Teensy les 3 (en 4)

MIDI over USB

Teensy -> Max

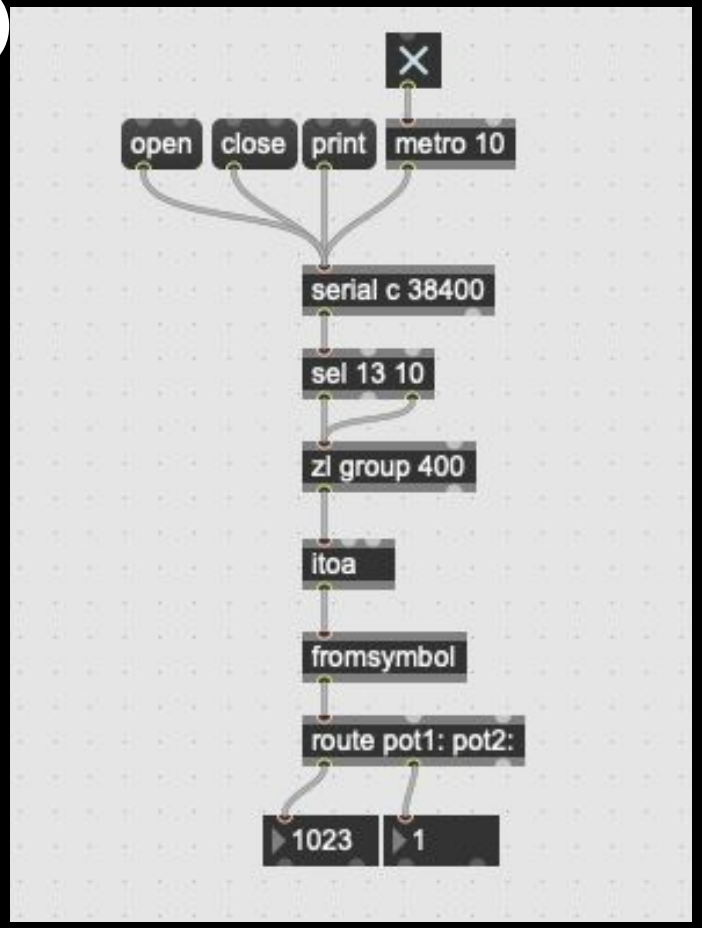
Via Seriële verbinding

Arduino setup

in de seriële monitor:

```
pot1: 123
pot2: 251
```

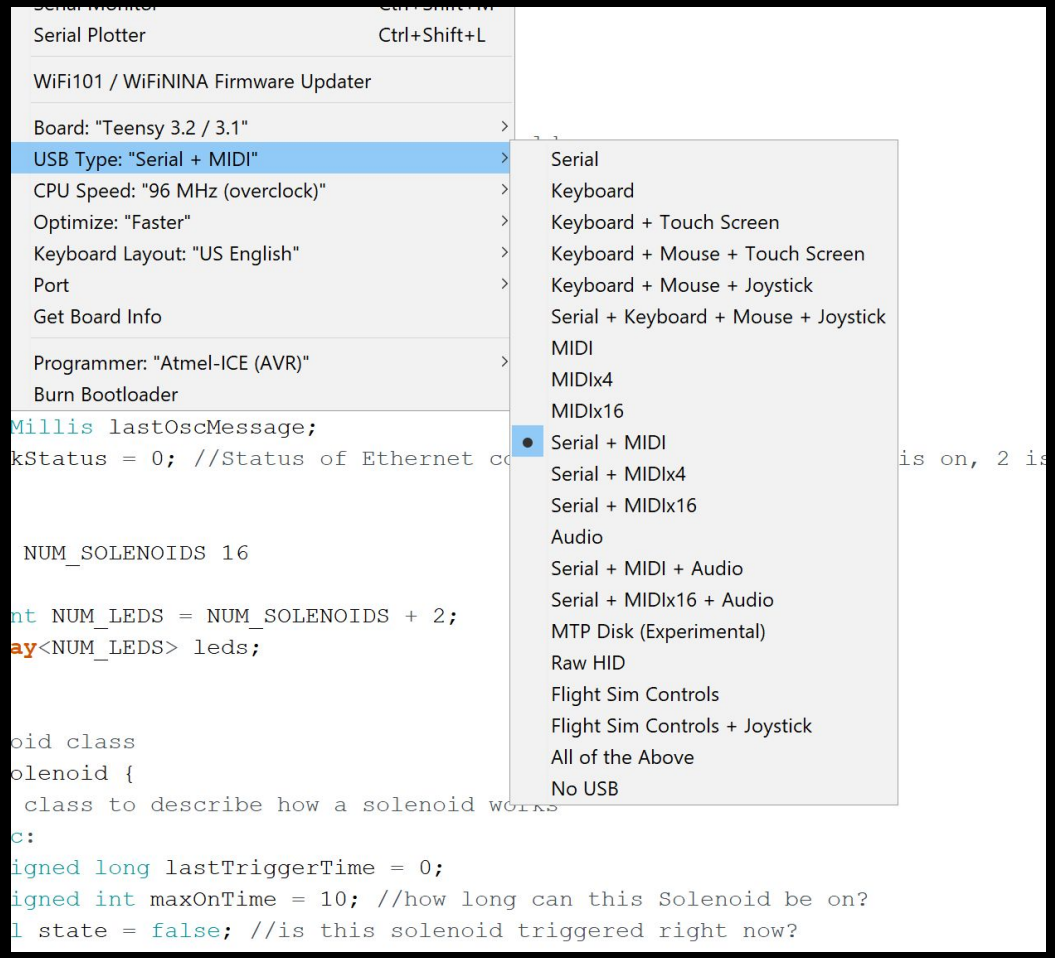
```
void loop() {
  // put your main code here, to run repeatedly:
  int pot1Val = analogRead(A0);
  int pot2Val = analogRead(A1);
  Serial.print("pot1: ");
  Serial.println(pot1Val);
  Serial.print("pot2: ");
  Serial.println(pot2Val);
  delay(10);
}
```



