MIDIdocs

Building a SEQ V4

Forum Discussion Thread - for comments, corrections, or questions about this article

If you're new to the MIDIbox universe, you might be a bit confused about how to actually build one of these things. What PCBs and parts you'll need, where to get them, etc.

All of the MIDIbox projects are fairly advanced DIY projects. If you have no experience soldering and sourcing parts for an electronics project you may want to start with another more straightforward DIY electronics project. Building a Mutable Instruments Shruthi-1 synth might be a good place to start - they're fairly beginner-friendly.

Hawkeye has put together a very detailed photo tutorial on how to build a SEQ V4 with Wilba's Frontpanel in the forums. You should check that out.

Basic Components

Most of the various MIDIbox devices are composed of a Core module and a control surface. The Core module is the “brain” of the device. That's where the microprocessor and firmware that runs the device live. The most recent core is the CORE_STM32F4 Module. Prior to that, the CORE_LPC17 Module was used. You can build a SEQ V4 with either the STM32F4 or the LPC17 core. The STM32F4 core is faster and has more onboard memory than the LPC17. It's also cheaper to build. If you're building a SEQ now, you may as well use the STM32F4 core.

The SEQ's core is connected to a control surface. The SEQ is extremely customizable, and it's relatively easy to design your own frontpanel and configure the MIOS32 (MIDIbox Operating System) software that runs the SEQ to fit a custom-designed control surface.

But if you're new to MIDIbox, you probably don't want to design a custom control surface. Wilba has designed a control surface for the SEQ, commonly known as the "Wilba Frontpanel". It has become the standard control surface for most MIDIbox SEQ V4s. If you're new to MIDIbox, you should probably use Wilba's Frontpanel.

You will also need two 40×2 LCD displays, cables to connect the PCBs and the LCDs, as well as the parts required to populate the Core and Frontpanel PCBs.

Most people power their SEQ V4s using the SEQ's USB connector, taking power from a computer or a powered USB hub. If you like, you can use other power options, but the USB option is the most straightforward.

So, to build a basic MIDIbox SEQ V4, you will need:

- Either a CORE_STM32F4 (with MIDI I/O board) or a CORE_LPC17 PCB;
- Wilba's Frontpanel PCB;
- Two 40×2 LCD displays;
- IDC Ribbon cables and connectors to connect the PCBs and LCDs; and
- the parts required to populate the PCBs.

Parts - Bills of Materials

BOMs for the Core modules can be found on uCapps.de: CORE_STM32F4 and CORE_LPC17.

The BOM for the Wilba Frontpanel can be found here.

You can buy your parts wherever you like to buy parts. Reichelt and Farnell are apparently good in Europe. Mouser and Digikey are the big ones in the US and Canada. Tayda Electronics or eBay can be good sources for cheap parts as well.

MIDIbox-shop.com

MIDIbox-Shop.com is run by SmashTV (Tim), a longtime member of the MIDIbox community. PCBs for many MIDIbox projects are available there. Kits are also available for some projects, and he offers some commonly used parts for sale as well (like MIDI jacks, IDC connectors, LEDs, Encoders, etc.). MIDIbox-shop's prices are extremely reasonable - seriously, you won't beat their prices by much, if at all. Tim must be selling all this stuff at very close to cost.

It usually does take some time to receive your order from MIDIbox-shop.com. Tim's busy with other things, and given the low prices in the store, I'm sure he's not raking in the cash from this venture. Place your order, and be patient. It may take anywhere from three weeks to a couple of months to get your order (but you will get it eventually.) Tim posts order/shipping status updates here.

You'll want to buy either (a) a Core STM32F4 + MIDI_I/O Module PCB; or (b) a Core LPC17 Module PCB, as well as a SEQ_CS PCB (Wilba's Control Surface Frontpanel). You'll also probably want to get 17 rotary encoders, some IDC connectors and ribbon cable, some midi jacks, and maybe some LEDs from MIDIbox-shop.

