Title : **High Precision Thermal Ionization Mass Spectrometer**

Specifications:

Resolution: 418 (10% valley)

Sensitivity

(Sample Quantity): 1 ion in 580 atoms of U (1-2 micrograms)

Precision: 0.06% (external for U) 20 ppm (for Nd) 20 ppm (for Sr)

Mass Range: 1-450 amu

Abundance Sensitivity: 30 ppm (for U238)

Acceleration Voltage: Up to 10 kV

Sample Changer: Turret with 12 Filament Assemblies

Analyser: Magnetic

Ion Source: Thermal Ionization

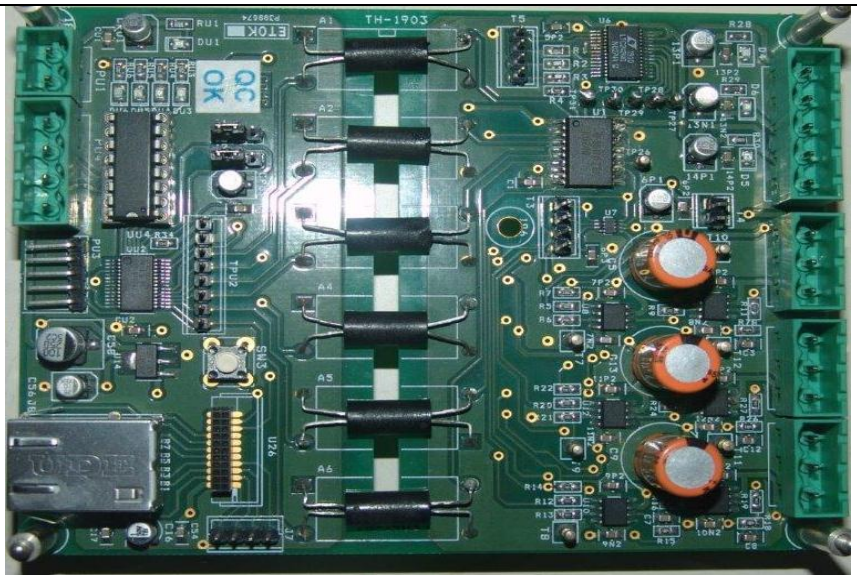
Colletor type/ number: Faraday/ seven ; Electron Multiplier/one

Mechanical Precision Assemblies of Mass Spectrometers

Mechanical design, fabrication and assembly of all the mechanical precision assemblies required for the development of different types of Mass Spectrometers like TIMS, PGMS, MC-ICPMS, RGA, and He-MSLD required for different users of DAE and in house R&D requirements.

Two nos. of PGMS and 1 no. TIMS were assembled very recently and 1 no. Portable He-MSLD also fabricated and assembled.

Filament Current Regulator Card for Thermal Ionisation Mass Spectrometer



Brief Description: This card has been used to control triple filament assembly of Thermal Ionisation Mass Spectrometer (TIMS). It consists of SoC controller, dual DAC, OP AMP based IGBT driver, 10 kV optical isolators, Ethernet controller etc.

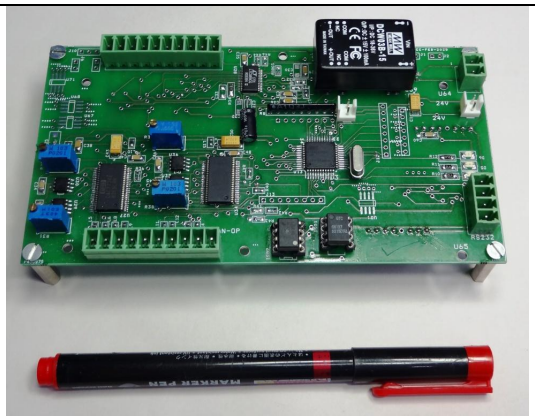
Date of completion: October 2020

Detailed Report: This card has been used to control triple filament assembly which has been used in Ion Source of Thermal Ionisation Mass Spectrometer (TIMS). This high stability current regulator regulates currents for assembly of three separate filaments (7Amp/ 7V) which is floated at 10kV. This card basically consists of PSoC controller, dual DAC, OP AMP based IGBT driver, 10 kV optical isolators etc This can be communicating through RS232 or Ethernet controller etc.

