Electric Manual

Thor

ORIGINAL INSTRUCTION

Code:		Year:	2020	Rev.:	01

www.alfadispenser.com

3. ELECTRIC REPAIRING OPERATIONS

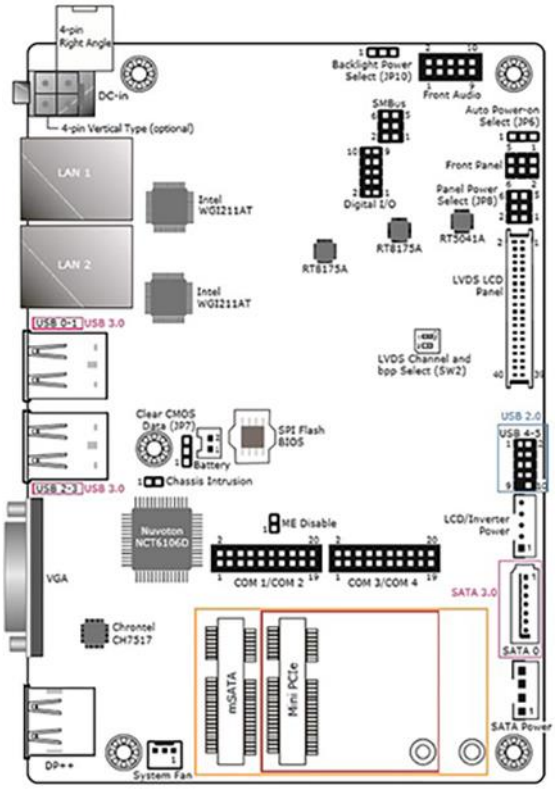
3.1. DIAGNOSIS AND ELECTRONIC PART DESCRIPTION

3.1.1. PC LINUX BOARD

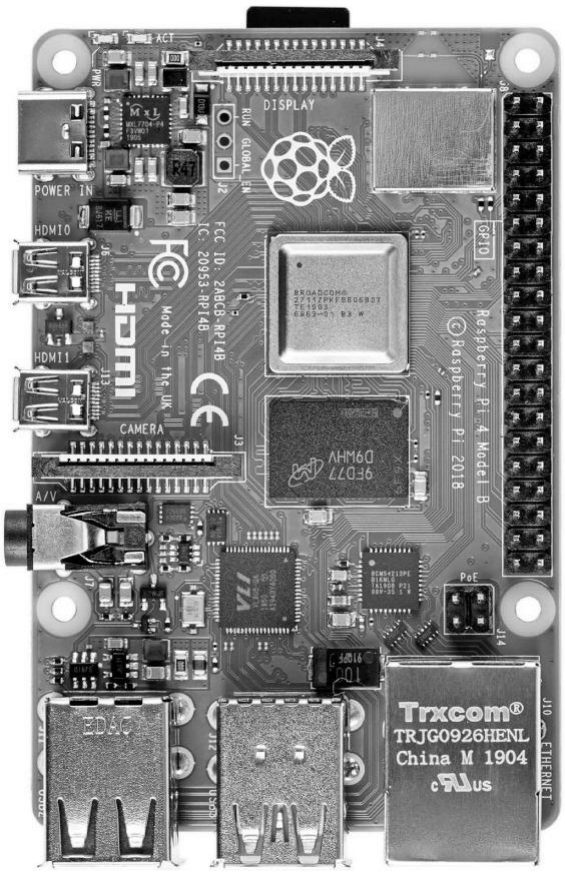
The machine is provided with a PC board (Linux or Raspberry Pi) on which the high-level machine software is memorised.

The Linux PC board receives the Ethernet connection from the outside (LAN1 port) and is internally connected to the Main board (refer to next paragraph) via RS-232. The Linux board has RS-232 and USB ports necessary to connect some accessories like the scale.

The Linux PC board is powered with 12V.



The Raspberry Pi board, present as an alternative to the Linux board, features the same functions.



3.1.2. MMT BOARD

MMT is the Main board on which machine management firmware is saved. The orders sent by the high-level software are managed at MMT level. This board organises the machine cycle by interrogating and sending orders via RS-485 to the slave boards of the single circuits.

MMT board receives the external 48Vdc and 24Vdc power supplies, while it internally generates the 5Vdc and 3.3Vdc voltages.

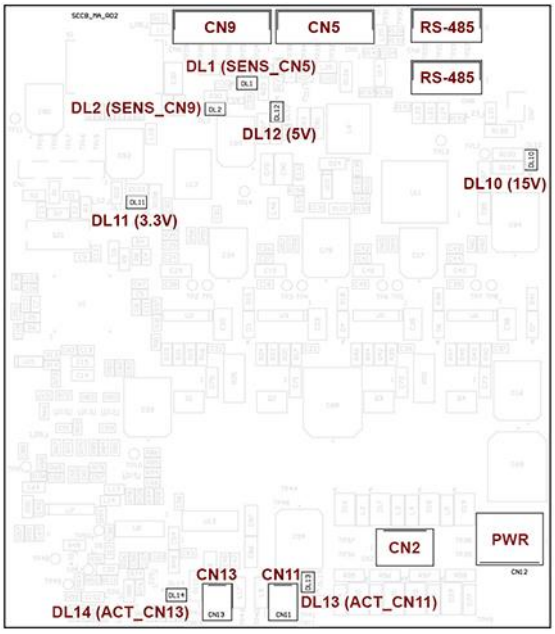
DL1 = +5V
DL2 = +3.3V
DL9 = +48V

MMT also directly controls many actuators and sensors, as summarised in the table below:

CN5 is used for firmware programming via USB with bootloader (refer to chapter 4 – PROGRAMMING THE ELECTRONIC BOARDS)

3.1.3. SCCB BOARD

Each circuit, not directly piloted by the Main board, is managed by a dedicated SCCB board addressed according to the machine configuration set in the software.



Each board is powered with 24 V (two separate lines for logics and power) and 48V, controls the digital sensor inputs and integrates the control drivers of two DC 24V peripheral units (DC motor stirring and/or electrovalves) and of one stepper motor.

The board generates the necessary on-board service voltage. To facilitate the diagnosis, each power supply features a status LED (on = power connected):
DL11 = 3.3V
DL12 = 5V
DL10 = 15V

In case one or more power supply LEDs is OFF, check the fuse relevant status (see para. 3.2).
Likewise, the CN13 and CN11 outputs have a status LED that indicates when they are powered.

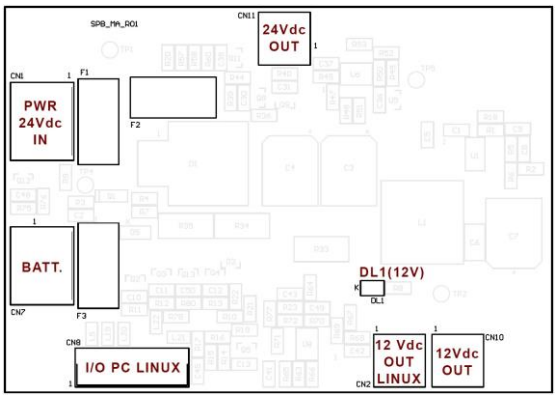
Following is a list of the controls of each SCCB board.

The CN1 connector, now no longer in use, was dedicated to firmware programming and updating through PICkit (refer to chapter 4 – PROGRAMMING THE ELECTRONIC BOARDS).

CIRCUIT	CN2	CN5	CN6	CN8	CN9	CN11	CN12	CN13
SLAVE PUMP3..4	STEPPER	HOME PHOT.	RS485	RS485		E.VALVE	PWR	STIR MOT
SLAVE PUMP5	STEPPER	HOME PHOT.		RS485		E.VALVE	PWR	STIR MOT
DOUBLE GROUP	STEPPER	HOME PHOT.	RS485	RS485		E.VALVE M	PWR	E.VALVE S

3.1.4. SPB BOARD

The SPB board is powered at 24Vdc and produces 12Vdc on board. These power supplies are also used to power the Linux board and any accessories. It is only used in combination with Linux board, not with Raspberry Pi.



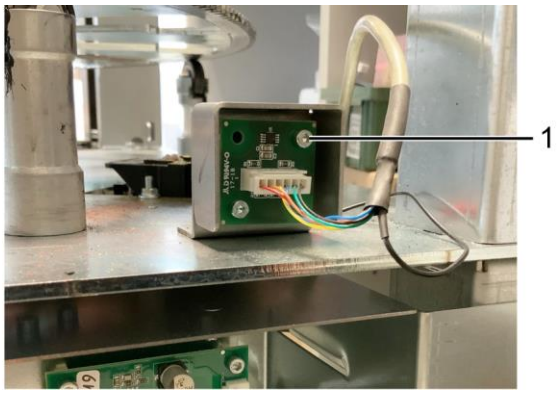
In case of machine shut-off or power failure (voltage interruptions or dips), the SPB board has the function to keep the Linux board powered at 12V for the time necessary for the controlled shutdown of the operating system.

A 16.8V - 1800mAh NI-MH battery is used to store the 12V power: it features a safety PTC inside and is connected to the board at CN7.
The board features two inner fuses:
- F2=0.5A on recharge branch (protection against a charging current higher than the maximum allowed by the battery);
- F3=2.5A on the battery (protection in case of excess power absorption).

The DL1 LED indicates the presence of 12V voltage.

3.1.5. HUTTS BOARD

The HUT_TS board (1) is the board supporting the temperature sensor TC72 used to monitor the temperature of the products (colorants and bases).
The board is located inside the cabinet, fixed on the back of the colorant support base.
The signal is acquired by the MMT board.



