
1x PDI Tuning

Release 6.8.71

Embention

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1x | PDI TUNING

1x PDI Tuning allows to adjust autopilot control laws during actual flight.

QUICK START

1x PDI Tuning is the application tool that allows the user to manage the control laws of the autopilot 1x during operation by adjusting each of the P (proportional) I (integral) D (derivative) gains.

Once 1x autopilot has been detected on [Veronte Link](#), install **1x PDI Tuning**.

1.1 Download

Once the **Veronte Autopilot 1x** has been purchased, a GitHub release should be created for the customer with the application.

To access to the release and download the software, read the [Releases section](#) of the **Joint Collaboration Framework** manual.

1.2 Installation

To install **1x PDI Tuning** on Windows just execute “1xVerontePDITuning.exe” and follow the indications.

1. Click on Next:

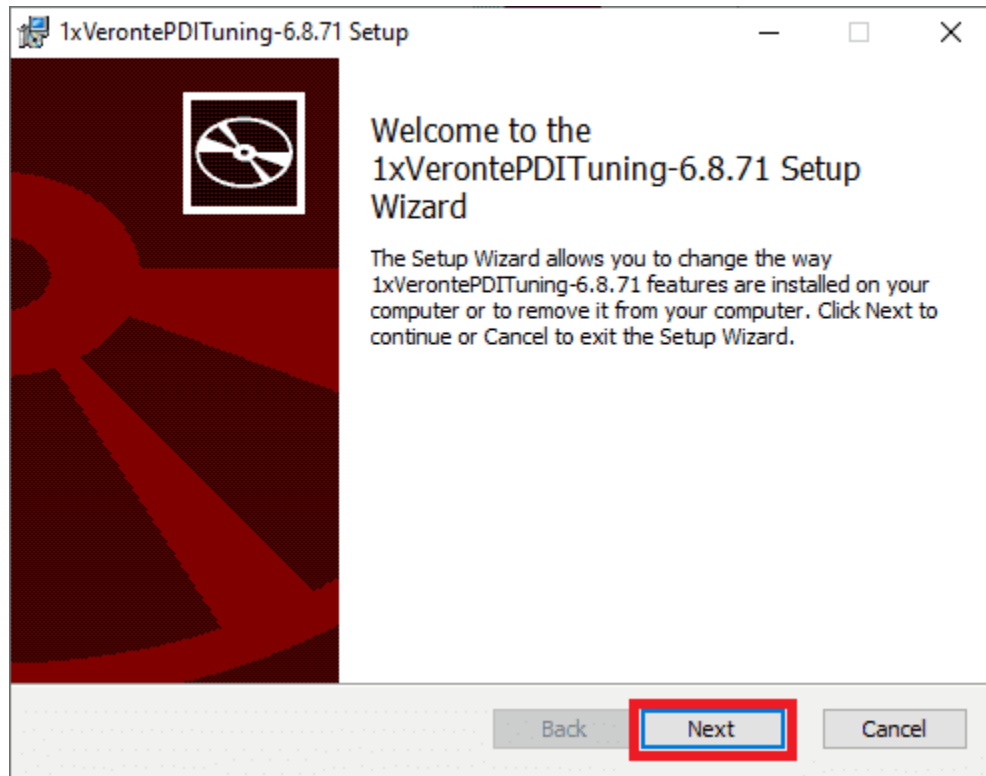


Fig. 1: Windows Installation - Step 1

2. Read and accept the EULA (End-User License Agreement):

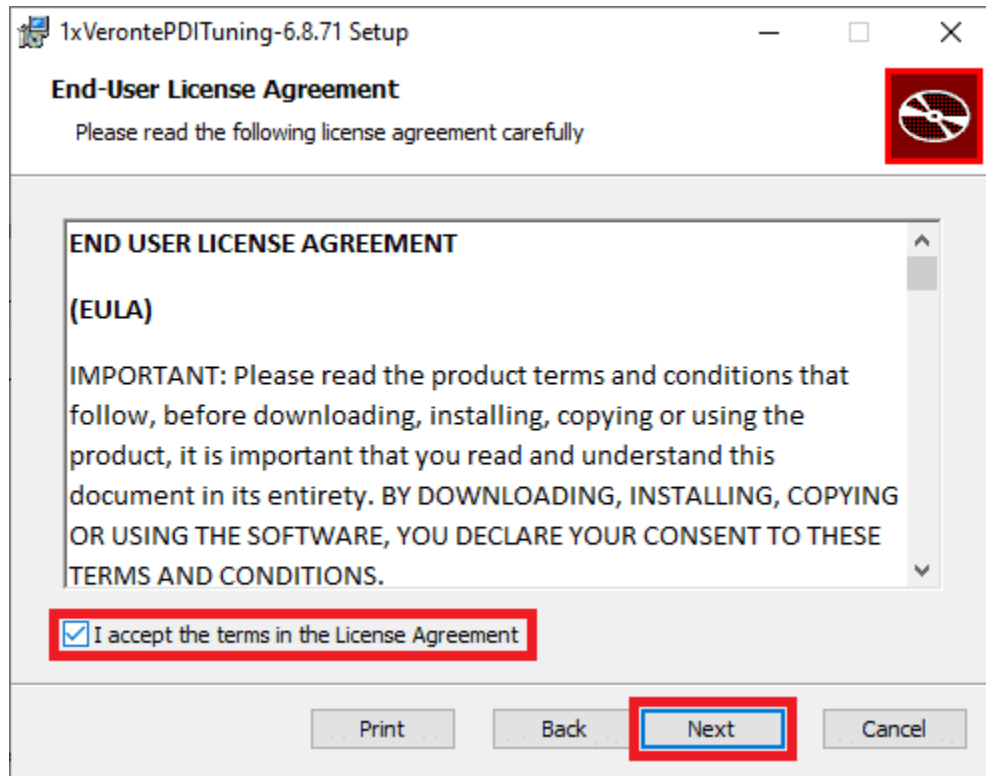


Fig. 2: Windows Installation - Step 2

3. Select the desired directory where the software will be installed and click on next.

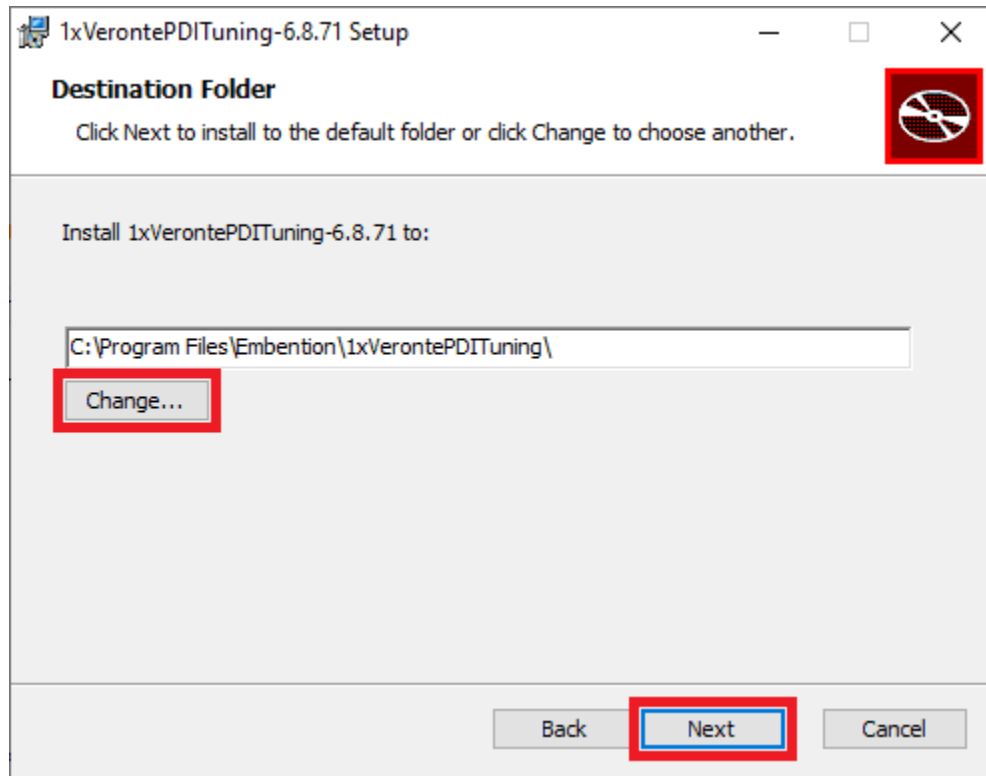


Fig. 3: Windows Installation - Step 3

4. Finally, click on **Install** (administrator rights are needed):

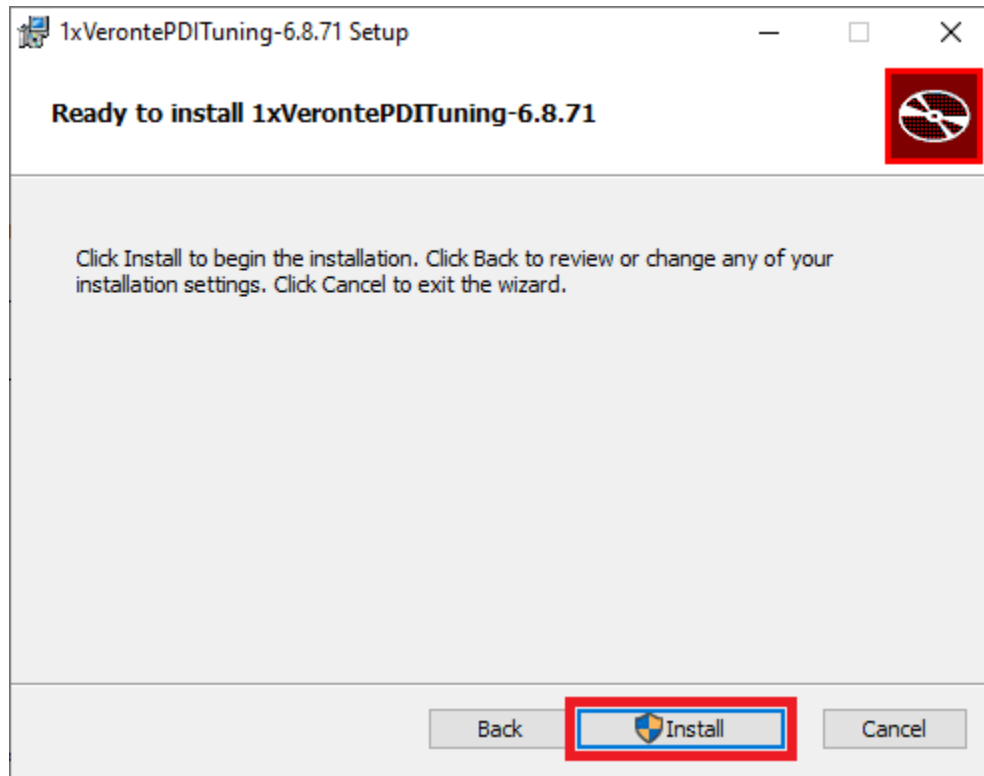


Fig. 4: Windows Installation - Step 4

