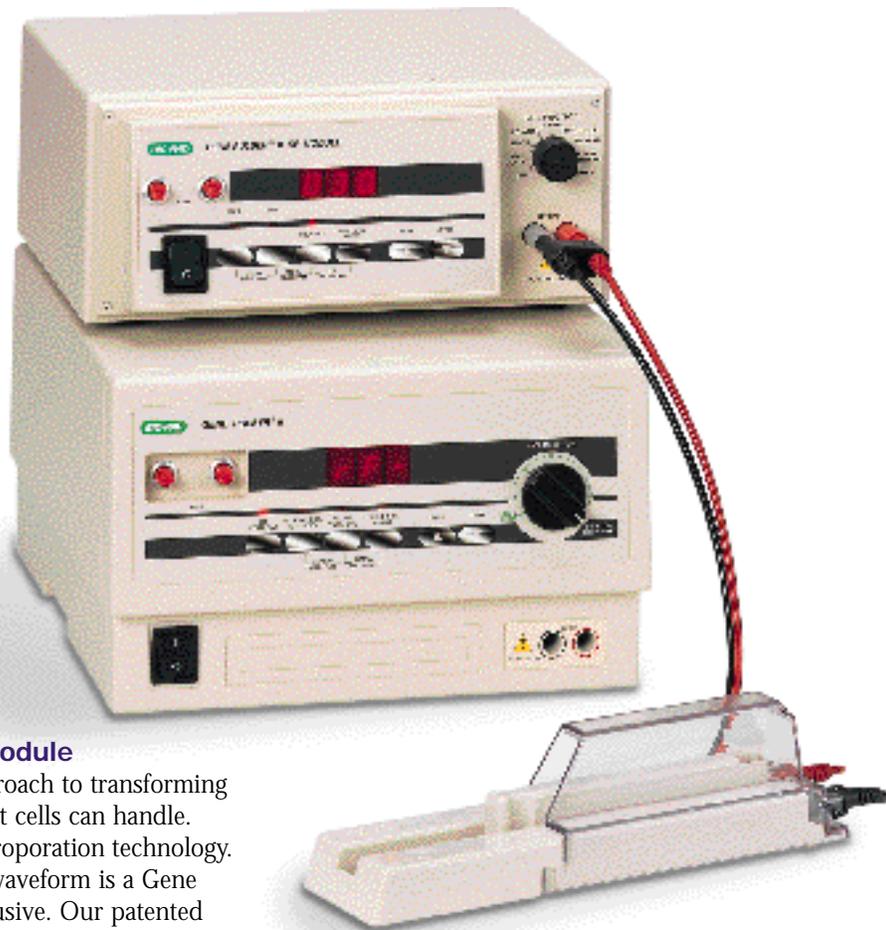


# Cells Are Riding the New Wave in Electroporation. It's Called **FlexWave™** Technology.



## Find It Only in the Gene Pulser® II RF Module

Take an entirely new approach to transforming cells with a waveform that cells can handle. We call it FlexWave electroporation technology. This adjustable, flexible waveform is a Gene Pulser II RF module exclusive. Our patented waveform uses RF (radio frequency) output in combination with the advanced PulseTrac circuitry of the Gene Pulser II system for improved cell viability and more efficient electroporation. It's the programmable and adaptable waveform cells prefer.

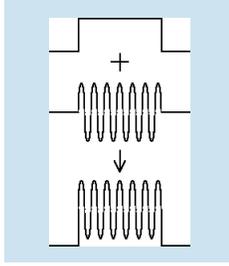
## With FlexWave Electroporation Technology, Flexibility Is the Basic Idea

The modular design of the Gene Pulser II system promotes electroporation flexibility. Simply plug in the

RF Module to the precision Gene Pulser II PulseTrac circuitry and receive the ultimate in FlexWave technology. Just what makes FlexWave technology unique? Its ability to generate flexible wave shapes and pulse patterns. The result is improved cell viability, while using less DNA in the process. You can tailor pulse output in a number of unique ways to suit your cell type. Which simply means that cell transformation is maximized. Everytime.

