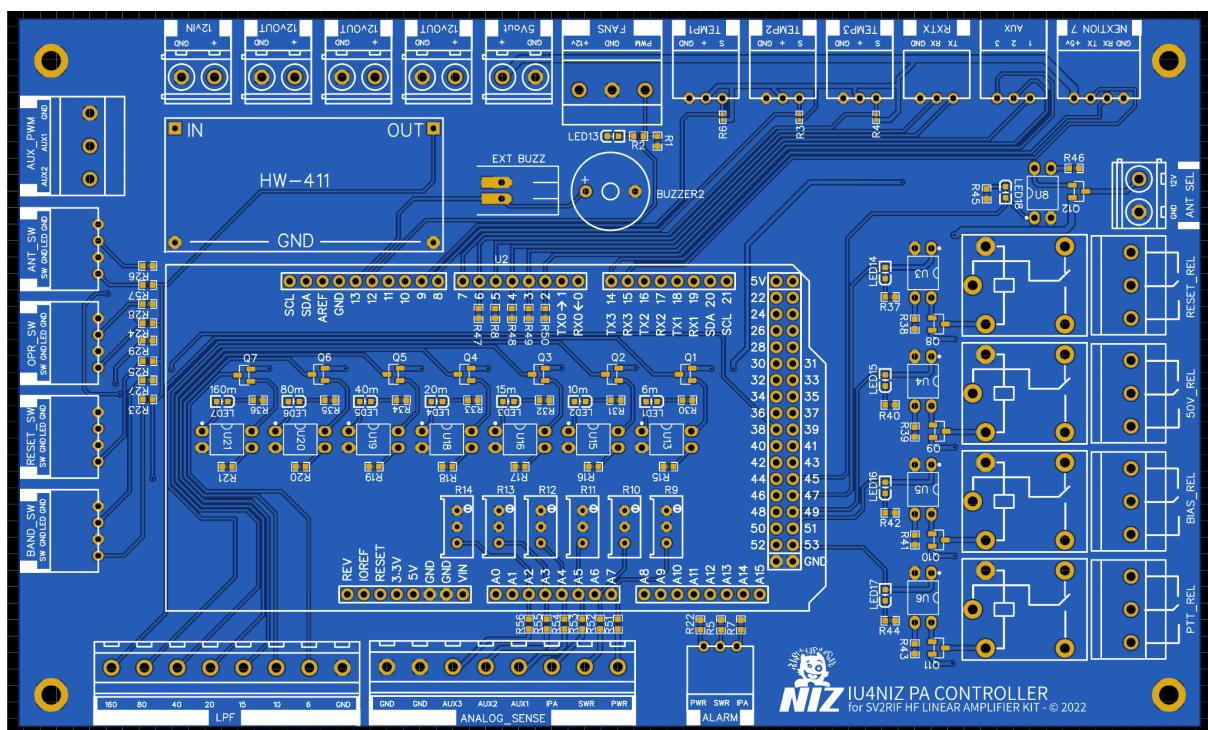


4xMRF300 LDMOS

HF 1200w Linear Amp

BOARD OVERVIEW PINOUT



LEFT SIDE

On this side of the board are JST connectors for connections to front panel buttons, such as:

- **BAND_SW** - Band filter change
- **RESET_SW** - Reset button in the event of a protection alarm
- **OPR_WS** - Button for changing operating status (OPERATE, STANDBY)
- **ANT_SW** - Button for switching between ANTENNA A (default) and ANTENNA B

A 3-pole Phoenix connector can also be used on this side of the board to use 2 auxiliary PWMs, e.g. to control other fans.

The button connectors are 4-pin, consisting of 2 ground (GND) references and two IN/OUT pins. The SW PIN is in the INPUT direction to send the button status to the Arduino board, while the LED PIN is used to provide visual feedback on the button.

