

# DE2-115 Control Panel - Part I

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Digital Circuit Lab

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# Outline

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- Introduction to DE2-115 Control Panel
- Control Panel Setup
- Controlling the LEDs, 7-segment Displays, and LCD Display
- Switches and Push-buttons

# Introduction to DE2-115 Control Panel

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# Introduction to Control Panel

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- The DE2-115 board comes with a Control Panel facility that allows users to access various components on the board from a host computer.
  - The host computer communicates with the board through a USB connection.
  - The facility can be used to **verify** the functionality of components on the board or be used as a **debug** tool while developing RTL code.

# Control Panel Setup

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# Control Panel Setup

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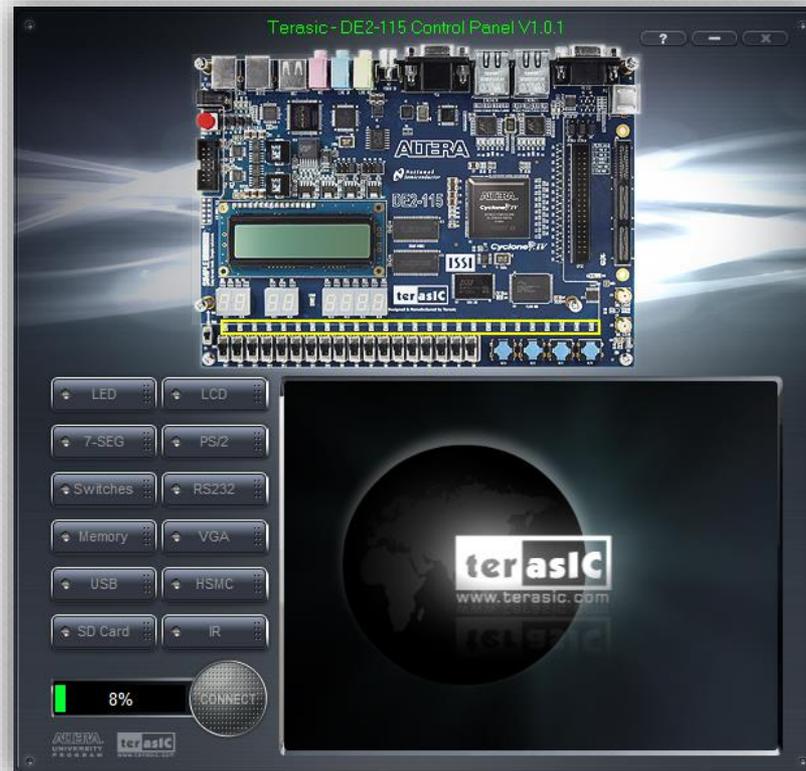
- The Control Panel Software Utility is located in `"/DE2_115_tools/DE2_115_control_panel/"` in the **DE2-115 System CD**.
- It's free of installation, just copy the whole folder to your host computer and launch the control panel by executing the `"DE2_115_ControlPanel.exe"`.

# Activate the Control Panel (1/2)

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1. Make sure Quartus II 10.0 or later version is installed successfully on your PC.
2. Set the RUN/PROG switch to the RUN position.
3. Connect the supplied USB cable to the USB Blaster port, connect the 12V power supply, and turn the power switch ON.
4. Start [DE2\\_115\\_ControlPanel.exe](#) on the host computer. The Control Panel user interface will appear.

