

User Guide

COSE 90ST/120ST Lens



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1 About this guide

This document is divided into the following chapters:

Chapter 1, "About this Guide".

Chapter 2, "Introduction" describes the purpose and scope of this guide.

Chapter 3, "Describing the System", details the purpose of the COSE lens.

Chapter 4, "Installing the COSE 90ST/120ST", describes how to install and connect the lens.

Chapter 5, "Using your COSE Lens", describes how to use the features of the lens and the COSE Controller software.

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1.1 Who Should Use It

This guide is intended for installers and users of surveillance systems who wish to incorporate a COSE 90ST/120ST lens in their system.

Installers: System installers can learn how to mount COSE 90ST/120ST to an appropriate camera system and how to integrate the lens with a standard PELCO protocol based control system.

Users: System users can learn how to operate and control the COSE 90ST/120ST lens using the provided software.

This guide assumes that you have some knowledge of surveillance systems, Pan/Tilt/Zoom cameras and their control systems, and the Windows operating system.

1.2 Typographical Conventions

This document uses the following typographical conventions:

Command and option names appear in **bold** type in definitions and examples. The names of directories, files, machines, partitions, and volumes also appear in bold.

Variable information appears in *italic* type. This includes user-supplied information on command lines.

Screen output and code samples appear in monospace type (Courier).

In addition, the following symbols appear in command syntax definitions.

Square brackets [] surround optional items.

Angle brackets < > surround user-supplied values.

Pipe symbol | separates mutually exclusive values for an argument.

2 Introduction

2.1 Purpose

The purpose of this document is to describe how to install and operate surveillance systems which include a Compact Optical Scanning Enhanced (COSE) pinhole lens.

COSE lenses use a patented internal optical scanning arrangement to provide pan, tilt and zoom (PTZ) capability with no external moving parts, allowing them to scan and zoom onto any target subject within the instantaneous field of view of the lens.

COSE lenses can be installed on a range of standard surveillance cameras, and can be easily integrated with industry standard PTZ control systems. As well as describing how to set up and install the COSE lens, this guide also describes controlling the operation of the COSE lens using the provided software.

2.2 Scope

This document describes installing COSE using the optional installation toolkit available from Claresys Ltd. It also describes operating the COSE lens using the example software provided free with the lens. However there are many alternative installation techniques and configurations which would work for COSE. There are also many “off-the-shelf” PELCO based control systems that can be used to control the COSE lens. This guide does not cover these many alternative installation and operation situations. However where possible general principles are identified to help installers and users to complete a successful installation.

If you wish to discuss a particular installation issue not covered in this guide please email support@claresys.com.

3 Describing the System

3.1 Key Features

Previous pinhole PTZ solutions require the camera to be moved behind the pinhole to face the point of interest. The COSE lens uses a patented arrangement of prisms to allow it to optically scan and zoom over its entire field of view, allowing it to remain stationary behind the entrance pupil.

The internal pan and tilt mechanism is based on a pair of Risley prisms.. The zoom uses a mechanically compensated scheme, developed to ensure the smallest possible volume and improved image quality over a digital equivalent.

By using an optical solution the quality of image obtained is significantly greater than with solutions based on scanning only a portion of the sensor image (i.e. digital PTZ). An additional benefit of the COSE design is the ability to stand the lens off from the pinhole by up to 2mm with no loss of field of view.

As the COSE lens remains stationary, the size of the aperture required to mount the lens can be up to 10x smaller than conventional moving pinhole lens arrangements. The pinhole size required for the COSE lens is usually also smaller than that required by traditional moving lens solutions. This translates directly into increased ease of installation and reduced chance of detection.

The COSE lens uses the industry standard Pelco D protocols over RS422/RS485, RS232 or USB depending on interface cable selected. Optionally, a version of firmware can be installed that uses Sony's VISCA protocol. COSE is equipped with a standard C mount and is designed to operate with a low light 1/3" sensor such as a Sony ExView.

3.2 System Components

COSE lenses are supplied with the following additional components:-

- A choice of interface cable (RS422/485, RS232 or USB)

- A CD containing Windows software for controlling the COSE lens; and drivers for the USB cableset.

