

TechWorks!

1403-N1 Printer Restoration

Art Law presentation
to
Southern Tier PC Club
March 2015

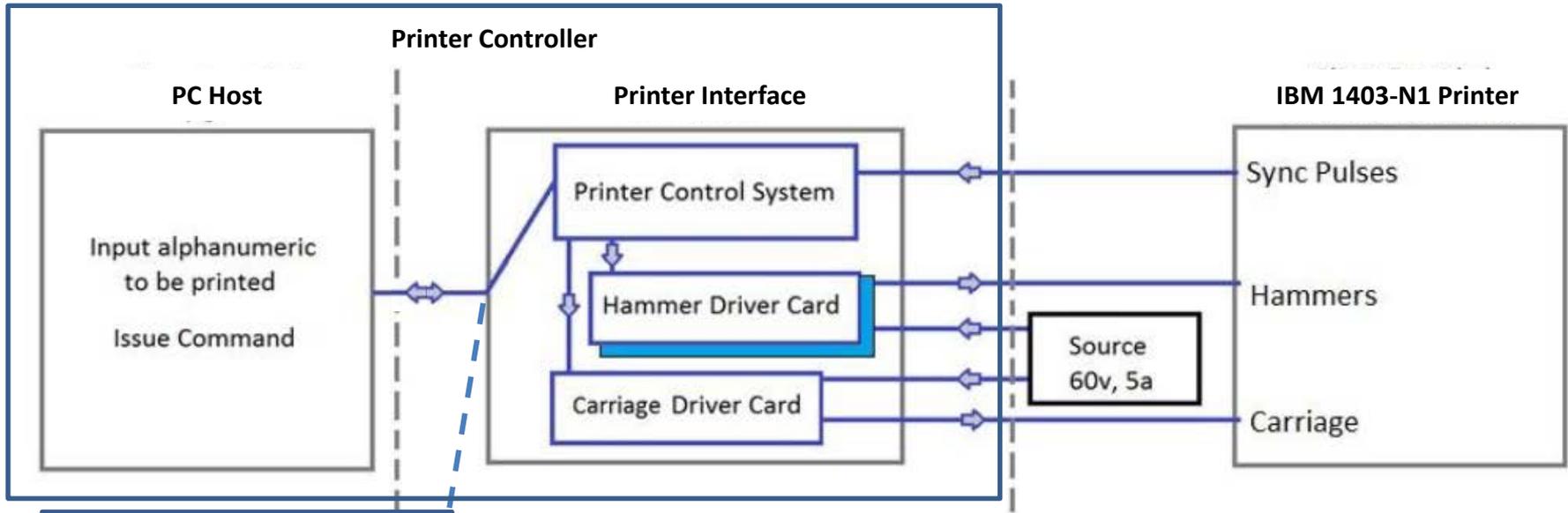
The Printer Project

- Restore printer to operational condition
- Build a Printer Controller that interfaces to a PC and drives the 1403-N1 printer



- Received printer Spring, 2013
- Printer undergoing refurbishment
- Prototype printer controller developed under 2013-2014 WCP

1403 Project System Overview

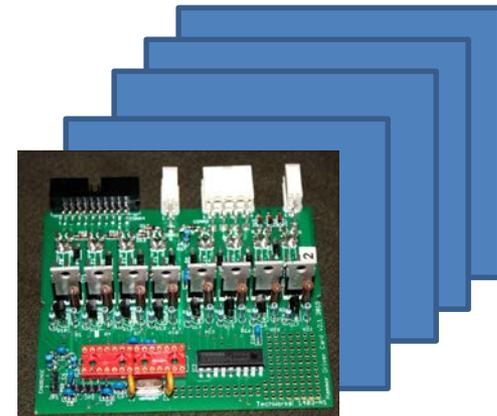
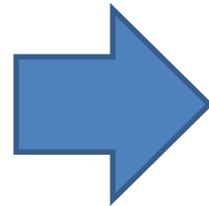


IBM 1403-N1 Printer Controller Challenges

- Sparse documentation
 - But we've got experienced and talented engineers and students
- Spare parts
 - We've been able to build or scrounge what we need
- Maintaining μsec synchronization with the printer
 - Replace SMS technology with cheap but powerful microcomputers
- Coordinating multiple teams
 - Make it fun!



