

# Target Spin Flip Control System Progress Report

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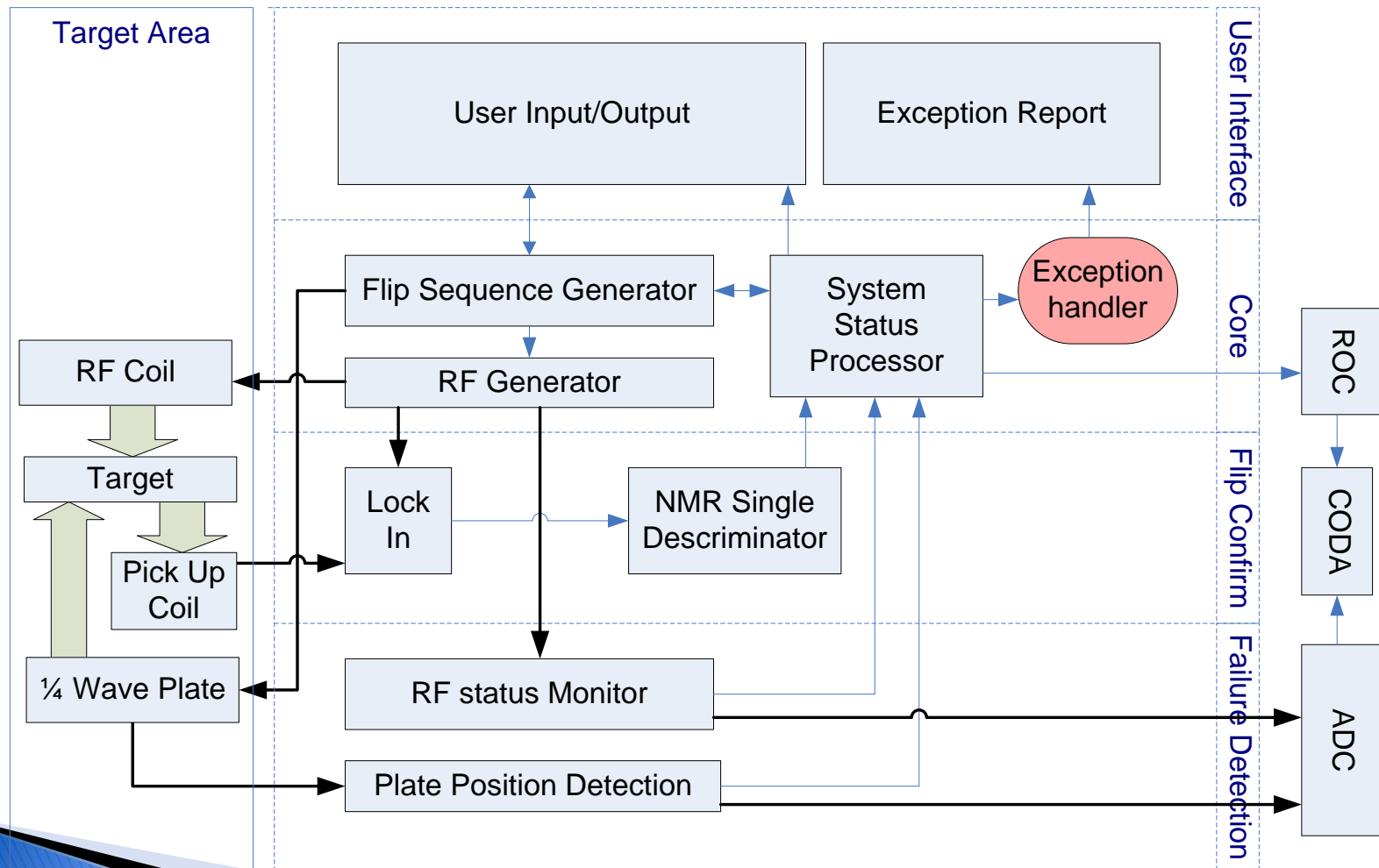
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# Review and Summary

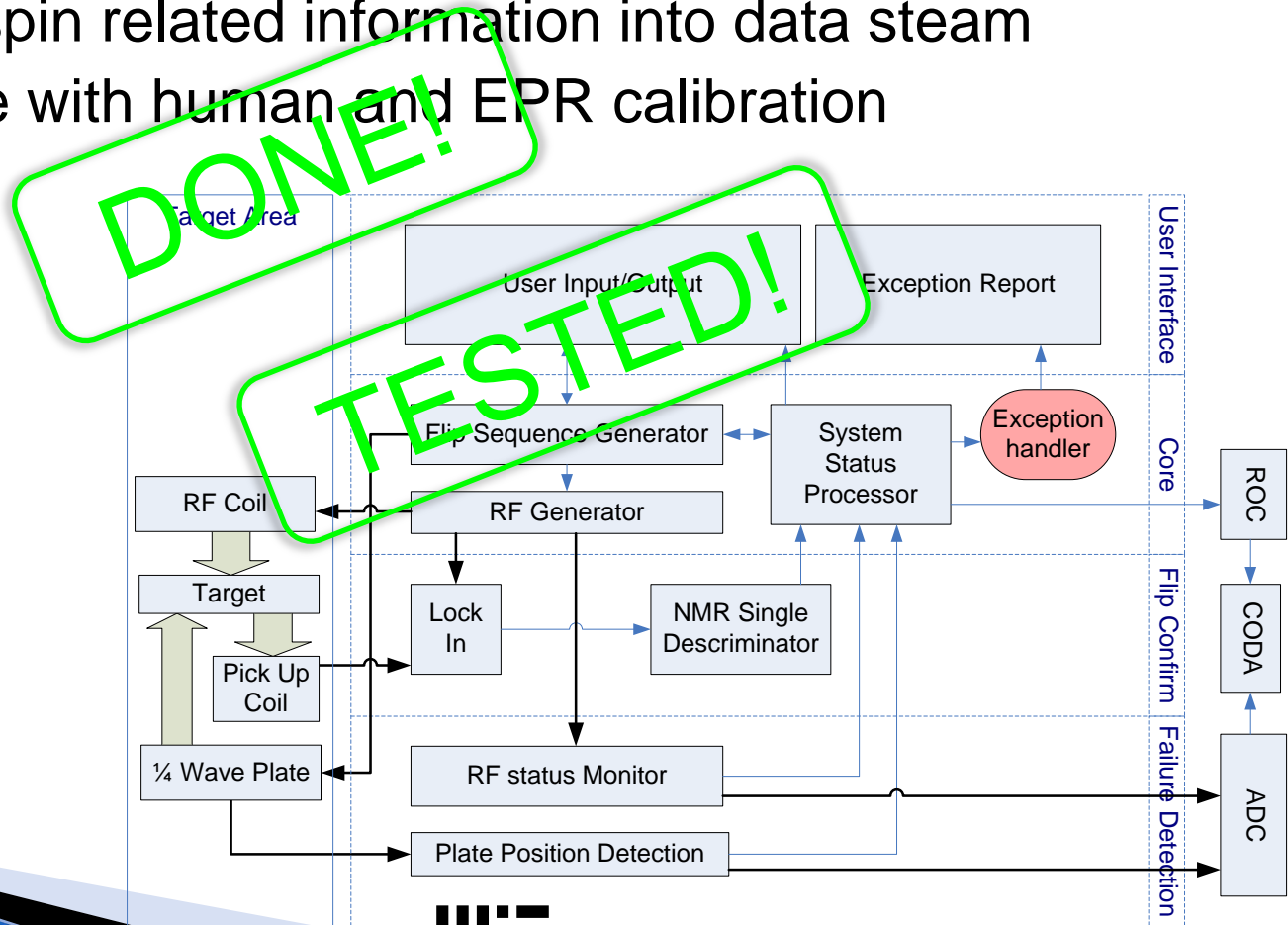
- 1. Review the goal and design of this project
- 2. Summary Current Progress

