

# Sanguinololu Users Manual

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# **Technical Support**

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### **1** Introduction

Sanguinololu is highly integrated with all the functions that a 3D printer needs. It is of high capacity-price ratio and support Reprap style printer and other CNC devices (Computer numerical control devices). The 4 stepper drivers are completely compatible with A4988 and DRV8825. Sanguinololu adapts developer friendly expansion port supporting I2C, SPI, UART, as well as ADC pins. All 14 expansion pins are reserved to be GPIO as well. Power supply for sanguinololu is also flexible; users can choose ATX-4 power input or the 2pin connector to supply.

#### Features:

1. Support multiple communication configurations :

UART1(RX TX)、I2C(SDA SCL)、SPI(MOSI MISO SCK)、PWM PIN(one)、ADC(five)

2. Support multiple power configurations:

Main board supplied by 5mm screw terminal, and optional 4pin ATX connector: 7v-12v

- 3. Adapts Atmel's ATMEGA1284P ATmega1284 drop-in compatible. Currently, we use 1284P, the bootloader has been burned before shipping, and users can put it into use after burning the programming code.
- 4. Adapts FT232RL on-board for USB connectivity, which is an industrial USB-serial chip, ensuring the stability and convenience of installation.
- 5. Selectable power supply for end stops (5v or12v).
- 6. With 4 stepper driver on board (Z supports 2 stepper motors)
- 7. 2 N-MOSFETs for extruder/bed, or other peripheral device
- 8. Supports LCD 2004 module, available for off-line printing.







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### **1.1 Overview and Hardware Resources**



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Size: 100mm x 60mm Weight: 73g



### **1.2 Software Resources**

Compiling enviroment: Arduino IDE Firmware: Marlin PC software: printrun Repetier-Host

### 1.3 Source

Arduino IDE: http://www.geeetech.com/wiki/index.php/Sanguinololu#Software\_Resources Marlin: http://www.geeetech.com/wiki/index.php/Sanguinololu#Software\_Resources printrun: http://www.geeetech.com/wiki/index.php/Sanguinololu#Software\_Resources Repetier-Host: http://www.geeetech.com/wiki/index.php/Sanguinololu#Software\_Resources Sanguinololu drive: http://www.geeetech.com/wiki/index.php/Sanguinololu#Software\_Resources



# **2 Interfaces**

### 2.1 Interface Layout



2-1



### 2.2 Interface specifications

- 1. 2 ADC interfaces for thermometry: one for extruder and another for hotbed.
- 2. 3 PWM to control extruder, hotbed and fan.
- 3. 3 end stops for x/y/z axis( mechanical, optical or hall sensor)

### 2.3 Jumper Instruction



2-2

Boot jumper cap: do remember to put the jumper cap, or it will affect the connection with PC(the system can't detect the corresponding COM port) and the upload of firmware.



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Step size of stepper driver (A4988)

jumper	Ye	es/No	stepsize
msl	ms2	ms3	
no	no	no	fullstep
yes	no	no	halfstep
no	yes	no	1/4step
yes	yes	no	1/8step
yes	yes	yes	1/16step

### Step size of stepper driver (Drv8825)

iumper	Ves/No	<b>)</b>	sten size
Jumper	105/10	5 2	step size
ms1	ms2	ms3	
no	no	no	full step
yes	no	no	half step
no	yes	no	1/4 step
yes	yes	no	1/4 step
no	no	yes	1/16 step
yes	no	yes	1/32 step
no	yes	yes	1/32step
yes	yes	yes	1/32step



# **3** Development Environment setting

### **3.1 Interface Connecting and Setting**



3-1

Pay attention to the Plus-n-Minus of power supply, in case the inverse connection may cause damage to the board.



### 2.4File Burning

Windows users need install driver before uploading. The board: Tools > Board > sanguino W/ATMEGA1284P 16, as shown below.

