Instructions for assembling the GINO-MIDI INTERFACE

Big-MIDI version 1.1

Disclaimer
Before you start building any of the projects on this website, keep in mind that I can't be held responsible for any damage that is caused by building and using the designs related to the GINO-MIDI Interface. All effort has been done to make the schematics and instructions as correct as possible and the whole project is successfully tested and used by not only me, but also by others then me.

Partlist Masterprint Big-MIDI-1.1

Semiconductors
IC1 µA7805 (voltage regulator) 1A (Vin=max 9V)
IC2 74HCT04 - Hex Inverter
IC3 ATMEGA8535 (Pre-programmed GINO-Core IC)
IC4 74HCT138 (8 to 1 address decoder IC)

Resistors
R1 220 ohm ¼ watt
R2 470 ohm ¼ watt
R3 220 ohm ¼ watt
R4 150 ohm ¼ watt
R5 470 ohm ¼ watt
RN1 Resistor network, 8 x 22K , common out (¼ watt)

Capacitors
C1 100nF (ceramic or disc)
C2 100nF (ceramic or disc)
C3 100nF (ceramic or disc)
C4 100nF (ceramic or disc)
C5 100uF/25v (Electrolytic or tantalum)
C6 22uF/16v (Electrolytic or tantalum)
C7 100nF (ceramic or disc)
C8 100nF (ceramic or disc)
C9 33pF (ceramic or disc)
C10 33pF (ceramic or disc)

Crystal
Q1 X-tal 4 Mhz

Diode's
D1 1N4001 of 1N4002 (Voltage rectifier diode)
LED1 Standard green led
LED2 Standard red led

Several parts
1 IC socket (40 pin) for the ATMEGA8535 processor
1 IC socket 16 pin for the 74HCT138
1 IC socket 14 pin for the 74HCT04
1 20 Pin Shrouded Male Headers
1 14 Pin Shrouded Male Headers
1 10 Pin .100" Polarized Header Connector
3 Krimpkous zwart, rood, blauw
1 entree voor voeding
1 DIN 5 Pin Right Angle PCB Mount Socket
1 Koellichaam
4 Afstandsbusjes
4 Parkers
1 PCB GINO NG210315-1

Instructions for assembly of the mainboard of the Big-MIDI-1.1

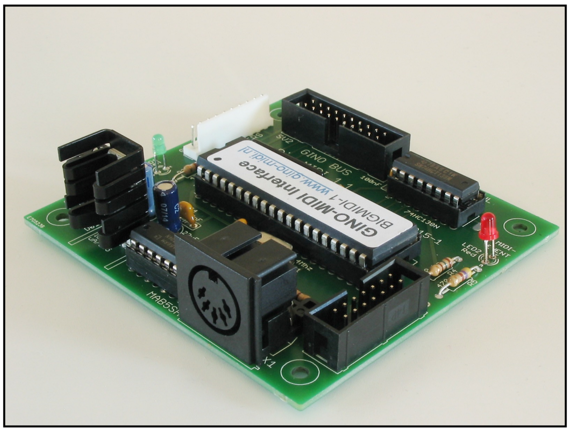
Introduction
The Big-MIDI is the bigger brother of the (first) GINO-MIDI interface, now called the Small-Midi, and is designed for the console of an organ to be equipped with a midi output. Via a midi output it is possible to control and play an expander or a personal computer. Especially the last application now offers many possibilities to play a truly digital organ on the personal computer.
On the Internet you can download applications with which you can build a virtual organ on the personal computer. Examples include jOrgan of Sven Meier and Grand Orgue. Both freeware software. Furthermore is called Hauptwerk. This software is not free, but does have a demo version.
The configuration of the Big-MIDI consists of up to eight ports on each 64 switches to distribute as desired on 5 keyboards (61 notes), a pedal(32 notes) and two stop panels of 64 registers each.
It is also possible for six keyboards to use a volume control and one can change various parameters and store them in the permanent memory of the microcontroller. Through three function buttons and an LCD screen you can change these parameters. There is also a LED that shows each "MIDI event".

