

Laser zap machine

Laser diode driver

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> Model number: AVO-9A-B-P-P3-SLAA
>
> Description: Laser Diode Driver (Pulsed Voltage) with IEEE-488.2 GPIB
> and RS-232 Computer Control Ports
>
> Polarity: positive
>
> Amplitude: 0 - 140 mA (see footnote 3 on datasheet)
>
> Maximum output of mainframe into 50 Ohms: 10V
>
> Pulse width (FWHM): 2 - 50 ns
>
> Maximum PRF: 50 kHz
>
> -P3-SLAA option: Provides an 8-pin socket for the QFLD-840-2SM. The
> positive output pulse is applied to pin 2 of the diode. All other pins
> are grounded. Rseries in the output module is approximately 42 Ohms,
> such that Rseries + Rdiode = 50 Ohms, approximately.
>
> Other: as per the standard AVO-9A-B-P, described at
> http://www.avtechpulse.com/laser/avo-9a
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- product page: <http://www.avtechpulse.com/laser/avo-9a/>
- programming manual: <http://www.avtechpulse.com/gpib/>
- manual (different output module, different maximum settings): <http://www.avtechpulse.com/manuals/AVO-9A-B-P1B-T1B%2Cedition2.pdf>

Notes: Output pulse looks like crap at lower amplitudes; use at least 5 V to minimize weirdness (plan is to always use 10 V, and use fixed RF attenuators to get the right amplitude for each diode). Narrow pulse widths come out narrower than advertised - a setting of 2 ns yields ~1 ns, 3 ns yields 2 ns, 4 ns yields 3 ns, etc. (This can apparently be calibrated - will do sometime if we decide we care.)

output modules

We have two AVX-S1-P3-SLAA (8-pin) and one AVX-S1-P4B (14-pin).

- product page: <http://www.avtechpulse.com/laser-bias/avx-s1/>
- data sheet: http://www.avtechpulse.com/catalog/page074_cat11_avx-s_rev8.pdf
- AVX-S1-P4B manual, P3-SLAA is same except for pinout: <http://www.avtechpulse.com/manuals/AVX-S1-P4B%20with%20-T4B-INV%20Optional%2Ced2.pdf>

Laser diodes

- <http://www.qphotonics.com/Single-mode-fiber-coupled-laser-diode-2mW-840.html>
- <http://www.qphotonics.com/Single-mode-fiber-coupled-laser-diode-10mW-1060nm.html>

Optics

Barrel connector from diode to attenuator: [ADAF1](#) mounted on bracket [ADABD2](#)

Adjustable attenuator (up to 50 dB):

- 840 nm: [VOA850-FC](#)
- 1060 nm: [VOA1064-FC](#)

Collimator (in holder [AD1109F](#)):

- 840 nm: get custom aligned version of [F280FC-B](#)
- 1060 nm: [F220FC-1064](#)

Neutral density filter (anti-reflective coating, why not) for fixed attenuation (between two retaining rings [SM05RR](#) - needs spanner [SPW603](#)):

- 840 nm: [NE530B-B](#) for OD 1.9 (cuts 2 mW to 26 uW)
- 1060 nm: [NE540B-B](#) for OD 2.6 (cuts 10 mW to 28 uW)

Lens (in holder [S05TM09](#) - needs spanner [SPW908](#)):

- 840 nm: [C280TME-B](#)
- 1060 nm: [C280TME-C](#)

Get some extra retaining rings (two per tube) in case we need to clamp down the lens holder or something, who knows.

Mounting

3-inch lens tube: [SM05M30](#)

Lens tube clamps (two per tube for stability): [SM05RC](#)

Stage

Motor/encoders are Quicksilver QCI-A17H-3 for Z, QCI-A23H-5 for X and Y.

X and Y stages are Lintech 209205 rev. A.

Bottom of X stage is 3-3/8" high. Bottom edge of Z stage (Deltron LRS2-1) moves from 6-1/2" to 7-1/2" high.

Mounting plate sticks out 3.75" from the bottom edge of the Z stage.

About 1 m run from stage to the back of the hood; 1 m from back of hood to electronics.

Laser power scratch work

Sensor is 320 um thick, so MIP = 124 keV, or $2e-14$ J.

Assume 2 ns pulse width, then we need $2e-14$ J/ $2e-9$ s = $1e-5$ W, or 10 uW. If we use wider pulses we need to attenuate more.

Filter damage: the narrower and more powerful of the two beams (1060 nm) is 2.4 mm diameter, so area is 4.5 mm^2 ; peak power density (factor of 2 is what Thorlabs says you should use for a Gaussian peak) is $2 \cdot 10 \text{ mW/A} = 0.4 \text{ W/cm}^2$. No actual spec on damage threshold for the AR coating, but the glass is definitely fine.