AVTECH

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

e-mail: info@avtechpulse.com
http://www.avtechpulse.com

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

INSTRUCTIONS

MODEL AVO-9E-C 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 dissembled, modified or subjected to conditions exceeding the applicable specifications or ratings. This warranty is the extent of the obligation assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

TECHNICAL SUPPORT

Phone: 613-226-5772 or 1-800-265-6681
Fax: 613-226-2802 or 1-800-561-1970

E-mail: info@avtechpulse.com
World Wide Web: http://www.avtechpulse.com

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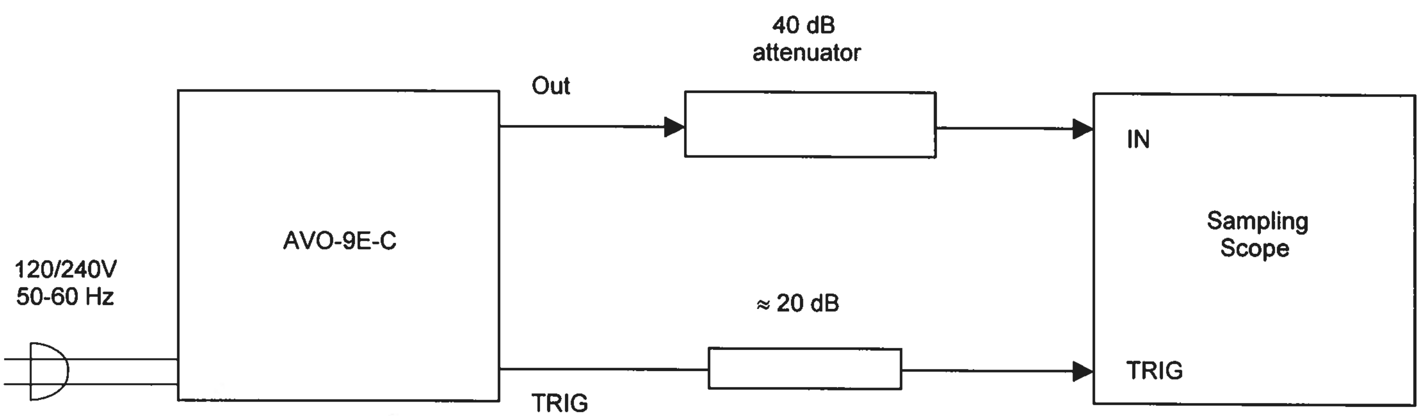
Manual Reference: Q:\office\instructword\Avo-9\AVO-9E-Cedb-fig.doc, created September 15, 2000

FIG. 1: PULSE GENERATOR TEST ARRANGEMENT
(AVX-S1 Module Disconnected)



GENERAL OPERATING INSTRUCTIONS
(AVX-S1 Module Disconnected)

1) The bandwidth capability of components and instruments used to display the pulse generator output signal (attenuators, cables, connectors, etc.) should exceed one gigahertz.

2) The use of 40 db attenuator at the sampling scope vertical input channel will insure a peak input signal to the sampling scope of less than one volt.

3) The TRIG output channel provides a +0.5 V, 20 ns wide pulse. To avoid overdriving the TRIG input channel of some sampling scopes, a 20 db attenuator should be placed at the input to the sampling scope trigger channel.

4) To obtain a stable output display the PRF and PRF FINE controls on the front panel should be set mid-range while the PRF range switch may be in either range. The front panel TRIG toggle switch should be in the INT position. The front panel DELAY control and the scope triggering controls are then adjusted to obtain a stable output. It is recommended that the DELAY control first be set max counter clockwise and then turned clockwise until a stable display is obtained. The scope may then be used to set the desired PRF by rotating the PRF and PRF FINE controls and by means of the PRF range switch.

5) The output pulse width is controlled by means of the front panel one turn PW control. The control should initially be set maximum counter clockwise and the pulse width adjusted using an oscilloscope.

6) The output pulse amplitude is controlled by means of the front panel one turn AMP control.

7) An external clock may be used to control the output PRF of the AVO-9E unit by setting the front panel TRIG toggle switch in the EXT position and applying a 50 nsec, or under, TTL level pulse to the TRIG BNC connector input.

8) WARNING: Model AVO-9E-C may fail if triggered at a PRF greater than 10.0 MHz or at a duty cycle exceeding 20%.

9) AVO-9E-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).

10) Dual Polarity Option. To invert the output of the AVO- 9E unit, connect the IN PORT of the AVX-3 unit to the OUT port of the AVO-9E mainframe. An inverted pulse is then obtained at the OUT port of the AVX-3 unit.

