



# OCEAN SR2

Scientific-Grade Spectrometer

Installation and Operation Manual



For Product: Ocean SR2

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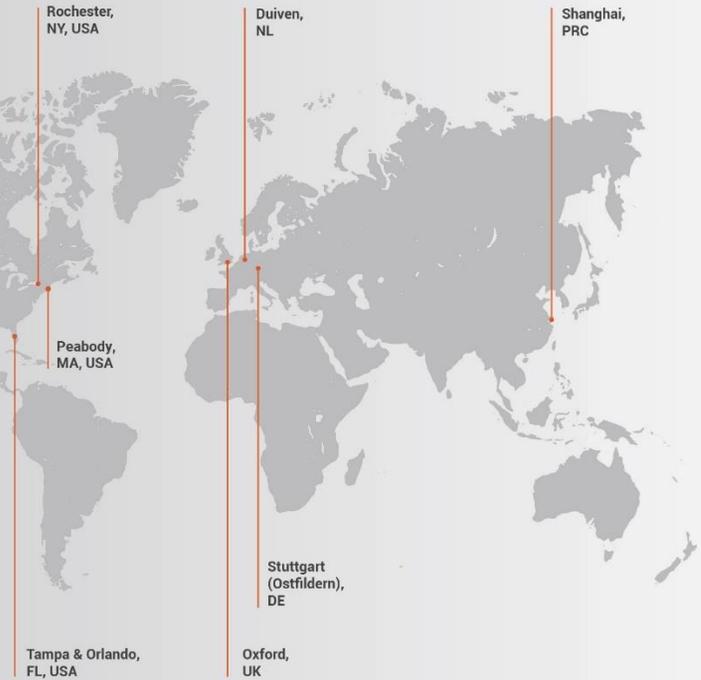
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# Before You Get Started

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## Warnings & Cautions

**Caution:** Do not let contaminants get into the bench. Keep the protective cap on the slit aperture when not connected to an accessory, probe or fiber.

**Caution:** Only change the slit aperture in a clean environment where contaminants including dust cannot enter the bench during the procedure.

**Caution:** Substitution of a component or accessory different from that supplied may result in measurement error, equipment damage, increased radio-frequency emissions or decreased immunity from electrical disturbances.

**Caution:** Repairs should be undertaken only by personnel trained or authorized by Ocean Insight. The device does not contain any user serviceable parts.

**Caution:** Do not immerse the device in any fluid, place fluids on top of or attempt to clean with liquid detergents or cleaning agents. This may cause an electrical hazard. Do not use if accidental wetting occurs.

**Caution:** Do not remove any covers. Doing so may increase the risk of electrical shock or compromise the integrity of the optical components.

**Caution:** Do not gas sterilize or autoclave this device.

**Caution:** Consult local codes and ordinances for proper disposal of equipment and other consumable goods.

**Caution:** The device and/or accessories may not operate correctly if used or stored outside the relevant temperature and humidity ranges described in the Technical Specifications.

**Caution:** Do not use if device is dropped and/or damaged. Have an authorized service representative check the device before using again.

**Caution:** Be sure to install any software BEFORE connecting the spectrometer to your PC or host system. The software installs the drivers required for spectrometer installation. If you do not install the software first, the system may not properly recognize the spectrometer.

**Caution:** The user of this spectrometer shall have the sole responsibility for any malfunction that results from improper use, faulty maintenance, improper repair, damage or alteration by anyone other than Ocean Insight or their authorized service personnel.

## Warranty

For the most current warranty information, please visit [OceanInsight.com](http://OceanInsight.com).

## Certifications and Compliance



### Warning

This is an FCC Class A product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures.



### FCC Compliance

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which the user will be required to correct the interference at his own expense.



### Warning

The authority to operate this equipment is conditioned by the requirement that no modifications will be made to the equipment unless the changes or modifications are expressly approved by the manufacturer.



### **WEEE Compliance**

The WEEE symbol on the product indicates that the product must not be disposed of with normal household waste. Instead, such marked waste equipment must be disposed of by arranging to return to a designated collection point for the recycling of waste electrical and electronic equipment. Separating and recycling this waste equipment at the time of disposal will help to conserve natural resources and ensure that the equipment is recycled in a manner that protects human health and the environment.



This device has been tested and complies with the following standards:

Electromagnetic Compatibility Directive – 2004/30/EU

EN 61326-1:2013

EN 55011:2009 w/A1:2010

### **RoHS Compliant**

This device complies with RoHS materials standards.

### **ISO Certification**

Ocean Insight, the applied spectral knowledge company, has been certified for ISO 9001:2015 certification applicable to the design and manufacture of electro-optical equipment.

# Introduction

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## Product Description

Ocean SR2 spectrometers are built using industry leading manufacturing techniques that help deliver high thermal stability and low unit-to-unit variation without compromising the flexibility and configurability that are the hallmark of the design. Features such as interchangeable slits, indicator LEDs and simple device connectors deliver more freedom and flexibility.

## Features

- Plug-and-play capability via the USB-C connection.
- User-interchangeable slit.
- LEDs show data transfer status.
- Compact and lightweight.
- 4 GPIO pins and the ability to provide power to external devices through the Ocean Insight standard 16 pin connector.
- OceanDirect Software Included

## Items Included with Shipment

- Ocean SR2 Spectrometer
- USB-C Cable
- Wavelength Calibration Data Sheet
- Linearity Calibration Data Sheet (please save Calibration sheets for future reference)

# Installation and Setup

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## NOTE

Be sure to install the spectroscopy application BEFORE connecting the spectrometer to your PC. The software installs the drivers required for spectrometer installation. If you do not install the software first, the system will not properly recognize the spectrometer. If you have already installed the OCEAN SR2 to a computer running on a Windows platform prior to installing the operating software, consult the Troubleshooting section for information on correcting a corrupt OCEAN SR2 installation.

