

**SDrive-500  
Shutter Control Unit**

**Operation Manual  
Part number J810025 rev. A**



# SDrive-500 Shutter Control Unit



## Operation Manual

Rev. A

<http://www.HORIBA.com/scientific>



**HORIBA**  
Scientific

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October 2012

Part number J810025

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# 1: Overview

## About the SDrive-500 Shutter Control Unit

The SDrive-500 Shutter Control Unit is designed to control the activation of an electro-mechanical shutter during the interval when the CCD of a HORIBA Scientific detection system is exposed to light.

If your HORIBA Scientific purchase included a Sincerity™ CCD Detection

System, the detection system's electro-mechanical shutter is driven by the Sincerity™'s shutter control accessory, the SDrive-500. The SDrive-500 incorporates a state-of-the-art shutter driver, which relies on either of its two digital Trigger Inputs to control the overall exposure (i.e., pulse width) and frequency (i.e., repetition rate) applied to the detection system's shutter.

Features of the SDrive-500 include:

- A dual TTL control input architecture with flexibility in allowing a single SDrive-500 unit to control the system's shutter operation, when either one or two HORIBA Scientific detectors (i.e., CCD and IGA) are configured on an associated multi-exit-port spectrometer.
- A shutter-override function that allows you to manually override (continuously open) the shutter for detector-spectrometer focusing and alignment.
- RoHS and CE compliant



Figure 1. SDrive-500 Shutter Control Unit



**Note:** Keep this and the other reference manuals near the system.

# Disclaimer

By setting-up or starting to use any HORIBA Instruments Incorporated product, you are accepting the following terms:

You are responsible for understanding the information contained in this document. You should not rely on this information as absolute or all-encompassing; there may be local issues (in your environment) not addressed in this document that you may need to address, and there may be issues or procedures discussed that may not apply to your situation.

If you do not follow the instructions or procedures contained in this document, you are responsible for yourself and your actions and all resulting consequences. If you rely on the information contained in this document, you are responsible for:

- Adhering to safety procedures
- Following all precautions
- Referring to additional safety documentation, such as Material Safety Data Sheets (MSDS), when advised

As a condition of purchase, you agree to use safe operating procedures in the use of all products supplied by HORIBA Instruments Incorporated, including those specified in the MSDS provided with any chemicals and all warning and cautionary notices, and to use all safety devices and guards when operating equipment. You agree to indemnify and hold HORIBA Instruments Incorporated harmless from any liability or obligation arising from your use or misuse of any such products, including, without limitation, to persons injured directly or indirectly in connection with your use or operation of the products. The foregoing indemnification shall in no event be deemed to have expanded HORIBA Instruments Incorporated's liability for the products.

HORIBA Instruments Incorporated products are not intended for any general cosmetic, drug, food, or household application, but may be used for analytical measurements or research in these fields, or for forensic applications. A condition of HORIBA Instruments Incorporated's acceptance of a purchase order is that only qualified individuals, trained and familiar with procedures suitable for the products ordered, will handle them. Training and maintenance procedures may be purchased from HORIBA Scientific at an additional cost. HORIBA Instruments Incorporated cannot be held responsible for actions your employer or contractor may take without proper training.

Due to HORIBA Instruments Incorporated's efforts to continuously improve our products, all specifications, dimensions, internal workings, and operating procedures are subject to change without notice. All specifications and measurements are approximate, based on a standard configuration; results may vary with the application and environment. Any software manufactured by HORIBA Instruments Incorporated is also under constant development and subject to change without notice.

Any warranties and remedies with respect to our products are limited to those provided in writing as to a particular product. In no event shall HORIBA Instruments Incorporated be held liable for any special, incidental, indirect or consequential

damages of any kind, or any damages whatsoever resulting from loss of use, loss of data, or loss of profits, arising out of or in connection with our products or the use or possession thereof. HORIBA Instruments Incorporated is also in no event liable for damages on any theory of liability arising out of, or in connection with, the use or performance of our hardware or software, regardless of whether you have been advised of the possibility of damage.

# Safety summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of instrument. HORIBA Instruments Incorporated assumes no liability for the customer's failure to comply with these requirements. Certain symbols are used throughout the text for special conditions when operating the instruments:



A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or similar that, if incorrectly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met. HORIBA Instruments Incorporated is not responsible for damage arising out of improper use of the equipment.



A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or similar that, if incorrectly performed or adhered to, could result in damage to the product. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met. HORIBA Instruments Incorporated is not responsible for damage arising out of improper use of the equipment.



Intense ultraviolet, visible, or infrared light! Wear light-protective goggles, full-face shield, skin-protection clothing, and light-blocking gloves. Do not stare into light.



Ultraviolet light! Wear protective goggles, full-face shield, skin-protection clothing, and UV-blocking gloves. Do not stare into light.



Hot! This symbol warns the user that hot equipment may be present, and could create a risk of fire or burns.



This symbol cautions the user that excessive humidity, if present, can damage certain equipment.



Wear appropriate safety goggles to protect the eyes.



Read this manual before using or servicing the instrument.

# Risks of ultraviolet exposure



**Caution:** This instrument is used in conjunction with ultraviolet light. Exposure to these radiations, even reflected or diffused, can result in serious, and sometimes irreversible, eye and skin injuries.

Overexposure to ultraviolet rays threatens human health by causing:

- Immediate painful sunburn
- Skin cancer
- Eye damage
- Immune-system suppression
- Premature aging

Do not aim the UV light at anyone.

Do not look directly into the light.

Always wear protective goggles, full-face shield and skin protection clothing and gloves when using the light source.

- Light is subdivided into visible light, ranging from 400 nm (violet) to 700 nm (red); longer infrared, “above red” or  $> 700\text{nm}$ , also called heat; and shorter ultraviolet radiation (UVR), “below violet” or  $< 400\text{nm}$ . UVR is further subdivided into UV-A or near-UV (320–400 nm), also called black (invisible) light; UV-B or mid-UV (290–320 nm), which is more skin penetrating; and UV-C or far-UV ( $< 290\text{ nm}$ ).
- Health effects of exposure to UV light are familiar to anyone who has had sunburn. However, the UV light level around some UV equipment greatly exceeds the level found in nature. Acute (short-term) effects include redness or ulceration of the skin. At high levels of exposure, these burns can be serious. For chronic exposures, there is also a cumulative risk of harm. This risk depends upon the amount of exposure during your lifetime. The long-term risks for large cumulative exposure include premature aging of the skin, wrinkles and, most seriously, skin cancer and cataract.
- Damage to vision is likely following exposure to high-intensity UV radiation. In adults, more than 99% of UV radiation is absorbed by the anterior structures of the eye. UVR can contribute to the development of age-related cataract, pterygium, photodermatitis, and cancer of the skin around the eye. It may also contribute to age-related macular degeneration. Like the skin, the covering of the eye or the cornea, is epithelial tissue. The danger to the eye is enhanced by the fact that light can enter from all angles around the eye and not only in the direction of vision. This is especially true while working in a dark environment, as the pupil is wide open. The lens can also be damaged, but because the cornea acts as a filter, the chances

are reduced. This should not lessen the concern over lens damage however, because cataracts are the direct result of lens damage.