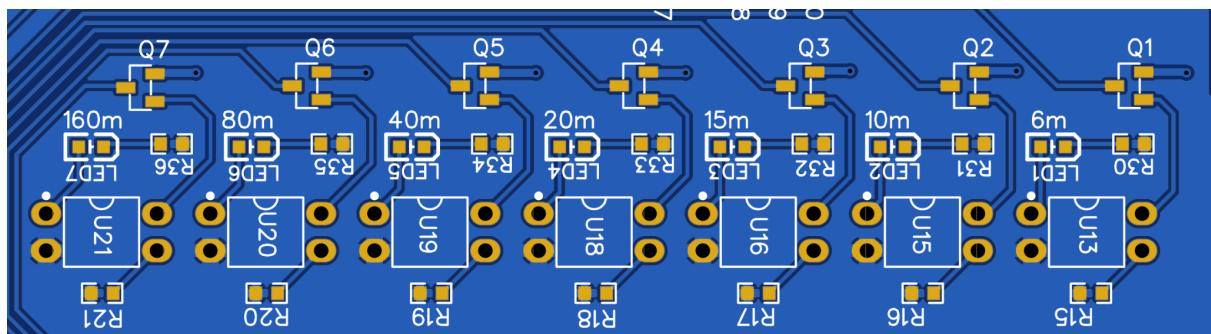
LOWER SIDE

The LPF, ANALOG_SENSE and ALARM connectors are located on the underside of the board.

LPF

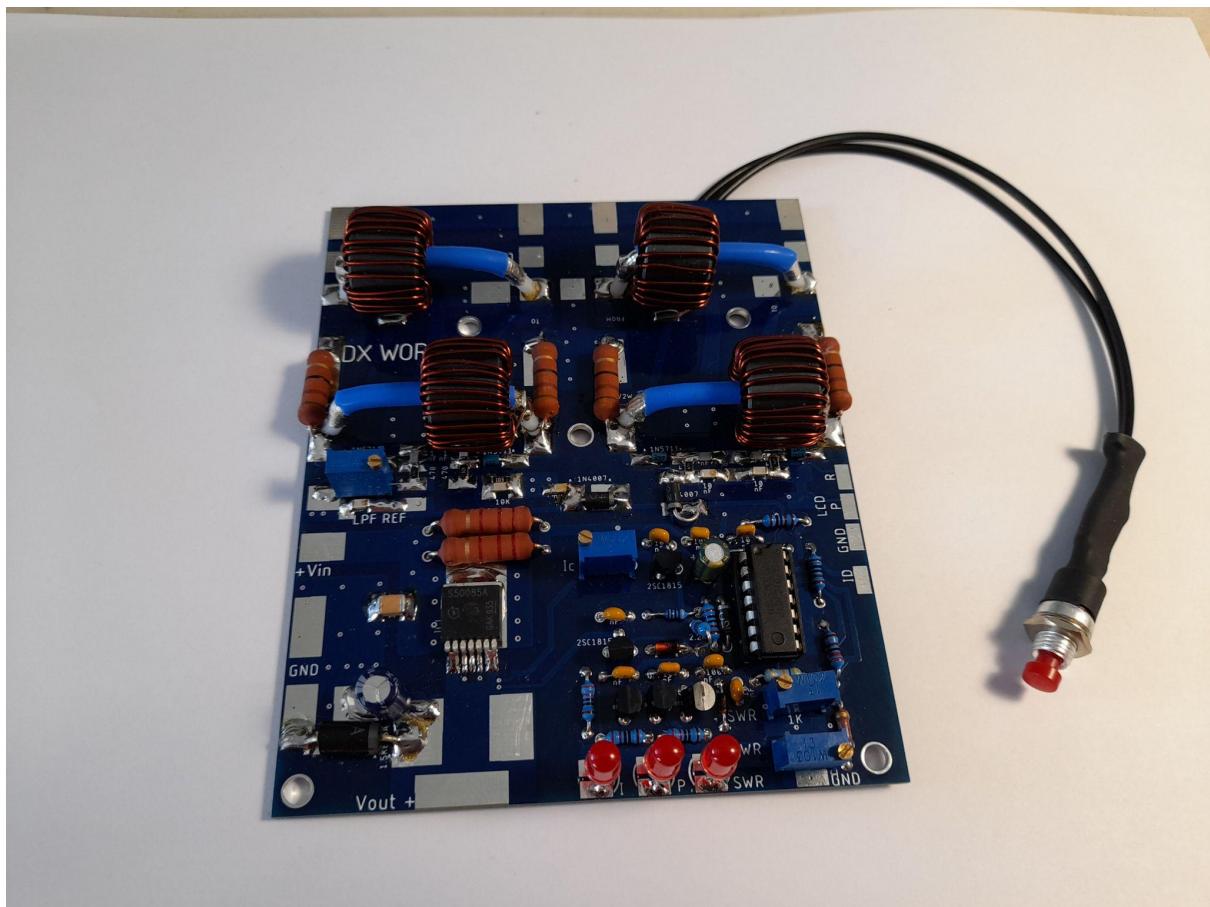
The LPF connector provides a ground reference (GND) and a PIN for each band.

