CosmosEx basics

A booklet about all the basic questions that there are…

…and Jookie keeps answering them over and over again through e-mail and on discussion forums ☺

by Jookie, 2016-04-15

Glossary / Vocabulary

CosmosEx device - a peripheral device for Atari ST, Mega ST, Mega STE, TT, Falcon

Hans - hard drive interface chip

Xilinx - helper chip for Hans

Franz - floppy drive interface chip

Raspberry Pi - a small computer which goes into CosmosEx device

GPIO - some interface, which connects Raspberry Pi and CosmosEx device inside of the box

SD card - flash storage media for your files, or for booting the linux on Raspberry Pi

Linux - operating system which runs on Raspberry Pi

Yocto, Raspbian - two different types of Linux

IKBD - mouse / keyboard / joystick interface in Atari computer

TOS - Atari operating system, stored in ROM memories in your computer, single task

MagiC - alternative operating system for Atari, multi-tasking

MiNT - alternative operating system for Atari, based on linux, multi-tasking

Sandwich case - type of Atari case where keyboard is together with motherboard

Mega case - type of Atari case where keyboard is separate from the motherboard and floppy

FDD - floppy drive

HDD - hard drive

ACSI - type of hard drive interface in Atari ST, Mega ST, Mega STE, TT

SCSI - type of hard drive interface in Atari TT, Atari Falcon

Internal - it's inside of your Atari computer case

External - it's outside of your Atari computer case

Raspberry Pi questions

Do I need a Raspberry Pi for the CosmosEx device?

If you plan to use the device as a hard drive replacement, only using SD card as a storage media, then no, you don't need Raspberry Pi for it. But you can mount it later and then your device will become the full featured device.

If you plan to use floppy drive emulation, USB mouse / USB keyboard / USB joystick, USB flash drive, web configuration interface, online updates, offline updates from USB drive, shared (network) drive, then you need a Raspberry Pi in the device.

What kind of floppy images are supported without Raspberry Pi?

Floppy emulation doesn't work without Raspberry Pi, because most of the floppy image processing and handling is done in Raspberry Pi. So no floppy images are supported and working without Raspberry Pi.

What USB mouse / USB keyboard / USB joystick is supported without Raspberry Pi?

No USB device (no mouse, no keyboard, no joystick, and no flash drive) can be connected without Raspberry Pi, because without Raspberry Pi there isn't a USB port in the device. Also the IKDB injection doesn't work, because all the IKDB data pass through Raspberry Pi, and when it's not present, the data have nowhere to go.

Which Raspberry Pi do I need?

For the latest CosmosEx device the **Raspberry Pi, model 1, B+, with 4 USB ports** is recommended, you need 40-to-26 pin internal cable, this cable is there by default if you order the device and don't have special notes / requests.

Raspberry Pi, model 1, B (without +) with 2 USB ports, with 2 mounting holes can be used, but you need 26-to-26 pin internal cable which is NOT included with the CosmosEx device, and you need to ask for it. It's not offered explicitly, because we want to support newer devices, which will all work with the 40-to-26 pin internal cable. You also need to move 2 metallic spacing pillars to other holes in the metallic box, and remove 2 metallic spacing pillars and use plastic spacing pillars instead. Please also note that the current metallic box has an opening in the front panel for 4 USB connectors, so using this model will lead to having a larger hole in the front panel.

Raspberry Pi, model 1, B (without +) with 2 USB ports, without any mounting holes can't be used, as their GPIO pinout is different. Technically – you could create a special 26-to-26 pin cable, where you would connect the right pins from CosmosEx to the right pins from Raspberry Pi, but I have never tried that. Plus you would have trouble to mount it in the box as is has no mounting holes.

Raspberry Pi, model 2 and model 3, with 4 USB ports, is currently not yet supported, as it needs newer linux distribution than the currently used one, but will be supported in the (near) future, when the transition to Raspbian will happen. The standard 40-to-26 pins internal cable will be used as GPIO pinout is compatible with B+ model.

General questions

Can the device be mounted internally – inside of my Atari?

Yes, it can.

For Atari ST, Atari Falcon (sandwich case):

- connect your floppy cable directly, inside of the case, where the floppy was connected
- connect your IKBD sandwich injector PCB and silly cable directly, inside of the case
- there is no internal ACSI / SCSI connector inside of sandwich case machines, so you have to drag the cable outside of your machine and connect the cable to external connector (or do some soldering and modify your ST / Falcon)

For Mega ST, Mega STE, TT (Mega case):

- connect your IKDB mega injector and silly cable between your computer and the original keyboard, possibly isolate the bottom of the Mega injector somehow, drag the silly cable inside your machine
- for ACSI interface: connect the ACSI cable to external connector and drag the cable inside of your machine
- for SCSI interface in TT: connect the SCSI cable to internal SCSI connector
- connect your floppy cable directly, where the floppy was connected

Can the device be mounted externally – outside of my Atari?

Yes, it can.

