
foo Documentation

Release 4.0.1-dev

ugkg

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Contents

1 Disclaimer	3
2 Notices	5
3 Legal status and copyright	7
4 Installation	9
4.1 New installation	9
4.2 Upgrade notes	11
4.3 USB & File-system	11
5 Reporting Bugs	13
6 A Note About this Manual	15
7 Main Page	17
7.1 Safety System	17
8 Navigating	19
8.1 Navigating with the physical buttons	19
9 Transmitter Menu	21
9.1 Transmitter config	21
9.2 Channel monitor	23
9.3 Input Monitor	24
9.4 Telemetry monitor	25
9.5 Range Test	25

Deviation is a replacement firmware for the Walkera Devention™ series (Devo) transmitters. The primary goal is to add support for multiple protocols, opening the full potential of this platform. The core of the deviation firmware is the mixer system, which is modeled after the system used in the Er9X firmware for the Turnigy/Flysky9x™ transmitters.

Deviation also brings USB file-system support, making it easy to manage the transmitter from any PC without the need for specialized upload/download tools.

Deviation has been designed for ultimate configurability. All model and transmitter configuration is controlled through text files which the firmware (or user) can read and write. It is easy to know exactly what is configured, as well as to modify the configuration either through the transmitter or with a text editor. The main screen is very customizable; any mix of inputs, switches, channel data, or timers can be displayed, and configured per-model.

Deviation supports multiple protocols without any modifications to the transmitter:

- Walkera Devo 6/7/8/10/12
- Walkera WK2401 / WK2601 / WK2801
- DSM2 / DSMX
- Nine Eagles J6 Pro (requires telemetry module)

Deviation can support other protocols with very easy transmitter modifications (appropriate transceiver module needed):

- Flysky (also for WLToys V911, V9x9, and Xieda 9938)
- Hubsan-X4
- Skyartec
- V202
- SLT
- HiSky

Deviation supports (flight) simulators connected via DSC cable (PPM) or USB cable (USBHID). Deviation also allows Buddy-Box and FPV setups.

Deviation can store up to 255 different models, and uses a portable syntax that allows sharing models between any transmitter supported by Deviation.

Deviation has been internationalized and comes with translations for English, Afrikaans, Traditional Chinese, Dutch, Spanish, French, German, Hungarian, Italian, Romanian, Russian and Chinese. New languages can be added by installing the proper translation file.

Disclaimer Deviation is experimental software. There are no guarantees made or implied about the quality or reliability of this software. RC models can cause

serious injury or even death if flown improperly. By deciding to use the Deviation software, you are taking sole responsibility for the control of your models. The authors of Deviation will not be held responsible for any injury or damage whatsoever caused by the use of the Deviation firmware. Be careful and cautious.

Notices Deviation is an independent work. The Deviation project is not affiliated, supported or acknowledged by Walkera®. The authors have never been in contact with Walkera nor do they know of Walkera's stance on this project. The Deviation team provides no guarantee that the Deviation firmware will not harm your transmitter (although this should not be possible). There is also no guarantee that Walkera® will not make changes to future versions of the hardware, firmware of Dfuse tool which would make it incompatible with Deviation.

Legal status and copyright This project is free software: you can redistribute it and/or modify it under the terms of the GNU General Public License as published by the Free Software Foundation, either version 3 of the License, or (at your option) any later version.

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You should have received a copy of the GNU General Public License along with Deviation. If not, see www.gnu.org/licenses.

The Deviation Project is hosted at www.deviationtx.com and the Source are available at <http://bitbucket.org/deviationtx/deviation>.

Installation

I New installation

Installation of Deviation is done in exactly the same manner as upgrading the Walkera Devention firmware. Note that Deviation will **NOT** overwrite Walkera models stored on the transmitter. While they cannot be accessed by Deviation, they will be safely preserved should the Walkera firmware ever need to be reinstalled

NOTE: As a result of memory limitations with the Devo12 firmware, the original models will be lost when switching to Deviation.

First download and unzip the deviation-dev0XX-x.y.z.zip firmware from <http://www.deviationtx.com/repository/Deviation-Releases/> where XX is the number of your Walkera

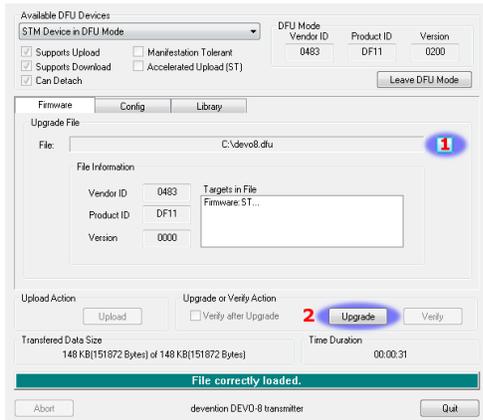
Devo™ transmitter. x.y.z identifies the deviation version number. Normally you should use the latest one.

