemPro to create your PEC table if you wish, there is a button that converts a PemPro file to a SiTech file.

Offset Tracking Rates.

Let's say a new fast moving comet has appeared, and you want to shoot it, but would like to track it during the exposures. Simply use features of your planetarium program (most Don't have this feature, but TheSky does, so does Earth Centered Universe), click on the comet, jot down the R/A and Declination Rates, and enter them in this window. Be sure they are the same Engineering Units, if different, you may have to convert them. The SiTech Telescope Driver uses arc seconds per second of time. Now your scope will track the object! This window has it's own help file, but just to re-iterate, the R/A Tracking Calibration at the bottom of the screen requires you to be in the "Drag Mode", and the Right Ascension and Declination "Offset Tracking Rates" require that you NOT be in the "Drag mode". If your planetarium program doesn't have this feature, use the SiTech users group, post a note of when you need the rates, and someone with TheSky will email them to you shortly! You can use this feature to track the moon, or asteroids too.

Also, this is where you calibrate the controller clock.

SiTechExe assumes your controller clock is more accurate than the PC clock over short periods, but less accurate over long periods.

The best thing to do is, after SiTechExe has been running and communicating with the controller for more than about 30 minutes, click on the "Save ServoCal" button. This will help your tracking. Typical numbers are 0.99995 or so.

You can adjust this rate if you have consistently slow or fast tracking, by entering your own calibration in the Servo Clock Calibration text box, and then clicking on the <<--Save ServoClock button. You can also do this by using the slider.

You can see the recommended ServoClock Ratio in the appropriate text box.

There is also a number labelled "Diff between Computer Time and ScopeTime".

Home Button:

This is where you can take advantage of axis homing switches. Please read the help file from this screen.

SatTrack Button:

We converted line by line Bill Gray's (ProjectPluto.com) C satellite algorithms to C#. Then we added a user interface, also ASCOM Extension methods and properties to track satellites.

Please read the help file from this screen for more information.

Colors Button:

If you want to change the colors of your SiTechExe screens, click here. I don't think I've updated a lot of the new text boxes, etc, so it may not work on all text boxes, etc.

Close Button:

You can close SiTechExe with this button.

SiTechExe Help
GoTo/Sync Tab
as of Version 0.91A

Since the SiTech Telescope Driver is a standalone program, there may be times where you know the NGC, IC or Messier number, or you want to synchronize on a named star, or something. This panel allows both of these actions, and also provides features of a "Scroll File" where you can list consecutive objects on each line, and then call up the objects, one by one.

Note: All coordinates in the scroll files themselves are in J2000 epoch. When the coordinates are displayed in the RA and DEC textboxes, they've already been "Cooked" to JNow, with precession, Nutation, and Aberration corrections applied.

When you have a selected object, the large text box near the center shows information about that object. If you have a currently open scroll file, you can edit this too. Just edit it in the text box, and press Enter.

ScrollFileName Button:

If you want to load an existing, or create a new Scroll File, then click on this button.

<-- and --> buttons:

The two buttons labelled <-- and --> allow you to scroll through each line of a scroll file.

Select File Line button:

You can go directly to a new line in your currently selected file using this button.

Add Line to File button:

Clicking on this button will allow you to add the current RA and Dec to a new line at the end of the selected scroll file.

Star button:

Clicking on this button allows you to select one of about 300 different named stars. You can then perform a GoTo or Sync to that star.

Messier Button:

Clicking on this button allows you to select a Messier object. You can then perform a GoTo or Sync to that object.

NGC and IC TextBoxes:

Enter the NGC number (not the name, just the number) in the box on the left, then press the Enter key.

You can then GoTo or Sync to that object.

Enter the IC number (not the name, just the number) in the box on the right, then press the Enter key.

You can then GoTo or Sync to that object.

RA and DEC Text Boxes:

Whenever you select an object from a scroll file or from the named stars, Messier, NGC or IC, the JNow Epoch Coordinates appear in these text boxes.

You can manually enter the RA and Declination in these text boxes too.

If you do manually enter, then you can enter JNOW or J2000 Coordinates. Just check the J2000 Checkbox if you're entering in J2000 Epoch, uncheck if you're entering in JNow Epoch.

J2000 Checkbox:

This checkbox ONLY function is when you manually enter coordinates in the RA and DEC text boxes.

Alt=NNNN Az=NNNN:

The current altitude and azimuth for the currently selected object is displayed here.

GoTo Button:

Click on this button to perform a GoTo to the currently selected coordinates in the RA and DEC text boxes.

Sync Button:

Click on this button to perform a Sync to the currently selected coordinates in the RA and DEC text boxes.

SiTechExe Help
Config Tab
as of Version 0.91A

This tab has information that the SiTech ASCOM driver receives from the controller. These are:

- Primary Motor Ticks Per Revolution,
- Secondary Motor Ticks Per Revolution,
- Primary Scope Ticks Per Revolution,
- Secondary Scope Ticks Per Revolution,
- Primary Slew Speed,
- Secondary Slew Speed,
- Primary Pan Speed,
- Secondary Pan Speed,
- Primary Guide Speed,
- Secondary Guide Speed.

The Primary axis is the Azimuth or the Right Ascension.
The Secondary Axis is the Altitude or the Declination

There is a button labeled "Add Cur Alt/Az to Horizon File" If you click this, you can add where the scope is to the horizon file. This makes it easy to point the scope above an obstruction, and creating your horizon file that way.

If you have troubles with your serial port, then you can try clicking the button "Cycle Comm Port", which completely renews the communication port with all the proper settings.
Be sure you have the correct communication port selected in the SiTech Configuration under the Misc tab.

All of the SiTechExe parameters are accessed by clicking on the "Change Config" button.

There is a separate help file for each of the Change Configuration tabs.

SiTechExe Help **SkyView Help** **as of Version 0.91A**

This is NOT a planetarium program! A true planetarium program will have better graphics, astropictures, and a lot more stuff. But I wanted to have a basic SkyView with basic features so many times a planetarium program would be unnecessary.

Click on the "Scope" tab, then click "SkyWindow" to bring up the SkyWindow, however, I'll bet you already did that if you're reading this!

New Feature, 0.91M

FAST Redraws! So, in working with Linux, we found out that the transparent forms didn't work, so, we reconfigured the graphics, and it turns out, it's a LOT faster.
We read the complete database of stars and Deep Sky into memory on opening of the skyview.
This only happens once.

We got rid of all the on screen buttons, and went to a menu driven approach. This means none of the buttons cover up anything anymore.

You can now zoom with the keys 1 through 6. Put the mouse where you want the zoom to be, before pressing the button.

Also added the Zoom Previous command

We added the Future CalPoints to the screen. You can click on them and do goto's.

You must create them first, by using the Features/Run Script/PlateSolveStuff and clicking on "Make PointXP Run, after you set up how many calibration points you want.

We also added a couple of items to the right click menu, you can zoom out, zoom1

We also added a FOV indicator that can be placed anywhere on the SkyView. It's location is saved to disk.

Description of new FAST graphic method (uses a lot of memory).

_____ One memory buffer is the Real Screen.

_____ One memory buffer is all the database objects.

_____ One memory buffer is the merge of the telescope indicator, satellite, and other moving things.

_____ The Database graphic is updated on a refresh, or about every 60 seconds.

_____ 4 times a second, we merge the moving objects with the database, then we display this

on the real screen.

New Database Feature, 0.90!:

There are now about 120,000 stars, and about 220,000 deep sky objects.

You can search for stars by HD number, and other numbers.

You can search for all PGC galaxy numbers.

Command Menu:

1. Refresh Display

_____ If the Display ever gets mixed up, clicking this will clear it up.

_____ Also, there is a refresh menu category, for a 1 click refresh.

2. Pan To Scope

_____ Selecting this will center the SkyView on the telescope position

3. Lock To Scope

_____ Selecting this will keep the SkyView centered on the telescope. This is Sticky...

4. Swap East/West

_____ Selecting this will swap the east and west of SkyView. This is Sticky....

5. Use System Time:

_____ Selecting this will synch SkyView with the computer clock.

6. Use Static Time:

_____ Selecting this will allow you to set the time of the SkyView.

7. Field Of View Setup

_____ Allows you to set up your Field Of View Indicators.

8. Place FOV Indicator

_____ There is ONE (maybe more in a later version) Static FOV indicator you can place.

_____ This Static FOV indicator is Sticky, ie, it's saved and reloaded on Exit/Restart of SiTechExe.

_____ This menu item allows you to place the static FOV indicator anywhere on the Sky, using the mouse.

9. Place FOV Indicator on Scope

_____ Places the Static FOV indicator on the current scope position.

10. Close SkyView

_____ Doesn't really close it, it simply hides it.

Object Menu:

There are various deep sky objects and/or grids, along with PointXP calibration points (future and present) that can be turned on, or turned off.

Magnitudes:

You can set up the stellar magnitude limit here.

SkyView doesn't crowd your display, so if you have this set to magnitude 10, it may only display up to magnitude 6 or 7 if zoomed out.

The size of Skyview also effects the magnitude that is displayed.

You can set up the Deep Sky Magnitude limit here as well.

A fairly recent feature is the minimum size feature.

I've "discovered" very nice dwarf galaxies from our local group using this feature.

It's also a way to keep your SkyView from being overrun with, small objects, but being able to view larger fainter objects.

Search:

This is a one click Search Menu item.

You can also press Cntrl/F to bring up the search window.

You can search for Messier, NGC, or IC objects, or, also search by name, such as "butterfly".

You can also type "Cntrl/F" to bring up the search.

If the search is not found, the search window disappears. If the object is found, then you can do a GoTo, or a Sync to the object.

To search by Messier, NGC, or IC, type M42 Messier 42, type N7331 (or NGC7331) for NGC 7331, and I302 (or IC302) for IC302.

You can search for Planets now.

You can search for named stars.

Refresh:

This is a one click Refresh menu item.

If the screen gets funky, or some places are not refreshed, you can click this to redraw the screen.

It also aligns the screen to the time, for instance the zenith indicator is aligned with the stars on a refresh.

If not refreshed manually, Skyview refreshes itself about every 60 seconds.

Zoom

You can zoom at 6 different levels with this menu item, same as pressing 1-6.

If you use the keys (1-6), if you place the mouse on the SkyView, it will zoom to this position.

You can also zoom in or out with the mouse wheel.

Zoom1:

Self explanatory

ZoomIn:

Self explanatory

ZoomOut:

Self explanatory

Help:

Allows you to display the SkyView Help document.

Also, displays compile information, such as for Linux, with or without ASCOM.

Some newer features are described here:

New Feature, 0.91!:

Stars are prettier, easier to see, and color of the star indicates spectral class

New Feature, 0.91!:

On the bottom right of the screen there is another Information window.

This appears when the mouse hovers near an object, there is information displayed here about the object.

New Feature, 0.91!:

SkyView Location and size is saved.

New Feature, 0.91!:

You can select and copy to the clipboard (cntrl/V) data about an object, before performing a GoTo, Sync, etc.

New Feature, 0.91!:

You can also configure SkyView to open automatically in the SiTechExe configuration, on the Misc tab. It's a checkbox called "Auto Open SkyView"

New Feature, 0.91!:

You can have F.O.V. indicators for your main and guide cameras.

New Feature, 0.91!:

You can have Control an ASCOM compatible rotator from SkyView. First you have to choose your ASCOM rotator with the SiTechExe/Config/ChangeConfig/Ascom and Logging.

