

# ASTRO-PHYSICS GTO QUICK START & WORKFLOW GUIDE

Congratulations on your new Astro-Physics mount! We have compiled several examples of workflow strategies to help get you started with your observing program with our mounts. The workflows in this guide are geared toward people who are controlling their mounts with their PC or Mac computers or mobile devices. If you are new to AP mounts or mounts in general, we encourage you to begin with your most basic mount control programs and only add camera control, guiding, or observatory control programs one at a time as you become proficient with each one. Only then, will you understand how they all work together. At that point, you may develop a more individual workflow based on the software that you are using and their requirements.

Please consult with the manual that came with your mount for instructions pertaining to the setup, balance and polar alignment of your mount. We encourage you to check the Technical Support section of our website for more recent versions of your mount manual. The GTOCP4 manual will also provide information regarding the control box.

Please look over the topics below and select the sections of this guide that are useful to your particular system and needs. In addition to the session workflows themselves, we offer guidance for the initial set up of the ASCOM V2 driver, Sky X, SkySafari and Luminos. The software setup should be done in advance of your observing session in the comfort of your home.

Note: Screen shot photos may differ slightly due to software version updates.

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## What is meant by “Initialization”?

In simplest terms, “initialization” is the process of giving the mount’s servo controller the information that it needs to know:

- Where is it?
- What is the time?
- How is it supposed to operate?
- It then unparks the mount and allows you to calibrate the pointing by using a defined AP park position (if needed).

The above is the information you entered into your software (AP V2 ASCOM driver's Setup Telescope and APCC) when you first installed and set it up. For keypad users, it is the information you entered when you followed the “First Session with your Keypad” instructions (in the Keypad manual). These four points are detailed below.

1. Latitude and longitude coordinates tell the mount where it is. The GTOCP4/5 will remember where it was when last powered down, but it can’t know if you have moved to a new location (by hand via loosened clutches) unless it is told.
2. Time, date and time zone give the mount the necessary time information. Time information is required to calculate the mount’s current pointing position if it hasn’t been moved, and it is needed to calculate the meridian and the horizons. The mount’s servo does not have an internal battery to maintain time between power-ups, so time is an essential part of every initialization.
3. Commands to establish the tracking, guiding, centering and slew rates along with other similar parameters like PEM tell the mount how it should operate.
4. The command to “unpark” the mount is sent. This command both ends the parked state and it also calculates the mount’s current pointing position if the mount has not been moved manually by hand via loosening the clutches. The decision whether or not to calibrate on a defined AP park position will depend on the circumstances.
  - a) For an established setup that has not been moved, do NOT calibrate on a park position. Resume from last parked or last position. The unpark command will have resulted in extremely accurate calculation of the current pointing position without further calibration being necessary.
  - b) For new setups, or if you have moved the mount with the clutches, you will need to calibrate on (aka “resume from”) an AP defined park position.

## QUICK START SUMMARY – NEW INSTALLATIONS using Keypads

**This summary gives an outline of the workflow to have a successful first observing session. Enjoy!**

1. Enter the Time and Location data into the Keypad. Follow the instructions in the Keypad Manual for entering your Time and Location data into the Keypad. Location 1 is generally chosen as your primary observing location.
2. Set the Keypad to AutoConnect: NO. This will allow you to choose the location for which you entered the data above. Remember to power cycle the mount after the data has been entered. This will lock the information.
3. Assemble the mount. Reference your Mount Manual.
4. Balance the system. Reference your Mount Manual.
5. Polar align the mount – at least roughly. If using the daytime routine, move this step to after the mount is initialized. If using the RAPAS, do it before initializing.
6. Place the system into a pre-defined AP Park position for initialization. Reference the positions shown at the end of this Quick Start Guide.
7. Power up the mount; select your location and press GoTo.
8. The next menu has 4 choices. Choose “4=New Setup” and select the Park position that you chose in #6 above. This will initialize the mount and ready it for going to your first object.
9. When you arrive at your first object you may need to use the N S E W buttons to center the object. Do so and then press the RA DEC REV button on the bottom right, followed by the #9 button to do a ReCal of position. The following GoTo slews to other objects should be more accurate.
10. After finishing your night’s observing (or day’s solar observing) it is best to park the mount into your chosen Park position by pressing 2=Setup; then 4=Park / Mount Opt.; and finally choosing the Park position number where you wish to park.
11. Power down the mount.

### Helpful Hints

- “New Setup” is only used when you are setting up the mount for the first time or if you have readjusted scope position via the clutches and wish to restart from a “Reference Position”.
- “ResumeLastPosition” is used when you parked the mount at the end of the previous session and wish to begin a new night of observing. Selecting it will initialize the mount and you’ll be ready to go to your first object.
- If you are in a permanent setup, then you should set the Keypad to “AutoConnect: YES” so that when you power up the mount, it will automatically be initialized and ready to go to your first object. This is the most automated of the setups using the Keypad.

### What If I Get Lost?

**Hope is not gone...there is a very quick and easy fix!**

1. Loosen all the R.A. and Dec. clutches so that the scope can be moved freely with your hands. Moving the scope into a Park 3 position will provide additional safety for this procedure.
2. Command the mount to go to Park 3 using either the Keypad or a computer (whichever you have been using for the evening). While the motors are moving, hold the scope with your hands so that it remains safe.
3. When the motors both stop, use your hands and put the scope into Park 3 (use your eyes to get close) and then tighten all the clutches. Newer mounts can use the alignment marks for accuracy.
4. That’s it...you’re done! Orientation has been restored to the universe! When you go to your first object you’ll need to tweak the centering and do a ReCal, but you’ll be close.

## QUICK START SUMMARY – NEW INSTALLATIONS using Computers

**This summary gives an outline of the workflow to have a successful first observing session. Enjoy!**

(Note: Your Keypad should either not be connected or should be set to AutoConnect: EXT)

1. Install and set up your control software and drivers. This can be done before you even take delivery of your mount. *As a note, your software programs should not be set to “run as administrator”.*
  - a) Set up ASCOM and the drivers first.
    - i) ASCOM Platform 6.5SP1 (currently) - [ascom-standards.org](http://ascom-standards.org).
    - ii) AP V2 ASCOM driver - <http://www.gralak.com/apdriver>.
    - iii) FTDI driver - locate on Astro-Physics Software Updates webpage - <https://www.astro-physics.com/software-updates/>.
  - b) Install third party software (Starry Night, TheSkyX, MaxImDL, etc.).
  - c) Adjust software settings - follow the appropriate Workflow documentation that follows in this guide
  - d) If using the Keypad along with a computer, set the Keypad to AutoConnect=EXT and power cycle the mount in order to lock in the change.
2. Assemble the mount. Reference your Mount Manual.
3. Balance the system. Reference your Mount Manual.
4. Polar align the mount – at least roughly. If using the daytime routine, move this step to after the mount is initialized. If using the RAPAS, do it before initializing.
5. Place the system into a pre-defined AP Park position for initialization. Reference the positions shown at the end of this Quick Start Guide.
6. Power up the mount and connect with your primary control software. Use the primary control software to initialize the mount. Start out from the park position chosen in #5 above. Your other initialization settings will have been set already in step #1.
  - a) If using APCC, always start it and connect with it first.
  - b) If the AP V2 Driver is being used as a software hub, it must be started with a client program.
7. Connect other software that you will use with the mount.
8. After finishing your night's observing (or day's solar observing) park the mount using either APCC or the Third Party software if you are using a PC for mount control.
9. Power down the mount.

## What If I Get Lost?

**Hope is not gone...there is a very quick and easy fix!**

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4. That's it...you're done! Orientation has been restored to the universe! When you go to your first object you'll need to tweak the centering and do a ReCal, but you'll be close.

