

ADC-MCA 3.x

SpectLab 2.1

User manual

Introduction

Dear customer,
Thank you for purchasing Analog-to-Digital Converter with integrated Multichannel Analyzer from TOIVEL.

This device is intended for indoor use. To ensure your safety and device reliable operation, you should avoid its use in conditions beyond specified.

Getting started

In the package you will find the following items:

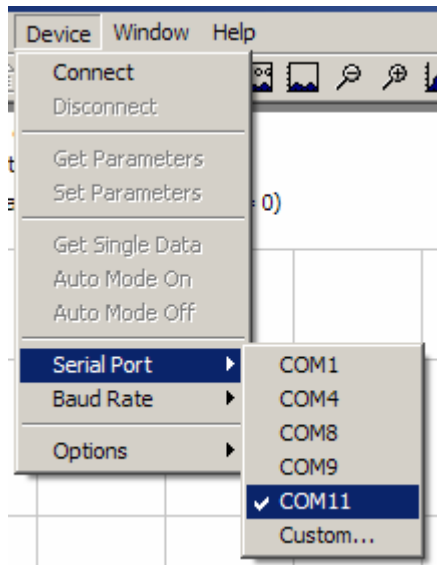
1. ADC/MCA device.
2. 12V DC power supply (optional).
3. USB cable

In addition you will need your customer ID code to access download section of www.toivel.com. This code is found on your invoice and looks like xxx-YY-zz.

After finding all the items, you are ready to install your ADC/MCA.

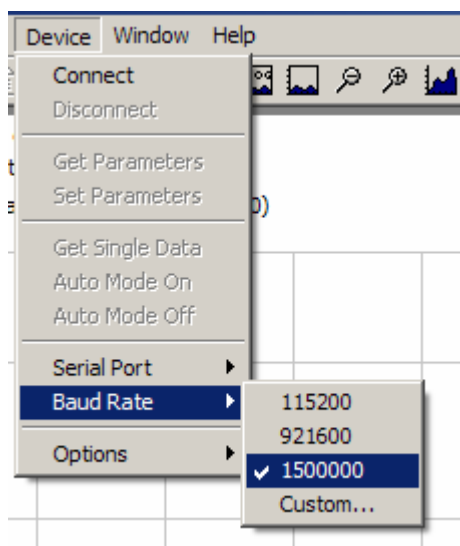
1. Download the latest SpectLab and USB drivers versions. **Please note that installing "standard" drivers, proposed by Windows is NOT RECOMMENDED as in some cases they do not behave correctly.**
2. Install SpectLab.
3. Connect the output of your shaping amplifier to the ADC/MCA input. You may also optionally supply a PUR signal to the ADC.
4. Connect the ADC/MCA to your PC using the USB cable. Take the necessary steps and follow Windows instructions to install required drivers. During driver installation, you may see a warning message that this driver is not WHQL certified. You can safely ignore this warning and continue installation.
5. If you have purchased the optional 12v power adapter, please connect its jack to the ADC/MCA unit and plug the adapter into the 110/220V mains.

When starting the SpectLab for the first time, you need to choose the communication port assigned to your USB<->serial interface. The list of available ports is found in Device/Serial Port menu.

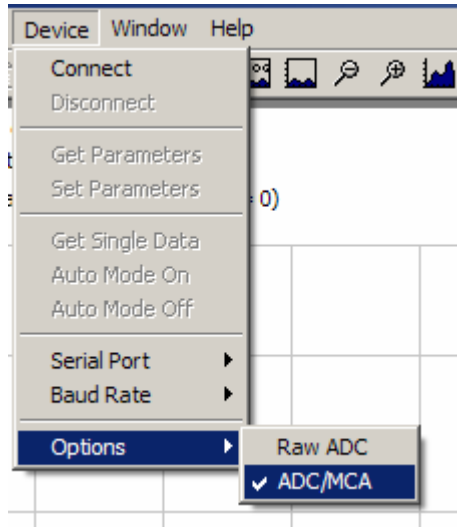


Your ADC/MCA uses a VCP (Virtual COM Port) driver to communicate via USB. Such COM port usually has a number, which is higher than the number of existing COM ports of your computer.


After selecting the COM port, you have to verify that the communication speed is set to 1500000 bps - the communication speed of ADC/MCA 2.x devices. This setting is found in Device/Baud rate menu.




Check also the Device/options menu to verify that your software is configured to communicate with ADC/MCA.



