



HICON EC-Link User Guide



Document Revision 1.0.0  
(Updated 1/07/2021)

© 2021 Vital Systems Inc  
Buford, GA USA

For more information, please visit the product web page:  
[www.vitalsystem.com/HICON](http://www.vitalsystem.com/HICON)

## Contents

<b>LICENSE AGREEMENT</b> .....	<b>2</b>
<b>INTRODUCTION</b> .....	<b>3</b>
Tested EtherCAT Devices .....	3
<b>EC-LINK GUI</b> .....	<b>4</b>
<b>EC-LINK STATUS INDICATOR</b> .....	<b>5</b>
<b>MENU ITEM FUNCTIONS</b> .....	<b>7</b>
ESI Files .....	7
PROJECT .....	8
CONTROLLER.....	8
MISCELLANEOUS.....	9
<b>ETHERCAT DEVICE TREE</b> .....	<b>10</b>
Manually Add EtherCAT Devices.....	10
Add a master EtherCAT controller .....	10
Add an EtherCAT device.....	10
Automatically Add EtherCAT Devices .....	11
<b>PDO TAB</b> .....	<b>12</b>
For All Users.....	12
For Advance Users (Most people can ignore this section) .....	13
Edit an existing PDO.....	13
Create a new PDO .....	13
Copy an existing PDO and add it as new.....	13
Delete a User Created PDO.....	13
Reset a PDO that exists in the ESI file .....	13
Using the PDO Editor .....	14
<b>SDO TAB</b> .....	<b>15</b>
Configuring an SDO object using SDO Editor .....	16
<b>ADDITIONAL REFERENCES</b> .....	<b>17</b>

## License Agreement

Before using the HICON and accompanying software tools, please take a moment to go thru this License agreement. Any use of this hardware and software indicate your acceptance to this agreement.

It is the nature of all machine tools that they are dangerous devices. In order to be permitted to use HICON on any machine you must agree to the following license:

I agree that no-one other than the owner of this machine, will, under any circumstances be responsible, for the operation, safety, and use of this machine. I agree there is no situation under which I would consider Vital Systems, or any of its distributors to be responsible for any losses, damages, or other misfortunes suffered through the use of the HICON board and its software. I understand that the HICON board is very complex, and though the engineers make every effort to achieve a bug free environment, that I will hold no-one other than myself responsible for mistakes, errors, material loss, personal damages, secondary damages, faults or errors of any kind, caused by any circumstance, any bugs, or any undesired response by the board and its software while running my machine or device.

I fully accept all responsibility for the operation of this machine while under the control of HICON, and for its operation by others who may use the machine. It is my responsibility to warn any others who may operate any device under the control of HICON board of the limitations so imposed.

I fully accept the above statements, and I will comply at all times with standard operating procedures and safety requirements pertinent to my area or country, and will endeavor to ensure the safety of all operators, as well as anyone near or in the area of my machine.

**WARNING:** Machines in motion can be extremely dangerous! It is the responsibility of the user to design effective error handling and safety protection as part of the system. VITAL Systems shall not be liable or responsible for any incidental or consequential damages. By Using the HiCON motion controller, you agree to the license agreement.

## Introduction

### IMPORTANT

This document makes the assumption that the reader has thoroughly reviewed the HiCON User Manual, has completed the proper hardware setup, and possesses basic knowledge and understanding of Mach4 CNC Software.

EC-Link is proprietary software created by Vital Systems to configure the HiCON EtherCAT motion controller like EC01. This software uses information provided within the ESI file (XML format) and presents in a user-friendly GUI for easy configuration.

- ❖ Please obtain the ESI files for your EtherCAT Device from the respective manufacturer's website before using this software. ESI file import procedure is defined in this [section](#).
- ❖ **Read the entire manual before attempting to use the software.**

