UF-4712 Board Manual

1.0 BOARD DESCRIPTION

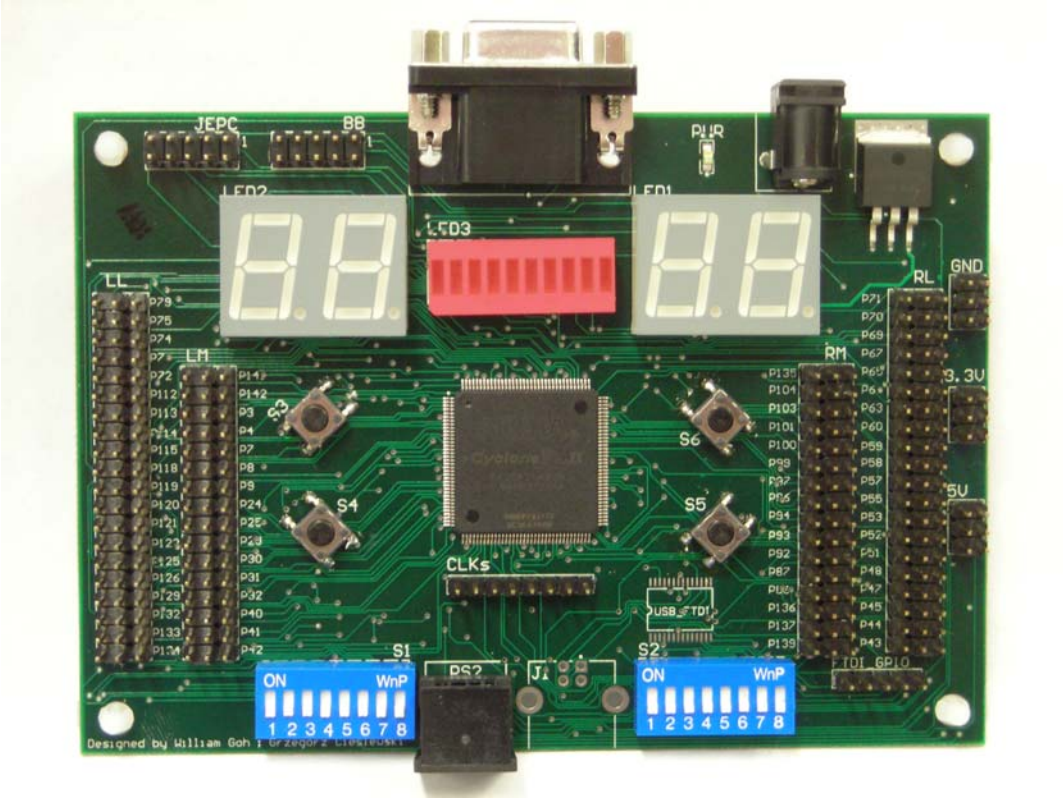


Figure 1: UF-4712 Board, V1.1

- UF 4712 Board comes with a Cyclone II EP2C8T144C8 FPGA
- I/O pins are routed to male wire-wrap headers
- 2 dual-digit 7-segment displays, 10 LED bank, and 8-pin dip switch banks are accessible via the headers
- USB connector, VGA connector, PS/2 connector, four momentary push buttons
- Full on-board power regulation
- On-board clock multiplication is possible
- JTAG programming header using a Byte Blaster or similar programmer
- +5V, +3.3V and GND headers available to power external devices.

2.0 YOUR BOARD KIT AND CONSTRUCTION

Read all of the following steps before you begin building your board.

Your parts package should include the following:

Part	Quantity
PS2 Connector	1
VGA Connector	1
Tactical Switches	4
7-Segment LED Pack	2
10-LED Pack	1
8-Dip Switch Pack	2
Power Connector	1
Single Row Headers	
Double Row Headers	
Jumpers	Many

Check that you have all of the parts you need. If anything is missing, ask your TA.

Optionally, you can purchase the following parts that are **NOT** presently needed for the course.

