



- ◆ Amplitudes to  $\pm 250$  Volts
- ◆ Pulse width from 100 ns to 0.5 sec
- ◆ Rise, fall times as low as 10 ns
- ◆ PRF to 1 MHz
- ◆ IEEE-488.2 GPIB / RS-232 standard
- ◆ Ethernet optional

The AVR-G series is specifically designed for gating and beam blanking applications requiring amplitudes up to  $\pm 250$  Volts, pulse widths from 100 ns to 0.5 sec and duty cycles as high as 50%. This series is designed to drive high impedance loads such as microchannel plates, grids and beam deflection plates. This series is also suitable for driving certain high-impedance electro-optic modulators (EOMs). Typical output waveforms provided by each of the five standard models in this series are shown on this page. It should be noted that the versatile AVR-G technology can be readily adapted to provide a wide variety of other waveforms (e.g., higher voltages, dual outputs, alternating polarity, etc). Contact Avtech if your particular requirement is not covered by the five standard models.

Model AVR-G1-B provides up to 250 Volts out, pulse widths from 100 ns to 1 ms, PRF to 10 kHz and duty cycles to 80%. An option is available which allows the inter-pulse baseline to be offset by 0 to  $\pm 50$  Volts. A switchable output polarity option is also available. Another option allows the polarity to invert with each pulse, to generate a bipolar waveform.

Model AVR-G2-B provides an output which is basically the complement of the AVR-G1-B output - that is, the output potential is high (and variable) during the inter-pulse interval. The amplitude during this interval is variable from 0 to 250 Volts (via a one-turn control) while the amplitude during the pulse is fixed at 0 Volts. However, the OS option allows the voltage during the pulse to be varied from 0 to  $\pm 50$  Volts.

Model AVR-G3-B provides a bipolar waveform - each trigger event generates a positive output pulse followed by a negative pulse. The amplitudes and pulse widths for the two pulses are independently variable (from 0 to 220 Volts and 1 us to 10 ms respectively). The pulse separation (from the trailing positive edge to the leading negative edge) is variable from 1 us to 10 ms.

Model AVR-G4-B generates a unipolar pulse with amplitudes of 0 to 200V. The pulse width is adjustable from 200 ns to 500 us, subject to a maximum duty cycle limit of 50%. The PRF is variable from 1 Hz to 1 MHz. A dual polarity option is available.

Model AVR-G5-B generates a bipolar waveform. The output swings between +V and -V (equal but opposite voltages), for a total peak-to-peak amplitude of up to 440V. The pulse repetition frequency is variable from 1 Hz to 100 kHz, and the pulse width (of the positive portion) is variable from 200 ns to 500 ms.

For all models, the pulse repetition frequency is variable using the internal clock oscillator. A delay control and a sync output are provided for scope triggering purposes. The units can also be triggered externally using a TTL-level pulse. A manual push button is provided for one shot operation. Models are protected from overload conditions (such as excessively high duty cycle or short circuited load) by an automatic control feature which limits the output power for as long as the overload condition persists.

All models with the "-B" suffix include a complete computer control interface (see <http://www.avtechpulse.com/gpib> for details). This provides GPIB and RS-232 computer-control, as well as front panel keypad and adjust knob control of the output pulse parameters. A large back-lit LCD displays the output amplitude, polarity, frequency, pulse width or duty cycle as appropriate, and delay. To allow easy integration into automated test systems, the programming command set is based on the SCPI standard, and LabView drivers are available for download at the Avtech web site (<http://www.avtechpulse.com/labview>). An Ethernet port for Telnet-based control is optional on all -B units (-TNT option, for details see <http://www.avtechpulse.com/options/tnt>).

For operation at higher voltages (up to 800V peak-to-peak), consider using the new AVR-GHV series instead.



