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NANOSECOND WAVEFORM ELECTRONICS
SINCE 1975

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*- reduced
version
contains a
disassembled
large diagram
(separate before
copying)*

INSTRUCTIONS

MODEL AVO-7E-C-IFGD-P-AT2-PWT PULSE GENERATOR

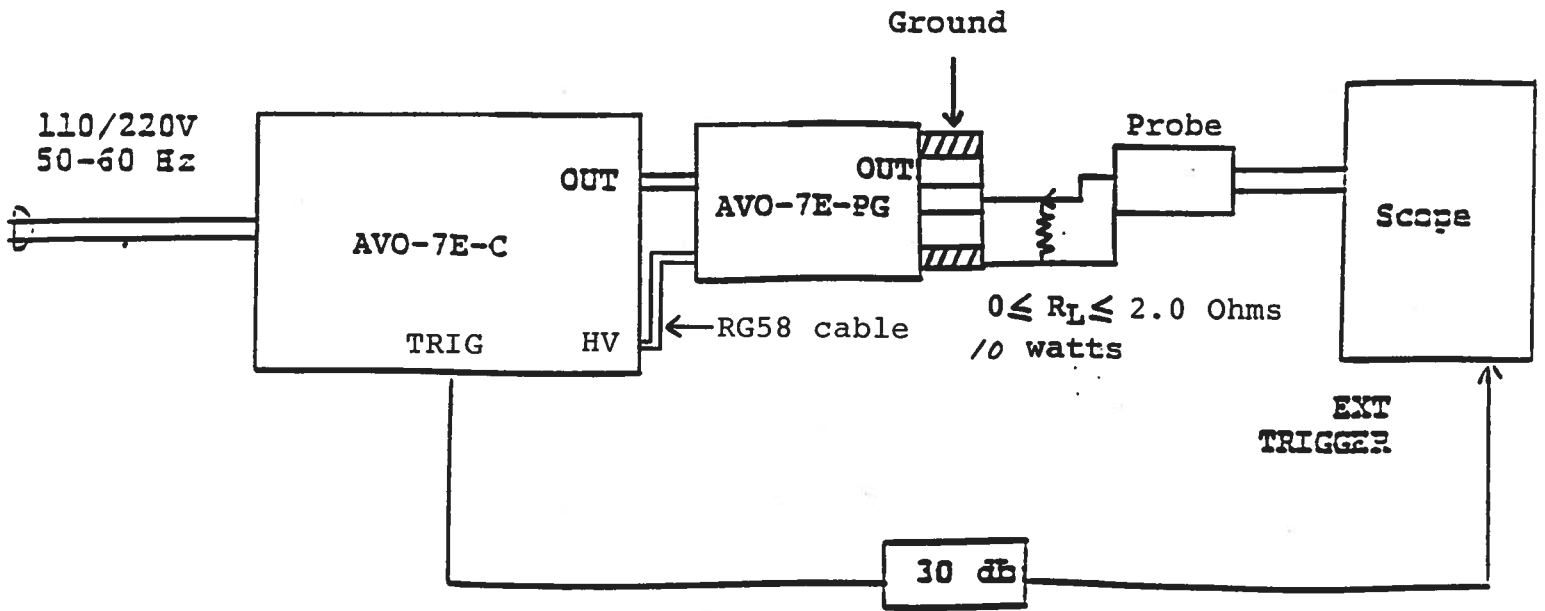
S.N. :

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 ns a fast oscilloscope (at least 50 MHz and preferably 200 MHz) should be used to display the waveform. The mainframe and the -PG output module must be connected as shown in Fig. 1. Note that the HV port on the -PG module and the HV port on the front panel of the mainframe must be connected by the RG-58A cable.
- 2) 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 ADVANCE-DELAY switch is in the ADVANCE position. The TRIG output lags the main output when the switch is in the DELAY position.
- 3) To obtain a stable output display the PW and PRF controls 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 controls.
- 4) When the MODE S-L switch is in the S position, the output pulse width is controlled by the 5-position range switch and ten turn control as follows:

