INSTRUCTIONS

MODEL AVOZ-A3-C

0 TO 100 VOLTS, 0 TO 100 AMPS
PULSED VOLTAGE LASER DIODE DRIVER

SERIAL NUMBER: _____

WARRANTY

Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech shall at its option repair or replace said defective item. This warranty does not apply to units which have been dissembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

TECHNICAL SUPPORT

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Manual Reference: /fileserver1/officefiles/instructword/avoz/AVOZ-A3-Cede.doc, created June 10, 2002

INTRODUCTION

The Avtech model AVOZ-A3-C is designed for pulsing laser diodes and other low impedance loads with rectangular pulses as high as 100 Amperes, with rise times of 30 ns. The pulse width is variable from 50 ns to 2 us. The maximum duty cycle is 0.1%.

The generator can be triggered internally or externally, or by the manual "Single Pulse" pushbutton. The internal trigger is continuously variable from 2 Hz to 20 kHz.

SPECIFICATIONS

Model:	AVOZ-A3-C[1]
Amplitude[3,4]:	0 to 100 Amps (to a 1.0 Ω load)
Pulse width (FWHM)[3,4]:	50 ns to 2.0 μs
Rise time:	≤ 30 ns
Fall time:	≤ 30 ns
PRF:	0 to 20 kHz
Duty cycle: (max)	0.1 %
Output impedance:	≤ 0.05 Ohms
Average output power:	10 Watts maximum
Droop:	≤ 5%, at maximum pulse width and maximum amplitude
Polarity[5]:	Positive or negative or dual polarity (specify)
Propagation delay:	≤ 100 ns (Ext trig in to pulse out)
Jitter:	± 100 ps (Ext trig in to pulse out)
Trigger required:	External trigger mode: + 5 Volts, 50 to 500 ns (TTL)
Sync delay: (sync out to pulse out)	Variable 0 to ± 2 μs
Sync output:	+ 3 Volt, 200 ns, will drive 50 Ohm loads
Connectors: OUT:	Solder terminals (or optional socket[6]), on end of 60 cm flexible microstrip
In, Sync:	BNC
Power requirements:	120/240 Volts (switchable) 50 - 60 Hz
Dimensions: Mainframe:	100 mm x 430 mm x 375 mm (3.9” x 17” x 14.8”)
Chassis material:	Anodized aluminum, with blue plastic trim
Mounting:	Any
Temperature range:	+ 15° to + 40° C

1) -C suffix indicates stand-alone lab instrument with internal clock and line powering. (See page 112 for additional details of the basic instrument formats).
2) -B suffix indicates IEEE-488.2 GPIB and RS-232 control of pulse amplitude, pulse width, delay and PRF. (See page 8).
3) For electronic control (0 to + 10V) of amplitude, suffix model number with -EA. Electronic control units also include standard front-panel one-turn controls.
4) For ten-turn dial control of pulse width (or amplitude) suffix model number with -PWT (or -AT). For -C units only.
5) Indicate desired polarity by suffixing model number with -P or -N (i.e. positive or negative) or -PN for dual polarity option.
6) To specify diode socket mounting option, suffix model number with -S5 and describe the diode package type (e.g. TO-18) and the required pin connections (eg. anode, cathode, ground, etc.). See page 75 for readily available package mounting. Contact Avtech for special or different packages.

INSTALLATION

VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, and handles. Confirm that a power cord is with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

PLUGGING IN THE INSTRUMENT

Examine the rear of the instrument. There will be a male power receptacle, a fuse holder and the edge of the power selector card visible. Confirm that the power selector card is in the correct orientation.

