



**AVTECH ELECTROSYSTEMS LTD.**

NANOSECOND WAVEFORM ELECTRONICS  
SINCE 1975

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INSTRUCTIONS

MODEL AVM-1-C-P-TOSB  
0 TO +10 V, 10 MHz  
DUAL-CHANNEL PULSE GENERATOR  
&  
MODEL AVM-1-C-P-TOSC  
PULSE COMBINER

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

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## INTRODUCTION

The Avtech AVM-1-C-P-TOSB is a special-purpose high-speed dual-channel pulse generator, capable of generating pulses with amplitudes to +10V, with pulse width from 0.5 to 5.0 ns, at repetition rates to 10 MHz. The relative delay of the two outputs may be adjusted by  $\pm 20$ ns. The supplied AVM-1-C-P-TOSB power combiner accessory may be used to combine the two outputs to generate a double-pulse waveform.

## ORIGINAL QUOTATION & SPECIFICATIONS

To: Dr. Zhiliang Yuan  
Toshiba Research Europe Limited  
Cambridge Research Laboratory  
260 Science Park  
Cambridge CB4 0WE  
Tel: 01223 436936  
Fax: 01223 436909  
zhiliang.yuan@crl.toshiba.co.uk

Zhiliang,

following our telephone conversations, I am pleased to quote as follows for a dual-channel pulse generator and a high performance power combiner:

Quote number: 10852A

Model number: AVM-1-C-P-TOSB

Description: dual-channel pulse generator

Pulse repetition frequency: 3 kHz to 10 MHz (internal trigger)  
0 to 10 MHz (external trigger)

Trigger source: internal oscillator, or external TTL signal. Both channels share a common trigger.

Amplitude: 0 to +10V, into a 50 Ohm load. Independent control of amplitude on both channels.

Pulse width: 0.5 to 5.0 ns. Independent control of pulse width on both channels.

Rise time: < 100 ps, 20%-80% (when used alone)  
< 130 ps, 20%-80% (when used with AVM-1-C-P-TOSC)

Fall time: < 200 ps, 20%-80% (when used alone)  
< 250 ps, 20%-80% (when used with AVM-1-C-P-TOSC)

Delay: Each channel may be delayed over a 20 ns range, with an independent one-turn control for each channel.

Dimensions: 100 mm x 430 mm x 375 mm (3.9" x 17" x 14.8")

Connectors: SMA

Power: 120/240 Volts (switchable) 50 - 60 Hz

Price: \$4998, US Funds. Ex-works Ottawa, Canada.

Delivery: 60-75 days after receipt of order.

Quote number: 10852B

Model number: AVM-1-C-P-TOSC

Description: A high performance pulse combiner compatible with the AVM-1-C-P-TOSB. To maintain proper operation, the two delay controls of the AVM-1-C-P-TOSB must be set such that the leading edge of the second pulse is 5-20 ns after the falling edge of the first pulse.

Dimensions: 22 mm x 38 mm x 29 mm (0.9" x 1.5" x 1.1")

Connectors: SMA

Price: \$4836, US Funds. Ex-works Ottawa, Canada.

Delivery: 60-75 days after receipt of order.

The prices quoted above assume that both items are ordered at the same time. Prices will be higher if ordered separately. For prepaid shipping via FedEx, add \$220.

Please call or email me if I can be of further assistance.

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

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

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Nanosecond Waveform Generators  
for general purpose, R&D and OEM applications

Pulse Generators - Laser Diode Drivers - Pulse Amplifiers  
Impulse Generators - Delay Generators - Comb Generators - Splitters  
Function Generators - Monocycle Generators - Frequency Dividers + more!

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## INSTALLATION

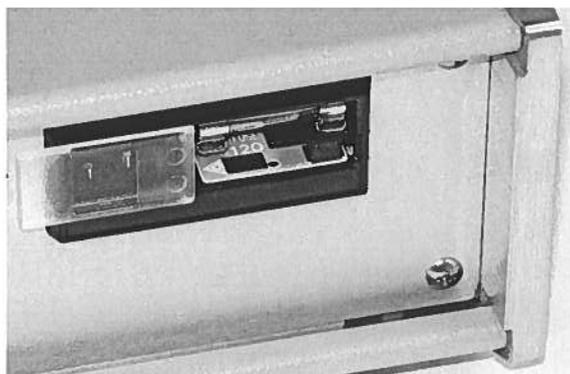
### VISUAL CHECK

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.