The circuit
The heart of the Big-MIDI consists of the circuit around the microcontroller ATMEGA8535. The microcontroller reads keystrokes, hence goes to work and translates it to midi codes. The diagram around this microcontroller can be found on the last page of this description. This diagram shows the power circuit, the circuit of the microcontroller and the midi output.

The keyboards and the register panel are connected through a flat cable to this circuit, through the IDC connector SV2. This flat cable we call in this guide the GINO BUS. Q1 and two capacitors C9 and C10 provide a continuous clock signal of 4 MHz.

The TXD output of the microcontroller (PD1) gives the midi signal and is inverted by IC2.
IC4 is an address decoder that determines which of the eight ports (keyboard and registry panels) will be read.

The power supply consists of a µA7805. This is a 5 volt voltage regulator that can deliver up to 1000 mA. To connect the supply voltage it must not exceed 12 volts DC. Preferably a bit lower, 9 volt also complies excellent. Many adapters provide a much higher voltage so that with a load the voltage finally is issued. The Big-MIDI uses very little power, not more than 90 mA. The adapter is in most cases not be fully loaded, so the voltage remains high. This may give some heat in the µA7805. So consciously choose an adapter that goes unloaded measured no higher than 12 volts DC. Note the polarity!



The program of the ATMEGA8535 read in a very fast pace the state of the switches of the keyboards and the registerpanels. This data is stored in the memory of the microcontroller and converted into MIDI data.

In the original design we use for the keyboards and register a diode matrix. This diode matrix makes a division of key contacts in groups of 8 keys.
So for a five octave keyboard matrix you have 8 sections of 8 keys needed. In total, we can read 64 keys. Sufficient, for a five-octave keyboard that has a size of 61 keys.
Before a diode array can be read, we must first have a decoder circuit between the diode matrix and the ATMEGA8535. This decoder is controlled by the ATMEGA8535 and IC4 and provides eight pulses per cycle. For each pulse the AT reads a portion of the diode matrix.

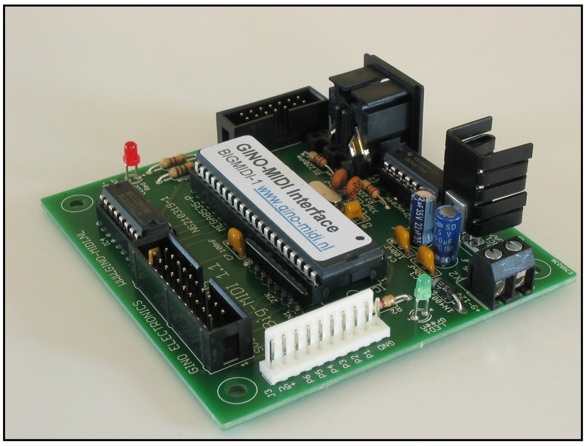
To reduce the wiring from the main board to the keyboards and register panels the decoder PCBs are placed at the keyboards and their matrix. The main board and the decoder PCB’s are connected by the GINO BUS.

Assembly.
Unlike the first design of the Big-MIDI is this PCB now double-sided.
At first we mount the resistors, the 1N4002 diode and IC sockets. Observe the IC sockets on the mark of pin1, and the diode on the cathode sign. There is also a resistor network, which is RN1. Again, be careful, what is the common pin.
Then we mount capacitors and electrolytic capacitors (capacitors). Observe the electrolytic capacitors polarity. The crystal and LED's are the last of the components. The LED also has a polarity. The short leg of an LED is the cathode. On the PCB is indicated, the "A" and "K". Then the voltage regulator is mounted. This is first provided with the snap-cooling body. You can slide the µA7805 into the heat sink, so you get an element with four pins. This corresponds with the PCB.
The cooling body is provided with a solderable lip.

