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SINCE 1975

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INSTRUCTIONS

MODEL AVO-9F-C-UCB PULSE GENERATOR

S.N.:

TABLE OF CONTENTS

Manual Reference: Q:\office\instructword\Avo-9\AVO-9F-C-UCB, edition a.doc, created January 17, 2002

WARRANTY

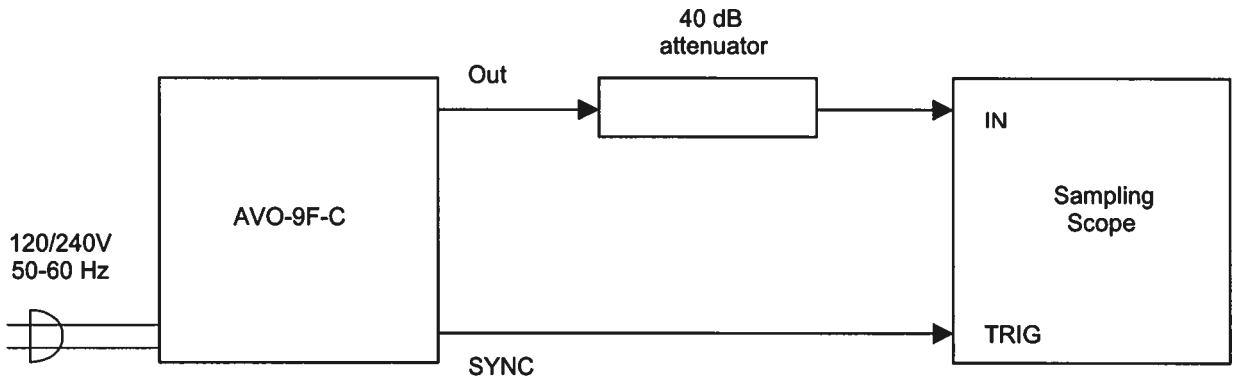
Avtech Electrosystems Ltd. warrants products of its manufacture to be free from defects in material and workmanship under conditions of normal use. If, within one year after delivery to the original owner, and after prepaid return by the original owner, this Avtech product is found to be defective, Avtech 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

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



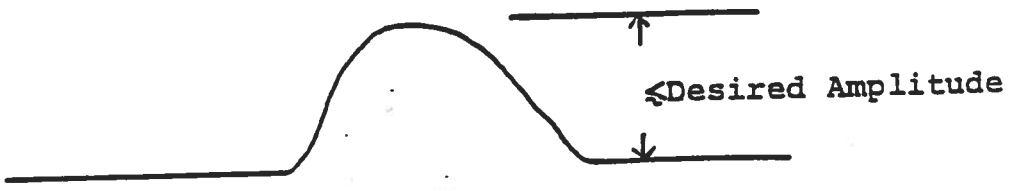
GENERAL OPERATING INSTRUCTIONS

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

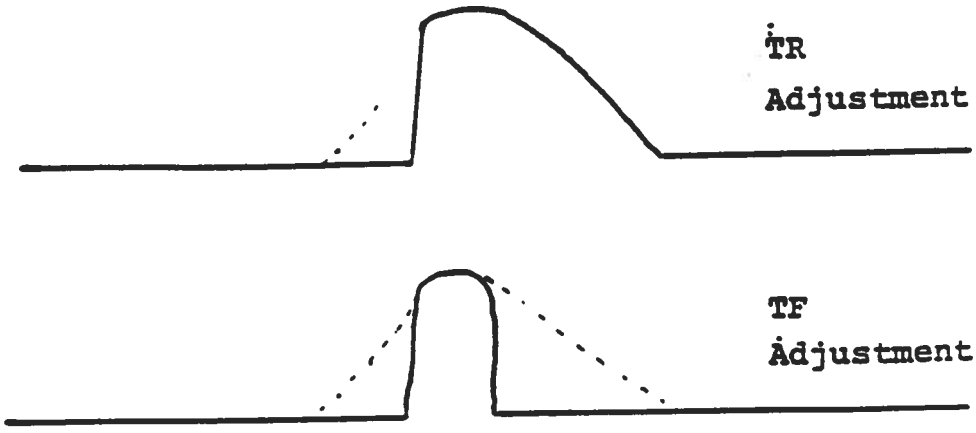
2) The use of 40 dB attenuator at the sampling scope vertical input channel will insure a peak input signal to the sampling scope of less than one Volt.

3) 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 scope triggering controls are then adjusted to obtain a stable output.

