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INSTRUCTIONS

MODEL AVR-3-PW-C-P-TEK2 PULSE GENERATOR

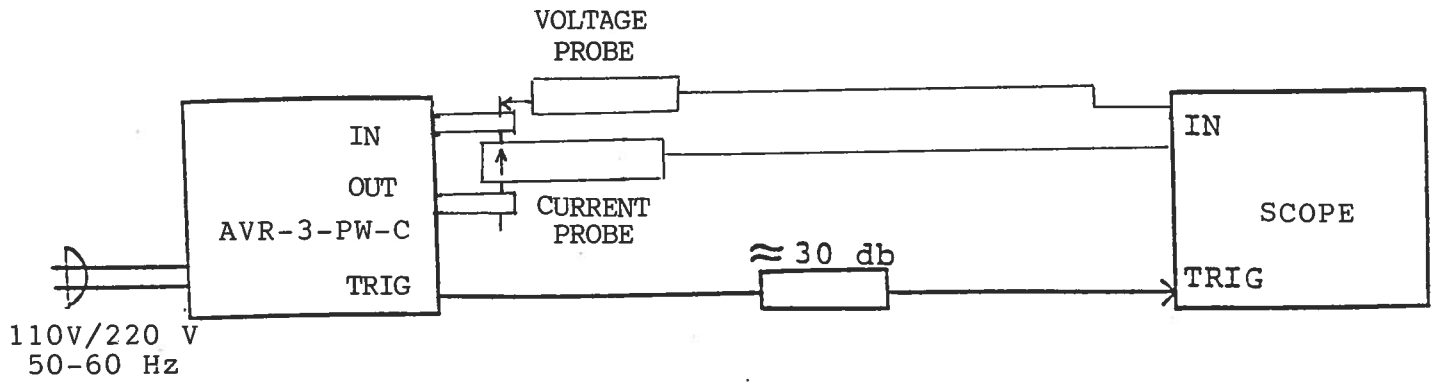
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WARRANTY

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



THEORY OF OPERATION

- 1) The AVR-3-PW-C-TEK2 generates a voltage pulse (0 to +200 Volts, 0.25 to 250 us) which is accessible at the front panel OUT terminal. A shorting bar (typically #18 bus bar wire) is connected between the OUT and IN terminals and the current probe is placed over the shorting bar. The IN terminal connects to ground via a 40 Ohm termination. A variable current of up to 5.0 Amperes is defined by the 200 Volt pulse and the 40 Ohm termination.

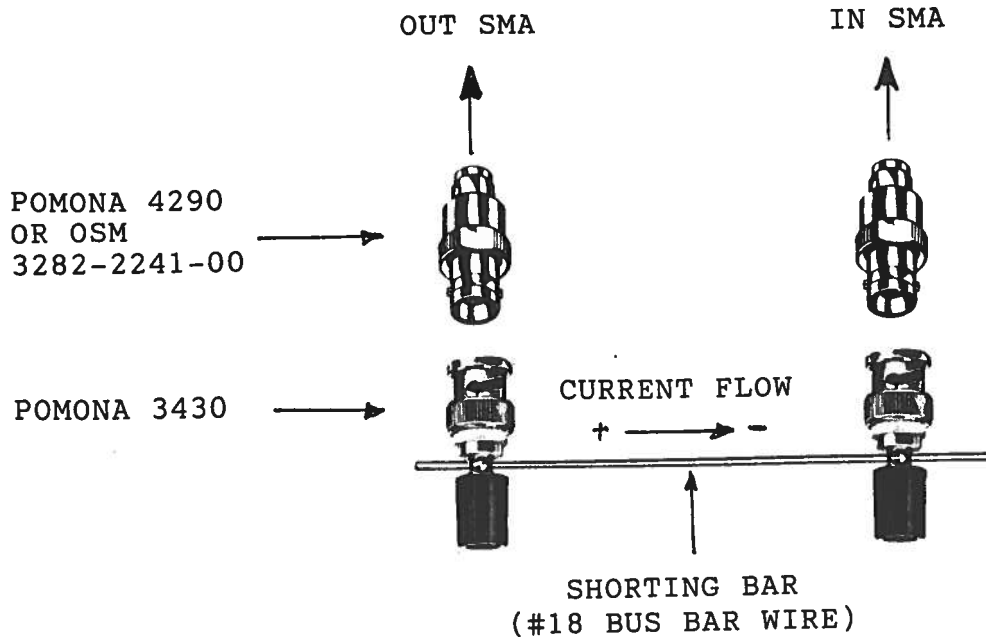
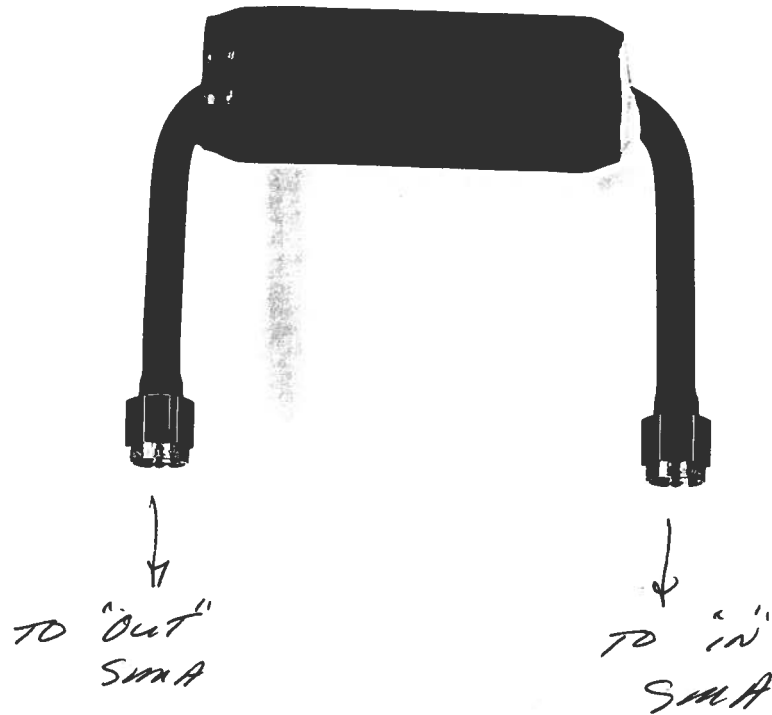


