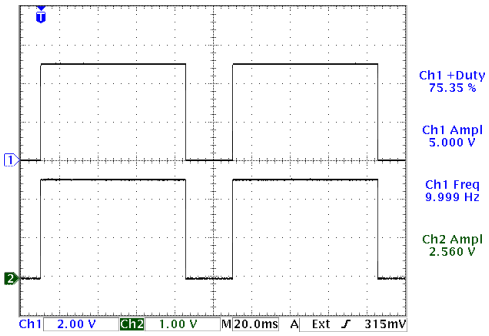
AVTECH

GPIB
IEEE-488

AV-109 SERIES

10 TO 100 AMPERE
WIDE PULSE & HIGH DUTY CYCLE
CONSTANT CURRENT LASER DIODE DRIVERS



Top: 10 Hz, 75% duty, +50A into 0.1Ω
Bottom: Monitor output

- 10, 20, 50 and 100 Ampere models
- Pulse widths from 10 us to 1 sec
- Duty cycles as high as 75%
- 37 to 200 Watts (average output)
- 5 Volt compliance voltage rating
- 10 us rise times
- IEEE-488.2 GPIB and RS-232 control
- Optional ethernet port for VXI-11.3 support
- Current monitor output

The AV-109E and AV-109F series of pulsed constant current generators are designed for driving laser diodes and other low impedance loads with constant current pulses as high as 100 Amperes, pulse widths from 10 us to 1 second, and average output powers of up to 200 Watts. All models will operate for load voltages in the range of 0 to 5V, making them suitable for most single-diode loads.

The 10 & 20 Amp models (the AV-109E series) are entirely self-contained in a single chassis, and are powered from a standard AC line connection (100-240 Volts, 50-60 Hz). The AV-109E-1-B can generate current pulses of up to 10 Amps at duty cycles up to 75%. Similarly, the AV-109E-2-B operates to 20 Amps at duty cycles to 50%.

The higher-current 50 & 100 Amp models (the AV-109F series) require an external user-supplied DC power supply in addition to standard AC power. This permits operation at higher average output power levels. The AV-109F-3-B operates to 50A and 75% duty, and the AV-109F-4-B operates to 100A and 40% duty. In terms of current, the external DC power supply must be capable of supplying the necessary average current to the instrument ($I_{AVG} = I_{PULSE} \times$ duty cycle). For narrow pulse widths (< 1 ms) the peak current is supplied by a large capacitor bank inside the pulser. For wider pulse widths, the DC power supply must be capable of supplying the full peak current. Voltage-wise, the voltage from the external power supply (V_{DC}) must be at least 2 Volts greater than the maximum expected load voltage (V_{LOAD}). The maximum difference between V_{DC} and the maximum V_{LOAD} must also be controlled to limit the power dissipation in the instrument to 80 Watts:

$$V_{DC} - V_{LOAD} > 2 \text{ Volts}$$
$$(V_{DC} - V_{LOAD}) \times I_{PULSE} \times \text{duty cycle} < 80 \text{ Watts}$$

For example, if the AV-109F-3-B is operating at 50A and a duty cycle of 50%, then V_{DC} should be between 2.0 and 3.2 Volts higher than V_{LOAD}. Protective sensors will disable the output if these conditions are violated.

The output signal is provided on a high-current rear-panel safety connector. Users can connect to their loads using the optional -AK9 accessory kit, which provides a 1 meter long cable and an adapter for the load end. The adapter also provides four contact posts (two identical posts for the signal, and two for the ground), to which the load may be attached using M6x1 threaded screws (maximum depth of 15 mm). The adapter may be plugged into the cable, and the cable into the rear panel. Alternatively, the adapter may be plugged directly into the rear panel.

All AV-109 units include a monitor output feature that provides an attenuated coincident replica of the main output current pulse ($V_{MON} = k \times I_{OUT}$).

Temperature and voltage sensors protect the output from overheating and excessively high power supply voltages. The average output power (P_{AVG}) is also monitored, and the output is disabled if the output power is excessive.

All models include an Output On/Off function, as well as power on/off protection circuitry, to protect attached loads. A DC offset feature is optional on all models, ideal for biasing laser diodes below threshold.

