Model RS-DAQ Instrument Controller
User Manual
Version 1.0

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Chapter 1: Overview

Thank you for purchasing the C&L Instruments Model RS-DAQ Instrument Controller. This controller not only provides microprocessor based control for the C&L Instruments Dye Fluorometer system and components, but it can also function as a complete fluorescence and analog data acquisition system.

The Controller can be programmed either by the front panel keypad or by ASCII commands through the RS-232 port. The unit includes a BNC input for photon counting photomultiplier tubes having TTL output signals (20 nsec minimum pulse width) and auxiliary BNC inputs for 8 channels of A/D conversion, 0-5VDC.

Please follow the instructions provided in this manual. Proper care of the RS-DAQ will insure peak-performance throughout the life of the instrument.

Chapter 2: Setup

Cable Connections

There are 9 types of electrical connections to the Model RS-DAQ Controller. The cables you use will depend upon your system configuration. These are:

1. A power cord from the desktop power supply.
2. A female DB-15 for control of the excitation (illuminator) filter wheel.
3. A female DB-15 for control of the neutral density (illuminator) wheel.
4. A female DB-15 for control of the emission (detector) filter wheel.
5. A female DB-9 for the Monitor output.
6. A female DB-9 for RS-232 communication.
7. A BNC input for TTL signals from the detector photomultiplier.
8. A BNC input for TTL trigger signals to toggle filter wheel filter changes.
9. Eight BNC connectors for input for auxiliary Analog Data input.

Attach the supplied power cable to the connector located on the end of the desktop power supply. The power supply is of universal type, and should operate from 95-250 VAC and 47-63 Hz. The power supply is supplied with a power cord for operation in either North America or Europe. In the event that the supplied power cord is incompatible with your electric utility, you may have to obtain either an adapter or a power cord locally. The power entry module is a standard IEC type. Attach the low voltage connector to the power input of the RS-DAQ Controller. This connector is located on the right side of the controller.

The 15 pin connectors used with the RS-DAQ controller will depend upon your system configuration. Attach one end of one of the supplied 15 pin molded cables to the connector located on the back panel of the Instrument Controller labeled EXCITATION. The other end is attached to a similarly labeled connector on the Model S48D Illuminator. Attach a second supplied 15 pin molded cable to the connectors marked NEUTRAL DENSITY on the Illumination Source and the RS-DAQ Controller in a similar fashion. If your application includes a detector, attach another 15 pin molded cable to the Detector module and the connector labeled EMISSION on the RS-DAQ Controller.

If your application includes analog inputs, attach BNC cables to the auxiliary inputs on the RS-DAQ. Input voltages should be restricted to the range of 0-5 VDC.

TTL inputs are provided to trigger filter wheel changes by the RS-DAQ Controller and to collect data from TTL-output photon counting systems.

The Model RS-DAQ can be used with several illumination and detection components offered by C&L Instruments. For more information about the RS-DAQ Controller that is not contained in this manual, please contact C&L Instruments or visit our web site.

Chapter 3: Using the Controller

Overview

The Model RS-DAQ Controller is designed to operate the Model S48D Illuminator and the Model D48 Detector and other hardware devices manufactured by C&L Instruments. The Illumination source contains an arc lamp assembly, a filter wheel and a neutral density wheel, motor controllers, a shutter and power supplies. The Detector contains a filter wheel, motor controller, shutter, power supply and a photon counting photomultiplier (PMT). The filter wheels are used for wavelength selection and the neutral density wheel is used to attenuate the light intensity of the illuminator output. The reader is referred to the manuals provided with the Illumination Source and Detector for more information about the operation of these instruments.

The RS-DAQ Controller also has complete data acquisition capability. It can collect photon count data from a photon-counting photomultiplier having a TTL output. It also can collect analog data using eight separate analog input channels. The data is obtained from the Controller using the supplied RS-232 interface. This manual describes the general operation of the RS-DAQ Controller and how it is programmed. To use the RS-DAQ as a data acquisition system, contact C&L Instruments to obtain the appropriate software.