# Activate the Control Panel (1/2)

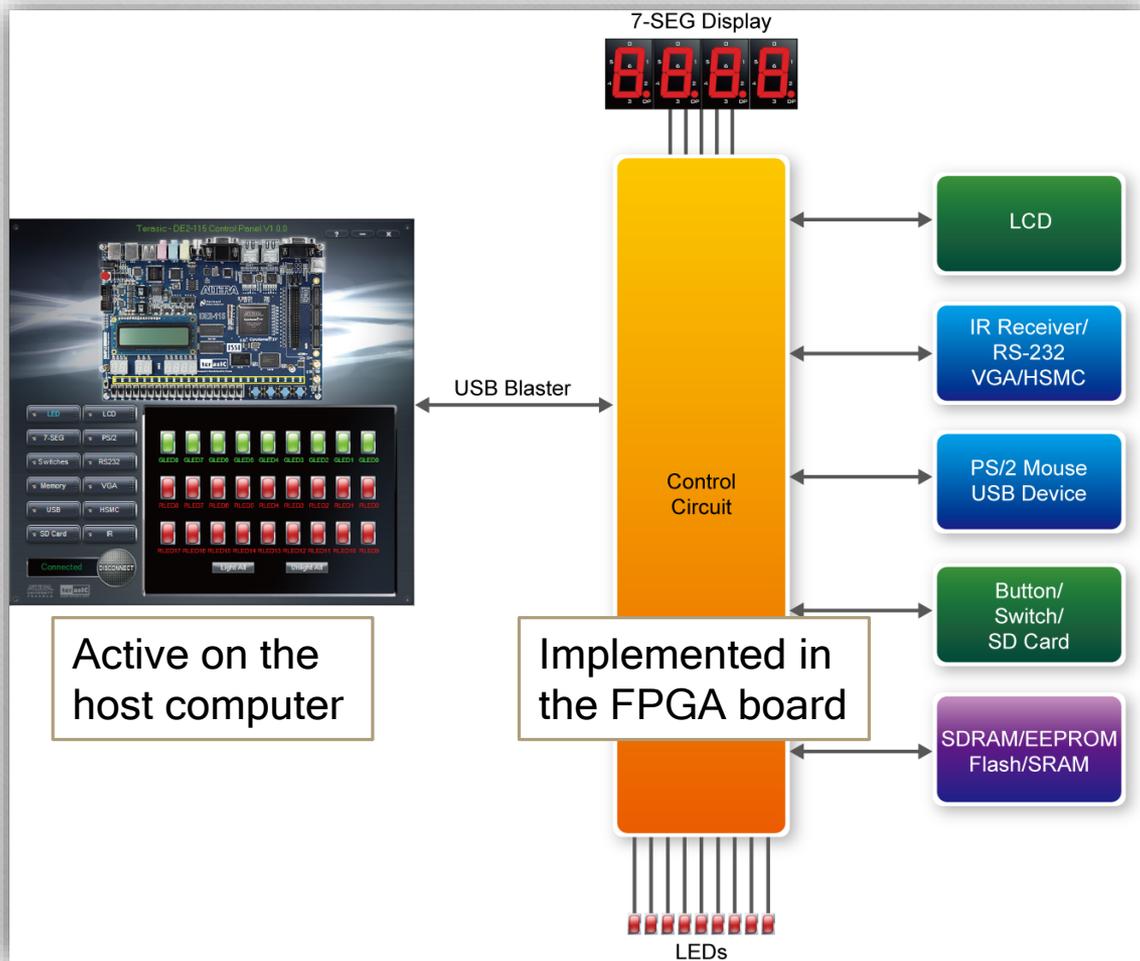


# Activate the Control Panel (2/2)

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5. The `DE2_115_ControlPanel.sof` bit stream is loaded automatically as soon as the `DE2_115_control_panel.exe` is launched.
6. In case the connection is disconnected, click on CONNECT where the `.sof` will be re-loaded onto the board.
7. Note, the Control Panel will occupy the USB port until you close that port; you cannot use Quartus II to download a configuration file into the FPGA until the USB port is closed.