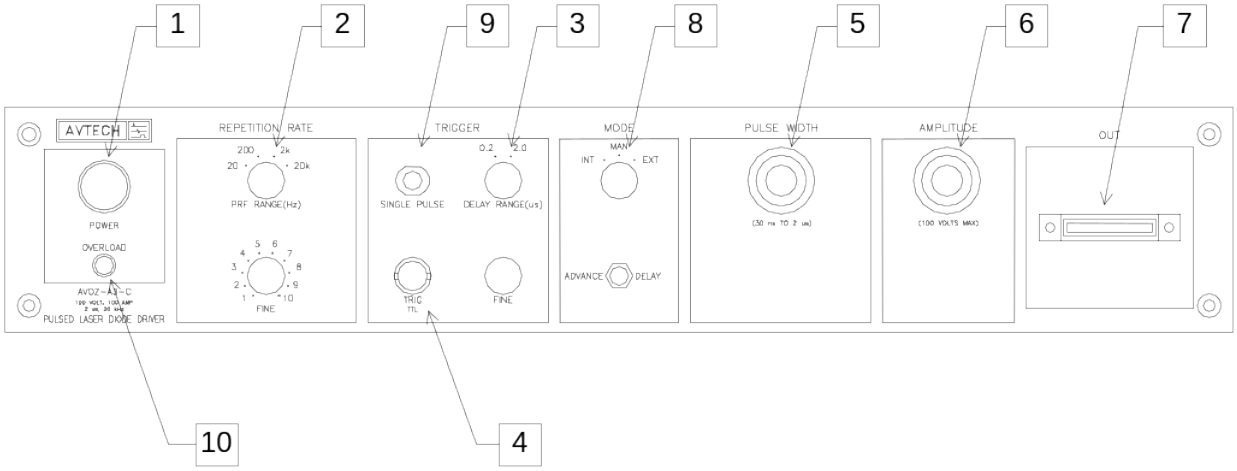
For AC line voltages of 110-120V, the power selector card should be installed so that the “120” marking is visible from the rear of the instrument, as shown below:

For AC line voltages of 220-240V, the power selector card should be installed so that the “240” marking is visible from the rear of the instrument, as shown below:

If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required.

FRONT PANEL CONTROLS



1. POWER Switch. The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the internal +15V DC supply.

2. REPETITION RATE Controls. Varies PRF as follows:

RANGE 1	2 Hz	-	20 Hz
RANGE 2	20 Hz	-	200 Hz
RANGE 3	200 Hz	-	2 kHz
RANGE 4	2 kHz	-	20 kHz

3. DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (7). This delay is variable over the range of 0 to about 1.0 us. The TRIG output precedes the main output when the ADVANCE-DELAY switch is in the ADVANCE position and lags when the switch is in the DELAY position.

4. TRIG Connector. When the MODE switch (item 8) is set to the “EXT” position, a TTL-level pulse applied to this connector will trigger the instrument. The instrument triggers on the rising edge of this input. The input impedance of this input is 1 kΩ. (Depending on the length of cable attached to this input, and the source driving it, it may be desirable to add a coaxial 50 Ohm terminator to this input to provide a proper transmission line termination. The Pasternack (www.pasternack.com) PE6008-50 BNC feed-thru 50 Ohm terminator is suggested for this purpose.)

   When the MODE switch (item 8) is set to the “INT” position, this connector is used as an output that generates a 200 ns wide TTL-level pulse for each trigger event.

This output can be used to trigger an oscilloscope, or other test equipment. The separation between the main output pulse and the TRIG output pulse is controlled by the DELAY controls and the ADVANCE/DELAY switch (item 8). For this output to operate correctly, the delay setting must be less than the period.

5. PW Control. This ten-turn control varies the output pulse width.

6. AMP Control. The output pulse amplitude is controlled by means of this ten-turn dial.

7. OUT. Detachable 1 meter long AV-LZ1 flexible output line inserts into female connector from the front panel. The end that plugs into the front panel is marked with an “UP” side and a “DOWN” side. (The UP side is the signal output, and the DOWN side is ground.) It is critically important that the “UP” side of the line be visible (i.e., facing up). The diode load and series matching resistor may be soldered to the circuit board on the opposite end of the LZ line. The total resistance should equal 1Ω to obtain 100 Amps when the mainframe outputs 100 Volts.

8. INT/EXT/MAN Mode Switch. With this switch in the INT position, the repetition rate of the unit is controlled by an internal oscillator, which in turn is controlled by the REPETITION RATE controls. With the switch in the EXT position, the unit requires a 50 ns (or wider) TTL level pulse applied at the TRIG input in order to trigger the output stages. For a single pulse output, the switch should be in the “MAN” position and then push the SINGLE PULSE pushbutton (9).

   The PULSE DELAY controls (item 9) and DELAY MODE switch (item 8) affect the operation of this output. When the DELAY MODE switch is in the “Main Out Delayed” position, the pulses on the main output (item 18) and the four logic outputs (items 11-14) are delayed relative to the SYNC OUT pulse by a time controlled by the PULSE DELAY controls (item 9).

