



# VEX Controller

Device Control for VEX Motors and Sensors

The VEX Controller directly manages sensor and motor devices isolating the Java host processor from low level control tasks. A 'C' program running on the Controller supports a simple serial port protocol which collects the host's commands and returns acknowledgements and events.

## VEX Controller Description

The VEX Controller packages a pair of Microchip PIC 18F8520 microprocessors connected via a fast SPI serial link. One microprocessor, the "Master Processor", manages signals from the RC receiver and generates PWM for motor and servo control. The second processor, the "User Processor", is available for software development.

The VEX Master Code, the 'C' compiler libraries and JVEX Sample Code largely insulate the programmer from hardware detail, but it is important to understand the basics. PIC's are designed for a Harvard architecture with a reduced instruction set running in separate instruction and data spaces. While the 8520 has 32K words of flash program space, it only has 2K bytes of RAM including the memory mapped I/O which controls the PIC's on-chip devices. There are 1K bytes of EEPROM data memory, and memory access at the instruction set level is via 256 word pages. See the [PIC 18F8520 Processor Data Sheet](#).

The dual microprocessor architecture drives what the programmer sees at the 'C' level. VEX programs are architected around a loop which polls the SPI to exchange RC and PWM data. However, JVEX will largely ignore the capabilities of the dedicated processor, focussing instead on resources directly available on the User Processor. These include serial ports, PWM outputs, A/D ports, interrupt capabilities and digital I/O.

## VEX Controller Specification

The VEX Controller I/O layout and general specifications are below.



<b>User Programmable Microcontroller</b>	
User Microcontroller	Microchip PICmicro® PIC18F8520
Processor Speed	10 MIPS (Million Instructions Per Second)
Variable Space	1800 bytes + 1024 bytes EE2
Program Space	32K
Programming	PIC C
Programming Tools	Microchip MPLAB IDE or easyC
Erase/Write Cycles	100,000
Data Retention	> 40 years
<b>Inputs and Outputs</b>	
Interrupt Inputs	6
Digital I/O	16 max with no Analog, Each can be Input or Output (shared with Analog)
Analog Inputs	16 max with no Digital, 10-bit resolution (shared with Digital)
Digital Input Freq.	50 KHz (typical)
Analog Input Access	10 µSec
Motor Output	8 PWM Outputs for motors or servos, refreshed every 18.5mSec
Serial Ports	RS232 Program (115Kb) and TTL Serial (115Kb) - RX and TX on Digital/Analog port
<b>General Features</b>	
Size (W x L x H)	4.5" x 3.9" x 1.1"
Weight	0.28 lbs.
Battery	7.2V Rechargeable Nickel Cadmium batteries - NiCd
Current Draw	62 mA - Controller & Receiver min, 5mA to 2A per Motor, 20mA to 1.5 A per Servo