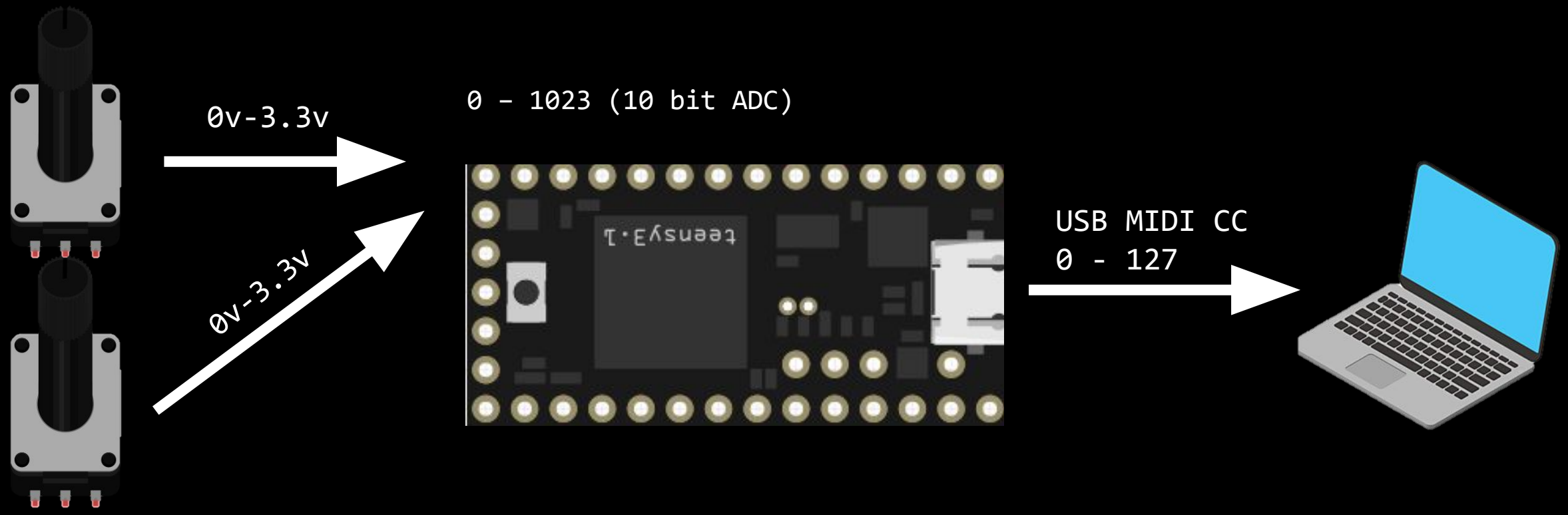
En nu met MIDI!

(makkelijker maar minder accuraat)

USB Types


Serial Plotter Ctrl+Shift+L
WiFi101 / WiFiNINA Firmware Updater
Board: "Teensy 3.2 / 3.1"
USB Type: "Serial + MIDI"
CPU Speed: "96 MHz (overclock)"
Optimize: "Faster"
Keyboard Layout: "US English"
Port
Get Board Info
Programmer: "Atmel-ICE (AVR)"
Burn Bootloader
Serial
Keyboard
Keyboard + Touch Screen
Keyboard + Mouse + Touch Screen
Keyboard + Mouse + Joystick
Serial + Keyboard + Mouse + Joystick
MIDI
MIDIx4
MIDIx16
Serial + MIDI
Serial + MIDIx4
Serial + MIDIx16
Audio
Serial + MIDI + Audio
Serial + MIDIx16 + Audio
MTP Disk (Experimental)
Raw HID
Flight Sim Controls
Flight Sim Controls + Joystick
All of the Above
No USB
Millis lastOscMessage;
kStatus = 0; //Status of Ethernet co
is on, 2 is
NUM_SOLENOIDS 16
nt NUM_LEDS = NUM_SOLENOIDS + 2;
ay<NUM_LEDS> leds;
oid class
olenoid {
class to describe how a solenoid works
c:
igned long lastTriggerTime = 0;
igned int maxOnTime = 10; //how long can this Solenoid be on?
l state = false; //is this solenoid triggered right now?

