this page contains redundant informations and needs a general cleanup!

Summary

This page is to contain information for people who are unfamiliar with either MIDI, electronics or programming and to provide them with a launching pad. New users are encouraged to read the following WIKI pages:

- What is a MIDIbox
- Introduction to uCApps.de
- Questions and Answers
- Forum Netiquette

Comments, Questions?

This page is a WIKI entry, that means EVERYONE is welcome to make corrections, changes and additions to it. Don't hesistate if you have something to add. If you have a quesiton or comment about this document head over to the forum and post here:

Contents

What is MIDI?

Ok, so if you've found this site you probably already have some idea of what MIDI is, and you've probably even used it before. Mabey you use it everyday in the studio. But, what exactly is MIDI? Well, the short answer is simple: MIDI is a specification for digital communication between musical equipment, not a particular peice of hardware. Ok, so what does that mean? This is where it becomes more technical and we'll need to start breaking things into smaller peices to become understandable. So, lets start with the basics. MIDI is an acronym for Musical Instrument Digital Interface and it was one of the many brain childs of Dave Smith, daddy of such great synths as the Prophet 5 and Poly Evolver. MIDI has been around for some time now, particularly in “digital years” . When MIDI first

became a standard most people were gawking at Apple IIe's ;) So, what does MIDI do and why did Dave invent it? What MIDI does is create a efficent way of communicating any bit of information about music: Note numbers, Note durations, Expression values, Tempo etc. It does this by assinging a special number to each kind of event and attaching that number to a value. Since digital circuits are good at dealing with numbers this is an efficient system for communicating information. All a device that want to communicate via MIDI has to do is send the right number at the right time and all other connected devices will know what to do with it. If a device wants to receive MIDI events it simply has to listen to it's MIDI port for incoming events and respond to them by triggering it's internal processes. The downside of being efficient in a computer is that raw MIDI information is hard if not impossible to read. You will need to study the detailed specification, become familiar with the number that represents each kind of event and the range of values each event has. Doesn't sound too bad? Well, there is another hitch, MIDI numbers don't come in “normal” 1-10 values. MIDI is almost always written in Hexidecimal, meaning each digit can be 1-F. That is 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, A, B, C, D, E, F. You get it? Let me explain a little more. In hex each digit can can be one of 16 values whereas we humans are used to each digit being one of 10 values. Instead of inventing new numbers for hex people simply use the first 6 letters of the alphabet. So, A = 10, B = 11 etc. In order to tell the difference between hex and decimal hex is usually written like this: 0x01. The “0x” is appened to the beginning of the number and is always the same.

Also see:

- About MIDI
- MIDI page at the WIKIpedia http://en.wikipedia.org/wiki/Musical_Instrument_Digital_Interface

Hardware Basics

It's real easy to overlook the hardware aspect of these projects, with all the other concerns you can easily forget that your creation needs to end up in a case of some kind. A shoebox has been known to work, but, seriously.. a shoebox? What this boils down to is learning how to manipulate wood, plastics, metals, paint, wires and various tiny dohickeys.

- Enclosures
- Front Panels
- Graphics
- Jacks and Plugs
- Wiring
- Knobs
- Buttons and Switches
- Displays
- Customizations
- Tools

Sourcing Components

For many people without a local electronics shop sourcing the proper components can really be a hassle. There are numerous different types of components and there seems to be no end to their variations. To make matters worse there is often little ryhme or reason behind how components are specified and labled and sometimes it can be left to a new user to figure this out by trial and error. For those who are completely new I would reccomend checking out the “Need To Know” section on electronics first.

- Resistor Specifications
  - Wattage rating
  - Ohms
  - Tolerance
- Potentiometers
  - Taper
  - Wattage rating
  - Package
  - Dual/Single
  - Ohms
  - Tolerance
- Caracitor Specifications
  - Capacitance
  - Voltage rating
  - Polarity
  - Capacitor types
    - Ceramic
    - Electrolytic
    - Polyester
    - Polystyrene
- Diode Specifications
- Transistor Specifications
  - NPN, PNP and FET's
- Linear Specifications
- Logic Specifications

Also see:

- Parts
- where_to_order_components

How to read Schematics, Datasheets and other technical documents

Too many beginners try to apply the same techniques for reading magazines and novels to the

documentation they find around here. Problem is that technical documentation is written with different intents than casual reading and as such requires a differnet approach if one want to extract information from it. The overarching theme here is that there is information EVERYWHERE, but you are going to have to think to extract it. Simply opening a .pdf and then running to the forum to have someone tell you what you want to know is not good enough, what follows is the proper technique for getting the most out of dense literature.

Microcontrollers

see Core Module

Programming

see Application Development

Getting started with electronics

Due to the excellent hardware designs and the work of SmashTV and Mike who sell PCB's, Components and kits a beginning Midiboxer really doesn't need to know much about electronics. Reading the “Need To Know” section will get you up to speed and prepare you for basic assembly and troubleshooting. For those who are brave, the rest is dedicated to an in depth look at electronics for music.

The first thing to understand is that electronics is a HUGE feild, far more diverse than computer programming (imo) or other similar technical feilds. If you are serious about this than you need to prepare, it will be months before you make it over the inital learning curves, at which point your reward is being able to see a dozen more learning curves ahead. Don't dispair though. There are plenty of people who will help someone who is willing to do their own work, and in alot of cases you really don't need to fully understand something to get satisfying results. In fact, many electronic designers these days have never touched a soldering iron! So take pride in your tiny bench cluttered up with half working modules, they are your creations! Now, once you've buckled up for the long ride start with these overviews:

Need To Know

- Identifying components

        - What is a resistor?
            - Wattage rating
            - 5% Carbon resistors
            - 1% Metal film resistor
            - Color codes
        - What is a capacitor?
            - Ceramic
            - Electrolytic
            - Polyester
            - The cryptic art of identifying capacitor values
        - What is a diode?
            - Power diodes
            - Signal diodes
- Integrated Circuits
    - The “Black Box”
    - Common pin voltages for MBHP IC's
- Understanding current and voltage
    - Ohm's law
    - Kirchoff's laws
- Using a DMM
- Using a Soldering Iron
- Good bench practices
- Proper troubleshooting technique
- How to ask for help

In Detail

Resistors, Capacitors, Inductors and Diodes This is the kiddie pool of electronics, if you passed algebra than figuring out these types of components will be easy (so long as we don't look to closely at the capacitor :).

Circuit anaylisis techniques

- Series and Parallel circuits
- Network Analysis
- Node Analysis
- Thevinin
- Norton

Diodes, part II: Enter the semiconductor As it turns out the humble diode is the gateway to everything we associate electronics with today. It all has to do with the material diodes are made of, materials classified as semiconductors because their conductive properties can be controlled using electricity. This is huge, real huge.

The Transistor

- PNP vs NPN
- The Transistor Switch
- The Emitter Follower
- The Amplifier

- The current source and current sink
- The current Mirror
- The differential amplifier
- The FET transistor

Linear devices

- The opamp
- The OTA

Logic devices

- Digital vs Analog
- Digital to Analog Converters and Analog to Digital Converters (DAC's and ADC's)
- Multiplexers and Switches

Electronic Fabrication

- What is a PCB?
- What kind of tools?

Also see:

- Parts