## Workflow When Using the AP V2 Driver with Third Party Software

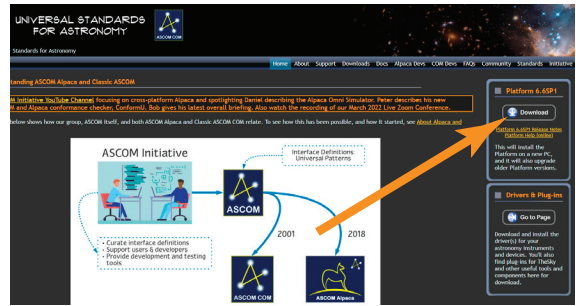
(examples: Starry Night, MaxImDL, Sequence Generator Pro, etc.)

1. Be sure that you first install the current ASCOM Platform and AP V2 ASCOM driver. Having all software and drivers current is important in order to avoid connectivity issues.

- a) ASCOM Platform 6.6SP1 or newer - install first  
<http://ascom-standards.org/index.htm> .

Click on the download button and install the full download. Once the download is complete you are done. There are no settings to make. See arrow.

- b) Astro-Physics V2 ASCOM driver - install second  
<http://www.gralak.com/apdriver> .



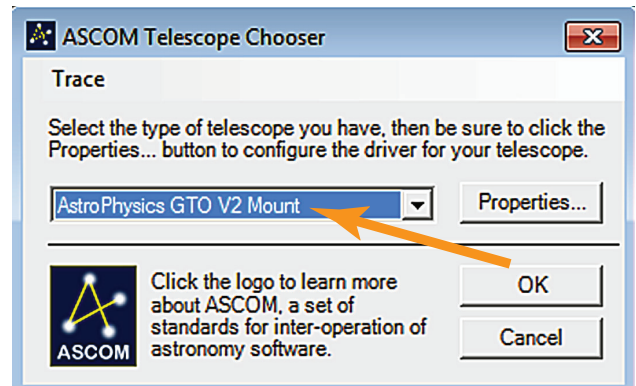
Detailed information regarding setting up the AP V2 ASCOM driver is located within these instructions. Please check frequently to ensure that you are using the current version of this driver. Important updates and bug-fixes are made periodically to ensure that your mount functions safely.

**Helpful Hint:** Clicking on the “?” in the upper right corner of each window in all the screens found in both the AP V2 driver and APCC will immediately jump you to that specific section of the Help Menu!

2. Open the “Setup Telescope” in the AP V2 driver and enter the required settings. Reference the section that follows entitled “Setting Up the Astro-Physics V2 ASCOM Driver”.
3. Install your third party software.
4. Locate the Telescope Chooser or Settings in the third party control software - all ASCOM compliant software will have a chooser or settings drop down menu.
5. Select the AP V2 driver. The driver will be called “Astro-Physics GTO V2 Mount”. See image at right.

Once you select it you may be asked to click “Properties...”. If you click “Properties...” you will be shown the AP V2 driver’s “Setup Telescope” window that you filled out earlier. You can review it if you wish. Then click “OK” once or twice and you are done.

*The Astro-Physics V2 ASCOM driver is a hub through which all third party ASCOM compliant software can be connected. Planetarium, camera control and focusing software, etc. can be connected to it and operated simultaneously.*



6. Place the mount / telescope system into a defined AP park position. See the section in the mount manual illustrating Park Positions.
  - a) If you are setting up the mount afresh (as when you need to disassemble the mount each night), you will tell the mount to unpark from a specific numbered position (for example Park 3).
  - b) If you simply park the mount each night (in an observatory or at a multi-night star party), then you will always unpark from “Last Parked”. This assumes that you have not loosened the clutches and moved the telescope via hands.
7. Power up the mount.
8. Start your control software and have it connect to the mount. It will start the AP V2 driver which will initialize the mount.
9. After finishing your night's observing (or day's solar observing) park the mount to your chosen Park position.
10. Disconnect and close the active software programs (the AP V2 driver will close automatically).
11. Power down the mount.

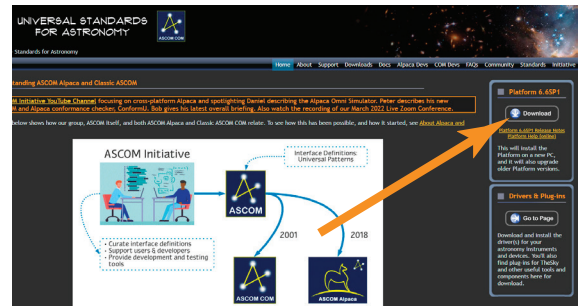
## Workflow When Using APCC & the AP V2 Driver with Third Party Software

(examples: Starry Night, MaxImDL, Sequence Generator Pro, etc.)

1. Be sure that you first install the current ASCOM Platform and AP V2 ASCOM driver. Having all software and drivers current is important in order to avoid connectivity issues.

ASCOM Platform 6.6SP1 or newer - install first  
<http://ascom-standards.org/index.htm> .

Click on the download button and install the full download.  
Once the download is complete you are done. There are no settings to make. See arrow.



- a) Astro-Physics V2 ASCOM driver - install second  
<http://www.gralak.com/apdriver> .

Detailed information regarding setting up the AP V2 ASCOM driver is located within these instructions. Please check frequently to ensure that you are using the current version of this driver. Important updates and bug-fixes are made periodically to ensure that your mount functions safely

- b) Astro-Physics Command Center (APCC) - install third

Please refer to the APCC Installation and Getting Started Quick Guide (PDF) located in the same section of our website as the APCC download files. We suggest that you download this PDF and the full manual for future reference.

**Helpful Hint:** Clicking on the “?” in the upper right corner of each window in all the screens found in both the AP V2 driver and APCC will immediately jump you to that specific section of the Help Menu!

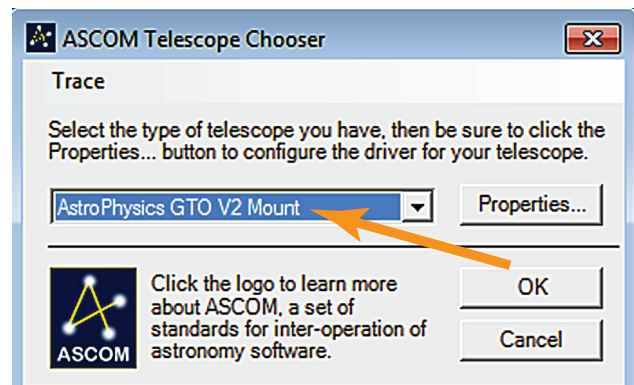
2. Open the “Setup Telescope” in the AP V2 driver and enter the required settings. Reference the section that follows entitled “Setting Up the Astro-Physics V2 ASCOM Driver”.

**Important:** When using the AP V2 driver with APCC you will need to change some settings in the V2 driver's Setup Telescope. The box “APCC Virtual Port” will need to be checked and a COM port with a high number (for example “COM21”) will need to be chosen so that it does not conflict with Real COM ports. This will be a Virtual COM port. You will need to create a Virtual port in APCC that corresponds with the chosen number. Detailed information is found in the APCC Help Menu.

3. Install your third party software.
4. Locate the Telescope Chooser or Settings in the third party control software - all ASCOM compliant software will have a chooser or settings drop down menu.
5. Select the AP V2 driver. The driver will be called “Astro-Physics GTO V2 Mount”. See image at right.

Once you select it you may be asked to click “Properties...”. If you click “Properties...” you will be shown the AP V2 driver's “Setup Telescope” window that you filled out earlier. You can review it if you wish. Then click “OK” once or twice and you are done.

*The Astro-Physics V2 ASCOM driver is a hub through which all third party ASCOM compliant software can be connected. Planetarium, camera control and focusing software, etc. can be connected to it and operated simultaneously.*



6. Place the mount / telescope system into a defined AP park position. See the section in the mount manual illustrating Park Positions.
  - a) If you are setting up the mount afresh (as when you need to disassemble the mount each night), you will tell the mount to unpark from a specific numbered position (for example Park 3).
  - b) If you simply park the mount each night (in an observatory or at a multi-night star party), then you will always unpark from “Last Parked”. This assumes that you have not loosened the clutches and moved the telescope via hands.