Upgrading is done using the Walkera ‘DfuSe USB Upgrade’ tool for Windows. You can download this tool directly from Walkera:

<http://www.walkera.com/en/upload/upgrade/DevoDfuSe%20V2.0.zip>

NOTE: Do NOT attempt to use the DfuSe tool from STMicroelectronics!

Unzip the upgrade tool and install locally. It is recommended that you test the DFU tool by first upgrading your TX to a different version of Walkera firmware.



Plug the transmitter into the PC via USB, and turn on the transmitter while holding ‘EXT’ to enter programming mode. On the Devo12, this is done by holding the trainer switch instead.

Several users have reported compatibility issues with Windows™ and/or USB ports when running this tool. If Dfuse do not recognition your TX, try removing all USB devices and restart your PC with only the USB connection to the TX.

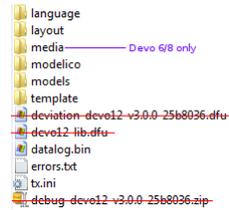
If your transmitter has been connected correctly ‘STM Device in DFU Mode’ will be displayed under ‘Available DFU Devices’. Otherwise this field will remain blank.

- 1) Press the ‘...’ button and select the deviation-devoXX-vx.y.z.dfu file to install.
- 2) Select ‘Upgrade’ to install the firmware. This will be grayed-out if your transmitter is not detected. **Do NOT use ‘Upload’ as this will destroy the dfu file on your PC.**
- 3) **Devo12 Only:** Select the ‘Library’ tab, click ‘...’ select the devo12-lib.dfu from the zip file. Then select ‘Upgrade’ again to install the library.

Turn off the transmitter, and turn back on while holding ‘ENT’. There should be a USB logo on the screen. If

this is a first-time install of Deviation, the PC should prompt to format a drive. Format using default options.

Open the folder of the zip and copy all the files and directories inside this folder to the root of the transmitter USB drive. For details of the file-system please see [USB & File-system](#). The files with the extension zip, and dfu need not to be copied.



II Upgrade notes

If you are upgrading from a previous Deviation release, it is strongly recommended that you back-up the ‘models’ directory from the transmitter as well as the tx.ini file to ensure you don’t lose any model or transmitter configuration. Copy all directories except for the ‘models’ directory and the tx.ini file to the transmitter. Optionally, copy the ‘models’ directory to the transmitter except for the currently configured model files. This last step will ensure that the defaults for newly created models have the latest options set. If the tx.ini file is overwritten, the stick calibration must be repeated and any settings reset.

III USB & File-system

Deviation stores all configuration, bitmaps, and models as regular files on the USB file-system. USB can be most easily enabled by holding down the ‘ENT’ button while powering up the transmitter. Files can then be easily copied to or from the transmitter.

The directory structure is as follows:

\tx.ini	Transmitter configuration. Includes trim settings, calibration data, and the last-used model number
\errors.txt	If the firmware crashes or reboots, debug information will be stored in this file
\data-log.bin	File for telemetry data
\media\config\transmitter	The color scheme and fonts for the transmitter
\media\sound.ini	Contains notes to play for various alarms
\media*.bmp	Images used for the current transmitter theme
\media*.fon	Font files
\models\default\clear	The default model, loaded whenever a model is cleared
\models\model\definition	Configuration files for each model. Due to a limitation in the firmware, deviation cannot create new files. It is therefore necessary to have a modelxx.ini for each model regardless of whether it is currently in use.
\models*.ico	All available model icons (96x96 pixels is recommended but not required). Model icons must be saved as 16-bit BMP files in either RGB565 (non-transparent) or ARGB1555 (transparent) format.
\templates*.pr	Configuration files used when loading predefined templates. These are nearly identical to the model configuration files, however they do not necessarily define all parameters
\language\lang*.txt	Language translation files. These are UTF-8 files containing the English string and the respective translated string.

Note: Deviation only supports 8.3 style file names. That means file names should be no larger than 'xxxxxxxx.yyy'**

Reporting Bugs Nobody is perfect.

This firmware has been developed carefully and has been successfully tested by many users around the world. Nevertheless under some circumstances it could happen that the transmitter does not work as you expect. Sometimes this behavior will be a handling problem and sometimes a real bug. Do not hesitate to ask the community at <http://www.deviationtx.com/forum>. Please bear in mind that the firmware can only improved with your help.

If you find a bug in Deviation, please report it here: <http://www.deviationtx.com/mantisbt>

You will need to register for an account on the Deviation

forums to submit a bug. That account will also allow you to communicate with the Deviation community, and will enable you to get email updates when the bug is updated/fixd.

