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INSTRUCTIONS

MODEL AVO-9A-C PULSE GENERATOR
MODEL AVX-S1 BIAS INSERTION UNIT

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

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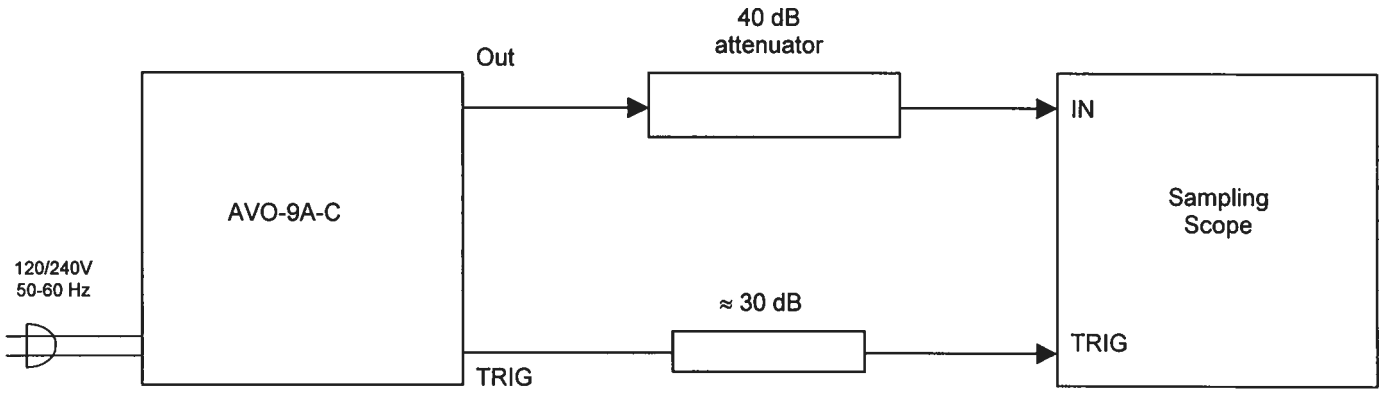
TABLE OF CONTENTS

Manual Reference: Q:\office\instructword\Avo-9\Avo-9a-c-edh-fig.doc, created October 2, 2000

FIG. 1: PULSE GENERATOR TEST ARRANGEMENT
(AVX-S1 MODULE REMOVED)



GENERAL OPERATING INSTRUCTIONS

1) The bandwidth capability of components and instruments used to display the pulse generator output signal (attenuators, cables, connectors, etc.) should exceed ten 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 TTL level signals. To avoid overdriving the TRIG input channel of some sampling scopes, a 30 dB attenuator should be placed at the input to the sampling scope trigger channel.

4) To obtain a stable output display the PRF control on the front panel should be set mid-range while the PRF range switch may be in either range. The front panel 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 control 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 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. The pulse width may change by several nanoseconds as the output amplitude is reduced from maximum to minimum. Therefore it is convenient to first set the desired amplitude and then set the desired pulse width. Rotation of the PW pot causes the position of the falling edge of the pulse to change.

7) Some properties of the output pulse may change as a function of the amplitude pot setting. For some demanding applications, it may be desirable to use a combination of external attenuators and the amplitude pot to achieve the desired output amplitude.

8) An external clock may be used to control the output PRF of the AVO unit by setting the front panel PRF range switch in the EXT position and applying a 50 ns 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.

9) To voltage control the output pulse width, set the rear panel switch in the EXT position and apply 0 to +10V to connector A ($R_{IN} \geq 10K$). (EW option).