4) The output pulse shape is determined by the two front panel pot controls TR and TF. TR controls the leading edge of the pulse while TF controls the falling edge. Clockwise rotation of TR and TF increases the output pulse width. Initially rotate the TF pot fully clockwise and set the TR pot at mid-range. The output amplitude is controlled by the front panel AMP control and by the input signal level. Initially the AMP control should be set maximum clockwise. The CRT display will resemble the following:



5) Having obtained a display of the form shown above, the desired pulse width is then obtained by adjusting the two front panel pots TR and TF. Rotate TR counter clockwise from the positive set in step 2) until a sharp 100 ps leading edge is observed. Then rotate TF counterclockwise until the desired pulse width and fall time are obtained.



Further iterative adjustments of TR and TF will be necessary to simultaneously obtain the lowest rise time, lowest fall time, the desired pulse width, and pulse top shape and low spurious signal level. In addition some additional adjustment of signal level may be necessary to obtain the desired amplitude. If the input frequency is then changed it will be necessary to readjust AMP, TR and TF to establish the required pulse shape. Following the above sequence it is possible to generate output pulses having amplitudes of at least +10 Volts with variable pulse width (at least from 400 to 1000 ps) with pulse repetition frequencies in the range of 25 to 50 MHz.

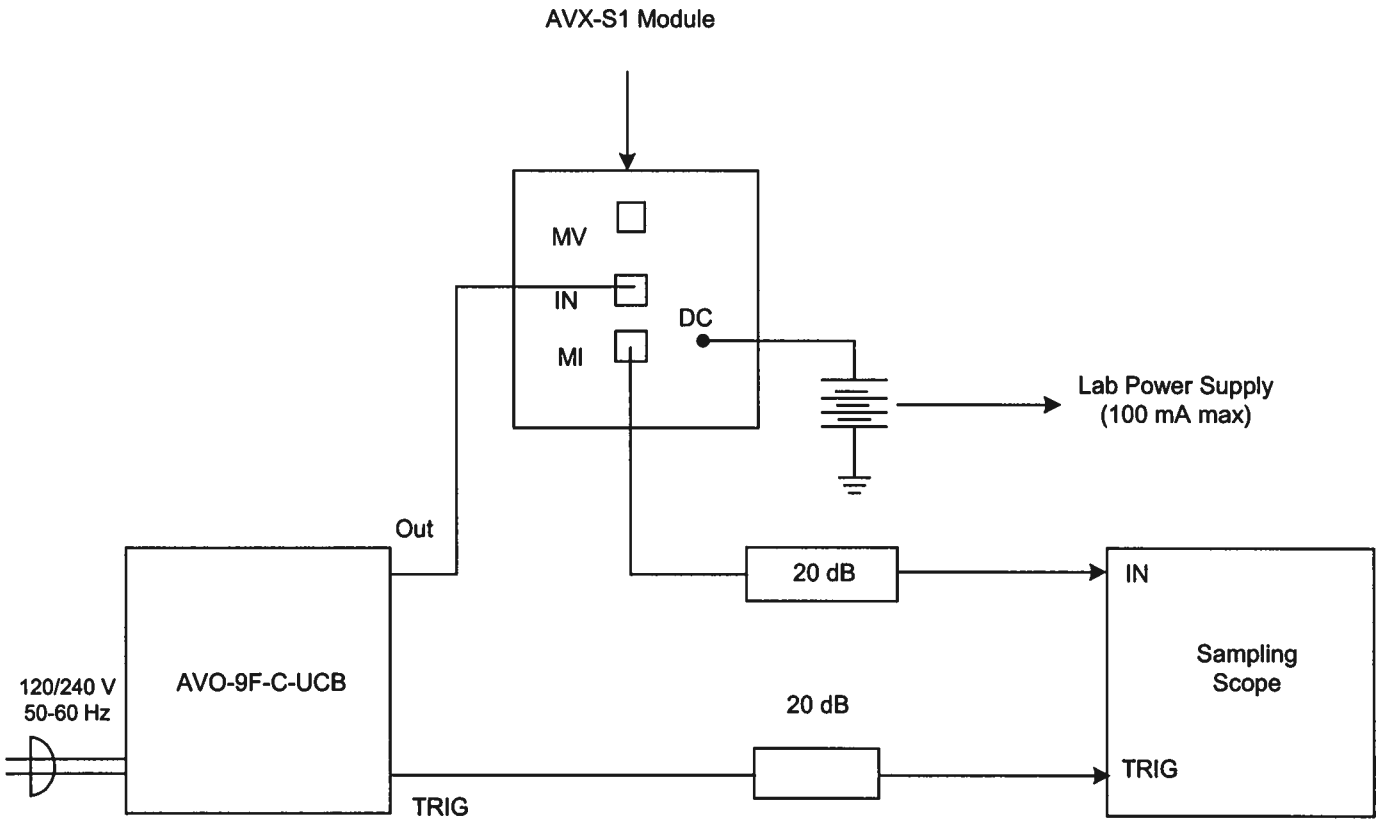
6) To trigger externally, set the INT-EXT switch to EXT and connect a sine wave generator to the TRIG connector. The output PRF will equal the sine wave PRF. The sine wave amplitude should be set at 0.3 VRMS.

