

# AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS  
ENGINEERING - MANUFACTURING

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## INSTRUCTIONS

MODEL AVO-7C-C PULSE GENERATOR

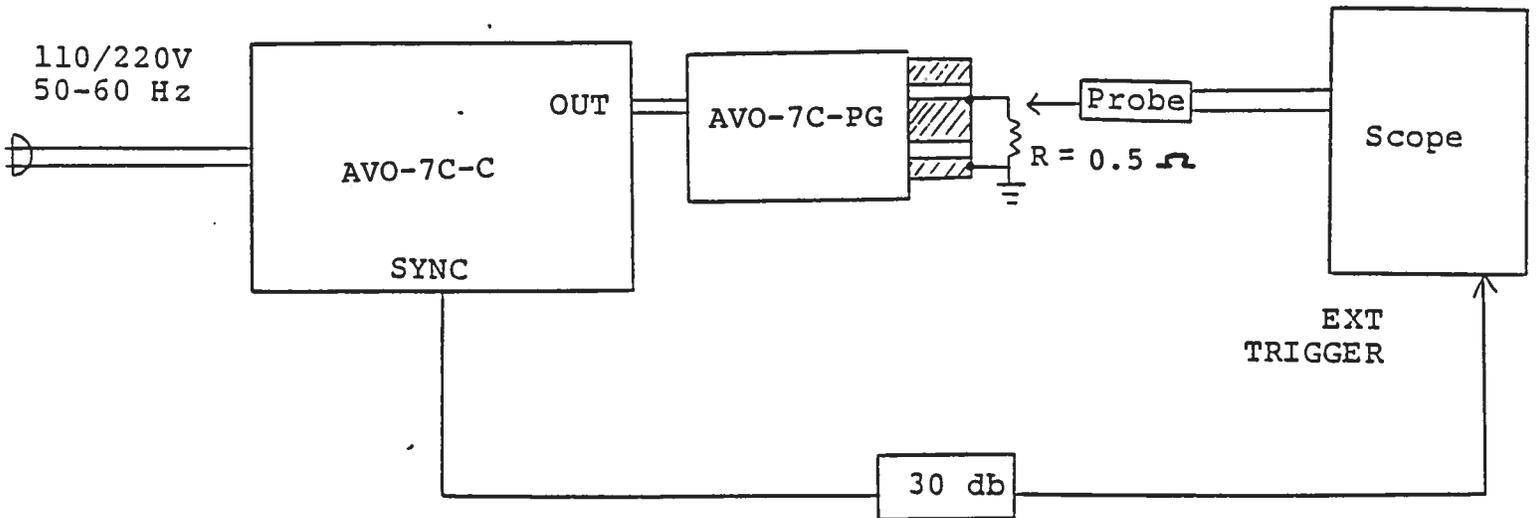
S.N. :

### 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 or liability assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