Fig. 2 SHORTING BAR, ADAPTER ARRANGEMENT FOR CURRENT PROBE

JULY 1994 MODIFICATION:

FIG 2 ASSEMBLY REPLACED BY ONE-
PIECE SMA ASSEMBLY SHOWN
BELOW.



GENERAL INSTRUCTIONS

- 1) The TRIG output channel provides TTL level signals. 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.
- 2) 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 controls.
- 3) The output pulse width is 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 0.25%.

| | PW min | PW max |
|---------|---------------------------|---------------------------|
| Range 1 | 0.25 us PRF max 10 kHz | 2.5 us PRF max 2.5 kHz |
| Range 2 | 2.5 us PRF max 2.5 kHz | 25 us PRF max 250 Hz |
| Range 3 | 25 us PRF max 250 Hz | 250 us PRF max 25 Hz |

- 4) The output pulse amplitude is controlled by means of the front panel ten turn AMP control. To voltage control the output amplitude, set the rear panel switch in the EXT position and apply 0 to +10 volts between terminal A and ground ($R_{IN} \geq 10K$).

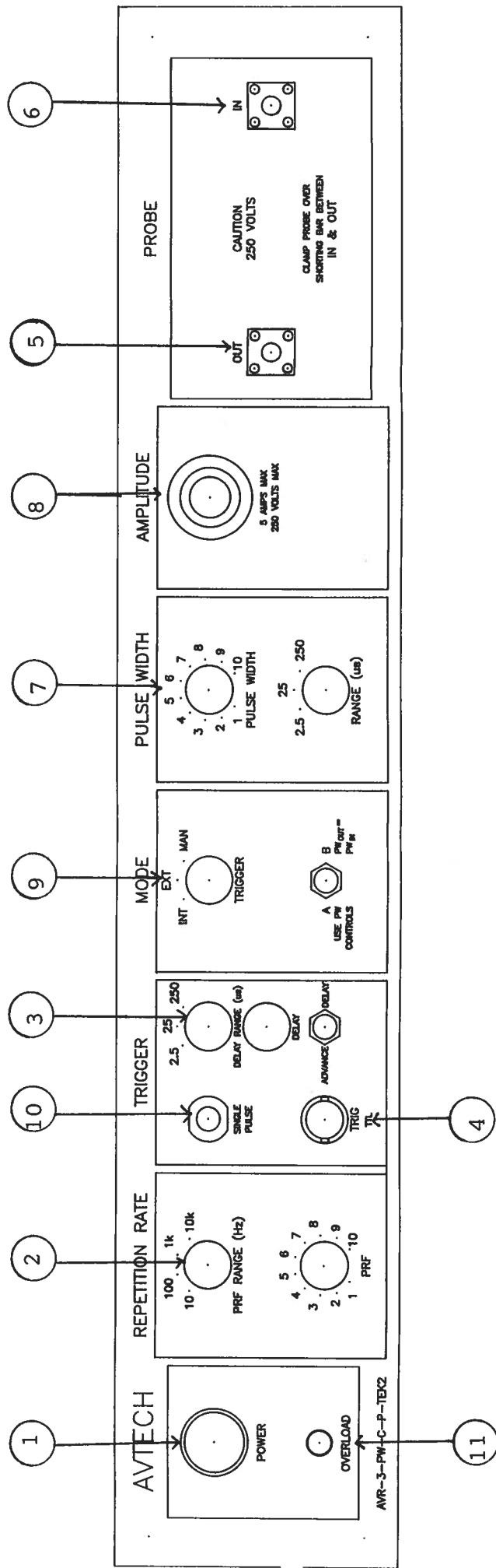
- 5) An external clock may be used to control the output PRF of the AVR unit by setting the front panel TRIG toggle switch in the EXT position and applying a 0.2 us (approx.) TTL level pulse to the TRIG BNC connector input. For operation in this mode, the scope time base must also be triggered by the external clock rather than from the TRIG output. When triggered externally, the output pulse width is controlled by the front panel PW controls provided the MODE A-B switch is in the A position. When the MODE A-B switch is in the B position, the output pulse width equals the input trigger pulse width.
- 6) For single pulse manual operation, set the front panel INT-EXT-MAN switch in the MAN position and push the SINGLE PULSE button.
- 7) 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 0.25 us to 250 us. 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.

| | MIN | MAX |
|---------|---------|--------|
| Range 1 | 0.25 us | 2.5 us |
| Range 2 | 2.5 us | 25 us |
| Range 3 | 25 us | 250 us |

- 8) AVR-3-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)

