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SINCE 1975

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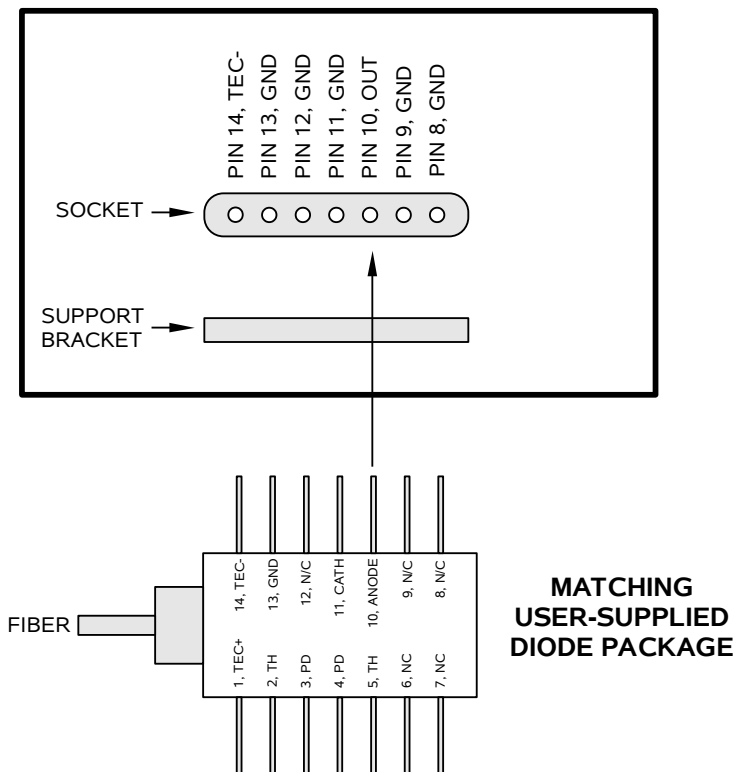
INSTRUCTIONS

MODEL AVX-S1-P1B

PLUG-IN SOCKET OUTPUT MODULE

SERIAL NUMBER: _____

“P1B” SOCKET VIEW



**MATCHING
USER-SUPPLIED
DIODE PACKAGE**

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 assumed by Avtech with respect to this product and no other warranty or guarantee is either expressed or implied.

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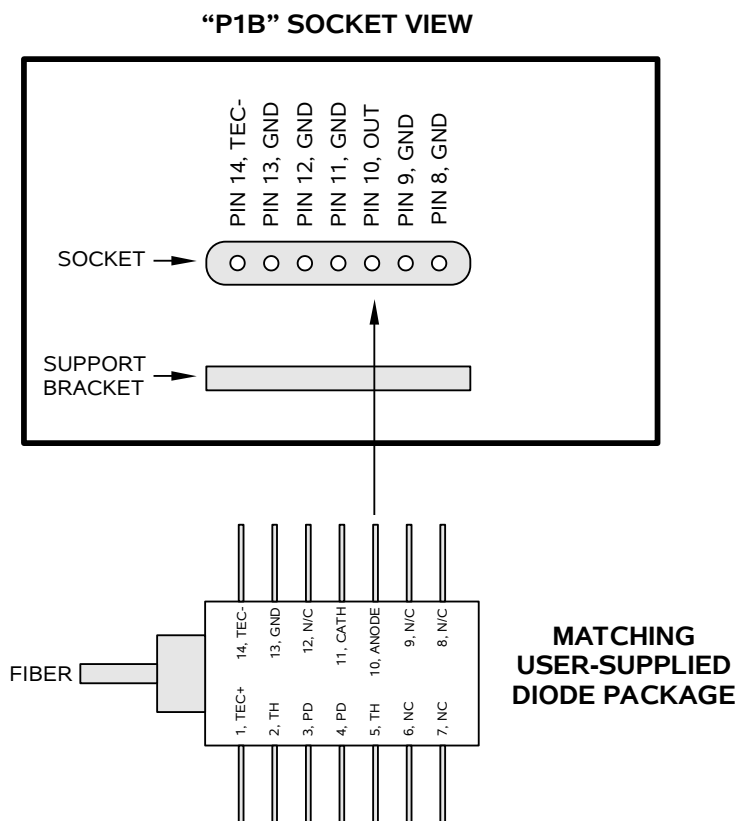
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Manual Reference: /fileserver1/officefiles/instructword/avx-s/AVX-S1-P1B with -T1B-HC-INV optional,ed4.odt.
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INTRODUCTION

The AVX-S series of bias insertion units is designed to combine a pulse 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 source, as well as networks for applying DC bias to the diode.