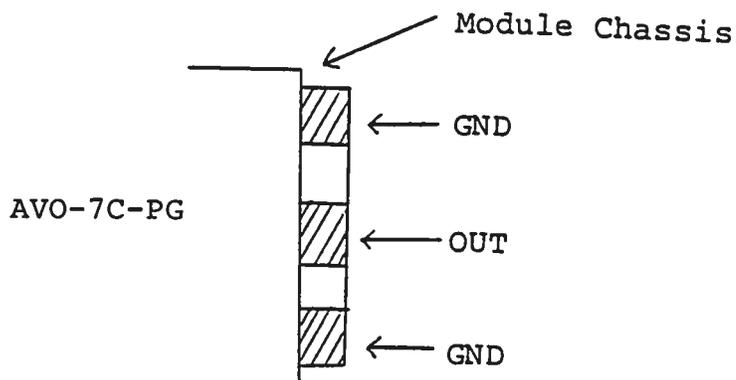
Fig. 1

PULSE GENERATOR TEST ARRANGEMENT

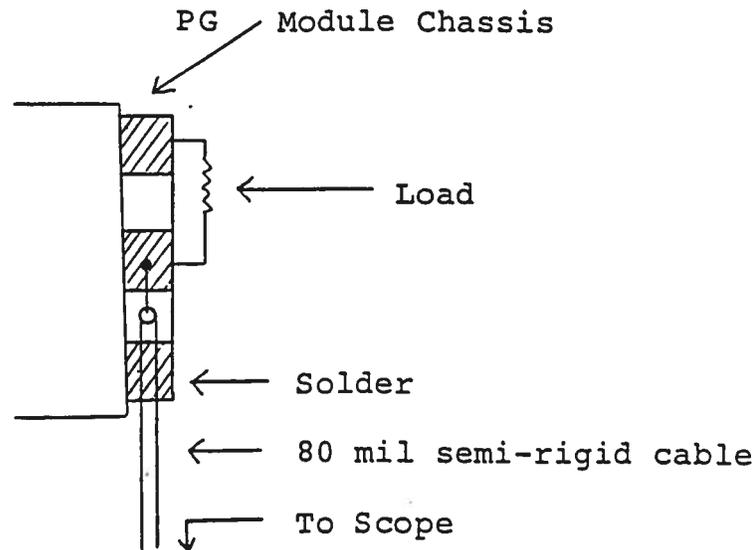


## GENERAL OPERATING INSTRUCTIONS

- 1) The equipment should be connected in the general fashion shown above. Since the AVO unit provides an output pulse rise time as low as 100 nsec a fast oscilloscope (at least 50 MHz and preferably 200 MHz) should be used to display the waveform.
- 2) The sync output channel provides TTL level signals. To avoid overdriving the TRIG input channel of some sampling scopes, a 30 db attenuator should be placed at the input to the sampling scope trigger channel.
- 3) To obtain a stable output display the PRF and PRF FINE controls 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 and PRF FINE controls. The main output is delayed with respect to the SYNC output by about 0 to 1 usec depending on the DELAY control setting.
- 4) 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 ( $\ll 0.5$  cm). The voltage across the load may be monitored by connecting a length of 80 mil semi-rigid 50 ohm cable as shown below (or by means of a high impedance scope probe):



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

- 5) To voltage control the output pulse width, remove the jumper wire between banana plugs A and B on the back panel and apply 0 to +10V to connector B ( $R_{IN} \gg 10K$ ). (option).
- 6) To voltage control the output amplitude, remove the jumper wire between banana plugs A and B on the back panel and apply 0 to +10V to connector B ( $R_{IN} \gg 10K$ ). (option).
- 7) An external clock may be used to control the output PRF of the unit by setting the front panel TRIG toggle switch in the EXT position and applying a 0.2 usec (approx) TTL level pulse to the TRIG BNC connector input. For operation in this mode, the scope time base

