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INSTRUCTIONS

MODEL AVR-4B-PW-C-PN PULSE GENERATOR

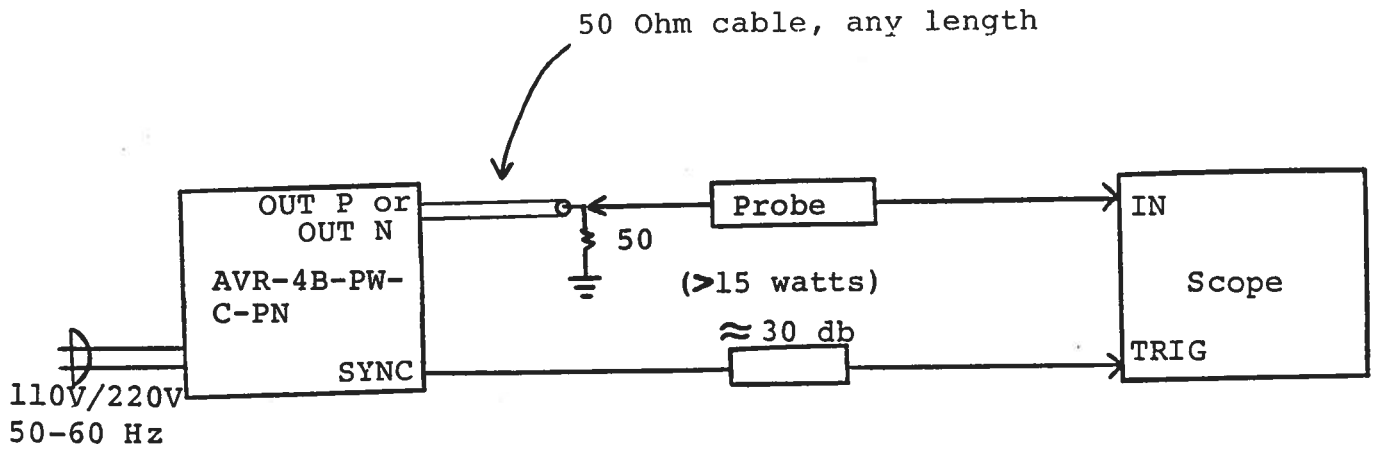
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WARRANTY

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



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. To obtain the rated rise time and an undistorted output pulse, the unit must be terminated in a 50 Ohm load. If the load impedance is substantially higher than 50 Ohms, ringing and overshoot will be observed. In such cases, pulse distortion may be minimized by keeping the length of 50 Ohm cable as short as possible (i.e. ≤ 1 foot). If the load impedance is less than 50 Ohms (eg. 25 Ohms), trigger of the output stage is inhibited. Note that a high impedance scope probe should be used to monitor the voltage. Typical output waveforms are shown on the performance check sheet.
- 2) 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.
- 3) 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. Note that the polarity will not change if the output voltage exceeds about 50 Volts. Therefore, rotate the AMP control full CCW before attempting to reverse the polarity. Note when the unit is operating at a low duty cycle and an attempt is made to reduce the output amplitude, the amplitude will decay slowly with a time constant of several tens of seconds. If a rapid decay is required, briefly switch the rear panel HV switch to the "OFF" position (and then back to the "ON" position).
- 4) The output pulse widths for the positive and negative outputs are controlled by means of the front panel one turn PW control and by the 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 0.5%.

	PW min		PW max	
Range 1	0.1 us		1.0 us	
	PRF max 1	kHz	PRF max 1	kHz
Range 2	1.0 us		10 us	
	PRF max 1	kHz	PRF max 500	Hz
Range 3	10 us		100 us	
	PRF max 500	Hz	PRF max 50	Hz