5. After a few seconds, the following window will appear indicating the process was successful. Click on **Finish**:

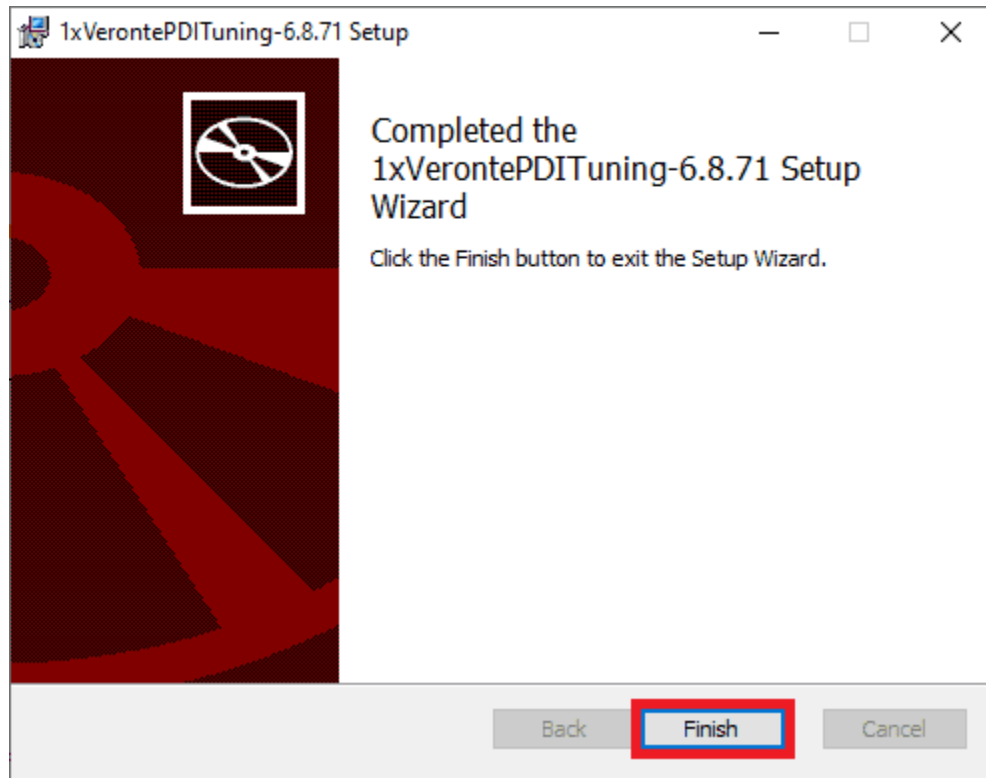


Fig. 5: Windows Installation - Step 5

Warning: If users have any problems with the installation, please disable the antivirus and the Windows firewall. Disabling the antivirus depends on the antivirus software.

To disable the firewall, go to "Control Panel" → "System and Security" → "Windows Defender Firewall" and then, click on "Turn windows Defender Firewall on or off".

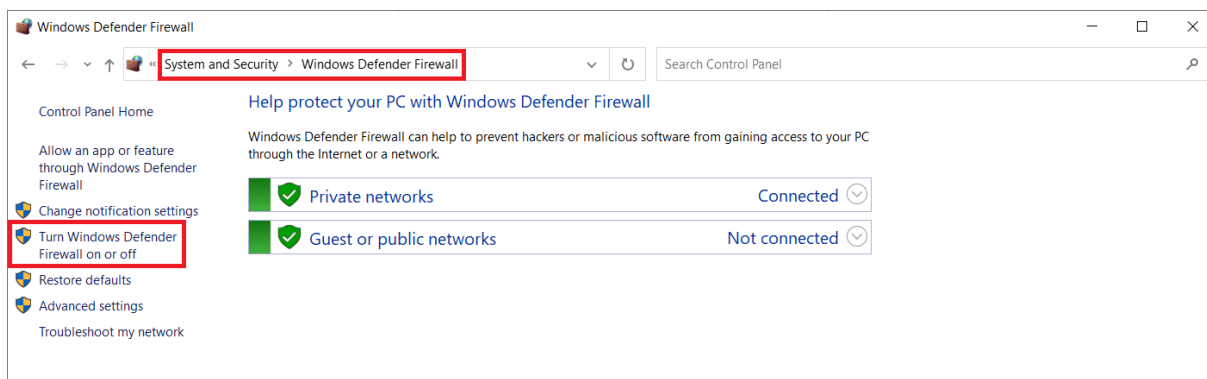


Fig. 6: Windows Defender Firewall

OPERATION

Once the installation is finished, open **1x PDI Tuning** and select the unit.

