

# GEN3 ETHERNET MODULE

## Web Interface Quick Start Guide

The screenshot shows the 'NCD.IO CONFIGURATION' web interface. A sidebar on the left contains navigation links: Device View, Basic Settings, Advanced Options, Web-i, Macros, ADC, Management, and About Us. The main content area is titled 'Bank 1' and includes a 'Refresh' button. Below this, there is a table of four relays, each with a status indicator and two control buttons.

Relay	Status	On	Off	Toggle
Relay 1	Off	On	Off	Toggle
Relay 2	Off	On	Off	Toggle
Relay 3	Off	On	Off	Toggle
Relay 4	Off	On	Off	Toggle

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The screenshot shows the 'NCD.IO CONFIGURATION' web interface. A sidebar on the left contains navigation links: Device View, Basic Settings, Advanced Options, Web-i, Macros, ADC, Management, and About Us. The main content area is titled 'NCD.IO CONFIGURATION' and includes a 'Refresh ADC Values' button. Below this, there is a list of eight channels, each with a status indicator and a label.

Channel	Status
Channel 1	undefined
Channel 2	undefined
Channel 3	undefined
Channel 4	undefined
Channel 5	undefined
Channel 6	undefined
Channel 7	undefined
Channel 8	undefined

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National Control Devices

# Introduction

## Gen3 Ethernet Module

In this guide we will cover the configuration and use of the NCD Gen 3 Module. We will discuss the configuration software as well as the web interface. The module can be configured through the web interface, however if you have a Windows Computer available, we recommend configuring settings in the module through the configuration software.

## Basic Usage

For most users, the Gen 3 Ethernet module will work right out of the box with no settings configuration required. Simply install the Ethernet module into your main control board, connect a standard ethernet cable to the Gen 3 module, connect the other end of the ethernet cable into your network, then power up the main control board. Your main control board Power LED(s) should turn on and the LEDs on the front of the Ethernet module should turn on and begin flashing which indicates the module is in fact powered up normally.

At this point you can open the Base Station software or Alpha Station software and communicate with the main control board through the Gen 3 Module. Both Base Station and Alpha Station should automatically discover the Gen 3 module on the network and allow you to connect to the main control board.

## Important Details

### DHCP

By default, NCD Gen 3 modules ship in DHCP mode so it is expected that they be connected to a DHCP enabled networks. Most routers support DHCP, however if your network does not support DHCP then you will want to store a static IP address into the controller.

### Force Static IP for Configuration

If your network does not support DHCP then power down the main control board. Install a jumper on the two pins directly to the left of the Ethernet Jack then power the board up again. Installing a jumper on these two pins will force the module to use a Static IP address of 192.168.1.88. This will allow you to connect to the Gen 3 Module for configuration on a Non DHCP enabled network or by connecting the Ethernet module directly to the Ethernet port of your PC. When configuring settings in this way you will need to leave the static IP address jumper in place, alter the settings, select “Apply Settings”, power down the control board, wait 2 seconds, remove the static IP jumper, and power the board back up for the settings to be stored in the module.

### Factory Reset

There is a hardware method of restoring the Gen 3 module to factory default settings. To do this press and hold the button to the right of the Ethernet Jack for 5 seconds, then release the button. This will factory reset all setting inside the Gen 3 module.

### Note

Always connect the Ethernet cable to the Gen 3 module and the network prior to powering the board up.

### Applying Settings

Any time settings are altered on the Gen 3 module it is necessary to power cycle the module. This can be done by manually removing power from the host board or by clicking the Reset button in the software/web interface.

# NCD Config Tool Software

If you need to make configuration changes to the Gen 3 module and you have a windows computer available, we highly recommend using this NCD Config Tool software to make your configuration changes:

[NCD5500 Configuration Software for Windows](#)

