



Canon® Lens Controller (LC-2)

Operation Manual (Version 2.6)



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Features

- Remotely control Canon® EF/EFS autofocus (AF) lenses
- Accurate control of Focus, and aperture
- Auto-detection of attached lens and F-number with included LC-2A-C/M42 lens adapter
- Interfaces for Ethernet
- Multiple devices can be connected and simultaneously controlled over a network
- Easy to use software interface
- Unlimited programmable preset capability to easily store and recall saved positions on the lens

Description & Specifications

Power	85-264V, 50-60Hz
Input	6V = 1.5A
Operating Temperature	0- 60 °C
Interface	Ethernet
Lens Adapter	M42, c
Lens inputs	1
Presets	Unlimited, programmable
Software	Windows GUI
Warranty	1 year
ECCN	EAR99

The ISSI Canon® Lens Controller (LC-2) is a control device for Canon® EF/EFS AF lenses. The LC-2 can operate most Canon® EF/EFS lenses. The device is operated via a graphical user interface and allows for preset positions of the lens to be saved and then recalled at any time. The presets will save the position of the focus and aperture. Since the LC-2 is an Ethernet device, it can be networked with other LC-2s or Ethernet devices. This makes communication and physical cable connections much simpler than traditional serial lens controllers and also allows them to be operated over a longer distance than serial devices. The IP address of the LC-2 can be configured to match the local network.

****Note****

Some Canon® lenses have are zoom lenses but they are not motorized zoom, only manual. For these lenses, the zoom is displayed in the interface but not controlled.

The LC-2 will connect with non-AF Canon® lenses but will only be able to control the aperture as they have no motor to control focus.

Connections

The Canon® lens control system consists of the control box (LC-2) and adapter (LC-2A-C/M42). The adapter should be selected to match the desired camera body connection.

LC-2 Control Box Back Panel

Power	Device is powered on
Ethernet	Ethernet communication connection

LC-2 Control Box Front Panel

Lens	Connection for LC-2A-C/M42 lens adapter
Reset	Reset switch

On the front panel, the power and Ethernet communication connections are made. The lens connection is located on the back panel. The side panel contains the reset switch for the device. If the IP address is changed and forgotten, the reset switch will set the device back to its default IP address of 192.168.2.252. Use a paper clip to reset the device, holding for 3 seconds. Restart the software and the LC-2 will connect with its default IP address.



Lens Connection / Reset



Ethernet / Power Connection



LC-2A-C Lens Adapter



LC-2A-M42 Lens Adapter

The lens adapters feature an EF lens mount on one side and the option of c- or M42-mount on the other. The EF side connects to the lens and the c/M42 side connects to the camera body.

The LC-2 is shipped with:

1. DC Power adapter
2. Ethernet cable
3. LC-2A-C/M42 lens adapter
4. LC-2 lens control box
5. M3 Toolkit for mounting
6. USB drive with software and instruction manual



Unboxing the LC-2 Lens Controller



Connection of LC-2 to Canon® EF Lens using LC-2A-C lens adapter on c-mount camera

The lens controller can be mounted using the provided M3 screw kit and wrench. Use a Cat5 or Cat6 Ethernet cable (provided) to connect to a PC network interface card or network switch. The lens adapter is supplied with a mini USB 2.0 connection to connect to the LC-2. The LC-2 is set up for universal power. The lens will have a red dot indicating the position of the lens to correctly install to the adapter. Line up the red dot on the lens with the one on the adapter, insert and twist until the lens locks in place. Connect the lens control adapter cable to the control box. This is a screw and lock connector. Rotate the plug on the receptacle until it lines up, then press and screw in until tight.

NIC Network Setup

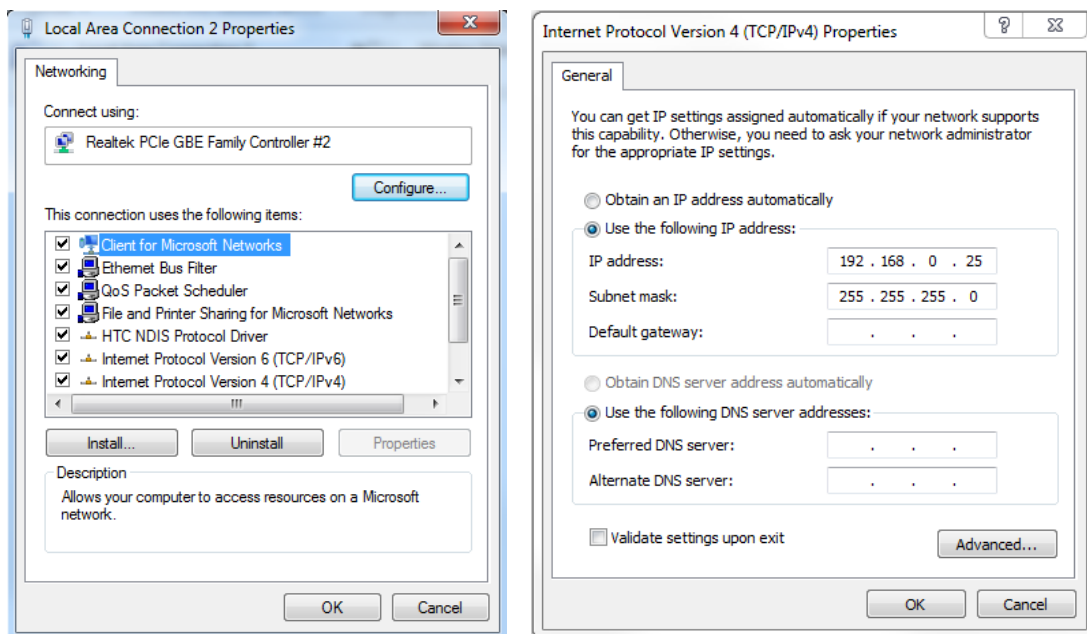
The network on the PC NIC (network interface card) needs to be properly configured for communication over the network. To do this, navigate to the '*Network Connections*' page on the control panel where the local networks of the computer is displayed. Right-click on the network where the LC-2 is connected and select '*Properties.*'

