
Music **T**echnologies **G**roup

MTG R100 Builder Kawai R100/R50 BIN File EPROM Builder

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1: Introduction

Features

The R100Builder application is companion Windows software for the MTG Kawai R100 ROM Switcher boards. The application enables you to create custom EPROMs for your Kawai R100 (or R50) from audio samples of your choice.

R100 3x ROM Switcher Board



R100 Builder Software



Some of the features of the Windows software are:

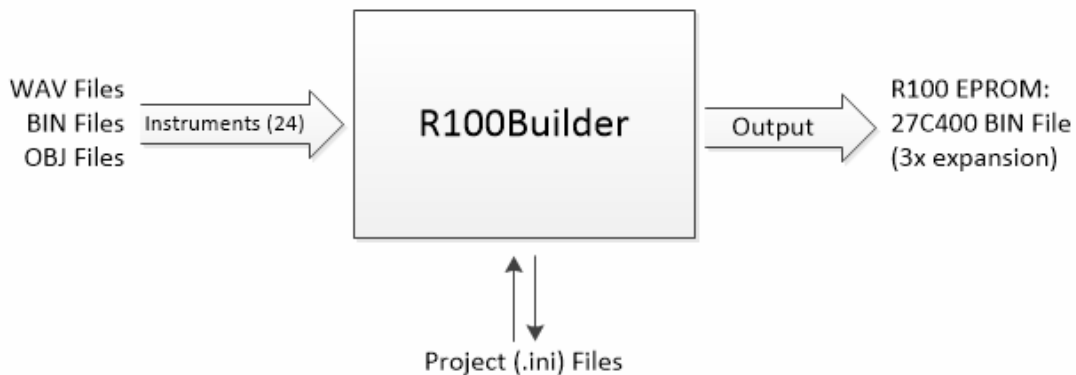
- Simple Project (INI) files can be saved and loaded so that you can easily modify file sets.
- WAV files are converted into the native proprietary compressed format of the R100.
- Visual indication of EPROM space usage is given.
- u-Law files from Linn, Oberheim, Sequential Circuits, 360 Systems, and others can be loaded. No need to use audio. Get it right from the chips.
- Easy to use software. No programming or engineering knowledge is required. **The user is expected to know how to manipulate audio files.** An EPROM programmer is needed to burn the chips (or have MTG do it for you).
- Convert the final BIN file back to WAV for audio preview and comparison.
- All 72 original WAV samples from Kawai for each instrument for all three Kawai EPROMs (KAA, KAB and KAC) are included. Bit perfect lossless conversions from the original EPROMs, not sampled audio.

2: Overview

What R100Builder Does (3x)

The R100Builder.exe application allows you to take up to 24 instrument sounds of your own choosing, often drums or percussion, and turn them into one 27C400 chip for installing into your R50 or R100. Even better, put the chip in one of the MTG R100 3x ROM Switcher board.

Here is the big picture.



On the left you see the input files. These are the sounds in WAV format or raw copies of the EPROMs found in drum machines by Linn, Oberheim, Sequential or 360 Systems.

Run these files through the software and the output is one .BIN file suitable for burning into a 27C400.

There are 3 sockets on the 3x R100 board, so you can fill it with 3 EPROMs of your choice. Of course you can also mix in the supplied EPROMs that come with the switcher. As if that wasn't enough, all of the R100 sounds are supplied with the software so you can mix your own sounds with Kawai factory sounds as well.

You can also save your R100Builder setup to a "project" file in human readable .INI format. This file simply contains the locations on your computer of all the input files used to create that 27C400. This lets you return to your project at a later time if you need to tweak something.

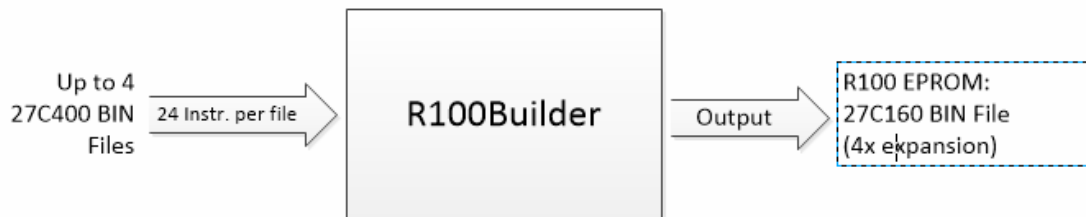
As mentioned, the 3x ROM Switcher has three 40-pin sockets that accept 27C400 EPROMs. The 4x ROM Switcher is a slightly different beast.