5 us to 50 us
50 us to 500 us
500 us to 5 ms
5 ms to 50 ms
50 ms to 500 ms

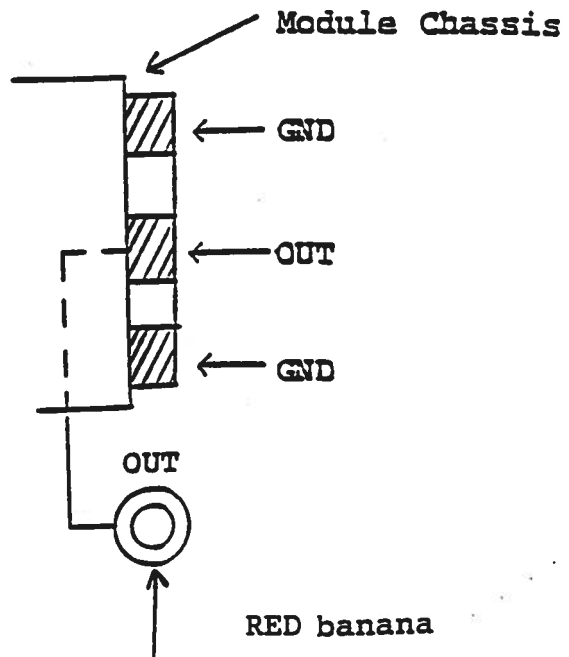
- 5) When the MODE S-L switch is in the L position, the output pulse width is fixed at 5.0 minutes. In this mode, the unit must be triggered externally or manually (via the SINGLE PULSE button).
- 6) The output amplitude is controlled by the front panel ten turn Amp control and the RANGE A-B switch as follows:

| <u>Amplitude</u> | <u>PW</u> (max) | <u>PRF</u> (max) |
|--------------------|--------------------|---------------------|
| 30 Amps (Range A) | 10 us | 300 Hz |
| 5.5 Amps (Range B) | 100 us | 180 Hz |
| 2.0 Amps (Range B) | 1 ms | 50 Hz |
| 1.5 Amps (Range B) | 10 ms | 6.6 Hz |
| 1.0 Amps (Range B) | 500 ms | 0.2 Hz |

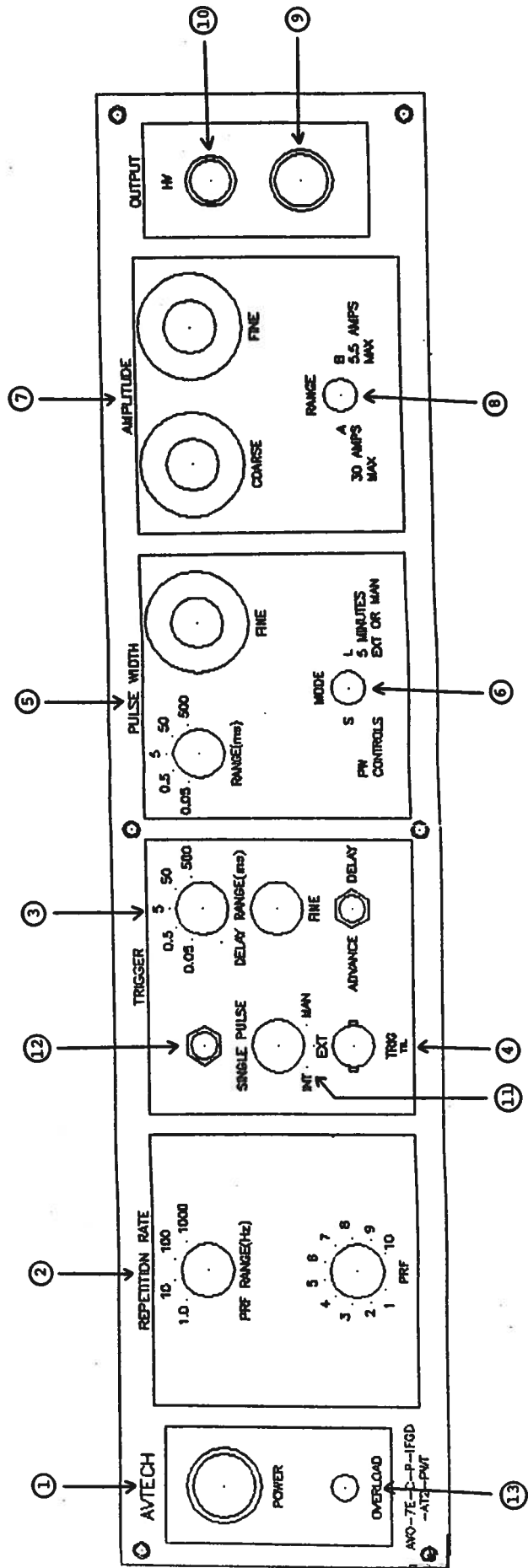
If the above PRF-PW ratings are exceeded the realizable maximum output amplitude will decrease and in severe cases lead to the failure of the output switching elements (see REPAIR SECTION).

