



# PVX-4141 3500 Volt Pulse Generator — Datasheet



## Precision Pulse Control

The PVX-4141 pulse generator produces fast, high voltage wave forms, using an externally supplied voltage source up to 3,500V. Optimized for high impedance capacitive loads, the PVX-4141 is well suited for driving extraction grids and deflection plates for electrostatic modulation of particle beams in time-of-flight mass spectrometers and accelerators. Its robust and versatile design also makes it well suited for pulsing or gating power tube grids, Pockels cells and Q Switches, acoustic transducers microchannel plates, photomultiplier tubes and image intensifiers. The exceptional pulse fidelity of the PVX-4141 will optimize the performance of any system in which it is used.

## System Operation

The PVX-4141 has an output pulse of up to 3,500 volts with rise and fall times of 25ns or less, with very flat voltage pulses to DC into a capacitive load. Using the externally supplied high voltage source the PVX-4141 can generate singled-ended output pulses from ground to +3500V or from ground to -3500V, and can also generate pulses originating from a DC voltage offset from ground by using both  $V_{Low}$  and  $V_{High}$  power supply inputs. This offset can be from -3500V to +3500V, with a maximum power supply voltage differential of  $\leq 3500V$ .

The PVX-4141 requires a user-supplied TTL gate signal, a high voltage DC power supply and optional DC offset supply inputs. The output pulse width and frequency are controlled by the gate signal. The pulse output voltage is controlled by the amplitude of the input DC power supplies.

If the unit is enabled and the input gate is high, the  $V_{HIGH}$  supply is connected to the output. When the input gate is low, the  $V_{LOW}$  supply is connected to the output. Therefore the PVX-4141 can be used to generate a negative-going pulse by logically inverting the input gate, so that the input gate is high until the unit is pulsed. When the input gate goes low, the  $V_{LOW}$  input supply is connected to the output, thereby generating a negative-going pulse.

The PVX-4141 features front panel indicator LEDs to monitor the status of the pulse generator. Front panel instrument-quality voltage and current monitors provide a straightforward means to view the output voltage and current waveforms in real-time, eliminating the need for an external high voltage oscilloscope probe.

The pulse generator is a direct-coupled, air-cooled solid-state 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. It has over-current detection and shut-down circuitry to protect the pulse generator from potential damage due to arcs and shorts in the load or interconnect cable. All control and protection logic circuitry, support power, energy storage and output network are incorporated into the PVX-4141. 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 PVX-4141.

## Ordering Information

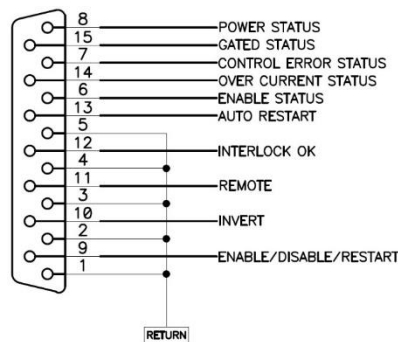
PVX-4141 System

## Remote Control

The PVX-4141 has the capability to be operated through remote controls. Below is a diagram of the 15 pin DSUB connector on the rear panel.

The control pins (9, 10, 11, 12, 13) are internally pulled high. For remote operation, the REMOTE pin should be pulled low. This disables the Front Panel ENABLE switch to prevent local operation. The remote ENABLE, INTERLOCK, INVERT, and AUTO RESET inputs are always active, regardless of the state of this REMOTE signal. If the ENABLE signal is momentarily pulled low, the unit will be enabled, or a fault will be cleared, on the rising edge of that signal. If the INVERT pin is pulled low, the gate pulses going in to the unit will become inverted internally. Therefore, the output pulse will be inverted from that of the input gate.

The status pins (6, 7, 8, 14, 15) allow a remote status of the front panel LEDs and are open drain outputs and require an externally pull up resistor (100 k  $\Omega$ ) to a voltage source, less than 24 VDC.