From the '*Local Area Connection X Properties*' window, click on '*Internet Protocol Version 4 (TCP/IPv4)*' and then press the '*Properties*' button, now useable. This will open the '*Internet Protocol Version 4 (TCP/IPv4) Properties*' window. This is where the IP addresses are entered so that LC-2 can be reached over the local network. The settings needed for communication are **IP Address** and **Subnet mask**.

The IP address of the NIC should use the following conventions:

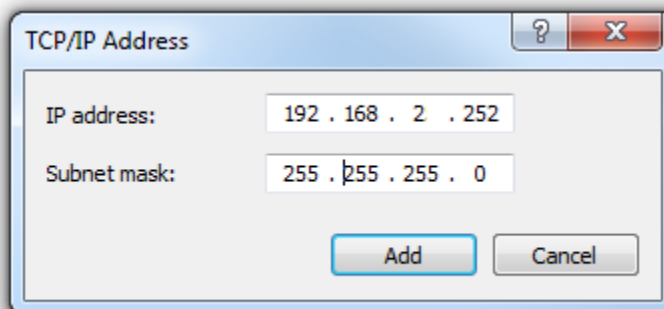
IP Format: **Network.Network.Subnet.Host**

- LC-2 IP: 192.168.2.252
- NIC IP: 192.168.2.XXX



The NIC IP address should have the same network and subnet addresses but a unique host, the last line of the IP address. The host can be any value 1-254 but different from the host address of the LC-2. The subnet mask should be set to match that of the LC-2 which, by default is 255.255.255.0. The **Default Gateway** and all other fields can be left blank.

Additional subnetworks can be configured for the same NIC. In the *'Internet Protocol Version 4 (TCP/IPv4)'* window, the **Advanced** button will open the *'Advanced TCP/IP Settings'* window. IP addresses of any subnetwork can be added for that NIC here. If multiple devices are being used on the same network and they have differing subnetworks, this option provides communication for all devices without the need to change IP addresses for each device.



If the lens controller is not connected properly a connection error (below) will be displayed. First, reset the device via the reset switch which will restore the default IP address.



If connection problems persist, check the connection of the Ethernet cable between the computer NIC and the LC-2. To check that there is a physical connection, ping the IP address of the LC-2 from the Command Prompt. To do this, open the command prompt window and enter:

Ping XXX.XXX.XXX.XXX -t

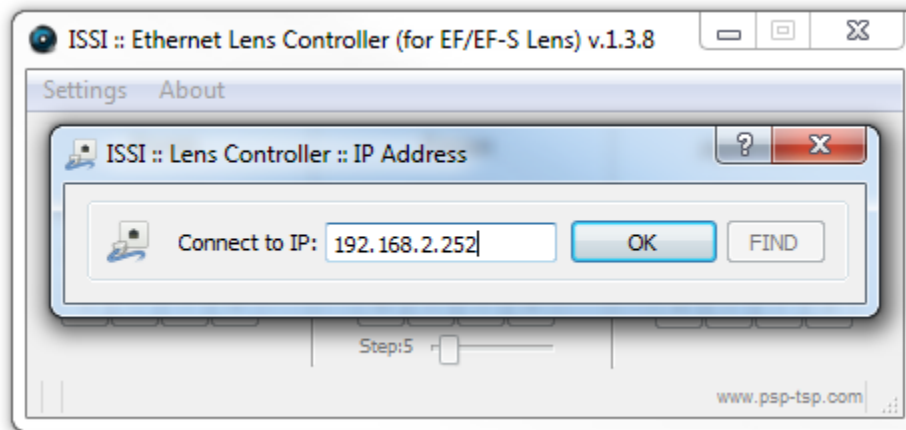
```
C:\Windows\system32\cmd.exe - ping 192.168.2.109 -t
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation. All rights reserved.

C:\Users\Steve>ping 192.168.2.109 -t

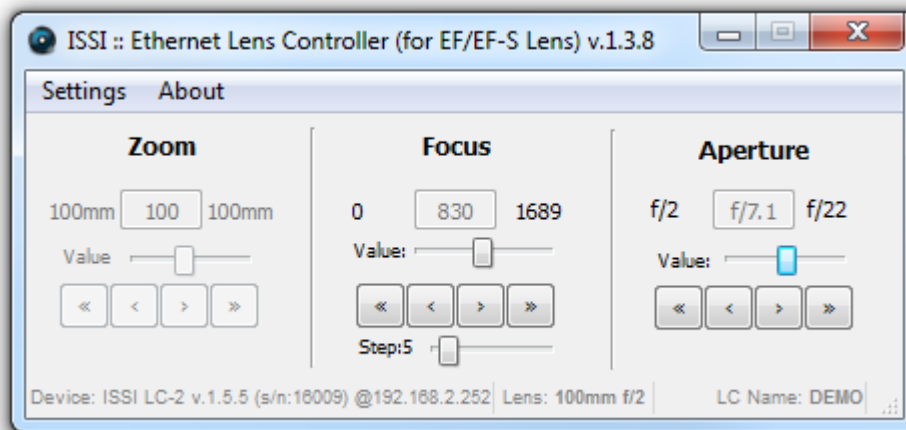
Pinging 192.168.2.109 with 32 bytes of data:
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
Reply from 192.168.2.109: bytes=32 time<1ms TTL=128
```

Software Operation

Open the software for the LC-2 from the desktop and it will ask for the IP of the connected LC-2. Enter the IP address of the LC-2 connected to the network.

