

Overview

This example design can be used to demonstrate the functions of the P160 Analog Module from Memec Design. The P160 module can plug onto any other P160-compatible Memec Design board for a base platform. This reference design documents three of those platforms: the Spartan-IIE Development Board, the Spartan-IIE LC Development Board, and the Virtex-IIPro P4-FG456 Development Board.

In addition to the boards, an oscilloscope, a function generator, and cables to connect between the SMB connectors on the P160 board and the test equipment will be needed. If needed, cables can be purchased at a local electronics supply store or through Digi-Key (www.digi-key.com).

The reference design performs two basic functions, DAC output, and ADC input. The design includes a SINE and COSINE waveform generator created through the Xilinx CoreGen application. The user can enable this waveform on the output of both DACs through the DIP switch controls.

The reference design also captures analog input data from the ADC channels and loops it back out the DAC#2 channel through user DIP switch control. This very simple demonstration shows the ADC data via the DAC output. The input for the ADC can come from an external function generator or from the DAC#1 sine wave output. Using the DAC#1 output is an easy way to create a self-contained demo of the board's capabilities.

Hardware Setup

The following section describes the basic hardware setup for the P160 Analog Module and the host Memec boards.

P160 Analog Module Setup

1. Place Jumpers on JP1 and JP2.
2. JP5 and JP6 jumper placement is dependent on the host platform:
 - a. For Spartan-IIE, jumper placement does not matter.
 - b. For Virtex-II, place jumper in "2V" position.
 - c. For Virtex-IIPro, place jumper in "2VP" position.

Spartan-IIE Development Board Setup

1. Uninstall all three J1 jumpers (FPGA mode select jumpers).

2. Install jumper on JP25.
3. Install jumper on JP37 ("ON" position).
4. Install jumpers on JP26 and JP36 ("3.3V" position).
5. Install jumpers on JP29, JP19, JP34, and JP35 ("3.3V" position).
6. Install jumpers on JP6, JP9, and JP12.
7. Install the P160 Analog Module.
8. Connect the JTAG cable to J2 and the parallel port of the PC.
9. Verify the Power switch, SW1, is in the OFF position.
10. Connect the AC/DC adapter to JP1.

Spartan-IIE LC Development Board Setup

1. Uninstall all three J1 jumpers (FPGA mode select jumpers).
2. Install jumper on JP6 (pins 1-2).
3. Install jumpers on JP11 (pins 1-2 and 3-4).
4. Install jumpers on JP4 and JP9 (pins 1-2).
5. Install jumpers on JP8 and JP10 (pins 2-3).
6. Install jumper on JP31 (pins 1-2 and 5-6).
7. Install jumper on JP32 (pins 1-2 and 5-6).
8. Install jumper on JP30 (pins 1-3).
9. Install jumper on JP3 (pins 1-2, DCE Mode).
10. Install jumper on JP5 (pins 1-2, DCE Mode).
11. Install the P160 Analog Module.
12. Connect the JTAG cable to J2 or JM1 and the parallel port of the PC.
13. Verify the Power switch, SW1, is in the OFF position.
14. Connect the AC/DC adapter to JP1.

Virtex-IIPro P4-FG456 Development Board Setup

1. Uninstall all three JP12 jumpers (FPGA mode select jumpers).
2. Install jumpers on JP3, JP6, and JP9.
3. Install jumper on JP31 on pins 2-3 ("DCE" position).
4. Install jumper on JP32 on pins 1-2 ("DCE" position).
5. Install jumper on JP15 on pins 2-3 ("3.3V" position).
6. Install jumper on JP16 on pins 2-3 ("3.3V" position).
7. Install jumper on JP18 on pins 2-3 ("3.3V" position).
8. Install jumper on JP30 on pins 1-3.
9. Install jumper on JP19 on pins 1-2 and 3-4.
10. Install jumper on JP26 on pins 1-2 ("PROM ENABLE" position).
11. Install the P160 Analog Module.
12. Connect the JTAG cable to J1 or JP20 and the parallel port of the PC.
13. Verify the Power switch, SW1, is in the OFF position.
14. Connect the AC/DC adapter to JP1.

