Electronics Challenge (Team 3204C)

For our electronics challenge (sponsored by Texas Instruments) entry, we will be disassembling the following devices:

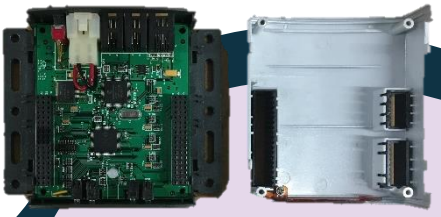
- VEX PIC Robot Microcontroller
- VEX ARM Cortex
- VEX IQ Robot Controller
- VEX V5 Robot Brain

We chose to disassemble these devices because we believe that they accurately portray VEX's history. Because this is a series of devices, we can compare them, seeing how the VEX Robotics Platform has evolved. They are also a likely place to find multiple Texas instruments components, as this is even listed on the challenge website!

VEX PIC Microcontroller

We started by disassembling the VEX PIC Robot Microcontroller. This was the first VEX product (aside from the innovation First Robot Controller) and was VEX's kickstart product. It is reasonably easy to disassemble, with only 4 screws holding the plastics cover and PCB together. Inside, we found the following components:

VEX PIC Robot Controller

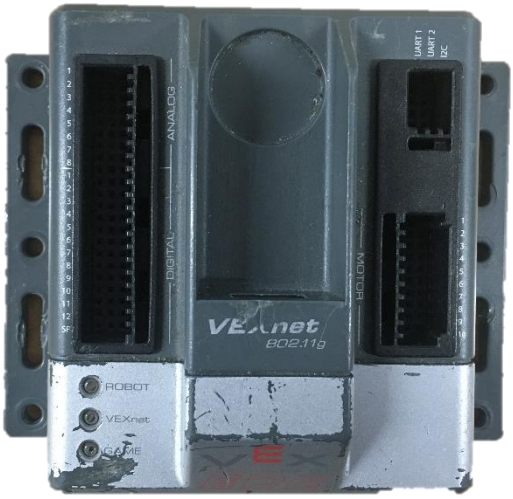


Partially disassembled VEX PIC Robot Microcontroller

Part no.	Function	Features
PIC18F8520 (1)	System Mode Processor	32 KB Storage, Low Power Consumption
PIC18F8520 (2)	User Mode Processor	32 KB Storage, Low Power Consumption
9AAQC6K	Unknown	Unknown

VEX ARM Cortex

Next, we disassembled the VEX ARM Cortex. Disassembly of this device was like the VEX PIC Microcontroller, as this is effectively just a more refined version. Similar to the VEX PIC that had come previously, the Cortex was relatively simple to disassemble, requiring just 4 philips head screws to be undone. After this was completed, we were left with a bare PCB, shown in the image below. Inside, we found the following components:



VEX ARM Cortex Microcontroller

Part no.	Function	Features
NXP LPC2458FET180	System Processor	74 MHz, 512 kb flash
ARM7 STM32F103	User Processor	74 MHz, 384 kb flash
MT 9WA47	Unknown	Unknown

VEX V5

The final robot brain that we disassembled was the VEX V5. This was by far the hardest device to open because of its touchscreen, button and plethora of ports on all sides. After spending more than 10 hours studying and researching the 2 double-sided PCBs contained inside the outer plastic casing, we were left with the following list of components:

Part no.	Function	Features
XILINX ZYNQ XC7Z010	Main Soc	Dual ARM® Cortex®-A9 MPCore™ (667 MHz)
Micron 7PHI5 (x2)	Suspected to RAM	Unknown
Micron 75A15	Suspected to be NAND Flash	Unknown
Texas Instruments HC175	High Speed CMOS Logic	Quad D-type Flip-Flops, Reset, Texas Instruments Component
Texas Instruments LCO7A	Unknown	Texas Instruments Component
(Unknown Brand) 824J (x2)	Unknown (Possibly FPGA?)	Unknown
WE-HCI 7443251600 High Current Inductor	Inductor (High Current)	Magnetically shielded Flat wire coil for low losses at high frequency

(Unknown Brand) PKJ21B23	Unknown	Unknown
Texas Instruments SN65HVD178x RS-485 Transceiver (x21)	RS-485 Transceiver	Texas Instruments Component, 70-V, Fault-Protected
Texas Instruments TPS25927 4.5-V to 18-V, 1-5A eFuse	4.5-V to 18-V eFuse	Texas Instruments Component
WE-HCI 7443550101 High Current Inductor	Inductor (High Current)	Magnetically shielded Flat wire coil for low losses at high frequency
Texas Instruments TPS54239 (x2)	4.5V to 23V Input Step-Down Converter	D-CAP2 Mode, Texas Instruments Component