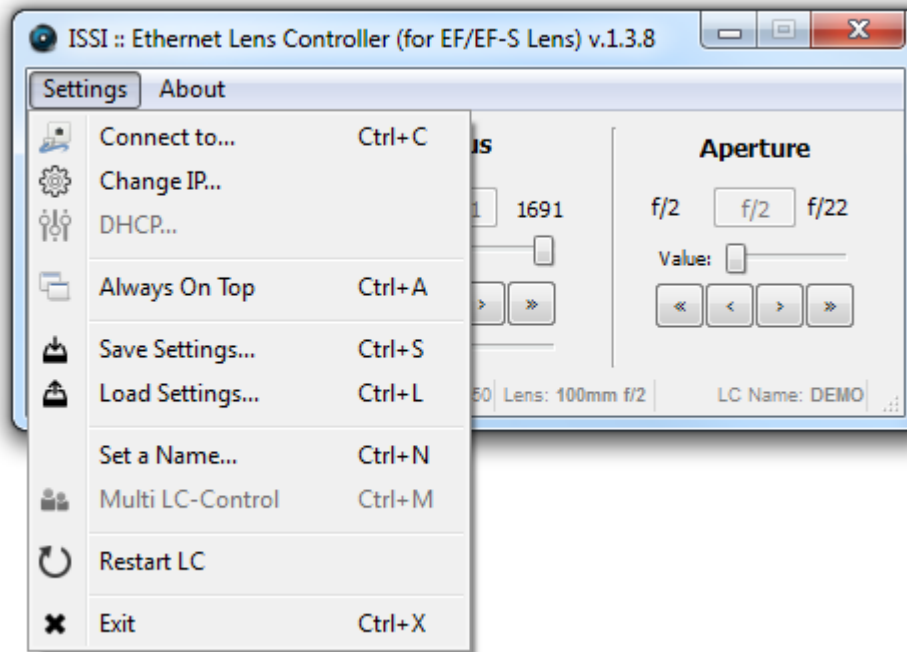


Once connected, the GUI will show the current position of each motor of the lens. When a new lens is connected, the lens controller will initialize the lens and learn the focus limits. The firmware version, serial number and IP address will be displayed in the bottom of the GUI. The lens information (focal length and F number) are displayed as well. To communicate with multiple LC-2s over this network (through a network switch), open up another instance of the program on the desktop.



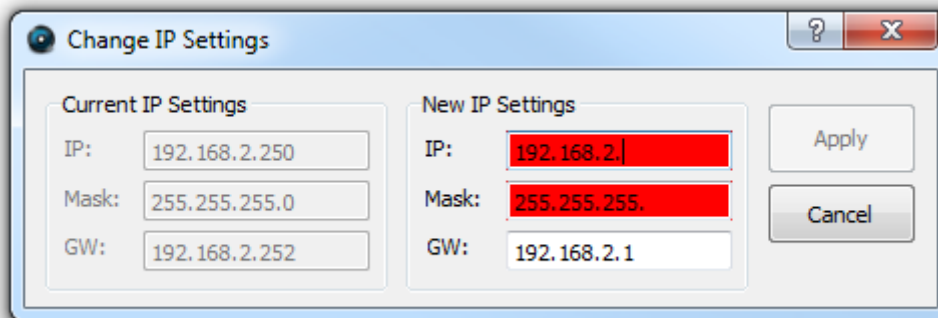
The user interface displays the current positions of the Focus and Aperture. There are two sets of arrows below this which are used to move the position of the motor. The single-arrow moves the focus one step increment and the double-arrow moves the focus 2x one step size for coarse

adjustments. Step size can be set from 1 to 50. The focus and aperture can also be moved to points within its range using the sliding adjustment labeled '*Value*'



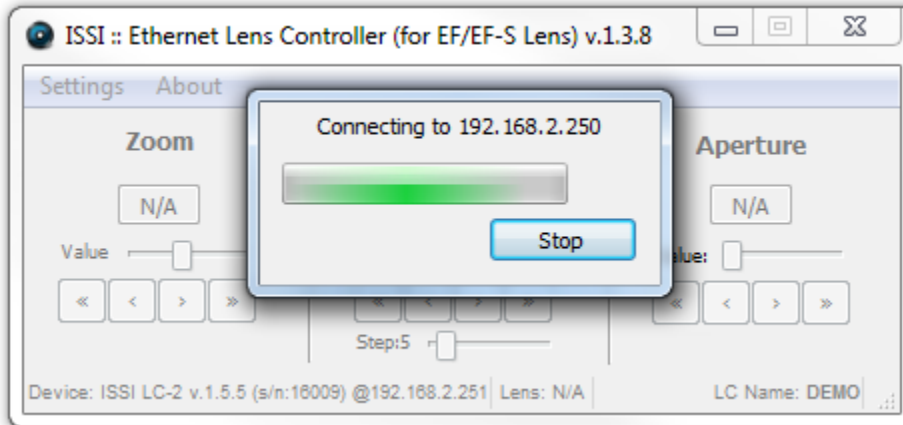
Upon opening, the motors of the lens will move through their minimum and maximum points to establish the limits. For the preset capability, this determines the minimum and maximum motor positions.

