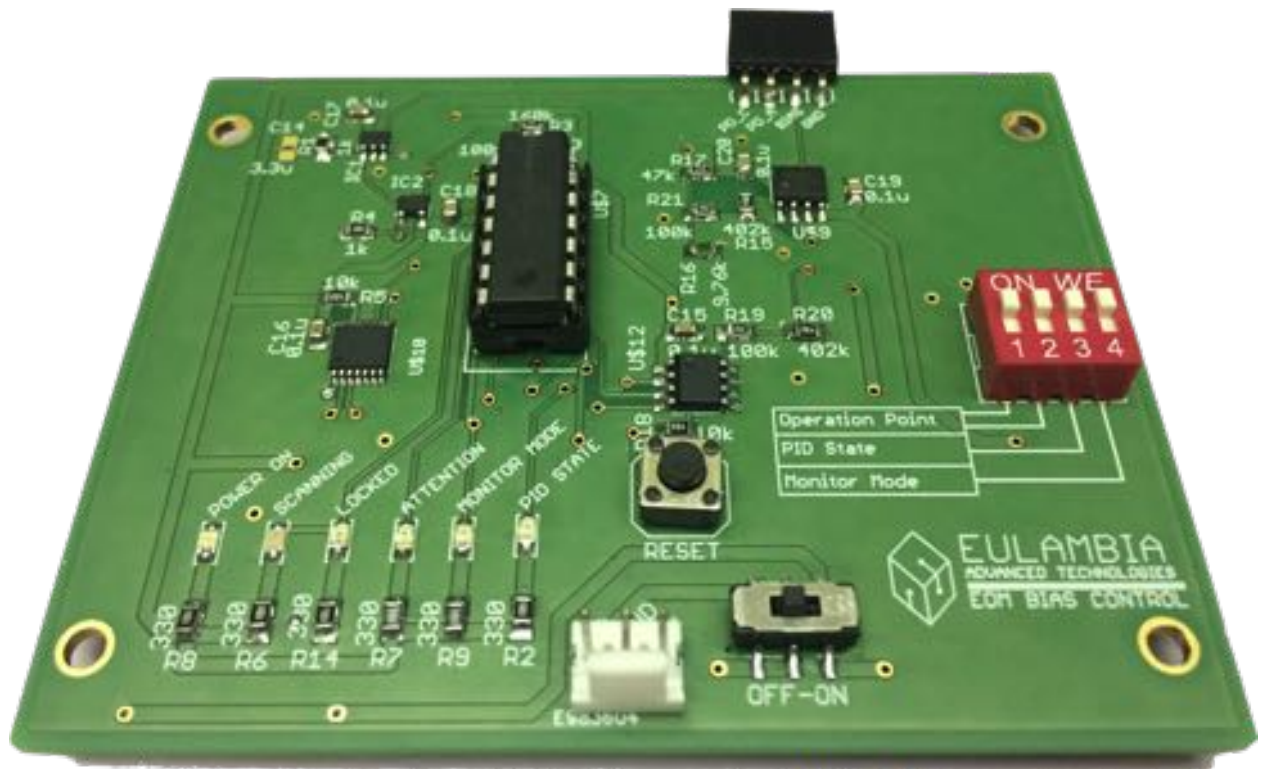


Datasheet

EAT-EOM-CTL-1



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Electro-Optic Modulator Bias Control Unit v2.0 Datasheet





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1 Bias Control Unit at a Glance

EAT-EOM-CTL-1 is an electro-optic modulator bias control unit that can be used with any Mach-Zehnder modulator having a V_{π} less than 10V. It is designed to operate using the integrated photodiode of the modulator and provides a voltage sweeping range of 18V, automatic gain control for wide optical dynamic range, on-board photodiode amplifier and real time tracking of MIN, MAX, QUAD- and QUAD+ operating points.