Starting a measurement

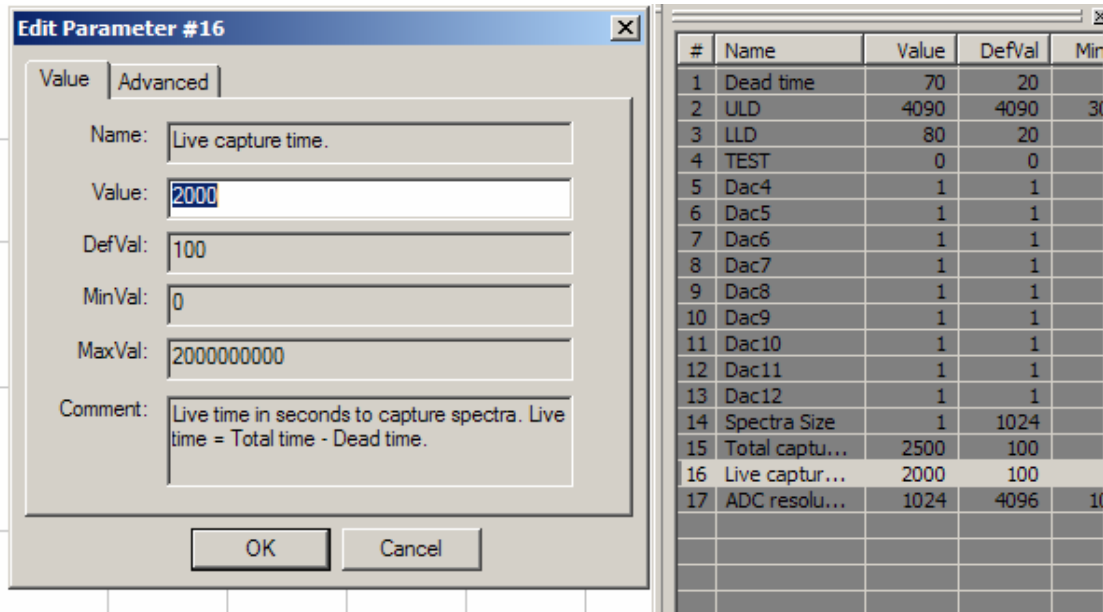
After setting the communication parameters properly you are ready to establish a connection with your ADC/MCA. Go to Device/Connect menu or just click on the connect icon .

Note! Upon connection establishment, all device parameters are retrieved from the ADC/MCA memory. These device parameters could be seen in the Dev-Params window.

When a connection is successfully established, the functions for single or multiple automatic spectra retrieval are activated. To start your analyzer for a given period of time you should use Device/Auto Mode On menu, or just click on the  icon found at the task bar.

Spectra capture time is defined by setting corresponding values in Work-Param tab. These are “Total capture time” and “Live capture time”.

#	Name	Value	DefVal	Min
1	Dead time	70	20	
2	ULD	4090	4090	3
3	LLD	80	20	
4	TEST	0	0	
5	Dac4	1	1	
6	Dac5	1	1	
7	Dac6	1	1	
8	Dac7	1	1	
9	Dac8	1	1	
10	Dac9	1	1	
11	Dac10	1	1	
12	Dac11	1	1	
13	Dac12	1	1	
14	Spectra Size	1	1024	
15	Total captu...	2500	100	
16	Live captur...	2000	100	
17	ADC resolu...	1024	4096	1



Spectra capture is terminated when either of these times elapses. Setting the “live capture time” to 0 disables this timer and it does not affect the process of spectra capturing.

Note! When using “Live capture time”, a suitable adequate value for “Total capture time” should be provided in relation to the dead time of the system. Otherwise the spectra capture may get terminated before the “Live Time” expires. For example – if the dead time of your system is 10% and you would like to start a capturing process for 100 sec Live capture time, your should set at least 112 sec Total capture time.

Region of interest (ROI)

Selecting a region of interest (ROI) is done in the following manner:

1. Point the left side of the region.
2. Push and hold the left mouse button.
3. Drag the mouse (while still holding the button) towards the right end of the region.
4. Release the mouse button.