Burns to the eyes are usually more painful and serious than a burn to the skin. Make sure your eye protection is appropriate for this work. **NORMAL EYEGLASSES OR CONTACTS OFFER VERY LIMITED PROTECTION!**



**Caution:** *UV exposures are not immediately felt. The user may not realize the hazard until it is too late and the damage is done.*

## Training

For the use of UV sources, new users must be trained by another member of the laboratory who, in the opinion of the member of staff in charge of the department, is sufficiently competent to give instruction on the correct procedure. Newly trained users should be overseen for some time by a competent person.

# Additional safety precautions



**Caution:** Your light source may emit high-intensity UV, visible, or infrared light. Exposure to these types of radiation, even reflected or diffused, can result in serious, and sometimes irreversible, eye and skin injuries. When using this light source, do not aim the light at anyone or look directly into the light or optical ports of the instrument.

## Visible radiation

Any very bright visible light source will cause a human aversion response: we either blink or turn our head away. Although we may see a retinal afterimage (which can last for several minutes), the aversion response time (about 0.25 seconds) normally protects our vision. This aversion response should be trusted and obeyed. NEVER STARE AT ANY BRIGHT LIGHT-SOURCE FOR AN EXTENDED PERIOD. Overriding the aversion response by forcing yourself to look at a bright light-source may result in permanent injury to the retina. This type of injury can occur during a single prolonged exposure. Excessive exposure to visible light can result in skin and eye damage.

Visible light sources that are not bright enough to cause retinal burns are not necessarily safe to view for an extended period. In fact, any sufficiently bright visible light source viewed for an extended period will eventually cause degradation of both night and color vision. Appropriate protective filters are needed for any light source that causes viewing discomfort when viewed for an extended period of time. For these reasons, prolonged viewing of bright light sources should be limited by the use of appropriate filters.

The blue-light wavelengths (400–500 nm) present a unique hazard to the retina by causing photochemical effects similar to those found in UV-radiation exposure.

## Infrared radiation

Infrared (or heat) radiation is defined as having a wavelength between 780 nm and 1 mm. Specific biological effectiveness “bands” have been defined by the CIE (Commission Internationale de l’Eclairage or International Commission on Illumination) as follows:

- IR-A (near IR) (780–1400 nm)
- IR-B (mid IR) (1400–3000 nm)
- IR-C (far IR) (3000 nm–1 mm)

The skin and eyes absorb infrared radiation (IR) as heat. Workers normally notice excessive exposure through heat sensation and pain. Infrared radiation in the IR-A that enters the human eye will reach (and can be focused upon) the sensitive cells of the retina. For high irradiance sources in the IR-A, the retina is the part of the eye that is at

risk. For sources in the IR-B and IR-C, both the skin and the cornea may be at risk from “flash burns.” In addition, the heat deposited in the cornea may be conducted to the lens of the eye. This heating of the lens is believed to be the cause of so called “glassblowers’ ” cataracts because the heat transfer may cause clouding of the lens.

- Retinal IR Hazards (780 to 1400 nm): possible retinal lesions from acute high irradiance exposures to small dimension sources.
- Lens IR Hazards (1400 to 1900 nm): possible cataract induction from chronic lower irradiance exposures.
- Corneal IR Hazards (1900 nm to 1 mm): possible flashburns from acute high irradiance exposures.

Who is likely to be injured? The user and anyone exposed to the radiation or xenon lamp shards as a result of faulty procedures. Injuries may be slight to severe.

# CE compliance statement

The SDrive-500 Shutter Control Unit is tested for compliance with both the EMC Directive 2004/108/EC and the Low Voltage Directive for Safety 2006/95/EC, and bears the international CE mark as indication of this compliance. HORIBA Instruments Incorporated guarantees the product line's CE compliance only when original HORIBA Instruments Incorporated supplied parts are used. Chapter 9 provides a table of all CE compliance tests and standards used to qualify this product.

# 2: Getting Started

## Unpacking

### Introduction

The SDrive-500 was shipped in packing designed to protect it from harm under normal shipping conditions. If shipping damage is noticed upon delivery, the carrier should note such damage on the receipt, and sign all copies. This will ease processing a damage claim with the carrier.



**Note:** Many public carriers will not recognize a claim for concealed damage if it is reported later than 15 days after delivery. In case of a claim, inspection by an agent of the carrier is required. For this reason, the original packing material should be retained as evidence of alleged mishandling or abuse. While HORIBA Instruments Incorporated assumes no responsibility for damage occurring during transit, the company will make every effort to aid and advise.

### Procedure

- 1 Open the top of the shipping carton and remove packing material until the SDrive-500 is exposed.
- 2 Reach down around the edges of the SDrive-500, grasp the bottom, and lift it out of the remaining packing.
- 3 Place the SDrive-500 on a sturdy table.
- 4 Check through the packing thoroughly, and gather the small parts and documents that were shipped with the SDrive-500.

### Inspection for damage

Inspect the instrument for visible evidence of any damage. Check that all readily visible mechanical and electrical components are in their proper places and intact. If damage is evident, do not operate the instrument. Notify our Customer Service and the carrier at once.

**Table 1: Components of the SDrive-500 unit**

| <b>Component</b>                                      | <b>Part number</b> |
|---|--------------------|
| SDrive-500 Shutter Control Unit                       | J356892            |
| CABLE, 2X SMB JACK 50 $\Omega$ RG174 6 FT             | 980197LF           |
| CABLE, COAX 50 OHM BNC 48"                            | J352470            |
| AC Power Cord CEE 7/7 to CEE-22 (220 V)               | J98020 or          |
| or NEMA 5-15 to CEE-22 (110 V)                        | J98015             |
| CCD Shutter Advisory                                  | J810030            |
| SDrive-500 digital-format Operation Manual (standard) | J810025            |
| SDrive-500 printed Operation Manual (optional)        | J810029            |

# Requirements

## Electrical requirements

The SDrive-500 Shutter Control Unit operates from universal AC single-phase input power over the range of 85 to 264 V AC with a line (mains) frequency of 47 to 63 Hz. This AC input power is applied to a two-pole fusing power entry module located on the rear panel of the shutter control unit. This module incorporates two 5 × 20 mm IEC approved, 1.6 A, 250 V, slow blow fuses (Littlefuse 021501.6HXP or equivalent) to protect against line disturbances / anomalies outside the system's nominal operating power range.

## Environmental requirements

- Storage temperature from  $-25^{\circ}\text{C}$  to  $+50^{\circ}\text{C}$
- Operating ambient temperature range from  $+20^{\circ}\text{C}$  to  $+30^{\circ}\text{C}$
- Relative humidity  $\leq 70\%$  non-condensing

## Ventilation requirements

A fan is incorporated in the SDrive-500 to cool the enclosed electronics and maintain optimum performance. Ensure that the ventilation slots are free from obstruction in order to maintain an adequate air-flow. Keep a minimum distance of 2" (5 cm) between the vents and any walls or surrounding equipment.



**Caution:** Do not block the air vents of the housing. Preventing the free flowing air can overheat and permanently damage the electronics.

## General safety requirements

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. HORIBA Instruments Incorporated assumes no liability for the customer's failure to comply with these requirements.