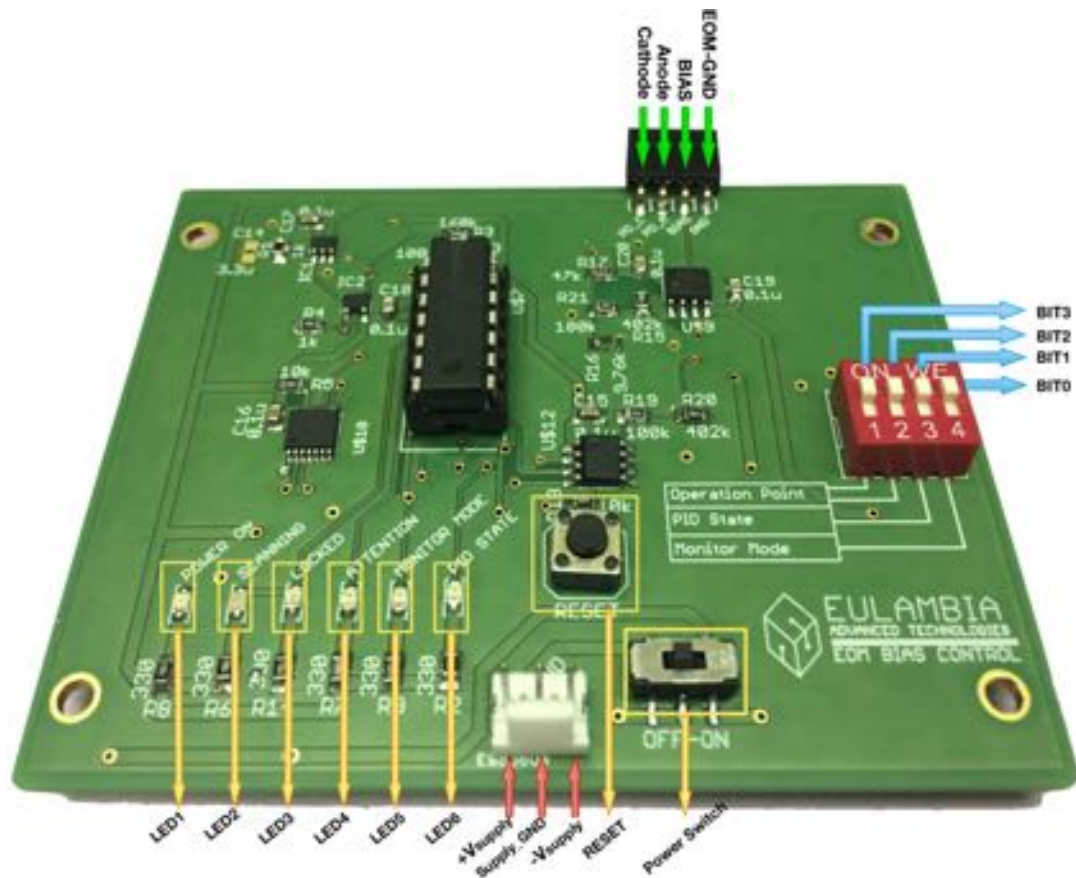
The selection of the desirable operating point and some other functions of the controller can be adjusted by a DIP switch located at the front panel of the board, while all the significant information about the operating status of the controller are indicated through a series of LEDs. At the minimum and maximum operating point the tracking is achieved using a dithering square wave signal of 14.2Hz frequency and a maximum amplitude of 80mVpp.

Specifications				
Parameter	Min Value	Typical Value	Max Value	Units
Acceptable Optical Power	-12		9	dBm
Output DC bias voltage	-9		+9	V
Locking mode	Quad \pm / Max / Min			
Locking slope	Negative or Positive			
Dither Frequency		14.2		Hz
Dither peak-to-peak voltage	40		80	mV
Bias point error @Quad \pm point	0.25		0.54	degrees
@MIN/MAX point	0.53		1	
Modulator full response detection time	5		10	sec
Electrical Signal Connectors	pin-header			
Power	\pm 14VDC @ 0.25Amp			
Operating Temperature	0		+70	$^{\circ}$ C
Storage Temperature	-40		+85	$^{\circ}$ C



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Bias Control Unit Top View



Signal Ports

Port Name	Direction	Description
PD_C	Input	Connects to the EOM's integrated monitoring photodiode cathode.
PD_A	Input	Connects to the EOM's integrated monitoring photodiode anode.
BIAS	Output	Connects to the bias port of the EOM.
GND	-	Connects to the ground of the EOM.

DIP Switches/Push Buttons

Port Name	Direction	Description
Operation Point (bit3,bit2)	Input	Sets the operating point. (00): Modulator minimum point, (10): Modulator Quad- point, (01): Modulator Quad- point, (11): Modulator maximum point.
PID State (bit1)	Input	Enables and disables the PID controller.
Monitor Mode (bit0)	Input	Sets the Monitor Mode of the controller.
RESET	Input	Resets the controller.
Power Switch	-	Powers on the board.



