

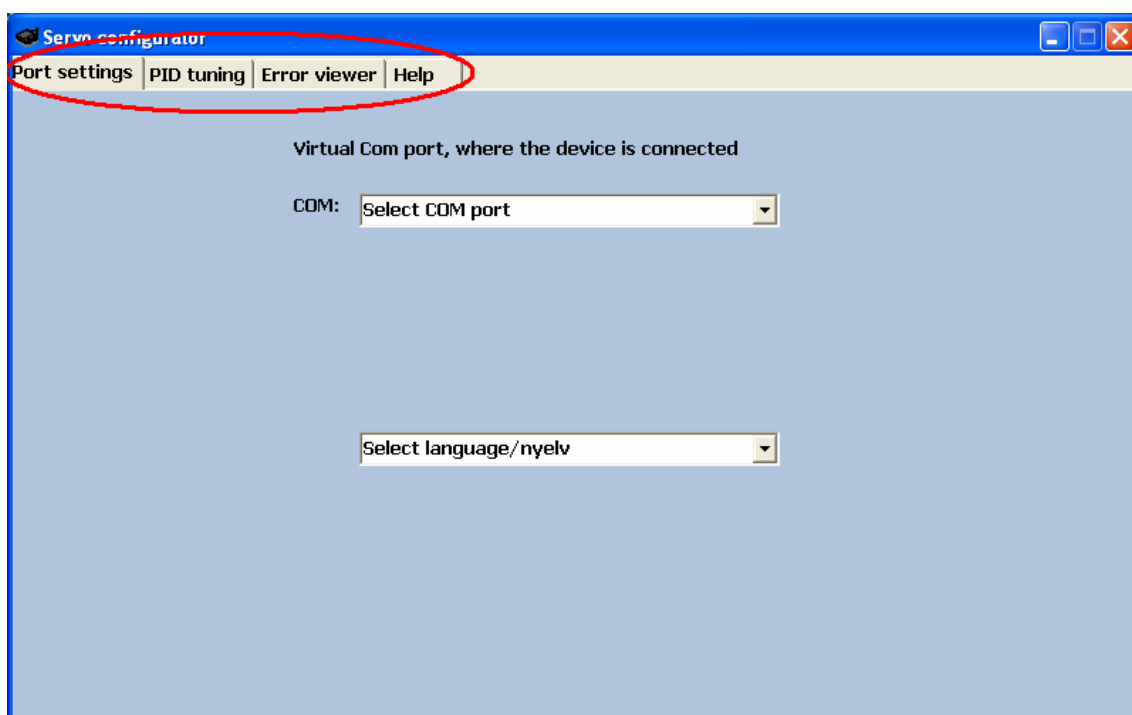
Servoconfigurator2 program user's guide

Introduction:

Servoconfigurator2 program is to configure and make diagnostics on „Whale2” and „Mammut” servo drives via USB port.

TAB pages:

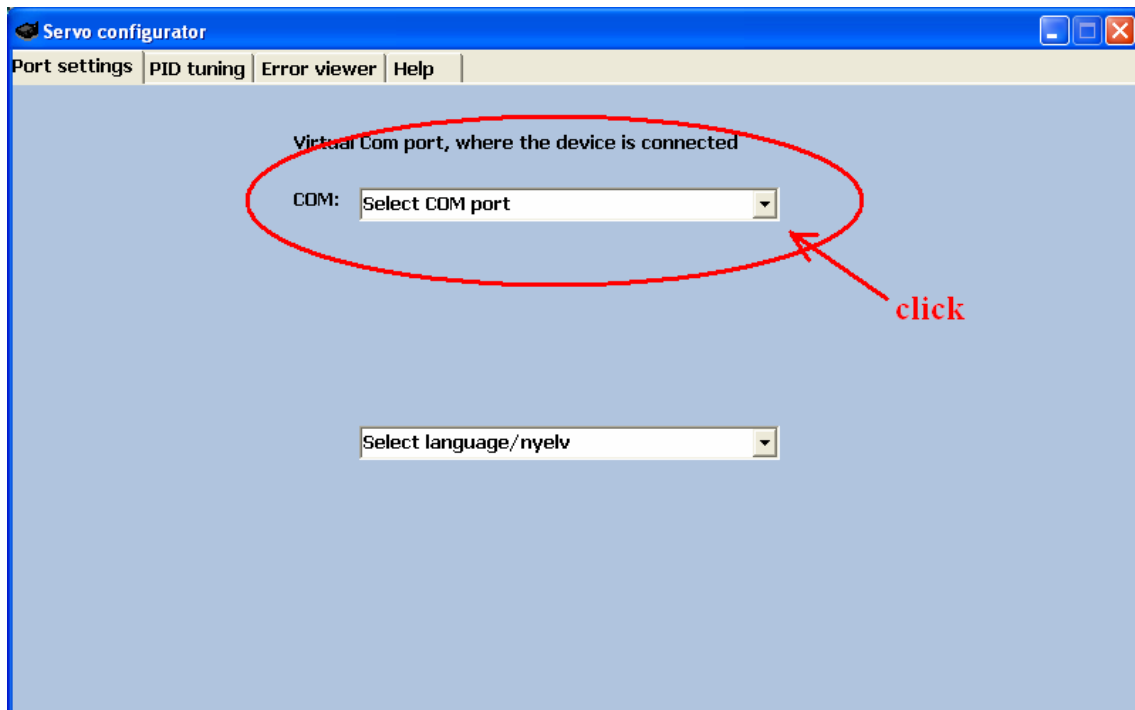
First apperance is the main screen, where user can select between four TAB pages, which are marked red on the picture:



