

# MM3D growing house controlling and monitoring unit

## User Manual



Hardware version: v190203  
Software version: v0.5  
User Manual version: v5.0  
Issue date: 2020-05-10

# Content

I. Hardware.....	3
1. Technical data.....	4
2. Administration.....	5
3. Description.....	5
4. Schematic and printed circuit draws.....	5
5. Terms of use.....	5
6. Look of the device.....	6
a) Manuals and connectors.....	6
b) Connector pinout.....	7
7. Downloadable documentation.....	8
II. Software.....	9
1. General description.....	10
2. Prepare.....	10
3. Download.....	10
4. Installation.....	10
3. Settings.....	13
6. Using the device.....	15
7. Terms of use.....	17
III. Example of application.....	19
IV. Related links.....	21
1. Hardware.....	22
2. Software.....	22
3. Terms of use.....	22
4. Developer and manufacturer.....	22
V. Annexes.....	23
1. Schematic draws.....	24
2. Printed circuit boards.....	24

Titles:	MM3D growing house controlling and monitoring unit		Rev.:	190203	Pages:	2/31
	User Manual					
Name:	Pozsár Zsolt				Date:	2020-05-10

# I. Hardware

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	3/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

The device is capable of measuring, controlling and monitoring the characteristics of a growing site.

## 1. Technical data

Supply voltage:	5V DC (powered by 230 V AC/5 V DC adapter)
Supply current:	max. 2.5 A
Isolation class:	Class II.
Mechanical size:	190 x 140 x 70 mm
IP protection:	IP 54
IK protection:	IK 03
Material of cover:	termoplaszt (ABS)
LAN:	Ethernet (RJ45)

Measured data:

value	range	resolution	accuracy	note
temperature	-40...+80 °C	0.1 °C	< ±0.5 °C	Length of sensor ca.ble: max. 20 m
humidity	0-100% RH	0.1 % RH	±2 % RH	

Programmable in- and outputs:

sign	type	note
IN #1	input	TTL level inputs with pull-up resistor, theirs active state is „L”.
IN #2	input	
IN #3	input	
IN #4	input	
OUT #1	output	NO/NC relay contact outputs. Load capacity: 250V 10A AC or 30V 10A DC.  The operation of the relays can be switched off with a key switch, this status is indicated by a red LED.
OUT #2	output	
OUT #3	output	
OUT #4	output	

Programmable error lights:

sign	note
ERR #1	Red LEDs on front panel.
ERR #2	
ERR #3	
ERR #4	

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	4/31
	User Manual				
Name:	Pozsár Zsolt	Date:	2020-05-10		

## 2. Administration

Setting: via SSH  
Access data: with web browser (via HTTP)

## 3. Description

The device is based on a Raspberry Pi 3 B + microcomputer with Raspbian operating system, which also includes software for operating the unit. No graphics system installed on it.

The device's four TTL-level inputs are equipped with pull-up resistors and have an active level of L. They can be used, for example, to check the position of air vents, doors and windows, check the functioning of the ventilation system (airflow sensor), the water pressure sensor, or the status of the motor or overcurrent protection devices with auxiliary contact.

The device has four relay contact outputs that are capable of switching to relatively high power (2.3 kW at 230V AC). The operation of the relays can be disabled by means of a front key switch; In all cases, external circuits must be provided with overcurrent protection.

There is no need to connect a keyboard or monitor to set up and operate the MM3D, and access to it is always done through SSH. Current status and measured data can be checked using a web browser.

## 4. Schematic and printed circuit draws

The wiring diagram of the device is shown in Annex 1, PCB draws are in Annex 3-7. You can download it as part of the complete documentation or in separate PS, PDF, SVG and KiCAD formats from the developer / manufacturer's website.

## 5. Terms of use

Hardware documentation can be modified and/or redistributed under the Creative Commons 4.0 Attribution Non-Commercial (CC-BY-NC-4.0) License. You can read the full (English) text of the license online. (Refer to Chapter IV for references.)

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	5/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## 6. Look of the device

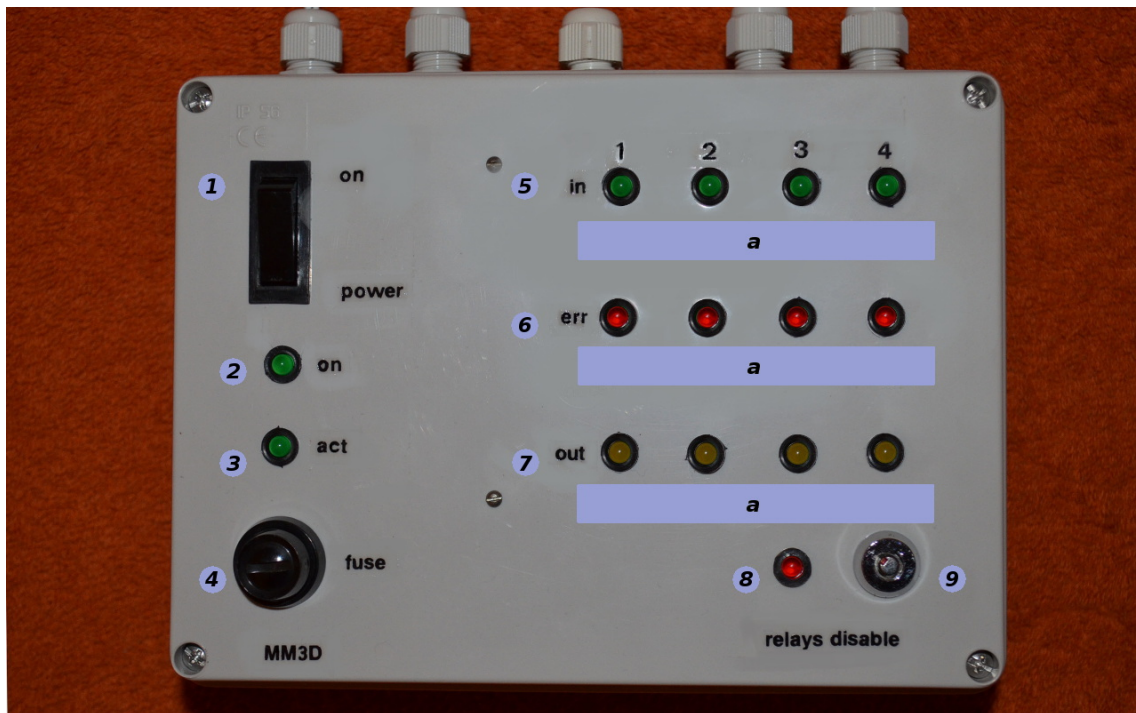


Figure 1: Front panel

### a) Manuals and connectors

- 1: supply voltage on/off switch
- 2: power on light (green LED)
- 3: ACT light (green LED)
- 4: fuse of supply voltage (2,5 A F)
- 5: IN #1-#4 input active status lights (green LED)
- 6: OUT #1-#4 output active status lights (yellow LED)
- 7: ERR #1-#4 error lights (red LED)
- 8: disable output relays light (red LED)
- 9: disable output relays switch

a: place for sticky labels

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	6/31
	User Manual				
Name:	Pozsár Zsolt	Date:		2020-05-10	

## b) Connector pinout

### Input terminal (J1):

- 1: IN GND
- 2: IN #1
- 3: IN #2
- 4: IN #3
- 5: IN #4
- 6: -
- 7: -
- 8: S1 GND (external sensor GND)
- 9: S1 data (external sensor data)
- 10: S1 +5V (external sensor +5V)
- 11: +5 V in (power voltage input)
- 12: GND in (power voltage input)

### Output terminal (J3):

- 1: NC1
- 2: COM1
- 3: NO1
- 4: NC2
- 5: COM2
- 6: NO2
- 7: NC3
- 8: COM3
- 9: NO3
- 10: NC4
- 11: COM4
- 12: NO4

Numbering on both connectors (terminal blocks) is in the installed position of device from top to bottom.

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	7/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## 7. Downloadable documentation

The complete documentation of the hardware in the .tar.gz format compressed file can be downloaded from the manufacturer's website. (Refer to Chapter IV for references.)

