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NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

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INSTRUCTIONS

MODEL AV-107D-B-EA-P-OSRC

0 to 20 AMP, 0 to 60 V, 30 ns RISE TIME
LASER DIODE DRIVER
WITH IEEE 488.2 AND RS-232 CONTROL

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.

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Manual Reference: /fileserver1/officefiles/instructword/av-107/AV-107D-B-EA-P-OSRC,edition1.sxw.
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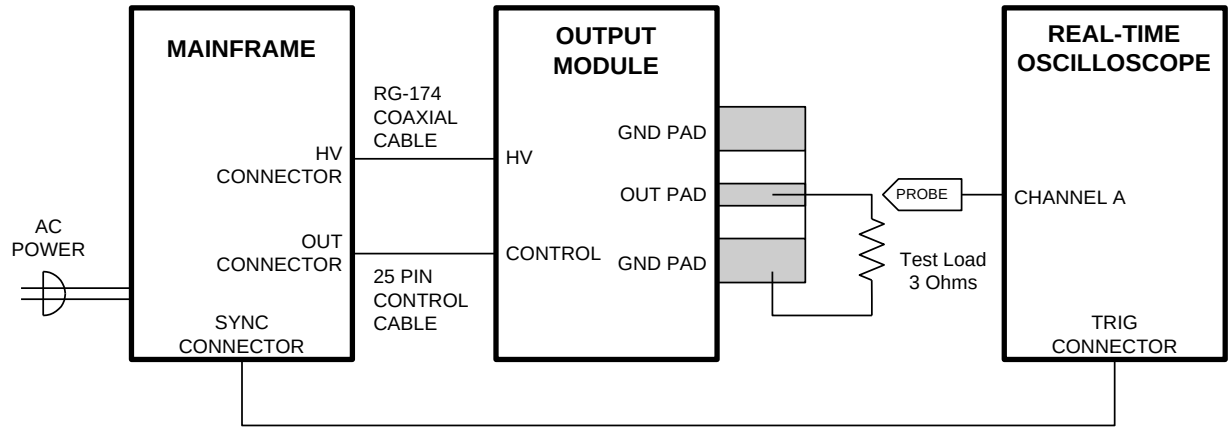
INTRODUCTION

The Model AV-107D-B-EA-P-OSRC pulse generator is designed for pulsing laser diode and other low impedance loads with rectangular pulses as high as +20 Amperes into load voltages up to 60V, with 30 ns rise and fall times. The pulse repetition frequency can vary from 1 Hz to 5000 Hz, and pulse widths can vary from 50 ns to 5 us. The maximum duty cycle is 0.5%

The Model AV-107D-B-EA-P-OSRC pulse generator is a current pulser. The current amplitude is largely independent of the load voltage. The load voltage must not exceed 60V.

The AV-107D-B-EA-P-OSRC system consists of an instrument mainframe and an output module (the AV-107D-P-PG). The output module connects to the mainframe using two cables: a 25-conductor detachable cable that carries the control signals, and a single-conductor shielded detachable RG-58 cable carries the high voltage power supply (+100V).



The loads can be connected (soldered) to the microstrip transmission line that protrudes from the output module. The lead lengths must not exceed several centimeters or severe inductive voltage spikes will result (as predicted by Lenz's Law.)

The AV-107D-B-EA-P-OSRC has three amplitude ranges, of 0 to 0.6A, 0 to 5A, and 0 to 20A, allowing the instrument to be used at moderate to high current levels. When using the front-panel controls or computer commands to set the amplitude, the instrument automatically selects the appropriate range based on the amplitude setting.

The output amplitude can also be controlled by external signals applied to rear-panel connectors. Two connectors allow selection of one of the three amplitude ranges using TTL inputs, and one connector provides vernier control using a 0 to +10V input voltage.

The AV-107D-B-EA-P-OSRC can be controlled from the front panel, or via a computer connected to the IEEE 488.2-compliant GPIB port, or the RS-232 serial port.

This instrument is intended for use in research and development laboratories.

SPECIFICATIONS

Model:	AV-107D-B-EA-P-OSRC
GPIB, RS-232 control:	Standard on -B units.
Amplitude:	+80 mA to +20 Amps, into a 3 Ohm load (or 3 Ohms in series with a diode)
Pulse width:	50 ns to 5 us
Rise time, fall time: (20% - 80%)	< 30 ns. This specification is only valid for operation into a non-inductive 3 Ohm load (or 3 Ohms in series with a diode).
PRF:	1 Hz to 5000 Hz
Duty cycle:	0.5% maximum (improved from standard 0.25% specification)
Current regulation:	Load voltage change from 0 to 60 Volts: 5%
Load voltage range:	0 to +60 Volts
Propagation delay, (Jitter):	100 ns, (100 ps 0.03% of sync delay, Ext trig in to pulse out)
Ext. trigger in:	+ 5 Volts, 50 ns or wider (TTL)
Sync delay: (sync to pulse out)	0 to 5 us
Sync output:	+ 3 Volt, 200 ns, will drive 50 Ohm loads
Gate input:	Synchronous or asynchronous, active high or low, switchable. Suppresses triggering when active.
Connectors:	Out: Solder terminals Trig: BNC Sync: BNC Gate: BNC HV: SMA
Power requirements:	100 - 240 Volts, 50 - 60 Hz
Dimensions:	Mainframe: 100 x 215 x 375 mm (3.9” x 8.5” x 14.8”) Output module: 109 x 66 x 43 mm (4.3” x 2.6” x 1.7”)
Temperature range:	+ 10 to + 40 C

ORIGINAL QUOTATION

June 13, 2003
To: Mehmet Mercan
OSRAM Opto Semiconductors GmbH
mehmet.mercan@osram-os.com
fax: +49 941 8503309

Mehmet,

This is a corrected version of my last email. The "output regulation" specification had an error in it (it referred to 8V instead of 60V).

I am pleased to quote as follows:

Quote number: 11610

Model number: AV-107D-B-EA-P-OSRC

Description: Current Pulser or Laser Diode Driver

Amplitude: +80 mA to +20 Amps, into a 3 Ohm load (or 3 Ohms in series with a diode).