New Feature, 0.91!:

When zoomed in far enough, and if you have your UCAC3 catalogs set up in the proper location, they will automatically appear. If they don't, click the "Refresh" button. If they still don't, you don't have your catalogs set up properly or you're not zoomed in far enough, or you have the magnitude limit set too bright (lower number)

The UCAC3 catalog is the same one used for PlateSolve2.

It must be located here for an American English computer:

C:\ProgramData\SiTech\SiTechExe\UCAC3PS

New Feature, 0.91!:

You can see where the telescope is going to go (a destination "bug" symbol).

Tip:

Try searching for Pluto!

On the Top Right of the screen there is a SkyView Info window.

You can see the Altitude, Azimuth, Right Ascension and Declination of the mouse location, the Alt/Az of the scope, the Current Altitude Low Limit, The Planetoid Tracking Rates, and the Local time (if the time is stopped, you're in the Static Time Mode.....

On the bottom right of the screen there is another Information window.

This appears when the mouse hovers near an object, there is information displayed here about the object.

ZOOMING and PANNING:

First a note about centering an object....

If you tried to center an object, but it isn't centered, then it's probably because the horizon circle is at the top of the screen, and/or the west part of the circle is on the east side of the screen.

If you have a mouse wheel, it's probably the easiest way to zoom in our out.

Just position the mouse on the object you want to zoom to, and then "wheel" in. What's under the mouse will be centered on your screen if you're zoomed in far enough. To zoom back out, "wheel" out.

Another really easy way to zoom is just click and hold, then drag the mouse (left button). You'll see a rubber band box, and you just surround what you want to see, then let up.

You can press 1-6 keys to zoom to preset levels. It will try to center on the location of the mouse.

Panning will be automatic if you zoom/drag, or use the wheel. You can also pan by the arrow keys.

One more way to pan is to right click, then select "Pan SkyView to Random Click Area".

SELECTING AN OBJECT WITH THE MOUSE:

Just LEFT click on the object that you see, and you'll be given several options, GoTo, Synch, or Track the object if it's a planet or moon. (future will be comets and asteroids)

This is a very nice feature for tracking the moon.

Skyview will try to center the object on your screen, if you're zoomed in enough.

If the screen is crowded where you click, then you'll get a list box, and you select the one you're interested in.

MEASURING TOOL:

If you click and hold down the right button, then drag it, you'll see a rubber band line, with a piece of text attached to it, that has the distance between where you clicked first, and where the mouse pointer is.

SiTechExe Help
SkyView FOV Help
as of Version 0.91A

You can have up to 10 FOV (Field Of View) indicators

The FOV indicators will only be visible if you're zoomed in far enough.

All distances are in arc minutes.

All angles are in degrees.

We've made the first two be what a Telrad would look like on the SkyView.

The 1st field is checked if you want to display it. If it's unchecked, the data will be there for later, but it won't be displayed.

The 2nd field is what you name it.

The 3rd field is the width in arc minutes of the eyepiece or camera field of view.

The 4th field is the height in arc minutes of the field of view. If you want it to be a circle, then make the value be zero.

The 5th field is the angle of the camera field of view. If you have a rotator that's connected to SkyView via ASCOM, this value is ignored, and instead, the angle of the rotator is used.

The 6th field is the width in arc minutes of the guider camera (or another circle)

The 7th field is the height in arc minutes of the guider camera. If you want it to be a circle, then make the sixth field value be zero.

The 8th field is the distance between the center of the main camera chip, and the center of the guider camera chip.

The 9th field is the Angle between the main camera chip, and the guider camera chip.

The 10th field is the Angle of the guider chip (relative to north). This is ignored if the 9th field is zero.

If the Associate checkbox is checked, then the guide camera will be drawn as if it turns with the

main camera. This should be checked, for instance with an SBig camera with built in autoguider chip.

SiTechExe Help Scripting Help as of Version 0.91A

Most folks are not going to be concerned with the details of writing a script, so we'll put the more useful items at the top of this help file:

"Plate Solve Stuff" Tab:

This tab allows you to automatically (or semi-automatically) make a telescope model using PointXP.

First of all, make sure you have your Camera set up, AND (Important), your Camera's F.O.V. Also, you need to decide if you want to use PlateSolve2 or PlateSolve3 (Both must have their catalogs installed in the proper folder).

This is done in SiTechExe/Config/ChangeConfig/Misc tab.

If you make a change in your SiTechExe/Config/ChangeConfig/Misc/ Camera type, you need to close the Script Window, and re-open it.

One more thing while you're in the configuration window, you may want to adjust your horizon. CalPointsXP will use your full horizon.

The available camera's are.

None.

MaximDL.

AstroArt

Nebulosity (two versions to select from)

If you're using MaximDL, it will use any running copy of Maxim that's up. If no running copies are up, it will start MaximDL.

If you're using AstroArt, be sure it is up and running.

If you're using Nebulosity, be sure the camera is working properly, then put it in the Listen Mode. There is a Nebulosity script for putting it in the "Listen" mode in your Documents folder. It's called "Listen"!

If you're selected NONE as your camera in SiTechExe/Config/ChangeConfig/Misc/ Camera type, then you can still make a script, but it will be semi-automatic. Each time the scope stops, you can center a star manually and perform a Sync with SkyView, then Add Calibration Point, or take and save an image manually, or use PlateSolve3.

If you're doing manual PlateSolves with PlateSolve3, proceed like this:

1. Take an image using your Camera Software, and save it somewhere as some file.
2. In the PlateSolve3 window (It should open with the Script Window), click on Get Starting Info from SiTechExe.
3. Click on Browse to the image, and load your new image.
4. Click on "PlateSolve Start"
5. After solved, Click on Sync Telescope, and "Load Cal Star" in the SiTech Init Window.
6. Click the Unpause button in the PlateSolve Stuff tab.
7. Lather, Rinse, Repeat.

Ok, here's how to proceed if you do have camera Software connected to SiTechExe.

First thing you may want to do is test your camera. Set up your exposure time, the binning, and click on "Make a Test Image". Your Camera Software should make an exposure, and if all goes

well, you should see it in your camera software image window.

If this works, maybe your next step would be to test the "Do a single photo-init".

If all goes well, your camera software will take an image, and save it to the SiTech Data folder as Default.fit (or Default.jpg if checkbox is selected).

Then PlateSolve2 or PlateSolve3 will try to solve it.

If PlateSolve is successful, it will call up the SiTech Init window, and you can choose what to do with it ("Simple Offset" or "Load Cal Star")

For your first test, I would choose a "simple offset init" in the Init window.

If you're using PlateSolve3 and you get the message "Possible False Solve", then you probably need to adjust your camera F.O.V. in SiTechExe/Config/ChangeConfig/Misc/.

Ok, so far so good, now setup how many PointXP Calibration points you want to do, How long of an exposure, your binning, and your settling delay after a slew is ended.

If you have high resolution Renishaw encoders, and a good mount, your final PointXP model should have at least 32 calibration points in it. I think after about 50 or 60, there are diminishing returns. Typical results for RMS pointing error and Renishaw encoders is 5 to 10 Arc Seconds.

If you have an ASCOM rotator configured, you have the option to wait for it to finish moving (think North Up and an Alt/Az or Alt/Alt scope). Check the "Wait For Rotator" Checkbox if this is the case.

If you want to use the SiTech Init Window, then turn on this checkbox. I think it's best not to. If your software will only right a JPG instead of a fits, turn on the "JPG instead of Fits" option.

If you would like to save all of the images from your automatic Telescope Pointing Model Run, then check the box labelled "Save All Fits". They will be in the SiTech Data Folder.

If you're using MaximDL and have a large F.O.V., you can trim it down by checking the "Use SubFrame (Maxim Only)" checkbox, and putting percentage values here. For instance if you have a 40 by 30 arc second FOV, you can trim it down by 1/2 by the following:

XOffset=25

YOffset=25

X Width = 50

Y Width = 50.

Your images will be 20 X 15 FOV.

Ok, I think you're ready to try an automatic calibration now. Click on the button labelled "Make PointXP Run".

You will see another program by Dave Rowe called CalPointsXP come up. You can see where his software recommends the calibration points to be. You can also see the order. If you have a GEM, it starts in the south, on whichever side your telescope is currently pointed, and works its way around the sky in Azimuth until it reaches the south on the other side of the meridian.

If you have any other type of scope, it starts in the north (on the side you're currently on), and works its way around to the north again. This is in case you have a Dome, it will only have to move a small amount.

Once satisfied with the CalPointsXP window, you can close it.

Ok, now I believe you're ready for the run.

Click on the Play button.

Grab your favorite drink, sit back and relax, as your scope gets more accurate.

Once you're done with your run, you will want to click on the PointXP button on the "Scope" tab of

SiTechExe. Assuming you're using the ActiveX version of PointXP, Click on the "Mount Model" button. Click on **"Recommended for Equatorial"** if you have a Gem or an Equatorial Fork mount.

Click on "Recommended for Alt-Az" if you have an Alt/Az mount.

Now you can close the "Mount Model" window.

If there are any bad points, and you have enough other points to compensate, you can disable it, and get a better model. You can simply click on the outlier calibration point in the graphic to disable it.

Now is a good time to save your calibration. Click on the File menu of PointXP, select "Save Calibration As".

You can close the PointXP window if you like, it still is running in the background, and you can always re-open it by clicking on the large PointXP button on the SiTech "Scope" tab.

Now, if you like your model, you can make it be the AutoLoad.pxp file. In the "PlateSolve Stuff" tab of the SiTech Script window, click the button labelled "Save Current Model as AutoLoad.pxp". You also have to enable the AutoLoad.pxp checkbox in SiTechExe/Config/ChangeConfig/Mount Params. This calibration file will load on start of SiTechExe next time.

Auto Focus Tab:

Before you can use AutoFocus, there are two details to attend to.

1. Make sure you have your camera configured in SiTechExe/Config/ChangeConfig/Misc tab.

2. Make sure you have an ASCOM compatible focuser, and you've "chosen" it in the SiTechExe/Config/ChangeConfig/ASCOM & Logging window.

First, there is no need to point your telescope anywhere special. Avoid really bright stars.

Set up your exposure time, your binning, and how many exposures you want to do.

Binning would normally be set as 1, for highest resolution.

Set up your StepSize Microns.

If your focuser is really in microns, start with 100, and go from there. Experience will dictate that you must have slightly out of focus stars on the first image and the last image, and one of the exposures in the middle are near focus.

Click on Do Auto Focus.

You can watch the status text to see how things are progressing.

Once done with the images, PlateSolve2 is run, and all of the images are analyzed. At this point you can click on "Keep Open", then click in the Focuser Analysis window, click on the "show graph". It should be a nice parabola.

The focuser will move to the best focus, then will take one last image.

If you clicked on the "Keep Open" on PlateSolve2, then don't forget to close the PlateSolve2 windows.

Note: if you want to use this AutoFocus in your observatory management software (ACP for instance), this is possible using another free SiTech Product called "FocusPocus". It becomes a focuser hub, for your ascom focuser, and then has a focuser CommandString that will autofocus your camera using a script.

Note. Both FocusPocus our focuser program for our Servo Motors and the AutoFocus that's built into SiTechExe Scripting use a feature of PlateSolve2 by Dave Rowe, which analyzes ALL the stars in your image. It's a very accurate autofocus routine. It's by far the best I've ever seen.

Writing your own Scripts:

Background:

I used my own design of a laptop computer controlling my 14" telescope for a number of years. I had a feature where one could create a script, and now it was possible to "Pan" the Veil nebula, etc. When I graduated to the Servo System, I lost this feature, until finally I can use it again, so I'm excited to Pan the veil in my 28" telescope, something which I haven't been able to do so far! (Note, Scopell has this feature, but I haven't been using Scopell).

