HICON EC-Link User Guide

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(Updated 11/22/2021)

Atlanta, GA USA
For more information, please visit the product web page:
www.vitalsystem.com/ec01

Contents

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.**

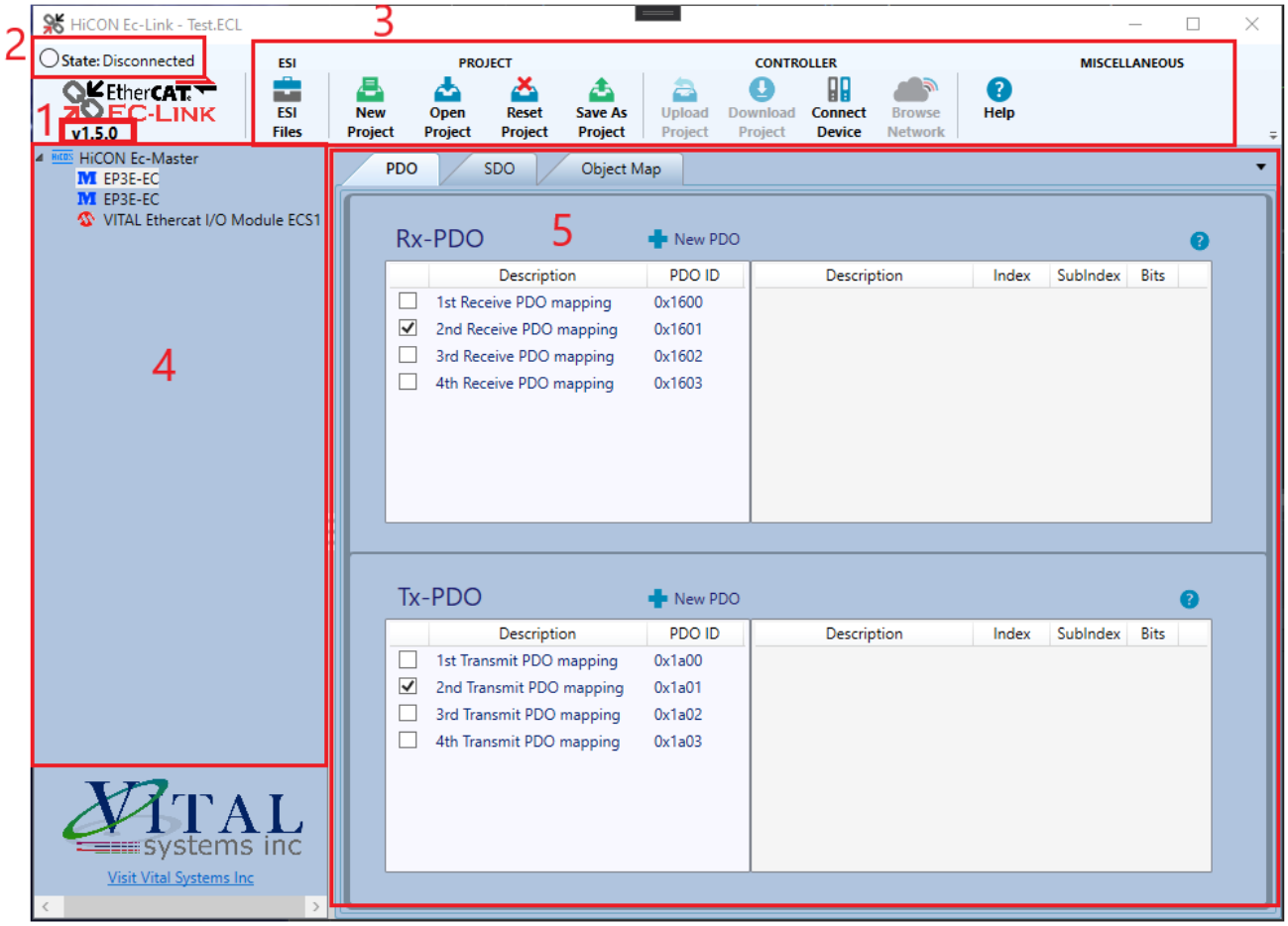
Tested EtherCAT Devices

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 Sigma7 SGD7S
- Yaskawa Sigma5 SGDV
- Festo CMMT-AS
- Advantech AMAX I/O Block
- Maxine EP3E-EC
- Beijing CTB Technology 3Axis Drives
- Delta ASDA-A2
- LeadShine EM3E-A882

