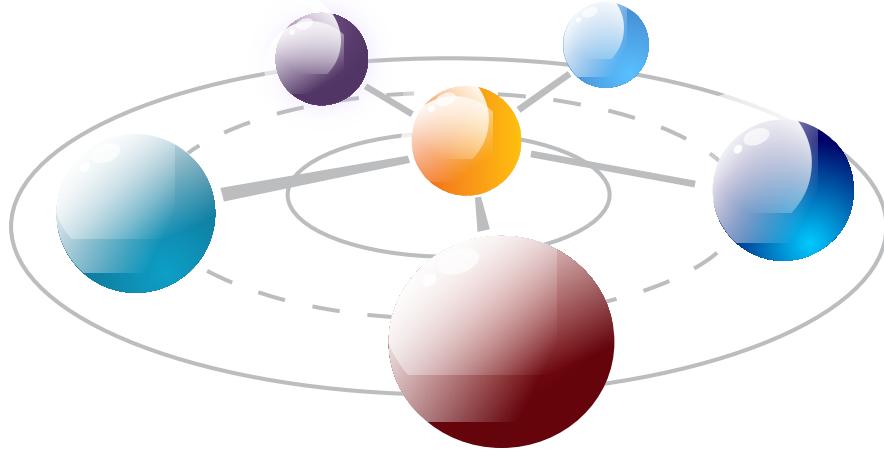




STITCH

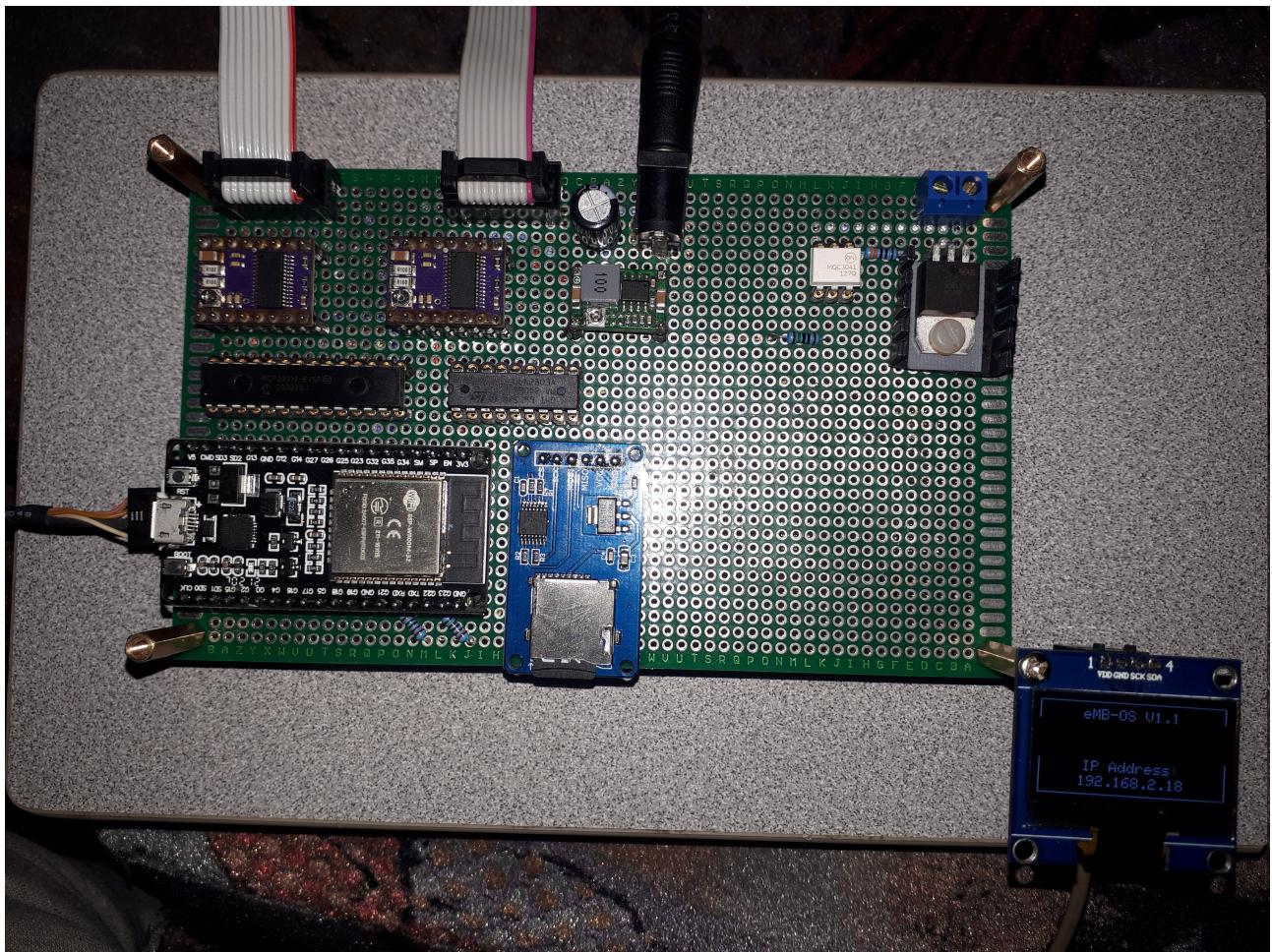
by
Nash A.



