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SINCE 1975

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OTTAWA, ONTARIO  
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INSTRUCTIONS

MODEL AVX-RL3-10

FAN-COOLED HIGH-POWER

10 OHM

SERIES RESISTANCE

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 disassembled, 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

Phone: 888-670-8729 (USA & Canada) or +1-613-686-6675 (International)

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TABLE OF CONTENTS

<b>WARRANTY.....</b>	<b>2</b>
<b>TECHNICAL SUPPORT.....</b>	<b>2</b>
<b>TABLE OF CONTENTS.....</b>	<b>3</b>
<b>INTRODUCTION.....</b>	<b>4</b>
<b>SPECIFICATIONS.....</b>	<b>5</b>
<b>REGULATORY NOTES.....</b>	<b>6</b>
FCC PART 18.....	6
EC DECLARATION OF CONFORMITY.....	6
DIRECTIVE 2002/95/EC (RoHS).....	7
DIRECTIVE 2002/96/EC (WEEE).....	7
<b>GENERAL INFORMATION.....</b>	<b>8</b>
CONNECTING TO THE OUTPUT.....	8
CONNECTING TO THE INPUTS.....	9
CONTROL CABLE.....	10
LENZ'S LAW AND INDUCTIVE VOLTAGE SPIKES.....	11

Manual Reference: /files/server2/officefiles/instructword/avx-rl/AVX-RL3-10,ed1.odt.

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## INTRODUCTION

Avtech voltage pulsers are frequently used to drive laser diodes. When driving a laser diode, resistance must normally be added in series with the diode. Most of the pulse generator output power will be dissipated in the series resistance, rather than the diode, so a high power rating is sometimes required. The fan-cooled AVX-RL3 series is provided for that purpose.

Model AVX-RL3 is a 10 Ohm, 50 Watt series resistance. It has five SMA input connectors wired in parallel. The output signal and a ground connection are provided on a section of microstrip board, with user-accessible solder pad areas. Different connector arrangements can be provided upon request.

A DB-9 female connector provides power to the internal fans (+24V to pins 6 and 7, ground to pins 8 and 9) and provides access to a thermistor (pins 1 and 2) thermally bonded to the resistance. It is important to provide power to the fan, or the internal resistance may experience thermal damage.

This instrument is intended for use in research, development, test and calibration laboratories by qualified personnel.

## SPECIFICATIONS

Model:	AVX-RL3-10
Series resistance:	$10\Omega \pm 5\%$
Connectors: Input(s):	SMA female (5)
Fan / thermistor:	DB-9 female
Output, ground:	Microstrip PCB
Max. power dissipation:	50 Watts (fan must be operational)
Maximum voltage:	500V <sup>1</sup>
Rise time (10%-90%):	< 15 ns
Parasitic inductance:	70 nH <sup>3</sup>
Dimensions (H×W×D):	4.1"×7.4"×6.3", 104×187×159 mm

- 1) The internal resistance can handle 500 V. However, the standard output connectors are exposed solder terminals, and operator safety may be compromised if these exposed terminals are operated at voltages greater than 50 V. The user may add additional insulation to protect the operator, depending of the nature of the connection required. Alternatively, Avtech can provide different output connectors upon request (BNC, safety banana, etc). Alternative connectors may increase the parasitic inductance. Contact Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) with your special requirement.
- 2) Measured by applying a 200 ps rise time pulse to the input and observing the output current pulse using a 711S current probe.
- 3) Estimated from the observed rise time using  $t_{RISE\ 10\%-90\%} = 2.2 L / R$ .

## REGULATORY NOTES

### FCC PART 18

This device complies with part 18 of the FCC rules for non-consumer industrial, scientific and medical (ISM) equipment.

This instrument is enclosed in a rugged metal chassis and uses a filtered power entry module (where applicable). The main output signal is provided on a shielded connector that is intended to be used with shielded coaxial cabling and a shielded load. Under these conditions, the interference potential of this instrument is low.

If interference is observed, check that appropriate well-shielded cabling is used on the output connectors. Contact Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) for advice if you are unsure of the most appropriate cabling. Also, check that your load is adequately shielded. It may be necessary to enclose the load in a metal enclosure.

If any of the connectors on the instrument are unused, they should be covered with shielded metal "dust caps" to reduce the interference potential.

