

Introduction:

Port lines are used both in input and output modes. For the experimental purpose, toggle switches and push button switches are used as input devices and point LEDs are used as output devices.

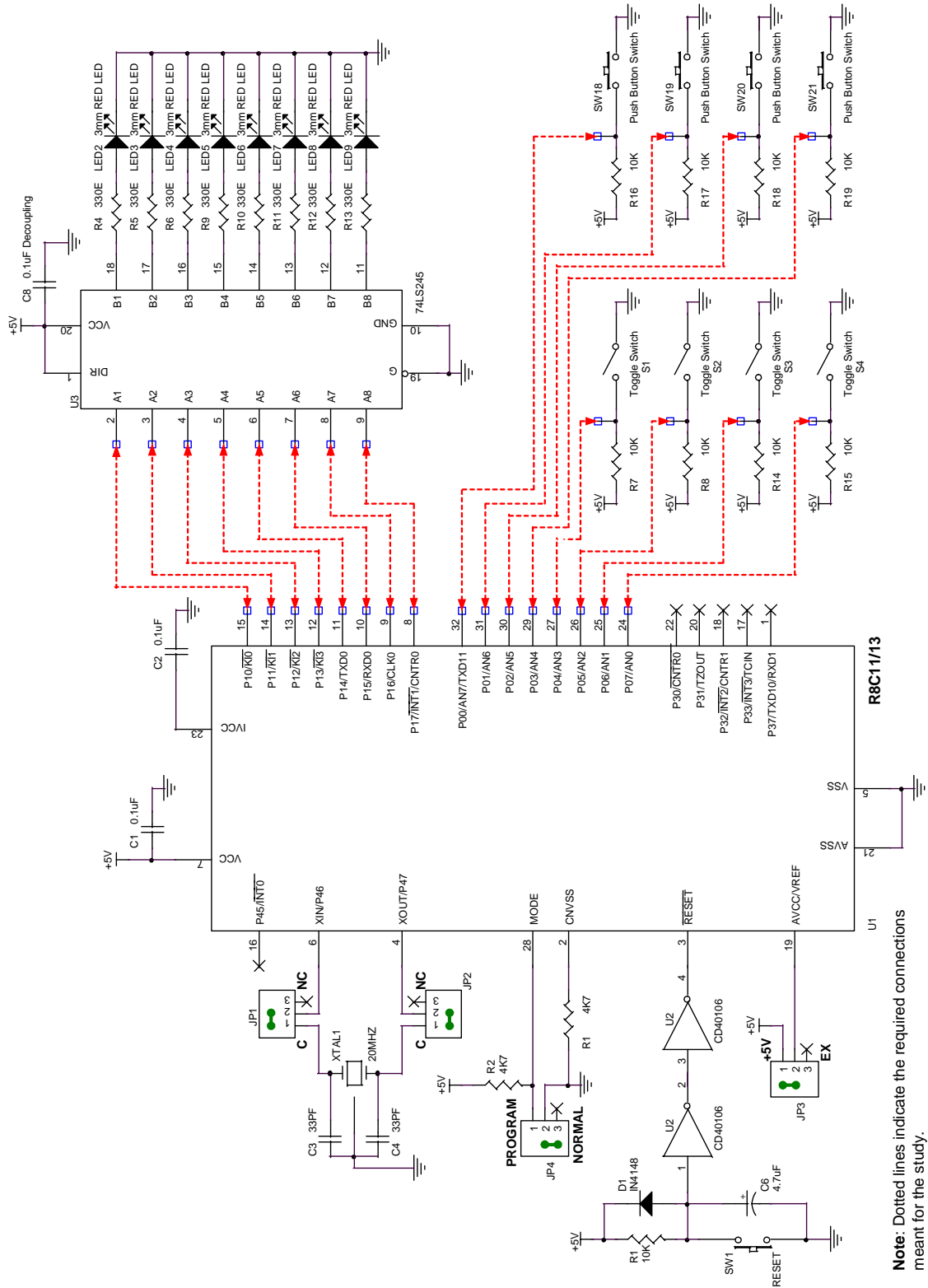
Hardware:

Here simple input and output devices are considered for port line operations. The push button switches and toggle switches are used for input devices and LEDs are used for output devices.

