Project M1727

Weasure
A Scale that Weighs and Measures

Introduction

Electronic scales are common today, and many of them easily interface to PCs. However, for most commercial shipping services, the weight alone isn't enough, they also want to know the physical dimensions of the package.

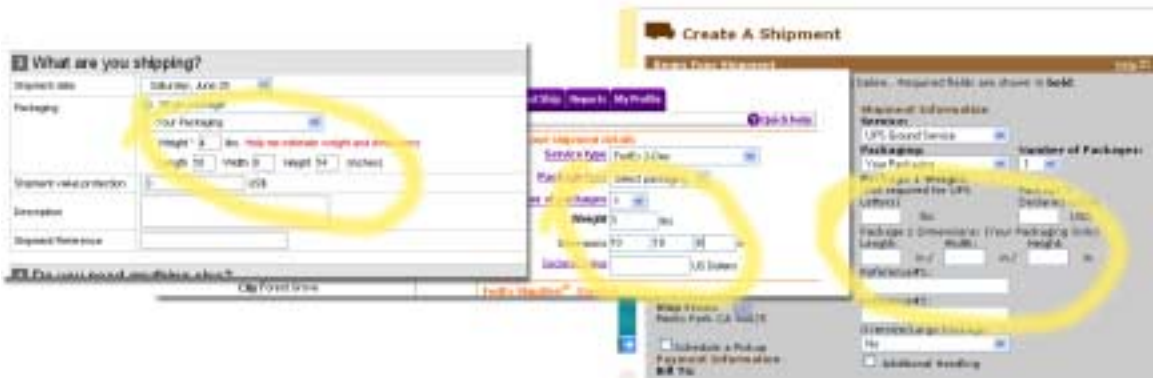


Figure 1 - Screen shots from the DHL, FedEx & UPS web sites

While you can get the weight directly from the scale, the measurements are still done by hand with a measuring tape or yardstick. In a high volume shipping room with many different package sizes, measuring and recording the package dimensions adds several steps to the shipping process.

Weasure offers a "one-touch" solution to this problem. Simply place the package on Weasure and both the weight and dimensions are displayed. By connecting Weasure to a PC's serial port, this data is uploaded directly to the PC, where a shipping application can send the measurements directly to the shipping company's web site, further streamlining the process.

Weight measurement

To measure the weight, I started with an existing postal scale. I found a new DigiWeigh DW-36XP on Ebay for about $10 . The scale is very basic, with a simple LCD digital readout. I took apart the scale as soon as it arrived, and started probing for a way to adapt it to this project.

Figure 2 - Photosensor schematic, photosensors on the measurement frame

Construction

Motherboard design

Figure 3 - Weasure board with SKP attached (the MAX233 is under the SKP)

The Weasure Prototype uses the SKP16C62P evaluation board "as is", since the peripherals on it (in particular the display, buttons and LEDs) are useful for development and the finished product.

To interface the board with the scale, a motherboard PCB was fabricated. The motherboard has sockets that line up with the interface pins on the SKP board. This board has the resistor networks and connectors for the size measurement photocells, a connector for the scale, and a MAX233 RS-232 serial interface chip to provide the proper signal levels for talking to a PC's serial port.

The DigiWeigh scale runs off of a 9v battery or an optional wall-wart power supply. The 9v supply from the scale is connected to the Weasure motherboard, where a 7805 regulator supplies the 5v supply for the SKP board, the MAX233 and the resistor networks. The PWM output from the scale is connected to the Timer B4 input pin of the M16C/62P.

Since the DigiWeigh scale is obscured by the Weasure measurement platform, the controls and display on its front panel are replicated on the Weasure board. The On/Off switch is duplicated by a switch on the motherboard, and the "Zero"

function is duplicated by S1 on the SKP board. The zero button resets the scale's zero point. This, like the other functions on the DigiWeigh's front panel, are easily duplicated in software.

The DigiWeigh scale was modified with a connector for the 9v supply, on/off and PWM signal outputs. Wires were tack-soldered onto the scale's control board and routed to the connector. Conveniently, there was a cutout on the back that was easily adapted to a connector for attaching it to the Weasure motherboard.

Measuring frame

The measuring frame for this prototype is constructed out of wood. Holes are drilled at 1" intervals along the measuring surfaces at a angle up towards the light. These surfaces are painted matte black to minimize stray reflections into the photocells.