First TAB page: Port settings.

Language selection

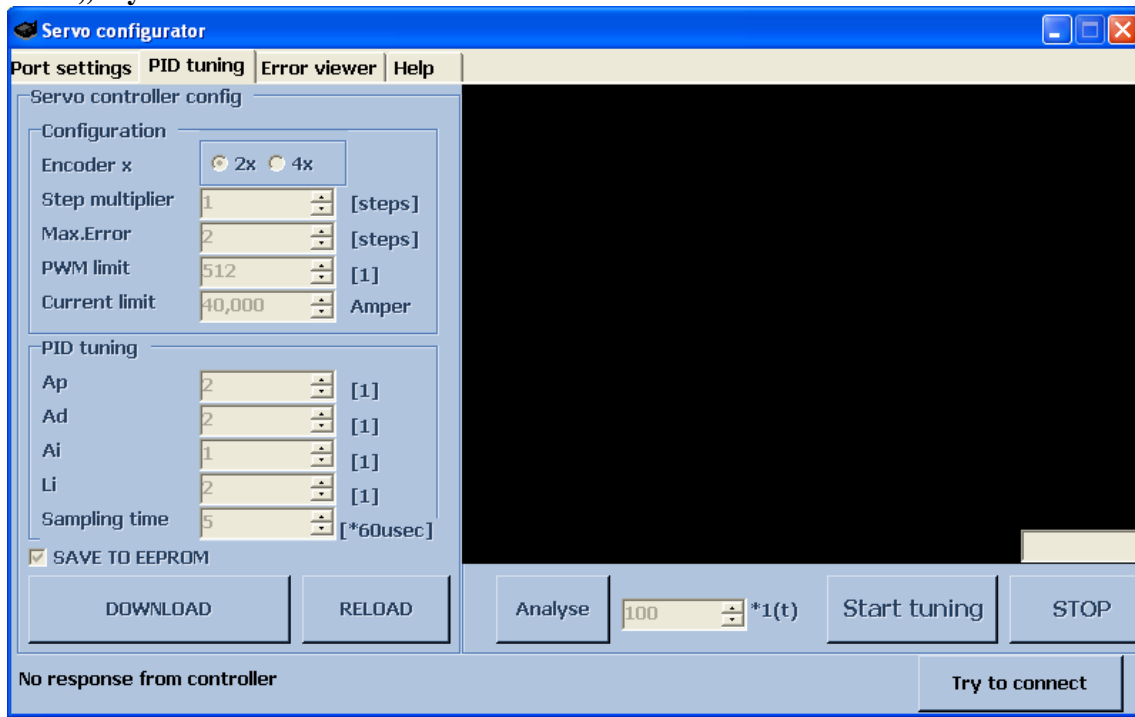
On the first page user can select languages, now English and Hungarian languages are supported, but language translation can be done easily with editing the lang.ini file in the product's folder.