2014-12-20



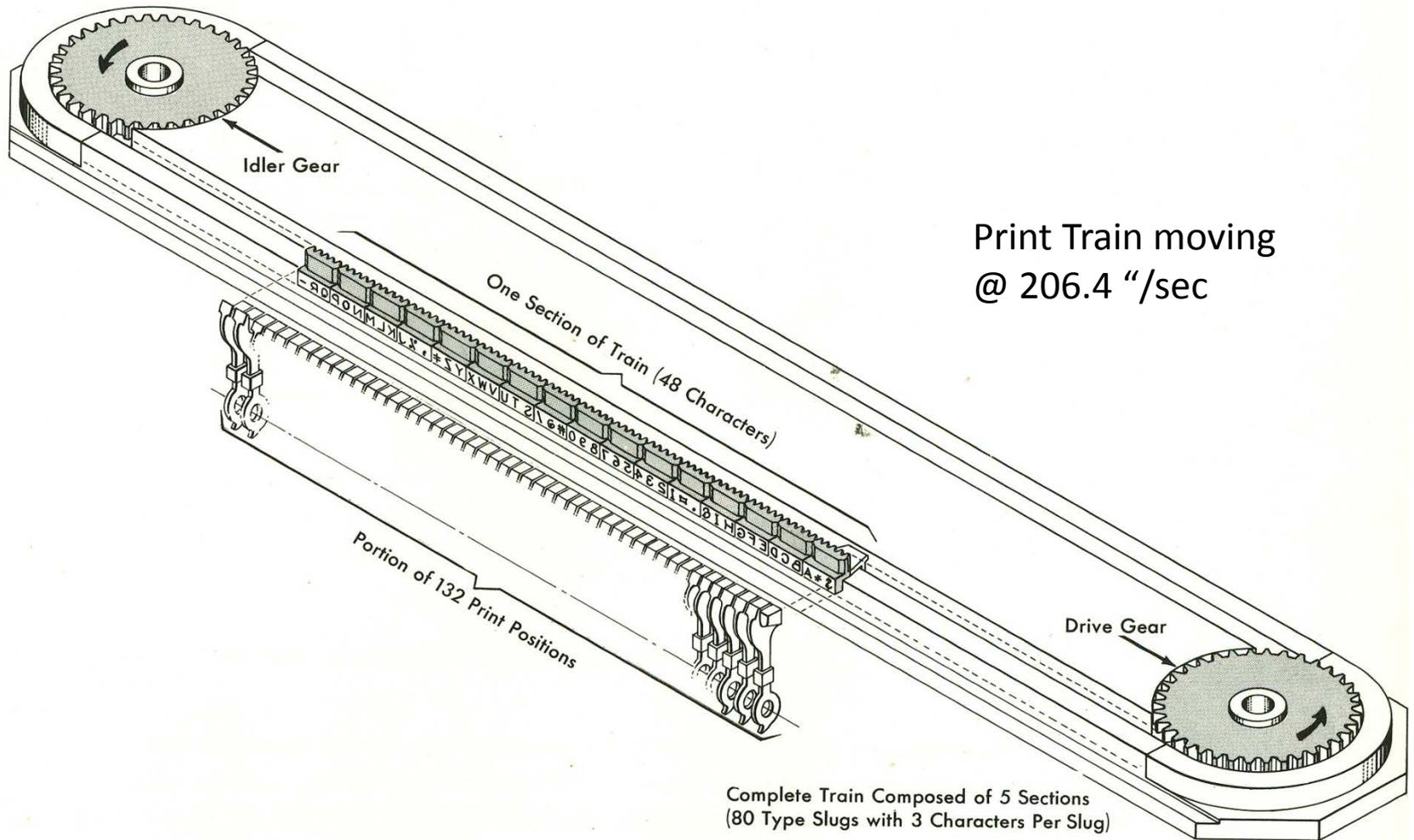


Team Members

- Center for Technology & Innovation
 - Client
 - Printer refurbishment
 - Technical and Program Management
- Watson School Senior Undergraduates
 - Software
 - Hardware safety interlocks
- Triple Cities Makerspace
 - Chassis, hardware & software development
- IEEE Binghamton Section
 - WCP sponsor & Technical Advisor

