November 13, 2024

Astro-Physics GTOCP4 and GTOCP5 Version History and Bug Fixes

VCPx-P02-xx was developed for both the GTOCP4 and GTOCP5 control boxes. Depending on the configuration, this software can operate as a GTOCP4 to drive the servo motors of all previous mounts, or it can operate as a GTOCP5 to drive the servo-steppers of the Mach2GTO. As noted below, some of the features and functions are only appropriate for the Mach2GTO.

Encoder mounts: The term "encoder mounts" refers to all Astro-Physics mounts with RA and DEC absolute encoders (some 1100 and 1600 mounts and all Mach2) unless stated otherwise.

Update to most recent versions: The most recent versions of the V2 ASCOM Driver, APCC and the Keypad V5 versions are required to take advantage of new features. Refer to the Software Updates tab of our website.

Keypad Modeling License: The Keypad Modeling License is required for pointing model features. All GTOCP5 control boxes are programmed with this feature as well as all GTOCP4 control boxes with serial number CP4-1423 and higher. All other GTOCP4 control boxes must be upgraded. Refer to the Software Updates tab of our website.

Version VCPx-P02-17, 11/12/24

Improvements/Additions:

- For Mach2, improved stall detection during slews to reduce false motor stall errors.
- Updated GTO control box startup procedures to improve handling of queued commands when using serial/USB.

Bug Fixes:

- In some conditions during a meridian flip, a false limit was temporarily reported and then immediately cleared. This has been fixed.
- Updated safety park timer to work correctly through time and time zone changes.

Version VCPx-P02-16, 10/23/23

Improvements/Additions:

- **Improved sky modeling for non-encoder mounts with PEM enabled.** For non-encoder mounts, account for PEM curve during slew to improve pointing accuracy and improve resulting sky maps.
- **Improved dithering/centering when counterweight up.** Safety slew is bypassed if the target DEC coordinate is within 5 arc minutes of the current DEC position. This allows coordinate based "dithering" from third party software without added overhead of safety slew. APCC currently implements this

feature, however, those that don't use APCC are currently affected by the safety slew (which brings the mount to the counterweight-horizontal position and back again).

- **Improved slew settle time** - Deceleration rate is slower to reduce the effects of mechanical resonance of overloaded systems at the end of a slew.

- **Improve fault tolerance for parking** - When the park timer is configured to park to specified coordinates (HA and DEC) in the GTOCP5, it uses use encoder position, if available, rather than coordinate position, so park timer parks to correct HA and DEC even if a bad sync is performed.

- **Improve limit status reporting –** When a limit is hit and the action is bounce back, ensures APCC will still be notified the limit was hit and notify customer accordingly.

- **Enhance firmware update reliability by Incorporating TFTP (Trivial File Transfer Protocol)** to avoid issues with browser downloads “bricking” the control box. When fully implemented TFTP will enable firmware updates over Ethernet but with an applet instead of a browser. Browser updates are discouraged and will likely be deprecated in the future. TFTP will be supported by an update or replacement to AP GTO Utilities in the future. Firmware updates using AP GTO Utility is currently recommended approach.

- **Improved safety slews for longer OTAs.** Implement ability to rotate definition of "horizontal" counterweights, as used in safety slew only. Shift amount is adjustable. Function has no relationship to the meridian or meridian delay; it only affects safety slew. Shift value is not remembered through a power cycle, identical operation as the meridian delay. Requires command sent via terminal.

- **Horizon Safety Check option**. Horizon Safety check is needed by a very small number of users. Horizon Safety means that at no point in a slew is the scope allowed to point below the horizon. Slews are broken into multiple segments when necessary to avoid transient below-horizon positions. Horizon safety is now remembered through a power cycle with the default setting of “off”. Requires command via terminal.

- **Eliminate redundant safety park** - If the mount is already parked, and the park timer expires, stay parked and ignore the timer. This is redundant to APCC, but conditions have been observed where park timer doesn't get canceled by APCC when mount is parked from another source.

Bug Fixes:

- **Mach2 stall recovery no longer requires power cycle.** Allow recovery from stall in the GTOCP5 (Mach2) without needing a power cycle, when stall is due to low motor current, such as is caused when a motor phase is disconnected.

