

# MicroStrain Sensing Technical Note

## 3DMGQ7

### Current Firmware Upgrade

#### Date

March 30, 2022

#### Summary

This technical note details the most current firmware available for the MicroStrain Sensing **3DMGQ7** inertial sensor. The technical note additionally describes firmware changes since the initial product release and the use of SensorConnect software to perform the firmware upgrade.

#### Detail

As we see in the table below, the current firmware for the model 6284-4220 **3DMGQ7** is version **1.0.10**. This firmware is contained in the file object entitled **GQ7\_Firmware\_2022\_FEB\_b9.zhex**.

#### 3DMGQ7 Firmware

Firmware Version	ChangeLog
1.0.01	Initial Firmware Release
1.0.02	<ol style="list-style-type: none"><li>Added odometer scale factor state to EKF to improve speed measurement and added ODOMETER_SCALE_FACTOR_ERROR (0x8247) and ODOMETER_SCALE_FACTOR_ERROR_UNCERTAINTY (0x8248) data fields.</li><li>Modified GNSS preprocessing to improve tight coupling / RTK performance.</li><li>Removed oscillations in attitude under static conditions in Vertical Gyro/AHRS mode.</li><li>Initial gyro bias convergence improved.</li><li>Now accepts GPS Time Update command (0x0172) when the PPS source is anything but one of the internal receivers.</li><li>USB driver modified to stop sending data when no host is detected via SET_LINE_CONTROL_STATE packet. This fixes a communications failure issue in Linux and Windows when the host reboots and the device was in streaming mode.</li><li>LED behavior modified to be consistent given above USB driver change.</li></ol>
1.0.03	<ol style="list-style-type: none"><li>Fixed bug with DA float solution uncertainty not updating if the number of L2 measurements are below threshold.</li><li>Fixed an inaccuracy in the calculation of DA float update using inertial data.</li><li>Improved recovery time of poor dual antenna fix.</li><li>Modified Kalman filter reset code to: a) prevent filter divergence for large clock jumps (occasionally seen on power up after initial PPS lock), b) ensure complete reset, both major and minor cycle.</li><li>Modified filter data timestamp assignment so that timestamps are monotonic, even after reset (they were resetting to zero for 1 major cycle after reset).</li><li>Lowered residual warning threshold for dual antenna measurement.</li></ol>
1.0.04	Fixed estimation filter orientation matrix and quaternion to match DCP (were the inverse transformation.)

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1.0.05	<ol style="list-style-type: none"><li>1. Fixed field index and field count values for raw GNSS data fields (0x20 and 0x22) to reflect only transmitted data (disabled constellations aren't counted now).</li><li>2. Balanced DA float solution to rely less on L2, and to reduce reliance on initial measurements and reduce chance of outliers giving a bad initial fix.</li><li>3. Modified RTK processing to improve long baseline performance.</li><li>4. Added (0x82,0x49) filter data with clearer information regarding DA fix.</li><li>5. Updated warning flag conditions for error states (high bias/scale factors/mounting errors) will trigger warning flags.</li><li>6. Made antenna offset error tracking enabled by default.</li><li>7. Fixed certain raw GNSS data quantities not being transmitted properly.</li><li>8. Fixed GNSS solution data not decimating properly when raw GNSS data was also selected for transmission.</li></ol>
1.0.06	Fixed a bug in the reference position configuration command (0x0D, 0x55) that caused an invalid parameter error for altitudes of 0 or less. These should be allowed.
1.0.07	<ol style="list-style-type: none"><li>1. Added complementary filter support.</li><li>2. Fixed a bug causing the compensated acceleration vector (0x82, 0x1C) to be reported incorrectly from the Kalman filter.</li><li>3. Added support for quaternion sensor-to-vehicle transform.</li><li>4. Increased serial buffer size to address issues with dropped packets when streaming large amounts of raw GNSS data over the serial port.</li></ol>
1.0.08	<ol style="list-style-type: none"><li>1. Added post-EKF smoothing to position, velocity, and attitude estimates to reduce sawtooth.</li><li>2. Improved handling of GNSS data inconsistencies between receivers to reduce impact of multipath effects. etc.</li><li>3. Adjusted EKF measurement model for pressure sensor aiding to improve consistency.</li><li>4. Fixed bug which caused sensor to incorrectly report a dual antenna configuration error when antenna separation was less than 50 cm (actual lower limit is 25 cm).</li></ol>
1.0.09	This is an urgent firmware release to address an algorithm error in the GNSS signal tropospheric delay model that causes filter instability in southern latitudes (< 0 degrees). An interpolation table used to compute coefficients was incomplete over the range of possible input values.
1.0.10	Firmware version changed to assist with internal production needs. Device executable remains the same.

### Upgrading Firmware With SensorConnect

The firmware on the **3DMGQ7** inertial sensor may be upgraded with MicroStrain Sensing's SensorConnect software. The Windows software is available for download and installation on the MicroStrain website at:

<https://www.microstrain.com/software/sensorconnect>. The user is required to download the ZHEX file from the **3DMGQ7** web page. SensorConnect performs the upgrade under user control.

### Support

MicroStrain Sensing support engineers are always available by phone, email, chat, and Teams to support you in any way we can.



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