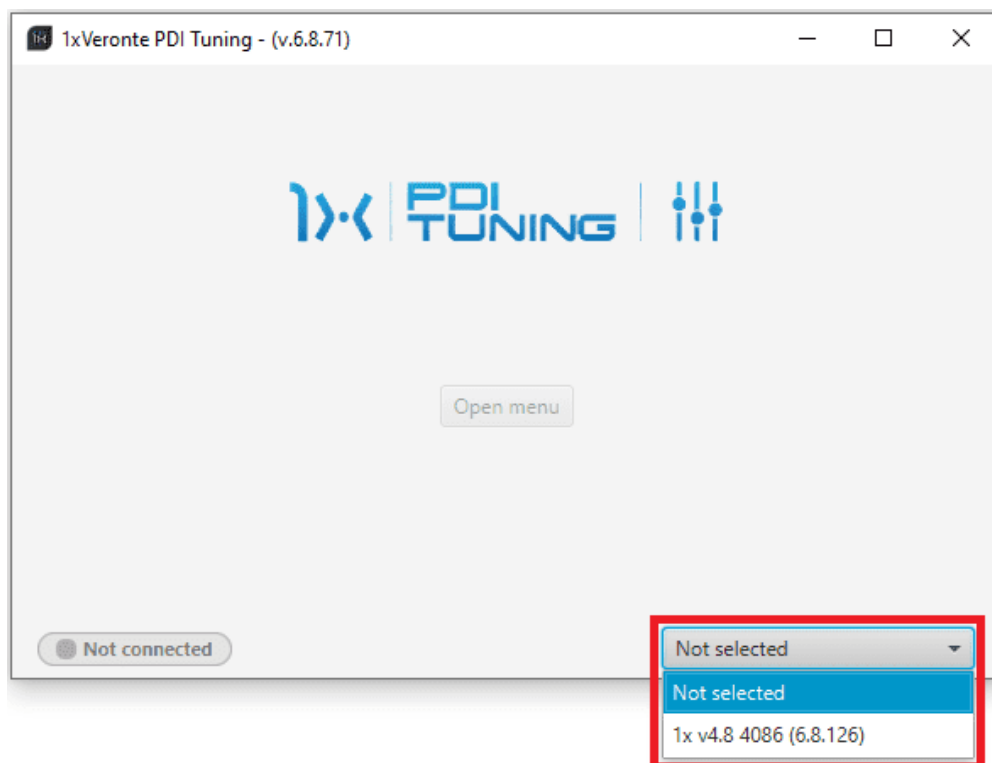
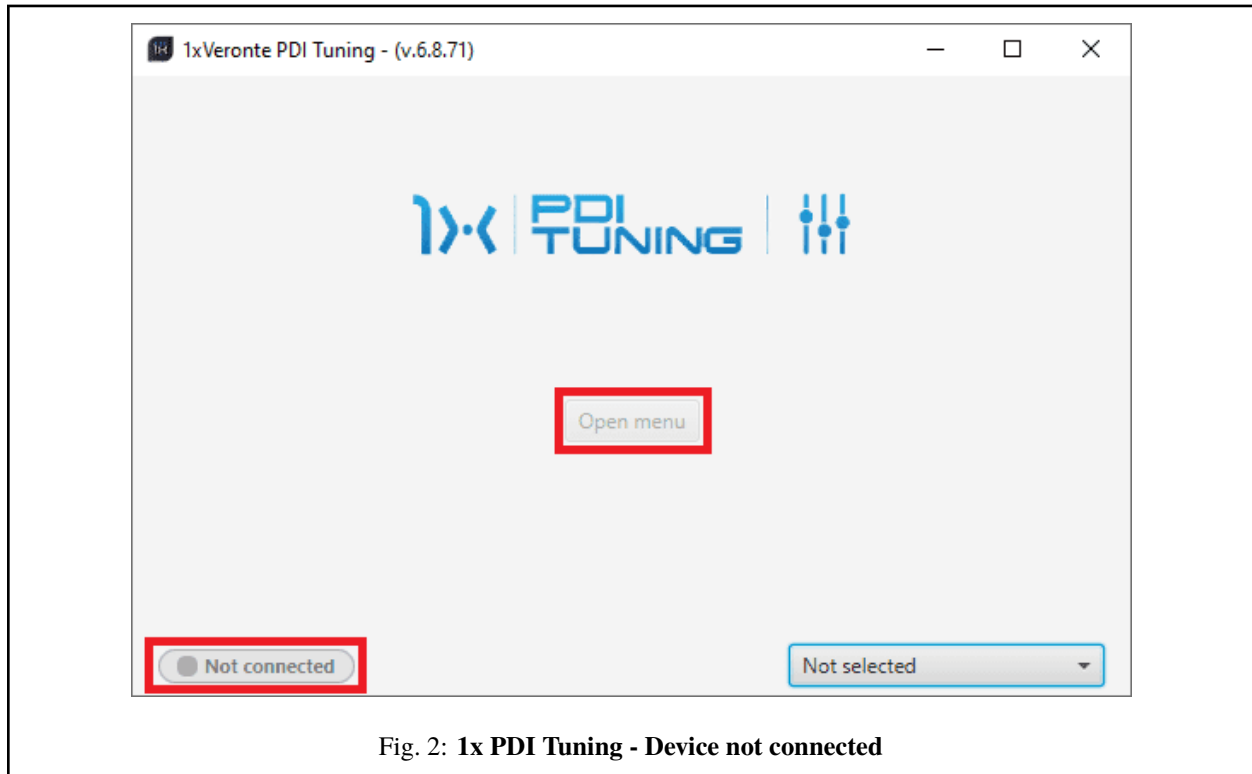


Fig. 1: Select device

Warning: If no unit is connected, e.g. when working offline, it is not possible to access the menus of the **1x PDI Tuning** software.



If it is correctly connected, it should appear in **Normal mode** as shown in the following figure.



Fig. 3: 1x PDI Tuning

Note:

- 1x unit can also appear as: Maintenance mode, Maintenance mode (loaded with errors) or Normal mode - Disconnected.
- **Maintenance mode (loaded with errors)** appears when something is wrong in the configuration.

The user can now access the software by clicking on '**Open menu**'. Then, the following window will be displayed:

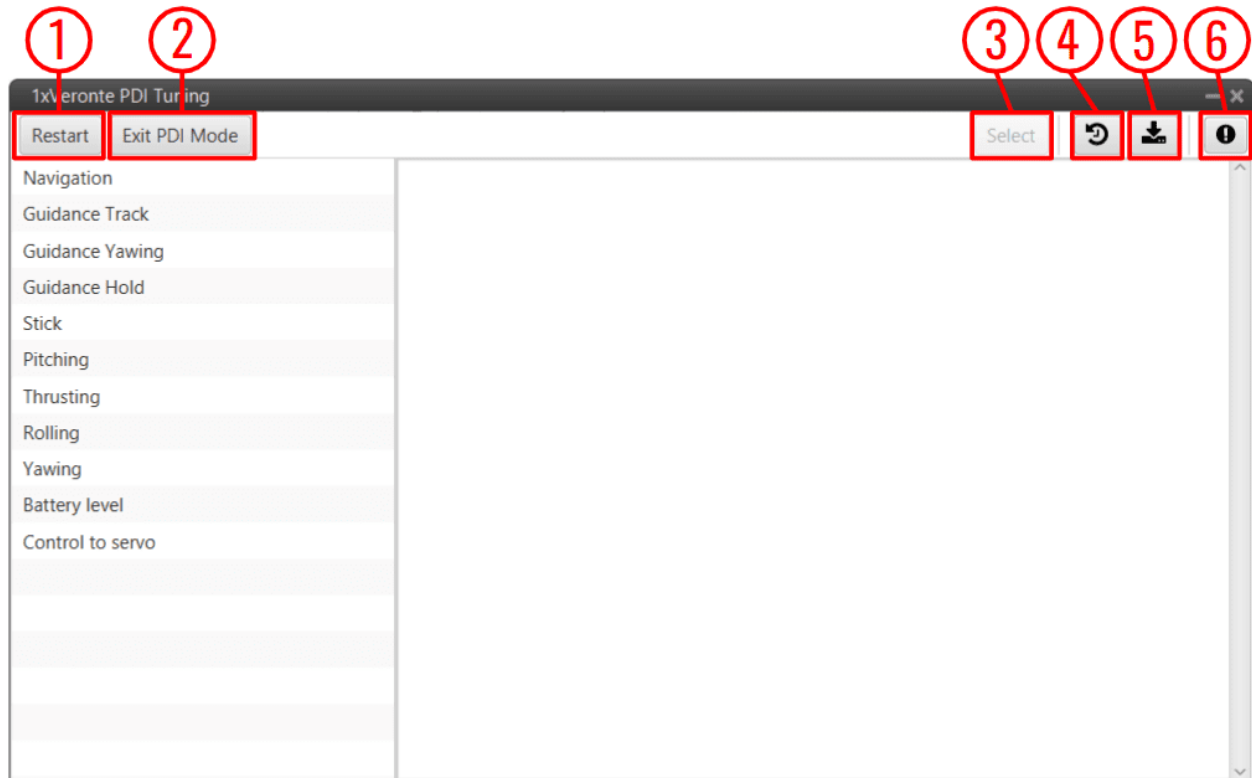


Fig. 4: **Initial menu**

1. **Restart device** button: This resets Veronte Autopilot 1x.

