QUICK START GUIDE

Congratulations on your new Astro-Physics mount! This quick guide is NOT intended as a substitute for reading the manuals. They are much more complete and detailed than this guide could possibly be. However, we understand the insurmountable urge to start playing right away, and therefore have provided this Quick Start Guide to get you up and running in a hurry. It is primarily geared toward people who did not elect to purchase the AP GTO Keypad, although it should also be useful to Keypad users as well. If you have the Keypad, refer to pages 9 - 13 of its manual.

You may find the following article "Transitioning to an AP GTO Mount" by Chris Erickson very useful:

Transitioning to AP GTO Mount – Chris Erickson

One thing is that the AP mount's GOTO system is going to be quite a bit different from the Celestron/Meade GOTO systems you may have used in the past.

The AP GOTO system is split into two parts. The servo controller box (CP2, CP3 or CP4) and the AP hand controller.

AP describes their hand controller as a "handheld planetarium program" and states that it isn't mandatory to have one to operate AP mounts. Their mounts can be controlled directly from a PC using their free ASCOM driver and an ASCOM-enabled planetarium program of some kind. Sky Safari Plus/Pro 5/6 is also capable of initializing the AP servo controllers and controlling the mount. AP also offers their optional APCC software program that adds a lot of additional functionality to their mounts, especially in permanent observatory installations.

AP's approach to sky alignment is different than most GOTO mount manufacturers. AP expects you to do a reasonablygood polar alignment and then sync/calibrate on one known star, if needed, and then you are good to go. If you haven't moved the mount since the last time you used it, you don't need to polar align again or sync/calibrate on a star.

If your combination of mount and OTA has excessive orthogonality error (a.k.a. cone-error or perpendicularity error), which is when your optical axis not perfectly perpendicular to the DEC axis, AP expects you to evaluate and physicallycorrect your orthogonal error, rather than try to compensate for it via 3-star (or more) alignment software routines or small pointing models in the hand controller. AP's optional APCC-Pro program sports full pointing models and AP has hinted that they might add small pointing model support to their CP4 servo controller and AP hand controller in the future for those customers who think they really need it.

If you decide to evaluate and correct your OTA's orthogonal error, make sure to be carefully collimated first. Collimation changes move the optical axis around and in turn effect orthogonal as well.

AP's hand controller has a real-time-clock internally so you don't need to enter time and date stuff on bootup. If you have moved your physical location more than a couple of hundred miles then you should probably add or update your Lat/Long/ time/date/time zone info in the hand controller. If you aren't using AP's hand controller, make sure the AP driver and your planetarium program are using correct Lat/Long/time/date/time zone data.

The AP servo controllers don't have a real-time-clock inside and need time/date/ time zone sent to them by the AP hand controller or some other PC or smartphone program. They do remember Lat/Long and worm wheel and gear positions. Having more than one device sending Lat/Long /time/date/ time zone info to the servo controller can cause unexpected results if the two sets of information don't match each other exactly. Essentially whichever device sent data last will be what the servo controller will be running with.

AP mounts, servo controllers and hand controllers don't need to be re-initialized if your power cord gets kicked out. Just reconnect power and go. The AP servo controller knows exactly where the mount's worm gears and worm wheels were positioned when power was lost and the AP hand controller has its real time clock. If the target has drifted out of the field of view while the power was out, simply do a slow button-slew West until the object is back in view. Or do another GOTO slew to the target object.

AP's term "Re-Calibrate" is the equivalent to Celestron's/Meade's term "Sync."

If you have an old CP2 servo controller, consider upgrading to a CP3 or CP4. CP3's can be found reasonably-cheap on the used market. The CP4 is the current AP flagship servo controller. It is very powerful and supports dual-RS-232, USB, Ethernet and WiFi communications. If you swap out your existing servo controller, you will have to re-do your stored PEC (AP calls it PEM) curve. This isn't a big deal and is easily done using PEMPro. Unless you are doing serious astrophotography, you won't have to worry about PE correction. The native PE of AP mounts is +-3.5 arcseconds or better.