The pins marked with the band name provide a voltage of +12v dc, to directly drive the relays on the LPF filter via opto-isolators. (see figure below)

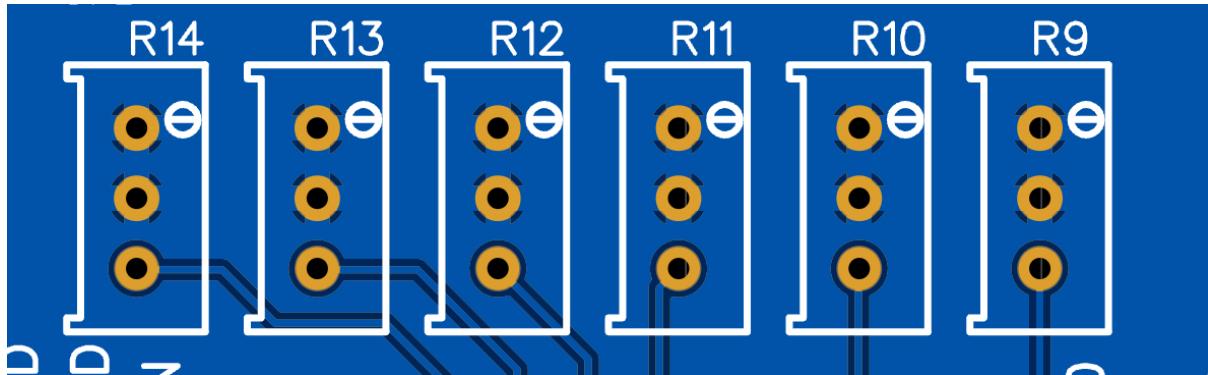


ANALOG_SENSE

The ANALOG_SENSE connector is connected to some analogue inputs of the Arduino Mega and is used to measure the analogue values of IPA, SWR and PWR coming from the dx-worlde protection board.



To make the calibration of readings from a tandem match or the dx-worde protection board more flexible, I introduced trimmers (variable voltage dividers).



The arduino accepts a maximum input voltage of +5v dc, the tandem match of the protection board I used can reach a value of 10v on the maximum power reading. The trimmers therefore allow the input voltage to the arduino mega to be reduced correctly and precisely.

ALARM

The alarm connector offers three digital pins in the INPUT direction on the Arduino Mega, such as:

- PWR
- SWR
- IPA

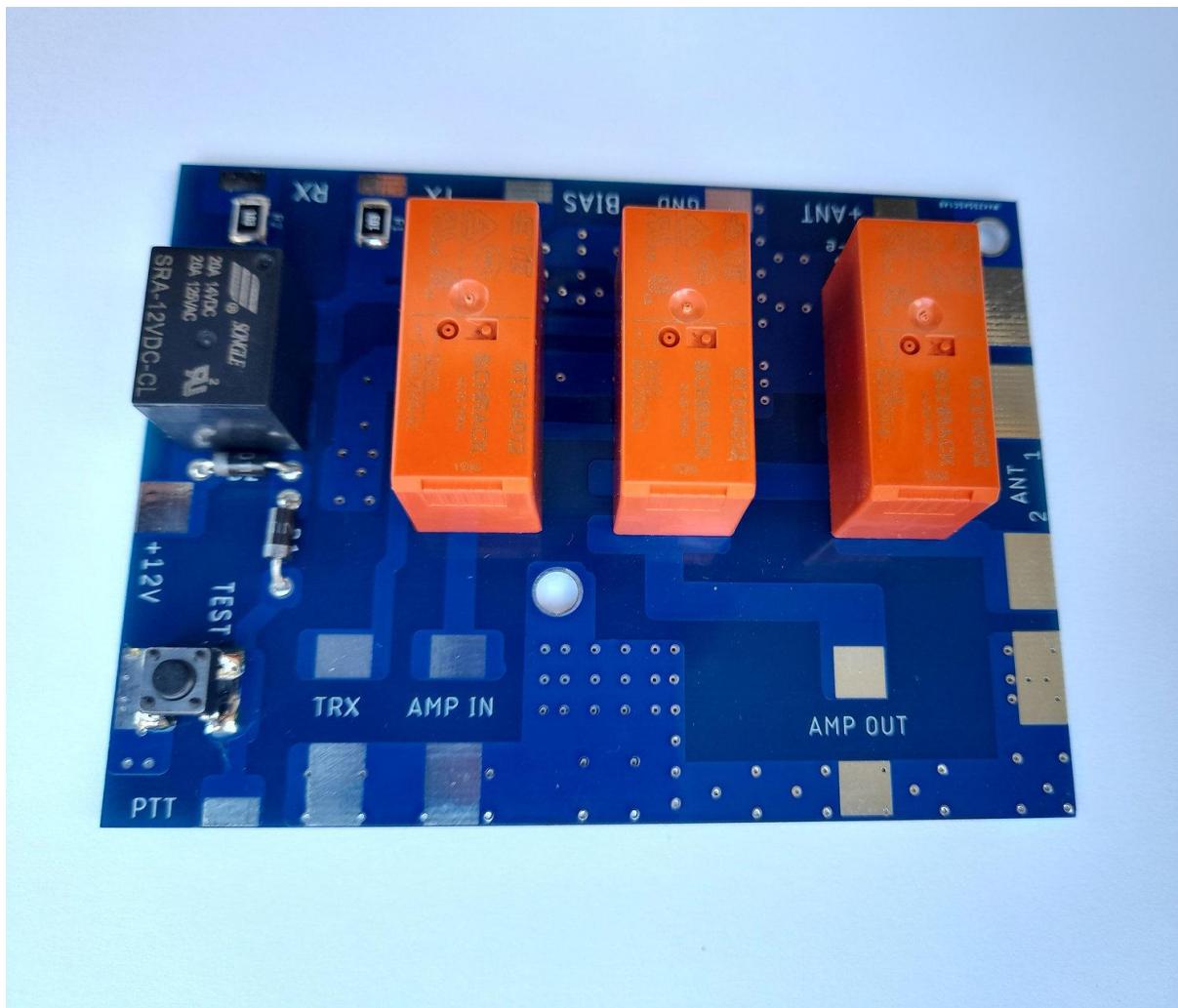
They are connected to the positive pole of the LEDs on the protection board and intercept the alarm status.

