

## FX2 Breadboard™ Reference Manual

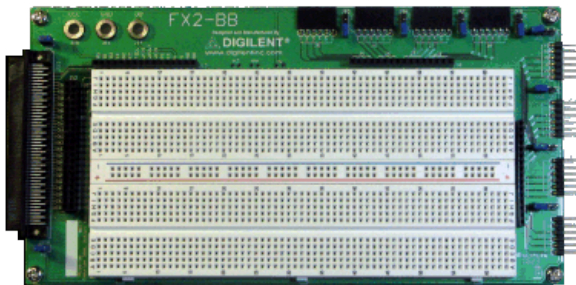
Revised September 26, 2006

This manual applies to the FX2BB rev. A

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### Overview

The Digilent FX2 Breadboard (FX2BB) offers a ready-made solution for prototyping breadboarded or wire wrapped circuits as accessories to Digilent system boards. The FX2BB provides connectors suitable for direct connection of various Digilent system boards as well as Digilent peripheral modules (Pmods).



*The FX2 Breadboard.*

Features include:

- Two 630 tie point breadboards separated by 100 tie point bus strip (solderless breadboard version)
- 32x65 hole wire-wrap area (wire-wrap version)
- Four 6-pin male header
- Four 6-pin female header
- FX2 connector
- Prototype/wire-wrap connections on every signal
- Two power buses and one ground plane.

## 1 Functional Description

### 1.1 Power Connections

The FX2BB provides two power busses and a ground bus. The two power busses are labeled VU and VCC. These two busses are made available at each connector position on the board. There is also a ground plane that connects the ground pins from all connectors together.

The usual Digilent convention is to power the VCC bus at 3.3V and the VU bus at 5.0V. However depending on the system board connected and the power supply used, other voltages may be present. Observe caution before using any voltage other than 3.3V on the VCC bus. Most Digilent system boards will be damaged if the voltage on the VCC bus is greater than 3.3V.

Banana jacks J14-J16 provide connection points for connecting external bench power supplies to the board to power the busses.

Alternatively, the power busses can be powered from the FX2 connector or any of the Pmod connectors. When configuring power jumpers and powering the board, it is important that each power supply bus be powered from a single power source. Damage can occur if the same bus is powered by more than one source.

## 1.2 Hirose 100-pin FX2 Connector

FX2 connector J11 is provided on one side of the board for connection to Digilent system boards like the Nexys that contain an FX2 style connector. The Digilent FX2 connector signal convention provides for forty general-purpose I/O signals, three clock signals, JTAG signals, and power busses.

The forty general-purpose I/O signals from the FX2 connector are brought out to connector J12. These signals are labeled IO1-IO40. See Table 1 for a description of the relationship between FX2 connector pins and signal names on J12. The remaining signals from the FX2 connector are brought out to connector J13. See Table 1 for a description of the relationship between FX2 connector pins and connector J13 signal names.

In addition to the FX2 connector signals, connector J13 also provides access to the power and ground busses.

Jumper blocks JP9 and JP10 are used to connect or disconnect the VU and VCC busses of the system board and the VU and VCC busses on the FX2BB. Shorting blocks are placed on JP9 and/or JP10 to connect the busses, or removed to disconnect the busses.

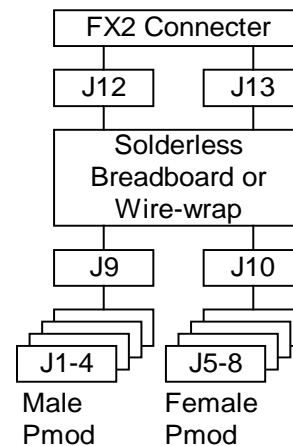


Figure 1. FX2BB block diagram.

## 1.3 Pmod Connectors

Digilent Pmod peripheral modules provide various peripheral functions. These can be as simple as buttons or switches for inputs and LEDs for outputs, to as complex as graphical LCD display panels, accelerometers and keypads.

All Digilent Pmod modules use a six-wire interface for connection to a system board. The interface provides four I/O signals, power and ground. The signal definitions for the four signals as well as the voltage requirements for the power supply depend on the specific module.

