

# AVTECH ELECTROSYSTEMS LTD.

NANOSECOND WAVEFORM ELECTRONICS  
ENGINEERING . MANUFACTURING

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## INSTRUCTIONS

Model AVR-3-PW-C-SEH-EA-EW-ED-PN-R 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.

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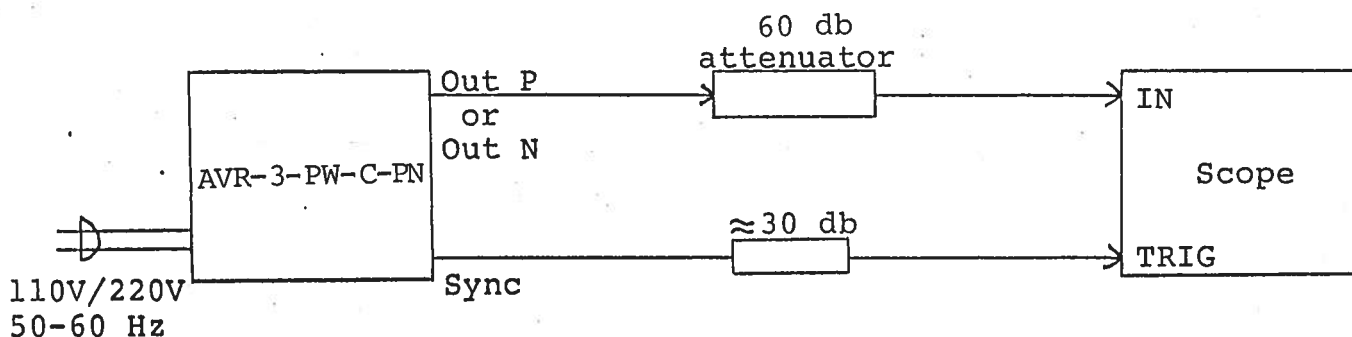
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Fig. 1

## PULSE GENERATOR TEST ARRANGEMENT



### 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 use of 60 db attenuator at the scope vertical input channel will insure a peak input signal to the scope of less than one volt (necessary only if sampling scope used). If a high impedance real time scope is used, the pulse generator should be terminated using a shunt 50 ohm resistor.
- 3) The sync 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.
- 4) The desired output polarity is selected by means of the front panel POLARITY switch. With the POLARITY switch in the P position, the negative output pulse generator is rendered

inactive. Likewise, with the POLARITY switch in the N position, the positive pulse generator is rendered inactive.

