

- ◆ 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 seconds, 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 standard models in this series are shown on this page. 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 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 up to  $\pm 50$  Volts. A switchable output polarity option is also available.

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 output voltage during this interval is variable up to 250 Volts, while the output voltage during the pulse is fixed at 0 Volts. However, the OT option allows the voltage during the pulse to be varied up to  $\pm 50$  Volts.

Model AVR-G4-B generates a unipolar pulse with amplitudes of up to 200V. The pulse width is adjustable from 200 ns to 500  $\mu$ s, 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.

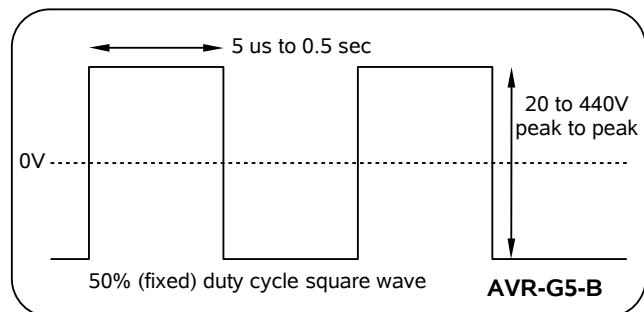
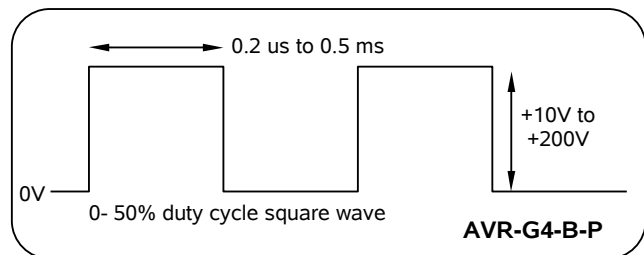
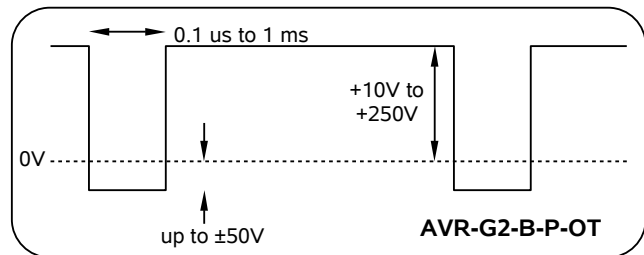
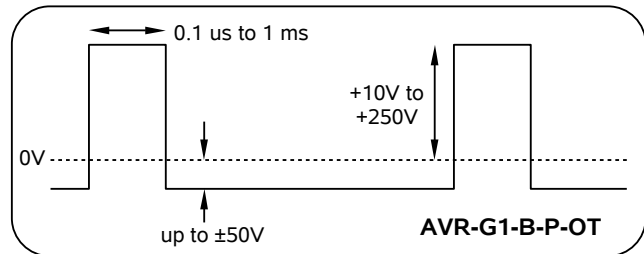
For all models, the pulse repetition frequency is variable using the internal clock oscillator. A delay control and a sync output are provided for scope triggering purposes. The units can also be triggered externally using a TTL-level pulse. A manual push button is provided for one shot operation. Models 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>).

The -VXI option adds a rear-panel Ethernet connector, allowing an instrument to be remotely controlled using the VXI-11.3, ssh, telnet, and web protocols. In particular, the VXI-11.3 features allows software like LabView to control an instrument using standard VISA communications drivers and network cabling, instead of using older-style GPIB cabling and GPIB controller cards. For additional details, see <http://www.avtechpulse.com/options/vxi>.

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



Model:	AVR-G1-B <sup>1</sup>	AVR-G2-B <sup>1</sup>	AVR-G4-B <sup>1</sup>	AVR-G5-B <sup>1</sup>
Amplitude <sup>9</sup> :	10 to 250 Volts	10 to 250 Volts	10 to 200 Volts	20 to 440 Volts (peak to peak)
Basic waveform (see diagrams):	Normal pulse	Complemented	Normal pulse	Bipolar pulse
Pulse width (FWHM):	100 ns to 1 ms <sup>2</sup>		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>7</sup> :	≤ 20 ns		≤ 10 ns	≤ 20 ns
PRF:	1 Hz - 10 kHz		1 Hz - 1 MHz	1 Hz - 100 kHz
Maximum duty cycle:	80 %			
Polarity <sup>3</sup> :	Positive or negative or both (specify)			Positive and negative
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			
Ethernet port, for remote control using VXI-11.3, ssh, telnet, web:	Optional <sup>4</sup> . Recommended as a modern alternative to GPIB / RS-232. See <a href="http://www.avtechpulse.com/options/vxi">http://www.avtechpulse.com/options/vxi</a> for details.			
Settings resolution:	The resolution of the timing parameters (pulse width, delay, period) varies, but is always better than 0.15% of ( set value  + 20 ns). The amplitude resolution is < 0.1% of the maximum amplitude.			
Settings accuracy:	Typically ± 3% (plus ±1V or ± 2 ns) after 10 minute warmup. For high-accuracy applications requiring traceable calibration, verify the output parameters with a calibrated oscilloscope <sup>10</sup> .			
Burst mode:	Optional <sup>8</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 modes:	Internal trigger, external trigger (TTL level pulse, > 10 ns, 1 kΩ input impedance), front-panel "Single Pulse" pushbutton, or single pulse trigger via computer command. In the external trigger mode, the pulse width may be set by the instrument, or it may be set to track the input pulse width.			
Variable delay:	Sync to main out: 0 to 1.0 seconds, for all trigger modes (including external trigger).			
Sync output:	> +3 Volts, > 50 ns, will drive 50 Ohm loads			
Gate input:	Synchronous or asynchronous, 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:	Aluminum frame and handles, gray 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.
- 4) Add the suffix -VXI to the model number to specify the Ethernet port.
- 5) To generate a 0 to ±50V offset internally, add the suffix -OT to the model number. 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) 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

- 7) 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.
- 8) 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-G5-B model.
- 9) For lower amplitudes, consider using an external resistor divider.
- 10) These instruments are provided with a basic calibration checksheet, showing a selection of measured output parameters. These measurements are performed with equipment that is calibrated on a regular basis by a third-party ISO/IEC 17025:2005 accredited calibration laboratory. However, Avtech itself does not claim any accreditation. For applications requiring traceable performance, use a calibrated measurement system rather than relying on the accuracy of the pulse generator settings.



AVR-G4-B