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Ocean Optics Inc.
First in Photonics™

A HALMA GROUP COMPANY

Breakout Box

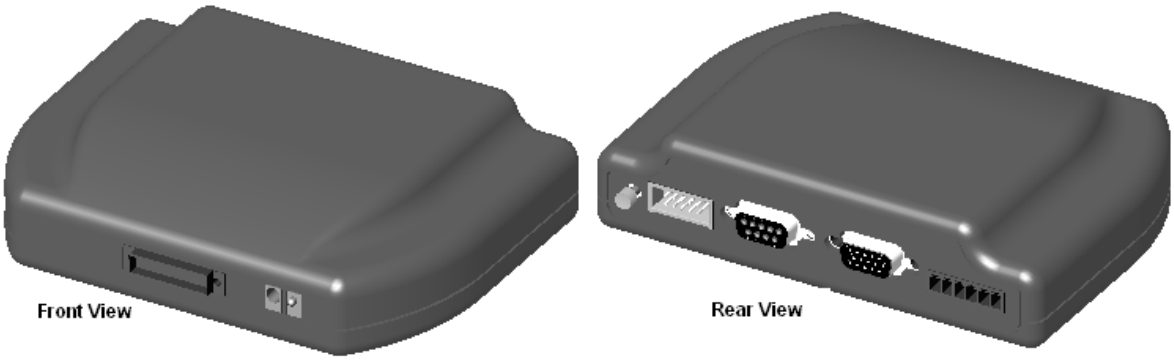
Installation and Operation Instructions

Description

The Ocean Optics Breakout Box (HR4-BREAKOUT) is a passive module that separates the signals from their 30-pin port to an array of standard connectors and headers, enabling easy access to a variety of features found in Ocean Optics' HR2000+, HR4000, and QE65000 Spectrometers. In addition to the accessory connector, the breakout box features a circuit board based on a neutral breadboard pattern that allows custom circuitry to be prototyped on the board itself.

The Breakout Box allows multiple interfaces to the spectrometer, such as the following:

- DB-15 light sources
- RS-232 interface
- GPIO
- External triggering
- Analog Input/Output



Note

The Breakout Box is compatible with HR4000 Spectrometers with Revision B or greater. HR4000 Spectrometers with serial numbers beginning with HR4**A** are *not* compatible with the HR4000 Breakout Box.

Parts Included

The Ocean Optics HR4000 Breakout Box ships with the following items:

- Breakout Box (HR4-BREAKOUT)
- Breakout Box Accessory Cable (HR4000-CBL-BB) - A 1-foot, 30-pin ribbon cable that connects the spectrometer to the breakout box.

Connecting the Breakout Box

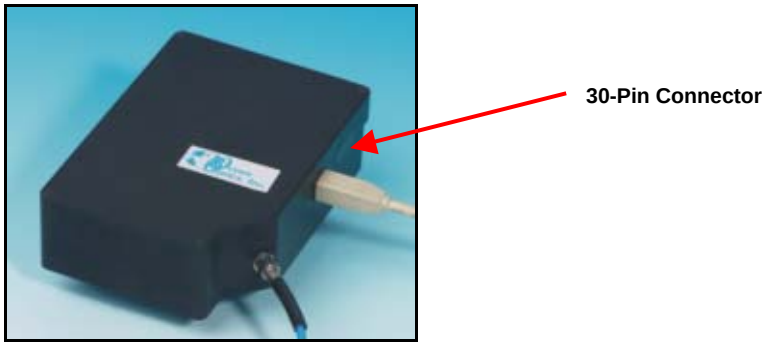
► *Procedure*

Follow the steps below to connect the breakout box to the spectrometer:

1. Connect the accessory cable to the 30-pin connector on the front of the breakout box. The HR4000-CBL-BB cable is polarized so that only fits in the breakout box and spectrometer connectors one way.

Breakout Box (Front View)

2. Connect the other end of the cable to the spectrometer.



Spectrometer Connection

3. Connect the desired device to the appropriate pins on the Breakout Box's circuit board (see *Circuit Board Connectors Pinout Information*).