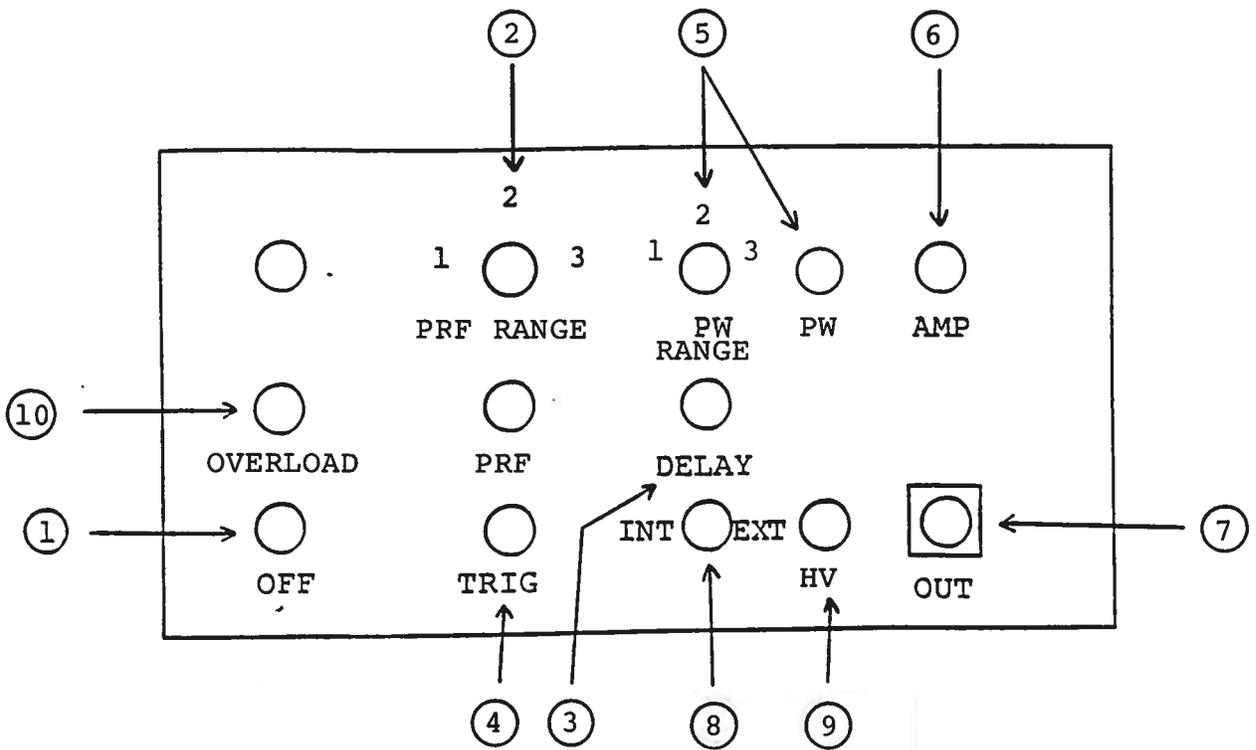
must also be triggered by the external clock rather than from the SYNC output.

- 8) The AVO-7C is designed to supply up to 30 amperes to a maximum load voltage of 30 volts. Factory tests are conducted with a 1.0 ohm load capable of dissipating at least 10 watts. Higher load resistance values may be used but the output voltage must be limited to 30 volts or less.
- 9) At max output pulse width and amplitude, the unit will operate at PRF as high as 50 Hz. For pulse width less than 2.5 usec, the unit will operate at PRF as high as 1 KHz. If the above PRF ratings are exceeded the realizable maximum output amplitude will decrease and in severe cases lead to the failure of the output switching elements (see REPAIR SECTION).
- 10) CAUTION: The output stage is protected against overload condition by a 1.0 A slow blow fuse on the main frame back panel. However, the output switching elements (SL11T) may fail if the duty cycle rating is exceeded. Heating and subsequent likely failure of the output stage is reduced if the following action is taken where possible:
  - a) PRF is kept to a minimum, ie. operate in the LOW PRF range when possible rather than in the HIGH range.
  - b) Keep the output PW to a minimum.
  - c) Keep the load resistance as high as possible.
- 11) OVERLOAD. AVO-7C-C units with a serial number higher than 5600 are protected by an automatic overload protective circuit which 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)
- 12) The unit can be converted from 110 to 220V 50-60 Hz operation by adjusting the voltage selector card in the rear panel fused voltage selector cable connector assembly.

- 13) MONITOR Option. The M output connector on the PG module provides a voltage pulse (to 50 ohms or higher) where amplitude is proportional to the output peak load current. An output current of 30 amperes provides a monitor voltage of 5.0 volts.

