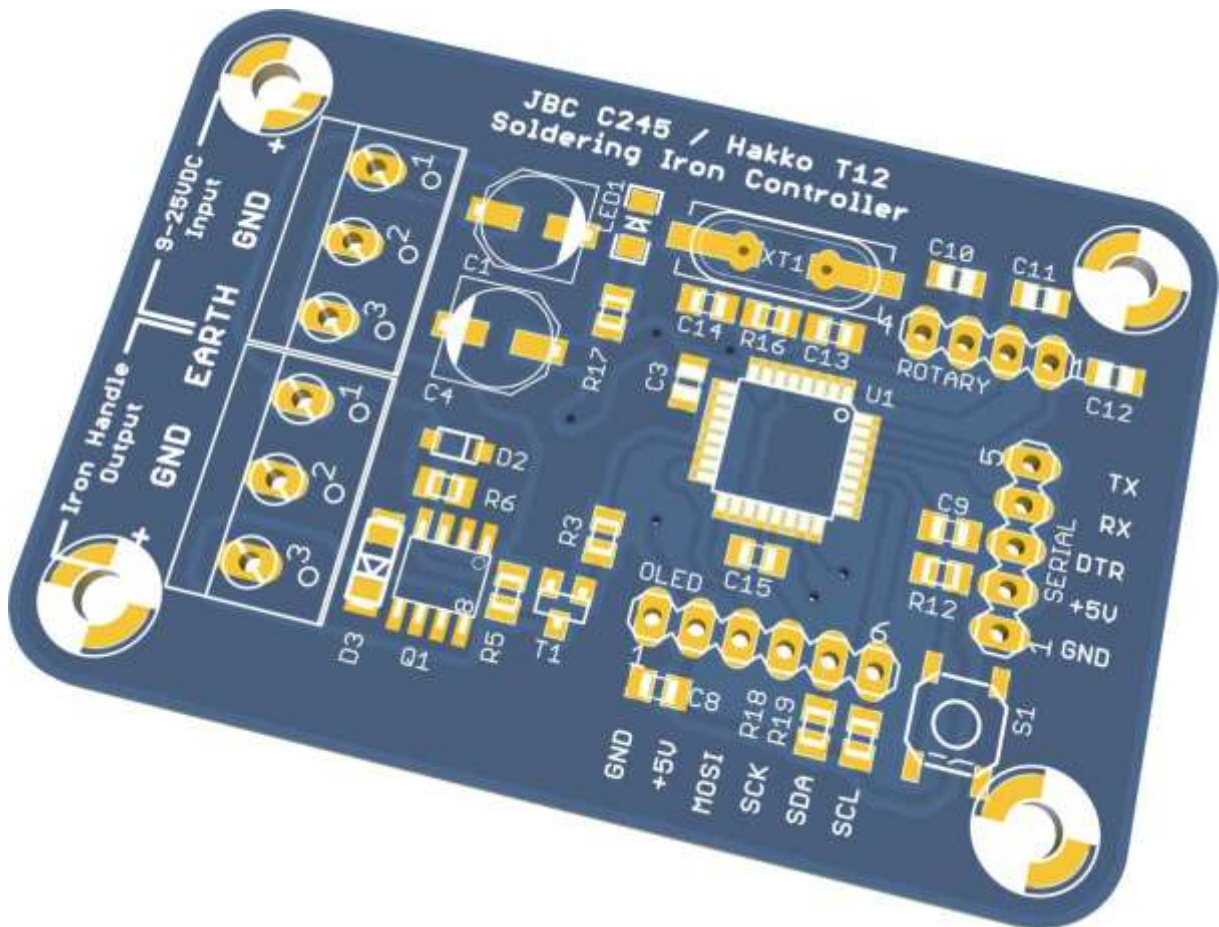# Soldering Iron Controller – The DIY Manual

V1.5

For PCB Code: SY9

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Thank you for choosing this soldering controller. This document will guide you on getting the working controller from the populated PCB.

Your populated PCB is electrically and functionally tested using our testbed and shipped in working condition.

Please use proper ESD handling procedures before unpacking the PCB. The PCB contains multiple ESD-susceptible devices on it and may become damaged if not properly handled.

What you need

A soldering iron: It is needed for terminal blocks, pin headers and iron handle connector.