3.2. CHECKING AND REPLACING THE NETWORK FUSES

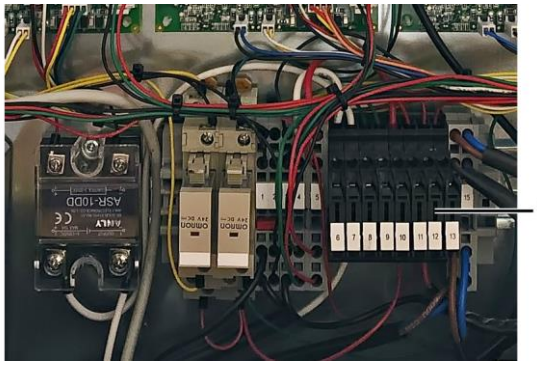
In case of mains malfunction or problems, the safety fuses could blow and cut power.
Fuses are located in the fuse holder built in the plug with switch on the back panel.
To replace the interrupted fuse open fuse holder using a flat screwdriver to prise it open.
Remove the fuse and its holder and install a new fuse.

	USE ONLY FUSES OF THE SAME TYPE AND THE NOMINAL RATING SHOWN IN THE PRODUCT LABEL. **Fuse requirements:** **EU - IEC 60127 Approval** **US - UL248-1 and UL248-14 Approval**

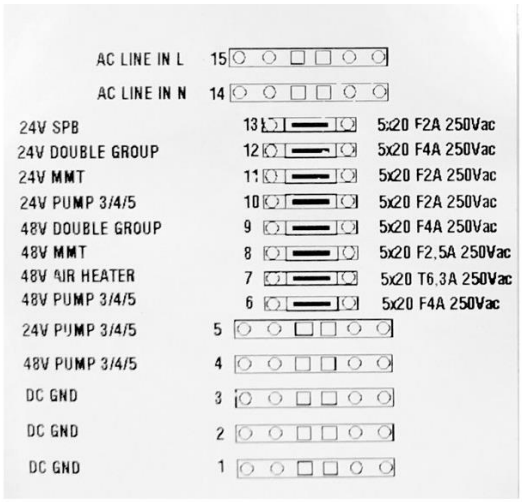
3.3. REPLACING THE SECONDARY CIRCUIT FUSES (INTERNAL TERMINAL BOARDS)

In case of malfunction or faults, the safety fuses could interrupt the output power supply of the terminal boards.
The fuses are located on the terminal boards located inside the rear electric compartment (see chapter 2 - ACCESS TO THE ELECTRIC PARTS).

- In order to replace the fuses, proceed as follows:
- Remove the rear panel as described in chapter 2 - EXTERNAL COVER REMOVAL to reach the fuse carrier terminal boards (1).



- Find the circuit of the interrupted power supply line and take a fuse with a correct rating according to the diagram to the side.
- Lift the fuse holder until it is possible to manually remove the damaged fuse.
- Insert the new fuse in the fuse holder.
- Close the fuse holder by slightly pressing on it.
- Reposition and fix the machine rear panel using the previously removed screws.

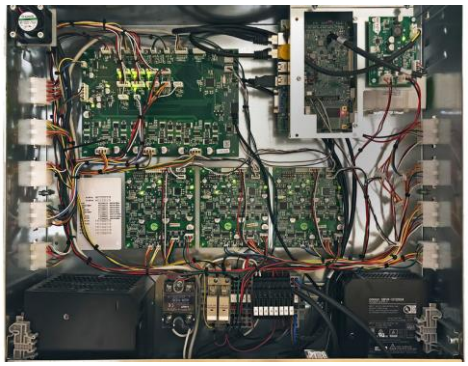


WARNING: use only fuse of the same type and with the same nominal rating specified by the manufacturer.

3.4. REPLACING THE POWER SUPPLY UNITS

In case of an electric fault in one or more power supply units of the machine, proceed as follows to replace them:

- To reach the power supply unit compartment, remove the rear panel as described in chapter 2 - EXTERNAL COVER REMOVAL.
- Disconnect the wiring between the power supply unit to be replaced and the rest of the machine.
- Remove the power supply unit by fitting a small flat screwdriver in the suitable retaining tab and remove the unit from the DIN bar.



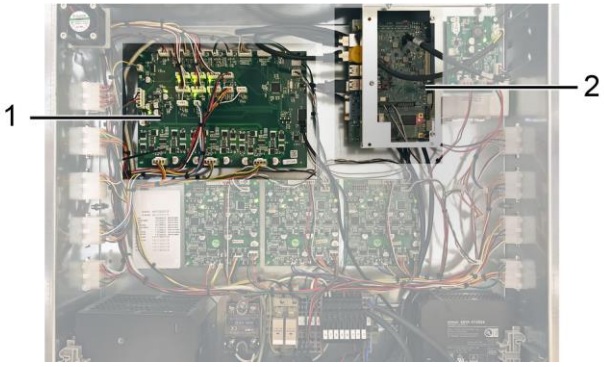
- Fit the new power supply unit manually on the DIN bar.
- Reconnect the power supply unit to the wiring according to the attached wiring diagram.
- Reposition the previously removed protection panel.

WARNING: use only genuine spare parts supplied by the manufacturer.

3.5. REPLACING THE PC AND MAIN BOARDS

To replace the PC (Linux or Raspberry) or Main (MAB or MMT) boards, proceed as follows:

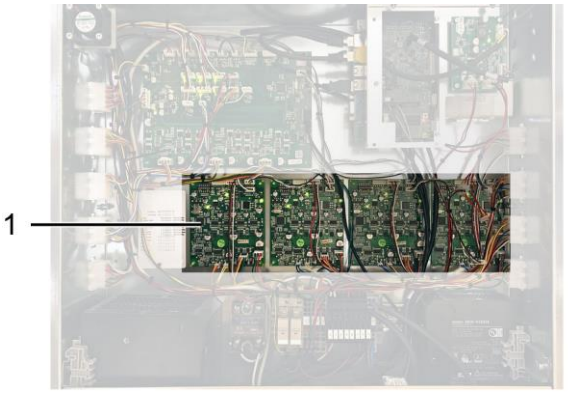
- Remove the rear panel as described in chapter 2 - EXTERNAL COVER REMOVAL.
- Disconnect the power supply and signal cables from the board to be replaced.
- Remove the Main (1) or PC (2) board from the supports at the corners (pressure-fit plastic supports for the Main board and M3 retaining screws for the PC board).
- Insert a new board on the supports having care not to damage its components.
- **WARNING**: Use an already programmed board or the suitable programmer to install the correct software/firmware. To reprogramme the boards refer to chapter 4.
- Restore the electric connections.



3.6. REPLACING THE SEMI-FINISHED PRODUCT SCCB BOARD

The SCCB boards of the semi-finished product circuits (1), when present, are also located inside the electrical box. To replace them, proceed as follows:

- Remove the rear panel as described in chapter 2 - EXTERNAL COVER REMOVAL.
- Disconnect the power supply and signal cables from the board to be replaced.
- Remove the board by releasing it from the plastic supports on its corners.



- Insert a new board on the supports having care not to damage its components.
- WARNING: Use a board already programmed with the function of the replaced board. To reprogramme the boards refer to chapter 4.
- Restore the previously disconnected connections according to the wiring diagram.

3.7. REPLACING THE HUTTS BOARD

The board is located inside the cabinet, fixed on the back of the colorant support base.

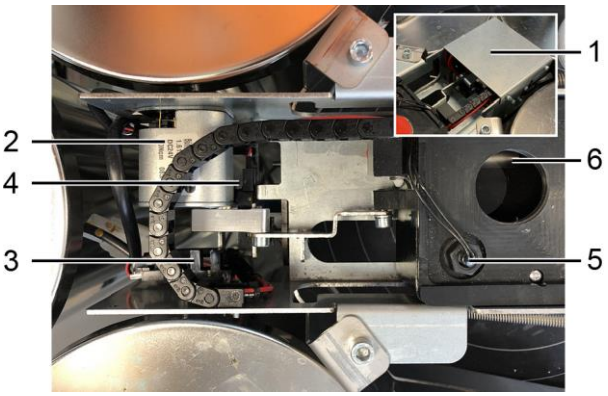
To change the board, remove the top rear panel as described in Chap. 2 - REMOVING THE EXTERNAL COVERS, then:

- Disconnect board connector.
- Loosen the two M3 screws that secure the board to the support, then proceed with the replacement by restoring the connections.

3.8. REPLACING THE AUTOCAP PARTS

By removing the metal sheet protection on the autocap (1), held in place by 3 M3 screws at the sides, it is possible to access group driving parts, such as motor and photocells.

For targeted interventions on motor (2), open group photocell (3), closed group photocell (4), level sensor (5) and heater (6) contact the assistance service.



3.9. LTE ROUTER SETTINGS

When a hard-wired ethernet network is not available, it is still possible to obtain a remote connection to the machine via an LTE Router.

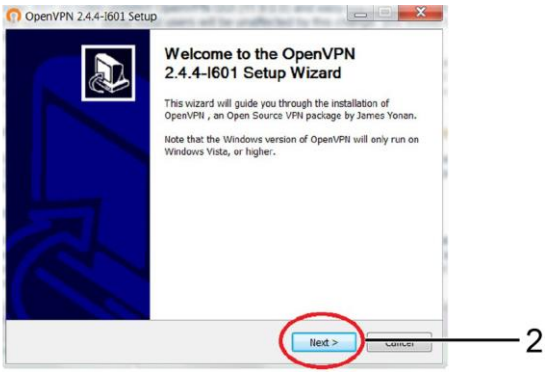
A VPN client - duly installed and set up - is necessary to connect to the machine.

3.9.1. CONNECTION VIA VPN CLIENT ON WINDOWS 7 AND 10

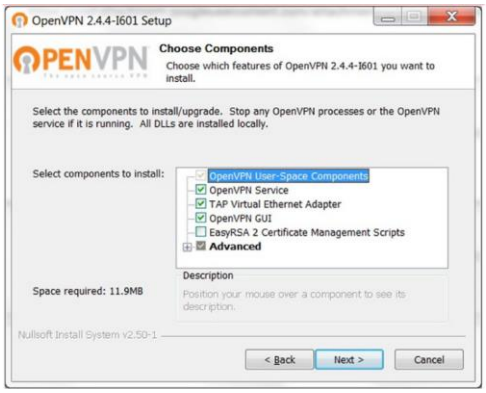
To install the VPN Client, proceed as described below:

- Open an internet browser at https://openvpn.net/index.php/open-source/downloads.html
- Click “openvpn-install-2.4.4-I601.exe” (1) and download the file.