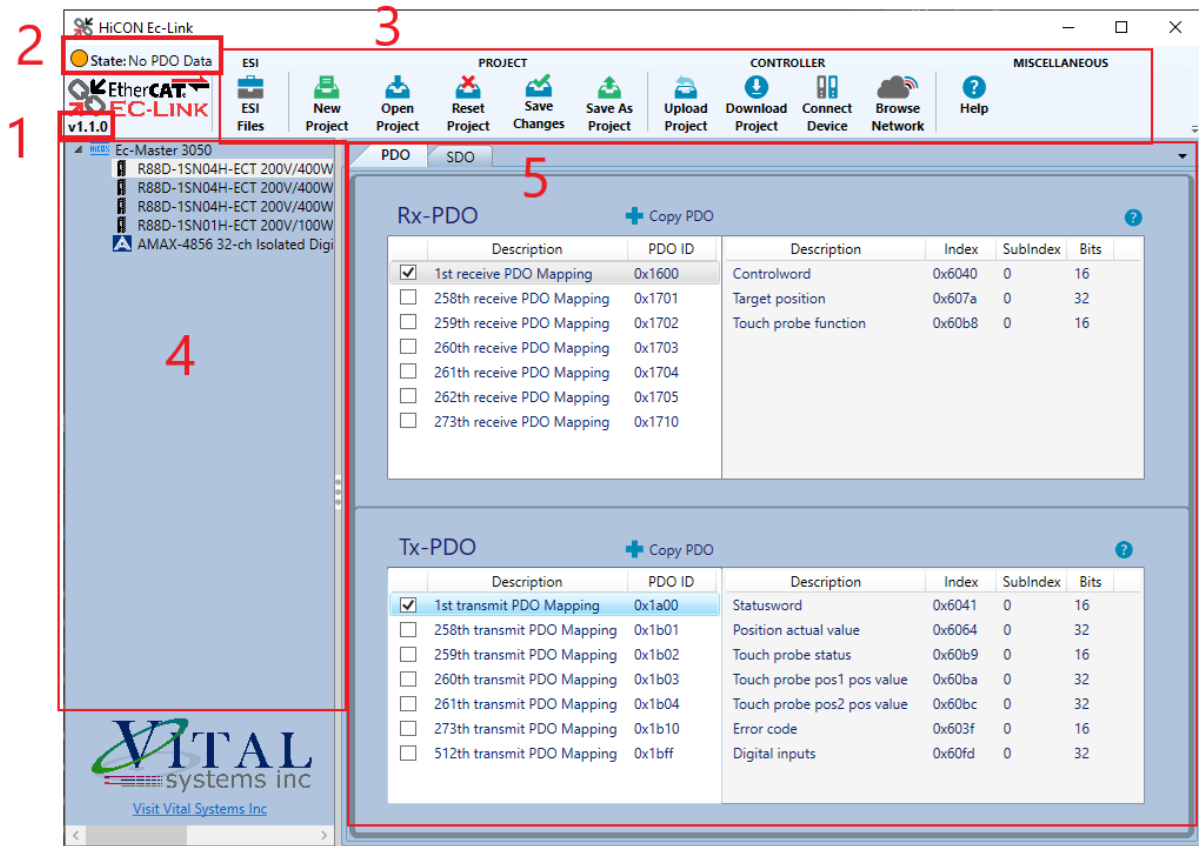
### *Tested EtherCAT Devices*

While any EtherCAT drive with CiA402 protocol should work with our controller we test and provide support for the EtherCAT drive of your choice on request. (Drive needs to be shipped to us)

EtherCAT I/O blocks and EtherCAT spindle devices are supported as well.

- ❖ Mitsubishi MR-JET, MR J5
- ❖ Omron 1S series
- ❖ Yaskawa SGD7S
- ❖ Maxine EP3E-EC
- ❖ Delta ASDA-A2
- ❖ Beijing CTB Technology 3-Axis Drive
- ❖ LeadShine EM3E-A882
- ❖ Advantech AMAX I/O Block series

## EC-Link GUI








Number	Description
1	EC-Link version number
2	Controller status indicator
3	Toolbar Menu
4	EtherCAT device tree
5	PDO and SDO Views







## EC-Link Status Indicator

The Status indicator provides useful information to determine what is the status of the controller and the EtherCAT Network.

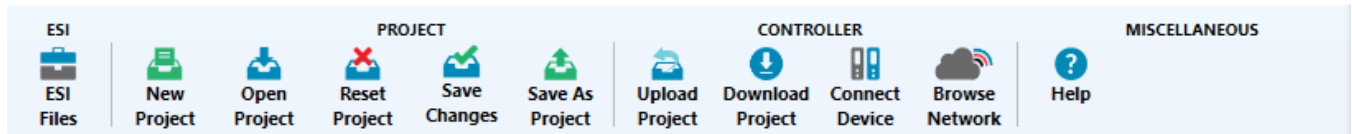
Controller States: Indicates the status of the controller

EtherCAT States: Indicates the state of the EtherCAT Network

<b>Controller States</b>	
<b>Color</b>	<b>Description</b>
Black 	Comms Error (The Controller communication has bad data contact support)
Ghost White 	Disconnected (The Controller is not connected to EC-Link)
Dark Red 	Searching... (EC-Link has lost connection with the controller)
Orange 	PDO Data Error (The controller does not have the project downloaded to it)
Blue 	Downloading (EC-Link is downloading the configuration to the controller)

