Commissioning Servo Drive Instruction

1 Inserting servo drive and servomotor parameters in software

Follow each step inserting correct parameter for your application.

Note: Servo drive must be connected to the PC and 24 Volt power on.

1.1 Drive Parameter Page

Go to the Drive Parameter page under Device Manager tab:

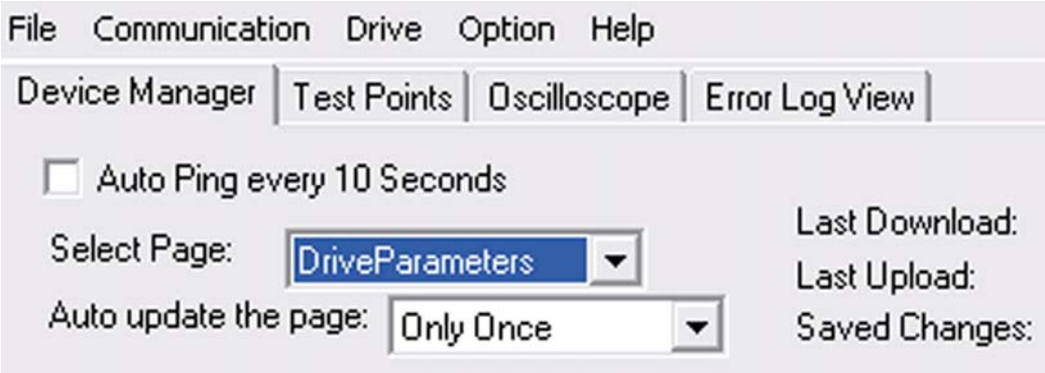

Figure 1 - Drive Parameters

Insert correct parameters for your application:

1.1.1 15 – Drive Mode

Figure 2 - Drive Mode

Input Data:

- **0** for Velocity Mode
- **1** for Current Mode
- **2** for Position Pulse and direction mode
- **3** for Position Encoder follower mode (Master/Slave mode)

1.1.2 16 – DC/1Ph/3Ph

Figure 3 - DC/1Ph/3Ph

Input data:

- **0** for DC Voltage Input
- **1** for Single Phase AC Power Input
- **2** for 3 Phase AC Power Input

1.1.3 18 – Enc Out Div

Figure 4 - Enc Out Div

This the emulated encoder output. The input number must be a binary number and the 2X , like 1, 2, 4, …, 128. i.e. the primary encoder is 2000 ppr and set the driver at 4, the emulated encoder output is 500ppr.

1.1.4 21 – Max Peak Current

Figure 5 - Max Peak Current

Input data can be any value no bigger than the drive's rated peak current. This value corresponds to the max current command input (10V) if the current mode is selected.

1.1.5 22 – RMS Current Limit

Figure 6 - RMS Current Limit

Input data can be any value no bigger than the drive's rated continuous current.

1.1.6 24 – Max RPM

Figure 7 - Max RPM

Input data defines the max velocity (RPM) of the motor. This value corresponds to the maximum velocity command (10V) if the velocity mode is selected.

And click update changes.

1.2 Motor Parameter Page

Go to the Motor Parameter select page:

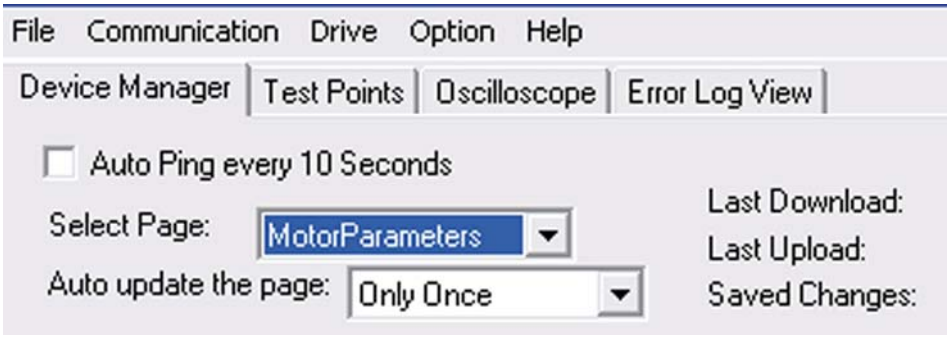

Figure 8 - Motor Parameter Page

Insert correct parameters for your application:

1.2.1 29 – Velocity Sensor Page

For all types of motors

Figure 9 - velocity Sensor Page

Input data defines the velocity feedback sensor type:

- **0** for Incremental encoder
- **1** for Tachometer
- **2** for Sensorless (Brushed motors only)

1.2.2 30 – Motor Type

For all types of motors.

