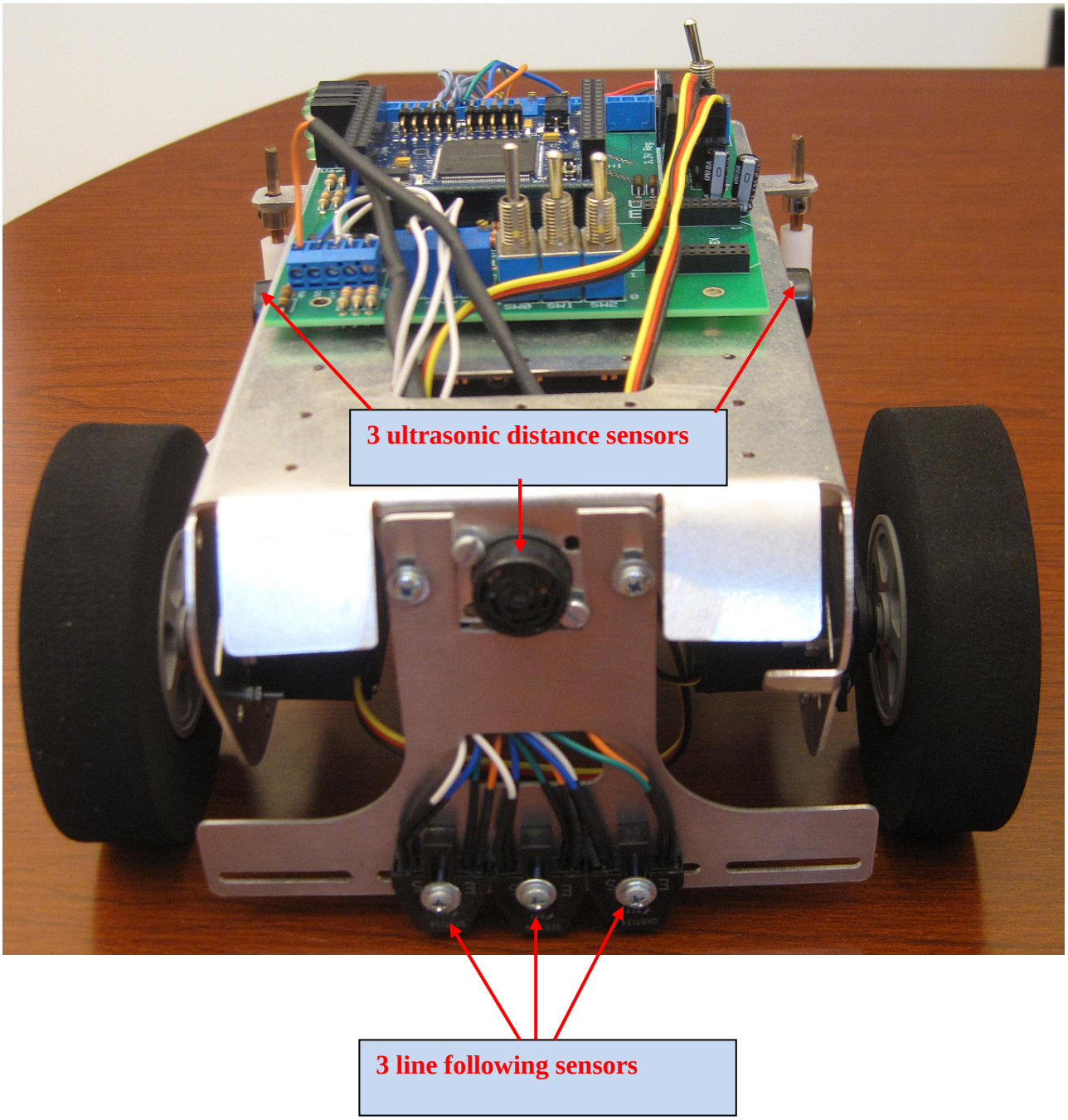
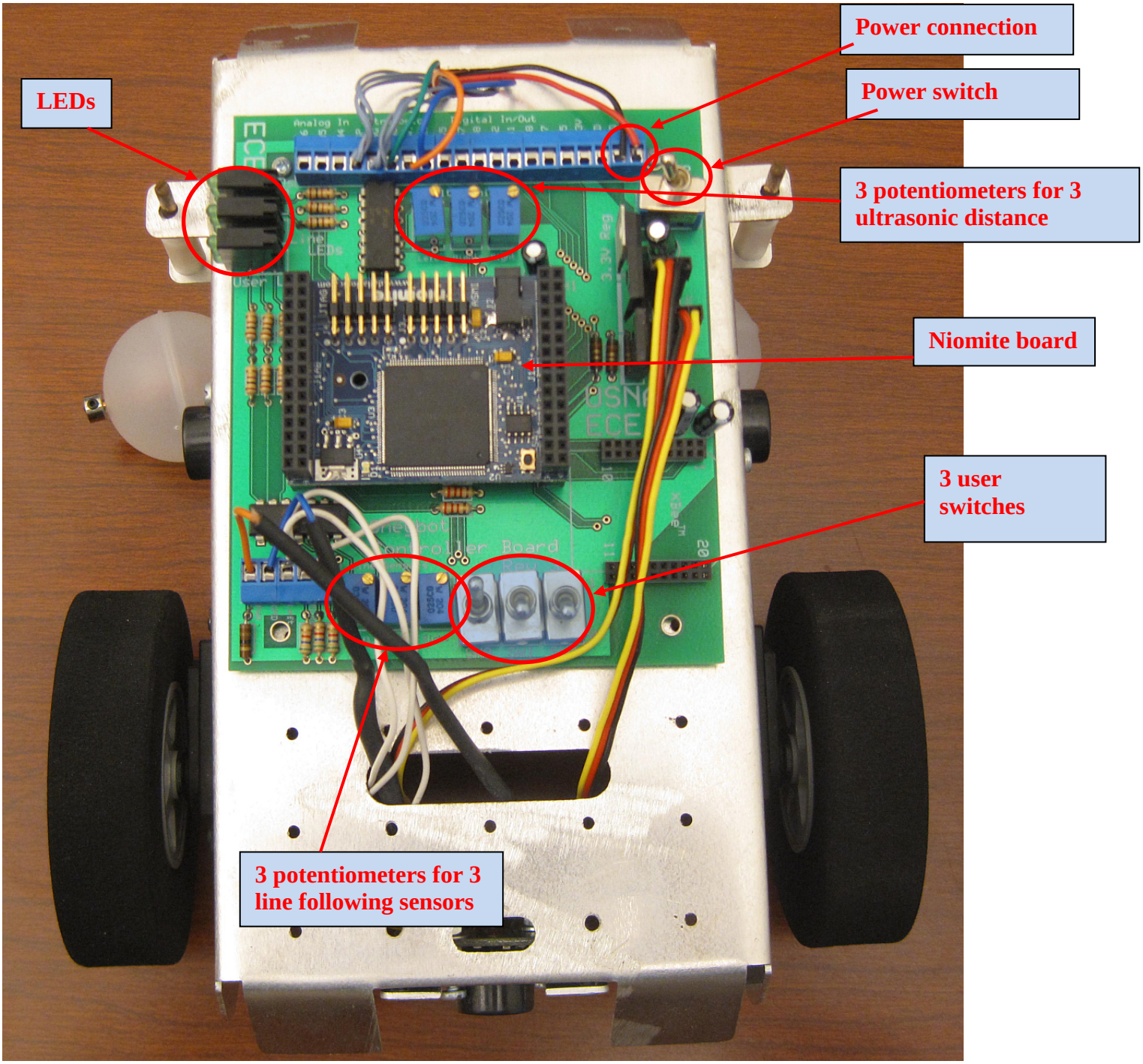
EC262 Digital Systems
Sheybot Supplementary Notes