Hence 4 push button switches are connected to the port lines P00, P01, P02, P03 respectively. Four numbers of toggle switches are connected to port lines P04, P05, P06, P07 respectively.

Eight numbers of LEDs are connected to Port 1 through a buffer IC 74LS245.

Circuit:



Note: Dotted lines indicate the required connections meant for the study.

Connections:

- **LEDs**

- 1st LED -> P10
- 2nd LED -> P11
- 3rd LED -> P12
- 4th LED -> P13
- 5th LED -> P14
- 6th LED -> P15
- 7th LED -> P16
- 8th LED -> P17

- **Switches**

- PushButton Switch SW1 -> P30
- PushButton Switch SW2 -> P01
- PushButton Switch SW3 -> P02
- Push Button Switch SW4 -> P03

- Toggle Switch SW5 -> P04
- Toggle Switch SW6 -> P05
- Toggle Switch SW7 -> P06
- Toggle Switch SW8 -> P07

Functional Description:

A port line can be used individually as an input line or as an output line in a port.

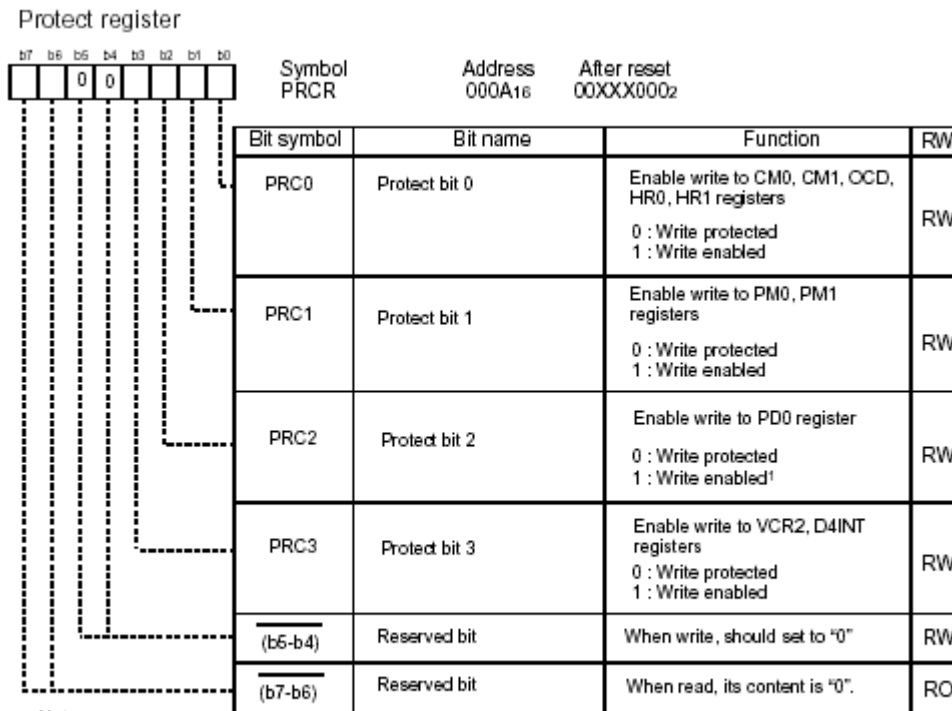
A port direction register is available for each port. For each port line, a bit is allocated in the direction register. If the 1 level is set to that bit, the port line will work as an output line. If the bit is set to 0 level, the port line will work as an input line.

To read data from a port line, or to write data to a port line, a port data register is available. Using the data register the data from the input devices are read. Using the same data register, the data is sent out for the output devices.