- **Mach2 correctly parks at home when using park timer.** In rare cases when the park-timer is configured to park to home, the Mach2 can park to the wrong place. Now it will Park to the correct home position whenever configured to do so.

- **Keypad (Meridian) Limit no longer ignores the meridian delay in the GTOCP5/Mach2**. See Keypad Manual for description of function.

- **Enhanced Safety Slew enforcement.** Reduce chances of an inadvertent pier crash by eliminating the Safety Slew bypass.

Version VCPx-P02-15, 8/1/22

Improvements/Additions:

- Further improvements in DEC axis auto-guiding when using a model and auto-guiding simultaneously when using mounts with absolute encoders.

Version VCPx-P02-14, 7/27/22

Improvements/Additions:

- All references to “Software” in the embedded web pages changed to “Firmware” for clarity and consistency with all the other documentation.

Bug fixes:

- Keypad V5.010 dropped “Modeling” from “Tools” menu when using Mach 2. Fix made here for expediency.

Version VCPx-P02-13, 6/30/22

Improvements/Additions:

- Improve stability of reported coordinates in an encoder mount. Done to mitigate the APPM "failure to reach target" errors.
- Implement detection of axis instability. Report RA and DEC axis oscillation in 9th and 10th $GOS# response characters respectively. Data recorded in APCC log files.

Bug fixes:

- Fix obscure bug that might cause serial firmware update to hang following successful completion of “part 2” download.
- Fix bug in stepper motor adaptive gain, broken by stepper motor “soft-start" when motor energized, introduced in prior version.

- Fix bug to allow proper encoder-based slew functions in the southern hemisphere (Find Home, Limits, Mach 2 Park). Bug introduced in P02-12.

Version VCPx-P02-12, 5/27/22

Improvements/Additions:

- Additional improvements in DEC axis auto-guiding when using a model and auto-guiding simultaneously when using mounts with absolute encoders.
- Add support for scanning and joining Wi-Fi networks using USBserialUtilities.
- Introduce “soft-start” to Mach 2, eliminate audible “click” when parking and unparking the Mach 2.
- Improvement in encoder fault tolerance when performing a “Find Home” by using mechanical home rather than encoder home.

Bug fixes:

- Change to Wi-Fi module firmware, creates VNET-P01-02. Turns Wi-Fi radio off when commanded to do so. Important for use near commercial radio telescopes. This change is not part of P02-12 but will be bundled with it. Only affects Wi-Fi modules in GTOCP4 beginning with S/N 1443 and GTOCP5 beginning with S/N 167.
- Improvement in ability to power up into a missing Wi-Fi network when the default action is to retry. Avoid hanging, only affects Wi-Fi modules in GTOCP4 beginning with S/N 1443 and GTOCP5 beginning with S/N 167.

Version VCPx-P02-11, 1/4/22

Improvements/Additions:

- Response time is improved on DEC axis when using a model and auto-guiding simultaneously when using mounts with absolute encoders.
- Peer-to-Peer connections made more robust on initial connection.
- Add two more characters to the encoder status string to separate the RA and DEC "trim" tracking rates from the RA/DEC "drift" tracking rates.

Bug fixes:

- Improve reliability of stall detection during tracking in GTOCP5.
- Updated to allow mDNS (multi-cast DNS) hostname resolution on Wi-Fi in BOTH Access Point and Station modes - previously only worked in Access Point on some hardware configurations.

Version VCPx-P02-10, 5/17/21

Improvements/Additions: None

Bug Fixes:

- Moving clutches on Mach 2 does not result in sync. Bug introduced in P02-09. Fix will also allow "Find Home" from a de-energized state.