The connectors.
The design of the Big-MIDI is based on the idea that this board somewhere in the console is installed, and the connections of the power and volume controls on the outside of the organ cabinet. Therefore it makes no sense to assemble an entry for the power supply or potentiometers on the board.

Power supply X2
For power supply we use a printing terminal block. The + and - are clearly marked on the PCB.
Also note the earlier mentioned level of the supply voltage.

IDC connectors SV1, SV2
To connect the GINO BUS and connecting the LCD & Switch board, we use IDC connectors. On the main PCB male headers are now to be installed. Note the numbering of pin 1 indicated on the assembly scheme. This is indicated by a small triangle on the male header.



For the GINO BUS we use the 20 pin header for the LCD & Switch board, we use the 14 pin header. The advantage of the IDC connectors is that they are robust and that the female part is always inserted in the right way in the male header.

Connecting the potentiometers
The potentiometers that we are using to adjust the volume of the 6 channels should have a value of 100Kohm linear and they are connected to the polarized headers J3. The wire ends that have been connected to the female connector have the following colors and functions.

Pinnr.	Color	Function	Remarks
1	Black	+ 5 volt = leftside potentiometer	Highest position volume
2	Brown	+ 5 volt = leftside potentiometer	Highest position volume
3	Red	Runner potentiometer 6	
4	Orange	Runner potentiometer 5	
5	Yellow	Runner potentiometer 4	
6	Green	Runner potentiometer 3	
7	Blue	Runner potentiometer 2	
8	Violet	Runner potentiometer 1	
9	Grey	GND = rightside potentiometer	Lowest position volume
10	White	GND = rightside potentiometer	Lowest position volume

It will not often happen that all six channels are provided with a potentiometer. In the case you will not connect a potentiometer the volume of that channel will be on the maximum. You don't have to make an interconnection.
The volume is controlled from 0 to 127 or in hexadecimal from 00H to 7FH with an interval of two steps. This interval is created because when a volume level is chosen for instance between 10 and 11 (09H and 0AH) the system will send out undesirable midi messages.
Now first, determine the length between the location of the main board and the place where you want to place the potentiometers in the organ case. The wires from the polarized header are not long enough to go to a potentiometer in for instance an expression pedal. Therefore it is necessary to extend the wiring. It is important to make a nice thin weld, which must later be isolated. For this purpose heat shrink tubing is provided to isolate these welds.
Slide the shrink tubing over the thin weld and heat the shrink tubing. For this example, use a lighter, but hold the lighter remotely, the tubing just need to be heated, so do not let it come into contact with the flame. The shrink tube will, as its name indicates, form an insulation on the weld.

Just pay attention:

- **When this connector is used it is important that the wire ends that are not used sufficiently be isolated or the non-insulated ends cut off, or else there may occur easily a short cut.**
- Be careful when taking apart the female part of these polarized header always the body of the female part, and doe not pull on the wires to disconnect the connector.
- The loose take of the female portion will initially be quite difficult. The crimp contacts are still new. Use a small and sharp screwdriver to lift the female part from below while you push the lock on the header back slightly.

Portnumbers.
About midi codes and all details in that field you can find a lot of data on the Internet. Here we will not go into details in this description. However we will discuss in this article the use of port numbers.

The Big-MIDI has eight port numbers that we can select with the jumpers. These are the ports numbered 1, 2, 3, 4, 5, 6, 7 and 8
Port 1 is used for e.g. the first set of 64 stops
Port 2 is used for e.g. the main manual
Port 3 is used for e.g. the second manual
Port 4 is used for e.g. the pedal
Port 5 is used for e.g. the second set of 64 stops
Port 6 is used for e.g. the third manual
Port 7 is used for e.g. the fourth manual
Port 8 is used for e.g. the fifth manual

The ports 2, 3, 4 and 6, 7, 8 can be freely mixed, but the ports 1 and 5 and are reserved for the registry switches, the stops. Thus, one can through the little interconnections or jumpers on each matrix decoder select the desired port number. Through the software, we can for each port choose the desired MIDI channel number.