Registers used:

- PRCR - Protect Register
- PD0 - Port 0 Direction Register
- PD1 - Port 1 Direction Register
- PD3 - Port 3 Direction Register

Protect Register

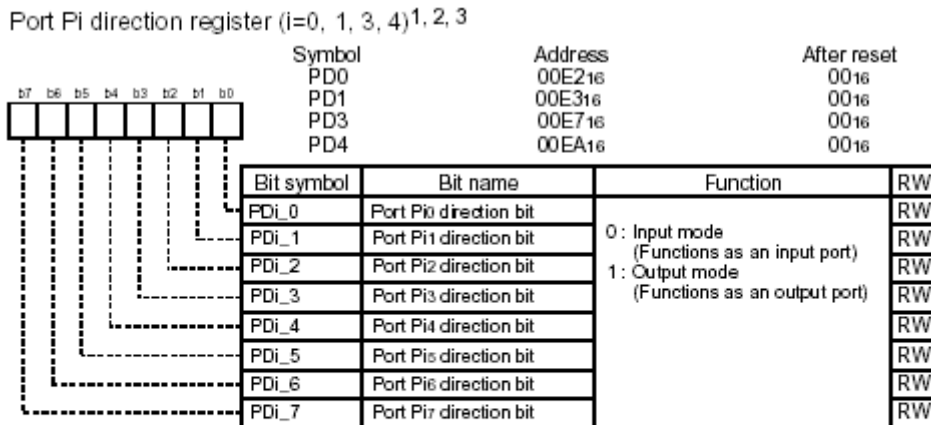


Notes:
1. The PRC2 bit is set to "0" by writing to any address after setting it to "1". Other bits are not set to "0" by writing to any address, and must therefore be set to "0" in a program.

Protect Register provides protection to important system control registers and Port 0 direction register (PD0). Before writing to PD0 set the bit 2 (PRC2) of PRCR register. After writing to PD0 clear the bit PRC2, which provides protection and disables further writing.

Port Direction Register

To set a port line as output line, load the corresponding bit of the direction register with a value of 1 level and for the input line the value should be 0 level. After the reset, all the port lines are set to input mode, which indicates that all direction registers are already set with a value 0.

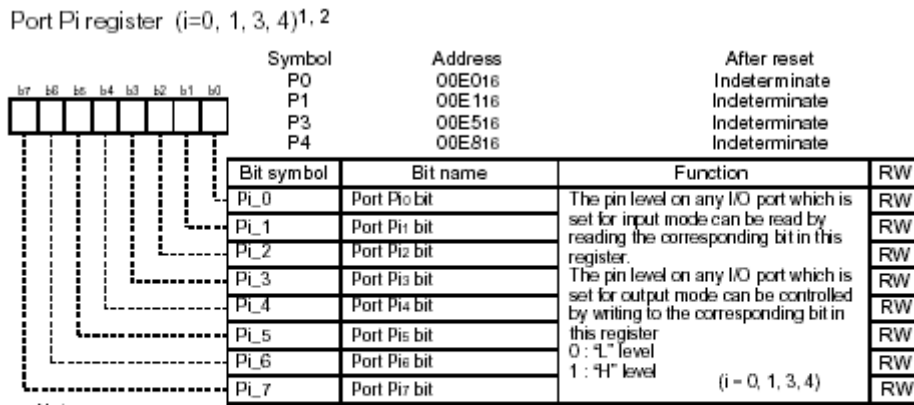


Notes:

1. The PD0 register must be written to by the next instruction after setting the PRC2 bit in the PRCR register to "1" (write enabled).
2. Nothing is assigned to the PD3_4 to PD3_6 bits in the PD3 register. When writing to the PD3_4 to PD3_6 bits, write "0" (input mode). When read, its content is indeterminate.
3. Nothing is assigned to the PD4_0 to PD4_4, PD4_6 and PD4_7 bits in the PD4 register. When writing to the PD4_0 to PD4_4, PD4_6 and PD4_7 bits, write "0" (input mode). When read, its content is indeterminate.

Port Data Register

To write a data to a port, write the value in the respective port register (Pi). To read a data from the port, read from the respective port register.



