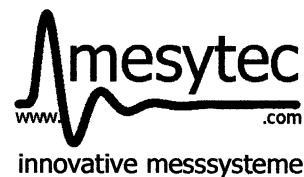


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MCA-2

Dual Channel Multichannel Analyser

with Preamplifiers and integrated HV Source

Users Manual



MCA-2

datasheet V1.0, preliminary

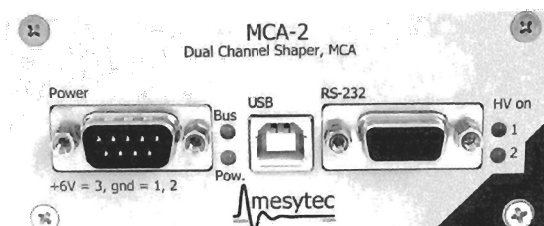
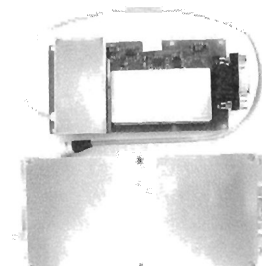
Dual Channel Filter Amplifier and MCA + Preamps with HV Generation

mesytec MCA-2 is a dual channel shaper, discriminator and multi channel analyzer. Together with the MCA-PH charge sensitive preamplifier with built in HV source it provides a complete readout system for high resolution and high rate X-ray, alpha or beta spectroscopy with proportional counter or silicon detectors.

All device parameters and functions (gains, thresholds, HV, histogram-download) are remote controlled via RS-232 or USB 2.0 interface.

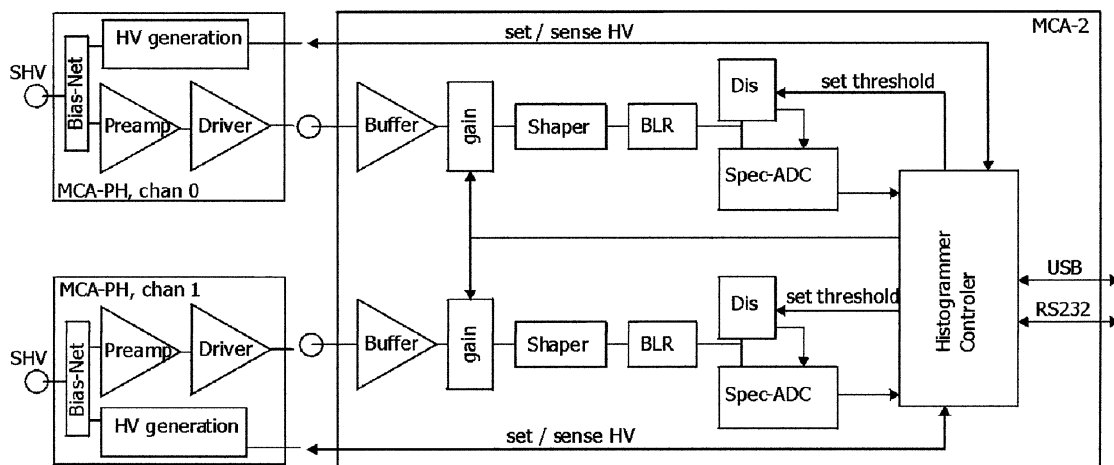
Features:

- Compact dual channel MCA module (MCA-2)
- Compact external preamps with built in HV source (MCA-PH)
- Sensitivities, thresholds and HV and other parameters are remote controllable.
- Real time clock
- 1Mbit non volatile histogram memory
- 10 bit spectroscopy ADC
- Data interfaces: RS232 and USB
- Additional 8 I/O ports and 4 ADC inputs for process control.
- Online ROI calculation



Main module MCA-2 and two preamp units MCA-PH

Schematics



Technical Data:

Preamplifiers

available as fully shielded PCB or in aluminum case

on	on	128	16pC
on	on	255	8pC

Input

- Negative charge input (anode readout).
- sensitivities available for proportional detectors / silicon detectors (MCA-PH_SI) and for photo multipliers (MCA_PH_PM).

