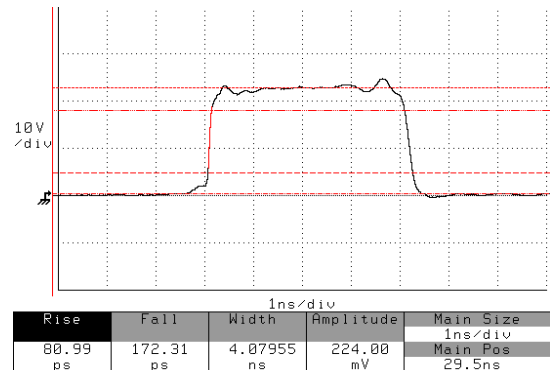


AVM-4-C, +20V, < 500 ps



AVM-4-C, +20V, > 4 ns

The models in the AVM family provide very fast rise times (100-170 ps), with high pulse repetition frequencies (PRFs) of up to 10 or 25 MHz, variable pulse widths, and amplitudes as high as 20 Volts.

The AVM-1 series provides 5V amplitudes, 25 MHz PRF, 0.25 to 6 ns pulse widths, with 100 ps rise times.

The AVM-2 series provides higher amplitudes (15V standard, 20V optional), for 0.25 to 2 ns pulse widths.

The AVM-3 series operates up to 15V, with wider 2 to 15 ns pulse widths (10 ns above 10 MHz), and 150 ps rise times.

The AVM-4 series provides 20V amplitudes, 10 MHz PRF, 0.5 to 5 ns pulse widths, with 150 ps rise times, and includes a computer-controllable version with GPIB and RS-232 ports.

The AVM-5 series is similar, with 10V amplitudes, 0.5 to 10 ns pulse widths, and 120 ps rise times.

The AVM-6 series is similar, with 5V amplitudes, 10 MHz PRF, 0.5 to 10 ns pulse widths, and 100 ps rise times.

Instruments with the "-B" suffix 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. A large back-lit LCD displays the output amplitude, polarity, frequency, pulse width, and delay. See <http://www.avtechpulse.com/gpib> for details. 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 (see <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. The VXI-11.3 feature 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. See <http://www.avtechpulse.com/options/vxi> for details.

The -C versions provide output pulse parameters similar to those of the -B models, but do not include the GPIB or RS-232 interfaces (i.e. no computer control or LCD display). The output parameters are controlled by front-panel switches and one-turn dials. -B and -C models require 100-240V, 50-60 Hz power.

Models with the -C or -B suffixes include an adjustable internal oscillator that is variable from up 10 or 25 MHz (depending on the model) using the front-panel controls. A sync output is provided for sampling scope triggering purposes. All models can also be triggered externally using an externally-generated TTL-level pulse.

AVM models are available in positive, negative, or dual-polarity versions. In dual-polarity -C units and modules, the polarity

inversion is accomplished by manually adding an inverting transformer accessory on the pulser's output connector. Dual-polarity -B units contain two separate pulse generator circuits (one for each polarity). The front-panel polarity setting (or computer command) controls an internal relay that connects the appropriate circuit to the main output connector.

Some AVM units are available in a DC-powered miniature module format. These modules require a TTL input trigger signal. The DC power and ground connections are applied to solder terminals. The output pulse width and amplitude are normally controlled by screwdriver-adjustable one-turn trimpots. These trimpots may optionally be replaced with single solder terminals, allowing the pulse width (-EW option) and amplitude (-EA option) to be controlled by a 0 to +10V DC control voltage. Alternatively, all solder terminals can be replaced with pin strips intended for use with mass-termination insulation displacement connectors (-MTA options). See the photos on page 3 for examples.

A DC offset or bias insertion function (similar to Model AVX-T, see <http://www.avtechpulse.com/bias/avx-t>) is included. The required DC offset or bias is applied directly to rear panel solder terminals. An available option provides an internally-generated DC offset (0 to $\pm 5V$) controlled from the front panel (also by computer command on -B units).

AVM units are available with a monitor output option that provides an attenuated (20 dB or x10) coincident replica of the main output pulse.

Additional options include analog electronic control (0 to +10V) of output amplitude, pulse width, propagation delay and DC offset. -C units with these options also include the standard front-panel controls. On modules, they replace the one-turn trimpots. These options provide a form of remote-control for units without the full GPIB / RS-232 interfaces (standard on -B units).

The AVM series is only specified for periodic triggering within the frequency ranges noted in the table below. It is not suitable for aperiodic applications. The output amplitude and pulse width may interact, particularly in the module and -C formats. For a given pulse width setting, decreasing the output amplitude increases the output pulse width. This interaction may be eliminated by using external variable attenuators to control the amplitude or by using the slower AVMM series.

The AVM series is ideally suited for systems or laboratory applications such as logic testing, TDR, radar, optical and cable communications, SAW, switching and propagation time studies and educational fields. In some cases, the specifications can be adapted to satisfy a particular requirement. Contact the factory (info@avtechpulse.com) with your special requirement!

Model:	AVM-1-C ¹ AVM-1	AVM-2-C ¹ AVM-2	AVM-3-C ¹	AVM-4-C ¹ AVM-4-B ²	AVM-5-C ¹ AVM-5-B ²	AVM-6-C ¹ AVM-6-B ²
Maximum amplitude (into 50Ω) ^{3,4,13} :	5V	15V standard, 20V optional ¹²	15V	20 V	10 V	5 V
Pulse width (FWHM) ³ :	0.25 - 6 ns	0.25 - 2.0 ns	2.0 - 15 ns ¹⁴	0.5 - 5.0 ns	0.5 - 10 ns	0.5 - 10 ns
Maximum PRF:	25 MHz			10 MHz		
Rise time (20% - 80%):	≤ 100 ps		≤ 150 ps	≤ 150 ps	≤ 120 ps	≤ 100 ps
Fall time (80% - 20%):	≤ 250 ps		≤ 800 ps ¹⁴	≤ 300 ps	≤ 300 ps	≤ 300 ps
Required load ⁹ :	50 Ohms					
Polarity ⁵ :	-C units and Modules: specify -P, -N, -P-PN, or -N-PN -B units: specify -P, -N, or -PN					
GPIB and RS-232 control ² :	Standard on -B units. Not available on -C units or modules.					
LabView Drivers:	-B units only: check http://www.avtechpulse.com/labview for availability and downloads					
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Optional on -B units ¹¹ . Recommended as a modern alternative to GPIB / RS-232. See http://www.avtechpulse.com/options/vxi for details.					
Settings accuracy:	Not calibrated; parameters may interact noticeably. For traceable calibration, verify the output parameters with a calibrated oscilloscope.					
Fixed propagation delay: (EXT TRIG in to pulse out)	-C units and Modules: ≤ 30 ns (Ext trig in to pulse out) -B units: ≤ 140 ns (Ext trig in to pulse out)					
Variable delay, internal trigger mode:	-C units: 0 to 50 ns -B units: 0 to +/- 1 second Modules: Not available					
Variable delay, external trigger mode:	-C units and Modules: Optional ^{3,6} , 0 to 5 ns -B units: Standard, 0 to +/- 1 second					
Jitter (EXT TRIG in to pulse out):	-C units and Modules: ±15 ps -B units: ± 35 ps ± 0.015% of sync delay					
Gate input:	-B units only. Active high or low, switchable. Suppresses triggering when active.					
DC offset or bias insertion ^{3,7} :	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max) An internally-generated offset function is optional ⁷ .					
External trigger	Modules, and -B and -C external trigger mode: TTL-level (Low: 0V, High: +3V to +5V), 10 ns or wider.					
Trigger input impedance:	-C units and Modules: 50Ω (optionally 1 kΩ ¹⁰). -B units: 1 kΩ					
Sync output:	-C units: +3 Volts, width varies with PRF (always > 10 ns), will drive 50Ω -B units: +3 Volts, 50 ns, will drive 50Ω Modules: Not Available					
Monitor output option ⁸ :	Provides a 20 dB attenuated coincident replica of main output					
Connectors (-B and -C units):	Out, Monitor: SMA, Trig, Sync, Gate (-B units only): BNC,					
Connectors (modules):	In, Out: SMA, Power: Solder terminals					
Optional accessory kit: (attenuators and terminators)	Add the suffix "-AK1" to the model number to include the recommended accessory kit. Consists of three SMA, 18 GHz, 2 Watt attenuators (10, 20 & 30 dB) for use on the output, and two 50 Ohm, 1 GHz, 1 Watt feed-through terminators (one SMA, one BNC) for use on external trigger inputs.					
Optional accessory kit: (coaxial cables and adapters)	Add the suffix "-AK8" to the model number to include the recommended accessory kit. Consists of one 12-inch SMA-M/SMA-M PE-SR405FL coaxial cable, one 12-inch SMA-M/SMA-MRG-316 coaxial cable, one 36-inch SMA-M/SMA-M RG-316 coaxial cable, one 24-inch SMA-M/BNC-M RG-316 coaxial cable, one 36-inch BNC-M/BNC-M RG58C/U coaxial cable, one SMA-F to BNC-M adapter, one SMA-M to BNC-F adapter, one SMA-F to SMA-F adapter, and one SMA-F to solder cup adapter					
Dimensions (H x W x D):	-B units: 100 x 430 x 375 mm (3.9" x 17" x 14.8") -C units: 100 x 215 x 375 mm (3.9" x 8.5" x 14.8") Modules: 43 x 66 x 107 mm (1.7" x 2.6" x 4.2")					
Power requirement:	-B and -C units: 100 - 240 V, 50 - 60 Hz. AVM-1 & AVM-2 modules: +24V DC. AVM-4 modules: +28V DC.					
Temperature range:	+5°C to +40°C					