- 5) 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 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 amplitudes for the positive and negative outputs are controlled by means of the front panel one turn AMP control. To avoid stressing the output stage, the AMP control should be rotated slowly when attempting to increase the output amplitude.
- 7) 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 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 SYNC output.
- 8) The AVR-4-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 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 200 Volts (from 400 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.
- 9) CAUTION: The output stage is protected against overload condition by a 0.5A slow blow fuse on the main frame back panel. However, the output switching elements (SL18T) may fail if the unit is triggered at a PRF exceeding 1 kHz or at duty cycles resulting in an average output power in excess of 16 Watts. 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, i.e. operate in a low PRF range when possible rather than in a high PRF range.
 - b) Keep the output PW to a minimum.
- 10) OVERLOAD INDICATOR. AVR-4B-PW-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) Removing output load short circuit (if any)

Note that the overload light may come on when the prime power is applied. The light will extinguish after a few seconds.

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

- 11) 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.
- 12) For further assistance:

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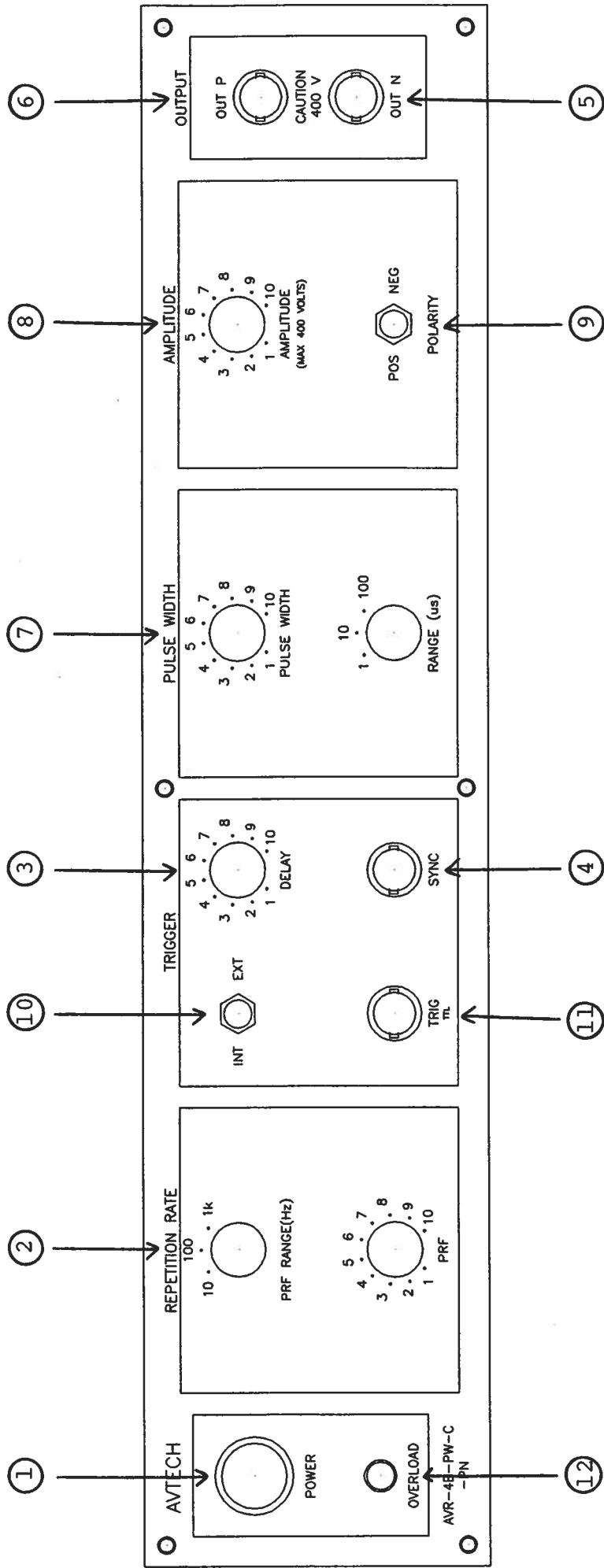


Fig. 2 FRONT PANEL CONTROLS

(1) ON-OFF Switch. Applies basic prime power to all stages.

