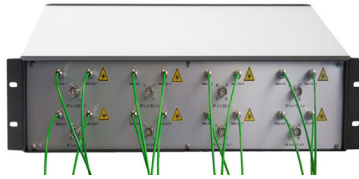


ModBox-CBC-1064 nm-CH

Modbox 1064 nm 4 or 8 Channels with phase modulation control

ModBox



The ModBox-CBC-1064nm is a proven and robust multi-channels phase modulation solution for multibeam coherent combination.

The ModBox operates at 1064 nm and is composed of 4 or 8 parallel and independent channels for adjusting the phase of each to match the others. Each channel allows an adjustment of the temporal phase for synchronization of all beams. The design integrates iXblue proprietary low frequency phase modulator combined with its matching RF electronic and associated with a selected for high accuracy and for wide delay range tunable optical delay line.

Specific effort is done for ModBox product: the iXblue electro-optical modulators are screened from our regular production to ensure very low insertion loss, high polarization extinction ratio, low Residual Amplitude Modulation, and high phase modulation stability. Additionally, iXblue phase modulator is well known to be the best planar phase modulator in the NIR featuring the highest optical input power handling capability.

The component selection makes the ModBox-CBC-1064nm an accurate, adjustable, and reliable phase-lock modulation solution for Coherent Beam Combining technique.

The ModBox-CBC-1064nm can be associated with the Spectral Broadening unit ModBox-SB-1064nm based on high frequency phase modulation in order to counter the SBS effects caused by the amplification of a narrow linewidth laser source.

FEATURES

- Proven and reliable solution
- Adjustable delay range and temporal phase modulation per channel
- Scalable number of channels
- Adjustable Residual Amplitude Modulation
- Lower Insertion Loss
- Higher PER

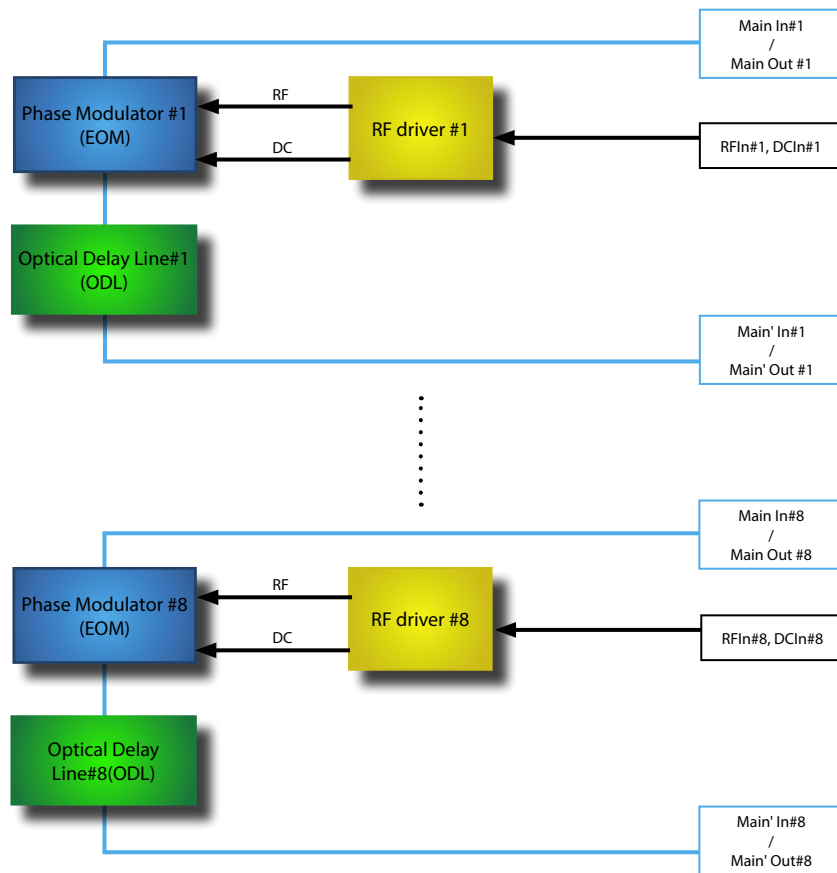
Performance Highlights

| Parameter | Typical |
|-------------------------------|------------|
| Operating wavelength | 1064 nm |
| Insertion loss | < 5 dB |
| Polarisation extinction ratio | > 25 dB |
| Adjustable delay range | 600 ps |
| RAM | Adjustable |

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Functional Block Diagram



The ModBox-CBC-1064nm-xCH is an independent 4 or 8 channels, each integrates:

- an high speed temporal phase modulator,
- a modulator matching RF amplifier,
- a tunable and remotely controllable optical delay line.