Package's name: *mm3d-hw-190203-5.0.tar.gz*

Content:

### mm3d-hw

#### cad\_files

##### example

example\_routing.pro  
example\_routing.sch  
README  
\*.\*

##### mm3d

mm3d\_base.pro  
mm3d\_base.kicad\_pcb  
mm3d\_front.pro  
mm3d\_front.kicad\_pcb  
mm3d.pro  
mm3d.sch  
\*.\*

#### documents

mm3d-hw\_en.pdf  
mm3d-hw\_hu.pdf  
pcb\_mm3d\_base-comp.ps  
pcb\_mm3d\_base-silk.ps  
pcb\_mm3d\_base-sold.ps  
pcb\_mm3d\_front-silk.ps  
pcb\_mm3d\_front-sold.ps  
sch\_example.pdf  
sch\_mm3d.pdf

#### pictures

mm3d.jpg  
pcb\_mm3d\_base-comp.svg  
pcb\_mm3d\_base-silk.svg  
pcb\_mm3d\_base-sold.svg  
pcb\_mm3d\_front-silk.svg  
pcb\_mm3d\_front-sold.svg  
sch\_example.svg  
sch\_mm3d.svg

#### README

#### KiCAD files

##### *example of application*

project file  
schematic draw  
information  
other files

##### *MM3D unit*

base panel project file  
base printed circuit board  
front panel project file  
front printed circuit board  
schematic project file  
schematic draw  
other files

#### documentation

User manual (EN)  
User manual (HU)  
base panel component side  
base panel silkscreen  
base panel solder side  
front panel silkscreen  
front panel solder side  
example schematic draw  
MM3D schematic draw

#### pictures

front panel  
base panel component side  
base panel silkscreen  
base panel solder side  
front panel silkscreen  
front panel solder side  
example schematic draw  
MM3D schematic draw

short description (EN)

Titles:	MM3D growing house controlling and monitoring unit			Rev.:	190203	Pages:	8/31
	User Manual						
Name:	Pozsár Zsolt					Date:	2020-05-10



## II. Software

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	9/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## 1. General description

Operation of the device is provided by Python (control), Perl (data access) and Bash (utilities) scripts.

## 2. Prepare

Before installing the program, you must install Raspbian OS Lite on Raspberry Pi. Remember to change the default password for the user 'pi', configure the hostname and access to the local network. For easier remote access, use a permanent IP address or configure the IP address assignment on your router.

Prepare operation system:

```
pi@raspberrypi$ sudo apt-get update
pi@raspberrypi$ sudo apt-get upgrade
pi@raspberrypi$ sudo apt-get install git wget
pi@raspberrypi$ sudo echo "deb http://www.szerafingomba.hu/deb/ ./" >> /etc/apt/sources.list
pi@raspberrypi$ sudo wget -q -O - http://www.szerafingomba.hu/deb/KEY.gpg | apt-key add -
pi@raspberrypi$ sudo apt-get update
pi@raspberrypi$ mkdir $HOME/download
```

## 3. Download

Download from homepage:

```
pi@raspberrypi$ cd $HOME/download
pi@raspberrypi$ wget http://www.szerafingomba.hu/software/mm3d/mm3d-sw-0.5-armhf.tar.gz
pi@raspberrypi$ tar -xzf mm3d-sw-0.5-armhf.tar.gz
```

Download new release from Github:

```
pi@raspberrypi$ cd $HOME/download
pi@raspberrypi$ git clone http://github.com/pozsarzs/mm3d-sw.git
```

## 4. Installation

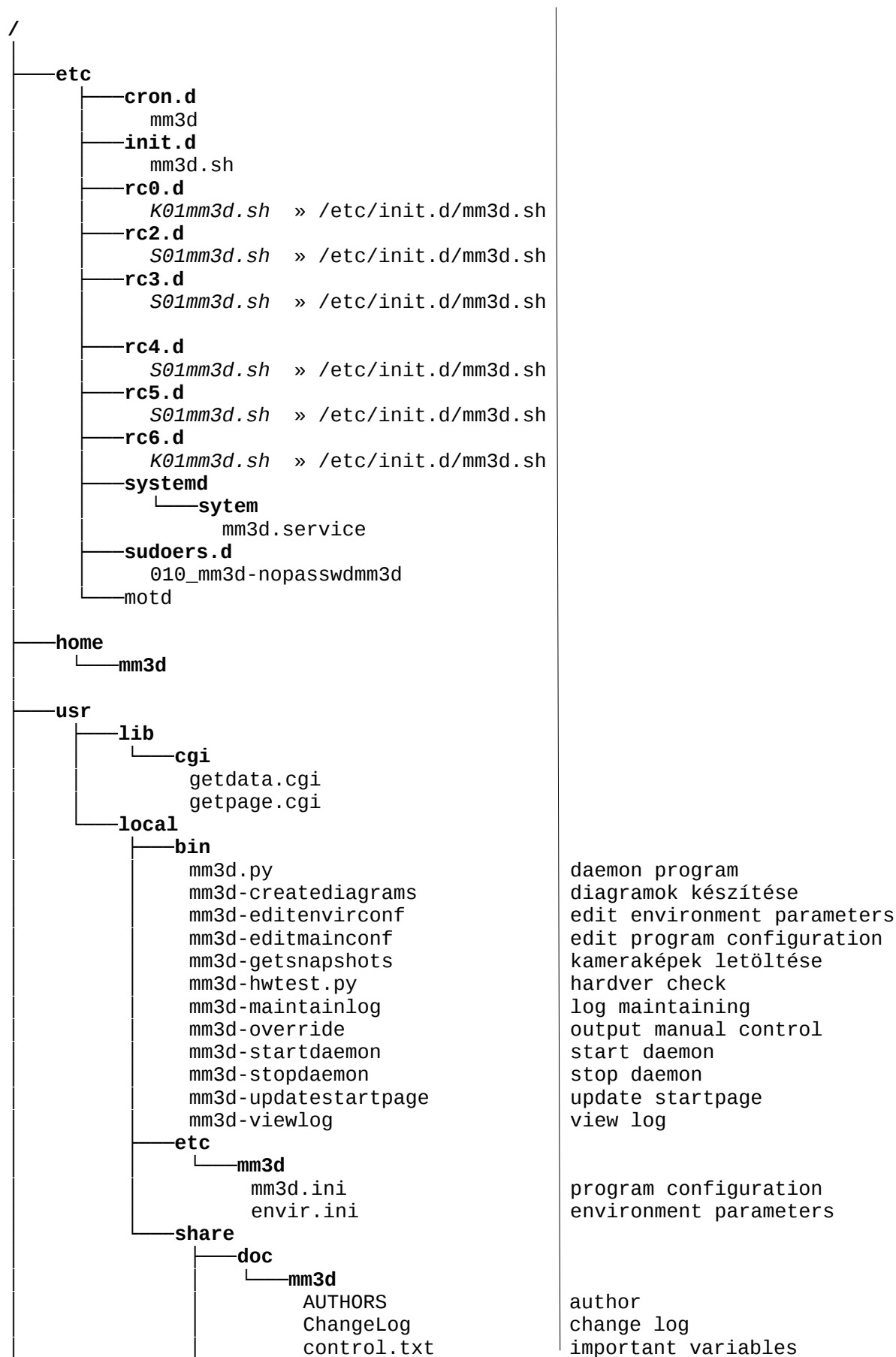
```
pi@raspberrypi$ cd mm3d-sw
pi@raspberrypi$ ./prepare
pi@raspberrypi$ ./install
```

Install program from internet with package manager:

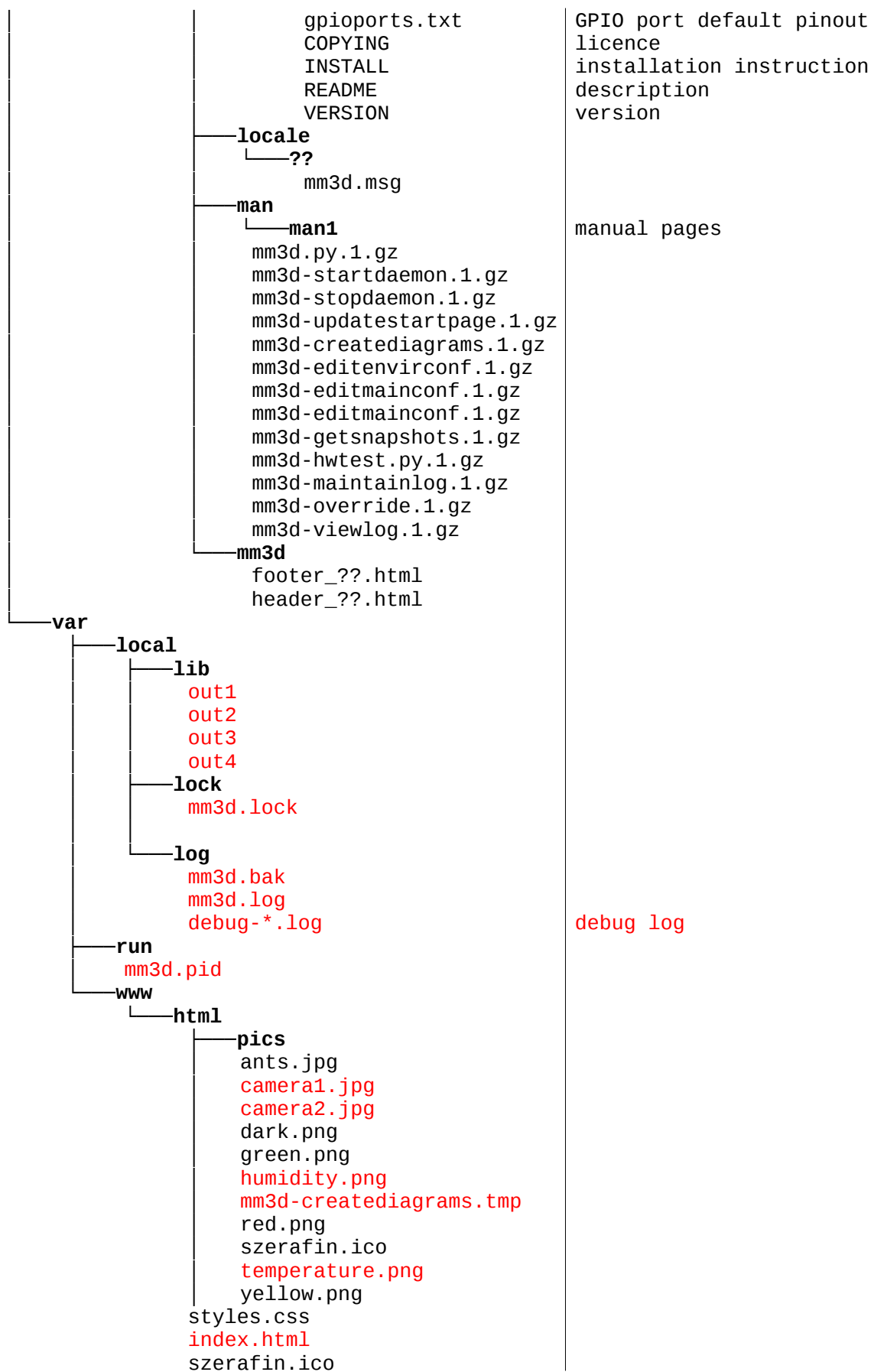
```
pi@raspberrypi$ sudo apt-get install mm3d-prepare
pi@raspberrypi$ mm3d-prepare
pi@raspberrypi$ sudo apt-get install mm3d-sw mm3d-web mm3d-eec
```

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	10/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

The installed and **created** on runtime files (important files with info and target of symbolic links):



Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	11/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10



It that is installed with the package manager is placed in the /usr directory instead of /usr/local.

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	12/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

### 3. Settings

Edit main settings:

```
mm3d@raspberrypi$ mm3d-editmainconf
```

The shellscript stops the service and opens the mm3d.ini file in the default editor. After saving the file, it refreshes the homepage and launches daemont. Content of configuration file:

```
; +-----+
; | MM3D v0.5 * Growing house controlling and remote monitoring system |
; | Copyright (C) 2018-2020 Pozsár Zsolt <pozsar.zsolt@szerafingomba.hu> |
; | mm3d.ini |
; | Main settings |
; +-----+

[user]
; User's data
usr_nam=User's name           ; user's name
usr_uid=00000000             ; user's ID
usr_dt1=User's city          ; more data (eg. country)
usr_dt2=User's address       ; more data (eg. address)
usr_dt3=Growing house number ; more data (eg. growing house)

[names]
; Name of error lights and ports
nam_err1=unnamed #1          ; name of error lights
nam_err2=unnamed #2
nam_err3=unnamed #3
nam_err4=unnamed #4
nam_in1=unnamed #1           ; name of inputs
nam_in2=unnamed #2
nam_in3=unnamed #3
nam_in4=unnamed #4
nam_out1=unnamed #1          ; name of outputs
nam_out2=unnamed #2
nam_out3=unnamed #3
nam_out4=unnamed #4

[ports]
; GPIO port number of error lights and ports
prt_act=24
prt_err1=14
prt_err2=15
prt_err3=18
prt_err4=23
prt_in1=2
prt_in2=3
prt_in3=4
prt_in4=17
prt_sens=11
prt_out1=27
prt_out2=22
prt_out3=10
prt_out4=9

[sensors]
; Type of temperature and humidity sensor
;sensor_type=AM2302
;sensor_type=DHT11
sensor_type=DHT22
```

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	13/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

```
[directories]
; Directories of program
dir_htm=/var/www/html/           ; webserver's directory
dir_lck=/var/local/lock/         ; lock file's directory
dir_log=/var/local/log/         ; logfile's directory
dir_msg=/usr/local/share/locale/ ; message files' directory
dir_shr=/usr/local/share/mm3d/   ; other files' directory
dir_tmp=/var/tmp/               ; place of temporary files
dir_var=/var/local/lib/mm3d/     ; workfiles's directory

[openweathermap.org]           ;login data
api_key=00000000000000000000000000000000
base_url=http://api.openweathermap.org/data/2.5/weather?
city_name=Tiszafoldvar

[ipc cameras]                   ; Show IP cameras' picture
cam_show=1
cam1_enable=0
cam1_jpglink=http://camera1-th01.lan/snapshot.cgi?user=username&pwd=password&count=0
cam2_enable=0
cam2_jpglink=http://camera2-th01.lan/snapshot.cgi?user=username&pwd=password&count=0

[others]
; Language of webpage
lng=en
;lng=...
; Storing time of log
day_log=7
; Enable/disable verbose debug log
dbg_log=0
; Number of log lines on web interface
web_lines=30                      ; Showed log lines
```

Set growing environment parameters:

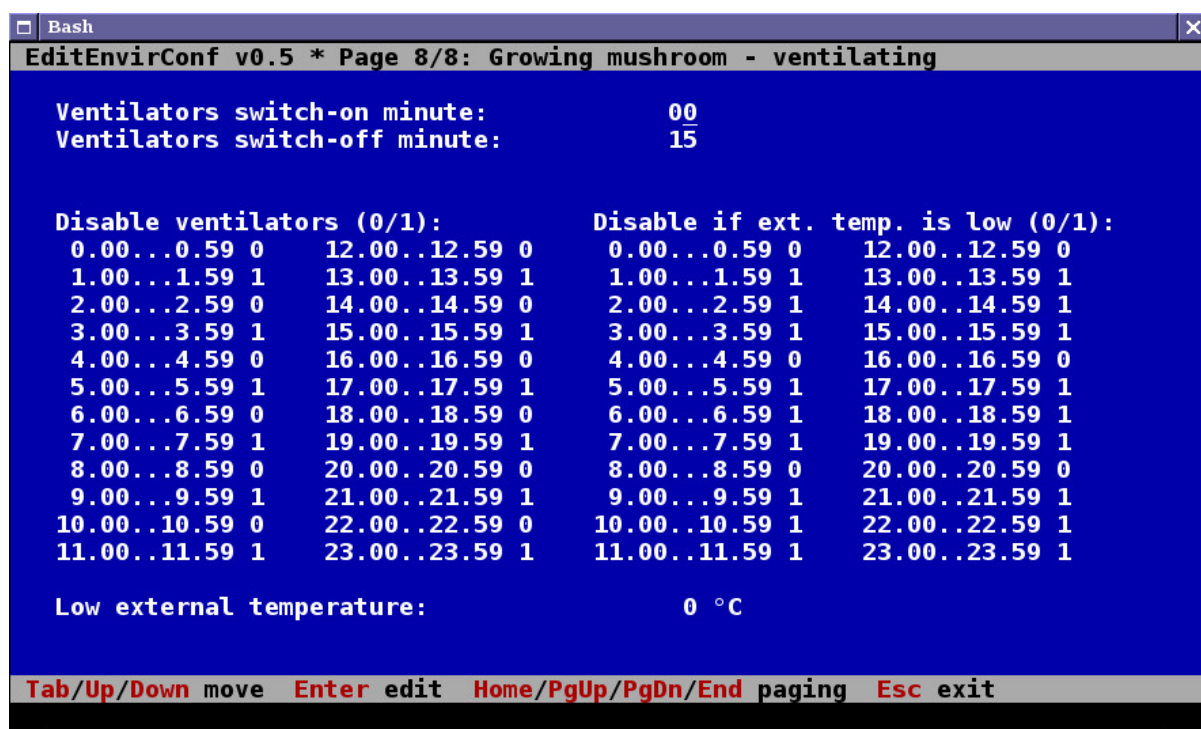


Figure 2: mm3d-editenvirconf

```
mm3d@raspberrypi$ mm3d-editenvirconf
```

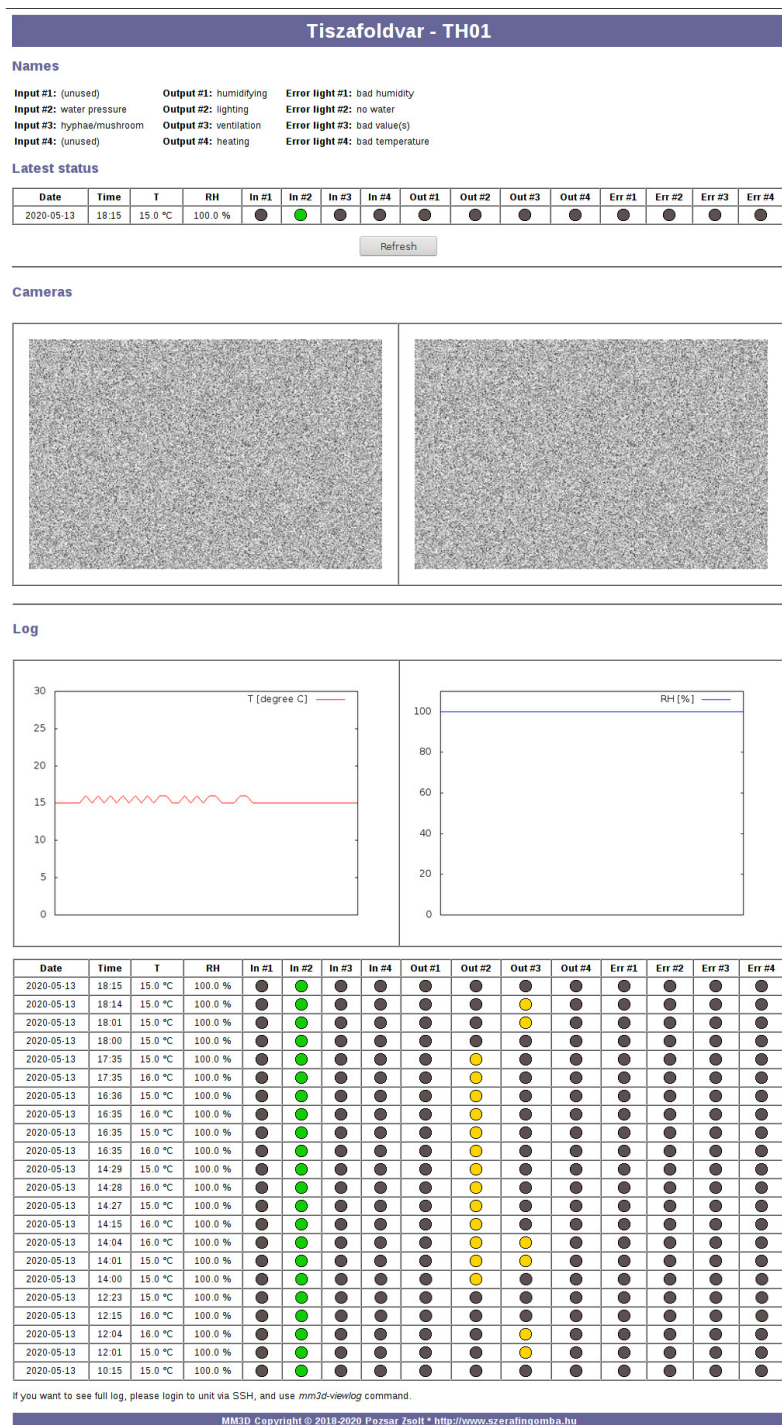
Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	14/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

The shell program starts the setup program and then resumes the service after saving and exiting.

## 6. Using the device

The device works automatically after installation and does not require human intervention. Checking and configuring your operation is only possible remotely via a network.

### Connect with a web browser



### 3. Ábra: Mért jellemzők

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	15/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## Connect with SSH client

For proper character display, the terminal terminal type must be set on non-Unix-like operating systems.

### Connect with OpenSSH on Windows:

```
C:\Users\pozsarzs>set TERM=linux  
C:\Users\pozsarzs>ssh mm3d@th01.1an
```

### Connect with Putty on Windows:

The type of terminal can be set in the field marked with the green frame. (Figure 4)

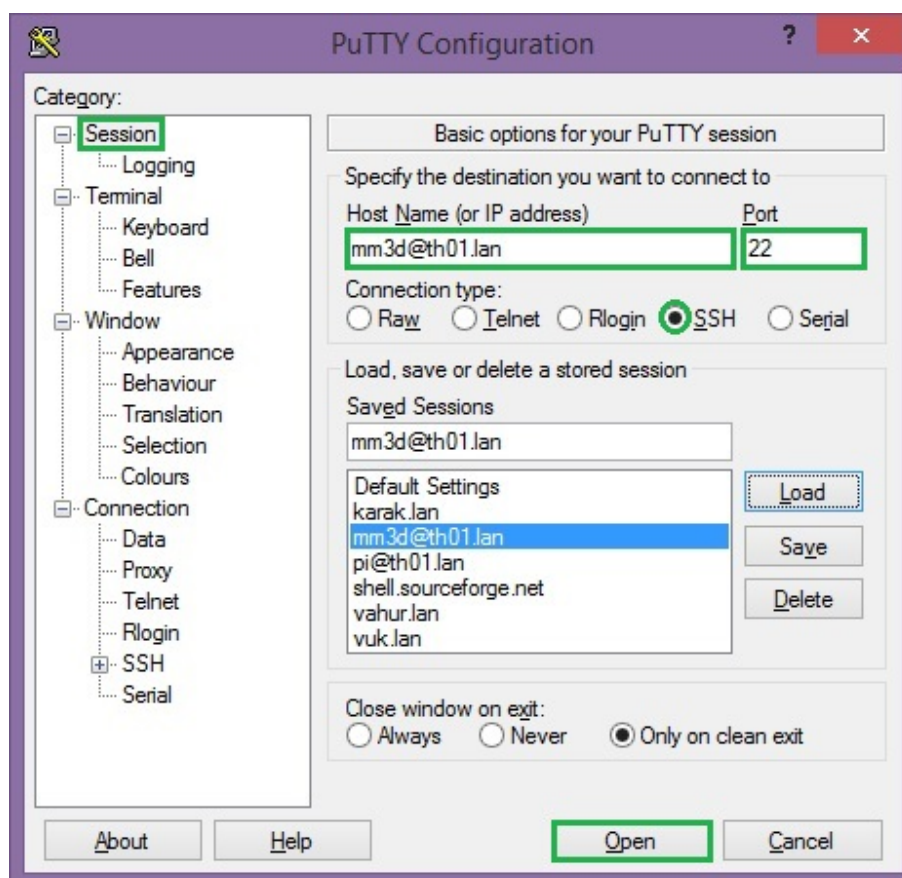
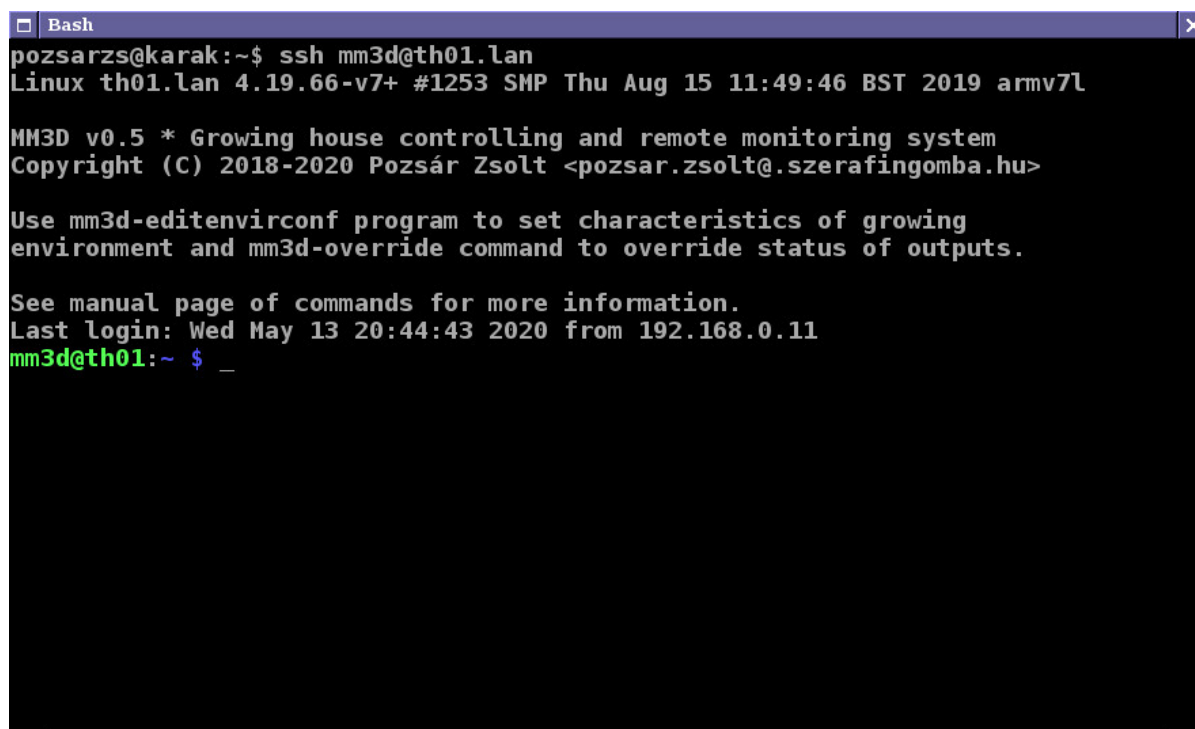