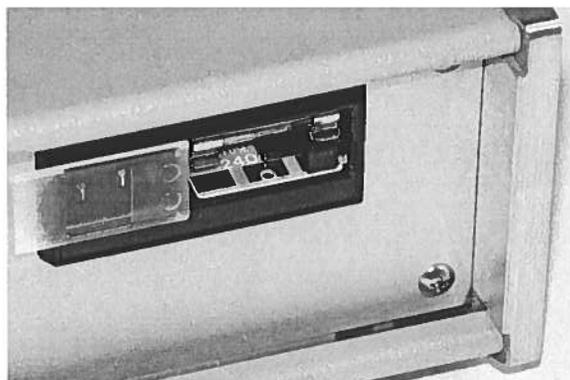
### PLUGGING IN THE INSTRUMENT

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:

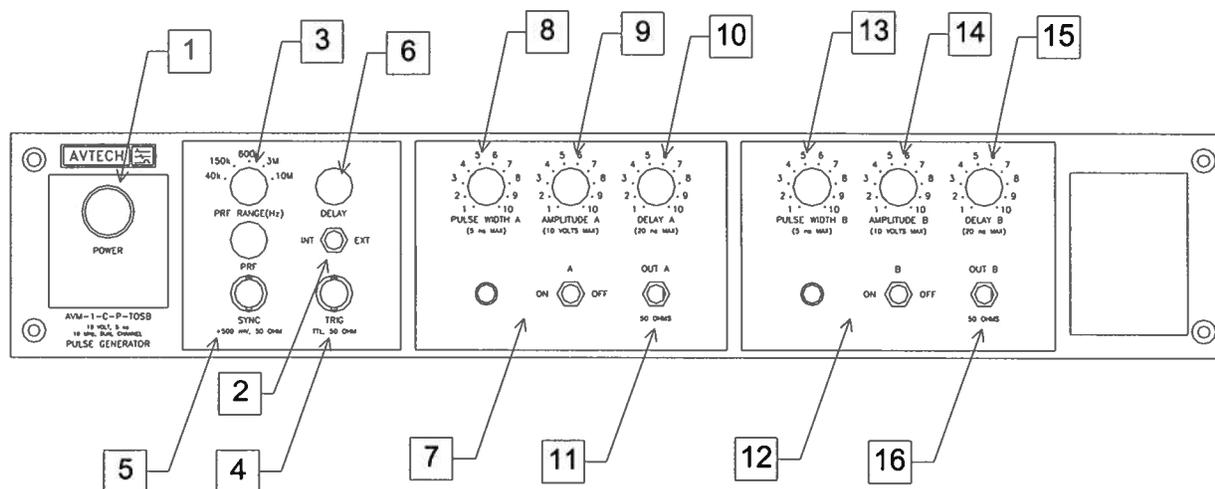




If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

In the 120V setting, a 1.0A slow blow fuse is required. In the 240V setting, a 0.5A slow blow fuse is required.