Pulse Width: 0.05 to 5 us

Pulse repetition frequency: 1 Hz to 5000 Hz

Output regulation: < 5% change for a load voltage change from 0 to +60V

Load voltage range (compliance voltage): 0 to +60V

Rise/fall time: < 30 ns. This specification is only valid for operation into a non-inductive 3 Ohm load (or 3 Ohms in series with a diode).

GPIB and RS-232 Control: yes. See www.avtechpulse.com/gpib for details.

-OSRC option: Adds two amplitude range control inputs to the rear-panel, to augment the -EA function, for better control of amplitudes below 5A. The response time of these range inputs is < 50 ms. To select the 80 mA - 600 mA range, both inputs should be TTL low. To select the 0.6-5A range, the "RNG1" input should be TTL high. To select the 5A-20A range, the "RNG2" input should be TTL high. BNC connectors are used for these inputs.

Response time of EA input: < 0.5 ms

Other: as per the standard AV-107D-B-EA-P. See http://www.avtechpulse.com/current/av-107d for details.

Price: $10698 US each, Ex-works, Ottawa, Canada.
   or: $10898 US each, CIF Germany.

Delivery: 60-75 days after receipt of order.

I will fax you a copy of this quote on company letterhead tomorrow morning.

In response to your technical questions: If the load impedance is roughly 3 Ohms, then this would be incompatible with the voltage clamping feature. This feature has been removed from the above quote.

The large inductance is still a concern. A reverse clamping diode would be a good idea to limit negative inductive spikes.

Regards,
Dr. Michael J. Chudobiak
VP, New Product Development

--- Avtech Electrosystems Ltd. ---------- since 1975 ---

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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 89/336/EEC 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

CE

INSTALLATION

VISUAL CHECK

After unpacking the instrument, examine to ensure that it has not been damaged in shipment. Visually inspect all connectors, knobs, liquid crystal displays (LCDs), and the handles. Confirm that a power cord, a GPIB cable, and two instrumentation manuals (this manual and the “Programming Manual for -B Instruments”) are with the instrument. If the instrument has been damaged, file a claim immediately with the company that transported the instrument.

CONNECTING THE OUTPUT MODULE TO THE MAINFRAME

The output module and the mainframe should be connected together as shown on page 13. One end of the gray cable mates to the multi-pin “OUT” connector on the rear panel of the mainframe, and the other end mates to the “CONTROL” connector on the output module. The black RG-174 cable connects to the “HV” SMA connectors. Note that the output module should be attached to a heatsink capable of dissipating 5 Watts if minimizing long-term drift of the output amplitude is critical.

POWER RATINGS

This instrument is intended to operate from 100 - 240 V, 50 - 60 Hz.

The maximum power consumption is 74 Watts. Please see the “FUSES” section for information about the appropriate AC and DC fuses.

This instrument is an “Installation Category II” instrument, intended for operation from a normal single-phase supply.

CONNECTION TO THE POWER SUPPLY

An IEC-320 three-pronged recessed male socket is provided on the back panel for AC power connection to the instrument. One end of the detachable power cord that is supplied with the instrument plugs into this socket. The other end of the detachable power cord plugs into the local mains supply. Use only the cable supplied with the instrument. The mains supply must be earthed, and the cable used to connect the instrument to the mains supply must provide an earth connection. (The supplied cable does this.)

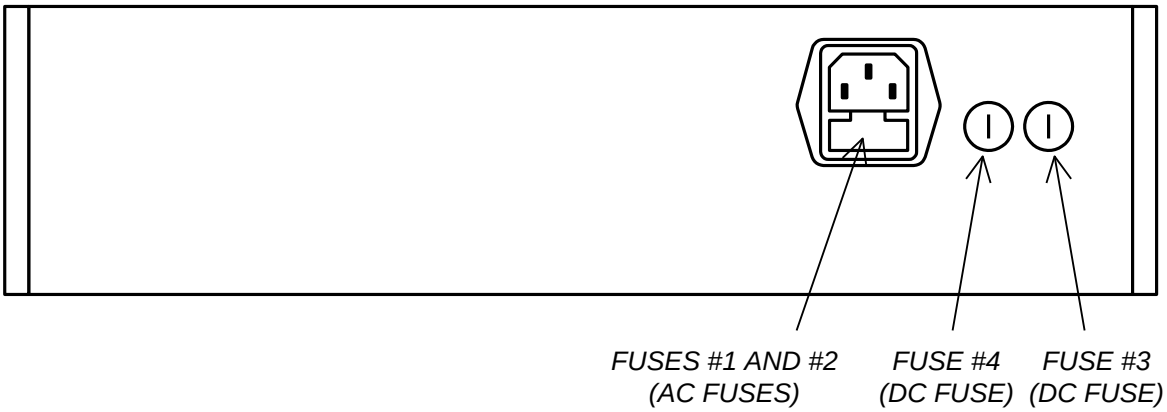
ENVIRONMENTAL CONDITIONS

This instrument is intended for use under the following conditions:

1. indoor use;
2. altitude up to 2 000 m;
3. temperature 5 °C to 40 °C;
4. maximum relative humidity 80 % for temperatures up to 31 °C decreasing linearly to 50 % relative humidity at 40 °C;
5. Mains supply voltage fluctuations up to ±10 % of the nominal voltage;
6. no pollution or only dry, non-conductive pollution.

