Soldering RT1

Soldering station compatible with Weller RTX tips family (12V 45W)

Hardware ver.1.0

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Overview

The design is a simple soldering station controller that uses an external power adapter (ideal 12V 5-10A) compatible with Weller RT micro soldering tips.

Each tip has a cost of about 20-25$ but the original Weller stations are expensive for amateur users. This station represents a good performance compromise and it's fully customizable (open source).

Enjoy!!!

SolderingRT1

Soldering station compatible with Weller RT tips (12V 45W), custom developed, perfect for SMD work :).

- Two independent channels
- Fully Programmable (temperatures 150-450C, preset temperatures, power limitation to use various power supplies), also serial interface and source code available.
- Runs on standard external 12V power adapter (voltage range 7-24V)
- Can run also on batteries (7-24V)

Main Functions

- Two independednt channels
- Two preset temperatures (programmable and loaded by default at startup)
- Input voltage monitoring (future implementation UVLO for batteries)
- Duty cycle limitation (allows using small power adapters, but slow heatup time)
- USB micro port for firmware update (Arduino pro micro 5V 16MHz) and for serial monitoring /debug

Absolute maximum ratings and other specs:

- Input voltage: 12V (7-24V working voltage)
- Power adapter: 12V min 2A (5-6A recomended for fast heatup time)
- Output current: 10A max (no current limit)
- Barrel: 5.5*2.1mm, center positive
- Examples of compatible AC adapters:

    -
- Temperatures range: 150-450 degC
- WARNING: The output current for each channel is inly limited by the tip resistance (about 2 ohm) and by the wire resistance.

Further impllementations might include:

- Duty cycle programmable via UI (no need of serial port)

- UVLO for battery operation

- Support for tracking function for the two channels and for SMD tweezers

Basic Operation

Picture of the Soldering Station:

Short description of the functionality:

- POWER: DC power in (12V center positive)
- SW: main power switch, turns on and off the soldering station
- HEATER 1 and HEATER 2 (channel 1 and channel 2):
  - Mini jack connectors for connecting the soldering tips.
  - Heater 1 shown on the display on the left ang Heater 2 on the right
- BUTTONS:
  - Short press:
    - Button 1 selects left channel
    - Button 2 selects right channel
  - Long press (~3sec):
    - Loads the PRESET1 or PRESET2 (according to the button you press) to the SET temperature of the selected channel (highlighted one).
    - NOTE: a long press in indicated with a "*" appearing on the selected channel close to "Set:"
  - Very Long press (~6sec):

- Programs the PRESET1 or PRESET2 temperature according to the button you press. To program a PRESET set the desired temperature on one channel, while keeping it selected (highlited), then very long press the corresponding PRESET where the temperature has to be programmed.
- NOTE: a very long press in indicated with a "**" appearing on the selected channel close to "Set:"

- DISPLAY:
  - STATUS:
    - ON: channel is on, the temperature regulator is running
    - OFF: channel is off, the temperature regulator is off
    - NC: no tip detected, possible defective tip or cable (NC: not connected)
  - SET:
    - Set temperature for the channel in degC
    - If the temperature is highlighted, it indicates that the channel is selected.
    - A "**" close to the "Set:" indicates a long press of PRESET1 or PRESET2
    - A "**" close to the "Set:" indicates a very long press of PRESET1 or PRESET2
  - MEASURED:
    - Measured temperature for the channel in degC.
    - "LOW" indicates temperatures below 60degC
    - "-" indicates that no soldering tip is connected or broken wire
  - PRESETS:
    - Preset temperatures. At boot the soldering station loads left preset temperature on the left channel and right preset temperature on the right channel
    - Left temperature is PRESET1
    - Right temperature is PRESET2

USB Communication and Debug

USB communication allows two main functions:

- Firmware update
- Parameter tuning and debug

Firmware update

Steps:

- Download the source code of the soldering station
- Download Arduino IDE and the additional libraries
    - Arduino IDE
    - Libraries:
        - Adafruit board manager for PRO MICRO 5V 16MHz
        - TimerTwo
        - AutoPID
        - Adafruit TFT library
        - and the others if requested... :)
    - Compile and upload the sketch
        - IMPORTANT: when you compile and upload the sketch be sure to select the correct micro "PRO MICRO 5V 16MHz" otherwise you risk to brick the unit.

Parameter tuning and debug

Opena serial command pompt with 9600 baud speed.

Type "h" and enter. You will get the following output:

```
************************************************************************
Soldering Station serial interface:
serial speed 9600baud
by Riccardo Pittini
************************************************************************
Menu:
h: Print help menu
a XXX: Set ch.1 temperature, XXX temperature in degC
b XXX: Set ch.2 temperature, XXX temperature in degC
d X: Disable/Enable debug serial mode, X 0 or 1
w XXX: Set Maximum duty cycle /Input Power (read below, default: 100)
s: Save parameters
************************************************************************
NOTE on input power limitation:
Feauture is implemented as duty cycle limitation
Calculate the desired duty cyckle as: Irms = Ipeak*sqrt(duty/255), Ipeak = Vin/TIP_Resistance, TIP_resistance = 2ohm for single and 1ohm
for dual
Duty value is from 0 to 255, Example: w 181
************************************************************************
```

The manu is self explanatory. All values are integer.

The value to set the maximum duty cycle is "w". With higher values, more power is delivered to the iron tip. For a 12V 3A power supply set it in the range of 70-120 max (out of a 255 count). If you have bigger power supply you can increase it up to 230 this will allow the tip to heat up faster but at the same time it will thermally stress it more and reduce its lifetime).