- C suffix indicates stand-alone lab instrument with internal clock and line powering. No suffix indicates miniature module requiring DC power and external trigger. (See <http://www.avtechpulse.com/formats> for additional details of the basic formats).
- B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width, PRF and delay (See <http://www.avtechpulse.com/gpib>).
- For analog electronic control (0 to +10V) of amplitude, pulse width, delay or offset suffix model number with -EA or -EW or -ED or -EO. Electronic control units also include the standard front panel one-turn controls. Not available on -B units (since remote control is already provided digitally).
- For -C units and modules, the minimum useful amplitude is 20% of the maximum. For -B units, it is 4% of the maximum, due to the use of internally-switched attenuators. For operation at lower amplitudes, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- Indicates desired polarity by suffixing model number with: -P, -N (-P, -N, -P-PN, -N-PN).

- modules (where the suffix preceding -PN indicates the polarity at the mainframe output port), or -PN for the dual-polarity option on -B units.
- Indicate delay option by suffixing model number with -D.
- For internally generated DC offset option (0 to ±5 V, one turn control) add suffix -OT to model number. -OT and -EO options not available on modules.
- For monitor option add suffix -M.
- 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.
- An input impedance of ≥1 kΩ can also be provided (-Z1K option).
- Add the suffix -VXI to the model number to specify the Ethernet port.
- Add the suffix -HV to specify the 20V maximum amplitude option. Not available on modules.
- The maximum output amplitude may decline by up to 20% when operating at PRFs higher than 20% of the maximum specified PRF.
- At PRFs above 10 MHz, the maximum pulse width falls to 10 ns and the fall time increases to 1.5 ns.



AVM-6-B



AVM-2-C



Front



Back

AVM-2-P-M, with standard AMP/PW trimpots and power solder terminals. A 12/25 MHz range switch is on the rear panel, to select the best operating mode.



Front

AVM-2-P, with -EA and -EW options. Solder terminals replace the AMP and PW trimpots. The back is unchanged.



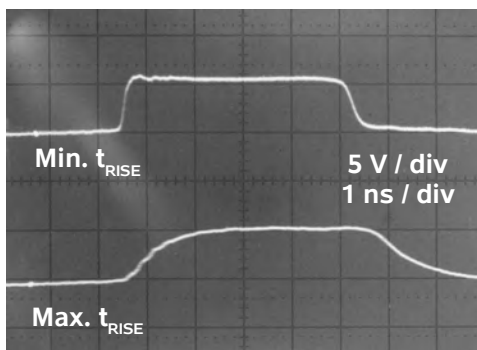
Front



Back

AVM-2-P-MTA. MTA pin strips replace the power and AMP/PW solder terminals. There are no mechanical trimpots or switches.

AVAILABLE MODULE CONFIGURATIONS



AVMM-2-C-D

- ◆ Rise time variable from 300 ps to 2.0 ns
- ◆ Amplitudes to 10 Volts, PRF to 25 MHz

The AVMM series features a 300 ps rise time, pulse width variable from 1 to 10 ns and an output pulse width which is independent of the output amplitude control setting. In addition, a variable rise time option is available (300 ps to 1.2 ns in 5 discrete steps). The output amplitude for all models is controlled by a front-panel one-turn control. A second one-turn control varies the pulse width.

Models AVMM-1-C and AVMM-2-C provide output amplitudes variable up to 2 and 5 Volts respectively with pulse width variable from 1 to 10 ns while Model AVMM-3-C provides up to 10 Volts with a pulse width variable from 1 to 5 ns.

The pulse repetition frequency is variable from 3 kHz to 25 MHz using the internal clock oscillator that is controlled by a six-position front-panel switch and a one-turn fine control. A delay control and a sync output are provided for sampling scope triggering purposes. The units can also be triggered externally using a TTL-level pulse. The propagation delay in the externally triggered mode is typically 30 ns and an optional variable relative delay (0 to 5 ns) is available. Either output polarity or an optional dual output polarity can be provided and the units include an output DC offset or bias insertion function (similar to Model AVX-T, for details see <http://www.avtechpulse.com/bias/avx-t>). The required DC offset or bias is applied directly to rear-panel solder terminals. An available option provides an internally generated

- ◆ Pulse widths variable from 0.5 to 10 ns
- ◆ Stand alone lab instruments or miniature modules

DC offset (0 to $\pm 5V$) that is controlled by a front-panel one-turn control. Polarity inversion in dual polarity units is accomplished by means of an inverting transformer module which mates to the pulse generator output port. AVMM units are available with a monitor option that provides an attenuated ($-20dB$ or $+10$) coincident replica of the main output pulse. Additional options include electronic control (0 to $+10V$) of output amplitude, pulse width, delay and DC offset. Units with these options also include the standard front-panel one-turn controls. All "-C" models require 100-240V, 50-60 Hz prime power.

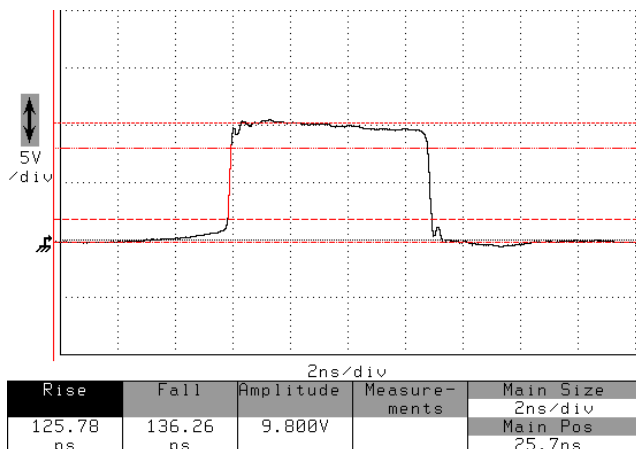
All AVMM units are also available in a DC-powered ($+24V$) miniature module form (AVMM-1, AVMM-2, AVMM-3). These modules require a TTL input trigger signal and the output PRF equals the input trigger PRF. Pulse width and output amplitude are controlled by one-turn controls (adjustable with a screwdriver). An optional relative delay (0 to 5 ns) control is available.

The AVMM series is ideally suited for systems or laboratory applications such as logic family propagation testing, TDR, radar, optical and cable communications, SAW, switching and propagation time studies and educational fields. In some cases, the specifications can be adapted to satisfy a particular requirement. Contact the factory with your special requirement.

Model:	AVMM-1-C ¹ AVMM-1	AVMM-2-C ¹ AVMM-2	AVMM-3-C ¹ AVMM-3
Amplitude ^{3,4} : (into 50 Ohm load ¹⁰)	Variable to 2 Volts	Variable to 5 Volts	Variable to 10 Volts
Pulse width (FWHM) ³ :	Variable 1 to 10 ns		Variable 1 to 5 ns
PRF:	0 to 25 MHz (-C units & modules, externally triggered) 3 kHz to 25 MHz (-C units, internally triggered)		
Rise time ² (20% - 80%):	300 ps or variable 300 ps to 1.2 ns ²		
Fall time ² (80% - 20%):	600 ps or variable 600 ps to 1.2 ns ²		
Polarity ⁵ :	Positive or negative or both (specify)		
Propagation delay:	≤ 30 ns (Ext trig in to pulse out)		
Variable propagation delay option ^{3,6} :	0 to 5 ns		
Jitter:	± 15 ps (Ext trig in to pulse out)		
DC offset or bias insertion ^{3,7} :	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max)		
Trigger required:	Modules, and -C ext trig mode: TTL-level ⁸ (Low: 0V, High: $+3V$ to $+5V$), 10 ns or wider. 50 Ω input impedance ⁹ .		
Sync delay:	Sync out to pulse out, -C units only: Variable 0 to 85 ns		
Sync output: (-C only)	Approximately 20 ns wide and 0.5V in amplitude. Logically complemented (i.e., LOW $\approx +0.5V$, HIGH $\approx 0V$). Will drive 50 Ohm loads.		
Monitor output option ⁸ :	Provides a 20 dB attenuated coincident replica of main output		
Connectors:	-C units: Out, Monitor: SMA, Trig, Sync: BNC, Modules: In, Out: SMA, Power: Solder terminals		
Dimensions (H x W x D):	-C units: 100 x 215 x 375 mm (3.9" x 8.5" x 14.8") Modules: 43 x 66 x 107 mm (1.7" x 2.6" x 4.2")		
Power requirement:	-C units: 100 - 240 V, 50 - 60 Hz. Modules: $+24V$ DC.		
Chassis material:	-C units: anodized aluminum, with blue plastic trim. Modules: cast aluminum, blue enamel		
Temperature range:	$+5^{\circ}C$ to $+40^{\circ}C$		

- C suffix indicates stand-alone lab instrument with internal clock and line powering. No suffix indicates miniature module requiring DC power and external trigger. (See <http://www.avtechpulse.com/formats> for additional details of the basic formats).
- For rise times variable from 300 ps to 1.2 ns (approximately) via a five-position switch add the suffix "-TR". TR switch also affects fall time. Not available on modules.
- For electronic control (0 to $+10V$) of amplitude, pulse width, delay or offset suffix model number with -EA or -EW or -ED or -EO. Electronic control units also include the standard front panel one-turn controls.

