



**AVTECH ELECTROSYSTEMS LTD.**

NANOSECOND WAVEFORM ELECTRONICS  
SINCE 1975

□ P.O. BOX 265  
OGDENSBURG, NY  
U.S.A. 13669-0265  
TEL: (315) 472-5270  
FAX: (613) 226-2802

TEL: 1-800-265-6681  
FAX: 1-800-561-1970

e-mail: [info@avtechpulse.com](mailto:info@avtechpulse.com)  
<http://www.avtechpulse.com>

□ P.O. BOX 5120 STN. F  
OTTAWA, ONTARIO  
CANADA K2C 3H4  
TEL: (613) 226-5772  
FAX: (613) 226-2802

## INSTRUCTIONS

**MODEL AV-107C-C PULSE GENERATOR**

**S.N.:**

### 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

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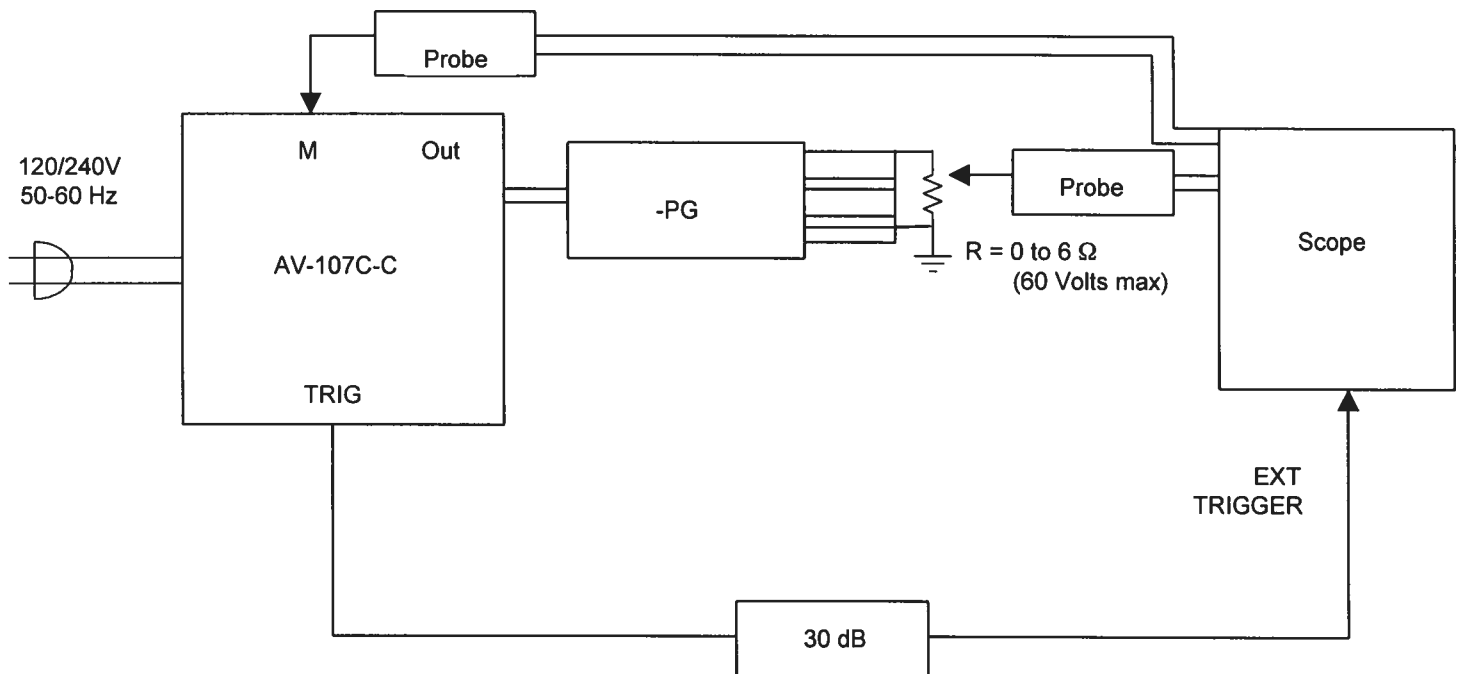
Fax: 613-226-2802 or 1-800-561-1970