Once connected, the IP address, mask and gateway (if being used through a router) of the lens controller can be changed if desired. Under the **Change IP** window the settings can be updated. If networking multiple LC-2s the IP address of each must be unique.

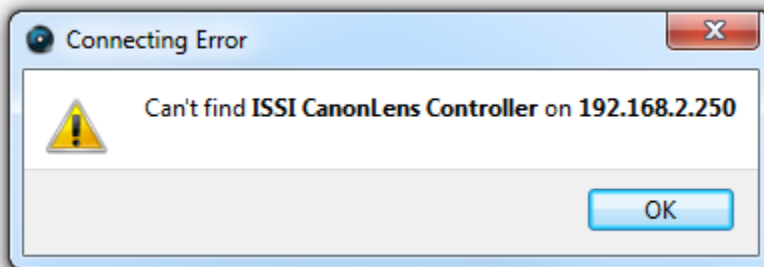


If the toolbar is red, that means it is not a valid IP address. Type in the desired IP address and click **Apply** to implement.

The new IP address will automatically be connected:



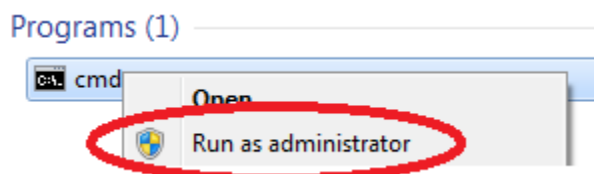
If the IP address does not change and the following message is displayed after the IP is changed, it may need to be run as administrator.



When the IP address is changed, the software will automatically attempt to switch communication to the new address. If it can't find that address, it is likely to be because the IP address previously used is stored on the computer and needs to be cleared before the new address can take hold. The timeout for this to occur by itself can sometimes be 10-20 seconds. To do this, there are two options:

1. Run the lens control software as the administrator
2. Clear the list of IP addresses in the computer through the command prompt (shown below):

Open the Command Prompt (Start > Search > cmd) as administrator:



Once the command prompt is open, type “**arp -a**” to display the IP address and Physical Address of all devices on the local network.

```

C:\Windows\system32\cmd.exe
C:\Users\Steve>arp -a

Interface: 192.168.1.25 --- 0xc
Internet Address      Physical Address      Type
192.168.1.1          6c-41-6a-48-78-2b    dynamic
192.168.1.2          6c-62-6d-a6-65-26    dynamic
192.168.1.3          14-18-77-6f-9d-76    dynamic
192.168.1.22         b4-b5-2f-d9-f3-4f    dynamic
192.168.1.30         14-dd-a9-d5-e8-9f    dynamic
192.168.1.32         00-1d-73-19-ef-86    dynamic
192.168.1.40         00-21-b7-ba-0a-84    dynamic
192.168.1.42         00-1e-c9-d5-05-91    dynamic
192.168.1.43         00-11-1c-f6-31-7b    dynamic
192.168.1.44         7c-05-07-8a-5d-d8    dynamic
192.168.1.48         c0-7c-d1-fc-98-68    dynamic
192.168.1.53         00-1f-bc-09-39-03    dynamic

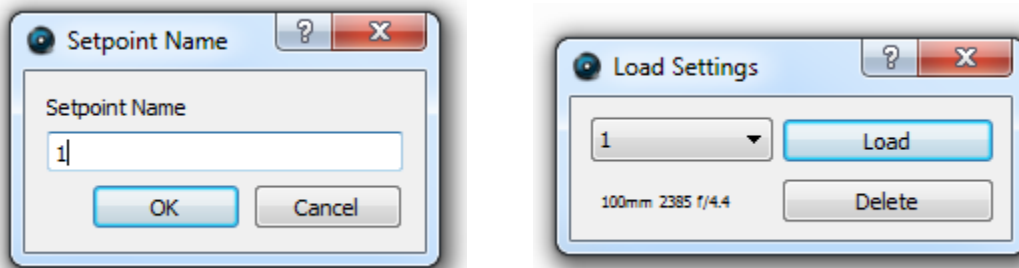
```

To clear the table so the lens controller IP is reset to the new address entered, type “**arp -d**”. Running the lens control software as administrator will automatically clear the ARP table.

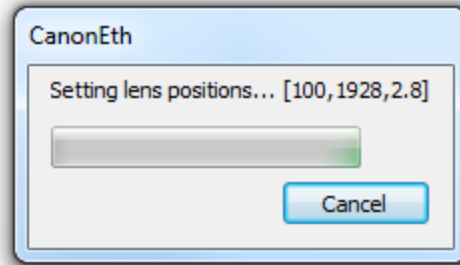
```
C:\Windows\system32>arp -d
```

Always on Top makes the LC-2 software always appear as the front window for all windows open on the desktop.

The save and load settings are used to save positions and recall them on each motor of the lens. When the lens parameters are at their desired location, those positions on each motor can be saved and later recalled. To save new settings, select **Save Settings** and enter a name for those lens settings. Settings are saved to the computer in which the interface is open, not the lens controller itself.



To recall those lens settings, select **Load Settings** and the lens will return each motor to those positions. The lens focal length, position of the focus motor and F number will be displayed for each saved set point.



