Digital Bird

Software Installation Guide

WARNING: If updating the code on the built device be sure to remove the battery from the device before you plug in the usb cable. Failure to do so may fry your ESP32 with too much power and also damage your PC usb port. I will not be held liable for either. This is generally the case with all project boards.

These instructions will take you through the software installation for the complete Digital Bird Motion Control system.

Currently the system consists of 5 parts.

- The Slider
- Pan Tilt Head OT or B
- Cinematic Turntable
- Focus motor and
- WIFI remote display

All parts of the system know use the ESP32 processor

DOWNLOADING THE DIGITAL BIRD SOFTWARE

1. If you haven't done so already your first step is to download the contents of the Digital Bird code repository from Github this is the link.https://github.com/digitalbird01/DigitalBird-Camera-Slider.git
2. Click on the Green "CODE" button top right and select **<Download Zip>**
3. Unpack the ZIP file to somewhere you will remember on your system but do not unzip the zip files contained in that top level folder.

   This folder contains all the Digital Bird specific software you need to install the system but be aware the project is still under development and you should check back for future updates and bug fixes.

SETTING UP THE ARDUINO IDE

All parts of the system are installed through the Arduino IDE. If you are not familiar with this don't worry you will only be using it to update firmware you will not have to write any code yourself. For those of you already familiar with this you can probably skip down to installing the ESP32 board and libraries.

The Arduino IDE is simply a software authoring tool which allows us to write code for a large number of different development boards and upload the code to many different processor development boards including the ESP32 we are using..

### Installing and setting up the Arduino IDE

1. Download the Arduino IDE from here: https://www.arduino.cc/en/software and install on your computer.
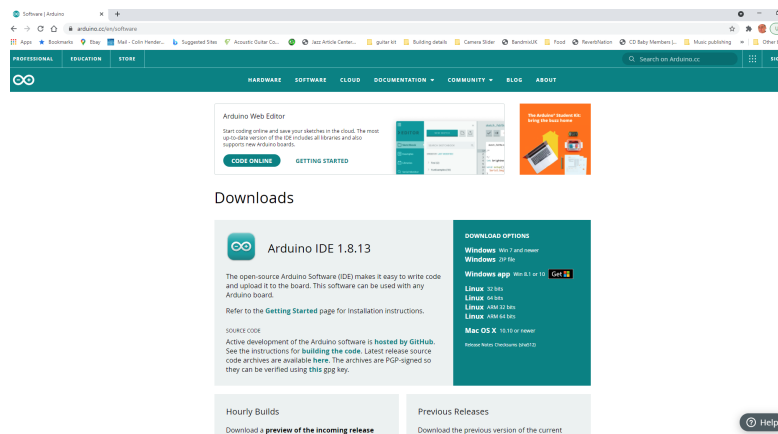

