

Scoreboard

Instruction Manual

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1 Scoreboard Description

This brief manual describes the functional specification and operation interface of the scoreboard for a FIBA basketball game.

The project will be developed in VHDL using the FPGA Basys 3 architecture and the VGA monitor will act as a scoreboard. A sketch of the scoreboard final visual design is described in Figure 1.1.

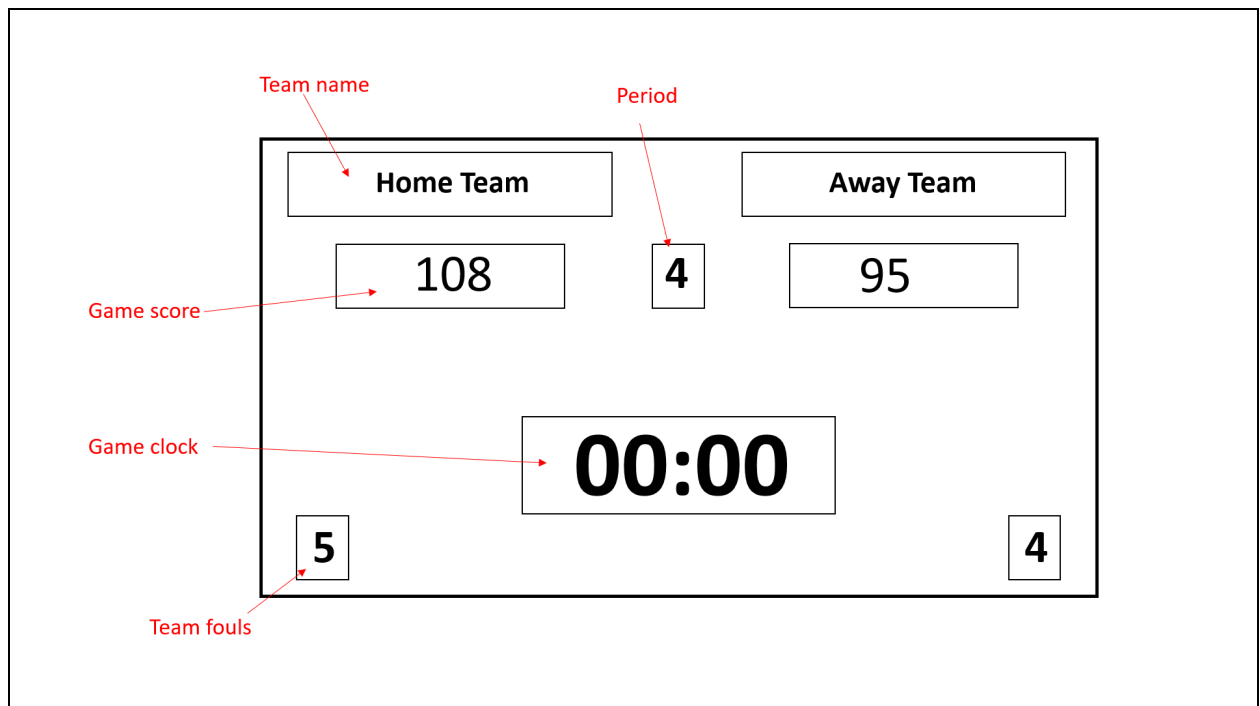


Figure 1.1: Sketch of the scoreboard final visual design

The scoreboard to be developed will follow FIBA regulations and shall contain the following attributes:

- Game clock: digital countdown clock indicating the remaining minutes and seconds that automatic signal the end of the period as soon as it reaches zero.
- Game score: display the score for each time during the game.
- Period: the game consists of 4 periods of 10 minutes each and shall be updated automatically when the game clock reaches 00:00.
- Teams name: the score and team fouls are to be displayed under the respective side of the 'Home' and 'Away' teams.

- Team fouls: counts up to 5, maximum of fouls that a team can commit until is disqualified.