E-mail: [info@avtechpulse.com](mailto:info@avtechpulse.com)

World Wide Web: <http://www.avtechpulse.com>

## TABLE OF CONTENTS

WARRANTY.....	2
TABLE OF CONTENTS .....	3
FIG. 1 : PULSE GENERATOR TEST ARRANGEMENT.....	4
GENERAL OPERATING INSTRUCTIONS .....	5
FIG. 2: FRONT PANEL CONTROLS .....	9
FRONT PANEL CONTROLS .....	10
FIG. 3: BACK PANEL CONTROLS.....	12
BACK PANEL CONTROLS.....	13
SYSTEM DESCRIPTION AND REPAIR PROCEDURE .....	14
POWER SUPPLY AND FUSE REPLACEMENT.....	16
PERFORMANCE CHECK SHEET .....	18

**FIG. 1 : PULSE GENERATOR TEST ARRANGEMENT**

## GENERAL OPERATING INSTRUCTIONS

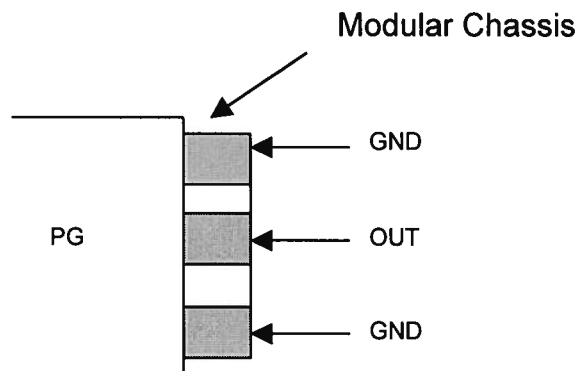
- 1) The equipment should be connected in the general fashion shown above. Since the unit provides an output pulse rise time as low as 20 ns a fast oscilloscope (at least 50 MHz and preferably 200 MHz) should be used to display the waveform.
- 2) The -PG output module must be connected to the rear panel RS-232 D style connector. Note that the black RG174 50 Ohm cable must be connectd to the rear panel HV SMA connector. CAUTION: 120 VDC is supplied to the black cable.
- 3) The TRIG output channel provides TTL level signals. To avoid overdriving the TRIG input channel of some scopes, a 30 dB attenuator should be placed at the input to the scope trigger channel. The TRIG output precedes the main output when the front panel ADVANCE-DELAY switch is in the ADVANCE position. The TRIG output lags the main output when the switch is in the DELAY position.
- 4) To obtain a stable output display the PRF control on the front panel should be set mid-range. The front panel TRIG toggle switch should be in the INT position. The front panel DELAY control and the scope triggering controls are then adjusted to obtain a stable output. The scope may then be used to set the desired PRF by rotating the PRF control and by the PRF RANGE switch.
- 5) The output pulse width is controlled by means of the front panel PW control. To voltage control the output pulse width, set the rear panel switch in the EXT position and apply 0 to +10V to the A BNC connector ( $R_{IN} \geq 10K$ ). (option).

- 6) The output pulse amplitude is controlled by means of the front panel AMP control in two ranges, as follows:

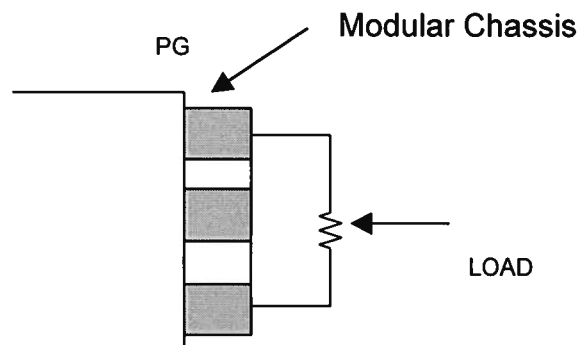
0 to 1.0 Amp  
0 to 10.0 Amp

To voltage control the output amplitude, set the rear panel switch in the EXT position and apply 0 to +10V between terminal A and ground ( $R_{IN} \geq 10K$ ). (option).

