CBM Collaboration Meeting

BI-Falta

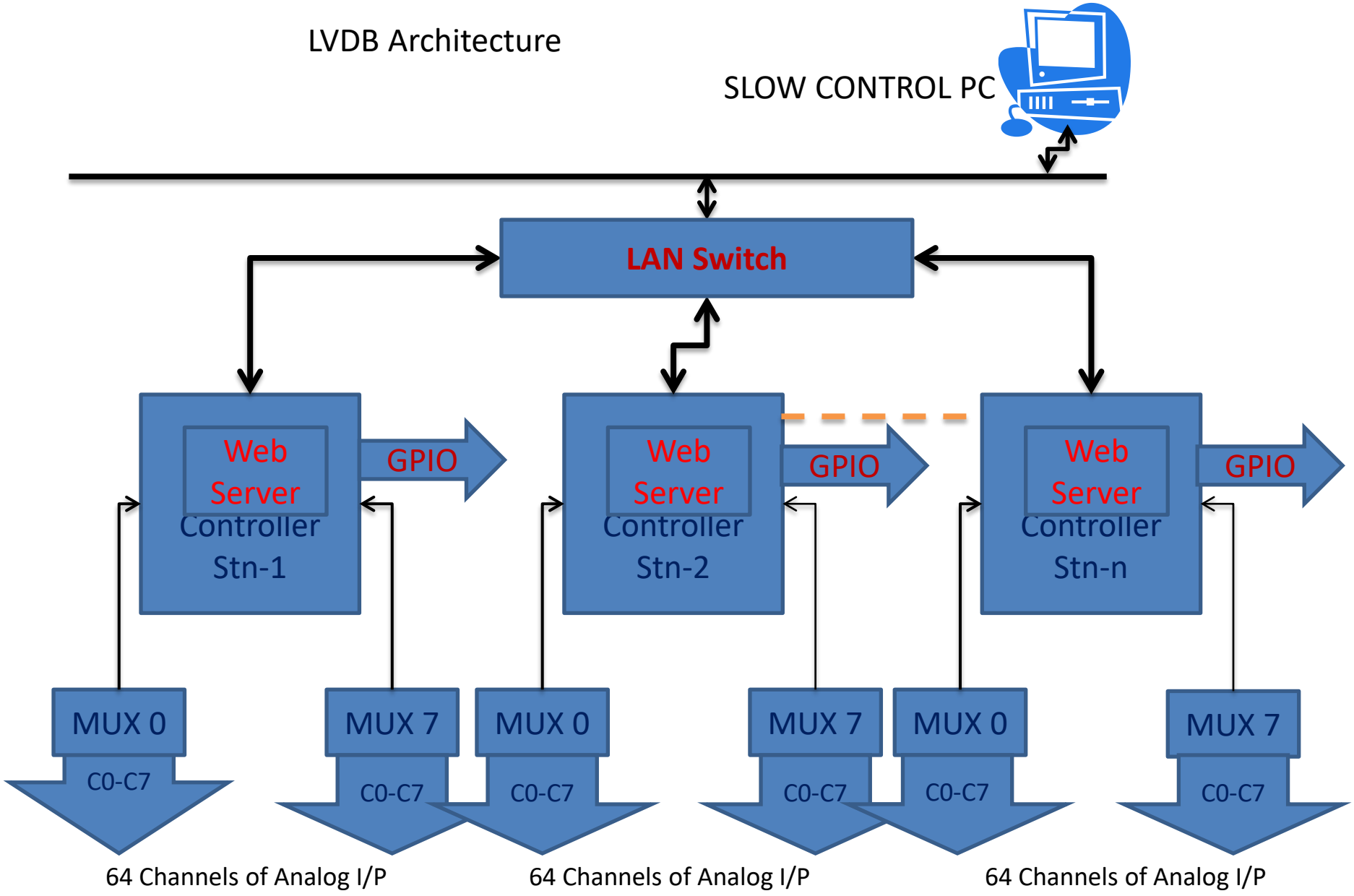
15th Feb – 17th Feb 2018

P.K. Sahu, S.K. Sahu
Institute of Physics,
Bhubaneswar, INDIA

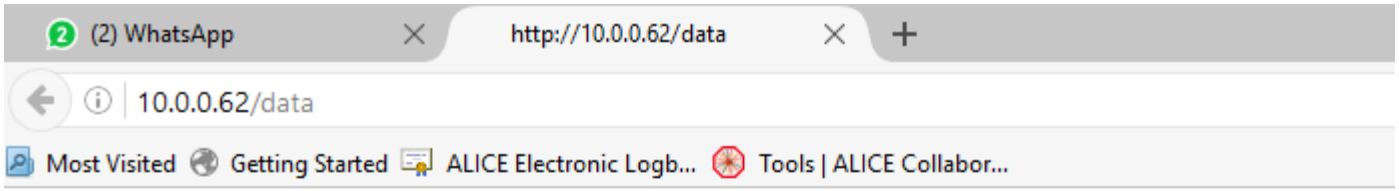
Highlights:

- Development of LVDB monitoring system
- Development of HV control System
- Development Flow monitoring System

LVDB Architecture



The Sample Data on Web Browser for 64 Channels



Ethernet Based LVDB Monitoring.....

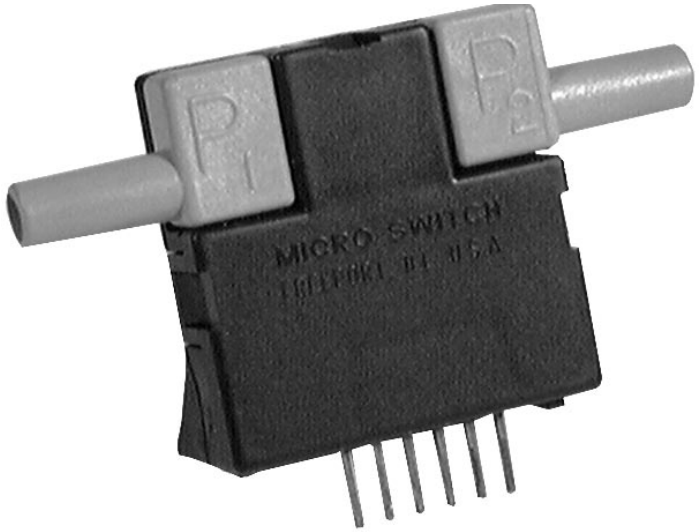
CBM Collaboration

Channel---- 0
ADC0---112,ADC1---102,ADC2---97,ADC3---92,ADC4---80,ADC5---67,ADC6---91,ADC7---103,
Channel---- 1
ADC0---133,ADC1---140,ADC2---144,ADC3---146,ADC4---152,ADC5---160,ADC6---142,ADC7---130,
Channel---- 2
ADC0---114,ADC1---108,ADC2---105,ADC3---103,ADC4---95,ADC5---86,ADC6---102,ADC7---109,
Channel---- 3
ADC0---129,ADC1---133,ADC2---134,ADC3---135,ADC4---139,ADC5---142,ADC6---130,ADC7---124,
Channel---- 4
ADC0---118,ADC1---116,ADC2---116,ADC3---115,ADC4---113,ADC5---111,ADC6---116,ADC7---117,
Channel---- 5
ADC0---123,ADC1---122,ADC2---122,ADC3---120,ADC4---118,ADC5---113,ADC6---113,ADC7---113,
Channel---- 6
ADC0---124,ADC1---128,ADC2---132,ADC3---135,ADC4---140,ADC5---148,ADC6---139,ADC7---131,
Channel---- 7
ADC0---116,ADC1---107,ADC2---102,ADC3---97,ADC4---89,ADC5---76,ADC6---93,ADC7---102,

GASFLOW MONITORING

GASFLOW SENSORS

Mass Flow sensor
AWM2100



Gas Flow from P1 to P2 then it is positive flow .

Gas Flow from P2to P1 then it is negative flow .

