

Studies of the I²C Shelf Manager

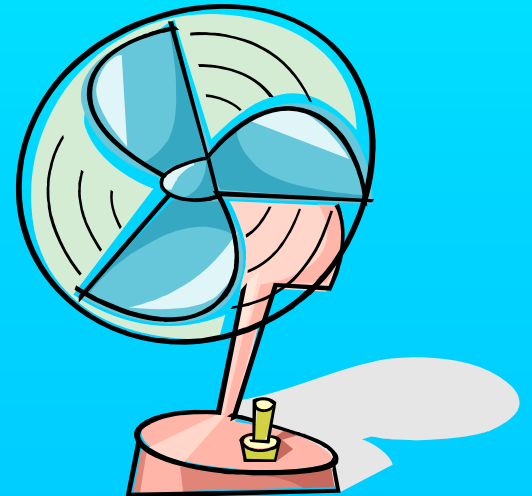
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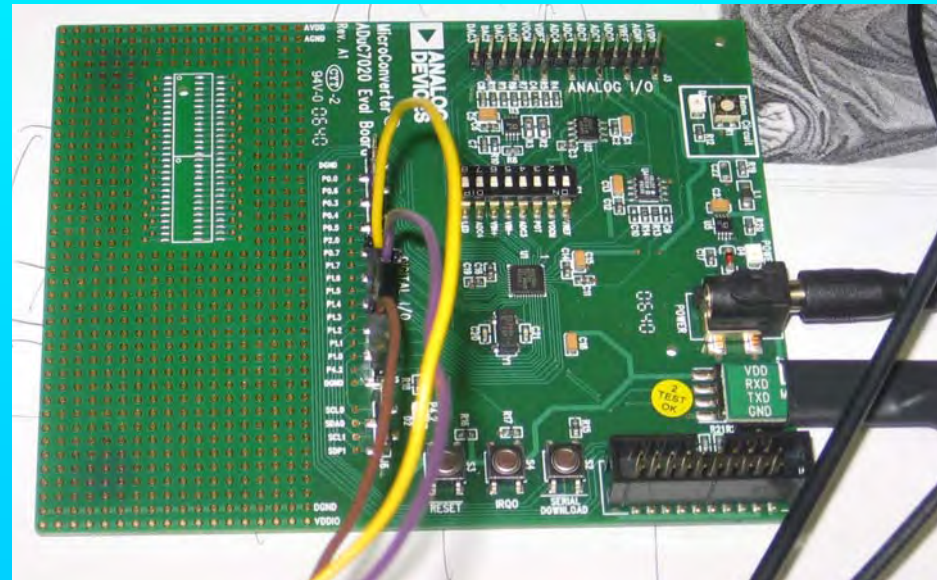
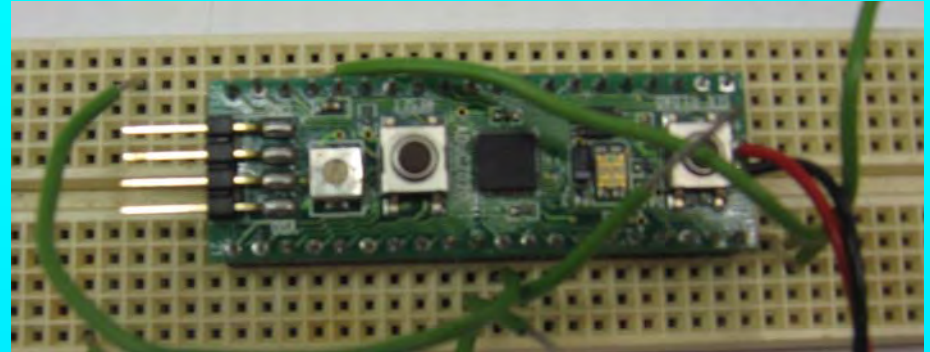
Goals

- Understand communications via I²C lines
- Develop an understanding of how the shelf manager communicates with an IPMC
- Become a fan
 - A simple FRU device