RIGHT SIDE

On the right side of the board is the RELAY group and the opto-isolated +12v dc output for driving the relay on the PTT board, where it is possible to switch between ANTENNA A (default) and ANTENNA B.

The relay group consists of four relays, such as:

- **RESET** - Via the RESET_SW button or the touch display and Arduino, the relay is operated to override the reset command on the protection board and unlock the operation of the amplifier in the event of a protection alarm
- **50v** - This relay is not currently used as it cannot withstand the load in amperes on the external 54v power supply. It can however be used to control a suitably sized voltage switch.
- **BIAS** - this relay, in STANDBY or ALARM state, removes BIAS voltage from the RF pallet. When the linear is in the OPERATE state, voltage is sent to the RF pallet.
- **PTT** - This relay performs a PTT LOCK when the amplifier is in STANDBY or ALARM state. When the linear is in the OPERATE state, PTT is made available on the PTT board (see image below) allowing the board's PTT contact to be grounded through the RCA connector in the back of the amplifier.



PTT BOARD

UPPER SIDE

On the upper side are the connectors for the board's power supply (+12v dc), a connector for PWM-controlled fans, 3 connectors for digital temperature probes, a connector for reading the status of RX and TX, a 3-pin auxiliary digital (AUX) connector, and finally the serial connector for the 7-inch Nextion Smart touch display.

POWER SUPPLY

Two positive voltages are required on the board, +12v DC and +5v DC. The 12v is used to drive all relays, fans and external relays, while the 5v voltage is used to power the Arduino Mega, the Nextion touch display and some other components or LEDs.

In order to avoid having to provide two separate power supplies with two power supplies, I have included a DC-DC HW-411, which is readily available on the market. So the board only needs a +12v DC supply and through the DC-DC the 5v voltage will then be derived.



BUZZER

It is possible to mount a piezo buzzer on-board or with a separate connector to bring the buzzer to the front panel of the amplifier.

CPU

I used an Arduino Mega 2560 mounted on the back of the board via pin headers to make the USB connector more accessible for firmware programming.

I chose an Arduino Mega because of the number of GPIOs available.

