RCU - Final Prototyping The local Slow Control
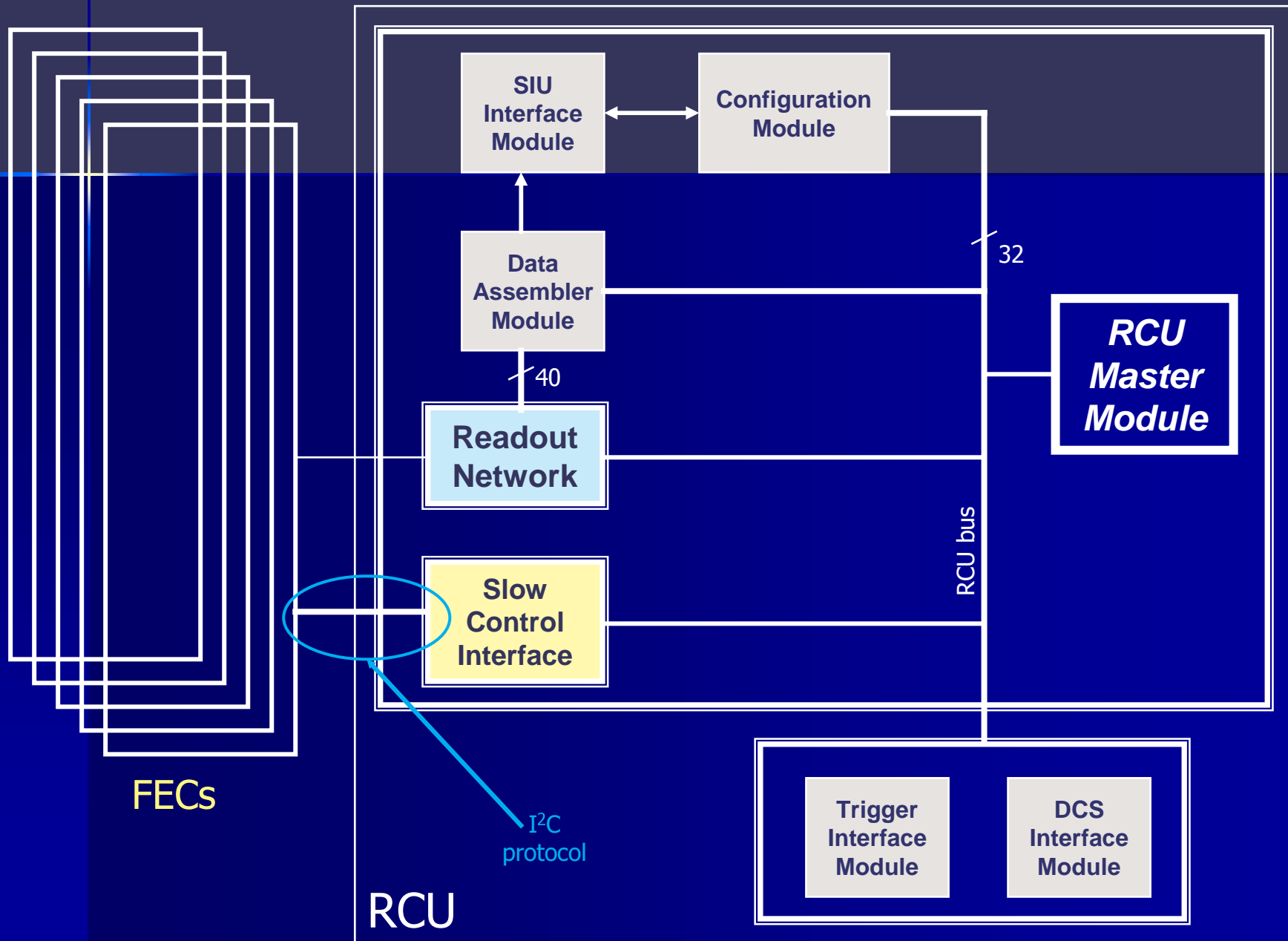
- Dedicated bus connection

  RCU ⟷ FEC Board Controller
- Sharing the Altro readout backplane
- Monitoring status of all FECs
- Interrupt and Error handling