<b>EtherCAT States</b>	
<b>Color</b>	<b>Description</b>
Red 	Error (EtherCAT Error State)
Gold 	Boot (EtherCAT Boot State)
Yellow 	Init (EtherCAT Init State)
Green Yellow 	Pre-Op (EtherCAT Pre-Op State)
Lime Green 	Safe-Op (EtherCAT Safe-Op State)
Lawn Green 	Op (EtherCAT Op State)

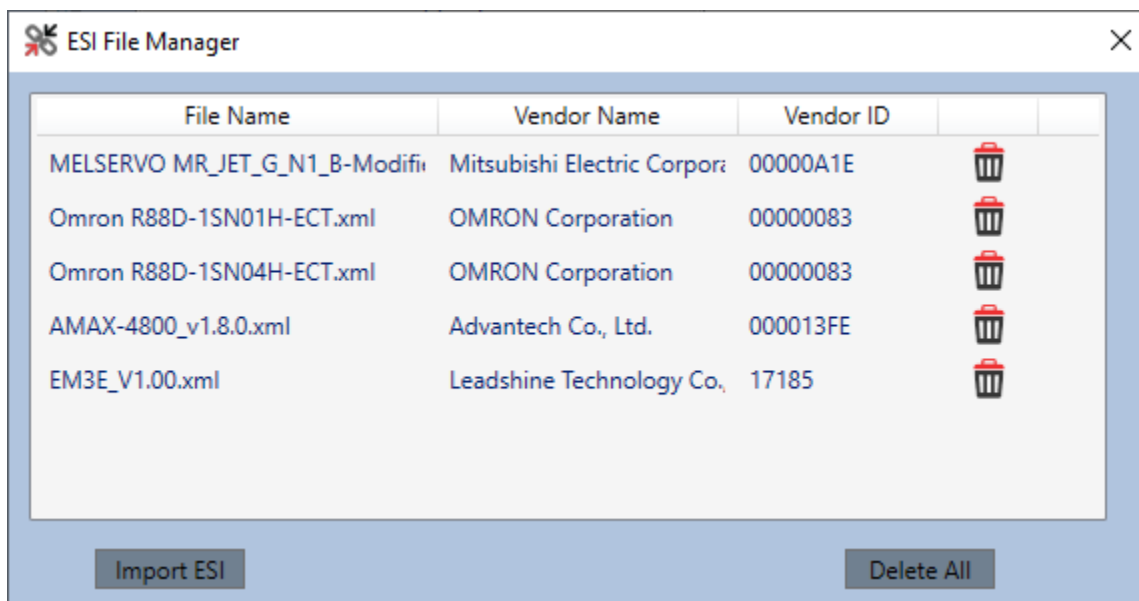
## Menu Item Functions



### ESI Files

A ESI file is an **Xml file** that contains the EtherCAT configuration.

The **ESI Files** opens the ESI File Manager where you import the ESI files into EC-Link



Import the ESI file that comes with your EtherCAT device. Click on the “Import ESI” button and select the ESI file then press “Ok”.

This should be the first step before using the application.

**Note:** You do not need the ESI file to use an already configured ECL project file. You can quickly load the ECL project file and Download it to the controller.



## PROJECT

New Project: Create a new ECL Project file.

Open Project: Open a ECL Project file.

Reset Project: Reset the current ECL Project and start over without creating a new one (Permanently clears the project file).

Save Changes: Save the changes made to the Project.

Save As Project: Save the current project into a new project file while continuing to work on the current one.