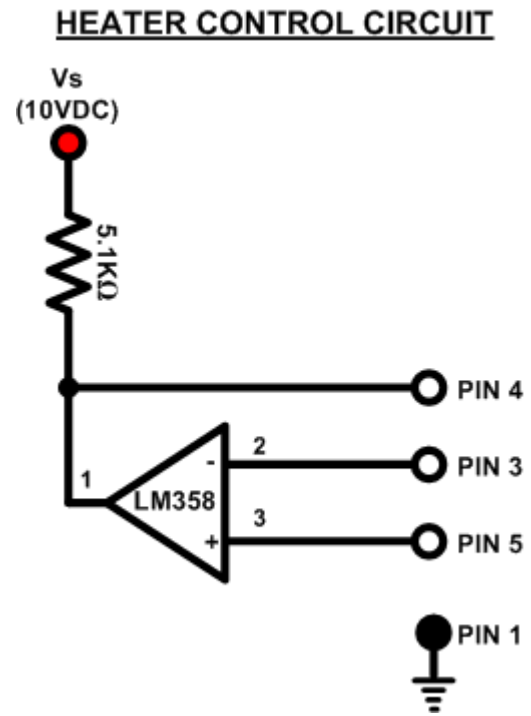
Mass flow sensor

The theory of operation of the hot wire mass airflow sensor is as follows,

1. This is achieved by heating a wire suspended in the air/ gas stream, with a constant current through the wire.
2. The wire is one of the element of the bridge. The wire's temperature changes as per the flow of gas , as gas carry away heat from the element.
3. When air flows past the wire, the wire cools, decreasing its resistance, In turn the bridge is unbalanced and a voltage output is obtained from the bridge.
4. The integrated electronic circuit converts the output of the bridge (voltage) into a calibrated signal.

