



- Simultaneous Positive and Negative 0 to +950 V and 0 to -950 V Pulse Outputs
- 1,900V Differential Outputs
- <25 ns Rise and Fall Times
- <50 ns to DC Pulse Width
- >20 KHz Pulse Repetition Frequency
- Internal High Voltage Power Supplies
- Optimized to Drive Deflection Plates, Pockels Cells, Q-Switches and other Capacitive Loads
- Economical, Modular Solid State Design

The PVM-4210 is a compact, OEM-style pulse generator module providing two simultaneous differential voltage pulses of up to  $\pm 950\text{V}$  (1,900V differential), with pulse rise and fall times <25 nanoseconds, and pulse widths continuously adjustable from <50 nanoseconds to DC. The pulser operates on +24VDC to +28VDC support power and features integrated DC high voltage power supplies.

The PVM-4210 is optimized for differential drive of deflection plates for electrostatic modulation of particle beams in time-of-flight mass spectrometers and accelerators. It will also drive any high impedance, capacitive load such as Pockels Cells and Q-Switches, electrodes, microchannel plates, acoustic transducers, image intensifiers and photomultiplier tubes. The exceptional pulse fidelity of the PVM-4210 will optimize the performance of any system in which it is used.

The module provides two pulse output channels, controlled by a common control logic. When the control logic receives a gate signal, both channels pulse simultaneously. One channel pulses from ground to the positive high voltage, and the other channel pulses from ground to the negative high voltage. Therefore, each output can be connected to the electrodes of a Pockels Cell or

Q-Switch, or to a pair of deflection plates, providing a 1,900V differential pulse across the cell or plates. These outputs may also be inverted, to pulse from the high voltage potential to ground. The width and frequency of the output pulses follow the width and frequency of the TTL input gate. The amplitude of the output pulse voltage for each channel is independently adjustable from 0 to 950V using screwdriver-adjustable potentiometers readily accessible on the end panel of the pulser module.

The PVM-4210 requires +24VDC to +28VDC support power and a TTL gate signal. For safety and control flexibility, a TTL level signal is used to enable and disable the DC power supplies.

Each channel is a half-bridge (totem pole) design, offering equally fast pulse rise and fall times, low power dissipation, and virtually no over-shoot, under-shoot or ringing. The unit has over-current detection and shut-down circuitry to protect the pulse generator against potential damage due to arcs and shorts in the load or interconnect cables.

Unlike some competing solid state switches, the PVM-4210 is a complete pulser solution with high voltage power supplies, energy storage and output network, ready for use. It can be connected directly to the load, and does not require series or shunt resistors, impedance-matching networks between the pulser and the load, or additional energy storage (capacitor banks). All of this is taken care of within the PVM-4210. The pulser is housed in an aluminum enclosure, with threaded mounting holes in the base to simplify installation and assembly in OEM applications.

The PVM-4210 is a direct-coupled, all solid-state design using air as the primary insulating medium. Its conservative design margin gives you long component life. And keeping the PVM-4210 free of potting compound or encapsulation materials makes it easy to service if a component ever does require replacement. Some competing products are potted, and must be replaced if they fail. But compactness and durability are not all you get in the PVM-4210. Inherent in the design is exceptional pulse fidelity with virtually no ringing, over-shoot or under-shoot, and protection against arcs, shorts and load transients in a reliable, economical module.

# PVM-4210 Dual Output High Voltage Pulse Generator Module



## Pulse Amplitude

Output Voltage	0 to +950V ±5V (Channel 1), 0 to -950V ±5V (Channel 2)
Output Voltage Adjustments	Screwdriver-adjustable potentiometers, End Panel
Pulse Width	<50ns to DC measured FWHM, controlled by input gate
Pulse Rise and Fall Time	≤25ns, 10% - 90%
Pulse Recurrence Frequency	Single shot to >20kHz continuous, 5MHz burst, controlled by input gate <sup>(1)</sup>
Pulse Droop	<1%
Over/Undershoot	<5%
Jitter	<1ns Shot-to-Shot
Throughout Delay (Delay from leading Edge of input gate To leading edge of Output pulse)	93 ns typical
Maximum Duty Cycle	Continuous
Maximum Average Power (Per Channel)	4W <sup>(1)</sup>
Pulse Output Connectors	SHV, End Panel
Output Cables	12" (~30cm) Belden 8218 75Ω Coaxial Cable

## Gate

Source	External
Input	TTL into 50Ω
Rise Time	<20ns
Connector	DSUB, End Panel

## General

Support Power	24VDC to 28VDC @ 600mA Maximum Current <sup>(2)</sup>
Dimensions (Excluding Connectors)	5.75"W x 1.75"H x 11.5"D (146mm W x 44.5mm H x 292mm D)
Weight (Approximate)	41 Ounces (1.16 kilograms)

(1) The power dissipated in each channel of the PVM-4210 when driving a capacitive load is defined by the formula  $CV^2F$ , where C is the total load capacitance, including the capacitance of the load, interconnect cable, and the internal capacitance of the PVM 4210, V is the pulse voltage, and F is the pulse repetition frequency (or the total pulses per second). (For these calculations, the internal capacitance of the PVM-4210 is 125pF, and Belden 8218 cable is 21.5pf/foot.) Given the maximum power supply capability of 4W (4mA) per channel, the maximum load capacitance, frequency and/ or voltage at which the PVM 4210 can operate can be approximated using this formula. At lower load capacitances and/or voltages less than 950V, the PVM-4210 can operate at continuous pulse recurrence frequencies greater than 20KHz. This formula is not applicable when driving non-capacitive (resistive or inductive) loads. Contact BNC for information or assistance in using the PVM-4210 with different load characteristics or impedances.

(2) 1A current needed for high frequency pulses when both negative and positive outputs are being used at 950V.