   When the DELAY MODE switch is in the “Main Out Advanced” position, the pulses on the main output (item 18) and the four logic outputs (items 11-14) are advanced relative to the SYNC OUT pulse by a time controlled by the PULSE DELAY controls (item 9).

   When the DELAY MODE switch is in the “Double Pulse” position, the SYNC OUT pulse is approximately coincident with the first pulse of the pair of pulses on the main output.

   For this output to operate correctly, the delay setting must be less than the period.

9. SINGLE PULSE Pushbutton. When the INT/EXT/MAN switch is in the “MAN” position, the instrument can be triggered by pressing this pushbutton. A single pulse is generated for each button press.

10. OVERLOAD. An automatic overload protective circuit controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a very low impedance), the protective circuit will turn the output of the instrument OFF and turn the indicator light ON. The light will stay ON (i.e. output OFF) for about 5 seconds after which the instrument will attempt to turn ON (i.e. light OFF) for about 1 second. If the overload condition persists, the instrument will turn OFF again (i.e. light ON) for another 5 seconds. If the overload condition has been removed, the instrument will turn on and resume normal operation. Overload conditions may be removed by:

    - Reducing repetition rate
    - Reducing pulse width
    - Increasing the load impedance
    - Reducing the output amplitude

REAR PANEL CONTROLS

19. AC POWER INPUT. A three-pronged recessed male connector is provided on the back panel for AC power connection to the instrument. Also contained in this assembly is a slow blow fuse and a removable card that can be removed and repositioned to switch between 120V AC in and 240V AC in.

    For AC line voltages of 110-120V, the power selector card should be installed so that the “120” marking is visible from the rear of the instrument.

    For AC line voltages of 220-240V, the power selector card should be installed so that the “240” marking is visible from the rear of the instrument.

    If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

    In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required. See the “Installation” section for more details.

GENERAL INFORMATION

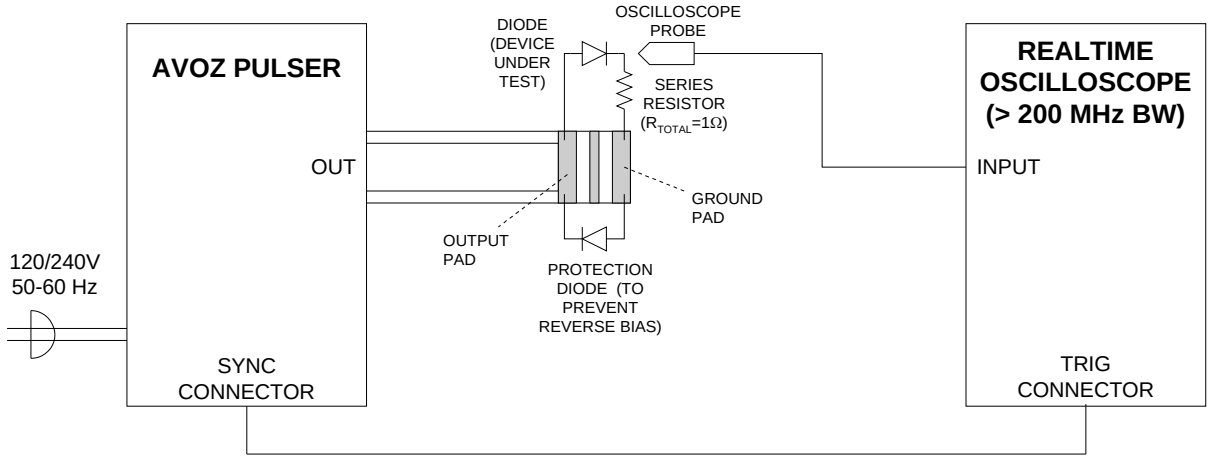
AMPLITUDE CONTROL

The AVOZ-A3-C is a voltage pulser, that can generate amplitudes up to 100V, into a 1 Ohm (or higher) load. This results in currents of up to 100 Amps.

If the device under test is a diode with a series resistance less than 1 Ohm, a resistor must be added in series with the diode. The sum of the diode resistance and the added resistance should be equal to 1 Ohm (or higher).