FEATURES

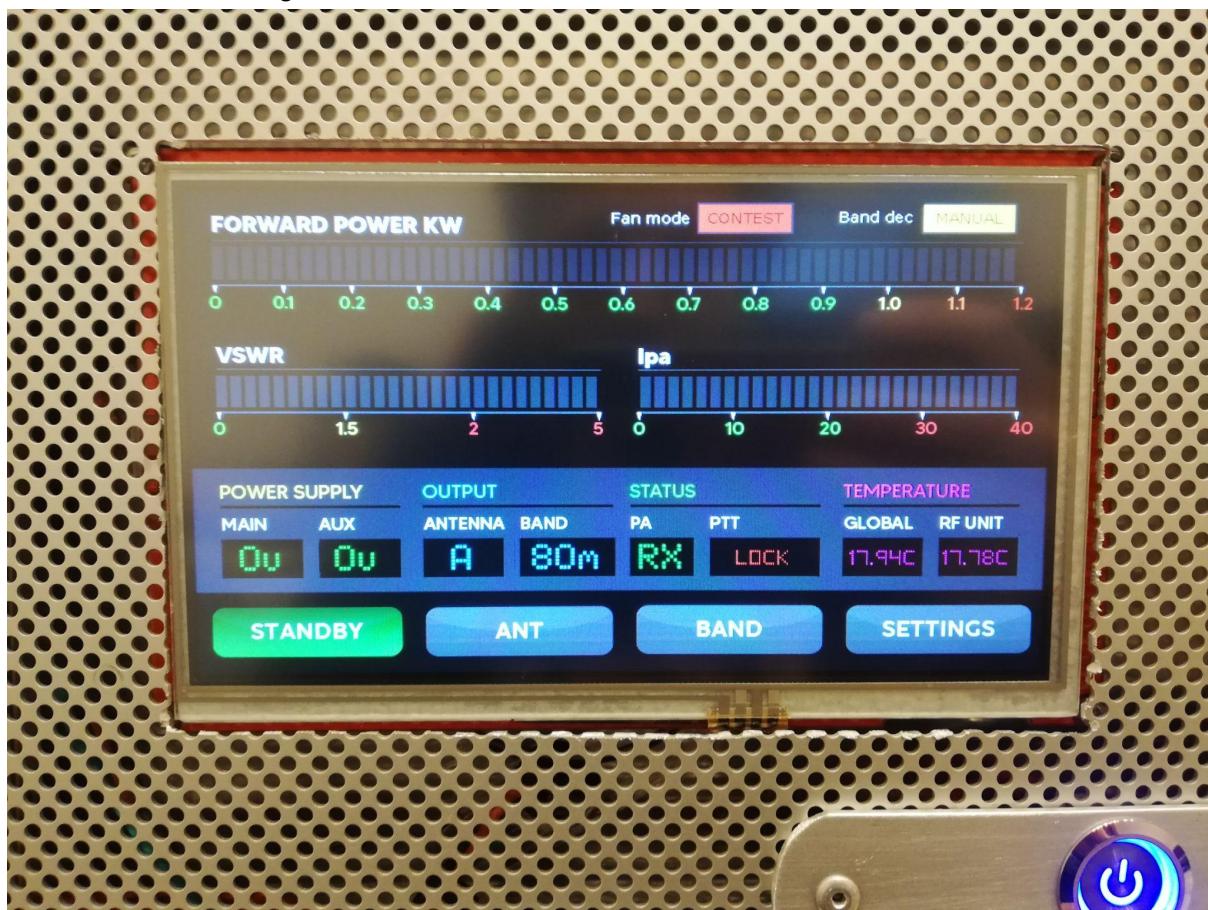
Listed below, with explanation, are the features that have been developed in the firmware.