Hardware:

- 128x64 OLED screen module with SSD1306 controller
  - The controller supports both I2C and SPI OLEDs. Just make sure the controller is SSD1306.
- EC11 Rotary Encoder with push button
- 6 pin terminal block, 5.08mm pitch
  - For iron handle and power connections.
- Male pin headers, 6 + 4 + 4 pins
- Female to female jumper cables, for OLED and rotary encoder.
 - Also known as "Dupont wires"

Power supply: Use 9-25V DC supply capable of delivering 9A peak. 24V is recommended for maximum performance. Don't use very long power cables for reducing power dissipation and EMI.

For JBC T245 handles/tips: The mating connector for original handle is Hirose RPC1-12RB-6P(71). You can get it from Farnell/Newark, Mouser or Digikey if needed.

For Hakko T12/T15 handles/tips: This is bit complicated, because these tips (and even the handles) are widely copied. If you want to use original handle (FM-2028) you'll need to get 8 pin DIN connector for it. If you want to explore knockouts, you'll find that every other seller use a different connector. And more importantly (and if you don't notice before plugging it in, tragically), even for the same connector pinouts may differ. If you see something like "air head plug" at the description, the connector it is probably GX12-5.

Assembly

- Start with soldering the pin headers, continue with terminal blocks if they are not already soldered on the PCB.
- Prepare the iron handle connector.
    - **For JBC T245:** We will only use 1st, 2nd and 5th pins. Pin mapping to the PCB is pictured below:
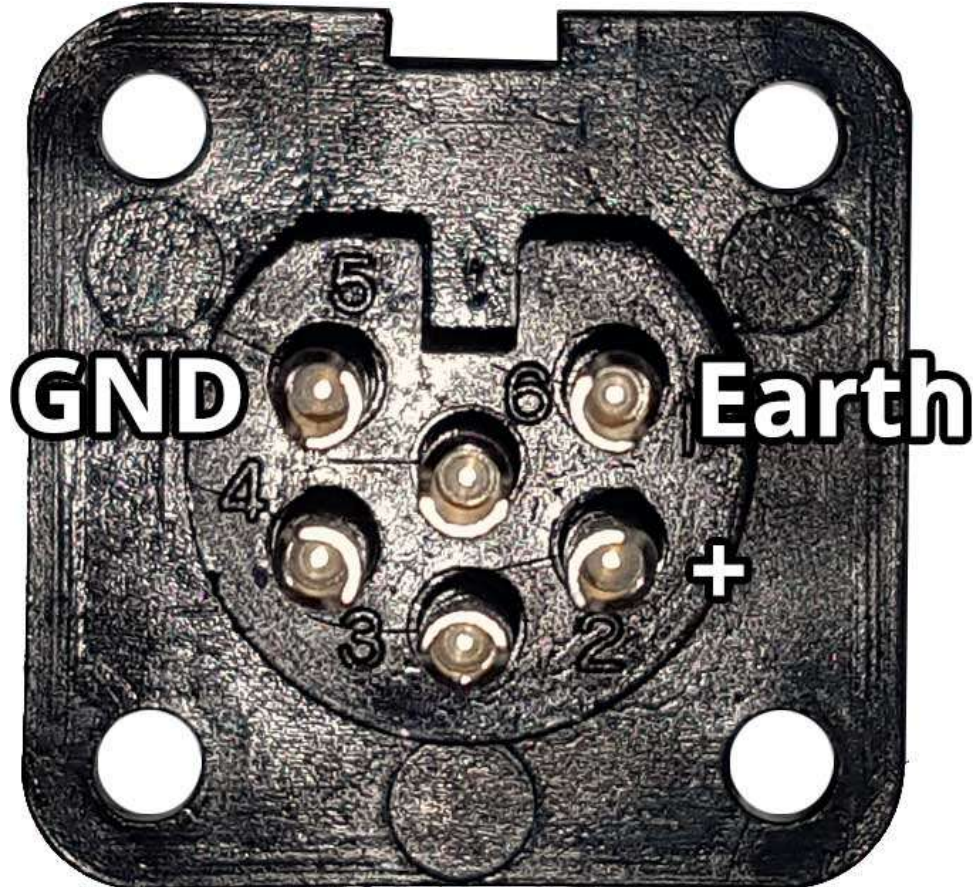
Back Side

Connection to the PCB: 1: Earth / 2: + / 5: GND

- **For Hakko T12/T15:** You must find the correct pinout for your handle, because there is no standard as described above. The most reliable method is describing connections from the tip side. You can find which wire is which easily with a multimeter.