So what is Stitch?

Stitch is a hardware and software device that manages a modified Singer 4528C, a very vintage but reliable and working sew machine as a one-colour at a time embroidery machine. The client-side software installed on the ESP32 controller board is called eM-BOS and is written in C while the host software is installed on the PC is called Stitch and that is written in VB.net.. This application is currently in development.

This is the Controller PCB.



The components that make up the PCB.

- | | | |
|------------|--------------------------|-------------------------------------|
| • IC-1 | ESP32 | |
| • IC3, IC4 | DRV8825 | X-Y stepper motor controllers |
| • C1,2 | 47uF 16V | |
| • IC-2,3 | MCP23017 | Port Expanders |
| • IC-4 | ULN2308A | Buffer |
| • CONN-1 | SD Card | |
| • CONN-2 | Remote control interface | (OLED Display & MCP23017) |
| • Q-1 | BTA16 | Triac 16A |
| • IC-5 | MOC3041 | Opto-coupled Triac drives the BTA16 |
| • M-1 | 5.0V Buck regulator | |
| • C-3 | Filter Capacitor | |
| • CONN-3 | 12V in. | |



How does it work?

It is basically a X-Y plotter that moves the fabric around in a frame that has a 150mm x 150mm work area, that's approximately 6x6 inches square and a control for the motor with needle sensors that locate the needle in a top and bottom limit position. There are also limits for the x and y axis.



Keeping the profile as low as possible!



This is the telnet direct interface to the machine. Using Putty to shell commands to the device's custom bash – nash!.