COM port selection

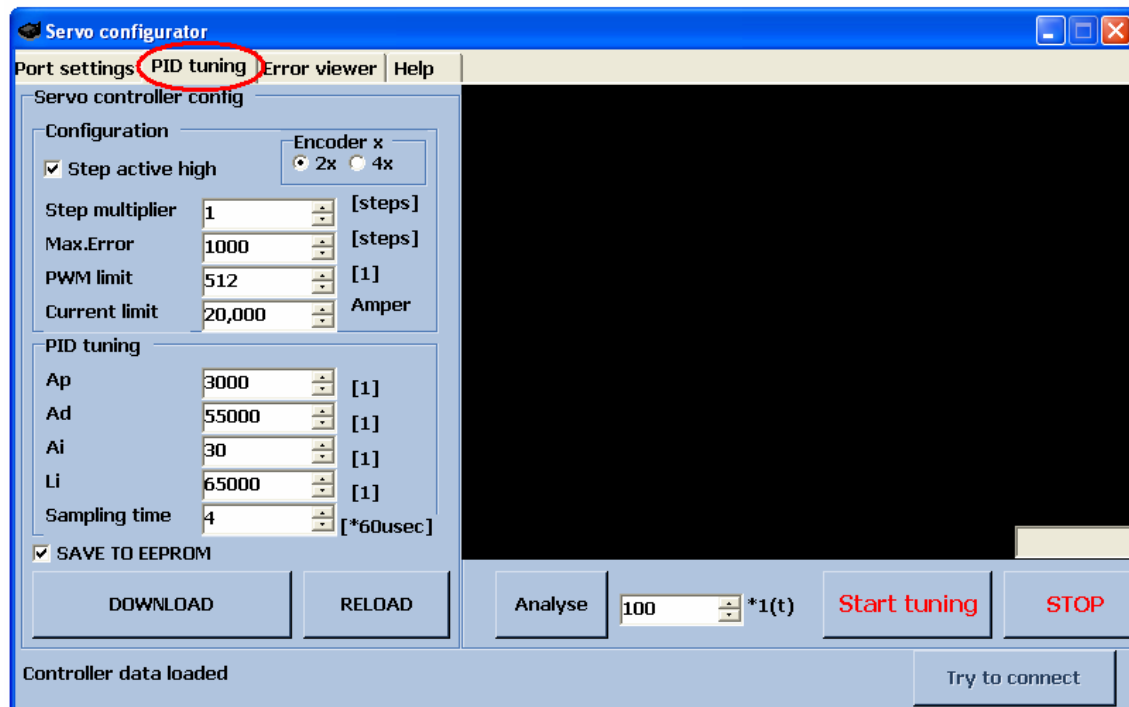
First of all user must select virtual COM port where the device is plugged in through the USB port. Simply click on the drop down list and select the required COM port number.

If bad COM port is selected, parameters and buttons becomes disabled and „No response from controller” message will appear at the bottom-left corner of the screen! Push „Try to connect” button to rebuild connection.



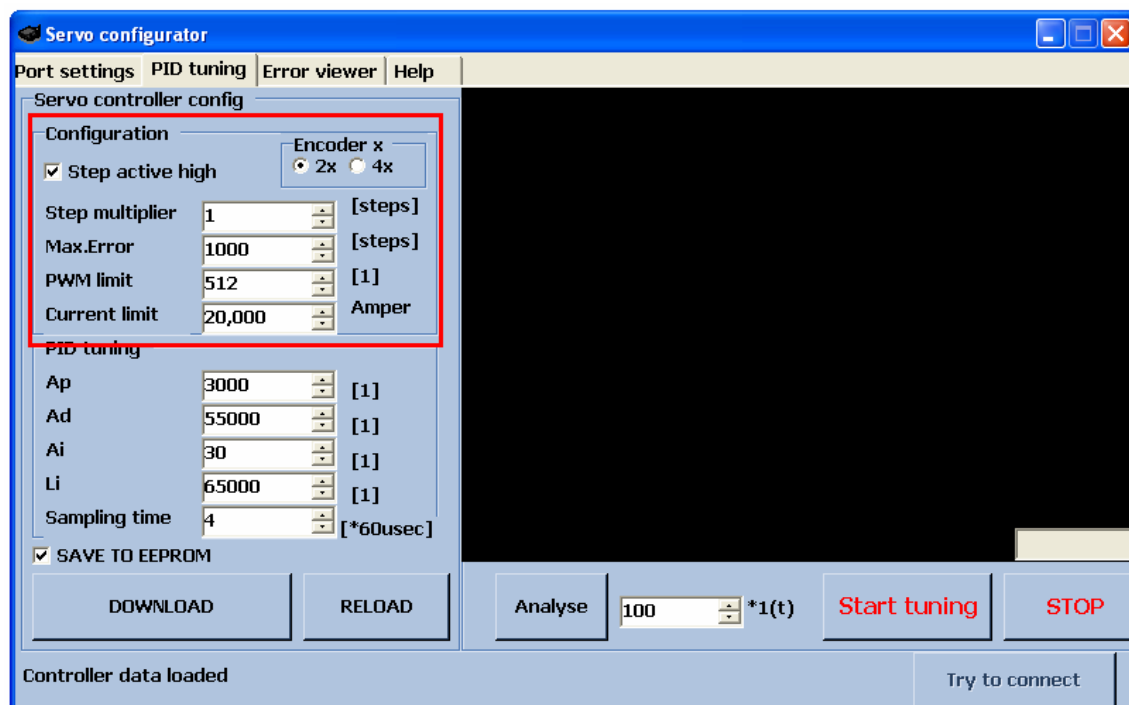
Second TAB page: PID tuning.