## Pulse Characteristics

Output Voltage Range	0 V to $\pm 3500$ V ( $V_{High} - V_{Low}$ )
	Controlled by power supply input voltages
Pulse Rise/Fall Time	$\leq 25$ ns (50 pf load)
Pulse Width	60 ns to DC, Controlled by input gate
Frequency Range	Single-shot to 30 kHz at 3500 V
	Continuous output, Controlled by input gate
Max. Average Power	100 W ( $V_{High} + V_{Low}$ ) <sup>(1)</sup>
Max. Duty Cycle	Continuous
Drop	<1%
Over/Undershoot	<5%
Throughput Delay	120 ns Typical
Jitter	<200 ps shot-to-shot

## Input DC Voltage + $V_{IN}$ ( $V_{High}$ )

Absolute Max. Value	+3500 V
Absolute Min. Value	-3500 V
Relative Max. Value	+3500 V over $V_{Low}$ Voltage
Relative Min. Value	+0 V over $V_{Low}$ Voltage

## Input DC Voltage - $V_{IN}$ ( $V_{Low}$ )

Absolute Max. Value	+3500 V
Absolute Min. Value	-3500 V

HV Input DC Connectors SHV, Rear Panel  
(One each + $V_{in}$  and - $V_{in}$ )

## Gate

Gate Source & Connector TTL into 50  $\Omega$ , BNC on front panel

## Monitors

Voltage Monitor 1000:1 into 1 Meg  $\Omega$ , BNC on front panel  
Current Monitor 10 A/V into 50  $\Omega$ , BNC on front panel

## Output Connector

Pulsed Output Connector Rear Panel, SHV, with 6 feet (~1.8M),  
RG-59 (75  $\Omega$ ) Coaxial Cable

## Power Specifications

Voltage Requirements	100 VAC to 120 VAC $\pm 10\%$ 220 VAC to 240 VAC $\pm 10\%$
Line Frequency	50 Hz to 60 Hz
AC Connector Type	NEMA C-14

## General

Size (HxWxD)	13.2 cm x 43.5 cm x 33.0 cm
Standard with rack ears	48.3 cm
Weight	8.2 kg
Operating Temperature	15 $^{\circ}$ C to 35 $^{\circ}$ C

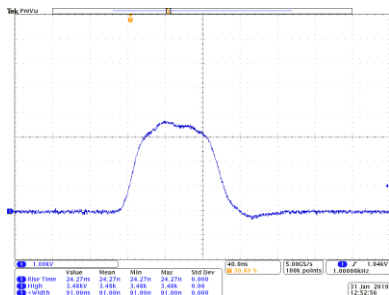
## Notes

Warranty: One year parts and labor on defects in materials and workmanship.

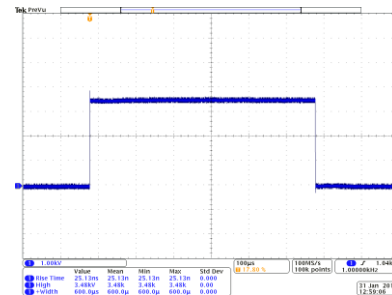
These specifications are measured driving a 50pF load connected with 6 feet of RG-59 cable, at 3500V output. However the PVX-4141 can drive loads of a few picofarads to several hundred picofarads of capacitance, limited by its maximum power dissipation capability<sup>(1)</sup>. At lower load capacitances and/or voltages less than 3500V, the PVX-4141 can operate at continuous pulse recurrence frequencies up to 400KHz. The PVX-4141 can also drive resistive or inductive loads, within limitations. Contact BNC for additional information and applications assistance.

<sup>(1)</sup>The power dissipated in the PVX-4141 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 PVX-4141, 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 PVX-4141 is 120pF, and RG-59 cable is 21.5pf/foot.) Given the maximum dissipation of 100W, the maximum load capacitance, frequency and/or voltage at which the PVX-4141 can operate can be approximated using this formula. This formula also approximates the high voltage power supply requirements needed to drive a given load at a specific voltage and frequency. This formula is not applicable when driving resistive or inductive loads.

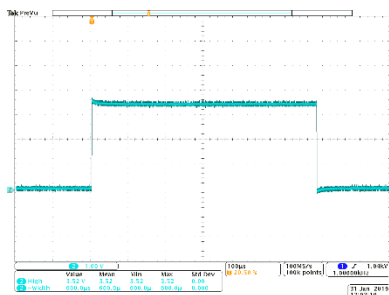
Specifications subject to change without notice.



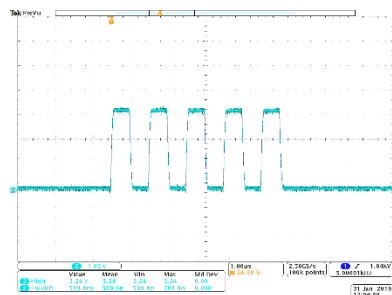
60 ns Minimum Pulse Width, 3500 V Output, at load



600  $\mu$ s Pulse Width, 3500 V Output, at load



Typical Output Waveform, 3500 V Output, at V-Mon



1 MHz Burst Frequency, 3000 V Output, at V-Mon