## FRONT PANEL CONTROLS

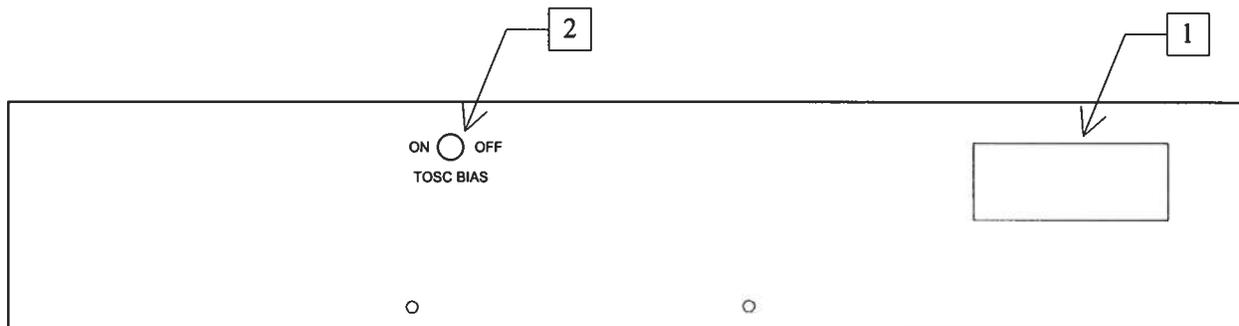


1. **POWER Switch.** The POWER push button switch applies AC prime power to the primaries of the transformer, turning the instrument on. The push button lamp (#382 type) is connected to the internal +15V DC supply.
2. **INT/EXT Switch.** In the "INT" position the instrument is internally triggered and the "SYNC OUT" connector provides a SYNC output which allows one to trigger other instruments, such as oscilloscopes. In the "EXT" position the instrument is triggered by a +5 Volt 10 ns (or wider) input pulse on the "TRIG" connector.
3. **REPETITION RATE Controls.** The rotary switch marked "RANGE" selects the pulse repetition rate for the internally triggered mode. The vernier (labelled "FINE") provides continuously variable control of each range. There are five ranges and the instrument is set to the rate indicated on the front panel when the vernier is in the clockwise position.
4. **TRIG Connector.** When the INT/EXT switch (item 2) is set to the "EXT" position, a TTL-level pulse ( $> 10$  ns) applied to this input will trigger the instrument. The instrument triggers on the rising edge of this input. The input impedance of this input is  $50 \Omega$ .
5. **SYNC OUT Connector.** This output generates a 20 ns wide, +500 mV pulse for each internal trigger event. This output can be used to trigger an oscilloscope, or other test equipment.
6. **DELAY Control.** This one-turn knob controls the separation between the main output and the SYNC OUT output (item 5). This delay, of 0-85 ns approximately, is

common to both outputs.

7. "A" On/Off Switch. This switch enables/disables the "A" output. The indicator light to the left of the switch is illuminated when this switch is in the "ON" position.
8. Pulse Width A. This one-turn knob varies the "A" output pulse width from 0.5 to 5 ns.
9. Amplitude A. This one-turn knob varies the "A" output amplitude from 0 to +10V.
10. Delay A. This one-turn knob varies the delay of "A" output pulse over a 0 to 20 ns range.
11. OUT A Connector. This is the "A" output. A 50 Ohm load is required. Alternatively, this output may be connected to one of the two inputs of the AVM-1-C-P-TOSC power combiner. (The output of the AVM-1-C-P-TOSC power combiner requires a 50 Ohm load.)
12. "B" On/Off Switch. This switch enables/disables the "B" output. The indicator light to the left of the switch is illuminated when this switch is in the "ON" position.
13. Pulse Width B. This one-turn knob varies the "B" output pulse width from 0.5 to 5 ns.
14. Amplitude B. This one-turn knob varies the "B" output amplitude from 0 to +10V.
15. Delay B. This one-turn knob varies the delay of "B" output pulse over a 0 to 20 ns range.
16. OUT B Connector. This is the "B" output. A 50 Ohm load is required. Alternatively, this output may be connected to one of the two inputs of the AVM-1-C-P-TOSC power combiner. (The output of the AVM-1-C-P-TOSC power combiner requires a 50 Ohm load.)

## REAR PANEL CONTROLS



1. **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 1.0A slow blow fuse is required. In the 240V setting, a 0.5A slow blow fuse is required. See the "Installation" section for more details.

2. **TOSC BIAS.** The AVM-1-C-P-TOSC power combiner requires a small DC bias on the OUT A and OUT B outputs. (This bias does not appear on the output of the power combiner). This bias is supplied when this switch is set to "ON". The switch should be set to "OFF" if the power combiner is not used.

