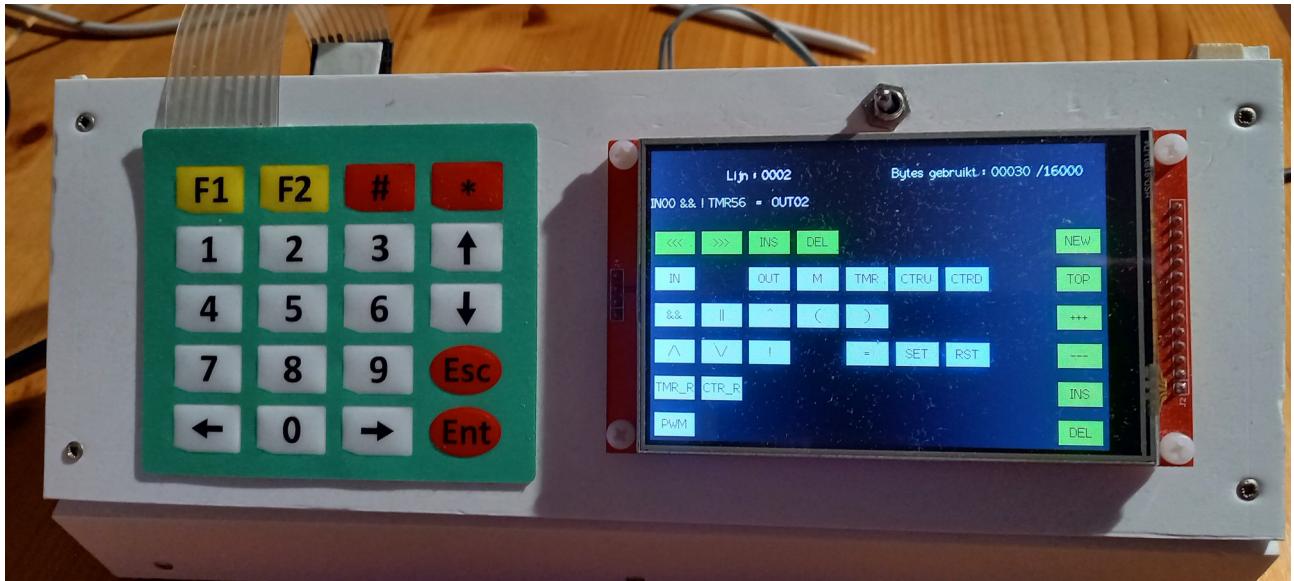


STM 32 mini PLC



Features :

STM32F407VGT6 Discovery board

Easy to program

Ideal for model building or other hobby applications

Cheap

16 digital inputs

16 digital outputs

can be expanded to:

64 digital inputs

64 digital outputs

4 PWM outputs (hardware PWMs do not take up processor time)

frequency can be set per PWM

64 internal markers

64 internal counters

counter_up input

counter_down input

counter_reset input

counter_up output

1 if count value reached

counter_down output

1 if count value 0

64 internal timers

timer input

timer_reset input

timer_output 1 if set time reached

adjustable between 0.1 second and 99:59:59:90

TMR56 to TMR63 continuous timers

deliver square wave of set time if input 1

Due to the limited dimensions of the screen, programming can only be done using Arduino logic

&& AND

|| OR

^ XOR

! NOT

(

)

^ RISING EDGE

\ FALLING EDGE

=

SET

RST

Cycle time adjustable between 10 milliseconds and 100 milliseconds (hardware timer interrupt)

To keep the Timer seconds the same as real seconds set to:

- 10 milliseconden
- 20 milliseconden
- 25 milliseconden
- 50 milliseconden
- 100 milliseconden

Program can be saved in the FLASH memory of the STM32F407.

16000 bytes of freely programmable memory

Maximum 1000 lines.

The number of lines and the cycle time are determined by the number of bytes per line.

Each program line can be a maximum of 20 bytes long (screen size and RAM storage capacity limitation)

with maximum usage of bytes in each line, the maximum number of lines is 800.

bytes per instruction

1 byte
&& || ^ != SET RST () ^ \vee

2 bytes
INxx OUTxx Mxx TMRxx CTRUxx CTRDxx TMR_Rxx CTR_Rxx

3 bytes
PWMxx %% PWM number percent output

Cycle time depends on the number of selected inputs/outputs and program length

time required for 16 inputs/outputs without program
110 microseconden

time required for 64 inputs/outputs without program
437 microseconden

average time per instruction
1.5 microseconden

For full use of the program space with 64 inputs/outputs, 50 milliseconds should be more than sufficient.

437 microseconden + (16000 instructions * 1.5 microseconden) = 24437 microseconden.

Inputs are read at the beginning of the program

Outputs are calculated during the runtime of the program but only written to the outputs at the end of the program.

Program line processing without brackets is done from left to right.

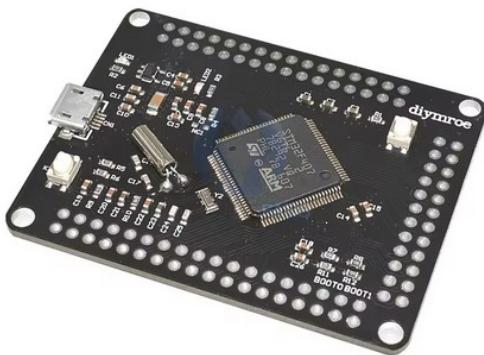
Program line processing with brackets, first all logic within the brackets from left to right until all brackets are processed and then the entire line from left to right.

Automatic restart of the program if saved in FLASH and prog/run switch set to run.

Parts

1 x STM32F407VGT6 Discoveryboard

https://nl.aliexpress.com/item/32757449543.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%2011%2C00%21%E2%82%AC%207%2C59%21%21%2111.07%217.64%21%40211b80e117391834555678607ed237%2161939415252%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007507701964.32757449543&gatewayAdapt=glo2nld



€7.59 €11.00 31% korting

Groothandel | Meer dan 3 stuks, 1% extra korting off
Prijs is inclusief btw

€0.99 off over €38.76 >

STM32F4 Discovery STM32F407VGT6 Arm Cortex-M4 32bit Mcu Core Development Board Spi I2C Iic Uart Isc Sdio Interface Module

★★★★★ 5.0 4 Recensies | 35 verkocht

Meer prijsinformatie ⓘ

1 x TFT 4.0" with touch

https://nl.aliexpress.com/item/33015586094.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%204%2C10%21%E2%82%AC%203%2C08%21%21%214.13%213.10%21%40211b80e117391832257753223ed237%2112000026583382486%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007585585678.33015586094&gatewayAdapt=glo2nld

Buying

€14.90 €19.87 25% korting

Prijs is inclusief btw

€0.99 off over €20.87 >

1.44 1.8 2.0 2.2 2.4 2.8 3.2 3.5 4.0 inch SPI TFT LCD-scherm Kleurrijke Touch Display Module ILI9341 ILI9488 480*320 240*320 Drive

★★★★★ 4.9 79 Recensies | 487 verkocht

Kleur: 4.0 inch with touch

1.44 inch no touch

1.8 inch no touch

2.2 inch no touch

2.4 inch no touch

2.4 inch with touch

2.8 inch no touch

2.8 inch with touch

3.2 inch no touch

3.2 inch wth touch

3.5 inch no touch

4.0 inch with touch

4.0 inch no touch

1 x keyboard

https://nl.aliexpress.com/item/1005006003827538.html?spm=a2g0o.productlist.main.19.186e6507ePonWY&algo_pvid=17155b4b-7689-462b-8714-781293fa734f&algo_exp_id=17155b4b-7689-462b-8714-781293fa734f-9&pdp_ext_f=%7B%22order%22%3A%22163%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%214.55%211.49%21%213.49%211.02%21%40211b612517391839046883591ebb9c%2112000035271891695%21sea%21BE%21924161374%21X&curPageLogUid=CuBLZAXDJYbI&utparam-url=scene%3Asearch%7Cquery_from%3A



€1.95 €5.91 67% korting

Prijs is inclusief btw Extra 2% korting

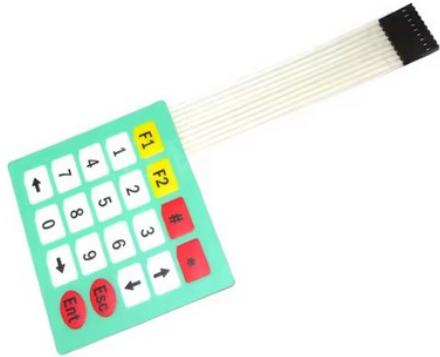
4 12 16 20 Sleutel 1*4*4*3 4*4 4*5 Membraan Schakelaar Toetsenbord 1X4 3X4 4X4 4X5 Matrix Matrix Toetsenbord Voor Arduino Slimme Auto

★★★★★ 4.8 18 Recensies | 163 verkocht

Kleur: 4x5



Meer prijsinformatie ⓘ



Good quality, Best service

1 x power supply 3.3V 1A

https://nl.aliexpress.com/item/4000010690717.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%203%2C17%21%E2%82%AC%203%2C17%21%21%213.19%213.19%21%40211b80e117391842098213682ed237%2110000000029017724%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007550430618.4000010690717&gatewayAdapt=glo2nld



€3.17

Elk €2.77, ≥ 10 stuks

Prijs is inclusief btw Extra 3% korting

€0.99 off over €23.85

HLK-PM01 HLK-PM03 HLK-PM12 AC-DC 220V naar 5 V/3.3 V/12 V mini voeding module, intelligente huishoudelijke schakelaar voeding module

★★★★★ 5.0 2 Recensies | 11 verkocht

Kleur: HLK-PM03



1 x fuse holder with fuse

https://nl.aliexpress.com/item/4000648795427.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%202%2C34%21%E2%82%AC%202%2C34%21%21%212.35%212.35%21%40211b80e117391840608967475ed237%2112000035593556380%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007586169297.4000648795427&gatewayAdapt=glo2nld



€2.46 / partij

Elk €1.40, ≥ 10 stuks

10stukken | Prijs is inclusief btw Extra 2% korting

€0.99 off over €19.88

>

10 Stuks BLX-A 5*20Mm Zwart Glas Zekering Houder 5*20 Verzekering Buis Fuseholder Voor 5X20Mm 5X20Mm 5X20 Zekering Printplaat

★★★★★ 4.9 82 Recensies | 900+ verkocht

Temperatuur: 1A

0.2A	0.25A	0.5A	1A	1.25A	1.5A	1.6A	2A
2.5A	3A	3.15A	4A	5A	6A	7A	8A
10A	15A	20A	25A	30A	No Fuse		

LED's

https://nl.aliexpress.com/item/1005003320296052.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%203%2C48%21%E2%82%AC%203%2C48%21%21%213.50%213.50%21%40211b80e117391836852806373ed237%2112000025195180423%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_2007601408665.1005003320296052&gatewayAdapt=glo2nld