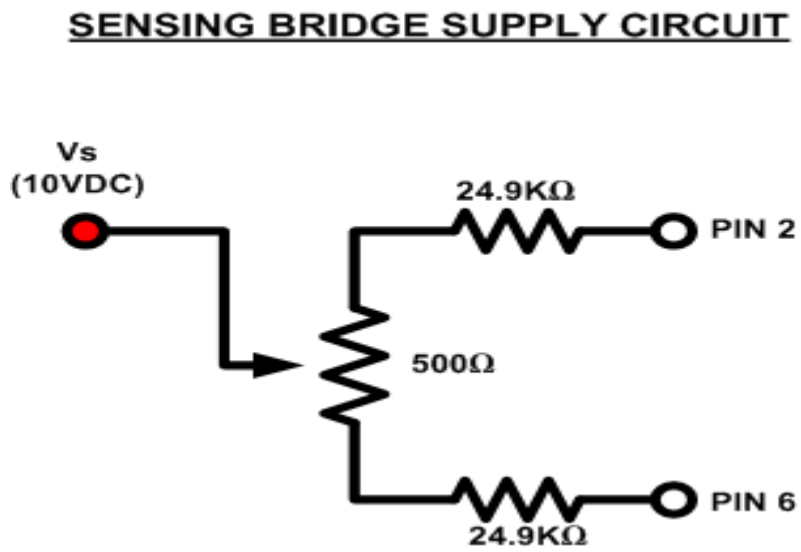
Heater Circuit

- A constant current heater circuit is used to the



Sensing Bridge Supply

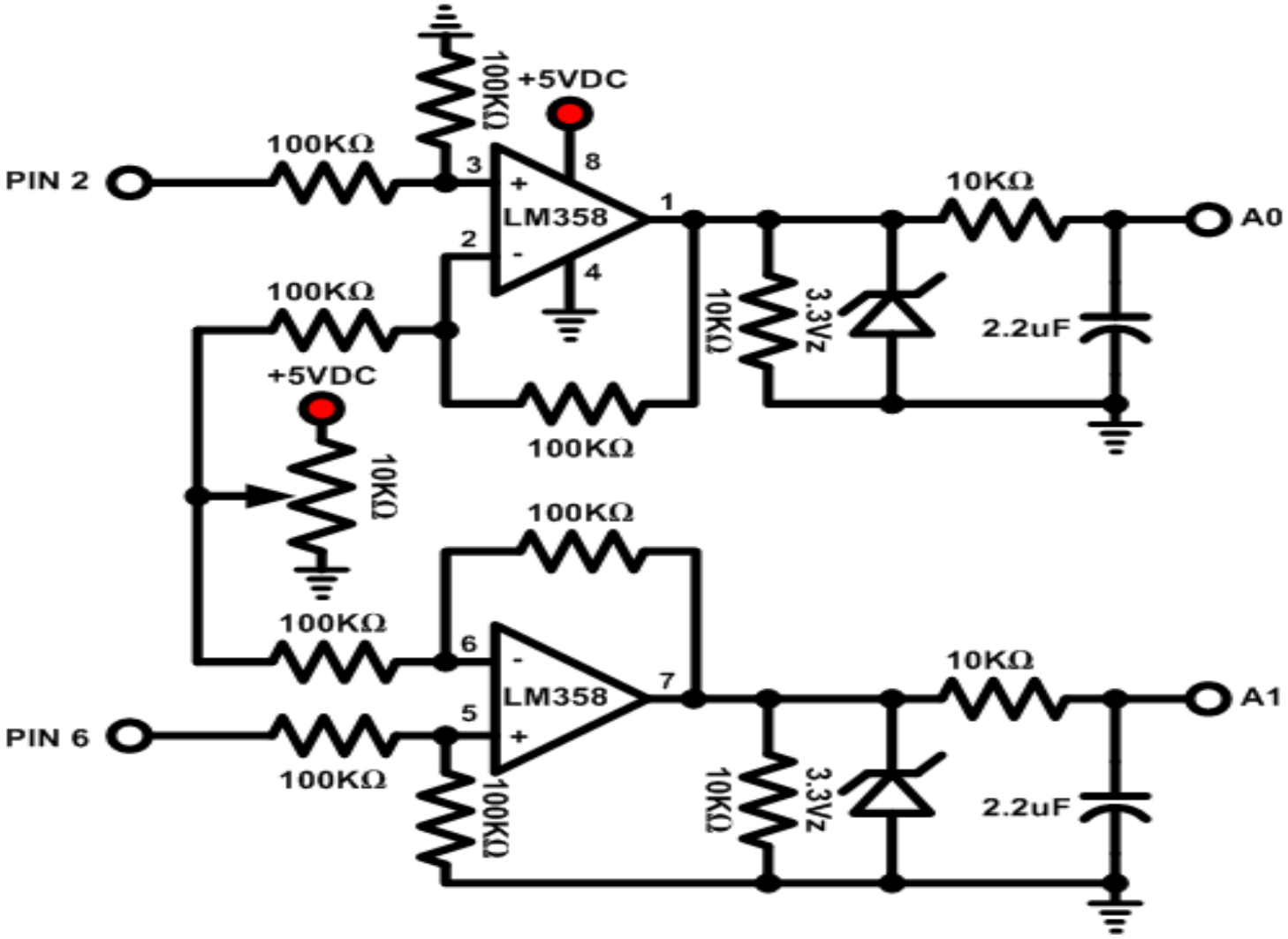
- The Sensing Bridge supply circuit and its null setting Circuit