# Initial Design

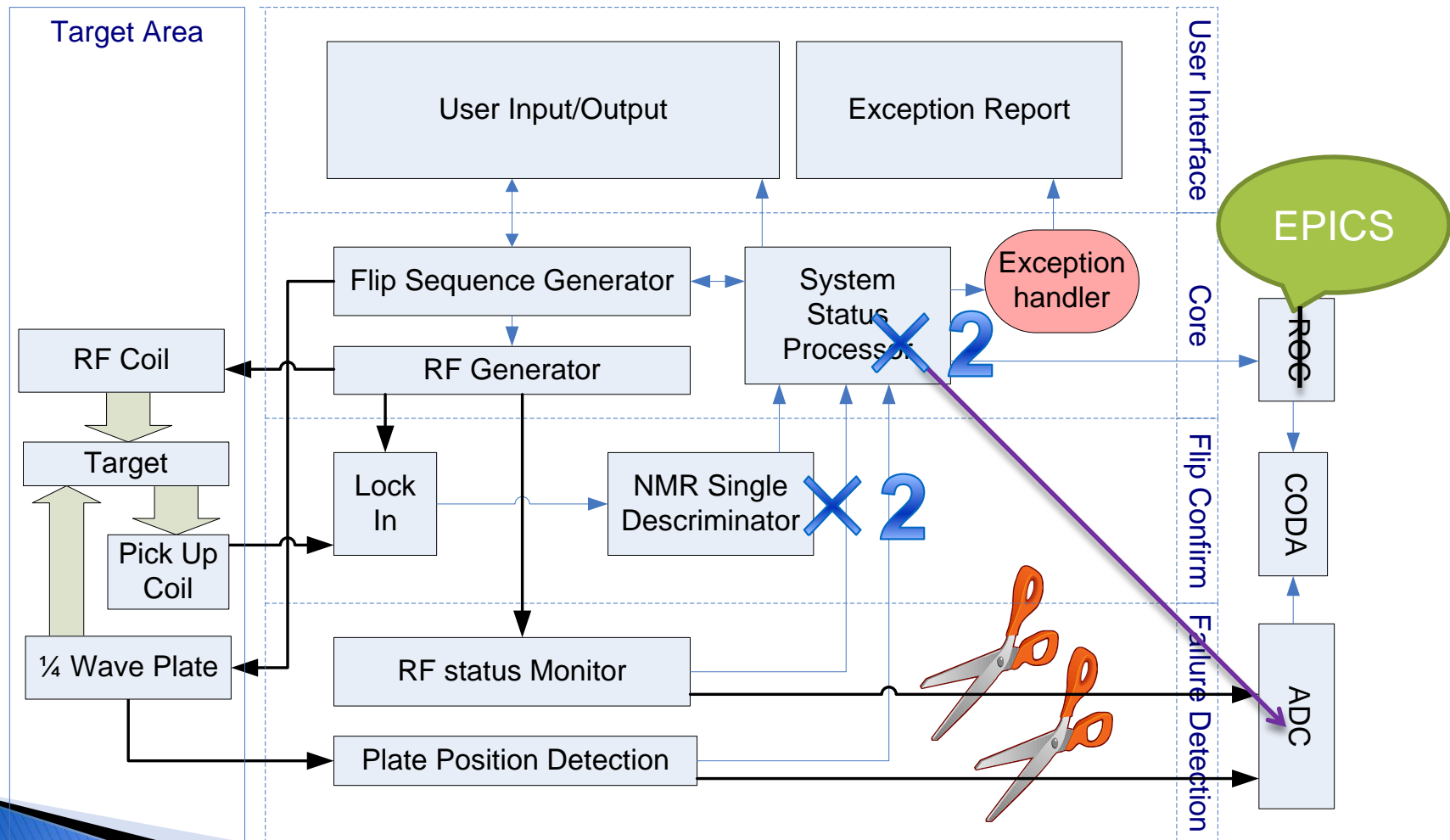


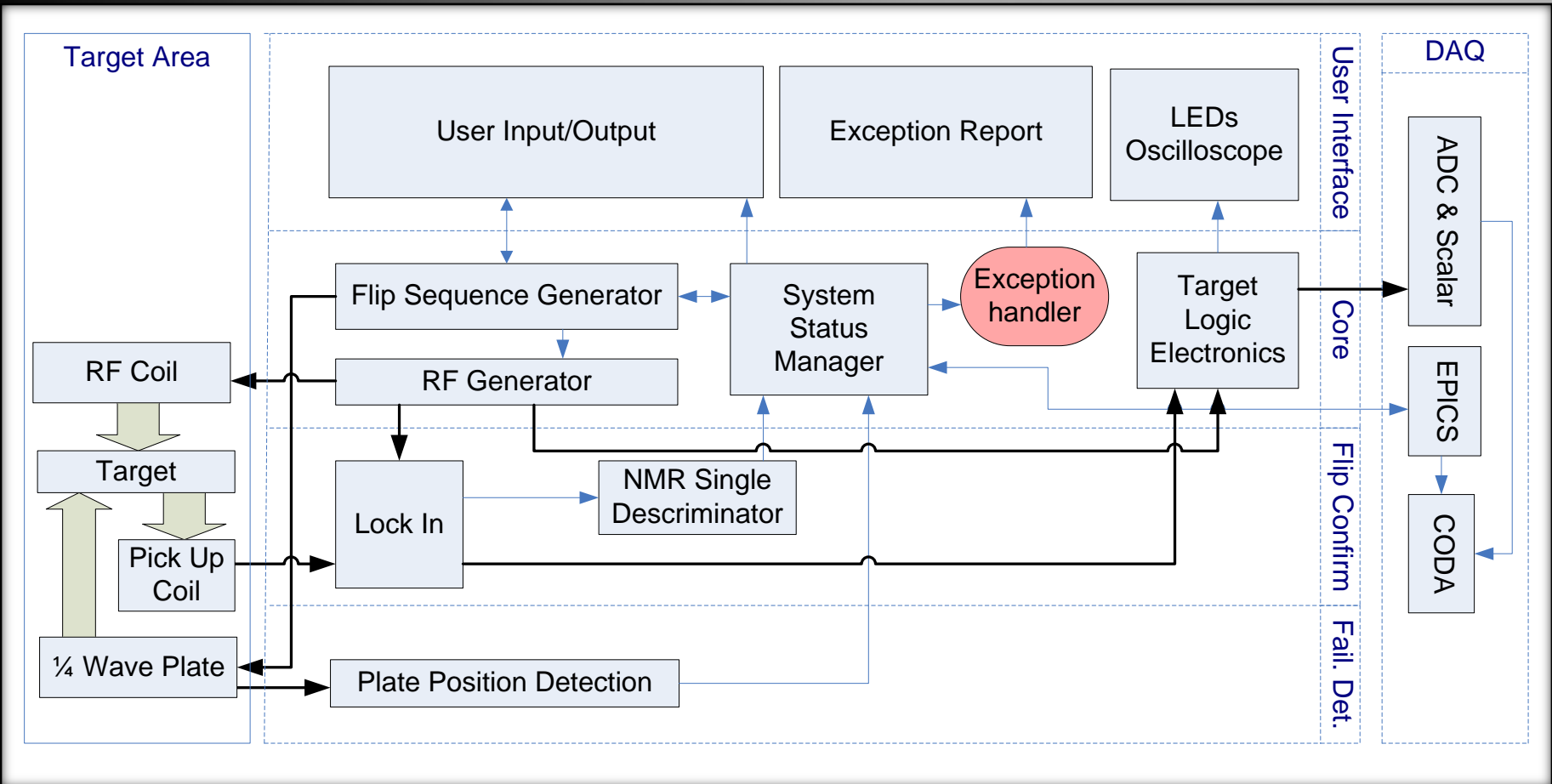
# Project Goal

- Control the target spin flip consequence
- Record current spin state
- Output spin related information into data steam
- Interface with human and EPR calibration



# Final Design





# Final Design >>>

Here comes the final design



# Progress Summary

- ▶ Coding is finished
- ▶ Logic Electronics Designed, Assembled and Tested
- ▶ Motorized Q-wave plate for Laser Polarization Calibrated and Tested
- ▶ **Full System Stress Test** (Except writing Fake EPICS Variable)  
Stable for designed Flip Life Time (1000 flips)