Part	Quantity
USB Type B Connector	1
FT232RL USB to Serial Bridge	1
EPCS1SI8N **or** EPCS4SI8N Configuration ROM	1

2.1 Construction Steps

1. Solder the four push-button switches, S3 – S6, on the top of PCB. These are the only surface mount components that you need to soldered.
2. Solder the two 8-DIP Switch Pack in locations S1 and S2.
3. Solder the 10-LED pack in position LED3. Position the package such that the writing on the case faces the FPGA (see Figure 2).
4. Solder on the two 7-segment LED packs in positions LED1 and LED2 with decimal point towards FPGA. See Figure 2 proper orientation.
5. Solder the dual row header into positions LL, LM, RM, RL, GND, 3.3V, 5V, JEPC, and BB.
6. Solder the single row header into the CLKs position.
7. Suggested (but not required): Solder on single row headers next to positions LL, LM, RM, and RL. These pins are duplicates of the respective FPGA pins so that you can simultaneously use a jumper and an external LSA.

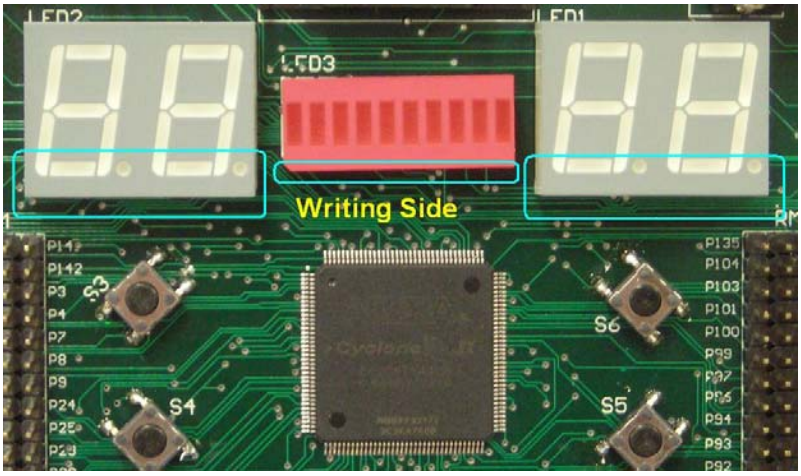


Figure 2: Positioning the LED pack and 7-segment LEDs.

8. Solder the PS2 connector into the PS2 position.
9. Solder the VGA and PWR connectors into the remaining silkscreen outlines on the top of the PCB Figure 3 shows the locations for these connects; they are **not** labeled on the silkscreen.

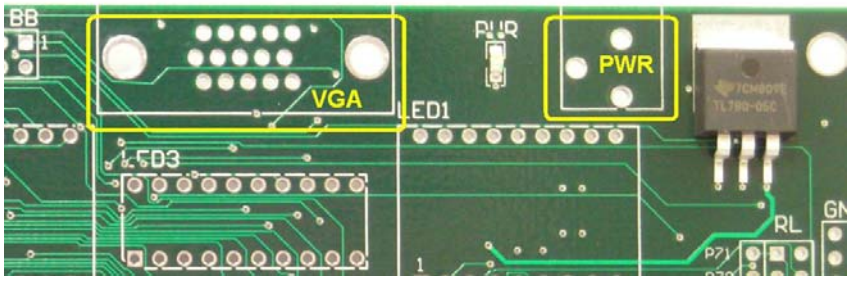


Figure 3: Locations for VGA and PWR connectors.

10. Optional: If you want persistent programs, purchase and solder an EPCS1SI8N or EPCS4SI8N (an 8-pin chip) into the position labeled EPC (this silkscreen text is printed mirror image) on the bottom of the PCB. Check the respective data sheet to ensure correct orientation. (~$3.50)
11. Optional: If you plan on experimenting with USB (on your own, not required in EEL4712) do the following steps:
    a. It's recommended that you solder this chip on before any other component including push-button switches due to its small size and the board density. Purchase the FTDI FT232RL USB-SRL 28-SSOP chip and solder it into the USB_FTDI position on top of the PCB. Pay careful attention to the orientation of the chip. Check the chip datasheet for details. (~$4.00)
    b. Solder the single row headers into position FTDI_GPIO.
    c. Solder the USB type B connector into position J1. (~$4.00)

The following jumpers must be in place to test your board with the UF4712 Board Test Guide. All jumpers are placed on the double row header as shown in Figure 4; don't bridge between the single row and double row headers. The following jumpers are required:

- LM Header: P3 (PS_CLK), P4 (PS_DATA)
- LL Header: P115 (Red), P118 (Green), P119 (Blue), P120 (VSync), P121 (HSync)

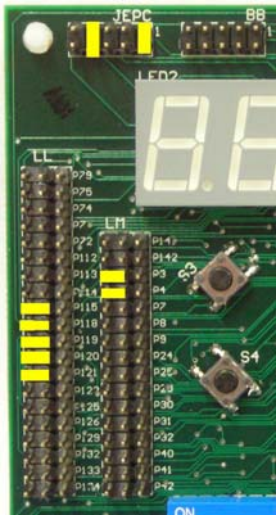


Figure 4: Jumpers needed for test program.

Use your multimeter to verify that there is **NO CONTINUITY** between the points given in the below table.

Point A	Point B
P112	P74; P75; S1_PIN2; S1_PIN3
Blue	Green
P119	VSync; HSync
LED2_D2	LED2_DP1; LED2_G2
LED2_C2	LED2_A2
LED1_B1	P87; LED1_A2
LED1_E1	P53; P55
P57	P63

Read the rest of this document and then continue to the *UF-4712 Board Test Guide* to start your board for the first time.

3.0 POWER PLUG INPUT

- The UF-4712 board accepts 7 to 25V input.
- The power connector dimensions are ID x OD: 2.1mm x 5.5mm (Size M)

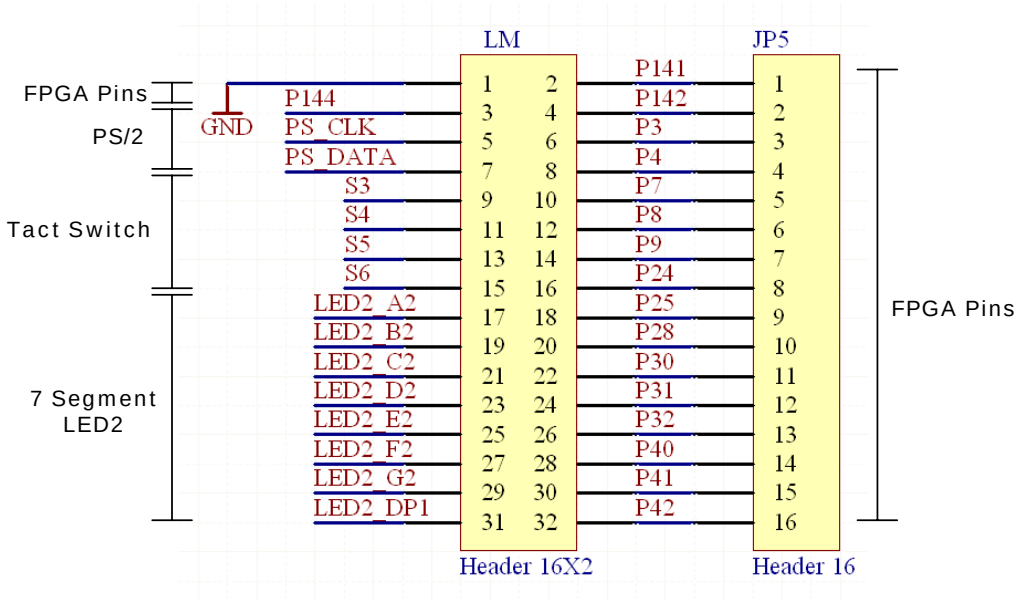
- Polarity: Center negative (Ground)