The screenshot shows a PuTTY terminal window titled "192.168.2.44 - PuTTY". The window displays the following text:

```
* eMBOS™ V1.1
©ETM Studios All Rights Reserved 2021/2022
Help system!

Commands:

netscan      - returns scan of network.
status       - returns complete status on system.
log          - system log.
clr          - clears the screen.
run          - runs a job on the system.
sdcardinfo   - returns SD card info.
files        - list file system on machine.
list         - dumps file to screen.
mkdir        - creates a new directory.
rmdir        - deletes named directory.
rename       - renames a file.
jobs         - show available jobs.
cancel       - cancels job if one is running.
selftest     - selftest diagnostics on system.
calibrate    - runs calibration on system.

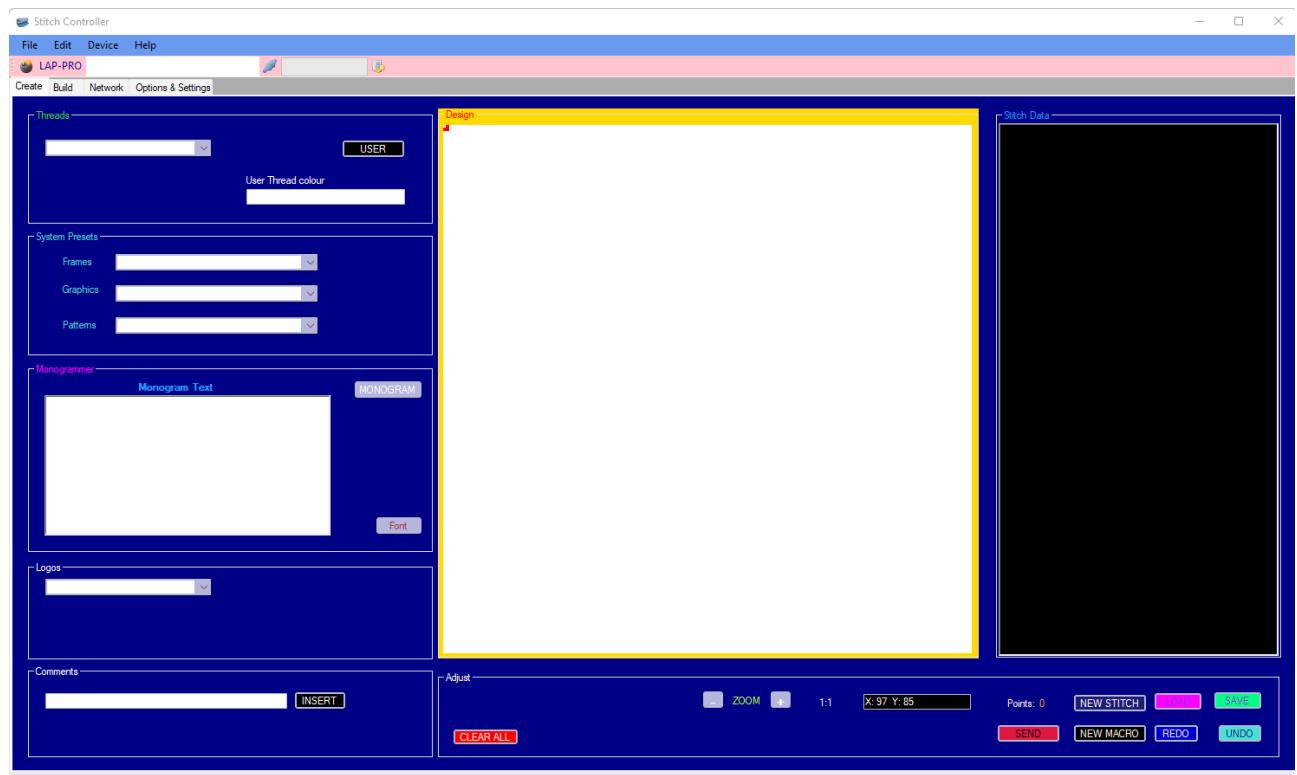
SewMachine Direct Commands:

W> X:<n> Y:<n>  - Hover to that location and wait.
G> X:<n> Y:<n>  - cycle NEEDLE at that location.
T> <colour>    - thread change.
C>           - continue.
M> <name>      - call macro - .msf loads file.
V> <0:1>       - set verbosity.

Type [command]-help / -? for more details.

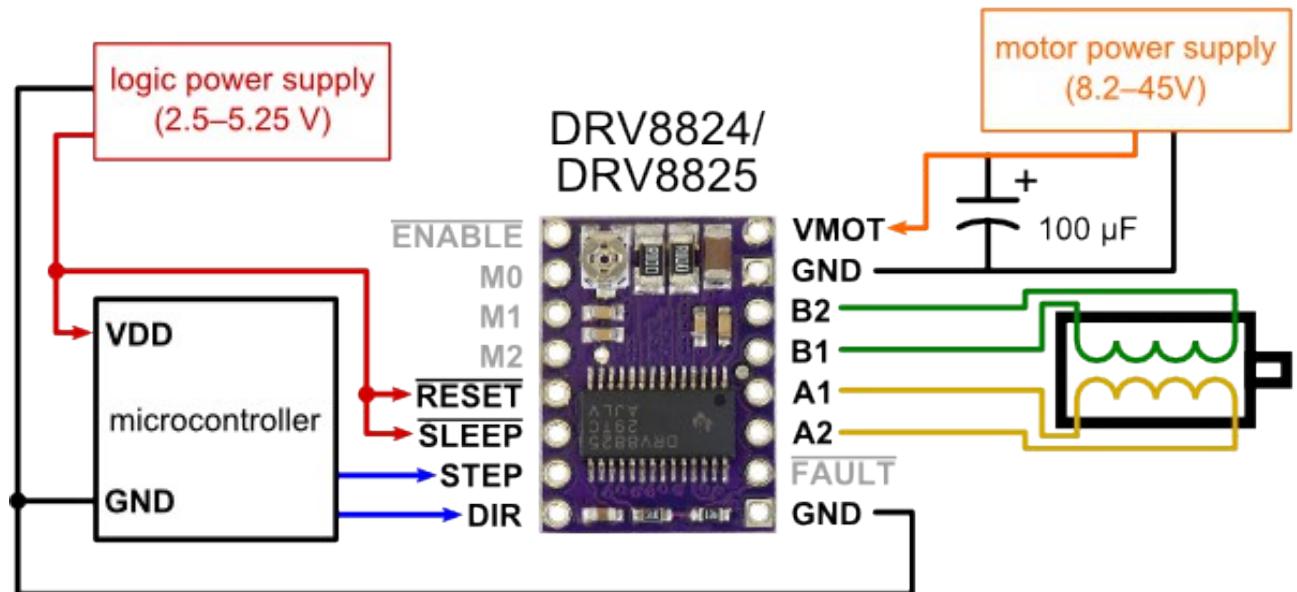
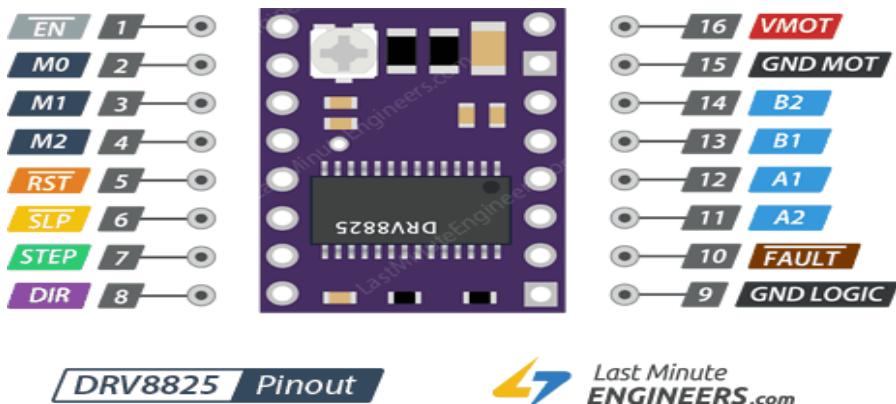
OK
$
```