NEXTION TOUCH DISPLAY and FRONT PANEL BUTTONS

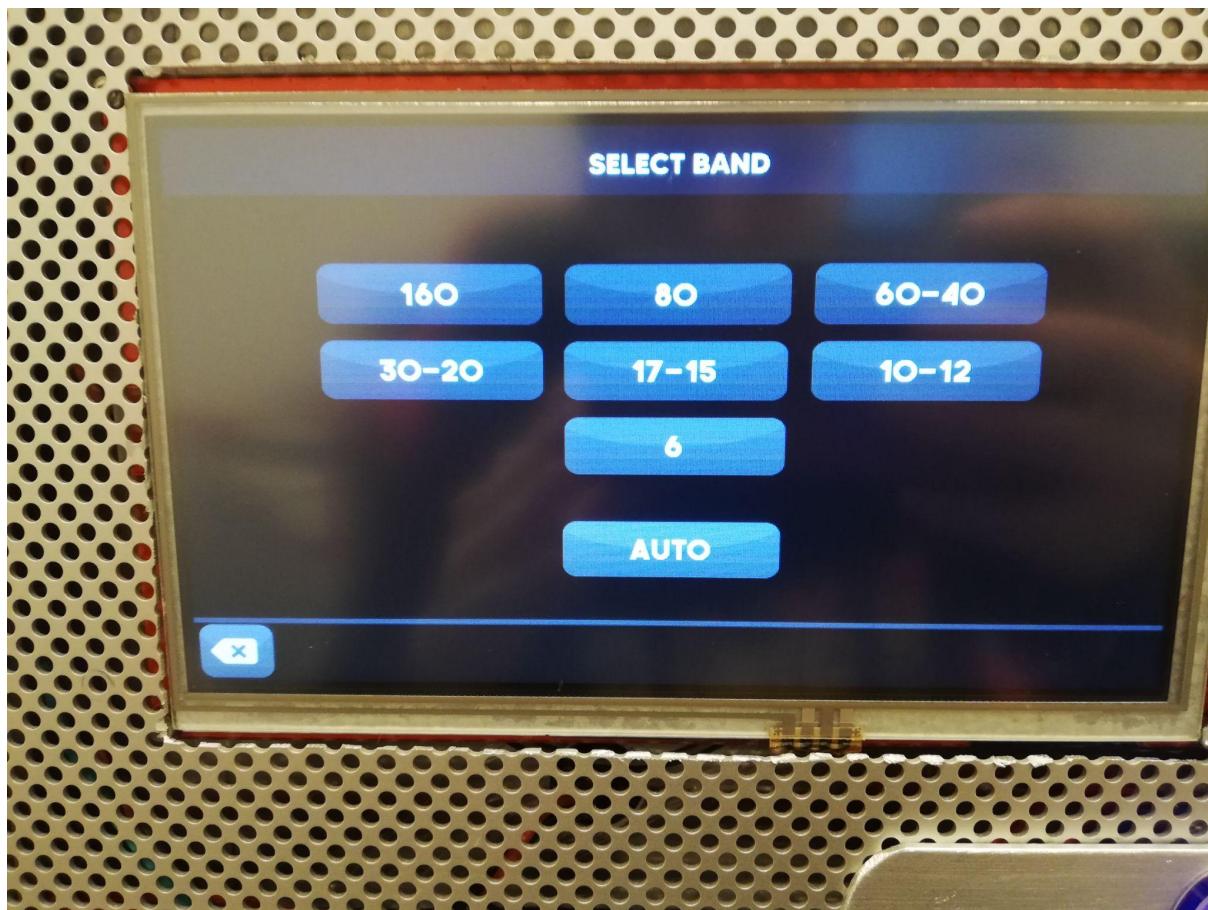
The touch display allows you to:

- Select the operational status of the amplifier (STANDBY - OPERATE)
- Select between two antennas, antenna A (default) and antenna B
- Select the band to be used
- Automatic band filter selection mode
- Settings
- Direct POWER reading, Reflected POWER (SWR), Current IPA
- RX TX State
- PTT State (Lock or ready)
- Chassis temp and RF unit temp
- Bias and Drain voltage
- Antenna and Band selected
- Reset button hardware

See main screen image



Band selection screen



AUTOMATIC BAND SELECTION FUNCTION

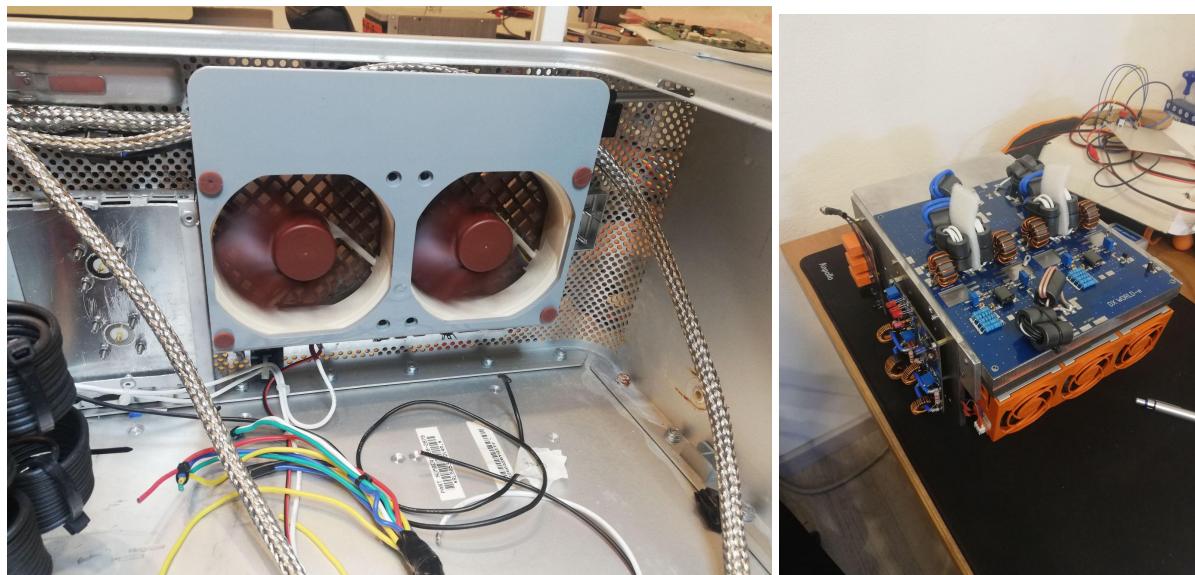
The AUTO function allows the amplifier to identify the band used on the radio automatically. I used 4 auxiliary digital outputs and implemented the band decoding with Yaesu's ABCD method.