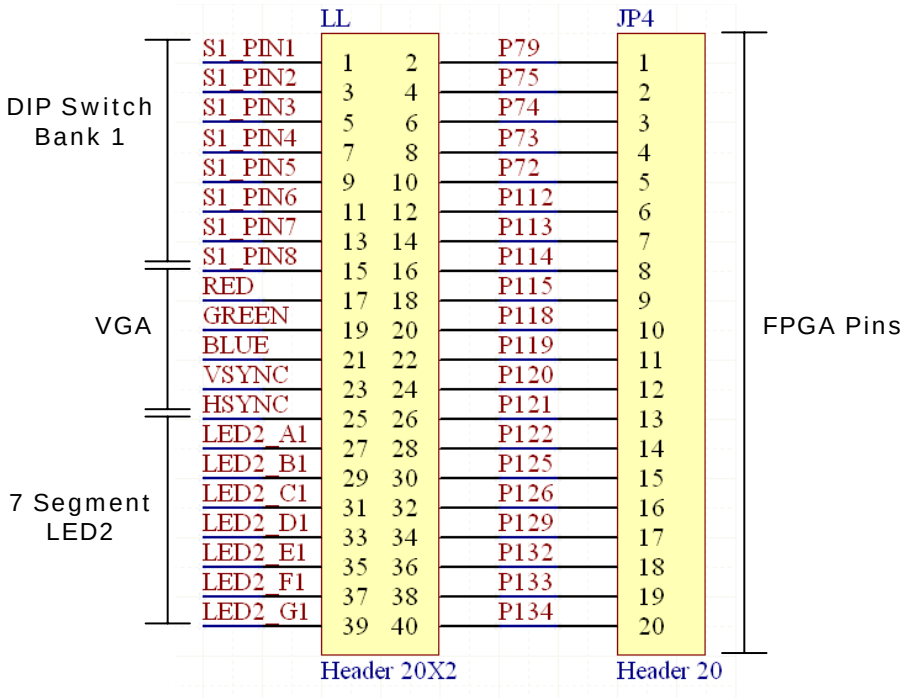
4.0 HEADER PINOUTS

NOTE: Bin-Tek's board power supply will not work on this board.

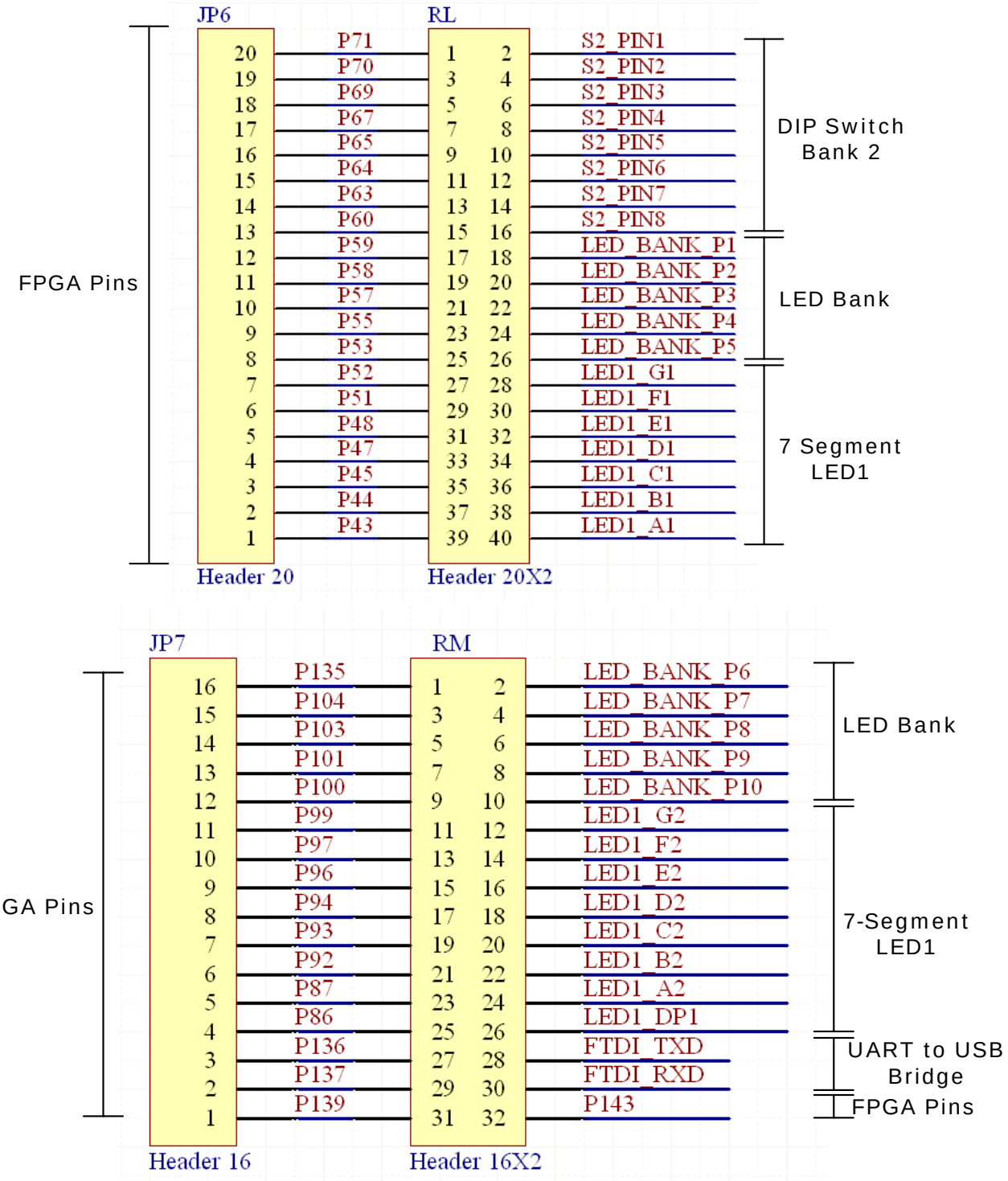
NOTE: The JP4, JP5, JP6 and JP7 headers are available for debugging purposes and will not have pins attached initially. If debugging via an LSA is required on one of these signals, solder a connector to the appropriate pin and attach an LSA there, rather than directly onto the LM, LL, RM and RL headers.