- 7) An external clock may be used to control the output PRF of the unit by setting the front panel INT-EXT-MAN toggle switch in the EXT position and applying a 50 ns (or wider) TTL level pulse to the TRIG BNC connector input.
- 8) For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.
- 9) The output terminals of the pulse generator module consists of a short length of microstrip transmission line protruding from the module chassis. The OUT terminal is the center conductor which is bounded on both sides by the ground plane (see below):



The load should be connected between the OUT and GND terminals using very short leads ( $\leq 0.5$  cm).



Take care to insure that during soldering the OUT conductor is not shorted to the chassis. Also, use minimal heat when soldering.

- 9A) **CAUTION:** When driving fragile loads (such as laser diodes) it is recommended that a clip on short circuit be placed across the diode before turning on or turning off the prime power. The amplitude control should be set fully CCW when the shorting circuit is in position (or when turning on or turning off the prime power).
- 10) **M Option.** The SMA output port (M) on the PG module provides a replica of the output current pulse. The output pulse load current (Amps) and the M output voltage (Volts) are related as follows:

$$I_{LOAD} = V_M$$

For example, for a  $V_M$  output of 5V, the load current would be 5 Amperes. Note that the calibration of the M outputs is valid only when terminated into a high impedance ( $R_L \geq 1K$ ).

- 11) **CAUTION:** The AV-107B-C unit is designed to provide 0 to 10 Ampere pulses to a load voltage in the range of 0 to 60 Volts. Insure that the load can dissipate up to 600 Watts peak power.
- 12) **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), 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:
- 1) Reducing PRF (i.e. switch to a lower range)
  - 2) Reducing pulse width (i.e. switch to a lower range)
  - 3) Reducing the output amplitude (i.e. switch to a lower range)

The overload light may illuminate when the prime power is first applied. The light will extinguish after a few seconds and the unit will then operate normally.

Note that the output stage will safely withstand a short-circuited load condition.

- 13) The unit can be converted from 120 to 240V 50-60 Hz operation by adjusting the voltage selector card in the rear panel fused voltage selector cable connector assembly.

14) For additional assistance:

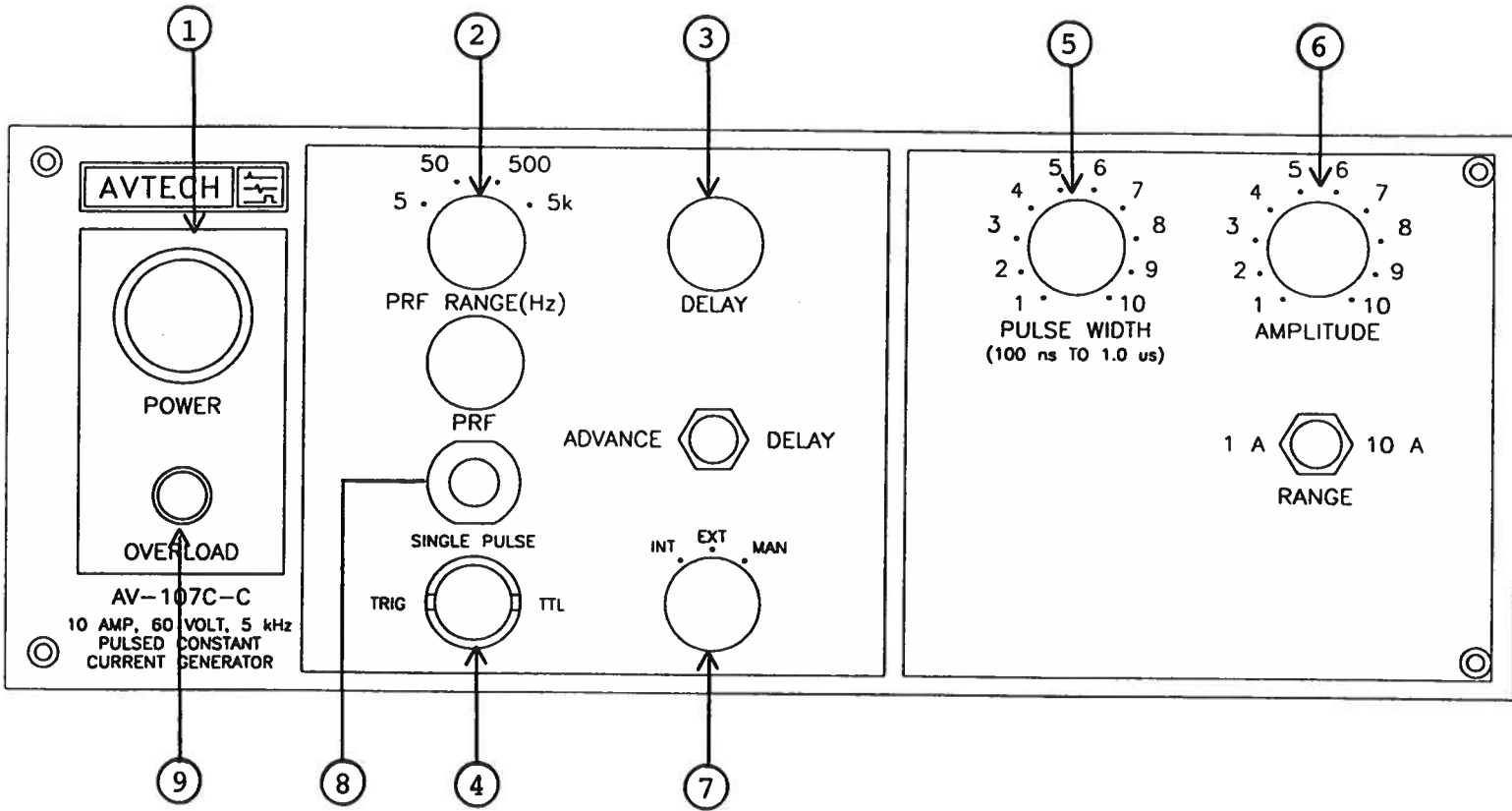
Tel: (613) 226-5772

Fax: (613) 226-2802

Email: [info@avtecpulse.com](mailto:info@avtecpulse.com)



FIG. 2: FRONT PANEL CONTROLS



## FRONT PANEL CONTROLS

- 1) **ON-OFF Switch.** Applies basic prime power to all stages.
- 2) **PRF Control.** Varies PRF from .5 Hz to 5 kHz as follows:

Range 1	0.5 Hz to	5 Hz
Range 2	5 Hz to	50 Hz
Range 3	5 Hz to	500 kHz
Range 4	500 Hz to	5 kHz
- 3) **DELAY Control.** Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (5). This delay is variable over the range of 0 to about 1.0  $\mu$ s. 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 Output.** This output precedes the main output and is used to trigger the scope time base. The output is a TTL level 100 ns (approx.) pulse capable of driving a fifty Ohm load. The external trigger signal is applied at this input when the EXT toggle switch is in the EXT position. The output pulse appears about 100 ns after the application of the TRIG pulse.
- 5) **PW Control.** One turn control which varies the output pulse width from 100 ns to 10  $\mu$ s.
- 6) **AMP Control.** The output pulse amplitude is controlled by means of the one turn potentiometer and the two-position range switch as follows:

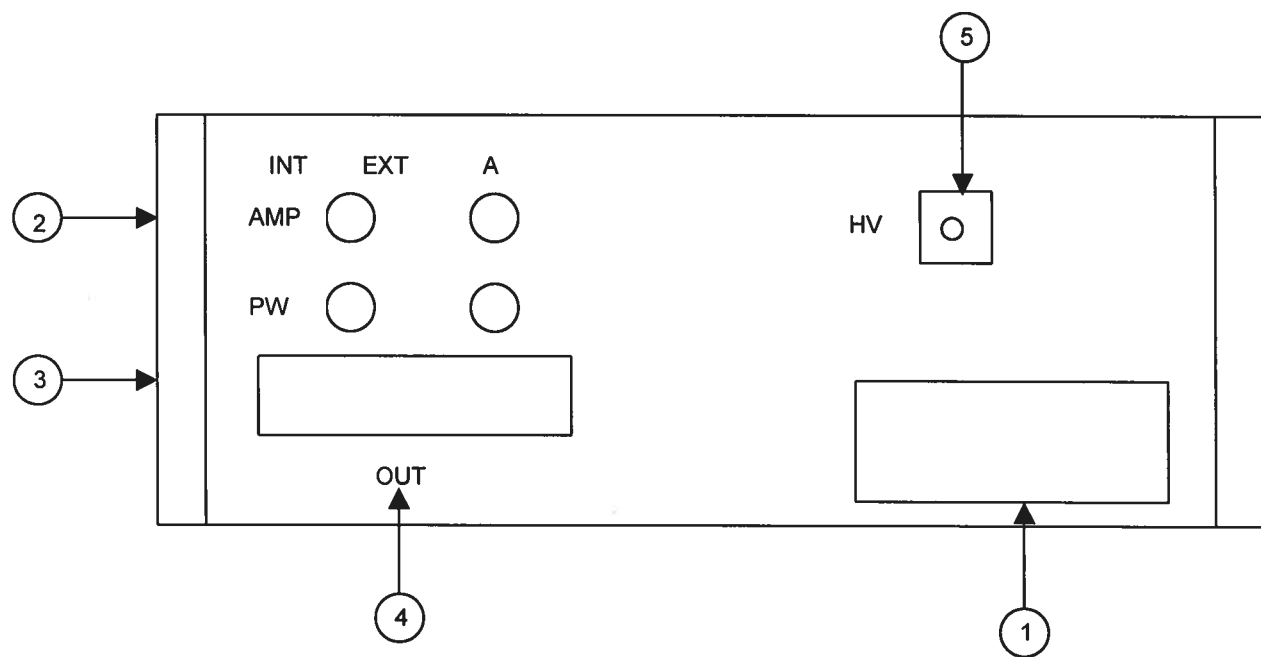
0 to	1.0 Amp
0 to	10.0 Amp
- 7) **EXT-INT-MAN Control.** With this toggle switch in the INT position, the PRF of the unit is controlled via an internal clock, which, in turn, is controlled by the PRF control. With the toggle switch in the EXT position, the unit requires a 50 ns (or wider) TTL level pulse applied at the TRIG input in order to trigger the output stages. In addition, in this mode, the scope time base must be triggered by the external trigger source. For single pulse operation, set the INT-EXT-MAN switch in the MAN position.
- 8) **SINGLE PULSE.** For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.

9) **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), 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:

- 1) Reducing PRF (i.e. switch to a lower range)
- 2) Reducing pulse width (i.e. switch to a lower range)
- 3) Reducing the output amplitude (i.e. switch to a lower range)

The overload light may illuminate when the prime power is first applied. The light will extinguish after a few seconds and the unit will then operate normally.

Note that the output stage will safely withstand a short-circuited load condition.

