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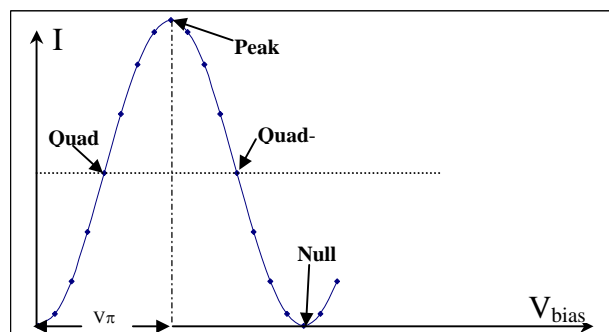
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## Introduction to Dual-Parallel-MZ Modulator Bias Controller

4/3/06

Dual-Parallel-MZ-Modulator Bias Controller is a device specially designed to control the bias positions for dual-parallel-modulator used for DQPSK or SSB (Single Side Band) applications. DQPSK (Differential quadrature phase-shift key) modulator can improve optical transmission properties such as total reach, dispersion tolerance, or spectral efficiency. Since the Dual Parallel modulator is a combination of phase modulator and Mach-Zehnder modulators, there are three bias points requiring controllers. YY Labs' Dual-Parallel-MZ modulator bias controller has been developed especially for this kind of device.

YY Labs' patent pending Dual-Parallel-MZ modulator bias controller (DP MBC) is a full-function miniature OEM version of the Modulator Bias Controller (MBC) family. It simultaneously sets the first and second modulators at Null points and the third modulator at quad point. The slope of each point is selectable from the board, and the point to be locked can be tuned in order to meet the special requirement of the desired working status for some particular applications.



### Features of Dual-Parallel-MZ-MBC (DP MBC)

- Three modulators can be controlled with one controller (1<sup>st</sup>, 2<sup>nd</sup> modulator at Null/peak mode, the 3<sup>rd</sup> at Quad);
- User selectable locking slope (QUAD+ ↔ QUAD-, NULL ↔ PEAK);
- User selectable function: DQPSK ↔ SSB;
- The locking point is tunable to other desired point other than Quad, Peak or Null;
- Tune-ability can be switched off and on;
- Two photodiodes are integrated in the controller with option to use one external PD integrated in the modulator for quad point locking.
- Two operation modes: calibration mode and locking mode;
- Calibration-off mode for quick system setup in locking mode;
- Low profile (3.5" \* 2.0" \* 0.65");