Warning: Do not jumper P143 & P144 together. They are open pins that can be used for other purposes.

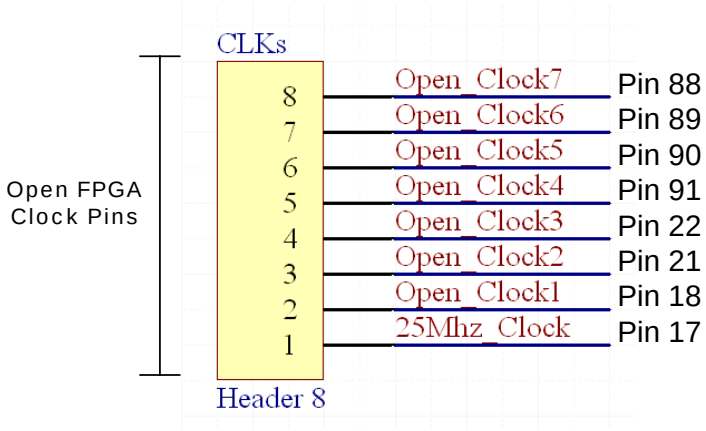



LL
JP4
DIP Switch Bank 1
VGA
7 Segment LED2
FPGA Pins
S1_PIN1 1 2 P79 1
S1_PIN2 3 4 P75 2
S1_PIN3 5 6 P74 3
S1_PIN4 7 8 P73 4
S1_PIN5 9 10 P72 5
S1_PIN6 11 12 P112 6
S1_PIN7 13 14 P113 7
S1_PIN8 15 16 P114 8
RED 17 18 P115 9
GREEN 19 20 P118 10
BLUE 21 22 P119 11
VSYNC 23 24 P120 12
HSYNC 25 26 P121 13
LED2_A1 27 28 P122 14
LED2_B1 29 30 P125 15
LED2_C1 31 32 P126 16
LED2_D1 33 34 P129 17
LED2_E1 35 36 P132 18
LED2_F1 37 38 P133 19
LED2_G1 39 40 P134 20
Header 20X2
Header 20

HEADER PINOUTS (CONTINUED)



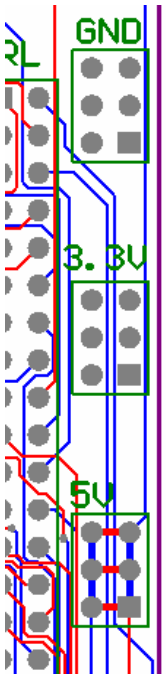
5.0 CLOCK



Header 8 is available to route an external clock into an open FPGA clock pin except Pin17. Pin 17 has an internal clock wired to a 25.175 Mhz clock. Pin 1 is where the silkscreen "CLKs" is. You can use this header to insert your own clock to the FPGA. The headers are also available for students to probe via LSA.