**FIG. 3: BACK PANEL CONTROLS**

### BACK PANEL CONTROLS

- 1) FUSED CONNECTOR, VOLTAGE SELECTOR. The detachable power cord is connected at this point. In addition, the removable cord is adjusted to select the desired input operating voltage. The unit also contains the main power fuse (0.5 A SB).
- 2) EA. To voltage control the output amplitude, set the switch in the EXT position and apply 0 to +10 Volts to the A BNC connector ( $R_{IN} \geq 10K$ ). (option).
- 3) EW. To voltage control the output pulse width, set the switch in the EXT position and apply 0 to +10 Volts to the A BNC connector ( $R_{IN} \geq 10K$ ). (option).
- 4) OUT D CONNECTOR. The gray cable from the -PG module connects to this connector.
- 5) HV. The black RG174 cable from the -PG module connects to this point.

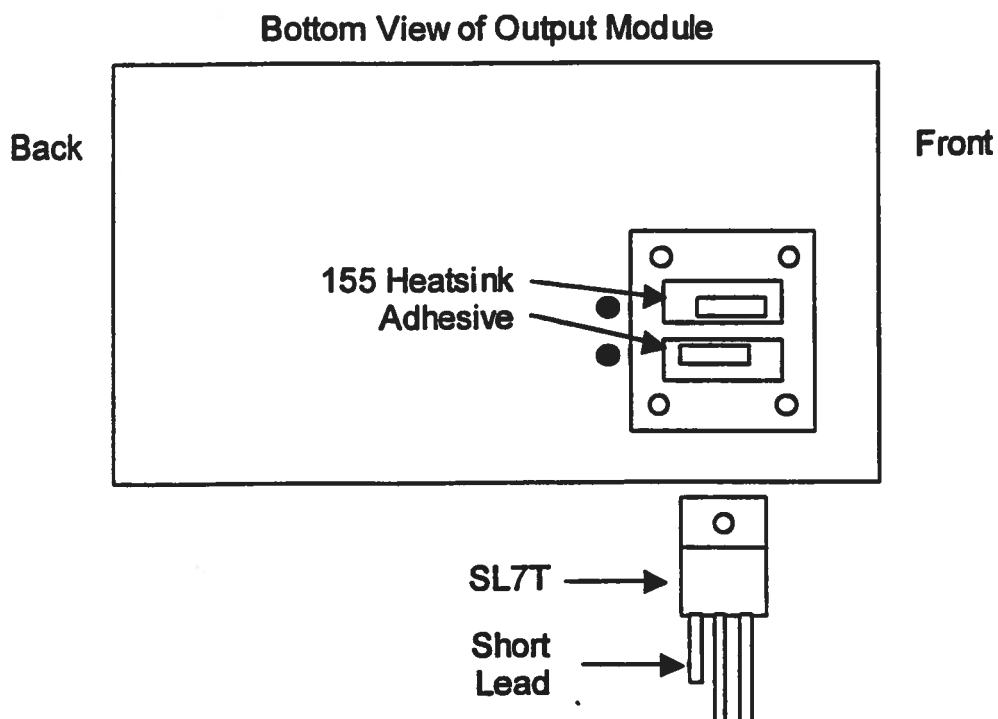
## SYSTEM DESCRIPTION AND REPAIR PROCEDURE

In the event of an instrument malfunction, it is most likely that the DC 1.0 A slow blow fuse or the main power fuse (0.5 A) on the rear panel has failed. Replace if necessary.

If the unit still does not function, it is most likely that some of the output switching elements (SL7T) may have failed due to an output short circuit condition or to a high duty cycle condition. The switching elements may be accessed by removing the cover plate on the bottom side of the output module. The cover plate is removed by removing the four countersunk 6-32 Phillips screws.

*NOTE: First turn off the prime power. Briefly ground the SL7T tabs to discharge the 100 Volts power supply potential.*

The elements may be removed from their sockets by means of a needle nosed pliers after removing the four counter sunk 2-56 Phillips screws which attach the small copper heat sink to the body of the output module. The SL7T is a selected VMOS power transistor in a TO-220 package and may be checked on a curve tracer. If defective, replacement units should be ordered directly from Avtech. When replacing the SL7T switching elements, take care to ensure that the short lead (of the three leads) is adjacent to the black dots towards the back of the chassis. (See the following illustration). The SL7T elements are electrically isolated from the small copper heat sink but are bonded to the heat sink using Wakefield Type 155 Heat Sink Adhesive.