Fig. 2

FRONT PANEL CONTROLS



- (1) ON-OFF Switch. Applies basic prime power to all stages.
- (2) PRF Control. Varies PRF as follows:

Range 1	0.5 Hz	50 Hz
Range 2	2 Hz	200 Hz
Range 3	10 Hz	1 KHz
- (3) DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the PG output. This delay is variable over the range of 0 to about 1 usec.
- (4) TRIG Output. This output precedes the PG output and is used to trigger the sampling scope time base. The output is a TTL level 100 nsec (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 nsec after the application of the TRIG pulse.
- (5) PW Control. A one turn control and three position range switch that varies PW as follows:

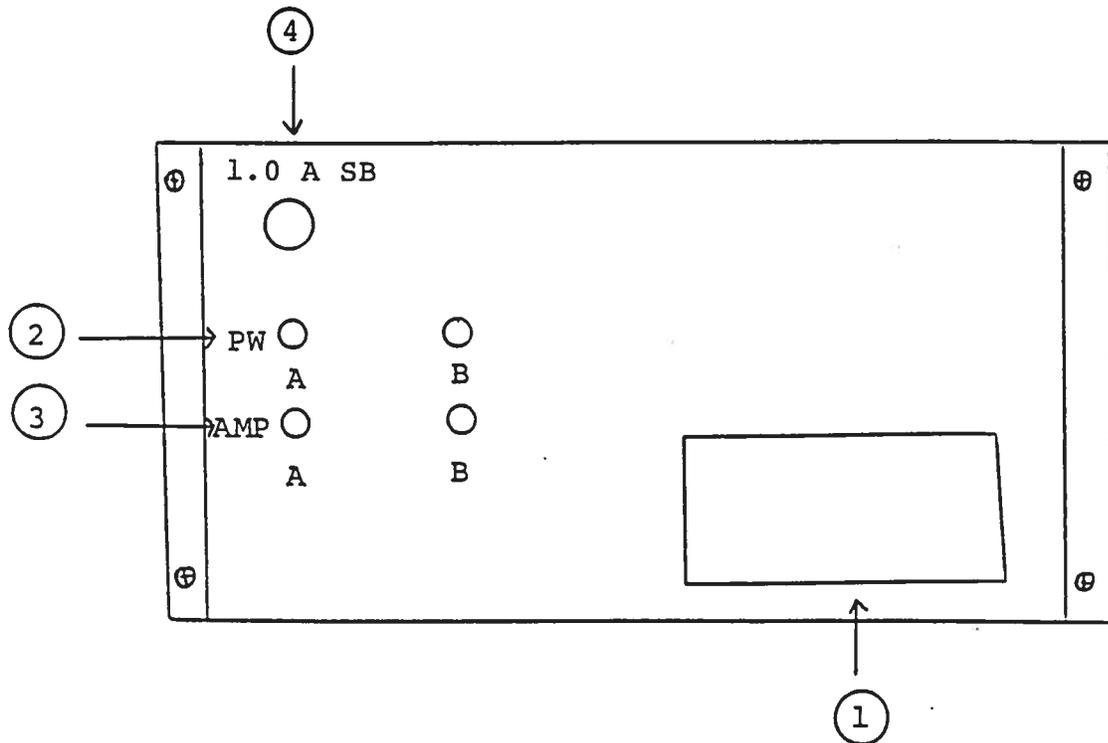
Range 1	0.2 to 1.5 usec
Range 2	1.4 to 17 usec
Range 3	15 to 50 usec
- (6) AMP Control. The output pulse amplitude is controlled by means of the one turn potentiometer (AMP). (10 turn if -AT option included).
- (7) OUT Connector. A multi pin connector which attaches the 2 foot cable from the pulse generator module to the main frame.
- (8) EXT-INT Control. With this toggle switch in the INT position, the PRF of the AVO unit is controlled via an internal clock which in turn is controlled by the PRF controls. With the toggle switch in the EXT position, the AVO unit requires a 0.2 usec 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.
- (9) HV Connector. Two foot long RG124 cable from -PG module connects to this SMA connector. Supplies 60 volts from mainframe to -PG module.
- (10) OVERLOAD. AVD-7C-C units with a serial number higher than 5600 are protected by an automatic overload protective circuit which 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:

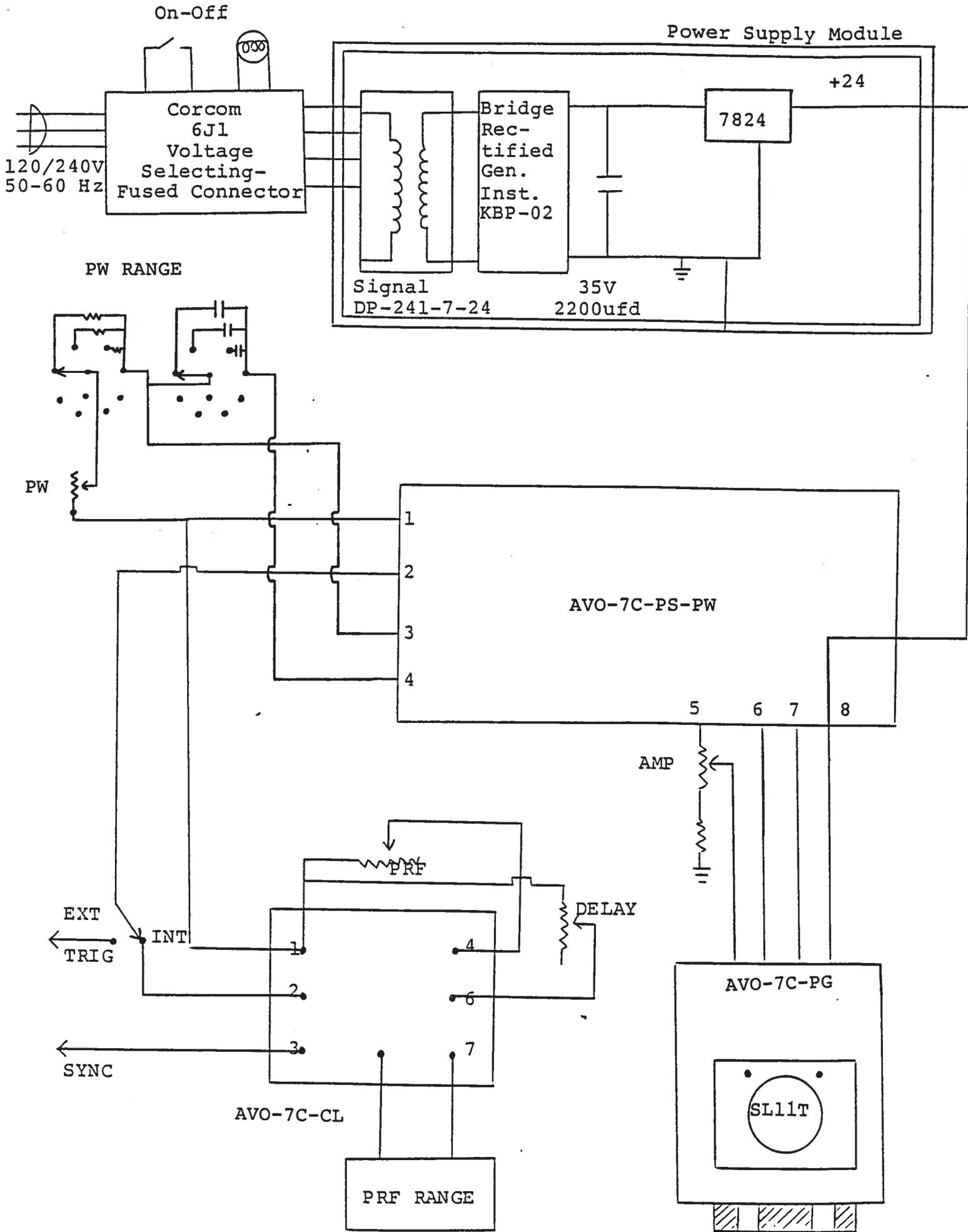
- 1) Reducing PRF (i.e. switch to a lower range)
- 2) Reducing pulse width (i.e. switch to a lower range)

Fig. 3

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 (0.5A SB).
- (2) To voltage control the output pulse width, remove the jumper wire between banana plugs A and B and apply 0 to +10V to connector B ( $R_{IN} \gg 10K$ ). (option).
- (3) To voltage control the output amplitude, remove the jumper wire between banana plugs A and B and apply 0 to +10V to connector B ( $R_{IN} \gg 10K$ ). (option).
- (4) 1.0 A SB FUSE. Protects output stage against overload conditions.



## SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVO-7C-C unit consists of the following basic modules:

- 1) AVO-7C-PG-SNL2 pulse generator module
- 2) AVO-7C-CL clock module
- 3) +24V power supply board
- 4) AVO-7C-PS-PW power supply-pulse width control module

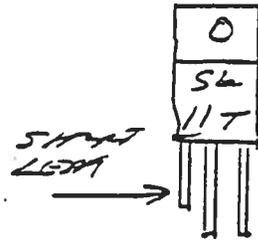
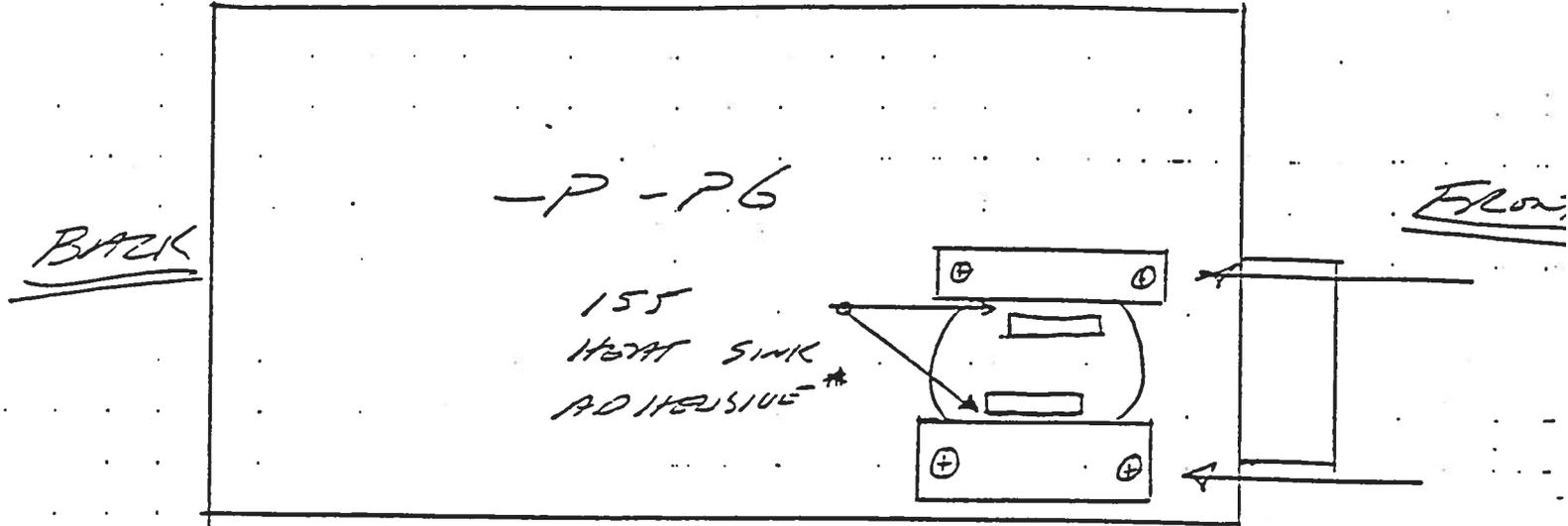
The modules are interconnected as shown in Fig. 4.

