



# 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

## 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



**BTX**<sup>®</sup>  
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**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

**Protocol Specifications after Pulse Switcher Installation**

Bipolar Square Wave Protocols	
<b>Voltage Range</b>	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
<b>Pulse Groups</b>	1 to 10 groups
<b>For each group:</b>	
<b>Voltage Polarity in Group</b>	Positive or Negative
<b>Pulses in Group</b>	
LV Mode	1 to 100 pulses per group
HV Mode	1 to 100 pulses per group
<b>Pulse Duration in Group</b>	
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
<b>Pulse Interval in Group</b>	0.05 to 10 s in 0.05 s steps
<b>Post-Group Interval</b>	0.05 to 10 s in 0.05 s steps

**Specifications**

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

\*Compatible with 7-inch touchscreen instruments only.

**Ordering Info**

Item No.	Description	Included Items
<b>Pulse Switcher Systems</b>		
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