## Software Installation

Use OceanView version 2.0.10 and above for Ocean SR2. You can use OceanView on the following operating systems:

## NOTE

Be sure that you download the correct software package for your computer version (32 or 64-bit). See the Frequently Asked Questions in Troubleshooting for more information on determining your computer version.

Windows			Mac
8	8.1	10	OS X Version 10.5 or later on Intel processor

\*Software may run with previous operating systems but Ocean Insight does not actively support these installations.

Consult the OceanView manual for computer hardware requirements.

## Configuring the Ocean SR2

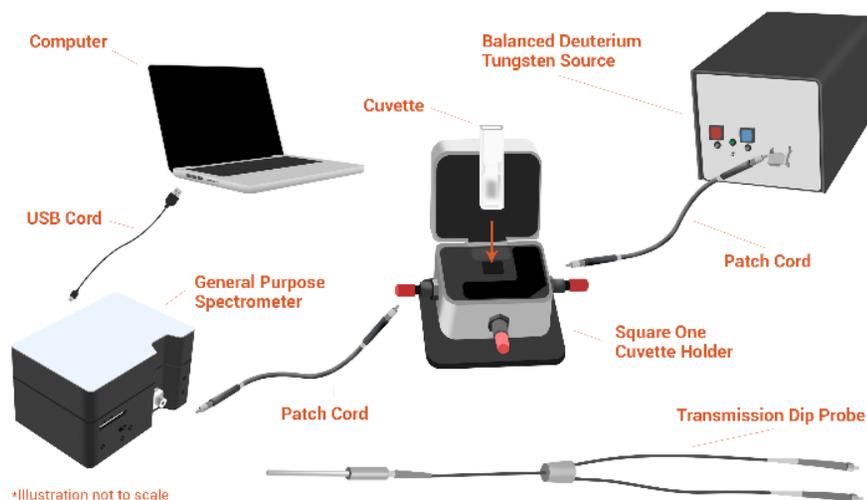
The Ocean SR2 can be used with OceanView software when connected to the USB port. If you have followed the previous steps and started your spectroscopy application, the spectrometer is already acquiring data. Even with no light in the spectrometer, there should be a dynamic trace displayed in the bottom of the graph. If you allow light into the spectrometer, the graph trace should rise with increasing light intensity. This means the software and hardware are correctly installed.

## Hardware Setup

The Ocean SR2 Spectrometer connects to a computer via the USB port. When connected through a USB 2.0 or 1.1 port, the spectrometer draws power from the host computer, eliminating the need for an external power supply.

Follow the steps below to connect the OCEAN SR2 to a computer via the USB port:

1. Install the spectrometer operating software on the destination computer.
2. Locate the USB cable (USB-Cable) provided with the Ocean SR2.
3. Insert the micro connector end of the cable into the side of the Ocean SR2 and the larger end of the cable into the USB port of the computer.
4. Connect any spectroscopy accessories. To find operating instructions for Ocean SR2-compatible products (such as light sources, sampling chambers, and probes), consult the Ocean Insight website at [OceanInsight.com](http://OceanInsight.com).
5. Attach the fiber to the fiber optic connector on the spectrometer.



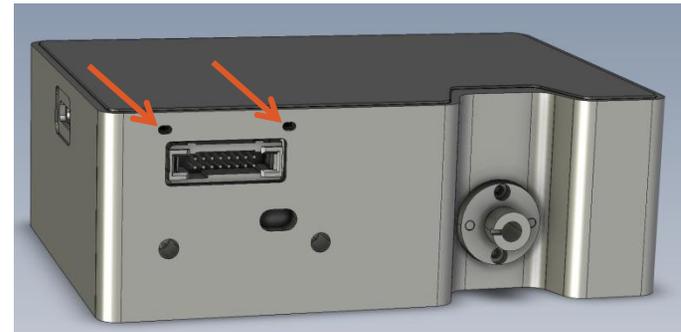
If you installed the spectrometer operating software prior to connecting the Ocean SR2, the software automatically installs the correct drivers. If the drivers do not successfully install (or if you connected the Ocean SR2 to the computer before installing the software), consult [Troubleshooting](#).

## Hardware Features

### Status Indicator LEDs

The Ocean SR2 features two indicator lights that operate as shown:

LED	Steady	Flashing
Red	Unit is on	N/A
Green	N/A	Unit is transmitting data

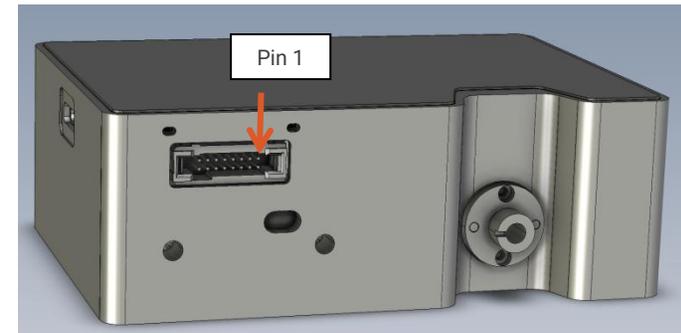
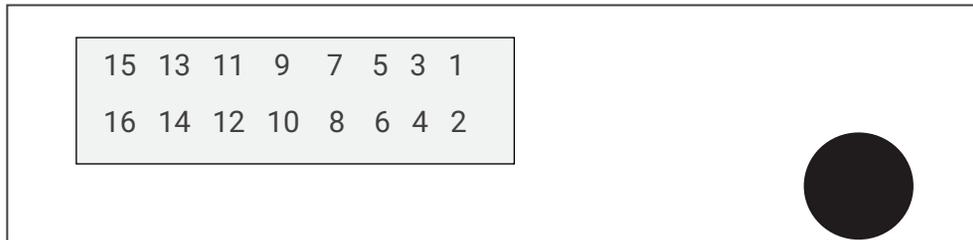


### NOTE

LEDs can be turned off in OceanView or by using a software API command in OmniDriver or OceanDirect.

