TriplePlay3

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TriplePlay3

1.1 Welcome

Welcome to the final TriplePlay project.

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Making the PCB the core

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1.2 Autor

My name is Alfred Faust. I'm a german men, and hope my english is understandable. I'm 45 years old, and I'm just pensioner of illness.

I work with an AMIGA since 1991. In the time between I had a A 500 with some expansions.

At this time I use a A1200 with a Blizzard1240/40 accellerator, build in a tower with ZorroII-board. There is a graphics-card "MerlinII", a soundcard "Prelude", a 3,2 GB-IDE-harddisk, a 8x ATAPI-CDROM, Fast-Ram 32 MB.

Since 1993 I work with Bars&Pipes. Since this fantastic program is FREE (not PD), I use Bars&Pipes2.5 and also "SuperJAM!1.1".

With my MIDI-equipment (DX11 and the (at the moment destroyed) DB-50XG from YAMAHA - that is the real sound...) a made some fine music. For this card I wrote some tools to program this card with all the fantastic sounds and effects.

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1.3 History

TriplePlay 1.Version (27.9.1999)
This was a new PCB for the TriplePlay from Ryan Osman (osman@sprint.ca).

TriplePlay 2.Version (30.9.1999)

As I tested the PCB from R.Osmans projekt MIDI-In won't work, so I altered it. I think the reason, why it don't work, was, that in the 1.version no translation was made between the TTL-logic and the RS232-logic.

Also there was no translation made backwards between RS232-logic and TTL-logic. The circuitry of R.Osman gives to the MIDI-ports 12V.

THAT WAS VERY DANGEROS. MY DB-50XG CARD WAS DAMAGED BY THIS HIGH VOLTAGE. (But YAMAHA was very accommodating, and helped me with a new DB-50XG :D)

First I havn't see this. As my card was died, it was to late. ... that was my risk. Everybody, who build such things for his own use, makes this at own risk.

I have learned ...

First I put some resistors at the MIDI-Out-ports.

Then I removed MIDI-Thru (this port is to find at the most MIDI-devices).

As above sayed I altered the MIDI-In circuitry (the translation between the TTL-logic and the RS232-logic was made in a primitive way - but works).

This TriplePlay2 projekt works fine. But I warn you: Don't use it with other MIDI-devices than such, that have standard MIDI-ports, see above ... I say only: 12V ... .

Triple Play 3.Version (14.10.1999)

The main difference to the previous versions is the IC "MAX 238"(from MAXIM)

This circuit makes the translation save, fast and with low power consumtion. It takes only 5-8mA current. This is important, because the voltages at the serial port are gives only at maximum 20mA.

The MAX238 makes the translation in both ways from TTL -> RS232 and back.

In this way the MIDI-Ports are real driven with the right 5V logic of MIDI.

I reinsert the MIDI-Thru-port. So the TriplePlay-MIDI-Interface is complete.

This kind of circuitry you see at the TP3Plan.iff is real very save. It is also compatible to TTL-inputs of other MIDI-hardware (like the DB-50XG-card from YAMAHA) without optocouplers at the input.

Triple Play 3 small Addenum (17.12.1999)

- added a possibility to switch the TP3-MIDI-Interface to a "normal" MIDI-Interface

- reworked the gif's & guide
  (thanks to Kjetil Svalastog Matheussen, who give me some hints)

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At this place I will also say you a fact, before you try this all. Have you ever used Bars&Pipes with 16 channels and many notes and other datas like PitchBend-data or SystemExclusive-datas?

If your AMIGA have had problems with this, it is not probable, that it can handle the full possibilities of 3x16 channels with many of this datas.

If you not often use PitchBend-data or SystemExclusive-datas the Sequencer works fine with the TriplePlay-MIDI-Interface and 3x16 channels.

In the other way I think a 68040 processor with 40 Mhz is the minimum of the work with this TriplePlay - MIDI - Interface.

But try it. Bars&Pipes have so much possibilities ...

1.4 Some theory

The MIDI-standard

The MIDI transmission based at a negtive 5V-logic, serial transmission.

That means:

Normaly the TTL (5V) logic is measured against the ground (-pol). So there is a high level (higher than 3V) and a low level (lower than 1V). This is in the language of the computer 1 or 0.

Serial means that the stream of data are "in a line" - one after one.

If you are interested in further information about MIDI, have a look at:

nuinfo.nwu.edu/musicschool/links/projects/midi/expmidiindex.html
(without "www.")

MIDI-signals are measured against the power (+5V).
If normal (TTL)signal is high (against ground) it is low against power (+5V).