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

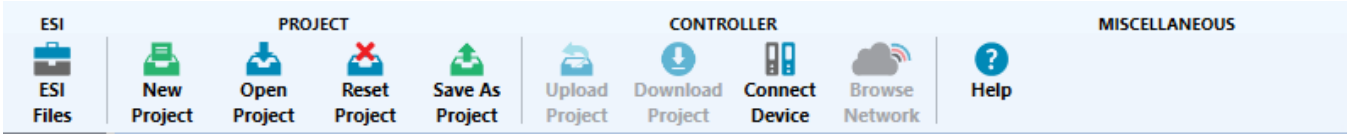
The Status indicator provides useful information to determine what is the status of the controller and the EtherCAT Network.

Controller States: Indicates the status of the controller
EtherCAT States: Indicates the state of the EtherCAT Network

Controller States	
Color	**Description**
Black 	Comms Error (The Controller communication has bad data contact support)
Ghost White 	Disconnected (The Controller is not connected to EC-Link (PC))
Ghost White 	E-CAT Unplugged (The Controller is not connected to EtherCAT network)
Dark Red 	Searching… (EC-Link has lost connection with the controller)
Orange 	None/PDO-Error (The controller does not have the project downloaded to it)
Blue 	Downloading (EC-Link is downloading the configuration to the controller)

EtherCAT States	
Color	**Description**
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)