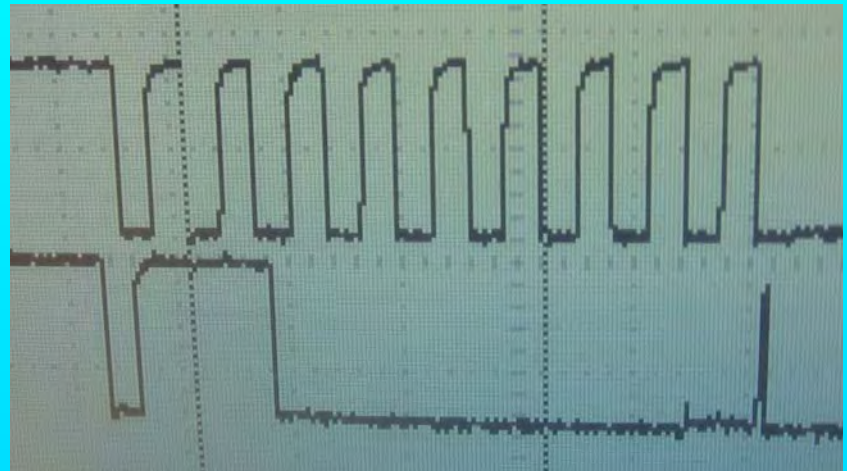
Analog Devices Microcontroller

- ADuC 7020 device
- 2 dedicated I²C lines
- Multiple DAC and ADC
- Multiple GPIO pins



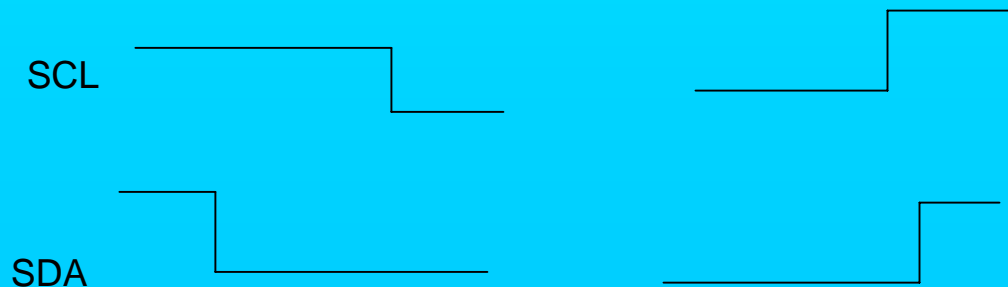
I²C Communication

- I²C uses two lines a data line and a clock line
- 1 master can communicate to multiple slaves
- Format of communication
 - Start
 - Address
 - Acknowledge
 - Data byte
 - Acknowledge
 - Stop or another data byte