To prevent permanent damage to your SDrive-500 Shutter Control Unit, please observe the following safety precautions:

- Do not block the side exhaust air vents on each side of the SDrive-500 chassis, as well as the ambient air entering the unit's rear. Preventing or impeding the free flow of air can overheat and permanently damage the SDrive-500's internal power electronics.
- Prior to the application of power, ensure that the ground (earth) prong of the power supply power cord is properly connected to a wall outlet (mains) or power strip that provides for a protective earth ground connection.

## General safety requirements (continued)

- Do not connect or disconnect any cables to or from the associated CCD / IGA Detection system while the system is powered on.
- When installing any part of your HORIBA Scientific CCD/IGA Detection system (including the SDrive-500 Shutter Control Unit), stand on a conductive mat and wear a grounded (earthed) Electrostatic Discharge (ESD) wrist-strap to properly guard against damage caused by ESD.
- The AC (mains) power cord supplied with your SDrive-500 is selected for the appropriate input current and power for this unit. Do not replace the detachable AC (mains) power cord.

## Computer requirements

Syncerity™ CCD detection systems are configured and controlled via HORIBA Scientific's SynerJY® or FluorEssence™ software. To successfully install SynerJY® or FluorEssence™, your computer system must be equipped with the following:

### Software

- Windows® operating system XP, Vista, or 7

### Hardware

- 3.0 GHz single-core or 2.4 GHz multi-core processor
- 2 GM RAM
- 32-bit or 64-bit compatible
- 500 MB free hard-disk space (additional disk space may be required depending on data-storage needs)

# Installation



**Caution:** Electrostatic discharge (ESD) may damage components of the system if you do not take proper precautions. The sensor and detector-head electronics are very sensitive to ESD. When installing the system, stand on a conductive mat and wear a grounded (earthed) ESD wrist-strap. The computer must be turned off; however, keep its power cord connected to a grounded (earthed) outlet (mains) to provide a proper chassis-to-earth electrical path.



**Note:** The HORIBA Instruments Incorporated warranty does not cover damage to the sensor or system electronics that arises as a result of improper handling, including the effects of ESD.

A typical setup between a Sincerity™ CCD Detection System and a spectrometer is shown below. All Sincerity™ CCD Detection Systems that are integrated with a spectrometer require the SDrive-500 Shutter Control Unit to properly drive the spectrometer's electromechanical shutter.

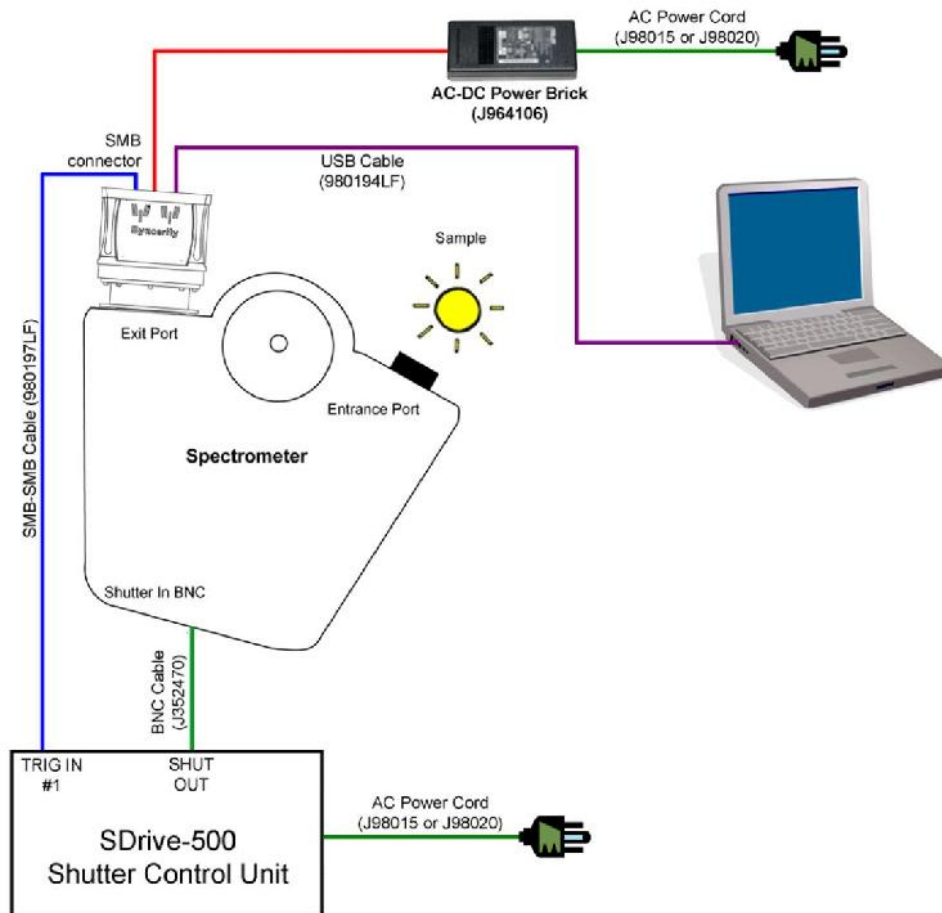


Figure 2: Typical SDrive-500 electrical interconnection scheme

- 1 Connect the female end of the power cord (J98015 for 110 V or J98020 for 220 V) to the SDrive-500 Shutter Control Unit.
- 2 Plug the wall-outlet end of the power cord into a properly grounded (earthed) outlet to provide a chassis-to-earth ground.
- 3 Connect one male end of the SMB-to-SMB cable (980197LF) to the TRIG IN #1 input on the front panel of the SDrive-500 Shutter Control Unit (J356892).
- 4 Connect the other male end of the SMB-to-SMB cable (980197LF) to the TTL OUT female SMB connector on the rear of the Sincerity™ detector.
- 5 Connect the BNC shutter cable (J352470) to the SHUTTER BNC on the front panel of the SDrive-500 Shutter Control Unit (J356892).
- 6 Connect the remaining end of the BNC shutter cable (J352470) to the spectrometer.

# 3: Operation

## Precautions



**Caution:** Always wear UV-blocking goggles and UV skin-protective clothing and gloves. Do not stare into the light.

## Interfaces

### Trigger inputs

Two TTL-level Trigger Input signals, triggers IN1 and IN2, control the activation and opening of the detection system's 25 mm shutter, during the interval when the CCD detector is exposed to light, via female SMB connectors on the front of the unit.

The SDrive-500's dual-trigger input architecture provides flexibility in allowing a single shutter drive unit to control the system's shutter when either one or two HORIBA Scientific detectors (i.e., IGA and CCD) are configured on an associated multi-exit-port spectrometer.



**Figure 3:** Front panel showing location of triggers



**Note:** Both trigger input signals use an active logic "high" to control shutter activation, with the shutter open as long as either one of these TTL-input signals is kept in its "high" state.

