DC servo axis controller (Mammut) user's guide

What is Mammut?

Mammut is CNCdrive's 2nd generation DC servomotor controller, it is the higher power and voltage version of Whale2 servo drive.
In this documentation explained the connectors, pinouts, indicator LEDs, electric parameters and mechanical dimensions.

Introduction

The controller panel is capable of driving 1 DC brushed servomotor. The control method is closed-loop, you need an incremental encoder with A and B channels to provide position feedback to the controller.
The controller input signals must be step and directions signals, recommended PC controller softwares are MACH2 – 3 , KCAM4.

Electronic properties

Electronic properties	**Min.**	**Max.**	**Unit**
Digital supply voltage	**18**	**28**	**V DC**
Motor supply voltage	**15**	**180**	**V DC**
Digital supply required current	**-**	**200**	**mA/controller**
Motor current continous	**0**	**40**	**A**
Stepping frequency	**-**	**400**	**kHz**
Encoder resolution	**2X**	**4X**	**1**
PWM frequency	**20**	**20**	**kHz**
Case temperature automatic shut down	**63**	**68**	**°C**

Software features:

Electronic properties	**Min.**	**Max.**	**Unit**
Setable Servo error limit.	**2**	**20000**	**Encoder counts**
PID parameters.	**16**	**16**	**bits**
PID algorithm.	**32**	**32**	**bits**
Setable current limit.	**0**	**40**	**A**
Setable PID sampling time.	**1**	**65535**	***60usec**
Step response viewer via USB port.	**-**	**-**	**-**
Servo error viewer via USB.	**-**	**-**	**-**
Step signal detection on rising or on falling edge.	**-**	**-**	**-**

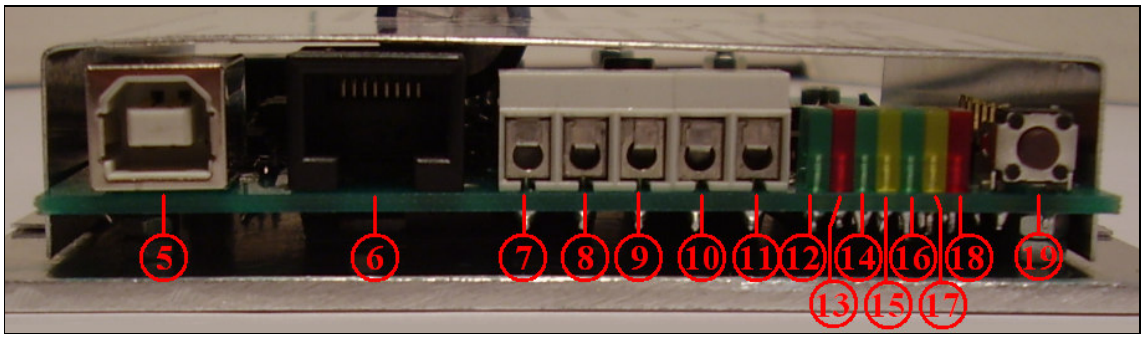
Properties:

Setable overcurrent. 0..40A.
Configuration via USB port.
Automatic and/or manual PID controller tuning.
Step/dir, digital supply connection via RJ45 ,ETHERNET connector.
Connect any number of controllers together with one error-wire.
Sign LEDs.
Diagnostic and error detection software.
Configurable maximum allowed error from 2 to 20000.
Built-in overtemperature safety circuit shuts down the controller above 65°C.

Mechanical details

Width: 115 mm
Length: 105 mm
Height: 32 mm
Weight: 120 gramm

Connectors and pinouts



Screw terminal connectors:

1.) Motor arm 1.
2.) Motor arm 2.
3.) Motor power supply GND.
4.) Motor power supply positive terminal.
7.) ERROR in/output
It is a common signal with the RJ45 connector's error signal. See below.
8.) Encoder 5Volts. (output!)
9.) Encoder A channel.
10.) Encoder GND.
11.) Encoder B channel.