Installations:

1. Presently this modified electronics installed in 2 nos. of TIMS
2. All future TIMS

Title : High Stability 8Ch Analog & Digital I/O card



Specification:
No of Channels 8.
Voltage Range: 0 to 10V.
Stability: Less than 10ppm/8Hr.
Interface: MODBUS Serial RTU @57600 Baudrate.

Month: Jan

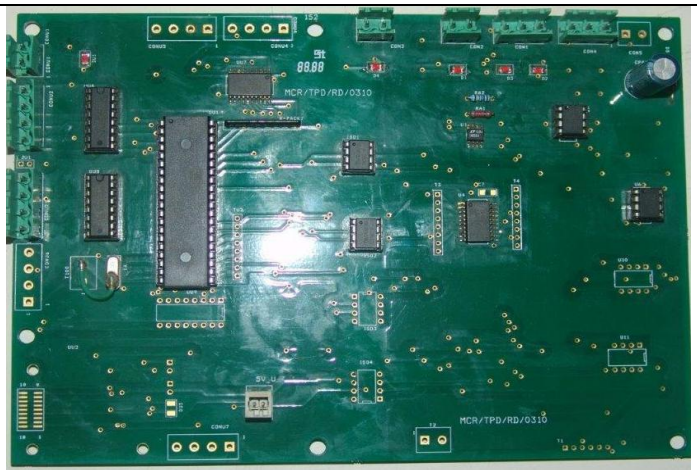
Year : 2003

Specifications/Possible applications:

1. **It can be used where precision high stability voltages are required.**

e.g. As setpoint for voltage controlled HV supplies.

Magnetic Field Regulator for Mass Spectrometer



Brief Description: Magnetic Field Regulator (MFR) regulates magnetic field of 0 to 1 Tesla in magnetic analyser of magnetic sector Mass Spectrometer. MFR consists of Microcontroller, DAC, OP AMP based IGBT driver, RS232 etc.

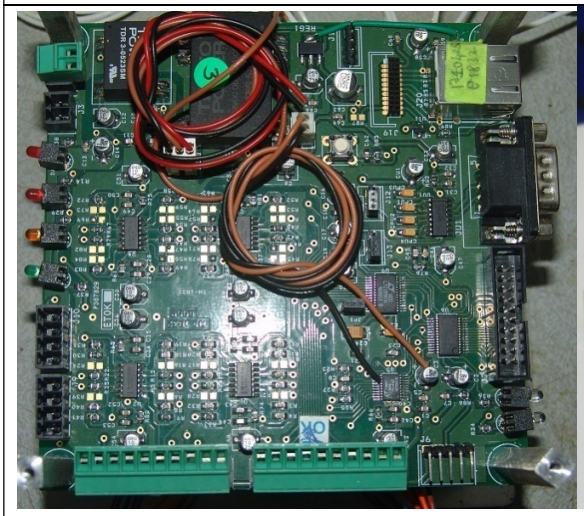
Date of completion: August 2014

Detailed Report: High Stability Magnetic Field Regulator has been used to regulate magnetic field of 0 to 1 Tesla in magnetic analyser of Mass Spectrometer. It is a cascade controller both magnetic field and magnetic current are controlled. MFR consists of Microcontroller, DAC, OP AMP based IGBT driver, RS232 etc and Hall probe based Teslameter is used to measure magnetic field.

Installations:

1. Presently installed in 9 nos. of magnetic sector isotope ratio mass spectrometers
2. All future IRMS

Zoom lens Electronics and control card for Mass Spectrometers



Brief Description: Compact zoom lens electronics (with up to 8 no. highly protected 0 to 2KV zoom lens and DCQ supplies) has been developed to steer the ion beam after analyser towards the collector cup.

