MSSIAH
MIDI SID SOFTWARE

Getting Started

Introduction

Thank you for your excellent choice of software purchasing the MSSIAH Cartridge!

We had a very clear philosophy developing this product: make it the simplest, most cost effective and easiest to use solution for retro-fitting the Commodore 64 with MIDI!

As you get to know the software we are quite confident that you will agree with us that our philosophy did turn into practice.
Those of you, who have been longing for a user-friendly product that takes the Commodore audio into your studio without being ruined, finally found home.
The only doorstep left to embed the unique sound of the SID circuit in your music is to start the cartridge up, insert a MIDI cable and get into the applications. However, we recommend that you first take the time and read this booklet through.

Then it is our wish that the MSSIAH becomes an invaluable tool next to your favorite gear and brings lots of fun for many creative hours to come at your favorite recording facility!

Note:

Caution! This software is highly addictive. We do not take responsibility for loss of sleep, calling in sick for work or neglecting friends and relatives.

How to start up the Cartridge

This section explains how to insert the cartridge and start it up.
Read this section thoroughly before you use the MSSIAH Cartridge. It contains information on how to handle the unit without causing damage to either cartridge or computer.

Inserting the Cartridge

1: Make sure your computer is completely turned off

> **Note:**
>
> **YOU MUST NEVER INSERT OR REMOVE THE CARTRIDGE WHILE THE POWER IS ON!**
>
> Seriously. We cannot emphasize this enough:
> **NEVER INSERT OR REMOVE THE CARTRIDGE WITH THE POWER STILL ON!!**

2: Insert the cartridge with the MIDI input connector facing upwards

3: Gently push the cartridge all the way into the expansion port

Make sure the cartridge terminals slide into the connector inside the expansion port when inserting the cartridge. Then gently apply a little more pressure on the cartridge's top side so it fully connects into the female connector inside the expansion port and sits tightly. Push it into the port until the MIDI input connector touches the C64's outer wall (where the *Expansion Port* text goes).

4: Turn the power on
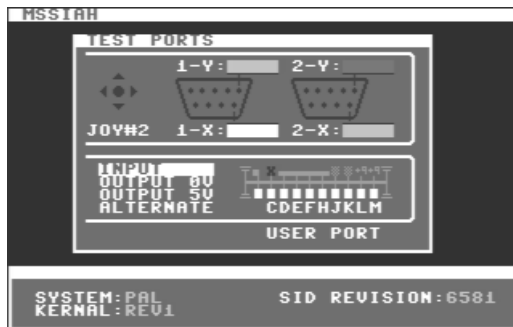
Your screen should now look like this:

Press any key to enter the startup menu.

Use the **CRSR** keys to navigate the menu and the **RETURN** key to start any of the MSSIAH applications.

The *Diagnostics* functions allow you to test audio and user/controller ports on your computer.

The upper part of the *Diagnostics / Ports* screen shows the Controller ports (joystick, potentiometers and mouse) and the lower part is a user port tester. Use **CRSR** keys to select port status and press **RETURN** key to execute.

There are four modes for the userport:
INPUT   input mode displaying any input on pins C-M.
OUTPUT 0V   outputs 0V on pins C-M
OUTPUT 5V   outputs 5V on pins C-M.
ALTERNATE   outputs 5V and 0V on every other pin C-M. **RETURN** key to toggle.

Bank Tests

You can quickly test the C64 timers, banks and MIDI functionality on the *Diagnostics / Banks* screen.
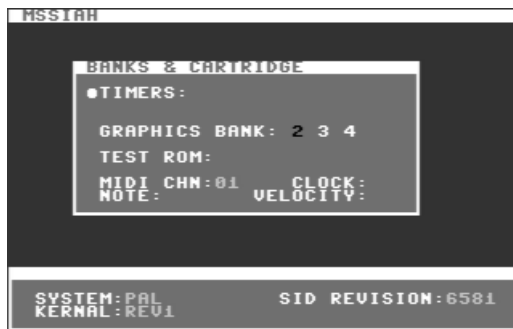
Timers
Press **RETURN** key to start the timer test. You should see two timer bars continuously progressing from left to right in time with the C64's timers. Left of the timer bars is a yellow circle flashing with an interval of approx. 1 second.
Press ← to stop the timer test.