Version VCPx-P02-09, 5/10/21

Improvements/Additions:

- Introduce mDNS (multi-cast DNS) for hostname resolution. Allows hostname resolution on non-Windows machines.
- Blink RED LED 90% duty cycle in some hardware configurations until Wi-Fi module is fully initialized.
- If an absolute encoder mount has a failed encoder, illuminate Amber LED, and convert encoder park commands to coordinate park commands. "Find Home" becomes park 3 coordinates, but no post-slew sync is performed in the Mach 2.
- Added capability the Network Association web page to allow manual entry of both the SSID and the password, bypassing the network scan. This is necessary to allow joining to a hidden network, and to get around limitatons with some Wi-Fi module types that don't provide scan results that include SSID's containing certain special characters.
- Eliminated hostname resolution enablement flags from Advanced Settings" embedded web pages. Wi-Fi only implements mDNS, and cabled Ethernet implements mDNS and NBNS. Enablement is not user configurable.
- If the input voltage is less than 18 volts, reduce GTOCP5 motor volts-per-hertz by 2/3. In concert with previously implemented slew and button rate limiting, reduces source power demand to reduce occurrences low-voltage warning errors.

Bug fixes:

- User updates to Access Point SSID, Password, channel, etc.,) take effect on next creation of the Access Point (i.e., power cycle or mode change).
- To avoid stalling Wi-Fi module during startup with certain module types, inhibit network scan until Wi-Fi fully initialized. Result is that the "Re-scan Available Networks" will need to be clicked initially.
- Keep progress bar at 100% following download of *.pt2.
- Allow for encoder correction loop to settle prior to parking at the end of a slew. Allows more accurate park positions.

Version VCPx-P02-08, 12/5/20

First wide release for GTOCP4

Improvements/Additions:

- Improvement in download to WiFi module.
- For Keypad: Facilitate improved automation of keypad downloads.
- For Keypad: Orthogonality modeling improvements (Mach2GTO at time of release; GTOCP4 can use this feature with as of July 2022 with Keypad Modeling License installed)
- **Bug Fixes:**
- Fix truncated network scan list from WiFi module, as shown in embedded web pages.

Version VCPx-P02-07, 10/16/20

Improvements/Additions:

- Upgrades and improvements to IP connection functionality.
- Update embedded web pages to refer to GTOCPx rather than GTOCP4. GTOCP5 users still see GTOCP4 in web pages.

Bug Fixes:

- Fix bug that requires DEC axis to also be active on startup, to get RA encoder data. (Mach2GTO)

Version VCPx-P02-06, 9/5/20

Improvements/Additions:

- For Keypad: Enablement for Internal meridian limits remembered through a power cycle. Internal meridian limits based on the encoder in the Mach2. (Mach2GTO)
- For Keypad: Further development of keypad pointing and tracking modeling feature. (Mach2GTO at time of release; GTOCP4 can use this feature with as of July 2022 with Keypad Modeling License installed)
- **Bug Fixes:**
- Account for amount of RA tracking while waiting for DEC to complete slew to home when re-calibrating.
- Fix error in Mach2 Encoder Park positions, Southern Hemisphere positions are 180 deg. off in DEC. (Mach2GTO)

Version VCPx-P02-05, 6/29/20

Improvements/Additions:

- For Keypad: Additional improvements to pointing, tracking and orthogonality models and other features for the keypad.

Bug Fixes:

- Restore stall detection in CP5, both tracking and slewing. Detection was affected by prior changes. (Mach2GTO)

November 13, 2024

Version VCPx-P02-04, 4/30/20

Improvements/Additions:

- For Keypad: Improvements in accuracy of pointing model. (Mach2GTO at time of release; GTOCP4 can use this feature as of July 2022 with Keypad Modeling License installed)

Bug Fixes:

- Eliminate stability problem resulting from bug fix in P02-03.

Version VCPx-P02-03, 3/21/20

Improvements/Additions:

- Improve legacy compatibility for updating older GTOCP4 units.
- For Keypad: Further development of pointing and tracking models. (Mach2GTO at time of release; GTOCP4 can use this feature with as of July 2022 with Keypad Modeling License installed)

Bug Fixes:

- Remove erroneous clutch slippage detection from non-encoder mounts.
- Fix bug that allowed slews to accumulate small amounts of positional error when correcting with encoders.

Version VCPx-P02-02, 2/25/20

Improvements/Additions:

- Modify button rate sequence such that 0.25x, 0.5x, and 1.0x button rates correspond to **:RC5#, :RC6#,** and **:RC7#** respectively. This allows **:RC0#** and **:RC1#** to remain 12x and 64x resp. for backward compatibility. Previously, the slower rates were shared with guide rates.
- Improve robustness of code download web pages.

