



# Prophet 600 GliGli mod

Created by Collin Cunningham



<https://learn.adafruit.com/prophet-600-gligli-mod>

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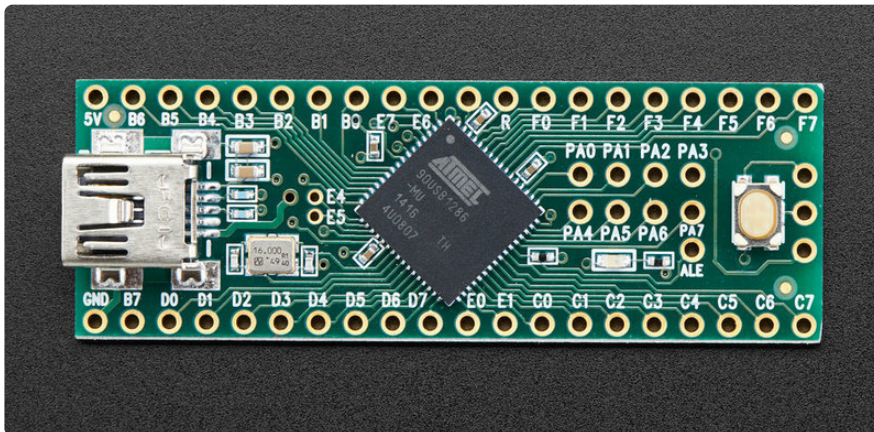
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# Overview



The [Sequential Circuits Prophet 600](https://adafru.it/Ciu) (<https://adafru.it/Ciu>) is a 6-voice polyphonic analog synthesizer released in 1982. It was the first commercially available synth to include MIDI functionality. The 600's analog voice's are controlled by a Zilog Z80 CPU. Though state-of-the-art at the time of its release, the Z80's specs means the synth feels limited and slow to respond to changes compared to modern instruments.



Luckily, synthesizer enthusiast & engineer [GliGli](https://adafru.it/Cix) (<https://adafru.it/Cix>) has written [new firmware](https://adafru.it/AmQ) (<https://adafru.it/AmQ>) for the Prophet 600, designed to run on a [Teensy++ development board](http://adafru.it/731) (<http://adafru.it/731>). Replacing the 600's Z80 with a Teensy++ running GliGli's firmware adds a long list of features to the classic synth, including:

- Increased resolution for sound parameters
- Faster, smoother amplifier and filter envelope generators
- New LFO function generator with a wider range
- Dedicated vibrato
- Unison detune
- Mix Overdrive
- Full Midi In control of parameters

- Improved tuning procedure

Swapping out the Z80 for the Teensy++ is a relatively simple process, and can easily be reversed if you decide you prefer the 600's original functionality. Some basic modifications will need to be made to the Teensy++ board before usage.

Warning: By performing this modification, you take the life of your Prophet 600 in your own hands. Take your time and be careful with your vintage synthesizer!

