MBC-DPIQ Controller Operating Instruction

I. Product Structure

| No.	Name	Description
1	Photodiode	External Optical Feedback Input
2	NC	No connection is required
	GND	Ground
	X-A X-C pins	Modulator's Internal photodiode Input
	Y-A Y-C pins	Modulator's Internal photodiode Input
3	Power Connector	Controller's power supply connector
4	RST pin	Operation for resetting controller
5	XPLRI pin	Operation for XI-channel polar selection
	XPLRQ pin	Operation for XQ-channel polar selection
	XPLRP pin	Operation for XP-channel polar selection
	YPLRI pin	Operation for YI-channel polar selection
	YPLRQ pin	Operation for YQ-channel polar selection
	YPLRP pin	Operation for YP-channel polar selection
6	3.3 pin	3.3V reference voltage of UART interface
	GND TX RX pins	UART interface for communication
7	YQp YQn pins	Controller's YQ-channel bias Output
	YIp YIn pins	Controller's YI-channel bias Output
	XQp XQn pins	Controller's XQ-channel bias Output
8	XIp XIn pins	Controller's XI-channel bias Output
	YPp YPn pins	Controller's YP-channel bias Output
	XPp XPn pins	Controller's XP-channel bias Output
9	M2 Mounting Hole	Controller's mounting hole
10	LED	Constantly on: Working under tracking state
		On-off or off-on every 0.2s: Initializing and searching for controlling point
		On-off or off-on every 1s: Controller's feedback input power is too weak
		On-off or off-on every 3s: Controller's feedback input power is too strong
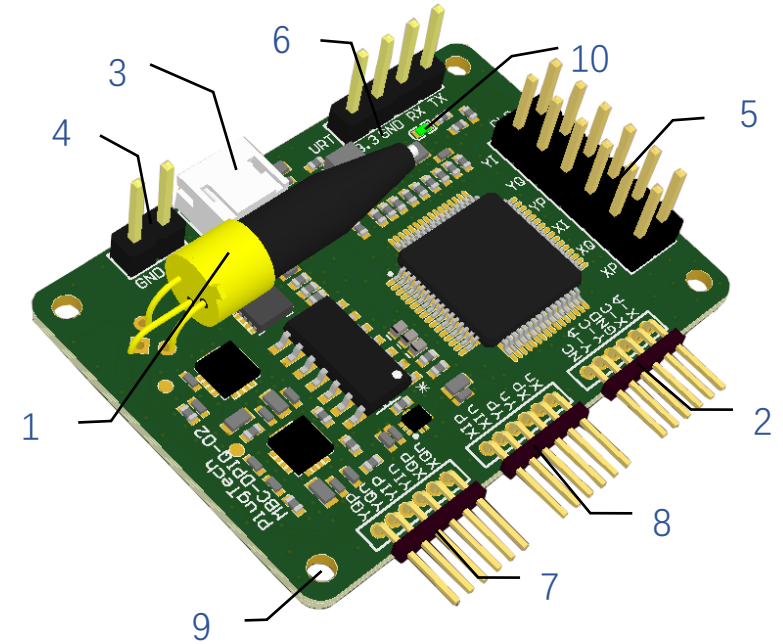
Figure1. Product Structure

II. Product Operating and Storage Information

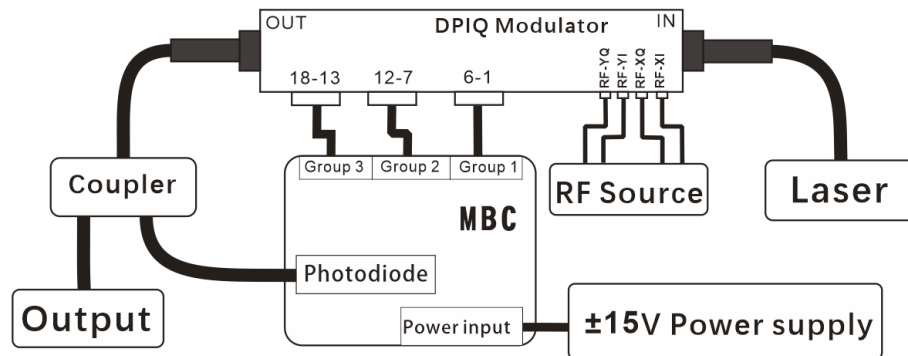| Parameter	Min	Typ	Max	Unit
Positive power voltage	+14.5	+15	+15.5	V
Positive power current	20		30	mA
Negative power voltage	-15.5	-15	-14.5	V
Negative power current	8		15	mA
Input optical power	-30		-8	dBm
Operating temperature	-10		50	℃
Storage temperature	-20		80	℃

