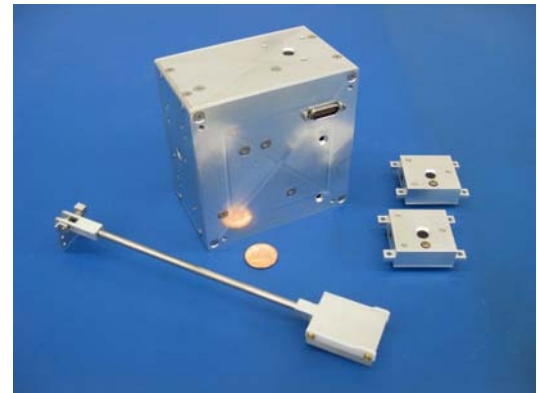
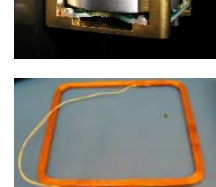
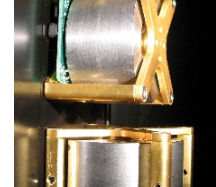
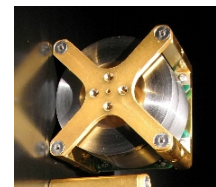


# CubeSat Compact Three-Axis Attitude Actuator and Sensor Pack with Sinclair Interplanetary

**Real numbers, real flight heritage.** To enable three-axis attitude control of CubeSats, SFL offers a high-performance actuator and sensor package that draws directly from **CanX-2 heritage and proven on-orbit performance**. This suite of attitude sensors and actuators enables detumbling maneuvers, nadir pointing and three-axis inertial pointing while adhering to strict volume, mass and power constraints. The reaction wheels are smaller versions of the CanX-2 reaction wheel, developed in collaboration with Sinclair Interplanetary.



<b>Package Features</b>	<ul style="list-style-type: none"> <li>Achievable pointing accuracy of 1-2 deg RMS in sunlight.</li> <li>Three 10mNm reaction wheels, three vacuum-core magnetorquers, six sun sensors (four in main box, two external), one magnetometer (external to main box).</li> <li>Sample rate: up to 5 Hz.</li> <li>Operating temp. range: -10 to +60°C.</li> <li>Survival temperature range: -30 to +80°C.</li> <li>Power consumption: &lt; 1 W typical.</li> <li>Total mass: &lt; 1 kg.</li> <li>Dimensions: 95x95x61 mm easy-to-integrate box containing reaction wheels, four sun sensors and three magnetorquers. Two sun sensors and one magnetometer external to box.</li> <li>Box connector is a 21-pin receptacle Micro-D.</li> <li>Optional deployable magnetometer boom.</li> <li>Compatible with Pumpkin CubeSat Kit (cutouts for sun sensor apertures may be required).</li> </ul>
<b>Attitude Sensors</b>	<ul style="list-style-type: none"> <li><b>Six SFL digital sun sensors</b>, each &lt; 0.175W at 5V, &lt;6g, 3x3x1 cm (not including box), FOV &gt; 92deg full field (square projection), resolution &lt;0.5°, accuracy &lt;1.5° (RMS of measurement direction error). Serial interface (Nanosatellite Protocol, open standard), fine measurement returns sun X-Y location, telemetry includes voltage and board temperature.</li> <li><b>One SFL three-axis magnetometer</b>, &lt; 0.025 W at 3.3V, &lt;30g (not including boom), 2x4x2cm (not including box). Returns three per-axis readings and a temperature measurement. Dynamic range <math>\pm 100\mu T</math>. Resolution 15nT in two axes, 30nT in third. Mean error &lt;35nT. Peak-to-peak noise &lt;70nT at 1Hz.</li> </ul>
<b>Attitude Actuators</b>	<ul style="list-style-type: none"> <li><b>Three Sinclair/SFL wheels</b>, each 0.1W at 2000 RPM (typical draw), peak power &lt;2W, mass &lt; 130g, 5x5x3cm, 10mNm momentum capacity, 1 mNm maximum torque, torque ripple 1<math>\mu</math>Nm at 1Hz, serial communications (Nanosatellite Protocol, open standard), speed or torque commands possible.</li> <li><b>Three SFL vacuum-core magnetorquers</b>, each 100g, 8x8x0.4cm, dipole <math>\sim 0.10 \text{ Am}^2</math> at 3.5V, 23°C, coil resistance <math>\sim 50\Omega</math>, inductance <math>\sim 50\text{mH}</math>, interface is direct connection.</li> </ul>
<b>Heritage</b>	<ul style="list-style-type: none"> <li>CanX-2: units have 1.2 years of successful on-orbit operation, as of July 2009.</li> </ul>
<b>Other Notes</b>	<ul style="list-style-type: none"> <li>Accuracy is defined as the RMS of the measurement-direction or pointing-direction error.</li> <li>Attitude control computer and software sold separately. Information available upon request.</li> </ul>



**Real Numbers, Real Flight Heritage!**

Specification Subject to Change Without Notice

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