1.1 Operation interface

A keyboard shall be used by an authorized scorer as an operation interface with the Basys 3 board and the VGA monitor. The **game score** and **team fouls** features displayed in the scoreboard will be updated manually and there will be also keyboard keys assigned for the start and reset of the game. Following, it is a brief functional description of those attributes:

| Feature | | Key | Functionality |
|------------|------------|--------------|-------------------------------------|
| Game clock | | 'Space' | Start and pause the clock. |
| | | Left 'Shift' | Increment the game period |
| | | 'Del' | Reset the status of the scoreboard. |
| Home Team | Game score | Q | Increment the score by 1. |
| | | A | Decrement the score by 1. |
| | Team fouls | E | Increment the foul by 1. |
| | | D | Decrement the foul by 1. |
| Away Team | Game score | U | Increment the score by 1. |
| | | J | Decrement the score by 1. |
| | Team fouls | O | Increment the foul by 1. |
| | | L | Decrement the foul by 1. |

Table 1: Keyboard keys functionalities

The last minute in the **10-minute period** shows the seconds and the tenth of the second decrementing in real time.

The square in the VGA screen, related to the **team foul** functionality, turns red when the team exceeds 5 fouls.

The Figure 1.2 shows this functionality:



Figure 1.2: Sketch of the scoreboard final visual design

1.2 Block Diagram

The RTL diagram is represented in the figure bellow. Following, is the brief description of each entity:

- **Keys:** this entity implement the functionalities activated by the keys on the keyboard as described in the table 1.
 - **Vga_sync_unit:** a video controller entity that generates the synchronization signals and the timing.
 - **Font_gen_unit:** this entity has the designs for the clock and implements the characters of the ASCII code to be displayed in the VGA screen.
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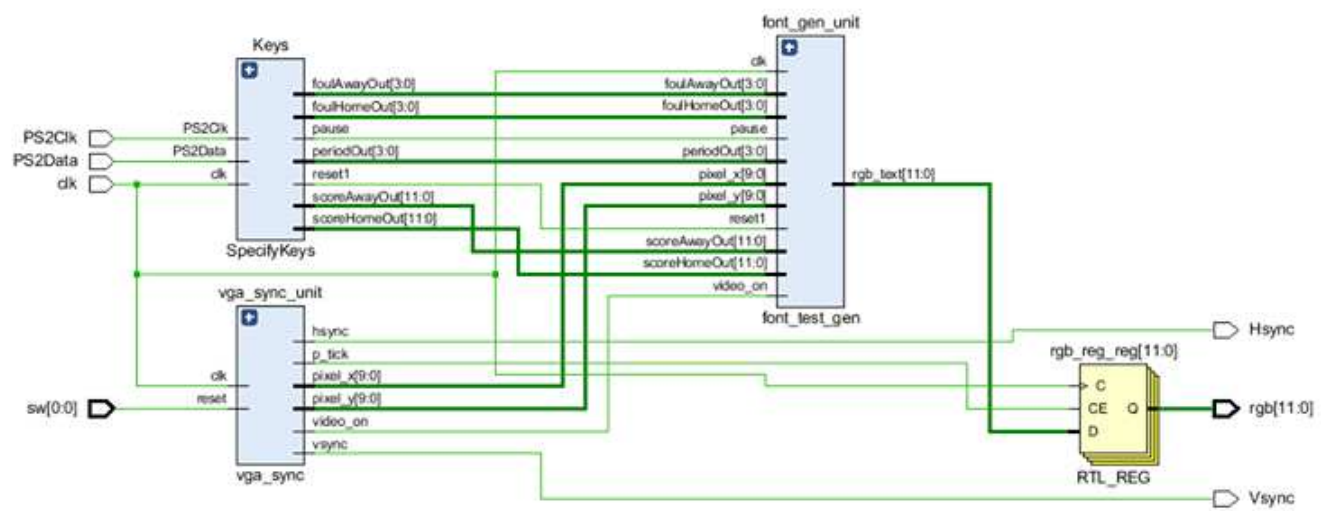


Figure 1.2: Sketch of the scoreboard final visual design