CELLCATRAZ
Developer Guide

Eliminate Distractions
Improve Productivity

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Junior Design II
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I. System Overview

Students and workers alike understand both the powerful capabilities of mobile devices as well as the complications they introduce. Though cell phones provide immediate access to an abundance of information and an instant connection to others, they can also be a source of distraction that can have disastrous effects on productivity. In fact, just being in the same room as one’s cell phone is enough to make it hard to focus on a task [1]. **Cellcatraz** (Figure 1) is the tool to overcome cell phones’ power over the human psyche. More generally, Cellcatraz can improves work and study habits through the use of the Pomodoro Technique [2].

Cellcatraz allows the user to select a 25-minute or 5-minute timer. If the 25-minute setting is selected, the user must place their phone in the box to start the timer. If the phone is removed early, an alarm will sound; the user has 5 seconds to return their phone before the system resets. If the 5-minute setting is selected, the user may remove their phone without penalty. In this way, Cellcatraz will allow the user to develop an effective 25-minutes-on/5-minutes-off study routine.

**Figure 1: Cellcatraz**
II. Electrical Specifications

Cellcatraz uses an LM7805T voltage regulator to step down input dc power and supply an ATmega328P microcontroller with 5V. The electrical characteristics of the two devices are summarized in Table 1 [3], [4].

Table 1: Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>ATmega328P</th>
<th>LM7805</th>
<th>Cellcatraz System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>-55</td>
<td>+125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Voltage on any pin except RESET with respect to ground</td>
<td>-0.5</td>
<td>VCC + 0.5</td>
<td>V</td>
</tr>
<tr>
<td>Voltage on RESET with respect to ground</td>
<td>-0.5</td>
<td>+13.0</td>
<td>V</td>
</tr>
<tr>
<td>Maximum Operating Voltage</td>
<td>6.0</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>DC current per I/O pin</td>
<td>40.0</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>DC current VCC and GND pins</td>
<td>200.0</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Injection current at VCC = 0V</td>
<td>±5.0</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>Injection Current at VCC = 5V</td>
<td>±1.0</td>
<td></td>
<td>mA</td>
</tr>
<tr>
<td>DC Input Voltage</td>
<td></td>
<td>+35</td>
<td>V</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td></td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Temperature (Soldering, 10sec)</td>
<td></td>
<td>+230</td>
<td>°C</td>
</tr>
<tr>
<td>ESD Susceptibility</td>
<td>2</td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>-0.5</td>
<td>+35</td>
<td>V</td>
</tr>
<tr>
<td>Supply Current</td>
<td>0</td>
<td>+1.5</td>
<td>A</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-55</td>
<td>+125</td>
<td>°C</td>
</tr>
</tbody>
</table>
III. User Guide

The Cellcatraz user interface includes an input DC_POWER jack, ON/OFF switch, 7-segment display, Time_Select switch, Brightness_Select pushbutton, and Reset pushbutton. The switch and pushbutton functions are summarized in Table 2.

Table 2: User Interface Functions

<table>
<thead>
<tr>
<th>Switches/Pushbuttons</th>
<th>Positions</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON/OFF Switch</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Time_Select Switch</td>
<td>25-Minute</td>
<td>5-Minute</td>
</tr>
<tr>
<td>Brightness_Select Pushbutton</td>
<td>OPEN</td>
<td>SHUT</td>
</tr>
<tr>
<td>RESET Pushbutton</td>
<td>OPEN</td>
<td>SHUT</td>
</tr>
</tbody>
</table>

A. System Startup

1. Ensure DC_POWER is available by plugging the Wall Transformer (Part No. 24) into a typical 120VAC wall socket and then into the Ø2.1mm barrel jack labeled POWER.
2. Turn on the system by placing the ON/OFF switch to the ON position.

B. Timer Mode Selection

1. To select 25-Minute Mode, place the Time_Select switch to the 25-Minute position.
2. To select 5-Minute Mode, place the Time_Select switch to the 5-Minute position.
C. 25-Minute Mode

When in 25-Minute Mode, the 7-segment display will blink 25:00 every second. The 25-Minute timer begins countdown once a cell phone or other device is placed in the phone bay, thus blocking light from entering through the pomodoro-shaped cutout.

If the cell phone is removed before the timer has reached 00:00, the countdown will pause and a 440Hz alarm will sound. If the cell phone is returned within 5 seconds, the alarm will silence, and normal countdown will continue. If the cell phone is not returned within 5 seconds, the system will reset.

Once 00:00 is reached, the speaker will play three beeps and Cellcatraz will display 88:88 for 1 second and then reset the 25-Minute timer. If the cell phone is still present, the 25-Minute timer will begin countdown.

D. 5-Minute Mode

When in 5-Minute Mode, Cellcatraz will count down regardless of whether a cell phone is or is not present in the phone bay.

Once 00:00 is reached, the speaker will play three beeps and Cellcatraz will display 88:88 for 1 second and then reset the 5-Minute timer.

E. Selecting Display Brightness

The 7-segment display has three brightness levels. The 7-segment display will cycle through brightness levels as follows:

\[
\text{DIM} \rightarrow \text{BRIGHT} \rightarrow \text{BRIGHTEST}
\]

1. To select the brightness level, depress the Brightness.Select pushbutton.
F. System Reset

System reset will stop the timer, silence the speaker, and return the Brightness setting to DIM.

1. To perform system reset, depress the RESET pushbutton.

G. System Shutdown

1. Turn off the system by placing the ON/OFF switch to the OFF position.
2. (Optional) Remove DC_POWER by unplugging the Wall Transformer (Part No. 24) from the Ø2.1mm barrel jack labeled POWER and then unplugging the Wall Transformer from the wall socket.

Figure 2a: User Interface Functions (Front)
Figure 2b: User Interface Functions (Side)