- 7) The AVO-7E is designed to supply up to 30 ampere to a maximum load voltage of 60 Volts when in RANGE A and up to 5.5 Amps to 15 Volts when in RANGE B. Factory tests are conducted with a 2.0 Ohm load capable of dissipating at least 10 Watts. Higher load resistance values may be used but the output voltage must be limited to 60 Volts or less (RANGE A) or 15 Volts or less (RANGE B).
- 8) 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 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) 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). Note that the "OUT" red banana terminal is in parallel with the microstrip center conductor and so may also be used as the output terminal.

AVO-7E-PG



- 10) Note that the RG58 cable on the PG module must be connected to the front panel BNC HV connector on the mainframe.
- 11) CAUTION: The output stage is protected against overload condition by a 2.0 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 load resistance as high as possible.
- 12) OVERLOAD. AVO-7E-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)
 - 3) Reducing the output amplitude
- 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) If application assistance is required, call (613) 226-5772 or Fax (613) 226-2802.



- (1) ON-OFF Switch. Applies basic prime power to all stages.
- (2) PRF Control. Varies PRF from 0.1 Hz to 1 kHz as follows:

| | |
|---------|-------------------|
| Range 1 | 0.1 Hz to 1 Hz |
| Range 2 | 1 Hz to 10 Hz |
| Range 3 | 10 Hz to 100 Hz |
| Range 4 | 100 Hz to 1.0 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 as follows:

| | |
|---------|-----------------|
| Range 1 | 5.0 us to 50 us |
| Range 2 | 50 us to 500 us |
| Range 3 | 500 us to 5 ms |
| Range 4 | 5 ms to 50 ms |
| Range 5 | 50 ms to 500 ms |

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.

- (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.
- (5) PW Control. A ten turn control and 5 position range switch which varies the output pulse width as follows when the MODE S-L switch is in the S position:

| | |
|---------|-----------------|
| Range 1 | 5 us to 50 us |
| Range 2 | 50 us to 500 us |
| Range 3 | 500 us to 5 ms |
| Range 4 | 5 ms to 50 ms |
| Range 5 | 50 ms to 500 ms |

When the MODE S-L switch is in the L position, the output pulse width is fixed at 5 minutes. In this mode the unit must be triggered externally or manually (via the SINGLE PULSE button).

- (6) MODE S-L. When this switch is in the S position, the output pulse width is controlled by the PW controls (5) as described in 5) above. When the S-L switch is in the L position, the output pulse width is fixed at 5.0 minutes. In this mode, the output current is limited to 0.5 Amperes and the unit must be triggered externally or manually (via the single pulse push button). For this mode to function, the Range A-B switch (8) must be in the B position. To initiate this mode it is recommended that the switch position be set when the prime power is off. Then push the manual push button for the single pulse after turning on the prime power and then set the required output amplitude. The 5 minute PW duration may be adjusted $\pm 10\%$ by removing the top cover of the instrument and rotating the one turn locking pot on the side of the -PS module.