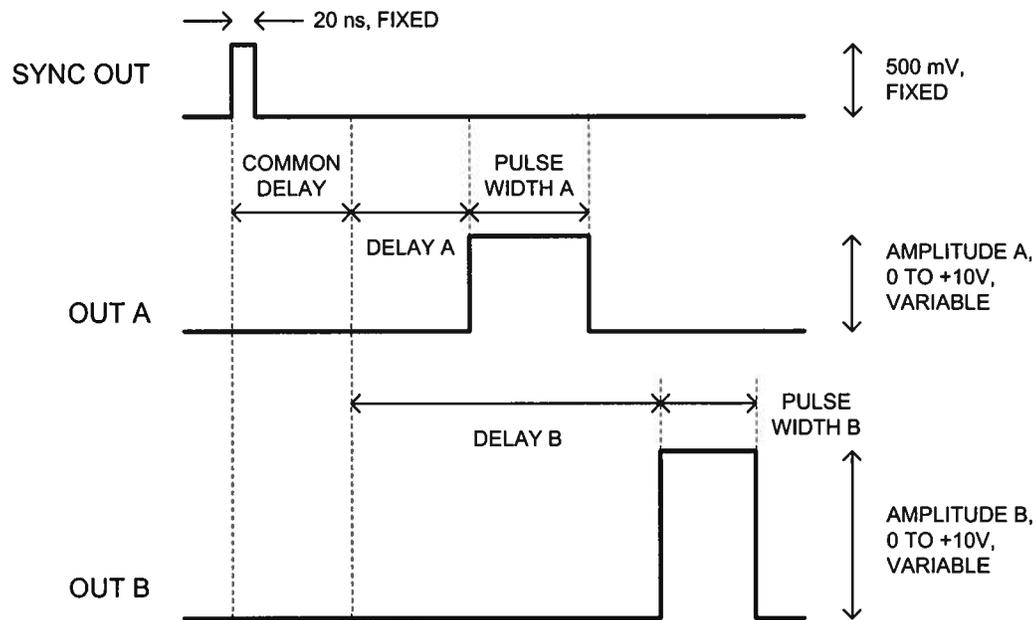
## GENERAL INFORMATION

### BASIC PULSE CONTROL

The AVM-1-C-P-TOSA pulse generator can be used with or without the supplied AVM-1-C-P-TOSB power combiner.

### OPERATION WITHOUT THE POWER COMBINER

In this mode, each of the outputs drives a separate 50 Ohm load. A SYNC pulse and two main output pulses are generated for each trigger event (when triggered internally), as shown below:

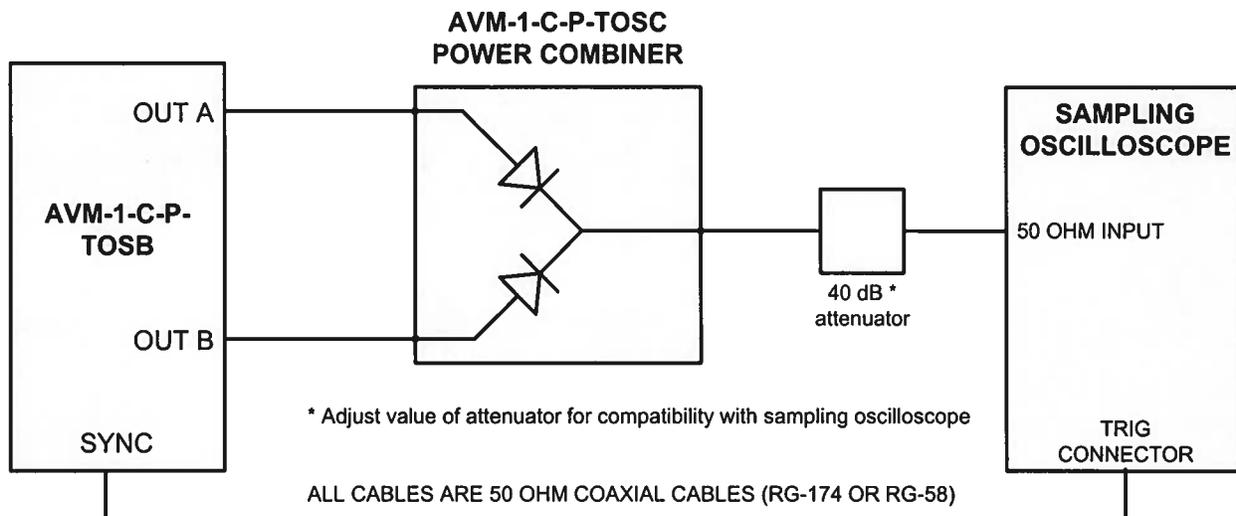


The pulse width, amplitude, and delay of each channel are independently variable. A variable common delay is also present. When triggered externally, the operation is similar, except that no SYNC pulse is generated.

