

# INSTALLATION OF A HARD DRIVE INSIDE THE YAMAHA EX5R SYNTHESIZER MODULE

by Dr. F.

**DISCLAIMER:** Every installation that is not performed by Yamaha qualified technicians may cause serious damage to your equipment and put your life in danger if you are not cautious while working with electricity. Always wear eye-protective equipment when power tools are used. If you damage your EX5R it's your fault. I offer all of the following advice in this document as a guide to people that like to take a challenge and experiment with their equipment.

## A. Introduction

Recently I thought of putting a SCSI hard drive inside my EX5R. After reading an article that was posted on EX5Tech about a similar project I decided to do it in a different way. The reasons of the different approach were the following:

- a) no serious alterations should take place inside the synthesizer,
- b) it had to be economical,
- c) a floppy drive, a hard drive and a CDRom should all be attached and working together,
- d) the space that was intended for the installation of other upgrade modules should be kept available for the future.

The only problem with this approach is that you will not have an easy access to the flash and DRAM modules anymore. Since I have done the necessary upgrades (8 MB flash, 64 MB DRAM) it was an easy decision for me. My EX5R had the ASIB1 option installed and as you all know this upgrade module is required for SCSI hard disks or CD-ROMs to be connected to the synthesizer.

## B. Bill of Materials

The installation of an internal hard drive is not difficult but it does take time. Think of it as your next weekend project. The list of parts and materials required for the upgrade follows:

- 1) One hard drive with a regular 50-pin SCSI connector (note 1)
- 2) One 38 cm (15 inches) long 50-conductor SCSI cable with two 50-pin connectors (note 2)
- 3) Two long screws or four long metal posts (note 3)
- 4) Two Philips-type screws to mount the drive, diameter 3.4 mm, length 5.5 mm (note 4)
- 5) One power-cable adapter (note 5)
- 6) Some short cable ties
- 7) 5 cm (2 inches) of heat shrink tubing with a before-heating diameter of 2 cm (0.8 inches)
- 8) Anti-static wrist strap to ground yourself
- 9) Power drill and drill bits to open two holes
- 10) Pair of pliers and a small Philips screwdriver bit for the two screws described above
- 11) Philips screwdrivers to open the EX5R (a power tool is optional but not necessary)

## Notes:

- a) Initially I tried a 68-pin SCSI drive with a capacity of 2 GB and a 50-to-68-pin adapter. It refused to even spin and I knew for sure that it was working fine with my PowerMac 9600 computer. I do not think that the issue was due to my EX5R older OS version. Maybe some jumper settings on the drive needed some manipulation. After upgrading to higher OS version I plan to try again though. I used a 50-pin 1 GB Quantum Fireball drive afterwards and everything went well.
- b) The SCSI cable that was used in this project came out of an older Macintosh computer. It has three connectors but only two are needed. The two connectors should be notched in order to avoid problems with the proper pin orientation.
- c) The two long screws must have a thread that fits the mounting holes of the drive that you plan to use and a length of about 7 cm (2.75 inches). I used four metal posts that I removed from an older computer and when two of them are connected together they have a total length of about 7 cm. A visit to your hardware store may be in order for you to find the proper screws/posts. Figure 1 shows the hardware that I used.



Figure 1. Hardware for internal mounting of the HD

- d) Use the screws that came with your drive, or find some that fit its **side** mounting holes.
- e) The adapter can be made or it can be found in older PCs. Details follow below.

## C. Installation

- 1) Remove the screws of the EX5R cover. I counted 17 of them and this is where the power screwdriver comes handy.
- 2) Plug your EX5R in a grounded outlet but **do not** turn it on.
- 3) Have the anti-static wrist strap on your hand all the time and connect it to the metal case of the EX5R every time that you need to touch something inside the synthesizer. **DO NOT SKIP THIS STEP.** You can damage your beloved EX5R forever if something goes wrong with static electricity. Also make sure that you clip the wrist strap to the metal case (the sides are better, so that you don't scratch the faceplate or the rear side).
- 4) Remove the long black plastic turn-on button by pulling outward and then inward. Store away and **note the way** that it was installed in the factory.