For Atari ST, Atari Falcon (sandwich case):

- Connect your floppy cable directly, inside of the case, where the floppy was connected, and drag that cable outside of the sandwich case, or…
- Connect your floppy cable to the external floppy connector, if you do have the appropriate cable reduction (you can modify SF 514 floppy for that purpose)
- connect your IKBD sandwich injector PCB and silly cable directly, inside of the case, but drag the cable outside of the sandwich case
- connect the ACSI / SCSI cable to the external ACSI / SCSI port

For Mega ST, Mega STE, TT (Mega case):

- connect your IKDB mega injector and silly cable between your computer and the original keyboard, possibly isolate the bottom of the Mega injector somehow
- for ACSI interface: connect the ACSI cable to external connector
- for SCSI interface in TT: connect the SCSI cable to internal SCSI connector, and drag the cable outside of the case
- connect your floppy cable directly, where the floppy was connected, and drag the floppy cable outside of the case

Do I need to connect all the cables?

If you don't need all the functionality, you don't have to connect all the cables for all the interfaces, so:

- if you don't need floppy emulation, you don't have to connect floppy cable
- if you don't need hard drive emulation, you don't have to connect ACSI / SCSI cable
- if you don't need IKDB injection, you don't need to connect IKDB injector and cable
- …but you have to connect at least one of the above, because otherwise it's useless ;)
- You do have to connect power supply – either through the original floppy power connector, or through the mini USB connector, but not through both at the same time.
- If you don't need networking stuff (updates, shared network drive / folder, time synchronization), you don't have to connect Ethernet cable

What cables do I need to connect?

- In any use case – you have to connect the power supply and turn on the device
- If you want the floppy emulation to be running, you need to connect floppy cable – it doesn't work through ACSI, it doesn't work through SCSI, it doesn't work through IKBD
- If you want any of the hard drive functionality (SD card as hard drive, USB flash drive as hard drive, network / shared folder as a hard drive), you have to connect ACSI or SCSI cable
- If you want to use USB mouse, USB joysticks, USB keyboard, you have to connect the IKBD injector and silly cable
- If you want to use shared (network) folder, time synchronization from internet, software updates from internet, network card functionality (STiNG), then you have to connect Ethernet cable or use Wifi USB dongle

Why is there an empty SD card adapter in my package?

If you ordered your CosmosEx device with Raspberry Pi already inside, you might have had found an empty micro SD adapter and you wonder if Jookie did forgot to send the card. The SD card is probably already inside of Raspberry Pi, and if your device boots (starts in less than 2 minutes) – front blue LEDs weakly blinking ever second, then the SD card is definitely there and Raspberry Pi boots from it. The (empty) micro SD card adapter in the package is then there just in case you need to write new linux image to that micro SD card, and you have a card reader which has full size SD card slot.

However, if your device has Raspberry Pi inside, but doesn't boot even after 2 minutes (first successful boot might be longer, others are shorter), please open the device and check if the micro SD card is inserted in the Raspberry Pi and if not, send a photo of that to Jookie.

Similarly, if you ordered device without Raspberry Pi, you should have that micro SD card inside that adapter and if it's not there, send a message to Jookie.

Can I use the free space on the linux SD card to store data?

Theoretically you could, but the partitions there are not prepared for that – you would need either expand the existing partition, or create another partition.

But I would like to discourage you to do that – the writes to SD card wear out the card, and in case of power loss (e.g. turning the device suddenly off) could lead to data on the SD card being corrupted, and the device might fail to boot then. So just get a different SD card and use it in the front slot of the device.

Also in the future there might be a linux image update from internet feature, which will utilize that free space…

Can I share the partition from the linux SD card?

The custom linux distro (yocto) doesn't allow that, it doesn't have the tools for that.

The future linux distro (Raspbian) will be able to do it, but I discourage you from doing it – please use a different place for sharing your data with other machines to avoid data corruption on shutdown and minimize SD card wearing.

Can I install additional packages on Raspberry Pi, e.g. using apt-get?

The custom linux distro (yocto) doesn't allow that as it is custom built and doesn't have any packages stored anywhere.

The future linux distro (Raspbian) will be able to do it, but I discourage to install unnecessary software on the device, which will not be used for Atari extension purposes. Sure, you feel that Raspberry Pi has plenty of space and power for additional apps, but once things or data get broken, you will try to fix the situation and create unnecessary issues, forum post, emails and so on. Also the current version of CE main app (under linux) is not prepared for sharing CPU time with other apps and might misbehave under load. So ask your self – do you want a reliable Atari hardware, or do you want to try things until they break? ;)

How long does it boot, until it's ready to be used?

With the current linux distro (Yocto) it takes from 13 to 20 seconds to device to boot from the power on moment, if it has ethernet cable connected. It might be longer, if your network address needs to be retrieved from DHCP server, or you use wifi dongle for network. The device has booted and is ready, if the blue front activity LEDs (FDD, ACSI) blink weakly in 1 second interval (they are quite dim when blinking, you might need to cover their surrounding with hand to see them blink).

With the upcoming linux distro (Raspbian) it might be shorter or longer, let's see.

You might speed up the boot time with replacing the original Raspberry Pi SD card (Kingston brand) with some more expensive and faster SD card (e.g. Sandisk Ultra), which might change the original time from 19 seconds to 12 seconds (according to tuxie).

How do I know that the device is ready for usage?

When the device is turned off, the FDD LEDs marked as 1, 2, 3 might light up and stay on showing that the Raspberry Pi is not communicating with Hans chip yet, and it's in the solo mode (only the SD card works). Then the blue front activity LEDs (FDD, ACSI) will blink weakly in 1 second interval (they are quite dim when blinking, you might need to cover their surrounding with hand to see them blink) showing that the Raspberry Pi is communicating with Hans (this is good). This takes some time:

- If you are running the device for the first time with your Raspberry Pi, this might take around 2 or 3 minutes (some tasks needs to finish in the initial boot)
- If it's not the first device boot, with the Ethernet cable connected it should take around 20 seconds.

