Digital Bird

Software Installation Guide

Updated 27th Oct 2023

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

Currently the system consists of the following devices

- The Slider
- Balanced Pan Tilt Head
- DB3 VISCA Pan Tilt Head
- Cinematic Turntable
- Focus/zoom motors
- Compact WIFI remote display
- PTZplus WIFI Controller

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.

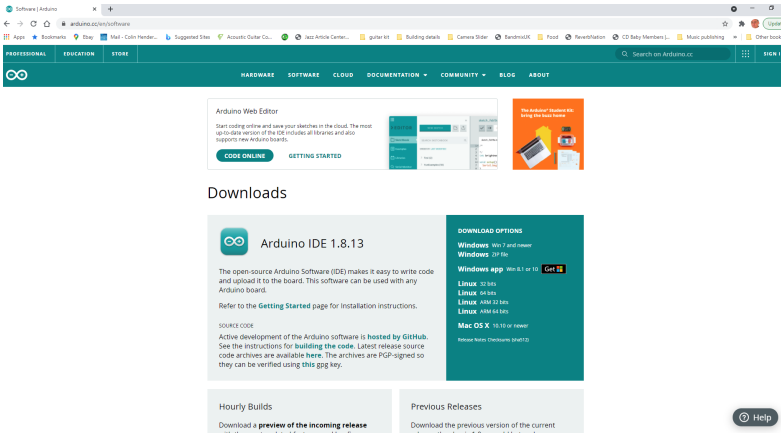
SETTING UP THE ARDUINO IDE

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.

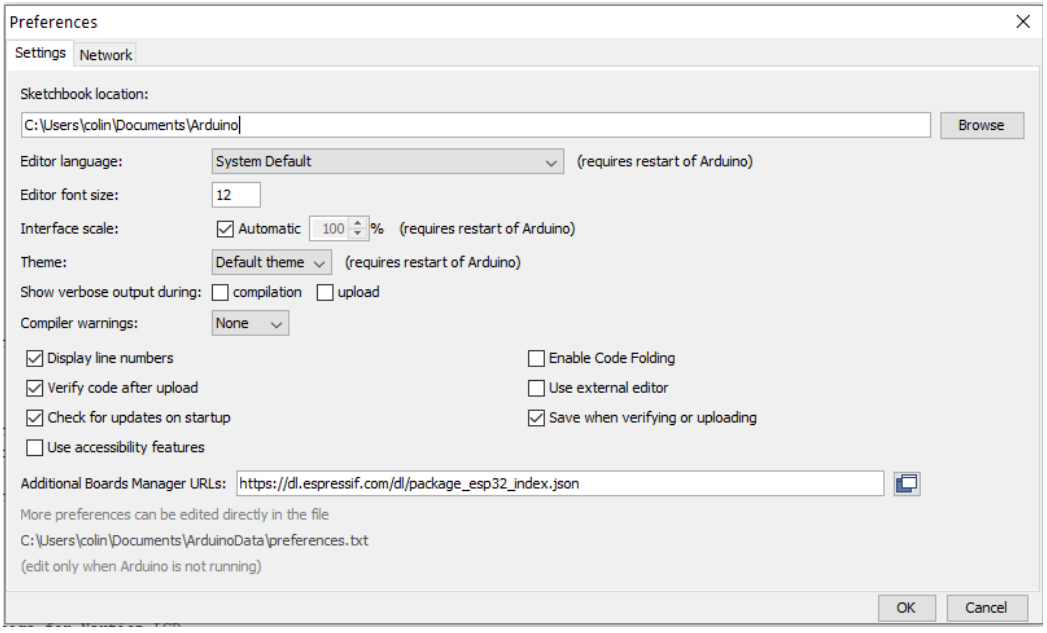
The Arduino IDE is simply a software authoring tool which allows us to write code for a large number of different development boards and upload the code to many different processor development boards including the ESP32 we are using..