In the event of an instrument malfunction, it is most likely that the 1.0A slow blow fuse or the main power fuse on the rear panel has blown. Replace if necessary. If the unit still does not function, it is most likely that some of the output switching elements (SL11T) 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 -PG module. The cover plate is removed by removing the four counter sunk 6-32 Phillips screws. **NOTE:** First turn off the prime power. **CAUTION:** Briefly ground the SL11T tabs to discharge the 60 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 aluminum heat sinks to the body of the AVO-7C-PG module. The SL11T 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 SL11T switching elements, take care to insure that the short lead (of the three leads) is adjacent to the back of the chassis. (See following Fig.). The SL11T elements are electrically isolated from the small aluminum heat sinks but are bonded to the heat sinks using WAKEFIELD TYPE 155 HEAT SINK ADHESIVE. If the switching elements are not defective, then the four Phillips screws on the back panel should be removed. The top cover may then be slid off and the operation of the clock and power supply modules checked. The clock module is functioning properly if:

- a) 0.1 usec TTL level outputs are observed at pins 2 and 3.
- b) The PRF of the outputs can be varied over the range of 0.2 Hz to 1 KHz using the PRF controls.
- c) The relative delay between the pin 2 and 3 outputs can be varied by at least 1 usec by the DELAY control.

The sealed clock module must be returned to Avtech for repair or replacement if the above conditions are not observed.

AVO-7C-C SL11T HEAT SINKING



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AVO-7C-M1

## INSTRUCTIONS

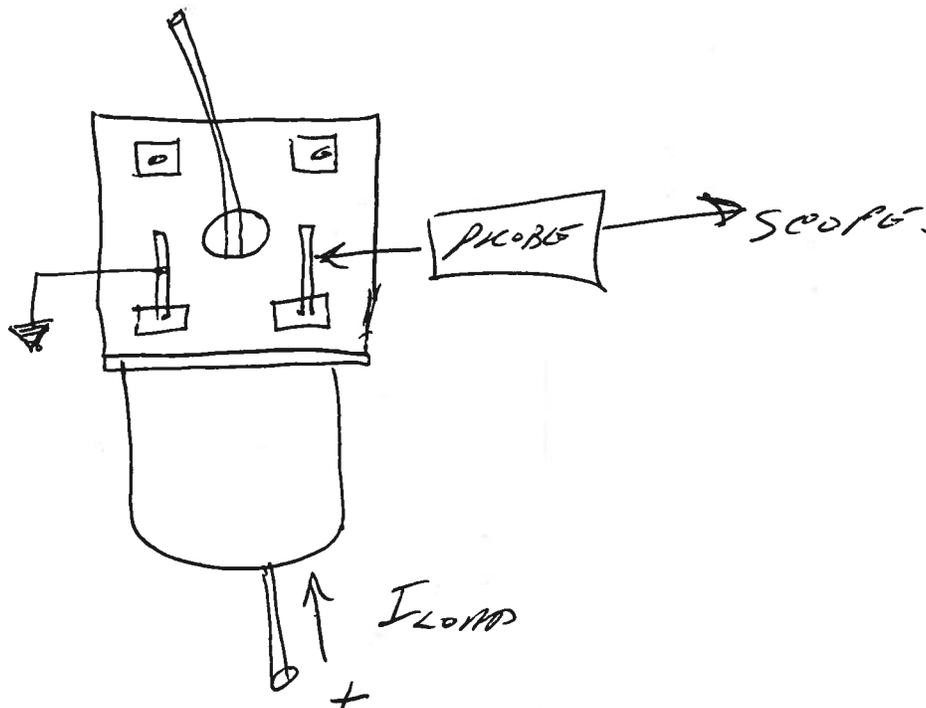
The current transformer should be connected as shown below.  
The basic specifications are as follows:

OUTPUT: 50 mV/Amp to a high impedance ( $> 1K$ ).  
1.5 volts for a peak current of 30 Amp.

Max pulse width: 60 us for a peak current of 30 Amp

Rise time:  $\ll 50$  ns

Peak current: 40 Amps



10.18.91