What SiTech Scripting is: It will smoothly "Pan" your telescope across the sky in a predetermined pattern, playing wav files if desired, for your line of people looking through your telescope!

What it isn't: You probably won't use this for doing photography of multiple objects, as there are several other better ways to do this, ACP, CCDCommander, and even MaximDL.

Here's a list of the commands:

Slew hh:mm:ss dd:mm:ss ;slews to right ascension and declination at a rate at slew speed
Slew M31 ;slews to right ascension and declination of M31 at a rate at slew speed
Slew NGC4565 ;slews to right ascension and declination of NGC4565 at a rate at slew speed
Pan hh:mm:ss dd:mm:ss dps ;moves to right ascension and declination at a rate in degs per sec
Pan with name of object, same as slew.
Wait secs (tracks while waiting)
Pause (waits for topright key) (will track while paused)
While (label for loop to go to)
Loop (goes to top of script or to the "While" label if present.)
Sound filename (plays a wav file)

Following are commands used for the relative panning mode. These commands won't be useful if you aren't using Pan Relative commands.

Anchor (memorizes the current co-ordinates that are used in the PanRel command (at time of script running, not time of adding command))
SlewToAnchor ;slews to the anchor RA/Dec
PanRel hh:mm:ss dd:mm:ss dps ;like pan, but instead of absolute co-ordinates, they are relative.
PanToAnchor dps

The pan speed "dps" mentioned above is Deg's per Second. Typical Pan Speeds for visual observing would be about 0.03 to 0.2.
After you put out the first DPS, then you can put an "=" sign instead, and it will use the previous speed.

Ok, a bit more about the Anchor command. When you click on "Add Anchor", the current telescope co-ordinates are not saved with the command, instead, at script runtime, the current co-ordinates of the telescope are remembered. This is useful to keep a sequence of PanRel commands from drifting each time the script is sequenced.

You can create your script by moving your telescope around, and clicking the tall row of "ADD" buttons, or you can also edit the script in the text area on the right, or, you can use a combination of both.

Be ABSOLUTELY SURE the telescope is in the proper position before adding any commands using position:

These commands are Slew, Pan, PanRel, Anchor.

The positions when clicking on the Add Command buttons, come from the actual telescope position!

MAKING SCRIPTS:

Here's a simple session that will move your telescope between M81 and M82:

1. Slew the telescope using your planetarium software to M81. It may be a good idea to do an

offset init on a nearby star, before you record the script.

2. Click on "Add Slew"

3. Click on "Add Pause"

4. Slew the telescope using your planetarium software to M82.

5. Click on "Add Slew"

6. Click on "Add Pause"

7. Click on "Add Loop".

The above actions will create the following script:

Slew 09:56:09 69:02:01

Pause

Slew 09:56:27 69:39:01

Pause

Loop

You could also do it like this:

Slew M81

Pause

Slew M82

Pause

Loop

Ok, now we'll try to make a script that will pan the dark nebula near the Cocoon nebula:

1.Center the telescope on the Cocoon nebula. If necessary, do an offset init on a nearby star first.

2. Click on "Add Slew"

3. Click on "Add Pause"

4. Move the telescope to follow the dark nebula, and at points of turns, stop the telescope, and then click "Add Pan"

5. Repeat Step 4 as many times as necessary.

6. Click on "Add Loop"

Here's what your result might look like:

Slew 21:53:43 47:18:10

Pause

Pan 21:52:42 47:25:24 0.05

Pan 21:51:48 47:31:29 0.05

Pan 21:51:01 47:35:29 0.05

Pan 21:49:28 47:32:54 0.05

Pan 21:48:01 47:31:59 0.05

Pan 21:46:04 47:35:48 0.05

Loop

To Record a pan relative sequence:

The advantage of a Pan Relative sequence, is it will work the same, anywhere in the sky. A PanRel script probably won't be used much, but there are times it may be useful. One idea I can think of is for using at a public star party, where each person will get to look at the moon at high power, panning the terminator and/or the edge.

Since the moon changes on a minute by minute basis, if you were to use a normal Pan, then the sequence would be wrong in just a few minutes, however, if we use the PanRel command, then it will work all evening long just fine! Simply move the scope before starting the script every once in a while, to keep up with the lunar movement.

Another fun idea would be to write your name in an PanRel script, then take an exposure during the pan, using a bright star, and a piggy back camera. You will then have your name written with a

star!

One more idea would be to use a relatively fast pan rate, and sweep the areas that aren't patrolled by the survey telescopes in search for comets. This would require a relative script, because then you could search the same relative areas of sky, instead of absolute areas of sky.

Proceed in a manner similar to this:

1. Move the telescope to the start position (if this is the moon, use the edge of the terminator for example).
2. Click on "Add Anchor"
3. Click on "Add While" This will keep the script from creeping, as the Anchor will only be done one time, because the Loop command will skip the "Anchor" command, since the "While" label is after the "Anchor" command.
4. Move the telescope to the next position.
5. Click on "Add Pan Relative". Enter the time in Deg's per second as desired.
6. Repeat Steps 4 and 5 as necessary.
7. If you want to end exactly where you started, your last movement command should be "PanToAnchor"

Here's an example of a PanRel script:

```
Anchor  
While  
PanRel -00:02:12 00:09:21 0.06  
PanRel 00:00:01 00:37:03 0.06  
PanRel 00:03:58 -00:31:15 0.06  
PanRel 00:00:08 -00:30:57 0.06  
PanToAnchor 0.06  
Wait 5  
Loop
```

IMPORTANT: Before you run the script, be sure the telescope is pointed at the exact location you want to start the script. If you don't, the script will be relative from wherever the telescope is pointed at the time the script is started.

Here's an example of a Pan script that Pans the Veil Nebula. You should have a wav file named "Veil.wav" in the SiTech folder for the Sound command to work. If the file is not found, it simply skips over the script line:

```
Slew 20:47:10 30:14:00.0 .06  
Sound C:\Program Files\Common Files\ASCOTelescope\SiTech\Veil.wav  
Prompt Press OK to start panning the Veil Nebula!  
Pan 20:46:30 30:33:03.0 .06  
Pan 20:46:15 30:44:25.0 =  
Pan 20:46:05 30:58:32 =  
Pan 20:45:55.5 31:15:13 =  
Pan 20:49:01 31:08:58 0.2  
Pan 20:48:25 31:46:11 .06  
Pan 20:48:37 31:58:49 =  
Pan 20:54:58 31:58:03 .2  
Pan 20:56:40 31:42:09 .06  
Pan 20:57:28 31:24:01 =  
Pan 20:57:17 31:11:06 =  
Pan 20:56:28 31:03:21 =  
Loop
```

Using the Handpad:

To pause the script, you can press the Top Right Button (RTN). To Unpause, press it again. When the Prompt or the Pause command is in use, pressing the Top Right button (RTN) will make the script continue.
When a count down (Wait) is in progress, you can terminate it and keep going by pressing the Top Left Button (ESC).

More info:

When panning, keep in mind that the communication loop time becomes critical for accuracy. What happens is at the beginning of a Pan, a goal is set for the longest moving axis. The telescope is told to go farther than this goal, but the position is checked, and when it gets there, it now performs the next move, so the nice thing, is it's a seamless move, no stopping, then re-starting. The bad part is, by the time the software "knows" it has moved far enough, it's possibly moved too far, because of communication latency. There are about 3 things you can do to improve the accuracy.

1. Pan slower.
2. Pan faster, but just before the next position where you want to change directions, put another shorter pan at a slower rate.
3. Use a faster Communication loop time in the SiTech Setup window.

Have fun!!!!

SiTechExe Help
PointXP SiTech Interface Help
as of Version 0.91A

PlateSolve3 is written by Dave Rowe, and is a very fast, all sky PlateSolve program. Before it will work properly, you MUST download and set up the PlateSolve3 catalog files. See end of this help file for instructions:

Assuming you're viewing this from the PlateSolve3 SiTech interface, then you've already configured SiTechExe to use PlateSolve3.

If you're reading this file a different way, you need to specify Use Platesolve3 in SiTechExe\Config\ChangeConfig\Misc Tab.

First of all, there are 8 text boxes at the top right.

The four on the left are the starting values for the Coordinates, and for the image size.

The four on the right are the solved coordinates, and image size.

Then there is one more text box that shows the difference (DD:MM:SS from the starting coordinates and the Solved coordinates.

Most of the time, PlateSolve3 will solve your image with all of these text boxes blank.

If you want PlateSolve3 to be its fastest, specify your image size.

There is a large button called "Get Starting Info from SiTechExe". This will get your configured image size (It's configured in SiTechExe\Config\ChangeConfig\Misc\Camera), and also will read the current RA and Dec from SiTechExe.

There's a radio button for Epoch J2000 or JNow. It's important to know that this only effects the display of the coordinates (the top four text boxes).

Next there's a text box that shows the current Altitude, Azimuth and AirMass of the solved coordinates.

Next is a button to "**Browse To Image**".

You can browse to any Fits file, and try to solve it. If the Coordinates are in the Fits Header, they will be read into the Starting Coordinates Text Boxes.

Once you have an image path loaded, you can click on "Platesolve Start".

You will see the status line at the bottom of the screen change to "PlateSolve Working....."
After just a few seconds, you will have a solved image, the Status Line at the bottom of the
screen will read:
PlateSolve Done, Success!

If you get the message "Possible False PlateSolve", then you probably have your camera FOV
set wrong in your SiTechExe\Config\ChangeConfig\Misc\Camera. It's also possible that the
platesolve was far away from the telescope coordinates (a telescope that's initialized wrong).
But very unlikely, it could be a false plateSolve. I've only seen this when shooting in the milky
way, and there's lots and lots of catalog and image stars.

You can ignore the false plateSolve if the expected solve image size looks right, and the expected
location looks right.

Once you've solve your image, there's a button called "Sync Telescope", which will call up the
SiTech Init window.
If you want the WCS (World Coordinate System) variables updated in the fits header, click on the
button labelled "**Update WCS in Fits Header**"

If you want to view the file with the stand alone version of PlateSolve3, click on the "View with
PlateSolve3ST" button.

The ST stands for SiTech. Dave made a special version for us "SiTechers".
I'm not going to write too many instructions for the stand alone version, but just to say, you can
solve the image, you can look at drift, you can do photometry and astrometry with his Stand Alone
program. Please play around with it. It's really fantastic. I use it as a tool all the time.

Ok, now there's a bunch of data displayed about the solved image. You can tell the plate rotation
angle, the image scale (arc secs per pixel), How many stars were Extracted from the image, how
many Matched stars there are, the elongation, the average RMS star diameter in arc seconds,
and how long it too to do the Match.

I hope you appreciate this PlateSolve3 software as much as I have.
Dave Rowe is on the SiTechExe users group, and would appreciate a thank you.

PlateSolve3 Catalog locations!

This is important if you want to use PlateSolve3, (I highly recommend it).
PlateSolve3 (PS3), does very fast all sky plate solves (Thanks Dave Rowe!)

The Star catalog for PS3 is about 2.1 GBytes zipped up.
You can try to download it here:
<http://siderealtechnology.com/PlateSolve3Catalogs.zip>
If that doesn't work, we're trying to set up a public FTP, when we get it working, we'll announce it
on the list.
Anyway, you need to unzip it, and it has to be in an exact location.