Power on considerations

To use your RS-DAQ Controller safely and as a component of other equipment from C&L Instruments, a specific sequence should be followed when turning the equipment on and off. Please follow these steps:

1. Always turn the Illumination System on ***before*** turning on the Controller, computer or any other components. This is a good practice to follow if C&L Instruments, or any other manufacturer supplies other equipment you plan to use with the Controller. It is unlikely, but it is possible that the initial illumination of an arc lamp assembly can damage other components due to electromagnetic discharge.
2. After igniting the arc lamp assembly, all other components can be turned on. The power switch on the RS-DAQ is located on the right side of the unit.
3. If you are using a computer with your RS-DAQ, it should be turned on last.

Filter Wheels

Filter Wheel Type

The Illuminators and Detector manufactured by C&L Instruments utilize filter wheels for wavelength selection. Your fluorometer may be configured with either one or two filter wheels. The complete C&L Instruments Dye Fluorometer uses two filter wheels to select the excitation and emission wavelengths. One is in the excitation path and one is in the emission path. Depending on the particular type(s) of filter wheels purchased with your

instrument, the filter wheels can contain either four 1-inch diameter filters or eight ½-inch filters.

Filter Wheels Modes and Data Acquisition Modes

The RS-DAQ Controller allows the user to control the operation of an excitation filter wheel, an emission filter wheel and a Neutral Density (ND) wheel. The features for each of the wheels can be controlled separately. Both the excitation and emission filter wheels can be operated in three different operation modes: Spin, Fixed and Mixed.

When used with accessory data acquisition software provided by C&L Instruments, data can be acquired with RS-DAQ Controller when the excitation and emission filter wheels are operated in these three operation modes, as described more detail below (i.e., Fixed, Spin and Mixed). Although the setting for each filter wheel can be specified separately, the user can select from 5 data acquisition modes when used in combination. These are Fixed-Fixed, Spin-Spin, Spin-Fixed, Fixed-Spin and Mixed-Mixed. For further details about data acquisition with the RS-DAQ Controller, the reader is referred to the software manuals provided by C&L Instruments.

Spin Mode

In Spin Mode, the filter wheel revolves at a constant velocity. In this mode, the period of time in which the sample is exposed to a specific wavelength of light is determined by the speed of revolution. This period of time is referred to as either the **sampling time** or the **aperture time**. The exposure of the sample to specific excitation wavelengths and the measurement of light emission from the sample are in a constant ordered sequence, determined by the placement of the individual filters in the filter wheels.

Fixed Mode

In Fixed Mode, the filter wheel is held in a stationary position, permitting light to pass through one position in the filter wheel. Both filter wheels can be placed in the Fixed mode for measurement of fluorescence using a single excitation and emission wavelength pair. Alternately, either the excitation filter wheel or the emission filter wheel can be placed in the Fixed Mode while the other filter wheel is operated in the Spin Mode. This setting would be used for either multiwavelength excitation with a single emission wavelength or multiwavelength emission with a single excitation wavelength. When either the excitation or emission wheel is operated in the Spin mode, the sampling time is determined by the speed of revolution.

Mixed Mode

In the Mixed Mode, the excitation and emission filter wheels can each be programmed to go to any filter position in any sequence. For instance, the excitation filter wheel can be set to cycle through the filter sequence of 2,1,4 while the emission wheel cycles through the filter sequence of 3,2,1. In this case, the excitation-emission pairs would be 2-3, 1-2, and 4-1. The **dwell time** can be specified. The **dwell time** is the duration of time that the filter wheels remain stationary in one position prior to moving to the next position

programmed in the sequence. This feature provides a programming ring, capable of up to eight excitation wavelength pair combinations.

Shutters

The C&L Dye Fluorometer contains two shutters, one in the excitation path (within the Model S48D Illumination Source) and one in the emission path (within the D48 Detection Module). These shutters can be controlled with the RS-DAQ Controller using the front panel switches or by download to the Controller using the RS-232 interface. With control of these shutters, the user can specify that the sample be exposed only during active data collection and that light be blocked when the filter wheel is repositioning during operation in the Mixed Mode.

Monitor Output

The RS-DAQ Controller has a Monitor output located on the right side of the unit. This output can be used to synchronize external events to the operation of the filter wheels. When either the excitation or emission filter wheel is in the Spin mode, timing signals are available on the Monitor output jack. This output is a set of TTL pulses indicating the position of the spinning filter wheel.

When both of the filter wheels are in the Fixed or Mixed mode, these outputs are not available.

The specifications for this output and further information about the use of this output can be obtained by contacting C&L Instruments.