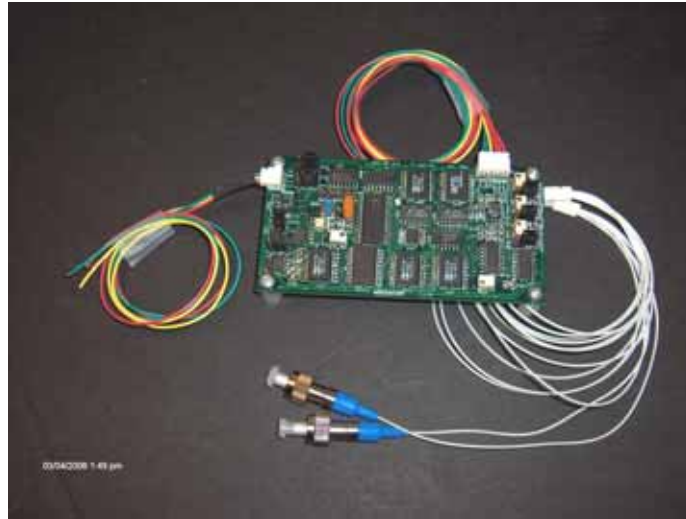


Figure 1. DPMZ-MBC \*

## 1. Dual-Parallel-MZ-MBC Specifications

| PARAMETERS                              | MIN   | TYP | MAX   | UNITS    |
|---|---|-----|-------|----------|
| <b>Optical Performance</b>              |   |     |       |          |
| Detector Input Power <sup>1</sup>       | -30   |     | -10   | dBm      |
| Optical wavelength                      | 1000  |     | 1650  | nm       |
| <b>Electrical Performance</b>           |   |     |       |          |
| Bias voltage                            | -10   |     | 10    | V        |
| Null Mode Extinction Ratio <sup>2</sup> |   | 25  | 40    | dB       |
| Tuning Range                            | +/- 18  |     |       | Degree   |
| Locking Slope                           | Positive or Negative  |     |       |          |
| Locking Mode                            | Two Null (Peak) positions,<br>one Quad+ or (Quad-) position |     |       |          |
| <b>Pilot tone</b>                       |   |     |       |          |
| Modulation Depth (QUAD) <sup>3</sup>    |   | 1   |       | %        |
| Modulation Depth (Null)                 |   |     | 0.1   | %        |
| Pilot Tone Frequency (QUAD)             |   | 1K  |       | Hz       |
| Pilot Tone Frequency (NULL)             |   | 2K  |       | Hz       |
| <b>Power Supplies</b>                   |   |     |       |          |
| Positive Power Voltage                  | 11.5  | 12  | 12.5  | V(DC)    |
| Negative Power Voltage                  | -12.5   | -12 | -11.5 | V(DC)    |
| Positive Power Current                  |   | 80  |       | mA(DC)   |
| Negative Power Current                  |   | 50  |       | mA(DC)   |
| <b>General</b>                          |   |     |       |          |
| Operating temperature                   | 0   |     | 70    | Degree C |
| Storage Temperature                     | -40   |     | +85   | Degree C |
| Dimension                               | 3.5x2.0x0.65 inch   |     |       |          |
| Weight                                  | 0.2 lb  |     |       |          |

1. For a given input, detection power refers to the coupled optical power to the photodiode of DPMZ-MBC when the modulator output is at its minimum attenuation (The detection power does not describe the detected power at locking status).
2. In this case, the modulator output power was greater than 0 dBm. 1% coupler was used. The distinction ratio will be close but not exceed the distinction ratio of the modulator. When the V-pp of the RF driving signal is close to V-2pi, an optical adaptor box from YY Labs has to be used.
3. Optical Modulation Index = amplitude of modulation/V $\pi$ .
4. The bias voltage can be increased to +/- 15V at user's request

## 7. Major Application

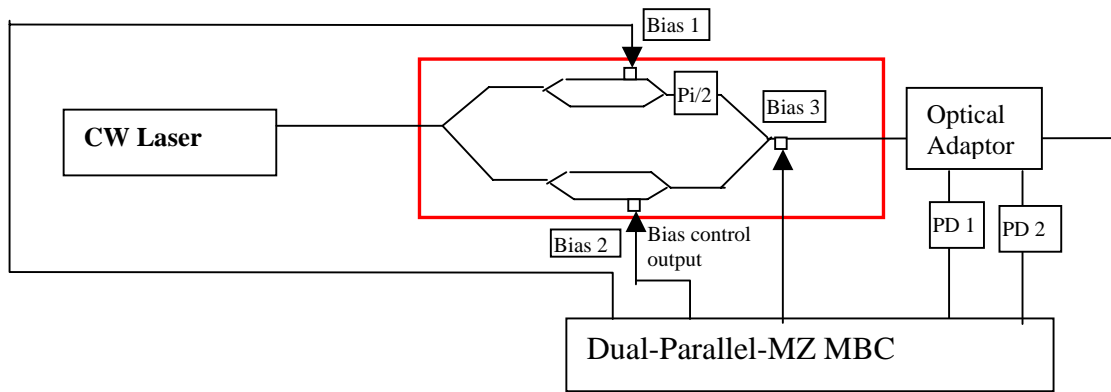


Figure 2. Configuration of Dual-Parallel-MZ modulator bias controller for DQPSK application



Figure 3. Optical Adaptor for DQPSK MBC

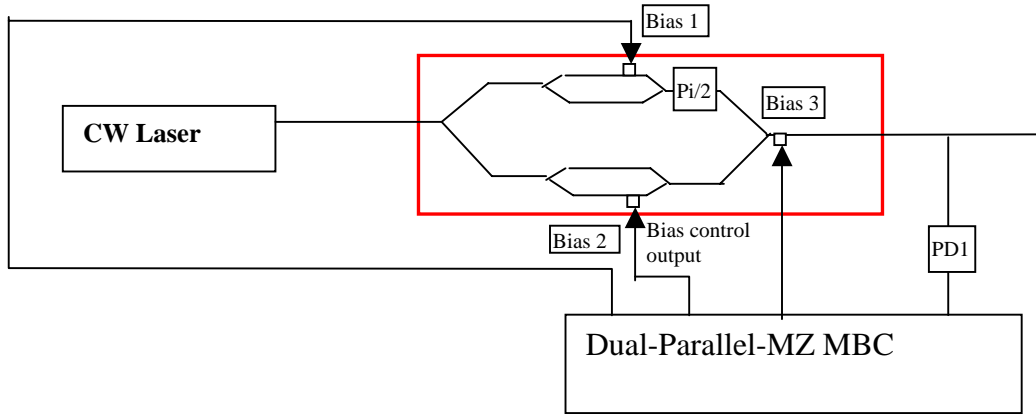


Figure 4. Configuration of Dual parallel MZ modulator bias controller for SSB application

For any question or information, please contact:

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