To prevent the user from inadvertently restarting the autopilot, the following confirmation message appears:

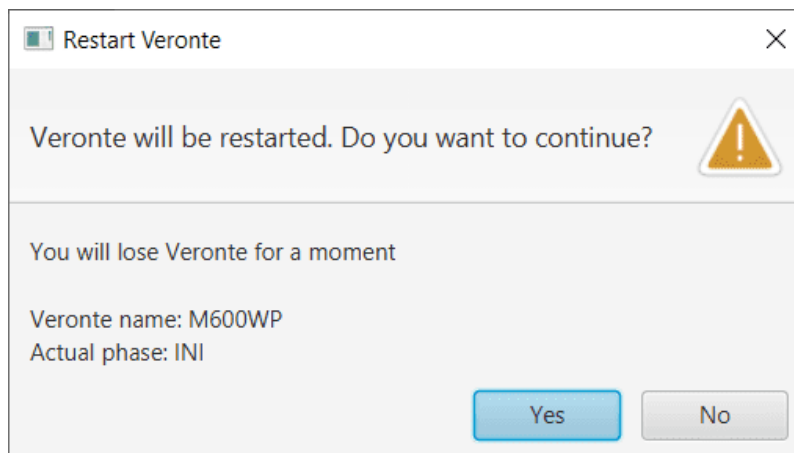


Fig. 5: **Restart confirmation message**

2. **Change PDI mode** button: Users can **exit/enter in PDI mode** by simply clicking this button. Please note that to change mode it is also necessary to reset 1x autopilot.

To prevent the user from inadvertently exiting/entering in PDI mode and consequently resetting the autopilot, the following confirmation message is displayed:

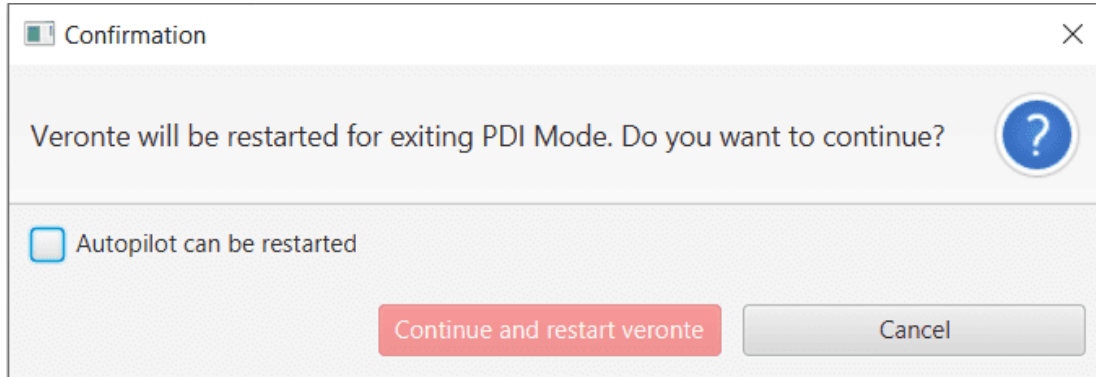


Fig. 6: **Exit PDI mode confirmation message**

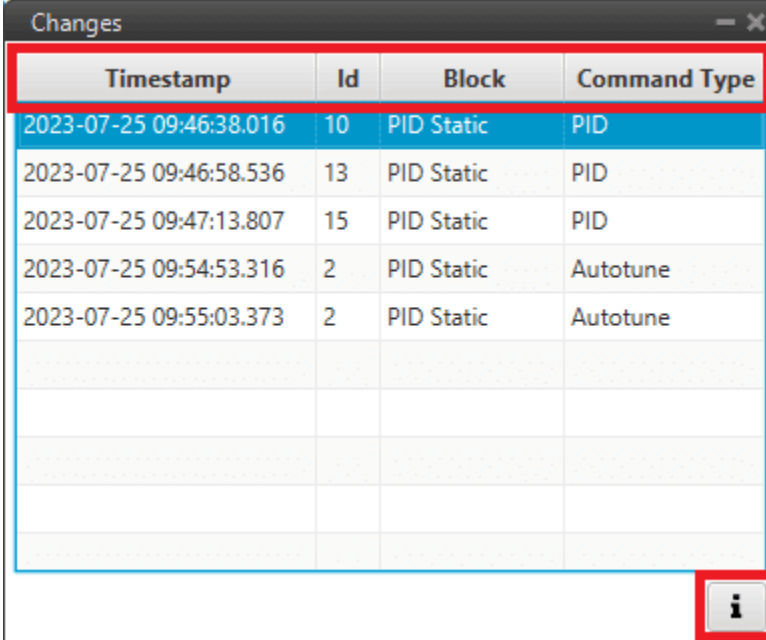
For more information on PDI mode, please refer to its explanation in the [Veronte section](#) of the **1x PDI Builder** user manual.

3. **Select** button: After choosing the **PID block** to be 'tunned', click here to adjust its gains.

The tuning procedure is detailed in the [Tuning section](#).

Note: If **no PID block** has been **chosen**, this **button** remains **disabled**.

4. **Access command history** button: This displays a pannel where users can consult a history of the gains that have been commanded during the tuning procedure.




Timestamp	Id	Block	Command Type
2023-07-25 09:46:38.016	10	PID Static	PID
2023-07-25 09:46:58.536	13	PID Static	PID
2023-07-25 09:47:13.807	15	PID Static	PID
2023-07-25 09:54:53.316	2	PID Static	Autotune
2023-07-25 09:55:03.373	2	PID Static	Autotune

Fig. 7: History panel

To make it easier and quicker for the user to identify each record, the history has 3 columns.