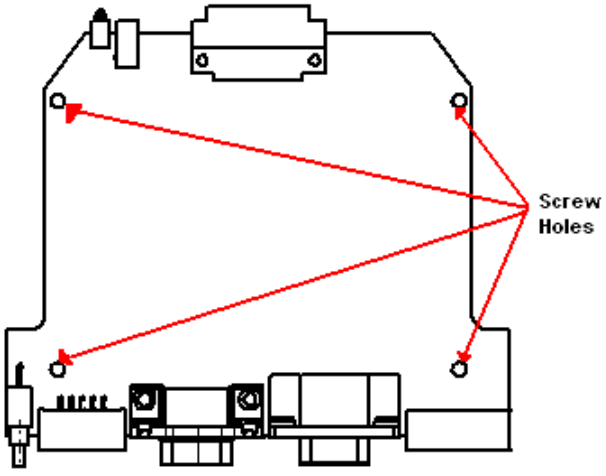
Supplying Power to the Breakout Box

The Breakout Box can be powered by

- The spectrometer via its USB port, or
- A separate 5V power supply (ADC-USB-SER). This power supply and serial cable must be purchased separately. If you are wiring custom circuitry on the Breakout Box, you must use the 5V power supply.

Accessing the Connectors on the Circuit Board

To access the connectors on the circuit board inside the breakout box, remove the four screws on the bottom of the breakout box using a Phillips-head screwdriver.



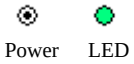
Breakout Box (Bottom View)

Breakout Box Specifications

30-Pin Connector Pinout Information

When facing the 30-pin connector on the front of the Breakout Box, pin numbering is as follows:

29	27	25	23	21	19	17	15	13	11	9	7	5	3	1
30	28	26	24	22	20	18	16	14	12	10	8	6	4	2



30-Pin Connector Pinout Diagram

Table 1: 30-Pin Connector Pinout Information

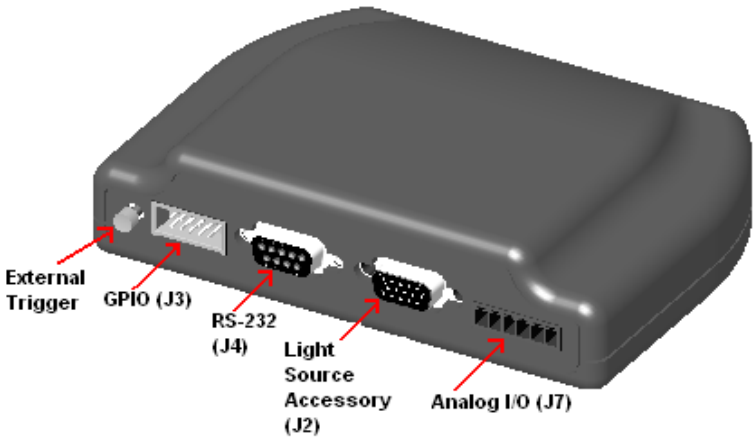
Pin #	Function	Input/Output	Description
1	RS232 Rx	Input	RS232 receive signal – Communicates with a PC over DB9 Pin 3
2	RS232 Tx	Output	RS232 transmit signal – Communicates with a PC over DB9 Pin 2
3	GPIO (2)	Input/Output	General purpose software-programmable, digital input/output (channel number)
4	V5_SW	Output	Regulated 5 Volt power pin – Supplies 50 mA (maximum)
5	Ground	Input/Output	Ground
6	I^2C SCL	Input/Output	I^2C clock signal for communication to other I^2C peripherals
7	GPIO (0)	Input/Output	General purpose software-programmable, digital input/output (channel number)
8	I^2C SDA	Input/Output	I^2C data signal for communication to other I^2C peripherals
9	GPIO (1)	Input/Output	General purpose software-programmable, digital input/output (channel number)
10	Ext. Trigger In	Input	TTL input trigger signal – See *External Triggering Options* document for more information
11	GPIO (3)	Input/Output	General purpose software-programmable, digital input/output (channel number)
12	V_{USB}	Input or Output	Input power pin for spectrometer – When operating via USB, this pin can power other peripherals – Ensure that peripherals comply with USB specifications
13	SPI Data Out	Output	SPI Master Out Slave In (MOSI) signal for communication to other SPI peripherals
14	V_{USB}	Input or Output	Input power pin for spectrometer – When operating via USB, this pin can power other peripherals – Ensure that peripherals comply with USB specifications

Table 1: 30-Pin Connector Pinout Information (Continued)