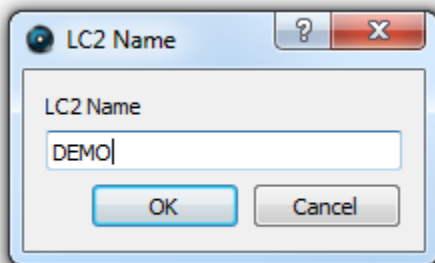
When the position of the lens is being set, the above status window will show the progress.

Keyboard Commands

For easier access to preset positions, keyboard commands can be used to recall saved positions. If a preset is saved with any single digit integer (0-9) it can be recalled by the command *Ctrl*+0, 2.....9. Individually recall these commands by holding down *Ctrl* then pressing the number of the preset. To recall these presets, they must have the name of the single digit integer being recalled.

For example, if a preset is saved as 1, then pressing *Ctrl*+1 will recall that preset.

Set Name will allow a device name to be entered for the connected lens controller. If multiple lens controllers are being used over the same network, this will aid in distinguishing them.



This name will then be displayed in the bottom right corner of the user interface.



Restart LC will perform a software reset. This should be used to fix connection problems or if the software becomes unresponsive.

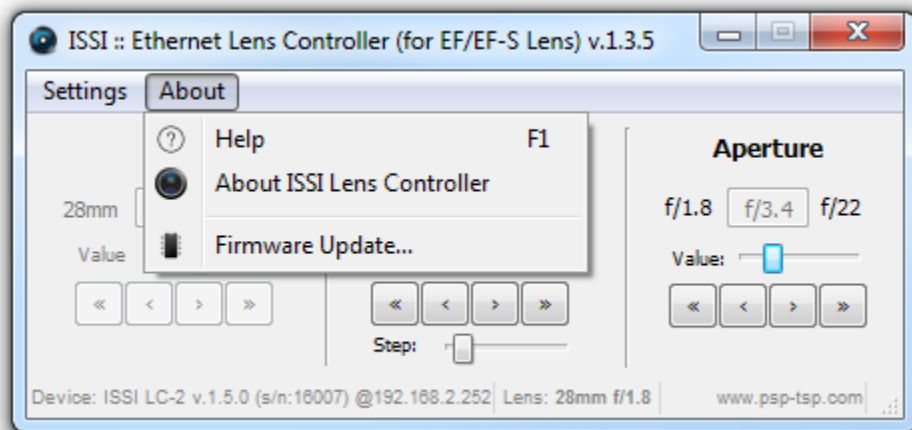
Exit will disconnect from the lens controller and exit the program.

Multi Control

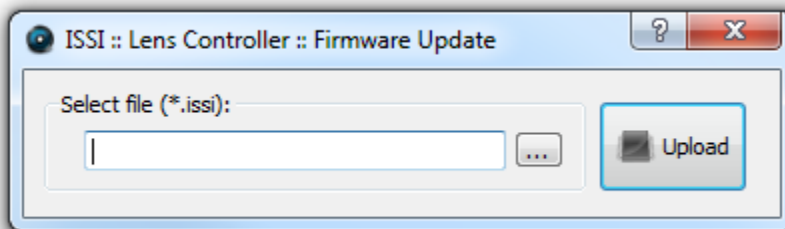
The *Lens Controller Interface* allows for master control of multiple LC-2s connected over a local network. This is only done through the ProAcquire Multi-camera add-on and is detailed in the ProAcquire user manual.

Firmware Upgrade

Firmware can be upgraded over the Ethernet connection. When a firmware update is available, download from the ISSI website (www.psp-tsp.com) and save. The firmware update tool can be found in the 'About' menu. Firmware updates will be issued if needed and will always be posted to the ISSI website under the ISSI products page in the download section for the LC-2.

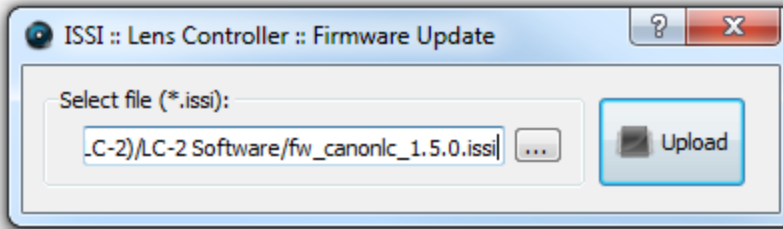


Click on *Firmware Update* to open the window to select the firmware file to upload.

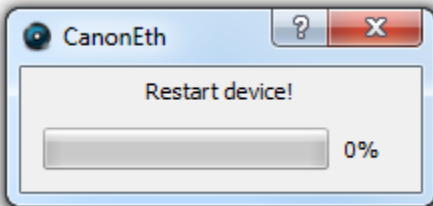


Select the file to upload.

Once the file is loaded into the Firmware Upload tool, click *Upload*.

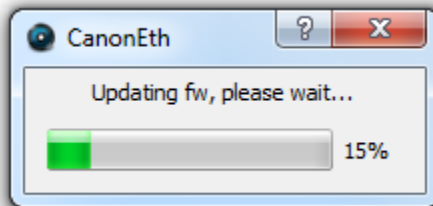


The following warning will appear to notify the user to cycle the power by the power connection before uploading the firmware update.