(2) PRF Control. Varies PRF from 10 Hz to 1 kHz as follows:

Range 1	1 Hz to 10 Hz
Range 2	1 Hz to 100 Hz
Range 3	10 Hz to 1 kHz

(3) DELAY Control. Controls the relative delay between the reference output pulse provided at the SYNC output (4) and the main outputs (5) and (6). This delay is variable over the range of 0 to about 1.0 us.

(4) SYNC Output. This output precedes the main output (5) and (6) 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.

(5) OUT N Connector. BNC connector provides output to a fifty Ohm load.

(6) OUT P Connector. BNC connector provides output to a fifty Ohm load.

(7) PW Control. A one turn control and 3 position range switch which varies the positive output pulse width from 0.1 us to 100 us. 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 us		1.0 us
	PRF max 1	kHz	PRF max 1 kHz
Range 2	1.0 us		10 us
	PRF max 1	kHz	PRF max 500 Hz
Range 3	10 us		100 us
	PRF max 500	Hz	PRF max 50 Hz

(8) AMP Control. A one turn control which varies the output pulse amplitude from 0 to +400 V to a fifty Ohm load.

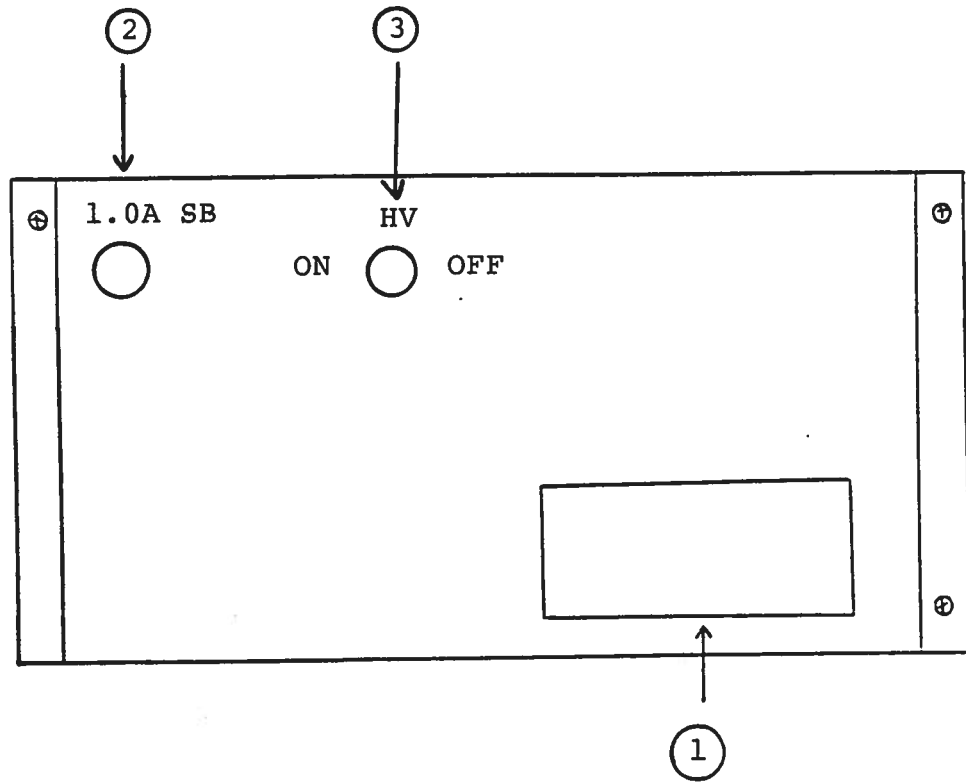
- (9) POLARITY Control. With the switch in the P position, the negative output pulse generator is rendered inactive. With the switch in the N position, the positive output pulse generator is rendered inactive. Note that the polarity will not change if the output voltage exceeds about 50 Volts. Therefore, rotate the AMP control full CCW before attempting to reverse the polarity. Note when the unit is operating at a low duty cycle and an attempt is made to reduce the output amplitude, the amplitude will decay slowly with a time constant of several tens of seconds. If a rapid decay is required, briefly switch the rear panel HV switch to the "OFF" position (and then back to the "ON" position).
- (10) 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 FINE controls. With the toggle switch in the EXT position, the AVR 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.
- (11) TRIG Input. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.
- (12) OVERLOAD INDICATOR. AVR-4B-PW-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) Removing output load short circuit (if any)

Note that the overload light may come on when the prime power is applied. The light will extinguish after a few seconds.