2. Once installed navigate to Open Arduino IDE and go to <File> <Preferences> and in the box labeled "Additional Boards Manager URL's" add the following link: https://dl.espressif.com/dl/package_esp32_index.json
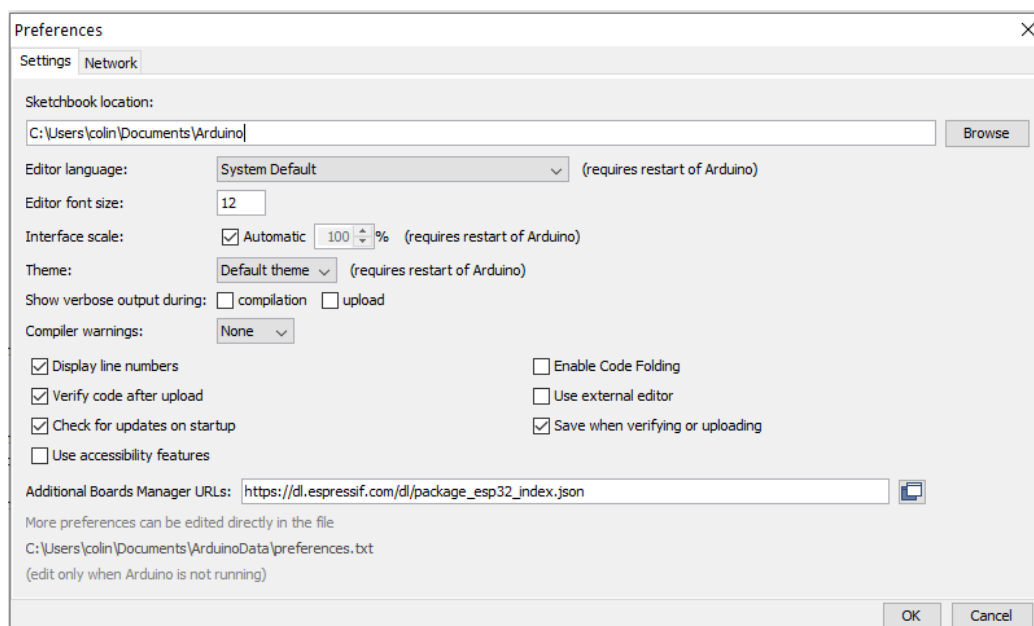
3. Next select <tools><Boards><Boards Manager> and you should see a window appear with the board manager. In the dialog box type ESP32 and return. Below the dialogue box you should know see the listing for the ESP32 drivers. Select install and all the ESP32 drivers will be added to your system.
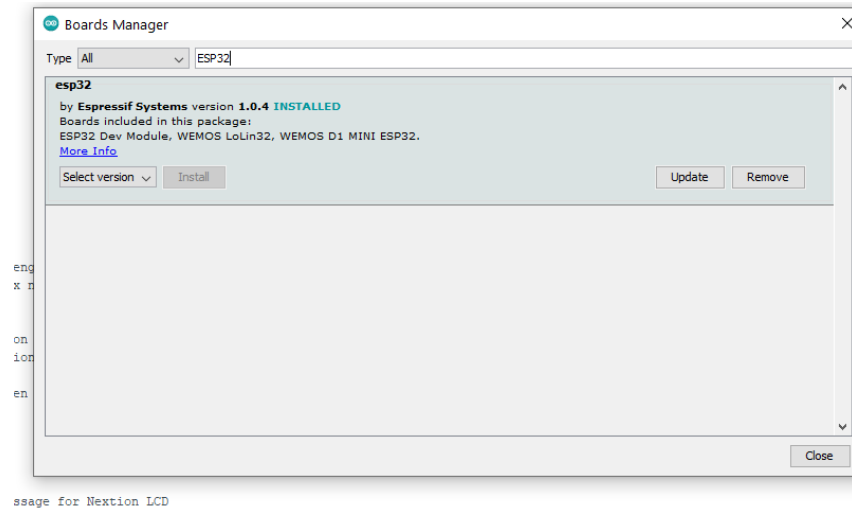
4. Depending on which board we are installing to you can now select this from the board list under the ESP32 title. The two boards we are interested in are the **ESP32 Dev** and the **Adafruit ESP32 feather**. The Adafruit board should be selected when installing to the WIFI remote; all other boards are the ESP32 Dev Module.
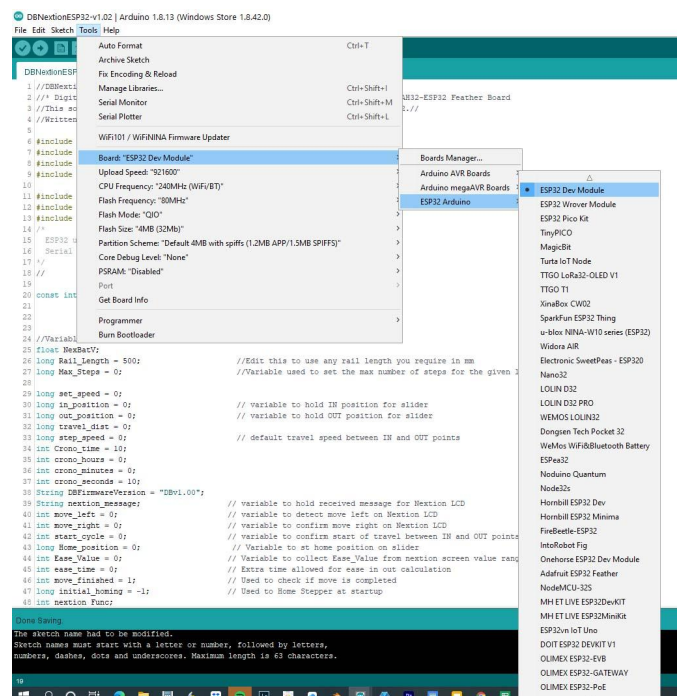
5. The software makes use of the following libraries which must be installed into the Arduino IDE before uploading the software to the boards. These libraries are included in your Digital Bird software folder as Zip files. You do not need to unpack these; the system will pull them directly from the zip files.
   - FastAccelStepper.h   (To control the stepper Drivers)
   - AS5600.h   (For the AS5600 magnetic encoder)
   - EasyNextionLibrary.h   (For control of the Nextion display)