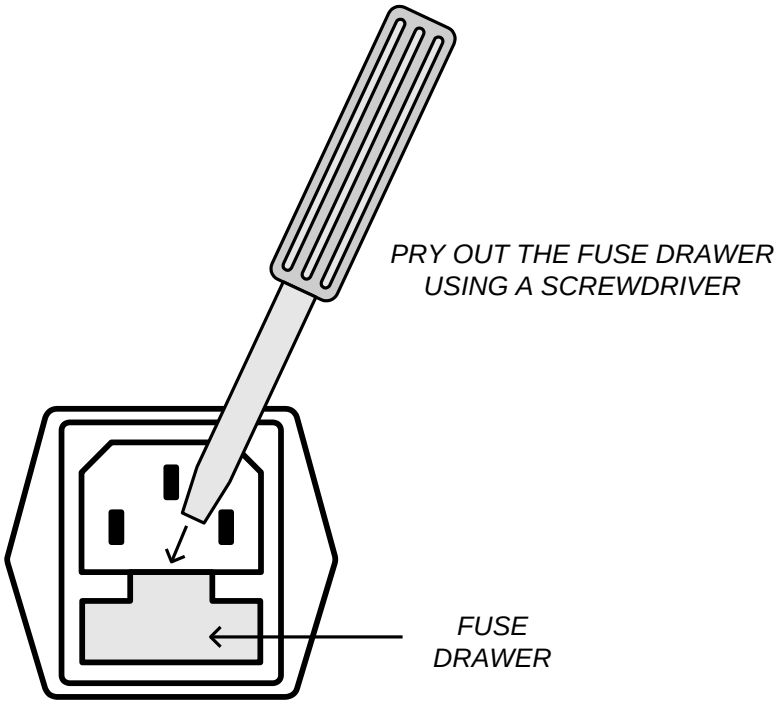
FUSES

This instrument contains four fuses. All are accessible from the rear-panel. Two protect the AC prime power input, and two protect the internal DC power supplies. The locations of the fuses on the rear panel are shown in the figure below:



AC FUSE REPLACEMENT

To physically access the AC fuses, the power cord must be detached from the rear panel of the instrument. The fuse drawer may then be extracted using a small flat-head screwdriver, as shown below:



DC FUSE REPLACEMENT

The DC fuses may be replaced by inserting the tip of a flat-head screwdriver into the fuse holder slot, and rotating the slot counter-clockwise. The fuse and its carrier will then pop out.

FUSE RATINGS

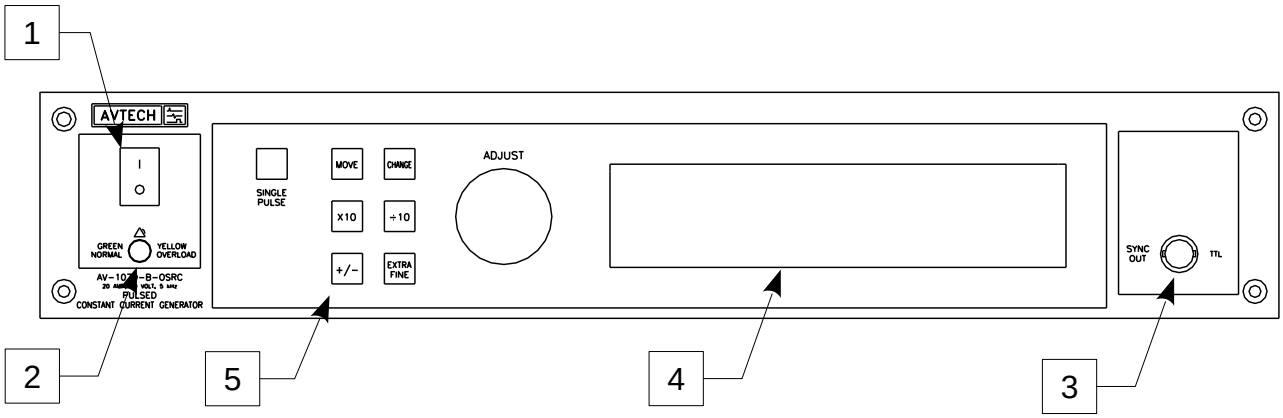
The following table lists the required fuses:

Fuses	Nominal Mains Voltage	Rating	Case Size	Manufacturer's Part Number (Wickmann)	Distributor's Part Number (Digi-Key)
#1, #2 (AC)	115 V	0.5A, 250V, Time-Delay	5 x 20 mm	1950500000	WK5041-ND
	230 V	0.5A, 250V, Time-Delay	5 x 20 mm	1950500000	WK5041-ND
#3 (DC)	N/A	1.6A, 250V, Time-Delay	5 x 20 mm	1951160000	WK5053-ND
#4 (DC)	N/A	1.0A, 250V, Time-Delay	5 x 20 mm	1951100000	WK5048-ND

The fuse manufacturer is Wickmann (http://www.wickmann.com/).

Replacement fuses may be easily obtained from Digi-Key (http://www.digikey.com/) and other distributors.

MAINFRAME FRONT PANEL CONTROLS



1. POWER Switch. This is the main power switch.

2. OVERLOAD. This instrumentis protected in its internal software against conflicting or dangerous settings. As an additional protective measure, an automatic overload circuit exists, which 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.

   This overload indicator may come on briefly at startup. This is not a cause for concern.

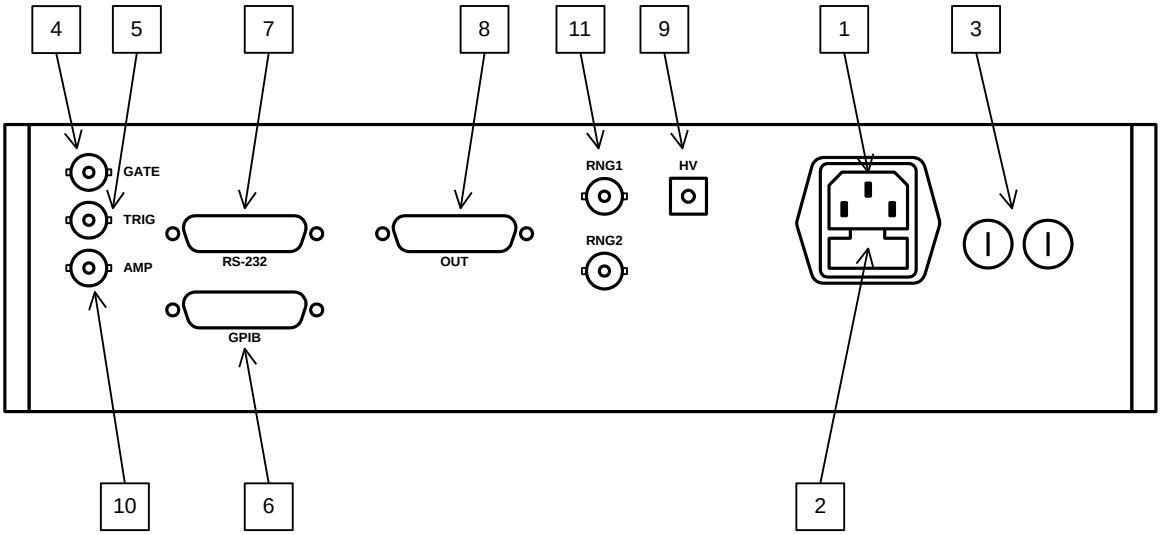
3. SYNC OUT. This connector supplies a SYNC output that can be used to trigger other equipment, particularly oscilloscopes. This signal leads, or lags, the main output by a duration set by the "DELAY" controls and has an approximate amplitude of +3 Volts to R_L > 1kΩ with a pulse width of approximately 200 ns.