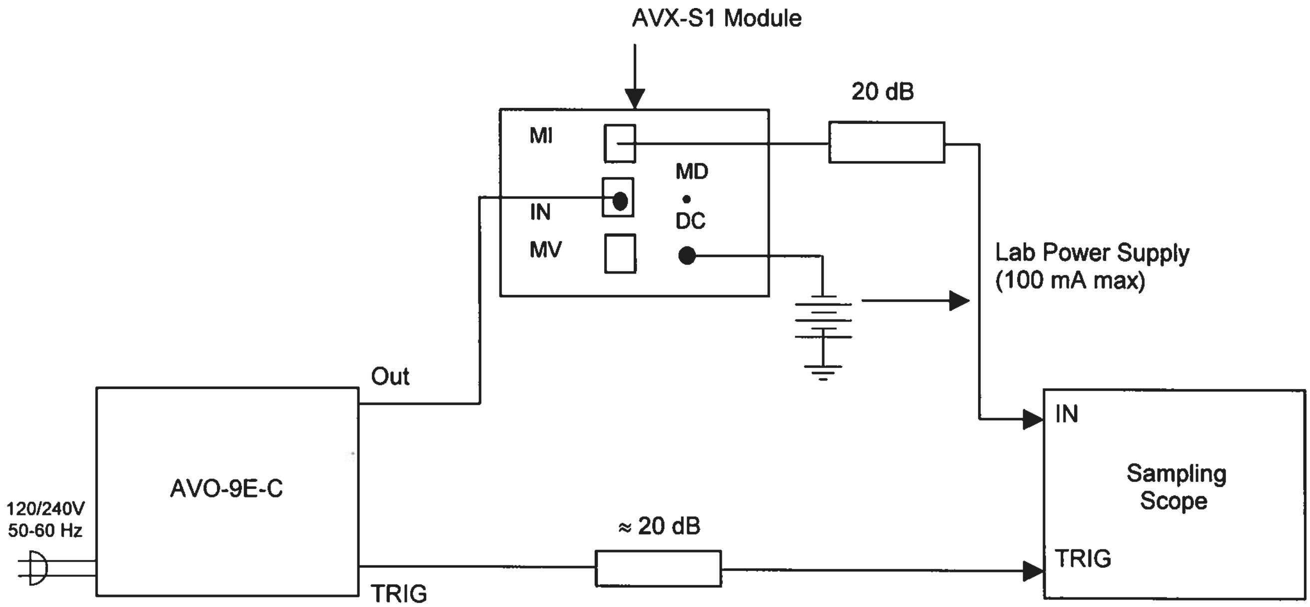
11) The rise and fall time are switched from the high to low range by means of the TR and TF two position switches. (TRF option).

12) The AVO-9E-C 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.

13) For additional assistance:

Tel: (613) 226-5772
Fax: (613) 226-2802
Email: info@avtechpulse.com

FIG. 2: PULSE GENERATOR TEST ARRANGEMENT
(AVX-S1 Module Connected)



CONNECTING THE AVO-9A-C TO THE AVX-S1

1) A general description of the AVX-S1 module is given in the enclosed data sheet.

2) The AVX-S1 module should be connected to the AVO-9A-C mainframe via the supplied 24" RG174 cable. The diode current may be monitored by connecting the MI and MV output ports to the sampling scope via 20 dB attenuators. The output amplitude (V_{MI} and V_{MV}, and Volts) and diode current (I_D, Amp) are related as follows:

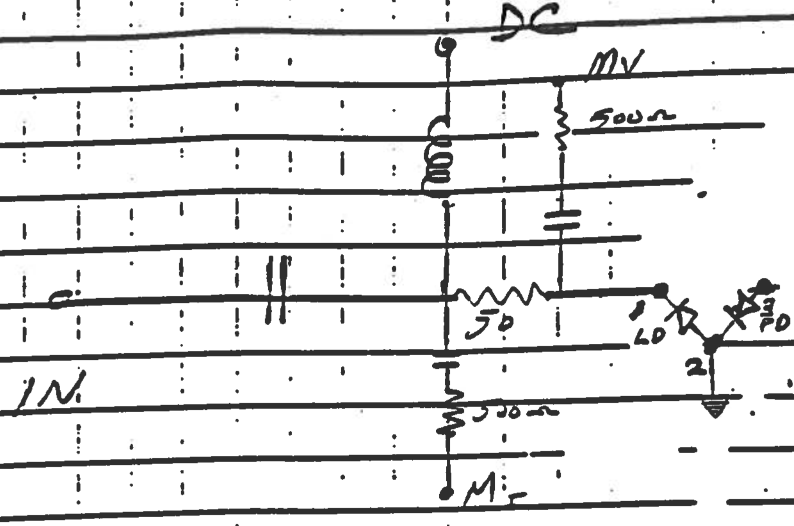
   $$I_D = 0.2\ (V_{MI} - V_{MV})$$

   The laser diode voltage is given by the following:

   $$V_D = 10\ V_{MV}$$

3) The laser diode plugs directly into the socket on the side of the AVX-S1 module.