To select PID tuning page, just simply click onto the TAB label „PID tuning”.
On this page you can make the configuration of your controller and some diagnostics also.



Setting up the controller:Configuration

In the configuration box, there are some parameters, which are advised to set first.



-Step active high

In most of the motion controller programs user can configure the software to generate high or low active step signal, but there are still some commercial products, where user cannot select between step signal edges, so we give the opportunity for the user to select step signal active edge.

If active high is selected (box checked), the controller will make to movement, when the step signal goes from GND to VDD, if active low is selected, controller makes the movement when step signal goes from VDD to GND.

-Encoder 2X and 4X logic:

The servo controller uses incremental encoder feedback to close control loop.

Incremental encoders have 2 channels called A and B, these lines provides square waves for the controller in 90° shift to each other. The controller calculate position from these two signals.

2X encoder logic mode counts every rising edge of channel A and B, in other words it doubles the encoder pulses and therefore the resolution of the encoder.

4X encoder logic mode counts every rising and falling edge of channel A and B, in other words it multiplies encoder resolution with 4.

Which one to use?

Most of the servocontrollers in the market uses 4X encoder logic only, 2X encoder logic is a safer way, because it is more immune to external, industrial noise, like plasma torch noise, etc.

-Step multiplier

Using high resolution encoder and low frequency CNC controller program there may be a problem, that the controller program cannot run the motor as fast as needed, motor cannot reach the maximum speed caused by low stepping frequency.

Using the step multiplier option in the software, frequency can be multiplied by a selectable factor of 1,2,3,4,5,6,7,8,9 or 10.

-Maximal error:

User can set maximum allowed servo error, which is a tolerance of your system, servo error is determined as: **commanded position – actual position.**

For a good servo system there's no following and there are only some increments of servo error. Because this error depends on many things, like servomotor performance, response time, encoder resolutions, etc user should set this to a value, which is acceptable for the application.

-PWM limit:

PWM is the pulse width modulation, it has 9 bit resolution, 512 increments.

It can be used, if motor's power supply is higher in voltage than the motor's rated voltage. Then the maximum average voltage on the motor can be calculated with the following formula: $(\text{PWM limit value}/512) * \text{power supply voltage}$

It is better to use a power supply, that has the required voltage, than to limit PWM, because limiting the PWM too much may make control performance wrong.

-Current limit:

User can limit the current in the motor windings.

In the Whale2 controller current limit is setable from 0 to 20Amps in 0.032Amps increments.

In the Mammut controller current limit is setable from 0 to 40Amps in 0.058Amps increments.