In the following paragraphs, we're trying to say where the folders MUST be. On most U.S.
computers,
the folders are here:
C:\ProgramData\SiTech\
But your mileage may vary. Sometimes it's:
C:\users\AllUsers\windows\application data,
and there's a variety of others where windows puts this folder.
You have to figure where the data files for SiTechEXE is, then going up one level.

In the following discussion, I'm going to call it:
C:\YourProgramDataPathWhateverThatMaybe\

You can find this SiTech Data folder by running SiTechExe, clicking on the Config tab,
then Click on Change Config. Now look at the path in the top textbox labelled "Folder for
SiTech.cfg"

Copy everything from the C: up to but not including the SiTechExe, then paste it into a
MyComputer browser.
That's where the catalog files MUST go.

The unzipped files should go here:
C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs

When you unzip the files, sometimes it will make a folder under a folder, like this.
C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs\PlateSolve3Catalogs
WRONG!!!
This is Wrong, and won't work

Again, the files must be here:
C:\YourProgramDataPathWhateverThatMaybe\SiTech\PlateSolve3Catalogs
In the above folder, there are 3 sub folders:
Orca
UC4
UC4Mag14

Make sure your PlateSolve3 catalog files are right exactly as above.

Ok, on to the UCAC3 Catalog files for PlateSolve2.

These catalog files are used if you DON'T select "Use Platesolve3" in the SiTechSetup.
Also, these are used if you zoom in far enough to the SkyView, so consider them important.
You can download the files here:
<http://siderealtechnology.com/UCAC3PS.zip>
Again, we'll try to set up a FTP for those soon.
And again, these unzipped files need to be in a certain position.
C:\YourProgramDataPathWhateverThatMaybe\SiTech\UCAC3PS
And again, make sure it's not another UCAC3PS folder under the UCAC3PS folder
There should be a total of 181 files in this folder.

SiTechExe Help Controller Stuff Help as of Version 0.91A

Motors and Encoders:

The top part of the controller allows you to have a look at the current values for the telescope
angles, according to the Motors, and also according to the Encoders. You can also update 1 to
the other or vice versa with the buttons.

You can view in raw numbers, by checking the "Use Raw Numbers" checkbox. Note: these are
not TRULY raw numbers, the Offsets applied by SiTechExe are applied.

Reading Controller Parameters:

With the Servo and the ServoII controllers, basically the normal communication loop is stopped, and SiTechExe asks the controller for a specific parameter. As this would conflict with normal telescope communication, we've made it possible to only view one of the parameters at a time. Simply hover the mouse over the desired parameter, and it will read continuously. This feature can be very helpful to see what controller volts you have, finding mechanical problems in your telescope can be easier by watching the current, and other helpful information.

Brushless Controller Differences:

With the Brushless Controller, the protocol sends all the available data in the normal communications, so this doesn't apply.

If the Brushless Controller goes into "Blinky Mode", the reason will be indicated in the two boxes (one for each axis).

If the Brushless controller trips out in "Hardware OverCurrent" or "Firmware OverCurrent" (not Timed OverCurrent), then you will probably need to click on the "**Reset Errors**" button for that axis.

Also, there's a button labeled "**Renew Motor Angle**". If you click on this, the Brushless Controller will go through it's initialization process, and then go back to normal operation. This is useful if you think maybe the controller lost track of the Motor Electrical Angle because of missed Motor Encoder Ticks.

Tuning a brushless controller from within SiTechExe:

Normally, you tune the brushless motors with the application "BrushlessServoConfig", but if you want to TUNE your Brushless PID parameters from SiTechExe, there is a button labelled "TUNE".

It's best to make a screenshot of this screen (or use your cell phone to take a picture of it), so you can get back to your original settings.

Hopefully, you can make it better, not worse. If you want to revert to your earlier settings, then don't click on the button labeled "**Write PID Parameters**". Right now, your only option is to Right Click on the slider, or reboot the controller and SiTechExe. I'll fix this in the next version of SiTechExe. The button labelled "**Read PID Parameters**" doesn't work right.

Terminal Mode:

The bottom text areas are a terminal. The one on the left is what you type. After Pressing the Enter key, the data you've typed is sent to the controller. The data that is received is displayed on the right hand text area. If there is no response from the controller, there will be an Underscore. This will be after a short time delay.

The SiTech Telescope Driver automatically "ToUppers" your commands, so even though the controller needs upper case, you don't have to use uppercase.

It is possible to make your scope run away, or do other bad things, so be very careful when using the terminal mode. If you don't understand what you're doing, or have a direct instruction from Sidereal Technology, it's best just to not do anything here.....

If you want to know what you're doing, study the following ASCII protocol commands, and you can see just what the controller can do. Have fun!

Sidereal Technology Servo Controller Ascii Command Set:

For a more complete description, go here:

<https://docs.google.com/document/d/10P7L-WyDicljkYnuNnAuRSgEJ6p6HEzD2aKb2ygj9OI/pub>
Thanks to Kevin Iverson (Planewave Instruments) for that document.

Neither of these cover the differences for the Brushless Controller, if you're in need of the Brushless Controller Differences, I can email it to you, just ask.

Notes:

1. All commands MUST BE IN ALL CAPS! (Both ServoConfig terminal and also the Terminal in The SiTech Telescope driver "ToUpper" the commands for you).
2. The # character represents a decimal number that you must type
3. After each command, press the ENTER key.
4. All Altitude commands begin with an "X".
_____ All Azimuth/RA commands begin with a "Y"

-----COMMANDS-----

Q (No cr after) Send scope encoder data in Tangent format

SB# Set Baud Rate (1 = 9600, 2 = 19200) Changes all controllers on serial bus. (1.5 or later)

X# Move Servo (-2147483648 to +2147483647) You can tag a speed command at the end.

_____ Example: X-2345S1000000<E>

X Returns the X position of the servo

XF# Forces the X position to be equal to the number (-2147483648 to +2147483647) (This stops the controller if moving)

XS# Velocity of X Servo (0-2147483647)

XS Returns the X velocity of the servo (what it would be if it was currently moving at fully accelerated speed, this may not be what it actually is at the moment).

XR# Ramping speed or Acceleration of X servo (0-3900)

XR Returns the Ramp speed.

XP# Proportional Band of X servo (0-32767)

XP Returns the Proportional band

XI# X Integral (0-32767)

XI Returns the Integral

XD# X Derivative (0-32767)

XD Returns the Integral

XE# Maximum position error limit before servo turns off (0-32767)

XEL Returns position error limit.

XE Returns the position error of the servo

XO# X Output limit (0-255)

XO Returns the PWM output of the servo (0-255)

XC# X Current Limit (0-240 = 0-2.40 amps)

XC Returns the X motor current * 100 (240 MAX)

XM# X to manual mode, the number is the PWM value, -255 to +255.

XA X to Auto mode.

XN X Normal Stop _____ (ramps down, then stops. Automatically clears when new position is given)

XNT Just like XN, except when it slows down enough, it starts tracking in the DragNTrack or SlewNTrack mode.

XG X Emergency stop (stops immediately)

XL# Set Integral Limit (0-24000)

XL Returns Integral Limit

XB# Number sets the servo bits like direction, etc. (0-255)

XB Returns current X Bits Value.

XZ# Forces the scope encoder position to be equal to the number (-2147483648 to +2147483647)

XZ Returns the scope encoder position

The following commands don't have a 'Y' command, only X. They affect both servos

XK Returns the handpad info in Decimal.

XH Returns the temperature of the CPU chip (in deg's F)

XV Returns the firmware version * 10.
XJ Returns the motor power supply voltage * 10 (please divide returned number by 10)
XQ Resets the servo system (both)
XU Programs factory defaults into the flash ROM.
XW Writes the configuration of both the x and y parameters from working RAM to the flash ROM.
XT Reads the configuration from the Flash Rom into the working RAM.
FC Flash Configure, Send 128 more bytes, then 2 bytes of checksum (Simple Addition of all data bytes sent), and it will write the new data to configuration. It also reads the new data into the working RAM.

SC Send Configuration, The controller Sends 128 bytes, followed by two bytes of checksum. This data is what is in the flash, not necessarily what is in the working RAM.

All of the following XX extended commands have a corresponding read command as an example, if you type "XXL<E>" it responds with the latitude.

XXL# Store the latitude to the controller (4500 = 45 deg's north, -4500 = 45 deg's south)
XXZ# Store the azimuth encoder ticks per full circle.
XXT# Store the altitude encoder ticks per full circle.
XXU# Store the number of encoder ticks for the Altitude Motor Encoder to the controller
XXV# Store the number of encoder ticks for the Azimuth Motor Encoder to the controller
XXA# Stores the Altitude Slew Rate to the controller
XXB# Stores the Azimuth Slew Rate to the controller
XXC# Stores the Altitude Pan Rate to the controller
XXD# Stores the Azimuth Pan Rate to the controller
XXE# Stores the Platform tracking rate to the controller
XXF# Stores the Platform up/down adjuster to the controller
XXG# Stores the Platform Goal to the controller
XXH# Stores the Altitude Guide Rate to the controller
XXI# Stores the Azimuth Guide Rate to the controller
XXJ# Stores the PicServo Timeout Value to the controller (Seconds).
XXQ# Turns off or on the digital outputs of the Radio Handpad Receiver
XXN# A zero turns off the Argo Navis ® mode. A one turns it on.

Version 1.6 and later has the following:

XXK# Local Search Altitude Distance
XXM# Local Search Azimuth Distance
XXO# Altitude Backlash
XXP# Azimuth Backlash

When the controller receives a 'Q' as the first character in a line, it responds emulating the Tangent "Q" protocol. The encoder resolution is always 18000 (the controller uses the configured values for encoder ticks per revolution for the Scope Encoders, and converts it to 18000).

0AAh Puts the servo into the PicServo Emulation mode (no CR required). See <http://www.jrkerr.com/psdata.pdf> for a description. There are some items different, all motion control is the same. The differences are described below.

The following two ASCII commands with Binary data are for reading and controlling the servo controller in a very efficient manner. They have been added at version 1.5 of the controller firmware.

XXS<E>

The controller responds with four long ints of position, then other bytes for keypad status, X and Y Bits, and other bits as follows:

Byte 0-3 Current Altitude/Dec Motor Position (least significant byte first)

Byte 4-7 Current Azimuth/RA Motor Position.

Byte 8-11 Current Altitude/Dec Scope Encoder Position

Byte 12-15 Current Azimuth/RA Scope Encoder Position.

Byte 16 is Keypad Status (see the top of this section for a description of bits)

Byte 17 is Xbits

Byte 18 is YBits

Byte 19 is Extra bits

_____ Bit 0 - Set if Altitude/Dec motor is stopped

_____ Bit 1 – Set if Altitude/Dec motor is in manual

_____ Bit 2 - future

_____ Bit 3 – future

_____ Bit 4 - Set if Azimuth/RA motor is stopped

_____ Bit 5 – Set if Azimuth/RA motor is in manual

_____ Bit 6 - future

_____ Bit 7 – future

Byte 20 is a 1 byte checksum of the previous 19 bytes (simple addition).

XXR<E>

The controller now waits for an additional 20 bytes from a host as follows:

Byte 0-3 New Altitude/Dec Motor Position Goal (least significant byte first)

Byte 4-7 New Azimuth/RA Motor Position Goal.