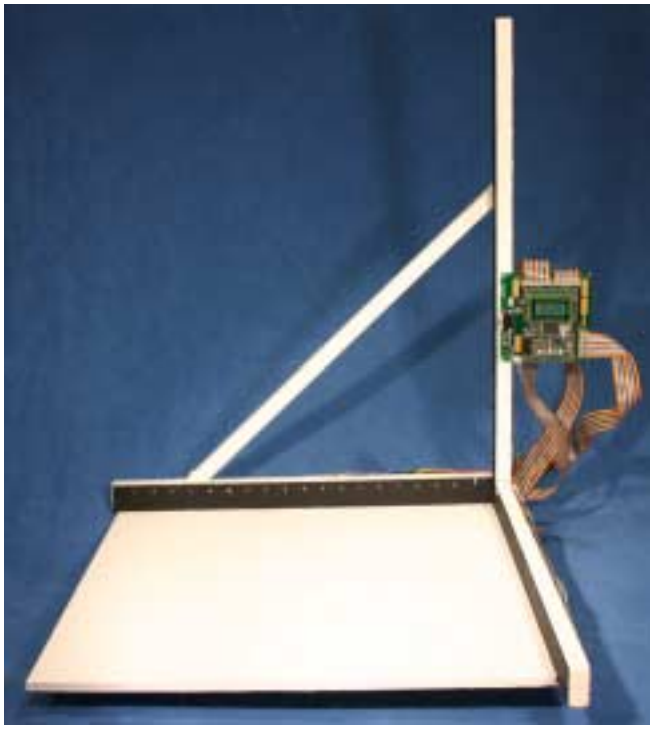


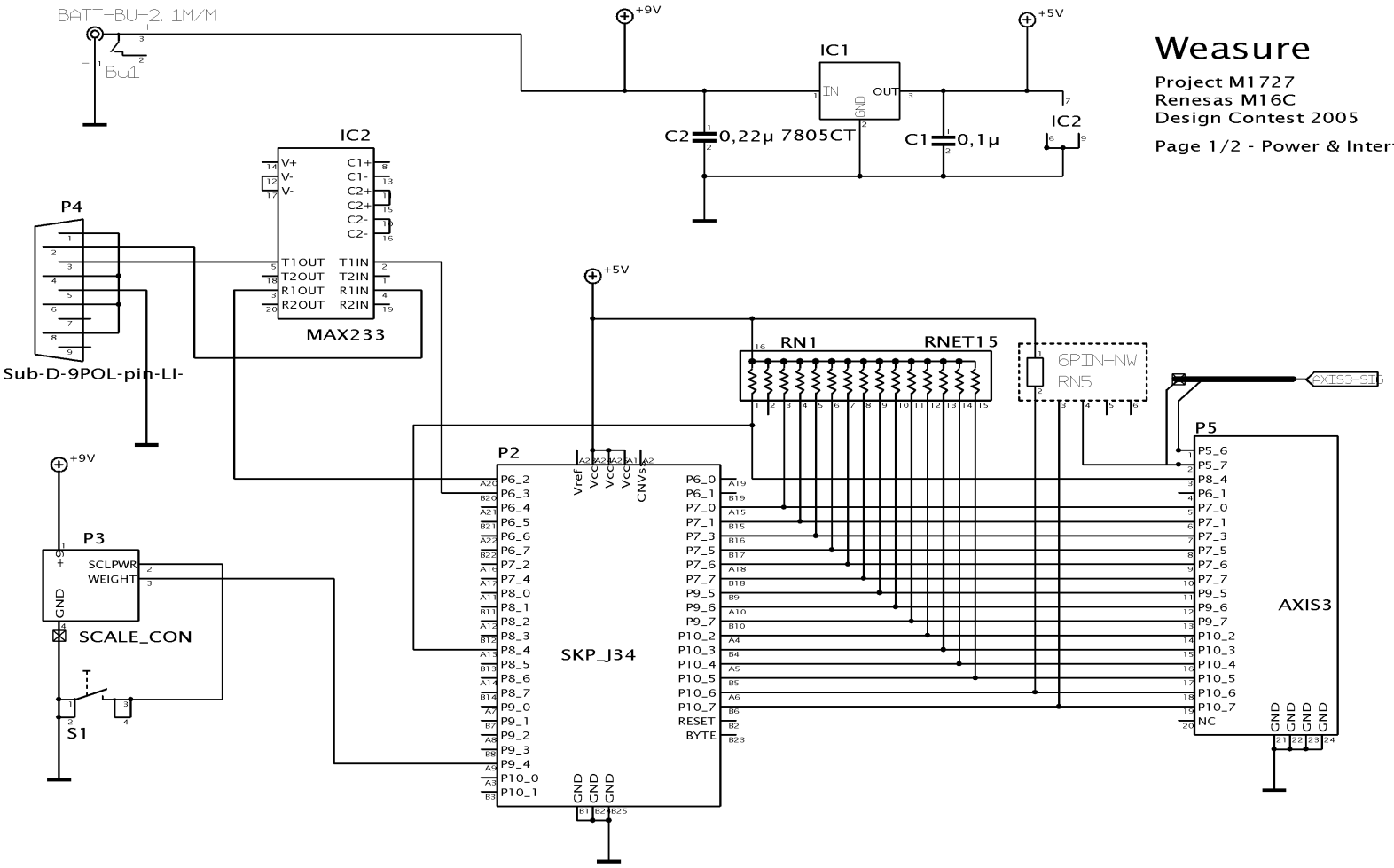
Figure 4 - Measuring frame

One side of each of the photocells is connected to a bare wire to ground. The other side is connected to a special ribbon cable that attaches to the Weasure motherboard. In retrospect, creating circuit boards for mounting the photocells would have been a major timesaver. Manually wiring and soldering all those connections took the better part of a day!