TEST ARRANGEMENT

The recommended test arrangement is shown below:



NOTE: BOTH DIODES ARE SHOWN ORIENTED FOR A POSITIVE OUTPUT. REVERSE BOTH DIODES FOR NEGATIVE OPERATION.

There are several key points to note. As explained above, a resistance should be added in series with the diode load, to limit the maximum current. This resistance may also be used to monitor the current through the diode current. If connected as shown above, the resistor voltage displayed on the oscilloscope is directly proportional to the diode current. It is essential the low-inductance resistors be used. Several non-inductive, medium power resistors should be used in parallel (for instance, five 4.7 Ohm 2W resistors). The Ohmite OY series (www.ohmite.com) or the RCD RSF2B series (www.rcd-comp.com) are appropriate.

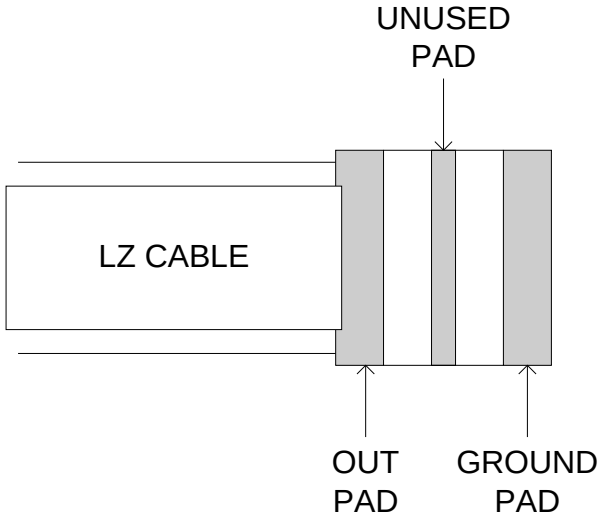
It is also recommended that a low-capacitance, high-voltage, ultra-fast Schottky rectifier diode be connected for reverse-bias protection, especially for sensitive or costly devices

under test. The APT (www.advancedpower.com) APT15S20K is an example of a suitable diode. Note, however, that the capacitance added by the protection diode may degrade the output rise time slightly.

USING THE LZ OUTPUT LINE

A flexible, low-characteristic-impedance transmission line is supplied with this instrument. One end plugs into the front-panel OUT connector, and the other end is terminated with a 1.0 $\times$ 2.5 cm section of glass epoxy circuit board. The end that plugs into the front panel is marked with an “UP” side and a “DOWN” side. (The UP side is the signal output, and the DOWN side is ground.) It is critically important that the “UP” side of the line be visible.

The load may be soldered to the circuit board end. The circuit board layout is illustrated below:



The length of leads used to connect the load to the circuit board should be kept extremely short (< 0.5 cm), as discussed below.

LENZ’S LAW AND INDUCTIVE VOLTAGE SPIKES

This instrument is designed to pulse resistive and diode loads and will exhibit a large output spike when used to drive a load with significant inductance (as predicted by LENZ'S LAW). For this reason the load should be connected to the output using low inductance leads (as short as possible and as heavy a gauge as possible).

The voltage developed across an inductance L (in Henries), when the current is changing at a rate given by dI_{LOAD}/dt (in Amps/sec), is: $V_{SPIKE} = L\frac{dI_{LOAD}}{dt}$.

For this reason, the length of leads used to connect the load to the circuit board should be kept extremely short (< 0.5 cm).

TOP COVER REMOVAL

The interior of the instrument may be accessed by removing the four Phillips screws on the top panel. With the four screws removed, the top cover may be slid back (and off).

RACK MOUNTING

A rack mounting kit is available. The -R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