The SDrive-500's shutter activation follows the pulse and frequency applied to either one of its trigger inputs (i.e., 1 or 2). Figure 4 depicts the relationship of the TRIG IN logic-level stimulus and the associated power SHUTTER output signal:

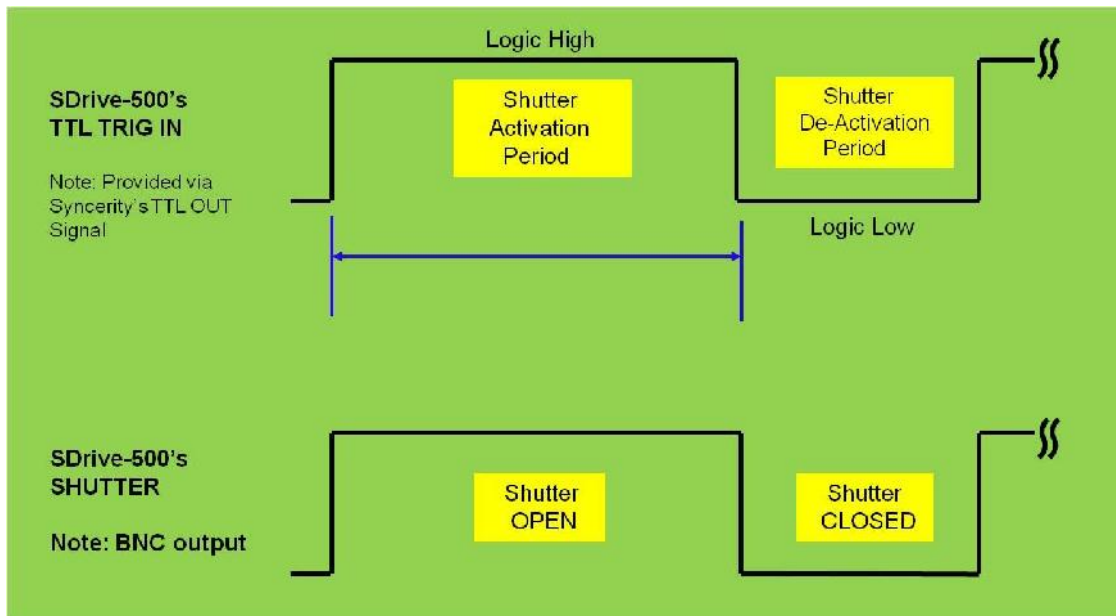


Figure 4: SDrive-500's TRIG IN Logic Level to SHUTTER Activation

### Shutter override switch

A small switch, labeled OPEN and SHUT, can override the automatic triggering of the 25 mm electromechanical shutter. Sliding the switch to OPEN opens the shutter manually, regardless of the electronic triggering status of the trigger inputs IN1 and IN2.

When the shutter override switch is in its active state (OPEN position), the shutter remains energized irrespective of the state of the two TTL trigger IN1 and IN2 inputs.



Figure 5: Front panel showing location of shutter override switch and SHUTTER connector

### Shutter output

To open and close the electromechanical shutter, there is a BNC connector labeled SHUTTER.

This output has the following characteristics to drive a 25 mm electromechanical shutter with 12 Ω coil resistance:

- Pulsed voltage to open +48 VDC nominal
- Hold voltage +5 VDC nominal
- Operating frequency See the section “Proper electromechanical shutter operation with the SDrive-500” later in this chapter for operating limits

## POWER LED

When the SDrive-500 is powered on, the POWER LED is illuminated green.

## Input AC Power

The SDrive-500 Shutter Control Unit accepts universal AC single-phase input power over the range of 85 to 264 VAC with an associated line-frequency range of 47 to 63 Hz to develop the necessary DC bias voltages to properly operate and control the detection system's 25 mm electromechanical shutter.



**Figure 6:** Front panel showing location of POWER LED.

The AC input power is applied to a two-pole fusing power entry module on the rear panel of the SDrive-500 unit, that incorporates two  $5 \times 20$  mm IEC approved, 1.6 A, 250 V slow blow fuses (Littlefuse 021501.6HXP or equivalent) to protect against line disturbances and anomalies outside the system's normal operating range.

## Initial SDrive-500 start up

- 1 Check that all system cables to and from the SDrive-500 Shutter Control Unit are properly connected.
- 2 Verify that the SDrive-500 Shutter Control Unit, Syncerity™ power-supply unit, computer, spectrograph, and any additional supporting equipment are connected properly to AC input power (mains).
- 3 Make sure that all software for your spectroscopic system has been installed before the SDrive-500 unit is turned on.
- 4 Set the power switch on the back of the SDrive-500 unit to the ON (“I” symbol) position.



**Note:** Operation of the Syncerity™ Detection System is predominantly controlled by software, and requires experimental setup and equipment configuration via SynerJY® or FluorEssence™ software.

Please refer to the SynerJY® or FluorEssence™ User's Guide and help files for information on proper experiment set-up as necessary.

# Proper electromechanical shutter operation with the SDrive-500

## Introduction

Programming of the detection system's CCD exposure time (i.e. shutter "on" time), as well as the system's spectral-acquisition rate (i.e., shutter "rep rate" time), is controlled by the user via the HORIBA Scientific software provided with your purchase (either SynerJY<sup>®</sup> or FluorEssence<sup>™</sup>). Thus, with this flexibility, it is important to understand the appropriate and allowable exposure times when using either a "Continuous" or a "Burst Frequency" mode of operation, so as not to violate the shutter manufacturer's operating requirements and possibly cause damage to the shutter.

A short description of the permissible shutter activation periods, including safe repetition rates where the electro-mechanical shutter will not be compromised or damaged, for experiments involving both a "Continuous" or "Burst Frequency" mode of operation follows.

## Continuous mode

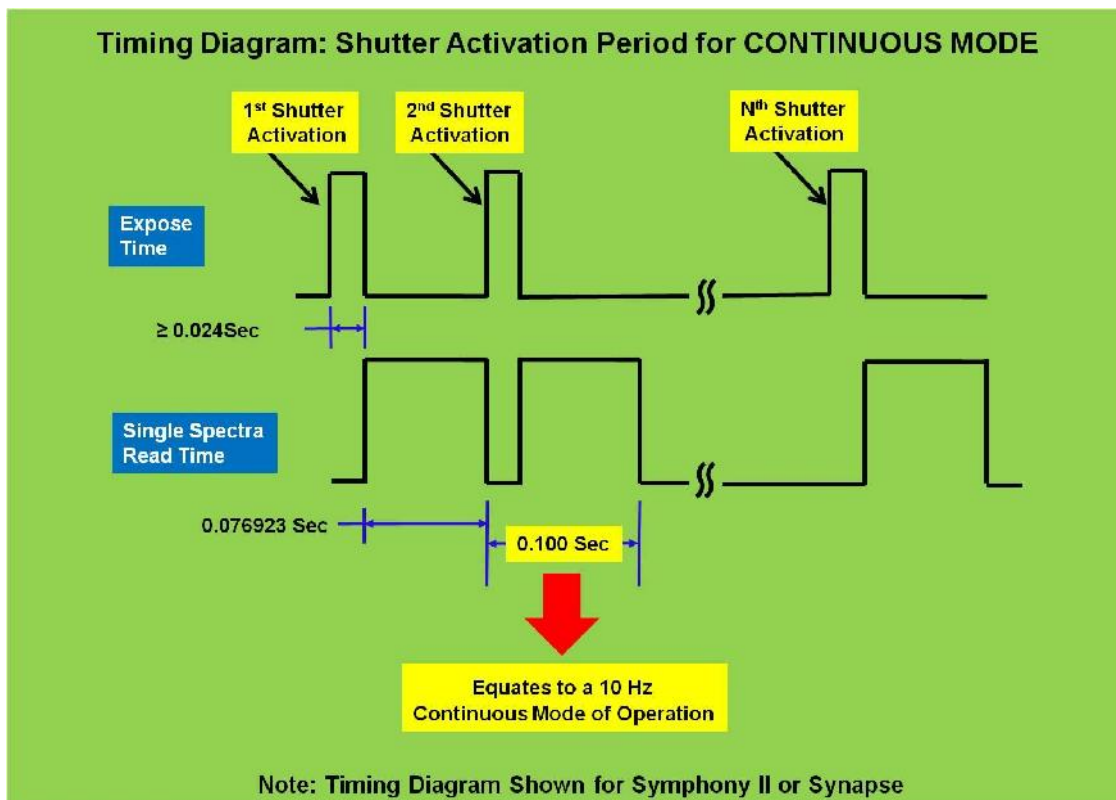
For applications that require continuous, repetitive spectral acquisitions that may last for hours or even days, it is important to be aware of the electromechanical shutter's limitations. Here, the shutter manufacturer warrants proper operation of your detection system's 25 mm electromechanical shutter for the continuous operating frequency mode as follows:

A maximum repetition rate of 10 Hz (i.e., shutter activation once every 0.100 s) with an adhered to 25%–75% "ON-OFF" duty cycle.



**Caution:** Failure to follow these specifications will result in physical damage to the electromechanical shutter.

Figure 7 below illustrates a simplified timing diagram of the shutter activation and rest periods (as defined by the shutter manufacturer) for your detection system’s 25mm shutter operating in the Continuous Frequency mode.



**Figure 7:** Timing diagram for shutter activation period for Continuous mode

Table 2 below specifies proper shutter times for Syncerity, Synapse, and Symphony® II CCD detectors when operating in a “Continuous” operating mode.

**Table 2.** Proper Shutter Times: Continuous Operation of HORIBA Scientific CCD Detectors

| Detector     | CCD size | Scan mode | Speed  | Single-spectrum read | Expose time (minimum) |
|--------------|----------|-----------|--------|----------------------|-----------------------|
| Symphony® II | 1024×256 | Slow      | 20 kHz | 76.923 ms            | ≥ 24 ms               |
| Synapse      | 1024×256 | Slow      | 20 kHz | 76.923 ms            | ≥ 24 ms               |
| Syncerity™   | 1024×256 | Slow      | 45 kHz | 35.963 ms            | ≥ 65 ms               |
| Symphony® II | 2048×256 | Slow      | 20 kHz | 166.67 ms            | N/A                   |
| Synapse      | 2048×256 | Slow      | 20 kHz | 166.67 ms            | N/A                   |

## Burst frequency mode

For applications that require extremely fast and repetitive spectral acquisitions, be aware of the limitations of the detection system’s electro-mechanical shutter with respect to “Burst Frequency” mode. While the internal power electronics within the SDrive-500 Shutter Controller unit may be able to sustain long periods of shutter Burst mode activity ( $\leq 40$  Hz repetition rate) without degradation or failure, the electro-mechanical shutter will not.

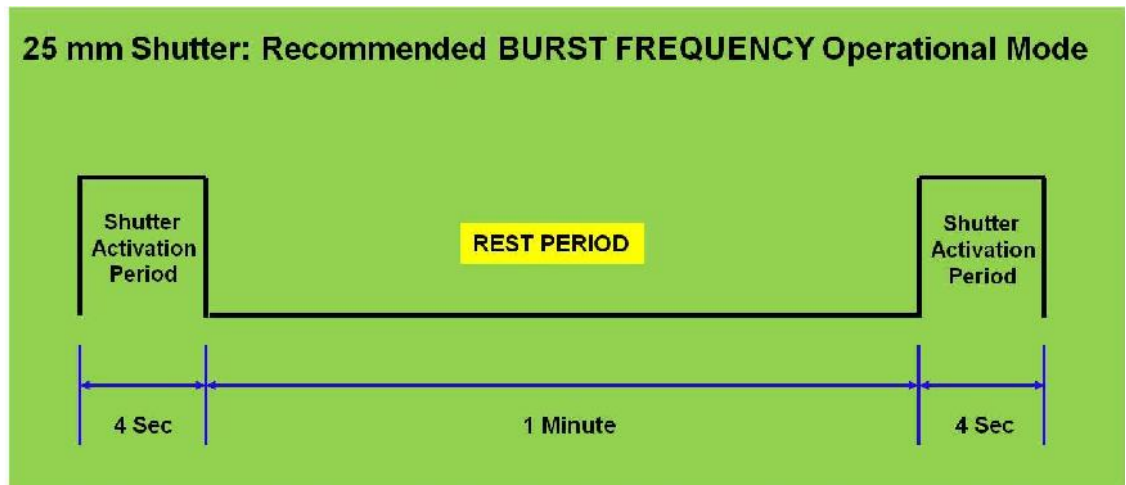
Hence, when operating in Burst frequency mode, the system’s 25 mm electromechanical shutter is warranted for proper operation as follows:

**40 Hz maximum repetition rate (i.e., shutter activation once every 0.025 s) for four seconds maximum with a dwell/rest period (i.e., no shutter excitation pulse applied to the shutter) of one minute between burst periods.**



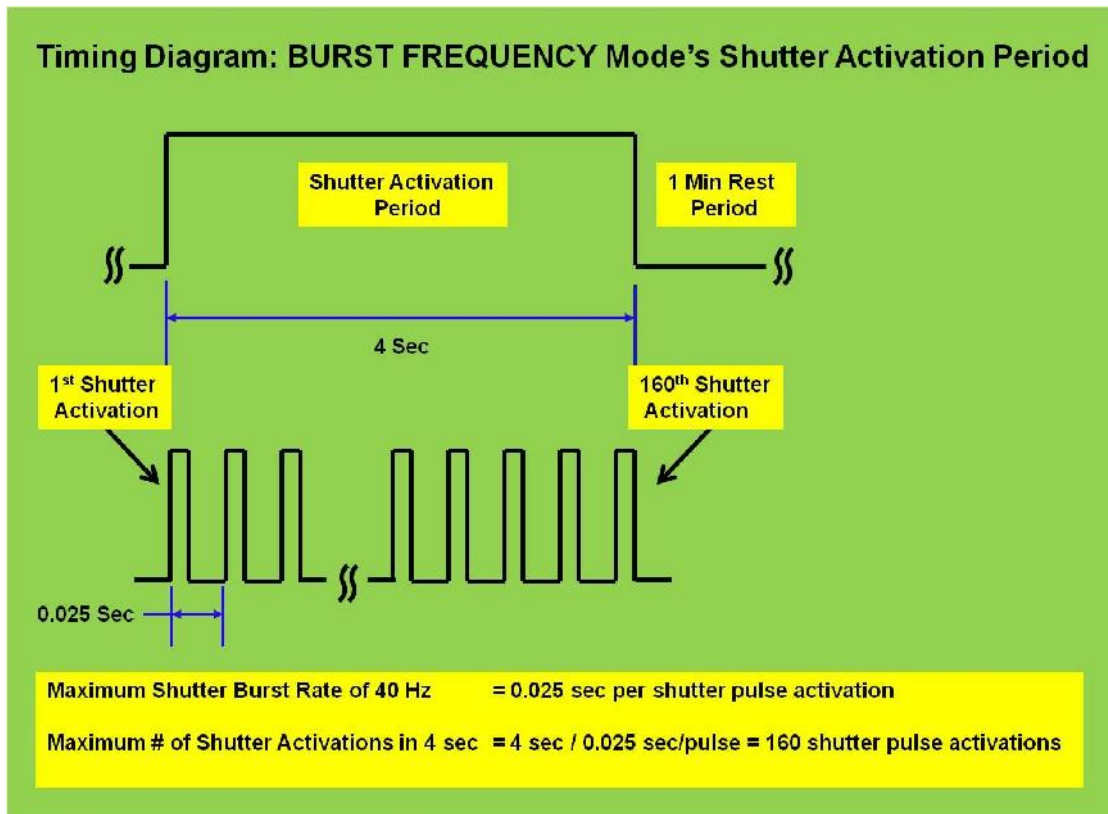
**Caution:** Failure to follow these specifications will result in physical damage to the electromechanical shutter.