4) A forward DC bias may be applied to the laser diode by connecting a DC potential of 0 to -5 Volts to the DC solder terminal. The application of a small forward bias often yields a more ideal diode current waveform (as observed on the MI port). Note that the DC port must be shorted to ground if a bias is not applied.



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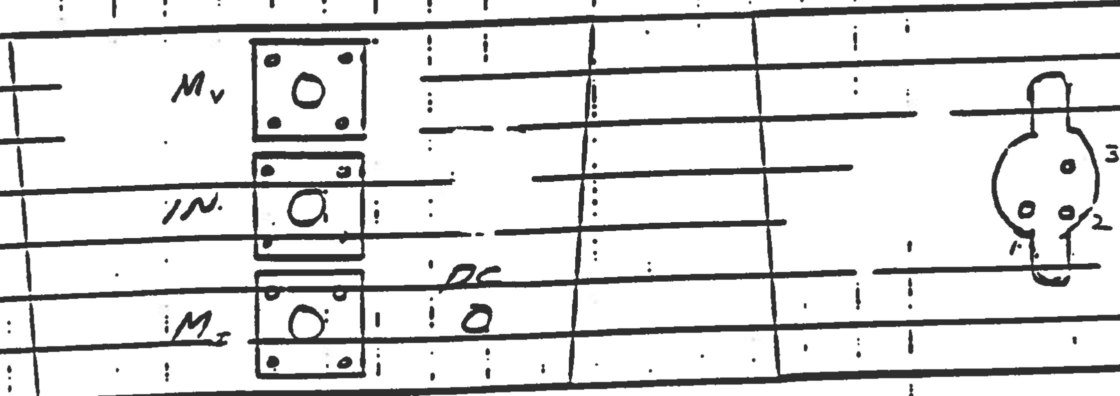
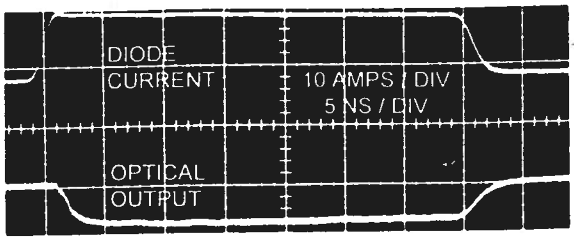


PACKAGE

LASER DIODE BIAS INSERTION UNITS



- Socket mounting of laser diodes
- Peak currents from 100 mA to 48 Amps
- Pulse widths from 0.4 to 200 ns
- Rise times from 0.2 to 2.0 ns
- Pulse or CW RF
- Diode voltage monitor and photodiode output options

The AVX-S series of bias insertion units is designed to combine a pulse or RF CW signal with a DC bias, and supply the resulting signal to a laser diode, which is inserted into a high quality socket included on the mount. The bias insertion module includes the necessary networks to match the laser diode to the pulse or RF source as well as networks for applying DC bias to the diode. An output for monitoring the diode current is included, and optional outputs allow for monitoring of the laser diode voltage and a photo detector diode output. Readily available socket configurations (TO-18, TO-5, TO-3, OP-3) are shown on the following page. Note that the laser diodes are not supplied with the AVX-S series.

The AVX-S series includes 3 basic models, namely the AVX-S1, AVX-S2 and the AVX-S3. The basic functional equivalent circuits for the three models are shown in Figures 1, 2, and 3 on page 75. Model AVX-S1 is specifically designed for ultra high-speed, low current applications (rise times as low as 200 ps, bandwidths to 100 MHz, $I < 1.0$ Amp). Model AVX-S1 is employed in the AVO-9-C series of diode drivers. Model AVX-S2 is intended for application with rise times greater than 2 ns and currents above 1 Ampere. Model AVX-S3 is specifically designed for use with the AVO-2 and AVO-5 series pulse generators (which provide currents in the range of 5 to 50 Amperes).

The input series blocking capacitor in Models AVX-S1 and AVX-S2 presents a low impedance to RF CW signals and to baseband pulses, while the shunt inductor presents a high impedance to RF (or pulse) signals but an extremely low impedance to the DC bias. The resistor in series with the laser diode is selected to insure that the impedance at the IN port is 50 Ohms. Normally a laser diode resistance of 3 Ohms is assumed.

The diode current monitor (M_I) is a standard feature that provides an output waveform (to 50 Ohms) which is an attenuated replica of the laser diode current. The output amplitude (V_{MI}, Volts) and diode current (I_D, Amps) are related as follows:

Fig. 1: $I_D = 0.2\,(V_{MI} - V_{MV})$ Fig. 2: $I_D = 0.2\,V_{MI}$

The optional diode voltage monitor (MV) provides an output waveform that may be related to the voltage across the laser diode (V_D, Volts) as follows:

Fig. 1: $V_D = 10\,V_{MV}$ Fig. 2: $V_D = 10\,(V_{MV} - V_{MI})$

The $-M_D$ option provides a connection to a photo diode detector output.