- the output.
- Indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative) or -P-PN or -N-PN for dual polarity option where the suffix preceding -PN indicates the polarity at the mainframe output port. (-PN available only for -C units).
- Indicate delay option by suffixing model number with -D.
- For internally generated DC offset option (0 to $\pm 5V$, one turn control) add suffix -OT to model number. -OT and -EO options not available on modules.
- For monitor option add suffix -M.
- An input impedance of $\geq 1 k\Omega$ can also be provided (-71K option).



The AVMP series of pulse generators offer 10V or 20V outputs with sub-nanosecond rise times, and pulse widths variable from several nanoseconds up to 100 ns, 1 μ s, or 10 μ s.

The 10 Volt AVMP-2 family provides 100 ps rise times and 135 ps fall times. The pulse width can be varied from 7 to 100 ns. The maximum PRF is 1 MHz, and the maximum duty cycle is 10%.

The AVMP-2A family is a 10 Volt model that offers a wider pulse width range, of 7 ns to 1 μ s, with 200 ps rise times and 300 ps fall times. The maximum pulse repetition frequency (PRF) is 500 kHz, and the maximum duty cycle is 5%. For wider pulse widths, the AVMP-4 family operates from 10 ns to 10 μ s, with 200 ps rise and fall times. The maximum frequency is 1 MHz, and the maximum duty cycle is 10%.

The 20 Volt AVMP-3 family provides 200 ps rise times and 300 ps fall times. The pulse width can be varied from 8 to 100 ns, and the PRF is variable to 1 MHz. The AVMP-3A family is similar, but offers an extended pulse width range of 8 ns to 1 μ s, and the PRF is variable to 100 kHz.

All -C and -B models include an internal oscillator with frequencies adjustable using the front-panel controls. A delay control and a sync output are provided for oscilloscope triggering purposes. All models can also be triggered externally with a TTL-level pulse.

Some AVMP units are also available in DC-powered (+24V) miniature module form (AVMP-2, etc.). These modules require a TTL input trigger signal.

Positive, negative, and (in -C and -B units) dual polarity models can be provided. Polarity inversion in dual-polarity AVMP-2-C and AVMP-3-C units is achieved by manually adding a supplied inverting transformer accessory to the main output. The transformer will increase the rise and fall times slightly. Polarity inversion in dual-polarity -B units and the AVMP-4-C is controlled by a front-panel switch (or by computer command on -B units) and no external transformer is required, and no speed degradation

- Rise times of 100 to 250 ps
- Amplitudes to 20 Volts, PRF to 1 MHz
- Pulse widths as low as 7 ns, as high as 10 μ s
- IEEE-488.2 GPIB Control (-B units)
- Optional ethernet port for VXI-11.3 support

occurs when changing polarities. The dual polarity option is not available on DC-powered modules.

A bias insertion option is available, which provides a circuit similar to Model AVX-T at the output. The DC offset/bias is applied to rear panel solder terminals. (See <http://www.avtechpulse.com/bias/avx-t> for details.) Another option provides an internally generated DC offset (0 to \pm 5V), which is adjustable using the front-panel controls. All AVMP units are also available with a monitor output option that provides an attenuated coincident replica of the main output pulse. Other options include analog electronic control (0 to +10V) of amplitude, pulse width, and offset.

Instruments with the -B suffix 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. A large backlit LCD displays the output amplitude, polarity, frequency, pulse width, and delay. (See <http://www.avtechpulse.com/gpib> for details).

To allow easy integration into automated test systems, the programming command set is based on the SCPI standard, and LabView drivers (see <http://www.avtechpulse.com/labview>) are available.

The -VXI option adds a rear-panel Ethernet connector, allowing 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 additional details, please see <http://www.avtechpulse.com/options/vxi>.

The -C versions provide output pulse parameters similar to those of the -B models, but do not include the GPIB or RS-232 interfaces (i.e. no computer control or LCD display). The output parameters are controlled by front-panel switches and one-turn controls. All -C and -B models require 100 - 240V, 50 - 60 Hz prime power.

In -C units and DC-powered modules, the output amplitude and pulse width interact to the extent that for a given pulse width setting, decreasing the output amplitude increases the output pulse width. This interaction may be eliminated by using external variable attenuators to control the amplitude. -B models use different circuitry, which circumvents this

effect, at the expense of slightly slower rise and fall times.

The AVPP series is also available, which offers much the same performance of the AVMP series at wide pulse widths, but offers lower minimum pulse widths (below 1 ns). See <http://www.avtechpulse.com/speed> for details.



-B style of instrument. GPIB, RS-232 (and optionally ethernet) ports are on the rear panel.



-C style of instrument, with manual controls.



*Module style of instrument.
The DC power & ground terminals are on the rear face.*

Use the "Pick the Perfect Pulser" parametric search engine at <http://www.avtechpulse.com/pick> to find the best pulser for your application!



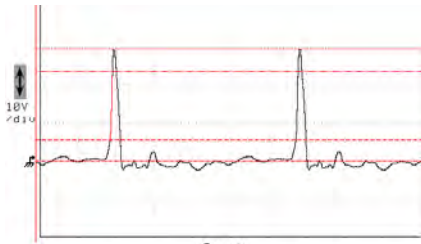
SPECIFICATIONS

AVMP SERIES

Model:	AVMP-2-C ¹ AVMP-2-B ² AVMP-2	AVMP-2A-B ²	AVMP-4-C ¹ AVMP-4-B ²	AVMP-3-C ¹ AVMP-3-B ² AVMP-3	AVMP-3A-B ²
Amplitude ^{3,4} : (50Ω load)	1 - 10 Volts	1 - 10 Volts	1 - 10 Volts	2 - 20 Volts	2 - 20 Volts
Pulse width (FWHM):	7 ns - 100 ns	7 ns - 1 us	10 ns - 10 us	8 ns - 100 ns	8 ns - 1 us
Maximum PRF:	1 MHz	500 kHz	1 MHz		100 kHz
Maximum duty cycle:	10%	5%	10%		5%
Rise time ⁵ (20%-80%):	≤ 100 ps	≤ 200 ps	≤ 200 ps		≤ 250 ps
Fall time ⁵ (80%-20%):	≤ 135 ps	≤ 300 ps	≤ 200 ps	≤ 300 ps	≤ 350 ps
Required load impedance:	50 Ohms ¹¹				
Polarity ^{6,7} :	Positive or negative or both (specify)				
GPIB and RS-232 control ² :	Standard on -B units. Not available on -C units or modules.				
LabView Drivers:	-B units only: check http://www.avtechpulse.com/labview for availability and downloads				
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Optional on -B units ¹⁰ . Recommended as a modern alternative to GPIB / RS-232. See http://www.avtechpulse.com/options/vxi for details.				
Settings resolution (-B units):	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 (-B units):	Amplitude: Typically ± (3% of setting) ± (2% of maximum). Delay, Period: Typically ± (3% of setting) ± (5 ns) Pulse width: Typically ± (3% of setting) ± (2 ns), at maximum amplitude. As the amplitude is reduced, the pulse width may shift ± 5 ns. For high-accuracy applications requiring traceable calibration, verify the output with a calibrated oscilloscope.				
Propagation delay:	Modules: ≤ 30 ns, -C and -B units: ≤ 120 ns (Ext trig in to pulse out)				
Jitter:	± 35ps ± 0.015% of sync delay				
DC offset ^{3,8} :	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max)		Not available	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max)	
Trigger modes:	-B units:	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.			
	-C units:	Internal trigger, or external trigger (TTL level pulse, > 10 ns, 1 kΩ input impedance),			
	Modules:	External trigger (TTL level pulse, > 10 ns, 50Ω input impedance ¹²),			
Variable delay: (Sync to main out)	-B units:	0 to 1.0 seconds, for all trigger modes (including external trigger).			
	-C units:	0 to 200 ns, for internal trigger mode only. No variable delay in external trigger mode.			
	Modules:	No variable delay.			
Sync output (-B and -C only):	> +3 Volts, > 50 ns, will drive 50 Ohm loads				
Monitor output option ⁹ :	Provides a 20 dB attenuated coincident replica of main output				
Connectors:	-B and -C units: Out, Monitor: SMA, Trig, Sync, Gate (-B): BNC Modules: Trig, Out, Monitor: SMA, Power: Solder terminals				
Power requirements:	-B and -C units: 100 - 240 Volts, 50 - 60 Hz Modules: +24V DC.				
Dimensions: (H x W x D)	-B and -C units: 100 mm × 430 mm × 375 mm (3.9” × 17” × 14.8”) Modules: 43 mm × 76 mm × 153 mm (1.67” × 3” × 6”)				
Chassis material:	-B and -C units: cast aluminum frame & handles, blue vinyl on aluminum covers Modules: cast aluminum with blue enamel				
Temperature range:	+5°C to +40°C				