€3.48

Elk €2.56, ≥ 10 stuks

Prijs is inclusief btw

100 stuks 3mm LED Diode Ultra Helder Warm Wit Rood Groen Blauw UV Paars Geel Oranje Roze 2 V 3 V Veelkleurig Emitting Assortiment

★★★★★ 4.9 222 Recensies | 1.000+ verkocht

Kleur: 100pcs Green



Meer prijsinformatie ⓘ

Resistors (depending on number of inputs and outputs)

https://nl.aliexpress.com/item/1005003342360099.html?pdp_npi=4%40dis%21EUR%21%E2%82%AC%202%2C27%21%E2%82%AC%202%2C27%21%21%2116.71%2116.71%21%40211b80e117391837652238084ed237%2112000_025311533853%21sh%21BE%21924161374%21X&spm=a2g0o.store_pc_allItems_or_groupList.new_all_items_200758700997_1.1005003342360099&gatewayAdapt=glo2nld



€2.35 / partij

Elk €1.30, ≥ 10 stuks
100stukken | Prijs is inclusief btw Extra 1% korting

100 stks 1/8 W 1% Metaalfilmweerstand 0.125 W 1R-4.7 M 10R 22R 47R 100R 220R 470R 680R 1 K 3.3 K 4.7 K 10 K 22 K 47 K 220 K 680 K 1 M ohm

★★★★★ 4.7 339 Recensies | 500+ verkocht

Weerstand: 4.7K

1R	1.2R	1.5R	1.8R	2R	2.2R	2.4R	2.7R
3R	3.3R	3.6R	3.9R	4.3R	4.7R	5.1R	5.6R
6.2R	6.8R	7.5R	8.2R	9.1R	10R	12R	15R
18R	20R	22R	24R	27R	30R	33R	36R

1 x capacitor 2200uF / 16V

3.3V power supply

1 x resistor 1K

Backlight TFT

1 x schakelaar

https://nl.aliexpress.com/item/1005002470127465.html?spm=a2g0o.productlist.main.5.36b80rSi0rSiMt&algo_pvid=1018b843-9e58-4360-9bf5-48682d8a6ecb&algo_exp_id=1018b843-9e58-4360-9bf5-48682d8a6ecb-2&pdp_ext_f=%7B%22order%22%3A%221254%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%211.56%210.98%21%21%211.57%210.99%21%40211b876717392161390216040ea283%211200020770603814%21sea%21BE%210%21ABX&curPageLogUid=MAmS7ToImaEZ&utparam-url=scene%3Asearch%7Cquery_from%3A

ON-OFF

€0.98 / partij €1.89 48% korting

2stukken | Prijs is inclusief btw

2 Stuks 6Mm Schakelaars Miniatur Tuimelschakelaar Enkelpolige Dubbele Worp Mini Waterdichte Cap Micro Elektronische Gadgets Aan-Uit-Op 6a

★★★★★ 4.8 267 Recensies | 1.000+ verkocht

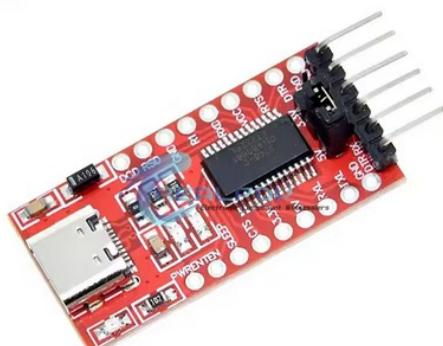
Kleur: ON-OFF 2pin



Meer prijsinformatie ⓘ

1 x FTDI INSTELLEN OP 3.3 V

https://nl.aliexpress.com/item/1005006445462581.html?spm=a2g0o.productlist.main.1.23bb270eNeShoT&algo_pvid=7d16b5fb-5c56-42a1-b1ad-d55cd02014f&algo_exp_id=7d16b5fb-5c56-42a1-b1ad-d55cd02014f-0&pdp_ext_f=%7B%22order%22%3A%223621%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%212.00%212.00%21%21%2114.68%2114.68%21%402103956b17391844391625279ecd59%211200037194056997%21sea%21BE%21924161374%21X&curPageLogUid=KZWRiDkoOkdD&utparam-url=scene%3Asearch%7Cquery_from%3A



€2.02

Elk €1.58, ≥ 10 stuks

Prijs is inclusief btw

FT232RL FT232 FTDI USB 3,3 V 5,5 V naar TTL seriële adaptermodule voor Arduino FT232 Pro minipoort USB NAAR TTL 232 Mini / Type-C USB

★★★★★ 4.8 340 Recensies | 3.000+ verkocht

Kleur: Type-C USB



Meer prijsinformatie ⓘ

1 x ST link

https://nl.aliexpress.com/item/1005005273159580.html?spm=a2g0o.productlist.main.3.5e44599bstE04R&algo_pvid=b82bd88e-6271-45d0-8932-17657c055b53&algo_exp_id=b82bd88e-6271-45d0-8932-17657c055b53-1&pdp_ext_f=%7B%22order%22%3A%221642%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%212.99%212.99%21%21%213.01%213.01%21%402103956b17391845385348306ecd59%211200032440955298%21sea%21BE%21924161374%21X&curPageLogUid=oAPZI20FNiVm&utparam-url=scene%3Asearch%7Cquery_from%3A



€2.99

Elk €2.48, ≥ 10 stuks

Prijs is inclusief btw Extra 2% korting

ST-Link V2 stlink mini STM8 STM32 ST LINK Simulator Downloadprogrammering met deksel

★★★★★ 4.9 212 Recensies | 1.000+ verkocht

Meer prijsinformatie ⓘ

Some useful addresses

Software STMicroelectronics

Integrated Development Environment for STM32

<https://www.st.com/en/development-tools/stm32cubeide.html>

STM32CubeProgrammer software for all STM32

<https://www.st.com/en/development-tools/stm32cubeprog.html>

Voor het laden van een .bin file in de STM32

PlatformIO

<https://dronebotworkshop.com/platformio/>

This project on Github

<https://github.com/thieu-b55/STM32-mini-PLC>

Connections

TFT 4.0" SPI touch

VCC 3.3 V Power Supply
GND GND Power Supply
LED -----R 1K----- 3.3V

TFT CS PB12
TFT RESET PB10
TFT DC PB11
TFT SDI(MOSI) PB15
TFT SCK PB13
TFT SDO(MISO) PB14

T_CLK PB3
T_CS PA4
T_DIN(MOSI) PB5
T_DO(MISO) PB4
T_IRQ PA5

Componenten zijde sluit J1 (bypass spanningsregelaar)

Keyboard

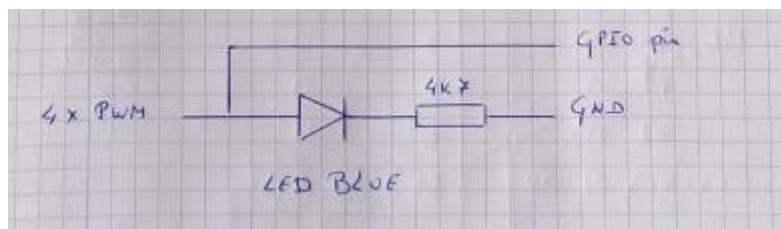
Top View Connector									
Column				Row					
1	2	3	4	1	2	3	4	5	
PE4	PE5	PE6	PE7	PC12	PC11	PC10	PC9	PC8	

Switch

+ 3.3V ---- N.O. ---- PA7 (0 program / 1 run)

PWM outputs

PWM0 PA8
PWM1 PA15
PWM2 PA6
PWM3 PB6



Connect LEDs according to drawing

FTDI

GND	GND
RX	PA9
TX	PA10

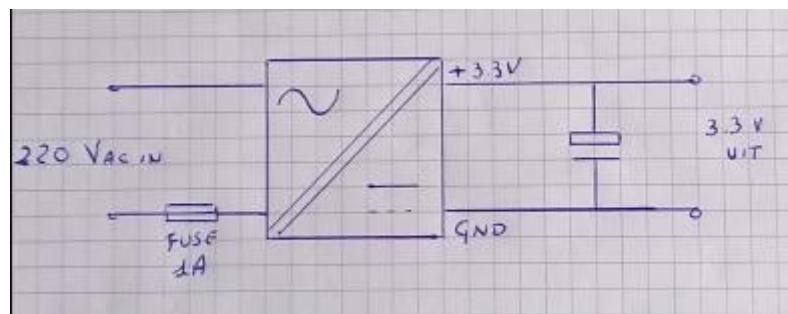
INSTELLEN OP 3.3 V**ST link**

GND	GND
SWDIO	PA13
SWCLK	PA14

Power Supply

3.3V 3 x 3.3V STM32F407VGT6 discovery board
VCC TFT

GND 5 x GND STM32F407VGT6 discovery board
GND TFT

**STM32F407VGT6 Discovery board****PA0****PA1****PA2****PA3**

PA4 TFT_TOUCH_CS

PA5 TFT_TOUCH_INT

PA6 PWM_2 UIT

PA7 0/1 PROG/RUN

PA8 PWM_0 UIT

PA9 RX FTDI

PA10 TX FTDI

PA11**PA12**

PA13 ST link SWDIO

PA14 ST link SW CLK

PA15 PWM_1 UIT

PB0 INPUT_M0

PB1 INPUT_M1

PB2

PB3 TFT_TOUCH_SCLK

PB4 TFT_TOUCH_MISO

PB5 TFT_TOUCH莫斯I

PB6 PWM_3 UIT

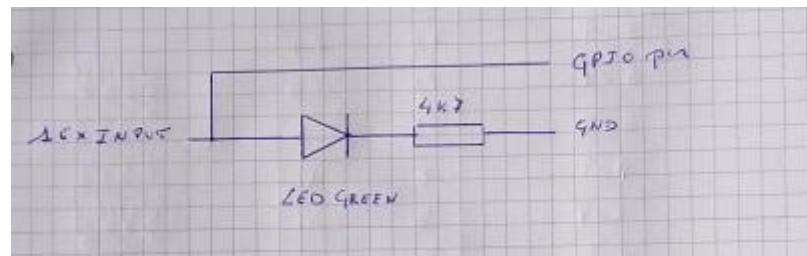
PB7 OUTPUT_M0

PB8	INPUT_M3
PB9	INPUT_M2
PB10	TFT_RST
PB11	TFT_DC
PB12	TFT_CS
PB13	TFT_SCLK
PB14	TFT_MISO
PB15	TFT_MOSI
PC0	IN_0
PC1	IN_1
PC2	IN_2
PC3	IN_3
PC4	IN_4
PC5	IN_5
PC6	IN_6
PC7	IN_7
PC8	KEYBOARD_R_0 (IN)
PC9	KEYBOARD_R_1 (IN)
PC10	KEYBOARD_R_2 (IN)
PC11	KEYBOARD_R_3 (IN)
PC12	KEYBOARD_R_4 (IN)
PC13	OUTPUT_M1
PC14	
PC15	
PD0	UIT_0
PD1	UIT_1
PD2	UIT_2
PD3	UIT_3
PD4	UIT_4
PD5	UIT_5
PD6	UIT_6
PD7	UIT_7
PD8	UIT_8
PD9	UIT_9
PD10	UIT_10
PD11	UIT_11
PD12	UIT_12
PD13	UIT_13
PD14	UIT_14
PD15	UIT_15
PE0	ONBOARD LED
	plc cyclus start
PE1	OUTPUT_M2
PE2	OUTPUT_M3
PE3	
PE4	KEYBOARD_C_0 (UIT)
PE5	KEYBOARD_C_1 (UIT)
PE6	KEYBOARD_C_2 (UIT)
PE7	KEYBOARD_C_3 (UIT)
PE8	IN_8
PE9	IN_9
PE10	IN_10
PE11	IN_11