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RCU: functional overview

SIU Interface Module

Configuration Module

Data Assembler Module

Readout Network

Slow Control Interface

RCU Master Module

RCU bus

Trigger Interface Module

DCS Interface Module

FECs

I^{2}C protocol

RCU
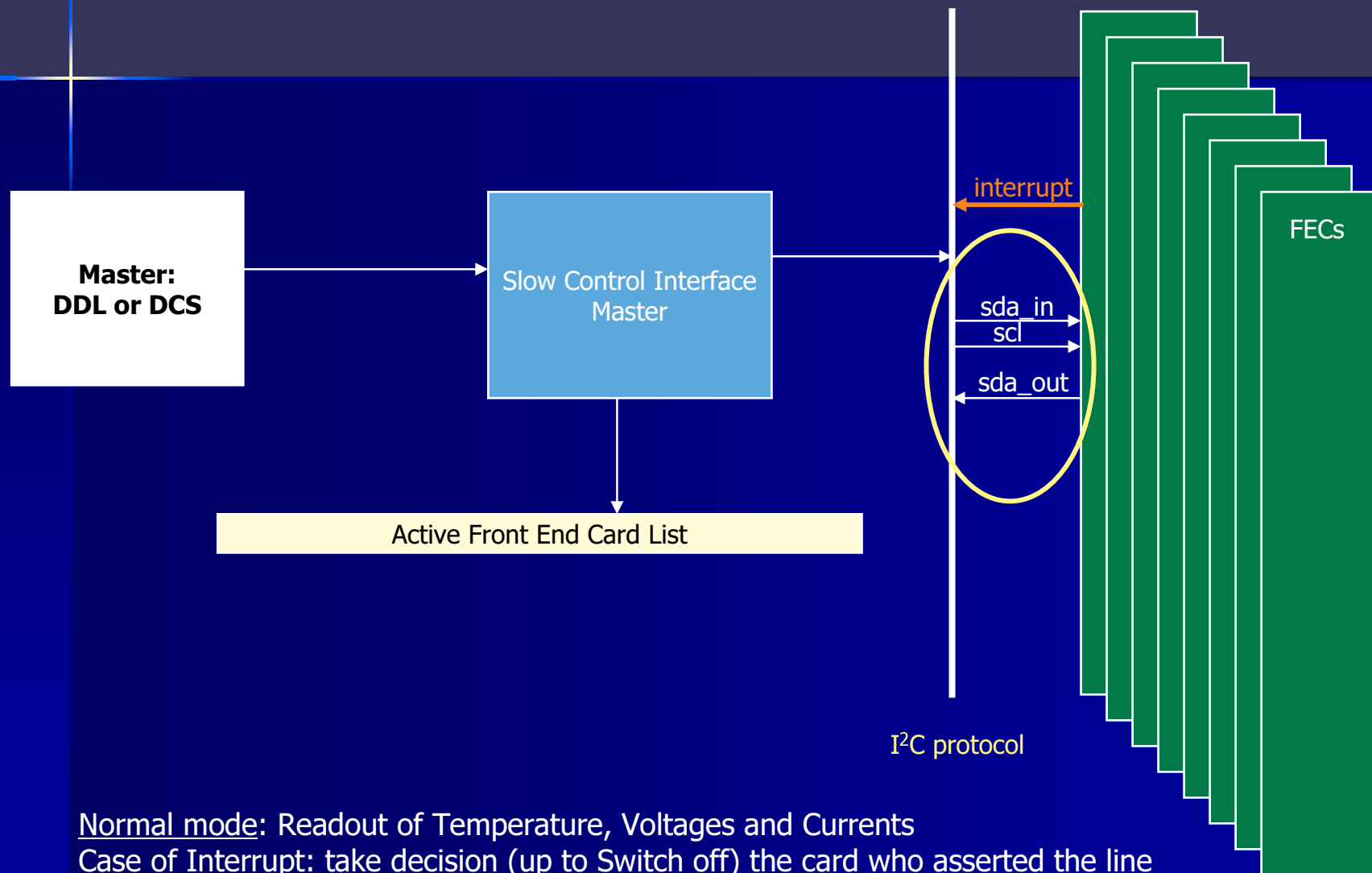
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I²C derived protocol