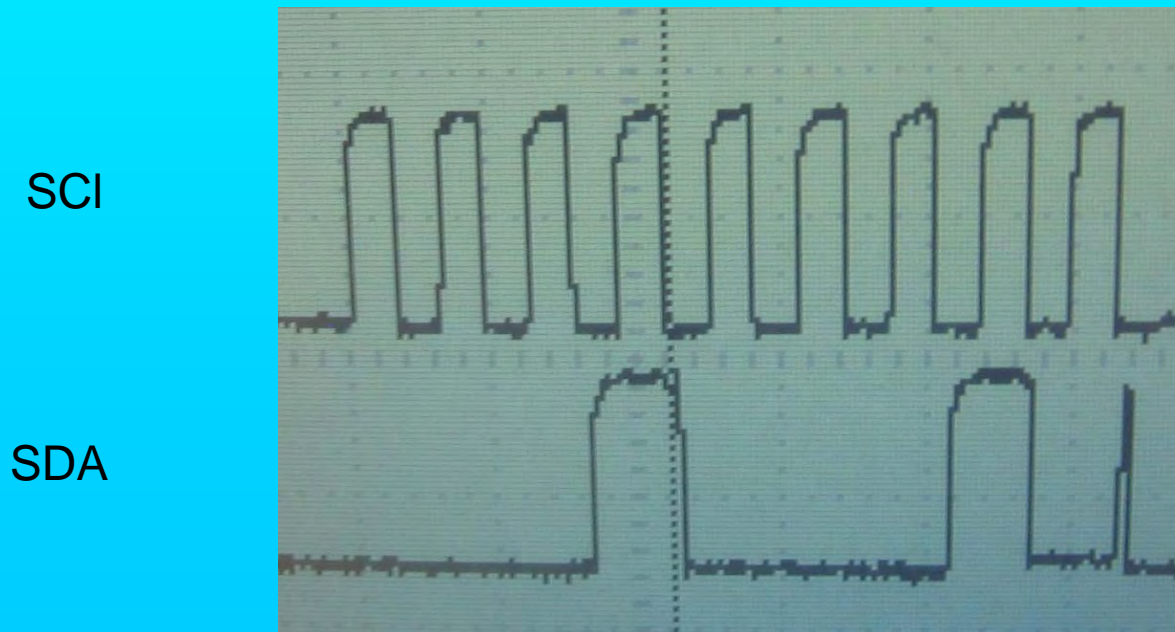
Start

Stop



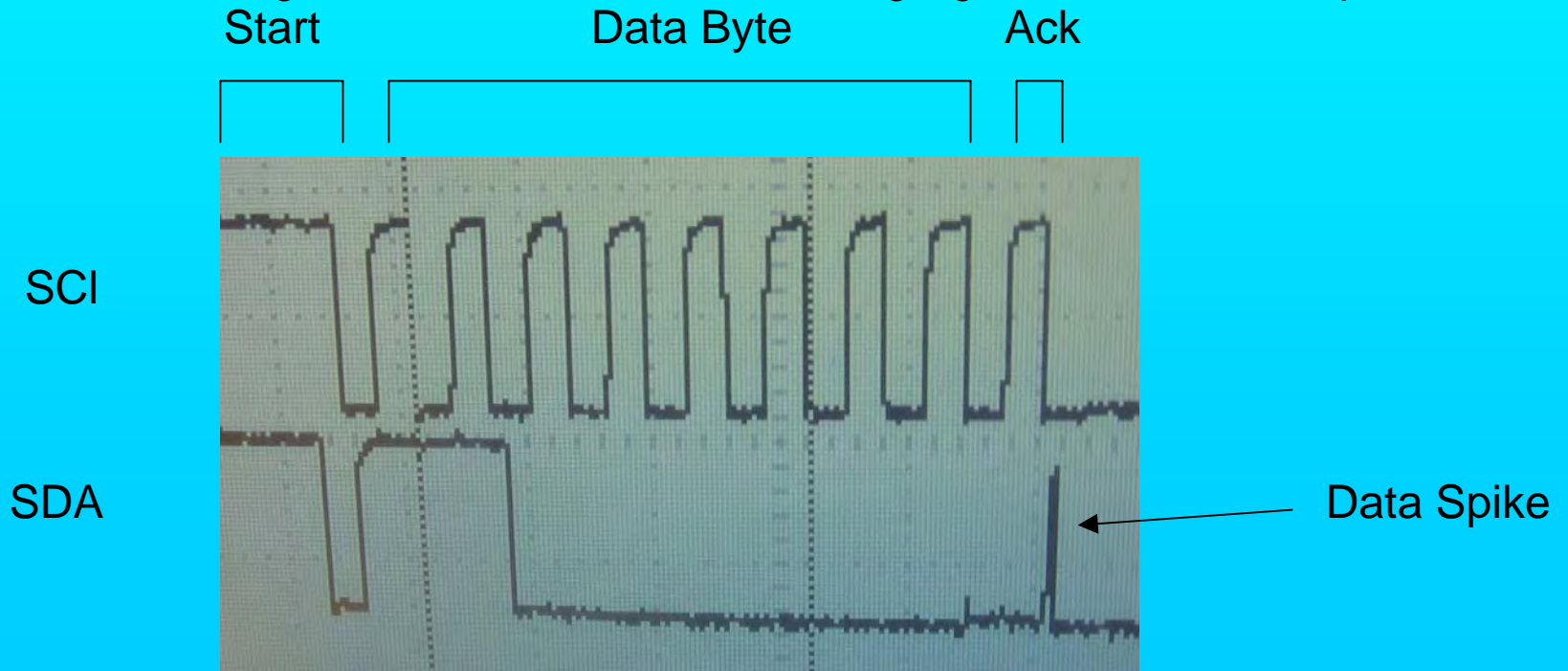
Address/Data Byte

- I²C address is 7 bits in length
- Least significant bit determines if the slave should read or write
- If LSB is 1 that means data read
- If LSB is 0 that means data write