- (7) AMP. Two ten turn pots for controlling the output pulse amplitude. The coarse control is 10 times more sensitive than the fine control.
- (8) RANGE A-B. With the switch in the A position the output amplitude can be varied from 0 to +30 Amperes. In this mode the output pulse width must not exceed 10 us and the PRF must not exceed 300 Hz. The unit may be damaged if the above duty cycle restrictions are exceeded. With the switch in the B position, the output amplitude may be varied between 0 to about 6 Amperes. Note, however, that the following duty cycle restrictions must not be exceeded:

| <u>Amplitude</u> | <u>PW</u> (max) | <u>PRF</u> (max) |
|------------------|--------------------|---------------------|
| 5.5 Amps | 100 us | 180 Hz |
| 2.0 Amps | 1 ms | 50 Hz |
| 1.5 Amps | 10 ms | 6.6 Hz |
| 1.0 Amps | 500 ms | 0.2 Hz |

When changing ranges it is recommended that the amplitude be turned down to zero.

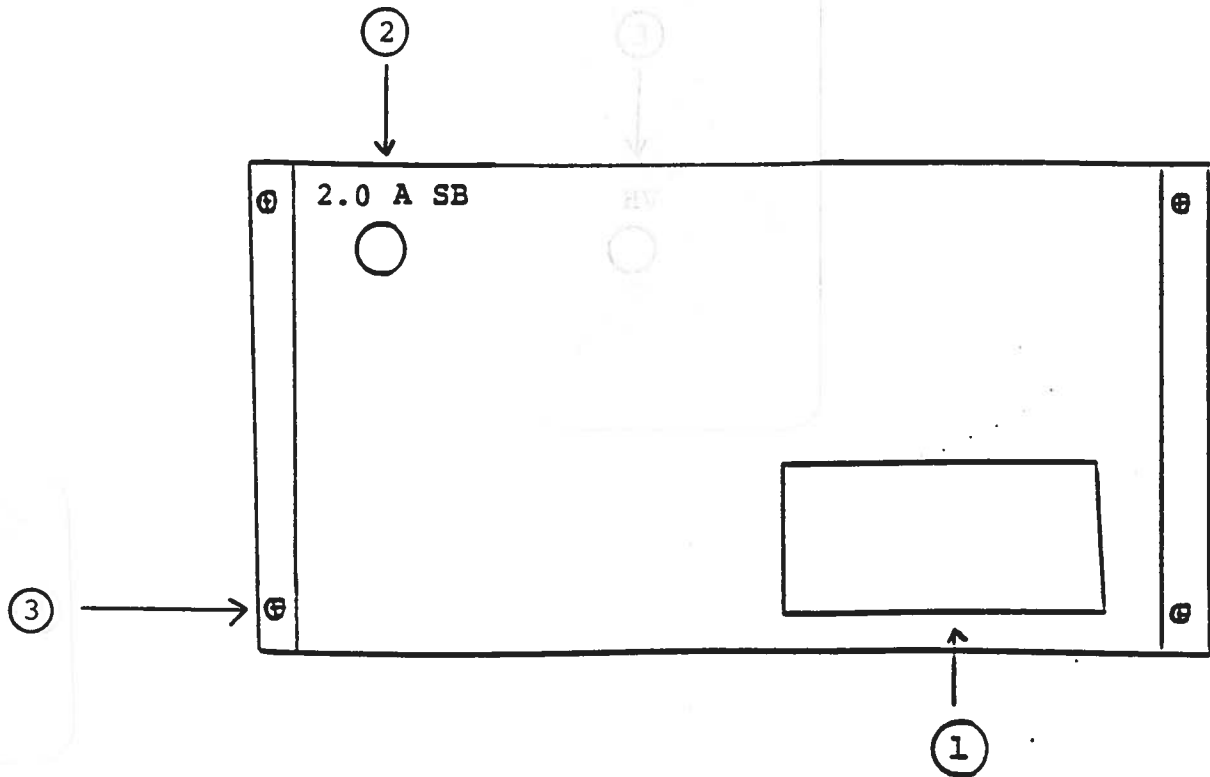
- (9) OUT Connector. A multi pin connector which attaches the 2 foot cable from the pulse generator module to the main frame. This cable controls the output pulse width and amplitude.
- (10) The RG58 cable from PG module must be connected to the front panel BNC HV connector. The potential on this cable is either 100V (Range A) or 36V (Range B).
- (11) EXT-INT-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 controls. 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. For single pulse operation, set the INT-EXT-MAN switch in the MAN position.
- (12) 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.
- (13) OVERLOAD. AVO-7E-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)
- 3) Reduce the output pulse amplitude