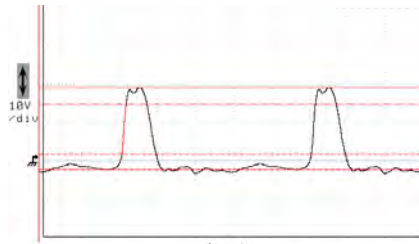
- 1) -C suffix indicates stand-alone lab instrument with internal clock and line powering. No suffix indicates miniature module requiring DC power and external trigger. (See <http://www.avtechpulse.com/formats> for the basic instrument formats).
- 2) -B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width, PRF and delay (See <http://www.avtechpulse.com/gpib>).
- 3) For analog electronic control (0 to +10V) of amplitude, pulse width, or offset, suffix the model number with -EA, -EW or -EO. These units also include standard front-panel controls. Not available on modules.
- 4) For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- 5) Add 20% to the rise and fall times if an inverting transformer used.
- 6) For single polarity units, indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative). For the dual-polarity AVMP-2-C and AVMP-3-C units, suffix the model number with -P-PN or -N-PN where the suffix preceding -PN indicates the polarity at the

- mainframe output port. For dual-polarity -B units, simply add suffix -PN.
- 7) Polarity inversion in dual-polarity AVMP-2-C and AVMP-3-C units is achieved by manually adding a supplied inverting transformer accessory to the main output. The transformer will increase the rise and fall times slightly. Polarity inversion in dual-polarity "-B" units, and the AVMP-4-C, is controlled by front-panel settings (or computer command for -B units), and no external transformer is required, and no speed degradation occurs when changing polarities.
- 8) Add -OT to model number for internally generated 0 to ±5V offset option. -OT and -EO options not available on modules or AVMP-4 models.
- 9) Add -M to model number for monitor option.
- 10) Add the suffix -VXI to the model number to specify the Ethernet port.
- 11) 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.
- 12) An input impedance of ≥1 kΩ can also be provided (-Z1K option).



Rise	Fall	Width	Measure-	Main Size
122.81	218.94	378.73	ments	2ns/div
ps	ps	ps		Main Pos
Amplitude	Frequency		Compare &	Remove/Clip Pan-
30.00	102.463		References	Trace 1 Zoom
V	Hz		Hori(M1)	Main Off

100 MHz, 0.4 ns PW, 30 Volts



Rise	Fall	Width	Measure-	Main Size
105.53	237.44	719.82	ments	1ns/div
ps	ps	ps		Main Pos
Amplitude	Frequency		Compare &	Remove/Clip Pan-
21.68	200.761		References	Trace 1 Zoom
V	Hz		Hori(M1)	Main Off

200 MHz, 0.7 ns PW, 20 Volts

- ◆ Amplitudes to 30 Volts
- ◆ PRF as high as 200 MHz
- ◆ Rise times of 100 to 200 ps
- ◆ Stand-alone lab instruments

The AVN series provides high-amplitude (to 30V) pulses with very fast rise and fall times (as low as 100 ps) at repetition rates up to 200 MHz.

Model AVN-W2-C operates from 10 to 75 MHz, generating amplitudes of up to 8V. The rise times are 200 ps. Below 40 MHz, the pulse width may be adjust from 1 to 10 ns. Above 40 MHz, the pulse width range is limited to 1 to 5 ns.

Model AVN-W1-C operates from 20 to 100 MHz, generating amplitudes of up to 5V with pulse widths variable from 0.2 to 2.5 ns (1.2 ns above 70 MHz). The rise time is 100 ps.

The AVN-1-C operated at repetition rates between 25 and 200 MHz, with 100 ps rise time. The AVN-1-C offers amplitudes to 5V, with a 0.2-1 ns pulse width range.

The higher-amplitude models AVN-3-C and AVN-4A-C offer pulse widths of 0.3 to 1.0 ns, with 150 ps rise time. The AVN-3-C can generate amplitudes to 15V for repetition rates below 100 MHz, falling to 10V at 150 MHz. The AVN-4A-C operates to 20V for repetition rates below 100 MHz, falling to 15V at 200 MHz.

The AVN-5A-C can generate amplitudes to 25V for repetition rates of 40 MHz, 30V at 100 MHz, falling to 20V at 200 MHz. The pulse width is adjustable from 0.4 ns to 1.0 ns (reduced to 0.7 ns above 150 MHz).

The AVN-W3-C model can generate 20V pulses at frequencies between 15 and 40 MHz. The pulse width is variable from 0.5 to 3 ns, and the rise time is 200 ps.

On all models, the output amplitude is adjustable using a front-panel ten-turn control.

The output pulse width is adjusted using two one-turn controls that control the position of the leading and falling edges of the output pulse, respectively.

The internal oscillator is controlled by a three-position front panel switch and a one-turn fine control. A 400 mV AC-coupled SYNC signal is provided for oscilloscope triggering purposes.

These units can also be triggered externally using an ECL-logic-level square wave (LOW = -1.6V, HIGH = -0.8V) with 50% duty cycle. The trigger input is terminated by 50 Ohms to -2V internally.

The AVN series is only specified for periodic triggering within the frequency ranges noted in the table below. It is not suitable for aperiodic applications. The amplitude, pulse width, and frequency controls on all models interact. Iterative adjustment of the controls is required to establish a particular operating point. For some applications, the user may prefer to rely on external attenuators to control the amplitude, to minimize such effects.

Either output polarity or an optional dual output polarity can be provided. Polarity inversion in dual polarity units is accomplished by means of an inverting transformer module which mates to the pulse generator output port. All units include an output DC offset or bias insertion function. The required DC offset or bias is applied directly to rear panel solder terminals. An available option provides an internally generated DC offset (0 to ± 5 Volts) which is controlled by a one-turn front panel control.

All models require 100-240V, 50-60 Hz prime power.

If the user is interested in operating in within a limited frequency range, most models can be tuned to offer improved performance (better waveform shape, faster switching times, wider pulse width ranges) within that range, at the expense of performance outside that range.

In many cases, the specifications can be adapted to satisfy a particular requirement. Contact the factory (info@avtechpulse.com) with your requirement!

SPECIFICATIONS

AVN SERIES

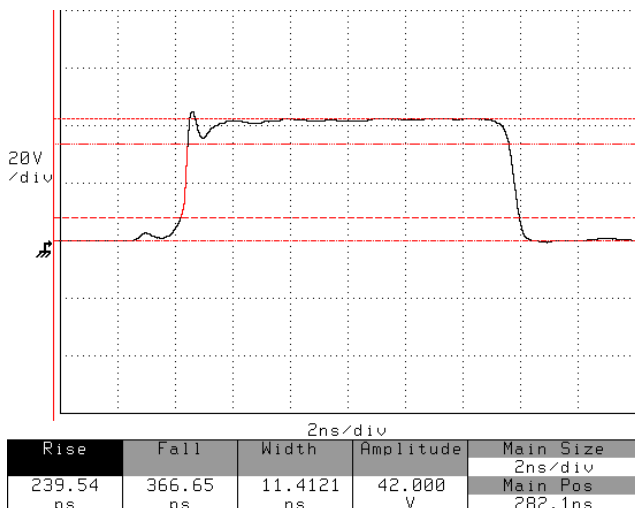
Model:	AVN-W2-C ¹	AVN-W1-C ¹	AVN-1-C ¹	AVN-3-C ¹	AVN-4A-C ¹	AVN-5A-C ¹	AVN-W3-C ¹
Maximum amplitude ² : (50Ω load required ³)	8V	5V	5V	15V at < 100MHz 10V at 150MHz	20V at < 100MHz 15V at 200MHz	25V at 40 MHz 30V at 100 MHz 20V at 200 MHz	20V
Pulse width, minimum:	1 ns	0.2 ns	0.2 ns	0.3 ns			0.5 ns
(FWHM) maximum:	10 ns (< 40 MHz) 5 ns (> 40 MHz)	2.5 ns (< 70 MHz) 1.2 ns (> 70 MHz)	1.0 ns (< 150 MHz) 0.7 ns (> 150 MHz)				3 ns
Pulse repetition frequency (PRF):	10 - 75 MHz	20 - 100 MHz	25 - 200 MHz				15 - 40 MHz
Rise time (20%-80%):	200 ps	100 ps	100 ps	150 ps		200 ps	200 ps
Fall time (20%-80%):	200 ps	200 ps	200 ps	250 ps		300 ps	300 ps
Polarity ³ :	Positive or negative or both (specify)						
Propagation delay:	≤ 5 ns (Ext trig in to pulse out)						
Jitter:	± 15 ps (Ext trig in to pulse out)						
DC offset ⁴ :	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max)						
Trigger required:	External trigger mode: ECL-logic-level (LOW = -1.6V, HIGH = -0.8V) square wave with 50% duty cycle. The trigger input is terminated by 50 Ohms to -2V internally.						
Sync output:	400 mV square wave, AC-coupled. Must be terminated with 50 Ohms to ground.						
Monitor output:	Provides a -20 dB attenuated coincident replica of main output						
Connectors:	Out, Monitor: SMA Trig, Sync: BNC						
Optional accessory kit: (attenuators & terminators)	Add the suffix "-AK1" to the model number to include the recommended accessory kit. Consists of three SMA, 18 GHz, 2 Watt attenuators (10, 20 & 30 dB) for use on the output, and two 50 Ohm, 1 GHz, 1 Watt feed-through terminators (one SMA, one BNC) for use on external trigger inputs.						
Optional accessory kit: (cables & adapters)	Add the suffix "-AK8" to the model number to include the recommended accessory kit. Consists of one 12-inch SMA-M/SMA-M PE-SR405FL coaxial cable, one 12-inch SMA-M/SMA-M RG-316 coaxial cable, one 36-inch SMA-M/SMA-M RG-316 coaxial cable, one 24-inch SMA-M/BNC-M RG-316 coaxial cable, one 36-inch BNC-M/BNC-M RG58C/U coaxial cable, one SMA-F to BNC-M adapter, one SMA-M to BNC-F adapter, one SMA-F to SMA-F adapter, and one SMA-F to solder cup adapter.						
Power requirements:	100 - 240 Volts, 50 - 60 Hz						
Dimensions:	(H x W x D) 100 x 430 x 375 mm, 3.9" x 17" x 14.8"						
Chassis material:	Anodized aluminum, with blue plastic trim.						
Temperature range:	+5°C to +40°C						