III. System Setup Instruction

Figure 2. System diagram with controller's on-board photodiode
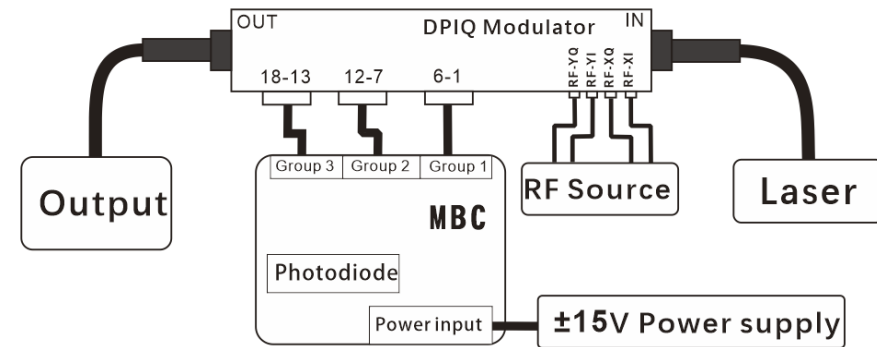
Figure 3. System diagram with modulator's internal photodiode

Since there is 'Bias Shift' in some of DPIQ modulator's integrated photodiode, it may cause a bad performance in modulation systems. It is suggested to use bias controller's on-board photodiode as feedback input, which is shown in Figure 2.

Depending on the different systems, the controller can be connected to the system as shown in Figure 2 or Figure 3. Here are the setup steps:

Setp1. Setup controller's feedback input

Note: User should only choose one of the feedback method between controller's on-board photodiode or modulator's internal photodiode.

1. **Using controller's on-board photodiode as feedback input：**
   Choose an appropriate optical coupler to ensure the controller's feedback optical power is within the range indicated in the Product Operating Information table. For example, if the laser output power is 10dBm and the modulator's insertion loss is 5dB, then the maximum optical output of the modulator is about 5dBm. In this situation, user can choose a 1:99 coupler and the 1% port output power is about -15dBm, which is within the range of controller's input range. Then user can connect the 1% port to controller's on-board photodiode as feedback input and the 99% port is the system's output.
2. **Using modulator's internal photodiode as feedback input：**
   - Connect modulator's **PD-Y Anode** pin to controller's **Y-A** pin.
   - Connect modulator's **PD-Y Cathode** pin to controller's **Y-C** pin.
   - Connect modulator's **PD-X Anode** pin to controller's **X-A** pin.
   - Connect modulator's **PD-X Cathode** pin to controller's **X-C** pin.

Step2. Controller's output connection

- Connect controller's **YQp** pin to modulator's **Bias-QYp** pin, Connect controller's **YQn** pin to modulator's **Bias-QYn** pin.
- Connect controller's **YIp** pin to modulator's **Bias-IYp** pin, Connect controller's **YIn** pin to modulator's **Bias-IYn** pin.
- Connect controller's **XQp** pin to modulator's **Bias-QXp** pin, Connect controller's **XQn** pin to modulator's **Bias-QXn** pin.
- Connect controller's **XIp** pin to modulator's **Bias-IXp** pin, Connect controller's **XIn** pin to modulator's **Bias-IXn** pin.
- Connect controller's **Yp** pin to modulator's **PHASE-Yp** pin, Connect controller's **Yn** pin to modulator's **PHASE-Yn** pin.
- Connect controller's **Xp** pin to modulator's **PHASE-Xp** pin, Connect controller's **Xn** pin to modulator's **PHASE-Xn** pin.

Step3. Controller's power connection

- Note： V+ connect to +15V DC supply, V- connect to -15V DC supply
- Controller can be turned on after the RF source and laser output is stable.
- After the controller is turned on, if the LED is lighted, that means the controller starts to work.

DPIQ Modulator's Pins		Controller's Pins		Connection Status	
				controller's on-board photodiode	modulator's internal photodiode
1-6	DC Input(Bias-QYp)	Group 1	YQp	connect	connect
	DC Input(Bias-QYn)		YQn	connect	connect
	DC Input(Bias-IYp)		YIp	connect	connect
	DC Input(Bias-IYn)		YIn	connect	connect
	DC Input(Bias-QXp)		XQp	connect	connect
	DC Input(Bias-QXn)		XQn	connect	connect
7-12	DC Input(Bias-IXp)	Group 2	XIp	connect	connect
	DC Input(Bias-IXn)		XIn	connect	connect
	DC Input(PHASE-Yp)		Yp	connect	connect
	DC Input(PHASE-Yn)		Yn	connect	connect
	DC Input(PHASE-Xp)		Xp	connect	connect
	DC Input(PHASE-Xn)		Xn	connect	connect
13-18	NC	Group 3	NC	Not connected	Not connected
	PD-Y Anode		Y-A	Not connected	connect
	PD-Y Cathode		Y-C	Not connected	connect
	Ground		GND	connect	connect
	PD-X Cathode		X-C	Not connected	connect
	PD-X Anode		X-A	Not connected	connect

IV. Operating manual

● **Set MBC-DPIQ's YI-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **YPLRI** pins. 3. Turn on or reset the controller.	● **Set MBC-DPIQ's XI-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **XPLRI** pins. 3. Turn on or reset the controller.
● **Set MBC-DPIQ's YQ-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **YPLRQ** pins. 3. Turn on or reset the controller.	● **Set MBC-DPIQ's XQ-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **XPLRQ** pins. 3. Turn on or reset the controller.
● **Set MBC-DPIQ's YP-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **YPLRP** pins. 3. Turn on or reset the controller.	● **Set MBC-DPIQ's XP-channel polarity reversal** 1. Connect controller's output and feedback input properly. 2. Insert jumper between **XPLRP** pins. 3. Turn on or reset the controller.
● **Controller Reset：** Insert jumper and pull out after 1 second.	