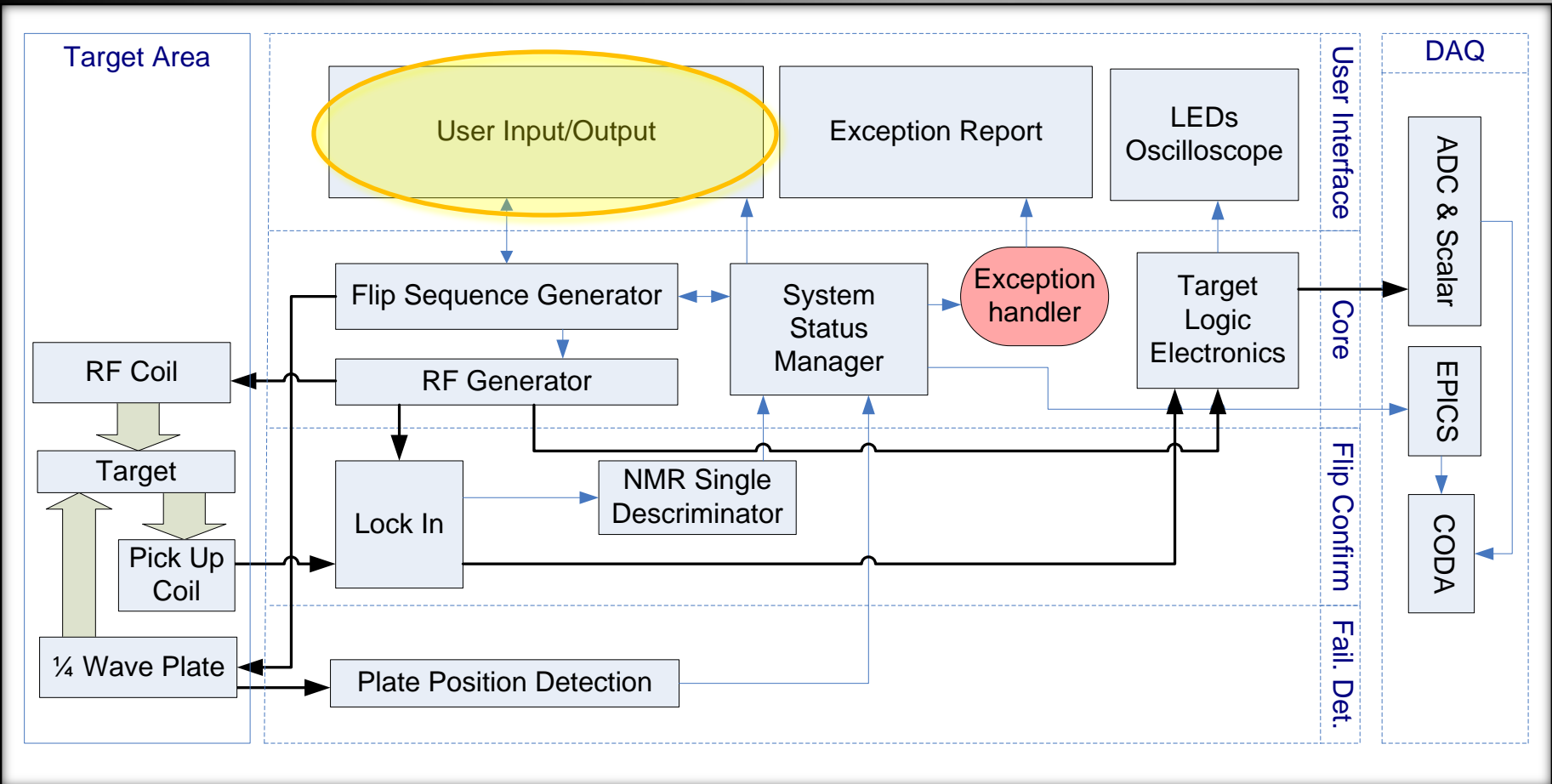


# Tour Across the System



1. General User Interface
2. Exception Handling
3. Logic Electronics
4. Laser Polarization Control



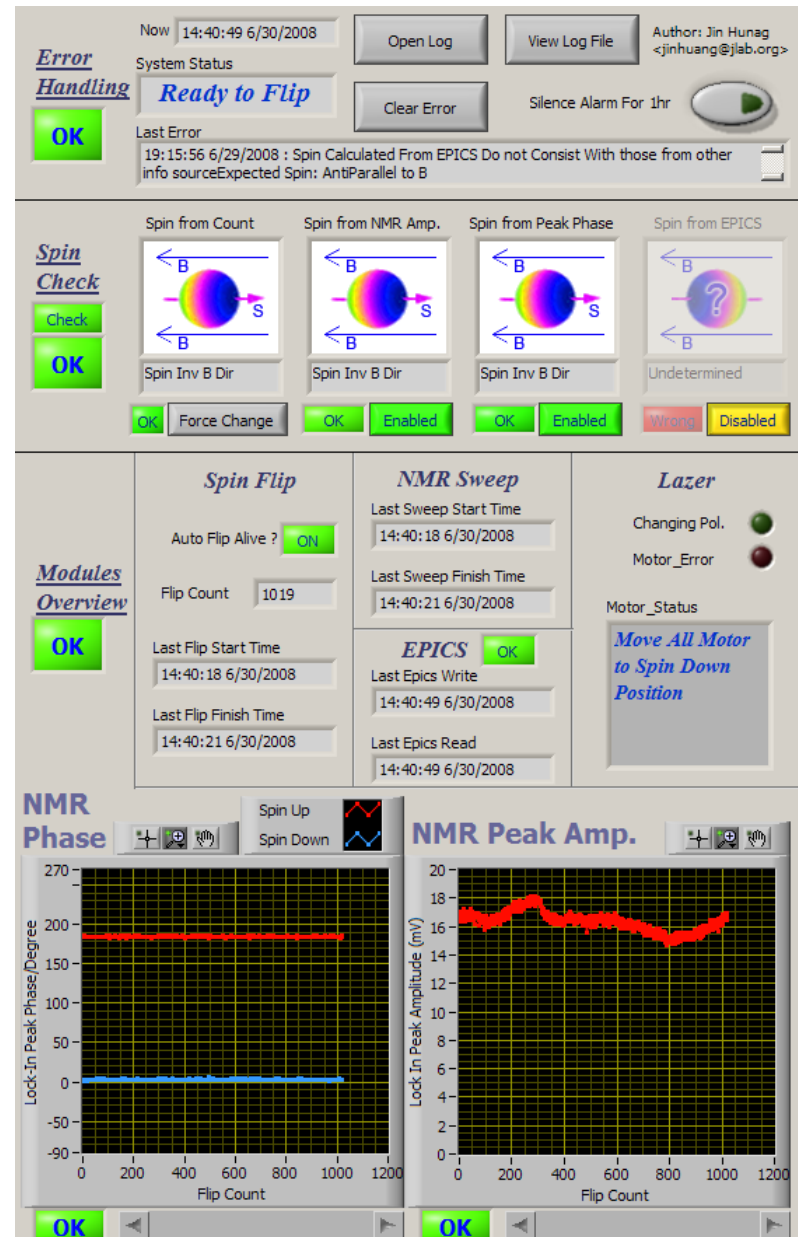


# General User Interface >>



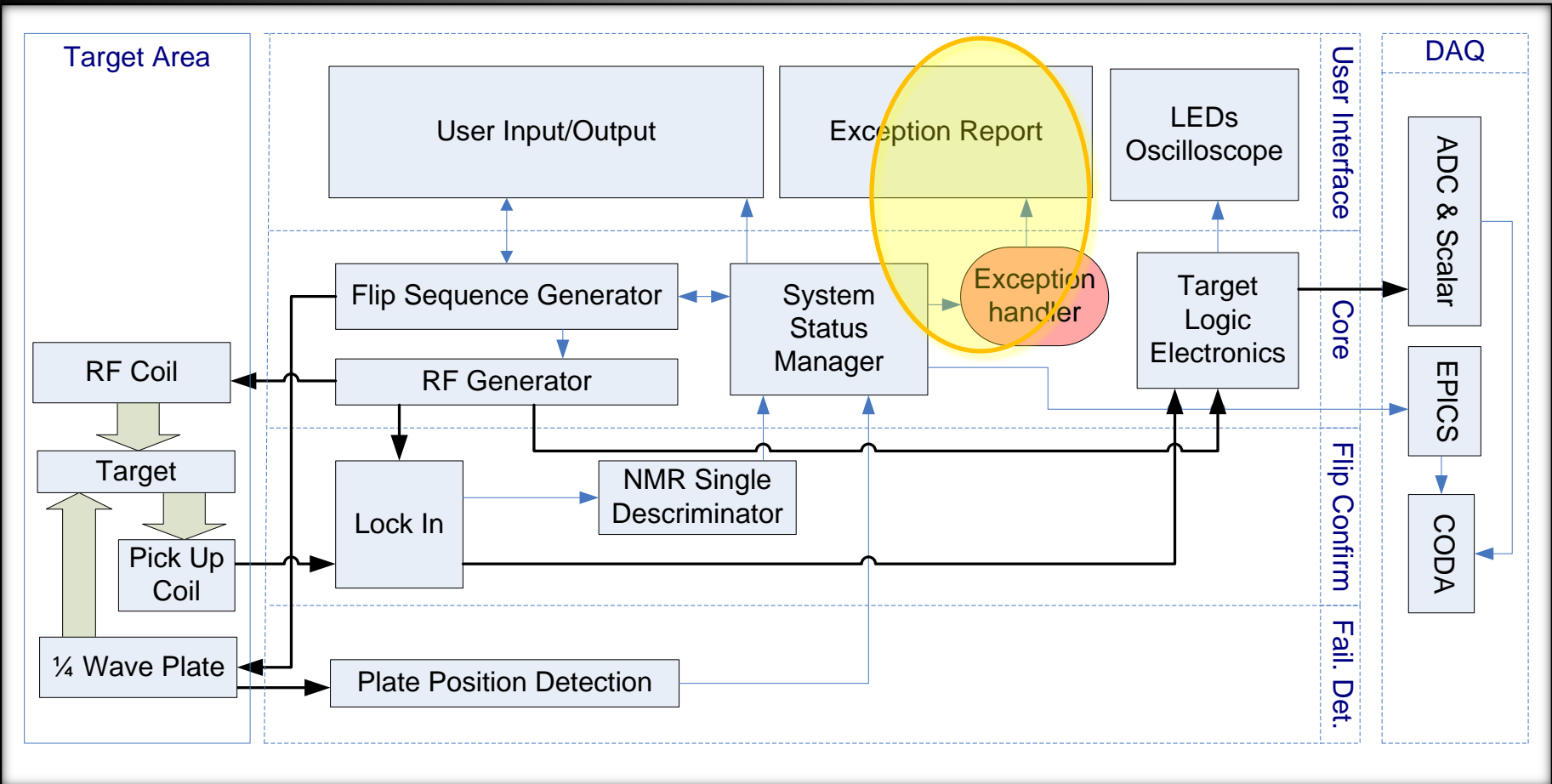
