MODULATOR BIAS CONTROLLER QUESTIONNAIRE

Thank you for choosing OZ Optics. In order to help you choose the best components for your system, we would appreciate it if you could answer the following questions. If you do not know what to enter, write DON'T KNOW beside the question. We will then recommend an option. If you need assistance filling out the form, you are welcome to contact your nearest distributor or our sales office where a sales representative will be happy to assist.

To help you fully understand all the relevant issues involved in the ideal **M**odulator **B**ias **C**ontrol (**MBC**) System, we ask you to read our *Modulator Bias Controller Frequently-Asked-Questions at Selection 3 of 4 and MBC Selection Guide at Selection 4 of 4,* before completing this questionnaire.

Section 1 of 4: Personal Information
To process your information as quickly as possible, please ensure that the fields marked in *red italics* are completed before submitting

As initial requirements, if this data is not entered, OZ will be unable to respond to your request.

Name : _____

Position : _____

Company : _____

Address: _____

City: _____

State / Province: _____

Country: _____

Postal / Zip Code: _____

Telephone : _____

Fax: _____

Email : _____

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Section 2 of 4: Brief Laser and Modulator Characteristics and MBC Requirements:

Laser Type: ❏ **DFB** (**D**istributed-**F**eed**B**ack laser), ❏ Other

Laser output power, in mW, (if CW) : _____

Modulator Bias Port Voltage Range, in Volts : _____

Modulator Bias DC Port impedance, in Ohm : _____

Preferred MBC Features (Locking Modes) : _____

Preferred MBC to use external Photodiode? : ❏ Yes, ❏ No

Coupler Fiber Type: ❏ PM,   ❏ SM

Preferred MBC to be remotely accessed via a computer interface such as GUI (Graphical User Interface): ❏ Yes, ❏ No

Preferred MBC to report bias voltage and photodiode optical power level: ❏ Yes, ❏ No

Preferred MBC selectable Locking points: ❏ Yes, ❏ No

Preferred MBC selectable Locking points by PC remote access: ❏ Yes, ❏ No

Preferred MBC adjustable Modulation depth (extinction ratio): ❏ Yes, ❏ No

Preferred MBC adjustable Pilot Tone Amplitude: ❏ Yes, ❏ No

Preferred MBC selectable Pilot Tone Frequency: ❏ Yes, ❏ No

Preferred MBC selectable Locking modes and slopes: ❏ Yes, ❏ No

Preferred MBC for **SSB** (**S**ingle **S**ide **B**and) applications while using SP-QPSK or Dual Parallel modulator: ❏ Yes, ❏ No

Preferred MBC used for high extinction ratio analog applications with locking point priority: ❏ 0V, ❏ 8V, ❏ No

Preferred MBC to control bias positions for DP/SP QPSK-modulator used for 80 Gbit DQPSK or QAM applications?: ❏ Yes, ❏ No

Prefer MBC format: ❏ PCBA (OEM version), or ❏ Desktop (Benchtop version)

*Note: Please refer to MBC Selection Guide and MBC Frequency Ask Question sheets

Please enter below any additional information about your requirements:

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MODULATOR BIAS CONTROLLER QUESTIONNAIRE

Section 3 of 4: Modulator Bias Controller (MBC) Frequency Asked Questions:

Frequently Asked Questions

1. **What is the difference between a digital signal versus an analog signal?**
   The difference between an analog and a digital signal is the amplitude. The amplitude of the analog signal is smaller than 70% of Vπ, while the digital signal has an amplitude that is close to or greater than Vπ.

2. **For digital applications, which MBC(Modulator Bias Controller) should I use?**
   Generally speaking, for quad mode operation, chip-MBCs are designed for digital applications, and mini-MBC, ditherless MBC, precision ditherless MBC, tunable, and Super MBC are designed for analog applications. For null/peak mode, all of our products can be used except ditherless MBC. Please note, chip-MBC has a 9.8K-pilot tone, while the mini-MBC has 1 kHz pilot tone when operating at Quad point, and 2-KHz pilot tone when operating at Null point.

3. **For analog applications, which MBC should I use?**
   In most instances, you should use the mini-MBC family or super MBC.

4. **For MBC-HER, what is the priority of 0V and 8V?**
   Depending on the manufactures, the modulator's working function may not be even, although most modulators have an even working function. The controller has the ability to set working positions close to 8V in order to obtain the highest extinction ratio. The user can obtain detailed information when they would like to place an order.

5. **I saw the green LED (light-emitting diode) flashing. Is the bias stable?**
   The controller is still locking even if the green LED is flashing. The flashing means the modulator is drifting faster than a certain level. The working position stability can be judged by the optical power stability. If the optical power is changing, then the modulator is not locked.