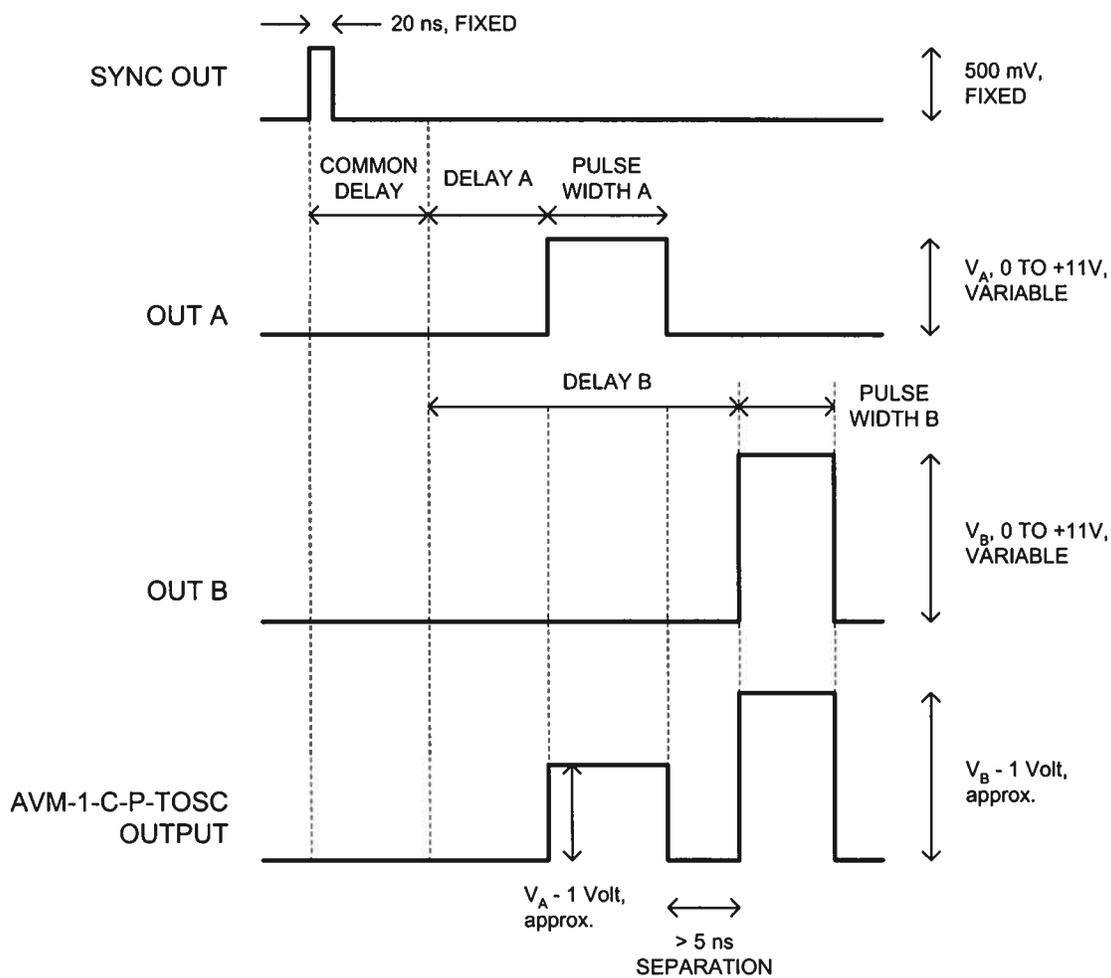
The rear-panel TOSC BIAS switch should be set to "OFF" when the AVM-1-C-P-TOSC power combiner is not used.

### OPERATION WITH THE POWER COMBINER

When using the supplied AVM-1-C-P-TOSB power combiner, the instrument should be connected as shown below:



In this mode, the AVM-1-C-P-TOSC combines the OUT A and OUT B signals into a composite output, as shown below.