Model AVX-S3 is available in four different versions (AVX-S3A, AVX-S3B, AVX-S3C and AVX-S3D) all of which include a matching transformer which effectively boosts the laser diode current beyond that provided by the pulse source.

Model AVX-S3A is designed to match 50 Ohm pulse generators such as Model AVO-2-C to 12 Ohm loads with peak currents of 5 Amperes. Consequently, the resistor R_S in the equivalent circuit for this model is 10 Ohm. This resistor is accessible in all AVX-S3 models and may be changed by the user (by desoldering). The series resistance of the laser diode and the resistor R_S must equal the pulse generator source impedance divided by N^2. Consequently, if the series resistance of the laser diode is relatively high, it then may be necessary to reduce the value of R_S. Model AVX-S3B is designed to match 50 Ohm pulse generators such as Model AVO-5-C to 3 Ohms and will provide peak diode currents up to 28 Amperes. Model AVX-S3C is designed to match Models AVO-2W-C and AVO-2-C (25 Ohm source impedance) to load resistance of about 5 Ohms and will provide peak diode currents as high as 10 Amperes. Model AVX-S3D is designed for use with Model AVO-5B-C and will provide up to 48 Amperes of diode current.

One (or two) SMA output connectors provide attenuated coincident replicas of the diode current ($-M_I$ current monitor feature) and diode voltage (-MV option) as per the following relationships (Amps, Volts):

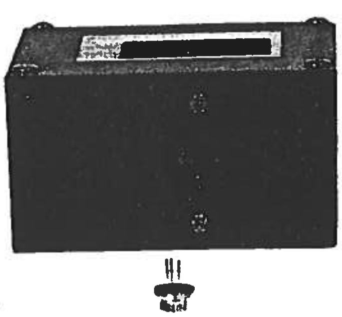
$$I_D = \frac{10V_{MI}}{R_S} \qquad V_D = 10\,(V_{MV} - V_{MI})$$

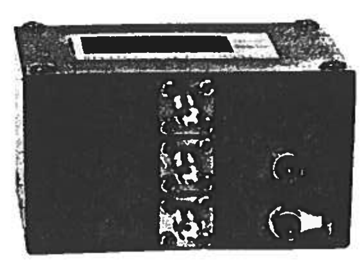
All AVX-S3 units include two foot long input cables with SMA male connectors.

When ordering members of the AVX-S family, the customer must specify the basic model number (eg. AVX-S1) and the following additional information:

a) Diode package type (e:g. TO-18) and the required pin connections (e.g. anode, cathode, ground, etc.). See the following page for readily available package mounting. Contact Avtech for special or different packages.
b) Desired options (e.g. -MV, -MD).

Contact Avtech for your special requirements.