- 1) -C suffix indicates stand-alone lab instrument with internal clock and line powering. (See <http://www.avtechpulse.com/formats> for details of the basic instrument formats).
- 2) For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- 3) Indicate desired polarity by suffixing the model number with -P or -N (i.e. positive or

- negative) or -P-PN or -N-PN for dual polarity option where the suffix preceding -PN indicates the polarity at the mainframe output port.
- 4) For internally generated DC offset option (0 to ±5 V, one-turn control) add suffix -OT to the model number.
- 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.



AVN-3-C



- 200 ps rise times
- Amplitudes to 100V
- PW variable from 1 to 100 ns
- IEEE-488.2 GPIB Control (-B units)
- Optional ethernet port for VXI-11.3 support

The AVI series provides high amplitude (up to 100 Volts) pulses with rise times as low as 100 ps.

The AVI-V family has rise times of 350 ps, pulse widths of 2 to 100 ns, variable amplitudes to 50V, and repetition frequencies up to 20 kHz. The AVI-V-HV1A family is similar, with faster 100 ps rise times.

The 40V AVI-V-3L family offers operation at pulse repetition frequencies as high as 100 kHz, with 500 ps rise and fall times. The pulse width is adjustable from 1 to 20 ns.

The higher-voltage AVI-V-HV2A family provides rise times of 300 ps, pulse widths variable from 4 to 100 ns, variable amplitudes of up to 100V, and pulse repetition frequencies of up to 20 kHz.

The AVI-V-HV3A family is similar, but with slower rise times of 1 ns.

The AVI-MP module offers high performance in an ultra-compact size. The AVI-MP has a fixed amplitude of 40V, with 350 ps rise time. The pulse width may be varied from 2 to 100 ns by varying the length of a user-supplied external delay line. Maximum PRF is 1 MHz when operating at minimum pulse width, and 20 kHz at maximum pulse width. Specifically, PW (in ns) \times PRF (in kHz) \leq 2000.

Models with -C or -B suffixes include an internal oscillator, whose PRF is variable using the front-panel controls. A delay control and a sync output are provided for oscilloscope triggering. All models can also be triggered externally with a TTL-level pulse, at any PRF between 0 Hz and the maximum rated value.

Either output polarity can be provided. A dual-polarity option is available on most models. Polarity inversion in dual polarity -C units is accomplished by means of an inverting transformer module which mates to the pulse generator output port. Polarity inversion in computer-controllable -B units is accomplished

internally, without need for external transformers.

A DC offset or bias insertion option is available. Units with this option include a circuit similar to Model AVX-T at the output. The required DC offset or bias is applied directly to rear panel solder terminals. Some models are available with a monitor option that provides an attenuated (20 dB or X10) coincident replica of the main output pulse. Additional options include electronic control (0 to +10V) of output amplitude and pulse width.

Instruments with the -B suffix include a complete computer control interface (for details, 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 back-lit LCD displays the output amplitude, polarity, frequency, pulse width, 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 <http://www.avtechpulse.com/labview>.

The -VXI option adds a rear-panel Ethernet connector, allowing 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 additional details, please see <http://www.avtechpulse.com/options/vxi>.

The -C versions provide output pulse parameters similar to those of the -B models, but do not include the GPIB or RS-232 interfaces (i.e. no computer control or LCD display). The output parameters are controlled by front-panel switches and one-turn controls.

-C and -B models require 100-240V, 50-60 Hz prime power.

The AVI-MP is provided in a DC-powered (+15V) miniature module form. The module requires a TTL input trigger signal, and the output PRF equals the input trigger PRF. Please note that the output amplitude is not adjustable on the AVI-MP module.

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

at:

<http://www.avtechpulse.com/speed/avi-v/#testresults>
<http://www.avtechpulse.com/speed/avi-v-hv1a/#testresults>
<http://www.avtechpulse.com/speed/avi-v-hv2a/#testresults>
<http://www.avtechpulse.com/speed/avi-v-hv3a/#testresults>
<http://www.avtechpulse.com/speed/avi-v-3l/#testresults>
<http://www.avtechpulse.com/speed/avi-mp/#testresults>



-B style of instrument. GPIB, RS-232 (and optionally ethernet) ports are on the rear panel.



-C style of instrument, with manual controls.



Module style of instrument (AVI-MP)



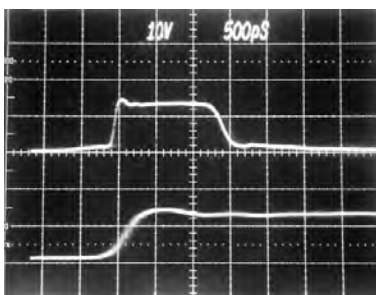
SPECIFICATIONS

AVI SERIES

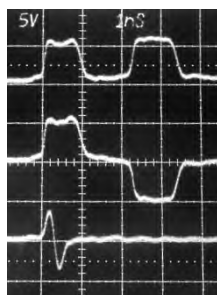
Model:	-C format: -B format (with GPIB): Module format:	AVI-V-C ¹ AVI-V-B ²	AVI-V-HV1A-C ¹ AVI-V-HV1A-B ²	AVI-V-HV2A-C ¹ AVI-V-HV2A-B ²	AVI-V-HV3A-C ¹	AVI-V-3L-B ²	AVI-MP
Amplitude ^{3,4,10} : (50 Ohm load)	10 - 50 V, variable			20 - 100 V, variable		10 - 40 V, variable	≥ 40 V, fixed
Rise time (20%-80%):	≤ 350 ps	≤ 100ps	≤ 300 ps	≤ 1 ns	≤ 500 ps	≤ 350 ps	
Fall time (80%-20%):	≤ 3 ns		≤ 4 ns		≤ 500 ps	≤ 2ns for PW<50ns ≤ 4ns for PW≥50ns ¹	
Pulse width (FWHM) ⁴ :	2 to 100 ns		4 to 100 ns		1 to 20 ns	2 to 100 ns	
Maximum pulse repetition frequency (PRF):	20 kHz					100 kHz	1 MHz (2ns PW) ⁹ 20 kHz (100ns PW) ⁹
Propagation delay:	≤ 250 ns						≤ 70 ns
Polarity:	Positive or negative or both (specify ⁵)						Pos or Neg (-P or -N)
Required load impedance ¹⁰ :	50 Ohms						
GPIB and RS-232 control ² :	Standard on -B units. Not available on -C units or modules.						
LabView Drivers:	-B units only: check http://www.avtechpulse.com/labview for availability and downloads						
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Optional on -B units ⁸ . Recommended as a modern alternative to GPIB / RS-232. See http://www.avtechpulse.com/options/vxi for details.						
Settings resolution (-B units):	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 (-B units):	Amplitude, PRF, Delay: Typically ± 3% (±2 ns or ± 2% of max. amplitude) after 10 minute warmup. The pulse width may vary (typically ±4 ns) as a function of the other settings, so its value should be verified by measurement. For high-accuracy applications requiring traceable calibration, verify the output with a calibrated oscilloscope.						
Jitter:	-C and Modules: ±15 ps -B units: ± 35 ps ± 0.015% of sync delay						
DC offset or bias insertion:	Optional ⁶ . Apply DC offset in the range of ±50V (250 mA max) to back panel solder terminal.						
Trigger modes:	-B units:	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.					
	-C units:	Internal trigger, or external trigger (TTL level pulse, > 10 ns, 1 kΩ input impedance)					
	Modules:	External trigger (TTL level pulse, > 10 ns, > 1 kΩ input impedance)					
Variable delay:	-B units:	0 to 1.0 seconds, for all trigger modes (including external trigger).					
(Sync out to	-C units:	0 to 200 ns, for internal trigger mode only. No variable delay in external trigger mode.					
main out)	Modules:	No variable delay.					
Sync output (-B and -C only):	> +3 Volts, > 50 ns, will drive 50 Ohm loads						
Monitor output:	Optional ⁷ . Provides a 20 dB attenuated coincident replica of main output.						
Connectors:	-C, -B:	Out, Monitor: SMA, Trig/Sync: BNC					
	Modules:	Trigger, Out: SMA, Power: Solder terminal					
Power required:	100-240 Volts, 50-60 Hz						+15 Volts, 200 mA
Dimensions (H × W × D):	100 x 430 x 375 mm (3.9 x 17 x 14.8")						58 x 36 x 28 mm (2.3" x 1.4" x 1.1")
Temperature range:	+5°C to +40°C						

