MIDECO v.2

64-outputs MIDI note decoder

USER MANUAL

Roman Sowa 2013

www.midi-hardware.com

1. Overview

Thank you for choosing MIDECO as your new MIDI-to-digital converter. This short manual will guide you through installation, and available settings.

Main purpose of this board is to drive digital inputs of your instrument lacking MIDI control. Each MIDI note within selected range is converted to logic voltage at one of the outputs. By default when a note starts playing, the output goes to 5V, and stays there as long the note is on. With note release voltage drops to 0. There are also other modes of operation available, including pulse trigers and dual line control (pulse at one output for note on and pulse on other output for note off)

You can choose any channel and any MIDI notes range that MIDECO will respond to. This can be done using user-friendly MIDI-learn function, or for advanced users - by sending proper MIDI System Exclusive messages.

There are 4 headers, each with 16 outputs. You can connect any kind of digital circuitry, or drive low power devices like LEDs. With optional MIBO add-on board it is possible to drive coils, valves, motors, or light bulbs, up to 2 Amps at each output.

All user settings are memorized in nonvolatile memory, taking power off does not reset anything to defaults, the settings are kept as they were last entered.

2. Layout & Connections

Picture below explains all connections to MIDECO board. They are:

- MIDI IN
- MIDI THRU
- Power Supply
- GND
- MIDI-learn header
- 64 digital outputs
- 2 activity LEDs
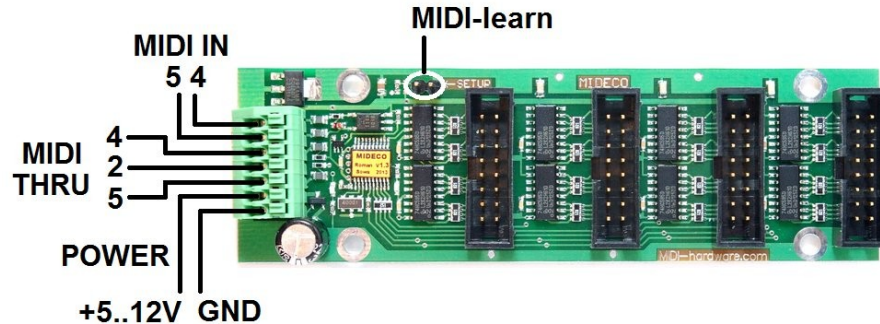
MIDI input is connected with push-in terminals, so no special connectors or tools are needed. MIDI DIN socket should be connected directly, without any components or power in between. If chaining more MIDECO boards, for example to have full 128 note display, you may connect MIDI signal between the 2 boards using plain 2-wire cable, no socket is needed.

Whenever MIDI signal is received by MIDECO, onboard activity LED blinks. When MIDI note from the programmed range and channel comes in, both status LEDs blink.

Power supply should be a regulated power supply giving from 5 to 12V DC but the board will also work at 3V. If MIDECO is about to drive LEDs directly, and regularly most of the LEDs will be on, it's strongly advised to supply the board with voltage no higher than 7V. Connecting power supply in reverse makes no damage to the board.

2.1. Digital Outputs

Each of the 64 note outputs can drive standard 5V digital logic circuit. Maximum current is limited by 820ohm resistor, so nothing gets damaged if it's accidentally shorted to GND or 5V supply. This also means that MIDECO can drive LEDs directly, providing about 3-4mA current to typical LED. Default positive logic (0V for note off, 5V for note on) can be altered using MIDI Sys-Ex, so you can connect LEDs with either common anodes at +5V rail, or common cathodes at GND. Each black connector contains 16 outputs. The left most one (refer to image in Connections section) contains notes lowest notes: 1-16, mid left – notes 17 to 32, mid right – 33 to 48 and right most connector 49 to 64. When working in SAM control mode, each note controls 2 outputs. In each connector even pins drive a pulse at note-on, and odd pins drive a pulse at note-off, hence only 8 notes per connector. The numbering within one connector is shown here:

2.2. Using MIBO add-on board

The MIBO current booster is available as dedicated add-on board. It alows to drive lamps, solenoids, motors, and other power loads. MIDECO must be inserted on the bottom side of MIBO, and secured by 4 supplied screws. 64 outputs are then available at green push-in terminals accepting wire up to 1.5mm^2. No tools or soldering is needed to atach wires. There's also one small screw terminal in MIBO board, where thick ground wire should be connected. This particular connection should be done very carefully, because it carries big currents, sum of all currents from 64 outputs of MIBO.

> ATTENTION! The same power supply must be used for supplying your heavy loads and MIDECO. Keep the MIDECO and MIBO connected together at all times, as GND connection is made via the stand-offs. If any of those requirement is not fulfilled, MIBO may (and will) blow out.

When MIDECO is plugged to MIBO, it may work with higher voltage than mentioned previously 12V for driving LEDs directly. However if power supply voltage is reaching, or higher than 20V, you must add a Zener diode between power supply [+] and power input

of MIDECO to reduce it to acceptable level. Typical 6V8 or 7V5 Zener diode is perfectly OK for this. Do NOT use resistive voltage dividers, or single resistors instead of Zener diode, it may lead to MIBO damage.

> ATTENTION! When using inductive loads like solenoid or motors, you must add rectifier diode across each coil, cathode towards positive supply. Otherwise MIBO will get damaged in time and eventually blow out.