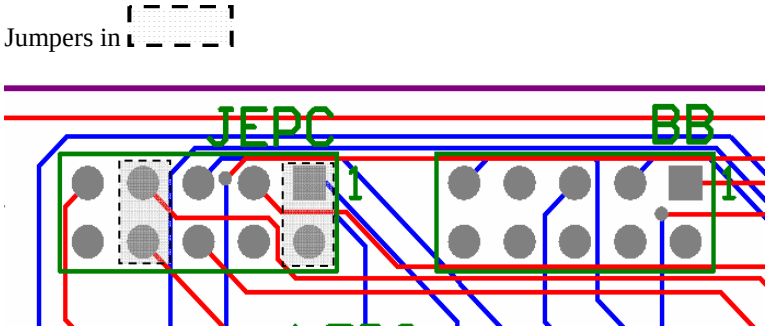
6.0 Power & Ground Connections

The UF 4712 Board has headers onboard to power external devices. It has GND, 3.3V, and 5.0V. Max current ratings

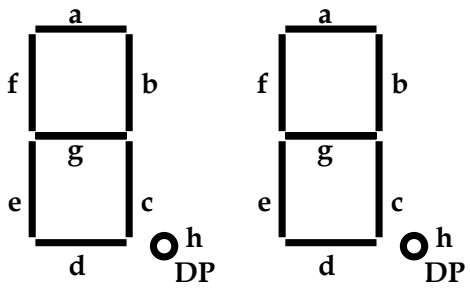


Programming Header

The 10-pin female plug on Altera's byte blaster cable connects to the 10 pin BB header on the board. The board provides +3.3V and ground to the programmers. When connecting a programmer, **make sure**



the red-stripe is on the same side as the BB Label.
LED1 and LED2 7-Segment LED Dual-Digit Display