What is it?

- Trekker Robot Chassis from SuperDroid Robots with mounting brackets for line following sensors and ultrasonic distance sensors.
- Controlled with a niomite board from Dallas Logic (**Cyclone II EP2C8T144C7** device).
- In house developed PCBs that provide a layer of protection for the FPGA.




Power connection
Power switch
LEDs
3 potentiometers for 3 ultrasonic distance
Niomite board
3 user switches
3 potentiometers for 3 line following sensors

Power Connection and Power Switch:

- PWR and GND pins
- 1 power switch

FPGA

- Cyclone II EP2C8T144C7 device

Clock

- 1 clock oscillator (25 MHz).

Line Following Sensors (active high):

- 3 phototransistor reflective object sensors (QRB1134)
- If there is a black line in front of them, they output a '1'.
- There are three 3 potentiometers that are used to adjust the sensitivity levels of 3 line following sensors.
- See the pin table below for specific pin assignments

Ultrasonic Distance Sensors (active low):

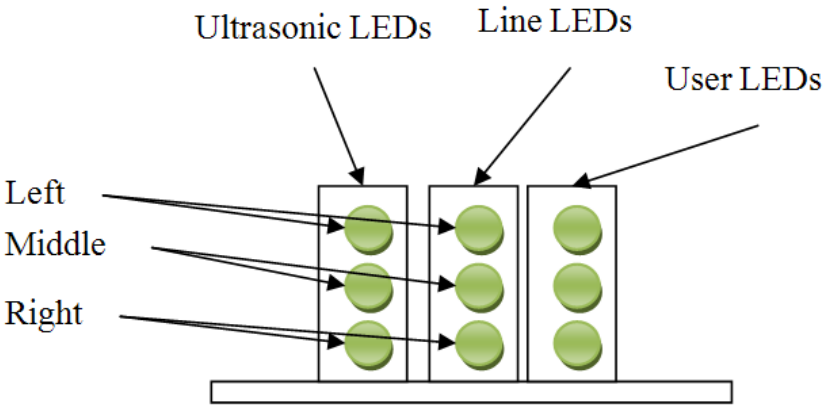
- 3 sonar range finder sensors (LV-MaxSonar-EZ1)
- If there is an object in front of them, they output a '0'.
- There are three 3 potentiometers that are used to adjust the sensitivity levels of 3 distance sensors.
- See the pin table below for specific pin assignments

User Switches:

- 3 user switches.
- Connect directly to the I/O pins of the Niomite board. See the pin table below.

LEDs (active low):

- 3 LEDs that are connected directly to the line following sensors.
- 3 LEDs that are connected directly to the ultrasonic distance sensors.
- 3 User LEDS that are connected directly to the I/O pins of the Niomite board. See the pin table below.