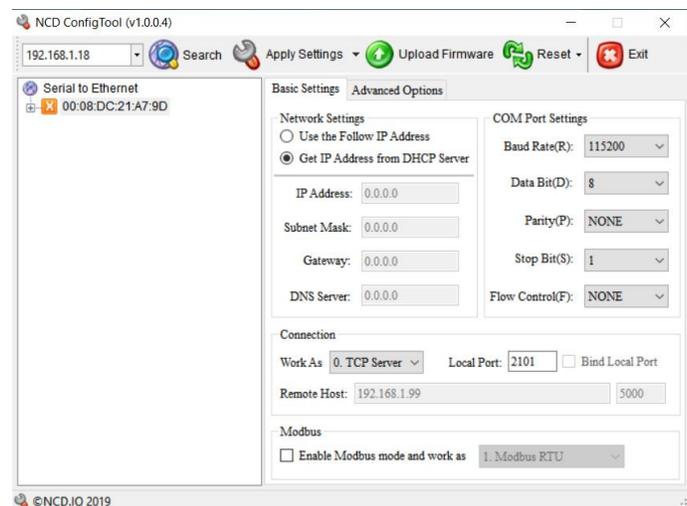
If you do not have a Windows computer available or cannot install this software for another reason, please proceed to the Web Interface Configuration section.

## Discovering Gen 3 Modules with the NCD Config Tool

Download and install the NCD Config Tool from the link above on a Windows computer connected to the same network as the Gen 3 module. Once installed open the NCD Config Tool software.

Power on the Main Control board with the Gen 3 module. After 20 seconds or so the module should appear in the list as a MAC address, if it does not click the Search button until the module appears in the list.

From here all settings of the Gen 3 module may be configured.



If the IP address shows up as 0.0.0.0 go ahead and click the Search button again and the IP address should appear in the IP Address Field.

We will now cover all settings that may be configured through the NCD Config Tool Software. You will notice two tabs on the software labeled Basic Settings and Advanced Options. We will cover each of these categories of settings individually.

Once settings are configured as desired click the Apply Settings button to store them into the Gen 3 module. It is also possible to power cycle the module with the Reset Button. **Keep in mind settings entered in the module do not take effect until the module is power cycled.**

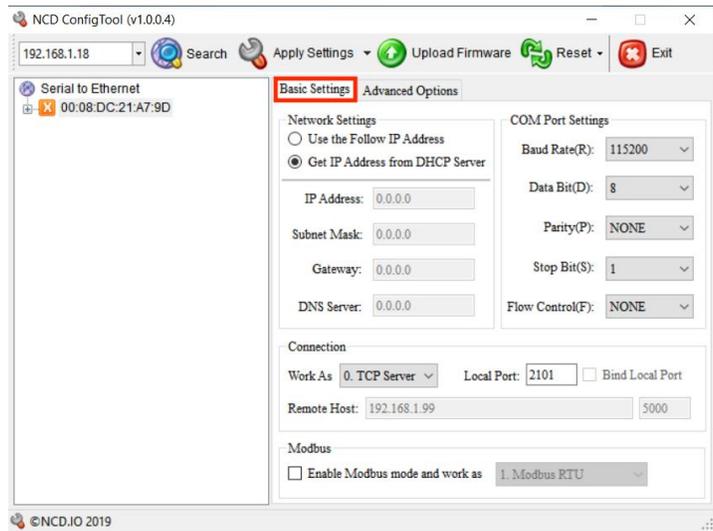
# Basic Settings

## Network Settings(Use the Follow IP address)

When this radio button is selected it forces the Gen 3 module to utilize the Static IP address settings entered by the user in the IP Address, Subnet Mask, Gateway, and DNS Server fields.

## Network Settings (Get IP address from DHCP Server)

When this radio button is selected the Gen 3 module will obtain an IP address from the network router upon boot. Configuration settings entered in the IP Address, Subnet Mask, Gateway, and DNS Server fields will be ignored however these fields will still display current module information.



## COM Port Settings

NCD Gen 3 Ethernet module ship with Com Port Settings which make the module compatible with the Main Control board it is installed in. If any settings are made to the COM Port Settings fields it must be assured that these settings are compatible with the Main Control Board. For most applications it is not recommended that these fields be changed.

## Connection

These settings determine how Software will communicate with the Gen 3 module in daily use. Socket connection type may be selected from the Work As drop-down menu. Options are TCP Server, TCP Client, or UDP. In TCP Server mode the Gen 3 module will accept TCP socket connections from your Software over the port specified in the Local Port Field. In TCP Client mode the Gen 3 module will automatically establish a TCP socket to a server on the IP specified in the Remote Host Field on the port specified in the port field to the right of the Remote Host field. Lastly UDP mode causes the Gen 3 Module to utilize UDP sockets. This is a good option if the board needs to send information to multiple software applications running on different servers.