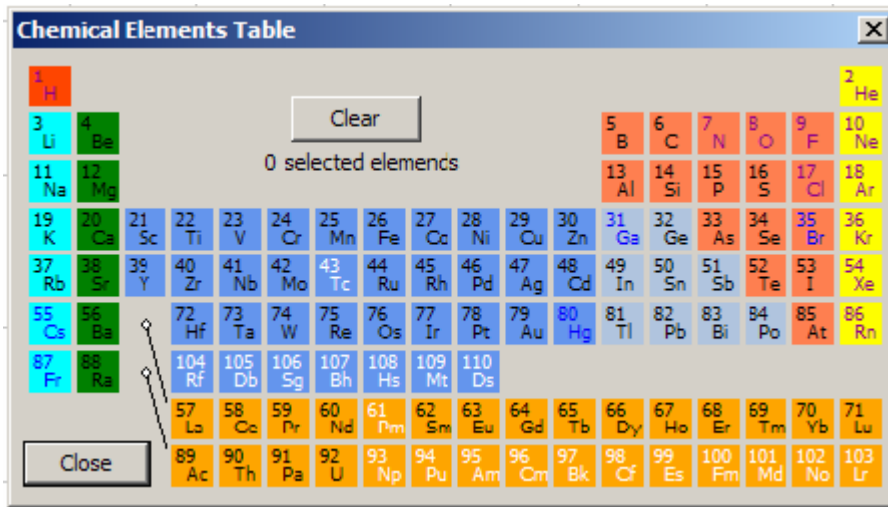
When the mouse pointer is inside a selected range, the centroid, area and FWHM are automatically calculated and displayed (if the selected range has suitable shape).

Energy calibration

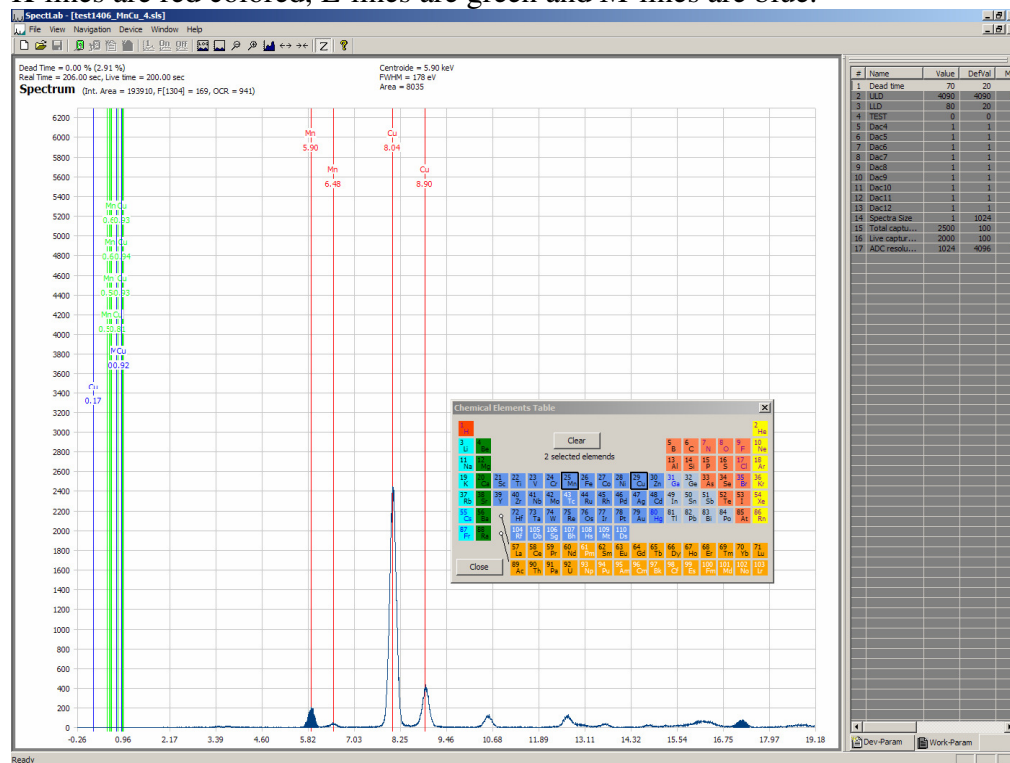
Linear energy calibration is defined by assigning energies (in KeV) to centroids of two given selected ROI. Use the following steps to set an energy calibration:

1. Mark two ranges of interest, preferably not close to each other.
2. Point one of the marked regions and click the right mouse button.
3. Choose “assign to energy”.
4. Enter the energy corresponding to the centroid of this ROI.
5. Repeat steps 2, 3 and 4 for the second marked region.
6. To remove the energy calibration, enter “0” at step 4.

Energy calibration enables the display of K, L and M lines of chemical elements. Just click on the **Z** button.



K-lines are red colored, L-lines are green and M-lines are blue.



System parameters

“Data bar” window shows system parameters as follows:

In “Dev-Param“ you can find the current settings of your ADC/MCA.

In “Work-Param” you can set new parameters of your system and load them into the ADC/MCA memory by using Device/Set Params menu or by clicking the button.