7) The AVO-9F-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.

8) 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-9F-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-9C-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 the 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:

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

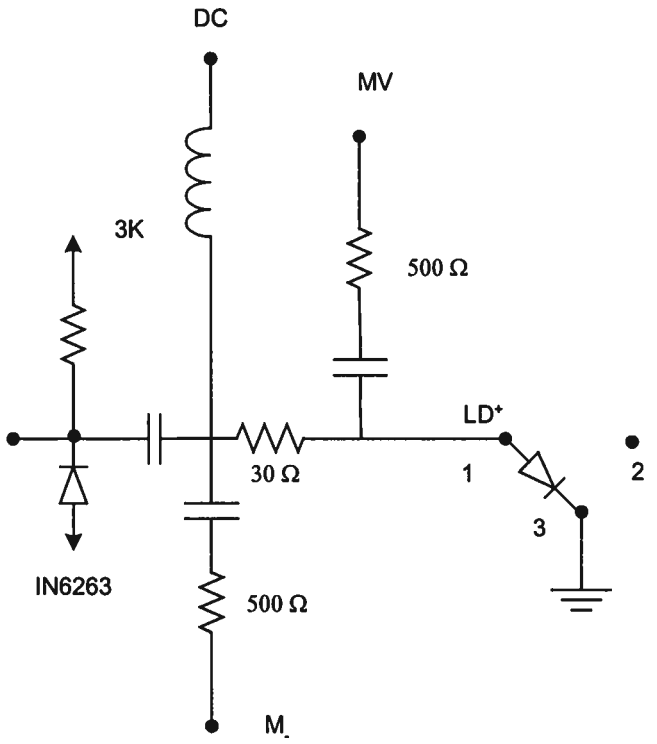
3) The laser diode plugs directly into the socket on the side of the AVX-S1 module.

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.

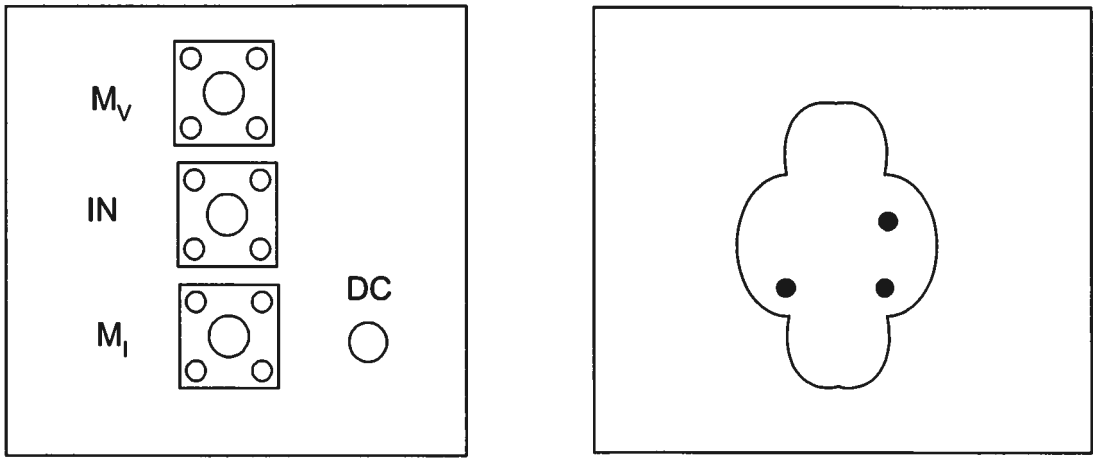
5) A IN6263 hot carrier diode is included at the input to the AVX-S1 unit to clip any negative potential swings.

6) A IN459A diode in series with a 20 Ohm chip resistor was used as a test load.