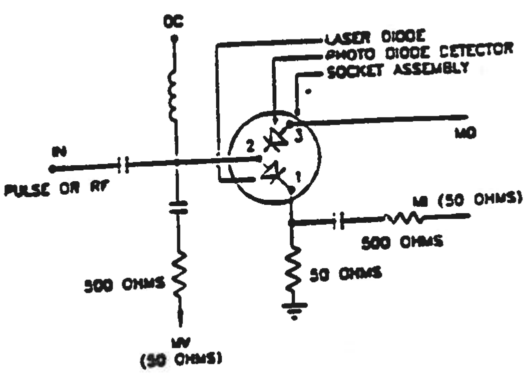




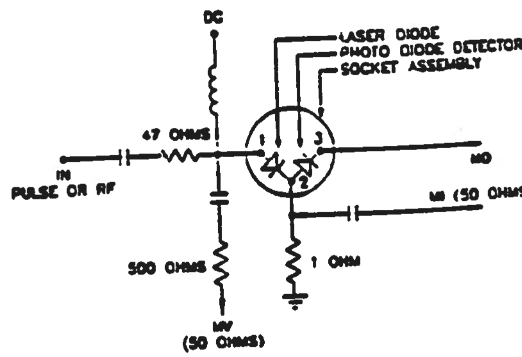
AVX-S1

SPECIFICATIONS

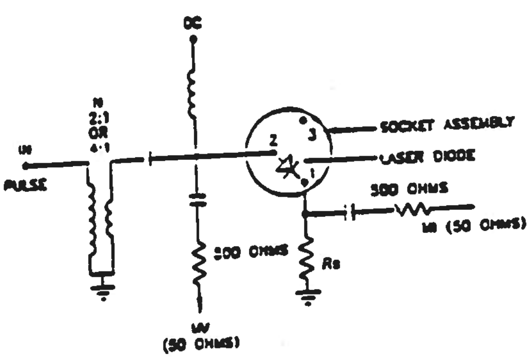
Model:	AVX-S1	AVX-S2	AVX-S3A	AVX-S3B	AVX-S3C	AVX-S3D
Peak diode current:	400 mA	2 Amps	5 Amps	28 Amps	10 Amps	48 Amps
Max. input amplitude:	20 volts	100 volts	150 volts	350 volts	150 volts	150 volts
Pulse width (nsec):	0.4 - 200	1 - 1000	2 - 100	2 - 100	2 - 100	5 - 500
Rise time (nsec):	0.2	0.5	0.5	1.0	0.5	2.0
Pulse PRF range:	DC - 0.5 GHz	DC - 100 MHz	DC - 10 MHz	DC-10 MHz	DC - 10 MHz	DC - 1 MHz
CW frequency range:	10 MHz - 1.0 GHz	1 - 200 MHz	-	-	-	-
Max. bias current:	100 mA	100 mA	100 mA	100 mA	100 mA	100 mA
Max. bias voltage:	50 volts	50 volts	50 volts	50 volts	50 volts	50 volts
Input impedance:	50 ohms	50 ohms	50 ohms	50 ohms	25 ohms	12 ohms
N:	-	-	2	4	2	4
Rs (ohms):	-	-	10	3	5	0.7
IN connector:	SMA					
Monitor connector:	SMA					
Bias connector:	Solder pin					
Size (in):	1.6 x 2.8 x 3.0					
Material:	Cast aluminum, blue enamel					
Mounting:	Any					



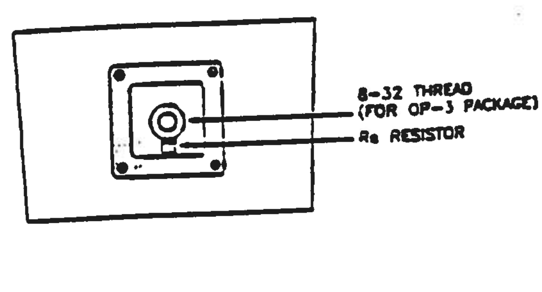
AVX-S1 FUNCTIONAL EQUIVALENT CIRCUIT



AVX-S2 FUNCTIONAL EQUIVALENT CIRCUIT

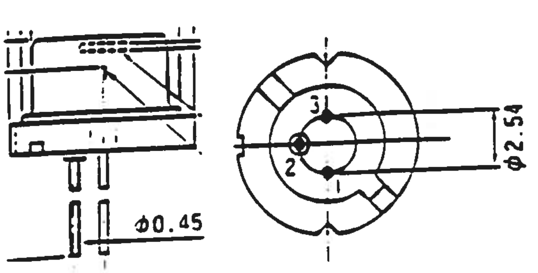


AVX-S3 FUNCTIONAL EQUIVALENT CIRCUIT

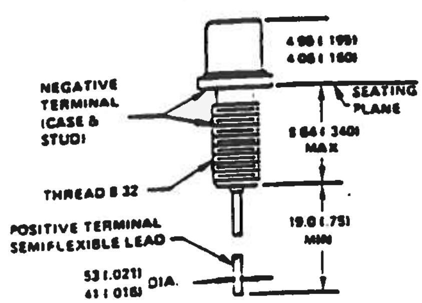


AVX-S3 INPUT ASSEMBLY (FOR OP-3 PACKAGE)