- C suffix indicates stand-alone lab instrument with internal clock and line powering. No suffix indicates miniature module requiring DC power and external trigger. (See <http://www.avtechpulse.com/formats> for details of the basic instrument formats).
- B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width, PRF and delay. (See <http://www.avtechpulse.com/gpib>).
- For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output. In some cases, it is possible to add internally-switched attenuators for low amplitude operation. Contact Avtech for details.
- For electronic control (0 to +10V) of amplitude or pulse width, suffix the model number with -EA or -EW. Electronic control units also include standard front-panel controls. -EA is available on AVI-V-C, AVI-V-B, AVI-V, and AVI-V-3L-B models only. -EW is available on AVI-V-C and AVI-V models only. AVI-V modules with -EA or -EW may be slightly larger than the dimensions given above.
- Indicate desired polarity by suffixing model number with -P or -N (i.e. positive or

- negative). For dual-polarity -C units, add the suffix -P-PN or -N-PN, where the suffix preceding -PN indicates the polarity at the mainframe output port. The other polarity is generated by adding an external inverting transformer. For dual-polarity -B units, add the suffix -PN. Both polarities are generated internally.
- For DC offset option suffix model number with -OS. Avtech Model AVX-T bias tee can also be used to obtain DC offset (<http://www.avtechpulse.com/bias/avx-t>).
 - For monitor option add suffix -M. (Not available on modules.)
 - Add the suffix -VXI to the model number to specify the Ethernet port..
 - More generally, PW (in ns) × PRF (in kHz) ≤ 2000
 - 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.
 - The fall time is dependent on the quality of the user-supplied external delay line. The specified values apply if PE-SR402FL coaxial cabling is used. Fall times for lower quality cabling, such as RG58C/U, will typically be 50% higher.



AVP-3S-C, 10V/div.
 Top: 500 ps/div
 Bot: 100 ps/div



← -DPP option

← -DPN option
(large delay)

← -DPN option
(small delay)

- ◆ Rise times to 50 ps
- ◆ Amplitudes to 40 Volts
- ◆ PRF to 1.0 MHz
- ◆ Pulse widths from 0.2 to 500 ns
- ◆ Two channel option
- ◆ Double pulse options
- ◆ Stand-alone lab instruments or miniature modules
- ◆ IEEE-488.2 GPIB and RS-232 control (-B units)
- ◆ Optional Ethernet/VXI port

The AVP series of pulse generators offer the fastest rise times available in the Avtech product line, with rise times as low as 50 ps for 10V units, and 150 ps for 40V units.

The AVP-3SA family provides uniquely low rise times of 50 ps, pulse widths variable from 0.2 to 4 ns, amplitudes of up to 10 Volts, and pulse repetition frequencies of up to 1 MHz. The similar AVP-AV-1S family offers 60 ps, 5 Volt operation, and the AVP-2SA family offers 40 ps, 5 Volt operation.

The AVP-AV-1 family provides 10V pulses with 100 ps rise times. The AVP-AV-HV2 family has amplitudes to 20V, pulse widths variable from 0.3 to 2 ns (optionally 4 ns), with 100 ps rise times. These two families are also available in the computer-controllable -B format.

The high-voltage AVP-AV-HV3 family operates to 40V, with pulse widths variable from 0.4 to 2 ns (optionally 4 ns), and 150 ps rise times.

For wide-pulse applications, the AVP-AV-2 family provides output pulse widths variable from 2 to 50 ns at frequencies as high as 50 kHz. With a wide pulse option (-W500) this model will operate in the output pulse width range of 20 to 500 ns. The rise time is 100 ps.

Models with the -C or -B suffixes include an internal oscillator that is variable up to 1 MHz (to 50 kHz for AVP-AV-2 models) using the front-panel controls. A delay control and a sync output are provided for sampling scope triggering purposes. All models can also be triggered externally using a TTL-level pulse.

Either output polarity or optional dual output polarity can be provided. Separate output ports with common pulse width and amplitude controls are provided in dual-polarity AVP-3SA and AVP-AV-1S units. Only one of the two outputs is active at a time. Instruments with the "-B" computer control option have a single output port, whose polarity may be switched using the front-panel controls or by computer command. Polarity inversion in all other dual-polarity units is accomplished by manually connecting a supplied inverting transformer accessory to the main output port.

Certain models are optionally available with two outputs, each with independent pulse width and amplitude controls. The two channels share a common trigger source, and have a variable delay separation of 0 to ± 50 ns. (Other delay ranges can be provided upon request.) To specify two positive outputs, add the suffix -2CHPP to the model number. To specify two negative outputs, add the suffix -2CHNN. To specify one positive and one negative output, add the suffix -2CHPN.

Options are available which permit the generation of double-pulse (doublet) waveforms, such as those shown in the photo above. The -DPP option provides a burst of two positive output pulses on a common output with a variable time separation of 0 to ± 5 ns. (Other delay ranges can be provided upon request.) Two independent pulse width and amplitude controls are provided. Units with the -DPP option have a maximum output

amplitude of 70% of the standard maximum amplitude (except when the relative time delay is set to zero, in which case the addition of the two coincident pulses allows the 140% of the standard amplitude to be obtained). The -DPN option is similar, except that one pulse in the doublet is positive, and one is negative. These double-pulse options are not available on units with the dual-channel options. The -DPP / -DPN options increase the rise and fall times by 50 ps.

All models are available with a monitor output option that provides an attenuated (20 dB) coincident replica of the main output pulse. Avtech recommends that units with the double-pulse option also be ordered with the monitor option, to simplify pulse alignment.

A bias insertion option is available. Units with this option include a circuit similar to Model AVX-T at the output (for details see <http://www.avtechpulse.com/bias/avx-t>). The required offset or DC bias is applied directly to rear panel solder terminals. Another option provides an internally generated DC offset (0 to ± 5 Volts), which is adjustable using the front-panel controls. Additional options include analog electronic control (0 to +10V) of output amplitude, pulse width and DC offset. Units with these options also include the standard front-panel controls.

Instruments with the "-B" suffix include a complete computer control interface (see <http://www.avtechpulse.com/gpiib> 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, 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 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. See <http://www.avtechpulse.com/options/vxi> for details.

The -C versions provide output pulse parameters similar to those of the -B models, but do not include the GPIB or RS-232 interfaces (i.e. no computer control or LCD display). The output parameters are controlled by front-panel switches and one-turn controls. -B and -C model require 100-240V, 50-60 Hz power.

Most AVP units are available in a DC-powered (+15V) miniature module format. These modules require a TTL input trigger signal and the output PRF equals the input trigger PRF. Pulse width and output amplitude are controlled by one-turn controls.

For applications requiring fast but narrower pulses, the Avtech AVH-S-1 series (<http://www.avtechpulse.com/impulse/avh-s-1>) of impulse generators should also be considered.