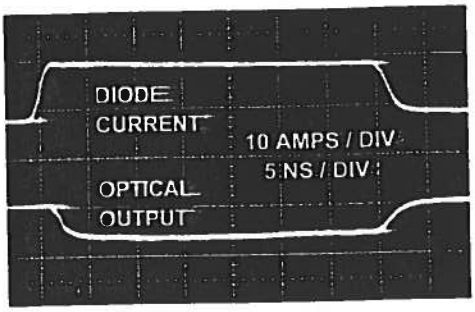
AVX-S1, S/N 10052



FUNCTIONAL EQUIVALENT CIRCUIT



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):

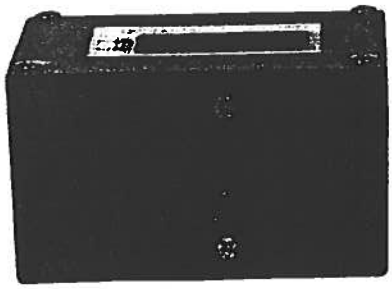
$$I_D = \frac{10V_{MI}}{R_S} \qquad V_D = 10\ (V_{MV} - V_{MI})$$

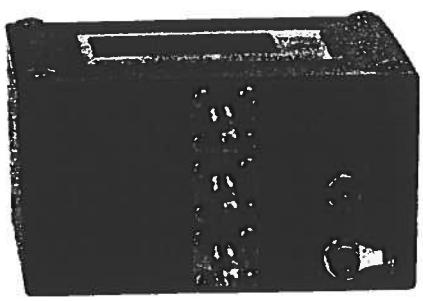
All AVX-S3 units include two foot long input cables with SMA male connectors.

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

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					

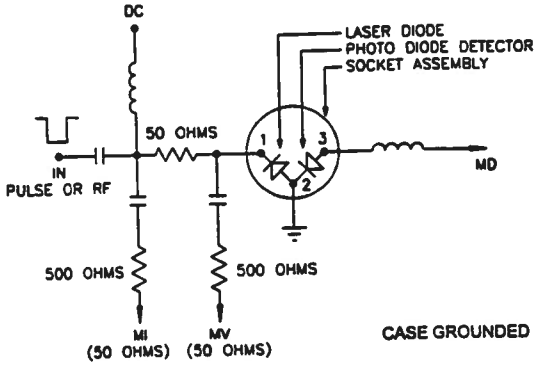


Fig. 1 - AVX-S1 and AVX-S2 functional equivalent circuit (preferred configuration)

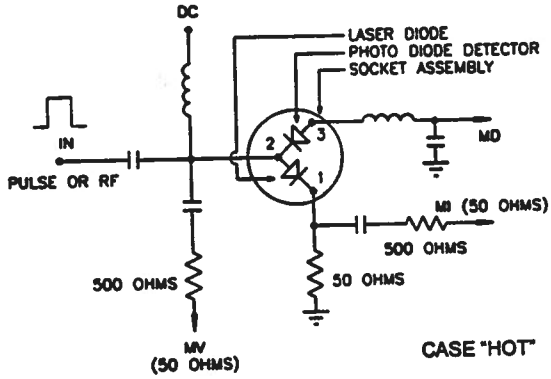


Fig. 2 - AVX-S1 and AVX-S2 functional equivalent circuit (alternative configuration)

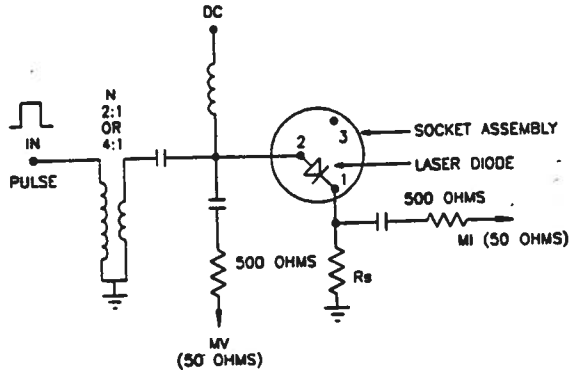


Fig. 3 - AVX-S3 functional equivalent circuit

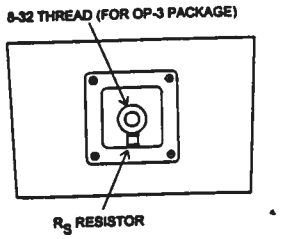
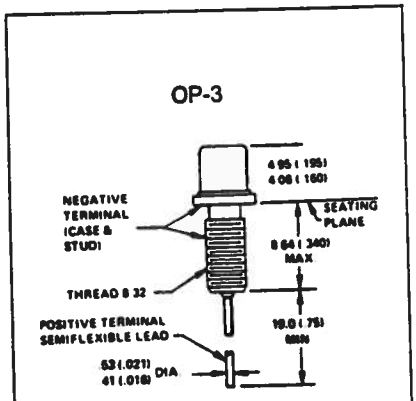
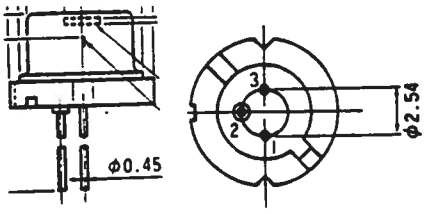