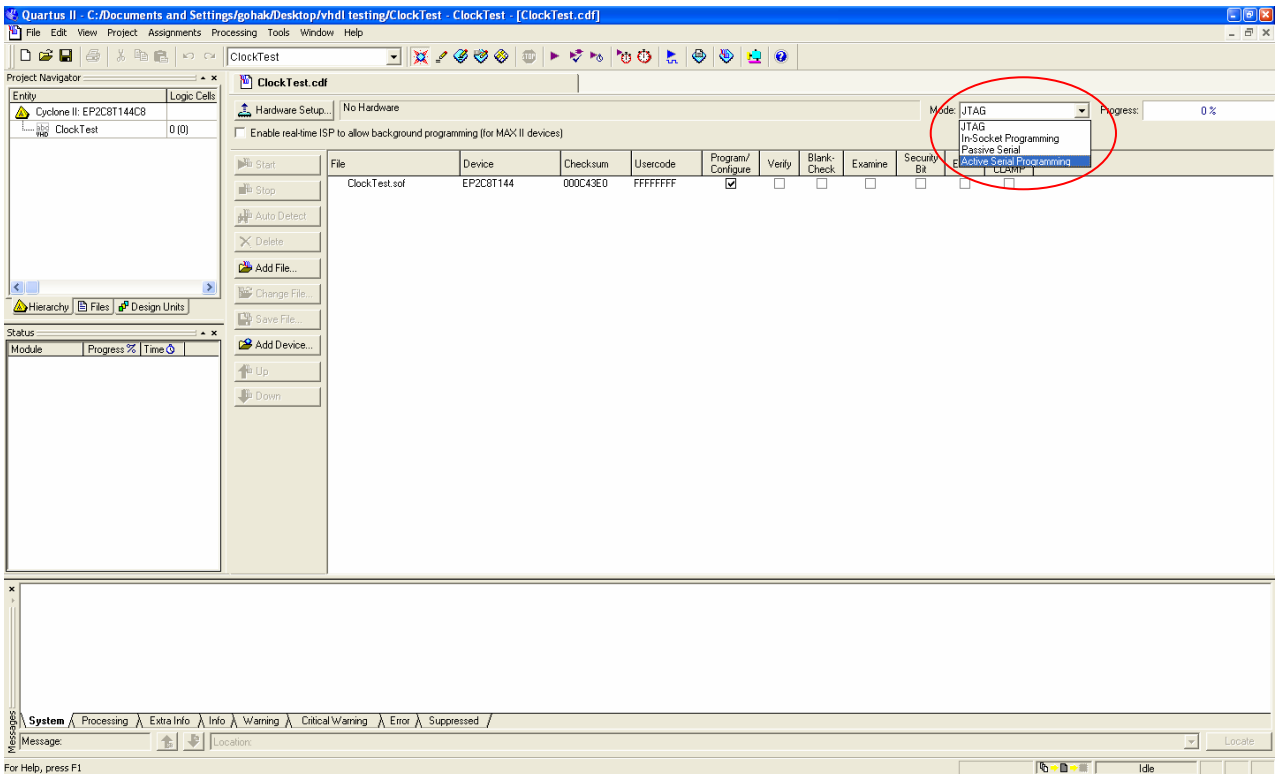


The A1-G1 signals control the digit on the left (when looking at the board with the VGA connector on top) and the A2-G2 signals control the digit on the right.

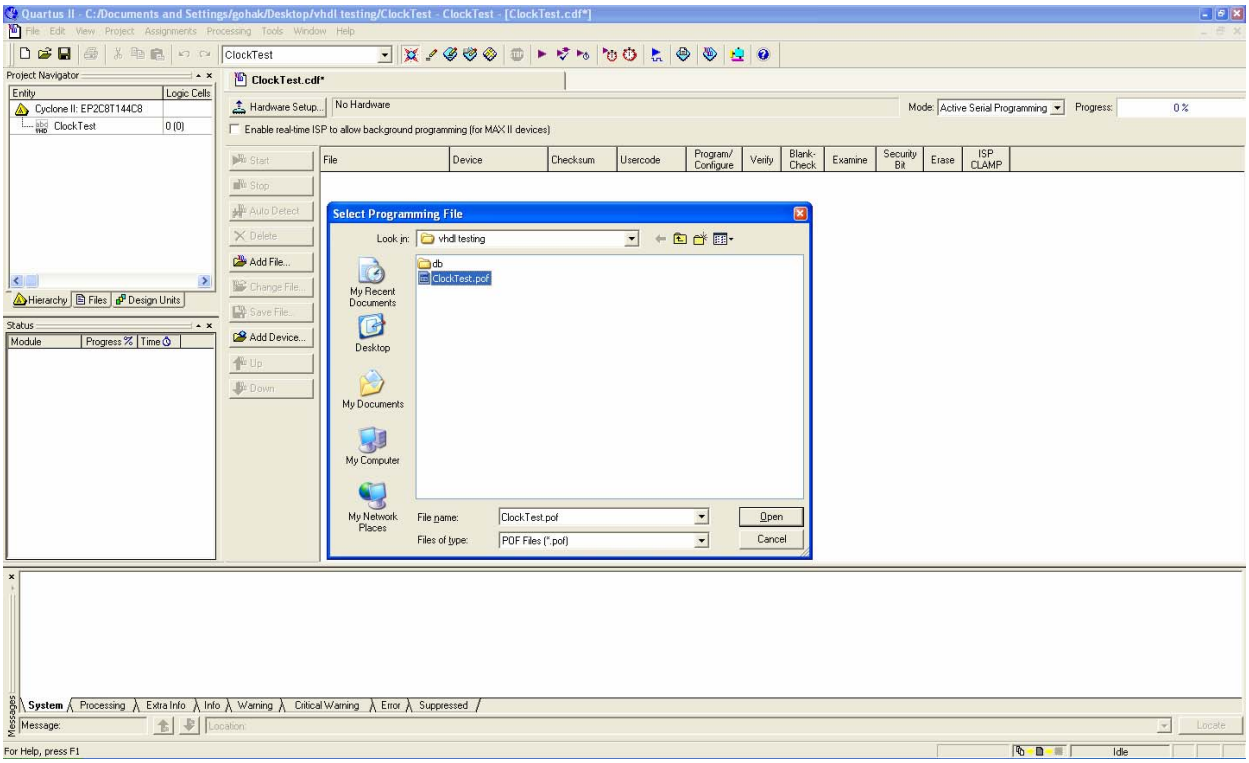
7-segment LED, LED Bank, DIP Switches, and Push Button switches are pulled up.