PE12	IN_12
PE13	IN_13
PE14	IN_14
PE15	IN_15
BOOT0	GND
3.3V	3.3V Power Supply
3.3V	3.3V Power Supply
3.3V	3.3V Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply
GND	GND Power Supply

16 inputs

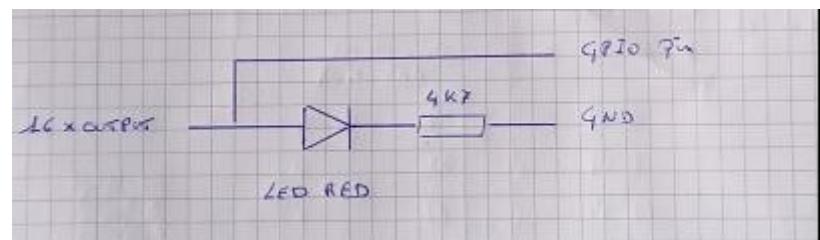
IN0	PC0
IN1	PC1
IN2	PC2
IN3	PC3
IN4	PC4
IN5	PC5
IN6	PC6
IN7	PC7
IN8	PE8
IN9	PE9
IN10	PE10
IN11	PE11
IN12	PE12
IN13	PE13
IN14	PE14
IN15	PE15



Connect LEDs to each input as per drawing.

16 outputs

OUT0	PD0
OUT1	PD1
OUT2	PD2
OUT3	PD3
OUT4	PD4
OUT5	PD5
OUT6	PD6
OUT7	PD7
OUT8	PD8
OUT9	PD9
OUT10	PD10
OUT11	PD11
OUT12	PD12
OUT13	PD13
OUT14	PD14
OUT15	PD15



Connect LEDs to each output as per drawing

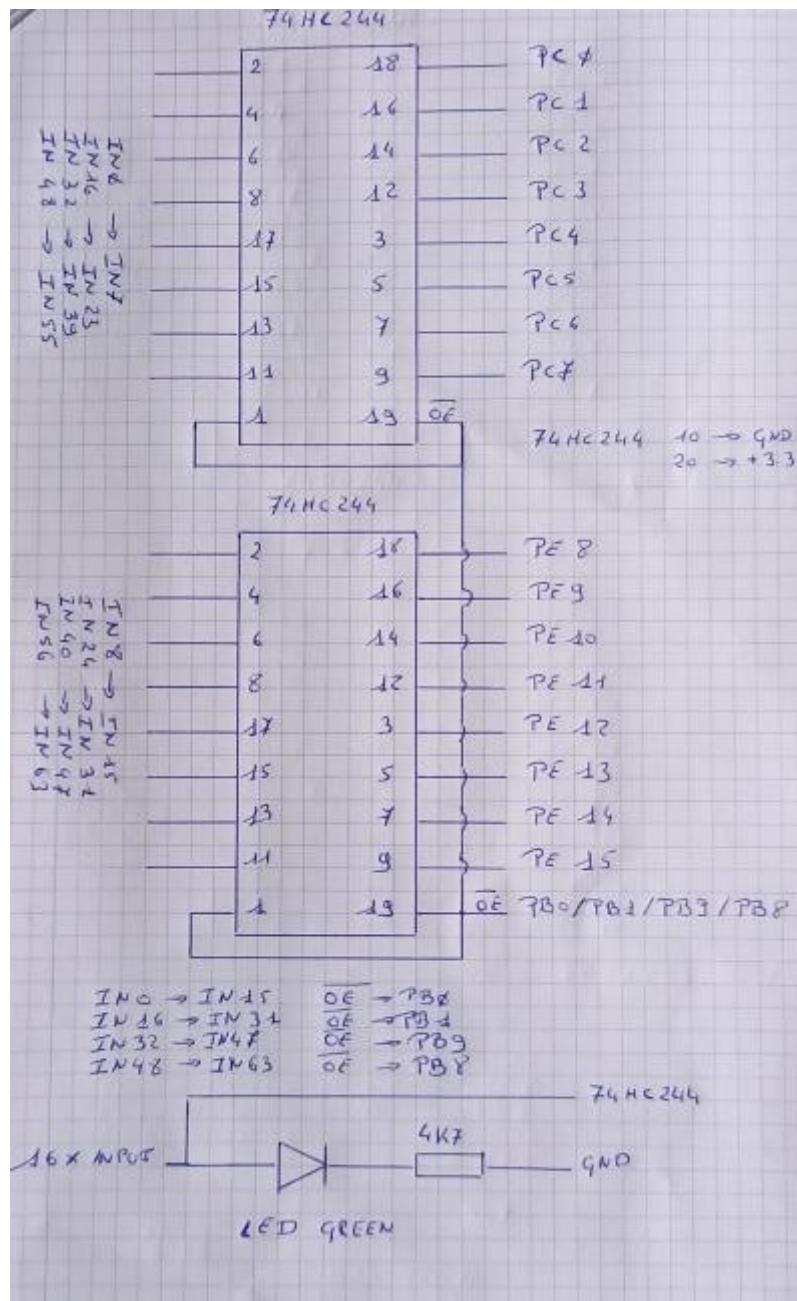
NUMBER OF INPUTS AND/OR OUTPUTS > 16

When using more than 16 inputs or outputs, the GPIO pins can no longer be used directly as inputs or outputs.

For the inputs, these are read in via 2 x 74HC244 per 16 inputs.

For the outputs, these are controlled via 2 x 74HC273 per 16 outputs.

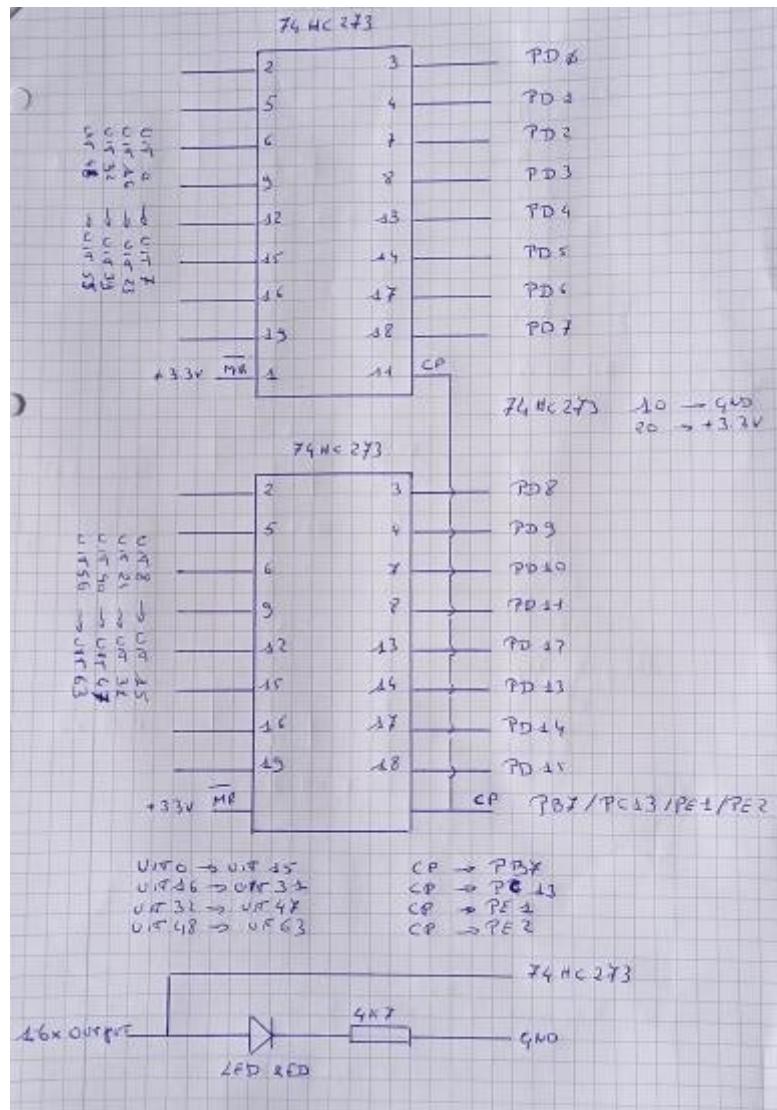
INPUTS > 16



inputs	0 → 15	/OE	>>	PB0
inputs	16 → 31	/OE	>>	PB1
inputs	32 → 47	/OE	>>	PB9
inputs	48 → 63	/OE	>>	PB8