Each column gives the following information:

- **Timestamp:** Indicates the day and the time the change was made.
- **Id:** This is the identifier of the block.
- **Block:** The type of the PDI block, it can be **PID Static** or **Tsched PID**.
- **Command Type:** The type of command sent to the 1x autopilot, it can be **PID** or **Autotune**. For more information on these 2 command options, see *Tuning section*.

To access the gains commanded in the register, just **double click** on the register or **select it and then click** on the  icon.

5. **Export configuration** button: By clicking on it, the current configuration (**PDI files** including the **production** folder) saved in Veronte Autopilot 1x will be stored in the selected folder.

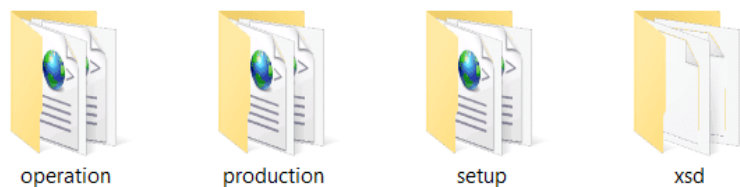


Fig. 8: Exported configuration - PDI files

For more information on the folders containing the **PDI files**, see the *initial menu* of the Configuration section of the **1x PDI Builder** user manual.

6. **Feedback** button: Users can report a problem they have encountered by **creating an issue in their own 'Joint Collaboration Framework'**. The **'Download'** button downloads a zipped folder with the current 1x

configuration and more information needed for Embention to resolve the issue. It is advisable to attach this folder when creating the issue.

Note: The user's 'Joint Collaboration Framework' is simply a **own Github repository for each customer**. To use the **Joint Collaboration Framework** read its [user manual](#).

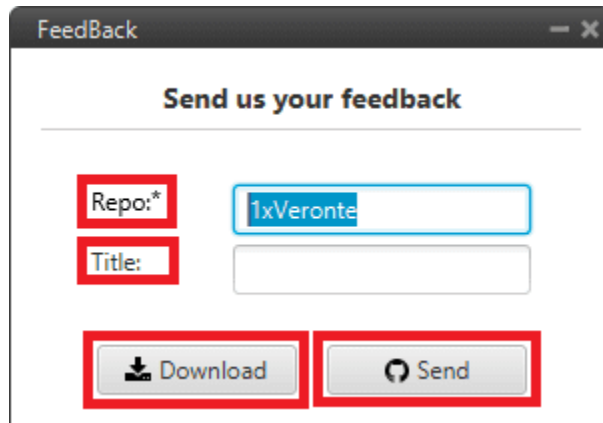


Fig. 9: Feedback

2.1 Tuning

All **Block Programs** created in **1x PDI Builder** are displayed here.

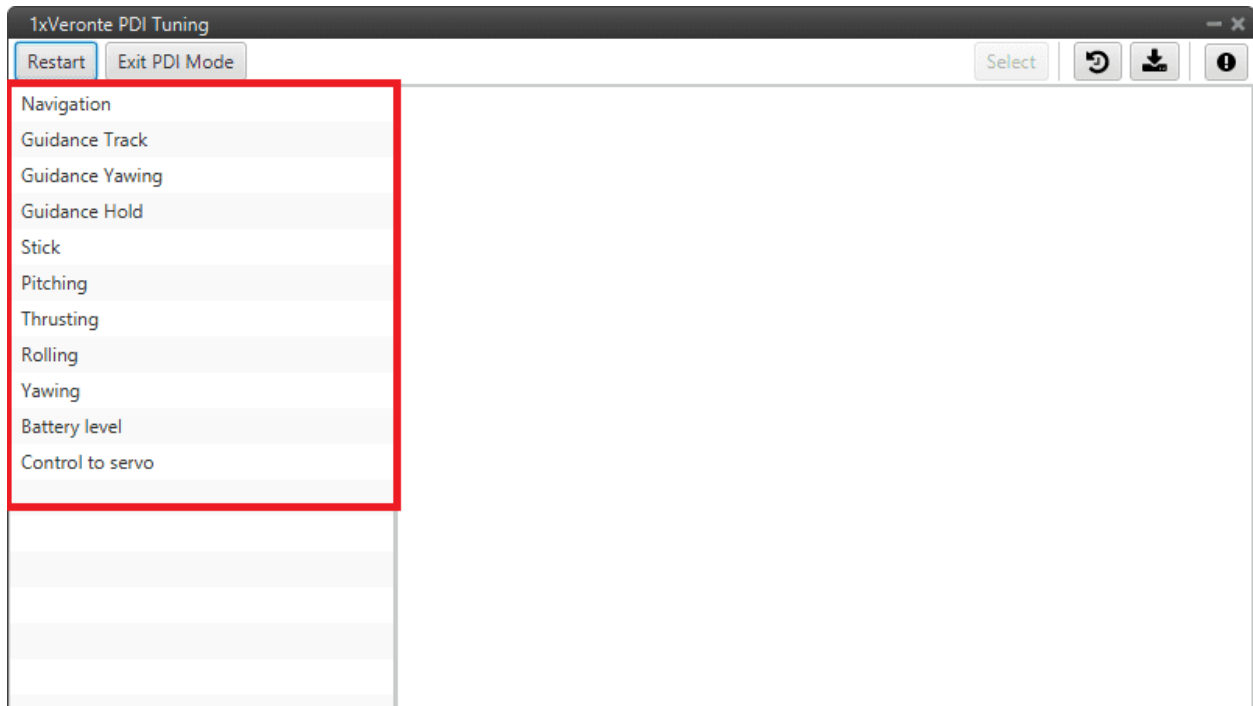


Fig. 10: Block Programs

The following steps describe how to tune the gains of PID blocks:

Warning: All changes applied are **volatile** and will be lost after resetting the system.

Once the desired values are found, it is recommended to note them on a piece of paper and then modify the block configuration in the **1x PDI Builder** software.

1. Select the program where the PID block to be tuned is located.

When the user selects it, a tree is displayed with all the blocks of that program. This tree represents how these blocks are organized in the program.