- Open the downloaded file, then press “Next” (2) on the following screen page.

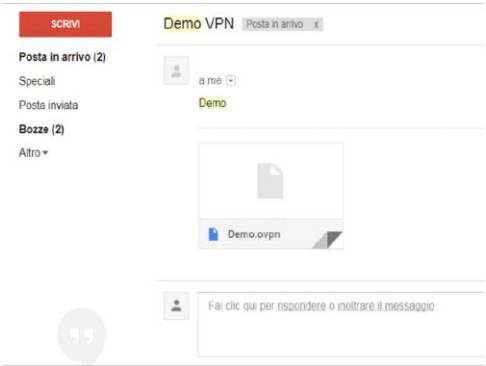


- Check the boxes indicated in the figure on the side, then press “Next”.

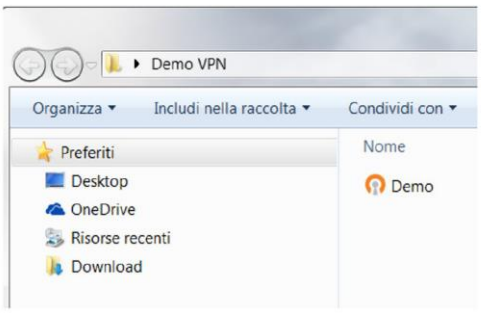


To connect to the machine via the VPN Client, proceed as described below:

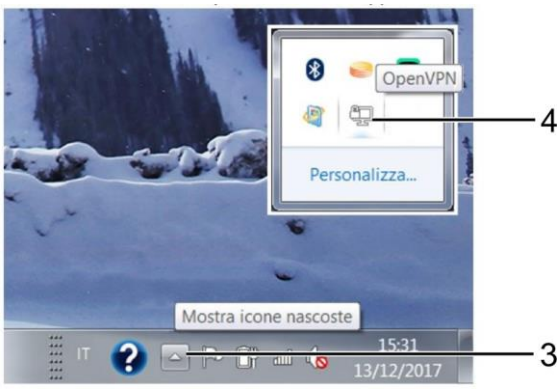
- Download the file containing the login credentials sent by Alfa via email.



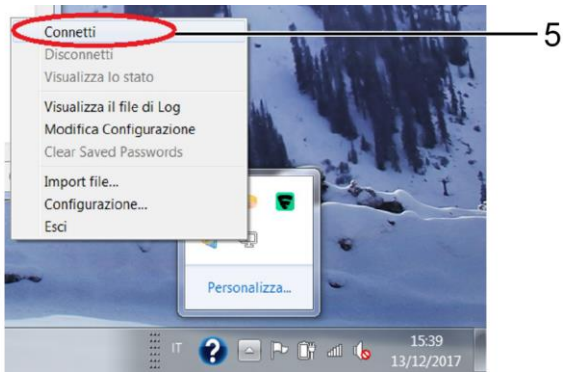
- Save the file containing the credentials in C:/programs/OpenVPN/Config
- Make sure you save it as an ".opvn" file.



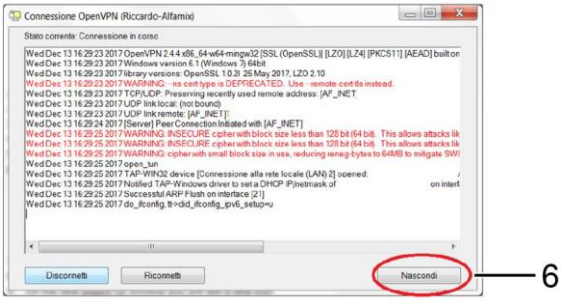
- On Windows Toolbar, click the arrow icon "show hidden icons" (3) then find the icon "OpenVPN" (4) in the pop-up.



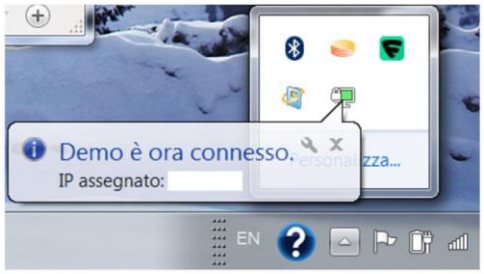
- Right click on the icon and select "Connect" (5);



- Press "Hide" (6) to close the following page;

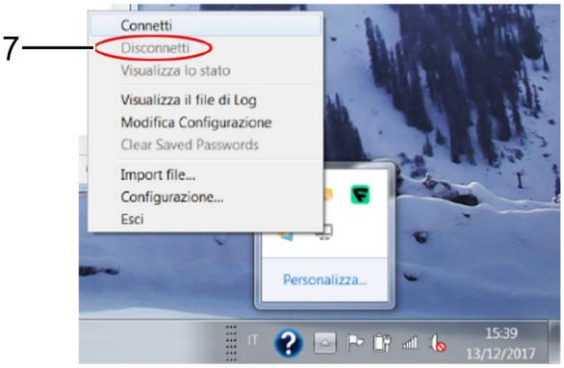


- After a few seconds a new pop-up will open on the toolbar, near the clock indicating that the PC is connected. This window could close automatically, while the OpenVPN icon will become green.



- To connect to the machine, open your internet browser.
- In the address bar, enter the IP address of the machine you wish to establish connection with, usually indicated on the LTE router.
- Enter the login credentials given by Alfa.

To disconnect from the machine, right click on OpenVPN icon and select “Disconnect” (7).



3.9.2. CONNECTION VIA VPN CLIENT FROM ANDROID DEVICES

To install the VPN Client, proceed as described below:

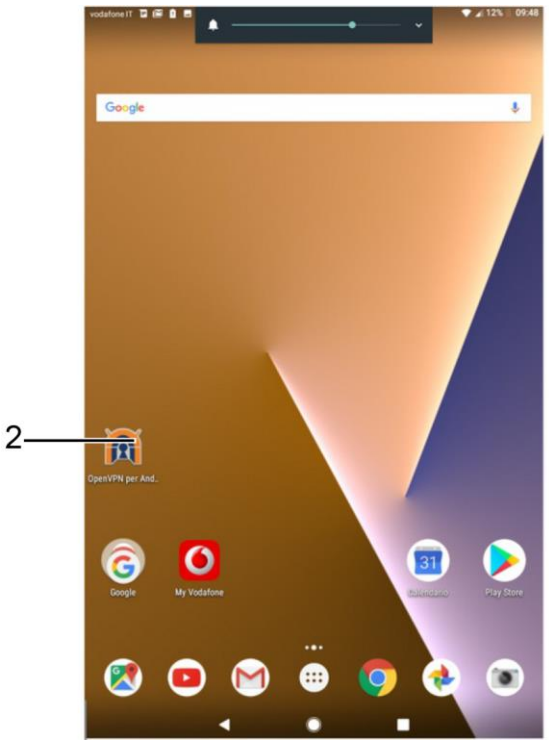
- From the Home screen of your device, open Play Store.
- In the search bar, type “openvpn for android”.

- Click the green button (1) to install the application.

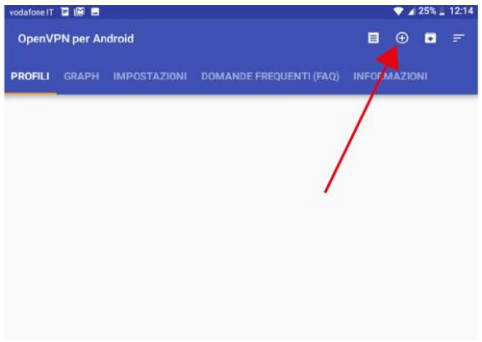
To connect to the machine via the VPN Client, proceed as described below:

- Download the file containing the login credentials sent by Alfa via email.

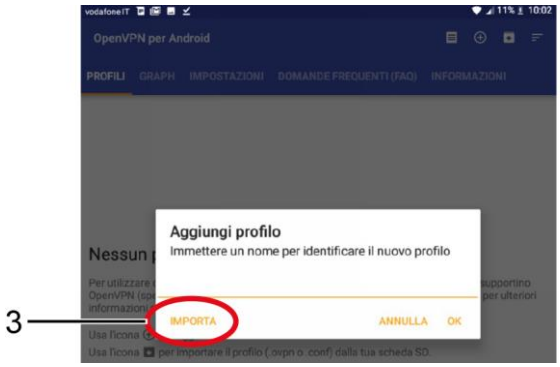
- Run the app OpenVPN (2) previously installed.



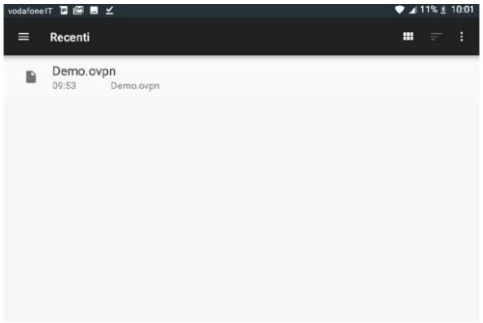
- Press symbol “+” present on the bar at top right of the app screen.



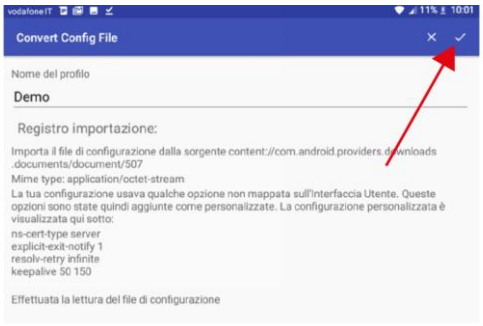
- Press “Import” (3).



