OtterX

Quick Assembly Guide

Overview

- The OtterX PCB has been designed to be easy to assemble by people of many soldering skill levels, but it is not well suited to be a first electronics project.
- Give yourself time appropriate to your level soldering skill
  - Those with significant experience generally require 3-4 hours
  - Those with less experience can take up to 12 hours for assembly
- 80-90% of assembled boards come up the first time.
- Take your time! The most common source of errors is going faster than your skill level allows.
- Leave cosmetic issues alone!
  - If a soldering mistake only affects the appearance of the completed project, consider it "character" added to your board
  - Fixing a cosmetic soldering error is likely to damage your board
- Need help? Join us on Discord!

https://discord.gg/cBpKJ8EDAa

Required Items for Assembly

Required tools for assembly
- Soldering Iron / station
- Solder
- Flush or diagonal cutting pliers

Other tools useful for assembly
- Blue "painters" tape or Kapton tape
- Isopropyl Alcohol or flux remover solvent
- Cloths, swabs, or brushes for flux cleanup
- Solder wick / braid
- No-clean solder flux
- IC pin-straightener

Items required for complete computer

1. An ATX style power supply and power adapter
   - A "Pico PSU" is commonly used for OtterX
   - Most Pico PSUs additionally require an external 12V power adapter
2. Monitor or television supporting VGA, S-Video, or composite input
   - A VGA-capable monitor is strongly recommended for first power on
3. PS/2 compatible keyboard
   - Some USB keyboards work with a passive USB to PS/2 "dongle".
   - Many do not. If in doubt, obtain a PS/2 compatible keyboard.
4. PS/2 compatible mouse
   - Same caveats here as with keyboards.

Install Components by Height

- Install the shortest components first.
- General order:
1. Small diodes, resistors, RTC crystal
2. Chips, TVS Diodes, Ferrite Beads, Sockets, Battery clip, audio out receptacle
3. Small capacitors, transistors, inductor, network resistors, switches, oscillators
4. LEDs, Headers, medium-sized caps
5. Large caps, expansion slot, ATX Power, ZIF socket, Fuses, Relay
6. Rear ports: SNES, IEC, PS/2

Diodes

- All diodes without a value are 1n4148 small signal diodes
  - These diodes must be installed with the line on the diode on the same side as the line on the footprint.
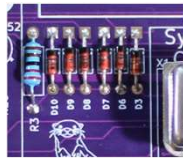
- Diode D2 is the single Schottky diode provided in the kit.
- The TVS diodes may not have a line as shown on the PCB silkscreen.
  - This is the case for the P4KE6.8CA diodes included in the kit.
  - If these diodes do not have a line on their packaging, they are bidirectional and the direction they are installed is not important.

Resistors, capacitors, inductor, crystal

- Resistors may be installed in either orientation
- Electrolytic capacitors (round "canister" type capacitors) must be installed with their negative terminal going to the hole surrounded by solid white silkscreen printing.
- Other capacitors may be installed in either orientation
- The inductor L1 looks similar to the resistors but is green in color and somewhat thicker. It can be installed in either orientation.
- The tiny real-time clock crystal Y1 should be installed lying flat against the footprint on the PCB.

Chip Family Errata

- Some chips have minor labeling errors between the silkscreen and what is provided

Silkscreen Label	Included component
74AHCT20	74ACT20 or 74AC20
74ACT163	74ACT163 or 74AC163
74AHCT10	74ACT10
U26 LM324/TL074	LM324
U22 LM324/TL074	TL074

Audio Errata

1. OpAmp Correction:
   The kit contains 1x LM324 OpAmp and 1x TL074
   Place the TL074 in U22 and the LM324 in U26
   Failure to place the TL074 in U22 may lead to undesired audio output noise.

2. Place the I2S chiplet replacement for YM3012 with the square pins to the left:

3. Notes on the YM2151 and YM3012 replacements
   1. The OPM2151 and I2S DAC may both be replaced by the user with an authentic YM2151 and YM3012.
   2. An authentic YM3012 DAC will work with the OPM2151 by removing the solder bridge on the "I2S Mode" jumper on the bottom of the chiplet.
   3. The I2S replacement for the YM3012 will not work with an authentic YM2151.
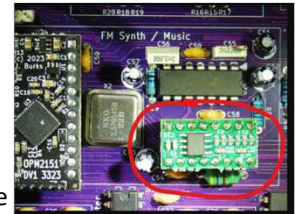
Tips for soldering chips