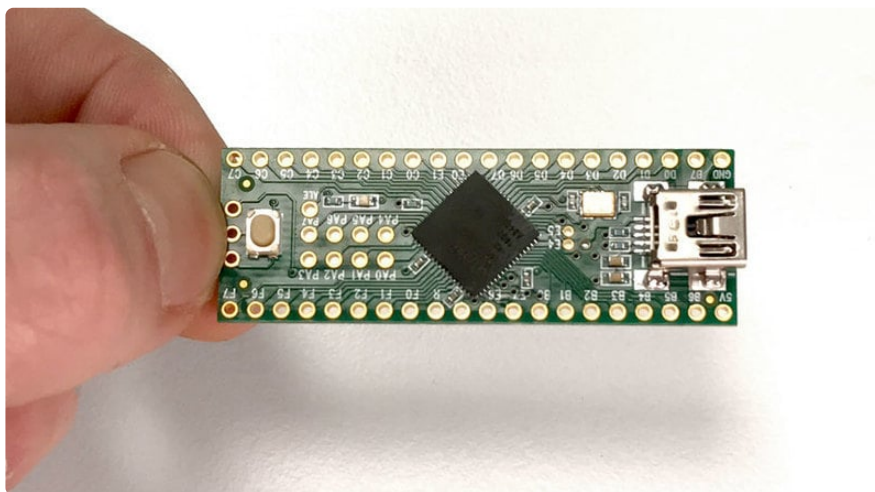
## What you'll need

- Prophet 600 Synthesizer
- [Teensy++](http://adafru.it/731) (<http://adafru.it/731>)
- [Solid core jumper wire](http://adafru.it/1311) (<http://adafru.it/1311>)
- [IC puller/extractor](http://adafru.it/1598) (<http://adafru.it/1598>)
- [Soldering iron](http://adafru.it/180) (<http://adafru.it/180>) & [solder](http://adafru.it/1886) (<http://adafru.it/1886>)
- [Needle nose pliers](http://adafru.it/1368) (<http://adafru.it/1368>)
- [Solderless breadboard](http://adafru.it/64) (<http://adafru.it/64>)
- [Mini USB cable](http://adafru.it/260) (<http://adafru.it/260>)
- X-acto knife or razor blade
- Conductive foam & antistatic bag (for storing old microcontroller)

Once you have all tools & materials ready, we can move on to programming the Teensy++.

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## Program the Teensy++



To program the Teensy++, you'll need to install the **Teensy Loader** application via instructions [available here \(https://adafru.it/xSA\)](https://adafru.it/xSA).

Once the Teensy Loader is installed, download the stable version of **GliGli's firmware** here:

**GliGli's P600 firmware**

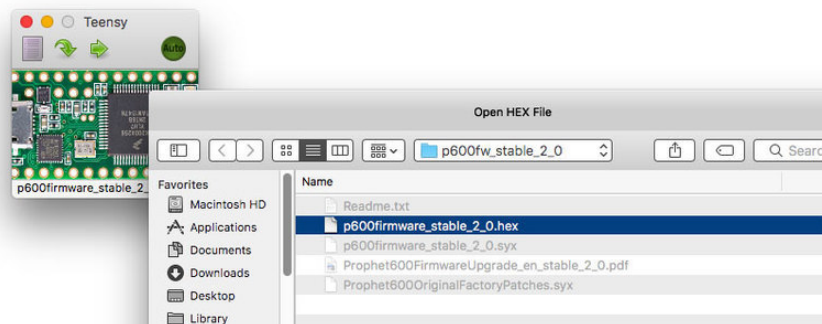
<https://adafru.it/AmQ>

Unzip the firmware zip file and locate the .hex file within the resulting folder - this is what we'll be uploading to the Teensy++ ...



Connect the **Teensy++** to your computer via micro USB cable and launch the **Teensy Loader** application.

Press the **reset button** on the Teensy++ and then click the grey **Open Hex File** button in Teensy Loader.



Choose the p600firmware .hex file, and then click the curved arrow **Program** button.

Once the programming process is complete, disconnect the Teensy from your computer. We can move on to modifying the board.



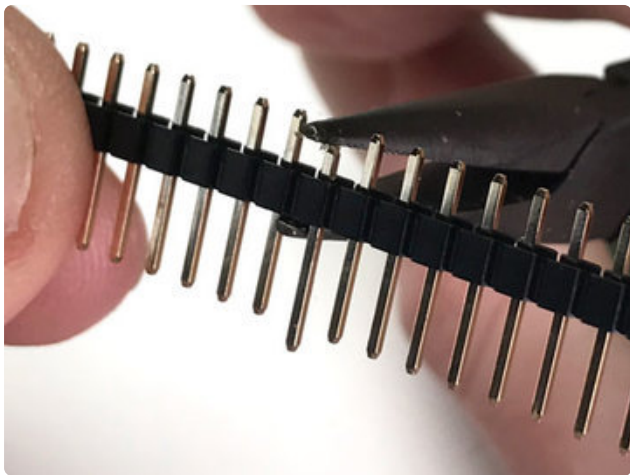
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# Modify the Teensy++

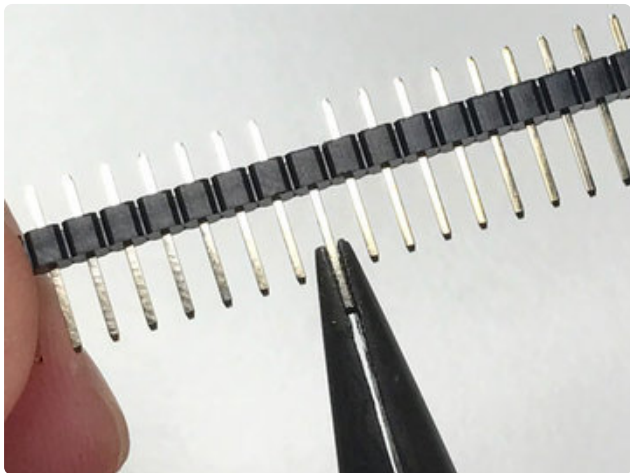
## Prep header pins

The Teensy++ comes with two 10-pin strips of **male headers**. We'll need to make one modification before soldering them to the board.