Figure 4: Connect with Putty

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	16/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10



## Connect with OpenSSH on linux:



```
Bash
pozsarzs@karak:~$ ssh mm3d@th01.lan
Linux th01.lan 4.19.66-v7+ #1253 SMP Thu Aug 15 11:49:46 BST 2019 armv7l

MM3D v0.5 * Growing house controlling and remote monitoring system
Copyright (C) 2018-2020 Pozsár Zsolt <pozsar.zsolt@szerafingomba.hu>

Use mm3d-editenvirconf program to set characteristics of growing
environment and mm3d-override command to override status of outputs.

See manual page of commands for more information.
Last login: Wed May 13 20:44:43 2020 from 192.168.0.11
mm3d@th01:~ $
```

Figure 5: Connect with OpenSSH

## 7. Terms of use

This program is free software: you can redistribute it and/or modify it under the terms of the European Union Public License 1.1 version.

This program is distributed in the hope that it will be useful, but WITHOUT ANY WARRANTY; without even the implied warranty of MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.

You can read the full (English and Hungarian) text of the license online. (Refer to Chapter IV for references.)

## 8. Downloadable software package

The package can be downloaded from the manufacturer's website in a .tar.gz compressed file. (Refer to Chapter IV for references.) Name of current package: *mm3d-sw-0.5-armhf.tar.gz*

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	17/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## Content of package:

### mm3d - sw

#### —binary

#### —documents

AUTHORS  
ChangeLog  
control.txt  
gpioports.txt  
INSTALL  
README  
VERSION

#### —manuals

#### —messages

#### —packaging

#### —programs

#### —scripts

#### —settings

#### —source

#### —webpage

—install  
—preinstall  
—uninstall  
—LICENCE  
—README

#### binary files

#### documentation (EN)

author(s)  
change log  
important variables  
GPIO port default pinout  
installation instruction  
information  
version

#### manual pages (EN)

#### translated webpage text

#### files for make deb packages

#### programs (Python)

#### programs (Bash)

#### settings

#### source code

#### components of webpage

installer script  
preinstaller script  
uninstaller script  
terms of use  
short description (en)

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	18/31
	User Manual				
Name:	Pozsár Zsolt	Date:	2020-05-10		

### III. Example of application

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	19/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

The example illustrates the co-operation of the analog controllers MM1A and MM2A. The operation of the growing house requires controlled lighting and ventilation, heating and humidification. The wiring of the house is in annex 2.

Input and output function:

<b>sign</b>	<b>function</b>	<b>note</b>
<i>Inputs</i>		
IN #1	-	
IN #2	water pressure sensor	low pressure: opened contacts
IN #3	operation mode switch	growing mushroom: opened contacts
IN #4	-	
<i>Outputs</i>		
OUT #1	Humidifying	magnetic valve with 24V AC solenoid
OUT #2	Lighting	fluorescent lamps
OUT #3	Ventilation	
OUT #4	Heating	electrical heaters
<i>Error lights</i>		
ERR #1	Humidity	Bad humidity
ERR #2	Low water pressure	Pressure of the incoming water is low for the operation of the humidifier system.
ERR #3	Wrong values-	Wrong measured values.
ERR #4	Temperature	Bad temperature

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	20/31
	User Manual				
Name:	Pozsár Zsolt	Date:	2020-05-10		

## IV. Related links

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	21/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## 1. Hardware

Full documentation	<a href="http://www.szerafingomba.hu/equipments/mm3d/mm3d-hw-190203-5.0.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/mm3d-hw-190203-5.0.tar.gz</a>
Github	<a href="http://github.com/pozsarzs/mm3d-hw.git">http://github.com/pozsarzs/mm3d-hw.git</a>
User manual (EN)	<a href="http://www.szerafingomba.hu/equipments/mm3d/user-manual-190203-5.0-en.pdf">http://www.szerafingomba.hu/equipments/mm3d/user-manual-190203-5.0-en.pdf</a>
User manual (HU)	<a href="http://www.szerafingomba.hu/equipments/mm3d/user-manual-190203-5.0-hu.pdf">http://www.szerafingomba.hu/equipments/mm3d/user-manual-190203-5.0-hu.pdf</a>

### Kapcsolási rajzok:

Example (KiCAD)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.tar.gz</a>
Example (PDF)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.pdf">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.pdf</a>
Example (SVG)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.svg">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d-example.svg</a>
MM3D (KiCAD)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.tar.gz</a>
MM3D (PDF)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.pdf">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.pdf</a>
MM3D (SVG)	<a href="http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.svg">http://www.szerafingomba.hu/equipments/mm3d/sch_mm3d.svg</a>

### Printed circuit boards:

MM3D base (PS)	<a href="http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_base-ps.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_base-ps.tar.gz</a>
MM3D base (SVG)	<a href="http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_base-svg.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_base-svg.tar.gz</a>
MM3D front (PS)	<a href="http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_front-ps.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_front-ps.tar.gz</a>
MM3D front (SVG)	<a href="http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_front-svg.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/pcb_mm3d_front-svg.tar.gz</a>

## 2. Software

Software package	<a href="http://www.szerafingomba.hu/equipments/mm3d/mm3d-sw-0.5-armhf.tar.gz">http://www.szerafingomba.hu/equipments/mm3d/mm3d-sw-0.5-armhf.tar.gz</a>
Github	<a href="http://github.com/pozsarzs/mm3d-sw.git">http://github.com/pozsarzs/mm3d-sw.git</a>

## 3. Terms of use

CC-BY-NC-4.0 (EN)	<a href="https://creativecommons.org/licenses/by-nc/4.0/legalcode">https://creativecommons.org/licenses/by-nc/4.0/legalcode</a>
CC-BY-NC-4.0 (EN)	<a href="https://creativecommons.org/licenses/by-nc/4.0/">https://creativecommons.org/licenses/by-nc/4.0/</a>
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EUPL v1.2 (HU)	<a href="https://eupl.eu/1.2/hu/">https://eupl.eu/1.2/hu/</a>

## 4. Developer and manufacturer

Homepage	<a href="https://www.szerafingomba.hu">https://www.szerafingomba.hu</a>
E-mail	<a href="mailto:info@szerafingomba.hu">info@szerafingomba.hu</a>

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	22/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## V. Annexes

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	23/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