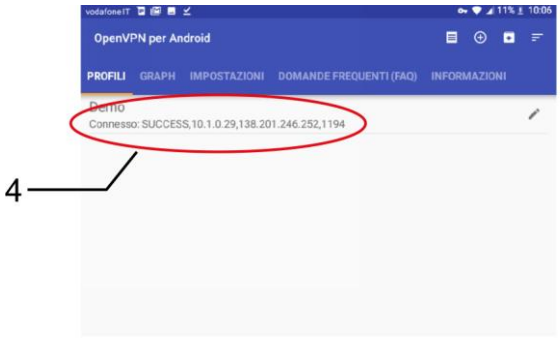
- Select the “.ovpn” file previously downloaded;



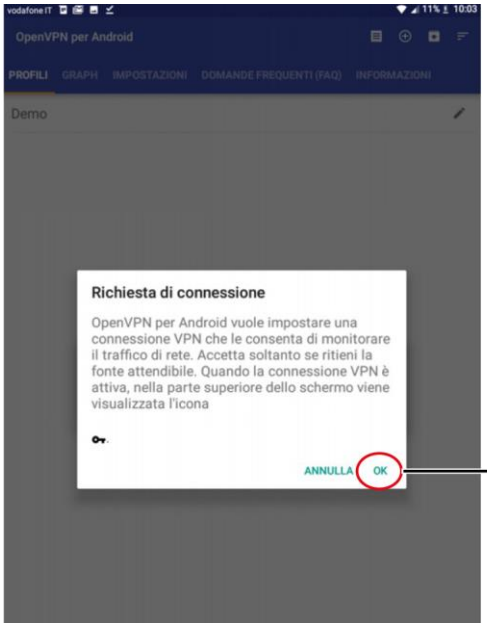
- Press on the check mark in the top right corner;



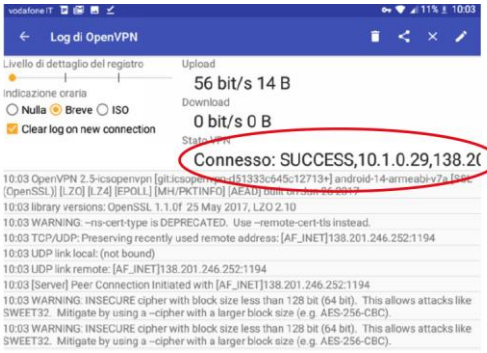
- Press on the just-added file (4).



- Press OK (5) on the next window.



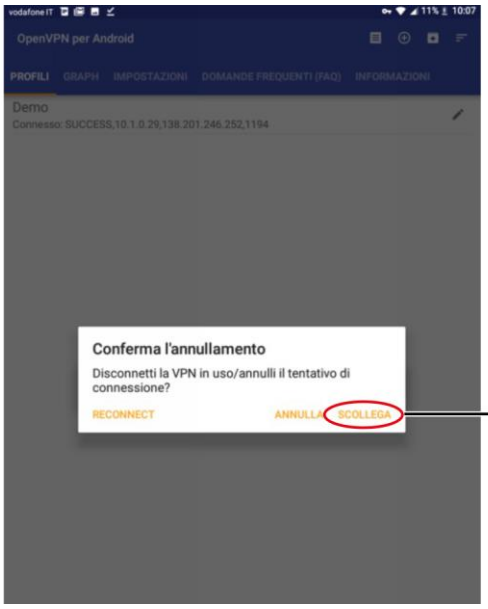
- Now the VPN status must be “Connected” (6).



- To connect to the machine, open your internet browser.
- In the address bar, enter the IP address of the machine you wish to establish connection with, usually indicated on the LTE router.

Enter the login credentials given by Alfa.

- To disconnect from the machine, open the app OpenVPN, then select the “Profiles” menu and press “Disconnect” (7).



4. PROGRAMMING THE ELECTRONIC BOARDS

Depending on board version, programming can be carried out in either of two different methods:
- Boards without bootloader (programming through PICkit / ICD3).
- Boards with bootloader.

Alfa products are delivered with the Bootloader loaded on all boards.

Each FW update therefore includes the procedure using the BootLoaderAPP Software (also called AlfaUSBProgrammer), described in paragraph 4.2 below.

4.1. PROGRAMMING OF BOARDS WITH NO BOOTLOADER

The procedure through PICkit (or ICD3 for MMT and HUTBRD boards) is still necessary only to load the Boot on boards without it, in particular on first-generation machines. This procedure can only be performed by Alfa Service.
Each spare part is shipped with the Boot already preloaded.

4.2. PROGRAMMING OF BOARDS WITH BOOTLOADER

4.2.1. SOFTWARE “BOOTLOADERAPP”

The most recent boards are preloaded with BOOT firmware for the management of the BootLoader, i.e. the application that allows the updating of the machine control firmware.
NOTE: To program a board that does not feature preloaded BOOT, please contact Alfa technical service.

To program a hard-wired board via BootLoaderAPP, it is necessary to follow this procedure:
1. Shut off the machine;
2. connect the special Alfa USB BOOT LOADER cable (code 305001893) across the dedicated connector of the Main board (CN13 for the MAB, CN5 for the MMT, if it is used instead of the MAB) and a USB port of the PC / LAPTOP on which the BootloaderAPP.exe application resides; Machine side, use the "BOOT" panel connector when present.
3. run BootloaderAPP;
4. switch the machine on.

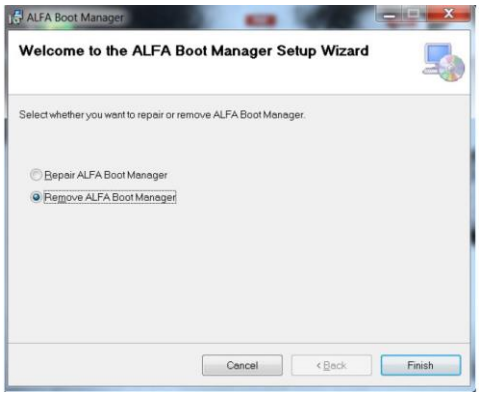
TO USE A MACHINE IN BOOT MODE, YOU MUST FIRST CONNECT THE USB CABLE FROM MAB/MMT TO PC / LAPTOP AND THEN SWITCH MACHINE ON.

BootLoaderAPP installation procedure is described in the following paragraph. If the software is already installed on the PC, go directly to the following paragraph explaining software use for programming boards.

4.2.2. INSTALLATION OF “BOOTLOADERAPP”

If a version of the application is already present on the PC, you must first remove it before installing a new version.

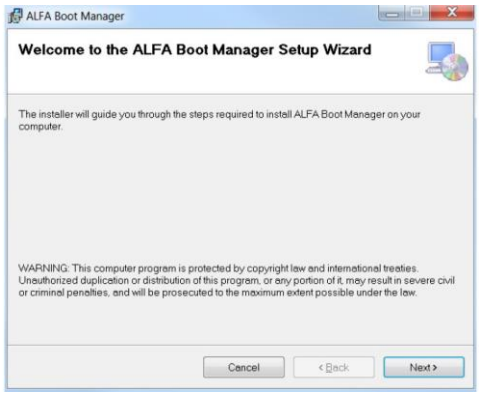
In this case, run the installation software ALFA Boot Manager and select option “Remove ALFA Boot Manager”, then press “Finish”.



Wait until uninstall is completed and press “Close”.

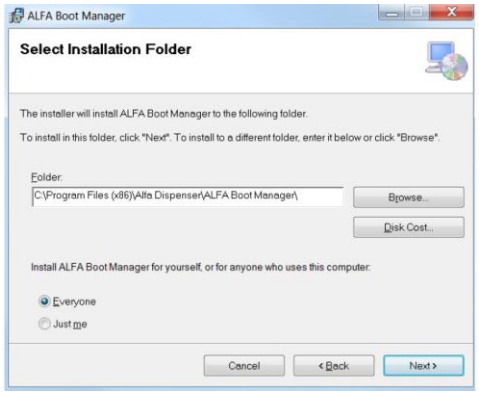
To install the application:

1. Run the installation file ALFA Boot Manager .

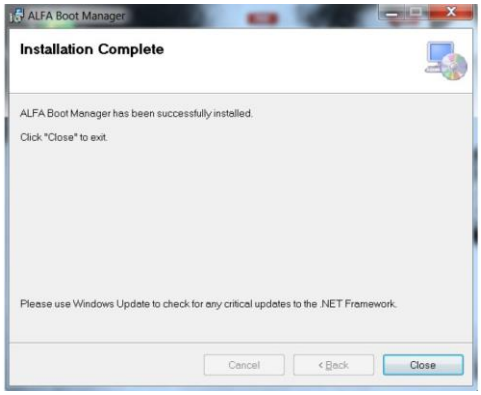


The page on the side will open.

2. In the following window, select the software installation path and select option “Everyone”, then press “Next >”.

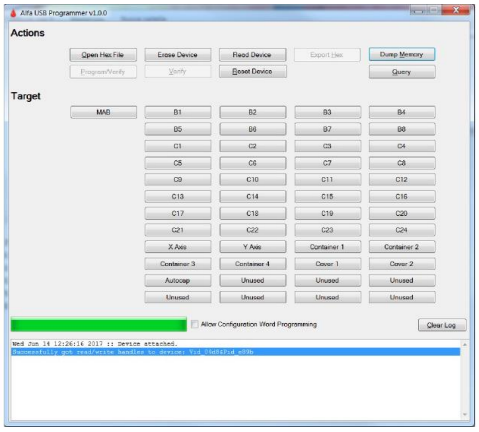


3. When prompted, press “Next >” until completing the installation procedure, then press “Close” to end the installation procedure.



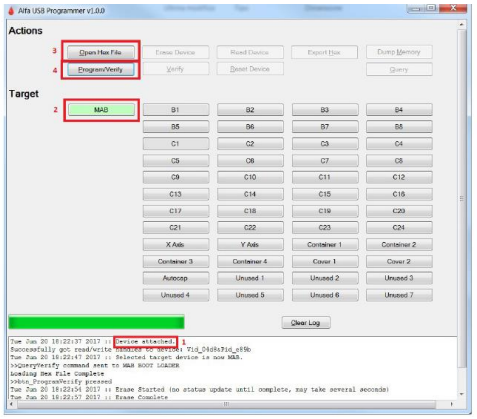
4.2.3. STARTING THE BOOTLOADER

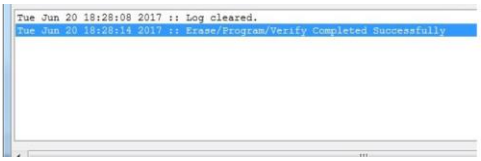
Run BootloaderApp on the PC (the application is in the folder selected in step 2 of the installation procedure).
The following window will open.