## 16 Pin IO Connector

This port allows the Ocean SR2 to be connected to Ocean Insight light sources and other external equipment.



PIN	Function	Description	PIN	Function	Description
1	Reserved		9	GPIO.0	General purpose I/O
2	Reserved		10	GPIO.1	General purpose I/O
3	GND	Ground	11	GPIO.2	General purpose I/O
4	RSTn	External reset input	12	GPIO.3	General purpose I/O
5	LampEnable	Output	13	Reserved	
6	ExtTrigIn	External trigger input	14	Reserved	
7	SingleStrobe	Single strobe output	15	+5VDC	External power supply input
8	ContStrobe	Continuous strobe output	16	GND	Ground

Pins 4 – 12, on the auxiliary connector are 3.3V CMOS compatible inputs and outputs, with +/- 1mA drive capability

## External Reset Input Pin

The Ocean SR2 can reset itself via an external reset pin. Applying a logic low input to the RSTn pin places the SR2 into a hardware reset condition and will remain in reset until the input is brought high again. Note that this is a full hardware reset, all operating parameters are also reset to defaults that can be restored by re-initializing via software commands.

## 16 Pin Connector Cable (CBL-ISDF-DB15)

This cable connects to the following external light sources:

DH-3P

DH-2000 (US)

HPX-(US)

HL-2000-FSHA

HL-3P

## *16 Pin Connector Cable (CBL-ISDF-PX-DB15)*

PX-2

# Troubleshooting

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Sometimes things do not go according to plan. When issues arise, do not hesitate to contact us and our Tech Support team will leap into action. Some typical questions are answered here. For more information, consult the FAQs on the Ocean Insight website.

## Ocean SR2 Connected to Computer Prior to Application Installation

### Windows Operating Systems

If you connected your Ocean SR2 device to the computer prior to installing your spectroscopy application (OceanView) on a Windows platform, you may encounter installation issues that you must correct before your Ocean Insight device will operate properly.

Follow the applicable steps below to remove the incorrectly installed device, device driver, and installation files.

#### NOTE

If these procedures do not correct your device driver problem, you must obtain the Correcting Device Driver Issues document from the Ocean Insight website: [OceanInsight.com](http://OceanInsight.com)

#### Remove the Unknown Device from Windows Device Manager

1. Open Windows Device Manager. Consult the Windows operating instructions for your computer for directions, if needed.
2. Locate the **Other Devices** option and expand the **Other Devices** selection by clicking on the "+" sign to the immediate left.

#### NOTE

Improperly installed USB devices can also appear under the Universal Serial Bus Controller option. Be sure to check this location if you cannot locate the unknown device.

3. Locate the unknown device (marked with a large question mark). Right-click on the **Unknown Device** listing and select the **Uninstall** or **Remove** option.
4. Click the **OK** button to continue. A warning box appears confirming the removal of the Unknown Device. Click the **OK** button to confirm the device removal.
5. Disconnect the Ocean SR2 from your computer.
6. Replug the spectrometer into your computer.

The system should now be able to locate and install the correct drivers for the USB device.

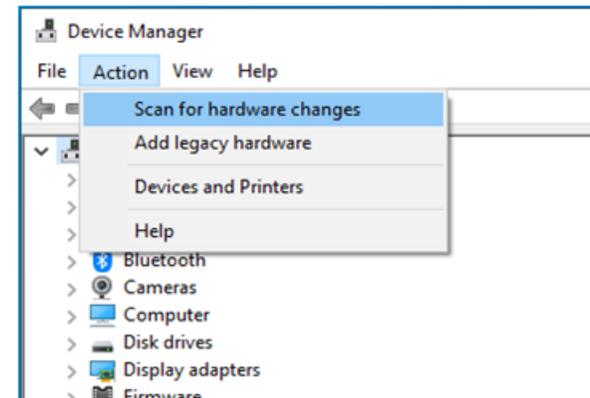
## Apple Mac OSX Operating Systems

Since there are no device files for the Ocean SR2 Spectrometer in a Mac operating system, you should not encounter any problems if you installed the spectrometer before the operating software.

## Frequently Asked Questions

### I connected the USB cable and started OceanView but I don't see my spectrometer attached.

Use the "Action -> Scan for hardware changes" selection in the Device Manager to rescan for attached devices.



### I am having trouble installing the drivers, what should I do?

Hardware device driver installation is usually seamless on Microsoft Windows operating systems and should happen in the background when you connect your spectrometer to a computer with the software installed. However, some Windows systems require a bit more care when connecting your spectrometer for the first time.

If your spectrometer is not recognized by OceanView on your computer, you need to manually install the spectrometer drivers. See your OceanView manual for this procedure. Also consult the *Correcting Device Driver Issues* document on [www.OceanInsight.com](http://www.OceanInsight.com)

## **How do I know my spectrometer has power?**

The red LED on the spectrometer should be constantly on if the unit is receiving power.

## **How do I know my spectrometer is transmitting data?**

The green LED on the spectrometer flashes when transmitting data.

## **I'm installing OceanView but I need a product key; where can I find this?**

The product key was sent to the contact e-mail on the sales order when you purchased your OceanView license. Contact [info@OceanInsight.com](mailto:info@OceanInsight.com) for more information. You'll need your sales order number, quotation number, the serial number of the spectrometer that was purchased with the software, and, if known, the e-mail address under which your product key was created to recover your key.

## **I connected the Ocean SR2 to the computer before installing my spectroscopy operating software to install the drivers. What do I do now?**

As detailed below, the steps to take to resolve this issue differ, depending on your computer's operating system.