7. Power up the mount.
8. Start APCC first and have it connect to the mount. APCC will be the software that initializes the mount with the settings that you have set in APCC. It will also start the AP V2 driver if you have it set to auto-connect.
9. Start your third party software and connect it to the mount. You are ready to enjoy the evening.
10. After finishing your night's observing (or day's solar observing) park the mount to your chosen Park position.
11. Once the mount is parked disconnect and close the active third party software.
12. Close APCC. The AP V2 driver will automatically close.
13. Power down the mount.

**Important note: If you are starting the mount and initializing from APCC, then it will override what has been set in the AP V2 ASCOM driver (if different).**

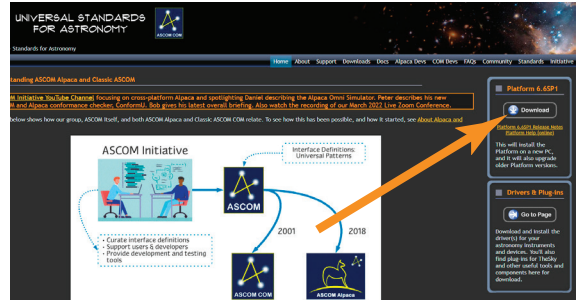


## Workflow When Using TheSkyX with the AP V2 Driver

1. Be sure that you first install the current ASCOM Platform and AP V2 ASCOM driver. Having all software and drivers current is important in order to avoid connectivity issues.

ASCOM Platform 6.6SP1 or newer - install first  
<http://ascom-standards.org/index.htm> .

Click on the download button and install the full download. Once the download is complete you are done. There are no settings to make. *See arrow.*



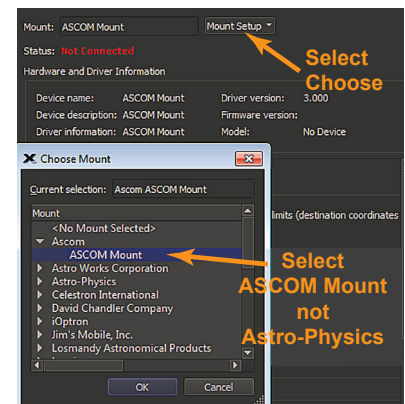
- a) Astro-Physics V2 ASCOM driver - install second  
<http://www.gralak.com/apdriver>

Detailed information regarding setting up the AP V2 ASCOM driver are found within these instructions. Please check frequently to ensure that you are using the current version of this driver. Important updates and bug-fixes are made periodically to ensure that your mount functions safely.

**Helpful Hint:** Clicking on the “?” in the upper right corner of each window in all the screens found in both the AP V2 driver and APCC will immediately jump you to that specific section of the Help Menu!

2. Open the “Setup Telescope” in the AP V2 driver and enter the required settings. Reference the section that follows entitled “Setting Up the Astro-Physics V2 ASCOM Driver”.
3. Install TheSkyX and any other third party software.
4. Go to “Telescope” in the menu bar and locate the Telescope Chooser in the drop-down menu. Then select ASCOM Mount. *See image at right.*

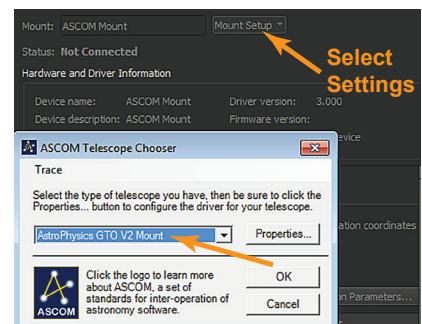
**Important Note:** Do NOT select Astro-Physics from that list. The listed mounts are TheSkyX native drivers and NOT Astro-Physics drivers. They will NOT connect through ASCOM and the AP V2 driver, nor through APCC; consequently, you will not be able to take full advantage of the functionality, precision and safety that is available through our software.



5. Go back to the drop-down menu and select “Settings”. It will open the ASCOM Telescope Chooser and you will select “AstroPhysics GTO V2 Mount”. *See image below right.*
6. Once you select it you may be asked to click “Properties...”. If you click “Properties...” you will be shown the AP V2 driver’s “Setup Telescope” window that you filled out earlier. You can review it if you wish. Then click “OK” once or twice and you are done.

*The Astro-Physics V2 ASCOM driver is a hub through which all third party ASCOM compliant software can be connected. Planetarium, camera control and focusing software, etc. can be connected to it and operated simultaneously.*

7. Place the system into a defined AP park position. See the section, Pre-Defined Park Positions, at the end of this Quick Start Guide.
  - a) If you are setting up the mount afresh (as when you need to disassemble the mount each night), you will tell the mount to unpark from a specific numbered position (for example Park 3).
  - b) If you simply park the mount each night (in an observatory or at a multi-night star party), then you will always unpark from “Last Parked”. This assumes that you have not loosened the clutches and moved the telescope via hands.



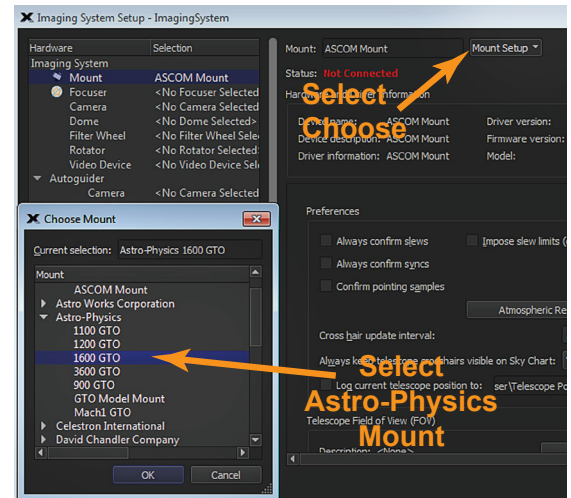
8. Power up the mount and then start TheSkyX. When TheSkyX connects to the mount it will start the AP V2 driver which initializes the mount.
9. After finishing your night’s observing (or day’s solar observing) park the mount to your chosen Park position.
10. Disconnect and close the active software programs (the AP V2 driver will close automatically). Power down the mount.



## Workflow When Using TheSkyX with Native Drivers

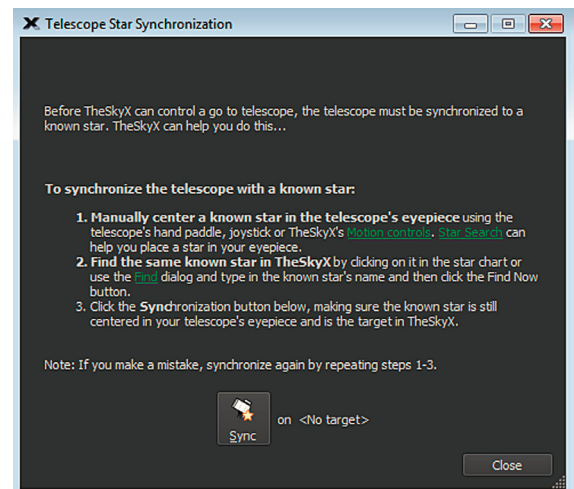
Note: This should also apply when using TheSkyX with native drivers on a Mac. Note: We did not confirm this on a Mac. However, when using a PC we highly recommend using the ASCOM driver connection to obtain full functionality, precision and safety.

1. Install TheSkyX and any other third party control software.
2. Go to "Telescope" in the menu bar and locate the Telescope Chooser in the drop-down menu. Then select Astro-Physics and the appropriate mount type. *See image at right.*
3. Connect the computer to the mount using any of the four connection options (USB, Serial, Ethernet or WiFi). If using USB or serial connection, open your computer's Device Manager and see which COM port is being used or available.
4. Go back to "Telescope" in the menu bar and locate the Telescope Settings in the drop-down menu. Be sure that the correct COM port has been chosen.