The following additional system components are required to establish a complete COSE based surveillance system:-

- A suitable analogue or digital camera capable of taking C-mount lenses with a minimum of a 1/3" sensor size (see Section 4.2);
- If not being powered by USB, a nominal 12V power supply (see Section 4.3);
- A control system capable of generating PELCO D control signals to the COSE (such as the provided Windows software - see section 4.3), or similar if using VISCA;
- A method of displaying the output from the camera for monitoring the observed scene (such as a video capture card).

3.3 Environment

COSE lenses are designed to operate in temperatures of between -20C to +50C and humidity of 5% to 95% (non-condensing). COSE lenses also meet IP65 when attached to a suitable camera.

Usage outside these limits is not recommended and correct operation cannot be guaranteed.

3.4 Specification

Feature	Value
Focal Length	28mm at full zoom
Field of View	90 degrees / 120 degrees
Pan and Tilt scan	81 degrees / 108 degrees
Stand off distance	2 mm
Zoom	x 10
Width	40 mm
Height	40 mm
Length	210 mm / 220 mm
Weight	TBA
Required aperture	1 mm
Camera mount	C Mount 1/3" Sensor
Resolution	> 570 TV Lines at wide angle > 200 TV Lines at full zoom and pan/tilt
Vignetting	50% at corners at wide angle

4 Installing the COSE 90ST Lens

4.1 Physical Installation

4.1.1 Site Survey

Prior to installation it is recommended a site survey is carried out to determine the optimum location for the lens and its associated camera assembly..

The lens is usually mounted in a hole drilled in an existing structure such as a brick or stone wall, or a stud partition wall. Claresys provide optional mounting kit parts to make it easier to install the lens, and to enable the lens to be easily and quickly moved between multiple surveillance locations.

Details of suggested installation techniques are given in the following sections.

4.1.2 Installation in Solid Walls

For installation in solid walls it is recommended to use a 48mm diamond coated core drill to remove a core from the wall. It is usually preferable to ensure that the hole is drilled perpendicular to the face where the pinhole will be located. Minor misalignment of up to 5 degrees can be tolerated if using the optional end cap, and up to 10 degrees if not using an end cap.

A core drill jig such as the one shown below can be used to align the hole.



The drilled hole should be lined with a length of NPS 1 1/2" SCH40 pipe or similar. Check the inside diameter of the specified pipe is no greater than 40.8mm. Alternatively Claresys supply a suitable liner pipe which can be cut to length using a standard pipe cutter.

It is recommended to use an end cap from the Claresys Installation kit to seal the "business" end of the pipe. End caps are available in a number of styles to support different make-good techniques (plaster, paper etc).

It is important that the tube is rigidly fixed in position to ensure that the lens cannot move in relation to the pinhole. In solid walls this is best achieved by cementing the tube and end cap in place. Alternatively, Claresys provides a flange which can be used to fix the pipe to the wall.

Warning: When the lens and camera assembly is fitted in the tube, it is very important that the lens is held in close contact with the end cap. If the lens is not in contact with the end cap vignetting and reduced performance will result.

4.1.3 Installation in stud partition walls

Basic installation is as for a solid wall, however care needs to be taken to make sure that the plasterboard is not damaged during the drilling process. If possible, it is preferable to fit the camera through a stud, in which case proceed as per solid wall installation. A perpendicular alignment is more critical and harder to achieve than in the case of a solid wall, so a jig may be required.

The drilled hole should be lined with a length of NPS 1 1/2" SCH40 pipe or similar. Check the inside diameter of the specified pipe is no greater than 40.8mm. Alternatively Claresys supply a suitable liner pipe which can be cut to length using a standard pipe cutter. It is recommended that the pipe extends out of the wall on the camera side to allow some support and fixings.

It is recommended to use an end cap from the Claresys Installation kit to seal the "business" end of the pipe. End caps are available in a number of styles to support different make-good techniques (plaster, paper etc).

Securing the tube in the wall to prevent movement is vital and can be achieved in various ways. If space allows, Claresys provides a flange which is attached to the pipe protruding from the wall with the provided jubilee clip, and this can then be secured to the wall with plasterboard fittings. Care needs to be taken when drilling the holes for the flange screws as the plasterboard will be weakened in the area of the large hole. At a minimum it must be ensured that the tube cannot be pushed further into the wall. This could be prevented by attaching a jubilee clip around the tube at the wall.