🥯 sketch_jul09a   Arduino 1.0.1	
File Edit Sketch Tools Help	
Auto Format Ctrl+T	快捷方式 到
Archive Sketch	arduino
sketch_jul09a Fix Encoding & Reload	Configuration 🔻 re.I
// 4 = Duemilanove Serial Monitor Ctrl+Shift+M	
// 5 = Gen6 Board	[usbtinyisp]AT90VSB1286
// 51 = Gen6 deluxe Serial Port	[usbtinyisp]Teensylu/Printrboard
// 6 = Sanguinololu	[BootloaderCDC]AT9OUSB1286
// 62 = Sanguinololu	[BootloaderCDC]Teensylu/Printrboard
// 63 = Melzi Burn Bootloader	Teensy 1.0
// 64 = STB V1.1	Teensy 2.0
// 65 = Azteeg X1	Teensy++ 1.0
// 66 = Melzi with ATmega1284 (MaKr3d version)	Teensy++ 2.0
// 7 = Vitimaker	Arduino Uno
<pre>// 71 = Vltimaker (Older electronics. Pre 1.5.4. This is r</pre>	Arduino Duemilanove w/ ATmega328
// 77 = 3Drag Controller	Arduino Diecimila or Duemilanove w/ ATmega168
// 8 = Teensylu	Arduino Nano w/ Almega328
// 80 = Rumba	Arduno Nano w/ Almegal68
// 81 = Printrboard (AT90USB1286)	Arduino Mega 2560 or Mega ADK
// 82 = Brainwave (AT90USB646)	Arduino Mega (Almegai200)
// 9 = Gen3+	Arduino Leonardo Arduino Nini w/ ATrogo228
// 70 = Megatronics	Arduino Mini w/ ATmega120
**	Arduino Ethernet
	Arduino Fio
	Arduino BT w/ ATmega328
	Arduino BT w/ ATmega168
	LilyPad Arduino w/ ATmega328
	LilyPad Arduino w/ ATmega168
1 Sanguino W/ ATmega1:	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega328
图像 1. jpg new mcu原理	Arduino Pro or Pro Mini (5V, 16 MHz) w/ ATmega168
	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmega328
street e street	Arduino Pro or Pro Mini (3.3V, 8 MHz) w/ ATmegal68
	Arduino NG or older w/ ATmega168
	Arduino NG or older w/ ATmega8
1 i i 5	Sanguino W/ ATmega644P
	Sanguino W/ ATmega1284p 8mhz
· • • • • • • • • • • • • • • • • • • •	<ul> <li>Sanguino W/ ATmega1284p 16mhz</li> </ul>

3-2

Configuring serial interface: Tools > Serial Port > the corresponding COM Port of Sanguinololu is usually the last one. As shown below



Click the "check ()" button to check if it is right and then click the "?" button to upload firmware, as shown below.





Upon uploading, IDE will display the rate of progress; when done uploading appears, the uploading process succeeded.

(	<b>_</b>	)4 +[
Done uploading.		
Binary sketch size: 102,	066 bytes (of a 258,048 byte max	imum)
5	Arduino Mega 2560 or Mega ADK	on /dev/tyway3ndologn6523000
	3-5	

After uploading, you can go on to the next step. If you cannot upload, check the dialog box below to identify the problem and solve it. The common mistakes are the wrong select of type of board or serial port etc.



### 2.5Software Setting

#### Arduino IDE Installation

Move the file sanguine into Arduino> hardware, reopen IDE.

Windows will prompt that a new USB device, named FT232R USB UART was found when connecting USB with Sanguinololu to the PC.

Then, windows will open the dialog box "found new hardware wizard", check "no, not this time", then click "next" to continue.



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Check "install from a list or specific location (advanced)", then click "next".



