



# Standard Positioner Operations

## Network Configuration & General Commands

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1708812 Rev C  
September, 2023

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#### **Revision Record**

MANUAL, STANDARD POSITIONER OPERATIONS | Part # 1708812 | Rev C

<b>Revision</b>	<b>Description</b>	<b>Date</b>
A	Initial Release	August, 2019
B	Changed to operations manual; was formerly a network connection document only. Added general commands and error message list.	June, 2021
C	Added information for linear slides	September, 2023

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# Notes, Cautions, and Warnings

	<b>Note:</b> Denotes helpful information intended to provide tips for better use of the product.
	<b>CAUTION:</b> Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
	<b>WARNING:</b> Denotes a hazard. Failure to follow instructions could result in <b>SEVERE</b> personal injury and/or property damage. Included text gives proper procedures.





\*All notes, cautions, and warnings will be located on the left column area of the page.



See the ETS-Lindgren **Product Information Bulletin** for safety, regulatory, and other product marking information

## Safety Information

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	<b>Note:</b> Denotes helpful information intended to provide tips for better use of the product.
	<b>ONLY QUALIFIED PERSONNEL</b> should install, operate, or service this equipment.
	<b>HIGH VOLTAGE RISK OF ELECTRIC SHOCK:</b> Indicates presence of hazardous voltage. Unsafe practice could result in severe personal injury or death. Disconnect power before servicing. Make all electrical and grounded connections in accordance with the National Electrical Code (NEC) and any applicable local code requirements.
	<b>HEAVY OBJECT:</b> Can cause muscle strain or back injury. Use proper lifting techniques when removing or replacing.

\*For complete safety information, see the ETS-Lindgren *Product Information Bulletin*.

# Network Configuration

## Network Factory Configuration

- IP Address.....: 192.168.0.100
- Net Mask.....: 255.255.255.0
- Gateway.....: 192.168.0.1
- Command Port...: 1206

## Changing the Positioner IP Address

In a Local Area Network (LAN), there cannot be more than one device using the same IP address. The IP address of the device will need to be changed if more than one device is in the same (LAN). To change the IP address of an ETS-Lindgren Ethernet device, use its embedded web page.

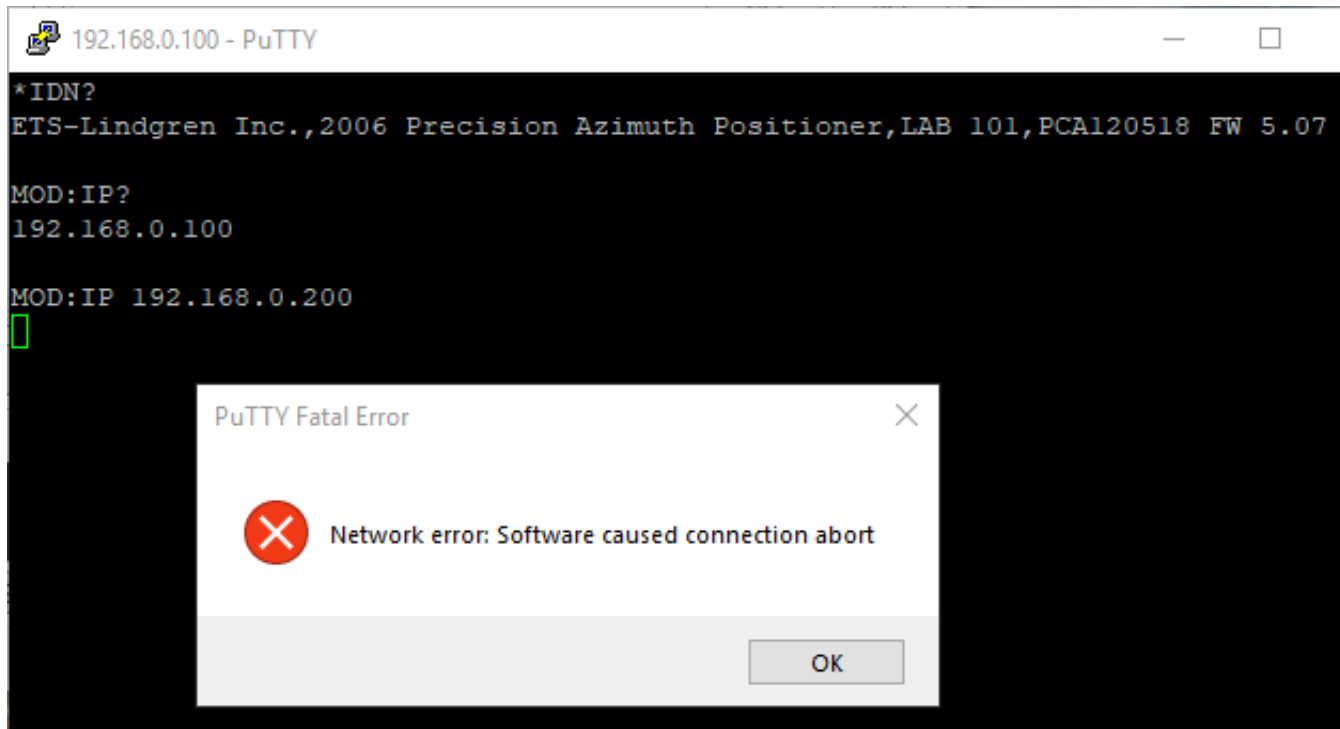
1. Point your browser to 192.168.0.100 or the address you have previously set your device to.
2. Type the new IP address as highlighted below and click 'SET'.