High voltage generation

- Positive bias voltage up to 950 V (for Si-detectors max 150V). (special version up to 2000V)

Conversion factors:

2kV version: (SV 3420 => 2kV)

- conversion factor write HV= set_val * 0.585V
- conversion factor read HV= read_val * 1.912V

950V version

- conversion factor write HV: set_val * 0.225
- conversion factor read HV: read_val * 0.731

150V version

- conversion factor write HV: set_val * 36mV
- conversion factor read HV: rd_val * 110mV

Noise (for MCA-PH_SI)

- 400 e- rms @ 20 cm of RG59 Detector cable + Detector (10pF)

Sensitivity:

SW1, SW are switches on the Preamp board

for MCA-PH_SI type: (up to 10MeV)

SW1 gain 3.3	SW2 gain 5.5	MCA2 gain	maximum range
off	off	50	9MeV / 360fC
off	off	128	4MeV / 180fC
on	off	128	1.2MeV / 55fC
on	on	128	250keV / 11fC
on	on	255	125keV / 6fC

for MCA-PH_PM type: (up to 10MeV)

SW1 gain 3.3	SW2 gain 5.5	MCA2 gain	maximum range
off	off	50	700pC
off	off	128	300pC
on	off	128	90pC

Output connector: Subd9 male

- gnd
- set -HV
- +6..12 V
- +10 V
- 5V
- Agnd
- sense HV
- out+
- out-

MCA settings:

Thresholds for the two channels can be set from 1 to 100. Values are in percent of the histogram full scale. (Value 50 is threshold to 50%)

Valid gain range is 20 to 255.

MCA extra outputs:

- 4x TTL (CMOS) outputs
- 4x TTL inputs
- 4x ADC input, 0..5V, 3kOhm

Connector on PCB or front panel:

pin	name	pin	name
1	gnd	14	gnd
2	+5V (max 50mA)	15	TTL1 in
3	gnd	16	TTL2 in
4	supply voltage out (6..10V, max 100mA)	17	TTL3 in
5	gnd	18	TTL4 in
6	gnd	19	NC
7	TTL1 out	20	NC
8	TTL2 out	21	gnd
9	TTL3 out	22	gnd
10	TTL4 out	23	ADC1 in
11	NC	24	ADC2 in
12	NC	25	ADC3 in
13	gnd	26	ADC4 in

NC pins should be left floating!!

Remote control and histogram download via RS232 or USB:

RS232 connector: SubD9 female, standard pinout:
pin2: TXD
pin3: RXD
pin5: gnd
other pins not connected

USB chip: FTDI with driver download from
www.ftdichip.com/FTDrivers.htm

Histogrammer controller unit

- Accumulates histograms with one of 6 selectable resolutions / bin widths:
960, 480, 240, 120, 60, 30 channels full range
Missing channels to full binary numbers (e.g. 1024-960) are used by the sliding scale ADC.
- Optional: setting of regions of interest

Multi Channel Analyser

- 10 bit sliding scale spectroscopy ADC
- 10 bit histogramming with 32 bit counter depth.

High Rate Capability

- Baseline restorer
- More than 20kHz per channel without baseline shift
- More than 500kHz counting (Si-detectors)

Power Supply

Connector:
SubD 9 male.
pin 1,2 : gnd,
pin 3 : 6..10 V
other pins not connected

Power consumption including 2 preamps:

- +6 V, 260 mA = 1.6 W

Dimensions MCA2:

(also available as PCB module)

- Length: 173 mm (without connectors)
- Width: 105 mm
- Height: 46 mm

Dimensions MCA2-Preamplifiers:

In aluminium case

- Length: 140 mm
- Width: 60 mm
- Height: 30 mm

PCB version

- Length: 111 mm
- Width: 54 mm
- Height: 20 mm

CMD-List MCA-2:

High Voltage Source:

Set Voltage:
SV chan val Set Voltage
 chan = 0,1
 val = 0...4095

Read back actual voltage:
GV chan Get Voltage
 chan = 0,1

Switch HV on/off:
V1 chan Voltage on
 chan = 0,1
V0 chan Voltage off

Read actual switch state (both channels):
V? Answer is n n
 n=1: on, n=0: off

Gains/Thresholds:

Set:
SG chan val Set gain
 chan = 0,1
 val = 0...255

ST chan val Set threshold
 chan = 0,1
 val = 0...255

Gain and threshold values are written into permanent memory and will be restored automatically on power up.

Read back:
GG chan Get gain
 chan = 0,1
GT chan Get threshold
 chan = 0,1

General Setup:

T=YYMMDDHHSS Set date and time

L List setup

D99 Delete setup,
 (mca-2 will start with
 a default configura-

SC Save configuration

RC Restore saved
 configuration

ROIs

R1=111uuu Set lower and upper
 Border for ROI1
 (R2...R5 similar)

R Show ROI borders

Start/Stop:

GO Start data acquisition

HA Stop data acquisition

TTL Ports:

O1=1 TTL Output 1 on
 (2-4 similar)

O1=0 TTL Output 1 off
 (2-4 similar)

I Show TTL Inputs
 4321

Histogram, Binning:
(operate only when histogramming is stopped)

SB val

Set Binning
val = 0...6 with:

val	Chans valid (total)
0	960 (1024)
1	480 (512)
2	240 (256)
3	120 (128)
4	60 (64)
5	30 (32)
6	1 (counting)

GH bin

Get single histogram bin
bin = 0...959, depending on binning value.
Output like DH.

DV start range

Dump histogram as numerical values
start = start bin 0...959,
range = number of bins = 0...959, depending on binning value.

DB

Display binning

CH

Clear histograms
Bin counters are set to zero, binning value persists.

A

Display ROI sum counts

DI n

Display raw spectrum of channel n=0,1 graphically (compressed to 64 chans)

