Temperature Converter

By: Adam Marszalek, Lovleen Madahar, Martin Shoraji, and Nicholas Romund

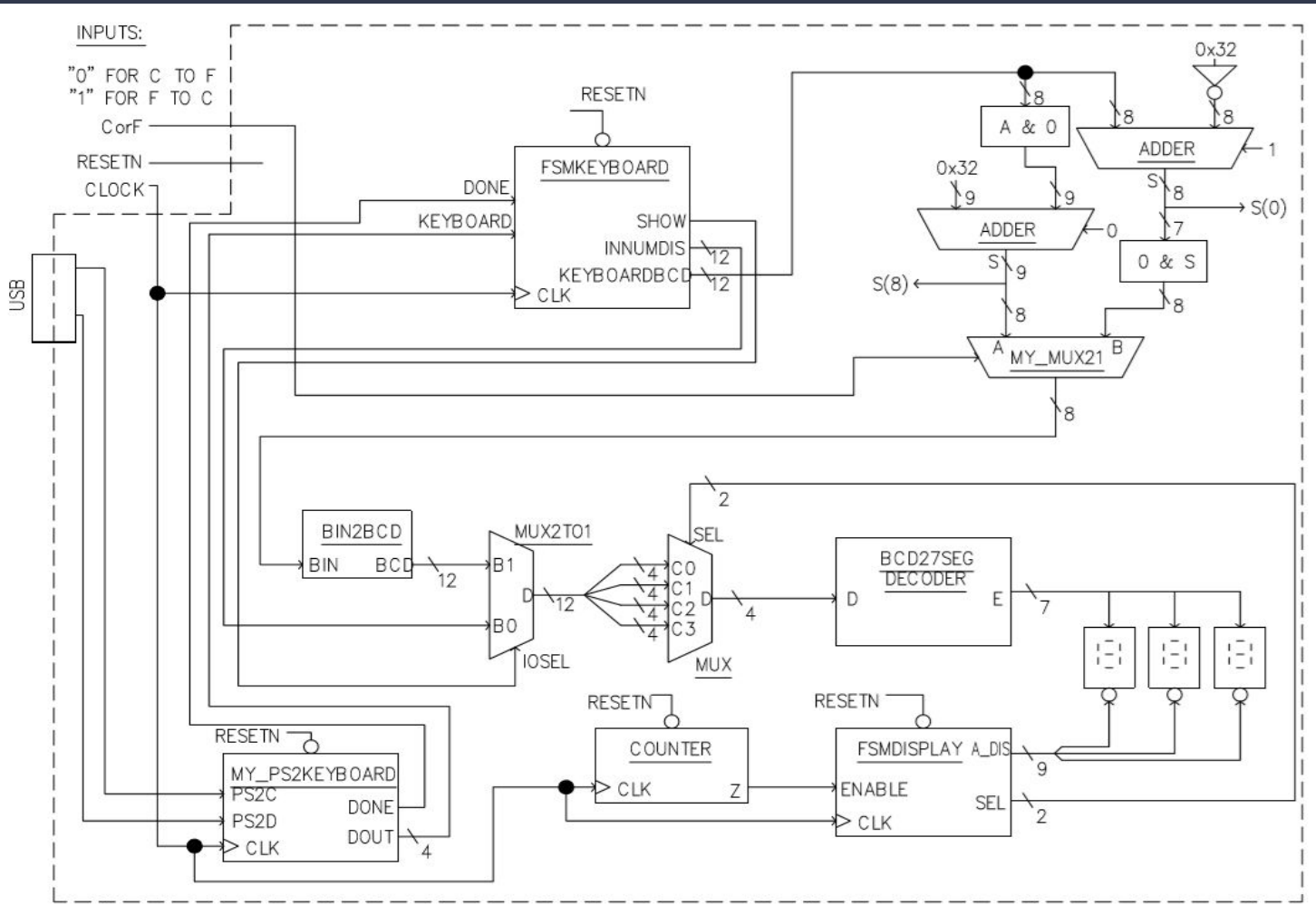
Introduction

- Converts from Celsius to Fahrenheit or Fahrenheit to Celsius
- A number is entered from the keyboard and the conversion is shown on the 7 segment display once the user hits enter.
- The unit is specified by switch 15 on the Nexys A7. “0” being °C to °F and “1” being °F to °C
- Supports inputs from 0 to 111 °C and 0 to 255°F

