

Adept I/O Expansion Reference Design

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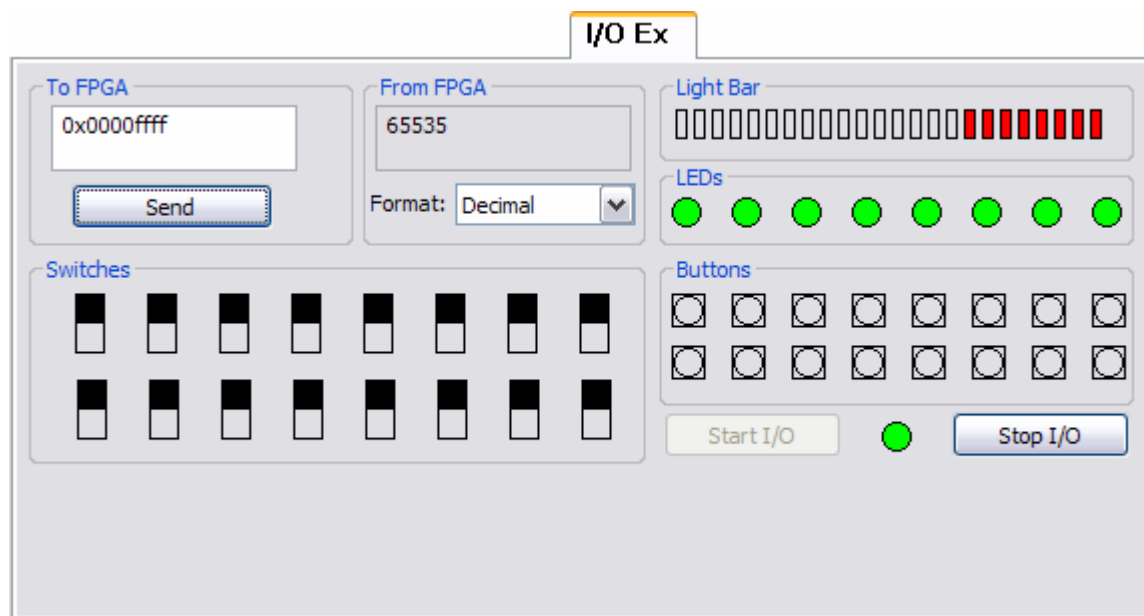
Overview

The Adept application provides virtual Input/Output controls (I/O Ex) for system boards. This significantly expands the number of input/output controls available to a board. The I/O Ex feature is only supported by system boards with DEPP data transferring capability.

In order to use the I/O Ex feature, system boards must first be programmed with an I/O Ex configuration. This configuration code is available in the IOExpansion.vhd reference design.

The expanded I/O controls include:

- 16 switches
- 16 buttons
- 8 LEDs
- 24 individual light bars
- 32-bit send value (in binary, hexadecimal, signed and unsigned decimal formats)
- 32-bit receive value (in binary, hexadecimal, signed and unsigned decimal formats)



Description of Register Transfer System

The register transfer system is patterned after the EPP mode of the parallel port interface on a PC. The interface uses an 8-bit parallel data bus and six handshaking lines to control the data transfer. For more information, see *Application Note 10: Asynchronous Parallel Interface*, available at www.digilentinc.com.

Description of I/O Registers

The I/O controls are linked to the system board through the following registers.

LEDs	0x01	
light bar (red)	0x02	
light bar (yellow)	0x03	
light bar (green)	0x04	
switches (bottom)	0x05	
switches (top)	0x06	
buttons (bottom)	0x07	
buttons (top)	0x08	
32-bit send value	0x09	(least significant byte)
	0x0a	
	0x0b	
	0x0c	(most significant byte)
32-bit receive value	0x0d	(least significant byte)
	0x0e	
	0x0f	
	0x10	(most significant byte)

When initializing an I/O Ex connection, Adept checks a verification register (register 0x00). When written to, the register inverts the byte. When Adept writes the value 0xaa, it expects to read back 0x55. If it does, the I/O Ex validation light (between the Start I/O and Stop I/O buttons) turns green. If not, the light turns yellow and a warning message about the validity of the I/O Ex configuration is shown.