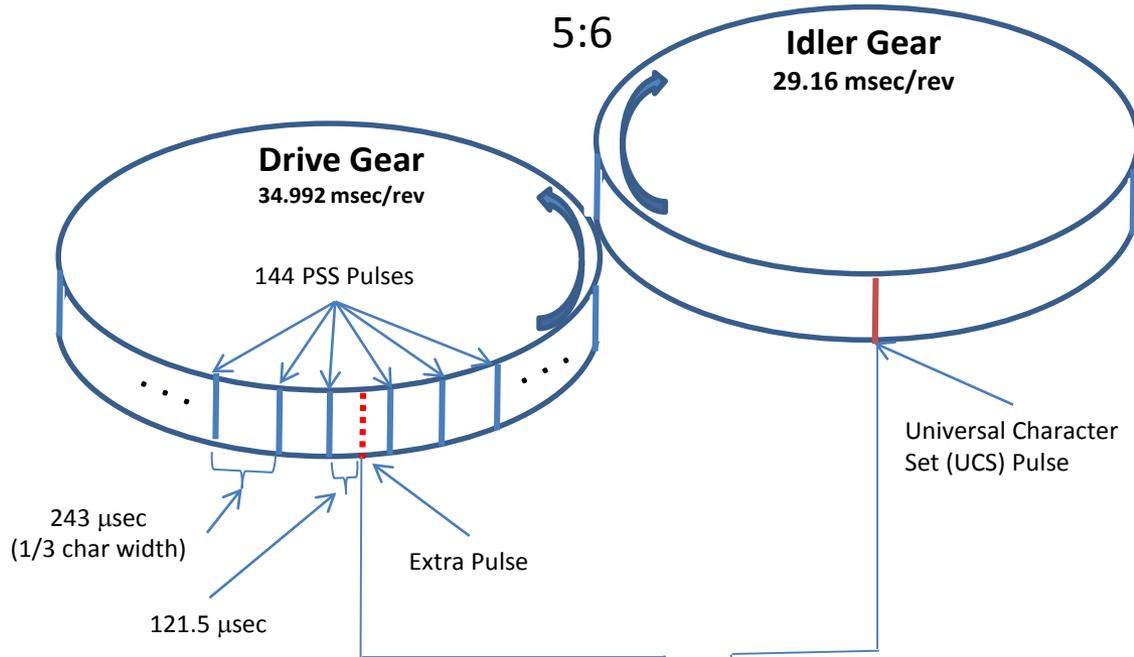


IBM 1403-N1 Printer Controller Print Train Assembly

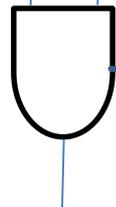


Drive Gear:Idler Gear

5:6



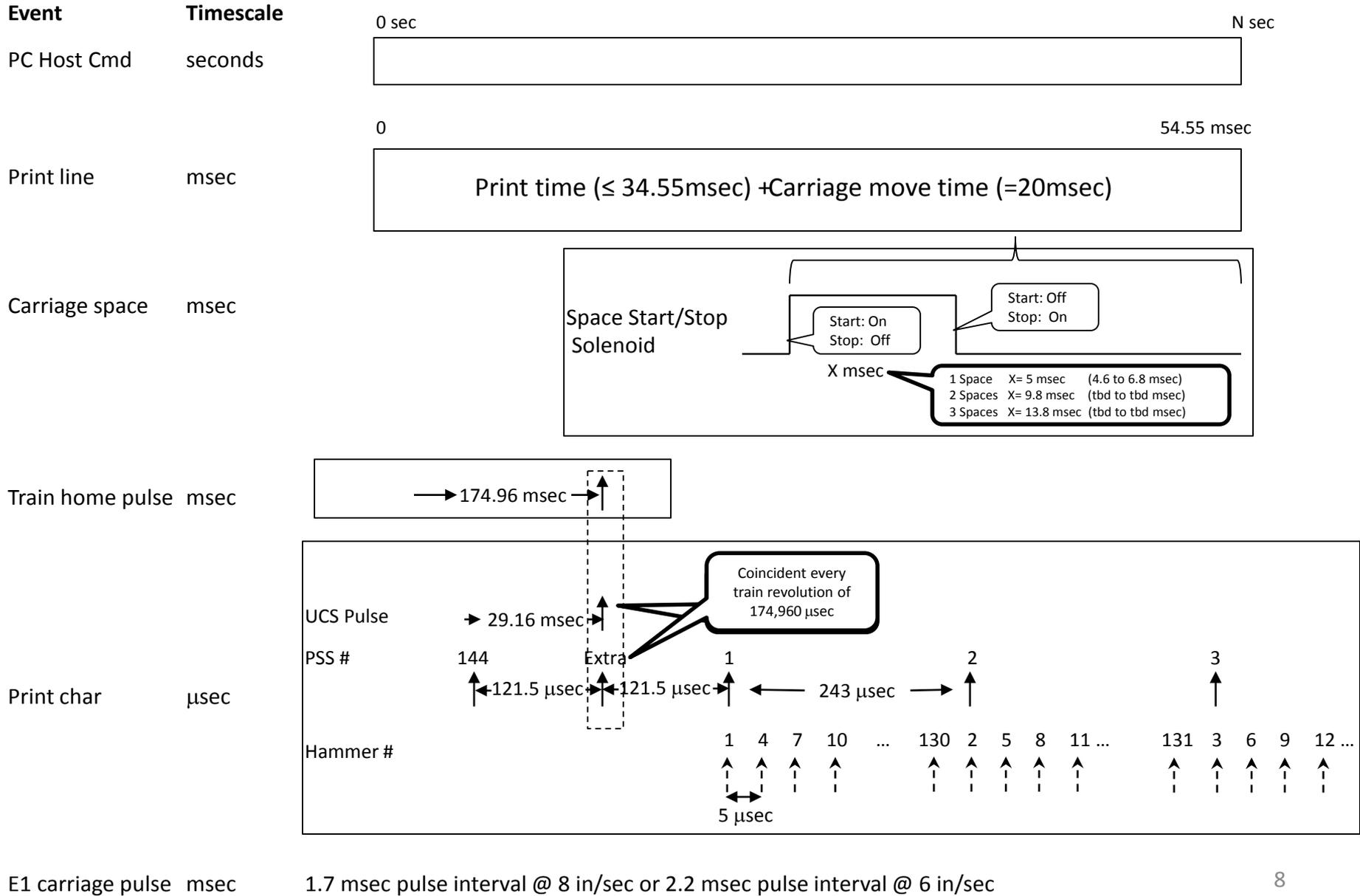
- At initialization:
 - Establish detection and tracking of PSS pulses
 - Determine PSS – PSS timing are within expectations
 - Detect Train Home Pulse to establish position on chain
- During operation:
 - Verify correct PSS detection and timing
 - Issue synch error if anomalous conditions detected



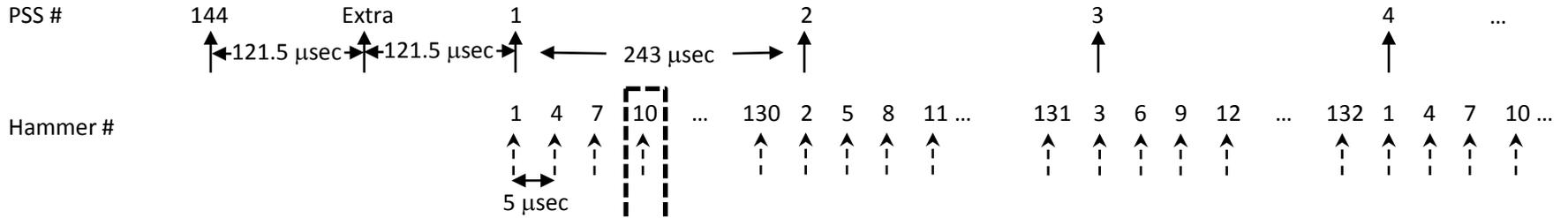
“Anding” done in SW although it could be done in HW

Train Home Pulse
(174.96 msec
once per 240 chars or
once around the chain)