What R100Builder Does (4x "QuadROM")

The R100 4x ROM Switcher is more and less. It has more banks of sounds. Four banks instead of three as you probably guessed. It also has fewer chips. It has one large EPROM whereas the 3x ROM Switcher has three smaller ones.

So the process for the 4x is a little different. What happens on the 4x is that you first create up to four 27C400 EPROM files just like in the previous 3x section. Those files are then combined into one larger 27C160 file.

Here is what that looks like:



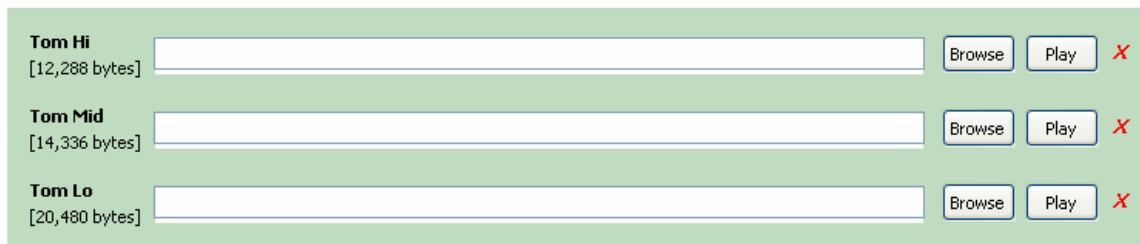
This allows the expansion board to be smaller and yet contain more.

3: Using R100 Builder

Loading Audio Files

The R100 has 8 pads and each pad has three instruments. Thus there are 24 instruments available in each EPROM. To load a sound file, choose which of the 24 sound “slots” you would like to use.

The sound slots are arranged in sets of three per panel for easy audition. Each slot is identified by the name used on the actual R100. The order of the panels differs slightly from the R100 itself. For instance the Toms are in arranged the same set in the software, but on the R100 they are on three different pads.



Use the table at the bottom of the application for reference as this table indicates where the sounds will show up on the actual hardware.

1	2	3	4	5	6	7	8
BD1	SD1	TOM HI	TOM MID	TOM LO	HH CLOSE	RIDE 1	CRASH 1
BD2	SD2	COWBELL	CLAPS	SHAKER	HH OPEN	RIDE 2	CRASH 2
BD3	SD3	AGOGO	CONGA	TAMBOURINE	TIMBALE	CLAVES	CHINA

Here is a sound slot showing a file loaded.



On the left side is the pad name. You can load any sound you want into the slot. Below the pad name is the size, in bytes, of the sample space available for that instrument. The space varies from pad to pad and is set by the R100 operating system.

On the right side are three buttons. **Browse** is used to choose the WAV file to be assigned to that pad. **Play** lets you audition the WAV file on your PC. The red **X** removes the assigned WAV file.

Below the filename is a horizontal bar graph indicating how much of the sample space is being used by the instrument you selected.

When you click on Browse, a dialog box opens to enable you to select a WAV file for your instrument. By default the software looks in the Instruments subdirectory.

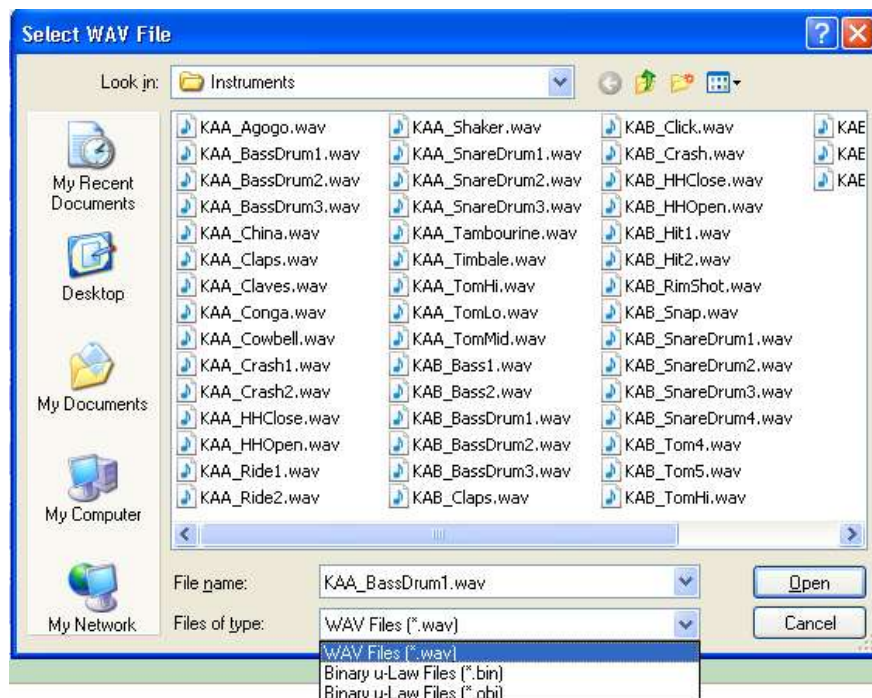
Your WAV files should be crafted for best use before you load them into the application. **Here are some requirements and suggestions:**