Graphics Bank
Use **CRSR** keys left/right to select bank, then press **RETURN** key to activate. While holding return key depressed you should see the bank number in the upper right corner of the screen. If not, your CIA chip is defective.
Bank #1 has no effect in this test, it is the same one used for displaying the startup menu graphics. If it's out you won't see anything on the screen anyway so there's no point in testing it here.

Test ROM
This is a system's test we perform on all cartridges. It is of no use to MSSIAH end users.

MIDI test
This is a system's test also. Press **RETURN** key to start the MIDI test. It uses the first receive channel and displays incoming notes, velocity and MIDI clock.
Press ← key to quit the test.
Note: There is no audio in this test!

Audio Test

Press keys **1** – **6** to toggle each oscillator on/off individually. Press **CRSR** keys down and up to select filter and **RETURN** key to start filter test.

Shutting Down the Computer

The MSSIAH applications share the same MIDI parameters such as MIDI channels and pitch wheel ranges. For example, changing MIDI channel for the Wave-Player will make the same change for the Mono Synthesizer and stays in memory as long as you quit and reboot the cartridge with the power still on.

The same goes for the Mono Synthesizer and Drummer sound parameters. Quitting and restarting any of those applications will recall the last patch/instrument settings.

The MSSIAH Cartridge is capable of storing these settings even when the computer is switched off. However, you need to manually activate the storing procedure.

If you have made changes and wish to store them for later use, select the *Shut Down Computer* option in the startup menu and choose *Yes* to save. When saving is done the computer tells you it is safe to shut down the computer. ***Do not turn the computer off until this message appears!***

```
SELECT APPLICATION

SEQUENCER
MONO SYNTHESIZER
BASSLINE
DRUMMER
WAVE-PLAYER

DIRECTORY VIEWER
PSID CONVERTER
DIAGNOSTICS
SHUT DOWN COMPUTER
```

If you have not made any changes or wish not to save, choose *No* when asked to save.

The MSSIAH Cartridge can save these parameters approx. 100.000 times.

CAUTION:
If you choose to save settings on shut down, **DO NOT** shut down your computer until the computer tells you it is safe to do so. Neglecting this warning WILL corrupt your cartridge's data storage!!

Removal of the Cartridge

Removal is opposite of insertion.

1: First turn the power off!

> **CAUTION:**
>
> **YOU MUST NEVER REMOVE OR INSERT THE CARTRIDGE WITH THE POWER STILL ON!**
>
> To really emphasize the importance of this message we say it again:
> **YOU MUST NEVER REMOVE OR INSERT THE CARTRIDGE WITH THE POWER STILL ON!**

2: Pull the cartridge out
Grip the cartridge firmly on the top side and pull it out of the computer, use two hands to get a better grip. Don't wiggle it, just pull it straight out.

3: Store the cartridge in a safe place
Take good care of the cartridge. Don't store it in excessive heat, cold or humidity.
Don't expose the terminals on the bottom side to grease or electrostatic discharges. Do not open the cartridge case. There are no user repairable parts inside.

MIDI

The MSSIAH Cartridge features an integrated MIDI interface for a full MIDI implementation with all MSSIAH applications. The MIDI port is input only, there is no MIDI output.
The MIDI interface does only work with the software provided on the MSSIAH Cartridge. It is not compatible with any other programs.

To use the MIDI interface, connect a MIDI cable from the MIDI output of your master sequencer or keyboard into the MIDI input on the MSSIAH Cartridge's top side.
Read the manual for each MSSIAH application to learn how to utilize the MIDI features properly.
The image above illustrates where and how to insert the cable. The MSSIAH Cartridge needs to be inserted into a Commodore 64 and powered up in order for the MIDI interface to work. See the *How to Start up the Cartridge* chapter.

TIPS:

Though MSSIAH's MIDI interface is capable of handling a busy load of MIDI information, it is recommended to split up the MIDI data in case you have many peripheral devices in a large MIDI setup. MIDI does, after all, have a limited bandwidth.