Connect LED to each input as shown in drawing

OUTPUTS > 16

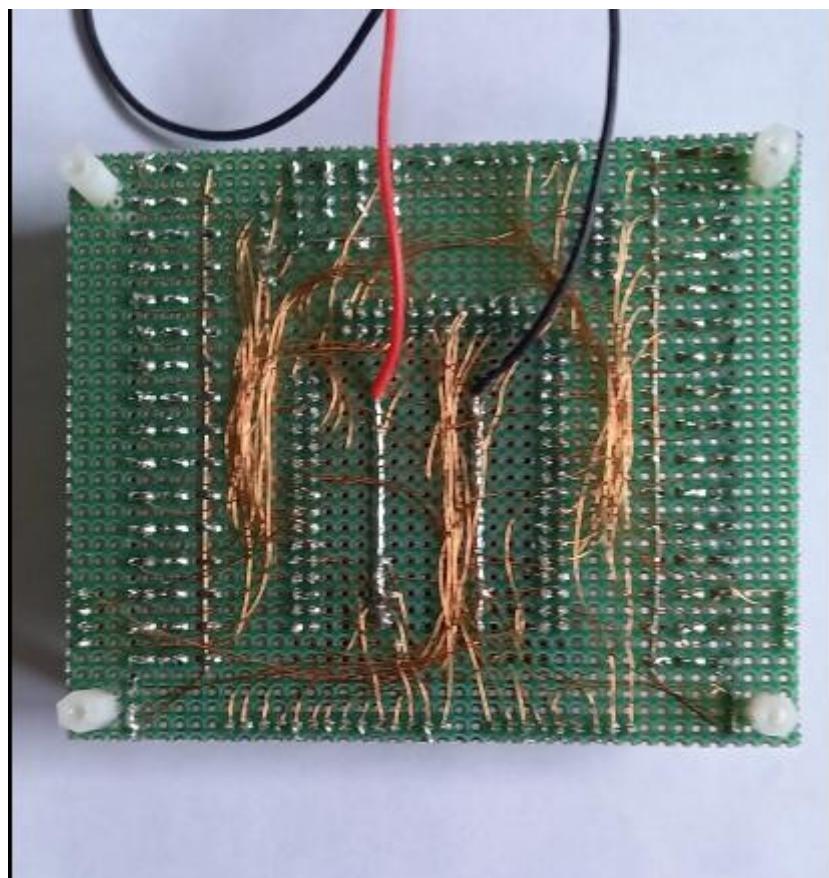
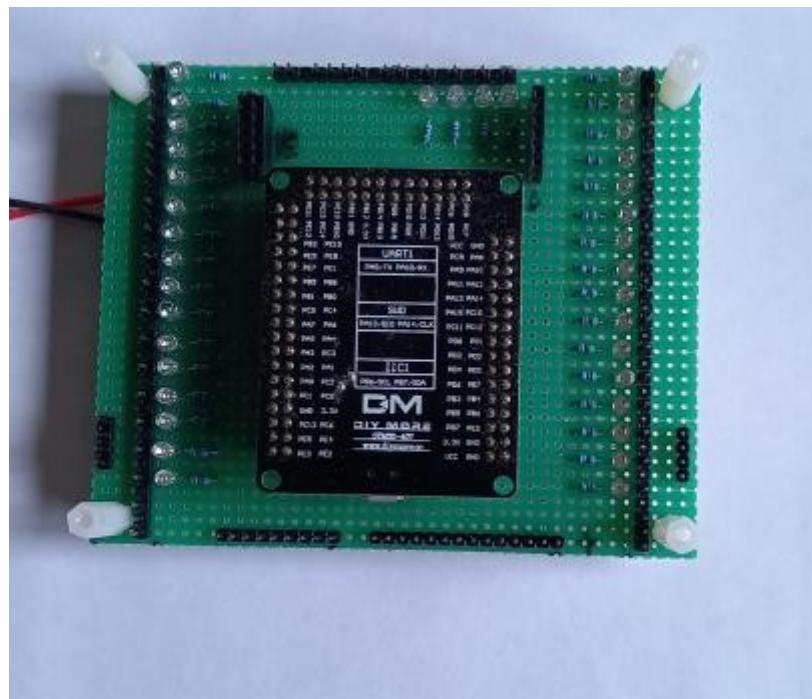


outputs	0 → 15	CP	>>	PB7
outputs	16 → 31	CP	>>	PC13
outputs	32 → 47	CP	>>	PE1
outputs	48 → 63	CP	>>	PE2

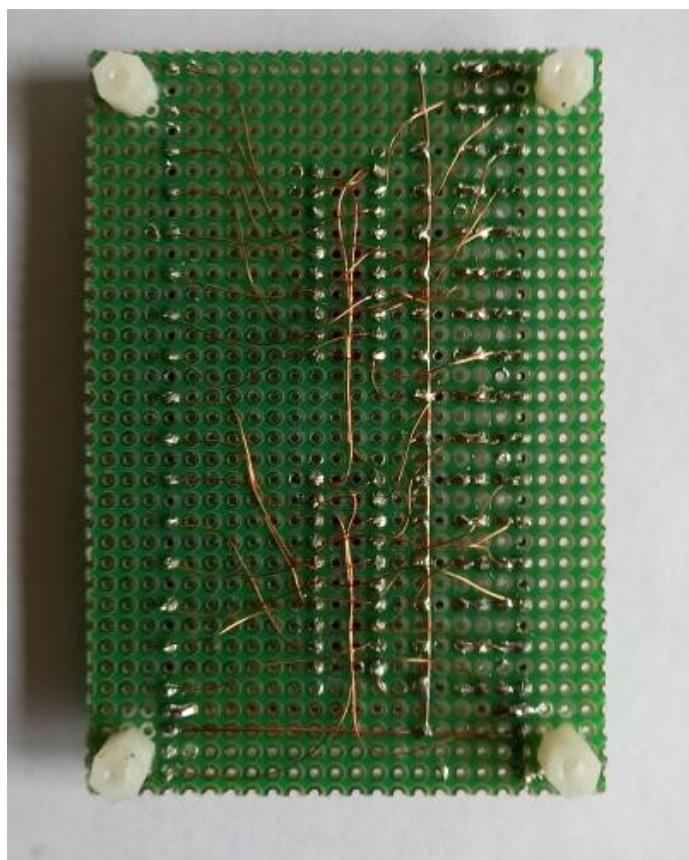
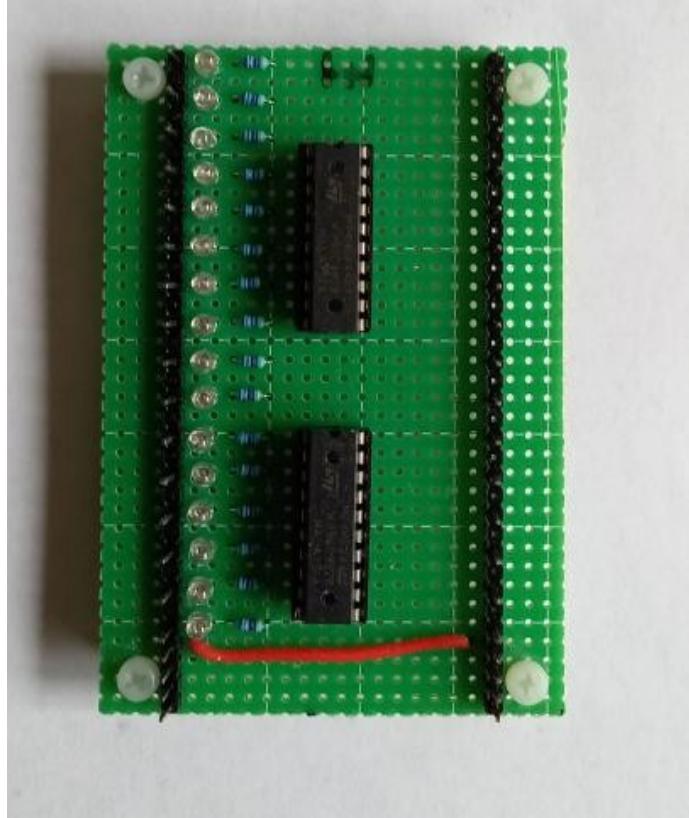
Connect LED to each output as shown in drawing

Result after a few hours of soldering fun

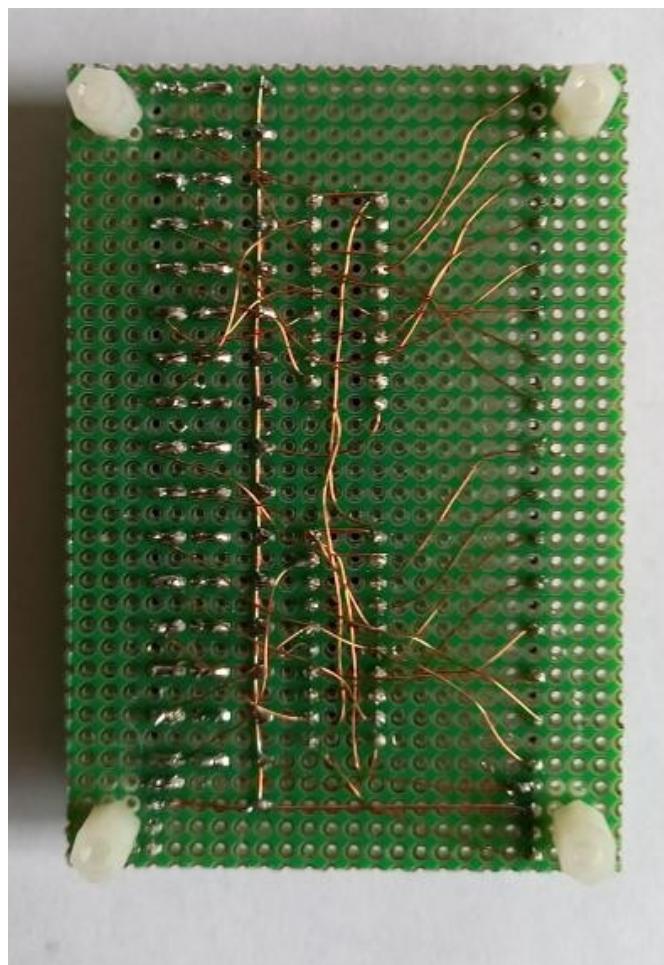
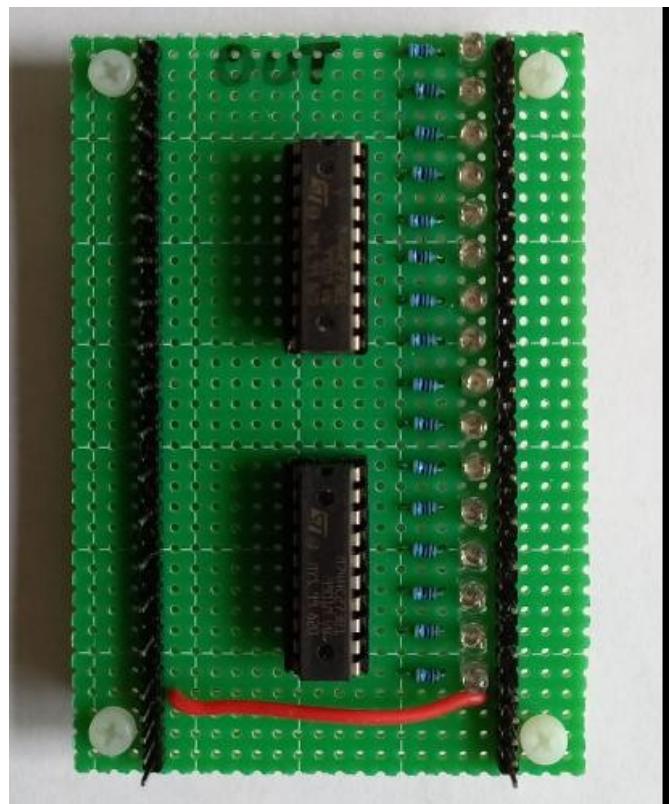
STM32F407 bord