What to do when the device is dead – not even green power LED is on?

The first thing that needs to be definitely on is the green power LED on the front panel. What do check and try:

- Is the power supply cable connect to the device?
- Is the power supply on? Is it in connected to the wall socket?
- Did you turn on the CosmosEx device with the power switch?
- Can you try a different cable between CosmosEx device and your power supply?
- If you used USB power supply, can you use the other power connector on CosmosEx? (The one which is normally connected to floppy drive). Sometimes the USB power connector on CosmosEx device has cold solder joint (bad connection), but the regular floppy power connector is working in almost every case

What to do, when the green power LED is on, but the device seems never get ready for usage?

- Make sure that you waited at least 2 or 3 minutes – your first device start might take longer
- Make sure that Raspberry Pi is inside of your CosmosEx device
- Make sure that the model of Raspberry Pi is supported – see some previous section on supported models.
- Make sure that Raspberry Pi is connected to the rest of the electronics using flat cable
- Does the Raspberry Pi have the SD card inserted in it? Without that it won't work.
- Does the Raspberry Pi have power? If you can locate any LEDs on Raspberry Pi, check if they are turned on, blinking or something similar.
- If that internal flat cable between Raspberry Pi and the rest of the electronics seems to be stretched too much, you can try to separate the whole cable into groups of 5 wires, like this:

- If everything from the earlier seems to be OK, you can connect to Raspberry Pi using some ssh client (e.g. Putty for Windows), username is 'root', password is 'ce', and then type 'ps' and hit enter. You should see a line which has 'cosmosex' written in it, and it's not there, then there's definitely something wrong.

What power supply should I use for the device?

If you connect the device internally (from inside of your Atari) then the recommended way is to power it from the floppy drive power connector. If your Atari PSU is in a good shape, it should handle the power consumption just fine, if you remove the floppy (which uses the power, too), and don't add too much USB devices to it.

If you connect the device externally (from outside of your Atari) then you should use some sort of power supply, which has 5V output and has mini USB connector on its end (e.g. cell phone charger), I would recommend at least 1A rated current output.

What to do if my USB device doesn't work when it's connected to USB of CosmosEx / Raspberry Pi?

The reasons why the USB device might not work can be several:

- Raspberry Pi is picky when it comes to USB devices – some just won't work, so if you can, try a different one
- If the device needs more current (mA) than just few, you might need a USB powered hub between Raspberry Pi and your USB device, as it currently can supply only few mA
- If the device isn't supported in the linux kernel or linux kernel modules, it might just not work, even though there's no hardware reason for not working
- Sometimes you can give it one more try – power off the device, connect the USB device, then power on the device – some devices behave nicer if they are already connected before powering on (some power hungry ones might even cause Raspberry Pi restart, if they are plugged in when the device is turned on)
- Sometimes it's just a configuration issue – if you want to use the USB drive as RAW or translated, then bad (or missing) CosmosEx configuration will cause that you won't be able to use the device – search for more info on configuring USB drives one way or another
- You can check if the device is recognized and used by the CosmosEx by opening the IP address of your device on PC in browser, then selecting 'Status' in the main menu and looking for that device under the right section (either drives, or IKDB section)

How do I configure the device?

To configure the device, you have to open the CE config console, and you can do that by one of these ways:

- If your ST boots and shows CE_DD being loaded, then open the config drive (usually O: by default), and run CE_CONF.PRG
- If your ST doesn't show (load) CE_DD on boot, download the CE_CONF.PRG either from CosmosEx web page, or from your device – if on your PC you open the IP address of your CosmosEx device in web browser, then put it on a floppy and run it from there
- On your PC open the IP address of your CosmosEx device in web browser, then click on the 'Config' in the menu
- On your PC open some SSH client (e.g. Putty), connect to your device, username 'root', password 'ce', then type: /ce/ce_conf.sh (and press enter)

Is it open source? Can I help? Wouldn't making it open source speed up the fixing and development?

Yes, it is open source. The sources are in publicly accessible github page and git repository, and before that it was in publicly accessible svn repository. Yes, you can get the sources. Yes, you can help me / us / the Atari community.

Through the years I thought some more developers will be attracted to the project, and we will fix the bugs soon, have many amazing new features, and have new demos and games utilizing its features, but only few of them helped. So here's the list of people who helped (and are helping):

- MiKRO / Mystic bytes
- ggn / kua
- tIn / absence
- nanard
- tuxie

Floppy emulation questions

What floppy image formats are currently supported?

Currently supported floppy image formats are .ST and .MSA files.

Other file formats could be added, it shouldn't be that difficult, but some floppy image formats which are used for preserving some protected floppies (e.g. Cryoflux images) might be hard if not impossible to add – they store data in much lower level format than the regular floppy images, they would require floppy interface chip firmware update, which I'm not sure if it's possible – the current Franz chip has 20 kB or RAM, and those special image formats might require more RAM to work.

Do I need to connect floppy cable to CosmosEx for floppy emulation to work?

