

Because the index on the encoder wheel triggers with the quill well above horizontal (see panel (f) of Figure 20-29 and page 410), the precise 90° orientation will be several hundred counts beyond. To calibrate the encoder, you need to determine exactly how many counts.

Actually, the code makes this easy: as written, it displays the current encoder counts (`encPos`) on the LCD display (line 178 of the code and Figure 20-34). Calibration is then a simple matter of noting down the number with the reference rod exactly horizontal. Add 10,000 to the value and insert it at the appropriate location in the sketch (see lines 29-30). Use the Verify button in the Arduino GUI to re-compile, upload the code, and you are good to go.

The depth of cut indicator requires a similar calibration to establish the value of `docMax` (see lines 61 and 139). For example, you could temporarily print the value of `doci` instead of `encPos` in line 178, and then enter into line 61 the `doci` measured with the contacts closed. Verify and upload the sketch to complete the calibration of the depth of cut indicator.

Using the encoder is a breeze. Just turn things on, wait for the friendly greeting (lines 92-94... feel free to customize this), and then move the quill past the reference point. The diagnostic LED should flash and the angle display will begin to track. Check that 90° is truly 90°. Move the quill down so that the depth of cut indicator electrodes make contact. You should see the corresponding signal in the lower half of the display and hear the buzzer. All is well, and you are ready to enjoy your new digital encoder.

## 20.8.7 Conclusion

Although the arrangement of my machine allowed me to preserve the original angle measuring hardware, I have found the digital encoder to be utterly reliable over several years of use. The Arduino controller is a tough little customer: despite multiple minor mishaps during construction, and several unintentional losses of power during use, it has unfailingly recovered, rebooted, and returned to operation within a second or two. Dialing in accurate and precise angles is now a pleasure. In short, I am not going back.

### The Upgrade...

I got it bad...I can't leave things well enough alone.

It was only a few months after completing my digital angle encoder that I started having ideas...ideas for the next big improvement. How could I make the encoder even more useful and pleasant to use?

If you have compared the display hardware described here with the photo on the cover of this book, you know exactly where this is going. You see, my local electronics shop was offering a wonderful, backlit graphical liquid crystal display (GLCD)...and it didn't even cost that much...With 128x64 individually addressable pixels, a GLCD opens up all kinds of possibilities.

I began with the notion of having a larger angle readout. Beyond a certain age, and with various loupes and lenses stacked up in front of your eyes, it can be difficult to read a small character display, even a nice one such as that shown in Figure 20-32. A larger screen can also accommodate more information, such as the target angle you are shooting for and a more realistic “analog” display of the depth of cut.

After a few months of hard use, I had also realized that the Arduino is so robust that it does not need a reset button: if there is a problem (and there never is a problem), just unplug it and plug it back in. This realization freed up the push button shown in the last panel of Figure 20-29 and in Figure 20-33. What could a newly liberated button accomplish? Why not use it to bring up an entire separate screenful of information, for example the last ten target angles or even the entire faceting prescription?

Thus began the Encoder Mark II, whose primary screen graces the front cover of this book and whose secondary screen appears in Figure 20-36 below. Note the large friendly numbers for the angle display. I had to learn how to create and edit GLCD fonts to get just the right look (not that this was a burden or anything...as I said, I got it bad). Pressing the front panel button temporarily flips the display to screen 2. Pressing and holding the button stores the current angle in slot 1 of the Reference Angles and shifts all the others down. This first Reference Angle also appears as the Target directly above the angle display on the primary screen. Finally, the Depth of Cut progress bar boasts 128 glorious steps between no electrical contact and fully closed, as opposed to the sixteen steps of the original display.

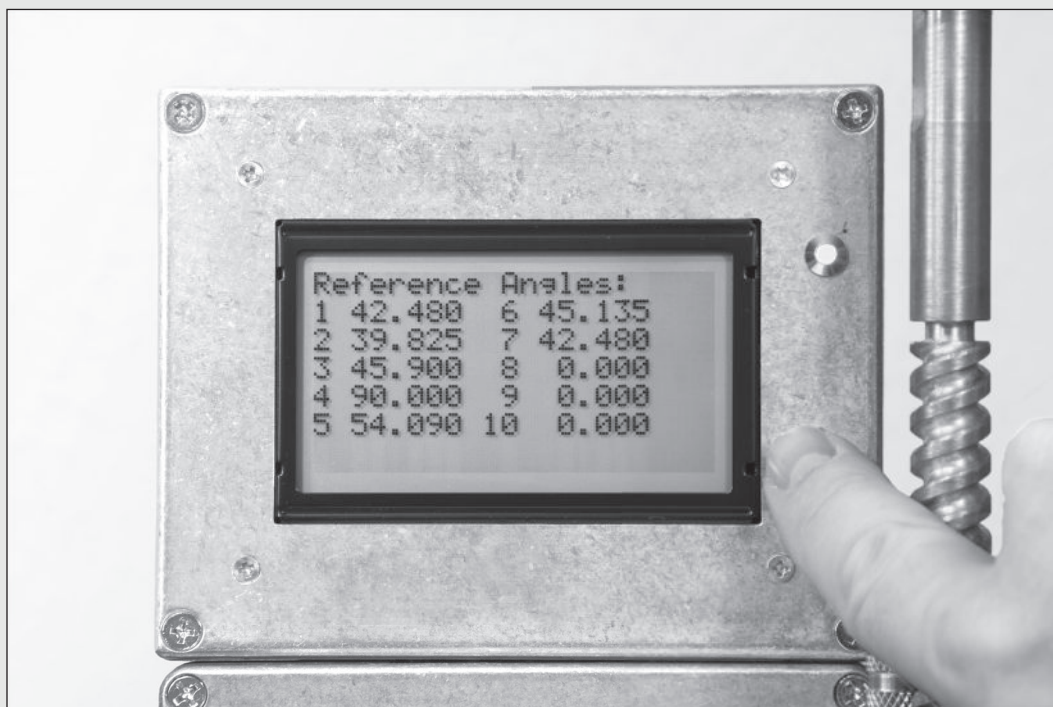


Figure 20-36 The second screen of the Mark II Encoder upgrade lists the last ten reference angles.