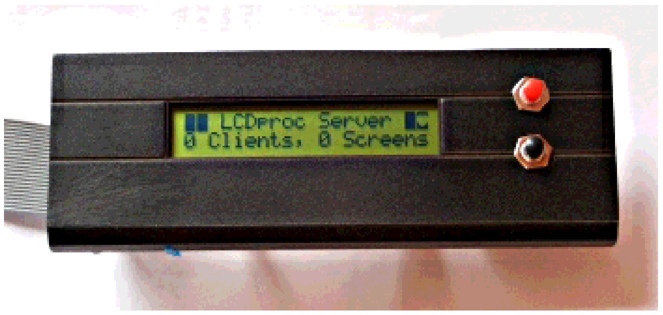
Content:

lcdproc -- LCD displays easy to use and easy to build



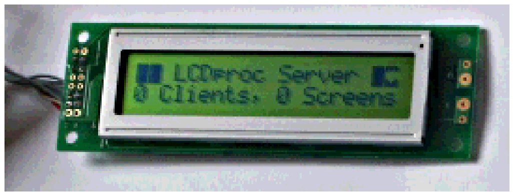
Abstract:

Those readers that might have expected now an article about microcontrollers should not worry. I will definitely continue. The next hardware article will again be about microcontrollers. I have also created a page where you find all recent electronics articles: www.tuxgraphics.org -> electronics
I hope that this makes it easier to follow and to get an overview.

Long time linuxfocus readers will still remember my old March 2003: Linux USB LCD display with watchdog and buttons and A LCD control panel for your Linux server articles. Those where really "luxury" LCD panels with hardware watchdog and ADC etc... Over time I have noticed that all this extra functionality is something that I do not use so often.

This article presents now the "basic" model: LCD display and 2 buttons; simple and easy to build for everybody.

What is lcdproc?



Lcdproc used to be at the very beginning a program to display some statistics (cpu load, uptime, time, ...) on an external LCD display. Over time it has however evolved into a much more generic solution. Today the lcdproc package contains LCDd, a generic server and LCD driver, plus many clients. One of those clients is still the actual executable called lcdproc which still shows server statistics however there are also others. This client server architecture has the big advantage that you do not need to write your client in a specific language. You just need to use the simple ascii protocol between client and server. Here is an example which implements a clock in just 36 lines of perl code. It displays time and date and the upper right corner shows a little icon called "heartbeat". The "heartbeat" is added by the LCDd server. This "heartbeat" icon blinks once in a while to indicate that the display is still alive.

In lcdproc you can have more than just strings. You get bar-graphs, scrollers, title bars.... and text strings. At the beginning of the program you define those objects (they are called widgets) and then you fill them with data. It's explained in the LCDproc Developer's Guide from page 7 and on wards.

The main part of the little LCD clock example program looks like this:

```
#!/usr/bin/perl -w
....
# initiate the communication:
print $remote "hello\n";
....
# set our name and define a text string widget
print $remote "client_set name lcdtime\n";
print $remote "screen_add scr1\n";
print $remote "widget_add scr1 str1 string\n";
....
while(1)
{
    ....
    $date = scalar localtime;
    # now write to the LCD:
    print $remote "widget_set scr1 str1 1 1 \"$date\"\n";
    sleep 10;
}
```

Easy enough? OK, then let's build something more useful.

The hardware

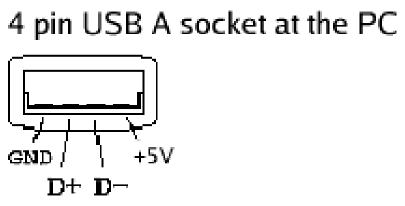
The parallel port of a PC works according to specifications with 5V. If you now take a look at the datasheet of a modern LCD display (e.g from tuxgraphics: http://shop.tuxgraphics.org/electronic/lcd.html) you will notice that even though the displays are big they need extremely little power. Only 2 mA ! With so little current it must be possible to power the display directly from the parallel port. The advantage is then that you do not need any extra power connector. It is just one LCD display with one connector to the parallel port. Very convenient.

It is possible with a parallel port that really provides 5V. The problem is that there are some which do not follow the specifications. So how do you know if your parallel port is good enough for "self powered" solution? Here is a little test:

1. Install lcdproc with the "parallel port power" patch (see references).
2. Configure the /etc/LCDd.conf file as described further down.
3. Start the program LCDd as root.
4. Take a digital voltmeter and measure the voltage on pin 1. It should be 4.90V or more (measure between pin 1 and pin 18 = GND).
5. Now connect a 33K resistor to the parallel port between pin 1 and pin 18. The voltage should go down to 4.25V. If you get more then your parallel port is very good. If you get less then the "self powered" solution will not work.