TO-18



OP-3



TO-3 8 PIN

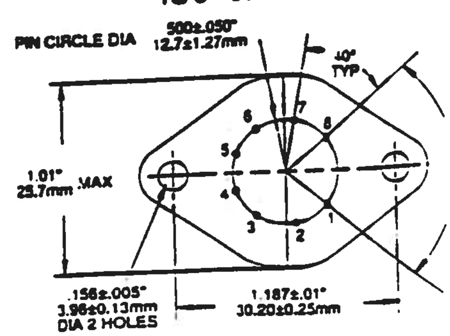
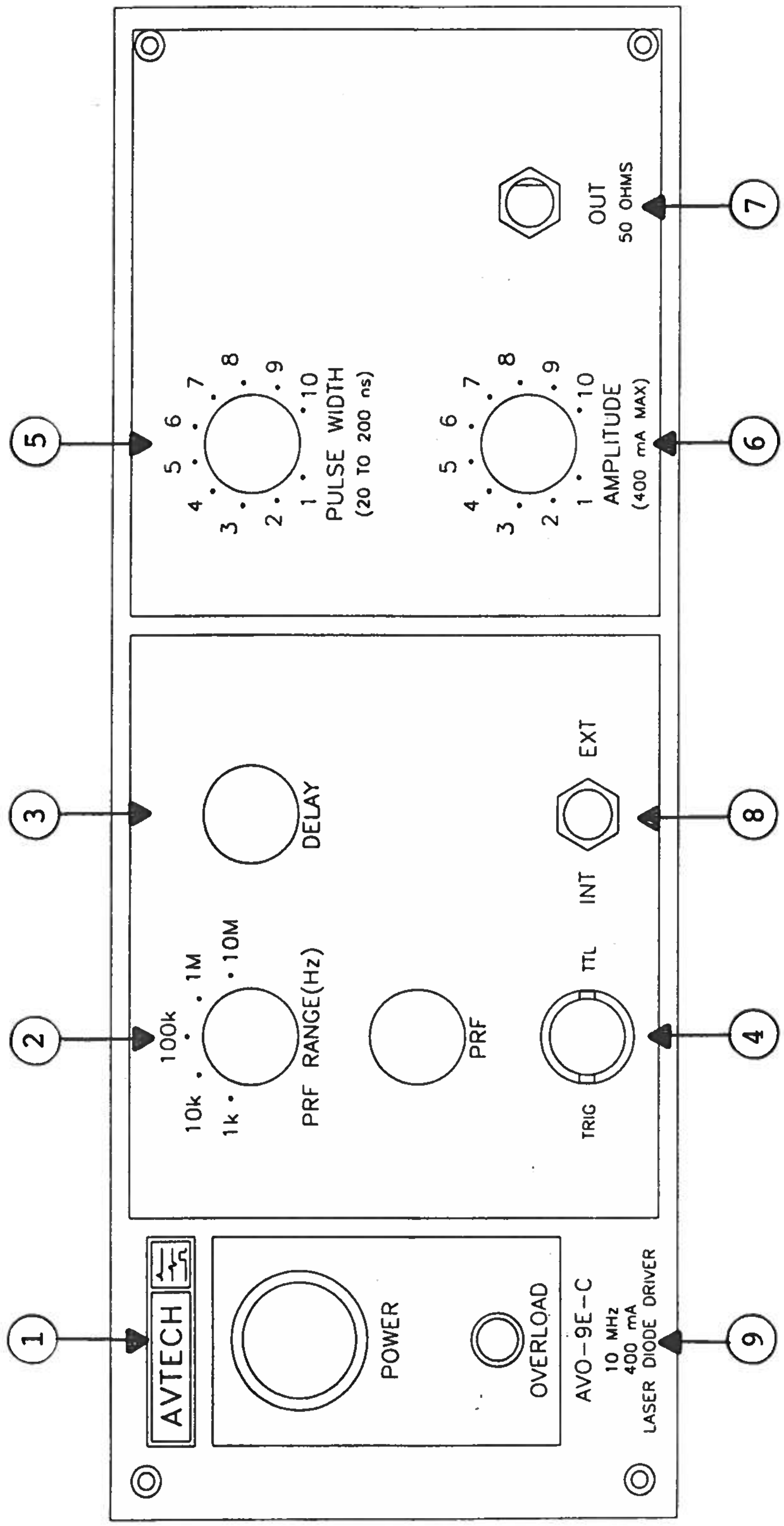


FIG. 3: FRONT PANEL CONTROLS



FRONT PANEL CONTROLS

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

(2) PRF Control. PRF RANGE, PRF and PRF FINE controls determine output PRF as follows:

	PRF MIN	PRF MAX
Range 1	100 Hz	1 KHz
Range 2	1 KHz	10 KHz
Range 3	10 KHz	100 KHz
Range 4	100 KHz	1.0 MHz
Range 5	1.0 MHz	10 MHz

(3) DELAY Control. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (7). This delay is variable over the range of 0 to at least 100 nsec.

(4) TRIG Output. This output precedes the main output (7) and is used to trigger the sampling scope time base. The output is a +0.5V 20 ns (approx) pulse capable of driving a fifty-ohm load.

(5) PW Control. A one-turn control which varies the output pulse width.

(6) AMP Control. A one-turn control which varies the output pulse amplitude from 0 to max output to a fifty-ohm load.

(7) OUT Connector. SMA connector provides output to a fifty-ohm load.

(8) EXT-INT Control. With this toggle switch in the INT position, the PRF of the AVO-9E 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-9E unit requires a 10 ns (or under) 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.