Warning: When the lens and camera assembly is fitted in the tube, it is very important that the lens is held in close contact with the end cap. If the lens is not in contact with the end cap then vignetting and reduced performance will result.

4.1.4 Plate Mounting

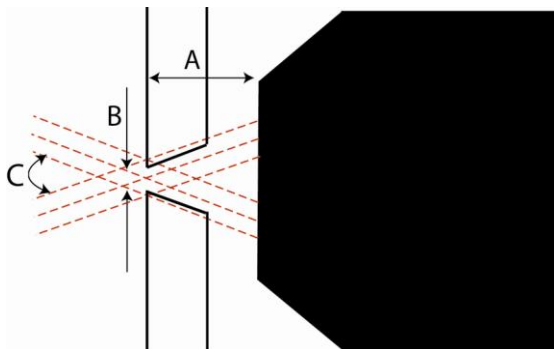
If the lens is to be mounted to a metal or plastic plate it is recommended to use the optional annular ring cap. This is designed to fit over the 20mm telescope portion of the lens and has the effect of making the unit a uniform 40mm cylinder. The annular ring cap can then be adhered to the plate using double sided tape or other adhesive. The COSE lens then slides into the annular cap. If the unit is used horizontally some additional support will need to be provided to take the bulk of the weight of the lens and the camera assembly.

Warning: The COSE lens must never be mounted with all its weight taken solely by the 20mm wide telescope element at the front of the lens.

4.1.5 Pinhole Shape

As COSE lenses have such a large field of view, it is possible for an incorrectly formed pinhole to cause unwanted vignetting. This is particularly a problem if the material in which the pinhole is made has any significant thickness.

The diagram below shows the optimum pinhole construction to ensure no vignetting. The sides of the pinhole must be tapered at an angle at least as great as the field of view of the lens (C). The distance from the front of the pinhole should be set to the stated stand-off distance for the lens (A) – usually 2mm. The pinhole (B) should have a minimum diameter of 1mm to ensure maximum light ingress without vignetting. Smaller pinholes are possible but will lead to a significant drop-off in brightness.



4.2 Camera Systems

4.2.1 Selecting a suitable camera

COSE lenses are designed to be used with C or CS mount cameras with 1/3" sensors. These can be either monochrome or colour visual range cameras. However it should be noted that due to the very small amount of light that enters the pinhole, if reasonable video frame rates are required it will be necessary to use a low-light camera. COSE does not include an iris, so cameras will need to have good autoexposure capability.

Good results have been obtained with the following cameras:-

- Watec 902H3 Ultimate
- Sony 1/3" EXview HAD based CCD cameras

4.2.2 Attaching the Camera

COSE lenses have rings to allow for the adjustment of back focal length and camera alignment. There are three rings. The ring nearest the camera is the Camera Alignment Lock ring. The middle ring is the Focus Adjust ring, and the ring furthest from the camera is the Focus Lock ring. See the diagram below.



Attach the camera to the lens as normal by screwing the lens onto the camera body. Loosen the Focus Lock and Camera Alignment Lock rings by inserting a 1.4mm allen key or similar in one of the blind holes in the ring and rotating while holding the other rings stationary. Back off both lock rings by the smallest amount to allow the focus adjust ring to turn easily. While observing the camera image, turn the Focus Adjust ring relative to the lens until the image is in best focus. Rotate the Focus Lock ring to lock the focus, being careful not to move the Focus Adjust ring at the same time.

Next, turn the camera until the top of the camera is aligned with the edge of the notch in the case nearest the cable outlet, which is Top Dead Centre. Note that COSE lenses present an uninverted image, unlike most camera lenses, so cameras are therefore usually installed in an inverted position when attached. Once the camera is aligned, lock the Camera Alignment Lock ring. This may result in a small change in focus, so it may be necessary to repeat the process to get best adjustment.

4.3 Control Systems

COSE lenses require to be connected to a controller to provide pan, tilt and zoom commands. They also need to be provided with power which is either a separate 12v DC supply or, if using USB via the USB bus.