Yes, you do need to connect that floppy cable to CosmosEx for floppy emulation to work. Although you might have other cables have connected as well (e.g. ACSI cable, IKDB cable), the Atari computer talks to floppies through the floppy interface (34 pin connector + 34 wire flat cable), and that's why you need it to have connected if you want it to work.

Sure, there could be some sort of software emulation, which would make Atari think that it has loaded the data from floppy while in reality it would load from other place, but that wouldn't work with games who access the hardware directly and don't care about special drivers.

Can the floppy emulation work without the floppy cable connected?

No. See the previous topic.

Can the CosmosEx be used for floppy emulation when ONLY the floppy cable is connected to it?

Yes, this should work just fine, as the floppy emulation requires only that floppy cable. But then you will have to upload the floppy images through the web interface from your PC, as for upload of images from Atari you need ACSI or SCSI connection to CosmosEx device.

From where (from what media) the floppy image might be uploaded to CosmosEx?

Your floppy images might be uploaded from different places:

- From ST, using CE_FDD.PRG, you can upload images from:
    - SD card - located in the front SD card slot
    - USB drive - inserted in the USB port of Raspberry Pi
    - Shared drive – a folder shared from your Windows or Mac, attached to your Atari using CosmosEx
- From PC, using web browsers, you can upload images from any place you can reach on your PC

I have uploaded the floppy image, but the floppy drive still seems to be empty

- Do you have the floppy cable connected to your CosmosEx device?
- Did you select that floppy slot? (by pressing the front button and turning the appropriate floppy LED 1, 2 or 3 on, or by doing that through web interface)
- Was the floppy image successfully loaded? Wasn't it corrupted? Can the image run under Steem?
- You can verify presence of the uploaded floppy image and selected floppy image slot by opening the web interface on PC through browser and clicking on the 'Status' menu item

Can I connect the floppy cable from outside of my Atari?

Yes, you can:

- You can connect it to external floppy connector, but you need a special cable for that, or…
- You can modify an old external floppy drive (e.g. SF 534) and then connect it to external floppy connector
- You can connect it to internal floppy cable, if you manage to extend that cable and drag it outside of your Atari

Can the CosmosEx emulated floppy act like drive A: when connected from outside of my Atari?

The external floppy usually acts like drive B:, and internal drive acts like drive A:. However, there is a possibility to swap that and make the external behave like drive A:, but I haven't tried that yet. Somewhere on Atari-forum.com might be some info on that topic, but it will probably require some soldering.

Is write on floppies supported?

No, currently the emulated floppies are just read only. The hardware has some preparation for it, but the firmware for Franz and Raspberry Pi currently lack this feature. The feature is planed (in a TO DO list), but there are other things that need to be done first.

Is high density (HD) floppy emulation supported?

No, not yet. I'm also not sure if doing it would be a major benefit, as most of the games and demos are either fine with DD floppies, or run from hard drive just fine. I know, it would be nice, but this one has a very low priority on the possible features list.

Hard drive related questions

What cable do I need to connect CosmosEx to my Atari for hard drive functionality?

- For Atari ST, STE, Mega ST, Mega STE, TT, connected externally through ACSI – you need the standard CosmosEx (UltraSatan) ACSI cable, which is delivered with the device by default. It connects to the external ACSI connector, which has 19 pins (and isn't manufactured anywhere anymore, and it's hard to get).
- For Atari TT, connected through SCSI – you need a 50 wire flat (ribbon) cable with 50-pin connectors on both ends, one end goes to SCSI connector of CosmosEx, and the other goes to SCSI connector inside of your TT
- For Atari Falcon, connected through SCSI – you need a special external SCSI 50 pin connector to internal 50 pin flat cable reduction. Jookie currently doesn't offer one, but if you're lucky, you could get one from eBays. Yes, they might be expensive.

What is the simplest configuration for hard drive?

The simples it can be is to have one ACSI / SCSI ID assigned to CE_DD in CE configuration, and with that configuration you should see the CE_DD driver to get loaded during the boot of your Atari, and you should even see drive O - the config drive on your desktop after finishing the boot.

The ACSI and SCSI interface of CosmosEx

The CosmosEx device (the most recent version) have the option to run either as ACSI or as SCSI, depending on your configuration (and depending on if it has both ACSI and SCSI connectors fitted). These two interfaces can't run at the same time, they require you to change the physical configuration (adding / removing jumper, removing / adding resistor networks if needed), and also writing of the correct ACSI or SCSI firmware to Xilinx chip.

- If your device is configured as ACSI, it will not work on the SCSI bus at that moment.
- If your device is configured as SCSI, it will not work on the ACSI bus at that moment.
- If your device is configured as ACSI and it has SCSI terminating resistor networks inside, it will not work on ACSI bus

Switching between ACSI and SCSI interface

If your device has both 50-pin SCSI connector and 20-pin ACSI connector, then your device is capable of running on both buses – ACSI and SCSI. But due to small space on PCB, small pin count on Xilinx chip and small amount of logic in that Xilinx chip, the device can't run in both those modes without reflashing the Xilinx chip. I guess that shouldn't be a problem, as you won't switch from ACSI to SCSI and back a couple of times per day (and if you need to do that, you should get another device instead – reflashing of Xilinx is limited to 10'000 times ;)).