- 5) Now you must remove the EX5R power supply in order to open two small holes exactly at the points shown with two yellow arrows in Figure 2. Use a magnetized screwdriver if possible. **Unplug** the power cord first. Then you have to remove two screws from the right side of the EX5R, four screws from the rear side and one screw found inside the EX5R. That last screw is located about 11.5 cm away from the rear side and 7 cm down as you face the synthesizer from above. Just look around and you will find it easily. If the power supply is not free after removing the seven screws you have removed the wrong ones and you need to try again. Remember **NO FINGERS INSIDE WITHOUT THE WRIST STRAP**. Since the power cord has been removed there is no anti-static protection!!!



Figure 2. Mounting holes and power connector on the HD

- 6) Take the power supply out and unplug the white connectors on the top right side of the EX5R motherboard. **Note** their orientation and location. Position the power supply behind the synthesizer but do not unplug the small white connectors labeled CN1, 2, 3, 6, and 7.
- 7) Near those five small white connectors there is a piece of steel that will be used to mount the hard drive (see Figures 2 and 3 below). Use a pencil and mark the location of the two holes. The first one should be 1.8 cm from the edge near the power switch and 1.7 cm from the top edge. The second should be 12 cm from the power switch edge and 1.7 cm from the top edge. Use my pictures as a guide. Drill two holes that will be just a bit larger in diameter than the mounting screws. Take care so that no metal particles fall inside the synthesizer or inside the power supply as you drill the holes. This is very important **since a very small piece of metal can create a short circuit that will damage your EX5R** and it is also very difficult to see. It may be a good idea to cover the EX5R with aluminum foil while you drill the holes. **PAY SPECIAL ATTENTION SO THAT YOU DO NOT DAMAGE THE POWER WIRES WITH YOUR DRILL.**



Figure 3. HD mounting location



Figure 4. HD mounting location

- 8) When the holes are in place use the screws to mount the hard drive. At this point you have to use your fingers to drive the screws since the space is tight. When you can no longer tighten the screws with your fingers, use the Philips screwdriver bit and a pair of pliers. It takes a while but it can be done. Alternatively you may use a special tool from Sears that allows you to tighten screws in very tight places.

- 9) Check your hard drive and set the SCSI ID to "0". Its SCSI termination should also be "ON". How you do that depends on the drive that you use.
- 10) Put the combination of power supply and drive inside the EX5R but first connect the white connectors on the top right side of the synthesizer motherboard. Make sure that they are attached **exactly** as they came from the factory.
- 11) Do not mount the power supply back to the EX5R yet. Instead use the two long screws or the four metal posts on the free side of the hard disk. Screw them on the bottom side of the drive exactly as shown in Figure 4. It's not a good picture but the arrow shows the hardware that I used. If the threads of the metal posts are a bit small, use some other material (plumber tape, etc) to make them fit. You do not want to leave anything loose. The long screws or the metal posts may touch the edge of the EX5R motherboard. **THEY MUST NOT STAND ON IT**. If your hardware is the proper one they will touch the bottom chassis of the synthesizer when everything is in place.
- 12) You can now mount the power supply back to its original place. If you have a magnetized screwdriver, use it for the screw that goes inside the EX5R.
- 13) At this point you must plug the EX5R to an outlet with its power cord and ground yourself with the wrist strap. However, **before** you plug the power cord check the power switch (mine is red) and make sure that it is in the OFF position (out, not in). Then use the SCSI cable and connect the drive to the ASIB1 board.
- 14) The power adapter consists of a regular 4-pin hard drive power connector which is connected to a 4-pin flat connector that is in turn connected to the small 4-pin EX5R power connector with metal pins (see Figures 2 and 5). The red wire of the small EX5R connector carries 12 Vdc and needs to be connected to the yellow cable of the HD power connector. The two white cables next to the red cable (EX5R side) are the ground wires and they must be connected to the black wires of the HD power connector. Finally the last white wire is connected to the red wire of the HD power connector. It is the 5 Vdc line for the logic circuits.