5. Power up the mount and start TheSkyX.
6. Open the Telescope tab and click on the Start Up drop-down menu. Select and click Connect Telescope.
7. Locate a bright star that you recognize about 40 to 60 degrees up from the east or west horizon. Manually center the star, either by loosening the mount's clutches and pushing the scope by hand, or using move buttons or with the Keypad direction buttons.
8. Find the star in TheSkyX's planetarium field and click on it or right-click the field and select Find. In the Start Up menu click Star Synchronization. Click the Sync button. You are now ready to enjoy your night. *See image below.*
9. After finishing your night's observing (or day's solar observing) it is best to park the mount by selecting Park in the above mentioned Shut Down menu.. **Note:** Establish a park position by going to a position of convenience for parking and set it with Set Park Position in the Telescope Tab's Shut Down drop-down menu (this can be done prior to finishing your evening).
10. Disconnect and close the active software programs.
11. Power down the mount.

**Important Note:** *If you encounter a problem using TheSkyX native drivers, you will need to contact Software Bisque for support. This will be especially true when operating with a Mac. We may be able to help with some minor problems, but Software Bisque will be the best source for addressing issues with their software.*



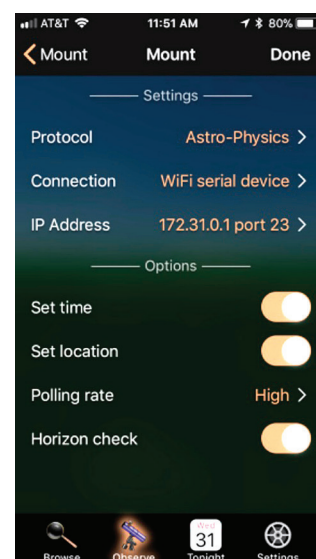
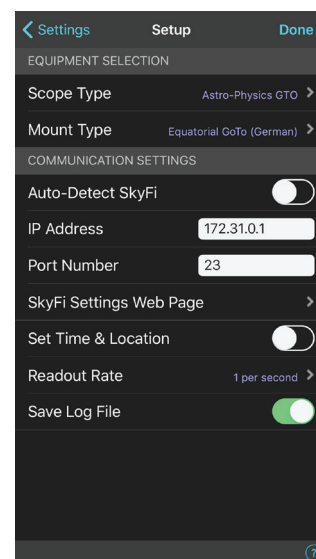
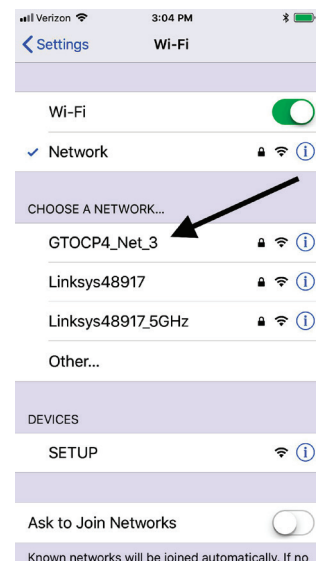
## Workflow When Using Mobile Smart Devices

- [SkySafari™ for iOS](#) and Android by Simulation Curriculum Corp – This software is offered through the App Stores in three versions. They do not use the ASCOM interface. Mount initialization is performed when connection is made and the mount is unparked.
- [Luminos™](#) for iOS by Wobbleworks LLC – This software is offered through their internet website. They do not use the ASCOM interface. Mount initialization is performed when connection is made and the mount is unparked.

Mobile smart devices will all connect over WiFi. The GTOCP4 ships out from the factory in Access Point mode which means that it will act as a hotspot for your smart device. If you wish to have both the GTOCP4 and Smart device go through a local area network, please see the information in the GTOCP4 manual. For this quick guide, we present the simple direct connection where you select the GTOCP4's network as the host for your device.

The screen shot to the right shows an iOS device running Sky Safari 5 Plus, but it generically illustrates what must be done for any device.

1. Open the device's Settings page and then open the WiFi settings.
2. Find and then select the GTOCP4 network. You will need the password: xxxadmin12345 where the xxx is the numeric portion of the GTOCP4's serial number.
3. Position the scope. See the section in the mount manual illustrating park positions.
  - a) SkySafari – Put the mount in a Park 4 position when using SkySafari (the only position recognized by SkySafari at this time)
  - b) Luminos – Put the mount in any of the Astro-Physics park positions if using Luminos (or restart from Current Position if previously parked and unmoved).
4. Open SkySafari or Luminos and enter settings for the Astro-Physics mounts.
  - a) Start SkySafari 5/6 - *see image at right*.
    - i) Click Settings at bottom of the screen.
    - ii) Scroll down to Telescope Setup and click.
    - iii) Scope Type: Astro-Physics
    - iv) Mount Type: Equatorial GoTo (German)
    - v) Enter IP Address: 172.31.0.1
    - vi) Enter Port Number: 23
    - vii) Turn on Set Time & Location and then click Done.
  - b) Start Luminos - *see image bottom right*.
    - i) Click Observe at bottom of screen.
    - ii) Click Remote and then Configure.
    - iii) Protocol - select Astro-Physics and then click mount to go back.
    - iv) Connection - select WiFi serial device and then click mount to go back.
    - v) IP Address - click Edit at top and enter 172.31.0.1 as the IP address and 23 as the port; then click Done.
5. To Connect to the mount (initialization will take place).
  - a) SkySafari
    - i) Side scroll at bottom to Scope and click.
    - ii) Click Connect (mount must be in Park 4).



- b) Luminos
  - i) Click Observe at bottom of screen.
  - ii) Click Remote Control and then the Connection slider.
  - iii) Scroll down and click Un-Park.
  - iv) Choose and click the correct Park Position. Click Done..
- 6. After an evening enjoying the stellar marvels:
  - a) SkySafari
    - i) Click Disconnect.
    - ii) Choose either Park 4 Position to park mount, or Disconnect to leave unparked or Cancel.
  - b) Luminos
    - i) Click Observe at the bottom of the screen.
    - ii) Click Remote Control.
    - iii) Scroll down to see Park and click it.
    - iv) Choose Park Position 1-4 or Current.
    - v) Scroll up and click the Connection slider to disconnect. Click Done.
- 7. Power down the mount.

## Workflow When Using Devices Other than PCs

Most Astronomy control software with which we are concerned is PC based and written to be ASCOM compliant. However, this is not universally true. There are some Mac based products that have developed their own drivers and there are also a few iPhone and Android products. Reference the Software from Other Vendors section in the GTOCP4 Servo Manual.

Although these products will allow mount control, they are limited in their scope. They are not able to take advantage of the many high precision, safety and expanded functionality features that are available in the AP V2 ASCOM driver and especially in APCC.

We do not have enough expertise with these Mac based products to feel confident to advise you and, thus, will refer you to the specific vender of the product. If you experience problems, you will need to seek solutions through the appropriate vender.

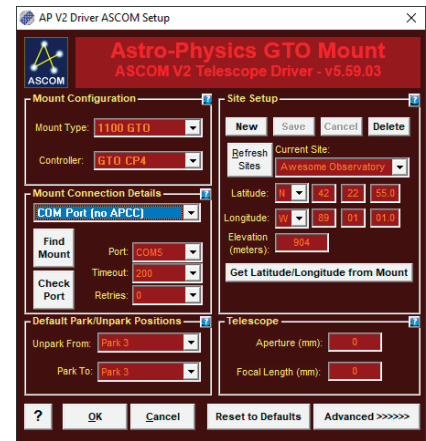
We can supply limited connection information for the Mobile Smart Devices previously described in order to get you started.

## Setting Up the Astro-Physics V2 ASCOM Driver

One of the first things that must be done is to set up the Astro-Physics V2 ASCOM driver. This is extremely important, as the settings that you enter will be used to initialize the mount once you power up and connect to the mount with your third party software.

Please note that the ASCOM Platform rules require that the AP V2 driver only be active when it is connected to from a third party ASCOM compliant software. When disconnected, the AP V2 driver will automatically close.