Chapter 4: Programming the Controller

Overview

The RS-DAQ Controller can be programmed in one of two ways. The unit can be programmed using either the keypad located on the front panel or by an external computer using the RS-232 serial interface. This chapter describes how these two methods can be used to program the Controller.

Switching between Panel Control and RS-232 Control Modes

The RS-DAQ Controller will operate in either one of two programming modes. The selection between these modes is made by the toggle switch located on the back of the unit. The two modes are Panel Control mode and RS-232 Control mode.

On the front panel is a button labeled Reset. Pressing the Reset button will reset the Controller and place the controller in the mode selected by the switch on the back panel. To change between modes, change the state of the toggle switch on the back panel and press the Reset button. Changing the state of the toggle switch will not take effect unless the Reset button is depressed or the unit is powered off and then on. After the Reset button is pressed, the LCD will display the operating mode of the Controller.

Programming using the Keypad

The keypad allows direct programming control of all functions of the RS-DAQ Controller using the front panel. When the Controller is first powered on, the display will briefly display the message:

C&L Instruments

Model RS-DAQ V1

After this message, the display will read either one of the following two prompts depending on whether the Controller is in the Panel Control or RS-232 Control mode.

Panel Control

>>>Press ENT<<<

or

RS232 Control

>>>Accept COM<<<

To place the Controller in the Panel Control mode, press the Reset button. The LCD display will indicate the mode of operation. If the Controller is in the RS-232 mode, follow the instructions discussed above to switch control modes to Panel Control. RS-232 Control is discussed later in this chapter.

In the Panel Control mode, commands are entered using the keypad in menu form and you are prompted for an appropriate input by the LCD display. Valid entries allow you advance through the menu sequence. The keypad has the numbers **1**, **2**, **3**, **4**, **5**, **6**, **7**, **8**, **9**

and **0**, as well as the function keys **UP ARROW**, **DOWN ARROW**, **2ND**, **CLEAR**, **HELP** and **ENTER**.

If you make a mistake when entering a selection, or if you desire to change a selection, there are two correction methods. If the selection is one of several choices (multiple choice), simply press the correct key before you press the **ENTER** key. This will overwrite the previous selection. If the entry is a multi-digit entry (such as "dwell time"), then you can delete the last digit entered by pressing the **UP ARROW** on the keypad. Each press of the **UP ARROW** will delete one digit. You can then enter the correct value. In many instances, only certain entries are valid and you will not be allowed to enter invalid choices.

After the prompt of

Panel Control

>>>Press ENT<<<

press **ENTER** to start the programming sequence. The display will read:

ExFilters4/8:

This is the prompt to select the type of filter wheel installed in the excitation source (either 4 position or 8 position). The two valid entry choices are either 4 or 8. Invalid choices are not allowed. Enter either 4 or 8 and then press **ENTER**.

You are next prompted to enter the offset value for the excitation.

ExOffset:

This is the mechanical offset for the excitation wheel. The value for this offset is fixed for your particular excitation source and this value should be entered each time the unit is programmed. Refer to the instructions that were supplied with your excitation source for this value. A negative value is entered by pressing **2ND** prior to entering the value. Pressing **ENTER** without first keying in a value is equivalent to entering a value of 0.

After the excitation offset has been entered, similar prompts are displayed for the emission filter wheel, these are:

Em Filters4/8:

and

EmOffset:

After these values are entered, you are prompted for the offset value of the Neutral Density wheel.

NdOffset:

Enter the value that was supplied with your excitation source.

You are next prompted to select the operating mode of the filter wheels, starting with the excitation filter wheel.

1Spin 2Fix 3Mix

Sel EX:

The only valid entries are 1, 2 or 3. This entry determines the operating mode of the excitation filter wheel. These modes are discussed in a previous section of this chapter.

If either Spin or Fix is selected, you are then prompted for the same selection for the emission filter wheel.

1Spin 2Fix 3Mix

Sel EM:

If Mix is selected, however, then the Mixed mode is automatically selected for the emission wheel. This selection is automatic since both the excitation and emission filter wheels must both operate in the Mixed mode. Further details of the Mixed mode are discussed below.