- Each WAV file must be a mono track.
- The stored format must be a standard (PCM signed 16-bit) WAV file.
- You should set the sample rate to 31250Hz. You can resample your files using Audacity or similar software. If you don't, the root pitch will be off.
- You should NOT include any metadata in the WAV file such as Title, Copyright, etc., as this could be converted in to sound data.

If the file is too long for the slot, it may be abruptly cut off when played on the hardware. You can cut and fade your sounds using Audacity if needed.

You should “normalize” your audio files if possible to use the maximum dynamic range. This would probably only be an issue for sounds you’ve created yourself since most sample sets for sale around the web are already very good.

You can load Linn, Oberheim, Sequential Circuits, 360 Systems and other u-Law binary files as long as they have the .BIN or .OBJ extension. To choose one of these files, change the File Type in the Select WAV File dialog:



When you load one of these u-Law files, they will be converted to WAV first. Then the R100 Builder uses the new WAV file. This is a simple mathematical operation and nothing is added or taken away from the original vintage EPROM sound.

If you know the sample rate of the original file you can enter it when prompted. This will affect the pitch of the audition when you click the Play button.

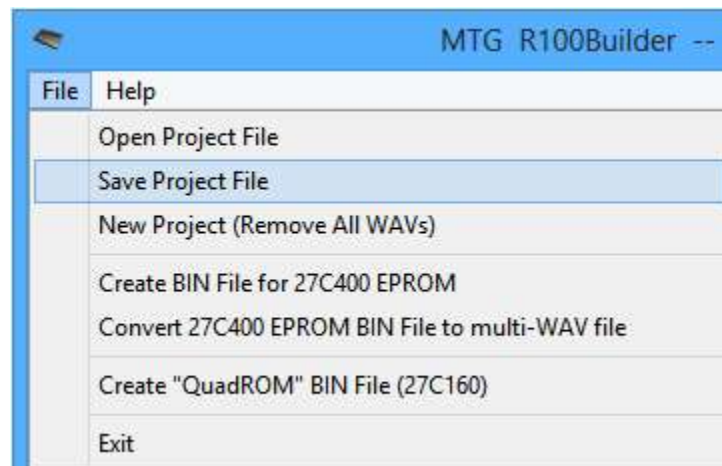
Note that the Play button plays the entire WAV (does not stop where the truncation would take place) at the sample rate specified in the WAV file. If you are starting with an instrument with a vastly different sample rate than the R100, you should resample it in your editing software so that the pitch is correct.

Once you have collected all of your sounds, it's time to make the EPROM file. But first, maybe save your work...

Saving the Project File

It's very easy to make the BIN file once you have all your sound slots established. You can use all 24 instrument slots, but this is optional as the software will mute any missing instruments.

Before creating the EPROM file, you should save your project. This simply saves the file names and paths to an INI file. This will save you time later in case you need to change something. To save the Project, click on **File** then **Save Project File**:

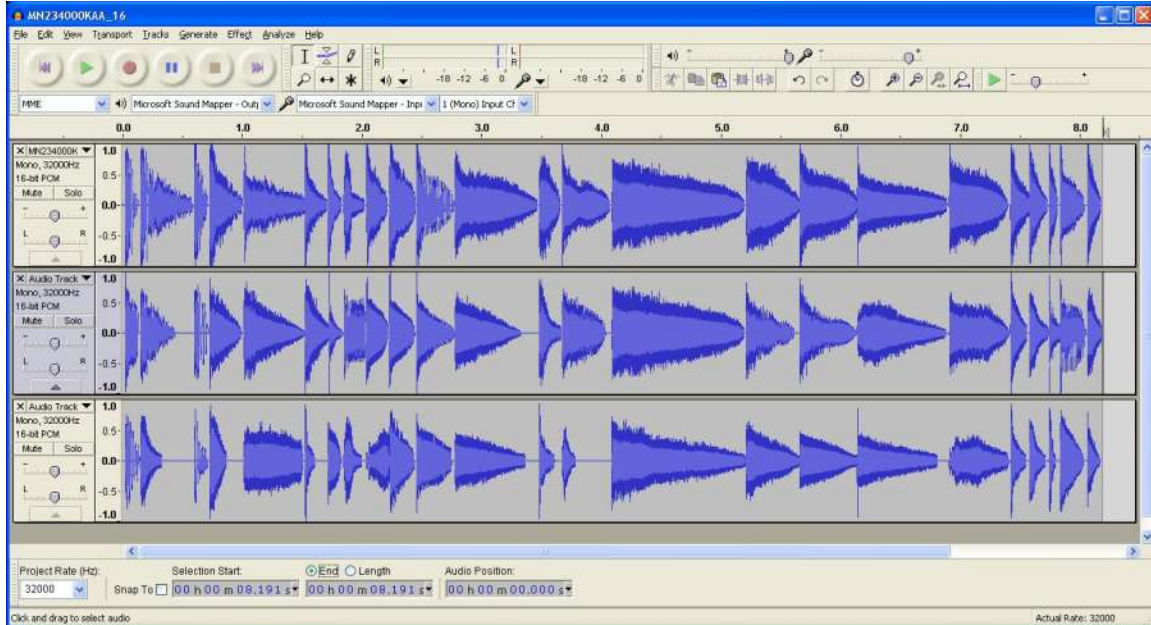


By default the software uses the **Projects** subdirectory for projects and the **Instruments** subdirectory for the sound files. You can add subdirectories off of Instruments if you need to organize a lot of sounds. Using this arrangement makes your files more portable.

If you ever want to erase your work, click on **New Project**.

Auditioning

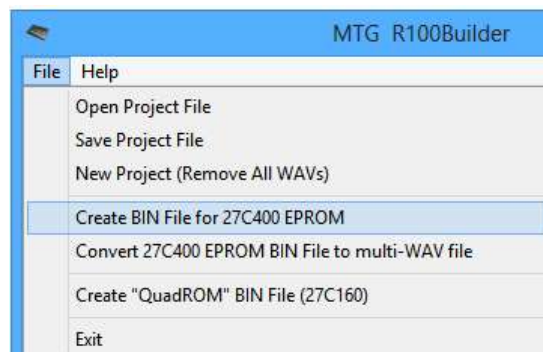
Another great feature is the menu item called "Convert 27C400 EPROM BIN File to multi-WAV file". Sounds like fun, doesn't it? This will take the sounds you intend to burn and put them all in one WAV file. Once you have this WAV file, you can load it into your audio editing software and compare instrument volumes, pitches and other audio qualities. You will see all 24 instruments lined up one after the other.



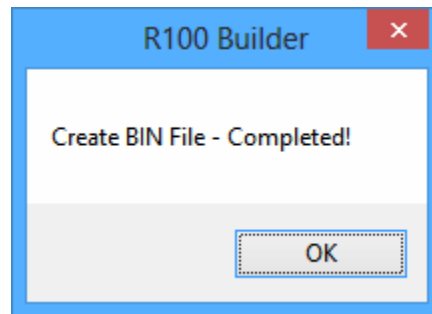
This file is organized using Kawai's settings, so the instrument locations in the file may not be what you expect. In any event, it's a great way to check things out before burning a chip.

Creating the 27C400 BIN File

To create the file for burning in your EPROM programmer, simply click on **File** then **Create BIN File for 27C400 EPROM**.