Byte 8-11 New Altitude/Dec Motor Speed

Byte 12-15 New Azimuth/RA Motor Speed

Byte 16 Various bits

_____ Bit 0 – if 0, the following new XBit and YBit values are ignored. If '1', the new XBit and YBit values are used.

_____ Bit 1-7 future

Byte 17 New XBits value (must have previous bit 0 set)

Byte 18 New YBits value (must have previous bit 0 set)

Byte 19 Checksum of all above data bits (simple 8 bit addition)

If you use the above binary command to control the servo controller, be sure to have a restart communication if the command gets out of sync by a communication fault. If you receive a bad checksum, you should resync communication by sending a few of XXS commands.

The flash ram values are loaded from the flash Rom to Ram on reset.

Both the X and Y parameters are stored to the flash ROM.

Use X and Y for module address 1.

If the module address is 3, use 'T' and 'U', for address 5, it's 'V' and 'W'.

Description of the bits for the XBits and YBits:

0 if 1, the motor encoder is incremented the other direction

1 if 1, the motor polarity is reversed

2 if 1, the azimuth (or altitude) encoder is reversed

3 if 1, (x only) we're in the computerless drag and track mode

3 if 1, (y only) we're in the computerless slew and track mode (no clutches, must use handpad to slew)

_____ (must be in drag and track too)

4 if 1, (x only) we're in the tracking platform mode

5 if 1, (x only) we enable the hand paddle

6 if 1, (x only) hand paddle is compatible with New Hand Paddle (allows slewing in two directions, and guiding)

7 if 1, (x only) we're in the guide mode. The pan rate is added or subtracted from the current tracking rate.

Note about the Guide Mode: If PC software puts the controller in the guide mode, and you are controlling an Equatorial mount, you must give the declination motor a destination, even if you want it to be stopped. If you want the declination axis to be normally stopped, give the declination a far far away goal, and set the speed to zero. This is because the controller adds or subtracts from the current speed and direction, and the controller gets confused if the axis is at its destination. This is changed inf servo version 1.6, and this is automatically done for you in the controller.

The Y_Bits bits 4-7 are the digital input status for the 4 digital inputs from the radio handpad receiver. This is only available if you're using servo version 1.6 and also if you have a handpad receiver connected.

SiTechExe Help **PEC Window Help** **as of Version 0.91A**

Well, This screen looks complicated at first, but after spending some time at it, it may make some sense, please hang in there.....

On the left of the window, you see a column of buttons. These buttons all have something to do with the controller.

In the middle of the Window, you see a column of buttons. These buttons all have something to do with the "collection" (The Collection has nothing to do with the Borg).

On the right of the Window, you see some checkboxes that have to do with displaying PEC data on the line graph. Under these you have some buttons having to do with files.

There are two ways to approach PEC in the SiTech driver, one is the simple way, which takes very little work and interaction, and the other is the more accurate but more complex way....

In Order for PEC to work, you MUST program the number of motor encoder ticks for one revolution of the worm.

Make sure the controller has programmed in it's flash, the number of motor encoder ticks for one revolution of the worm. This is done using ServoConfig, version 1.1 or later. As I write this help file, this version doesn't exist, so you will have to use the ascii commands. From a terminal program (or the Terminal Mode from an earlier version of ServoConfig) type the command `YXCnnnn<E>` . Be sure to use caps. The nnnn is the number of motor encoder ticks for one revolution of the worm. Now save this to flash by typing `XW<E>`.

Also, if you're using Servo Controller Firmware version 3.0 with a letter after it, then you may need to configure the SiTech ASCOM driver to be in the "Drag Mode". In version 3.0 of the Servo controller firmware, the position of the motor during PEC corrections is reported, and this may make the SiTech ASCOM driver try to "fight" the PEC corrections. In version 3.1 and later,

SIMPLE RECORDING SESSION:

Here is what you might consider doing for a simple session, assuming motor ticks per worm revolution is programmed:

1. Select the PEC screen from the SiTech ASCOM driver.
2. Select whether you have an automatic PEC sensor or not, at the left side of the screen.

3. Start guiding on a star, either manually or with an autoguider.

4. Click on the button labeled: "Arm PEC Record".

_____ If you have an automatic PEC sensor, wait for it to line up and recording will start automatically.

_____ If you don't, wait for the worm to line up with your reference and press the top left button on the handpad.

_____ When recording is started, you will see the status textbox on the left change to "Recording".

_____ During the next revolution of the worm, the controller will record all of your button presses.

_____ Once the worm revolution has completed, The status will go to "Idle" and you're ready for playback

_____ If you have an automatic PEC sensor, wait for it to line up and playback will start automatically.

_____ If you don't, wait for the worm to line up and press the top left button on the handpad.

_____ When Playback is started, you will see the status textbox on the left change to "Playing".

6. Watch the PEC correction happen by examining the star or image (if using a ccd camera). It should be much better than before.

7. If you're happy with the PEC correction, then you can click on the button "Save Table in Controller RAM to Flash" This table will be loaded each time the controller is powered up.

PLAYBACK SESSION:

If you've a PEC table saved to flash, then this is the procedure to get playback going:

If you've an automatic PEC sensor, then you can program the controller to start playback automatically on powerup. To do this, use ServoConfig version 1.1 or later.. As I write this help file, this version doesn't exist, so you will have to use the ascii commands. From a terminal program (or the Terminal Mode from an earlier version of ServoConfig) type the command `XXJ1<E>`. Be sure to use caps. Now save this to flash by typing `XW<E>`.

1. If you don't have an automatic PEC sensor, call up the PEC screen in the SiTech ASCOM driver.

2. Click the button labeled "Arm PEC Playback".

3. Wait for the worm to line up with your reference and press the top left button on the handpad.

PEC will now be active, and will be even after slewing the scope.

COMPLEX RECORDING SESSION:

Here is what you might consider doing for a simple session, assuming motor ticks per worm revolution is programmed:

1. Select the PEC screen from the SiTech ASCOM driver.

2. Select whether you have an automatic PEC sensor or not, at the left side of the screen.

3. Start guiding on a star, either manually or with an autoguider.

4. Click on the button labeled: "Arm PEC Record".

_____ If you have an automatic PEC sensor, wait for it to line up and recording will start automatically.

_____ If you don't, wait for the worm to line up with your reference and press the top left button on the handpad.

_____ When recording is started, you will see the status textbox on the left change to "Recording".

_____ During the next revolution of the worm, the controller will record all of your button presses from the handpad or from an autoguider.

_____ At this time, click on the check boxes at the right so the Average, 5 collection items, and

Current Collection item are displayed on the graph.

Once the worm revolution has completed, The status will go to "Idle" and you're ready for your next record session.

5. Click on the button labeled "Read Controller PEC Table into Internal Buff"

6. After the table is loaded, click on the button labeled "Load Collection Item from Controller Buffer". You'll notice that you will have one more item in the collection.

7. Repeat steps 3 through 6 as many times as required. We recommend about 6-8 record sessions.

8. Now you will have several PEC tables in the "Collection". You may want to save the collection by clicking on "Save PEC Collection". At this point, run through all of the PEC tables in the collection by incrementing or decrementing the numeric up/down button. You will see the black line on the graph change. If there is a black line that is in bad disagreement with the others, delete it by clicking on the "Delete Collection Item"

9. When you're happy with all PEC tables in the "collection", be sure to save the collection for later use. Now you're ready to load the final averaged PEC table to the controller. Click on the button labeled "Send Averaged Table to controller".

10. Be sure to save the table to flash ROM by clicking on "Save Table in Controller RAM to Flash".

MORE INFO:

There are two three internal PEC Table buffers in the PEC window:

1. The controller buffer

2. The file buffer

3. The Averaged buffer.

These 3 buffers can be displayed on the graph. There is a textbox which shows the status of the first two buffers.

Once data is in the buffers, they can be loaded into the collection.

Every time you load a table into the collection, the table is averaged, and any drift is removed.

The filename extension for a collection is *.pecc. The filename extension for a PEC file is *.pec.

You can save any PEC table in the collection to a file, or save any of the buffers to a file (except for the file buffer(which comes from a file!)).

SiTechExe Help **Offset Tracking Rates Help** **as of Version 0.91A**

There are two features here, one for doing offset tracking, to follow a comet or asteroid, and the other is for "tweaking" the tracking rate(s).

The top two sliders are for doing Offset Tracking, and the bottom slider is for tweaking the tracking rates.

THE OFFSET TRACKING WILL NOT WORK IF *IN* DRAG MODE!!!!

TheSky software has a feature where if you click on a solar system object, the offset tracking rates appear. You can enter these tracking rates into the two text boxes (or use the sliders), and your scope will now track the solar system object.

if you use Earth Centered Universe, there is a feature that will sent the offset tracking rates directly to SiTechExe, now that's handy!

You can type in an offset rate of up to 30,000 arc seconds per second, but the sliders only move to +/- One arc second per second.

The Offset tracking rates are applied to RA/Dec even if you have an Alt/Az or an Alt/Alt telescope.

One thing to keep in mind that many planetarium programs use different Engineering Units for the Offset Tracking Rates, for instance TheSky uses Arc Seconds per Second of Time (same as the SiTech Telescope Driver), but Earth Centered Universe uses Arc Seconds Per Minute of time, so you would have to divide the ECU values by 60 for the SiTech Driver to track properly.

Before changing tracking rates, be sure you are polar aligned properly (if you've an equatorial mount) or be sure you've entered many stars and calculated your telescope axis's errors.

Clock Calibration:

Also, this is where you calibrate the controller clock.

SiTechExe assumes your controller clock is more accurate than the PC clock over short periods, but less accurate over long periods.

The best thing to do is, after SiTechExe has been running and communicating with the controller for more than about 30 minutes, click on the "Save ServoCal" button. This will help your tracking. Typical numbers are 0.99995 or so.

You can adjust this rate if you have consistently slow or fast tracking, by entering your own calibration in the Servo Clock Calibration text box, and then clicking on the <<--Save ServoClock button. You can also do this by using the Bottom slider.

You can see the recommended ServoClock Ratio in the appropriate text box.

There is also a number labelled "Diff between Computer Time and ScopeTime". This is normally about 30 mS, but jumps around, because of the Windows operating system.

SiTechExe Help **Homing** **as of Version 0.91A**

IMPORTANT: You MUST have homing sensors to use this feature!
See the end of this help file for information on wiring home switches.

Setting up your homing switches:

Step 1:

Be sure the switches work.

You can read the buttons labeled "Home Switch=False" (or True). Move the axis with the handpad to the transition point, and be sure the label on the button changes. The polarity (On or Off) isn't important.

Step 2:

Very important is a checkbox labelled "On True, Move CCW" for the primary axis, and "On True, Move Up" for the secondary axis. Simply click on the button labeled "Home Switch= (false or true)", and the scope axis should move TOWARD the transition point. Click the Stop Button. If the axis had moved AWAY from the transition point, then you need to toggle the checkbox, that reads "On True, Move...."

Be sure BOTH axis's of your scope move toward the transition point when clicking the button labelled "Home Switch=(true or false)".

Step 3:

Set up your Homing Fast Speed ("Find Fast Speed (DPS)"), and your "Creep Speed (DPS)". The slower the creep speed, the more accurate the homing function will be, but it will take longer to

find the last transition angle. The Fast speed is either the Slew Speed you've already set up, or the speed you enter, whichever is lower.

Step 3:

Assuming you've done steps 1, 2 and 3, you are ready to memorize your telescope axis transition angles. Be absolutely sure that you have the telescope initialized, and if you want to load a PointXP model automatically, when you perform the "Initialize Scope Using Homing Switches" function, be sure the PointXP model that you want to reload is loaded. Now, one at a time, click the "Find Transition Angle" buttons, one for each axis. Let the first one finish before you start the second one.

