Remote power control; laser die cutting; short time delays . . . .

By Don Lancaster

It has been a real zoo around here lately since the whole new world of laser printing and desktop publishing is now literally bursting at the seams. Laser printing seems to be the opportunity of the decade and is something that no serious hacker can any longer afford to ignore. The potential here is absolutely astounding. I have lots of stuff to get you started in this, some free, some for a small fee, so be sure to write or call. You may want to start exploring this exciting new world.

Several readers have asked where to get that oddball “shrink DIP” socket for the M50734 microprocessor we looked at a few columns back. The Electronic Molding people have these for around $3 each.

I have several versions of this micro up and running. It looks like it will be absolutely outstanding for such things as data logging, student trainers, and dedicated “blue-collar” uses. Write or call for a preliminary schematic.

While I am thinking of it, let’s make one important update to your copy of the TTL Cookbook. This one has caused some grief to several recent callers. At the time the book was written, Motorola had an MTTL voltage-controlled oscillator that had the unfortunate choice of a 4024 part number. Several of the circuits in the book used this original part. You most definitely cannot substitute any of today’s 4024 CMOS binary counters for this chip. These are totally different devices from the MTTL VCO.

On to whatever it is we are doing here.

How can I remotely control ac power?

Those older BSR remote power controllers, such as the ones offered by Sears and Heathkit, are often ideal for this sort of thing. They use low-frequency radio signals sent through the power-line wiring to control up to 256 different appliances or dimmable lamps.

Unfortunately, the original BSR versions did not offer any means for direct computer control. Worse yet, these devices use a “hot-chassis” circuit that is difficult and unsafe to directly connect to your personal computer. A number of manufacturers offer plug-in BSR interface cards for Apple systems that can be quite expensive, particularly for preliminary experiments.

Instead, I would like to share with you a quick and simple $1 Apple-to-BSR interface that I worked up some time ago. It works like a champ. What this dude does is connect an ultrasonic transducer to the game paddle output of your Apple. This transducer “whistles” at the BSR controller in the same way that the handheld remote controller does. The whistling is done from one-to-three-feet away, completely eliminating any hot-chassis problems and any need to modify the BSR controller itself.

Please note before we begin that this takes the type of BSR controller that supports a handheld remote ultrasonic controller. Some low-end Radio Shack versions do not. The way to tell is by whether or not the handheld controller is listed in the catalog. You can also open the unit and see if there is an ultrasonic microphone present in the front-center of the case.

The circuit works on an Apple II+, IIe, or IICs in its slow mode. However, it will not run on a IIC.

As shown in Fig. 1, all you need are a DIP plug that fits the game I/O connector, a short piece of two-conductor wire, a pull-up resistor, and a 40-KHz ultrasonic transducer. The transducers are available...

Fig. 1. Remote ac power controller interface construction details.

Fig. 2. An Apple IIe-to-BSR controller machine-language software driver.
First, select a BSR command from this list:

<table>
<thead>
<tr>
<th>CODE</th>
<th>HEX</th>
<th>DEC</th>
<th>CODE</th>
<th>HEX</th>
<th>DEC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 1</td>
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<td>1</td>
<td>Unit 13</td>
<td>$0D</td>
<td>13</td>
</tr>
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<td>$11</td>
<td>17</td>
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<tr>
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<td>On</td>
<td>$13</td>
<td>19</td>
</tr>
<tr>
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<td>$08</td>
<td>8</td>
<td>Off</td>
<td>$14</td>
<td>20</td>
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<tr>
<td>Unit 9</td>
<td>$09</td>
<td>9</td>
<td>Dim</td>
<td>$15</td>
<td>21</td>
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<tr>
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<td>$0A</td>
<td>10</td>
<td>Bright</td>
<td>$16</td>
<td>22</td>
</tr>
<tr>
<td>Unit 11</td>
<td>$0B</td>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td>Unit 12</td>
<td>$0C</td>
<td>12</td>
<td></td>
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</tr>
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</table>

Then poke this value into location $0301 or decimal 769.

To send a single command, do a JSR $0300 or CALL 768.

To send a more reliable burst of seven identical commands, do a JSR $0363 or a CALL 883.

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The actual information needed by the BSR controller is a 5-bit command code.
Various combinations of 1 and 0 in this 5-bit command code correspond to codes created by the buttons on top of the controller. The transmitted code consists of a start unit followed by the five-unit command code.

Next, to pick up some noise immunity and to ignore key jangles, the complement of the command code is transmitted. To complement a code, you make all of the 1s into 0s and vice-versa.