By default, COSE lenses support a subset of the PELCO D protocol. A version of firmware that supports the VISCA protocol is also available. There are many controllers that are capable of generating PELCO or VISCA commands. The controller can be connected to the COSE lens over three different serial connections. These are described below. The COSE lens signal lead is terminated in a 4 pole IP65 compliant connector. This connects to one of three different cable sets depending on the serial connection and power requirement required.

4.3.1 RS422/485 Connection

The COSE controller uses RS485 as its default communications standard. COSE supports multi-drop connection, allowing one controller to control several COSE or other PELCO compliant PTZ systems. If you are using COSE in a multi-drop configuration, please ensure all devices are set to different unit address. For more detail see section 4.3.4.

Multidrop configurations are not currently supported when using Sony VISCA protocol.

To interface to an RS422 or RS485 controller, cable set part number CL485 is required. This connects at one end to the IP65 connector on the end of the COSE lens signal lead and at the other end provides a bare 2 wire connection for the RS422/485 signals and a power

socket for connecting to a standard 12v power supply (centre pin +ve). The RS422/485 wires should be connected to the terminal block on the controller as follows:-

Wire	Terminal Marking
Black	A or '-' or TxD-/RxD-
White	B or '+' or TxD+/RxD+
Gnd	Gnd or N/C

The baud rate supported by COSE is 9600 baud only. Please make sure you controller is set to generate Pelco D protocol at 9600 baud.

4.3.2 RS232 Connection

To connect a COSE lens to an RS232 based controller, such as a laptop or PC, cableset part number CL232 is required. This connects at one end to the IP65 connector on the COSE lens signal lead and at the other terminates in a male 9 pin RS232 connector and a power socket for connecting to a standard 12v power supply (centre pin +ve).

The baud rate supported by COSE is 9600 baud only. Please make sure you controller is set to generate Pelco D protocol at 9600 baud.

4.3.3 USB Connection

USB provides both serial control signals and power, and in computer based security networks is a simple way to control a COSE lens. Most computer based Pelco control software assumes that a standard serial port (e.g. COM port in windows) will be used. In order to allow a USB connected COSE to run with this standard software, drivers are available to map the USB port to a standard serial port.

To connect a COSE lens to a USB based controller, such as a laptop or PC, cableset part number CLUSB is required. This connects at one end to the IP65 connector on the COSE lens signal lead, and at the other end to a standard USB Type A connector. Power to the COSE lens is taken from the USB port.

Warning: As the COSE lens is powered from the USB port, only a full powered USB port or powered hub port should be used for this connection. A COSE lens represents one unit load / 100mA current draw.

Before using COSE over USB, driver software needs to be installed to create virtual serial ports. The driver software for windows is provided on the CD-ROM provided with the COSE lens. This driver, and drivers for other operating systems can also be downloaded from:-

<http://www.ftdichip.com/Drivers/VCP.htm>

Driver installation help is available here:-

<http://www.ftdichip.com/Documents/InstallGuides.htm>

4.3.4 Setting the Unit Address

Unlike many PTZ cameras, COSE does not have a switch-settable unit address. Instead the Unit Address needs to be set using the supplied software running on a Windows laptop and connected to the lens either via RS422/485, RS232 or USB.

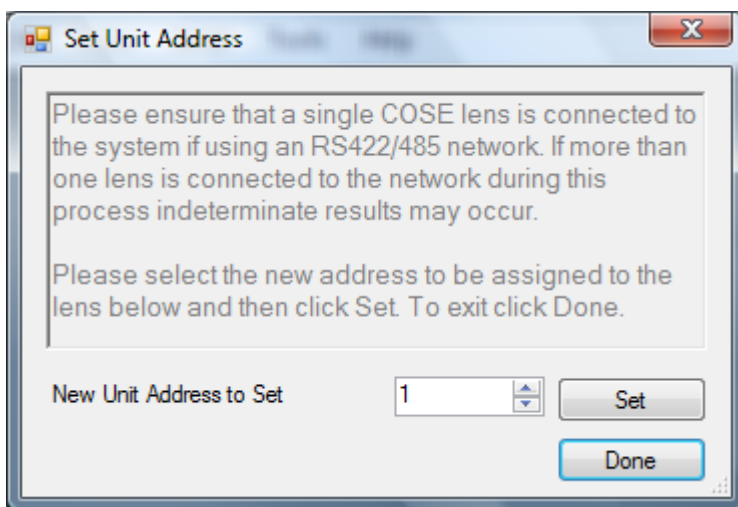
If using VISCA control, the Unit Address must be set to 1, as multidrop is not supported. This MUST be done BEFORE loading the VISCA software. To reset the Unit Address the unit must be in Pelco mode. If necessary reload suitable Pelco firmware to effect the change.

