



**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  
U.S.A. & CANADA

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

## INSTRUCTIONS

MODEL AVO-7A-C-P-PN-MI-MV-M4 PULSE GENERATOR

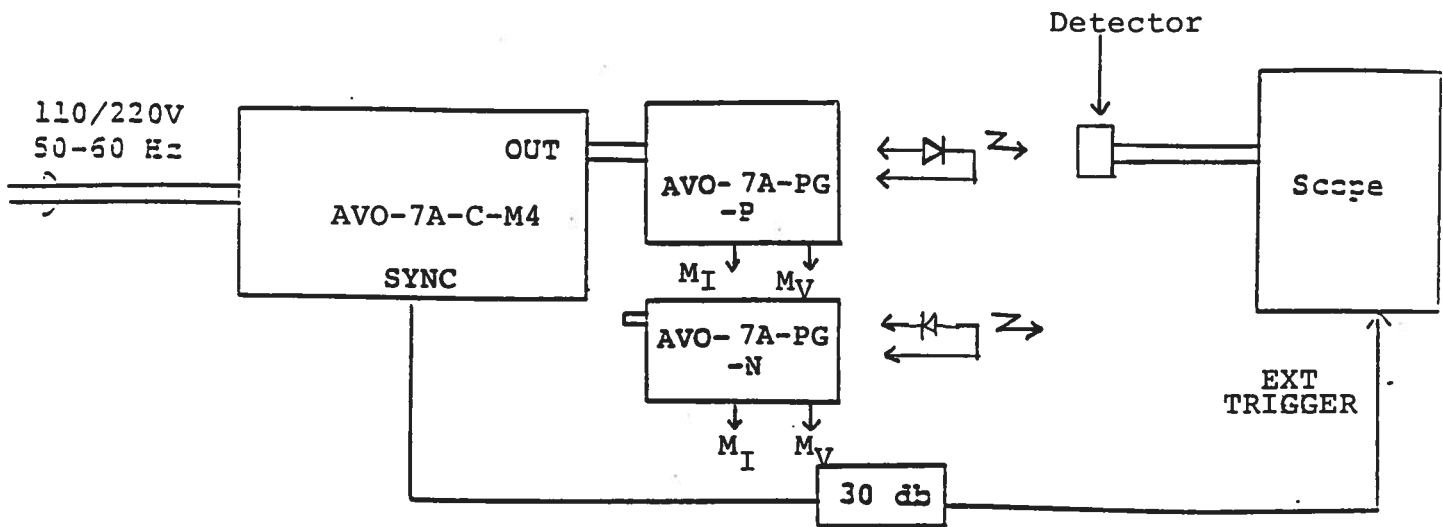
S.N. :

### WARRANTY

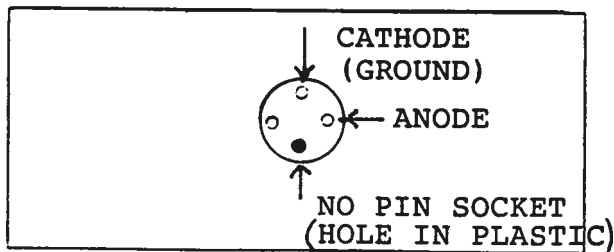
Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech 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

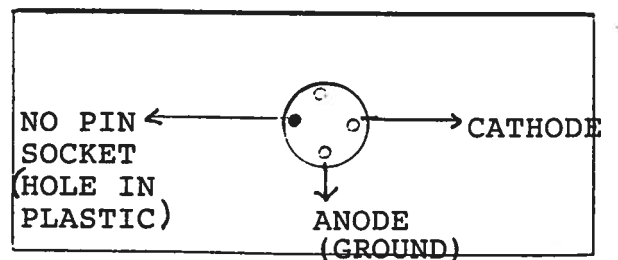
PULSE GENERATOR TEST ARRANGEMENT



PG-P



PG-N



Notes:

- 1) The bandwidth capability of components and instruments used to display the pulse generator output signal (attenuators, cables, connectors, etc.) should exceed 100 MHz.
- 2) The PIN socket connections for the P and N -PG module are as shown in Fig 1. Note that the diode will be damaged if the diode leads are inserted into the incorrect socket pins. The diode leads should be inserted the full 2.0 cm into the socket pins. This should be done gently and with caution as the pin sockets are precision elements and will not withstand abuse or force.
- 2A) The output module should be attached to a heatsink capable of dissipating at least 15 watts. Note that the modules will not supply 100 Amperes if the diode ON voltage exceeds 16 Volts. Note also that the PIN sockets will accept load lengths as long as 2.0 cm but the modules and the diode may be damaged if the lengths exceed 2.0 cm.
- 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) The desired output polarity is selected by means of the front panel POLARITY switch and by connecting the desired output module to the mainframe. The gray multi-pin cable must be plugged into the OUT connector and the black 50 Ohm RG174 cable connected to the HV SMA connector.
- 5) To obtain a stable output display the PRF control on the front panel should be set mid-range. The front panel TRIG switch should be in the INT position. The DELAY controls 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.
- 6) The output pulse width is controlled by means of the front panel ten turn PW control.

- 7) The output pulse amplitude is controlled by means of the front panel one turn AMP control. Great care should be taken when increasing the amplitude to insure that the diode current does not exceed 100 Amperes as this may damage the diode and damage the pulser as well. The functional equivalent circuit of the pulser output stage is as shown in Fig. 2. The diode current is defined by the series 50 milliohm resistor and the driving voltage - diode voltage difference. If the diode on voltage is relatively low (eg 5 Volts) the driving voltage will attempt to force more than 100 Amperes through the 50 milliohm resistor (and diode). The diode current may be determined as follows:

$$I_{DIODE} = \frac{V_I - V_V}{0.05}$$

where  $V_I$  is the voltage at the  $M_I$  port (to  $R_I \geq 10 K$ ) and  $V_V$  is the voltage at the  $M_V$  port (to  $R_V \geq 10 K$ ). Clearly, the voltage difference  $V_I - V_V$  must not exceed 5 Volts, or the diode current will exceed 100 Amperes. Note that the  $M_I$  and  $M_V$  outputs are displayed on a 50 Ohm scope, then

CAUTION!

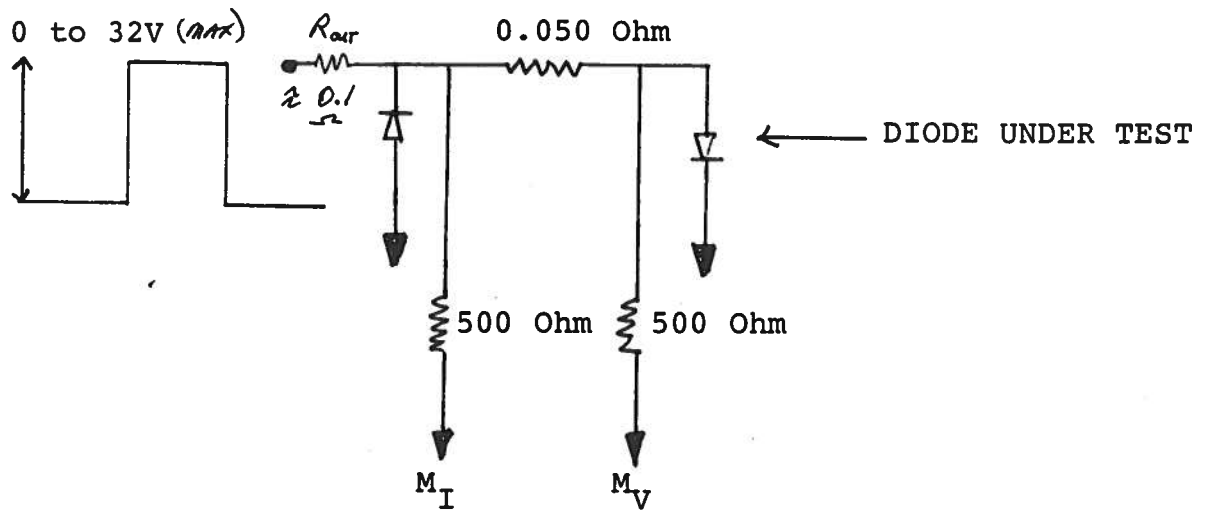
$$I_{DIODE} = \frac{10V_I - 10V_V}{0.05}$$

- 8) An external clock may be used to control the output PRF of the AVO unit by setting the front panel TRIG toggle switch in the EXT position and applying a 0.2 us (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 TRIG output.
- 9) For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.
- 10) The DELAY control controls the relative delay between the reference output pulse provided at the TRIG output and the main output. This delay is variable over the range of 0 us to 500 ns. 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.