This is the operational software on the PC side. This is written in vb.net. It is a multi layered software that generates proprietary code which is sent to the controller in an assortment of communication methods. The Telnet interface provides a basic means of controlling the SewMachine while ftp manages the file transfers to the client machine.

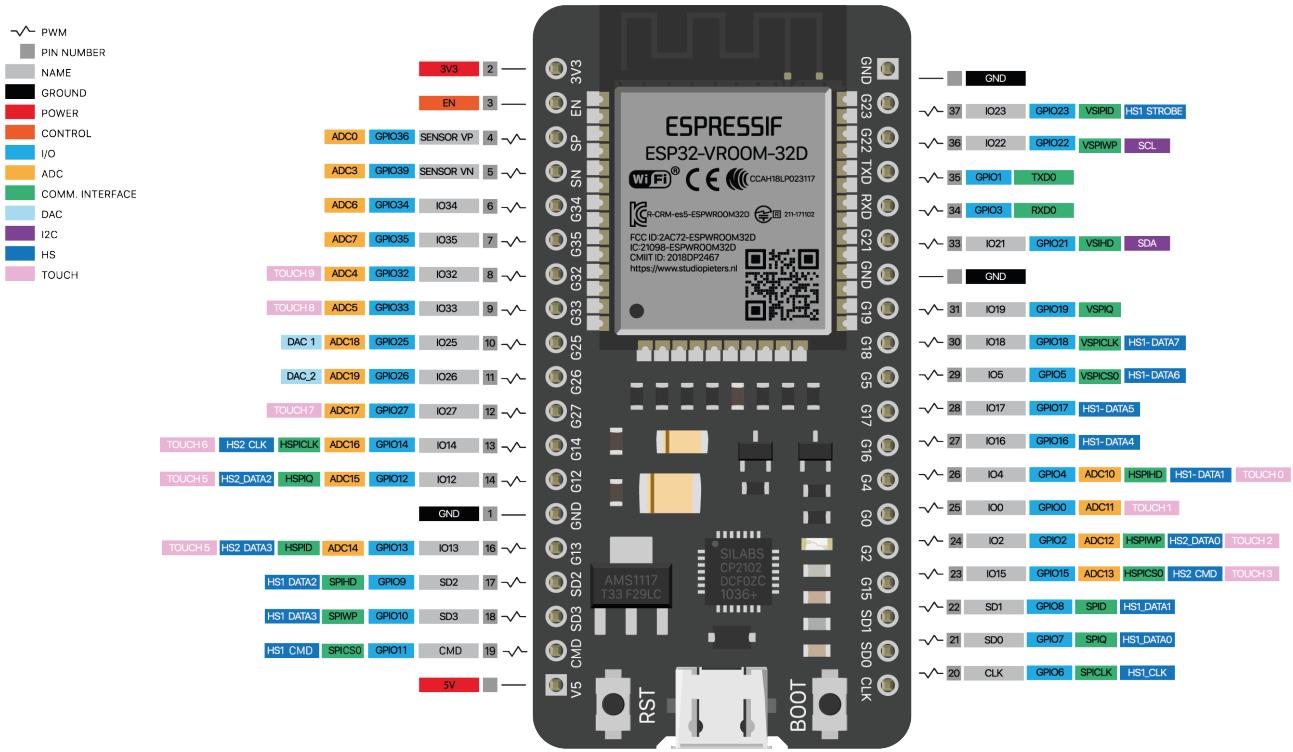




Component Info:

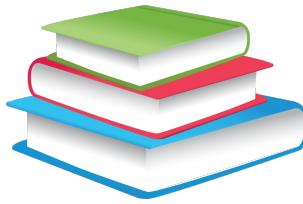


This is the esp32 development PCB being used for this project.



Pins being used are as follows:

- GPIO4 EM STOP
 - GPIO5 SD Card select – VSPI SS
 - GPIO34 Interrupt A - Motors
 - GPIO35 Interrupt A - Aux.
 - GPIO21 i2c DATA
 - GPIO22 i2c SCK
 - GPIO23 MOSI - VSPI
 - GPIO19 MISO - VSPI
 - GPIO18 SCLK – VSPI



Software:

Bluetooth

The bluetooth module only accepts one command at this time. The login. Once entered, the values are stored in EEPROM and these values are read back and used to initialize the Wifi unit. On future system restarts the credentials are retrieved from EEPROM and used to access the network.

Format of login string:

Connect:xx,yy

- xx is your station name
- yy is your password

Enter this string into any BT serial android application – available at the Google Play store. Once sent to the machine, it will respond with:

Station:xx
Password:yy
will be stored in EEPROM...
SSID & Password Stored!
Network setup complete!

The system will now auto login to the network and continue its' setup. Access to the telnet service will become available.

NOTE: if no Wifi is available the machine defaults to creating an AccessPoint. This address is fixed at “**192.168.5.1**”. If for any reason there is a failure of the Wifi to connect the machine will reboot until a login is accomplished or an AP can be sucessfully started.

Telnet

Commands:

- ***netscan***
- ***status***
- ***log***
- ***clr***
- ***run***
- ***sdcardinfo***
- ***files***
- ***list***
- ***mkdir***
- ***rmdir***
- ***rename***
- ***jobs***
- ***cancel***
- ***selftest***
- ***calibrate***
- ***worklight***

Command Descriptions:

NETSCAN

- ***description***
displays a list of all available networks.
- ***syntax***
netscan

STATUS

- ***description***
show the current status of the radio system network connections.
- ***syntax***
status,sta,stat,statu

LOG

- ***description***
dumps to the terminal the system log, which contains info such as system start times, users logged in as well as events such as calibrations etc.
- ***syntax***
log <-?:-l:-d>
 - ? help
 - l list,dump
 - d delete log

CLR

- ***description***
simple clear the screen and home the cursor.

- *syntax*
clr

RUN

- *description*
- *syntax*
run

SDCARDINFO

- *description*
Shows info about the sd card currently inserted, capacity, used space and free space.
- *syntax*
sdcardinfo

FILES

- *description*
shows a list of files on the SD card., optionally you can specify a dir to be viewed.
- *syntax*
files <-?:-'dir'>
 -?
 help
 -'*dirname*'

LIST

- *description*
dumps to the screen, the listed file
- *syntax*
list <-?:-'filename'>

MKDIR

- *description*
Creates a directory in the name specified.
- *syntax*
mkdir <-'dirname'>

RMDIR

- *description*
Removes a directory.
- *syntax*
rmdir <-'dirname'>

RENAME

- *description*
Renames a file.
- *syntax*
rename <-'oldname','newname'>

JOBS

- *description*

Shows a list of jobs in the system and the status of those jobs.

- *syntax*
jobs

CANCEL

- *description*
- *syntax*
cancel

SELFTEST

- *description*
Runs the machine diagnostics; motors, limits, needle, etc.
- *syntax*
selftest <-l:-i:-m:-n>

CALIBRATE

- *description*
Runs the calibrations.
- *syntax*
calibrate

WORKLIGHT

- *description*
- *syntax*
work-light <-0:-1>

-0	turn off lamp
-1	turn on lamp