

G V V Sharma\*

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**Abstract**—This manual shows how to balance chemical equations using matrices.

Download python codes using

```
svn co https://github.com/gadepall/school/trunk/
training
```

Download the codes from below link

```
svn co https://github.com/pratibha444/icoboard
```

## 1 COMPONENTS

The necessary components for this manual are listed in Table

Component	Quantity
Icboard	1
Raspberry Pi 4	1
Male-Male Jumper Wires	20
Breadboard	1
Seven segment display	1

TABLE 0

## 2 SOFTWARE SETUP

### 2.1 Icboard

For installing icoboard Open a terminal and execute the following commands.

```
git clone https://github.com/WiringPi/WiringPi.git
cd WiringPi && ./build
sudo apt install build-essential clang bison flex
libreadline-dev gawk tcl-dev libffi-dev
mercurial graphviz xdot pkg-config libftdi-
dev
```

#Icoprog

#On termuxarch run as root user

#With termuxarch and pizero, this is the only tool required at the pi

```
svn co http://svn.clifford.at/handicraft/2015/icoprog
cd icoprog && make install
```

#Icestorm

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cliffordwolf/icestorm
cd icestorm && make -j4 && sudo make install
```

#arachne-pnr

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cseed/arachne-pnr
cd arachne-pnr && make -j4 && sudo make
install
```

#Yosys

#On termuxarch run as normal user without sudo

```
git clone https://github.com/cliffordwolf/yosys
cd yosys && make -j4 && sudo make install
```

## 3 HARDWARE SETUP

### 3.1 4 bit binary input

- The hardware connections between the Icboard and Raspberry Pi 4 are available in

\*The author is with the Department of Electrical Engineering, Indian Institute of Technology, Hyderabad 502285 India e-mail: gadepall@iith.ac.in. All content in this manual is released under GNU GPL. Free and open source.

below figures.

- In figure 2 and 3 the Icoboard and raspberry pi connections are shown. And fig 4 shows the Raspberry Pi pin configuration.
- Place icoboard on Raspberry Pi 4 and make the connections according to following steps:
- Take the wires and connect them to A5,A2,C3,B4 of the icoboard . These pins are used to give input manually.
- Similarly make connection to GND pin and 3.3V pin of Icoboard
- Connect GND and 3.3V pin on the bread board
- Give the binary input using input pins .
- For example connect all the input pins to GND pin on bread board
- Now open the terminal give the following commands

```
cd icoboard
cd trunk
cd codes
cd Binary
make v_fname=binary
python binary.py
```

- The output is displayed on terminal as 0
- Similarly you can change the values.
- If 1 is to be given as input connect it to 3.3V pin and if 0 is to be given as input then connect it to GND pin.

### 3.2 Seven segment display

Make the connections according to the Tabel II. The pin configuration of seven segment display is shown in fig 1.

- Open the terminal and execute the following commands

```
cd icoboard
cd codes
cd trunk
cd seven
make v_fname=seven
```