- Serial Communication with 3 lines:

  - 2 unidirectional serial data lines, SDA

  - serial clock, SCL

- Interrupt line

- Frequency of SCL: 5 MHz
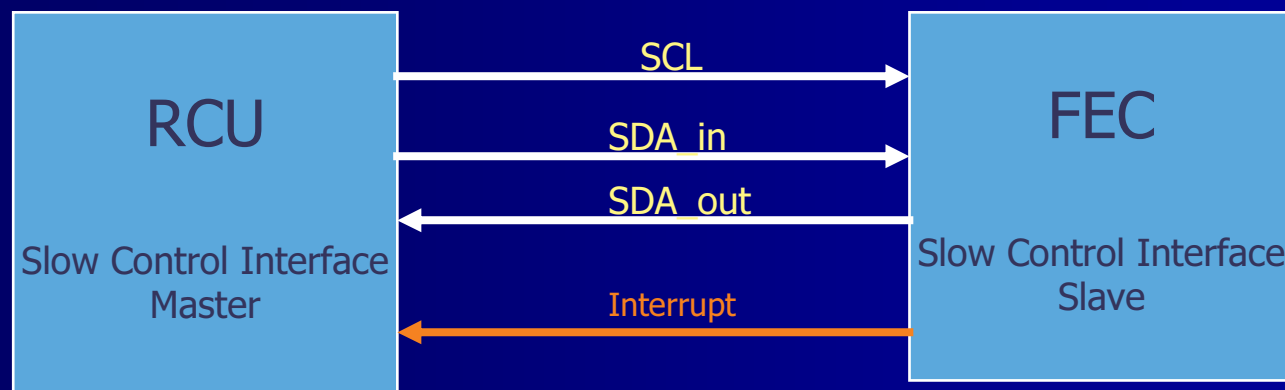
Local Slow Control operations

- Configure the power state of all FECs

- Monitor voltages, currents and temperature

- Interrupt handling in case of :
  - Temperature or currents over thresholds
  - Voltages under threshold
  - Power supply errors
  - Missed sclk
  - Protocol error

- Read status parameters:
  - L1, L2 counters
  - sclk counter
  - dstb counter

Readout with Slow Control

**Master:
DDL or DCS**

Slow Control Interface Master

interrupt

FECs

sda_in

scl

sda_out

Active Front End Card List

I^{2}C protocol

Normal mode: Readout of Temperature, Voltages and Currents
Case of Interrupt: take decision (up to Switch off) the card who asserted the line

Example of readout values for 1 crate

	Card	T [ºC]	AV [V]	AC [mA]	DV [V]	DC [A]
BRANCH A	0	27.00	3.970	641	3.234	1.114
	1	26.50	3.964	575	3.228	1.075
	2	26.25	3.987	619	3.257	1.075
	3	26.50	3.964	619	3.234	1.154
	4	25.50	3.964	575	3.228	1.154
	5	25.50	3.976	575	3.257	1.075
	6	23.75	3.981	575	3.257	1.075
BRANCH B	0	26.75	3.970	553	3.252	1.114
	1	27.75	3.964	597	3.228	1.075
	2	27.00	3.964	575	3.252	1.075
	3	25.50	3.976	597	3.247	1.154
	4	26.25	3.964	553	3.234	1.114
	5	26.25	3.976	575	3.252	1.075
	6	25.50	3.958	531	3.252	1.075
	7	26.25	3.976	597	3.252	1.154
	8	25.75	3.976	575	3.234	1.114