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

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) 1.0A SB. Protects output stage against overload condition.
- (3) HV SWITCH. This switch must be in the "ON" position to obtain an output pulse. Note when the unit is operating at a low duty cycle and an attempt is made to reduce the output amplitude, the amplitude will decay slowly with a time constant of several tens of seconds. If a rapid decay is required, briefly switch the rear panel HV switch to the "OFF" position (and then back to the "ON" position).

Fig. 4

AVR-4B-PW-PN-C BLOCK DIAGRAM

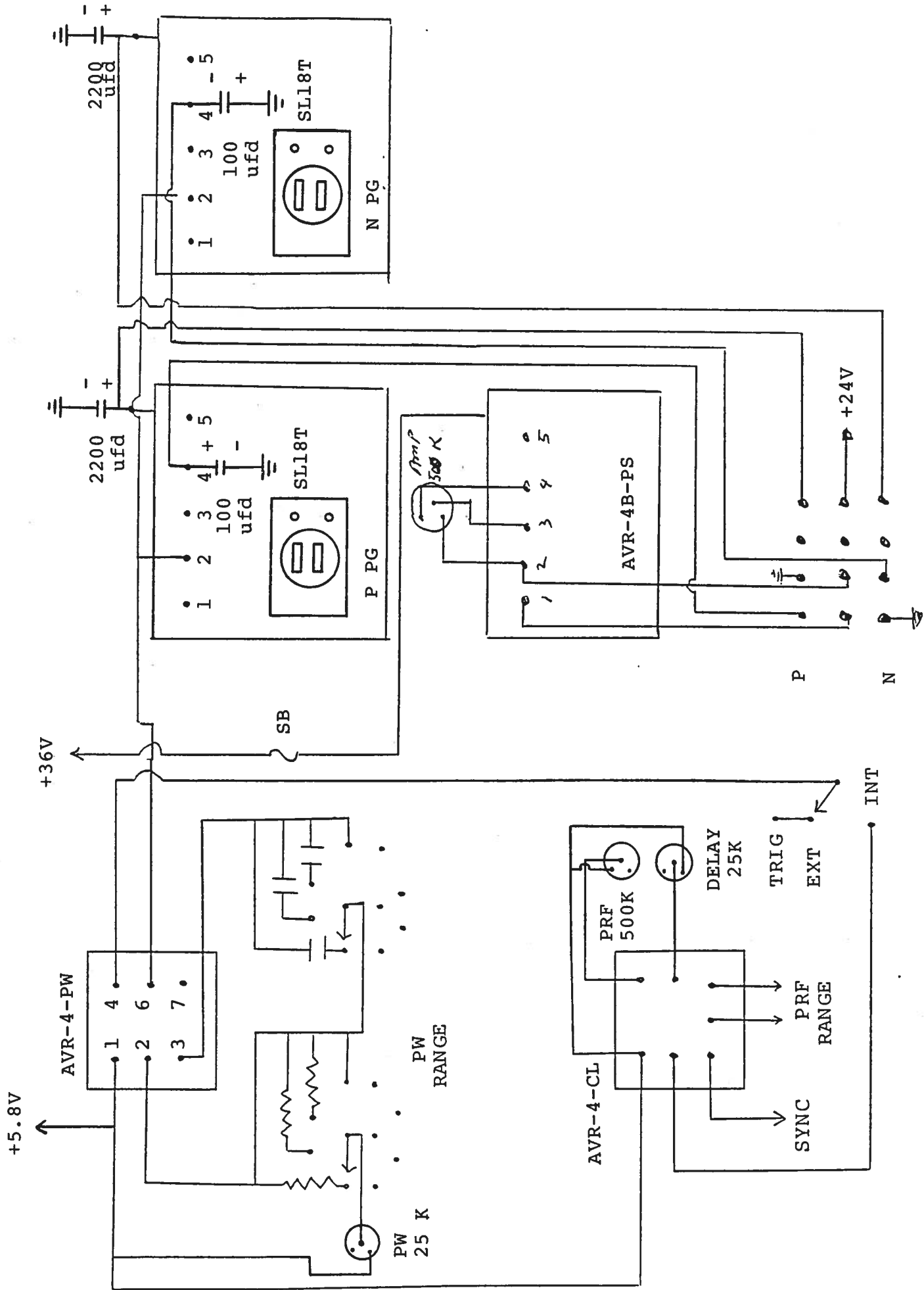
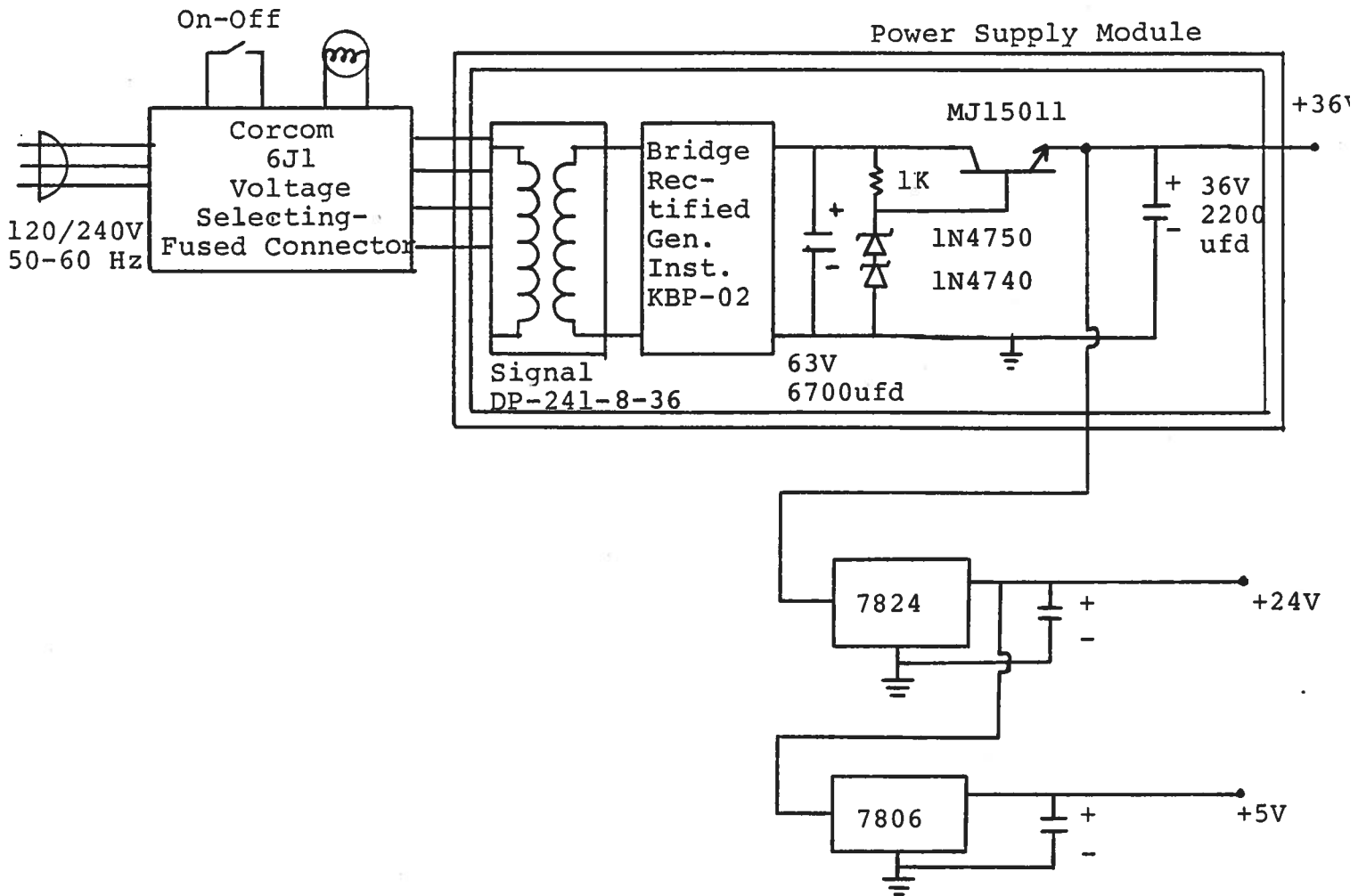