AP's mount axes will seem very stiff compared to Celestron/Meade. This is normal. AP mounts have very powerful Swiss Maxon motors and axis balance isn't as critical as it is with Celestron/Meade mounts.

If you have both an AP hand controller as well as a connection to a PC, be advised that there are rules about how to use the two together without causing problems for yourself. If you have the PC slew the mount someplace and then tell the hand controller to calibrate on its current target object, the hand controller isn't going to know that the PC sent the mount off somewhere else and will calibrate on the wrong sky location. AP has announced that the next version of their hand controller firmware will check with the servo controller first to see if it has been moved by some other program before performing calibrations. There are some other cautions too but you get the general idea. Basically, on any given night, either use the hand controller exclusively or use the PC control exclusively if you want to avoid self-inflicted problems. Once you are really-familiar with the AP way of doing things, you will know how to use the two together at the same time without problems. Not that you will actually ever really need to.

If you plan to primarily use the hand controller for running your AP mount, I would set up the controller as follows:

Under 2=Setup / 3=Keypad Options / 1=Auto-Connect: YES

YES means that the mount (hand controller + servo controller) will automatically resume from where it was left when it was turned off. It will know where it is pointing in the sky and will automatically send time and date info to the servo controller. If you have opened up the clutches or if they have slipped, you will need to do a GOTO to a known star, center it with the buttons, and do a 9=Re-Calibrate after pressing the [RA/DEC/REV] button.

NO means that during bootup, you will get a chance to pick what park position the servo controller will think it is initializing from. After you have chosen one of the available options the hand controller will send that data, along with Lat/Long/time/ date/time zone data to the servo controller. This mode is handy if you open the clutches and spin the axes around at some point after you break everything down and put stuff away and when you set everything up again. It is also the best choice when travelling around the world with your AP mount. There are also some daytime setup procedures that utilize some of the park positions and a bubble level.

EXT means that you are using some kind of PC or smartphone program as your primary source to initialize the servo controller, for example the AP ASCOM driver or Sky Safari 5/6 Plus/Pro. This is often the preferred setting in a permanent observatory.

If you are a world traveler with your AP mount, the www.StarGPS.ca GPS units are handy for painlessly initializing your AP servo controller at new locations. It is compatible with the AP hand controller but using it with a PC can be complicated. Sky Safari 5/6 Plus/Pro on an Android/iOS smartphone with its own built-in GPS and clock don't need an external GPS unit to initialize the AP servo controllers correctly. Note that some Android/iOS tablet computers don't have automatic internal clock synching to their GPS or Internet connection so may not have highly-accurate time available for initializing the AP servo controller. Most of the time this won't be a problem but it is good to know about.

If you are using a CP3 servo controller and APCC, make sure you have the latest "V2" firmware chip in your CP3. A call to AP might be required.

AP's customer support is absolute top-shelf and very accessible. Roland, himself, is very active in the two AP Yahoo groups...along with Marj, George and Howard. Help is always just a few clicks or a phone call away.

I hope this helps.

QUICK START SUMMARY – NEW INSTALLATIONS AND PORTABLE SETUPS

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

- 1. Install and set up your control software. For all but the AP GTO Keypad, this can be done before you even take delivery of your mount.
 - a) 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.
- 3. Balance the system.
- 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.
- 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 your primary control software, 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) it is best to park the mount into your chosen Park position using either the AP V2 driver or APCC, rather than Third Party software if you are using a PC for mount control.
- 9. Power down the mount.

Some Important Notes

- 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.
- Be sure that the Gearbox engage/disengage lever is <u>fully disengaged</u> 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!
- 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 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!
- **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 Technical support is ready to help.

Set up software

- 1. Install software ASCOM software and drivers need to be installed before connecting mount. It is important to stay current with all software and drivers; otherwise, failures and unexpected performance can occur.
 - a) ASCOM Platform 6.3 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.