Events & Timescales



Pulse Timing

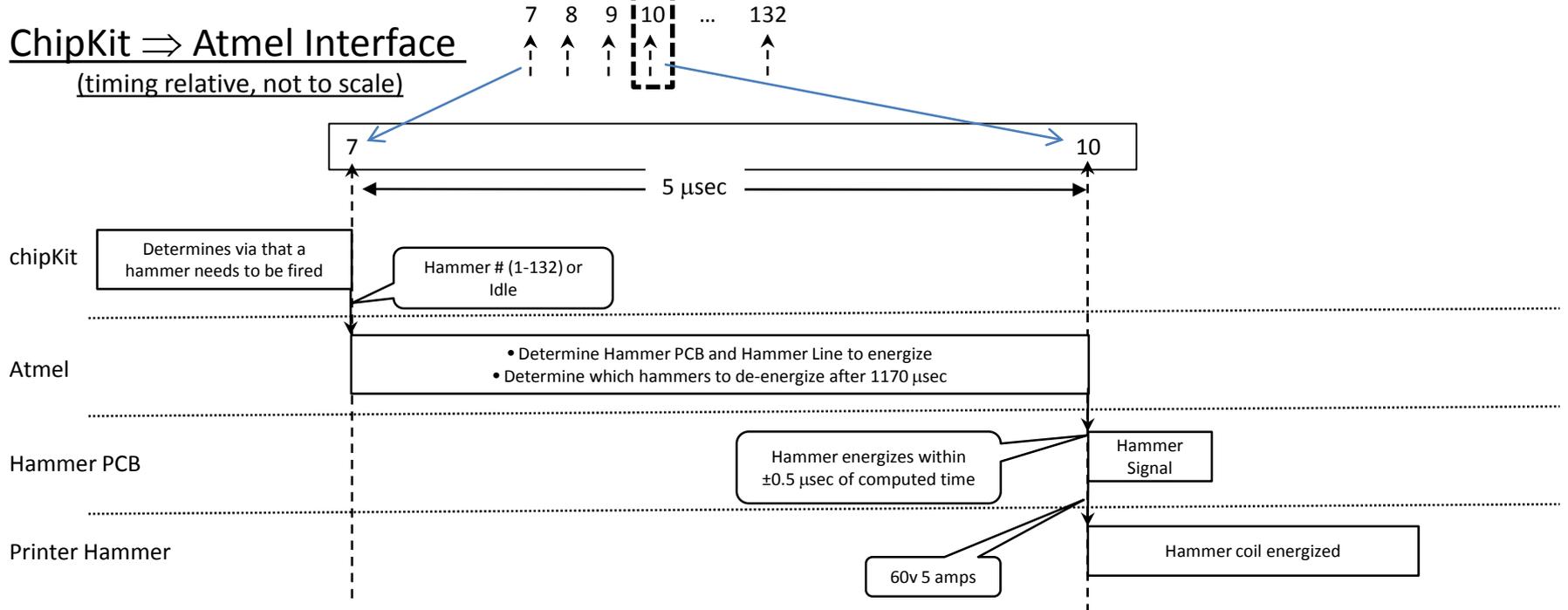


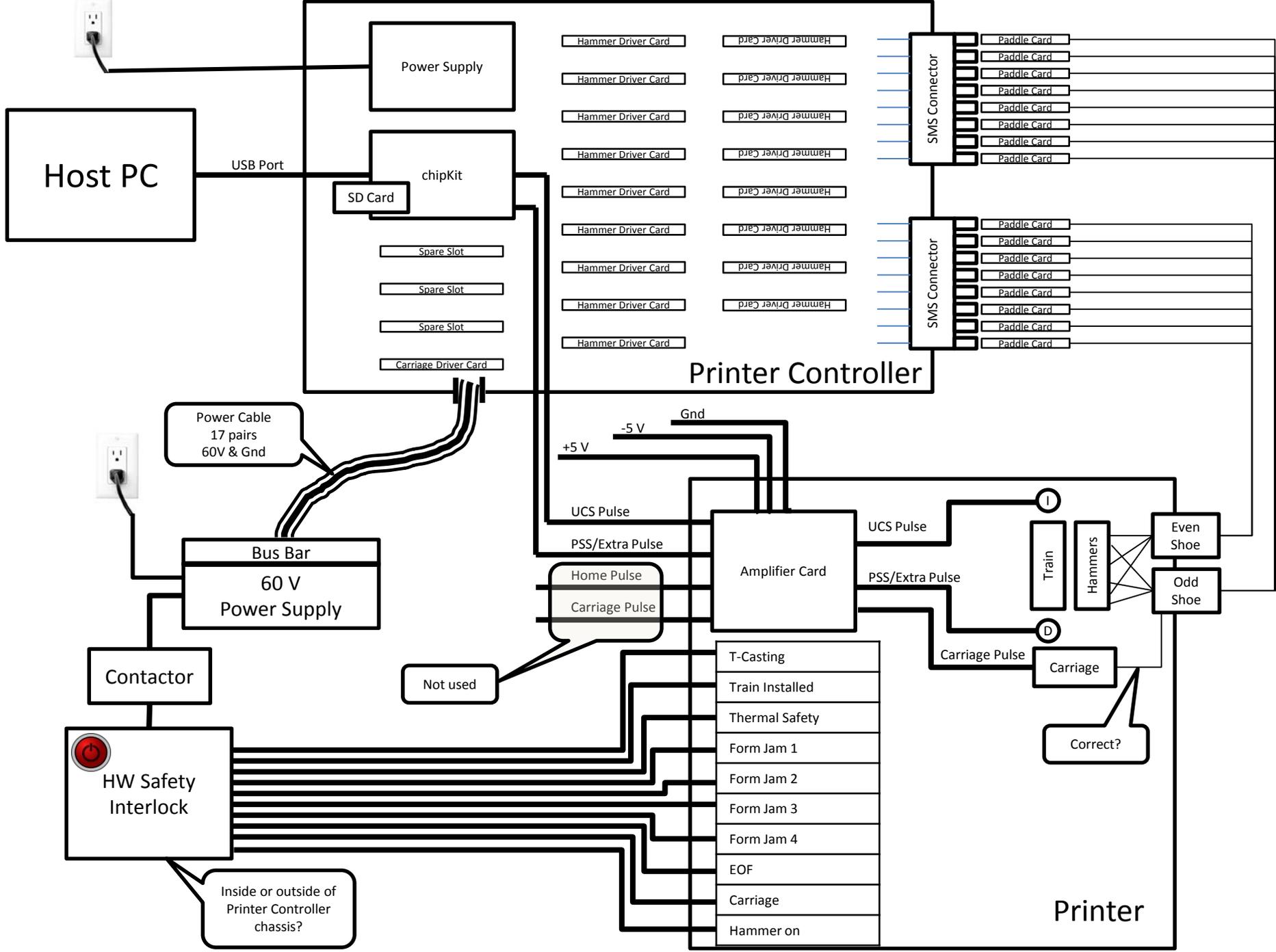
Print Train Character Alignment

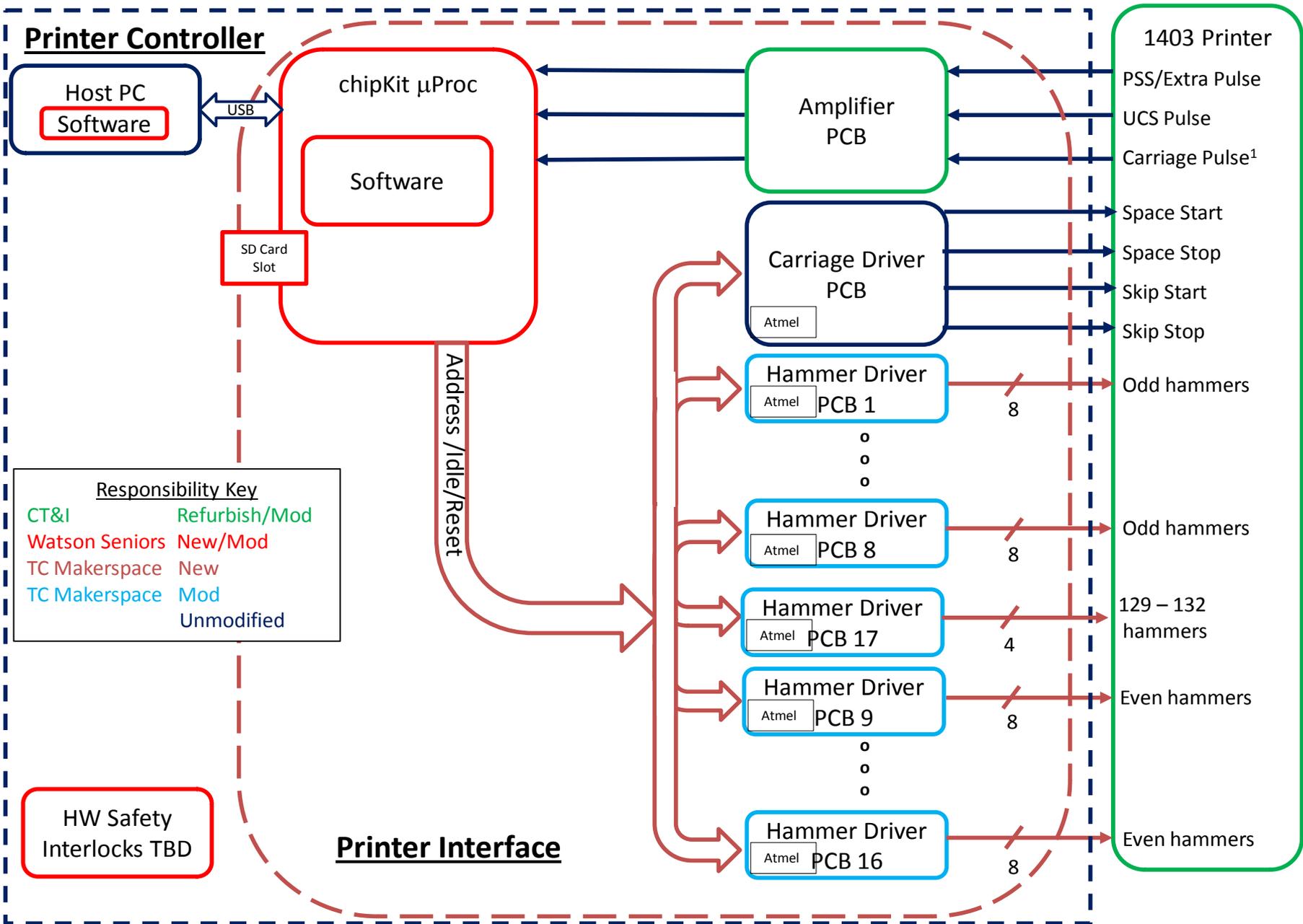