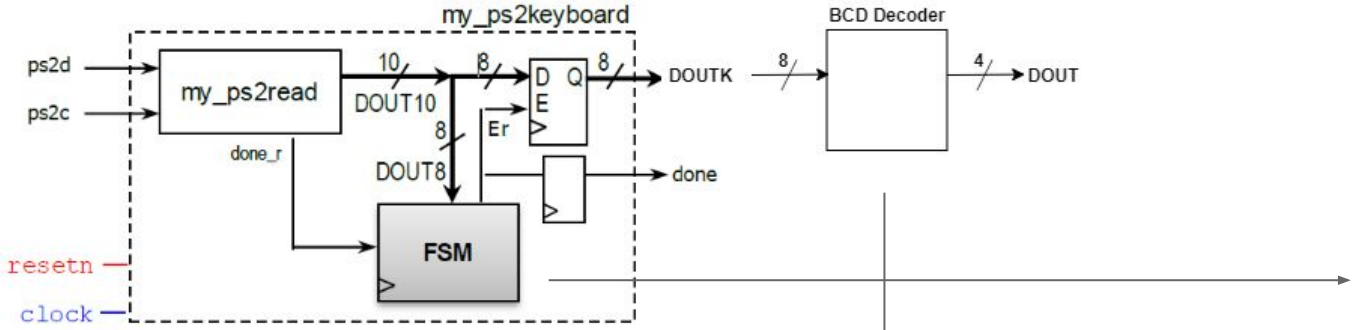
- Simplified mathematical conversions:
- $C(9/5) + 32 = F \Rightarrow C(2) + 32 = F$
- $(F - 32)(5/9) = C \Rightarrow (F - 32)/2 = C$