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

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

- check frequently to ensure that you are using the current version of this driver. Important updates and bug-fixes are made to ensure that your mount functions safely
- c) FTDI driver for Serial and USB install third <u>http://www.ftdichip.com/Drivers/VCP.htm</u> and see location for driver download: <u>http://www.astro-physics.com/products/accessories/software/</u> <u>Serial_USB/FTDI_driver_find4.pdf</u>

It is <u>very</u> important to download and install this FTDI driver in your computer <u>BEFORE</u> plugging in your CP4 or FTDI devices. It is necessary for USB communication. Install on all computers that may be used with your mount.

d) Third Party software for planetarium / mount control and camera control, etc.



- Windows PCs utilize the ASCOM Platform and the AP V2 driver to control the mount. ASCOM is a Windows based system. ASCOM compliant software will be able to utilize the added safety, functionality and precision provided by Astro-Physics software, such as the Astro-Physics Command Center (APCC).
- ii) Devices other than Windows PCs Macs, Linux computers, tablets and iPhone devices utilize drivers that the Third Party software companies have written to control basic functionality of Astro-Physics mounts. It is to be noted that whereas they will be able to slew and guide the mount, they will not be able to provide the safety, limits and high precision that is available through the AP ASCOM compliant software. *Note: This will be discussed later in this documentation.*

2. Enter information into software

- a) Location latitude and longitude coordinates
- b) Time data (most likely handled by computer clock)
 - i) date and time
 - ii) time zone and daylight savings

The following AP V2 ASCOM driver setup represents a common example; however, as one becomes more comfortable with their equipment and software, there are many other options to customize the setup to meet one's personal style of visual observing or imaging. We recommend taking one step at a time and learning it well; otherwise, the process can be daunting! Enjoy!

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 you 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.

Entering basic settings to get started

- 1. Mount Configuration (photo immediate right)
 - a) Enter Mount type
 - b) Enter GTOCPx Control Box model
- 2. COM Port Details (photo far right)
 - a) Check box if APCC is being used
 - b) Select Port
 - i) If APCC is <u>not</u> being used, then simply find the COM port in the computer's Device Manager and enter it here.
 - ii) If APCC is being used and you have checked the box above, then choose a random port number that is high enough not to have a chance conflict with an existing port. This chosen port will be a virtual port in APCC in the Virtual Ports tab. Using COM15 or COM21 is usually a safe way to go.
 - c) Leave the other settings in this window at default settings and the ASCOM Serial Object box unchecked.
- 3. Default Park / Unpark Positions
 - a) Unpark From What you choose is dependant on whether you are permanent or portable.
 - Portable and setting up each night you will want to unpark from a reference position so that the mount is automatically oriented when initialized. This will allow you to slew to your first object with reasonable accuracy and requiring a simple centering of the object and a ReCalibrate (Sync).
 - ii) Permanent setups (observatory or week-long star parties) You will want to unpark from "Last Parked". At the end of the previous evening you will have parked to a reference position. That being the case, unparking from "Last Parked" will

resume from a highly precise position and initialize with precise time agreement to your computer. **TREAT YOUR FIRST-TIME SETUP IN A PERMANENT OBSERVATORY AS A PORTABLE SETUP! Then change to the setting outlined in 3. a) ii) above.

- b) Park To Will be chosen based upon convenience and personal preference. For example, covering your scope at a star party is usually best done at Park 3; however, removing your scope is probably easier from a Park 2 position.
- 4. Site Setup
 - a) Click the "New" button and enter a site name
 - b) 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.
 - c) Click the Save button to retain the site. You can enter multiple locations for future use.