4. LIQUID CRYSTAL DISPLAY (LCD). This LCD is used in conjunction with the keypad to change the instrument settings. Normally, the main menu is displayed, which lists the key adjustable parameters and their current values. The “OP1B Interface Programming Manual” describes the menus and submenus in detail.

5. KEYPAD.

Control Name	Function
MOVE	This moves the arrow pointer on the display.
CHANGE	This is used to enter the submenu, or to select the operating mode, pointed to by the arrow pointer.
10	If one of the adjustable numeric parameters is displayed, this increases the setting by a factor of ten.
10	If one of the adjustable numeric parameters is displayed, this decreases the setting by a factor of ten.
+/-	If one of the adjustable numeric parameters is displayed, and this parameter can be both positive or negative, this changes the sign of the parameter.
EXTRA FINE	This changes the step size of the ADJUST knob. In the extra-fine mode, the step size is twenty times finer than in the normal mode. This button switches between the two step sizes.
ADJUST	This large knob adjusts the value of any displayed numeric adjustable values, such as frequency, pulse width, etc. The adjust step size is set by the "EXTRA FINE" button. When the main menu is displayed, this knob can be used to move the arrow pointer.

MAINFRAME REAR PANEL CONTROLS



1. AC POWER INPUT. An IEC-320 C14 three-pronged recessed male socket is provided on the back panel for AC power connection to the instrument. One end of the detachable power cord that is supplied with the instrument plugs into this socket.

2. AC FUSE DRAWER. The two fuses that protect the AC input are located in this drawer. Please see the “FUSES” section of this manual for more information.

3. DC FUSES. These two fuses protect the internal DC power supplies. Please see the “FUSES” sections of this manual for more information.

4. GATE. This TTL-level (0 and +5V) logic input can be used to gate the triggering of the instrument. This input can be either active high or active low, depending on the front panel settings or programming commands. (The instrument triggers normally when this input is unconnected). When set to active high mode, this input is pulled-down to ground by a 1 kΩ resistor. When set to active low mode, this input is pulled-up to +5V by a 1 kΩ resistor.

5. TRIG. This TTL-level (0 and +5V) logic input can be used to trigger the instrument, if the instrument is set to triggering externally. 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.)

6. GPIB Connector. A standard GPIB cable can be attached to this connector to allow the instrument to be computer-controlled. See the “OP1B Interface Programming

Manual" for more details on GPIB control.

7. RS-232 Connector. A standard serial cable with a 25-pin male connector can be attached to this connector to allow the instrument to be computer-controlled. See the "OP1B Interface Programming Manual" for more details on RS-232 control.

8. OUT. The 25-pin cable from the output module is connected to this connector.

9. HV SMA Connector. The shielded RG-174 cable from the output module is connected to this connector. This carries the high-voltage power supply (+100V) to the output module.

   ⚠ Caution: Voltages as high as 110V may be present on the center conductor of this output connector. Avoid touching this conductor. Connect to this connector using standard coaxial cable, to ensure that the center conductor is not exposed.

10. AMP Connector. The output amplitude can be set to track the voltage on the rear-panel "AMP" input. Zero Volts in corresponds to zero amplitude output, and +10V in corresponds to maximum amplitude out (for the range selected by the RNG1 and RNG2 inputs). This mode is activated by selecting "Ext Control" on the front-panel amplitude menu, or with the "source:voltage external" command. The input impedance is greater than 1 kilohm.

11. RNG1 & RNG2 Connectors. The output amplitude can be set to track the voltage on the rear-panel "AMP" input. These TTL-level inputs controls the full-scale range, as follows:

RNG1	RNG2	Amplitude Range
TTL low (0 V), or unconnected	TTL low (0 V), or unconnected	0 – 0.6 Amps, approximately
TTL high (3-5V)	TTL low (0 V), or unconnected	0 – 5 Amps, approximately
TTL low (0 V), or unconnected	TTL high (3-5V)	0 – 20 Amps, approximately

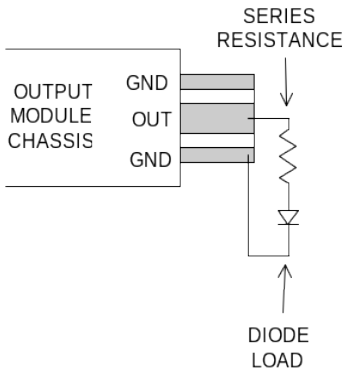
The input impedance is greater than 1 kilohm.

OUTPUT MODULE CONTROLS AND CONNECTORS

OUT Microstrip Line

The main output is provided on the center conductor of the microstrip board protruding from the output module. The outer two conductors, as well as the reverse side of the microstrip board are connected to ground.

A typical connection scheme (for positive output current) is shown below:

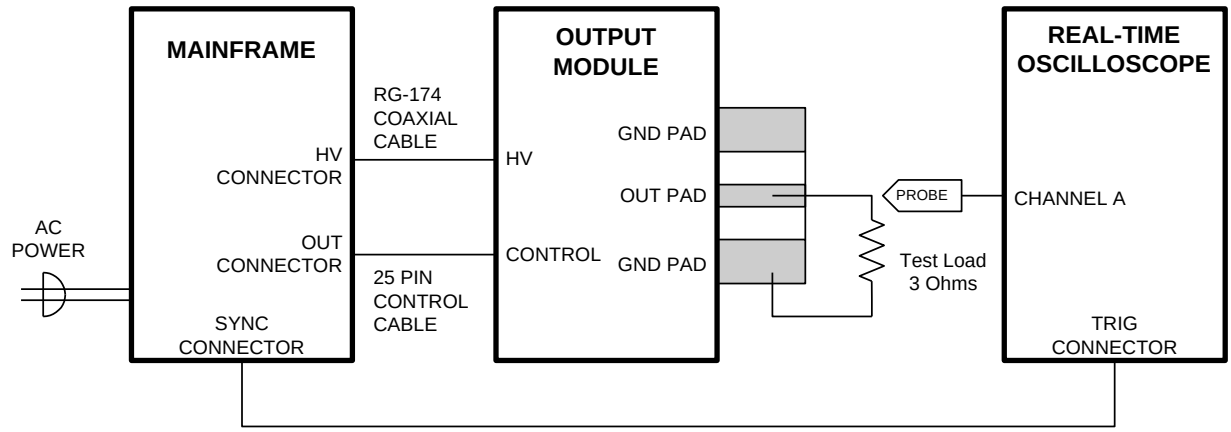


The load should be connected between the OUT and GND terminals using very short leads (<5.0 cm, and preferably < 0.5 cm). Severe inductive voltage spikes will result from any series inductance (Lenz's Law). Take care to ensure that during soldering the OUT conductor is not shorted to the chassis. Use minimal heat when soldering to avoid delaminating the metal pads.

If the load cannot be placed directly on the output terminals of the -PG module, the AV-LZ lines should be used between the -PG module and the load (see the Avtech AV-LZ data sheet, available at www.avtechpulse.com).

GENERAL INFORMATION

BASIC TEST ARRANGEMENT



The equipment should be connected in the general fashion shown above.

Output modules should always be connected to the mainframe **BEFORE power is applied**.

⚠ Caution: Voltages as high as 110V may be present on the center conductor of the HV connectors. Avoid touching these conductors. Connect to these connectors using standard coaxial cable, to ensure that the center conductors are not exposed.

Proper choice of test resistance is important. It is essential that the resistive test load be low-inductance. (Wirewound resistors are not acceptable, unless many are connected together in parallel.) The power dissipated in the resistor is given by

$$P_{AVERAGE} = I^2 \times R \times \frac{PW}{T}, \quad P_{PEAK} = I^2 \times R$$

where “I” is the current, “R” is the resistance, “PW” is the pulse width, and “T” is the pulse period (1/frequency).

The power rating of the resistance should exceed this average power rating by a large margin. Beware that some low-value resistors exhibit a significant temperature-dependence, even when the average power dissipated is below the resistor’s power rating. This is particularly true if the peak power exceeds the resistor’s power rating.

Factory tests are conducted with a 3Ω load capable of dissipating at least 6 W. Higher load resistance values may be used but the output voltage must be limited to 60V or less.

CURRENT MEASUREMENT

Measuring current is more difficult than measuring voltage. Two methods are suggested:

1. Use a high-performance current transformer, such as a Pearson 2878. The output voltage of the transformer is proportional to the sensed current. Note that because of the relatively large size of the 2878, it is necessary to introduce a significant lead length (i.e., inductance) to pass the conductor through the transformer.

2. Use a low-resistance, low-inductance, current-sensing resistor connected in series with the load. To minimize inductance, it is usually wise to connect several resistors in parallel. Beware that wirewound resistors usually have far too much inductance to be useful as current-sensing resistors.

BASIC PULSE CONTROL

This instrument can be triggered by its own internal clock or by an external TTL trigger signal. In either case, two output channels respond to the trigger: OUT and SYNC. The OUT channel is the signal that is applied to the device under test. Its amplitude and pulse width are variable. The SYNC pulse is a fixed-width TTL-level reference pulse used to trigger oscilloscopes or other measurement systems. When the delay is set to a positive value the SYNC pulse precedes the OUT pulse.

These pulses are illustrated below, assuming internal triggering, positive delay, and a positive output:

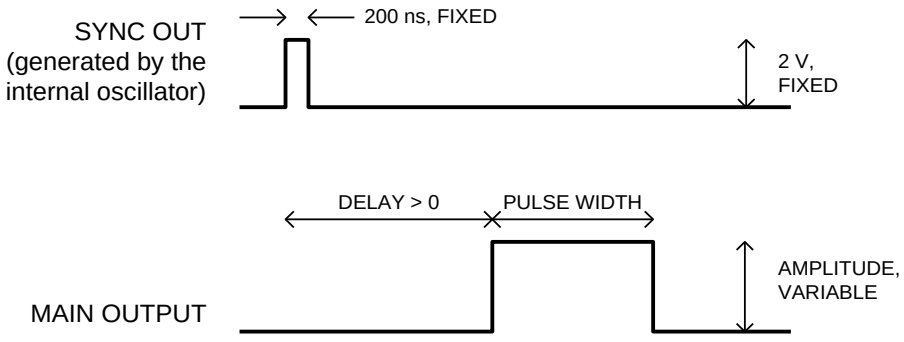


Figure A

If the delay is negative, the order of the SYNC and OUT pulses is reversed:

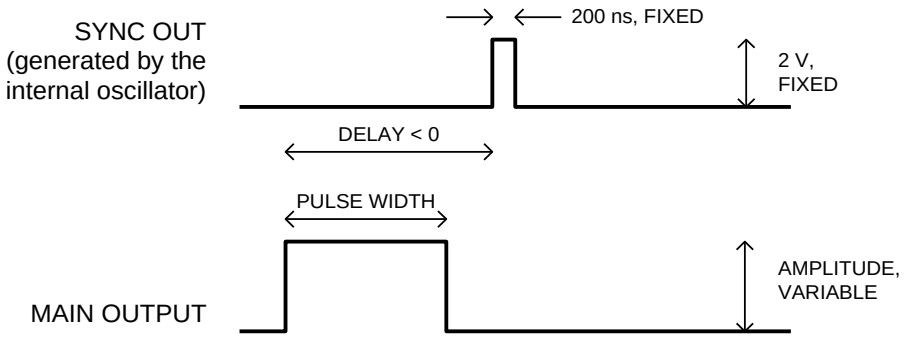


Figure B

The next figure illustrates the relationship between the signal when an external TTL-level trigger is used:

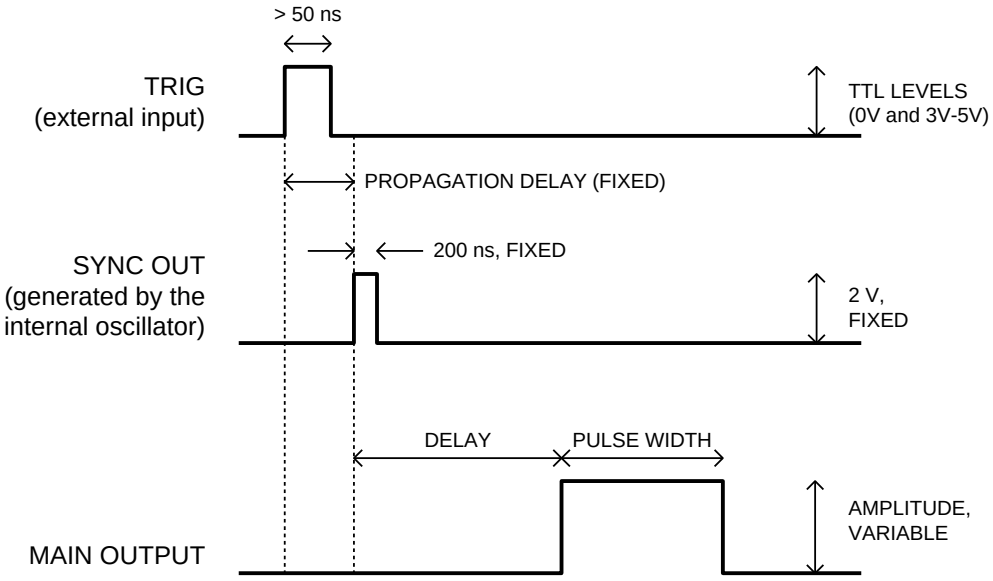


Figure C

As before, if the delay is negative, the order of the SYNC and OUT pulses is reversed.

The delay, pulse width, and frequency (when in the internal mode), of the OUT pulse can be varied with front panel controls or via the GPIB or RS-232 computer interfaces.

TRIGGER MODES

This instrument has four trigger modes:

Internal Trigger: the instrument controls the trigger frequency, and generates the clock internally.

External Trigger: the instrument is triggered by an external TTL-level clock on the back-panel TRIG connector.

Manual Trigger: the instrument is triggered by the front-panel “SINGLE PULSE” pushbutton.

Hold Trigger: the instrument is set to not trigger at all.

These modes can be selected using the front panel trigger menu, or by using the appropriate programming commands. (See the “OP1B Interface Programming Manual” for more details.)

GATING MODES

Triggering can be suppressed by a TTL-level signal on the rear-panel GATE connector. The instrument can be set to stop triggering when this input high or low, using the front-panel gate menu or the appropriate programming commands. This input can also be set to act synchronously or asynchronously. When set to asynchronous mode, the GATE will disable the output immediately. Output pulses may be truncated. When set to synchronous mode, the output will complete the full pulse width if the output is high, and then stop triggering. No pulses are truncated in this mode.

EXTERNAL AMPLITUDE CONTROL

The computer control interface of the AV-107D-B-EA-P-OSRC is sophisticated but slow. For some applications, it may be preferable to control the amplitude of the output using the rear-panel RNG1, RNG2, and AMP connectors.

The output amplitude can be set to track the voltage on the rear-panel “AMP” input. Zero Volts in corresponds to zero amplitude output, and +10V in corresponds to maximum amplitude out (for the range selected by the RNG1 and RNG2 inputs). This mode is activated by selecting "Ext Control" on the front-panel amplitude menu, or with the "source:voltage external" command. The input impedance is greater than 1 kilohm.

The RNG1 and RNG2 TTL-level inputs controls the full-scale range, as follows:

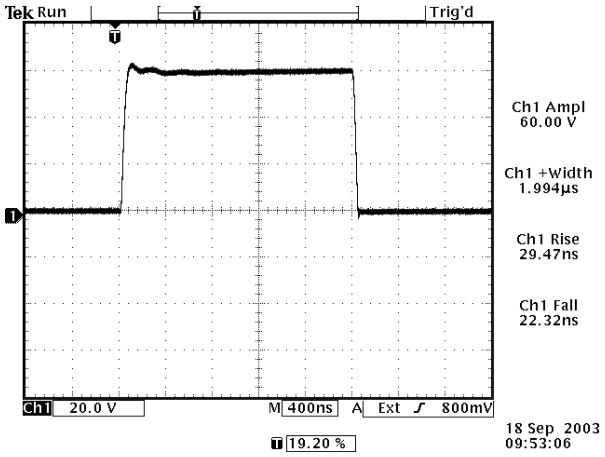
RNG1	RNG2	Amplitude Range
TTL low (0 V), or unconnected	TTL low (0 V), or unconnected	0 – 0.6 Amps, approximately
TTL high (3-5V)	TTL low (0 V), or unconnected	0 – 5 Amps, approximately
TTL low (0 V), or unconnected	TTL high (3-5V)	0 – 20 Amps, approximately

The AMP input has a response time of < 0.5 ms. The RNG1 and RNG2 inputs have response times of < 50 ms.

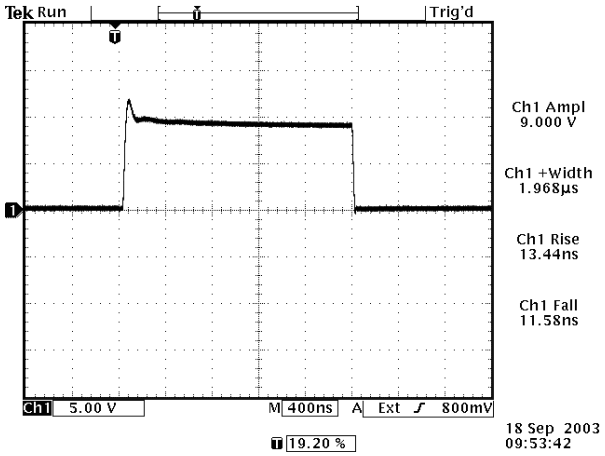
SAMPLE WAVEFORMS

The following waveforms were produced using a 3 Ohm load directly soldered to the output microstrip board.