- **UART Command Control （Optional, available for Version A）：**

  1. Connect controller's output and feedback input properly.

  2. Use UART accessories to connect the controller to PC as shown

     in Figure4.

  3. Turn on bias controller.

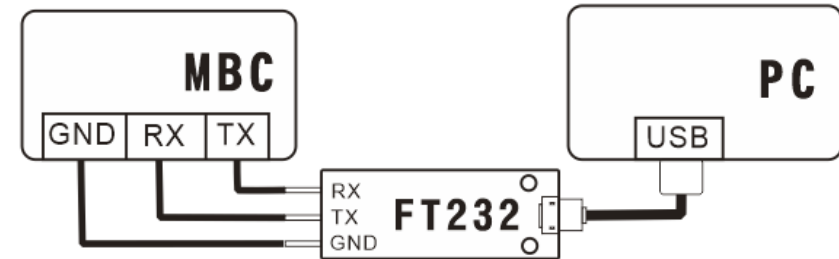 4. Use GUI software or Matlab script to operate the UART function.


Figure 4. UART Connection

V. Cautions

- Do not reverse the V+ and V- power pins, otherwise it will cause permanent damage to the controller.

- ESD sensitive, please pay attention to human static electricity when operating.

- Please provide the correct power supply voltage to avoid interfering with the operation of the controller or damaging it.

- It is recommended that the ripple of the power supply be less than 120mV.

- Please turn on the bias controller after the laser and RF output are stable.

VI. PowerBoard Operation Instruction（Optional）

1. Production Instruction

No.	Name	Description
1	M2 Mounting Hole	Powerboard's Mounting Hole
2	OUTPUT	Output voltage ± 15V
3	Switch	Control Powerboard's Status
4	LED	Show Powerboard's Status
5	EARTH pin	Ground pin
6	INPUT1	+5V Input1
7	Input selection port	Connection between input 1 and + 5V: INPUT1 as the input
7	Input selection port	Connection between input 2 and + 5V: INPUT2 as the input
8	INPUT2	+5V Input2
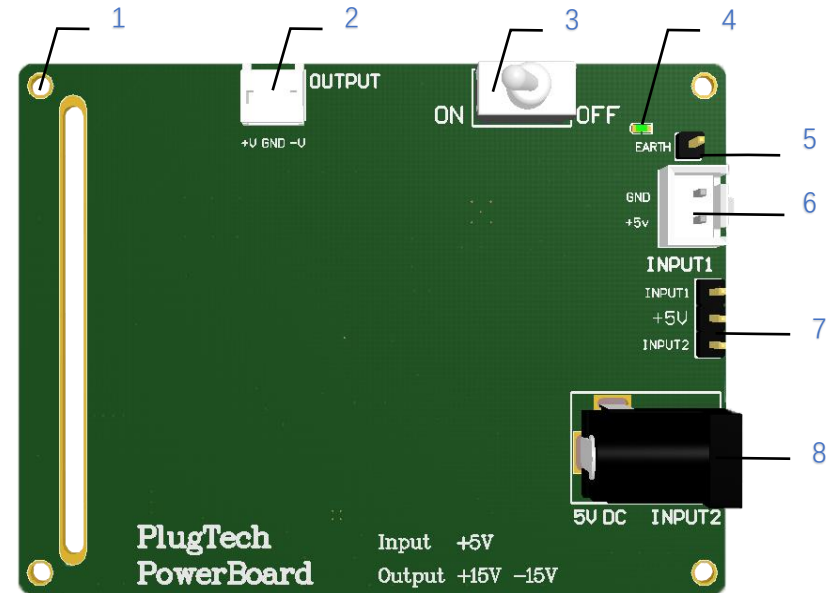
2. Operation manual

Step1：Choose Input Port（User should only choose one of the input port between INPUT1 and INPUT2）

a) **Choose INPUT1**
- Insert jumper between +5V pin and INPUT1 pin.
- Provide +5V voltage for INPUT1.

b) **Choose INPUT2**
- Insert jumper between +5V pin and INPUT2 pin.
- Connect the adapter's output to INPUT2.

Step2：Powerboard's output connection
- Connect powerboard's output to controller's supply connector.

Step3：turn on Powerboard
- Turn the switch to the "ON" direction. if the LED is lighted, that mean powerboard start to work.

Version	Content	Date
1.0.0	First Release	2020/11/19
1.0.1	System Setup Instruction correction	2020/12/23
1.0.2	Add powerboard's operation Instruction	2021/1/12