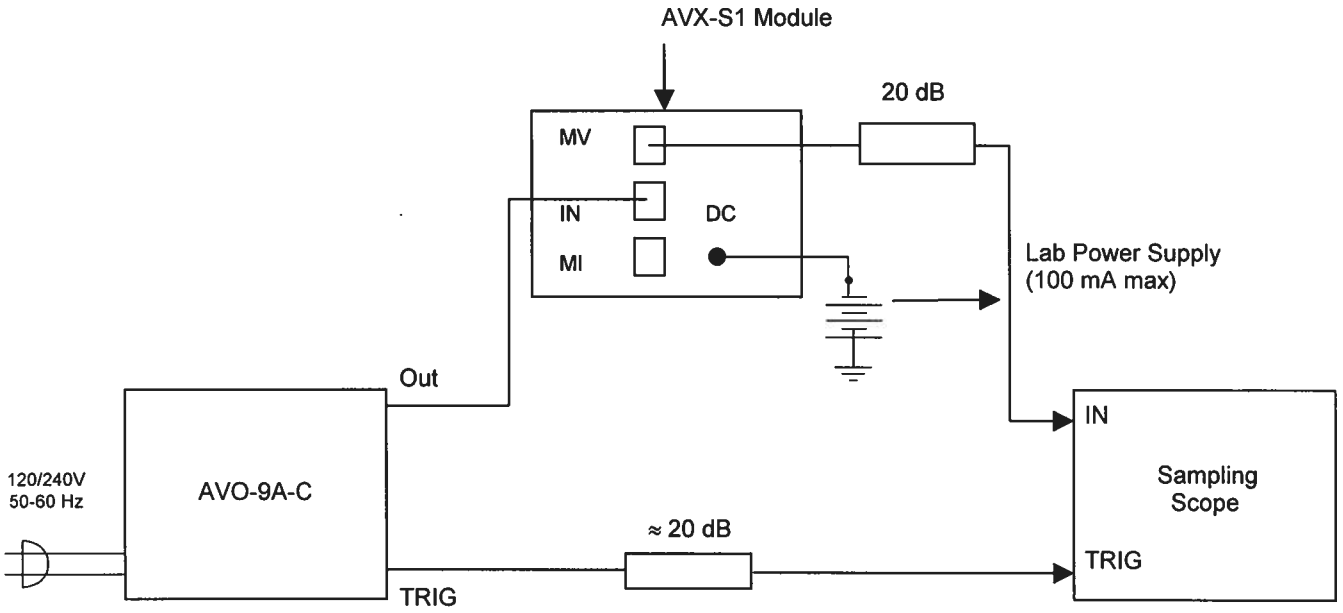
10) To voltage control the output amplitude, set the rear panel switch in the EXT position and apply 0 to +10V to connector B ($R_{IN} \geq 10K$). (EA option).

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 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}, Volts) and diode current (I_D, Amp) are related as follows:

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

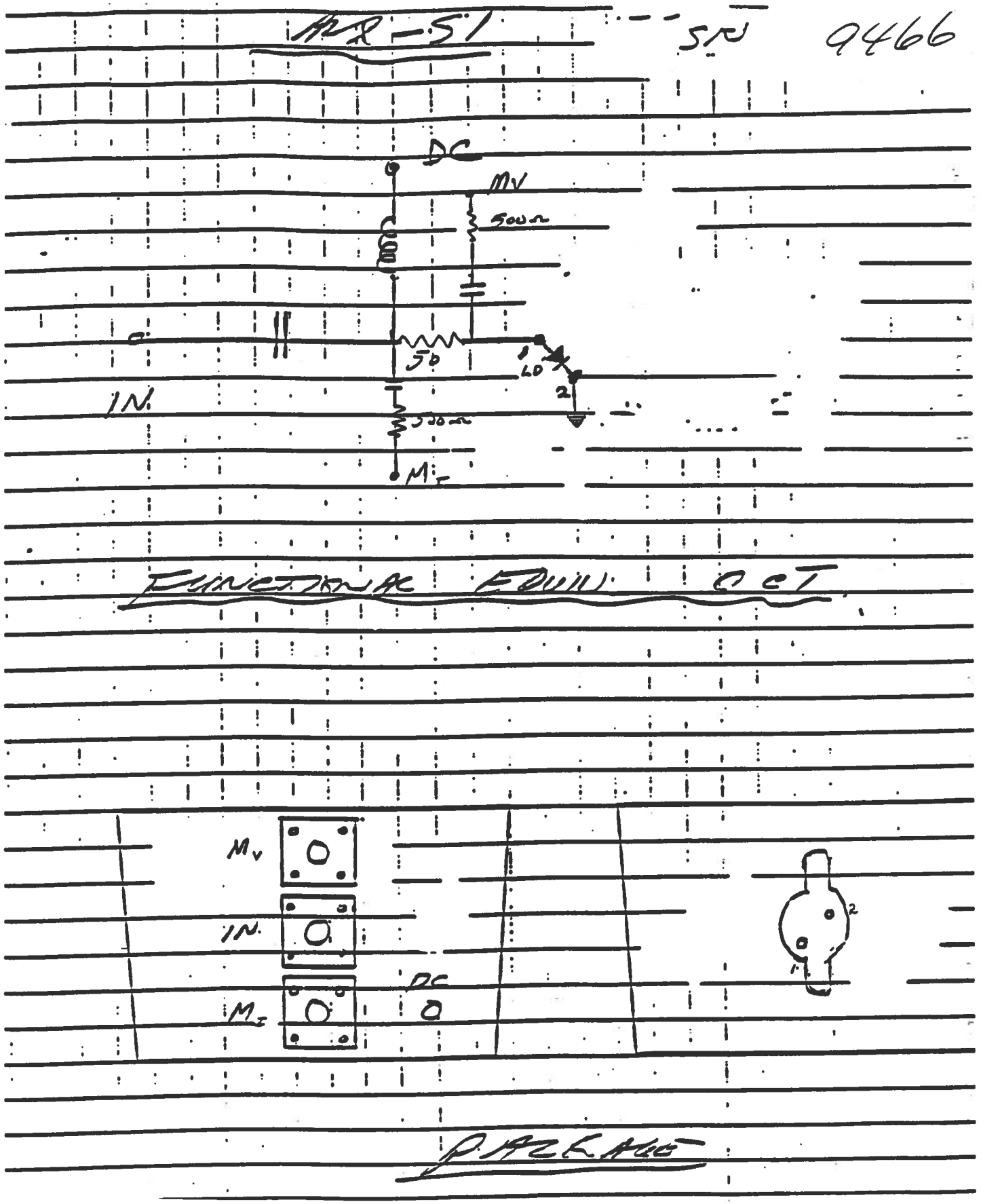
The laser diode voltage is given by the following:

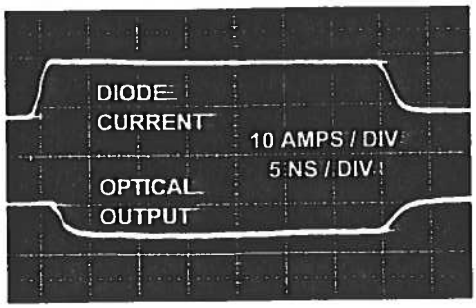
$$V_D = 10\ V_{MV}$$

3) The laser diode plugs directly into the socket on the side of the AVX-S1 module. CAUTION: The laser diode cathode must mate with Pin 1 while the anode must mate with Pin 4. The diode may be damaged if the above connections are not achieved. Pins 2,3 and 4 are all grounded.

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.

FIG. 3: FUNCTIONAL EQUIVALENT CCT & PACKAGE





- 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):

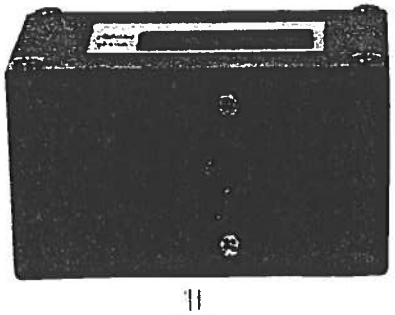
$$I_D = \frac{10V_{MI}}{R_S} \qquad V_D = 10\ (V_{MV} - V_{MI})$$

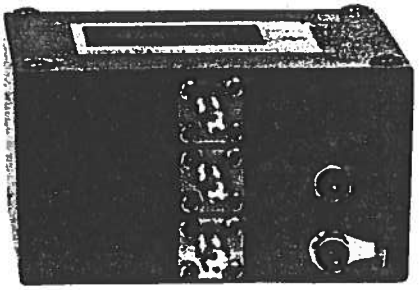
All AVX-S3 units include two foot long input cables with SMA male connectors.

When ordering members of the AVX-S family, the customer must specify the basic model number (e.g. 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.