Model:	AVP-AV-1S-C ¹	AVP-2SA-C ¹	AVP-3SA-C ¹	AVP-AV-1-C ¹ AVP-AV-1-B ² AVP-AV-1	AVP-AV-HV2-C ¹ AVP-AV-HV2-B ² AVP-AV-HV2	AVP-AV-HV3-C ¹ AVP-AV-HV3-B ² AVP-AV-HV3	AVP-AV-2-C ¹ AVP-AV-2-B ² AVP-AV-2	
Maximum amplitude ^{3,4,8} : (50Ω load)	5 Volts	5 Volts	10 Volts	10 Volts	20 Volts	40 Volts ¹²	10 Volts	
Pulse width ³ : (FWHM)	-C & Modules: -B units:			0.2 - 4 ns	0.2 - 4 ns	0.3 - 2 ns std. (0.3 - 4 ns opt ¹⁶)	0.4 - 2 ns std. (0.4 - 4 ns opt ¹⁵)	2 - 50 ns std. (20-500 ns opt ⁵)
PRF:	external trigger mode: internal trigger (-B, -C):			0 Hz to 1 MHz 100 Hz to 1 MHz				0 Hz - 50 kHz 5 Hz - 50 kHz
Rise time (20%-80%) ^{7,8} :	≤ 60 ps	≤ 40 ps	≤ 50 ps	≤ 100 ps	≤ 100 ps	≤ 150 ps	≤ 100 ps	
Fall time (80%-20%) ^{7,8} :	≤ 200 ps	≤ 250 ps	≤ 250 ps ¹³	≤ 300 ps	≤ 300 ps	≤ 600 ps	≤ 200 ps	
Polarity:	-C units: specify -P, -N, -PN Modules: specify -P or -N			-C units: specify -P, -N, -P-PN, or -N-PN (see note 6) -B units: specify -P, -N, or -PN Modules: specify -P or -N				
Dual-Polarity Option Style: (not available on modules)	Two outputs (+ and -). Only one active at a time.			-C units: one output, with inverting transformer accessory. -B units: one output, with switchable polarity				
Required load impedance:	50 Ohms ¹⁴							
GPIB and RS-232 control ² :	Standard on -B units. Not available on -C units or modules.							
LabView Drivers:	-B units only: check http://www.avtechpulse.com/labview for availability and downloads							
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Optional on -B units ⁹ . Recommended as a modern alternative to GPIB / RS-232. See http://www.avtechpulse.com/options/vxi for details.							
Settings resolution (-B units):	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 (-B units):	Typically ± 3% (±2 ns or ± 2% of max. amplitude) after 10 minute warmup, for pulse widths > 1 ns and PRF ≤ 10 kHz. At lower pulse widths and higher PRFs, the amplitude tends to roll off relative to the set value. For high-accuracy applications requiring traceable calibration, verify the output with a calibrated oscilloscope.							
Two channel option:	Optional ⁷ . Available on -B & -C models.							
Double pulse option:	Not available.			Optional ⁸ . Available on -B & -C models. 0 to ±5 ns pulse separation (other ranges available).				Not available.
Propagation delay: (Ext trig in to pulse out)	-C units and Modules: ≤ 70 ns ¹⁷ (Ext trig in to pulse out) -B units: ≤ 140 ns ¹⁷ (Ext trig in to pulse out)						< 250 ns	
Jitter, Ext trig in to pulse out:	-C units and Modules: ±15 ps -B units: ± 35ps ± 0.015% of sync delay							
Trigger modes:	-B units:	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						
	-C units:	Internal trigger, or external trigger (TTL level pulse, > 50 ns, 1 kΩ input impedance)						
	Modules:	External trigger (TTL level pulse, > 50 ns, 1 kΩ input impedance)						
Variable delay:	-B units:	Sync to main out: 0 to 1.0 seconds, for all trigger modes (including external trigger).						
	-C units:	Sync to main out: 0 to 200 ns, for internal trigger mode only. No variable delay in external trigger mode						
	Modules:	No variable delay						
Sync output (-B, -C unit only):	+3 Volts, > 50 ns, will drive 50 Ohm loads							
DC offset or bias insertion:	Optional ¹⁰ . Apply required DC offset or bias in the range of ± 50V (250 mA max) to back panel solder terminal.							
Monitor output option ¹¹ :	Provides a 20 dB (x10) attenuated coincident replica of main output							
Connectors:		Modules		-C units		-B units		
OUT, MONITOR:		SMA		SMA		SMA		
TRIG:		SMA		BNC		BNC		
SYNC:		-		BNC		BNC		
GATE:		-		-		BNC		
DC POWER:		solder terminals		-		-		
Optional accessory kit: (attenuators and terminators)	Add the suffix "-AK1" to the model number to include the recommended accessory kit. Consists of three SMA, 18 GHz, 2 Watt attenuators (10, 20 & 30 dB) for use on the output, and two 50 Ohm, 1 GHz, 1 Watt feed-through terminators (one SMA, one BNC) for use on external trigger inputs.							
Optional accessory kit: (coaxial cables and adapters)	Add the suffix "-AK8" to the model number to include the recommended accessory kit. Consists of one 12-inch SMA-M/SMA-M PE-SR405FL coaxial cable, one 12-inch SMA-M/SMA-M RG-316 coaxial cable, one 36-inch SMA-M/SMA-M RG-316 coaxial cable, one 24-inch SMA-M/BNC-M RG-316 coaxial cable, one 36-inch BNC-M/BNC-M RG58C/U coaxial cable, one SMA-F to BNC-M adapter, one SMA-M to BNC-F adapter, one SMA-F to SMA-F adapter, and one SMA-F to solder cup adapter							
Temperature range:	+5°C to +40°C							
Other:		Modules		-B & -C units				
Power requirements:		+15 Volt, 200 mA		100 - 240 Volts, 50 - 60 Hz				
Dimensions:		43 × 66 × 107 mm (1.7" × 2.6" × 4.2")		100 × 430 × 375 mm (3.9" × 17" × 14.8")				
Chassis material:		cast aluminum, blue enamel		anodized aluminum, with blue plastic trim				

- C suffix indicates stand-alone lab instrument with internal clock and line powering. No suffix indicates miniature module requiring DC power and external trigger. (See <http://www.avtechpulse.com/formats> for details of the four basic instrument formats).
- B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width, PRF and delay (See <http://www.avtechpulse.com/gpib>).
- For analog electronic control (0 to +10V) of amplitude, pulse width or DC offset suffix model number with -EA or -EW or -EO. Electronic control units also include standard front-panel controls. -EW not available on -B units.
- For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- For 20-500 ns pulse width, suffix model number with -W500. Rise times increase to 150 ps for -W500 units.
- Indicate desired polarity by suffixing model number by -P or -N (i.e. positive or negative) or -P-PN or -N-PN for dual-polarity option where the suffix preceding -PN indicates the polarity at the mainframe output port.
- For the two channel option, add the suffix -2CHPP for two positive outputs, the

- For the double pulse option add the suffix -DPP for a unipolar output, and add the suffix -DPN for a bipolar output. These options cause the maximum amplitude to be reduced by 30%, and increase the rise and fall times by 50 ps.
- Add the suffix -VXI to the model number to specify the Ethernet port.
- For externally applied DC offset option suffix model number with -OS. The Avtech AVX-T bias tee can also be used to obtain DC offset. For internally generated DC offset option (0 to ±5V) add suffix -OT or -EO to model number. (The -OT option is controlled by a front-panel dial, whereas the -EO option can be controlled by a front-panel dial or by an external 0 to +10V voltage). -OT, -EO not available on modules.
- For monitor option add suffix -M.
- At maximum pulse width. The maximum amplitude may fall for narrower pulse widths, with reduction of < 25% at the minimum specified pulse width.
- Typically < 100 ps at minimum pulse width. Increases at wider pulse widths.
- 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.
- For 0.4 - 4 ns pulse width, suffix model number with -W4.
- For 0.3 - 4 ns pulse width, suffix model number with -W5.



AVP-AV-1-B

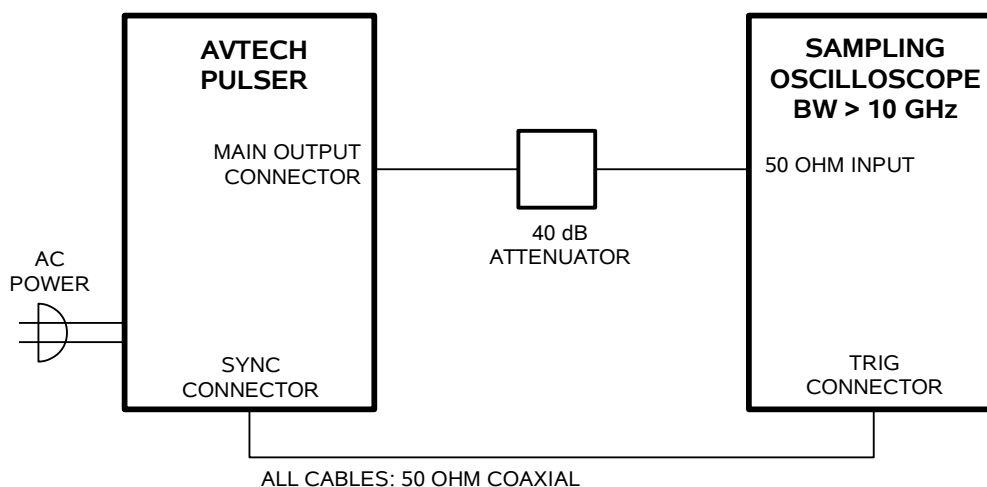


AVP-AV-1-C



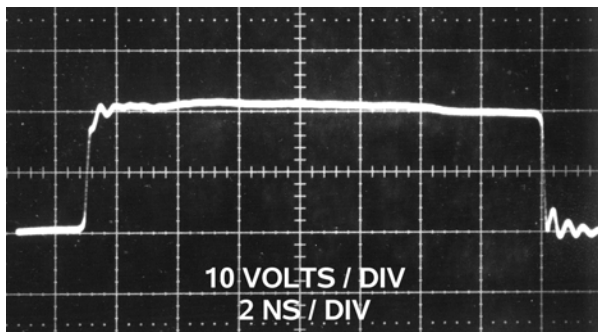
AVP-AV-1

BASIC TEST ARRANGEMENT FOR -B AND -C UNITS



Avtech frequently customizes models to meet special requirements at near-stock prices!

Contact Avtech (info@avtechpulse.com) today with your special requirements!