To ensure **pin 30** of the Teensy++ does not connect to the Prophet's PCB, we'll need to remove the **tenth pin** from one of the strips. An easy way to do this is to simply pull the pin from the header strip before soldering.

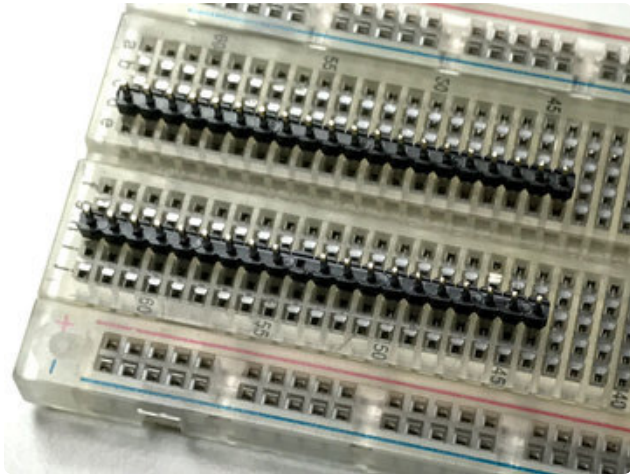


Locate the **tenth pin** of one of the header strips by counting pins inward from one side.

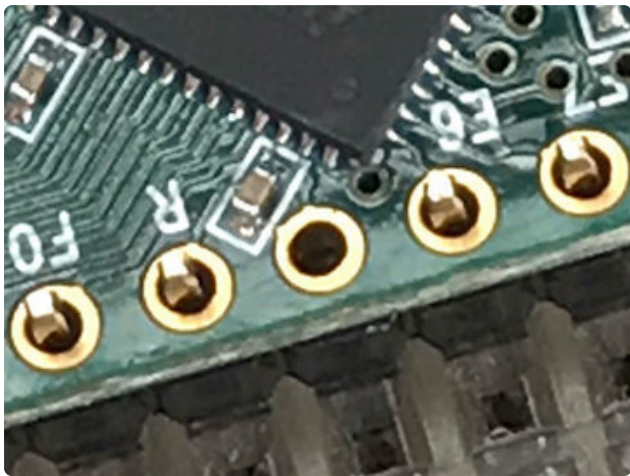


Use a pair of **needle nose pliers** to remove the pin from one of the strips, as seen on the images to the left.

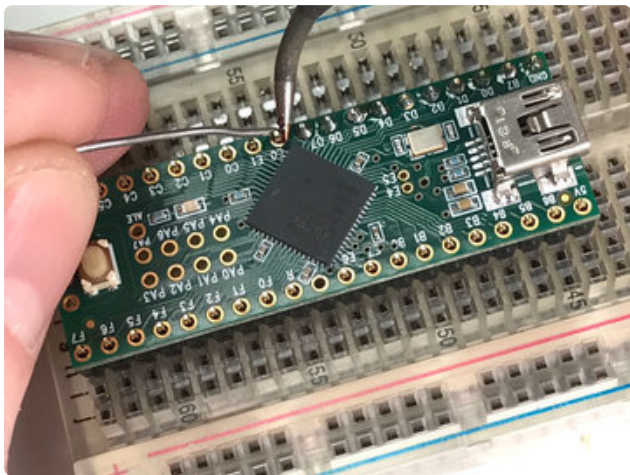
# Solder pins to the Teensy++



Insert the header strips into a solderless breadboard to keep them stable while soldering.