SPECIFICATIONS

AVX-S SERIES

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 (ns):	0.4 - 200	1 - 1000	2 - 100	2 - 100	2 - 100	5 - 500
Rise time (ns):	0.2	0.5	0.5	1.0	0.5	2.0
Pulse PRF range:	DC - 100 MHz	DC - 20 MHz	DC - 10 MHz	DC - 10 MHz	DC - 10 MHz	DC - 1 MHz
CW frequency range:	10 - 100 MHz	1 - 20 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
R_S (Ohms):	-	-	10	3	5	0.7
IN connector:	SMA					
Monitor connector:	SMA					
Bias connector:	Solder pin					
Dimensions: (H x W x D)	41 mm x 66 mm x 76 mm (1.6" x 2.6" x 3.0")					
Material:	Cast aluminum, blue enamel					
Mounting:	Any					

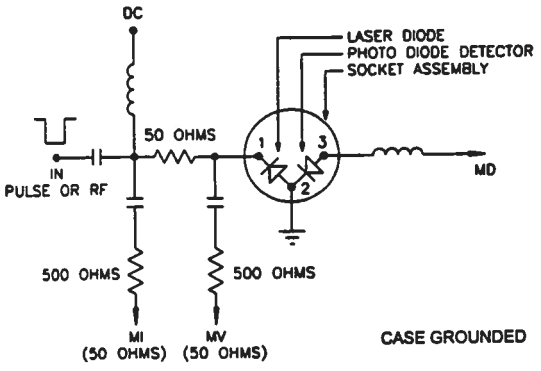


Fig. 1 - AVX-S1 and AVX-S2 functional equivalent circuit (preferred configuration)

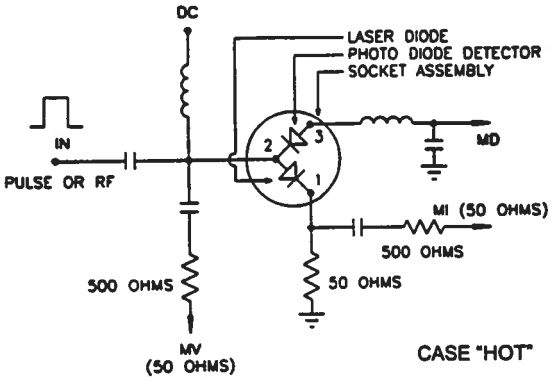


Fig. 2 - AVX-S1 and AVX-S2 functional equivalent circuit (alternative configuration)

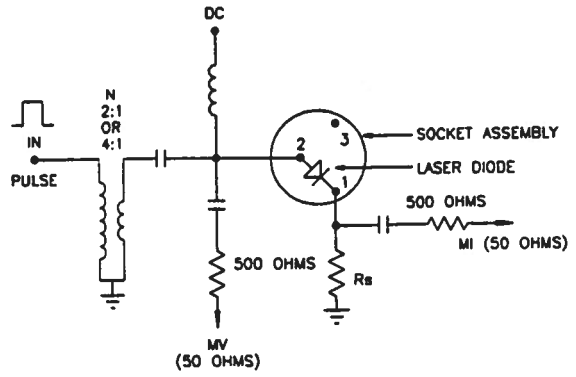


Fig. 3 - AVX-S3 functional equivalent circuit

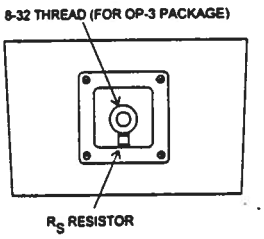
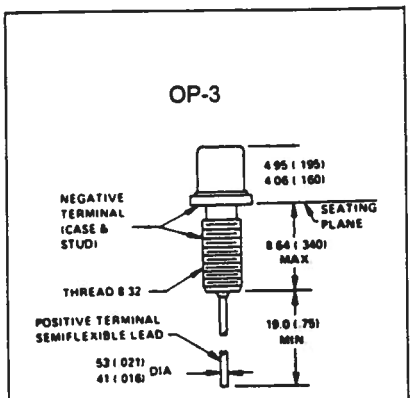
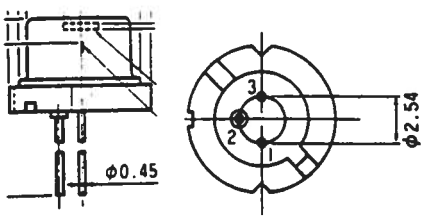