The pulse repetition frequency is variable for all models from 0.5 Hz to 1 kHz using the internal oscillator. A delay control and a sync output are provided for oscilloscope triggering purposes. A pushbutton is provided for one-shot operation. The units can also be triggered externally using a TTL-level pulse. When triggered externally, the output pulse width can be set to follow the input trigger pulse width ($PW_{OUT} = PW_{IN}$), if desired.

Either output polarity can be provided (positive = sourcing current, negative = sinking current).

All 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. A large backlit LCD displays the output amplitude, frequency, pulse width, and delay. (For the AV-109F models, the DC power supply must be equipped with a GPIB feature, if you wish to remotely control all aspects of the system.)

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.

The AV-109F models are available with the -AK3 option, which includes high-current cables and adapters to assist in connecting to DC power supplies.

Some aspects of these instruments are readily adaptable for special applications. For instance, maximum duty cycles can be extended if the maximum load voltage rating is reduced.

SPECIFICATIONS

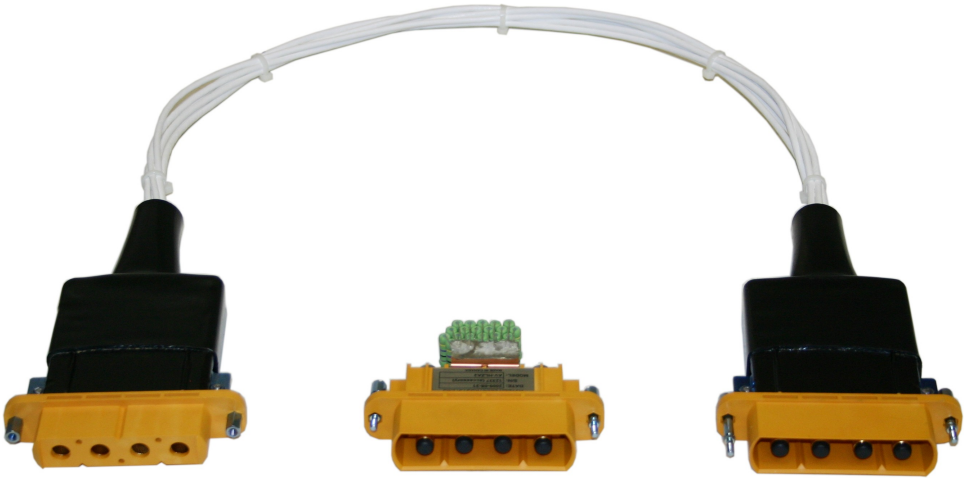
AV-109 SERIES

Model[1]:	AV-109E-1-B	AV-109E-2-B	AV-109F-3-B	AV-109F-4-B
Amplitude[2]: Pulse:	0.3 to 10 Amps	0.6 to 20 Amps	1.5 to 50 Amps	3 to 100 Amps
Optional DC offset[3]:	0.05 to 1 Amp	0.05 to 1 Amp	0.05 to 1 Amp	0.05 to 1 Amp
Peak (Pulse + DC offset):	10 Amps	20 Amps	50 Amps	100 Amps
Average power out: (maximum)	38 Watts	50 Watts	188 Watts	200 Watts
Load voltage range:	0 to 5 Volts			
Pulse width (FWHM):	10 us – 1.0 seconds			
Maximum duty cycle:	75 %	50 %	75 %	40%
Rise time, fall time (20%-80%):	10 us			
PRF:	Internal trigger: 0.5 Hz to 1 kHz External trigger: 0 Hz to 1 kHz			
Output current regulation:	≤ 5% (for load voltage change from 0 Volts to maximum voltage)			
Polarity[4]:	Positive or negative (specify)			
GPIB & RS-232 control[1]:	Standard on -B units.			
LabView drivers:	Download			
Ethernet port, for remote control using VXI-11.3, ssh, telnet, & web:	Optional[6]. Recommended as a modern alternative to GPIB / RS-232.			
Controls:	Keypad and adjust knob, and GPIB / RS-232 control			
Propagation delay:	≤ 1 us (Ext trig in to pulse out)			
Jitter:	± 100 ps ± 0.03% of sync delay (Ext trig in to pulse out)			
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.			
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 ± 1.5% of maximum amplitude/offset, or ± 3 ns) after 10 minute warmup, subject to a minimum timing uncertainty of 1.5 × (Rated rise time + Rated fall time). For high-accuracy applications requiring traceable calibration, verify the output parameters with a calibrated oscilloscope.			
Monitor output:	Provides an attenuated coincident replica of output current pulse			
Connectors: DC Power (+ and -):	Not applicable.		6 mm plug / 4 mm sockets[7] (+ red, - black)	
OUT & GND:	Positronic female connector[9]			
Trig, Sync, Monitor, Gate:	BNC			
Power requirements, AC:	100 - 240 V, 50 - 60 Hz			
Power requirements, DC[5]:	Not applicable.		7V, 50A (worst-case)	7V, 100A (worst-case)
Possible DC power supplies:				
Xantrex (www.xantrex.com):	Not applicable.		XHR 20-50	XFR 12-100
Sorensen (www.sorensen.com):			LHP 20-50	DCS 10-100E
Kepco (www.kepco.com):			JQE 15-50M	-