To switch from SCSI to ACSI:

- turn off device, or leave it turned off
- remove ACSI and SCSI cable, if you had any of them connected
- **ADD jumper** to place marked with A/S
- **REMOVE** (yellow) **resistor networks** from near the SCSI connector by gently pulling from side to side, slowly, so you won't break them
- have the ethernet cable connected
- turn on device, wait 2 minutes (120 seconds) – it will detect the new config, and it should reflash the Xilinx chip

To switch from ACSI to SCSI:

- turn off device, or leave it turned off
- remove ACSI and SCSI cable, if you had any of them connected
- **REMOVE jumper** to place marked with A/S
- depending on if you need terminators on this device for your SCSI bus: **ADD or DON'T ADD resistor networks**, with dot markers on the right side – where the red arrows point
- have the ethernet cable connected
- turn on device, wait 2 minutes (120 seconds) – it will detect the new config, and it should reflash the Xilinx chip

Correct location of the marker dots on resistor networks:
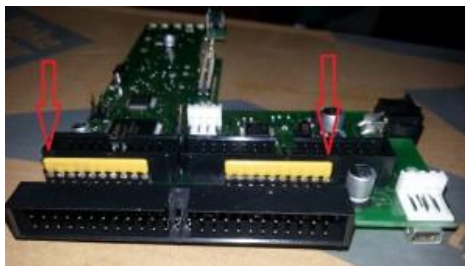
Location of the A/S (ACSI / SCSI) jumper:

What is SCSI termination?

- The SCSI standard requires both ends of the SCSI cable to be terminated, and this is done by enabling the termination in the last device in the SCSI chain (the first end of the SCSI is terminated in your TT / Falcon).
- If you are running the device in ACSI mode, you should remove the SCSI termination (the resistors networks) – see the section on switching the
- If your device is configured as SCSI, it's the last device in the SCSI chain, it should be terminated, because otherwise it will probably not work.
- If your device is configured as SCSI, it's not the last device in the SCSI chain, it shouldn't be terminated, because then it might not work, and it could possibly damage other SCSI devices
- If your device is configured as SCSI and you want to use it with Mega STE internal SCSI adapter, then it must not be terminated - terminating the SCSI device can damage the SCSI adapter.
- If you want to use your CosmosEx in SCSI mode with anything else than TT and Falcon, please consult the manual of your SCSI adapter on termination.

What is ACSI ID / SCSI ID?

- The ACSI / SCSI ID is a number, which is assigned to the device (to CosmosEx, to hard drive, to printer), and your Atari computer uses it to talk to specific device.
- Two hardware devices can't have one / the same ID, it has to be unique for each device, because when Atari computer wants to talk to one device, they both have the same ID, they both then try to respond, and the result is either bad communication / bad data, or in some cases it might even result in destroying of ACSI / SCSI interface. And although it theoretically shouldn't break anything in SCSI, you should definitely avoid situation like that.
- One CosmosEx device might respond on more ACSI / SCSI IDs, because it can emulate more devices at once, and some Atari drivers require unique IDs for different devices. The CE_DD, CE STiNG and other CE tools and apps can communicate through a single ACSI / SCSI ID, so as long as you have at least one ACSI / SCSI ID assigned to the device, then the CE tools, drivers and apps should be able to communicate with it

Why I can't use SCSI ID 0 or SCSI ID 7?

On the SCSI bus each device has to have a unique ID number, and also the computer's SCSI interface has to have one SCSI ID.

- SCSI ID 7 is used for SCSI interface on TT
- SCSI ID 0 is used for SCSI interface on Falcon

As these are already taken by the computer's SCSI interface, and the SCSI ID for the device has to be unique (nobody else, not device nor computer can use it), these two IDs are not usable on TT and Falcon.

ACSI bus works bit differently, so when using ACSI interface, you can use ACSI ID 0 and ACSI ID 7 without a problem.

What is the minimal configuration for hard drive with CosmosEx that there is?

If you don't want to buy an SD card, USB drive or something similar, the absolute minimal configuration that there is to use CE_DD (translated driver) on a single ACSI / SCSI ID, and then use shared drive (shared folder) from your Windows / linux / Mac – this way there is no media inserted into the device, and all is stored on your PC. You should be able to store data and apps there, run the apps, do stuff with data from there.

What is CE_DD / translated driver?

The CE_DD (CosmosEx disk driver) or translated driver is a driver, which enables you do use these things on your Atari through CosmosEx device:

- USB flash drives, formatted on PC, as a regular TOS drive, if you have '**Mount USB media as translated**' configured in the CE config
- Shared drives (folders shared from PC) on your Atari as a regular TOS drive
- Time synchronization from the internet

This works by translating TOS filesystem functions calls to linux filesystem function calls. Although it might sound just like 'translate this to that', there's still have to be some processing behind that, and also some parameters and data validation, and so on.

Can the CE_DD driver work with the SD card inserted in the front slot?

No, that SD card slot (and SD card itself) can be accessed by Atari only in RAW mode, which means serving raw sectors from SD card to your Atari without any other processing. All the partition handling, file handling, directories handling, is then done by some raw HDD driver (HDDRIVER, ICD Pro, PPera's driver).

Can I share the SD card from the front slot with my PC?

No, that SD card can be accessed by Atari only in RAW mode, and linux (which does the sharing) can't access that card, so definitely no. Could it be somehow done? Well yes, but it's not worth the effort.

Can the raw HDD driver access shared drive?

