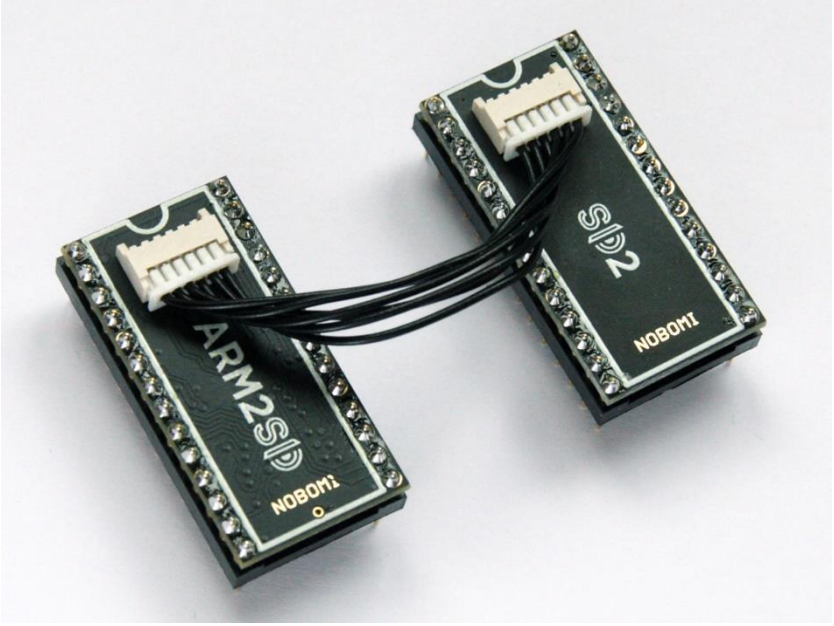
ARM2SID quick installation guide



Thank you for your purchase!

ARM2SID is a new replacement for 2 Commodore SID music chips and more. ARM2SID is a bigger brother of our well known ARMSID, which is a real "plug & play solution and fully replaces both the MOS6581 and MOS8580 chips.

ARM2SID comes whenever 2 SID chips are needed, usually for stereo. If you have 2 SID sockets, just place the ARM2SID in the primary socket, SID2 in the secondary socket, connect both of them with the provided 5 or 10 cm cable, configure with the provided C64/C128 utility and go.

If you have just one socket and are not afraid of soldering, you can get even more. Use the provided connector cable, connect the 6 wires to your C64/C128 and you get the 2nd SID for stereo, the 3rd SID for 3SID music and OPL FM synthesis compatible with FM Sound Expander!

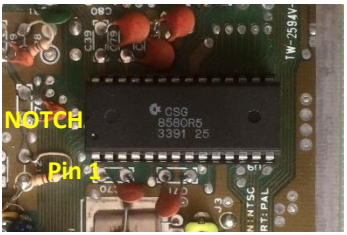
Enjoy your ARM2SID!

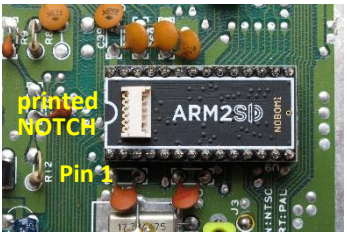
CAUTION: Before you install ARM2SID, the computer must be turned OFF and disconnected from the power supply.

WARNING: The installation of ARM2SID should be performed by a skilled person. It requires you to open your Commodore computer. Most of the chips are sensitive to static electricity, ground yourself. Neither ARTAX nor NOBOMI will be responsible for any damages caused by an improper ARM2SID installation.

ARM2SID orientation.