## **How do I check the configuration of my spectrometer?**

Check the label on the bottom of your spectrometer. You can also check your configuration using OceanView by opening the Schematic window and double-clicking the spectrometer icon.

## Repairs

Sometimes accidents happen! If you need to return your Ocean Insight Product for repair, here is what to do:

1. Contact us to evaluate and diagnose the problem. If it is determined that the product must be returned, the representative will issue an RMA number.
2. Package your product, ideally in the original packaging, and return it to Ocean Insight, along with the RMA number that you received.

### NOTE

For RMA returns under warranty we will organize and pay for shipping both ways. For accidental damage, you pay only to have the product shipped to your closest Ocean Insight or Distributor Office.

Upon careful examination, we'll advise you with an estimate. When your product is ready, it will be returned to you.

## Servicing

To keep your instrument in tip-top shape we recommend yearly wavelength recalibration. You can do this yourself if you have appropriate tools or we can do this for you. Contact your local representative to find out more about service availability and cost. We offer the following services:

- Wavelength Calibration
- Absolute Irradiance Calibrations

# Technical Specifications

Test conditions for the following data: 25° C

Specification	OCEAN SR2
<b>Optical and Spectroscopic</b>	
Integration Time	1 $\mu$ s – 1.5 s
Dynamic Range for single acquisition <sup>1</sup>	3400:1
Dynamic Range of system <sup>2</sup>	1.1 x 10 <sup>8</sup>
Signal-to-Noise (single acquisition)	380:1
Resolution (FWHM)	1.3 nm (25 $\mu$ m slit UV-VIS)
Scan rate (typ) <sup>3</sup>	480 Hz
Thermal Stability	0.06 nm/°C
Triggering	Software, External rising edge, External level
Wavelength Range	190 - 920 nm (UV-VIS)
Grating	Configurable
Entrance Slit	5, 10, 25, 50, 100, 200 $\mu$ m
<b>Detector</b>	
Active Pixels	2098
Corrected Linearity	>99.8%(10-90% saturation) (1 $\mu$ s - 1.5 s)
<b>Electrical</b>	

Specification	OCEAN SR2
Power-up Time	3s
Connectors	USB Type-C, SMA, 16 pin Samtec TFM
USB Type-C Ratings: V <sub>CC</sub>	Minimum 4.40V, Nominal 5V, Maximum 5.25V
IO Standard	3.3V CMOS
Absolute Maximum Ratings: Voltage on any pin (other than input power)	5V
Interface	USB 2.0 High Speed
External Triggering Jitter	10 ns
<b>Mechanical</b>	
Input Fiber Connector	SMA 905
Physical Dimensions	88.9 mm x 63.5 mm x 31.9 mm
Weight	275g
<b>Environmental</b>	
Temperature: Storage Operation	-30 to 70°C 0 to 55°C
Humidity	0-85% non-condensing
<sup>1</sup> Dynamic range for a single acquisition is a measure of the ratio of full signal to noise.	
<sup>2</sup> Dynamic range of the system is the range of the detectable light level and can be thought of as the maximum detectable light level at the minimum integration time divided by the minimum detectable light level at the maximum integration time.	
<sup>3</sup> Scan rate is dependent on factors external to the spectrometer. This figure was obtained using OmniDriver and OceanDirect APIs.	

## Timing Signals

### Single Strobe Output

Synchronization of external devices to the spectrometer's integration period can be accomplished with the Single Strobe Output. The Single Strobe Output is an active-high programmable pulse that occurs at a user-defined time during each acquisition cycle. This pulse has a user-defined delay ( $t_{SSDLY}$ ) and a user-defined width ( $t_{SSH}$ ). Both values are programmable in 1  $\mu$ s increments for the range of 0 to 65,535  $\mu$ s.

The timing of the Single Strobe signal output is referenced from a Trigger Event. The Single Strobe Delay defines the time from the Trigger Event until the rising edge of the Single Strobe output. Note that a programmed Acquisition Delay can cause the Single Strobe to pulse before the start of integration. After the Single Strobe Delay has elapsed and the Single Strobe Output has gone high, it will remain active for a duration equal to the Single Strobe Width. The Single Strobe Output will return to a low or inactive state at the end of the Single Strobe Width.

If the Single Strobe Output is programmed for a longer period than the integration time, it will reset to its inactive state at the end of the integration period.

See timing diagrams later in this section for more information of the Single Strobe Timing.

### Synchronous Continuous Strobe

The Continuous Strobe output signal is a programmable TTL pulse that occurs at a user-defined time during each acquisition cycle. The Continuous Strobe is a series of pulses defined by a user-defined period with a 50% duty cycle. The Continuous Strobe Period ( $t_{CSPER}$ ) has a resolution of 1  $\mu$ s. The polarity is also selectable so that the Continuous Strobe signal period starts with either a 0 or 1.

The Continuous Strobe signal is only valid during the integration period ( $t_{INTEG}$ ). The Continuous Strobe period has a resolution of 1  $\mu$ s for a range of 0 to 65,535  $\mu$ s. However, the Continuous Strobe signal is only exercised if it can complete a full period within the integration period. If there are multiple Continuous Strobe periods within an integration period, only full periods are realized. This means the time between the last Continuous Strobe period and the end of integration time is between 0 and  $t_{CSPER}$ .

For the continuous Strobe signal to be fully realized for at least one period, the integration time must be greater than or equal to the Continuous Strobe Period. See timing diagrams for more information of the Continuous Strobe Timing.

## Triggering

A trigger or trigger event is an action that causes the Spectrometer to start an acquisition cycle. An acquisition cycle can be broken up into 3 sections. The first is comprised of a delay, followed by an Integration period, and then lastly a busy time. A trigger event can be a command from OceanView software, or a signal located on the auxiliary access connector.