Acknowledge

- The 9th bit is an acknowledge
- An acknowledge is observed if the slave or master receives a data byte and the data line is pulled low
- If the device fails to receive the data byte or there is no device at that address a no acknowledge is sent
- No acknowledges are seen as the data line being high for the ninth clock pulse



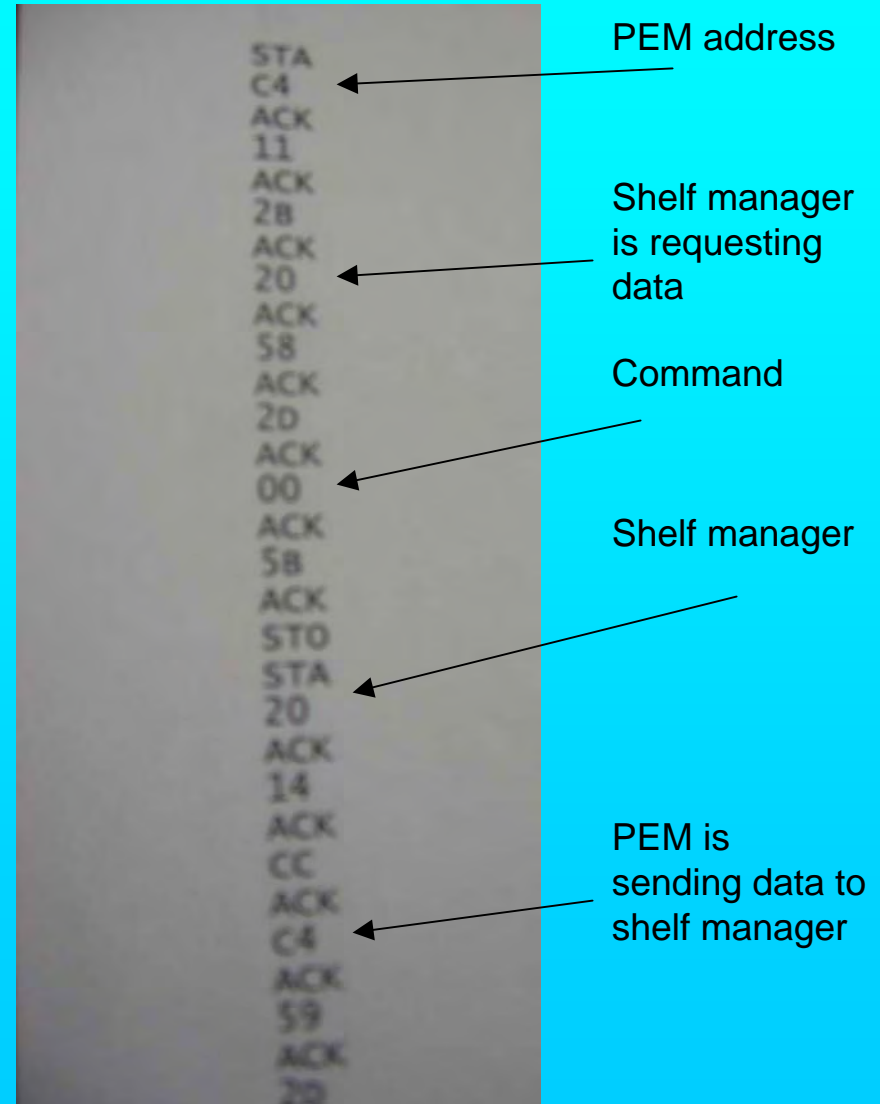
Spying on the Shelf Manager

- Clock line on data bus has a period $\sim 1 \mu\text{s}$
- GPIO pins were used in order to not interfere with the I²C line
- Spying loop takes a reading once every 120 ns
- Limited size of the data array



Results of Spying

- Communications were seen between the shelf manager and the fans and power entry modules (PEM)
- The data must be decoded before any attempt of simulating a slave device can be done



So why Study the Shelf?

- Before implementing this system for the ILC it helps to understand how communication works
- The end goal would be to develop IPMCs that are tailored specifically for use with the ILC

Research Group

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