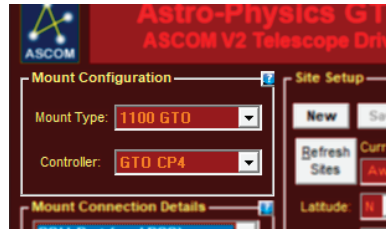
The photo at the right shows the Setup Telescope for the AP V2 driver. It is here that you enter your settings. Versions may vary slightly.



### Entering basic settings to get started

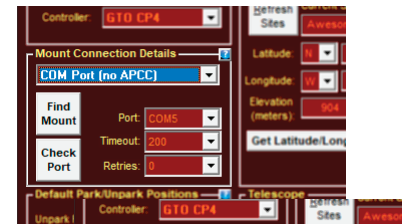
#### 1. Mount Configuration.

- Enter Mount type.
- Enter GTOCPx Control Box model.



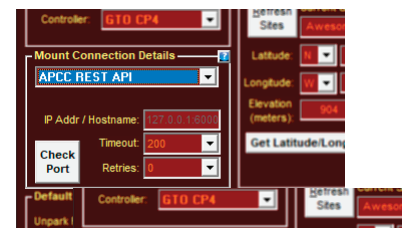
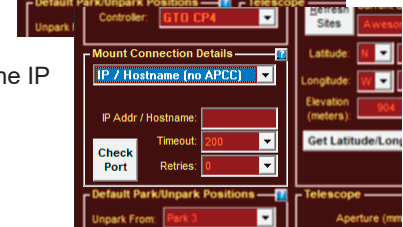
#### 2. Mount Connection Details.

- Drop Down Box (AP V2 driver used alone - APCC not used):
  - Select COM Port (no APCC) from the drop-down menu if using USB or Serial cable connectivity (this is the default). Then click the Find Mount button and the COM number should automatically be entered in the Port drop-down.
  - Select IP / Hostname (no APCC) from the drop-down menu if using Ethernet or Wireless connectivity (this is an optional choice). Then enter the IP address or Host name in the window.
  - Leave the Timeout and Retries in this window at default settings.



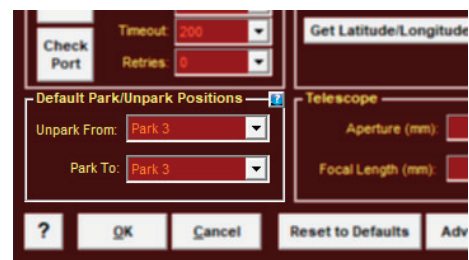
- Drop Down Box (AP V2 driver used with APCC):

- Select APCC REST API from the drop-down menu if you choose to use REST API as the connection method between the AP V2 ASCOM driver and APCC. Then enter the IP address or Host name in the window. **This is the RECOMMENDED choice of connectivity.**
- Select APCC Virtual COM Port from the drop-down menu if you choose to use virtual ports as the connection method between the AP V2 ASCOM driver and APCC. Then click the Find Mount button and enter the COM Port in the COM window.



#### 3. Default Park / Unpark Positions

- Unpark From - What you choose is dependent on whether you are permanent or portable.
  - Portable and setting up each night - you will want to unpark from a reference Park position (default is Park 3) so that the mount is automatically oriented when initialized. This will allow you to slew to your first object with reasonable accuracy and only require a simple centering of the object and a ReCal (Sync).
  - Permanent setups (observatory or week-long star parties) - You will want to unpark from a reference Park position when first setting up (or if you have moved the telescope by loosening the clutch knobs and using your hands). At the end of the evening you will park to a reference Park position. Subsequently, you will unpark from Last Parked, which will initialize the mount with precise position and time agreement to your computer.



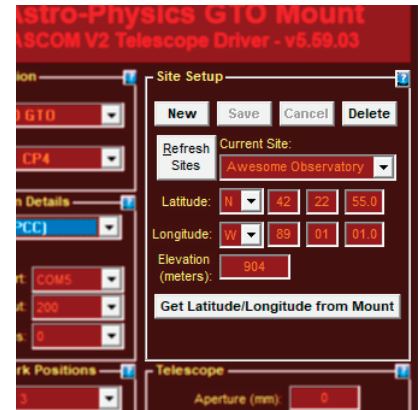
- Park To - Will be chosen based upon convenience and personal pref-

erence. For example, covering your scope at a star party is usually best done at Park 3; however, mounting and removing your scope is probably easier from a Park 2 position.

#### 4. Site Setup

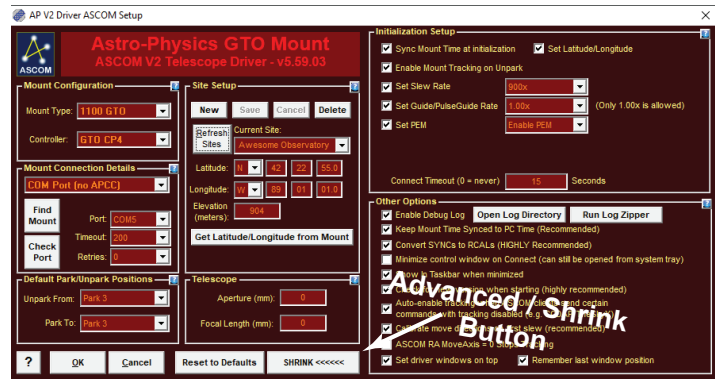
- Click the "New" button and enter a site name.
- Enter the Latitude and Longitude in degrees, minutes and seconds by clicking in the appropriate box each time (don't forget the N/S and E/W boxes). Then enter the Elevation in meters.
- Click the Save button to retain the site. You can enter multiple locations for future use.

**Click the Advanced / Shrink Button in the lower right corner of the AP V2 driver Setup Telescope. See image below right.**



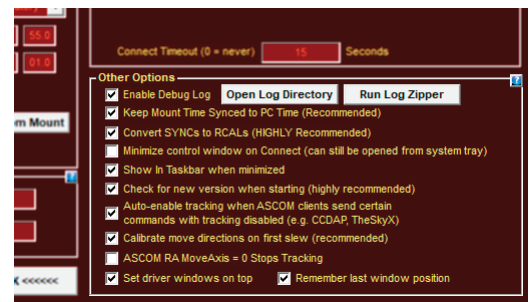
#### 5. Initialization Setup - Check all the boxes in the top right window.

- Sync Mount to PC Time.
- Set Latitude / Longitude - default is to leave it checked.
- Enable Mount Tracking on Unpark - under normal circumstances this is usually checked; however, if you like to power up the mount and go have dinner and watch a movie, then you may want to uncheck the box.
- Set Slew Rate - Assuming that you are not in a rush, this is usually set to 900x.
- Set PulseGuide / Guide Rate - **This is auto set at 1.00x and cannot be changed.**
- Set PEM - Enable / Disable The default is set to Enable PEM. If your mount is more than a year or two old and you have not made a new curve, then it should be set to Disable PEM.
- Set RA Backlash (not visible with CP4/5) - always set to Zero correction.
- Set Dec Backlash (not visible with CP4/5) - always set to Zero correction.
- Connect Time Out - use default settings.



#### 6. Other Options

- Enable Debug Logs - Checked.
- Keep Mount Time Synced to PC Time - Checked.
- Convert Syncs to ReCals - Checked.
- Minimize Control Window on Connect - Unchecked.
- Show in Taskbar when Minimized - Checked.
- Check for New Version when Starting - Checked.
- Auto-enable Tracking when ASCOM Clients Send certain Commands - Checked.
- Calibrate Move Directions on First Slew - Checked if NOT using APCC.
- ASCOM RA MoveAxis = 0 Stops Tracking - Unchecked.
- Set Driver Window on Top - Checked
- Remember Last Window Position - Checked



**Important:** Check for new versions of drivers and software frequently. This will help your software to remain bug free and keep your equipment safe from unwanted surprises!



## Setting Up Astro-Physics Command Center (APCC)

The Astro-Physics Command Center (APCC) adds precision and functionality to the control system of the mount and it will act as a serial hub for the use of additional applications. It takes remote operation to the next level with safety and convenience that you won't want to be without.