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 (1.0A SB).
- (2) 2.0 A SB FUSE. Protects output stage against overload conditions.
- (3) COVER REMOVAL. To remove the top cover, remove the 4 Phillips screws on the back panel. The top cover may then be slid back (and off).

SYSTEM DESCRIPTION AND REPAIR PROCEDURE

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

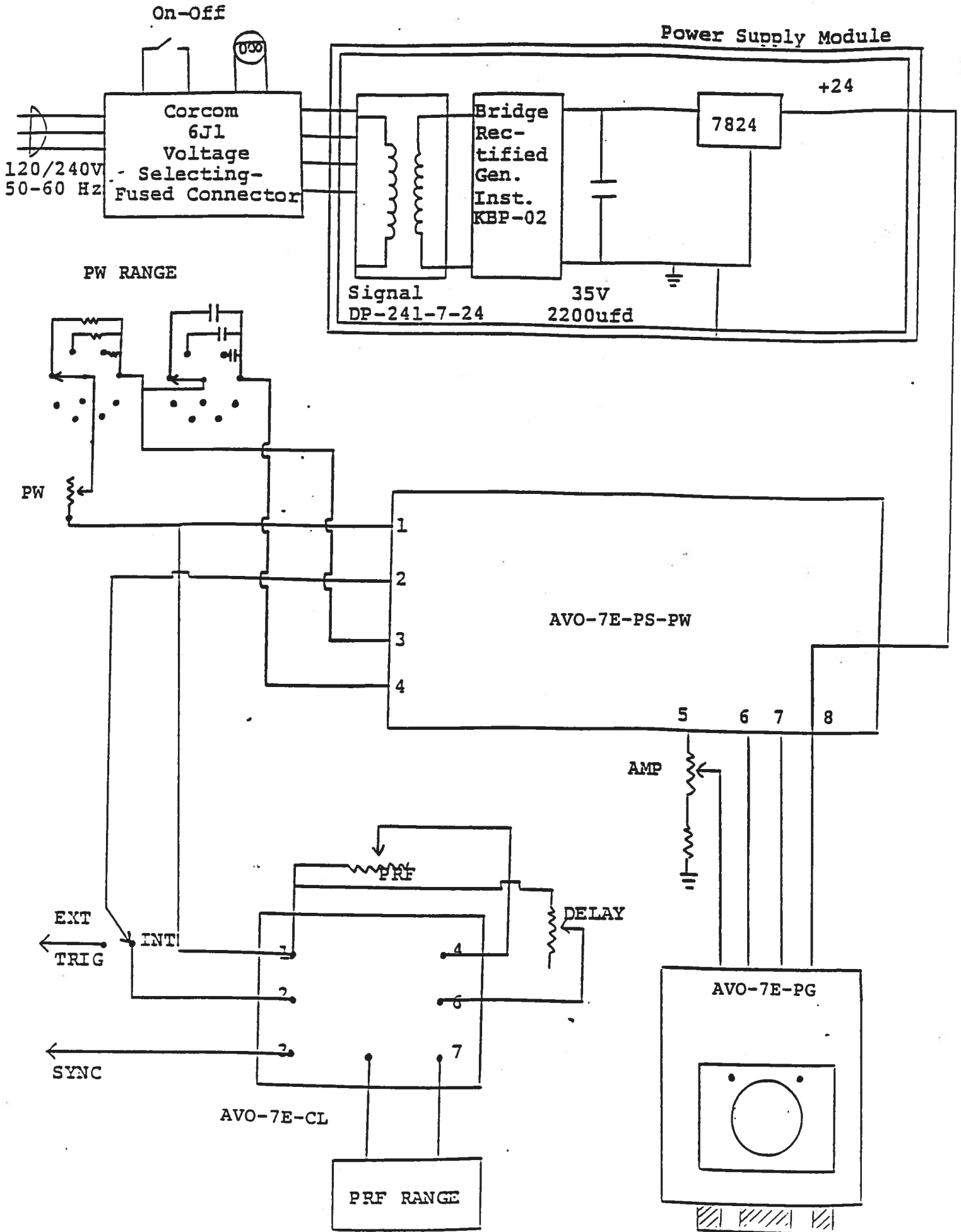
- 1) AVO-7E-PG pulse generator module
- 2) AVO-7E-CL clock module
- 3) AVO-7E-EW pulse width control module
- 4) +24V power supply board and +50 volt power supply board
- 5) -15 volt power supply module