That's it! You're finished setting it up. Be sure to click the OK button, or the information may not be saved to the SiTech.cfg file.

As long as you don't move your telescope mount, it's not necessary to set up your homing switches again.

Initializing your scope with the Homing switches:

You can perform a "Find Home" by clicking the large button labelled "Initialize Scope Using Homing Switches" near the bottom of the Home Window. When you do this, the telescope axis's move to the transition points, then backs up slower, then does a creep to the switch for the final movement to the transition point. It then loads up the saved homing information, along with the homing PointXP model. You're then ready to go!

If you want to to the Find Home using ASCOM, you have to go to the SiTechExe Config tab, then click on "Change CONfig", then the ASCOM and Logging tab, and turn on "Enable ASCOM Homing".

More Information:

Here's a schematic which shows how to wire homing switches on the Servoll and Brushless controllers:

<http://www.siderealtechnology.com/HomeSwitches/DigitalInputsForServollAndBrushless.jpg>

For Servol, go here:

<http://www.siderealtechnology.com/HomeSwitches/TelescopeControllerIODiagram.jpg>

For more pictures, go here:

<http://www.siderealtechnology.com/HomeSwitches/DisplayAll.php>

IMPORTANT: Your switches should be roughly 50% of the axis motion ACTIVATED, and 50% Not Activated. This is so the software will always "know" which way to move the axis to perform a Home, or a "Find Transition Angle".

SiTechExe Help
Satellite Tracking Help
as of Version 0.91A

Please see the end of this file for all acknowledgements for Satellite Tracking

There are TWO parts to the SiTechExe Satellite Tracking Screen, the left half is data about the satellite you've selected, and ways to control it.

The right half of the screen has to do with loading and selecting a satellite from your database.

We'll start with the database part of the SiTechExe Satellite Tracking screen, or the right side of the screen.

First thing you'll want to do is get the latest TLE files from Celestrak or SpaceTrack. Make sure you download the 3 line instead of the 2 line.

<http://celestrak.com/>
<https://www.space-track.org/auth/login>

You must register with SpaceTrack.Org in order to obtain the data.

*****Screen Right Side: Database*****

There is a very wide button near the bottom of the right hand side labelled TLE File= and your current TLE file, or "NoName" if none is selected. To select a file, click here, and browse to your file. As mentioned previously, you can get your files from:

<http://celestrak.com/>
or
<https://www.space-track.org/auth/login>

You MUST register with Space-Track to get their data.

As soon as you select a file, it's loaded into the large Listbox on the right side of the screen.

There are 3 checkboxes above this button, you can select which satellites to read into the ListBox.

1. In Sun Only: The satellite has to be in the sun.
 2. Above Horizon Only: The satellite has to be above the horizon.
 3. Rising Only: The satellite must be rising. Buttons 2 and 3 are mutually exclusive.
- When you make a change to these buttons, the listbox is immediately updated.
The default is Above Horizon Only.

Above the Listbox are 4 labels, Description, Alt, Dir, Elev, Norad
These are Clickable, and the Listbox will be ordered by what you click on.

I like to click on Rising Only checkbox, then sort by altitude, and you can see all of the high satellites.
Also, you can click on Elev, and the low earth orbit satellites are listed first. These move FAST!

The altitude and Direction are not updated except at the time a change is made, such as loading a new file,
changing the InSun, Rising Only, or Clicking the Refresh button at the top of the listbox.

*****Screen Left Side Satellite Control*****

Now that you've selected a satellite, we'll concentrate on the left half of the screen:

Ok, starting at the upper left is a TextBox that is read only. It is the current TLE data. You can read here, to see what all the numbers mean:
<http://celestrak.com/NORAD/documentation/tle-fmt.asp>

The default is an early 2010 TLE of the space station. Whenever you select a new satellite, the TLE is displayed here.

Next down is information about the current satellite you've selected....

Name: Name, from the 1st line of the 3 lines of data.

Norad Number.... You can find information on the web about this particular satellite on the web, here's one

alternative:

<http://celestrak.com/satcat/search.asp> Just enter the Norad Number.

Next is the current Julian Day, used for these calculations

Next is the azimuth of the satellite.

Next is the altitude or elevation above the horizon of the satellite.

Next is the Range in Kilometers from you to the satellite.

Next is the RA or Right Ascension of the satellite. If tracking a satellite, you'll also see the Error between where the satellite is, and where the telescope is.

Next is the Declination, same as Right Ascension.

Next is an indicator if the satellite is in the sun or not.

Pass Indication, the next line is the maximum altitude of the next pass, and the time of maximum altitude.

Next line is the Rise time, where it rises above 10 degrees over your horizon, and also the set time, when it falls back below 10 deg's.

Important note: The pass indications above, may NOT agree with where the satellite is currently, that's because the pass indications are from 10 deg's.

You could have a satellite selected, that's above the horizon, but if it never makes it above 10 degrees, then it will not be considered a valid "Pass".

Next is the telescope Altitude and Azimuth,

Next is the telescope current lower altitude limit, based on your azimuth if using your Horizon File.

Now there's a checkbox labelled "Show TLE Data. If you check this, all of the above information gets changed to the TLE information.

It shows the Epoch (last time the TLE was updated), Eccentricity, Inclination, Perigee, Apogee, Etc.

If IsDeep is true, then SDP4 or SDP8 is selected. If IsDeep is false, SGP, SGP4, or SGP8 is selected (see following paragraph).

Next is a box which allows you to select the algorithm used. There are a total of 5 algorithms published by Norad (originally in the language Fortran).

Three for satellites closer than about 5,900 Kilometers average distance from the surface of the earth, and Two for the satellites farther.

SGP, SGP4, SGP8, are for the closer satellites, and SDP4 and SDP8 are for the farther satellites.

Bill Gray (Bill is no relation to Dan Gray) of Project Pluto, and "Guide" told me that the TLE files today are all based on the SGP4 or SDP4 algorithms,

so this is now the default.

For a discussion of these algorithms, you can go here:

http://en.wikipedia.org/wiki/Simplified_perturbations_models

If the satellite is not visible, you can try other settings. Theoretically, the SDP8 and SGP8 are supposed to be more accurate.

Underneath this box is two checkboxes, used as indicators only, to indicate if using the SDPn model or the SGPn model

There is a time offset feature, where you can see the passes, etc, in the future or the past. This does NOT affect the trajectory in the SkyView window, just the current satellite RA and Dec.

You can slide the very bottom slider, to correct for a slow or fast PC Clock. This does not affect the trajectory either, just the current satellite RA and Dec.

Clicking on the ShowTrajectory button will update the trajectory in the Sky View window. This window must already be opened. If it's a slow satellite, the satellite (and telescope if you're tracking it) may appear to drift from the trajectory. In fact, it is not. Just click the "ShowTrajectory" button again, it will update.

Next is the "Track Satellite" button.

If it is "Grayed out", then you can't track the current satellite now.

Here's the reasons:

1. The satellite is below 10 deg's in elevation and rising
2. The satellite is below your altitude limit and falling
3. Your telescope isn't initialized

If it's not grayed out, you can track the satellite.

When you click on "Track Satellite" the text changes to "Stop Tracking Satellite". Your telescope will move to intercept the satellite. If the satellite is rising and it's below your altitude limit, the telescope will move to just above your altitude limit and wait for the satellite to appear. You can watch the satellites progress in the SkyView window.

Once it starts tracking the satellite, there are some options for you...

1. Position Error Gain. Slide to the left if there is too much oscillation. Slide to the right to decrease the error between the RA and Dec of the satellite, and the RA and Dec of the telescope. This can be controlled automatically (starting version 0.90F) if you use the "AutoPosition Gain" checkbox. See below.

2. Left Right Correction. This moves the telescope relative to the trajectory of the satellite, left or right. You can also do this with the Left/Right arrows on the (real) telescope handpad when tracking a satellite. When you stop tracking a satellite, the handpad reverts to normal operation.

3. Fwd Reverse Correction. This moves the telescope relative to the trajectory of the satellite, Forward or Reverse. You can also do this with the up/down arrows on the (real) telescope handpad when tracking a satellite. When you stop tracking a satellite, the handpad reverts to normal operation.

Clicking on the Text, just below the slider will revert the correction to zero. This is also done when you stop tracking the satellite.

In Version 0.90F, a new AutoGain feature is introduced. This seems to work very well, I recommend you use it all the time.

There are 4 settings you need to set.

1. Threshold High. The default is 2 arc minutes. When the position error reaches this amount, the High Position Gain is selected.
2. Threshold Low. Once the Position Error reaches this lower value, the Low Position Gain is selected.
3. Low Position Gain, if you set this for zero, then the satellite will be tracked by RATE only. This is the smoothest tracking.

I like to set the Low Position Gain to zero.

4. High Position Gain. This is the gain selected if the position error grows to more than the threshold High. A High Position Gain of greater than 80 is good.

So, to use it, just click on the checkbox Auto Position Gain. Moving the Gain Slider will cancel this checkbox.

*****What to do if you can't find a satellite?*****

Be sure your Site Latitude, Site Longitude and site elevation are very accurate in SiTech config.
Be sure your computer clock is very accurate
Use the very latest TLE data from Space-Track.
Do a telescope Model using PointXP.
Try the different Satellite Tracking Algorithms, SGP, SGP4, SGP8
Look up the Norad Number on the internet and see if it has decayed.
Make sure it's in the sun.
Check the transit time and transit elevation of the satellite displayed in SiTech with heavens-above.com or other satellite software that's proven, and be sure it's the same (look for a possible bug in SiTech algorithms).
Do longer exposures for fainter satellites.

Accessing the SiTechExe Satellite routines from ASCOM:

In version 1.3 of ASCOM.SiTechDLL.Telescope and SiTechExe version 90T, Satellite control ASCOM extensions have been added. There's two ways to access these functions, one, with the ASCOM extensions, and the other with the ASCOM method: `String CommandString("String",bool Raw):`

Using the CommandString Method:

When using the CommandString method, you can only send one string, but if there are more than one parameter to send, you separate the string with Coma's (,).

Here's a list of the CommandString functions:

`CommandString ("SatelliteOpenWindow", false)`

_____ Opens the satellite control window. This MUST be done before other commands are issued (or you can open it manually from the SiTech "Features" tab).

`CommandString`

`("SatelliteLoadTLE,SatelliteName,Sat2LineElementLine1,Satellite2LineElementLine2", false)`

_____ Returns either "Satellite " + SatelliteName + " is Loaded"
_____ Or, "Bad Two Line Element String"

`CommandString ("SatelliteInformation, 0.0", false)`

The 0.0 is the Julian Day that you want the information for. If you specify 0.0, it uses the current Julian Day.

SatelliteInformation returns a CSV string with everything SiTechExe knows about the currently loaded satellite. Here's an example, with new lines at the coma's ", ""s.

Normally, it will be one long string, with the different data separated by a coma (,).

"JulDay=2456553.48340578,

GMT=9/17/2013 11:36 PM,

Name=0 AMC-7 (GE-7),

NORAD=26495,

Epoch=8/7/2013 5:46:16 AM,

Eccentricity=0.0003007,

Inclination=0,

Perigee Height=35773.6,

Apogee Height=35799,

RightAscension of Ascending Node=5.39,
Argument of Perigee=2.912,
Revs Per Day=1.0027283,
Mean anomaly at epoch=2.6154,
Orbit Number at Epoch=4705,
IsDeep=True,
Method=SGP4,
Latitude=44.29889,
Longitude=-120.1416,
SiteElevation=1645.92,
JD=2456553.48340578,
RA=14.23971,
Dec=-6.7817,
dist=38040.1,
Alt=36.5766,
Az=201.6355,
TrackingSat=False"

CommandString ("SatelliteAltitudeAzimuth", false)
Returns a string with the current satellite Altitude first, then Azimuth. The two numbers are separated by a coma (,).

