TriplePlay3

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COLLABORATORS			

	TITLE : TriplePlay3		
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Contents

Chapter 1

TriplePlay3

1.1 Welcome

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Welcome to the final TriplePlay project.

Copyright and Disclaimer .... it is neccessary !!
Autor  who am I ...
History with some explaination

Some theoreticals if you are interested ... :)

What components we need
Making the PCB the core

Addenum TP3 as a "normal" MIDI-Interface

The Triple Play Tools  The driving Software
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1.2 Autor

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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)

   ****

   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

A MIDI-Interface Projekt by © Alfred Faust 1999

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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.

****

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.

```
              ___  ___
        1 =|    O     |= 16
          =|          |=
          =|          |=
          =|   4052   |=   Top View
          =|          |=
          =|          |=
          =|          |=
        8 =|_____|= 9



              ___  ____
        1 =|    O     |= 24
          =|          |=
          =|          |=
          =|   MAX    |=   Top View
          =|   238    |=
          =|          |=
          =|          |=
          =|          |=
          =|          |=
          =|          |=
          =|          |=
       12 =|_____|= 13
```
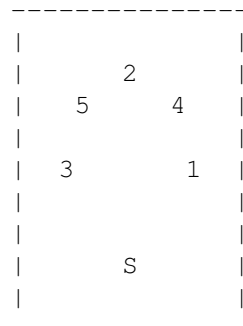
Use only so much solder tin as necessary. Use only solder tin for electronics.

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:

```
              --------------
             |              |
             |      2       |
             |   5      4   |
             |              |
             |   3      1   |
             |              |
             |              |
             |      S       |
             |              |
              --------------
```

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 SEPARATELY 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-Sound-studio or MIDI-Play or other programs that works with MIDI.

Good luck !
Have fun !

:))