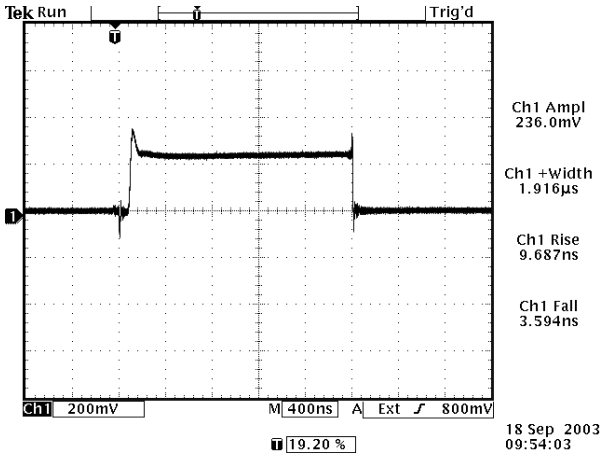
20 Amp pulse:



3 Amp pulse:

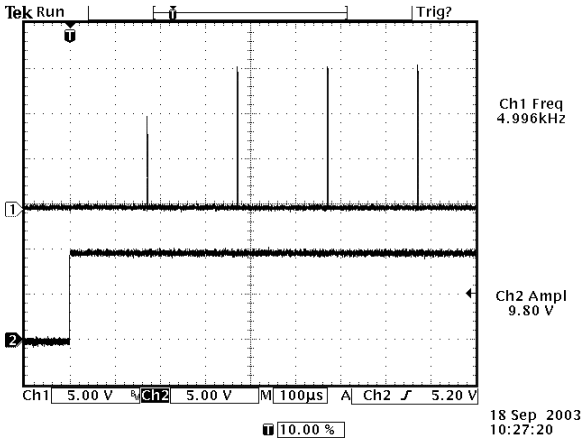


0.08 Amp pulse:



Some peaking may be observed on the leading edge of the pulse. This is normal. However, if it is substantially larger than that shown above, it is most likely caused by excessive parasitic inductance in the load circuit. See the “LENZ’S LAW AND INDUCTIVE VOLTAGE SPIKES” section for details.

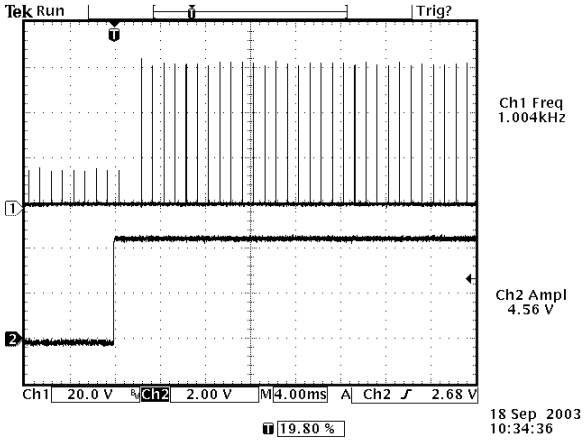
The next photo shows the response of the output amplitude to a step change in the AMP control input, when the amplitude is externally controlled:



Top: 5 kHz, +20A, 1 us, into 3 Ohms.
Bottom: 0 to +10V AMP control voltage input.

This photo shows the < 0.5 ms response time of the AMP input.

The next photo shows the response of the output amplitude to a step change in the RNG inputs, when the amplitude is externally controlled. The RNG2 input goes high, and the RNG1 input goes low:



Top: 5 kHz, +20A, 1 us, into 3 Ohms.
Bottom: RNG2 input.

This photo shows the < 50 ms response time of the RNG input. In fact, the response time is approximately 2 ms.

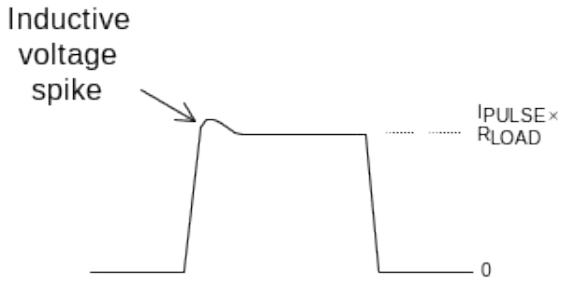
LOAD PROTECTION

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: $V_{SPIKE} = L\frac{dI_{LOAD}}{dt}$.

Some load inductance is unavoidable. As a result, the output voltage waveform (measured across a resistance) will have some distortion on the leading edge, as shown:



Attaching a current transformer (for measuring current waveforms) can add significant inductance, because of the necessary wire length that must be fed through the transformer. (The Pearson 2878 requires approximately 1.5".)

ATTACHING AND DETACHING LOADS

To avoid damaging the loads connected to main outputs, the loads should only be connected to or removed from the instrument when the instrument is off. Do not connect loads when the instrument is on and the output amplitude is not zero. This can cause sparking.

CHANGING PARAMETERS WHEN A LOAD IS ATTACHED

If your load is easily damaged, the amplitude should be reduced to zero before changing the trigger source, frequency, pulse width, or other pulse parameters. This protects the loads from possible short transient effects.

START-UP CHECK-LIST FOR LOCAL CONTROL

1) The instruction manual has been studied thoroughly.

2) The “Local Control” section of the “OP1B Interface Programming Manual” has been studied thoroughly.

3) The output module is connected to the mainframe as shown in the “Basic Test Arrangement” section. (The output module should always be connected to the mainframe BEFORE power is applied.)

4) The load is connected to the output module microstrip output. The center conductor is the output line, and the two outer conductors are connected to ground. For initial testing, it is recommended that a resistive load be used. Factory tests are conducted using a 3 Ohm, 12 Watt resistive load.

5) Attach an oscilloscope probe to the load.

6) Turn on the prime power to the mainframe. The main menu will appear.

7) The arrow pointer should be pointing at the frequency menu item. If it is not, press the MOVE button until it is.

8) Press the CHANGE button. The frequency submenu will appear. Rotate the ADJUST knob until the frequency is set at the desired setting. The arrow pointer should be pointing at the “Internal” choice. If it is not, press MOVE until it is.

9) Press CHANGE to return to the main menu.

10) Press the MOVE button to move the arrow pointer to the pulse width menu item. Press CHANGE to bring up the pulse width submenu, and rotate the ADJUST knob until the pulse width is set at the desired setting. The arrow pointer should be pointing at the “Normal” choice. If it is not, press MOVE until it is. Press CHANGE to return to the main menu.