## SPECIFICATIONS

## AVR-G SERIES

Model:	AVR-G1-B <sup>1</sup>	AVR-G2-B <sup>1</sup>	AVR-G3-B <sup>1</sup>	AVR-G4-B <sup>1</sup>	AVR-G5-B <sup>1</sup>
Amplitude <sup>2</sup> :	0 to 250 Volts	0 to 250 Volts	0 to ±220 Volts	0 to 200 Volts	0 to 440 Volts (peak to peak)
Basic waveform (see diagrams):	Normal pulse	Complemented	Bipolar doublet	Normal pulse	Bipolar pulse
Pulse width (FWHM):	100 ns to 1 ms <sup>2</sup>		1 us to 10 ms	0.2 us to 0.5 ms	200 ns to 0.5 s
Load impedance:	≥ 10 kΩ		≥ 10 kΩ		≥ 100 kΩ
Output impedance <sup>7</sup> :	50 Ω				
Rise, fall times (20%-80%) <sup>8</sup> :	≤ 20 ns		≤ 100 ns	≤ 10 ns	≤ 20 ns
PRF:	1 Hz - 10 kHz		1 Hz - 5 kHz	1 Hz - 1 MHz	1 Hz - 100 kHz
Duty cycle:	0 - 80 %		0 - 50 %	0 - 80%	
Polarity <sup>3</sup> :	Positive or negative or both (specify)		Positive and negative	Positive, negative or both (specify)	Positive and negative
Alternating polarity mode:	Optional <sup>6</sup>	N/A	N/A	N/A	N/A
Pulse separation:	N/A	N/A	1 us - 10 ms	N/A	N/A
GPIB and RS-232 control <sup>1</sup> :	Standard on -B units.				
LabView Drivers:	Check <a href="http://www.avtechpulse.com/labview">http://www.avtechpulse.com/labview</a> for availability and downloads				
Telnet / Ethernet control <sup>4</sup> :	Optional. See <a href="http://www.avtechpulse.com/options/tnt">http://www.avtechpulse.com/options/tnt</a> for details.				
Burst mode:	Optional <sup>9</sup> . Generates 1-500 pulses per trigger event. See <a href="http://www.avtechpulse.com/options/br">http://www.avtechpulse.com/options/br</a> .				
Propagation delay:	≤ 100 ns (Ext trig in to pulse out)				
Jitter:	± 100 ps ± 0.03% of sync delay (Ext trig in to pulse out)				
DC offset:	Option available <sup>5</sup>		N/A		
Trigger required:	External trigger mode: TTL logic-level pulse (LOW = 0V, HIGH = +3V to +5V), > 50 ns				
Sync delay:	Variable 0 to ± 1 sec		Variable 0 to + 1 sec	Variable 0 to ± 1 sec	Variable 0 to ± 1 sec
Sync output:	+ 3 Volts, 200 ns, will drive 50 Ohm loads				
Gate input:	Synchronous or asynchronous (except no async mode on AVR-G3-B), active high or low, switchable. Suppresses triggering when active.				
Connectors:	Out, Trig, Sync, Gate: BNC				
Power requirements:	100 - 240 Volts, 50 - 60 Hz				
Dimensions (H x W x D):	100 mm x 430 mm x 375 mm (3.9" x 17" x 14.8")				
Chassis material:	cast aluminum frame and handles, blue vinyl on aluminum cover plates				
Rack-mount kit:	Optional. Add -R5 to the model number.				
Temperature range:	+5°C to +40°C				

- 1) -B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width or duty cycle (as appropriate), pulse repetition frequency, and delay (See <http://www.avtechpulse.com/gpib>).
- 2) When triggered externally, the pulse width can be set by the pulse instrument controls, or it may be set to track the input trigger pulse width.
- 3) Indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative) or -PN for dual polarity option (controlled by a two-position switch which controls the polarity of the signal output port). Keypad polarity control on -B units.
- 4) Add the suffix -TNT to the model number to specify the Telnet / Ethernet control option.
- 5) To generate a 0 to ±50V offset internally, add the suffix -OT to the model number. (Not available for -G3, -G4 and -G5 series). When generating a pulse with positive amplitude, the offset plus amplitude must remain between 0 and +250V, and when generating a pulse with negative amplitude, the offset plus amplitude must remain between 0 and -250V.

- 6) Add the suffix -ALT to the model number to specify the alternating polarity mode option. In this mode, the polarity inverts with each pulse. In other words, every second pulse is negative; the remainder are positive. Must be ordered with the -PN option. The instrument can also be operated in the normal positive and negative modes, where the polarity does not change from pulse to pulse.
- 7) This is the resistance in series with the output, internally. The 50 Ohm series resistance provides transmission line back-matching to absorb reflections from the load. This is not the same as the load impedance. The AVR-G series can not drive 50 Ohm loads.
- 8) For a non-capacitive load. The 50 Ohm output impedance will cause rise and fall time degradation if the load has capacitance, governed by the RC time constant.
- 9) Add the suffix -BR to the model number to specify the burst mode option. See <http://www.avtechpulse.com/options/br> for details about this option. Not available on the AVR-G3-B or AVR-G5-B models.



AVR-G4-B