Fig. 4 - AVX-S3 input assembly (for OP-3 package)

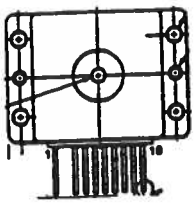


TYPICAL PACKAGES

TO-18 (or 9 mm or G1)



P1 (or P2, P3)



TO-3, 8 PIN (or H1)

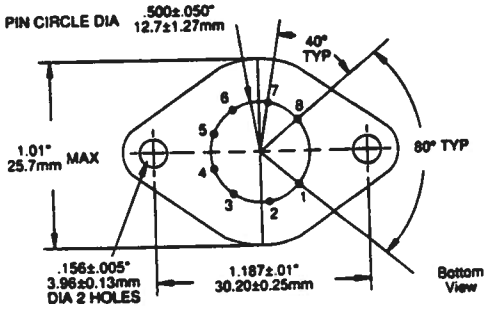
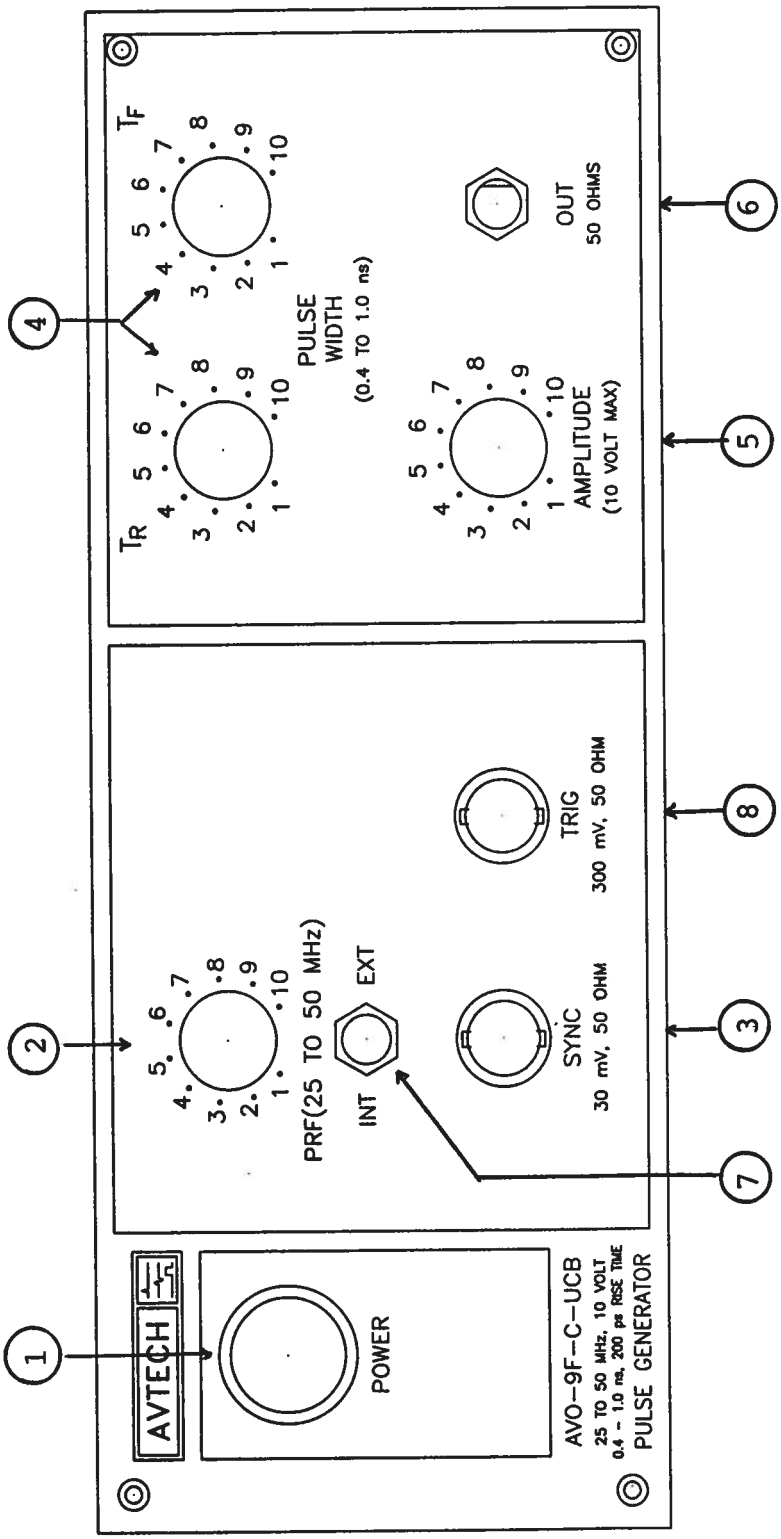