Connection to the PCB: 1: Earth / 2: GND / 3: +

o PCB-side connections for handle (Also can be found on PCB silkscreen)
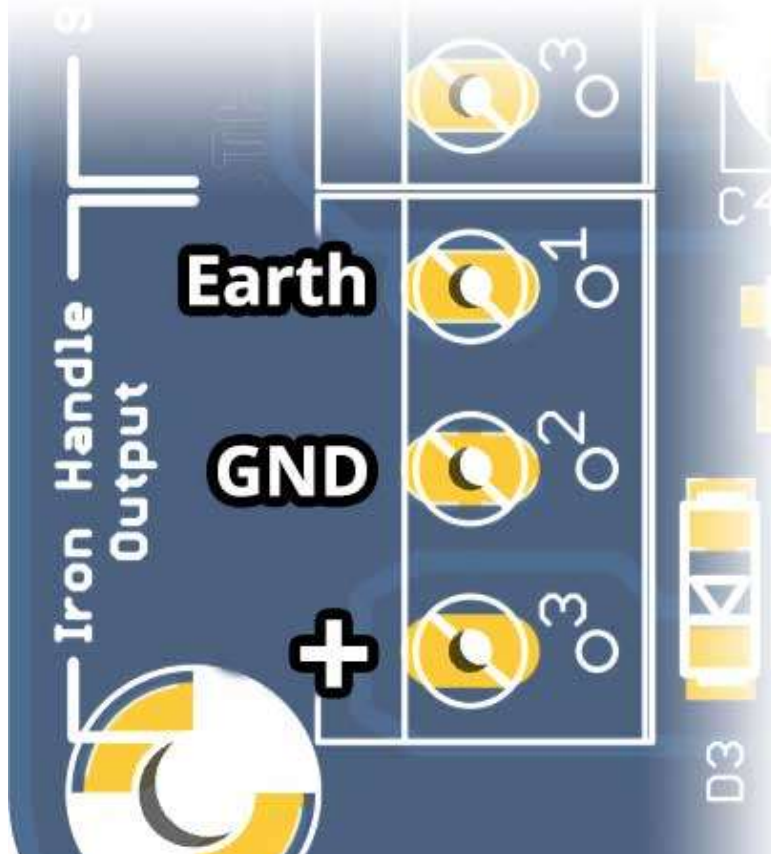
- Connect the OLED display.
  o If your display has I2C interface:
    ▪ We are using pins 1-2 and 5-6. Pin 3 and 4 on the OLED connector should be left unconnected.

On OLED	On PCB
GND	GND (Pin 1)
VCC or VDD or 5V	+5V (Pin 2)
SDA or DAT or DATA	SDA (Pin 5)
SCK or SCL or CLK	SCL (Pin 6)

  o If your display has SPI interface:

| On OLED	On PCB
GND	GND (Pin 1)
VCC or VDD or 5V	+5V (Pin 2)
SDA or DAT or DATA	MOSI (Pin 3)
SCK or SCL or CLK	SCK (Pin 4)
RST or RES	SDA (Pin 5)
D/C or DC	SCL (Pin 6)
CS (if exists)	GND (Pin 1)

- o PCB-side connections for OLED (Also can be found on PCB silkscreen)
- o 1: GND, 2: +5V, 3: MOSI, 4: SCK, 5: SDA, 6: SCL

- Connect the rotary encoder.
  - o Using the breakout board:
    - ▪ Your order will include a complimentary encoder breakout board, but its usage is not required. If it is not already assembled, first solder the 4-pin male header, trim the legs, and mount the encoder on top of that, on the component side, as the breakout board is single sided.
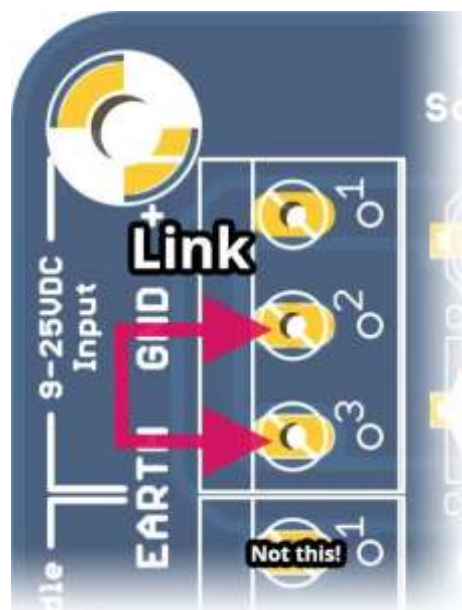   - ▪ When assembled, it should look and connect like this:

- o Not using the breakout:
  - ▪ Connections on encoder side:
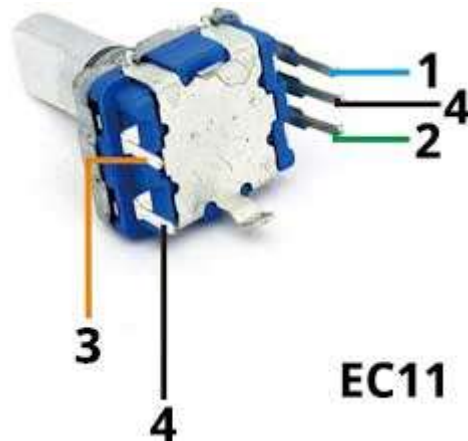
- o Connection on PCB side:

- Connect the shield link.
  - o Install a jumper wire between GND and EARTH inputs.

Note that on JBC cartridges, the shield is not always GND because of the T245 cartridge design. This is normal.

- Connect the power wiring and power switch
  - Wire your preferred connectors for powering the unit. Power input terminals marked with "9-25V Input" on PCB and it is positioned at top left. Please connect the + and GND. Note that there is **no reverse polarity protection.** Reverse polarity **will** result instant destruction of PCB. So **please double check your supply polarity and wiring.**
- **Assembly is now completed.**

Powering on

For the first power on, start with your soldering iron unplugged. Connect a 9-25V DC (with correct polarity) supply. Use a current limited (200mA is enough for testing) lab supply if you have and/or want to be extra cautious. In a second the screen should light up and say "Iron unplugged". If that's the result; congratulations, the controller is alive! Let's start some basic tests and settings:

- Try the rotary encoder. If you press it, settings menu should open. Rotate it to left and right in the menu and observe the screen. If you rotate right (clockwise) menu should select the next item & scroll to bottom. If you rotate left (counterclockwise) menu should select the previous item & scroll to top. If all works, the encoder performs properly.
- Set your temperature unit. Controller ships with Celsius preselected. If you prefer Fahrenheit, select it from the "Temperature Unit" menu.
- Set your iron tip type. Choices are JBC C245 and Hakko T12/T15, select it from the "Tip Type" menu.

Now connect your soldering iron. It should detect it and starts to heat immediately. If that's the result; congratulations again. You now have a fully working unit.

Note for T12/T15: If you use a brand new T12/T15 tip, the controller may show erratic temperatures and jumps up/down. Especially if you use a non-original Hakko tip it almost certainly will happen to you.

This is not a controller problem. It is caused by the tips itself. Set it to highest temperature, tin the tip and leave it for 5 minutes (or you can actually use it by the meantime) and it'll fix itself. You need to do only once for a tip.

Troubleshooting

Symptom	Possible cause and solution
Dead with on-board LED off	No power. Check the power supply. Less than 3V supply voltage. Use 9-25V.
No display but iron heats up	Check display wiring. For SPI: Ensure the CS pin tied to LOW. Displays are very fragile and can easily be damaged via ESD. Try with another display.
Buzzing noise is heard	It is normal, to the some extent. Here is the suggestions to reduce it. Use thicker supply wires and heavier duty screw terminals. Screw tightly. Clean iron tip and iron handle contacts. Secure iron tip to handle tightly.
Temperature jumps up and down	Read the note if you are using T12/T15. Clean handle and tip contacts with isopropyl alcohol. Do not touch the contacts with your bare hand after you cleaned it.
Improper supply error with voltage reading	Make sure that input is between 9-25V DC. Input power may not be sufficient. Make sure your supply can supply 8A peak. Use the "Power limit" setting on the menu.
Improper supply error with 0V voltage reading	Check R7 & R8 on board
Iron unplugged error shows when iron is plugged, iron tip is not heating	Check connections, iron handle contacts, measure iron tip resistance, change tip.
Iron unplugged error shows when iron is plugged, iron tip is heating	MOSFET failure. Immediately unplug the controller for prevent damaging the iron tip. Needs repair, contact us for your options.

Hacking

The controller is hackable. We decided to use Optiboot bootloader and that makes it Arduino compatible out of the box. You can develop a custom firmware and upload it to the board with an USB/Serial converter. Select "Arduino Uno" for uploading. Remember to back up the original firmware before all of this, if you want it back after some time.

Here is the MCU pin map for your convenience. MCU is ATMega328P @ 16MHz.

OLED	ROTARY	ADC's	PWM
3: PB3 (MOSI) 4: PB5 (SCK) 5: PC4 (SDA) 6: PC5 (SCL)	1: PD2 2: PD3 3: PD4	Iron temperature: PC0 (ADC0) Input voltage: PC1 (ADC1)	Heater: PB2