PIN TABLE

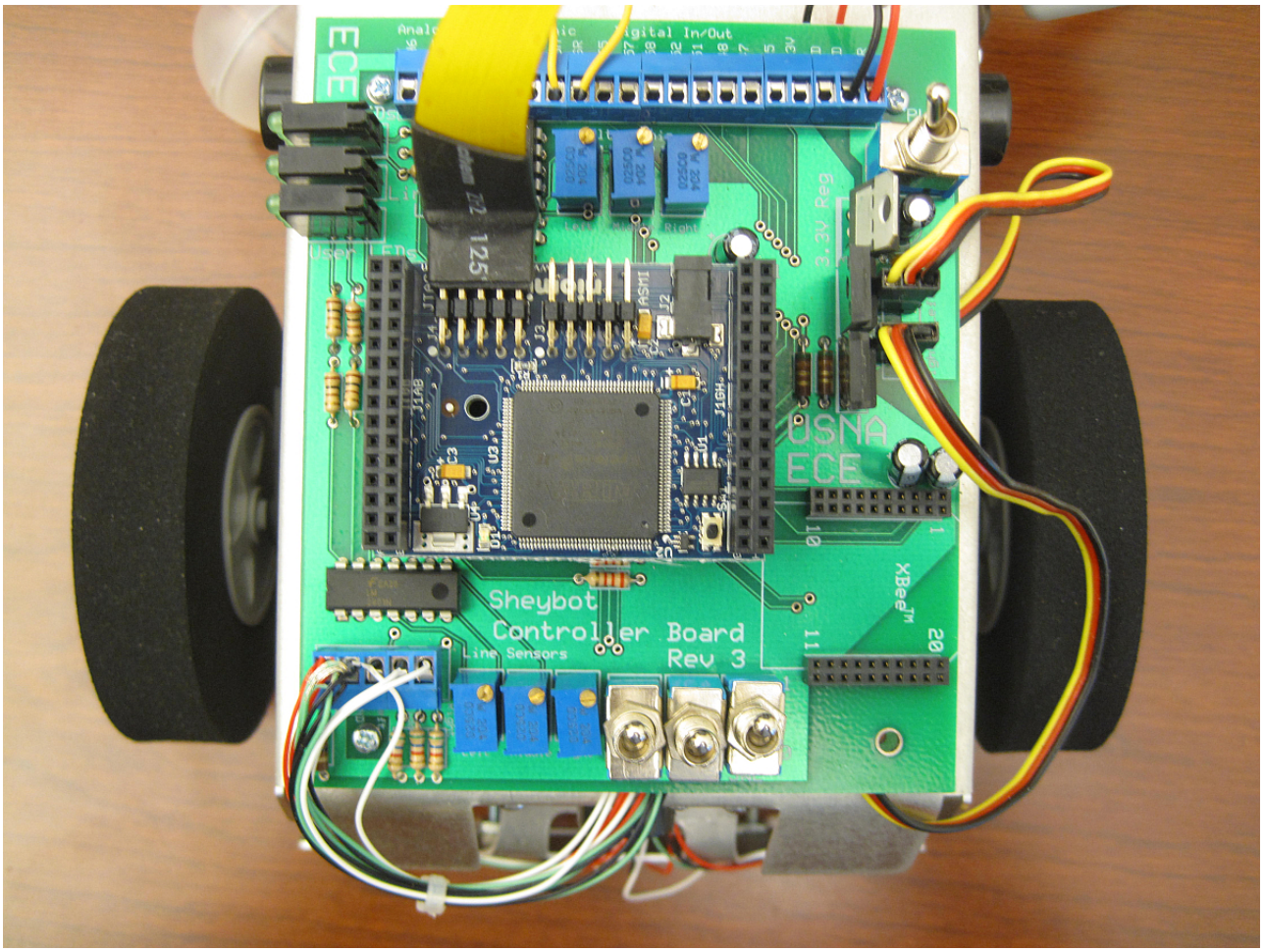
	Niomite Pin	Altera Pin
Motors		
Left	H10	PIN_30
Right	H11	PIN_28
Ultra Sonic Sensors		
Left	B2	Pin_74
Middle	B3	Pin_75
Right	B1	Pin_73
Line Sensors		
Left	A8	Pin_99
Middle	A6	Pin_97
Right	A5	Pin_92
Input/Output		
LED Top	A4	Pin_87
LED Middle	A3	Pin_86
LED Bottom	A2	Pin_79
Niomite LED	B12	Pin_118
SW2	B10	Pin_114
SW1	B11	Pin_115
SW0	B13	Pin_90
Clock		PIN_17
Xbee		
DOUT	H15	PIN_9
DIN	H13	PIN_24
DTR	H12	PIN_25
CTS	G14	PIN_4
RTS	G15	PIN_3