Installing and setting up the Arduino IDE

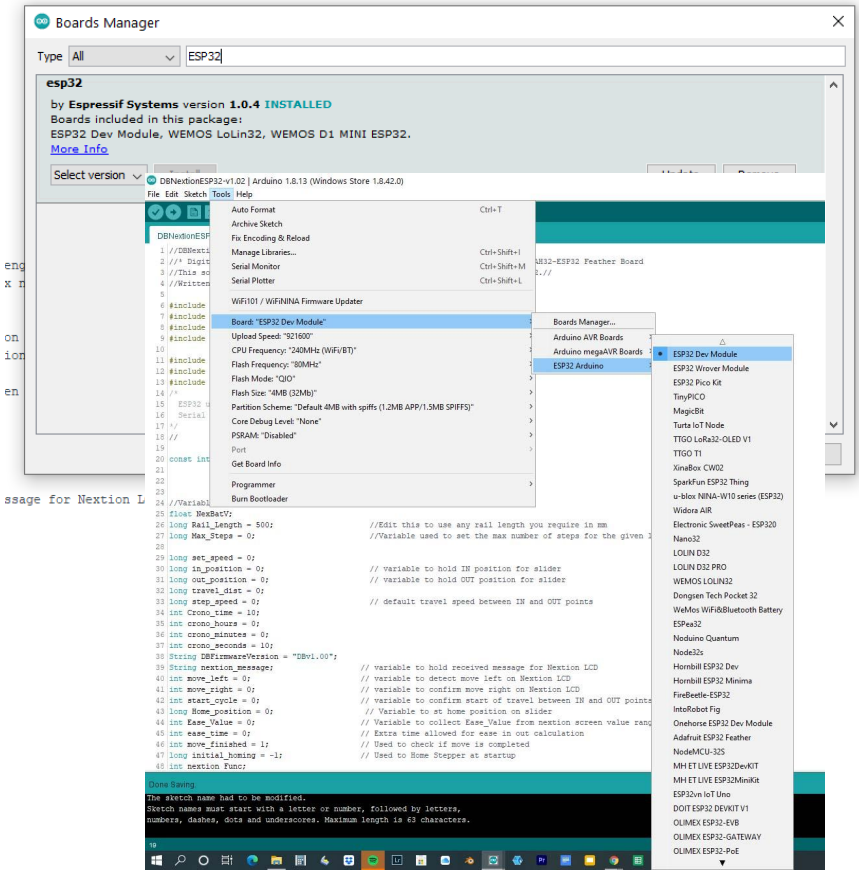
1. Download the Arduino IDE here:https://docs.arduino.cc/software/ide-v2 and install it on your computer.



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 now see the listing for the ESP32 drivers.
4. Depending on which board we are installing 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.

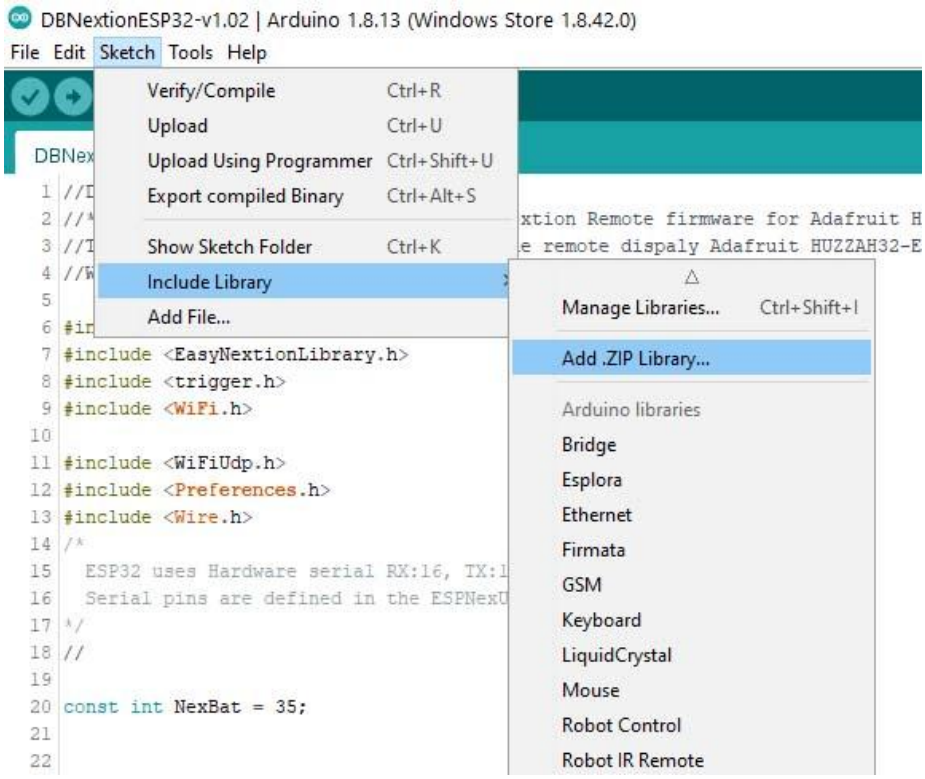
   Note it is important that you use the version of these libraries supplied in the Digital Bird folder and not any other updated versions. Libraries are frequently updated by developersit is not practical to expect the Digital Bird software to