Splitting MIDI signals means using a MIDI interface for your computer with, let's say, four outputs. You then use your computer's sequencer and assign the MIDI output for every track to any of those four outputs. Besides having extra MIDI channels (16*4 = 64 in this case), this will effectively balance the load on the MIDI bus.

Ground Rules

Three important things to remember to not damage your MSSIAH Cartridge:

DO <u>NOT</u> INSERT OR REMOVE CARTRIDGE WITH THE POWER STILL ON!!

DO <u>NOT</u> TOUCH THE TERMINALS!
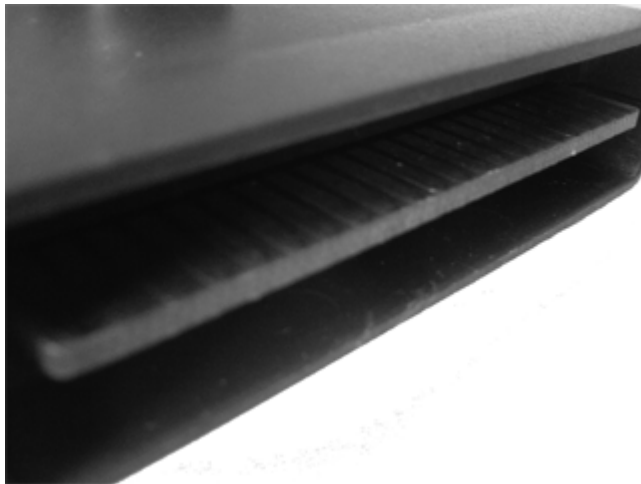
The word "Terminals" refers to the part of the circuit board
sticking out of the bottom of the cartridge.

DO <u>NOT</u> OPEN THE CARTRIDGE!
The MSSIAH Cartridge is not designed to be opened and closed repeatedly. There are no
service repairable parts inside.

Directory Viewer

The Directory Viewer is a simple application included in MSSIAH's startup menu.
It lists the files on your disk and mounts D64 files if you are using Savyour.

Navigate with the **CRSR** keys, **RETURN** key and ← key to go back or cancel.

Drive selects which drive to use ranging from 8 to 11. Unless you have changed the drive number on the back of your floppy drive, 8 is default. There is no reason changing it unless you have multiple drives where the second would become 9, etc.

Directory starts loading the directory. Use **CRSR** keys to navigate or **F1** and **F7** to scroll one whole page up and down.
Pressing **COMMODORE** (**C=**) key together with **CRSR** keys selects sorting. You can sort alphabetically, by size or by type (four last letters including letter ".")
The ← exits windows and returns to the main meny.

If you are using Savyour you can mount a D64 file before you start up any MSSIAH application in case you want to load and save your work on a D64 disk image.

Highlight a D64 image and press **RETURN** key to access the mount dialog.
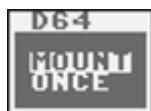
 Select *MOUNT* option to mount the D64 permanently.
Select *ONCE* option to dismount the D64 next time you pull out the USB memory.

Press **RETURN** key to mount or ← key to cancel.

The Commodore 64

In a long forgotten time and place where internet only existed in sci-fi movies, Hollywood special effects were not CGI but hand crafted models, car design was boxy, drum sounds were big, shoulder pads were big and hair was…well, also big.., the number one console people had in their homes was the Commodore 64.

With a total of 17 million units sold it still holds the world record in home computer sales.
That's a good thing because it means there are lots of used C64s out there ready to be picked up at a fair price.