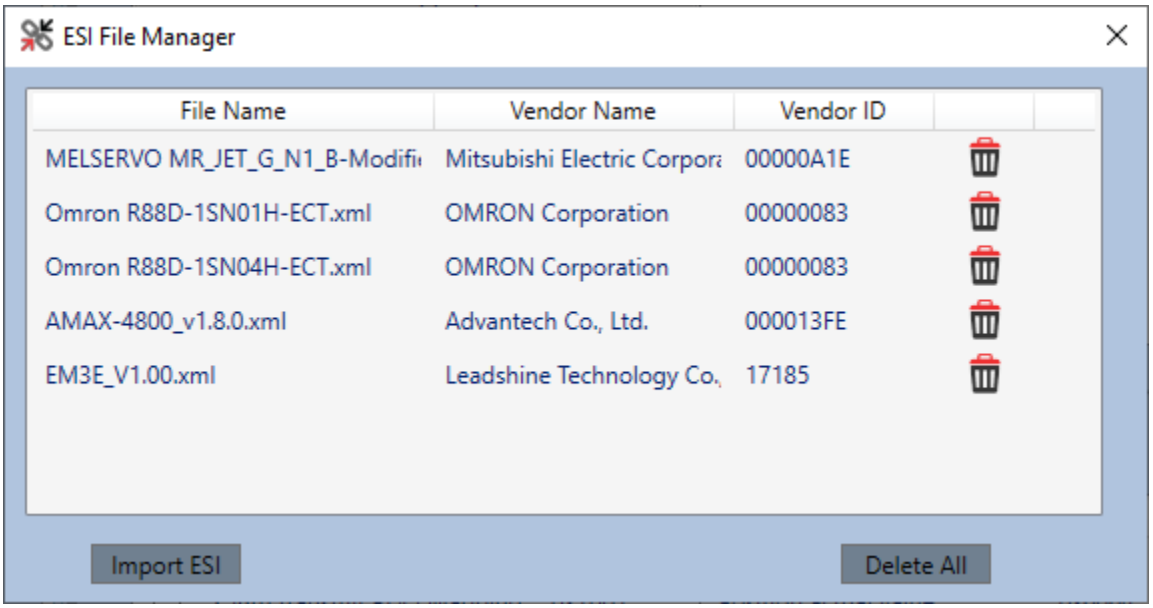
Menu Item Functions



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

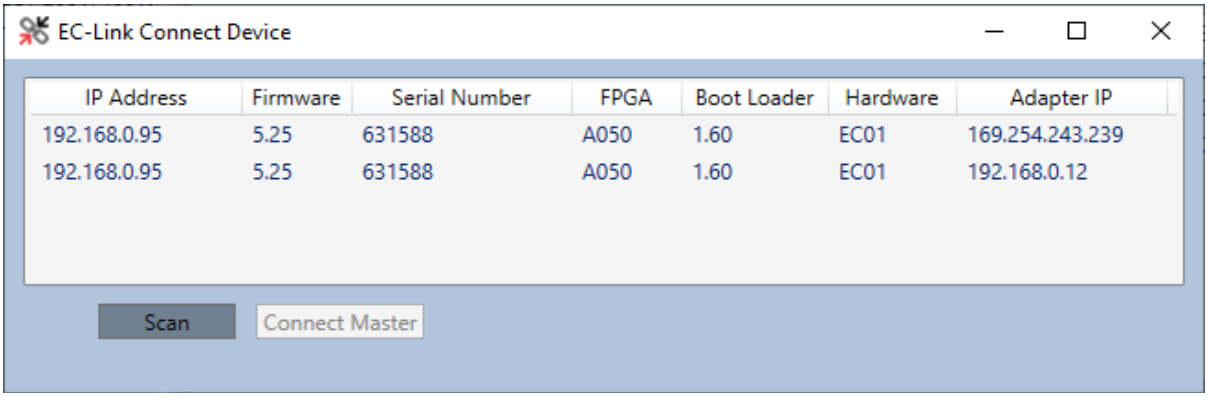
CONTROLLER

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