Please provide as much information as possible in your ticket. Include: * Build version (you can find this on the 'USB' page of the transmitter) * Did you compile yourself, or download the dfu? * Type of transmitter (Devo8, Devo7e, Devo8-emulator,...) * Have you tried reproducing this on the emulator? * Is this easily reproducible? If so, please provide step-by-step instructions * What protocol are you using? * If your transmitter rebooted, please provide the errors.txt on the root file-system of the transmitter along with the 'debug-dev0???.zip file that came with the dfu

The more detail you can provide, the faster fixing the issue will be.

A Note About this Manual The images in this manual will generally show the Devo7e/10/12E interface. In some cases the Devo7e may not support a given feature or the screen may be slightly different. Situations where the Devo7e, 10, or 12E behave differently will be noted accordingly.

Main Page The standard main page layout is as follows:

Current Model: The name of the current model. Clicking the label will open up the Model Load page. The model is configured from section '**Model setup (Std & Adv GUI)**'.

Battery Voltage: Numerical representation of current transmitter battery state.

Transmitter Power: This indicates the currently selected transmitter power. It is configured from section '**Model setup (Std & Adv GUI)**'.

Current Time: This indicates the current time (on Devo12 transmitters only). The time is set from section '**Transmitter config**'.

Model Icon: An image representing the current model. It is configured from section '**Model setup (Std & Adv GUI)**'. Pressing the icon will take you to that page.

Trims: The trim display can be configured to show up to 10 different horizontal and vertical trims.

Displays: These items can be text-boxes containing input, channel, telemetry, or timer data; bar graphs displaying channel data; or icons / toggles displaying specific states (ex. gear, flaps,...).

Quick Menus: Quick menus can be reached via a long UP/DN press. They can be defined from section 8.7 Main page config (Std & Adv GUI).

IV Safety System



Deviation has a safety system to prevent starting up in a dangerous state (for instance spinning up the main rotor of a helicopter accidentally). The safety system works by verifying that specific conditions are met before starting to transmit to the model. By default the output channel associated with the throttle stick must be minimum. The Deviation firmware does not include a mechanism to define new safety conditions, however, they can be added by directly modifying the model.ini file. While the safety message is displayed, the transmitter will not communicate with the model. This message may appear either when initially turning on the transmitter, or when switching to a different model. The message will disappear automatically once all safety conditions have been met or when 'OK' is pressed. In either case, Deviation will start communication with the model once the dialog is dismissed.

Navigating The transmitter menus can be navigated via the physical buttons UP, D(ow)N, L(eft), R(ight), ENT(er), EX(i)T. All buttons and switches have been marked with the same descriptions as used in this manual.

The main menu is accessed by pressing 'ENT' on the main menu.

There are two types of spin-boxes available: 1. Spin-boxes consisting of both arrows and an oval may act both as spin-boxes (for selecting a value) and as a button (which can have various effects). 2. Spin-boxes that contain only arrows and no oval do not act as buttons, and are only used for value selection. Note that a spin-box may change between being pressable or not for different values of the spin-box.

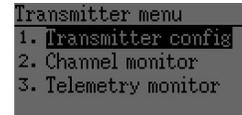
V Navigating with the physical buttons

- On all menu pages, 'UP' and 'DN' are used to navigate to the previous/next item.
- The 'R+' and 'L-' buttons are used on spin-box widgets to increase or decrease the selected value. In some cases holding down the button will use larger step values to move more quickly to the desired value.

- For buttons and rounded-spin-boxes, pressing ENT' will press the button,
- Pressing 'EXT' will remove selection from the current item. A long-press of 'EXT' will exit one (1) menu level.

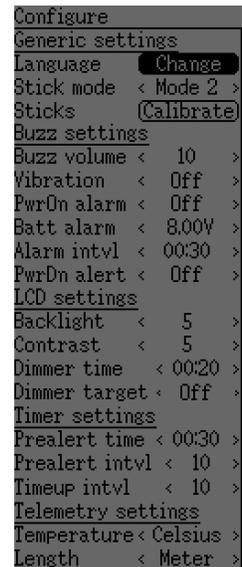
Transmitter Menu

VI Transmitter config



The configuration page defines various transmitter functions. It is entered from the main menu via 'Transmitter menu' followed by 'Transmitter config'. Please note that all screens in this section show the Deviation default settings.

VI-A Generic settings



Language: Select an appropriate language for all text.

Stick mode: Select one of Mode 1-4.

- Mode 1 is common in Europe. Elevator and Rudder on left, Throttle and Aileron on right.
- Mode 2 is common in North America. Throttle and Rudder on left, Elevator and Aileron on right.
- Mode 3 has Elevator and Aileron on left, Throttle and Rudder on right
- Mode 4 has Throttle and Aileron on left, Elevator and Rudder on right

Sticks: Calibrate the range of all analog sticks and dials.