Average values in 7 hours

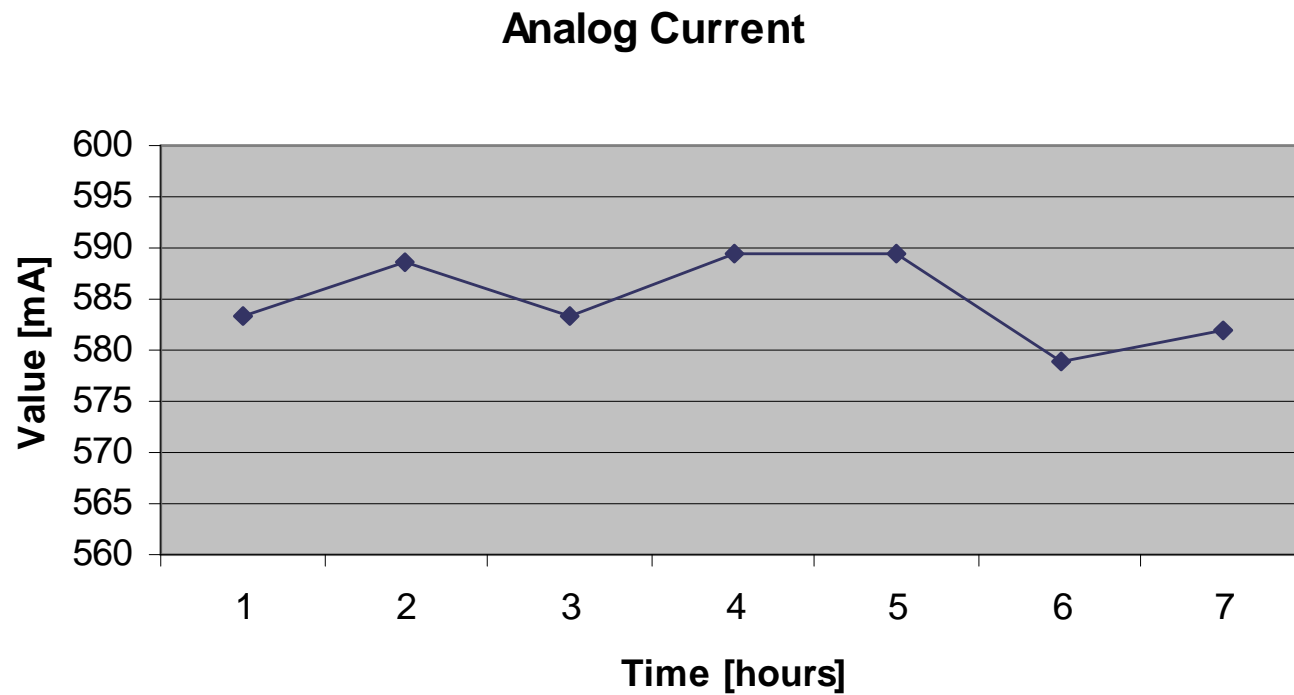| time	T [ºC]	AV [V]	AC [mA]	DV [V]	DC [A]
1	26.12	3.970	583.25	3.244	1.105
2	30.10	3.972	588.75	3.242	1.097
3	21.57	3.972	583.25	3.247	1.098
4	29.28	3.957	589.34	3.246	1.087
5	27.65	3.973	589.34	3.246	1.101
6	24.80	3.969	579.02	3.242	1.093
7	27.27	3.971	581.97	3.241	1.095