## 1. Schematic draws

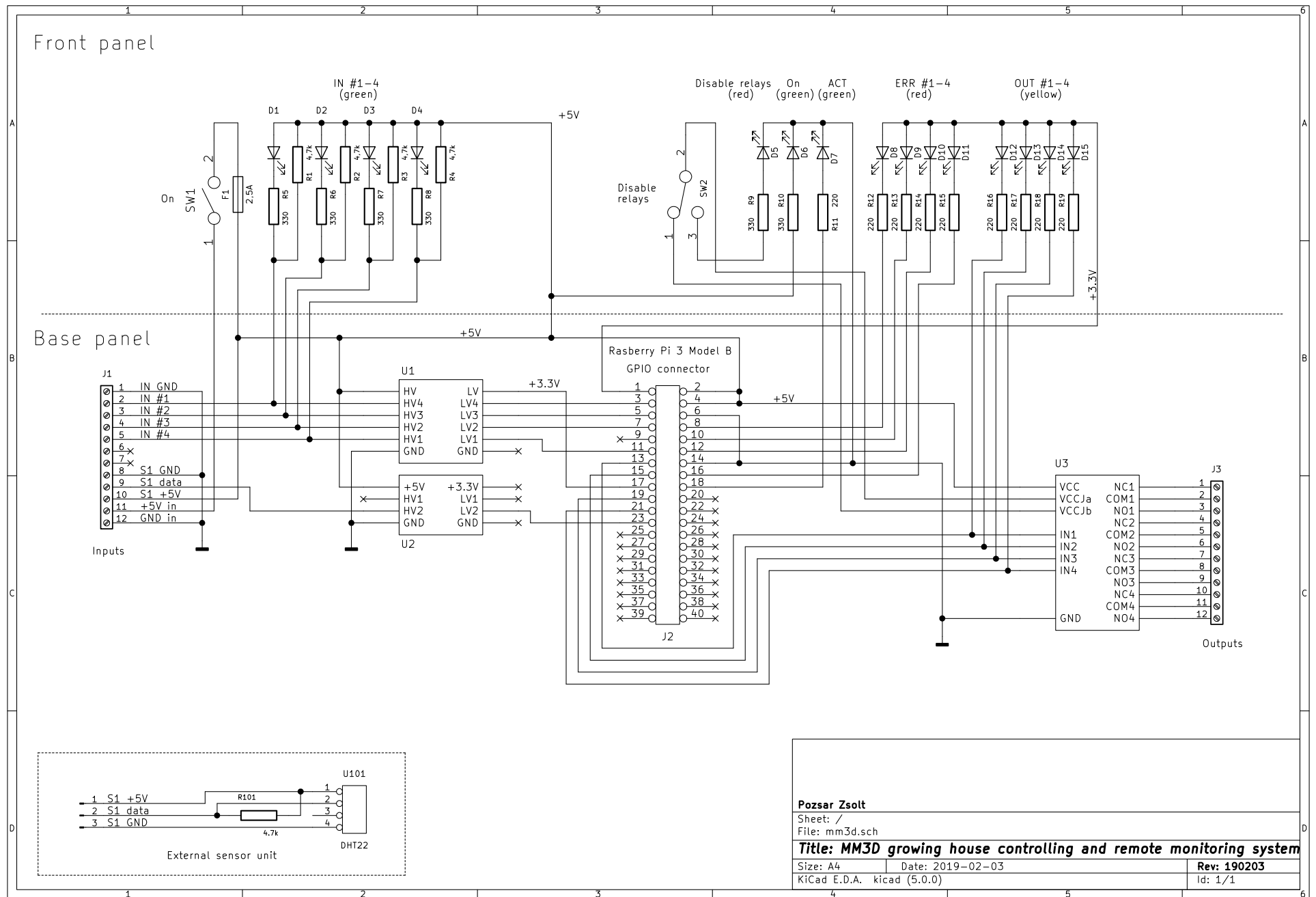
1. Schematic of MM3D
2. Example of application

## 2. Printed circuit boards

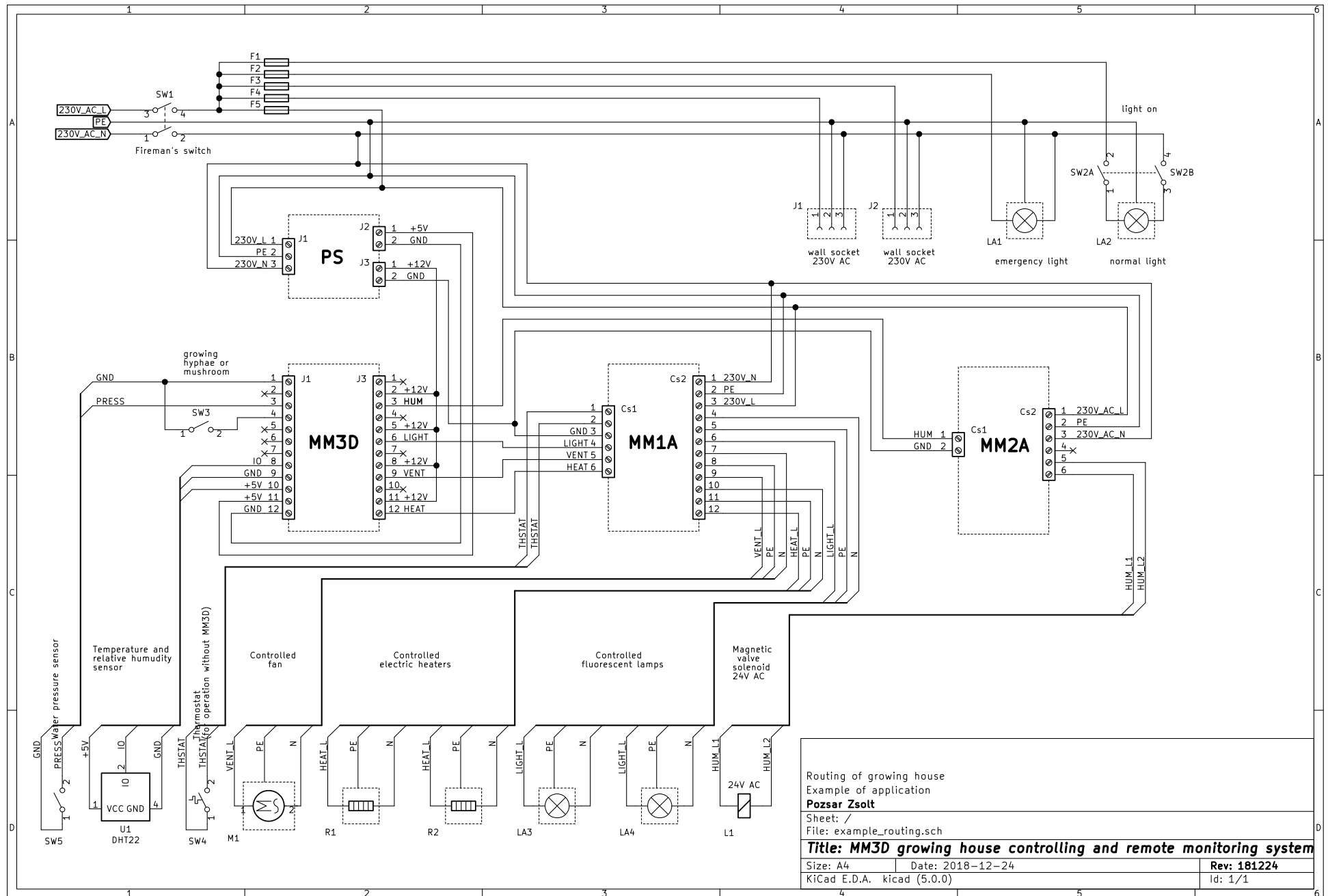
3. Base panel component side
4. Base panel solder side
5. Base panel silkscreen
6. Front panel component side
7. Front panel silkscreen

Titles:	MM3D growing house controlling and monitoring unit	Rev.:	190203	Pages:	24/31
	User Manual				
Name:	Pozsár Zsolt			Date:	2020-05-10