A LOW NOISE AMPLIFIER

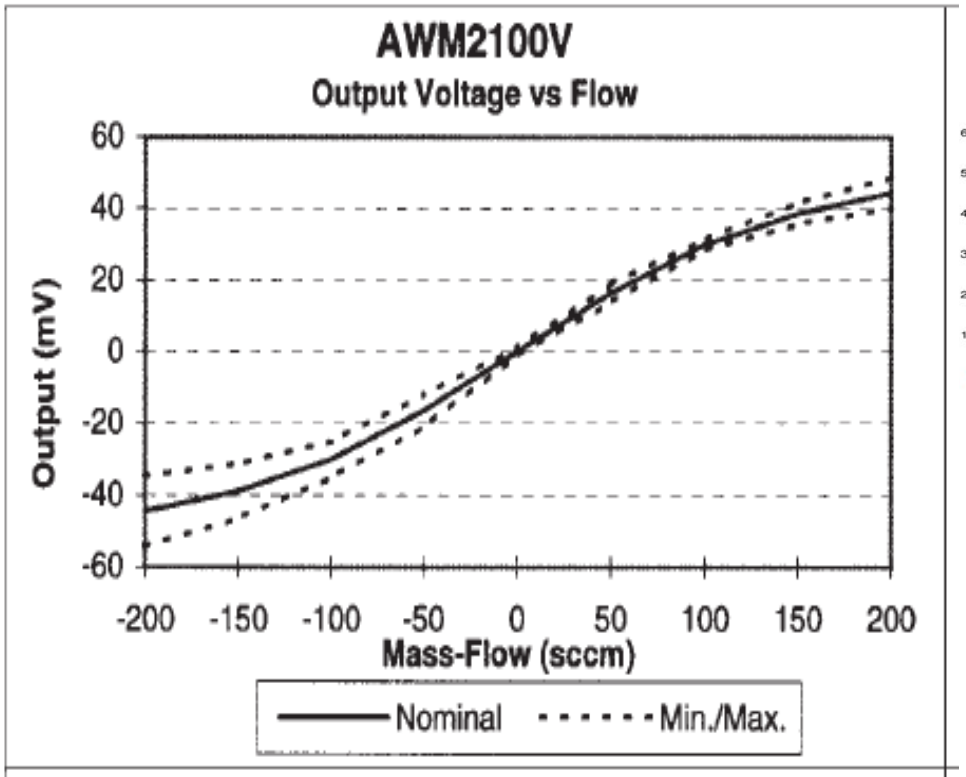
- There are two amplifiers with filter circuit also a common source is used to remove power supply noise.
- The output of the differential amplifier is filtered with a LOW-PASS filter to remove ripples.
- Also a 3.3V protection Zener Diode is connected at output to protect the ADCs.

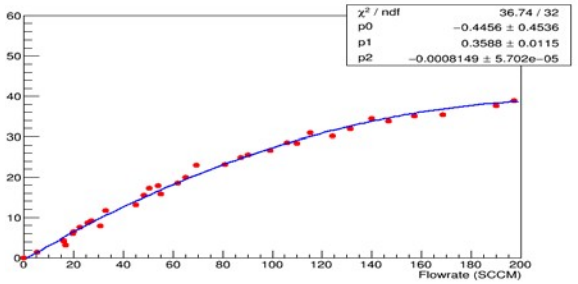
DIFFERENTIAL INSTRUMENTATION AMPLIFIER CIRCUIT



Calibration Result

- The graphs bellow indicates the similarity of sensor behaviour





The negative par of the curve is for gas flow in opposite direction

Correction factor

The Need of correction factor is to find out the actual output voltage of the mass flow sensor with flow rate.

The data obtained during the calibration is fitted with a polynomial and found a suitable equation for measuring the gas flow.

$$y=f(x)=0.07705\ X^2 + 1.7696X$$

Temperature measurement :

AD590 sensor Based Temperature measurement system is designed and tested for measurement of temperature from a distance of 100ft.

Further work is under process for better stability and improving distance.

HV Control System

HV Control System

OBJECTIVE:

- The Basic motivation of this HV control system is to isolate the high current drawing sections of the GEM detector from the Remote location.

HV Control System

Design Criteria :

- The basic objective to disconnect the HV channel from the GEM detector and maintain an isolation from the LV section .
- To avoid undesired status change of HV channel
  - ✓ during power fluctuation
  - ✓during Microcontroller Reset condition.
- To preserve the HV channel status during LV disconnection.