No, the raw HDD driver (HDDRIVER, ICD Pro, PPera's driver) works with the device as with bunch of sectors. The shared drive (shared folder from PC) is accessed by letting the linux handle the connection to that drive, and serving just files and directories through CE_DD on a higher level, not as a bunch of sectors.

Can the raw HDD driver access my USB flash drive?

Yes, if you have the **'Mount USB media as RAW'** configured in CE config. That way the USB flash disk is accessed and server to your Atari as just a bunch of sectors. Please note that for this to work you have to assign at least one ACSI ID / SCSI ID as 'RAW' in the CE config, and the USB flash drive then will be accessible under that ACSI ID / SCSI ID. You can format and partition the USB flash drive on your Atari using the raw HDD driver in this setup.

If you have '**Mount USB media as translated**' configured in the CE config, you can't use raw HDD driver to access that USB flash drive, even if you do have some ACSI ID / SCSI ID assigned to RAW type. You can't format and can't partition the USB flash drive on your Atari in this mode.

Why I can't format and partition my USB flash drive on my Atari?

Because:
- You probably don't have 'Mount USB media as RAW' in CE config, but instead you have 'Mount USB media as translated' (change it to RAW, if you want to achieve that)
- You probably don't have assigned an ACSI ID / SCSI ID to a RAW type, under which the USB drive could be accessible (change at least one ACSI / SCSI ID to RAW, if you want to achieve that)
- Both of the above

Why should I use CE_DD (translated) driver instead of raw HDD driver?

- Because you want to access the shared drive, and that's not accessible through raw HDD driver
- Because you trust the combination of CE_DD driver + linux partition + filesystem handling more than you trust the raw HDD driver ;)
- Because it's already built inside of CosmosEx device, and you don't have to partition your USB drive on Atari
- Because it's free
- Because it's your personal choice, for no specific reason

Why you should use raw HDD driver instead of CE_DD (translated) driver?

- Because you don't need access to shared drive, which is accessible only through CE_DD (translated) driver
- Because you trust the raw HDD driver more than you trust the combination of the CE_DD driver and linux partition + filesystem handling
- Because you already have it and it has been verified through the years as reliable
- Because it's your personal choice, for no specific reason

Why you should use both CE_DD and raw HDD driver?

- Because you want to access shared drive and SD card at the same time

Why you shouldn't use both CE_DD and raw HDD driver at the same time?

- To save some valuable RAM of your Atari
- To avoid compatibility issues between those two drivers

When I use HDDRIVER / ICD Pro, the CE_DD fails to load

When combining multiple drivers, sometimes the order of the drivers plays a great role, e.g. if HDDRIVER is loaded first, then it avoid loading other drivers from other devices. You can work around these issues by:

- Changing the order of the devices, and thus the order in which drivers load – driver from ACSI / SCSI ID 0 is loaded first, then the driver from ACSI / SCSI ID 1, then from 2, and so on
- If that doesn't help, you can always have one driver loaded from the device directly (from bootsector), and then having the 2nd driver in the AUTO folder of the first drive.

What raw HDD driver do you recommend?

This depends on what you need:

- If you don't need TOS/DOS compatibility (using the SD card / USB drive on ST and on PC), then you can use ICD Pro, which is free (but you don't have that TOS/DOS compatibility)
- If you need TOS/DOS compatibility (using the SD card / USB drive on ST and on PC), then you can use:
  - PPera's HDD driver, less features than HDDRIVER, price is 10 Euro
  - HDDRIVER by Uwe Seimet, more features than PPera's HDD driver, price is 44 Euro

Please see the description of each driver to see the available features of that driver.

What SD card / USB flash drive do you recommend?

I'm not favoring any specific brand, I mostly use the 2nd cheapest (not the cheapest, but not much more expensive) brands and types, but I don't use them much either, so I'm not very good reference for that. But here's some general info on that topic:

- The more expensive ones are usually faster and more reliable than the cheaper ones
- There is no guarantee that any brand / size / type will work, you will have to test it and see for your self – this is due to Raspberry Pi having issues with some USB devices, and that my SD card handling is not guaranteed to work with every SD card, and also because some SD card behave bit differently than others.
- Please don't use MMC cards, although they might work - a bit, completely, or not at all
- If you plan to use that media for storage for a longer time, and you plan NOT to lose your data, don't buy used SD card or USB flash drive, and just buy something new.
- When it comes to size of SD card or USB flash drive – TOS on Atari ST machines is able to access 14 partitions, each has maximum 512 MB I guess (in older TOS versions it was only 256 MB, if I remember correctly), so there is no point in buying media, which is larger than 14 * 512 MB = 7 GB
- No driver never makes an error, no device is 100% without an error, no media exists which never fails, and TOS (Atari operating system) is buggy as hell (the older one is, the more bugs it has), so if you have some valuable data, **make backups as often as possible and needed**!

What partition sizes do you recommend for SD card / USB drive (in RAW mode)?

There was some limit on the first boot partition (and it still might be, with older TOS and older drivers), so I usually create something like:

- 1st partition used for booting – GEM type, 16 MB
- 2nd, 3rd, 4th partitions and so on – BGM type, 512 MB

Some people might say this is wrong, or these limits are wrong, or we can achieve now more with newer drivers, new OS, with patches, and that might be true (I don't know ;)), but I like to stay conservative in this.

