

## General description:

The EMM-08-B is a low-cost power multiplexer based on electromechanical switches and intended for applications with low to medium switching rates. It supports high voltage operation while high currents can be driven with an insignificant heat dissipation due to the low resistance of the switches. Each unit provides 8 analog and bidirectional channels that can be interconnected between them or a common terminal. The device is easily controlled from a host computer through an USB 3.0 link.

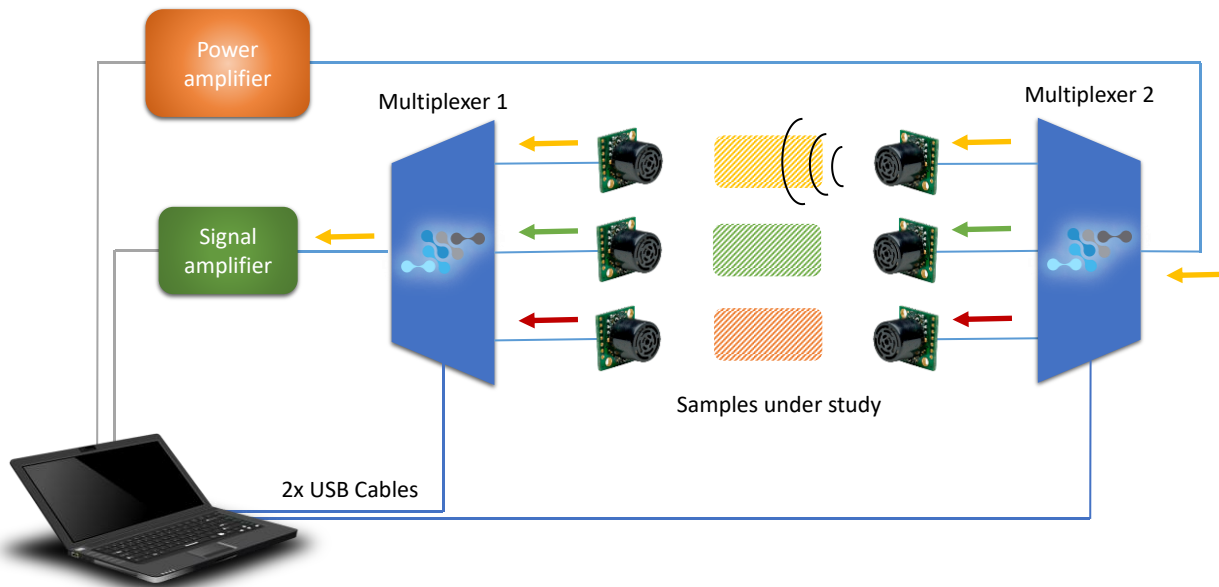
### Main features:

- Bidirectional operation.
- High voltage / high current operation.
- High isolation of disabled channels.
- DC-5MHz bandwidth.
- USB 3.0 link with host computer.

The EMM-08-B multiplexer is a low-cost alternative to the Ciprian SSM series of multiplexers based on solid-state switches. The main differences between both families involves the switching times and lifetime of the devices. Please, refer to application note “[Solid state vs electromechanical multiplexers](#)” for further information about these two technologies.


### Typical application:

Multiplexers make it possible to share common resources instead of having dedicated devices for each experiment. This reduces the cost and complexity of experimental setups employing multiple channels with redundant equipment. In the figure below several samples are sequentially measured by using the same power and receiving amplifiers.



Other typical applications involve pulse-echo measurements, distribution of power signals or acquisition of multiple sensors (see “[Applications of power multiplexers](#)”). Ciprian’s Multiplexers are bidirectional and their channels are individually configured. This means that any combination of enabled/disabled channels is possible, including schemes with several channels activated.