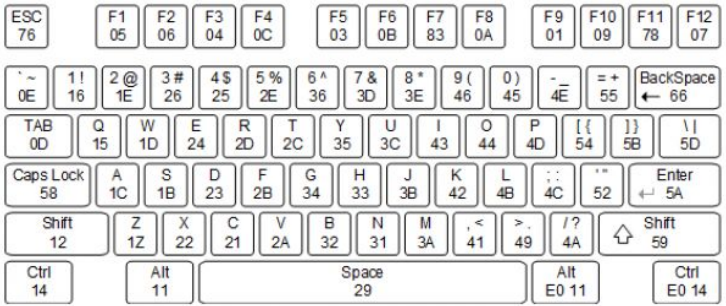
Control:
-> FSMKEYBOARD
->FSMDISPLAY

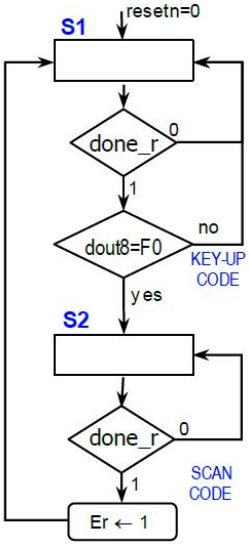
Datapath:
-> Everything else



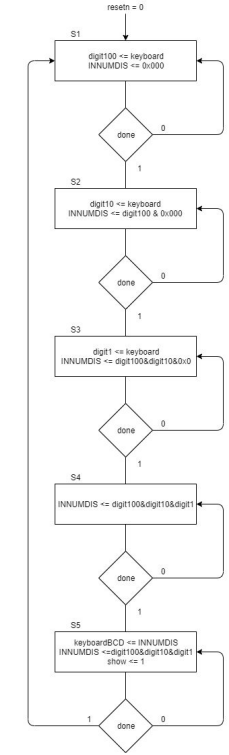
PS/2 Keyboard



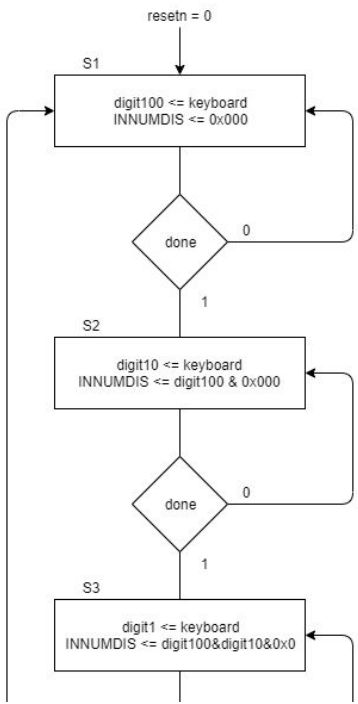




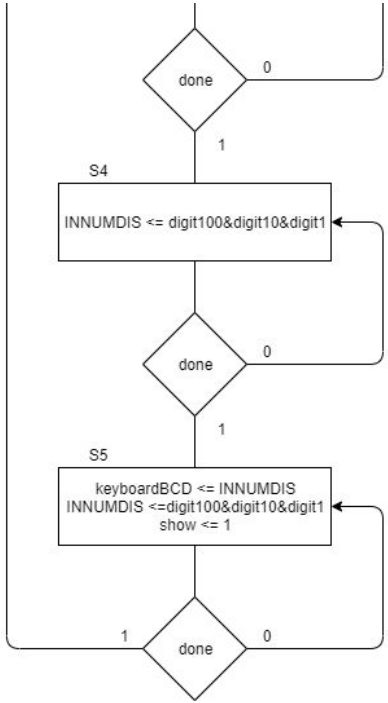
Keyboard/Main Input State Machine



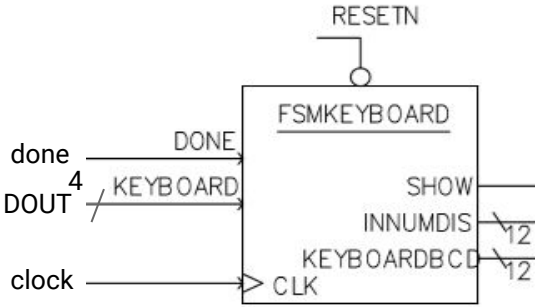
ASM Full Diagram



ASM Top Half

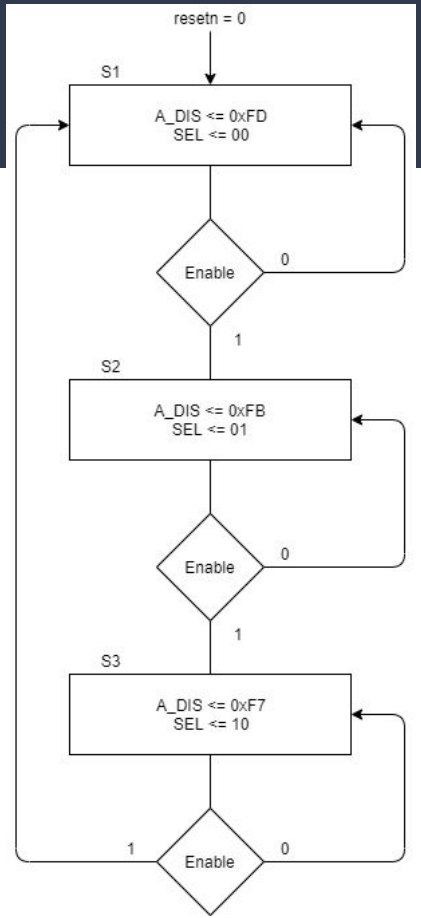


ASM Bottom Half

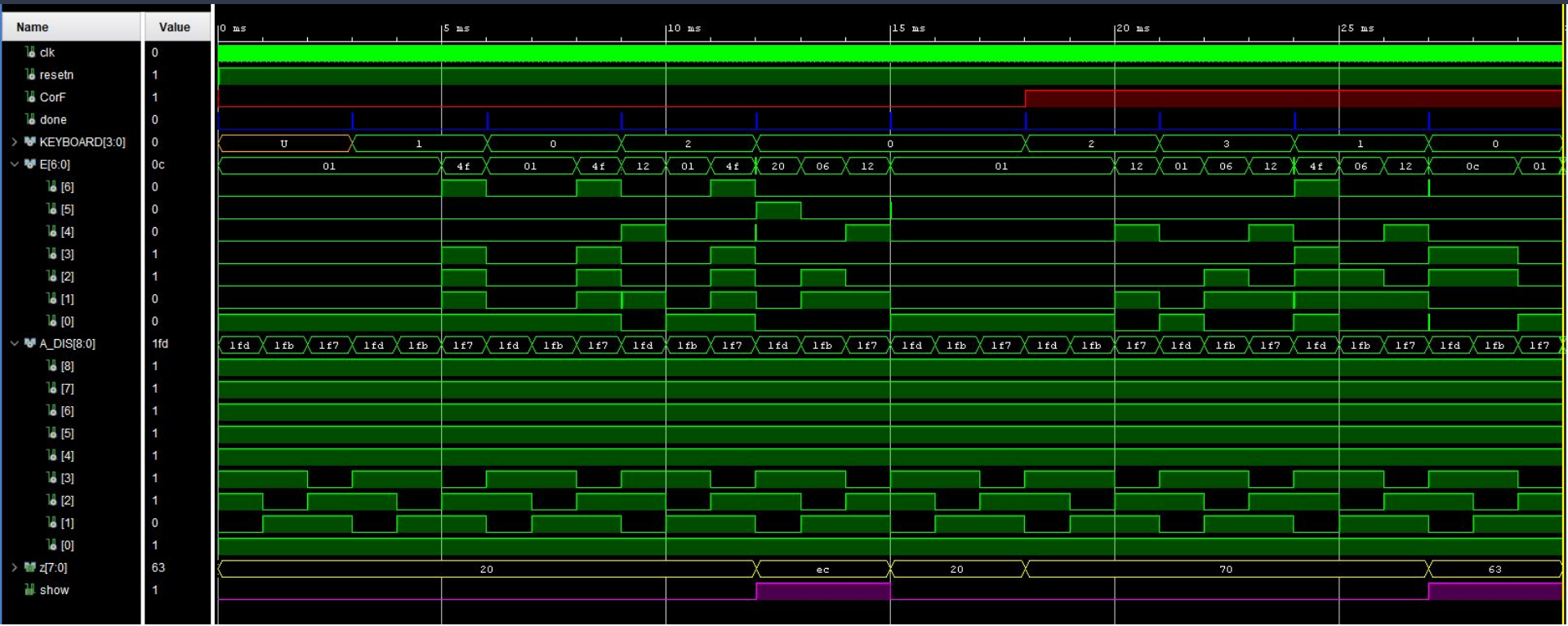


Display

- Enable is supplied by a counter that counts clock cycles and supplies a high enable input for one clock cycle when it reaches a count of 100,000
- Provides a state change every 1ms, fast enough to trick the human eye
- One output enables only the proper digit on the display
- The other output selects the corresponding input for that digit



Testbench Simulation



Input 102 => Output 236 , Input 231 => Output 99

Demo