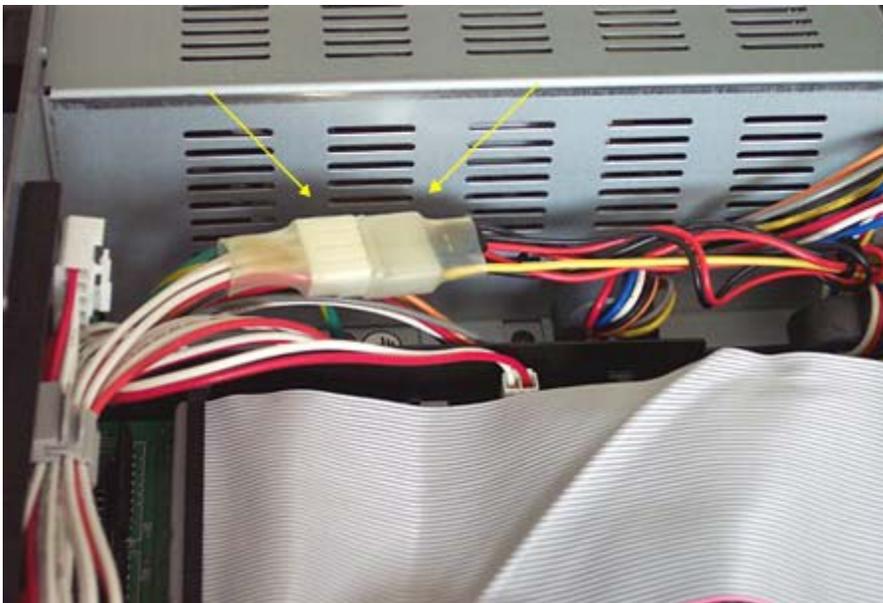


Figure 5. Power adapter for the HD

- 15) When everything has been put in place, put the heat-shrink tubing around the coupling connectors and heat it. This will hold the two connectors securely together. Alternatively, remove a hard drive power connector with 30 cm (12 inches) of cable from an old PC. Strip 0.8 cm of the four wires and cover the stripped part with solder. Plug them in the EX5R power connector, put a cable tie around them and then use the heat-shrink tubing as before. Some cable ties may be used to keep the cables inside the synthesizer in good order.
- 16) Put the long black plastic turn-on button back to its original location. Remove the wrist strap and power up the EX5R. If everything is OK you will see your greeting message and the floppy drive will make its normal start-up noises. **If you see nothing on the display turn off the synthesizer immediately.** Try to locate errors. Unplug the SCSI connector, the power connector, etc, until you locate the problem.
- 17) Assuming that all went well you must format the HD. Press "DISK" and then "DEV" (or F7). Then press "FORM" (or F6) and sooner or later (depending on the size of the drive) you will receive a "format completed" confirmation. You will also read the available HD space on your screen. This procedure took less than 10 seconds in my EX5R.
- 18) Now you can put the cover back (turn off the power first) and enjoy your upgraded and very beloved EX5R. You can also connect an external CDROM if you wish and start copying files from a CD to your HD. Just make sure that each of the SCSI devices (EX5R included) has a different SCSI ID and that the last one in your external chain is terminated. One thing will not change though despite the upgrade: internal or external the SCSI is slow and there is nothing you can do about it. It does load faster than the floppy and I do like to have a lot of songs, samples and data around without having to use floppies. And this is always a good thing that is worth spending one afternoon to complete this upgrade.

Happy sampling fellow EX5R users!!!

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