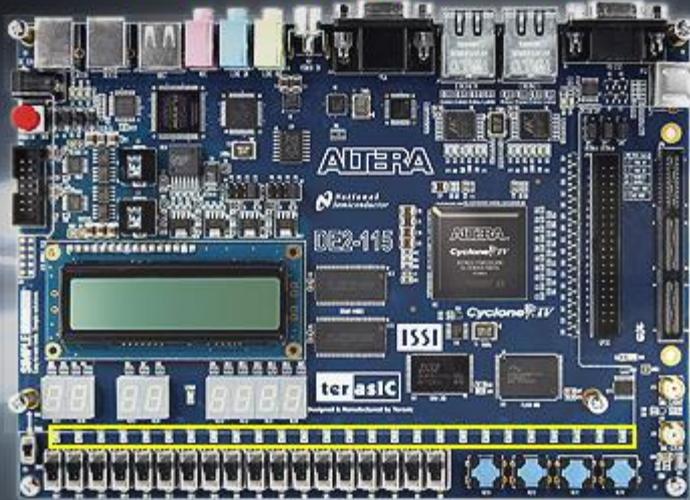
# DE2-115 Control Panel Concept



# Controlling the LEDs, 7-segment Displays, and LCD Display

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Terasic - DE2-115 Control Panel V1.0.1



- LED
- LCD
- 7-SEG
- PS/2
- Switches
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

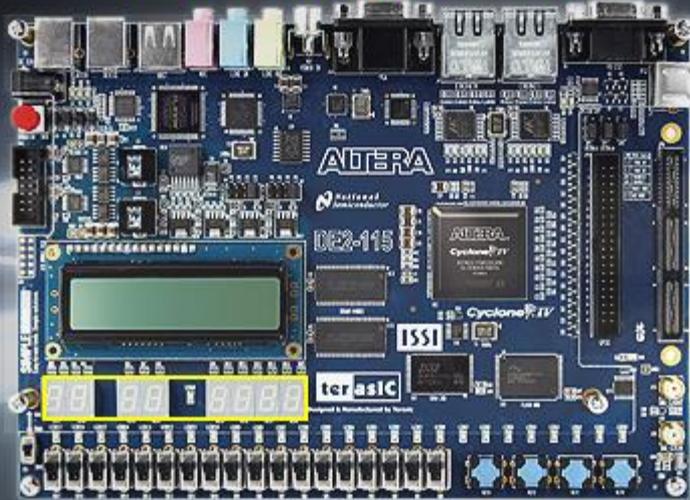
Connected DISCONNECT

A control panel for the DE2-115 board. It features 18 LEDs arranged in three rows of six. The top row consists of 6 green LEDs labeled GLED8 through GLED0. The middle and bottom rows consist of 6 red LEDs labeled RLED8 through RLED0 and RLED17 through RLED9 respectively. Below the LEDs are two buttons: "Light All" and "Unlight All".

GLED8	GLED7	GLED6	GLED5	GLED4	GLED3	GLED2	GLED1	GLED0
RLED8	RLED7	RLED6	RLED5	RLED4	RLED3	RLED2	RLED1	RLED0
RLED17	RLED16	RLED15	RLED14	RLED13	RLED12	RLED11	RLED10	RLED9



Terasic - DE2-115 Control Panel V1.0.1



- LED
  - LCD
  - 7-SEG**
  - PS/2
  - Switches
  - RS232
  - Memory
  - VGA
  - USB
  - HSMC
  - SD Card
  - IR
- Connected DISCONNECT

HEX7	HEX6	HEX5	HEX4
5	5	6	6

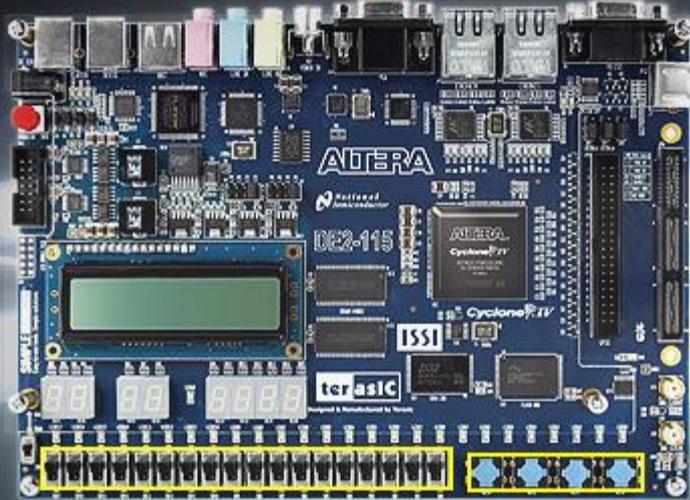
HEX3	HEX2	HEX1	HEX0
5	5	6	6



# Switches and Push-buttons

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Terasic - DE2-115 Control Panel V1.0.1



