Piksi Multi Firmware 3.0 Release Notes

Version 2
2022-08-25

Introduction

Swift Navigation provides the Piksi® Multi firmware release v3.0.11 that features a new Starling sensor fusion engine along with numerous improvements. This firmware is used on Piksi Multi, Piksi Multi Inertial, Duro® and Duro Inertial products.

New and Enhanced Features

- Delivers improved GNSS performance in all environments.
- Sensor fusion software engine, available on Piksi Multi Inertial and Duro Inertial, is updated to Starling Fusion Engine.
    - Most applications will see position accuracy and availability improvements in GNSS challenging environments.
    - Separate INS output rate, independent of the GNSS-only output rate.
    - Several prior inertial fusion settings are replaced with new ones.
    - A new alignment process has been implemented.
    - Outputs new POS_LLH_ACC message
- Update Piksi Multi to Starling version 1.10.
- Provides improved stability.
- New firmware settings to reduce electromagnetic emissions.
    - Option to disable SD card interface.

    - Ethernet speed set to 10 Mbps.

- New Swift Console v4.0 released in combination with Piksi 3.0 firmware.

Settings Changes

The following settings have been updated for the v3.0 firmware release.

INS Settings

Many INS settings have been created for the new Fusion Engine. While most settings are visible only within the Advanced Settings, some are visible by default. The subsections below present the updated settings.

New and Updated Settings

All settings that have been created or updated for this v3.0 release are listed in their subsections below. Refer to the SBP v4.1.1 Specification for complete details regarding all settings.

INS Settings

- accel_bias_instability_avar_millig_sensorframe_x
- accel_bias_instability_avar_millig_sensorframe_y
- accel_bias_instability_avar_millig_sensorframe_z
- accel_velocity_random_walk_microgpersqrtHz_sensorframe_x
- accel_velocity_random_walk_microgpersqrtHz_sensorframe_y
- accel_velocity_random_walk_microgpersqrtHz_sensorframe_z
- alignment_cog_enable
- alignment_cog_low_speed_disambiguation_enable
- alignment_cog_min_speed_meters_per_second
- alignment_settings_1
- antenna_offset_deviation
- antenna_offset_z
- dr_duration_max
- dr_timeout_pos_stddev
- fused_soln_freq
- gyro_angular_random_walk_degpersqrth_sensorframe_x
- gyro_angular_random_walk_degpersqrth_sensorframe_y
- gyro_angular_random_walk_degpersqrth_sensorframe_z

- gyro_bias_instability_avar_degperh_sensorframe_x
- gyro_bias_instability_avar_degperh_sensorframe_y
- gyro_bias_instability_avar_degperh_sensorframe_z
- lowpass_filter_cutoff_hz
- pos_std_deviation_cutoff_meters
- solution_accuracy_confidence_level
- vehicle_frame_deviation
- zupt_enable_full_zerovel_update
- zupt_enable_partial_zerovel_update
- zupt_enable_zero_angular_rate_update
- zupt_acceleration_threshold_mpers2
- zupt_angular_rate_threshold_degpers
- zupt_settings_1
- zupt_settings_2
- zupt_settings_3
- zupt_settings_4
- zupt_settings_5

nmea Settings

- cog_output_min_speed
- cog_update_min_speed

rtcm_out Settings

- enable_ephemeris

standalone_logging Settings

- sdcard_enable

Message Changes

All messages that have been created or updated for this v3.0 release are listed in their subsections below. Refer to the SBP v4.1.1 Specification for complete details regarding all messages.

New Messages

- MSG_SOLN_META
- MSG_GPS_TIME_GNSS
- MSG_UTC_TIME_GNSS
- MSG_POS_LLH_ACC
- MSG_GNSS_TIME_OFFSET
- MSG_GROUP_META

Updated Messages

- MSG_IMU_RAW
- MSG_INS_STATUS
- MSG_VEL_ECEF_GNSS
- MSG_VEL_NED
- MSG_VEL_NED_COV
- MSG_VEL_ECEF
- MSG_VEL_ECEF_COV
- MSG_MAG_RAW

Corrected Issues/Enhancements since Firmware v2.4

- Fixed a crash that occasionally happened when using GPS-only solutions.
- Decreased the latency of IMU measurements reported to the sensor fusion engine.
- Fixed a buffer overflow in NTRIP client which could leave the system unable to use corrections.
- Fixed a buffer overflow when a very long settings value is provided.
- Added an additional check which enforces that the IMU rate is always twice that of the INS rate, which avoids unintended behaviors.
- Added an additional check that enables alignment COG minimum speeds to be set to greater than 0 m/s and issues a warning when speeds less than 1 m/s are set.
- Fixed issue where an upcoming leap second would be applied as soon as it is announced, instead of at the later leap second epoch when it should take effect.

Known Issues

- Fusion Alignment—the initialization behavior of the sensor-fusion filter has changed. The initialization has been made more robust to improve the overall performance of the sensor-fusion filter and to limit long attitude convergence times. Most applications will experience improved performance and improved usability.

  However, in a number of specific applications, the change may prevent the sensor-fusion filter from initializing correctly. The impact may be limited to changing the default alignment settings to ensure initialization. In some cases, the stricter initialization criteria may prevent correct initialization entirely.

  - The new INS alignment process requires vehicles to drive forward during the alignment.
  - At the end of alignment, when the engine switches to Ready state, there is a momentary period of DR mode.

- There is a short (few seconds) position output data gap when the inertial fusion is running during the GPS time of the week rollover.

- Age of Corrections is not provided in MSG_SOLN_META SBP message.

- POS_LLA_ACC message is available only if inertial fusion is enabled. If inertial fusion is not enabled and the license file does not exist, this message is not available as expected.

- Messages POS_ORIENT_QUAT and ANGULAR_RATE are not being output.

- GNSS simulator position output works only when the INS mode is disabled (Piksi Multi Inertial and Duro Inertial only).

- When the INS fusion is enabled, MSG_UTC_TIME reports a UTC offset status as factory default and uses only the default GPS time - UTC offset. Message MSG_UTC_TIME_GNSS reports the correct status and uses the proper time offset value.

SBP Version

- SBP v4.1.1

Document History

Date	Version	Changes
2022-07-12	1	Initial release.
2022-08-25	2	Updated Messages update ● Added “MSG_MAG_RAW” Known Issues updates ● Added three bullets to the end of the section.