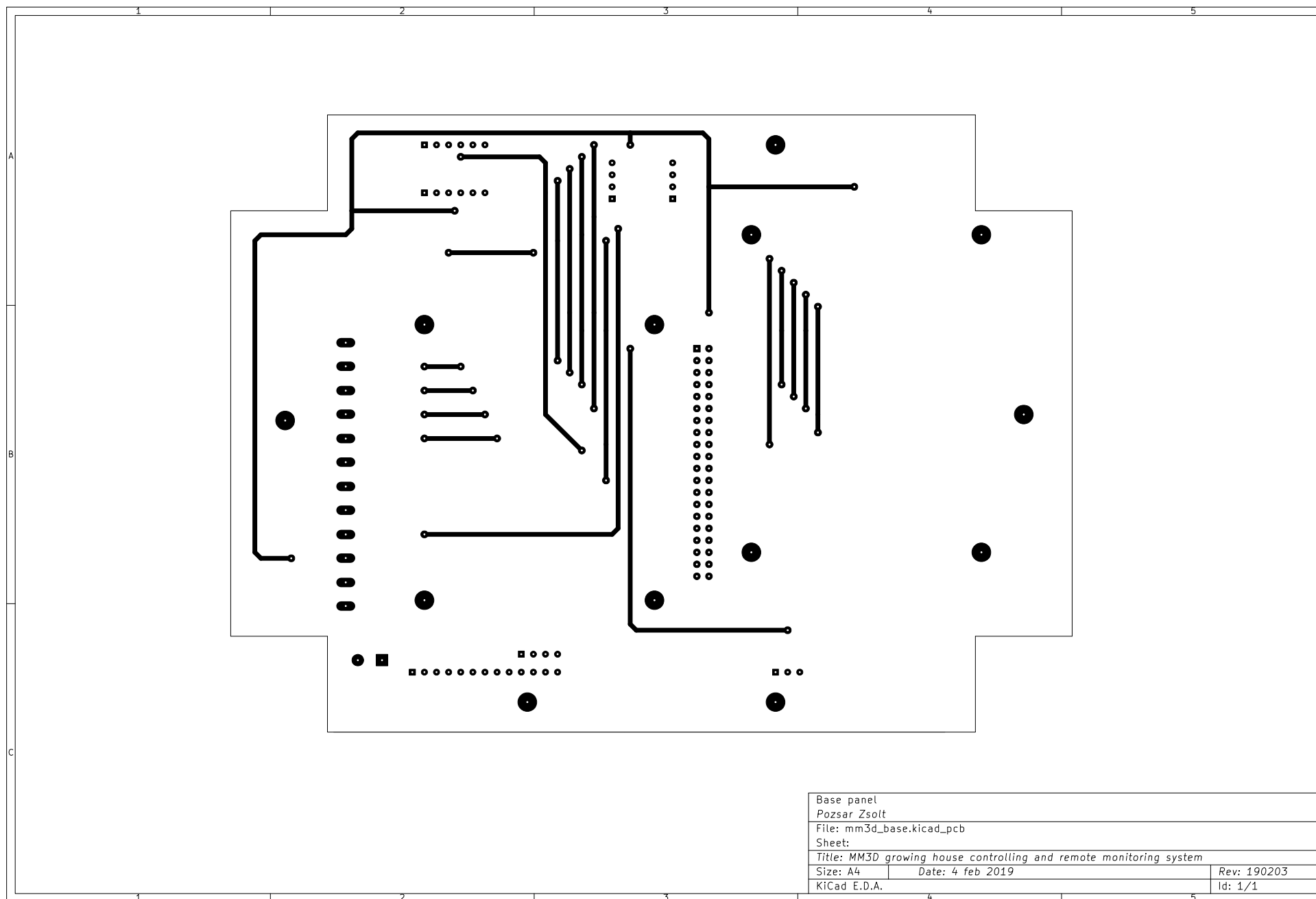




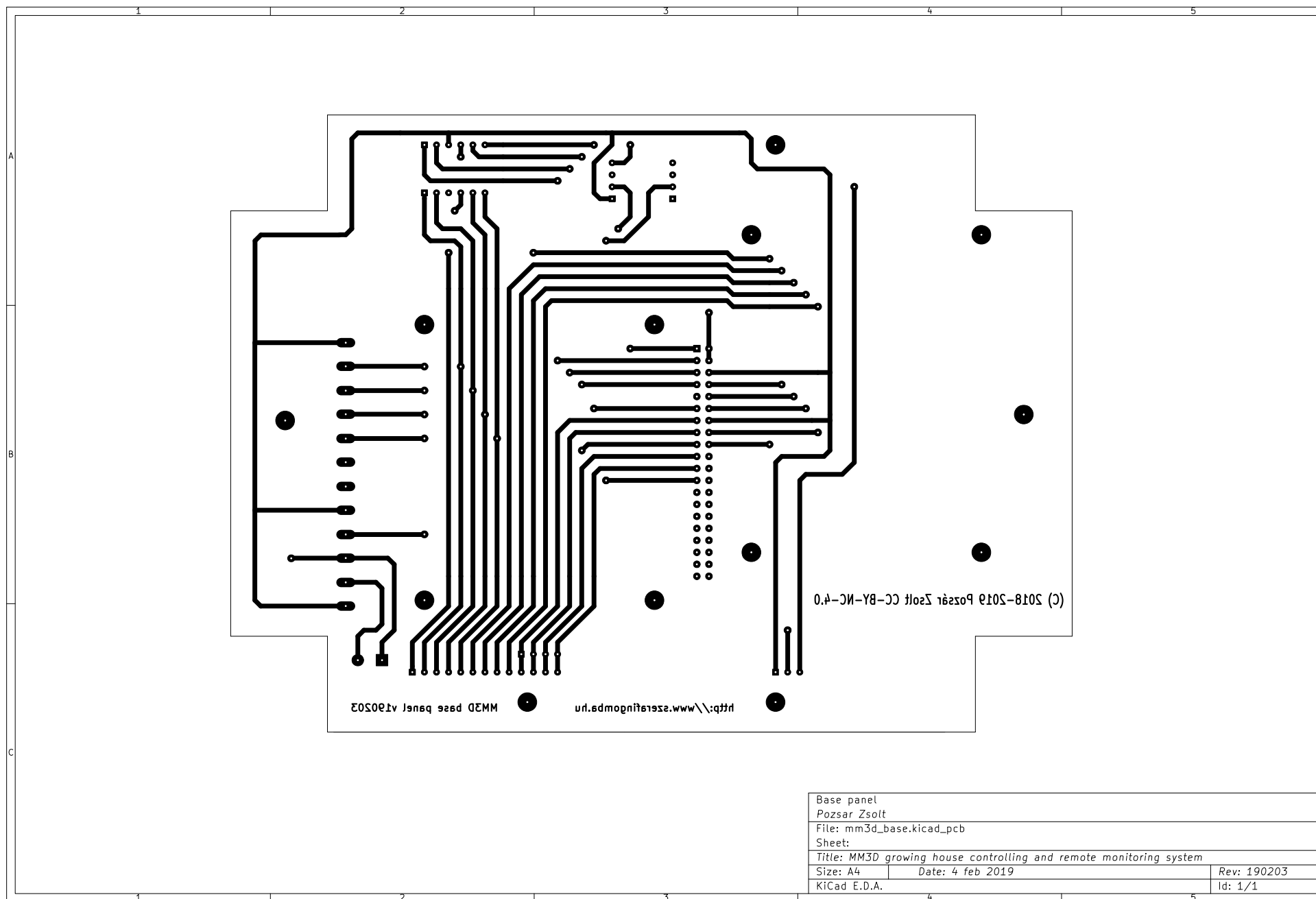
Annex 1: Schematic of MM3D



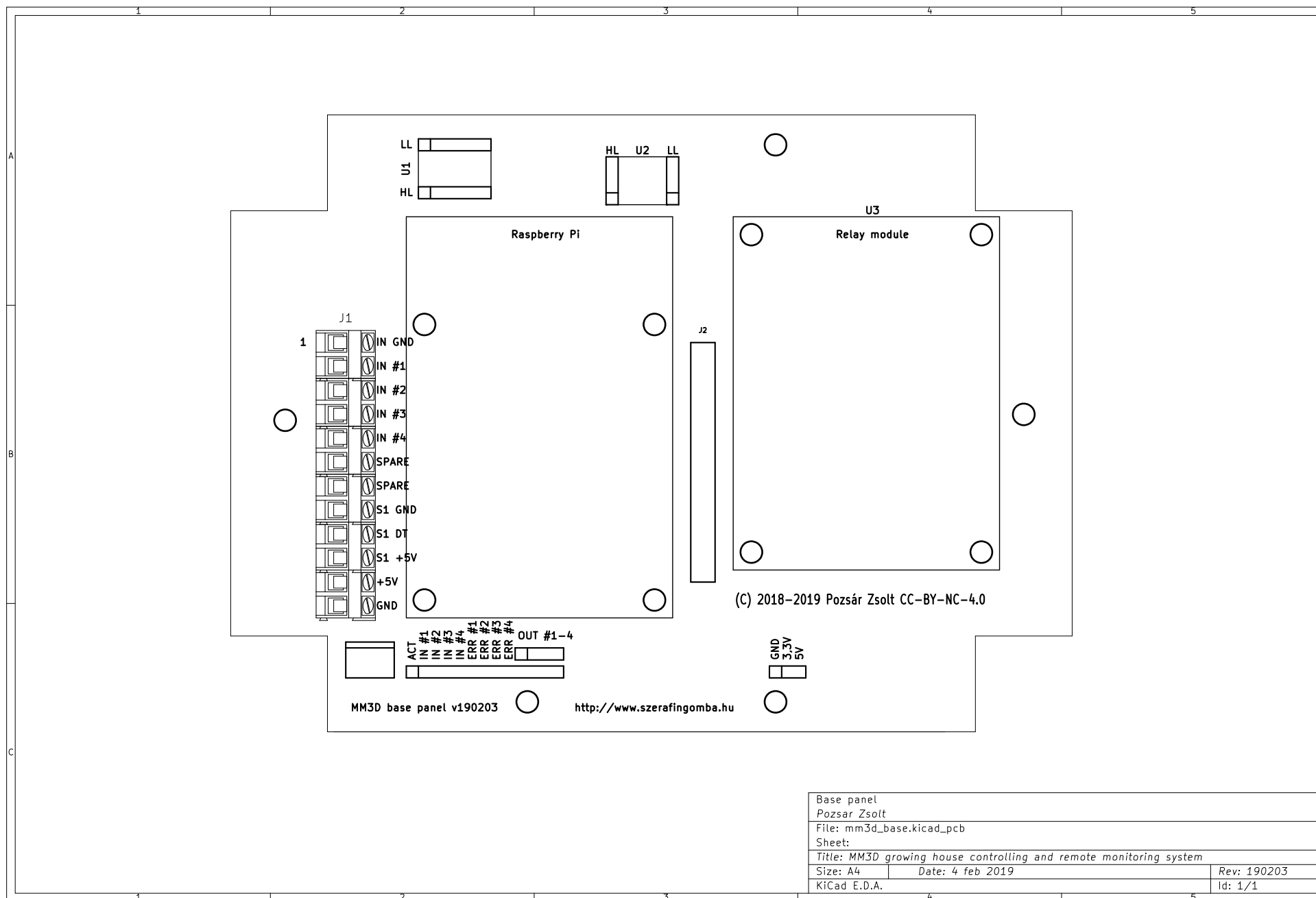
Annex 2: Example of application



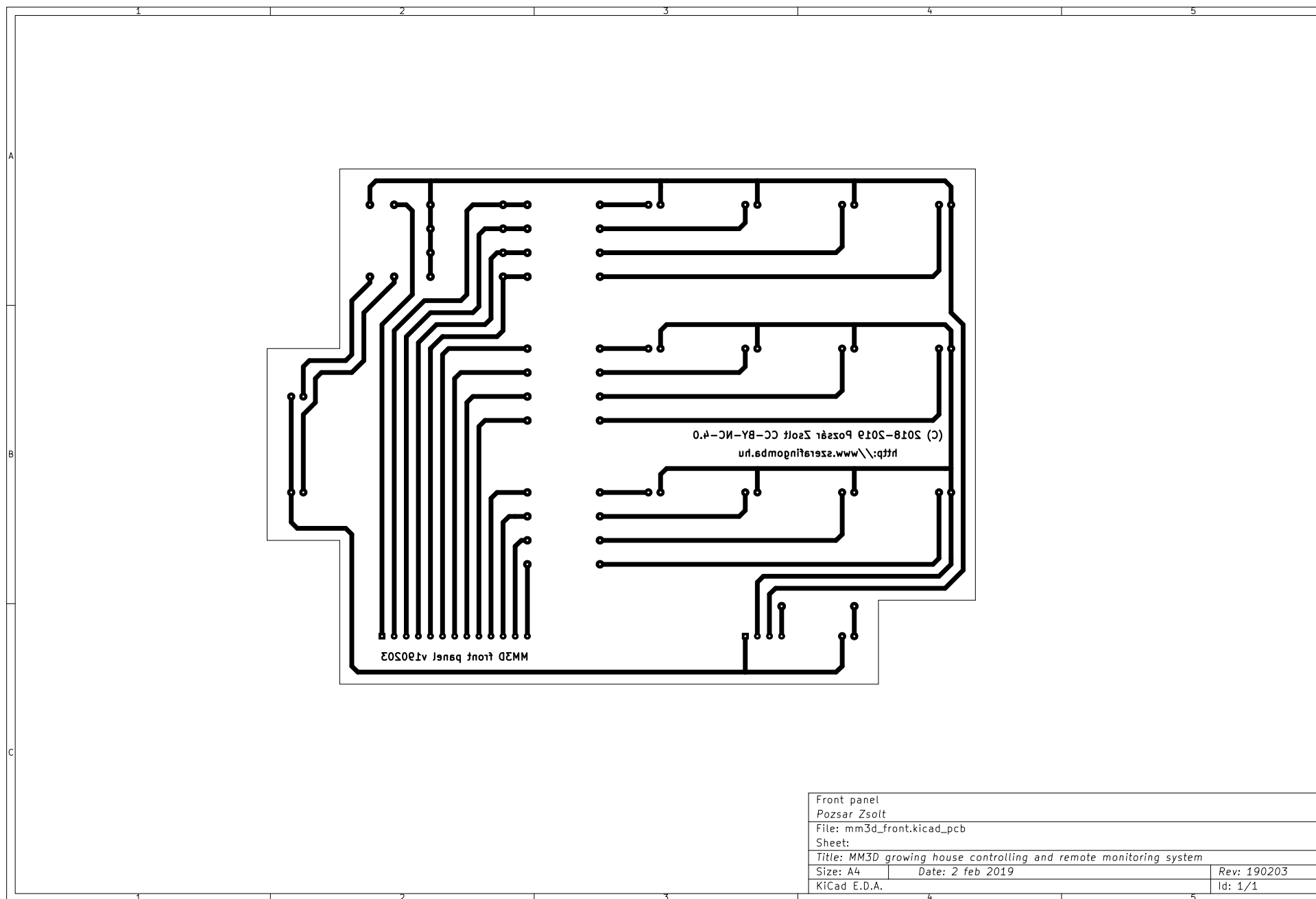
Annex 3: Base panel component side



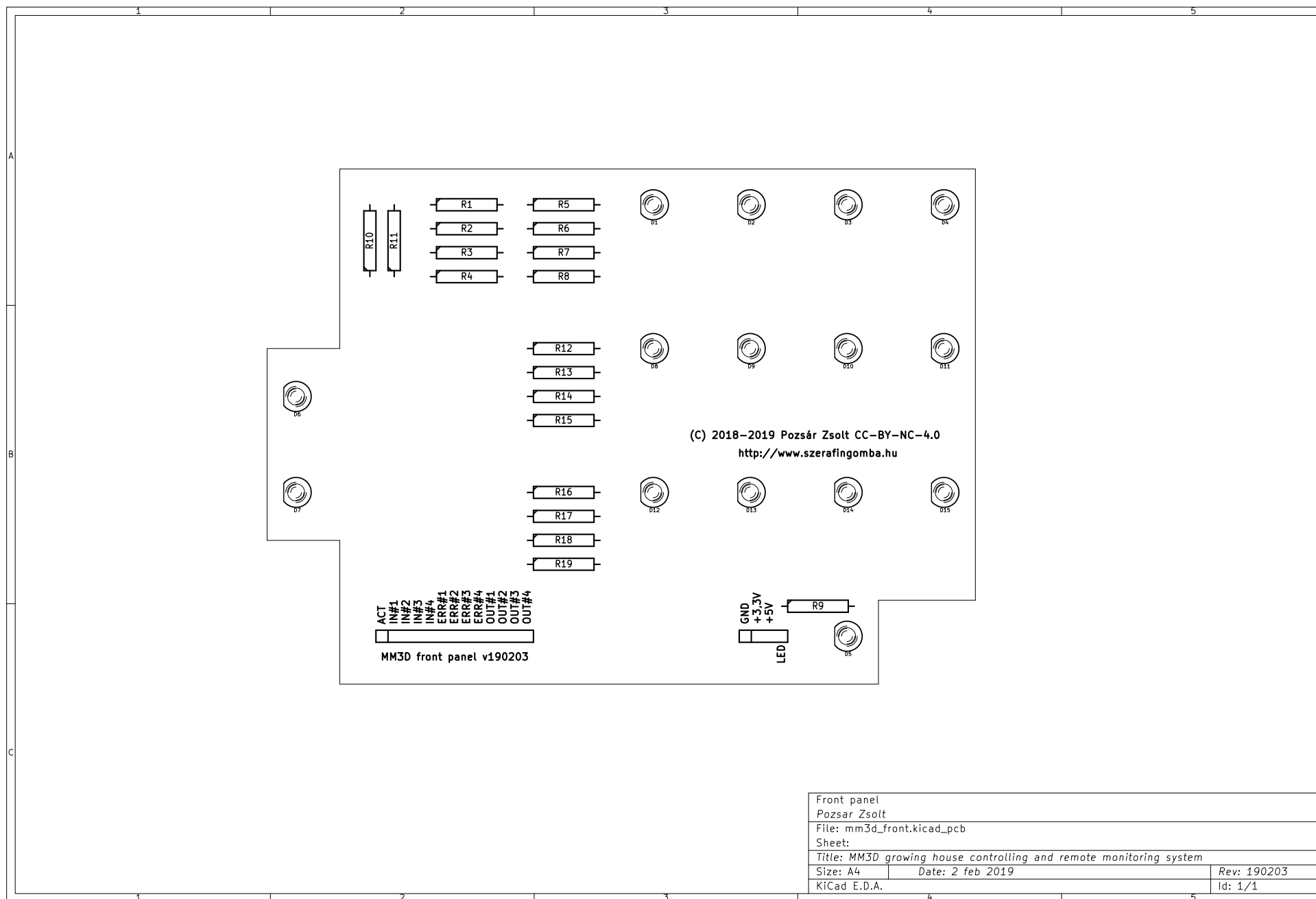
Annex 4: Base panel solder side



Annex 5: Base panel silkscreen



Annex 6: Front panel solder side



Front panel		
Pozsar Zsolt		
File: mm3d_front.kicad_pcb		
Sheet:		
Title: MM3D growing house controlling and remote monitoring system		
Size: A4	Date: 2 feb 2019	Rev: 190203
KiCad E.D.A.		Id: 1/1

Annex 7: Front panel silkscreen