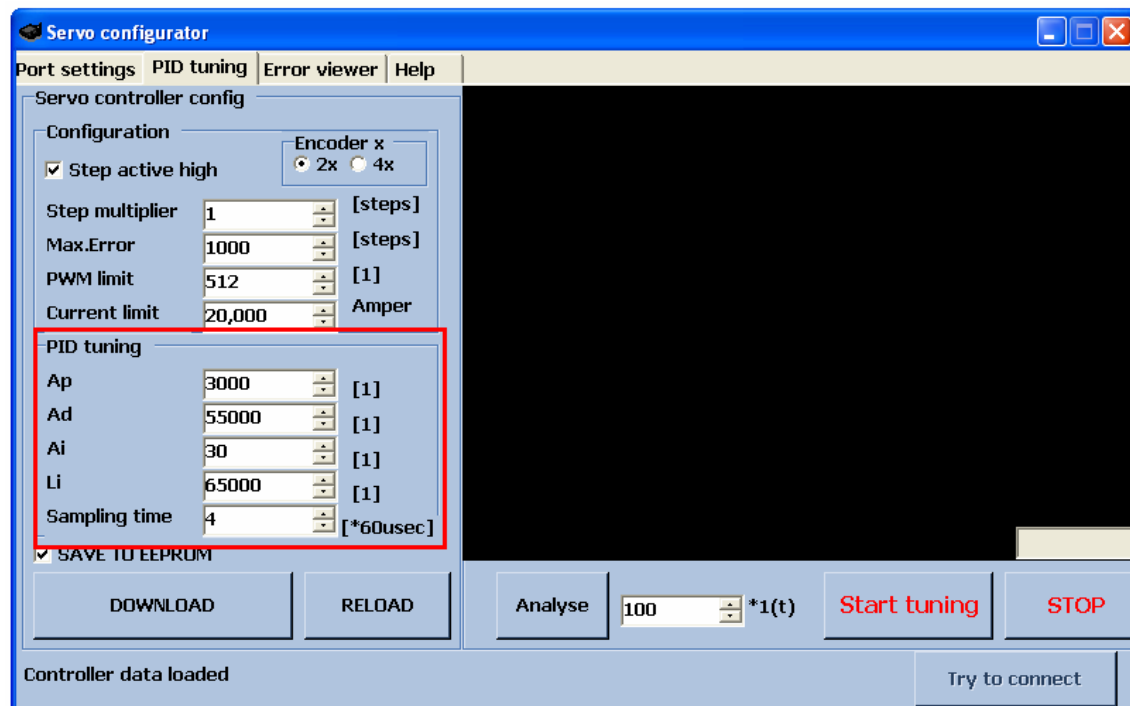
When current limiting is active, the current limit LED turns on in the controller as an indication to inform user.

Setting up the controller:PID tuning

PID tuning is the most important part of this manual.

User should tune PID controller inside the servo controller to an optimal value for the servomotor.

All parameters are 16bit wide from 0 to 65535 in value.



-Ap (Proportional term)

This term is for set the system response fast and dynamic.

There's linear relation between A_p * position error and PWM output.
Increasing this value makes the response time better but makes the system more unstable. This term is also known as „gain”.

-Ad (Differential term)

This term is for make the system damped, in other words it will helps to accelerate and decelerate faster.

There's linear relation between A_d *motor's speed and PWM output.

Increasing this value makes the stability of the system better and makes the response time longer. This term is also known as „damping”.

-Ai (Integral term)

This term is for trimming out the following error to 0 and reach the position accurately.
Increasing this value makes faster settling time but increases instability.

-Li (Integral limit)

User may limit the integral term to eliminate windup near 0 point, but it is not advised to limit it too low, because it may causes following error. Leave this value to maximum is the optimal.

-Sampling time

Most of servo controllers does not support sampling time adjustment, we think, that it is important and the controller can be tuned for wide range of servomotors, because these parameters are setable.

The optimal value for most of the servomotors is between 3 and 15.

Setting up the controller:downloading data to EEPROM

The servo controllers have volatile RAM and non-volatile data EEPROM onboard.