Found New Hardware Wiza	ard
	This wizard helps you install software for: USB Device If your hardware came with an installation CD or floppy disk, insert it now. What do you want the wizard to do? Install the software automatically (Recommended) Install from a list or specific location (Advanced) Click Next to continue.
	< Back Next > Cancel

3-7

Specify "drivers" in Arduino 1.0.1 installation directory to install driver.

<ul> <li>Search for the best driver in these locations.</li> <li>Use the check boxes below to limit or expand the default search, which includes I paths and removable media. The best driver found will be installed.</li> <li>Search removable media (Hoppy, CD-ROM)</li> <li>Include this location in the search:         <ul> <li>D:\Documents and Settings\Matt\Desktop\REPRA</li> <li>Browse</li> </ul> </li> <li>Don't search. I will choose the driver to install.</li> <li>Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.</li> </ul>
Use the check boxes below to limit or expand the default search, which includes I paths and removable media. The best driver found will be installed.  Search removable media (floppy, CD-ROM)  Include this location in the search: D:\Documents and Settings\Matt\Desktop\REPRA v Browse  On't search. I will choose the driver to install.  Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.
<ul> <li>Search removable media (floppy, CD-ROM)</li> <li>Include this location in the search:         <ul> <li>D:\Documents and Settings\Matt\Desktop\REPRA</li> <li>Browse</li> </ul> </li> <li>Don't search. I will choose the driver to install.         <ul> <li>Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.</li> </ul> </li> </ul>
<ul> <li>Include this location in the search:</li> <li>D:\Documents and Settings\Matt\Desktop\REPRA V</li> <li>Browse</li> <li>Don't search. I will choose the driver to install.</li> <li>Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.</li> </ul>
D:\Documents and Settings\Matt\Desktop\REPRA      Browse     Browse     On't search. I will choose the driver to install.     Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.
Don't search. I will choose the driver to install. Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.
Choose this option to select the device driver from a list. Windows does not guara the driver you choose will be the best match for your hardware.
the driver you choose will be the best match for your hardware.
3-8



If everything goes well, windows will install the corresponding driver.

The graph below shows installation completed.



3-9

Now, you can find the corresponding Sanguinololu device in device manager of windows.



B Device Manager	
File Action View Help	
+ → ∞ ☆ ⊕ 않 ∞ 🧏 ≈ 🗶 🗶	
<ul> <li>P4</li> <li>Computer</li> <li>Display adapters</li> <li>DVD/CD-ROM drives</li> <li>Floppy disk controllers</li> <li>Floppy disk drives</li> <li>Human Interface Devices</li> <li>IDE ATA/ATAPI controllers</li> <li>Keyboards</li> <li>IDE ATA/ATAPI controllers</li> <li>Keyboards</li> <li>Monitors</li> <li>Monitors</li> <li>Network adapters</li> <li>Ports (COM &amp; LPT)</li> <li>US Serial Port (COM15)</li> <li>Communications Port (COM1)</li> <li>Communications Port (COM1)</li> <li>Communications Port (COM1)</li> <li>Communications Port (COM2)</li> <li>Printer Port (LPT1)</li> <li>Processors</li> <li>Sound, video and game controllers</li> <li>System devices</li> <li>Universal Serial Bus controllers</li> </ul>	

3-10

# 4 Get Started

Sanguinololu is the CPU of a 3D printer, manipulating the whole process of printing.

Sanguinololu can't be put in use directly without uploading firmware.

1. Firmware uploading- marlin.

2. Setting parameters of the firmware

The parameters that need setting are as below, for those not mentioned just leave them as default.

#### #define BAUDRATE 250000

This parameter is for the baud rate of serial port. Note: a successful communication can be realized only when the Baud rate of upper computer is identical with that of Firmware. The Baud rate is not



set in random. The common Baud rate are: 2400, 9600, 19200, 38400, 57600, 115200, 250000. The last three are frequently used for 3D Printer.