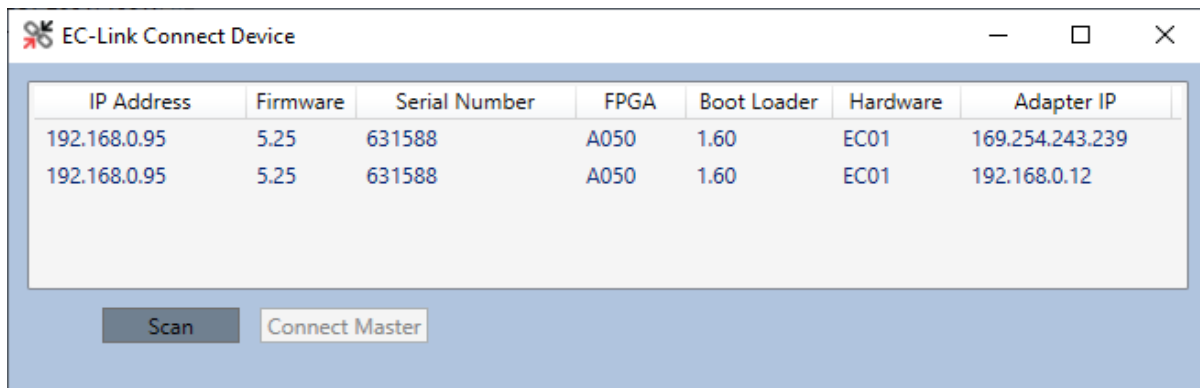
## CONTROLLER

Upload Project: Upload the project file from the controller (If it Exists) and save it on the computer. Opens a dialog to select the location of the save file. The project is saved within a Zip File.

Download Project: Downloads the configured ECL project to the controller.

Connect Device: Connect the EtherCAT motion controller to EC-Link.

Opens a dialog where the user can scan for HiCON EtherCAT Motion Controllers connected to the PC



Select the device from the list and press Connect Master. If successful the Status Led will start blinking.

Browse Network: Opens a new window where you can see EtherCAT devices connected to the controller. Here you can Read/Write SDO and get all the connected devices into the project file.

## MISCELLANEOUS

Help: Opens the EC-Link User Manual in a browser.

## EtherCAT Device Tree

- This is an offline view where EtherCAT Devices can be added to the configuration.
- The devices must be added in sequence of the EtherCAT devices connected to the controller.
- The EtherCAT devices can be deleted and shifted up/down by right clicking on a device.

## Manually Add EtherCAT Devices

### *Add a master EtherCAT controller*

1. Right click on empty space and select “Add Master Device”

### *Add an EtherCAT device*

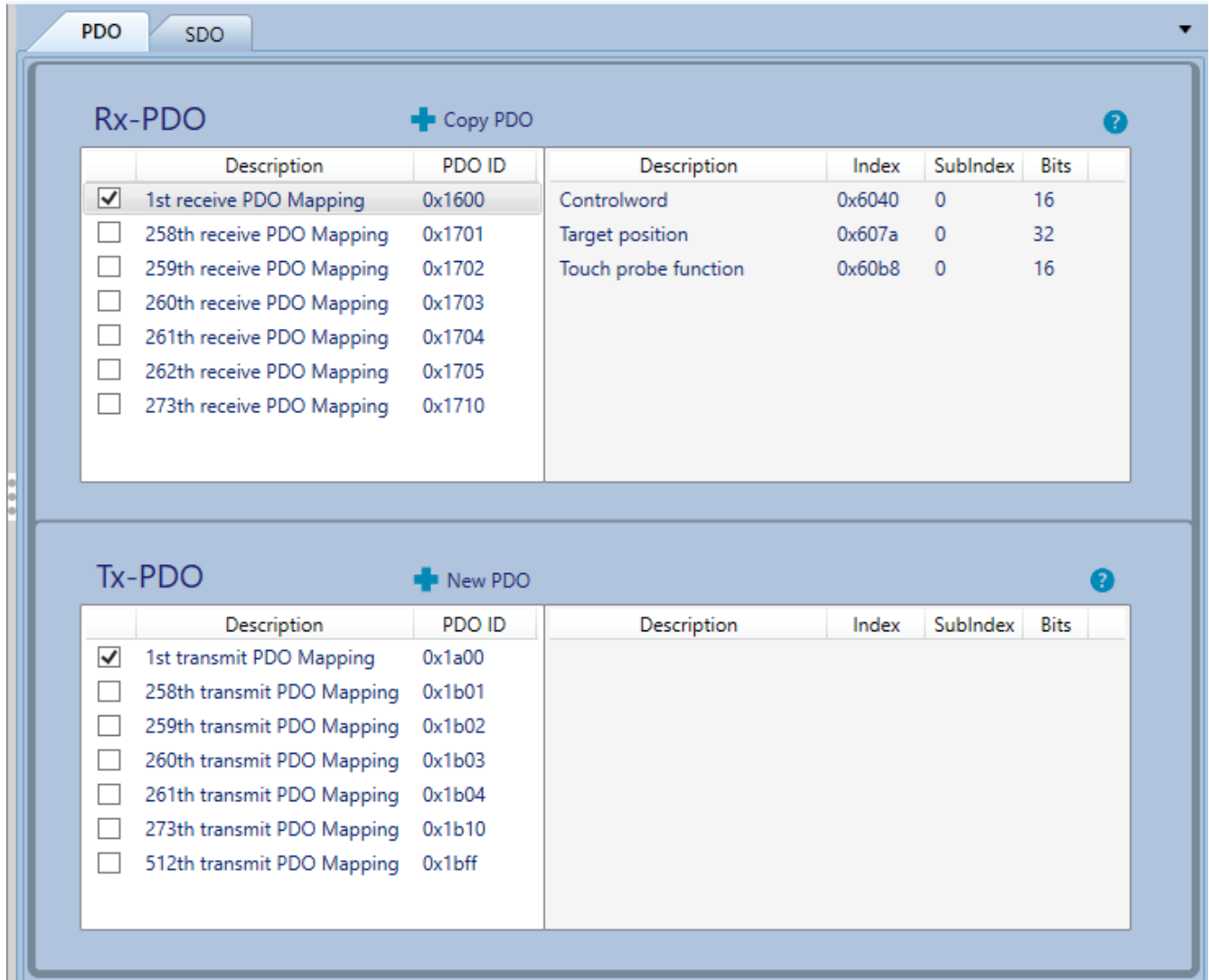
1. Right click on the “HiCON Ec-Master” to open the Device list.
2. Choose a Vendor from the dropdown.
3. Select a device form the list and click on Add Slave. The device should be added to the selected master.