# Advanced Options

## Show Debug Messages

Not recommended for use in NCD Devices

## Echo In AT Mode

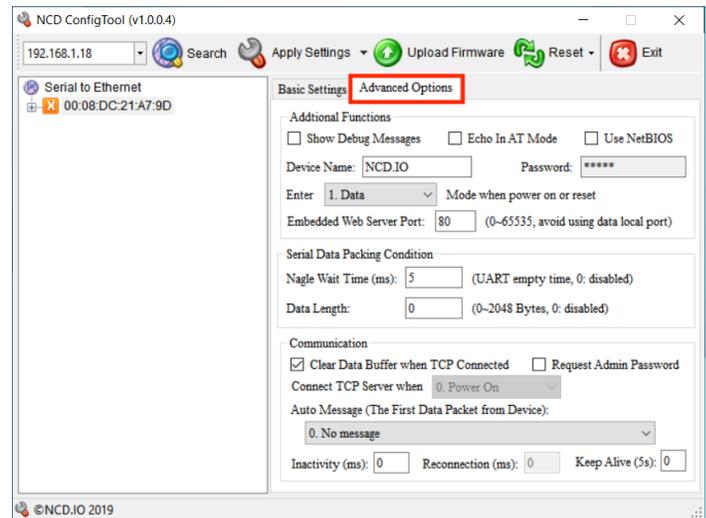
Not recommended for use in NCD Devices

## Use NetBIOS

Not recommended for use in NCD Devices

## Device Name

Gen 3 module send out discovery packets which allow software to discover them on the network. This Device Name field allows the user to specify the name of this particular device in the discovery packet. This can be used to differentiate between devices if there are multiple on the same network.



## Password

The Web interface of the Gen 3 module is password secured. Double click the Password field here and it is possible to edit the web interface password.

## Enter Mode when power on or reset

Only Data mode is recommended for NCD Devices.

## Enabled Web Server Port

By default the Gen 3 module serves its web interface on port 80 like most normal web servers, however this field allows the user to alter the port the web interface is served on. This field may be set to 0 if it is desired to disable the web interface for the Gen 3 module.

## Nagle Wait Time (ms):

This configures the amount of time the Gen 3 module waits after data is initially received over its serial connection to the Main Control Board before sending the data packet over the Network Socket. The default/recommended setting for this field is 5.

**Data Length:**

This is the amount of data required to be received over the Serial connection to the Main control board before the data packet is sent out over the Network Socket. For use in NCD Devices it is recommended to leave this setting at 0.

**Clear Data Buffer when TCP Connected**

The Gen3 module has an internal buffer where data received over it's serial connection may be stored. This setting determines whether or not that data buffer should be emptied when a TCP socket connection is established to the board or from the board to the Server. For most applications it is recommended to leave this setting checked.

**Request Admin Password**

This setting is only available when the Gen 3 module is in TCP Server Mode. This setting requires software connecting to the Gen 3 module to submit a password in order to communicate with it. The Password from the Password field is utilized as the connection authorization password. It should be noted that this setting has not yet been thoroughly tested by NCD Staff.

**Connect TCP Server When**

This setting is only available when the Gen 3 module is in TCP Client Mode. This setting determines when a socket should be established with the Remote Host TCP server. Options are Power On and Serial Data Received.

**Auto Message**

This setting determines whether the Gen 3 module should send a message to the Client or Server when a socket is initially established. This is not necessary for most applications as it is possible to retrieve this information from the socket, however it may be utilized to identify the device to the software. Options are No Message, Device Name, Device IP, or Device MAC address.

**Inactivity(ms)**

This setting determines how long a socket will be maintained if no data is transmitted or received over a network socket connection. After this amount of time the Gen 3 module will disconnect the socket. If it is not desired to automatically disconnect the socket after no data is transferred for a specified amount of time set this field to 0.

**Reconnection(ms):**

This setting is only applicable in TCP Client mode. This setting determines the amount of time the Gen 3 module will wait after a connection has been closed by the remote Host. After this amount of time the Gen 3 module will attempt to reconnect to the remote Host.

**Keep Alive (5s):**

This is the interval in 5 second increments the Gen 3 module will send keep alive packets to the remote host/client.

## Setting Web Interface

The NCD5500 allows you to easily change from a simple TCP socket or UDP datagram communication architecture over to a web interface based control and monitoring system. This interface is usable out of the box or completely customizable using HTML, CSS, and JS.