Click the Advanced Button in the lower right corner of the AP V2 driver "Setup Telescope"

| Astro-Physics GTO Mount ASCOM V2 Telescope Driver - v5.10.02 | -Initialization Setup — V Sync Mount To PC Time V Set Latitude/Longitude V Enable Mount Tracking on Unpark |
|---|--|
| Mount Configuration Site Setup Mount Type: 1100 GT0 Controller: GT0 CP4 Controller: GT0 CP4 COM Port Details Current Ste: COM Port Details ACCC Virtual Port Port: COM15 Tmeout 1000 Retry Count: ✓ Use ASCOM Check Port Default Park/IUnpark Positions Telescope Park To: Park 3 QK Cancel | Set Slew Rate Set PulseGuide/Guide Rate Set PulseGuide/Guide Rate Set PEM Set PEM Connect Timeout (0 = never) Seconds Windows Priority Above Hormal Connect Timeout (0 = never) Seconds Windows Priority Above Hormal Connect Timeout (0 = never) Seconds Windows Priority Connect Timeout (0 = never) Seconds Windows Priority Connect Timeout (0 = never) Seconds Windows Priority Above Hormal Connect Timeout (0 = never) Seconds Connect Timeout (0 = never) Seconds Connect Timeout (0 = never) Seconds Convert SYNCs to RCALs (HiGHLY Recommended) Minimize control window on Connect (can still be opened from system tray) Solve Taskbar when minimized Check for new version when starting flightly recommended) Auto-enable tracking when ASCOM clients send certain calibrate move directions on first setw (recommended) ASCOM RA MoveAxis = 0 Stops Tracking |

- 5. Initialization Setup Check all the boxes in the top right window
 - a) Sync Mount to PC Time
 - b) Set Latitude / Longitude default is to leave it checked.
 - c) 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.
 - d) Set Slew Rate Assuming that you are not in a rush, this is usually set to 600x.
 - e) Set PulseGuide / Guide Rate This must always be set at 1.00x.
 - f) Set PEM Enable / Disable This will depend on whether your factory set PEM is less than a year old or if you have created a new curve (provided that it was made correctly).
 - g) Set RA Backlash (not visible with CP4) always set to Zero correction.
 - h) Set Dec Backlash (not visible with CP4) always set to Zero correction.
 - i) Connect Time Out and Window Priority use default settings.
- 6. Other Options
 - a) Enable Debug Logs checked
 - b) Keep Mount Time Synced to PC Time checked
 - c) Convert Syncs to ReCals checked
 - d) Minimize Control Window on Connect uncheck
 - e) Show in Taskbar when minimized -checked
 - f) Check for New Version when Starting checked
 - g) Auto-enable Tracking when ASCOM Clients Send certain Commands checked
 - h) Calibrate Move Directions on First Slew checked if NOT using APCC.
 - i) ASCOM RA MoveAxis = 0 Stops Tracking unchecked

What is meant by "Initialization"?

All the important information that the mount needs is in the AP V2 ASCOM driver (you entered that information in the V2 driver's "Setup Telescope"). The information consisted of the latitude and longitude of your site, as well as the orientation of the telescope (expressed in the chosen "Unpark From" position). When you connect to the mount with your Third Party software, this information, along with the time and time zone from your computer, is sent to the mount providing it with all that is needed to calculate its move to your first object. A special initialization command is also sent. This process is called...**Initialization**.

Astro-Physics Command Center (APCC)

The Astro-Physics Command Center (APCC) adds many features and extended 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 via 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. Features of APCC Standard include the following:

- Direct Ethernet and / or WiFi connection to the mount from your PC. No Ethernet to serial emulators required!
- Virtual Serial Ports to connect multiple applications. The first port is optimized for the AP V2 Driver.

Some APCC Thoughts

- APCC launches first.
- It connects directly to the mount on its physical interface. RS232, USB, Ethernet or WiFi.
- It then creates one or more virtual COM ports for other programs (such as the AP V2 ASCOM driver) to connect to.
- Since it can create multiple virtual COM ports, multiple programs can connect to the mount at the same time. Even
 programs that don't normally want to share a connection to the same mount with other programs. (Note that the AP
 V2 ASCOM Driver is a hub and normally only needs one virtual port even with several client programs running.)