Bug Fixes: None

Version VCPx-P02-01, 2/10/20

VCPx-P02-xx is a major update that provides full support for the Mach2GTO. Depending on the configuration, this software can operate as a GTOCP4 to drive the servo motors of all previous mounts, or it can operate as a GTOCP5 to drive the servo-steppers of the Mach2GTO. Going forward, we will continue to include BOTH configurations in a single software package. There are also many new features that all users will find beneficial.

Improvements/Additions:

- Included higher precision on command responses; **HH:MM:SS.ss#** and **sDD*MM:SS.s#**. This brings precision to one hundredth of a second for hour fields like Right Ascension, and to one-tenth of an arc-second for degree fields like Declination. You must use the appropriate version of APCC or other software to utilize this precision.
- Added ability to query for the last commanded coordinates.
- Slew rates and the fastest 2 button rates are now modulated for different mounts. This allows the faster slew rate for the Mach2GTO, and slower rates for the 3600GTO and OEM mounts that use the Astro-Physics GTO Servo System (Mathis, Parallax). The appropriate rate table is indicated in the status string from the GTOCPx. This allows rate commands to remain unchanged in external software applications.
- Guide rates have been decoupled from the slowest button rates.
- Improved fault and limit reporting.
- Provisions for different gearing on RA and DEC
- Add option to park to pre-defined coordinates, or to home, on timeout of park timer.
- Added option for tracking at rate computed by the "King Equation". **:RT8#**
- Numerous improvements to IP functionality – both Ethernet and WiFi.
- Numerous improvements to the internal web pages.
    - Added additional "command set" lines to debug terminal web page, and button to Restore from Last Parked.
    - Software update improvements including better recovery from problems and text clarifications
- Extensive support for Mach2 encoder-based standard and custom park positions, re-calibration in event of initialization error and encoder-based slews. (Mach2GTO)
- Provisions for use of Stepper Motors (Mach2GTO).
- For Keypad: Added full tracking and pointing model, 128 points on each of the pier sides, for each model type. Includes orthogonality. (Mach2GTO at time of release; GTOCP4 can use this feature with as of July 2022 with Keypad Modeling License installed)

Bug Fixes: None

November 13, 2024

********** Version P01-xx for the GTOCP4 only **********

Version VCP4-P01-14, 07/16/20

- Added support for keypad updates through bottom COM port and USB. Both 9-pin COM ports and the USB now support keypad firmware and database uploads.
- This installation package for VCP4-P01-14 also includes the : WiFi A404.wif update

Version VCP4-P01-13, 1/14/19

- Fix bug: Corrected errors in responses to encoder status queries.

Version VCP4-P01-12, 10/22/18

- Fix bug: Slew Scaling factor incorrectly calculated when standard slew command is issued, and when slew scaling is enabled. Affected 3600s, 400/600s with 32:1 gearboxes, and some OEM mounts.

Version VCP4-P01-11, 12/19/17

- Fix bug where a meridian delay could cause an incorrect internal limit calculation if the delay crossed the LST 24/0 rollover point.

Version VCP4-P01-10, 9/17/17

- Ignore whitespace in numeric data when using terminal page of embedded browser.
- Fix bug causing erratic motion when meridian overflows from 23:59:59 to 0:00:00 during slew.
- Recognize negative sign on entry of hour-only format for GMT offset.

Version VCP4-P01-09, 8/29/17

- Backed out change in VCP4-P01-07: Hour Angle command now returns "normalized" hour-angle again. Added new command to return un-normalized representation of HA.
- Both hour angle commands now return 0:00.0 if mount has not been initialized.
- Fix bug in PEM record function to allow proper playback of PEM record "drift"
- Fix bug that corrupts Centering Rate when reading Guide Rate.
- Fix bug that results in errors introduced in the saved mechanical positions and zero'ing the meridian delay, in a power interruption that does not result in reboot of the unit (i.e. recoverable Low Voltage Warning)
- Fix bug in trim command responses.