Diode array
In the proposed diagram you can see that we use a diode matrix to read the keys and stop switches. A diode matrix is controlled by a decoder circuit. This decoder circuit receives signals from the mainboard to activate the right matrix part.
The disadvantage of a diode matrix is, that we have to divide the key contacts in groups of 8 keys. The key-contact rail can not be in one piece, but should be divided into 8 short pieces of 8 keys.
The advantage is that we only need one diode per key and these diodes (1n4148 =) are relatively inexpensive.

An alternative is to use octal buffer / line driver, such as the 74HCT541. Thereby is per group of eight keys the need of a resistor network and for each key again a diode. This method is especially important if the current electronics of the organ is to maintain. Thereby, one should pay attention to the keycontacts for the voltage used. Also with this method of reading a decoder circuit is needed.

GINO BUS
The GINO BUS connects all the decoder circuits with the main board. Underneath you find a specification of this bus.

Pinnr IDC connector	Name	Description
SV2-20	PORT 1	Signal
SV2-18	PORT 2	Signal
SV2-16	PORT 3	Signal
SV2-14	PORT 4	Signal
SV2-12	PORT 5	Signal
SV2-10	PORT 6	Signal
SV2-8	PORT 7	Signal
SV2-6	A2	Adress 2 for decoders
SV2-4	A1	Adress 1 for decoders
SV2-2	A0	Adress 0 for decoders
SV2-1	GND	Ground
SV2-3	D7	Data 7
SV2-5	D6	Data 6
SV2-7	D5	Data 5
SV2-9	D4	Data 4
SV2-11	D3	Data 3
SV2-13	D2	Data 2
SV2-15	D1	Data 1
SV2-17	D0	Data 0
SV2-19	+ 5 VOLT	Supply + 5 volt

Use of current.
The circuit uses a current of 90 mA including LCD & Switch board. Most of the current is consumed by the backlight of the LCD screen.
If the 74HCT138 decoder circuits with array of keyboards and / or pedal and stop switches is connected, the current will not increase. This type of HCT uses almost no current.

Testing the circuit.
It is possible to test the circuit without the use of a keyboard. First of all we will check if the supply voltage is correct. Do not place any integrated circuit in the sockets. Check the plus and minus connection of the power supply and connect the main print with a DC adapter. For the power supply you can use a DC adapter which gives a voltage from 8 till 12 volt DC. Notice that the voltage of 12 volt should not be exceeded. If there is no load on the adapter the output voltage will be soon 15 volt and because this circuit draws almost no current, no supply voltage will be reduced by the load.

Measure the supply voltage for example on pin 16 and pin 8 of the IC socket of IC4. There must be a 5 volts DC on it. If this is not the case, then inspect the circuit again thoroughly. Is IC1, the voltage regulator, connected properly? There are some of those easy mistakes. If the supply voltage is correct you can put the IC2, IC3 and IC4 in the sockets. Notice the direction of the ICs.
Then connect the MIDI Out to the PC or with a midi instrument. Switch the power on.
The green LED will light and the red LED will indicate a MIDI event briefly. The Big-MIDI send all midi codes out. Namely the codes for All Notes Off. More on that later.

We are now going to simulate a keyboard. Make a short cut between for instance pin SV2-6 and pin SV2-17 of the GINO-Bus (IDC connector).

You will hear now a reaction of you midi equipment. We simulate now that we are pressing the first key of every matrix. This sound is composed of many tones and we can not hear which tones, but it is a way to see that the heart of the midi interface is working. If you have a **midi monitor** available on your computer, then you can follow these actions on the screen of your PC or laptop.

Is there no reaction, or output at all, then you have to examine the circuits once again. You can also monitor if the first midi signal (All-Notes-Off) is transmitted by the midi interface. For each of the 16 channels the code All-Notes-Off is transmitted and you can follow this on a midi monitor. Underneath you find a link where you can find a very good midi monitor.

www.midi-ox.com

It is very useful to have this kind of software on the PC. On the Internet you can find many applications.