Drawing below shows how loads should be connected to the MIBO board. There's no need to lead GND wire to MIDECO, as the contact is made by metal stand-offs. Only positive supply wire is needed. Maximum supply voltage is 20V, or 25V with additional Zener diode in the way to MIDECO power.
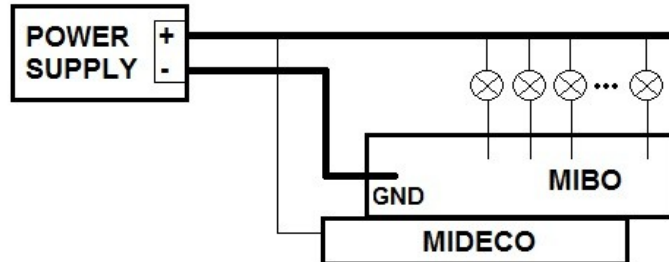
2.3. MIDI THRU output

MIDI signal is available at MIDI THRU output to chain more devices. As any MIDI THRU circuit, it causes minimal degradation of MIDI signal, so after chaining 20 or so devices, it may become difficult to assure reliable performance. Last devices in the chain may have problems understanding MIDI correctly. MIDI-THRU option is given mainly to connect more MIDECO boards together, but you can always connect it to typical MIDI THRU DIN socket, and add any kind of MIDI instrument there. All 3 connections required by MIDI standard for THRU option are available at the green terminal.

2.4. MIDI-learn input

MIDI-learn is the way to set basic operation: MIDI channel and starting note. To use learn mode, connect momentary, normally open switch to little 2-pin header on MIDECO board marked as "SETUP". After you press this button and play any MIDI note, MIDECO will treat it as new lowest note for the range of 64 outputs and will tune to MIDI channel used.

3. User settings

After successful installation, you can set up the MIDI channel, starting note and polarity of the outputs. To do so, apply power to MIDECO board, connect MIDI source to MIDI IN, and MIDI-learn button to the "setup" header. Alternatively you may do all the settings via Sys-Ex using any kind of Sys-Ex editor, for example MIDIOX, or SendSX from Bome Software. There are 5 parameters to set:

1. MIDI channel
2. range of notes
3. mode of operation
4. outputs polarity
5. pulse duration (in pulsed modes)

Only the first two parameters (channel and notes range) can be set both ways, via MIDI-learn button and Sys-Ex. The rest is accessible via Sys-Ex only.

The System Exclusive command's structure is as follows:

Sys-Ex header (**F0**), manufacturer ID (**00 20 7A**), device ID (**05**), command (01, 02 or 04), its parameters and Sys-Ex footer (**F7**). This is described in details here. All numbers are represented in hexadecimal format, as entered in mentioned software.

3.1. Channel and range of notes

Channel and range of notes can be set by MIDI-learn button, or Sys-Ex. For example to make MIDECO respond to your keyboard, push the MIDI-learn button momentarily, and play the lowest note.

The same settings via System Exclusive:

F0 00 20 7A 05 01 <channel> <mode> <startnote> F7

<channel> parameter is MIDI channel number in range 1-16 (01-10 in hex)

<mode> parameter switches MIDECO into one of those modes of operation:

- mode = 01: default, output is active as long as note is on
- mode = 11h: velocity trigger, output is active only for a short time determined by each note velocity, modified by Duration Parameter (see 3.2.)
- mode = 12h: fixed trigger, output is active for a fixed time period at each note start. Period defined by Duration Parameter from 1ms to 2s
- mode = 13h: SAM (Stop Action Magnet) control, MIDECO works with only 32 notes because outputs are paired. One output triggers a pulse at note on, the other one triggers a pulse at note off. Time defined by Duration Parameter.

<startnote> is MIDI note number associated with lowest output. The range always

covers 64 notes (or 32 in SAM control mode) starting from that one.

3.1. Pulse Duration range

F0 00 20 7A 05 02 <duration> F7

<duration> determines active time of the pulses in pulsed modes of operation. Possible values are from 0 to 7Fh. When *<duration>* = 0, pulse is always 1ms in all pused modes. Actual duration in settings >0 is dependent on mode used.

- in velocity trigger mode if *<duration>* = 1, output will be on for periods from 1 to 20ms, depending on velocity (higher velocity - longer pulse). Increasing the *<duration>* makes the pulses longer accordingly, up to the range from 30ms at minimum velocity to 1.25s at highest veolcity.
- in fixed trigger mode and in SAM control mode if *<duration>* = 1, the period is 30ms. Rising this parameter further will increase it in steps of about 15ms up to 2s when *<duration>* = 7Fh

3.1. Outputs polarity reversal

F0 00 20 7A 05 04 <polarity> F7

 <polarity> determines how active note is indicated at the outputs.
If <polarity> is "00", note on means +5V and note off 0V. If *<polarity>* is "01", output
note is reversed, meaning 0V for note on, and note off is +5V.

3.2.Factory defaults

Send this Sys-Ex sequence to MIDECO to go back to default settings:

      F0 00 20 7A 05 01 01 01 24 F7
      F0 00 20 7A 05 04 00 F7
      F0 00 20 7A 05 02 05 F7

MIDECO will respond then to note range C2-C7 (36-99 in MIDI note numbers) in channel 1
with positive gates (off 0V, on 5V) in normal mode – output is on as long the note is on. It
also predefines 85ms pulses for constant duration modes, and 1-110ms range for velocity
duration mode if any pulsed mode will be selected later.