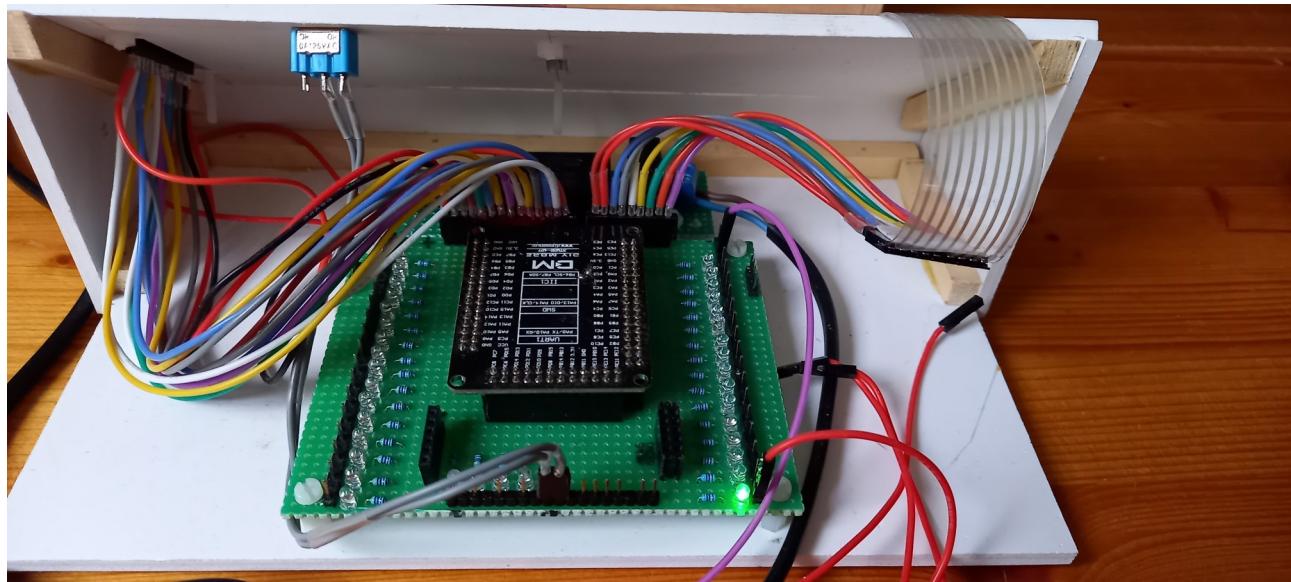
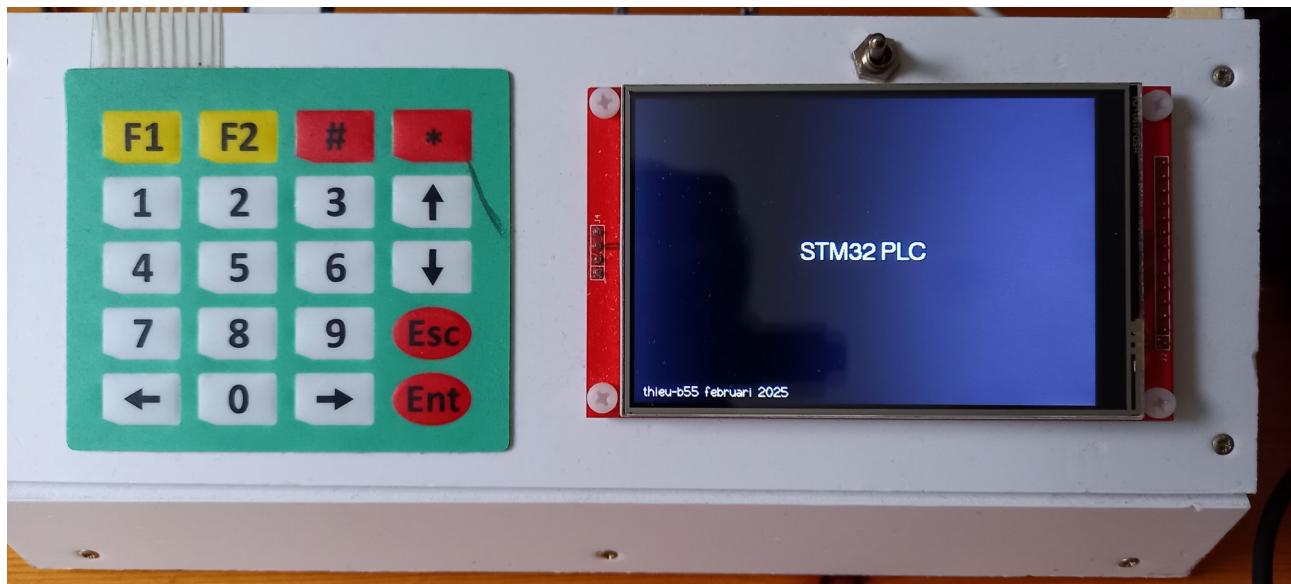
Input module



Output module



In housing

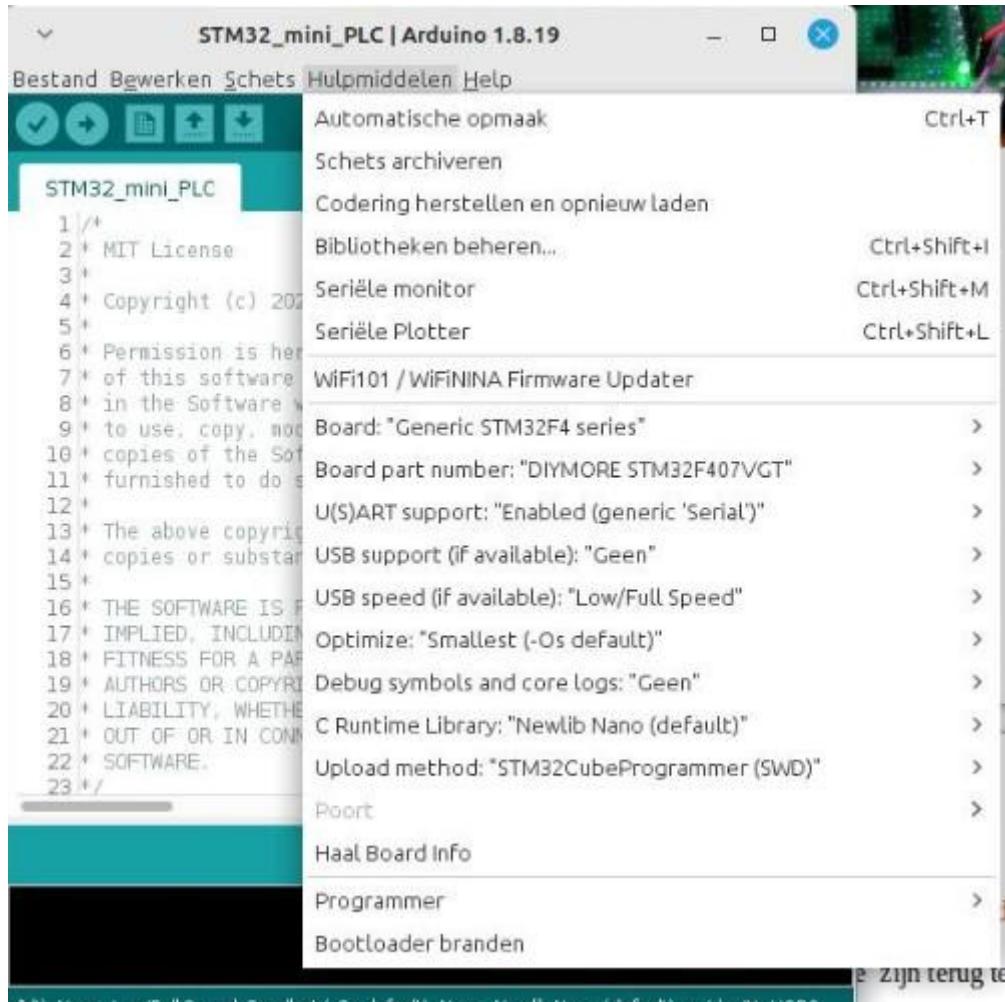


The libraries used, the .ino file and the .bin file can be found on Github:

<https://github.com/thieu-b55/STM32-mini-PLC>

Don't forget to connect BOOT0 of the STM32 to GND, these are 2 adjacent pins on the header.

Load the program STM32_Plc.ino into the STM32F407 using the Arduino IDE
use these settings



This program was written using Platformio and can therefore be loaded into the STM32F407 that way.

The firmware.bin file can be loaded into the STM32F407 using the STM32CubeProgrammer. If everything went well, the STM32 mini PLC is ready for use.

When using Arduino IDE 1.8.19, uploading the program to the STM32F409VGT6 is not possible.

For more explanation

<https://forum.arduino.cc/t/ide1-8-19-st-link-stm32f103cbt6-cant-upload/1308454>

On Linux Mint you will find the **STM32Plc.ino.bin** file in the folder tmp/arduino_build_xxxxxx
You can upload this file to the STM32 using the STM32CubeProgrammer.