keep pace. Only the library versions supplied in the Digital Bird repository are guaranteed to work!

- FastAccelStepper.h (To control the stepper Drivers)
- AS5600.h (For the AS5600 magnetic encoder)
- EasyNextionLibrary.h (For control of the Nextion display. Not the version zipped in the digital bird directory has added triggers which we require. Do not install this from the board manager)

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.

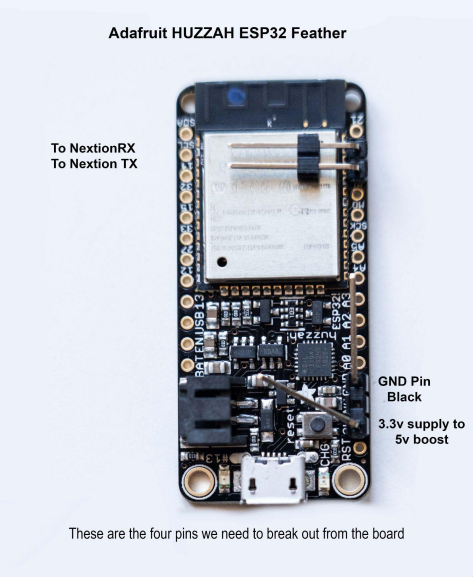
You will need:

- **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

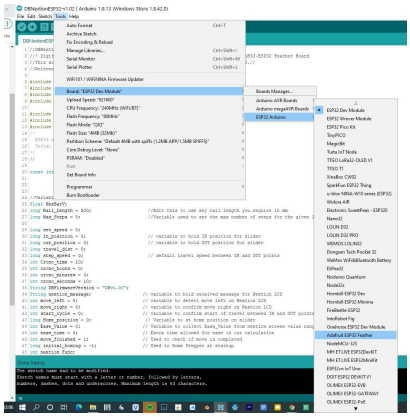
- **Your own 3D printed case** files downloadable from **Thingiverse Installing to the Adafruit HUZZAH 32 Feather**

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.



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.

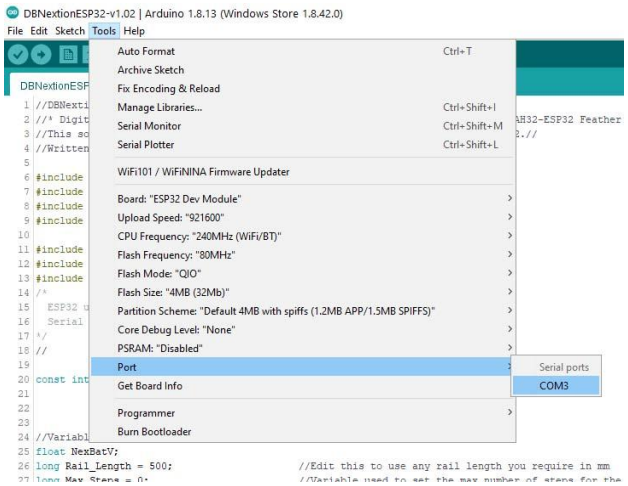
   navigate to **<Tools> <Board> <ESP32> <Adafruit ESP32 feather>**



