



# BTX Pulse Switcher

For Gemini X2 and ECM 830

## Automate Grouped Pulse, Bipolar Switching Protocols

Easily execute automatic grouped pulse, bipolar switching protocols by adding the BTX Pulse Switcher to your ECM 830 or Gemini X2 electroporation waveform generator. These systems are ideal for high efficiency transfection of mammalian cells and tissues, including difficult to transfect cell types, such as stem cells and primary cells.

- Simplify execution of advanced protocols—including automatic, hands-free bipolar switching
- Suitable for many applications including in vitro, in vivo, in utero, in ovo, and ex vivo
- Easy to install

## The BTX Pulse Switcher is compatible with many accessories including:

- BTX Safety Domes/Safety Stands for cuvette- and flatpack-based in vitro electroporation
- Specialty/in vivo electrodes with 4 mm diameter banana cables or 4 mm diameter banana cable adapters
- HT-100 (Manual Column Switching) High-Throughput-Electroporation Plate Handlers

## Significantly expand pulsing application capabilities

The ECM 830 and Gemini X2 solutions already have an established electroporation publication record, including use in CRISPR gene editing technologies. Adding a BTX Pulse Switcher to your system further expands your application protocol capabilities.

- Program up to ten groups of pulses with defined polarities (+ or -) and specified numbers of pulses and pulse lengths—within each group
- Maximum number of pulses increases to 100 pulses per group and 1,000 pulses per protocol
- Minimum interval between pulses and between groups of pulses reduces to just 50 ms
- Includes ten additional preset electroporation protocols in the new Pulse Switcher protocol category

## Protocol Specifications after Pulse Switcher Installation

Bipolar Square Wave Protocols	
Voltage Range	Voltage magnitude is constant for all groups
LV Mode	5 to 500 V in 1 V steps
HV Mode	505 to 3000 V in 5 V steps
Pulse Groups	1 to 10 groups
For each group:	
Voltage Polarity in Group	Positive or Negative
Pulses in Group	
LV Mode	1 to 100 pulses per group
HV Mode	1 to 100 pulses per group
Pulse Duration in Group	
LV Mode	10 to 999 $\mu$ s in 1 $\mu$ s steps; 1 to 999 ms in 1 ms steps
HV Mode	10 to 600 $\mu$ s in 1 $\mu$ s steps
Pulse Interval in Group	0.05 to 10 s in 0.05 s steps
Post-Group Interval	0.05 to 10 s in 0.05 s steps

## Specifications

Standard Capabilities	
Voltage Range	1 to 3000 VDC
Pulse Length Range	10 $\mu$ s to 10 s
Other Specifications	
Compatible BTX Generators	Gemini X2 and ECM 830*
Power Supply Input Voltage Ratings	100 to 240 VAC, 50/60 Hz
Pulse Switcher Input Voltage	5 VDC, 100 mA
Warranty	Two Years
Storage Temperature	-10°C to 70°C (14°F to 158°F)
Operating Temperature	5°C to 40°C (40°F to 104°F)
Intended Use	Indoor Use Only
Operating/Storage Humidity	20% to 80% RH, non-condensing
Pollution Degree	IP2X
Insulation Category	Category II
Regulatory Certifications	CE, WEEE, RoHS
Physical Characteristics	
Dimensions L x W x D	8.9 x 7.8 x 5.4 cm (3.5 x 3.1 x 2.1 in)
Weight	276 g (0.6 lb)

## Ordering Info

Item No.	Description	Included Items
Pulse Switcher Systems		
45-2061	Pulse Switcher	Pulse Switcher, Power Supply and USB Connector Cable
45-2062	Gemini X2 Pulse Switcher System	Gemini X2 Generator, Pulse Switcher, Power Supply and USB Connector Cable, Safety Dome, Cuvettes 1 mm, 2 mm, 4 mm, pkg. of 30 (10 each), and Cuvette Rack
45-0669	ECM 830 Pulse Switcher System	ECM 830 Generator, Pulse Switcher, Power Supply and USB Connector Cable, Safety Stand, Cuvettes 1 mm, 2 mm, 4 mm, pkg. of 30 (10 each), and Cuvette Rack

Please visit [www.btxonline.com](http://www.btxonline.com) for a full list of accessories and consumables for Pulse Switcher.

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