Agilent (www.agilent.com):			HP 6032A	-
Maximum internal dissipation, $(V_{DC} - V_{LOAD}) \times I_{PULSE} \times$ duty cycle:	Not applicable		80 Watts. V_{DC} must be set appropriately to respect this limit.	
Cooling:	Self-contained fan			
Optional recommended accessory kit for DC input cabling:	Not applicable		-AK3 option: Provides two 1m cables (1 red, 1 black) with 6mm safety sockets[8], and two 6mm safety plug to M6 stud adapters[7] (1 red, 1 black)	
Optional recommended accessory kit for output cabling:	-AK9 option: Provides one AV-HLZ1-100 cable (100 cm length, Z0 = 1 Ohm. This transmission line cable matches low impedance loads without degrading the signal rise and fall times significantly. The chassis end of the cable is terminated with a Positronic male connector[10] and the load end is terminated with a Positronic female connector[9]). Also provides an adapter which mates to the end of this cable, and provides the output on two identical contact posts into which M6x1 threaded screws may be screwed to a maximum depth of 15 mm.			
Dimensions (H x W x D):	138 mm x 430 mm x 425 mm (5.5" x 17" x 16.8")			
Chassis material:	Anodized aluminum, with blue plastic trim			
Rack-mount kit:	Add the suffix -R6 to the model number to include 19" rack mount kit.			
Temperature range:	+5°C to +40°C			

1) -B suffix indicates IEEE-488.2 GPIB and RS-232 control of amplitude, pulse width, PRF and delay.
2) The minimum useful amplitude is 3% of the maximum amplitude.
3) To specify the DC offset option add the suffix -OT to the model number
4) Indicate desired polarity by suffixing the model number with -P or -N (i.e. positive or negative), or -PN for dual polarity.
5) AV-109B models rated at 50 Amps or more require an end-user-supplied external DC power supply. The voltage rating of the power supply must be greater than VLOADmax + 5V. The current rating must be greater than the peak output current of the pulser.
6) Add the suffix -VXI to the model number to specify the Ethernet port..
7) Multi-Contact ID/S6AR-N-B4S series, or similar.
8) Multi-Contact SLK616-AR/BGG series, or similar.
9) Positronic part number GG8888F1, with four GGFIT00MS/AA high-current contacts. The inner two contacts carry the signal, and the outer two carry the ground lines.
10) Positronic part number GG8888M1, with four GGMIT00MS/AA high-current contacts. The inner two contacts carry the signal, and the outer two carry the ground lines.

Pulser mainframe (left) with AK9 kit, including the AV-HLZ1-100 output cable (middle) and mating adapter (right)

AV-109F Series Rear Panel. (AV-109E models do not have the DC and GND power supply terminals).



AK9 kit, including the AV-HLZ1-100 output cable (right and left) and mating adapter (middle). The adapter is shownwith some test resistors installed on copper brackets. The copper brackets are screwed into the four contact posts on the rear of the adapter. These brackets and resistors are not included with the adapter; this is just a sample configuration.

Front view of the adapter included with the AK9 kit. This end may be plugged directly into the rear panel output connector, or into the output end of the AV-HLZ1-100 cable.

Rear view of the adapter included with the AK9 kit. The outer two contact posts are grounded, and the inner two carry the signal. The user may screw into these posts, to attach the user's load.