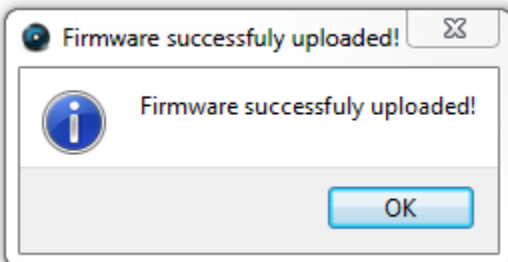


Restarting the power to the LC-2 will place it into firmware upgrade mode. Cycle the power and the firmware will be uploaded.

When the firmware is uploading the status will be displayed.



Once the firmware is successfully uploaded, the following message will appear.



Troubleshooting

The lights on the Ethernet port should be flashing if communication is established. If the device is locked and the lights are not flashing, it is locked in firmware upgrade mode.

If the lens controller firmware update fails to initialize, it may appear that the lens controller is locked and communication can't be established. Start by pinging the IP address in the command prompt to assure there is communication.



```
Pinging 192.168.2.251 with 32 bytes of data:
Reply from 192.168.2.251: bytes=32 time<1ms TTL=128
Reply from 192.168.2.251: bytes=32 time<1ms TTL=128
Reply from 192.168.2.251: bytes=32 time<1ms TTL=128
Reply from 192.168.2.251: bytes=32 time<1ms TTL=128

Ping statistics for 192.168.2.251:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

If there is no communication and a general failure message is displayed, there may be another issue like the Windows Firewall or antivirus blocking the program.

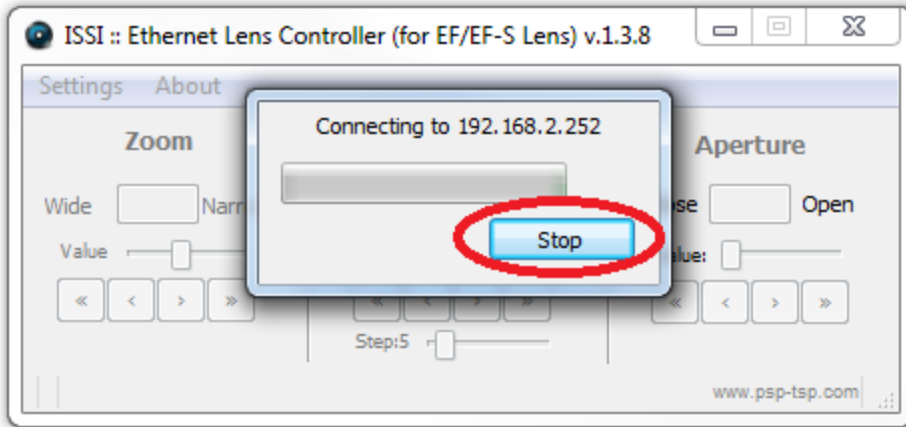
```
Pinging 172.0.0.21 with 32 bytes of data:
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.
PING: transmit failed. General failure.
```

The firewall or antivirus will either need to be turned off or an exception for the software will have to be made to allow it through.

In this case, try connecting to the lens controller in the software interface. It won't connect so press the **STOP** button.

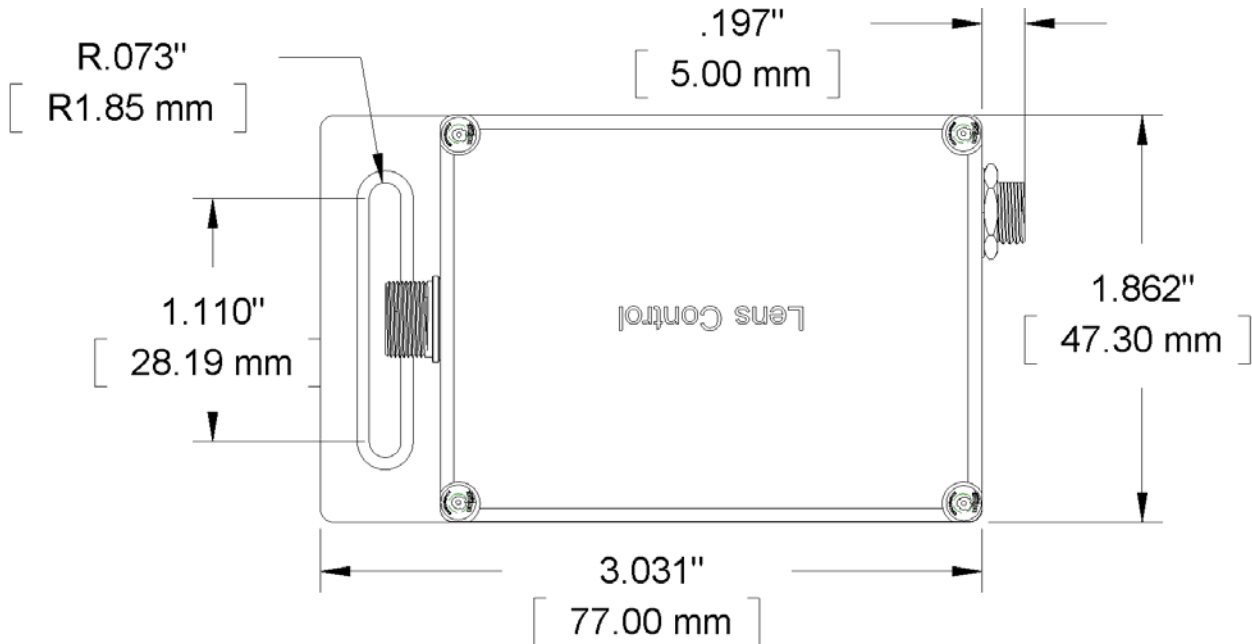
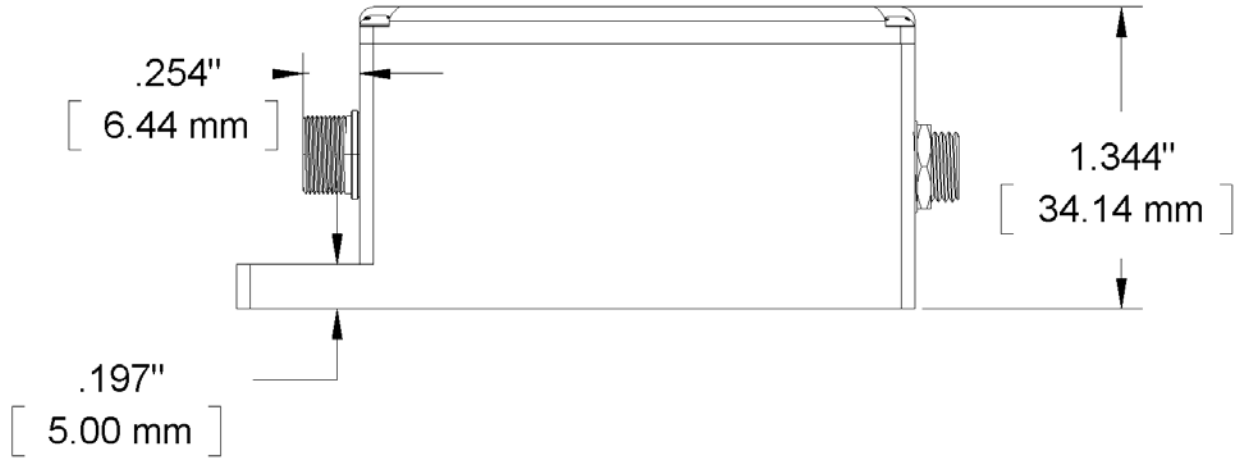
Another solution to communication issues is to clear the associated IP addresses to the LC-2. This problem can occur when the IP address is changed. There are two methods to clear the IP addresses.

- 1.) Run the lens control interface as administrator
- 2.) Open the command prompt (as administrator) and type "**arp d**".

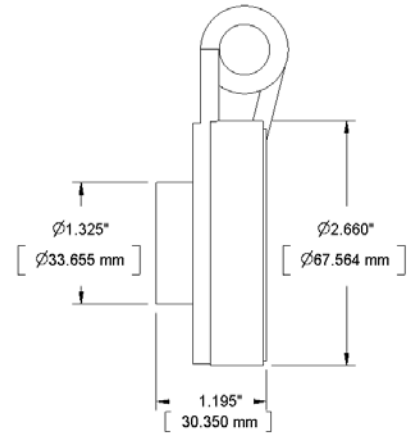
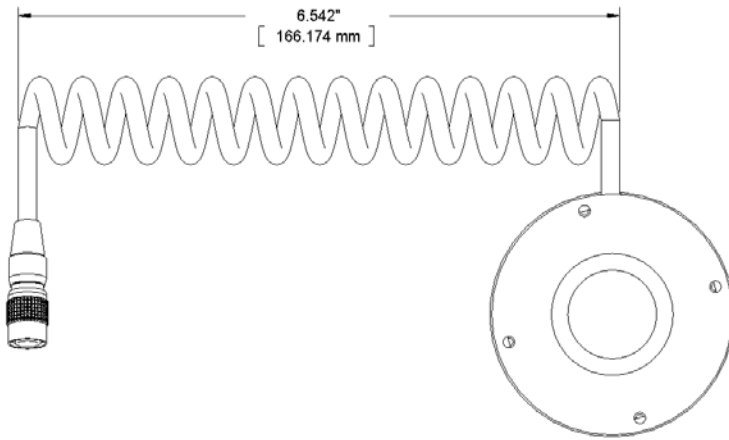


Next, go to the firmware update and load the firmware again. Even though the communication is not established with the software interface, it is still connected to the NIC, which means the firmware can still be updated. Once the firmware is uploaded, the controller should connect via the interface.

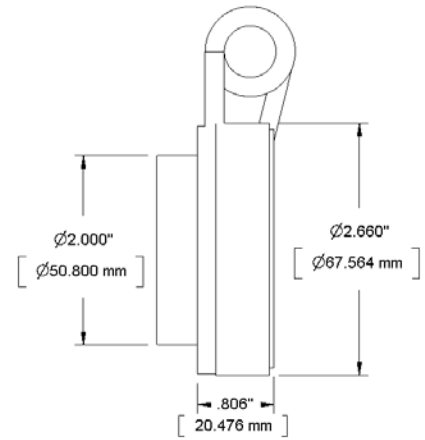
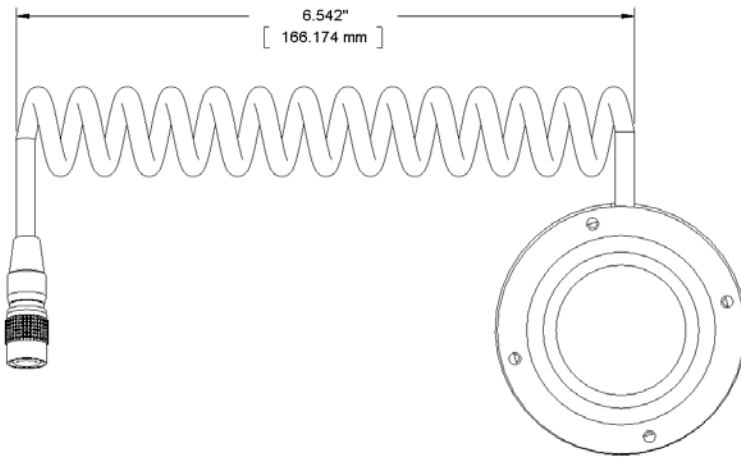
Dimensions