11) Press the MOVE button to move the arrow pointer is pointing at the output item. Press CHANGE to bring up the output submenu. The arrow pointer should be initially be pointing at the “Output Off” choice. Press MOVE so that the arrow pointer is pointing at the “Output On” choice. (The mainframe is now supplying a trigger to the output module.) Press CHANGE to return to the main menu.

12) Press the MOVE button to move the arrow pointer to the amplitude menu item. Press CHANGE to bring up the amplitude submenu, and rotate the ADJUST knob until the amplitude is set at the desired setting. A rectangular pulse should appear on the scope and the amplitude should increase as the ADJUST knob is rotated.

13) Observe the pulse width and pulse period on the scope and confirm that the peak current does not exceed 20 Amps.

14) Adjust pulse width, pulse period (i.e. PRF) and amplitude to obtain the desired settings.

15) If additional assistance is required:

Tel: (613) 226-5772, Fax: (613) 226-2802
Email: info@avtechpulse.com

PROGRAMMING YOUR PULSE GENERATOR

KEY PROGRAMMING COMMANDS

The “OP1B Interface Programming Manual” describes in detail how to connect the pulse generator to your computer, and the programming commands themselves. A large number of commands are available; however, normally you will only need a few of these. Here is a basic sample sequence of commands that might be sent to the instrument after power-up:

*rst	(resets the instrument)
trigger:source internal	(selects internal triggering)
frequency 10 Hz	(sets the frequency to 10 Hz)
pulse:width 500 ns	(sets the pulse width to 500 ns)
pulse:delay 200 ns	(sets the delay to 200 ns)
output on	(turns on the output)
source:current 17 A	(sets the current amplitude to 17 amperes)

For triggering a single event, this sequence would be more appropriate:

*rst	(resets the instrument)
trigger:source hold	(turns off all triggering)
pulse:width 500 ns	(sets the pulse width to 500 ns)
output on	(turns on the output)
source:current 17 A	(sets the current amplitude to 17 amperes)
trigger:source immediate	(generates a single non-repetitive trigger event)
trigger:source hold	(turns off all triggering)
output off	(turns off the output)

To set the instrument to trigger from an external TTL signal applied to the rear-panel TRIG connector, use:

*rst	(resets the instrument)
trigger:source external	(selects internal triggering)
pulse:width 500 ns	(sets the pulse width to 500 ns)
pulse:delay 200 ns	(sets the delay to 200 ns)
source:current 17 A	(sets the current amplitude to 17 amperes)
output on	(turns on the output)

These commands will satisfy 90% of your programming needs.

ALL PROGRAMMING COMMANDS

For more advanced programmers, a complete list of the available commands is given below. These commands are described in detail in the “OP1B Interface Programming Manual”. (Note: this manual also includes some commands that are not implemented in this instrument. They can be ignored.)

Keyword	Parameter	Notes
DIAGnostic:		
:AMPLitude		
:CALibration:	<numeric value>	[no query form]
LOCAL		
OUTPut:		
:[STATe]	<boolean value>	
:PROTection		
:TRIPped?		[query only]
REMOTE		
[SOURce]:		
:FREQuency		
[:CW | FIXed]	<numeric value>	
[SOURce]:		
:CURRent		
[:LEVel]		
[:IMMediate]		
[:AMPLitude]	<numeric value>	
:PROTection		
:TRIPped?		[query only]
[SOURce]:		
:PULSe		
:PERiod	<numeric value>	
:WIDTh	<numeric value>	
:DCYCle	<numeric value>	
:HOLD	WIDTh | DCYCle	
:DELay	<numeric value>	
:GATE		
:TYPE	ASYNC | SYNC	
:LEVel	HIgh | LOw	
STATUS:		
:OPERation		
:[EVENt]?		[query only, always returns "0"]
:CONDition?		[query only, always returns "0"]
:ENABle	<numeric value>	[implemented but not useful]
:QUEStionable		
:[EVENt]?		[query only, always returns "0"]
:CONDition?		[query only, always returns "0"]
:ENABle	<numeric value>	[implemented but not useful]
SYSTem:		
:COMMunicate		
:GPIB		
:ADDRess	<numeric value>	
:SERial		
:CONTrol		
:RTS	ON | IBFull | RFR	
:[RECeive]		

:BAUD	1200 | 2400 | 4800 | 9600	
:BITS	7 | 8	
:ECHO	<boolean value>	
:PARity		
:[TYPE]	EVEN | ODD | NONE	
:SBITS	1 | 2	
:ERRor		
:[NEXT]?		[query only]
:COUNT?		[query only]
:VERSion?		[query only]
TRIGger:		
:SOURce	INTernal | EXTernal | MANual | HOLD | IMMediate	
*CLS		[no query form]
*ESE	<numeric value>	
*ESR?		[query only]
*IDN?		[query only]
*OPC		
*SAV	0 | 1 | 2 | 3	[no query form]
*RCL	0 | 1 | 2 | 3	[no query form]
*RST		[no query form]
*SRE	<numeric value>	
*STB?		[query only]
*TST?		[query only]
*WAI		[no query form]

MECHANICAL INFORMATION

TOP COVER REMOVAL

If necessary, 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).

Always disconnect the power cord before opening the instrument.

There are no user-adjustable internal circuits. For repairs other than fuse replacement, please contact Avtech (info@avtechpulse.com) to arrange for the instrument to be returned to the factory for repair.

⚠ Caution: High voltages are present inside the instrument during normal operation. Do not operate the instrument with the cover removed.

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 coaxial terminators or with shielded coaxial dust caps, to prevent unintentional electromagnetic radiation. All cords and cables should be less than 3m in length.

MAINTENANCE

REGULAR MAINTENANCE

This instrument does not require any regular maintenance.

On occasion, one or more of the four rear-panel fuses may require replacement. All fuses can be accessed from the rear panel. See the “FUSES” section for details.

CLEANING

If desired, the interior of the instrument may be cleaned using compressed air to dislodge any accumulated dust. (See the “TOP COVER REMOVAL” section for instructions on accessing the interior.) No other cleaning is recommended.

PERFORMANCE CHECK SHEET