The ModBox is a reciprocal modulation unit: each main input (respectively output) can be seen as an output (respectively input) without any alterations to the specification.

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Input Specifications

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---------------------------------|--------------|-------------|-----|-----------|-----|------|
| Electrical Input Specifications | | | | | | |
| Input RF voltage | V_{RF_IN} | 50 Ω | - | 110 | - | mVpp |
| Input RF frequency | F_{RF_IN} | 50 Ω | - | - | 200 | MHz |
| Input DC voltage | V_{DC_IN} | 50 Ω | - | ± 250 | - | mV |

Output Specifications ⁽¹⁾

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|-------------------------------|-------------------|-------------------------------------------|-------------------|-------------------|------|------|
| Operating wavelength | λ | - | 950 | 1064 | 1150 | nm |
| Maximum insertion loss | IL | Including ΔIL_{ODL} / Per channel | - | 4 | 5 | dB |
| Insertion loss uniformity | ΔIL_{ODL} | Loss variation over delay range | - | 0.6 | - | dB |
| Insertion loss inter-channels | ΔIL | - | - | 0.8 | 1 | dB |
| Polarisation extinction ratio | PER | Optimized for 1064 nm | 25 | 30 | - | dB |
| Temporal modulation | BW | From EOM | - | - | 200 | MHz |
| Adjustable delay range | DR | ODL, remotely controllable | - | 600 | - | ps |
| Inter-channel delay range | ΔDR | - | 0 | - | 150 | ps |
| Delay resolution | DRes | - | - | 1 | - | fs |
| Optical return loss | ORL | - | -40 | -45 | - | dB |
| RF driver gain | G | DC & RF | 25 ⁽²⁾ | 26 ⁽²⁾ | - | dB |
| Modulation rise & fall times | Rt / Ft | 20 % - 80 % | 8 | - | - | ns |

(1): The proposed system/components will properly work either with a kHz linewidth laser as well as with a 27 GHz one.

(2): The driver's gain will be not affected by the temperature when it ranges 25 °C \pm 10 °C.

Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

| Parameter | Symbol | Condition | Min | Max | Unit |
|-----------------------|------------|----------------------------------|-----|---------|------|
| RF input voltage | EV_{in} | - | - | 10 | Vpp |
| DC input voltage | DCV_{in} | - | - | ± 1 | V |
| Optical input power | OP_{in} | To the EOM input port (Main In) | - | 25 | dBm |
| | | To the ODL input port (Main' In) | - | 27 | dBm |
| Operating temperature | OT | | 0 | +55 | °C |

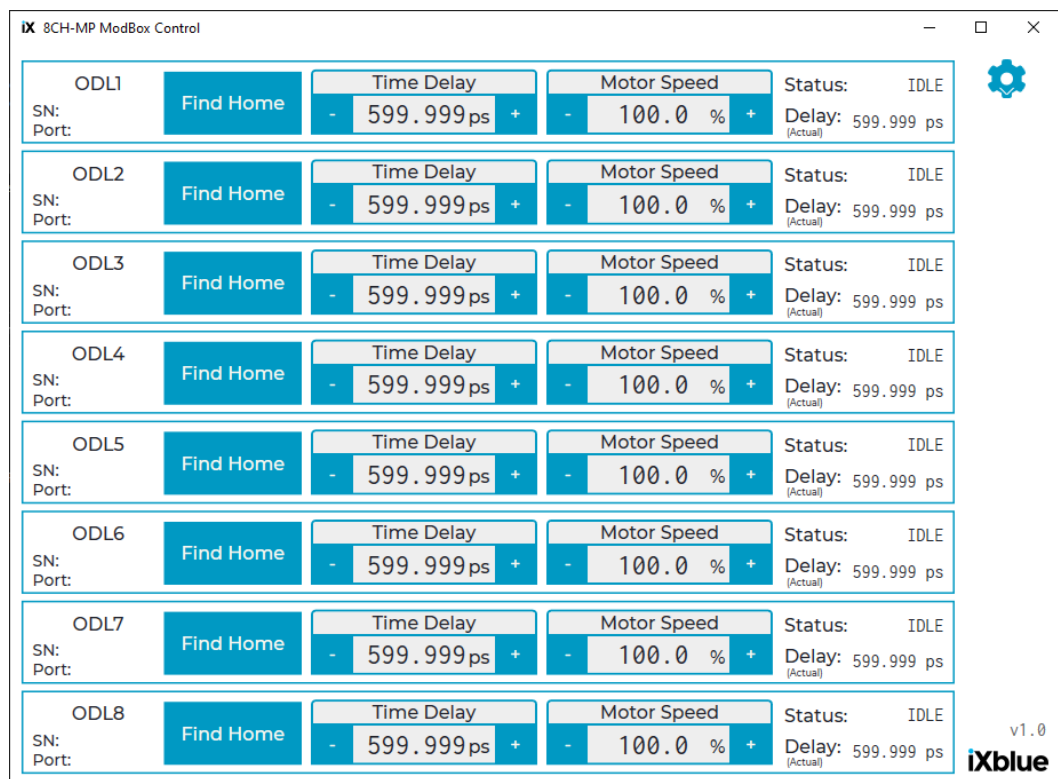
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Software interface