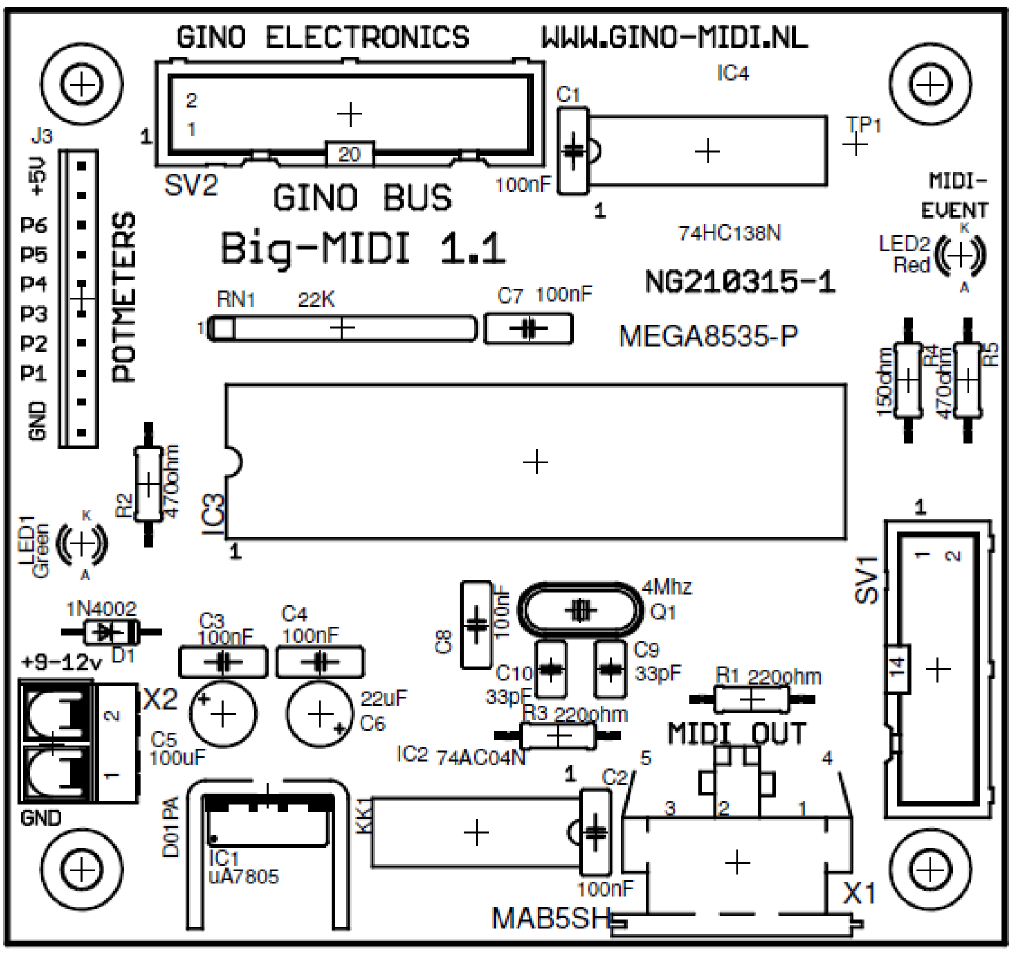
Port 8

The observant reader will see that the connection of 8th array (port 8) in the GINO Bus not is included. That's right: there was quite simply no place to include these (mostly obsolete) terminal in the GINO BUS. In the case of using this port, a loose connection must laid between TP1 and TP9 of that particular decoder print.

Finally

We have tried in this guide to mention many items according to building this GINO-MIDI interface.
If you have remarks and comments, please let us know. Also our English is a little bit poor, so feel free to correct us.This allows other users to take advantage of them.
Good luck with the construction of the **Big-MIDI-1.1 Interface**

Assembly scheme



Electronic scheme