



- Amplitudes to 50, 100, 200, 250, or 400 Volts
- IEEE-488.2 GPIB and RS-232 interfaces
- Ethernet port for VXI-11.3 support
- 10 or 15 ns rise and fall times
- Pulse widths variable from 0.1 to 100 us
- PRF to 10 kHz or 100 kHz
- Peak powers up to 3.2 k
- Average powers up to 200W
- For time-of-flight and many other applications

The AVR models are high-voltage pulse generators capable of driving 50Ω (or higher) loads and operating over a wide pulse width range. The instruments include IEEE-488.2 GPIB and RS-232 interfaces. For diode loads, these models can be used to provide up to 1, 2, 4, 5 or 8 Amps of pulsed current if the diode is connected in series with 50Ω. Most models operate over a wide pulse width range of 100 ns to 100 us.

Model AVR-1A-B provides amplitudes of up to 50 Volts with rise times of 10 ns. The pulse repetition frequency (PRF) is variable from 1 Hz to 100 kHz, provides average output powers up to 25 Watts and a maximum duty cycle of 50%.

Models AVR-2A-B and AVR-2B-B provide up to 100 Volts with rise times of 10 ns, and repetition rates up to 100 kHz. These models provide average output powers up to 50 and 100 Watts with maximum duty cycles of 25 and 50%, respectively. Higher power operation (160W, 80%) is optional on the AVR-2B-B.

The AVR-3-B provides up to 200 Volts with rise times of 10 ns. The PRF is variable from 1 Hz to 10 kHz. This model will provide peak output power of 800 Watts and average output power of 16 Watts (2% maximum duty cycle).

The AVR-3HE-B offers higher maximum PRF (to 100 kHz), higher duty cycles and average output powers (10% / 80W standard, 20% / 160W optional.)

The AVR-3HF-B offers higher amplitudes (up to 250V), and a standard maximum duty cycle and average power of 4% / 50W (optionally 8% / 100W or 16% / 200W).

The AVR-4-B provides up to 400 Volts out with rise times of 15 ns, and pulse widths variable from 100 ns to 100 us. The PRF is variable from 1 Hz to 10 kHz. This model will provide peak output power of 3.2 kW and a standard maximum duty cycle and average power of 4% / 50W (optionally 3.1% / 100W or 6.2% / 200W).

The MOSFET output stages in all models will safely withstand any combination of front panel control settings, output open or short circuits, and high-duty cycles. An internal power supply monitor removes the power to the output stage for five seconds if an average power overload exists. The AVR-3-B output stage will source up to 4A, and will automatically shut down if the load current exceeds 4.8A, approximately. Similarly, the AVR-3HF-B will supply 5A and shut down at 6A, and the AVR-4-B will supply up to 8A and shut down at 10A.

Aside from the internal clock, these instruments can also be triggered by a single-pulse pushbutton or an external TTL-level trigger input. When triggered externally the output pulse width can be set to track the input trigger pulse width ( $PW_{OUT} = PW_{IN}$ ). A delay control and a sync output are provided for scope triggering. A gate input is also provided.

All models include a complete computer control interface (see <http://www.avtechpulse.com/gpib>). 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 backlit LCD displays the output amplitude, polarity, frequency, pulse width, and delay.

A standard rear-panel Ethernet connector allows the 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 details, please see <http://www.avtechpulse.com/options/vxi>.

All models are available with positive or negative outputs. A dual-polarity option is also available. The polarity must be specified when ordering, by adding the suffix “-P”, “-N”, or “-PN” to the model number. The output polarity of units with the -PN dual-polarity option can be controlled by the front-panel settings, or by computer commands.

All models require 100 - 240 Volts, 50 - 60 Hz, and are mounted in a rugged all-metal 4” x 17” x 15” chassis.

LabView drivers for these instruments are available for download at <http://www.avtechpulse.com/labview>.

Models in the AVR series may be suitable for replacing obsolete models from the former Velonex Corporation in many applications.

Actual test waveforms from shipped units are available from the online data pages for each model, at:

- <http://www.avtechpulse.com/medium/avr-2a/#testresults>
- <http://www.avtechpulse.com/medium/avr-2b/#testresults>
- <http://www.avtechpulse.com/medium/avr-3/#testresults>
- <http://www.avtechpulse.com/medium/avr-3hf/#testresults>
- <http://www.avtechpulse.com/medium/avr-4/#testresults>

For higher-voltage applications, Avtech also offers the AVR-5B (500V), AVR-7B (700V), and AVR-8A (1000V) families.



# SPECIFICATIONS

# AVR-1, -2, -3 & -4 SERIES

Model <sup>1</sup> :	AVR-1A-B	AVR-2A-B	AVR-2B-B	AVR-3-B	AVR-3HE-B	AVR-3HF-B	AVR-4-B	
Amplitude (into $\geq 50\Omega$ ) <sup>2,3,5</sup> :	<2.5 to 50V	<5 to 100V		<10 to 200V	<10 to 200V	<10 to 250V	<20 to 400V	
Maximum output current:	1A	2A		4A	4A	5A	8A	
Rise & fall times (20%-80%):	$\leq 10$ ns						$\leq 15$ ns	
Pulse width (FWHM):	100 ns to 100 us				50 ns to 100 us	100 ns to 100 us		
Maximum PRF:	100 kHz			10 kHz	100 kHz	100 kHz	10 kHz	
Max. duty cycle and average output power:	Standard:	50%, 25W	25%, 25W	50%, 100W	2%, 16W	10%, 80W	4%, 50W	0.5%, 16W
	-XP1 option:	N/A	N/A	N/A	N/A	N/A	8%, 100W	3.1%, 100W
	-XP2 option:	N/A	N/A	80%, 160W	N/A	20%, 160W	16%, 200W	6.2%, 200W
Polarity <sup>4</sup> :	Positive or negative or both (specify). Dual polarity not available with -XP2 option.							
Output Impedance:	1.5 $\Omega$ , approximately							
Propagation delay:	$\leq 150$ ns (Ext trig in to pulse out)							
Jitter:	$\pm 100$ ps $\pm 0.03\%$ of sync delay (Ext trig in to pulse out)							
Trigger modes:	Internal trigger, external trigger (TTL level pulse, > 10 ns, 1 k $\Omega$ 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							
Gated operation:	Synchronous or asynchronous, active high or low, switchable.							
Connectors:	Out, Trig, Sync, Gate: BNC							
GPIB & RS-232 control <sup>1</sup> :	Standard feature on all -B units.							
LabView drivers:	Available for download at <a href="http://www.avtechpulse.com/labview">http://www.avtechpulse.com/labview</a> .							
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Included. 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 $\pm 3\%$ (plus $\pm 1V$ or $\pm 2$ ns) after 10 minute warmup. For high-accuracy applications requiring traceable calibration, verify the output parameters with a calibrated oscilloscope <sup>6</sup> .							
Power requirements:	100 - 240 Volts, 50 - 60 Hz							
Dimensions:	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							
Mounting:	Any. Add -R5 to the model number to add a rack-mount kit.							
Temperature range:	$+5^{\circ}\text{C}$ to $+40^{\circ}\text{C}$							

- B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude and frequency. See <http://www.avtechpulse.com/gpib> for details.
- For operation at amplitudes of less than 10% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- For analog electronic control (0 to +10V) of amplitude, suffix the model number with -EA. These units also include the standard front-panel controls.
- Indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative), or -PN for dual polarity option.
- The instrument may be used to drive resistive loads of less

than 50 Ohms, as long as the maximum output current specification is not exceeded. The rise and fall times may increase.

- 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-3-B-PN