Seven segment display	Icoboard
a	A5
b	A2
c	C3
d	B4
e	B7
f	B6
g	B3
COM	3.3v

TABLE 0

```
python seven.py
```

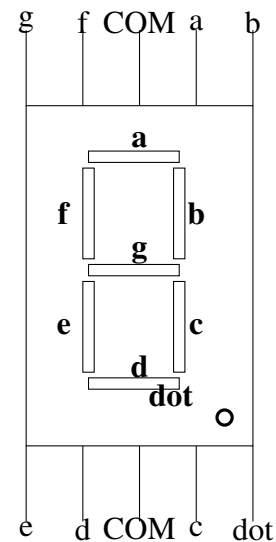


Fig. 0: SSD pin configuration

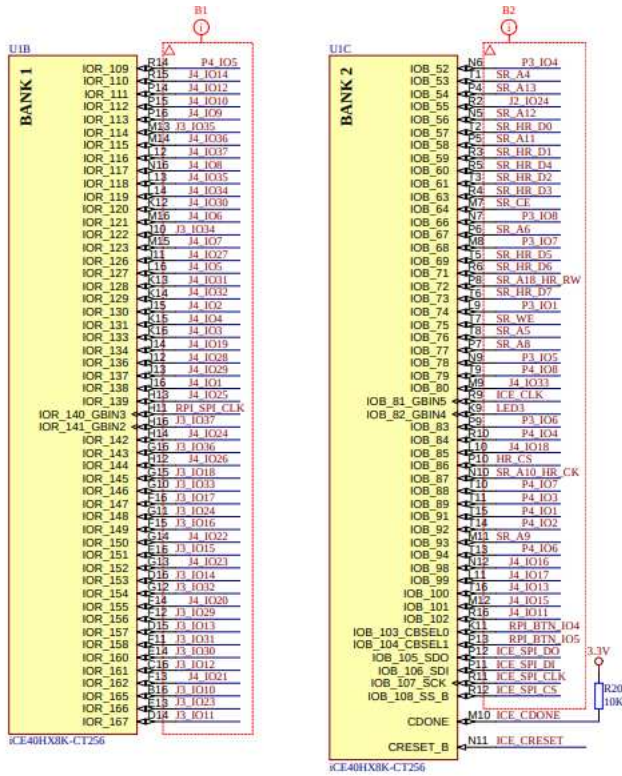


Fig. 0: Icoboard pin configuration

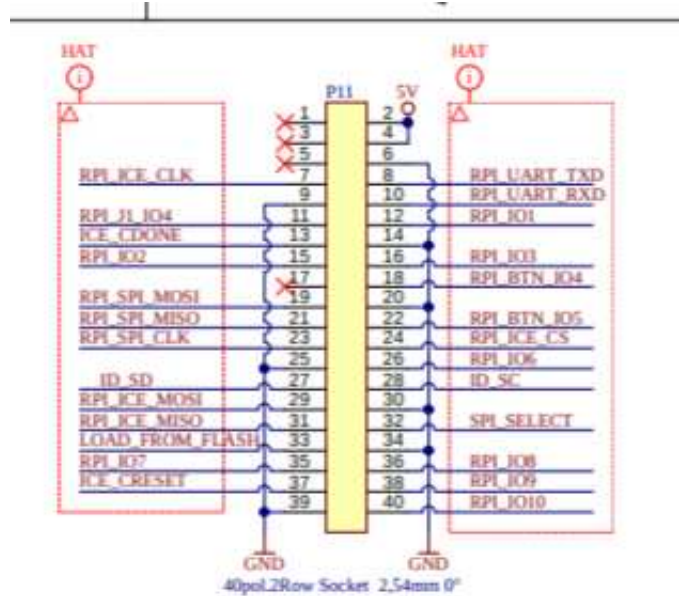


Fig. 0: RaspberryPi pin configuration

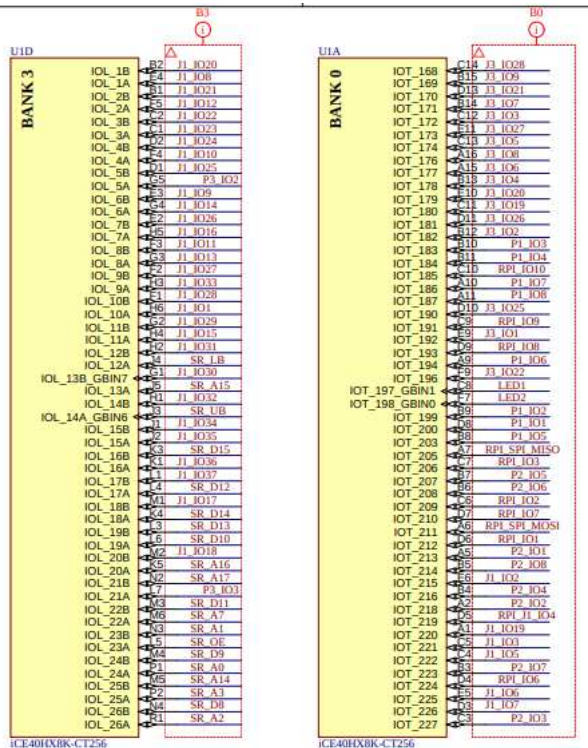


Fig. 0: Icoboard pin configuration