If the Spin or Fixed mode is selected for the excitation or emission filter wheel, the user is prompted to enter the spin aperture time and the fixed wheel position. The prompts for these entries are:

SpinApTime:

Fix ExFilter:

Fix EmFilter:

The user is prompted for the appropriate entry for the excitation wheel first, followed by the entry for the emission wheel. The spin aperture time is the duration of time, in milliseconds, that the filter wheel is in the light path while the filter wheel is spinning. This speed also determines the rate of data collection when the RS-232 Controller is used in conjunction with data acquisition software provided by C&L Instruments.

The valid entries for **Fix ExFilter:** and **Fix EmFilter:** can be either 1 to 4 or 1 to 8, depending on the type of filter wheel (either 4 or 8 position) entered in response to the earlier prompts. If the excitation and emission filter wheels are different types, then they cannot be both programmed to spin simultaneously. For this reason, the user is encouraged to use the same type of filter wheel (either 4 or 8 position) in both the excitation and emission optics. If the spin mode is selected for both filter wheels after different types of filter wheels have been entered, the following error message will be displayed when the Controller attempts to initialize the hardware.

Diff ExEmFilters

Press CLR

If valid choices of Fixed and Spin are entered for the excitation and emission wheels, the user is then prompted to select the state of the Neutral Density wheel. This setting determines the output intensity of the illumination source. This feature is designed for when the Controller is used with the C&L Instruments Model S48D Illumination Source.

Fix NdPos:

Valid entries are between 1 and 100. An entry of 100 indicates full illumination (i.e., 100%) and an entry of 1 indicates minimal illumination.

After the filter wheel modes and the Neutral Density wheel are programmed, the user is prompted to select the state of the excitation and emission shutters. These prompts are as follows.

1 Close 2 Open

ExShutter:

and

1 Close 2 Open

EmShutter:

Select the initial state of the excitation and emission shutters. These commands work together with the two toggle switches on the front panel that can also be used to control the shutters. If the shutter is programmed to be closed (choice 1), then the state of the shutter can also be controlled with the toggle switches on the front panel. If the shutter is programmed to be initially open, the toggle switches on the front panel are disabled. In other words, either the panel or the toggle switch can be used to open the shutter, but they both have to be set to the closed position to close the shutter.

If the Mixed mode is selected, the programming sequence is slightly different from when either the Spin or Fixed mode is selected.

To enter the Mixed mode, select Mixed when prompted for the mode of the excitation filter wheel. After this selection, you are prompted to chose between either Internal or External triggering for the signal used to change the position of the filter wheels.

1IntTri 2ExtTri

Sel:

If internal triggering is selected, you will be prompted for the dwell time of each filter wheel position. The dwell time is the duration of time that the filter wheel is held in a programmed stationary position before moving to the next programmed position. This is discussed in further detail below.

If external triggering is selected, the filter wheel is repositioned to the next programmed position only when an external TTL signal is received by the TTL input. External triggering is discussed in more detail in a later section of this chapter.

After the choice between internal and external triggering has been made, the user is prompted to select how many different positions will be used in the programming loop. These positions are combinations of excitation, emission and neutral density positions that are programmed to change in a continuous loop. For instance, the excitation filter position 3 can be programmed to align with emission filter position 2 while using the neutral density setting of 80. Another combination can be used and the two different settings will loop continuously. Up to eight different settings can be programmed to sequence in this loop fashion.

MixLoop Filters:

Sel:

Valid entries are between 1 and 8. The user is then prompted to enter all the excitation positions followed by the emission positions. If two Mix Loop Filters are selected, the prompts will be:

Mix1ExFilter:

Mix2ExFilter:

Mix1EmFilter:

Mix2EmFilter:

Valid entries are either 1 to 4 or 1 to 8, depending on the type of filter wheel programmed in an earlier prompt. Two different types of filter wheels (i.e., 4-position and 8-position) can be used in the Mixed mode. Invalid entries are ignored.

After the positions are programmed, the dwell time setting for each position is entered. This prompt is only given when the Internal Triggering is selected. If two Mix Loop Filters are selected, the prompts will be:

1Dwell Time:

2Dwell Time:

This is the duration of time in milliseconds that the filter wheel will be stationary before moving to the next programmed position.

The user is then prompted for the position of the neutral density wheel. If two Mix Loop Filters are selected, the prompts will be:

Mix1Nd Pos:

Mix2Nd Pos:

Valid entries are between 1 and 100. An entry of 100 indicates full illumination (i.e., 100%) and an entry of 1 indicates minimal illumination.