The screenshot shows a web browser window titled "ETSL Positioner" with the address bar displaying "192.168.0.100". The page content includes the ETS-Lindgren logo and the title "Positioner". Below the title is a "Command List" section. The "System" section contains three rows of configuration fields: "Device" (Positioner), "IP Address" (192.168.0.100), and "Firmware" (6.02 May 28 2021 14:30:47 PCA120518). Each row has a "GET" button, and the "IP Address" row also has a "SET" button. The "Position" section shows three axes (Axis 1, Axis 2, Axis 3) all set to 0.0. The "Command" section has a dropdown menu set to "AXIS1" and various control buttons like "Speed Preset", "Acceleration", "Lower Limit", "Upper Limit", "Position", "Seek Relative", "Home", "Zero", "Move", "Enter/Exit Cont. Rot.", "Scan", and "Stop Movement". The "Trigger" section includes fields for "State", "Step (Deg)", "Pre Delay", "Pulse Width", "Post Delay", and "Polarity", with "GET" and "SET" buttons. At the bottom, there is a copyright notice: "© 2021 by ETS-Lindgren Inc. All rights reserved. (ALP 2/1/21)".

A second method for resetting the IP configuration of the device is to connect to the device using any TCP/IP capable terminal application, and sending commands to it. PuTTY is a terminal emulator available for use. PuTTY is a free (MIT licensed) Windows Telnet and SSH client and can be downloaded from <https://www.putty.org/>.

Run PuTTY, and point it to Host 192.168.0.100 Port 1206. Then set Connection type to **Raw** and click **Open**.

Ensure the connection is working by typing **\*IDN?** then pressing the **Enter** key on the keyboard. The device will respond with an identification string such as the one shown below.



The IP address can be changed using the **MOD:IP** command. To check the current IP address by typing **MOD:IP?** To change the IP address to 192.168.0.200, type **MOD:IP 192.168.0.200** and press the **Enter** key on the keyboard. The device will set the new address and reset the connection.

## Reset to Factory Default

To reset configuration, press the reset button for at least 6 seconds. It will reset the IP address back to factory configurations, 192.168.0.100, Mask = 255.255.255.0.

If your positioner does not have a reset button, please follow these instructions to reset the network configuration, Start with the device powered off for at least 5 seconds

1. Turn the device ON for 5 seconds.
2. Turn the device OFF for 5 seconds.
3. Repeat the ON/OFF cycle four more times.

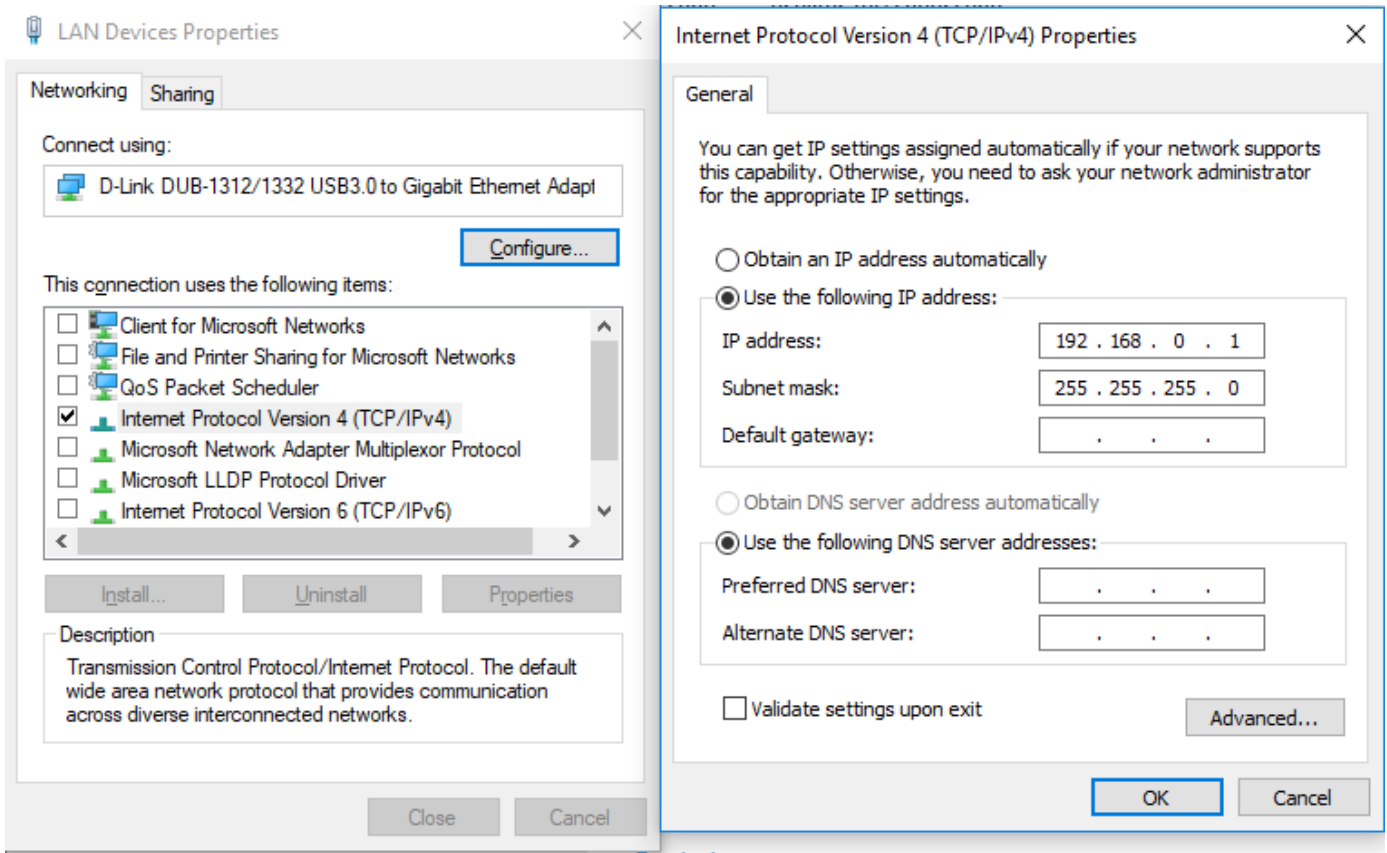
Make sure you wait 5 seconds between power cycles.