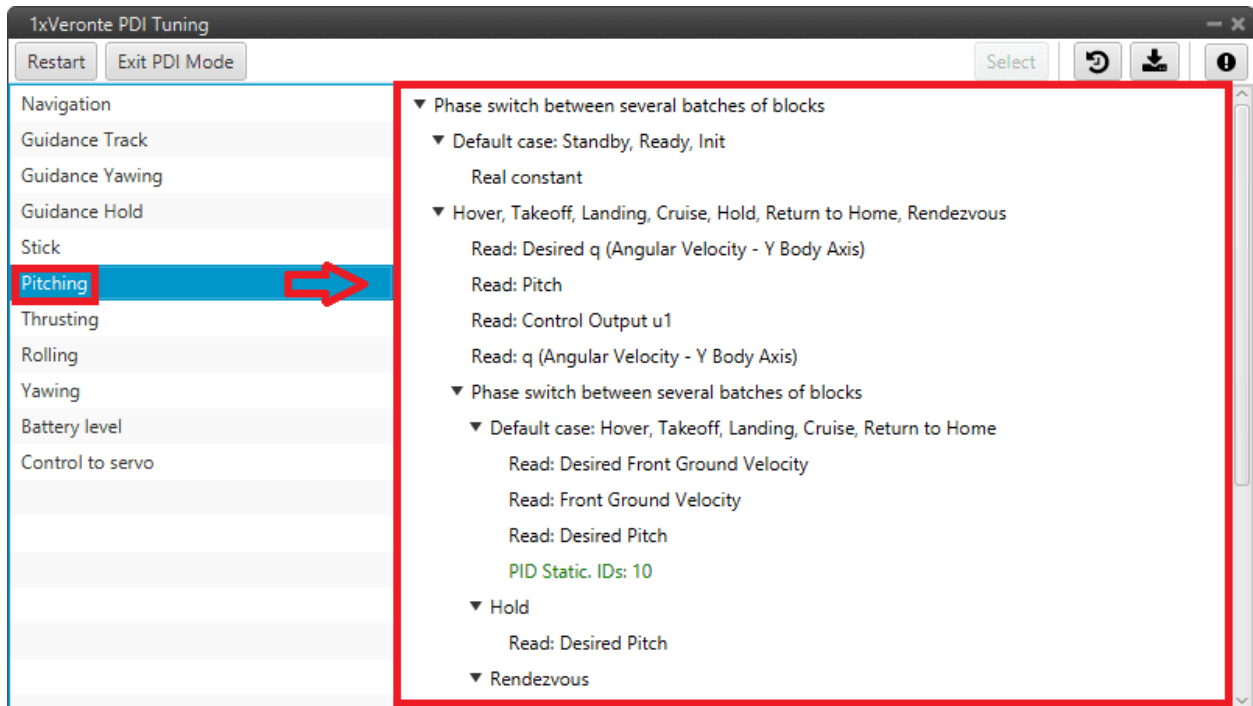


Fig. 11: Program selected - Block tree

2. Choose a valid PID block (**PID Static** or **Tsched PID**) from the tree (they are shown in green).

To do this, click on the **PID block** and then click on the 'Select' button at the top of the menu:

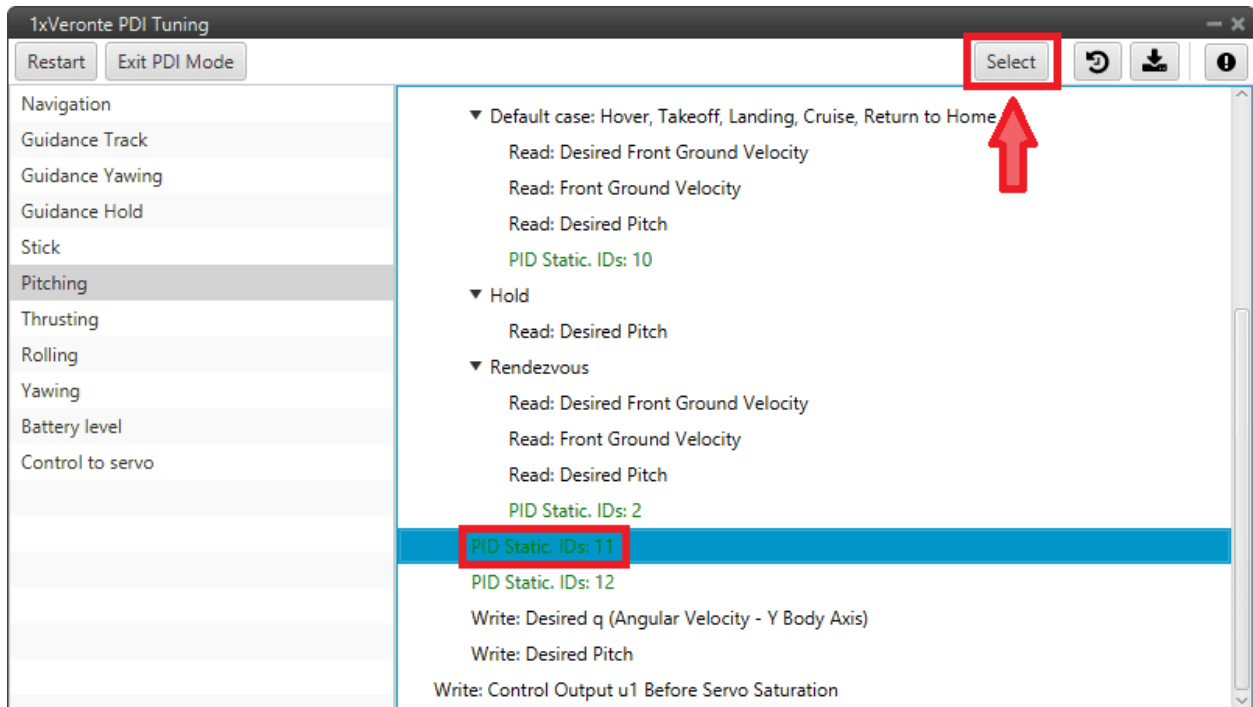


Fig. 12: PID block selected

Important:

- Only those PID blocks that have been **enabled to be commanded**, in the **1x PDI Builder** software, will appear as **valid PID blocks** in this tree.

A PID block is enabled to be commanded if the 'wifi icon' of the block is activated.