APCC takes its place as the final arbiter between all of your software and the mount. It is the program to which the mount directly connects, and everything else connects through APCC. It was designed from the beginning to integrate perfectly with the AP V2 ASCOM Driver. APCC connects directly to the mount via USB, Serial, Ethernet or WiFi.

APCC is the master when it comes to mount initialization and shut-down controls. It should be the first piece of mount related software that is opened, and the last one that is shut down.

***Important note:*** In previous versions of APCC, virtual port connectivity with the AP V2 ASCOM driver was used; however, issues sometimes occurred with a few computer brands and/or Windows versions. We have switched to the use of a ReST API interface to correct these issues and recommend its use going forward. Refer to the APCC Help Manual for information on virtual port use.

### Some APCC Thoughts

- APCC launches first.
- It connects directly to the mount on its physical interface: RS232, USB, Ethernet or WiFi.
- ReST API is the preferred interface for connection to the AP V2 ASCOM driver.
- APCC connects to the AP V2 ASCOM Driver, which is a hub. The AP V2 driver is that to which your third-party software connects ("AstroPhysics GTO V2 Driver"). The AP V2 driver starts automatically when your third-party software connects.

***APCC can be as simple or as complex as you wish to make it. This Quick Start guide will only touch upon the Setup of this software. The Help menu (and its Quick Start Guide) will provide more detailed information. Don't forget to click the "?" in the corners for specific information in that window!***

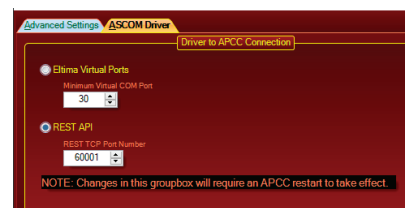
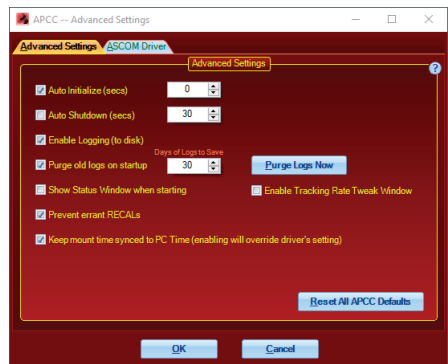
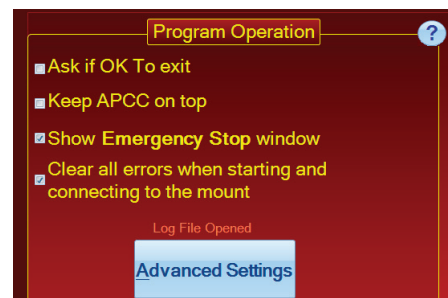
### APCC Setup

#### 1. Program Operation window

- a) Ask if OK to exit - Unchecked.
- b) Keep APCC on top - Unchecked.
- c) Show Emergency Stop window - Checked.
- d) Clear all errors when starting and connecting to the mount - Checked.

#### 2. Advanced Settings (click Advanced Settings button).

- a) Auto Initialize (secs) - Check & set to "0".
- b) Auto Shutdown (secs) - Unchecked.
- c) Enable Login (to disk) - Checked.
- d) Purge old logs on startup - Checked & set to "30".
- e) Show Status Window when starting - Unchecked.
- f) Enable Tracking Rate Tweak Window - Unchecked.
- g) Prevent errant RECALLs - Checked.
- h) Keep mount time synced to PC Time (enabling will override driver's setting) - Checked.
- i) Click ASCOM Driver tab at top of window.





- i) ReST API radio button should be highlighted (default) and the dropdown should read "60001".

### 3. Edit Initialize Mount Settings window (choose from Settings in the Menu Bar).

- a) Initialization Site and Unpark will fill in automatically from the other tabs.
- b) Optional Initialization (all boxes checked)
  - i) Set Tracking Rate - Sidereal.
  - ii) Set Slew Rate - 900x.
  - iii) Set Dec. and R.A. Backlash - Check "0" (these options only show up when using the CP3).
  - iv) Set PEM (Non-Encoder Only) - The default is set to Enable PEM. If your mount is more than a year or two old and you have not made a new curve, then it should be set to Disable PEM.

### 4. Site Tab - Site Information (should agree with AP V2 driver).

- a) Click "Manage Sites" button.
- b) Click New button and create a named site.
- c) Enter Latitude and Longitude (and check that the N-S and W-E radio buttons are correct).
- d) Click Time Offset button (at right) and choose time zone.
- e) Enter Elevation in meters (after checking the Metric box).
- f) Use default Temp (approximate) and Pressure.
- g) Click Save button and close.

### 5. Connection

- a) Set USB/Serial in drop-down (default).
- b) Click Find Mount button (mount must be powered up and connected via a USB or Serial cable).
- c) COM number from Find Mount should automatically be entered in the Primary Port drop-down.
- d) Click the Config Driver button - this will optimize the APCC / V2 driver configuration.

#### Important Notes:

Complete connection information is found in the "Getting Started" section of the Pdf manual for APCC found at the following link:  
[http://www.astro-physics.com/tech\\_support/apcc/apcc-pro.pdf](http://www.astro-physics.com/tech_support/apcc/apcc-pro.pdf)

The CP4 uses an industrialized and self-powered USB connector and its robustness will only be limited by the USB of your computer (the weak link). Avoid using USB hubs which can reduce reliability. If you must use a hub, then buy a high quality, powered hub.

Reference the APCC Help file by clicking the "?" for additional information that is beyond the scope of this Quick Start Guide.

## Using Your Keypad and PC in Shared Harmony

There will come a time in a future iteration of the Keypad firmware when the Keypad and your PC will talk and share information. At this time they do not. Consequently, there are some rules that need to be observed.

- **The Keypad and the PC do not talk to each other.** When doing a GoTo the Keypad and the PC do not know to which object the other has slewed. Therefore, you must always sync (ReCal) using the device that did the slew.

When either the Keypad or the PC issue a GoTo, the object's coordinates are sent to the CPx control box which knows the current coordinates where the mount is pointing. It then calculates how much each motor needs to turn to get to the new GoTo coordinates. These are strictly mathematical calculations.

Both the Keypad and the PC can read the current coordinates from the CPx, but the opposing device can not know to which object the mount was sent (it would simply be syncing on the last GoTo coordinates that IT sent to the mount). You can only sync using the device that issued the latest GoTo.

However, once you send the mount to an object you can then center the object with the opposing device by doing N-S-E-W button moves. The pointing coordinates in the GTOCPx will change by the amount of the button adjustments you make, but then syncing WITH THE DEVICE THAT ISSUED THE GOTO SLEW will restore the coordinates to those requested by the GoTo slew command.

- **Set the Keypad to AutoConnect: EXT.** If you are using a computer along with the Keypad, you'll want to set the Keypad to AutoConnect: EXT. When powering up the mount using this mode the Keypad will wait patiently for the computer to initialize the mount. Once the computer has initialized the time and location information the Keypad will advance to the main menu screen. This is the preferred procedure when using both control devices, as it assumes the computer's priority status.

If a computer is not available, you can easily push the Menu button on the Keypad and then it will walk you through the Keypad initialization process.

- **Park the mount using the device that provided the initialization.** Another rule to follow is to park the mount using the device that did the initialization. The primary reason for this is that there may be a difference in time between the computer clock and the Keypad clock. This will affect GoTo and meridian flip accuracy. In a worse case, a scope/counterweights orientation error can occur and send the scope slewing into the pier upon the first GoTo slew.
- **Review the Keypad manual.** The Keypad manual provides a wealth of detailed information. Even if you do not own a Keypad, you will find very useful information in the manual which is available in PDF format on the Technical Support page of our web site.