   From the Arduino IDE Menu Bar at the top of the screen select:

   <Sketch> <Include Library> <Add .ZIP library> and point this at each of the three zipped libraries in your Digital Bird Software folder one at a time until all three are installed.
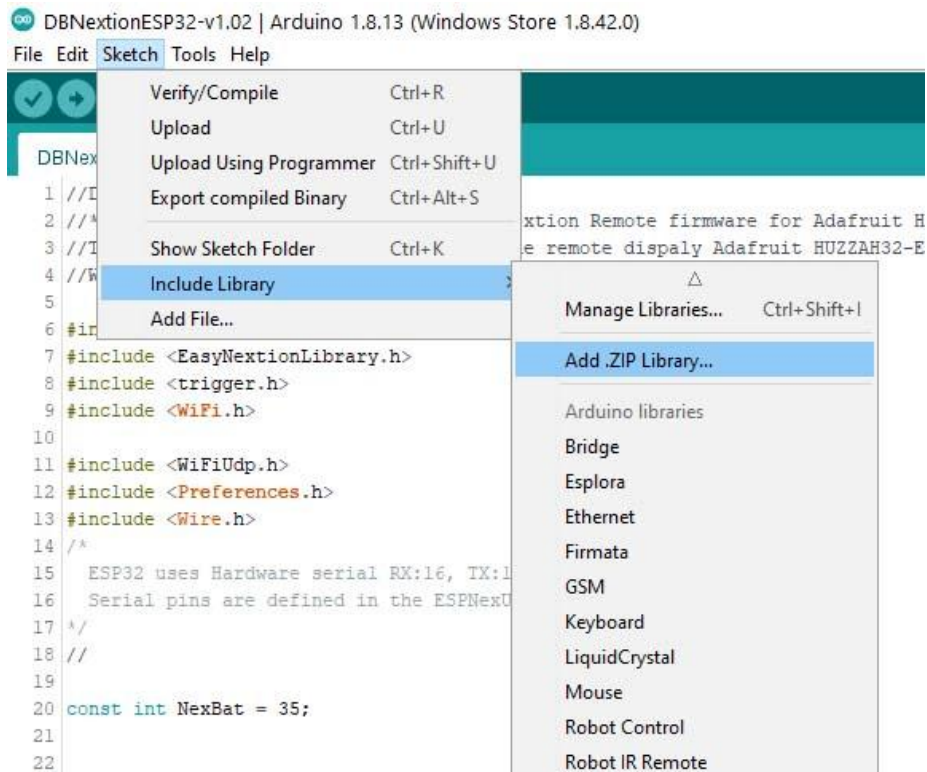
6. That's it you now have all the tools you need to install the software to all parts of the system.

WIFI REMOTE DISPLAY

If you purchased a slider kit after 15th April 2021 you can skip all of this as the board will have come supplied with all the correct pins attached and the software installed.

