Reverse Engineering Challenge

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VEX ROBOTICS COMPETITION

OVER UNDER

What We’re Deconstructing

For our reverse engineering challenge, we have decided to reverse engineer a Texas Instruments TI-30XIIS scientific calculator. We chose this because it is something that we often see used in everyday schoolwork, and want to further understand a piece of technology that has be used for so long. This specific model of calculator first released in 1993 and hasn't undergone any changes since original release. We plan on fully deconstructing Miles’ calculator so we can completely understand all components that make it up.

Components

After disassembling the calculator, we are able to see all components, and start to understand how it all works.

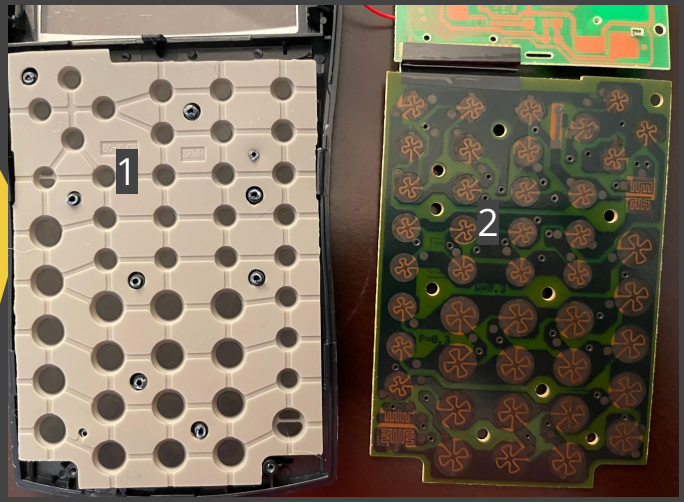
Circuit Board

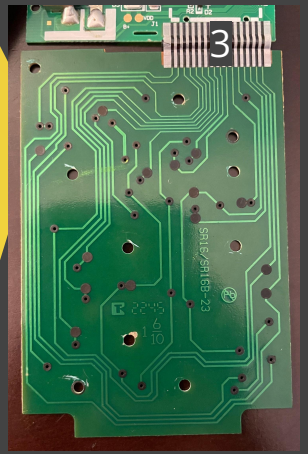
This calculator uses a SR16N/N1-11 circuit board. This is where all the processing is done for the calculator. This board is connected to the solar panel on the front of the calculator with two wires (red and black), and he energy gathered by it is stored in the battery, also on the circuit board. It is also connected to the display screen which is a two-line display, 11 digit scrollable entry line with 10-digit answer and two-digit exponent line.

Key:
1 - display screen
2 - wires connecting to screen
3 - battery
4 - chip (covered in plastic)
5 - wires connecting to sensor board

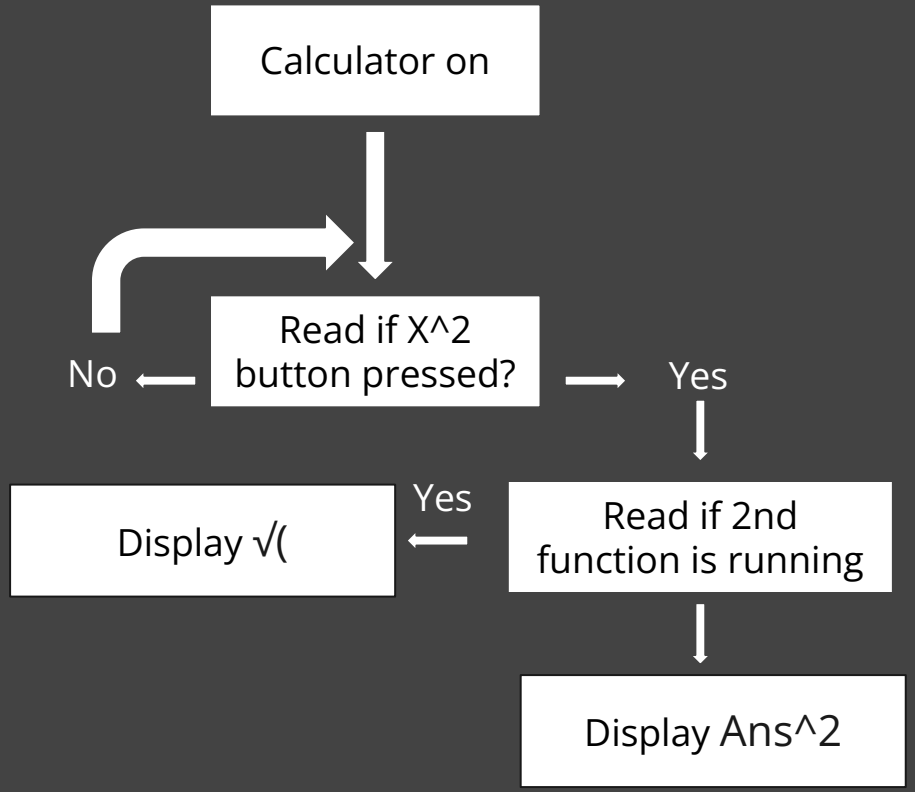
Sensor Board

This sensor board is a SR16/SR16 B-23. This board and rubber sheet are used to sense whenever a button is pressed. When a button is pressed, the key pushed presses the metal plate connected to the rubber sheet into the sensor on the board. Once the press is detected, the signal is sent to the circuit board which then displays the corresponding action or symbol on the screen.





Key:
1 - rubber sheet
2 - sensor board
3 - wires connecting to circuit board



Program

The program of this calculator is pretty basic, really only having the basic “press button, run command” cycle, but the 2nd button command makes it so that any button pressed has a second command programmed. The flowchart to the left demonstrates how the X^2 button on the calculator works.

Conclusion

After disassembling this TI-30XIIS calculator and observing how all the components of it work, we realize that something doesn't necessarily need to be particularly complicated for it to be effective. This calculator, while using some pretty basic functions and equipment, has been able to remain effective for students everywhere and will continue to do so in the future. Deconstructing this calculator, we learned that the types of sensors we have been learning about through our PLTW engineering pathway here at Foothill are easily put to use in various way, and this calculator was a prime example of a simple button. Understanding that it just takes a sensor and a place to process the data received from it made all of us realizes that some things are far more understandable than we previously thought, and next year we plan on using the experience we had this year to disassemble an even more complex electrical appliance.