This instrument does not normally require regular maintenance to minimize interference potential. However, if loose hardware or connectors are noted, they should be tightened. Contact Avtech ([info@avtechpulse.com](mailto:info@avtechpulse.com)) if you require assistance.

### EC DECLARATION OF CONFORMITY



We                      Avtech Electrosystems Ltd.  
                             P.O. Box 5120, LCD Merivale  
                             Ottawa, Ontario  
                             Canada K2C 3H4

declare that this pulse generator meets the intent of Directive 2004/108/EG for Electromagnetic Compatibility. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 50081-1 Emission

EN 50082-1 Immunity

and that this pulse generator meets the intent of the Low Voltage Directive 72/23/EEC as amended by 93/68/EEC. Compliance pertains to the following specifications as listed in the official Journal of the European Communities:

EN 61010-1:2001 Safety requirements for electrical equipment for measurement, control, and laboratory use

#### DIRECTIVE 2002/95/EC (RoHS)

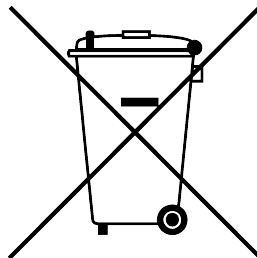
This instrument is exempt from Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the Restriction of the use of certain Hazardous Substances (RoHS) in electrical and electronic equipment. Specifically, Avtech instruments are considered "Monitoring and control instruments" (Category 9) as defined in Annex 1A of Directive 2002/96/EC. The Directive 2002/95/EC only applies to Directive 2002/96/EC categories 1-7 and 10, as stated in the "Article 2 - Scope" section of Directive 2002/95/EC.

#### DIRECTIVE 2002/96/EC (WEEE)

European customers who have purchased this equipment directly from Avtech will have completed a "WEEE Responsibility Agreement" form, accepting responsibility for WEEE compliance (as mandated in Directive 2002/96/EC of the European Union and local laws) on behalf of the customer, as provided for under Article 9 of Directive 2002/96/EC.

Customers who have purchased Avtech equipment through local representatives should consult with the representative to determine who has responsibility for WEEE compliance. Normally, such responsibilities will lie with the representative, unless other arrangements (under Article 9) have been made.

Requirements for WEEE compliance may include registration of products with local governments, reporting of recycling activities to local governments, and financing of recycling activities.



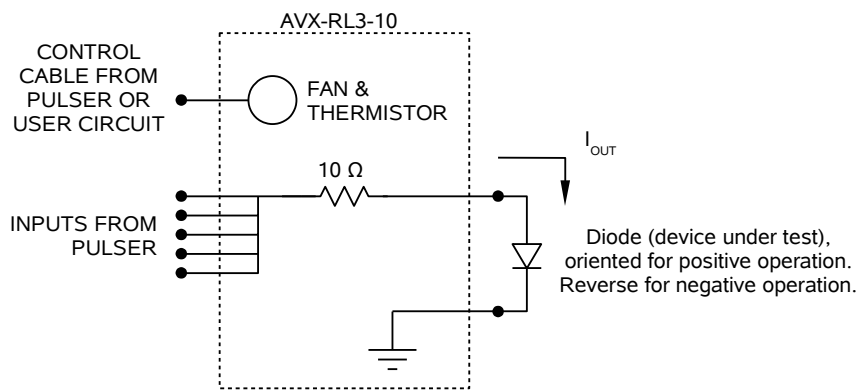
## GENERAL INFORMATION

The AVX-RL3-10 contains a  $10\Omega$  series resistance (capable of dissipating up to 50 Watts of average power). Packaged laser diodes may be soldered to the output terminals of this module. The diode load is connected in series with the internal resistance, so that the current through the diode is normally given by:

$$I_{\text{DIODE}} = (V_{\text{IN}} - V_{\text{DIODE}}) / (10\Omega + R_{\text{DIODE}})$$

where  $V_{\text{DIODE}}$  is the voltage drop across the diode and  $R_{\text{DIODE}}$  is the parasitic resistance of the diode.