The MIDI transmission is standardly based at a transmission via current and not voltage. 0 means no current and 1 current flowes. This is realised with a optocoupler at MIDI-In. The normal current of an optocoupler is between 5 and 25mA. To guarantee this current (not more), in the lines are resistors of 220 Ohm. There is one at the OUT and one at the IN. Often there is also one at the second line PIN 4. So is a current of maximal 12mA guaranteed and a security against short-circuit.

You will wonder, because in my projekt is no optocoupler .... ??!!

I've tested this kind of circuitry. I'd made a projekt sometimes ago to connect a DB-50XG-wavetable-card with the AMIGA. This work's fine without a optocoupler for a long time. The main advantage of this kind of circuitry is, that there is near no current at the cable. And so you can use long cables.

And it is also compatible with TTL-inputs of other MIDI-hardware (like the DB-50XG-wavetable-card from YAMAHA).

The transmission is done via 5pol-DIN sockets and plugs. MIDI uses PIN 4&5 and PIN 2 for the shield. PIN 4 is MIDI-High (power +5V), PIN 5 is MIDI-Low (this is the "working line").

If we will connect MIDI to AMIGA's serial-port we must know, that the logic of this port is based at RS232.

This logic works with a voltage between +12V and -12V. So is between High and Low a difference of 24V (!!!). We must translate it in both directions. Another way is not possible.

The reason: The TTL-logic circuits will be destroyed by RS232-voltages and RS232-logic won't work with TTL-voltages.

For this reason there are some IC at the market. For our projekt I use the MAX238 from MAXIM.

1.5 Copyright and Disclaimer

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DISCLAIMER

FIRST OF ALL:

I AND THE ORIGINAL AUTORS ARE NOT HELD LIABLE IF THERE ARE ANY DAMAGES OR HARD ERRORS WHEN YOU MAKE AND USE THIS TRIPLE-PLAY.

MAKING MONEY WITH THIS PROJEKT IS NOT ALLOWED.

IT IS ADAPTED FROM THE ORIGINAL "TRIPLE-PLAY MIDI-INTERFACE" FROM "BLUE RIBBON INC." AND FROM A PCB BY RYAN OSMAN.

!!! USE IT AT YOUR OWN RISK !!!

THAT MUST BE ... I'M A POOR MAN ... ;(

This projekt is freeware. That means you can use it without to pay anything. But I will be very enjoyed, if you send me a mail, when you use it.

It comes with NO warranties.

But I've tested it with my MIDI-hardware ... it works fine :)) .

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1.6 What we need

Logical IC:

The label of the logical IC's are some different by the different companys. But at all: there is a international standard. The last 4 numers in the label are the same everywhere.

For example:

The IC "4052" we need : MOTOROLA MC14052B
PHILIPS HEF4052B
TOSHIBA 4052B

You can see: the last 4 numbers are the same.
Don't use the 74... types (example 74HC4052).

We need: 1x 4052 (4 channel Multiplexer/Demultiplexer)

1x MAX238 (in 24-DIL package) (RS232<->TTL transceiver)

Voltage-Controller-IC: 1x 78L05

Transistors: 2xBC108 (or similar npn) only for switch-function

Resistors: 5x 220 Ohm
4x 10 KOhm

Capacitors: 5x 1 $\mathrm{\mu}$F/16V (micro Farad) tantal-capacitors
1x 100 $\mathrm{\mu}$F/16V (micro Farad) electrolyt-capacitor

5 DIN-sockets for the MIDI-connections
1 SUB-D female plug 25 pin
short piece 9 wire-cable (shielded)

What kind of connectors at the PCB you are use, is your choice.
A small METAL case (100x70X30);
!!!It is very important for shielding radiation!!!

1.7 MAKINGTHEPCB

For making the PCB you need:

- transparentpaper (for the exposuremask)
- a piece of 6 x 10 cm fotopositv PCB-material
  (I highly recommend to by more, it is cheap. The first attempt to make a PCB in the explained photomechanical way is most a mistake.)
- a UV-lamp (a normal flourescent lamp does the same)
- developer for the exposured PCB: NaOH
- corrosive for the developed PCB: FeCl3 or other

First:

Print out the exposure-mask (TP3PCB.gif) to the transparent paper. It is possible with a normal computerprinter in black/white. Use maximal contrast. The best result you get with a laser-printer.

If you use a inkjet-printer, it is possible, that the black color is not real black. It may be, that than there are some difficulties (see below). You can also make a fotocopy with maximum contrast. The result is like a printout with a laser-printer.

The #?.ps - files you can print out using "ghostscript" or "post", if you have no postscript-printer. Then all will be printed in the right messures.