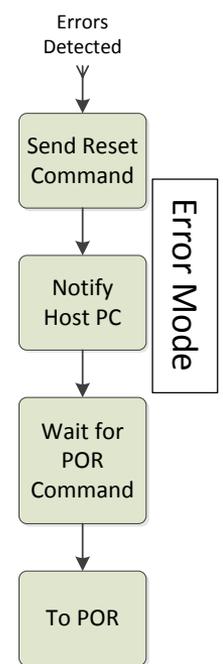
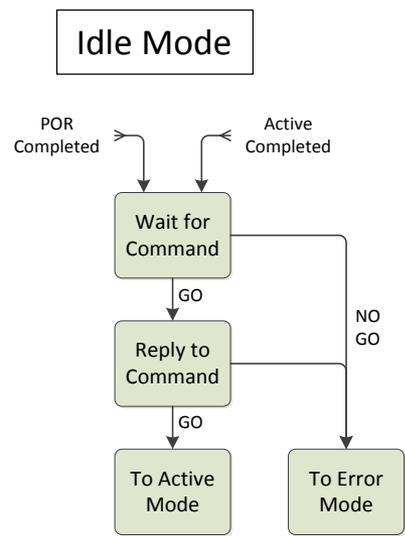
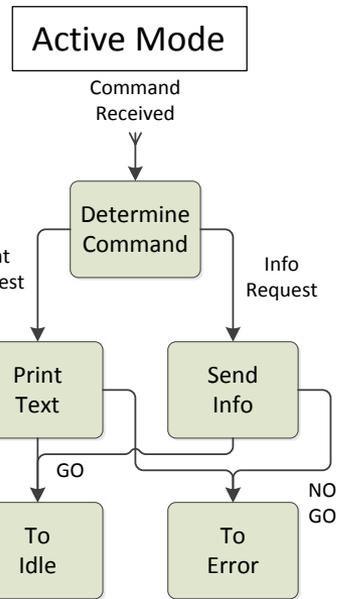
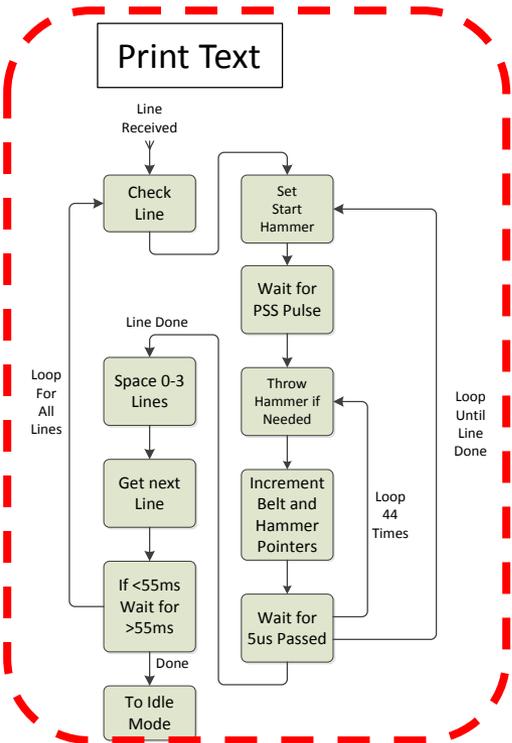