This reset procedure only works on devices running on firmware version 5.7 or later



## Computer Network Configuration

Connect to an ETS-Lindgren Ethernet by setting the computer Ethernet interface to the selections shown below.

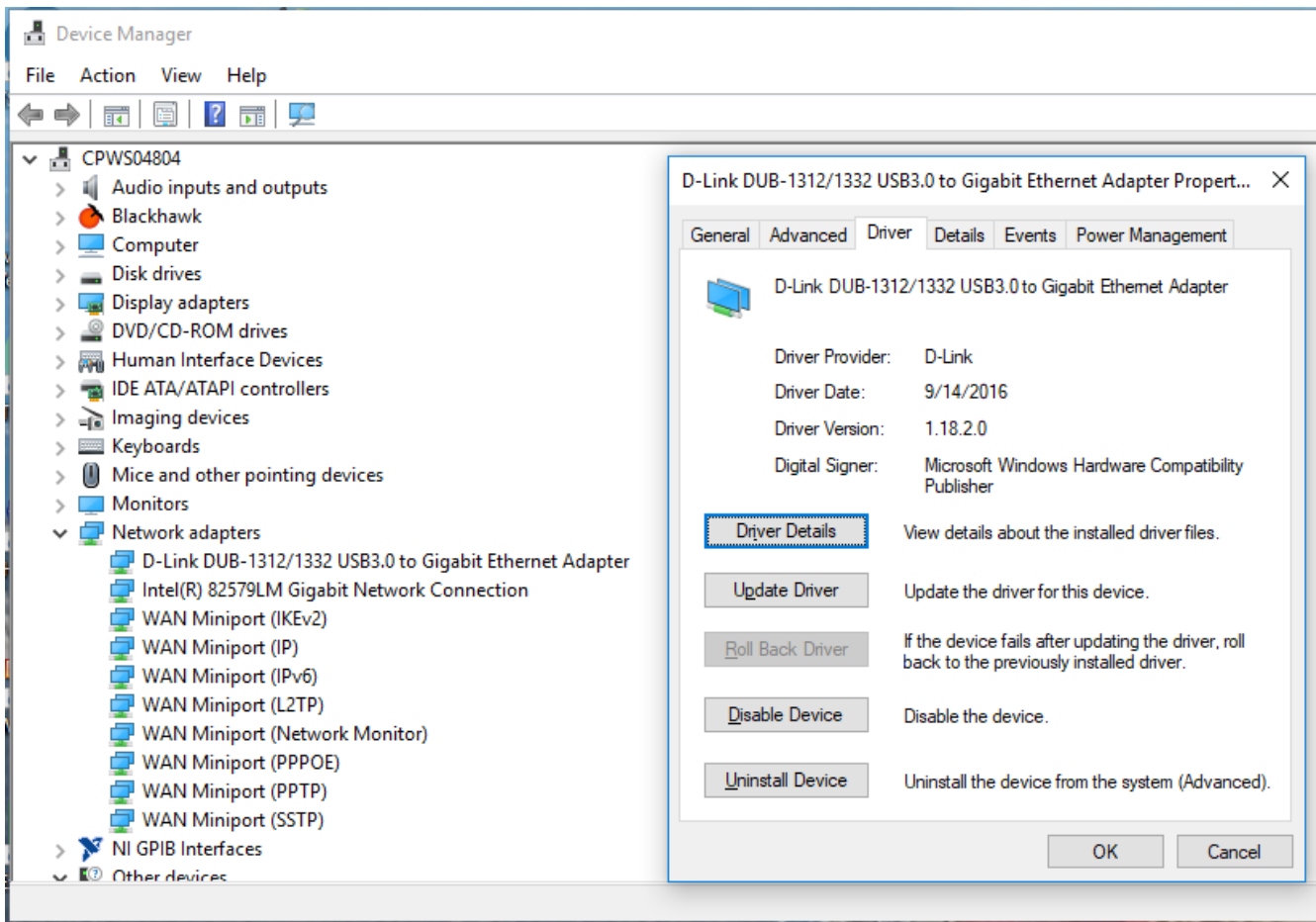


## Background Information

Preparing a computer for connection is relatively simple if you have an Ethernet adapter installed. An Ethernet adapter, also called a network card, network interface card, or network interface controller, provides a physical port for networking mediums such as Ethernet cables. It also communicates with the computer and allows it to access a network device.