4.2.4. MAB FIRMWARE UPDATE

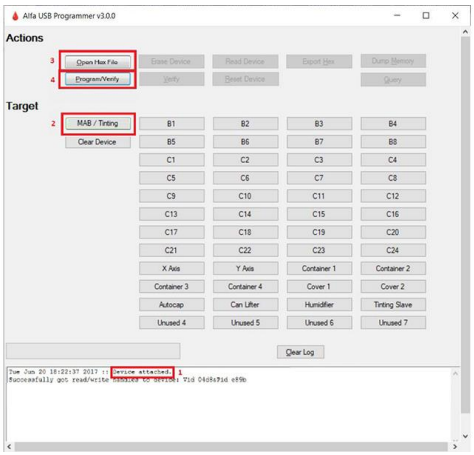
- Check that the software detected the presence of a MAB ‘Device attached’ (1)
- Select the MAB board to be used by pressing the MAB button (2) ‘Selected target device is now MAB’ + ‘QueryVerify command sent to MAB BOOT LOADER’
- Select the Intel HEX file to be programmed, and press ‘Open Hex File’ (3) ‘HEX File Complete’
- Proceed with Programming and Verification, by pressing ‘Program/Verify’ (4) ‘’: wait for the final message ‘Erase/Program/Verify Completed Successfully’
- If programming is successful, the ‘MAB’ button becomes GREEN.





4.2.5. UPDATING THE MMT FIRMWARE

- Check that the software detected the presence of a MMT ‘Device attached’ (1).
- Select the MAB board to be used by pressing the MAB button (2) ‘Selected target device is now MAB’ + ‘QueryVerify command sent to MAB BOOT LOADER’.
- Select the Intel HEX file to be programmed, and press ‘Open Hex File’ (3) ‘HEX File Complete’.
- Proceed with Programming and Verification, by pressing ‘Program/Verify’ (4) ‘’: wait for the final message ‘Erase/Program/Verify Completed Successfully’.
- If programming is successful, the ‘MAB/Tinting’ button becomes GREEN.

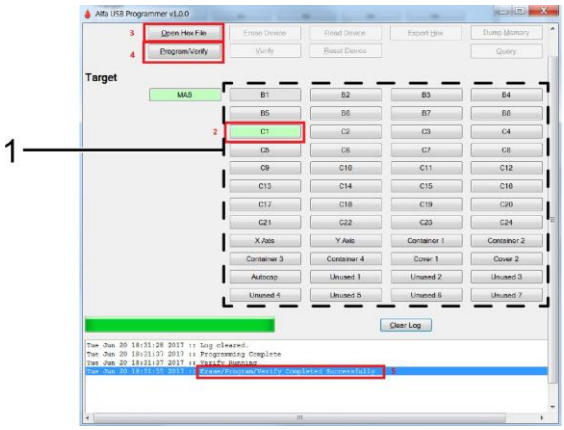


4.2.6. UPDATING THE ACTUATOR FIRMWARE (SCCB, MMT THOR 1.0 with BRUSH, HUTBRD THOR 1.0 BOARDS)

- Connect the special Alfa USB BOOT LOADER cable (code 305001893) across the dedicated connector of the Main board (CN13 for the MAB, CN5 for the MMT, if it is used instead of the MAB) and a USB port of the programming PC; Machine side, use the "BOOT" panel connector when present.
- Switch the machine on (or the board when programming it on a bench);
- Check that the software detected the presence of a MAB (MMT for Thor 2.0) 'Device attached';
- Select actuator board (1) to be programmed by pressing the corresponding button (Fig. C1) (2) 'Selected target device is now C1' + 'QueryVerify command sent to MAB BOOT LOADER' (MMT for Thor 2.0);

  Check that the address set in the actuator board to be programmed is consistent with the selected device (please refer to the following paragraph "SETTING ADDRESSES");
  NOTE: THE MMT BOARD FEATURES NO DIP SWITCH, ITS ADDRESS IS WIRED INTO THE FIXED FIRMWARE.

- Select the Intel HEX file to be programmed, and press 'Open Hex File' (3) 'HEX File Complete';
- Proceed with Programming and Verification, by pressing 'Program/Verify' (4), then wait for the final message 'Erase/Program/Verify Completed Successfully' (5);
- If programming is successful, the 'C1' button becomes GREEN.

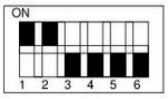
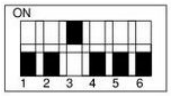
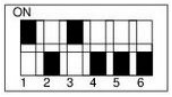


4.2.7. SETTING ADDRESSES

For programming an SCCB actuator board, the address set via the dip-switches must be consistent with the Target selected via the programming software (see previous paragraph).
Before programming a board, set the corresponding dip-switches accordingly.

Dip-switch addressing is a binary code.
The less significant bit is the leftmost; A dip switch set to ON corresponds to a bit with a value equal to '1'.

SCCB boards must have a fixed addressing according to the following coding:

GROUP OR CIRCUIT	DIP-SWITCH
DOUBLE GROUP	
PUMP 3	
PUMP 4	
PUMP 5	

Each address must be unique in the machine.
After programming, board address can be changed but only into addresses belonging to the same group of circuits (colorants, bases, etc.).

5. HANDLING THE MACHINE

5.1. MOVING THE MACHINE

Machine Thor must be moved in full safety.

In order to move the machine with the cabinet, it is possible to raise the support feet and use the dedicated wheels.

IN ORDER TO AVOID THE RISK OF PAINTING SPILLS INSIDE THE MACHINE, NEVER MOVE THE MACHINE WITH THE COLORANT CIRCUITS FULL.

BEWARE OF ANY STEPS OR IRREGULARITIES IN THE FLOORING/TERRAIN THAT COULD RESULT IN SUDDEN STOPPAGES, AS THESE COULD CAUSE MACHINE TO BECOME UNBALANCED. ALWAYS PROCEED AT A LOW SPEED WITH TWO PEOPLE HANDLING THE MACHINE AT ALL TIMES.

For bigger movements, it is necessary to use a suitable lifting mean. In this case, proceed as follows:

- Switch the machine off and disconnect all electric connections (power supply, ethernet, etc.);
- Remove PC, keyboard, monitor and any other device from the machine bearing surfaces;
- Push the machine on the forks of a forklift truck or a manual lift truck having a suitable capacity, after checking the weight of the configuration in section 1.5 – DIMENSIONS AND WEIGHT of the operator's manual;

EMPTY ALL TANKS OR BRING THEM TO MINIMUM LEVEL BEFORE LIFTING AND/OR MOVING THE MACHINE. BASED ON THE MOVEMENT TO BE MADE, CHECK FOR THE POSSIBLE NEED TO LOCK ALL MOBILE PARTS BY RESTORING THE LOCKS SPECIFIED IN CHAP.3 – INSTALLATION – OF THE OPERATOR'S MANUAL.

LIFT THE MACHINE CAREFULLY, TAKING CARE TO MAKE SURE THAT IT IS GRIPPED PROPERLY AND IS NOT AT RISK OF TIPPING OVER

- Handle the machine using the fork lift truck and position it in the installation space.

Always place the machine on a surface suitable for sustaining its weight or on perfectly smooth and level flooring.

Once the movement has been completed, lower the support feet to stabilise the machine and reconnect the electrical circuits. Use a spirit-level to level the machine.

6. ACCESS TO THE DIAGNOSTIC FUNCTIONS

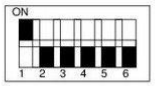
6.1. ADMIN CONTROL AND DIAGNOSTIC INTERFACE

The web control browser Admin interface has diagnostic functions that indicate the status of the machine and of the relevant circuits, as well as specific controls to activate and test each single circuit or the valve and motor functions.

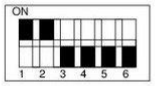
For information about the interface access modes and the function description refer to the software manual.

