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## Overview

This document covers the steps and components needed to enable KDECAN on the Pixhawk (PX4) and Pixhawk 2.1 (CUBE). The configuration steps for Pixhawk flight controllers, hardware, and software are explained in further detail. For more information about KDECAN, refer to the KDECAN Protocol Document.

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### Quick Start and Requirements

Hardware required:

- KDE UVC series ESCs
- KDE CAN bus wiring kit
- Pixhawk 2.1 (CUBE) or Pixhawk (PX4)
- SiK telemetry radio (compatible with Pixhawk) \*as per Pixhawk recommendations.

Software required:

- ESC firmware (D460117\_1012.dfu or above)
- KDE Device Manager (KDE\_Direct\_Device\_Manager\_V134.5.exe or above)
- Pixhawk firmware (arducopter.px4)
- Mission Planner (MissionPlanner.exe)

*KDECAN is compatible with ArduPilot Copter-4.0 (and higher), Plane-3.10 (and higher), and Rover-3.5 (and higher).*

### Setup Guide:

- 1) Correctly wire the ESCs to connect the CAN bus network.
- 2) Connect and test the telemetry radio.
- 3) Update all ESCs with the latest firmware supporting telemetry, and assign each ESC an ID using the KDE Device Manager.
- 4) Update the Pixhawk with the latest firmware supporting telemetry, and go through the initial configuration via Mission Planner.
- 5) Set CAN\_P1\_DRIVER to 1. For Copter-4.0, set CAN\_D1\_PROTOCOL to 2. For Copter-4.1.0-beta2 and above, set CAN\_D1\_PROTOCOL to 8. Write the parameters, and then restart the Pixhawk by unplugging and then reconnecting power.
- 6) Connect to MAVLink 2 via the telemetry COM port to view telemetry of the ESCs.

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### Wiring Schematic

*Warning: Incorrect wiring can result in damage to the flight controller or ESC.*

Using the KDE CAN bus wiring kit will ensure that the network is correctly wired. Each CAN bus network must contain a master, one or more ESCs connected to the master, and a 120 Ohm terminating resistor.

Refer to the wiring diagrams below for reference.

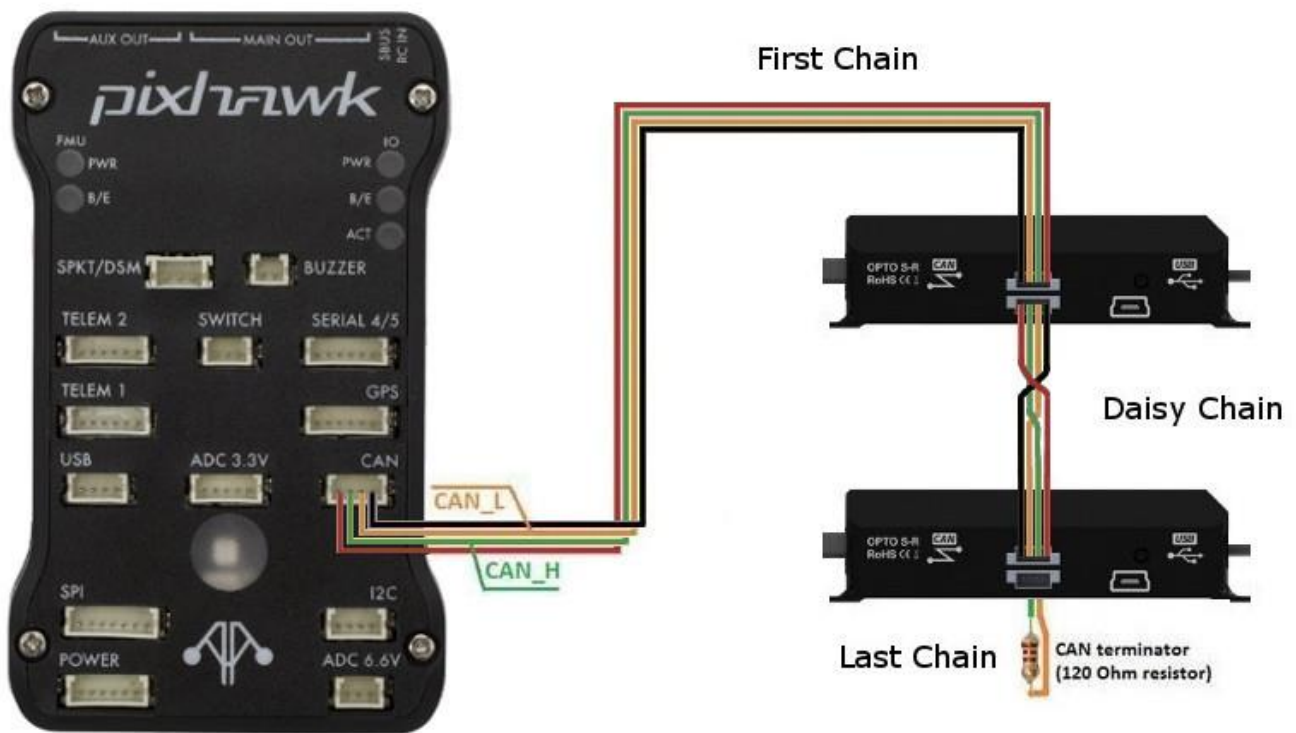


Figure 1: Pixhawk (PX4) CAN bus example.