- **Do NOT attempt to desolder a completely soldered IC or socket intact!**
  - Doing so requires special skills and/or equipment
  - A spring-loaded "solder sucker" or solder braid generally will not work
  - If the soldering error is a cosmetic issue only, it is better to leave it
- Consider a chip leg straightener if you are having trouble inserting the ICs because of the angle of the legs
  - 3D Printable chip leg straightening tool files are available on the internet for free
- When soldering ICs or sockets
  - Double check pin 1 and/or orientation matches the silkscreen
  - Start by soldering the two opposite corner pins first
  - Flip the board over and correct fit if necessary
  - Solder remaining pins
- Without proper tools or desoldering skills, incorrectly soldered ICs *must* be replaced:
  1. Cut off the IC body from the legs
  2. Remove the legs one at a time
  3. Clean holes of solder using braid or a solder sucker
  4. Install a new IC

Take your time! Soldering mistakes can be difficult and time consuming to fix and may permanently damage your board!

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Sockets

Using the included sockets is optional but recommended. The kit contains:

- 2x 40 pin sockets
  65C02 (allows easy upgrade to 65C816) and 65C22 (allows replacement of blown VIA)
- 1x 32 pin socket and 1x 32 pin ZIF socket
  For the ROM. User's choice as to low profile socket or ZIF
- 1x 24 pin socket
  YM2151/OPM2151; allows easy swapping of OPM2151 for genuine YM2151
- 1x 16 pin socket
  YM3012/I2S DAC; allows easy swapping of I2S DAC for genuine YM3012
- 1x 8 pin socket
  System clock oscillator – requires cutting the four inner legs. Allows easy overclocking using faster oscillator.
  It is not recommended to use the 8 pin socket for the MCP7940N real time clock.
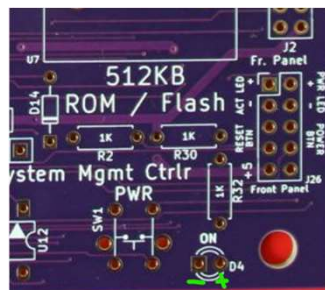
Do not socket the "Bus Decode", "BANK Register", or "$00/$01 Write Detection" chips

- Doing so will prevent the memory expansion module from sitting flat if that board module is added later.

LEDs

- The short leg of the LED is the negative side
- The square hole on the PCB is the negative/GND contact
- Solder the LEDs with the long leg inserted into the round hole

Network Resistors

- The network resistors will have a small circle printed on them to indicate the location of pin1
- Place pin 1 of the network resistor into the single marked hole of the network resistor footprint

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Double check the transistors

- The 2n7000 transistors have a fine 1.27mm pitch between their pins.
- Double check these with a magnifying lens if necessary to ensure that none of the pins are not bridged.
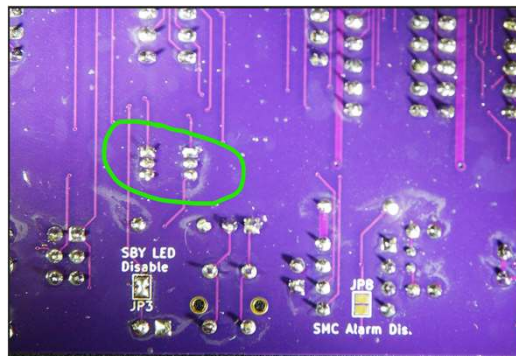
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Installing VERA's standoff posts

- There are 4 nylon spacers provided to use with the 18mm brass standoffs for holding VERA.
- These spacers are needed so that the VERA PCB is not flexed when the screws holding it are tightened.
- It is recommended to install the spacers between the board so that if VERA is removed, the spacers are not lost.
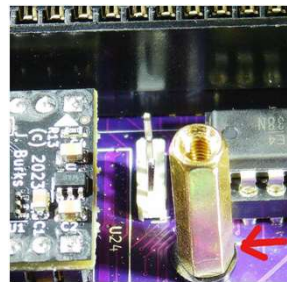
Finishing up

- There is a blank PCB "rail" on the left and right sides of the board that is only needed for wave soldering or dip soldering. The rails are scored so that they may be "snapped" off. The board may not fit a Mini-ITX case until the rails are removed.
- The small 2mm jumper must be installed on J27 between the center pin and the "Dis" (external RAM disable) pin.
  - Failure to install a jumper correctly on J27 is the most common cause of a blank screen during first power on.
- A jumper on J25 should be installed between the center pin and the "Sys" (System power) pin
- A jumper on J14 is optional. Having no jumper on J14 protects the ROM from accidental overwrite.

Power On

- If everything is connected correctly, the "SBY" (standby power) light should come on when the ATX power supply is energized.
- The relay K1 should audibly "click" when the power button is pressed.
- The keyboard "Num Lock" light should illuminate and remain illuminated after powering the system on.
- LED D4 will illuminate when the main 5V rail from the PSU is providing power.