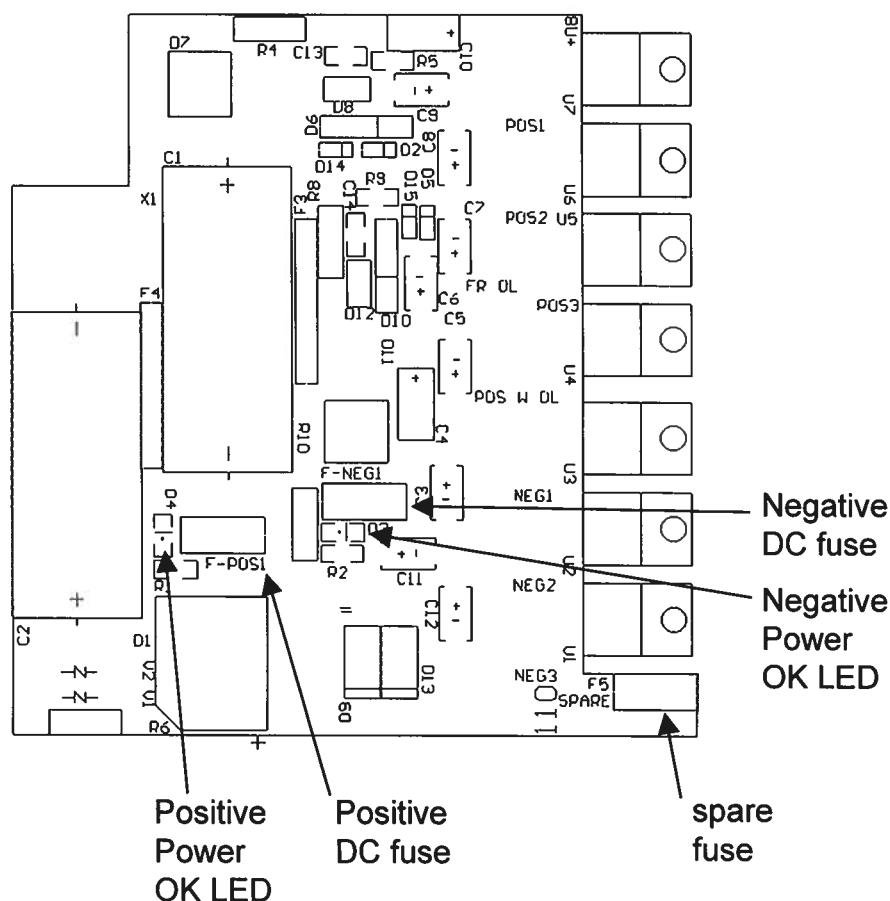


If the switching elements are not defective, then the mainframe timing signal should be checked for proper operation. To do this, disconnect the output module from the mainframe (i.e. both the 25-pin cable and the HV cable). Observe the signal on pin 4 of the 25-pin OUT connector on the rear panel, when in the "Output On" state. This line is the TTL-level (i.e. 0 and +3V) trigger signal for the output module. A signal should be present on this line exactly equal in frequency, and approximately equal in pulse width, to the set values on the front panel. The mainframe and output module should be returned to Avtech if these conditions are not observed

## POWER SUPPLY AND FUSE REPLACEMENT

This instrument has three fuses (plus one spare). 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 one spare) are located on the internal DC power supply, as shown below:



The positive fuse and the spare fuse on this circuit board are 1A slow-blow fuses, Littlefuse part number R452001. (This fuse can be ordered from Digikey, [www.digikey.com](http://www.digikey.com). The Digikey part number is F1343CT-ND). The negative fuse is a 0.5A slow-blow fuse (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.

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