To perform a stick calibration, highlight the Calibrate option and press the ENT button. Follow the on screen prompts for moving the sticks and confirming with the ENT button.

VI-B Buzzer settings

Power On alarm: Select the interval to be notified if your transmitter is on without action. Range is 0 – 60 minutes in 1 minute intervals.

Battery alarm: Set battery voltage at which alarm will sound. The voltage range is 3.30V – 12.00V in 0.01V increments.

Alarm interval: Set frequency of alarm when battery is low. Alarm intervals can be set from 5 seconds to 1 minute in 5 second intervals. It may also be set to Off.

Buzz volume: Set buzzer volume. Available range is 1 – 10; the buzzer may also be set to None.

Power-down alert: Play sound at power-down.

VI-C LCD settings

Backlight: Set screen brightness. Acceptable entries are from 1 to 10 and may also be turned off.

Dimmer time: Set delay before screen dimming. Times may be set from 5 seconds to 2 minutes in 5 second intervals. A setting of Off will force backlight to remain on as long as the transmitter is on.

Dimmer target: Set screen brightness when dimmed. Acceptable entries are from 1 to 10 and may also be turned off.

VI-D Timer settings

Prealert time: Time before timer reaches zero to start beeping. Acceptable entries are from 5 seconds to 1 minute in 5 second intervals and may also be turned off.

Prealert intvl: How often to beep before timer reaches zero. Interval may be set from 1 – 60 seconds and may also be turned off.

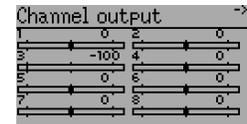
Timeup intvl: How often to beep once timer has expired. Interval may be set from 1 – 60 seconds and may also be turned off.

VI-E Telemetry settings

Temperature: Set units to display temperature for telemetry. Available options are Celsius and Fahrenheit.

Length: Set units to display length for telemetry. Selection choices are Meters and Feet.

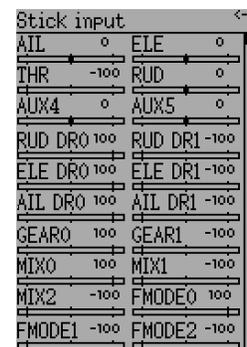
VII Channel monitor



The channel monitor screen allows the user to see the values of each channel as output by the transmitter. Channel output displayed is the value based on minimum / maximum values as well as scaling.

Example: A channel scaled from -60 to +60 will only display the range of values from -60 to +60 depending on the stick position.

VIII Input Monitor



The input monitor screen shows the values associated with the current position of the control points. The values shown are a percentage of the total range of the controls based on a -100% to +100% scale.

NOTE: Devo7e is limited to AIL, ELE, THR, RUD, HOLD0, HOLD1, FMODE0 and FMODE1.

IX Telemetry monitor

	Temp	Volt	RPM	->
1	100C	21.8V	14040	
2	9C	18.2V	4080	
3	85C	24.3V		
4	162C			

GPS			<-
Latitude:			
-26	-2	-57.	-28
Longitude:			
-578	-32	-56.	-682
Altitude:			
203720.480m			
Speed:			
211306.996m/s			
Time:			
30:04:24	2044-03-26		

Certain protocols have the ability to transmit telemetry data back to the transmitter during use. Telemetry data may include, but is not restricted to, temperature readings, various voltage readings, motor or engine rpm, as well as GPS related information.

Telemetry data is turned off by default for all supported protocols except DEVO. See the corresponding 9 Protocols section to learn which protocols support telemetry, and identify which fields will be available.

Since each protocol differs in the type of data it can return please see the original equipment manufacturers documentation concerning what additional hardware may be needed to collect this data.

Until valid data is transmitted the values will all be inverted

X Range Test

```
Range Test
-----
Press ENT to start test
```

It is recommended that you range test a new model before flying it the first time to verify that you will be able to control the model at normal flying distances. At some clubs, this is required as a safety measure. The range test page allows this.

Once the range test page is opened, press the 'Start test' button to start the range test. The old and new power levels will be displayed. The standard procedure is then to walk about 30 meters away, and verify that you still have control of the aircraft. You can then press the 'Stop test' button to end the range test and restore the configured radio power level. Pressing the 'Ext' button to exit the page will also restore the power level.

```
Range Test
-----
Power reduced to 100uW
from 100mW
Press ENT to stop test.
```

The radio range will be reduced by the square root of the change in power level. So going from 100mW to 100uW represents a change of power of roughly 1000, or a range reduction of a factor of a little over 30. So the normal range test of 30 meters would indicate that you should be able to control the model out to 900 meters.

```
Range Test
-----
No range test possible.
```

The installed RF module used for the current model must have a PA. If that is not the case, or the power level chosen for the model is already at the minimum value, a message to that effect will be displayed.