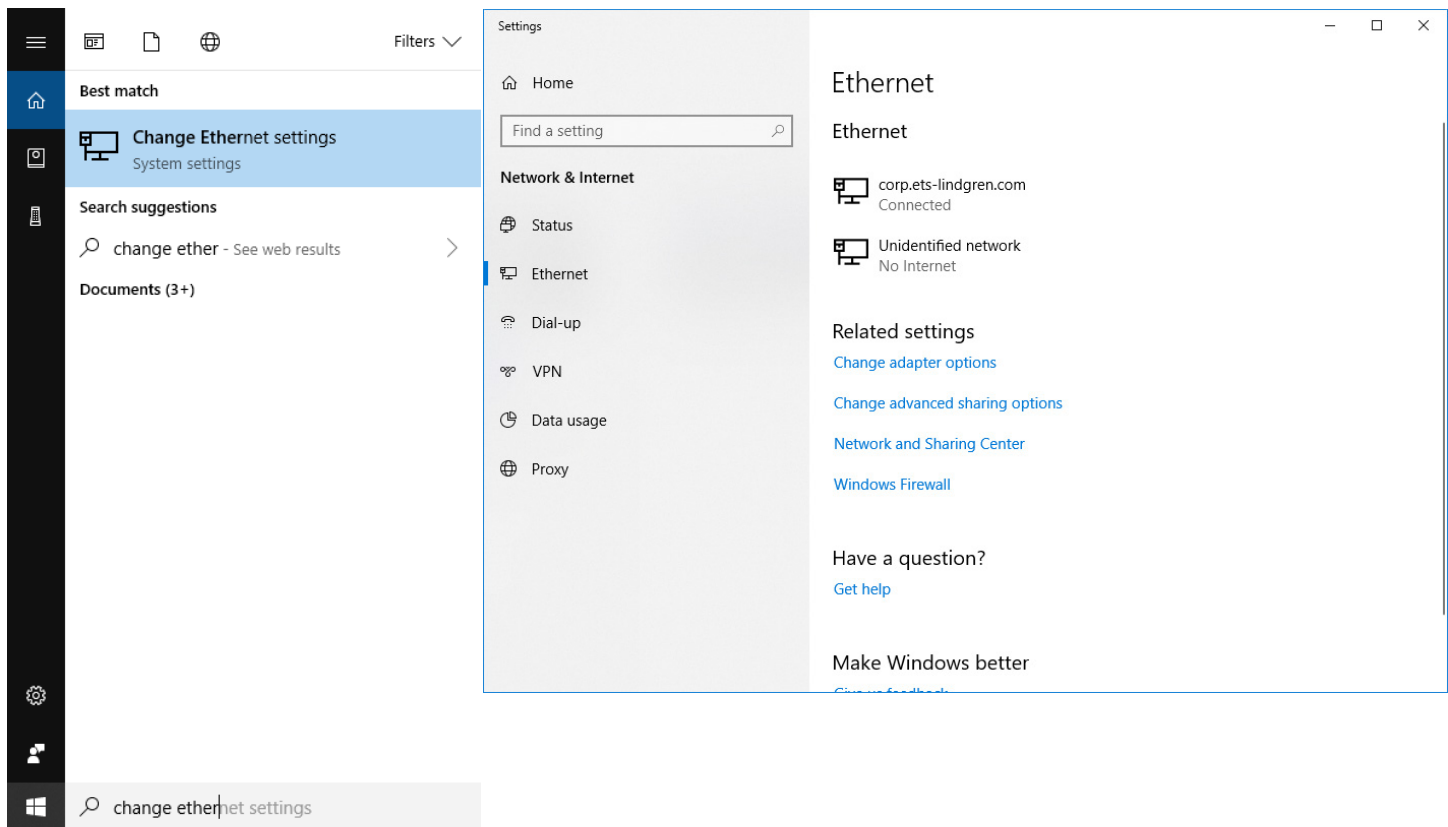
Follow these steps on a Windows 10 PC to configure the Ethernet adapter.

1. Verify that the Ethernet adapter is installed:
  - a. Open **Device Manager**.
  - b. Select **Network adapters**.
  - c. Right-click the network adapter.
  - d. Click **Properties**. The information in the Properties window will indicate whether or not your Ethernet adapter is installed and working.