Figure 8 provides a simplified timing diagram illustrating the shutter activation and rest periods (as defined by the shutter manufacturer) for your detection system’s 25mm shutter in the Burst Frequency mode.



**Figure 8:** Timing diagram for shutter activation period for Burst mode

In addition, the aforementioned four-second “Shutter Activation Period” for this Burst Frequency mode of operation is detailed in Figure 9 below, including the maximum number of shutter activation pulses defined by the manufacturer’s 40 Hz maximum repetition rate within this four-second interval:



**Figure 9:** Timing diagram for maximum shutter pulses in 4 s Burst period

Table 3 below lists the minimum exposure time settings of the various HORIBA Scientific CCD detectors to conform within the shutter manufacturer’s maximum 40 Hz repetition rate (0.025 s period) for the Burst Frequency mode of operation. Minimum exposure time values found in Table 3 provide valid shutter activations during this “Burst” mode of operation, and are obtained by subtracting the required time to perform a single spectral read from the aforementioned shutter manufacturer’s recommended 0.025 second “rep rate” period.

**Table 3.** Proper Shutter Times: Burst Operation of HORIBA Scientific CCD Detectors

| Detector     | CCD size | Scan mode | Speed       | Single-spectrum read | Expose time (minimum) |
|--------------|----------|-----------|-------------|----------------------|-----------------------|
| Symphony® II | 1024×256 | Fast      | 1 MHz       | 12.658 ms            | ≥ 13 ms               |
|              |          |           | 1 MHz ultra | 3.597 ms             | ≥ 22 ms               |
| Synapse      | 1024×256 | Fast      | 1 MHz       | 12.658 ms            | ≥ 13 ms               |
|              |          |           | 1 MHz ultra | 3.597 ms             | ≥ 22 ms               |
| Syncerity™   | 1024×256 | Fast      | 1 MHz       | 11.468 ms            | ≥ 14 ms               |
|              |          |           | 1 MHz ultra | 3.430 ms             | ≥ 22 ms               |
| Symphony® II | 2048×256 | Fast      | 1 MHz       | 25.641 ms            | ≥ 1 ms                |
|              |          |           | 1 MHz ultra | 7.143 ms             | ≥ 18 ms               |
| Synapse      | 2048×256 | Fast      | 1 MHz       | 25.641 ms            | ≥ 1 ms                |
|              |          |           | 1 MHz ultra | 7.143 ms             | ≥ 18 ms               |

# 4: Powering Down and Disassembly of the SDrive-500

If the experimental set-up needs to be disassembled, take the following steps to disconnect the SDrive-500 unit from the spectrometer-detector system:

- 1 Exit the HORIBA Scientific software (SynerJY<sup>®</sup> or FluorEssence<sup>™</sup>).
- 2 Set the power switch on the back of the SDrive-500 unit to the OFF (“O” symbol) position.
- 3 Disconnect the SMB-to-SMB cable (980197LF) from the TTL OUT female SMB connector on the rear of the Sincerity<sup>™</sup> detector.
- 4 Disconnect the other end of the SMB-to-SMB cable (980197LF) from the TRIG IN1 input on the front panel of the SDrive-500 Shutter Control Unit (J356892).
- 5 Disconnect the BNC shutter cable (J352470) from the SHUTTER output BNC on the front panel of the SDrive-500 Shutter Control Unit.
- 6 Disconnect the remaining end of the BNC shutter cable (J352470) from the HORIBA Scientific spectrometer.
- 7 Disconnect the AC power cord (J98015 for 110 V or J98020 for 220 V) from both the SDrive-500 Shutter Control Unit and the wall outlet (mains).



**Note:** The HORIBA Instruments Incorporated warranty on SDrive-500 Shutter Control Unit does not cover damage to the internal electronics that arises as a result of improper handling, including the effects of electrostatic discharge (ESD).



# 5: Maintenance

## General maintenance



**Caution:** The only user service that can be performed on the SDrive-500 is fuse replacement to the input power filter module on the unit's rear panel, in the unlikely event of a blown fuse.



**THERE ARE NO SERVICEABLE PARTS INTERNAL TO THE SDRIVE-500 CHASSIS. ANY ACCESS and/or ATTEMPTED ACCESS WILL VOID THE PRODUCT WARRANTY.**

## Cleaning the dust cover of the SDrive-500

The dust cover of the SDrive-500 Shutter Control Unit must be removed and cleaned at least once every six months.

To clean the dust cover:

- 1 Make sure that the power switch located on the back of the power supply unit is set to the off ("O" symbol) position.
- 2 Remove the "snap fit" dust cover that houses the dust filter.
- 3 Remove the dust filter and clean appropriately.

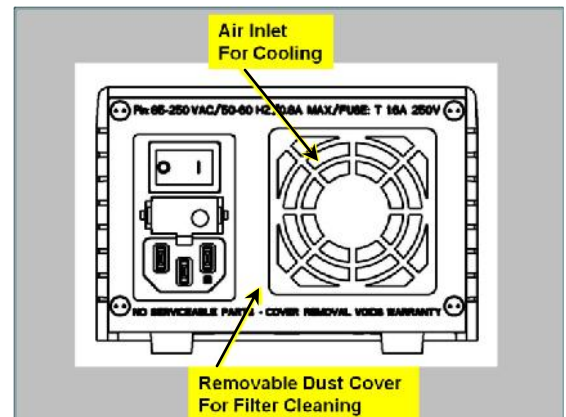


Figure 10: SDrive-500 removable dust cover



**Caution:** If the pores of the dust filter are clogged with dust and particulate matter, replace the old filter with a new one.

- 4 Put either the cleaned old filter or a new filter into the dust-cover housing.
- 5 Gently snap the dust cover back onto the SDrive-500's back panel.

# 6: Troubleshooting

## Introduction

Your SDrive-500 is designed to provide years of reliable service. If you are experiencing a problem, review this section before contacting us to save time and help you to eliminate some simple errors that can be easily corrected.

## Common problems

Some of the more common difficulties that may be encountered are listed below. With each, some suggestions are given that will correct the problem for most cases.

Refer to the Service Policy in the following section to contact us for further assistance.