Temperature
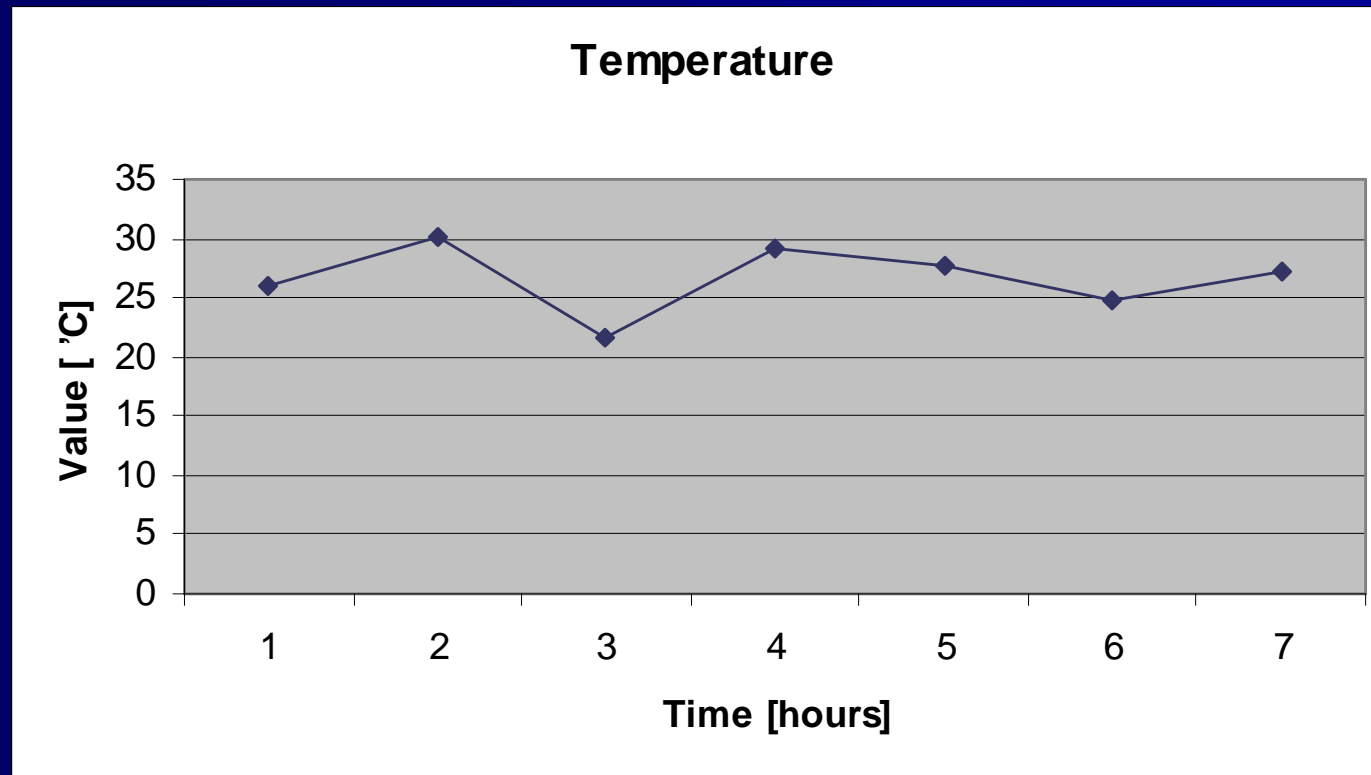
Maximum Temperature Threshold = 40 º C