- 11) 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 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 output amplitude as low as possible, (definitely less than 100 Amps)
- 12) AVO-7A 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 or by operating into a short circuit), 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 amplitude setting.
- 13) 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.
- 14) For additional assistance:
- Tel: 1-800-265-6681  
Fax: (613) 226-2802

FIG. 2

OUTPUT STAGE EQUIVALENT CIRCUIT



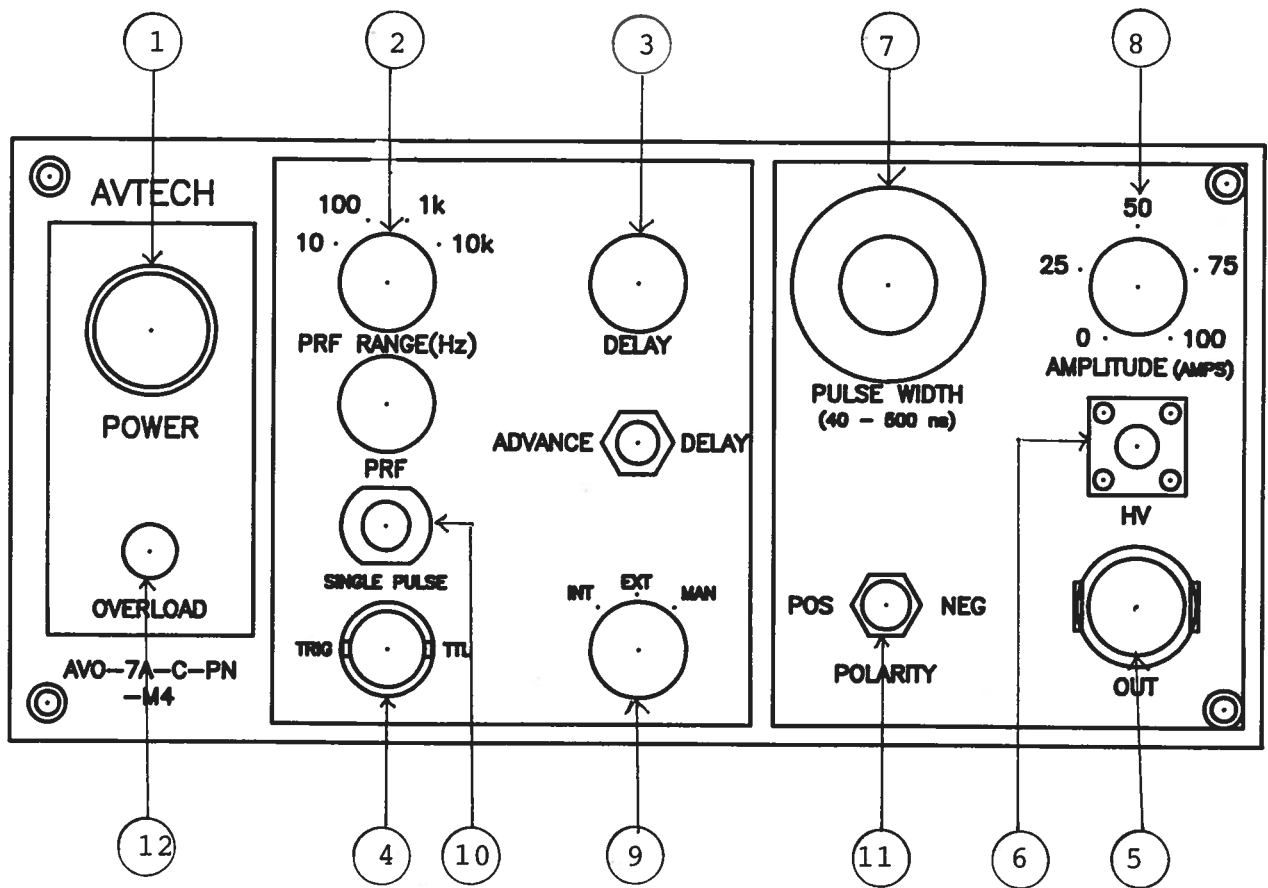


FIG 3.