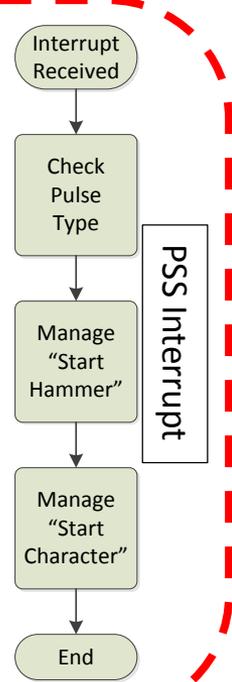
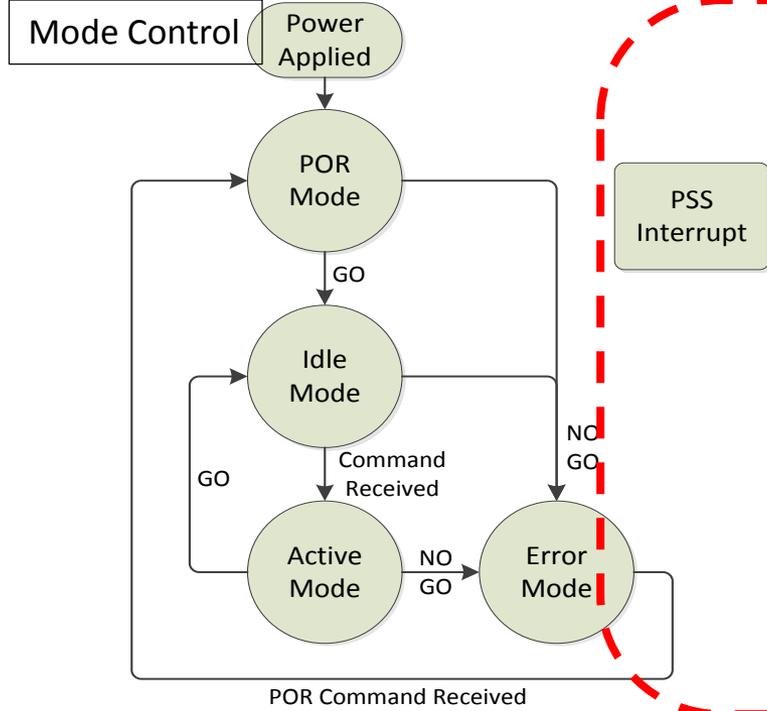
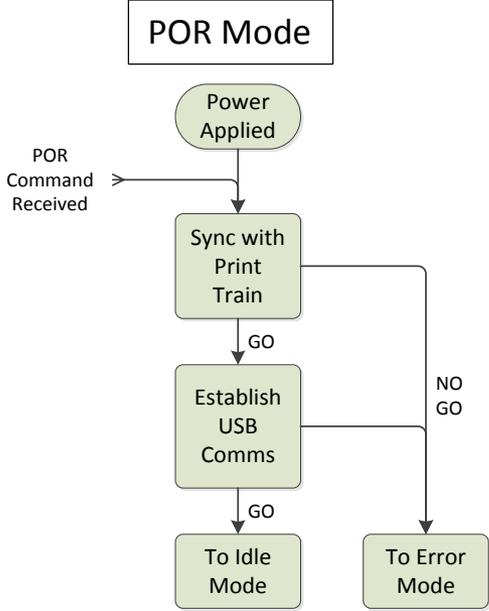
ChipKit ⇒ Atmel Interface

(timing relative, not to scale)