### Compatibility

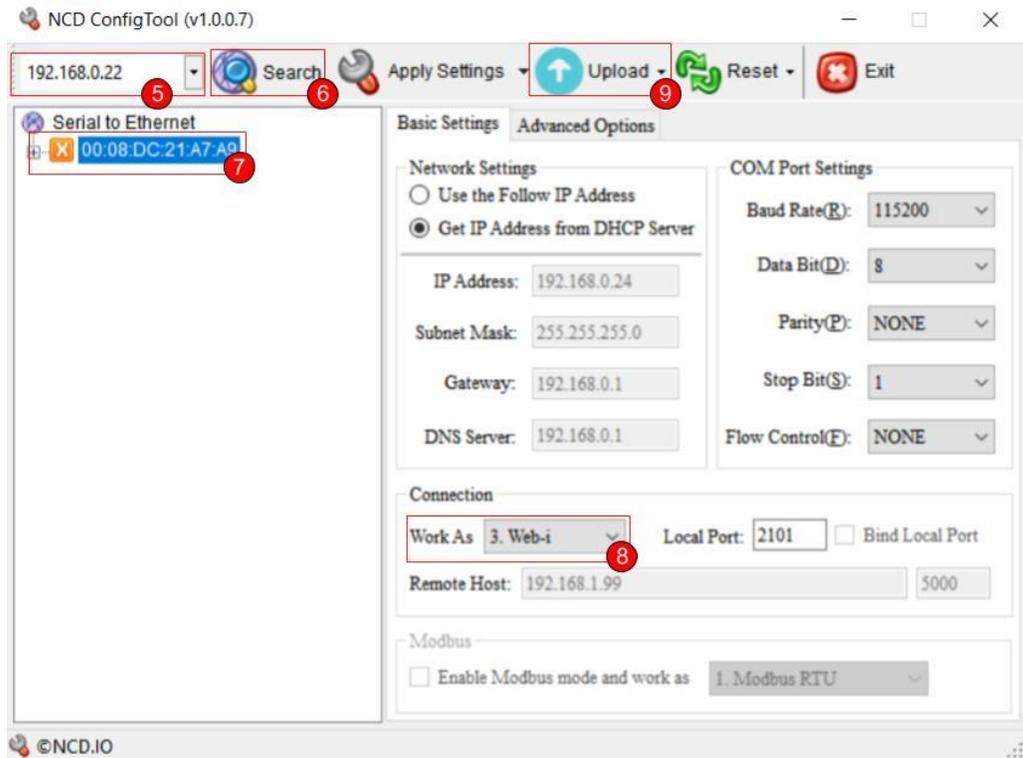
Currently the Web Interface configuration of the NCD5500 Ethernet module is only compatible with ProXR Lite.

## Software Setup

Follow these steps to set up the software. The diagram below the steps will correspond to a step number.