HV Control System

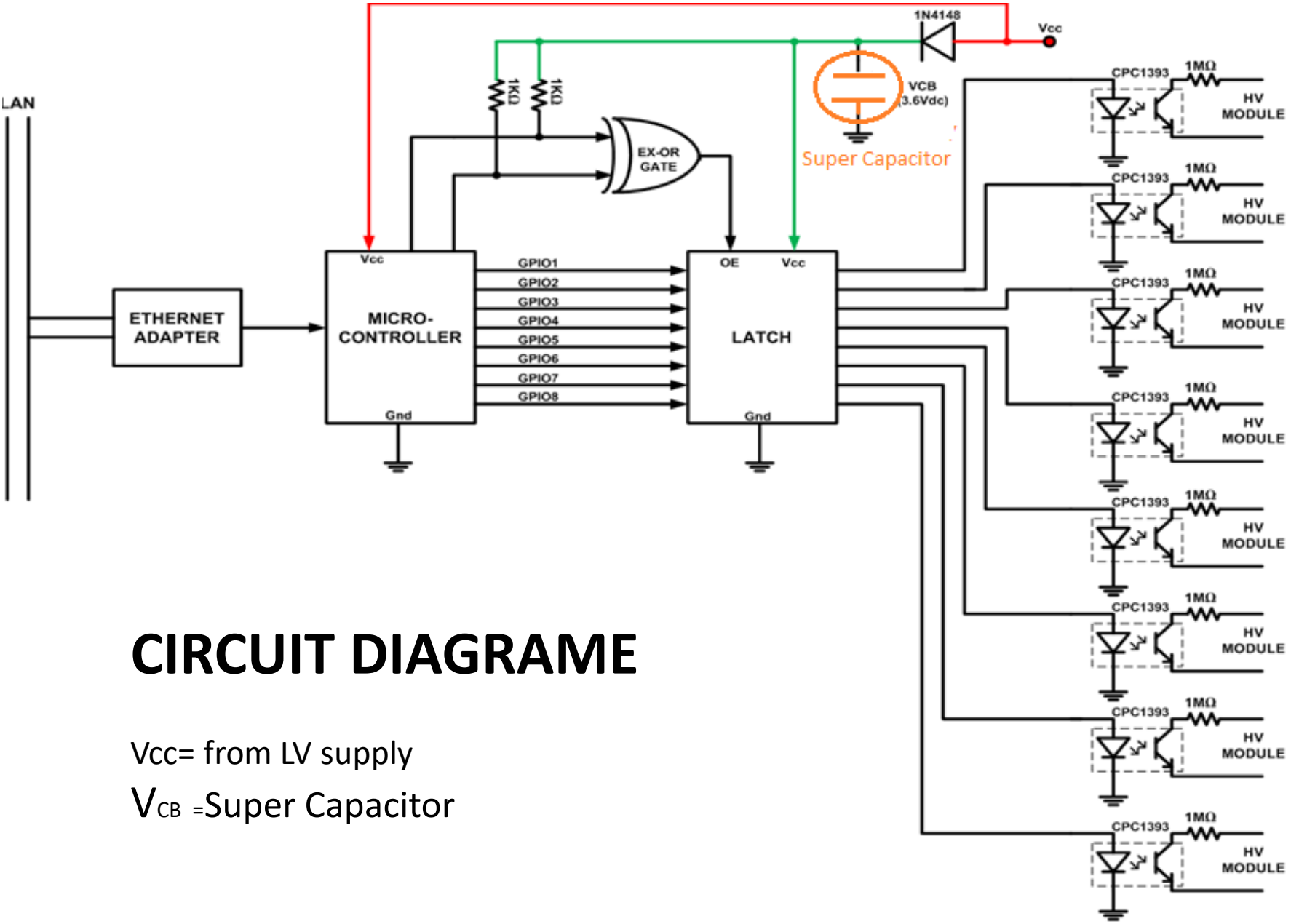
Design-I:

- In the HV control system the isolation is maintained using a opto-isolator chip(CPC1393).
- The output of the microcontroller (MSP430FR5969) is latched using a Octal latch.
- The octal latch is enabled by using a XOR gate for avoiding operation during Power ON Reset of CPU.

HV Control System

Design-II

- It is planed to backup the power of the latch using SUPER Capacitor
- The control communication is designed using TCP/IP protocol .
- The system is hosted as web server in the LAN



CIRCUIT DIAGRAME

Vcc= from LV supply

V_{CB} =Super Capacitor

TEST RESULTS

- TESTRESULT:

A 4 Channel HV control unit was tested with HV setup at VECC detector Lab and the result is quit satisfactory in laboratory condition.

- SUGGESTION:

It is suggested to use radiation hardened latch and analog mux and implement a two/ three fold majority logic technique to have better reliability against bit flip and single event offset during exposer to radiation.

Conclusion

- A 18/36 Channel HV control unit is under development for testing under radiation condition.
- The 2/3 fold majority logic will be implemented in this control unit.
- The Low Power component selected is under process for procurement.

Future Plan

- We are planning to make one 18/36 channel test circuit to expose under Test Beam radiation to study the radiation hardened test.

- A prototyping of Gas flow monitor for MUCH.
- Frame out the DCS for MUCH

THANKS