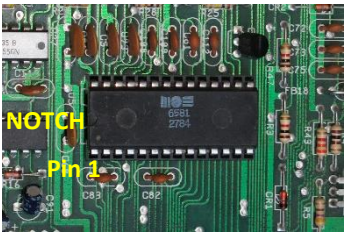
It is **very important** to place your ARM2SID into the socket the correct way. The original SID chip has a slightly beveled notch near the pin 1. ARM2SID has a white printed notch on the PCB above the pin 1. See the pictures from the Commodore C64:

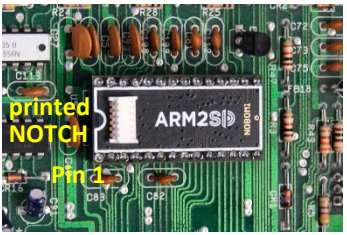




CAUTION: Please, really DO take care about the ARM2SID orientation. If you turn the ARM2SID the wrong way, you WILL damage your computer. High voltage (9 or 12 V) will go to your computer bus and most likely destroy your computer RAM, ROM and more chips.

The orientation in the Commodore C128 is similar. Always place ARM2SID with the same orientation as the original SID chip.

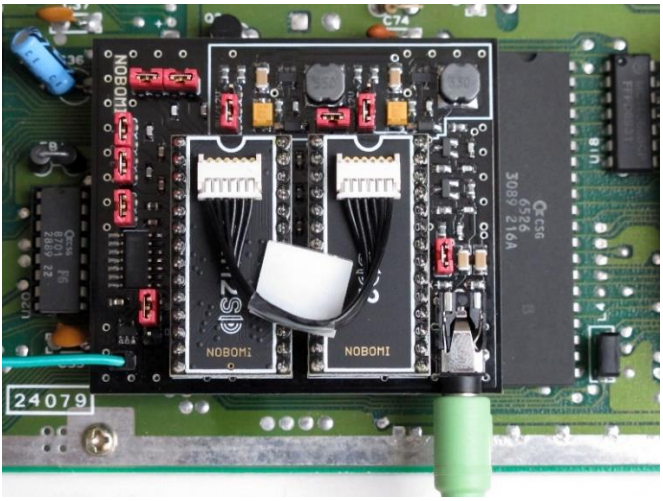




Dual socket configuration

This is easy no-soldering solution for stereo SID expanders (MixSID, SIDFX, SID2SID etc.) or dual-SID boards.

Install the ARM2SID in the primary socket, SID2 in the secondary socket and connect them with the provided 5 or 10 cm cable. Take care for the proper ARM2SID and SID2 orientation! Wrong orientation will destroy your computer!



Configure ARM2SID with the provided ARMSID TESTER utility. Start it, choose $D400 SID, select M for ADDRESS MAPPING CONFIGURATION and select PIN CONNECTION: SOCKET, then choose what to play in the LEFT and RIGHT socket. If your socket supports $DFxx addressing, you can use SFX (FM) too.

Dual socket configuration for C64 Reloaded MK2

The special ARM2SID version for C64 Reloaded MK2 allows correct autodetection in this computer. This option however affects the Digifix introduced in newer ARMSID firmware versions.

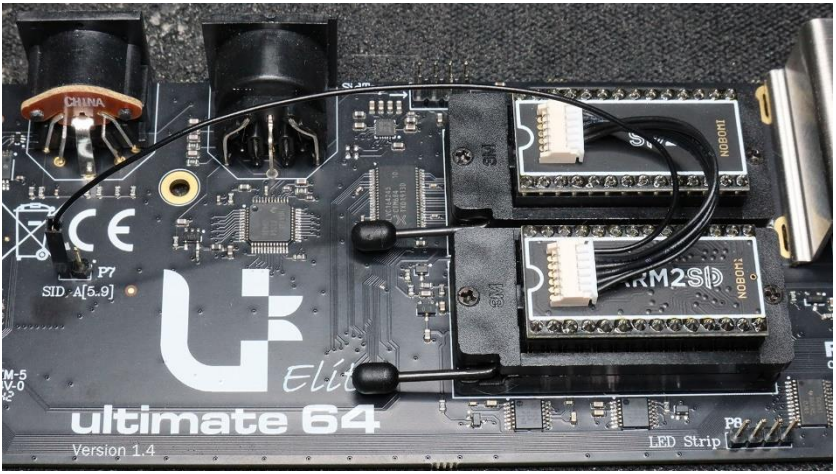
Fortunately the Digifix can be set by hardware pin or the software. The hardware is affected and will set your Digifix to -100%, so for the ARM2SID usage in C64 Reloaded MK2 you have to change the Digifix configuration to Software to enjoy the SID music the best. Adjust the Digifix value to desired level then.