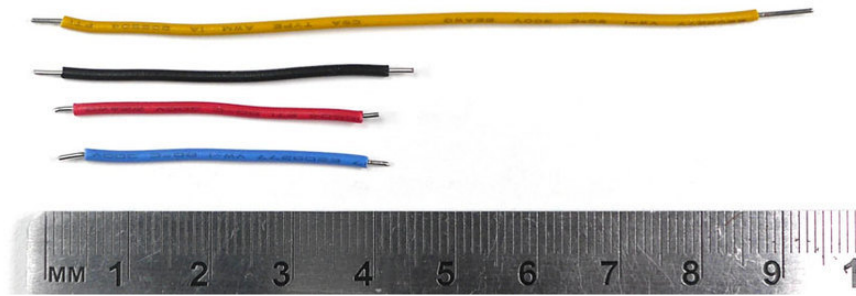
Mount the Teensy++ on top and **ensure you have it oriented correctly** with pin 30 empty. Pin 30 is the unlabelled pad between the pads labelled "E6" & "R" (see image).



Solder all pins, taking care not to let any solder bits stray onto the Teensy++.

## Teensy wiring

Next up, we'll solder some connections on the Teensy++ using jumper wire. Cut 3 pieces of ~4.5cm and one of ~10cm length and strip the ends as seen below.

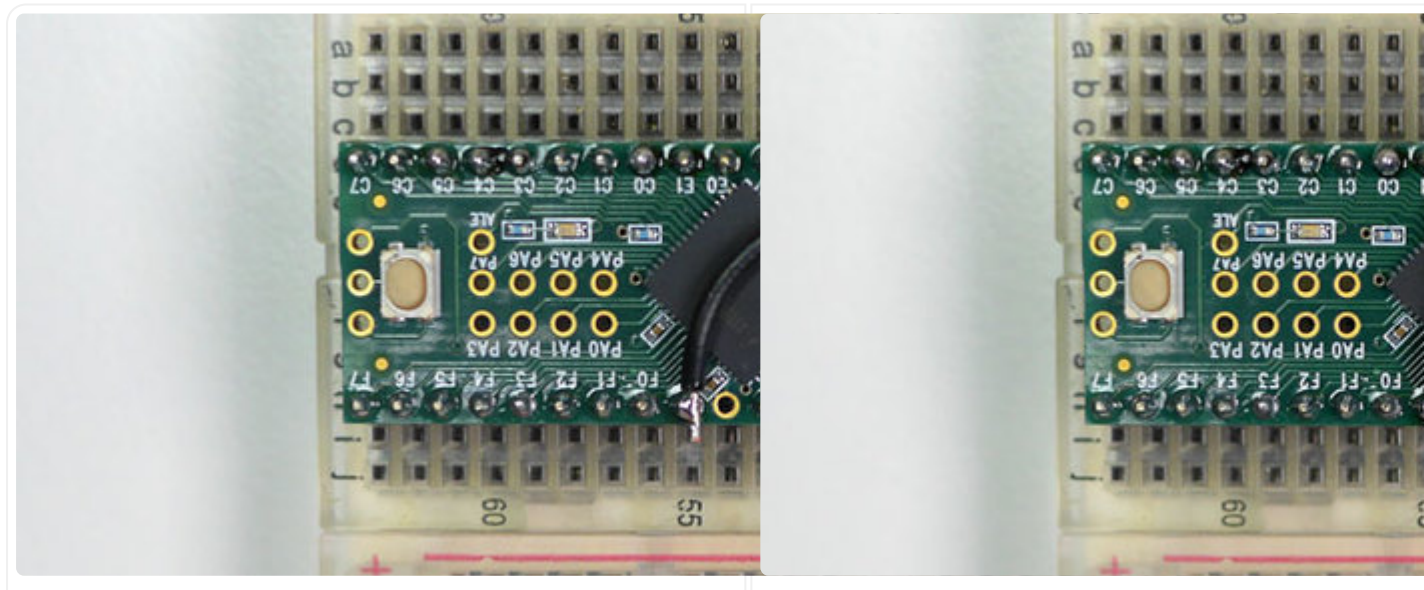


We'll use the shorter jumper wires to connect the following pads on the Teensy:

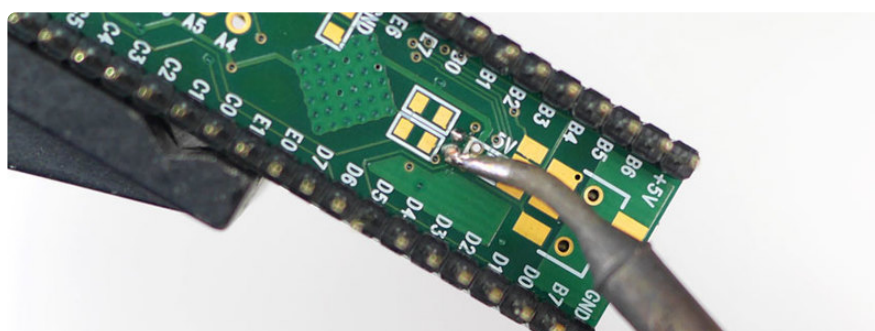
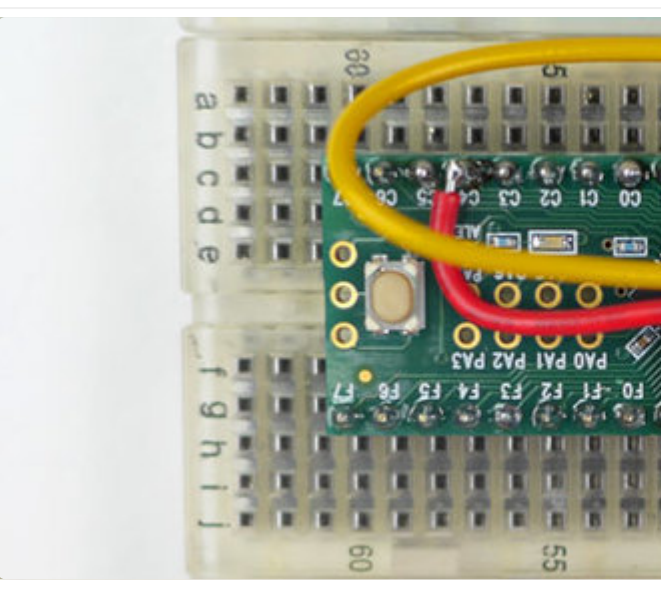
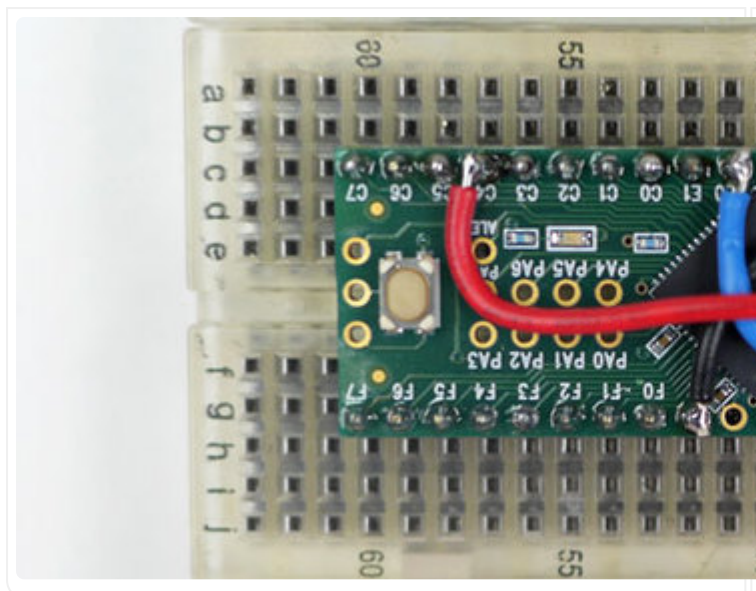
- **GND** to **R**
- **E0** to **5V**
- **E4** to **C4**

The remaining long wire will be used to connect the **E5** pad to a socket contact on the Prophet 600's PCB.

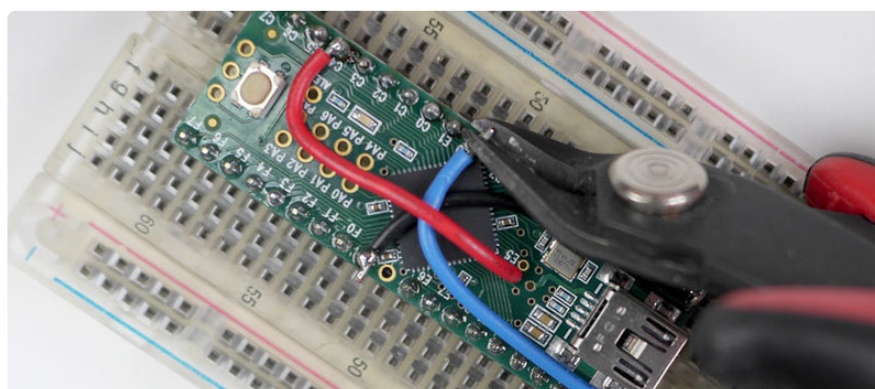
Solder the short wire connections listed above, then solder the **longer** wire to **E5**.