The modules are interconnected as shown in Fig. 4.

In the event of an instrument malfunction, it is most likely that the 2.0A slow blow fuse or the main line fuse (1.0 Amp) 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 may have failed and the unit should be returned to the factory for repair.

Fig. 4

SYSTEM BLOCK DIAGRAM



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✕

January 31, 1992.

Steve Wirrig
Inland Fisher Guide, General Motors
P.O. Box 1224, MS02-11
Dayton, OH 45401

Tel: 513-455-3181
Fax: 513-455-3942

Dear Steve:

Following our telephone conversation of January 31, I am pleased to provide a revised price and delivery quotation for two special purpose pulsed constant current generators meeting the following specifications:

A)

Model designation: AVO-7E-C-P-IFGC.

| | <u>Amplitude</u> | <u>PW</u> | <u>PRF</u> (max) |
|------------------------|--------------------|-----------|------------------|
| Output amplitude: | 30 Amps (Range A) | 10 us | 300 Hz |
| (via 10 turn locking | 5.5 Amps (Range B) | 100 us | 180 Hz |
| dial control and two | 2.0 Amps (Range B) | 1 ms | 50 Hz |
| position range switch, | 1.5 Amps (Range B) | 10 ms | 6.6 Hz |
| Range A, Range B) | 1.0 Amps (Range B) | 500 ms | 0.2 Hz |

Output pulse width: 5 us to 500 ms via a five position range switch and a one turn fine control.

PRF: Internal clock: 0.1 Hz to 1 KHz via a four position range switch and a one turn fine control.

External trigger: 0 to 1 KHz (includes manual push button for one shot operation).

Rise, fall time: ≤ 0.5 us.
Load voltage range: Range A (0 to +60 volts).
Range B (0 to 15 volts).
Chassis size: 4" x 12" x 16".
Other: See standard Model AVO-7E-C,
Cat. No. 8.
Price: \$4,690.00 US each, FOB destination.
Delivery: 30 days ARO.

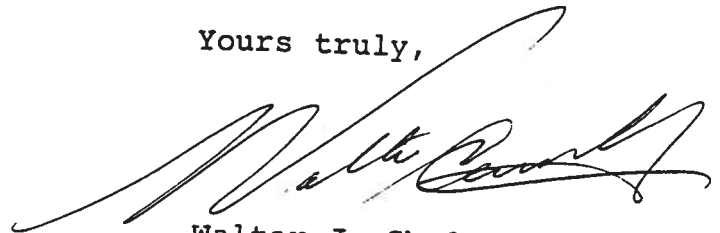
Note that this model could be subsequently converted (at the factory) to meet the specifications of Model AVO-7E-C-P-IFGD (\$600.00 US).

B)

Model designation: AVO-7E-C-P-IFGD.
Function: As Model AVO-7E-C-P-IFGC but includes additional PW selector switch which provides a 5 minute wide output pulse when triggered externally or when manual push button activated. Maximum output amplitude in this mode limited to 0.5 Amperes.
Price: \$4,995.00 US each, FOB destination.
Delivery: 60 days ARO.

Thank you for your interest in our products. Please call me again if you require any additional information or modifications to the above quotations.

Yours truly,



Walter J. Chudobiak
Chief Engineer

WJC:pr
Encl. Cat. No. 8S1
Price list

Oct. 12, 1993