1x PDI Tuning

Release 6.8.71

Embention

2023-08-02

CONTENTS

1	Quick Start	3
	1.1 Download	
	Operation 2.1 Tuning	9 14

)>< POING

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

CHAPTER

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:

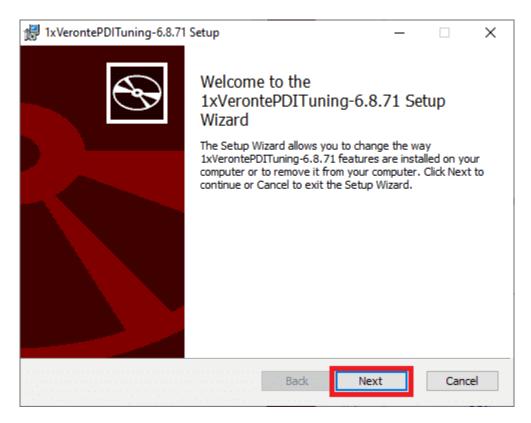


Fig. 1: Windows Installation - Step 1

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

₩ 1xVerontePDITuning-6.8.71 Setup —		\times
End-User License Agreement		
Please read the following license agreement carefully		S
		_
END USER LICENSE AGREEMENT		^
(EULA)		1.
IMPORTANT: Please read the product terms and conditions that	t	
follow, before downloading, installing, copying or using the		
product, it is important that you read and understand this		
document in its entirety. BY DOWNLOADING, INSTALLING, COP OR USING THE SOFTWARE, YOU DECLARE YOUR CONSENT TO TH		
TERMS AND CONDITIONS.		~
☑ I accept the terms in the License Agreement		
. Print Back Next	Can	cel _{I I}

Fig. 2: Windows Installation - Step 2

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

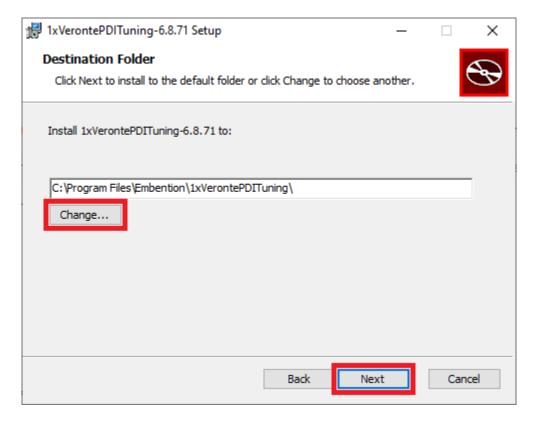


Fig. 3: Windows Installation - Step 3

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

😹 1xVerontePDITuning-6.8.71 Setup	_		×
Ready to install 1xVerontePDITuning-6.8.71			Ð
Click Install to begin the installation. Click Back to review installation settings. Click Cancel to exit the wizard.	or change any of yo	ur	
Back	Install	Can	cel

Fig. 4: Windows Installation - Step 4

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

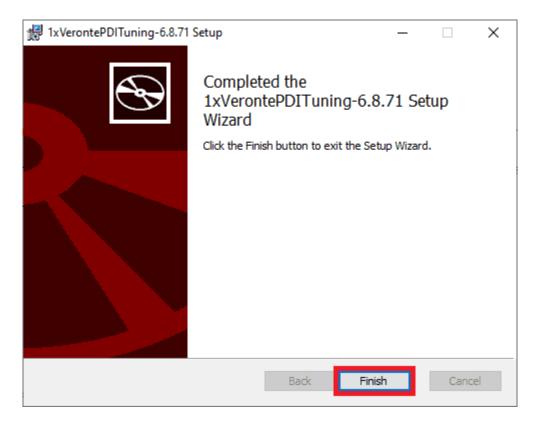


Fig. 5: Windows Installation - Step 5

U	have any problems with the ir rus depends on the antivirus s		please disable the antivirus and	the Windows	s fire	wall.
	II, go to "Control Panel" \rightarrow "ows Defender Firewall on or o	•	Security" \rightarrow "Windows Defendence	der Firewall"	and t	then,
📽 Windows Defender Firewall						×
← → ∽ ↑ 💣 « System an	d Security > Windows Defender Firewall	~ Ŭ	Search Control Panel			م
Control Panel Home Allow an app or feature through Windows Defender	Help protect your PC with Windows D Windows Defender Firewall can help to prevent he through the Internet or a network.					
Firewall Change notification settings	Private networks					
Turn Windows Defender Firewall on or off	Guest or public networks		Not connected \bigcirc			
Restore defaults						
Advanced settings						
Troubleshoot my network						
	Fig. 6: Wi	ndows Defe	ender Firewall			

CHAPTER

TWO

OPERATION

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

IxVeronte PDI Tuning - (v.6.8	.71)	-		×
1				
	Open menu			
Not connected		Not selected		•
		Not selected 1x v4.8 4086 (6.8.1	126)	

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.