7.0 Serial Configuration Devices

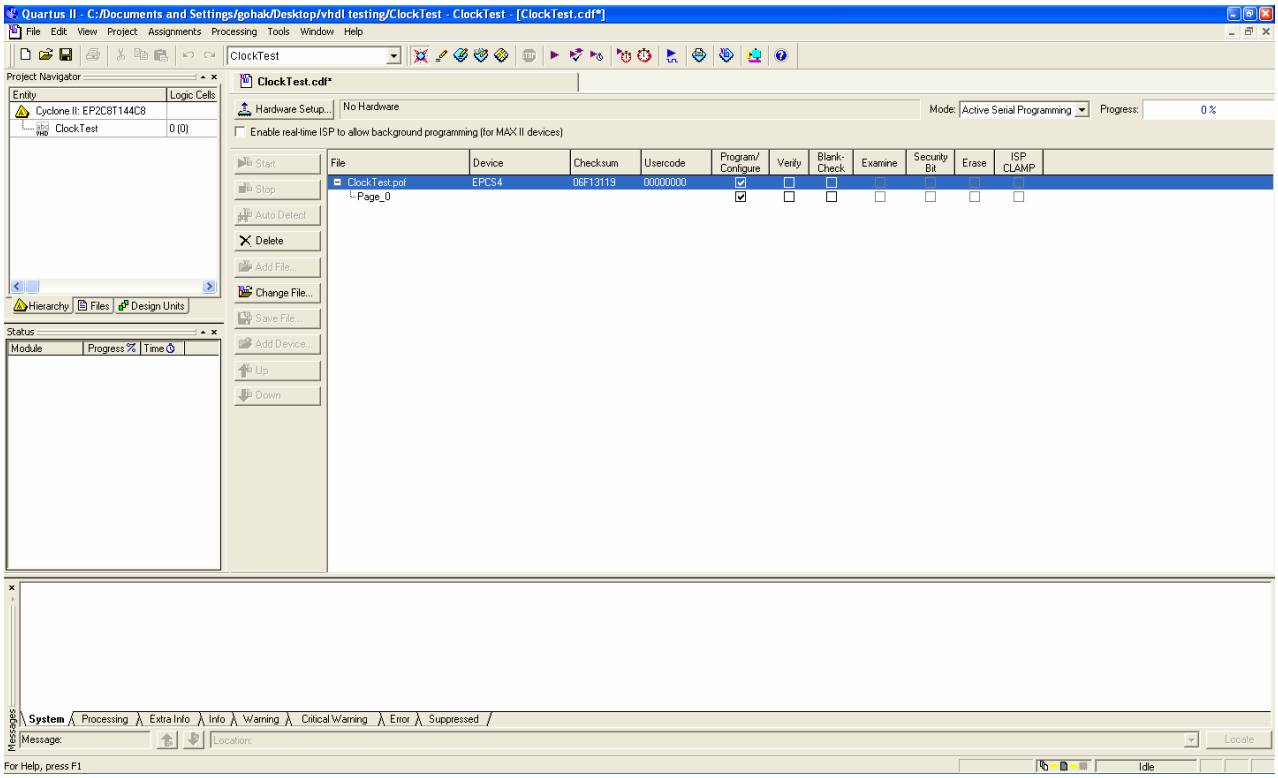
- The UF-4712 board is designed to be used with a serial configuration device.
- This board can support the following devices:
- 1 Mbit - EPCS1SI8N
- 4 Mbit - EPCS4SI8N
- The footprint silkscreen is "EPC"
- Once soldered, remove the 2 jumpers from JEPC. To program the configuration device, place the JTAG programmer on JEPC header instead of BB. Then, change the settings in Quartus as follow.



Change the mode to “Active Serial Programming” as shown above in the red oval.



Click “Add File”. Select the .pof file and click “Open”.



Check “Program/Configure” and click “Start”.

These pins are not supposed to show connectivity.