Notes:

- Nothing is assigned to the P3_4 to P3_6 bits in the P3 register. When writing to the P3_4 to P3_6 bits, write "0" ("L" level). When read, its content is indeterminate.
- Nothing is assigned to the P4_0 to P4_4 bits in the P4 register. When writing to the P4_0 to P4_4 bits, write "0" ("L" level). When read, its content is indeterminate.

Here Port 0 is used as input port and Port 1 is used as output port. Connect LEDs to the port 1. Connect 4 toggle switches and 4 pushbutton switches to the port 0.

Software Description:

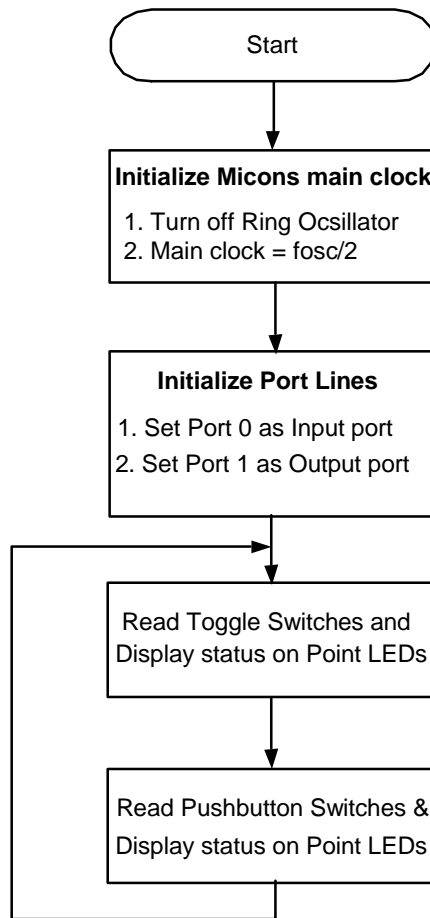
A push button switch will give a 1 level in unpressed condition. Press the pushbutton switch, the port line will read 0 level. A toggle switch in 'ON' condition will generate a 1 level and 0 level during OFF condition.

LED will be switched on for 1 level and off for 0 level.

The functions in the file "**Demo9.C**" and short descriptions are listed below:

<i>Functions</i>	<i>Description</i>
main	Main routine which initializes the micon port lines. Reads key values and displays them on point LEDs.
MCUInitialize	Initializes Micon
Initialize I/O	Initializes required port lines

Program Flow:



Execute Demo:

Activation level for LED = 1.

Activation level for push button Switch = 0.

