

Re: Help to copy PAL16 / GAL16 / GAL20 ICs

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- *From:* "David L. Jones" <altzone@xxxxxxxxxx>
 - *Date:* 31 Jul 2005 19:39:18 -0700
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Henry wrote:

- > I'm currently working on a project to "clone" some old computer boards I
- > have. The companies are long since out of business. These boards are from
- > around 1983 to 1985.
- >
- > Please be a little patient with me as I'm not that familiar PAL/GAL ICs and
- > can use all the advice I can get.
- >
- > I'm researching in to copying a few of the PAL16 / GAL16 / GAL20 ICs on
- > these boards. I've been reading that it is possible to "read protect"
- > (aka - registered) these chips and fear I may run in to this issue.
- >
- > I'm going to be purchasing an EPROM/PAL/GAL programmer in the near future
- > and could use some advice on what models and software may be appropriate for
- > my work. My needs are pretty basic and most of the technology I'll be
- > working with is from the 1980s. I've been look at an Advin Pilot-MVP, but
- > fear it may be more programmer then I might need. Any recommendations?
- >
- > If the PAL16 / GAL16 / GAL20 ICs are "read protected" (aka - registered)
- > what options do I have to try and reverse engineer these chips? What
- > options do I have to try and
- > figure out how these chips are programmed? I have some basic electronics
- > knowledge, enough to be dangerous, but nothing advanced enough to guide me
- > with PAL/GAL ICs. Any and all advice will be appreciated.
- >
- > I'm also looking for someone to help or "tutor" me with these PAL/GAL ICs
- > and I'd be willing to pay for this service.
- >
- > You can email me directly at "apl2research -at- comcast.net" or post a
- > replay
- > here. Thanks in advance for your help.

Best place to start is to download a datasheet for one of these devices and see what is actually in it:

<http://www.latticesemi.com/products/spld/GAL/index.cfm>

As you'll see they are just a bunch of general purpose configurable gate inputs and register outputs (with a common clock), so you can't do all that much with them (compared to modern PLD and FPGA's for

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instance). They are usually used for address decoding and latching etc. Although if your devices are doing some tricky stuff it will be harder to reverse engineer.

It's easy to figure out which inputs and outputs are used, and then you could try capturing the outputs with a logic analyser while modifying the inputs and see if you get lucky.

The circuit around the device can tell you a lot about what is its intended function, but you've got to have a fair bit of design experience to know this.

You can extract the data from *some* of these "read protected" GALs, but some techniques are destructive, so that may not be too good if you don't have many of them. There are companies which claim to be able to do this for a fee, or will reverse engineer the design for you, again, for a fee.

If yours aren't read protected then your job is pretty easy. You can get GAL programming software that will read in the device and show you the internal gate and register mapping, or draw you a schematic.

Regards
Dave :)

• **References:**

◆ **[Help to copy PAL16 / GAL16 / GAL20 ICs](#)**

◇ *From:* Henry

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