Note! When setting “Dead time level limit”, you should make sure the value is equal or lower than the value of LLD.

"Dead Time" is the time during which the ADC is "busy" processing an incoming pulse. This time depends on the input pulse's shaping time combined with the ADC's inherent processing time.

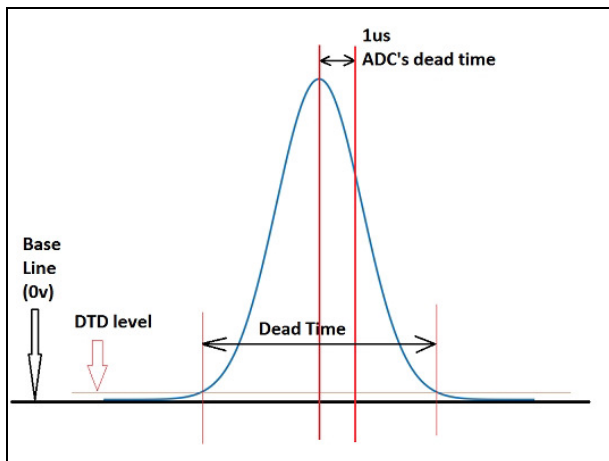


Fig. 1. Pulses lasting longer than 1us after peak

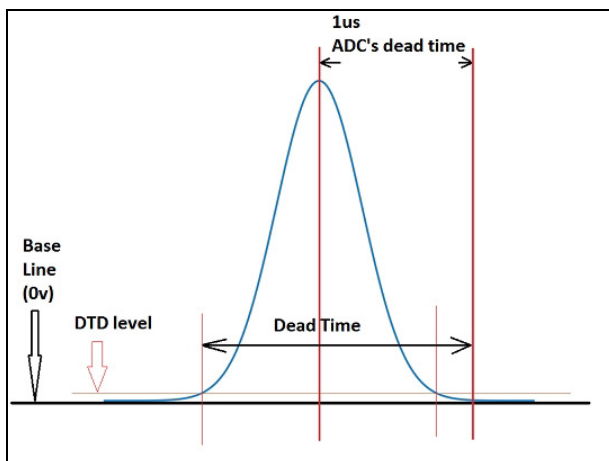


Fig. 2. Pulses lasting less than 1us after peak

Parameters DAC4-DAC12 are not used in standard ADC/MCA devices.

Parameter “Spectra size” is used to limit the number of channels saved into a file. If this number is 2048 for example, only the first 2048 channels will be saved.

Parameter “ADC resolution” defines the conversion mode of the ADC – 1024, 2048, 4096 or 8192 channels.

MCS functionality

A "standard" ADC/MCA is a PHA (Pulse Height Analysis) instrument. The incoming pulses' amplitude is measured and the results are accumulated in bins (channels). ADC/MCA V3.0 and V3.1 could operate also in Multi-Channel Scaler (MCS) mode, where all incoming pulses with

amplitudes higher than LLD and lower than ULD will be count and the result stored in bins (channels). In this case channel number accumulating incoming pulses is being incremented automatically in equal time intervals T_{inc} , where $T_{inc} = \text{TotalCaptureTime} / \text{Number_of_channels}$. For example in 8192 channel mode, a total capture time (parameter #15) set to 80 seconds will result in $T_{inc} = 9,7656\text{ms}$. The MCS mode is controlled (where applicable) by parameter #39.















Saving a file





When the measurement process is finished, the spectra can be saved in a file. The standard file name extension is .SLS. Any other file name extension could be used and in this case the recorded file will have slightly different format.

For files with .TXT extension, the data will be in one column, which is useful when importing these files into MathLab, Excel or other software packages.

Files with .SPE extension will be similar to .TXT files, but with different header.

Task bar buttons

-  (ctrl-n) Clear captured spectra content and prepare for new measurement.
-  (ctrl-o) Open a saved spectra.
-  (ctrl-s) Save spectra.
-  Establish a connection with the ADC/MCA.
-  Terminate connection.
-  Read ADC/MCA parameters (LLD, ULD, D_T).
-  Set new (modified) parameters in the ADC/MCA memory.
-  Read a single spectra.
-  (ctrl-a) Start automatic capture mode. This function also restarts Live time and Real time counters. The new captured data will be added to the existing ones.
-  Stop capture mode.
-  Logarithmic vertical scale.
-  Max vertical scale.
-  (-) Decrease vertical scale.
-  (+) Increase vertical scale.

-  Automatic vertical scale.
-  (<) Increase horizontal scale.
-  (>) Decrease horizontal scale.
-  Z Show/hide table of chemical elements.