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>

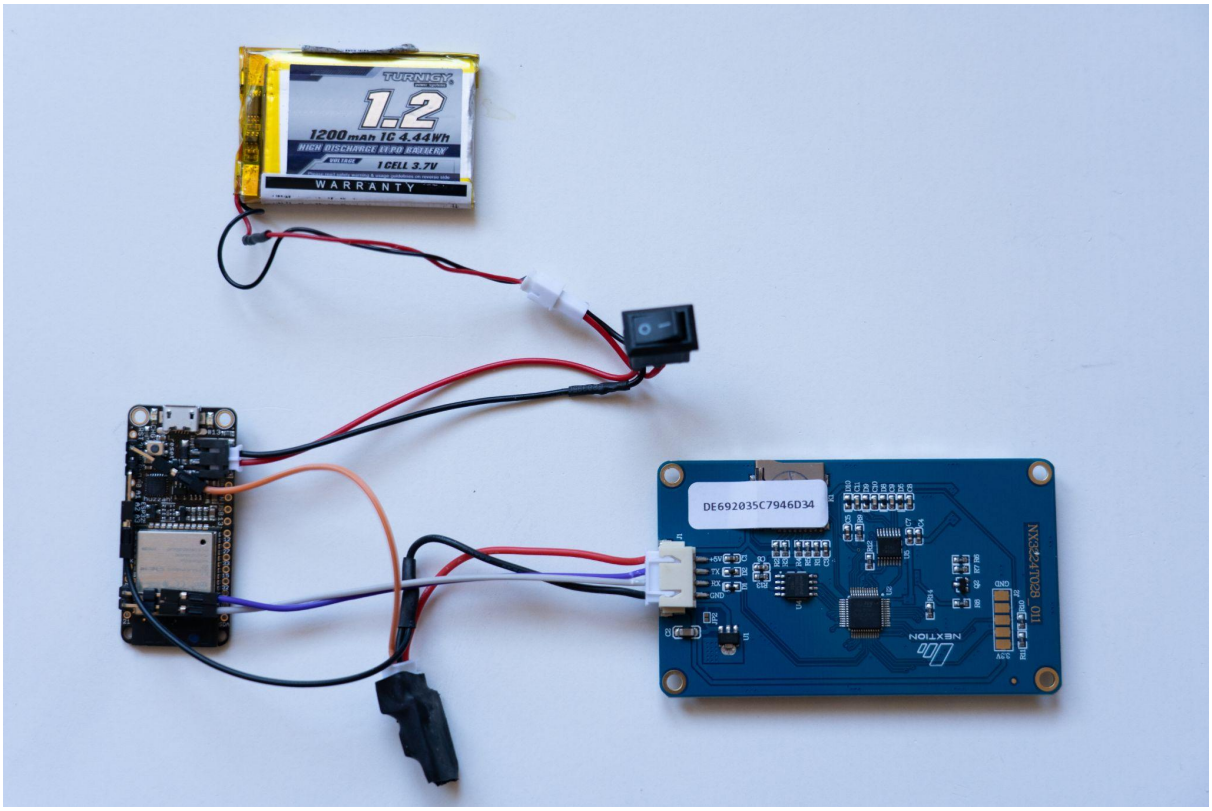


5. Finally Install the software to the board by selecting **<Sketch><Upload>** The system will compile the software, connect to your board and upload the code. If the compiler comes back with any errors make sure you have performed all the previous steps correctly. If the error is not obvious send me 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.