Instructions for installing the software are given in Section 4.4.

Warning: Setting the Unit Address can not be done when connected to a multidrop network. Ensure only one COSE lens is connected to the controller before attempting to set the unit address. Failure to ensure only one device is connected will cause indeterminate results and may lead to total loss of function requiring a return to factory repair.

In order to set the unit address:-

1. Launch the COSE Controller software
2. Select the COM port to which the lens is connected from the **Port** menu
3. Select **Set Address** from the **Tools** menu.
4. In the dialog box that appears, select the new unit address you wish to assign to the device.



5. Click **Set** to set the new unit address.
6. When you have set the new address, or to exit without setting a new address, choose **Done**.

If you wish to continue using the COSE Pelco Controller software to control your lens, you will now need to select the address you have newly assigned in the Address box situated on the main screen on the top right of the joypad control.

4.3.5 Uploading New Firmware

From time to time Claresys may issue new versions of lens firmware to correct problems and improve performance or functionality. These new versions will be downloadable from the Claresys web site at:-

<http://www.claresys.com/support>

New firmware can only be uploaded to the COSE lens using the supplied COSE Pelco Controller software running on a Windows PC and connected to the COSE lens by either RS422/485, RS232 or USB. Instructions for how to install the software are provided in section 4.4.

Warning: Once started, the uploading process must be allowed to complete. Only valid upload files should be used. Using an invalid file, or failing to allow the upload to complete may result in total loss of function requiring a return to factory repair.

Once you have downloaded new firmware then you can upload it to your COSE lens as follows:-

1. Unzip the firmware from the archive file download. The firmware file should have a .txt file extension.
2. Launch the COSE Pelco Controller software
3. Select the COM port to which the lens is connected from the **Port** menu
4. If you are uploading firmware to a device currently configured for Pelco control, Select **Upload Firmware – To Pelco Unit** from the **Tools** menu.
5. If you are uploading firmware to a device currently configured for VISCA control, Select **Upload Firmware – To VISCA Unit** from the **Tools** menu.
6. In the dialog box that appears, select the location of the unzipped .txt firmware file you have downloaded. If you wish to exit without uploading the firmware, click **Cancel** from the file selection dialog box.
7. Select **OK** to start the firmware upload. A progress bar will appear. This may take some time to complete. When the progress bar disappears, the upload has completed and the COSE lens should be reset by cycling the power to the unit.
8. Once started, **DO NOT** interrupt the upload procedure.

4.4 Installing COSE Pelco Controller Software

Claresys supplies COSE Pelco Controller software on a CD with each lens. This software operates on a Windows PC under Windows XP, Windows Vista or Windows 7. Earlier versions of Windows are not supported.

For equivalent free software using the Sony VISCA protocol visit:-

<http://j3soft.home.comcast.net/~j3soft/webcam/evi-d30.htm>

To install the COSE Pelco Controller software, insert the CD into the CD drive on your PC. Open the disc from **My Computer**. Open the **COSE Software** folder. Open the **COSE Pelco Controller** folder. Double click **Setup.exe** to start the installation. Follow the instructions on screen. When the installation is complete you will be able to run the software by selecting it from your Windows Programs menu.

5 Using Your COSE Lens

Once you have installed your COSE lens as described in Section 4, power up the lens, camera, control and display systems. You are now ready to use the internal pan, tilt and zoom, and preset capability of the lens.

5.1 Supported Pelco Commands

The following Pelco D commands are supported by the COSE lens (as specified by Pelco D Version 5.0.1 Dated 1 April 2008).