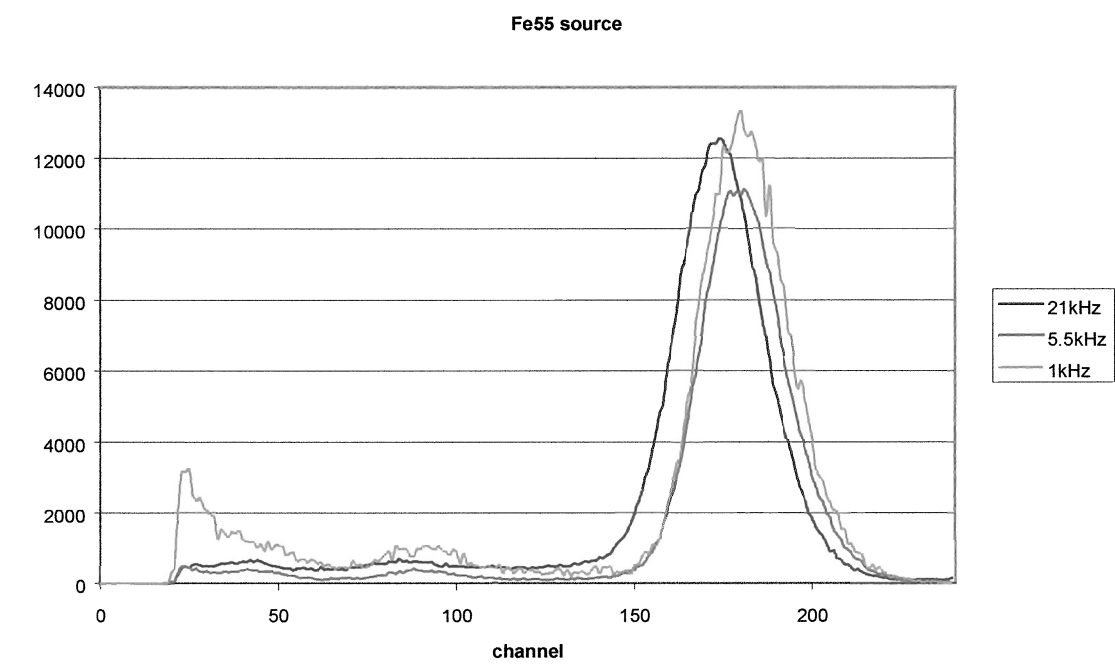
DH start range

Dump histogram in ASCII representation
start = start bin 0...959,
range = number of bins = 0...959, depending on binning value.

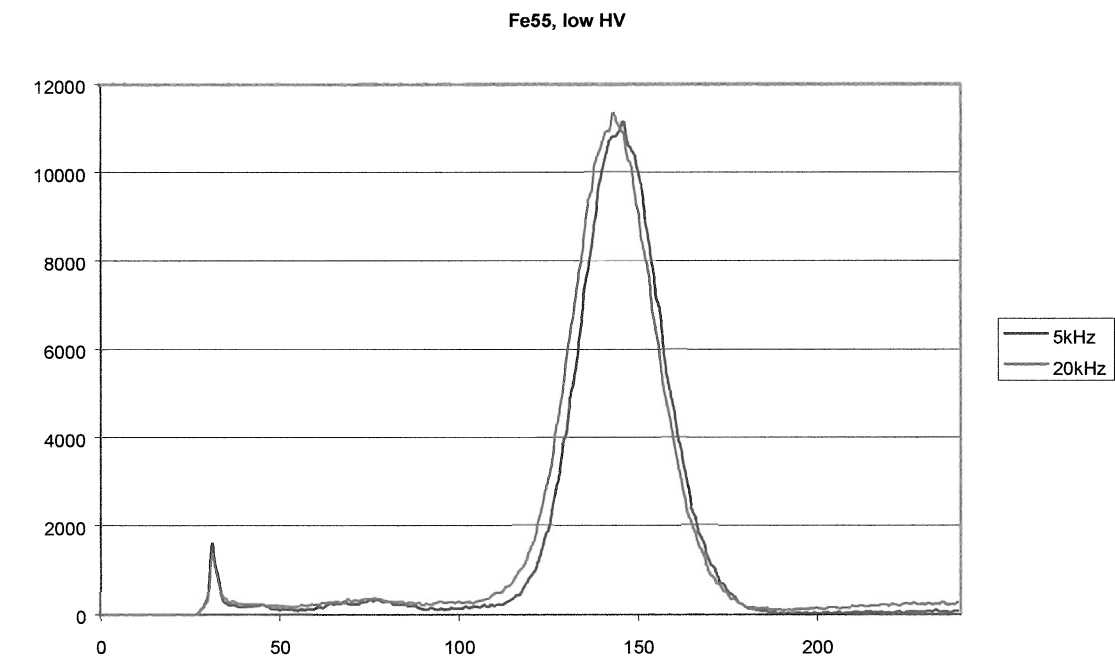
Output is in rows:
n cts0 cts1
n = bin number
ctsi = counts in channel i

Output is as a byte stream as follows:
'H', '0',
n x bin values of Histogram 0 in 4 bytes (LSB first),
'H', '1',
n x bin values of Histogram 1 in 4 bytes (LSB first),
'E', 'N',

Measurements with proportional counter and Fe55 y source



HV= 742V (set val = 3300), gain = 1 (set val=128). Peak shift from 5kHz to 20kHz of 3.3%



HV = 675V (set val = 3000), gain = 2 (set val= 255). Minor shift from 5kHz to 20 kHz of 1.5%