If you don't see some of the required PCBs listed in the shop, then SmashTV is probably out of stock and has removed them from the list until he gets more stock. For example, at the time I'm writing this, he's out of stock on the Wilba Frontpanel CS PCBs. You could go get your own PCBs made somewhere else on your own, or maybe you'll just have to wait. Patience is a virtue in MIDIbox land.

Wilba Frontpanel Parts Bulk Order

SmashTV also runs a bulk order for the parts required for Wilba's Frontpanel. I'm not entirely sure how this works, since I sourced my own parts. But I hear the bulk order is still ongoing. Check this page for more information. I think you have to contact SmashTV on the forums to be added to the bulk order list.

LCDs

You need two HD44780 Compatible 40×2 LCDs. You can find cheap LCDs on ebay or from BuyDisplay.com. Or you can get all fancy and use OLEDs or VFDs if you want. The SEQ is a great device - it deserves some decent displays... But you can always add them later. Since they're just connected by IDC cables, it's very easy to switch displays. I used Noritake CU40025-UW6J VFDs.

Case

You don't need a case. My SEQ V4 is currently just a couple of bare PCBs mounted on standoffs on a piece of plexiglass... Build costs go way down if you don't need a case. I'll probably build a case for mine once I finalize its configuration, and decide what add-on modules I want to incorporate, etc. But if you want to cut your build costs, foregoing a case will really save you a lot of money.

If you want a case, there are many options available. If you build Wilba's Frontpanel with the switches and caps specified, there are laser cutter templates that you can send off to your favourite laser cutting establishment. Sometimes there are group buys organized for aluminum or other fancy cases. Check the forums.

Build Instructions

Build Instructions for the Core modules can be found on uCapps.de:

- CORE_STM32F4
- CORE_LPC17

There is also a lot of useful information in the SEQ User manual's Hardware Options page.

Build instructions for the Wilba Frontpanel can be found here.

Basically, build your Core and Frontpanel PCBs, then make two 16 Pin IDC Ribbon cables (to connect your LCDs to the core) and one 10 Pin IDC ribbon cable (to connect the frontpanel to the core). Search for “how to make IDC cables” or something if you're confused about that.

If you're using the CORE_LPC17, you'll also have to make a SD card connector, as described here. The STM32F4 Core has a built-in SD Card slot.

If you're using Wilba's Frontpanel or some custom layout, the SEQ won't work if you don't put a hardware configuration file on the SD Card that assigns the buttons and LEDs. You'll need to put this MBSEQ_HW.V4 file in the root of the SD Card. If you're using a custom frontpanel, you'll have to write a custom MBSEQ_HW.V4 file, but if you look at the file linked above, you'll see it's pretty well commented. If you're building your own frontpanel, you'll probably be able to figure out the config file.

You'll have to flash the MIOS32 (MIDIbox Operating System) firmware to your Core. Download the latest SEQ V4 firmware. Choose the right version for your MIDIbox Core. Unzip the firmware, and upload the project.hex file from the zip to your SEQ using MIOS Studio.

Adding Modules to the Basic SEQ

There are many modules that you might want to add to your SEQ after it's built. For example:

- **TPD ("Track Position Display") Module** - Displays BPM and a LED matrix display to show the position of each track. Also provides a rotary encoder for tempo adjustment, as well as four extra assignable buttons and LEDs.
- **QUAD MIDI IIC Module** - adds four extra MIDI ports to your SEQ. More info here.

- **AOUT_NG Module** - adds 8 channels of CV out for interfacing with modular equipment.

...and many more. These modules integrate pretty effortlessly into the SEQ. Just plug them into the right IDC connector on your Core. The Quad MIDI IIC, for example, is 100% plug-and-play. The TPD module requires a few simple adjustments to your MBSEQ_HW.V4 file. I believe the AOUT does as well, but I haven't built it yet. Anyway, the MIDIbox framework is really incredible - these modules more or less “just work”.

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Last update: **2014/09/18 02:13**