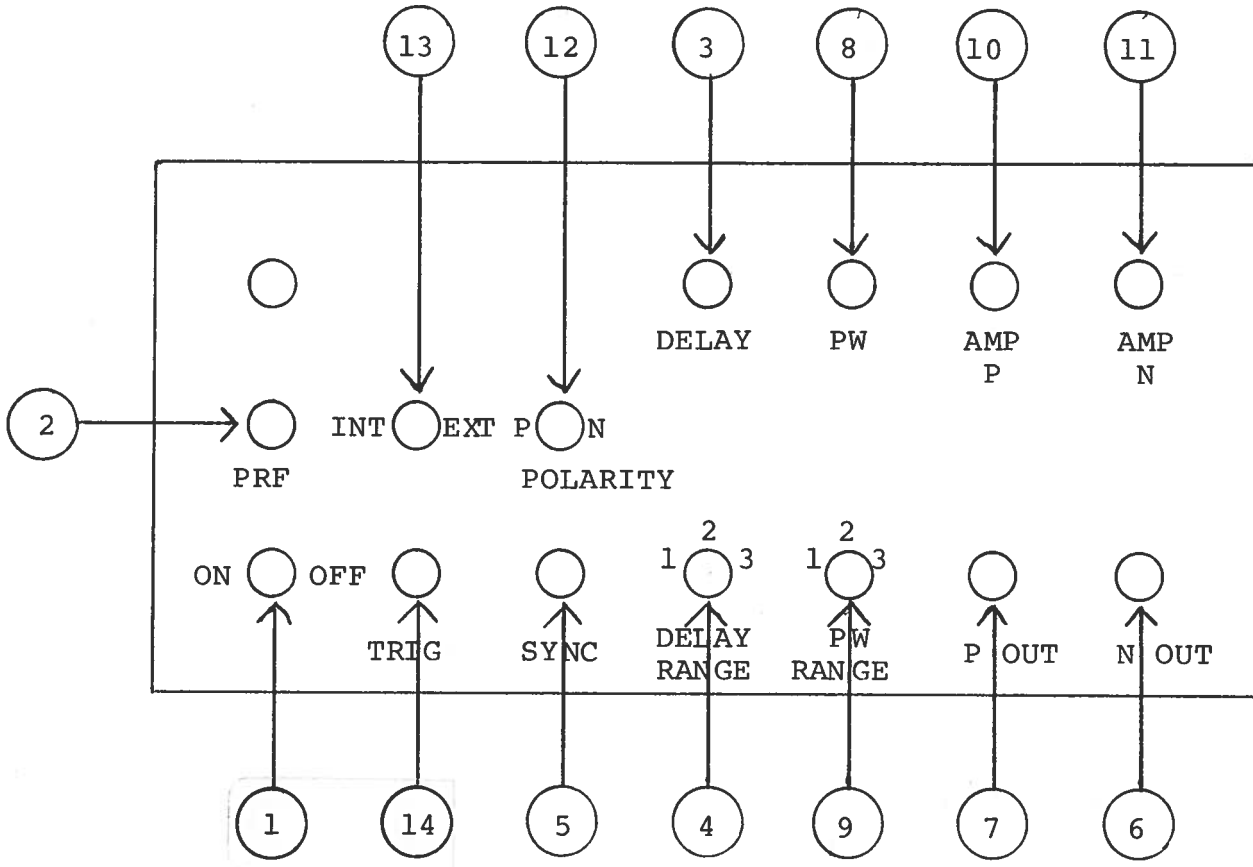
- 5) The output pulse widths for the positive and negative outputs are controlled by means of the front panel ten turn PW control and by the 3 position PW RANGE control. The minimum and maximum PW for each range and the corresponding maximum PRF are as follows. Note that the unit may fail if operated at duty cycles exceeding the above.

	PW min	PW max
Range 1	≈ 0.1 usec PRF max 1 KHz	≈ 1.0 usec PRF max 1 KHz
Range 2	≈ 1.0 usec PRF max 1 KHz	≈ 10 usec PRF max 500 Hz
Range 3	≈ 10 usec PRF max 500 Hz	≈ 100 usec PRF max 50 Hz

- 6) The output pulse amplitudes for the positive and negative outputs are controlled by means of the front panel ten turn AMP P and AMP N controls.
- 7) The delay between the output pulses and the sync output pulse (or on externally applied trigger pulse) is controlled by the 3 position DELAY RANGE switch and the ten turn DELAY control pot.
- 8) To obtain a stable output display the PRF control on the front panel should be set mid range and the PRF range control on the back panel should be set in position one. The front panel TRIG toggle 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 RANGE controls.
- 9) To voltage control the output amplitude, remove the jumper wires between banana plugs A and B on the back panel and apply 0 to +10V to connector B ( $R_{IN} \geq 10K$ ).
- 10) 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 ( $R_{IN} \geq 10K$ ).
- 11) To voltage control the delay, remove the jumper wire between banana plugs A and B on the back panel and apply 0 to +10V to connector B ( $R_{IN} \geq 10K$ ).