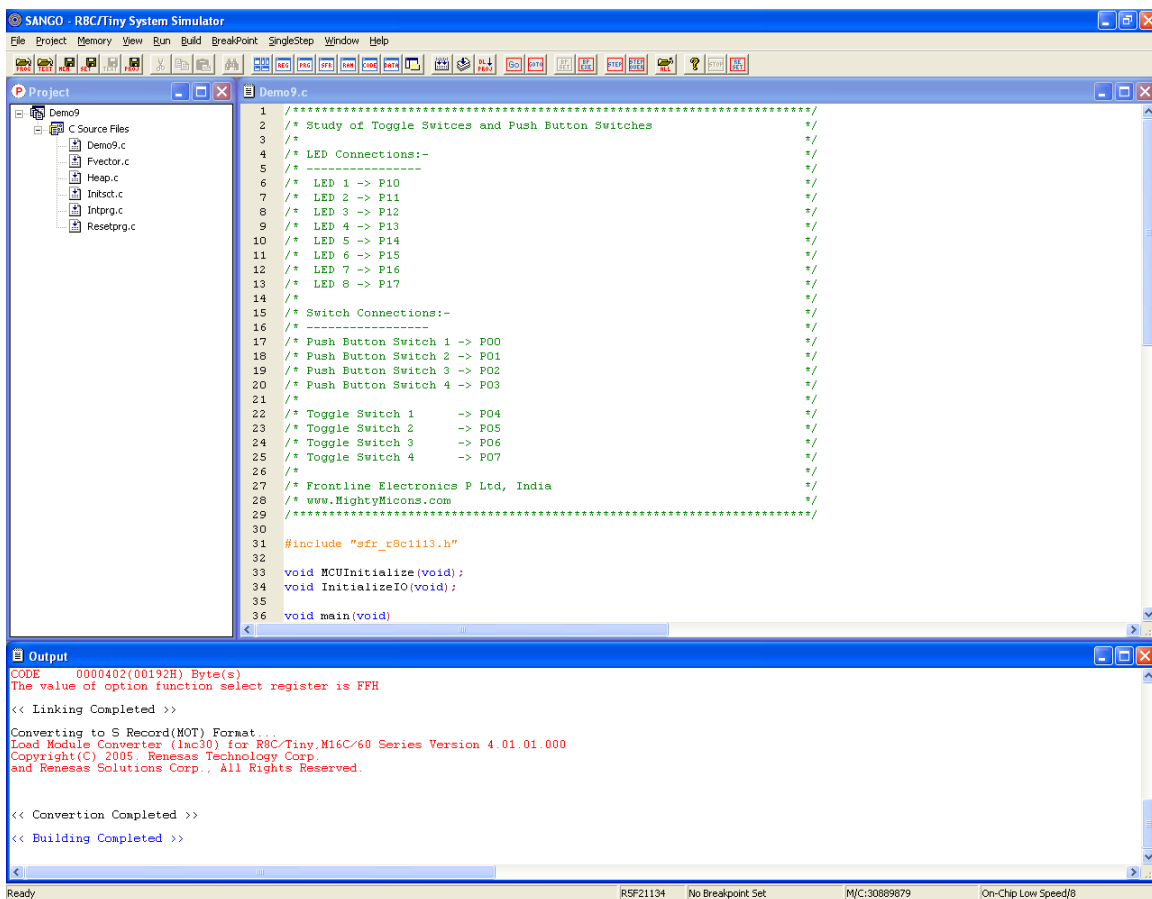
Activation level for toggle Switch = 1.

Switch on the toggle switches to see the corresponding LEDs lighting up. Press the toggle switch to switch off the LED.

Use Topview Simulator to Verify the Design.

Open the project Demo9 in the R8C/Tiny System Simulator using **Open Project** option from **Project** menu. The project window opens up along with the Demo9.c file. Use **Build** option from **Build** menu to compile the project. An output window captures the compiler output.