*Note: You must first [import ESI](#) file for the EtherCAT devices to be listed.*

## Automatically Add EtherCAT Devices

Coming soon.

## PDO Tab



The screenshot shows a software interface for configuring PDOs. It has two tabs: 'PDO' (selected) and 'SDO'. The main area is divided into two sections: 'Rx-PDO' and 'Tx-PDO'.

**Rx-PDO Section:** Includes a '+ Copy PDO' button and a table with two columns: 'Description' and 'PDO ID'. The first row is selected (checked).

Description	PDO ID
<input checked="" type="checkbox"/> 1st receive PDO Mapping	0x1600
<input type="checkbox"/> 258th receive PDO Mapping	0x1701
<input type="checkbox"/> 259th receive PDO Mapping	0x1702
<input type="checkbox"/> 260th receive PDO Mapping	0x1703
<input type="checkbox"/> 261th receive PDO Mapping	0x1704
<input type="checkbox"/> 262th receive PDO Mapping	0x1705
<input type="checkbox"/> 273th receive PDO Mapping	0x1710

To the right of the Rx-PDO table is another table with columns: 'Description', 'Index', 'SubIndex', and 'Bits'.

Description	Index	SubIndex	Bits
Controlword	0x6040	0	16
Target position	0x607a	0	32
Touch probe function	0x60b8	0	16

**Tx-PDO Section:** Includes a '+ New PDO' button and a table with two columns: 'Description' and 'PDO ID'. The first row is selected (checked).

Description	PDO ID
<input checked="" type="checkbox"/> 1st transmit PDO Mapping	0x1a00
<input type="checkbox"/> 258th transmit PDO Mapping	0x1b01
<input type="checkbox"/> 259th transmit PDO Mapping	0x1b02
<input type="checkbox"/> 260th transmit PDO Mapping	0x1b03
<input type="checkbox"/> 261th transmit PDO Mapping	0x1b04
<input type="checkbox"/> 273th transmit PDO Mapping	0x1b10
<input type="checkbox"/> 512th transmit PDO Mapping	0x1bff

To the right of the Tx-PDO table is another table with columns: 'Description', 'Index', 'SubIndex', and 'Bits', which is currently empty.

### For All Users

In this tab you can configure the device PDOs. Select on a slave to populate the values.

- There are two types of PDO's Rx-PDO and Tx-PDO
- Rx-PDO are received by the EtherCAT device E.g., Target Position, Digital Inputs
- Tx-PDO are transmitted by the EtherCAT device E.g., Actual Position, Digital Outputs
- Selecting a PDO will list the objects contained with it on the right section
- Tick a PDO to add it to the configuration and Save Changes.

## For Advance Users (Most people can ignore this section)

### *Edit an existing PDO*

1. Right Click on a PDO and select Edit to open the PDO Editor

*Note: Some PDO's obtained from the ESI file can be edited*

### *Create a new PDO*

1. Click on an empty space in the PDO list section to unselect a PDO.
2. Click on the "New PDO" Button to open the PDO Editor

### *Copy an existing PDO and add it as new*

1. Click on the PDO you want to copy
2. Click on the "Copy PDO" Button to open the PDO Editor with all the values populated