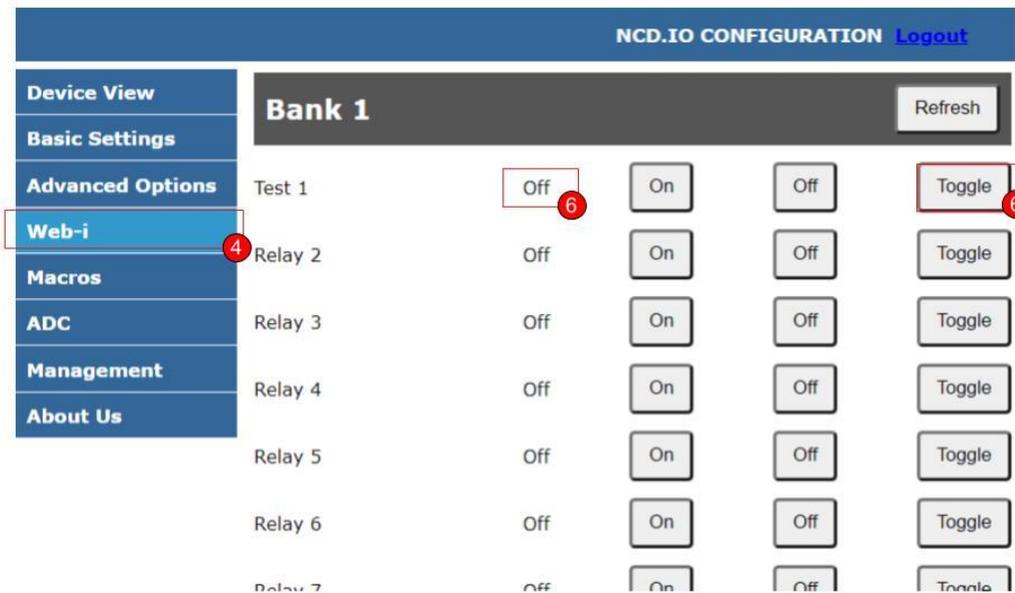
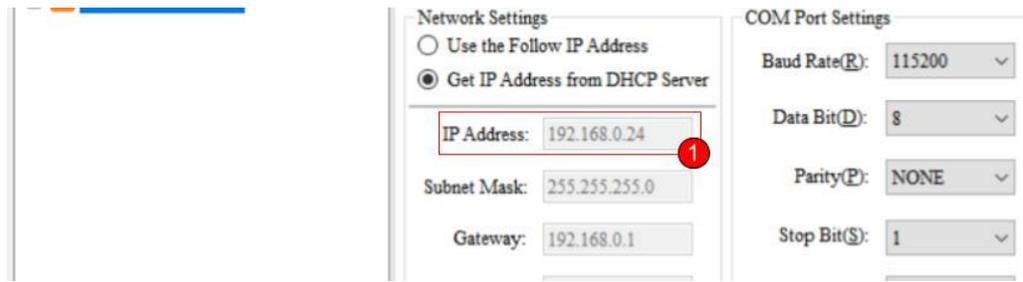
1. Navigate to the NCD5500 Repository at <https://github.com/ncd-io/NCD5500-Files>
2. On the repository page, download the repository (Code Button> Download ZIP)
3. Unzip the file you just downloaded
4. Run the NCD5500 Configuration utility (/configuration/NCD ConfigTool.exe)
5. Make sure that the IP address drop down in the top left has the IP address of your computer on the network (Figure 1)
  - Some windows computers have a loopback interface that will display here. This interface will have an IP address such as 127.0.0.1. Do not choose this interface
6. Click the “Search” Button (Figure 1)
7. Select the MAC address of the device you would like to configure (Figure 1)
  - You can match the MAC address displayed here against the one printed on the top of the ethernet module
  - If the device shows an IP address of 0.0.0.0 it has not fully booted yet, select search again until a valid IP address is displayed
8. Under the “Connections” section change “Work As” to “3. Web-i” (Figure 1)
9. Click on the “Upload” button along the top of the NCD5500 Configuration Utility (Figure 1)
10. Select Upload Firmware
11. In the file explorer that comes up navigate to the unzipped firmware folder and upload the file marked NCD5500.bin

12. Allow this upload time to process
13. Once the firmware has finished uploading click on the Reset button along the top of the application and click on “Reset Now!”
14. Click on the “Upload” button along the top of the NCD5500 Configuration Utility again and select “Upload Webpage”
15. In the file explorer that pops up navigate to the unzipped firmware folder and go to the HTML folder inside of it
16. Choose the .html file appropriate for the number of relays you have on your relay controller



# Confirmation

1. The NCD5500 Utility will display the IP address of the module in the “Network Settings” section next to the label “IP Address” (Figure 2)
2. Enter the IP address displayed here into the URL bar of your computer’s browser (we recommend google chrome)
3. Log in with the default password of “admin” without the quotes
4. In the left navigation select “Web-i” (Figure 3)
5. You should now see controls for each relay on your controller with its current status.
6. Click on the “Toggle” button to make sure that the status of the relay updates (Figure 3)



# Customization

## Number, Names, and Buttons for Relays

The NCD5500 module does not have on-board storage for variables so you must alter the HTML files saved into the module. First you will need to have the .HTML file for your board which can be obtained from: <https://github.com/ncd-io/NCD5500-Files>.

1. Open the HTML file for your relay controller with a text or code editor. I recommend Atom ([atom.io](https://atom.io)) or Notepad++ ([notepad-plus-plus.org/downloads/](https://notepad-plus-plus.org/downloads/))
2. Perform a find operation (CTRL+F) and look for “get\_standard\_ui\_json” without the quotes
  - This function simply builds and returns an object in JSON format to the UI constructor
  - You can alter the number of relays using the number\_of\_relays property
  - You can alter the names of the relays using the names property. If you do no name all of the relays your UI is configured to show then the unnamed relays will be labeled Relay X where X is the relay number
  - You can add and remove control buttons using the buttons property. By default On, Off, and Toggle are shown. The property name here is the function that will be called when the button is clicked. The property value is the text displayed on the button. By default these buttons will also call query\_relay\_bank\_status and update\_relay\_bank\_status\_ui in order to update the UI with the new state of the relay.
3. Alter this function to suit your requirements
4. Save this file
5. Use the NCD5500 Configuration Utility to find and upload the new .html file

# Macros

The NCD5500 module does not have on-board storage for variables so you must alter the HTML files saved into the module. First you will need to have the .HTML file for your board which can be obtained from: <https://github.com/ncd-io/NCD5500-Files>.