5.1.1 Standard Commands

Command	Effect	Byte	Bit	Speed
Zoom Wide	Zoom out	4	6	As set
Zoom Tele	Zoom in	4	5	As set
Down	Move Down	4	4	As set
Up	Move Up	4	3	As set
Left	Move Left	4	2	As set
Right	Move Right	4	1	As set
Open(#)	Selects Pan/Tilt mode	3	1	N/A
Close(#)	Selects RTheta Mode	3	2	N/A
Near(#)	Synchronise and go to centre	3	0	N/A
Far(#)	Set far right pan position	4	7	N/A

(#) These commands are used for Special COSE functions and not their equivalent Pelco function.

5.1.2 Extended Commands

The following additional commands are supported

Command	Code	Effect	Values
Set Preset	0x03	Record location in preset whose number given in Value	1-16
Clear Preset	0x05	Delete location in preset whose number is given in Value	1-16
Call Preset	0x07	Go to the location in preset whose number is given by Value	1-16
Preset Scan	0x47	This command tells PTZ to visit every defined preset for a given number of seconds (the number of seconds given in Value). Cancelled by issuing any motion command.	1-255
Remote Reset	0x0F	Resets and reboots the lens. Same as turning off and on.	N/A
Set Zoom Speed	0x25	Sets speed at which lens zooms in and out	0-3 (slowest to fastest)

5.2 Supported VISCA Commands

The following VISCA commands are supported by the COSE lens (as specified by the EVI-D30/D31 Command List manual).

5.2.1 Standard Commands

Command	Effect	Command	Options
CAM_Zoom Tele (Std)	Zoom in	81 01 04 07 02 FF	N/A
CAM_Zoom Wide (Std)	Zoom out	81 01 04 07 03 FF	
CAM_Zoom Tele (Var)	Zoom in	81 01 04 07 2Z FF	Z = 2-7
CAM_Zoom Wide (Var)	Zoom out	81 01 04 07 3Z FF	

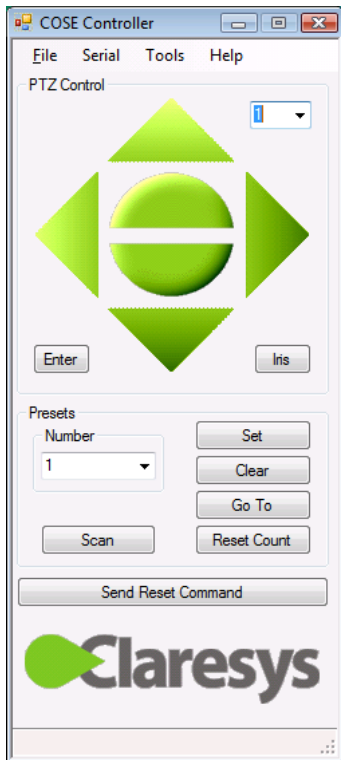
Pan-tiltDrive Up	Move Up	81 01 06 01 VV WW 03 01 FF	VV = Pan Speed (01 -08) WW = Tilt Speed (01-14)
Pan-tiltDrive Down	Move Down	81 01 06 01 VV WW 03 02 FF	
Pan-tiltDrive Left	Move Left	81 01 06 01 VV WW 01 03 FF	
Pan-tiltDrive Right	Move Right	81 01 06 01 VV WW 02 03 FF	
Pan-tiltDrive Up Left	Move Up left	81 01 06 01 VV WW 01 01 FF	
Pan-tiltDrive Up Right	Move Up Right	81 01 06 01 VV WW 02 01 FF	
Pan-tiltDrive Down Left	Move Down Left	81 01 06 01 VV WW 01 02 FF	
Pan-tiltDrive Down Right	Move Down Right	81 01 06 01 VV WW 02 02 FF	
CAM_Memory Reset	Reset preset	81 01 04 3F 00 0Z FF	Z = Preset No (0 – 5)
CAM_Memory Set	Set preset	81 01 04 3F 01 0Z FF	
CAM_Memory Recall	Go to preset	81 01 04 3F 02 0Z FF	
Firmware Load (#)		88 01 02 00 FF	

(#) These commands are used for Special COSE functions and not their equivalent VISCA function.

5.3 Setting up the COSE Controller Software

If you wish to use the supplied COSE Controller software, please install it as described in Section 4.4.

Launch the COSE Pelco Controller software from your Windows Programs menu. You will see a screen as shown below.