# System Status Manager

- ▶ Simple Operation Rule:
  - **Green**: Working Fine
  - **Yellow**: Potential Problem Attention Needed
  - **Red**: Error Occurred Data Quality in Threaten



# A Collection of GUI for Every Part in the system

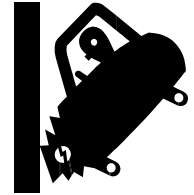
& More



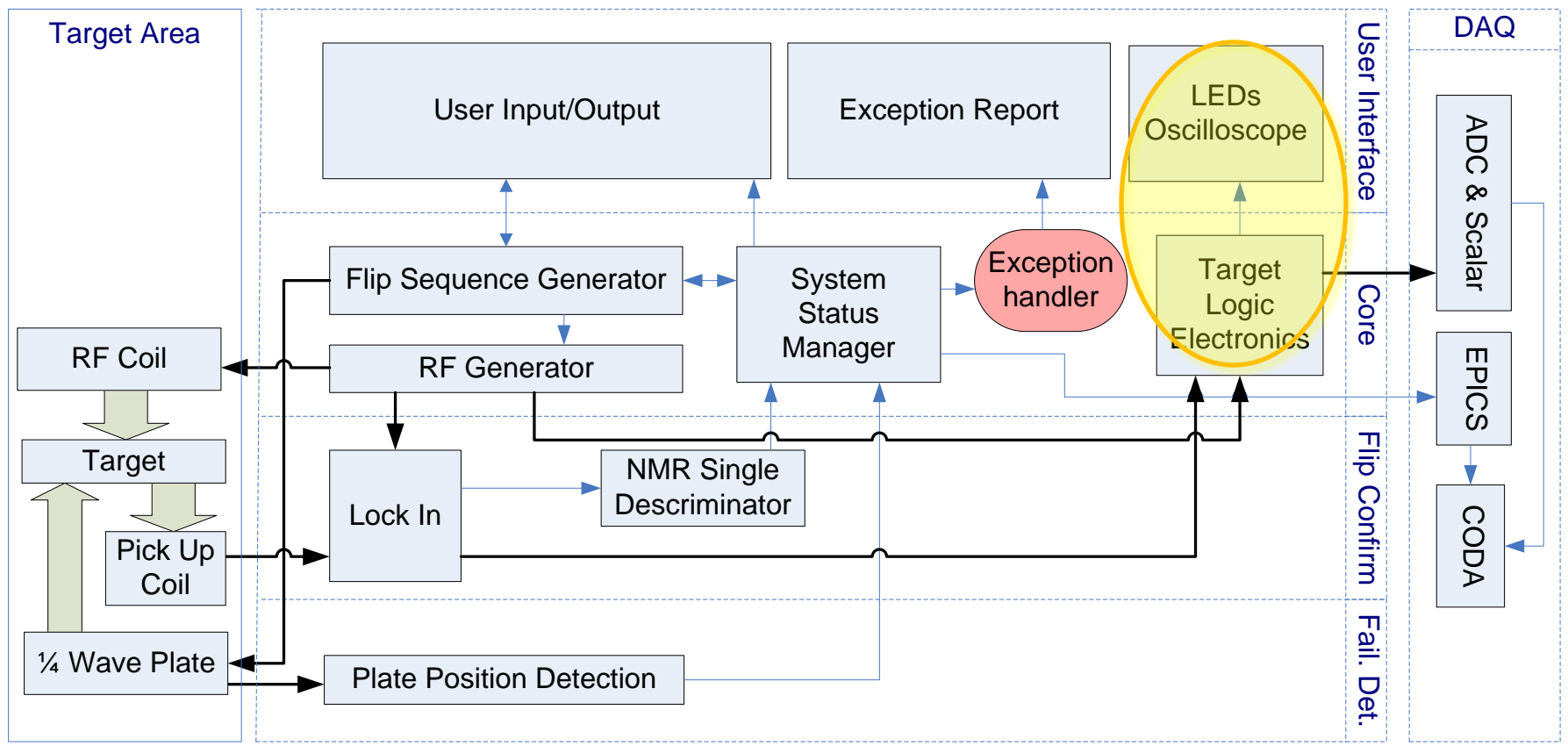
# Exception Handling >>



# Exception Handling



- ▶ **Before Exception**
  - Expert Key
  - Text Log of Every Operation
  - [WWW Report](#)
- ▶ **During Exception**
  - Alert TO, DAQ
  - Capability to Adjust Each Part
  - Clear Error
- ▶ **After Exception**
  - Automatic Full System Snapshot for Future Analysis