If you are supplying your own board or are updating the software on a supplied board read on.
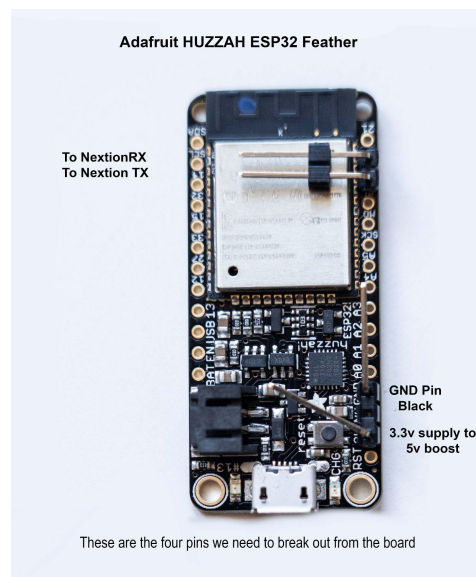
You will need:

- **Adafruit HUZZAH 32 Feather** (no pins attached. This board is used alongside the Nextion display inside the remote)
- **2.8" Nextion display part No. NX3224T028** (Not the enhanced version we don't need the extras)
- **Adafruit 5V mini boost** (To bring the boards 3.3v up to 5v for the Nextion,Switch harness and cables all supplied in the slider kit.)
- **A 2000 - 5000 mAh lipo battery** with JST-PH 2.0mm plug, (not supplied in kit due to handling issues.)
- A mini USB-C Lipo charging board.

  https://www.aliexpress.com/item/1005002953903622.html?spm=a2g0s.9042311.0.0.710e4c4d2nn5RA

- **Your own 3D printed case** files downloadable from **Thiniverse** these are included with the slider parts. Make sure you have the most up to date files before you begin.

Installing to the Adafruit HUZZAH 32 Feather

1. Prepare the Adafruit HUZZAH 32 Feather by soldering the pins as per below image. Note regardless of if you had to supply your own board the pins are supplied in the kit together with all the other cables required.

Adafruit HUZZAH ESP32 Feather

To NextionRX
To Nextion TX

GND Pin
Black

3.3v supply to
5v boost

These are the four pins we need to break out from the board

2. Cut the pins quite close to the underside of the board surface and cover the bottom of the board with electrical insulation tape. This board will rest on the nextion display and we don't want any shorts!
3. Open the Arduino IDE on your computer and set the board we are installing to.

   navigate to **<Tools> <Board> <ESP32> <Adafruit ESP32 feather>**
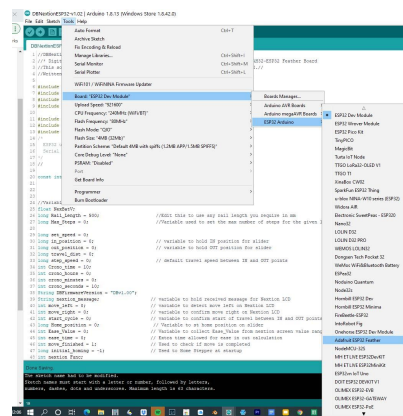
4. Now select **<File> <Open>** and find the file titled **"DBNextionESP32-v*.**.ino"** and you should see the code open in the main window. The Arduino IDE may ask to install a copy in its own file location under documents just accept this.

   Plug your board into the computer using a mini usb cable and check that the correct COM port is selected. Your System may use any number of COM select

   <TOOLS> <PORT><COM X>
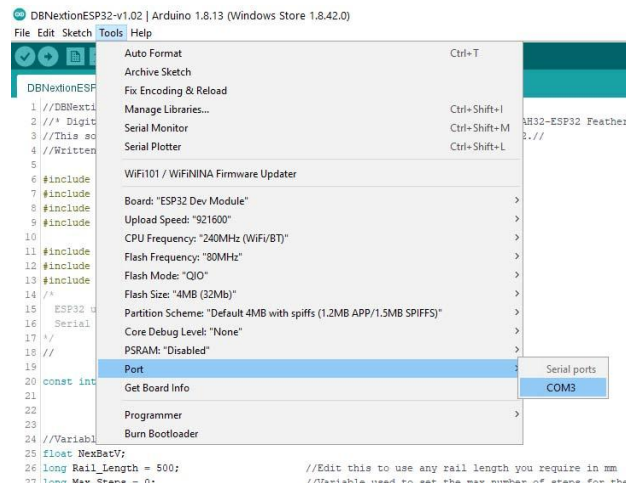
5. Finally Install the software to the board by selecting **<Sketch><Upload>** The system will compile the software, connect to your board and upload the code. If the compiler comes back with any errors make sure you have performed all the previous steps correctly. If the error is not obvious send me an email with the error and I will do my best to assist. digitalbirdfilm@gmail.com. That's it for the Feather.