## Some Important Notes

- **When using Mounts with Auto-Adjust Motor Gearboxes:**
  - **Use the clutches when repositioning the mount!** This is a safer practice than using the gearbox disengagement lever in order to ensure that the gear teeth are not damaged by accident. Refer to your manual for clutch operation.
  - **Begin your balance procedure in Park 3 position (pointing to the pole).** This will ensure that an out of balance scope does not have a sudden, wild swing that could damage the scope, the mount or you!
  - **Be sure that the Gearbox engage/disengage lever is fully disengaged and that the worm is fully separated from the worm wheel when balancing the mount (or moving the mount when repositioning)!** It is important not to damage the tops of the gears by bumping the worm and worm wheel teeth!
- **Be careful not to twist and inadvertently damage internal cables.** It is important to remember not to twist and damage internal cables by over-rotating the axes. If the axes are rotated when setting up or performing mount maintenance, you will need to undo the axis rotation to return cables to their normal position. Internal cables should not be pulled tight; rather, they should be left slack and free to move.
- **Be sure that all fasteners on the mount and scope are tight.** You do not want to have to catch a falling scope or see it sitting unexpectedly on the concrete!
- **Computer and Keypad use together.** If you are using a computer for primary mount control, but wish to have the Keypad connected for convenience while at an eyepiece, then set the Keypad to AutoConnect: EXT so that the computer will initialize the mount, not the Keypad.
- **Always Initialize and park the mount using the same device.** If you initialize with the Keypad, then park with the Keypad...if you initialize with the computer, then park with the computer. **Important Note:** If the Keypad is your chosen method of operation, then uncheck the following two boxes in the AP V2 driver's Setup Telescope...1- Sync Mount to PC Time and 2- Keep Mount Time Synced to PC Time.
- **Unpark from Last Parked.** If the mount is being re-started from a previous night, as in a permanent observatory or at a week-long star party, then unpark from Last Parked (assuming that the scope has not been repositioned manually by hand via the clutches since it was last parked).
- **Unpark from a defined park position.** If your equipment is being set up afresh for a night's observing, then place the scope in a defined park position and have it unpark from that specific position. If it is to remain set up for the next night, then park it to your position of choice and resume from Last Parked the next night.
- **GTOCP4 Control Box will auto-park mount when powered off.** The GTOCP4 control box will auto-park the mount in place when the power is turned off or is interrupted. Nevertheless, we do recommend parking the mount to a convenient park position when finishing the evening's viewing (and leaving the mount set up for another night).
- **Use the mount with its own power supply.** For best performance the mount should have its own power supply. This is especially true when imaging.
- **Reference the Astro-Physics Technical Support page of the website.** There is a wealth of information on the Technical Support page that can often answer the questions that you have, as well as provide in-depth understanding and fixes. All the latest versions of the manuals can be found on the page.
- **Remember that the answer to most questions can be found in the supplied manuals or on the website.** Please reference these manuals or the website Technical Support before calling Astro-Physics. If you cannot find the answer, then the Technical Support team is ready to help.

## Please take special notice:

- **Outdoor Storage** – If you have a mount that is left outside for extended periods covered by a tarp or scope cover, then it is highly recommended to remove the GTOCP4 and Keypad and take them inside to a safer environment. Tarps and covers cause significant condensation build up unless steps are taken to mediate the problem. Often low wattage light bulbs or fans are used to reduce condensation for short term storage, but this is no guaranty.
- **VERY IMPORTANT:** We take every precaution to make our control boxes moisture and dew resistant; however, they are not waterproof! We cannot be responsible for water damage when reasonable care has not been taken to shield them from excessive dew or when storing them outside under tarps for extended periods.

# Assemble Mount

## *Handy Tools to Have on Hand*

### **In Your Accessory or Tool Box:**

- Small torpedo level to level your scope when using the handy reference park positions, particularly during the daytime polar alignment routine outlined in your Keypad manual.
- Compass - Don't forget to know your magnetic offset when using a compass (there can be a large difference).
- Documentation – Physical copies of your mount, control box and keypad (if you have one) manuals as well as any other documentation that you received with your mount (or control box) or that you find in the Technical Support section of our website that may be useful.

### **On Your Smart Phone:**

For the upmost of convenience, the following items can be downloaded to your smart phone, which you are likely carry with you everywhere.

- App(s) that allow your phone to be used as a level, inclinometer and compass. Don't forget to know your magnetic offset when using a compass since there can be a large difference.
- Astro-Physics Polar Alignment App – The longitude and latitude of your current site will display. Apps are available for iOS, Android and Windows.
- Download PDFs of all relevant and recent documents from the Technical Support Section of our website or you can link to our website if you have service at your observing site.

## **Let's Get Set to Have Some Fun**

### **1. Place mount on pier or tripod**

This is fairly fundamental and will depend on the mount that you are using and your choice of pier or tripod. If you are using a pier of your own construction, please be sure that it is robust and does not downgrade the performance of your Astro-Physics mount. We recommend these minimums:

- 6" pier for the *Mach1GTO*
- 8" pier for the 1100GTO
- 10" pier for the 1600GTO

Pier strength and non-flexure is based on pier diameter, not wall thickness.

### **2. Connect cabling and power**

Please reference the manual which came with your mount for specifics. Note that all our up-to-date manuals can be found in Pdf form on the Technical Support page of our website.

### **3. Load counterweights onto mount**

This may seem like a no-brainer, but it is all too easy when rushing to get set up for the evening to forget and put the scope on the mount before the counterweights.. it can have VERY bad consequences!

### **4. Attach scope to mount**

Ok...now we can put the scope on the mount, along with finder, diagonals, eyepieces and cameras. Having everything on the scope before doing the balancing is important.

## Balancing

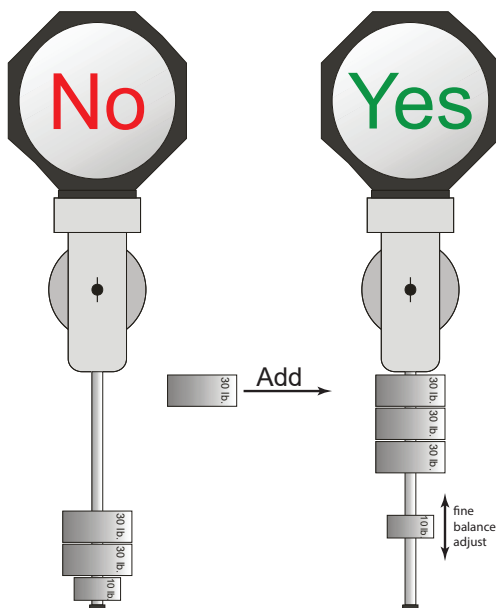
Balancing your scope would seem like a simple operation; however, some care must be taken to prevent injury and damage. When beginning the balance process your scope may be considerably out-of-balance. In order to prevent a wild swing that could scrape and damage the worm wheel's gear teeth or a painful collision to one's person you should head the following steps.

**Start with the counterweights at the bottom of the counterweight shaft and scope in Park 3.**

- Scope Balance First** - Place the scope into a Park 3 position before beginning the balance process. Do this by loosening the clutches and moving the scope by hand. This will provide a feel for preliminary adjustment.
  - Using only the loosened clutches, rotate the scope horizontally and do a rough balance by placing a hand on either side of the scope and with a back and forth motion with your hands feel for the proper balance.
  - Place the scope back into Park 3 position and tighten the clutches. Now disengage the motor box using the Lever Assembly. With the motor box fully disengaged bring the scope into a horizontal position and adjust the balance. Return the scope to Park 3 and re-engage the Lever Assembly.
- Counterweight Balance Second** - Similar to the procedure above, loosen the R.A. clutches and carefully rotate the axis to have a preliminary feel for balance adjustment.
  - Using only the loosened clutches to gauge balance, slide the heaviest weight all the way to the top of the shaft and see if the balance is still counterweight heavy. If so, then slide the next heaviest weight all the way up. If not, then you should add a counterweight. You will want to have the heaviest weights at or near the top of the shaft. The adjustment should be done with the a smaller weight. The reason for this is to minimize Inertial Moment Arm.
  - Once you have achieved a near balance, place the scope in the Park 3 position and tighten the clutches. Now fully disengage the motor box using the Lever Assembly and perform a precise balance. Again, return to the Park 3 position and re-engage the Lever Assembly.