Figure 10 - Motor Type

Input data defines the motor type:

- **0** for Brushless DC Motor
- **1** for Brushed Motor

1.2.3 31 – Encoder Resolution

For encoder feedback motors

Figure 11 - Encoder Resolution

Input data defines the quadratic incremental encoder resolution in ppr (Pre-quad). The maximum resolution is 16384.

1.2.4 32 – Num of Poles

For Brushless Motors only.

Figure 12 - Num of Poles

Input data defines the number of brushless motor poles. (Not pole pairs)

1.2.5 33 – Stall Current

For all types of motors.

Figure 13 - Stall Current

Input data defines the continuous stall current of the motor. This data is necessary for the auto-phasing.

1.2.6 36 – Brushed R (ohm)

For sensorless mode only.

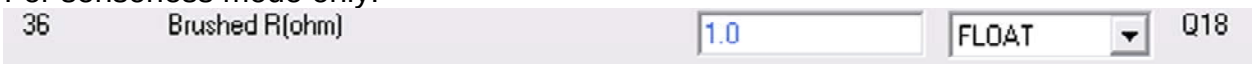

Figure 14 - Brushed R

Input data defines the winding resistance of the brushed motor. The value is only used in the sensorless mode.

1.2.7 37 – Brushed Ke (V/Krpm)

For sensorless mode only.

Figure 15 - Brushed Ke

Input data defines the voltage constant Ke (V/kRPM) of the brushed motor. The value is only used in the sensorless mode.

1.2.8 38 – Tacho

For tachometer feedback.

Figure 16 – Tacho

Input data defines the tachometer voltage constant (V/kRPM). It can be a positive or a negative number to determine the correct rotation.

And click update changes button.

2 Tuning the Servo System

Once the drive and motor parameters have been entered you are ready to begin to tune the system. Connect all wiring per installation instructions for your application requirements. Before tuning make sure the servomotor is not connected to the load. This is to prevent any possible damage due to initial tuning parameters or wiring problems. Begin tuning the drive.

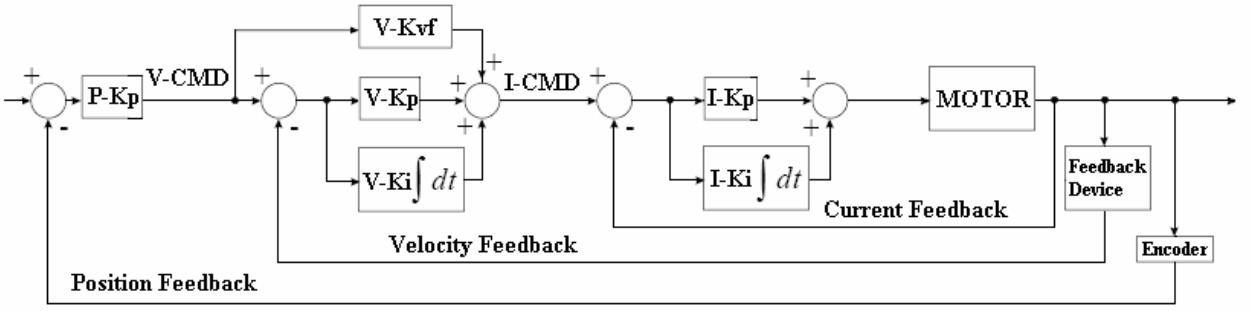

Figure 17 - Control Diagram

Brushless Servomotor:

1. Tune the current loop by following the **Current Loop Tuning Instructions**.
2. Phase the servomotor by following the **Servomotor Phasing Instructions**.

   The servo drive is now ready to run in **Current Mode**. For **Velocity or Position Mode** additional configuration and tuning is required. Follow specific instructions for **Velocity or Position Mode** as shown in this document.

Brushed Servomotors:

1. Tune the current loop by following the **Current Loop Tuning Instructions**.

   The servo drive is now ready to run in **Current Mode**. For **Velocity or Position Mode** additional configuration and tuning is required. Follow specific instructions for **Velocity or Position Mode** as shown in this document.