Experiments

As described in the P160 Analog Module User's Guide, the host board DIP switches control the operation of the P160 Analog Module. Figure 1 shows the control settings for the DIP switches.

DIP 1	Function
OFF	DAC#1 output = 0
ON	DAC#1 output = sine wave

DIP Switches			Function
2	3	4	
OFF	OFF	OFF	DAC#2 output = 0
ON	OFF	OFF	DAC#2 output = cosine wave
OFF	ON	OFF	DAC#2 output = ADC#1 loopback
OFF	OFF	ON	DAC#2 output = ADC#2 loopback

DIP Switches			Function
6	7	8	
OFF	OFF	OFF	sin/cos frequency = 24Hz
OFF	OFF	ON	sin/cos frequency = 381Hz
OFF	ON	OFF	sin/cos frequency = 1.5KHz
OFF	ON	ON	sin/cos frequency = 6.1KHz
ON	OFF	OFF	sin/cos frequency = 390KHz
ON	OFF	ON	sin/cos frequency = 3.1MHz
ON	ON	OFF	sin/cos frequency = 12.5MHz
ON	ON	ON	sin/cos frequency = 25MHz

Figure 1 – DIP Switch Settings for Reference Design

Figure 2 shows an example setup of how to connect the P160 Analog Module with the oscilloscope and function generator.

Figure 3 provides an oscilloscope screen capture of what the reference design outputs with a DIP switches 1, 2, 6, and 8 set to ON.

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Figure 2 – Example Test Setup

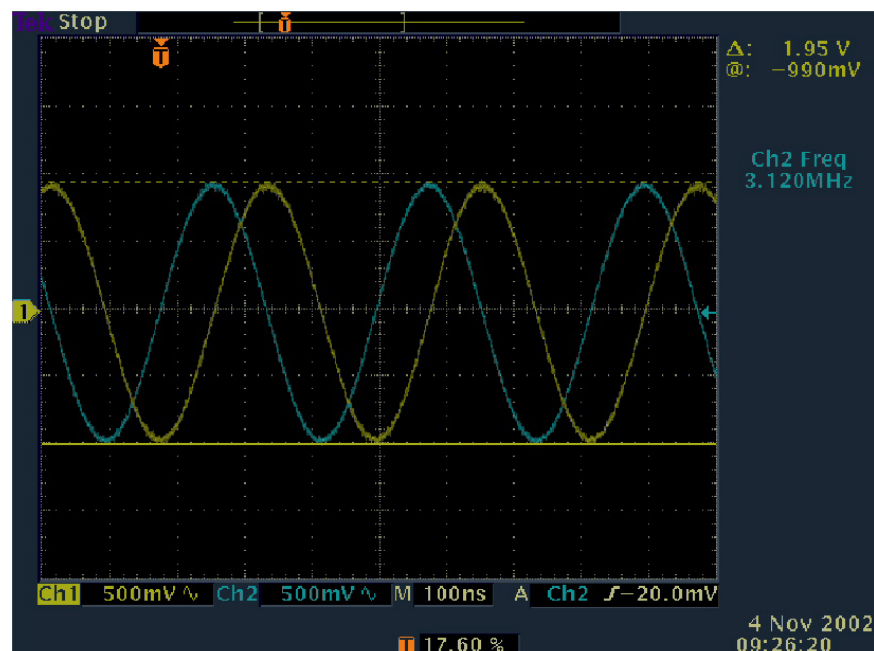


Figure 3 – Oscilloscope Display

Working with the Design

The included bitstreams were generated using ISE Foundation 5.2.03. When recompiling the design on a different ISE version or on a different architecture, the Sine/Cosine core must be updated to work properly.

Revision History

Date	Version	Revision
11/04/02	1.0	Initial Memec release
06/25/03	1.1	Modified document format. Added hardware setup section. Reference design adapted for Spartan-IIE LC board.
7/23/03	1.2	Added setup instructions for Spartan-IIE and Virtex-IIPro P4-FG456 boards. Added “Working with the Design” note.