The final setting to program the Controller to operate in the mixed mode is the state of the excitation and emission shutters.

1 Close 2 Open

ExShutter:

and

1 Close 2 Open

EmShutter:

If closed is selected, the shutter will remain closed while the filter changes position. Once in position, you can use the manual switches on the front panel to open the shutter and reclose the shutter, if desired. If you select option 2 (open), the shutter will remain closed while the filter changes position and will then open when the filter is in position. If the shutter is programmed in the open position, you cannot override that selection with the front panel shutter switches. In other words, either the panel or the toggle switch can be

used to open the shutter, but they both have to be set to the closed position to close the shutter.

When you press **ENTER** after selecting a shutter position, the program begins to execute. The display shows the filter positions and the operating mode. You can stop execution by pressing the **CLEAR** button. The program will not stop until after the current operation is completed. Pressing the **CLEAR** button a second time bring up a menu for the user to chose one of three options.

1Cont 2Set 3Exit

Sel:

Selecting 1 (Continue) will place the Controller back into the last programmed settings. Selecting 2 (Set) will reset the Controller to the prompts for selecting the control mode for the filter wheels. Resetting the Controller in this manner will alleviate the user from having to reprogram the type of filter wheels and the offset values. Selecting 3 (Exit) will halt the system. After selecting Exit, the Controller must be reset using the Reset button to resume programming and operation of the controller.

Toggling between filter wheel and neutral density positions

When the excitation wheel is set to the Fixed mode using the front panel control, it is possible to toggle through all the filter wheel positions and neutral density settings using the keypad. The front panel will display the current mode and filter wheel positions. For instance, when the excitation and emission filters wheels are in the Fixed mode and are both positioned at filter 2, the display will read as follows.

Control Mode:

Ex:Fix2 Em:Fix2

To toggle the excitation filter wheel, use the **UP ARROW** and **DOWN ARROW** keys. The **UP ARROW** will increment the filter wheel position and the **DOWN ARROW** will decrement the filter wheel position.

To change the setting of the neutral density wheel, press the **2ND** key. The display will indicate the current setting of the neutral density wheel. For example, if the neutral density wheel is set to 2, the display will read as follows after pressing the **2ND** key.

Control Mode: 02

Ex:Fix2 Em:Fix2

To toggle the neutral density setting, use the **UP ARROW** and **DOWN ARROW** keys. The **UP ARROW** will increment the neutral density wheel setting and the **DOWN ARROW** will decrement the neutral density wheel setting.

To return to option of toggling the excitation filter wheel position with the **UP ARROW** and **DOWN ARROW** keys, press the **HELP** key.

Using the TTL trigger Input

In addition to using the keypad, an external TTL input can be used to trigger the movement of the filter wheel(s) to the next programmed position when the Controller is in the Mixed mode. The rising edge of the external TTL input will trigger the change of filter wheel positions to the next position programmed into the Controller. Note that the filter wheels require between 60 and 90 milliseconds to reposition after a trigger pulse is received. Thus, it is best to wait at least 100 milliseconds between trigger pulses.

Manual Shutter Control

The C&L Dye Fluorometer contains two shutters, one in the excitation path (within the Model S48D Illumination Source) and one in the emission path (within the Detection Module). The shutter in the illumination source can be used to limit the exposure of the sample to light. The shutter in the D48 Detector Module can be used to limit the photomultiplier tube's exposure to excessive light. If the RS-DAQ Controller is used in the RS-232 mode with acquisition software provided by C&L Instruments, the shutters can be controlled through software.

The shutters can also be controlled using the toggle switches located on the front panel of the RS-DAQ Controller. The switches are labeled EX (for Excitation, i.e. the Illuminator) and EM (for Emission, i.e. the Detector Module). The up position is closed, the down position is open.

Programming using the RS-232 Interface

The RS-DAQ controller can be programmed with a computer using the provided RS-232 interface. A standard 9-pin DB-9 connector is supplied on the right side of the Controller for this purpose. The serial interface is 8 data bits, no parity and 1 stop bit. The data transfer rate is 57600 baud. If a different baud rate is required, contact C&L Instruments.

If you wish to use the RS-232 capabilities of the Controller with your own software, you may use these commands to control all the functions of the RS-DAQ Controller. You may also purchase software from C&L Instruments.