Pin #	Function	Input/Output	Description
15	SPI Data In	Input	SPI Master In Slave Out (MISO) signal for communication to other SPI peripherals
16	GPIO (4)	Input /Output	General purpose software-programmable, digital input/output (channel number)
17	Single Strobe	Output	TTL output pulse used as a strobe signal – Has a programmable delay relative to the beginning of the spectrometer integration period
18	GPIO (5)	Input/Output	General purpose software-programmable, digital input/output (channel number)
19	SPI Clock	Output	SPI clock signal for communication to other SPI peripherals
20	Continuous Strobe	Output	TTL output signal used to pulse a strobe – Divided down from the master clock signal
21	SPI Chip Select	Output	SPI Chip/Device Select signal for communication to other SPI peripherals
22	GPIO (6)	Input/Output	General purpose software-programmable, digital input/output (channel number)
23	Analog In (0–5V)	Input	13-bit low power, analog-to-digital input with a 0–5V range
24	Analog Out (0–5V)	Output	9-bit programmable output voltage with a 0–5V range
25	Lamp Enable	Output	TTL signal driven Active HIGH when the Lamp Enable command is sent to the spectrometer
26	GPIO (7)	Input/Output	General purpose software-programmable, digital input/output (channel number)
27	Ground	Input/Output	Ground
28	GPIO (8)	Input/Output	General purpose software-programmable, digital input/output (channel number)
29	Ground	Input/Output	Ground
30	GPIO (9)	Input/Output	General purpose software-programmable, digital input/output (channel number)

Circuit Board Connectors Pinout Information

The following tables list pinout information for the J2, J3, J4, J5, J6, and J7 connectors on the breakout box circuit board.



J2 Connector Pinouts

Use the J2 connector for light source accessory connection.

Pin #	Description	Pin #	Description
J2-1	Single_strobe	J2-9	GPIO-9
J2-2	ContStrobe	J2-10	GND_SIGNAL
J2-3	V5_SW	J2-11	SDA
J2-4	ExtTrigIn	J2-12	SCL
J2-5	ExtTrigIn	J2-13	LampEnable
J2-6	GPIO-8	J2-14	A_IN
J2-7	A_OUT	J2-15	GPIO-7
J2-8	ExtTrigIn		

J3 Connector Pinouts

Use the J3 connector for GPIO connection.

Pin #	Description	Pin #	Description
J3-1	GPIO-0	J3-6	GPIO-5
J3-2	GPIO-1	J3-7	GPIO-6
J3-3	GPIO-2	J3-8	GPIO-7
J3-4	GPIO-3	J3-9	GPIO-8
J3-5	GPIO-4	J3-10	GPIO-9

J4 Connector Pinouts

Use the J4 connector for RS-232 connection.

Pin #	Description	Pin #	Description
J4-1	No Connection	J4-6	No Connection
J4-2	Tx	J4-7	No Connection
J4-3	Rx	J4-8	No Connection
J4-4	No Connection	J4-9	No Connection
J4-5	GND_SIGNAL		

J5 Connector Pinouts

Use the J5 connector for internal breakout for custom circuitry.

Pin #	Description	Pin #	Description
J5-1	Tx	J5-9	VUSB
J5-2	Rx	J5-10	GND_SIGNAL
J5-3	SCL	J5-11	A_OUT
J5-4	SDA	J5-12	A_IN
J5-5	MOSI	J5-13	No Connection
J5-6	MISO	J5-14	No Connection
J5-7	SPI_CLK	J5-15	No Connection
J5-8	SPICS_OUT	J5-16	No Connection

J6 Connector Pinouts

Use the J6 connector for internal breakout for custom circuitry.