Remember to save the settings to flash memory by pressing ‘P’ key.

Ultimate 64 usage and configuration

Install the ARM2SID in the primary (lower, SID-1) socket and SID2 in the secondary (upper, SID-2) socket in your Ultimate 64. Connect ARM2SID and SID2 with the provided special cable harness for Ultimate 64. The small connector with all pins populated belongs to ARM2SID and the connector with only 5 pins populated to SID2. The one longer wire connects to left pin on SID A[5..9] dual pin header in Ultimate 64.

Take care for the proper ARM2SID and SID2 orientation! Wrong orientation could damage your computer!



The SID A[5..9] brings an addition address line to the ARM2SID to recognize more different addresses where internal SIDs/SFX could be positioned. It is controlled by Ext DualSID Range Split setting of Ultimate 64 configuration.

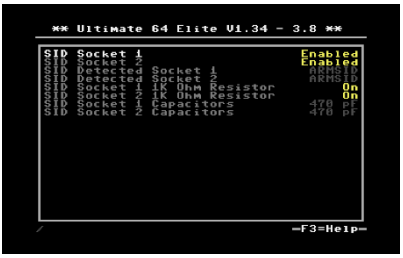
There are some setting common for all ARM2SID modes and then you have to configure Ultimate 64 and ARM2SID with its configuration utility for required mode of operation:

- Standard 2 SID stereo
- 3 SIDs
- SID + SFX Sound Expander
- SFX Sound Expander only

Common Ultimate 64 settings for ARM2SID usage

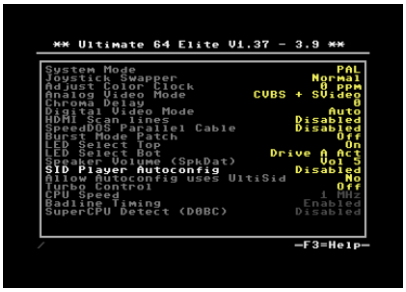
You have to enable both SID sockets and disable UltiSID.

U64: SID Socket 1 ... Enabled
U64: SID Socket 2 ... Enabled
U64: UltiSID 1 Address ... Unmapped
U64: UltiSID 2 Address ... Unmapped



It is also necessary to disable Ultimate 64 SID Player Autoconfiguration. The Ultimate 64 can configure ARMSID using public API and it will modify your settings unintentionally, the way you did not want it and you could be confused what is going on, so it is definitely better to disable the Autoconfiguration and to all configuration yourself. Also disable the UltiSID.

SID Player Autoconfig … Disabled
Allow Autoconfig uses UltiSid … Off



It also a good idea to slightly adjust the Audio Mixer, but this is about preference of different people. We usually slightly increase the volume of both sockets and extend the pan for both sockets to wider stereo enjoyment.

The next screen is ARM2SID test and configuration utility. You will need to make ARM2SID configuration changes to use different modes. You can also use it to change between 6581 and 8580 emulation, adjust Digifix and more.