The AVX-S1-P1B is specifically designed to accommodate butterfly-packaged laser diodes with the pinout illustrated below:



AVAILABLE OPTIONS

A number of options are available for the AVX-S1-P1B, including:

- T1B option: Adds a secondary (low-bandwidth) slide-on socket board for pins 1-7 of a butterfly package. A flexible cable connects the slide-on socket to the output module. A male DB-9 connector is provided on the output module, which provides access to the thermal control pins of the diode. DB-9 pin 2 connects to diode pin 2 (TH). DB-9 pin 3 connects to diode pin 5 (TH). DB-9 pin 4 connects to diode pin 1 (TEC+). DB-9 pin 5 connects to diode pin 14 (TEC-). The remaining DB-9 pins are unconnected. Pins 3, 4, 6, and 7 of the diode are grounded. Access to the photodiode, if present, is not provided. This option requires the -P1B option. This option is designed for compatibility with Thorlabs temperature controllers and Lumics laser diodes. It may be suitable for others as well.
- HC option: Adds a current-doubling transformer to the input of the AVX-S1-P1B.
- INV option: Adds a polarity-inverting transformer to the input of the AVX-S1-P1B.

SPECIFICATIONS

Model:	AVX-S1	AVX-S1-HC
Peak diode current:	400 mA	2 Amps
Max. input amplitude:	20 Volts	50 Volts
Pulse width:	0.4 ¹ - 200 ns	0.4 - 200 ns
Rise time:	0.2 ns ¹	0.2 ns
Pulse PRF range:	DC - 25 MHz	DC - 10 MHz
Max. bias current:	100 mA	100 mA
Max. bias voltage:	50 Volts	50 Volts
Input impedance:	50 Ohms	50 Ohms
N (transformer ratio ^{2,3}):	+1	+2
$R_S + R_{DIODE}$:	50 Ohms	12 Ohms
IN connector:	SMA female (one)	
Other connectors:	MV, MI, MD: SMA (female), DC bias: solder terminal	
Diode socket:	-P1B option: for specific butterfly package, see footnote ⁵	
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	

- 1) Lower pulse widths (to 0.2 ns) and faster rise times (0.1 ns) may be possible for laser diode packages with very low parasitic inductance. The -P0 and -P2 packages generally have very low inductance. The -P1, -P3, and -TO3 packages normally have somewhat higher parasitic inductance.
- 2) The transformer reduces the input voltage by a factor of N (approx) and increases the current by a factor of N (approx). The load resistance ($R_S + R_{DIODE}$) must equal $50\Omega / N^2$ (approx).
- 3) A polarity inverting option is available. Add the suffix -INV to the model number to specify this option. "N" is a negative number when this option is installed.
- 4) Generic option. A drawing showing the diode package size and electrical pinout must be provided by the end-user, and the model number and price may change.
- 5) -P1B (specific pinout option). No further drawings are required. The socket will accept pins 8-14 of a standard butterfly package with 0.5 mm wide pins. A pulse will be applied to the diode anode (pin 10). Pins 8-9 and 11-13 will be grounded. Pin 14 will be made accessible through a solder terminal. Four mounting holes on a 8.9 x 26 mm grid will be provided. The diode parasitic resistance (dV/dI at lasing) must be < 1 Ohm. A low-bandwidth slide-on socket can also be provided for pins 1-7 of the diode, with the thermal control pins brought out to a standard DB-9 connector (-T1B option).
- 6) -P1C (specific pinout option). No further drawings are required. The socket will accept pins 8-14 of a standard butterfly package with 0.5 mm wide pins. A negative pulse will be applied to the diode cathode (pin 12). Pins 8-11 and 13-14 will be grounded. Four mounting holes on a 8.9 x 26 mm grid will be provided. The laser input impedance (dV/dI at lasing) must be 25 Ohms (+/- 5 Ohms). Not available on AVX-S3 models, or models with the -HC suffix. A low-bandwidth slide-on socket can also be provided for pins 1-7 of the diode, with the thermal control pins brought out to a standard DB-9 connector (-T1C option).