- Amplitudes to 20 Volts
- 100 ps rise times
- Pulse widths variable from 0.2 to 1 μ s
- IEEE-488.2 GPIB Control (-B units)
- Optional ethernet port for VXI-11.3 support

The AVPP series combines the pulse circuitry used in the AVP and AVMP families to provide extended pulse width ranges, going as low as 200 ps and as high as 1 μ s.

Model AVPP-1-C is a manually-controlled instrument that provides 100 ps rise times, with output voltage variable to 10 Volts. The pulse width can be varied from 0.2 to 100 ns, in two ranges (0.2-5 and 5-100 ns).

The AVPP-1-B is similar, but it includes IEEE-488.2 GPIB and RS-232 interfaces. The pulse width may be varied from 0.4 to 100 ns. The rise time is less than 120 ps for pulse widths greater than 5 ns, and less than 150 ps for narrower pulses. The fall time is less than 120 ps for pulse widths greater than 10 ns, and less than 420 ps for narrower pulses.

For wider pulse width 10 Volt applications, the AVPP-1A-B provides pulse widths of 0.5 ns to 1 μ s, with amplitudes to 10V, rise times of 200 ps, and fall times of 420 ps. The maximum repetition rate is 500 kHz, and the maximum duty cycle is 5% (e.g., the maximum pulse width at 500 kHz is 100 ns).

The AVPP-2 series provides 200 ps rise times for amplitudes to 20 Volts and pulse widths variable from 0.5 to 100 ns. This series is offered in the manually-controlled "-C" format and the computer-controllable "-B" format.

For wider pulse width 20 Volt applications, the AVPP-2A-B provides pulse widths of 0.5 ns to 1 μ s, with amplitudes to 20V, rise times of 200 ps, and fall times of 200 ps (350 ps for pulse widths below 8 ns). The maximum repetition rate is 100 kHz, and the maximum duty cycle is 5% (e.g., the maximum pulse width at 100 kHz is 500 ns).

All models include an internal oscillator, adjustable using the front-panel controls. A delay control and a sync output are provided for oscilloscope triggering purposes. All models can also be triggered externally with a TTL-level pulse.

Positive, negative, and dual polarity models can be provided. Polarity inversion in dual-polarity "-C" units is achieved by manually adding a supplied inverting transformer accessory to the main output. The transformer will increase the rise and fall times slightly. Polarity inversion in dual-polarity "-B" units is controlled by front-panel settings (or computer command), and no external transformer is required, and no speed degradation occurs when changing polarities.

A bias insertion option is available, which provides a circuit similar to Model AVX-T at the output. The DC offset/bias is applied to rear panel solder terminals. Another option provides an internally-generated DC offset (0 to ± 5 V), which is adjustable using the front-panel controls. All AVPP units are also available with a monitor output option that provides an attenuated coincident replica of the main output pulse. Other options include analog electronic control (0 to +10V) of amplitude and offset.

Instruments with the -B suffix 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. A large backlit LCD displays the output amplitude, polarity, frequency, pulse width, and delay. (See <http://www.avtechpulse.com/gpib> for details). To allow easy integration into automated test systems, the programming command set is based on the SCPI standard, with LabView drivers (at <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. See <http://www.avtechpulse.com/options/vxi>.

The -C versions provide output pulse parameters similar to those of the -B models, but do not include the GPIB or RS-232 interfaces (i.e. no computer control or LCD display). The output parameters are controlled by front-panel switches and one-turn controls. All models require 100-240V, 50-60 Hz prime power.

In "-C" models, the output amplitude and pulse width for the 0.2 ns to 5 ns range interact to the extent that for a given pulse width setting, decreasing the output amplitude increases the output pulse width. This interaction may be eliminated by using external variable attenuators to control the amplitude. "-B" models use different circuitry, which circumvents this effect, at the expense of slightly slower rise and fall times.

Typical waveforms from shipped units are available online. For example, see:

<http://www.avtechpulse.com/speed/avpp-1/#testresults>



Model:	AVPP-1-C ¹	AVPP-1-B ²	AVPP-1A-B ²	AVPP-2-C ¹	AVPP-2-B ²	AVPP-2A-B ²
Amplitude ^{3,4} : (50Ω load)	< 1 - 10 Volts			< 2 - 20 Volts		
Pulse width (FWHM):	0.2 ns - 100 ns	0.4 ns - 100 ns	0.5 ns - 1 us	0.5 ns - 100 ns	0.5 ns - 1 us	
PRF: internal trigger:	100 Hz - 1 MHz	1 Hz - 1 MHz	1 Hz - 500 kHz	10Hz - 100 kHz	1 Hz - 100 kHz	1 Hz - 100 kHz
external trigger:	0 Hz - 1 MHz		0 Hz - 500 kHz	0 Hz - 100 kHz		
Maximum duty cycle:	10%	10%	5%	1%	1%	5%
Rise times (20%-80%) ⁵ :	≤ 100 ps	120ps, > 5ns PW 150ps, < 5ns PW	≤ 200 ps	≤ 200 ps		
Fall times (80%-20%) ⁵ :	120ps, for > 10ns PW ¹² 420ps, for < 10ns PW ¹²		≤ 420 ps	200ps, > 8 ns PW ¹² 420ps, < 8 ns PW ¹²		
GPB & RS-232 control ² :	No	Yes	Yes	No	Yes	Yes
Required load impedance:	50 Ohms ¹⁰					
Polarity ^{6,7} :	Positive or negative or both (specify)					
LabView Drivers:	-B units only: check http://www.avtechpulse.com/labview for availability and downloads					
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	-B units only: optional ¹¹ . Recommended as a modern alternative to GPB / RS-232. See http://www.avtechpulse.com/options/vxi for details.					
Calibration:	Not calibrated. For high-accuracy applications requiring traceable calibration, verify the output parameters with a calibrated oscilloscope.					
DC offset ^{3,8} :	Apply required DC offset to back panel solder terminals (± 50 Volts, 250 mA max)					
Propagation delay:	≤ 150 ns (Ext trig in to pulse out)					
Jitter:	± 35ps ± 0.015% of sync delay					
Trigger modes: -B units:	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					
-C units:						
Variable delay: -B units:	0 to 1.0 seconds, for all trigger modes (including external trigger)					
-C units:	0 to 200 ns, for internal trigger mode only. No variable delay in external trigger mode					
Sync output:	+3 Volts, > 50 ns, will drive 50 Ohm loads					
Monitor output option ⁹ :	Provides a 20 dB attenuated coincident replica of main output					
Connectors:	Out: SMA, Trig: BNC, Sync: BNC, Gate (-B): BNC, Monitor: SMA					
Optional accessory kit: (attenuators and terminators)	Add the suffix "-AK1" to the model number to include the recommended accessory kit. Consists of three SMA, 18 GHz, 2 Watt attenuators (10, 20 & 30 dB) for use on the output, and two 50 Ohm, 1 GHz, 1 Watt feed-through terminators (one SMA, one BNC) for use on external trigger inputs.					
Optional accessory kit: (coaxial cables and adapters)	Add the suffix "-AK8" to the model number to include the recommended accessory kit. Consists of one 12-inch SMA-M/SMA-M PE-SR405FL coaxial cable, one 12-inch SMA-M/SMA-MRG-316 coaxial cable, one 36-inch SMA-M/SMA-M RG-316 coaxial cable, one 24-inch SMA-M/BNC-M RG-316 coaxial cable, one 36-inch BNC-M/BNC-M RG58C/U coaxial cable, one SMA-F to BNC-M adapter, one SMA-M to BNC-F adapter, one SMA-F to SMA-F adapter, and one SMA-F to solder cup adapter					
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 & handles, blue vinyl on aluminum cover plates					
Temperature range:	+5°C to +40°C					

- C suffix indicates stand-alone lab instrument with internal clock and line powering. (See <http://www.avtechpulse.com/formats/> for the basic instrument formats).
- B suffix indicates IEEE-488.2 GPB and RS-232 control of amplitude, pulse width, PRF and delay (See <http://www.avtechpulse.com/gpb/>).
- For analog electronic control (0 to +10V) of amplitude or offset, suffix the model number with -EA or -EO. These units also include standard front-panel controls.
- For operation at amplitudes of less than 20% of full-scale, best results will be obtained by setting the amplitude near full-scale and using external attenuators on the output.
- For -C units, add 20% to the rise and fall times if an inverting transformer used.
- For single polarity units, indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative). For dual-polarity -C units, suffix the model number with -P-PN or -N-PN where the suffix

preceding -PN indicates the polarity at the mainframe output port. For dual-polarity -B units, simply add the suffix -PN.

- Polarity inversion in dual-polarity "-C" units is achieved by manually adding a supplied inverting transformer accessory to the main output. The transformer will increase the rise and fall times slightly. Polarity inversion in dual-polarity "-B" units is controlled by front-panel settings (or computer command), and no external transformer is required, and no speed degradation occurs when changing polarities.
- Add -OT to model number for internally generated 0 to ±5V offset option.
- Add -M to model number for monitor option.
- 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.
- Add the suffix -VXI to the model number to specify the Ethernet port.
- The pulse width thresholds are approximate.