There are several triggering modes for the spectrometer, and they have specific timing requirements. In addition, the single and continuous strobe signal outputs are directly related to the triggering modes and their function. This document will describe and define the overall function of the trigger modes and strobe signals.

### Triggering Modes

The Ocean SR2 supports three triggering modes, which are set with the Trigger Mode command. Detailed information of each triggering mode follows. Also, refer to the External Triggering Options document located on our website at [OceanInsight.com](http://OceanInsight.com).

The 3 trigger modes are:

**Software Triggering:** A trigger is initiated internal to the Spectrometer with a command from Ocean Insight approved software. The integration period is set by software configuration.

**External Edge Triggering:** A trigger is initiated by the rising edge of the external trigger signal on the auxiliary connector. The integration period is set by software configuration.

**External Level Triggering:** A trigger is initiated by the rising edge of the external trigger signal on the auxiliary connector. The integration time is determined by how long the trigger pulse is held high.

#### Software Trigger

The default triggering mode is for a Software Trigger. A Software Trigger may be initiated by either OceanView, OmniDriver, or OceanDirect software. Once a command is sent to the Spectrometer, an internal trigger is generated that begins an integration cycle. A software trigger will initiate a single acquisition cycle with the spectral data made available after the integration period and a specific busy time.

If a start time of  $T_0$  is defined as the moment a software command is entered into OceanView software requesting an acquisition, then there is a latency time of  $t_{PROC}$ , which is the Software Command Processing time from  $T_0$  to when the integration cycle starts. This latency varies from computer system to computer system.

The integration delay,  $t_{\text{INTDLY}}$ , starts after  $t_{\text{PROC}}$  and ends before the start of integration time,  $t_{\text{INTEG}}$ . The integration delay is the sum of the user defined acquisition delay,  $t_{\text{ACQDLY}}$  (entered in OceanView software) and  $t_{\text{BUSY1}}$ .

The integration period,  $t_{\text{INTEG}}$ , is user defined but has a minimum value of 1  $\mu\text{s}$ .

Following the integration period, the detector is busy to finish the acquisition cycle and that time is  $t_{\text{BUSY2}}$ . After this time, the detector is ready for another trigger.

The equation for the integration delay can be written as

$$t_{\text{INTDLY}} = t_{\text{ACQDLY}} + t_{\text{BUSY1}}$$

where the spectrometer busy time 1 ( $t_{\text{BUSY1}}$ ) is:

$$t_{\text{BUSY1}} = (219 \mu\text{s} - t_{\text{INTEG}}) \quad \text{when } t_{\text{INTEG}} < t_{\text{BUSY2}}$$

and

$$t_{\text{BUSY1}} = 1 \mu\text{s} \quad \text{when } t_{\text{INTEG}} \geq t_{\text{BUSY2}}, \text{ where } t_{\text{BUSY2}} = 218 \mu\text{s}.$$

It should be noted that the maximum value of  $t_{\text{BUSY1}}$  is 218  $\mu\text{s}$ , which is important for the Level Trigger mode.

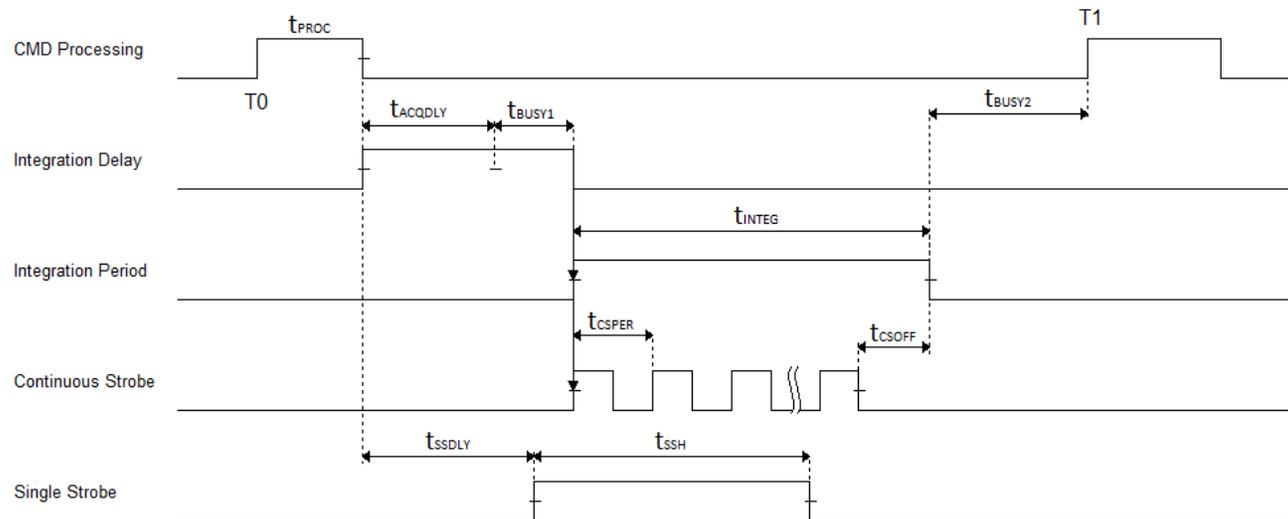
The single strobe is a single active-high pulse defined by an initial delay ( $t_{\text{SSDLY}}$ ) from the start of the acquisition delay ( $t_{\text{ACQDLY}}$ ) and a pulse width ( $t_{\text{SSH}}$ ). The values for the single strobe delay and pulse high width are set by the user in OceanView or OceanDirect software.

The continuous strobe signal is a series of pulses with a user specified period that starts with the beginning of the integration time,  $t_{\text{INTEG}}$ . The pulses have a 50% duty cycle and only full periods are exercised during an integration period. If a subsequent continuous strobe period cannot be completed before the end of the integration cycle, the continuous strobe signal is turned off and set to 0.