GENERAL INFORMATION

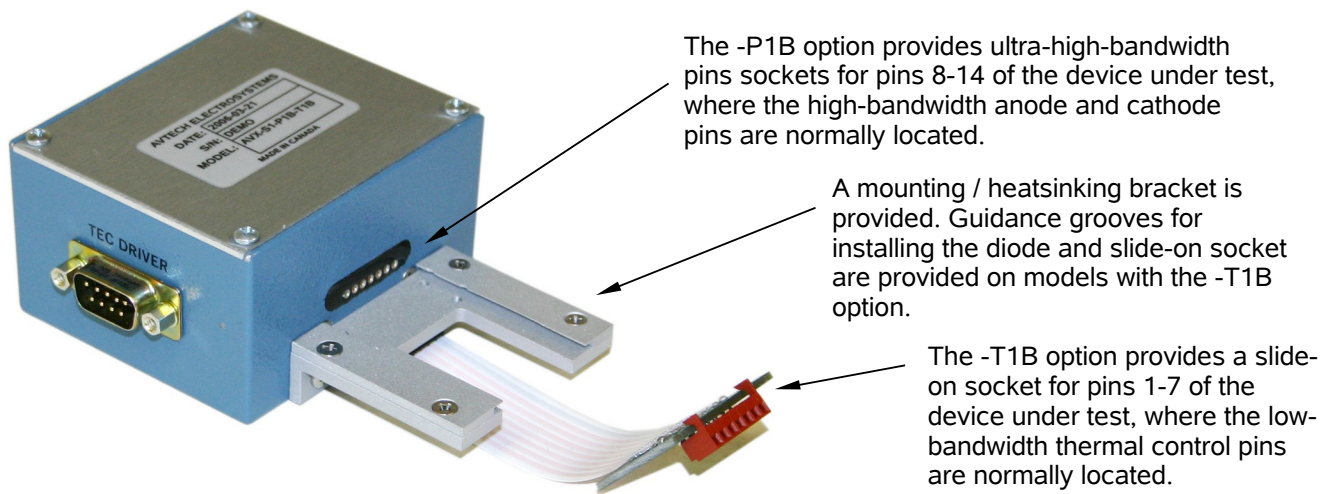
INSTALLING THE DEVICE UNDER TEST

The AVX-S1-P1B has a “P1B” high-speed socket for pins 8-14 of the diode under test. If the “-T1B” option has been specified, a slide-on socket for pins 1-7 of the diode will also be present.

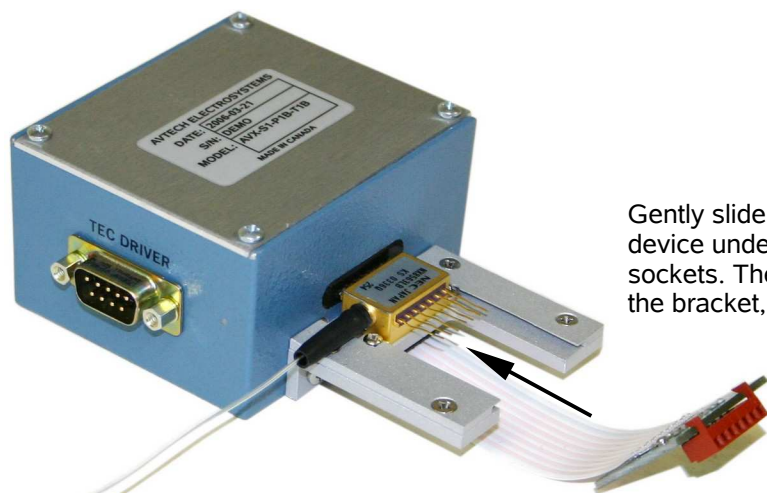
The “P1B” socket consists of seven high-bandwidth pin sockets. This socket arrangement will accept pins 8-14 of a standard butterfly package with 0.5 mm wide pins. A positive pulse will be applied to the diode anode (pin 10). Pins 8-9 and 11-13 will be grounded.

The optional “T1B” socket consists of a low-bandwidth slide-on socket board for pins 1-7 of a butterfly package. A flexible cable connects the slide-on socket to the output module. A male DB-9 connector is provided on the output module, which provides access to the thermal control pins of the diode. DB-9 pin 2 connects to diode pin 2 (TH). DB-9 pin 3 connects to diode pin 5 (TH). DB-9 pin 4 connects to diode pin 1 (TEC+). DB-9 pin 5 connects to diode pin 14 (TEC-). The remaining DB-9 pins are unconnected. Pins 3, 4, 6, and 7 of the diode are grounded. Access to the photodiode, if present, is not provided. This option is designed for compatibility with Thorlabs temperature controllers and Lumics laser diodes. It may be suitable for others as well.