#### #define MOTHERBOARD 62

This parameter is set for board type. 3D Printer has many types of main board, and the settings of IOs are different, therefore, the parameter has to correspond to the type of your board, or it can't operate normally. The parameter of Sanguinololu should be 62(single-nozzle). For other board, you can refer to the annotation on the board.

#define TEMP\_SENSOR\_0 3

#### #define TEMP\_SENSOR\_BED 3

The two parameters are set for the type of temperature sensor respectively. They are the critical parameter to check if the sensor read temperature correctly. The printer can't operate normally, even has potential risk (damage the device and even worse). You must modify depending on the temperature sensor you use.

#### #define EXTRUDE\_MINTEMP 170

This parameter is set to avoid potential risks when the extruder operates before reaching the rated temperature. If you use other 3D Printer, such as printer to make Chocolates, 45°C is appropriate, so that the parameter configured to a lower value(such as 40°C).

const bool X\_ENDSTOPS\_INVERTING = true; const bool Y\_ENDSTOPS\_INVERTING = true; const bool Z\_ENDSTOPS\_INVERTING = true.



The three parameters are set for the end stops of three axes. If the configuration is true, the end stop outputs 1 in default condition, and outputs 0 when triggered. That is to say, mechanical end stop should connect to the NO (normally open) contactor. If it is connected to the NC (normally closed), true should be changed to false.

### #define INVERT\_X\_DIR false

#define INVERT\_Y\_DIR true

Mistakes are often made in the above two parameters. The parameters are different for different machinery. In principle, the origin should be at lower-left corner of the print platform (origin: [0, 0]), or at up-right corner (origin: [max, max]). Only in this way will the printing be correct, otherwise, the printing is the mirror image of one axis which is not what expected.

#define X\_HOME\_DIR -1

#define Y\_HOME\_DIR -1

#define Z\_HOME\_DIR -1

If the position of the origin is the minimum, the parameter is -1; if it is the maximum, the parameter is 1.

#define X\_MAX\_POS 205

#define X\_MIN\_POS 0

#define Y\_MAX\_POS 205

#define Y\_MIN\_POS 0

#define Z\_MAX\_POS 200

#### #define Z\_MIN\_POS 0

These parameters are crucial to the printing size. Fill in parameters by reference to the coordinate graphs. It is important to note that the origin is not the printing center and the real printing center usually lies at [(x.max - x.min)/2, (y.max - y.min/2)]. The coordinate of central will be used in the slice tool. The printing center's coordinate must correspond to the parameter



configuration, or it will print to the outside of the platform.

#### #define HOMING\_FEEDRATE {50\*60, 50\*60, 4\*60, 0}

The parameter means the homing speeds (mm/min). This parameter can be set as default if you use the x-axis and y-axis adopt synchronous belt drive and z-axis adopts screw drive.

#define DEFAULT\_AXIS\_STEPS\_PER\_UNIT {85.3333, 85.3333, 2560, 158.8308}

These parameters are crucial to the printing size. These parameters indicate the pulse the axis need when operating 1mm. they are corresponding to x, y, z axis and extruder respectively. In most cases these figure should be calculated by yourself, you can refer to: http://calculator.josefprusa.cz/#steppers.

So far, the commonest parameters have been configured and the printer can work now. In addition, if the 2004 LCD needs verifying, you should delete the "//" from "//#define REPRAP DISCOUNT SMART CONTROLLER" to ensure the normal working.

# **5 FAQS**

- 1. The LED doesn't light when connected to USB and 5v external power supply.
- (1) LED is broken (2) LED is not well welded (3) the power supply doesn't work.
- 2. How to solve it if the driver installation failed?

Click here to reinstall the driver (<u>http://www.geeetech.com/wiki/index.php/Sanguinololu</u>) in Arduino IDE/hardware

- 3. What type of printer can Printrboard be applied to?
- Solidoodle, printrbot, and most type of reprap (with 2 stepper motor drivers for Z axis and single extruder)