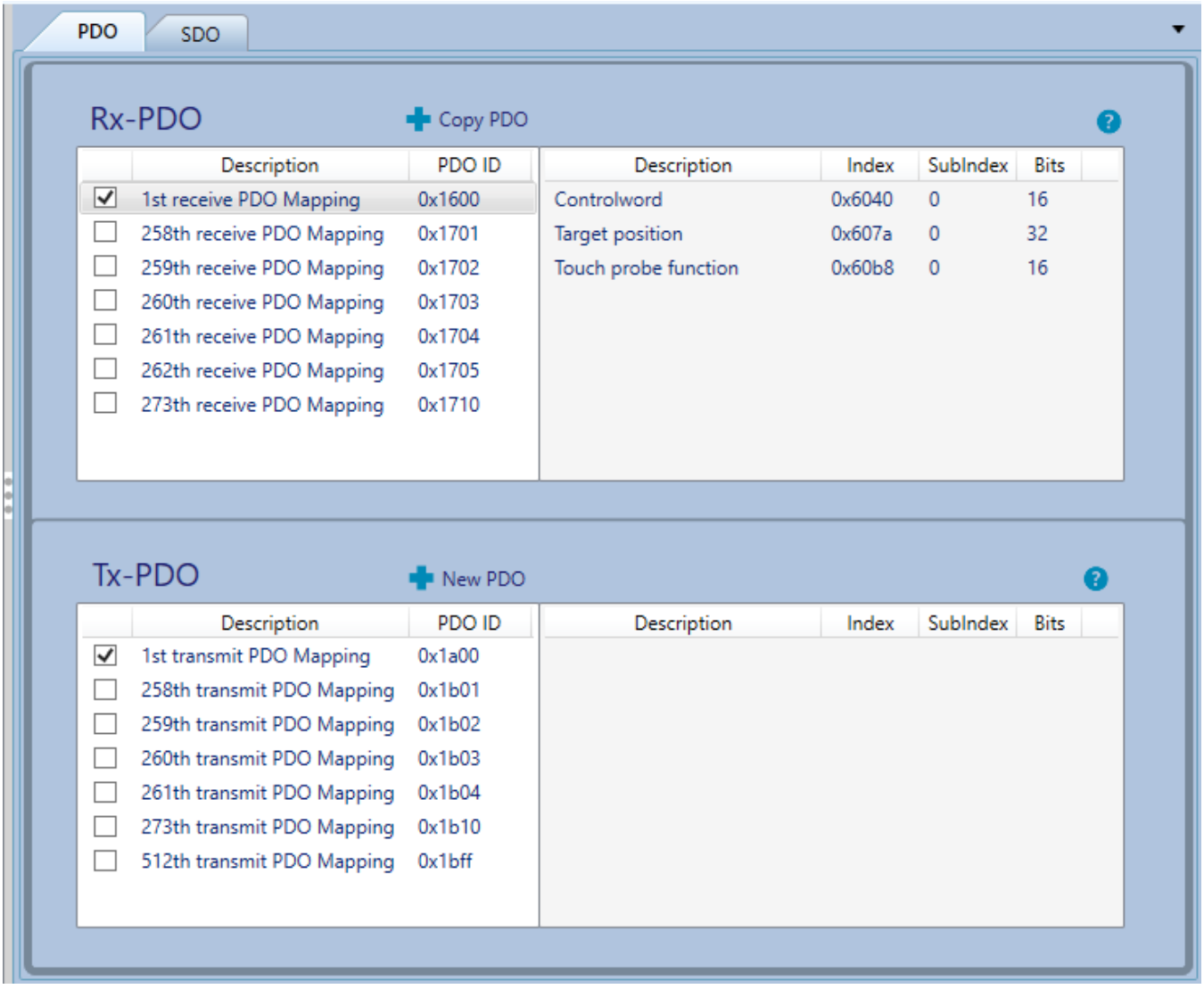
1. Right click on the “HiCON Ec-Master” to open the Device list.
2. Choose a Vendor from the dropdown.
3. Select a device form the list and click on Add Slave. The device should be added to the selected master.