Use **Project -> Download Project** from main menu to download the .mot file into the simulator's memory for simulation.



```

1  /*****
2  /* Study of Toggle Switces and Push Button Switches
3  /*
4  /* LED Connections:-
5  /* -----
6  /* LED 1 -> P10
7  /* LED 2 -> P11
8  /* LED 3 -> P12
9  /* LED 4 -> P13
10 /* LED 5 -> P14
11 /* LED 6 -> P15
12 /* LED 7 -> P16
13 /* LED 8 -> P17
14 /*
15 /* Switch Connections:-
16 /* -----
17 /* Push Button Switch 1 -> P00
18 /* Push Button Switch 2 -> P01
19 /* Push Button Switch 3 -> P02
20 /* Push Button Switch 4 -> P03
21 /*
22 /* Toggle Switch 1 -> P04
23 /* Toggle Switch 2 -> P05
24 /* Toggle Switch 3 -> P06
25 /* Toggle Switch 4 -> P07
26 /*
27 /* Frontline Electronics P Ltd, India
28 /* www.MightyMicons.com
29 /* -----
30
31 #include "sfr_r8c1113.h"
32
33 void MCUInitialize(void);
34 void InitializeIO(void);
35
36 void main(void)

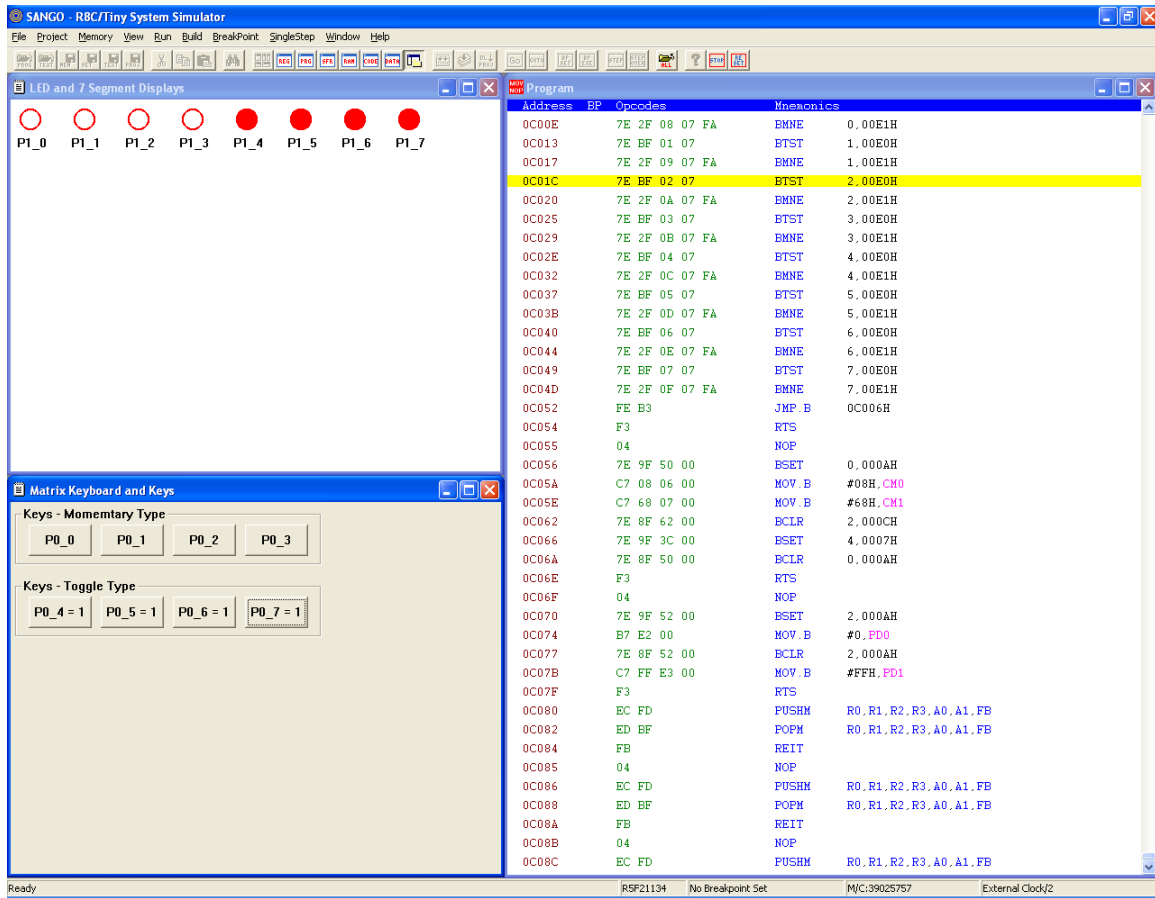
```

```

CODE 0000402(00192H) Byte(s)
The value of option function select register is FFH
<< Linking Completed >>
Converting to S Record(MOT) Format...
Load Module Converter (lmc30) for R8C/Tiny.M16C/60 Series Version 4.01.01.000
Copyright(C) 2005, Renesas Technology Corp.
and Renesas Solutions Corp.. All Rights Reserved.
<< Conversion Completed >>
<< Building Completed >>

```

Connect point LEDs to the port line P10 and P11 using LED module setting, connect 4 numbers of push button switches to the port lines P00 to P03 and connect 4 numbers of toggle switches to port line P04 to P07 using keyboard module setting . Open the LED and keyboard window and arrange them as shown for better visibility.



Download the program using **Download Project** command in **Project** menu.

Run the program using **Go** command in **Run** menu.

The LEDs will indicate the levels of all switches.