### SDrive-500 unit fails to turn on

If the SDrive-500 unit fails to turn on, check that:

- The green POWER LED (SDrive-500's front panel) is illuminated.
- The power cord is connected to the SDrive-500 Shutter Control Unit.
- The power cord is plugged into a live outlet (mains).
- The two fuses in the input power entry module (SDrive-500's rear panel) are not blown.

### SDrive-500 unit fails to activate the 25 mm shutter

If the detector system's electromechanical shutter should fail to actuate, verify that:

- The shutter override switch (SDrive-500's front panel) is in the SHUT position.
- All cables to and from the HORIBA Scientific spectrometer-detector system are correctly connected.
- The TTL OUT signal from the HORIBA Scientific detector is properly applied to the SDrive-500's trigger IN1 or IN2 inputs.



**Caution:** If a problem still exists after the verification process above, please contact HORIBA Scientific for further assistance.



**DO NOT ATTEMPT TO SERVICE THE SDRIVE-500, FOR THERE ARE NO INTERNAL SERVICEABLE PARTS. ANY CHASSIS ACCESS AND/OR ATTEMPTED ACCESS WILL VOID THE PRODUCT WARRANTY.**



# 7: Specifications

## Table 4: Technical specifications

### Environmental

|                                 |  |
|---------------------------------|--|
| <b>Environmental conditions</b> | Storage temperature from $-25^{\circ}\text{C}$ to $+50^{\circ}\text{C}$<br>Operating ambient temperature range $+25^{\circ}\text{C} \pm 5^{\circ}\text{C}$<br>Relative humidity $\leq 70\%$ non-condensing |
|---------------------------------|--|

### TTL-Level electrical input signals

|   |   |
|---|---|
| <b>Trigger input #1</b><br>TTL compatible:<br>Min High-level = <b>+2.0 VDC</b><br>Max Low-level = <b>+0.8 VDC</b> | Active High TTL level controls the opening of the electro-mechanical shutter. Pulse-width and frequency of shutter activation will follow the active High level of this signal. |
| <b>Trigger input #2</b><br>TTL compatible:<br>Min High-level = <b>+2.0 VDC</b><br>Max Low-level = <b>+0.8 VDC</b> | Active High TTL level controls the opening of the electro-mechanical shutter. Pulse width and frequency of shutter activation will follow the active High level of this signal. |
| <b>Shutter override</b>   | TTL-level switch on the unit's front panel provides a manual override (i.e., opening) of the shutter.   |

### Shutter output excitation drive

|                                       |  |
|---------------------------------------|--|
| <b>Shutter coil resistance</b>        | 12 $\Omega$ nominal                          |
| <b>Shutter pulsed voltage to open</b> | +48 VDC nominal                              |
| <b>Shutter hold voltage</b>           | +5 VDC nominal                               |
| <b>Operating frequency</b>            | See Chapter 3 for proper limits of operation |

### Input power requirements

|                             |                                 |
|-----------------------------|---------------------------------|
| <b>Input line voltage</b>   | 85–264 VAC continuous/universal |
| <b>Input line frequency</b> | 47–63 Hz                        |
| <b>Input power</b>          | 70 W maximum                    |

### Mechanical dimensions

|                               |  |
|-------------------------------|--|
| <b>Dimensions (L × W × H)</b> | 7.24 in. (18.4 cm) × 4.50 in. (11.4 cm) × 3.15 in. (8.00 cm) |
| <b>Weight</b>                 | 1.3 kg (2.9 lbs)   |



**Note:** All specifications are subject to change without notice.

# Dimensional drawings



**Note:** Dimensions are in inches [mm].

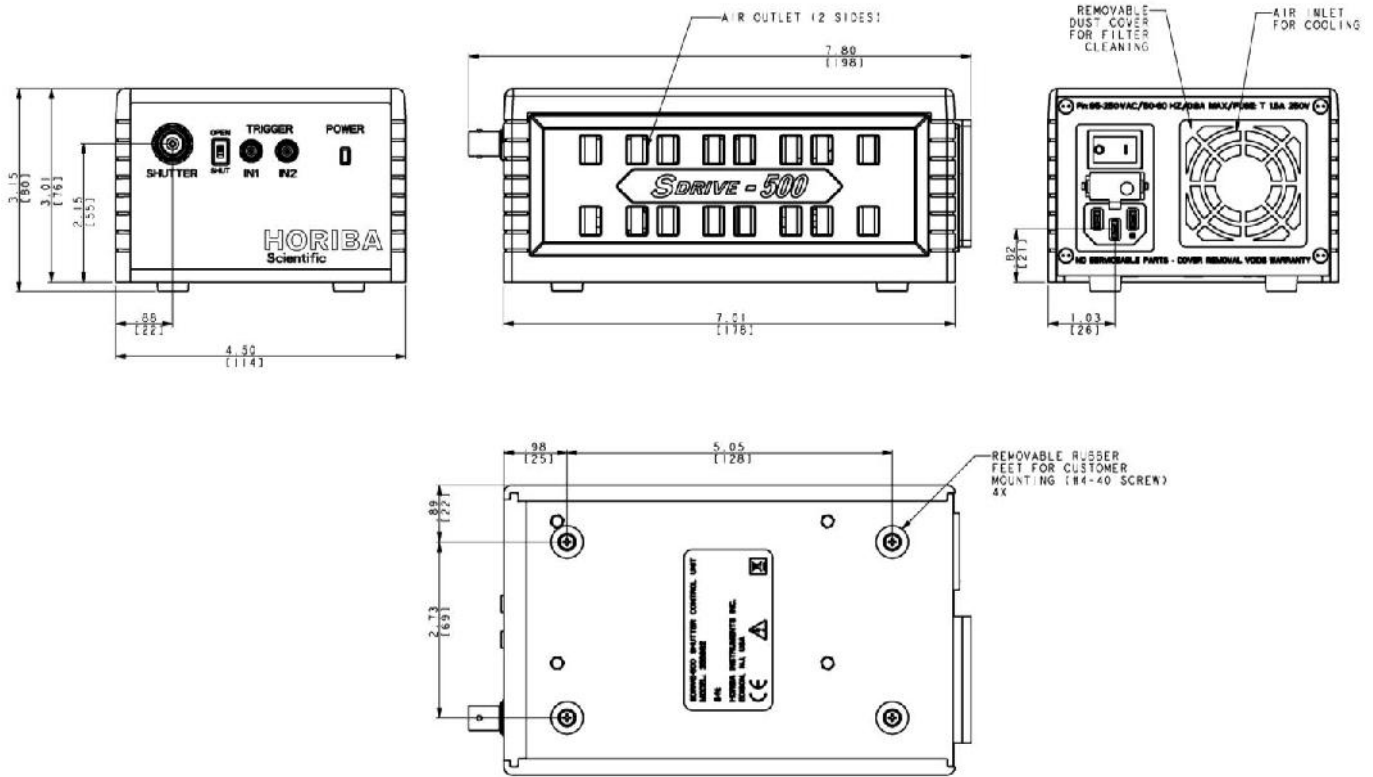


Figure 11: Technical drawing of SDrive-500

# 8: Service Policy

If you need assistance in resolving a problem with your instrument, contact our Customer Service Department directly, or if outside the United States, through our representative or affiliate covering your location.

