

Overview

The PmodHB5 Reference Project instantiates an HB5 Reference Component which controls the En and Dir pins of a PmodHB5 board to drive a DC motor. Buttons are used to set a BCD value to set the duty factor of the signal driving the motor. A switch is used to set the rotation direction. The PmodHB5 Reference Component implements safe direction switching. Both the BCD duty factor value and the sign of direction are shown on the seven-segment display. The SA and SB Hall sensor signals are not used, and no loop control is implemented. The PmodHB5 Reference Project can also drive a PmodHB3, with no change.

Functional Description

The Project instantiates a PmodHB5 Reference Component (HB5RefComp). For details about this component, see the *PmodHB5 Reference Component* document and the source file comments. The component is set to work in BCD mode.

The adjustBcd component is also instantiated. It implements a BCD Up/Down counter with no overflow. That means the counter is prevented from counting up at 99, and counting down at 00. The 50MHz clock is pre-divided to 10Hz, which is the clock signal for the actual Up/Down counter. Two enable signals (bitCountUp, bitCountDown) are used for the respective count directions, and bitCountUp has priority over bitCountDown.

A modified seven-segment display controller is used. Only the two least significant digits are used to display the BCD value of the Duty Factor. The most significant digit is not used, and the remaining digit is used to show the sign (if minus).

Project Setup

Start by building a new VHDL project and add the provided source files. Set the Project Properties according to the target Digilent FPGA system board. Choose a connector on the system board for the PmodHB5. Build a .ucf file to assign signals to pins (as follows) and then compile the project.

<i>ck</i>	system clock (50MHz)
<i>btnFaster</i>	a button to raise Duty Factor command
<i>btnSlower</i>	a button to lower Duty Factor command
<i>swDir</i>	a switch to set Direction
<i>pinEn</i>	HB5 (or HB3) pin En
<i>pinDir</i>	HB5 (or HB3) pin Dir
<i>seg</i>	segment outputs
<i>an</i>	anode select signals

Connect the PmodHB5 to the DC motor and to the system board. Connect the programming cable. Supply power to the PmodHB5 and the system board. Configure the FPGA. Press buttons to change the motor speed and use the switch to revert direction. Use a scope to observe the safe direction switching.