The functional equivalent circuit of the output module is shown below:



*Output Module Functional Equivalent Circuit*

An additional resistance ( $R_{\text{SENSE}}$ ) can be placed in series with the diode load, for current monitoring purposes. In this case, the diode current is given by:

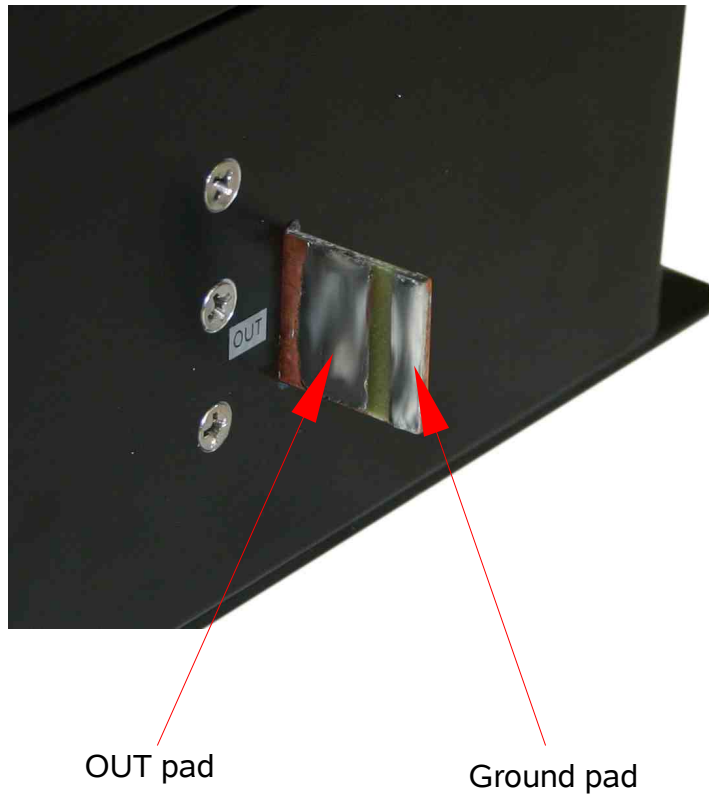
$$I_{\text{DIODE}} = (V_{\text{IN}} - V_{\text{DIODE}}) / (10\Omega + R_{\text{DIODE}} + R_{\text{SENSE}})$$

Alternatively, a fast current probe may be used to monitor the current waveform. Factory testing is conducted using a Tektronix CT2 or Pearson 2878 current transformer. (This technique tends to introduce less waveform distortion than the sensing resistor method. However, AC-coupled current probes such as the CT2 will not be able to operate at pulse widths of more than a few microseconds.)

## CONNECTING TO THE OUTPUT

The AVX-RL3-10 output and ground pads are shown below:





The ground pad wraps around the end of the board, and the entire back side is ground plane.

The device under test (DUT) may be soldered between these two pads.

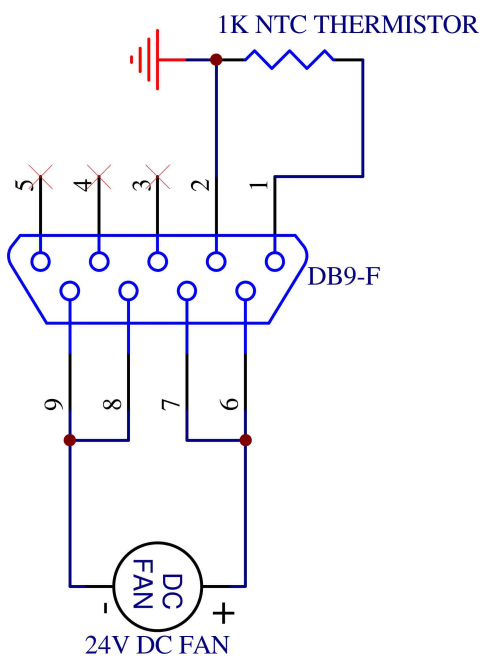
### CONNECTING TO THE INPUTS

The 5 input signal SMA connectors, and the control cable connector are shown below:



### CONTROL CABLE

The DB-9 female connector shown above provides power to the internal fans (+24V to pins 6 and 7, ground to pins 8 and 9) and provides access to a thermistor (pins 1 and 2) thermally bonded to the resistance. The internal wiring is shown below:



It is important to provide power to the fan, or the internal resistance may experience thermal damage.

One end of the thermistor is (pin 2) is also connected to the chassis ground. The thermistor has a nominal room-temperature resistor of 1 kilohm, and falls at higher temperatures. A resistance of less than 400 Ohms indicates overheating.

The thermistor is a GE Sensing model AL03006-624-73-G1.

### 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).

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:  $V_{SPIKE} = L di_{LOAD} / dt$ .