LEDs

Port Name	Direction	Description
POWER ON (LED1)	Output	Power indicator. (BLUE)
SCANNING (LED2)	Output	This indicator is turned on during the response scanning process. (YELLOW)
LOCKED (LED3)	Output	This indicator is turned on when the EOM is stabilised at the pre-selected operating point. (GREEN)
ATTENTION (LED4)	Output	This indicator is turned on when the input optical power at the EOM exceeds the preconcerted maximum value. (RED)
MONITOR MODE (LED5)	Output	This indicator shows the power monitoring state. (GREEN)
PID STATE (LED6)	Output	This indicator shows if the PID controller is enabled. (GREEN)



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2 Getting Started

1. Connect the appropriate symmetrical power supply to the three pin power connector⁽¹⁾.
2. Connect the EOM ground and Vbias pins to the corresponding pins on the bias control unit.
3. Connect the EOM's integrated monitoring photodiode pins to the PD_C and PD_A ports⁽²⁾.
4. Connect the EOM's input fiber to a laser source before turning on the Bias Control unit⁽³⁾.
5. Select the operating point using the appropriate sliders (bit3,bit2) at the 4 position DIP switch.
6. Turn on the Bias Control unit by sliding to the right the Power Switch on the board. "POWER ON" and "SCANNING" LEDs will turn on.
7. Wait until the "LOCKED" LED turns on and the "SCANNING" LED turns off.
8. Turn on the RF modulation connected to the EOM RF port.

Notes:

1. A maximum of ± 22 Volt can be connected to the supply pins.
2. The specific bias controller is designed to operate only with the integrated monitoring PD of the modulator. Do not connect a biased or amplified photodiode to this port.
3. In case of not using polarization maintaining fibers across the light path between the laser and the EOM, a polarization controller should be connected between them in order to align the polarization axes and maximise the performance of the bias controller.



3 Bias Control Unit Operation

3.1 «Power On» Procedure

Before powering on the EAT-EOM-CTL-1 board, ensure that the EOM is connected to an optical source with its polarization axes aligned to the incident light. Select the desirable operating point, PID state and monitoring mode and power on the board.

When the board is powered on, the “Power On” and “SCANNING” LEDs will turn on to indicate proper operation of the board. During scanning, the controller generates a ramp signal at the BIAS port within the range of -9V to 9V with 20mV resolution. The response of the EOM will be scanned twice and the gain of the PD amplifier will be automatically adjusted at the appropriate level, maximizing the SNR and resolution of the received signal.

At the end of the scanning process, the bias controller will automatically detect and track the predefined operating point selected by the user. When the operating point is locked the “LOCKED” LED will turn on (GREEN) and the “SCANNING” LED will turn off.

Small perturbations around the operating point may occur, which will result in “LOCKED”-“SCANNING” LEDs flickering. Unless the “LOCKED” LED turns off permanently, the bias point remains locked.

In case that the input optical power at the EOM is greater than 9dBm, the “ATTENTION” LED will turn on RED.

3.2 PID State

Using the 3d slider on the board the user can enable and disable the PID tracking.

If the PID is enabled the “LOCKED” LED is turned on (GREEN) and the controller continuously tracks the operating point compensating any temperature drifts. By disabling the PID (“LOCKED” LED is turned off), the controller initially tracks the operating point, and when the EOM is stabilized the PID is disabled. This means that the controller no longer compensates any temperature drifts. This mode is better to be used at the minimum and maximum points, for short periods of time in cases that the dithering signal is not desirable.

In order to re-enable the PID, the user must select the appropriate position and reset the controller.

3.3 Monitor Mode

By enabling, the Monitor Mode slider, the controller continuously tracks the optical power at the input of the EOM and notifies the user about abrupt power changes. These changes are indicated by a flashing sequence on the “ATTENTION” LED.

3.4 Reset Button

The ordinary duration of the scanning process and the locking of the operating point ranges from 5s to 10s, depending on the power of the optical carrier and the value of the operating point. If the “LOCKED” LED will not turn on even after 30sec then the “RESET” button must be pressed in order for the unit to initialize its parameters and restart the scanning process. If the operation of the bias controller is unstable or incorrect the “RESET” button must be pressed, and if the malfunction continuous the power switch must be toggled.