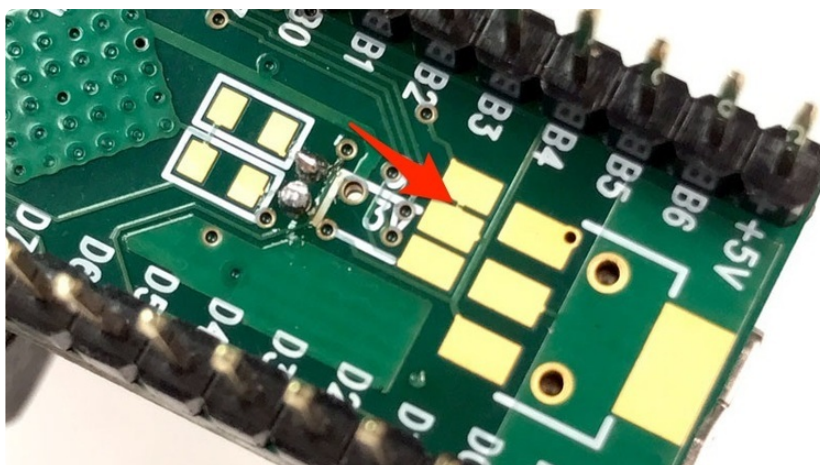
Note that connecting to the **E4** and **E5** pads will require turning the board over and soldering to pads on the underside.



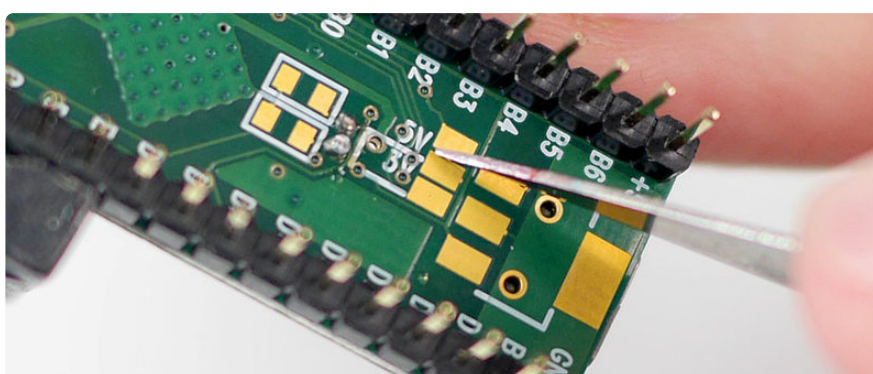
After soldering, trim any excess wire leads to keep things nice and tidy.

## Cut the 5V connection

Finally, we'll need to cut the tiny trace connecting to **5V** on the underside of the board.



Locate the 5V trace and carefully cut it using an x-acto or razor blade.



You can check to ensure the cut is successful using a **multimeter's continuity mode** or simply examine it using a **magnifier loupe**.

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## CPU Transplant

Now we're ready swap the Prophet 600's Z80 chip with the Teensy board.

Ensure the Prophet is powered down and remove the power cable. Open the Prophet by removing the screws on both wooden end panels.

## Remove the Z80

Once the Prophet is open locate the **Z80** near the lefthand side of the main PCB.





The Z80 chip we need to remove is located below the large yellow capacitor.