Sometimes when I get some data corruption, partition table loss (due to TOS bugs) or something similar, I just create 3 partitions (16 MB, 256 MB, 512 MB), and use only that – it hurts less to loose less data, because you spend less time filling them, you have to back up sooner, and I like to keep all I need on my shared drive (through CE_DD / translated driver), which is just a folder on my PC, so I can back up the files more easily.

But this is just personal preference, you might like it organized in a different way, but hey – you asked, so I told you what I use ;)

Why I can't use TOS 1.00 for accessing the hard drive features?

From the tests I've done on my 520 ST with TOS 1.00 it seems that there is some data corruption going on the ACSI bus, it might be TOS checking the floppy drive in the VBL interrupt, and thus it seems there is no way to fix it from the driver point of view. If you could update your machine to at least TOS 1.02, then it should work.

What TOS version should I use when using CosmosEx hard drive features?

You should try to use the newest TOS possible you can with your Atari, because the newer versions of TOS have some bugs repaired. Otherwise use TOS patches if possible. Don't use TOS 1.00 if possible.

How to set up the shared drive

1. You definitely need CE_DD driver being loaded for that, so either set one ACSI ID / SCSI ID to type CE_DD (which will allow booting the CE_DD driver from that device ID), or have the CE_DD driver somewhere – in AUTO folder on SD card, or on floppy
2. Have the Ethernet cable connected to your Raspberry Pi (or wifi dongle), with the correct network settings (either use same DHCP as your PC, or set the similar network settings as your PC)
3. Share the folder from your PC – when using Windows – right click on the folder you want to use for that, select something like 'Share' or 'Share with -> Specific people' or something similar – I'm sure you can find a tutorial for that on the internet
4. You can set it to require username and password for that shared folder, although on some Windows versions you must use the username and password for it to work, while on other Windows versions it works if you don't use username or password (I know, this sucks, but this is due to different Windows versions behaving differently, and linux trying to do what it can) – you will find this out by trial and error, don't worry ;)
5. If you choose your folder name, username and password, I strongly recommend doing it as simple as possible – no special characters there (no national characters either), no spaces, possibly all characters lowercase – you will avoid many issues
6. To definitely verify the name of the shared folder, open your network neighborhood – either on the same PC, or even better - on a different PC, see if you can see the name of the shared folder there (and mark it down), and see if you can really open it – by double clicking it – you should definitely see the real content of the file, not some error message
7. In the CE config you open the 'Translated disk' settings, type (assign) a drive letter to 'Shared drive' (and possibly to others), then hit 'Save'
8. In the CE config you open 'Shared drive' settings, where you:
   - Check 'Enable'
   - Select 'Sharing protocol - Samba / cifs / windows'
   - Fill in the 'IP address of server' (IP address of your PC), e.g. 192.168.255.1
   - Fill in the 'Shared folder path on server' – the name of the bullet 6, e.g. 'mystuff'
   - If you used username and password for sharing, then fill also username and password
   - Press 'Save'
9. Then you should wait a while (few seconds), and you can also restart your Atari (if you want). Then you should be able to access your shared drive under the letter you specified (once again – CE_DD has to be loaded for this)

How to use USB drive with CE_DD (translated) driver?

1. Make sure that the USB drive is formatted on PC, so it will most probably have a reasonable structure. You can use FAT16, FAT32 or NTFS format
2. In the CE config you open the 'Translated disk' settings:
   - Type (assign) a drive letter to 'First translated drive' (and possibly to others)
   - Select 'Mount USB media as translated'
   - Press the 'Save' button
3. If you want to boot without any other media (SD card, floppy drive), then in the CE config you open 'ACSI IDs config' and assign a ACSI / SCSI ID to CE_DD, e.g. 0 as CE_DD, and press the 'Save' button
4. If you don't want to boot the CE_DD from the device directly, or you can't boot the CE_DD from the device directly, then you copy the CE_DD file to the AUTO folder (or some other folder) on the media, which you will use for the other stuff and booting
5. Connect your USB drive, restart your Atari, and once you see CE_DD driver loaded, you should be able to access the USB drive under that letter.

How to use USB drive with raw HDD driver?

1. In the CE config you open the 'Translated disk' settings:
   - Select 'Mount USB media as RAW'
   - Fill in drive letters assignment if they are empty (it will not let you save the config without it)
   - Press the 'Save' button
2. In the CE config you open the 'ACSI IDs config':
   - You have to now assign at least one ACSI ID / SCSI ID to the type 'raw', and the USB drive will be visible to raw HDD drivers under that ACSI ID / SCSI ID
   - Please note that when using SCSI, then the ID 0 and ID 7 might be reserved (they are used by your Atari). They can be used just fine with ACSI interface.
3. Insert the USB flash drive into the USB slot of the device
4. Run your raw HDD driver (ICD Pro, HDDRIVER, PPera's driver) and do everything you need with the drive

How do I format the raw USB drive or SD card using HDDRIVER?

There's a bit outdated step by step list of things you need to do on Jookie's home page:

http://joo.kie.sk/?page_id=266

It is bit outdated, because there's already newer version of HDDRIVER, but you will get the point anyway.

How do I format the raw USB drive or SD card using ICD Pro?

There's an up-to-date step by step list of things you need to do on Jookie's home page:

http://joo.kie.sk/?page_id=306

It up-to-date, because ICD Pro is outdated ;)

ICD Pro doesn't support TOS/DOS compatibility (switching the USB drive / SD card between Atari and PC), so if you need this feature, then use HDDRIVER or PPera's driver.