Often it is possible to correct, reduce, or localize the problem through discussion with our Customer Service Engineers.

All instruments are covered by warranty. The warranty statement is printed inside of this manual. Service for out-of-warranty instruments is also available, for a fee. Contact HORIBA Instruments Incorporated or your local representative for details and cost estimates.

If your problem relates to software, please verify your computer's operation by running any diagnostic routines that were provided with it. Please refer to the software documentation for troubleshooting procedures. If you must call for Technical Support, please be ready to provide the software serial number, as well as the software version and firmware version of any controller or interface options in your system. The software version can be determined by selecting the software name at the right end of the menu bar and clicking on "About." Also knowing the memory type and allocation, and other computer hardware configuration data from the PC's CMOS Setup utility may be useful.

In the United States, customers may contact the Customer Service department directly. From other locations worldwide, contact the representative or affiliate for your location.

|                                |             |                            |                                   |
|--------------------------------|-------------|----------------------------|-----------------------------------|
| <b>In the USA:</b>             |             | <b>In France:</b>          | <b>Worldwide: +1-877-546-7422</b> |
| HORIBA                         | Instruments | Jobin Yvon SAS             | China: +86 (0) 10 6849 2216       |
| Incorporated                   |             | 16-18 rue du Canal         | Germany: +49 (0) 89 462317-15     |
| 3880 Park Avenue               |             | 91165 Longjumeau Cedex     | Italy: +39 (0) 2 57603050         |
| Edison, New Jersey 08820       |             | France                     | Japan: +81 (0) 3 58230141         |
| USA                            |             | Tel: +33 (0) 1 64 54 13 00 | UK: +44 (0) 20 8204 8142          |
| Tel: +1-732-494-8660 Ext. 160  |             | Fax: +33 (0) 1 69 09 93 19 |                                   |
| Fax: +1-732-494-9796           |             |                            |                                   |
| Email: service.jyus@horiba.com |             |                            |                                   |

If an instrument or component must be returned, the method described on the following page should be followed to expedite servicing and reduce your downtime.

# Return authorization

All instruments and components returned to the factory must be accompanied by a Return Authorization Number issued by our Service Department.

To issue a Return Authorization number, we require:

- The model and serial number of the instrument
- A list of items and/or components to be returned
- A description of the problem, including operating settings
- The instrument user's name, mailing address, telephone, and fax numbers
- The shipping address for shipment of the instrument to you after service
- Your Purchase Order number and billing information for non-warranty services
- Our original Sales Order number, if known
- Your Customer Account number, if known
- Any special instructions

# Warranty

## Basic Limited 1 Year Warranty:

For any item sold by Seller to Buyer or any repair or service, Seller agrees to repair or replace, without charge to Buyer for labor or materials or workmanship of which Seller is notified in writing before the end of the applicable period set forth below, beginning from the date of shipment or completion of service or repair, whichever is applicable:

- a. New equipment, product and laboratory apparatus: 1 year with the following exceptions:
  - i) Computers and their peripherals
  - ii) Glassware and glass products.
- b. Repairs, replacements, or parts – the greater of 30 days and the remaining original warranty period for the item that was repaired or replaced.
- c. Installation services – 90 days.

The above warranties do not cover components manufactured by others and which are separately warranted by the manufacturer. Seller shall cooperate with Buyer in obtaining the benefits of warranties by manufacturers of such items but assumes no obligations with respect thereto.

All defective items replaced pursuant to the above warranty become the property of Seller.

Seller must deliver the entire product to HORIBA Instruments Incorporated factory or, at our option, to a factory authorized service center. Buyer is responsible for the shipping costs to return the product.

This warranty shall not apply to any components subjected to misuse due to common negligence, adverse environmental conditions, or accident, nor to any components which are not operated in accordance with the printed instructions in the operations manual. Labor, materials and expenses shall be billed to the Buyer at the rates then in effect for any repairs or replacements not covered by this warranty.

This warranty shall not apply to any HORIBA Instruments Incorporated manufactured components that have been repaired, altered or installed by anyone not authorized by HORIBA Instruments Incorporated in writing.

THE ABOVE WARRANTIES AND ANY OTHER WARRANTIES SET FORTH IN WRITING HERIN ARE IN LIEU OF ALL OTHER WARRANTIES OR GUARANTEES EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY, FITNESS FOR PURPOSE OR OTHER WARRANTIES.

The above shall constitute complete fulfillment of all liabilities of Seller, and Seller shall not be liable under any circumstances for special or consequential damages, including without limitation loss of profits or time or personal injury caused.

The limitation on consequential damages set forth above is intended to apply to all aspects of this contract including without limitation Seller's obligations under these standard terms.



# 9: C € Compliance Information

## Declaration of Conformity

Manufacturer: HORIBA Instruments Incorporated  
Address: 3880 Park Avenue  
Edison, NJ 08820  
USA  
Product Name: SDrive-500 Shutter Control Unit  
Model Number: J356892  
Equipment Type: Laboratory

### Conforms to the following Standards:

Safety: **EN 61010-1:2010**  
EMC: **EN 61326-1:2006 (Emissions & Immunity)**

### Supplementary Information

The product herewith complies with the requirements of the Low Voltage Directive 2006/95/EEC and the EMC Directive 2004/108/EC.

The CE marking has been affixed on the device according to Article 8 of the EMC Directive 2004/108/EC.

The technical file and documentation are on file with HORIBA Instruments Incorporated.



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Nicholas Vezard, Vice-President  
HORIBA Instruments Incorporated  
Edison, NJ 08820  
USA  
December 7, 2012

**Table 5. Applicable CE Compliance Tests and Standards**

| Tests  | Standards                |
|--|--------------------------|
| <b>Emissions:<br/>Radiated / Conducted<br/>Class B</b> | EN55011:1998 +A1, +A2    |
| <b>Radiated Immunity</b>                               | EN61000-4-3:2006 +A1, A2 |
| <b>Conducted Immunity</b>                              | EN61000-4-6:2009         |
| <b>Electrostatic Discharge</b>                         | EN61000-4-2:1995 +A1, A2 |
| <b>Voltage Dips &amp; Interrupts</b>                   | EN61000-4-11:2004        |
| <b>Electrical Fast Transients</b>                      | EN61000-4-4:2004         |
| <b>Surge Immunity</b>                                  | EN61000-4-5:2006         |
| <b>Magnetic Field Immunity</b>                         | EN61000-4-8: 2009        |
| <b>Harmonics</b>                                       | EN61000-3-2:2006 +A1, A2 |
| <b>Flicker</b>   | EN61000-3-3:2008         |

# 10: Index

**Key to the entries:**

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|---------------------------------------|---|
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| Arial font.....                       | command, menu choice, or data-entry field |
| <b>Arial Condensed Bold</b> font..... | dialog box                                |
| Courier New font.....                 | file name or extension                    |

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# **HORIBA**

## **Scientific**

3880 Park Avenue, Edison, New Jersey 08820-3012, USA  
[www.horiba.com/scientific](http://www.horiba.com/scientific)

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[Design Concept]

The HORIBA Group application images are collaged in the overall design.  
Beginning from a nano size element, the scale of the story develops all the way to the Earth with a gentle flow of the water.