You can download it with the newest firmware from Downloads section on Retrocomp e-shop or from the author's pages:
https://www.nobomi.cz/8bit/arm2sid/

Standard 2 SID stereo (SIDs on addresses $D400 and $D420)

Adjust SID Addressing in Ultimate 64 configuration

U64: SID Socket 1 Address ... $D400
U64: SID Socket 2 Address ... $D420
U64: Ext DualSID Range Split ... A8

Configure ARM2SID using ARM2SID Test and Configuration Utility

ARM2SID: PIN CONNECTIONS ... SOCKET
ARM2SID: SID/1 ... SIDL
ARM2SID: SID/2 ... SIDR
ARM2SID: EMULATION MODE ... SID

3 SIDs (SIDs on addresses $D400, $D420 and $D500)

Adjust SID Addressing in Ultimate 64 configuration

U64: SID Socket 1 Address ... $D400
U64: SID Socket 2 Address ... $D420
U64: Ext DualSID Range Split ... A8

Configure ARM2SID using ARM2SID Test and Configuration Utility

ARM2SID: PIN CONNECTIONS ... WIRE
ARM2SID: $D400 ... SIDL
ARM2SID: $D420 ... SID3
ARM2SID: $D500 ... SID3
ARM2SID: $D520 ... SIDL
ARM2SID: $DE00 ... SIDR
ARM2SID: EMULATION MODE ... 3SID

SID + SFX Sound Expander (SID on address $D400, SFX on addresses $DFxx)

Adjust SID Addressing in Ultimate 64 configuration

U64: SID Socket 1 Address ... $D400
U64: SID Socket 2 Address ... $DF40
U64: Ext DualSID Range Split ... A5

Configure ARM2SID using ARM2SID Test and Configuration Utility

ARM2SID: PIN CONNECTIONS ... SOCKET
ARM2SID: SID/1 ... SIDL
ARM2SID: SID/2 ... SFX
ARM2SID: EMULATION MODE ... BOTH

SFX Sound Expander only (SFX on addresses $DFxx)

Using ARM2SID in “SFX only” mode allows the CPU to put all the power to FM synthesis and so it makes slightly better sound quality.

Adjust SID Addressing in Ultimate 64 configuration

U64: SID Socket 1 Address ... $D400
U64: SID Socket 2 Address ... $DF40
U64: Ext DualSID Range Split ... A5

Configure ARM2SID using ARM2SID Test and Configuration Utility

ARM2SID: PIN CONNECTIONS ... SOCKET
ARM2SID: SID/2 ... SFX
ARM2SID: EMULATION MODE ... SFX

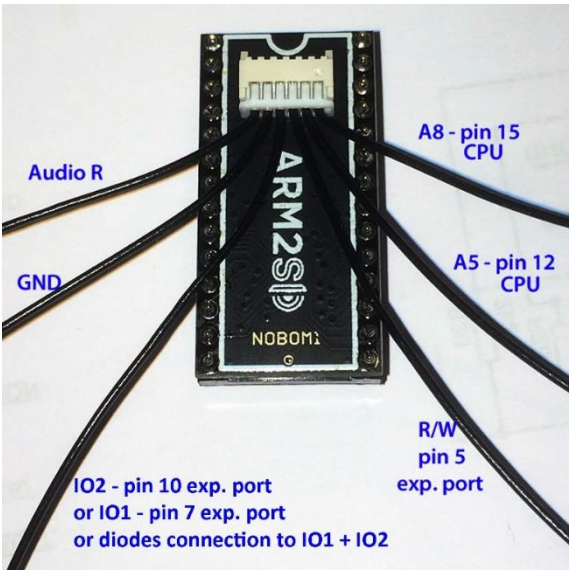
Single socket (wired) configuration

Congratulations, you are the brave one, not afraid of a soldering iron!

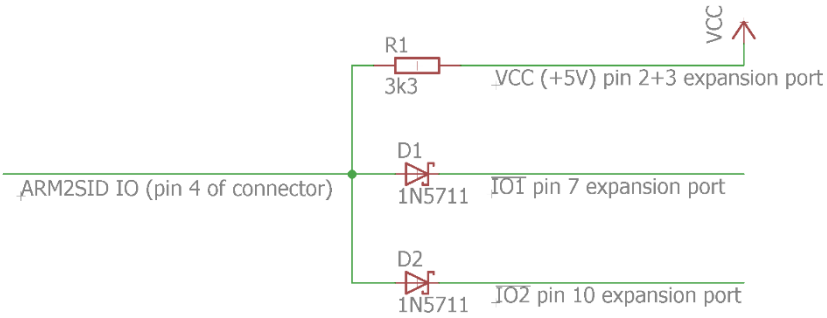
Install ARM2SID to the socket with the correct orientation. Connect the provided cable with the connector to the ARM2SID and connect its wires to the following points in you C64/C128:

A8 – pin 15 of CPU
A5 – pin 12 of CPU
R/W – pin 5 of expansion port connector
IO – connects to IO2 (pin 10 of expansion port connector) for Sound Expander SFX $DFxx compatibility, IO1 (pin 7 of expansion port connector) for $DE00 stereo SID play or both with diodes and resistor pullup.
GND – computer ground, not needed to connect
Audio R – right audio channel, usually connects to pin 7 of A/V DIN jack. We suggest to add 10µF/10V electrolytic capacitor between ARM2SID Audio R output and pin 7 of A/V DIN jack to separate the DC component from the ARM2SID audio output. Capacitor + pin should go to the ARM2SID.

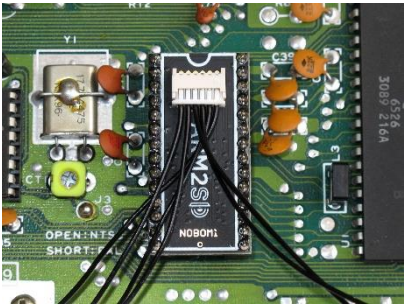
ARM2SID wires connection:

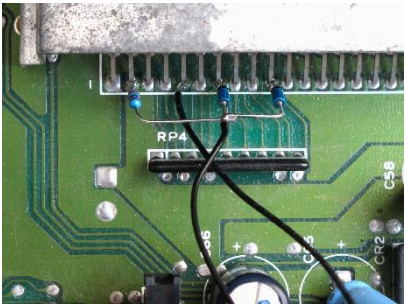


ARM2SID IO connection with diodes:



The ARM2SID IO connection with diodes and a pullup resistor (all parts are provided with ARM2SID with 30 cm cable wires) is necessary only if you want to use all possibilities of ARM2SID. In case, that you do not want to use the 2nd SID on an address $DExx, you do not have to connect IO1 and just connect the ARM2SID IO pin directly to the IO2 of expansion connector for the SFX Sound Expander $DFxx. If you do not want to use ARM2SID on address $DExx and $DFxx, you do not have to connect ARM2SID IO pin at all.





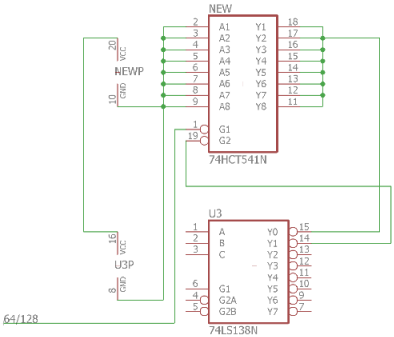
$D5xx addresses decoding in Commodore C128

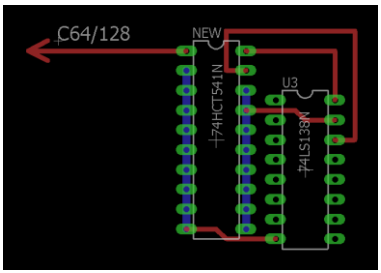
Using $D5xx addresses in C128 is a little bit difficult because the SIDs chip-select pin in C128 addresses only $D400-$D4FF range, unlike C64 where it is $D400-$D7FF. You still need to connect the A8 address pin to the CPU, but you have to somehow extend the address range of the SIDs chip-select. It is more complicated, you can not extend the range for C128 mode, you can do it only for C64 mode where the range of $D5xx addresses is usable (free).