### *Delete a User Created PDO*

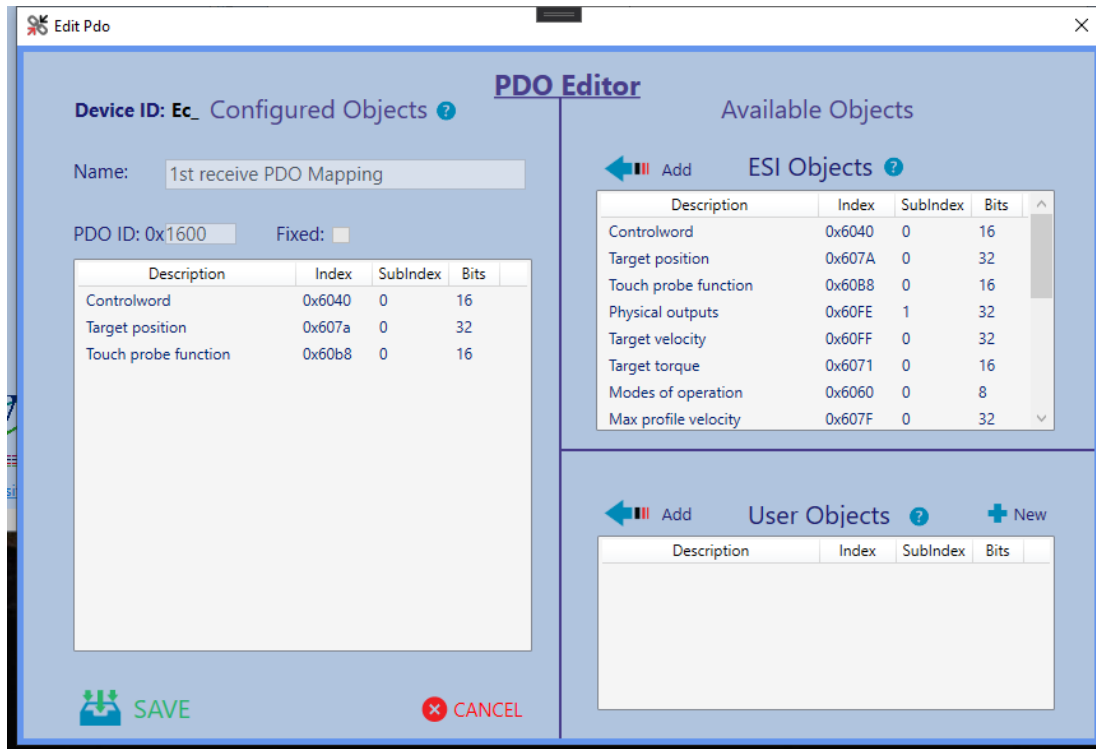
1. Right Click on a PDO and select Delete