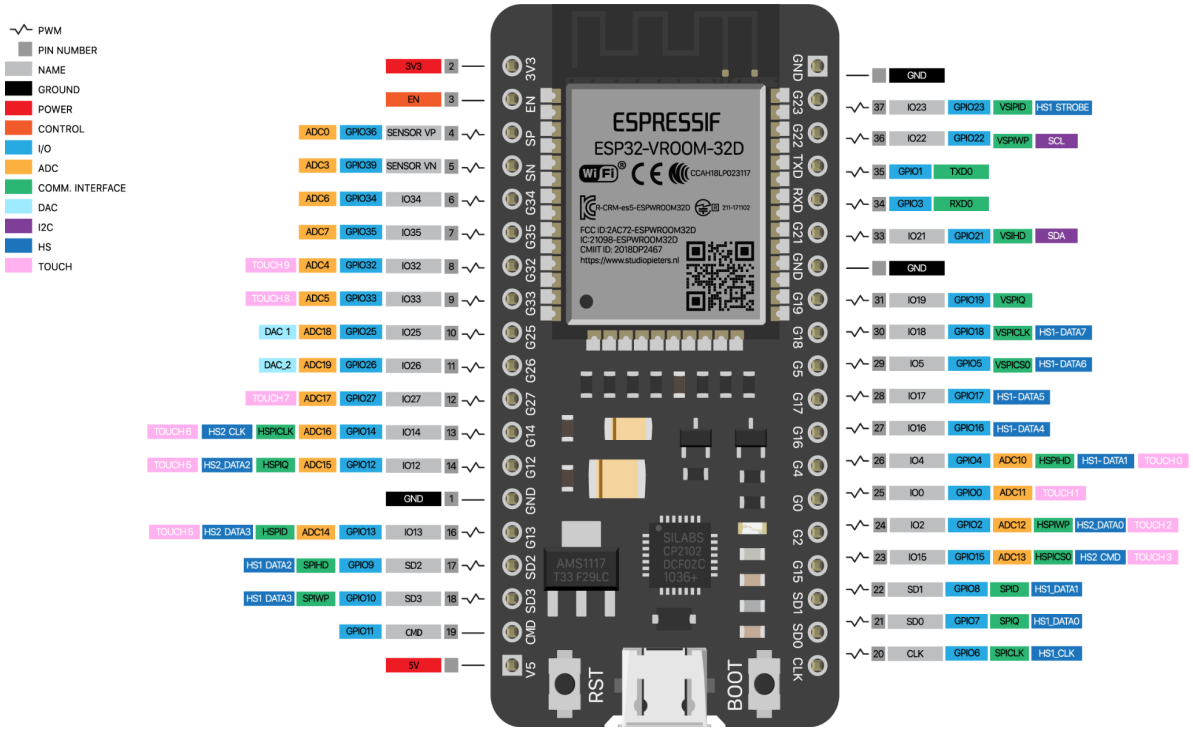
4. **That's it!** Unplug all the cables and install everything in your 3D printed case.

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)

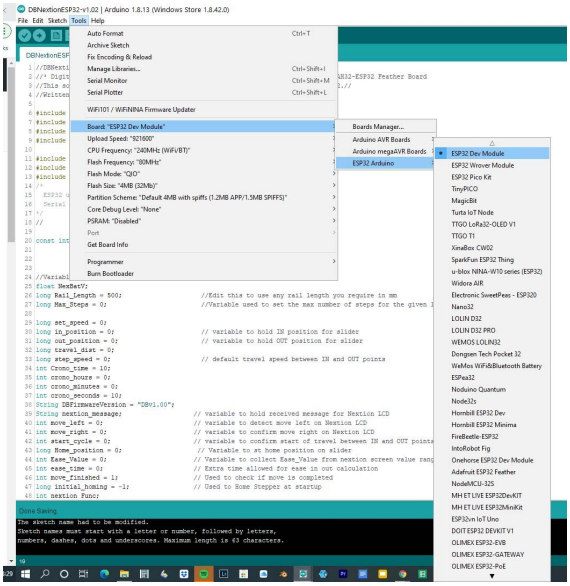
Unlike the Arduino boards the ESP32 boards come with many different pinouts and pin spacings in a number of different form factors and it is important to find one which matches the pinouts used on the digital Bird motherboards. If your kit was supplied with the ESP32 installed you do not have to install 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.