The ModBox-CBC is coming with a Graphical User Interface (GUI) allowing the controls of the Optical Delay Lines delays. Each channel can be adjusted individually.



The screenshot shows a software interface titled "8CH-MP ModBox Control" with a gear icon in the top right. It displays eight channels, ODL1 through ODL8. Each channel has a "Find Home" button, a "Time Delay" control set to 599.999 ps, and a "Motor Speed" control set to 100.0%. The status for each channel is "IDLE" and the actual delay is 599.999 ps. The interface is branded with "ixblue" and "v1.0" in the bottom right corner.

| Channel | SN: | Port: | Time Delay | Motor Speed | Status | Delay (Actual) |
|---------|-----|-------|------------|-------------|--------|----------------|
| ODL1 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL2 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL3 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL4 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL5 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL6 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL7 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |
| ODL8 | | | 599.999 ps | 100.0 % | IDLE | 599.999 ps |

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Panels

| Parameter | Condition | Min | Typ | Max | Unit |
|---------------------------|---------------------------------------------|-----------------------------------------------------------------------------|-----|-----|------|
| Rear Panel | | | | | |
| Remote port | - | USB | | | |
| Front panel | | | | | |
| Optical ports | "Main in #N" ⁽¹⁾ | Narrow key FC/APC, free space divergence | | | |
| | "Main Out #N" ⁽¹⁾ | Narrow key FC/APC, free space divergence, cable gand, 2 meters fiber length | | | |
| MFD (Mode Field Diameter) | "Main in #N" / "Main Out #N" ⁽¹⁾ | 6.5 ±0.5 μm | | | |
| Fiber core-diameter | "Main in #N" / "Main Out #N" ⁽¹⁾ | 5,6 μm | | | |
| Numerical aperture | "Main in #N" / "Main Out #N" ⁽¹⁾ | 0.12 @1060 nm | | | |
| Optical fiber | "Main in #N" / "Main Out #N" ⁽¹⁾ | Polarization maintaining fiber, Corning PM 98-U25A | | | |
| RF & DC input port | "RFin#N, DCInN" ⁽¹⁾ | BNC | | | |

With N = 1, ..., 8

Compliance and safety

| Parameter | Condition | Min | Typ | Max | Unit |
|------------|-----------|----------------------------|-----|-----|------|
| Compliance | - | BS EN 60825 - CE certified | | | |

Dimensions

| Parameter | | | | | |
|--------------|--------------------------------------------------------|--|------------------------------|--|--|
| Size | 19 inches 2U | | | | |
| Weight | ModBox-CBC-1064 nm-4CH: 8 kg | | ModBox-CBC-1064 nm-8CH: 8 kg | | |
| Power supply | 100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz | | | | |

Ordering information

ModBox-CBC-1064nm-xCH

xCH = Number of parallel channels: 4CH 4 channels or 8CH: 8 channels

About us

iXblue Photonics includes iXblue iXfiber brand that produces specialty optical fibers and Bragg gratings based fiber optics components and iXblue Photline brand that provides optical modulation solutions based on the company lithium niobate (LiNbO₃) modulators and RF electronic modules.

iXblue Photonics serves a wide range of industries: sensing and instruments, defense, telecommunications, space and fiber lasers as well as research laboratories all over the world.

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