LC-2 Control Box



LC-2A-C Lens Adapter



LC-2A-M42 Lens Adapter

ISSI EF/EFS Lens Controller-2 :: API

Firmware version 1.5.2

API based on UDP protocol, 1339/UDP port is used for communication.

Action: Get controller f/w version

Command: “ver” (hex: 76:65:72)

Answer: “ISSI LC-2=1x.y (s/n:150xx)”

Action: Change controller IP address to 192.168.1.2

Command: “ChangeIP=192.168.1.2”

Answer: no answer, controller will set IP and restart

Action: Initialize lens, and get current motors values and ranges (aperture ranges would change when zoom changed),

Command: “ping” (hex: 70:69:6e:67)

Answer: contains 5 packets:

#1 “zRange=minX,maxX”

where *minX*– minimum zoom value, *maxX* – maximum zoom value

#2 “fRange=minZ,maxZ”

where *minY*– minimum focus value, *maxY* – maximum focus value

#3 “aRange=minY,maxY”

where *minZ*– minimum aperture value, *maxZ* – maximum aperture value

#4 “Current=XX,YY,ZZ”

where *XX*– current zoom value, *YY*– current focus value, *ZZ*– current aperture value

#5 “AF=X”

where *X* =1 if AF selected on lens and 0 if MF selected.

Action: Move Focus motor on X units

Command: “moveFocus=X”

where X could be as positive as negative values.

Answer: “Focus=Y”, where Y – current value of Focus motor

Action: Move Aperture motor on X step (one-quarter-stop f-number)

Command: “moveAper=X”

where X could be as positive as negative values.

Answer: “Iris=Y”, where Y – current value of Aperture

Action: Set desired value for Focus motor

Command: “setFocus=X”

where X is positive value

Answer: *Focus* =XXX, where XXX is the current value, and next packet “*focusDone*” - indicate that desired focus is set (for non USM lens could take more time)

Action: Cancel ‘setFocus’ command helps cancel unreachable focus value.

Command: “stopFocus”

Answer: no answer

Action: Set desired value for Aperture (in f-number)

Command: “setAper=X”

where X is in quarter-stop f-number scale

(1.0,1.1,1.2,1.3,1.4,1.5,1.7,1.8,2,2.2,2.4,2.6,2.8,3.1,3.4,3.7,4.0,4.4,4.8,5.2,5.6,6.2,6.7,7.3,8,8.7,9.5,10,11,12,14,15,16,17,19,21,22,0,25,27,29,32,35,38,41,45,49,53);

Answer: “Iris=Y”, where Y – current value of Aperture, if X is out of range will answer with current Aperture value.

Action: Set nickname for LC (stored in LC memory)

Command: “setNAME=XXXXXXX”

where XXXXXXX is 7-symbols name for this controller.

Answer: no answer

Action: Get LC nickname (stored in LC memory)

Command: “getNAME”

Answer: “NAME=XXXXXXX”

Action: soft restart LC-2

Command: “Reboot” (hex: 52:65:62:6f:6f:74)

Answer: no answer

Perl Example Script – Send Command