Version VCP4-P01-08, 7/25/17

- Fix bug that prevents completion of slew in RA axis when zero tracking rate selected. Bug introduced in VCP4-P01-07

Version VCP4-P01-07, 7/21/17

- Implemented method of allowing software updates to be performed while preserving the calibration of the mount.
- Eliminate internal limit-bounce if unit powers up in internal limits.
- Bug Fix: When internal limit is active with zero tracking speed selected, fix bug that produces tracking in direction opposite sidereal rate in RA axis.
- Bug Fix: Fixed issue of rounding up 59+ seconds in seconds field, to 60 in both DDD*MM:SS and HH:MM:SS formats.

Version VCP4-P01-06, 6/15/17

- Internal limits added. Fixed RA limits at hour-angles that position the counterweights straight up. Fixed DEC limits at 180 degrees from the pole.
- "Page not Found" web page auto-redirects to main page.
- Bug Fix: Auto-Guide moves superimposed on zero tracking rate produce proper rates.
- Bug Fix: Keypad download support restored, bug introduced in VCP4-P01-04 (COMM2 and Keypad serial interfaces logically swapped)

Version VCP4-P01-05, 04-18-17

- Bug Fix: Absolute Encoder based "Go Home" ($HA# command) function fails to complete move in DEC axis. Bug introduced in VCP4-P01-04.

Version VCP4-P01-04, 03-08-17

- Safety slew/ meridian delay now allows delay of +/- 11:59:59.
- Improved accuracy of RA/DEC readings in standard servo loop.
- Add web page entry for indicating WiFi Firmware revision in Advanced WiFi Settings page.
- Allow WiFi Module firmware updates from web browser or serial (Ymodem).
- Extensive restructuring.
- Improved reliability in startup when no wifi network is available.
- Bug Fix: Improved recovery from lost WiFi network connection, in concert with WiFi firmware revision A402.
- Bug Fix: Joining or leaving a WiFi network from the web-page occasionally resulted in hung GTOCP4.
- Bug Fix: "EW" field reversed in status string (:GOS#) command response.

- Bug Fix: List of available networks web-page occasionally failed to update after joining or leaving a network.

Version VCP4-P01-03, 10-28-16

- Improve accuracy of gear angle command responses.
- Allow use of encoders to trim the pointing at the end of a slew, enabled separately from tracking corrections.
- Fixed bug that prevented DEC centering rate from updating when using :Rcxxx# command.
- Fixed bug in handling of blocked command sets received on a network port in some situations.

Version VCP4-P01-02, 09-28-16

- Added command to allow slew without "safety slew" logic.
- Added support for 3600GTO Precision (incremental) encoder on RA axis, used for tracking corrections.
- Included Home and Limit Switch support for the GTOCP4 as it was with the with GTOELS box.
- Added support for independent RA and DEC centering rates, intended for future use with joy-stick controllers.
- Bug fix: Update DEC centering rate when guide rates are selected to make it function the same as RA and same as in GTOCP1/GTOCP2/GTCOP3.

Version VCP4-P01-01, 07-12-16

- Include signal strength in table of available Wi-Fi networks when using browser to connect the GTOCP4 to a Wi-Fi network. This will assist in adjusting the GTOCP4 Wi-Fi antenna for optimal reception. Added serial command to provide strength of currently joined Wi-Fi “hot spot”.
- Force retention of IP addresses when re-booting during a web browser-based download, by not issuing a DHCP request as a client.
- DHCP server mode does not provide a default gateway in the DHCP reply. Done to avoid problems of PC not knowing whether a given subnet is accessed locally on one interface, or through a gateway on another interface.
- Software downloads using Wi-Fi disabled due to unreliable nature of Wi-Fi.
- Bug fix: Include timed moves in PEM correction recording.
- Bug fix: If DHCP client times out, apply default IP address, subnet and default gateway.
- Bug fix: Upload/download of PEM curves using Ethernet can be done without intermittent Servo Fault indication.
- Bug fix: To prevent overlap in buffering for different communication interfaces.
- Bug fix: No longer hangs if CP4 is scanning available Wi-Fi networks and more than 10 are available.
- Bug fix: Command returns correct Wi-Fi MAC address when unit has joined a Wi-Fi network.
- Bug fix: When setting Absolute Encoder home, reset encoder correction loop to avoid trying to correct for a 360 degree error when starting with an encoder position outside 0-360 degree range.
- Bug fix: PEM programming offset is correctly computed.

Version VCP4-P01-00, 05-06-16, Initial Release