Software Trigger timing parameters for the Single Spectra Capture mode are described below. The timing resolution for the spectrometer is 1  $\mu\text{s}$ . This means values entered in Ocean View for "User Specified" values are integer multiples of 1  $\mu\text{s}$ .

Symbol	Description	Time			Notes
		min	typ	max	
T0	Software Trigger Command				Start of Acquisition Cycle
t <sub>PROC</sub>	Trigger Command Processing				System dependent (e.g., computer hardware, software, driver)
t <sub>ACQDLY</sub>	Acquisition Delay	0 μs	--	21.47 s	User specified, 1 μs resolution
t <sub>BUSY1</sub>	Busy	1 μs	--	218 μs	1 μs for t <sub>INTEG</sub> ≥ t <sub>BUSY2</sub> (219 - t <sub>INTEG</sub> ) μs for t <sub>INTEG</sub> < t <sub>BUSY2</sub>
t <sub>INTEG</sub>	Integration Period	1 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>BUSY2</sub>	Busy	--	--	--	Constant at 218 μs
t <sub>SSDLY</sub>	Single Strobe Delay	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>SSH</sub>	Single Strobe High Time	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>CSPER</sub>	Continuous Strobe Period	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>CSOFF</sub>	Continuous Strobe Off Time	0 μs	--	t <sub>CSPER</sub>	

The following timing diagram represents the acquisition process for a Software Trigger event.



## External Edge Trigger

The External Edge Trigger mode for the spectrometer looks for a trigger signal on the 16-pin connector. The trigger signal must have a minimum high time of 10 ns. Once the external pulse rising edge is detected, there is a short delay,  $t_{ETRGDLY}$ , before the acquisition cycle begins.

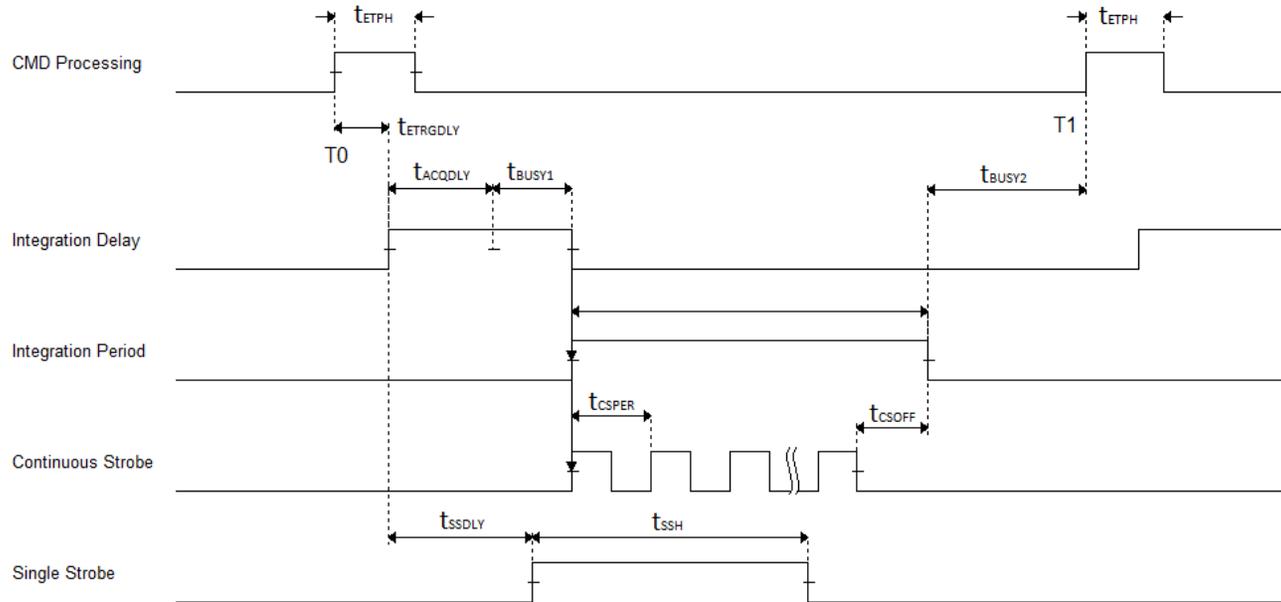
For the case of an External Edge Trigger,  $T_0$  can be defined as the moment the external trigger signal goes from low to high. After the External Edge Trigger Delay,  $t_{ETRGDLY}$ , there is the integration delay, followed by the integration period, and finally the busy period,  $t_{BUSY2}$ , during which time another trigger cannot be accepted.

The equations for the integration delay are the same as those for Software Triggering Mode.

External Edge Trigger timing parameters are described below.

Symbol	Description	Time			Notes
		min	typ	max	
T0	External Edge Trigger				Start of Acquisition Cycle
t <sub>ETPH</sub>	External Edge Trigger Pulse Width	10 ns			
t <sub>ETRGDLY</sub>	External Edge Trigger Delay		30 ns		
t <sub>ACQDLY</sub>	Acquisition Delay	0 μs	--	21.47 μs	User specified, 1 μs resolution
t <sub>BUSY1</sub>	Busy	1 μs	--	218 μs	1 μs for t <sub>INTEG</sub> ≥ t <sub>BUSY2</sub> (219 - t <sub>INTEG</sub> ) μs for t <sub>INTEG</sub> < t <sub>BUSY2</sub>
t <sub>INTEG</sub>	Integration Period	1 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>BUSY2</sub>	Busy	--	--	--	Constant at 218 μs
t <sub>SSDLY</sub>	Single Strobe Delay	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>SSH</sub>	Single Strobe High Time	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>CSPER</sub>	Continuous Strobe Period	0 μs	--	1.19 hours	User specified, 1 μs resolution
t <sub>CSOFF</sub>	Continuous Strobe Off Time	0 μs	--	t <sub>CSPER</sub>	

The following timing diagram represents the acquisition process for an External Edge Trigger event.