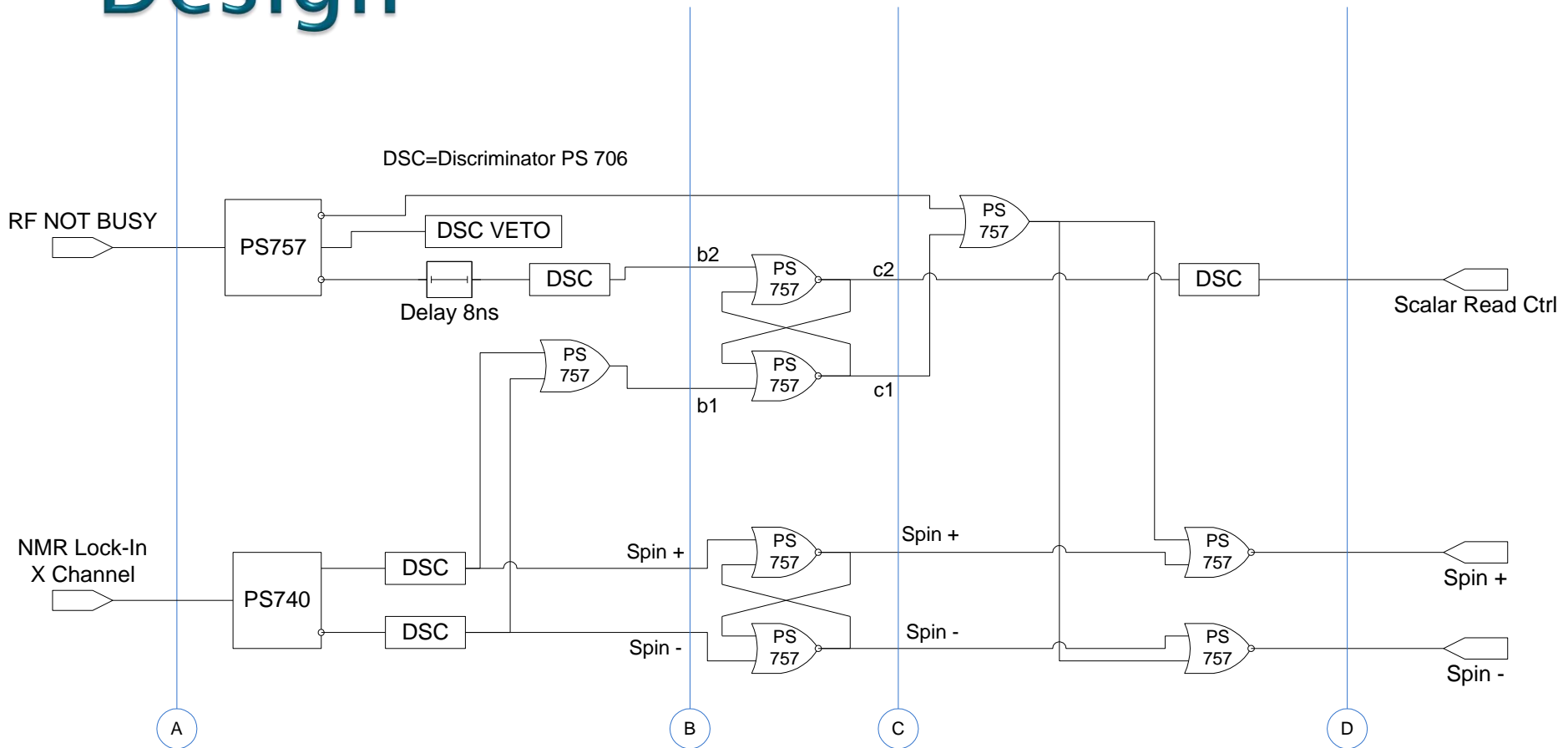
# Logic Electronics >>



# Description

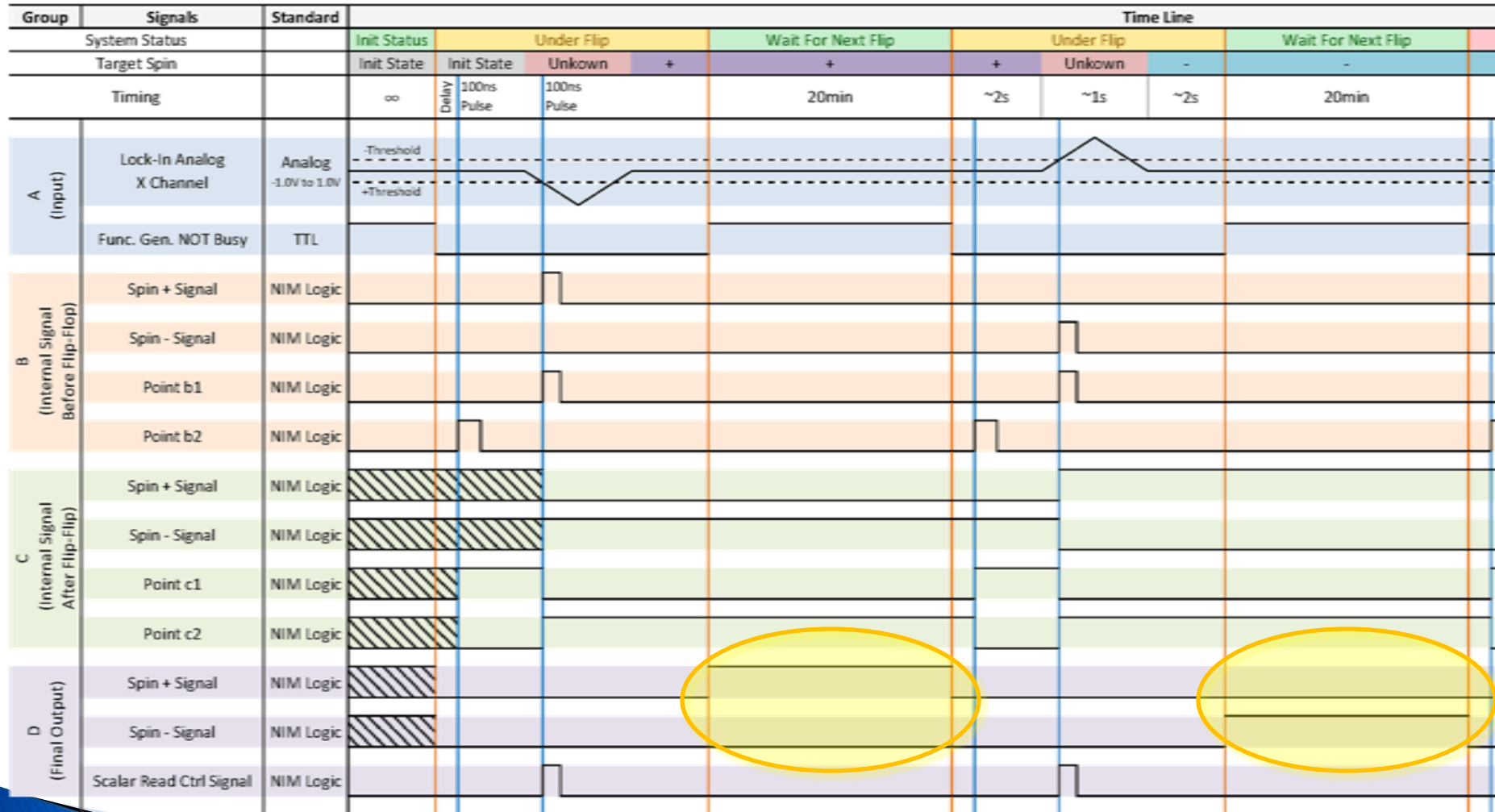
- ▶ A Complete Separate Electronics System Produce a Hard Copy of Spin Signal
- ▶ Input
  - NMR Signal
  - RF Status
- ▶ Output
  - Spin State (NIM Signal for DAQ)  
Output Undetermined State if
    - Under Flip
    - A Flip Failure is Detected
  - Flip Count & Spin State (thr LED for TO)