- 9) A shorting bar (typical #18 bus bar wire) is connected between the OUT and IN SMA connectors. The shorting bar connects to the SMA connector via a POMONA 3430 adapter and a POMONA 4290 adapter (or OSM 3282-2241-00) as shown in Fig. 2. The current probe is clamped over the shorting bar. Note that the current flow is from the OUT terminal to the IN terminal and note that the shorting bar may be at a pulsed potential as high as +250 Volts. The voltage waveform (across the self contained 40 Ohm termination) may be observed by connecting a voltage probe between ground and the shorting bar.
- 10) Large energy storage capacitors are employed in the output stage to obtain very low droop ($\leq 2\%$) at very wide pulse (250 us). As a result of the large capacitors, the output voltage amplitude will decrease slowly when the amplitude control is rotated counter-clockwise. This effect is particular pronounced at narrow pulse widths. The delay time constant may be reduced by a factor of ten by placing the HIGH-LOW capacitor switch in the LOW position. The switch may be accessed by removing the top cover (by removing the four Phillips screws on the top cover and sliding the cover back and off).
- 11) The unit can be converted from 120 to 240V 50-60 Hz operation by adjusting the voltage selector card in the rear panel fused voltage selector-cable connector assembly.
- 12) For additional information:

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FRONT PANEL CONTROLS

Fig. 3

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

1 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) the main output (5). This delay is variable over the range of 0.25 to about 250 us. Delay LEADS or LAGS depending on the position of the ADVANCE-DELAY switch.

| | MIN | | MAX |
|---------|---------|--|--------|
| Range 1 | 0.25 us | | 2.5 us |
| Range 2 | 2.5 us | | 25 us |
| Range 3 | 25 us | | 250 us |

- (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 0.25 us to 250 us. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.
- (5) OUT Connector. SMA connector provides 0 to +200 Volt output to a 40 Ohm load. (5) and (6) are to be connected as shown in Fig. 2.
- (6) IN Connector. SMA connection to internal 40 Ohm load. (5) and (6) are to be connected as shown in Fig. 2.