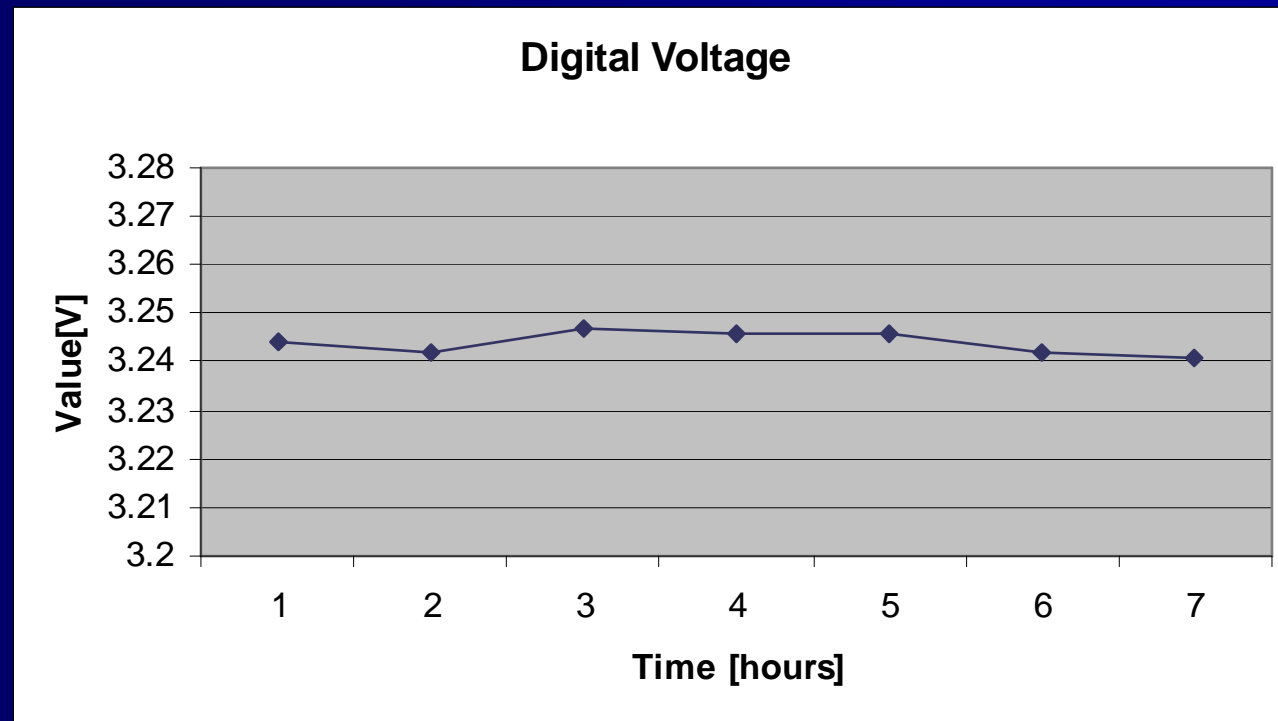# Analog Voltage
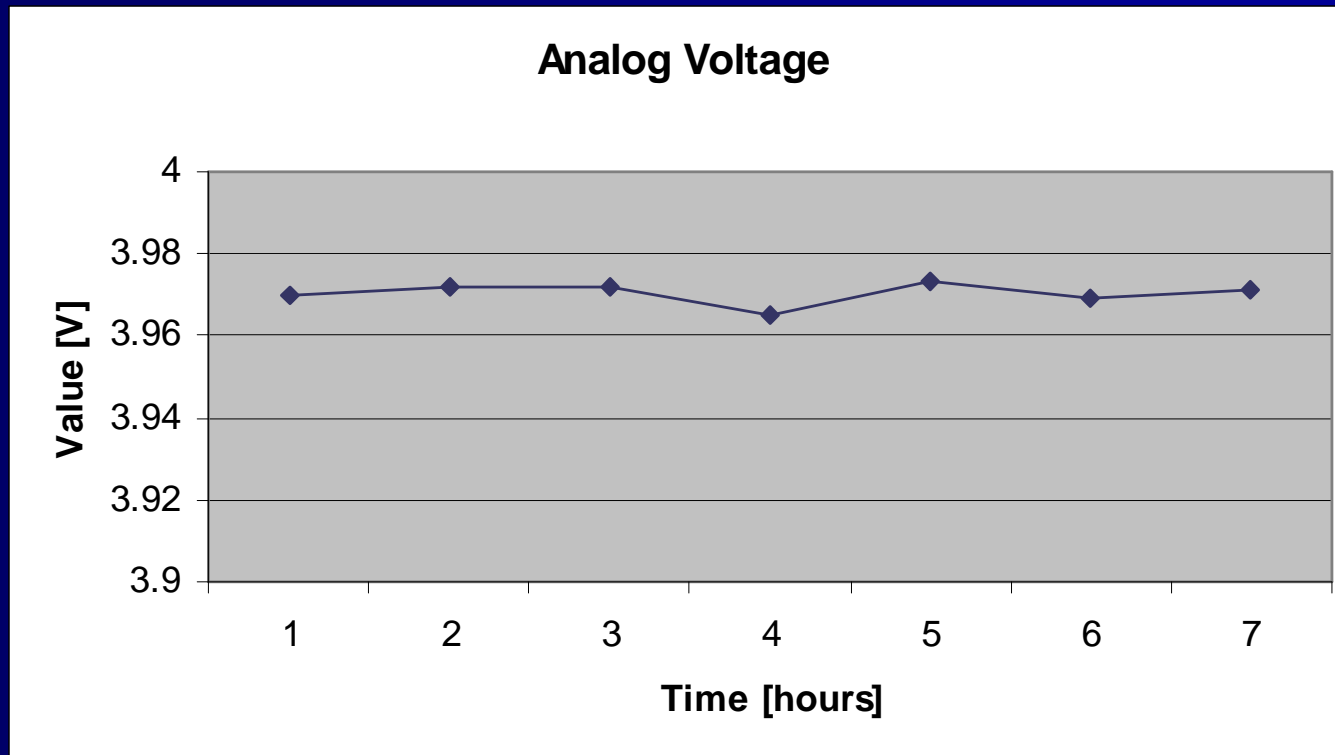
Analog Voltage