There is plenty of information on the C64 on the net so instead of a deep look into its history and tech specs we just take a quick peek at it to refresh our minds.
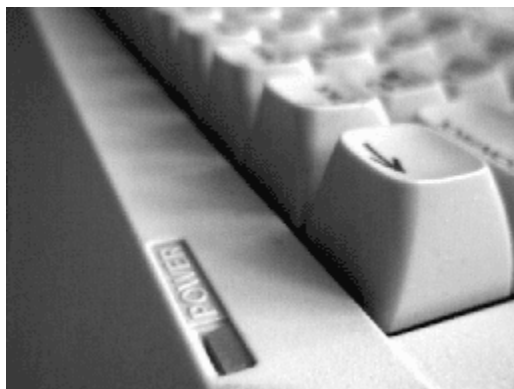
CPU:	1 MHz
Memory:	64 Kb RAM
	8 Kb Kernal ROM
	8 Kb Basic interpreter
	ROM had to be switched off to fully access the 64 Kb RAM.
Graphics:	<u>Hires</u>
	320 x 200 16 colors
	2 colors for every 8 x 8 area
	<u>Multicolor</u>
	160 x 200 16 colors
	2-4 colors for every 8 x 8 area
	<u>Text mode</u>
	320 x 200, 40 x 25 characters
	16 colors, 2 colors per 8 x 8 area
	Useless border
Audio:	SID Sound Interface Device.
	3 oscillators w/ 4 waveforms.
	Envelopes for every oscillator.
	1 resonant low/band/high-pass filter.
	Different versions for NTSC and PAL TV systems. NTSC running a little faster.
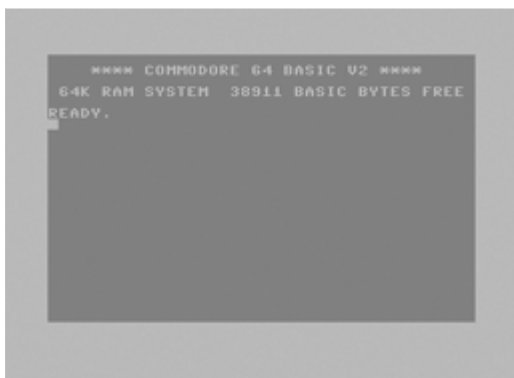
The Commodore 64's operating system is nothing like a modern MS-Windows computer. On the retro looking blue screen, the user enters commands or writes simple basic programs. Unlike MS-DOS, you can navigate the screen window with the cursor keys, up, down, sideways, you name it.
We can't do that these days…
(Thanks a lot, Bill!)

Storage Media

Screw SSD, memory cards, sticks, hard drives and 30 years of mass storage evolution…
Back in the day the number one choice for storing data was big clunky 5 1/4" floppy disks!
The dinosaur disks slid nicely into the Commodore built disk drive named "1541".

However, the cheaper alternative most people opted for as a starter was the 1530 *Datasette* tape cassette recorder. It was a notoriously slow loader mainly because of its backward compatibility with the VIC-20 (C64 predecessor).
The idea behind tape saves is in fact quite good, modulating data into audio signals stored on regular audio tapes.

Games from this era often contained images and music embedded in the loader software to entertain the gamer while waiting for the game to load.

Another storage media primarily made for game distribution was the ROM cartridge that went into the expansion port of the computer. Modern game consoles and handheld devices still make use of the cartridge concept and so does the MSSIAH Cartridge.
A cartridge is basically a circuit board with ROM circuits containing the software. The whole thing is wrapped up in a plastic case that fits well into a dedicated slot in the computer.
Memory buses allow the computer to access the software that loads instantly and much faster than any other media.

Inputs and Outputs of the C64

Let's have a look at the C64's ins and outs, starting from the left:

Controller ports
9 pin D-Sub connectors for old time joysticks, game paddles (potentiometers), mice and even light pens. The one to the left is port #1 and the one on the right is #2.

Peripherals connected into port #1 cause major conflicts with the keyboard. That is why most programs run the joystick in port #2.

Next to the controller ports is the power supply input.

The big bulky power supply unit (PSU) in the left picture is the 2.5 amps version that proved to be more reliable.
It's vital to have a trusty power source to your Commodore 64. For that reason it is recommended to use this one in favor of the earlier models.

Expansion port
Here is where you insert your MSSIAH Cartridge.

This port was also used for a variety of hardware: external RAM expansions, MIDI interfaces etc.

Note: Though there are expansion port splitters, the MSSIAH Cartridge is not designed to work simultaneously with other units on the expansion port.

RF out
Direct connect your TV-set.