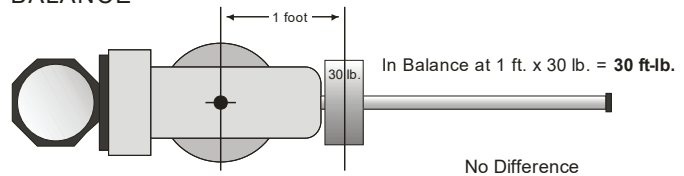
## Optimizing Balance

Both examples provide balance, but the example to the left will experience a huge inertial moment arm. The examples on the following page will show the calculations.

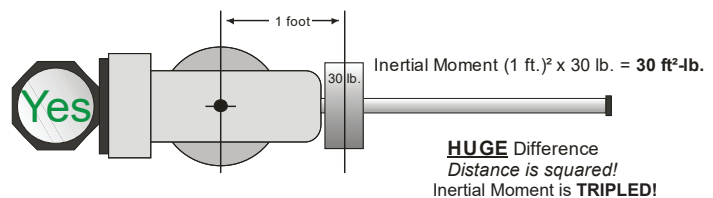


## Why More Weight Higher Up the Shaft is Better!

### BALANCE



### INERTIAL MOMENT ARM



## Polar Align Mount

Polar alignment is a necessary first step for all German equatorial mounts. You will want to get the mount roughly polar aligned and level before following one of the methods below. This will get you up and running and enjoying your mount. If you enter the realm of astro-imaging, then you will want to refine your alignment. The mount manual will describe in more detail several procedures.

You may also want to review the highly refined (and yet simple) “Drift Alignment R.A. Correction Method” described on the Technical Support page of our website under “General Information that Applies to all German Equatorial Mounts”.

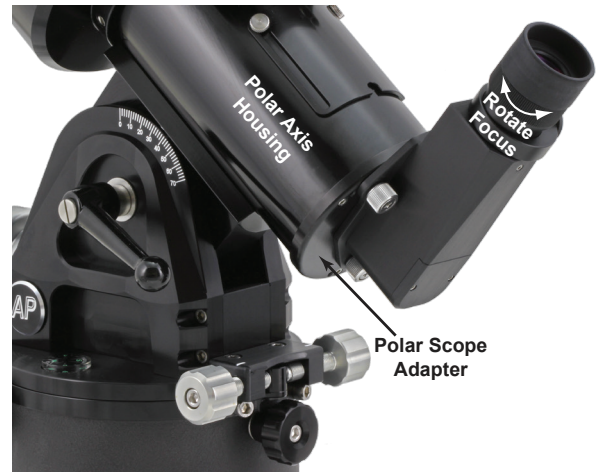
### Tools

- Torpedo or Bubble Level
- Compass corrected for magnetic declination
- Smart phone Apps for the above

### Methods

#### Right-Angle Polar Alignment Scope (RAPAS)

Using our highly accurate, neck-friendly Right-Angle Polar Alignment Scope will provide all the polar aligning accuracy needed for visual observing. As an imager, if you make the one-time R.A. rear plate adjustment as described in the RAPAS instructions, then you will be able to start imaging immediately after aligning with the RAPAS. Long focal length scopes may benefit from further refinement of polar alignment. This polar scope is designed for both Northern and Southern Hemispheres. See example photo at right with *Mach1GTO*. Complete instructions for the RAPAS are found on the technical support page of our website under “Mount Accessories / Instructions”.



#### 1. Daytime Alignment

Use the Park 1, Park 4 or Park 5 position (along with Park 2) to polar align your telescope in the daytime or when Polaris is not visible. Note that Park 5 is our recommended “horizontal” park position. Park 1 is only seconds away from tracking into a counterweight up status. Complete instructions for the Daytime Alignment Method are found in the Keypad Manual on the technical support site of our website.

This is a great method in these situations:

- a) Solar observing.
- b) Observe planets and stars during the day...it'll amaze your friends!
- c) Get a head start at a star party or observing site without wasting any of the night.

#### 2. Drift Alignment R.A. Correction Method

Please see the Technical Support page of our website for the instructions to this alignment technique ( [http://www.astro-physics.com/tech\\_support/mounts/Drift\\_Alignment\\_RA\\_Correction\\_Method.pdf](http://www.astro-physics.com/tech_support/mounts/Drift_Alignment_RA_Correction_Method.pdf) ). This will provide the highest precision of polar alignment with the least amount of drift within 45 degrees of the zenith (where most imaging is done). It is easiest with the use of a CCD camera and camera control software that can create a guiding graph; however, it can also be done using a reticle eyepiece (using with a Barlow for more accuracy) provided that you orient the reticle to the R.A. and Dec. axes and know which is which.



## Pre-defined Park Positions (NORTHERN & SOUTHERN HEMISPHERES)

When first setting up the mount in a new location it is recommended to loosen the clutches and, using your hands, position the mount into one of these five Reference Park Positions. You will then tighten the clutches and power up the mount.

**Recommended:** **Park 3** is a safe and balanced position. **Park 5** is a safe, low profile position with minimum cable twisting.

**Keypad:** Choose “New Setup” and “Start from Park Position” from that specific position.

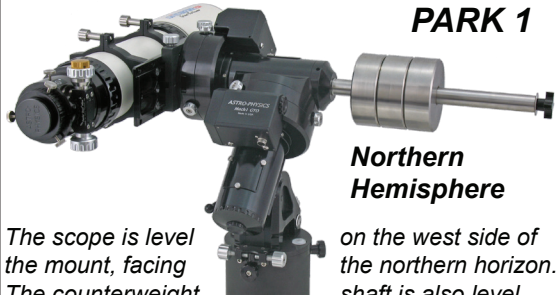
**Computer:** Set the AP V2 driver to resume from that specific position and connect your software to the mount.

When the connection is made the mount will be properly initialized with time, location and orientation information. It will be ready to go to your first object.

### **WARNING!**

**If you want a park position that can be accurately leveled, we recommend Park 5.**

#### **PARK 1**



##### **Northern Hemisphere**

*The scope is level on the west side of the mount, facing the northern horizon. The counterweight shaft is also level and pointing due east.*

*Both Hemispheres: RA is horizontal,  
North: Dec = (90-Latitude) South: Dec = (-90-Latitude)*

*The southern hemisphere is mirror reversed. The scope is still level on the west side of the mount, but is facing the southern horizon.*

*The counterweight shaft is also still level and pointing due east.*

##### **Southern Hemisphere**



#### **PARK 2**

##### **Northern Hemisphere**

*The scope is level on top of the mount facing the eastern horizon. The counterweight shaft is pointing down.*

*Both Hemispheres: RA axis is vertical, Dec = 0*

*The southern hemisphere is mirror reversed.*

*The scope still points to the eastern horizon, but east is to the left when facing the southern pole.*

##### **Southern Hemisphere**



#### **PARK 3**

##### **Northern Hemisphere & Southern Hemisphere**

*The scope is pointing to the pole. The counterweight shaft is pointing down.*

*RA axis is vertical, Dec = 90*



## PARK 4

### Northern Hemisphere

The scope is level on the east side of the mount, facing the southern horizon. The counterweight shaft is also level and pointing due west.

Both Hemispheres: RA is horizontal,  
North: Dec =  $(-90 + \text{Latitude})$  South: Dec =  $(90 + \text{Latitude})$

The southern hemisphere is mirror reversed. The scope is still level on the east side of the mount, but is facing the northern horizon. The counterweight shaft is also still level and pointing due west.

### Southern Hemisphere

## PARK 5

### Northern Hemisphere

The scope is level on the east side of the mount, facing the northern horizon. The counterweight shaft is also level and pointing due west.

Both Hemispheres: RA is horizontal,  
North: Dec =  $(90 - \text{Latitude})$  South: Dec =  $(-90 - \text{Latitude})$

The southern hemisphere is mirror reversed. The scope is still level on the east side of the mount, but is facing the southern horizon. The counterweight shaft is also level and pointing due west.

### Southern Hemisphere