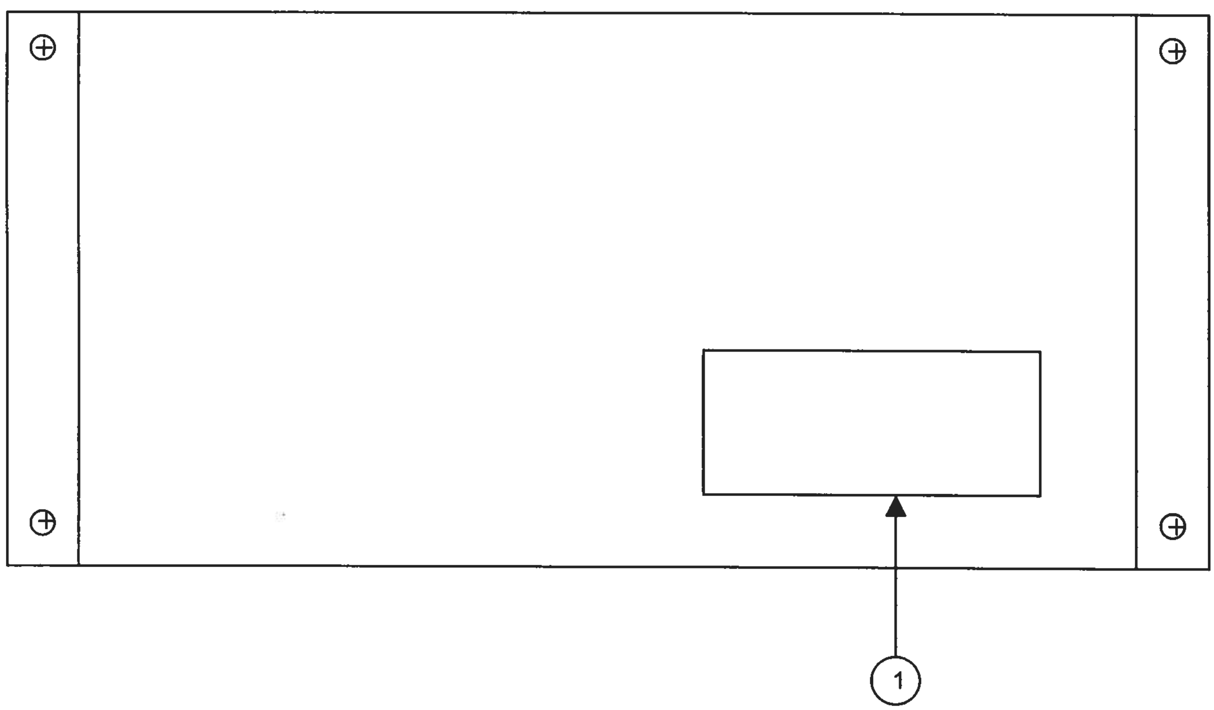
(9) AVO-9E-C units with a serial number higher than 5600 are protected by an automatic overload protective circuit which controls the front panel overload light. If the unit is overloaded (by operating at an exceedingly high duty cycle or by operating into a short circuit), the protective circuit will 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 illuminate when the prime power is first applied. The light will extinguish after a few seconds and the instrument will then function normally.