- (7) PW Control. A one turn control and 3 position range switch which varies the positive output pulse width from 0.25 us to 250 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 0.25%.

| | PW min | PW max |
|---------|---------------------------|---------------------------|
| Range 1 | 0.25 us PRF max 10 kHz | 2.5 us PRF max 2.5 kHz |
| Range 2 | 2.5 us PRF max 2.5 kHz | 25 us PRF max 250 Hz |
| Range 3 | 25 us PRF max 250 Hz | 250 us PRF max 25 Hz |

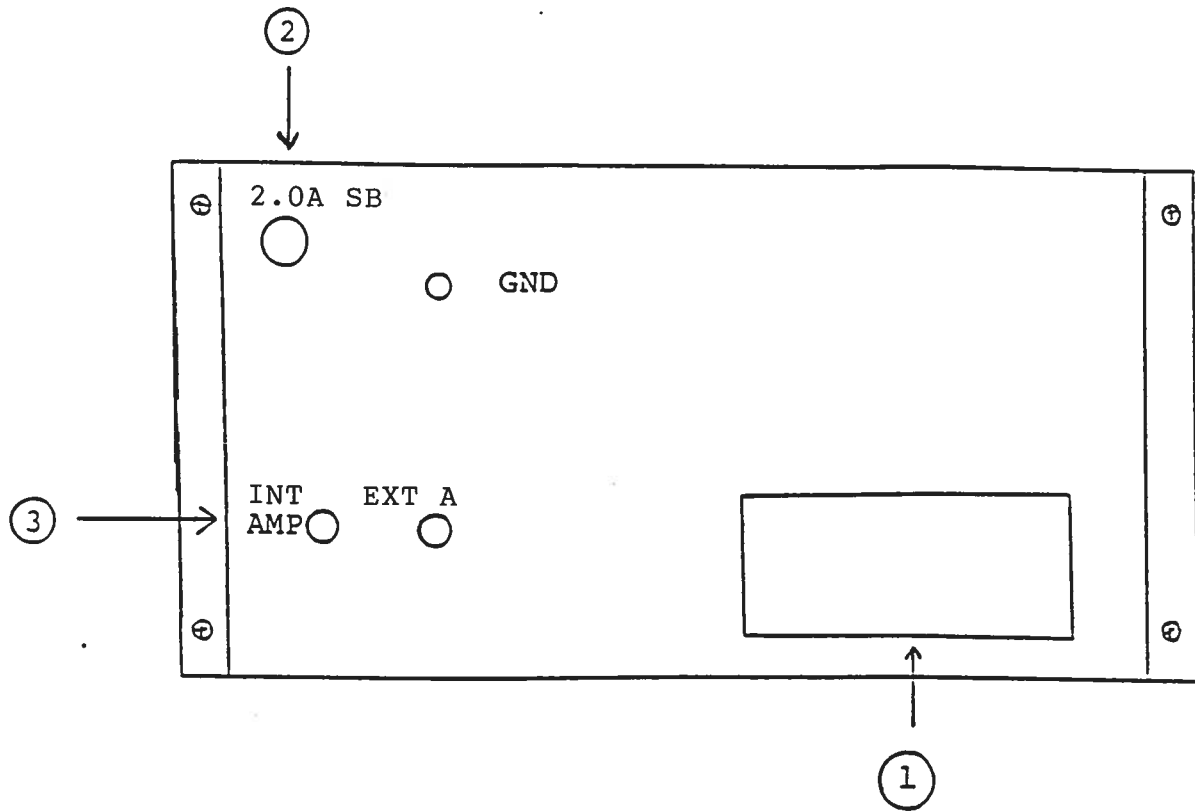
- (8) AMP Control. A ten turn control which varies the output pulse amplitude from 0 to 200 V (to 40 Ohms).
- (9A) INT-EXT-MAN Control and MODE A-B. With this toggle switch in the INT position, the PRF of the AVR unit is controlled via an internal clock which in turn is controlled by the PRF control.
- (9B) 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. When triggered externally, the output pulse width is controlled by the front panel PW controls provided the MODE A-B switch is in the A position. When the MODE A-B switch is in the B position, the output pulse width equals the input trigger pulse width.
- (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) OVERLOAD INDICATOR. AVR-3-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)

Fig. 14

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 (0.50 A SB).
- (2) 2.0A SB. Fuse which protects the output stage if the output duty cycle rating is exceeded.
- (3) EA. To voltage control the output amplitude, set the switch in the EXT position and apply 0 to +10 volts between terminal A and ground ($R_{IN} > 10K$).

TOP COVER REMOVAL AND RACK MOUNTING

- 1) 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).
- 2) The optional R5 rack mount kit may be installed after first removing the one Phillips screw on the side panel adjacent to the front handle.