Note: You must first import ESI file for the EtherCAT devices to be listed.

Automatically Add EtherCAT Devices

Coming soon.

PDO Tab



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

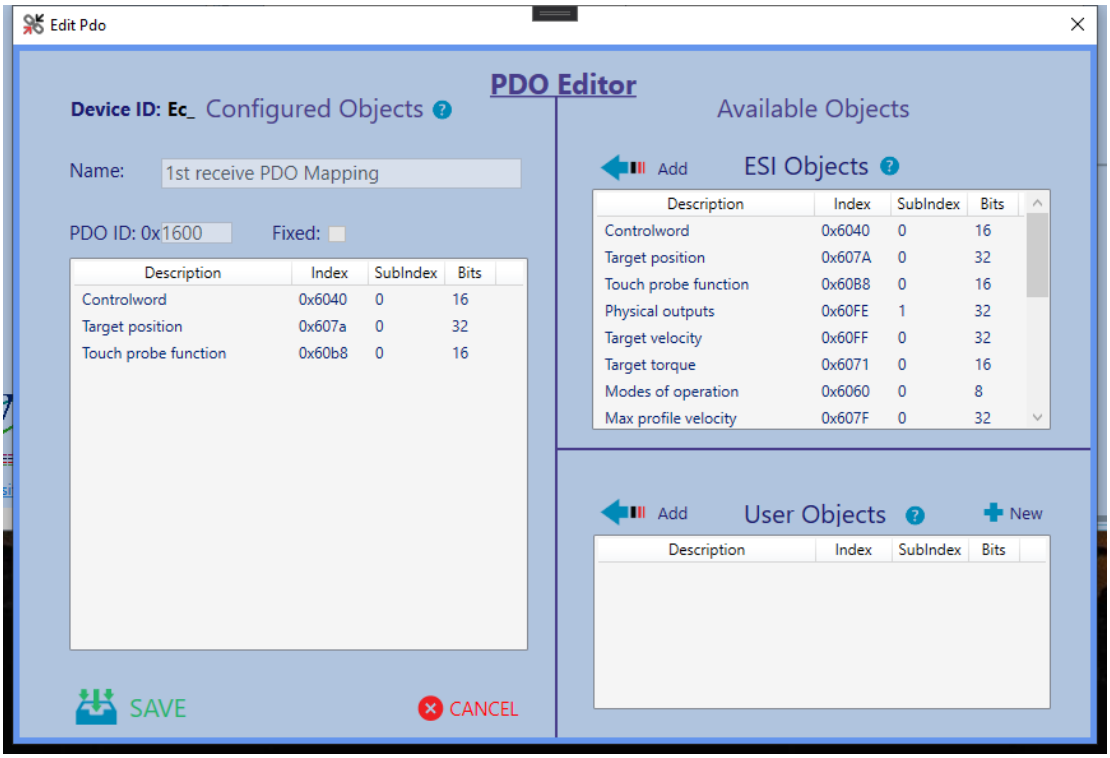
1. Right Click on a PDO and select Delete

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.