With no diode installed, the output module will look similar to this:



The diode is first installed by sliding pins 8-14 into the “P1B” pin sockets, as shown below:



Gently slide the high-bandwidth side of the device under test into the matching pin sockets. The device can be screwed down to the bracket, if desired.

If present, the T1B slide-on socket assembly can then be slid onto pins 1-7, as shown below:



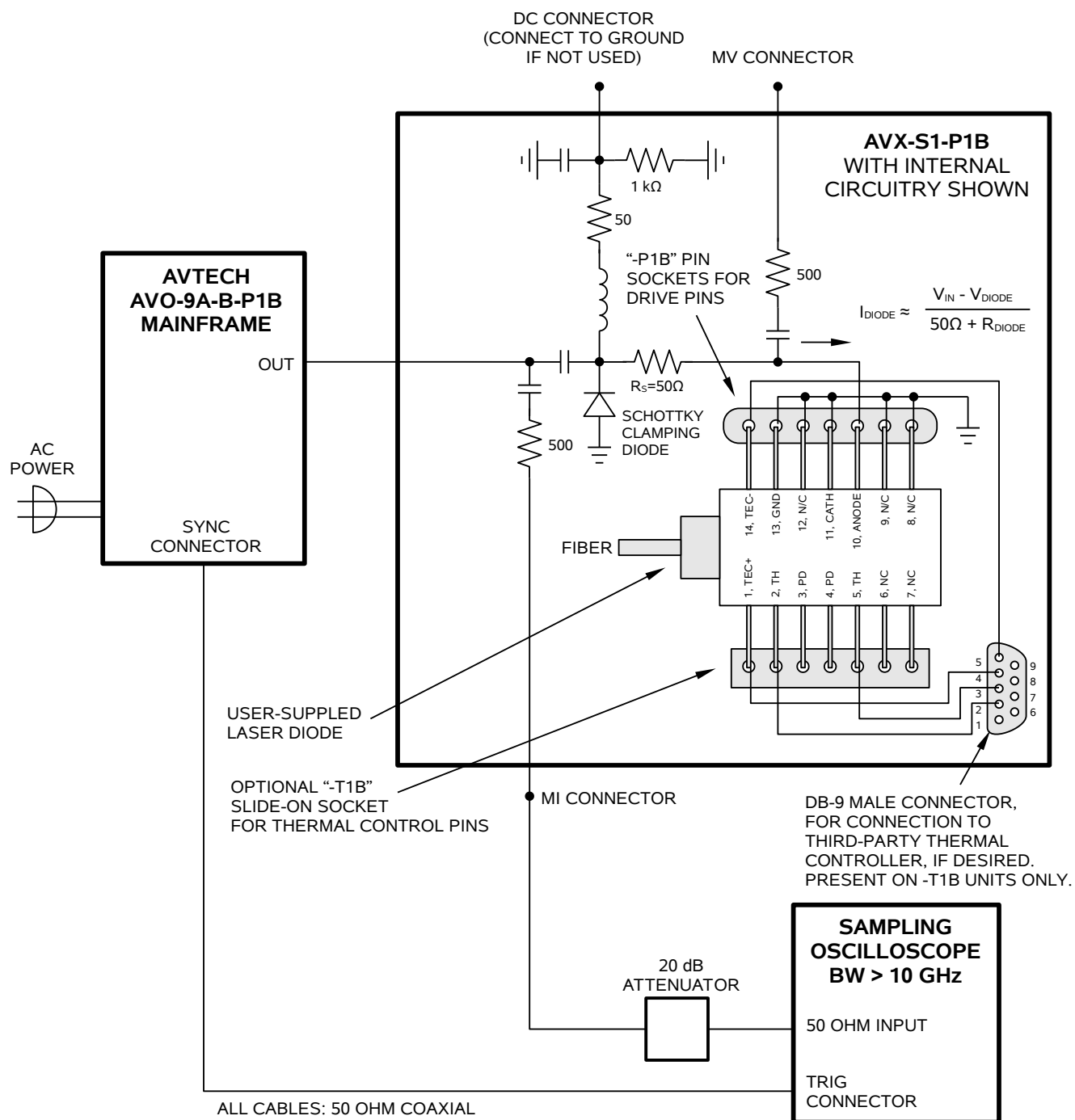
Gently slide the low-bandwidth slide-on socket onto the matching pins of the device under test. The slide-on socket is connected to the output module using a short length of flexible ribbon cable. The thermoelectric cooler and thermistor pins are made accessible to the user through the “TEC DRIVER” DB-9 connector, which will mate to cables from common third-party TEC controllers.