CommandString ("SatelliteRightAscensionDeclination", false)
Returns a string with the current satellite Right Ascension, and Declination. The two numbers are separated by a coma (,)

CommandString ("SatelliteStartTrack", false)
If you have a satellite loaded, it's above (or nearly above) the horizon limit, and your scope is initialized and tracking, this function will start the scope tracking a satellite. Returns a string letting you know if it worked or not:

CommandString ("SatelliteStopTrack", false)
If a satellite is tracking, this routine will stop the scope from tracking the satellite, and it will track at the sidereal rate again. Returns a string "Stopped"

CommandString ("SatelliteIsTracking", false)
Returns a string, either "True", or "False". This is for tracking a satellite, not standard tracking.

CommandString ("SatelliteTrackingError", false)
Returns a string with the current position error (it's either R/A or Dec, whichever is greater). If the scope is not tracking a satellite, it returns "0";

CommandString ("SatelliteSetTrackingGain,44", false)
You can set the gain from 0 to 100. A gain of 100 will track more accurately, but you may have oscillations. A gain of 0, will track the satellite on Rate only. Returns a string

with the current gain.

Visual Basic Script Example Using CommandString:

Here's a Visual Basic Script (VBS file) that I used to test the Command String functions. You can copy and paste it in a file with the extension *.VBS, then double click it. Make sure windows doesn't hide the extensions, because sometimes it may invisibly be "Script.VBS.txt", and you can't see the txt.

'This script is for testing the Satellite Interface....

Set Scope = CreateObject("ASCOM.SiTechDll.Telescope")
Scope.Connected = True

'Remember, The Sat Tracking window must be open before other Satellite
'methods and properties work

RS = Scope.CommandString ("SatelliteOpenWindow", false)
WScript.Echo "SatelliteOpenWindow=" & RS

'The following satellite is a geosynchronous satellite so it's up for the west coast of the
U.S.

RS = Scope.CommandString ("SatelliteLoadTLE,0 AMC-7 (GE-7),1 26495U 00054B
13219.24047003 .00000000 00000-0 10000-3 0 2178.2 26495 000.0012 308.8225
0003007 166.8455 149.8531 01.00272828 47051", false)
WScript.Echo "LoadTLE=" & RS

'Get the satellite information for the current time:

RS = Scope.CommandString("SatelliteInformation,0.0", false)
WScript.Echo "" & RS

'Get the satellite information for a particular julian day

RS = Scope.CommandString("SatelliteInformation,2456550.0", false)
WScript.Echo "" & RS

RS = Scope.CommandString ("SatelliteAltitudeAzimuth", false)
WScript.Echo "AltAz=" & RS

RS = Scope.CommandString ("SatelliteRightAscensionDeclination", false)
WScript.Echo "RADec=" & RS

RS = Scope.CommandString ("SatelliteSetTrackingGain,44", false)
WScript.Echo "TrackingGainReturn44=" & RS

RS = Scope.CommandString ("SatelliteStartTrack", false)
WScript.Echo "StartTrackReturn=" & RS

RS = Scope.CommandString ("SatelliteIsTracking", false)
WScript.Echo "IsTrackingReturn=" & RS


```
RS = Scope.CommandString ("SatelliteTrackingError", false)  
WScript.Echo "TrackingErrorReturn=" & RS
```

```
RS = Scope.CommandString ("SatelliteStopTrack", false)  
WScript.Echo "StopTrackReturn=" & RS
```

```
RS = Scope.CommandString ("SatelliteIsTracking", false)  
WScript.Echo "IsTrackingReturn=" & RS
```

```
Scope.Connected = False
```

Satellite control using the ASCOM Extensions:

```
//Satellite Window MUST be open for the following Methods to work.  
//You can run this method, or you can open it manually.  
String SatelliteOpenWindow();
```

```
double SatelliteRightAscension(); //Returns Current Right Ascension in hours  
double SatelliteDeclination(); //Returns Current Declination in Degrees  
double SatelliteAltitude(); //Returns current Altitude in Degrees  
double SatelliteAzimuth(); //Returns current Azimuth in Degrees
```

```
//returns 1 for success, 0 or -1 for failure.  
int SatelliteLoadTLE(String Name, String TLEOne, String TLETwo);
```

```
//if scope is tracking, and satellite is above (or near) the horizon limit,  
// the scope will start tracking the satellite  
//returns 1 if satellite started tracking, 0 or -1 if failure.  
//Failure could be SiTechExe is not tracking, not initialized,  
//or satellite is not above the horizon limit  
String SatelliteStartTrack();
```

```
//Stops tracking any satellite you're currently tracking,  
//scope returns to the sidereal rate  
//Returns 1 for success, 0 or -1 if not available  
String SatelliteStopTrack();
```

```
//Gain should be 0-100. It will return the current gain  
int SatelliteSetTrackingGain(int Gain);
```

```
//returns 1 for tracking, 0, for not tracking,  
//-1 if the Satellite window isn't open.  
int SatelliteIsTracking();
```

```
//returns the highest of the two position errors in Deg's, ra or dec.  
double SatelliteTrackingError();
```

```
//retuns a long CSV string with information about the satellite.  
//if Julian day is zero, uses the current time.  
String SatelliteInformation(double JulDay);
```

Visual Basic Script Example Using the ASCOM Extensions:

Here's a Visual Basic Script (VBS file) that I used to test the ASCOM Extension

functions.

You can copy and paste it in a file with the extension *.VBS, then double click it. Make sure windows doesn't hide the extensions, because sometimes it may invisibly be "Script.VBS.txt", and you can't see the txt. "

'This script is for testing the Satellite Interface....

Set Scope = CreateObject("ASCOM.SiTechDll.Telescope")

Scope.Connected = True

'Remember, Satellite Window must be open for the following Methods to work.

WScript.Echo "OpenSatWindow=" & Scope.SatelliteOpenWindow

RS = Scope.SatelliteLoadTLE("0 AMC-7 (GE-7)","1 26495U 00054B 13219.24047003 .00000000 00000-0 10000-3 0 2178","2 26495 000.0012 308.8225 0003007 166.8455 149.8531 01.00272828 47051")

WScript.Echo "LoadTLE=" & RS

RS = Scope.RightAscension

WScript.Echo "RightAsc=" & RS

RS = Scope.SatelliteDeclination

WScript.Echo "Dec=" & RS

RS = Scope.SatelliteAltitude()

WScript.Echo "Alt=" & RS

RS = Scope.SatelliteAzimuth()

WScript.Echo "Az=" & RS

RS = Scope.SatelliteSetTrackingGain(66)

WScript.Echo "TrackGain=" & RS

RS = Scope.SatelliteStartTrack()

WScript.Echo "StartTrackReturn=" & RS

RS = Scope.SatelliteIsTracking()

WScript.Echo "IsTrackReturn=" & RS

RS = Scope.SatelliteTrackingError()

WScript.Echo "TrackErrReturn=" & RS

RS = Scope.SatelliteStopTrack()

WScript.Echo "StopTrackReturn=" & RS

RS = Scope.SatelliteIsTracking()

WScript.Echo "IsTrackReturn=" & RS

RS = Scope.SatelliteInformation(2456550.0)
WScript.Echo "" & RS

RS = Scope.SatelliteInformation(0.0)
WScript.Echo "" & RS

Scope.Connected = False

Acknowledgments:

Bill Gray from Project Pluto has provided a lot of program source code on his website. I converted his CPP implementation of SGP, SGP4, SGP8, SDP4 and SDP8 to C# for satellite tracking. thanks Bill.

You can view (or use) My C# code at:

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

SiTechExe Help
GoTo/Sync Tab
as of Version 0.91A

Since the SiTech Telescope Driver is a standalone program, there may be times where you know the NGC, IC or Messier number, or you want to synchronize on a named star, or something. This panel allows both of these actions, and also provides features of a "Scroll File" where you can list consecutive objects on each line, and then call up the objects, one by one.

Note: All coordinates in the scroll files themselves are in J2000 epoch. When the coordinates are displayed in the RA and DEC textboxes, they've already been "Cooked" to JNow, with precession, Nutation, and Aberration corrections applied.

When you have a selected object, the large text box near the center shows information about that object. If you have a currently open scroll file, you can edit this too. Just edit it in the text box, and press Enter.

ScrollFileName Button:

If you want to load an existing, or create a new Scroll File, then click on this button.

<-- and --> buttons:

The two buttons labelled <-- and --> allow you to scroll through each line of a scroll file.

Select File Line button:

You can go directly to a new line in your currently selected file using this button.

Add Line to File button:

Clicking on this button will allow you to add the current RA and Dec to a new line at the end of the selected scroll file.

Star button:

Clicking on this button allows you to select one of about 300 different named stars. You can then perform a GoTo or Sync to that star.

Messier Button:

Clicking on this button allows you to select a Messier object. You can then perform a GoTo or Sync to that object.

NGC and IC TextBoxes:

Enter the NGC number (not the name, just the number) in the box on the left, then press the Enter key.

You can then GoTo or Sync to that object.

Enter the IC number (not the name, just the number) in the box on the right, then press the Enter key.

You can then GoTo or Sync to that object.

RA and DEC Text Boxes:

Whenever you select an object from a scroll file or from the named stars, Messier, NGC or IC, the JNow Epoch Coordinates appear in these text boxes.

You can manually enter the RA and Declination in these text boxes too.

If you do manually enter, then you can enter JNOW or J2000 Coordinates. Just check the J2000 Checkbox if you're entering in J2000 Epoch, uncheck if you're entering in JNow Epoch.

J2000 Checkbox:

This checkbox ONLY function is when you manually enter coordinates in the RA and DEC text boxes.

Alt=NNNN Az=NNNN:

The current altitude and azimuth for the currently selected object is displayed here.

GoTo Button:

Click on this button to perform a GoTo to the currently selected coordinates in the RA and DEC text boxes.

Sync Button:

Click on this button to perform a Sync to the currently selected coordinates in the RA and DEC text boxes.

SiTechExe Help
PointXP (ActiveX Version) Help
as of Version 0.91A

PointXP was created by David Rowe. Special thanks to David Rowe!

Please email a note of appreciation to David Rowe if you are so inclined. He is a member of the SiTech users group.

Make sure you click on the SiTechExe\Scope tab\PointXP button to view the ActiveX PointXP user interface.

Once you make your model, and open the PointXP user interface, click on Mount Model, then "Recommended For" your telescope.

This will turn on the modeling terms, and your model will get pretty accurate.

There's a lot more that should be written, but too tired tonight, and I'm trying to get the release 0.91A out!

Dan Gray

SiTechExe Help PointXP (Internal Version) Help as of Version 0.91A

PointXP was created by David Rowe. Dave generously loaned Dan Gray the source code for PointXP, and Dan converted from Visual Basic to C#. Special thanks to David Rowe!

This is the help file for the INTERNAL PointXP. The newer and better ActiveX pointXP isn't here.

Background:

The PointXP engine takes a series of "Calibration Stars" performs some very complex transformations, Gauss-Jordan, Partial Derivatives, and more stuff that's way over my head, and does a fine job in correcting for many telescope mounting errors and mount flexure.

PXP is simple to use....