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 will provide more detailed information. **Don't forget to click of the "?" in the corners for specific information in that window!**

APCC -- Advanced Settings

APCC Setup

1. Program Operation window

- a) Ask if Ok to exit Checked (uncheck for remote)
- b) This form is always on top Unchecked
- c) Show Emergency Stop window 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) Show Status Window when starting Unchecked
- Auto Initialize (secs)
 0
 Image: Construction of the second s

Program Operation

Show Emergency Stop window

☑Ask if OK To exit ■This form is always on top ?

- e) Prevent errant RECALs Checked
- f) Exhaustive COM Port Search (Uncheck only if start up is slow) Checked
- g) Keep mount time synced to PC Time (enabling will override driver's setting) Checked
- h) Enable Tracking Rate Tweak Window Unchecked
- **3.** Virtual Ports Tab (see top of following page)
 - a) Virtual Ports randomly choose high COM numbers for the first two Virtual Ports (COM21 and COM22) so that they do not conflict with real COM ports. Once you have chosen them, click the "Create" button to the left of each.

 b) Once you have selected these Virtual COM ports, you will need to go to the AP V2 ASCOM driver and check the box "APCC Virtual Port" and change the selected Port to agree with your top Virtual port in APCC (we chose COM21 in the example).

| | Virtual Port Management | | | | | |
|------------|-------------------------|----------------|------------|--------------------------|-----------------|----------|
| | Virtual Port | Bytes Received | Bytes Sent | SYNC -> RCAL Translation | | |
| Delete | COM21 | 0 | 0 | Translate | | |
| Delete | COM22 | 0 | 0 | Translate | | |
| Create | None | 0 | 0 | Translate | | |
| Create | None | 0 | 0 | Translate | Delete Residual | |
| Create All | Delete All | | | | Virtual Ports | |
| | | | | | | |
| | | | | | | <u> </u> |

Remember: APCC will connect to the mount with the real port and the AP V2 driver will connect to the virtual port. Third Party software will connect to the AP V2 driver, which is a hub. In Third Party software the AP V2 driver is called "AstroPhysics GTO V2 Mount".

- 4. Edit Initialize Mount Settings window (choose from "Setting" in the Menu Bar)
 - a) Initialization "Site" and "Unpark" will fill in automatically from the other tabs
 - b) Optional Initialization
 - i) Set Tracking Rate Sidereal
 - ii) Set Guide Rate 1.00x (always)
 - iii) Set Slew Rate 600x
 - iv) Set Dec. and R.A. Backlash Check "0" (these only apply to CP3)
 - v) Set PEM Enable PEM (factory created PEM on new mounts)
- 5. Site Tab Site Information (should agree with AP V2 driver)
 - a) Click "Manage Sites" button
 - b) Create a named site
 - c) Enter Latitude and Longitude
 - d) Click Time Offset button (at right)
 - e) Enter Elevation, Temp (approximate) and default Pressure
- 6. Connection (reference the help file by clicking the "?" the details of this topic are beyond the scope of the Quick Start Guide)

The most complete information is found in the "Getting Started" section of the Pdf manual for APCC found at the following link: <u>http://www.astro-physics.com/tech_support/apcc/apcc-pro.pdf</u>

The most robust and recommended methods of connection are Ethernet and Serial. These will also allow greater computer to mount connectivity distance (up to 100' or more).

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.

- a) Create Virtual Ports first Checked
- b) Click the Now button connect the mount, but not the driver and click the now button to optimize the APCC / V2 driver configuration. Leave Auto-Config Unchecked.
- c) Auto-Connect these are a personal choice (generally checked)



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APCC - Initialize Astro-Physics Mount





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 to 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.

- **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 <u>fully</u> 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. <u>If so</u>, then slide the next heaviest weight all the way up. <u>If not</u>, 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!