On other operating systems look for the file **STM32_Plc.ino.bin**

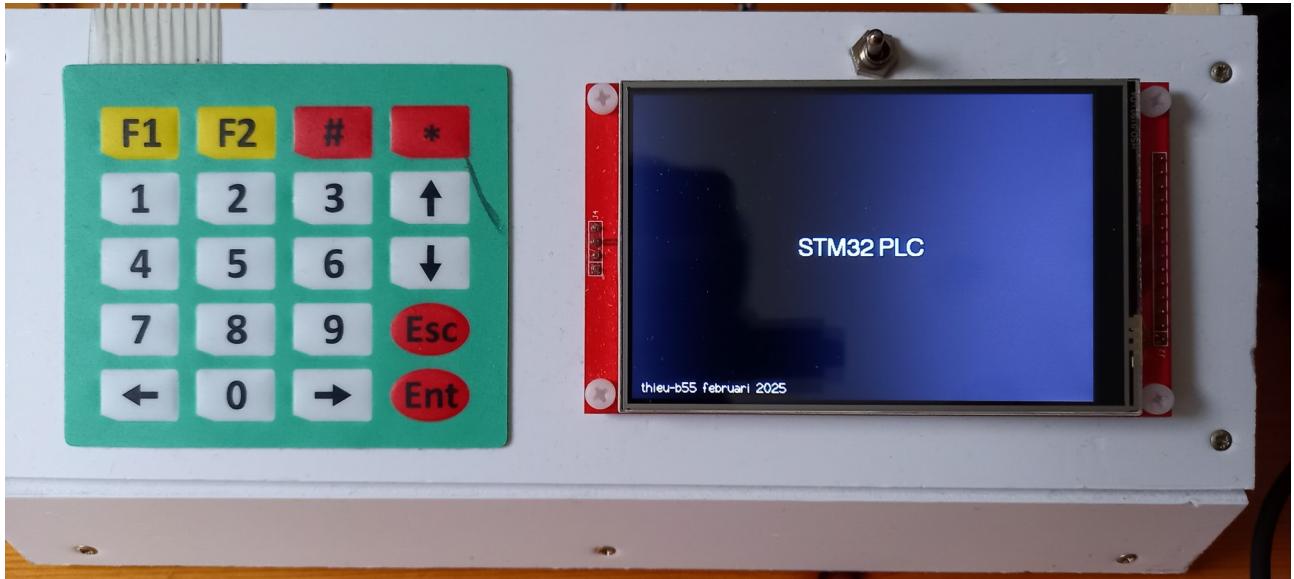
Touch calibrate



Press in the indicated corners

Startup screen

The switch above the TFT screen is the programming / run switch



Selection menu

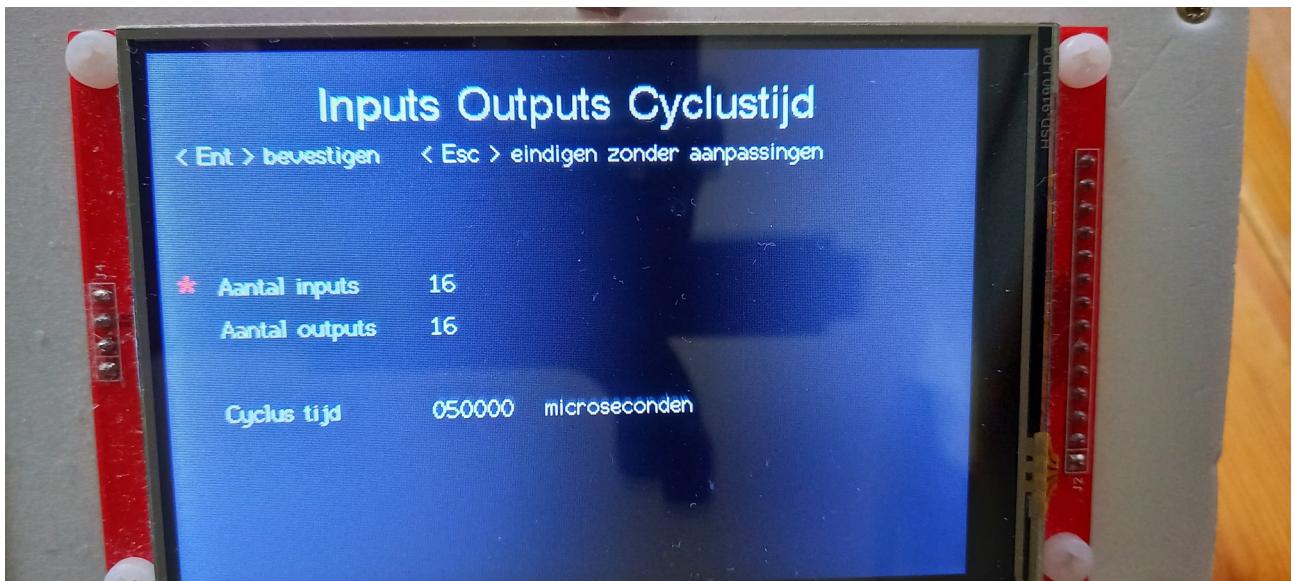


Choose between the different options

Touchscreen works best with supplied pen

It is best to first set the number of inputs and outputs.

Inputs Outputs Cyclustijd



Use the <UP> and <DOWN> arrows on your keyboard to select what you want to adjust.

Only 16, 32, 48, and 64 are correct choices.

For the cycle time, any time ≥ 10000 microseconds and ≤ 100000 microseconds is possible.

To make the Timer seconds run in line with real seconds, choose

10000 microseconden

20000 microseconden

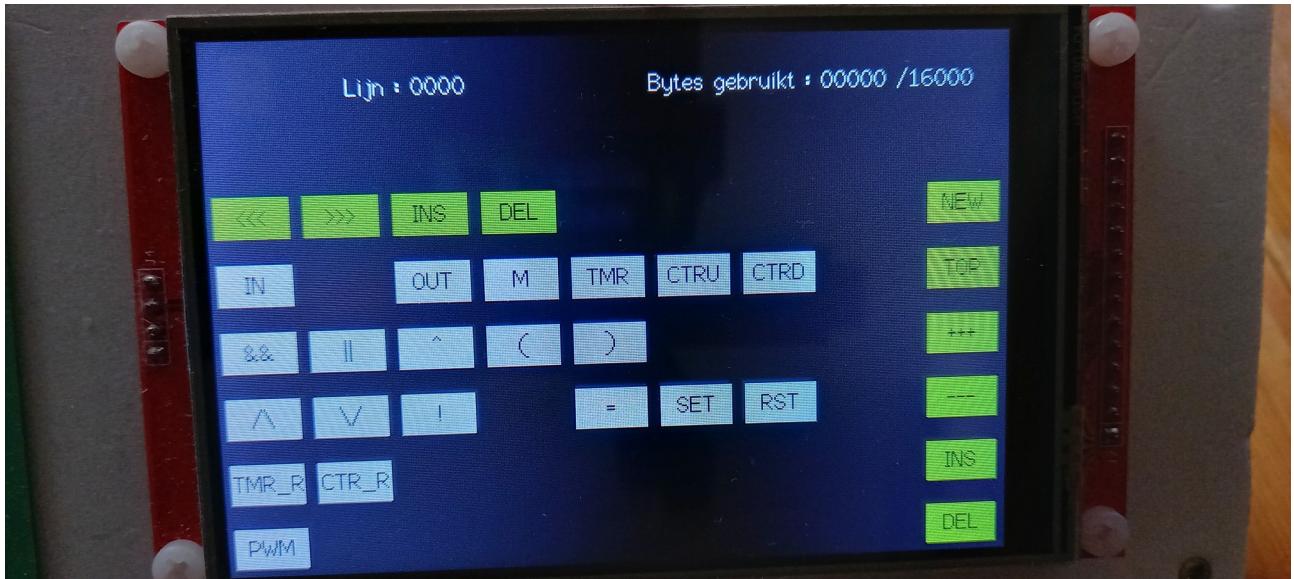
25000 microseconden

50000 microseconden

100000 microseconden

After setting press <OK> on the keyboard <ESC> to exit without adjustment

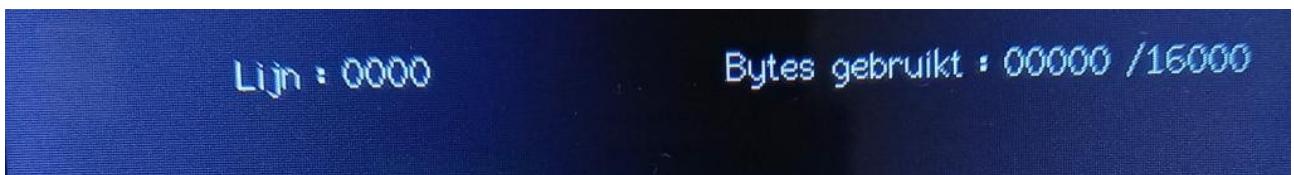
Programming



Exit programming with <Esc> on the keyboard

The programming screen consists of several parts

Info



Line number of the current line

Number of bytes used out of 16000 available

In-line edit



<<< and >>> move the cursor left or right

<INS>

use <<< or >>> to go to the instruction you want to insert something for
press <INS>

text INS appears before the current instruction
go to INS with <<< or >>> and press the desired instruction

go to the instruction you want to delete with <<< or >>>

press to delete

Line edit



<NEW>

Save the line you just entered.

Any errors will be shown in red, but checking it yourself is not a bad idea.

If everything is OK, the editor will jump to the next empty line after saving <NEW> after in-line edit

1 x <NEW> saves and checks the line

2x <NEW> jumps to the next empty line.

<NEW> can also be used to go to the end of the program

<TOP>

ga naar het begin van het programma

<++>

next line

<-->

previous line

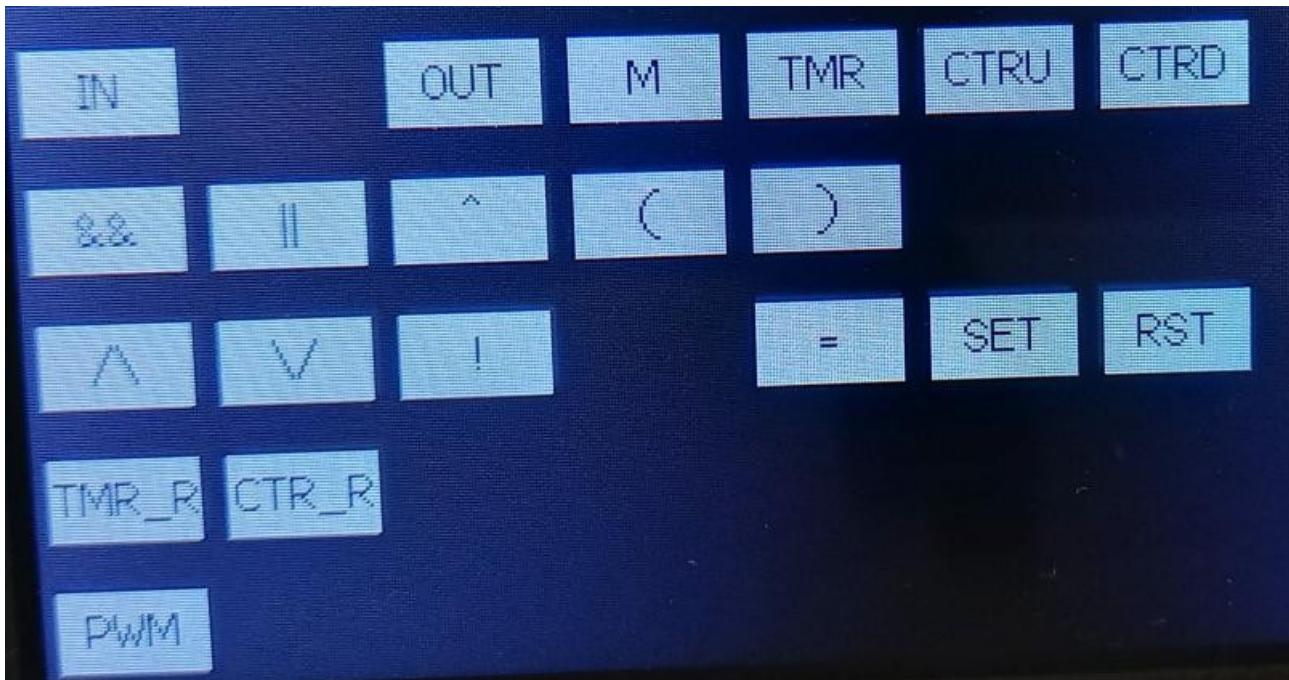
<INS>

insert empty line

PLEASE NOTE ANY EMPTY LINE IN THE PROGRAM IS CONSIDERED THE END OF THE PROGRAM

delete lijn

Programming



Programming

Build a program line here by choosing the instructions.