FRONT PANEL CONTROLS



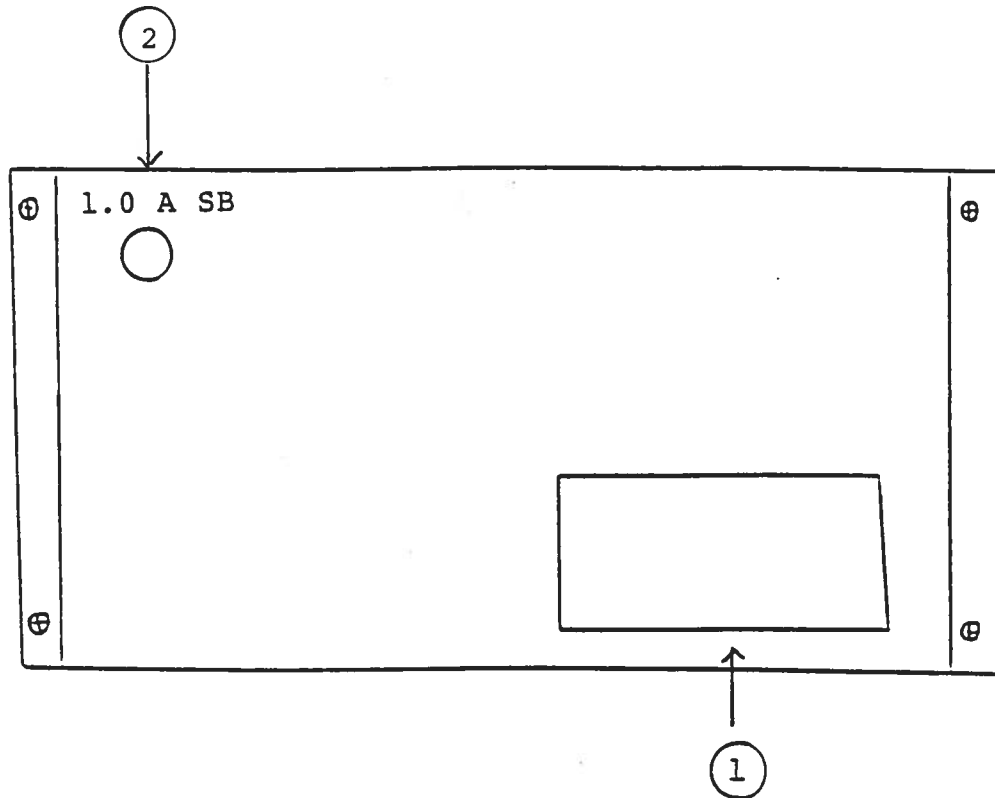
- (1) ON-OFF Switch. Applies basic prime power to all stages.
- (2) PRF Control. Varies PRF from 1 Hz to 10 kHz as follows:

4	Hz	to	10	Hz
10	Hz	to	100	Hz
100	Hz	to	1	kHz
1	kHz	to	10	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 500 ns. Delay LEADS or LAGS depending on the position of the ADVANCE-DELAY switch.
- (4) TRIG Output. This output 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. This output precedes the output at (5) if the two position ADVANCE-DELAY switch is in the ADVANCE position. This output follows the output at (5) if the switch is in the DELAY position. The delay range is variable from 0 us to 500 ns. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.
- (5) OUT Connector. A multi pin connector which attaches the gray 2 foot cable from the pulse generator module to the mainframe.
- (6) HV Connector. Two foot long black RG124 cable from -PG module connects to this SMA connector. Supplies  $\pm$  32 Volts from mainframe to -PG module.
- (7) PW Control. A ten turn control which varies the output pulse width from 40 to 500 ns.
- (8) AMP Control. A one turn control which varies the output pulse amplitude from 0 to 100 Amperes.
- (9) INT-EXT-MAN 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 control. With the toggle switch in the EXT position, the AVO unit requires a 0.2 us 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.
- (10) 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.

- (11) POLARITY. The desired output polarity is selected by means of the front panel POLARITY switch and by applying the desired output module to the OUT connectors (5,6).
- (12) OVERLOAD INDICATOR. AVO-7A-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 or by operating into a short circuit), 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.