7. CONNECTION DIAGRAMS

DOUBLE GROUP



PUMP 3



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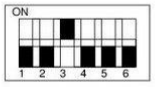
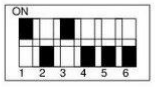
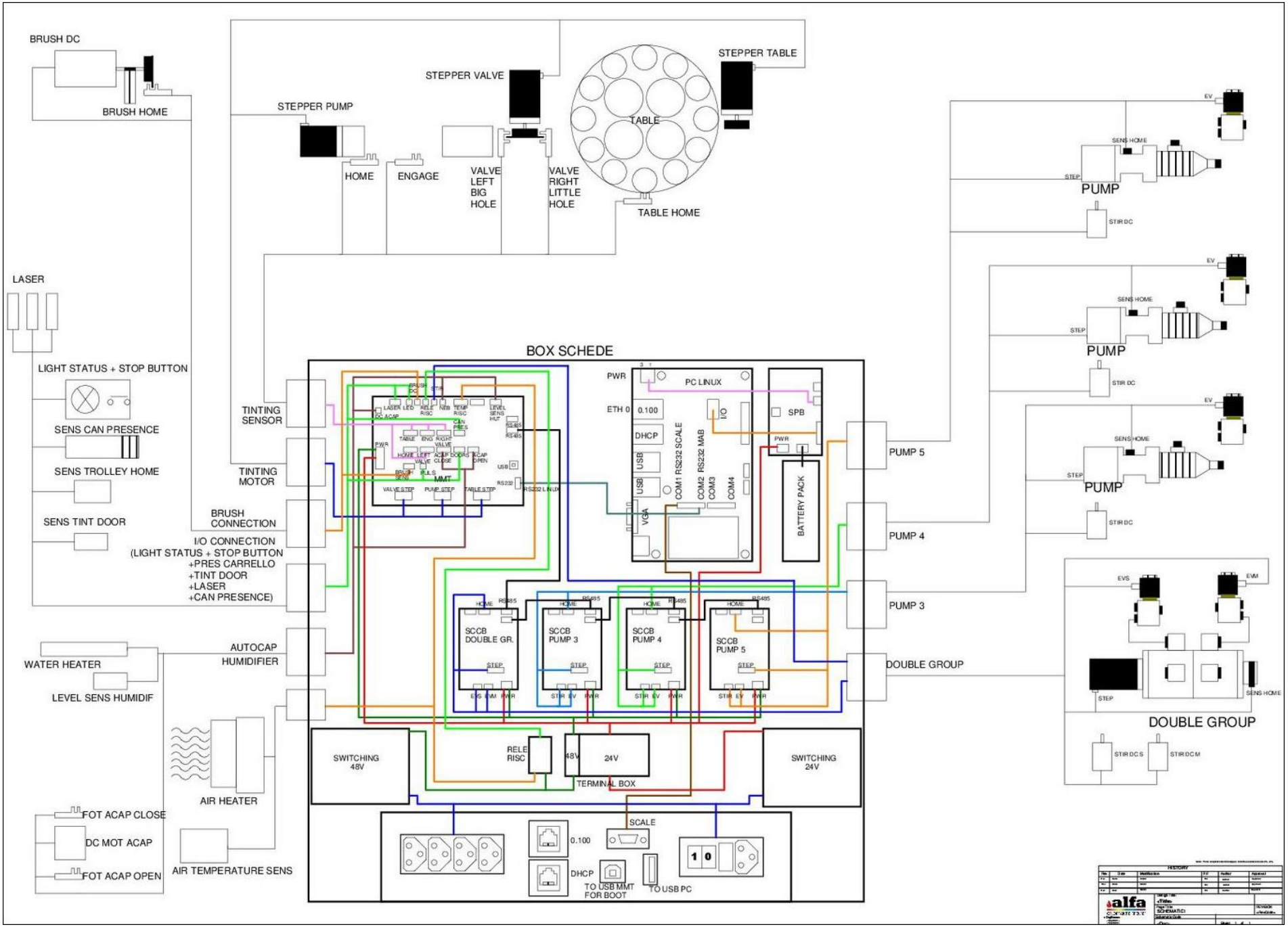
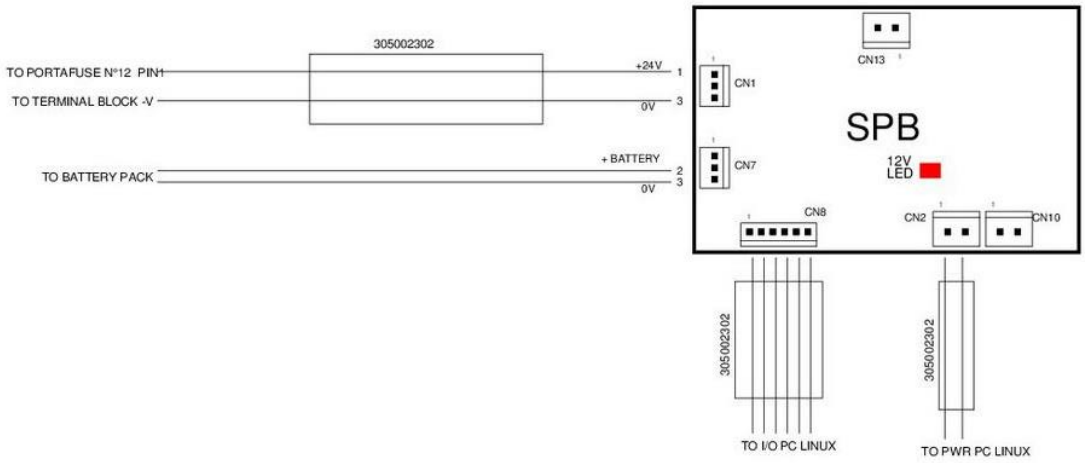


PUMP 5




BRUSH DC
BRUSH HOME
STEPPER PUMP
HOME
ENGAGE
STEPPER VALVE
VALVE LEFT BIG HOLE
VALVE RIGHT LITTLE HOLE
TABLE
STEPPER TABLE
TABLE HOME
LASER
LIGHT STATUS + STOP BUTTON
SENS CAN PRESENCE
SENS TROLLEY HOME
SENS TINT DOOR
TINTING SENSOR
TINTING MOTOR
BRUSH CONNECTION
I/O CONNECTION
(LIGHT STATUS + STOP BUTTON
+PRES CARRELLO
+TINT DOOR
+LASER
+CAN PRESENCE)
BOX SCHEDE
PC LINUX
SPB
BATTERY PACK
PUMP 5
PUMP 4
PUMP 3
DOUBLE GROUP
SCCB DOUBLE GR.
SCCB PUMP 3
SCCB PUMP 4
SCCB PUMP 5
SWITCHING 48V
SWITCHING 24V
RELE RISC
TERMINAL BOX
AUTOCAP HUMIDIFIER
WATER HEATER
LEVEL SENS HUMIDIF
AIR HEATER
AIR TEMPERATURE SENS
FOT ACAP CLOSE
DC MOT ACAP
FOT ACAP OPEN
SCALE
TO USB MMT FOR BOOT
TO USB PC
PUMP
DOUBLE GROUP
STIR DC
STIR DC S
STIR DC M
SENS HOME
EV
EVS
EVM

SPB BOARD



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Rev.	Data	Modif.	Ref	Author	Approval

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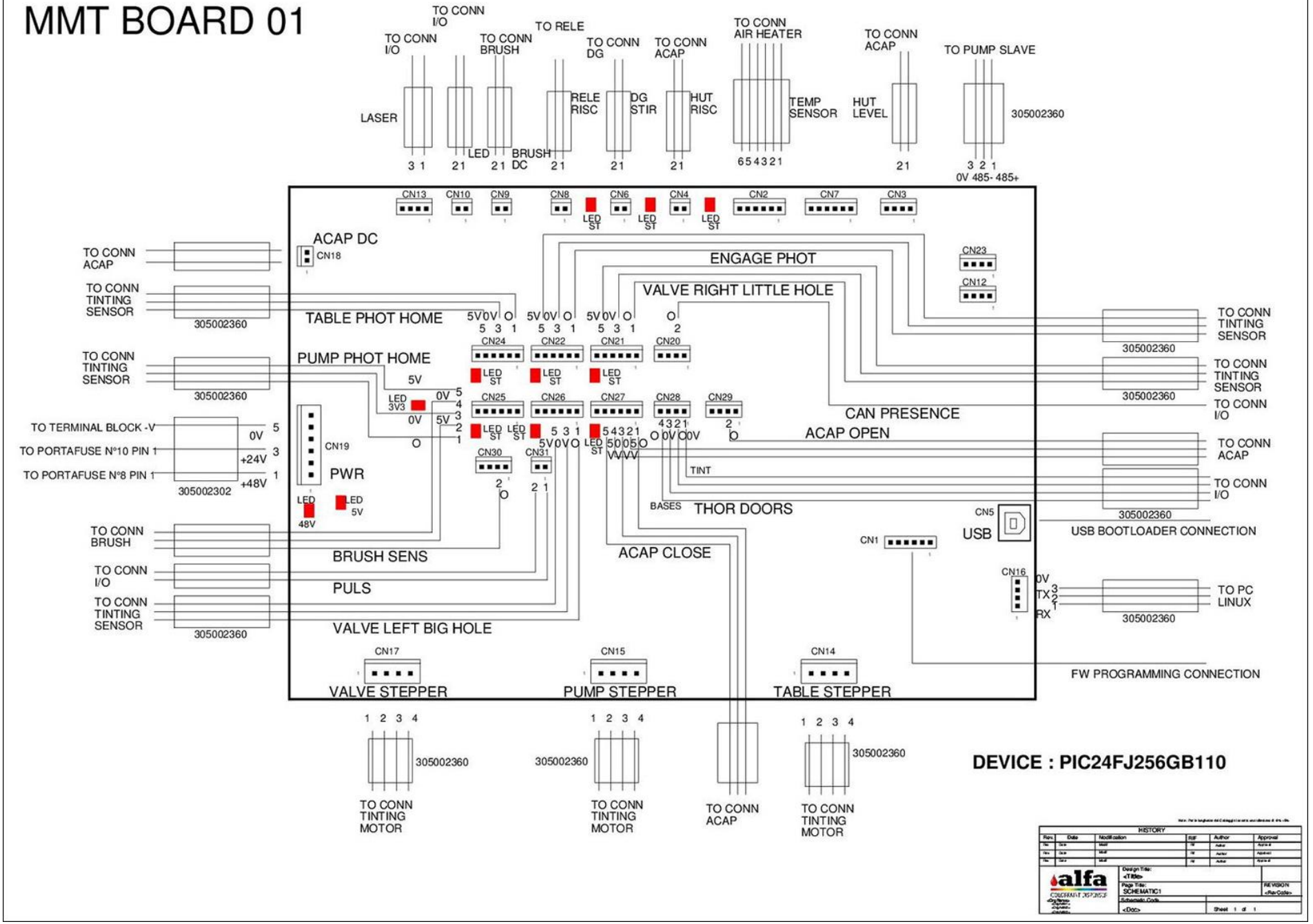
MMT BOARD 01