6. **How can I know the input power to the PD (Photodiode)? Do I need to measure it?**
   The specified power to the PD in our spec sheets is defined as the PD power received when the modulator is at Peak position. It is different from the real optical power when the modulator is being locked. Therefore, when the modulator is locked at Null, the optical power to the PD should be much less than the specified PD input power of -30dBm. The PD input power can be estimated very easily by: input power to the modulator minus the modulator insertion loss, then apply the tap splitting ratio.

7. **Can I change the pilot tone frequency?**
   The pilot tone frequency and amplitude of the MBC-SUPER may be selected through the GUI Interface.
   It is not changeable for the MBC-MINI. Contact OZ Optics if you would like a custom pilot tone frequency.

8. **Can I change the pilot tone amplitude?**
   The program in the MBC-MINI product family determines the pilot tone amplitude automatically. But the MBC-CHIP has a potentiometer for users to adjust the amplitude of the pilot tone. The MBC-SUPER pilot tone amplitude can be adjusted through the GUI.

9. **Can I use the modulator's built-in photodiode? Do I have to remove the photodiode installed in the MBC?**
   You may use the modulator's built-in photodiode. You need to remove the photodiode installed in the MBC. The MBC-MINI family has an external port for connecting an external photodiode. The MBC-CHIP has been designed to use the modulator's built-in photodiode, although the user may want to install a photodiode of their own choosing to the MBC-CHIP

10. **When using the modulator's built-in photodiode, how much optical signal power can I use?**
    You need to check your modulator specifications, to find out the responsivity of the built-in diode, then calculate the current output from the diode. The current range to our product is typically 0.8-80 μA when the modulator is set at Peak.

11. **Can I use the controller for short wavelengths such as 630,780 nm?**
    Although the responsivity of the PD drops at shorter wavelengths, some of our controllers have auto-gain-control which will compensate for this change, so our controller can also be used for the shorter wavelength such as 630 nm.

12. **The pilot tone interferes with my system. Can I use a ditherless MBC on our system?**
    You may use the MBC-DBC for analog applications.

Section 4 of 5: Modulator Bias Controller (MBC) Frequency Asked Questions (Cont.):

Frequently Asked Questions (Cont.)

13. We would like to order your MBC-CHIP. How do we specify the right locking mode in our request for quotation?
Please check your modulator specifications to find out if the photodiode output has the same phase with the output signal. If they are in the opposite phase, you will need to lock in to the opposite mode of your output signal. For example, if you would like to lock to Null, you may need to place an order for Peak mode.

14. We plan to use your MBC for SSB (single-sideband modulation) and DQPSK(Differential Quadrature Phase Shift Keying) applications. Will the pilot tones cause interference between the three modulators in the IQ modulator?
In our MBC, we use a time division method. The pilot tone is applied to the three modulators in a timed sequence at a cycling frequency of about 2 Hz so that the pilot tones don't cause any interference problems.

15. Any tips for using your SSB MBC for SSB applications?
The most important thing is the phase between the two RF drivers at the two RF ports of the modulator. The hybrid-phase-shifter and their cabling are very important. The other important thing is the amplitude of the signal. The signal amplitude should be close to Vπ.

16. Any tips for using your MBC-QPSK-DP or MBC-QPSK-SP for DQPSK/QAM/Arbitrary applications?
The most important item to remember is the RF driving signal amplitude Vpp. For DQPSK, the Vpp should be about V2pi, and for QAM, Vpp should be around Vpi or less. Also, no matter which mode you are going to work in, you need to use V2pi RF driving voltage to do the calibration.

17. Can we use your DP-QPSK-MBC for SP-QPSK modulator?
Yes, you can. DP-QPSK-MBC is a combination of two SP-QPSK-MBCs.

18. Can we use the modulator's built-in PD for QPSK(Quadrature phase-shift keying) modulator bias controller?
NO. The controller is designed to use one external PD to provide the feedback. The modulator's built-in PD does not meet the requirement for our circuit.

Section 4 of 4: Bias Controller (MBC) Selection Guide:

	Modulator Bias Controller Selection Guide Questionnaire								
Applications	Null/Peak only (generating pulses)			On/Off Null/Peak	N/P/Q selectable	Any point	Any point except Null/peak	QPSK/QAM	SSB
	High extinction ratio 40dB	High extinction ratio (40-60 dB)	>25 dB						
Modulator Required	Single DC Port	EO Space Dual DC-port	Single DC port	Single DC port	Single DC-port	Singe DC-port	single DC-port	QPSK	QPSK
Suitable Controller	MBC-HER	MBC-DUAL-BIAS	MBC-CHIP	MBC-chip	MBC-MINI	MBC-TUNABLE	ditherless MBC-DBC	MBC-QPSK	MBC-SSB
			MBC-MINI	MBC-SUPER	MBC-HER		MBC-PDBC		
			MBC-HER	MBC-TUNABLE	MBC-SUPER				
					MBC-TUNABLE				

Note 1.   Please check the item in the Table for your selection
Note 2.   MBC-CHIP is single function controller, it can be used for Quad locking with RF driver
Note 3.   Red colored controllers have computer interface with GUI or RS 232 command