Fig. 5a

POWER SUPPLY

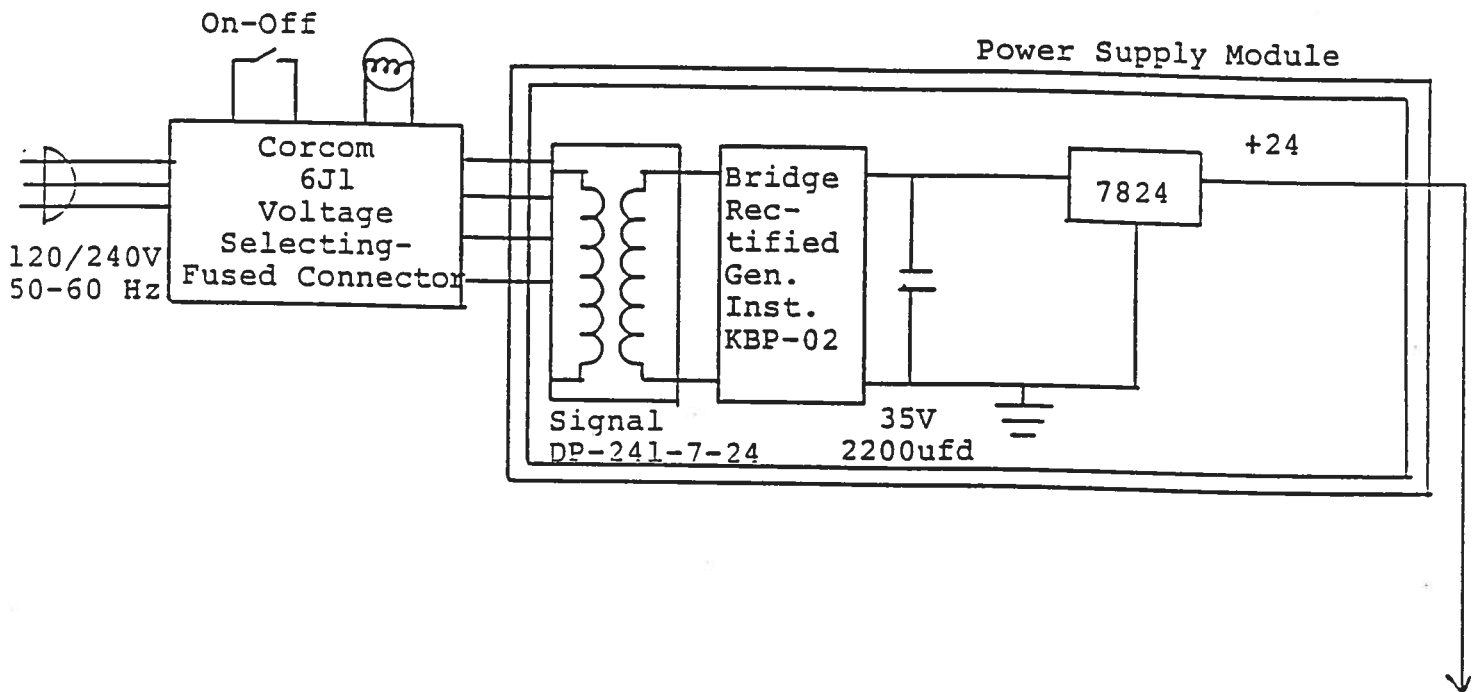


Fig. 5b

SYSTEMS DESCRIPTION AND REPAIR PROCEDURE

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

- 1) AVR-3-PW-PG pulse generator module
- 2) AVR-3-CL clock module
- 3) +24V power supply board
- 4) AVR-3-PS power supply module
- 5) AVR-3-PW pulse width module
- 6) AVR-3-PW overload module
- 7) AVR-3-TEK2-40 internal loop
- 8) AVR-3-DB2 single pulse module

The modules are interconnected as shown in Fig. 5. The clock module controls the output PRF and the relative delay between the main output and the TRIG output. The PG pulse generator modules generate the output pulse. The PS module generates 0 to +220 volts to power the pulse generator module. The PW module controls the output pulse width. In the event of an instrument malfunction, it is most likely that the rear panel 2.0A SB fuse or some of the output switching elements (SL4T) 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 SL4T 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 SL4T switching elements, take care to insure that the short lead (of the three leads) is adjacent to the black dot on the chassis. If the switching elements are not defective, then the four Phillips screws on the top cover panel should be removed. The top cover may then be slid off and operation of the clock and power supply modules should be 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 1.0 Hz to 10 kHz using the PRF controls.
- c) The relative delay between the pin 2 and 3 outputs can be varied by at least 0.1 us to 100 us by the DELAY controls.

The sealed clock module must be returned to Avtech for repair or replacement if the above conditions are not observed. The power supply board generates +24V DC 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.

~~May 30/94~~

December 10/97

Edition A

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