FIG. 3 FRONT PANEL CONTROLS



FRONT PANEL CONTROLS

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

2) PRF Control. Varies PRF from 25 to 50 MHz.

3) SYNC Output. This output is approximately coincident with the main output (7) and is used to trigger the sampling scope time base. The output is a 30 mV sine wave capable of driving a fifty Ohm load.

4) PW Control. One turn controls which vary the output pulse width. The output pulse shape is determined by the two front panel pot controls TR and TF. TR controls the leading edge of the pulse while TF controls the falling edge. Clockwise rotation of TR and TF increases the output pulse width.

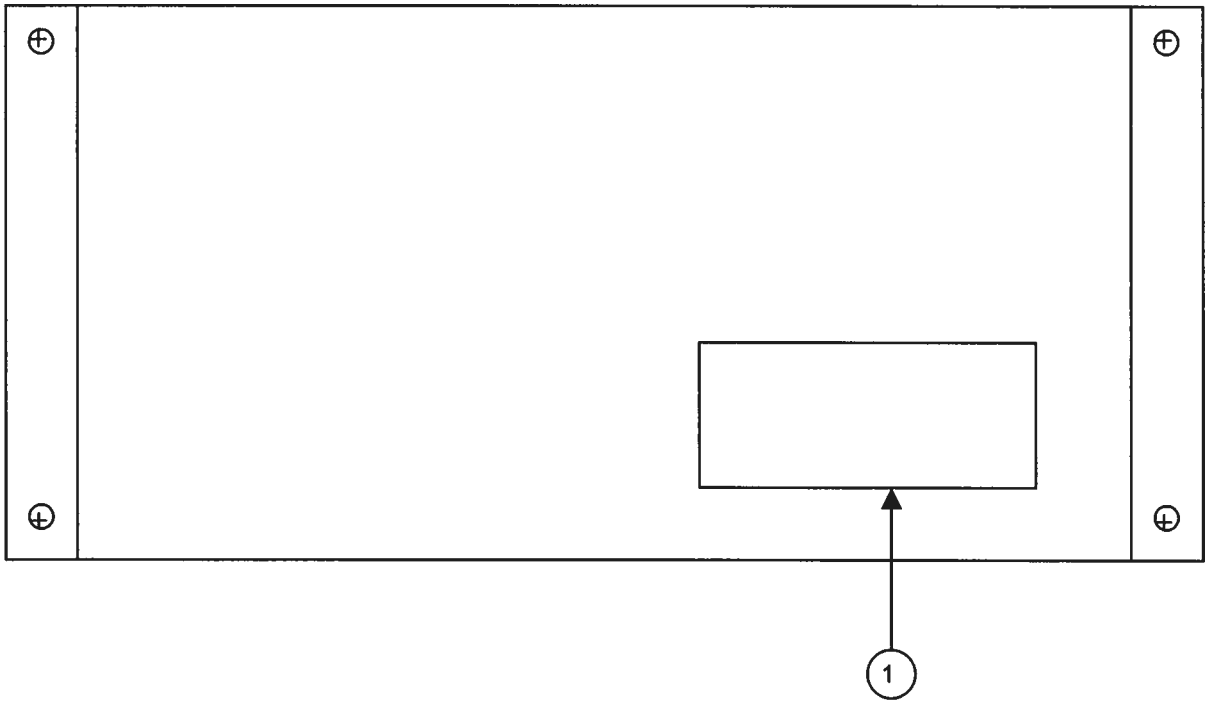
5) AMP Control. A one turn control which varies the output pulse amplitude from 0 to max output to a fifty Ohm load.

6) OUT Connector. SMA connector provides output to a fifty Ohm load.

7) EXT-INT Control. With this toggle switch in the INT position, the PRF of the AVN 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 AVN unit requires a 0.3 V RMS sine wave 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.