The address decoding of IO peripherals is managed inside C128 by IC 74LS138 named U3. Probably the best way (fastest in signal timing) is a solution also recommended in the MixSID project by replacing this IC with a GAL with such a functionality. Described here:

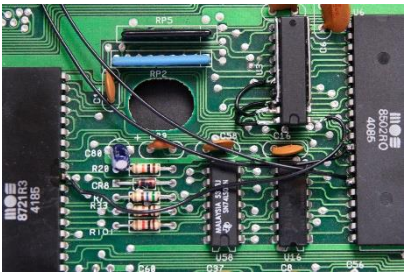
https://github.com/hbekel/MixSID/tree/master/firmware/c128

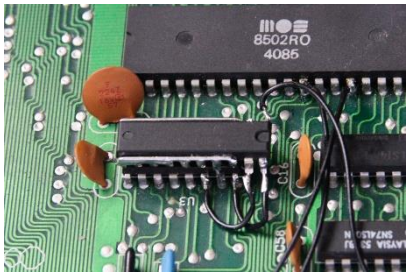
But if you do not like cutting pins on the board as we do not like, NOBOMI created a piggy back solution for U3 with 74HCT541. This uses a little bit of "force" to push the signal where we want to, but all is in the working range of participating ICs.





Shorten all pins on 74HCT541 with the exception of pins 10 and 17. Wire (solder) together all pins 2-10 and 11-18. Piggy back place 74HCT541 on top of U3 and solder the pin 10 of 74HCT541 to the pin 8 of U3. Then solder the pin 17 of 74HCT541 to the pin 15 of U3. Connect VCC (the pin 20 of 74HCT541 to the pin 16 of U3) and connect G2 (the pin 19 of 74HCT541 to the pin 14 of U3) by short wires. Finally connect 64/128 signal from the MMU pin 47 to the pin 1 of 74HCT541.





Single socket (wired) software configuration

If you connected everything as noted before, you can use all configuration possibilities. If you did not connect some signals, the configuration utility will allow you to setup everything, but some parts of emulation will not work, it is up to you, if you need it and connect all the wires.

Configuration for most common stereo or 3 SID music:

If you set stereo and play one SID music, ARM2SID will automatically switch to dual mono (same music on both audio channels) after 15 seconds of inactivity on the 2nd channel. This function does not work in 3 SID setup. If you want dual mono, you have to switch the down-mix in config utility.

Configuration for SFX (Sound Expander compatible):

With this configuration you can play all OPL FM synth music for Sound Expander and one SID together. You can down-mix to mono, if you do not use stereo output on your C64. It is possible to switch to SFX only mode (without SID). In that case all computing power is put to the FM synthesis and SFX emulation is even better and goes to both channels.

For SFX music it is necessary to the connect ARM2SID IO pin to the pin 10 of C64/C128 expansion port connector (IO2) to enable $DFxx addressing. You can connect it directly or with diodes as stated before.

All settings will take effects in emulation only after saving it by key S to RAM or by key P to save to permanent flash memory. Always save first to the RAM (press S) and test your configuration before saving it permanent. If you save to RAM, you can easily return to previous settings by switching computer off and on again. If configuration works, then save permanently to the flash memory.

Firmware update

Start firmware update utility and follow the instructions. If the update fails in some rare circumstances, try to use the blind version of the update utility (the filename ends with the letter b).

Do not try to update ARM2SID with any ARM hardware programmer directly. The firmware is encrypted and needs a special bootloader. If you erase the bootloader, there is no way you can program the ARM2SID with the correct firmware again and you will need to send it back to us.

More information and support

You can find more information, download the configuration and the firmware update utility on the author's website:
https://www.nobomi.cz/8bit/arm2sid/index_en.php

The configuration utility, some SID music, recorded music samples and more can be downloaded from our ARM2SID e-shop page:
https://retrocomp.cz/produkt?id=20

News, information and discussions on our Faceboook page:
https://www.facebook.com/SIDreplacement/

In case of any troubles, you can get support on the following e-mail:
support@retrocomp.cz