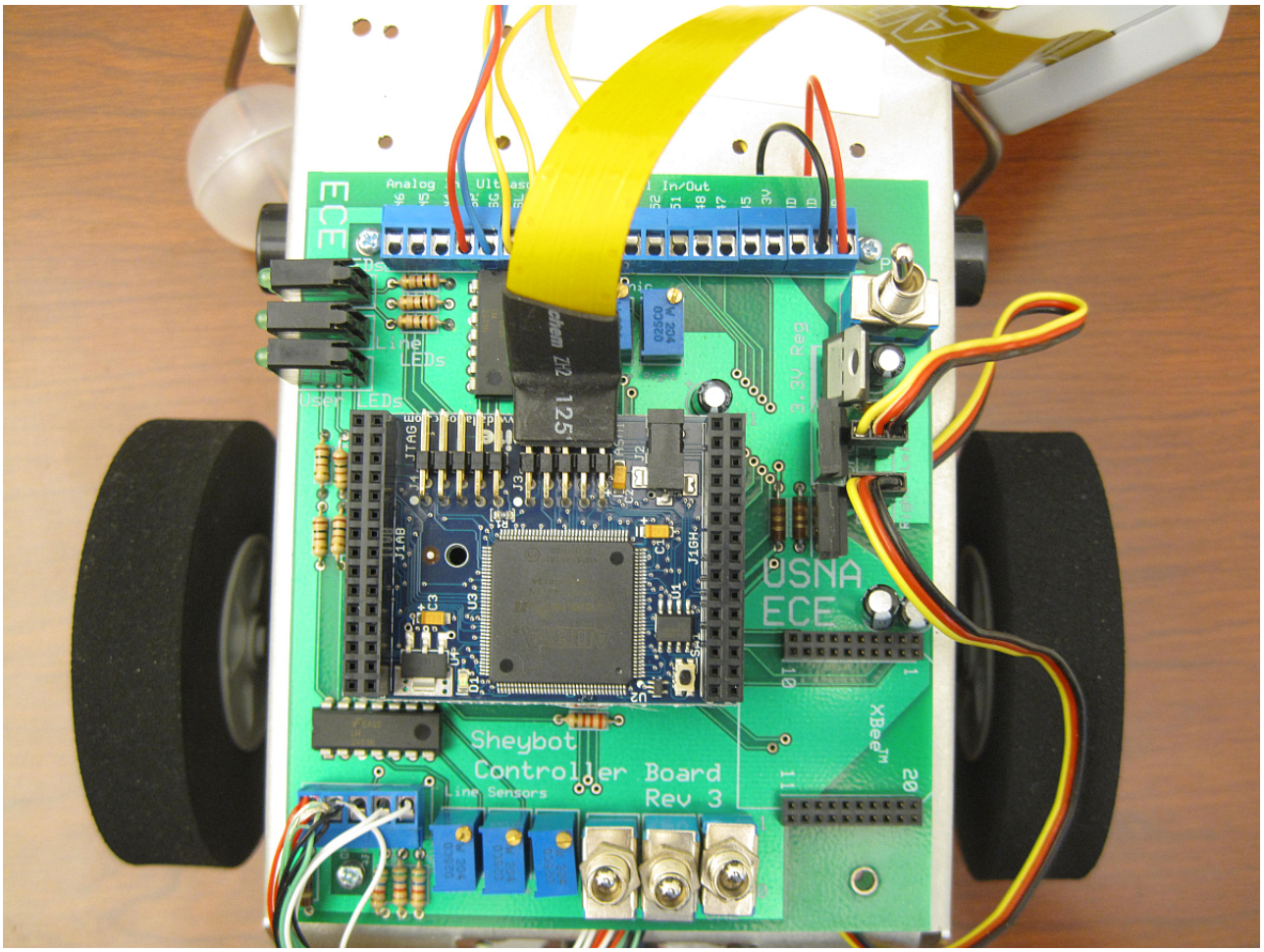
	Niomite Pin	Altera Pin
Digital In/Out		
P55	G5	PIN_55
P57	G4	PIN_57
P58	G3	PIN_58
P52	H3	PIN_52
P51	H4	PIN_51
P48	H5	PIN_48
P47	H6	PIN_47
P45	H9	PIN_45
ADC		
A0	G6	Pin_53
A1	G7	Pin_44
A2	G8	Pin_43
D0	B4	Pin_76
D1	B5	Pin_93
D2	B6	Pin_94
D3	B7	Pin_96
D4	G12	Pin_8
D5	G11	Pin_40
D6	G10	Pin_41
D7	G9	Pin_42
RD/CS	B8	Pin_112
INT	B9	Pin_113

Quartus Programming Directions

<u>Programming with a sof file</u>

- Need to reprogram the FPGA every time the FPGA is powered up.
- Connect the USB-Blaster to the JTAG set of pins as shown in the figure below
- Turn the power switch to ON
- Open the Programmer window in Quartus
- Make sure the USB-Blaster is detected. If not, click on “Hardware Setup” button, then select USB-Blaster from the drop-down menu.
- Select “JTAG” for the programming mode (from the Programmer window).
- Select the appropriate .sof file.
- Make sure that the “Program/Configure” box is checked and click on “Start”.



Programming with a pof file

- Programs stay on the FPGA without reprogramming every time the FPGA is powered up.
- Connect the USB-Blaster to the ASMI set of pins as shown in the figure below
- Turn the power switch to ON
- Open the Programmer window in Quartus
- Make sure the USB-Blaster is detected. If not, click on “Hardware Setup” button, then select USB-Blaster from the drop-down menu.
- Select “Active Serial Programming” for the programming mode (from the Programmer window).
- Select the appropriate .pof file.
- Make sure that the “Program/Configure” box is checked and click on “Start”.