1. Be sure you've done a "ClearTerms and Cal Stars". Then perform an offset init on a star.
2. Do at least 16 "Load Cal Star" initializations, using your planetarium program's "Sync" button. These should be scattered around the sky. Click on the "Errors (Toggle)" button to see area's of the sky you've missed. You can click on a blank area, and perform a Goto to this area.
3. Click on "Save CalStar file" to save your work.

Important:

Once you start "LoadCal Stars" type of Sync, then don't do a "Simple Offset Init" until you're all done loading cal stars. Once you do a "Simple Offset Init" then you shouldn't do any more "Load Cal Star" inits, unless you want to start over.....

Changing the mount error terms used:

The checkboxes on the left side of the PointXP screen will enable or disable various mount error terms. You can see the result after enable or disabling a particular item by watching the "stars" in the pointXP error display and looking at the RMS or peak errors. Some of the values will be 00:00:00, even if the box is checked. This is because PointXP will not do some of the Mount Error terms until enough stars are loaded to make sense of the particular terms.

The "Model Sensitivity" number:

This number is not based on how accurate your telescope is, but instead is an indicator of what PointXP has to work with. This should be as low as possible, hopefully less than 25. If higher than 100, please keep adding Cal Stars until the number is acceptable to you. Be sure you've included azimuths / RA's through all 360 deg's (if possible), and altitude /Declinations from horizon to zenith (from lowest declination to pole if equatorial). This will give PointXP enough information to work with.

Viewing your Cal Stars.....

You can click on "Display Cal Stars" button, and you will see a window that has all the calibration points in it. You can remove any star from being used in the PointXP Engine by clicking on the word "USED". It will change to "Not Used". You can change it back to being used by clicking on the "Not Used". Pay special attention to the column labelled "Error". This is the deviation from the RMS that this particular star has. Viewing the Cal Stars makes it easy to see if a particular calibration star(s) is causing problems.

You can select multiple stars by clicking on the line of text (just not the "Used" portion). The line will turn red. You can then delete your selected stars if you want.

Note: Since the names of the stars aren't sent to the SiTech telescope driver, then the names are

found by searching the co-ordinates of the star. The star name comes from a file called: C:\Program Files\Common Files\ASCOT\Telescope\SiTech\Database\CoorToName.dat If this file is not there, all star names will be "No Coordinat". If you don't have this file, you can copy your NamedStars.dat file to CoorToName.dat. If you're so inclined, adding more stars to this file would be worthwhile. Be sure the co-ordinates are from epoch 2000. Please share your work on the SiTech users group if you do this.

Common problems:

Unpark.....

The SiTech driver will automatically load up the ppx file that was in use at the time of your "Set Park" command. If you've moved your mount, or changed something in your mount, you may want to do another calibration run, and another set park.

Garbage in, MegaGarbage out.....

PointXP needs truth (as we are all searching for). If you feed PXP garbage, it can sometimes make things even worse. Sources of garbage:

1. Roller Drive Slippage,
2. Noise on motor or telescope encoder lines,
3. Adding the wrong Cal Star,
4. Large Periodic Error or non-periodic error,
5. Star Catalog Coordinate Errors,
6. Backlash.

About the PointXP User Interface.....

The left side of the PointXP screen holds the telescope Error Terms. You can see a checkbox and also, the current value of the error term. If the error term is enabled, but the value is zero, then probably the error term is blocked by the number of calibration stars included in the model. In other words, for all of the terms to be enabled, at least 16 cal stars have to be included.

Below this are buttons for various purposes:

Read Config: Reads the previously saved Telescope Error Terms from the SiTech.cfg file.

Write Config: Writes the current telescope Error Terms to the SiTech.cfg file.

Clear Terms and Cal Stars: Clears all terms, and Cal Stars from the PointXP model.

Clear Stars, but Leave Terms. This will leave the error terms.

Below these buttons are the current Polar (or zenith) Alignment Errors. If you are using an equatorial telescope, this will tell you how far to move your mount to get it polar aligned.

What are the mount error terms?

1. Cone (Z2): This is a fabrication error. It is sometimes called Collimation error, as it is the error between the optical axis of the scope, and the altitude (declination) axis.
2. Hub (Z1): This is a fabrication error. It is the error between the azimuth (RA) axis and the altitude (declination) axis.
3. Dec Imbalance: As the scope moves in Altitude (declination), the scope may flex. Also will correct for a non-centered encoder.
4. RA Imbalance: As the scope moves in azimuth (RA), the scope may flex. Also will correct for a non-centered encoder.
5. Dec Transvers: Same as #3, however it is as if a weight was on the side of the scope.
6. RA Transvers: Same as #4, however it is as if a weight was on the side of the scope.

Story behind PointXP, by Dan Gray:

I'm a pretty good programmer, however, I'm not a mathematician, so when it goes beyond basic trig or algebra, I rely on the internet, or some of my friends who are better than I am. Well in the summer of 2007, I attended a workshop on doing science with small telescopes:

<http://www.orionobservatory.org/Word%20Files/STAR%20Workshop.pdf>

I gained a new friend at this workshop, David Rowe. After Dave saw what I was doing with SiTech, he was pretty interested, also appreciative of all the work that went into it. So he casually mentioned..... I've got a telescope mount modelling program, would you like to incorporate it? Well, I said "yes". He said, well it will take me a couple of months to go through the source and make sure it's documented, etc, but we'll be in contact about this. I took a deep breath, and was wondering if it was vaporware.... Well it wasn't, true to his word, Dave emailed me the source code which is in visual basic.

I went through all his source line by line, and converted it to C#. After getting out the bugs I introduced, it worked! I was thrilled. So after much testing, adding to the user interface, etc, I've finally been able to release this. Please email a note of appreciation to David Rowe if you are so inclined. He is a member of the SiTech users group.

*****Appendix A*****

Ok, here's a list of some of the ASCOM extensions, that SiTech supports.

int OffsetSync(double RightAscension, double Declination); Coordinates are in JNow
int LoadStarSync(double RightAscension, double Declination); Coordinates are in JNow

double[] DoPlateSolve(String FileName, double StartRightAscensionHrs, double StartDeclinationDegs, double StartFOVXmins, double StartFOVYmins, int SecondsUp, int Priority, bool UpdateWCS);

Use this to have SiTech manage PointXP3 to platesolve an image, and also, possibly update it's WCS

SiTechDLL returns a coma space (" ") separated string with 12 double values. You need to use the split command with " " as the separator to separate the values

String 1 is the Right Ascension in Hours, J2000

String 2 is the Declination in Degrees, J2000

String 3 is the Solved Field of view X axis, in arc minutes

String 4 is the Solved Field of view Y axis, in arc minutes

String 5 is the image rotation angle in Deg's

String 6 is the number of extracted stars in the image

String 7 is the number of matched stars in the image

String 8 is the image scale in arc seconds per pixel

String 9 is the Average star diameter in arc seconds

String 10 is the Elongation amount of the stars (arc seconds)

String 11 is the time (seconds) it took to solve the image

String 12 is the result message.

Possible messages are:

"PlateSolve3 Valid Plate Match";
"PlateSolve3 Valid Plate Match, Possible False Solve";
"PlateSolve3 Unknown Error";
"PlateSolve3 FileNotFound";
"PlateSolve3 Stopped while in process";
"PlateSolve3 Couldn't Match Image";
"Couldn't find the PlateSolve3 Catalogs";

Satellites:

//Satellite ASCOM extensions
public double SatelliteRightAscension()
public double SatelliteDeclination()
public double SatelliteAltitude()

```

public double SatelliteAzimuth()
public int SatelliteLoadTLE(String Name, String TLEOne, String TLETwo)
public String SatelliteInformation(double JulDay)
public int SatelliteStartTrack()
public int SatelliteStopTrack()
public int SatelliteOpenWindow()
public int SatelliteSetTrackingGain(int Gain)
public int SatelliteIsTracking()
public double SatelliteTrackingError()

```

Have a look at the visual basic script file named "TestPlateSolve.vbs" in the SiTech Data folder for an example how to use the commandString or the ASCOM extension.

here are the Command String "commands" supported by SiTech

The DoAPhotoxxxInit will make SiTech control the camera, make an image, plate solve it, and then perform the initialization or Synch.

result = CommandString ("DoAPhotoInit") Takes an image, tries a plateSolve, brings up the Init Window, you can select the Init Type

result = CommandString ("DoAPhotoOffsetInit") Takes an image, tries a plateSolve, if successful, performs a photo offset init instantly

result = CommandString ("DoAPhotoCalibrationInit") Takes an image, tries a plateSolve, if successful, performs a calibration init instantly

The resultant strings are as follows:

"Finished Photo Init" OR "Error in Photo Init"

"Finished Photo Offset Init" OR "Error in Photo Offset Init"

"Finished Photo Calibration Init" OR "Error in Photo Calibration Init"

If the platesolve takes more than 2 minutes, this will return with the error message.

The following is similar to the ASCOM extension method of SiTech using the All Sky PlateSolve3 by Dave Rowe to solve an image for you:

```
result = CommandString ("DoPlateSolve")
```

Have a look at the visual basic script file named "TestPlateSolve.vbs" in the SiTech Data folder for an example how to use the commandString or the ASCOM extension.

```
result = CommandString(("SyncToCoordinates2000, 12.0, 34.0"
```

This will perform an offset Sync to the coordinates you specify in J2000 (instead of JNow).

First number is Right Ascension Hours, 2nd is Declination degrees.

Result will be:

"Sync20000K"

"SyncToCoordinates2000 Error! Not enough ComaSpace separated Parameters."

"Can't sync below horizon!"

"Exception in CommandString: SyncToCoordinates2000. Err="

```
double PlateAngle=CommandString"GetSolvedAngle"
```

This returns the last solved angle from a platesolve.

```
String Data = CommandString("GetAllData")
```

Returns a string with comma's separating the various data

String 1 = "S" or "s". An upper case indicates the the mount is slewing.

String 2 = "T" or "t" An upper case indicates the the mount is tracking.

String 3 = "B" or "b" An upper case indicates the controller is in Blinky, followed by the error why it's in Blinky (if a brushless controller)

String 4 = current Right Ascension in Radians

String 5 is Current Declination in Radians

String 6 is Current Altitude in Radians

String 7 is Current Azimuth in Radians

String 8 is the Primary Axis Motor Encoder location (Raw with offsets applied)

String 9 is the Secondary Axis Motor Encoder location (Raw with offsets applied)

String 10 is the current Sidereal time

String 11 is Current Julian Day

String 11 is "E" means "Looking East" and "W" means "Looking West"

ResultString = CommandString("GetFlipWillBe, 3.1415926")

I have pi as the example. The parameter is the right ascension in radians that you want to know if the mount will flip or not.

Returns a string of "E" or "W"

ResultString = CommandString("Blinky") Returns a "1" if in blinky, and a "0" if in auto.

ResultString = CommandString("GetMotorEncoders")

Returns "45.0,12.0" Where the first number is the primary axis angle in deg's, and the second number is the secondary angle in degs.

ResultString = CommandString("Satellite.....")

Please see SatelliteTestCommandString.vbs for examples how to use the various satellite options

ResultString = CommandString("PECIDX#") returns the RA Worm Angle, "34.0#" returns "-1.0#" if not synched.

ResultString = CommandString("GetWormAnglePri")

ResultString = CommandString("GetWormAngleSec")

The above two will return the worm angle in degrees, for the new Auto Pec.

ResultString = CommandString("GetKeypad")

Returns "KEnter", "KEscape", "KLeft", "KRight", "KUp", "KDown", "KSpeed", or "KNone"