TO CONN I/O
TO CONN I/O
TO CONN BRUSH
TO RELE
TO CONN DG
TO CONN ACAP
TO CONN AIR HEATER
TO CONN ACAP
TO PUMP SLAVE
LASER
LED
BRUSH DC
RELE RISC
DG STIR
HUT RISC
TEMP SENSOR
HUT LEVEL
305002360
0V 485- 485+
CN13
CN10
CN9
CN8
CN6
CN4
CN2
CN7
CN3
LED ST
ACAP DC
CN18
ENGAGE PHOT
VALVE RIGHT LITTLE HOLE
CN23
CN12
TO CONN ACAP
TO CONN TINTING SENSOR
TABLE PHOT HOME
PUMP PHOT HOME
CN24
CN22
CN21
CN20
CN25
CN26
CN27
CN28
CN29
CAN PRESENCE
ACAP OPEN
TINT
TO TERMINAL BLOCK -V
TO PORTAFUSE N°10 PIN 1
TO PORTAFUSE N°8 PIN 1
305002302
0V
+24V
+48V
CN19
PWR
LED 48V
LED 5V
CN30
CN31
BASES
THOR DOORS
CN5
USB
USB BOOTLOADER CONNECTION
CN1
CN16
TO PC LINUX
TO CONN BRUSH
TO CONN I/O
TO CONN TINTING SENSOR
BRUSH SENS
PULS
VALVE LEFT BIG HOLE
ACAP CLOSE
FW PROGRAMMING CONNECTION
CN17
CN15
CN14
VALVE STEPPER
PUMP STEPPER
TABLE STEPPER
TO CONN TINTING MOTOR
TO CONN ACAP
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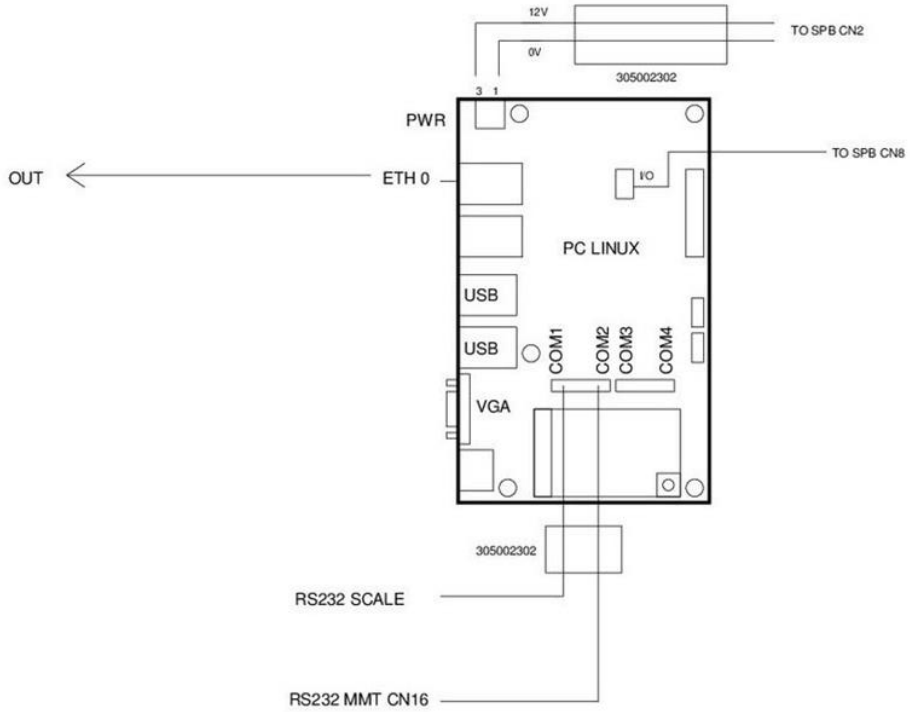
PC LINUX



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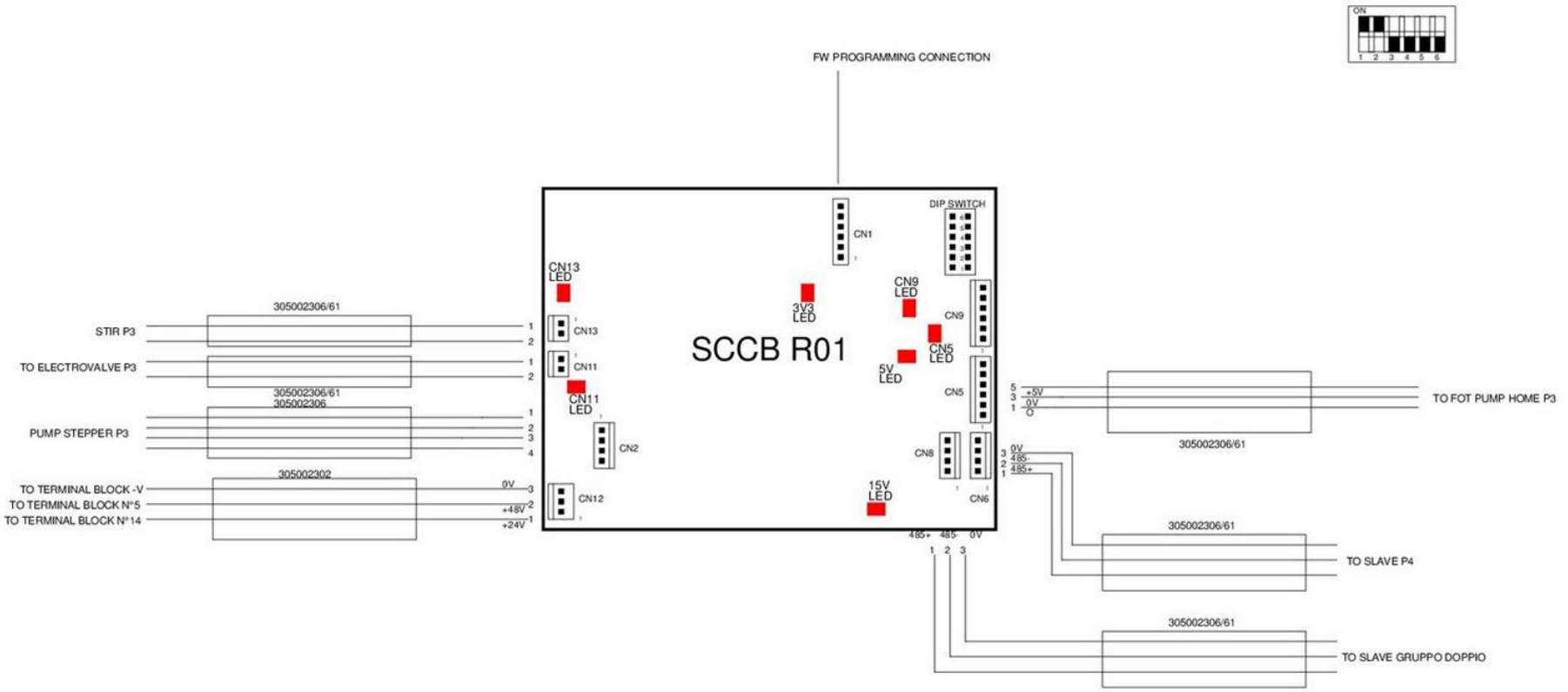
SLAVE PUMP 3



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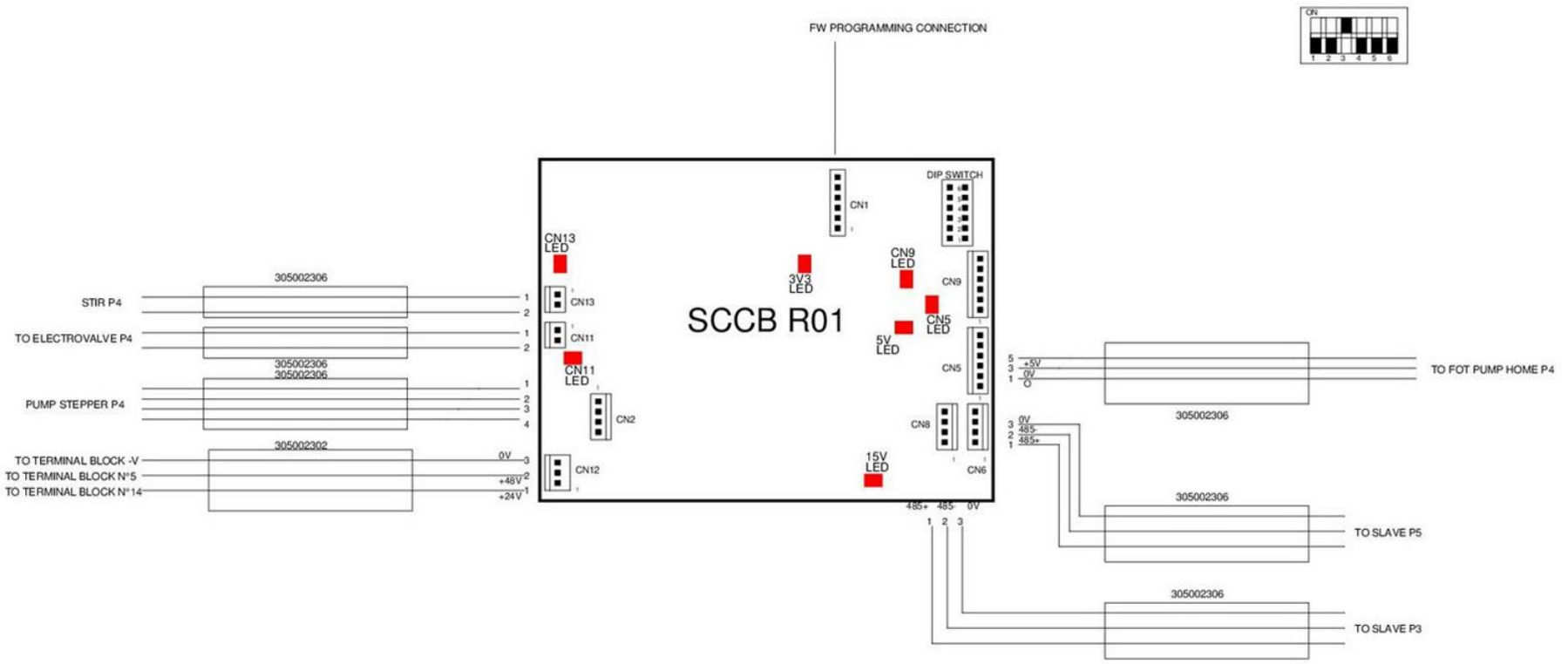
SLAVE PUMP 4



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SLAVE PUMP 5

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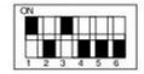