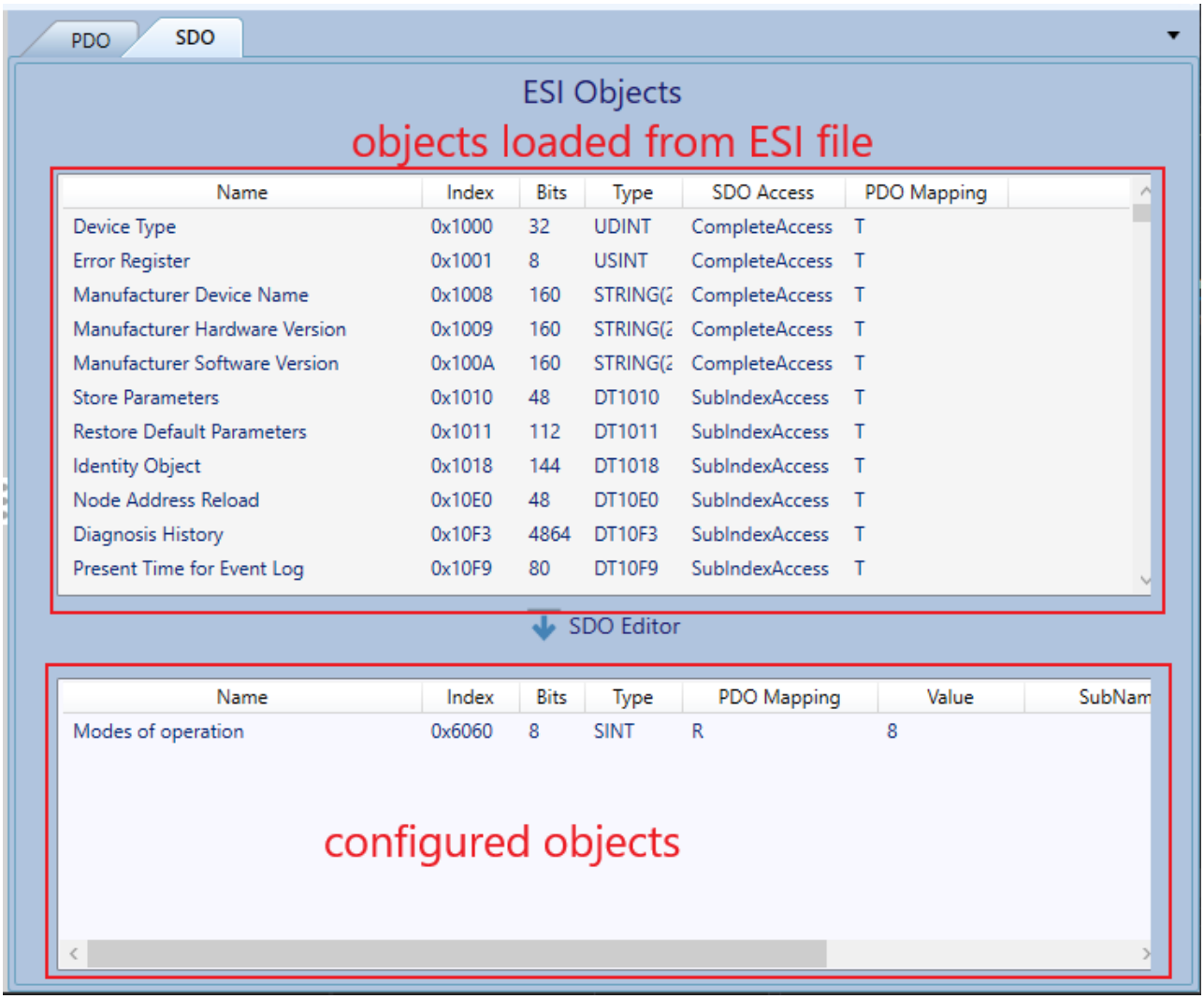
Using the PDO Editor



- 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

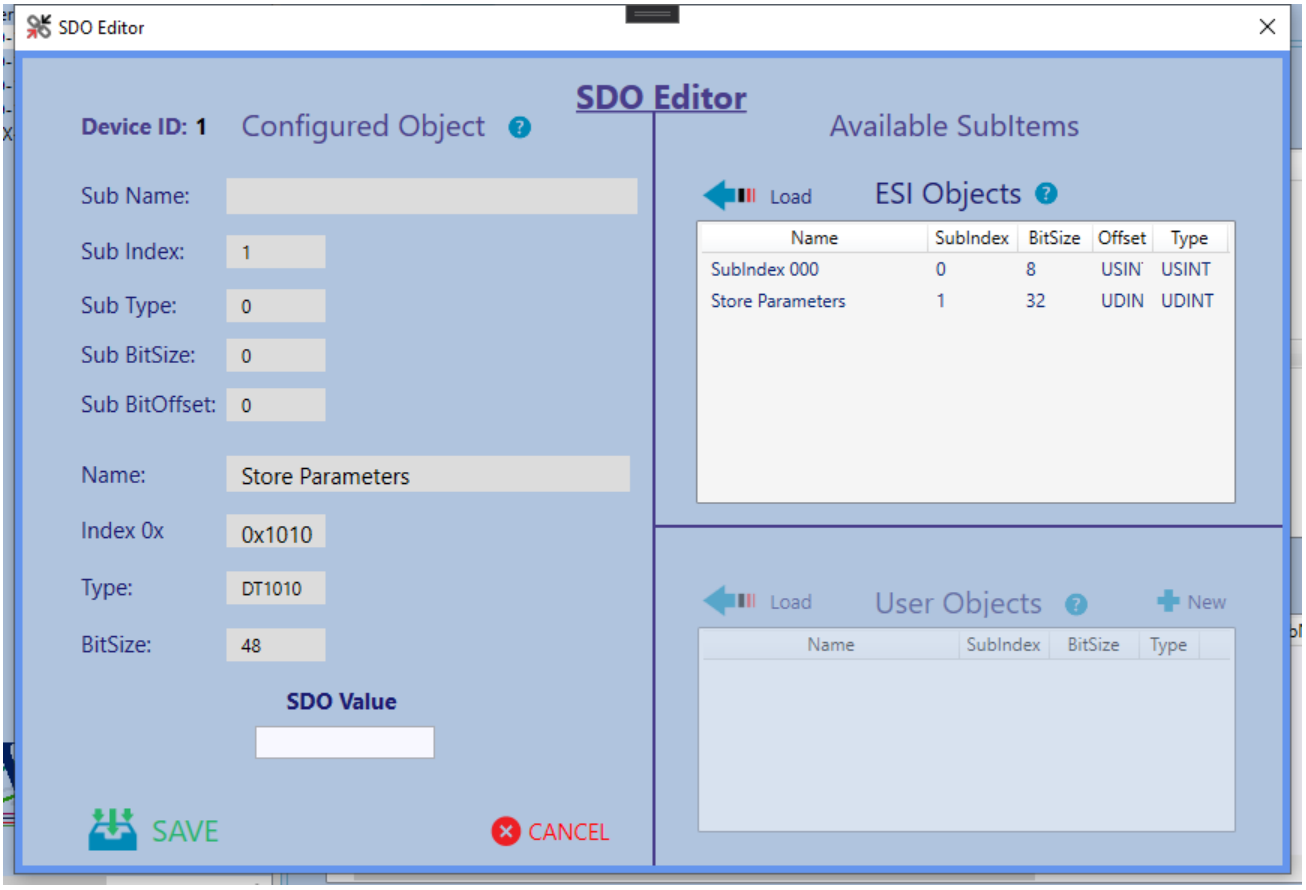


In the SDO tab the top section lists all the SDO objects from the ESI file. The bottom section lists all the configured objects that will be downloaded to the controller in Pre-Op State.

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.