📧 1xVeronte PDI Tuning	- <mark>(</mark> v.6.8.71)			-	×
)> •< 5		 		
		Open menu			
Not connected			Not selecte	ed	•
	Fig. 2: 1x PDI 7	Funing - Device not	connected		

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

1xVeronte PDI Tuning - (v.6.8.71)			_		×
)ን-‹ 두	DI UNING	ŧŧŧ			
	Open menu				
Normal mode		1x v4.8 408	36 (6.8.12	26)	*

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:

1 2	3450
1xveronte PDI Tur ing Restart Exit PDI Mode	Select 🤊 📥
	Select 🥑 🖬
Navigation	
Guidance Track	
Guidance Yawing	
Guidance Hold	
Stick	
Pitching	
Thrusting	
Rolling	
Yawing	
Battery level	
Control to servo	

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:

Restart Veronte		×
Veronte will be restarted. Do you wa	nt to continue?	
You will lose Veronte for a moment		
Veronte name: M600WP Actual phase: INI		
	Yes	No

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:

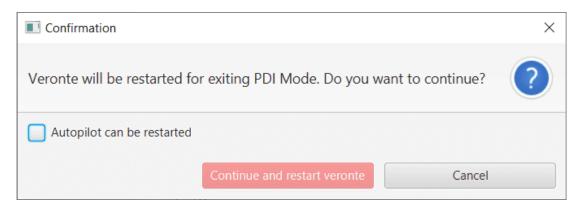


Fig. 6: Exit PDI mode confirmation message

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.

Changes			- ×
Timestamp	ld	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
<u>.</u>			and the second second
			and the second second
			i

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 indentifier 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



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.

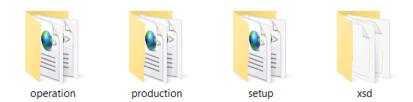


Fig. 8: Exported configuration - PDI files

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.

FeedBack	- ×
Send us you	ır feedback
Repo:* 1xVero	onte
🛓 Download	O Send

Fig. 9: Feedback

2.1 Tuning

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

1xVeronte PDI Tuning
Restart Exit PDI Mode
Navigation
Guidance Track
Guidance Yawing
Guidance Hold
Stick
Pitching
Thrusting
Rolling
Yawing
Battery level
Control to servo

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.

1xVeronte PDI Tuning	– ×						
Restart Exit PDI Mode Select Select							
Navigation	▼ Phase switch between several batches of blocks						
Guidance Track	▼ Default case: Standby, Ready, Init						
Guidance Yawing	Real constant						
Guidance Hold	 Hover, Takeoff, Landing, Cruise, Hold, Return to Home, Rendezvous 						
Stick	Read: Desired q (Angular Velocity - Y Body Axis)						
Pitching	Read: Pitch						
Thrusting	Read: Control Output u1						
Rolling	Read: q (Angular Velocity - Y Body Axis)						
Yawing	Phase switch between several batches of blocks						
Battery level	Default case: Hover, Takeoff, Landing, Cruise, Return to Home						
Control to servo	Read: Desired Front Ground Velocity						
	Read: Front Ground Velocity						
	Read: Desired Pitch						
	PID Static. IDs: 10						
	▼ Hold						
	Read: Desired Pitch						
	▼ Rendezvous ~						

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:

1xVeronte PDI Tuning	- ×				
Restart Exit PDI Mode	Select 🤊 🛓 🛛				
Navigation Guidance Track	 Default case: Hover, Takeoff, Landing, Cruise, Return to Home Read: Desired Front Ground Velocity 				
Guidance Yawing Guidance Hold Stick	Read: Front Ground Velocity Read: Desired Pitch				
Pitching Thrusting	PID Static. IDs: 10 ▼ Hold Read: Desired Pitch				
Rolling Yawing	✓ Rendezvous Read: Desired Front Ground Velocity				
Battery level Control to servo	Read: Front Ground Velocity Read: Desired Pitch				
	PID Static. IDs: 2 PID Static. IDs: 11 PID Static. IDs: 12				
	Write: Desired q (Angular Velocity - Y Body Axis) Write: Desired Pitch				
	Write: Control Output u1 Before Servo Saturation				

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.

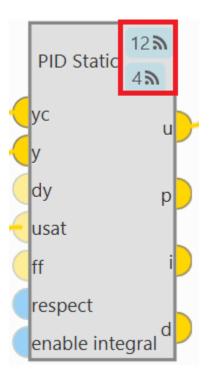


Fig. 13: PID block enable

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:

Choose command	—	×
Select an	option:	
Command PID	Autotune	

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:

Command PI)	- x
Parallel		
Standard		
₽ ←	• [4.5]	→
. €	• 0.0	÷
▷ ←	• 0.0)	→
Tau 🗲	• 0.0)	→
📄 Imax 🗲	0.0	→
		1

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:

Comman	d PID								
	Кр	Td	Tau	TI	TA	Uf	lmax	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
		Standa	rd						
	P	←	2.0						
	I.	4	0.0						
	D	4	0.2						
	Tau	+	0.0) →	
	max	←	0.0					-→	
									1

Fig. 16: Command PID panel - Tsched 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:

Confirmation	×
Command PID	?
The PID command has been sent correctly	
ОК	Cancel

Fig. 17: Command PID message