1. Open the HTML file for your relay controller with a text or code editor. I recommend Atom ([atom.io](http://atom.io)) or Notepad++ ([notepad-plus-plus.org/downloads/](http://notepad-plus-plus.org/downloads/))
2. Perform a find operation (CTRL+F) and look for “get\_macros\_ui\_json” without the quotes
  - This function simply builds and returns an object in JSON format to the UI constructor
  - You can alter the number of macros by creating a new object keyed by integer index
  - You can alter the label of the button by altering the label property of each button object
  - You can alter what is triggered after the macros are executed for further parsing by altering the callbacks property. The default callback simply displays the response on the Macros page. Multiple callbacks can be entered and they will trigger in the order entered
  - You can alter what commands are executed by either entering an integer array in for the command you wish to send or calling a get\_...\_command function such as get\_toggle\_relay\_command to obtain the desired command
3. Alter this function to suit your requirements
4. Save this file
5. Use the NCD5500 Configuration Utility to find and upload the new .html file

## Code

You can alter and customize the code of the web page itself if you want to. NCD has limited support for doing so and a working knowledge of HTML5 is recommended.

### KWARGS

Many functions in the base code expect an argument called kwargs. This is short for keyword arguments and allows you to pass context and variables through our functions and access them through your own callbacks later on down the communications flow. You can find an example of doing this in our standard relay control code which passes the kwargs of 'callbacks' (array of function to pass GET request responses to) and 'bank' (specifies the target bank for UI updates after getting current relay status'). This argument is not required and will default itself to being empty if no kwargs are passed. We recommend if you design your own code for the NCD5500 web interface to implement this practice as well.

### COMMAND FUNCTION LIST

The list of callable commands is in development. Contact us for questions or peruse the code. All of the pertinent functions will be listed after the NCD AJAX function.

software. Options are No Message, Device Name, Device IP, or Device MAC address.

# Management

## Password Setting

The Web interface is password protected. The default password for the web interface is admin. If desired, you may change this password using the Password Setting Fields. After the new password is set it will take effect after the next power cycle.

## Factory Default

It is possible reset the Gen 3 module to factory default settings by pressing this Default Button

## Reset Device

It is possible to power cycle the Gen 3 Module by pressing this Reset Button.

## Logout

This button will log the user out of the web interface. Keep in mind password changes will not take effect until a power cycle to the module.

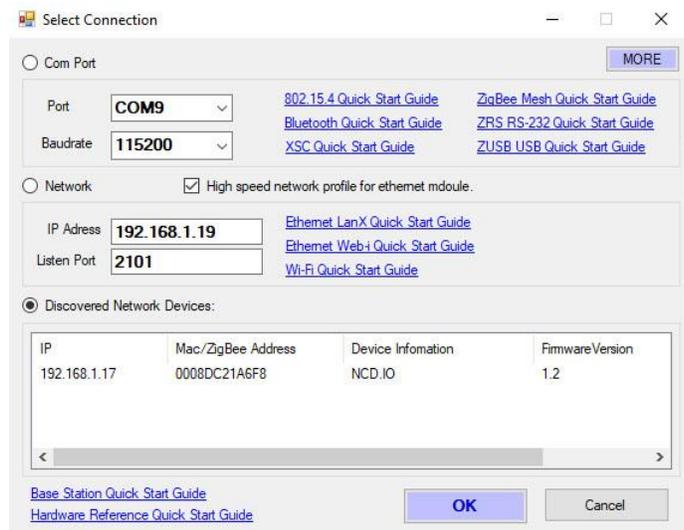
The screenshot shows the NCD.IO CONFIGURATION web interface. At the top right, it says "NCD.IO CONFIGURATION" and "Logout". On the left side, there is a navigation menu with the following items: "Device View", "Basic Settings", "Advanced Options", "Firmware", "Management" (highlighted with a red box), and "About Us". The main content area is titled "Password Setting" and contains three input fields: "Old Password:", "New Password:", and "Confirm Password:". To the right of the "Confirm Password:" field is a "Set" button. Below this, there is a "Management" section with three buttons: "Factory Default:", "Reset Device:", and "Logout:". The "Factory Default:" button is highlighted with a red box. At the bottom right of the interface, the version number "v1.5" is displayed.