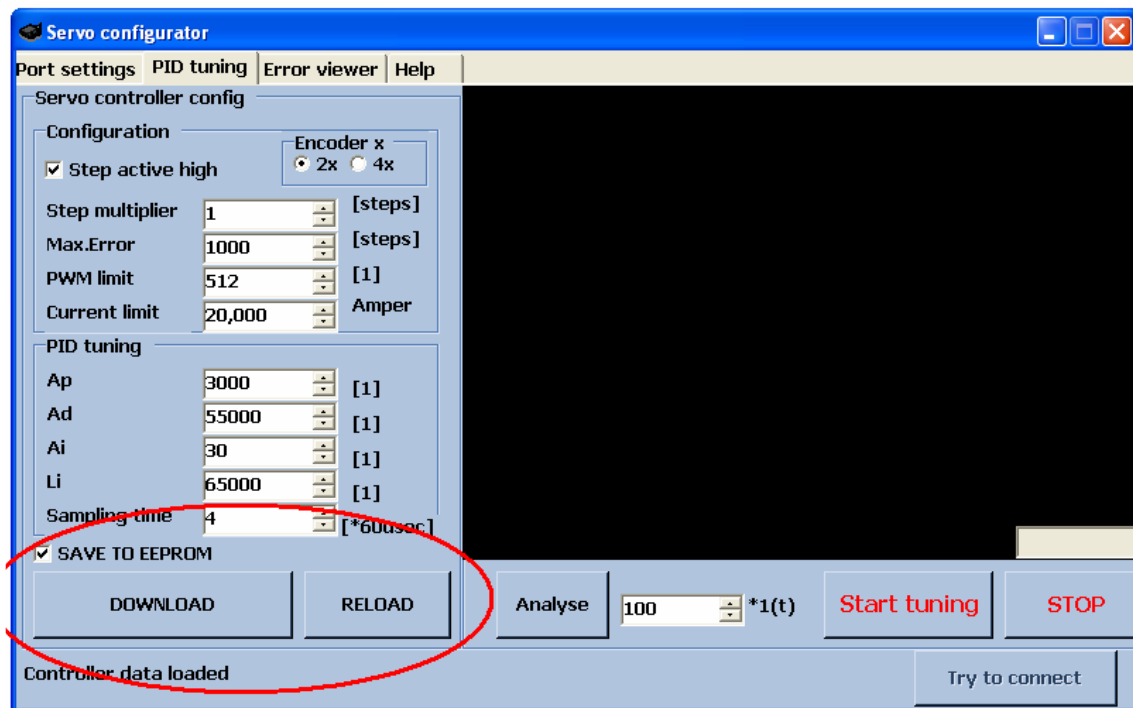
User can select where to store parameters by by checking the „save to EEPROM” bokx

If the bokx is not checked, values will be downloaded to RAM and they will be stored only while controller is switched on. **This downloading mode is only for testing parameters.**

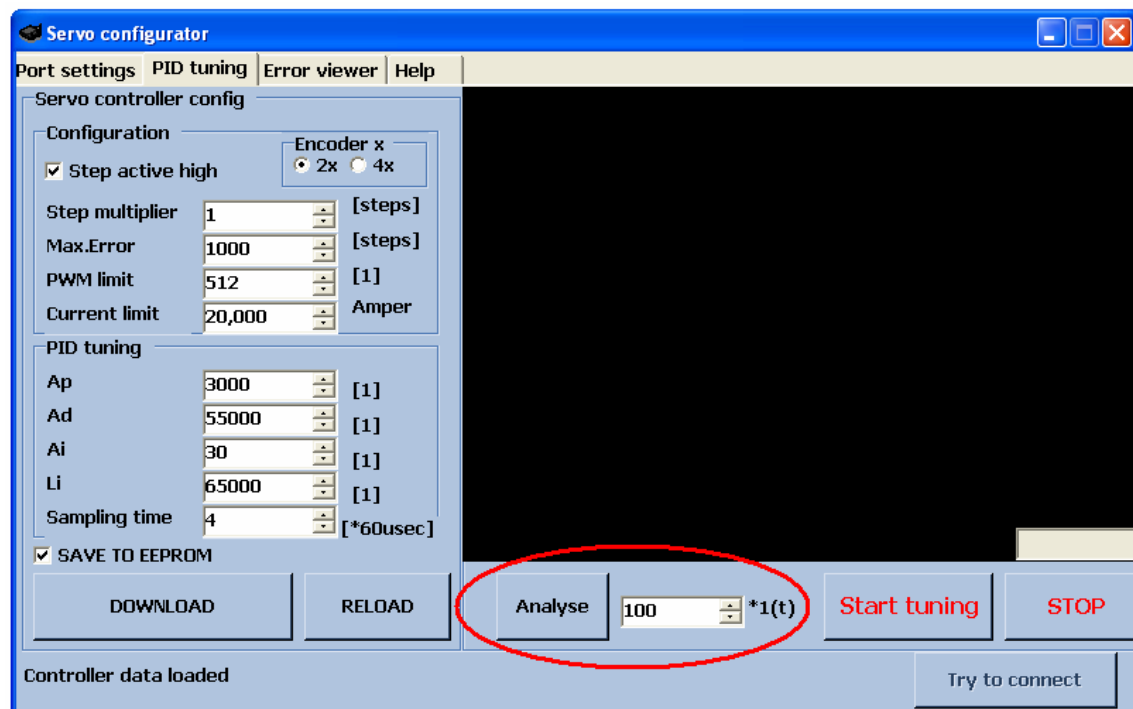
If box is checked, values will be stored in EEPROM and they be will be also reloaded at next startups of the controller. EEPROM can be also reprogrammed.