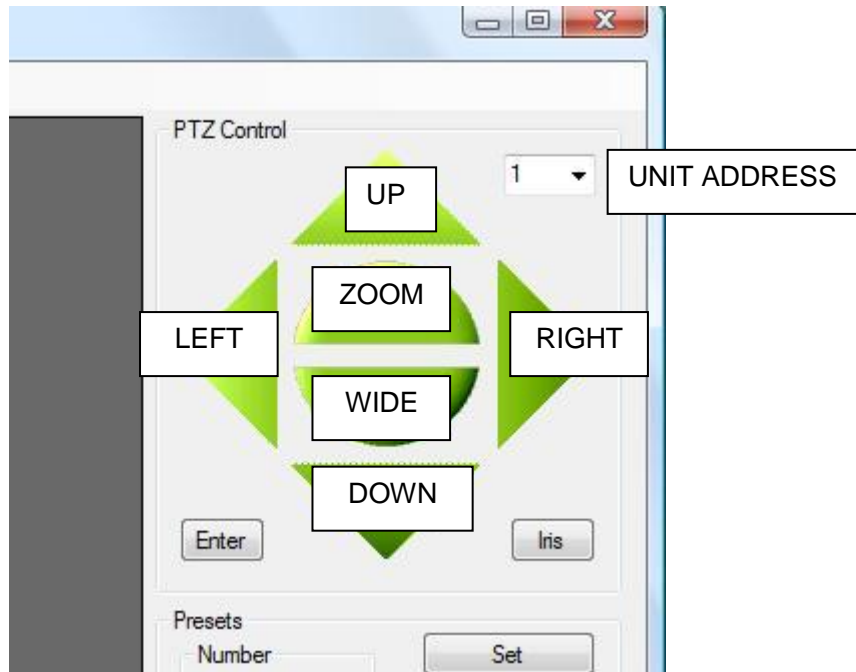


Before issuing PTZ commands you must select the COM port that you are using to communicate to the COSE lens. All COM ports on the system are listed under the **Serial** menu. Select the correct port from the list.

If you are using a USB connection (which utilises virtual COM ports), ensure that the connection is established and the COM ports are active before starting COSE Controller. If the virtual COM port is not shown under the Ports menu, check the COM port is showing in Windows Device Manager and then try restarting the COSE Controller application.

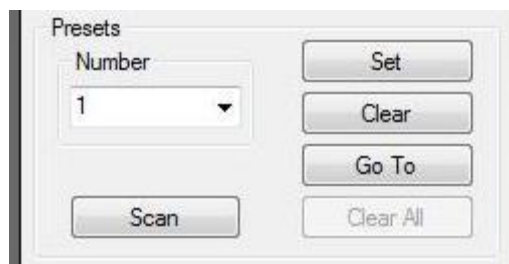
5.4 Sending Motion Commands

Select the Unit Address of the lens from the pop-up box in the top right of the motion button area. You can now enter motion commands by clicking the green buttons as shown below.



5.5 Using Presets

You can use the buttons in the Presets area to set, clear and go to preset locations.



To set a preset, move the lens to the correct location and zoom position using the motion buttons. Select the number of the preset you wish to set from the Number selector and then click **Set**. The COSE lens will then remember this location.

To clear a location, select the number from the selector and click **Clear**.

To go to a preset location, select the number and click **Go To**. If the preset has not been set nothing will happen.

To initiate a scan of saved preset locations, click the **Scan** button. The lens will then circulate between all the saved preset locations, stopping for 5 seconds in each location. To stop the preset scan, click any of the motion buttons.

5.6 To reset the Lens

To reset the lens, click the **Send Reset Command** button or select **Reset Lens** from the **Tools** menu.

5.7 Program Settings

COSE Pelco Controller can be used to control any Pelco-D PTZ device. To get optimum operation it may be necessary to vary some of the standard parameters used by the software. Some program settings can be altered by selecting **Settings** from the **Tools** menu in order to tune performance with non-COSE lenses.

Warning: Altering these settings may prevent the software from working correctly with COSE lenses. Do not change these unless you know what you are doing. If problems occur reset to the default values given below.

Default settings:-

Setting	Default Value
Baud Rate	9600
Motion Timeout (Motion Speed)	50 ms
Pelco Pan/Tilt Speed	10
Motion Timeout (Motion Tracking)	100 ms
RGB Boundary	10



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