Finally, an end unit is transmitted. Thus, there are 12 units to the serial ultrasonic code, all but the last of which takes 8 milliseconds. You have a start unit, five command-code units, five complements to the command-code units, and then the final stop unit.

Let me know the most unusual use for remote power control that you come up with using this super-cheap circuit.

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**How can I create short electronic delays?**

I got a call from some students that were working up a dynamic memory demo as a class project and wanted to avoid buying a very-expensive short time-delay generator.

For quick, dirty, and cheap time delays in the 1-nanosecond to several microsecond region, just use ordinary small coax cable or twisted pair wiring. You will get around 1.6 nanoseconds per foot, or 1 microsecond for each 600 feet or so.

The bandwidth is very high and can accommodate analog and digital signals with equal ease. Both ends of the cable should be properly terminated to eliminate reflections.

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**Can I do die cutting on a laser printer?**

The amazing answer to this question is that, yes, you can easily do die cutting on a laser printer. You can also do any of a number of other mind-boggling things, including direct printed circuits, T-shirts, full vibrant color from plain old black
toner originals, silk screening, translucent overhead transparencies and much more. We've covered some of these in previous columns, but the die cutting is brand new and reported here for the first time anywhere.

Kroy Kolor has a super new material that is more or less like the sticky-back vinyl and carrier used by professional sign people, except for one major difference. This material is not cross-linked properly until it is exposed to light and treated with a simple chemical.

Here is how you use it: With your laser printer, print the die cut outlines onto a clear acetate sheet. Then place the sheet in contact with the diecut material and expose it to strong sunlight or the usual UV exposure boxes. The toner prevents the light from cross-linking the material. When you next wipe the material with a developing chemical, every place that toner was will dissolve, leaving you with perfect ‘die-cut’ letters or whatever ready to peel and use. Neat stuff.

Contact Randy Bailey at Kroy for samples and more info on this exciting new material.

What’s worth hacking this month?

There are so many unique new components that need looking into that it is hard to pick a starting point. To quote Pogo, “We are beset with insurmountable opportunities.” At any rate, here goes.

We'll start off with my perennial favorite, the 30-cent three-way pneumatic valve shown in Fig. 4. These remain available from Jerryco and many other surplus houses and are an outstanding bargain part that has gone begging. Low-pressure air has great hacker robotics potential, but it has been virtually ignored.

A premounted strain gauge useful for electronic scales and whatever is available from Revere as the Model FT-30 force translator transducer. It is available in ranges from 1 to 40 pounds and in resistances from 0.5 to 25 ohms.

The Hewlett Packard Journal is a good free source of technical details on sophisticated electronic devices. The February 1987 issue has a good tutorial on wide-range optical and infrared sensors in it.

Speaking of IR sensing, Amperex has
some miniature and sensitive pyrolytic infrared detectors whose prices start at $3.50. These look like really great components, but I have not yet had the chance to test them. One obvious application is in "hot-spot" detectors for use by the fire service. Current devices are ridiculously expensive and many of the volunteer fire departments simply cannot afford them.

For some new information on electronic noise, and noise diodes for testing in particular, check out the Micronetics noise-diode catalog, which also contains a tutorial on noise and noise testing.

We seem to be turning the corner on solid-state imaging devices. These should soon be cheap enough to open up all sorts of new low-end hacker stuff, including image scanners, simple robotic vision, various desktop publishing accessories, and whatever. There's now even a toy camcorder being introduced that should list for under $150 and actually be sold in toy stores. Just as hackers ripped open the early Speak and Spell toys to get at the sound chips, you might now see a new generation of hackers ripping apart these "toys" for the imaging electronics.

The leader in charge-coupled-device CCD image sensors is now Reticon. But Texas Instruments has TC210, 220, 230, and 240 sensors and evaluation kits available, which include a 488 × 754 full-color RGB evaluation board.

Other companies that are introducing lower-cost CCDs include RCA with its SIDS04DD device.

As usual, be sure to write or call with any tech questions per the "Need Help?" box. I'll send you the usual free-stuff list plus some other goodies.

**NEED HELP?**

Phone or write your Hardware Hacker questions directly to:

Don Lancaster
Synergetics
Box 809
Thatcher, AZ 85552
(602) 428-4073

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<tr>
<td>35 MHz DUAL TRACE OSCILLOSCOPE</td>
<td>$498</td>
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<td>20 Freq. Counter</td>
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<tr>
<td>GF-8016 Function Generator</td>
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<td>GF 8015 without Freq. Meter '169</td>
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<tr>
<td>DIGITAL LCR METER</td>
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