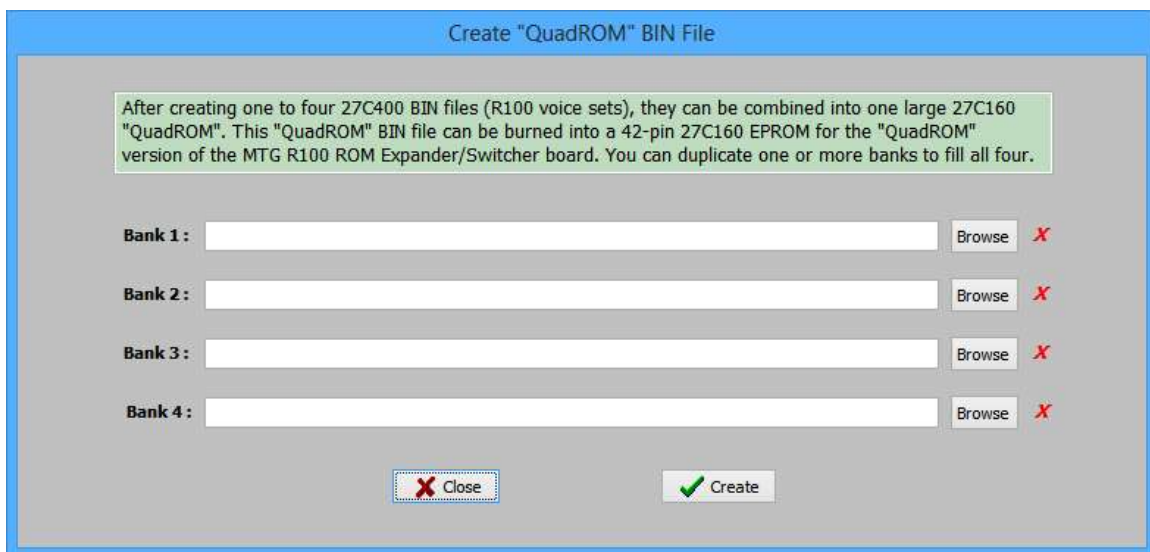
Select a name for your BIN file. By default the BIN file will be placed in the Output directory. The software will compile the instruments in the order of the R100 EPROM and then convert them all to Kawai compressed format.



The resulting BIN file is 512kB long and you can burn this to a 27C400 or similar EPROM. The 27C400 will work in an R100 with or without the 3x switcher and it will work in the R50.

Creating the 27C160 BIN File (4x "QuadROM" only)

If you have the 4x "QuadROM" version of the switcher you should first create one to four 27C4000 BIN files as described above. Once you have done that, simply combine these by using the **Create "QuadROM" BIN File (27C160)** menu item.



By now this should be a familiar process. For each "bank", choose the 27C400 BIN file by clicking on the **Browse** button on the right hand side. If you want to remove one bank, click the associated red **X**. If you don't have four 27C400 files ready, simply duplicate the ones you have to fill all four slots.

Once you have all the desired files in place, click the **Create** button. This will produce one large BIN file suitable for burning into a 27C160 42-pin EPROM. By default this BIN file will also be found in the Output directory.

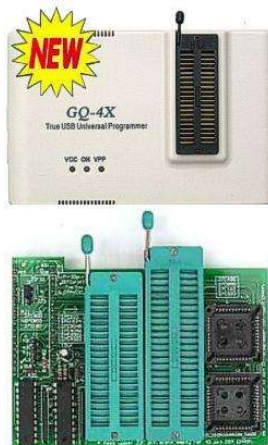
EPROM Burning

The market for EPROM programmers changes quite a lot and there are a variety of choices ranging from old vintage programmers to brand new ones. Prices are all over the spectrum as well. The 27C400 and 27C160 EPROMs used by the MTG 3x and 4x switchers are relatively "new" by EPROM standards. So, very old vintage EPROM programmers will probably not support them.

It's also important to note that the 27C400 EPROM is a 40-pin device and the 27C160 is a 42-pin device. The EPROM programmer you choose must be able to support the device you want to program. Sounds obvious, but make sure to check the "supported device list" for any programmer you buy.

A tech shop should buy the best programmer that they can afford.

As an individual (rather than a tech shop), if you don't want to break the bank, but still want a decent programmer we recommend the GQ-4X by MCUmall (in Canada) or GQElectronics (same company but in the USA). It is also available from other vendors and both of the above also have a presence on eBay. One nice thing about this company is that there is an active user forum. It's a great place to learn about EPROM programming in general.



If you do buy this product and want to program the 27C160 devices, you will also need to buy the ADP-054 16 Bit EPROM 40/42 pin ZIF adapter.

Finally, you will probably need an EPROM eraser. These are very inexpensive and you may be able to get one bundled with your EPROM programmer. You may be able to get all of this together for a little over \$100 USD. It's a great investment if you like vintage music gear.