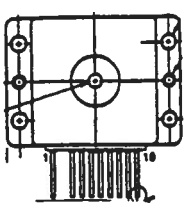
Fig. 4 - AVX-S3 input assembly (for OP-3 package)



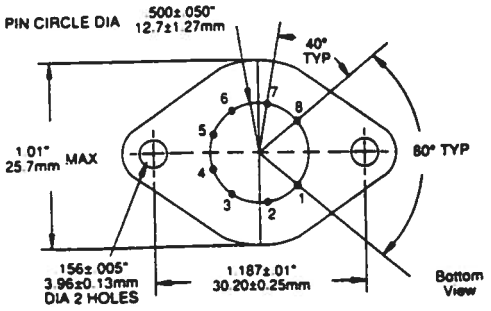
TO-18 (or 9 mm or G1)



P1 (or P2, P3)

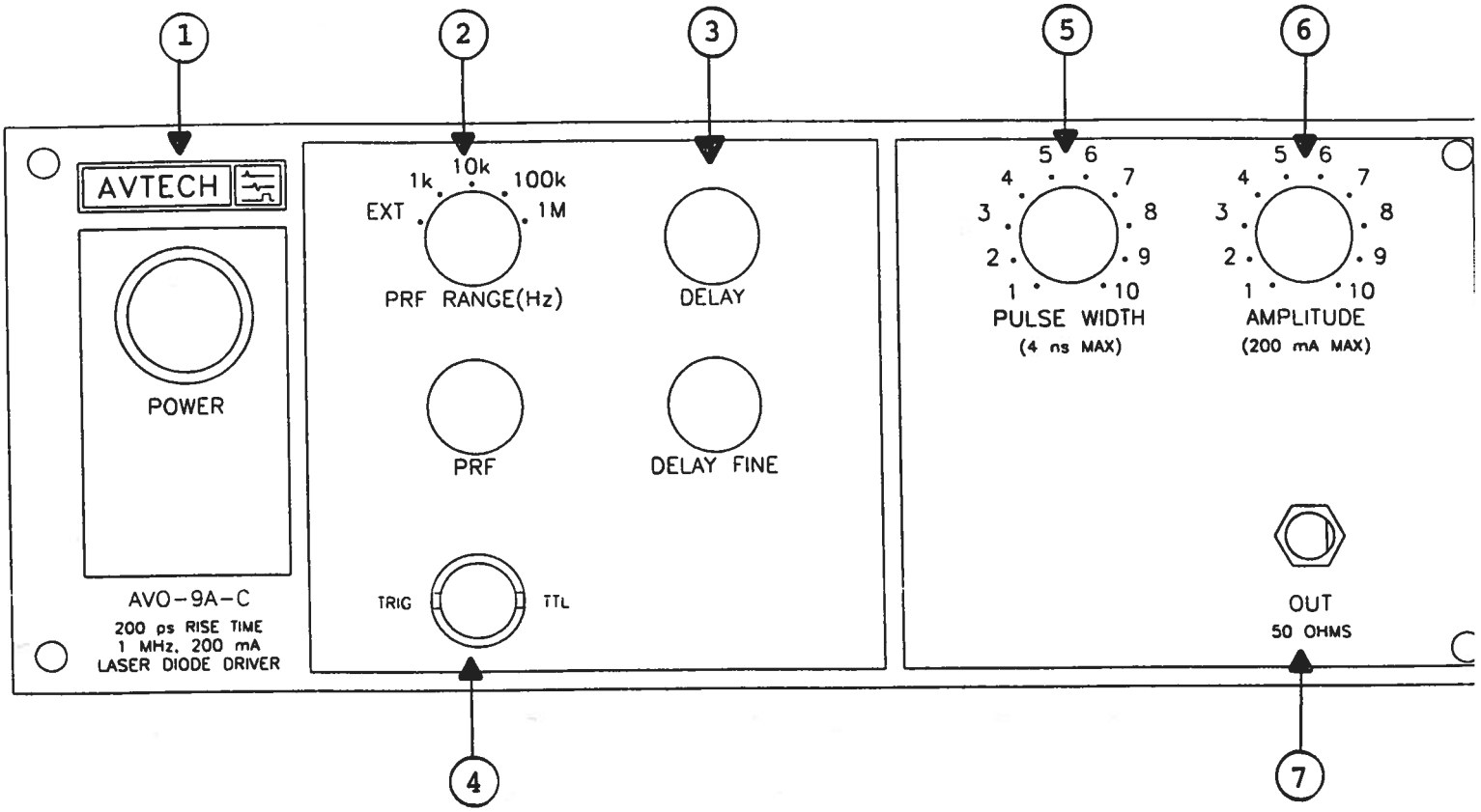


TO-3, 8 PIN (or H1)



TYPICAL PACKAGES

FIG. 4: FRONT PANEL CONTROLS



FRONT PANEL CONTROLS

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

(2) PRF Control. With this range switch in the 1K, 10K, 100K or 1M positions, the PRF of the AVE unit is controlled via an internal clock which in turn is controlled by the PRF controls. With the range switch in the EXT position, the AVE unit requires a 50 ns (or wider) TTL level pulse applied at the TRIG input in order to trigger the output stages.