### *Reset a PDO that exists in the ESI file*

1. Right Click on a PDO and select Reset

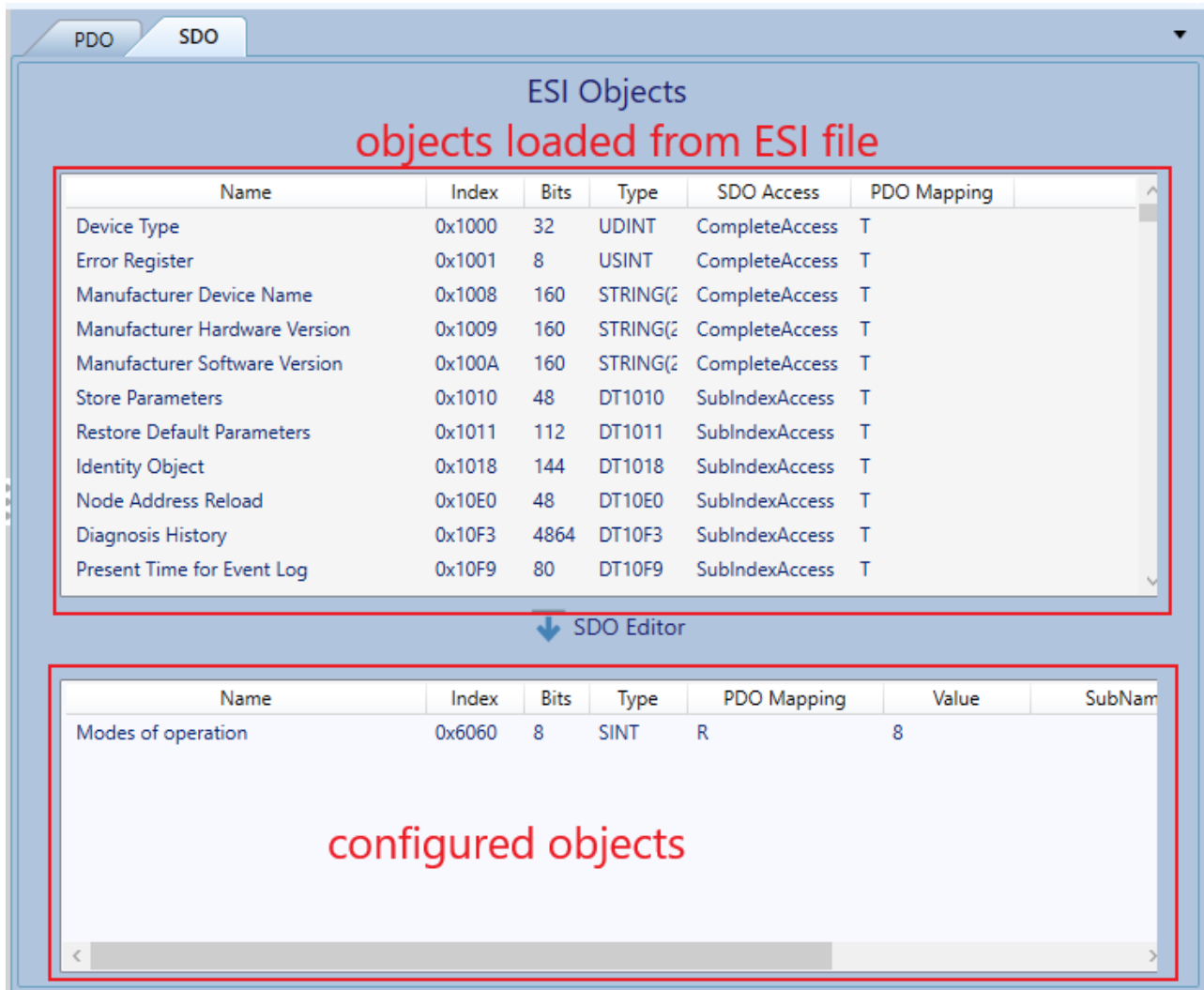
*Note: Some PDO's obtained from the ESI file can be edited and reset. User created PDO's cannot be reset.*

## Using the PDO Editor



- The PDO Editor has two sections.
  - The “Configured Object” section displays values that will be saved into the configuration.
  - The “Available Objects” section display the values that can be used to configure the object.
    - ESI Objects – All the objects within the ESI file are listed here. Please refer the respective EtherCAT device manual if the PDO can use those objects. Refer [Reset PDO](#) to reset the object back to ESI defaults.
    - User Objects – The User can create their own custom PDO objects. Custom PDO objects are saved within the ECL project file and can be used with other devices easily.
- To remove a configured object right click on it and select “Remove”.
- To add an object to the configured list, select one object from the right and click on “Add”.
- Save the PDO by clicking on “SAVE”

## SDO Tab



The screenshot shows the SDO Tab interface with two main sections. The top section, titled "ESI Objects" and "objects loaded from ESI file", contains a table of objects. The bottom section, titled "configured objects", contains a table of objects that will be downloaded to the controller.

**ESI Objects (objects loaded from ESI file)**

Name	Index	Bits	Type	SDO Access	PDO Mapping
Device Type	0x1000	32	UDINT	CompleteAccess	T
Error Register	0x1001	8	USINT	CompleteAccess	T
Manufacturer Device Name	0x1008	160	STRING(2	CompleteAccess	T
Manufacturer Hardware Version	0x1009	160	STRING(2	CompleteAccess	T
Manufacturer Software Version	0x100A	160	STRING(2	CompleteAccess	T
Store Parameters	0x1010	48	DT1010	SubIndexAccess	T
Restore Default Parameters	0x1011	112	DT1011	SubIndexAccess	T
Identity Object	0x1018	144	DT1018	SubIndexAccess	T
Node Address Reload	0x10E0	48	DT10E0	SubIndexAccess	T
Diagnosis History	0x10F3	4864	DT10F3	SubIndexAccess	T
Present Time for Event Log	0x10F9	80	DT10F9	SubIndexAccess	T