The single strobe function for the case of an edge trigger event is similar to that of a software trigger. The start of the single strobe pulse begins with the start of the integration delay.

Also, the continuous strobe signal function is the same as that of the software trigger and starts with the start of the integration cycle. Again, only full periods are exercised during integration time.

### External Level Trigger

The External Level Trigger mode for the spectrometer waits for a trigger signal on the 16-pin connector. However, in External Level Trigger mode, the integration time is directly related to the pulse width of the trigger pulse.

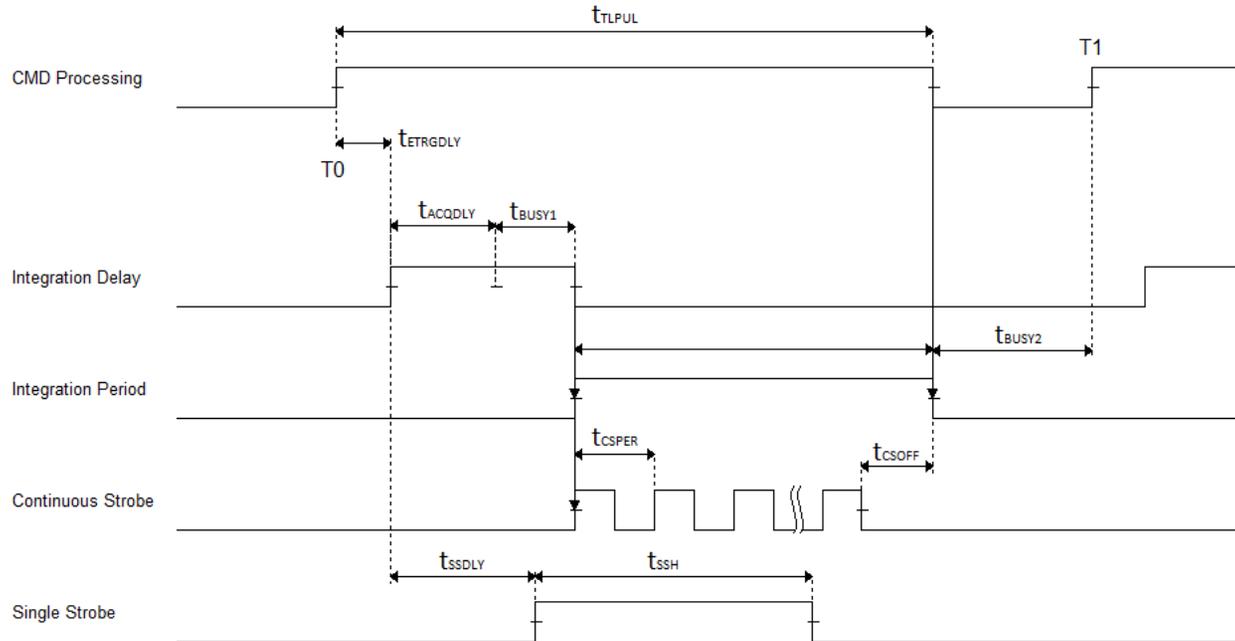
Since the trigger pulse width determines the integration time, the trigger signal must be high for a minimum time. Specifically, the minimum trigger pulse width must satisfy the following condition, otherwise an error will occur and the received spectral values will be all 0's.

$$t_{LPUL} \geq t_{ETRGDLY} + t_{ACQDLY} + \max(t_{BUSY1})$$

Since the integration is not predefined (user defined), the minimum integration time is no longer 1  $\mu$ s. The minimum integration effectively becomes the maximum busy time 1,  $t_{BUSY1}$ , which is 218  $\mu$ s. The user can still define an acquisition delay; however, the minimum integration remains fixed. External Level Trigger timing parameters are described below.

Symbol	Description	Time			Notes
		min	typ	max	
T0	External Level Trigger				Start of Acquisition Cycle
$t_{TLPUL}$	External Level Trigger Pulse Width	218.03 $\mu$ s	--	1.19 hours	30 ns + 218 $\mu$ s (Minimum, $t_{ACQDLY} = 0$ )
$t_{ETRGDLY}$	External Edge Trigger Delay	--	--	30 ns	
$t_{ACQDLY}$	Acquisition Delay	0 $\mu$ s	--	1.19 hours	User specified, 1 $\mu$ s resolution
$t_{BUSY1}$	Busy	--	--	1 $\mu$ s	Constant at 1 $\mu$ s
$t_{INTEG}$	Integration Period	218 $\mu$ s	--	1.19 hours	Integration period is equal to $t_{LPUL} - t_{ACQDLY} - 30$ ns.
$t_{BUSY2}$	Busy	--	--	--	Constant at 218 $\mu$ s
$t_{SSDLY}$	Single Strobe Delay	0 $\mu$ s	--	1.19 hours	User specified, 1 $\mu$ s resolution
$t_{SSH}$	Single Strobe High Time	0 $\mu$ s	--	1.19 hours	User specified, 1 $\mu$ s resolution
$t_{CSPER}$	Continuous Strobe Period	0 $\mu$ s	--	1.19 hours	User specified, 1 $\mu$ s resolution
$t_{CSOFF}$	Continuous Strobe Off Time	0 $\mu$ s	--	$t_{CSPER}$	

The following timing diagram represents the acquisition process for an External Level trigger event.