(3) DELAY Controls. Controls the relative delay between the reference output pulse provided at the TRIG output (4) and the main output (5). This delay is variable over the range of 0 to at least 150 ns.

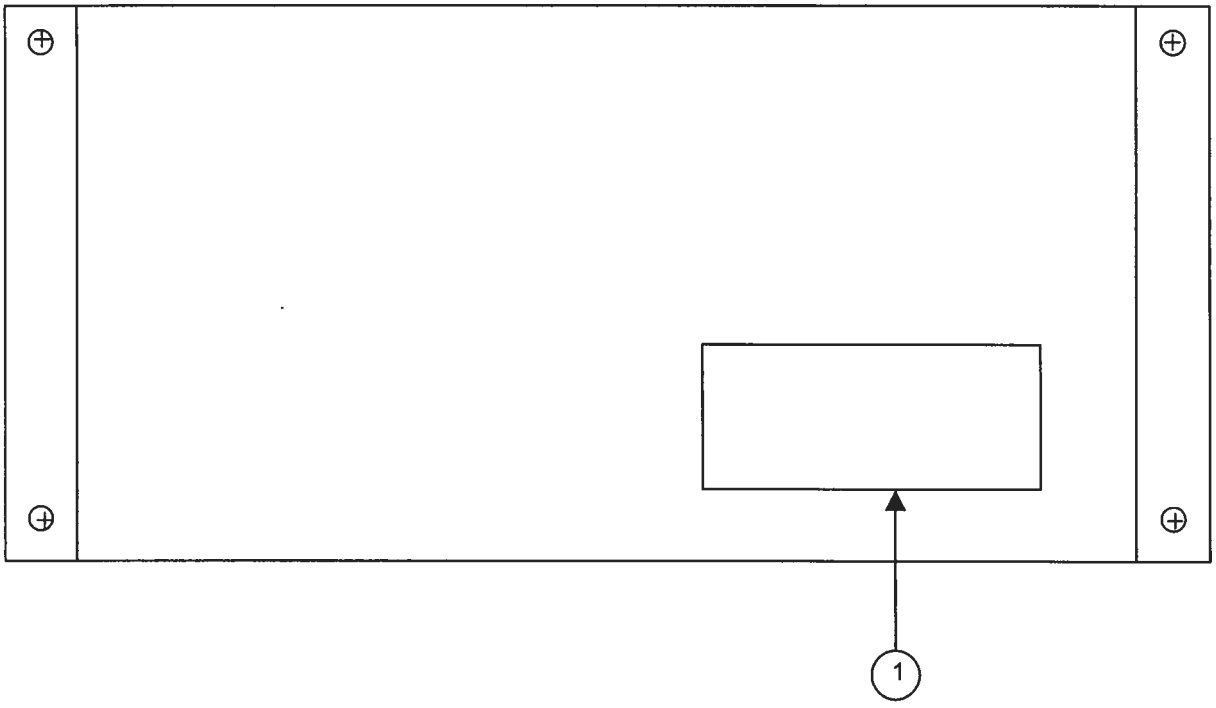
(4) TRIG Output. When triggered internally, this output precedes the main output (5) and is used to trigger the scope time base. The output is a 500 mV 20 ns (approx) pulse capable of driving a fifty-Ohm load. Set scope to trigger on positive edge. The external trigger signal is applied at this point when the PRF INT toggle switch is in the EXT position.