Installing the Digital Bird Menu to the Nextion Display

1. Next we need to Install the Digital Bird Interface onto the Nextion display. To do this we don't need to use the Arduino IDE. All we need is an empty micro SD card. Copy the file titled **"DBNextionESP32.tft"** from your Digital Bird folder onto the SD card.

2. Layout and Plug in all the cables as shown below. Before you power up the system, insert your SD card into the Nextion SD card Slot.
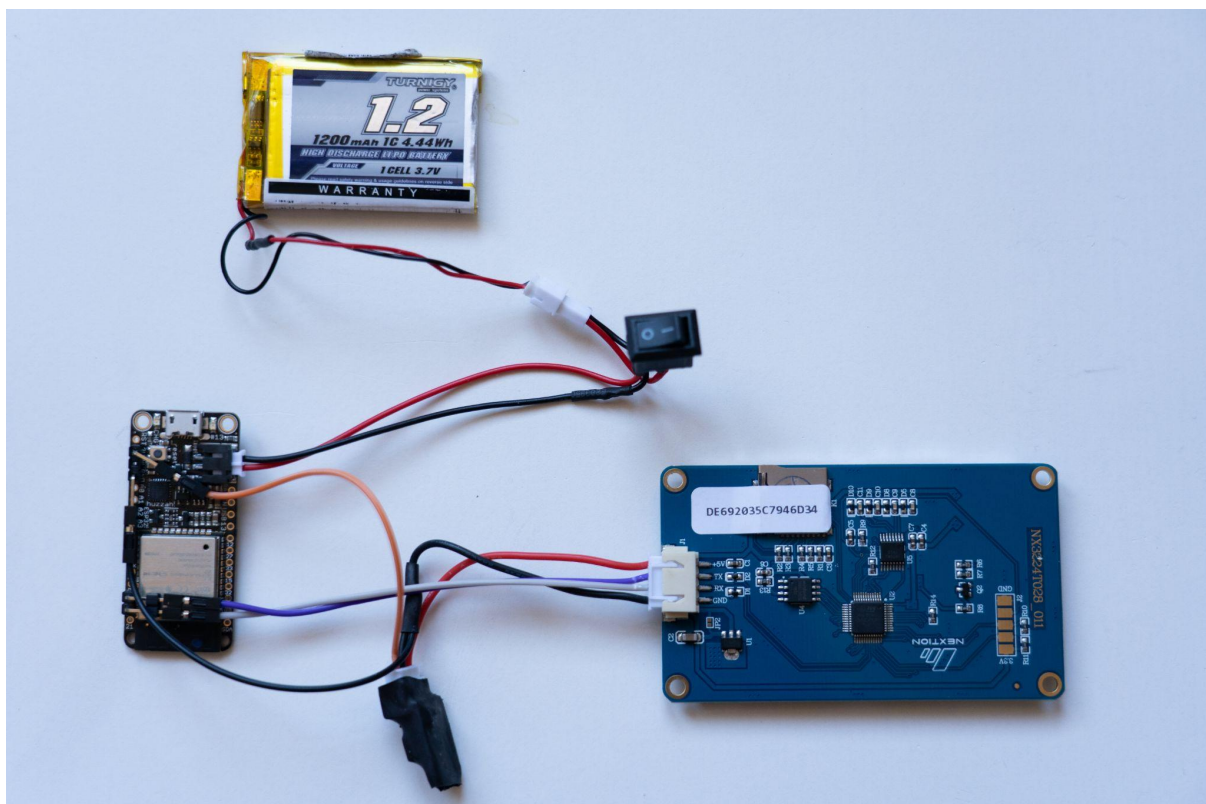
3. Power up the system and the display should automatically install the firmware from the card. When it has finished, switch off the system and remove the SD card. When you power up the system again you should see the Digital Bird menu on the display.


4. **That's it!** Unplug all the cables and install everything in your 3D printed case.