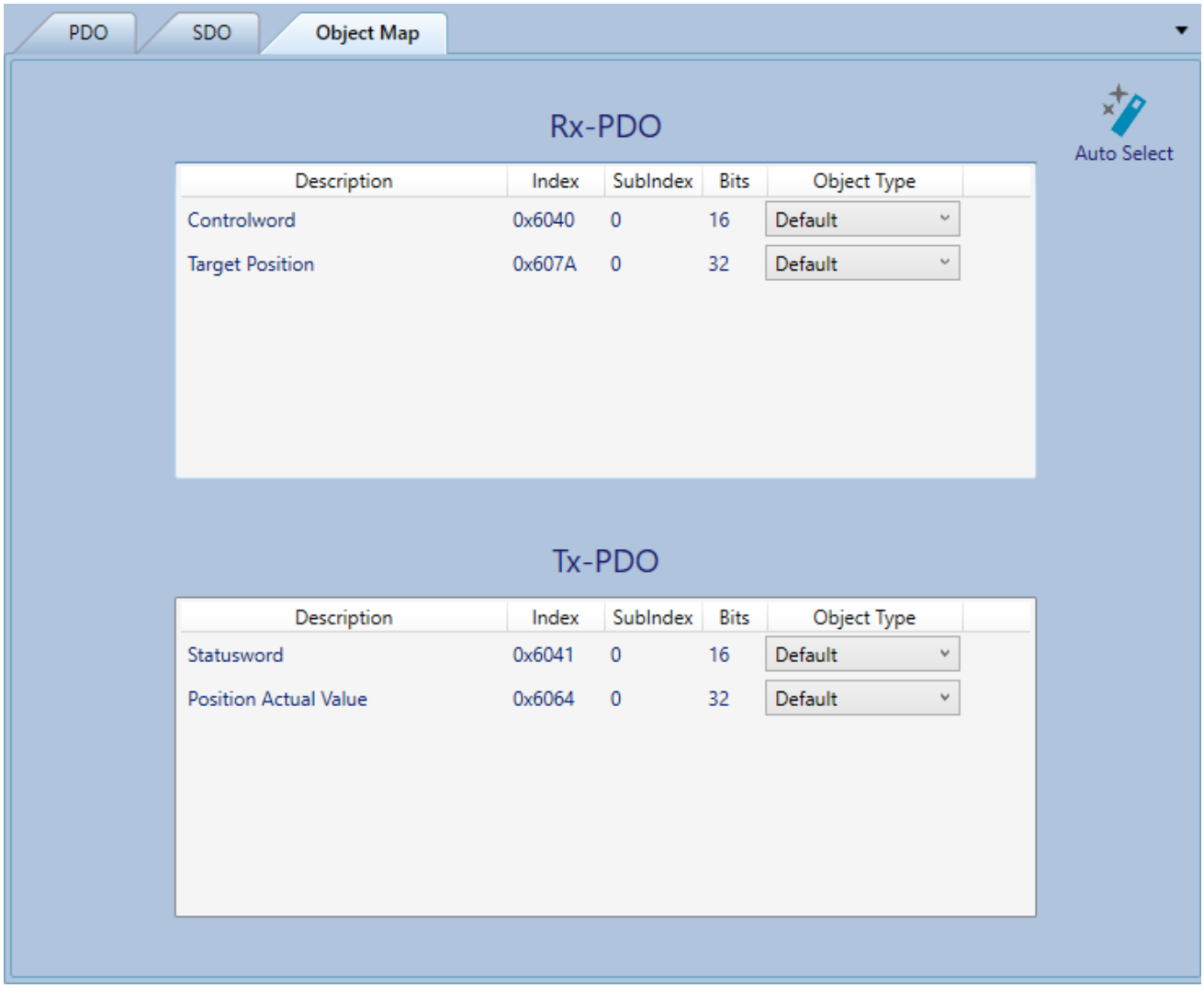
- The “Configured Object” section displays values that will be saved into the configuration.
- The Available Subitems display the values that can be used to configure the object.
    - ESI Objects – Some SDO’s will have “SubIndex Access” and this section will list them. For “Complete Access” SDO this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

Object Map Tab



The “Object Map” Tab is for mapping the PDO objects to a certain function.
For example, Input PDO object must be mapped to Inputs in Object Type drop down.
This is a mandatory configuration and cannot be skipped. Correct mapping is required for Mach4 plugin to function.