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Figure 2: Pixhawk 2.1 (CUBE) CAN bus example.

*Note: 3.3V CAN transceivers are fully interoperable with 5V CAN transceivers.*

*Note: If using Pixhawk 2.1, connect to port CAN2 as the ports are incorrectly labelled.*

### Update ESCs and Assign IDs

Run the KDE Device Manager installer and connect the first ESC to a computer via the USB cable provided with the ESC. The first ESC represents the ESC that is directly connected to the Pixhawk.

Update the ESC by clicking “UPDATE FIRMWARE” and selecting the firmware from the extracted zip folder. Select the “FIXED” checkbox, assign the ESC ID with “ID 02”, and click “SEND SETTINGS”. Mark this ESC as the first ESC, and disconnect it from the computer.

Refer to the KDECAN protocol document for more information.

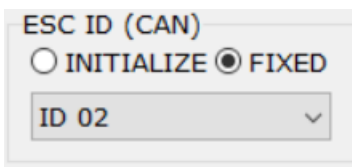


Figure 3: ESC Unique ID.

Connect the next ESC that will be directly connected to the first ESC, and update the firmware with an ID assignment of “ID 03”. Send the settings, and proceed to repeat the steps with incrementing IDs for all ESCs in the CAN network.

### Update Pixhawk Firmware and Mandatory Hardware Configuration

*Warning. Early Pixhawk (PX4) models have a processor bug that is unable to support firmware files larger than 1MB. The Pixhawk 2.1 (CUBE) is unaffected by this bug. This video will show how to check for affected units. <https://diydrones.com/forum/topics/pixhawk-1mb-flash-limit>*

Open the “MissionPlannerPortable” folder, and run the program “Mission Planner.exe”. Next, connect the Pixhawk to the computer via USB cable. The firmware needed for telemetry is included in the extracted folder. Update the Pixhawk with the “Arducopter.px4” file to enable telemetry. Navigate to “Initial Setup (Hardware Config)” and “Install Firmware”. Select “Load custom firmware” and select the PX4 firmware file mentioned earlier. Click “Stats...” located in the top right of the screen, and ensure MAVLink 2 is check marked. Connect to MAVLink 2 via the “Connect” button in the top right corner of Mission Planner. Go through and finalize the initial setup with the options in “Mandatory Hardware” located in the “Initial Setup”.

For more information and questions about Mandatory Hardware and the Initial Setup section, refer to the [Ardupilot documentation](#).



### Enabling KDECAN through Mission Planner

To enable the CAN bus port and use the KDECAN protocol driver, verify MAVLink 2 is connected, and select “Config/Tuning (Software Config)” and navigate to the “Full Parameter List”. Scroll down to “CAN\_P1\_DRIVER”, set it to “1”, and then scroll to “CAN\_D1\_PROTOCOL” and set it to “2” for Copter-4.0. Set “CAN\_D1\_PROTOCOL” to “8” for Copter-4.1.0-beta2 and above. To accurately measure mechanical RPM, change the parameter of “CAN\_D1\_KDE\_NPOLES” and set to the number of magnetic motor poles on the motor. This can be found under the motor’s “Specifications” tab on the motor webpage, or on the motor in the format of “##P”. Finally, select “Write Params”, reboot the Pixhawk, and connect to MAVLink 2 via the telemetry port.

### Telemetry Radio Configuration

*Warning. Not all telemetry radios are compatible with the Pixhawk (PX4) and the Pixhawk 2.1 (CUBE). Refer to the telemetry radio’s manual for full compatibility details.*

The Pixhawk should now be connected to an external power source and wired to the telemetry radio. Connect the telemetry receiver to the computer and verify it is connected and that MAVLink 2 is still enabled. The telemetry radio requires changing the Baud Rate from the standard 115,200 to 57,600. To enable telemetry, navigate to “Config/Tuning (Software Config)” and “Full Parameter List”. There set “SERIAL1\_PROTOCOL” to “2”. This will enable telemetry use by MAVLink 2.

Refer to Ardupilot’s SiK documentation for trouble shooting setup information.