(Now, you don't have this on your brand new PC, do you?)

Video/Audio out
An eight pin DIN input/output for Audio out, Video out (composite and S-video Y/C) and Audio in.

Even though it's got eight pins, a standard five pin DIN fits right into it. Good to know when building an audio cable to hook up the C64 to your Neve console…

Serial port ("IEC")
This is where to connect the disk drive.
Some printers use this port too.

The C64 can have multiple drives each with a different device number. In that case, they are chained together still using only this output.

Cassette port
Here is where to connect the "datasette" cassette recorder.

User Port
Looks like the cassette port, only bigger.

This 24 pin output is a bi-directional parallel communication port. It is mostly used for printers and modems. The MSSIAH can handle Sync24 ("DIN sync") inputs and outputs on this port.

The SID – Sound Interface Device

Besides a vast amount of classic games, people will mainly recognize the Commodore 64 in this day and age for its remarkable sound. A sound generated by a special chip, the legendary SID.

The SID has been claimed to be one of the best synthesizer circuits built. Technically this is not true, anyone into vintage analog synthesizers will tell you why. What is true is that the SID is probably the most beloved audio circuit of all time. Its unique sound, much due to the software controlling it, certainly comes with a lot of soul.

During the years in production the SID got altogether five upgrades. It started with the 6581 revision 1 (allegedly never in production) and ended with 8580 revision 5.
The 8580 had a major overhaul of its filters which was the biggest flaw in the older SIDs making them inconsistent in filter response, R4 being an exception.
Search the net and you will find people telling you that the 6581 R4 has the best filters of *all* the SIDs. There is really no right or wrong in that saying, it's all a matter of taste.
However, 8bit ventures advocates the use of the 8580 R5. Its filter response is more versatile and has a much wider cutoff slope than the R4 thereby sounding more like a "real" synthesizer. The MSSIAH Bassline is in fact tailor made for the 8580 R5.
If you can't find an 8580, the 6581 will do quite well with the rest of the applications. As for the Wave-Player either SID version will do since it does not make use of the filter.

Other differences between the 6581 and 8580 are the 8580's somewhat (very subtle) tighter VCA envelopes and its capability to mix waveforms. Add two waveforms on the 6581 and you will very likely end up with complete silence.

Voices or Oscillators?

An oscillator is the frequency generator that creates the basic timbre in a subtractive synthesizer. A synthesizer voice however is the whole package of oscillators, VCA, envelope and filter in a polyphonic system. Old analog synthesizers built up their polyphony by adding as many audio circuits as there were voices.
The SID, a one voice chip per se, has only one filter yet three oscillators w/ one VCA envelope each and thereby becomes somewhat of a hybrid. Even though MOS technologies (designers of the SID) saw prospective clients in the synthesizer industry, the main purpose of the SID ended up as audio source within a game computer. The three oscillators then became "voices" playing computer game music and sound effects.
One filter per oscillator would have made a huge improvement but due to interviews with designer Bob Yannes, lack of space inside the chip as well as lack of time during development made such add-ons impossible.

Envelope Bug

The SID envelopes have an annoying bug where triggering fails every eight notes or so.
This occurs whenever decay or release values are applied limiting the SIDs versatility.
Luckily people came up with a technique to get around this bug and make the SID envelopes work acceptable.
The idea behind the technique named *Hard Restart* is to reset the SID a certain amount of time before the trigger occurs. By learning to deal with hard restart and how the envelopes behave, you learn how to get the most out of the SID and become a good SID musician.

What to look for when shopping for C64s

Besides being in nearly mint condition (keyboard, ins and outs, nice picture etc.) you want it to sound great, after all we are going to use the C64 as a synthesizer.

Don't believe the myth that older C64s sound better than newer ones. Yes, they might sound grittier due to either old SIDs or poor components along the audio chain and yet a good thing when listening to old game music it's less attractive when using the C64 in your synthesizer setup. MSSIAH musicians are advised to look for late model C64s with 6581 R4 or 8580 R5 chips instead.

It's always a special feeling getting one's hands on a late model C64 with either an R4 or R5 inside. Of course if you already have a stockpile of good SIDs, it's of less importance.