8) TRIG Input. The external trigger signal is applied at this input when the EXT-INT toggle switch is in the EXT position.

FIG. 3: 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.

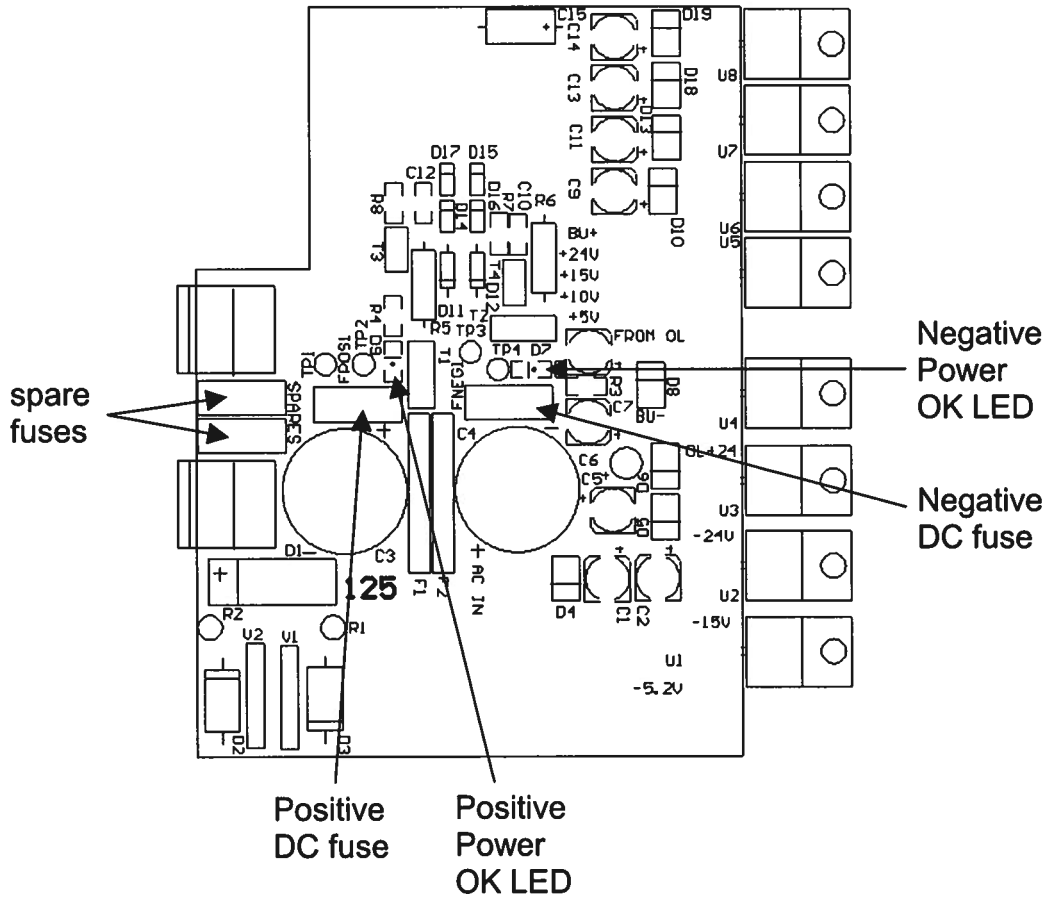
If it is not set for the proper voltage, remove the fuse and then grasp the card with a pair of pliers and remove it. Rotate horizontally through 180 degrees. Reinstall the card and the correct fuse.

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 main fuses, plus two spares. 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 two spares) are located on the internal DC power supply, as shown below:



The four 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. (Two spare 0.5 Amp fuses are provided on the circuit board. They may be transferred to the active fuse locations using needle-nose pliers.)

Walter Chudobiak

From: Dr. Michael J. Chudobiak
Sent: Friday, September 28, 2001 9:34 AM
To: 'Hodak Jose H'
Cc: Avtech Sales
Subject: RE: Avtech laser diode driver quote

> Dr Michael Chudobiak,
> Thanks for your very instructive comments. I have asked Nichia
> about the pin out for the diode, and they confirmed that the pin 3
> (cathode) is connected to the case of the device. This means
> that we shoud
> be able to drive the blue or violet diodes with your waveform
> generator. There is a last question I wanted to ask you, and
> it is about
> the use of a protection diode to avoid reverse biasing of
> these sensitive
> laser diodes. Is there any way that that can be done withot seriously
> degrading the performance of the laser diode-waveform
> generator set?. If
> that can be done, can you integrate it in the AVX-S1?.
> I am woried about adding extra inductance or capacitance and
> therefore degrading the speed performance of the device.
> Thank you very much again.
> Best regards,
> Jose Hodak

To: Jose Hodak
Research Associate
Joint Institute for Laboratory Astrophysics (JILA)
Univ. of Colorado

ph. (303) 492-2942
hodak@jilau1.colorado.edu

Jose,

we can add a protection diode in the AVX-S1 output module without noticeably degrading the rise and fall times. To reflect this, and the other changes discussed previously, I am requoting as follows:

Quote number: 10668

Model number: AVO-9F-C-UCB (note the changed model number)

Description: 25 to 50 MHz pulse generator with socketed output module.