Specifications:

 Input / output analog signal

Parameter	Value	Conditions
Input / output connectors	BNC	
Max. voltage	800V <sub>PP</sub> (AC) 125V (DC)	
Max. current	5A (AC) 500mA (DC) <sup>(1)</sup>	
Bandwidth	DC – 5MHz <sup>(2)</sup>	
Input impedance	43pF	
Switch resistance	<30mΩ	
Crosstalk	-76.1dB -56.2dB	100kHz, 50Ω load 1MHz, 50Ω load

 Digital control

Interface	USB 3.0	
Switching time	<15ms	
Maximum switching rate	1.8·10 <sup>3</sup> switches / hour 1.8·10 <sup>4</sup> switches / hour	Rated voltage and current <sup>(3)</sup> 0V and 0A
Lifetime	10 <sup>5</sup> switches min. 2·10 <sup>6</sup> switches min.	Rated voltage and current <sup>(3)</sup> 0V and 0A

 Electrical and mechanical

Dimensions	48cm x 36cm x 13.3cm (19" rack 3U)
Weight	5 Kg
Line voltage	Universal 85~264VAC, 50~60Hz
Power consumption	20W max.
Operating conditions	-10 to 40°C, 30-80% RH non-condensing

Note 1: Up to 5A DC is allowed except at the time of switching.

Note 2: For operation up to 10MHz, please contact us.

Note 3: Specified voltage and current conditions apply at the time of switching.

## Installation and usage:

Ciprian Multiplexer can be controlled from Matlab and Labview platforms running on Windows systems. To install the USB driver follow the next steps:

1. Power ON the multiplexer and plug the USB cable to the computer.
2. Windows will try to find appropriate drivers for the device. If this process finishes successfully, the driver is installed. If not, follow step 3 for a manual installation.
3. Open the Device Manager of Windows:
  - a. Windows XP: Invoke "Start", right-click in "My Computer" and choose "Properties". In the "Hardware" tab select "Device Manager".
  - b. Windows Vista, 7, 8, 10: Type "Device Manager" in the search bar of the start menu.
4. Locate "FX3" entry with a yellow symbol in the "Other devices" list.
5. Right-click on it and choose "Properties". In the "Driver" tab press "Update Driver".
6. Select "Browse my computer for driver software". Provide the location of the folder "USB Driver" in the search field. Select "Include subfolders" and click "Next".

## Driver usage:

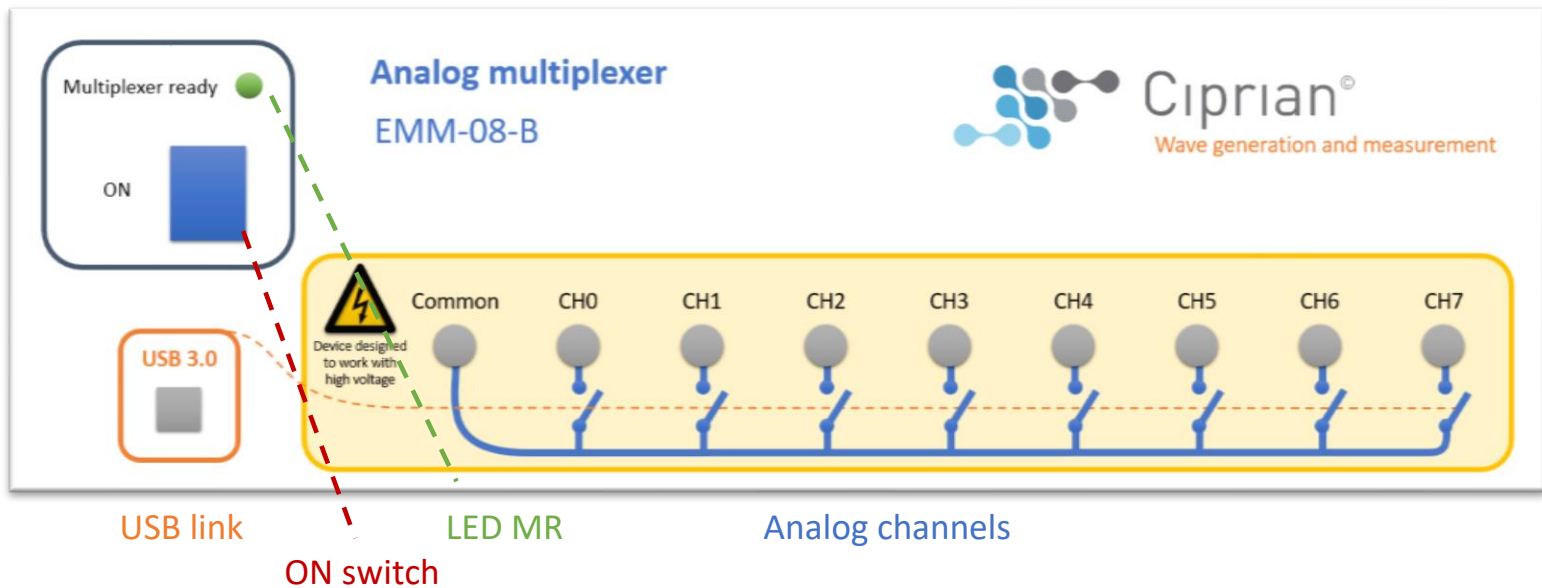
Copy the folder supplied by Ciprian and corresponding to the employed platform (Matlab, Labview) to your working folder or any other location included in the search path.

