PanelDue for 3D printers

The PanelDue is a full-colour touch-sensitive graphical control panel for 3D printers. Although primarily intended for use with Duet electronics, it should also work with other 3D printer electronics that supports a true serial port and includes the required support in the firmware.

Please note: this page is work-in-progress. Images will be added later.

Components

There are four or five components to a PanelDue setup:

- A touch-sensitive TFT screen. The PanelDue controller board is designed to work with 3.2 inch widescreen, 4.3 inch, and 5 inch TFT panels. The recommended displays are ITDBD02-3.2WD, ITDB02-4.3, and ITDB02-5.0 from Itead Studio.
- The PanelDue controller board. This sits on the back of the display. Its main components are a 32-bit ARM-core processor, a connector for the display, a piezo sounder, a voltage regulator, a micro USB socket for programming it, and a 4-pin connector for power and communication with your 3D printer controller board.
- A 4-wire cable to connect the PanelDue to your controller board.
- An enclosure. You will typically print this yourself on your 3D printer.
- Optionally, a rotary encoder with built-in push button. This is not essential, because all functions can be controlled using the touch panel.

You can order the PanelDue controller board, mating 4-pin connector and fixing screws from me. I can also supply cables, although as I make these by hand, they are not the cheapest! Alternatively, you can make up the cable yourself using the connectors I supply (crimp tool recommended). You may also be able to source complete kits including display panel and cables from distributors.

To update the firmware on the PanelDue, you will need a USB cable with a micro-USB connector at the device end and a standard USB A connector at the other. If your 3D printer uses Duet electronics, you can use the same cable that you use for connecting the Duet to your PC.

Assembly

1. If you want to use the optional rotary encoder, fit it to the space provided on the component side of the PanelDue, make sure it is level, and solder it in place on the underside of the board. Caution: the rotary encoder connects directly to the microcontroller inputs, so use anti-static precautions when soldering it! Alternatively, you may connect it to the board with flying leads if you want to position it elsewhere or if the encoder you are using is not mechanically compatible with the board. The recommended encoder model is Bourns PEC12R-4220F-S0024, which is available from RS Components (part no. 737-7773) and elsewhere.

2. Fit the display to the enclosure using four of the 2.9mm x 6.5mm self-tapping screws supplied with the PanelDue controller. Make sure you fit it the right way round, so that there is room in the enclosure for the PanelDue too.

3. Plug the PanelDue on to the pins at the back of the display. Make sure it is the right way round, and mated centrally! The 4-pin and USB connectors should be at the edge of the PanelDue that is remote from the display, not underneath the display.

4. Use the remaining two 2.9mm x 6.5mm self-tapping screws to secure the PanelDue to the enclosure, one on each side of the hole for the rotary encoder shaft.

Firmware

The PanelDue controller is supplied as standard with firmware for driving a 3.2 inch widescreen 400×240 pixel display (ITDB02-3.2WD or compatible). If you use a different display, then you will need to re-program the board with firmware for that display.

Programming the board is done via the USB interface and the **bossac** program, as follows:

- If your 3D printer uses Duet electronics or an Arduino Due, then you should already have the **bossac** program and associated device drivers on your PC. If not, download and install them from http://www.shumatech.com/web/products/bossa.
- Locate and download PanelDue firmware for your display. My firmware repository is at https://github.com/dc42/PanelDue and you can find standard binaries in the Release directory. To download a binary, click on its link, then press the Raw button.
- Ensure that the PanelDue is not connected to your 3D printer electronics.
- Use a suitable cable to connect the micro USB connector on the PanelDue controller to a USB port on your PC. The backlight on the PanelDue should illuminate, but the display may not be legible if you are using a display panel that is not compatible with the ITDB02-3.2WD.
- Press and hold the Erase button of the PanelDue down for several seconds. You can access this button by pressing the end of a straightened-out paper clip through the hole in the enclosure.
- Release the Erase button.
- Press and release the Reset button.
- Identify the COM port number or port name of the PanelDue board on your PC. If you use Windows, you can do this via **Start->Control Panel->System->Device Manager**. Expand **Ports (COM and LPT)**, and look for **Bossa port**. Make a note of the port [Follow] you can't find the port, try repeating the Erase and Reset sequence.
- Use **bossac** to program the [Follow "David Crocker's Solutions blog"] command to use is:

```
bossac.exe --port=COM9 -                    ueFirmware.bin
```

Replace COM9 in this comm [Get every new post delivered to your Inbox. Join 37 other followers] er you found, and PanelDueFirmware.bin by the path to your firmware file. [Enter your email address] [Sign me up]

- When bossac has completed [Build a website with WordPress.com] sful", press the Reset button again. If you have successfully installed firmware that is correct for the type of display you are using, the display should be legible, and you can test that the display responds to touch.
- Whenever the firmware is uploaded, the touch panel calibration is lost. To calibrate the touch panel, touch **Info** and then **Calibrate touch**, then follow the instructions on the screen. Touch the spots as accurately as possible. It is better to use the tip of your fingernail rather than the pad of your finger.
- Disconnect the USB cable before connecting the PanelDue to your 3D printer.

Connecting PanelDue to Duet electronics

Make sure your 3D printer is completely powered down (don't forget to disconnect the USB cable!).

Using the connector provided, connect the 4-pin connector on the PanelDue to your 3D printer. The pins on the PanelDue marked +5V and Gnd go to the corresponding pins on the Duet expansion connector. The Dout pin on the PanelDue goes to the URXD pin on the Duet. The Din pin on the PanelDue goes to the UTXD pin on the Duet. Here are the pin numbers on the Duet expansion connector:

+5V ... pin 1
Gnd ... pin 2
URXD (for Dout) ... pin 7
UTXD (for Din) ... pin 8

If you are using the DueX4 expansion board, then all four of these connections are also brought out on the DueX4 expansion connector, but the pin numbers are different.

Commissioning

- Double-check you have the correct connections between the PanelDue and your 3D printer electronics.
- Power up your 3D printer electronics. The PanelDue should come to life. Initially all numeric fields will be displayed as zero. However, once your printer electronics starts responding to requests from the PanelDue, the fields should show the correct values.
- If you haven't already calibrated the touch panel, you may wish to do so now, by pressing **Info** and then **Calibrate** Touch.
- Test the various functions. Note: to cancel a pop-up menu that does not have a **Cancel** button on it, touch the field that you touched originally to get the pop-up menu (this will be the field with a green outline around it).

Using the PanelDue with other electronics

If you are using Arduino-based electronics instead of the Duet, then you will need to identify a serial port on the board with available TxD and RxD pins, and the firmware on that board must be capable of receiving gcode commands and sending replies in the required format through that port. Connect the TxD pin of that serial port to Din on the PanelDue, and the RxD pin to Dout. If your electronics uses 5V signal levels instead of 3.3V, then we recommend that you also connect a 10K pullup resistor between the RxD pin and +5V. The PanelDue will tolerate a 5V signal on its Din pin.

If your printer electronics does not already have an SD card socket, but has provision for connecting one, then you may be able to use the socket on the back of the display panel. You would need to solder wires on the back of the board to the pins of the 40-pin connector that are connected to the SD card socket. Note that SD cards use 3.3V signals, therefore if your electronics uses a 5V Arduino then you will need to use level shifters.

Rolling your own firmware

If you can write C++ and wish to make your own modifications to the firmware, then you can find the firmware source at https://github.com/dc42/PanelDue. The firmware is built under Windows using Atmel Studio 6.2, which is freely downloadable from Atmel. For those wishing to build the firmware under other operating systems, it should not be difficult to port it to Eclipse.