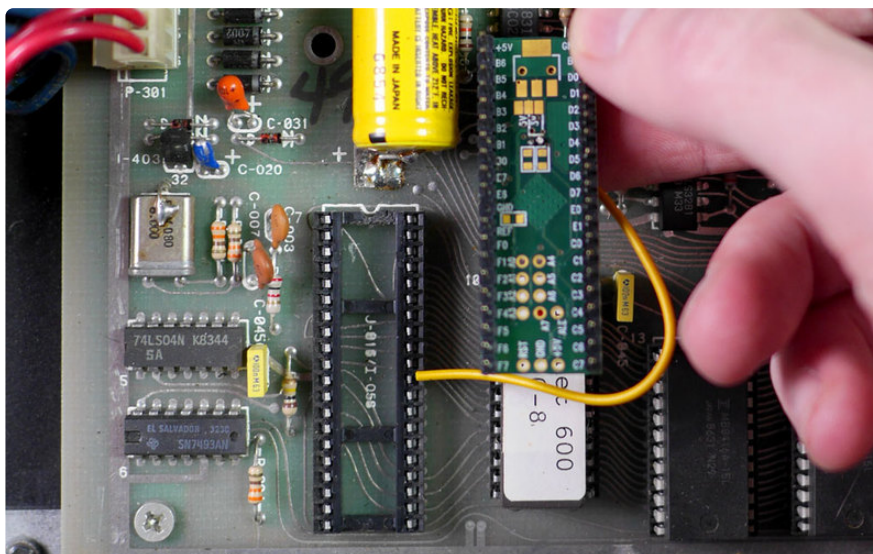
Place the jaws of your **IC extraction tool** firmly around the **Z80**, gripping it at both ends. You'll need to rock the chip back and forth to free it from the socket, but we want to **avoid bending its pins**.

Slowly pull the chip upward, alternating force slightly between both ends.



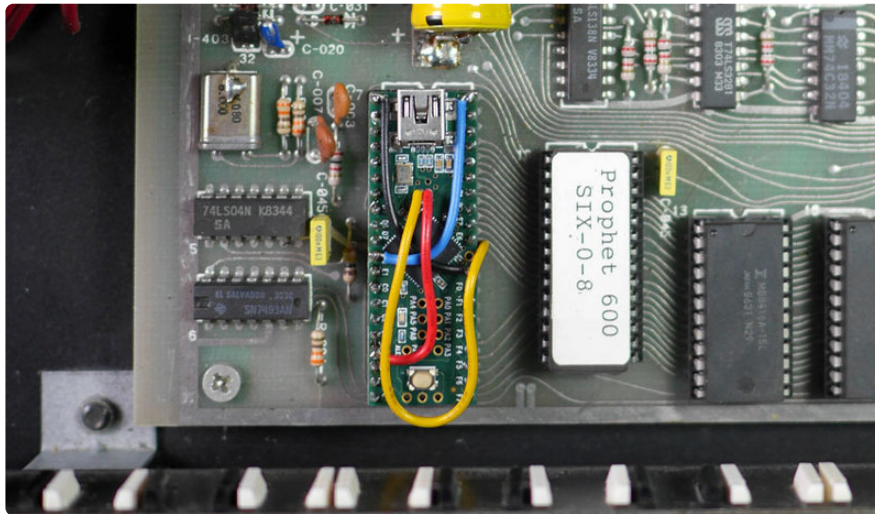
Once the chip is free, place it on a piece of **conductive foam** and store it in an **antistatic bag**. You can reinstall it later if you decide to revert the synth to its original state.

## Install the Teensy++





Insert the Teensy's long wire into the **pin 30 contact** of the exposed socket. It's the **tenth one up from the bottom on the right side** of the socket - it corresponds with the pin we removed from the Teensy's header strips.



Align the Teensy's pins with the socket and press it firmly down into place. Once its in, confirm that the pin 30 wire remains secure in the socket as well.

If everything looks good, close the panel and replace the screws on both of the Prophet's wooden end caps.

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## Use It



Connect power to the Prophet and turn the unit on. On startup, the synth will begin the tuning process and you'll see different note numbers cycle through the red LED display.

After the tuning process is complete, you'll see the "GliGli" title scroll across the display and then the synth will be ready to use.

## Changes



Most of the potentiometers and switches will work as they did before - the biggest change you'll notice involves the **Mixer** and **Glide** controls. These have now been assigned to **Oscillator A** and **Oscillator B** levels respectively. This change allows the oscillator levels to be set independently and overdrive the synth's amplifier.

## Presets

The new firmware doesn't include any presets. You'll either need to make your own or upload a new set of presets over **MIDI** using a **SysEx** software tool such as [MidiOx \(https://adafru.it/nkF\)](https://adafru.it/nkF). GliGli's firmware download includes a **.sysex** file which includes recreations of the Prophet's original presets.

## Learn More

The new firmware includes many functions which require keypad usage to access. Consult GliGli's PDF guide (included with [firmware download \(https://adafru.it/AmQ\)](https://adafru.it/AmQ)) to learn how to use them all.