Date of completion: September 2019

Features of Zoom lens electronics card:

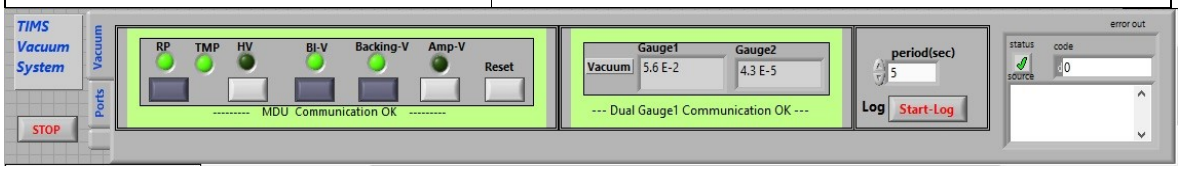
1. Analog IO: Eight 16-bit Analog outputs and analog inputs.
2. Configurable Digital IO: 14 No.
3. Communication interface: Ethernet and RS232
4. Communicates over Modbus RTU protocol
5. Output Stability: Better than 10ppm

Installations:

3. Presently installed in 2 nos. of PGMS
4. All future PGMS

Vacuum Interlocks Unit for Mass-Spectrometers

This is 3U-42T plug-in-module which can be fitted in 3U-19” rack



Software to control the unit remotely

Brief Description: This unit controls the interlocking of Rotary Pump, TMP, High Vacuum interlocked Electronics, Beam Isolation Valve, Backing Valve, and Amplifier-chamber Valve.

A switching logic has been implemented using micro-controller based card. This unit can be controlled remotely from PC via Serial MODBUS link.

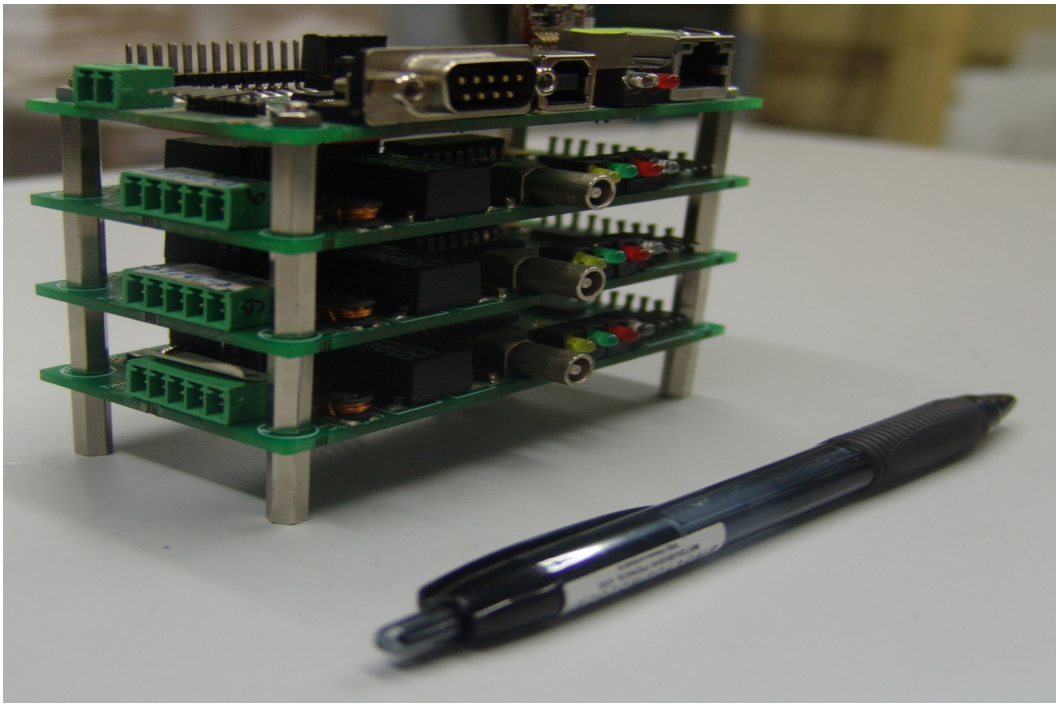
Month: May

Year : 2010

Possible applications:

2. Any UHV application to control sequencing of Rotary Pump, TMP, Valves & UHV protected sub-systems.

ION BEAM CURRENT MEASUREMENT MODULE



The measurement of low ion beam currents of the order of sub pico-ampere range is always challenging due to interference of noise generated by the circuit components itself. Therefore, to achieve this, the precision of measurement system must be at least one order higher than the precision of the measuring current itself.