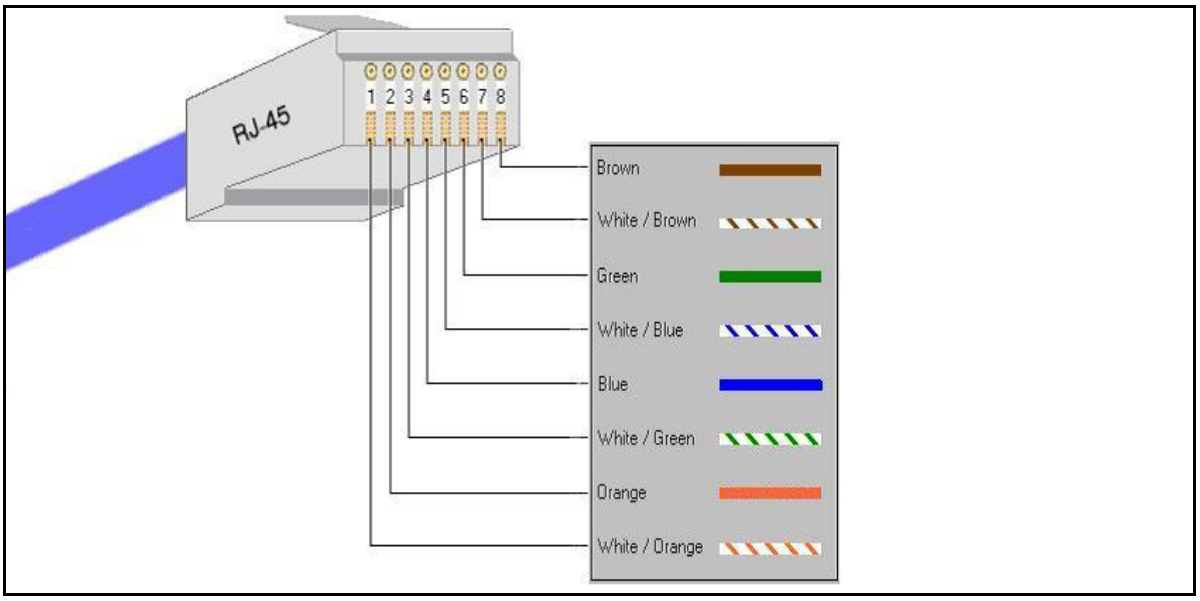
LED indicators:

12.) Digital power supply indicator.
13.) Error limit override LED.
14.) Controller running LED.
Flashing indicates normal operation.
15.) Motor moving CW indicator.
16.) Motor moving CCW indicator.
17.) Overtemparature (t>65°C) indicator.
18.) Current limiting active indicator.

Connectors:

19.) USB-B config connector.
Standard USB-A – USB-B connector can be used to connect the controller to the PC. This connection is only needed for tune the controller.

20.) RJ45 connector.
Which can be connected into the controller's RJ45 socket.

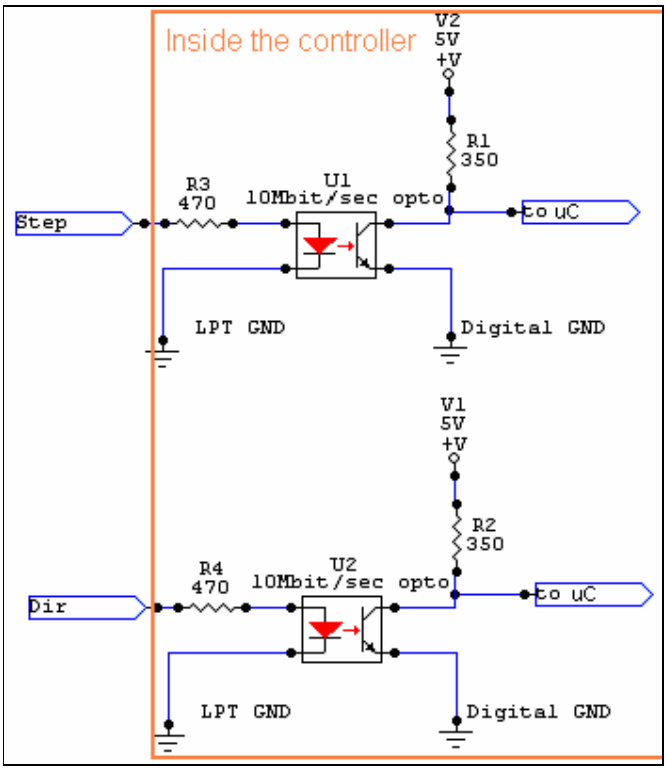


1.) Step signal.
2.) Direction signal.
3.) GND for step and direction signals.
4.) N/C No Connection.
5.) Master reset.
Resets the controller if pulls down to GND. User can reset all the connected controllers by pulling this line to GND.
6.) Error signal.
In case of error, the controller pulls this line to GND potential. Connect controllers together with this line. If one of the controlles generates error signal then all controllers will be stopped which is connected together.
Because this line is an in/output it can be pulled down by external logic also.
7.) Digital supply +18..28 V.
8.) Digital supply GND.

