



## OVERVIEW



**navX2-MXP** is a second generation 9-axis sensor (3-axis accelerometers, gyroscopes and magnetometers) with sophisticated data fusion, motion processing and sensor calibration algorithms. Key specifications include:

- Very high-accuracy orientation (yaw/pitch/roll), with *minimal yaw drift of ~0.5 degree per minute when moving, and < 0.2 degrees/hour when still*
- New Industrial-class IMU sensor handles high rotation (4000 degree/second) and impact (16G, operates in higher temperature environments and can survive extreme shock events (20,000G)
- Rapid startup (5 seconds or less)
- Linear Velocity Measurements
- Tilt-corrected compass heading

## FEATURES



- **Plug-n-play install on a National Instruments RoboRio™**
- **Fast Kalman-filtering with adaptive fusion weighting minimizes yaw drift even during periods of heavy vibration.**
- **High-Quality Sensor Calibration**
- **Multiple Communication Interfaces**
- **LabView™, Java and C++ libraries and sample code enable rapid integration on FIRST FRC robot. Android library and sample code enabled rapid integration on a FIRST FTC robot.**

## ▶ navX2-MXP Robotics Navigation Sensor

**Supercharge your robot with:**

- **Field-oriented drive**
- **Auto-balancing**
- **Auto-rotate-to-angle**
- **Motion/no-motion detection**
- **Collision Detection**
- **Real-time Linear Velocity Vector Measurements**
- **and more...**

**Expand your National Instruments RoboRIO™ with:**

- **10 Digital I/O ports**
- **4 Analog Input**
- **2 Analog Output**

## BENEFITS



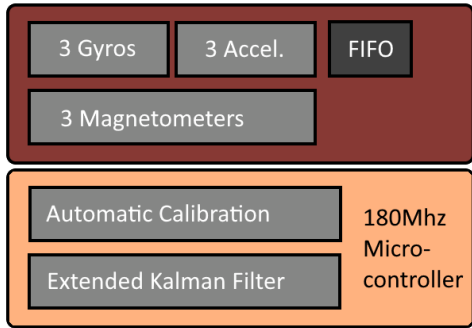
**Kauai Labs**  
**Build Better Robots™**

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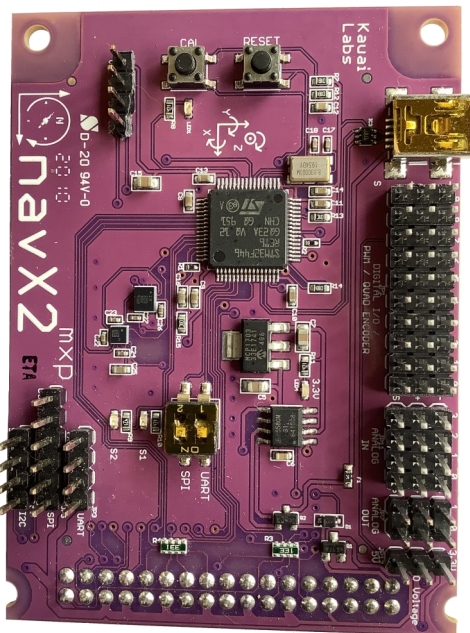


CUTTING-EDGE TECHNOLOGY



- **STMicro Industrial-class ISM330DHCX IMU**
- **STMicro LIS2MDL Magnetometer**
- **180MHz Microcontroller**

EASY-TO-USE DESIGN



Multiple Interface Options

## ▶ Technical Specifications

### Key Components

COMPONENT	DESCRIPTION	MODEL	CAPABILITIES
<b>Microcontroller</b>	180Mhz 32-bit ARM Cortex-M4 w/FPU	ST Microelectronics STM32F446	Data acquisition, calibration and sensor fusion
<b>Inertial / Magnetic Sensors &amp; Motion Processor</b>	6-Axis Accel/Gyro sensor 3-Axis Magnetometer	ST Micro ISM330DHCX, LIS2MDL	Industrial-class sensors; High-quality acceleration, rotation rate and heading measures
<b>Altimeter (navX-MXP Aero only)</b>	High-resolution barometric pressure w/24-bit ADC	Measurement Specialties MS5611	High-quality relative altitude measures with 10cm resolution

### Communication Interfaces

TYPE	MAXIMUM SPEED	CAPABILITIES
<b>SPI</b>	2Mb/s	3.3V and 5V Tolerant
<b>I2C</b>	400Khz	3.3V and 5V Tolerant
<b>TTL UART</b>	57.6 Khz	3.3V and 5V Tolerant
<b>USB</b>	12 Mb/s	Alternate Power Supply

### RoboRio™ MXP I/O Expansion (w/selectable 5V or 3.3V Source Power)

INTERFACE	COUNT	USAGE
<b>Digital I/O</b>	10	RoboRio PWM, Quad Encoders, GPIO
<b>Analog Inputs</b>	4	Input to RoboRio ADC
<b>Analog Outputs</b>	2	Output from RoboRio DAC
<b>I2C</b>	1	RoboRio External Device Control
<b>SPI</b>	1	RoboRio External Device Control
<b>UART</b>	1	RoboRio External Device Control

### Key Features

FEATURE	DESCRIPTION	BENEFIT
<b>Sophisticated, High-accuracy Sensor Fusion</b>	Extended real-time, high-speed Kalman Filter running at 416Khz	High-accuracy orientation measures even during high-G events, using state-of-the-art algorithms
<b>Magnetometer Calibration Tools and Anomaly Detection</b>	Support and tools for in-situ hard and soft-iron magnetometer calibration, and auto-detection of magnetic anomalies	High-accuracy compass heading measures after completion of a manual calibration process.
<b>Configurable Update Rate</b>	From 4-200 Hz	Allows tradeoff between application load and latency
<b>Tilt-compensated Compass Heading</b>	Compass heading correction based upon tip/tilt measures	Heading accuracy independent of sensor "pose"
<b>Automatic Accelerometer and Gyro Calibration</b>	Self-calibration algorithms; storage of calibration coefficients in flash memory; continuous recalibration during operation	High-accuracy yaw, pitch and roll measures with no calibration effort required.

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