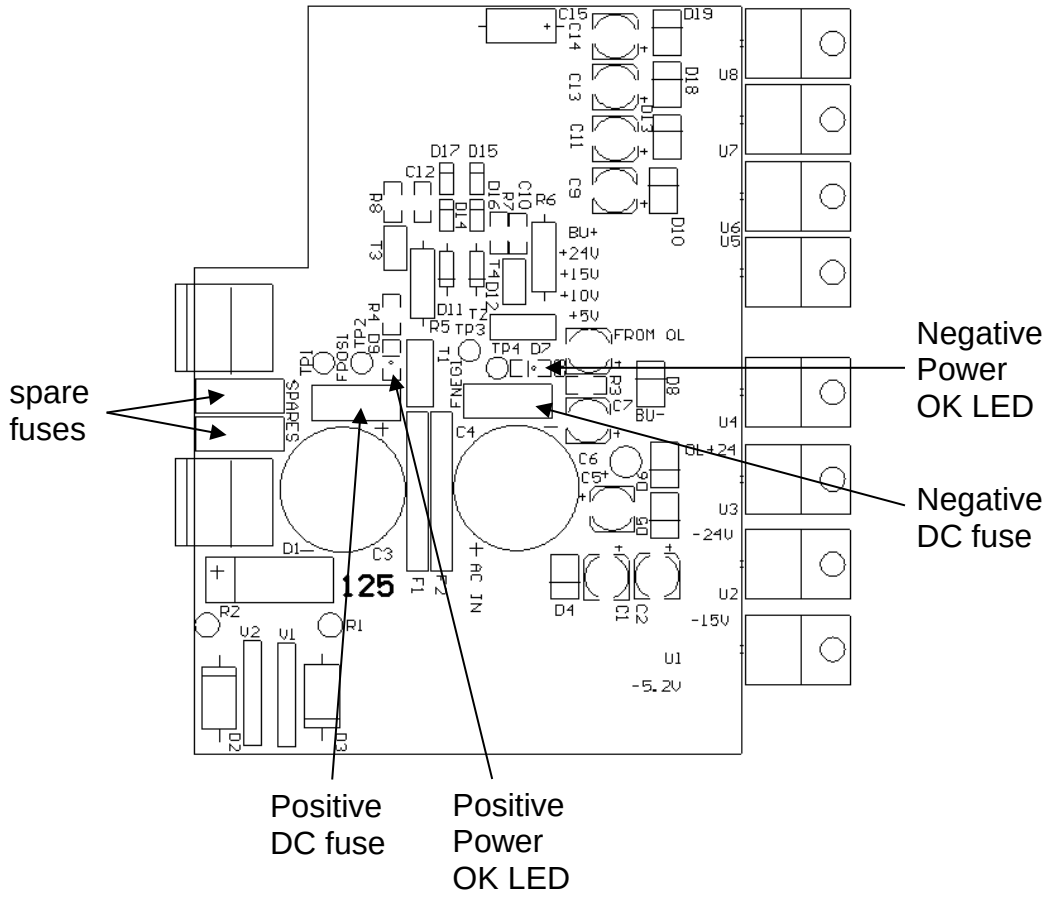
ELECTROMAGNETIC INTERFERENCE

To prevent electromagnetic interference with other equipment, all used outputs should be connected to shielded 50Ω loads using shielded 50Ω coaxial cables. Unused outputs should be terminated with shielded 50Ω BNC terminators or with shielded BNC dust caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

POWER SUPPLY AND FUSE REPLACEMENT

This instrument has three main fuses, plus two spares. One, which protects the AC input, is located in the rear-panel power entry module, as described in the “Rear Panel Controls” section of this manual. If the power appears to have failed, check the AC fuse first.

The other two fuses (plus two spares) are located on the internal DC power supply, as shown below:



The positive fuse and one of the spare fuses on this circuit board are 1A slow-blow fuses, Littlefuse part number R452001. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is F1343CT-ND). The negative fuse and the second spare fuse are 0.5A slow-blow fuses (Littlefuse R452.500, Digikey part number F1341CT-ND).

If you suspect that the DC fuses are blown, follow this procedure:

1. Remove the top cover, by removing the four Phillips screws on the top cover and then sliding the cover back and off.

2. Locate the two “Power OK” LEDs on the power supply circuit board, as illustrated above.

3. Turn on the instrument.

4. Observe the “Power OK” LEDs. If the fuses are not blown, the two LEDs will be lit (bright red). If one of the LEDs is not lit, the fuse next to it has blown.

5. Turn off the instrument.

6. If a fuse is blown, use needle-nose pliers to remove the blown fuse from its surface-mount holder.

7. Replace the fuse. (Spare 1 Amp and 0.5 Amp fuses are provided on the circuit board. They may be transferred to the active fuse locations using needle-nose pliers.)

PERFORMANCE CHECK SHEET