I decided to use this system as I use a Yaesu FT920.

COOLING PROFILE SETTINGS

The fans do not run at a fixed speed, but are driven in PWM to vary their speed according to the detected temperature.

The higher the temperature, the higher the speed and thus the greater the required airflow. The amplifier has a total of five fans, three 40mm fans (recovered from a DELL server) and two 80mm fans. The 40mm fans are placed on the heatsink of the RF pallet and 2 extraction fans in the back of the case. (see pictures below)



The cooling profile setting screen allows you to choose the profile and change its parameters (see below)



It is possible to select between 3 modes, Normal, DX and Contest.

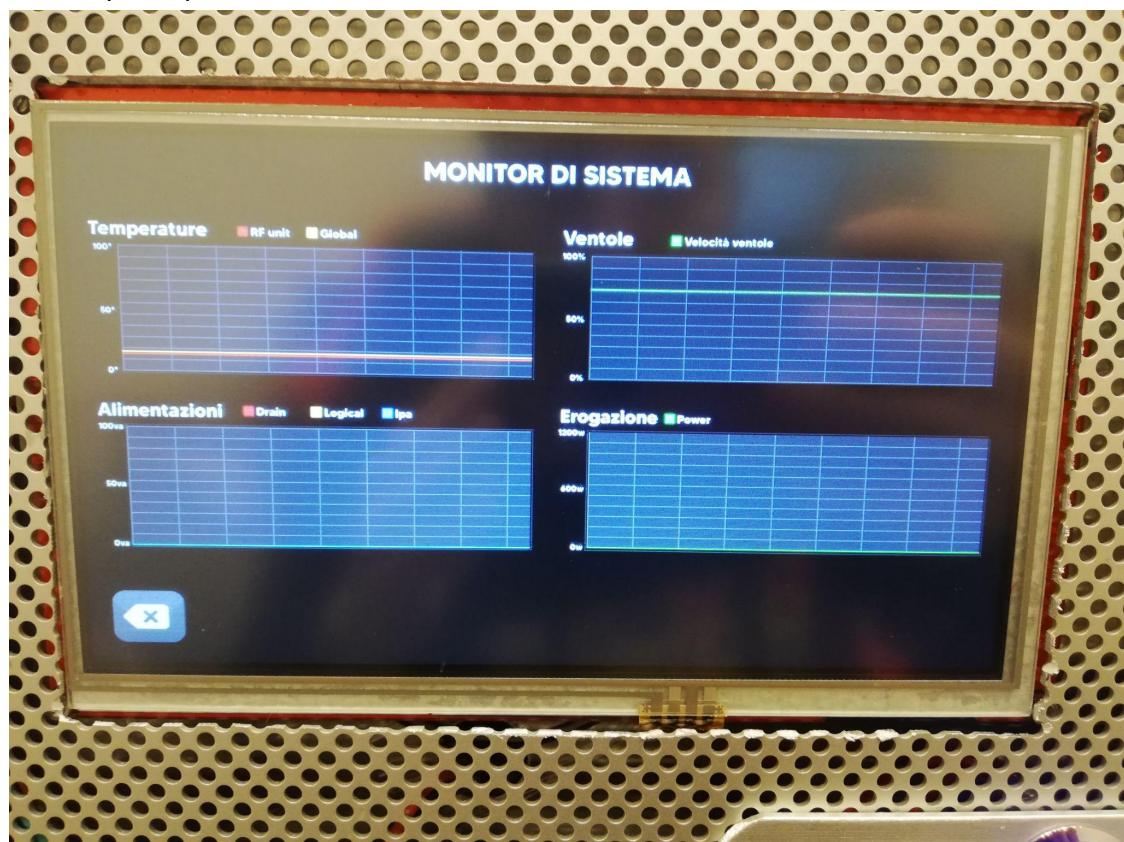
From NORMAL mode to CONTEST mode, the fan speed is increased, resulting in a greater flow of air.