Digital Bird Camera Slider

You will need:

- A Digital Bird Slider main board
- ESP32 Dev board the Espressif ESP32-DevD (38 pin version)
- AS5600 encoder
- For other parts (see kit specifications)

Unlike the Arduino boards the ESP32 boards come with many different pinouts and pin spacings in a number of different form factors and it is important to find one which matches the pinouts used on the digital Bird motherboards. If your kit was supplied with the ESP32 installed you do not have to install any software unless there has been an update.
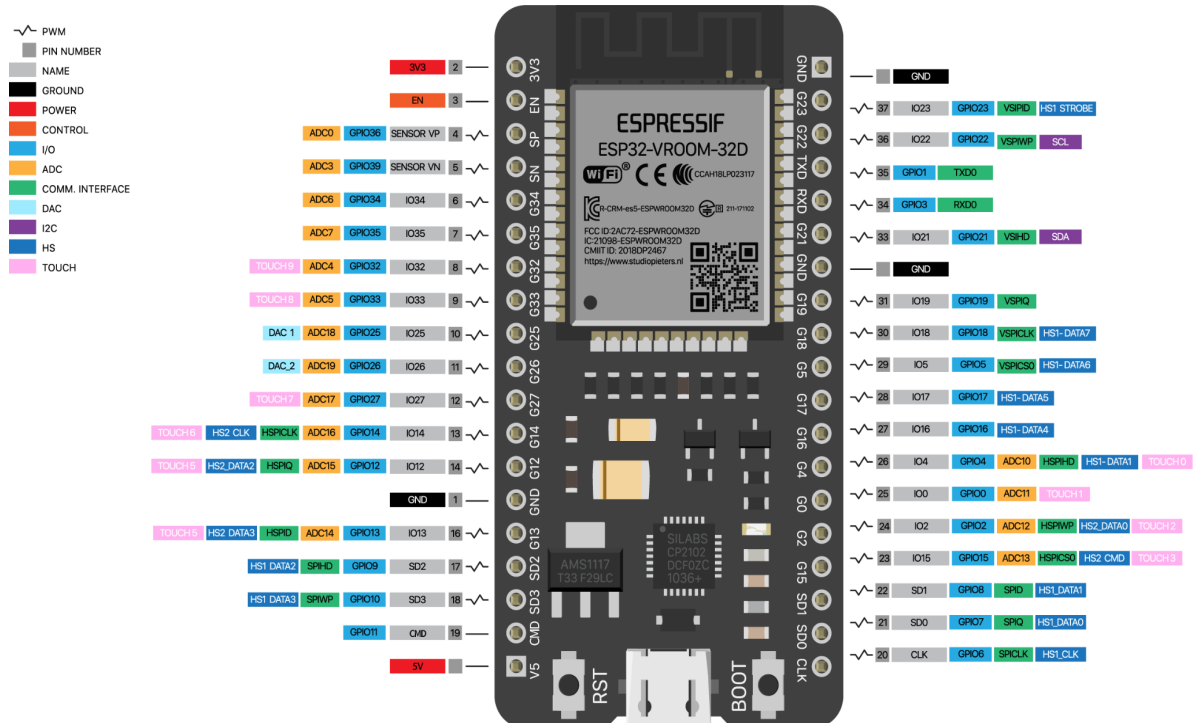
Note the position of the 5V and 3.2V pins on the board together with 38 pins)