The #?.gif - files you can print out with any graphic print program ("graphic-publisher" of "Turboprint", or "Studio" or other). A DTP-Program is also a good coice. You must experiment a little up to the measure-lines matchs the lenght that shown. A small difference of +/- 1mm doesn't matter.

NB.: With Multiview you can view the iff-pictures. Printing with Multiview is not so good.

I've made the PCB with ProDraw3. If you have this program, I can mail you the file. With this the printig is easier and accurate.

If you can't make PCB's by yourself, I can help you. But I'm not a electronic concern ... ;-)

I recommend you very much also printing out the TP3Plan.gif and the TP3Comp.gif. So you can always see what you do.

The plan is a mixed form for people, are not so familiary with circuitry.

Second:

Prepare the developer and the corrosivebath.

!!!! CAUTION !!!

The developer and the corrosive are very corrodive.

!!!! USE GLOVES !!!

NaOH : 50g to 1l water
FeCl^3: 400g to 1l water

Lay the printed mask down the PCB-material. (remove the protectionsfoil before). Use the mirrored one with the printcoulor to the PCB. That means, that it is now unmirrored. Press it down with a glasplate. Than lay it under the UV-lamp.

exposure time with UV-lamp : 3 min
exposure time with flourecent-lamp : 7-8 min
(a small distance between lamp and PCB is necessary)

After the exposure put the PCB immediately in the developer. In a short time you will now see appearing the line wires. When all spaces between the line wires are free, immediately take the PCB out of the developer and bring it under water. Then let it dry accurate. Don't use a cloth, it wipes the line wires.

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NB.: I tryed to make the mask with a inkjet-printer. The ink isn't real black. So the UV-light wasn't exact shielded at the black lines. So the developer also destroyed the lines and the PCB was lost.

So I experimented a little. My result:

Make a low concentrated developerbath : 20g NaOH to 1l water

Print the exposure mask at normal Inkjet-paper.

Exposure like above explained.

Lay exposured PCB with the metal side to top in the developer bath. Wait so long up to all lines are clearly to see. (the color of the parts, that will later cauterized changed to blue.) Then immediately put it under flowing water.

You can put the PCB again in the developer if it is not enough developed, and than again under the water .... and so on. You can also hold down the PCB partially in the developer bath.

Be careful ! In the other way you will lose your work.

But this is only for that reason if you use a inkjet-printer.

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If the PCB is dry, put it in the corrosivebath . The time it takes to cauterize is between 10 min and some hours. Look often at the PCB in the corrosivebath. If you heat up the corrosivebath to 60\textdegree{}C the ↩
cauterize-time

will be very short. Often move your PCB in the bath, that will also minimize the time.

If all line wires clean cauterized, put the PCB under water to wash up all corrodive thorough.

Third:

Drilling:

- use a drill 0,8 - 1,0 mm thick.

Forth:

Soldering:

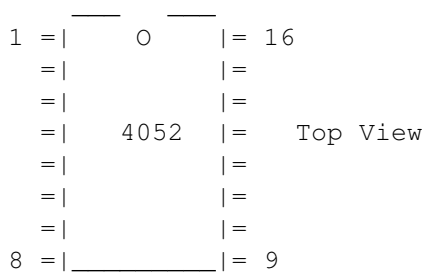
Print out the TPP3Components.iff. So you can see in the right form, how to build in the components.

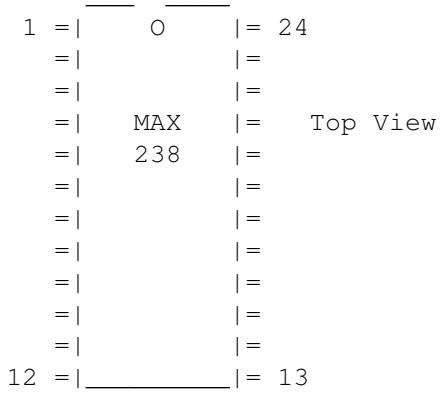
Also at the PCB you can see how all components shall be connected. Also you will see the connections to the PCB. (MIDI-Output, and serial connection)

Use a electric soldering iron with no more than 20 W.

Look accurate before soldering the IC.

I'm very recommend to use sockets for the IC's. They are very cheap, and if anything is wrong, you must not dissolder the IC - this is very difficult.