So, where does it say what SID is inside the computer? Answer: Nowhere... You will have to find out yourself.

1. Look at the keyboard
Late version SIDs were housed in late model Commodores.

You can spot a late C64 by the symbol letters printed on the top side of the keys (left image) as opposed to old commies where symbol letters were printed on the vertical side (right image). Don't trust this method too much though. Keyboards as well as audio circuits in the computer might have been switched. It's merely a first notice of what might be a nice purchase when looking at an ad for a used C64.

2. Use the MSSIAH Cartridge
Plug in the MSSIAH Cartridge, turn the power on and see what it says.
The startup menu tells you what system is running and the SID version. Be aware of that this function may occasionally fail to detect the correct SID version. Start it up a couple of times to be sure.
This will still not tell you the revision in case of a 6581 (R4 being the most attractive) though. For that, you will need to go for the third option:

3. Look at the SID
This calls for opening up the Commodore 64 to look at the motherboard and the SID chip.
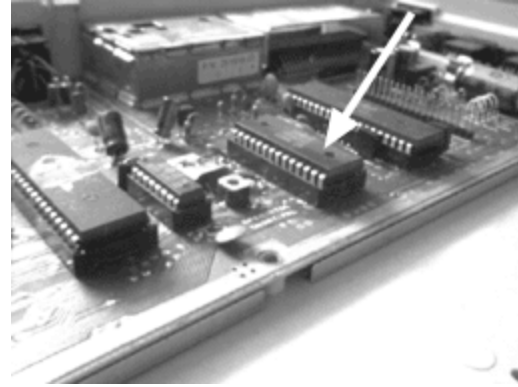
6581s are located to the left of the "RF modulator" (TV output) as seen in the left picture whereas 8580s are located just below it (right picture).
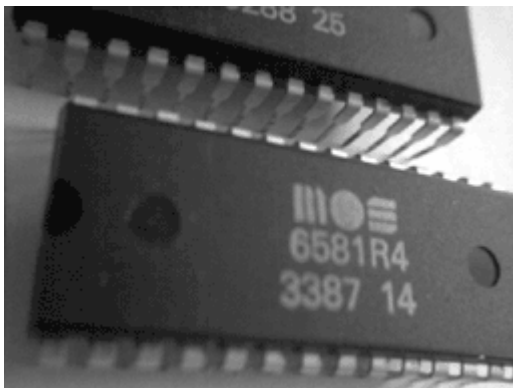
The 6581s have a printing on the top saying *6581*. *R3* or *R4* means Revision 3 or Revision 4. On the left picture above, the SID in question is a 6581 Revision 4 (good!). The right picture shows an 8580 which is always revision 5.

The bottom line is a manufacturing week-year time stamp, *0288* being week 2 1988 (and a high likeliness that at least someone at the plant had achy breaky hair…).

Check the filters

When you have found the C64 of choice, it's time to test its filters. Insert your MSSIAH Cartridge and switch the power on. Use the audio diagnostics function in the startup menu to see if all three oscillators work and listen to the filter. Start up the Drummer and see if it triggers well.

If you are at the seller's house maybe it might not be such a good idea to show the MSSIAH software. The seller may suddenly see the computer's potential and end up not selling it to you, at least not for a bargain! Ask for some coffee so he or she leaves the room…