- 12) An external clock may be used to control the output PRF of the AVR unit by setting the front panel TRIG toggle switch in the EXT position and applying 50 nsec or wider 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.
- 13) The AVR-3-PW features an output impedance of the order of several ohms (rather than 50 ohms). The following consequences of this feature should be noted:
  - a) When used to switch some semiconductor devices (eg. bipolar and VMOS power transistors), the AVR unit will yield much faster switching times than those provided by 50 ohm pulse generators.
  - b) The AVR unit will safely operate in to load impedances in the range of 50 ohms to an open circuit. However, the fall time may degrade for load impedances higher than fifty ohms.
  - c) The AVR unit may be effectively converted to a fifty ohm output impedance generator by placing a fifty ohm  $\frac{1}{2}$  watt carbon composition resistor in series with the output of the unit and the load. The maximum available load voltage will then decrease to 100 volts (from 200 volts).
  - d) The output switching elements may fail if the unit is inadvertently operated into a short circuit. The switching elements are easily replaced in the field following the procedure outlined in the REPAIR Section.
- 14) The AVR unit may be installed in a standard 19" rack using the two rack mounting angle pieces that are supplied. Remove the four Phillips 6-32 screws on each side of the instrument and attach the angles using the four screws on each side.

FRONT PANEL CONTROLS



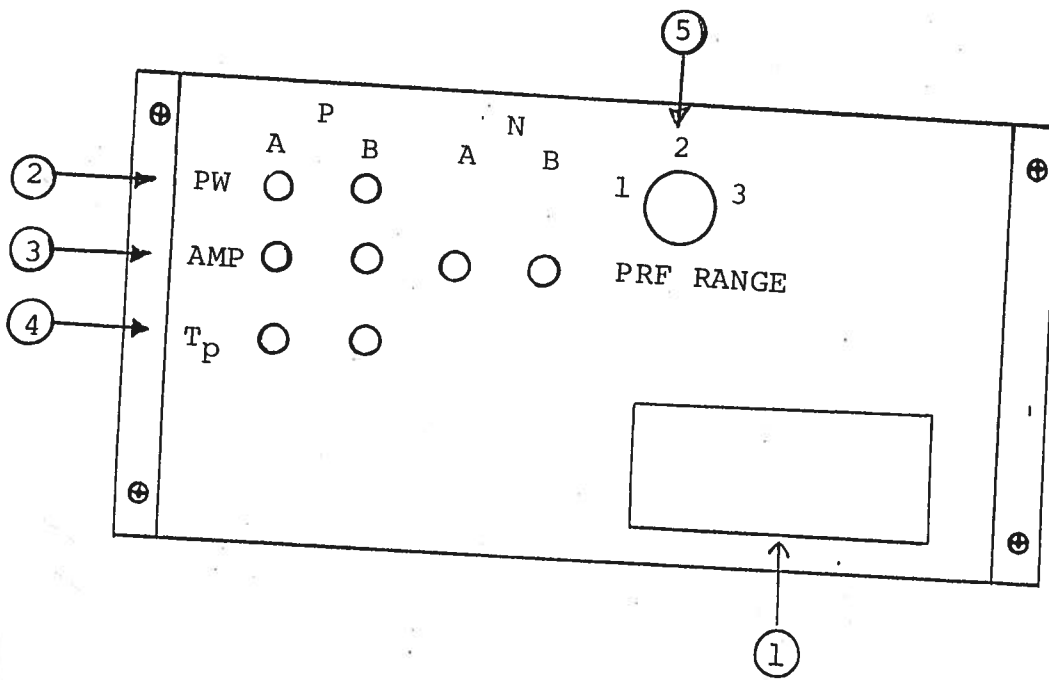
- ① ON-OFF Switch. Applies basic prime power to all stages.
- ② PRF Control. Varies PRF from 5 Hz to 1 KHz (used with back panel PRF RANGE switch).
- ③ DELAY Control. Controls the relative delay between the reference output pulse provided at the SYNC output ⑤ and the main output ⑥ and ⑦. This delay is variable over the range of 0 to about 100 usec as follows:
- RANGE 1: 0.1 to 1.0 usec  
RANGE 2: 1.0 to 10 usec  
RANGE 3: 10 to 100 usec
- ⑤ SYNC Output. This output precedes the main output ⑥ and ⑦ and is used to trigger the scope time base. The output is a TTL level 100 nsec (approx.) pulse capable of driving a fifty ohm load.
- ⑥ OUT N Connector. BNC connector provides output to a fifty ohm load.
- ⑦ OUT P Connector. BNC connector provides output to a fifty ohm load.
- ⑧ PW Control. A ten turn control and 3 position range switch which varies the output pulse width from 0.1 usec to 100 usec. The minimum and maximum PW for each range and the corresponding maximum PRF are as follows. Note that the unit may fail if operated at duty cycles exceeding the above.