Instructie	Meaning	number
IN	INPUT	0 up to number of inputs set
OUT	OUTPUT	0 up to number of set outputs
M	MERKER	0 → 63
TMR	TIMER	0 → 63
CTRU	CTR UP	0 → 63
CTRD	CTR DOWN	0 → 63
TMR_R	TIMER RESET	0 → 63
CTR_R	COUNTER RESET	0 → 63
PWM	PWM OUTPUT	0 → 3 0 → 100%

When entering, 99 appears behind the instruction
such as IN99 replace the 99 with a correct number

&&	AND
	OR
^	XOR
(
)	
^	RISING EDGE
\	FALLING EDGE
!	NOT
=	EQUALS
SET	SET
RST	RESET

TMR56 to TMR63 are continuous timers and deliver a square wave at input = 1 with an on and off time determined by the timer settings

Some program examples

IN0 = TMR56

TMR56 = OUT1

IN0 && ! TMR56 = OUT2

! OUT0 = OUT0 OUT0 changes status every cycle

OUT1 && ! M0 = CTRU0

^ CTRU0 SET M0

M0 && OUT1 = CTRD0

^ CTRD0 RST M0

M0 = OUT4

! M0 = OUT3

((IN4 || IN5) && IN6) || IN7 = OUT15

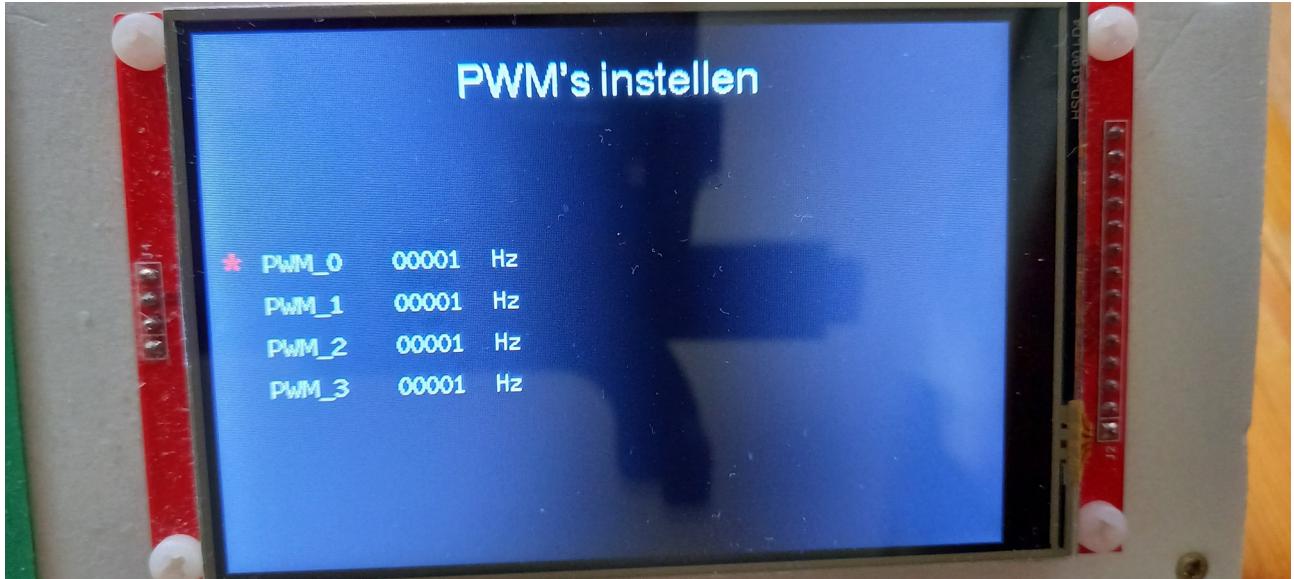
IN0 = PWM0 50

Explanation of PWM0 50

At input IN0 = 1, PWM0 50% is output

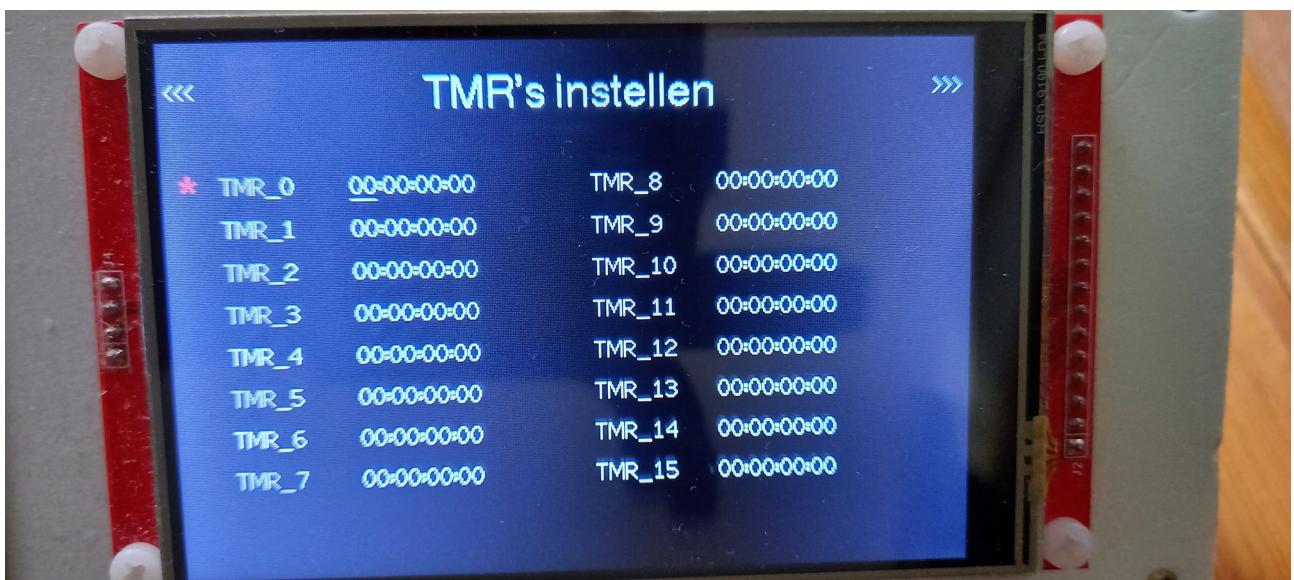
Frequency PWM is done in the PWM setting section, see further in the manual

PWM's instellen



Set the desired PWM frequency here. Between 1 and 99999 Hz

TMR's set up



16 timers per page

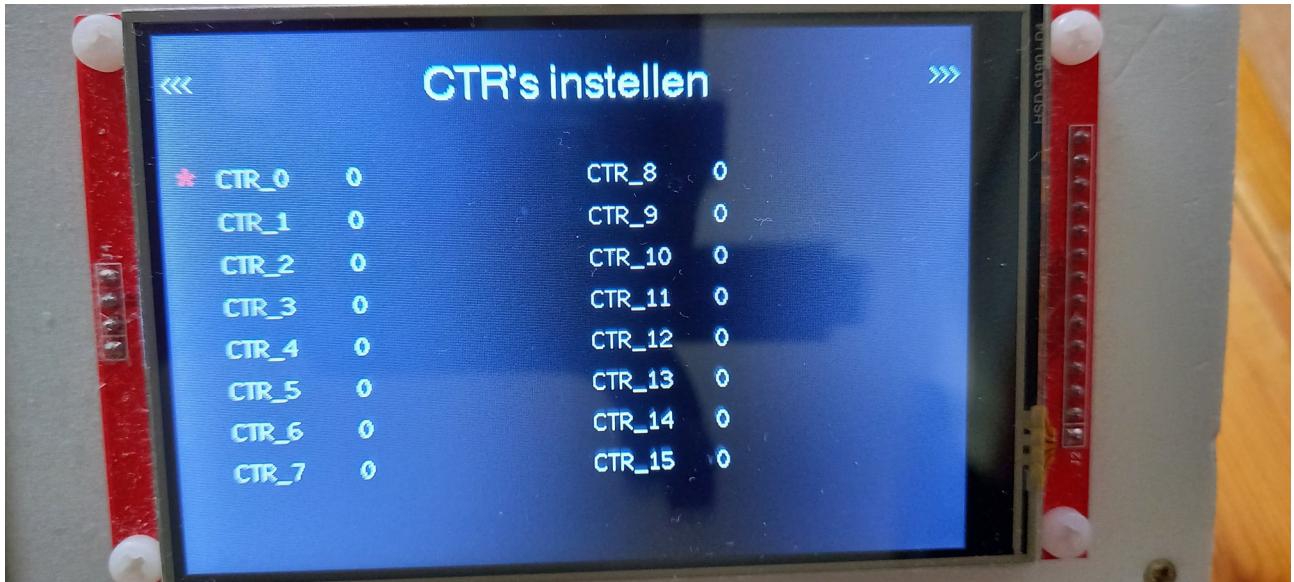
go to the previous or next page with <<< and >>>

go to the previous or next timer with the <UP> and <DOWN> arrow on the keyboard

go to what you want to set on the timer with the <LEFT> and <RIGHT> arrow:

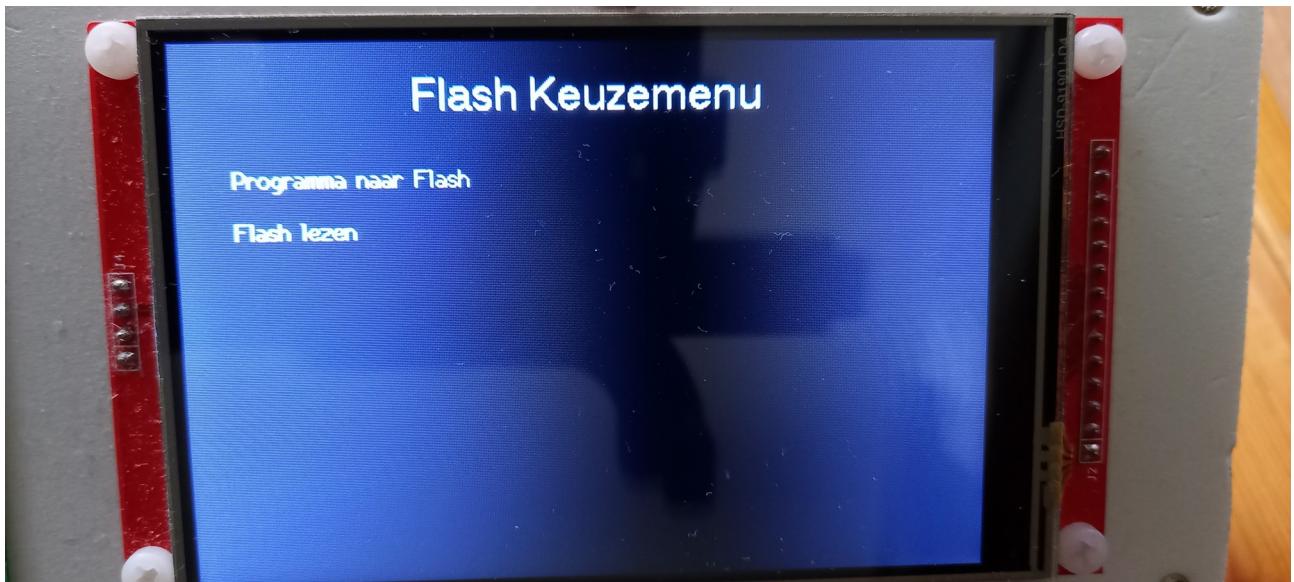
hours minutes seconds 10ths of seconds
Set between 00:00:00:10 and 99:59:59:90

confirm with <ENT>
Ctr's set up



16 counters per page
go to the previous or next page with <<< and >>>
go to the previous or next counter with the <UP> and <DOWN> arrows on the keyboard
Set between 0 and 9999

FLASH



Program to Flash
saves the current program in Flash

Read Flash

Clears any current program in RAM and reads the program from Flash to RAM

Print program



Sends the program to a terminal via the FTDI

Example of a program print

Programma gebruikt: 102 bytes van de 16000 beschikbare bytes

```
000 IN0 = TMR56
001 TMR56 = OUT1
002 IN0 && ! TMR56 = OUT2
003 ! OUT0 = OUT0
004 OUT1 && ! M0 = CTRU0
005 ^ CTRU0 SET M0
006 M0 && OUT1 = CTRD0
007 ^ CTRD0 RST M0
008 M0 = OUT4
009 ! M0 = OUT3
010 ( ( IN4 || IN5 ) && IN6 ) || IN7 = OUT15
011 IN0 = PWM0 50
```

Aantal inputs: 16
Aantal outputs: 16

Cyclustijd: 10000 microseconden

```
PWM0 11111 Hz
PWM1 22222 Hz
PWM2 33333 Hz
PWM3 44444 Hz
```

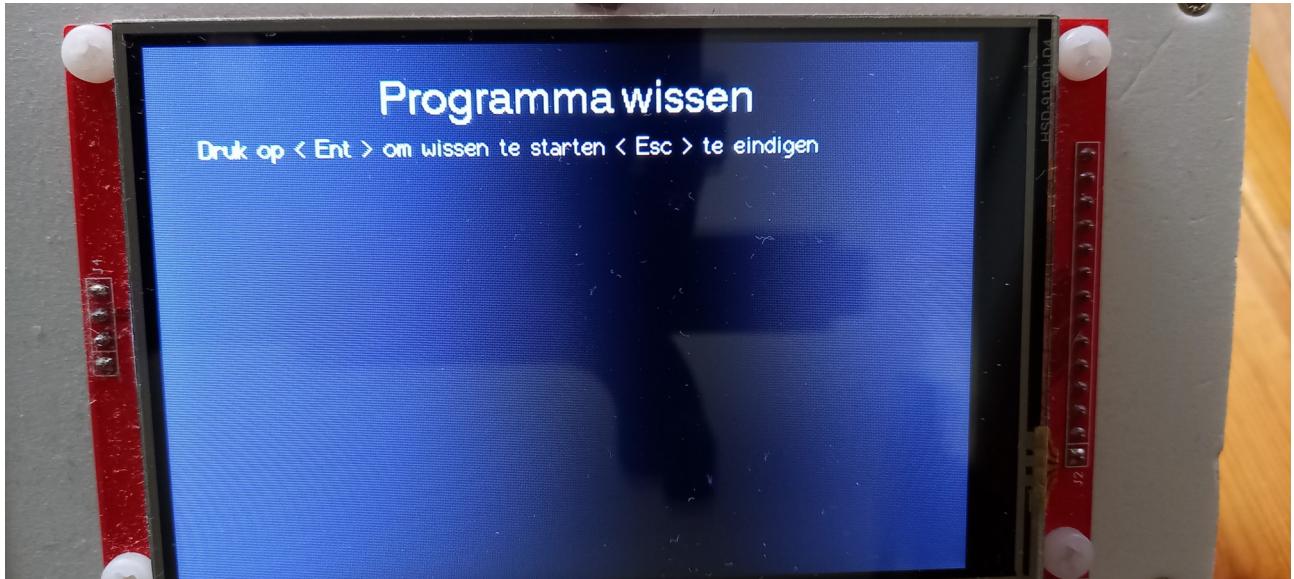
```
TMR0 00:00:00:20
TMR1 99:00:00:00
TMR2 00:00:00:00
TMR3 00:00:00:00
TMR4 00:00:00:00
TMR5 00:00:00:00
```

TMR6 00:00:00:00
TMR7 00:00:00:00
TMR8 00:00:00:00
TMR9 00:00:00:00
TMR10 00:00:00:00
TMR11 00:00:00:00
TMR12 00:00:00:00
TMR13 00:00:00:00
TMR14 00:00:00:00
TMR15 00:00:00:00
TMR16 00:00:00:00
TMR17 00:00:00:00
TMR18 00:00:00:00
TMR19 00:00:00:00
TMR20 00:00:00:00
TMR21 00:00:00:00
TMR22 00:00:00:00
TMR23 00:00:00:00
TMR24 00:00:00:00
TMR25 00:00:00:00
TMR26 00:00:00:00
TMR27 00:00:00:00
TMR28 00:00:00:00
TMR29 00:00:00:00
TMR30 00:00:00:00
TMR31 00:00:00:00
TMR32 00:00:00:00
TMR33 00:00:00:00
TMR34 00:00:00:00
TMR35 00:00:00:00
TMR36 00:00:00:00
TMR37 00:00:00:00
TMR38 00:00:00:00
TMR39 00:00:00:00
TMR40 00:00:00:00
TMR41 00:00:00:00
TMR42 00:00:00:00
TMR43 00:00:00:00
TMR44 00:00:00:00
TMR45 00:00:00:00
TMR46 00:00:00:00
TMR47 00:00:00:00
TMR48 99:00:00:00
TMR49 00:00:00:00
TMR50 00:00:00:00
TMR51 00:00:00:00
TMR52 00:00:00:00
TMR53 00:00:00:00
TMR54 00:00:00:00
TMR55 00:00:00:00
TMR56 00:00:00:20
TMR57 00:00:00:00
TMR58 00:00:00:00
TMR59 00:00:00:00
TMR60 00:00:00:00
TMR61 00:00:00:00
TMR62 00:00:00:00
TMR63 00:00:00:00

CTR0 10
CTR1 0
CTR2 0
CTR3 0
CTR4 0
CTR5 0
CTR6 0
CTR7 0
CTR8 0
CTR9 0
CTR10 0
CTR11 0
CTR12 0
CTR13 0
CTR14 0
CTR15 0
CTR16 0
CTR17 0
CTR18 0
CTR19 0
CTR20 0
CTR21 0
CTR22 0
CTR23 0
CTR24 0
CTR25 0
CTR26 0
CTR27 0

```
CTR28 0
CTR29 0
CTR30 0
CTR31 0
CTR32 0
CTR33 0
CTR34 0
CTR35 0
CTR36 0
CTR37 0
CTR38 0
CTR39 0
CTR40 0
CTR41 0
CTR42 0
CTR43 0
CTR44 0
CTR45 0
CTR46 0
CTR47 0
CTR48 1234
CTR49 0
CTR50 0
CTR51 0
CTR52 0
CTR53 0
CTR54 0
CTR55 0
CTR56 0
CTR57 0
CTR58 0
CTR59 0
CTR60 0
CTR61 0
CTR62 0
CTR63 0
```

Delete program

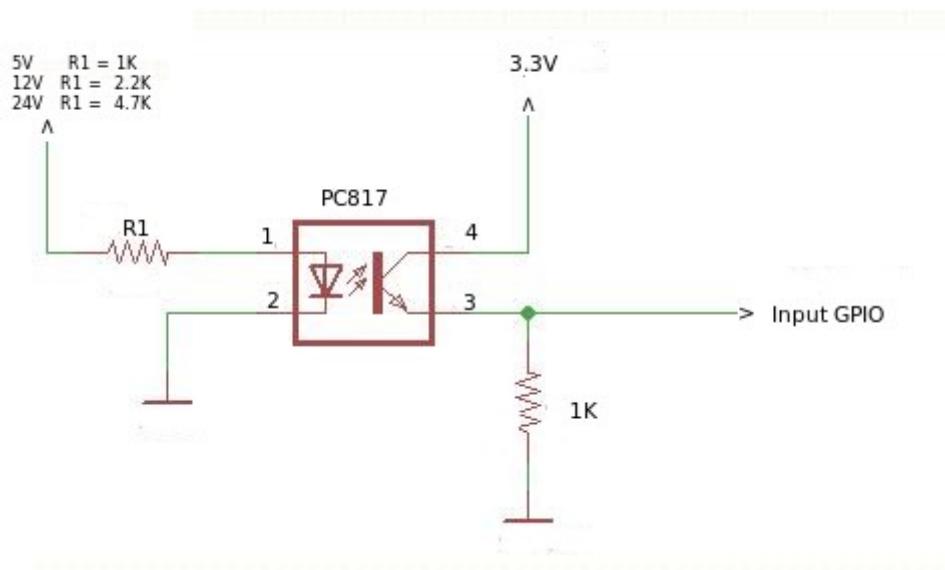


does what the title says.

Program, PWM settings, Timer settings and Counter settings are erased

That was about it, just to mention that all inputs are 3.3V. Higher voltages can and will seriously damage the STM32F407VGT6.

Input higher than 3.3 V



Output higher than 3.3V

IRF520 module

https://nl.aliexpress.com/item/1005006157177189.html?spm=a2g0o.productlist.main.1.1900O7dKO7dKOg&algo_pvid=c5e6c073-2384-417f-9968-9cb927321b1a&algo_exp_id=c5e6c073-2384-417f-9968-9cb927321b1a-0&pdp_ext_f=%7B%22order%22%3A%22531%22%2C%22eval%22%3A%221%22%7D&pdp_npi=4%40dis%21EUR%213.61%211.63%21%213.65%211.65%21%40211b816617393907047688993ec539%211200036028414526%21sea%21BE%210%21ABX&curPageLogUid=GH7MeJvjNbDq&utparam-url=scene%3Asearch%7Cquery_from%3A#nav-specification

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