# Design

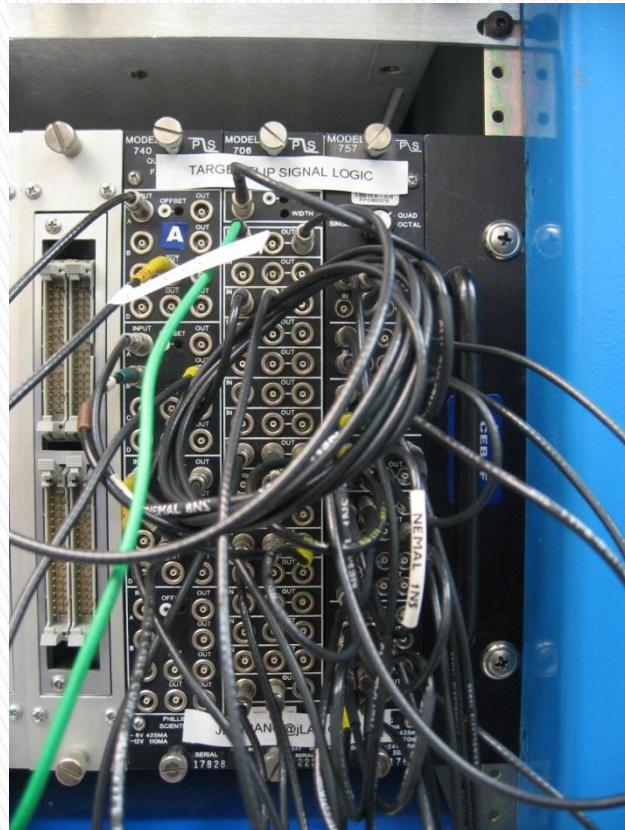




# Sequential Diagram

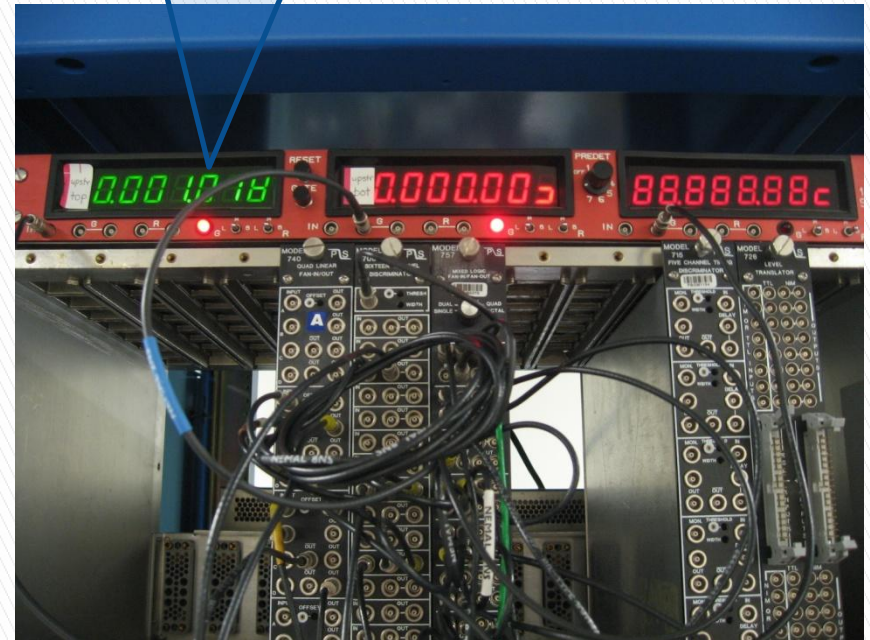


# Photo Show

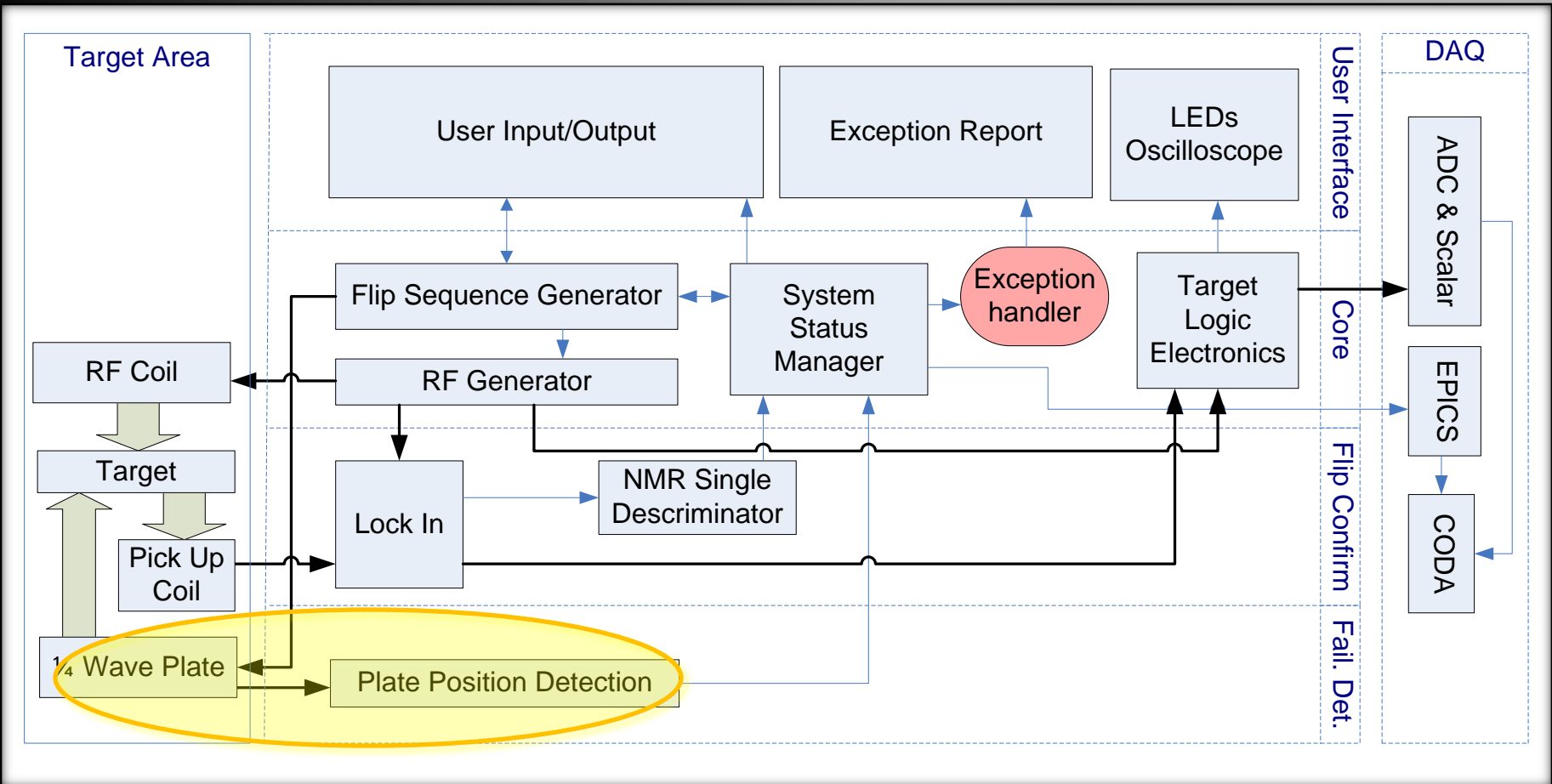


It has been Built

Spin Count  
Agree with Software  
count for 1018 Flips



And Tested

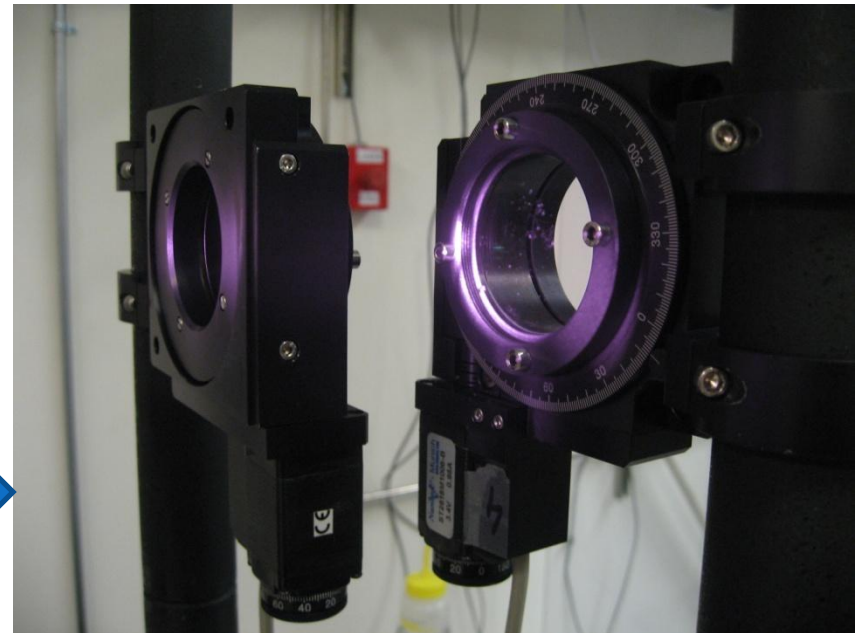
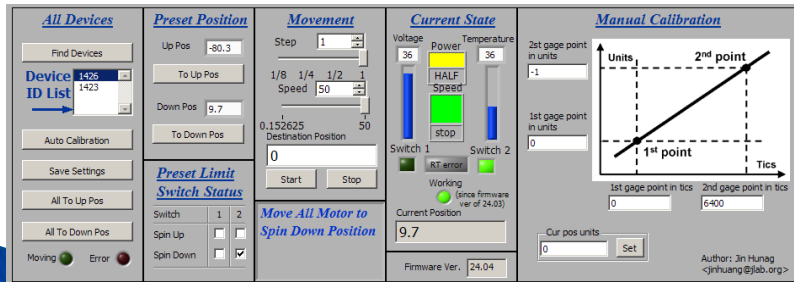


# Laser Polarization Control >>>



# Motorized Quarter-Wave Plate

- ▶ Precise to 1 Degree
- ▶ Failure rate  $<1/10^4$  Flips (if properly matched)
- ▶ Failure Detection
- ▶ Automatic Failure Recovery



# TODO List



1. Documentation
2. Establish EPICS Variables
3. Equipment Setup & Test in Hall
4. Exception Simulation & Handling Procedure