(The SMA connectors which connect to the cabling from the mainframe are on the module side opposite the pin socket. They are not visible in these photos.)

To optional third-party TEC controller.

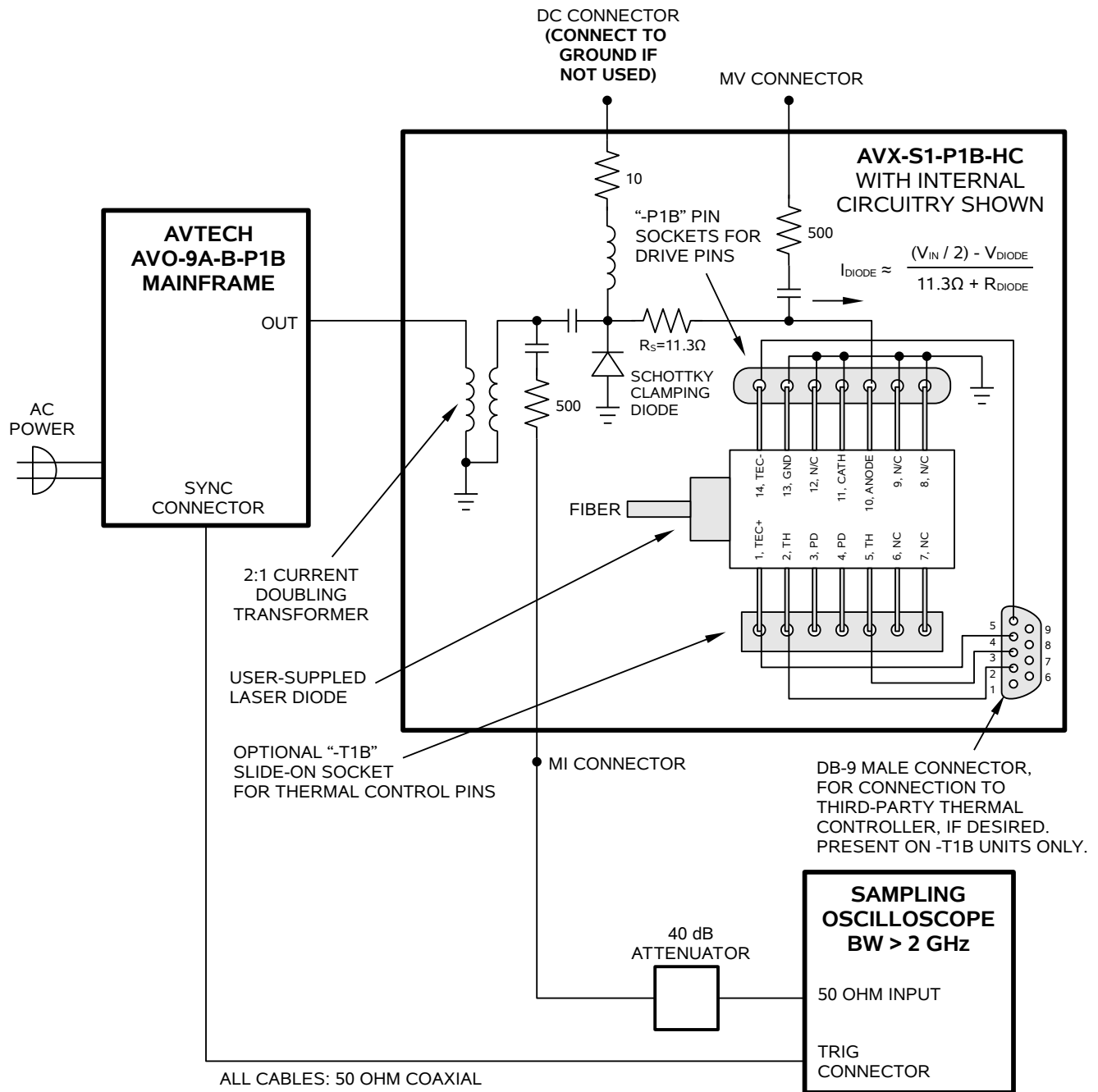
NORMAL TEST ARRANGEMENT (WITHOUT -HC OPTION)

To fully test the instrument, and for normal operation, the output module must be connected as shown below. The basic functional equivalent circuit of the output module is shown. (See the next section for the correct circuit for models with the -HC option).