	PW min	PW max
Range 1	≈ 0.1 usec PRF max 1 KHz	≈ 1.0 usec PRF max 1 KHz
Range 2	≈ 1.0 usec PRF max 1 KHz	≈ 10 usec PRF max 500 Hz
Range 3	≈ 10 usec PRF max 500 Hz	≈ 100 usec PRF max 50 Hz

- ⑩ AMP P Control. A ten turn control which varies the positive output pulse amplitude from 0 to +200 V to a fifty ohm load.
- ⑪ AMP N Control. A ten turn control which varies the negative output pulse amplitude from 0 to -200 V to a fifty ohm load.
- ⑫ POLARITY Control. With the switch in the P position, the negative output pulse generator is rendered inactive. With the switch in the N position, the positive output pulse generator is rendered inactive.
- ⑬ EXT-INT Control. With this toggle switch in the INT position, the PRF of the AVR unit is controlled via an internal clock which in turn is controlled by the PRF and PRF RANGE controls. With the toggle switch in the EXT position, the AVR unit requires a 50 nsec 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.
- ⑭ TRIG Input. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.

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.
- 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 ( $R_{IN} \geq 10K$ ).
- ③ To voltage control the output amplitude for the P and N outputs, remove the jumper wires between banana plugs A and B and apply 0 to +10V to connector B ( $R_{IN} \geq 10K$ ).
- ④ To voltage control the output delay, remove the jumper wire between banana plugs A and B and apply 0 to +10V to connector B ( $R_{IN} \geq 10K$ ).
- ⑤ PRF Range. A three position range switch used with the front panel one turn PRF control to determine PRF as follows:

RANGE 1: 5 to 50 Hz  
 RANGE 2: 5 to 250 Hz  
 RANGE 3: 5 to 1 KHz

The PRF ranges and allowable output pulse widths are related as follows. Note that the unit may fail if operated at duty cycles exceeding those shown.

	PW min	PW max
Range 1	0.1 usec	100 usec
Range 2	0.1 usec	20 usec
Range 3	0.1 usec	5 usec

## SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVR-3-PW-C-PN consists of the following basic modules:

- 1) AVR-3-PW-PG pulse generator modules (-P and -N)
- 2) +24V power supply board
- 3) AVR-3-PN-EA-EW-ED-PS power supply module
- 4) AVR-3-PN-EA-EW-ED-T timing module

The modules are interconnected as shown in Fig. 4. The timing module controls the output PRF, PW and the relative delay between the main output and the SYNC outputs. The PG pulse generator modules generate the output pulse. The power supply modules generate 0 to  $\pm 210$  volts to power the pulse generator module.

In the event of an instrument malfunction, it is most likely that some of the output switching elements (SL<sup>4</sup>) 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 instrument. NOTE: First turn off the prime power. The elements may be removed from their sockets by means of a needle nosed pliers. The SL<sup>4</sup> is a selected VMOS power transistor in a TO 220 packages and may be checked on a curve tracer. If defective, replacement units should be ordered directly from Avtech. When replacing the SL<sup>4</sup> switching elements, take care to insure that the short lead (of the three leads) is adjacent to the black dot on the chassis.