1. Open the Arduino IDE on your computer and set the board we are installing to.

   navigate to **<Tools> <Board> <ESP32> <ESP32 Dev Module>**
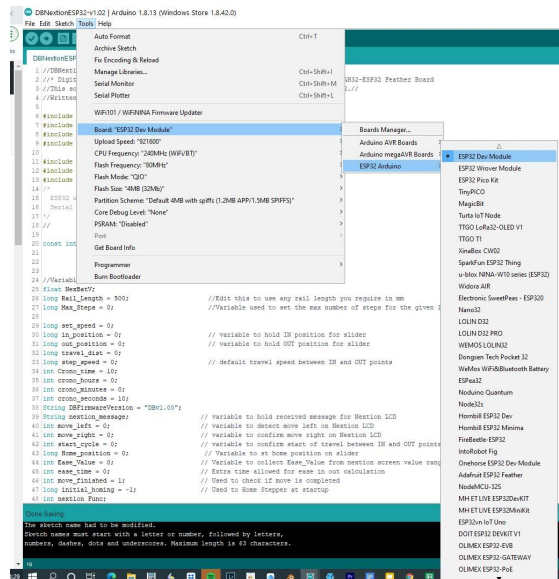
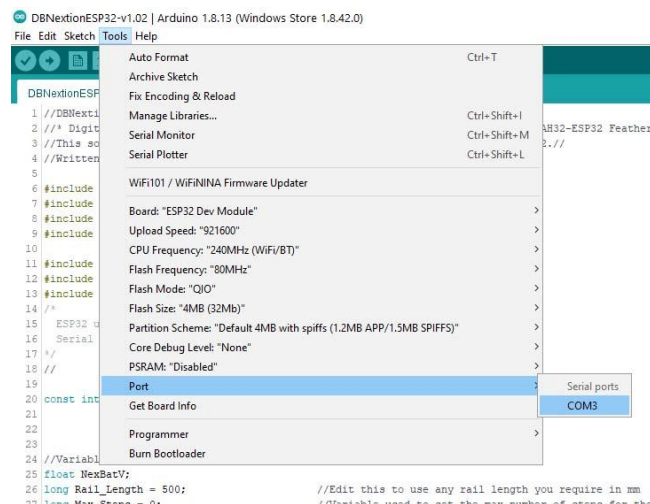2. Now select **<File> <Open>** and find the file titled **"DBsliderESP32-v*.**.ino"** and you should see the code open in the main window. The Arduino IDE may ask to install a copy in its own file location under documents just accept this.

   Plug your board into the computer using a mini usb cable and check that the correct COM port is selected. Your System may use any number of COM select

   <TOOLS> <PORT><COM X>

3. Finally Install the software to the board by selecting **\<Sketch\>\<Upload\>** The system will compile the software, connect to your board and upload the code. If the compiler comes back with any errors make sure you have performed all the previous steps correctly. If the error is not obvious send me an email with the error and I will do my best to assist. digitalbirdfilm@gmail.com.

   Note: I have occasionally had a problem where the board will not listen for the install from the computer. When this happens you may see a lot of…._____…. and finally a failed to connect message. To force the board to listen. Wait until the compile is finished and the install begins then hold down the boot button on the ESP32 for a few seconds. This will normally force the board to listen and you should see the normal % countdown .

INSTALLING FOR THE PAN TILT HEAD & VIDEO TURNTABLE

To Install our software on the Pan Tilt Head or Video Turntable simply follow all the steps as per the Slider above but upload the following files to the Arduino IDE in place of the slider code.

- Pan Tilt head **"DBpantiltESP32-v*.**.ino"**

- Video turntable **"DBturntableESP32-v*.**.ino"**

Note There are currently two different Pan Tilt files. The one ending in "OT" is for the original Over the top arm Pan Tilt. The one ending in B is for the Balanced Pantilt head. The two programs are identical except for the Joystick and return speeds which are specific to the gear ratios on the motors, the balanced head using smaller geared motors.

Troubleshooting

Pan Tilt Head

An axis moves but is very juddery

- Check your stepper motor cables for bad connections. The most likely cause of a stammering motor is a bad or incorrect connection with the motherboard. Look for bad crimps on the end of the cable, broken or loose connections, are the crimps all the way home in the plug housing or has the male pin pushed it out.

- Check the cables where they enter the motor. Are they sound? If the stepper is of the type with a plug socket at the motor end remove the cable and use a meter to check for continuity on each pin.

- Colour codes of wires may vary between stepper motor suppliers, If the stepper pins poles are not in the correct order the motor may judder or not work at all. Generally you will not have done any damage with incorrect wiring of the stepper simply check the manufacturer's diagram and re-order as required.

Motor is moving but in the wrong direction
- Reverse the order of the pins in the plug so if its Green, Black,Blue,Red Make it Red,Blue,Black,Green

After powering on the PanTilt head and trying to set up a new position the head begins to spin on its own with no command

- Power on the PT head and allow 5 sec before moving the joystick. The system needs a few seconds to boot during which time the joystick should not be moved. Moving the joystick during this period will upset the calibration process.

- While powered down check the joystick cable plugs are all the way home and that there are no bad connections. Unrequested spinning will also occur if you forget to plug in the joystick cable before startup!