FIG. 4

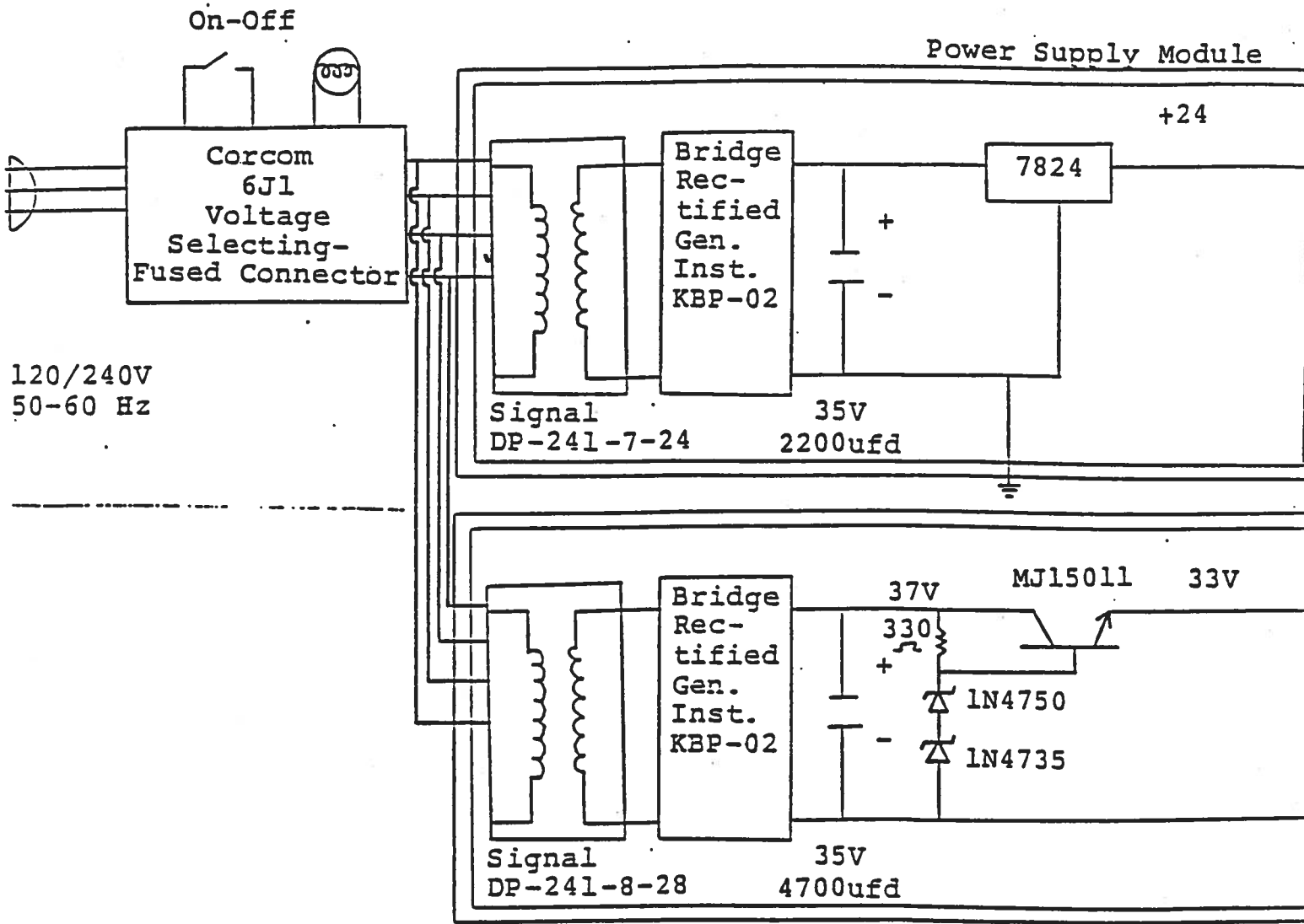
BACK PANEL CONTROLS



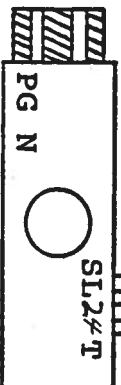
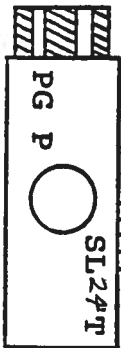
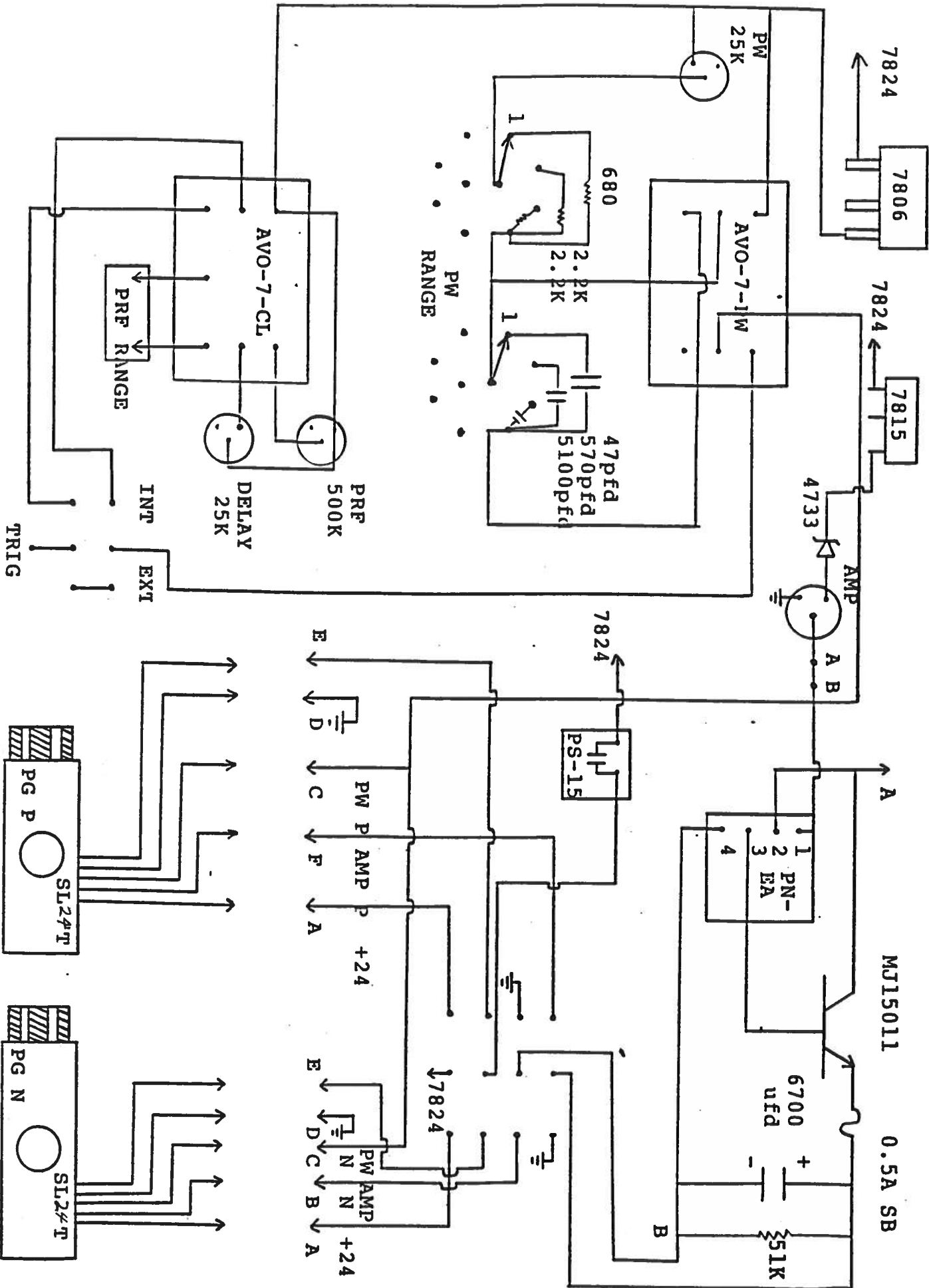
- (1) FUSED CONNECTOR, VOLTAGE SELECTOR. The detachable power cord is connected at this point. In addition, the removable cord is adjusted to select the desired input operating voltage. The unit also contains the main power fuse (0.25 SB).
- (2) 1.0 A SB. Fuse which protects the output stage if the output duty cycle rating is exceeded.

Fig. 5

SYSTEM BLOCK DIAGRAM



AVO-7-C-PN-EA BLOCK DIAGRAM



## SYSTEM DESCRIPTION AND REPAIR PROCEDURE

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

- 1) AVO-7A-PG pulse generator modules (two)
- 2) AVO-7A-CL clock module
- 3) +24V power supply board
- 4) AVO-7A-PS-PW power supply-pulse width control module
- 5) AVO-7A-PS-15 -15 volt power supply module

The modules are interconnected as shown in Fig. 4.

In the event of an instrument malfunction, it is most likely that the 1.0 A 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 the output switching element may have failed due to an output short circuit condition or to a high duty cycle condition. If no, the unit must be returned to the factory for repair. 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 us TTL level outputs are observed at pins 2 and 3.
- b) The PRF of the outputs can be varied over the range of 0.5 Hz to 5 kHz using the PRF controls.
- c) The relative delay between the pin 2 and 3 outputs can be varied by at least 1 us by the DELAY control.

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

June 21/94