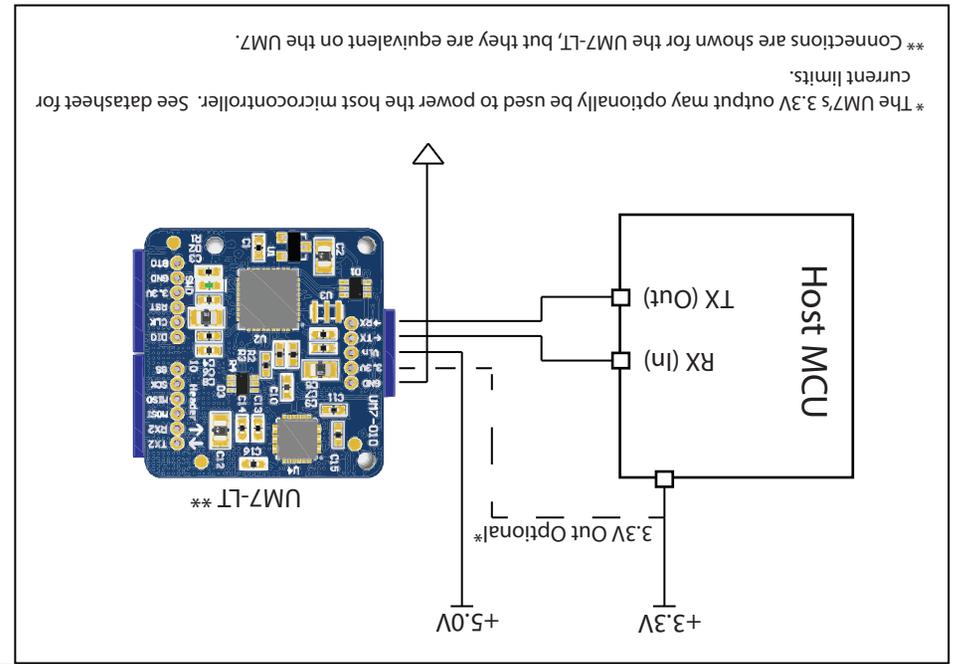
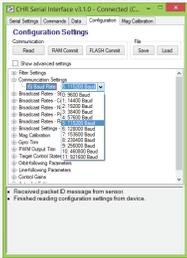


Connection Diagram (USB Expansion)



Connection Diagram (Microcontroller)

## Serial Interface Software



- Plot sensor data in real-time
- Configure Sensor Settings
- Log sensor data

Download the latest version:  
<http://www.chrobotics.com/serial-interface>

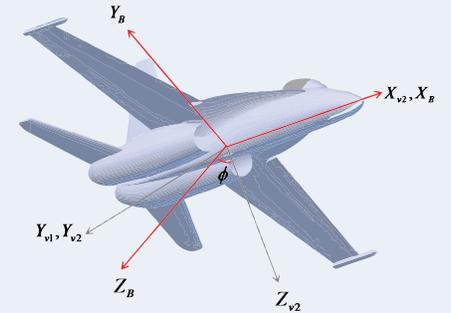
## Customer Support

Learn more about attitude sensing at our educational library:  
<http://www.chrobotics.com/library>

Find solutions to common problems and ask questions on our support forum:  
<http://www.chrobotics.com/forums>

Still have questions? You can also contact us at the following email address:  
[support@chrobotics.com](mailto:support@chrobotics.com)

# CHROBOTICS Quick-Start Guide UM7 Orientation Sensor



# Getting Started

## Connecting to your UM7



The quickest and easiest way to work with your new UM7 is to connect it to your PC using the USB Expansion Board. You can then use the Serial Interface to plot data in real-time, log data, and change configuration settings.

You can download the Serial Interface from the following address:

<http://www.chrobotics.com/serial-interface>



All inputs and outputs on the UM7 are protected against Electrostatic Discharge (ESD). However, the UM7 is not designed to handle ESD resulting from direct contact to the circuit board. The UM7 enclosure is not sealed, and ESD events near the bottom of the enclosure can affect the circuit board.

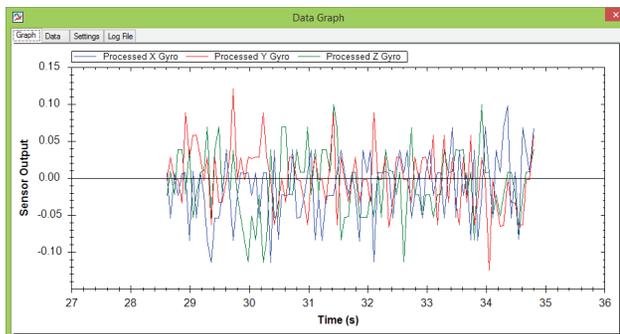
Please take appropriate precautions when handling the UM7 to avoid ESD-related damage to the device.

## Zeroing the Rate Gyros

Even if your UM7 has been temperature-compensated, the gyros will have output biases on the order of tenths of a deg/s or more during normal operation. This means that the UM7's rate gyros will measure some rotation even when the sensor isn't moving, which causes errors in the angle outputs.

The UM7's onboard bias estimator will detect non-zero biases and correct for them over time (on firmware revision U71D and above). However, you can ask the UM7 to detect and remove non-zero biases right away by issuing a ZERO\_RATE\_GYROS command from the Serial Interface while the UM7 isn't moving.

You can see if the UM7's gyro biases are wrong by plotting processed rate gyro data when the UM7 isn't moving. The rate outputs should be close to zero as shown below:



## Calibrating the Magnetometer

The UM7's magnetometer is used to estimate yaw. Since distortions in the magnetic field can cause errors in the angle estimates, the magnetometer needs to be calibrated. There is an instructional video that demonstrates how to do this on the CH Robotics website:

<http://www.chrobotics.com/>

If you don't need to measure the yaw angle, then there is generally no need to calibrate the magnetometer. If the UM7 is operating in quaternion mode, magnetometer calibration is always required for correct operation.

## Troubleshooting/FAQ

### Q. The Serial Interface times-out when trying to connect to the UM7.

Make sure that the correct serial port is selected and that the sensor is plugged in. If you've recently changed communication settings, you can also try issuing a RESET\_TO\_FACTORY command to revert to factory default settings. Contact us for help if the problem persists.

### Q. After the UM7 stops moving, the angle outputs take a while to "settle," slowly changing for several seconds.

This behavior shows up when the magnetometer and/or accelerometer disagree with the rate gyros about where the sensor is pointed: the quick change during motion is tracked by the rate gyros, and the slowly drifting change represents correction by the accelerometer and/or the magnetometer.

You might see this behavior if the magnetometer needs to be calibrated, or if it is calibrated but there is something nearby distorting the magnetic field in unpredictable ways. You'll also see this behavior to a smaller extent (less than a degree of disagreement) due to accelerometer miscalibration on uncalibrated units. There are ways to decrease the amount of time it takes for the angle estimate to "settle." Contact us if you need help.

### Q. My UM7 was working, but it stopped. What might have happened?

The sensor can stop functioning for a variety of reasons, including ESD damage and mechanical shock. But even if the sensor is working just fine, it can seem to stop working if the hardware connecting it to your PC fails, or a connection is broken somewhere.

If you can't get the sensor working again, let us know and we'll help you out. When it isn't clear how your UM7 was damaged, we'll be happy to replace it for you - even if it might have been your fault.

### Other Questions?

Visit our support forum at [www.chrobotics.com/forums](http://www.chrobotics.com/forums), or contact us directly via email.



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