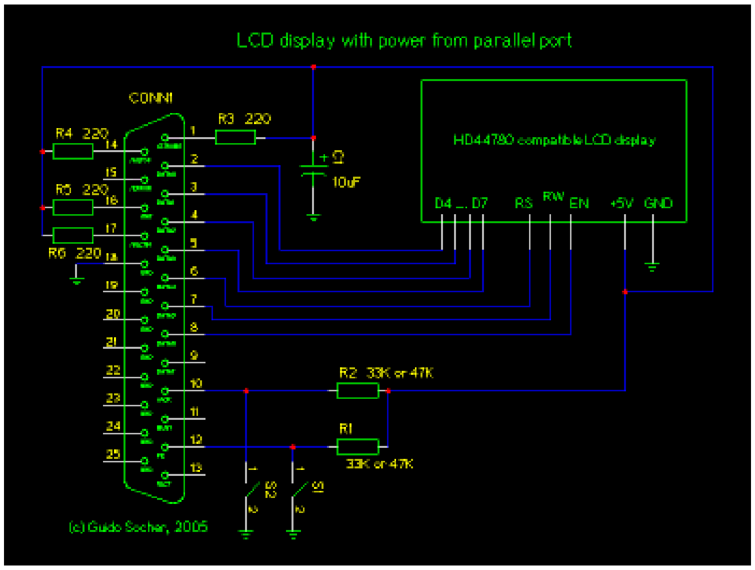
If this test passes then you can go for the "parallel port power" solution using the tuxgraphics 20x2 display (or equivalent). This is tested. It will work.

If your parallel port is a bit weak then don't worry too much. You can either use the internal 5V of your PC (you have to open it for this purpose) or you can get 5V from an free USB connector.



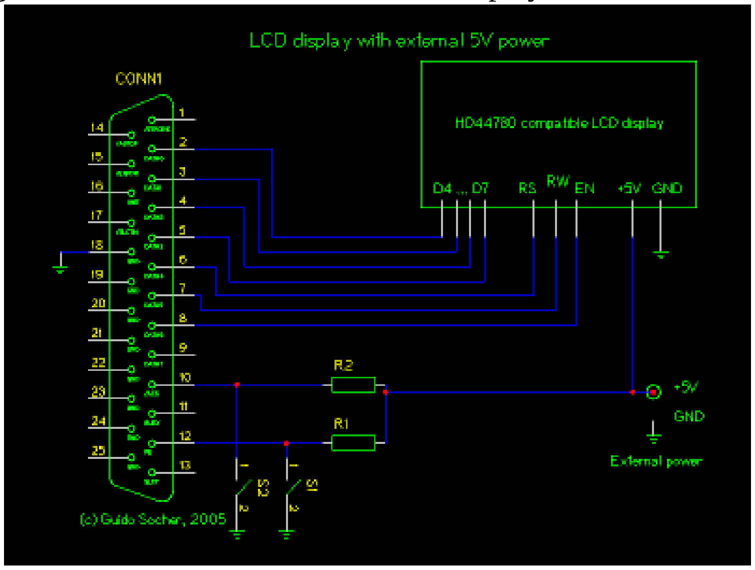
The circuit diagram

The first diagram shows the connections for a LCD display with 2 buttons using the "parallel port power" solution.



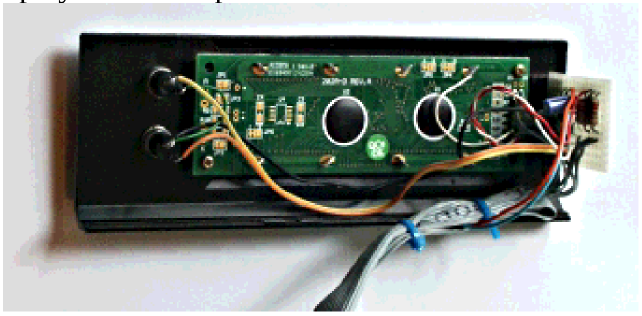
```
Parallel port
pin 1 , strobe  = 220, supply voltage
pin 2 , D0      = LCD pin D4
pin 3 , D1      = LCD pin D5
pin 4 , D2      = LCD pin D6
pin 5 , D3      = LCD pin D7

pin 6 , D4      = LCD pin RS
pin 7 , D5      = LCD pin RW
pin 8 , D6       = LCD pin EN

pin 10, ACK      = button A, upper red button
pin 12, PE       = button C, lower black button

pin 14, strobe  = 220, supply voltage
pin 16, strobe  = 220, supply voltage
pin 17, strobe  = 220, supply voltage

pin 18, ground  = 0V, GND
```