For proper operation, the two delay controls of the AVM-1-C-P-TOSB must be set such that the leading edge of the second pulse is 5-20 ns after the falling edge of the first pulse.

The power combiner will cause a voltage drop of 1 Volt in amplitude, approximately. It will also cause some rise and fall time degradation.

The rear-panel TOSC BIAS switch should be set to "ON" when the AVM-1-C-P-TOSC power combiner is used.

### OTHER NOTES

The amplitude and pulse width controls interact. When adjusting one, it may be necessary to adjust the other.

The bandwidth capability of components and instruments used to display the pulse generator output signals (attenuators, cables, connectors, etc.) should exceed 10 GHz.

The AVM-1-C-P-TOSB may fail if triggered at a PRF greater than 10 MHz.

The AVM-1-C-P-TOSB can withstand an infinite VSWR on the output port.

### 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.

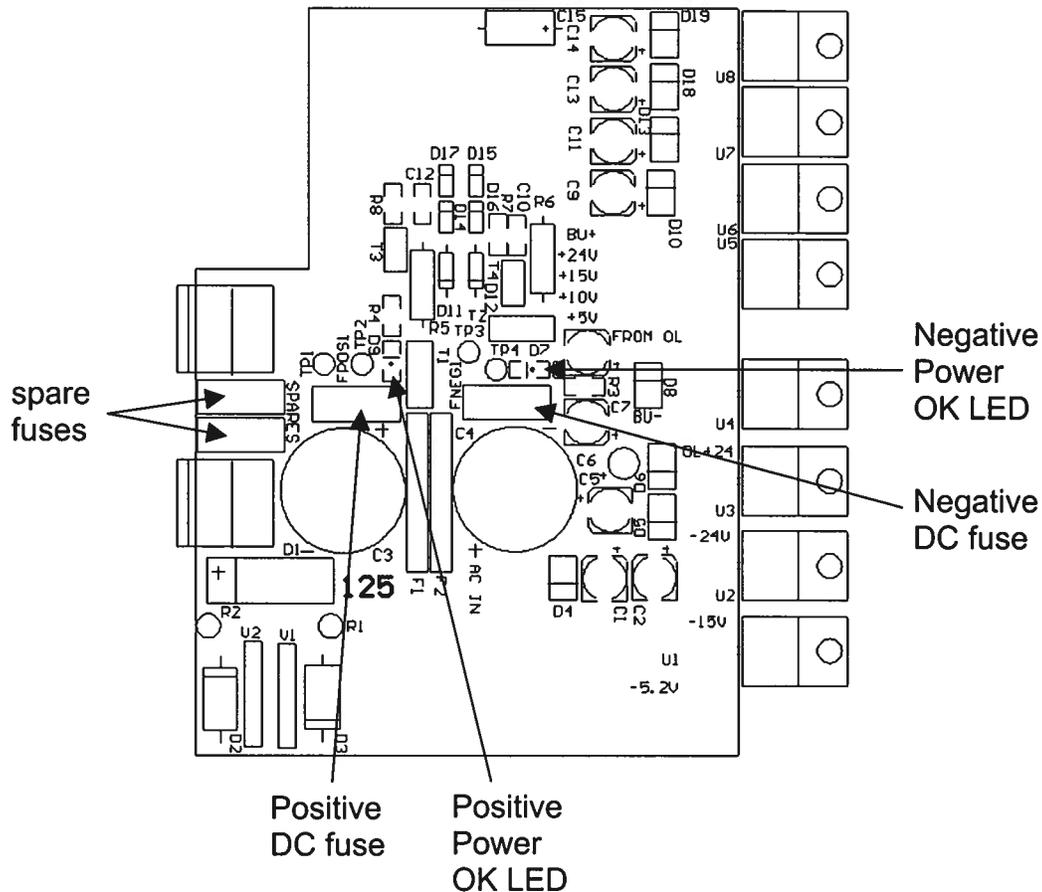
### ELECTROMAGNETIC INTERFERENCE

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 four fuses on this circuit board are 1.0A 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).

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. (Two spare 1.0 Amp fuses are provided on the circuit board. They may be transferred to the active fuse locations using needle-nose pliers.)

Apr 12, 2002