Viewing I/O Operation

When testing a program, in simulation or with hardware debugger, it is possible to observe data present on the general purpose I/O ports (GPIO) using the debugger. Start the debugger, click on the Peripherals tab on the tool bar, and select GPIO Slow Interface > Port 0.



A pop-up box will open like this:

General Purpose Inpu	t/Output	0 (GP	10 0) - S	ilow Inter	face				×
GPI00 100DIR: 0:00000000	31	Bits	24 23	Bits		Bits	87	Bits	
100SET: 0x00000000		ТГГ						тггг	
100CLR: 0x00000000	ГГГГ	TTT		-ггг			ГГГ	ТГГГ	ГГ
IOOPIN: 0x82FFFFFF		977	াবন ন	বিবিহ	অব অ	াললল	মাতা হাত	অঅঅঅ	যথ
Pins: 0xF2FFFFFF		v 1		~~~~	<u>vv</u> v	~~~			মা

You can drag this box to a convenient location on the screen. Displayed are little squares that represent bits. A check mark in a square represents a 1 and no check a 0. When you single step a program that does a store to the memory addresses for IO0DIR and IO0SET you will see the bit pattern of the word you write displayed on the respective line and the affect it has on the bottom row labeled Pins which represents the actual logic level (and hence voltage) present on the physical pin of the microcontroller. You may not see check marks in the boxes on the IO0CLR line when you store to IO0CLR but you should see check marks on the Pins line change.

To summarize operation of the GPIO port:

- Each pin or bit of GPIO port 0 can be configured for output or for input. If a pin is used for both input and output its direction has to be changed between doing one and then doing the other (actually 29 of the 32 bits of GPIO port 0 are connected to a physical I/O pin and hence usable to control external circuitry or read data from external circuitry). By default at power-up, all pins are configured for input. Thus in the figure above there are no check marks in the IO0DIR boxes.
- Write a word of data (using an STR instruction) to IO0DIR with one's in the bit positions that correspond to pins that will be used for output and zero's in the bit positions that will be used for input or that you are not using in your program. For example, to use the 8 LEDs write 0xFF00 to IO0DIR (that is 00000000000000011111111100000000 in binary)

Here are images of the I/O window during execution of the demo_gpio program.

After writing 0xFF00 to the IO0DIR register:

General Purpose Inpu	/Output 0 (GPIO 0) - Slow Interface
GPI00 IO0DIR: 0x0000FF00	31 Bits 24 23 Bits 16 15 Bits 8 7 Bits 0
100SET: 0x00000000	
100CLR: 0x00000000	
IOOPIN: 0x82FF00FF	
Pins: 0xF2FF00FF	

After writing 0x0100 to the IO0SET register:

General Purpose Inpu	it/Output 0 (GPIO 0) - Slow Interface	X
GPI00	31 Bits 24 23 Bits 16 15 Bits 8 7 Bits 1	0
IO0SET: 0x00000100		
100CLR: 0x00000000		-
IOOPIN: 0x82FF01FF	מססססס מרוודיין מססססס ומרוויים	7
Pins: 0xF2FF01FF		7

After writing 0x0200 to the IO0SET register. Note that pins 10 to 15 are not checked which means they are at a logic 0 or low voltage while pins 8 and 9 are checked and thus at a logic 1 or high voltage:

GPIDU 100DIR: 0x0000FF00	31 Bits 24 23 Bits 16	6 15 Bits 8 7 Bits	0
00SET: 0x00000300			-
00CLR: 0x00000000			Т
IOOPIN: 0x82FF03FF			717
Pins: 0xF2FF03FF			14

Then after writing 0x0100 to the IO0CLR register pin 8 is not checked meaning it has now been cleared to a logic zero state which is a low voltage:

General Purpose Inpu	ut/Output 0 (GPIO 0) - Slow Interface	×
GPI00 IOODIR: 0x0000FF00	- 31 Bits 24 23 Bits 16 15 Bits 8 7 Bits 0	
100SET: 0x00000200		
100CLR: 0x00000000		
IOOPIN: 0x82FF02FF	מסמסמסס המרוונים ממסמסמים המרוונים	
Pins: 0xF2FF02FF		