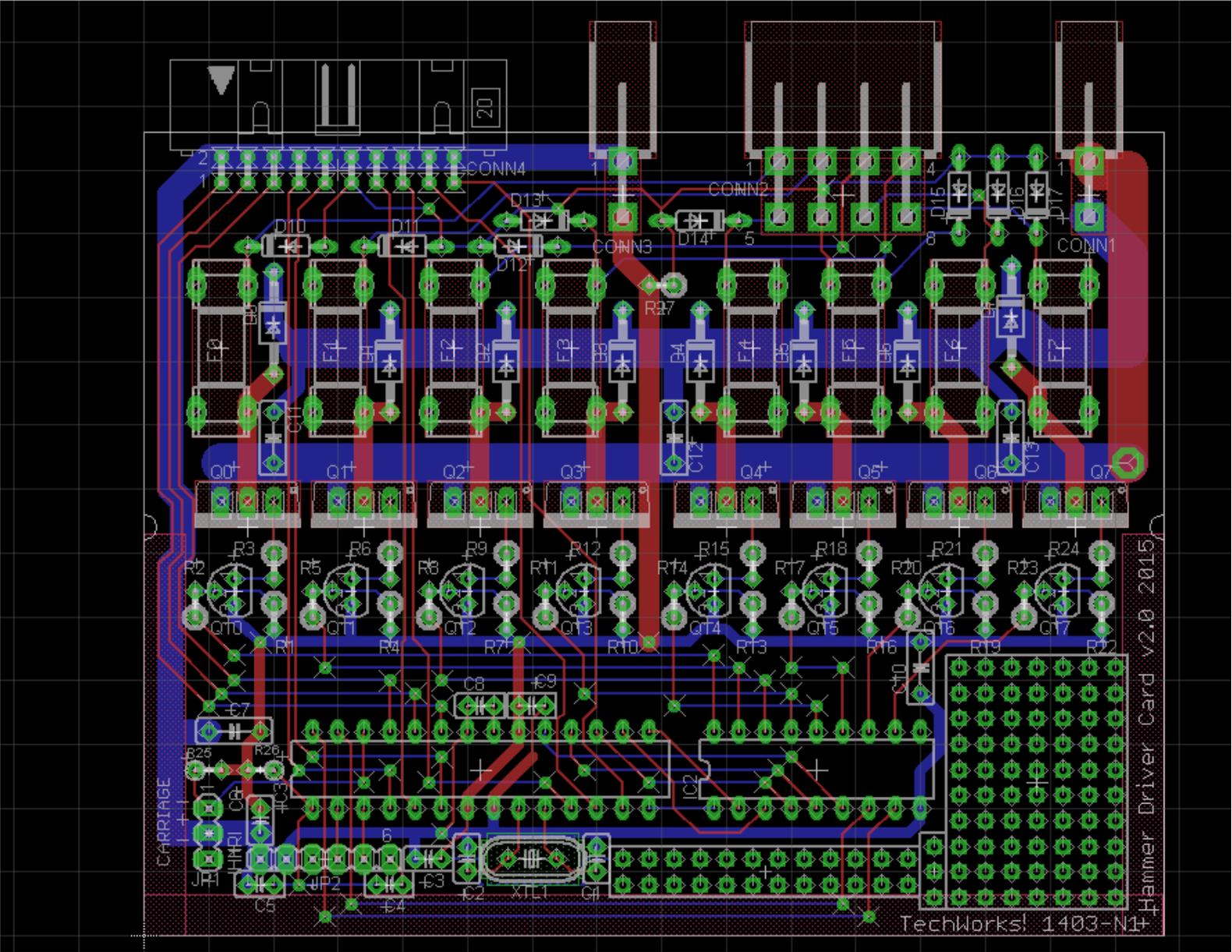




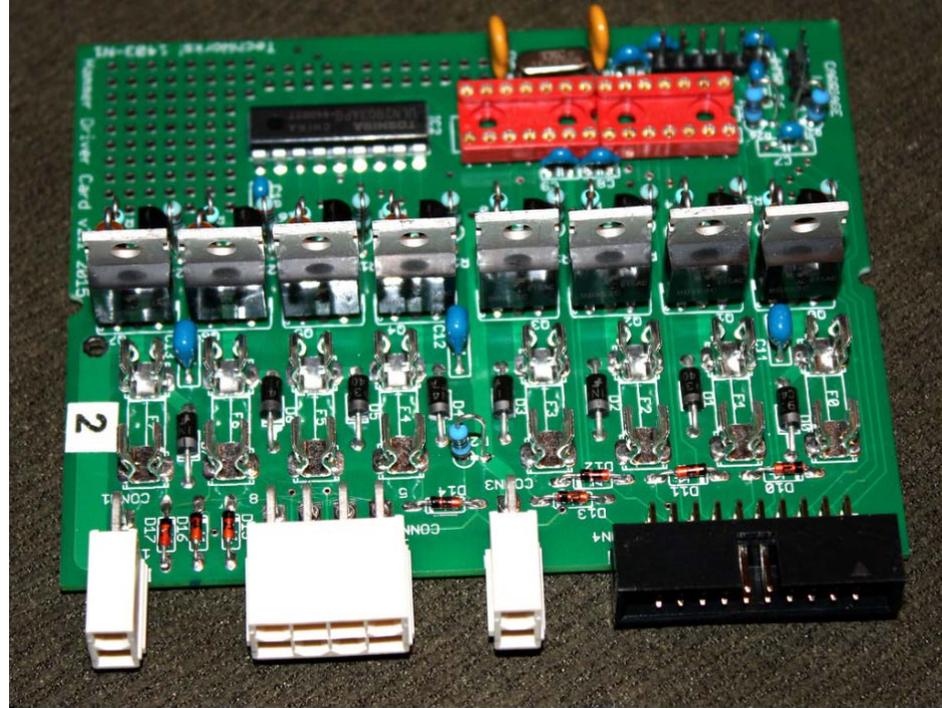
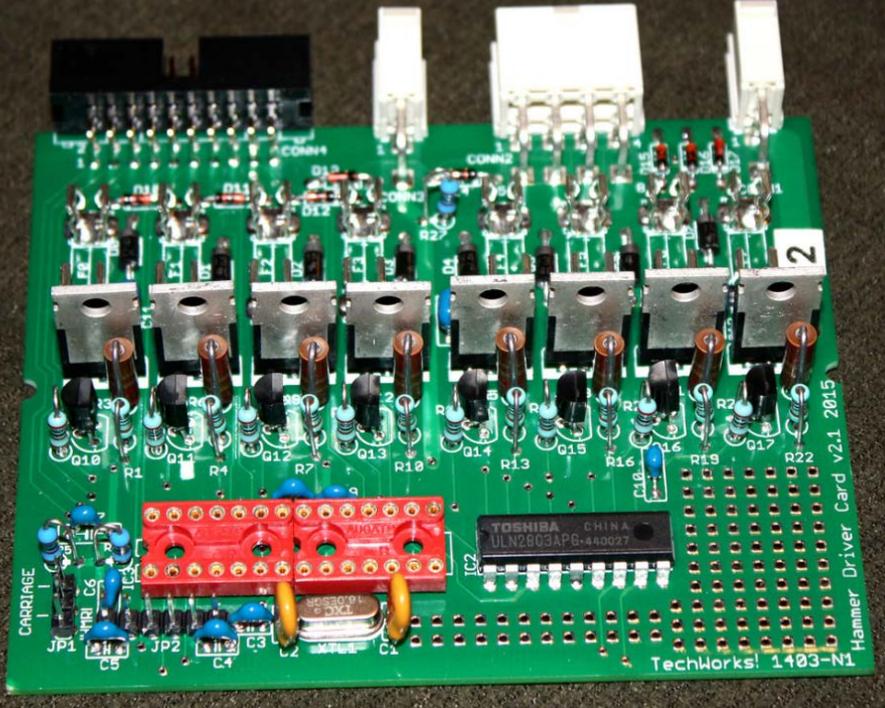


Software Components

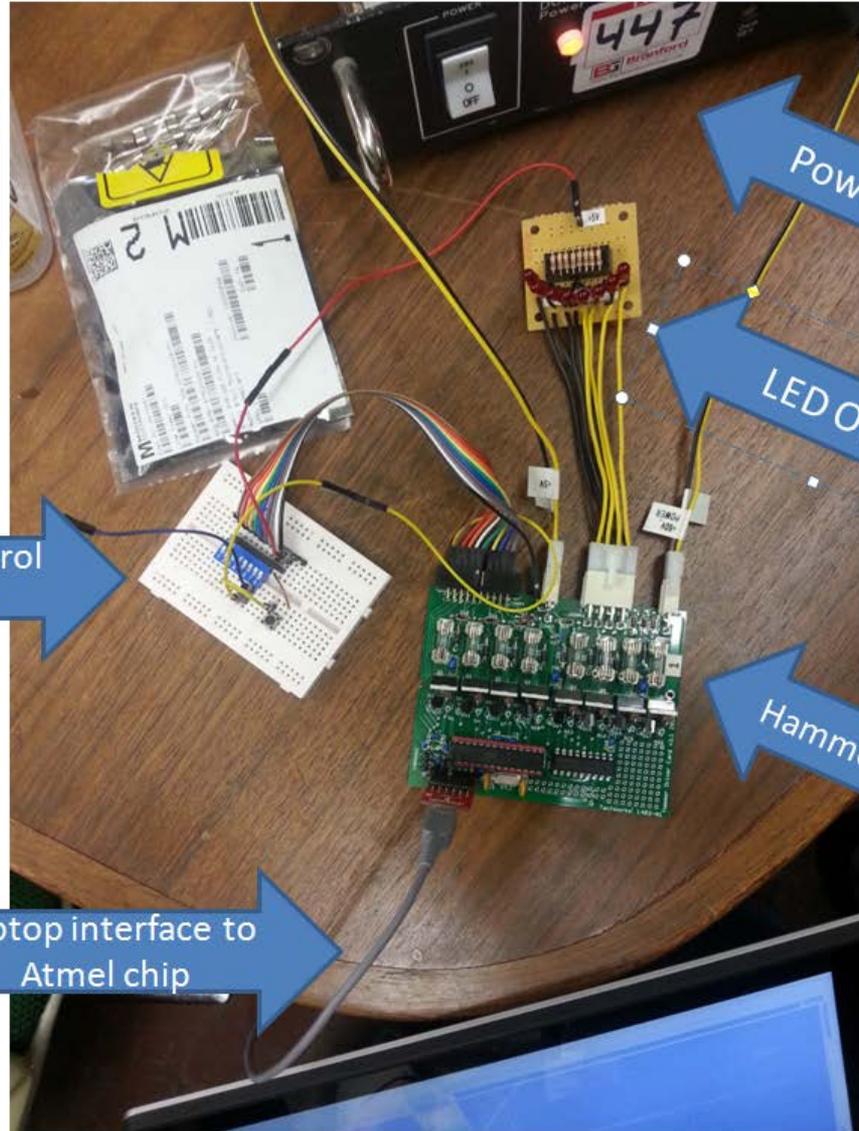
Hammer Driver Card Layout



Hammer Driver Card



Latest Test Results



Switches to control test software

Laptop interface to Atmel chip

Power Supply

LED Output

Hammer Driver Card