Download the data to the controller by simply clicking the „DOWNLOAD” button.

Data can be reloaded to the screen from EEPROM by simply clicking on the „RELOAD” button.



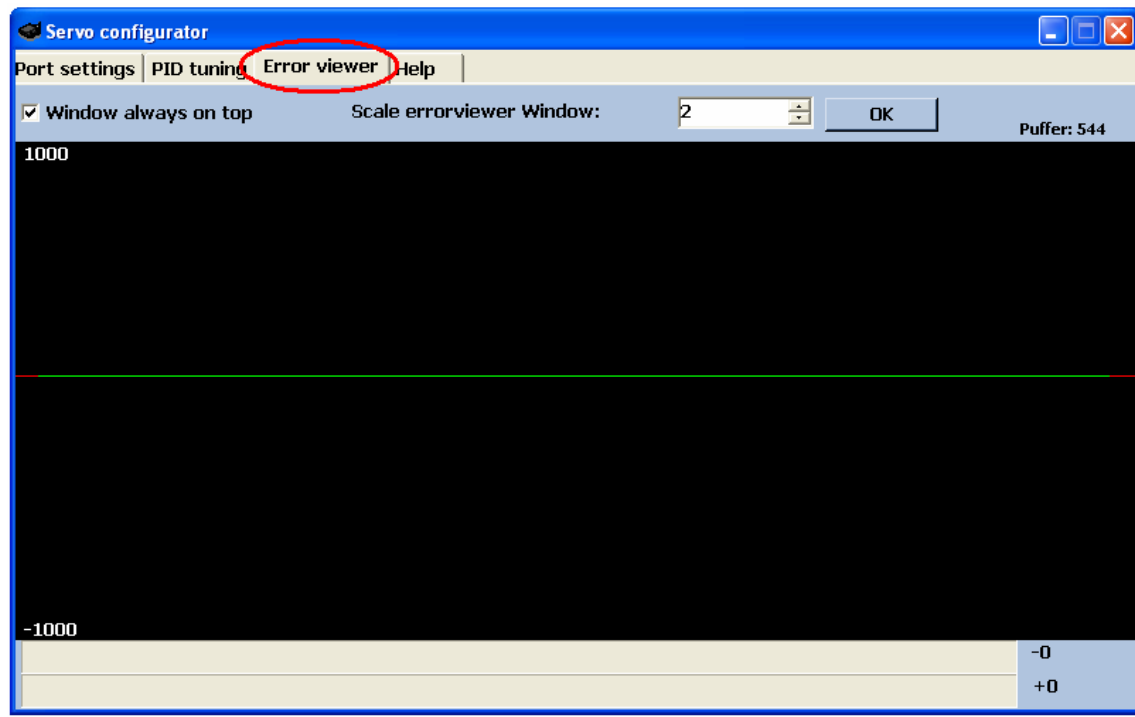
-Setting up the controller:Analyse step response



With analyse function user can check step response quality of the control loop tuning. By clicking the analyse button, commanded signal change to actual position + number of steps wrtitten into the textbox next to the button. In other words, commanded position changed immadiately. In this situation controller commands the motor to pick up new

position, the servo error signal is monitored and drawn graphically onto the black windows above the button.

Third TAB page: Error viewer.



Error viewer is a tool to check servo error continuously.
500 samples shown on the screen one time and the graph updated continuously.
The error viewer scaled vertically to the maximum allowed error set in the controller.
This value is changable to any values between 1 and the maximum allowed error
programmed into the controller. When user change this value, the maximum allowed
error programmed into the controller will not change, only viewer window is rescaled.

Fourth TAB page: Help screen

Help documentations are located here.

More informations at:
<http://www.cncdrive.com>