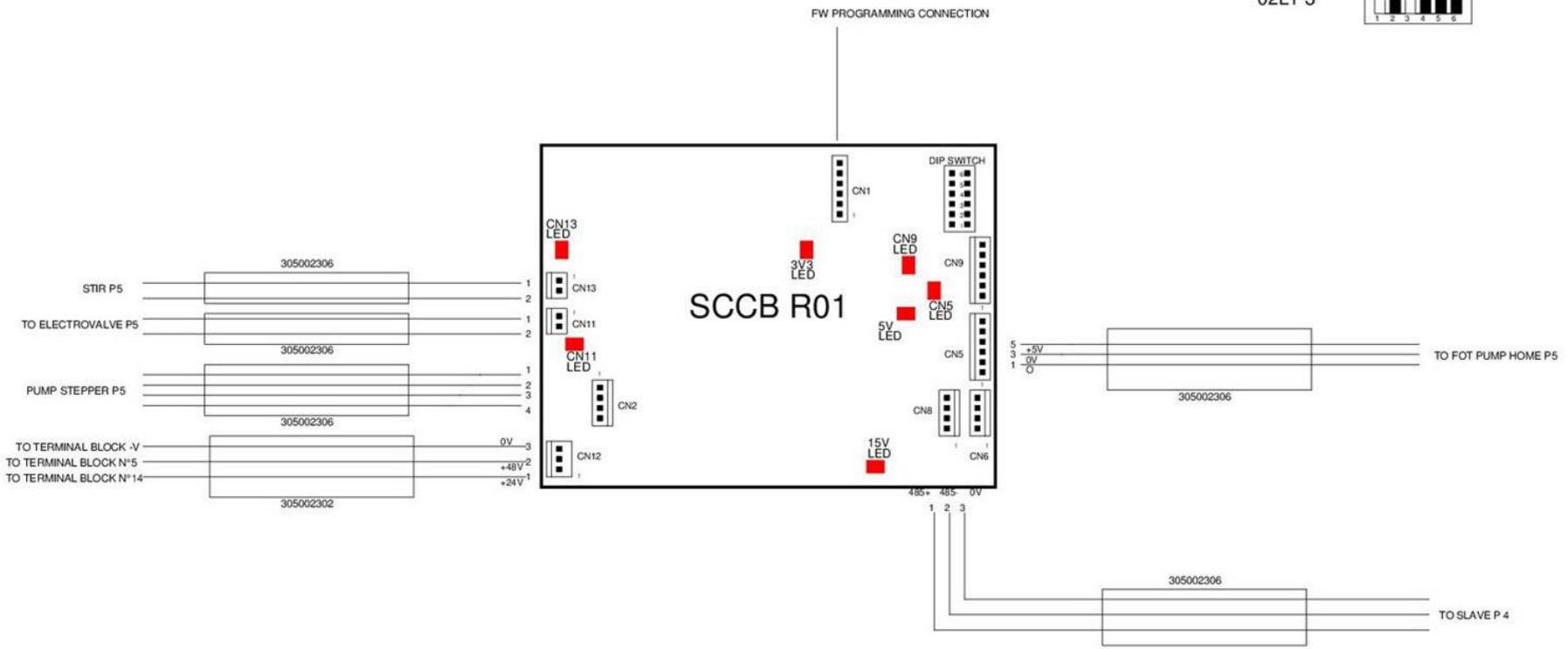

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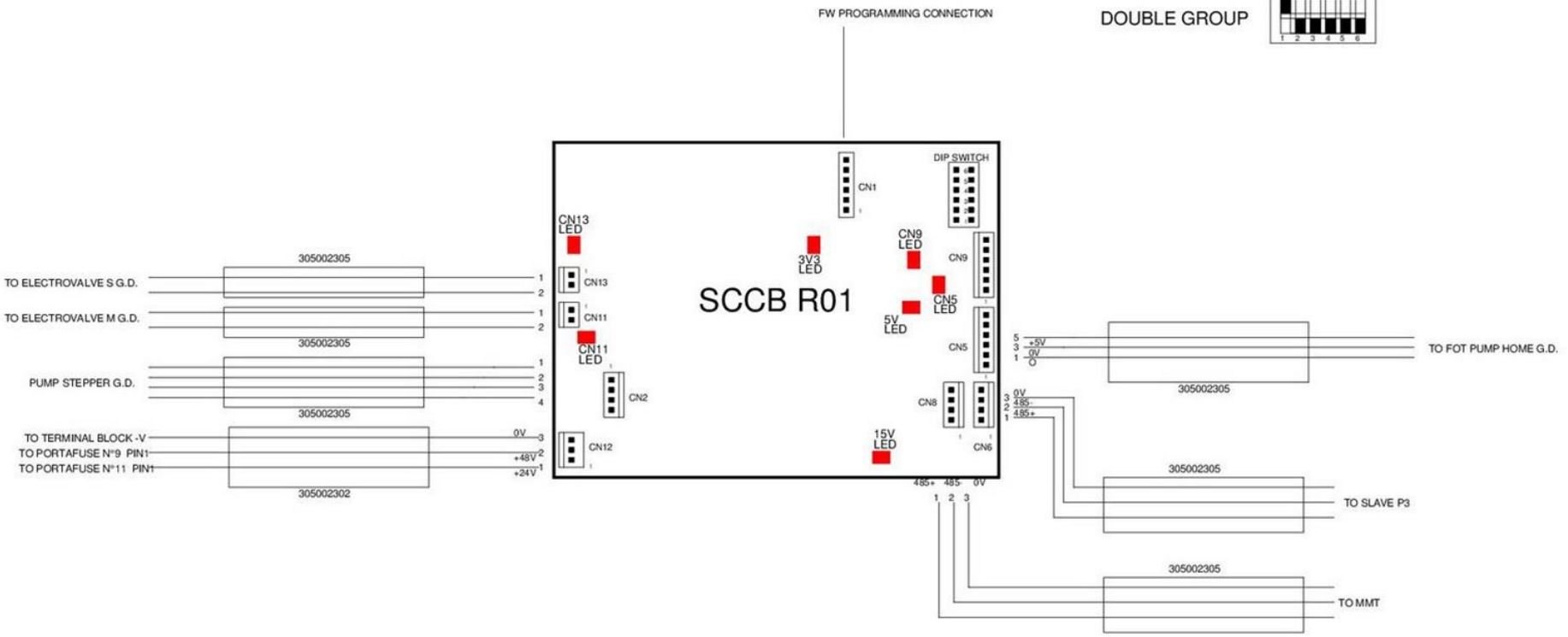
DOUBLE GROUP SLAVE



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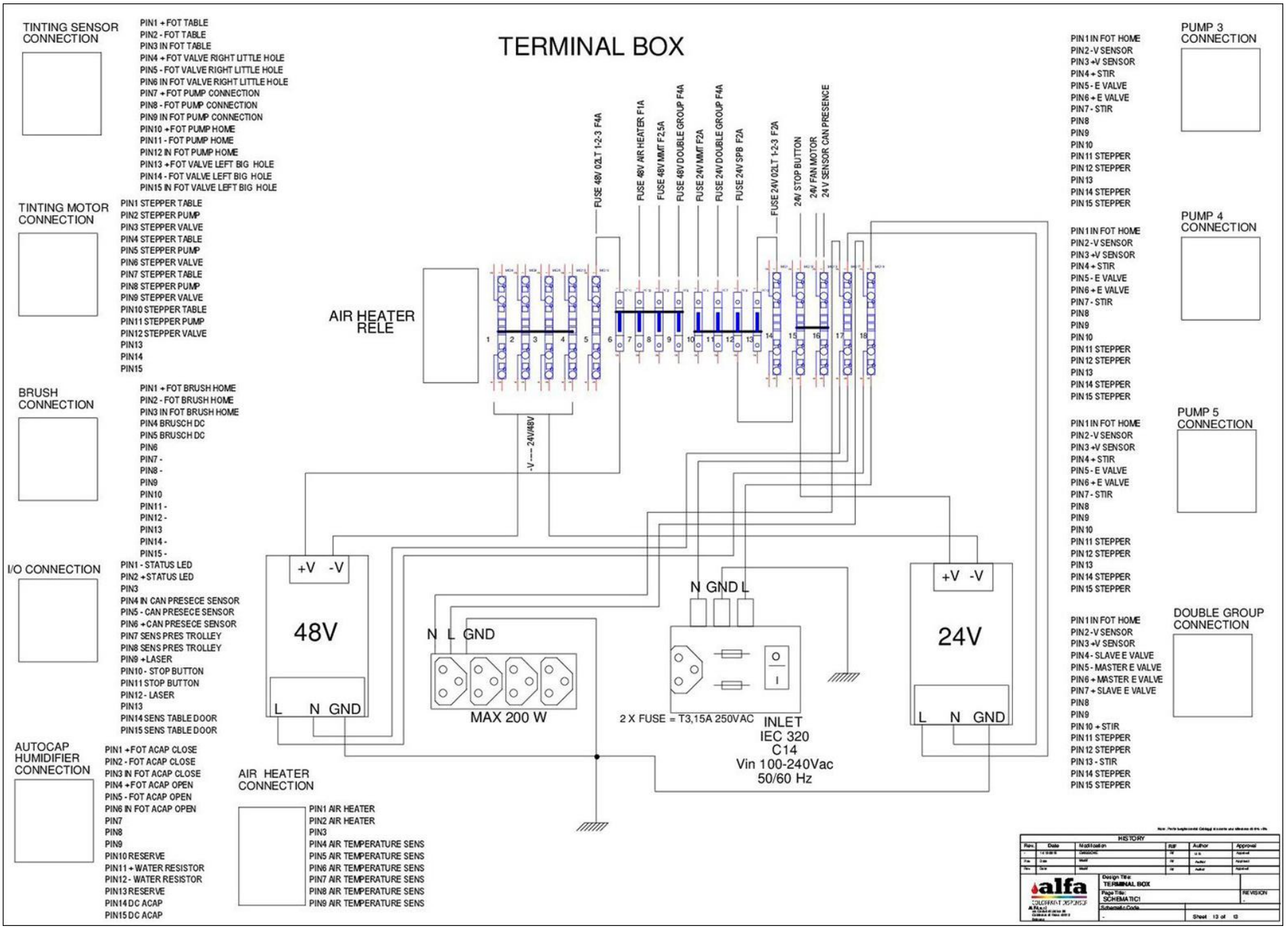
TERMINAL BOX