COMPLETION DATE: Nov 2019

Detailed report: In current design, the measurement of low ion beam current collected at various Faraday Cups of magnetic sector Isotope Ratio Mass Spectrometer (IRMS) can be broadly classified into two parts: ion current to voltage conversion (using current amplifier) and voltage to digital signal (Data Acquisition System) which is fed to computer through communication interface.

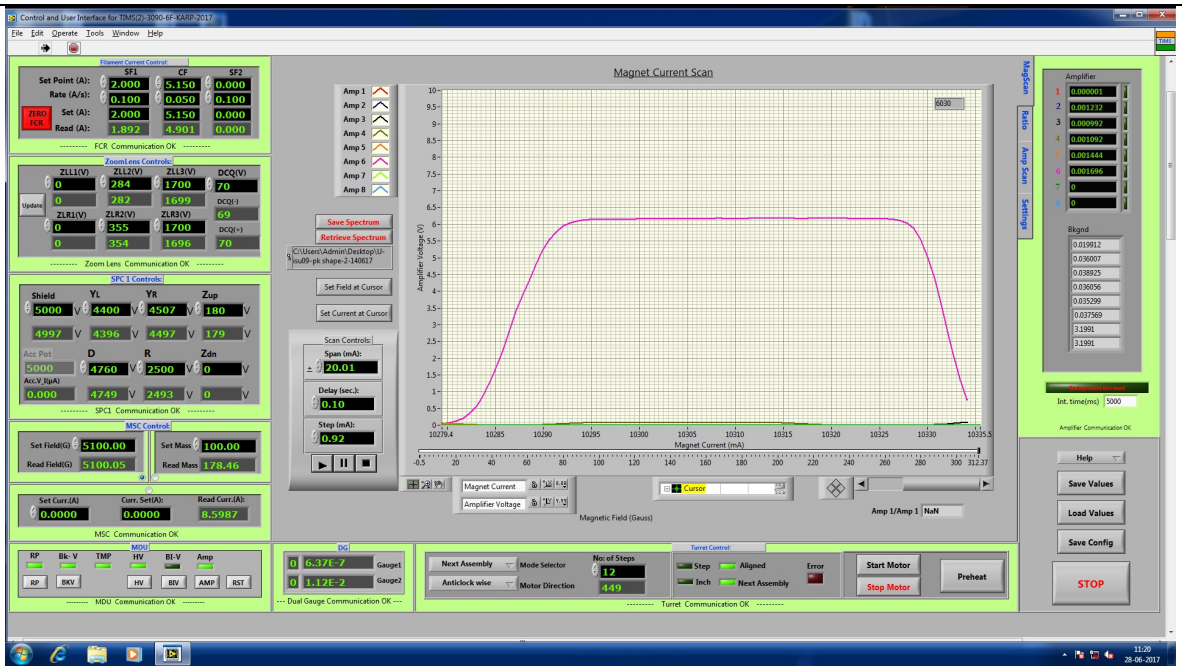
Features:

1. No of measurement channels: 1 to 16 (configurable)
2. Programmable integration time: 1 ms to 7 min in a step of 1 ms
3. Measurement precision: less than 10 ppm (measured with 3 ppm reference voltage source for 1 second integration time).
4. Communication interface with industry standard MODBUS protocol.
   (a) Ethernet, (b) RS232 and (c) USB

Installations:

5. Presently installed in 4 nos. of IRMS (2 TIMS, 2 PGMS)
6. All future IRMS

Thermal Ionisation Mass Spectrometer Software



Brief Description: Control and multimode analysis software for TIMS

Date of completion: March 2020 (upgradation continued)

Software controls mass scan controller (MSC), source potential, zoom lens, filament current regulator, mains distribution unit, vacuum gauges, sample assembly turret, ion current amplifier. Feature available for mass calibration for field/current to elemental mass scaling, sample preheat algorithm, data, report and configuration generation retrieval.

Analysis mode: user configurable single collector, multi collector and dynamic multi collector peak jumping.

This software is being used in all TIMS, EmA&ID has developed (10 nos.)