Fig. 4a

POWER SUPPLY



SYSTEM DESCRIPTION AND REPAIR PROCEDURE

The AVR-4-PW-C-PN consists of the following basic modules:

- 1) AVR-4-PW-PG pulse generator modules (-P and -N)
- 2) AVR-4-CL clock module
- 3) +36V, +24V, +5.8V power supply board
- 4) AVR-4-PS power supply module
- 5) AVR-4-PW pulse width module

The modules are interconnected as shown in Fig. 4.

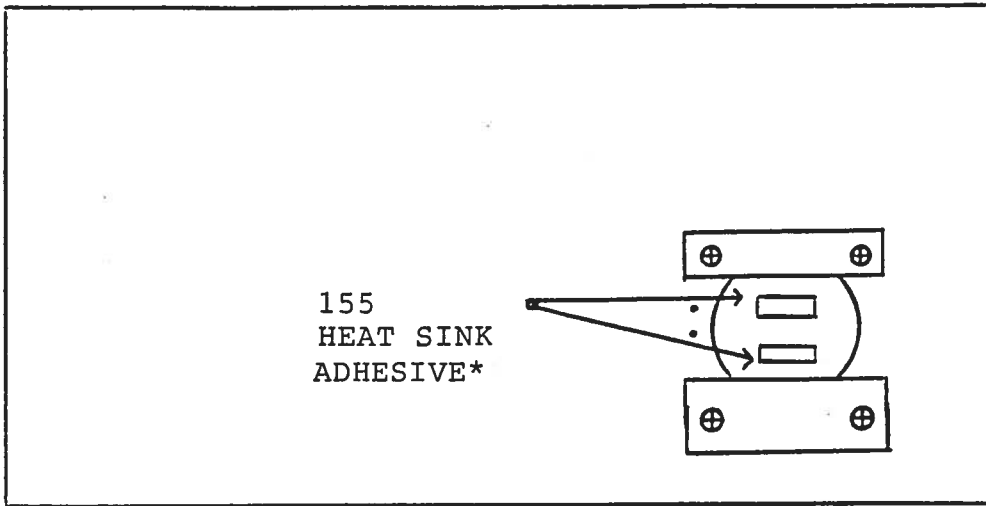
In the event of an instrument malfunction, it is most likely that the 0.5A slow blow fuse or the main power fuse on the rear panel has blown. Replace if necessary. If the unit still does not function, it is most likely that some of the output switching elements (SL18T) may have failed due to an output short circuit condition or to a high duty cycle condition. The switching elements may be accessed by removing the cover plates on the bottom side of the instrument. The cover plate is removed by removing the two 2-56 Phillips screws. NOTE: First turn off the prime power. CAUTION: Briefly ground the SL18T tabs to discharge the 400 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 instrument. The SL18T 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 SL18T 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 SL18T 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 us TTL level outputs are observed at pins 2 and 3.
- b) The PRF of the outputs can be varied over the range of 10 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 ns by the DELAY control.

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

SL18T HEAT SINKING

BACK



155
HEAT SINK
ADHESIVE*



SHORT LEAD →

Jan. 23/96

Edition E

Disk: AVR-4B-C

Name: PWCPNE.INS