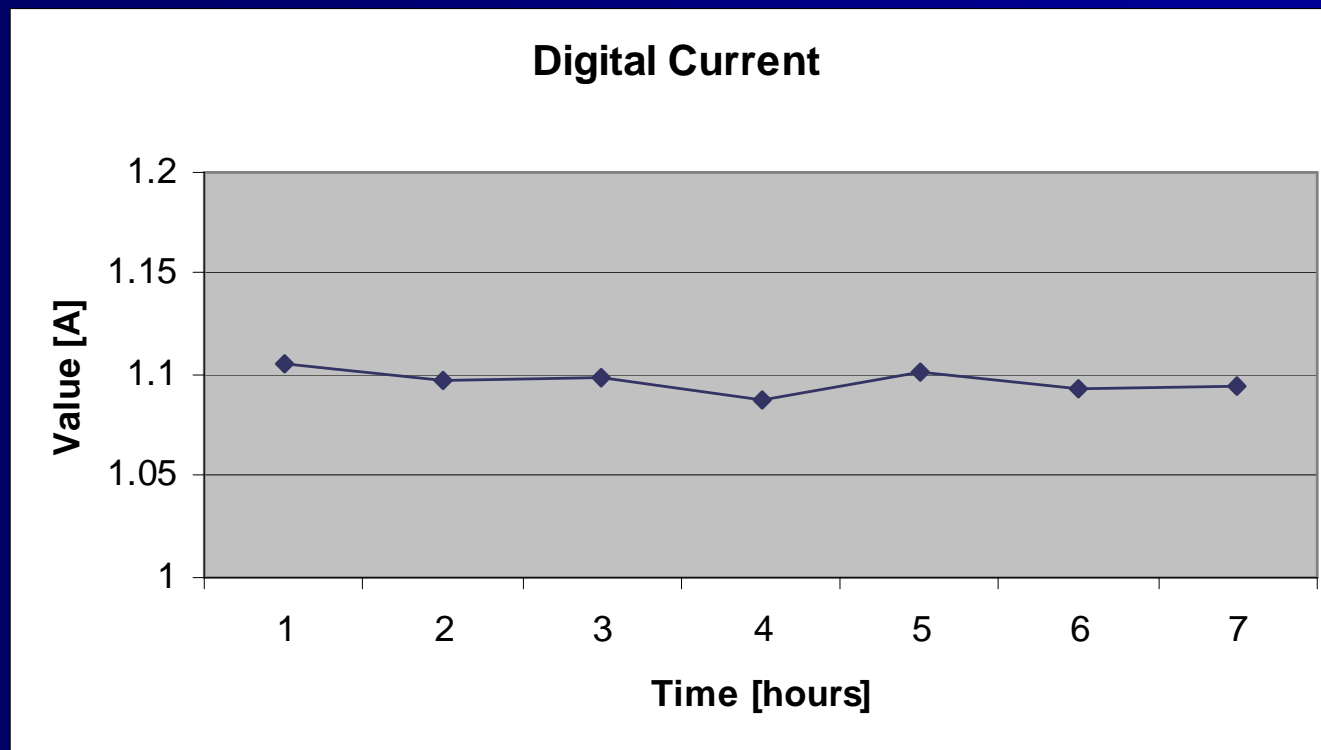Minimum Analog Voltage Threshold = 3.63 V

Analog Current

Maximum Analog Current Threshold = 750 mA

Digital Voltage

Minimum Digital Voltage Threshold = 2.82 V

Digital Current

Maximum Digital Current Threshold = 1.91 A

Summary

- The local Slow Control is able to:
  - Monitor Temperatures, Voltages and Currents from the FEC's
  - Read status parameters and counters
  - Configure the power state of the FEC's
  - Switch off the card in case of Interrupt