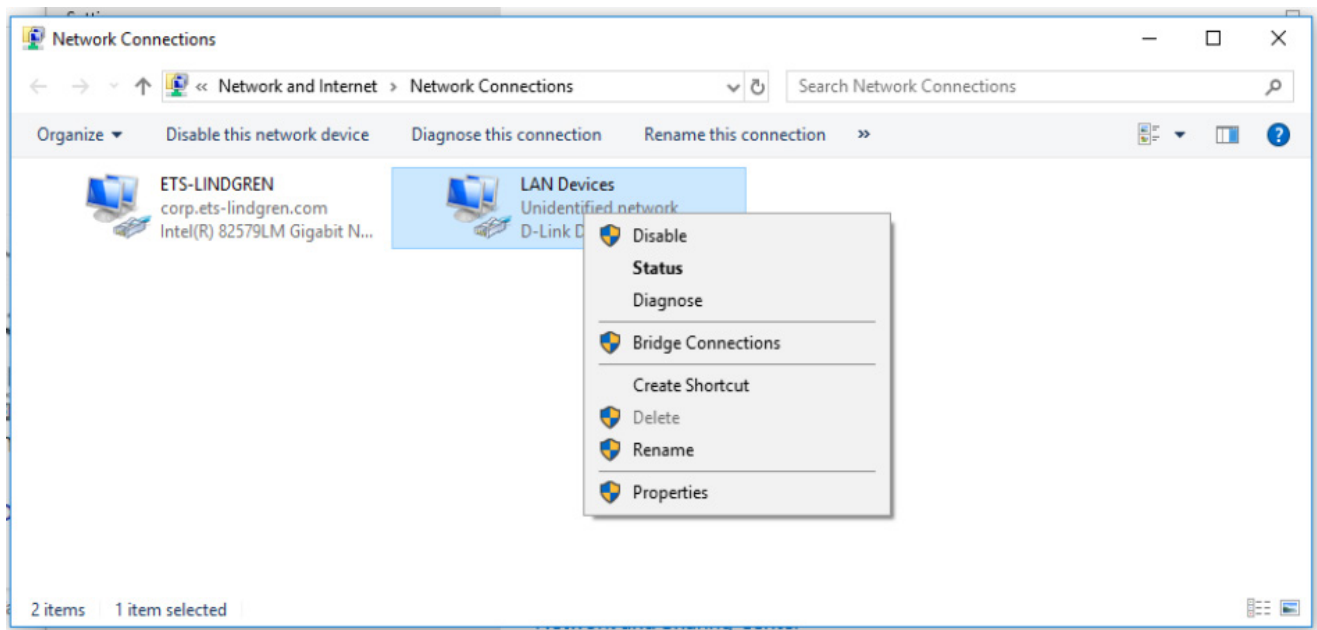


## 2. Configure the Ethernet Adapter

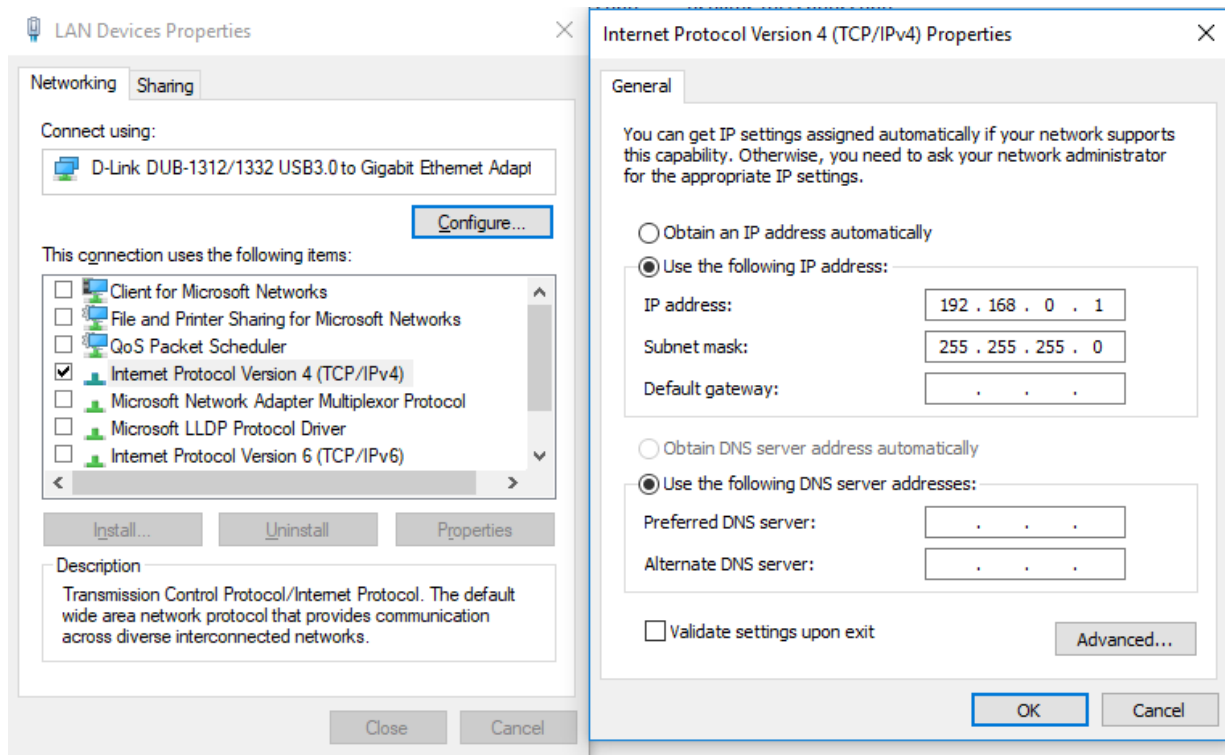
- a. In Windows, click into the **Start** toolbar.
- b. Type ***change Ethernet settings***.
- c. In the search results, click **change Ethernet settings**.
- d. In the Settings window, click ***Change adapter options***.



- e. Right click on the Ethernet adapter you intend to configure, and select **Properties**.  
(Ensure you are logged into an administrator account to change the configuration.)



- f. Select **Internet Protocol Version 4 (TCP/IPv4)**; then click **Properties**.  
Select **Use the following IP address**, then enter the addresses as follows:  
IP address: **192.168.0.1**  
Subnet mask: **255.255.255.0**  
Default gateway: **blank**
- g. Select **Use the following DNS server addresses** and leave Preferred and Alternate DNS server fields blank.
- h. Click **OK**.



Information about subnet mask can be found online at the following two locations:

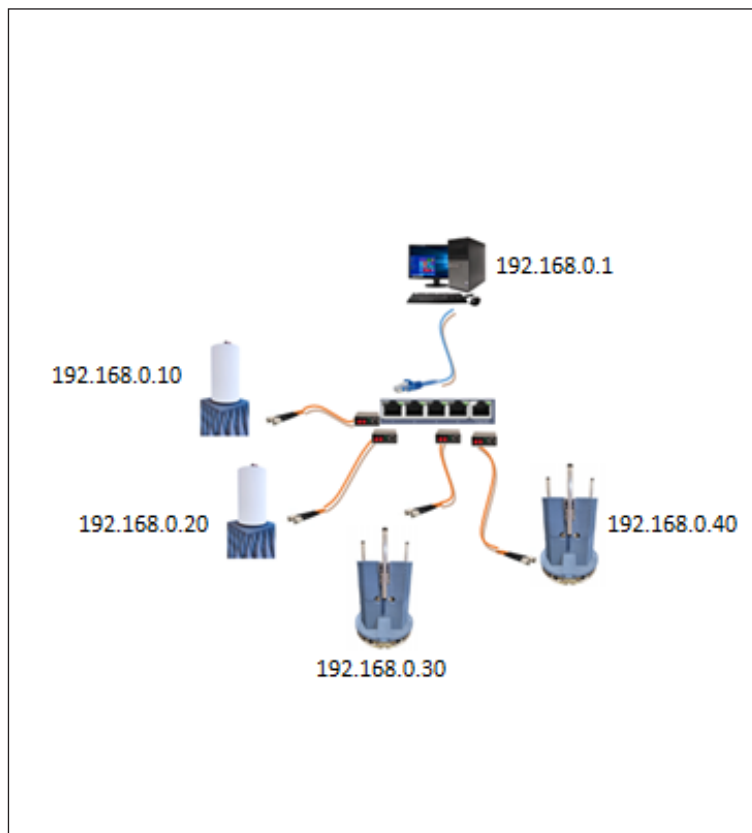
<https://www.iplocation.net/subnet-mask>

<https://searchnetworking.techtarget.com/definition/subnet>

## Multiple Devices in a LAN

When using more than one positioner, there is no need for a separate server for each positioner. An Ethernet switch can be used to connect as many devices as necessary to a single computer. Such a configuration requires each device have a unique IP address. If using more than one positioner in a LAN, change the device's IP address. Point your browser to the device (192.168.0.100) and set a new IP address.