2.1 Current Loop Tuning:

Go to Controllers Page in software as shown below:

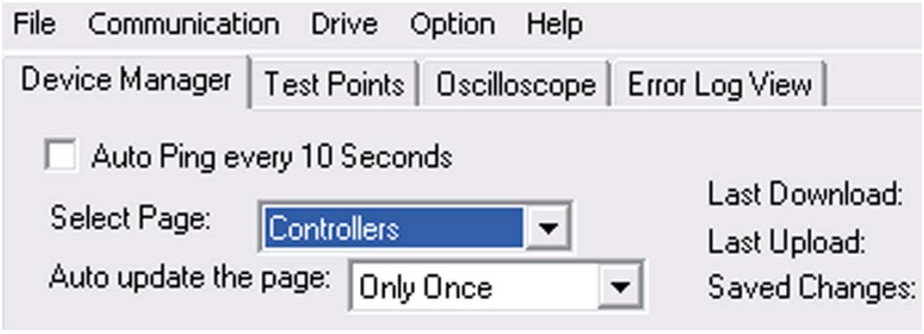

Figure 18 – Controllers

Insert "1" in the Value column of Current PI Man/Auto row and click update changes button:

Figure 19 - Current PI Man-0/Auto-1

The current loop auto-tuning process begins running when updated. The process will last for 10 seconds. The tuning results in Figure 20 will be:

Figure 20 - Current PI Man-0/Auto-1

- If "0" is shown, it means the auto-tuning is successful; there should be a positive number in "I-Kp" row.

Figure 21

- If 99 is shown, it means the auto-tuning has failed:

Reduce the value of "Current Loop Bandwidth" row and repeat the auto-tuning process,

Figure 22

2.2 Servomotor Phasing for Brushless Servomotors only

Note: In order to successfully auto-phase the motor, the bus voltage should be sufficient for the motor to run above 2000 RPM, also the drive should be disabled (orange light)

Go to Motor Parameters Page in software as shown below:

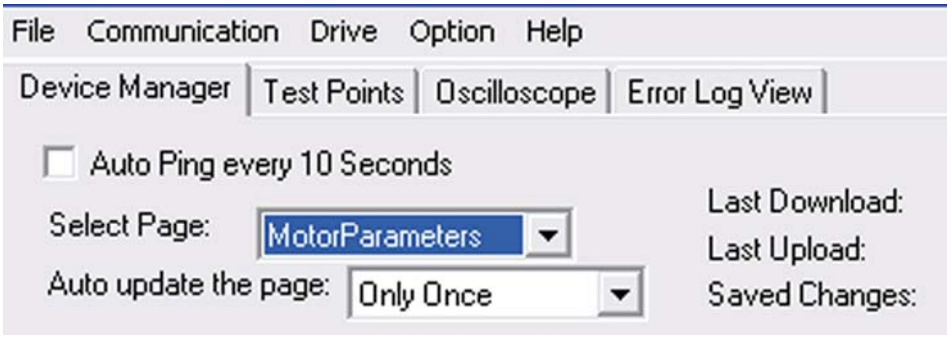

Figure 23 - Motor Parameter Page

Insert "1" in the Value column of Autophase row and click update:

Figure 24 - AutoPhase

The brushless motor auto-phasing process begins running when updated. The phasing result will be:

a. There is a number of 1~6 shown in the row 35—hall code. It means the auto-phasing process is successful. The number is the right hall code for this motor.
b. There is a 0 shown in the row 35. It means the auto-phasing process is failed. The user has to manually put the hall code in row 35. The motor can be tested under the current or velocity mode to verify the code. The right code should let the motor run with the current and the velocity in the same direction (The current and velocity feedback value should have the same sign. The signals can be found in the signal monitoring page)

Click the "Update Changes" button.
Click the "Save Changes" button to save the changes into the drive's EEPROM.

1. Tune the velocity loop.
   THE CURRENT LOOP NEEDS TO BE TUNED BEFORE THE VELOCITY LOOP.
   Set the drive in velocity mode. Apply a step velocity command and compare the velocity feedback with the command. Use the oscilloscope as the tool by selecting channel 1 as the velocity command and channel 2 as the velocity feedback. Adjust the Vel-Kp, Vel-Ki and Vel-Kvf parameters to optimize the velocity feedback.

2. Tune the position loop.
   THE CURRENT AND VELOCITY LOOP NEEDS TO BE TUNED BEFORE THE POSITION LOOP.
   Set the drive in position mode (Dir/step or encoder follower mode). Apply a step position command and compare the position feedback with the command. The Ruby drive does not provide the oscilloscope for the position monitoring, so a 2nd source of the position scope is necessary (Usually from the motion controller). Adjust the Pos-Kp parameter to optimize the position feedback.