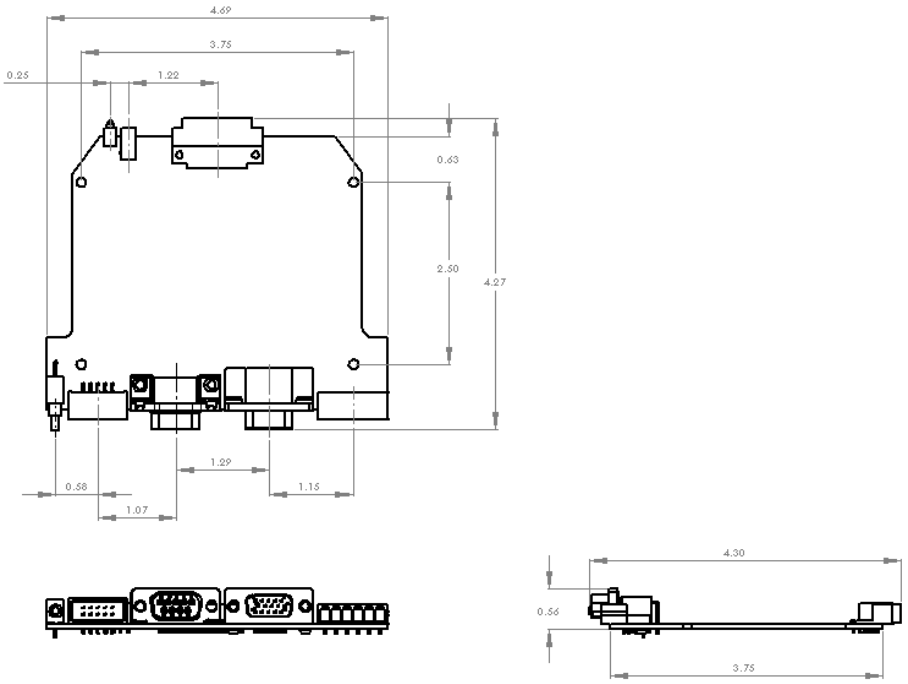
Pin #	Description	Pin #	Description
J6-1	GPIO-0	J6-9	GPIO-8
J6-2	GPIO-1	J6-10	GPIO-9
J6-3	GPIO-2	J6-11	VUSB
J6-4	GPIO-3	J6-12	GND_SIGNAL
J6-5	GPIO-4	J6-13	Single_strobe
J6-6	GPIO-5	J6-14	ContStrobe
J6-7	GPIO-6	J6-15	LampEnable
J6-8	GPIO-7	J6-16	ExtTrigIn

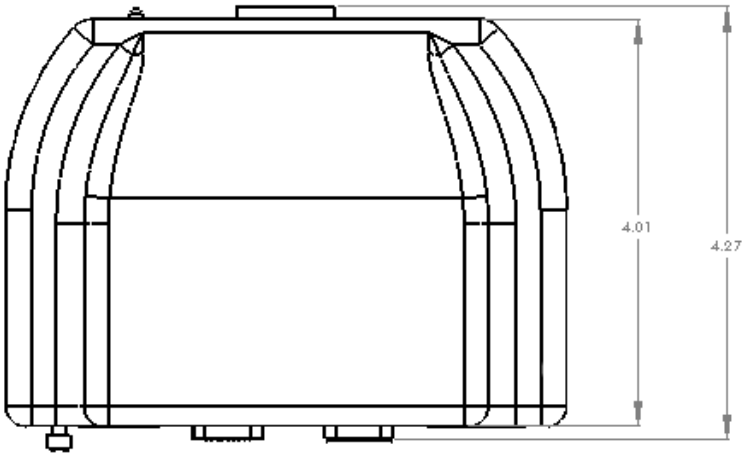
J7 Connector Pinouts

Use the J7 connector for analog input/output connection.

Pin #	Description
J7-1	VUSB
J7-2	ExtTrigIn
J7-3	GND_SIGNAL
J7-4	A_OUT
J7-5	GND_SIGNAL
J7-6	A_IN

Mechanical Diagrams

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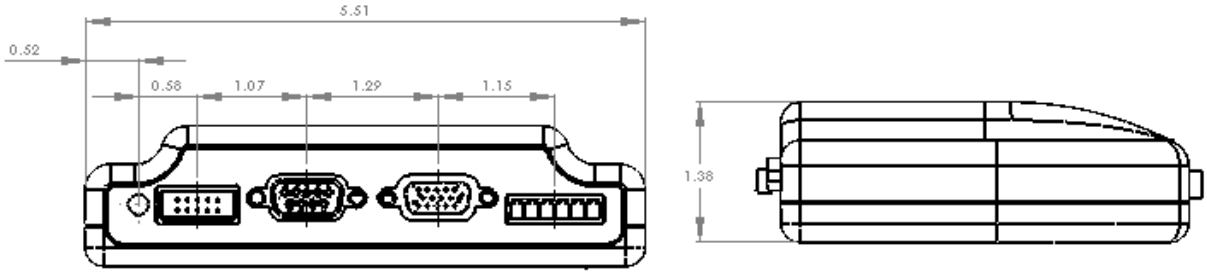
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