



APX Release Notes

Document # PUBS-CINS-005671

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1. Introduction

This document describes software release notes for the following APX products:

- APX-15 V2 single antenna OEM board (End Of Life as of firmware 5.50-F)
- APX-15 V3 single antenna OEM board
- APX-18 dual antenna OEM board
- AVX210 single antenna enclosed system
- LVX dual antenna enclosed system
- APX-15EI single antenna OEM board stack with interface to external AIMU-M5
- APX-20 single antenna OEM board stack with interface to external AIMU-M6 and AIMU-M7.

The features described for each software release apply to all APX products unless explicitly noted.

Note that although the firmware version is typically common for all APX products there are unique files to load for each hardware platform.

2. APX-8/APX-15/APX-EI Firmware 8.20.006

Release Date: 2022-03-02

- **DMI**
 - Added support for Pulse and Direction type DMIs for AVLV models.
- **Configuration**
 - Enable Beidou B1C and GPS L1C tracking options.
 - Added support for APX-8.
 - Added support for AVLV models.
- **I/O Configuration**
 - Corrected output of high rate real-time navigation solution messages to eliminate data clumping.
 - Corrected NMEA HDT heading output on all navigation modes.
 - Fixed the incorrect port ID on FTP passive mode.
- **INS Control**
 - Changed INS configuration mounting angles page labels from Roll, Pitch and Yaw to X, Y and Z as per Tait-Bryan Z-Y'-X" rotation sequence.
 - Changed GNSS lever arm 1-sigma default to non-zero value.
- **Navigation**
 - Corrected a condition that some remote IMUs do not handle week rollover correctly resulting in DR mode.
 - Enhanced Navigation solution performance.
 - Enhanced L2C carrier performance.
 - Enhanced IRNSS position solutions.
 - Updated the antenna library.
 - Enhanced CMRx Performance.
 - Improved outlier detection in GNSS navigator.
 - Improved RTK availability after gaps.
 - Improved GNSS navigator noise modeling and performance.
 - Added validity check for GLONASS ephemeris parameter.
 - Added support for GPS-L1C.

3. APX Firmware 5.50-J

Release Date: 2021-03-02

- **APX-20 New IMU**
 - Added support for new AIMU-M7. The IMU is identified as Type 90 in the firmware and is available for selection from the *External IMU Type* drop-down menu on the *Receiver Configuration – External IMU Configuration* GUI page.
 - Refer to the **IMU Type 90 OEM Integration Manual** (PUBS-MAN-006497) for mechanical and electrical details.

4. APX-18/LVX Firmware 6.10-0.68-A for LV Only

This firmware is only for Land (LV) configurations of APX-18 and LVX products.

This firmware was originally released as 5.50-0.68-A but has been renamed to match the version displayed on the web GUI Identity and Firmware pages.

- **New Navigation Engine**
 - This firmware release (for Land products only) introduces a new navigation engine which delivers superior performance in all environments but especially in challenging urban locations.
 - Key features of the navigation engine are:
 - Higher stability and robustness of the navigation solution
 - Faster convergence of the ambiguity-fixed positioning solution
 - Ability to maintain lock in the most difficult scenarios leveraging the tightly coupled - multiple constellation support
 - Improved performance under tree crown environment with new multipath model
 - Improved performance of dual antenna heading
 - Faster heading convergence during dynamic start

- **Ethernet Clock**
 - Clock jitter was reduced to improve efficiency of communications. The ramifications may not be obvious except with higher volumes of Ethernet traffic and certain switches and routers.

5. APX Firmware 5.50-H

Active Firmware Warranty Date: November 29, 2020

- **System Reset Fix**

- A bug was introduced in firmware 5.50-G where the system could reset at boot up as soon as navigation started. This was caused by a memory misalignment in the navigation engine which, depending on the memory allocations during boot, would cause the process to crash and the system to reset. This has been corrected in 5.50-H with no other changes in functionality. The release date and warranty date have been updated.

6. APX Firmware 5.50-G

DO NOT USE, THIS VERSION HAS BEEN REPLACED BY 5.50-H.

- **1 PPS Time Tag**
 - A bug was introduced in firmware 5.50-F where the 1 PPS time tag output was removed. This function has been restored in the new firmware.

- **Gimbal Display**
 - Raw gimbal data will now be displayed on the web GUI regardless of the navigation status to facilitate debugging of the gimbal interface. There is no change to the gimbal data processing.

- **External IMU Parameters**
 - There was a bug where the external IMU installation parameters were passed to the navigation engine if an external IMU was configured, regardless if the external IMU navigation mode was selected or not. This has been corrected.

