1x PDI Tuning

Release 6.12.54

Embention

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

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Quick Start Operation Integration examples Troubleshooting	Veronte Link		
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	Veronte Link interconnects multiple control st	ations and autopilot units, so they can operate simultaneous	siy.

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 Autopilot 1x 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 of the *Setup Wizard*.

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" \rightarrow "System and Security" \rightarrow "Windows Defender Firewall" and then, click on "Turn windows Defender Firewall on or off".

📽 Windows Defender Firewall			-		×		
← → × ↑ 📽 « System and	d Security > Windows Defender Firewall	Search Control Panel			٩		
Control Panel Home	Panel Home Help protect your PC with Windows Defender Firewall						
Allow an app or feature through Windows Defender	Windows Defender Firewall can help to prevent hackers or m through the Internet or a network.	alicious software from gaining access to your PC					
Firewall Change notification settings	Private networks	Connected 📀					
Turn Windows Defender Firewall on or off	Guest or public networks	Not connected \odot					
Restore defaults							
Advanced settings							
Troubleshoot my network							
	Fig. 1: Windows	b Defender Firewall					



CHAPTER

TWO

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.

1xVeronte PDI Tuning			-	\times
))/(781/11/10G	† <u>†</u> †		
	Open menu			
Not connected		Not selecte	d	•
	Fig. 2: 1x PDI Tuning - Device not c	onnected		

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:

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

Fig. 4: Initial menu

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

The tuning procedure is detailed in the *Tuning - Operation* section of this manual.

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

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

Changes			x
Timestamp	ld	Block	Command Type
2024-01-11 17:24:29.109	10	PID Static	PID gain change
2024-01-11 17:25:03.587	10	PID Static	PID gain change
2024-01-11 17:25:08.495	10	PID Static	PID gain change
2024-01-11 17:25:11.588	10	PID Static	PID gain change
	1000		
			i

Fig. 5: History panel

To make it easier and quicker for the user to identify each record, the history has 4 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 Autopilot $1x \rightarrow PID$ gain change. For more information on this command, see *Tuning Operation* section of this manual.

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

3. **Export configuration** button: By clicking on it, the current *Blocks configuration* saved in the Veronte Autopilot 1x will be stored in the selected folder.



Fig. 6: Exported configuration - PDI file

4. 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.

If the user has any questions about this Joint Collaboration Framework, please see Joint Collaboration Framework user manual or contact sales@embention.com.

FeedBack –	- ×
Send us your feedback	
Repo:* 1xVeronte Title:	
🛓 Download 🕥 Send	

Fig. 7: Feedback

2.1 Tuning

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

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

Fig. 8: 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	- >	¢
	Select 🦻 📩 🕒	
Navigation	Phase switch between several batches of blocks	â
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 u0	
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. 9: 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	— ×
	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 u0
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. 10: **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. 11: 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 - Block Programs 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. 12: Tuning options

Command PID: In this panel users can **manually entering** 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	PID	- ×
Parallel Standa	d	
Р	€ 4.5]≯
Т	€ 0.0]→
D	€ 0.0]→
Tau	€ 0.0]→
lmax	€ 0.0]→
		1

Fig. 13: 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								een 🏅
	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
	C	Paralle	1						
		Standa	ard						
	Р	÷	2.0					→	
	I.	←	0.0						
	D	4	0.2						
	Tau	÷	0.0						
	0.0					→			
									1

Fig. 14: Command PID panel - Tsched PID block

For more information on these parameters, please refer to PID - Control blocks of the **Block Porgrams** 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	Cancel

Fig. 15: Command PID message

CHAPTER

THREE

SOFTWARE CHANGELOG

Improved

• Safer Veronte Autopilot 1x operation: users are not allowed to switch to maintenance mode or restart Autopilot 1x during tuning operation

Changed

• Autotune option temporarily disabled