Amplitude, at mainframe output: 0 to +10V.

Output module matching network: the supplied AVX-S1-UCB output module contains a 30 Ohm series resistance, for use with a diode load with approximately 20 Ohms of parasitic resistance. A DC offset input is provided. A protection diode is also included.

Rise & Fall Time: < 200 ps

Pulse Width: <0.4 to 1 ns, variable

PRF: 25 to 50 MHz

Other: as per the standard AVO-9F-C, see

http://www.avtechpulse.com/laser/avo-9f/

Price: $5298, FOB destination. Includes a 5% academic discount.

Delivery: 60-90 days, after receipt of order.

Please call or email me if I can be of further assistance.

Regards,
Dr. Michael J. Chudobiak
VP, New Product Development

--- Avtech Electrosystems Ltd. ---------- since 1975 ---

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Impulse Generators - Delay Generators - Comb Generators - Splitters
Function Generators - Monocycle Generators - Frequency Dividers + more!

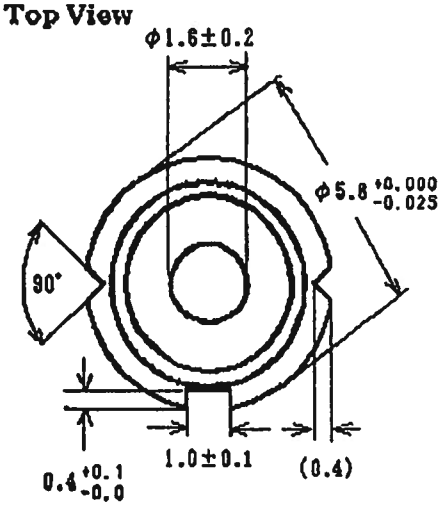
Laser diode characteristics:
Forward resistance: 22 Ohm
Pin out:

Pin 1 LD anode
Pin 2 not connected
Pin 3 LD cathode, connected to the case

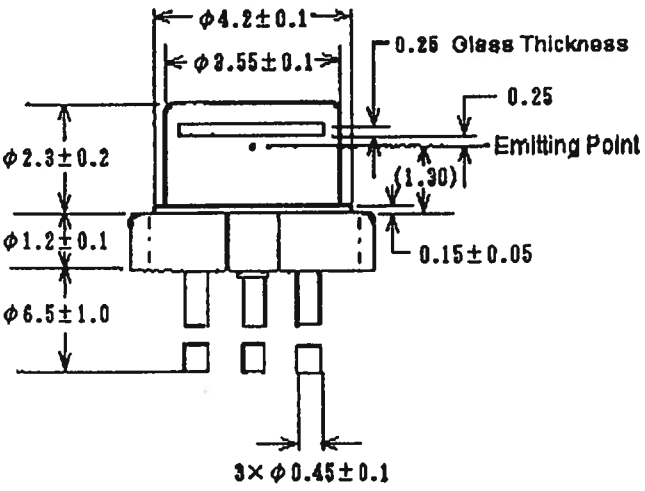
Case dimensions, see figure:

◆Outline Dimensions (Unit:mm)

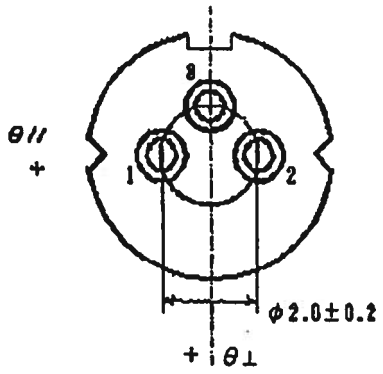
Top View



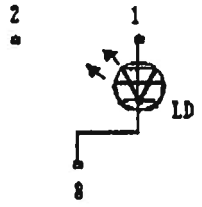
Side View



Bottom View



Connection



1. LD Anode
2. N.C.
3. LD Cathode

※ This model does not have Photo Diode.