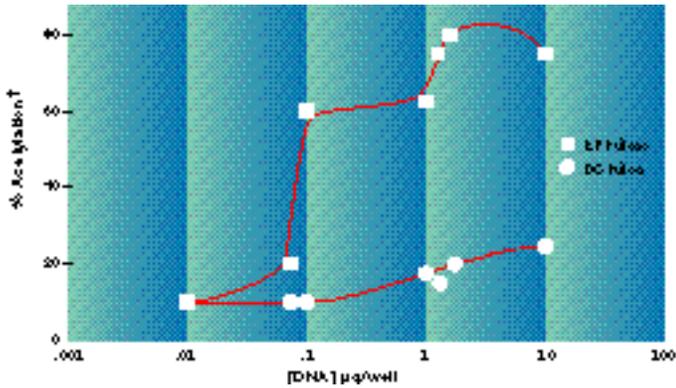
**BIO-RAD**

## Customize Your Waveform



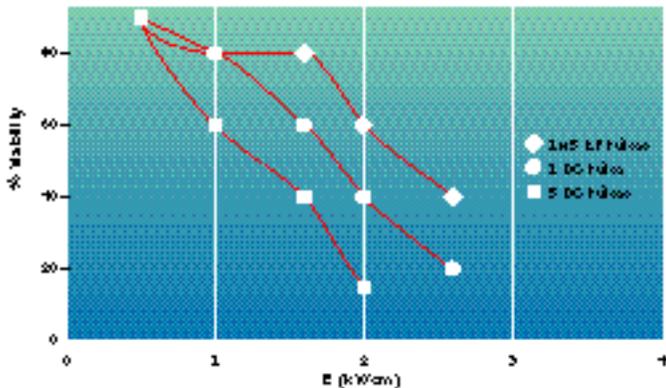
Go beyond the limits of traditional square wave and capacitor discharge electroporation with the combined strength of a square wave base and the flexible RF pulse output. Program multiple pulses in a variety of ways. The advantages begin with using less DNA and increasing cell viability. More are sure to follow.

## Optimization of DNA Concentration for Square Wave and RF Pulse



Comparison of DC to RF waveform with respect to DNA concentration. RF pulse parameters, 40 kHz, 2 ms pulse, 5 pulses with 1 second intervals. DC pulse was a single 2 ms square wave pulse. († CAT assay)

## Comparison of RF to Square Wave with Respect to COS Cell Viability



Comparison of DC to RF waveforms. RF consists of 40 kHz, 2 ms pulse, 5 pulses with 1 second intervals. DC consists of a square wave pulse, 2 ms duration. Sequential pulses were separated by one second intervals.

## FlexWave Technology Advantages

FlexWave technology offers new advantages in electroporation. Let your research grow along the full range of electroporation options that are now possible only with the complete

The image shows two pieces of equipment: the Gene Pulser II Unit and the Gene Pulser II RF Module (FlexWave Technology). The Gene Pulser II Unit is a larger, light-colored device with a control panel. The Gene Pulser II RF Module is a smaller, dark-colored device. A red line connects the two units, indicating their compatibility.

**Gene Pulser II Unit**

- Constant drives the precision PulseTrite circuitry via any of the four accessory modules
- Sample monitoring for true time constant based on actual pulse delivered
- Accurate measurement of actual volts delivered at output
- Complete arc protection regardless of sample or module
- Simple conductivity measurement for maximum sample protection
- Diagnostic algorithm for a lifetime of consistent pulses

**Gene Pulser II RF Module (FlexWave Technology)**

- Increased cell viability for better transformation efficiency, especially with mammalian cells
- Achieve more transformation with low DNA (reduce DNA concentrations at least 100x)
- Multiple pulse capability (up to 25 pulses)
- Programmable pulse settings (store up to 20 programs)
- Capable of square wave delivery

## General References

- Chang, D.C., Cell poration and cell fusion using an oscillating electric field, *Biophys. J.*, **56**, 641-65 (1989).
  - Chang, D.C., Gao, P-Q. and Maxwell, B.L., High efficiency gene transfection using a radiofrequency electric field, *Biochim. Biophys. Acta*, **1992**, 153-160 (1991).
  - Chang, D.C., Hunt, J.R., Zheng, Q. and Gao P-Q., Electroporation and electrofusion using a pulsed radio-frequency electric field. Chapter 19, pp: 303-326, in "Guide to Electroporation and Electrofusion," 1992, Academic Press, NY.
  - Chang, D.C. and Reese, T.S., Changes in membrane structure induced by electroporation as revealed by rapid-freezing electron microscopy, *Biophys. J.*, **58**, 1-12 (1990).
- \* U.S. Patent Number 4,822,470 and patents in application.

## Ordering Information

Catalog #	Product Description
165-2112	<b>Gene Pulser II RF Module</b> , 100/120 V, 50/60 Hz, includes 9-pin cable to connect to Gene Pulser II apparatus
165-2113	<b>Gene Pulser II RF Module</b> , 220/240 V
165-2105	<b>Gene Pulser II Apparatus</b> , 100/120 V, 50/60 Hz, includes shocking chamber, 15 sterile cuvettes (five 0.1 cm gap, five 0.2 cm gap, five 0.4 cm gap)
165-2106	<b>Gene Pulser II Apparatus</b> , 220/240 V
165-2088	<b>Gene Pulser/E.coli Pulser cuvettes</b> , 0.1 cm electrode gap, 50, sterile
165-2086	<b>Gene Pulser/E.coli Pulser cuvettes</b> , 0.2 cm electrode gap, 50, sterile
165-2089	<b>Gene Pulser/E.coli Pulser cuvettes</b> , 0.4 cm electrode gap, 50, sterile

