***Arduino MIDI Control Pedal***

***User Manual***

# Introduction

The Arduino MIDI control pedal is a software and hardware design that allows an analogue controller pedal plus a normally-closed on/off switch pedal to both be used as MIDI controllers.

The default MIDI controller set in the firmware for the analogue pedal is controller 11 (Expression) to provide volume or swell control, and the default for the on/off switch pedal is controller 66 (Sostenuto) but both can be changed in the firmware.

The software and hardware designs are © Robin Terry 2023.

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# Brief description of the hardware

The circuit diagram is given below. It consists of a standard MIDI OUT interface driven directly from the Arduino Nano, plus two ¼” jack sockets. One accepts an analogue controller pedal, and the other accepts an on/off switch pedal.

The analogue pedal used for this project is a Yamaha FC7 analogue foot controller.

The on/off pedal used for this project is a Yamaha FC4A sustain pedal/foot switch.

Both jack sockets have to have both normally-open and normally-closed contacts.

The USB connection is required to power the unit at all times, as there is no power available from MIDI IN interfaces on sound producers (such as synthesisers or sound modules).

The 1k0 resistor in the analogue pedal circuitry is required so that the firmware is able to detect when the pedal has been removed or inserted. The analogue reading from the pedal is prevented, by this resistor, from dropping all the way to minimum. However, when the pedal is removed, the normally-closed contact will pull the analogue input all the way to ground, so it will read as zero.

# Brief description of the firmware

The firmware requires the Arduino MIDI library to be installed in the Arduino IDE.

## Reading the analogue pedal (MIDI expression controller)

The firmware will read the A0 analogue input frequently and will convert the pedal position to a 10-bit analogue reading. Various conditions are applied to the reading to limit the rate of change (to suppress glitches which can occur when the pedal is removed).

The firmware then converts the analogue value to a MIDI controller change message for controller 11, and sends the message.

When the pedal is removed, the firmware will send a message to set controller 11 to maximum level (127) which is the default level for this controller.

## Reading the on/off pedal (MIDI sostenuto pedal)

The firmware will read the A1 analogue input frequently and will convert the pedal position to a 10-bit analogue reading. Since this is an on/off pedal, the analogue reading will either be close to maximum or close to minimum, but hysteresis is applied to avoid jitter.

When the pedal is not inserted, or is inserted but not depressed, the firmware will send a MIDI controller change message for controller 66 to minimum level (zero).

When the pedal is depressed, the firmware will send a MIDI controller change message for controller 66 to maximum level (127).

Circuit diagram

On/Off pedal

normally closed

(sostenuto)

Analogue pedal

(expression)

2x 6.5mm

jack socket

24

2NO

2NC

25

2A1

210k

2NO

2NC

2TIP

2RING

2SLEEVE

2TIP

2RING

2SLEEVE

21k0

2220R

2220R

25V

2GND

2TX

2A0

Arduino Nano

23

25

22

24

21

212

216

219

25V (USB)

20V (USB)

MIDI

OUT