```
#!/usr/bin/perl -w
use IO::Socket;
use strict;

my $sock = IO::Socket::INET->new(
    Proto => 'udp',
    PeerPort => 1339,
    PeerAddr => '192.168.2.252',
) or die "Could not create socket: $!\n";

my $size = $sock->send($ARGV[0]) or die "Send error: $!\n";
print "$size bytes sent\n";

my $response = "";
$sock->recv( $response, 1024 );
print "Response: $response";

$sock->close();
```

Usage: [./udpsend.pl](#) setFocus=1000

will send command “setFocus=1000” to 192.168.2.252 to port 1339/UDP

Python Example Script – Send Command

```
#!/usr/bin/env python
import socket

UDP_IP = "192.168.2.252"
UDP_PORT = 1339
MESSAGE = "setFocus=1000"

print "UDP target IP:", UDP_IP
```

```
print "UDP target port:", UDP_PORT  
print "message:", MESSAGE
```

```
sock = socket.socket(socket.AF_INET, socket.SOCK_DGRAM)  
sock.sendto(MESSAGE, (UDP_IP, UDP_PORT))
```

Usage: [./yudpsend.pl](#)

will send command "setFocus=1000" to 192.168.2.252 to port 1339/UDP

Export Disclaimer

Any and all underlying information and technology contained in this document may be subject to U.S. export controls, including the Export Administration Act (50 U.S.C. Appx. §§ 2401 et seq.) and the Export Administration Regulations ("EAR", 50 C.F.R. Parts 730-774), and may be subject to export or import regulations in other countries. You are responsible for complying with all trade regulations and laws both foreign and domestic. Except as authorized by law or distributor agreement with ISSI, you agree and warrant not to export or re-export the information to any country, or to any person, entity, or end-user subject to U.S. export controls, including without limitation persons or entities listed on the U.S. Department of Commerce Bureau of Export Administration's Denied Parties List and the U.S. Department of Treasury's Specially Designated Nationals. You further represent and warrant that no U.S. federal agency has suspended, revoked, or denied your export privileges.