MIDI Controller



INPUT

TRANSFORMATIE

OUTPUT

MIDI berichten

- **NoteOn**
- **NoteOff**
- **Control Change**

Extra:

- Program Change
- After Touch
- Pitch Bend
- SysEx
- Song Position
- Clock
- Etc (zie hier)

MIDI berichten

Control Change op Teensy

```
usbMIDI.sendControlChange(control, value, channel);
```

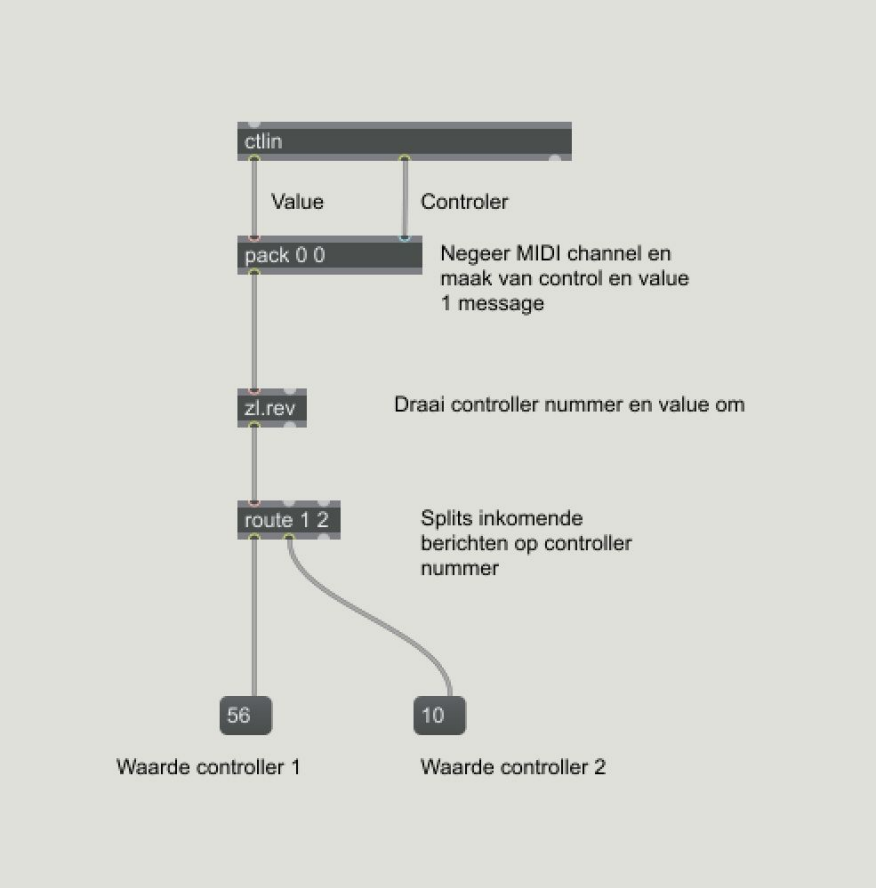
```
Control     = index van controller (potmeter) (0 -127)
Value       = positie / waarde van potmeter (0 -127)
Channel     = MIDI kanaal van bericht (1 – 16)
```

Ontvangen in Max

ctlin

- Broertje van notein
- Volgorde van control, value omgedraaid

Ontvangen in Max



EINDE LES 3

MIDI ontvangen op Teensy

Hoe kan je berichten naar je Teensy sturen over MIDI en daar iets mee doen?