(5) PW Control. A one-turn control which varies the output pulse width from 0 to 4 ns.

(6) AMP Control. A one-turn control which varies the output pulse amplitude.

(7) OUT. SMA connector provides output to 50-Ohm load.

FIG. 5: 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.

For AC line voltages of 110-120V, the power selector card should be installed so that the "120" marking is visible from the rear of the instrument.

For AC line voltages of 220-240V, the power selector card should be installed so that the "240" marking is visible from the rear of the instrument.

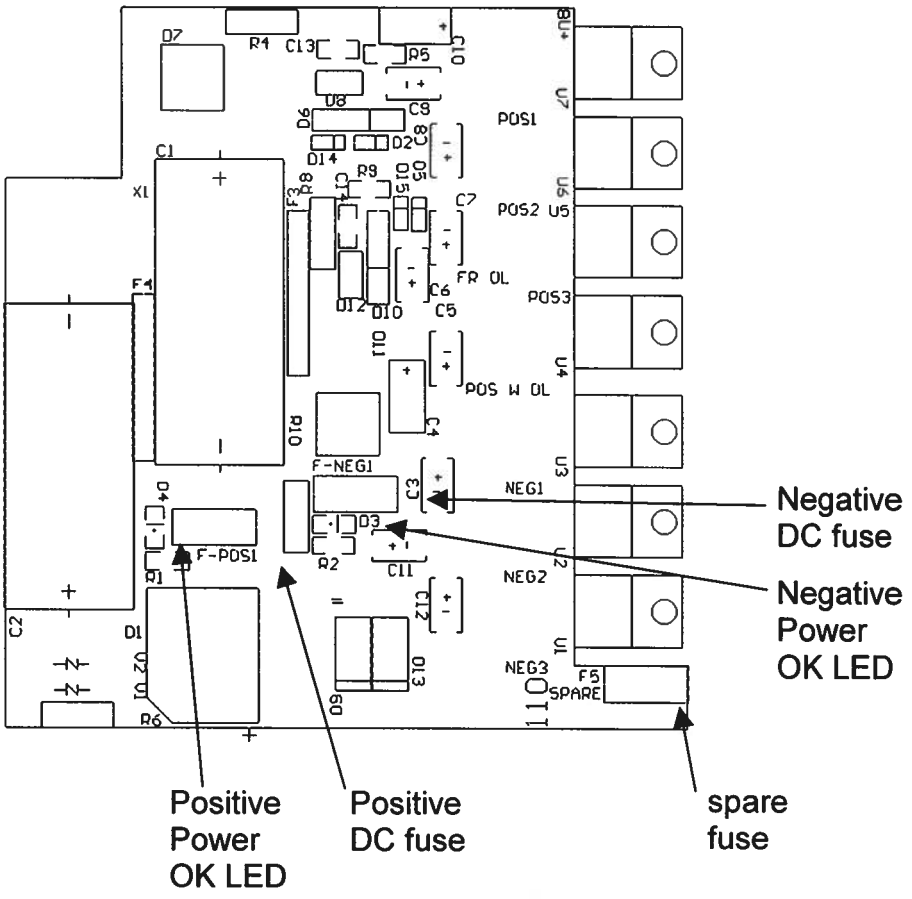
If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

In the 120V setting, a 0.5A slow blow fuse is required. In the 240V setting, a 0.25A slow blow fuse is required.

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 spare fuse may be used to replace one of the other fuses, if required.

The three fuses on this circuit board are 0.5A slow-blow fuses, Littlefuse part number R452.500. (This fuse can be ordered from Digikey, www.digikey.com. The Digikey part number is 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.