Multiple Device LAN



## WARNING



**High Voltage:** Unsafe practice could result in severe personal injury or death.



**Heavy object:** Can cause muscle strain or back injury. Use proper lifting techniques.



Stay clear of all moving components.



**Keep hands clear:**  
Moving parts can crush and cut.



**Pinch Points:**  
Keep hands clear during operation.



**Moving Gears:**  
Do not stick hand in or near machine during operation.

## CAUTION

**Damaged or crimped AC cords:**

Using damaged or crimped AC cords may damage the equipment and/or cause physical injury.

## Operation

Firmware is installed in the positioner, and it is controlled by PC. The number of and type of axes varies. Please see your positioner manual for its specific axis information and speeds.

## CAUTION

Read this manual completely before operating. Before and during operation, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

## WARNING

Ensure the current travel limit settings will not cause damage to existing cables.

## WARNING

Do not operate any positioner in a stalled condition. Doing so can cause damage to the drive unit and will void the warranty. Ensure the positioner will continue to operate under load at all speeds.

## Command Set



The following command set is general and includes commands that may not apply to your specific positioner. Speeds listed in this generic list are representative only. Please see your positioner manual for its specific commands and speeds.



Equipment will only respond to commands that are applicable to it. The Seek commands work differently depending on whether the equipment is capable of continuous rotation.



In the non-continuous mode, the positioner motion is restricted between the upper and lower limits. A seek from 350.0 to 10.0 will rotate counterclockwise. In the continuous mode of operation the positioner is allowed infinite movement. The turntable travels from 0-359.9 and the limits are ignored.



In continuous rotation mode, the device will seek the target value by the shortest possible path. Thus, a seek from 350.0 to 10.0 will rotate clockwise, not counterclockwise.

## General Command Structure

For turntables, commands refer to unit degrees.

For linear positioners, commands refer to unit centimeters.

Most of the following commands use this general structure:

[**AXIS**<n[-m]>:]**COMMAND** <argument\_n>[,<argument\_m>]

Where:

[ ]	Indicates optional.
< >	Indicates required.
<b>COMMAND</b>	The backwards compatible Model 2090 Multi Device Controller command.  When used by itself, controls the first device in a multi axis system, and, when arguments are required, supports only a single argument.
<b>The command prefix in optional brackets [ ]</b> <b>[AXIS&lt;n[-m]&gt;:]</b> <b>COMMAND &lt;argument_n&gt;[,&lt;argument_m&gt;]</b>	Required to access a specific axis or multiple axes at a time.  Selects the desired axis or axes to control.  A single index specifies a single axis (e.g. AXIS1 or AXIS2) with a single argument, while a range (e.g. AXIS1-2) specifies a range of axes with a corresponding range of arguments.  Note that some commands only support single axis control.
<b>&lt;argument_n&gt;</b>	The single argument required for a single axis command.
<b>[,&lt;argument_m&gt;]</b>	Represents the additional arguments required for an optional multi-axis command (e.g. AXIS1-2:COMMAND 1,2).



## System Commands

Device Identification Query	
<b>Command:</b>	*IDN?
<b>Description:</b>	Identification query. Determines the nature of device located at a given address on the network. The string returned ("ETS-Lindgren Inc.,2303 Precision Positioner,<Module Name>,PCA120518 FW N.NN") identifies this device as a 2303 Precision Positioner. The <Module Name> parameter is a place holder to identify a specific module. The N.NN parameter is a place holder for the firmware version identification.
<b>Query:</b>	*IDN?
<b>Returns:</b>	ETS-Lindgren Inc.,2303 Precision Positioner,<Module Name>,PCA120518 FW n.nn
<b>Example:</b>	*IDN? ETS-Lindgren Inc.,2303 Precision Positioner,Comm,PCA120518 FW 4.14

Module IP Address	
<b>Command:</b>	MOD:IP <nnn.nnn.nnn.nnn>
<b>Description:</b>	The device default IP address and subnet mask is 192.168.0.100, 255.255.255.0. The default address and subnet mask are assigned to the device by ETS-Lindgren and do not change even if your computer reboots. The IP address can be changed using the MOD:IP command. The port number is 1206.
<b>Query:</b>	MOD:IP?
<b>Returns:</b>	nnn.nnn.nnn.nnn
<b>Example:</b>	MOD:IP 192.168.0.55

Module IP Address	
<b>Command:</b>	MOD:NAME <Module Name>
<b>Description:</b>	The <Module Name> parameter in the *IDN? query response is a place holder to identify a specific device in a network. If you have more than one device you might want to identify them with different module names. For instance, "EMC LAB1" and "EMC CHAMBER".
<b>Query:</b>	MOD:NAME?
<b>Example:</b>	MOD:NAME EMC LAB1

Module Subnet Mask	
<b>Command:</b>	MOD:NETMASK <nnn.nnn.nnn.nnn>
<b>Description:</b>	The device default IP address and subnet mask is 192.168.0.100, 255.255.255.0. This address and mask are assigned to the device by ETS-Lindgren and does not change even if your computer reboots. The subnet mask can be changed using the MOD:NETMASK command. The new subnet mask will not change even if your computer reboots.
<b>Query:</b>	MOD:NETMASK?
<b>Returns:</b>	nnn.nnn.nnn.nnn
<b>Example:</b>	MOD:NETMASK 255.255.0.0