# Base Station Software

Base Station Software is our reference tool for designing and testing all currently manufactured NCD Devices. Base Station will assist you in learning how any NCD device functions and will provide valuable diagnostic tools to help determine if your controller is functioning as designed. Base Station software exercises every supported feature of every supported device. It is the ultimate reference tool for learning, diagnosing, and testing NCD devices.

## Discovered Network Devices

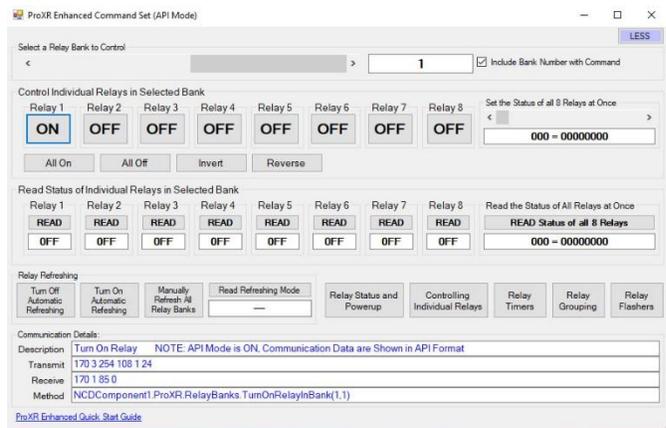
Base Station will discover the Ethernet board on the network and show you the IP address assigned to the board. Select Discovered Network Devices button then click on the IP Address, this will open your browser and show you the Web Interface Connection and all its features. By selecting the Discovered



Network Devices button then clicking OK, Base Station Software will open showing you the command sets that are available for your board.

## Device Command Sets

Base Station software asks the controller which command sets are supported. The supported command sets are listed when you run the Base Station software application. Some controllers may show more command sets while other controllers may show fewer command sets. The Base Station program will decide which command sets apply to your board.



# Troubleshooting

If you lose communications with the module follow these steps:

## Factory Reset

1. Check that the Ethernet Module is seated correctly on the connection socket of the board it is mounted on
2. Power up the module by applying power to the board the module is mounted on
3. Press and hold the factory reset button on the side of the Ethernet module for 5 seconds to reset the module back to factory settings
4. Use the [NCD5500 Configuration Software for Windows](#) to discover the device
  - Make sure that the IP address dropdown box in the top left of the NCD5500 Configuration software is set to your computer's external IP address. If you select the dropdown and only one IP address is listed, then you do not need to change this
  - If the correct network is selected in the top left dropdown and the device is still not being discovered, try the steps in the "Static IP Configuration" section below
5. Use the NCD5500 Software to configure your device to the desired settings
6. Select Apply Settings at the top
7. Select Reset at the top

## Static IP Configuration

If the Factory Reset above does not discover the device

1. Check that the Ethernet Module is seated correctly on the connection socket of the board it is mounted on
2. Use a jumper to connect the two pins on the Ethernet Module to force the static IP address of 192.168.1.88 onto the module
3. Power up the module by applying power to the board the module is mounted on
4. Connect the Ethernet Module directly to the Ethernet Port of your computer
5. Use the [NCD5500 Configuration Software for Windows](#) to discover the device
  - Make sure that the IP address dropdown box in the top left of the NCD5500 Configuration software is set to your computer's external IP address. If you select the dropdown and only one IP address is listed then you do not need to change this
  - If the device is not discoverable at this point contact NCD's support team for additional steps
6. Use the NCD5500 Software to configure your device
7. Select Apply Settings at the top
8. Power down the ethernet module by removing power from the board that the Ethernet Module is mounted on
9. Wait 2 seconds
10. Remove the Static IP jumper from the Ethernet Module
11. Power up the board

# Technical Support

Base Station Software is

## **NCD Community**

National Control Devices has a forum where you can search and post questions on the operation of the boards. The NCD Community is where you will get the fastest support for all NCD products right from the developers! Discussions are welcome on applications, and you are encouraged to share your experiences with other users. Visit the community here: [community.ncd.io/](https://community.ncd.io/)