When I use HDDRIVER, I see some extra drive letter, but I can't access (open) that drive

This is a feature of HDDRIVER, and it should help on removable media to reserve some extra drive letter in case the current media would have less partitions then the next one which could be hot swapped later, during the app run.

So if you have one ACSI ID / SCSI ID assigned to CosmosEx (e.g. for SD card) and you have 3 partitions on that HDDRIVER handled media, then you will see 4 drive letters (partitions) on HDDRIVER start. And if you have 2 ACSI IDs / SCSI IDs assigned to CosmosEx (e.g. for SD card and for CE_DD), and you have 3 partitions on that SD card, then you will see 5 drive letters (partitions) on HDDRIVER start.

IKDB injection and USB input devices

Do I need a Raspberry Pi in my CosmosEx device for IKDB injection?

Yes, you definitely need Raspberry Pi mounted in your device, as all the data which go through IKBD are routed through Raspberry Pi, when IKBD injection is used. And without Raspberry Pi you don't have USB ports on your device, so you don't have a place to connect your USB mouse / keyboard / joysticks to.

When using IKBD injection, my ST produces 'bells' sound and keyboard and mouse don't work.

Please note, that for the IKDB injection to work, the CosmosEx device has to be turned on, and the device has to be booted and in ready state. If the device is just starting after power on, the IKDB injection won't work until the device gets to ready state.

Similarly, you can't have IKDB injector between your Atari and the original keyboard, not having it connected to CosmosEx, and expecting it to work with the original keyboard, because injector isn't just a way how the CosmosEx receives a copy of the keyboard / mouse data and just inserts new one, it's a complete detour – the original mouse / keyboard data now have to pass through CosmosEx, Raspberry Pi and return back, otherwise your Atari will not get anything (it disconnects the original direct route from keyboard to Atari).

My IKDB injector is broken, because even when I disconnect my CosmosEx from it, the original mouse / keyboard still don't work!

No, this is OK, and it will never work without CosmosEx being correctly connected – the IKDB injector replaces the short original path between original keyboard and Atari and replaces it a detour to Raspberry Pi and back, and without the whole path being correct and running you won't be able to use the original mouse and keyboard.

My CosmosEx is turned on and ready, but having IKBD injector still produces hearing 'bells' all the time

This happens, when there's something wrong - anywhere on the injection path. What causes and what you can check when this happens:

- Is the IKDB injector properly connected to Atari and to original keyboard? (it can be off by one pin if it's a sandwich type)
- Is the silly cable connected to IKDB injector?
- Is the silly cable connected to CosmosEx?
- Is the CosmosEx turned on and in ready state? (I know it's in the title, just asking)
- Is the orientation of silly cable correct on the both ends of it? (http://joo.kie.sk/?page_id=607)
- Is the cable between CosmosEx and Raspberry pi OK? Isn't it too stretched / under tension?
- Can you verify with a multimeter every connection on the IKDB injector?
- Can you verify with a multimeter every connection on the silly cable?
- Can you verify that the CosmosEx device is receiving data from original keyboard? (open the web interface using web browser on PC, see the 'Status' menu item).
- You still can take a look at the IKBD injector troubleshooting page: http://joo.kie.sk/?page_id=529

What USB mouse / USB keyboard / USB joystick is supported?

The generic (and silly) answer to this is: anything that will work ;) There is no list, you just have to try it, and if it doesn't require too much power (mA) and behaves as standard mouse / keyboard / joystick, then it should work. If one doesn't work, try another one.

How can I see if the USB mouse / USB keyboard / USB joystick is recognized and used?

If you open the IP address of CosmosEx device in a browser on PC, then in the web interface of CosmosEx click on the 'Status' menu item and check if you see some mouse / keyboard / joystick in IKBD section of status report.

My sandwich IKBD injector doesn't fit under the original keyboard in my sandwich case

Some Atari keyboards have different components placement, and in some cases the components on the keyboard collide with the IKDB injector. If it's possible, try to carefully cut off the part injector, which touches with those components – these is a bit of injector, which doesn't have any trace (wire) on it, so some cutting there might be possible.

Picture and tip by *retango* on Atari-forum.com:

I need to connect IKDB injector to Atari Stacy / STbook

There is no specific injector for Atari Stacy and STbook, as I didn't even see them on my own eyes (in person), but only online. Connecting it there might require some soldering and therefore might be only if you are skilled enough in soldering. For more info visit Atari-forum.com, where it has been discussed.

Picture and tip by *Bama* on Atari-forum.com:

My favorite game XXXXX has issues / doesn't work with IKDB injector

Yes, this might happen, it might be a bug ;) Please report it on Atari-forum.com, or even better – you can help with fixing it if you can program in C.

I didn't find my question and answer to it in this document, what now?

- You can search for 'CosmosEx guide for dummies' from DrCoolZic, it's a great and more technical document than this one… It may be possibly here:

  http://info-coach.fr/atari/documents/_mydoc/CosmosEx_Users_Guide.pdf

  …but that link might get broken in the future, so just google it.

- You can try to search on www.atari-forum.com – there is a section on CosmosEx device, many questions have been asked and answered there
- You can also ask Jookie by e-mail, he tends to respond within 3 days ;) Your question and answer to it might be added to future version of this document.