The driver is based on three basic functions:

- Init\_mux: Initializes the USB 3.0 link. If more than one multiplexer is connected, this function differentiates them through the serial number.
- Change\_channel: Enable a single channel while disabling all others.
- Change\_channel\_Adv: Enable a list of one or several channels and disable all others.

The user is recommended to check, run and modify the demo program included in the driver. It is also recommended not to connect power sources to the analog ports during initial tests for safety reasons, especially if high voltages or currents are involved. Please, read the section "Safety considerations" to identify potential risks associated with the high speed switching of high voltages and currents.

## Product usage:



1. Before turning on the multiplexer, connect the devices that will be used to its ports.
2. Turn on the multiplexer through the switch S1. Check that the LED L1 is on.
3. Connect the multiplexer to the host computer through a USB cable.
4. The device is ready for use.

When an error event occurs (such as a ventilation obstruction or an unintended and short-term shutdown of the product), the user is warned by the blinking of LED L1. This condition is hold even if the cause of the problem no longer persists, allowing the user to know if long experiments have been performed without errors. After the error event, the blinking of L1 will persist until the user communicates with the multiplexer through the host computer and an error message is reported.

## Use recommendations:

- The lifetime of the electromechanical switches strongly depends on the current and voltage that they are driving at the time of switching. In order to extent the lifetime of the multiplexer, it is recommended to perform the switching operations at zero current and voltage (soft-switching).

### Safety considerations:

- **The multiplexer is designed to operate with high voltages (up to 800V<sub>PP</sub>) and currents (5A). These conditions represent a highly dangerous risk of electrical shock which can be lethal for the user in case of unsafe use of the multiplexer and the devices connected to it.**
- **Unused ports must be protected with the BNC caps supplied with the device.**
- It is advised to turn off the multiplexer and any power source connected to it before connecting or removing cables from the analog terminals. Do not leave cables with an open end connected to the multiplexer.
- The maximum voltage and current ratings must not be exceeded in any port. Operation above these ratings may result in overheating and permanent damages to the multiplexer.
- The fast switching of inductive loads may result in high voltage pulses that can damage the multiplexer or any other connected device. See application note “[Switching inductive loads](#)” for further information. Hardware protections can also be specifically designed for customers intended to work with inductive loads. Please, contact us if your application involves large inductive loads.
- Depending on the specific set of connected devices, improper use of this product may lead to the unintended interconnection of high voltage sources and sensitive equipment, resulting in damages to the latter. Caution should be exercised when operating under these conditions. Overvoltage protective elements are recommended for sensitive devices. Please, contact us if this issue is of your concern.
- Only qualified and experimented users should be authorized to use this product.
- This product is intended for research purposes only and in an indoor class II environment.
- The power supplied to this product must be from a mains connection with protective earth.





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