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

1. 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 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 site of our website under "Mount Accessories / Instructions".



2. Daytime Alignment

Use the Park 1 or Park 4 position to polar align your telescope in the daytime or when Polaris is not visible. Note that Park 4 has been chosen for this procedure, as it is our recommended "horizontal" park position. Park 1 is only seconds away from tracking into a counterweight up status and, depending on your position, slews from Park 1 to western objects will cause the scope to point toward the ground when beginning the slew. Reference your mount manual for complete instructions.

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.
- 3. Drift Alignment R.A. Correction Method

Please see the Technical Support page of our website for the instructions to this alignment technique (<u>http://www.astro-physics.com/tech_support/mounts/Drift_Alignment_RA_Correction_Method.pdf</u>). 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 position the mount into one of these four Reference Park Positions. You will then tighten the clutches and power up the mount.

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.





Power up Mount; Connect Primary Control Software; Initialize.

Third Party connection to AP V2 driver

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 can be connected to it and operate simultaneously.

It is very easy to setup in your Third Party software.

 Locate the Telescope Chooser or Settings - all ASCOM compliant software will have a chooser or settings drop down menu with which you can select the AP V2 driver. The driver will be called "AstroPhysics GTO V2 Mount". 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. It is that simple!

- 2. Software Bisque's theSkyX software adds a step before the above procedure. From the Telescope Menu one selects "Telescope Setup"
 - a) Mount Setup drop down menu select "Choose" and then when the Choose Mount window opens you will select "AS-COM" and then highlight "ASCOM Mount". *Photo at right*

Important Note: Do NOT select Astro-Physics and the mounts listed. These are theSkyX drivers and not Astro-Physics drivers. They will NOT connect through ASCOM and the AP V2 driver, nor through APCC.

 b) Mount Setup drop down menu - select "Settings" and choose "AstroPhysics GTO V2 Mount" from the drop down menu. 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. Photo below left





Third Party connection to mount for devices other than Windows 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.

Whereas 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 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.

Resources for Mac users:

- <u>Starry Night Pro / Pro Plus</u> from Simulation Curriculum Corp. (Mac version with native driver) Currently v7.0.
- <u>The Sky X™</u> from Software Bisque. *The Sky X™* (Mac version with native driver). Currently v10.5.0.
- <u>Voyager</u>[™] from Carina Software (Mac version with native driver). Currently v4.5.
- Equinox Pro[™] from Microprojects Astronomy Software (Mac version with native driver). Currently v7.2.2.
- <u>SkySafari 5™ for OS X</u> by Simulation Curriculum Corp

In addition to the Mac software mentioned above, check out this resource of additional Mac software: *The Mac in Astronomy* by David E. Illig. Website: http://www.primordial-light.com/macastronomer.html

Mobile Smart Devices:

- <u>SkySafari™ for iOS</u> 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.
- <u>Luminos</u>[™] for iOS by Wobbleworks LLC This software is offered through their internet website. They do not use the ASCOM interface. Mount initialization is performed.

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 screenshots at right show an iOS device running Sky Safari 5 Plus, but it should be illustrative of 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. Open the app and go to its settings section.
- 4. Enter 172.31.0.1 as the IP address, and be sure to set the port to 23.
- 5. Connect and have fun.



| 〈 Settings | Setup | Done | | |
|-------------------------|------------|------------------|--|--|
| EQUIPMENT SELECTION | | | | |
| Scope Type | Ast | ro-Physics GTO > | | |
| Mount Type | Equatorial | GoTo (German) ゝ | | |
| COMMUNICATION SETTINGS | | | | |
| Auto-Detect Sk | yFi | | | |
| IP Address | 17: | 2.31.0.1 | | |
| Port Number | 23 | | | |
| SkyFi Settings Web Page | | | | |
| Set Time & Loc | ation | | | |
| Readout Rate | | 1 per second ゝ | | |
| Save Log File | | | | |
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