The system board connection is through a 6-pin male connector. In addition to the system board connection, many Pmods, such as A/D and D/A converters, provide interfaces to outside signals. These connections are made through a 6-pin female connector.

The FX2BB provides two sets of four 6-pin connectors for connection of Pmods. Connectors J1-J4 are male connectors for connection to the external signal side of Pmods like A/D or D/A converters. Connectors J5-J8 are female connectors for connection to the system board side of Pmods.

The signals for Pmod connectors J1-J4 are brought out to connector J9. These signals are labeled; J1, 1-4; J2, 1-4, etc. Similarly, the signals for Pmod connectors J5-J8 are brought out to connector J10 and labeled; J5, 1-4, etc.

Each Pmod connector has an associated power select jumper. The power select jumper for J1 is JP1 and so on. These jumpers are used to select one of the two power busses on the FX2BB to provide power to the power supply pin on a Pmod plugged into that connector position. Placing a shorting block in the VCC position provides VCC power to the Pmod. Placing a shorting block in the VU position provides VU power to the Pmod. Place a shorting block so that it hangs off of the center pin only, disconnects power to the Pmod.

| A  |                               | B  |                               |
|----|-------------------------------|----|-------------------------------|
| 1  | VCC                           | 1  | SHLD                          |
| 2  | VCC                           | 2  | GND                           |
| 3  | TMS                           | 3  | TDI (from host to peripheral) |
| 4  | JTSEL                         | 4  | TCK                           |
| 5  | TDO (From peripheral to host) | 5  | GND                           |
| 6  | IO1                           | 6  | GND                           |
| 7  | IO2                           | 7  | GND                           |
| 8  | IO3                           | 8  | GND                           |
| 9  | IO4                           | 9  | GND                           |
| 10 | IO5                           | 10 | GND                           |
| 11 | IO6                           | 11 | GND                           |
| 12 | IO7                           | 12 | GND                           |
| 13 | IO8                           | 13 | GND                           |
| 14 | IO9                           | 14 | GND                           |
| 15 | IO10                          | 15 | GND                           |
| 16 | IO11                          | 16 | GND                           |
| 17 | IO12                          | 17 | GND                           |
| 18 | IO13                          | 18 | GND                           |
| 19 | IO14                          | 19 | GND                           |
| 20 | IO15                          | 20 | GND                           |
| 21 | IO16                          | 21 | GND                           |
| 22 | IO17                          | 22 | GND                           |
| 23 | IO18                          | 23 | GND                           |
| 24 | IO19                          | 24 | GND                           |
| 25 | IO20                          | 25 | GND                           |
| 26 | IO21                          | 26 | GND                           |
| 27 | IO22                          | 27 | GND                           |
| 28 | IO23                          | 28 | GND                           |
| 29 | IO24                          | 29 | GND                           |
| 30 | IO25                          | 30 | GND                           |
| 31 | IO26                          | 31 | GND                           |
| 32 | IO27                          | 32 | GND                           |
| 33 | IO28                          | 33 | GND                           |
| 34 | IO29                          | 34 | GND                           |
| 35 | IO30                          | 35 | GND                           |

|    |                                  |    |                                 |
|----|----------------------------------|----|---------------------------------|
| 36 | IO31                             | 36 | GND                             |
| 37 | IO32                             | 37 | GND                             |
| 38 | IO33                             | 38 | GND                             |
| 39 | IO34                             | 39 | GND                             |
| 40 | IO35                             | 40 | GND                             |
| 41 | IO36                             | 41 | GND                             |
| 42 | IO37                             | 42 | GND                             |
| 43 | IO38                             | 43 | GND                             |
| 44 | IO39                             | 44 | GND                             |
| 45 | IO40                             | 45 | GND                             |
| 46 | GND                              | 46 | CLKIN (from peripheral to host) |
| 47 | CLKOUT (from host to peripheral) | 47 | GND                             |
| 48 | GND                              | 48 | CLKIO (from host to peripheral) |
| 49 | VU                               | 49 | VU                              |
| 50 | VU                               | 50 | SHLD                            |

Table 1. FX2 signals and connector pinout.