- **Event Nav Shift Time**
 - Corrected the bug where the Nav Shift Time for Event #2 was always overwritten by Event #1.

- **DGaaS ID Assignment**
 - Cleaned up the assignment of DGaaS ID so internal and external IMU data is consistent.

- **APX-15v2 Support Ended**
 - The End Of Life (EOL) product APX-15v2 is not supported by this firmware.

7. APX Firmware 5.50-F

- **OEM ICD**
 - OEM customers under a NDA have access to a programmatic interface. There are messages to set and read GNSS and IMU installation parameters, control data logging and retrieve information about the APX such as serial number and firmware version.
 - The details of the interface are described in document PUBS-ICD-006232.

- **AV18 Antenna**
 - Antenna type AV18 has been added to the Antenna Type selection list on the antenna configuration web pages.

- **Event 2 Trigger Correction**
 - The Event 2 Slope setting (positive/negative) on the General receiver configuration web page is now maintained when the system is rebooted.

- **Enhanced CPU Performance**
 - APX firmware has been tuned to reduce real-time data output latency and the possibility of logged data gaps when the system is under 'heavy load'. Heavy load is difficult to define since many variables affect CPU processing such as the number of satellites tracked and used in the solution, the number of frequency bands enabled, correction streams employed, external event input rates and the number and frequency of output streams configured. Nevertheless, this firmware does a superior job at managing competing priorities to keep everything functioning properly.
 - Practical tips to minimize unnecessary load are:
 - Keep the Elevation Mask angle at 10° or higher.
 - Track only those GNSS signals that have the most benefit in the environment.
 - Eliminate unnecessary event input triggers
 - Make judicious choices of output data streams

- **Week Rollover Reset**
 - A correction has been implemented to prevent the system from resetting at the week rollover when in RTK or SBAS mode.

8. APX Firmware 5.50-A

Refer to the user guides for details on the two new features summarized below.

- **Event Triggered Navigation Output**
 - There are new NMEA and GSOF real-time output formats that are triggered by event inputs. These formats are identified as EN1 and EN2 in the NMEA output selection page and Event ‘n’ Navigation Info in the GSOF output selection page, where ‘n’ is 1 or 2.
 - When an event pulse is received by APX its time is registered. Only for the event triggered navigation output this time can be adjusted, forward or backward, to account for misalignment of the event pulse and the time of interest in the sensor. This is set on the Receiver Configuration – General page in the Event ‘n’ Navigation Shift boxes for events 1 and 2.
 - Using the adjusted time tag the APX computes an interpolated navigation record and formats the output stream. Because the navigation needs to be interpolated the latency on the output is greater than the EVT output.

- **GNSS Denied (‘Indoor Only’) Mode**
 - APX firmware now supports Indoor Only mode which completely ignores GNSS, whether it is available or not, and simply logs IMU data.
 - Data is logged using system time starting from 0, unless the NTP client is enabled and there is a source of network time, in which case the data is logged using that time.

9. APX Firmware 5.40-B

- **External IMU Navigation**
 - For systems that have external IMU support (APX-15EI and APX-20) it is now possible to select the external IMU for real time navigation processing. Both the internal and external IMU data will still be logged (if enabled) and a flag in the logged data will indicate to POSpac which IMU was used in real time so the data will be displayed correctly.
 - Please refer to the APX UAV Configuration Guide for details on how to configure and select the external IMU navigation.

- **Microdrones Autopilot Support**
 - APX firmware now supports microdrones autopilot input for computation of gimbal angles when APX is mounted on a gimbal mount.

- **Antenna Type Added**
 - Antenna type AT1675-540TS has been added to the Antenna Type selection list on the Antenna Configuration Web page.

- **DMI Direction Indication**
 - The DMI direction indication (forward/reverse) on the Web GUI has been corrected for negative DMI scale factors.

- **External IMU Enhancements**
 - Systems in the field may now upgrade the External IMU support model (none, -15EI or -20) through the application of an option code in the Web GUI. It is no longer necessary to use Winflash through a serial port.

- **IMU 82 Support**
 - This firmware adds support for IMU type 82 for APX-20 products. This IMU type is selectable from the configuration page along with the previous IMU type 71.