↓ SDO Editor

**configured objects**

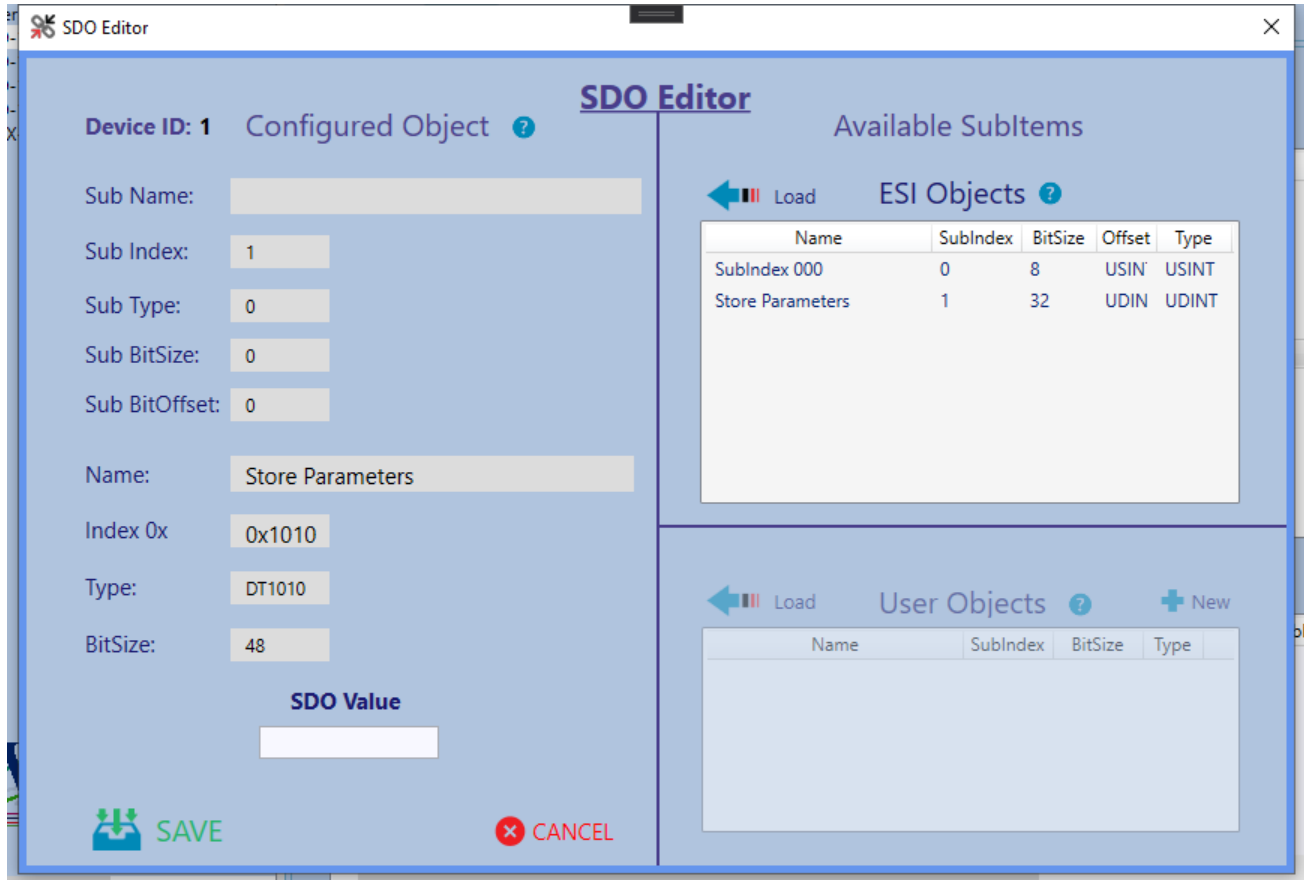
Name	Index	Bits	Type	PDO Mapping	Value	SubName
Modes of operation	0x6060	8	SINT	R	8	

In the SDO tab the top section lists all the SDO objects from the ESI file. The bottom section lists all the configured objects that will be downloaded to the controller in Pre-Op State.



## Configuring an SDO object using SDO Editor

1. Select an object from the list
2. Click on “SDO Editor” to open the SDO Editor window



The SDO Editor has two sections.

- The “Configured Object” section displays values that will be saved into the configuration.
- The Available Subitems display the values that can be used to configure the object.
  - ESI Objects – Some SDO’s will have “SubIndex Access” and this section will list them. For “Complete Access” SDO this will be empty.

- User Objects – The User can create their own SDO objects. Custom SDO objects are saved within the ECL project file and can be used on other devices easily.
3. You can load the ESI Object/User Object values by clicking on the Load button. For “Complete Access” SDO this step is not required.
  4. Enter a value for the SDO object in **decimal** and click “SAVE”

### Additional References

- [EC01 User Guide](#)
- [Mach4 Software Integration Manual](#)
- [Quick Start YouTube Video](#)
- [EC01 Product Page](#)