## Control Commands

Acceleration in Milliseconds	
<b>Command:</b>	A <nnnn>
<b>Description:</b>	Acceleration setting for variable speed devices. The number nnnn represents the time in milliseconds for the positioner to reach max speed. For high inertial loads, a longer acceleration time might be required.
<b>Query:</b>	A?
<b>Returns:</b>	The time in milliseconds for the positioner to reach max speed.
<b>Example:</b>	AXIS1:A 1000

Acceleration in Seconds	
<b>Command:</b>	ACC nn.n
<b>Description:</b>	Acceleration setting for variable speed devices. The number N.N represents the time in seconds for the positioner to reach max speed. For high inertial loads, a longer acceleration time might be required.
<b>Query:</b>	ACC?
<b>Returns:</b>	The time in seconds for the positioner to reach max speed.
<b>Example:</b>	AXIS2:ACC .5

Continuous Rotation Mode	
<b>Command:</b>	CR
<b>Description:</b>	Set the positioner in continuous rotation mode. In the continuous mode of operation the positioner is allowed infinite movement. The turntable travels from 0-359.9 and the limits are ignored. Also, in continuous rotation mode, the device will seek the target value by the shortest possible path. Thus, a seek from 350.0 to 10.0 will rotate clockwise, not counterclockwise.
<b>Query:</b>	CR?
<b>Returns:</b>	1 when in continuous rotation mode, 0 otherwise
<b>Example:</b>	CR

Current Position	
<b>Command:</b>	CP nn.n
<b>Description:</b>	Changes the current position of the device. When editing limits or the current position setting, the software will not allow the current position to be set outside the software limits, nor can the upper or lower limits be adjusted below or above, respectively, the current position or each other.
<b>Example:</b>	AXIS1:CP 90
<b>Query:</b>	CP?
<b>Returns:</b>	Axis current position The value returned is either in XXX.X or XXX.XX format. Negative values are preceded by a "-" minus sign. Linear positioners return current position in centimeters, turntables return it in degrees..
<b>Example:</b>	AXIS1-3:CP? Response 10.5, -90.0, 70.0

Current Position	
<b>Command:</b>	CP nn.n
<b>Description:</b>	Changes the current position of the device. When editing limits or the current position setting, the software will not allow the current position to be set outside the software limits, nor can the upper or lower limits be adjusted below or above, respectively, the current position or each other.
<b>Example:</b>	AXIS1:CP 90
<b>Query:</b>	CP?
<b>Returns:</b>	Axis current position The value returned is either in XXX.X or XXX.XX format. Negative values are preceded by a "-" minus sign. Linear positioners return current position in centimeters, turntables return it in degrees..
<b>Example:</b>	AXIS1-3:CP? Response 10.5, -90.0, 70.0

Error Query	
<b>Command:</b>	ERR?
<b>Description:</b>	Queries the axis error register. The error register is cleared on read.
<b>Query:</b>	ERR?
<b>Returns:</b>	An error code (See list at the end of command set.)
<b>Example:</b>	AXIS3:ERR?

Homing Procedure	
<b>Command:</b>	HOME
<b>Description:</b>	<p>The device has a mechanical home sensor. Every time the positioner is turned on, a home procedure must be performed so the current position is known by the firmware.</p> <p>To home the positioner, send the following commands:</p> <p>HOME</p> <p>*OPC?</p> <p>Keep querying the positioner by sending the *OPC? until it returns 1.</p> <p>*OPC? Will return 0 if the turntable is still being homed.</p> <p>*OPC? will return 1 if the home procedure is done.</p> <p>After *OPC returns 1, send the query HOME? to confirm that the positioner found the mechanical home sensor.</p> <p>HOME? returns 0 if the home procedure was not successful; result of a faulty sensor.</p>
<b>Query:</b>	HOME?
<b>Returns:</b>	1 if the AXIS1 has been homed, 0 otherwise
<b>Example:</b>	AXIS1:HOME

Lower Limit	
<b>Command:</b>	LL nnn.n
<b>Description:</b>	Sets the lower/counterclockwise limit of the device. The specified value nnn.n must be less than the upper/clockwise limit.
<b>Query:</b>	LL?
<b>Returns:</b>	Lower or counterclockwise limit of the device in degrees.
<b>Example:</b>	AXIS1-2:LL 0,-10

Motion Direction	
<b>Command:</b>	DIR?
<b>Description:</b>	Queries the motion direction for the device.
<b>Query:</b>	DIR?
<b>Returns:</b>	<direction> Value indicating the current motion of the queried device. +1 Device is moving up/clockwise. 0 Device is stopped. -1 Device is moving down/counterclockwise
<b>Example:</b>	AXIS1-2:DIR? Response: 0,+1

Move Clockwise	
<b>Command:</b>	CW
<b>Description:</b>	Instructs the positioner to move in the clockwise direction. In non-continuous mode this movement is limited by the clockwise (upper) limit.
<b>Example:</b>	AXIS1-2:CW

Move Counterclockwise	
<b>Command:</b>	CCW
<b>Description:</b>	Instructs the positioner to move in the counterclockwise direction. This movement is limited by the counterclockwise (lower) limit.
<b>Example:</b>	AXIS2:CCW

Non-Continuous Rotation Mode	
<b>Command:</b>	NCR
<b>Description:</b>	Set the positioner in non-continuous rotation mode. In the non-continuous mode the positioner motion is restricted between the upper and lower limits. A seek from 350.0 to 10.0 will rotate counterclockwise.
<b>Example:</b>	NCR

Scan	
<b>Command:</b>	SCAN
<b>Description:</b>	Instructs the positioner to begin scanning between preset lower and upper limits.
<b>Example:</b>	AXIS1:SCAN

Seek Negative	
<b>Command:</b>	SKN <nnn.n>
<b>Description:</b>	Instructs the device to begin seeking the specified target value in the negative (down/counterclockwise) direction only. This command primarily supports continuous rotation mode. It allows forcing seeking a position from a particular direction. Thus, a SKN from 180.0 to 181.0 will rotate counterclockwise to reach the target value. In non-continuous rotation mode if the target is up/clockwise from the current position, no motion occurs. The target must be located between the current upper/clockwise and lower/counterclockwise limits.
<b>Example:</b>	AXIS1:SKN 30

