

# Texas Instruments VEX Online Challenge

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For our online challenge we deconstructed/took apart a broken Xbox controller. By doing so we achieved a higher level of understanding of what it takes to simply play a video game. We chose this product because of how common it is and we wanted to observe what goes into just playing video games.

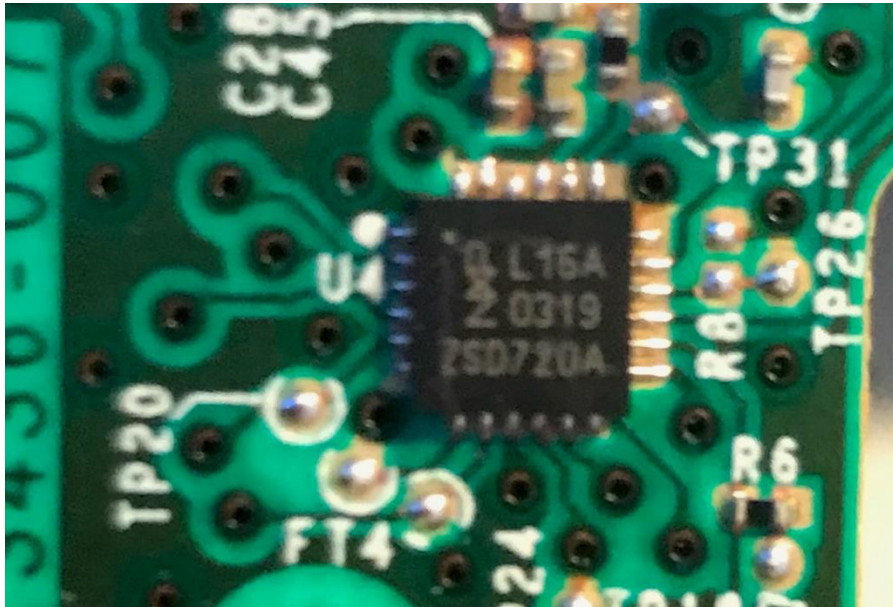
Inside of our controller were multiple mother boards, 4 Motors that vibrate, 4 triggers. Sadly, there were only 2 Texas Instrument parts found under the main circuit covered by a metal frame.

The MSP430 can be used for low powered embedded devices. The current drawn in idle mode can be less than  $1 \mu\text{A}$ . The top CPU speed is 25 MHz. It can be throttled back for lower power consumption. The MSP430 also uses six different low-power modes, which can disable unneeded clocks and CPU. Additionally, the MSP430 is capable of wake-up times below 1 microsecond, allowing the microcontroller to stay in sleep mode longer, minimizing its average current consumption. The device comes in a variety of configurations featuring the usual peripherals: internal oscillator, timer including PWM, watchdog, USART, SPI, I<sup>2</sup>C, 10/12/14/16/24-bit ADCs, and brownout reset circuitry. Some less usual peripheral options include comparators (that can be used with the timers to do simple ADC), on-chip op-amps for signal conditioning, 12-bit DAC, LCD driver, hardware multiplier, USB, and DMA for ADC results. Apart from some older EPROM (MSP430E3xx) and high volume mask ROM (MSP430Cxxx).

This is the front of one of the motherboards.



The second piece was under the Motter for the right trigger.



This is a picture of the Motters found in the controller.



This is a picture of the disassembled controller with all of the parts together.