Control Language and Syntax

Note:

1. All Commands start with a space before the command and end with a Carriage-Return.
2. All Commands are case sensitive.
3. The Serial Port's settings are:

   Baud Rate: 57600

   Data Bits: 8

   Parity: None

   Stop Bits: 1

There are 8 system routines, as follows:

InitializeSystem

ResetMotors

ShutDownSystem

WheelIndex

WheelFixed

WheelSpin

ModeWheelDance

ShutterControl

These routines have the following function:

InitializeSystem:

Initializes the hardware

Example:

InitializeSystem()

ResetMotors:

Software reset of motors

Example:

ResetMotor()

ShutDownSystem:

Shuts down the hardware

Example:

ShutDownSystem()

WheelIndex:

Indexes the selected wheels.

Syntax: WheelIndex(wheels,ex_offset,em_offset,nd_offset)

wheels:

Wheels can be any of the following, to indicate a single wheel or multiple wheels:

Ex

Em

Nd

ExEm

ExNd

EmNd

ExEmNd

Xx_offset:

xx_offset sets the offset for the respective filter wheel. One unit of offset is equivalent to 1 part in 2048 positions of revolution. Thus, an offset value of 256 is an offset equivalent to 45 degrees of arc. Place dummy data into parameters that are not applicable.

Example:

WheelIndex(Ex,10,0,0)	:this will index the excitation wheel
	:Ex offset of 10
	:Em offset dummy data
	:Nd offset dummy data
WheelIndex(ExEmNd,1,-2,3)	:this will index the excitation, emission, and neutral density wheels
	:Ex offset of 1
	:Em offset of -2
	:Nd offset of 3

WheelFixed:

WheelFixed(wheels, Ex 4/8 Filters, Ex Filter Position, Em 4/8 Filters, Em Filter, Nd Position).

This command moves the selected wheels to a filter position (Ex and Em) or position (Nd)

Wheels can be any of the following:

Ex

Em

Nd

ExEm

ExNd

EmNd

ExEmNd

Ex 4/8 Filters selects the type of Ex filter wheel

Ex Filter Position selects the Ex filter to move to

Em 4/8 Filters selects the type of Em filter wheel

Em Filter Position selects the Em filter to move to

Nd Position selects the Nd position to move to

Place dummy data into parameters that are not applicable

Example:

WheelFixed(ExEmNd,8,1,4,2,0)	:Ex wheel has 8 filters - move to filter 1
	:Em wheel has 4 filters - move to filter 2
	:move Nd to position 0
WheelFixed(Ex,8,2,0,0,0)	:Ex wheel has 8 filters - move to filter 2
	:Em dummy data
	:Nd dummy data
WheelFixed(Nd,0,0,0,0,1024)	:Ex dummy data
	:Em dummy data
	:move to Nd position 1024

WheelSpin:

WheelSpin(wheels,number_of_filters,spin_aperture_millisec)

Spins the selected wheels at a constant aperture. Wheels can be any of the following:

Ex

Em

ExEm

number_of filters corresponds to the number of filters in the spin wheel

spin_aperture_millisec corresponds to the spin aperture given in milliseconds

Example:

WheelSpin(Ex,4,10)	:spins the 4 filter Ex wheel at 10mSec aperture
WheelSpin(ExEm,8,10)	:spins the 8 filter Ex wheel and em wheel at 10msec aperture

ModeWheelDance:

Synchronized movement of the filter wheels with a specific dwell time for each filter position.

ModeWheelDance(ex_numberoffilters,em_numberoffilters,

filterpos1_ex,filterpos2_ex,filterpos3_ex,filterpos4_ex,

filterpos5_ex,filterpos6_ex,filterpos7_ex,filterpos8_ex,

filterpos1_em,filterpos2_em,filterpos3_em,filterpos4_em,

filterpos5_em,filterpos6_em,filterpos7_em,filterpos8_em,

pos1_nd,pos2_nd,pos3_nd,pos4_nd,pos5_nd,pos6_nd,pos7_nd,pos8_nd,
dwelltimepos1,dwelltimepos2,dwelltimepos3,dwelltimepos4,
dwelltimepos5,dwelltimepos6,dwelltimepos7,dwelltimepos8)