NORMAL TEST ARRANGEMENT (WITH -HC OPTION)

Models with the -HC option contain a current-doubling transformer in the output module, to boost the maximum current. The appropriate connection arrangement and the functional equivalent circuit are shown below:



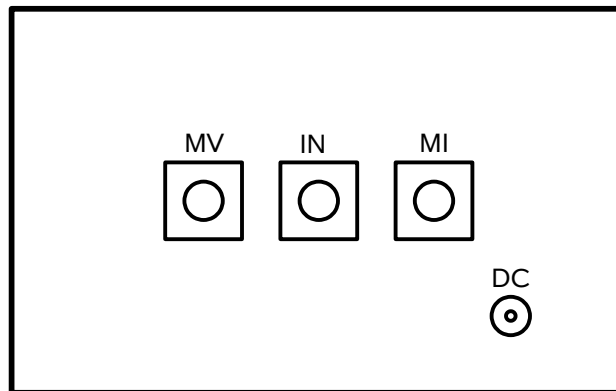
THERMAL CONTROL (-T1B UNITS)

Models with the "-T1B" option include a DB-9 male connector that will mate to third-party temperature controllers. These third-party controller provide a means of controlling the thermoelectric cooler that is typically present in butterfly-packaged laser diodes, if desired. The need for cooling is dependent on the user's application. Cooling is generally recommended by device manufacturers.

SIGNAL CONNECTORS ON THE OUTPUT MODULE

An oscilloscope may be used to monitor the MI and MV outputs. A forward DC bias may be applied to the laser diode by connecting a DC potential of 0 to +10 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. Waveform distortions will occur otherwise.



AVX-S1-P1B OUTPUT MODULE, CONNECTOR VIEW

AMPLITUDE CONTROL

For models without the -HC option, the pulse current through the diode load installed in the output module is given by:

$$I_{\text{DIODE}} = (V_{\text{SET}} - V_{\text{DIODE}}) / (50\Omega + R_{\text{DIODE}})$$

where V_{SET} is the amplitude setting on the mainframe (between 0 and 13V), V_{DIODE} is the forward voltage drop across the diode (typically 2 or 3V), and R_{DIODE} is typically negligible (compared to the 50 Ohm series resistance).

Models with the -HC option have a current-doubling transformer in the output module, and a reduced series resistance. The pulse current through the diode load installed in the output module is then given by:

$$I_{\text{DIODE}} = ((V_{\text{SET}} / 2) - V_{\text{DIODE}}) / (11.3\Omega + R_{\text{DIODE}})$$

where V_{SET} is the amplitude setting on the mainframe (between 0 and 13V), V_{DIODE} is the forward voltage drop across the diode (typically 2 or 3V), and R_{DIODE} is typically on the order of 1 Ohm. Ideally, $(11.3\Omega + R_{\text{DIODE}}) = 12.5\Omega$ for an optimal transmission line impedance match.

Standard AVX-S1-P1B models require a positive pulse ($V_{\text{SET}} > 0$) on the input, in order to forward bias the device anode.

-INV OPTION

Models with the -INV option have a polarity inverting transformer on the input. This is useful if the user has a pulse generator that generates negative amplitudes only. (The standard AVX-S1-P1B requires a positive pulse for normal operation.)

For models without the -HC option, the amplitude control equation becomes:

$$I_{\text{DIODE}} = (-V_{\text{SET}} - V_{\text{DIODE}}) / (50\Omega + R_{\text{DIODE}})$$

For models with the -HC option, the amplitude control equation becomes:

$$I_{\text{DIODE}} = ((-V_{\text{SET}} / 2) - V_{\text{DIODE}}) / (11.3\Omega + R_{\text{DIODE}})$$

COMPATIBLE PULSE GENERATORS

The AVX-S1-P1B is designed for use with high-speed Avtech pulse generators, such as those in the AVP, AVPP, AVMP, AVMM, AVMR, AVN, and other families. The AVX-S1-P1B may also be suitable for use with other pulse generators. Contact Avtech (info@avtechpulse.com) if you need assistance selecting a pulse generator.

Models in the Avtech AVO-9 series include a pulse generator and an AVX-S series output module in a complete “bundle”. See <http://www.avtechpulse.com/laser/> for details.

PERFORMANCE CHECKSHEET