On a serious note, do take that extra time when looking for at C64. It will pay off later.
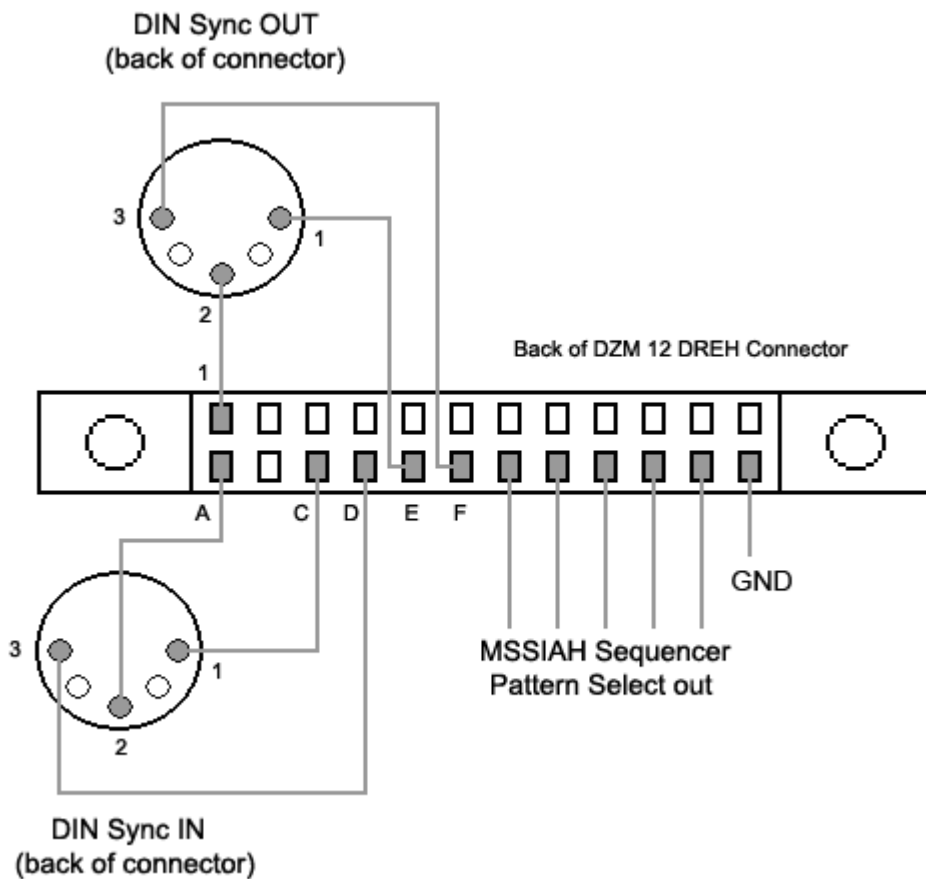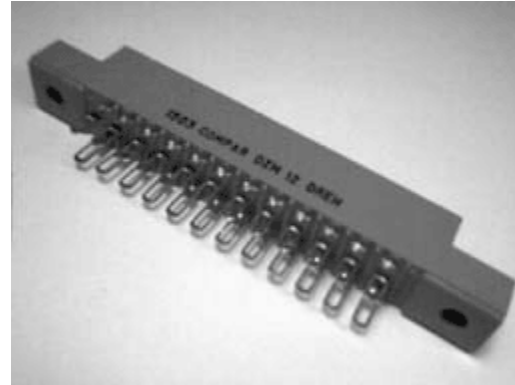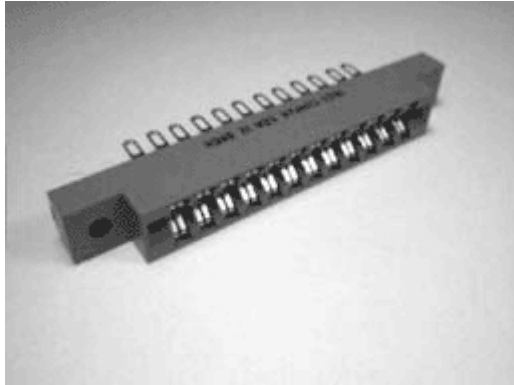
Second SID

For years people have been piggy-backing an extra SID on top of the main one to gain six oscillators or a stereo sound in their C64s. The 8bit ventures SID2SID circuit board is based on the same idea but gives you a neat installation so you don't have to jeopardize the SIDs by direct soldering.

There haven't been many programs around capable of handling a second SID though, MSSIAH Cartridge being an exception.

A full description on how to assemble the SID2SID board is provided in the SID2SID installation guide available for download on our website.