Buttons:

21.) Reset Button.
User can restart the controller pushing this button when it is stopped in case of any error.

STEP/DIR Inputs (the picture shows the controller's optical isolation):



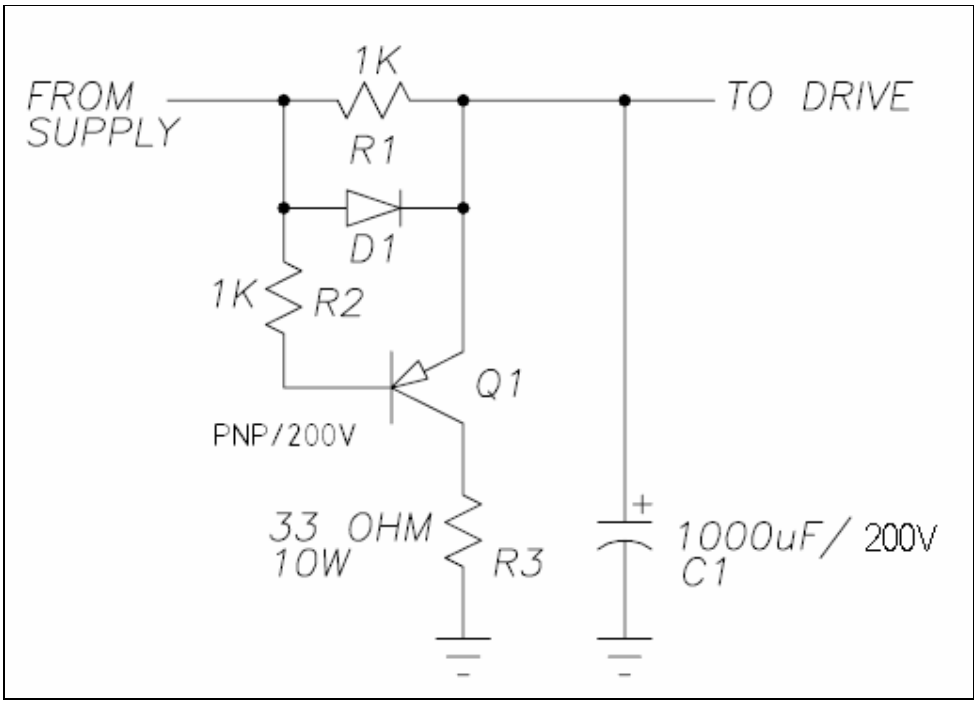
Enoder inputs:

Encoder channel A and B are pulled to high (5 Volts) with 10kOhm resistors inside the controller.
Push-pull or Open-collector output type incremental encoders can be used with the controller.
5V power supply for the encoder is generated by the controller from digital power supply.

Recommended protection circuit:

Some servomotors, like disk type motors have very low coil resistance. Under around 2 Ohms and when Supply voltage is greater then 100VDC, a so called energy-dump circuit is required to protect the drive.
The problem occurs when the motor deccelerating rapidly, in this case, the motor works as a generator and generates energy, which is pumped back into the power supply. This generates a Voltage rise in the PSU and can damage the servo drive's H-bridge, if the generated Voltage exceeds 200VDC.

Recommended energy dump protection circuit schematics:



Explanation of the circuit:

Normally power supply current flows thru rectifier D1, biasing Q2 off via R2. If the direction of current reverses, D1 shuts off and a reverse voltage develops across R1. This voltage now turns Q1 on. The returned current now flows from the drive, thru Q1 and to ground via R3. The main purpose of R3 is to keep Q3 within its secondary-breakdown limits.

Because all current from the PSU to the drive flows through D1, it should be a power type diode and must handle all current flows.

Warranty

We give 12 mounths replace/repair warranty for our servo controllers, if device failes caused by manifacturing fault not from user's fault! Users who cannot make the controller work or not satisfied with performance can ship back controllers within 15days from purchase time, in this case we refund the device's price to customer. User must pay shipping costs in all cases!

Safety warning!

These safety issues are very important, read them carefully and keep them in mind in the first place:

The device can operate with low(0..50V) and medium (50..180V) voltages. Above 50 Volts the controller's metal case must be connected to safety ground!

Motor and power supply terminals are bare M4 screws, the controller must be build in a box, if supply Voltage is above 50V DC!
Touching the screws while device is under high voltage can cause personal injury or even death!

An energy dump circuit must be used when supply voltage is greater than 100VDC and motor's coil resistance is lower then 2Ohms, otherwise the generated energy can cause permament damage in the device!

More information at: http://www.cncdrive.com