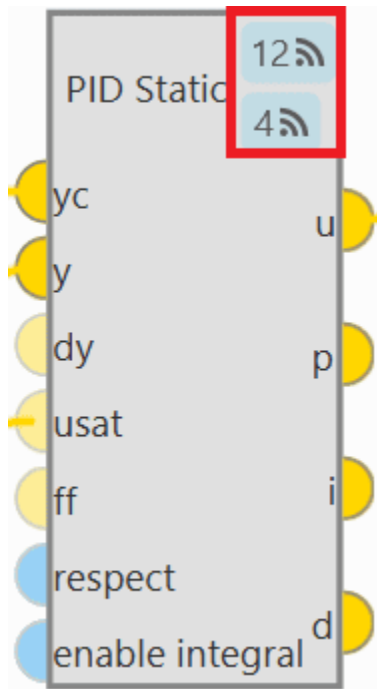


Fig. 13: PID block enable

The first icon is for enabling 'Command PID' and the second is for the 'Autotune' command.

For more information about this, see the [Control blocks](#) section of the **1x PDI Builder** user manual.

Warning: Be careful when **selecting the PID block**. To make sure it is the **correct block**, the user should not rely on the order in which the blocks are in the tree, but always check the **ID** of the block.

3. Then, the following window will appear:

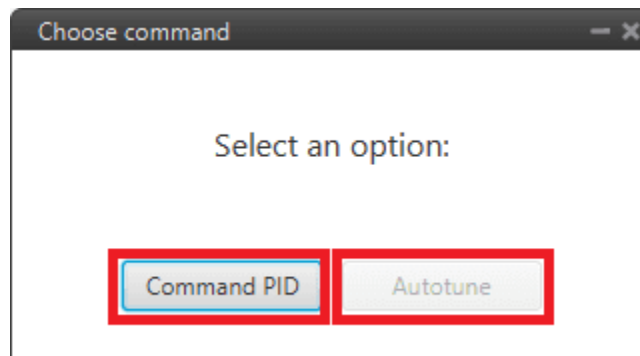


Fig. 14: Tuning options

The 2 options shown in the figure allow the user to choose between **manually entering** the PID gains values or letting Veronte Autopilot 1x calculate the gains **automatically**.

Danger: The user should not select the **Autotune** option as it is under development and there are known issues with it.

- **Command PID:** In this panel users can modify the values of the **PID gains** and the **type** (standard or parallel).

Depending on the **PID block** selected, this panel is different:

- **PID Static block:**

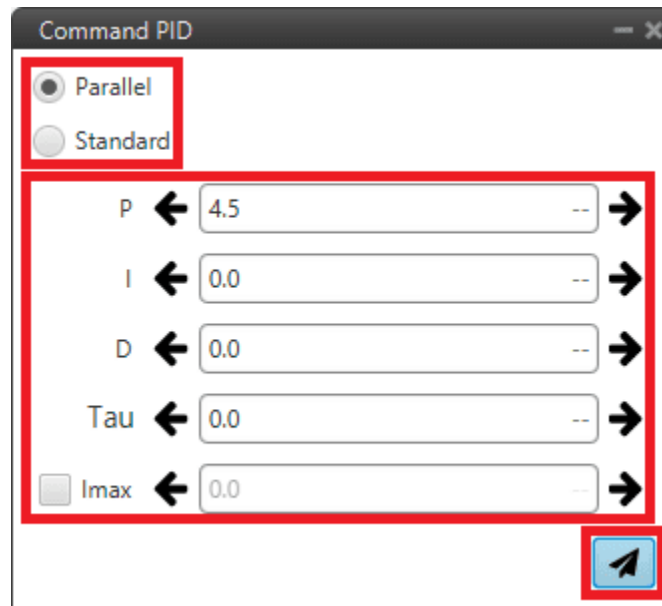


Fig. 15: Command PID panel - PID Static block

- * **Type:** Parallel or Standard type can be selected.
 - * Users can increase or decrease each of the **P/I/D**, **Tau** or **Imax** gains.
- **Tsched PID block:** As in the Tsched PID block configuration the gains are adjusted for each of the values in the table, this panel also reflects this table with the values so that the gains can be adjusted for each of them:

The screenshot shows the 'Command PID' panel with the following data table:

	Kp	Td	Tau	TI	TA	Uf	I _{max}	BetaP	BetaD
2.0	2.0000	0.2000	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
3.4285715	1.1667	0.1167	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
4.857143	0.8235	0.0824	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
6.285714	0.6364	0.0636	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
7.714286	0.5185	0.0519	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
9.142858	0.4375	0.0437	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
10.571428	0.3784	0.0378	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000
12.0	0.3333	0.0333	0.0000	0.0000	0.0000	0.0000	-1.0000	1.0000	1.0000

Below the table, the control mode is set to **Parallel**. The manual input fields are:

- P: 2.0
- I: 0.0
- D: 0.2
- Tau: 0.0
- I_{max}: 0.0

Fig. 16: Command PID panel - Tshed PID block

For more information on these parameters, please refer to [PID -> Control blocks](#) section of the **1x PDI Builder** user manual.

- **Autotune:** Autotuning allows the user to find automatically the PID controller gains.

Note: In the figure above (*Tuning options*), the **Autotune** option is shown as disabled because the **command autotune** for this block has not been activated in the **1x PDI Builder** software.

For more information, see the [Control blocks](#) section of the **1x PDI Builder** user manual.

4. Finally, after making the modifications, press the **send** button to update Autopilot 1x with the new values.

In addition, if the values are sent correctly, the following message will appear:

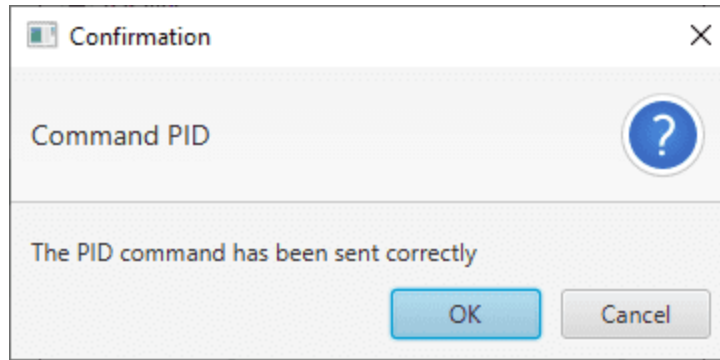


Fig. 17: Command PID message