This second drawing shows the connections for a LCD display with 2 buttons and external power:



As for all new electronics articles you can again get a kit with all the components from shop.tuxgraphics.org

I have mounted the lcd display in a black plastic frame:



The lcdproc parallel port power patch

LCDd sends always some data to the display. One could therefore use some diodes and derive the power from the signal lines. The problem is that diodes will cause a voltage drop of at least 0.5V even at low currents. We can’t afford this. There are however enough output lines free if you use LCDd with just one LCD display. Nothing is easier than patching the LCDd software to always keep those free pins on logical "1". We still insert some resistors to have a minimum short circuit protection (or stupid mistake protection ;-). The patch for lcdproc-0.4.5 is available from the download section. You apply it like this:

```
tar zxvf lcdproc-0.4.5.tar.gz
cd lcdproc-0.4.5
patch -p 1 < lcdproc-0.4.5-pp-powerpatch-v1.txt
./configure --enable-drivers=hd44780
make

make install
(or you can just copy LCDd.conf /etc and copy server/LCDd to /usr/bin)
```

The LCDd.conf file

The /etc/LCDd.conf file configures our LCD driver and server (=the LCDd process). In the /etc/LCDd.conf file you need to uncomment the following in order to use a HD44780 compatible display with wiring as described in this article:

```
[server]
Driver=HD44780

[HD44780]
# Hitachi HD44780 driver

Port=0x3BC
# Port where the LPT is. Usual values are 0x278, 0x378 and 0x3BC

ConnectionType=4bit
Keypad=yes
Backlight=no

Size=20x2
# Specifies the size of the LCD.

DelayMult=4
DelayBus=true
```

The difficult part is the port address (0x278, 0x378 and 0x3BC). How do you know at which IO address your parallel port is? The easiest is to load the parport kernel module (modprobe parport) and then look at /proc/ioports:

```
modprobe parport
modprobe parport_pc

cat /proc/ioports

...
0388-0389 : OPL2/3 (left)
038a-038b : OPL2/3 (right)
03bc-03be : parport0
03c0-03df : vga+
03f6-03f6 : ide0
...

in this case you use: 0x3bc
```

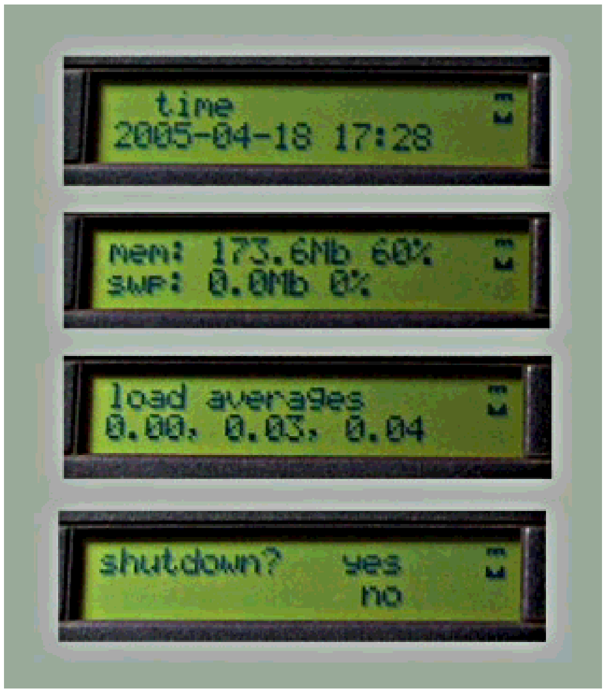
Our own application

You have seen at the beginning of this article how easy it is to send some text strings to the display. It becomes a bit more complicated if you want an interactive display (with the two buttons). In this case we need to avoid the sleep statement otherwise the buttons are not responsive during the sleep period. At the same time we need a blocking statement which stops the loop. What we need is the system call "select". It stops execution until a timeout or until a button is pressed at the display.

Our application will provide some stats (mem, swap, cpu, time) and you can use the buttons to shutdown the machine.

The script is called servermenu_pl and you find it in the download section.

I present here only such a basic application as experience from previous articles showed that most readers just want to know how to do something and then they have their own applications for it. I received emails with all kind of ideas, CD-burning station, weather station PC, alarm systems, ... all this can be done. Just modify the code a bit.
It’s really cool and a lot of fun to play with this display and lcdproc.



```
  time
2005-04-18 17:28

mem: 173.6Mb 60%
swp: 0.0Mb 0%

load averages
0.00, 0.03, 0.04

shutdown?    yes
              no
```

References

- **Download** section for this article
- lcdproc homepage: http://www.lcdproc.org
- The tuxgraphics online shop. You can order all the needed parts from this shop (http://shop.tuxgraphics.org).