Passing Arguments:

ex_numberoffilters:	number of filters in Ex wheel
em_numberoffilters:	number of filters in Em wheel
filterposX_ex:	position X Ex filter 1-4 for four filter wheel
	position X Ex filter 1-8 for eight filter wheel
filterposX_em:	position X Em filter 1-4 for four filter wheel
	position X Em filter 1-8 for eight filter wheel
posX_nd:	position X Nd position
dwelltimeposX:	position X dwelltime in seconds

Example:

ModeWheelDance(8,4,1,2,3,4,5,6,7,8,1,2,3,4,1,2,3,4,100,200,300,400,500,600,700,800,1,1,1,1,1,1,1,1)

: 8 filter Ex wheel, 4 filter Em wheel

pos	Ex filter	Em filter	Nd filter	dwell time
1	1	1	100	1
2	2	2	200	1
3	3	3	300	1
4	4	4	400	1
5	5	1	500	1
6	6	2	600	1
7	7	3	700	1
8	8	4	800	1

ModeWheelDance(8,4,1,8,0,0,0,0,0,0,1,2,0,0,0,0,0,0,100,200,0,0,0,0,0,0,2,3,0,0,0,0,0,0)

: 8 filter ex wheel, 4 filter em wheel

pos	Ex filter	Em filter	Nd filter	dwell time
1	1	1	100	2
2	8	4	200	3

loop

ShutterControl:

ShutterControl(ex_open_notclose, em_open_notclose)

ShutterControl opens and closes the shutters.

Passing Arguments:

ex_open_notclose:	0 - close Ex shutter
	1 - open Ex shutter
em_open_notclose:	0 - close Em shutter
	1 - open Em shutter

Example:

ShutterControl(1,0)	Open Ex Shutter, Close Em shutter

Acquisition of Fluorescence Data

The RS-DAQ Controller is capable of acquiring fluorescence data. TTL counts from a photon-counting photomultiplier is input into the controller using the BNC connector labeled **PMT Input** located on the left side panel. The minimum pulse width must be 20 nanoseconds. The Controller contains eight separate 16-bit pulse counters.

Data from the pulse counters can be transferred to a host computer using the RS-232 interface. When used with accessory data acquisition software provided by C&L Instruments, fluorescence “counts” supplied to this input can be acquired with RS-DAQ Controller. For further information about using this feature with your own software, contact C&L Instruments.

Acquisition of Analog Data

Along with the acquisition of fluorescence data, the C&L Dye Fluorometer is able to monitor and record external events through acquisition of analog data. Inputs are provided for acquisition of up to eight analog channels. Data can be acquired within an input range between 0 and 5 Volts. The Model RS-DAQ Controller is equipped with a 10 bit analog-to-digital converter, providing a resolution of 4.9 mVolt. This feature gives the user the ability to record events that may be occurring simultaneously with the recording of fluorescence data. This may include, but is not limited to, the recording of data from patch clamp instruments, flow meters, and other sensors.

When used with accessory data acquisition software provided by C&L Instruments, analog data supplied to these inputs data can be acquired with RS-DAQ Controller. For further information about using this feature with your own software, contact C&L Instruments.

Chapter 5: Maintenance and Service

System Controller

The Controller itself has no maintenance requirements.

Power supply

The 5Volt power supply is a universal input desktop supply and does not require service or maintenance. It is designed for use in controlled office environments only: Ambient temperature 40°C (max), relative humidity 85% (max). The power plug type is outside neutral, inside hot. Do not use any other type of power supply. The power supply requires an external ground. The line cord supplied includes the ground wire connection. Do not attempt to defeat this feature. If you need to replace the cord (for example if you need a European style cord), use a suitable type with a ground wire connection.

Service

If you believe your RS-DAQ requires service, contact C&L Instruments to discuss the return of the Controller. C&L Instruments will provide shipping instructions and a return authorization RMA number. Units must be shipped prepaid to C&L Instruments. Units returned to C&L Instruments without prior authorization and an RMA number will be returned unopened.

If you purchased your RS-DAQ Controller from a Distributor and not directly from C&L Instruments, contact the Distributor to arrange for service.

You can contact C&L Instruments by telephone or email (support@fluorescence.com).

C&L Instruments, Inc.
314 Scout Lane
Hummelstown, PA 17036
USA

Telephone: 717-566-3642
Fax: 717-566-3643

Chapter 6: Agreement, License and Warranty

Agreement and License

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Should you have any questions concerning this agreement, you may contact C&L at 314 Scout Lane, Hummelstown, PA, USA, 717-566-3642.