Auto Select: This button will auto map the required objects to their corresponding functions.

On ECS1 this button will automatically map all the I/O and Analog functions. Stepper and Encoder functions must be mapped manually if the drive has the necessary software activations.

Rx-PDO object mapping

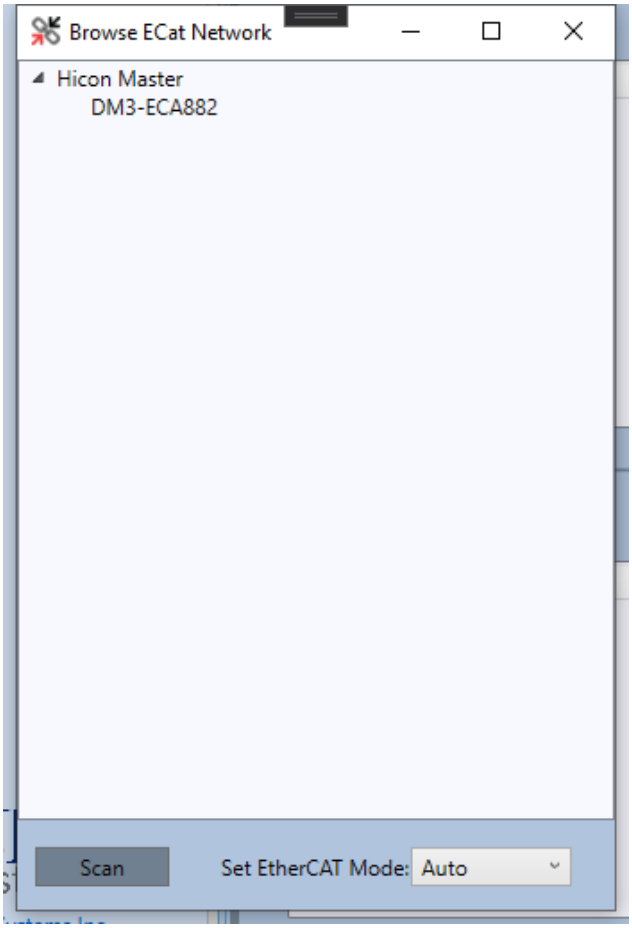
Default	The object will just show up in EtherCAT status and will have no other function
Digital Output	The object is mapped as Digital Output. Each bit is an On/Off switch
Analog Output	The object is mapped as Analog Output. Must be 16-bit
Controlword	The object is mapped as Controlword for Cia402 drives
Target Position	The object is mapped as Target Position for Cia402 drives
DRO Output	The object shows up as a Mach4 Register. A total of 5 objects can be mapped to this type (Available on EC01-6 and up)

Tx-PDO object mapping

Default	The object will just show up in EtherCAT status and will have no other function
Digital Input	The object is mapped as Digital Input. Each bit is an On/Off switch
Analog Input	The object is mapped as Analog Input. Must be 16-bit.
Encoder	The object is mapped as an Encoder read out. Must be 16-bit
DRO Input	The object shows up as a Mach4 Register. A total of 5 objects can be mapped to this type (Available on EC01-6 and up)
Statusword	The object is mapped as Statusword for Cia402 drives
Actual Position	The object is mapped as Actual Position for Cia402 drives

Browse Network

Live view of the EtherCAT Network.



- Scan to list the devices available on the EtherCAT Network
- The EtherCAT mode can be locked to a desired mode. Setting it to “Auto” will make the controller go into operational mode using the PDO and SDO values configured using EC-Link.

Troubleshooting

This section refers to troubleshooting the EC-Link application itself and not the operation of the controller or the EtherCAT network.

- If the application crashes a log file is saved on the Desktop with the name 'EcLink-ERROR-LOG'. Please send this file along with a brief description on where this crash occurred to our support email. Contact Us

Additional References

- EC01 Hardware Manual
- Mach4 Software Integration Manual
- Quick Start YouTube Video
- EC01 Product Page