Conclusion

Weasure provides a complete, “one touch” solution for getting all of the measurement information about a package required to ship it. By connecting it to a PC, it’s possible to create shipping applications that streamline shipping by eliminating a separate measurement step.

The M16C/62P was an excellent fit for this application. It has plenty of I/O to implement the photocell measurement scheme without additional hardware, and all of the other peripherals (timers, serial I/O) are available directly on the chip.



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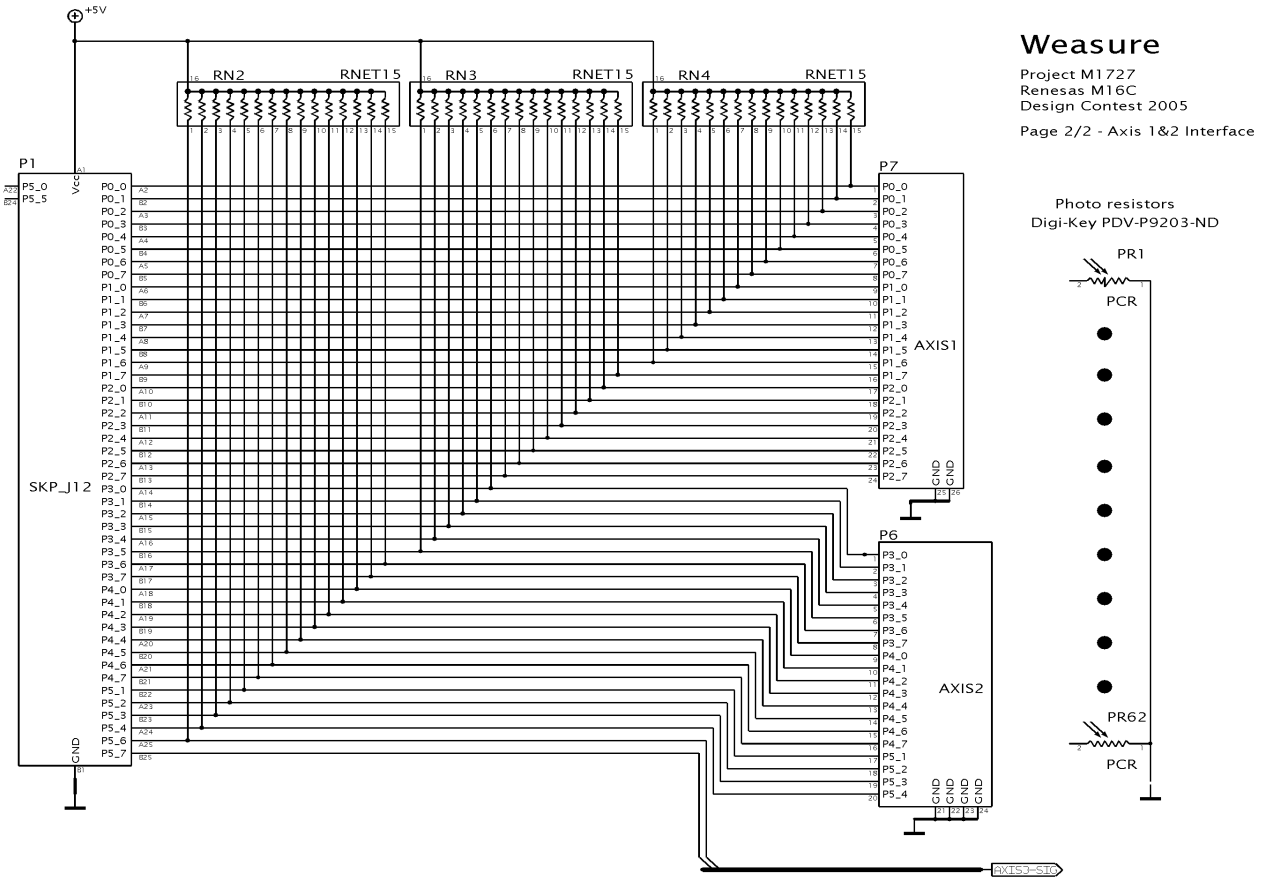

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Photo resistors
Digi-Key PDV-P9203-ND