The fans are only switched on when the amplifier is in OPERATE state, in STANDBY state the fans are switched off.

MONITOR

The monitor is a screen that presents graphs of supply voltage, power output, current draw, and fan speed.

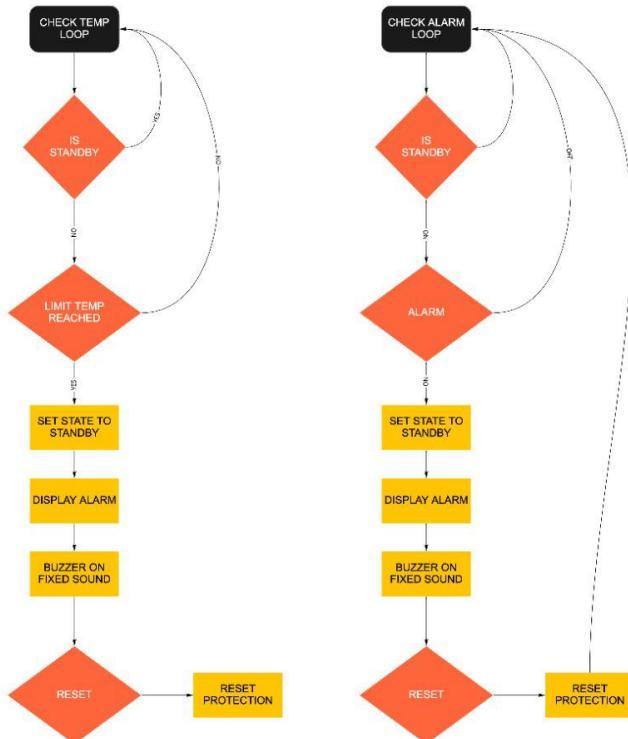
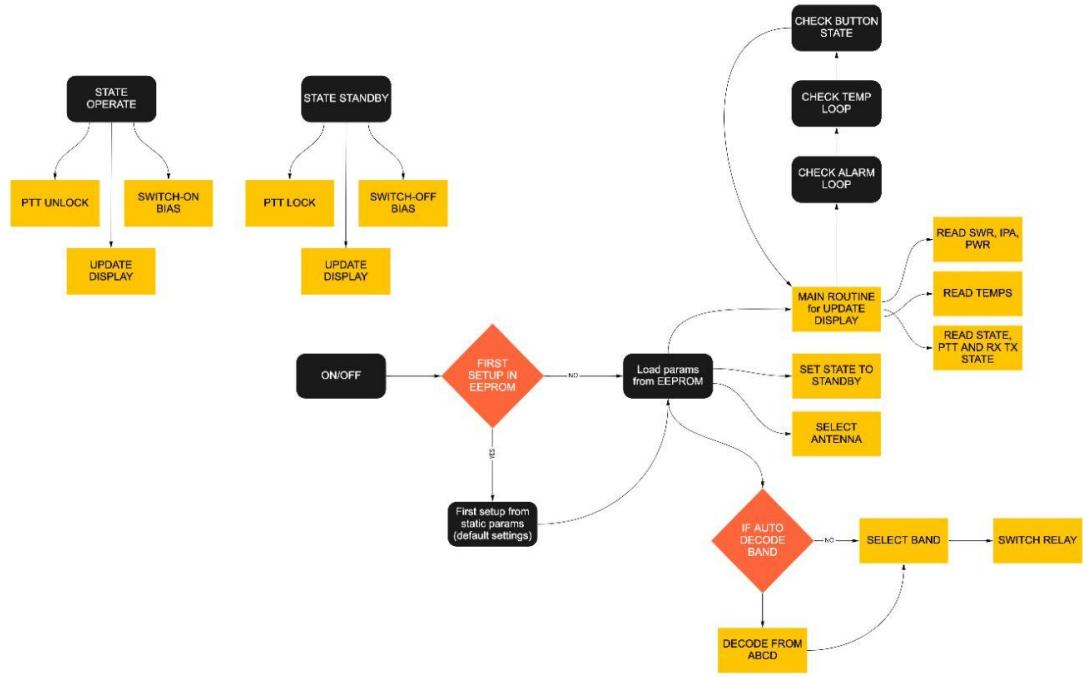
It has no specific purpose, it is just an additional tool for monitoring the progress of certain vital amplifier parameters over time.



INTERNAL MEMORY

All settings, selected band and selected antenna are stored in EEPROM on the Arduino Mega, in order to keep the settings and operating choices even after rebooting the linear.

FIRMWARE WORKFLOW OVERVIEW



Realizzato da

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