



AVRZ-5W-B, 100 V/div, 100 ns/div

The AVRZ-5 family provides high amplitude outputs (to +500V) with very fast rise times (< 6.5 ns), very fast fall times (6.5 ns), and a pulse width that is variable over a wide range (15 ns to 10 us).

The AVRZ-5W-B has a pulse width range of 15 ns to 10 us, with a maximum duty cycle of 0.1%. The maximum pulse repetition frequency is 5 kHz. The rise time is  $\leq 4.5$  ns for amplitudes below 250V, and  $\leq 6.5$  ns above that. The fall time is  $\leq 6.5$  ns.

This model requires a 50 $\Omega$  load for proper operation.

Standard models generate positive output amplitudes only. Two options are available to allow generation of negative pulses. The -INV option provides an external inverting transformer which can be manually installed on the output (using coaxial cabling) to invert the pulse. (This transformer is available separately, as model AVX-R5. See <http://www.avtechpulse.com/transformer/avx-r5> for details.) The -PN option integrates this pulse transformer and a relay inside the pulse generator chassis, and permits front panel or computer control of the polarity. In both cases, the inverting transformer slows the rise and fall times slightly (up to 3 ns typically), and some slight rounding and ringing is introduced. See the waveform on the next page for a typical example.

An external bias-tee module is available. This may be used to add an externally-generated DC offset voltage to the output, in the range of -5V to +5V. The DC bias is applied to a solder terminal. The input and output pulses are provided on BNC connectors. At maximum

- ◆ Amplitudes to +500V
- ◆ 4.5 ns rise time for +250V
- ◆ 6.5 ns rise time for +500V
- ◆ 15 ns to 10 us pulse width
- ◆ IEEE-488.2 GPIB and RS-232 interfaces
- ◆ Ethernet port for VXI-11.3 support

pulse width, this bias tee will introduce up to 10% droop on the pulse top, typically. (This bias tee is also available separately as model AVX-TG.)

Both instruments may be triggered by the internal trigger source (variable from 1 Hz to 5 kHz), by an external TTL trigger source, by a front-panel pushbutton, or by a computer command. Both models include a complete computer control interface. This provides GPIB and RS-232 computer-control, as well as front panel keypad and adjust knob control of the output pulse parameters. (See <http://www.avtechpulse.com/gpib> for additional details). A large back-lit LCD displays the output amplitude, frequency, pulse width, and delay. To permit easy integration into automated test systems, the programming command set is based on the SCPI standard. LabView drivers are available for free download online at <http://www.avtechpulse.com/labview>.

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, see <http://www.avtechpulse.com/options/vxi>.

For applications that require wider pulses, and can tolerate slower rise times, consider the AVR-5B series (please see <http://www.avtechpulse.com/medium/avr-5b>). Call or email Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) with your special requirement!



AVRZ-5W-B

Model:	AVRZ-5W-B
Amplitude <sup>1</sup> :	Standard: $\leq 50$ to 500 Volts. With -LVA option <sup>7</sup> : $\leq 0.1$ to 500 Volts
Polarity:	Positive <sup>4</sup>
Output impedance during pulse <sup>2</sup> :	50 $\Omega$
Required load impedance <sup>5</sup> :	50 $\Omega$
Rise time (20% - 80%) <sup>4</sup> :	0 to +250V: $\leq 4.5$ ns (6.5 ns for units with -LVA option) +250 to +500V: $\leq 6.5$ ns Add 3 ns for negative outputs.
Fall time (80% - 20%) <sup>4</sup> :	$\leq 6.5$ ns (10 ns for units with the -LVA option) Add 3 ns for negative outputs.
Pulse width (FWHM):	15 ns to 10 $\mu$ s
“Back-porch” transient:	< 20% of amplitude, < 100 ns in width. Repeats and decays every ~120 ns (see photo on previous page).
PRF:	0 to 5 kHz
Duty cycle (max):	0.1% (i.e., pulse width is limited to 200 ns at 5 kHz, 2 $\mu$ s at 500 Hz, etc.)
Jitter (Ext trig in to pulse out):	$\pm 200$ ps $\pm 0.03\%$ of sync delay
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.
Variable delay:	Sync to main out: 0 to 1.0 seconds, for all trigger modes (including external trigger).
Propagation delay:	$\leq 400$ ns (Ext trig in to pulse out)
Sync output:	> +3 Volts, > 50 ns, will drive 50 Ohm loads
Gate input:	Synchronous, active high or low, switchable. Suppresses triggering when active.
Safety interlock:	Optional <sup>9</sup> . Adds a safety lock circuit on a rear-panel BNC connector. The signal pin of this safety lock BNC connector must be shorted to chassis ground by the user’s circuitry (the short must be capable of carrying 5 mA of current from an internal +5V/1k $\Omega$ DC source), otherwise the output will be switched off automatically. The connector shield is connected to chassis ground.
GPIB and RS-232 control:	Yes. (Visit <a href="http://www.avtechpulse.com/labview">http://www.avtechpulse.com/labview</a> for LabView drivers.)
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 $\pm 3\%$ after 10 minute warmup. For high-accuracy applications requiring traceable calibration, verify the output parameters with a calibrated oscilloscope <sup>8</sup> .
DC offset:	Optional <sup>6</sup> . Apply externally-generated DC voltage (-5V to +5V) to accessory bias tee.
Connectors:	Out <sup>3</sup> , Trig, Sync, Gate: BNC
Power requirements:	100 - 240 Volts, 50 - 60 Hz
Dimensions: (H x W x D)	100 mm x 430 mm x 475 mm (3.9” x 17” x 18.8”)
Temperature range:	+5°C to +40°C

- 1) 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. Alternatively, add the -LVA option.
- 2) The output impedance falls to 2 $\Omega$  (approx) for 1  $\mu$ s (approx) after the falling edge of the pulse, then rises to 1k $\Omega$  for the remainder of the time before the next pulse.
- 3) Add the suffix -NC, -HN, -MHV, or -SHV to the model number to replace the standard BNC output connector with N, HN, MHV, or SHV connectors, respectively.
- 4) Negative amplitudes can be generated by ordering the -INV or -PN options. The -INV option provides an optional external inverting transformer accessory, which must be manually installed. The -PN option provides internal polarity-inverting capability, with front-panel or computer control of the polarity. These options degrade the rise and fall times slightly (up to 3 ns).
- 5) A 50 Ohm load is required. Other loads may damage the instrument.

- Consult Avtech (info@avtechpulse.com) if you need to drive other load impedances.
- 6) To include the bias tee module, add the suffix -OS to the model number.
  - 7) Adds internally-switched attenuators to allow very low amplitude settings. The amplitude is adjustable from < 0.1V to 500V, in steps of < 0.1V.
  - 8) 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.
  - 9) Add the -SIL option suffix to the model number to include the safety interlock function.

The output polarity of the AVRZ-5 series can be inverted with the optional -INV transformer accessory, shown below:



AVRZ-5W-B with -INV option. 100 V/div, 200 ns/div