- Check that the battery is not flat. Unrequested spinning can also occur suddenly during operation when the battery is very low since the analog joystick is reading voltage change across the pins. Low power can affect the pin reading. Replace or charge the battery

SLIDER

At startup the slider moves towards home but just crashes into the end of the rail.

- Check that your limit switch is working properly and is plugged in with no loose or bad connections

Slider crashes into the end of the rail while performing a programed move

- This is most likely a communication error during keyframe programming and is often the result of a low battery either at the slider or the wifi controller end.

Slider will not power up and there is no light on the ESP32 board

- Check that the battery board pins have not been damaged or moved out of place
- Check the positive and negative pins on your battery supply lead are correct way around
- Check for loose connections or bad crimps
- Make sure your ESP32 board is in the correct way round and that the pins are all in the headers, not one too far to the left or right. Note it is surprisingly easy to get this wrong and could result in a wasted ESP32!

Slider does not hear the controller commands

- Check that both the batteries on the controller and the slider are not flat. This is the most common error when any part of the system stops listening to the controller.

- Read the controller debug list below.

Slider moves but is very juddery

- Check your stepper motor cables for bad connection. The most likely cause of a stammering motor is a bad or incorrect connection with the motherboard.

- Look for bad crimps on the end of the cable, broken or loose connections. Are the crimps all the way home in the housing or has the mail pin pushed it out?.

- Check the cables where they enter the motor. Are they sound? If the stepper is of the type with a plug socket at the motor end remove the cable and use a meter to check for continuity on each pin.

- Colour codes of wires may vary between stepper motor suppliers, If the stepper pins poles are not in the correct order the motor may judder or not work at all. Generally you

will not have done any damage with incorrect wiring of the stepper simply check the manufacturer's diagram and re-order as required.

- If the juddering is more slight. Check for good belt tension and loose belt end connections

At startup the motor is moving but in the wrong direction away from home
- Reverse the order of the pins in the stepper plug so if its Green, Black,Blue,Red Make it Red,Blue,Black,Green

At startup The slider homes but does not stop at the end of the rail
- Check the limit switch is working and that the cables running from it have sound connections to the main board

After setting a key point and moving the slider to position on second press the carriage locks but the slider does not return to home and the 0 move is recorded on the button

- This indicates that the encoder on the back of the stepper is not functioning correctly.

- Check the cable from the encoder to the main board is sound.

- Is the magnet in place on the back of the stepper?

- If you supplied your own encoder did it come with the correct type of magnet? (many do not!) The magnet must be diametrically magnetised. North and south split across the circular face not North on one side and south on the other.

- Ensure that you have not confused the stepper motor cable with the encoder cable! Both are white 4 pin. Remove the encoder from the back of the encoder and gently pull the cable to ensure you know which is the encoder and which is the stepper cable. Note Plugging the encoder into the stepper port can destroy the AS5600 encoder chip.

WIFI Controller

On power up the display does not come alive

- Check all your cables are correct and look for bad contacts

- Is there power in your battery! They often do not come supplied with charge.

- Check that the battery plug positive and negative match the charging board cables. Batteries that come supplied with the same plugs do not work to any convention

- Use the cable supplied by Nextion and the small usb port to check whether the display is working correctly. If the display works with this cable then the problem is elsewhere.

- Check that the cables running to the nextion are plugged in correctly see diagram

- Check that the plug running into the small black 5V boost board is all the way home.

The controller displays the Digital bird menu but does not communicate with other parts of the system and the seconds do not change when using the arrow keys.

- This means that while the display is working it is not connecting with the ESP32

- Check all the cables running to the ESP32 since the display receives power through the ESP32 board it is likely that the issue is with the TX/RX cables over the processor. Are they the correct way round? Swap them over and try again. TX on the Board goes to RX on the display.

- Check the controller battery voltage shown bottom right of the display a good working voltage should be above 3.4v less than this and you may experience communication errors.

- Check that the battery on the other devices has enough charge. Failing batteries on any part of the system will result in communication errors.

No charge light on the lipo charge board

- Try another usb C cable

- Charge board is rated for 1Amp. Are you using a 2Amp charger?