### Viewing Live Telemetry

The Pixhawk will now send CAN bus messages. If it is not doing so, go back through the steps and verify all settings and parameters have been implemented. The Pixhawk initially looks for ESCs on the network before MAVLink 2 can connect. Allow up to 20 seconds for this process to complete.

While connected to MAVLink 2 via the telemetry COM port, the ESCs' live telemetry via "Flight Data" -> "Status" can be viewed numerically. Each ESC has numerous fields marked (escX\_volt, escX\_curr, etc) with X indicating the ESC's ID. The fields indicate the ESCs' voltage, current, rpm, and temperature. To view the telemetry graphically, click the "Tuning" checkbox, double click the empty graph, and then select up to ten parameters to populate the graph.

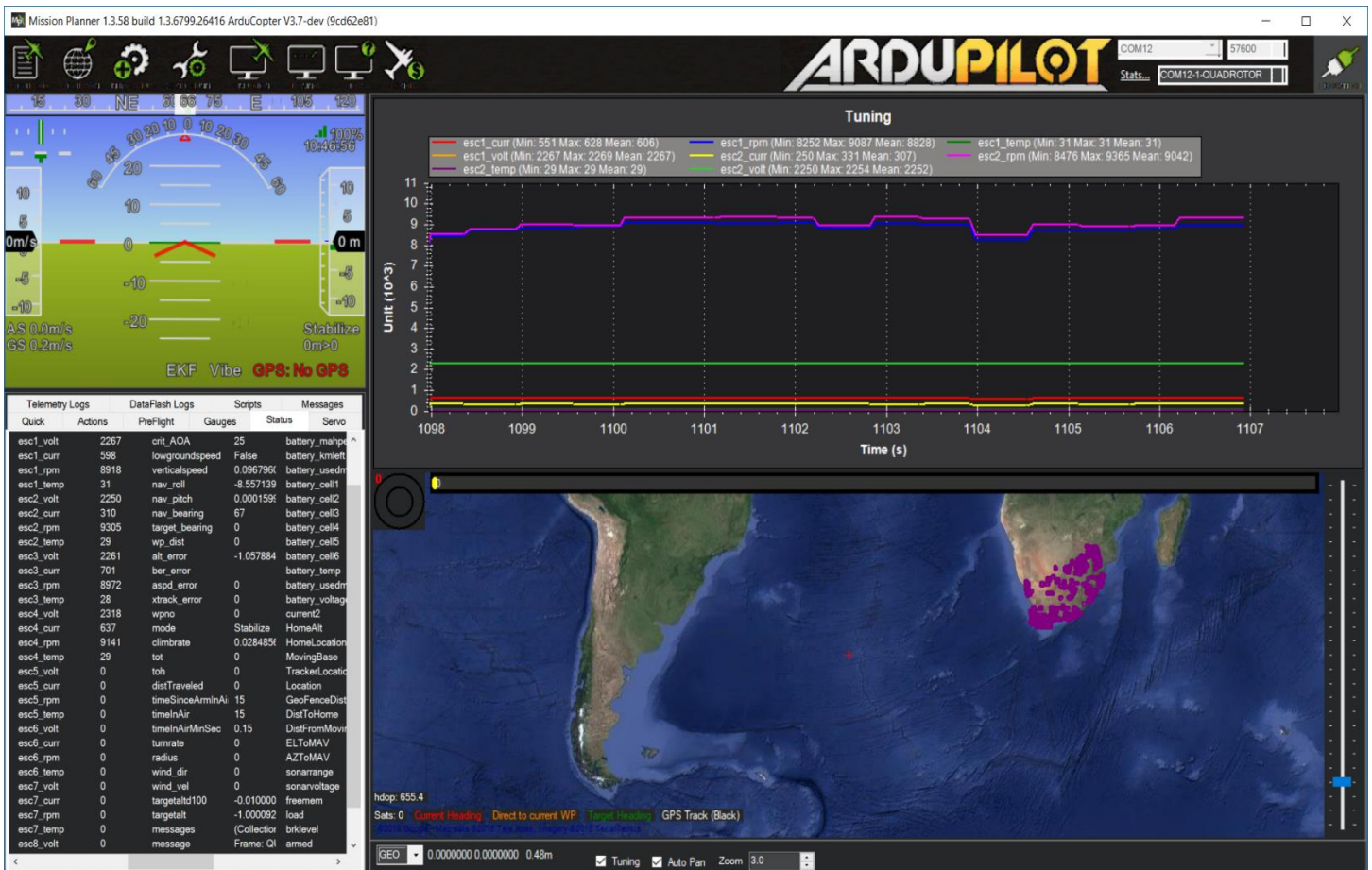


Figure 4: Pixhawk telemetry window.