Peripherals

User Port Sync24

DIN Sync OUT
(back of connector)

Back of DZM 12 DREH Connector

A   C   D   E   F

GND

MSSIAH Sequencer
Pattern Select out

DIN Sync IN
(back of connector)

The user port connector is a 12/24 pin edge board connector with .156" (3.96 mm) spacing. These are available from a number of manufacturers such as Sullins, Compar etc.
Use a 5 pin male DIN connector for the sync IN. Though depicted as a male connector you might want to use a female one for sync OUT. In that case, remember that pin 1 and 3 are mirrored. Sync OUT is optional, you do not need it to slave the MSSIAH to your Sync24 equipment.

The Pattern Select is used for input only on old Prophet64 Mono Synthesizer, Bassline and Drummer applications. The MSSIAH Sequencer uses the same pins for output only. Because the user port is bidirectional you risk damaging your computer if connecting two computers before the programs are fully started up.

Since you are advised not to insert anything into the user port with the computer's power turned on, a good idea is to solder the Pattern Select wires to a 6 pin male DIN connector for the output, then use a female DIN for the inputs and you can safely leave the Pattern Selects pins disconnected until both applications are up and running.
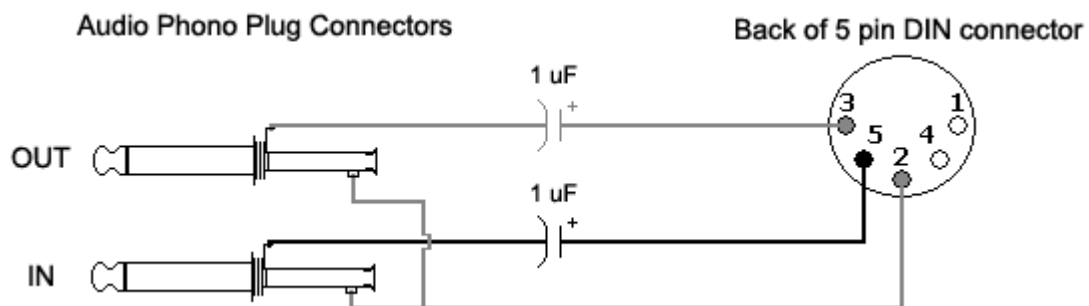
CAUTION:

Never insert or remove your user port connector while the computer's power is turned on!

The user port and your home built connector can be tested with the port diagnostic function in the startup menu on the MSSIAH Cartridge.

Audio Out / In

On the back of the Commodore 64 there is an 8-pin female DIN connector labeled *Video*. The port is for audio and video signals. Though the connector is 8-pin, a male 5-pin DIN connector can be inserted without a problem.


The 1 uF capacitors are from the SID specs. Their purpose is to improve the sound quality. With a fairly high S/N ratio and ground noise level, the caps do not really make any noticeable difference to the SID's audio output.

Note:

Caution! SIDs have been observed failing after being connected to mixing devices when mixer power has been turned off. Whether this is due to back current or spikes on the connection is not known. User is advised to first carefully remove the audio connection to the SID before external unit is turned off.

Potentiometers

Back of 9 pin DSUB connector
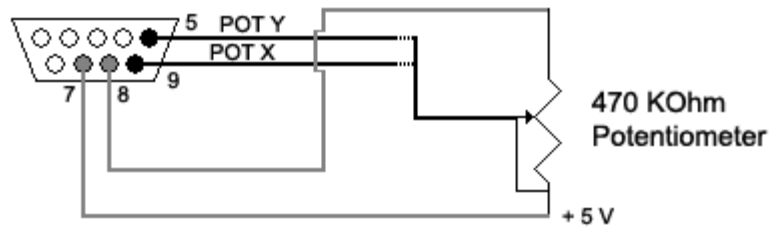
The MSSIAH Mono Synthesizer and Bassline applications are both capable of simultaneously handling four connected potentiometers.
The C64 connects two pots in every controller port (X and Y).
MSSIAH Drummer lets you choose either X and Y of controller port #2 if using pots.

Note:

Caution! Connecting a potentiometer into a controller port while power is on may cause a cold start (reset) of the computer. It is advisable not to insert/remove pots (or joysticks/mice) into the controller ports while the power is on.

Second SID installation

There's a complete guide on how to install the SID2SID board in a separate booklet available for download on *http://www.mssiah.com*.