Seek Position	
<b>Command:</b>	SK nnn.n
<b>Description:</b>	Instructs the device to begin seeking for a target position. In continuous rotation mode, the device will seek the target value by the shortest possible path. Thus, a seek from 350.0 to 10.0 will rotate clockwise, not direction.
<b>Example:</b>	AXIS1-2:SK 90,30

Seek Positive	
<b>Command:</b>	SKP <nnn.n>
<b>Description:</b>	Instructs the device to begin seeking the specified target value in the position (up/clockwise) direction only. This command is provided primarily to support continuous rotation mode. It allows forcing seeking a position from a particular direction. Thus, a SKP from 181.0 to 180.0 will rotate clockwise to reach the target value. In non-continuous rotation mode if the target is down/counterclockwise from the current position, no motion occurs. The target must be located between the current upper/clockwise and lower/counterclockwise limits.
<b>Example:</b>	AXIS2:SKP 90

Seek Relative	
<b>Command:</b>	SKR [+ -]nnn.n
<b>Description:</b>	Instructs the device to begin seeking the specified target value relative to the current position. The specified value is added to the current position to obtain the target position. Thus, a positive value will cause up/clockwise motion and a negative value will cause down/counterclockwise motion.
<b>Example:</b>	AXIS1-2:SKR -10,10

Speed																			
<b>Command:</b>	Sn Where n is a number between 1 and 8. The factory speed settings configuration is: <table> <tr> <th>Setting</th><th>Deg/s</th></tr> <tr><td>1 -</td><td>0.35</td></tr> <tr><td>2 -</td><td>0.70</td></tr> <tr><td>3 -</td><td>1.05</td></tr> <tr><td>4 -</td><td>1.22</td></tr> <tr><td>5 -</td><td>1.40</td></tr> <tr><td>6 -</td><td>1.56</td></tr> <tr><td>7 -</td><td>1.74</td></tr> <tr><td>8 -</td><td>2.10</td></tr> </table>	Setting	Deg/s	1 -	0.35	2 -	0.70	3 -	1.05	4 -	1.22	5 -	1.40	6 -	1.56	7 -	1.74	8 -	2.10
Setting	Deg/s																		
1 -	0.35																		
2 -	0.70																		
3 -	1.05																		
4 -	1.22																		
5 -	1.40																		
6 -	1.56																		
7 -	1.74																		
8 -	2.10																		
<b>Description:</b>	Changes the device speed																		
<b>Query:</b>	S?																		
<b>Returns:</b>	A number between 1 and 8																		
<b>Example:</b>	S3 Set AXIS1 current speed to 1.05 deg/s																		

Speed Preset	
<b>Command:</b>	SS<n> <speed>
<b>Description:</b>	Assigns a preset speed setting 0-255 to n, where n is a number 1-8. <b>Warning:</b> There can be no white space between the command and the register number. However, there must be white space between the register number and the speed value.
<b>&lt;speed&gt;</b>	Value from 0-255 representing the desired speed setting for the specified speed selection. A value of 0 represents the minimum available speed of the device. A value of 255 represents the maximum speed of the device. The actual speed of the device is given approximately by the formula: Actual Speed = (MaxSpeed – MinSpeed) / 255 + MinSpeed For Axis 1, 2, and 3: Min Speed = .18 deg/s Max Speed = 2.45 deg/s
<b>Query:</b>	SS#?
<b>Returns:</b>	Value between 0 (minimum) and 255 (maximum) speed.
<b>Example:</b>	SS2 127                      Set speed 2 to half speed SS5 63                        Set speed 5 to quarter speed

Stop Motion	
<b>Command:</b>	ST
<b>Description:</b>	Causes device motion to stop.
<b>Example:</b>	AXIS1-2:ST

Trigger Configuration	
<b>Command:</b>	TRIGGER (<ON OFF>, <step size>,<reference>,<pre trigger delay>, <pulse length>,<post trigger delay>,<polarity>)
<b>Description:</b>	Use this command to configure the trigger. Where step size is the angular distance between trigger pulses in degrees, reference position is one of the positions where a trigger should occur (not necessarily a starting position), pre-trigger delay is the time between reaching the target encoder position and producing a trigger pulse, trigger pulse length is the active period of the trigger pulse, post trigger delay is the minimum inactive period after the trigger pulse before another trigger event can occur, and High/Low sets the polarity of the trigger signal. Time unit is milliseconds.
<b>Query:</b>	TRIGGER?
<b>Returns:</b>	Trigger configuration
<b>Example:</b>	TRIGGER (ON,15.00,0.00,0.10,1.00,0.00,LOW)

Upper Limit	
<b>Command:</b>	UL nnn.n
<b>Description:</b>	Sets the upper/clockwise limit of the device. The specified value nnn.n must be greater than the lower/counterclockwise limit.
<b>Query:</b>	UL?
<b>Returns:</b>	Upper or clockwise limit of the device in degrees.
<b>Example:</b>	AXIS2:UL 90

## Error Codes

- 1 – Controller board Flash memory malfunction
- 2 – Axis not moving
- 3 – Motor not stopping
- 4 – Motor moving on wrong direction
- 5 – Hardware Limit hit
- 6 – Polarization limit violation
- 7 – Lost communication
- 9 – Encoder failure
- 10 – Trigger failure
- 11 – Motor overheat
- 12 – Relay failure,
- 13 – Position out of bounds
- 14 – Trying to move a locked axis
- 32 – Motor driver fault
- 100-399 – Command syntax error
- 400-499 – Home procedure failure
- 500-599 – Trigger command malformed
- 1000 – Firmware upgrade failure