MIDI binnenkrijgen op Teensy

```
void setup() {
  Serial.begin(115200);
  usbMIDI.setHandleControlChange(myControlChange);
}

void loop() {
  usbMIDI.read();
}

void myControlChange(byte ch, byte cntl, byte val) {
  int channel = int(channel);
  int control = int(control);
  int value = int(val);
  Serial.println(“Channel ” + String(ch) + “ controller ” + String(control) + “ value: ” + String(value));
}
```

Waar kan je naar luisteren op een Teensy?

```
usbMIDI.setHandleNoteOff(myNoteOff)
usbMIDI.setHandleNoteOn(myNoteOn)
usbMIDI.setHandleAfterTouchPoly(myAfterTouchPoly)
usbMIDI.setHandleControlChange(myControlChange)
usbMIDI.setHandleProgramChange(myProgramChange)
usbMIDI.setHandleAfterTouch(myAfterTouch)
usbMIDI.setHandlePitchChange(myPitchChange)
usbMIDI.setHandleSystemExclusive(mySystemExclusiveChunk);
usbMIDI.setHandleTimeCodeQuarterFrame(myTimeCodeQuarterFrame);
usbMIDI.setHandleSongPosition(mySongPosition);
usbMIDI.setHandleSongSelect(mySongSelect);
usbMIDI.setHandleTuneRequest(myTuneRequest);
usbMIDI.setHandleClock(myClock);
usbMIDI.setHandleStart(myStart);
usbMIDI.setHandleContinue(myContinue);
usbMIDI.setHandleStop(myStop);
usbMIDI.setHandleActiveSensing(myActiveSensing);
usbMIDI.setHandleSystemReset(mySystemReset);
usbMIDI.setHandleRealTimeSystem(myRealTimeSystem);
```

Maar FL Studio / Logic / Ableton / Reaper / Audacity / Cubase / Studio One / Reason / Bitwig / GarageBand / Mixcraft / Pro Tools / Cakewalk / een MIDI learn programma snapt hier niets van

Waarom?

Slimme MIDI sturen

- Niet altijd sturen
- Ruis filteren
- Weinig latency behouden

Niet altijd sturen

- Alleen MIDI sturen als MIDI waarde verandert

Aan het einde van loop()

```
_potValue = potValue;
```

In loop():

```
    if (potValue != _potValue) {
        //als de huidige potValue anders is dan de vorige potValue,
        //stuur dan een MIDI CC bericht
        usbMIDI.sendControlChange(1, potValue, 16);
    }
```

Analoge ruis

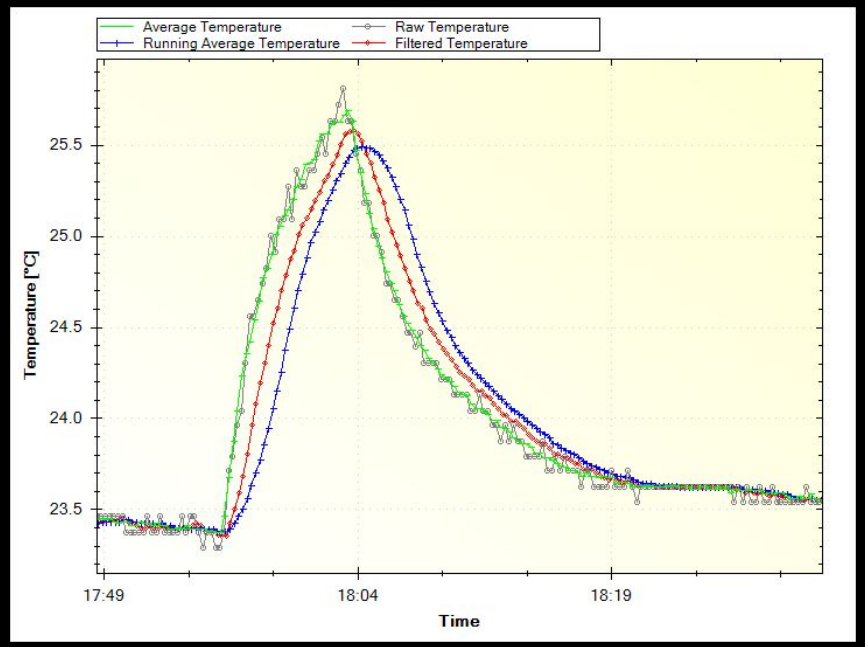
- Onontkoombaar
- USB voeding ruis
- Netstroom ruis
- Externe ruis

Analoge ruis (filteren)

- Analoog filteren is het beste
- Goedkoper en makkelijker is digitaal filteren

MAAR

digitaal filteren -> latency



Analoog ruis (filteren 2)

- Vooralsnog makkelijkst in Max op te lossen

- Anders lopend gemiddelde nemen of digitaal filter
- Zie hier voor meer info of hier

MIDI USB naam

- name.c maken in nieuw tabblad

```
// To give your project a unique name, this code must be
// placed into a .c file (its own tab).  It can not be in
// a .cpp file or your main sketch (the .ino file).

#include "usb_names.h"

// Edit these lines to create your own name.  The length must
// match the number of characters in your custom name.

#define MIDI_NAME   {'M','y',' ','M','I','D','I'}
#define MIDI_NAME_LEN  7

// Do not change this part.  This exact format is required by USB.

struct usb_string_descriptor_struct usb_string_product_name = {
        2 + MIDI_NAME_LEN * 2,
        3,
        MIDI_NAME
};
```

Demonstratie