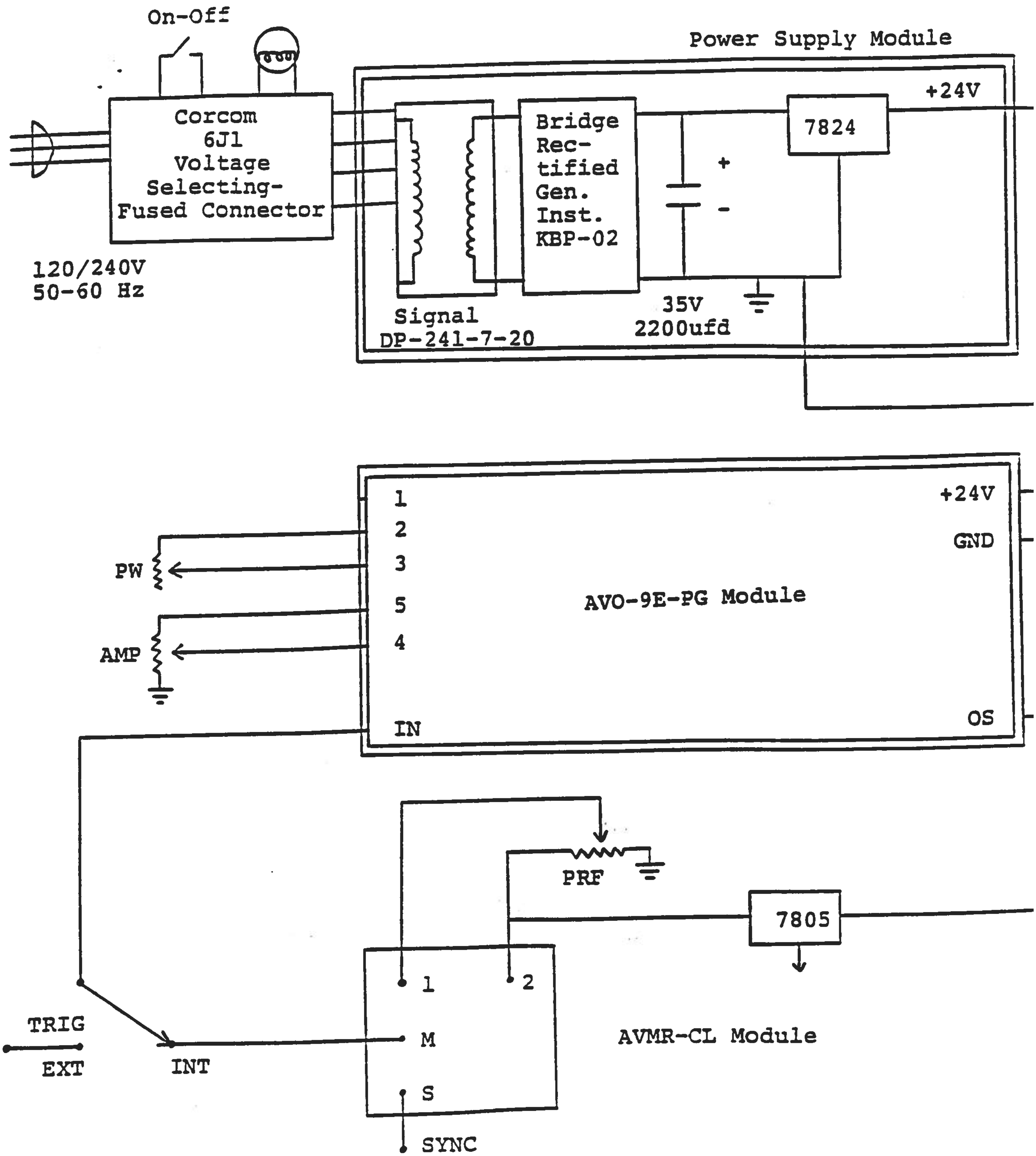
FIG. 4: BACK PANEL CONTROLS



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 A SB).

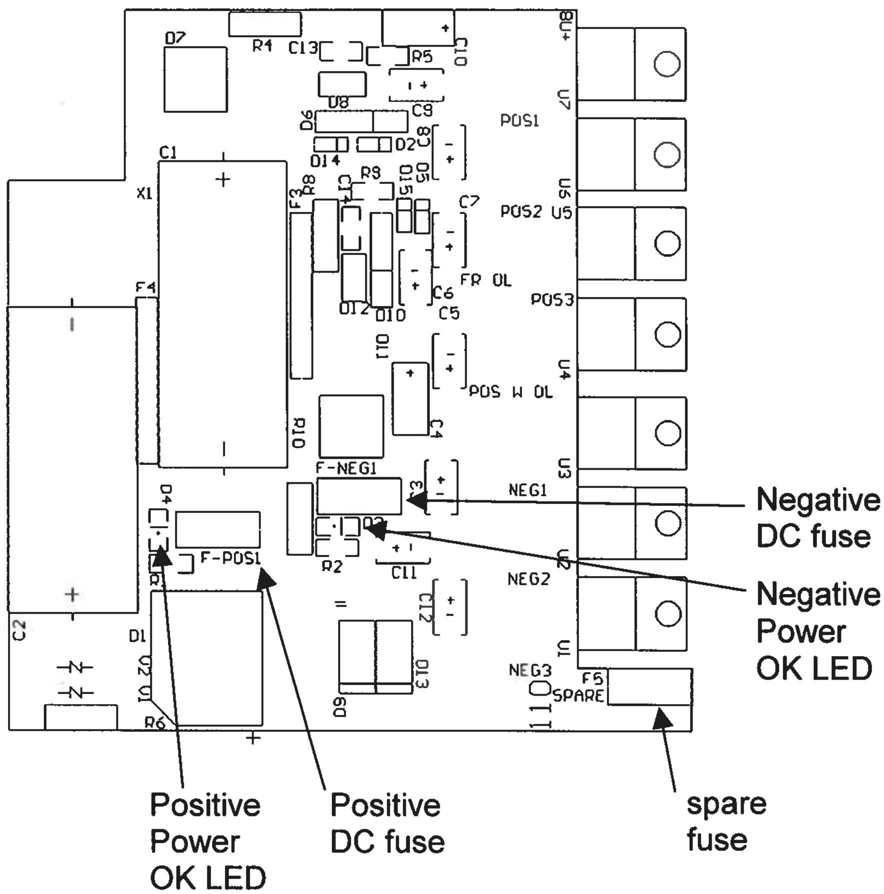
FIG. 5: SYSTEM BLOCK DIAGRAM



POWER SUPPLY AND FUSE REPLACEMENT

This instrument has three fuses (plus one spare). One, which protects the AC input, is located in the rear-panel power entry module, as described in the "Rear Panel Controls" section of this manual. If the power appears to have failed, check the AC fuse first.

The other two fuses (plus one spare) are located on the internal DC power supply, as shown below:



The positive fuse and the spare fuse on this circuit board are 1A slow-blow fuses, Littlefuse part number R452001. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is F1343CT-ND). The negative fuse is a 0.5A slow-blow fuse (Littlefuse R452.500, Digikey part number F1341CT-ND).

If you suspect that the DC fuses are blown, follow this procedure:

1. Remove the top cover, by removing the four Phillips screws on the top cover and then sliding the cover back and off.

2. Locate the two “Power OK” LEDs on the power supply circuit board, as illustrated above.

3. Turn on the instrument.

4. Observe the “Power OK” LEDs. If the fuses are not blown, the two LEDs will be lit (bright red). If one of the LEDs is not lit, the fuse next to it has blown.

5. Turn off the instrument.

6. If a fuse is blown, use needle-nose pliers to remove the blown fuse from its surface-mount holder.

7. Replace the fuse.

Ed B Sept 15/2000