10. APX Firmware 5.40-A

- **External IMU Enhancements**
 - Baud Rate - When the external IMU is enabled the baud rate on COM 2 is automatically set to 115200 and the controls for baud rate, parity, etc. are locked. These settings are required for external IMU communications.
 - COM 2 Usage – The external IMU only requires the input side of COM 2 so now the output is available to the user, under the constraints of fixed baud rate, etc. If the external IMU is disabled via the Web GUI then COM 2 is freed up for user configurations.
 - Diagnostics – Real time external IMU data is displayed on the INS Status page of the Web GUI. This allows verification that the external IMU is functional prior to launching a mission.
 - Configuration Upgrade – An APX-15v3 system may now be upgraded in the field to external IMU APX-15EI or APX-20 through the application of a password through Winflash (connection via serial or USB required). Note that the appropriate hardware is required to complete the package.
- **Clone File Enhancement**
 - Cloning now includes all IMU and dual antenna installation parameters which were missing in previous firmware versions. Clone file generation and installation is controlled from the Receiver Configuration-> Application Files-> Operation menu.
- **Gimbal startup corrected**
 - APX and gimbal may now be started up in any order.

11. APX Firmware 5.32_EI

Note that this firmware is applicable only to the APX-15EI and APX-20 products.

- **Support for External IMUs**

This firmware supports the logging of external IMU data for subsequent post processing in POSpac. These products consist of the APX GNSS-INS board plus an interface board which connects to a remote IMU. The remote IMU data is logged while the real-time navigation is performed using the INS on-board the APX.

12. APX Firmware 5.31

- **Gimbal Support for APX-15**
- **Support for new APX-18 Product**
- **Added SBAS/SBAS+**
- **Minor fixes and enhancements**
 - Correction to Mag status on INS Status page
 - Core GNSS updates
 - Correct antenna vector output when secondary antenna disconnected

13. APX-15v2 Firmware 5.21

- **Capability to enable/disable Ethernet power saving mode**

A new button has been added to enable or disable the system from entering Ethernet power saving mode. In previous firmware versions the system would automatically enter Ethernet power saving mode if Ethernet was not active for a period of time, which meant APX had to be rebooted after a mission to access the logged files via Ethernet.

- **Fix GGA output inconsistency in SBAS mode**

GGA output message was inconsistent in SBAS mode in previous releases. It is now corrected and consistent with our manual.

- **Increase stability when hot plugging USB**

In previous firmware hot plugging a USB on APX-15 systems might restart the firmware. This issue is now fixed.

- **GNSS Enhancements**

Numerous low level enhancements to GNSS operations.

14. APX-15v2 Firmware 5.15

Release date September 16, 2016

- **Batch file download**

New feature to download multiple files without having to individually select and confirm each file. The procedure is to check mark all the files you want to download and then select “Download selected files”. Note that the exact behaviour depends on the web browser being used and the browser security settings.

- **Magnetometer calibration on GUI**

The web GUI (Receiver Status-> INS Status page) now indicates the status of magnetometer and when it was last calibrated. The mode (2D/3D) is also displayed.

- **DMI pulse count display**

The DMI pulse count, distance and direction are now displayed in the web GUI (Receiver Status-> INS Status page) which is a valuable tool for testing and trouble shooting the interface. There is a known issue with negative scale factor not being accounted for in the direction display, however, the navigation solution isn't affected by this.

- **Expand magnetometer calibration range**

Previously the magnetometer was only allowed to be calibrated if system was less than 50 meters from power on location. This limit is now removed and system can begin calibration beyond 50 meters, provided the dynamics required for calibration are met.

- **Relax accelerometer threshold that causes navigator reset**

The accelerometer saturation threshold was 6g. Once saturation happened the system would restart 5 seconds after the occurrence. The acceleration limit has now been increased to 8g and the restart wait time has been reduced to 1 second. This primarily benefits fixed wing UAVs that are launched from catapults as it reduces the chance that the navigator will reset, and if it does reset the quick restart time means it is more likely the UAV is still in a straight trajectory which aids in alignment.

- **Calibration procedure improvement**

This firmware introduces new augmentation to the calibration procedure. Now calibration can be achieved after rotating the system through two full revolutions.

15. APX-15v2 Firmware 5.14

Release date May 20, 2016

- **100 Hz Output**

Implemented 100 Hz real-time NMEA output.

- **AutoLog File Creation Improved**

Enabling the AutoLog feature is a convenient way to ensure mission data is always logged, but previously there could be confusion in the file names if one mission quickly followed another. The new implementation only offers the AutoLog functionality if “Always” or “Continuous” schedule modes are selected. The file names are then limited to:

####JJJx

#####YYYYMMDDHHMM

SystJJJhmm YYMMDDhhmm

System__YYYYMMDDHHmm

SystYYYYMMDDHHmm

With this configuration the AutoLog feature will always start a new file upon system restart, ensuring that missions are uniquely identified.

- **GNSS Enhancements**

Numerous low level enhancements to GNSS operations.