Super 8 bit v4.1PCB Assembly Guide

To assemble the Super 8 bit you will need:

- Super 8 bit motherboard
- All Digikey parts listed in the B.O.M.
- CPU and PPU (picture processing unit) removed from original NES
- 2 NES controller ports
- 72 pin 2.5mm pitch NES cartridge connector
- 60 pin 2.54mm pitch Famicom cartridge connector

For improved video output:

- NESRGB by Viletim adds RGB, s-video, composite: https://etim.net.au/shop/shop.php?crn=203&rn=522&action=show_detail

The Super 8 bit can be assembled as a NTSC console or a PAL compatible console depending on the CPU / PPU chipset and crystal. Since the Super 8 bit has no region lockout, this only affects CPU speed, sound frequency, and video output. A Super 8 bit system built with the PAL chipset may be incompatible with some Famicom accessories.

NTSC (North America, Japan)

- CPU: RP2A03 (original) or UA6527 (clone)
- PPU: RP2C02 (original) or UA6528 (clone)
- 21.47727 MHz crystal (Mouser part # HC49US-21.47727-MABJ-UB)

PAL (Europe)

- CPU: RP2A07
- PPU: RP2C07
- 26.601712 MHz crystal (removed from original NES)

Note: Using the clone chips may be cheaper and easier, but I do not recommend them. Compatibility is questionable and there are sound glitches.

Be careful when desoldering CPU and PPU chips from a Nintendo system, as the NES PCB does not have thermal traces on the ground pins and these require extra heat to desolder. I simple solder pump removal tool and high wattage soldering iron can be used, but a quality desoldering station will make this job much easier.

There are 2 options for assembling the Super 8 bit's video output circuit:

1. Standard composite video only

This is the easiest way to assemble the Super 8 bit and provides improved composite video output over an unmodified NES system. Using dual wipe 40p sockets is recommended for the CPU and PPU. Jumper J1 must be bridged to enable the built-in compostie video circuit.

2. NESRGB installation for RGB, s-video, and composite video output
Installing the NESRGB provides RGB, s-video, and composite video output. Component video output can be added with an optional add-on board available from the same supplier. Refer to these instructions for assembling the NESRGB: https://etim.net.au/nesrgb/installation-nes/

40 pin IC sockets can be used for the CPU and PPU if tall machine pins are installed in the NESRGB instead of the ones included. A dual-wipe socket IC can be installed in U6 and the NESRGB, with a precision IC socket in U5.

The extra 5v regulator included with the NESRGB is not needed. The Super 8 bit's 5v regulator can handle the additional current draw of the NESRGB.

Refer to the NESRGB install guide and bridge the correct jumbers for this install. If your NESRGB is v4.0 or later, palettes and and system reset can be controlled with the player 1 controller. On the Super 8 bit, use the 5 pins between controller ports for the reset, data, latch, and clock connections. The super 8 bit is reset when the "RST" pin is pulled low.

The red, green, and blue signals must be tapped off the BH7236AF encoder chip on the NESRGB rather than the usual connection points. On the enconder chip, red is pin 23, green is pin 22, and blue is pin 21. There are 5 open solder pads on the NESRGB in an "L" layout; 3 of these are used for the red, green, and blue connections.

Video output connections from the NESRGB connect to a 8p JST connector near the s-video jack.

Super 8 bit audio circuit notes:
The Super 8 bit does not mix the 2 sound outputs coming from the CPU chip, allowing stereo sound. Potentiometers allow independent gain adjustment for each sound channel; turning clockwise increases gain. The recommended starting point for audio potentiometer adjustment is midway; channel 2 is weaker and needs to be adjusted with more gain.

Auxiliary sound is input from cartridge slot pin 54 and mixed with channel 1 (left audio). Channel 2 is output to right audio.

Famicom microphone circuit notes:
The optional Famicom microphone circuit's sensitivity is adjustable with the "MIC ADJUST" potentiometer. A LED indicates when the sound level is high enough and the microphone input is active. The microphone should be adjusted to flicker the LED rapidly when the desired volume level is reached.

Usage Notes:

Remember that Famicom games are inserted with the label facing the back of the

system.

Component substitution:

U2 and U3 have two options: 74HC373 and 74HC139 are in the BOM, but a 74LS373 and 74LS139 can also be used (original NES system uses these.)

Memory chips can be substituted if they have the following specifications: Asynchronous SRAM, 32K x 8 or 2K x 8, parallel interface, 5v, 28-DIP or 24-DIP, 0.6" width, compatible pinout. Using 2K memory chips requires two lifted pins and jumper wires.

Potentiometers can be substituted if they have the same size, pin layout and value.

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