Control panel buttons:

- LED
- LCD
- 7-SEG
- PS/2
- Switches** (highlighted)
- RS232
- Memory
- VGA
- USB
- HSMC
- SD Card
- IR

Connection status: **Connected** (green text) and **DISCONNECT** (button)

Keys

KEY3 KEY2 KEY1 KEY0

Switches

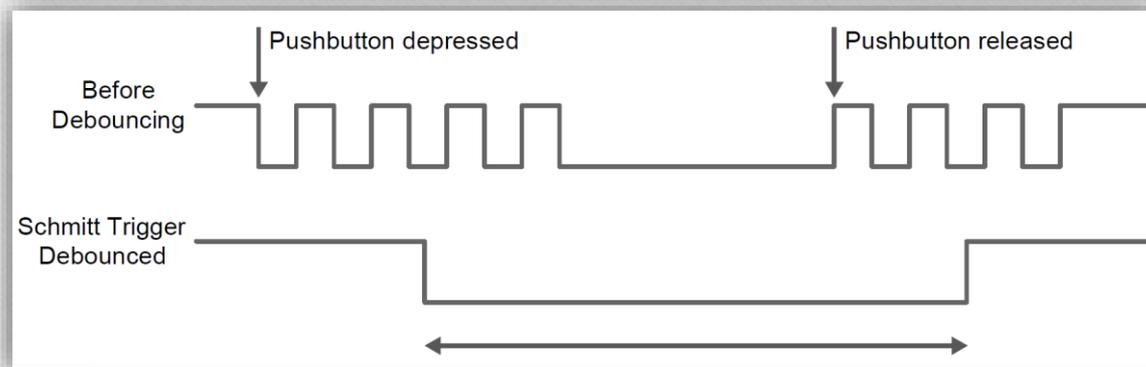
SW8 SW7 SW6 SW5 SW4 SW3 SW2 SW1 SW0

SW17 SW16 SW15 SW14 SW13 SW12 SW11 SW10 SW9

Monitor Switches and Pushbuttons...