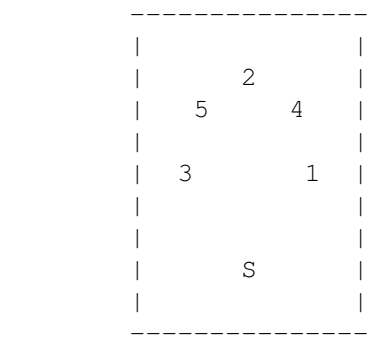


Use only so much solder tin as necessary. Use only solder tin for electronics.

There a long jumper to sold in. At the PCB these are marked with "jumper". Don’t forget these! I recommend to use a isulated wire.

For the MIDI-Ports use normal DIN-sockets:

View from the back (soldering) - side:



S = Shield of the Plug (must be connected to Pin 2)

Most there are numbers of the pins at the DIN-sockets. Look accurate please.

For the connection to the DIN-sockets use soldering pins, or sold in PCB-plugs.

The numbers of the pin-connections of the serial-port-plug you see at the top of the PCB.

3 2 1/7 4 9 20

CONNECT ONLY THIS PINS. THE PIN 1 + PIN 7 MUST BE CONNECTED AT THE SERIAL-PORT-PLUG !!!

DON’T CONNECT THE SHIELD AND PIN 1+7.

CONNECT THE SHIELD SEPARATLY BESIDE THE PINS.

LOOK VERY ACCURATE AND COUNT THE PINS FOR SECURITY THREE TIMES ORE MORE.

MOST FOR PIN 9 and 10. THE REASON IS: PIN 9 HAVE +12V PIN 10 HAVE -12V !
IT WILL BE VERY DANGEROS IF YOU EXCHANGE THESE TWO PINS. THE IC’s WILL BE DAMAGED.

At last build the PCB and the DIN-sockets in the metal case. For the connection to the serial-port I made a short cable with the female plug at

the one side.

Before you connect or disconnet to your AMIGA:

!!!!! S W I T C H O F T H E P O W E R !!!!!

IT IS VERY EASY TO DESTROY THE PORT IC's, WHEN YOU MAKE ANY CONNECTION OR DISCONNECTION AT YOUR AMIGA, IF THE POWER IS ON.

The time you loose with a new boot is very good invested in the life of your AMIGA.

BE WARNED ....

And now good luck and many fun with the Triple-Play-MIDI-Interface .... :))

1.8 The Triple Play Tools

The "Driver Tools" I've also put in this package. They replaces the MIDI-OUT.ptool.
Before you can use the TriplePlay.ptools you must remove the MIDI-Out.ptool in the Toolbox (in the menu of the Toolbox "Remove Tool").
After that "Install Tool..." - the three TriplePlay.ptools. Use them as MIDI-Out-Tools.

Each of them can handle 16 Channels.

That means: Each MIDI-OUT-Port has 16 MIDI-Channels. 3x16 = 48

So you have now real up to 48 MIDI-Channels.

All other functions the same like in the MIDI-Out-Tool.

What are these tool do ?

To control the TriplePlay-MIDI-Interface these tools use PIN4 (Request To Send) and PIN20 (Data Terminal Ready).

If data arrived in the track, where the tool resides, the tool switch PIN4 & PIN20.

	PIN4	PIN20
Triple Play 1	0	0
Triple Play 2	1	0
Triple Play 3	0	1

The IC 4052 of TriplePlay-MIDI-Interface switches the data to the correspondending MIDI-Out-port.

Theoretical it is possible to switch PIN4 & PIN20 to 1 and 64 channels are possible. But I think this is far away of that, what a AMIGA is able to do.

I think, a normal AMIGA has trouble to manage the 48 channels, if there datas in all 48 channels at the same time. But try it ...

1.9 TP3 as a

If you are made my TP3-project you have noticed that in this form it is not useable for other applications except Bars&Pipes with the TriplePlay-Tools.

It’s a pity, you will think. But for this I have a solution:

You only need a little switch and a thin two-wired cable.

In this package you will find a picture("TP3Add.gif") that is a detail of the picture "TP3Comp.gif" an shows where the little swich must be connected.

With this switch the multiplexer IC 4052 will be bridged for the "OUT1".

So you can switch the OUT1 to a normal MIDI-Out, and you can use the TP3-OUT1 as a normal MIDI-Interface. Switching can be done during the computer is on.

In THIS case you must NOT turn the computer off before switching.

But I say it again : don’t make any connection ore disconnection to the ports of your AMIGA when the computer is on. The IC’s for the serial or parallel ports are very sensitive.

Don't make more than this one switch to the TP3. It will not work proper if more than one OUT of the TP3 will be "bridged".

With this addenum you can use the TP3 with programs like OctaMED-Soundstudio or MIDI-Play or other programs that works with MIDI.

Good luck !
Have fun !

:))