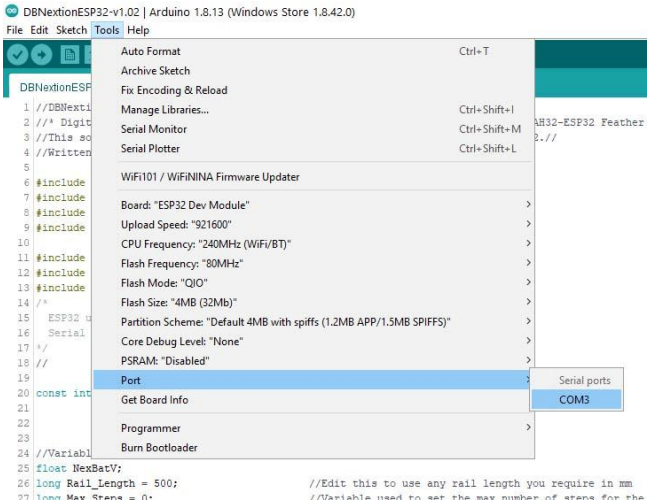
   navigate to **<Tools> <Board> <ESP32> <ESP32 Dev Module>**



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: It is common that the ESP32 boards 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 as the install takes place . On the feather board you don't normally have to do this.

INSTALLATION FOR BALANCED PAN TILT HEAD , VIDEO TURNTABLE and Mini JIB

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.

- Balanced Pan Tilt head **“DB_PanTilt_B-v*.**.ino”**
- Video turntable **“DBturntableESP32-v*.**.ino”**
- Mini Jib **“DBJIB_v*.**.ino”**

Installation for DB3 VISCA PAN TILT HEAD

There are two processors on the DB3 VISCA system. The main processor is in the main body of the head behind the battery compartment. Firmware installation on this processor is the same as all the other parts of the Digital Bird system.

DB3 Main processor: **DB3_PTZ_v*.**.ino**

The second process is in the VISCA Base. which uses a WT32 processor board. Note this firmware is installed just like all the others however because the WT32 has no native USB port we are using the installed FTDI board which is accessed from the underside of the Base unit.

The important difference here is that you must press the small black button on the base and keep it pressed until you have inserted the mini USB cable. This places the board in program mode ready to receive the update.

VISCA base decoder firmware is **“DB3_VISCA_Decoder_v*.**”**

Troubleshooting

Pan Tilt Head

An axis moves but is juddery

- For severe judder 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.

- If you are experiencing very small judders when the motors are moving slowly this may mean that your timing belt is too loose on the gears.Try tightening the tension on the belt.

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

DB3 VISCA PTZ HEAD

Cannot connect head to network

The DB3 follows the following startup process

1) The head performs its homing setup (This must complete successfully)
2) The main upper cpu passes the current IP address down to the cpu in the VISCA base using the UART port.
3) The visca base connects to the network using the supplied IP.

There are three pieces of information that determine the success of that connection.

- An available IP address which matches the controlling computers IP in all but the last part. So if your computer or controller has an IP of **192.168.137.1** then the DB3 must have an IP of **192.168.137.X** where X is any available IP not already in use on your network. I generally start at about 80.
- The controller/ Computer IP known as the Gateway this would be the **192.168.137.1** address in the above example.
- The UDP port number should always be **1259**.

Not it is important that when you set up the head from OBS, vMix, or a PTZ controller that you select VISCA (UDP) in the setup options and ensure the UDP port is set to 1259

Tip: When you first plug your DB3 head into the network you will only see one light on the POE switch port. When the DB3 completes its homing setup and supplies the IP to the VISCA base you should see two lights on the port. Remember the network switch must provide POE power. A non POE switch will not work since the VISCA base is only powered by POE not the battery. This is by design.

OT Pan Tilt head stalls for a second when moving from a forward down position to a backwards looking up position.

- This is caused by backlash in the tilt motor gearbox even in a high precision gearbox there is always some backlash noticeable when the gears change direction or as in this case the weight distribution of the camera changes from a forward position to a backward position on the arm.
  The backlash amount may be tiny at the gearbox but is amplified by the length of the lever arm.
  Unfortunately despite many attempts at mechanical fixes for this problem the backlash persists. However there is a simple work around which solves the problem for us and that is to move the camera further forward on the mount. By changing the weight distribution on the arm this has the effect of stalling the point at which we witness backlash typically when the arm is at its highest point until a little after the arm has gone past this point and weight distribution has already taken place with no notiple stall!
  No backlash motors do exist in the form of harmonic drives however these are extremely expensive and rather bulky.
  In short, move the weight of the camera forward on the mount until the stall is not apparent for the move!

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

regarding which side the positive and negative are on. If this is incorrect you may have blown your feather board and possibly your charging board.

- 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?