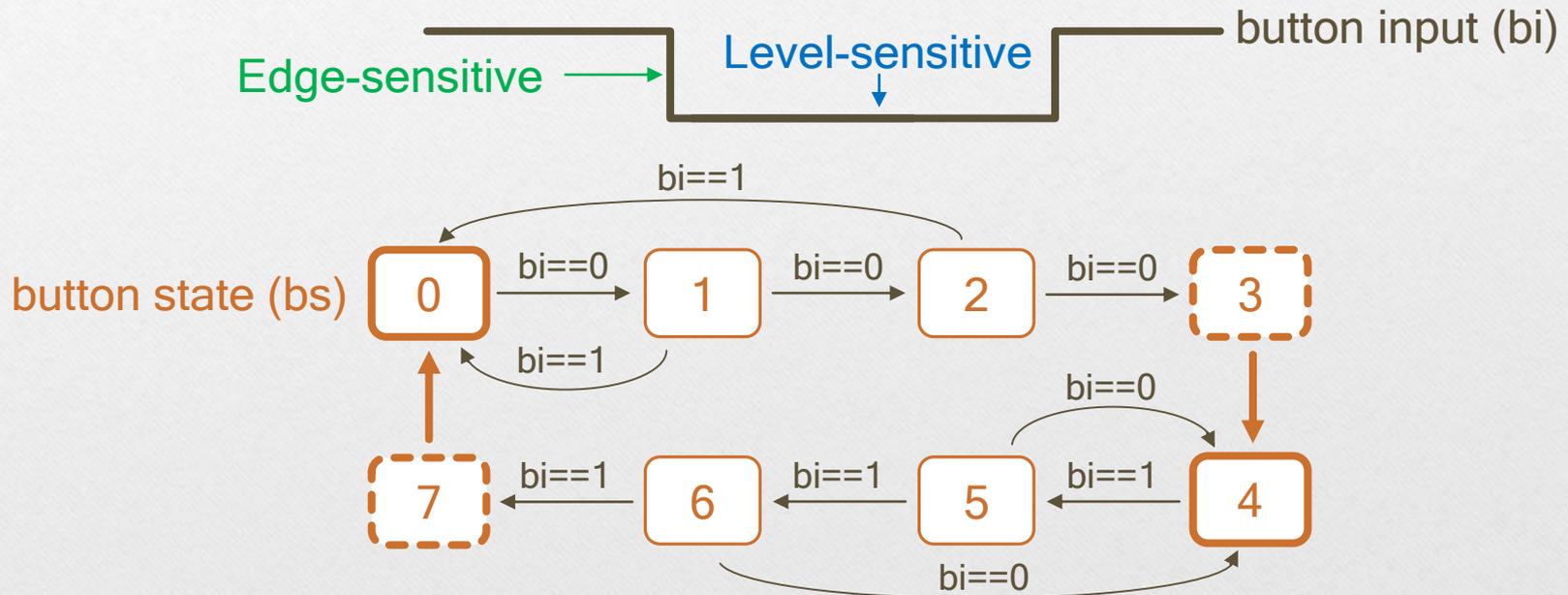
# Push-buttons

- Each of these buttons is debounced using a Schmitt Trigger circuit.
  - Since the push-buttons are debounced, they are appropriate for using as reset inputs in a circuit.



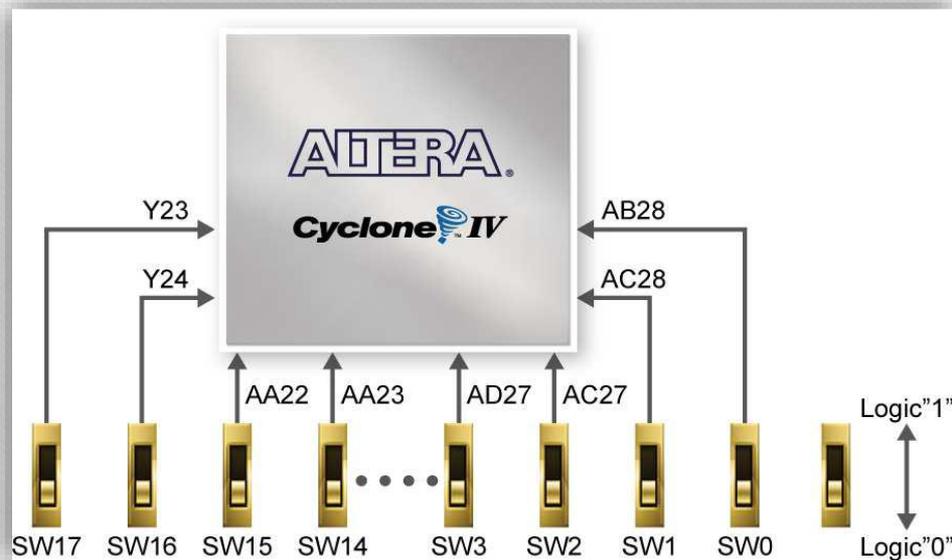
# Debounce Logic Circuit

- Level-sensitive v.s. edge-sensitive



# Switches

- Switches are not debounced, and are assumed for use as **level-sensitive** data inputs to a circuit.



**The End.**

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Any question?

# Reference

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1. "DE2-115 User Manual" by Terasic Technologies Inc.