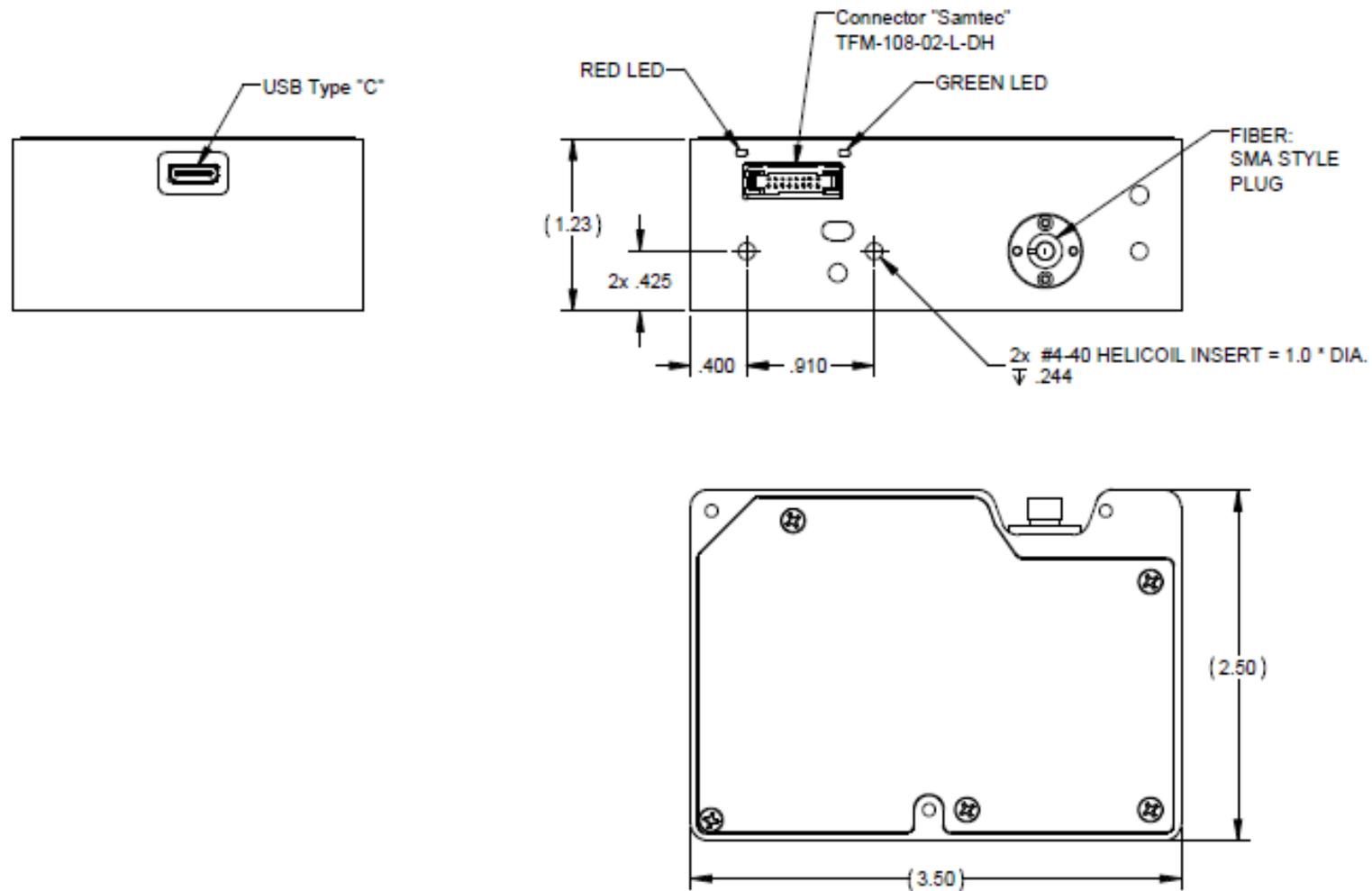


Again, the single strobe signal functions the same as the two previous trigger modes. However, the continuous strobe signal is slightly different. For this case, the continuous strobe signal starts at the same time as the single strobe, start of  $t_{INTDLY}$ , and is exercised for as long as the trigger level pulse is high or at least until the start of spectrometer busy time, or the start of  $t_{BUSY2}$ . The continuous strobe signal will be cut off at any time during a period, which means the final period is not necessarily a full period.

## Mechanical Dimensions

Note: Dimensions are in inches.

Mounting: Recommend use of two #4-40 holes located on the Samtec/Fiber input side for a mounted configuration.



# Calibration

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Each Ocean SR2 contains wavelength calibration coefficients, linearity coefficients, and a serial number unique to each spectrometer. The spectroscopy application reads these values directly from the spectrometer, enabling the ability to “hot-swap” spectrometers between computers without entering the spectrometer coefficients manually on each computer.

## Wavelength Calibration

Each spectrometer is calibrated before it leaves Ocean Insight, however the wavelength for all spectrometers will drift slightly as a function of time and environmental conditions.

For instructions on how to calibrate the OCEAN SR2, visit [OceanInsight.com](https://www.oceaninsight.com).

## Irradiance Calibrations

Irradiance calibrations and relative irradiance calibrations are about quantifying the spectra, by translating the signal (incident number of photons) to a calibration. This can be either absolute (an atomic emission light source of known output power) or relative (corrected for instrument response function but not absolute units). It can be considered a measurement technique and is used widely in remote sensing, light metrology and anywhere where you wish to characterize the incident light source. Irradiance calibrations are not required for many techniques because these measure the relative signal changes with respect to the sample and not the light source.

You can find out more about irradiance calibration techniques at [OceanInsight.com](https://www.oceaninsight.com).

OceanView has wizards that will step you through absolute irradiance and relative calibrations and more information on these is located in the OceanView.

# Unlock the Unknown

Ocean Insight exists to end guessing. We equip humanity with technology and data to make precisely informed decisions providing transformational clarity for human advancement in health, safety, and the environment.

## Questions?

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