The power supply board generates +24VDC to power the other modules. If the voltage is less than +24V, turn off the prime power and unsolder the lead from the 7824 regulator chip on the power supply board. Solder a 100 ohm 5 watt resistor to the 7824 output to ground and turn on the prime power. A voltage of +24 volts should be read. If the voltage is less then the power supply board is defective and should be repaired or replaced.

Fig. 4a

POWER SUPPLY

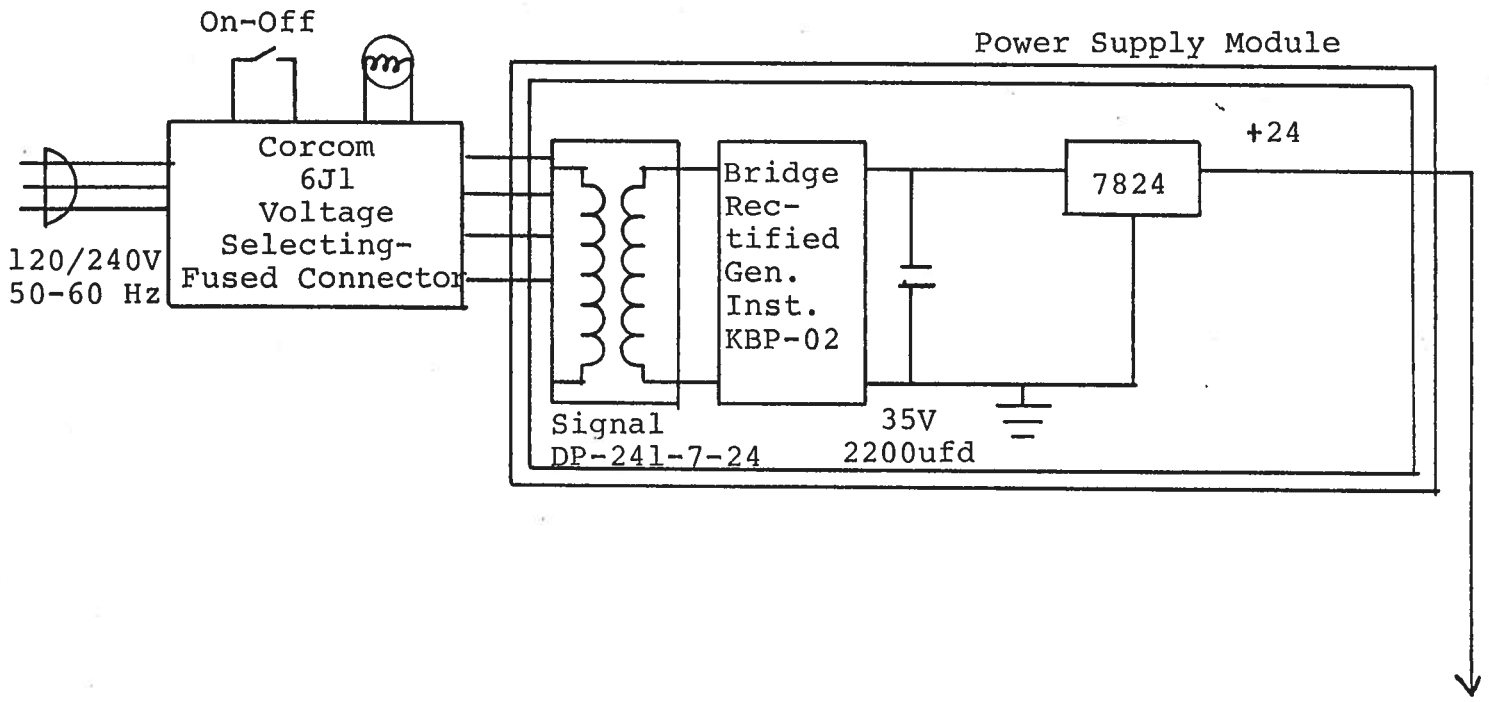
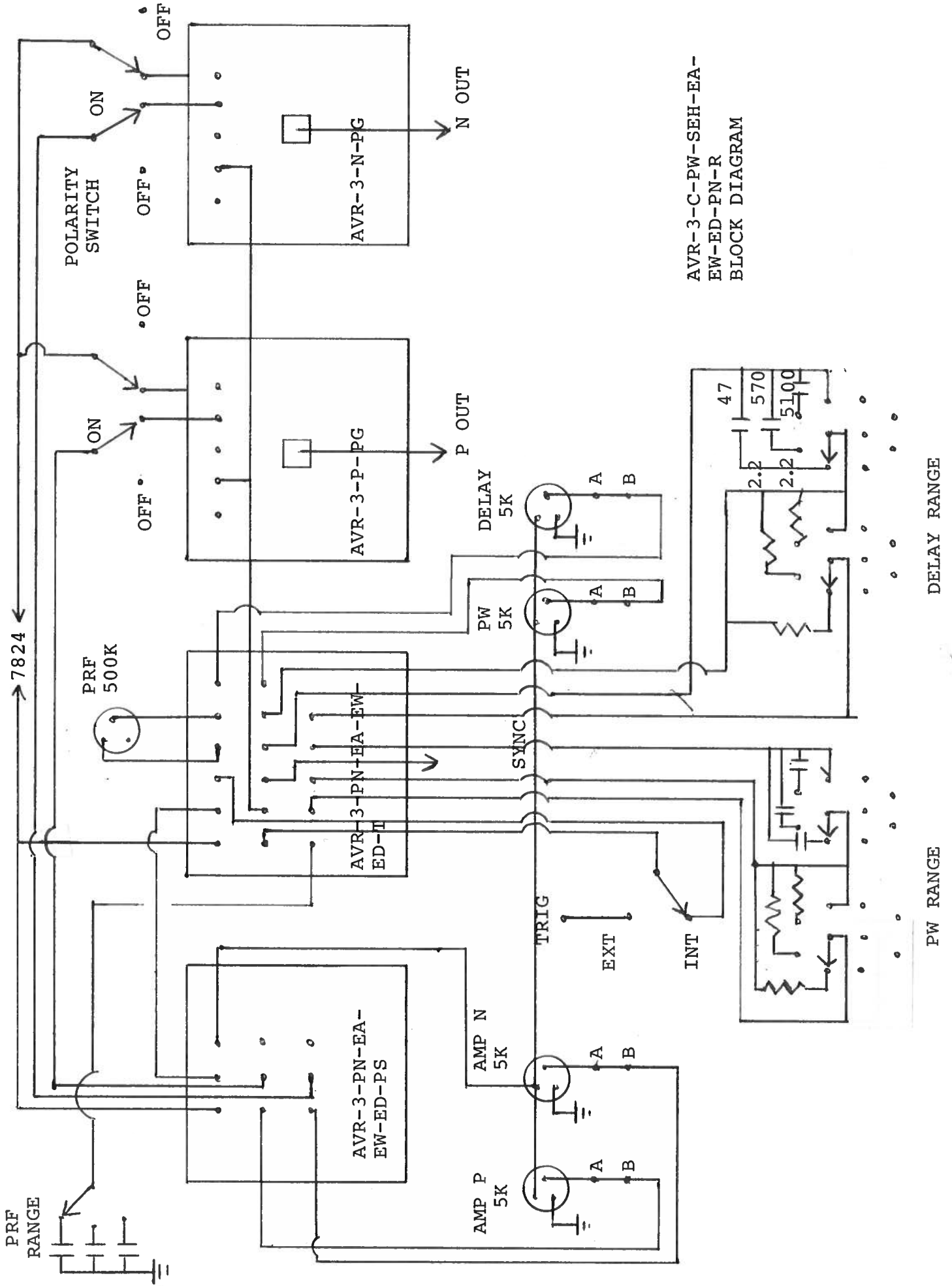


Fig. 4b



AVR-3-C-PW-SEH-EA-ED-PN-R  
BLOCK DIAGRAM

Schroff

10.04.85