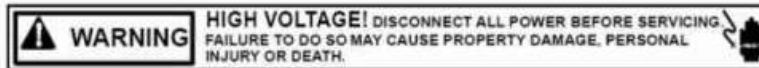
EPROM Installation

Please follow the warnings, cautions and instructions in the ROM Switcher **Installation** documentation so that you don't harm yourself, your R100 or your EPROM. The following page describes general chip changing/installation.

MTG Kawai R100 ROM Switcher Installation



Precautions!



High Voltage Safety Warning

Turn the R100 power switch OFF and disconnect the AC power cable before opening the unit.

General ESD Precautions and Proper Handling Procedures

You should observe standard static-safe handling behavior when working with sensitive electronic equipment such as synthesizers and drum machines:

- o Avoid carpets in cool, dry areas.
- o Dissipate static electricity before handling any system components by touching a grounded metal object.
- o If possible, use anti-static devices, such as wrist straps and floor mats.
- o Take care when connecting or disconnecting cables. A damaged cable can cause a short in the electrical circuit.
- o Note the polarity and position of cables for later re-installation.
- o Prevent damage to the connectors by aligning connector pins before you connect the cable. Misaligned connector pins can cause damage to system components at power-on.
- o When disconnecting a cable, always pull on the cable connector or strain-relief loop, not on the cable itself.

Open the R100

After unplugging, turn the unit over on a soft, preferably anti-static, surface. Using a Philips head screwdriver, remove the 8 screws from the bottom. Set the screws aside.

Turn the unit back over and open the front. The lid should open clam-shell style. You may need to snip a wire tie in order to open the unit enough to comfortably work.



Remove the Stock Sound ROM

Locate the 40 pin DIP sound ROM chip named U24 near the center of the main board. The chip will probably bear a marking like MN234000KAA or similar.

Some units are shipped with two sockets installed. A lower PCB socket soldered into the board, a Zero Insertion



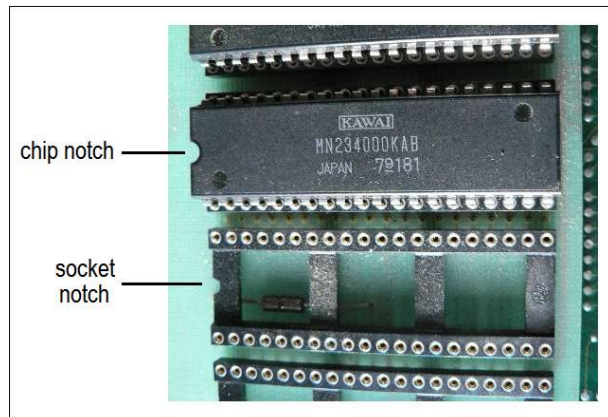
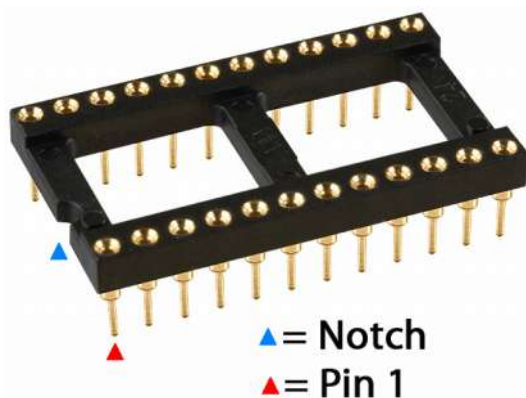
When removing any chip from a socket, gently remove it by prying each end and each corner back-and-forth with a small flat head screwdriver. Try to remove it evenly without bending any pins. Avoid touching any of the metal pins with the screwdriver if possible. Take your time.



Photos courtesy electrongate.com

Place the removed chip on a static safe surface such as the pink foam that the expansion board was shipped with.

The new **chips must be installed with the correct pin 1 orientation!** The notch at the "top" of the chip indicated the end where pin 1 is found. The notch on the chip must match the location of the notch on the socket the chip will be inserted into.



Carefully place the new chip on top of the vacated socket and make sure all the pins line up. Check pin 1 orientation again. Firmly and evenly press the new chip in place. Make sure the receiving board is well supported beneath the socket you are pressing into. Once inserted, check around and under the chip as best you can to make sure no pins were bent under.

All good? All done!